INVENTUM ENGINEERING, PC

DRAFT

Alternatives Analysis Report

Riverview Innovation & Technology Campus

Brownfield Cleanup Program Site No. C915353

3875 River Road

Tonawanda, New York 14150

September 29, 2022

Revised May 20, 2024

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List of Acronyms and Abbreviations

AA	Alternatives Analysis
AAR	Alternatives Analysis Report
ACM	Asbestos Containing Material
AJD	Approved Jurisdictional Determination
AMSL	Above Mean Sea Level
AOI	Area of Investigation
AST	Aboveground Storage Tank
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below Ground Surface
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CO_2	Carbon Dioxide
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CBS	Chemical Bulk Storage
CCR	Construction Completion Report
cm/s	Centimeters per second
COG	Coke Oven Gas
CPP	Community Participation Plan
CSM	Conceptual Site Model
DOT	Department of Transportation
DOW	Division of Water
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
EDI	Earth Dimensions, Inc.
EIMS	Environmental Information Management System
EQ	Equalization
EWP	Excavation Work Plan
FER	Final Engineering Report
FS	Feasibility Study
ft bgs	Feet below ground surface
ft-amsl	Feet above mean sea level
FWRIA	Fish and Wildlife Resources Impact Analysis
GHG	Green House Gasses
HASP	Health and Safety Plan
HDPE	High-density polyethylene
HSA	Hollow-Stem Auger
IDW	Investigation Derived Waste
IHWS	Inactive Hazardous Waste Site
ISCO	In situ Chemical Oxidation
ISS	In situ Solidification
IRM	Interim remedial measure
Koc	Organic carbon partition coefficient

Kow	Log octanol-water partition coefficient
MCC	Maximum Concentration of Contaminates
mg/kg	Milligrams per kilogram
mL/min	Milliliters per minute
MS/MSD	Matrix spike/matrix spike duplicate
MW	Monitoring Well
NA	Natural Attenuation
NAPL	Non-aqueous Phase liquid
ng/L	Nanograms per liter
NWI	National Wetland Inventory
NYCRR	New York Codes, Rules, and Regulations
NYSDOA	New York State Department of Agriculture
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
ORP	Oxidation Reduction Potential
OSC	Ontario Specialty Contracting
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PBS	Petroleum Bulk Storage
PCB	Polychlorinated biphenyls
PEM	Palustrine Emergent
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization detector
POTW	Publicly Owned Treatment Works
Powers	Powers Coal and Coke, LLC.
PPE	Personal protective equipment
PRAP	Proposed Remedial Action Plan
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
RA	Remedial Action
RAO	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
RIR	Remedial Investigation Report
RITC	Riverview Innovation & Technology Campus, Inc.
RIWP	Remedial Investigation Work Plan
ROD	Record of Decision
RQD	Rock Quality Designation
SB	Soil Boring
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SGV	Standards and Guidance Values
SMP	Site Management Plan
SMR	Site Management Report

SPDES	State Pollutant Discharge Elimination System
SRIWP	Supplemental Remedial Investigation Work Plan
SS	Surface Sample
SSDS	Sub-Slab Depressurization System
SVOC	Semi-volatile organic compound
SVE	Soil Vapor Extraction
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCC	Tonawanda Coke Corporation
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCWG	Tonawanda Community Work Group
TOGS	Technical and Operational Guidance Series
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
ug/Kg	Micrograms per kilogram
ug/L	Micrograms per liter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U. S. Geological Survey
VISL	Vapor Intrusion Screening Levels
VOC	Volatile Organic Compound
W	Water Sample (Not Groundwater)
WOUS	Waters and Wetlands of the United States

Engineering Certification

I, John P. Black certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Alternatives Analysis Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31) that all activities producing the data were performed in full accordance with NYSDEC-approved work plans and any NYSDEC-approved modifications.

Respectfully Submitted,

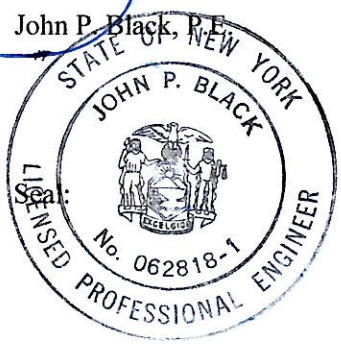
Inventum Engineering, P.C.

Date: May 20, 2024

John P. Black, P.E.

License No: 062818-1

Seal:



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1 Introduction

On behalf of Riverview Innovation & Technology Campus, Inc (RITC), Inventum Engineering, P.C. (Inventum) has prepared this Alternatives Analysis Report (AAR)for the RITC Brownfield Cleanup Program Site (BCP Site) located at 3875 River Road in Tonawanda, Erie County, New York (Figure 1-1). RITC is a volunteer under the BCP as it had no ownership or operational history at the facility until after it was purchased through the U.S. Bankruptcy Court. The coke making and by-products facilities were never operated by RITC. All work conducted for this AA was completed on behalf of RITC.

The BCP Site is listed as Site Number C915353. The BCP Site represents a portion of the former Tonawanda Coke Corporation (TCC) facility, which was an operating coke making and by-products facility for more than 100-years. TCC filed for bankruptcy protection in 2018 and all manufacturing on the BCP Site was permanently suspended in October 2018. On September 23, 2019, the sale of the former TCC properties to RITC was approved by the U.S. Bankruptcy Court and the purchase was completed October 10, 2019. On February 14, 2020, a Brownfield Cleanup Agreement (BCA) was signed by the New York State Department of Environmental Conservation (NYSDEC).

The AA was conducted in accordance with the BCP Agreement (Index No. C915353-02-20) between the NYSDEC and RITC dated February 14, 2020, and DER-10 Technical Guidance for Site Investigation and Remediation (May 2010). The Draft Remedial Investigation Report (Draft RI Report, Inventum, 2022) for the BCP Site was submitted to the NYSDEC on March 18, 2022, and a revision was submitted July 25, 2022. A second revision of the Draft Remedial Investigation Report will be submitted following the submission of this document.

The tax parcel[1] at 3875 River Road has been separated into three separate areas for the purpose of addressing legacy environmental conditions as shown on Figure 1-2.

- BCP Site No. C915353 encompasses approximately 86.5± acres and is the subject of this Alternatives Analysis (AA);
- Site 109 (Site No. 915055) is approximately 7.6± acres of the 3875 River Road tax BCP Site and Honeywell International, Inc. (Honeywell) is managing the investigation and remediation on that portion of the RITC Campus in accordance with an Administrative Order on Consent (Index No. B9-85-2-77D) with the NYSDEC dated February 14, 2020; and
- Site 110 (Site No. 915055) is approximately 4.8± acres of the 3875 River Road tax parcel and Honeywell is managing the investigation and remediation on that portion of the RITC Campus in accordance with an Administrative Order on Consent (Index No. B9-85-2-77D) with the NYSDEC dated February 14, 2020. For clarity, an additional portion of Site 110 lies on property owned by National Grid, east of the 3875 River Road property owned by RITC.

The third portion of Site No. 915055 located at 3800 River Road is being addressed under the State Superfund program as Site 108 (Figure 1-2). Honeywell is managing the investigation and remediation on that portion of the RITC Campus in accordance with an Administrative Order on Consent (Index No. B9-85-2-77D) with the NYSDEC dated February 14, 2020. For clarity, a portion of Site 108 lies on property owned by National Grid, west of River Road between property (of the same address) owned by RITC.

[1] For purposes of this and other documents the term “RITC Campus” refers to the approximate 120-acre Riverview Innovation & Technology Campus, Inc. (RITC) properties at 3875 (S-B-L 64.08-1-10) and 3800 River Road in the Town of Tonawanda. The “BCP Site” is the approximate 86.5-acre portion of the 3875 River Road tax parcel addressed by the BCP Agreement and this Alternatives Analysis.

1.1 Alternatives Analysis Objectives

The objectives of the AA are to evaluate the conditions identified by the comprehensive investigation of soil and groundwater at the BCP Site to identify as well as evaluate and propose alternatives to complete final Remedial Actions (RAs). The overall goals for the BCP Site are to create a remediated BCP Site that is protective of human health and the environment that can be safely redeveloped for commercial or industrial purposes. The remedial action will be a multi-track cleanup, with limited areas around the perimeter meeting Track 1, and the majority of the BCP Site meeting a Track 4 cleanup – restricted use with generic soil cleanup objectives (SCOs) based on the reasonably anticipated commercial use of the BCP Site. As a result of the recommended remedial action, more than 7 acres of the BCP Site are planned to meet Track 1 – unrestricted use, cleanup criteria.

1.2 AA Report Organization

This AA Report has been organized into the following sections:

Section 1 - Introduction
Section 2 - BCP Site Description
Section 3 - Summary of RI and Exposure Assessment
Section 4 – Remedial Goals and Remedial Action Objectives
Section 5 – Identification and Screening of Technologies
Section 6 – Development and Screening of Remedial Alternatives
Section 7 – Recommended Remedial Alternative
Section 8 - Schedule
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1.3 Contacts

A Citizen Participation Plan (CPP, Inventum, 2020a) has been followed throughout the management of the BCP Site and is also included as Appendix A to the Remedial Investigation Work Plan (Inventum 2020o). The CPP provides information on how information generated on behalf of RITC is being made available and how the owner and NYSDEC inform and involve the public during the remediation of the BCP Site.

Key contact information for NYSDEC, New York State Department of Health (NYSDOH), and Inventum is provided below for reference:

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A website has been established for the projects at the RITC properties and can be accessed through: www.RiverviewTechCampus.com. The website contains numerous documents and photographs that may help the reader envision the locations referenced throughout this report.

Copies of approved documents are sent in print and on compact disk to the Buffalo and Erie County Public Libraries, both the Central (Main) and Kenmore Branches:

- Buffalo and Erie County Public Library
  Central Library
  One Lafayette Square
  Buffalo, New York 14203
- Buffalo and Erie County Public Library
  Kenmore Branch
  160 Delaware Road
  Kenmore, New York 14217

The Draft Remedial Investigation Report and NYSDEC approved documents can also be accessed in the NYSDEC DECinfo Locator;
https://www.dec.ny.gov/pubs/109457.html

2 BCP Site Description and History

The BCP Site (Figure 1-2) represents former operating areas of the TCC. The TCC had a long history of environmental and safety violations and was closed in October 2018. The closure and shutdown of the facility eliminated the primary source of those environmental violations. The shutdown did not address residuals in buildings, containers, process equipment, or fill at the BCP Site. Control and remediation of the conditions left on the BCP Site by TCC have been, and are currently, the subject of numerous Interim Remedial Measures (IRMs) and are the focus of this AA.

2.1 BCP Site Location and Description

The BCP Site is located at 3875 River Road in the Town of Tonawanda, Erie County, New York (Figure 1-1). The BCP Site (Figure 2-1) occupies an area of approximately 86.5 acres of the approximately 120-acre RITC properties and consists broadly of the former production area (ex. battery, powerhouse, oil recovery, and by-products area) and coke and coal yards (described in the revised Draft RI Report, Inventum 2023). The former production area (AOI2, Figure 2-2) occupies approximately one-quarter, near the northwestern boundary, of the BCP Site. The coke and coal yards occupy nearly the southern one-half of the BCP Site. The balance of the BCP Site was a former railroad spur, stormwater and wastewater management areas, and areas used for parking. Rail lines that once serviced the facility and the former Wickwire Spencer Steel Mill, have largely been removed, with the largest concentration formerly located adjacent to the northern boundary of the BCP Site and east of the coal and coke yards. Much of the railroad equipment and infrastructure within the limits of the BCP Site, including the northern spurs, was sold in the post-bankruptcy auction, and were removed prior to RITC ownership.

The BCP Site (Figure 1-1) is in a heavily industrial area approximately 0.5 mile east of the Niagara River. The BCP Site is bordered to the:

- north by abandoned railroad lines, a closed reclamation facility/salvage yard (recently purchased by the Town of Tonawanda), a solid waste landfill within a quarter mile, and further north (>0.25-mile) by oil storage and refining operations and Interstate 190;
- east by Site 110 (Site No. 915055), high voltage power lines, and a commercial industrial area within a quarter mile and further east (>0.25-mile) by Grand Island Boulevard and Interstate 190;
- south by a high voltage electrical line easement, a major oil storage facility, and commercial/industrial operations within a quarter mile, further south (>0.25-mile) by more commercial/industrial operations, and a small residential community. The nearest residences to the BCP Site are located approximately 0.4-miles from the southern BCP Site boundary; and
- west by Site 109 (Site No. 915055), the former Allied Chemical Special Chemical Division facility (Tonawanda Plastics Site, 3821 River Road BCP Site, Site No. C915003), industrial operations (Vanocur), and Swift River Associates (an aggregate supplier). River Road is within a quarter mile of the BCP Site (contiguous with Site 109). Further southwest and west is Site 108 (Site No. 915055, at 3800 River Road), Niagara River World (heavy industrial and logistic operations) and an oil terminal, and beyond these industrial properties, the Niagara River.

2.2 BCP Site Background

Prior to the 2018 closure, the BCP Site was an operating coke making and by-products facility for more than 100-years. The facility was owned and operated from circa 1917 through 1947 by Semet Solvay Company, a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet Solvay Company was merged into Allied Chemical Corporation[2], which owned and operated the facility until 1978, when it sold

[2] Note: Allied-Signal acquired Honeywell in 1999. The combined/merged entity retained the Honeywell name.

the facility to TCC. TCC owned and operated the facility continuously from 1978 through October 2018. TCC filed for bankruptcy protection in 2018 and all manufacturing on the BCP Site was permanently discontinued. Between October 2018 and March 2020, the U.S. Environmental Protection Agency (USEPA) conducted emergency response activities to remove gases from pipes and tanks and treat waste- and stormwater. The USEPA continued to manage stormwater through May 2020. On September 23, 2019, the sale of the former TCC properties to RITC was approved by the U.S. Bankruptcy Court. The purchase was completed October 10, 2019. Management of the BCP Site and State Superfund Sites was transitioned from the USEPA to RITC between September 2019 and June[3] 2020.

RITC is a volunteer under the terms of the BCP Agreement signed on February 14, 2020 (NYSDEC, 2020a) as RITC had never conducted coking or by-product production operations on the BCP Site, had never operated any of the equipment that is presumed to have caused releases to the environment, had never disposed any waste on or previously from the BCP Site, had never conducted any commercial or industrial operations on the BCP Site, and has exercised all appropriate care since acquisition. Following approval of the BCP Agreement, RITC has conducted extensive site management, cleanup, and investigation activities in accordance with a series of NYSDEC approved IRM and RI work plans and has characterized the conditions at the BCP Site and arranged for the proper transportation and disposal of residual materials remaining from the TCC manufacturing period.

Manufacturing processes used at the plant have included coking, by-products recovery, light oil distillation, ammonia recovery, and benzene, toluene, and xylene extraction. Coke making involves the removal of gases, liquids (oils) and tar from coal by heating the coal in the absence of oxygen. The resulting carbon material "coke" was used, among other things, in foundries and for the production of steel.

The liquids and tars produced on the BCP Site were conveyed through pipes to onsite by-products facilities where they were processed for sale as raw materials or feedstocks. The management of these materials was the source of the majority of releases to the ground surface.

At the time of the RITC acquisition of the BCP Site, the facility buildings, equipment, and other infrastructure were in various states of deteriorating conditions. Since the acquisition, RITC has implemented a series of IRMs and is conducting associated maintenance and site management activities to eliminate potential threats and improve the safety and control of the remaining infrastructure, both within and outside the requirements of the BCP Program. Although not all demolition is regulated by the NYSDEC, RITC provides notices and weekly updates to the NYSDEC and NYSDOH on all BCP Site activities. The implemented and ongoing IRMs are eliminating safety hazards on the BCP Site and were selected and designed to address potential threats.

2.3 BCP Site Development

The RITC development project is designed to unlock the employment and tax generation capacity of the RITC Site (BCP and State Superfund) and allow overall RITC Campus development (3875[4] and 3800 River Road, Figure 1-2) to support multiple commercial and industrial tenants. The redevelopment strategy has been developed to integrate the RITC properties into the overall development of the region and is in compliance with the proposed zoning for the properties. The plans for this BCP Site will be coordinated with the ongoing development of the Town of Tonawanda. The key targets for this portion of the development area are commercial and industrial activities including, but not limited to, technology

[3] The USEPA managed surface water on the BCP Site until the NYSDEC approved RITC's current Storm Water Pollution Prevention Plan (SWPPP) in May 2020.
[4] Only a portion of 3875 River Road (Figure 1-2) is addressed under the BCP Agreement and this report.

components, data management, data users, and associated academic institutions. The RITC Campus properties will support commercial and industrial technology related facilities, offices, and other commercial use operations that are consistent with the potential long-term requirements of the final remedy.

2.3.1 Current Uses

The BCP Site is undergoing active maintenance, IRMs, and demolition activities. All current activities on the BCP Site are focused on site security, monitoring, maintenance, stormwater management, environmental investigations, IRMs, and demolition. The IRMs are focused on mitigation of safety hazards and potential exposure sources.

2.3.2 Future Uses

The RITC Campus properties occupy nearly 120 acres in the Town of Tonawanda. The development teams' vision is to coordinate closely with the Town of Tonawanda and local business leaders to create a sustainable integrated technology center with commercial and industrial facilities. The development will integrate with the larger regional effort to redevelop and revitalize stranded assets in the immediate surrounding areas along the River Road industrial corridor.

An environmental easement will be placed on the areas of the BCP Site that achieve Track 4 cleanup and, at minimum, will prohibit unpermitted groundwater use and uncontrolled subsurface excavations, and may include other institutional controls to protect commercial and industrial users of the BCP Site from potential exposure to the defined environmental impacts related to historical facility operations. A Site Management Plan (SMP) will define the procedures to be followed while redeveloping and maintaining the BCP Site. An Excavation Work Plan (EWP) will define the procedures to be followed while excavating on the BCP Site for foundations, utilities, and other subgrade construction.

2.4 Areas of Investigation

For purposes of managing the different conditions at the BCP Site, for the identification of specific areas of impact, and for ease of understanding during the AA; the BCP Site has been delineated with a grid (Figure 2-1) and subdivided into seven Areas of Investigation (AOIs, Figure 2-2):

- AOI1 – North Rail Corridor – Approximately 6.7 acres - The North Rail Corridor covers an approximately 100-foot-wide (Rows 1 and 2 of the grid) portion of the BCP Site from a gate at the northeast portion of the BCP Site to the former parking area (AOI3). AOI1 is bound to the north by; a closed fly ash landfill (unrelated to TCC or the BCP Site), a closed salvage yard formerly owned by the Erie County Industrial Development Corporation (sold to the Town of Tonawanda), and an abandoned rail corridor; to the east by National Grid high voltage transmission rights of way; to the south by AOI2, and to the west by AOI3.

  The north rail corridor located along the northern boundary of the BCP Site contains the space formerly occupied by abandoned rail spurs, a railroad scale and scale building, a two-story brick house (the "Mansion") that was utilized as office space, a large storm water sump ("mansion sump"), and excavated soil piles placed prior to RITC ownership. The Interim Site Management Work Plan April 2020 (Site Management IRM, Inventum 2020c, see Section 3.0) was implemented and has addressed miscellaneous debris/trash and abandoned equipment left by TCC and the auction salvage companies. As a result of completion of the IRM field work in the North Rail corridor, the area is now accessible and the potential for erosion of BCP Site related residuals is controlled.

  The mansion sump is the main collection sump for stormwater from the former production area. With the exception of the basement slab for the former office building (a/k/a the "Mansion"), the

mansion sump, the scale and former scale house slab, this AOI is unpaved and was heavily disturbed during the post auction (pre-acquisition) track and rail car removals. RITC has recovered the ties, most of the spikes and plates, the majority of the abandoned equipment and debris, and has regraded the surface to direct surface water to the storm sewer discharge systems monitored in accordance with the SWPPP.

In accordance with the approved Site Management IRM (Inventum 2020c) and the Site Management Work Plan, Scope 2, June 2020 (Site Management Scope 2, Inventum 2020g), the trash and abandoned equipment was organized and managed. As materials were inspected and approved by NYSDEC, the materials were properly disposed of, or recycled offsite.

- AOI2 – Former Production Area – Approximately 23.6 acres – The former production area AOI encompasses the area of the BCP Site where coke was produced, the by-products were separated and managed, and the boiler house and other auxiliary equipment was located. This area extends from the western boundary of Site 110 to the former parking area (AOI 3) and included the buildings used for heavy vehicle maintenance and the machine shop. Large areas of this AOI are paved, covered with building slabs, building remnants, process and storage tank foundation slabs, or covered by concrete lined secondary containment structures. Stormwater from this AOI is collected in two underground storm sewer systems (the box culvert and the North Storm Sewer System) and conveyed to the mansion sump and subsequently to two concrete lined settling and oil water separation ponds prior to discharge through the SWPPP Outfall #001. This stormwater system has been the subject of multiple phases of IRMs to remove the residuals left by TCC and improve water quality.

  Prior to 1998[5], storm and process water were discharged under permit to the Niagara River through pipelines that crossed the north BCP Site boundary westerly near the Mansion and then traversed the former Wickwire Spencer properties. The discharge location and associated ponds are not on the BCP Site, or any property owned by RITC, and therefore are not addressed in the RI or this AA. The pipelines had been plugged previously by TCC, and the integrity of the seals were confirmed during the abandoned pipeline IRM. The pipes were broken, separated by no less than 2 feet, and additional hydraulic seals were added by OSC during implementation of the abandoned pipeline IRM. Specific inspections were conducted to determine if there was or could have been flow along the outside of the pipes. No indication that there had been any flow along the pipes on the BCP Site or leaving the BCP Site toward the west was present.

  Asbestos containing materials (ACM)s were present throughout AOI2. Extensive removal of ACM was one of the major activities conducted during the first 18 months of RITC ownership. As required by the NYSDOL, a comprehensive ACM and universal waste survey was completed on the BCP Site, and a comprehensive ACM abatement program was conducted. The abatement program has been completed except for some painted surfaces containing ACM, and limited floor tiles in the office spaces.

  AOI2 contained the remaining coke oven battery (battery) and the largest number of tanks and process equipment. The battery has been properly demolished, and the remaining process equipment and above ground storage and process tanks located in this area of investigation were addressed in accordance with NYSDEC approved IRM Work Plans. There are no longer any above

[5] The final discharge pond was filled in 1998. The actual date the discharged stopped is unknown but is believed to have been in the mid- to late-1990s.



ground storage tanks, process vessels or above ground pipes in this AOI. Ongoing maintenance, monitoring, sampling, testing, and materials recovery and disposal are the subject of multiple ongoing IRMs in this AOI.

- AOI3 – Parking Lot – Approximately 5.8 acres - The parking lot AOI is the westernmost AOI between the north rail corridor, the former production area, the coke yard and the coal yard. This AOI represents the western downgradient (relative to AOIs 1, 2, 4 and 5) BCP Site boundary. The area comprising the Parking Lot AOI was acquired from Wickwire Spencer in the 1960s.

  The parking lot is an elongated area from north to south located on the western side of the BCP Site. The area varies in width but averages 150-feet wide and is largely within columns A to C of the grid (Figure 2-2). AOI 3 is bound to the west by Vanocur and Swift River (the offsite industrial properties to the west), the Town of Tonawanda compost facility (former recycling center/salvage yard) to the north, Site 109 to the south, and production and coal and coke yards AOIs to the east.

  The parking lot AOI contains a wood frame building that was historically and is currently used for office space. There were three structures on the southeast portion of the parking lot that were used for storage, employee locker/shower (demolished in 2021), and main electrical access. Additionally, there is a small fiberglass white shed abutting a grated sump (Grid Cell D25) that is the monitoring point for RITC's Industrial Sewer Discharge permit[6] (Town of Tonawanda Permit No. 331).

  No production operations are known to have occurred within this AOI. The area was largely paved with asphalt and concrete that is currently visibly cracked and rutted. Several underground utilities cross this AOI:

  - The North-South Storm Sewer conveys surface water from the mansion sump to the concrete-lined settling ponds on Site 109;
  - Former process, fire, and emergency water supply pipes crossed the north, or just north, portion of the AOI;
  - Two sealed former discharge pipes crossed the northern portion of the AOI, plugged by TCC and again by RITC in 2021; and
  - A gas line that serviced the former Wickwire Spencer Steel Mill crossed the AOI. This gas line was plugged by RITC in 2021.

- AOI4 – Coke Yard – Approximately 23.2 acres - The coke yard is in the middle of the BCP Site and includes(ed) the coke yard, coal crusher building (ACM abated and building demolished in 2021), coke screening building (demolished in 2021), the breeze crusher building (demolished in 2021), the coke laboratory trailer (demolished in 2021), the coke office trailer (demolished in 2021), the thaw shed, and the former coke rail yard and coke conveyor structure (partially demolished in 2021 and 2022). This AOI is surrounded by other AOIs and Site 110. AOI4 is unpaved apart from the slabs from the former coal crusher and breeze crusher buildings (both demolished in 2021).

  Sedimentation pool #003 is located within this area to collect and manage surface water. Powers Coal and Coke, LLC (Powers) conducted material recovery activities under approval of the Bankruptcy Court in portions of the coke yard. The current elevation of the coke yard is well below the grade that was present during the TCC operating period presumably due to the removal of coke by Powers. The discharge elevation of sedimentation pool #003 is below the grade of the

[6] Note: Permit No. 331 applies to the tax parcel, not only to the BCP Site.

surrounding access roads, maintaining the water surface below drainage, and therefore below the elevation that would allow overtopping.

Several pieces of abandoned coke handling and screening equipment were removed from the coke yard. An IRM was completed in 2021 to reconstruct the flow channel from the eastern portion of AOI4 to sedimentation pool #003 and allow access for removal of ACM panels from the coal handling (crushing) building. The east end of the coke yard has been graded and compacted to reduce erosion and transport of fine-grained materials to the surface water systems.

- AOI5 – Coal Yard – Approximately 16.2 acres - The coal yard is located south of the coke yard. The coal yard is the area where coal from suppliers (via barge, rail, and truck) was stockpiled prior to blending and use in the production process. There was a stacker/reclaimer/conveyor system (removed in 2020) that bisected and extended the length of the coal yard from west to east. The coal yard contains an engineered storm water collection ditch (the North Ditch) and sedimentation pool #002 in the northwest corner, which accepts flow from the North Ditch. The North Ditch conveys flow from the northern one-half of the coal yard and the adjacent coke yard. Flow, when present, from sedimentation pool #002 is directed through culverts and below grade conduits to the stormwater retention basin in AOI6 (Water Treatment).

  Powers conducted material recovery activities under approval of the U.S. Bankruptcy Court in the coal yard. The recovery left a significant above grade retention basin that was addressed by an approved IRM Work Plan.

  A coal conveyor tunnel (the "Coal Yard Tunnel") extended from the coal yard (Grid Cell AJ15) to a transfer station that fed a conveyer leading to the former coal crusher building (Grid Cell Y13, Building No. 63). The tunnel was flooded. The tunnel water was treated and discharged to the Town of Tonawanda under a supplemental approval to the BCP Site IWD Permit. The tunnel and the identified ACM has been addressed in accordance with NYSDOL requirements. A tar filled pipe was discovered in the coal yard tunnel and has been removed in accordance with the approved pipe protocol section in the demolition work plan. The removal and testing of the water from the tunnel allowed observation of the behavior and testing of the water quality in the eastern coal and coke yards. The groundwater yield is very low after the initial stored volume was removed and the water quality is good, requiring only limited settling and filtration before discharge. The coal yard tunnel was backfilled to prevent a long-term collapse risk.

  The coal yard also contains the former mixing pad (Grid Cells AE24 to AF24). The former mixing pad is a containment pad with a concrete floor and poured concrete walls. Historically, coal tar was transferred from the tar decanter hopper (in AOI2 - Former Production Area) and spill materials were brought to the mixing pad. The coal tar and spill materials were blended with coal (and potentially coke or breeze) on the mixing pad, and the mixture was then charged to the coke battery to recover additional by-products. The mixing pad was the subject of an IRM and has been decontaminated and closed with respect to its former use as a hazardous waste management area. The former mixing pad is now used for non-hazardous solid waste management. AOI5 is unpaved other than from the floor and sidewalls of the mixing pad and limited remaining sections of the former perimeter road.

- AOI6 – Water Treatment – Approximately 5.7 acres - The former water treatment area is located on the southwest corner of the BCP Site. There was formerly one metal building and two concrete block buildings (demolished in 2021) that were associated with the four large above ground storage



tanks (ASTs, ST21 through ST24) and one former small tank (ST20) located in this AOI (Figure 2-2). ST24 was demolished in 2022, ST21 through ST23 were closed under the approved AST IRM Work Plan.

The engineered stormwater sedimentation pool #001 is located in the northern portion of the water treatment area, and the storm water retention basin is located on the northwestern side of the AOI. Flow from sedimentation pool #001 is conveyed through an underground pipe system to the stormwater retention basin. Flow from the north ditch (via sedimentation pool #002) also enters the northwest corner of the stormwater retention basin. The discharge from the stormwater retention basin is through a below grade conduit which discharges to a small ditch just upstream of SWPPP Outfall No. 002. Outfall No. 002 is located on the western portion of the water treatment area at the BCP Site/Site 109 boundary (Grid Cell C32). The water treatment area contains a portion of a small approximately 0.75-acre of non-jurisdictional wetlands identified as part of the wetland and waterways assessment.

The four large ASTs within a secondary containment area were originally fuel and pentane storage tanks. The two large tanks (ST21 and ST22) in the western portion of the containment area were converted for use as components of TCC's process water treatment system. The converted tanks (ST21 and ST22) were used for equalization and neutralization (pH adjustment) of TCC wastewater prior to discharge to the Town of Tonawanda POTW. These treatment/equalization (EQ) tanks accepted process water via an above-grade piping system from the Ammonia/Lime Still located in the former production area (AOI2). The piping was removed in accordance with the approved demolition work plan. Acid for neutralization was originally fed from the smallest tank (ST20) in the AOI, but the use of ST20 was eliminated from the process at some point in favor of metering the acid from drums. This small tank (ST20) was inspected, found to be empty and removed in 2021. ST21, ST22, and ST23 contained multi-phase residual contents from the TCC operations. A layer of water was present over a non-aqueous liquid (NAPL) and wastewater treatment sludge. The water from ST21 and ST22 was pumped, treated, and discharged under permit to the Town of Tonawanda. ST21, ST22 and ST23 were emptied, decontaminated and the stabilized contents are disposed of offsite.

ST24 was a former pentane tank that contained a relatively thin layer of solid residuals (mostly steel scale). ST24 was demolished in May 2022 and the underlying soils were investigated in accordance with an approved sampling Work Plan. The soil samples representing the areas of impact contained, in varying concentrations; benzene, various PAHs and one contained Arsenic above the SCOs. A bioremediation IRM Work Plan is ongoing to evaluate the effectiveness of bioremediation for petroleum impacted soils at the BCP Site.

- AOI7 – South Drainage Area - Approximately 10.3 acres - The south drainage area is adjacent to the southern boundary of the BCP Site. No production processes are known to have occurred in this area but there were former rail lines, four abandoned rail cars (three rail tank cars were decontaminated and removed in 2021, one in 2023), and the South Ditch in this AOI. The South Ditch collects runoff from the southern one-half of the coal yard and the south drainage area. The south drainage area is largely unpaved except for the south drainage ditch access road which serves as a stormwater retention facility. The road prevents direct runoff from the coal yard. The runoff is retained behind the south ditch road until it reaches one of a series of catch basins that then directs the water to the south ditch. The pavement on the south ditch road was largely degraded at the time of the RITC acquisition and the surface has been reconstructed with recycled concrete.

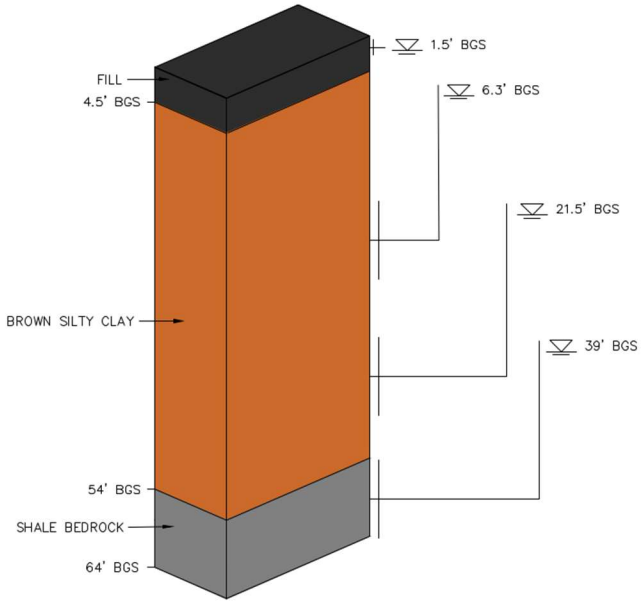


2.5 Topography

Topographical surveys of the BCP Site were conducted in November 2019 and March 2022 by Niagara Boundary and Mapping Services, a New York State licensed surveyor (Figure 2-3). The elevation of the BCP Site is generally flat with a slight downslope from east to west and north to south. Surface elevations range from approximately 608 feet above mean sea level (ft. AMSL) on the northeastern boundary (AOI1) to 600 ft AMSL on the southwestern boundary (AOI6), with some piles and local areas above 608 ft. msl. The average elevation of the former production area (AOI2) is approximately 606 ft AMSL. At the time of the 2019 topographic survey, the coal and coke recovery operations were ongoing and numerous piles of residuals from TCC that remained at that time have been removed. The entire surface of the BCP Site had been completely altered from its natural grade. All coal and coke recovery activities were completed in 2020, well before the 2022 survey. IRMs and ACM activities have continued since the 2022 survey, so the topography continues to evolve. As slabs are removed, the depressions are filled to grade using materials from the excavations or fill with similar properties, after notification of the NYSDEC. No original surface soils/elevations are believed to exist on the BCP Site. The 2022 topographic survey is used as the baseline for actions screened in this AA Report.

2.6 Geology

This description of the geology beneath the BCP Site and the larger regional geology is based on the test pit and drilling programs conducted as part of the RI (Inventum, 2022), regional studies conducted by others, boring/monitoring well log data from adjacent properties, historical knowledge and local experience. The geology of the BCP Site is remarkably uniform as detailed in the boring logs (Appendix B of the Draft RI Report) and as shown in a generalized schematic typical of BCP Site conditions below.



The schematic is to scale showing the relative thickness of clay between the fill and the underlying bedrock. The depths to groundwater shown on the right side of the schematic are typical although at several locations across the BCP Site there is no saturation in the fill.

Fill material overlies the native clay and till deposits across the BCP Site and is composed primarily of coal, coke, breeze and to a lesser extent silt, sand and gravel (reworked alluvium and glaciofluvial deposits) and miscellaneous debris (ex. wood and brick). The fill was the near surface material encountered in every

test pit and boring. Gravel-sized slag (nodules) fill appear to have been used as a base for the former rail beds and produce the most water of all materials encountered within the fill. Fill thicknesses (2- to 110-inches, average 54-inches) across the BCP Site were mapped and the mapping was based on ground surface elevations and depths to top of clay observed within the test pits (Figure 2-4). This data was used to contour the top of clay across the BCP Site. As anticipated, the fill was thicker within the former operational areas of the BCP Site (AOI2, AOI4, and AOI5) compared to the BCP Site perimeter.

A glacial lacustrine clay deposit consisting primarily of silt, sand, and clay appear to be the most widespread natural overburden deposits in the area of the BCP Site. Glacial till consisting of a poorly-sorted, non-stratified mixture of sand, silt, clay, gravel and rock fragments lies below the lacustrine deposit. The presence and depth of clay below the BCP Site was verified in all medium and deep boring locations at thicknesses in excess of 45-feet. Permeabilities for clay samples from the BCP Site were 3.3 x 10^{-8} centimeters per second (cm/s) and 2.1 x 10^{-8} cm/s. For reference this is a lower permeability than required for clay used in landfill bottom layer liner systems.

Inventum made a distinction between the clay and till deposits across the BCP Site based on stiffness, field estimation of moisture content, grain size, and plasticity. The upper clay generally extends across the BCP Site below the fill to depths of 20 to 30-feet bgs. The upper clay was typically described as a reddish brown to brown, very firm to stiff, dry to moist, low to medium plasticity, silty clay (lean clay [CL]). Several cores retrieved from the upper clay exhibited vertical desiccation cracks. The average permeability of the upper clay material was 3.3 x 10^{-8} centimeters per second (cm/s) from a thin-walled tube sample collected at MW-BCP-02 (14 to 16 feet bgs). This permeability is consistent with the results of 3.3 x 10^{-6} cm/s 2.9 x 10^{-8} cm/s reported in the *Supplementary Site Investigation (SSI) Report* dated July 1990 prepared by Conestoga-Rovers & Associates (CRA, 1990).

The lower clay extends below the upper clay to the top of the bedrock between 50 and 54-feet bgs. The lower clay was typically described as reddish brown to brown, soft to very soft, moist to saturated, high to very high plasticity, clay with trace rounded gravels. The average permeability of the sample of the lower clay material was 2.1 x 10^{-8} cm/s from a thin-walled tube sample collected at MW-BCP-01 (30 to 32 feet bgs). No desiccation cracks were observed in the lower clay.

The BCP Site is located within the Erie-Niagara drainage basin of the Erie-Ontario Lowlands Physiographic Province of New York, which is characterized by a thick sequence of rock formations consisting predominantly of sandstones, shales, dolostones, and limestones. The shale bedrock was encountered between 50 and 54-feet below ground surface (bgs) in the borings completed for the four bedrock monitoring wells installed during the RI (MW-BCP-01D, MW-BCP-03D, MW-BCP-05D, and MW-BCP-21D). The bedrock encountered below the BCP Site is consistent with the regional description of the Camillus Shale formation. The upper 10-feet of the bedrock was described as a brownish thinly bedded shale with isolated gypsum lenses. The rock-quality designations (RQDs) of the recovered cores were good to excellent.

2.7 Surface Water Hydrology

RITC discharges storm water to the Niagara River under a Storm Water Pollution Prevention Plan (SWPPP) approved by the NYSDEC. Surface water is discharged through three outfalls[7]:

- Outfall #001 (West of Grid at Row 33 on Site 109) – Former discharge point for non-contact cooling water, boiler blowdown, and stormwater runoff from the former production area after

[7] Outfall 003 was not in use at the time of the bankruptcy and there had been no flow from this outfall since 2008 (TCC 2016).

treatment in two concrete-lined settling/skimming ponds/lagoons. The ponds were dewatered, the solids removed, and the weirs repaired by RITC in 2021 in accordance with the approved Surface Water Maintenance, IRM Work Plan, Concrete-lined Settling Ponds. Only stormwater runoff has been discharged through this outfall since the acquisition of the BCP Site by RITC.

- Outfall #002 (B32) – Discharge of runoff from the coal and coke yards and the southern drainage area. Two major IRMs were conducted to regrade the surface of the coal yard and reconstruct the south ditch road/retention berm to eliminate the potential for uncontrolled discharge from the coal yard through Outfall #002. During dry weather periods there is no flow from Outfall #002, there is no sustained base flow.
- Outfall #004 – (Southwest of Grid on Site 109) – Represents the combined flow from Outfalls #001, #002, Site 109, and a section of the offsite Tonawanda Plastics Site (3821 River Road Site #C915003). Outfall #004 discharges to a drainage ditch on the east side of River Road where the flow combines with flows from the western portion of Site 109 and other industrial properties south of Site 109 including the western portion of the Tonawanda Plastics Site, the Energy Transfer Terminal, as well as portions of the National Grid right of way and River Road. The combined flow is conveyed through a culvert under River Road, into a drainage ditch on Site 108, and finally to the Niagara River.

2.7.1 Existing Stormwater Management Features

RITC assumed responsibility for stormwater management after the approval of the SWPPP. RITC has implemented a series of NYSDEC approved IRMs to eliminate potential runoff and contributions in and to the stormwater system.

2.7.1.1 Former Production Area

The surface water from the North Rail Corridor and Former Production Area flows to one of two systems; the box culvert or the North Storm Sewer System (Figure 2-11). The box culvert originates at the former compressor building (demolished in 2021), flows south between the purifier boxes, and turns west and collects and conveys stormwater from the central production area road (aka "Broadway") between the byproducts area, battery, and coal charging building. The box culvert discharges to a south to north oriented box culvert located west of the primary BCP Site road (east of AOI3) and discharges into the mansion sump[8]. A portion, and at times 100 percent, of the flow from the box culvert is treated in the groundwater IRM during low groundwater and construction flow periods[11]. The north storm sewer originates at the west side of the former firewater standpipe location (Grid Y5, demolished in 2021) and flows west to the former Oil House location (Manhole "MHC", Grid I5). At that location the North Storm Sewer pipe alignment bends approximately 45 degrees to the northwest to convey water to the northeast corner of the former Mansion location (Grid E2), after which it conveys flows west into the mansion sump (Figure 2-11).

From the mansion sump, surface and stormwater flow through the North-South Storm Sewer (Figure 2-11) to the concrete lined settling ponds on Site 109. The concrete lined settling ponds are primarily a two-chamber design system with overflow v-notched weirs. The water is currently routed to the north pond, then the south pond, and through pumps and filters that discharge to a chase that contains the Outfall #001 monitoring location. The control valves for the concrete-lined settling ponds were designed and installed to allow flow to be routed to the north pond, south pond, or directly to the chase.

The concrete-lined settling ponds, as designed, are an effective means to treat the stormwater from the Former Production Area under normal conditions of maintenance. Unfortunately, the entire system had

[8] The current ground water IRM includes a pumping system to remove 25-gallons per minute from the box culvert, reducing a portion, and at times 100 percent of the flow from the box culvert to the mansion sump.

been neglected for years, if not decades. The surface water IRMs (Inventum 2020n and 2020p and 2021d and 2021h) included the addition of an aeration system, filters to reduce particulates, and cleaning of the contributory storm sewer systems. Those actions along with the elimination of secondary sources to the storm sewer system have dramatically improved the surface water quality. One of the IRM actions completed during the summer of 2021 was the cleaning of the concrete lined settling ponds to increase the retention time and dispose of a mass of residuals left in the ponds by TCC. The cleaning of the settling ponds removed over 300 tons of residual sediment left by TCC. The removal provided nearly an additional 100 percent additional retention capacity in the ponds and removed a potential source of constituents of concern at the point of discharge.

2.7.1.2 Coal and Coke Yards

RITC put in place temporary flow restrictions (through approved work plans) and engineering control features to maintain the quality of drainage through Outfall #002, the discharge point for the Coal and Coke Yards (AOI4 and AOI5). RITC maintains the efficiency of the system by periodic maintenance dredging and establishing vegetation over disturbed areas in the south drainage AOI.

2.7.1.3 Ongoing Management

Ontario Specialty Contracting (OSC) conducts daily inspections of the controls, and Inventum conducts a detailed monthly inspection. Inventum on behalf of RITC conducts a monthly, quarterly, and semi-annual sampling program in accordance with the approved SWPPP. SWPPP Site Management Reports (SMRs) are submitted monthly to the NYSDEC.

2.8 Wetlands and Waterways

Inventum reviewed the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps for the potential presence of Waters and Wetlands of the United States (WOUS) and the NYSDEC Environmental Resource Mapper for the potential presence of NYS Freshwater Wetlands on the BCP Site. A BCP Site-wide Wetland and waterways assessment was completed by Earth Dimensions, Inc. (EDI) of Elma, New York for the RI (Appendix C of the Draft RI Report). The wetland investigation area encompassed approximately 103-acres and included the BCP Site, Site 109, and Site 110.

The wetland delineation identified six (6) Palustrine Emergent (PEM) wetlands and three (3) waterways (stormwater ponds) within the investigation area (Figure 2-5). The identified wetlands on the BCP Site and the adjacent State Superfund Site encompass approximately 1.664 acres and were assessed by EDI as being non-federally jurisdictional under the Navigable Waters Protection Rule due to an apparent lack of connectivity to an intermittent or perennial stream. The NYSDEC has notified EDI that these are not state jurisdictional waters. Only two of the wetland areas totaling approximately 0.756 acres are located on the BCP Site. The remainder of the identified wetland acreage is located on the adjacent State Superfund Site. All three of the identified waterways (stormwater ponds) are located on the BCP Site.

An approximately 41.3-acre NYS Freshwater wetland (ID: BW-6) was determined by EDI to be just off-site along the southern BCP Site line of the BCP Site and a portion of the 100-foot upland adjacent area would fall within the BCP Site boundary. Additional Section 404 or Article 24 permitting may be required through the US Army Corps of Engineers (USACE) and NYSDEC if these upland buffer areas are impacted through implementation of the selected BCP Site remedial alternative.

EDI, on behalf of Inventum and RITC, submitted a letter to the USACE and NYSDEC on November 21, 2021, requesting an Approved Jurisdictional Determination (AJD) for the investigation area (BCP Site, Site 109, and Site 110). In a letter dated February 1, 2022, the NYSDEC determined that none of the wetlands identified would be state regulated. The NYSDEC confirmed the limits of BW-6 outside of the BCP Site



boundary and the corresponding limits of the 100-foot upland adjacent area on the BCP Site. Approximately 2,500 sq. ft. of the upland area may extend onto the extreme eastern portion of AOI1 (North Rail Corridor) and 5,350 sq. ft. onto AOI7 (South Drainage Area) near the offsite Plastics flare. In a letter dated January 6, 2023, the USACE approved the AJD.

No listed species or significant habitats were identified on the BCP Site. A Step 1 Fish and Wildlife Resource Impact Analysis (FWRIA) was conducted in accordance with DER-10 and is provided in Appendix D of the RI Report. No additional steps are required based on the findings of the Step 1 FWRIA.

2.9 Groundwater

Groundwater occurs within the BCP Site in three water bearing units as evidenced by regional groundwater studies (NYSDEC 2007), site investigations on this and adjacent properties, and historical knowledge and experience of the area.

The groundwater in the fill layer at the BCP Site can be characterized as a discontinuous unconfined or perched water bearing unit. The observations made during the remedial investigation identified numerous areas where the fill zone lacked water or contained limited saturated thickness. For purposes of understanding the groundwater potential energy, groundwater elevation maps (Figures 2-6 and 2-6A) have been developed for the water perched in the fill. Subsurface water was discontinuous across the BCP Site in this unit and the presence and flow of water is highly dependent on the presence and thickness of permeable gravel and slag materials, the variation of elevation of the underlying clay, and the presence of the storm sewers, former rail beds, and other anthropogenic BCP Site features.

Subsurface water within the fill is likely the primary unit for the potential transport of any BCP Site related constituents within the BCP Site, but the absence of saturated fill along some areas of the BCP Site perimeter, the absence of flowing water in the test pits around the perimeter of the BCP Site, and inward and parallel gradients along BCP Site boundaries demonstrate the fill water bearing unit is not a complete pathway to any offsite receptor. Note: the lack of water in several areas around the perimeter of the site supports the understanding that there is no known offsite transport of groundwater in fill from the BCP Site.

The presence and movement of water in the fill was dominated by the gravel and slag used for rail bed materials. The absence of water in the fill at the BCP Site boundaries showed the shallow groundwater system is contained within the fill layer and is localized to the BCP Site. The flow through the monitored outfalls indicates the shallow groundwater is controlled by onsite discharge from the fill to the north and south stormwater ditches, surface water pipes and the box culvert (Figure 2-11). Staff gauges were added at locations across the BCP Site in surface water bodies to allow correlation of the interaction between the fill groundwater bearing zone and the surface water management facilities.

The groundwater IRM collects groundwater from 5 collection trenches, among other sources, in the western portion of the former production area (AOI2). The groundwater elevation data show that at moderate pumping rates (less than 4 gallons per minute[9]) the groundwater system in the western production area can be controlled (Figure 2-6). The groundwater was depressed on average more than three feet within the zone of influence of the groundwater IRM after only 2 months of operation, the system has been operating for 15 months and continues to remove and treat groundwater and associated constituent mass from the shallow groundwater system.

[9] The pumping rate is a function of the yield of the fill formation, not the pumping or treatment capacity of the system.

Groundwater also occurs in the underlying clay deposits (Figures 2-7 and 2-8). The water in the upper clay and lower clay represents different phreatic surfaces as shown by Figures 2-7 and 2-8. The clay can be characterized as an aquitard, confining groundwater from the underlying bedrock. There is likely a very low east to west gradient of groundwater flow across the BCP Site given the topography and low permeability of the water bearing overburden units.

Samples of the clay material from the BCP Site were tested by Geotechnics of Pittsburgh, PA (Appendix A of the RI Report). Samples from the boring for monitoring well MW-BCP-02 (16 to 18 feet bgs) and MW-BCP-01 (30 to 32 feet bgs) were tested. The samples were classified in the laboratory as a Brown Lean Clay based on the Atterberg Limits. The results of the permeability testing were 3.3×10^{-8} centimeters per second (cm/s) and 2.1×10^{-8} cm/s. For reference landfill liners are required to meet a permeability requirement of 1×10^{-7} cm/s so data collected for this clay is much thicker (typical clay liner is 2 feet thick) and less permeable than a landfill liner. This is consistent with references for the area that suggest the hydraulic conductivity of the clay unit is extremely low, typically ranging from 10^{-6} to 10^{-8} cm/s.

The upper most portion of the clay unit is typically described as moist and, in some areas, contained vertical desiccation cracks, the presence of which may allow for some localized vertical flow. The desiccation cracks, when noted, were only observed within the first couple of feet past the Fill/Clay transition. To the extent practicable, no desiccation cracks were observed in the clay in the test pits installed in the coal and coke yards. The clay observed in both the borings and test pits was described as moist; however, the horizontal groundwater flow within the clay unit underlying the BCP Site is described on a regional level as generally not water bearing and yielding only small quantities of water. This was verified during the two rounds of RI groundwater sampling where most of the monitoring wells screened in the upper and lower clay units went dry at very low purge rates and failed to recharge in a timely fashion. The limited potential for horizontal groundwater flow in the clay unit can likely be ascribed to thin seams of silt and sand in the top few feet of the uppermost clay unit, but will still be predominantly toward the west, and as demonstrated by water elevations in downgradient wells does not migrate far from its source.

Regionally, the uppermost Camillus Shale bedrock unit is characterized as a confined aquifer and is considered a productive water producing system. Groundwater within the bedrock unit (Figure 2-9) occurs primarily in weathered surface fractures, horizontal gypsum dissolution beds, vertical joints, and small cavities. No vertical fractures or solution cavities were encountered by the bedrock borings on the BCP Site; however, gypsum lenses were identified in the borings for the four monitoring wells (MW-BCP-01D, MW-BCP-03D, MW-BCP-05D, and MW-BCP-21D) advanced into the underlying bedrock. Groundwater elevations in the bedrock unit are shown in Figure 2-9.

Groundwater elevation data collected in January 2021 and September 2021 for the three water bearing units is provided in Table 2-11. Groundwater is not utilized as a source of drinking water in the Town of Tonawanda or the larger Tonawanda area due to the low productivity of the overburden units (fluvial/lacustrine fill and clay deposits), the naturally occurring high mineral content of groundwater in the bedrock unit, and the proximity of the Niagara River. There are no municipal or known private drinking water wells within a 1-mile radius of the BCP Site (EDR 2019). The Erie County water intake from the Niagara River is upstream of the RITC properties and the BCP Site.



3 Summary of RI and Exposure Assessment

The RI was completed on the BCP Site between October 2020 and September 2021. The RI data is supplemented and confirmed by data collected during the IRMs, site management on the BCP Site and the RIs on the adjacent Sites 109 and 110. The RI and IRM data provided the information required to conduct an AA.

3.1 Objectives

As stated in the RI Work Plan, the objectives of the RI programs were to complete a comprehensive investigation of soil and groundwater for the BCP Site; recommend the applicable SCGs and Remedial Action Objectives (RAOs); and propose potential additional IRMs to address environmental impacts that resulted from historical operations at the BCP Site. A revised draft Remedial Investigation Report (RIR) was submitted in August 2023.

The following objectives were achieved during the RI program.

- Gather, compile, and evaluate existing historical investigation data;
    - *The data available from historical reports, the USEPA Emergency Response Team, the NYSDEC, recoverable TCC records were used to complete the historical record for the RI and subsequently this AA.*
    - *In addition to the dozens of documents listed in the Bibliography, more than 2,000 historic drawings and maps were recovered and reviewed.*
- Compile the data collected since the TCC Closure (USEPA and RITC) and compile with historical data;
    - *The remedial investigation report (RIR) presents the compilation of the historic, IRM and RI data. The compiled historic and recent data form the basis for the evaluations presented in this AA.*
- Complete the investigation of the BCP Site, including surface soil, shallow fill, and subsurface soil, sediments, groundwater, and former TCC process infrastructure (former storage/process tanks, drums, buildings, former process piping, and equipment);
    - *The investigation of the BCP Site was comprehensive. The data collected during the RI, the supplemental data collection, and the IRMs provide data to identify and characterize the conditions at the BCP Site to the extent required to complete this AA.*
- Conduct qualitative exposure assessments for both onsite and offsite receptors using the collective data for the BCP Site and including assessing conditions at and beyond the perimeter in relation to the BCP Site;
    - *The qualitative exposure assessments are provided in Section 6.0 of the RIR.*
- Identify and propose any IRM activities that may be appropriate to complete in advance of the AA to protect the environment and ensure continued protection of public safety and health;
    - *Inventum has and continues to identify and recommend IRMs throughout and following the RI. Section 3 of the RI report describes NYSDEC and NYSDOH approved IRMs that have been completed or are ongoing at the BCP Site.*
    - *Potential exposures to human health and the environment left on the BCP Site by TCC are being eliminated through the completed and ongoing IRMs.*
    - *As described in the qualitative exposure assessments, after closure of the TCC operations and completion of the IRMs, there are no offsite potential exposures to the community.*
- Complete an AA and identify the appropriate remedy(ies) for NYSDEC consideration and public comment, and;



- *The AA has been completed and is presented in this AA Report. In order to provide the data more quickly, a preliminary draft RIR was submitted in March 2022 for completeness review in advance of the AA and a revised RI Report will be submitted in July 2022.*

- Provide a draft schedule for implementation of the proposed remedial actions.
  - *Section 9 - Schedule presents the proposed high-level schedule for completion of the RA, ongoing IRMs, and remedial actions (RAs).*

3.2 RI Conclusions

RI activities on the BCP Site were divided into seven specific AOIs based on historical use and anticipated environmental impacts related to the historical use.

