nygeology

Phase I Environmental Site Assessment

Tonawanda Coke and Related Parcels

3874 River Road

Tonawanda, NY

Date: 30 August 2020

The Clean Air Coalition of WNY
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Buffalo, NY 14209

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Project No.: 20011

Executive Summary

New York State Professional Geological Services, PLLC (nygeology), was retained by the Clean Air Coalition of Western New York to conduct a Phase I Environmental Site Assessment (ESA) at the former Tonawanda Coke manufacturing facility located at 3875 River Rd., Tonawanda Erie County, NY 14150 (the Site) as well as nearby sites associated with or adjacent to facility operations (the ESA Study Area). The ESA was conducted in general accordance with acceptable practices including the ASTM E1527-13 Standard Practice for Environmental Site Assessments. Clean Air retained nygeology to conduct the ESA for the specific purpose of better understanding potential environmental conditions on behalf of the local community and for the evaluation of work plans developed by third parties in the interest of Property redevelopment under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), referred to as the BCP Site and related remediation work plans for NYSDEC Superfund Enforcement Actions at adjacent sites, specifically Superfund Sites 108, 109 and 110.

nygeology has considered the migration of hazardous substances or petroleum products in soil, groundwater, and vapor in the evaluation of potential RECs associated with this Property and reports them in the Conclusions section of this report. Further, nygeology has addressed other environmentally stressed properties in the vicinity, such as Roblin Steel to the West, that must be considered if any off-site migration of substances has occurred and, in the course of this assessment, nygeology has discovered new areas, such as the North Drain, that may have been impacted from former site operations as well.

The facility was owned and operated from 1917 through 1947 by Semet-Solvay Company, which was a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet-Solvay Company was merged into Allied Chemical Corporation, which owned and operated the facility until January 27, 1978, when it was sold to The Tonawanda Coke Corporation (TCC). TCC operated the facility from 1978 until it filed for bankruptcy protection in October 2018, at which time all operations ceased.

Historically, manufacturing processes at the plant used coal to make coke. 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 known as coke was used, among other things, in foundries and for the production of steel. The extracted gas was used to fire the subsequent coking operations, to fuel the boiler house, flared or historically was sold as fuel. The coking process generated byproducts such as light oil , ammonia, benzene, toluene, and xylene. The liquids and tars were conveyed through pipes to by-products facilities where they were cooled, separated, and processed for sale as raw or feedstock for construction materials and other uses.

Historic operations associated with the Tonawanda Coke manufacturing facility were examined to determine the potential for the release of petroleum or hazardous substances to the environment. For the purposes of this ESA, historic operations were classified into five general categories: materials management, byproduct management, supporting operations, reported spills and other operations and conditions. Specifically, process and chemical reviews of associated hazardous waste streams indicated 23 specific byproduct management units which were mapped to the extent possible for future investigation.

Standard record searches were performed. While our request for the database search by the contractor EDR met the requirements of the ASTM E-1527 ESA standard, the EDR Sanborn collection did not include key maps necessary for this assessment. Therefore nygeology obtained key Sanborn Coverage from the Buffalo and Erie County Public Library system and from the archives at the University at Buffalo library, as well as aerial photos from a variety of other sources. In addition, many other sources and studies important to the industrial history of the area, along with previous site reports and other special reports on sites both in and out of the ESA study area, were relied upon for our information base. Interviews were conducted with former employees familiar with site operations from the 1970s onward including a plant superintendent and plant hydrologist. Due to site access restrictions, high-resolution drone flyovers on various dates were used in lieu of physical site reconnaissance.

Generally, a large number of concerns were noted and mapped. In addition to documents concerns, including many spills, site history suggested that spills were common across the operational history of the site and that many more undocumented spills may have occurred.

In summary, 57 Recognized Environmental Conditions and 17 Controlled Recognized Environmental Conditions were reported. Because of ongoing NYSDEC efforts to address certain issues through Interim Remedial Measures and other mechanisms, nygeology acknowledges that some of the conditions reported in the ESA may have been mitigated or scheduled to be mitigated prior to the release of this ESA report.

Beyond the works in progress by responsible parties in concert with NYSDEC to investigate known or suspected environmental conditions, this ESA revealed 1) A former northern drainage pathway currently not known to be associated with the BCP or other NYSDEC enforcement actions that discharged millions of gallons per day of potentially contaminated water into the Niagara River, sometimes retained for fuel reprocessing, for most of the history of the facility; 2) the now in-filled former Erie Canal along the northern drainage pathway; 3) the presence of a former river channel that had separated an island called Rattlesnake Island, most likely filled with high permeability slag that could divert groundwater flow in Site 108 and also along the former northern drainage pathway; 4) the potential presence of approximately 2,000 pile foundations for the coke oven batteries driven through a corrosive soil, that according to USEPA documentation, could create a conduit for contaminant migration to bedrock; and 5) the lack of sufficient vertical geological and hydrogeological information regarding the potential for any contamination from the BCP Site to migrate to bedrock or to the Niagara River.

In summary, with respect to the conclusions of the ESA, many Recognized Environmental Conditions have been identified at the BCP Site and across the ESA Study Area at large. With respect to ongoing management of known sources, many activities are currently underway, under NYSDEC supervision, to investigate and remediate environmental releases at the site. However, certain data gaps still exist, and any interested parties should proceed with caution.

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Appendix 1: nygeology_2020_Tonawanda_Coke_ESA_Appendix_1_EDR_Reports.zip

Appendix 2: nygeology_2020_Tonawanda_Coke_ESA_Appendix_2_Digital_Files.zip
(Includes all georeferenced map, points, aerial photos and Sanborn maps.)

1 INTRODUCTION

New York State Professional Geological Services, PLLC (nygeology), was retained by the Clean Air Coalition of Western New York (also referred to herein as User, Client and Clean Air) to conduct a Phase I Environmental Site Assessment (ESA) at the former Tonawanda Coke manufacturing facility located at 3875 River Rd., Tonawanda Erie County, NY 14150 (Property). The Property is further defined as Section-Block-Lot: 64.08-1-10 and other specific properties identified herein that were associated with the Tonawanda Coke operations.

nygeology conducted this Phase I ESA in general accordance with the United States Environmental Protection Agency (USEPA), Standard and Practices for All Appropriate Inquires (AAI), Final Rule (40 CFR Part 312) and the ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E1527-13). Any exceptions to, or deletions from these practices are described in Section 1.2 of this report.

1.1 Purpose

The purpose of conducting a Phase I ESA in accordance with the ASTM Practice E1527-13 and the AAI Final Rule is normally to permit the User to satisfy one of the requirements to qualify for the Innocent Landowner, Contiguous Property Owner, or Bona Fide Prospective Purchaser limitations on Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) liability. In the case of this ESA, however, Clean Air has retained nygeology to conduct the assessment to better understand potential environmental conditions on behalf of the local community for the purpose of evaluating work plans developed in the interest of Property redevelopment under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and related remediation work plans for NYSDEC Superfund Enforcement Actions at related adjacent sites. Nevertheless, the goal of the Phase I ESA process is to identify Recognized Environmental Conditions (RECs) at the Property and present findings in a written report. An REC is defined by ASTM E1527-13 as follows:

The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions.

nygeology has considered the migration of hazardous substances or petroleum products in soil, groundwater, and vapor in the evaluation of potential RECs associated with this Property and reports them in the Conclusions section of this report.

1.2 Limitations to the ASTM Standard and Data Gaps

Limitations or exceptions to ASTM E1527-13 and data gaps, as defined in the AAI Final Rule noted during the course of the Phase I ESA are discussed below.

Based on a review of available resources and conditions observed during the site inspection, the potential data gaps or limitations to ASTM E1527-13 described below do not likely affect the ability to identify conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to the Property and would not be likely to have a material impact on the conclusions of this report. The following limitations or deviations to the ASTM standard are not considered significant, as they do not substantially change the findings and conclusions of this report:

1. Property access restrictions were considered for the purpose of conducting the site reconnaissance element of the process required to meet the ASTM standard. Because the property was purchased by a developer and some work is already underway, and, because the purpose of conducting this ESA does not involve any protections under CERCLA, nygeology did not consider the physical elements of site reconnaissance necessary to the process of determining RECs; rather nygeology used recent publicly available 3D aerial photography, drone footage and LIDAR to assess the physical conditions at the site; and
2. The Client did not provide nygeology with an environmental lien and/or area use limitation search for the Property and that nygeology was not requested to obtain this item for the purposes of review.

Therefore, no exceptions or significant data gaps to the ASTM Standard were noted during the course of conducting this Phase I ESA.

1.3 Reliance

The Phase I ESA Report has been prepared for the exclusive use of the Client and may not be relied upon by any other party. nygeology understands that the Client may wish to release this ESA to the public during a formal comment periods associated with the BCP and Superfund enforcement actions in order to help strengthen investigation and cleanup work. nygeology further understands that the public includes and is not limited to Clean Air members, news organizations, the NYSDEC, and others involved with BCP and Superfund enforcement actions such as developers and responsible parties and their attorneys and technical consultants. nygeology hereby grants permission for any such public parties to use any and all information presented herein for informational purposes only, and that any reliance on such information for CERCLA AAI protections is strictly prohibited by nygeology.

2 USER PROVIDED INFORMATION

Where the term "User" appears in this report, it refers to the Client. To satisfy the intent of ASTM E1527-13, inquiries were made with the User for information that could help identify the potential for a REC. Therefore, nygeology provided the User with an ASTM E1527-13 Questionnaire (User Questionnaire). When completed, the User Questionnaire can help provide certain information to satisfy the User's Responsibilities under the ASTM E1527-13 Standard.

The User completed the User Questionnaire to assist in gathering information that may be material to identifying RECs at the Property. A copy of the completed questionnaire is provided as an Appendix. Other than as described below, no particularly useful information was provided by the User that assisted in this assessment.

2.1 Activity and Use Limitations

The User provided no information on any Activity or Use Limitations.

2.2 Specialized Knowledge or Experience

The User provided no specialized knowledge or experience other than introductions to former employees knowledgeable about the operational history of the property.

2.3 Relationship of Purchase Price to Fair Market Value

The User provided no information on the relationship of purchase price to fair market value.

2.4 Commonly Known or Reasonably Ascertainable Information

The User did provide access to information gathered through the FOIL process. Such information was considered in the performance of this ESA.

2.5 Presence of Contamination

With the exception of information gathered during the FOIL process described above in Section 2.4, the User had no specific knowledge of contamination at the property.

2.6 Other

The User provided no other useful information on environmental conditions at the Property.

3 SITE DESCRIPTION

The Property subject to this ESA comprises a former coke manufacturing facility and all parcels associated with or potentially affected by facility operations. The Property will be discussed in detail in its entirety in subsequent sections of this report. At least four parcels are currently under New York State Department of Environmental Conservation (NYSDEC) enforcement initiatives as follows:

- Brownfield Cleanup Program (BCP) Site;
- Superfund Site 108;
- Superfund Site 109; and
- Superfund Site 110.

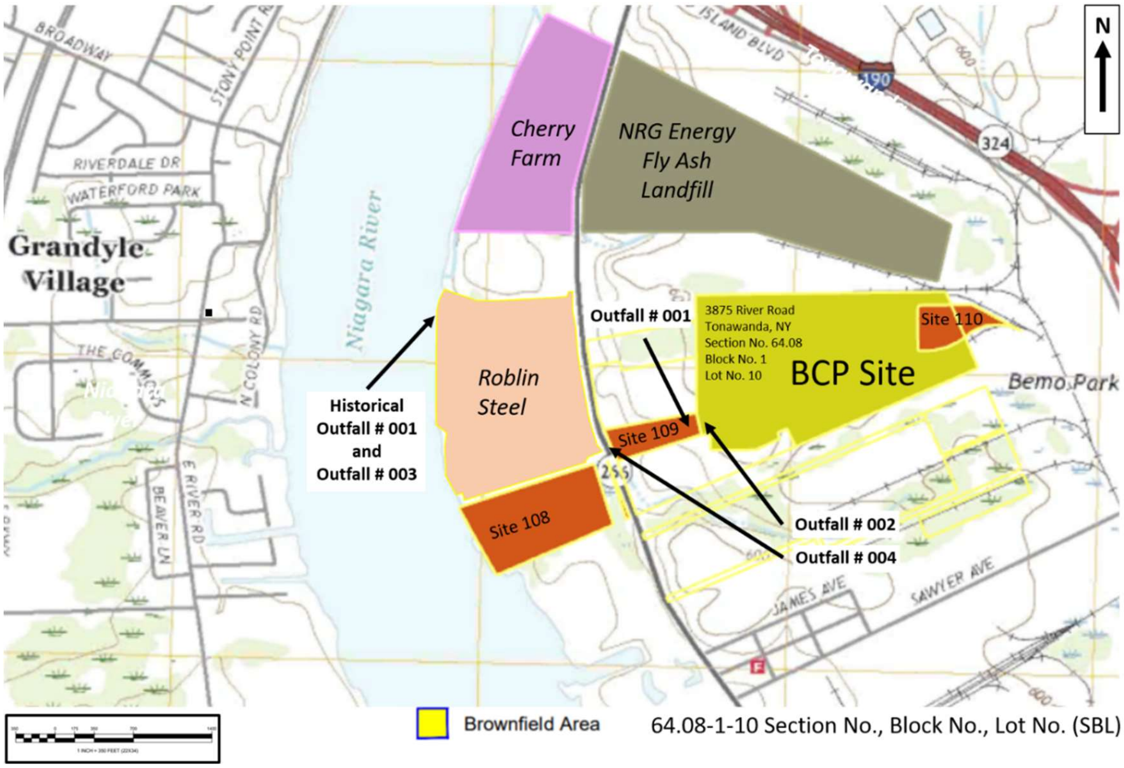
Further, NYSDEC has addressed other environmentally stressed properties in the vicinity, such as Roblin Steel to the West, that must be considered if any off-site migration of substances has occurred and, in the course of this assessment, nygeology has discovered new areas, such as the North Drain, that may have been impacted from former site operations as well.

Impacts from former operations located on the BCP site are the focus of this ESA. The BCP Site No. is C915353. On September 23, 2019, the sale of the BCP parcel to Riverview Innovation and Technology Campus, Inc. was approved by the U.S. Bankruptcy Court and on February 14, 2020 the Brownfield Cleanup Agreement was signed by the New York State Department of Environmental Conservation (NYSDEC).

All the Superfund Sites have a Site Classification of 2 pursuant to ECL 27-1305 and are listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State collectively as Site Number 915055. Honeywell International, Inc. is the party responsible for managing the Superfund investigations and remediation on those parcels in accordance with an Administrative Order on Consent (Index No. B9-85-2-77D) with the NYSDEC dated February 7, 2020.

3.1 General Property Location

The property is located in a historic industrial area along the Niagara River in Tonawanda, New York. The figure below shows the location of the Property. The area on which the property sits is currently the subject of a landscape design to upgrade the waterfront corridor in the area.



3.2 Vicinity Characteristics

The vicinity is generally characterized by its historical industrial nature with residential properties located in close proximity to the south and southeast. Former industrial properties include a wire manufacturing facility directly to the west on the Niagara River, a former coal burning power plant, and a former rail yard and fly ash disposal landfill to the north.

The wire manufacturing facility is now a Class 2 Inactive Hazardous Waste Disposal Site known to the NYSDEC as Roblin Steel (916056.) Roblin Steel Site contains within it the three operable units of the Envirotek II Site, a former chemical waste treatment and disposal facility. Even though the two sites have difference responsible parties and have been the subject of separate environmental investigation and remedial actions under the oversight of the NYSDEC, the sites share the same registry number. Current businesses nearby include petroleum storage and distribution, aggregate management and a recycling facility. Transecting the site north-south along River Road is a public recreational trail along the former Erie Canal bed and a 41-acre wetland area to the north. There is also evidence of groundwater quality degradation and a localized extraction center to the south of the Site.

3.3 Property Information

Property Information

As shown on the index map the Property subject to this ESA includes:

- The BCP Site that encompasses over 85 Acres to the east of River Road;
- The area from the northwest corner of the BCP site with the historic drain to the Niagara River;
- Site 108, approximately 27 Acres in size along the Niagara River to the west of River Road;

- Site 109, over seven acres in size east of River Road and the west of the BCP Site; and
- Site 110, which is essentially the 4.8-acre disposal area in the northeast corner of the manufacturing parcel.

3.4 Property Characteristics

Most of the acreage of the BCP site is a vacant, environmentally stressed parcel with abandoned coal storage fields, abandoned buildings and other structures, abandoned rail operations, and industrial disposal areas particularly in the eastern areas of the site. The parcels to the west of the site appear to have grown over, obscuring much of the industrial history of the property. Access to the sites is controlled and bank of the Niagara River has been reworked to mitigate somewhat any direct immediate impact posed by the former northern drain.

3.5 Past Uses of Property

The facility was owned and operated from 1917 through 1947 by Semet-Solvay Company, which was a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet-Solvay Company was merged into Allied Chemical Corporation, which owned and operated the facility until January 27, 1978, when it was sold to The Tonawanda Coke Corporation (TCC). TCC operated the facility from 1978 until it filed for bankruptcy protection in October 2018, at which time all operations ceased.

Historically, manufacturing processes used at the plant have included by-products coking, 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 known as coke was used, among other things, in foundries and for the production of steel. The extracted gas was used to fire the subsequent coking operations, to fuel the boiler house, flared or historically was sold as fue1. The liquids and tars were conveyed through pipes to by-products facilities where they were cooled, separated, and processed for sale as raw or feedstock for construction materials and other uses.

Disposal of industrial and construction and demolition (C&D) wastes from plant operations occurred at multiple areas throughout the plant property. Prior to 1978, materials such as tar sludge, fly ash, and cinders were reportedly deposited in the rear of the plant within Site 110. In 1977, an unknown quantity of brick, rubble, and demolition material was also disposed in this area. Allied Chemical was granted permission by the Erie County Health Department in 1973 to establish a new refuse disposal area at what is now Site 108. The area was subsequently filled with refuse, wood, scrap polyethylene, and ceramic saddle packing from refining equipment. The disposal of coke/coal, fly-ash, cinders, and coal tar sludge has also been documented. Additionally, Site 108 formerly included a tank farm consisting of three large above ground storage tanks containing waste coal tar and standing water. These tanks were removed as part of a prior IRM. Coal tar excavations were also performed as part of the IRM.

Site 108 was also used for transferring coal and other materials between the Niagara River, where materials were delivered by barge, and the main plant facility via conveyor belts and pipes.

Between October 2018 and March 2020, the U.S. Environmental Protection Agency (USEPA) conducted emergency response activities to remove gases from pipes and tanks, treat wastewater, and manage stormwater.

3.6 Current Uses of Property

During the TCC bankruptcy proceedings, Powers Coal and Coke, LLC (Powers) of Cleveland, Ohio was awarded the rights to recover coke and coal that was left on the property, to the benefit of creditors. Powers has been conducting recovery operations in the coal and coke yards since November 2018 and was scheduled to complete their operations in June 2020.

3.7 Past Uses of Adjoining Sites and Surrounding Area

Past Uses of adjoining sites included a rail right of way and a landfill/junkyard to the north, Wickwire steel to the west and the Allied Chemical/Tonawanda Plastics site (#915003) located immediately to the south southeast, as well as the historic Erie Canal corridor. Wickwire, currently referred to as the Roblin Steel or Envirotech II site, lies between the Site and the Niagara River and has been the subject of targeted investigations and remediation efforts. Past Uses of properties in the surrounding areas include residential use, commercial and light industrial operations, aggregate management, petroleum storage, chemical manufacturing and product manufacturing.

