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REMEDIAL INVESTIGATION SUMMARY REPORT

Tonawanda Coke Corporation
Tonawanda, New York

REMEDIAL INVESTIGATION SUMMARY REPORT

Tonawanda Coke Corporation
Tonawanda, New York

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

This report has been prepared by Conestoga-Rovers & Associates (CRA) on behalf of Tonawanda Coke Corporation (TCC). In a letter dated March 28, 1996, the New York State Department of Environmental Conservation (NYSDEC) formally requested that TCC prepare a Remedial Investigation (RI) Report for Site No. 915055 (Tonawanda facility). This RI Report has been prepared in accordance with TCC's response letter (prepared by Mr. Rick Kennedy of Hodgson Russ Andrews Woods and Goodyear) to the NYSDEC, dated May 2, 1996. A proposed Table of Contents was submitted to the NYSDEC on October 30, 1996. NYSDEC issued a letter dated November 27, 1996 approving the Table of Contents, with some recommendations. Copies of all letters are provided in Appendix A for reference.

1.2 SITE BACKGROUND

1.2.1 Site Description

The TCC Site is located along and to the east of the eastern bank of the Niagara River within the Town of Tonawanda, Erie County, New York. The Site location is presented on Figure 1.1.

A number of areas were used to dispose of industrial and C&D wastes on the Site between 1917 and 1978. The NYSDEC's areas of concern have historically been referred to as Site 108, Site 109, and Site 110. Figure 1.2 presents the approximate locations of these former disposal areas. All of these disposal areas are inactive and have been since 1978.

1.2.2 Site History

The Buffalo Coke Plant which is located at 3875 River Road in Tonawanda, New York was owned and operated from 1917 through 1947 by

Semet-Solvay Company, a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet-Solvay Company was merged into Allied Chemical Corporation, which owned and operated the plant until January 27, 1978, when it was sold to TCC.

Manufacturing processes which were used at the plant beginning in 1917 included by-products coking; light oil distillation; ammonia recovery; and benzene, toluene, and xylene extraction. A few areas of the plant Site were used for the disposal of wastes. Materials such as tar sludge, fly ash and cinders may have been deposited at the rear of the plant (southeast corner of the area east of River Road, now referred to as Site 110) before 1978. In 1973, the Semet-Solvay Division was granted permission by the Erie County Health Department to establish a new refuse disposal area on the west side of River Road (now referred to as Site 108). This Site was eventually filled with refuse, wood, scrap polyethylene, and ceramic saddle packing from refining equipment. An unknown quantity of brick, rubble, and related demolition wastes were also disposed in an area adjacent to River Road in 1977 (Site 109).

1.2.3 Previous Investigations

Four major investigations and several other sampling events have been conducted at the Site, focusing primarily on the former on-Site disposal areas.

In July 1982 and May 1983, the United States Geological Survey (USGS) undertook the sampling of a number of inactive hazardous waste disposal sites roughly within a 3-mile wide band along the Niagara River. This sampling program was part of an overall investigation of toxic contaminant entry into the Niagara River. The USGS program involved the collection of two groundwater samples, 10 soil samples and two surface water samples from the TCC Site.

Subsequent to the USGS sampling, four major investigations have been performed over the past 10 years. The results of the four subsequent major studies are presented in the following previously submitted reports:

1. "Tonawanda Coke Corporation
New York State Superfund Phase I Summary Report
November 1983"
prepared by Recra Research Inc.;

This study did not involve the collection of any samples for chemical analyses. The purpose of the study was to calculate a Hazard Ranking System Score for the Site based upon the USGS sample results.

2. "Phase II Site Investigation
Tonawanda Coke Site"
December 1986"
prepared by Malcolm Pirnie Inc.;

The Phase II Site Investigation consisted of the following activities:

i) installation of seven overburden groundwater monitoring wells;
ii) collection of 13 groundwater samples;
iii) installation of 12 test pits;
iv) collection of one composite soil sample from four of the 12 test pits; and
v) collection of eight surface water samples.

3. "Supplemental Site Investigation
Tonawanda Coke Corporation
Tonawanda, New York
July 1990"
prepared by Conestoga-Rovers & Associates; and

The Supplemental Site Investigation consisted of the following activities:

i) installation of 10 overburden groundwater monitoring wells;
ii) collection of 32 groundwater samples;
iii) installation of eight test pits;
iv) collection of four composite soil samples from the test pits;
v) advancement of four boreholes;

vi) collection of two composite samples from the boreholes;
vii) collection of 21 surface water samples; and
viii) collection of 10 sediment samples.

4. "Additional Site Investigation
Tonawanda Coke Corporation
Tonawanda, New York
November 1992"
prepared by Conestoga-Rovers & Associates.

The Additional Site Investigation consisted of the following activities:

i) installation of three overburden groundwater monitoring wells;
ii) collection of 10 groundwater samples;
iii) installation of nine test pits;
iv) collection of two samples from the test pits;
v) advancement of one borehole;
vi) collection of five surface water samples; and
vii) collection of two sediment samples.

1.3 REPORT ORGANIZATION

This RI Report summarizes the field activities undertaken and the associated analytical data which resulted primarily from the latter two Site Investigations performed by CRA. Information and data from previous studies are included. In addition, pertinent information from studies on an adjacent Site (Allied Chemical Corporation) has also been included.

Section 2.0 presents the Site characterization field activities.

Section 3.0 presents the physical characteristics of the study area; specifically, surface features, surface water hydrology, geology, soils, and hydrogeology.

Section 4.0 presents the nature and extent of contamination; specifically, chemical sources, soils, groundwater, surface water, sediments, and air.

Section 5.0 discusses contaminant fate and transport; specifically, potential routes of migration and actual contaminant migration.

Section 6.0 presents the summary and conclusions.

2.0 STUDY AREA INVESTIGATION

2.1 SITE CHARACTERIZATION FIELD ACTIVITIES

2.1.1 Surface Features

As part of CRA's Supplemental Site Investigation, an aerial survey firm was contracted to perform an aerial survey of the TCC Site and produce a topographic plan of the entire Site. This aerial survey topographic base was developed into a base plan (Plan 1) incorporating all the well and sampling locations.

2.1.2 Geological Investigations

The geology at the TCC facility has been determined from soil samples collected during monitoring well and borehole installations as well as test pit excavations during the various field investigations conducted at the Site. The soil encountered beneath the Site can be divided into two types of material or stratigraphic units: fill material and underlying glaciolacustrine clay.

2.1.3 Soil Investigations

As part of the USGS study, a total of ten soil samples were collected. Two rounds of samples were collected from two locations at Site 108 on each of July 13, 1982 and May 24, 1983. As well, three samples were collected from each of Sites 109 and 110 coincident with the second round of samples collected at Site 108. The approximate sample collection locations are presented on Figure 2.1.

As part of the Malcolm Pirnie Phase II Investigation, 12 test pits were excavated at the TCC Site. Three test pits were excavated at Site 108; five test pits were excavated at Site 109; and four test pits were excavated at Site 110. The approximate locations of the test pits are presented on Figure 2.1.

The purpose of the test pits was to characterize the type and extent of wastes buried on Site. Each test pit was logged by the supervising geologist and, in some instances, representative soil/waste samples were retained. These samples were collected from visually different waste types occurring in the four test pits at Site 110 and were composited into a single sample which was submitted for chemical analysis for the following parameters:

Polynuclear Aromatic Hydrocarbons (PAHs)
Purgeable Aromatic Hydrocarbons (BTX)
Phenols (4-AAP)
Cyanides (total and free)
Total Organic Halogens (TOX)

As part of CRA's Supplemental Site Investigation, another test pit and soil sampling program was conducted specifically to characterize the materials which have been disposed at the TCC facility. This investigation was conducted in three areas of the facility; Site 108 on the west side of River Road, Site 110 in the northeast corner of the Site, and the coal storage area in the center of the Site. No investigative activities were conducted at Site 109 as results from previous studies indicated no chemical presence. Two test pits were located in each of Sites 108 (TP-Q and TP-S) and 110 (TP-M and TP-N), while four test pits were located in the coal storage area (TP-T, TP-U, TP-V, and TP-W), as shown on Figure 2.1.

The depth of each test pit extended to the fill/native soil interface and the materials encountered were logged for stratigraphy by CRA personnel. Following sample collection from each test pit, the excavation was backfilled with the excavated material in the reverse order from which it was originally removed with the original surface material being returned to the surface position. The stratigraphic logs for the test pits are contained in Appendix B.

During the test pit excavation program, soil/fill samples were also collected. Each test pit soil sample was collected by scraping the freshly exposed face of the excavation with a precleaned stainless steel sampling trowel/spatula in order to remove material which may have been contacted by

the backhoe bucket. A sufficient sample volume was collected representative of the entire depth of fill material encountered. Groundwater filled the test excavations at TP-S and TP-Q, making sample collection from these excavations impossible. In these instances, the samples were collected with the sampling tool from the pile of excavated material representative of the entire soils encountered. Also, because groundwater filled the excavation, it was not possible to accurately determine the fill/native contact at TP-S and TP-Q.

Following sample collection from the test pits, composite soil samples were mixed in the field by filling each sample jar with equal portions of homogenized soil material from two test pits in the same area. The sample compositions were as follows:

TP-Q and TP-S (Site 108)	= sample TP-1
TP-T and TP-U (coal storage area)	= sample TP-2
TP-V and TP-W (coal storage area)	= sample TP-3
TP-M and TP-N (Site 110)	= sample TP-4

Each composite sample set consisted of two 1-liter and two 4-ounce glass jars of soil. The sample containers were handled and transported in accordance with appropriate chain-of-custody procedures and submitted, along with a Quality Assurance duplicate sample from TP-1, to CompuChem Corp. for analysis. The soil samples were analyzed for the following groups of parameters, with reporting by Contract Laboratory Procedures (CLP) for the Target Compound List parameters only:

Target Compound List (TCL)
- Volatile Organic Compounds (VOCs)
- Base/Neutral and Acid Extractables (BNAs)
- Inorganic Compounds (Metals and Cyanide)

Toxicity Characteristics Leaching Procedure (TCLP)
- Volatile Organic Compounds (VOCs)
- Base/Neutral and Acid Extractables (BNAs)
- Inorganic Compounds (Metals and Cyanide)

Oil and Grease

Hexavalent Chromium (Cr+6)

Table 2.1 presents a summary of the test pit soil sample handling details.

As a follow-up to the test pit investigation in the coal storage area, a soil sampling program of the underlying native clay materials was conducted. Four boreholes were advanced using a drilling rig at the same locations as the previous test pit excavations. The boreholes were drilled to a depth necessary to collect a sample of the native clay beneath the fill in the coal storage area. The borehole locations are shown on Figure 2.1 along with the test pit locations.

Each borehole was augered into the native clay using 6.5-inch outside diameter hollow stem augers. Continuous split spoon sampling was conducted in order to identify the geologic strata and confirm the native clay/fill interface. Once the native clay was observed in a split spoon, a subsequent precleaned split spoon was driven and a soil sample collected for chemical analysis. The residual soils were placed in clear glass sample jars and stored on Site for geologic reference. Following sample collection, the open borehole was grouted to the ground surface. The stratigraphic logs for the boreholes are contained in Appendix B along with the test pit logs.

The sample volume collected from each borehole consisted of one 1-liter glass sample jar, which was handled and transported in the same manner as the test pit samples. CompuChem Corp., upon receipt of the four borehole sample jars, composited the samples similar to the previous test pit samples; BH-T with BH-U and BH-V with BH-W. The composite samples were then analyzed for the same parameter groups as the previous test pit samples except for TCLP analyses. Reporting followed non-CLP procedures in this instance.

Table 2.2 presents a summary of the borehole soil sample handling details.

As part of CRA's Additional Site Investigation, nine test pits were excavated at the TCC facility. The purpose of these excavations was to refine the definition of physical and chemical conditions at the TCC Site. A summary of the materials encountered during these test pit excavations is presented in Table 2.1.

Three test pits (TP-AA, TP-BB, and TP-CC) were excavated along the coal field boundary at the locations shown on Figure 2.1. These test pits were excavated to determine the thickness of overburden above native clay in the area so that a monitoring well could be installed in the deepest fill area. This was done to refine the definition of hydrogeological conditions and chemistry in the fill in this area of the plant. However, it was discovered that the greatest thickness of fill at the three test pit locations was at TP-AA where only 1.8 feet of fill was observed. Therefore, another well was not installed at this location as the existing well, MW16-89, was determined to be representative of typical conditions in this area of the plant Site.

Another three test pits (TP-X, TP-Y, and TP-Z) were excavated in the area of Site 108, at locations shown on Figure 2.1, to more comprehensively characterize the waste/fill. Test pits TP-X and TP-Y were installed to native clay. Test pit TP-Z was terminated at 12.5 ft. BGS when a black vegetative mud unit (assumed to be native soil) was encountered. A composite sample of test pits TP-X, TP-Y, and TP-Z as well as a chemical sample of only the black mud from TP-Z were taken for chemical analysis prior to backfilling. The samples were submitted for analysis of the full Target Compound List (TCL)/Target Analyte List (TAL) of parameters including cyanide.

As a result of the discovery of the black vegetative mud unit in test pit TP-Z, additional test pits and a borehole were installed to further define both the horizontal and vertical extent of this unit. Three test pits (TP-DD, TP-EE, and TP-FF) were excavated in locations shown on Figure 2.1. During the excavation of test pit TP-EE, a similar black mud unit was encountered and therefore, the third test pit (TP-FF) was excavated further west. Also, a borehole (BHZ-91) was drilled in the area of test pit TP-Z in order to determine the depth

of the black mud unit and the depth to the top of the native clay surface. Appendix B contains the stratigraphic log for this borehole.

During excavation of the test pits, air readings for background and vapors over the open hole were taken with an HNu Photoionization Detector. The readings observed are presented in Table 2.4.

2.1.4 Groundwater Investigations

As part of the USGS study, two groundwater samples were collected from two locations in July 1982. The approximate sample locations are presented on Figure 2.2.

As part of the Malcolm Pirnie Phase II Investigation, seven overburden groundwater monitoring wells (MW-1 through MW-7) were installed at the Site. Groundwater samples were collected from all seven wells in November 1985, and from six of the seven wells in August 1986. A sample could not be collected from one of the wells because this well had been damaged. The approximate well locations are presented on Figure 2.2.

As part of CRA's Supplemental Site Investigation, ten "supplemental" overburden groundwater monitoring wells (MW8-89 through MW17-89), as well as one replacement well (MW3R-89), were installed around the perimeter of the Site in June 1989. The locations of these wells had been agreed to by the NYSDEC as part of TCC's effort to demonstrate that no chemicals were migrating from the Site via the groundwater route. The stratigraphic and instrumentation logs for these new wells are presented in Appendix C. Three separate groundwater sampling events, involving varying numbers of wells, were conducted following completion of the well installations. Groundwater samples were collected at six well locations (four supplemental and two historic wells) during Round 1 in June and July 1989. Groundwater samples were collected at 12 well locations (six supplemental and six historic wells) during Round 2 in October 1989. Groundwater samples were collected at 14 well locations (ten supplemental and four historic wells) during Round 3 in December 1989. The supplemental well locations are presented on Figure 2.2.

As part of CRA's Additional Site Investigation, three "additional" overburden groundwater monitoring wells (MW18-91 through MW20-91) were installed. The stratigraphic and instrumentation logs for these wells are also presented in Appendix C. One well was installed at the western Site boundary, the other two wells were installed off Site, to the northeast. Two separate groundwater sampling events (Rounds 4 and 5), both involving different well combinations, were conducted following completion of the well installations. Groundwater samples were collected at three well locations (two additional and one supplemental well) during Round 4 in July 1991. Groundwater samples were collected at seven well locations (three additional, three supplemental, and one historic well) during Round 5 in July 1992. The additional well locations are presented on Figure 2.2.

The groundwater samples collected during the USGS Study and Malcolm Pirnie Investigation were analyzed for VOCs, BNAs, and cyanide. During CRA's Supplemental Site Investigation, following the first round of sample collection, a set of Site Specific Indicator (SSI) parameters was developed. Subsequent groundwater samples collected (second and third rounds of the Supplemental Site Investigation and Additional Site Investigation) were analyzed for the SSI parameters. The SSI parameters are discussed in more detail in Section 4.3.1.

2.1.5 Surface Water and Sediment Investigations

As part of the USGS study, two surface water samples were collected from two locations in July 1982. The approximate sampling locations are presented on Figure 2.3. No sediment samples were collected from these locations as part of the USGS study.

As part of the Malcolm Pirnie Phase II Investigation, two rounds of surface water samples were collected from four locations in each of November 1985 and August 1986. The approximate sampling locations are also presented on Figure 2.3. No sediment samples were collected from these locations as part of the Malcolm Pirnie Phase II Investigation.

As part of CRA's Supplemental Site Investigation two rounds of surface water samples were collected. Surface water samples were collected from nine different locations during Round 1 sampling in October 1989. Surface water samples were to be collected from the same nine locations, as well as three additional locations, during Round 2 sampling in December 1989. However, the surface water was frozen at five of the nine original Round 1 sample locations during the December 1989 sampling event; therefore, sampling at these three locations was delayed until March 1990. Following review of the Round 1 surface water analytical data (Section 4.4), it was decided to sample the sediment at and downstream of surface water sampling locations which had chemistry present. Sediment samples were to be collected in December 1989 at a total of five locations. However, as with the surface water, two sediment locations were frozen in December 1989 and sampling at these two locations was delayed until March 1990. The surface water and sediment sample locations are presented on Figure 2.3.

As part of CRA's Additional Site Investigation, surface water samples were collected at five locations in July 1992. In addition, sediment samples were collected at two of the five locations. These sample locations corresponded to some of those previously sampled during the Supplemental Site Investigation. The surface water and sediment sample locations are also presented on Figure 2.3.

The surface water samples collected during the USGS Study were analyzed for BNAs and metals. Surface water samples collected during the Malcolm Pirnie Investigation were analyzed for VOCs, BNAs, and cyanide. Surface water samples collected during CRA's Supplemental and Additional Site Investigations were analyzed for the SSI parameters. Sediment samples collected during the two CRA investigations were analyzed for SSI VOCs and BNAs, as well as cyanide, oil and grease, and hexavalent chromium.

2.2 ADJACENT SITE INFORMATION

The TCC Site is located in a heavy industrial neighborhood consisting of steel mills, petroleum storage/transfer and refining facilities, power plants, and chemical manufacturing firms.

Allied Specialty Chemicals owned and operated the property directly to the south of a portion of the TCC Site, specifically Site 109. The New York State Department of Environmental Conservation (NYSDEC) has provided TCC with analytical summary tables for sampling programs involving surface water, sediment, and groundwater conducted at the Allied site. These tables are included in Appendix D. Some remedial work has been performed at the Allied Site. NYSDEC acknowledges that chemistry remains at the Allied Site. The Allied Site is upgradient of the TCC Sites, specifically Sites 108 and 109.

2.2.1 Groundwater Sampling

Groundwater samples were collected at eight monitoring wells at Allied during seven separate sampling events between December 1988 and June 1992. The approximate well locations are shown on Figure 2.2. All eight wells were not sampled during each event, in fact, none of the events involved all eight wells. The sampling events typically involved two to five wells. The tables provided in Appendix D outline which wells were sampled on which dates.

In summary, five of the eight Allied wells were non-detect for VOCs and BNAs. At the other three wells (MW-1, MW-6, and MW-7), the primary VOCs reported were benzene, ethylbenzene, toluene, and xylenes (BTEX) with total concentrations of approximately 600 µg/L, 300 µg/L and 50 µg/L, respectively. These same three wells contained PAHs at total concentrations of 2,100 µg/L, 700 µg/L, and 250 µg/L, respectively. Typically, the reported concentrations at these wells exceeded groundwater standards for BTEX and PAHs.

There are also significant concentrations of inorganics at many of the Allied wells, with numerous exceedances of the groundwater standards for arsenic, chromium, iron, lead, magnesium, manganese, mercury, and nickel. Cyanide was also prevalent across the Allied site as every detection in all eight wells indicated an exceedance of the groundwater standard (100 µg/L). The 26 reported detections of cyanide ranged from 500 µg/L to 20,000 µg/L, with the six highest detections (4,800 µg/L to 20,000 µg/L) reported for wells MW-6 and MW-7.