The data from the RI and IRMs establish that:

- Potential exposure routes and sources on the BCP Site have been, and are being, eliminated by the removal of residuals abandoned by TCC in process equipment, tanks, pipes and buildings.
- The BCP Site surface is entirely covered with fill (average 54-inches thick) underlain by more than 40 feet of low permeability silty clay.
- There are no areas of the BCP Site surface that meet the criteria for unrestricted use in the current condition.
- The most significant area of impact is in fill below the western portion of the former production area (AOI2).
- The fill at the BCP Site does not present a potential exposure to human health or the environment to off-site receptors, it is limited to the property.
- With very few isolated, and near surface exceptions, the clay at the BCP Site has not been affected by the TCC operations.
- The impacts to groundwater, with very few isolated exceptions in the upper clay, are limited to shallow perched ground water in the fill;
- Impacts to shallow groundwater are contained on the BCP Site and do not flow off the BCP Site prior to the treatment in the onsite surface water controls.
- Naturally occurring background metals are the only constituents detected above Class GA Standards in upper clay groundwater samples in areas not associated with the tar deposition areas.
- Naturally occurring background metals are the only constituents detected above Class GA Standards in lower clay groundwater samples.
- The only constituents detected in bedrock water samples above the Class GA Standards are naturally occurring background metals.
- The removal of waste from the fill, buildings and process equipment from the BCP Site, to date, has controlled the majority of potentially mobile chemicals left on the BCP Site.
- Shallow groundwater can be effectively controlled with collection trenches collecting moderate volumes of groundwater.

On a site-wide scale the identified impacts are shown in Figures 3-1 to 3-7. The figures have been developed to show:

- Figure 3-1 – Occurrence of Viscous Tar
- Figure 3-2 – Occurrence of NAPL
- Figure 3-3 – Occurrence of VOC Impacted Fill
- Figure 3-4 – Occurrence of Petroleum Impacted Fill
- Figure 3-5 – Occurrence of Iron Oxide Materials, Purifier Waste and Blue-stained Soil/Fill



- Figure 3-6 - Occurrence of Fill Impacted by Metals and Cyanide
- Figure 3-7 – Occurrence of Residual Groundwater Impacts

Larger scale figures showing additional detail are given as Figures 3-8 to 3-20.

As shown on Figure 3-1, Viscous Tar has been identified on the BCP Site, and fill with viscous tar (grossly contaminated soil) encountered during the remedial investigations and IRMs was stockpiled in the Thaw Shed. The viscous tar is present in thin layers of 2-inches or less, most often less than 1-inch thick. The estimated quantity includes fill above and below the viscous tar that will be removed to ensure the tar is removed. The locations and estimated volume of viscous tar and associated fill:

- A Tar filled pipe was encountered in TP-BCP-04 – Confirm pipe and residuals were completely removed – 200 tons;
- Tar has been observed seeping from the seam around the base of PT-02 and PT-03 - 400 tons;
- 3,600 tons, north and under the tar management area;
- 500 tons stockpiled in the Thaw Shed.
- TP-BCP-48 was excavated at the Site 110 Boundary west of Tar Seep No. 1, viscous tar seeped into the Test Pit – 800 tons;
- 1,400 tons have been identified around the Tar Seep (TP-BCP-25) location;
- 200 tons in a very thin seam (less than 1-inch thick) along the former location of the south rail in the southwest corner of the BCP Site where rail cars RC-01, RC-02, and RC-03 were removed; and
- Approximately 600 tons of material along the boundary with Site 110, north end of TP-BCP-09.

As shown on Figure 3-2, NAPL were observed in five areas of the BCP Site. Unlike the Viscous Tar, the lower viscosity of NAPL allows it to move to monitoring wells and test pits as the presence of the wells and effects of purging and sampling create a gradient in the associated fill. The volume of material associated with the NAPL areas is difficult to estimate. In every case of VOC impacts NAPL or viscous tar has been detected as the source. The estimated weight shown on the figure represents the weight of the fill containing NAPL. The groundwater IRM has collected NAPL, and that material is separated from the aqueous phase in the weir tank and oil water separator (OWS) before the aqueous phase is treated. The locations and estimated volume of NAPL are:

- Light Oil Area – 700 tons[10] of potentially NAPL and directly impacted fill;
- MW-BCP-5A Area – 700 tons of potentially NAPL and directly impacted fill;
- Exhauster Building and Sumps – Estimate based on indirect evidence, 200 tons[11];
- Pump House Fill – Estimate based on indirect evidence, 400 tons[16]; and
- Junction Building Area – 400 tons.

As shown in Figure 3-3, Volatile Organic Compound (VOC) impacted soils and fill are largely in the production area and are near and coincident with areas of NAPL and Tar and near areas that had been used to process and cool VOC containing liquids and gases. The production area volumes include the NAPL impacted fill listed above and the zones around the NAPL that have been impacted by the separate phase materials but do not exhibit signs of the presence of a separate phase. The VOCs in the two coal yard areas (MW-BCP-13 and MW-BCP-19) are localized as additional wells downgradient of these locations were not affected by VOCs. The areas of VOC impacted fill and soil are:

[10] The quantity of NAPL in the Light Oil Area will be defined more accurately during the Solidification IRM.
[11] The quantity of NAPL in the Exhauster Building and Pump House Fill will be defined more accurately during the Solidification IRM.

- Light Oil Area – 5,000 tons[15] of potentially NAPL impacted fill;
- MW-BCP-5A Area – 2,500 tons of potentially NAPL impacted fill;
- Exhauster Building and Sumps – Estimate based on indirect evidence, 500 tons[16];
- Pump House Fill – Estimate based on indirect evidence, 1,200 tons[16]; and
- MW-BCP-19 Area and MW-BCP-13 Area – 3,000 tons.

Figure 3-4 includes the areas where the fill has been impacted by petroleum hydrocarbons. The impacts of these constituents have been identified primarily in areas of former storage tanks. The largest volume of impact is in the water treatment area located where the ST-24 Bioremediation Pilot Test is proposed (DRAFT, ST24 Bioremediation Interim Remedial Measures Work Plan, Inventum, April 2023):

- Former Diesel Tank Area – 1,500 tons (Note: this remediation was started by TCC, but they abandoned the work before completion);
- Compressor Building – 200 tons (Former Fuel Oil UST location southeast corner)[12];
- Pump House – 700 tons; and
- Wastewater Treatment Area – 7,000 tons.

Notably, significant concentrations of petroleum hydrocarbons were not detected in the test pits near the heavy equipment building, an area of historic spills Nos. 1207205 and 1311845. The spills may have naturally degraded or been remediated by TCC without reporting the cleanup.

There are two areas of known Iron Oxide and Purifier wastes on the BCP Site. There are three other areas that may have been impacted by purifier materials (Figure 3-5):

- Remaining Purifier Boxes – 3,000 tons;
- Iron Oxide Pile – 5,000 tons;
- TP-BCP-46 Area – 1,800 tons;
- Stained Soils in the vicinity of the South Fill Piles – 2,000 tons; and
- SS-BCP-15 Area – 1,000 tons (Note: this is within the recommended perimeter buffer area and the fill is being moved to meet Track 1 only).

Figure 3-6 includes the areas where materials impacted by metals and/or cyanide (not including purifier wastes) were identified. The soil piles accumulated, but undocumented, by the USEPA are included in this category:

- USEPA Soil Piles – 1,000 tons;
- Shallow fill in the vicinity of MW-BCP-01 – 150 tons (Note: this is within the recommended perimeter buffer area and is being moved for that purpose); and
- Fill in the vicinity of MW-BCP-27A – 400 tons (Note: this is within the recommended perimeter buffer area).

Residual groundwater impacts are largely centered on the production area, although there are areas outside AOI1 and AOI2 that have significant concentrations of VOCs or cyanide (Figure 3-7). Due to the relatively thin nature of the impacted groundwater zone, the volume of impacted groundwater is a relatively small (estimated at 5,000,000 gallons) volume that the proposed treatment system will extract six times each year.

[12] The excavation of the compressor building did not encounter the suspect UST or petroleum impacted fill at this location. During the RA, the area will be excavated to ensure the UST was previously removed and no impact exists.

Under the recommended alternative, the areas of residual groundwater impacts outside the production area will be remediated through removal and or direct treatment:

- Production Area (including North Rail and Production Area AOIs) – 3,300,000 gallons (Groundwater IRM Collection Systems);
- MW-BCP-22A Area – 100,000 gallons (Removal: this is within the recommended perimeter buffer area);
- MW-BCP-23A Area – 22,000 gallons (Removal: this is within the recommended perimeter buffer area);
- Purifier Box/MW-BCP-12A Area – 600,000 gallons[13] (Battery and MW-BCP-12 Area Collection Systems);
- MW-BCP-13 Area – 20,000 gallons (Removal);
- MW-BCP-19 Area – 20,000 gallons (Removal);
- ME-BCP-18 – 20,000 gallons (Removal: within the recommended buffer area);
- TP-BCP-49 Area - 30,000 gallons (Removal: within the recommended perimeter buffer area);
- MW-BCP-27A Area - 200,000 gallons (Removal: within the recommended perimeter buffer area).

An overall summary of the nature and extent of impact on the BCP Site can be subdivided into three characteristics:

- Low Impacts: AOI3 (Parking Lot Area) and AOI6 (Water Treatment Area);
- Materials Management Impacts: AOI4 (Coke Yard), AOI5 (Coal Yard), and AOI7 (Southern Drainage Area); and
- Production Area Impacts: AOI1 (North Rail Corridor) and AOI2 (Former Production Area).

3.2.1 Low-impact Areas

The low impact areas are the two areas of investigation (Figures 3-12, 3-13, and 3-18) that produced data with limited numbers and concentrations in excess of SCOs in the general BCP Site fill, limited impacts in clay and no shallow groundwater migration. The impacts in these areas are due to the presence of coal and coke in the BCP site fill, petroleum and wastewater storage, and the compositional constituents contained within those materials. The IRM data identified (as shown on Figure 3-18) that there are fill and shallow clay petroleum related impacts under the former wastewater treatment tank footprints. The petroleum impacts appear to be limited to the sand fill and shallow clay surface under the former tank footprints. A limited area of tar impacted fill was removed to the grossly contaminated storage area following the removal of the tanks. An ongoing pilot test of the impacted soils under the former ST24 location is evaluating if bioremediation of this material will eliminate the characteristic of toxicity and therefore as a potential source.

3.2.2 Materials Management Impact Areas

The area affected by TCC materials management practices are those AOIs (Figures 3-14, 3-15, 3-16, 3-17, 3-19 and 3-20) that are generally covered with a layer of coal and coke containing fill, but also have isolated areas impacted by management of wastes or transportation (rail bed materials) related impacts. These isolated areas contain viscous mobile tar (Figure 3-1) that is localized to the disposal area and has been defined spatially by the RI data and observations. The isolated transportation related impacts are those discontinuous areas where slag-like nodules are present in the fill and comparatively elevated

[13] A significant volume of this groundwater was removed and treated during the compressor building demolition. For purposes of the Alternative Analysis, it is assumed the groundwater volume will be restored during the period between the compressor building foundation removal and the remedial action.

concentrations of BCP Site related constituents of potential concern (primarily PAHs) are found in the shallow groundwater.

3.2.3 Production Area Impact

The former production area and contiguous portions of the north rail corridor (Figures 3-8 to 3-11) are characterized by more widespread, continuous, and significant impacts from the TCC operations. The numbers and concentrations of constituents above the industrial criteria are highest in these areas. Viscous tar (Figure 3-1) and NAPL (Figure 3-2) are present in limited areas within the fill and shallow groundwater.

There are no areas of the BCP Site that are unaffected by historical uses.

3.3 Data Gaps

There are no data gaps that have not been addressed by the RI, supplemental RI, or ongoing IRMs that must be filled to complete a comprehensive understanding of the nature and extent of impacts on the BCP Site and allow completion of this AA.

More than 800 samples have been collected during the implementation of the Site Management and other IRMs, which combined with the onsite observations and RI data provides a comprehensive understanding of the BCP Site. The distribution of samples collected during the site management and IRMs include:

- 480+ samples of soils and residual solids;
- 33 samples of NAPL;
- 360+ samples of ground and surface water; and
- 12 samples of submerged fill "sediment[14]".

The IRMs have progressed to the stage where the nature and extent of impacts associated with each are well understood. The following data has been, and continues to be collected through the completion of the approved IRMs:

1. The understanding of the presence and mobility of liquids and sludges in tanks and piping was addressed through the demolition and Above-ground Storage Tank (AST) IRMs. No TCC above ground storage tanks remain on the BCP Site;
2. The control of groundwater mobility and the effectiveness of shallow groundwater collection and treatment is being tested using the groundwater treatment IRM;
3. The potential impacts associated with the former tanks removals are being assessed by completion of the Secondary Containment IRMs;
4. The implementability of multiple treatment technologies have and are being tested through ongoing IRMs associated with specific types of impacted media identified during the RI and IRMs; and
5. Surface water quality associated with the BCP Site is closely monitored at the three outfalls. The Whole Effluent Toxicity (WET) testing completed in 2023 showed no toxicity to the target species.

[14] There is no "sediment" on the BCP Site. The term is used for submerged fill in ditches and the stormwater management pools and basin.

4 Remedial Goals and Remedial Action Objectives

The remedial goals and remedial action objectives (RAOs) for the BCP Site address all media encountered. For the purposes of the AA, the following classifications are used:

- Perched Water – Discontinuous zones of groundwater in fill above the clay.
- Aquifer – Continuous saturated groundwater bearing zones in clay, and bedrock.
- Surface Water – Water in the BCP Site ditches and engineered BMPs.
- Soil – Unconsolidated materials above bedrock. Native soils, as the term is used in this AA, are those unconsolidated materials that are in their naturally deposited locations on the BCP Site. Only silty clay is considered natural soil on the BCP Site.
- Fill – Unconsolidated soil and soil-like materials above the clay on the BCP Site.

4.1 Remedial Goals

The remedial goals for the BCP Site include:

- Overall protection of human health and the environment;
- Implementation of remedial actions that allow redevelopment of the BCP Site for commercial or industrial purposes;
- Implementation of remedial actions that are permanent and sustainable;
- Implementation of remedial actions that are consistent with the actions required on the adjacent superfund site at the boundaries; and
- Implementation of remedial actions that result in a BCP Site that is consistent with the developing River Road area vision of the Town of Tonawanda.

4.2 Remedial Action Objectives

Remedial Action Objectives (https://www.dec.ny.gov/regulations/67560.html) are specific action goals by media and receptor. The RAOs that potentially apply to the BCP Site are listed below and in Table 4-1. As not all media, impacts or receptors are present at all AOIs, Table 4-1 indicates which RAOs apply to each AOI.

4.2.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water [15]aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent, or reduce to the extent practicable, the discharge of compounds to surface water.
- Remove the source of ground water contamination.

[15] Perched groundwater above the clay is localized and discontinuous in the fill and is not considered a useable aquifer and there are not pre-disposal/pre-release conditions within the context of this RAO. There are limited areas of the clay to be restored, but the metals in the clay and bedrock groundwater system are considered naturally occurring and are therefore considered pre-disposal/pre-release conditions. Achieving Class GA standards in the groundwater within the shallow fill zone is the primary objective for this unit.

4.2.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation exposure to contaminants volatilizing from soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

4.2.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the BCP Site.



5 Identification and Screening of Technologies

The identification and screening of technologies[16] and process options are presented in Table 5-1 and are discussed in this section. The identification and screening follow several steps:

- Remedial Technology – Potentially Applicable remedial technologies that can address each General Response Action are identified and listed.
- Process Options – Process options are the specific means of implementing the technology that are potentially applicable to the BCP Site.
- Description – A brief description of the process option is presented to provide an understanding of how it addresses the General Response Actions and what limitations it may possess.
- Screening – The screening of the process options as they may apply to the BCP Site or a specific AOI.

5.1 No Further Action

Discussion and evaluation of No Further Action technologies is provided as a baseline for analysis of cost effectiveness. Under No Further Action, the only thing that would be considered are access restrictions. The Process Options available include:

- Institutional Controls (see Section 5.2)
- Fencing

5.2 Institutional Controls

Institutional Controls (ICs) are those actions or requirements that are applied to the management and use of the BCP Site. These actions will be in accordance with DER-33, “Institutional controls" (ICs) are any non-physical means of enforcing a restriction on the use of real BCP Site that limits human or environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of a remedial program or with the effectiveness and/or integrity of site management activities at or pertaining to a remedial site. [also see 6 NYCRR 375-1.2(aa)]”.

5.2.1 Access Restrictions

Access restrictions would be employed to limit the scope of what can be done on the BCP Site and restrict the physical opportunities to unknowingly enter onto the BCP Site.

5.2.1.1 Environmental Easement

An environmental easement is an instrument required by the NYSDEC which contains a use restriction and/or a prohibition on the use of the land in a manner inconsistent with engineering controls. An environmental easement is considered to be required for all portions of the BCP Site that do not meet the requirements of a Track 1 cleanup.

5.2.1.2 Fencing

Fencing is a means of notifying an inadvertent trespasser that they are approaching private BCP Site that is not accessible as a public thoroughfare or for unapproved public use. Fencing would only be potentially applicable under a no further action alternative; fencing would not be applicable under alternatives that include a soil cover or around areas where the surface soil meets commercial SCOs or better.

[16] For the purposes of this AA some activities and actions that are not specifically “technologies” are screened under this methodology.

5.2.2 Routine Long-term Care

These technologies and process options are those that define the requirements for care after the remedial actions have been completed.

5.2.2.1 Site Management Plan

A Site Management Plan (SMP) is a comprehensive document that provides all future operators of the BCP Site with the required procedures and protocols to maintain the permanent and ongoing components of the remedial actions. Compliance with this document is required for all future operators of the BCP Site. A SMP is required.

5.2.2.2 Excavation Work Plan

An Excavation Work Plan (EWP) is a document that is a component of the SMP and defines those procedures that must be followed for any intrusive excavation on the BCP Site after the remedial actions are complete. The EWP covers, but is not limited to, project planning, personnel protective equipment (PPE), air monitoring requirements, and materials management. The EWP is required to be followed for any intrusive subsurface work that is expected to encounter contaminated material at the BCP Site including but not limited to installing new sidewalks, roads, utilities, foundations, and fence posts. An EWP is required.

5.2.2.3 Stormwater Best Management Practices

The BCP remedy must prevent the contamination of storm water from subsurface contaminant sources during and after (if any remain on-site) the remedial action. Stormwater Best Management Practices (BMPs) are the procedures, practices and components of a stormwater system that are necessary to ensure the stormwater from the BCP Site does not convey excess water, sediment or BCP Site related constituents offsite. The BMPs range from erosion and sediment controls (E&SCs), to inspection, maintenance and testing of the system. BMPs are required for the BCP Site under a no further action alternative. For other alternatives they are required as a design element but under the post remediation conditions are not necessarily considered a remedial action.

The collection, management, and discharge of storm water during the remedial actions will be subject to the requirements of the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity and local requirements of the Town of Tonawanda.

Following completion of the remedial actions, stormwater management will be in accordance with any requirements of the Town of Tonawanda but are not a remedial action.

5.2.3 Monitoring

The monitoring technologies and process options are those that provide qualitative and quantitative information about the long-term integrity and performance of remedial actions.

5.2.3.1 Monitoring Surfaces/Covers

Following completion of the remedial action, the surface of the BCP Site must be monitored and maintained. The surface is potentially subject to wind and runoff erosion, burrowing animals, and depending on the type of remedial action, may require removal of plants that obstruct inspection. Hard surfaces intended to provide a barrier also require monitoring to ensure their integrity is maintained. Surface monitoring and a surface monitoring plan is potentially applicable based on the remedial technologies implemented.



5.2.3.2 Groundwater

Groundwater monitoring provides quantitative data on the characteristics of the groundwater systems with time, the control exerted from groundwater collection systems, and the progress of remedial action(s). Groundwater monitoring may include depth to water measurements, sampling and analysis of groundwater, interpolation of data and reporting. Groundwater monitoring is potentially applicable depending on the remedial actions implemented.

5.3 Containment

Containment technologies and process options are those that control mobility by eliminating direct contact between underlying materials with water runoff, that limit exposure by placing a barrier between receptors and residual materials, and that support or provide erosion resistant surfaces to provide long-term protection.

5.3.1 Covers

Covers are composed of materials that meet the requirements of 6 NYCRR Part 375-6.7(d) and that interrupt the direct contact pathway to underlying materials that have the potential to contain concentrations of constituents in excess of the commercial SCOs.

5.3.1.1 Soil Covers

Soil covers that are properly maintained provide an effective means to interrupt the potential for direct contact with underlying fill. Soil covers for commercial uses are a minimum of 12-inches thick. The process of constructing the cover includes clearing, grading, and compaction of the subgrade. A cover for the RITC BCP Site would consist of one of three types;

(1) Vegetated - three layers; a demarcation layer, a 9-inch-thick layer of unclassified soil fill that meets the commercial SCOs, and 3-inches of topsoil that meets the NYSDEC import requirements for a commercial site (there is no topsoil available on the BCP Site),

(2) Gravel - two layers; a demarcation layer, a 12-inch-thick layer of granular unclassified granular soil fill that meets the requirements of 6 NYCRR Part 375-6.7(d) (to be used in areas that will be redeveloped within two years after the remedial action), or a

(3) Building or pavement slab (Figure 7-9).

A soil cover shall be seeded, fertilized and mulched in accordance with New York State Department of Agriculture recommendations. The newly seeded covers would be watered and inspected until the vegetation has been established. Depending on the season that a vegetated cover is completed, temporary seeding may be required to maintain the BCP Site until the next appropriate planting season.

Cover maintenance (incorporated into the SMP) will, at a minimum, consist of:

- semi-annual cutting to prevent the establishment of woody species;
- inspections to identify erosion or burrowing animal damage, and repair of any damage; and
- Inspections and surveys to identify settlement that is allowing pooling of surface water that could impair proper growth of the vegetative cover.

In perimeter areas where the fill can be removed and clay meeting unrestricted SCOs is unearthed, the soil covering the surface will be modified to placement of soils to support vegetation and ditch linings to control erosion. In areas that meet the unrestricted SCOs, there is no need for a demarcation layer and these areas may be planted with species that encourage habitat. Locations that meet unrestricted SCOs may be allowed to develop naturally without mowing or removal of woody species. BCP Site

Placement of a soil cover utilizes proven techniques and readily available conventional construction and agricultural equipment. The placement of an equivalent test plot vegetated cover system has been successfully implemented near the former shower building in AOI4. There is no limitation to implementation of the technology other than the availability of an offsite topsoil borrow source.

Soil covers are considered potentially applicable depending on the remedial actions implemented.

5.3.1.2 Asphalt or Concrete Pavement

As the BCP Site is developed, roads, sidewalks and parking areas may be placed in lieu of or to replace the soil covers. Pavement, whether placed before or after the soil cover, must comply with the requirements of the Town of Tonawanda. The design of the drainage of all paved areas will be incorporated into the stormwater management plan for the BCP Site, and in accordance with local and state requirements.

If installed after the completion of the remedy, all excavation for pavement and associated underground utilities will be required to comply with the approved SMP and EWP. If during the remedial action, excavations for pavement and associated utilities are required, these activities will be addressed in the RD.

Placement of pavement utilizes proven techniques and readily available conventional construction equipment. There is no limitation to implementation of the technology other than the availability of construction materials (precast concrete utilities, pipe, asphalt and concrete), some of which are only seasonally available.

Pavement as a component of a cover system is considered potentially applicable depending on the remedial actions and redevelopment implemented.

5.3.1.3 Buildings or Structures

Buildings and structures may be constructed on the BCP Site depending on the alternative selected. The foundations for structures planned before the soil cover is placed may be constructed before the soil cover is placed. These foundations, slabs, and associated underground utilities will be designed to function as, or replace any cover system. Foundation excavations that are conducted before the completion of the remedial action in areas where the fill potentially contains hazardous waste will be conducted by Hazardous Waste Operations and Emergency Response (HAZWOPER) trained and certified construction personnel trained in the management of the materials and in the appropriate personnel protective equipment. All foundation and utility excavation activities where fill does not meet unrestricted SCOs shall be monitored following the Community Air Monitoring Program (CAMP). Foundation excavations that are conducted after completion of the remedial action will be conducted in compliance with an approved EWP.

In addition to the standard vapor barriers, a demarcation/marker layer will be placed below the subgrade for all building slabs. Building drainage systems will be incorporated into the ground and surface water management plans. Slab design will include testing and where required, sub-slab depressurization systems (SSDSs).

Construction of buildings and structures utilizes proven techniques and readily available conventional construction equipment. There is no limitation to implementation of the technology other than the availability of construction materials (gravel, pipe, structural steel, and concrete), some of which are only seasonally available.

Buildings and structures as a component of a cover system are considered potentially applicable depending on the location, remedial actions, building permitting process, and redevelopment implemented.



5.3.2 Consolidation Areas

Consolidation areas are specifically designated areas outside the limits of the proposed redevelopment that allow isolation of materials in a matter that eliminates potential contact by receptors or with shallow groundwater. Consolidation allows development and implementation of the final grading plan while removing residuals from proposed utility or foundation locations. The construction of consolidation areas allows (1) construction of a placement area that eliminates shallow groundwater at the consolidation site, (2) placement of a lower demarcation and lining layer, (3) placement and compaction of the residual materials, (4) placement of a low permeability capping system, (5) a focused perimeter monitoring network, and (6) incorporation of environmental and social sustainability factors. Like a soil cover, consolidation areas have an erosion resistant barrier to prevent contact between site receptors and the consolidated materials that exceed Commercial SCOs. In addition to the components of a soil cover, the capping system on a consolidation area includes a layer of geotextile, a low permeability membrane, an upper layer of non-woven geotextile, and an additional 12-inches (no less than a total of 24-inches) of unclassified fill to protect the upper membrane.

The approximate locations of the consolidation areas being screened are shown in Figure 7-5. Three areas are being considered to (1) allow efficient sequencing of excavation and placement, (2) reduce the time each section is exposed to precipitation, and (3) provide flexibility should the volume requiring consolidation vary from that defined during the pre-design investigations. The proposed details of the construction of the consolidation cells are shown in Figure 7-6.

Consolidation areas can be constructed relatively quickly and would be sized to manage the amount of residual materials to be placed. Only stable or solidified materials can be placed and compacted in a consolidation area. The limited time the material is exposed to precipitation eliminates the presence of free moisture in the consolidated materials, eliminating the need for a moisture collection/monitoring system within each area. The design of the units will have relatively limited above grade slopes that will not exceed three horizontal to one vertical, eliminating the need for a cap drainage system.

The consolidation areas will have groundwater collection around the perimeter of the base to verify the residuals are posing no potential risk to groundwater. The materials being consolidated are not degradable, so there is no risk of soil vapor accumulation or need for a venting layer or system.

Consolidation areas are potentially applicable.

5.4 Fill/Soil Management

The management of impacts to fill and soil on the BCP Site fall into two classes; Excavation and Treatment. These address reduction in mobility, toxicity and volume using different mechanisms. The management of fill/soil follows the hierarchy of 6 NYCRR Part 375-1.8(c), *[the explanation of how they are applicable is provided in square brackets]*:

"c) Source removal and control measures. The following is the hierarchy of source removal and control measures which are to be used, ranked from most preferable to least preferable;

1) Removal and/or treatment. All sources, concentrated solid or semi-solid hazardous substances, dense non-aqueous phase liquid, light non-aqueous phase liquid and/or grossly contaminated media shall be removed and/or treated; provided however, if the removal and/or treatment of all such contamination is not feasible, such contamination shall be removed or treated to the greatest extent feasible."
2) *[Due to the volume of material on the BCP Site it may not be feasible to remove all potential sources of contamination, but in each alternative (except Alternative No. 1) the application of*



treatment or containment (containment is next preferred approach) are included.] "Containment. Any source remaining following removal and/or treatment set forth in this subdivision shall be contained; provided however, if full containment is not feasible, such source shall be contained to the greatest extent feasible."

[Full containment is proposed in each alternative with the exception of Alternative No. 1 and No. 8. The proposed cover system is proposed over the entire area not meeting Track 1 criteria and is anchored into the underlying clay along the perimeter of the cover creating a complete containment system.]

3) "Elimination of exposure. Exposure to any source remaining following removal, treatment and/or containment set forth in this subdivision shall be eliminated through additional measures, including but not limited to, as applicable, the timely and sustained provision of alternative water supplies and the elimination of volatilization into buildings; provided however, if such elimination is not feasible such exposure shall be eliminated to the greatest extent feasible such exposure shall be eliminated to the greatest extent feasible."

[All potential exposures are eliminated in Alternatives Nos. 2 through 8. Exposure routes are interrupted by cover and capping systems in each alternative, except Alternatives Nos. 1 and 8.]

4) "Treatment of source at the point of exposure. Treatment of the exposure resulting from a source of environmental contamination at the point of exposure, as applicable, including but not limited to, wellhead treatment or the management of volatile contamination within buildings, shall be considered as a measure of last resort."

[In practical terms, the sources of contamination at the BCP Site at the time of the BCA, were in tanks, pipes, pits, and buildings. These sources will all have been removed in advance of the below grade remedial actions. The secondary sources in the fill zone will be treated in all but Alternatives Nos. 1 and 2.]

5.4.1 Fill/Soil Excavation

The excavation process options address the range of options that could be implemented to handle fill on the BCP Site depending on the remedial goals, nature and magnitude of impact, and its position relative to the proposed final grade.

5.4.1.1 Excavation and Onsite Placement

The entire BCP Site is covered with fill. The final grading of the BCP Site may include management of soils that are consistent with the general quality of the fill across the BCP Site. The activities that could be incorporated into the remedial action that involve excavation and onsite placement include, but are not limited to:

- Excavation of fill to allow access to more impacted materials that require treatment or excavation and offsite disposal;
- Excavation of fill to allow grading of the BCP Site as required for proper drainage and the installation of surface water controls;
- Excavation of fill for underground utilities, pavement and foundations;
- Excavation of fill along the perimeter of the BCP Site to allow anchoring of a soil cover system;
- Excavation of fill along the BCP Site boundary that will eliminate contact between the onsite fill and contiguous soils;



- Excavation of soil and fill to consolidate materials in areas requiring additional fill and to remove materials from development areas; and
- Excavation/regrading of piles of materials that are analytically similar to the surrounding fill to produce grades and subgrade suitable for soil cover construction and maintenance.

The materials that would be excavated and remain on the BCP Site within the limits of the BCP Site in accordance with a final remedial design, and potentially a redevelopment site plan. Regraded fill on the BCP Site shall be placed below the elevation of the demarcation layer of a soil cover or in a consolidation area. The fill would be excavated and placed in accordance with an approved remedial design and excavation activities would be monitored in accordance with the CAMP. The inspection and monitoring required for the excavation and placement of the materials will be defined in the approved Remedial Action Work Plan (RAWP) that will be prepared for the remedial action.

Excavation and onsite placement of materials utilizes proven techniques and readily available conventional construction equipment. There is no limitation to implementation of the technology.

Excavation and onsite placement are considered potentially applicable depending on the remedial actions and redevelopment implemented.

5.4.1.2 Excavation, Onsite Treatment, and Placement

The entire BCP Site is covered with fill. The final grading of the BCP Site may include management of soils that are, or can be, generally consistent with the general quality of the fill across the BCP Site, yet contain constituents that are present at concentrations that require treatment. The activities that could be incorporated into the remedial action that involves excavation, onsite treatment (See Section 5.4.2), and onsite placement include, but are not limited to:

- Excavation of fill to allow blending of nutrients and aeration for biological treatment;
- Excavation of fill to allow blending of compounds to stabilize or neutralize potentially mobile constituents; and
- Excavation of fill to allow blending of compounds to solidify fill.

Materials that contain significantly higher concentrations of potentially mobile TCC residual constituents, i.e. not consistent with the general quality of fill across the BCP Site, will be excavated and placed in the consolidation areas rather than under the soil cover.

The materials would be excavated and treated to achieve a defined treatment endpoint in accordance with the approved RAWP. The approved RAWP will define the intended goals and testing required to confirm the material is suitable for placement on the BCP Site. Following confirmation testing the treated materials would be placed on the BCP Site within the limits of the BCP Site in accordance with a final remedial design, and potentially a redevelopment site plan. Treated fill on the BCP Site shall be placed below the demarcation layer of a soil cover. Treated fill will not be placed in proposed utility corridors.

Excavation, treatment and onsite placement of materials utilizes proven techniques and readily available conventional construction equipment and reagents. There is no limitation to implementation of the technology with the exception of weather. The rate and effectiveness of certain biological processes are reduced during periods of cold or dry weather.

Excavation, treatment, and onsite placement is considered potentially applicable depending on the remedial actions and redevelopment implemented.



5.4.1.3 Excavation and Offsite Disposal

Fill that is grossly contaminated and cannot be treated effectively on the BCP Site may require excavation and offsite disposal. Offsite disposal, as used here, may include onsite solidification and offsite treatment before land disposal would be permitted. Excavation and offsite disposal technologies introduce a potential offsite exposure pathway associated with trucking on public roadways and increased greenhouse gas (GHG) emissions associated with both transportation and offsite treatment. Offsite treatment likely includes incineration using fossil fuels, producing additional GHGs.

Excavation and offsite disposal of materials utilizes proven techniques and readily available conventional construction equipment, but is dependent on the availability of transportation and offsite treatment and disposal capacity. There is a limitation to the technology based on the accessibility of transportation and offsite facility distance and capacity, which are thousands of miles from the BCP Site for hazardous wastes. Transportation and disposal limitations have added months to the IRM schedules and may add years to the remedial action schedule.

Excavation and offsite disposal are considered potentially applicable depending on the remedial actions implemented.

5.4.2 Soil/Fill Treatment

The treatment process options for treatment of fill on the BCP Site address the range of technologies that could be implemented to treat fill at the BCP Site to reduce the toxicity, mobility or volume of contaminants depending on the remedial goals, nature and magnitude of impact, and its position relative to the proposed final grade.

5.4.2.1 Biotreatment

Bio-treatment involves the stimulation of existing bacteria or the introduction of bacteria that consume or transform organic constituents in the fill to less mobile or toxic forms. Biotreatment can be implemented both in situ and ex situ (e.g., Bio piles) and is dependent on the characteristics of the constituents with regard to their bioavailability (i.e., can the bacteria access the compound in the matrix) and the rate the specific compound or constituents biodegrade. There are areas of petroleum hydrocarbon impact identified at the BCP Site that may be well suited to biotreatment. While polycyclic aromatic hydrocarbons (PAHs) have, in studies, been successfully treated, the PAHs on the BCP Site are largely bound in the fill matrix and not bio-available.

Biotreatment of petroleum hydrocarbons has been successfully implemented both in situ and ex situ. The technology relies on readily available construction equipment, exposure to or introduction of air, nutrients that can be procured locally and moisture. The limitations for biotreatment are the time required to stimulate the bacteria degrading/consuming the target constituents and weather. Biological process rates decrease in cold weather. If there are no naturally occurring bacteria present, the introduction of cultivated bacteria is less likely to be successful, indigenous bacteria are far more efficient than cultured bacteria.

The biotreatment of fill would be conducted in accordance with an approved IRM Work Plan or the approved RAWP. The approved IRM Work Plan or RAWP will define the intended goals and testing required to confirm the material has been effectively treated. Following confirmation testing the treated materials would be closed in place if remediated in situ, or if a bio pile, placed on the BCP Site within the limits of the BCP Site in accordance with a final remedial design, and potentially the redevelopment site plan. The treatment of fill using biological processes could, and likely would, continue after completion of the remedial action.



Biotreatment of petroleum hydrocarbons is considered potentially applicable depending on the remedial actions implemented. Biological treatment of PAHs in the fill matrix, the majority of which has been subject to the intensity of the coke battery, is not applicable.

5.4.2.2 Chemical Stabilization/Reduction/Neutralization

Chemical stabilization/reduction/neutralization (chemical treatment) processes are those that can convert constituents to less mobile (typically by reducing solubility) or less toxic forms either using in situ or ex situ alternatives. These processes are typically used on inorganic constituents including cyanide. Similar to the factors limiting biotreatment, chemical treatment is dependent on the ability to create contact between the chemical reagent and the compound being treated and the availability of a chemical reaction to permanently convert the compound to a less mobile or toxic form. Processes are available to treat certain forms of cyanide and metals that are soluble. Processes for organic constituents are less reliable and produce less consistent results. The implementation of these processes typically requires excavation and blending/mixing in equipment that allows homogenization of the matrix and chemical reagent, although in situ blending and treatment is possible. The incorporation of a chemical reagent is usually in a liquid form, resulting in a treated material that is not suitable for direct placement on the BCP Site. As a result, the chemically stabilized material usually requires a solidification process to produce a structurally stable matrix.

Chemical treatment of organic constituents has been successfully implemented both in situ and ex situ, although with less experience and reliability that comparable biotreatment processes. The technology relies on readily available construction equipment, chemicals that are less accessible and often proprietary, and the ability to bring the reagents in contact with the target compound (s). The limitations for chemical treatment are associated with the current form of the target constituents and the ability to bring the reagent and target constituents into contact. Chemical treatment must be tested on the specific material at bench- and pilot scales before they can be incorporated into a remedial design.

Two samples of the blue-stained soil/fill identified during the RI in the South Drainage Area (AOI7) at TP-BCP-35 were collected for analysis using the Synthetic Precipitation leaching Procedure (SPLP) and ASTM Method D-3987. The leachate from the SPLP and ASTM analysis were then analyzed for cyanide using EPA Method 9012. The study was conducted to provide some estimation of the potential cyanide leachability of the blue-stained soil/fill. The SPLP and ASTM methods are similar procedurally and each use deionized water as the extraction fluid.

The results were inconclusive. The SPLP leachate of each sample (0.041 mg/L and 0.079 mg/L) was below the Class GA standard of 0.2 mg/L; however, the SPLP/cyanide analysis was run outside of the holding time due to a laboratory error. The ASTM leachate of each sample was (0.44 mg/L and 0.34 mg/L) and above the 0.2 mg/L Class GA standard. Using the ASTM results as a conservative estimate, and for the purposes of this AA, the blue-stained soil/fill show limited potential for leaching to shallow groundwater, where present. The chemical treatment of constituents in fill would be conducted in accordance with an approved Pre-design Work Plan or RAWP to ensure the resulting materials would not act as a source. The approved Pre-design Work Plan will define the intended goals and testing (bench- and pilot scale) required to confirm the material can be effectively treated. After a successful pilot-scale test, the full-scale treatment would be conducted in accordance with a Pre-design Work Plan or the RAWP. Following confirmation testing the treated materials would be placed on the BCP Site within the limits of the BCP Site in accordance with a final remedial design, and potentially a redevelopment site plan.

Chemical treatment of cyanide containing fill is considered potentially applicable depending on the remedial actions implemented.



5.4.2.3 Solidification

Solidification as used in this AA is the process of binding constituents in the treated material, eliminating free liquids and improving the strength of the fill being treated. The objective is to produce a material that effectively reduces the mobility of the target compound(s) by binding them in a solid matrix while producing a material that will support a cover. Although the constituents in the solidified matrix are less mobile, the process typically increases volume and does not reduce the constituent mass specifically this technology is focused on reduction of mobility and toxicity. Solidification can be effective for both organic and inorganic constituents but must, be tested on the specific material at bench- and pilot scales before they can be incorporated into a remedial design. Solidification can be effectively implemented both in situ (in situ stabilization/solidification [ISS]) and ex situ in piles or in mechanical mixing equipment.

Solidification is a proven technology. The crystalline tar and hardened tars at the BCP Site do not have associated groundwater impacts, demonstrating after years on the BCP Site solidified tars do not allow migration of constituents from their matrix. Samples of the tar seeping from Tar Seep No. 2 are being collected and stabilized, at bench-scale, with combinations of fine coke breeze, lime kiln dust (LKD), and Portland cement. Laboratory analysis have been conducted to demonstrate the selected solidification approach creates a matrix from which the constituents of the stabilized tar are no longer leachable. Additional testing of the soil/fill matrices throughout the former production area are being conducted.

Solidification of constituents in fill would be conducted in accordance with an approved RAWP. An approved Pre-design Investigation Work Plan will define the intended goals and testing (bench- and pilot scale) required to confirm the material can be effectively treated. Mobile tar materials would be converted to concrete/asphalt like solids. After a successful pilot-scale test, the full-scale treatment would be conducted in accordance with an approved RAWP. Following confirmation testing, the treated materials would remain in situ, or be placed on the BCP Site within the limits of the BCP Site in accordance with a final remedial design, and potentially the development plan. Stabilized/solidified fill on the BCP Site shall remain or be placed below the demarcation layer of a soil cover. Stabilized/solidified materials would not be treated and remain or be placed in known proposed utility corridors.

Solidification is considered potentially applicable depending on the remedial actions implemented.

5.4.2.4 Soil Vapor Extraction

Soil vapor extraction (SVE) is a process that accelerates the transfer of VOCs and some Semi-Volatile Organic Compounds (SVOCs) from a fill or soil matrix to soil vapor and then to a treatment system or the atmosphere depending on the measured concentrations in the extracted air. The process depends on volatility of the target compound(s), the ability to maintain vapor flow from the fill/soil matrix (avoiding "short-circuiting" to/from the atmosphere) and the accessibility of the target compound(s). The limited VOCs at the BCP Site are either in fill that is too thin to effectively control the radius of influence of the extraction system or in limited areas of the clay that is too dense to allow migration of the associated vapor.

Soil vapor extraction is not applicable to the BCP Site due to the limited thickness of impacted materials.

5.4.2.5 Thermal Desorption/Treatment

Thermal desorption is an extremely high temperature process that vaporizes target organic constituents to allow them to be separated from the solid matrix, which is effectively the same process previously used in the TCC coke plant. Thermal treatment is an in situ or ex-situ process operated at a reduced, but still high temperature, compared to thermal desorption, and is often coupled with SVE processes to mobilize and capture VOCs and less volatile SVOCs. Both thermal desorption and treatment equipment are energy intensive, the associated air control equipment requires specific permitting, and mobilization is expensive.



There is not a sufficient quantity of fill impacted to the degree that would justify mobilization of thermal desorption equipment at the BCP Site. The majority of the PAH impacted fill on the BCP Site was a result of a thermal process and therefore would not be altered by thermal desorption. Those areas of the fill affected by disposal of tar could potentially be treated ex situ (in treatment piles/units) coupled with SVE or other vapor control systems. In-situ treatment was evaluated by a leading firm in in situ treatment, but their analysis indicated that the thin layer of fill coupled with the presence of conveyance of groundwater in the rail bed materials would not allow in-situ implementation.

The thermal technology being considered for the BCP Site is thermal conduction heating in treatment piles constructed in areas of the BCP Site outside the limits of the proposed redevelopment. The approach proposed by TRS Group (the leading supplier of this technology in the United States) would involve construction and operations including:

- Two treatment phases – each ~15,000 cubic yards;
- Area ~ 34,000 square feet;
- Pile height ~ 12 ft;
- Volume per pile: ~15,000 cubic yards;
- The piles are covered to allow capture of the constituents that are volatilized;
- 2,500 kW TCH power supply (equipment used for Pile One and Pile Two);
- 208 horizontal heaters, 65 feet long;
- 220 days of heating per pile (Pile One will operate during Pile Two construction); and
- On-site treatment of the extracted vapors with thermal oxidizers.

The process involves raising the temperature of the pile while the vapor phase is under vacuum to allow recovery and treatment of the liberated constituents. Following treatment and cooling the fill will be sampled to verify the treatment gas been effective. After confirmation testing, moisture will be added to restore the fill to a condition that it can be placed and compacted in the subgrade of the BCP Site.

Thermal desorption is not applicable to the majority of the fill at the BCP Site due to the origin of the fill in a coke battery (effectively a thermal desorption process). Some fill at the site with VOC and PAH impacts may be treated by thermal ex situ technology and for those volumes thermal treatment is potentially applicable as an alternative to offsite incineration or thermal destruction.

5.5 Groundwater Management

Perched groundwater in the fill and in a few locations the groundwater in the upper clay[17] have been impacted by the past TCC operations. Two technologies and multiple process options have been identified to collect and treat impacted groundwater at the BCP Site. The collection process options are the means to extract groundwater from areas of the BCP Site, while the treatment processes are those that can treat the constituents in groundwater either in situ or in above grade (ex situ) processes. The collection and treatment of groundwater is intended to control the migration (mobility) and toxicity of impacted groundwater. The management of groundwater follows the hierarchy of 6 NYCRR Part 375-1.8(c), [the explanation of how they are applicable to the BCP Site is provided in square brackets]:

[17] The single detection of arsenic in the second-round deep clay groundwater sample (Arsenic was not detected in the first-round sample) from MW-BCP-05 is considered an anomaly, and that assumption will be verified during the pre-design phase.

c) "Source removal and control measures. The following is the hierarchy of source removal and control measures which are to be used, ranked from most preferable to least preferable;

1) Removal and/or treatment. All sources, concentrated solid or semi-solid hazardous substances, dense non-aqueous phase liquid, light non-aqueous phase liquid and/or grossly contaminated media shall be removed and/or treated; provided however, if the removal and/or treatment of all such contamination is not feasible, such contamination shall be removed or treated to the greatest extent feasible."

[The sources of the contamination were primarily in the tanks, pits, pipes and buildings on the BCP Site. They have been removed prior to the remedial action. The secondary sources of impact to the groundwater system will be addressed by removal and or treatment in all Alternatives Except Alternatives Nos. 1 and 2.]

2) "Containment. Any source remaining following removal and/or treatment set forth in this subdivision shall be contained; provided however, if full containment is not feasible, such source shall be contained to the greatest extent feasible."

[All of the residuals on the BCP Site will be contained by the cover system in all Alternatives except the baseline Alternative No. 1 and Alternative No. 8 that includes removal of the impacted groundwater system. The cover system will key into the clay layer to create complete containment.]

3) Elimination of exposure. Exposure to any source remaining following removal, treatment and/or containment set forth in this subdivision shall be eliminated through additional measures, including but not limited to, as applicable, the timely and sustained provision of alternative water supplies and the elimination of volatilization into buildings; provided however, if such elimination is not feasible such exposure shall be eliminated to the greatest extent feasible such exposure shall be eliminated to the greatest extent feasible."

[The design of the cover system will reduce infiltration, control migration, and thereby interrupt direct contact pathways. The environmental easement in all alternatives will eliminate the installation of groundwater extraction wells.]

4) "Treatment of source at the point of exposure. Treatment of the exposure resulting from a source of environmental contamination at the point of exposure, as applicable, including but not limited to, wellhead treatment or the management of volatile contamination within buildings, shall be considered as a measure of last resort."

[Management of VOCs inside buildings is being considered as a remedial technology. SSDSs will be addressed for future buildings in the SMP.]

d) "Groundwater protection and control measure.

1) On-site groundwater contamination. All remedial programs shall consider the protection of groundwater and will consider Department guidance including, but not limited to, any groundwater remediation strategy issued as set forth in ECL, 15-3109. The following are the measures to be considered.

i. source removal or control as set forth in subdivision (c) above."



[Sources of groundwater contamination will be removed or treated to eliminate mobility in all except Alternatives Nos. 1 and 2.]

ii. "groundwater quality restoration. Restoration of groundwater shall be evaluated to determine the feasibility of measures to restore groundwater quality to meet applicable standards and guidance."

[Absent the primary sources of contamination of groundwater and the reduction of infiltration due to the presence of cover and capping systems the groundwater will progress through natural attenuation to break down the residual groundwater contamination over time and reach an equilibrium condition.]

iii. "plume containment/stabilization. All remedies shall, to the extent feasible, prevent the further migration of groundwater plumes, whether on-site or off-site; provided, however that a volunteer in the Brownfield Cleanup Program shall only be obligated to evaluate the feasibility of containing the plume on-site. The development of alternatives will include an evaluation of feasible remedial alternatives that can achieve groundwater plume containment/stabilization."

[As a volunteer in the BCP, RITC will contain the residual groundwater plume on the BCP Site. The impacted groundwater will be isolated within the cover system that is keyed into the underlying clay or removed in all except Alternative No. 1.]

2) Off-site source of groundwater contamination with no on-site source (or contribution).

[Not Applicable]

i. "on-site groundwater contamination may be attributed to an off-site source if the Department determines that:
   a. no act of the remedial party has contributed to the upgradient contamination, or caused such contamination to become worse.
   b. there is an off-site source of contamination, located on one or more upgradient locations, that has impacted on-site groundwater as a result of the migration of the contaminant in, or on, the groundwater; and
   c. there is not an on-site source(s) that may be causing or contributing more than inconsequential amounts to the groundwater contamination.

ii. where the Department has determined that the criteria in this paragraph have been satisfied, the remedial party shall:
   a. have no remedial responsibilities with respect to such groundwater contamination migrating under the site;
   b. continue to satisfy the conditions in subparagraph (2)(i) above;
   c. identify a remedy for the site which eliminates or mitigates, to the extent feasible, the impact of any off-site contamination entering the site."

3) *"*Off-site source of groundwater contamination with an on-site source (or contribution):

i. On-site groundwater contamination may be attributed to both an on-site and an off-site source, if the Department determines that:



a. there is an off-site source of contamination, located at one or more upgradient locations, that has impacted on-site groundwater as a result of the migration of the contaminant in, or on, the groundwater; and
b. there is an on-site source(s) that may be contributing to the groundwater contamination; and

ii. Where the Department has determined that the criteria in subparagraph (3)(i) above exist, the remedial party shall:
a. identify a remedy for the site which includes removal, containment or treatment of the on-site sources contributing to the groundwater contamination;'

[Alternatives Nos. 2 through 8 will address groundwater contamination, regardless of the source. Alternatives Nos. 2 to 7 include complete containment as described above. Alternative No. 8 will remove the shallow groundwater system.]

and

b. "include in the remedy actions which eliminate or mitigate on-site environmental or public health exposures, to the extent feasible, resulting from any off-site contamination entering the site"

[The design of the cover system will include removing fill from the perimeter and keying the cover into the clay to eliminate any potential for offsite contributions to the BCP Site groundwater system. Alternatives Nos. 1 and 8 do not address the potential for offsite contributions.]

4) "Groundwater protection decision-making shall consider the following factors set forth at ECL-15-3109 and any groundwater strategy issued pursuant thereto:

i. recognition that both short-and long-term remediation strategies may be necessary to address groundwater contamination."

[Both short- and long-term strategies are addressed throughout the activities of RITC. Elimination of the sources of groundwater impact, removal of underground reservoirs of water (pits, sumps, basements and pipes) and long-term reduction of infiltrating surface water contacting residuals in fill. Both short term and long-term groundwater management has been incorporated into the alternatives analysis.];

ii. "identification of the long-term groundwater remedial activities that are required to be taken by the State pursuant to the part for sites which the Department has determined pose a significant threat as set forth in section 375-2.7"

[A significant threat determination has been made. The short- and long-term actions associated with the BCP site to prevent a significant threat after implementation of the selected remedial action, if any, would be limited and defined in the SMP.];

"and

iii. "establishment of criteria for the prioritization of long-term groundwater remediation activities to be performed by the Department. Such criteria shall include, but not be limited to:

a. the current or reasonably anticipated future use of contaminated groundwater drinking water"

[There are no anticipated future uses of groundwater. Municipal water is available and the impacted groundwater at the site is not a viable resource.],

b. "the current or reasonably anticipated future use of a groundwater aquifer into which contaminated groundwater is flowing as drinking water"

[The shallow groundwater is isolated from the underlying bedrock water bearing zone by 40 feet of clay. The groundwater in the clay does not prove a usable quantity of water.];

c. "the current or reasonably anticipated future use of contaminated groundwater for non-potable purposes including, but not limited to, recreational uses, institutional uses and agricultural or non-agricultural irrigation"

[There is an insufficient amount of groundwater available on the site to sustain any non-potable use.];

d. "community needs"

[None, there is an excellent municipal supply.];

e. feasibility of remediation

[Limited, the shallow groundwater zone lies entirely in fill materials.];
and

f. "Protection of natural resources and minimizing the impairment of the resource"

[The shallow groundwater zone will be isolated and will not impair any natural resource.];
and

iv. Not withstanding clauses (iii)(a) through (f) above, while the current use of groundwater as drinking water may be considered, the absence of such use shall not exclude the need for remediation."

[The impacted groundwater is not used as a drinking water source and is of limited quantity and cannot provide a drinking water source.]

5.5.1 Groundwater Collection

Groundwater collection is required for those areas of the BCP Site containing impacted groundwater that are not conducive to in situ treatment of groundwater. Collection controls migration and therefore reduces the mobility of constituents in groundwater systems.

Although not specifically described in this text, the process options discussed below both include the use of common equipment/components such as sumps or vaults, pumps, and conveyance piping. The typical materials utilized in the construction of these common components are compatible with the constituents and concentration levels in the areas potentially applicable to the technologies.

5.5.1.1 Collection Trenches

Collection trenches allow control of large areas of shallow groundwater in low yield formations like the fill on the BCP Site. Trenches 100-feet to 200-feet long can be installed in the fill to control the migration of groundwater. Trenches are typically excavated into or through the zone of groundwater targeted for collection and consist of a collection media (fabric or granular), a collection/conveyance pipe and a sump or collection point. Collection trenches have been tested and shown to be effective on the BCP Site. The groundwater IRM trenches collect[18], on average, 0.8 GPM and the resulting draw down has reduced the groundwater elevations more than 3-feet over an extended area in a relatively short time frame (~2 months). The collection trenches proposed for the BCP Site would include both existing and newly installed trenches to allow collection of residual VOC's, SVOC's, Ammonia and Cyanide after the sources have been remediated and controlled.

The groundwater collection system will include the coal yard collection system, the five groundwater IRM collection systems (three may be moved[19]) and location specific systems included in the recommended remedial alternative. The additional groundwater collection system is assumed to (Figure 7-8) consist of:

- Five groundwater collection trenches have been installed in and around the former production area (AOI1 and AOI2) for the Groundwater IRM. Extraction and treatment of groundwater from these trenches (as modified) will continue after completion of the remedial action. The system will be expanded to include groundwater collection trenches in in the following locations (Figure 7-8):
  - –AOI2 – Along Broadway south of the former boiler house to the area south of the purifier boxes (MW-BCP-12A to TP-BCP-12);
  - AOI2 – Former battery exhaust tunnel area (upgraded collector if temporary system continues to produce ammonia concentrations above Class GA standards); and
  - –Perimeter collection systems around in situ stabilized fill or around the bases of the Containment System(s) (if selected).
- Conveyance Systems will be installed to transfer the collected groundwater from the collection trenches and extraction wells to the treatment system. The collection systems will include pumps, piping, utility vaults, cleanouts, and power and signal cables.

Collection trenches are constructed using conventional construction equipment and with readily available materials. There is no limitation to the construction of collection trenches in the fill. The trenches would be installed to allow collection of the entire zone of saturation of the fill by placing the collection sump into

[18] The groundwater collection rate is a function of the formation yield, the recovery rates are not limited by the pumps or treatment system.

[19] Depending on the final alternative selected, the collection trenches at the west end of the production area may be relocated.

the top of the underlying clay. Trenches can be designed to ensure continued access across the BCP Site for construction equipment and personnel.

Collection trenches, by nature of their construction are not suited to the clay water bearing units. The vertical excavation of a collection trench could exacerbate the movement of the shallow impacted groundwater into the clay zones and the low permeability of the clay would produce little to no flow.

Collection trenches are potentially applicable to the fill groundwater zone depending on the remedial actions implemented.

5.5.1.2 Extraction Wells

Unlike collection trenches, extraction wells are vertical and in the shallow water bearing zones at the BCP Site would be limited in lateral influence. The thin shallow fill zone groundwater system could not be effectively controlled using extraction wells. The isolated areas of groundwater impact in the upper clay could be controlled with extraction wells, although the yield will be low, and the radius of influence may be limited. Due to these isolated locations of impact in the upper clay producing little water during sampling of monitoring wells, extraction wells would not be effective in the fill or clay zones.