3.8 Current Uses of Adjoining Sites and Surrounding Area

Most areas immediately surrounding the Property are currently vacant or underutilized, but some residential areas lie within ½ mile of the Site. Many of the past operations discussed above continue at many of the sites in the surrounding area, but, over the years, some have ceased operations.

3.9 Receptors

Receptors to be considered include the residents in surrounding neighborhoods and visitors engaged in recreational activities along the former Erie Canal greenway. The main environmental receptors are groundwater and the Niagara River. Because of planned site redevelopment, future occupants and visitors should also be considered receptors until such time as studies are completed, including vapor intrusion studies if necessary, and any remedies undertaken.

3.10 Nomenclature of General Areas of Interest

For purposes of managing the different conditions at the BCP Site and for the identification of specific areas of investigation, the applicant's consultant gridded the BCP Site and divided it into seven Areas of Investigation (AOIs). This report uses the AOI nomenclature and adds the Superfund sites and Northern Drainage Zone to discuss the locations of various operations and conditions on the Property as follows:

AOI 1 – North Rail Corridor: At 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 property to the former parking area (AOI 3). AOI 1 is bounded to the North by a closed fly ash landfill (unrelated to TCC or the BCP Site), to the east by National Grid high voltage transmission rights of way, to the south by AOI 2, and to the west by AOI 3. The north rail corridor is located along the northern boundary of the BCP Site and contains an abandoned rail spur, scale and scale building, a two-story brick house (the "mansion") that was utilized as office space, a large storm water sump ("mansion sump"), excavated soil piles, and miscellaneous debris/trash and abandoned equipment. The mansion sump is the main collection sump for stormwater from the former production area.

AOI 2 – Former Production Area: At approximately 23.6 acres, the Production Area encompasses the area of the BCP Site where the coke was produced, the area in which by-products were separated and managed, and where the boiler house and other auxiliary equipment was located. This area extends from the western boundary of Site 110 to the former parking area and includes the buildings used for heavy vehicle maintenance and the machine shop. Large areas of this AOI are paved, covered with buildings, or covered by concrete lined secondary containment structures.

AOI 3 – Parking Lot: At approximately 5.8 acres, the Parking Lot represents the property along the western edge of the BCP Site. . 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. The Parking Lot is bounded to the west by Vanocur (the offsite industrial property to the west), the closed fly ash landfill to the north, Site 109 to the south, and production and coal and coke yards to the east The area contains a wood frame building that was historically, and is currently, used for office space. There are three structures on the southeast portion of the parking lot. These structures were used for storage, employee locker/showers, 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 Riverview's Industrial Sewer Discharge permit. The area is largely paved over with asphalt and concrete that is visibly cracked and rutted.

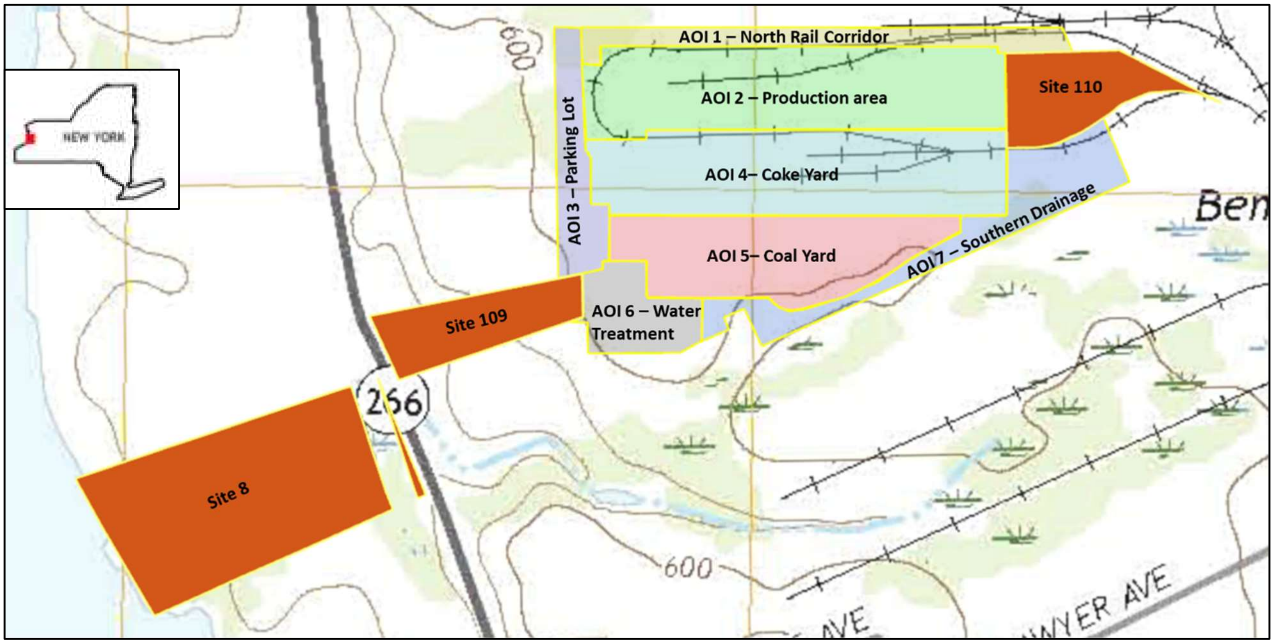
AOI 4 – Coke Yard: At approximately 23.2 acres, the Coke Yard is located in the middle of the facility and includes the coke yard, coal crusher building, coke screening building, the thawing shed and the former coke rail yard and coke conveyor structure. This Coke Yard is surrounded by other AOIs and Site 110. With the exception of the coal crusher building, the coke screening building and the thaw shed, this area is unpaved. Sedimentation Pool #003 is also located within this area.

AOI 5 – Coal Yard: At approximately 16.2 acres, the Coal Yard lies 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 is a conveyor system that bisects and extends the length of the coal yard from west to east. The Coal Yard contains an engineered storm water sedimentation pool in the northwest corner. A coal conveyor tunnel runs from the coal yard (Grid Cell AJ15) to the coal crusher building (Grid Cell Y13, Building No. 63). The Coal Yard also contains the mixing pad (Grid Cells AE24 to AF24), a containment pad with a concrete floor and poured concrete walls.

AOI 6 – Water Treatment: At approximately 5.7 acres, the Water Treatment area is located on the southwest corner of the BCP Site. There is one metal building and two concrete block buildings that are associated with the four (4) large tanks that are also located in this area. In the northern portion of the water treatment area is the last of the engineered stormwater sedimentation ponds, the storm water retention basin. The large aboveground storage tanks within the secondary containment area were fuel and pentane storage tanks (ST21 and ST22) that were later converted for use as components of TCC's process water treatment system prior to discharge to the Town of Tonawanda POTW. Since these equalization (EQ) tanks accepted treated process water via an above-grade piping system from the Ammonia Still located in the former production area, the tanks were used for settling and pH adjustment of the treated process water prior to discharge to the POTW.

AOI 7 – South Drainage Area: At approximately 10.3 acres, the South Drainage Area abuts the southern boundary of the BCP Site. No production processes are known to have occurred in this area but former rail lines, abandoned rail cars, and the South Ditch remain present in this area.

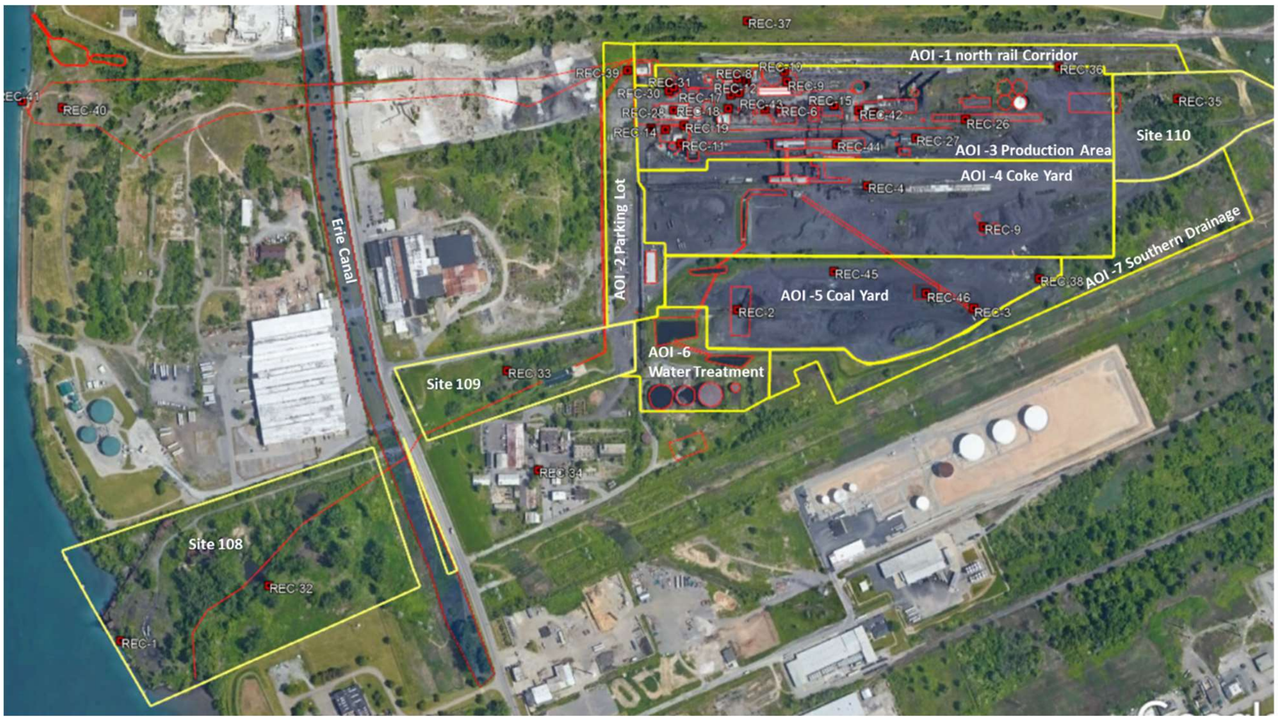
In addition to the seven general AOIs identified for the BCP Site, additional AOIs discussed separately have been identified as Sites 108, 109, 110, and also Roblin Steel and the Northern Drainage Area as shown in the Site Location and AOI Maps below.



4 OPERATIONAL HISTORY AT TONAWANDA COKE

Historic operations associated with the Tonawanda Coke manufacturing facility were examined to determine the potential for the release of petroleum or hazardous substances to the environment. For the purposes of this ESA, historic operations are classified into five general categories: materials management, byproduct management, supporting operations, reported spills and other operations and conditions. Specific operations and events are discussed by category below.

A map of the BCP site and surrounding areas is presented below showing all historical structures, and wastewater lines.



4.1 Materials Management

Operations at the site began as early as 1917. At that time, in the area of Site 108, bituminous coal was received from barges docked in the Niagara River to the southwest and transferred to the Site via an above ground conveyor belt. The coal was then delivered to storage piles by an east-west rail mounted "iron bridge". The earliest coal storage took place in the west-central and mid-central areas of the Site in the vicinity of the AOI-4 Coke Yard. Later, the track for the iron bridge was moved to the south, and storage seems to have been relocated to the south and south-west to what is now referred to as the AOI-5 Coal Yard.

Coal was then transferred to a coal crusher in the mid-central area of the Site and delivered by conveyor across a bridge to a coal bin where it was batch fed into a 60 unit coke oven battery (Battery 1) in the mid-central area of the site, now known as the AOI-2 Production Area. Coke ovens, which may have used coal to start up, were run continuously thereafter with process gas to maintain proper operating temperatures. Batches of coal were cooked in every 7th or 10th oven using a pyrolysis process (heating without oxygen) for a period on the order of 24 hours to generate the carbon coke product. A rail-mounted electric tram then delivered each batch to a water quench unit to the west and offloaded to a coke wharf for rail transit offsite. According to the former Tonawanda Coke website, a second battery (Battery 2) was placed to the east in 1926 with typical quench and wharf units. A tunnel under the batteries served to deliver the oxygen to burn the gas fuel. Off-gases from the coking operations were collected and sent for byproduct recovery.

While it is likely that coal-fired steam boilers were used in the early days to power these processes, it is equally likely that many of these processes converted to other sources. Such sources would have likely included electricity generated onsite along with some from the power grid (supplied by Niagara hydroelectric power and the Huntley plant), as well as diesel-powered engines over time. Fuel management and equipment maintenance, as time goes on, is therefore a concern anywhere along this process. Further, many operations were known to be electrified, such as the tram, and the currents and voltages necessary to conduct such operations would demand a suitable electrical feed. Maps clearly show the presence of a powerhouse near the tram operating area. These operating conditions strongly suggest the presence of transformers, which, as early as the 1930s and for decades after, contained Polychlorinated Biphenyl (PCB) transformer oils.

4.2 Byproduct Management

Although much immediate byproduct management was conducted directly to the north and west of the production operations, in conformance with the RIWP, the nomenclature used herein places this area with the AOC-2 Production Area.

First, not all off gas could be used in the manufacturing process, therefore, for many years, Tonawanda Coke manufactured gas for off-site consumption, transmitting it via a gas supply pipe to carry it to a local gas company plant in the City of Tonawanda. Records show that up to 30 million cubic feet of gas was produced for the town on a daily basis. In order to sell the gas, however, certain hydrocarbons and other materials in the off gas needed to be removed. In fact, many of these materials had economic value, so these byproducts were recovered to the extent possible.

Beyond the management of off-gases, many other byproducts needed to be removed, and, to the extent possible, were recovered to be sold as byproducts. Byproduct management stages are presented in detail below gathered from USEPA documents. Because many of these processes can produce hazardous waste, wastes are discussed in terms of USEPA RCRA Listed Hazardous Waste regulations. While USEPA does not consider many of these wastes hazardous if they are recycled into the coking operation, uncontrolled releases over time at specific processing units could be responsible for elevated levels of hazardous chemicals present in the soil at this time. For instance , according to a 1971 International Joint Commission Report, the plant’s phenol releases to the Niagara River were a recognized concern at that time. Note that in the unit byproduct tables below, 1) many byproducts are listed as “NA” or not applicable because the RCRA hazardous waste listing does not apply; 2) many of the byproducts are further treated as described; and 3) the full byproduct chain is shown here because of the potential for byproducts to have been released to the environment at each of the units described.

4.2.1 Stage 1: Tar Removal

The following operations would have been conducted first to remove tar.

Tar Decanter Unit. The Tar Decanter generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Waste	K060	Ammonia still lime sludge from coking operations.
Waste	K087	Decanter tank tar sludge from coking operations.
Ammonia Liquor	NA	NA

Tar Collection Sump. The Tar Collection Sump generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Waste	K141	Process residues from the recovery of coal tar, including, but not limited to, collecting sump residues from the production of coke from coal or the recovery of coke by-products produced from coal. This listing does not include K087 (decanter tank tar sludges from coking operations).

Tar Dewatering Unit. The Tar Dewatering Unit generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Effluent	NA	NA

Tar Storage Units. The Tar Dewatering Units generate the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Waste	K142	Tar storage tank residues from the production of coke from coal or from the recovery of coke by- products produced from coal.
Waste	K147	Tar storage tank residues from coal tar refining.
Coal Tar	NA	NA

Tar Refining Units. The Tar Refining Units generate the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Pitch	NA	NA
Refined Coal Tar	NA	NA
Creosote	NA	NA
Waste	K148	Residues from coal tar distillation, including but not limited to, still bottoms.

4.2.2 Stage 2: Ammonia Removal

The following would have been conducted next to remove ammonia.

Excess Ammonia Liquor Tank(s). Ammonia Storage does not generate byproducts but could be a source of an environmental release.

Phenol Extraction Unit. The Tar Dewatering Units generate the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition

Sodium Phenolate	K142	Tar storage tank residues from the production of coke from coal or from the recovery of coke by- products produced from coal.
Waste	K060	Ammonia still lime sludge from coking operations.
Ammonia Vapor	NA	NA

Ammonia Absorber Unit. Ammonia Absorber Unit combines refined off gas and Ammonia Vapor with Acid to neutralize the Ammonia. Acid Storage does not generate byproducts but could be a source of an environmental release.

Ammonia Dryer Unit. The Ammonia Dryer Unit generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Sludge	NA	NA
Effluent	NA	NA

4.2.3 Stage 3: Final Cooler

Several operations would have then been conducted mainly to remove naphthalene as follows.

Naphthalene Separator Unit. The Naphthalene Separator Unit further refines the off gas and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Waste	K145	Residues from naphthalene collection and recovery operations from the recovery of coke byproducts produced from coal.

Naphthalene Cooling Heater and Cooling Tower Units. The Naphthalene Cooling Heater and Cooling Tower Units generate the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Waste	K145	Residues from naphthalene collection and recovery operations from the recovery of coke byproducts produced from coal.

Naphthalene Dryer Unit. The Naphthalene Dryer Unit generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Naphthalene	NA	NA

4.2.4 Stage 4: Light Oil Recovery

Next, light oil would need to be recovered. Note that a former chemist at the plant has identified the constituents of light oil as follows:

Light Oil Constituents	Amount Present in Light Oil
Benzene	56%
Toluene	16%
Xylene	5%
Miscellaneous Paraffins, Olefins, and Aromatics	Trace

Any releases of light oil in these byproduct process areas would have likely contained the above Constituents of Concern (CoCs.) The light oil recovery process is discussed below.

Wash Oil Storage Unit. The Wash Oil Storage Unit does not generate byproducts but could be a source of an environmental release.

Light Oil Scrubber Unit. The Light Oil Scrubber Unit combines the further refined off gas with Wash Oil collected from the stripper and separator units described below and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Light Oil Mix	NA	NA
Waste	K143	Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke byproducts produced from coal.

Light Oil Stripper Unit. The Light Oil Stripper Unit uses steam to strip the Light Oil Mix from the scrubber and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Light Oil Mix Feedstock	NA	NA
Light Oil / Water Mix	NA	NA
Waste	K143	Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke byproducts produced from coal.

Stripper Decanter Unit. The Stripper Decanter Unit decants the Light Oil / Water Mix from the stripper and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Wash Oil	NA	NA
Wash Oil Mix	NA	NA
Waste	K143	Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke byproducts produced from coal.

Separator Unit. The Separator Unit receives the Wash Oil Mix from the Stripper Decanter likely along with any aqueous waste from the Condenser Decanter and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Wash Oil	NA	NA
Waste	K144	Wastewater sump residues from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke byproducts produced from coal.
Effluent	NA	NA

Condenser and Condenser Decanter Units. The Condenser Unit receives the Light Oil Mix Feedstock from the Stripper which in turn sends the condensate to the Condenser Decanter and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Aqueous Waste	NA	NA
Light Oil	NA	NA

4.2.5 Stage 5: Desulfurization

Finally the gas would have gone through desulfurization as follows.

Desulfurization Unit. The Desulfurization Unit receives the remaining purified off gas and generates the following byproducts:

Byproduct	Listed Waste	RCRA Hazardous Waste Definition
Sludge	NA	NA
Manufactured Gas	NA	NA

4.2.6 Stage 6: Manufactured Gas Storage

It is not clear whether the string of Gas Purification Boxes to the east southeast of Coke Battery 2 were associated with the desulfurization operation described above or with another process. In particular, contrary to its own written guidance regarding the two known methods of producing manufactured gas, the NYSDEC in its response to public comments to the application stated that the facility was not a Manufactured Gas Plant because the process used was not the same process as that used by manufactured gas plants. However, that the second process, carburetted water gas, was also likely used at the facility, most likely at a later time to improve the quality of the gas. Sanborn maps clearly show the presence of a Water Gas process building at the facility. NYSDEC guidance documents suggest that one of the wastes generated in the carburetted water gas process is cyanide, possibly accounting for why the facility was required to monitor cyanide historically in its water discharges to the Niagara River.