2.2.2 Surface Water Sampling

Surface water samples were collected at Allied at three locations identified as SW-01, SW-02, and SW-03, on September 27, 1988. These sampling locations are not known. Analyses of inorganics (metals) indicated low-level presence of many analytes; however, most did not exceed standards. Iron and manganese showed large exceedances at the SW-03 location. Sampling for VOCs and BNAs was limited to the SW-03 location and the results were basically non-detect, with only PAHs detected at a total concentration of 52 µg/L.

2.2.3 Sediment Sampling

Sediment samples were collected at Allied at presumably similar locations to the surface water samples. Sampling took place on September 27, 1988 at sample locations identified as SD-01, SD-02, and SD-03. The analytical results were quite similar to the surface water data previously discussed. Analyses of inorganics (metals) indicated low-level presence of many analytes; however, most did not exceed standards. Iron and manganese showed large exceedances at the SD-03 location. Sampling for VOCs and BNAs was limited to SD-03 and the results were all non-detect, including no PAHs detected.

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

3.1 SURFACE FEATURES

In general, the Site slopes gently to the west toward the Niagara River. The Site is comprised of two areas which are separated by River Road. The larger of the two areas exists in the upslope area to the east of River Road and encompasses the main manufacturing facility. This area is relatively flat on its eastern side and is bordered to the east by a wetlands area. The western portion of this upslope area, near River Road, has a steeper slope. River Road runs along the western boundary of the downslope area owned by TCC. An intermittent stream (or ditch) crosses the lower part of this slope.

The area of the Site west of River Road extends from River Road to the eastern bank of the Niagara River. Encompassed within this area are relatively flat marshy areas and areas which were landfilled. The stream which crossed the western portion of the upslope area also meanders through this lower western area and eventually discharges to the Niagara River.

3.2 SURFACE WATER HYDROLOGY

As part of CRA's Additional Site Investigation, observations of surface water movement were made by TCC personnel across the entire TCC Site to confirm the surface water flow patterns. Surface water within the manufacturing area of the Site is collected by the below ground sewer system and directed to the permitted outfall 001 west of the Site. There has never been a violation of the Permit Limits for the monitored parameters at this outfall location.

The topography in the southeast corner of the Site suggests a general surface water flow direction toward the low marshy area with the collected water outletting to the west.

At the south boundary of the Site, approximately 500 feet east of River Road, there are two large underground culverts which direct all the

surface water, both from TCC to the east and the surrounding areas to the south, toward the north and under the adjacent Allied property. The surface water outletting from these two culverts then joins other TCC surface water drainage pathways prior to crossing River Road and traveling through Site 108 to the Niagara River.

Surface water draining off of the coal storage field area is also controlled by a discharge permit. There has never been an exceedance of the monitored parameters from the coal storage field area.

3.3 SOILS/GEOLOGY

The soils encountered beneath the Site can be divided into two types of material or stratigraphic units; fill material and glaciolacustrine clay.

Fill material is present as the uppermost stratigraphic unit over the entire Site as noted at all of the monitoring well and test pit/borehole locations. The fill unit, as would be expected at this type of manufacturing facility, typically consists of mixtures of silt, clay, and gravel along with some slag, cinders, and coke ranging in thickness from 0.9 to 6.3 feet. However, west of River Road, the fill unit exceeded 10.5 feet in thickness at one location (MW8-89). The fill encountered in this area was a composite of the following: silt, sand, gravel, clay, cinders, slag, coke, brick, wood, concrete, glass, plastic, metal, and rubber.

Underlying the fill material is a native glaciolacustrine deposit. This unit, which is present beneath the entire Site, is composed primarily of red-brown silty clay with some silt and gravel lenses. Native clayey soils were encountered at all monitoring well and test pit locations; however, the thickness of the native glaciolacustrine clay unit beneath the Site is unknown as the monitoring wells and test pits were completed in the fill unit and the boreholes only extended a few feet into the clay unit. The Malcolm Pirnie Phase II Investigation report indicates that at borings completed approximately 300 feet east of the Site, the clay stratum averages more than 50 feet in thickness.

Beneath the TCC facility, a similar thickness is expected to exist as the area was covered by the same glacial lake.

Figure 3.1 presents the location of a geologic cross-section. The cross-section detail is provided on Figure 3.2. Table 3.1 summarizes the stratigraphic information collected at the monitoring well and test pit/borehole locations.

3.4 HYDROGEOLOGY

3.4.1 Overburden Groundwater

Beneath the TCC Site, the fill strata contains the uppermost waterbearing unit, although this unit is neither extensive nor continuous in depth due to the typically varied shallow fill depth across the Site. This waterbearing unit is not suitable for use as a source of drinking water or other potable uses. It is an intermittent, low volume source. The underlying clay strata acts as a significant aquitard to both horizontal and vertical groundwater movement. Due to the extensive thickness of the clay strata and its low hydraulic conductivity (see Section 3.4.2), the groundwater in the fill unit is perched upon the clay unit. Furthermore, the groundwater within the fill unit is effectively isolated from the groundwater aquifer found within the upper bedrock unit beneath the clay layer. The bedrock is expected to be at least 50 feet below grade. Although the upper bedrock waterbearing unit is more extensive than the overburden waterbearing unit, the primary regional source of drinking water is the Niagara River. Thus there never has been nor will there ever be a drinking water source established on the TCC facility.

The groundwater flow in the fill strata at the TCC Site mimics the top of clay surface which in turn mimics the surface topography to a great extent. The general direction of groundwater flow is to the west toward the Niagara River as illustrated by the overburden groundwater contours presented on Figure 3.3. The groundwater information on this figure was obtained during CRA's Additional Site Investigation, July 1992. Table 3.2 presents all the groundwater elevation data collected during previous

investigations. The gradient of the surface of the identified water table is very slight across most of the eastern portion of the Site (approximately 0.003 feet/foot) but increases significantly to approximately 0.025 feet/foot in the area between the TCC facility and River Road, which coincides with the significant change in ground surface elevation. The groundwater gradient then decreases again to approximately 0.006 feet/foot across the remaining western portion of the Site leading to the Niagara River.

In the east-central portion of the Site there is a slight groundwater mound with flow components toward the north, east, and south. However, this mound appears to be very localized. For example, the groundwater flow component to the south corresponds to the slope of the ground surface as it dips toward a low marshy area southeast of the Site. The surface water within this marshy area is subsequently redirected to the west; therefore, it is expected that the groundwater flow would also be redirected to the west following the predominant ground surface dip.

In summary, most of the groundwater beneath the Site is directed to the west and toward the Niagara River, when groundwater is present. The varied fill depth across the Site indicates that the clay surface has minor local irregularities but typically mimics the ground surface topography. The perched water table within the fill unit creates pockets of groundwater which rise and fall as water is available. During low precipitation seasons, there is very little overburden groundwater. Thus groundwater is not directed in a continuous flow to the Niagara River. The extent of the groundwater gradient off-Site to the north, south, and east is unknown; however, the eventual flow direction is likely towards the Niagara River. No significant impacts to adjacent properties' groundwater is attributable to the minor off-Site gradients.

3.4.2 Recovery Tests

During CRA's Supplemental Site Investigation, each overburden monitoring well was tested for hydraulic conductivity. Recovery tests were completed following development/purging and sampling. Each test was conducted by monitoring the water level within the well as it recovered to

its natural static condition. The recovery data for all 17 monitoring wells at the TCC Site is presented in Appendix E.

The recovery tests were conducted in order to determine the hydraulic conductivity of the fill materials beneath the Site. As many of the Site wells had shallow water columns, the analytical technique of Bouwer and Rice was deemed the most appropriate method available to estimate the hydraulic conductivity of the fill materials. The equation used was as follows:

$$K = \frac{r_e^2 \ln (R_e / R) \ln (y_1 / y_2)}{2Lt}$$

where:

K	=	hydraulic conductivity (ft/min)
r_e	=	equivalent radius of well
R_e	=	effective radius over which head loss is dissipated (feet)
R	=	radius of borehole (feet)
y_1	=	water level at time t_1 (feet)
y_2	=	water level at time t_2 (feet)
L	=	length of saturated interval (feet)
t	=	time between y_1 and y_2 (min)

The equivalent radius (r_e) is required as the recovery tests were conducted within the portion of the wells governed by the sandpack porosity (i.e., the dewatering involves both the water in the pipe and within the surrounding sandpack). This radius is calculated as follows:

$$r_e^2 = r_p^2 + n (r_b^2 - r_p^2)$$

where:

r_p	=	radius of the well pipe (feet)
n	=	porosity of the sandpack (assumed 0.3)
r_b	=	radius of the borehole

Using the above formulas, the hydraulic conductivity at each monitoring well was calculated and is presented in Table 3.3

The geometric mean of the individual well hydraulic conductivities is 3.6×10^{-4} cm/sec. All of the wells are screened within the shallow fill layer. The relatively low hydraulic conductivities demonstrate that, within the fill regime, groundwater movement is low. The clay unit beneath the fill acts as a confining unit and prevents downward vertical migration of groundwater. Based on Shelby tube analyses performed on the clay from the Site, the estimated hydraulic conductivity of the underlying clay unit ranges from 3.3×10^{-6} to 1.6 to 10^{-8} cm/sec which demonstrates its effectiveness as a confining unit.

In summary, with respect to overburden groundwater, a thin perched water table exists over much of the Site. The varied fill depths indicate that the underlying clay is undulating and creates locations for pockets of perched groundwater to collect throughout the Site. Downward vertical migration of the overburden groundwater is not possible due to the tight, thick (>50 feet) clay unit. Seasonal precipitation variations allow some of the locations to dry up as was exhibited by the number of dry wells, during some sampling events. As such, although groundwater movement has been shown to be toward the Niagara River, due to the ground surface elevation dipping in that direction, the relatively thick fill unit and the tight underlying clay indicate that groundwater has limited potential for off-Site migration.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 SOURCES

The sources of soil, groundwater, and surface water contamination at this plant are not discrete units or operations. Contamination is attributable to historical manufacturing and materials handling practices. Therefore, although the former disposal areas have been investigated individually, the focus of the CRA studies has been on the nature and extent of contamination across, and at the boundaries, of the entire plant property, regardless of historical sources.

The purpose of this report was to try and pinpoint discrete units.

4.2 SOILS

4.2.1 Introduction

Soil samples were collected from test pits and boreholes during the four Site investigative programs to characterize the fill and underlying clay material on Site. The soil sample locations are shown on Figure 2.1 The analytical data for the various programs is presented on Tables 4.1 through 4.6. Included on these tables are Recommended Soil Cleanup Objective (RSCO) values (for VOCs and BNAs) and Eastern USA Background Soil Concentrations (EUBSC) values (for metals). The source of these values is NYSDEC TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. TAGM #4046 also states that "Soil cleanup objectives are limited to the following maximum values:

1) Total VOCs ≤ 10 ppm
2) Total Semi VOCs ≤ 500 ppm
3) Individual Semi-VOCs ≤ 50 ppm
4) Total Pesticides ≤ 10 ppm

TAGM #4046 values are RSCO for remedial actions at sites which pose a significant threat to the environment. An exceedance by itself does not require

remediation. The analytical results for Site soils are compared to the RSCO and EUBSC values to define the nature and extent of contamination.

Analysis of these samples revealed that low level VOCs and BNAs (PAHs) are prevalent across the entire Site as would be expected at a facility of this nature. Cyanide was present in isolated instances. Chemicals and metals found in the fill material was not detected in the confining clay unit.

4.2.2 Discussion

There are four areas of the Site in which test pits and boreholes have been advanced: the coal fields storage area, Site 108, Site 109, and Site 110. Each of the four areas are discussed in the paragraphs below.

Coal Storage Area

To characterize the fill materials disposed at the coal storage field area, four test pits and four boreholes were advanced. As discussed in Section 2.1.3, two composite soil samples were collected from the test pits and two from the boreholes.

The only VOC compounds detected above the RSCO values were acetone and methylene chloride. However, both compounds were also present in laboratory blanks, indicating probable laboratory contamination.

(12-A1)

The analytical results for the BNAs indicate that there are only 5 PAH compounds present at the coal storage area which exceeded the individual parameter RSCO values. These are benzo(a)anthracene (TP-2 (T&U) - 1,700 µg/kg, June 1989, and TP-3 (V&W) - 8,700 µg/kg, June 1989); benzo(b)fluoranthene and benzo(k)fluoranthene (TP-2 (T&U) - 3,800 µg/kg, June 1989 and TP-3 (V&W) - 17,000 µg/kg, June 1989); indeno(1,2,3,-cd)pyrene (TP-3 (V&W) - 4,500 µg/kg, June 1989); chrysene (TP-2 (T&U) - 2,200 µg/kg, June 1989; and TP-3 (V&W) - 11,000 µg/kg, June 1989); and dibenzo(a,h)anthracene (TP-3 (V&W) - 3,200 µg/kg, June 1989). All of these compounds would be expected to be present due to the coal presence. The total

BNA concentration (all detected parameters whether above or below RSCO values) at the two locations where BNAs were detected above RSCO values is as follows:

Sample ID	*Total BNA Concentrations (ppm)*
TP-2 (T&U)	22.8
TP-3 (V&W)	109

Both locations exhibited total BNA concentrations below the maximum value of 500 ppm for BNAs.

There were no metals detected in the two test pit composite samples above the EUBSC values. Only four metals (calcium, magnesium, nickel, and zinc) were detected above the EUBSC values for the borehole composite samples. The exceedances were within the same order of magnitude and are insignificant. (12A2)

The two test pit composite samples submitted for TCLP analyses (sample collection is discussed in Section 2.1.3) did not identify any significant chemical presence. None of the parameters present exceeded the TCLP regulatory levels.

For soils with elevated chemical concentrations to pose a problem to human health or the environment, one of two mechanisms must be present at the Site. The soil with elevated chemical concentrations must either be accessible for direct contact or manifest itself off-Site through groundwater or surface water. Neither mechanism is present at the coal storage area. Although BNAs were present in the soil samples at the coal storage area, there were no SSI BNA exceedances at any of the coal storage monitoring wells. There is no off-Site migration of groundwater with elevated chemical presence. Additionally, there is no chemical presence in the surface water (permitted outfall) or surface soils (soil samples were collected from test pits or boreholes). (12A3)

Site 108

To characterize the fill materials disposed at Site 108, eleven test pits and three boreholes were advanced. As discussed in Section 2.1.3, two samples were collected from two locations during the USGS study and one composite sample was collected from two test pits (TP-Q and TP-S) during CRA's Supplemental Site Investigation. One composite sample from three test pits (TP-X, TP-Y, and TP-Z) and one "mud" sample (TP-Z) were also collected during CRA's Additional Site Investigation.

(12 B1)

The analytical results for the VOCs indicate the presence of several different VOCs above RSCO values. However, these parameter exceedances are either for compounds which were qualified due to holding time exceedances and surrogate recoveries above or below acceptable limits or is attributable to the vegetative mud sample collected from TP-Z. These parameters are acetone (USGS #3 - 352 µg/kg, May 1983); toluene (TP-X,Y,Z - 0.0064 µg/kg, June 1991, and TP-Z - 0.14 µg/kg - June 1991); xylene (TP-X,Y,Z - 0.0144 µg/kg, June 1991, and TP-Z - 0.198 µg/kg, June 1991); benzene (USGS #3 - 134 µg/kg, May 1983, TP-X,Y,Z - 0.0028 µg/kg, June 1991 and TP-Z - 0.066 µg/kg, June 1991); 1,2-Trans-dichloroethene (USGS #3 - 468 µg/kg, May 1983); ethylbenzene (TP-X,Y,Z - 0.022 µg/kg, June 1991, and TP-Z - 0.060 µg/kg, June 1991), and vinyl chloride (USGS #3 - 2,180 µg/kg, May 1983). As shown in Table 4.5, four VOCs (combining xylenes) were detected in the black mud sample from TP-Z. These same parameters were detected in the composite sample (TP-X,Y,Z). However, the concentrations in the composite sample were lower. Therefore, it appears that the VOC presence noted in the composite sample was contributed solely by the naturally occurring black mud found in TP-Z. All VOC parameters detected at Site 108, as part of the USGS study, were qualified and should be used cautiously.

(12 B2)

The analytical results for the BNAs indicate that there is an assortment of PAH compounds present in the soil samples collected at Site 108. However, the total BNA concentrations from all samples collected, for all BNA parameters detected (whether above RSCO value or below), is as follows:

(12 B3)

Sample ID	*Total BNA Concentration (ppm)*
TP-1 (Q&S)	98.3
TP-1 (Q&S) dup	176.5
TP-X,Y,Z	265
TP-Z	1,249

This shows that all samples collected, with the exception of TP-Z, have total BNA concentrations below the maximum value of 500 ppm. The vegetative mud sample was isolated.

The analytical results for the metals indicate the presence of only five compounds (calcium, chromium, copper, magnesium, and zinc) from the TP-1 composite sample above the EUSBC soil values. The relative insignificance of the exceedances is proven by the fact that a duplicate sample was collected at this location. Three of the compounds (calcium, chromium, and copper) did not exceed the EUSBC value for either the original or duplicate sample. This indicates sample variability. The other two parameters only marginally exceed (within the same order of magnitude) the EUSBC values. For the borehole soil samples from Site 108, only five compounds (arsenic, copper, mercury, nickel, and zinc), exceed the EUSBC values. Two of these compounds (arsenic and copper) were only attributable to the TP-Z mud sample. The remaining parameters only marginally exceed (within the same order of magnitude) the background values.

12 B4

The test pit composite sample submitted for TCLP analyses (sample collection is discussed in Section 2.1.3) did not identify any significant chemical presence. None of the parameters present exceeded the TCLP regulatory levels.

12 B5

Soils with elevated chemical concentrations must either be accessible for direct contact or manifest itself off-Site through groundwater or surface water to pose a problem. Neither mechanism is present at Site 108. Although an assortment of VOCs, BNAs, and metals were detected in the soil samples collected at Site 108, chemical presence in the groundwater was limited primarily to the immediate vicinity of MW8-89. Compounds detected at

12 B6

MW8-89 are not present at downgradient well locations. Only one sample was collected from MW8-89 as the well did not again, during subsequent sampling events, yield sufficient groundwater for sample collection. This indicates that the chemical presence is limited to the area around MW8-89. Limited chemical presence in the surface water is attributable to off-Site sources (Section 4.4.2). Finally, there is little potential for soil contact because the soil contamination was detected only below grade.

Site 109

To characterize the fill materials disposed at Site 109, five test pits and three boreholes were advanced. The five test pits were advanced during the Malcolm Pirnie Investigation and did not include the collection of any soil samples.

The only soil samples collected at Site 109 were during the USGS study. No VOCs or BNAs were detected above the RSCO values. Metals analyses was not performed.

There is also no elevated chemical presence in the groundwater at Site 109. Only two common metals were marginally detected in the surface water above their MCLs. Finally, there is little potential for soil contact because the soil contamination was detected only below grade. Site 109 is also fenced and covered with vegetation.

Site 110

To characterize the fill materials at Site 110, six test pits and three boreholes were advanced. One composite soil sample was collected from the four test pits advanced during the Malcolm Pirnie Investigation and one composite soil sample was collected from the two test pits advanced during the CRA Supplemental Site Investigation. Three soil samples were collected during the USGS study.

The analytical results for the VOCs indicate the presence of three compounds (benzene, methylene chloride, and acetone), which exceed the

RSCO values. However, these are only for the USGS samples. As stated earlier, these data must be used cautiously as the data were qualified due to surrogate recoveries, being above or below acceptable limits. There was no VOC exceedances for the CRA composite sample. Benzene was the parameter which most greatly exceeded the RSCO value in the USGS study, however, benzene was not detected in the TCLP sample collected during CRA's Supplemental Site Investigation.

The analytical results for the BNAs indicated the presence of only three compounds and only in the one June 1989 CRA composite sample. These compounds include benzo(a)anthracene (4,700 µg/kg); chrysene (5,600 µg/kg), and benzo(b)fluoranthene, and benzo(k)fluoranthene (7,400 µg/kg). The total BNA concentration from all BNA parameters detected (whether above RSCO value or below) was 54.5 ppm. This is below the maximum allowable value of 500 ppm.

Only the CRA composite sample was analyzed for metals. There were no detections reported above the EUSBC values.