Extraction wells are constructed using conventional drilling technologies. The use of multiple solid casings can limit the potential for vertical migration from the overlying shallow groundwater zone.

Extraction wells are not applicable to the fill or upper clay groundwater zones. The yield would be low and have limited influence on the groundwater systems.

5.5.2 Groundwater Treatment

Process options considered for treatment of groundwater impacted by the TCC operations range from natural attenuation (NA) through extraction and treatment in a multi-technology primary, secondary and tertiary treatment facility. The groundwater treatment process options all reduce the toxicity of the target constituents in the groundwater medium.

5.5.2.1 Natural Attenuation

Natural attenuation (NA) is the degradation of constituents in groundwater due to biodegradation, dispersion, dilution, sorption, volatilization, and chemical transformation. This process occurs regardless of outside influence. Natural attenuation as a process option is relying on these natural processes to achieve the established remedial goals. Common geochemical indicators of natural attenuation processes (ex. nitrate, ferrous iron, sulfate, sulfide, methane, chloride, and alkalinity) were collected as part of the RI to establish a baseline; however, sampling and analysis during a long-term groundwater monitoring program would establish a trend useful for determining natural degradation rates and time frames for reaching remedial goals.

NA as used in this AA Report is the ongoing processes attenuating concentrations in groundwater without enhancement. Given control of the sources this is an extremely effective and low energy process for final reduction of residual organic impacts in the BCP Site groundwater systems. There is no limitation to the implementation of this process. It should be noted while there is no limitation to the physical monitoring, the effectiveness can be limited by time frames required to reach the remedial goals and the concentration of the target constituents. High concentrations can be toxic to the bacteria and very low concentrations do not provide sufficient food sources for development of an active bacterial population.

NA is potentially applicable as a stand-alone or supplemental process option at the BCP Site. NA as a standalone process is only potentially applicable in areas that are marginally impacted by organic constituents and that cannot allow potential exposure.



5.5.2.2 Phytoremediation

Phytoremediation utilizes the natural processes of trees and other woody species to utilize groundwater, thereby controlling movement (mobility), absorbing constituents from the groundwater and evapotranspiration of organic constituents to the atmosphere. In Western New York, the process is seasonal, so it is potentially a supplemental technology.

The process is applicable in areas of impact with lower concentrations of groundwater organic compound impact and outside the limits of a soil cover system at the BCP Site. The root system and potential exposure should a tree be toppled by high winds does not allow phytoremediation in areas where a containment technology has been implemented. The limitations are associated with the types of trees that are relatively quick to establish a root system, growth, and seasons. This technology has the advantage of producing no greenhouse gases after the trees have been planted and established. An additional advantage is that the phytoremediation areas can provide habitat and forage for wildlife.

Phytoremediation could only be an applicable process option outside the limits of any implemented containment technology. The root systems collecting groundwater would penetrate a soil cover and therefore potentially compromise containment system integrity. As all areas with impacted groundwater will require a containment system and either collection or monitoring, phytoremediation is not applicable.

5.5.2.3 Enhanced In situ Biological Treatment

Enhanced in situ biological treatment as used in this AA report is the process of in situ decay enhanced by the addition of oxygen or nutrients to stimulate or accelerate processes that would otherwise be considered NA. The same processes occur in the groundwater zone, but reducing limiting factors to biological growth (oxygen limitations) or enhancing co-metabolism can accelerate the process.

Enhanced in situ biological treatment does not rely on any specialized equipment although some vendors claim proprietary rights to oxygen sources (ORC™) or blends of nutrients. The delivery and dispersion of the reagents is often the limiting factor. Given the relatively thin layer of shallow groundwater, distribution of oxygen sources or nutrients could be limited unless they are blended into the fill from the surface and allowed to migrate to and through the groundwater system. Another limitation is the concentration of the target constituents. High concentrations can be toxic to bacteria and very low concentrations do not provide sufficient food sources for the development of an active population.

Enhanced in situ biological treatment is potentially applicable as a stand-alone or supplemental process option at the BCP Site.

5.5.2.4 In situ Chemical Oxidation

In-situ chemical oxidation (ISCO) is the introduction of an oxidizer to destroy organic constituents rather than rely on biologic processes to metabolize or disperse the target constituents. ISCO typically involves the injection of chemical oxidants, most commonly permanganate, persulfate, and hydrogen peroxide. ISCO is applicable to treat a wide-range of target constituents including petroleum hydrocarbons, 1,4-dioxane, and phenols.

ISCO requires the introduction of one or more oxidants and potential activation agents into the groundwater system. Oxidants are, by their nature, hazardous. Introduction of an oxidant into the BCP Site can only be implemented after careful bench- and pilot-scale testing. Oxidants were tested on the COG pipe residuals with little effect.

ISCO can be implemented at the BCP Site although specialized equipment is required to receive, mix and inject the oxidant. Additionally, ISCO injections would be subject to EPA Region 2 Underground Injection



Control (UIC) permitting and registration. The introduction of an oxidant in a BCP Site with potential buried combustible materials, rail ties and trestle foundations can potentially increase the risk of fire.

ISCO is potentially applicable to the upper clay groundwater if the appropriate distribution technology is used. To create the contact a mixing, rather than an injection, technology is assumed. ISCO has been proven ineffective on fill and the introduction of an oxidant in flammable materials (some coal fines remain in portions of the fill) is a potential concern for increasing the potential combustibility of the material and is therefore a screening consideration.

5.5.2.5 Air Sparging

Air sparging is an in-situ groundwater treatment technology that involves the pumping of air into the saturated groundwater zone and transferring VOCs from the liquid phase to the vapor phase. The VOCs are then conveyed in vapor form to a collection and treatment system or to the atmosphere. Air sparging produces a secondary benefit as it increases the dissolved oxygen concentration in the surrounding groundwater enhancing natural attenuation.

The limitations of air sparging are that It requires a relatively permeable medium to allow dispersion of the injected air and a relatively thick saturated zone to allow the sparged air to expand and treat a significant volume of groundwater. At the BCP Site, the clay water bearing zone permeability is too low and all sparged air would simply follow the injection casing to the surface. While the permeability of the fill zone is more suitable, the thin saturated thickness is not compatible with the technology.

Air sparging is not applicable to the BCP Site.

5.5.2.6 Onsite Pre-treatment

On-site treatment as used in this AA Report is an on-site processing facility used to reduce concentrations in the aqueous effluent prior to discharge to the Publicly Owned Treatment Works (POTW). Pre-treatment removes solids, separate phase liquids, foaming materials and other constituents at concentrations that would be a concern in a sanitary sewer or POTW. The discharge from pre-treatment is not initially intended to meet the requirements for discharge to surface water. The additional treatment required for discharge to surface water is completed at the POTW. As the source control remedial actions take effect, the extracted groundwater quality should improve, and surface water discharge may be approved and eventually reduction or suspension of collection and treatment is possible.

There are no technical limitations on this type of treatment, and it is currently being utilized on the BCP Site. Pre-treatment of the groundwater sampled at the BCP Site utilizes conventional treatment equipment. The Groundwater IRM is targeting the most highly impacted groundwater on the BCP Site to confirm the treatment train required to meet discharge requirements.

Pre-treatment has been tested at bench-, pilot- and full-scale throughout the period of RITC ownership and continues to be tested at full scale during the Groundwater IRM. The limitations on this type of treatment are flow restrictions that could be placed by the Town of Tonawanda and the cost. The BCP Site discharge, while averaging 112 GPM can vary widely from nearly zero to more than 1,600 GPM. The peak flow would correspond to peak flows at the POTW and there could be times when their capacity is reached, and discharge would be curtailed. The cost is high simply because there is a cost of the pre-treatment and then the additional cost of the POTW treatment, essentially paying twice to treat the same flow.

The pre-treatment of groundwater on the BCP Site will rely on physical treatment as well as natural processes. It is anticipated that the treatment system will be a multi-phase system built using technology tested during the groundwater IRM. The system will allow segregation of groundwater from the various



collection systems into two systems consisting of a pretreatment train and a primary, secondary and tertiary treatment train. The treatment will not differ significantly between the two systems, but the influent may vary significantly because the groundwater from the eastern portion of the production area is far less impacted than that near the former process equipment locations and absent sources after the implementation of source control actions will dramatically reduce the concentration of site-related constituents on the extracted groundwater and reduce the duration of collection and treatment.

Each groundwater treatment system train for the recommended alternative will likely include:

1. Influent equalization and settling tank(s), within a dedicated secondary containment. The tanks will provide a minimum of 4 hours of retention time and will be used as needed to reduce the total solids concentration loading prior to the oil water separator. The tanks will be conical bottom tanks to allow removal of accumulated solids.
2. Oil/water Separator (OWS) – NAPL and passive organic compound treatment including; an oil skimmer to remove light NAPL; and a coalescing media pack and a parallel corrugated plate coalescer to collect dense NAPL. Recovered NAPL will be accumulated in drums or a holding tank and transported offsite for appropriate treatment and disposal.
3. Chemical pH adjustment – a tank and chemical feed to adjust pH if as needed before or in a settling tank after the OWS.
4. Chemical Precipitation – Total suspended solids (TSS) and filterable metals removal;
5. Bag Filtration – Physical removal of TSS and particulate metals (Polishing Phase) removal;
6. OGC/GAC filtration/absorption – dissolved VOCs, Semi-volatile Organic Compounds (SVOCs) and dissolved metals removal. Organoclay/granular activated carbon (GAC) vessels operated as a mixed-media or in series;
7. Cartridge Filtration – TSS and Colloidal Metals (polishing phase); and
8. Effluent Holding – A tank or tanks that will allow stabilization and holding of the effluent prior to discharge to the POTW or surface water system.

The system will be designed and installed in two parallel treatment trains, for example, each capable of treating 30 to 50 gallons per minute (gpm). The parallel systems will allow separation of flow from specific collection systems on the BCP Site, continued operation of one train during maintenance of the other, and a treatment capacity of the average flow rate anticipated from the collection systems on the BCP Site.

Based on the water quality entering the IRM system and as extrapolated from site monitoring wells, air stripping may be incorporated into the system after the chemical precipitation step to reduce the rate of organic compound loading to the GAC. If needed, the system would include a stacked tray air stripper and potentially, depending on the predicted loading, a vapor phase GAC unit.

Pre-treatment is considered potentially applicable for the BCP Site.

5.5.2.7 Onsite Primary, Secondary and Tertiary Treatment

Onsite Primary, Secondary and Tertiary Treatment as used in this AA Report is on-site processing prior to discharge to surface water. The discharge criteria to surface water are typically more restrictive than those from a POTW and for the BCP Site will likely address quantification of additional parameters. In addition to the processes involved in pretreatment, secondary treatment can involve chemical treatment, treatment through different forms of filter/resin media, air stripping, and final polishing. All of these processes are well proven over decades of successful use.

There are no technical limitations on this type of treatment. Multi-phase treatment of the groundwater sampled at the BCP Site utilizes conventional treatment equipment. The Groundwater IRM is targeting the



most highly impacted groundwater on the BCP Site to allow full-scale testing of different processes to confirm the treatment train required to meet discharge requirements.

Surface water treatment has been conducted at bench-, pilot- and full-scale throughout the period of RITC ownership and continues to be tested at full scale in accordance with the SWPPP. The limitations on this type of treatment are solely based on the scale of the equipment required to meet the applicable surface water discharge criteria at the proposed discharge point. The process of preparing and submitting an application for a SPDES permit equivalency will be expedited by the data being collected during the Groundwater IRM. The process of review and granting a SPDES Permit equivalent can be protracted.

Onsite treatment and discharge to surface water is considered potentially applicable for the BCP Site.

5.6 Soil/Fill Vapor

The existing buildings will be removed during IRMs or the remedial actions. There are limited areas that VOCs were detected in fill within the former production area. A full soil vapor intrusion evaluation will be required for all buildings constructed over remaining VOC contamination. Should the buildings be constructed over fill or clay that potentially contains VOCs, evaluations shall be conducted in accordance with the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with updates).

SSDSs are considered a potentially applicable process option for the BCP Site.

5.7 Remnant Material Management

The historic construction and periodic renovation of the former TCC facility has resulted in numerous buried utilities on the BCP Site. While primarily in the former production area AOI, there are other notable largely inactive buried utilities on the BCP Site that may remain after the pre-design investigations:

- Former distribution lines for COG to the Town of Tonawanda, City of Buffalo and the Huntley Power Project;
- Former electrical conduits from the Site 108 substation to the TCC production area;
- Former water and discharge lines in the Parking Lot AOI;
- Former emergency water line under the North Rail Corridor AOI;
- Box Culvert;
- Mansion sump, and
- North storm sewer and north-south storm sewers.

5.7.1 Buried Utility Management

The management of former and current utilities must be completed if they affect compliance with SCGs and to meet the requirements of the future redevelopment plans for the BCP Site. The following buried utilities are considered a potential migration pathway should they collapse and will be removed:

- North-south Storm Sewer – This system will be removed.
- Outfall #001 – The current stormwater outfall is on State Superfund Site 109, but will be eliminated after the remedial actions are completed.
- Emergency Water Line – An emergency water line crosses the north BCP Site line in the vicinity of the former Mansion. The section crossing near the BCP Site line will be removed or grouted.
- COG Lines – There are three COG pipelines that may cross the BCP Site line; the Town COG Line, the City of Buffalo COG Line, and the Huntley Gas Line. These lines were removed from service decades ago, were plugged, and sections of them have been previously removed. The sections



along the BCP Site line will be removed and the removal will continue to the former compressor building location.

- Box Culvert – The box culvert system conveyed storm and quench waters for decades. The system will be removed prior to the removal of the Mansion Sump and the North-south Storm Sewer, the outlet for the box culvert flow.

Other buried utilities known on the BCP Site have been investigated and do not pose an exposure route to human health or the environment in their current condition. depending on the remedial actions selected, utilities encountered in the perimeter excavations or in the process area may require removal or reinforcement for effective completion of remedial action and for the redevelopment.

Buried utility management is considered a potentially applicable process option.

5.7.1.1 No Further Action

All known buried inactive utilities crossing the BCP Site boundary have been cut and both ends of the cut have been plugged. None of the pipes or the fill surrounding the pipes provided a migration pathway to or from the BCP Site. Abandoning pipes that do not affect the other remedial actions reduces the energy use during remediation, lowers potential GHG production (because heavy equipment and transportation is not required), and shortens both the remedial and redevelopment schedule.

No further action for buried utilities that do not affect the other remedial actions or redevelopment is considered a potentially applicable process option.

5.7.1.2 Reuse

The storm water sewer systems (north storm sewer and north-south storm sewer) are intact subsurface systems which may possibly be incorporated into the final redevelopment plans for the BCP Site. The north storm sewer and north south storm sewers may be adaptable for reuse as part of the final surface water management system if they could be cleaned to a new and clean standard or relined. Due to the shallow depth and location of these pipes, they cannot be effectively incorporated into the redevelopment.

Reuse of buried utilities is not a potentially applicable process option.

5.7.1.3 Crush and Use as Fill

A number of the buried utilities conveyed stormwater, electricity or other inert materials. Many of the utilities have vertical components constructed of brick or concrete. Some of the horizontal components are composed of vitrified clay or concrete. These vertical components and conduits may be suitable to be crushed and used as structural fill below a containment system.

Crushing and using inert non-solid waste materials as fill is considered a potentially applicable process option for buried utilities that do not contain process residuals.

5.7.1.4 Grout

Some buried utilities cannot be physically removed. The removal of utilities can sometimes affect an IRM, foundation, or the stability of the surrounding soils/fill. In those cases, grouting a buried conduit, or portion of a conduit can provide a stable foundation for areas that will be redeveloped using slab on grade construction.

Grouting utilities in place is considered a potentially applicable process option.



5.7.1.5 Removal and Offsite Disposal

There are some buried utilities that contain process residuals or are within areas that would otherwise obstruct the planned redevelopment. In these situations, excavation and offsite disposal is appropriate.

Excavation and offsite disposal utilize conventional equipment. Offsite disposal is subject to the requirements of the disposal facilities and requires inspection and sampling as well as preparation and submittal of a waste profile. Following profile approval, the disposal is based on the availability of transportation.

Removal and offsite disposal are considered a potentially applicable process option.

5.8 Selected Technologies

The selected technologies and process options are listed on Table 6.1. The technology process options that cleared the screening process are those that have been considered for the assembly of alternatives:

- No Further Action
- Institutional Controls
    - Environmental Easement
    - Use Restriction–- Groundwater
    - Use Restriction–- Commercial
- ICs/ECs (Routine Long-term care)
    - Fence
    - Site Management Plan
    - Excavation Work Plan
    - Stormwater Best Management Practices
    - Monitoring
        - Monitoring Surface for Erosion/damage
        - Groundwater Monitoring
- Containment
    - Soil or Gravel Cover
    - Asphalt or Concrete Pavement
    - Building or Structure
    - Consolidation Area(s)
- Fill/Soil Excavation
    - Excavation and Onsite Placement
    - Excavation, Treatment, and Onsite Placement
    - Excavation and Offsite Disposal
- Fill/Soil Treatment
    - Biotreatment
    - Chemical Treatment
    - Solidification
    - Ex situ thermal treatment
- Groundwater Collection
    - Collection Trenches
- Groundwater Treatment
    - Natural Attenuation
    - Enhanced In situ Attenuation



    - In situ Oxidation
    - Onsite Pre-treatment
    - Onsite Primary, Secondary and Tertiary Treatment
- Buried Utility Management
    - Crush and Use as Fill
    - Grout
    - Removal and Offsite Disposal



6 Development and Screening of Remedial Alternatives

Remedial Alternatives are the combination of technologies/process options that cleared screening and that would provide a BCP Site-wide remedial action. The alternatives were assembled as shown in Table 6-1. The selection of applicable technologies and process options is shown either for the BCP-Site. The technologies and process options are identified as well as the area or volume to which the process option could apply. Eight alternatives are considered. The range of alternatives spans from No Action to Removal of all soil with constituents above the unrestricted SCOs. The No Action Alternative does not meet the Threshold Criteria but is included in the analysis as a basis for comparison, the removal of all compounds above unrestricted SCOs may not be implementable (due to landfill capacity restrictions) but is included as a 6 NYCRR Part 375 requirement.

Each alternative is then screened against the Threshold and Primary Balancing Criteria:

Threshold Criteria
- Overall Protection of Human Health and the Environment
- Compliance with Standards, Criteria and Guidance (SCGs)

Primary Balancing Criteria
- Long-term Effectiveness and Permanence
- Reduction of Toxicity, Mobility or Volume of Contamination through Treatment
- Short Term Impact and Effectiveness
  - Conventional Evaluation
  - Innovative and Sustainable Evaluation
- Implementability
- Cost Effectiveness
- Land Use

An alternative must meet the Threshold Criteria to be considered for implementation. The SCGs for screening under this AA include:

- 6 NYCRR Part 375–- Environmental Remediation Programs (December 2006)
- 6 NYCRR Part 376–- Land Disposal Restrictions
- 6 NYCRR Part 608–- Use and Protection of Waters
- 6 NYCRR Part 663–- Freshwater Wetlands–- Permit Requirements
- 6 NYCRR Parts 700-706–- Water Quality Standards (June 1998)

The following guidance was considered during the screening in this AA:

- CP-43–- Groundwater Monitoring Well Decommissioning Policy (November 2009)
- TAGM 3028–-“"Contained I”" Criteria for Environmental Media: Soil Action Levels (August 1997)
- Freshwater Wetlands Regulations–- Guidelines on Compensatory Mitigation (October 1993)
- Air Guide 1–- Guidelines for the Control of Toxic Ambient Air Contaminants
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with updates).
- NYSDEC CP-51/Soil Cleanup Guidance, October 21, 2010.
- Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS), November 2022.
- NYSDEC DER-10/Technical Guidance for Site Investigation and Remediation, May 3, 2010.

- NYSDEC DER-31/Green Remediation, January 20, 2011.
- USEPA Office of Solid Waste and Emergency Response Directive 9355.047FS Presumptive Remedies: Policy and Procedures (September 1993)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.048FS Presumptive Remedies: Site Characterization and Technology Selection for CERCLA sites with Volatile Organic Compounds in Soils (September 1993)

The Primary Balancing Criteria are used as the basis for comparison of those alternatives that meet the threshold criteria. The selection of the recommended alternative is based on the Primary Balancing Criteria.

The third category of screening criterion is termed "Modifying Considerations" and that is Community Acceptance. While the goal of the assembly of alternatives is to meet the Threshold and Primary Balancing Criteria, understanding the desires of the community is always considered. The Tonawanda Community Working Group (TCWG) and discussions with community leaders has provided insight into the desires of the community and the long-term vision for this BCP Site in the River Road Corridor, the full assessment of this criteria can only be completed after this AA Report has been reviewed and offered for public comment.

For purposes of the alternatives screening, the following are the source areas as the term is used herein:

Viscous Tar has been identified on the BCP Site, and fill with viscous tar (grossly contaminated soil) encountered during the remedial investigations and IRMs was stockpiled in the Thaw Shed. The viscous tar is present in thin layers of 2-inches or less, most often less than 1-inch thick. The locations and estimated volume of viscous tar and associated fill:

- A Tar filled pipe was encountered in TP-BCP-04 – Confirm pipe and residuals were completely removed – 200 tons;
- Tar was observed seeping from the seam around the base of PT-02 and PT-03 - 400 tons;
- 3,600 tons, north and under the tar management area;
- 500 tons stockpiled in the Thaw Shed.
- TP-BCP-48 was excavated at the Site 110 Boundary west of Tar Seep No. 1, viscous tar seeped into the Test Pit – 800 tons;
- 1,400 tons have been identified around the Tar Seep (TP-BCP-25) location;
- 200 tons in a very thin seam (less than 1-inch thick) along the former location of the south rail in the southwest corner of the BCP Site where rail cars RC-01, RC-02, and RC-03 were removed; and
- Approximately 600 tons of material along the boundary with Site 110, north end of TP-BCP-09.

NAPL was observed in five areas of the BCP Site. Unlike the Viscous Tar, the lower viscosity of NAPL allows it to move to monitoring wells and test pits as the presence of the wells and effects of purging and sampling create a gradient in the associated fill. The locations and estimated volume of NAPL are:

- Light Oil Area – 700 tons[20] of potentially NAPL and directly impacted fill;
- MW-BCP-5A Area – 700 tons of potentially NAPL and directly impacted fill;

[20] The quantity of NAPL in the Light Oil Area will be defined more accurately during the Solidification IRM.

- Exhauster Building and Sumps – Estimate based on indirect evidence, 200 tons[21];
- Pump House Fill – Estimate based on indirect evidence, 400 tons[16]; and
- Junction Building Area – 400 tons.

VOC impacted soils and fill are largely in the production area as well as near and coincident with areas of NAPL and Tar and near areas that had been used to process and cool VOC containing liquids and gases. The areas of VOC impacted fill and soil are:

- Light Oil Area – 5,000 tons[15] of potentially NAPL impacted fill;
- MW-BCP-5A Area – 2,500 tons of potentially NAPL impacted fill;
- Exhauster Building and Sumps – Estimate based on indirect evidence, 500 tons[16];
- Pump House Fill – Estimate based on indirect evidence, 1,200 tons[16]; and
- MW-BCP-19 Area and MW-BCP-13 Area – 3,000 tons.

Areas where the fill has been impacted by petroleum hydrocarbons were:

- Former Diesel Tank Area – 1,500 tons (Note: this remediation was started by TCC, but they abandoned the work before completion);
- Compressor Building – 200 tons (Former Fuel Oil UST location southeast corner)[22];
- Pump House – 700 tons; and
- Wastewater Treatment Area – 7,000 tons.

There are two areas of known Iron Oxide and Purifier wastes on the BCP Site. There are two

other areas that may have been impacted by purifier materials (Figure 3-5):

- Remaining Purifier Boxes – 3,000 tons;
- Iron Oxide Pile – 5,000 tons;
- TP-BCP-46 Area – 1,800 tons;
- Stained Soils in the vicinity of the South Fill Piles – 2,000 tons; and

Areas where materials impacted by metals and/or cyanide (not including purifier wastes) were identified:

- USEPA Soil Piles – 1,000 tons; and

Residual groundwater impacts are largely centered on the production area, although there are areas outside AOI1 and AOI2 that have significant concentrations of VOCs or cyanide:

- Production Area (including North Rail and Production Area AOIs) – 3,300,000 gallons (Groundwater IRM Collection Systems);
- MW-BCP-22A Area – 100,000 gallons (Removal: this is within the recommended perimeter buffer area excavation);
- MW-BCP-23A Area – 22,000 gallons (Removal: this is within the recommended perimeter buffer area excavation);

[21] The quantity of NAPL in the Exhauster Building and Pump House Fill will be defined more accurately during the Pre-design Investigations.

[22] The excavation of the compressor building did not encounter the suspect UST or petroleum impacted fill at this location. During the RA, the area will be excavated to ensure the UST was previously removed and no impact exists.

- Purifier Box/MW-BCP-12A Area – 600,000 gallons[23] (Battery and MW-BCP-12 Area Collection Systems);
- MW-BCP-13 Area – 20,000 gallons (Removal);
- MW-BCP-19 Area – 20,000 gallons (Removal);
- ME-BCP-18 – 20,000 gallons (Removal: within the recommended buffer area);
- TP-BCP-49 Area - 30,000 gallons (Removal: within the recommended perimeter buffer area);
- MW-BCP-27A Area - 200,000 gallons (Removal: within the recommended perimeter buffer area).

An Ammonia SCO will be developed to use to determine which areas of fill contain Ammonia at concentrations that may act as a source of groundwater contamination. The screening is described in the text of this section and briefly in Table 6-2. For comparison purposes, Inventum has assigned a weighting factor and numeric score as shown in Table 6-3. The relative rank/scale that each alternative of the criterion achieves is assigned based on the screening and the product of the weighting factor and assigned rank are summed to produce an Overall Score. The Overall Score is an indication of how effectively each alternative addresses the NYSDEC criteria.

The estimated cost of each alternative is presented in Table 6-4. The estimates have been calculated using the data from the Draft RI report, the IRMs, and the combined experience of OSC and Inventum successfully remediating similar sites. The estimate totals have been rounded up to the closest, $,000s representing the appropriate level of precision available.

For purposes of this AA, the following assumptions apply to all alternatives:

- The Groundwater IRM collection and treatment systems are operated for the period during the review and approval of the RI Report and the AA Report. The groundwater IRM will not be completed prior to remedy selection due to the desire to maintain control of the process area shallow groundwater system until a permanent system has been installed and tested;
- All above ground structures except the office, maintenance building, and green warehouse are demolished in accordance with the approved Demolition Work Plan (Inventum, March 2021);
- All above ground process equipment and piping have been emptied, decontaminated and either recycled or disposed offsite;
- The creation of a defined unrestricted buffer zone around the perimeter of the RITC property;
- The ongoing surface management IRMs are completed before implementation of the remedial action. A CCR will have been submitted but the surface management IRM is not required to be completed to achieve Commercial RAOs; and
- Common Elements of all remedies will include:
    - A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program.
    - In addition to the available SCOs, an Ammonia SCO will be developed and used for definition of source areas during the remedial action.

[23] A significant volume of this groundwater was removed and treated during the compressor building demolition. For purposes of the Alternative Analysis, it is assumed the groundwater volume will be restored during the period between the compressor building foundation removal and the remedial action.

- Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
  - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
  - Reducing direct and indirect greenhouse gases and other emissions;
  - Increasing energy efficiency and minimizing use of non-renewable energy;
  - Conserving and efficiently managing resources and materials;
  - Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
  - Maximizing habitat value and creating habitat when possible;
  - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
  - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

- Institutional Controls

Imposition of an institutional control in the form of an environmental easement for the controlled BCP Site (all portions not meeting Track 1 requirements) that will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
  - allow the use and development of the controlled BCP Site for commercial or industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
  - restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH and the Erie County Department of Health; and
  - require compliance with the Department-approved Site Management Plan (SMP).

- A SMP is required, which includes the following:
  - an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
    - Institutional Controls: The Environmental Easement above.
    - Engineering Controls:
  - This plan includes, but may not be limited to:
    - an Excavation Work Plan (EWP) which details the provisions for management of future excavations in areas of remaining impacts;
    - descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
    - a provision for evaluation of the potential for soil vapor intrusion for any proposed occupied buildings on the site, including provision for implementing actions recommended to address exposures, if any, related to soil vapor intrusion;



        - a provision that should a building foundation, building slab, pavement or utility be removed in the future, a cover system consistent with the commercial use will be placed in any area where the upper one foot of exposed surface soil exceeds the applicable soil cleanup objectives (SCOs)
        - provisions for the management and inspection of the identified engineering controls;
        - maintaining site access controls and NYSDEC notification; and
        - the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.
- Monitoring Plan to assess the performance and effectiveness of the remedy, if needed. The plan includes, but may not be limited to:
    - monitoring of NAPL, groundwater and soil vapor to assess the performance and effectiveness of the remedy;
    - a schedule of monitoring and frequency of submittals to the NYSDEC;
    - monitoring for sub slab depressurization, if needed, for any proposed occupied buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.
- Operation, Maintenance & Monitoring (OM&M) Plan(s), if needed, to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the future remedy. The plan(s) include, but are not limited to:
    - procedures for operating and maintaining the remedy;
    - compliance monitoring of treatment systems to ensure proper OM&M as well as providing the data for any necessary permit or permit equivalent reporting;
    - maintaining site access controls and NYSDEC notification; and
    - providing NYSDEC access to the site and OM&M records.

6.1 Alternative No. 1: No Further Action, Institutional Controls

The baseline alternative is no further action and the registering of institutional controls on the BCP Site.

As shown in Table 6-1, this alternative is limited to:

- Ongoing Operation, Maintenance and Monitoring (OM&M);
- Removal of process piping;
- Removal of remaining potentially impacted buildings (Purifier Boxes and MG Building); Allowing the progression of native vegetation; and
- Allowing Natural Attenuation (NA) to occur.

6.1.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.1.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a fundamental criterion for all BCP Site alternatives. Alternative No. 1 does nothing to protect trespassers or site workers from contact with fill that contains constituents above the commercial SCOs.

Alternative No. 1 does not meet the requirements for Overall Protection of Human Health and the Environment.

6.1.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with Standards, Criteria and Guidance (SCGs) is a fundamental criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 1 does nothing to address exposure to the media that exceeds the SCGs or control of source materials within the fill.

Alternative No. 1 does not meet the requirements for Compliance with SCGs.

Since this alternative does not meet the Threshold Criteria, the Primary Balancing Criteria are not considered. Alternative No. 1 is screened from further consideration.

6.2 Alternative No. 2: Containment, Institutional Controls, and Engineering Controls

The source containment alternative includes completion of actions included in several IRMs; the removal of the remaining secondary containment structures, and removal of potentially impacted slabs. The ongoing OM&M of the Groundwater IRM will continue during the remedial design and the initial implementation of this Alternative, but will be decommissioned as the soil cover is completed. The interruption of the contact pathways in this alternative is achieved by placement of a cover system. Ongoing operation of the Groundwater IRM is eliminated in this alternative as it will have removed the most significantly impacted groundwater from the production area and the cover system will be designed to promote runoff and reduce future infiltration.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M;
- Removal of all remaining process piping;
- Removal of potentially impacted structures or buildings (Purifier Boxes and MG Building, action is part the Demolition IRM, Inventum 2021c);
- Establishing procedures for BCP Site management and onsite excavation (ongoing site management subject to the Site Management IRM [Inventum 2020c] and as will be revised for post-remedial action);
- Regrading the fill on the BCP Site to allow placement of a cover system(s); and
- Placement of a soil or gravel cover systems.

Depending on the timing, pavement and buildings for the redevelopment will serve as portions of the BCP Site cover system.

6.2.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.2.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 2 increases the overall protection of human health and the environment on the BCP Site by interrupting all direct exposure pathways on the BCP Site. BCP Site workers are protected by following the SMP and EWPs. The environment is protected by the combination of the underlying clay and the containment provided by the proposed soil cover that includes a perimeter clay layer keyed into the underlying silty clay.

Alternative No. 3 meets the requirements for Overall Protection of Human Health and the Environment.



6.2.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 2 addresses the soil exceedances by containing all fill that exceeds SCOs with a cover. The groundwater exceeding the Class GA standards would be limited and contained by the cover system that includes a clay perimeter keyed into the underlying clay. Alternative No. 2 does not alter the state of the NAPL but limits potential mobility and exposure to the materials by containing the materials in place.

Alternative No. 2 does not address source controls directly and therefore is removed from further consideration. Under the definition in 6 NYCRR Part 375-1.8(c):

"c) Source removal and control measures. The following is the hierarchy of source removal and control measures which are to be used, ranked from most preferable to least preferable;

1) Removal and/or treatment. All sources, concentrated solid or semi-solid hazardous substances, dense non-aqueous phase liquid, light non-aqueous phase liquid and/or grossly contaminated media shall be removed and/or treated; provided however, if the removal and/or treatment of all such contamination is not feasible, such contamination shall be removed or treated to the greatest extent feasible."

As shown in Alternatives 3 through 6 it is feasible to remove the known source materials on the BCP Site. As a result, Alternative No. 2 will be screened from further consideration.

6.3 Alternative No. 3. Source Containment, Groundwater Control, Institutional Controls, Engineering Controls

The source containment and groundwater control alternative (Alternative No. 3) includes the components of Alternative No. 2 with the addition of a long-term groundwater extraction and treatment system. The interruption of the potential contact pathways in this alternative is achieved by placement of a soil cover. The reduction in mobility, toxicity and volume is achieved through the collection and treatment of the groundwater from the fill zone eliminating potential mobility from the BCP Site. Additional reduction in mobility, toxicity and volume will continue to be achieved by ongoing NA.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of remaining process piping;
- Removal of all potentially impacted structures or buildings (Purifier Boxes and MG Building);
- Establishing procedures for BCP Site management and onsite excavation;
- Construction of a full-scale long-term groundwater collection and treatment system that is capable of collection and treatment of groundwater potentially affected by VOC's, SVOC's, Ammonia and Cyanide (Section 5.5.1);
- Conducting groundwater monitoring to quantify groundwater management and NA;
- Regrading onsite fill to allow placement of the cover systems; and
- Placement of a soil or gravel cover system.

Depending on the timing, pavement and buildings for the redevelopment will serve as portions of the BCP Site cover system.



6.3.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.3.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 3 increases the overall protection on the BCP Site by interrupting all direct exposure pathways and collecting and treating groundwater. BCP Site workers are protected by following the SMP and Excavation Work Plans. The environment is protected by the extraction and treatment of the impacted and potentially impacted groundwater, and the containment provided by the soil cover.

Alternative No. 3 meets the requirements for Overall Protection of Human Health and the Environment.

6.3.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 3 addresses the soil exceedances by containing all fill that exceeds commercial SCOs with a cover. The groundwater exceeding the Class GA standards would be contained by the cover system and treated with the installation and operation of the full-scale groundwater collection and treatment system. Alternative No. 3 does not alter the state of the NAPL[24] but the partition of constituents and any potential migration or partitioning of constituents from these areas is controlled through collection and treatment of groundwater.

Alternative No. 3 meets the requirements for Compliance with SCGs based on collection and treatment of NAPL in the former production area, and indirect treatment of NAPL constituents in the subsurface groundwater. In Alternative No. 3, NAPL mobility is addressed by groundwater collection and treatment, and the containment system.

6.3.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the remedial actions will be.

6.3.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 3 is effective and permanent by recovering and treating impacted groundwater and maintaining the cover system. While the secondary containment IRM and pre-design investigation slab removals will have addressed the most significant exposure pathways, this alternative contains potential migration of residual NAPL in areas not addressed by IRMs through both groundwater collection, groundwater treatment, and containment. The areas with potential remaining NAPL will be identified in the SMP and EWPs to ensure the containment is not disrupted during redevelopment.

6.3.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective by reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

[24] NAPL as used in this alternative includes viscous flowing tar (Figure 3-1) and separate phase petroleum and light oil (Figure 3-2).

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and
- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.

In addition, more than 10,200 tons of material suitable for reuse (steel, other metals, fuels, etc.) have been reused or recycled rather than being abandoned on the BCP Site or filling a landfill. Recycling is a critical component of RITC's commitment to the environment.

The additional reduction of toxicity, mobility and volume of contamination through treatment in Alternative No. 3 is comparatively aggressive by recovering and treating impacted groundwater in addition to the mass being degraded by natural attenuation. Mobility of residual impacts will be limited by the collection systems and the containment system. Ongoing natural attenuation will be quantified through the groundwater monitoring in the SMP developed in this alternative.

6.3.2.2.1 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but is not a specifically defined primary balancing criteria.

6.3.2.2.2 Conventional Evaluation

The short-term effectiveness of Alternative No. 3 is rapid. Placement of the cover can be implemented rapidly after the required permits are secured. There will be a number of trucks on local roadways transporting topsoil and the treatment system components to the BCP Site, but the volume of traffic should not be disruptive on the NYS Thruway or River Road. There is sufficient space on the BCP access road to queue incoming truck traffic. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates the direct contact pathway for trespassers.

6.3.2.2.3 Innovative and Sustainable Evaluation

The innovative and sustainable components of the cover will include the use of onsite borrow reducing the GHGs associated with the transportation of unclassified fill.

The construction of the cover and the transportation of topsoil to the BCP Site produce GHGs, but only for a limited period. The energy consumption of the groundwater collection and treatment system is modest compared to the benefit achieved. To the extent practical, the groundwater treatment system will be constructed in a partially below grade structure to reduce energy requirements.

The selection and planting of the appropriate native plants in and around the rain gardens, bioretention ponds/basins, and the stormwater ponds in the Track 1 areas can require a lengthy period to establish. The



selection of plants that are native to western New York's climate may require consultation local experts but should lead to a more sustainable cover.

6.3.2.3 Implementability

Alternative No. 3 can be implemented with existing equipment and procedures. The earthmoving associated with the construction of the cover system and stormwater controls relies on conventional equipment and readily available materials.

The design, permitting, procurement, construction and operation of the groundwater extraction and treatment systems are relatively conventional but must be designed for the extremely wide range of groundwater quality at the BCP Site. The current Groundwater IRM system has been placed to collect the most impacted groundwater on the BCP Site, the long-term system will treat a combination of this impacted water and other groundwater with little to no impact. The process is not difficult, but additional pilot-scale testing of water from all areas of the BCP Site will have to be collected and treated through the Groundwater IRM to confirm the required process options for full-scale operation. Permitting a facility like this is administratively feasible and will require implementation of two stages; permitting to the Town of Tonawanda for an Industrial Waste Discharge followed by the granting of a SPDES permit equivalence by NYSDEC.

6.3.2.4 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 3 is considered relatively effective as it is the least expensive alternative to meet the threshold criteria using treatment and score well in the primary balancing criteria evaluations. Alternative No. 3 is estimated to cost $46,260,000, (Table 6-4). The benefits of providing BCP Site-wide groundwater management and containment systems exceeds the extra cost required and therefore Alternative No. 3 is considered more cost effective than Alternative No. 2.

6.3.2.5 Land Use

The BCP Site is suitable for commercial and industrial redevelopment under Alternative No. 3. The groundwater collection, conveyance and treatment system(s) will be designed to be consistent with the development and its utility corridors. The perimeter areas of the BCP Site will meet unrestricted criteria (Track 1).

6.3.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.

6.3.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.4 Alternative No. 4: In Situ Solidification, Containment, Groundwater Control, Institutional Controls, Engineering Controls

The in-situ solidification, source containment and groundwater control alternative includes the components of Alternative No. 3 with the addition of in-situ treatment of areas potentially containing petroleum and residual NAPL (NAPL still remaining after any secondary containment IRM removals). NAPL will be solidified to eliminate free liquids and mitigate leaching characteristics. The interruption of the contact pathways in this alternative is achieved by placement of a soil cover. The reduction in mobility, toxicity



and volume is achieved through the solidification of areas with significant NAPL, eliminating the mobility of the constituents; and through collection and treatment of groundwater from the fill zone.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of any remaining process piping;
- Removal of potentially impacted buildings (Purifier Boxes and MG Building);
- Management and control of surface water during remediation[25];
- Establishing procedures for BCP Site management and onsite excavation;
- Construction of a full-scale groundwater collection and treatment system that is capable of collection and treatment of groundwater potentially affected by VOC's, SVOC's, Ammonia and Cyanide (Section 5.5.1);
- Installation of collection systems around the stabilized materials to reduce the potential for saturation and to allow collection and treatment of associated groundwater;
- Solidification (see Section 5.4.2.3) of viscous mobile tar and NAPL (Figure 3-1) including the Tar Seep No. 2 area;
- Regrading fill on the BCP Site to allow placement of the cover systems; and
- Placement of a soil or gravel cover system.

Depending on the timing, pavement and buildings for the redevelopment will serve as portions of the BCP Site cover system.

6.4.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.4.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 4 potentially offers more overall protection to the environment compared to Alternative No. 3. Direct exposure pathways on the BCP Site are interrupted by the Alternative No. 3 technology process options that are all included in Alternative No. 4. However, the in situ treatment options provide reduction in toxicity, and mobility of NAPL through treatment within the containment provided by the soil cover. BCP Site workers are protected by following the SMP and EWPs and the restrictive requirements in those plans may be lessened compared to Alternative No. 4. The environment is protected by the solidification of NAPL, extraction and treatment of the impacted groundwater, and the containment provided by the soil cover.

Alternative No. 4 meets the requirements for Overall Protection of Human Health and the Environment.

6.4.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 4 addresses the soil exceedances by containing all fill that exceeds SCOs with a cover. The groundwater exceeding the Class GA standards would be contained by the full-scale groundwater collection

[25] Surface water management after completion of the soil cover is not a remedial action and is not included in this AA.

and treatment system. Alternative No. 4 eliminates NAPL through treatment. The solidification will reduce the mobility of both separate phase and dissolved phase constituents.

Alternative No. 4 meets the requirements for Compliance with SCGs.

6.4.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the actions will be.

6.4.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 4 is effective and permanent by solidifying NAPL materials that could act as sources of constituents to shallow groundwater, recovering and treating previously impacted groundwater and maintaining the cover system. While the Tank Management, Secondary Containment and Groundwater IRMs and the Pre-design Investigation Work Plan activities will have addressed the most significant exposure pathways, Alternative No. 4 will contain potential migration of constituents in NAPL in areas not addressed by the secondary Containment and Groundwater IRMs through both treatment and containment. The areas with potential remaining residual materials will be identified in the SMP and EWPs to ensure the containment is not disrupted during redevelopment.

6.4.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and
- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.

In addition, more than 10,200 tons of material suitable for reuse (Steel, other metals, fuels, etc.) have been reused or recycled rather than being abandoned on the BCP Site or filling a landfill. Recycling is a critical component of RITC's commitment to the environment.

The additional reduction of toxicity, mobility, and volume of contamination through treatment in Alternative No. 4 is more aggressive than that included in Alternative No. 3. Operation of the full-scale groundwater collection and treatment system will significantly reduce the mobility and volume of contamination in the shallow/perched groundwater system and will be further enhanced by natural attenuation. The operation of the Groundwater IRM has demonstrated that collection and treatment can control the shallow groundwater system, eliminating potential mobility in that media. The solidification of NAPL (Figure 3-2) will significantly and aggressively reduce the mobility of this area of impact. Solidification is also a means to eliminate the potential impact from viscous mobile tar and residual NAPL



should one of these areas need to be excavated during redevelopment. Ongoing natural attenuation will be monitored in this alternative to quantify degradation rates and reductions in volume of contamination through ongoing natural degradation.

6.4.2.3 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but is not a specifically defined primary balancing criteria.

6.4.2.3.1 Conventional Evaluation

The short-term effectiveness of Alternative No. 4 is lessened (less favorable) compared to Alternative No. 3 due to the time required to solidify the target materials. After solidification is completed in an area, the location can be graded for subgrade and placement of the cover can be implemented rapidly. The Town of Tonawanda permits for the cover system can be procured during the solidification. There will be a number of trucks on local roadways transporting solidification compounds, topsoil, and treatment system components to the BCP Site, but the volume of traffic should not be disruptive on the NYS Thruway or River Road. The use of the carbon rich breeze in the solidification process not only reduces the amount of traffic on public roads but also effectively uses an available resource on the BCP Site. There is sufficient space along the access road to the BCP Site for queuing of the truck traffic. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates contact for trespassers even in the alternative including solidification.

6.4.2.3.2 Innovative and Sustainable Evaluation

The innovative and sustainable components are consistent with Alternative No. 3.

The solidification, the construction of the cover, and the transportation of topsoil to the BCP Site will produce marginally more GHGs (6,211 Tons for Alternative No. 4 v 4,136 tons of CO_2 equivalent for Alternative No. 3 [Table 6-5]) due to the exposure of the materials and the additional fuel consumption of the construction equipment during source removal, but the GHG production will only occur for a limited period and is considered acceptable given the long-term benefit.

The selection and planting of the appropriate native plants in and around the rain gardens, bioretention ponds/basins, and the stormwater ponds in the Track 1 areas can require a lengthy period to establish. The selection of plants that are native to western New York's climate may require consultation with local experts but should lead to a more sustainable cover.

6.4.2.4 Implementability

Alternative No. 4 can be implemented with existing equipment and procedures. The earthmoving associated with the solidification and construction of the cover system and stormwater controls all rely solely on conventional equipment and readily available materials. The solidification has been demonstrated by the processes used to stabilize the contents of above ground storage tanks (ASTs) across the BCP Site and the ongoing bench-scale testing. The process for solidifying the in situ materials will be different from that used for offsite transportation and therefore bench- and full-scale testing of the solidification approach is required during remedial design. Preliminary bench-scale testing has been conducted for proof of concept, and the pre-design investigations are being conducted at a scale for design. The materials used for solidification are available locally, including breeze on the BCP Site, and locally sourced materials have already been used to allow disposal in accordance with the approved NYSDEC Tank Management IRM.



The design, permitting, procurement, construction and operation of the groundwater extraction and treatment systems are relatively conventional but must be designed for the extremely wide range of groundwater quality at the BCP Site. The process technology is not difficult, but additional pilot-scale testing of water from all areas of the BCP Site will have to be collected and treated through the Groundwater IRM to confirm the required process options for full-scale implementation. Permitting a facility like this will require implementation of two stages; permitting to the Town of Tonawanda for an Industrial Waste Discharge followed by the granting of a SPDES permit equivalence by NYSDEC.

6.4.2.5 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 4 is considered only marginally less cost effective than Alternative No. 3. Alternative No. 4 costs 13% more than Alternative No. 3 however, it provides some additional protection of human health or the environment through an increased reduction in the mobility of contamination. Alternative No. 4 is estimated to cost $52,298,000 (Table 6-4). Solidifying the NAPL and viscous tar beneath a permanent cover and within areas controlled by a groundwater collection system provides a long-term site management benefit over Alternative No. 3.

6.4.2.6 Land Use

The BCP Site is suitable for commercial and industrial redevelopment under Alternative No. 4. The groundwater collection, conveyance and treatment system(s) will be designed to be consistent with the development and its utility corridors. Perimeter areas of the BCP Site will meet unrestricted criteria in the areas where stormwater management features will be installed. The solidification of the materials below the cover does not increase the ability to redevelop the BCP Site, but in situ solidification in the former production area will not inhibit the planned redevelopment, and the location of the solidified materials will be identified in the SMP and EWP so they can be avoided during redevelopment.

6.4.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.

6.4.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.5 Alternative No. 5: In Situ Solidification, Containment, Groundwater Control, Institutional Controls, Engineering Controls

The in-situ solidification, source containment and groundwater control alternative include the components of Alternative No. 4 with the addition of in-situ treatment or solidification of areas potentially containing petroleum impacted and blue-stained soil/fill and, consolidation of potential source materials from the stockpiled solid wastes, and Tar Seep No. 2 to reduce the footprint of areas requiring long-term monitoring and care. Petroleum impacted soils will be treated in-situ using biotreatment, blue-stained soil/fill in the TP-BCP-35 area will be solidified in place to eliminate free liquids and potential leaching characteristics. The solid wastes in the iron oxide pile, purifier boxes and the EPA soil piles will be placed in the consolidation areas. The interruption of the contact pathways in this alternative is achieved by placement of a soil cover. The reduction in mobility, toxicity and volume is achieved through the treatment of areas with significant petroleum hydrocarbon impacts, solidification of NAPL, solidification of blue-stained soil/fill in the TP-BCP-35 area; and through collection and treatment of the groundwater from the fill zone. The solidified NAPL and viscous tar will be placed covered in place or placed in the consolidation cells.



The potential mobility of solidified materials (see Section 5.4.2.3) is significantly reduced by reducing the number of locations that the materials will be managed on the BCP Site.

As shown in Table 6-1 and Figure 7-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of any remaining above ground tanks, process piping, and process equipment;
- Removal of all potentially impacted buildings (Purifier Boxes and MG Building);
- Management and control of surface water;
- Construction of a full-scale groundwater collection and treatment system that is capable of collection and treatment of groundwater potentially affected by VOC's, SVOC's, Ammonia and Cyanide. Due to the solidification of potential source materials the collection system will be only required in AOC's 1 and 2 (Section 5.5.2);
- Biotreatment of areas of high TPH concentrations (Wastewater Treatment and Former Diesel Tanks Areas, Figure 3-4);
- Construction of consolidation area(s) including perimeter groundwater management;
- Solidification (see Section 5.4.2.3) of the viscous mobile tar and NAPL (Figures 3-1 and 3-2);
- Excavation and placement of the blue-stained soil/fill currently in the iron oxide pile, purifier boxes and materials stockpiled by the USEPA into the consolidation areas;
- In situ solidification of the TP-BCP-35 area (blue-stained soil/fill);
- Regrading fill on the BCP Site to allow placement of the cover systems; and
- Placement of capping systems on the consolidation areas and soil or gravel covers on the balance of the BCP Site.

6.5.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.5.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 5 offers slightly more overall protection of the environment comparted to Alternative No. 4 by reducing the number of areas with solidified residual materials and improving the overall surface water drainage on the BCP Site. Direct exposure pathways on the BCP Site are interrupted by the Alternative No. 4 technology process options that are all included in Alternative No. 5. However, the in situ treatment options in Alternative No. 4 provide a potential reduction in toxicity and mobility of impacts but the resulting solidified materials remain in several areas of the site, complicating grading for surface water management. BCP Site workers are protected by following the SMP and EWPs and the restrictive requirements in those plans may be lessened in Alternative No. 5 compared to Alternative No. 4 because the consolidation area(s) will be in a specific area rather than across the BCP Site. The environment is protected by the solidification and consolidation area construction that eliminates the potential for contact between shallow groundwater and the most impacted materials, extraction and treatment of the impacted groundwater, and the containment provided by the capping systems and soil cover.

Alternative No. 5 meets the requirements for Overall Protection of Human Health and the Environment.

6.5.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 5 addresses the soil exceedances by containing all fill that exceeds SCOs with a capping



system or cover. Site preparation for the cover system will include clearing the fill around the perimeter of the BCP Site. The clearing of the Track 1 area around the perimeter creates a defined buffer between the BCP Site and the surrounding properties. The perimeter surface water management systems; ditches, rain gardens, and bio-retention basins will be completed in the perimeter buffer zones outside the area of remedial action.

The groundwater exceeding the Class GA standards would be contained by the full-scale groundwater collection and treatment system that will focus on the remaining areas of impact around the former production area (Figures 3-1 to 3-7). Alternative No. 5 eliminates NAPL through treatment and subsequent consolidation. In addition, Alternative No. 5 treats or solidifies/stabilizes petroleum impacted and blue-stained soil/fill in the TP-BCP-35 area (AOI7, Figure 3-5). This additional treatment and solidification cannot be directly linked to additional protection of the environment as the associated constituents are not predominant in groundwater samples, but they address potential sources. The purifier contents and iron oxide pile materials will be placed in a consolidation area to eliminate the potential of migration of any residual cyanide. The solidification of NAPL will reduce the mobility of both separate phase and dissolved phase constituents.

Alternative No. 5 meets the requirements for Compliance with SCGs.

6.5.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the actions will be.

6.5.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 5 is effective and permanent by solidifying materials that could act as sources of constituents to shallow groundwater, consolidating materials in limited areas of the BCP Site outside the areas of planned redevelopment, recovering and treating previously impacted groundwater and maintaining the capping and cover systems. While the Tank Management and Secondary Containment IRMs will have addressed the most significant exposure pathways, Alternative No. 5 will contain potential migration of constituents in NAPL in areas not addressed by the Secondary and Groundwater IRMs through treatment and containment. The areas with potential remaining NAPL must be identified in the SMP and EWP to ensure the containments are not disrupted during or following redevelopment.

6.5.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and

- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.

In addition, more than 10,200 tons of material suitable for reuse (steel, other metals, fuels, etc.) have been reused or recycled rather than being abandoned on the BCP Site or filling a landfill. Recycling is a critical component of RITCs commitment to the environment.

The additional reduction of toxicity, mobility, and volume of contamination through treatment; Alternative No. 5 addresses restrictions on redevelopment of the BCP Site by consolidation of materials, potential sources of petroleum hydrocarbons and blue-stained soil/fill by treatment; in addition to the NAPL treatment included in Alternative No. 4. The placement of materials from areas outside the former production area in the consolidation area(s) reduces potential mobility by moving solidified materials from areas of active grading for the stormwater controls. The soil process options (biotreatment and solidification) also significantly and aggressively reduce the toxicity and mobility of impacts that have lower potential mobility than address in Alternative No. 4. Solidification is also a means to eliminate the potential impact from viscous mobile tar, residual NAPL, and blue-stained soil/fill should one of these areas (Figure 3-5) need to be excavated during redevelopment.

Operation of the full-scale groundwater collection and treatment system will significantly reduce the mobility and volume of contamination in the shallow/perched groundwater and will be further enhanced by natural attenuation. Collection systems below each consolidation cell will ensure no leachate from the consolidation cells reaches the groundwater system. Ongoing natural attenuation will be quantified by the groundwater monitoring conducted in accordance with the SMP required in this alternative.

6.5.2.3 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but it is not a specifically defined primary balancing criteria.

6.5.2.3.1 Conventional Evaluation

The short-term effectiveness of Alternative No. 5 is comparable to Alternative No. 4 due to the time required to solidify/stabilize and subsequently consolidate the target materials is not significantly different. Some solidified materials may have to be double handled as the consolidation area(s) may be placed over some of the areas with materials to be solidified. After solidification is completed in an area, the solidified materials from outside the production area will be placed in a consolidation area, the location can be graded for stormwater drainage and subgrade preparation, and placement of the cover can be implemented rapidly. The advantages of in situ solidification and utilization of the consolidation area are significant due to the benefit of eliminating the much higher GHG impact associated with trucking for offsite disposal. The additional time required to construct and place materials in the production area is far less than required to stage and transport materials offsite. Not only do the consolidation areas eliminate the zones of highest groundwater impact, but they create a barrier to migration of residual impacts in shallow groundwater from the production area.