4.2.7 Byproduct Management Locations

The 100 years of activity at this site resulted in the expansion and contraction of the infrastructure that supported the production, refinement, and storage of coke oven byproducts. Waste associated with by-production production and debris from former structures are present on this site. The applicant has designated areas of investigation (AOI) aimed at characterizing the waste that is still present at this site. Our site location map will give the overall location of this site context, and our index maps will show the position of all structures that were present on this site during its history. The index maps and their sub-maps with also show the areas of investigation designated by the applicant and our additional AOI's, which are informed by an in-depth review of the historical documentation that was available for this site. The individual supplemental AOI's will be individually referenced and described later in this document. The yellow features and symbols in the index maps are from the applicant. The red place markers are our recognized environmental concerns (RECs) and inform our AOIs.

4.2.8 USEPA Compounds of Concern from Coke Byproduct Management

EPA Hazardous Waste Nos. K060, K087, K141, K142, K143, K144, K145, K147, and K148 are considered exempt from hazardous waste regulatory classification under RCRA if they are recycled to coke ovens, to the tar recovery process as a feedstock to produce coal tar, or mixed with coal tar prior to the tar's sale or refining. However, given that so much of the manufacturing history at the site happened prior to the advent of environment regulation and given the environmental enforcement history at the site, it is prudent to assume the potential for environmental releases across the byproduct management process. To better understand the chemistry of potential releases from byproducts management at the site, the table below summarizes the waste streams identified by USEPA for coking operations if the waste was not considered to be exempt from hazardous waste regulatory classification.

Table: USEPA Compounds of Concern from Coking Operations

Listed Waste	RCRA Hazardous Waste Definition
K060	Ammonia still lime sludge from coking operations.
K087	Decanter tank tar sludge from coking operations.
K141	Process Residues from Coal Tar Recovery.
K142	Process Residues from Coal Tar Recovery.
K143	Process Residues from light oil processing.
K144	Wastewater treatment sludges from light oil processing.
K145	Residues from naphthalene collection and recovery.
K147	Tar Storage Tank Residues.
K148	Tar Distillation Residues.

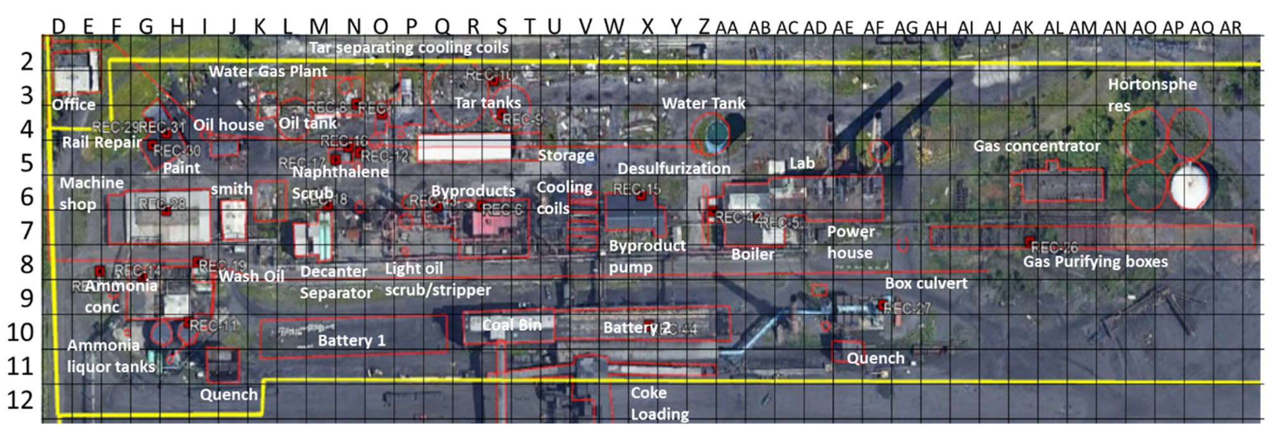
The following table presents a summary of wastes generated at each of the byproduct management units.

Table: Waste Generation by Byproduct Management Unit at Tonawanda Coke.

Byproduct Management Unit	Waste Streams
Tar Decanter Unit	K060, K087, Ammonia Liquor
Tar Collection Sump	K087, K141

Tar Dewatering Unit	Effluent to Storm Sewer
Tar Storage Units	K142, K147, Coal Tar
Tar Refining Units	K148, Pitch, Refined Coal Tar, Creosote
Excess Ammonia Liquor Tank(s)	None
Phenol Extraction Unit	K060, K142, Sodium Phenolate, Ammonia Vapor
Ammonia Absorber Unit	None
Ammonia Dryer Unit	Sludge, Effluent
Final Cooler	None
Naphthalene Separator Unit	K145
Naphthalene Cooling Heater and Cooling Tower Units	K145
Naphthalene Dryer Unit	Naphthalene
Wash Oil Storage Unit	None
Light Oil Scrubber Unit	K143, Light Oil Mix
Light Oil Stripper Unit	K143, Light Oil Mix Feedstock, Light Oil / Water Mix
Stripper Decanter Unit	K143, Wash Oil, Wash Oil Mix
Separator Unit	K144, Effluent to Storm Sewer
Condenser and Condenser Decanter Units	Aqueous Waste, Light Oil
Desulfurization Unit	Sludge, Manufactured Gas
Carburetted Water Gas Unit	Possible Cyanide Waste
Manufactured Gas Storage Units	None
Gas Purifier Boxes	None

A map of the AOI 2- Production Area is presented below with all buildings, structures and wastewater lines labeled.



4.3 Support Operations

Support operations included a variety of operations as described below.

4.3.1 Laboratory

Support operations included a laboratory. An interview with a former laboratory manager at the facility was helpful to understand the types of analyses conducted. In the early days, the lab was likely used for quality control to support the coking and byproduct management operations. For instance, lab measurements showed that the light oil, also referred to as benzol, consisted of at least 50% benzene with the remaining half composed of toluene, xylene and similar compounds. It is also likely that quality assurance for other economically viable products such as naphthalene, pitch, refined coal tar and creosote was also conducted. By the late 1970s, the lab was also analyzing plant wastewater for cyanide, pH and other parameters. While various aliphatic and aromatic solvents were likely used at the lab, the use of chlorinated solvents was not reported.

4.3.2 Machine Shop

Support operations included a machine shop. The preponderance of heavy equipment used for coal and coke transport at the site suggests the machine shop was likely quite busy with equipment fabrication and repair. Prior to the 1940s, it is likely that and oils and solvents used were aromatics from the benzol recovery operation. In later times, most machine shops moved to the use of chlorinated solvents. Although such a move at this facility is unknown, the presence of chlorinated aliphatics in samples collected in previous site investigation work suggests they were used someplace on the site, so the machine shop is the most likely location for the usage of such compounds.

4.3.3 Locomotive Repair

Support operations included locomotive repair. Rail transport was used extensively at the site. Early on, coal-fired steam would have powered the worker engines. Later, facility rail operations would have migrated to diesel-fired electric engines. It is common for railyards with diesel engines to have used Polychlorinated Biphenyls (PCBs) and inadvertently released them to the environment. It is also likely that this shop used a similar suite of solvents as the machine shop.

4.3.4 Rail Operations

Support operations included a plethora of rail operations. Given the age of the facility and the rail operations, it is likely that any railroad ties left on the site will have been treated with creosote and not with pentachlorophenol. Worker engines may have also applied small amounts of oil for bearing lubrication, building up over many years in areas with rail siding. In addition, a significant amount of diesel fuel may have needed to be stored and may have been released during filling operations.

4.3.5 Paint Shop

Support operations included a paint shop. Environmental concerns from painting operations mainly center around the use of volatile organic carriers and paint pigments, as well as associated degreasing operations necessary to apply the paint to objects. Specifically in paints, the use of aromatic carriers such as xylenes are typical, as well as the preponderance of lead in the paint that would have been historically used on facility equipment. In addition, the use of chlorinated solvents would also be expected in degreasing operations.

4.3.6 Locker Rooms

Support operations included Locker Rooms. The only specific concerns with older buildings would be construction materials such as asbestos, lead and PCB ballasts in older fluorescent light transformers. If such buildings remain on site, such items might be cause for concern in building demolition. If such buildings were already demolished and disposed of on-site, a condition may exist at the disposal location.

4.3.7 Offices

Support operations included offices. Likewise, the only specific concerns with older buildings would be construction materials such as asbestos, lead and PCB ballasts in older fluorescent light transformers. If such buildings remain on site, such items might be cause for concern in building demolition. If such buildings were already demolished and disposed of on-site, a condition may exist at the disposal location.

4.4 Reported Spills

Spill numbers were collected and reviewed for the site. Three sources were used to determine the spill numbers, the NYSDEC Sills Database, the EDR Radius Report, and the BCP application. Using each source respectively and eliminating duplicate spill numbers, a total of 32 spills were reported at the site. The tale below shows the total count of unique spill records discovered.

Table: Tonawanda Coke Unique Spills Summary

Unique Spill Report Source	Count of Unique Spill Numbers
NYSDEC Spills Database	18 Unique Spill Numbers
EDR Radius Report	10 Unique Spill Numbers
BCP Application	4 Unique Spill Numbers

nygeology cannot determine the reason for the differences in spill reporting. Notably, however:

1. The NYSDEC Database first began recording spills in in 1978 yet the first spill at Tonawanda Coke was reported in in 1993;
2. Only one spill was recorded in the ten-year period leading to the second spill report in 2003; and, then
3. Only one spill was recorded in the four-year period leading to the third spill report in 2007.

Given the 29 remaining spills reported from 2010 to the closing of the site, the lack of spill reporting over time suggests that spills were common across the operational history of the site and that many more undocumented spills may have occurred. As also recorded in many documented spill numbers, undocumented spills by definition would have not recorded the location of the spill, materials spilled, or amount of material released. Documented spills sorted by spill number, date and NYSDEC status are included as an Appendix. For the purposes of this ESA, spills are summarized below:

Table: Tonawanda Coke Spill Summary

Spill Number	Year	Spill Summary

9306743	1993	Closed by NYSDEC, no SCGs referenced. Diesel. Location and amount unreported.
210041	2003	Closed by NYSDEC, no SCGs referenced. Material, location and amount unreported.
750710	2007	Closed by NYSDEC, no SCGs referenced. Transformer oil. Location and amount unreported.
890582	2008	Closed by NYSDEC, no SCGs referenced. Material, location and amount unreported.
1006190	2010	Closed by NYSDEC, no SCGs referenced. Material, location and amount unreported.
1012929	2011	Closed by NYSDEC, no SCGs referenced. Petroleum. Location and amount unreported.
1304545	2013	Closed by NYSDEC, no SCGs referenced. Tar. Location and amount unreported.
1406188	2014	Closed by NYSDEC, no SCGs referenced. 50 gallons spilled. Material and location unreported.
1304471	2013	Closed by NYSDEC, no SCGs referenced. 60 Gallon tar spill. Location unreported.
1310569	2014	Closed by NYSDEC, no SCGs referenced. Coal tar. Location and amount unreported.
1310569	2014	Closed by NYSDEC, no SCGs referenced. Coal tar. Location and amount unreported.
1406697	2014	Closed by NYSDEC, no SCGs referenced. 60 gallons of caustic soda. Location unreported.
1600522	2016	Closed by NYSDEC, no SCGs referenced. 11 gallons of hydraulic oil. Location unknown.
1605698	2016	Closed by NYSDEC, no SCGs referenced. 0.25 gallons of hydraulic oil. Location unknown.
1207205	2012	Closed by NYSDEC, no SCGs referenced. Auto waste fluids. Location and amount unreported.
1311845	2014	Closed by NYSDEC, no SCGs referenced. 5 gallons of hydraulic oil. Location unknown.
1506305	2015	Closed by NYSDEC, no SCGs referenced. Unknown petroleum. Location and amount unreported.
1603606	2016	Closed by NYSDEC, no SCGs referenced. Unknown petroleum. Location and amount unreported.
1509056	2015	Open spill. 5,000 L tar. Location unknown.
1707802	2017	Open spill. 50 gallons diesel. Location unknown.
1411461	2015	Open spill. 25 gallons hydraulic oil. Location unknown.
1312043	2014	Open spill. 1-gallon hydraulic oil. Location unknown.
1312126	2014	Open spill. 30 gallons hydraulic oil. Location unknown.
1400418	2014	Open spill. 30 gallons hydraulic oil. Location unknown.
1402754	2014	Open spill. 0.25 gallons hydraulic oil. Location unknown.
1402932	2014	Open spill. 2 gallons motor oil. Location unknown.
1403658	2014	Open spill. 0.5 gallons hydraulic oil. Location unknown.
1404225	2014	Open spill. Unknown petroleum. Location and amount unreported.

1404294	2014	Open spill. 5 lbs. hydraulic oil. Location unknown.
1803893	2018	Sodium hydroxide. Amount unreported.
1804001	2018	Open spill. Unknown petroleum. Location and amount unreported.
1908744	2019	Open spill. Hydraulic oil. Amount unreported.

Each reported spill is analyzed for its potential to be considered a Recognized Environmental Conditions elsewhere in this ESA.

4.5 Other Environmental Releases

Other potential concerns included certain known environmental releases, a conveyor tunnel, the storm sewer system and the permitted outfall, as well as the main tunnel collapse and a number of major fires. Information from certain known environmental releases is available in a series of previous site assessment reports, site remediation reports and other supporting documentation from NYSDEC Superfund Sites 108, 109 and 110 associated with Tonawanda Coke operations. In addition, a number of other potential release sites have also been identified. Information known about each of these potential release sites is summarized below.

4.5.1 Superfund Site 108:

Site 108 was used as dock to offload coal and ship finished coke from 1917 through at least 1966. By 1938 the conveyor that moved material from site 108 to the coke plant was put into an underground tunnel. There was a large drainage ditch that transected site 108 and ended in a settling pond before terminating in the Niagara River. Sometime between 1966 and 1978 site 108 transitioned from the shipping and receiving center to a landfill. The aerial photos show that material was being dumped in 1978 on the eastern half of the site. By 2002 the site had been covered and was no longer in use.

4.5.2 Superfund Site 109:

The area to the south of 109 remained undeveloped through at least 1938 based on aerial photos of the area. There was a single road that ran along the northern border of the site that led to the parking area for the coke plant. By 1959 the land to the south of 109 had been used to build the plastics plant. The site was largely unchanged about 1978 when the eastern portion of the site was used for material storage and a landfill. The western boundary of the site along River Road was also being used as a landfill at this time. By 2002 the site had been covered and concrete settling ponds had been installed in the eastern half of the site. These ponds received drainage from the southwestern portion of the coke plant and discharged directly into the western half of 109. There are currently large trees on the site suggesting a lack of activity since 2002.

4.5.3 Superfund Site 110:

Site 110 began to be used as a landfill and a coal pile storage site sometime between 1938 and 1959. By 1962 a large rectangular building was constructed on the site. This building was located approximately 50 meters from the Hortonspheres and gas purifying boxes. The 1967 Sanborn map of this site did not show this building or identify its purpose. By 1978 the building had been removed and the northern half of the site was used to store coal in large piles. By 1983 it appears that most of the coal had been removed and the site was used primarily as a landfill. By 2006 large trees had begun to grow in the southeastern portion of site 110 and large piles of white debris were present on the northern half of the site. By 2009 the entire eastern half of the site became heavily vegetated and the western half was used to store coal.

4.5.4 Other Potential Release Sites

A number of other potential environmental release sites are also of concern as described below.

Refractory Brick Disposal Areas. An uncontrolled disposal pile in the north-west quadrant labeled as a "Coal Pile" clearly shows a white debris pile of unknown origin. A former plant superintendent stated in an interview that a large amount of refractory brick had been buried on the site. Several areas -- including this area, the area found to be up to 25 feet deep in previous site investigations and a third area that appears as a berm to the south of the main plant entrance on River Road – are all candidate sites for refractory brick disposal

Suspect Rail Car Disposal Areas. Several objects appeared in a 2020 Google Maps aerial photo which clearly appear to be half-buried rail tanker cars at two locations. No other information is known about these objects.

Mixing Pad. Near the east end of the current iron bridge track there appears to be the mixing pad where coal tar was mixed with coal. The concrete slab (18 x 31 meters) first appeared in the 2002 aerial photo of the site. The mixture of coal and tar was loaded from this pad into the opening of the conveyor tunnel.

Conveyor Tunnel. A conveyor tunnel exits at the east end of the current iron bridge track to carry coal to the coal bin. This tunnel is likely to now be filled with water and could have collected release substances.

Sumps. Some sumps are specifically considered as parts of byproduct recovery units. Any other sumps will be reported here.

Floor Drains. Floor drains will be identified on the site plan. While certain outdoor drains are expected in the quench areas and byproduct management areas, other floor drains of interest were likely present in the painting building, machine shop, locomotive shop and laboratory.

Sewer System. Since the earliest drain maps for the site show offsite water discharge at the northwest corner of the property, it is likely that the original site sewer system terminated in the Erie Canal until it was filled in around 1930. Early in the history of the site the canal was filled in and the sewer lines were extended to the Niagara River. Until modern metal culverts entered wide use, systems were constructed of clay pipes with bell fittings designed to allow for leakage. Given the clay reported to be present at the site, any effluent entering the sewer system is likely to have traveled along the pipes and the surrounding conduits of higher permeability fill, as can be seen on the above maps, out to the Niagara River. It is also likely that this effluent discharged into the higher permeability backfill in the former Erie Canal channel which could discharge to the wetland area to the north.

Settling Ponds at Northern Niagara River Outfall: Two settling ponds off the northwestern corner of Roblin Steel Site was observed in the 1978 aerial photo. Both ponds were located on Rattlesnake Island land between the filled channel and the Niagara River. Based on information gathered from a former plant hydrologist, this settling pond was fed by an underground culvert that collected sanitary waste and storm water from the coke plant. The water would leave this pond and enter the Niagara River via an outfall. By 2002, only the smaller pond was present in an aerial photograph. The pond was present on the site through 2002 and was filled in before 2006. The soil underneath and near the ponds may include residual contamination associated with settling.

Northern Niagara River at Historic Outfall 001/Former Outfall 003. Recent color aerial photos reveal discoloration at the former storm sewer outfall into the Niagara River. Direct discharge to the Niagara River from the Tonawanda Coke sewers and, later, also from the settling ponds, was likely.

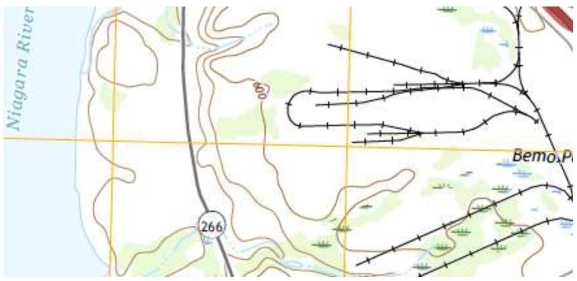
Other Uncontrolled Events. Other uncontrolled events included major fires at Battery 2 and the By-Products Building. The fire at the by-products building limited the plant's ability to process and remove by-products from the gases produced during the manufacture of coke. Uncontrolled events also included the major Battery 2 Tunnel Collapse. Other known major fires also occurred in underground tanks, the excess heat tunnel, and in some of the other building in the plant. Any leakage or runoff associated with these events, and, in particular, the use of firefighting foams, also poses and environmental concern. Such concern includes the possibility that polyfluorinated (PFOS/PFOA) firefighting foams were used to control these major fires, thus introducing PFOA/PFOS contamination to the Property. NYSDEC listed PFOA and PFOS as hazardous substances in 2017 (6 NYCRR 597.3).