The test pit composite sample submitted for TCLP analyses (sample collection is discussed in Section 2.1.3) did not identify any significant chemical presence. None of the parameters present exceeded the TCLP regulatory levels.

Phenols were detected in the Malcolm Pirnie sample at a concentration of 0.30 mg/kg which is above the RSCO value of 0.03 mg/kg, however, phenols were not detected in the subsequent CRA composite sample. This result is therefore anomalous and insignificant.

Soils with elevated chemical concentrations must either be accessible for direct contact or manifest itself off-Site through groundwater or surface water to pose a problem. Neither mechanism is present at Site 110. Although some VOC and BNA compounds were detected in the soil at Site 110, chemical presence in the groundwater is limited to the vicinity of monitoring well MW-3/MW3R-89. There is no migration of groundwater off-Site from Site 110. Elevated chemical presence in surface water samples collected from the

low marshy area south of Site 110 was limited to three common metals during the CRA investigations (surface water results from the Malcolm Pirnie Investigation should be used with caution as a downstream location was not sampled). VOCs and BNAs which were detected in surface water samples during the Malcolm Pirnie Investigation were not found during the CRA investigations. There is no off-Site migration of surface water with elevated chemical presence. Finally, there is little potential for soil contact because the soil contamination was detected only below grade. Site 110 is also fenced and covered with vegetation.

4.2.3 Conclusion

In summary, low level VOCs and metals were detected in the fill material across the Site. The presence of BNAs, specifically PAHs, across the Site would be expected at a coke/coal production facility. In fact, coal is comprised of PAHs. PAH compounds in the soil would be anticipated as these compounds readily adsorb to the soil particles. However, this adsorption also virtually eliminates the possibility of migration of the PAH compounds into the groundwater. This is supported by the groundwater sample data (discussed in Section 4.3). Despite widespread PAH presence in the Site soils, PAH presence in the groundwater is limited to localized areas. Thus, chemicals present in the soils have not and will not migrate into the groundwater. There is also no surface water migration and no surficial soil exposure. Therefore, there is no significant threat to human health and the environment.

4.3 GROUNDWATER

4.3.1 Introduction

Groundwater is present at the Site within the thin fill veneer that constitutes the overburden regime. Chemicals are present within the overburden regime sporadically and usually at low concentrations. Due to the limited thickness of the overburden groundwater regime and its intermittent nature in some areas, groundwater movement throughout the Site is negligible.

Thus areas of chemical presence are localized and do not migrate off-Site. During CRA's Supplemental Site Investigation, a set of Site-Specific Indicator (SSI) parameters was developed which included six VOCs (1,2-dichloroethene (total), 1,1,1-trichloroethane, benzene, toluene, ethylbenzene, and total xylenes), BNAs (all polynuclear aromatic hydrocarbons (PAHs)), cyanide, hexavalent chromium (Cr+6) and oil and grease. Although other compounds are discussed where relevant, these SSI parameters form the basis of the following groundwater discussions.

4.3.2 Discussion

There are five distinct areas of the Site which require an evaluation of groundwater chemical presence: the manufacturing area, the coal fields storage area, Site 108, Site 109, and Site 110. Each are discussed in the paragraphs below.

Manufacturing Area

Four monitoring wells (MW9-89, MW10-89, MW11-89, and MW12-89) were installed around the perimeter of the manufacturing area during CRA's Supplemental Site Investigation to investigate potential off-Site groundwater migration. None of the SSI parameters were ever detected above the most stringent MCLs in the groundwater samples collected from these wells.

Coal Storage Area

Three downgradient monitoring wells (MW-4, MW15-89, and MW16-89) can be used to evaluate the potential impacts on the groundwater resulting from the coal storage area. Only one SSI parameter, (Chrysene, 88 µg/L, November 1985) has ever been detected above the most stringent MCL at MW-4. Similarly, only one SSI parameter (Benzene, 3.76 µg/L, December 1989) has ever been detected above the most stringent MCL (ND) at MW16-89. The previous sample round reported benzene as non detect. Although this detected benzene level is above the most stringent MCL, it is below the Sanitary Code Part 5 drinking water standard of 5 µg/L. No SSI VOC's or BNA's have

ever been detected above the most stringent MCLs at the third coal storage area monitoring well, MW15-89. The only SSI parameter ever detected above the most stringent MCL (100 µg/L) at MW15-89 was cyanide (250 µg/L, October 1989 and 147 µg/L, December 1989). These results are only marginally above the MCL (within the same order of magnitude). More importantly, reported cyanide detections at the adjacent upgradient Allied facility are much higher (detected in all eight monitoring wells (see Plan 1) ranging in concentration from 585 µg/L at MW-1 to 9,500 µg/L at MW-7). Allied, despite the higher cyanide detections, has already been relieved of the requirement for additional remedial work by the NYSDEC.

Site 108

Four monitoring wells (MW-6, MW-7, MW8-89, and MW18-91) have been used to evaluate the groundwater conditions at Site 108. No SSI VOCs or BNAs (or other VOCs and BNAs) have ever been detected above the most stringent MCLs at MW-6 and MW-7. The only parameter ever detected above the most stringent MCL (100 µg/L) at MW-6 and MW-7 was cyanide [189 µg/L, November 1985 and 198 µg/L, August 1986 at MW-6 and 167/170 (duplicate) µg/L, December 1989 at MW-7]. Cyanide is also present at elevated concentrations at all eight upgradient monitoring wells (585 µg/L to 9,500 µg/L) on Allied property. MW-7 is located generally downgradient of both MW-6 and MW8-89. At MW8-89, five of the six SSI VOCs were present above the most stringent MCL for the groundwater sample collected in June 1989. Repeat attempts to sample this well were not successful as the well did not yield sufficient groundwater for sample collection. The lack of sufficient water to even provide a sample gives an indication of the limited extent of chemical presence. The total VOC concentration at MW8-89 was low, 104 µg/L. Benzene, toluene and total xylenes were only present at low levels (41 µg/L, 16 µg/L and 27 µg/L) which are relatively insignificant given the volume of water available. Of the remaining VOCs 1,2-dichloroethylene and ethylbenzene were only marginally above their MCL (5 µg/L) at concentrations of 6 µg/L and 8 µg/L, respectively. VOC presence is not widespread at Site 108 as evidenced by the four "clean" samples collected from MW-7, located only 500 feet downgradient from MW8-89. The inability to collect subsequent groundwater samples from MW8-89 further indicates that there is little groundwater movement across Site 108. Thus the

groundwater with elevated chemical presence is localized in the MW8-89 area at Site 108. At MW8-89, the only SSI BNA compound present above the most stringent MCL (50 µg/L) is naphthalene. The only other detected PAH compound was 2-methylnaphthalene at 19 µg/L which is below the most stringent MCL (50 µg/L). The total PAH concentration at MW8-89 is 1919 µg/L, but as mentioned previously in the VOC discussion, MW8-89 was only sampled once due to low groundwater recharge. Similar to the observed VOC presence, no evidence of PAH presence was detected 500 feet downgradient at MW-7.

Cyanide was detected at MW8-89 at a concentration of 3,730 µg/L (December 1989). As mentioned earlier, the cyanide concentration at downgradient well location MW-7 was only marginally above the MCL, at concentrations of 167/170 (duplicate) µg/L in samples collected during the same sampling event. Aside from the MW-6 sample discussed previously, the only other MCL cyanide exceedance was for the USGS sample collected at Site 108 (280 µg/L - July 1982). The location of this sample is not known. All other samples were well below the MCL. Cyanide, also as discussed previously, is present upgradient on Allied property at elevated concentrations in all eight monitoring wells.

In order to determine whether any Site chemicals were migrating into the Niagara River, the analytical data from two wells were examined; MW-7 and MW18-91. Well MW18-91 was installed in the northwest corner of Site 108, adjacent to the Niagara River. The initial sample from this well indicated the presence of only one VOC parameter, cis-1,2-dichloroethane (7.68 µg/L, July 1991). No BNAs were present. Cyanide was present (36 µg/L) but well below the most stringent MCL. Concurrent with the collection of a second sample from MW18-91, a sample was collected from MW-7 in July 1992. There were no SSI VOC, BNA or cyanide MCL exceedances from either well location. In fact there were no VOC or BNA parameters detected. Cyanide was detected (37/26 (duplicate) µg/L at MW-7 and 40 µg/L at MW18-91) however, the most stringent MCL was not exceeded. The cyanide concentration was the same as for the previous round at MW18-91 and less at MW-7. Using the most recent sample results from MW-7 and MW18-91, the estimated cyanide loading to the Niagara River is 7.2×10^{-9} lbs/day.

In summary, groundwater with elevated chemical presence has been detected at Site 108, specifically at monitoring well MW8-89. Compounds detected at MW8-89 are not present at downgradient well locations. The lack of groundwater with elevated chemical presence downgradient of MW8-89 and the poor availability of groundwater at MW8-89 shows that the groundwater with elevated chemical presence is extremely localized.

Site 109

Three monitoring wells (MW-4, MW-5, and MW17-89) have been used to evaluate the groundwater conditions at Site 109. Monitoring well MW-4 was previously discussed for the coal field storage area. With the exception of chrysene, no SSI parameters were detected above the most stringent MCLs. There has never been an SSI parameter detected above the most stringent MCLs at MW-5. Methylene chloride (not an SSI parameter) was detected at a concentration of 8.04 µg/L in December 1989, however this compound was also present in the laboratory/reagent blank indicating possible/probable laboratory contamination and thus is not suspected of having been present in the field. No SSI VOCs or BNAs have ever been detected at the remaining monitoring well, MW17-89. The only parameter ever detected above the most stringent MCL (100 µg/L) was cyanide (270 µg/L, December 1989). As for other cyanide results, this concentration is only marginally above the MCL (same order of magnitude) and is insignificant given the upgradient concentrations at Allied.

Site 110

Six monitoring wells (MW-2, MW-3, MW3R-89, MW13-89, MW19-91, and MW20-91) can be used to evaluate the groundwater conditions at Site 110. Monitoring wells MW-2 and MW-3 were installed as part of Malcolm Pirnie's Phase II Investigation. No SSI VOCs or BNA's have ever been detected at MW-2. The only SSI parameter ever detected above the most stringent MCL (100 µg/L) at MW-2 was cyanide (740 µg/L, November 1985; 500 µg/L, August 1986; 230/259/254 (duplicate) µg/L, June 1989 and 620 µg/L, October 1989). As shown in Tables 4.8 and 4.9 some of the VOC and BNA compounds were detected above the most stringent MCLs at MW-3 during Malcolm Pirnie's Investigation. During CRA's Supplemental Site Investigation a

replacement well, MW3R-89, was installed to replace the damaged well MW-3. The VOC parameter which is present at the highest levels at MW3R-89 is 1,1,1-trichloroethane, which was only detected at concentrations between 10 and 12 µg/L which is only slightly above the most stringent MCL of 5 µg/L. Total xylenes were detected marginally above the most stringent MCL (5 µg/L) at 6 to 7 µg/L. Benzene was detected at lower levels (2 to 2.5 µg/L), however, the most stringent MCL, as derived from 6 NYCRR Part 703.5, is ND. These levels are all very low. Toluene and ethylbenzene were present at levels (1 to 2 µg/L) below the most stringent MCl of 5 µg/L. The total VOCs concentration at MW3R-89 is only 22.5 µg/L which is not significant given its location in the center of the Site. No VOCs are present in adjacent wells MW-2, MW-13, MW-14, or MW-15.

Although Table 4.11 indicates the presence of several PAH compounds at MW-3 and MW3R-89, the concentrations are only marginally above the most stringent MCLs. Analytical data are presented for MW3R-89 for two samples from round two and one sample from round three of CRAs Additional Site Investigation. As noted from Table 4.11, the data for the first two samples have been qualified as estimated due to outlying surrogate recoveries. In comparison with the round three sample, it can be seen that the concentration of each PAH compound is somewhat lower for the unqualified third round sample. From the round three data, the most prevalent PAH compound is naphthalene at 404 µg/L. This concentration is above the most stringent MCL (50 µg/L). Two other PAH compounds, fluorene and phenanthrene, were detected slightly above the most stringent MCL (50 µg/L). The total PAH concentration at MW3R-89, using round three data, is approximately 693 µg/L. Cyanide has also been consistently detected at MW-3/MW3R-89. Concentrations range from 120 µg/L to 220 µg/L.

No SSI VOCs or BNAs were ever reported at MW13-89. During CRA's Supplemental Site Investigation however cyanide concentrations were reported at 2,750 µg/L and 1,690/1,720 (duplicate) µg/L.

To investigate the possibility of cyanide migration across the Site boundary from Site 110, MW19-91 was installed off-Site within the Con Rail track area, northeast of the TCC facility during CRA's Additional Site Investigation. A second well, MW20-91, did not have sufficient groundwater

recharge to produce the necessary sample volume for complete analysis. The cyanide concentration reported for MW19-91 (4 µg/L) is approximately two orders of magnitude lower than that previously found at the adjacent on-Site wells, MW-2 and MW13-89, and well below the most stringent MCL (100 µg/L). The absence of any VOC parameters is also similar to that previously reported at the adjacent Site boundary wells.

In the MW19-91 Additional Site Investigation sample, (Round 4) SSI PAH compounds were present at concentrations equivalent to or below the most stringent MCL. The previous Supplemental Site Investigation sampling results showed that no PAH compounds were even detected at the boundary wells MW-2 and MW13-89; while many of the PAH compounds found at MW-3 and MW3R-89, further to the south, were below the drinking water standards. MW-3 and MW3R-89 are located in the center of the groundwater mound and are adjacent to the coal piles in Area 110; however, the total PAH concentration found off Site (MW19-91) exceeds those found on Site (MW-3 and MW3R-89) by more than an order of magnitude. As previously mentioned, no PAH presence was detected at the boundary wells MW-2 and MW13-89, which are between MW19-91 and MW-3/MW3R-89. Thus the presence of PAHs in this off-Site area show that the PAHs are not related to the TCC Site conditions. Similarly, the off-Site oil and grease at this location is not consistent with the on-Site perimeter data indicating an off-Site source as well. This is not unexpected in a railroad setting.

During the second round sampling of the Additional Site Investigation, no SSI VOC's were detected. However acetone was detected at MW19-91. Acetone is ubiquitous within the laboratory environment and thus this result is considered anomalous. SSI BNA's were detected at MW19-91 (12 compounds ranging in concentrations from 11 to 57 µg/L) however the results are more than an order of magnitude less than the previous round. The other off-Site well MW20-91 was sampled during the second round. No SSI VOC's or BNA's were detected. In summary, groundwater with elevated chemical presence exists in the vicinity of MW-3/MW3R-89, which is upgradient from Site 110. Cyanide concentrations reported at MW-2 have been shown not to have migrated off-Site as both MW19-91 and MW20-91 showed cyanide presence, but below the most stringent MCL. Thus, groundwater with elevated chemical

presence is localized to the vicinity of monitoring well MW3R-89, at Site 110. There is no migration of groundwater off-Site from Site 110.

4.3.3 Conclusion

During the course of the various Site Investigations, a total of 57 groundwater samples were collected. Of these 57 samples, exceedances of SSI parameter maximum contaminant levels (MCLs) were reported as shown in Table 4.17. For VOC's, the six compounds were analyzed a total of 291 times. MCL exceedances were reported only 17 times or 6 percent of the samples, represented 15 of 17 times by only two well locations (MW-3 or MW3R-89 and MW8-89). Both wells (MW-3 or MW3R-89 and MW8-89) are located on the Site interior, upgradient of boundary wells. There is no elevated chemical presence at the boundary wells. For BNA's the 16 compounds were analyzed a total of 693 times. MCL exceedances were reported only 50 times or 7 percent of the samples, represented 49 of 50 times by only two well locations (MW-3 or MW3R-89 and MW19-91). The total PAH concentration at off-Site well MW19-91 exceeded those found on Site which indicates the PAH presence is not Site related. The other two wells are located on the Site interior and chemical presence at these wells has not been detected at downgradient boundary wells. Cyanide has been detected at numerous well locations at the TCC Site. However, higher concentrations exist at the eight upgradient Allied Site monitoring wells. In summary there are two areas of groundwater with chemical presence at the Site. These areas are represented by wells MW-3/MW3R-89 and MW8-89. Based on surrounding and downgradient sample results these areas are localized and insignificant. There is no indication that chemicals have migrated off Site. Additionally, the waterbearing unit is not suitable for use as a source of drinking water or other potable uses. It is an intermittance, low volume source.

4.4 SURFACE WATER

4.4.1 Introduction

Surface water samples have been collected during the four Site investigative programs to determine potential on-Site and off-Site chemical presence. The sampling locations are shown on Figure 2.3. The analytical data for the various programs are presented on Tables 4.18, through 4.21. Due to the steep ground surface gradient at the Site immediately adjacent to the east side of River Road, groundwater upgradient of this location can seep through the face of the slope and become surface water prior to infiltrating downward into the fill material and again becoming groundwater at the bottom of the slope (i.e., Site 108). In general, chemical presence was observed in the samples however, the source of this presence is primarily a result of off-Site sources.

4.4.2 Discussion

There are three distinct areas of the Site from which the surface water samples were collected: Site 108 (and upgradient off-Site sources), Site 109 (and upgradient off-Site sources), and the marshy area located south of Site 110. As was done for the groundwater, select samples (4 of 9), collected during CRA's Supplemental Site Investigation were submitted for analysis of the SSI parameters. The remaining five samples were submitted for analysis of the full TCL/TAL list, with the exception of TAL metals for which sample collection was inadvertently omitted. It was observed that the detectable concentration of non-SSI parameters was infrequent and either low-level or attributable to potential field or laboratory contamination. All samples collected for the CRA Additional Site Investigation were analyzed for parameters detected during the Supplemental Site Investigation. Each of the three areas are discussed separately in the paragraphs below.

Site 108

To characterize the surface water quality at Site 108, ten surface water samples were collected (seven within Site 108 and three off-Site);

one during the USGS study, four during the Malcolm Pirnie Investigation, and five during the CRA Supplemental Investigations.

Only two SSI VOC parameters, benzene and toluene, were present above the most stringent surface water MCLs of ND and 5 µg/L, respectively. Benzene was detected at SW-3 (7.7 µg/L - November 1985 and 7.8 µg/L - August 1986); SW-4 (7.0 µg/L - November 1985 and 34 µg/L - August 1986), and SW-6 (6.9/7.0 (duplicate) µg/L - October 1989). Toluene was detected at SW-3 (20 µg/L - November 1985 and 17 µg/L - August 1986); SW-4 (14 µg/L - November 1985 and 87 µg/L - August 1986), and SW-6 (13/14 (duplicate) µg/L - October 1989). These concentrations are essentially equal to the MCL.

16A2

Low level, relatively insignificant MCL exceedances were reported for non-SSI VOC parameters chlorobenzene, o-xylene, and m-xylene/chlorobenzene in the Malcolm Pirnie samples. These parameters were all non detect in the subsequent CRA Supplemental Site Investigation samples. Acetone was detected in the SW-5 sample, however, this result was qualified as estimated due to potential field contamination.

16A3

The only SSI BNA parameter detected at any of the sample locations was phenols. Phenol was detected at SW-3 and SW-4 during both sampling rounds at these locations, but was not detected during subsequent sampling at either SW-5 or SW-6.

16A4

Only two common metals, iron and manganese, were detected above the surface water MCL's of 300 µg/L each. Iron was detected at Site 108 (USGS study - 2,400 µg/L - July 1982), and SW-5 (820/830 (duplicate) µg/L - December 1989). Manganese was detected at SW-5 (960/800 (duplicate) µg/L - December 1989). These results are only marginally (within same order of magnitude) above the most stringent MCL.

Cyanide and hexavalent chromium were not detected above the most stringent MCLs, except for the revisit sample at SW-6 where cyanide was reported at 1,680 µg/L. Previous samples were well below the MCL indicating that this result is anomalous and may be linked to a groundwater

discharge from the steep slope as discussed earlier in Section 4.3.1. High cyanide concentrations were reported in the upgradient Allied groundwater.