The Town of Tonawanda permits for the cover system can be procured during the solidification. There will be a number of trucks on local roadways transporting solidification compounds, topsoil and treatment components to the BCP Site, but the volume of traffic should not be disruptive on the NYS Thruway or River Road. There is sufficient space on the access road to the BCP Site to allow queuing of trucks. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates contact for trespassers even in the alternative including during solidification.

6.5.2.3.2 Innovative and Sustainable Evaluation

The innovative and sustainable components are consistent with Alternative No. 4. The consolidation of stabilized materials, solidification, and treatment of the petroleum impacted soils and blue-stained soil/fill will produce additional GHGs for a limited period. Although there is no demonstratable benefit to the environment during the remedial action, the benefit is in the longer term by allowing more efficient stormwater grading, potentially a shorter duration of groundwater collection and treatment, and less effort, and associated GHG generations, during redevelopment.

The selection and planting of the appropriate native plants in and around the rain gardens, bioretention ponds/basins, and the stormwater ponds in the Track 1 areas can require a lengthy period to establish. The selection of plants that are native to western New York's climate may require consultation local experts but should lead to a more sustainable cover.

6.5.2.4 Implementability

Alternative No. 5 can be implemented with existing equipment and procedures. The earthmoving associated with the solidification; construction of the consolidation areas and cover systems; and development of stormwater controls all rely solely on conventional equipment and readily available materials. Solidification has been demonstrated by the processes used to solidify the contents of above ground storage tanks (ASTs) across the BCP Site and a preliminary bench-scale test of solidification of Tar Seep No. 2 materials. The solidification and treatment alternatives are being refined by bench- and full-scale testing during the pre-design investigation and remedial design. The materials used for solidification are available locally, including on the BCP Site, and locally sourced materials have already been used to allow disposal in accordance with the approved NYSDEC Tank Management IRMs. The materials required for construction of the consolidation areas; geotextiles, low permeability membranes, and topsoil are all available commercially, some locally.

The design, permitting, procurement, construction and operation of the groundwater extraction and treatment systems are relatively conventional but must be designed for the groundwater quality in the former production area of the BCP Site. The process is not difficult, but additional pilot-scale testing of water from the remaining target areas, including around the solidified areas and the consolidation area, of the BCP Site will have to be collected and treated through the Groundwater IRM to confirm the required process options for full-scale implementation. Permitting a facility like this will require implementation of two stages; permitting to the Town of Tonawanda permitting to the Town of Tonawanda for an Industrial Waste Discharge followed by the granting of a SPDES permit equivalence by NYSDEC. for the long-term treatment plant.

6.5.2.5 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 5 is considered only marginally less cost effective than Alternative No. 4. Alternative No. 5 costs 29% more than Alternative No. 4 and while it does not provide demonstratable additional protection of human health or the environment through an increased reduction in the mobility or volume of contamination it improves the ability to regrade the site for efficient stormwater management and reduces the number of locations requiring long-term care and monitoring. Alternative No. 5 is estimated to cost $67,212,000 (Table 6-4). Treating the petroleum impacted soils and solidifying/stabilizing the blue-stained soil/fill that will be contained beneath a permanent cover and controlled by a groundwater collection system provides no demonstratable greater benefit than Alternative No. 4.



6.5.2.6 Land Use

The BCP Site is suitable for commercial and industrial redevelopment under Alternative No. 5. The perimeter areas of the BCP Site will meet unrestricted criteria. Clearing the perimeter will provide a barrier between the BCP Site and the surrounding properties. In situ solidification and consolidation of solidified and solid waste materials will allow more effective grading and reduce the scope and effort required under the EWPs. Placement of the consolidation areas in the former Production Area AOI will not interfere with development of the BCP Site.

The groundwater collection, conveyance and treatment system(s) will be designed to be consistent with the development and its utility corridors.

6.5.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.

6.5.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.6 Alternative No. 6: Ex Situ Thermal and Solidification, Containment, Groundwater Control, Institutional Controls, Engineering Controls

The thermal treatment and in situ solidification, source containment and groundwater control alternative include the components of Alternative No. 5 with the replacement of the solidification and consolidation of source materials in areas (Figure 3-2) potentially containing NAPL (following the Secondary Containment and Groundwater IRM removals) with thermal treatment of these materials. Excavation of NAPL for ex situ treatment requires less import material, but significantly increases the schedule and air emissions (more than double that of Alternative No. 5). Petroleum impacted soils will be treated using biotreatment and blue-stained soil/fill (TP-BCP-35 area) will be solidified to eliminate potential free liquids and leaching characteristics. The interruption of the contact pathways in this alternative is achieved by placement of a soil cover. The reduction in mobility, toxicity and volume is achieved through the treatment of the viscous tar in the Tar Seep No. 2 area (Figure 3-1), solidification of areas with significant petroleum impacts and blue-stained soil/fill; and through collection and treatment of the groundwater from the fill zone.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of any remaining process piping;
- Removal of all potentially impacted buildings (Purifier Boxes and MG Building);
- Management and control of surface water during remediation;
- Construction of a full-scale groundwater collection and treatment system that is capable of collection and treatment of groundwater potentially affected by Ammonia and Cyanide (Section 5.5.2). Under this alternative the VOC and SVOC source materials will be thermally treated and only a limited capture period for those constituents would be required.;
- Biotreatment of areas of high TPH concentrations (Wastewater Treatment and Former Diesel Tanks Areas, Figure 3-4);
- Excavation of viscous mobile tar and NAPL in the Former Production Area, Tar Seep No. 2 area and the southwest corner of AOI7 (Figures 3-1 and 3-2) for thermal treatment. The materials will



be placed in a treatment pile for on-site ex situ thermal treatment (see Section 5.4.2.5). Due to the duration required for thermal treatment, the pile will be placed outside the limits of the proposed redevelopment, most likely in the southeast corner of the BCP Site;
- Solidification of the blue-stained soil/fill in the iron oxide pile and the TP-BCP-35 area. The blue-stained soil/fill at the TP-BCP-35 area will be stabilized in place;
- Regrading of fill on the BCP Site to allow placement of the cover systems; and
- Placing the capping and soil or gravel cover systems.

Depending on the timing, pavement and buildings for the redevelopment will serve as portions of the BCP Site cover system.

6.6.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.6.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 6 does not significantly alter the overall protection to the BCP Site over Alternative No. 5, in fact the excavation and ex situ thermal treatment of tar impacted fill doubles the GHG emissions, nearly all on site treatment emissions. Direct exposure pathways on the BCP Site are interrupted by the Alternative No. 4 technology process options that are all included in Alternative No. 6. BCP Site workers are protected by following the SMP and EWPs. The environment is protected by the combination of the underlying clay, the extraction and treatment of the impacted groundwater, and the containment provided by the soil cover.

Alternative No. 6 meets the requirements for Overall Protection of Human Health and the Environment.

6.6.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 6 addresses the soil exceedances by containing all fill that exceeds SCOs with a cover. The groundwater exceeding the Class GA standards would be contained by the full-scale groundwater collection and treatment system. Alternative No. 6 eliminates NAPL in the Light Oil Area (if any remains after the Secondary Containment IRM) and in the Tar Seep No. 2 location through excavation and thermal treatment. The blue-stained soil/fill and iron oxide pile materials will be solidified/stabilized to eliminate the potential of migration of any residual cyanide. The solidification will reduce the mobility of soluble and dissolved phase constituents by bonding them into the solid matrix.

Alternative No. 6 meets the requirements for Compliance with SCGs.

6.6.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the actions will be.

6.6.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 6 is effective and permanent by thermal treatment, solidifying or stabilizing materials that could act as sources of constituents to shallow groundwater, recovering and treating impacted groundwater and maintaining the cover system. While the Secondary Containment and



Groundwater IRMs will have addressed the most significant exposure pathways, Alternative No. 6 eliminates potential migration of constituents in NAPL in areas not addressed by the Secondary Containment IRM through excavation, treatment and on- or off-site disposal.

6.6.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and
- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.

In addition, more than 10,200 tons of material suitable for reuse (Steel, other metals, fuels, etc.) have been reused or recycled rather than being abandoned on the BCP Site or filling a landfill. Recycling is a critical component of RITC's commitment to the environment.

The additional reduction of toxicity, mobility, and volume of contamination through treatment in Alternative No. 6 is similar to Alternative No. 5. The fill/soil process options (ex situ thermal, biotreatment, and solidification) included in this alternative aggressively reduce the toxicity and mobility of the residual constituents in fill. Excavation and ex situ treatment reduce the volume of material on the BCP Site, but by increasing the schedule and potential emission hazards. Ongoing natural attenuation will be monitored in this alternative to quantify degradation rates and reductions in volume of contamination.

6.6.2.3 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but is not a specifically defined primary balancing criteria.

6.6.2.3.1 Conventional Evaluation

The short-term effectiveness of Alternative No. 6 is lessened compared to Alternative No. 5 due to the additional time required to excavate and prepare materials for ex situ treatment, the two-year treatment cycle, and excavation and placement of treated materials as fill on the BCP Site. The two-year treatment period will disrupt access to a large portion of the BCP Site, lessening availability and desirability for redevelopment.

After excavation thermal treatment and solidification is completed in an area, the location can be graded for subgrade and placement of the cover can be implemented but incremental construction drastically increases GHG emissions. The time required to obtain a permit for onsite thermal treatment, a process similar to the coke plant, is unknown. This introduces a schedule risk for the development of the BCP Site.



The required permits and approvals for the cover system can be procured during the excavation, thermal treatment, and solidification. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates contact for trespassers even in the alternative including excavation, thermal treatment and solidification.

In addition to the limitations placed on the timeline for returning the BCP Site to productivity, thermal treatment is effectively the same technology used in the coke plant. The heating of the fill allows the constituents in the fill to be liberated and extracted as a vapor phase before being cooled, separated, and treated. The technology is proven but will be subjected to high temperatures for nearly one year while exposed to the variability of Western New York weather. Like any air control technology there is a potential for an upset and the release of limited amounts of untreated emissions.

6.6.2.3.2 Innovative and Sustainable Evaluation

The innovative and sustainable components are consistent with Alternatives No. 5, with the exception of the increased energy consumption and increased GHG and treatment system emissions. The thermal treatment alternative has an electrical energy demand of 1,500 kV over 440 working days. This results in more than twice the GHG production (Based on Total CO_2 Equivalent Estimates using the USEPA Estimator) that Alternative No. 5 (Table 6-5).

The excavation, treatment and post-treatment placement; solidification; the construction of the cover; and the transportation of topsoil to the BCP Site would produce significant GHGs over a longer period compared to the previous alternatives, potentially for several years.

The selection and planting of the appropriate native plants in and around the rain gardens, bioretention ponds/basins, and the stormwater ponds in the Track 1 areas can require a lengthy period to establish. The selection of plants that are native to western New York's climate may require consultation with local experts but should lead to a more sustainable cover.

6.6.2.4 Implementability

Alternative No. 6 may be able to be implemented with existing equipment, procedures, and access to thermal treatment equipment and air permits. The earthmoving associated with the excavation of tar, solidification, construction of the cover system and stormwater controls all rely on conventional equipment and readily available materials. The difficulty is the permitting of an emission source at a site that was closed due to air emissions from a process similar to thermal treatment. Even after obtaining the permits, the time required to construct a substation for the required electrical energy, and prepare the treatment pile(s) for thermal treatment will add no less than 2 years to the remedial action schedule. The completion of this alternative and the time that portions of the site are exposed will be no less than two years longer than Alternative No. 5.

The design, permitting, procurement, construction and operation of the groundwater extraction and treatment systems are relatively conventional but must be designed for the extremely wide range of groundwater quality at the BCP Site. The process is not difficult, but additional pilot-scale testing of water from all areas of the BCP Site will have to be collected and treated through the Groundwater IRM to confirm the required process options for full-scale operation. Permitting of a facility like this will require implementation of two stages; permitting to the Town of Tonawanda permitting to the Town of Tonawanda for an Industrial Waste Discharge followed by the granting of a SPDES permit equivalence by NYSDEC.

6.6.2.5 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 6 is not cost effective. Alternative No. 6 costs more than 66% more than



Alternative No. 5, and 113% more than Alternative No. 4 with no additional protection of human health or the environment, and in fact less. Alternative No. 6 is estimated to cost $111,364,000, Table 6-4). Thermally treating the viscous tar while solidifying/stabilizing the blue stained soils and the site-wide fill beneath a permanent cover controlled by a groundwater collection system is no more protective than Alternative No. 5. Absent the ability to eliminate the cover, the additional cost for thermal treatment, especially in light of the significantly higher generation of GHGs, is not effective when compared to Alternative No. 5

6.6.2.6 Land Use

The BCP Site is suitable for commercial and industrial redevelopment after Alternative No. 6 is completed, but the opportunities that exist in the near term will be lost. The entities that are interested in redevelopment of the BCP Site have a defined planning horizon. The schedule to complete Alternative No. 6 is indeterminant and therefore the developments will be moved to other sites.

The groundwater collection, conveyance and treatment system(s) will be designed to be consistent with the development and its utility corridors. The perimeter areas of the BCP Site will meet unrestricted criteria.

6.6.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.

6.6.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.7 Alternative No. 7: Source Removal, Groundwater Control, Institutional Controls, Engineering Controls

The source removal, source containment and groundwater control alternative included the components of Alternative No. 5 with the addition of removal of source materials in areas potentially containing iron oxide, as well as other areas in the former production area that have some impact from the TCC operations beyond the identified materials management impact areas (Figure 3-6). Petroleum impacted soils will be treated using biotreatment under Alternative No. 7. The interruption of the contact pathways in this alternative is achieved by placement of a soil cover. The reduction in mobility, toxicity and volume is achieved through the removal of the viscous tar in the Tar Seep No. 2 area removal of the blue-stained soil/fill and iron oxide pile, removal of additional fill from the former production area, treatment of areas with significant petroleum impacts; and through collection and treatment of the groundwater from the fill zone.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of any remaining process piping;
- Removal of potentially impacted structures or buildings (Purifier Boxes and MG Building);
- Management and control of surface water during the remedial action;
- Biotreatment of fill areas of high TPH concentrations (Wastewater Treatment and Former Diesel Tanks Areas, Figure 3-4);
- Solidification and offsite disposal of viscous mobile tar and NAPL in the Tar Seep No. 2 area, the southeast rail car area, and other areas in the former production area (Figures 3-1 and 3-2);



- Offsite disposal of the blue-stained soil/fill in the iron oxide pile and the TP-BCP-35 area;
- Regrading fill on the BCP Site to allow placement of the cover systems and
- Placement of soil and gravel covers.

Depending on the timing, pavement and buildings for the redevelopment may serve as portions of the BCP Site cover system.

6.7.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.7.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 7 does not significantly alter the overall protection to the BCP Site over other alternatives, in fact the excavation and offsite transportation of additional waste dramatically increases the GHG emissions and the potential exposures and hazards of highway incidents. Direct exposure pathways on the BCP Site are interrupted by the Alternative No. 4 technology process options that are all included in Alternative No. 7. BCP Site workers are protected by following the SMP and EWPs. The environment is protected by the extraction and treatment of the impacted groundwater, and the containment provided by the soil cover.

Alternative No. 7 meets the requirements for Overall Protection of Human Health and the Environment.

6.7.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 7 (like Alternative No. 4) addresses the soil exceedances by containing all fill that exceeds SCOs with a cover. The groundwater exceeding the Class GA standards would be contained by the full-scale groundwater collection and treatment system. Alternative No. 7 eliminates NAPL through excavation and offsite disposal. The blue-stained soil/fill (TP-BCP-35 area) and iron oxide pile materials will be removed.

Alternative No. 7 meets the requirements for Compliance with SCGs.

6.7.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the actions will be.

6.7.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 7 is effective and permanent by solidifying or stabilizing materials that could act as sources of constituents prior to offsite transportation and disposal. Shallow groundwater will be protected by recovery and treatment of groundwater and by maintaining the cover system. While the Secondary Containment and Groundwater IRMs will have addressed the most significant exposure pathways, Alternative No. 7 eliminates potential migration of constituents in residual NAPL in areas not addressed by the Secondary Containment IRM through excavation, solidification and offsite disposal.



6.7.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and
- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.

In addition, more than 10,200 tons of material suitable for reuse (Steel, other metals, fuels, etc.) have been reused or recycled rather than being abandoned on the BCP Site or filling a landfill. Recycling is a critical component of RITCs commitment to the environment.

The additional reduction of toxicity, mobility, and volume of contamination through treatment in Alternative No. 7 is extremely aggressive compared to the previous alternatives. The fill/soil process options (biotreatment and solidification) coupled with offsite disposal primarily involve moving some volume of residual from the BCP Site to another location. Solidification and offsite disposal significantly increase the potential for exposure and potential exposures during remediation, but eliminate the potential impact from viscous mobile tar and residual NAPL that could have been encountered during redevelopment. The alternative greatly increases potential exposures, safety hazards, and increased GHG generation that offset any benefit of moving materials from the BCP Site to another location.

6.7.2.3 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but is not a specifically defined primary balancing criteria.

6.7.2.3.1 Conventional Evaluation

The short-term effectiveness of Alternative No. 7 is poor as it will leave the BCP Site uncontained for a significantly longer period than any other alternative except Alternative No. 1 due to the time required to excavate, prepare and transport materials for offsite disposal. Offsite treatment and disposal capacity is limited. The time required to arrange transportation and disposal would add years to the remediation project and therefore the time for closure. The time is a function of the rate that disposal facilities can accept the waste stream. The potential disruption to traffic patterns on River Road will be much longer and greater than under any other alternative including Alternative No. 6. The extended period of closure and traffic will also eliminate the possibility of redevelopment and jobs for an additional 4- to 5-years.

After solidification and subsequent loading for offsite transport is completed in an area, the location can be graded for subgrade and placement of the cover can be implemented. Unlike other alternatives the rate that materials are removed is dependent on third party transportation that has been difficult to schedule to date. In addition, the incremental construction activities drastically increase GHG emissions. The Town of



Tonawanda permits for the cover system can be procured during the excavation and solidification and loading for transport. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates contact for trespassers even in the alternative including excavation, solidification, staging, onsite storage of materials pending transportation and disposal availability.

6.7.2.3.2 Innovative and Sustainable Evaluation

Alternative No. 7 is the least sustainable of the previous alternatives considered. The excavation, solidification, offsite disposal, cover construction, and import material transportation will produce significant GHGs over many years and expose precipitation and accumulated groundwater to impacts that are currently contained.

The only disposal facilities available for these materials are located in Quebec, Texas and Ohio; all requiring significant transport. The transportation of the materials alone would require 2,000 trucks entering and leaving the BCP Site and would consume and discharge an equivalent of the emissions from burning 340,000 gallons of diesel fuel (Table 6-5). The capacity of these facilities is based on long-term contracts; they do not have the capacity to accept the amount of waste generated under Alternative No. 7 unless scheduled over many years.

The delay caused by the limitations associated with trucking and disposal would increase the time that materials, which are currently covered, would be exposed to the atmosphere and precipitation. The cover construction would also be extended, rather than being placed in a single year, the cover would be constructed in stages as the materials are removed. The lack of a single consistent construction program, this requires additional erosion controls, extended dust control, and extending the period of operation of the borrow source.

The selection and planting of the appropriate native plants in and around the rain gardens, bioretention ponds/basins, and the stormwater ponds in the Track 1 areas can require a lengthy period to establish. The selection of plants that are native to western New York's climate may require consultation with local experts but should lead to a more sustainable cover.

6.7.2.4 Implementability

Alternative No. 7 may be able to be implemented with existing equipment, procedures, and access to offsite disposal. The earthmoving associated with the excavation of fill, solidification and construction of the cover system and stormwater controls all rely on conventional equipment and readily available materials. The solidification effectiveness have been demonstrated by the processes used to stabilize the contents of above ground storage tanks (ASTs) across the BCP Site. The materials used for solidification are available locally.

The limitation is the capacity for offsite disposal. The available disposal capacity will define the time frame for completion of this alternative which would be many years longer than Alternative No. 5.

The design, permitting, procurement, construction and operation of the groundwater extraction and treatment systems are relatively conventional but must be designed for the extremely wide range of groundwater quality at the BCP Site. The process is not difficult, but additional pilot-scale testing of water from all areas of the BCP Site will have to be collected and treated through the Groundwater IRM to confirm the required process options for full-scale implementation. Permitting a facility like this will require implementation of two stages; permitting to the Town of Tonawanda permitting to the Town of Tonawanda for an Industrial Waste Discharge followed by the granting of a SPDES permit equivalence by NYSDEC.



The delay in the availability of the BCP Site will eliminate the viability for the current parties interested in redevelopment of the BCP Site, so consultation with the redevelopment consultants is improbable.

6.7.2.5 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 7 is not cost effective. Alternative No. 7 is estimated to cost over 20% more than Alternative No. 6, and 99 % more than Alternative No. 5 with no additional, and in fact much less, protection afforded for human health or the environment. Given the rate of fuel inflation, the difference in the estimated costs could be much greater. Alternative No. 7 is estimated to cost $133,798,000, Table 6-4). There is no added protective benefit to removing the additional fill contemplated under this alternative.

6.7.2.6 Land Use

The BCP Site is suitable for commercial and industrial redevelopment after Alternative No. 7 is completed.

Although not strictly a primary balancing criterion, it is reasonable to consider that the redevelopment of the BCP Site is dependent on the ability to provide future occupants with a timeframe for occupancy. Due to the fact that the schedule for Alternative No. 7 is completely dependent on outside facilities and cannot be defined, there is no possibility of attracting a significant user to the BCP Site for years, delaying redevelopment 4- to 5 years, if not longer.

6.7.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.

6.7.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.8 Alternative No. 8: Track 1 Cleanup – Unrestricted Use Criteria

Alternative No. 8 is being evaluated in accordance with the requirements of 6 NYCRR Part 375. It is unlikely this volume of landfill capacity is available to the project. Under this alternative all of the fill and soil at the site that exceeds the unrestricted use criteria would be removed from the BCP Site. There is no soil/fill above the clay that was identified that would meet the unrestricted criteria. This alternative will include the source removal included in Alternative No. 7 with the addition of removal of all fill above the clay. It is not possible to revegetate the clay, so the clay surface will be graded to drain, the clay will be scarified, and 3-inches of topsoil will cover the BCP Site.

As shown in Table 6-1, this alternative includes:

- Ongoing OM&M (OM&M);
- Removal of any remaining process piping;
- Removal of all potentially impacted buildings (Purifier Boxes and MG Building);
- Management and control of surface water;
- Offsite disposal of the source materials and fill;
- Regrading clay on the BCP Site to allow stormwater management; and
- Placement of topsoil and revegetation.



6.8.1 Threshold Criteria

The two threshold criteria must be met for an alternative to be considered for the BCP Site.

6.8.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a threshold criterion for all BCP Site alternatives. Alternative No. 8 does not significantly alter the overall protection at the BCP Site over other alternatives. Under this alternative more than 1,090,000 tons (approximately 50,000 truck trips) dramatically increases the GHG emissions and the potential exposures and hazards of highway incidents. The GHG emissions for this alternative are the highest of all alternatives considered, over 18,000 tons of CO_2 equivalents assuming local landfill volume is available.

Alternative No. 8 meets the requirements for Overall Protection of Human Health and the Environment on the BCP Site, but increases the risk to the public on the highways and to the climate.

6.8.1.2 Compliance with Standards, Criteria and Guidance (SCGs)

Compliance with SCGs is a threshold criterion for all BCP Site alternatives. Exceedances of commercial SCOs, exceedances of groundwater Class GA Standards, and NAPL have been identified on the BCP Site. Alternative No. 8 addresses the soil exceedances by removing all fill that exceeds SCOs from the BCP Site. The groundwater exceeding the Class GA standards would be excavated and disposed of with the fill.

Alternative No. 8 meets the requirements for Compliance with SCGs.

6.8.2 Primary Balancing Criteria

The eight primary balancing criteria are the criteria that are used to determine which of the alternatives that meet the threshold criteria is the most appropriate alternative for the BCP Site. As summarized in the following text and in Table 6-2 the analysis of each of these criteria provides an understanding of how each alternative will address the characteristics of the BCP Site and what the long-term result of the actions will be.

6.8.2.1 Long-term Effectiveness and Permanence

The long-term effect of Alternative No. 8 is effective and permanent at the BCP Site by moving all of the soil/fill to an offsite location for destruction or disposal. Shallow groundwater will be eliminated.

6.8.2.2 Reduction of Toxicity, Mobility or Volume of Contamination through Treatment

The IRMs have been very effective in reducing mobility, toxicity and volume through treatment. To date (July 2023, for purposes of this report) the IRMs have treated or properly managed offsite more than:

- Pre-treating and discharging over 17 million gallons of ground and surface water to the Town of Tonawanda Publicly Owned Treatment Works (POTW) for tertiary treatment;
- Treating and discharging over 108 million gallons of surface water through the SWPPP regulated system;
- Disposing of over 4,500 tons of solid waste for proper offsite disposal;
- Removing and disposing over 3,600 tons of ACMs;
- Removing for treatment and offsite disposal 7,400 tons of hazardous waste;
- Characterizing and either recycling or incinerating 38 tons (~10,000 gallons) of non-hazardous and hazardous liquids; and
- Surface grading throughout the BCP Site to reduce erosion and infiltration to the perched groundwater system.



Alternative No. 8 is intended to move the soil/fill above the unrestricted criteria to another location. If there is available treatment and landfill space, this alternative is the most effective reduction of Toxicity, Mobility or Volume of Contamination through treatment and disposal at the BCP Site, but simply moves the soil and fill to another location. The alternative greatly increases potential exposures, safety hazards, the duration of the remediation and increased GHG generation that offset any benefit of moving materials from the BCP Site to another location.

6.8.2.3 Short Term Impact and Effectiveness

There are two components to the Short-term Impact and Effectiveness in this AA; Conventional Evaluation and an Innovative and Sustainable Evaluation. The innovative and sustainability evaluation has been included to highlight those aspects of each alternative that fall within the scope of DER-31/Green Remediation, but is not a specifically defined primary balancing criteria.

6.8.2.3.1 Conventional Evaluation

The short-term effectiveness of Alternative No. 8 is poor as it will leave the BCP Site uncontained for a significantly longer period than any other alternative except Alternative No. 1 due to the time required to excavate, prepare and transport materials for offsite disposal. Offsite treatment and disposal capacity is limited. The time required to arrange transportation and disposal would add years to the remediation project and therefore the time for closure. The time is a function of the rate that disposal facilities can accept the waste stream. The potential disruption to traffic patterns on River Road will be much longer and greater than under any other alternative including Alternative No. 6. The extended period of closure and traffic will also eliminate the possibility of redevelopment and jobs supporting the growth of the local economy for an additional 6- to 7-years.

After solidification and subsequent loading for offsite transport is completed in an area, the location can be graded for subgrade and placement of the vegetative cover can be implemented. Unlike other alternatives the rate that materials are removed is dependent on third party transportation that has been difficult to schedule to date. In addition, the incremental construction activities drastically increase GHG emissions. The required permits for the surface water management/soil cover can be procured during the excavation and solidification and loading for transport. The imposition of procedures for BCP Site management and excavation effectively protects BCP Site workers and eliminates contact for trespassers even in the alternative including excavation, solidification, staging, onsite storage of materials pending transportation and disposal availability.

6.8.2.3.2 Innovative and Sustainable Evaluation

Alternative No. 8 is by far the least sustainable of the alternatives considered. The excavation, solidification, offsite disposal, cover construction, and import material transportation will produce significant GHGs over many years and expose precipitation and accumulated groundwater to impacts that are currently contained. The extended contact time that precipitation and groundwater would have with the long-term required to complete excavations of the entire fill mass would create new exposure pathways and wastewater streams requiring treatment.

The only disposal facilities available for the hazardous materials are located in Quebec, Texas and Ohio; all requiring significant transport. The transportation of the materials alone would require 2,000 trucks entering and leaving the BCP Site and would consume and discharge an equivalent of the emissions from burning 949,000 gallons of diesel fuel (Table 6-5). The capacity of these facilities is based on long-term contracts; they do not have the capacity to accept the amount of waste generated under Alternative No. 8 unless scheduled over many years.



The additional transportation of over 1,150,000 tons of fill would require 58,000 trucks entering and leaving the BCP Site and would consume and discharge an equivalent of the emissions from burning 859,000 gallons of diesel fuel (Table 6-5)

The delay caused by the limitations associated with trucking and disposal would increase the time that materials, which are currently covered, would be exposed to the atmosphere and precipitation. The revegetation would also be extended, rather than being placed in a single year, the revegetation would be implemented in stages as the materials are removed. The lack of a single consistent construction program, this requires additional erosion controls, extended dust control, and extending the period of operation of the borrow source.

6.8.2.4 Implementability

Alternative No. 8 may be able to be implemented with existing equipment, procedures, but there is no way to identify the disposal volume for over 1,150,000 tons of material. The earthmoving associated with the excavation of fill, solidification and construction of the soil cover and stormwater controls all rely on conventional equipment and readily available materials.

The limitation is the capacity for offsite disposal. The available disposal capacity will define the time frame for completion of this alternative which would be many years longer than any other alternative including Alternatives Nos. 6 and 7.

The delay in the availability of the BCP Site will eliminate the viability for the current parties interested in redevelopment of the BCP Site, so consultation with the redevelopment consultants is improbable.

6.8.2.5 Cost Effectiveness

As explained above, cost effectiveness is not a measure of the cost, but of the benefit to the environment for the cost. Alternative No. 8 is not cost effective. Alternative No. 8 is estimated to cost over 215% more than Alternative No. 5 with no additional, and in fact much less, protection afforded for human health or the environment. Given the rate of fuel inflation, the difference in the estimated costs could be much greater. Alternative No. 8 is estimated to cost $211,643,000, Table 6-4). There is no added protective benefit to removing the additional fill contemplated under this alternative. This is the least cost-effective alternative that meets the threshold criteria.

6.8.2.6 Land Use

The BCP Site is suitable for residential, commercial and industrial redevelopment after Alternative No. 8 is completed.

Although not strictly a primary balancing criterion, it is reasonable to consider that the redevelopment of the BCP Site is dependent on the ability to provide future occupants with a timeframe for occupancy. Due to the fact that the schedule for Alternative No. 8 is completely dependent on outside facilities and cannot be defined, there is no possibility of attracting a significant user to the BCP Site for years, delaying redevelopment 6 to 7 years, if not longer.

6.8.3 Modifying Considerations

Modifying Considerations incorporate the comments and input of the community. This input includes the input of the local representatives, community groups and the general public. This input is in addition to compliance with local zoning, regulations and permits.



6.8.3.1 Community Acceptance

Community acceptance is not addressed in the Draft AA Report. Input into this evaluation will be incorporated after the community has had an opportunity to review the draft.

6.9 Recommended Alternative

Alternative No. 1 does not meet the threshold criteria and was not considered when comparing the primary balancing criteria. Alternative No. 2 is marginally compliance but does not meet the preference for management of mobility and has not been considered further. Alternative No. 7 is neither implementable, effective in the short term, consistent with ESG initiatives or cost effective, and has been screened from further consideration.

An analysis of the four remaining alternatives identifies Alternatives Nos. 4 and 6 as the most appropriate and effective approach to remediate Site 108 (Table 6-3 and Figure 7-1). These Alternatives meets the threshold requirements using the combination of technologies that achieves the RAOs with the best short-term effectiveness, provides the most opportunity for compliance with ESG goals and the incorporation of innovative and sustainable strategies.

Alternatives No. 4 and 6 are the second highest rated for implementation, Alternative No. 4 and No. 5 are the second and highest rated for cost effectiveness and Alternatives No. 4 and 5 are the second and the highest rated for future land use and allowing redevelopment of the BCP Site. Alternative No. 5 is the recommended Alternative.



7 Recommended Remedial Alternative

The recommended remedial alternative is Alternative No. 5 which consists of In situ Solidification of NAPL, Containment, Groundwater Control, Institutional Controls, and Engineering Controls. The Alternative as shown in detail in Table 7-1 and conceptually on Figures 7-1 through 7-12, includes:

- Institutional/Engineering Controls
  - Placing an Environmental Easement on the controlled BCP Site (all portions not meeting Track 1 requirements, see Figure 7-1);
  - Placing use restrictions on the BCP Site prohibiting the installation of drinking water wells without necessary Erie County Department of Health approvals and water quality treatment as determined by the NYSDOH to render it safe for intended use and prohibiting residential development;
  - Establishing procedures for BCP Site management, including requirements for future onsite excavation in a SMP and EWP(s);
  - Conducting groundwater monitoring in accordance with the SMP;
  - Establishing protocols for onsite excavation in an EWP;
  - Annual reporting in Periodic Review Reports (PRRs);
- Source Controls
  - Ongoing OM&M through completion of the remedial actions;
  - Removal of any remaining above ground process piping;
  - Removal of remaining potentially impacted buildings (Purifier Boxes and MG Building);
  - The existing concrete lined stormwater sedimentation ponds will be used until the new stormwater retention basin is completed. The concrete lined basins will be cleaned and taken out of service thereafter in accordance with the Site 109 remedial actions;
  - Removal of fill along the perimeter of the BCP Site (Figure 7-3). The removal of the fill around the perimeter is expected to expose the underlying silty clay and allow the perimeter to meet Track 1 criteria. This removal will effectively manage the impacted fill at MW-BCP-24A, MW-BCP-27A, and SS-BCP-15 and contain the groundwater at MW-BCP-18;
  - Biotreatment of areas with high TPH concentrations (Figure 7-4). The treatment protocol will be based on the results of the ongoing ST24 Bioremediation IRM Work Plan;
  - In situ solidification of the blue-stained soil/fill (TP-BCP-35 area) in the South Drainage Area AOI;
  - Excavation and bio-treatment or solidification of upper clay with impacted groundwater at and around the MW-BCP-13B and MW-BCP-19B areas (Figure 7-4);
  - Excavation and solidification of the fill and associated shallow groundwater within the footprint of the/each consolidation area;
  - Solidification of the viscous mobile tar and NAPL (Figure 7-5);
  - Consolidation of solidified materials and piles of solid waste;
  - Cover placement over, or placement of the solidified tar, solidified fill with NAPL, purifier and iron oxide pile materials in consolidation areas constructed in the former production area (Figures 7-6 and 7-7);
  - The volumes of materials to be managed are listed in Section 7.1.2.
- Elimination of Exposure Pathways
  - Clearing, grubbing and grading the BCP Site to allow placement of the cover and if appropriate accommodate pending redevelopment;
  - Cover placement or consolidation of solidified materials in the production area;



- Continuing the monitoring of the surface water discharge in accordance with the SWPPP until the completed cover is established and no contact between precipitation and underlying fill is possible;
- Closure of existing underground utilities that could act as preferential pathways (Figure 7-8);
- Construction of a full-scale groundwater collection system to manage residual groundwater impacts as shown on Figure 7-9;
- Testing, installation, and startup of a groundwater collection and treatment system (Figure 7-9);
- Regrading of fill on the BCP Site to allow placement of cover system (Figures 7-3, 7-10 and 7-12) where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). The measured concentrations in the cover materials will be at or lower than the commercial SCOs;
- During site development there will be an evaluation of the potential for soil vapor intrusion for any proposed occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- Soil vapor intrusion sampling will be conducted in and from below all buildings with a potential for soil vapor intrusion in the soil vapor intrusion evaluation; and
- Maintenance of the cover systems, vegetated areas and groundwater collection and treatment system.

As stated earlier, the following actions have been assumed to be completed prior to implementation of the recommended remedial alternative:

1. Demolition of all above ground structures except the office, green warehouse, and former maintenance buildings. The Town of Tonawanda POTW revenue monitoring structure may be replaced with a below grade facility;
2. ASTs have been emptied and removed;
3. Above ground process equipment has been decontaminated and removed;
4. ACM has been abated, with the possible exception of the office and former maintenance buildings;
5. Groundwater IRM is operational, and the technology required for groundwater treatment is successfully demonstrated, although additional bench-scale testing is assumed as the BCP Site remedial actions improve the occurrence and quality of the groundwater; and
6. The Feasibility Studies for Sites 109 and 110 have been completed and the selected technologies are consistent with the BCP Site recommended alternative where the site boundaries meet.

7.1 Description of Alternative Implementation

The following sections provide a detailed description of Alternative No. 5. The text is organized in accordance with the approximate sequence each activity will start. Many activities will be completed concurrently.

7.1.1 Institutional Access Restrictions

The institutional controls that will be implemented include placing a NYSDEC approved/required environmental easement on the controlled BCP Site (all portions not meeting Track 1 requirements, see Figure 7-1). The easement will be filed with Erie County at a time when the remedy is substantially complete, and will appear any time a party conducts a title search or has a BCP Site survey prepared. The easement will notify the party searching for the deed that the BCP Site containing the BCP Site is in the NYSDEC BCP, registered as Site No. C915353 and that the NYSDEC and NYSDOH have, among other

rights, rights of entry and inspection to those portions of the BCP Site that do not meet Track 1 requirements. Identification of the BCP Site number will allow a future potential buyer or occupant to directly access and review the documents in the DEC Info Locator:

(https://www.dec.ny.gov/cfmx/extapps/derexternal/haz/details.cfm?ProgNo=C915353).

In addition, specific deed restrictions will be placed on the BCP Site to prohibit the installation of a well for the purposes of human consumption without necessary Erie County Department of Health approvals and water quality treatment as determined by the NYSDOH to render it safe for intended use; prohibit residential development without upgrading the remedial action and obtaining NYSDEC approval; and prohibiting excavation on the BCP Site without complying with the SMP and EWP(s).

7.1.2 Source Control Actions

The recommended remedial alternative includes a number of source control actions (Figure 7-2) including solidification of potentially mobile constituents in the former process area, the coal yard and the south drainage AOIs. These actions will convert fill materials that could potentially act as sources of ongoing shallow groundwater contamination, into inert or relatively impermeable masses. The conversion eliminates the potential for partitioning of constituents into groundwater and may ultimately reduce the cost and duration of groundwater collection and treatment. The physical solidification using materials such as lime kiln dust, Portland cement and fine coke breeze. Prior to implementation, the target materials from each area will be tested at both a bench- and pilot-scale.

Solidified viscous tar, NAPL, and other potentially mobile constituents will be placed in areas to be covered or in consolidation areas (Figure 7-5) to reduce the number of locations with solidified materials and allow effective stormwater grading. The materials in the abandoned purifier boxes and iron oxide pile will be consolidated with the solidified materials. The blue-stained soil/fill in the vicinity of TP-BCP-35 will be solidified in-situ.

The quantities given on Table 7-1 and Figures 7-4 and 7-5 are based on the observations and testing conducted during the RI, IRMs and daily site maintenance. The actual quantities will be defined during the remedial actions.

An estimated 50,000 Tons of material will be subject to source control actions under the selected alternative. The areas to be treated (Figure 7-4) to reduce the toxicity and mobility, and the estimated volume in each, include:

- Biotreatment of 1,500 Tons of fill around the TCC diesel spill area (TP-BCP-14);
- Biotreatment of 1,700 Tons the fill around the former maintenance building, heavy equipment building and oil house;
- Biotreatment of 7,000 Tons of impacted fill and upper clay from under the former water treatment tanks.

Fill that is more impacted and cannot be treated in-situ to eliminate the characteristics of hazardous waste (Figure 7-5) will be treated, stabilized, or solidified ex-situ to remove the characteristic and placed in the consolidation areas within the production area to isolate the impacted materials and allow proper grading of the BCP Site:

- Solidification of approximately 7,700 Tons of fill with viscous tar in:
  - The vicinity of the former tar pipe encountered in TP-BCP-04 (assuming 200 tons of pipe and impacted fill remains);

  - The weak ammonia tank area below the former PT-02 and PT-03 (400 tons);
  - The area below and north of the tar management area (3,600 tons);
  - The materials stockpiled in the Thaw Shed (500 tons);
  - The materials associated with Tar Seep No. 1 on the BCP Site identified in TP-BCP-48 (800 tons);
  - The area west of Tar Seep No. 1 (Note: Tar Seep is on Site 110) at TP-BCP-48 (800 Tons);
  - The area around Tar Seep No. 2 (1,400 tons);
  - The area adjacent to the former rail car location in the southwest corner of the BCP Site (200 tons); and
  - The materials identified at the border of Site 110 near the north end of TP-BCP-09 (600 Tons).
- Solidification of NAPL impacted soils:
  - There is an estimated 700 tons of fill impacted/containing NAPL below the Light Oil Area;
  - The area around MW-BCP-05A to the collection trench is estimated to contain an additional 700 tons of NAPL impacted/containing fill;
  - The area next to the exhauster building, including the location of the sumps backfilled by the USEPA is estimated to contain 200 tons of NAPL impacted/containing fill;
  - The area below the floor of the oil pumps in the pump house is estimated to contain 400 tons of NAPL impacted/containing fill; and
  - The area east of the former Coal Yard Tunnel Junction Building is estimated to contain 400 tons of NAPL impacted/containing fill[26].
- In addition to the NAPL impacted soils, fill and soil impacted by VOCs, although not in concentrations to remain in a separate phase will be solidified:
  - The area below the Light Oil Area could be impacted by VOCs. It is estimated up to 5,000 tons of fill could require removal and consolidation;
  - In the western production area around MW-BCP-05 and the collection system, an additional 2,500 tons of fill may have been impacted by VOCs;
  - Under the exhauster building, pump house, and near the Junction Building there an estimated 500 tons and 1,200 tons, respectively, of fill impacted by VOCs; and
  - Excavation and solidification of 3,000 Tons of fill and upper clay in the vicinities of MW-BCP-19 and MW-BCP-13.
- There are areas of soil/fill that have been impacted by purifier operations and wastes:
  - Consolidation of 8,000 tons of materials from the purifier boxes and iron oxide piles into the consolidation cells. The materials will be solidified as necessary to allow compaction and long-term support of the capping system;
  - Solidification of 1,800 Tons of fill in the TP-BCP-46 area;
  - In situ solidification of the 2,000 Tons of blue-stained soil/fill in the TP-BCP-35 area; and
  - Relocation of 1,000 Tons fill from the BCP boundary in the vicinity of SS-BCP-15 to low areas that will be confined with the soil cover.
- Consolidation of the EPA Soil Piles (1,000 Tons);
- Solidification and consolidation of 400 Tons of fill from the MW-BCP-27A area; and
- Solidification and consolidation of 700 Tons of fill along the rail tracks in the southwest corner of the BCP Site (south end of TP-BCP-31).

[26] This material is being removed in accordance with the approved work plan, but final solidification and placement in the consolidation cells will not occur until the remedial action.

In addition to the actions noted above, material encountered from the following locations including those from ongoing routine BCP Site maintenance activities will be managed to allow closure of the BCP Site:

- Removal of 3,000 Tons of concrete slabs and foundations that would interfere with access to and treatment of underlying fill. The concrete will be removed, crushed, sampled and used below the cover to construct construction roads during inclement weather and to achieve the appropriate grades as detailed in the RAWP;
- Sedimentation Pool #001 will be cleaned of soft saturated materials. The recovered saturated fill/sediment will be stabilized for geotechnical purposes before placement as fill in the sedimentation pool cavity before the sedimentation pool is closed and taken out of service;
- Sedimentation Pool #002 will be cleaned of soft saturated materials. The recovered saturated fill/sediment will be stabilized for geotechnical purposes before placement as fill in the sedimentation pool cavity before the sedimentation pool is closed and taken out of service;
- Sedimentation Pool #003 will be cleaned of soft saturated materials. The recovered saturated fill/sediment will be stabilized for geotechnical purposes before placement as fill in the sedimentation pool cavity before the sedimentation pool is closed and taken out of service;
- Stormwater Retention Basin will be cleaned of soft saturated materials. The recovered saturated fill/sediment will be stabilized for geotechnical purposes before placement as fill in the sedimentation pool cavity before the sedimentation pool is closed and taken out of service; and
- The South Ditch sediment will be cleaned of soft saturated materials. The recovered saturated fill/sediment will be solidified for geotechnical purposes before placement as fill. The South Ditch will be filled after it is replaced with a perimeter system in the area of the rail tracks along the south BCP Site boundary. The fill to be placed will be inspected to confirm it is consistent with the surrounding materials.

The ability for the materials that will remain after solidification to act as sources of groundwater impact will be reduced or eliminated. No solidified materials remaining under the cover or placed in the consolidation cells will have free liquids (as defined by the paint filter test). The combination of source treatment, consolidation, placement of the cover and cap systems, and collection and treatment of groundwater will eliminate any potential for potential exposure to human health and the environment.

7.1.3 Buried Utility Management

Alternative No. 5 includes management of the underground utilities on the BCP Site (Figure 7-8). The actions will eliminate the underground utilities that could contain materials that potentially affect groundwater or that could serve as a migration pathway. The underground utilities that will be addressed in the recommended alternative include:

- The perimeter excavation will remove any utility that crosses the BCP Site boundary line;
- The north storm sewer system has been jetted and is in use. This system will be protected during the remedial actions. Some portions of the system may be removed as the stormwater retention basin is constructed. Following completion of the cover, this pipe will be removed from service;
- The mansion sump will be cleaned and closed in place;
- The location of an emergency water line was identified during the abandoned pipeline IRM. The emergency water line will be removed from within the area to be cleared around the north perimeter of the BCP Site. The pipe conveyed water, so any remaining section(s) will be grouted to ensure it does not create a migration pathway;
- The box culvert walls will be crushed and used to fill the box culvert cavity;



- Process lines identified in the former production areas will be removed during the consolidation area construction or grouted to eliminate the potential for creation of a migration pathway;
- The abandoned COG lines from the former compressor building location to the BCP Site line will be removed or grouted closed. They previously had been air-gapped and do not connect to the former compressor or to pipes at the BCP Site line;
- The north-south Storm sewer along the western BCP Site line is relatively new, has been recently jetted and will be removed and recycled after the new stormwater retention basin is in service;
- The manhole risers from any section of the north south storm sewer that are removed will be crushed and used as fill;
- The stormwater control/coal yard access road will be incorporated into the fill at the BCP Site. The road is not likely to be at the correct elevation for stormwater control after the cover has been placed;
- The former COG line from TCC to the Huntley facility has been separated and plugged in several locations on the BCP Site. The remaining section crossing the coal yard, if present, will be removed; and
- The pipes between the sedimentation pools and the storm water retention basin only conveyed stormwater and will be crushed and used as fill or removed and disposed offsite.

The management of underground utilities on the BCP Site is based on an AOI by AOI analysis of the underground utilities and considerations; crushing conduit for reuse as fill, grouting in place to eliminate the potential for an onsite migration pathway that could complicate the collection of groundwater, or excavation and offsite recycling or disposal. Grouting will only be considered for competent process piping or waterlines.

7.1.4 Groundwater Collection and Treatment

The groundwater collection and conveyance systems (Figure 7-9) should be installed before the BCP Site cover to avoid double handling of materials and allowing for efficiencies in system layout. Coordination between BCP Site preparation stormwater system grading, and groundwater system installations ensures the final configuration and operation of each system is compatible.

The groundwater collection system will include the five groundwater IRM collection systems (three may be moved) and location specific systems included in the recommended remedial alternative. The additional groundwater collection system for the recommended alternative (Figure 7-9) consists of:

- Five groundwater collection trenches have been installed in and around the former production area (AOI1 and AOI2) for the Groundwater IRM. Extraction and treatment of groundwater from these trenches (as modified) will continue after completion of the remedial action. The system will be expanded to include groundwater collection trenches in in the following locations (Figure 7-9):
    - AOI2 - Along Broadway south of the former boiler house to the area south of the purifier boxes (MW-BCP-12A to TP-BCP-12);
    - AOI2 – Former battery exhaust tunnel area (upgraded collector if temporary system continues to produce ammonia concentrations above Class GA standards); and
    - Perimeter groundwater collection drains around the solidified materials and consolidation cells.
- Conveyance Systems will be installed to transfer the collected groundwater from the collection trenches and extraction wells to the treatment system. The collection systems will include pumps, piping, utility vaults, cleanouts, and power and signal cables.



The treatment of groundwater on the BCP Site will rely on physical treatment as well as natural processes. The treatment system will be a multi-phase system built using technology tested during the groundwater IRM. The system will allow segregation of groundwater from the various collection systems into a pretreatment train and a primary, secondary and tertiary treatment train. The treatment will not differ significantly between the two systems, but the influent will vary. Initially one train of the treatment system may only be able to achieve the SPDES equivalence criteria for water from the collection systems outside the former production area.

- Natural attenuation is an ongoing process in the groundwater system that complements the proposed collection and treatment systems. TCC had potentially impacted the shallow and upper clay groundwater system for decades. Natural processes respond to changes in the environment. Bacteria suited to the co-metabolism of the constituents released by TCC would have adapted and are likely present throughout the groundwater system. Monitoring these processes will inform decisions about potential actions that may be taken to enhance or accelerate those processes. The recommended alternative includes sampling and analysis to allow evaluation of the rate and extent of natural attenuation. As these processes reduce or eliminate residual organic impacts, the operation of the collection systems may be adjusted;
- Each groundwater treatment system train for the recommended alternative will likely include:
    1. Influent equalization and settling tank(s), within a dedicated secondary containment. The tanks will provide a minimum of 4 hours of retention and will be used as needed to reduce the total solids concentration loading of the oil water separator.
    2. Oil/water Separator (OWS) – NAPL and passive organic compound treatment including; an oil skimmer to remove light NAPL; and a coalescing media pack and a parallel corrugated plate coalescer to collect dense NAPL.
    3. Chemical pH adjustment – to adjust pH if needed in an equalization tank after the OWS.
    4. Chemical Precipitation – Total suspended solids (TSS) and filterable metals removal;
    5. Bag Filtration – TSS and Particulate Metals (Polishing Phase);
    6. OGC/GAC filtration/absorption – dissolved VOCs, Semi-volatile Organic Compounds (SVOCs) and dissolved metals. Organoclay/granular activated carbon (GAC) vessels operated in a series.
    7. Cartridge Filtration – TSS and Colloidal Metals (polishing phase); and
    8. Effluent Holding – A tank or tanks that will allow stabilization and holding of the effluent prior to discharge to the POTW or surface water system.

The system will be designed and installed in two parallel treatment trains, for example, each capable of treating 30- to 50 gallons per minute (gpm). The parallel systems will allow separation of flow from specific areas of the BCP Site, continued operation of one train during maintenance of the other, and a treatment capacity factor of safety of more than the flow rate anticipated from the collection systems on the BCP Site.

The operation of the system will be monitored through a system of monitoring wells (Figure 7-11). The recommended monitoring well network will consist of monitoring wells (Figure 7-11) in the fill, upper clay, and lower clay around the perimeter of the BCP Site and the perimeter of the consolidation areas. The final monitoring well network will be designed during the remedial design to provide data on the quantity and quality of the groundwater at the BCP Site. The number and depth of the monitoring wells will be defined in the SMP. It is anticipated that during the first five years quarterly groundwater elevation data will be collected from the monitoring wells and collection system sumps to provide seasonal information on the effectiveness of the collection systems. Following the quarterly sampling period, annual groundwater



sampling and analysis will provide data on the combined effectiveness of the source control measures and natural attenuation processes. Influent and effluent data (flow and water quality) from the groundwater treatment system will allow for estimates of the overall mass removal. Reporting of monitoring data will be in accordance with the SMP and applicable permits.

7.1.5 Containment

The cover system for the BCP Site (Figures 7-2, 7-10, 7-11 and 7-12) will include multiple process options; capping, soil cover, gravel cover, buildings and pavement. The entire system will be inspected and maintained in accordance with an approved SMP. The SMP will include the requirements for maintaining, inspecting, and monitoring runoff (surface water) from the containment systems. In addition to the SMP, an EWP will provide the health and safety and physical requirements for intrusive activities that may penetrate the cover system.

7.1.5.1 Site Preparation

The construction of the soil cover will require preparation of the surface and the perimeter of the system. The surface will be cleared of vegetation and debris and grubbed. Grubbing will be limited to the removal of large tree stumps that would deteriorate over time and damage the cover. The cleared and grubbed materials will be shredded and composted for use as a growth media amendment within the limits of the Track 1 areas if testing shows the material meets unrestricted criteria or below the 12-inches of cover on the Track 4 areas.

7.1.5.2 Grading

The BCP Site will be graded to ensure proper anchoring of the capping and cover systems and proper stability and drainage of the finished surface. The fill will be removed from the perimeter (Figure 7-11) to allow the cover to completely enclose the fill and the shallow groundwater system. The extent of fill excavation and placement on the BCP Site will vary by location based on the final use of each area. Areas where greater than average fill removal will be completed include:

- The east end of the north rail corridor AOI1 (MW-BCP-23A Area). This area will be cleared to remove fill and eliminate the impacts in shallow groundwater near the east BCP Site boundary and allow installation of trees.
- The east end of the south drainage AOI7 (MW-BCP-27A Area). Following removal of the source materials (see Section 7.1.2) this area will be cleared to remove the fill and potentially impacted shallow groundwater system near the east BCP Site boundary and allow (1) installation of trees and (2) construction of a bioretention basin in the area of the offsite wetland buffer zone.
- The areas of the proposed rain gardens and bioretention basins along the surface water ditch systems.
- The area(s) of the proposed final stormwater retention basin in AOI1, AOI3 and AOI6.

All fill from the Track 1 perimeter areas will be inspected and if suitable will be placed as fill in lower areas of that BCP Site to receive a cover. Unsuitable fill will be that with industrial debris or that is grossly contaminated with viscous tar. Industrial debris will be disposed or recycled offsite. Fill with viscous tar will be stabilized and placed in the consolidation areas. Fill containing potential source materials have been identified in the production area and near MW-BCP-13 and MW-BCP-19. Fill material containing or acting as potential sources of groundwater impact will be treated in place or stabilized and placed in the containment areas (Figures 7-6 and 7-7).

In addition to clearing anchoring areas of the cover systems around the perimeter, the piles of fill that are located in AOI1, AOI4, AOI5, and AOI7 will be excavated and placed to help eliminate low areas that



could result in ponding on the cover system and to eliminate steep grades that could promote erosion of the completed cover.

Placement of fill will be performed in lifts no greater than 12-inches in loose thickness and will be compacted by no less than three passes of a smooth-wheel or sheepsfoot roller. Following the regrading, the entire surface will be proof rolled with a smooth-wheel roller to ensure a surface that will not damage placement of the demarcation layer and to identify any areas of loose or potentially unstable material. Additional compaction of areas with loose or unstable materials will be completed.

7.1.5.3 Cover System

The cover system as required for the recommended remedial alternative. The soil cover will include three layers over the prepared subgrade:

1. Demarcation Layer – The marker layer will be a layer of geotextile, geogrid, or polyethylene sheeting or other suitable indicator of the base of the cover that will identify the boundary between the cover system and the underlying fill.
2. Unclassified fill - Nine inches of unclassified fill will be placed over the marker layer. The unclassified fill will meet the commercial SCOs and it is anticipated that it will be from the stormwater retention pond excavation. Alternative sources of the unclassified fill may also be used if they meet the import requirements and the commercial SCOs.
3. Topsoil - Three inches of topsoil will be sourced from offsite. All offsite borrow sources will be tested and approved in accordance with the NYSDEC import soil requirements.
4. Seeding – The seeding shall be done in accordance with NYS Department of Agriculture recommendations, likely the appropriate mixture of Creping Red Fescue, Chewings Fescue, Perennial Ryegrass, Red Clover, and White Clover.