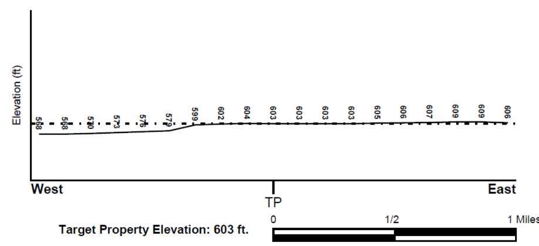
5 PHYSICAL SETTING INFORMATION

This ESA report examines the potential sources of releases of petroleum and hazardous substances to the environment, and an ESA report section on physical setting is usually standard, however, since the Property is known to be environmentally impacted and under enforcement, this section can become essential in evaluating work plans created to investigate the releases. Therefore, pathways for contaminant migration are addressed specifically as part of this report section.

5.1 Topography

The Property sits in proximity of the Niagara River. The 7.5 Minute USGS Topographic Map for the Buffalo NW Quadrangle is shown below to the left, along with an elevation profile prepared by EDR as part of its GeoCheck service contained in its Radius Report for the Property.





Topography drops from an elevation of over 600 feet above mean sea level (ft AMSL) to less than 570 ft. AMSL from the BCP parcel to the river. Inventum reports that a topographical survey of the Site 110 and the BCP Site was conducted in November 2019 by Niagara Boundary and Mapping Services, a New York State licensed surveyor. The topography of each parcel is presented below from highest elevation to lowest:

Site 110 Topography: A mounded area about 200 feet by 300 feet in size in the southwest corner of Site 110 where the topography is about six feet higher than the surrounding ground suggests that Site 110 could be a disposal area. There is a slight topographic low to the southeast of 110, occupied by a marshy wetland area that locally dips slightly towards a drainage ditch, which runs northeast to southwest through the Site.

BCP Site Topography: Inventum reports that the natural elevation of the BCP Site is generally flat with a slight downslope from east to west and north to south. Natural elevations range from approximately 600 ft. AMSL on the western boundary (AOI 6) of the BCP Site to 608 ft. ASML on the eastern boundary (AOI 1). There are various debris piles and coal/coke piles that are (or were at the time of the survey) elevated above this natural grade. The average elevation of the former production area (AOI 2) is approximately 606 ft AMSL.

Site 109 Topography: A steep slope extending downward to River Road. There are reported to be several mounds and a large berm throughout the east end of the site.

Site 108 Topography: Site 108 terminates at the Niagara River to the west. The site is reported to have an undulating surface in portions with two large berms oriented north south.

5.2 Surface Water

Regionally, the Niagara River located to the west of the Property flows north toward Niagara Falls, connecting Lake Erie to the south and Lake Ontario to the north. Surface water flow at the Property has changed over time. According to the 1948 USGS topographic map, the Property appears to sit at a slightly higher elevation than its surroundings. It seems that, historically, all water from the Property has discharged either directly or indirectly into the Niagara River.

Surface water in the southeast corner of the BCP in the area of Site 110, which is relatively remote from current stormwater management system at the Property, flows towards a topographically low marshy area. The 1948 topographic map shows the marshy area to be the west side of Site 108 which presumably discharged into the channel to the east of the Rattlesnake Island. This channel, shown on the 1901 topographic map but now infilled, separates the east and west portions of Site 108. By the 1970s, stormwater management became regulated through State Pollution Discharge Elimination System (SPDES) permits. The following outfalls were regulated:

Outfall 001: Located on Site 109, this outfall discharged non-contact cooling water, boiler blowdown and stormwater runoff from the former production area after treatment in two concrete-lined settling/skimming ponds/lagoons located on the site;

Outfall 002: This outfall discharged runoff from the coal and coke yards located on the 3875 River Road parcel; and

Outfall 004: This outfall combines flow from Outfalls 001 and 002, discharging to a drainage ditch on Site 109 on the east side of River Road where it combines with flows from other industrial properties north and south of Site 109 and the ditch draining site 110. The combined flow is then conveyed through a culvert under River Road, into a drainage ditch on Site 108, and finally to the Niagara River. The impact from discharges originating from other industrial properties north and south of Site 109 is not known and is not regulated through the means of a discharge permit.

At a later point in the history of the facility, two concrete-lined settling/separation ponds at Outfall 001 and a series of earthen settling/sedimentation basins in the coal and coke yards hydraulically upgradient of Outfall 002 were installed. Because of ongoing work at the Property Riverview is managing stormwater flow at this time.

For much of the operational history in the production areas of the property, however, most culverts, sumps and storm drains were directed to a discharge point on the Niagara River to the north of the former Wickwire Steel plant to the west. Prior to redirecting all water flow to the current SPDES-regulated system, historic maps clearly show all site discharge following this northern pathway. For the first ten years or so of operation, discharge may have been directly to the Erie Canal. Following the infilling of the canal, drainage was extended to the Niagara River to a point we assume to have been called Outfall 003, which dropped from the SPDES permit after system modifications redirected flow around the early 1980s. In the 1970s, a series of settling ponds, clearly visible on aerial photos, were dug near the Niagara River Outfall to control particulate discharge to the river. The drainage pathway to Outfall 3 must have crossed this slag-filled channel prior to the settling ponds. According to senior employees at Tonawanda Coke, this area was the subject of NPDES testing at the time. The ponds were later filled in, most likely when the SPDES system upgrades made them obsolete. No closure reports or documentation exists for the filling in of these ponds, and it is unknown whether the material in the ponds was dredged prior to closing or remains in situ. It is also unknown whether the ponds have been capped or retrofitted with a synthetic liner, however unlikely. Although this outfall is no longer in active use, it may still collect water along its corridor and discharge it to the river.

5.3 Soil

The soil across much of the property is classified by the USDA SCS Urban Land. The soil underneath and exposed to the south is reported by the USDA SCS to be the Odessa Silt Loam. The Odessa Silt Loam is reported to have a high corrosion potential for uncoated steel.

5.4 Wetlands

nygeology has identified wetlands as follows from the following descriptions in reviewed documents:

According to the NYSDEC Environmental Resource Mapper, there are no State Regulated wetlands on or adjacent to Site 110. A 41-acre State Regulated Freshwater Wetland, designated BW-6, borders Site 110 to the south and east. Based on the NYSDEC Environmental Resource Mapper, it does not appear that any portion of the wetland falls within the Site 110 boundary. However, a portion of Site 110 falls within the State Regulated Freshwater Wetland Checkzone, a zone that represents uncertainty regarding the wetland boundary. It is possible that an estimated 0.2-acre of that potential wetland could extend onto the BCP Site, but a site-specific jurisdictional wetland delineation is not available at this time.

According to the U.S. Fish and Wildlife Service National Wetlands Inventory, there is a portion of a 1.74-acre Freshwater Emergent Wetland with a classification of PEM1B located to the southeast and a Freshwater Forested/Shrub Wetland located to the south on the east side of the former TCC Facility. Neither of these wetlands border Site 108, parallel to River Road. The drainage ditch running from Site 109 through Site 108 is considered a 2.11-acre riverine habitat with a classification of R4SBC.

5.5 Geology

While much is known about the general geology in the area, the Site Geology has not been well characterized. nygeology has reviewed geological information presented in previous reports and work plans as presented in Section 7.2 of this ESA and compiled the following comprehensive summary of geology across the Property.

5.5.1 Regional Geology

In 2007, NYSDEC Region 9 in Buffalo released a special report on the geology and hydrogeology of the southwestern portion of the Town of Tonawanda. The northern portion of the NYSDEC study area included the study area under review in this ESA. The NYSDEC description of the regional geology in the area is summarized in the following paragraph.

Tonawanda is located within the Erie Niagara drainage basin of the Ontario Lowlands physiographic province of New York State. This basin borders Lake Erie and the Niagara River to the West and includes the ESA study area. Of the four major episodes of glaciation in North America, two reached Western New York. At the end of the second and final episode of glaciation, proglacial lakes formed during the final retreat of the Wisconsin ice sheet, inundating Western New York and depositing stratified lacustrine clay, silt, sand and gravel sediments. Bedrock in Western New York consists of a thick sequence of Shale, Sandstone, Limestone and Dolostones deposited during the Silurian and Devonian periods. Bedrock generally strikes in an East-West Direction approximately paralleling the Niagara and Onondaga escarpments and dips to the South at approximately 30 to 40 feet per mile. Erosion and weathering, however, have produced local differences in the bedrock surface configuration. The uppermost bedrock formation that underlies the study area is the Camillus Shale formation of the Salina Group. The upper 10 to 25 feet of the Camillus Shale is known to be heavily weathered containing abundant fractures enlarged by dissolution.

5.5.2 Local Geology

In addition to the NYSDEC study cited above, detailed geological studies were made of the nearby Tonawanda Site, consisting of the Linde Center and Ashland 1, Ashland 2, and Seaway Industrial Park properties which were radioactively contaminated by uranium ore processing and associated disposal activities in the 1940s and '50s. The Linde site is about 1.8 miles ESE of the BDP Site, and the non-contiguous Ashland 1, Ashland 2, and Seaway properties range from about 0.4 to 1.2 miles north northeast of the ESA Study Area. Of the many reports prepared on these Linde-Ashland-Seaway properties, one of the most comprehensive is the 740-page Volume I of the *Remedial Investigation Report for the Tonawanda Site* prepared for U.S. Dept. of Energy (USDOE) by Bechtel (Bechtel, 1993). A cross section from that report is presented below showing the generalized geology in the local area.

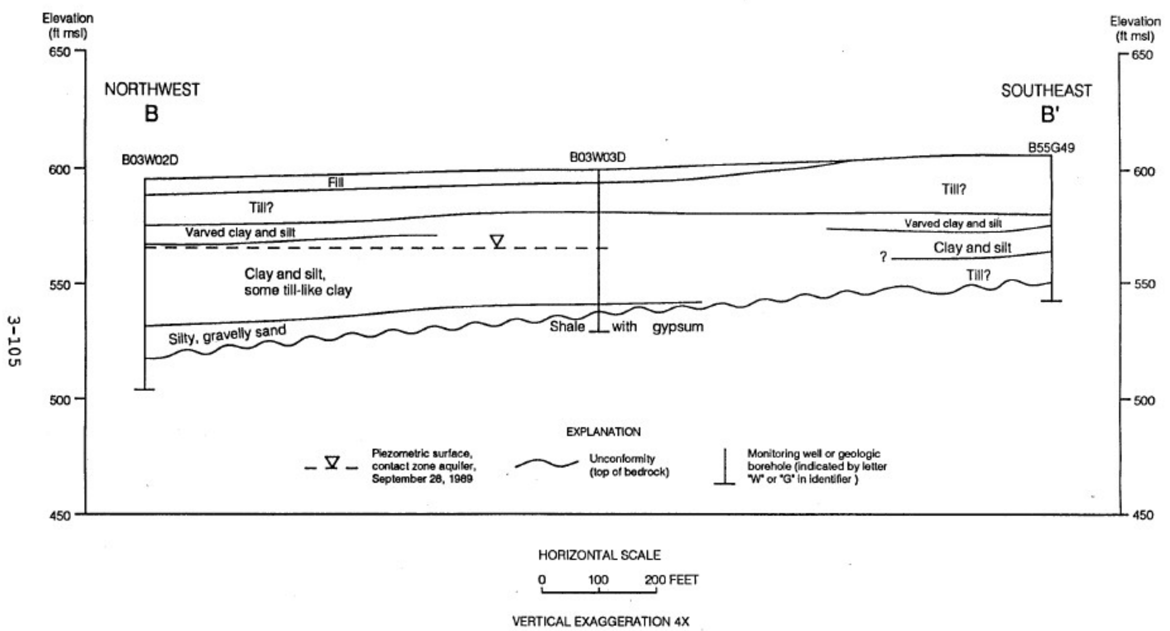


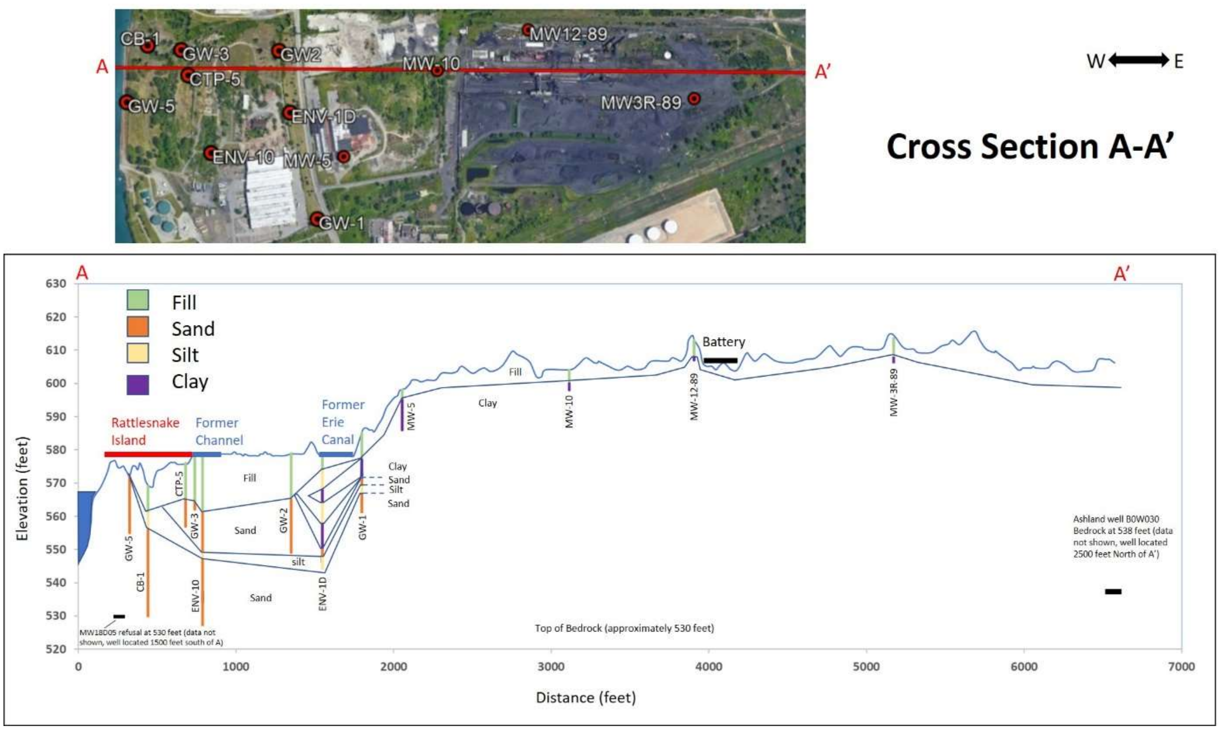
Figure 3-27
Geologic Cross Section B-B' at Ashland 1, Ashland 2, and Seaway

4.91 6863.2

5.5.3 Study Area Geology

Information from Bechtel , combined with remedial investigation results from other nearby sites such as the former Huntley Power Plant and Roblin Steel, provides an excellent framework for the geologic and hydrogeologic characterization of the ESA study area.

Extensive work at the nearby Huntley facility indicates that the geology is complicated by mixed alluvial deposits complexly stratified both horizontally and vertically due to deposition by the Niagara River. nygeology has also reviewed logs of dozens of test pits, borings and wells from dozens of investigations, including those from the three Superfund Sites, the BCP Site, and the Roblin Steel Site, to develop a more complete Conceptual Site Model of the ESA Study Area The cross section below presents the resultant geological information from east to west to define the geological conditions across the ESA Study Area.



The geology of specific areas of the subsurface necessary to understand the hydrogeological connection between areas of environmental concern and the Niagara River is discussed below.

Deposits near the Niagara River: Site 108, the closest ESA Study Area Site to the Niagara River, was reported as underlain by gravelly sands, sandy silts, clayey silts, and silty sands, the gradation and thickness of which are highly variable. This agrees with the geology of the Huntley site almost immediately to the south. In one area at Huntley, the fine sand, silty sand and silt deposits are approximately 15 feet thick on the east side of the site and thin to approximately 5 feet thick near the river. In another area at Huntley, the clay unit ranges from a thickness of 24 feet adjacent to River Road to being absent adjacent to the river. The thinning of these layers toward the river is likely due to erosion by the Niagara River.

Rattlesnake Island: The 1901 USGS topographic map clearly shows the presence of Rattlesnake Island and the channel separating it from land along the western edge of Site 108. The channel was subsequently filled, and the 1948 USGS topographic map shows the Wickwire Steel plant and associated railroad tracks occupying the former island and filled channel. Relatively permeable slag may have been used to fill this channel, the base of which was likely in the neighborhood of 555 ft AMSL.

Former Erie Canal: Another important geological interruption in the overburden is the presence of the north-south trending former Erie Canal bed immediately west of River Road. The original Erie Canal had a depth of 4 feet but by 1862 had been deepened to 7 feet over its entire length, with the far western end having generally greater depth and width because of its water-supply role (it needed to transmit Lake Erie water eastward as far as Montezuma to offset leakage and maintain the 7-foot water level in the canal). As discussed by N.E. Whitford in the *History of the Canal System of the State of New York* (Albany, 1906) and by W.B. Langbein in USGS Water Supply Paper 2038 *Hydrology and Environmental Aspects of Erie Canal* (USGS, 1976), by 1893, the canal was deepened to 12 feet at Black Rock, and to 18 feet at Erie Basin in Buffalo. Thus, when the canal between Buffalo and Tonawanda was abandoned in 1918, its depth was at least 7 feet and probably twice that depth. Abandoned sections were not filled immediately – in 1923, the Tonawanda *Evening News* announced the infilling of the former canal, work on which was not completed till at least early 1930 – but when it was filled, the fill material typically had a higher permeability than the surrounding native geological materials. Slag from the adjacent Wickwire Steel plant may have been used as fill, resulting in high permeability. Wickwire slag was variously used for fill and as a base for road construction. In *Canal Boatman* (Garrity, 1977), Richard Garrity describes working in the summer of 1917 on canal boats that carried slag from the Wickwire Steel plant to various road construction projects. While this precedes the time when the canal between Buffalo and Tonawanda was filled, it illustrates the availability of the slag byproduct from Wickwire. In any case, the base of the filled canal prism at Site 108 is at an elevation no higher than 564 ft AMSL and probably closer to 557 ft AMSL.

As can be seen in the cross section, the data are in good agreement with local and regional geological interpretations provided earlier; however, further to the east the lack of penetration of boreholes, test pits and wells to any significant depth indicates a lack of geological understanding beneath the BCP Site. The geology of the BCP site is discussed further below.

5.5.4 BCP Site Geology

Near-surface characterization is generally not at issue. As reported above in the topography section of this report and echoed in the BCP work plan, with the exception of some possible additional fill placement in the area of Site 110, the geological surface horizon at the BCP Site ranges from 608 ft. AMSL to 600 ft. AMSL with an average elevation of the former production area (AOI 2) of approximately 606 ft AMSL.

As data from various investigations show in the cross section, the basic shallow geology at the BCP Site generally consists of a layer of fill underlain by clay with occasional sand lenses. The first layer of unconsolidated material at the BCP Site is mainly fill material related to production operations.

The fill covers the top few feet of natural materials which likely begin closer to a 600 ft. AMSL elevation. Natural material underlying the fill consists of mixed glacial deposits mainly of a red to brown silty clay which is known to extend at least 0.3 miles to the south. These glacial deposits could be in the range of 40 feet thick at the BCP site therefore possibly ranging in elevation from 600 Ft. AMSL to 560 ft. AMSL.