In order to better understand the surface water pathways, a visit was made to the Site to confirm sample locations and surface water directions between the first and second round surface water sample collection event during CRA's Supplemental Site Investigation. It was discovered that two different flow components contribute to the flow through the culvert crossing under River Road to the west which discharges to the SW-6 location. Sample location SW-8 (discussed with Site 109) represented the flow coming from the north along the east side of River Road, but there was also a flow component from the east. Following this swale upstream, it was found that two separate flows contributed to this swale. One flow component originated from the coal storage area of the Site further to the east. This is a permitted monitored discharge. The second flow component came from the southeast, discharging from two long culverts beneath the building complex just east of River Road. South of the Site, these culverts collected all of the surface waters from the large marshy area, including much of the petrochemical facilities to the south.

Subsequent sampling of these components of the surface water drainage pattern was conducted as follows:

SW-18 sample collected from the ditch originating just west of the coal piles, at the southeast corner of Site 109, prior to surface water drainage down the slope toward River Road;

SW-16 sample collected from the flow exiting the combined culverts prior to that flow joining the swale containing the flow from SW-18; and

SW-17 sample collected prior to the combined SW-16/SW-18 flow joining with the southerly SW-8 flow component and discharge to the culvert under River Road.

The results of the surface water samples collected from these three additional locations showed only SW-16 to contain a detectable level of benzene (6.4 µg/L) above the most stringent MCL. All other SSI VOC

parameters were non detect at all three locations. The benzene presence at SW-16 indicates that the concentration detected on-Site at SW-6 is originating from southerly off-Site sources prior to entering the TCL Site surface water drainage network via the two culverts. It should be noted that sample SW-17, representing the combined TCC flow (SW-18) and off-Site flow (SW-16) had no detectable benzene concentrations. This is postulated to be due to dilution effects. Thus, with respect to VOCs in the surface water at Site 108, off-Site sources appear to contribute the chemistry present. There are no VOCs (other than acetone previously discussed as qualified data) at location SW-5 which is closest to the Niagara River. Therefore there is no VOC chemical contribution to the Niagara River from the Site surface water.

The three additional samples did not report any presence of BNA compounds. This demonstrates that there is no BNA surface water contamination originating from the coal storage area, the southern off-Site areas, and the low marshy area (described as part of Site 110 in the following paragraphs). There are no BNAs at the location of SW-5. Therefore there is no BNA chemical contribution to the Niagara River from the Site surface water.

The three additional samples reported both manganese and iron presence. The highest reported manganese concentration (3,520 µg/L) was observed at the SW-16 sample. This is the location representing the southerly off-Site flow directed through the two long culverts. Although some lower levels of manganese were detected in SW-18 surface waters from the TCC coal storage area, it appears that the southern off-Site areas are the major contributor to the elevated manganese levels reported for SW-6, and the downgradient SW-5 surface waters.

Since the SW-18 samples representing TCC surface water flow from the coal storage area contained iron below the most stringent MCL and SW-16 sample, representing the southerly off-Site flow, contained elevated iron concentrations (920 µg/L), it appears that the iron contamination, like the manganese contamination, originates off-Site and is not attributable to TCC.

Both iron and manganese were reported at SW-5, marginally above the MCLs. These common parameters therefore discharge to the Niagara River via the TCC Site, however appear to originate from off-Site sources.

Cyanide and hexavalent chromium have never been detected above MCLs at SW-5 and thus are not discharged to the Niagara River via surface water.

In summary, only two VOCs and two metals were detected in the surface water at Site 108, and these parameters (except for toluene) were detected upstream at greater concentrations, indicating that the source is off-Site. There is no unpermitted chemical discharge to the Niagara River via surface water from the TCC Site. Two common metals, iron and manganese, are discharged to the Niagara River, but these are contributed from southerly off-Site sources.

Site 109

To characterize the groundwater at Site 109, six surface water samples were collected, one during the USGS study, two during the Malcolm Pirnie Investigation and three during the CRA Supplemental Site Investigation.

There were no SSI VOCs detected in any of the samples collected at Site 109. Acetone was reported in two samples; SW-8 (200 µg/L), and SW-10 (80 µg/L); however, these data were qualified as estimated due to potential field contamination, and are therefore considered insignificant.

There were no SSI BNAs detected in any of the samples collected at Site 109. Phenol was detected at SW-8 (10 µg/L - October 1989), however, it was not detected downstream at SW-6 during the same sampling round.

Only two common metals, iron and manganese, were detected above the most stringent surface water MCLs. Iron was detected at SW-8 (810 µg/L - December 1989), and SW-9 (1,180 µg/L - March 1990).

Manganese was detected at SW-8 (1,200 µg/L - December 1989), and SW-10 (460 µg/L - December 1989). The surface water at location SW-9 represents the drainage from the New York Wire Site to the north of the sample location. Iron was detected at a higher concentration at SW-9 than SW-8 indicating, metals contribution from upstream. The elevated levels of both iron and manganese are only marginally (within an order of magnitude) above the MCLs.

Cyanide and hexavalent chromium have never been reported above the most stringent MCLs at Site 109.

Site 110/Low Marshy Area

The third area at which surface water samples were collected is the low marshy area, located south of Site 110. Through review of the aerial survey, it was possible to estimate the direction of surface water flow (sample locations are shown on Figure 2.3). It appears that the surface waters at SW-12, SW-14, and SW-15 all flow toward a central location in the area of SW-13. Thereafter, the general direction of surface water flow appears to be toward the west, represented by sample location SW-11. This is confirmed by the physical barriers and railroad tracks to the east and south which prevent any off-Site surface water flow in these directions.

To characterize the surface water at the low marshy area, ten samples were collected, two during the Malcolm Pirnie Investigation, three during CRA's Supplemental Site Investigation, and five during CRA's Additional Site Investigation. Results from the Malcolm Pirnie SW-1 sample should be discussed separately as no downstream location was sampled. Two SSI VOCs, benzene, and toluene, were detected. Benzene was detected at SW-1 (48 µg/L - November 1985 and 33 µg/L - August 1986). Toluene was detected at SW-1 (24 µg/L - November 1985 and 12 µg/L - August 1986). Low level, relatively insignificant MCL exceedances were reported for non-SSI VOC parameters m-xylene/chlorobenzene and o-xylene. BNAs which exceeded MCLs were anthracene (208 µg/L - August 1986), naphthalene (210 µg/L - November 1985 and 1,050 µg/L - August 1986), and phenols (39 µg/L - November 1985 and 610 µg/L - August 1986). Metals analysis was not performed on the SW-1 samples.

For the CRA samples, there were no SSI VOCs detected at the low marshy area. Only one VOC parameter, acetone, was detected. Acetone was detected at SW-14 (55 µg/L - October 1989 and 364 µg/L - July 1992). The October 1989 concentration was qualified as estimated due to potential field contamination. Despite this possible acetone presence at SW-14, acetone was not detected downstream at SW-13 or SW-11.

No SSI BNAs were detected in any of the CRA samples at concentrations greater than the most stringent MCLs.

The analytical results for metals for the CRA samples show that only three common parameters exceeded their respective most stringent MCL's; iron, magnesium, and zinc. Iron was reported at concentrations greater than its MCL at eight of eight locations. During the Supplemental Site Investigation (March 1990), iron was reported in all three samples with the highest concentration occurring at SW-14 (472,000 µg/L). This reduced to 82,600 µg/L at the downstream SW-11 location. At SW-12 the concentration was 1,120 µg/L. For the more recent Additional Site Investigation samples (July 1992), iron concentrations exceeding the most stringent surface water MCL were reported in all five samples (six including the duplicate). The highest concentration was again at SW-14 (161,000 µg/L). The iron concentrations reduce downstream towards SW-11 (1,370 µg/L). This value is only marginally above the MCL (within an order of magnitude) and is not considered significant. The same scenario exists for the manganese concentrations. Concentrations during the Supplemental Site Investigation ranged from 68 µg/L (below MCL) at SW-12 to 2,480 µg/L at SW-14. The downstream location SW-11 reported a concentration of 1,080 µg/L. For the Additional Site Investigation, four of five sample locations reported concentrations which exceeded the most stringent surface water MCL. The highest concentration was again at SW-14 (3,910 µg/L) however, at the downstream location, SW-11, the concentration was below the most stringent MCL. Zinc was only detected once above its most stringent MCL, also at SW-14 (450 µg/L). Zinc was not detected above the MCL at the downstream location, SW-11. Thus the only metal compound which exceeds the most stringent MCL at SW-11 is iron, and as discussed this is relatively insignificant due to the order of exceedance.

Cyanide was only detected above the most stringent MCL (100 µg/L) on one occasion. At SW-11, the cyanide concentration was reported to be 138 µg/L, which is only slightly above the MCL. This presence is anomalous as all of the upstream locations had cyanide concentrations below the non-detect. It should be noted that the 100 µg/L level is derived from a water supply sources regulation (10 NYCRR Part 170), while the Class GA groundwater standard (6 NYCRR Part 703.5) is 200 µg/L. The surface water in the wetlands to the southeast of the TCC plant is not, and never will be, used as a source of water supply.

Hexavalent chromium was only detected in one sample, SW-14, and this was below the most stringent groundwater MCL. Oil and grease were detected at low levels at only two locations, SW-11 and SW-12.

4.4.3 Conclusion

There is no VOC or BNA chemical contribution to the Niagara River from the TCC Site. Two common metals, iron and manganese appear to be being discharged to the Niagara River. However, these compounds are attributable to southerly off-Site sources. There are no off-Site discharges of surface water with elevated chemical presence. Any chemical exceedances of most stringent MCL's are marginal - less than an order of magnitude.

4.5 SEDIMENTS

4.5.1 Introduction

Sediment samples were collected from select surface water sample locations during CRA's Supplemental and Additional Site Investigations where chemistry had previously been detected in surface water samples. The sediment sampling centered around two areas of the Site; Site 108 (specifically SW-6) and the low marshy area south of Site 110. The sample locations are shown on Figure 2.3. Tables 4.23 and 4.24 summarize the sample analytical

results. Table 4.25 presents a summary of the three sources comprising the sediment screening levels. Table 4.26 presents a summary of parameter exceedances as compared to the sediment screening levels. Three separate sediment screening level sources were used so that values would be presented for the maximum number of parameters. These sources are NYSDEC "Technical Guidance for Screening Contaminated Sediments", July 1994; USEPA ECO Update "Ecotox Thresholds", January 1996; and Minnesota Pollution Control Agency "Site Screening Evaluation: Sediment Ecological Screening Criteria", Working Draft, April 1996. There are some VOC and BNA sediment screening level parameter exceedances. However, neither area sustains an ecological system throughout the year. As stated in Section 4.3, groundwater is not always available in some Site locations. The same is true for surface water. Lack of constant surface water prohibits the creation of sustainable ecosystems. Therefore, although chemistry is present in some Site sediments, there is virtually no possible contact with humans.

4.5.2 Discussion

Site 108

Three sediment samples were collected to evaluate the chemistry reported in the SW-6 sample location at Site 108. Sediment samples were collected at SW-6, downgradient at SW-5 and upgradient at SW-9. Sediment samples were not collected at the three additional southerly off-Site surface water locations, as the three surface water samples were collected following the sediment sample collection.

Only two VOCs were reported above sediment screening criteria levels at Site 108. These are methylene chloride and 1,2-Dichloroethane. Methylene chloride was detected at SW-5 (2,500 µg/kg), SW-6 (2,090 µg/kg), and SW-9 [2,010/1,300 (duplicate) µg/kg]. However, methylene chloride was also detected in the field blank at 4,840 µg/kg. This would indicate sample collection contamination from equipment cleaning. 1,2-Dichloroethane was detected at SW-5 (2,690 µg/kg) but at much lower levels upgradient at SW-6 (90 µg/kg). This chemical presence would appear to be originating from the Site 108 area.

1,2-Dichloroethane was not detected in any of the surface water samples and in only one groundwater sample from MW8-89. The groundwater concentration was only (6 µg/kg) which is only 1 µg/kg above the most stringent MCL of 5 µg/kg.

The analytical results for BNAs at Site 108 show that seven PAH compounds are present at SW-6 above sediment screening levels but that only two of these seven parameters, phenanthrene and pyrene, were present above the screening levels downgradient at SW-5. As stated repeatedly throughout this document, PAHs adsorb to soil particles and would be expected to be present at a Site of this nature. The soil adsorption prevents the chemistry present in the sediments from migrating into either the groundwater or surface water. As such, although PAHs are present in the sediment at Site 108, this is expected, and will not create subsequent surface water or groundwater chemical presence.

Cyanide and hexavalent chromium were not detected in the three samples collected for Site 108. Oil and grease was present in all the sediment samples but the only elevated concentration was detected at SW-5. This correlates with the low level oil and grease concentration detected in the corresponding surface water sample. The oil and grease exceedance is within an order of magnitude of the screening level.

Low Marshy Area

Four sediment samples were collected from the low marshy area. Samples were collected from SW-11 and SW-14 during both the CRA Supplemental and Additional Site Investigations.

Only four VOCs were reported above the sediment screening criteria. These are methylene chloride, 1,1,1-Trichlorethane, benzene, and toluene. Methylene chloride was detected at both sample locations (SW-11 and SW-14) during CRA's Supplemental Site Investigation and only at SW-14 during CRA's Additional Site Investigation. Methylene chloride is a common lab contaminant and was detected during previous sediment sampling rounds in the

field blank. This parameter is not a concern. 1,1,1-Trichloroethane was detected in the first sample collected at SW-11 [200/210 (duplicate) µg/kg]. This is only marginally above (within same order of magnitude) the sediment screening criteria of 170 µg/kg and is considered relatively insignificant. Benzene (680 µg/kg) and toluene (870 µg/kg) were detected in the initial SW-14 sample marginally above their respective screening levels of 570 µg/kg and 670 µg/kg. Neither parameter were detected in the subsequent samples collected at SW-11 and SW-14. Benzene and toluene pose no concern in the sediment at the low marshy area.

The analytical results for the BNAs at the low marshy area show that nine PAH compounds were present at SW-14 during the initial sampling round above the sediment screening criteria levels. Downgradient at SW-11 only four of the nine PAH compounds exceeded the screening criteria. The second sample collected at SW-14 reported six parameters which exceeded the screening levels; however, downgradient at SW-11, no exceedances were reported. BNAs, specifically PAH, presence is not unexpected, due to the nature of the Site. The sediment data shows that PAHs have not migrated beyond the downgradient, low marshy area SW-11 sample location.

Hexavalent chromium and oil and grease were not detected at the four sample locations. Cyanide was not detected at either SW-11 or SW-14 during the Supplemental Site Investigation but was detected at concentrations greater than the screening level in the Additional Investigation samples. Cyanide was detected at SW-14 [30,300/21,900 (duplicate) µg/kg] and SW-11 (2,400 µg/kg). The screening level is 0.1 µg/kg. This cyanide presence is inexplicable and is theorized to be anomalous.

4.5.3 Conclusion

In summary, there is elevated chemical presence in the Site sediments at select locations. These exceedances pose no ecological concern as the lack of continually available surface water precludes establishment of sustained ecosystems in these areas. Additionally, limited access virtually eliminates exposure to the sediments, thus precluding human contact.

4.6 AIR

As part of CRA's Supplemental Site Investigation, findings of previous studies were reviewed. CRA concluded that air emission sources are adequately controlled as air permitting standards are met by TCC. No further air testing was conducted or required.

5.0 CONTAMINANT TRANSPORT AND FATE

5.1 INTRODUCTION

The following section presents a qualitative consideration of the potential pathways of contaminant migration from the Site and the general behavior of the contaminant types. The assessment is based on the data collected during the various Site investigations.

5.2 POTENTIAL CONTAMINANT MIGRATION PATHWAYS

Site-related chemicals have been detected in subsurface soil, groundwater, surface water and sediment, although many of the measured concentrations are low. The potential contaminant migration pathways which exist at the Site include:

i) atmospheric dispersion from surface soils;
ii) groundwater flow; and
iii) surface water runoff.

Each of these potential migration pathways is discussed in the following subsections.

5.2.1 Atmospheric Dispersion

Atmospheric dispersion of chemicals from the Site is restricted to chemicals present in the surface soils. There was no surface soil sampling conducted as part of the various Site investigations because there is no surface waste definition, no staining, and no odors. Detected VOCs in sediment samples would be subject to atmospheric dispersion if not covered by surface water. VOC presence in the sediments was minimal. Consequently, atmospheric dispersion from the Site is an inconsequential migration pattern.

5.2.2 Groundwater Migration

The previous investigations have identified two distinct areas of groundwater with elevated chemical presence. These are as follows:

i) the area around MW-3 (and its replacement well MW3R-89); and
ii) the area around MW8-89.

Migration from these two areas is discussed below.

At this Site, groundwater is available only in the uppermost waterbearing unit which consists primarily of fill material. The fill material is generally less than 8 feet thick across the Site. (The one exception to this is at Site 108 where the fill averages 10-12 feet thick.) Below the fill material exists a thick layer of clay which forms an effective aquitard preventing vertical groundwater migration. There are two on-Site areas where groundwater within the fill unit exhibited chemical presence; the eastern area of the main plant fenced area (MW3 and MW3R-89) and the area between River Road and the Niagara River (MW8-89). Total VOC and BNA concentrations during CRA's Supplemental Site Investigation were reported as 22.5 µg/L and 404 µg/L, respectively, at MW3R-89 and 104 µg/L and 1944 µg/L, respectively, at MW8-89. These two areas are not hydraulically connected due to surface topography and the existence of the clay strata which forms an effective aquitard between the two areas.

Low level MCL exceedances for VOCs and BNAs were reported at MW-3/MW3R-89, however, the groundwater with elevated chemical presence is localized to the immediate vicinity as evidenced by the chemical data from surrounding monitoring wells. There is no migration of groundwater off-Site from MW-3/MW3R-89.

It is also apparent that the transmissivity of the well which exhibited chemical presence in the area between River Road and the Niagara River (MW8-89) is very poor, as it did not contain enough water for sampling during the last two sampling rounds of CRA's Supplemental Site Investigation. A high chemical concentration in a very low water producing setting is

indicative of a very localized impact. This is substantiated by the fact that SSI parameters were not detected at MW-7 which is located between MW8-89 and the Niagara River, confirming that the impact of the water near MW-8 is not of significance as the water moves towards the Niagara River. This also indicates that the sampled groundwater is confined to a very small area and since the fill area is neither a suitable location for a production well, nor is there a productive aquifer present, there is minimal potential exposure to groundwater contained within the Site.

5.2.3 Surface Water Runoff

Surface water runoff or overland flow may carry particulate or dissolved contaminants from the surficial soil. Surface water within the building/plant area of the Site is collected by the below ground sewer system and directed to the sewer outfall west of the Site. The topography in the southeast corner of the Site suggests a general surface water flow direction towards the low marshy area with the collected water outletting to the west. South of the Site, approximately 500 feet east of River Road, there are two large underground culverts which direct all the surface water drainage from southerly neighboring areas toward the north and under the adjacent Allied property. The surface water outletting from these two culverts then joins the TCC surface water drainage pathways prior to crossing River Road and traveling through Site 108 to the Niagara River. The stream which meanders through the Site is small and intermittent.

23A

Surface water concentrations were low for the SSI chemicals. Benzene and toluene were the only VOCs reported in surface water at detectable concentrations. Acetone was reported but is considered a laboratory contaminant. Benzene concentrations only slightly exceed the MCL value of 5 µg/L. The toluene concentrations were well below any State or Federal limits noted in Table 5.1. Toluene and benzene were detected at location SW-6, adjacent to River Road which carries a heavy traffic load. VOCs and PAHs would be expected as surface contamination from vehicle exhausts. Benzene was also noted at SW-16, but again at a concentration that is only slightly greater than

23B

the MCL. This could be expected in surface waters within an urban/industrial area.

PAHs (pyrene and fluoranthene) were also detected in the surface water. These parameters have low molecular weights, are more soluble, and are not carcinogens. Concentrations similar to those found at the Site are ubiquitous in an urban industrial setting. Some of the surface water locations which exhibited elevated chemical presence are located in the eastern portion of the Site. As such, there is a potential for this contaminated surface water to migrate to the marshy areas adjacent to the Site. Benzene and toluene migration is not a concern as these parameters would dissipate rapidly due to volatilization in shallow surface water. The high adsorption characteristic of PAHs would prevent these chemicals from migrating off-Site, or any distance into the marshy area. The VOCs present are not highly toxic and would have a short residence time in the marshy areas due to biodegradation and volatilization. The PAHs have low toxicity and are rapidly metabolized by vertebrates including birds, mammals and fish.