The surface of the soil cover system will be treated to adjust the pH, fertilized, seeded, and mulched in accordance with the NYS Erosion and Sediment Control (E&SC) Guidance. Vegetation on the soil cover will consist of grasses and legumes.

Based on the progress of the redevelopment planning and permitting, the pavement and buildings for the redevelopment will constitute a part of the cover system. In areas to be redeveloped a gravel cover may be used, including:

1. Demarcation Layer – The marker layer will be a layer of geotextile, geogrid, or polyethylene sheeting that will identify the boundary between the cover system and the underlying fill.

2. Unclassified Gravel fill - Twelve inches of unclassified granular fill will be placed over the marker layer. The unclassified fill will meet the commercial SCOs and will be from a source approved by the NYSDEC.

Pavement systems, sidewalks, roadways, and parking lot(s) must be designed and constructed to meet the requirements of the Town of Tonawanda and provide a barrier to contact with underlying fill. Building slabs, foundations, and utility vaults must also be designed and constructed to provide a barrier to contact with underlying fill.

If a building is proposed in those areas of the north rail corridor AOI1 or former production area AOI2 or other areas that have fill with potential VOC impacts, a sub-slab depressurization (SSD) system may be required below the lowest level slab. The SSD would provide a means for any potential soil vapor migration to exhaust above the building roof line rather than potentially into the structure. The design of the SSD will be based on the soil vapor intrusion evaluation within the footprint and vicinity of the proposed buildings.

7.1.5.4 Long-term Monitoring and Maintenance

The monitoring and maintenance of a soil cover includes periodic mowing, inspection and removal of burrowing animals, inspection and removal of woody and invasive plants, and identification and repair of erosion damage.

7.1.6 Innovative and Sustainable Remediation

Remediation and long-term care of the BCP Site is relatively energy intensive. Solidification, earthmoving, and groundwater extraction and treatment require significant amounts of energy. Utilization of innovative and sustainable remedial approaches reduces the long-term use of energy and are typically highly efficient because they use natural processes, organisms, and plants native to the BCP Site and vicinity.

The remedial process options that may be considered innovative or sustainable in the recommended remedial alternative include:

- Natural Attenuation throughout the shallow and upper clay groundwater zones allowing indigenous microbial populations to degrade the organic constituents with no additional chemicals or energy.



8 Schedule

The proposed baseline schedule for the implementation of the recommended remedial altentive is shown on Figure 9-1. The recommended alternative largely removes external factors impacting the schedule by limiting the dependance on resources that are not controlled by the State of New York, the Town of Tonawanda, or RITC. The schedule is largely driven by the review and approvals needed from the state and local representatives and the time required to manage the onsite materials and prepare and place the cover system. Highlights of the baseline schedule include:

- The RAWP or remedial design is completed in three phases; Preliminary, Pre-Final and Final. The entire remedial design process is anticipated to require 6 months to complete.
- The remedial actions are completed in phases, the majority of which overlap. Some activities will be initiated before the remedial design is completed, such as:
    - Permit Applications
    - Buried Utility Management
- From the initiation of action through the completion of the capital phases,the remedial actions is estimated to take 21 months.
- Operation, Maintenance and Monitoring (OM&M) will begin during the later phases of the remedial action primarily associated with the changeover from the groundwater IRM system to the permanent groundwater collection and treatment system and the migration of the stormwater management system from the TCC controls, to construction E&SC controls, to the permanent systems.
- At the completion of the remedial actions, a Final Engineering report (FER) summarizing all of the work completed from the time of the BCP Agreement to the completion of the remedial action will be prepared.
- Environmental Easement with relevant institutional contraols will be filed with the Erie County Clerk for those portions of the BCP Site that will not meet Track 1 requirements
- Use Restrictions
- The final OM&M programs will be defined in the SMP that will be prepared at the same time as the FER. The SMP will include all monitoring requirements, cover conditions, groundwater and soil vapor; operating requirements; and proceedures to be followed for intrusive actions that could penetrate the cover or capping systems.
- The baseline schedule is an evergreen document that will be updated quarterly as the cleanup progresses.



9 Bibliography

The bibliography provides a list of documents used in conjunction with numerous BCP Site visits, discussions with USEPA and NYSDEC personnel, IRM data and observations, and expertise at coke making facilities to develop this alternatives analysis report. Some of the documents listed below are not specific to the BCP Site but were referenced to provide regional or other background information.

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Tables

Table 4-1
Remedial Action Objectives
Identified by Area of Investigation
Riverview Innovation & Technology Campus, Inc.
Town of Tonawanda, New York

Media	Remedial Action Objective	Area of Investigation (AOI)						
		1	2	3	4	5	6	7
Groundwater								
	RAOs for Public Health Protection							
	Prevent ingestion of groundwater with concentrations exceeding Class GA Standards.	✓	✓	✓	✓	✓	✓	✓
	Prevent, or reduce to the extent practicable, contact with, or inhalation of volatiles, from contaminated groundwater.	✓	✓		✓	✓		
	RAOs for Environmental Protection							
	Restore ground water aquifer (clay) to pre-disposal/pre-release conditions, to the extent practicable.		✓		✓	✓	✓	✓
	Perched water above the clay is localized and discontinuous in the fill and is not considered an aquifer within the context of this RAO. Groundwater standards apply, the concept of restoration is not applicable.							
	Prevent, or reduce to the extent practicable, the discharge of compounds to surface water.		✓		✓	✓	✓	✓
	Remove the source of groundwater contamination.		✓		✓	✓	✓	✓

Table 4-1
Remedial Action Objectives
Identified by Area of Investigation
Riverview Innovation & Technology Campus, Inc.
Town of Tonawanda, New York

Media	Remedial Action Objective	Area of Investigation (AOI)						
		1	2	3	4	5	6	7
Soil								
	RAOs for Public Health Protection							
	Prevent, or reduce to the extent practicable, potential ingestion/direct contact with fill containing concentrations above the SCOs for the anticipated future (commercial) land uses.	✓	✓		✓	✓	✓	✓
	Prevent, or reduce to the extent practicable, inhalation exposure to compounds volatilizing from soil.		✓		✓	✓	✓	✓
	RAOs for Environmental Protection							
	Prevent, or reduce to the extent practicable, migration of compounds that would result in groundwater, surface water, or sediment concentrations in excess of the SCGs.		✓		✓	✓	✓	✓
Soil Vapor								
	RAOs for Public Health Protection							
	Mitigate unacceptable potential impacts to public health resulting from soil vapor intrusion into buildings under the current (industrial) and reasonably anticipated future (commercial) land uses.	✓	✓		✓	✓	✓	✓

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
No Further Action	None	None	No Action	Not Applicable
Institutional Actions	Access Restrictions	Environmental Easement	BCP required EE for NYSDEC and NYSDOH long-term access	Required
		Deed Restriction	Deed Restriction - Drinking Water Well Prohibition	Required
		Deed Restriction	Deed Restriction - No Residential without Additional Remedial Action	Required
		Fence	A fence surrounding the property to discourage trespassing.	Potentially applicable
	Routine Long-term Care	Site Management Plan	Procedures and protocols to be followed for routine and non-routine care of the property.	Required
		Excavation Work Plan	Procedures and protocols to be followed for intrusive site activities conducted under the Site Management Plan	Required
		Stormwater Best Management Practices	Procedures for managing surface water on the property and post-event inspections	Required
	Monitoring	Monitoring Surface for Erosion/damage	Routine inspection of surface water controls and the contributary water sheds for sediment transport.	Potentially applicable
		Surface Water Monitoring	Routine inspection, sampling, analysis and reporting of surface water discharge(s).	Required
		Groundwater Monitoring	Routine measurement of the depth to groundwater, sampling, analysis, and reporting of groundwater characteristics.	Potentially applicable

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Containment	Cover	Soil Cover	Commercial soil cover of unclassified fill and topsoil in vegetated areas. Commercial area cover is 12-inches.	Potentially applicable
		Containment Area		
		Asphalt or Concrete Pavement	Asphalt or concrete pavement meeting the requirements of the Town of Tonawanda for access and mobility around the site.	Potentially applicable
		Building or Structure	Structures around the site constructed in accordance with the Town of Tonawanda Building requirements.	Potentially applicable
Fill/Soil Management	Fill/Soil Excavation	Excavation and Onsite Placement	Excavation and placement in an area to be covered.	Potentially applicable
		Excavation, Treatment, and Onsite Placement	Excavation and application of one of the ex-situ treatment technologies and placement in an area to be covered.	Potentially applicable
		Excavation and Offsite Disposal	Excavation and transportation for offsite treatment and disposal.	Potentially applicable
	Soil/Fill Treatment	Biotreatment	Insitu or exsitu treatment of organic compounds	Potentially applicable
		Chemical Treatment	Insitu or exsitu destruction or conversion of compounds to more stable or less toxic forms.	Potentially applicable
		Solidifcation	Addition of materials to eliminate the potential for mobility and partitioning of constituents of the fill.	Potentially applicable
		~~Soil Vapor Extraction~~	~~Extraction of vapor from unsaturated soil/fill column by applying a vacuum.~~	~~Not applicable, fill zone is too thin and clay zone permeability is not conducive to vacuum extraction.~~
		In Situ Thermal Desorption/Treatment		
		~~Exsitu Thermal Desorption~~	~~Thermal desorption of volatile and semi-volatile organic compounds, producing a residual that is potentially less toxic.~~	~~Not Applicable, highly impacted volume insufficient for permitting and mobilization of an emission source on a site that was closed due to emissions. Technically a "coke plant"...public~~

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Groundwater Management	Groundwater Collection	Collection Trenches	Horizontal trenches to collect groundwater from a significant area.	Potentially applicable
		~~Extraction Wells~~	Vertical wells to collect water at specific locations.	Limited applicability, fill zone too thin for effective collection, clay zone permeability too low for effective extraction.
	Groundwater Treatment	Natural Attenuation	Attenuation of compounds in groundwater due to the biotransformation by naturally occurring micro organisms.	Potentially applicable
		Phytoremediation	Planting trees that utilize shallow groundwater and thereby remove associated constituents that are absorbed or evapotranspired to the atmosphere.	Potentially Applicable
		Enhanced Insitu Attenuation	Enhancement of the conditions to promote bio reduction of compounds through the addition of oxygen and nutrients.	Potentially applicable
		Insitu Oxidation	Addition of oxidizers to reduce the volume and toxicity of compounds in the clay or fill.	Potentially applicable in clay; not applicable in fill due to risk of combustion.
		~~Air Sparging~~	~~Insitu stripping of volatile compounds from groundwater.~~	~~Not applicable, fill zone is too thin and clay zone permeability is not conducive to sparging.~~
		Onsite Pre-treatment	Pre-treatment of extracted groundwater to meet the requirements of the Town of Tonawanda Industrial Waste Discharge Program.	Potentially applicable
		Onsite Primary, Secondary and Tertiary Treatment	Onsite treatment to meet the requirements of the New York State Pollutant Discharge Elimination System.	Potentially applicable

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Surface Water	Collection, Conveyance, and Treatment	Ditches	At grade surface Water collection and conveyance.	Potentially applicable
		Catch Basins and Underground Stormwater Piping	Below grade surface water collection and conveyance.	Potentially applicable
		Rain Gardens	Collection ponds with passive plantings to filter and support native vegetation and wildlife habitat.	Potentially applicable
		Bio-retention Ponds	Collection ponds with active biological collection and passive treatment.	Potentially applicable
		Retention Ponds	Passive or Active collection and sedimentation pond(s). The active components can include aeration and filtration.	Potentially applicable
Remnant Materials Management	Buried Utility Management	No Action	No action of any utility that is not creating a conduit for migration of impacted water or acting as a source of compounds to groundwater.	Potentially applicable
		~~Reuse~~	Reuse of underground utilities that are suitable for long-term operation; electrical conduit, north-south storm sewer, etc.	Potentially applicable
		Crush and Use as Fill	Crush clean concrete underground utilities that do not meet the determination of solid waste and use as onsite fill below a cover system.	Potentially applicable
		Grout	Fill underground conduits in place that could provide a migration pathway.	Potentially applicable
		Removal and Offsite Disposal	Remove underground conduits that contain residuals that exceed SCGs or that provide a conduit for groundwater migration from the site.	Potentially applicable

General Response Action		Area or Volume		Alternative								
				1	2	3	4	5	6	7	8	
Technology Type	**Process Option**	**Quantity**	**Units**	**No Action**	**Source Containment**	**Source Containment, Groundwater Control**	**Source Containment, NAPL Stabilization, Groundwater Control**	**Insitu Stabilization, Containment, Groundwater Control**	**Ex Situ Thermal and Stabilization, Containment, Groundwater Control**	**Source Removal, Containment, Groundwater Control**	**Track 1 Cleanup**	**Comments**
Access Restrictions	Environmental Easement	Track 4 Area		✓	✓	✓	✓	✓	✓	✓		
	Deed Restriction - No Drinking Water Wells	Track 4 Area		✓	✓	✓	✓	✓	✓	✓	✓	
	Deed Restriction - No Residential Development	Track 4 Area		✓	✓	✓	✓	✓	✓	✓		
Routine Long-term Care	Site Management Plan	Track 4 Area			✓	✓	✓	✓	✓	✓		
	Excavation Work Plan	Track 4 Area			✓	✓	✓	✓	✓	✓		
	Stormwater Best Management Practices	Entire BCP Site			✓	✓	✓	✓	✓	✓		
Monitoring	Monitoring Surface for Erosion/damage	Entire BCP Site			✓	✓	✓	✓	✓	✓		
	Surface Water Monitoring	Entire BCP Site		✓	✓	✓	✓	✓	✓	✓		
	Groundwater Monitoring	Entire BCP Site			✓	✓	✓	✓	✓	✓		
Groundwater Treatment	Onsite Pre-treatment	Impacted Areas				✓	✓	✓	✓	✓		Discharge to POTW v SPDES Permit Equivalence
	Onsite Primary, Secondary and Tertiary Treatment	Impacted Areas				✓	✓	✓	✓	✓		Capacity of 120 GPM, surface water duscharge under SPDES Permit Equivalence
Collection and Conveyance	Stormwater Management/Retention Ponds	7	Acres			✓	✓	✓	✓	✓	✓	The proposed retention pond(s) will occupy the northwest corner of the BCP Site.
General Fill Exceeding Commercial SCOs												
Containment	Soil Cover	80	Acres		✓	✓	✓	✓	✓	✓	✓	
	Asphalt or Concrete Pavement				✓	✓	✓	✓	✓	✓		
	Building or Structure				✓	✓	✓	✓	✓	✓		Entire Site less the retention pond and consolidation areas under Alternative No. 6. Topsoil cover required in Alternative No. 8 as vegetation will not grow effectively on clay.
	Consolidation Areas	4.5	Acres					✓				Other Covers Reduce to 75.5 Acres.
Fill/Soil Excavation	Excavation and Onsite Placement	4.7	Acres		✓	✓	✓	✓	✓	✓		Clear Perimeter of all soil that exceeds unrestricted SCOs
	Excavation and Onsite Placement	1,000	Ton		✓	✓	✓		✓			EPA Soil Piles
	Excavation and Onsite Placement	TBD	Ton				✓	✓	✓	✓		Fill moved to access viscous tar and NAPL
	Excavation and Onsite Placement	0	Acre		✓	✓	✓	✓	✓	✓		Clear Perimeter south of retention basin
	Excavation and Onsite Placement	7	Acre		✓	✓	✓	✓	✓	✓		Clear Retention Basin Area, use to fill low areas in Coke Yard
	Excavation and Onsite Placement	23	Acre				✓	✓	✓	✓		Regrade Coke Yard to eliminate low areas created by the coke recovery.
	Excavation and Onsite Placement	5	Acre				✓	✓	✓	✓		Final subgrade grading
	Excavation and Onsite Placement	2,600	Ton				✓	✓	✓	✓		Dredge pile near sedimentation pool #002
	Excavation and Onsite Placement	20,000	Ton		✓	✓	✓	✓	✓			Fill piles Near TP-BCP-49, TP-BCP-35 and TP-BCP-36.
	Excavation, Treatment, and Onsite Placement	200	Ton						✓	✓		TP-BCP-04 Area

General Response Action		Area or Volume		Alternative								
Technology Type	Process Option	Quantity	Units	1 No Action	2 Source Containment	3 Source Containment, Groundwater Control	4 Source Containment, NAPL Stabilization, Groundwater Control	5 Insitu Stabilization, Containment, Groundwater Control	6 Ex Situ Thermal and Stabilization, Containment, Groundwater Control	7 Source Removal, Containment, Groundwater Control	8 Track 1 Cleanup	Comments
Soil/Fill Treatment	Biotreatment	1,700	Ton					✓	✓			Heavy Equipment Mainteance and Oil House Area, if required
	Biotreatment	1,500	Ton					✓	✓			Diesel Spill/TP-BCP-14
	Biotreatment	200	Ton					✓	✓			Compressor Building Fill at former AST location
	Biotreatment	3,000	Ton					✓	✓			MW-BCP-19 Area
	Biotreatment	7,000	Ton				✓	✓	✓			Residual impacts in the fill from below the former waste water a fuel storage tanks, if not removed during the IRM, will be addressed if exhibiting characteristics of hazardous waste.
Soil/Fill Treatment	**Viscous Tar**											
	Solidification	200	Ton							✓		TP-BCP-04 Area
	Solidification	400	Ton				✓	✓				Weak Ammonia Area Fill with Viscous Tar/NAPL (PT02 and PT03 Area)
	Solidification	3,600	Ton				✓	✓				Tar Management Area Fill with Viscous Tar
	Solidification	500	Ton				✓	✓				Thaw Shed Materials
	Solidification	800	Ton				✓	✓				TP-BCP-48 Area (West of Tar Seep No. 1 on Site 110)
	Solidification	1,400	Ton				✓	✓				Tar Layer at Tar Seep No. 2 (TP-BCP-25 Area)
	Solidification	200	Ton				✓	✓		✓		Viscous Tar layer near South Rail
	Solidification	600	Ton				✓	✓		✓		TP-BCP-09 along the Site 110 southern boundary/former rail tracks.
	Fill with NAPL											
	Solidification	700	Ton				✓	✓				Light Oil Area Fill with NAPL
	Solidification	700	Ton				✓	✓				Fill with NAPL from the Production Area near MW-BCP-5A
	Solidification	200	Ton				✓	✓				Fill with NAPL from the Exhauster Building and Sump Areas
	Solidification	400	Ton				✓	✓				Fill with NAPL from Pump House Area
	Solidification	400	Ton				✓	✓				Fill with NAPL from Former Junction Building Area
	Fill with VOC Impacts											Note: These quantities are refering to fill materials around the NAPL areas, including the NAPL materials that have been impacted by those materials, these are combined NAPL and associated impacted fill volume.
	Solidification	5,000	Ton				✓	✓				Fill with VOC impacts from the Production Area near the Light Oil Area
	Solidification	2,500	Ton				✓	✓				Fill with NAPL and VOC impacts from the Production Area near MW-BCP-5A
	Solidification	700	Ton				✓	✓				Fill with VOC impacts from the Exhauster Building and Sump Areas
	Solidification	1,500	Ton				✓	✓				Fill with VOC impacts from Pump House Area
	Solidification	6,000	Ton				✓	✓				TP-BCP-19 to MW-BCP-13A area
	Blue-stained Fill/Soils											
	Solidification	3,000	Ton				✓	✓	✓			Purifier Box Residuals
	Solidification	5,000	Ton				✓	✓	✓			Iron Oxide Pile
	Solidification	1,800	Ton				✓	✓	✓			Debris in TP-BCP-46 Area
	Solidification	2,000	Ton				✓	✓	✓			TP-BCP-35 Area Blue-stained Soils
	Stabilization to Improve Geotechnical Properties											
	Solidification	400	Ton			✓	✓	✓	✓	✓		Sedimentation Pool #001
	Solidification	400	Ton				✓	✓	✓	✓		Sedimentation Pool #002
	Solidification	400	Ton				✓	✓	✓	✓		Sedimentation Pool #003
	Solidification	2,200	Ton			✓	✓	✓	✓	✓		Stormwater Retention Basin
	Solidification	2,000	Ton		✓	✓	✓	✓	✓	✓		South Ditch sediment

General Response Action		Area or Volume		Alternative								
				1	2	3	4	5	6	7	8	
Technology Type	**Process Option**	**Quantity**	**Units**	**No Action**	**Source Containment**	**Source Containment, Groundwater Control**	**Source Containment, NAPL Stabilization, Groundwater Control**	**Insitu Stabilization, Containment, Groundwater Control**	**Ex Situ Thermal and Stabilization, Containment, Groundwater Control**	**Source Removal, Containment, Groundwater Control**	**Track 1 Cleanup**	**Comments**
Soil/Fill Treatment	Ex situ Thermal Desorption/Treatment	400	Ton						✓			Light Oil Area Fill with Viscous Tar
	Ex situ Thermal Desorption/Treatment	3,600	Ton						✓			Tar Management Area Fill with Viscous Tar
	Ex situ Thermal Desorption/Treatment	700	Ton						✓			Light Oil Area Fill with NAPL
	Ex situ Thermal Desorption/Treatment	700	Ton						✓			Fill with NAPL from the Production Area near MW-BCP-5A
	Ex situ Thermal Desorption/Treatment	200	Ton						✓			Fill with NAPL from the Exhauster Building and Sump Areas
	Ex situ Thermal Desorption/Treatment	400	Ton						✓			Fill with NAPL from Pump House Area
	Ex situ Thermal Desorption/Treatment	5,000	Ton						✓			Light Oil Area Fill with VOC Impacts
	Ex situ Thermal Desorption/Treatment	2,500	Ton						✓			Fill with VOCs from the Production Area near MW-BCP-5A
	Ex situ Thermal Desorption/Treatment	500	Ton						✓			Fill with VOCs from the Exhauster Building and Sump Areas
	Ex situ Thermal Desorption/Treatment	1,200	Ton						✓			Fill with VOCs from Pump House Area
	Ex situ Thermal Desorption/Treatment	800	Ton						✓			TP-BCP-48 Area (Tar Seep No. 1 western advance)
	Ex situ Thermal Desorption/Treatment	1,400	Ton						✓			Tar Seep No. 2 area
	Ex situ Thermal Desorption/Treatment	3,000	Ton						✓			TP-BCP-19 to MW-BCP-13A area
	Ex situ Thermal Desorption/Treatment	500	Ton						✓			Grossly Contaminated Materials in storage area
	Ex situ Thermal Desorption/Treatment	500	Ton						✓			Fill with VOCs from the Exhauster Building and Sump Areas
	Ex situ Thermal Desorption/Treatment	1,400	Ton						✓			Tar Seep No. 2 area
	Ex situ Thermal Desorption/Treatment	200	Ton						✓			South Rail Car Area
	Ex situ Thermal Desorption/Treatment	600	Ton						✓			TP-BCP-09
Consolidation Areas												
	Excavation and Placement in Consolidation Areas	200	Ton					✓				TP-BCP-04 Area Fill with viscous tar
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	400	Ton					✓				Light Oil Area Fill with Viscous Tar
		3,600	Ton					✓				Tar Management Area Fill with Viscous Tar
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	700	Ton					✓				Light Oil Area Fill with NAPL
		700	Ton					✓				Fill with NAPL from the Production Area near MW-BCP-5A
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	200	Ton					✓				Fill with NAPL from the Exhauster Building and Sump Areas
		400	Ton					✓				Fill with NAPL from Pump House Area
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	3,000	Ton					✓				Purifier Box Residuals
		5,000	Ton					✓				Iron Oxide Pile
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	500	Ton					✓				Thaw Shed Stockpiles
	Excavation, Treatment, and Onsite Placement in Consolidation Areas	400	Ton					✓				Junction Building Area Fill with NAPL
	Excavation, Treatment, and Onsite Placement in Containment Area	1,400	Ton					✓				Tar Layer at Tar Seep No. 2
	Excavation, Treatment, and Onsite Placement in Containment Area	400	Ton					✓	✓			NAPL Impacted Fill at Junction Building
	Excavation, Treatment and Onsite Placement in Consolidation Areas	200	Ton				✓	✓	✓			Viscous Tar layer near South Rail
	Excavation, Treatment and Onsite Placement in Consolidation Areas	700	Ton				✓	✓	✓			Viscous Tar at Site 110 Boundary (North end of TP-BCP-09)

General Response Action		Area or Volume		Alternative								
				1	2	3	4	5	6	7	8	
Technology Type	Process Option	Quantity	Units	No Action	Source Containment	Source Containment, Groundwater Control	Source Containment, NAPL Stabilization, Groundwater Control	Insitu Stabilization, Containment, Groundwater Control	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	Source Removal, Containment, Groundwater Control	Track 1 Cleanup	Comments
Offsite Disposal												
	Excavation and Offsite Disposal	1,000	Ton							✓	✓	EPA Soil Piles
	Excavation and Offsite Disposal	400	Ton							✓	✓	Light Oil Area Fill with Viscous Tar
	Excavation and Offsite Disposal	3,600	Ton							✓	✓	Tar Management Area Fill with Viscous Tar
	Excavation and Offsite Disposal	700	Ton							✓	✓	Light Oil Area Fill with NAPL
	Excavation and Offsite Disposal	700	Ton							✓	✓	Fill with NAPL from the Production Area near MW-BCP-5A
	Excavation and Offsite Disposal	200	Ton							✓	✓	Fill with NAPL from the Exhauster Building and Sump Areas
	Excavation and Offsite Disposal	400	Ton							✓	✓	Fill with NAPL from Pump House Area
	Excavation and Offsite Disposal	3,000	Ton							✓	✓	Purifier Box Residuals
	Excavation and Offsite Disposal	5,000	Ton							✓	✓	Iron Oxide Pile
	Excavation and Offsite Disposal	150	Ton							✓	✓	Shallow Fill at MW-BCP-01
	Excavation and Offsite Disposal	500	Ton				✓			✓	✓	Grossly Contaminated Materials in Thaw Shed
	Excavation and Offsite Disposal	1,400	Ton							✓	✓	Tar Layer at Tar Seep No. 2
	Excavation and Offsite Disposal	400	Ton							✓	✓	NAPL Impacted Fill at Junction Building
	Excavation and Offsite Disposal	7,000	Ton							✓	✓	Residual impacts in the fill from below the former waste water a fuel storage tanks, if not treated during the
	Excavation and Offsite Disposal	400	Ton							✓	✓	MW-BCP-27A Area (Mercury)
	Excavation and Offsite Disposal	60000	Ton							✓	✓	Rail Bed Ballast/Slag Product
	Excavation and Offsite Disposal	1,092,000	Ton								✓	All soi exceeding unrestricted SCOs
Groundwater												
	Groundwater Containment	Soil Cover Keyed into Clay	4.7	Acre			✓	✓	✓	✓	✓	Track 1 Area
	Groundwater Collection	Collection at In sSitu Stabilized Areas and Consolidation Areass							✓			Collection system below or around in situ stabilized materials and consolidation Areass
	Collection and Conveyance	No Action			✓							
		Catch Basins and Underground Stormwater Piping	900	LF			✓	✓	✓	✓	✓	Existing or replacement north storm sewer.
		Catch Basins and Underground Stormwater Piping					✓	✓	✓	✓	✓	Potentially replace north ditch with below grade system, at or near current north ditch, depending on redevelopment plans.
		Catch Basins and Underground Stormwater Piping					✓	✓	✓	✓	✓	
		Grout or Remove						✓	✓	✓		Line to Huntley
		Removal and Offsite Disposal								✓	✓	
		Crush and Use as Fill	1,600	Ton						✓		Storm water controls (catch basins) and access road
		Crush and Use as Fill	600	Ton						✓	✓	Mixing Pad (Testing Required)
		Crush and Use as Fill						✓	✓	✓	✓	Former stormwater retention basin outlet pipes
		Removal and Offsite Disposal									✓	Former stormwater retention basin outlet pipes
	Groundwater Monitoring	Natural Attenuation	Site Wide				✓	✓	✓	✓	✓	Outside Source Removal Areas

General Response Action		Area or Volume		Alternative								
Technology Type	Process Option	Quantity	Units	1 No Action	2 Source Containment	3 Source Containment, Groundwater Control	4 Source Containment, NAPL Stabilization, Groundwater Control	5 Insitu Stabilization, Containment, Groundwater Control	6 Ex Situ Thermal and Stabilization, Containment, Groundwater Control	7 Source Removal, Containment, Groundwater Control	8 Track 1 Cleanup	Comments
Buried Utility Management												
	No Action			✓								
	Crush and Use as Fill	80	Ton							✓		Mansion sump
	Crush and Use as Fill	100	Ton				✓	✓	✓	✓		Former rail scale
	Crush and Use as Fill	1,400	Ton		✓	✓	✓	✓	✓			Box Culvert
	Crush and Use as Fill	8	Ton		✓	✓	✓	✓	✓	✓		Manhole Risers from north south storm sewer
	Remove or Grout	100	LF				✓	✓	✓	✓		Emergency water line
	Remove or Grout	8,000	LF				✓	✓				Abandoned process lines
		2,000	LF				✓	✓	✓	✓		Abandoned COG lines to Town and City
	Removal and Offsite Disposal	500	LF						✓	✓	✓	Abandoned Process Lines, except water lines, North Storm Sewer
	Removal and Offsite Disposal	450	LF							✓	✓	Remaining abandoned outfall and water lines crossing retention basin, North-south Storm Sewer

Alternative	Description	Threshold Criteria	
		Overall Protectiveness of the Public Health and the Environment	Compliance with Standards Criteria and Guidance (SCGs)
1	No Action	Does not protect trespasser or onsite worker receptors. Does not protect the onsite environment.	Does not comply with SCGs
2	Source Containment	Interrupts all exposure pathways and contains migration of source materials.	Compliance through elimination of the pathways. Does not address all sources through treatment or removal.
3	Source Containment, Groundwater Control	Interrupts all exposure pathways and contains migration of source materials. The expansion of the groundwater collection and treatment system controls mobility and accelerates the rate of volume reduction.	Compliance through elimination of the pathways. Groundwater impacts will be controlled long term through hydraulic containment and control.
4	Source Containment, NAPL Stabilization, Groundwater Control	Interrupts all exposure pathways and eliminates migration from source materials. The expansion of the groundwater collection and treatment system controls mobility using stabilization, and accelerates the rate of volume reduction.	Compliance through elimination of the pathways. Eliminates separate phase materials through treatment. Shallow groundwater is controlled long term through hydraulic containment.
5	Insitu Stabilization, Containment, Groundwater Control	Interrupts all exposure pathways and eliminates migration from source materials. Consolidation of materials reduces the potential for contact with stabilized fill. The expansion of the groundwater collection and treatment system controls mobility and accelerates the rate of volume reduction.	Compliance through elimination of the pathways. Eliminates separate phase materials and purifier materials through treatment and consolidation. Shallow groundwater is controlled long term through hydraulic containment.

Alternative	Description	Threshold Criteria	
		Overall Protectiveness of the Public Health and the Environment	Compliance with Standards Criteria and Guidance (SCGs)
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	Interrupts all exposure pathways and eliminates migration from source materials. The expansion of the groundwater collection and treatment system controls mobility and accelerates the rate of volume reduction.	Compliance through elimination of the pathways. Eliminates separate phase materials and purifier materials through both treatment and removal. Shallow groundwater is controlled long term through hydraulic containment.
7	Source Removal, Containment, Groundwater Control	Interrupts all exposure pathways and eliminates migration from source materials. The expansion of the groundwater collection and treatment system controls mobility and accelerates the rate of volume reduction.	Compliance through elimination of the pathways. Eliminates separate phase materials through excavation and offsite disposal. Shallow groundwater is controlled long term through hydraulic containment.
8	Track 1 Cleanup	Relocates source materials from the BCP Site.	Compliance through elimination of the pathways. Eliminates source materials through excavation and offsite disposal.

Alternative	Description	Evaluation Criteria Primary Balancing Criteria Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume of Contamination through Treatment	Short-term Impact and Effectiveness Conventional Evaluation	Short-term Impact and Effectiveness Innovative and Sustainable Evaluation	Implementability	Cost Effectiveness	Land Use
1	No Action	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2	Source Containment	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
3	Source Containment, Groundwater Control	Effectiveness is based on long-term maintenance of the cover, operation of the expanded groundwater extraction and treatment system, and natural attenuation.	The reduction in toxicity is based on natural attenuation. The reduction in mobility is based on the reduction of infiltration BCP Site-wide, and the extraction and treatment of the groundwater across the BCP Site. The reduction in volume is based on the extraction and treatment of water and separate phase liquids from the BCP Site.	The placement of the cover and construction of a larger storm water retention pond will provide short-term protection from directed contact and improve surface water quality. Both the cover and stormwater systems are passive and will be effective with relatively little maintenance. The expansion of the groundwater collection system across the BCP Site will accelerate the rate of attenuation in the shallow water zone.	A larger storm water retention pond can be designed incorporating native and natural habitats. Pond construction will reduce the amount of material that would remain onsite and increase offsite export for waste disposal and increase fuel usage and GHGs from trucking and equipment operations. Little maintenance required and unused portions of the site can be designed to minimize surface vegetation maintenance which would reduce fuel use and GHGs. The construction phase of implementing the groundwater collection system expansion would create a short term increase in fuel consumption and GHGs. However, operation of an expanded groundwater collection system would have lower GHG emissions compared to the benefit to the environment.	Implementable. The actions do not rely on any unproven technology. The permitting will likely define the schedule.	Cost effective. Although much more expensive than Alternative No. 3, the verifiable control of the shallow water zone significantly improves the control of the potential constituent migration..	Allows commercial or industrial redevelopment.
4	Source Containment, NAPL Stabilization, Groundwater Control	Effectiveness is based on elimination of any partitioning of constituents from separate phase liquids, long-term maintenance of the cover, operation of the expanded groundwater extraction and treatment system, and natural attenuation.	The reduction in toxicity is achieved by solidification and stabilization of NAPL materials than can potentially allow additional partitioning of constituents and ongoing natural attenuation. Natural attenuation will be more effective by the removal of additional constituent partitioning from separate phase liquids. The reduction in mobility is based on the stabilization of separate phase liquids, reduction of infiltration BCP Site-wide, and the extraction and treatment of the groundwater across the BCP Site. The reduction in volume is based on the extraction and treatment of water containing constituents from the TCC	Stabilization and solidification is a effective short-term treatment to stop any potential partitioning from the separate phase liquids on the property. The placement of the cover and construction of a larger storm water retention pond will provide short-term protection from directed contact and improve surface water quality. Both the cover and stormwater systems are passive and will be effective with relatively little maintenance. The expansion of the groundwater collection system across the BCP Site will accelerate the rate of attenuation in the Shallow water zone.	Same innovative evaluation as Alternative No. 4., with increase in fuel use and increased GHGs for the insitu stabilization work. Natural attenuation will be a viable process over a larger area and the energy and fuel required for long-term operation of the groundwater collection system would be reduced.	Relatively easily implemented. The actions do not rely on any unproven technology. The difficulty is weather related. Periods of high precipitation limit access and mobility on the BCP Site. The permitting and weather will likely define the schedule.	Expensive. While very expensive, the elimination of the separate phase liquids will in the long-term reduce the need for the groundwater extraction and treatment system. The verifiable control of the Shallow water zone will be accelerated and significantly improved. Potential constituent migration will be more rapidly effected and natural attenuation processes will accelerate.	Allows commercial or industrial redevelopment.
5	Insitu Stabilization, Containment, Groundwater Control	Effectiveness is based on elimination of any partitioning of constituents from separate phase liquids and hydrocarbon impacted fill,, long-term maintenance of the cover, operation of the expanded groundwater extraction and treatment system, and natural attenuation.	The reduction in toxicity is achieved by solidification and stabilization of materials than can potentially allow additional partitioning of constituents and ongoing natural attenuation. Mobility is reduced by stabilization and consolidation. Natural attenuation will be more effective by the removal of additional constituent partitioning from separate phase liquids. The reduction in mobility is based on the stabilization of separate phase liquids, reduction of infiltration BCP Site-wide, and the extraction and treatment of the groundwater across the BCP Site. The reduction in volume is based on the extraction and treatment of water	Stabilization and solidification is a effective short-term treatment to stop any potential partitioning from the separate phase liquids on the property. The placement of the cover and construction of a larger storm water retention pond will provide short-term protection from directed contact and improve surface water quality. Both the cap and cover and stormwater systems are passive and will be effective with relatively little maintenance. The expansion of the groundwater collection system across the BCP Site will accelerate the rate of attenuation in the shallow water zone.	Same innovative evaluation as Alternative No. 5., with increase in fuel use and increased GHGs for the additional insitu stabilization and chemical treatment work. Natural attenuation will be a viable process over a larger area and the energy and fuel required for long-term operation of the groundwater collection system would be reduced.	Relatively easily implemented. The actions do not rely on any unproven technology. The difficulty is weather related. Periods of high precipitation limit access and mobility on the BCP Site. The permitting and weather will likely define the schedule.	Expensive. While very expensive, the elimination of the separate phase liquids, biological and chemical treatment will in the long-term reduce the need for the groundwater extraction and treatment system. The verifiable control of the shallow water zone will be accelerated and significantly improved. Potential constituent migration will be more rapidly effected and natural attenuation processes will accelerate.	Allows commercial or industrial redevelopment. The consolidation of the stabilized materials from the proposed development makes the site more attractive and reduces the scope and cost of the EWP.

Alternative	Description	Evaluation Criteria Primary Balancing Criteria Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume of Contamination through Treatment	Short-term Impact and Effectiveness Conventional Evaluation	Short-term Impact and Effectiveness Innovative and Sustainable Evaluation	Implementability	Cost Effectiveness	Land Use
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	Effectiveness is based on elimination of any partitioning of constituents from separate phase liquids by treatment, elimination of partitioning from purifier materials by removal, long-term maintenance of the cover, operation of the expanded groundwater extraction and treatment system, and natural attenuation.	The reduction in toxicity is direct by ex situ treatment, solidification and stabilization of materials than can potentially allow additional partitioning of constituents and ongoing natural attenuation. Natural attenuation will be more effective by the removal of additional constituent partitioning from separate phase liquids. The reduction in mobility is based on the stabilization of separate phase liquids, reduction of infiltration BCP Site-wide, and the extraction and treatment of the groundwater across the BCP Site. The reduction in volume is based on the extraction and treatment of water containing constituents from the TCC operations.	Thermal treatment and stabilization and solidification are effective relatively "short-term" treatments to stop any potential partitioning from the separate phase liquids on the property. The removal of the purifier wastes eliminates the partitioning of inorganic compounds. The thermal treatment is longer in duration (approximately 2 years) and produces an air emission source that the other technologies do not induce. The placement of the cover and construction of a larger storm water retention pond will provide short-term protection from directed contact and improve surface water quality. Both the cover and stormwater systems are passive and will be effective with relatively little maintenance. The expansion of the groundwater collection system across the BCP Site will accelerate the rate of attenuation in the shallow water zone.	Ex situ thermal remediation requires the use of significant amounts of electrical energy and induces an emission stream that the other technologies do not. The stabilization and solidification phase and placement of cover would result in an increased fuel use and increase GHGs. A larger storm water retention pond can be designed incorporating native and natural habitats. Little maintenance required and unused portions of the site can be designed to minimize surface vegetation maintenance which would reduce fuel use and GHGs. The increased short term fuel usage and GHGs from equipment operation during construction would likely be offset by reductions in the operational time of the groundwater treatment system. In comparison to insitu stabilization and natural attenuation to manage the soil and surface material, the source removal will increase the tons of waste transported offsite for disposal which will also increase the fuel use and GHGs and increase the risk of fugitive emissions. An offset for the fuel use, GHGs, and risk of fugitive dust is the reduced long-term operation of the groundwater collection system and rapid increase in the natural attenuation process.	Relatively easily implemented. The actions rely on any unproven technology. The difficulty is the time required for thermal treatment and the management of the generated liquids and emissions. Periods of high precipitation limit access and mobility on the BCP Site required to excavate and place the materials to be treated. Removal of purifier wastes have a larger range of disposal options, potentially making capacity available. The air permitting, construction of a temporary substation, and weather will likely define the schedule.	Very expensive. While very expensive, the elimination of the separate phase liquids will not significantly change the long term impact over solidification/stabilization. Potential constituent migration will be more rapidly effected by stabilization and solidification.	Allows commercial or industrial redevelopment. The lack of a definable schedule could lead developers to select alternative shovel ready sites.
7	Source Removal, Containment, Groundwater Control	Effectiveness is based on elimination of any partitioning of constituents from separate phase liquids and purifier materials by removal, long-term maintenance of the cover, operation of the expanded groundwater extraction and treatment system, and natural attenuation.	The reduction in toxicity is direct by excavation and offsite treatment of materials than can potentially allow additional partitioning of constituents and ongoing natural attenuation. Natural attenuation will be more effective by the removal of additional constituent partitioning from separate phase liquids. The reduction in mobility is based on the transportation and offsite disposal of separate phase liquids, reduction of infiltration BCP Site-wide, and the extraction and treatment of the groundwater across the BCP Site.	Increases the short term risks by transporting the separate phase materials on public roads. Effectiveness impaired by the limited capacity of available disposal facilities.	Significant increase in fuel usage and GHGs from equipment operation for excavating and transporting impacted material offsite for disposal while also significantly increasing the offsite waste disposal and reducing the about of material reused onsite. The risk of fugitive dust increases with excavation.	Not practical. There is extremely limited capacity for the transportation and disposal of the separate phase materials from the BCP Site.	Potentially expensive, if even possible. The limited capacity for disposal of separate phase materials and the risks associated with transportation make quantification of the cost difficult.	Could prevent redevelopment as the removal of materials could extend the schedule for years.
8	Track 1 Cleanup	Effectiveness is based on disposal at off-site permitted facilities.	The reduction in toxicity is direct by excavation and offsite treatment of materials than can potentially allow additional partitioning of constituents and ongoing natural attenuation. The reduction in mobility is based on the transportation and offsite disposal of all materials that exceed the unrestricted SCOs.	Dramatically increases the short term risks by transporting the over 1 million tons of material on public roads. Effectiveness impaired by the limited capacity of available disposal facilities.	Significant increase in fuel usage and GHGs from equipment operation for excavating and transporting impacted material offsite for disposal while also significantly increasing the offsite waste disposal and reducing the about of material reused onsite. The risk of fugitive dust increases with excavation.	Not practical. There is extremely limited capacity for the transportation and disposal of the separate phase materials from the BCP Site and this would require significant non-hazardous disposal.	Not cost effective. No benefit to moving materials to another location to create unrestricted property on industrial property.	Could prevent redevelopment as the removal of materials could extend the schedule for years.

Alternative	Description	Modifying Considerations
		Community Acceptance
1	No Action	N.A.
2	Source Containment	N.A.
3	Source Containment, Groundwater Control	To be determined
4	Source Containment, NAPL Stabilization, Groundwater Control	To be determined
5	Insitu Stabilization, Containment, Groundwater Control	To be determined

Alternative	Description	Modifying Considerations Community Acceptance
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	To be determined
7	Source Removal, Containment, Groundwater Control	To be determined
8	Track 1 Cleanup	To be determined

Alternative	Description	Evaluation Criteria: Threshold Criteria		Primary Balancing Criteria							Modifying Considerations	Overall Score
		Overall Protectiveness of the Public Health and the Environment	Compliance with Standards Criteria and Guidance (SCGs)	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume of Contamination through Treatment	Short-term Impact and Effectiveness: Conventional Evaluation	Short-term Impact and Effectiveness: Innovative and Sustainable Evaluation	Implementability	Cost Effectiveness	Land Use	Community Acceptance	
	Weighting Factor >>	10	10	8	8	5	4	6	4	4	N.A.	
1	No Action	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2	Source Containment	5	5	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
3	Source Containment, Groundwater Control	7	7	8	5	7	5	8	10	8	To be determined	419
4	Source Containment, NAPL Solidification, Groundwater Control	10	10	10	7	9	5	7	9	9	To be determined	515
5	Insitu Stabilization, Containment, Groundwater Control	10	10	10	9	9	5	7	8	10	To be determined	**531**
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	10	10	10	9	7	2	4	4	8	To be determined	467
7	Source Removal, Containment, Groundwater Control	7	10	10	9	6	2	3	4	5	To be determined	414
8	Track 1 Remediation	5	10	10	10	2	2	0	0	10	To be determined	368

2. The Overall Score is the sum of the products od the weighting factors and the individual score.
3. Community Acceptance cannot be evaluated until after the Draft Alternative Analysis has a public comment period, hence the TBD reference.

Alternative	Description	Environmental Easement and Deed Restrictions	Surface Water Monitoring See Note 4	Site Management and Monitoring See Note 3	Structure, Process Equipment and Utility Removal	Groundwater Extraction and Treatment See Note 5	Groundwater Monitoring See Note 5	Site Management Plan and Excavation Work Plan, Site Maintenance See Note 3	Slab and Underground Utility Removal	Clearing, Grubbing, Grading and Site-wide Cover See Note 6	Stabilization/ Solidification Ex Situ Thermal	Source Consolidation or Removal	Engineering, FER and CoC Documentation	TOTAL COST ESTIMATE
1	No Action	$ 25,000	$ 1,859,000	$ 12,774,000	$ 10,519,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 283,000	$ 25,460,000
2	Source Containment	$ 25,000	$ 2,117,000	$ 12,774,000	$ 10,519,000	$ -	$ 1,233,000	$ 777,000	$ -	$ 9,833,000	$ -	$ -	$ 1,432,000	$ 38,710,000
3	Source Containment, Groundwater Control	$ 25,000	$ 2,117,000	$ 12,774,000	$ 10,519,000	$ 7,256,000	$ 1,233,000	$ 777,000	$ -	$ 9,833,000	$ -	$ -	$ 1,726,000	$ 46,260,000
4	Source Containment, NAPL Stabilization, Groundwater Control	$ 25,000	$ 1,859,000	$ 12,774,000	$ 10,519,000	$ 7,256,000	$ 1,233,000	$ 777,000	$ 715,000	$ 9,833,000	$ 5,133,000	$ -	$ 2,174,000	$ 52,298,000
5	Insitu Stabilization, Containment, Groundwater Control	$ 25,000	$ -	$ 12,774,000	$ 10,519,000	$ 4,497,000	$ 1,233,000	$ 777,000	$ 715,000	$ 8,990,000	$ 12,377,000	$ 12,027,000	$ 3,278,000	**$ 67,212,000**
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	$ 25,000	$ -	$ 12,774,000	$ 10,519,000	$ 4,497,000	$ 1,233,000	$ 777,000	$ 715,000	$ 8,990,000	$ 39,767,000	$ 25,518,000	$ 6,549,000	$ 111,364,000
7	Source Removal, Containment, Groundwater Control	$ 25,000	$ -	$ 12,774,000	$ 10,519,000	$ -	$ 1,233,000	$ 777,000	$ 715,000	$ 9,833,000	$ 12,377,000	$ 77,001,000	$ 8,544,000	$ 133,798,000
8	Track 1 Cleanup	$ -	$ -	$ -	$ 10,519,000	$ -	$ -	$ 2,331,000	$ 715,000	$ 9,833,000	$ 39,767,000	$ 133,617,000	$ 14,861,000	$ 211,643,000

Notes:

1. All estimates rounded up to the nearest $,000s.
2. Future costs discounted 3%
3. Site Maintenance and Utilities Costs Assumed for 10 years for the purposes of the Alternatives Analysis , site management is the responsibility of lessor thereafter. The SMP shall be implemented until the NYSDEC has determined it is not longer required, the requirements of the SMP do not stop after 10 years.
4. Alternatives 6, 7, and 8 do not have surface water discharge testing requirements after consolidation and source controls.
5. Groundwater monitoring requirements reduced for Alternatives 6, 7, and 8 due to consolidation and source controls.
6. The Sitewide cover is reduced in Alternatives 6 and 7 by the area occupied by the consolidation cells. The cost of capping those areas is included in the consolidation cell estimate.
The Site Management is much longer under Track 1 due to the difficulty and time required to transport the soils to multiple landfills.

Table 6-5
Alternative Green House Gas Estimates
Carbon Dioxide (CO2) Equivalent
(Metric Tons)
Riverview Innovation & Technology Campus, Inc.
Town of Tonawanda, New York

Alternative	Description	Groundwater Extraction and Treatment	Site Management Plan and Excavation Work Plan, Site Maintenance	Slab and Underground Utility Removal	Clearing, Grubbing, Grading and Site-wide Cover	Stabilization/ Solidification Ex Situ Thermal	Source Removal	TOTAL CO2 EQUIVALENT ESTIMATE
1	No Action	-	-	-	-	-	-	-
2	Source Containment	-	2,373	-	1,306	-	-	3,678
3	Source Containment, Groundwater Control	457	2,373	-	1,306	-	-	4,136
4	Source Containment, NAPL Stabilization, Groundwater Control	457	2,373	721	1,306	-	1,355	6,211
5	Insitu Stabilization, Containment, Groundwater Control	457	2,373	721	1,306	-	1,494	**6,350**
6	Ex Situ Thermal and Stabilization, Containment, Groundwater Control	457	2,373	721	1,306	7,515	1,494	13,865
7	Source Removal, Containment, Groundwater Control		2,373	721	1,306	-	7,042	11,441
8	Track 1 Cleanup		2,373	721	1,306	-	14,232	18,631

General Response Action		Area or Volume		Alternative 5	
Technology Type	**Process Option**	**Quantity**	**Units**	**Insitu Stabilization, Containment, Groundwater Control**	**Comments**
Access Restrictions	Environmental Easement	Track 4 Area		✓	
	Deed Restriction - No Drinking Water Wells	Track 4 Area		✓	
	Deed Restriction - No Residential Development	Track 4 Area		✓	
Routine Long-term Care	Site Management Plan	Track 4 Area		✓	
	Excavation Work Plan	Track 4 Area		✓	
	Stormwater Best Management Practices	Entire BCP Site		✓	
Monitoring	Monitoring Surface for Erosion/damage	Entire BCP Site		✓	
	Surface Water Monitoring	Entire BCP Site		✓	
	Groundwater Monitoring	Entire BCP Site		✓	
Groundwater Treatment	Onsite Pre-treatment	Impacted Areas		✓	Discharge to POTW v SPDES Permit Equivalence
	Onsite Primary, Secondary and Tertiary Treatment	Impacted Areas		✓	Capacity of 120 GPM, surface water duscharge under SPDES Permit Equivalence
Collection and Conveyance	Stormwater Management/Retention Ponds	7	Acres	✓	The proposed retention pond(s) will occupy the northwest corner of the BCP Site.