Because of the shallow depth of drilling on the BCP Site, the depth of the clay unit is unknown at this time. As can be seen in the cross section, no information is available regarding presence or extent of the silt and sand units that appear under this clay unit directly west of the site. Likewise, bedrock depth can only be speculated across the ESA study area as a whole.

Bedrock is reported to be the Camillus Shale, a gray-green to gray-brown dolomitic thinly bedded shale. However, The Camillus is known to be susceptible to dissolution, and reports of Rock Quality Designations of this unit at Huntley indicate that the top of rock is thinly bedded and weathered possibly measured up to 20 feet in depth from its surface. The weathered surface of the Camillus is therefore expected to lie between 510 ft. AMSL and 530 ft. AMSL prior to reaching somewhat more competent bedrock at lower elevations. Given an elevation of less than 570 feet MSL at the river, direct contact of the Camillus with the Niagara River channel is not likely.

5.5.5 Geological Data Gaps

Site characterization of the natural material underlying the fill is insufficient. With one exception, borings in the ESA Study Area have been too shallow to penetrate the glacial/postglacial overburden and reach bedrock, resulting in inadequate characterization of the overburden and a nearly complete lack of data on the depth and topography of the top-of-bedrock surface beneath the site. The one exception is well MW-18D-05 which encountered auger refusal, apparently top of bedrock, at 42.5 ft depth or about 530 ft AMSL, consistent with top-of-bedrock data from the adjacent Roblin Steel site. Based on existing data, it is not possible to determine if the natural material underlying the fill is an aquiclude, or sufficient aquitard, such that no contamination could possibly reach the upper bedrock aquifer.

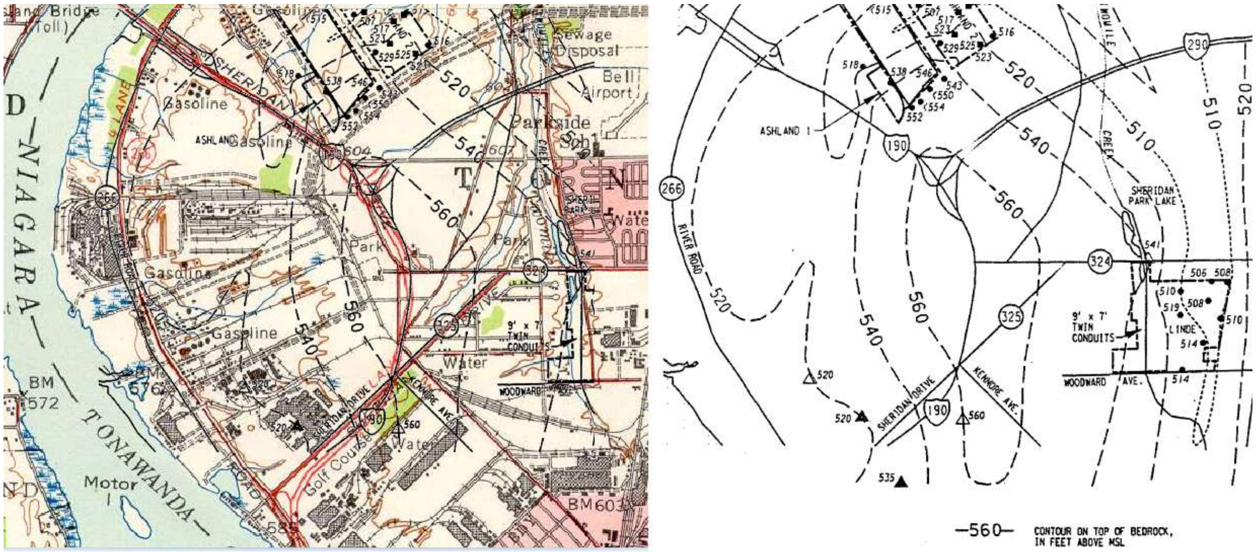
In summary, under the surficial fill near the BCP Site lies a poorly characterized sequence of glacial/postglacial overburden and Camillus bedrock. It is not possible to tell, based on the limited shallow data depth at the BCP site, whether the uppermost weathered Camillus bedrock is hydraulically connected to the river overburden that grades and thins to sandier river deposits which could discharge into the Niagara River. Further, the potential geological connection between environmental conditions and the two filled channels (Erie Canal and the Rattlesnake Island channel) as well as the Camillus Shale also needs to be documented.

5.6 Groundwater

Groundwater flow in the NYSDEC Study area of southwestern Tonawanda is generally toward the Niagara River. However, seasonal pumping centers in bedrock and the overburden units in the vicinity of the river can complicate flow. Regional and local hydrogeology, as well as the hydrogeology of the ESA Study Area and the BCP Site, are discussed below.

5.6.1 Regional and Local Hydrogeology

In the 1993 USDOE *Remedial Investigation Report for the Tonawanda Site* discussed earlier, Bechtel describes the Camillus upper bedrock aquifer as a "contact-zone aquifer at the contact between basal unconsolidated materials and weathered bedrock" and that "fractures, cracks, joints, solution features, and weathered gypsum and gypsiferous shale in the upper part of the bedrock, in conjunction with a thin zone of relatively coarse-grained glaciofluvial deposits underlying the glaciolacustrine deposits, constitute the principal water-bearing interval at the Tonawanda site." Their Fig. 3-22, a contour map of the irregular top-of-bedrock surface that defines the aquifer, encompasses not only their Linde-Ashland-Seaway sites but also the Property and the entire ESA Study Area. Part of their figure is shown below in the right-hand panel and is superimposed on the 1948 USGS topographic map in the left-hand panel.



Of particular interest are the two heads of bedrock valleys seen in the 520-ft elevation contour, one approaching the 110-BCP Property from the south, the other from the north. If mapped correctly, these favor southward flow in the aquifer beneath the southern part of the Property, and northward flow in the aquifer beneath the northern part of the Property, with the western part of the aquifer beneath Sites 108 and 109 flowing westward toward the river. Eastward flow toward the Linde site is not expected due to the north-south trending bedrock ridge (>560 ft AMSL) between the Property and Linde. Well MW-18D-05 and nearby Roblin wells suggest that the 520-ft contour on the above map may need to be shifted a short distance *west* of River Road, but such a minor revision would not substantially change the westward slope that descends from the 560-ft bedrock ridge.

To complicate matters further, the 2007 NYSDEC special report was precipitated by a State Superfund Investigation of the Polymer Applications site just south of the ESA Study Area which discovered a seasonal depression the water table in the bedrock aquifer of over 30 feet. The depression was attributable to the large volumes of water extracted by a local production well for the Dunlop Tire (now Sumitomo Rubber) facility. It is also possible that the contact-zone aquifer depression could be receiving groundwater from under the BCP Site, but it is not currently possible to say since there are no wells in that zone to complete the map.

5.6.2 Study Area and BCP Site Hydrogeology

The top of groundwater across the ESA Study Area appears to remain roughly five feet below the ground surface across the Property until its discharge into the Niagara River. While shallower water would likely be travelling in the fill, the more variable nature of the underlying geology and increase in coarser-grained sediments closer to the river suggest that these higher permeability units could also be involved in any potential contaminant discharge to the river. NOAA charts show river soundings in the area out past the bank before the navigable channel at up to 20 feet deep. Given the elevation and geology of the riverbank and channel, groundwater discharge to the Niagara River is likely taking place in the weathered zone exposed to the river.

The extent to which clay that underlies fill, especially at the BCP Site, acts as an aquiclude or aquitard is currently unknown for several reasons. First, clay and silt lenses are less prevalent and more variable near the river. In addition, potential for contaminant migration in groundwater into and away from the higher permeability, possibly slag, backfill in both the former Erie Canal and the former Rattlesnake Island channel is also not known. Lastly, the depth of the clay is unknown, and it is not known whether any foundations may have penetrated it, which will be discussed in greater detail shortly.

As previously stated, bedrock beneath the ESA Study Area is recognized as Camillus Shale, a gray-green to gray-brown dolomitic thinly bedded shale. The Camillus and its gypsum inclusions are known to be susceptible to dissolution, and reports of Rock Quality Designations of this unit at Huntley indicate that the top of rock is thinly bedded and weathered to a depth of several feet, and possibly up to as much as 20 feet. Elevation of the weathered top-of-rock surface is has not been measured elsewhere on the Property but is known to be about 530 ft AMSL on Site 108 at the river bank. . The bed of the river there is typically at about 547 to 552 ft AMSL; it therefore remains to be determined whether and how the weathered, transmissive top of the Camillus is in hydrologic contact with the Niagara River channel.

5.7 Pathways

The following pathways have been identified as potential pathways for the movement of compounds of concern from environmental release at the site:

Northern Drainage Pathway: This pathway recognizes historic sources of contamination leaving the site to the north. Reservoirs of contamination could exist along this pathway and could discharge into groundwater and surface water. Northern pathway elements include: 1) Potential contamination of a former ditch or pipe backfill along the drain to the former Erie Canal; 2) Historic discharge into the former Erie Canal; 3) Current discharge into the backfilled Erie Canal channel; 4) Similar interactions (potential contamination, historic discharge, current discharge) with the backfilled Rattlesnake Island channel; 4) Contamination of and discharge into backfill and natural materials along the former drain out to the Niagara River; 5) Residual contamination and discharge left in place at the time of closure of the settling ponds; 6) any current movement of contaminants associated with this drain into the Niagara River; and 7) any localized residual contamination of the Niagara riverbed from current and historic discharges.

Southern Drainage Pathway: This pathway recognizes the discharges to the south. Southern drainage pathway elements include, in addition to unaddressed interactions with the Erie Canal and Rattlesnake Island channel, 1) historic contamination leaving the site to the south along historic surface water pathways; 2) residual contamination and discharges related to the SPDES system though the area of Outfall 004; and 3) impacts from possible discharges originating from other industrial properties north and south of Site 109.

Groundwater Pathway: This pathway recognizes the introduction of contaminants from surface water infiltration as described above and direct recharge for spills and other contaminant sources. Groundwater pathway elements include 1) leakage from potential Recognized Environmental Conditions presented elsewhere in this report; 2) potential migration through the silty clay under the production areas; 3) the potential migration of contaminants in westerly groundwater flow toward and under the Roblin Steel Site; 4) the potential for contamination to move in the less competent top of the Camillus Shale; 5) the potential for groundwater flow interruption and control by the former Erie Canal bed; 6) the potential for interruption and control of groundwater flow by the former Rattlesnake Island channel across site 108; 7) the potential for interruption and control of groundwater flow by the 1919 gas supply pipe to the Niagara Light, Heat & Power plant in the City of Tonawanda, if not already addressed and removed during the remedial work for DEC's site #915171; 8) the transmission of any contaminants from the silty clay layer to the complex units closer to the river; 9) the potential discharge of contaminated groundwater, whether through thinning unconsolidated material or less competent bedrock horizons, into the Niagara River bed; and 10) potential leakage into the less competent Camillus Shale bedrock surface associated with the likely presence and potential corrosion at the large number of pilings that serve as the foundation footings for the coke batteries and smokestacks.

Regarding groundwater pathway element 10 mentioned above, it is well known that pilings may transmit contaminants down through aquitards. Reports done on behalf of EPA on "Deep Foundations on Brownfields Sites" have addressed the issue of piles penetrating contaminated soils and underlying aquitards, thereby providing migration pathways for contaminants. Among the pile types tested, steel H-piles and untreated wood piles "showed rapid and significant adverse changes in contaminant transfer." (USEPA, 2002.) Similarly, New-York-based expert Ruwan Rajapakse notes in his book, *Pile Design and Construction Rules of Thumb* (Rajapakse, 2016) notes that *"When piles are driven through contaminated soil into clean water aquifers, water migration pathways could be created. Water would migrate from contaminated soil layers above to lower aquifers.... When a pile is driven or bored, a slight gap is created.... H-piles are more susceptible for creating water migration pathways than circular piles."*

According to court documents from a Honeywell product liability lawsuit at Bethlehem Steel in Lackawanna, New York, a typical foundation construction would have required approximately 1,000 piles to be driven to bedrock per coke oven battery of this size. A former Town of Tonawanda engineer confirmed that this would likely have been the case at Tonawanda Coke, suggesting the possibility of up to 2,000 or more piles such as steel H-piles driven through the corrosive Odessa Silty Loam soil into the Camillus Shale bedrock at the BCP Site. The presence, state of corrosion, and migration pathway from surficial groundwater and soil contamination to the deeper bedrock aquifer associated with the presence of piles at the BCP Site are therefore currently unknown.

6 HISTORICAL RECORDS REVIEW

Past uses of the Property, adjoining sites and the area surrounding the Property were determined by reviewing available Sanborn Fire Insurance (Sanborn) maps and historical aerial. Historic topographic maps were obtained from other sources. City directories were not obtained or reviewed for this ESA. Historical information was provided by Environmental Data Resources, Inc. (EDR) and supplemented with additional materials from the University at Buffalo, the Buffalo and Erie County public library and Google Earth and Maps applications. Historical records are included in the Appendices.

6.1 Sanborn Fire Insurance Maps

nygeology also used EDR to determine the availability of Sanborn maps for the Property and adjoining sites. While the EDR search meets the requirements of the ASTM E-1527 ESA standard, the EDR Sanborn collection did not include key maps necessary for this assessment. Therefore nygeology obtained key Sanborn Coverage from the Buffalo and Erie County Public Library system and from the archives at the University at Buffalo library. Sanborn map coverage included the years 1917, 1918 1921, 1940, 1947 and 1967. Information gathered from Sanborn maps is summarized below.

1917: The Semet-Solvay Coke plant was first constructed in 1917. Bituminous coal was delivered to the site via boat and was offloaded by what is now Superfund site 108. A conveyor sent the coal to the site where it was organized into piles before it was brought to the coal crusher. The plant had a central coal crusher and bin that led to a single battery of 60 coke ovens. The coke would be quenched after it was pushed out of the oven on the west side of the plant where is was then sorted and shipped to customers either by boat or by rail. The gases and vapors that resulted from the coking processes were sent to the byproducts building for condensation, scrubbing, and distillation into several products. These products included an ammonia liquor, coal tar and light oil. These products were stored in tanks on the site until they were sold. During this period the site produced its own power by burning coal in a boiler in the powerhouse. This electricity was used to run the tram cars that filled the coke oven with fresh coal and removed the coke. Water for the quench was drawn from a section of the Erie Canal located to the west of the plant. The wastewater and runoff from the plant were also discharged into the canal.

1918: The coke plant did not significantly change from 1917 to 1918

1921: The coke plant did not significantly change from 1918 to 1921

1940: By 1940 the coke plant had expanded its operation and could meet the increased demand following the start of World War II. The section of Erie Canal at the site was filled in sometime between 1921 and 1940. Coal was brought to the site by both barge and by rail. A second 60-oven battery was installed in 1926 (according to Tonawanda Coke) to the east of the existing battery 1. The number of cooling coils needed to condense the byproducts from the coking operation also increased. The plant also expanded to the south with the addition of added tar storage capacity in large above ground tanks. The ability of the plant to produce coal gas was also increased when additional gas purifying boxes were installed in the northeast corner of the plant.

1947: The plant's coal storage expanded to the south and an underground conveyor was installed to bring the coal to the coal crusher. The conveyor's opening was located in the south of the site at the end of the rail line used by the iron bridge, which formed the piles of coal as it arrived on site. The gas purifying boxes were again expanded. Four Hortonspheres were constructed to the east of the gas purifying boxes to store excess gas.

_1967:_ The plant was significantly expanded from 1947 to 1967. The by-product infrastructure now included dedicated naphthalene scrubbers and tanks, additional tar separators, actifiers, light oil production, gas production, and bulk fuel oil storage. By this time all coal was delivered by train. The generators in the powerhouse were no longer visible on the site map.

6.2 Aerial Photographs

nygeology also obtained aerial photographs for the Property and surrounding area from EDR for the following years: 1938, 1959, 1962, 1966, 1978, 1983, 2002, 2006, 2009, 2013, 2017, and 2020. Information gathered from these aerial photographs is summarized below.

_1938:_ The landfill 108 on the riverbank had not yet been extended into the river. The land directly south of the plant was not yet disturbed. No buildings were found to the north of the plant footprint. There was only one major building between River Road and the west side of the plant. A row of small buildings was present on the south border of the plant below the coal piles. Both coke batteries were present on the site and this was confirmed using the active quenches on both sides of the plant. Hortonspheres, the trade name for the large spherical gas holders, were not yet present on the site and there was only one building that purified the gas that exited the by-products processing system. Tar tanks for storage and shipment were located on the southwestern corner of the plant and were connected to the by-products building with an above ground pipeline.

_1959:_ Three large tanks were installed on the southeastern corner of the plant. The coal yard was expanded on the south side of the plant. The land to the east of the plant had been disturbed with evidence of dumping. The landfill 108 on the riverbank was expanded into the river and several tanks were installed on the site. The four Hortonspheres were installed and the gas purifying boxes were extended to the east of the site.

_1962:_ Landfill 108 was fully expanded into the Niagara River. Additional storage tanks were also built in landfill 108. Large coal and coke piles were present on the plant and now extend to the southern boundary. A large building can be found to the east of the gas purifying boxes. An elongated drainage ditch was observed to the north of the 108 landfill. All of the by-product gas, oil, and ammonia buildings, tanks and scrubbers have been installed in the north half of the plant. A large building to the east of the gas purifying boxes was seen on the aerial photos but was not present on the contemporary Sanborn map (1967).

_1966:_ No major changes to the infrastructure of the plant are visible, but an increase in mature foliage such as trees and large shrubs in the landfill 110 area is evident.

_1978:_ A large settling pond was installed on the north east corner of the map area by the northern river outfall. The 108 and 109 landfills look recently covered. Most of the byproduct related buildings on the north side of the coke plant such as the water gas plant, several tar separating cooling coils, water tanks, gas tanks, tar tanks and the other covering of the main by-products building have been removed. The large building to the east of the gas purifying boxes has also been removed.

_1983:_ No major changes to the infrastructure of the plant are visible.

2002: The concrete recycling pad has been installed in the southern section of the plant at the end of the iron bridge track. The settling pond in the northwest corner of the map area has been filled in. The concrete lined rectangular settling pond in the east side of landfill 109 was installed.

2006: Mature trees are now present in both landfills 108, 109 and 110. Only one of the four Hortonspheres remains on the site. The east half of the gas purifying boxes has been removed.

2009: No major infrastructure changes. A new settling pond was installed on the southwest corner of the coke plant.