5.3 SUMMARY

The potential chemical migration pathways at the Site (i.e., atmospheric dispersion, surface water runoff, and groundwater migration) are not viable transfer mechanisms. Atmospheric dispersion of chemicals is only likely to occur from sediments and only if not covered with water. Surface water and groundwater have been shown to be poor or insignificant means of chemical migration. Therefore, these pathways are not of concern at this Site. A detailed analysis of the fate of the chemical compounds which exceeded the most stringent MCLs for each respective media is not necessary.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made regarding the TCC Site.

- The underlying clay is acting as an aquitard, preventing both vertical and horizontal groundwater movement. In support of this conclusion, the clay does not contain TCC chemicals.

- PAH presence is isolated to two specific on Site locations. Other adjacent off-Site sources of PAHs also exist.

- Groundwater chemical presence is isolated to two specific on-Site locations; wells MW3R-89 and MW8-89. There is no evidence of the observed chemical presence exiting the Site.

- The groundwater samples from wells MW-2 and MW18-91 along the Niagara River have not exhibited any VOC or PAH presence exceeding the most stringent MCL. This indicates that no significant migration of the localized chemical presence in the middle of Site 108 has reached the Niagara River. There are no loadings of Site-specific parameters to the Niagara River.

- Cyanide is present in the groundwater beneath the Site but does not appear above MCLs at the Site boundaries except in the northeast corner. However, there is no observed cyanide presence in off-Site wells adjacent to the northeast corner. The estimated chemical mass flux of cyanide to the River via the groundwater is estimated to be 7.2×10^{-9} lbs/day. Other sources of cyanide are present in the industrial neighborhood in which the TCC facility is located and likely contribute to this loading.

- No chemicals are currently leaving the TCC Site via the surface water pathways, either to the Niagara River or to adjacent properties to the Site.

- Chemical presence in TCC surface waters to the west of River Road appears to be due to off-Site surface water drainage from the southern oil-field properties.

- Manufacturing Area: There were no SSI parameter exceedances reported for the collected groundwater samples. Thus, there is no off-Site migration of groundwater with chemical presence. Therefore, the manufacturing area does not pose a significant risk to human health and the environment.

- Coal Fields Storage Area: Small insignificant metals MCL exceedances were reported for the soil samples collected. Marginal groundwater MCL exceedances were reported for three parameters and one of these was cyanide, which is present upgradient on Allied property. Surface water flow is discharged under an outfall permit. No monitored parameter exceedances have ever been reported at this outfall. Therefore, the coal fields storage area does not pose a significant risk to human health and the environment.

- Site 108: Chemistry present in the collected soil samples is limited to PAHs and low metals exceedances. Soil exceedances are primarily attributable to the collected "mud" sample. Elevated chemical presence in the groundwater is limited to the vicinity around MW8-89. The chemistry is known to be isolated as water availability at MW8-89 is poor and there is no elevated chemical presence in the groundwater downgradient at MW-7. Elevated chemical presence in the surface water is attributable to southerly off-Site sources. There is no discharge of TCC chemicals to the Niagara River from surface water. Marginal VOC MCL exceedances were reported for collected sediment samples. PAHs were present in the sediment samples, however, due to particle adsorption, this chemistry has not migrated to either the groundwater or surface water. Therefore, Site 108 does not pose a significant risk to human health and the environment.

- Site 109: Elevated levels of cyanide were detected in the groundwater, however, greater concentrations of cyanide have been reported on adjacent upgradient property. Surface water chemical presence was limited to minor insignificant metals exceedances. Therefore, Site 109 does not pose a significant risk to human health and the environment..

- Site 110: Chemical presence in the collected soil samples was limited to PAHs, as would be expected, however, the total PAH concentration is below

the maximum allowable level. Elevated chemical presence in the groundwater is localized to the vicinity around MW-3/MW3R-89. There is no off-Site migration of groundwater with elevated chemical presence. Therefore, Site 110 does not pose a significant risk to human health and the environment.

- Low Marshy Area: Only one compound, zinc, marginally exceeded its MCL during the final sample round for surface water at the most downgradient sample location. Marginal, very low VOC exceedances were reported at the downgradient location in the sediment samples. PAHs were not detected during the most recent sample collected at the downgradient location. Therefore, the low marshy area does not pose a significant risk to human health and the environment.

- The TCC Site does not pose a significant risk to human health or the environment.

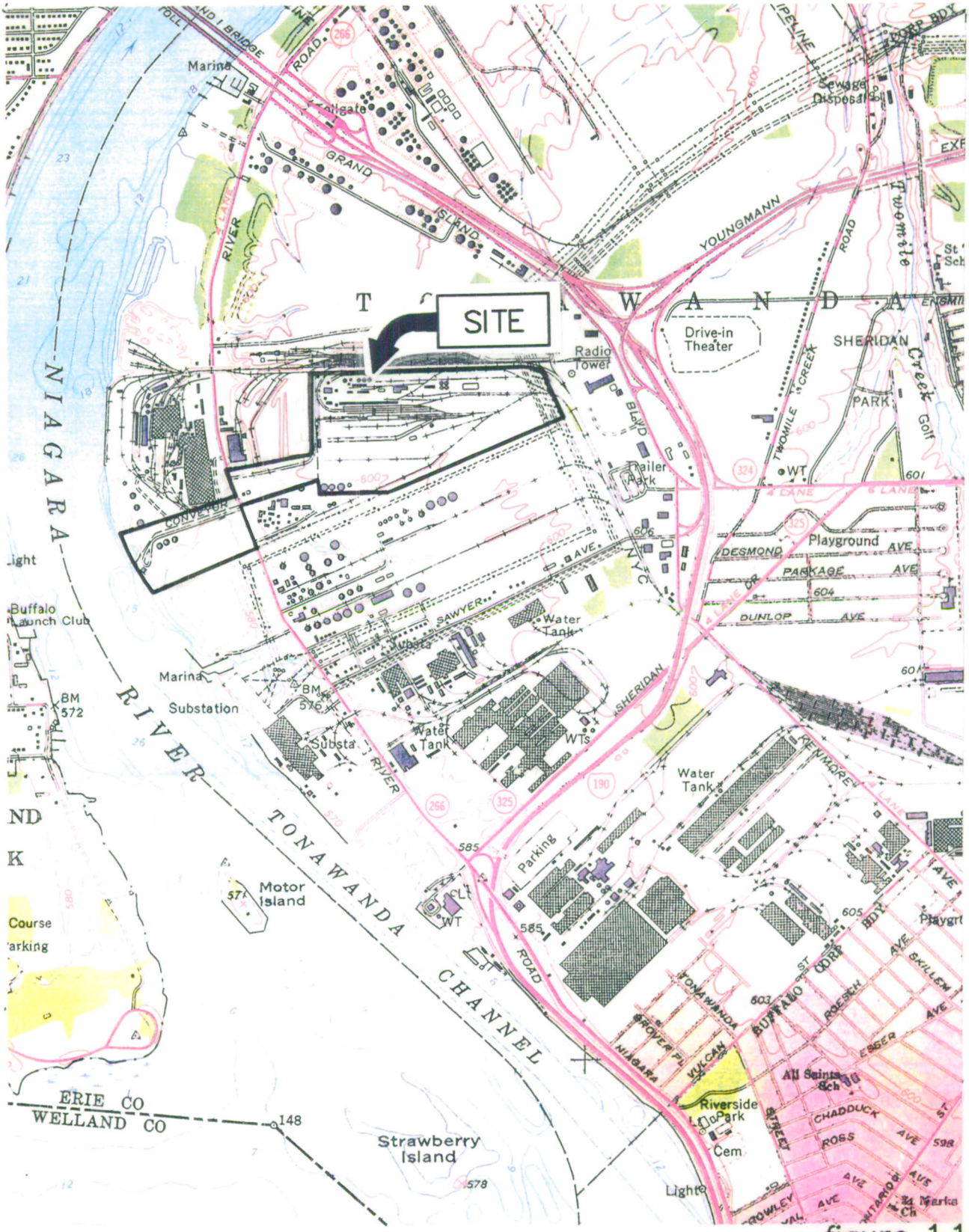


figure 1.1

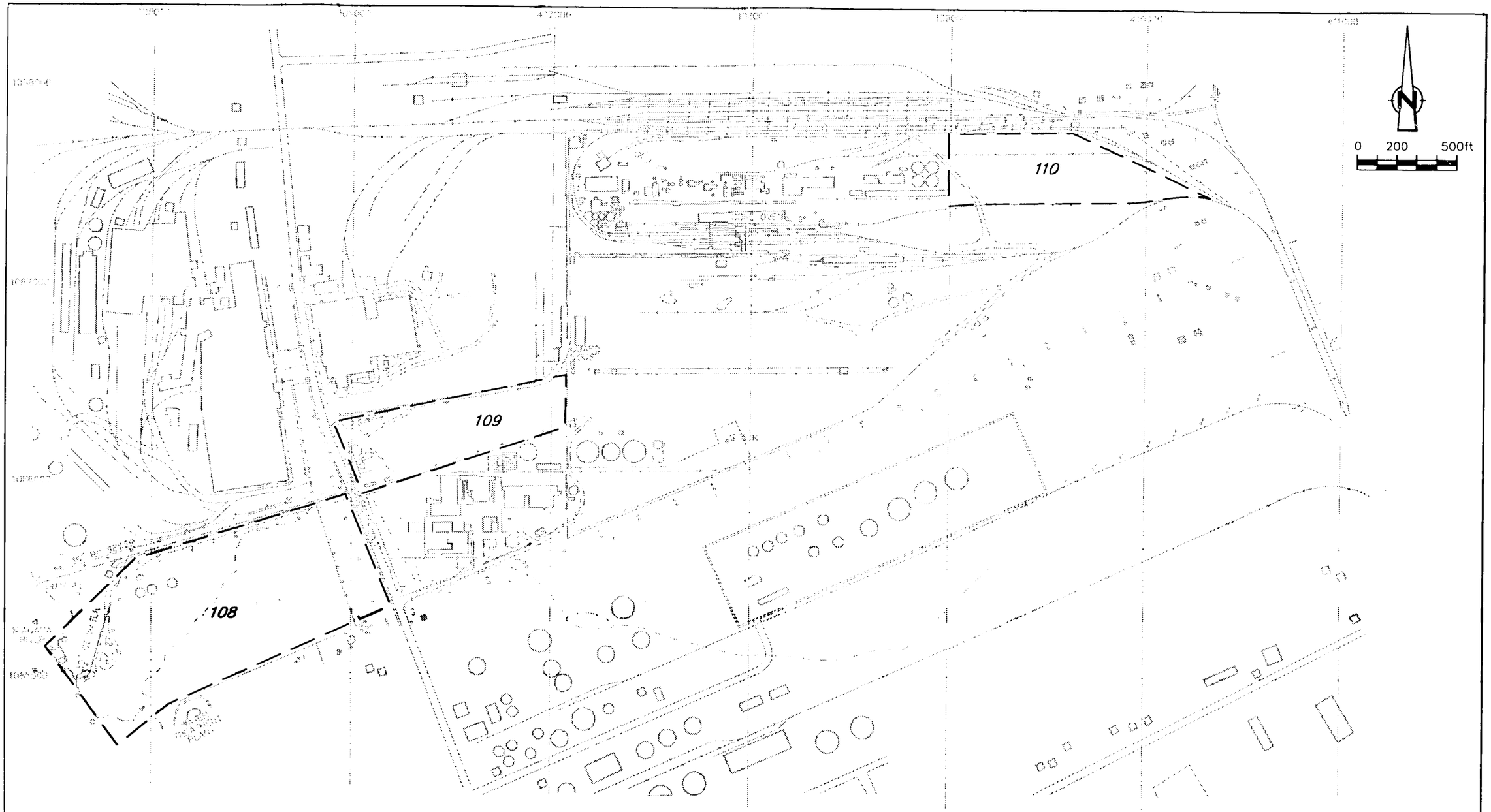
SITE LOCATION

REMEDIAL INVESTIGATION SUMMARY REPORT

Tonawanda Coke Corporation

CRA

2428 (6) 03/07/96(W) REV.0



LEGEND

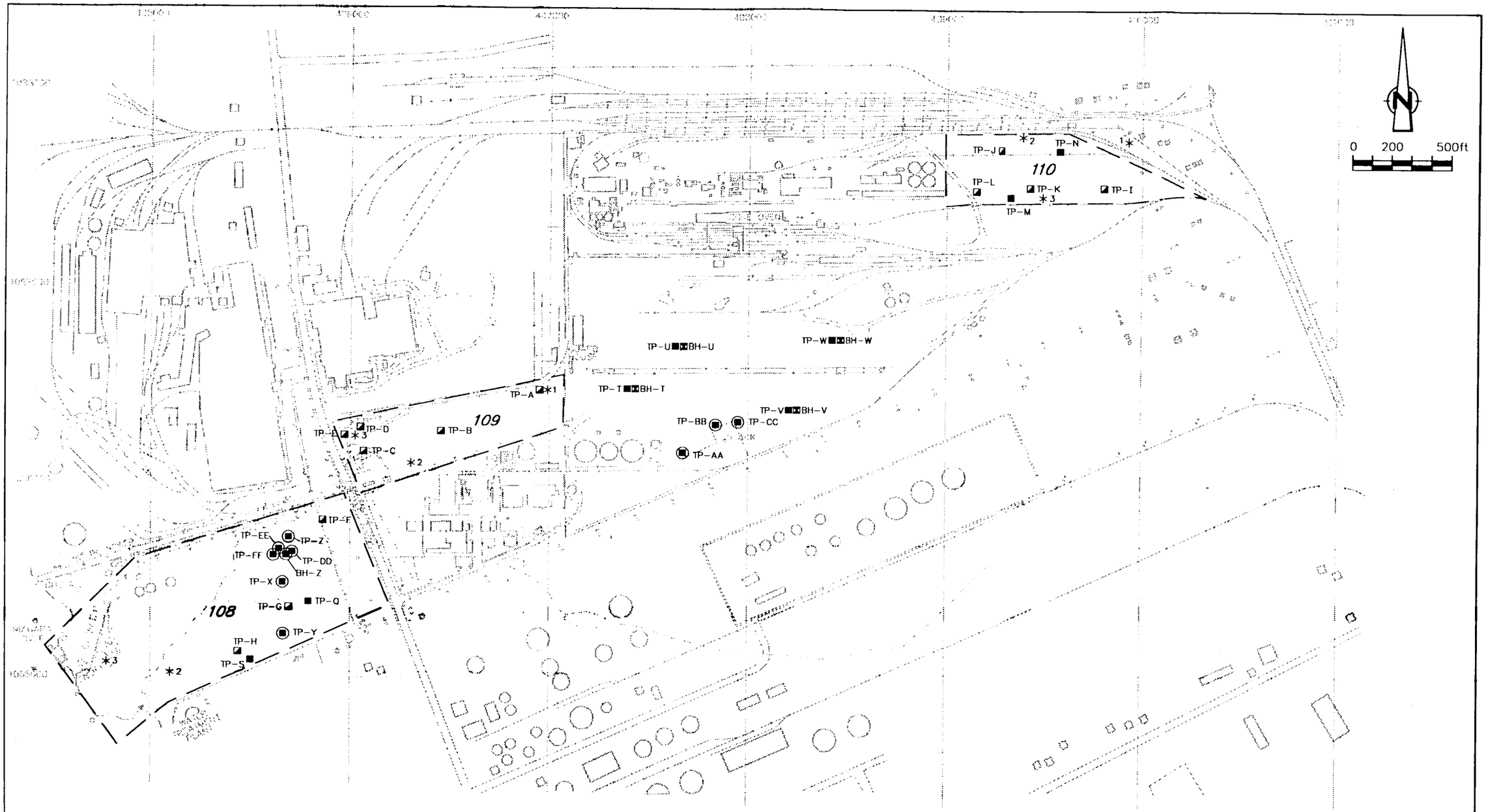
108 SITE LOCATION

figure 1.2

FORMER DISPOSAL AREA LOCATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation

CRA

2428 (6) APR 11/97(W) REV.0 (P-21)



LEGEND

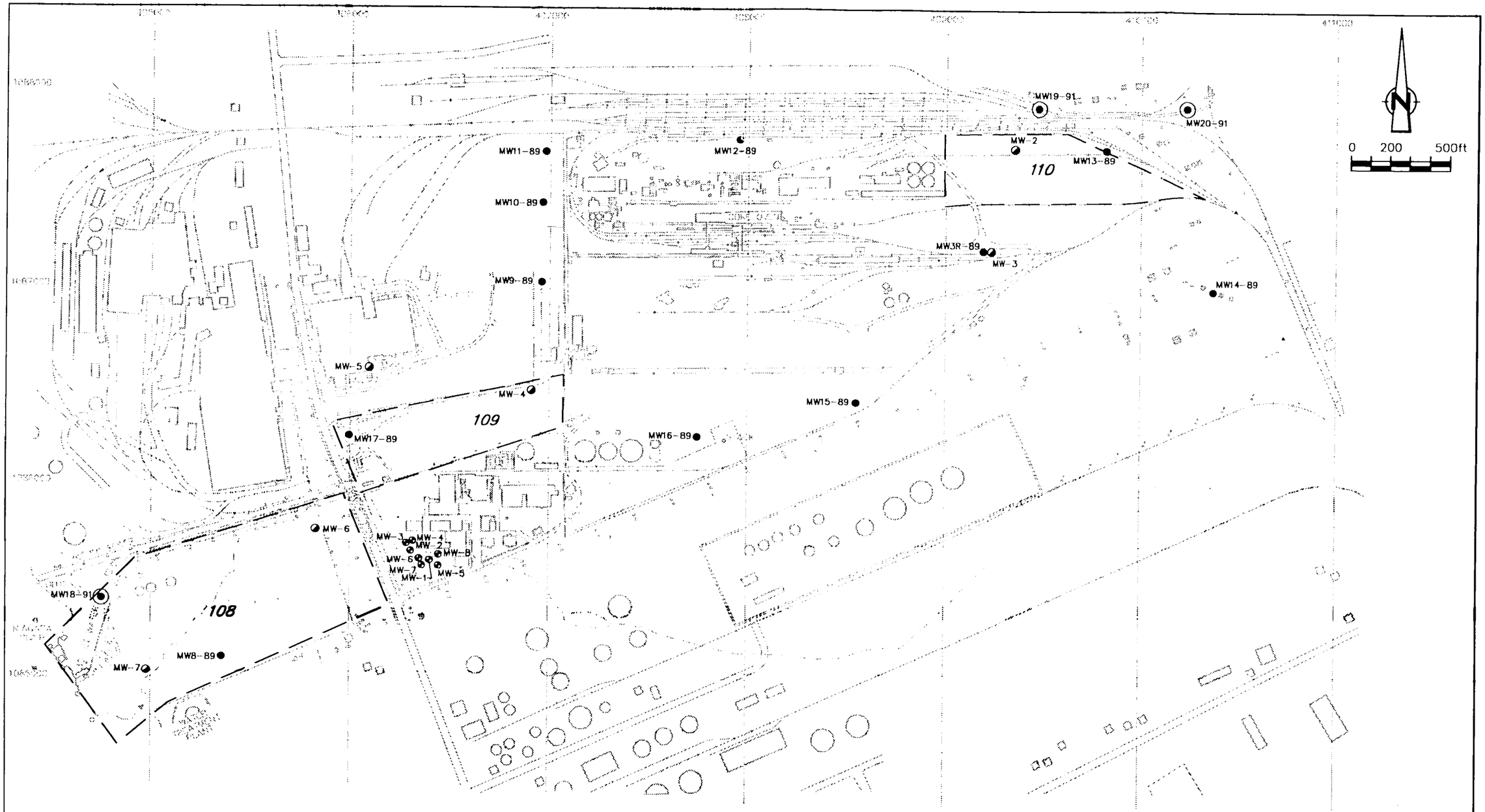
108	SITE LOCATION
*2	BOREHOLE – USGS STUDY (APPROXIMATE)
TP-H	TEST PIT – MALCOLM PIRNIE PHASE II INVESTIGATION
TP-U	TEST PIT – CRA SUPPLEMENTAL SITE INVESTIGATION
TP-AA	TEST PIT – CRA ADDITIONAL SITE INVESTIGATION
BH-W	TEST PIT / BOREHOLE – CRA SUPPLEMENTAL SITE INVESTIGATION