General Response Action		Area or Volume		Alternative	
Technology Type	**Process Option**	**Quantity**	**Units**	**Insitu Stabilization, Containment, Groundwater Control**	**Comments**
General Fill Exceeding Commercial SCOs					
Containment	Soil Cover	80	Acres	✓	
	Asphalt or Concrete Pavement			✓	
	Building or Structure			✓	Entire Site less the retention pond and consolidation areas under Alternative No. 6. Topsoil cover required in Alternative No. 8 as vegetation will not grow effectively on clay.
	Consolidation Areas	4.5	Acres	✓	Other Covers Reduce to 75.5 Acres.
Fill/Soil Excavation	Excavation and Onsite Placement	4.7	Acres	✓	Clear Perimeter of all soil that exceeds unrestricted SCOs
	Excavation and Onsite Placement	1,000	Ton		EPA Soil Piles
	Excavation and Onsite Placement	TBD	Ton	✓	Fill moved to access viscous tar and NAPL
	Excavation and Onsite Placement	0	Acre	✓	Clear Perimeter south of retention basin
	Excavation and Onsite Placement	7	Acre	✓	Clear Retention Basin Area, use to fill low areas in Coke Yard
	Excavation and Onsite Placement	23	Acre	✓	Regrade Coke Yard to eliminate low areas created by the coke recovery.
	Excavation and Onsite Placement	5	Acre	✓	Final subgrade grading
	Excavation and Onsite Placement	2,600	Ton	✓	Dredge pile near sedimentation pool #002
	Excavation and Onsite Placement	20,000	Ton	✓	Fill piles Near TP-BCP-49, TP-BCP-35 and TP-BCP-36.
Soil/Fill Treatment	Biotreatment	1,700	Ton	✓	Heavy Equipment Mainteance and Oil House Area, if required
	Biotreatment	1,500	Ton	✓	Diesel Spill/TP-BCP-14
	Biotreatment	200	Ton	✓	Compressor Building Fill at former AST location
	Biotreatment	3,000	Ton	✓	MW-BCP-19 Area
	Biotreatment	7,000	Ton	✓	Residual impacts in the fill from below the former waste water a fuel storage tanks, if not removed during the IRM, will be addressed if exhibiting characteristics of hazardous waste.
Soil/Fill Treatment	**Viscous Tar**				

General Response Action		Area or Volume		Alternative 5	
Technology Type	**Process Option**	**Quantity**	**Units**	**Insitu Stabilization, Containment, Groundwater Control**	**Comments**
	Solidification	400	Ton	✓	Weak Ammonia Area Fill with Viscous Tar/NAPL (PT02 and PT03 Area)
	Solidification	3,600	Ton	✓	Tar Management Area Fill with Viscous Tar
	Solidification	500	Ton	✓	Thaw Shed Materials
	Solidification	800	Ton	✓	TP-BCP-48 Area (West of Tar Seep No. 1 on Site 110)
	Solidification	1,400	Ton	✓	Tar Layer at Tar Seep No. 2 (TP-BCP-25 Area)
	Solidification	200	Ton	✓	Viscous Tar layer near South Rail
	Solidification	600	Ton	✓	TP-BCP-09 along the Site 110 southern boundary/former rail tracks.
	Fill with NAPL				
	Solidification	700	Ton	✓	Light Oil Area Fill with NAPL
	Solidification	700	Ton	✓	Fill with NAPL from the Production Area near MW-BCP-5A
	Solidification	200	Ton	✓	Fill with NAPL from the Exhauster Building and Sump Areas
	Solidification	400	Ton	✓	Fill with NAPL from Pump House Area
	Solidification	400	Ton	✓	Fill with NAPL from Former Junction Building Area
	Fill with VOC Impacts				Note: These quantities are refering to fill materials around the NAPL areas, including the NAPL materials that have been impacted by those materials, these are combined NAPL and associated impacted fill volume.
	Solidification	5,000	Ton	✓	Fill with VOC impacts from the Production Area near the Light Oil Area
	Solidification	2,500	Ton	✓	Fill with NAPL and VOC impacts from the Production Area near MW-BCP-5A
	Solidification	500	Ton	✓	Fill with VOC impacts from the Exhauster Building and Sump Areas
	Solidification	1,200	Ton	✓	Fill with VOC impacts from Pump House Area
	Solidification	3,000	Ton	✓	TP-BCP-19 to MW-BCP-13A area
	Blue-stained Fill/Soils				
	Solidification	3,000	Ton	✓	Purifier Box Residuals
	Solidification	5,000	Ton	✓	Iron Oxide Pile
	Solidification	1,800	Ton	✓	Debris in TP-BCP-46 Area
	Solidification	2,000	Ton	✓	TP-BCP-35 Area Blue-stained Soils

General Response Action		Area or Volume		Alternative 5	
Technology Type	**Process Option**	**Quantity**	**Units**	**Insitu Stabilization, Containment, Groundwater Control**	**Comments**
	Stabilization to Improve Geotechnical Properties				
	Solidification	400	Ton	✓	Sedimentation Pool #001
	Solidification	400	Ton	✓	Sedimentation Pool #002
	Solidification	400	Ton	✓	Sedimentation Pool #003
	Solidification	2,200	Ton	✓	Stormwater Retention Basin
	Solidification	2,000	Ton	✓	South Ditch sediment
Consolidation Area					
	Excavation and Placement in Consolidation Area	200	Ton	✓	TP-BCP-04 Area Fill with viscous tar
	Excavation and Placement in Consolidation Area	1,000	Ton	✓	EPA Soil Piles
	Excavation, Treatment, and Onsite Placement in Consolidation Area	400	Ton	✓	Light Oil Area Fill with Viscous Tar
		3,600	Ton	✓	Tar Management Area Fill with Viscous Tar
	Excavation, Treatment, and Onsite Placement in Consolidation Area	700	Ton	✓	Light Oil Area Fill with NAPL
		700	Ton	✓	Fill with NAPL from the Production Area near MW-BCP-5A
	Excavation, Treatment, and Onsite Placement in Consolidation Area	200	Ton	✓	Fill with NAPL from the Exhauster Building and Sump Areas
		400	Ton	✓	Fill with NAPL from Pump House Area
	Excavation, Treatment, and Onsite Placement in Consolidation Area	3,000	Ton	✓	Purifier Box Residuals
		5,000	Ton	✓	Iron Oxide Pile
	Excavation, Treatment, and Onsite Placement in Consolidation Area	500	Ton	✓	Thaw Shed Stockpiles
	Excavation, Treatment, and Onsite Placement in Consolidation Area	400	Ton	✓	Junction Building Area Fill with NAPL
	Excavation, Treatment and Onsite Placement in Consolidation Area	1,400	Ton	✓	Tar Layer at Tar Seep No. 2
	Excavation, Treatment and Onsite Placement in Consolidation Area	400	Ton	✓	NAPL Impacted Fill at Junction Building
	Excavation, Treatment and Onsite Placement in Consolidation Area	200	Ton	✓	Viscous Tar layer near South Rail
	Excavation, Treatment and Onsite Placement in Consolidation Area	700	Ton	✓	Viscous Tar at Site 110 Boundary (North end of TP-BCP-09)

General Response Action		Alternative			
		Area or Volume		5	
Technology Type	**Process Option**	**Quantity**	**Units**	**Insitu Stabilization, Containment, Groundwater Control**	**Comments**
Groundwater					
Groundwater Containment	Soil Cover Keyed into Clay	4.7	Acre	✓	Track 1 Area
Groundwater Collection	Collection at In sSitu Stabilized Areas and Consolidation Cells			✓	Collection system below or around in situ stabilized materials and consolidation cells
Collection and Conveyance	No Action				
	Catch Basins and Underground Stormwater Piping	900	LF	✓	Existing or replacement north storm sewer.
	Catch Basins and Underground Stormwater Piping			✓	Potentially replace north ditch with below grade system, at or near current north ditch, depending on redevelopment plans.
	Catch Basins and Underground Stormwater Piping			✓	
	Grout or Remove			✓	Line to Huntley
	Crush and Use as Fill			✓	Former stormwater retention basin outlet pipes
	Removal and Offsite Disposal				Former stormwater retention basin outlet pipes
Groundwater Monitoring	Natural Attenuation	Site Wide		✓	Outside Source Removal Areas
Buried Utility Management					
	Crush and Use as Fill	100	Ton	✓	Former rail scale
	Crush and Use as Fill	1,400	Ton	✓	Box Culvert
	Crush and Use as Fill	8	Ton	✓	Manhole Risers from north south storm sewer
	Remove or Grout	100	LF	✓	Emergency water line
	Remove or Grout	8,000	LF	✓	Abandoned process lines
		2,000	LF	✓	Abandoned COG lines to Town and City

Figures

A



INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
(703) 722-6049
www.InventumEng.com

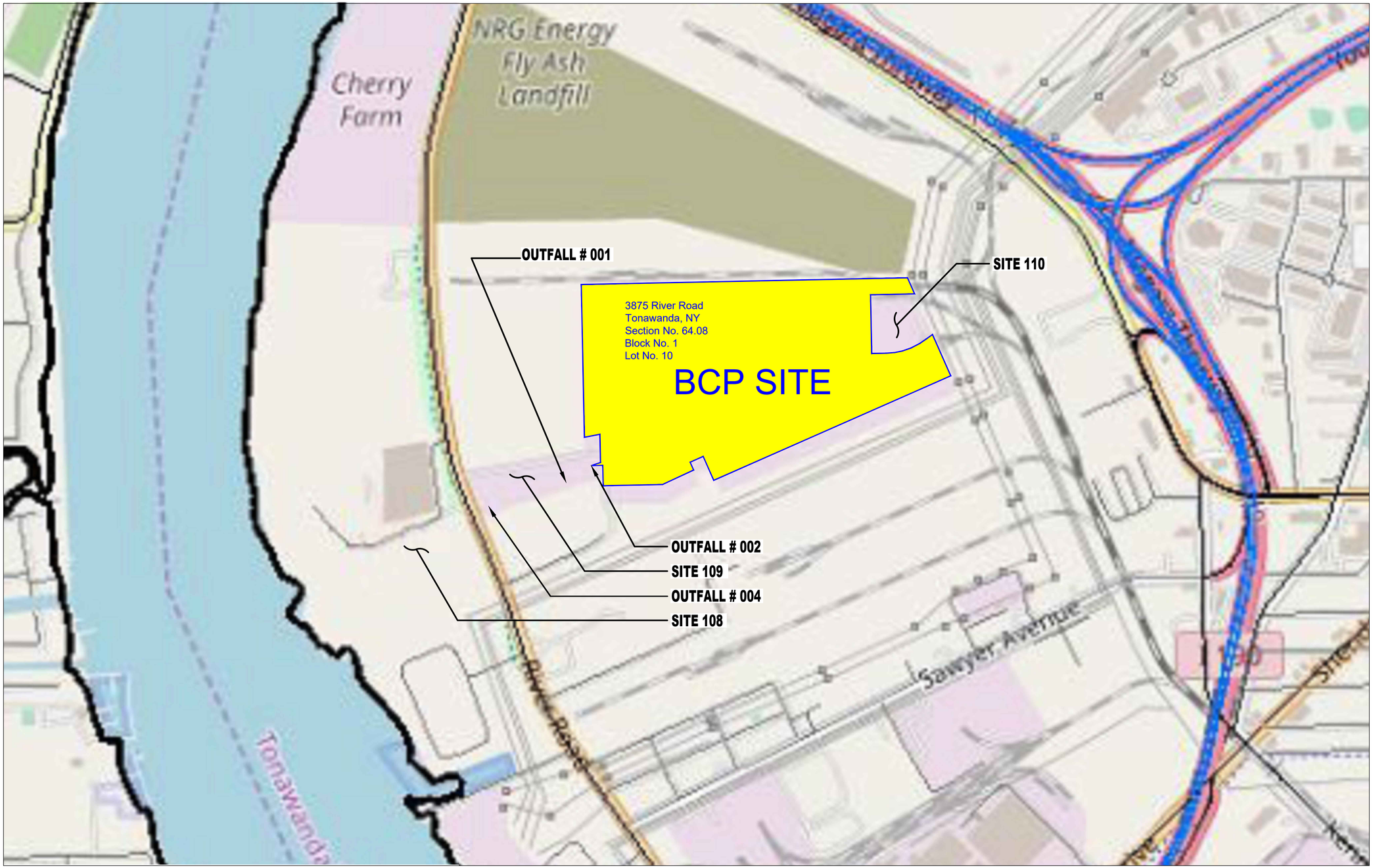
SITE LOCATION MAP

RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS, INC.
3875 RIVER ROAD
TONAWANDA, NEW YORK 14150
BCP SITE No. C915353

DRAWING BY	RB
CHECKED	
APPROVED	

FIGURE 1 - 1

ALTERNATIVES ANALYSIS
AUGUST 2023



Erie County, New York, Interactive Mapping Viewer, www2.erie.gov/gis

64.08-1-10 Section No., Block No., Lot No. (SBL)

Brownfield Site

350 0 175 350 700 1400

1 INCH = 350 FEET (22X34)

D

N

DRAWING BY	RB
CHECKED	
APPROVED	

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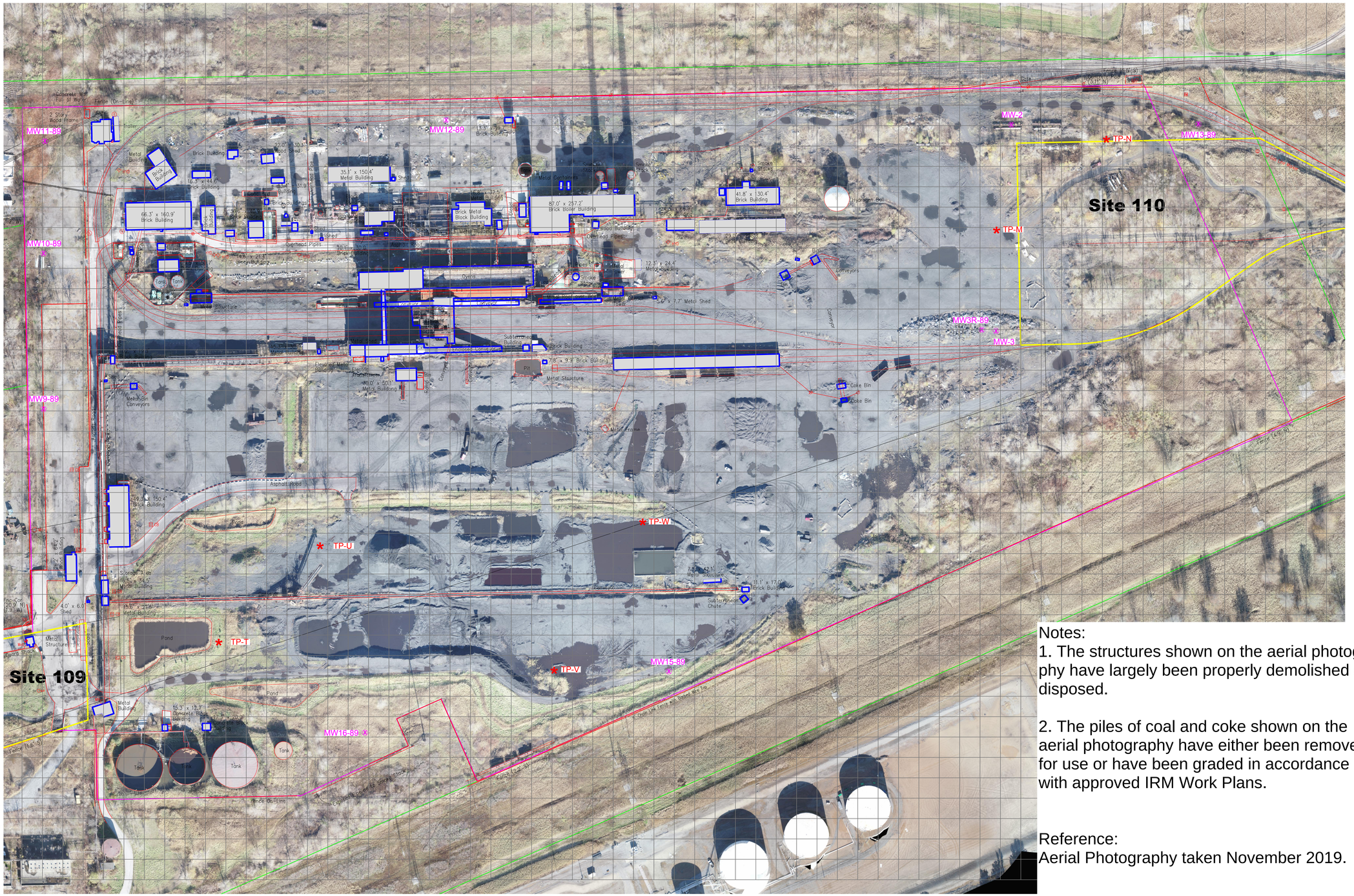
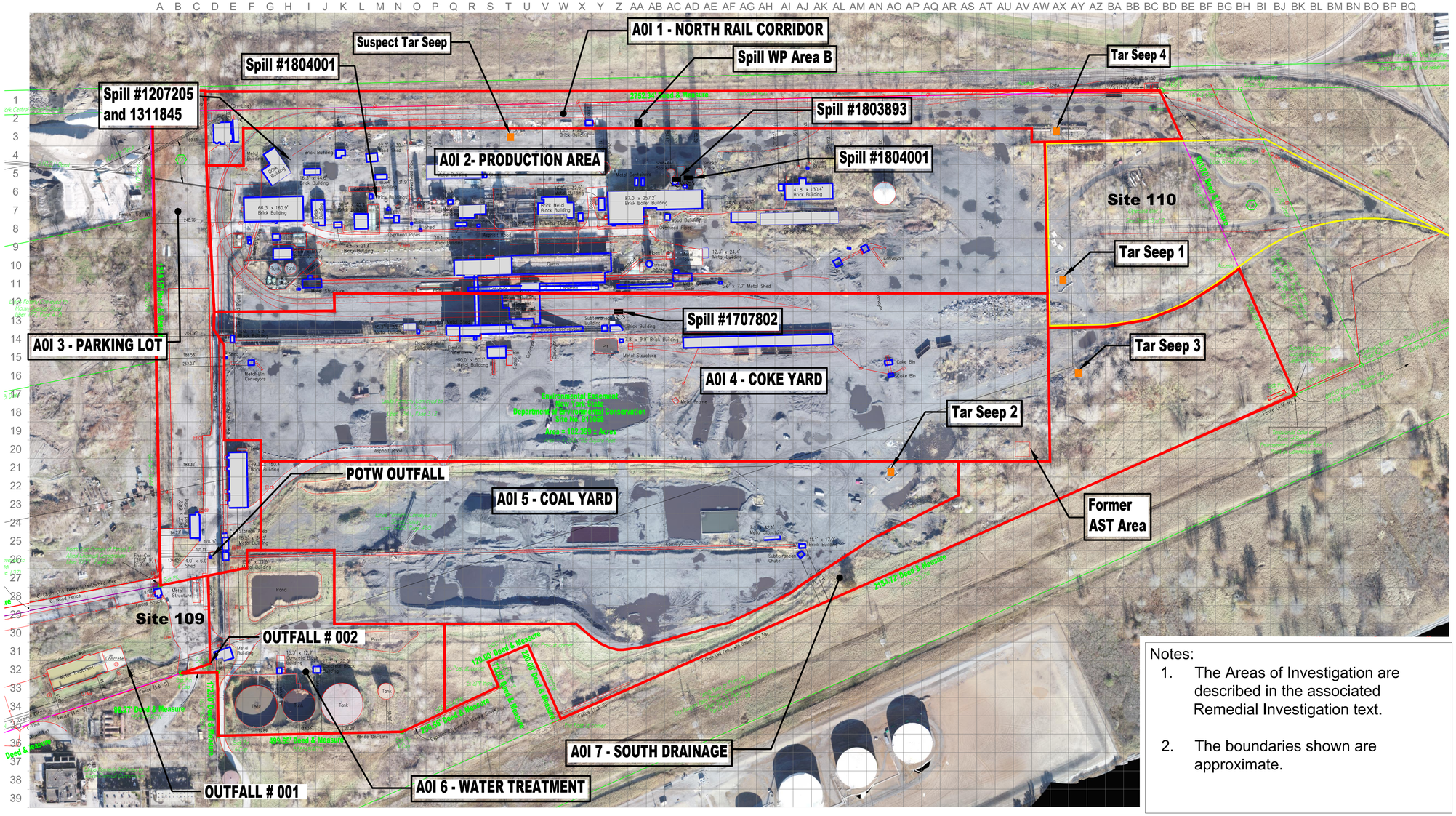
FIGURE 1 - 2

ALTERNATIVES ANALYSIS
AUGUST 2023


Site 110
Site 109
MW2
MW3
MW3R-89
MW9-89
MW10-89
MW11-89
MW12-89
MW13-89
MW15-89
MW16-89
TP-M
TP-N
TP-T
TP-U
TP-V
TP-W
Brick Building
Metal Building
Metal Structure
Tank
Pond
Asphalt Road
Fence
Overhead Pipes
Conveyors
Coke Bin
Smoke Stack
Hydrogen Ball
Sheds
Trailer
Pit
Concrete Wall Full of Water
Electric Substation
Underground Chute
Scrubber Area
Meter Building
Concrete Block Building
Wood Building
Wood Shed
Metal Frame
Fence Line
Property Line
Drainage Ditch
Railroad Tracks
Gas Line
Electric Line
Steam Line
Water Line
Sewer Line
Storm Sewer
Underground Pipes
Underground Building
Subterranean Building
Flewald Metal Building
Metal Bin
Metal Tanks
Metal Shed
Metal Tanks
Metal Tanks
Metal Tanks



Notes:

1. The Areas of Investigation are described in the associated Remedial Investigation text.
2. The boundaries shown are approximate.

150 0 75 150 300 600

1 INCH = 150 FEET (22X34)

D

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AREAS OF INVESTIGATION (AOI) BOUNDARIES
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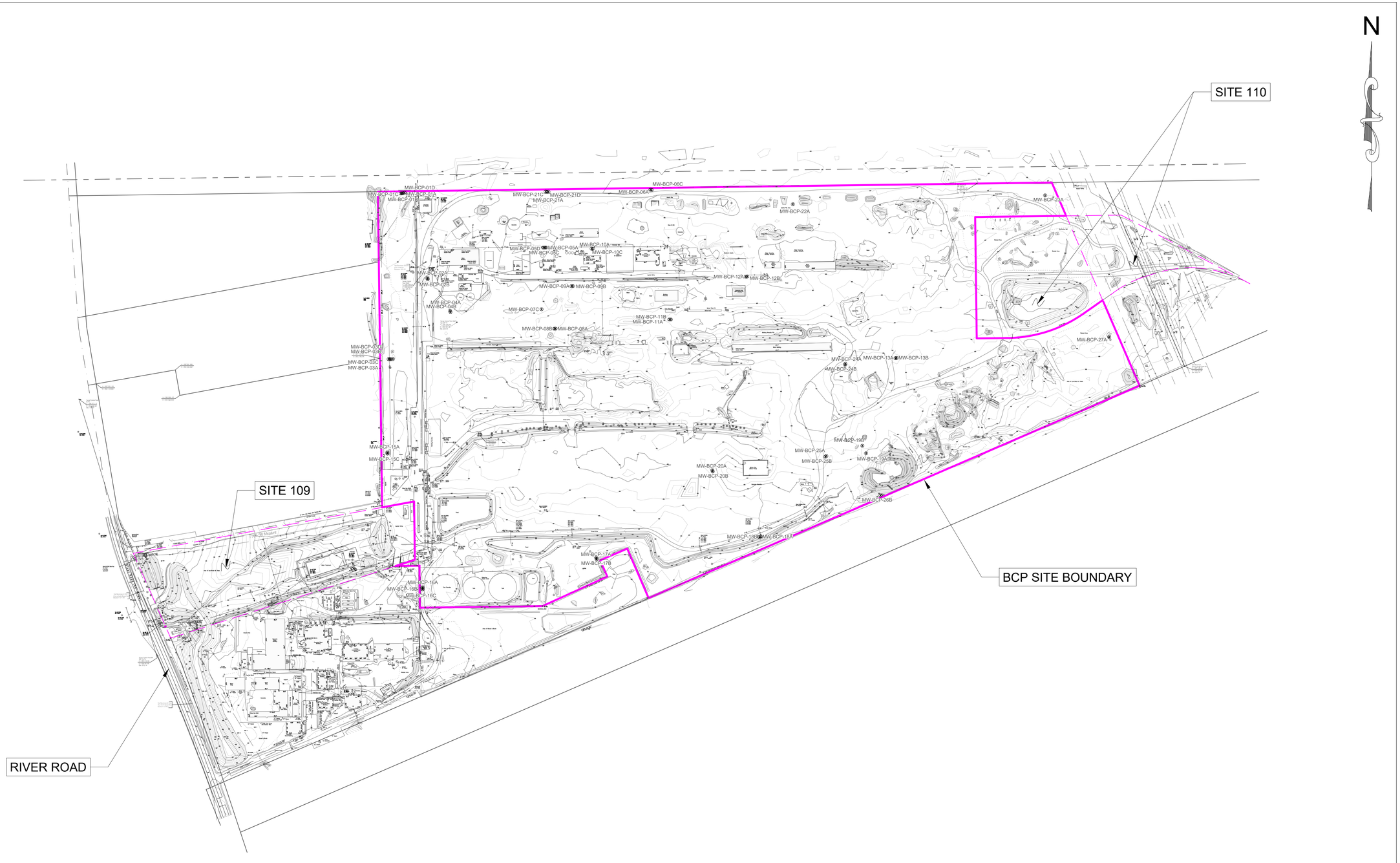
FIGURE 2 - 2

ALTERNATIVES ANALYSIS
AUGUST 2023



LEGEND
- BCP SITE BOUNDARY
- SSF SITE BOUNDARY

D

1" = 200'
200' 100' 0' 200'

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

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SITE TOPOGRAPHIC MAP, APRIL 2022

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FIGURE 2 - 3

ALTERNATIVES ANALYSIS
AUGUST 2023

N



NOTES:
1. Top of Clay elevation contours are referenced to feet above mean sea level based on depth to clay (feet BGS) shown and surveyed ground surface elevation at observation point.
2. Depth to Clay (feet BGS) based the RI test pitting program on the BCP Site, Site 109 and Site 110.

150 0 75 150 300 600
1 INCH = 150 FEET (22X34)

D

LEGEND:

—	Remedial Investigation (RI) Test Pit
XXX.XX	Top of Clay (TOC) Measured in RI Test Pit (ft BGS)
—604—	Elevation Contour
x	Monitoring Well

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TOP OF CLAY CONTOUR MAP

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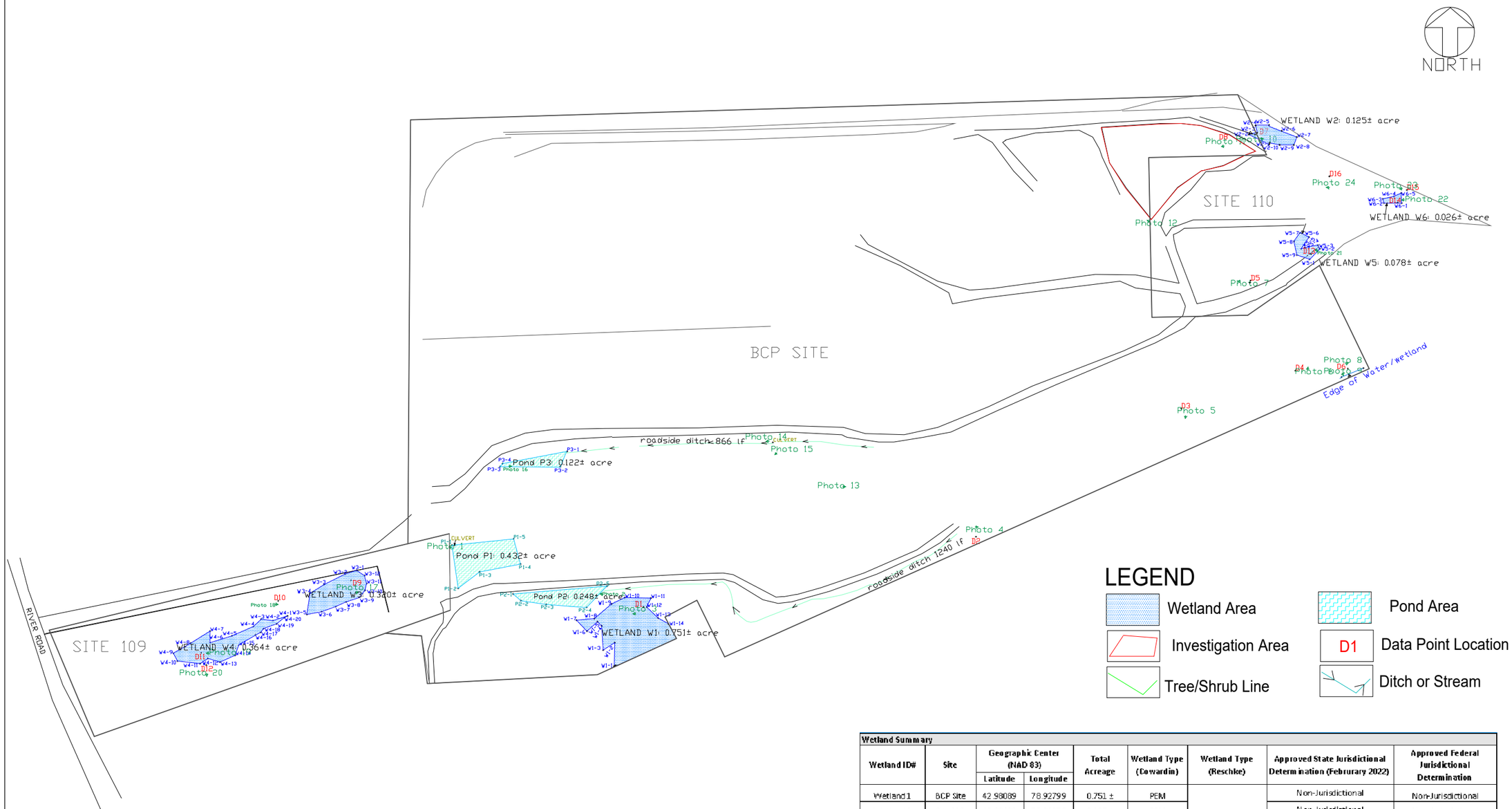
FIGURE 2 - 4

ALTERNATIVES ANALYSIS
AUGUST 2023



Wetland Summary

Wetland ID#	Site	Geographic Center (NAD 83)		Total Acreage	Wetland Type (Cowardin)	Wetland Type (Reschke)	Approved State Jurisdictional Determination (Februrary 2022)	Approved Federal Jurisdictional Determination
		Latitude	Longitude					
Wetland 1	BCP Site	42.98089	78.92799	0.751 ±	PEM	Shallow Emergent Marsh	Non-Jurisdictional	Non-Jurisdictional
Wetland 2	Site 110	42.98492	78.92059	0.125 ±	PEM		Non-Jurisdictional	Non-Jurisdictional
Wetland 3	Site 109	42.98124	78.93131	0.320 ±	PEM		Non-Jurisdictional	Non-Jurisdictional
Wetland 4	Site 109	42.98075	98.93277	0.364 ±	PEM		Non-Jurisdictional	Non-Jurisdictional
Wetland 5	Site 110	42.98397	78.92012	0.078 ±	PEM		Non-Jurisdictional	Non-Jurisdictional
Wetland 6	Site 110	42.98435	78.91901	0.026 ±	PEM		Non-Jurisdictional	Non-Jurisdictional

Waterbody Summary

Wetland ID#	Site	Geographic Center (NAD 83)		Total Acreage	Wetland Type (Cowardin)	Wetland Type (Reschke)	Approved State Jurisdictional Determination (Februrary 2022)	Approved Federal Jurisdictional Determination
		Latitude	Longitude					
Pond 1	BCP Site	42.9851	78.92966	0.432 ±	POW	SWPPP Pond	Non-Jurisdictional	Non-Jurisdictional
Pond 2	BCP Site	42.98111	78.92871	0.248 ±	POW	SWPPP Pond	Non-Jurisdictional	Non-Jurisdictional
Pond 3	BCP Site	42.98229	78.92904	0.122 ±	POW	SWPPP Pond	Non-Jurisdictional	Non-Jurisdictional

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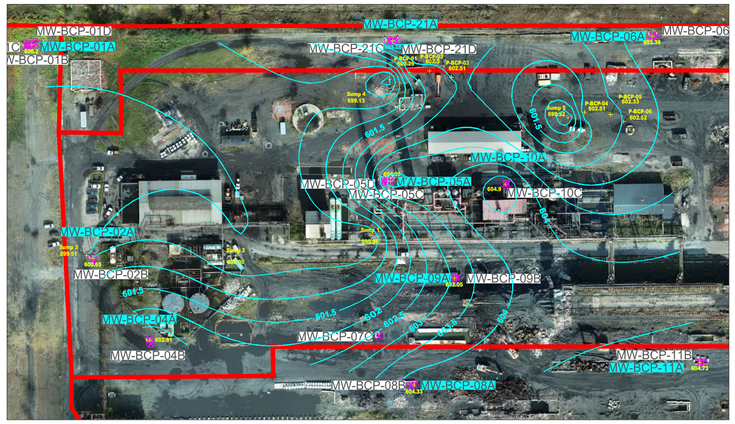
FIGURE 2 - 5

ALTERNATIVES ANALYSIS
AUGUST 2023



Groundwater Contours from June, 2022.



Groundwater Contours from September 2021.

LEGEND:

MW-BCP-XXX	Shallow (A-Zone) Monitoring Well and Collection Point
XXX.XX	Collection Point Groundwater Elevation (Sept 2021)
XXX.XX	Collection Point Groundwater Elevation (June 2022)
604	Groundwater Contour
⊗	Monitoring Well

150 0 75 150 300 600

1 INCH = 150 FEET (22X34)

Reference: Aerial Photography by Niagara Boundary, March 2022

NOTES:

1. Ground elevations shown are in feet above mean sea level (Feet AMSL).

D

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GROUNDWATER CONTOURS - FILL
A ZONE MONITORING WELLS - SEPTEMBER 2021
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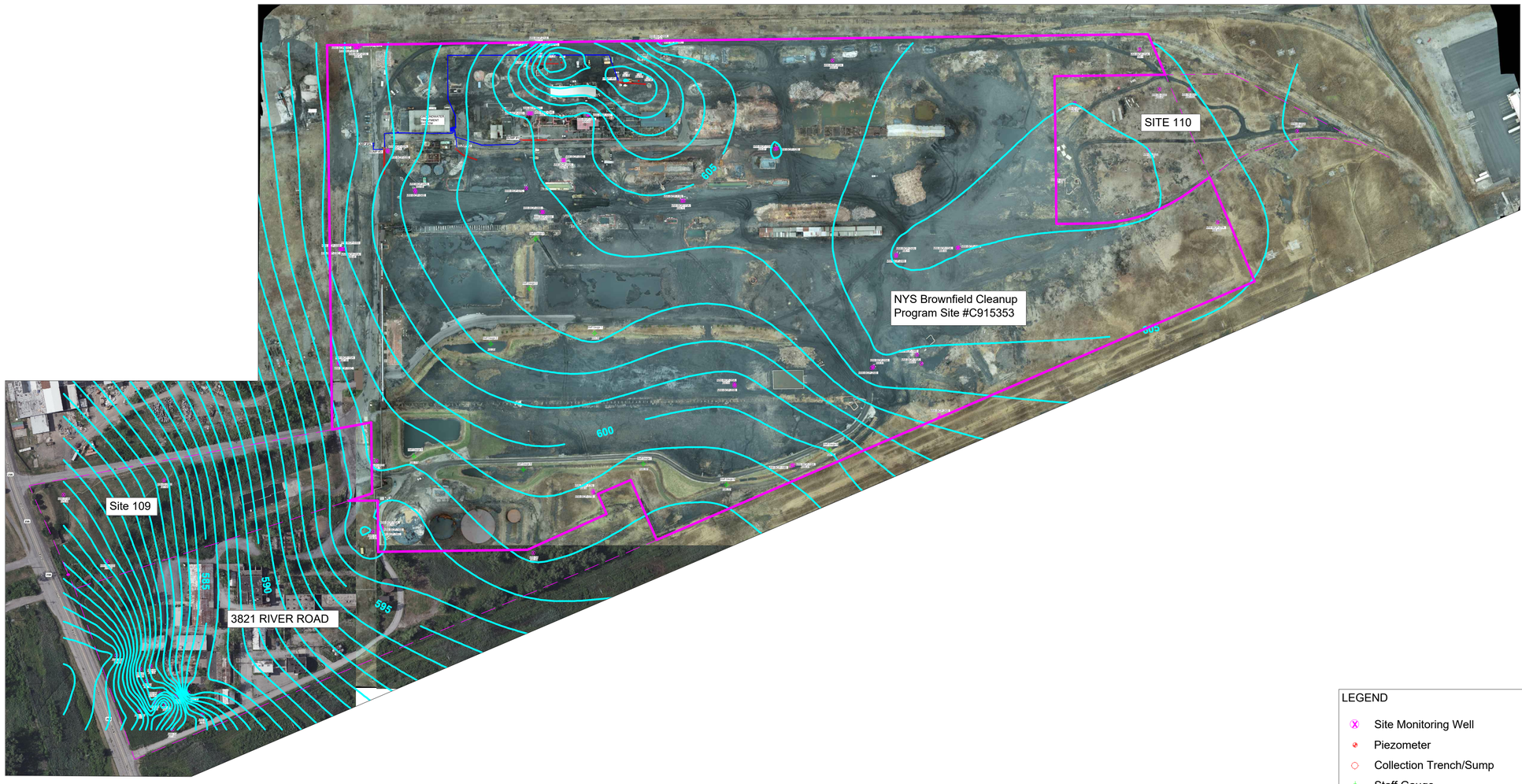
FIGURE 2 - 6

ALTERNATIVES ANALYSIS
AUGUST 2023



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LEGEND

- Site Monitoring Well
- Piezometer
- Collection Trench/Sump
- Staff Gauge
- Groundwater Collection System
- BCP Site Boudary
- 3821 River Road & SSF Sites Boundary
- Groundwater Collection Trench
- 600 Groundwater Contour

NOTE No. 1: SITE SURFACE AND GROUNDWATER GAUGING OCCURRED ON MAY 23, 2023

NOTE No. 2: STAFF GAUGES 3, 4, 6, AND PIEZOMETER P-3 WERE INACCESSABLE DURING THE GAUGING EVENT

200 0 100 200 400 800

1 INCH =200 FEET (22X34)

D

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GROUNDWATER CONTOUR MAP
FILL WELLS MAY 2023
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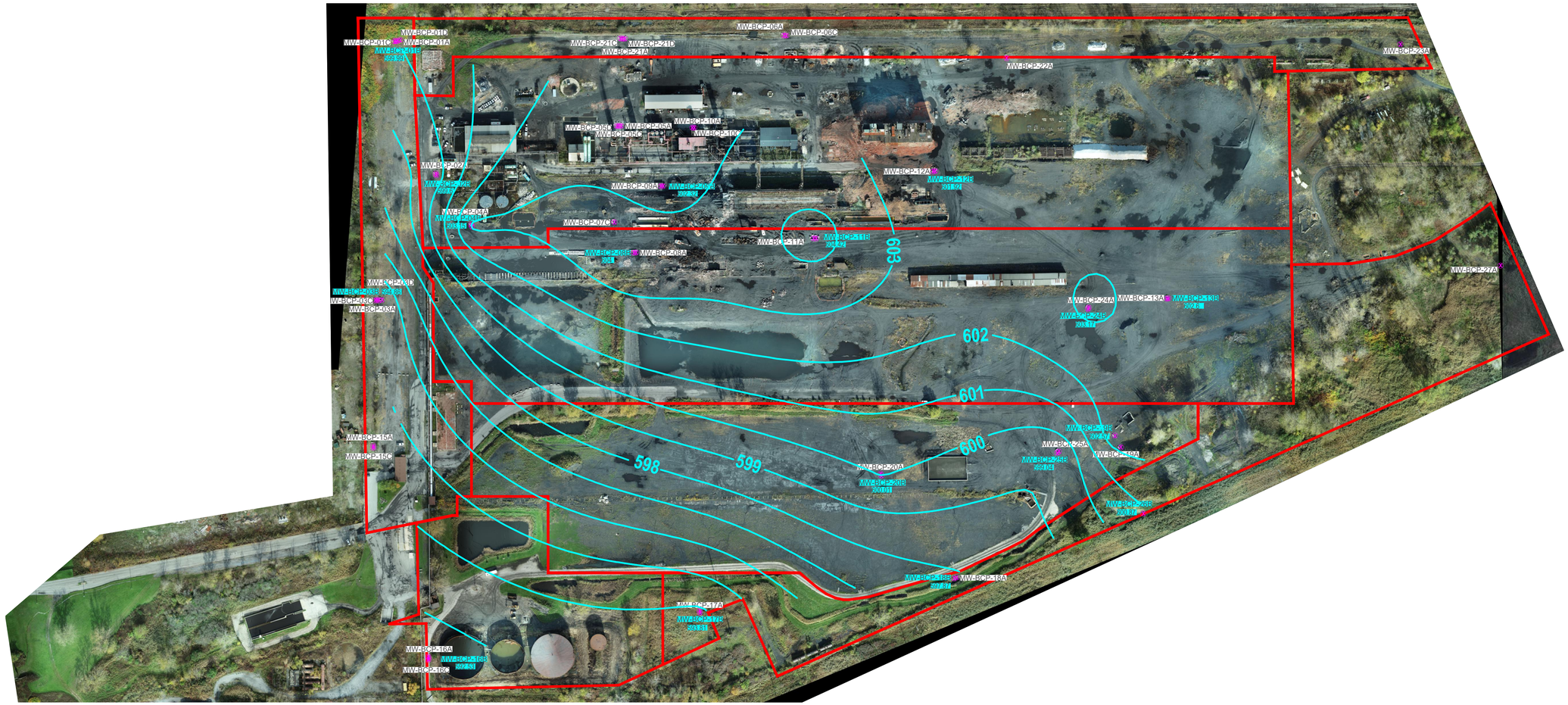
FIGURE 2-6A

ALTERNATIVE ANALYSIS
AUGUST 2023



NOTES:

1. Groundwater elevations shown are in feet above mean sea level (Feet AMSL).

LEGEND:

MW-BCP-XXX	Upper Clay (B-Zone) Monitoring Well and Collection Point
XXX.XX	Collection Point Groundwater Elevation
604	Groundwater Contour
	Monitoring Well

150 0 75 150 300 600

1 INCH = 150 FEET (22X34)

D

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GROUNDWATER CONTOURS - UPPER CLAY
B-ZONE MONITORING WELLS - SEPTEMBER 2021
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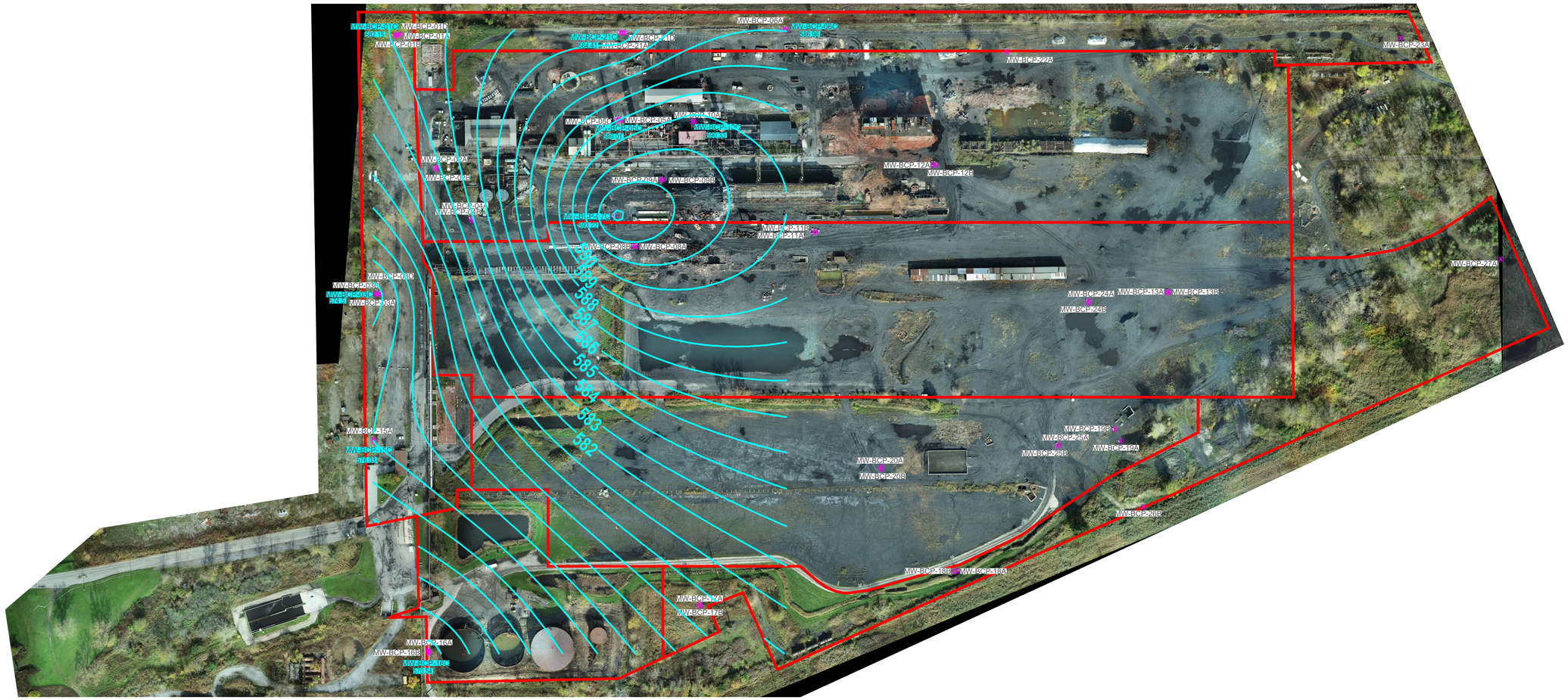
FIGURE 2 - 7

ALTERNATIVES ANALYSIS
AUGUST 2023



NOTES:

1. Groundwater elevations are shown in feet above mean sea level (Feet AMSL).

LEGEND:

MW-BCP-XXX	Lower Clay (C-Zone) Monitoring Well and Collection Point
XXX.XX	Collection Point Groundwater Elevation
604	Groundwater Contour
	Monitoring Well

150 0 75 150 300 600

1 INCH = 150 FEET (22X34)

D

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GROUNDWATER CONTOURS - LOWER CLAY
C-ZONE MONITORING WELLS - SEPTEMBER 2021

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FIGURE 2 - 8

ALTERNATIVES ANALYSIS
AUGUST 2023



NOTES: Groundwater elevations are shown in feet above mean sea level (Feet AMSL).

LEGEND:

MW-BCP-XXX	Bedrock (D-Zone) Monitoring Well and Collection Point
XXX.XX	Collection Point Groundwater Elevation
604	Groundwater Contour
	Monitoring Well

150 0 75 150 300 600

1 INCH = 150 FEET (22X34)

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GROUNDWATER CONTOURS - BEDROCK
D-ZONE MONITORING WELLS - SEPTEMBER 2021
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FIGURE 2 - 9

ALTERNATIVES ANALYSIS
AUGUST 2023



Note: The sample locations shown are the Remedial Investigation sample locations. More than 880 samples have been collected during the IRMs, Pre-Design Investigations, and surface and groundwater management to supplement these data points.

150 0 75 150 300 600

1 INCH =150 FEET (22X34)

D

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SAMPLE LOCATIONS
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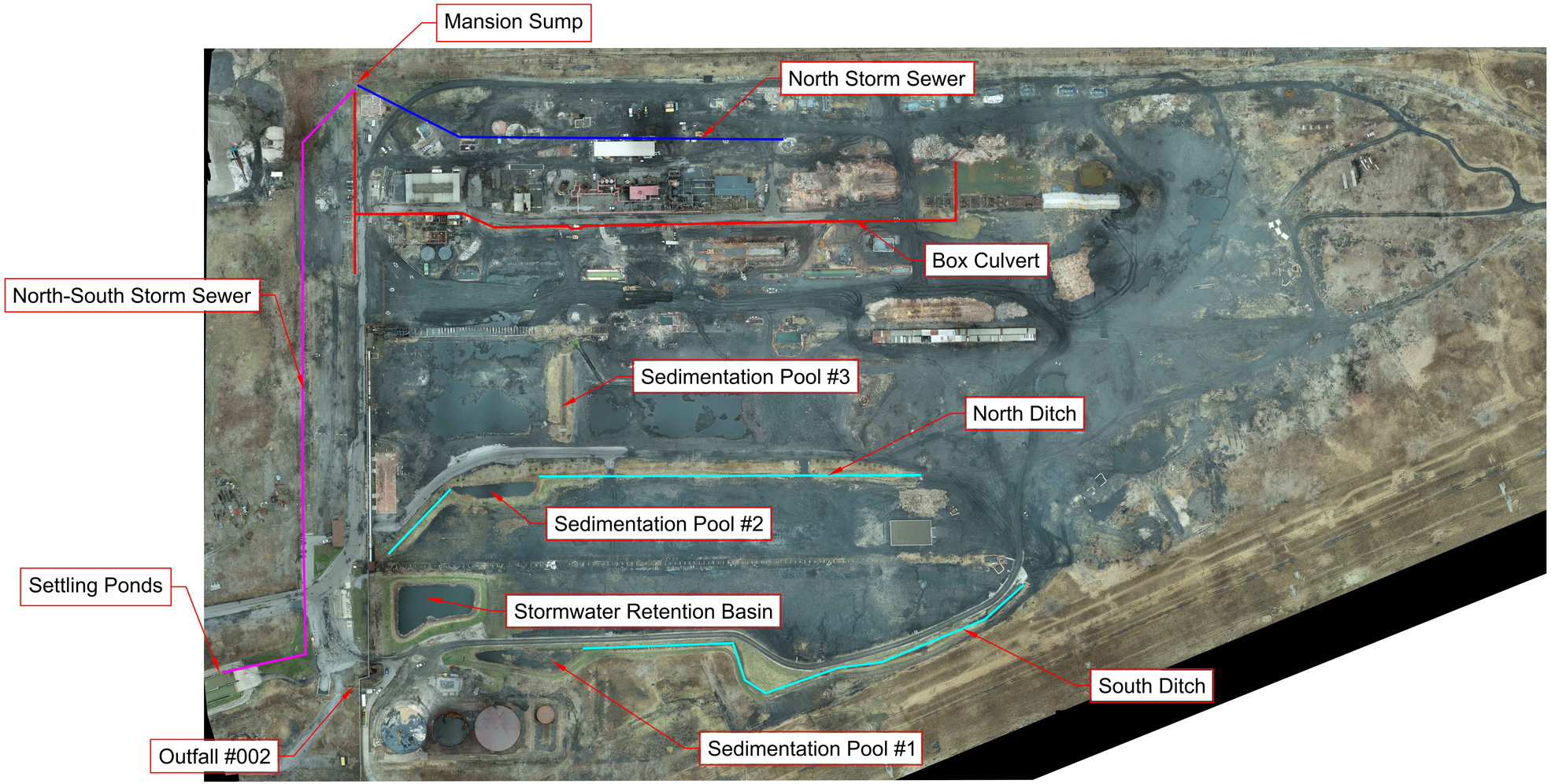
FIGURE 2 - 10

ALTERNATIVES ANALYSIS
AUGUST 2023



150 0 75 150 300 600

1 INCH =150 FEET (22X34)

D

N

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STORM WATER
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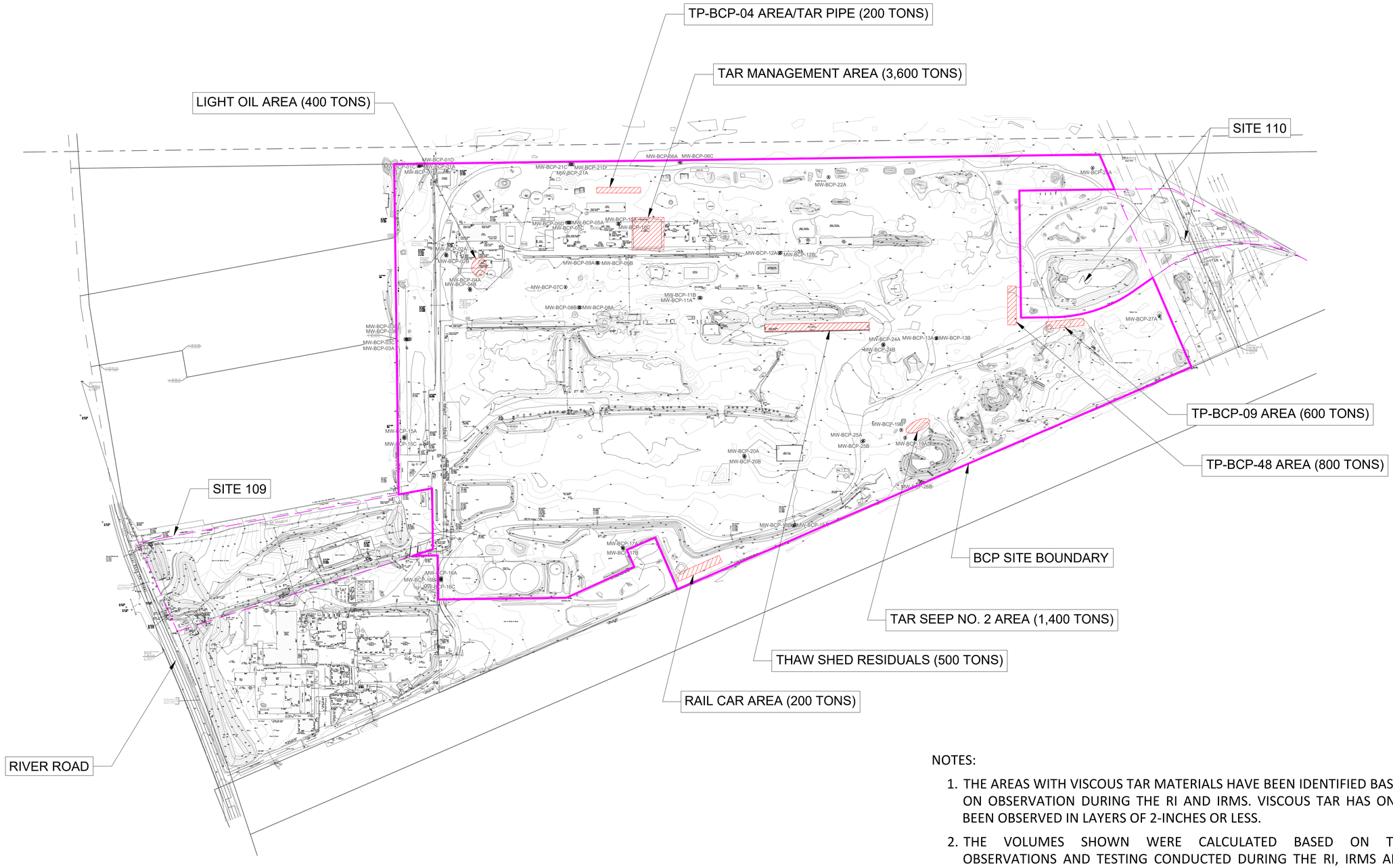
FIGURE 2-11

DRAWING NUMBER
STORMWATER



NOTES:

1. THE AREAS WITH VISCOUS TAR MATERIALS HAVE BEEN IDENTIFIED BASED ON OBSERVATION DURING THE RI AND IRMS. VISCOUS TAR HAS ONLY BEEN OBSERVED IN LAYERS OF 2-INCHES OR LESS.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

1" = 200'

200' 100' 0' 200'

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

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FIGURE 3 - 1

ALTERNATIVES ANALYSIS
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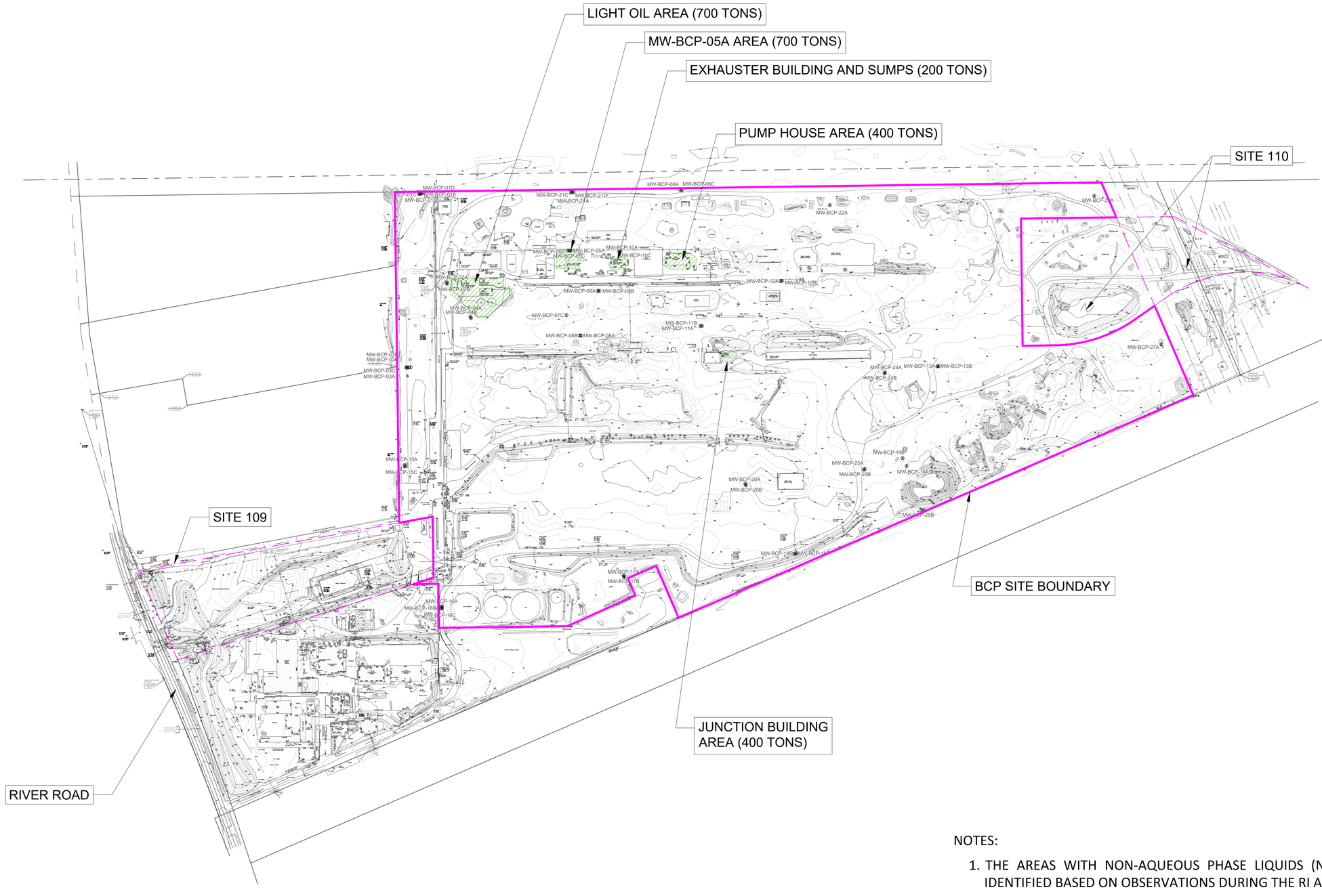