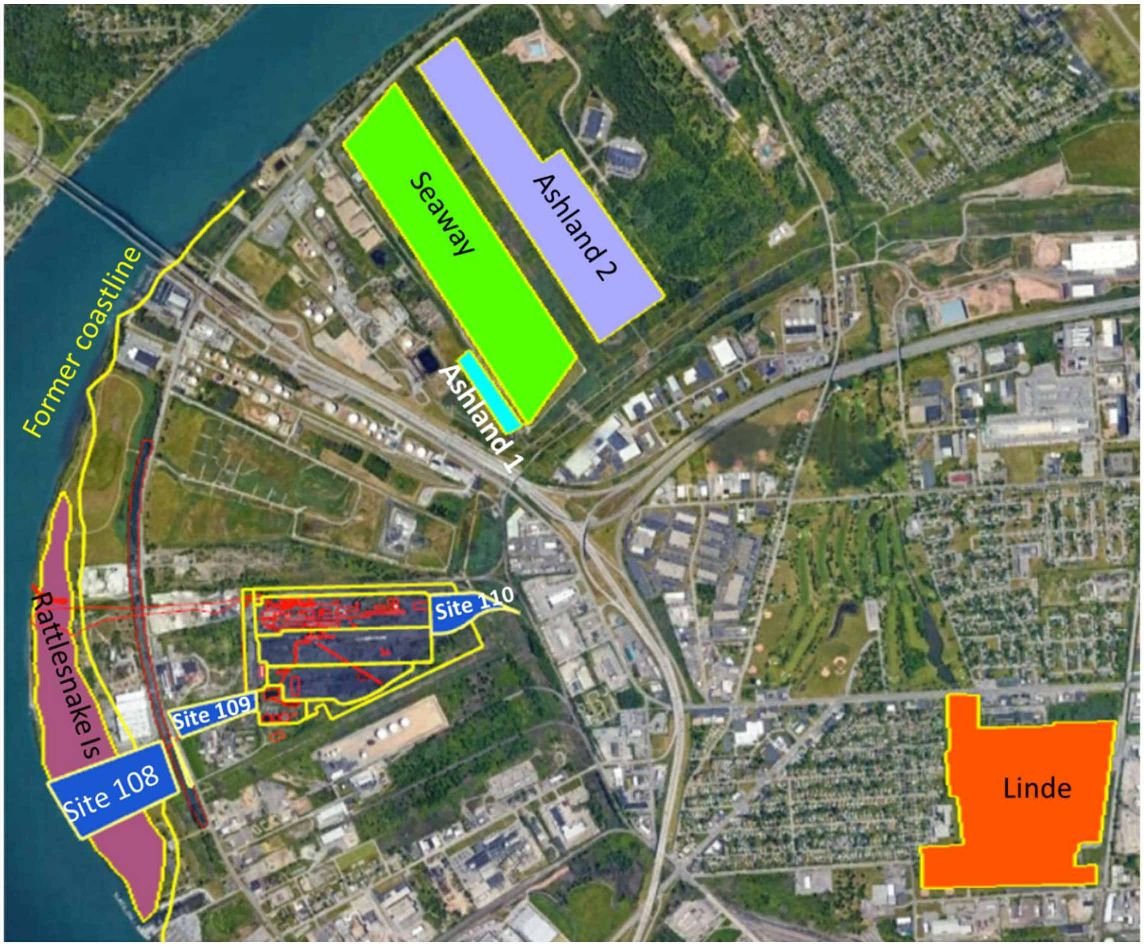
2013: No substantive change.

2017: Additional settling ponds were installed in the southern portion of the coke plant

2020: No substantive change.

6.3 Historic Topographical Maps

Historic topographical maps were discovered and reviewed from USGS maps dated 1901 and 1948. The 1901 map clearly shows the presence of Rattlesnake Island. The figure below georeferences the island, the former coastline and the channel that separates it from land. It is clear that the former channel was located directly in the area that separates the eastern and western portions of site 108, and that it also crosses the Northern Drainage Pathway. The Ashland, Seaway and Linde parcels shown on the map make up the Tonawanda Site discussed earlier.



The map from 1948 shows an intermittent stream draining to a wetland in what is now the eastern portion of Site 108.

7 RECORDS REVIEW

nygeology conducted extensive records reviews as described below. This was a typical ASTM records review that included a Radius Report with GeoCheck provided by EDR along with historical aerial photos and Sanborn maps which are provided in their entirety as Appendices. In addition, nygeology visited public document repositories and conducted extensive reviews of materials obtained by Clean Air Freedom of Information Act Law requests and of materials supplied through web searches and other sources conducted by its members and by nygeology. Much of that information has been included and discussed in many other places in this report including in the Site Description, Operational History, Physical Setting, Site Reconnaissance and Findings sections. This section, therefore, simply summarizes the EDR report and some of the historic site reports for completeness of this ESA report only.

7.1 Regulatory Database Records

In addition to the EDR Radius Report, additional information was obtained directly from NYSDEC databases.

7.1.1 Property

Dozens of records in regulatory databases were discovered for the Property. The most useful information took the form of tank inventories and spill information. Such information is presented in detail as needed in other sections of this ESA report.

7.1.2 Adjoining and Nearby Sites

Dozens of records in regulatory databases were discovered for nearby sites. Other information defined at parcels considered as part of the ESA Study Area were also helpful. In addition, information from the Tonawanda Site (Linde/Seaway/Ashland), Huntley, and the Dunlop/Polymer Applications investigations were helpful in understanding site geology and hydrogeology.

As an important note, however, sufficient information regarding the Roblin Steel site to the west between the BCP site and the Niagara River was obtained and reviewed which warranted additional research. This research revealed a series of useful documents obtained through online searches of the NYSDEC documents database. Roblin Steel reports were reviewed and used mainly to add to the understanding of the geology and hydrogeology of the study area.

7.1.3 Orphan Sites

Similar to information reported for adjoining and nearby sites, the information regarding orphan sites was not relevant to the determination of environmental conditions at the Property.

7.2 Previous Reports

In addition to draft work plans submitted by Parsons for the Superfund sites and by Inventum for the BCP site, the following reports were reviewed to determine the level of work performed previously to characterize site conditions:

Conestoga-Rovers & Associates, July 1990. Supplemental Site Investigation. Three overburden groundwater monitoring wells were installed with the collection of 12 groundwater samples (two rounds of sampling at six wells). Two test pits were excavated along with the collection of one composite soil sample from test pits, the collection of 11 surface water samples and the collection of three sediment samples.

Conestoga-Rovers & Associates, November 1992. Additional Site Investigation. Two overburden groundwater monitoring wells were installed with the collection of three groundwater samples. Five surface water samples were collected along with two sediment samples.

Conestoga-Rovers & Associates, May 1997. Remedial Investigation Summary Report. Summary of available information from the previous investigations pertaining to groundwater, surface water, soils, and sediments and discussed their significance regarding potential impacts to human health and the environment.

Conestoga-Rovers & Associates, January 2008. Final Supplemental Report Revision 1 and Feasibility Study. Five surface soil samples were collected from both Site 109 and Site 110. One test pit at Site 110 was excavated.

Malcolm Pirnie, Inc., December 1986. Phase II Summary Report. Three overburden groundwater monitoring wells were installed with the collection of six groundwater samples (two rounds of sampling at three wells). Nine test pits were excavated along with the collection of one composite soil sample from four test pits on Site 110 and the collection of two surface water samples.

Recra Research, November 1983. New York State Superfund Phase I Summary Report. Reviewed existing data to calculate a USEPA Hazard Ranking System Score (HRS) to assess the relative threat associated with actual or potential release of hazardous substances from the site.

A detailed analysis of the findings of these reports is beyond the scope of this ESA; however, this ESA recognizes that in all cases, sites investigated in the reports remained environmentally compromised and are the subject of ongoing enforcement actions.

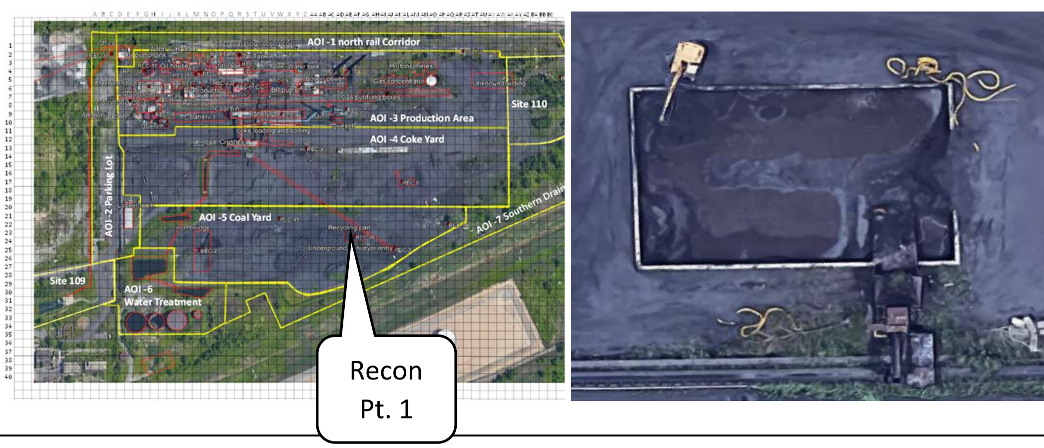
8 PROPERTY AND SURROUNDING SITE RECONNAISSANCE

Property access restrictions were considered for the purpose of conducting the site reconnaissance element of the process required to meet the ASTM standard. Because the property was purchased by a developer and some work is already underway, and, because the purpose of conducting this ESA does not involve any protections under CERCLA, nygeology did not consider the physical elements of site reconnaissance necessary to the process of determining RECs; rather, nygeology used recent publicly available 3D aerial photography, drone footage and LIDAR to assess the physical conditions at the site.

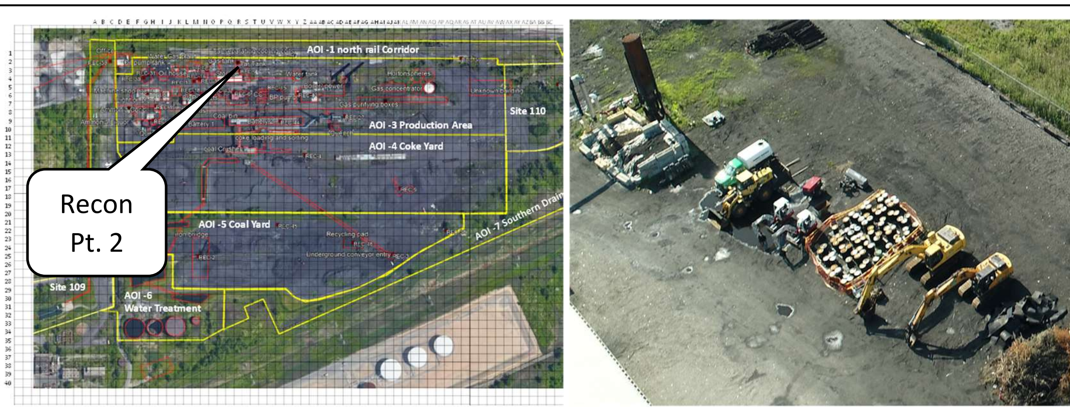
8.1 Property Reconnaissance

Map numbers, locations and photos for each specific geocoded reconnaissance point (Recon Pt.) are provided and discussed below. Geographic information is available from nygeology upon request.

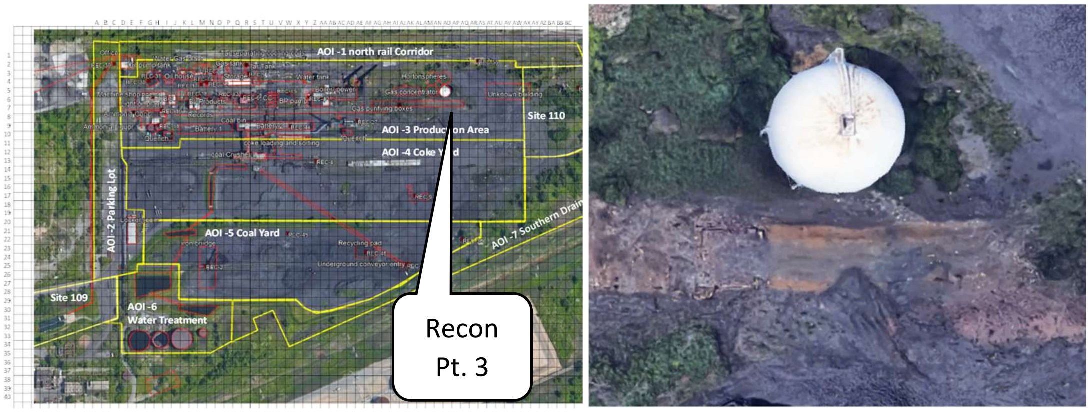
Recon Pt. 1: Mixing Pad. This picture shows the concrete mixing pad on the south side of the coal fields. This mixing pad, at grid location AE 24 & AF24, was used to combine sludge and tar with coal before it went to the battery.



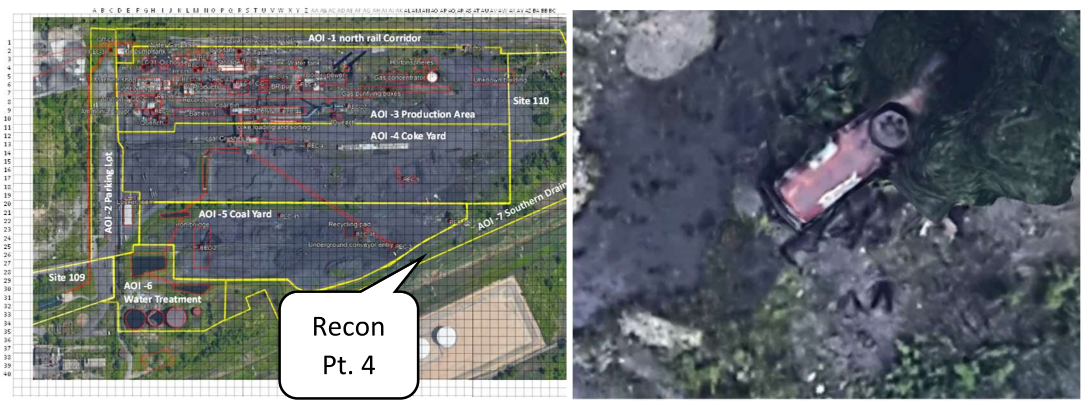
Recon Pt. 2: Drum Field. This picture shows the drum field at grid location Q3 on the BCP site. These drums are thought to contain both waste from the site and EPA investigation derived waste.



Recon Pt. 3: Gas Purifying Boxes. This picture shows the stained soil at the former site of the gas purifying boxes at grid location AL7 in the coke oven gas processing area.



Recon Pt. 4: Buried Rail Tanker car. This picture shows the Buried tanker rail car at grid location AP22 on the south side of the BCP site. This rail car may contain or have leaked hazardous material.



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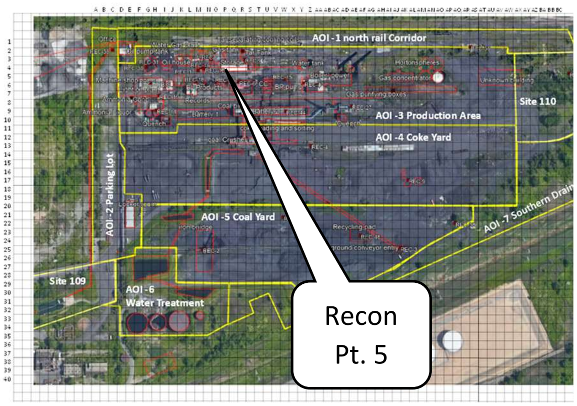
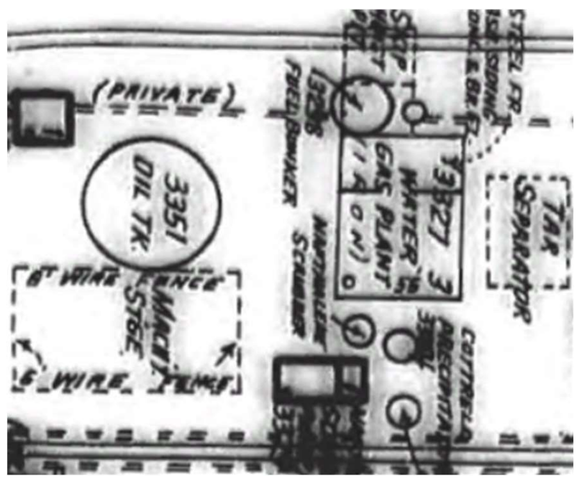
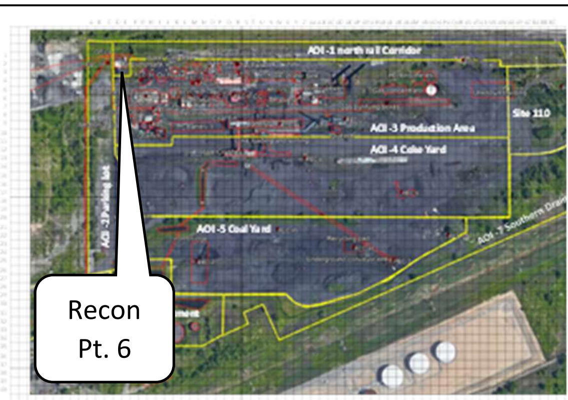
<u>Recon Pt. 5: Water Gas Plant</u> This picture shows the former location of the Water Gas plant and naphthalene processing area. This area, at grid location L3&4 and M3&4, may be contaminated with cyanide, naphthalene, tar, and light oil rich in benzene.

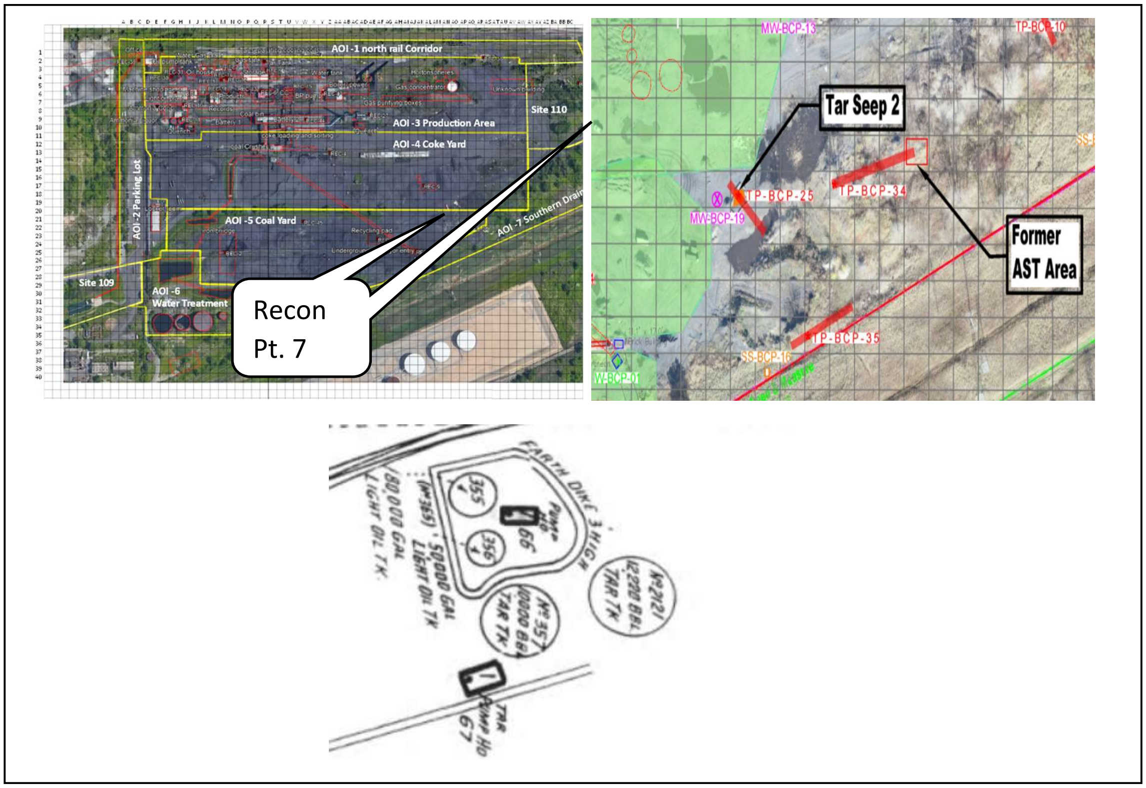




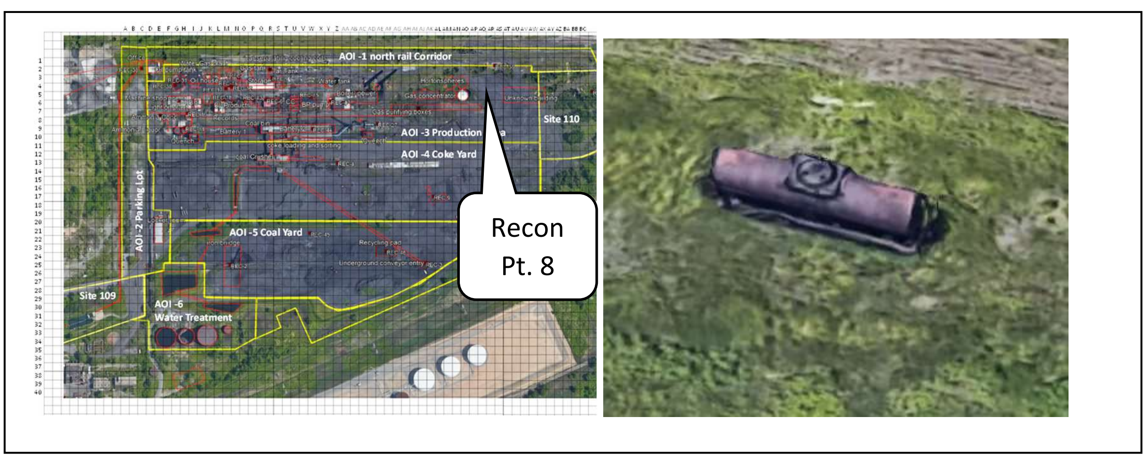
<u>Recon Pt. 6: Office Stormwater Sump:</u> This picture shows the open sump in the northwest comer of the office building. This sump at grid location C 3 is the central connection for the abandoned storm water drain with an outfall in the Niagara river (outfall 3).