CRA

2428 (6) APR 11/97(W) REV.0 (P-18)

figure 2.1

TEST PIT/BOREHOLE SOIL SAMPLING LOCATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation



LEGEND

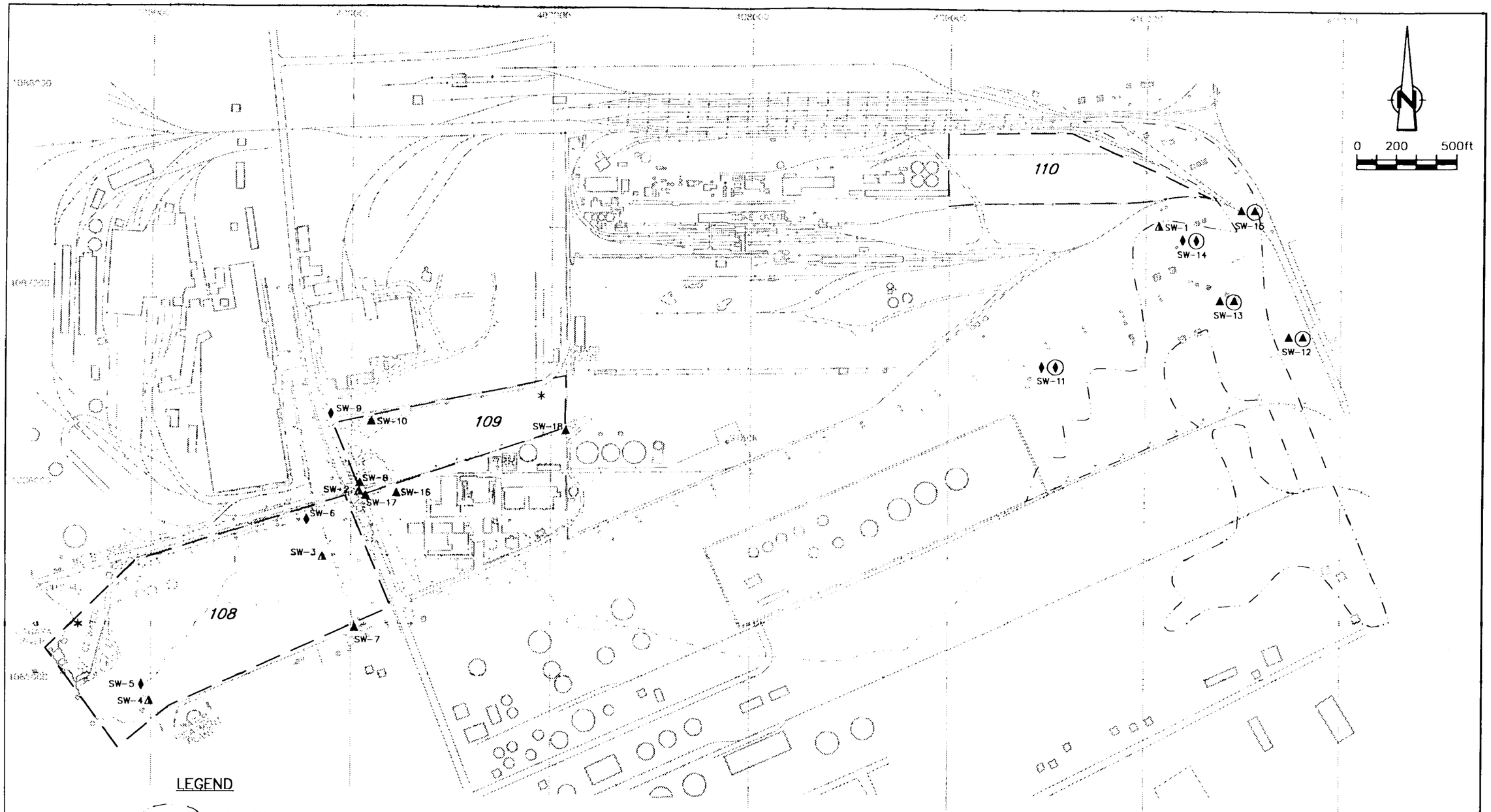
108	SITE LOCATION
MW-5	MONITORING WELL – MALCOLM PIRNIE PHASE II INVESTIGATION
MW15-89	MONITORING WELL – CRA SUPPLEMENTAL SITE INVESTIGATION
MW20-91	MONITORING WELL – CRA ADDITIONAL SITE INVESTIGATION
MW-3	MONITORING WELL – APPROXIMATE ALLIED CHEMICAL SITE LOCATION

CRA

2428 (6) APR 11/97(W) REV.0 (P-20)

figure 2.2

GROUNDWATER SAMPLING LOCATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation



LEGEND

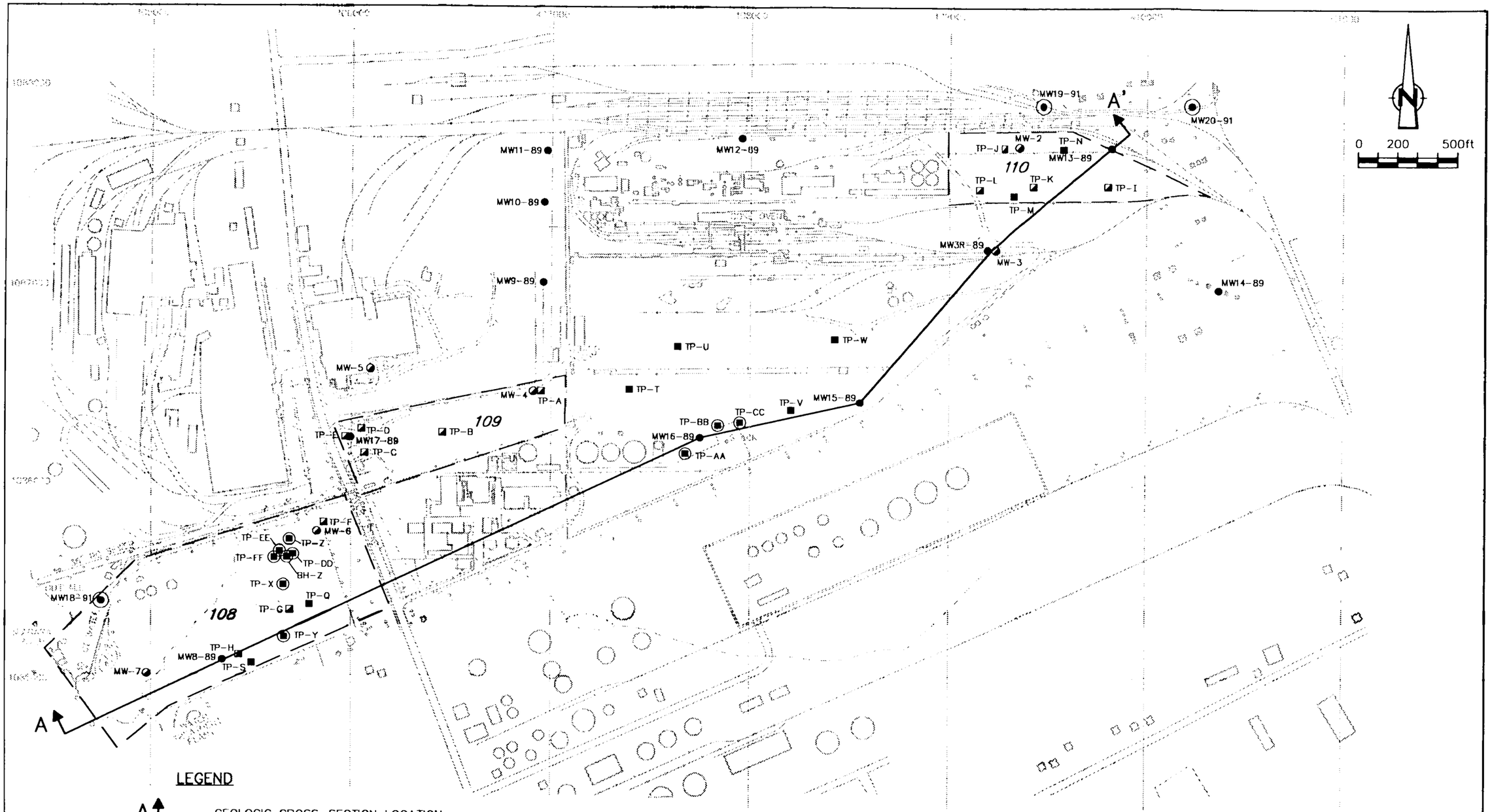
- WETLAND
- 108 — SITE LOCATION
- * — SURFACE WATER SAMPLE – USGS STUDY (APPROXIMATE)
- ▲SW-4 — SURFACE WATER SAMPLE – MALCOLM PIRNIE PHASE II INVESTIGATION
- ▲SW-7 — SURFACE WATER SAMPLE – CRA SUPPLEMENTAL SITE INVESTIGATION
- ◉SW-12 — SURFACE WATER SAMPLE – CRA ADDITIONAL SITE INVESTIGATION
- ♦SW-11 — SURFACE WATER/SEDIMENT SAMPLE – CRA SUPPLEMENTAL SITE INVESTIGATION
- ◉SW-11 — SURFACE WATER/SEDIMENT SAMPLE – CRA ADDITIONAL SITE INVESTIGATION

CRA

2428 (6) APR 11/97(W) REV.0 (P-16)

figure 2.3

SURFACE WATER/SEDIMENT SAMPLING LOCATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation



LEGEND

A ↑	GEOLOGIC CROSS-SECTION LOCATION
108	SITE LOCATION
MW-5	MONITORING WELL – MALCOLM PIRNIE PHASE II INVESTIGATION
MW15-89	MONITORING WELL – CRA SUPPLEMENTAL SITE INVESTIGATION
MW20-91	MONITORING WELL – CRA ADDITIONAL SITE INVESTIGATION
TP-H	TEST PIT – MALCOLM PIRNIE PHASE II INVESTIGATION
TP-U	TEST PIT – CRA SUPPLEMENTAL SITE INVESTIGATION
TP-AA	TEST PIT – CRA ADDITIONAL SITE INVESTIGATION

CRA

figure 3.1

GEOLOGIC CROSS-SECTION LOCATION
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation

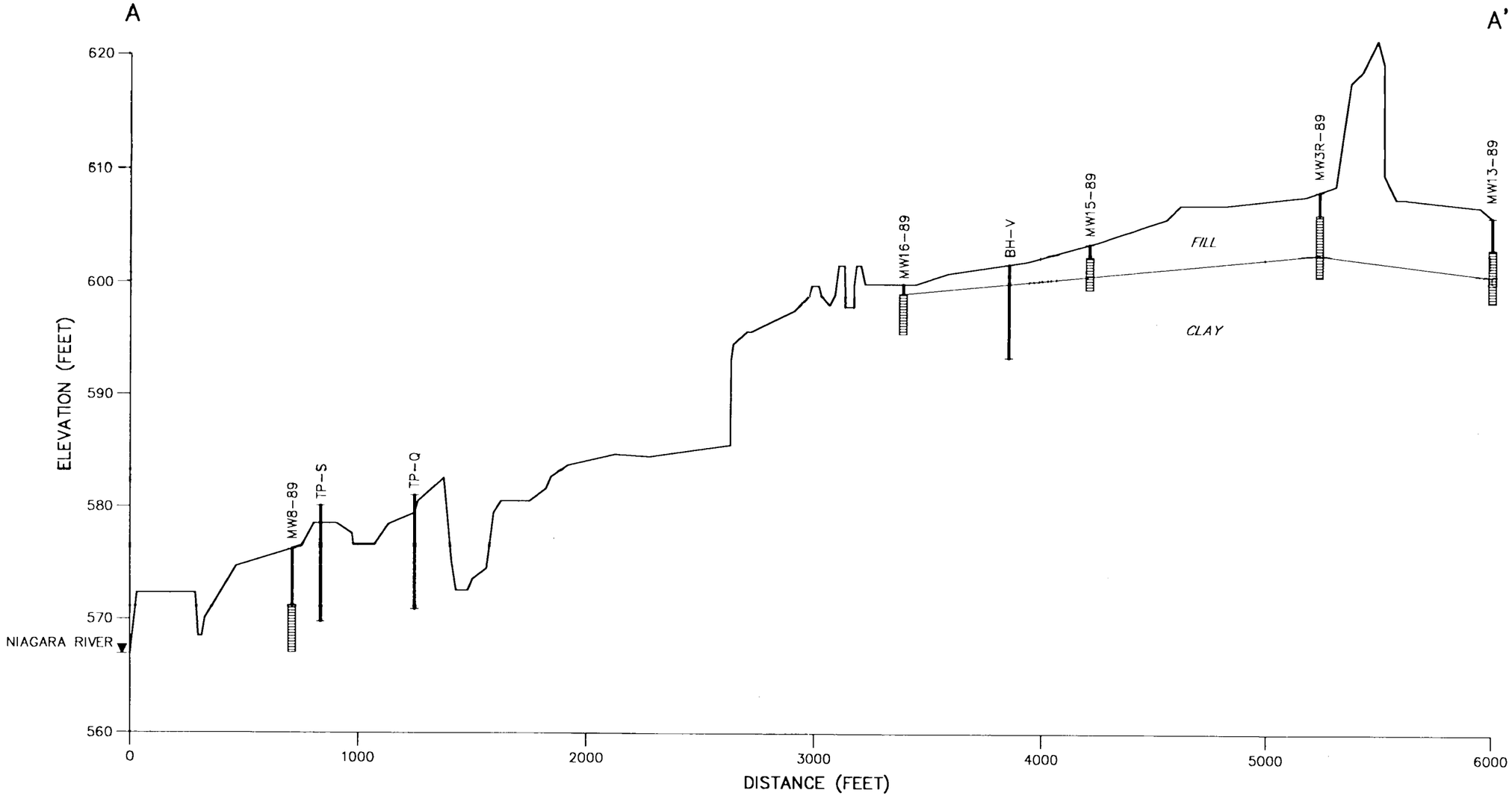
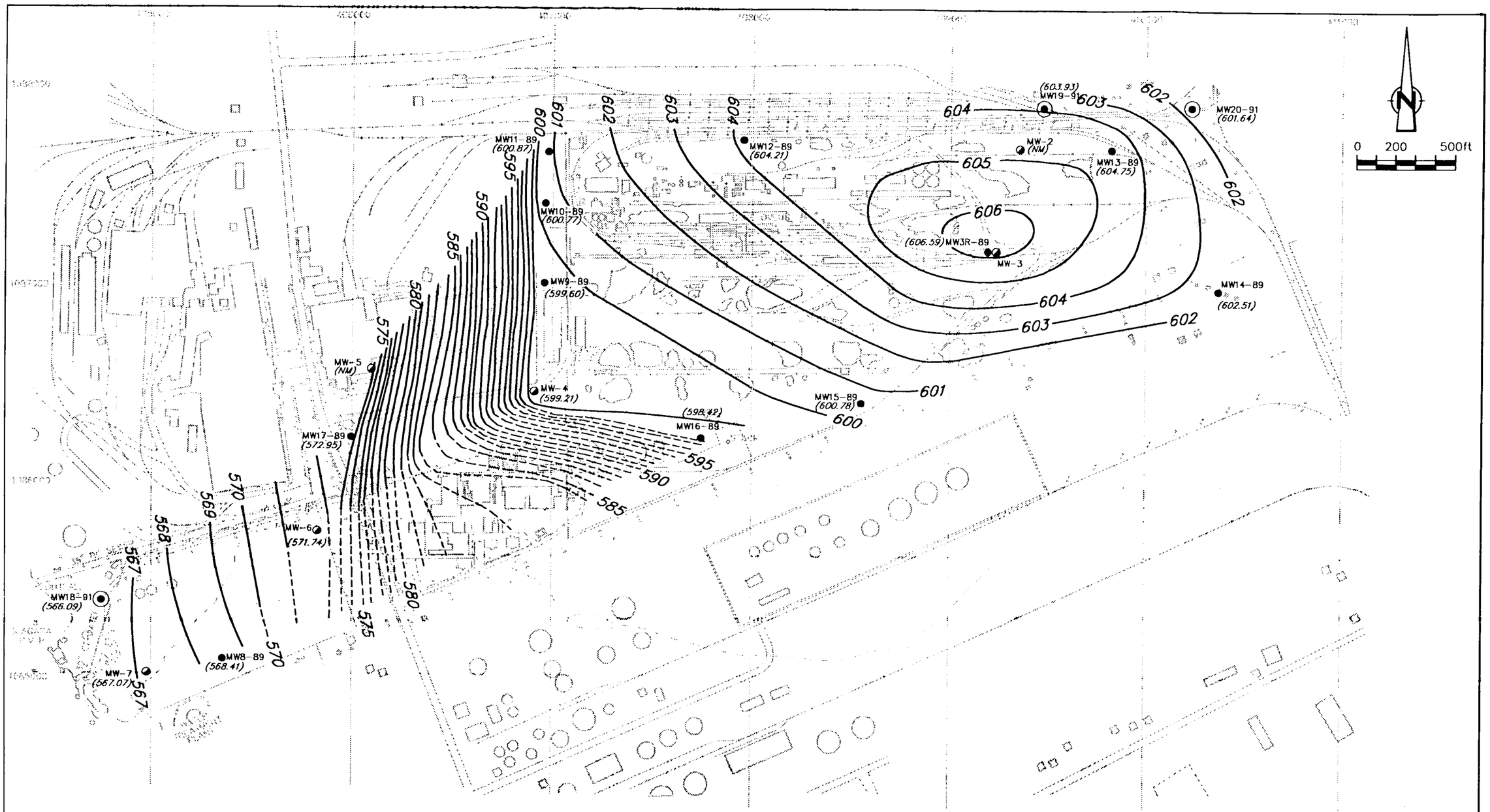


figure 3.2
GEOLOGIC CROSS-SECTION A-A'
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation

CRA



LEGEND

- COAL PILE
- MW-5 MONITORING WELL – MALCOLM PIRNIE PHASE II INVESTIGATION
- MW15-89 MONITORING WELL – CRA SUPPLEMENTAL SITE INVESTIGATION
- MW20-91 MONITORING WELL – CRA ADDITIONAL SITE INVESTIGATION
- 570 GROUNDWATER CONTOUR (FEET)
- (598.42) GROUNDWATER ELEVATION (FEET)(7/6/92)

CRA

figure 3.3
OVERBURDEN GROUNDWATER CONTOURS
REMEDIAL INVESTIGATION SUMMARY REPORT
Tonawanda Coke Corporation

27A

TABLE 2.1

CRA SUPPLEMENTAL SITE INVESTIGATION
TEST PIT SOIL SAMPLING SUMMARY
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Sample Location	*Sample Number*	*Sample Date*	*Sample Time*	*Shipping Date*	*Chain-of-Custody Number*	*Comments*
TP-1	2428-DT-001	6-19-89	1345	6-19-89	4375	Composite of TP-Q and TP-S
TP-2	2428-DT-002	6-19-89	1050	6-19-89	4375	Composite of TP-T and TP-U
TP-3	2428-DT-003	6-19-89	1005	6-19-89	4375	Composite of TP-V and TP-W
TP-4	2428-DT-004	6-19-89	0920	6-19-89	4375	Composite of TP-M and TP-N
TP-5	2428-DT-005	6-19-89	1450	6-19-89	4375	Duplicate of TP-1

TABLE 2.2

CRA SUPPLEMENTAL SITE INVESTIGATION
BOREHOLE SOIL SAMPLING SUMMARY
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Sample Location	*Sample Number*	*Sample Date*	*Sample Time*	*Shipping Date*	*Chain-of-Custody Number*	*Comments*
BH-T	S-2428-DT-021	10-16-89	1010	10-16-89	7632	4.6 ft - 6.0 ft BGS Composited with BH-U in lab
BH-U	S-2428-DT-021	10-16-89	1050	10-16-89	7632	6.0 ft - 8.0 ft BGS Composited with BH-T in lab
BH-V	S-2428-DT-022	10-16-89	1400	10-16-89	7632	6.0 ft - 8.0 ft BGS Composited with BH-W in lab
BH-W	S-2428-DT-022	10-16-89	1200	10-16-89	7632	10.0 ft - 12.0 ft BGS Composited with BH-V in lab