NOTES:

1. THE AREAS WITH NON-AQUEOUS PHASE LIQUIDS (NAPL) HAVE BEEN IDENTIFIED BASED ON OBSERVATIONS DURING THE RI AND IRMS.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

1" = 200'

200' 100' 0' 200'

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FIGURE 3 - 2

ALTERNATIVES ANALYSIS
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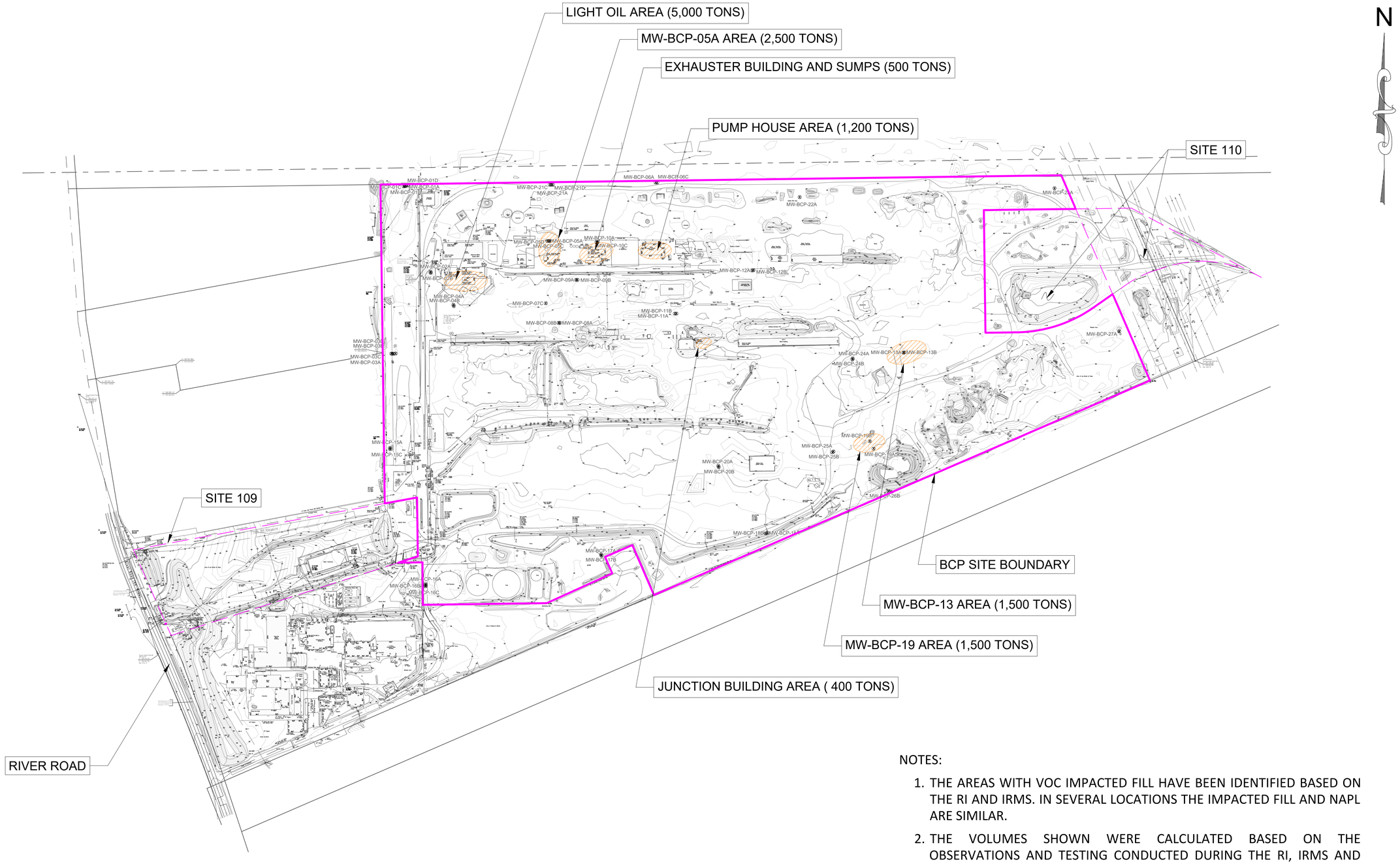

NOTES:

1. THE AREAS WITH VOC IMPACTED FILL HAVE BEEN IDENTIFIED BASED ON THE RI AND IRMS. IN SEVERAL LOCATIONS THE IMPACTED FILL AND NAPL ARE SIMILAR.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

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200' 100' 0' 200'

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FIGURE 3 - 3

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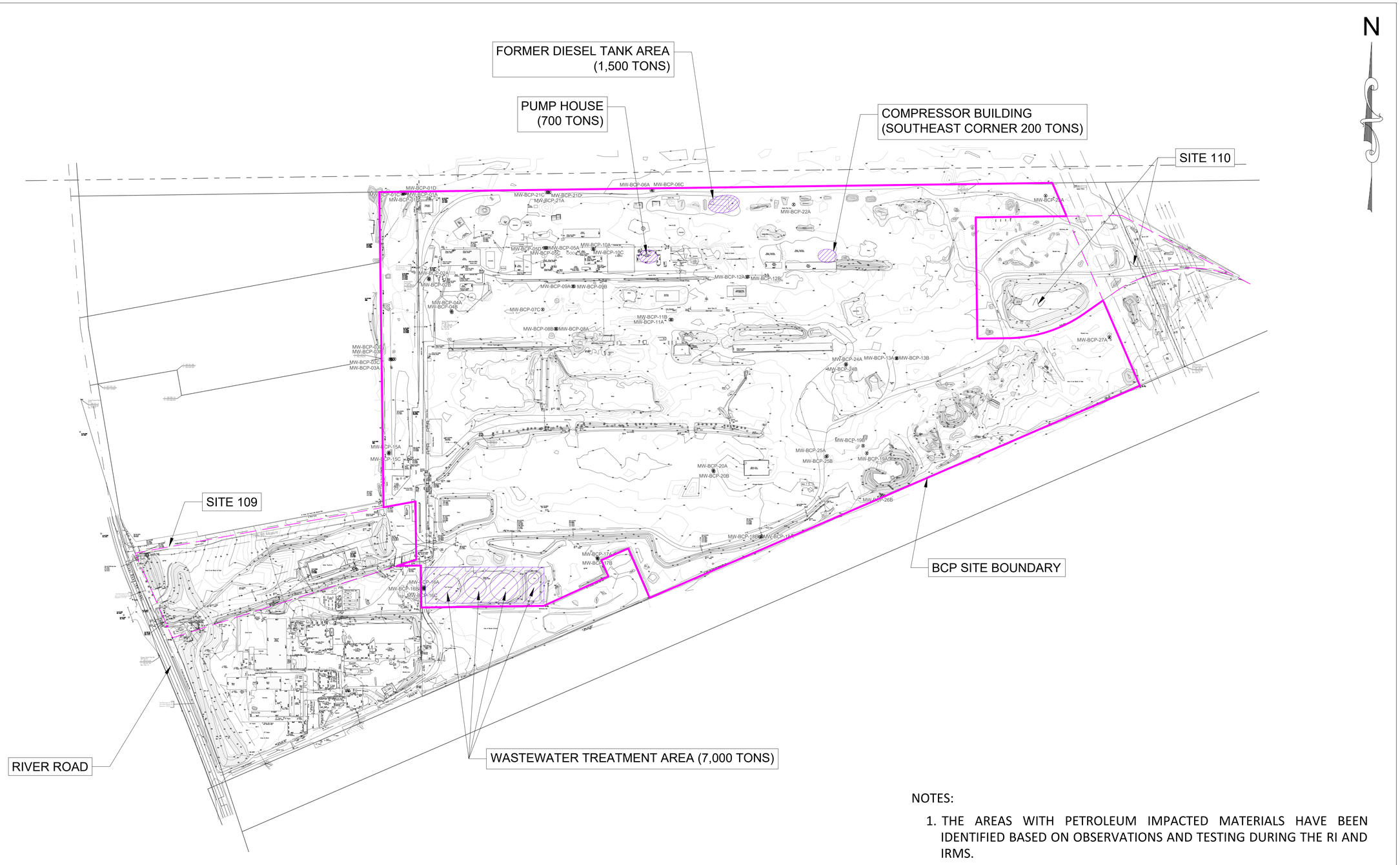

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

NOTES:

1. THE AREAS WITH PETROLEUM IMPACTED MATERIALS HAVE BEEN IDENTIFIED BASED ON OBSERVATIONS AND TESTING DURING THE RI AND IRMS.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

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OCCURRENCE OF PETROLEUM IMPACTED FILL

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FIGURE 3 - 4

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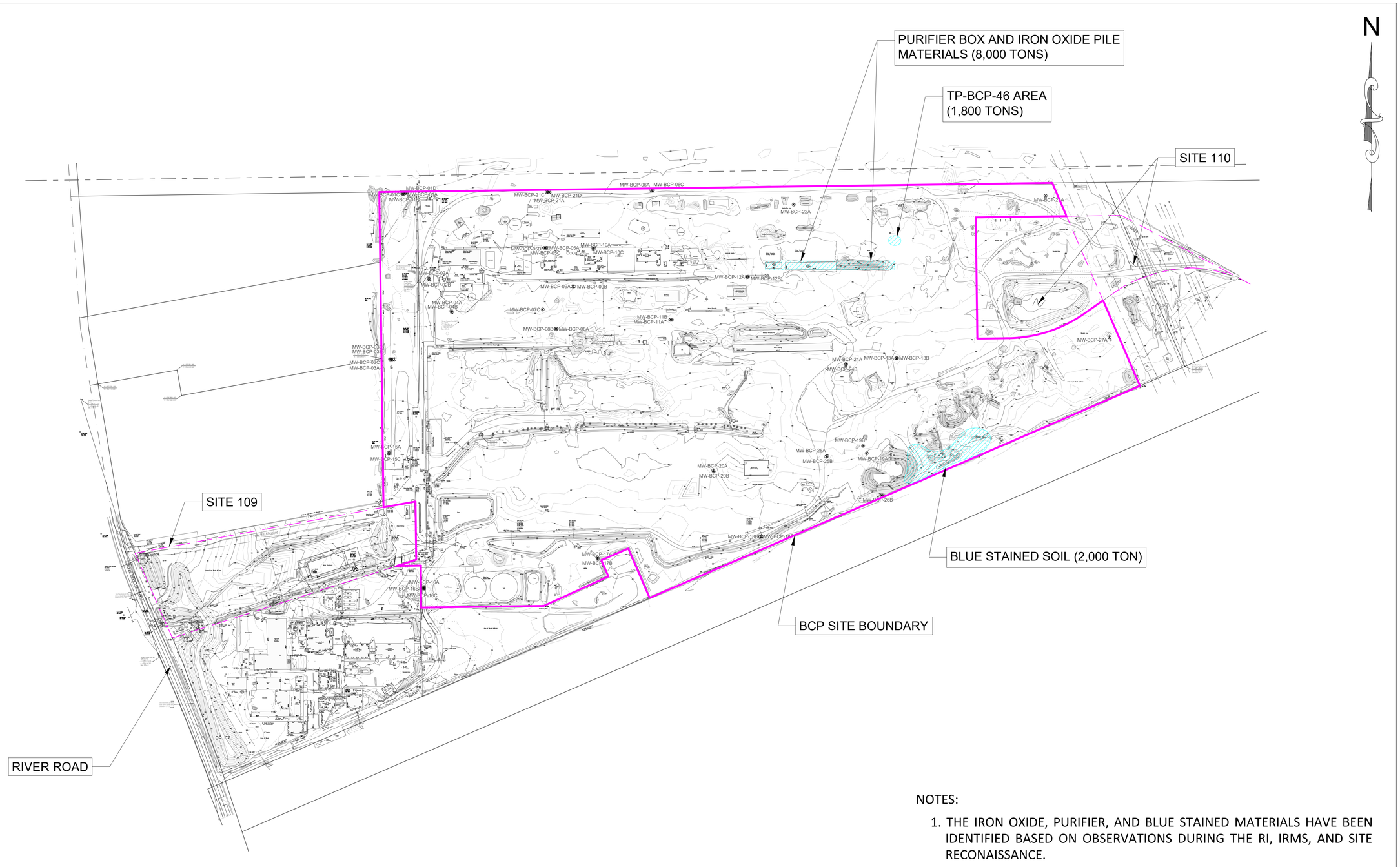

NOTES:

1. THE IRON OXIDE, PURIFIER, AND BLUE STAINED MATERIALS HAVE BEEN IDENTIFIED BASED ON OBSERVATIONS DURING THE RI, IRMS, AND SITE RECONAISSANCE.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

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200' 100' 0' 200'

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OCCURRENCE OF IRON OXIDE MATERIALS, PURIFIER WASTE, AND BLUE STAINED SOILS/FILL

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FIGURE 3 - 5

ALTERNATIVES ANALYSIS
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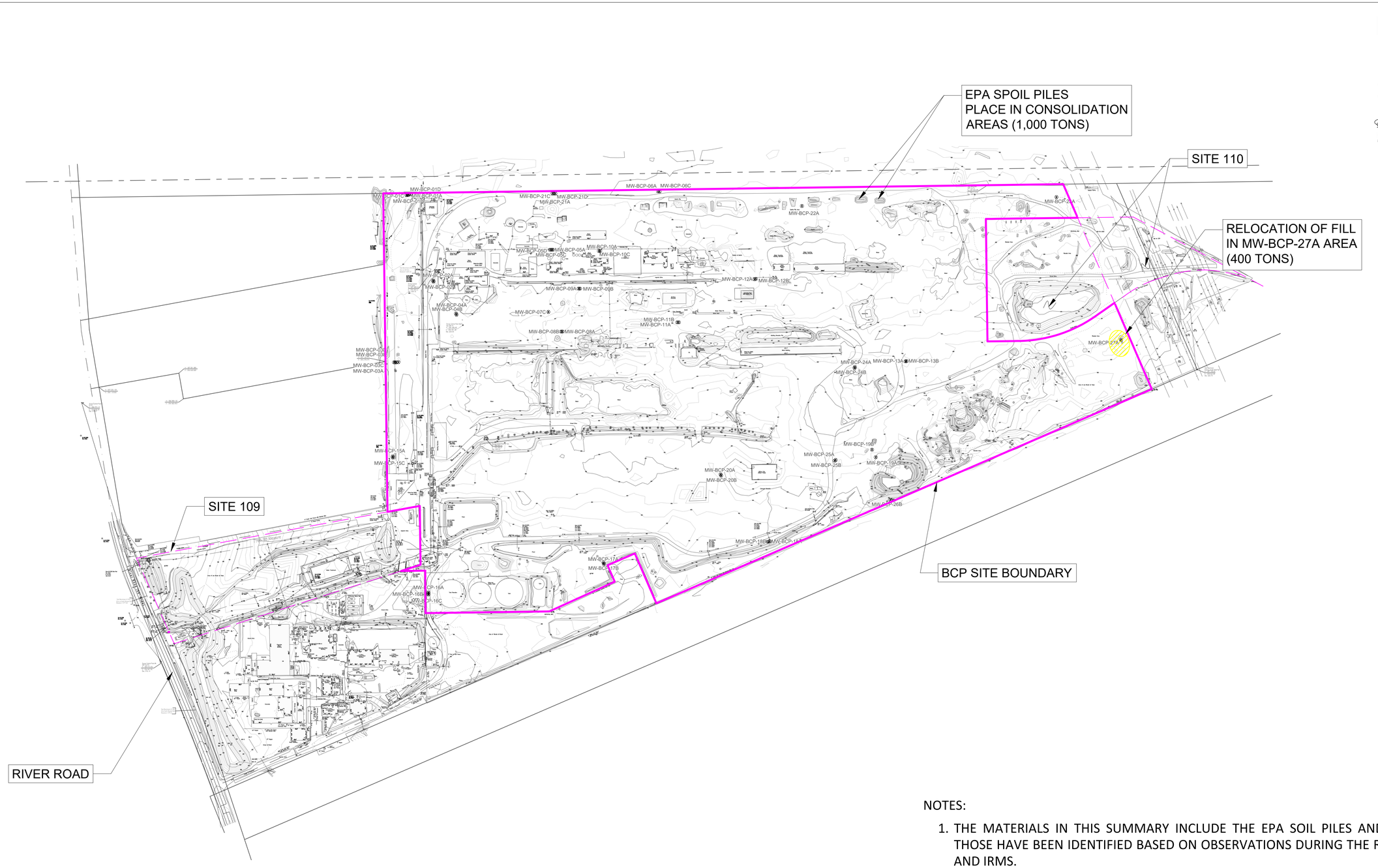

NOTES:

1. THE MATERIALS IN THIS SUMMARY INCLUDE THE EPA SOIL PILES AND THOSE HAVE BEEN IDENTIFIED BASED ON OBSERVATIONS DURING THE RI AND IRMS.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

1" = 200'
200' 100' 0' 200'

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OCCURRENCE OF FILL IMPACTED BY METALS & CYANIDE

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FIGURE 3 - 6

ALTERNATIVES ANALYSIS
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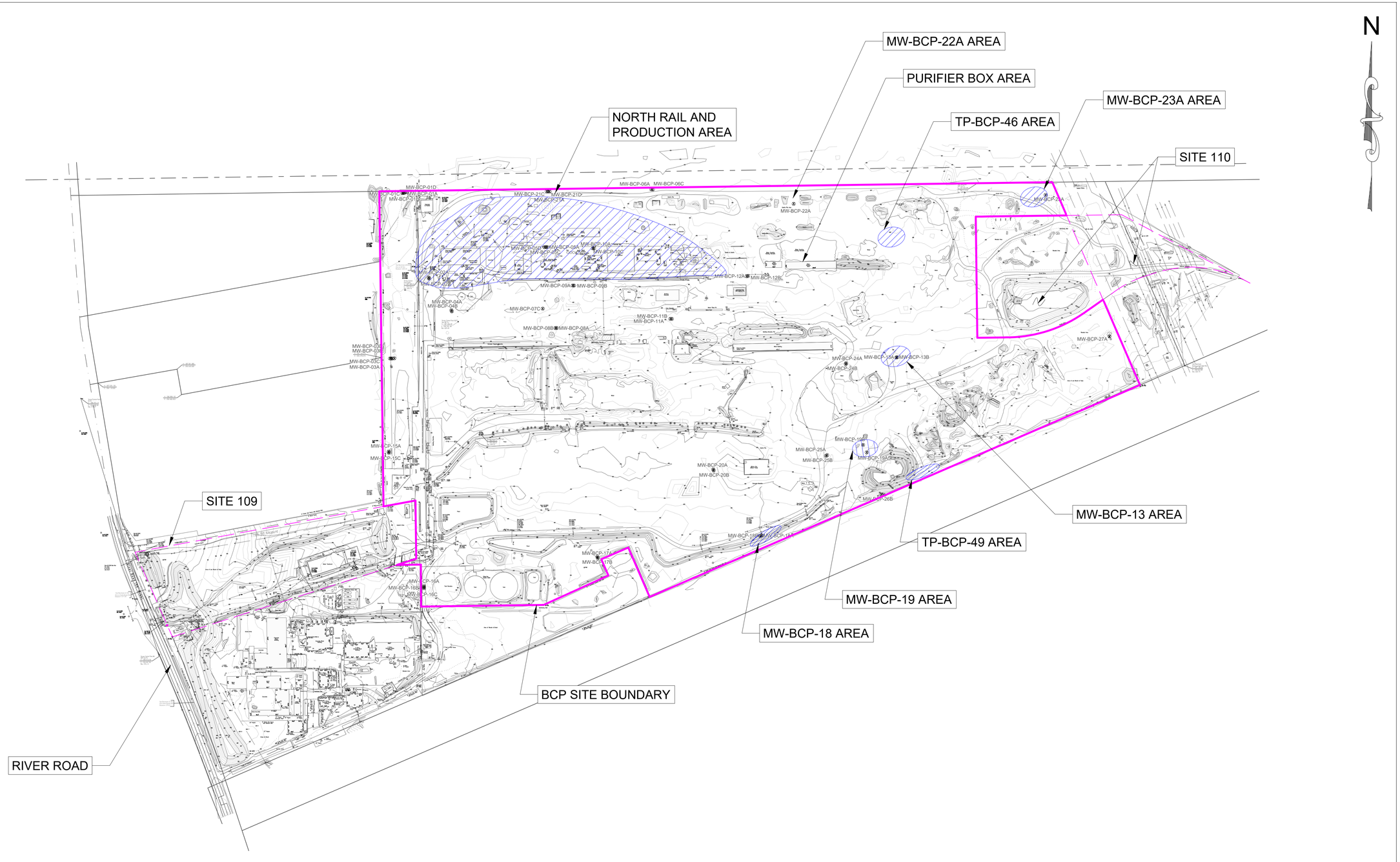

NOTES:

1. THE OCCURRENCE OF RESIDUAL GROUNDWATER IMPACTS HAVE BEEN IDENTIFIED BASED ON GROUNDWATER DATA FROM THE RI AND DATA COLLECTED DURING IRMS.

D

1" = 200'

200' 100' 0' 200'

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OCCURRENCE OF RESIDUAL GROUNDWATER IMPACTS

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FIGURE 3 - 7

ALTERNATIVES ANALYSIS
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D

50 0 25 50 100 200

1 INCH = 50 FEET (22X34)

Reference: Aerial Photography by Niagara Boundary, March 2022

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FIGURE 3 - 8

ALTERNATIVES ANALYSIS
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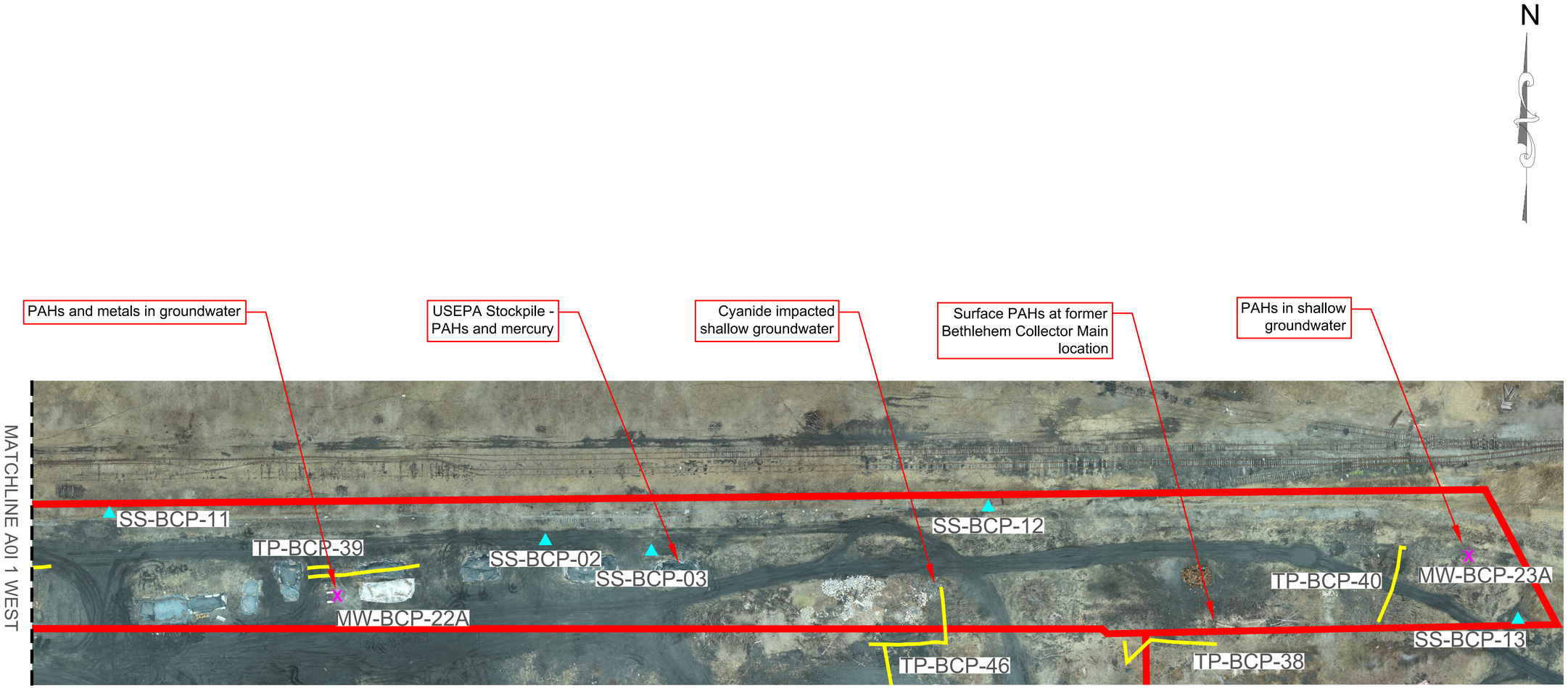

D

50 0 25 50 100 200

1 INCH = 50 FEET (22X34)

Reference: Aerial Photography by Niagara Boundary, March 2022

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FIGURE 3 - 9

ALTERNATIVES ANALYSIS
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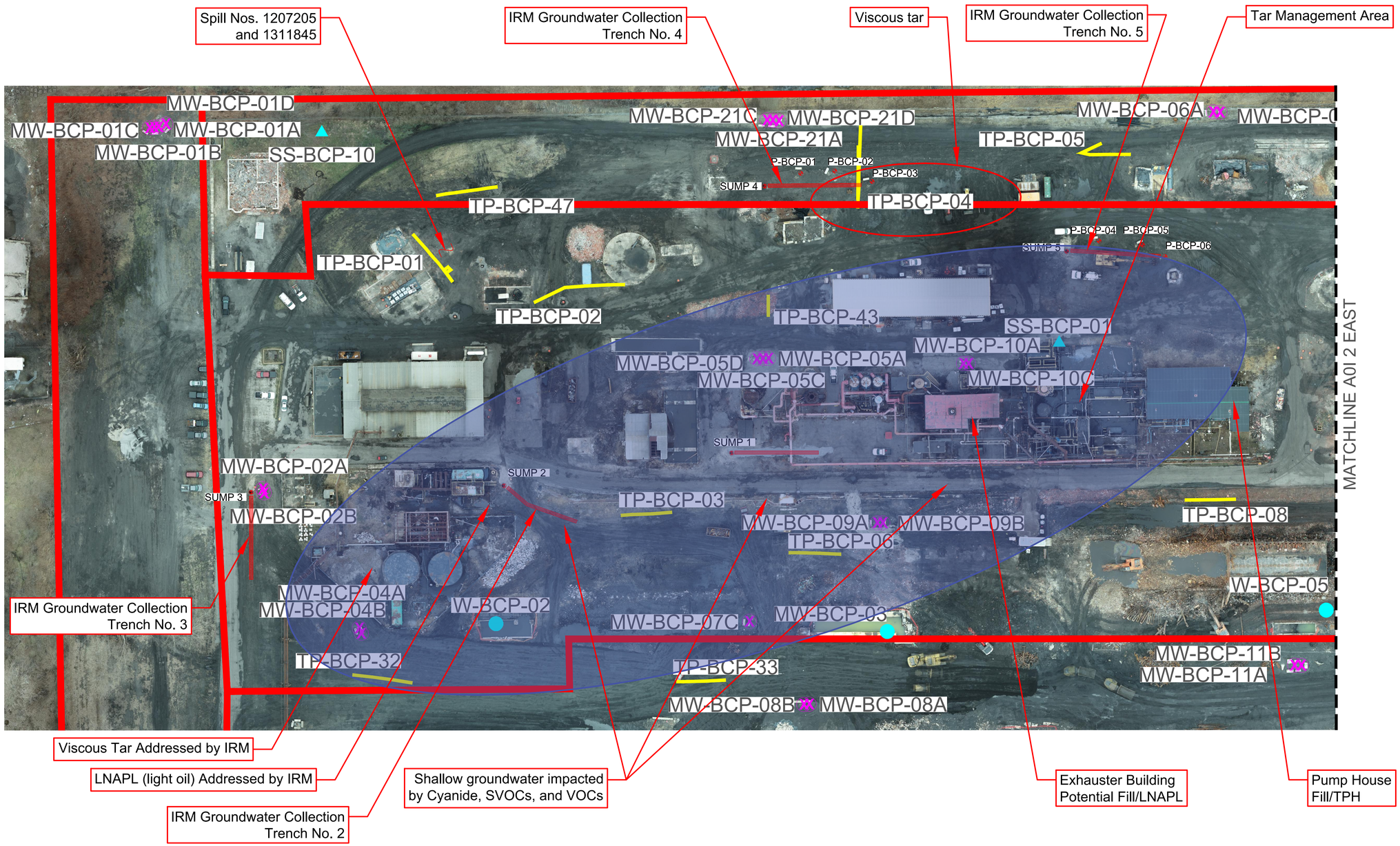

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1 INCH = 50 FEET (22X34)

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FIGURE 3 - 10

ALTERNATIVES ANALYSIS
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N

TPH at southeast corner of former Compressor Building

COG Pipelines to Town, City, and Huntley

Debris field - impacted shallow groundwater

MATCHLINE A0I 2 WEST

TP-BCP-14
TP-BCP-39
SS-BCP-02
SS-BCP-03
MW-BCP-22A
TP-BCP-46
TP-BCP-42
SS-BCP-04
SS-BCP-05
TP-BCP-12
TP-BCP-13
SS-BCP-06
MW-BCP-12A
MW-BCP-12B
P-BCP-08
TP-BCP-11
W-BCP-05
W-BCP-04
W-BCP-06
TP-BCP-43
BCP-11B
CP-11A
SS-BCP-07
SS-BCP-08
SS-BCP-09

Cyanide in shallow groundwater

Quench Pit water addressed by IRM (Completed)

Purifier Box contents

Iron Oxide Pile Contents

Industrial debris and high PAHs to the top of clay

50 0 25 50 100 200

1 INCH = 50 FEET (22X34)

Reference: Aerial Photography by Niagara Boundary, March 2022

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FIGURE 3 - 11

ALTERNATIVES ANALYSIS
AUGUST 2023



MATCHLINE A0I 3 SOUTH

50 0 25 50 100 200

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FIGURE 3 - 12

ALTERNATIVES ANALYSIS
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N

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FIGURE 3 - 13

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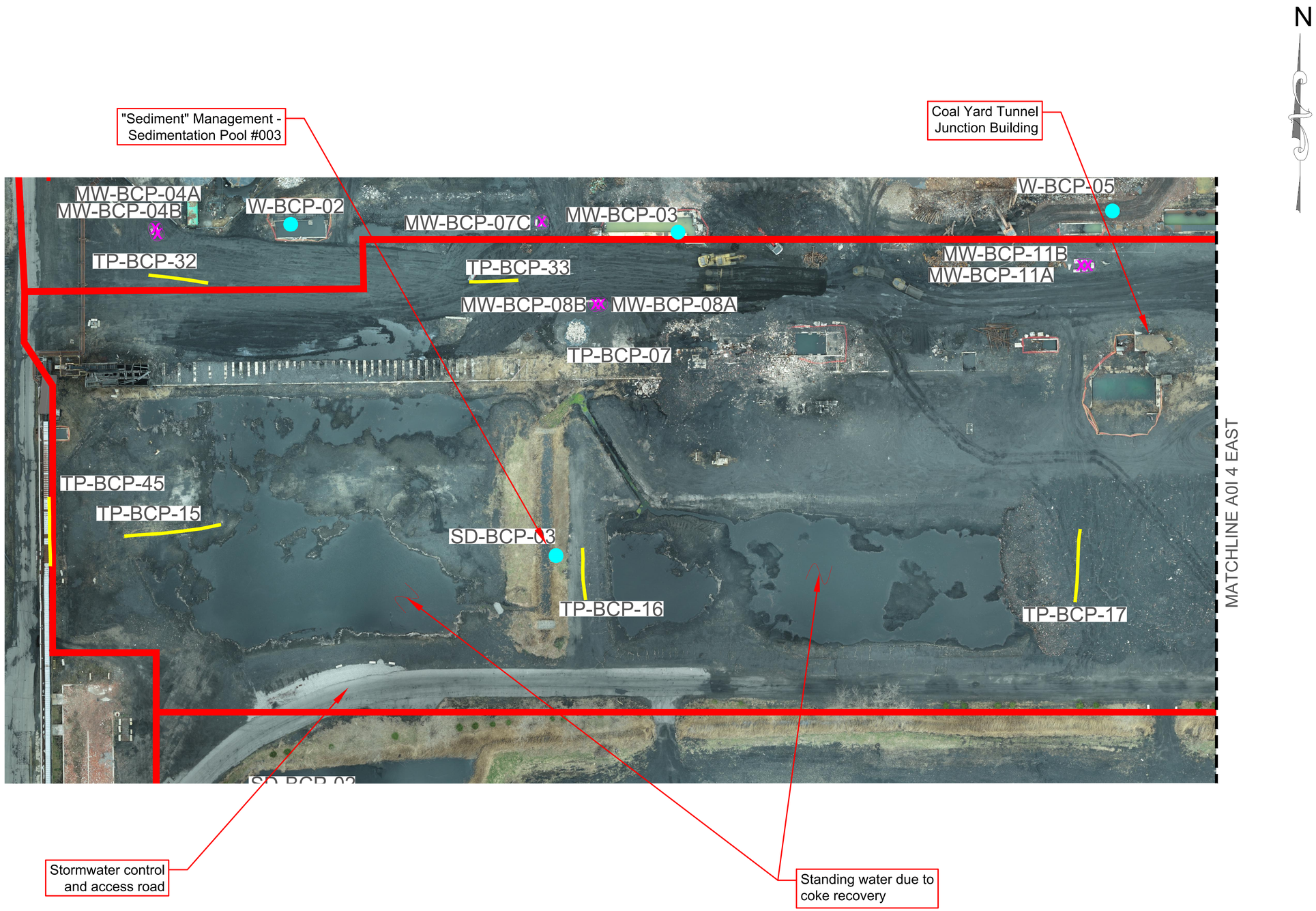

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50 0 25 50 100 200

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FIGURE 3 - 14

ALTERNATIVES ANALYSIS
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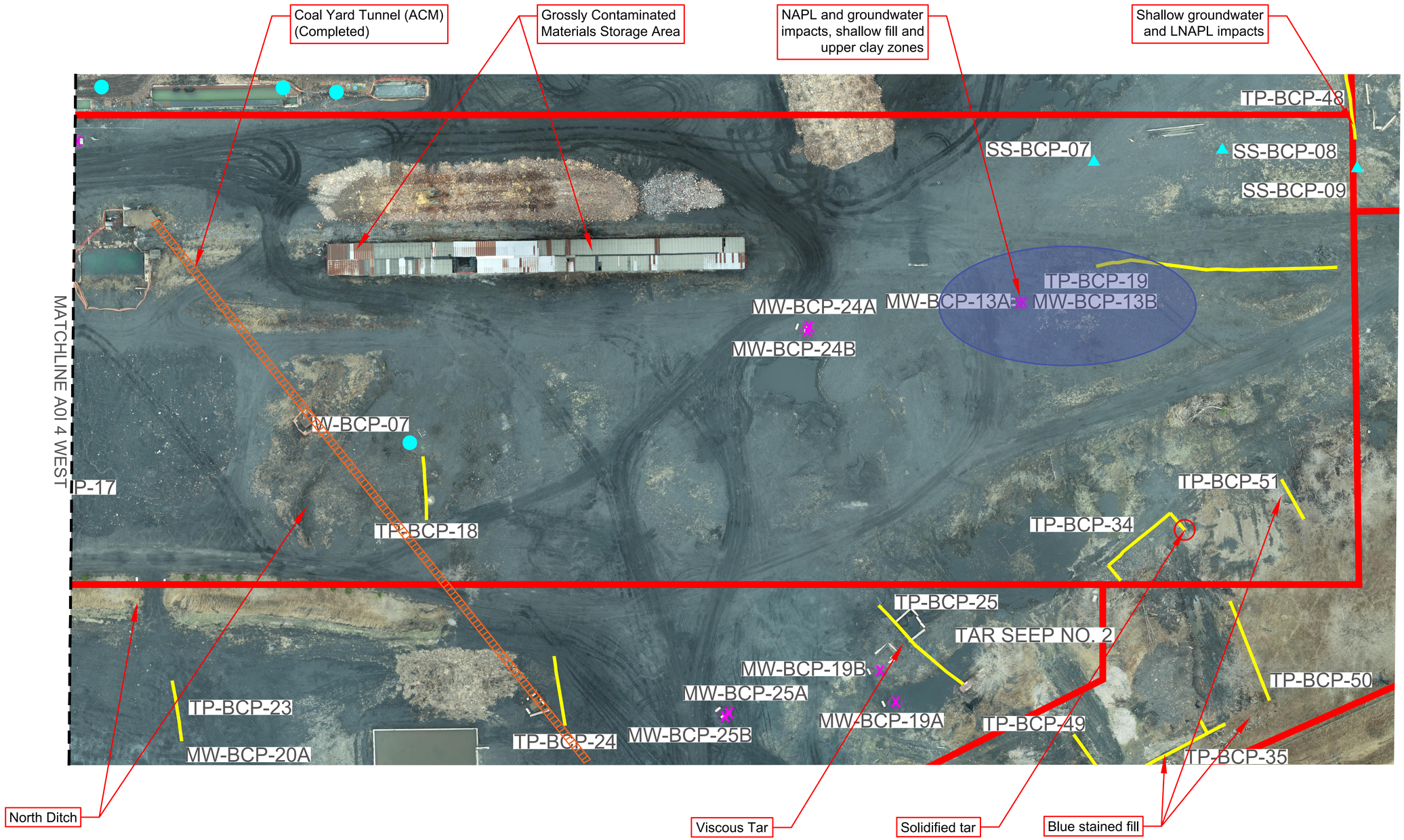

D

50 0 25 50 100 200

1 INCH = 50 FEET (22X34)

Reference: Aerial Photography by Niagara Boundary, March 2022

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FIGURE 3 - 15

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50 0 25 50 100 200

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FIGURE 3 - 16

ALTERNATIVES ANALYSIS
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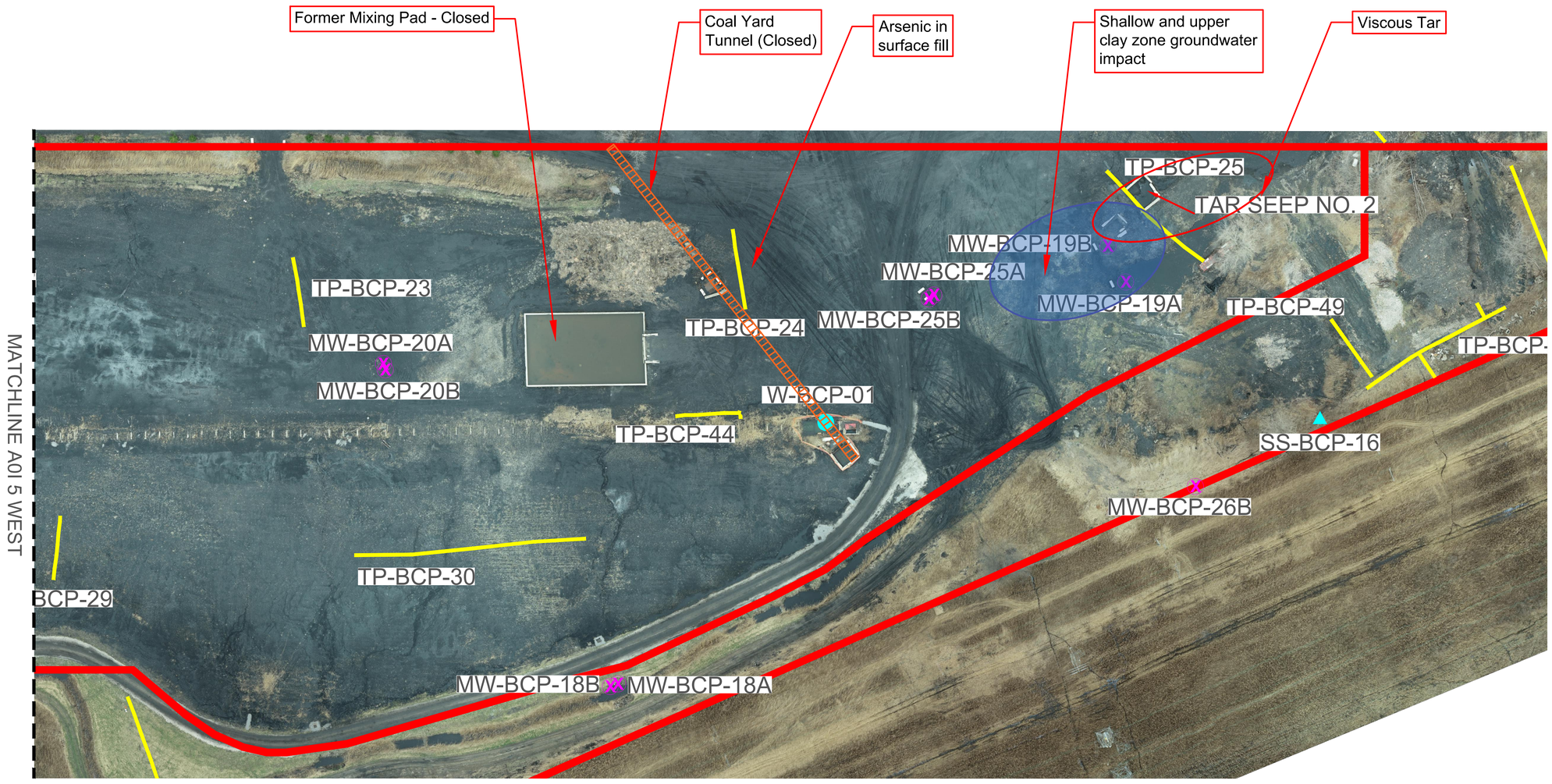

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FIGURE 3 - 17

ALTERNATIVES ANALYSIS
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NATURE AND EXTENT
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FIGURE 3 - 18

ALTERNATIVES ANALYSIS
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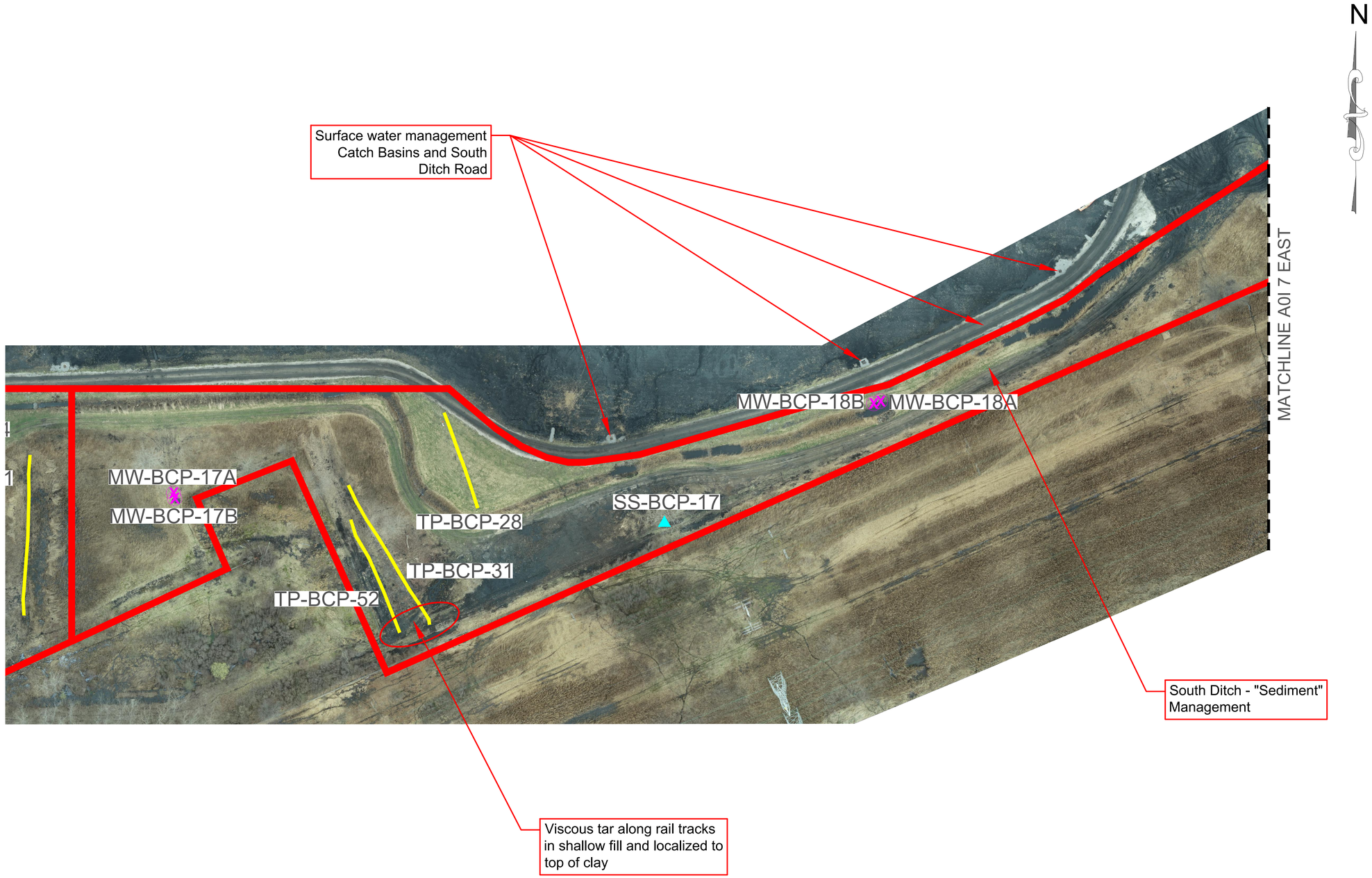

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FIGURE 3 - 19

ALTERNATIVES ANALYSIS
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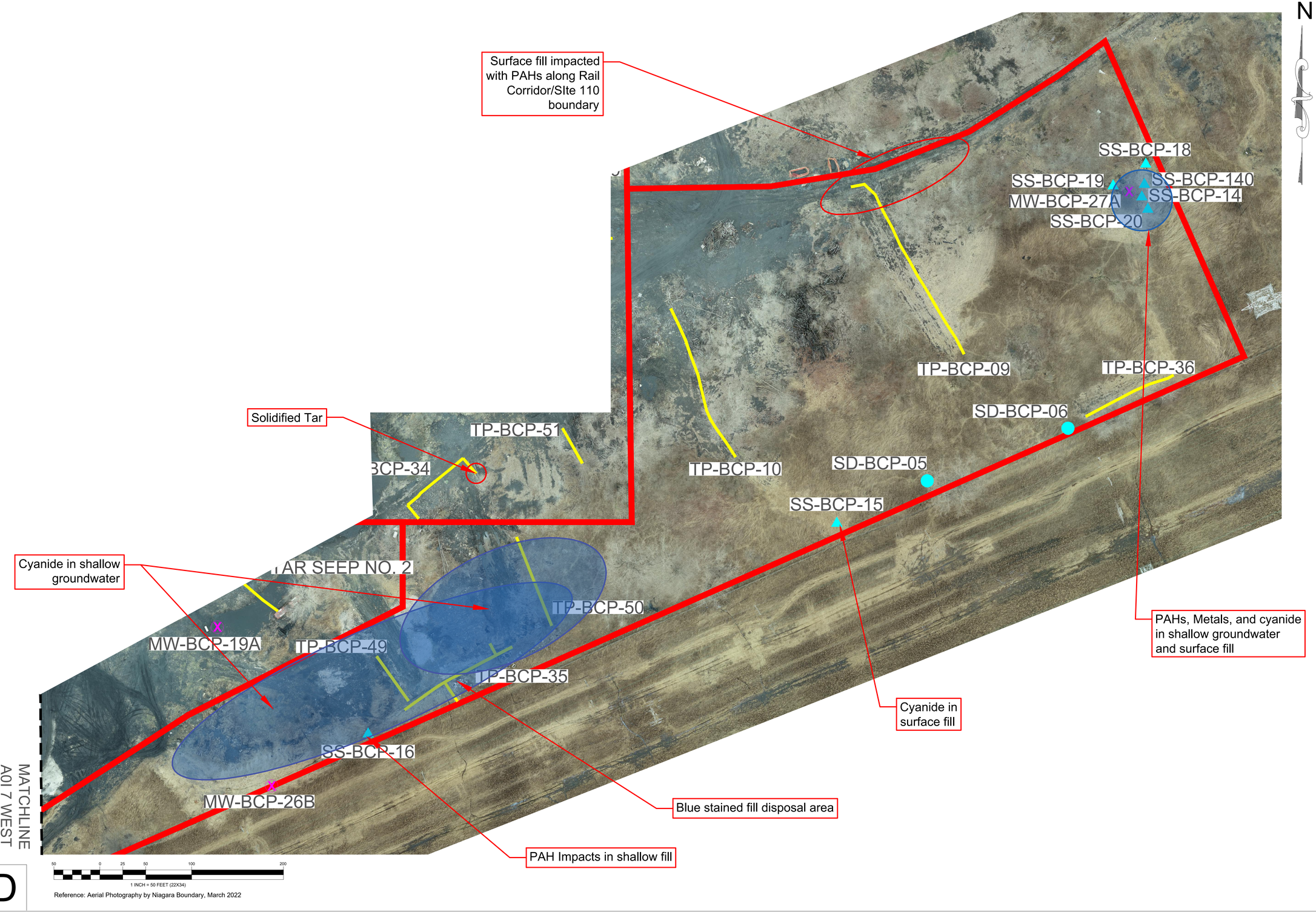

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FIGURE 3 - 20

ALTERNATIVES ANALYSIS
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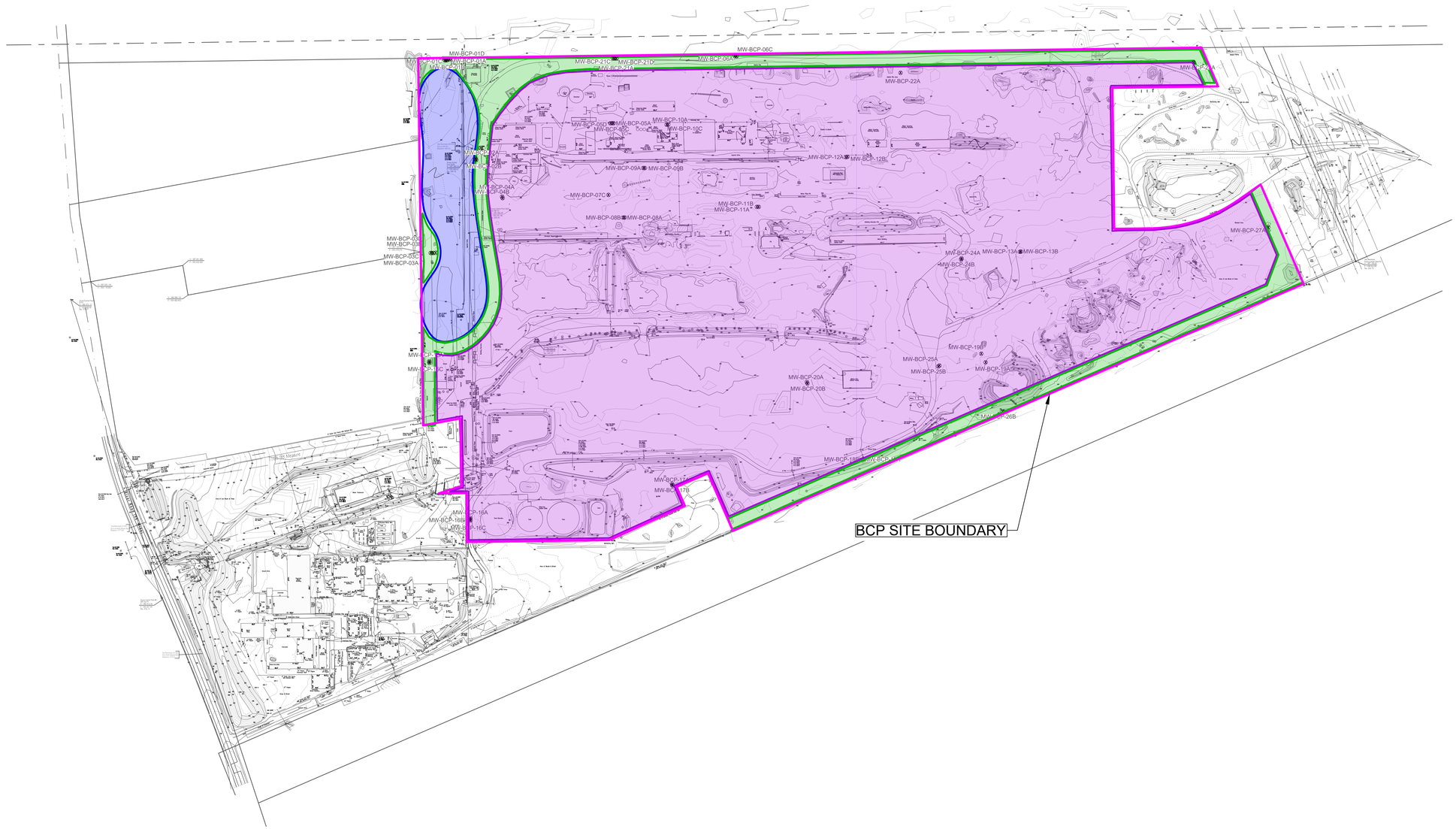
LEGEND
- PERIMETER FILL REMOVAL AREA (TRACK 1)
- STORM WATER RETENTION BASIN (TRACK 1)
- TRACK 4 CLOSURE AREA



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LIMITS OF TRACK 1 AND 4 CLEANUPS

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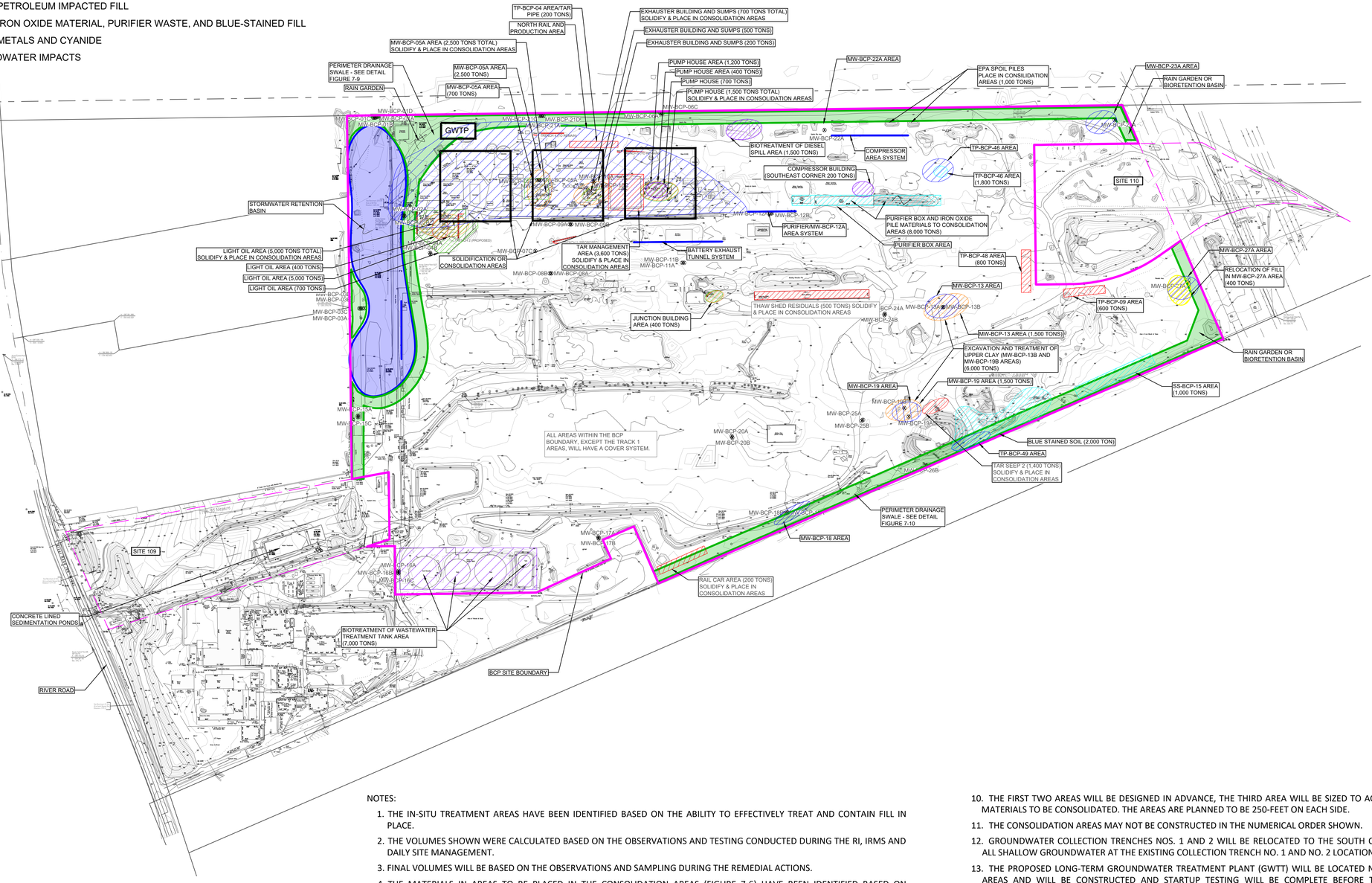
FIGURE 7 - 1

ALTERNATIVES ANALYSIS
AUGUST 2023

LEGEND

- PERIMETER FILL REMOVAL AREA (TRACK 1)
- STORM WATER RETENTION BASIN (TRACK 1)
- OCCURRENCE OF VISCOUS TAR
- OCCURRENCE OF NAPL
- OCCURRENCE OF VOC IMPACTED FILL
- OCCURRENCE OF PETROLEUM IMPACTED FILL
- OCCURRENCE OF IRON OXIDE MATERIAL, PURIFIER WASTE, AND BLUE-STAINED FILL
- OCCURRENCE OF METALS AND CYANIDE
- RESIDUAL GROUNDWATER IMPACTS



NOTES:

1. THE IN-SITU TREATMENT AREAS HAVE BEEN IDENTIFIED BASED ON THE ABILITY TO EFFECTIVELY TREAT AND CONTAIN FILL IN PLACE.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.
4. THE MATERIALS IN AREAS TO BE PLACED IN THE CONSOLIDATION AREAS (FIGURE 7-6) HAVE BEEN IDENTIFIED BASED ON MATERIALS THAT WOULD ADVERSELY AFFECT THE STORMWATER MANAGEMENT OR EXCAVATION DURING REDEVELOPMENT.
5. THE EXISTING FILL AROUND THE PERIMETER OF THE BCP SITE VARIES FROM 6- TO 36-INCHES THICK.
6. THE FILL AROUND THE PERIMETER WILL BE REMOVED AND PLACED AS FILL WITHIN THE BCP SITE. SEE DETAIL ON FIGURE 7-10.
7. THE STORMWATER RETENTION BASIN AND PERIMETER BUFFER AREAS WILL BE EXCAVATED TO THE UNDERLYING CLAY AND WILL MEET TRACK 1 STANDARDS.
8. THE CONSOLIDATION AREAS WILL BE CONSTRUCTED TO ALLOW PLACEMENT OF MATERIALS FROM WITHIN THE BCP SITE THAT COULD OTHERWISE LIMIT PROPER GRADING FOR STORMWATER MANAGEMENT OR REDEVELOPMENT.
9. THREE AREAS ARE PROPOSED TO ALLOW PROPER SIZING AND CONSOLIDATION OF THE TARGET MATERIALS.
10. THE FIRST TWO AREAS WILL BE DESIGNED IN ADVANCE, THE THIRD AREA WILL BE SIZED TO ACCOMMODATE THE REMAINING MATERIALS TO BE CONSOLIDATED. THE AREAS ARE PLANNED TO BE 250-FEET ON EACH SIDE.
11. THE CONSOLIDATION AREAS MAY NOT BE CONSTRUCTED IN THE NUMERICAL ORDER SHOWN.
12. GROUNDWATER COLLECTION TRENCHES NOS. 1 AND 2 WILL BE RELOCATED TO THE SOUTH OF THE CONSOLIDATION AREAS. ALL SHALLOW GROUNDWATER AT THE EXISTING COLLECTION TRENCH NO. 1 AND NO. 2 LOCATIONS WILL BE ELIMINATED.
13. THE PROPOSED LONG-TERM GROUNDWATER TREATMENT PLANT (GWTT) WILL BE LOCATED NORTH OF THE CONSOLIDATION AREAS AND WILL BE CONSTRUCTED AND STARTUP TESTING WILL BE COMPLETE BEFORE THE EXISTING FACILITY IN THE MAINTENANCE BUILDING IS REMOVED FOR CONSOLIDATION AREA CONSTRUCTION.