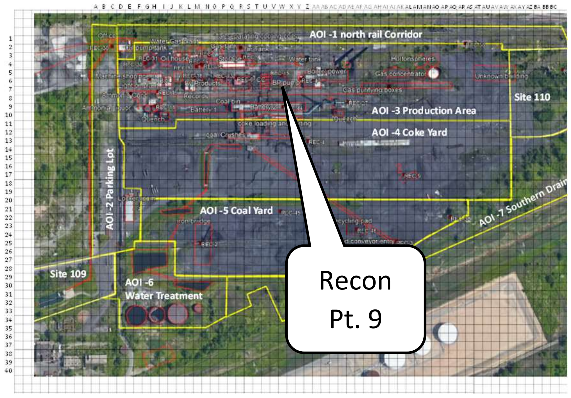
Recon Pt. 7: Tar Storage Area. This picture shows the tar and light oil storage area that is visible in aerial photos from 1959 to 1983 but is now completely invisible. The high benzene concentration of the light oil and the high likelihood of spills in an area where the tanks and their contents were removed before 1983 at grid location AL 29 is a continuing concern.



Recon Pt. 8: Buried Rail Tanker Car. This picture shows the Buried tanker rail car at grid location R1 to the north of the BCP site. This rail car may contain or have leaked hazardous material.



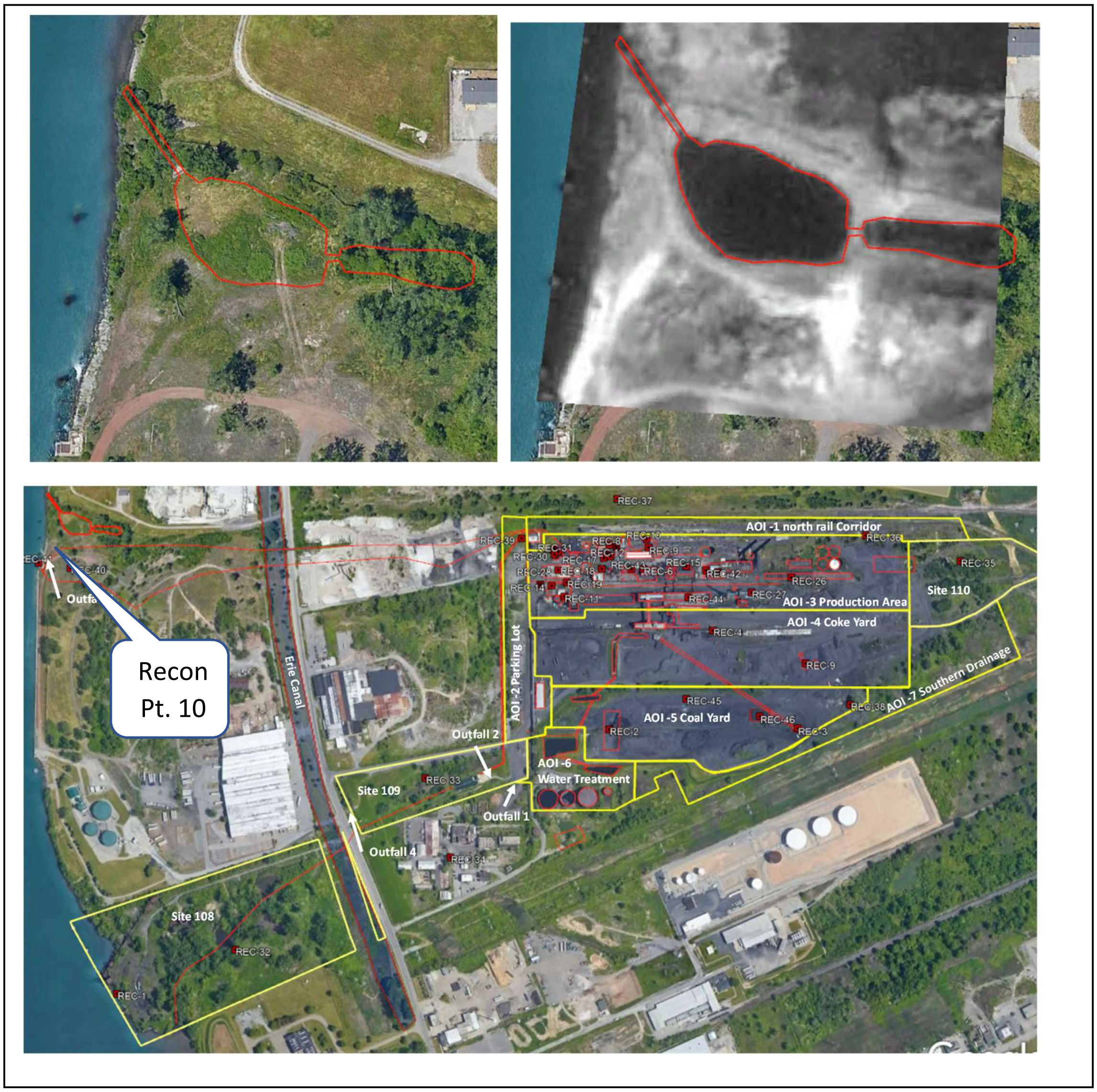
Recon Pt. 9: Byproduct Building Rear Containment Area . This picture shows the containment area at grid location R5 behind the Byproduct Building. The surface of the water has what appears to be a chemical or petroleum sheen on its surface which may indicate the presence of contamination.



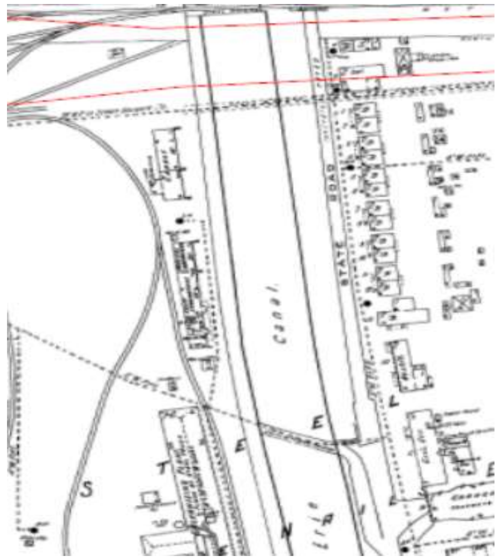
8.2 Adjoining Sites and Surrounding Area

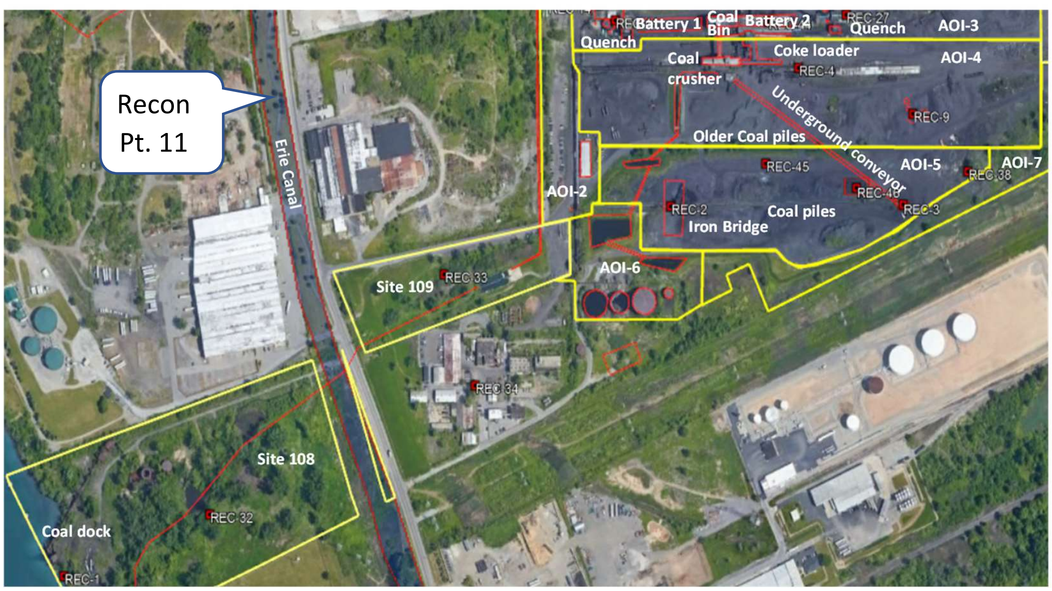
Map numbers, locations and photos for each specific geocoded reconnaissance point (Recon Pt.) outside the BCP Site areas are provided and discussed below. Geographic information is available from nygeology upon request.

Recon Pt. 10: Outfall 3 and Former Settling Pond. This picture shows the northern outfall connected with the BCP site and the location of a former settling pond from the 1983 aerial photo. The outflow may be an active release point into the Niagara River and the sediment from the ponds may also contain residual contamination. The former Rattlesnake Island Channel sits to the east of the ponds.



Recon Pt. 11: Former section of Erie canal. This picture shows an area that was a section of the Erie Canal from 1917 through at least 1921. This section of canal was the original outflow point for the northern half of the BCP site. We suspect the fill currently in the canal would allow more ground water movement that the natural glacial deposits, so any contaminants entering this channel may be transported north to the protected wetland off site.





9 INTERVIEWS

Interviews were conducted with certain former employees in order to obtain pertinent information regarding the Property including the current or historical presence and chemistry of the following potential sources of environmental conditions: ASTs; USTs; drums and containers; electrical or hydraulic equipment likely to contain PCBs; pits, ponds or lagoons; stained soils or pavement; stressed vegetation and depressions or mounds which could indicate past burial or disposal activities; waste water; wells or septic systems; and odors.

9.1 Plant Operator

nygeology interviewed Mr. Ron Snyder, the former plant manager of Tonawanda Coke Corporation (1986-2006). Mr. Snyder described the general process flow of the plant from the input of coal, the output of coke and the process associated with the byproducts of coke production. His first-hand account of the plant operations stated that the coal would arrive by truck and be dumped in the coal yard near the iron bridge which would organize the coal into smaller piles. The coal was moved with front end loaders to the opening of the underground conveyor in the coal field which transported the coal to the crusher. The crushed coal would be sent to the coal bin where it was blended. A mixture of high and low volatile bituminous coal was used for the coking process. After blending the coal was put into electric rail cars on top of the coke batteries. The railcars would travel across the batteries and deposit crushed coal into the ovens. The coal would then be leveled in the ovens to help regulate the coking process. The battery was made up of 60 coking ovens. All 60 ovens were emptied of coke and refilled with coal on a rotating schedule, with every sixth oven being emptied and refilled in sequence, in order to help maintain the proper temperature in the entire battery. The plant had originally been built with one battery on the west half of the plant site in 1917. An additional battery was installed before 1938 and was located directly to the east of the original battery. The original battery 1 was rebuilt in the mid 1960’s and the old silica bricks from the oven were buried in landfill 109 and 110. Battery 1 was eventually torn down before 1978 and was never replaced. Battery 2 was serviced in the late 1980’s and again the used silica bricks were buried in landfill 110 on site.

The coke oven would run continuously unless they were shut down for maintenance. The ovens would be initially lit with natural gas, then the gas from the coking process would sustain the temperature in the battery throughout the rest of the process. The coal in the ovens was not burned but rather denatured by the intense heat. The volatiles would be driven off and sent to the byproducts building for further processing. The coking process would take 16-24 hours to completely remove all the volatiles from the coal and form the final coke. The coke was then removed from the oven using a pusher and it would fall into a railcar. The coke would then be quenched with 10,000 gallons water before being sent to the sorting room. After sorting the coke would be put in trucks and shipped out to customers. The volatile gases and vapors sent to the byproduct building would go through a series of distillations and chemical separations. The process would remove tar, sludge, light oil, coke gas, ammonia compounds, phenols, creosote and other substances. The tar and light oil would be stored in tanks on the site. A portion of the coke gas would be sent back to the battery to help maintain its temperature. The sludge and other non-valuable byproducts would be stored on site until they could be disposed of. When the plant was working at peak efficiency 1,000 tons of coal would result in 2-3 tons of waste products. As the plant aged a series of fires, spills and other factors caused the byproduct infrastructure to break down. The ammonia still and processing equipment had not been functional since about 1995 and a fire near the byproducts building damaged most of the other equipment. Throughout the 1980s and 1990s the byproducts became less valuable due to their high benzene content and much of the light oil and tar produced on the site after 1995 may have been buried on someplace onsite. No details were provided, but this information requires further investigation beyond the scope of this ESA.

In order to keep the plant operational, TCC would accept truckloads of sludge from other coke plants across the eastern US in exchange for spare parts and tooling. TCC would dispose of the sludge in their ovens so the other plants could avoid paying high disposal fees in industrial landfills. In the late 1990s they would receive one truck load of sludge a week and this material would be mixed in with coal on a concrete mixing pad before being put in the ovens. Over time the number of sludge shipments increased to one per day, and eventually up to about 20 shipments per day over a period of several years. Eventually the amount of sludge arriving to the plant exceeded coke production, so it was dumped in the landfill on the site. Again, no details were provided, but this information requires further investigation beyond the scope of this ESA.

The ovens could only process 2-3 tons of sludge per 1000 tons of coal, but this ratio was regularly exceeded. This improper mixture reduced the efficiency of the coke ovens and caused extra wear on the underground excess heat tunnel. A combination of wear and poor plant operation caused the tunnel to collapse which greatly reduced the operating temperature of the battery. As a result coke gas and natural gas were constantly added to help maintain temperature. The stack on the battery was also extended to increase the draft of the ovens. The incomplete combustion of the coke oven gas would result in unburned gas being released into the air. The plant had to start operating at night because the thick cloud of smoke that came off the battery would be too conspicuous during the day. Eventually a combination of broken equipment, poorly run ovens, community complaints and EPA violations resulted in the closure of the plant. In addition to the issues of the plant operations there were also multiple spills and fires on the site during Mr. Snyder's time on the plant. The plant workers would have to put out the fire with steam pipes in the plant and need to wear half face respirators while they worked because of fumes and poor air quality. Mr. Snyder stated that he was terminated from his position in 2006 after voicing concerns that numerous employees were being diagnosed with Crohn's Disease, various cancers and other work-related ailments associated with coke production.

9.2 Plant Hydrologist

nygeology interviewed Nellie Brown, a former plant hydrologist at TCC (1978-1980). She stated that her job was to measure the surface runoff, storm water and wastewater outflow for levels of contamination. She needed to monitor the levels of mercury, cyanide, suspended solids, the pH of the water and its temperature. She would take water samples at several locations in the plant and at the outflow settling pond throughout the day. She stated that during a strike she was pressed into service operating the electric rail car on top of the batteries and the quench station. It was not uncommon for excess water from the trench to pool by the station and flow directly into the storm drain. She also stated that the light oil was typically composed of 56% benzene, 16% toluene and 5% xylene making it a BTX oil. This oil was used to clean the plant machinery and was eventually replaced with chlorinated hydrocarbons. She told us of several major spills that occurred at the plant like a major ammonia liquor spill that overflowed its dike and went into the storm system. She also stated that the quenching process released chlorinated compounds and gases from the hot coke. There was also a major fire next to the by-product building that caused severe damage to the plant. Toward the end of her employment at the plant, the Town of Tonawanda put in municipal storm and wastewater drains. As a result the settling pond near the north river outflow was filled shortly after that installation.

10 FINDINGS

nygeology has reviewed the information presented in the Operational History section of this report to determine the potential conditions for the release of petroleum or hazardous substances at the site. To the extent possible, nygeology has attempted to accurately determine the location of each of the above potential conditions, referred to as Map References in the tables below. With the exception of closed spills which are considered separately, this section identifies specific areas of concern that are considered Recognized Environmental Conditions (RECs). Closed spills are considered Controlled Recognized Environmental Conditions (CRECs) because the information gathered to date does not document whether compounds above Soil Cleanup Guidance levels (SCGs) remained in the ground at the time of NYSDEC spill closure. To the extent that data become available to support an unrestricted closure status, spills meeting the unrestricted land use SCGs can be considered as Historical Recognized Environmental Conditions (HRECs).

10.1 NYSDEC Reviewed Plans, Reports and Interim Remedial Measures

In the interest of completeness, all potential environmental concerns have been reported in this ESA. However, from discussion with NYSDEC and USEPA, nygeology understands and acknowledges that many concerns identified in the report are in various stages of enforcement. In addition to the Remedial Investigation Work Plan currently out for public comment, additional work that NYSDEC is currently reviewing or has already approved include:

Work Plan/Report	Status
ISMP	DEC Approved
Light Oil Secondary Containment	DEC Approved
Storm Water Pollution Prevention Plan	DEC Approved
Storm Sewer IRM	DEC Approved
Mixing Pad IRM	Draft
PCC Excavation Work Plan	Draft
ISMP Work Scope 2	DEC Approved
Container Management IRM	Draft
ISMP Work Scope 3	Draft

nygeology acknowledges that some of the conditions reported in the ESA may have been mitigated or planned to have been mitigated prior to the release of this report.