TABLE 2.3

TEST PIT/BOREHOLE STRATIGRAPHIC SUMMARIES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

CRA Supplemental Site Investigation

Test Pit/Borehole	*Ground Elevation (ft AMSL)*	*Depth of Fill (feet)*	*Top of Clay Elevation (ft AMSL)*	*Depth of Hole (feet)*
TP-M	609.6	3.5	606.1	3.5
TP-N	606.9	5.0	601.9	5.0
TP-Q	580.6	>10.0	<570.6	10.0
TP-S	580.0	>10.5	<569.5	10.5
BH-T	602.1	4.6	597.5	6.0
BH-U	603.9	4.0	599.9	8.0
BH-V	601.9	2.0	599.9	8.0
BH-W	604.6	6.3	598.3	12.0

CRA Additional Site Investigation

TP-X

0 to 1.0 ft BGS	- Brown, black and tan SILT, some fine to medium sand and cinders, FILL
1.0 to 8.0 ft BGS	- PLASTIC, BRICKS and WOOD, some black silt and tar paper, little glass, moist
8.0 to 13.0 ft BGS	- Black SILT with vegetation, NATIVE
13.0 to 15.0 ft BGS	- Black SILT and fine SAND, little clay, wet
15.0 ft BGS	- Bottom of test pit

TP-Y

0 to 3.5 ft BGS	- Brown SILT and fine SAND, little roots and vegetation, FILL
3.5 to 7.0 ft BGS	- Black CINDERS, some brick, wood and plastic, trace foundry core
7.0 to 9.0 ft BGS	- Reddish brown CLAY, little silt, NATIVE
9.0 ft BGS	- Bottom of test pit

TP-Z

0 to 11.5 ft BGS	- Brown and black SILT, some fine sand, bricks and concrete, little medium and coarse sand, trace wood, plastic, wire, metal, roots and vegetation, dry to moist, FILL
11.5 to 12.5 ft BGS	- Black vegetative MUD, some vegetation, wet, NATIVE**
12.5 ft BGS	- Bottom of test pit

TP-AA

0 to 1.6 ft BGS	- COAL, grain size range from coarse sand to coarse gravel
1.6 to 1.8 ft BGS	- Reddish-Brown CLAY with trace silt, NATIVE
1.8 ft BGS	- Bottom of test pit

TABLE 2.3

TEST PIT/BOREHOLE STRATIGRAPHIC SUMMARIES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

TP-BB	
0 to 1.2 ft BGS	- COAL, grain size range from coarse sand to coarse gravel
1.2 to 1.4 ft BGS	- Reddish-brown CLAY with trace silt, NATIVE
1.4 ft BGS	- Bottom of test pit
TP-CC	
0 to 0.8 ft BGS	- COAL, grain size range from coarse sand to coarse gravel
0.8 to 1.0 ft BGS	- Reddish-brown CLAY with trace silt, NATIVE
1.0 ft BGS	- Bottom of test pit
TP-DD	
0 to 13.0 ft BGS	- Black SILT and fine SAND, some bricks and concrete, little wood and clay, trace roots and vegetation, moist, FILL
13.0 to 13.5 ft BGS	- Black VEGETATION, wet, NATIVE
13.5 to 15.5 ft BGS	- Dark brown SILT, little fine to medium sand, trace clay, moist
15.5 to 16.5 ft BGS	- Gray fine SAND, some silt, little medium sand, moist
16.5 ft BGS	- Bottom of test pit
TP-EE	
0 to 11.0 ft BGS	- Black SILT with red and white bricks, little wood, clay and sand, trace plastic and metal, moist, FILL
11.0 to 12.5 ft BGS	- Black VEGETATION, wet, NATIVE
12.5 ft BGS	- Bottom of test pit
TP-FF	
0 to 14.5 ft BGS	- Black SILT and fine to medium SAND, some bricks and wood, little plastic and paper, moist, FILL
14.5 to 15.0 ft BGS	- Black VEGETATION, wet, NATIVE
15.0 to 15.5 ft BGS	- Dark gray SILT, little clay, trace wood, moist
15.5 ft BGS	- Bottom of test pit

Note:

** - HNU readings of 140 ppm above background, abandoned test pit and backfilled due to high readings

TABLE 2.4

CRA SUPPLEMENTAL SITE INVESTIGATION
AIR MONITORING (HNU) SUMMARY
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Test Pit/Well Location	*Date*	*Background Reading*	*Highest Reading Over Open Hole*
TP-X	6-14-91	0.9	*
TP-Y	6-14-91	1	3.5
TP-Z	6-14-91	1.2	140
TP-DD	6-14-91	*	4
TP-EE	6-14-91	*	25
BH-TP-Z	6-17-91	3	0.5
MW18-91	6-17-91	1.1	0
MW18-91	6-18-91	1.6	0
MW18-91	6-19-91	1.8	0
MW19-91	6-18-91	1.6	0.6
MW20-91	6-18-91	1.8	0.7

Notes:

* - HNu readings not recorded
No HNu readings were reported for TP-AA, TP-BB, TP-CC and TP-FF

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TABLE 3.1

STRATIGRAPHIC WELL SUMMARY
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Well ID	*Ground Elevation (ft AMSL)*	*Depth of Fill (feet)*	*Top of Clay Elevation (ft AMSL)*	*Depth of Hole (feet)*
MW3R-89	609.0	6.3	602.7	8.0
MW8-89	576.7	>10.0	566.7	10.0 ←
MW9-89	602.8	4.1	598.7	6.0
MW10-89	603.9	4.5	599.4	6.0
MW11-89	602.0	2.1	599.9	6.0
MW12-89	606.3	5.0	601.3	6.0
MW13-89	606.2	5.5	600.7	8.0
MW14-89	603.6	2.1	601.5	6.0
MW15-89	603.8	3.3	600.5	4.0
MW16-89	599.9	0.9	599.0	4.0
MW17-89	576.9	4.9	572.0	6.0
MW18-91	570.2	0.5	<548.2	22.0 ←
MW19-91	605.4	2.0	602.1	4.0 ←
MW20-91	603.5	3.0	600.5	4.0

TABLE 3.2
GROUNDWATER ELEVATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

		MW-1	MW-2	MW-3	MW3R-89	MW-4	MW-5	MW-6	MW-7	MW8-89	MW9-89
	TOC Elevation	*606.67*	*609.57*	*610.49*	*611.16*	*602.84*	*580.56*	*579.78*	*575.15*	*578.99*	*604.92*
(1)	Nov. 25/26 1985	603.67	607.17	606.69	NI	599.24	573.96	573.18	567.15	NI	NI
	Jan. 31 1986	603.47	606.57	606.49	NI	599.14	574.96	573.18	567.65	NI	NI
	Feb. 27 1986	Frozen	Frozen	606.69	NI	599.54	575.16	573.68	567.65	NI	NI
	Mar. 6 1986	Frozen	Frozen	606.49	NI	599.84	574.86	573.48	567.15	NI	NI
	Mar. 18 1986	Frozen	606.97	607.19	NI	599.74	575.26	573.88	567.65	NI	NI
	Apr. 2 1986	604.27	606.47	606.29	NI	599.04	574.96	573.38	567.35	NI	NI
	Apr. 17 1986	604.97	607.07	607.19	NI	599.84	575.46	573.68	567.75	NI	NI
	Apr. 28 1986	604.47	606.67	606.49	NI	599.14	575.16	573.68	567.55	NI	NI
	May 12 1986	604.37	605.57	605.89	NI	598.34	574.86	572.98	567.25	NI	NI
	May 26 1986	601.47	606.67	606.69	NI	599.24	575.16	573.28	567.65	NI	NI
	Jun. 9 1986	604.57	606.67	606.59	NI	599.24	575.06	573.08	568.75	NI	NI
	Jun 30 1986	603.77	605.87	606.09	NI	598.84	574.46	572.18	567.55	NI	NI
	Jul 9 1986	603.47	605.57	605.39	NI	598.44	573.96	572.08	567.25	NI	NI
	Aug 6 1986	Destroyed	606.57	605.79	NI	599.24	574.26	572.48	567.15	NI	NI
(2)	Jun. 26/28 1989	Destroyed	606.42	606.39	NM	NM	NM	NM	NM	NM	600.47
	Oct. 9/18 1989	Destroyed	604.94	603.49	NM	598.52	571.56	569.21	568.70	567.39	599.12
	Dec. 12/15 1989	Destroyed	NM	NM	605.93	598.87	574.26	572.01	564.95	567.37	600.36
(3)	Apr. 15, 1992	Destroyed	NM	NM	606.99	NM	574.56	573.36	NM	569.74	599.92
	Jul. 6, 1992	Destroyed	NM	605.23	606.59	599.21	NM	571.74	567.07	568.41	599.60

Notes:

(1) Measurements collected during Malcolm Pirnie Phase II Investigation
(2) Measurements collected during CRA's Supplemental Site Investigation
(3) Measurements collected during CRA's Additional Site Investigation
NI - Well not installed at time of water level measurements.
NM - Well not measured.

TABLE 3.2
GROUNDWATER ELEVATIONS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	MW10-89	MW11-89	MW12-89	MW13-89	MW14-89	MW15-89	MW16-89	MW17-89	MW18-91	MW19-91	MW20-91
TOC Elevation	*605.54*	*603.77*	*609.19*	*608.39*	*605.57*	*605.99*	*603.46*	*579.15*	572.2	*607.17*	*605.33*
(1) Nov. 25/26 1985	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Jan. 31 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Feb. 27 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Mar. 6 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Mar. 18 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Apr. 2 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Apr. 17 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Apr. 28 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 12 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 26 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Jun. 9 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Jun 30 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Jul 9 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Aug 6 1986	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
(2) Jun. 26/28 1989	NM	601.09	NM	NM	NM	NM	NM	NM	NI	NI	NI
Oct. 9/18 1989	600.19	600.84	603.85	603.14	601.50	603.05	599.64	572.67	NI	NI	NI
Dec. 12/15 1989	600.99	600.81	604.00	605.01	602.49	602.69	598.55	574.27	NI	NI	NI
(3) Apr. 15, 1992	601.12	600.60	604.02	605.47	NM	601.99	599.71	574.48	566.03	604.84	602.50
Jul. 6, 1992	600.77	600.87	604.21	604.75	602.51	600.78	598.42	572.95	566.09	603.93	601.64

Notes:

(1) Measurements collected during Malcolm Pirnie Phase II Investigation
(2) Measurements collected during CRA's Supplemental Site Investigation
(3) Measurements collected during CRA's Additional Site Investigation
NI - Well not installed at time of water level measurements.
NM - Well not measured.

TABLE 3.3

SUMMARY OF SUPPLEMENTAL SITE INVESTIGATION MONITORING WELL HYDRAULIC CONDUCTIVITY VALUES REMEDIAL INVESTIGATION SUMMARY REPORT TONAWANDA COKE CORPORATION

MW-2	1.3×10^{-3} cm/sec
MW-3	no drawdown during purging
MW3R-89	no drawdown during purging
MW-4	3.6×10^{-5} cm/sec
MW-5	5.8×10^{-5} cm/sec
MW-6	1.4×10^{-3} cm/sec
MW-7	3.9×10^{-4} cm/sec
MW8-89	2.0×10^{-3} cm/sec
MW9-89	4.4×10^{-5} cm/sec
MW10-89	3.2×10^{-5} cm/sec
MW11-89	4.3×10^{-4} cm/sec
MW12-89	1.1×10^{-2} cm/sec
MW13-89	2.3×10^{-3} cm/sec
MW14-89	8.6×10^{-5} cm/sec
MW15-89	7.4×10^{-4} cm/sec
MW16-89	3.8×10^{-4} cm/sec
MW17-89	2.3×10^{-4} cm/sec
geometric mean	3.6×10^{-4} cm/sec

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 108				Recommended Soil clean up Objective (4)
Location	2		3		
Date	*13/07/82*	*24/05/83*	*13/07/82*	*24/05/83*	
	(µg/kg)	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*
Inorganic Constitutents					
Cyanide	ND	NA	ND	NA	--
Iron	9,500,000	NA	5,900,000	NA	2,000,000
Molecular Sulfur (1)	NA	11,000	NA	ND	--
Priority Pollutants					
Diethylphthalate	ND	ND	ND	ND	7,100
Benzene	NA	32.2(1)	NA	134(1)	60
1,2-Trans-dichloroethene	NA	ND	NA	468(1)	300
Ethylbenzene	NA	28.5 (1)	NA	150(1)	5,500
Methylene Chloride	NA	45.0(1)	NA	ND	100
Tetrachloroethene	NA	ND	NA	33.0(1)	1,400
Toluene	NA	16.1(1)	NA	363(1)	1,500
Vinyl Chloride	NA	ND	NA	2,180(1)	200
Acenaphthene	NA	(2)	NA	ND	50,000*
Fluoranthene	NA	(2)	NA	ND	50,000*
Naphthalene	NA	(2)	NA	(2)	13,000
Bis (2-ethylhexyl)phthalate	NA	(2)	NA	ND	50,000*
Benzo(a)anthracene	NA	(2)	NA	ND	224
Benzo(b)fluoranthene and benzo(k)fluoranthene	NA	(2)	NA	ND	1100
Acenaphthylene	NA	(2)	NA	ND	41,000
Benzo(g,h,i)perylene	NA	(2)	NA	ND	50,000*
Fluorene	NA	(2)	NA	ND	50,000*
Indeno(1,2,3-cd)pyrene	NA	(2)	NA	ND	3,200
Pyrene	NA	(2)	NA	ND	50,000*

Notes:
(1) Surrogate recoveries were above or below the acceptance limits.
(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.
(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.
-- No value provided.
(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.
* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

27C

Location	Site 108 (cont'd)				Recommended Soil clean up Objective (4)
	2		3		
Date	13/07/82 (µg/L)	24/05/83 (µg/L)	13/07/82 (µg/L)	24/05/83 (µg/L)	(µg/L)
Non-Priority Pollutants					
Acetone	NA	ND	NA	352(1)	200
Benzoic Acid	ND	NA	ND	NA	2,700
Carbondisulfide	NA	44.2(1)	NA	247(1)	2,700
o-Xylene	NA	126(1)	NA	530(1)	1,200**
Dibenzofuran	NA	(2)	NA	ND	6,200
2-Methylnaphthalene	NA	(2)	NA	ND	36,400
2,3-Dihydro-1H-indene (3)	NA	(2)	NA	ND	--
1H-Indene (3)	NA	(2)	NA	ND	--
Cyclohexane (3)	NA	ND	NA	(2)	--
Methylcyclopentane (3)	NA	ND	NA	(2)	--
1,1,3-Trimethyl-cyclohexane (3)	NA	ND	NA	(2)	--
2,2,3,4-Tetramethylpentane (3)	NA	ND	NA	(2)	--
1-Ethyl-3-methyl-trans-cyclopentane	NA	ND	NA	(2)	--
2,6,6-Trimethyl-bicyclo-(3.1.1)hepten-2-ene (3)	NA	ND	NA	(2)	--
Unknown hydrocarbons (3)	NA	ND	NA	(2)	--

Notes:

(1) Surrogate recoveries were above or below the acceptance limits.

(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.

(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.

-- No value provided.

(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 109			Recommended Soil clean up Objective (4)
	1A	2A	3A	
Second Sampling (5-24-83)				
(µg/kg)				
Inorganic Constituent				
Molecular sulfur (3)	ND	1,900	ND	--
Organic Compounds				
Priority pollutants				
Benzene	5.7(1)	8.3	ND	60
1,1,1-Trichloroethane	ND	ND	LT	800
Toluene	3.9(1)	LT	8.2(1)	1,500
BMC-alpha	ND	LT	LT	--
Acenaphthene	(2)	(2)	ND	50,000*
Fluoranthene	(2)	(2)	(2)	50,000*
Naphthalene	(2)	(2)	(2)	13,000
Bis(2-ethylhexyl)phthalate	(2)	(2)	(2)	50,000*
Butylbenzylphthalate	ND	(2)	ND	50,000*
Di-n-butylphthalate	ND	(2)	ND	8,100
Diethylphthalate	ND	(2)	ND	7,100
Benzo(a)anthracene	ND	(2)	(2)	224
Benzo(a)pyrene	(2)	(2)	(2)	--
Benzo(b)fluoranthene and benzo(k)fluoranthene	(2)	(2)	(2)	1,100
Chrysene	(2)	ND	ND	400
Acenaphthylene	(2)	(2)	(2)	41,000
Benzo(ghi)perylene	(2)	(2)	(2)	50,000*
Fluorene	(2)	(2)	(2)	50,000*
Dibenzo(a,h)anthracene	(2)	(2)	(2)	14
Indeno(1,2,3-cd)pyrene	ND	(2)	(2)	3,200
Pyrene	(2)	(2)	(2)	50,000*

Notes:

(1) Surrogate recoveries were above or below the acceptance limits.

(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.

(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.

-- No value provided.

(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 109 (cont'd)			Recommended Soil clean up Objective (4)
	1A	2A	3A	
Second Sampling (5-24-83)				
(µg/kg)				
Organic Compound (continued)				
Non-priority pollutants				
Carbondisulfide	2.9(1)	33.4	37.9 (1)	2,700
O-xylene	ND	ND	5.3 (1)	1,200**
Benzoic acid	(2)	ND	ND	2,700
2-Methylphenol	ND	LT	ND	100
Dibenzofuran	(2)	(2)	ND	6,200
2-Methylnaphthalene	(2)	(2)	(2)	36,400
1,3-Dimethylbenzene (3)	ND	ND	(2)	--
1,4-Dimethylbenzene (3)	ND	ND	(2)	--
1-Methylnaphthalene (3)	ND	ND	(2)	--
1,8-Dimethylnaphthalene (3)	ND	ND	(2)	--
1,6,7-Trimethylnaphthalene (3)	ND	ND	(2)	--
7-Octadecanol (3)	ND	(2)	ND	--
Hexadeconaol (3)	ND	(2)	ND	--
Hexadecanoic acid (3)	(2)	ND	ND	--
2-Octadecanol (3)	(2)	ND	ND	--
Perylene (3)	(2)	ND	ND	--
9-Methylphenanthrene	ND	ND	(2)	--
Unknown hydrocarbons (3)	(2)	ND	(2)	--
Unknown PAH (3)	NA	NA	(2)	--
Compound Potentially of Natural Origin				
2,6-Dimethylundecane (3)	ND	ND	(2)	--

Notes:

(1) Surrogate recoveries were above or below the acceptance limits.

(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.

(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.

-- No value provided.