D

1" = 200'
200' 100' 0' 200'

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FIGURE 7 - 2

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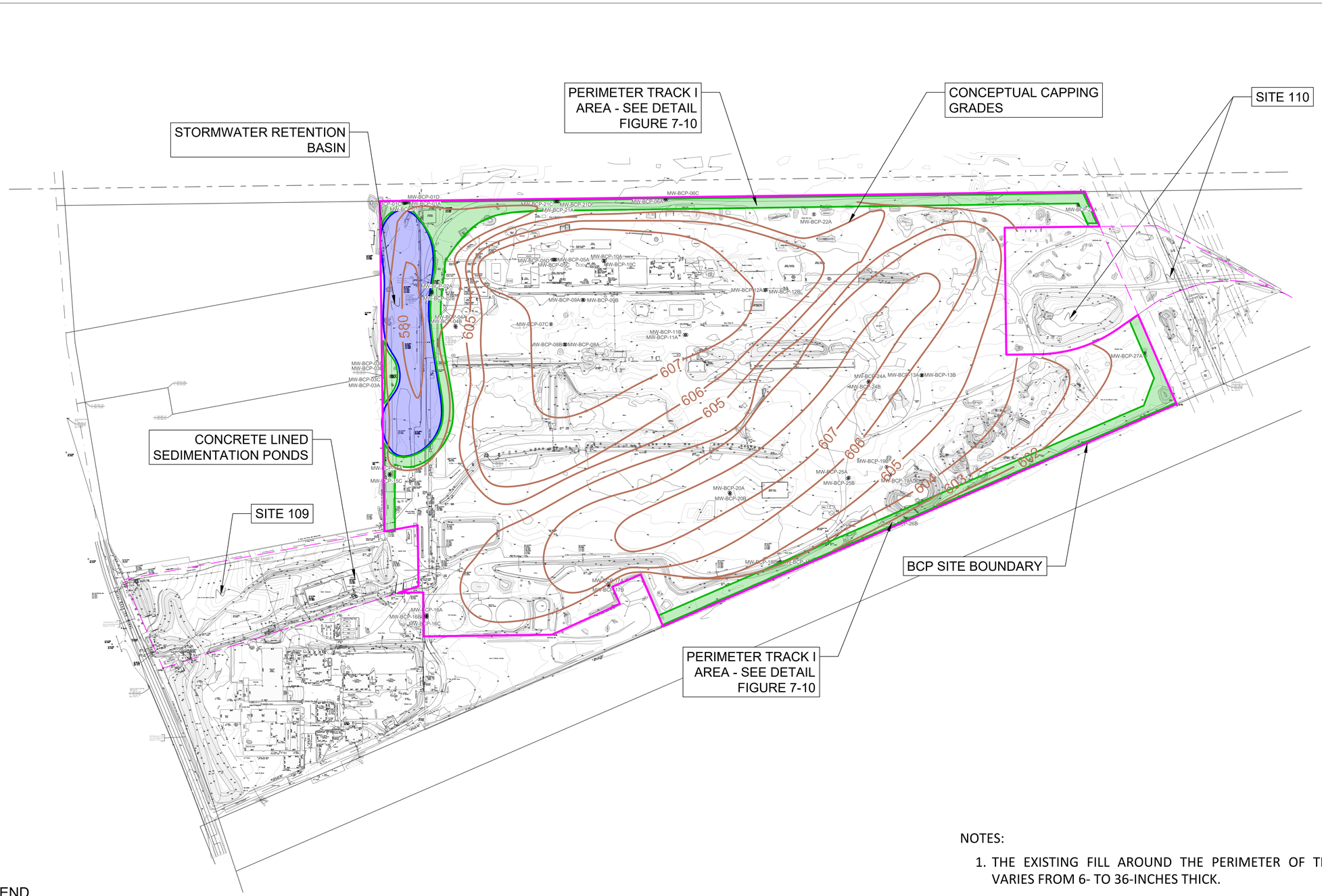

LEGEND

PERIMETER FILL REMOVAL AREA (TRACK 1)

STORM WATER RETENTION BASIN (TRACK 1)

NOTES:

1. THE EXISTING FILL AROUND THE PERIMETER OF THE BCP SITE VARIES FROM 6- TO 36-INCHES THICK.
2. THE FILL AROUND THE PERIMETER WILL BE REMOVED AND PLACED AS FILL WITHIN THE BCP SITE. SEE DETAIL ON FIGURE 7-10.
3. THE STORMWATER RETENTION BASIN AND PERIMETER BUFFER AREAS WILL BE EXCAVATED TO THE UNDERLYING CLAY AND WILL MEET TRACK 1 STANDARDS.

D

1" = 200'

200' 100' 0' 200'

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FIGURE 7 - 3

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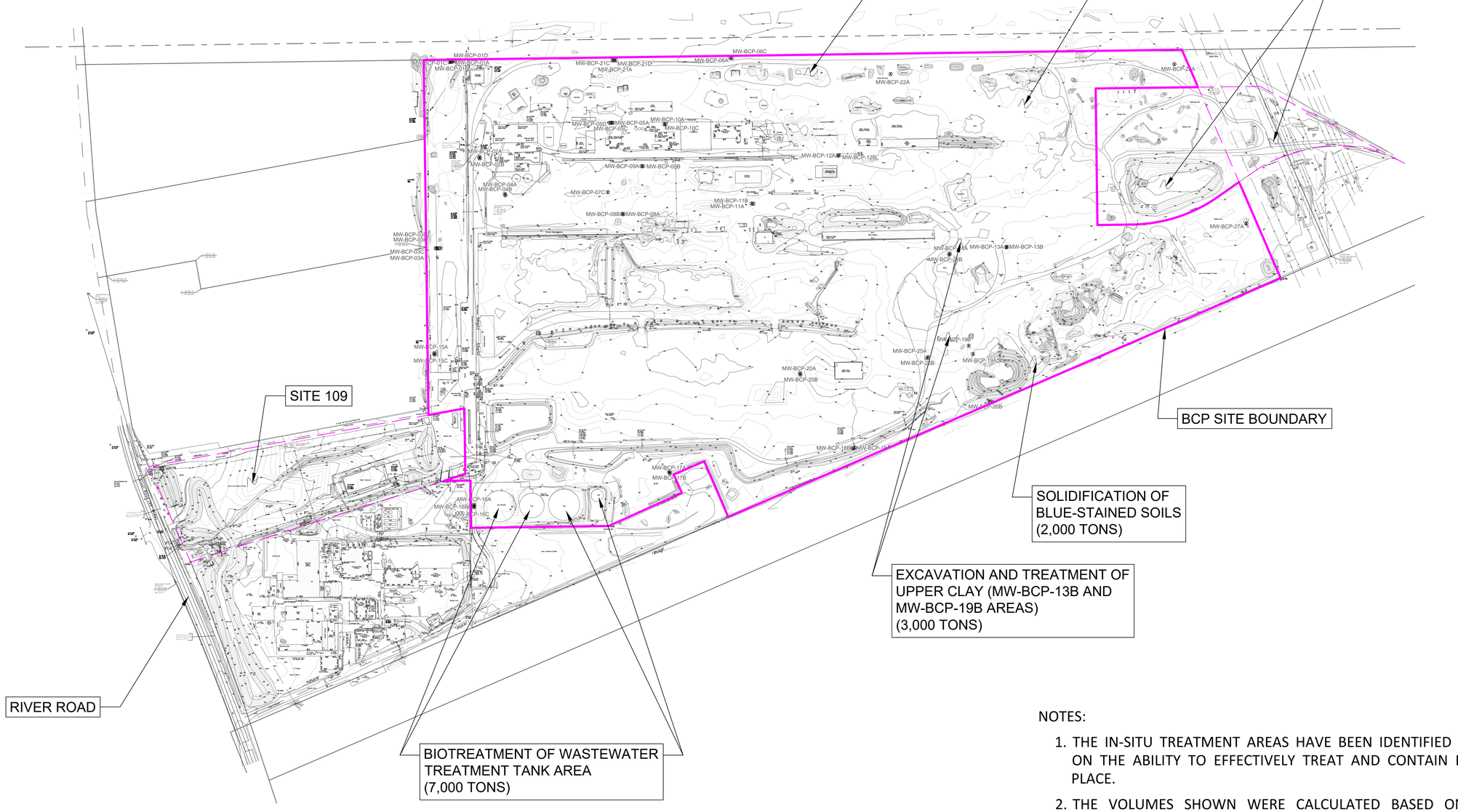

NOTES:

1. THE IN-SITU TREATMENT AREAS HAVE BEEN IDENTIFIED BASED ON THE ABILITY TO EFFECTIVELY TREAT AND CONTAIN FILL IN PLACE.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

1" = 200'

200' 100' 0' 200'

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FIGURE 7 - 4

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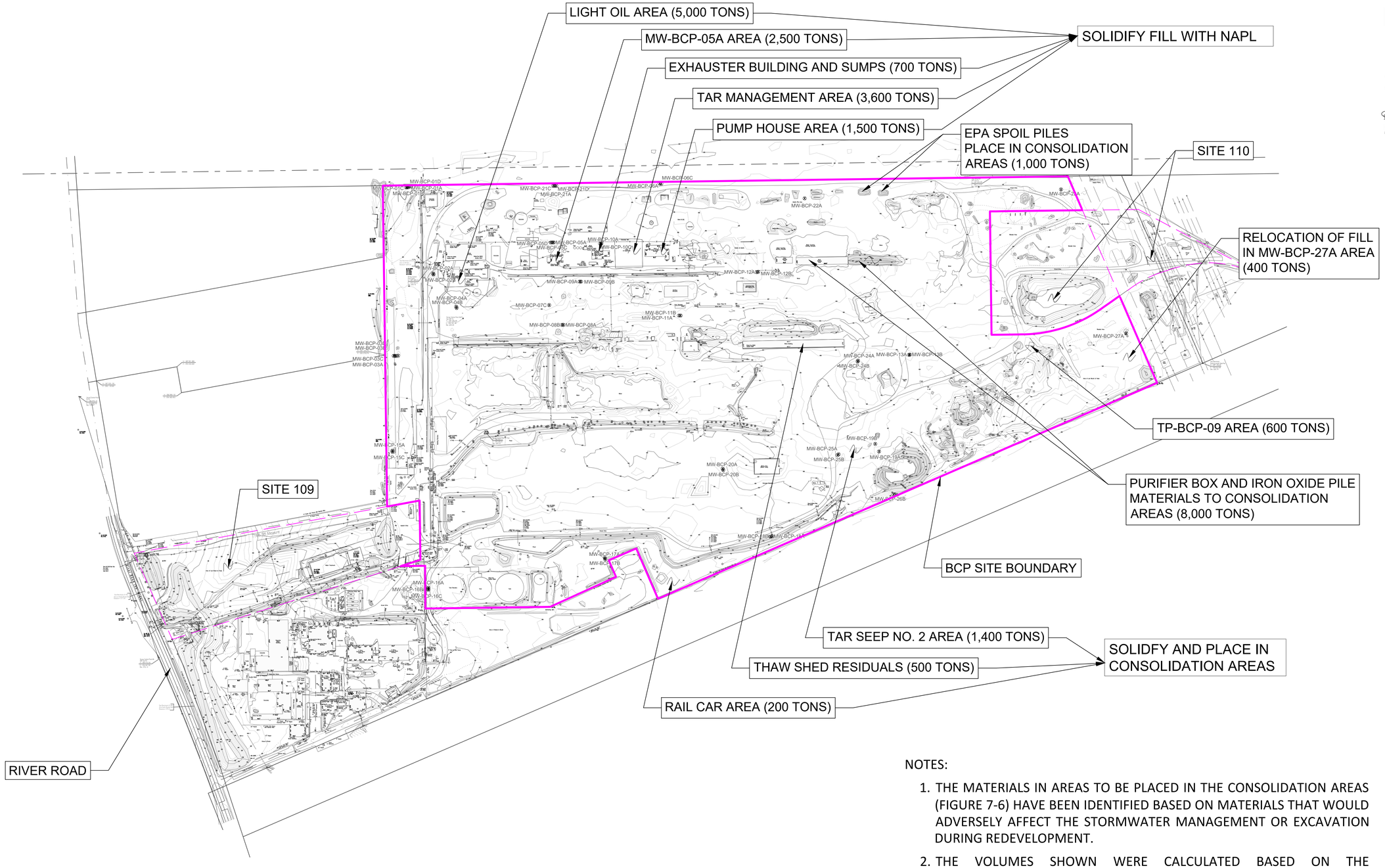

NOTES:

1. THE MATERIALS IN AREAS TO BE PLACED IN THE CONSOLIDATION AREAS (FIGURE 7-6) HAVE BEEN IDENTIFIED BASED ON MATERIALS THAT WOULD ADVERSELY AFFECT THE STORMWATER MANAGEMENT OR EXCAVATION DURING REDEVELOPMENT.
2. THE VOLUMES SHOWN WERE CALCULATED BASED ON THE OBSERVATIONS AND TESTING CONDUCTED DURING THE RI, IRMS AND DAILY SITE MANAGEMENT.
3. FINAL VOLUMES WILL BE BASED ON THE OBSERVATIONS AND SAMPLING DURING THE REMEDIAL ACTIONS.

D

1" = 200'

200' 100' 0' 200'

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FIGURE 7 - 5

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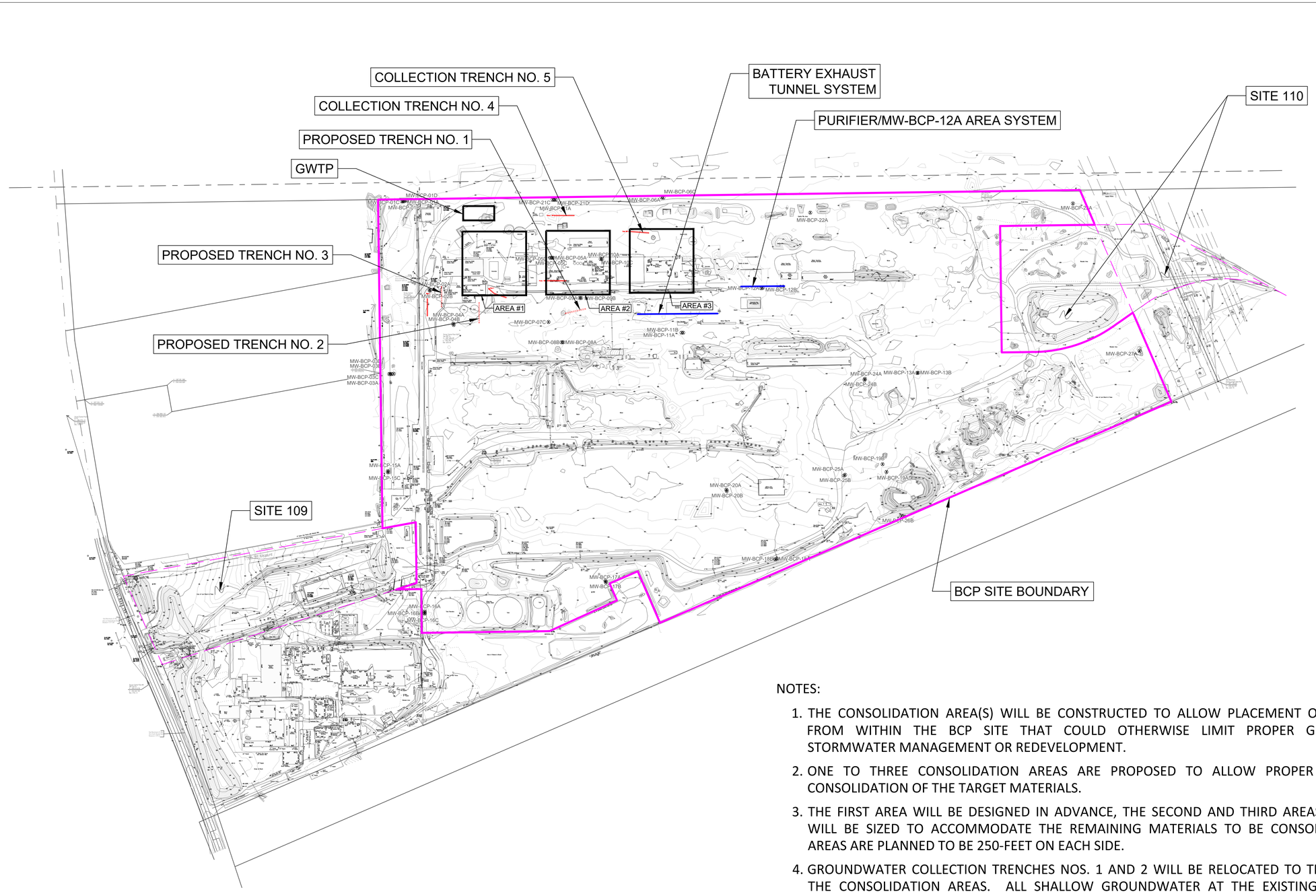

NOTES:

1. THE CONSOLIDATION AREA(S) WILL BE CONSTRUCTED TO ALLOW PLACEMENT OF MATERIALS FROM WITHIN THE BCP SITE THAT COULD OTHERWISE LIMIT PROPER GRADING FOR STORMWATER MANAGEMENT OR REDEVELOPMENT.
2. ONE TO THREE CONSOLIDATION AREAS ARE PROPOSED TO ALLOW PROPER SIZING AND CONSOLIDATION OF THE TARGET MATERIALS.
3. THE FIRST AREA WILL BE DESIGNED IN ADVANCE, THE SECOND AND THIRD AREAS, IF NEEDED, WILL BE SIZED TO ACCOMMODATE THE REMAINING MATERIALS TO BE CONSOLIDATED. THE AREAS ARE PLANNED TO BE 250-FEET ON EACH SIDE.
4. GROUNDWATER COLLECTION TRENCHES NOS. 1 AND 2 WILL BE RELOCATED TO THE SOUTH OF THE CONSOLIDATION AREAS. ALL SHALLOW GROUNDWATER AT THE EXISTING COLLECTION TRENCH NO. 1 AND NO. 2 LOCATIONS WILL BE ELIMINATED.
5. THE PROPOSED LONG-TERM GROUNDWATER TREATMENT PLANT (GWTP) WILL BE LOCATED NORTH OF THE CONSOLIDATION AREA(S), WILL BE CONSTRUCTED, AND WILL HAVE STARTUP TESTING COMPLETED BEFORE THE EXISTING FACILITY IN THE MAINTENANCE BUILDING IS REMOVED FOR CONSOLIDATION AREA CONSTRUCTION.

NOTE:
COLLECTION TRENCHES NOS. 1, 2, & 3 WILL BE MOVED TO ACCOMMODATE THE IN-SITU SOLIDIFICATION, CONSOLIDATION AREAS CONSTRUCTION, AND STORMWATER RETENTION BASIN EXCAVATION

D

1" = 200'
200' 100' 0' 200'

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FIGURE 7 - 6

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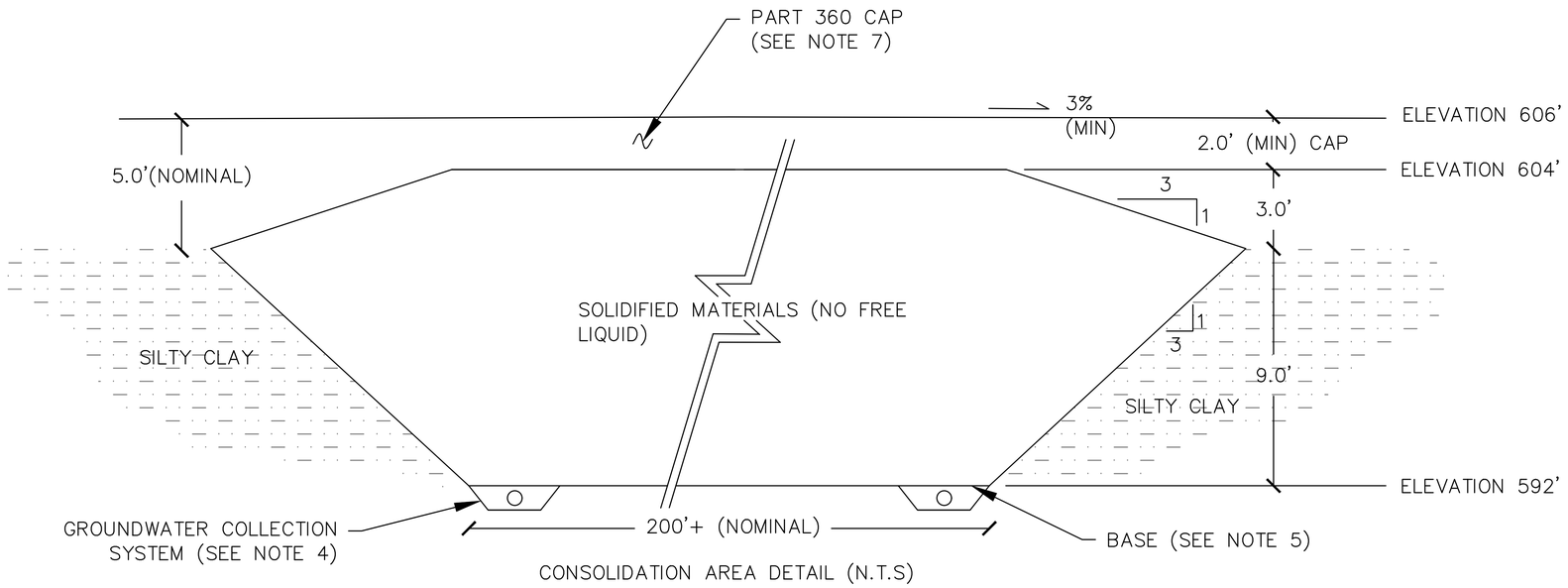

CONSOLIDATION AREA DETAIL (N.T.S)

NOTES:

1. THE FILL WILL BE REMOVED FROM THE CONSOLIDATION AREA TO REMOVE ALL POTENTIALLY IMPACTED SHALLOW GROUNDWATER FROM THE CONSOLIDATION AREA FOOTPRINT.
2. THE BASE OF THE CONSOLIDATION AREA WILL BE EXCAVATED 9-FEET (NOMINAL) INTO THE UNDERLYING CLAY TO ENSURE NO UNDERLYING NEAR SURFACE DESICCATION FRACTURES EXIST.
3. THE SURFACE OF THE UNDERLYING CLAY WILL BE PROOF ROLLED.
4. A GROUNDWATER COLLECTION SYSTEM WILL BE INSTALLED ALONG THE PERIMETER OF THE CONSOLIDATION AREAS. THE COLLECTION SYSTEM WILL BE CONNECTED TO A SUMP OUTSIDE THE NORTHWEST CORNER OF THE INDIVIDUAL AREAS TO CONVEY THE WATER TO THE TREATMENT SYSTEM.
5. THE BASE OF THE CONSOLIDATION AREA WILL BE LINED WITH ONE LAYER OF NON-WOVEN GEOTEXTILE, A 40-MIL HDPE LINER, A COLLECTION MEDIA, AND A PROTECTIVE LAYER OF NON-WOVEN GEOTEXTILE, IF REQUIRED.
6. THE FINAL SLOPES OF THE SIDEWALLS WILL BE DETERMINED DURING FINAL DESIGN, BUT THE FINISHED SURFACE GRADE WILL NOT BE FLATTER THAN 3 PERCENT.
7. THE CONSOLIDATION AREA WILL BE CAPPED WITH A WOVEN GEOTEXTILE, A 40-MIL HDPE MEMBRANE, A NON-WOVEN GEOTEXTILE, UNCLASSIFIED FILL MEETING THE COMMERCIAL SCOS, AND A COVER (SOIL, PAVEMENT, OR STRUCTURE).

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FIGURE 7 - 7

ALTERNATIVES ANALYSIS
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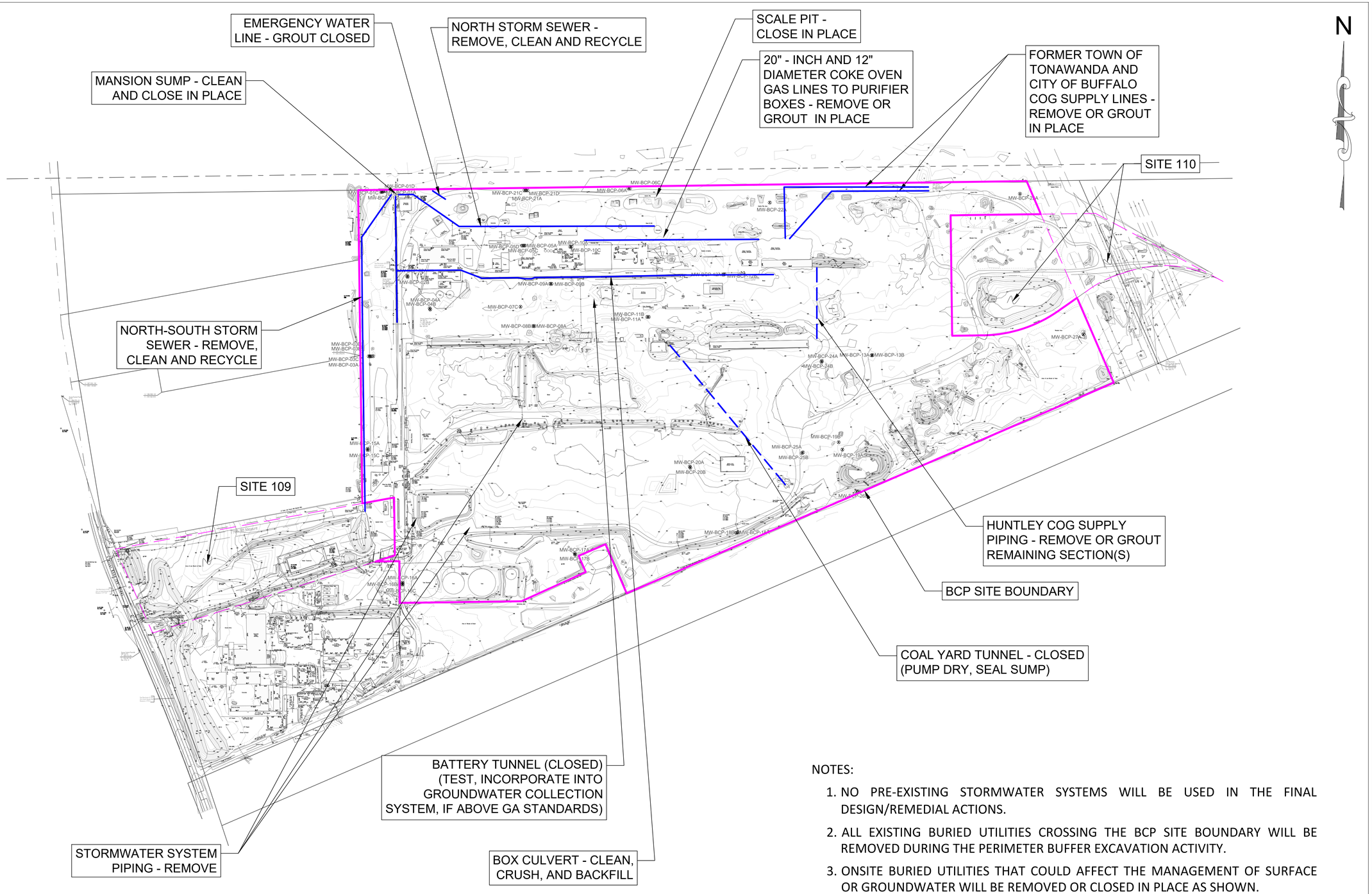

NOTES:

1. NO PRE-EXISTING STORMWATER SYSTEMS WILL BE USED IN THE FINAL DESIGN/REMEDIAL ACTIONS.
2. ALL EXISTING BURIED UTILITIES CROSSING THE BCP SITE BOUNDARY WILL BE REMOVED DURING THE PERIMETER BUFFER EXCAVATION ACTIVITY.
3. ONSITE BURIED UTILITIES THAT COULD AFFECT THE MANAGEMENT OF SURFACE OR GROUNDWATER WILL BE REMOVED OR CLOSED IN PLACE AS SHOWN.

D

1" = 200'

200' 100' 0' 200'

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

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PLAN - BURIED UTILITIES RECOMMENDED REMEDIAL ALTERNATIVE

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FIGURE 7 - 8

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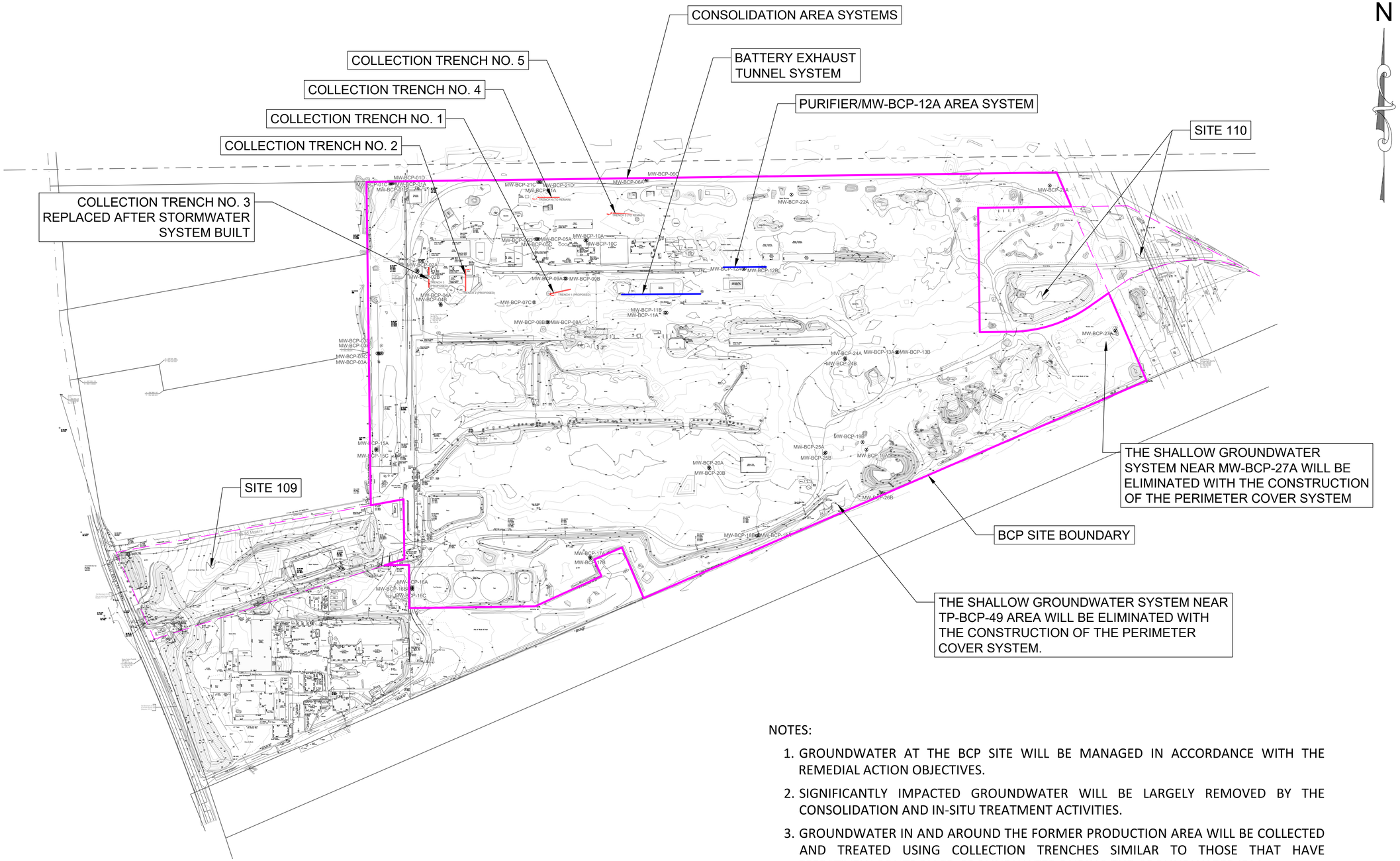

NOTES:

1. GROUNDWATER AT THE BCP SITE WILL BE MANAGED IN ACCORDANCE WITH THE REMEDIAL ACTION OBJECTIVES.
2. SIGNIFICANTLY IMPACTED GROUNDWATER WILL BE LARGELY REMOVED BY THE CONSOLIDATION AND IN-SITU TREATMENT ACTIVITIES.
3. GROUNDWATER IN AND AROUND THE FORMER PRODUCTION AREA WILL BE COLLECTED AND TREATED USING COLLECTION TRENCHES SIMILAR TO THOSE THAT HAVE EFFECTIVELY CONTROLLED GROUNDWATER DURING THE GROUNDWATER IRM.
4. GROUNDWATER MONITORING AROUND THE PERIMETER WILL BE DESIGNED TO VERIFY THE REMEDIAL ACTIONS ARE EFFECTIVE. THE GROUNDWATER MONITORING ARRAY WILL BE DEFINED IN THE SMP.

D

1" = 200'
200' 100' 0' 200'

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

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PLAN - GROUNDWATER MANAGEMENT RECOMMENDED REMEDIAL ALTERNATIVE

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FIGURE 7 - 9

ALTERNATIVES ANALYSIS
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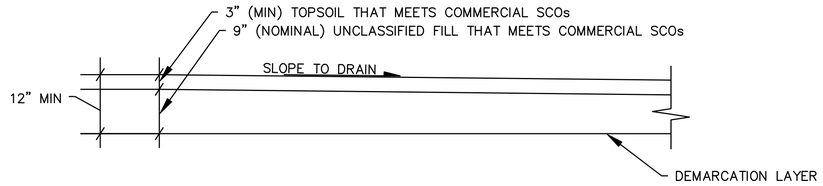
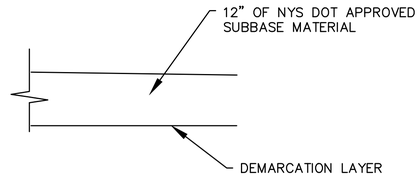
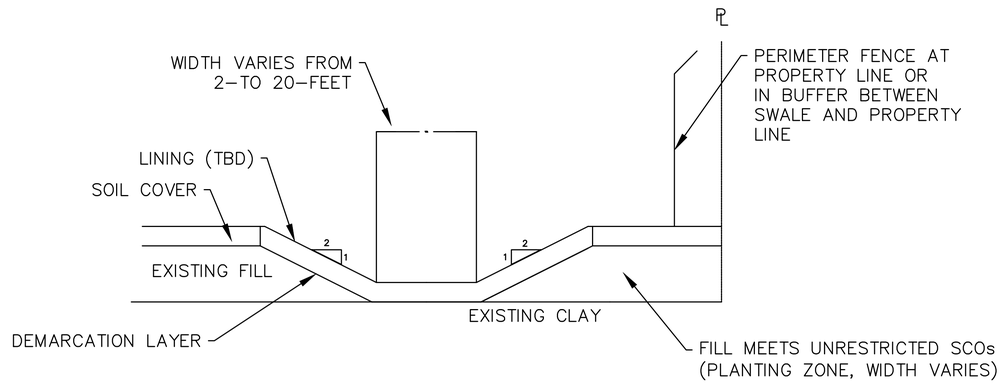


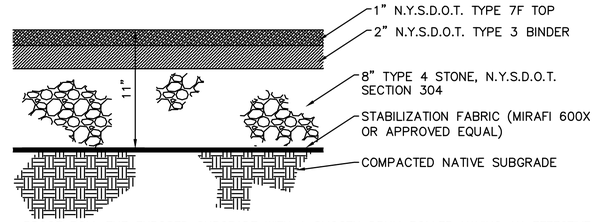
ORGANIC SOIL COVER
NTS



GRAVEL COVER
NTS



PERIMETER STORMWATER DRAINAGE SWALE
NTS

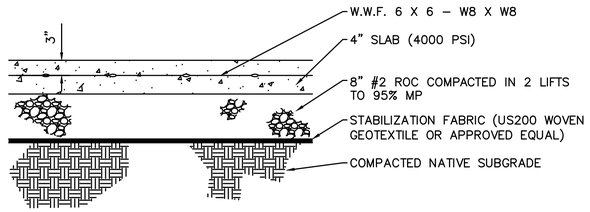


PROOF ROLL THE EXPOSED SUBGRADE WITH A SMOOTH DRUM ROLLER HAVING AN EFFECTIVE FOR OF AT LEAST 600LBS/LI. ANY AREAS EXHIBITING WEAVING, YIELDING, RUTTING, OR BOILING SHOULD BE REWORKED BY OVER EXCAVATED AND REPLACEMENT WITH STRUCTURAL FILL COMPACTED TO 95% MP

COMPACT FOUNDATION COURSE WITH A MINIMUM OF 5 PASSES OF A SMOOTH DRUM ROLLER HAVING AN EFFECTIVE WEIGHT OF AT LEAST 600LBS/LI. THE FINISHED SURFACE SHOULD BE UNIFORM AND DENSE AND COMPACTED TO 95% MP, WITHIN A MOISTURE RANGE OF 2% OF OPTIMUM CONTENT

* OWNER/CONTRACTOR RESPONSIBLE FOR REVIEW OF GEOTECHNICAL REPORT AND ANY DEVIATION FROM RECOMMENDED PAVEMENT SECTION.

STANDARD DUTY PAVEMENT*
NTS



PROOF ROLL THE EXPOSED SUBGRADE WITH A SMOOTH DRUM ROLLER HAVING AN EFFECTIVE FOR OF AT LEAST 600LBS/LI. ANY AREAS EXHIBITING WEAVING, YIELDING, RUTTING, OR BOILING SHOULD BE REWORKED BY OVER EXCAVATED AND REPLACEMENT WITH STRUCTURAL FILL COMPACTED TO 95% MP

COMPACT FOUNDATION COURSE WITH A MINIMUM OF 5 PASSES OF A SMOOTH DRUM ROLLER HAVING AN EFFECTIVE WEIGHT OF AT LEAST 600LBS/LI. THE FINISHED SURFACE SHOULD BE UNIFORM AND DENSE AND COMPACTED TO 95% MP, WITHIN A MOISTURE RANGE OF 2% OF OPTIMUM CONTENT

CONCRETE SLAB
NTS

NOTES:

1. THREE TYPES OF COVER OR CAPPING SYSTEMS WILL BE USED FOR ALL AREAS OF THE SITE NOT MEETING TRACK 1 CLEANUP CRITERIA.
2. AREAS THAT ARE PLANNED AS GREEN SPACES IN THE REDEVELOPMENT PLANS WILL BE COVERED WITH A 12-INCH SOIL COVER CONSISTING OF A DEMARCATION LAYER, 9-INCHES OF UNCLASSIFIED FILL, 3-INCHES OF TOPSOIL AND VEGETATION SUITABLE FOR THE LOCATION, CLIMATE AND EROSION CONTROL.
3. AREAS PLANNED FOR REDEVELOPMENT (BUILDINGS, PARKING OR ROADWAYS) WILL BE COVERED WITH A SOIL COVER OR A DEMARCATION LAYER AND 12-INCHES OF THE APPROPRIATE NYSDOT SUBGRADE FILL.
4. THE PERIMETER BUFFER AREAS WILL BE SEPARATED FROM NEWLY PLACED FILL NOT MEETING COMMERCIAL SCOS WITH A DEMARCATION LAYER.
5. THE PERIMETER AREAS WILL BE FILLED TO ALLOW CONSTRUCTION OF THE PERIMETER STORMWATER SWALES, RAIN GARDENS AND BIORETENTION BASINS. THE SWALE LININGS WILL BE DESIGNED TO PREVENT EROSION WHILE USING NATURAL MATERIALS TO THE EXTENT PRACTICAL.

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FIGURE 7 - 10

ALTERNATIVES ANALYSIS
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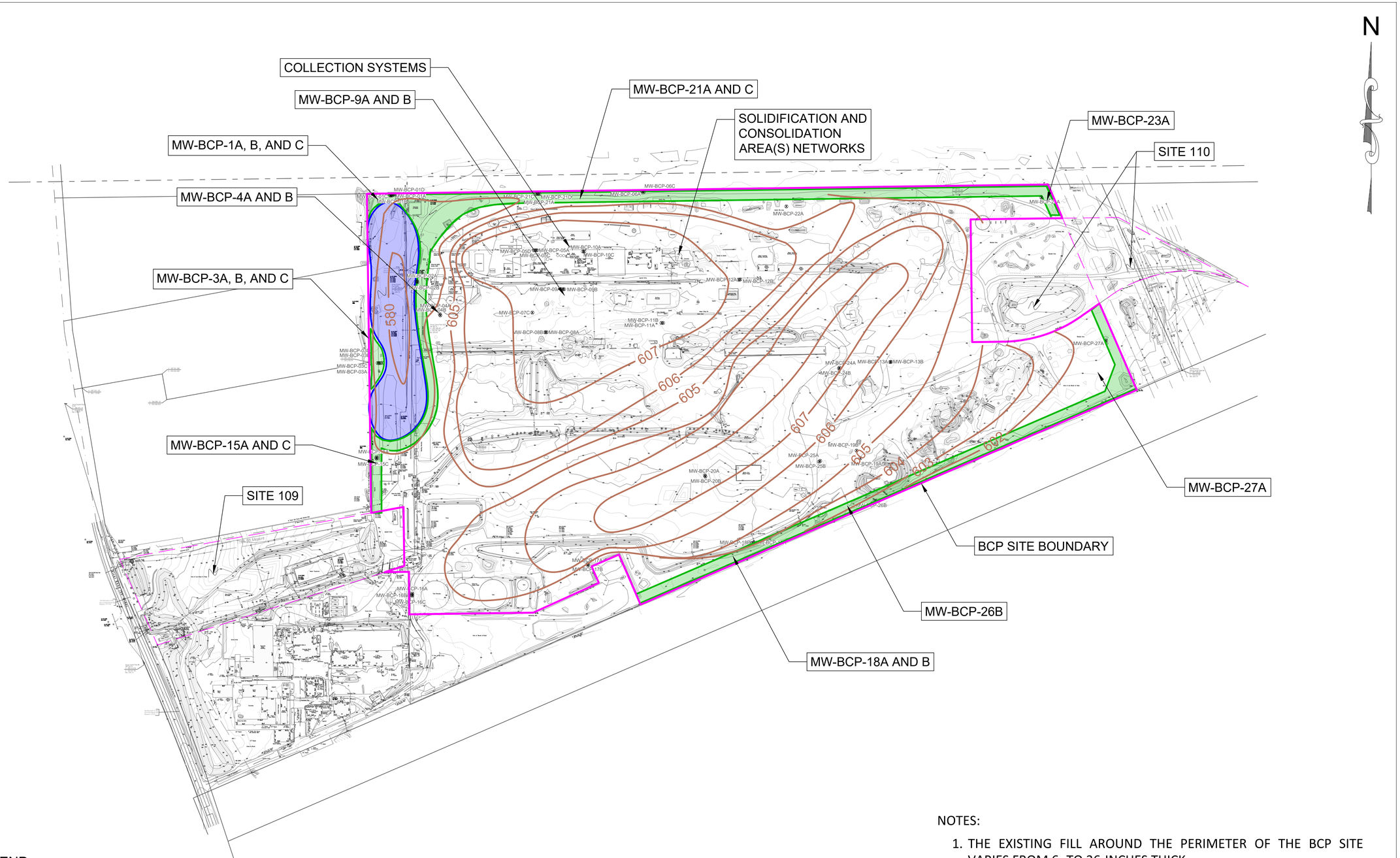

LEGEND

PERIMETER FILL REMOVAL AREA

STORM WATER RETENTION BASIN

D

1" = 200'

200' 100' 0' 200'

Reference: Niagara Boundary, Map Showing Topographic Survey of Property Owned by Riverview Innovation & Technology Campus Inc., April 2022

NOTES:

1. THE EXISTING FILL AROUND THE PERIMETER OF THE BCP SITE VARIES FROM 6- TO 36-INCHES THICK.
2. THE FILL AROUND THE PERIMETER WILL BE REMOVED AND PLACED AS FILL WITHIN THE BCP SITE. SEE DETAIL ON FIGURE 7-10.
3. THE STORMWATER RETENTION BASIN AND PERIMETER BUFFER AREAS WILL BE EXCAVATED TO THE UNDERLYING CLAY AND WILL MEET TRACK 1 STANDARDS.

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CONCEPTUAL GROUNDWATER MONITORING NETWORK

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FIGURE 7 - 11

ALTERNATIVES ANALYSIS
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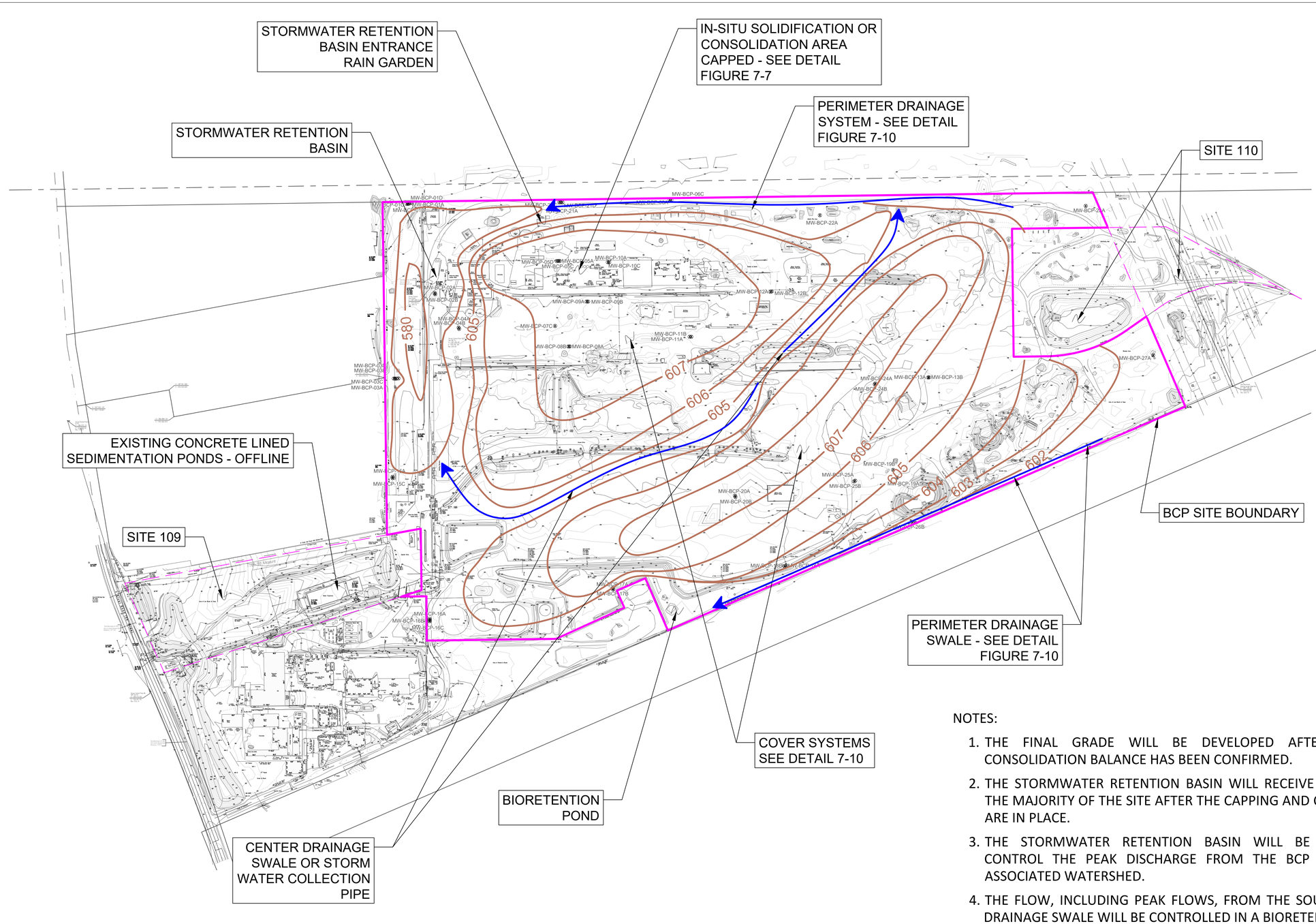

NOTES:

1. THE FINAL GRADE WILL BE DEVELOPED AFTER THE FINAL CONSOLIDATION BALANCE HAS BEEN CONFIRMED.
2. THE STORMWATER RETENTION BASIN WILL RECEIVE RUNOFF FROM THE MAJORITY OF THE SITE AFTER THE CAPPING AND COVER SYSTEMS ARE IN PLACE.
3. THE STORMWATER RETENTION BASIN WILL BE DESIGNED TO CONTROL THE PEAK DISCHARGE FROM THE BCP SITE AND THE ASSOCIATED WATERSHED.
4. THE FLOW, INCLUDING PEAK FLOWS, FROM THE SOUTH PERIMETER DRAINAGE SWALE WILL BE CONTROLLED IN A BIORETENTION BASIN.
5. AFTER THE CAPPING SYSTEM HAS BEEN PLACED AND THE WATER QUALITY IN THE STORMWATER RETENTION BASIN IS CONFIRMED, THE CONCRETE-LINED SEDIMENTATION PONDS WILL BE TAKEN OUT OF SERVICE.

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PLAN - SURFACE WATER MANAGEMENT RECOMMENDED REMEDIAL ALTERNATIVE

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FIGURE 7 - 12

ALTERNATIVES ANALYSIS
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