10.2 Materials Management Concerns

Potential environmental conditions posed by materials management at the site as described in the previous section of this report are summarized in the table below:

Area of Concern	Potential Cause	Compounds of Concern
Barge Conveyor	Potential Diesel Operation	Petroleum
Iron Bridge	Potential Diesel Operation	Petroleum
Coal Tunnel Loading	Potential Diesel Operation	Petroleum
Coal Tunnel	Potential Submerged Corridor	Petroleum / Hazardous Substances
Powerhouse	Likely PCB Transformer	PCBs

10.3 Byproduct Management Concerns

Potential environmental conditions posed by byproduct management at the site as described in the previous section of this report are summarized in the table below:

Area of Concern	Potential Cause	Compounds of Concern
Tar Decanter Unit	Leaks and Spills	Petroleum / Hazardous Substances
Tar Collection Sump	Leaks and Spills	Petroleum / Hazardous Substances
Tar Dewatering Unit	Leaks and Spills	Petroleum / Hazardous Substances
Tar Storage Units	Leaks and Spills	Petroleum / Hazardous Substances
Tar Refining Units	Leaks and Spills	Petroleum / Hazardous Substances
Ammonia Tanks	Leaks and Spills	Petroleum / Hazardous Substances
Phenol Unit	Leaks and Spills	Petroleum / Hazardous Substances
Ammonia Absorber	Leaks and Spills	Petroleum / Hazardous Substances
Ammonia Dryer Unit	Leaks and Spills	Petroleum / Hazardous Substances
Final Cooler	Leaks and Spills	Petroleum / Hazardous Substances
Naphthalene Separator	Leaks and Spills	Petroleum / Hazardous Substances
Naphthalene Heating and Cooling Units	Leaks and Spills	Petroleum / Hazardous Substances
Naphthalene Dryer Unit	Leaks and Spills	Petroleum / Hazardous Substances
Wash Oil Storage Unit	Leaks and Spills	Petroleum / Hazardous Substances
Light Oil Scrubber Unit	Leaks and Spills	Petroleum / Hazardous Substances
Light Oil Stripper Unit	Leaks and Spills	Petroleum / Hazardous Substances
Stripper Decanter Unit	Leaks and Spills	Petroleum / Hazardous Substances
Separator Unit	Leaks and Spills	Petroleum / Hazardous Substances
Condenser and Decanter Units	Leaks and Spills	Petroleum / Hazardous Substances
Desulfurization Unit	Leaks and Spills	Petroleum / Hazardous Substances
Carburetted Water Gas Unit	Leaks and Spills	Possible Cyanide Waste
Gas Purifier Boxes	Leaks and Spills	Petroleum / Hazardous Substances

10.4 Support Operations Concerns

Potential environmental conditions posed by byproduct management at the site as described in the previous section of this report are summarized in the table below:

Area of Concern	Potential Cause	Compounds of Concern
Laboratory	Operational Discharges	Petroleum / Hazardous Substances
Machine Shop	Maintenance Discharges	Petroleum
Locomotive Repair	Diesel and Electrical Repair	Petroleum / Hazardous Substances /PCBs
Rail Operations	Diesel Fueling Operations	Petroleum
Paint Shop	Painting Operations	Hazardous Substances

Offices, locker rooms and other support buildings at one time may have contained construction materials such as asbestos, lead and PCB ballasts in older fluorescent light transformers. If such buildings remain on site, such items might be cause for concern in building demolition. If such buildings were already demolished and disposed of on-site, a condition may exist at the disposal location.

10.5 Concerns from Other Potential Releases

Spills generally fall into one of three categories: closed spills, open spills and unreported spills. Reported spills, open or closed, below 5 gallons, the NYSDEC reporting requirement, are presented in the table below and are considered *de minimis*, not needing further attention.

Spill No.	De Minimis Condition
1312043	Open spill. 1-gallon hydraulic oil. Location unknown.
1402754	Open spill. 0.25 gallons hydraulic oil. Location unknown.
1402932	Open spill. 2 gallons motor oil. Location unknown.
1403658	Open spill. 0.5 gallons hydraulic oil. Location unknown.
1404294	Open spill. 5 lbs. hydraulic oil. Location unknown.
1605698	Closed

Potential environmental conditions posed by the information gained to date on closed spills at the site as described in the previous section of this report are summarized in other sections of this report and are not summarized again here.

Potential environmental conditions posed by open spills at the site as described in the previous section of this report are summarized in the table below:

Spill No.	Material	Location	Amount	SCGs
1509056	Coal Tar	Unreported	5,000 L	Not Applicable at this time.
1707802	Diesel	Unreported	50 gallons	Not Applicable at this time.
1411461	Hydraulic Oil	Unreported	25 gallons	Not Applicable at this time.
1312126	Hydraulic Oil	Unreported	30 gallons	Not Applicable at this time.
1400418	Hydraulic Oil	Unreported	30 gallons	Not Applicable at this time.
1404225	Unknown Petroleum	Unreported	Unreported	Not Applicable at this time.
1803893	Sodium Hydroxide	Unreported	Unreported	Not Applicable at this time.
1804001	Unknown Petroleum	Unreported	Unreported	Not Applicable at this time.
1908744	Hydraulic Oil	Unreported	Unreported	Not Applicable at this time.

Given the 29 spills reported in just the last ten years, the sparse reporting history in the time frame after NYSDEC required spill reporting, and the log period of operations prior to required spill reporting, there is a strong likelihood that many more unreported spills routinely occurred at the site throughout its history. Such spills of unknown petroleum and/or hazardous substances, in unknown amounts, would have occurred in numerous unidentified locations. For this reason, unreported spills are also considered a potential environmental concern at the site.

10.6 Concerns from Other Potential Releases

A variety of other concerns from systems and events not directly related to materials management, byproduct management, support operations or spill history were identified. Such concerns included but are not limited to certain known environmental releases, the storm sewer system and the permitted outfall, as well as the main tunnel collapse and a number of major fires. Potential environmental conditions posed by these other concerns as described in the previous section of this report are summarized in the table below:

Area of Concern	Potential Cause	Compounds of Concern
Superfund Site 108	Disposal Operations	Petroleum / Hazardous Substances
Superfund Site 109	Settling Ponds and Disposal Area	Petroleum / Hazardous Substances
Adjacent Plastics Plant	Chemical Usage and Shared Drain	Hazardous Substances
Superfund Site 110	Support and Disposal Operations	Petroleum / Hazardous Substances
Refractory Brick Areas	Residual Brick Contamination	Hazardous Substances
Buried Rail Tank Car 1	Potential Leakage	Petroleum / Hazardous Substances
Buried Rail Tank Car 2	Potential Leakage	Petroleum / Hazardous Substances
Historic Drain Systems	Exfiltration	Petroleum / Hazardous Substances
Former Settling Ponds	Overfill, Residuals and Exfiltration	Petroleum / Hazardous Substances
Former Niagara Outfall	Discharge to Niagara River	Petroleum / Hazardous Substances
Battery 2 Fire	Contaminant Dispersion	Petroleum / Hazardous Substances
Byproducts Fire	Contaminant Dispersion	Petroleum / Hazardous Substances
Battery 2 Tunnel	Contaminant Reservoir	Petroleum / Hazardous Substances
Other Major Fires	Contaminant Dispersion	Petroleum / Hazardous Substances

Since the use of firefighting foams cannot be documented, PFOA and PFOS compounds are also considered as potential compounds of concern at locations where fires had occurred.

10.7 General Concerns

General concerns include the length of time the facility was operational and the lack of knowledge of specific operating history during that time. Further, after a review of earlier site studies cited in the Records Review section of this report, other concerns include:

Focus of Earlier Investigations: Earlier studies were mainly initiated as response actions and were not based on a systematic review of site operations; therefore, results cannot be readily assumed to indicate site conditions since sampling locations are not referenced to site operations where releases were more likely to have occurred. For instance, vapor intrusion considerations were unknown and/or not routinely considered when these reports were developed;

Development of Future Investigation Plans: The Phase II study on which most of the Superfund Site 110 conclusions are based, and on which upcoming site investigation workplans might be based, was conducted in the era prior to the standardization of the now industry-accepted ASTM E1527 standard which would have produced the systematic review of site operations as presented in this report and on which future site investigation plans should be based; and

Validity of the Earlier Investigations: Reviews of draft work plans to date incorrectly suggest that the site has been well characterized. For instance, while few volatile organic compounds were detected in test pit soil at the site, even if the test pit locations were correctly associated with specific site operations, samples were composites from various test pits and therefore no volatiles would be expected since they would have volatilized out of the samples, invalidating any reliance of that data as an indication of site conditions.

Validity of Conceptual Site Models: Information regarding the nature of the unconsolidated materials near the Niagara River and the nature and elevation of the top of the Camillus Shale, along with the effect of the presence of the former Erie Canal and the Rattlesnake Island channel, calls into question the validity of the Conceptual Site Models' work plans for all sites under enforcement and therefore the investigations on which they may someday be based.

Beyond the above statements, this ESA does not form an opinion of the validity of the earlier reports but provides an opinion regarding the data gaps. However, any future plans should be based on a systematic understanding of site operations and conform with the NYSDEC guidance document DER-10 Technical Guidance for Site Investigation and Remediation, including the possibility of Vapor Intrusion associated with any residual volatile organic compounds that may be present at the site.

11 OPINIONS AND CONCLUSIONS

New York State Professional Geological Services, PLLC (nygeology), was retained by the Clean Coalition of Western New York (User/Client) to conduct a Phase I ESA at abandoned industrial areas including and associated with former coking operations conducted at 3875 River Rd., Tonawanda, Erie County, NY 14150. The Property is further defined as Section-Block-Lot: 64.08-1-10 and properties associated with the Tonawanda Coke operations.

nygeology conducted the Phase I ESA in general accordance with the USEPA, *Standard and Practices for AAI, Final Rule* (40 CFR Part 312) and *ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E1527-13).* Any exceptions to, or deletions from these practices are described in **Section 1.2** of this report. The purpose of conducting a Phase I ESA in accordance with the ASTM Practice E1527-13 and the AAI Final Rule is usually to permit the User to satisfy one of the requirements to qualify for the Innocent Landowner, Contiguous Property Owner, or Bona Fide Prospective Purchaser limitations on CERCLA liability. In the case of this ESA, however, nygeology was retained by CACWNY to determine conditions of concern to the surrounding community in support of a review of investigative work plans required under a Brownfield Cleanup Program Application and various other associated NYSDEC Superfund enforcement actions.

nygeology has considered the migration of hazardous substances or petroleum products in soil, groundwater, and vapor in the evaluation of potential RECs associated with this Property. Recognized Environmental Conditions are reported below.

11.1 Recognized Environmental Conditions

A Recognized Environmental Condition (REC) is defined by ASTM E1527-13 as follows:

> *The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions.*

This assessment has revealed no evidence of RECs in connection with the Property except for the following:

REC No.	Associated Operation/Event	Recognized Environmental Condition	Map Ref.
1	Materials Management	Barge Conveyor	Rec-1
2	Materials Management	Iron Bridge	N-25, Rec-2
3	Materials Management	Coal Tunnel Loading	AK-25, Rec-3
4	Materials Management	Coal Tunnel	AA-14, Rec-4
5	Materials Management	Powerhouse	AA-6, Rec-5
6	Byproduct Management	Tar Decanter Unit	R-6, Rec-6

7	Byproduct Management	Tar Collection Sump	O-4, Rec-7
8	Byproduct Management	Tar Dewatering Unit	N-3, Rec-8
9	Byproduct Management	Tar Storage Units	S-3, Rec-9
10	Byproduct Management	Tar Refining Units	S-2, Rec-10
11	Byproduct Management	Ammonia Tanks	H-11, Rec-11
12	Byproduct Management	Phenol Unit	N-4, Rec-12
13	Byproduct Management	Ammonia Absorber	F-8, Rec-13
14	Byproduct Management	Ammonia Dryer Unit	G-8, Rec-14
15	Byproduct Management	Final Cooler	X-5, Rec-15
16	Byproduct Management	Naphthalene Separator	M-4, Rec-16
17	Byproduct Management	Naphthalene Heating and Cooling Units	M-5, Rec-17
18	Byproduct Management	Naphthalene Dryer Unit	N-6, Rec-18
19	Byproduct Management	Wash Oil Storage Unit	I-8, Rec-19
20	Byproduct Management	Light Oil Scrubber Unit	O-3, Rec-20
21	Byproduct Management	Light Oil Stripper Unit	O-4, Rec-21
22	Byproduct Management	Stripper Decanter Unit	P-4, Rec-22
23	Byproduct Management	Separator Unit	Q-4, Rec-23
24	Byproduct Management	Condenser and Decanter Units	Q-3, Rec-24
25	Byproduct Management	Desulfurization Unit	P-3, Rec-25
26	Byproduct Management	Water Gas Building	Ak-7, Rec-26
27	Byproduct Management	Gas Purifier Boxes	AF-9, Rec-27
28	Support Operations	Laboratory	G-6, Rec-28
29	Support Operations	Machine Shop	G-3, Rec-29
30	Support Operations	Locomotive Repair	H-4, Rec-30
31	Support Operations	Rail Operations	H-3, Rec-31
32	Support Operations	Paint Shop	Rec-32
33	Other Systems / Events	Superfund Site 108	Rec-33
34	Other Systems / Events	Superfund Site 109	Rec-34
35	Other Systems / Events	Adjacent Plastics Plant	BE-5, Rec-35
36	Other Systems / Events	Superfund Site 110	AS-2, Rec-36
37	Other Systems / Events	Refractory Brick Areas	U-1, Rec-37
38	Other Systems / Events	Buried Rail Tank Car 1	AQ-22, Rec-38
39	Other Systems / Events	Buried Rail Tank Car 2	C-2, Rec-39
40	Other Systems / Events	Mixing Pad	Rec-40
41	Other Systems / Events	Historic Drain Systems	Outfall 3, Rec-41
42	Other Systems / Events	Former Settling Ponds	Rec-42
43	Other Systems / Events	Former Niagara Outfall	Q-6, Rec-43
44	Other Systems / Events	Battery 2 Fire	X-9, Rec-44
45	Other Systems / Events	Byproducts Fire	W-22, Rec-45

46	Other Systems / Events	Battery 2 Tunnel	AF-23, Rec-46
47	Other Systems / Events	Other Major Fires	Unreported
48	Spills	Open Spill 1509056	Unreported
49	Spills	Open Spill 1707802	Unreported
50	Spills	Open Spill 1411461	Unreported
51	Spills	Open Spill 1312126	Unreported
52	Spills	Open Spill 1400418	Unreported
53	Spills	Open Spill 1404225	Unreported
54	Spills	Open Spill 1803893	Unreported
55	Spills	Open Spill 1804001	Unreported
56	Spills	Open Spill 1908744	Unreported
57	Spills	Unreported Spills	Unknown

11.2 Controlled Recognized Environmental Conditions

A Controlled Recognized Environmental Condition (CREC) is defined by ASTM E1527-13 as follows:

> *A recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). A condition considered by the environmental professional to be a controlled recognized environmental condition shall be listed in the findings section of the Phase I Environmental Site Assessment report, and as a recognized environmental condition in the conclusions section of the Phase I Environmental Site Assessment report. A condition identified as a controlled recognized environmental condition does not imply that the environmental professional has evaluated or confirmed the adequacy, implementation, or continued effectiveness of the required control that has been, or is intended to be, implemented.*

Closed spills are considered Controlled Recognized Environmental Conditions (CRECs) because the information gathered to date does not document whether compounds above SCGs remained in the ground at the time of NYSDEC spill closure. This assessment has revealed no evidence of CRECs in connection with the Property except for the following:

Spill No.	Material	Location	Amount	SCGs
9306743	Diesel	Unreported	Unreported	Unreported.
210041	Unreported	Unreported	Unreported	Unreported
750710	Transformer Oil	Unreported	Unreported	Unreported
890582	Unreported	Unreported	Unreported	Unreported
1006190	Unreported	Unreported	Unreported	Unreported

1012929	Unreported	Unreported	Unreported	Unreported
1304545	Unreported	Unreported	Unreported	Unreported
1406188	Unreported	Unreported	50 gallons	Unreported
1304471	Unreported	Unreported	60 gallons	Unreported
1310569	Coal Tar	Unreported	Unreported	Unreported
1310569	Coal Tar	Unreported	Unreported	Unreported
1406697	Caustic Soda	Unreported	Unreported	Unreported
1600522	Hydraulic Oil	Unreported	11 gallons	Unreported
1207205	Auto Waste Fluids	Unreported	Unreported	Unreported
1311845	Hydraulic Oil	Unreported	5 gallons	Unreported.
1506305	Unknown Petroleum	Unreported	Unreported	Unreported
1603606	Unknown Petroleum	Unreported	Unreported	Unreported

11.3 Historic Recognized Environmental Conditions

An HREC is defined by ASTM E1527-13 as follows:

> *A past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). Before calling the past release a historical recognized environmental condition, the environmental professional must determine whether the past release is a recognized environmental condition at the time the Phase I Environmental Site Assessment is conducted (for example, if there has been a change in the regulatory criteria). If the EP considers the past release to be a recognized environmental condition at the time the Phase I ESA is conducted, the condition shall be included in the conclusions section of the report as a recognized environmental condition.*

This assessment has revealed no evidence of HRECs in connection with the Property at this time. To the extent that data become available to support an unrestricted closure status, spills meeting the unrestricted land use SCGs will be considered as HRECs at that time.

11.4 De Minimis Conditions

A *De minimis* condition is defined by ASTM E1527-13 as follows:

> *A condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be de minimis conditions are not recognized environmental conditions nor controlled recognized environmental conditions.*

This assessment has revealed no evidence of *de minimis* conditions in connection with the Property, with the exception of the following:

Spill No.	De Minimis Condition
1312043	Open spill. 1-gallon hydraulic oil. Location unknown.
1402754	Open spill. 0.25 gallons hydraulic oil. Location unknown.
1402932	Open spill. 2 gallons motor oil. Location unknown.
1403658	Open spill. 0.5 gallons hydraulic oil. Location unknown.
1404294	Open spill. 5 lbs. hydraulic oil. Location unknown.
1605698	Closed

11.5 Data Gaps

After a review of earlier site studies, data gaps include the lack of a clear knowledge of operating history across the 100 years of facility operations, and the focus and validity of earlier investigations as previously discussed. Any future plans should be based on a systematic understanding of site operations as presented herein and conform with the NYSDEC guidance document DER-10, Technical Guidance for Site Investigation and Remediation, including the possibility of Vapor Intrusion associated with any residual volatile organic compounds that may be present at the site.

In summary, with respect to the conclusions of this ESA, many Recognized Environmental Conditions have been identified at the BCP Site and across the ESA Study Area at large. With respect to ongoing management of known sources, many activities are currently underway, under NYSDEC supervision, to investigate and remediate environmental releases at the site. However, certain data gaps still exist, and any interested parties should proceed with caution.

11.6 Client Specified Scope Considerations

No specific Out-of-Scope considerations were requested by the Client or assessed by nygeology. However, the Client understands that the community is aware of the poor condition of certain structures on the properties discussed herein and understands that the eventual decommissioning and demolition of structures may involve abatement for out-of-scope materials, such as the asbestos at Site 108, which will need to be conducted safely by those responsible parties likely under regulatory agency supervision.

12 SIGNATURE OF ENVIRONMENTAL PROFESSIONAL

New York State Professional Geological Services, PLLC (nygeology), authorized by the University of the State of New York Education Department to provide geological services in the State of New York, has prepared this Phase I ESA of the Tonawanda Coke Property on behalf of our Client, the Clean Air Coalition of Western New York.

Individuals that participated in the preparation of this Phase I ESA Report include:

- Thomas J. Morahan, P.G., Principal Scientist, Project Assessor
- Raymond C. Vaughan, PhD., P,G., Senior Scientist, Project Reviewer
- Christopher Sbarra, Geological Scientist
- Alexandra Dombrowski, Environmental Scientist
- Hayley Martinez, Associate Scientist

Professional Profiles for all individuals who participated on this report are included as an Appendix to this report.

As senior assessors, we declare that we, to the best of our professional knowledge and belief, meet the definition of Environmental Professional as defined in 40 CFR Part 312.10 and have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. In performing the Tonawanda Coke ESA, we have developed and performed all appropriate inquires in conformance with the standards and practices set forth in 40 CFR Part 312.

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Thomas J. Morahan, P.G.

Project Assessor

New York State P.G. No. 001199

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Raymond C. Vaughan, PhD., P.G.

Project Reviewer

New York State P.G. No. 000258

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APPENDICES