(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 110				Recommended Soil clean up Objective (4)
	1		2	3	
		(split)			
Second Sampling (5-24-83)					
(µg/kg)					
Organic Compounds					
Priority pollutants					
Acrolein	LT	ND	ND	ND	--
Benzene	64.0(1)	ND	3,560(1)	77.1(1)	60
1,1,1-Trichloroethane	LT	10.8(1)	ND	3.0(1)	800
Cis,1,3-Dichloropropene	ND		ND	5.9(1)	300
Ethylbenzene	LT		737(1)	ND	5,500
Methylene chloride	81.4(1)	83.9(1)	314(1)	160(1)	100
Toluene	5.97(1)	21.0(1)	1,420(1)	16.8(1)	1,500
Dieldrin	ND	31	ND	ND	44
Heptachlor epoxide	22(1)	ND	ND	ND	20
Acenaphthene	ND	(2)	ND	ND	50,000*
3,4-Dinitrotoluene	ND	(2)	ND	ND	--
Fluoranthene	(2)	(2)	ND	(2)	50,000*
Naphthalene	(2)	(2)	ND	(2)	13,000
N-nitrosodidiphenylamine	ND	(2)	ND	ND	--
Bis(2-ethylhexyl)phthalate	(2)	(2)	ND	ND	50,000*
Di-n-butylphthalate	ND	(2)	ND	ND	8,100
Di-n-octylphthalate	(2)	ND	ND	ND	50,000*
Diethylphthalate	ND	(2)	ND	ND	7,100
Benzo(a)pyrene	(2)	(2)	ND	(2)	--
Benzo(b)fluoranthene and benzo(k)fluoranthene	(2)	(2)	ND	(2)	1,100
Chrysene	(2)	ND	ND	(2)	400
Acenaphthylene	ND	(2)	ND	(2)	41,000
Benzo(ghi)perylene	(2)	(2)	ND	(2)	50,000*
Fluorene	(2)	(2)	ND	(2)	50,000*
Phenanthrene	(2)	(2)	ND	(2)	50,000*
Dibenzo(a,h)anthracene	(2)	(2)	ND	(2)	14
Indeno(1,2,3-cd)pyrene	(2)	ND	ND	(2)	3,200
Pyrene	(2)	(2)	ND	(2)	50,000*

Notes:
(1) Surrogate recoveries were above or below the acceptance limits.
(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.
(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.
-- No value provided.
(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.
* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.1

USGS STUDY
SOIL ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 110 (cont'd)				Recommended Soil clean up Objective (4)
	1	(split)	2	3	
Organic Compounds Cont'd (µg/kg)					
Non-priority pollutants					
Acetone	ND	164(1)	379(1)	ND	200
Carbondisulfide	180(1)	614(1)	620(1)	161(1)	2,700
2-Hexanone	ND	ND	ND	17.1(1)	--
4-Methyl-2-pentanone	ND	ND	ND	6.3(1)	1,000
Styrene	ND	ND	86.1(1)	ND	--
O-xylene	4.7(1)	25.5(1)	238(1)	17.1(1)	1,200**
4-Chloroaniline	(2)	ND	ND	ND	220
Dibenzofuran	ND	(2)	ND	(2)	6,200
2-Methylnaphthalene	(2)	(2)	ND	(2)	36,400
4-Methylphenanthrene (3)	ND	(2)	ND	ND	--
Tetrahydrofuran (3)	ND	ND	ND	(2)	--
Perylene	ND	(2)	ND	ND	--
1-Methylnaphthalene (3)	(2)	ND	ND	ND	--
1,8-Dimethylnaphthalene (3)	(2)	ND	ND	ND	--
Thiophene (3)	ND	ND	(2)	ND	--
2-Methylbutane (3)	ND	ND	ND	(2)	--
Cyclohexane (3)	ND	ND	ND	(2)	--
Unknown hydrocarbons (3)	(2)	(2)	ND	ND	--

Notes:
(1) Surrogate recoveries were above or below the acceptance limits.
(2) Compounds detected but not quantified. Holding times exceeded before GC/MS acid and base-neutral extractable compounds were extracted.
(3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semi-quantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analyses.
-- No value provided.
(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.
* As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.2

MALCOLM PIRNIE PHASE II INVESTIGATION
SOIL ANALYTICAL RESULS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

27D

Parameter	*Site 110* Result (mg/kg Wet Weight)	*Site 110* Recommended Soil Cleanup Objective (1) (mg/kg)
Free Cyanide	0.76	--
Total Cyanide	4.96	--
Phenols	0.30	0.03
Benzene	LT 0.33	0.06
Toluene	LT 0.33	65
Ethylbenzene	LT 0.33	5.5
Para-Xylene	LT 0.33	1.2**
Meta-Xylene/Chlorobenzene*	LT 0.33	1.2**
Ortho-Xylene	LT 0.33	1.2**
Para-dichlorobenzene	LT 0.33	8.5
Meta-dichlorobenzene	LT 0.33	1.6
Ortho-dichlorobenzene	LT 0.33	7.9
Acenaphthene	LT 0.50	50***
Acenaphthylene	LT 0.63	41
Anthracene	LT 3.3	50***
Benzo(a)anthracene	LT 4.0	0.224
Benzo(a)pyrene	LT 6.3	- 0.061
Benzo(b)fluoranthene	LT 6.0	1.1
Benzo(g,h,i)perylene	LT 3.2	50***
Benzo(k)fluoranthene	LT 23	1.1
Chrysene	LT 2.5	0.4
Dibenzo(a,h)anthracene	LT 1.9	0.014
Fluoranthene	LT 2.0	50***
Fluorene	LT 1.2	50***
Indeno(1,2,3-c,d)pyrene	LT 12	3.2
Naphthalene	LT 1.4	13
Phenanthrene	LT 6.7	50***
Pyrene	LT 3.6	50***
TOX	LT 0.6	--

Note:

(1) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels.

* Chlorobenzene and Meta-Xylene coelute as one peak on the Gas Chromatogram.

** Value shown is for Total xylenes.

(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

*** As per TAGM #4046, Total Pesticides ≤10ppm.

TABLE 4.3

CRA SUPPLEMENTAL SITE INVESTIGATION
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source *Sample ID* *Date*	*TP-1(Q&S)* *S-2428-DT-001* *6-19-89*	*TP-1(Q&S) dup* *S-2428-DT-005* *6-19-89*	*TP-2(T&U)* *S-2428-DT-002/002re* *6-19-89*	*TP-3(V&W)* *S-2428-DT-003/003re* *6-19-89*	*TP-4(M&N)* *S-2428-DT-004/004re* *6-19-89*	*Recommended* *Soil Cleanup* *Objective (2)*
TCL VOCs (µg/Kg)						
Methylene Chloride	44*	29*	27*/110	46*/46*	30*/73*	100
Acetone	42*	24*	–/260C	37*/21*	49*/94*	200
Toluene	9	8	ND(7)	ND(6)	ND(7)	1,500
Total Xylenes	11	11	ND(7)	ND(6)	ND(7)	1,200
TCL BNAs (µg/Kg)						
Napthalene	14,000	21,000	ND(900)	ND(1,900)	ND(2,300)	13,000
2-Methynapthalene	7,400	14,000	ND(900)	ND(1,900)	ND(2,300)	36,400
Acenaphthylene	2,900	5,000	ND(900)	ND(1,900)	ND(2,300)	41,000
Acenaphthene	970	ND(2,100)	ND(900)	ND(1,900)	ND(2,300)	50,000***
Dibenzofuran	640	ND(2,100)	ND(900)	ND(1,900)	ND(2,300)	6,200
Fluorene	4,600	6,000	ND(900)	ND(1,900)	ND(2,300)	50,000***
Phenanthrene	17,000	29,000	1,800	4,400	5,200	50,000***
Anthracene	ND (4,200)	5,000	ND(900)	ND(1,900)	ND(2,300)	50,000***
Fluoranthene	8,800	20,000	3,600	14,000	9,900	50,000***
Pyrene	12,000	18,000	2,600	12,000	7,400	50,000***
Benzo(a)Anthracene	4,400	9,800	1,700	8,700	4,700	224
Chrysene	5,700	11,000	2,200	11,000	5,600	400
Benzo(b)Fluoranthene (1)	5,200	11,000	3,800	17,000	7,400	1,100
Benzo(k)Fluoranthene (1)	5,200	11,000	3,800	17,000	7,400	1,100
Benzo(a)Pyrene	4,800	8,700	2,400	11,000	4,400	---- (0.061)
Indeno(1,2,3-cd)Pyrene	2,100	3,400	ND(900)	4,500	ND(2,300)	3,200
Dibenzo(a,h)Anthracene	510	ND(2,100)	ND(900)	3,200	ND(2,300)	14
Benzo(g,h,i)Perylene	2,100	3,600	940	6,200	2,500	50,000***

TABLE 4.3

CRA SUPPLEMENTAL SITE INVESTIGATION
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source *Sample ID* *Date*	*TP-1(Q&S)* *S-2428-DT-001* *6-19-89*	*TP-1(Q&S) dup* *S-2428-DT-005* *6-19-89*	*TP-2(T&U)* *S-2428-DT-002/002re* *6-19-89*	*TP-3(V&W)* *S-2428-DT-003/003re* *6-19-89*	*TP-4(M&N)* *S-2428-DT-004/004re* *6-19-89*	*Eastern USA Background Soil Concentrations (2)*	*Recommended Soil Cleanup Objective*
TAL Metals (mg/Kg)							
Aluminum	9,570	13,400	848	87.6	1,320	33,000	SB
Arsenic	10.6	4.1	3.1	2.2	0.59	3 - 12	7.5 or SB
Barium	118	105	28.6	9.0	40	15-600	300 or SB
Beryllium	0.69	0.7	ND(0.13)	ND(0.11)	ND(0.14)	0-1.75	0.16 or SB
Calcium	27,100	41,600	750	405	792	130-35,000	
Chromium	116.1	17.6	6.7	4.8	5.2	1.5-40	10 or SB
Cobalt	10	12.1	3.8	ND(0.74)	3.3	2.5-60	30 or SB
Copper	43.2	68.7	11.2	10.0	16.4	1-50	25 or SB
Iron	35,700	21,800	3,210	329	6,730	2,000-550,000	2,000 or SB
Lead	81.8	36.3	3.2	5.8	10.1	200-500***	SB****
Magnesium	8,190	12,500	72.3	ND(15.4)	162	100-5,000	SB
Manganese	579	488	41.7M	39.0	109	50-5,000	SB
Mercury	1.0	0.4	ND(0.11)	ND(0.11)	ND(0.14)	0.001-0.2	0.1
Nickel	16.4	22.2	7.1	8.9	ND(5.1)	0.5-25	13 or SB
TAL Metals (mg/Kg)							
Potassium	1290*	2,090*	3,430	ND(390)	522*	8,500-43,000	SB
Selenium	ND(0.74)	ND(1.3)	0.54W	0.31	ND(0.26)	0.1-3.9	2 or SB
Sodium	ND(361)	ND(399)	1,350	ND(349)	ND(429)	6,000-8,000	SB
Vanadium	46.7	33.5	9.9	28.8	9.4	1-300	150 or SB
Zinc	136	95.5	34.0	17.4	42.0	9-50	20 or SB

TABLE 4.3

CRA SUPPLEMENTAL SITE INVESTIGATION
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source *Sample ID* *Date*	*TP-1(Q&S)* *S-2428-DT-001* *6-19-89*	*TP-1(Q&S) dup* *S-2428-DT-005* *6-19-89*	*TP-2(T&U)* *S-2428-DT-002/002re* *6-19-89*	*TP-3(V&W)* *S-2428-DT-003/003re* *6-19-89*	*TP-4(M&N)* *S-2428-DT-004/004re* *6-19-89*	*Background Surface Soil Concentrations (2)*
Other Compounds (mg/Kg)						
Cyanide	186	271	0.68W	ND(0.56)	1.5	–
Oil & Grease	3,300	38,000	180	240M	250	–
Hexavalent Chromium	<0.5R**	<0.5R**	<0.5R**	<0.5R*	<0.5R**	–
TCLP VOCs (µg/L)						TCLP Regulatory Level µg/L
Benzene	4J	2J	ND(5)	ND(5)	ND(5)	500
Methylene Chloride	31*	14*	15*	11*	15*	--
2-Butanone	38	ND(10)	ND(10)	ND(10)	ND(10)	200,000
Toluene	75	5	ND(5)	ND(5)	ND(5)	–
TCLP BNAs (µg/L)						
3-MethylPhenol (1)	all phenolic data	ND(10)	all phenolic data	ND(10)	ND(10)	200,000
4-MethylPhenol (1)	qualified X	ND(10)	qualified X	ND(10)	ND(10)	200,000
Pentachlorophenol		ND (20)		ND(20)	ND(20)	100,000
TCLP Metals (µg/L)						
Arsenic	8.4	49.3	6.8	2.1	6	5,000
Barium	769	679	329	101	288	100,000
Chromium	4.8	132	ND(3.8)	16.9	9.8	5,000
Lead	14.5	389	13.0	41.8	16.9	5,000
Mercury	ND(0.20)	37.2	ND(0.20)	ND(0.20)	ND(0.20)	200
Selenium	ND(10.0)	ND(5.0)	ND(10.0)	1.5	ND(10.0)	1,000

TABLE 4.3

CRA SUPPLEMENTAL SITE INVESTIGATION
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Notes:

All other TCL/TAL/TCLP parameters were not detected in any samples.

re Samples S-2428-DT-002,003 and 004 were reanalyzed for VOCs (sample IDs noted with the suffix - re) due to outlying surrogate spike recoveries. The reanalyzed samples showed similar surrogate spike recoveries.

C Denotes a compound whose concentration is estimated due to unsatisfactory percent differences (%D's) in response factors determined from the calibration.

* Also present in laboratory blanks, indicating possible/probable laboratory contamination.

ND Not detected above quantifiable limits stated in parentheses.

R Unusable data due to holding time exceedence.

** The concentration of Cr+6 may have been equal to, however not greater than, the amount of total chrome detected in the associated sample.

M Indicated matrix spike recoveries were outside control limits and may reflect a high bias in sample data.

W Indicated spike recoveries were outside control limits and may reflect a low bias in sample data.

(1) Indistinguishable isomers, reported value is total concentration.

X Unusable data due to low surrogate spike recoveries. All sample data for the affected compounds were non-detected.

SB Site Background.

(2) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels.

(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:

1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

*** As per TAGM #4046, Total Pesticides ≤10ppm.

**** Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61ppm. Average background levels in metropolitan or surburban areas or near highways are much higher and typically range from 200-500 ppm.

TABLE 4.4

CRA SUPPLEMENTAL SITE INVESTIGATION
BOREHOLE SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Sample ID	*S-2428-DT-021*	*S-2428-DT-022*	*Eastern USA Background*	*Recommended*
Source	*BH-1(T&U)*	*BH-2(V&W)*	*Surface Soil*	*Soil Cleanup*
Date	*10-16-89*	*10-16-89*	*Concentrations (1)*	*Objective (1)*
TCL VOCs (µg/kg)	none detected			
TCL BNAs (µg/kg)				
Bis(2-ethylhexyl)phthalate	8.0	1.0		50,000*
TAL Metals (mg/kg)				
Aluminum	10,200	11,800	33,000	SB
Arsenic	1.90	1.80	3-12	7.5 or SB
Barium	47.0	30.0	15-600	300 or SB
Beryllium	1.60	1.60	0-1.75	0.16 or SB
Cadmium	0.15	0.15	0.1-1	1 or SB
Calcium	36,780	22,400	130-35,000	SB
Chromium	15.0	13.0	1.5-40	10 or SB
Copper	17.0	18.0	1-50	25 or SB
Cobalt	10.0	13.0	2.5-60	30 or SB
Iron	180	179	2,000-550,000	2,000 or SB
Lead	4.40	4.10	200-500**	SB**
Magnesium	16,500	16,500	100-5,000	SB
Manganese	530	480	50-5,000	SB
Nickel	25.5	24.0	0.5-25	13 or SB
Potassium	3,260	3,080	8,500-43,000	SB
Sodium	630	690	6,000-8,000	SB
Vanadium	17.7	14.0	1-300	150 or SB
Zinc	64.0	70.0	9-50	20 or SB
Other Compounds (mg/kg)				
Oil and Grease	419	1050		

Note:

(1) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels.
All other TCL/TAL parameters, cyanide and Cr+6 were not detected in any sample.
SB Site Background
(4) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.
* As per TAGM #4046, Total Pesticides ≤10ppm.
** Background levels for lead vary widely. Average levels in underdeveloped, rural areas may range from 4-61 ppm. Average background levels in metropolitan or suburban areas or near highways, are much higher and typically range from 200-500 ppm.

TABLE 4.5

CRA ADDITIONAL SITE INVESTIGATON
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Test Pit # *Sample Type* *Date*	*TP-X,Y,Z* *COMPOSITE* *6-14-91*	*TP-Z* *GRAB* *6-14-91*	*Recommended* *Soil Cleanup* *Objective (1)*
TCL VOCs (mg/kg)			
Benzene	2.8	66	0.06
Toluene	6.4	140	1.5
Ethylbenzene	22	60	5.5
m/p-Xylene	6.4	100	1.2
o-Xylene	8	98	1.2
TCL BNAs (mg/kg)			
Naphthalene	92	270	13
Phenanthrene	62	180	50*
Anthracene	ND(33)	74	50*
Fluoranthene	67	150	50*
Pyrene	44	99	50*
Benzo(a)Anthracene	ND(33)	57	0.224
Chrysene	ND(33)	47	0.4
Benzo(b)Fluoranthene	ND(33)	40	1.1
Benzo(k)Fluoranthene	ND(33)	45	1.1
Benzo(a)Pyrene	ND(33)	47	0.061
2-Methylnaphthalene	ND(33)	86	36.4
Dibenzofuran	ND(33)	69	6.2
Fluorene	ND(33)	85	50*

TABLE 4.5

CRA ADDITIONAL SITE INVESTIGATON
TEST PIT SOIL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

TAL METALS (mg/kg)			*Eastern USA Background Soil Concentrations (1)*	*Recommended Soil Cleanup Objective (1)*
Aluminum	15,000	22,500	33,000	SB
Arsenic	10.1	240	3-12	7.5 or SB
Barium	16.2	46.7	15-600	300 or SB
Cadmium	1.05	ND(0.05)	0.1-1	1 or SB
Calcium	9,490	496	130-35,000	SB
Chromium	24.1	16.7	1.5-40	10 or SB
Copper	50.7	64	1-50	25 or SB
Iron	32,000	77,100	2,000-550,000	2,000 or SB
Lead	108	172	200-500**	SB**
Magnesium	4,250	3,480	100-5,000	SB
Manganese	245	190	50-5,000	SB
Mercury	4	3.5	0.001-0.2	0.1
Nickel	362	83	0.5-25	13 or SB
Potassium	875	1,590	8,500-43,000	SB
Selenium	1.43	ND(0.5)	0.1-3.9	2 or SB
Silver	1.74	23.3	NA	SB
Sodium	365	488	6,000-8,000	SB
Vanadium	1.6	13.8	1-300	150 or SB
Zinc	145	204	9-50	20 or SB

Note:

(1) Source: TAGM #4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. Soils cleanup objectives are limited to the following maximum values:
1) Total VOCs ≤10 ppm.
2) Total Semi-VOCs ≤500 ppm.
3) Individual Semi-VOCs ≤50 ppm.
4) Total Pesticides ≤10 ppm.

ND(#) Not detected above quantifiable limits stated in parentheses

* As per TAGM #4046, Total Pesticides ≤10ppm.

** Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm. Average background levles in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 ppm.

TABLE 4.6

SUMMARY OF SOIL PARAMETER EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*Sample Exceedance/ Total Number of Samples*	*Exceedance Location*
VOC's		
Acetone	3/11	Site 108-#3*, Site 110-#2*, TP-2 (T&U)
Methylene chloride	3/11	Site 110-# 2*, Site 110-#3*, TP-2 (T&U)
Toluene	2/13	TP-X,Y,Z, and TP-Z
Xylene	2/14	TP-X,Y,Z, and TP-Z
Benzene	6/12	Site 108-#3*, Site 110-#1*, Site 110-#2**, Site 110-#3**, TP-X,Y,Z, and TP-Z
1,2-Trans-dichloroethane	1/2	Site 108-#3*
Ethylbenzene	2/7	TP-X,Y,Z, and TP-Z
Tetrachloroethene	0/2	
Vinyl Chloride	1/2	Site 108-#3*
Acrolein	0/3	
1,1,1-Trichloroethane	0/3	
Cis,1,3-Dichloropropene	0/3	
Styrene	0/4	
	20/86 23%	
BNA's		
Polynuclear Aromatic Hydrocarbons		
Acenaphthene	0/10	
Fluoranthene	0/7	
Naphthalene	3/8	TP-1 (Q&S), TP-X,Y,Z, and TP-Z
Benzo(a)anthracene	5/9	TP-1 (Q&S), TP-2 (T&U), TP-3 (V&W), TP-4 (M&N), TP-Z
Benzo(b)fluoranthene and Benzo(k)fluoranthene	5/9	TP-1 (Q&S), TP-2 (T&U), TP-3 (V&W), TP-4 (M&N), TP-Z
Acenaphthylene	0/8	
Benzo(g,h,i)perylene	0/7	
Fluorene	1/9	TP-Z
Indeno(1,2,3-cd)pyrene	2/9	TP-1 (Q&S), TP-3 (V&W)
Pyrene	1/9	TP-Z
Chrysene	5/11	TP-1 (Q&S), TP-2 (T&U), TP-3 (V&W), TP-4 (M&N), TP-Z

TABLE 4.6

SUMMARY OF SOIL PARAMETER EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*Sample Exceedance/ Total Number of Samples*	*Exceedance Location*
Dibenzo (a,h) anthracene	2/6	TP-1 (Q&S), TP-3 (V&W)
Perylene	0/5	
Anthracene	1/7	TP-Z
Phenanthcene	2/8	TP-X,Y,Z, and TP-Z
2-Methynaphthalene	1/7	TP-Z
Base Neutrals		
Diethylphthalate	0/9	
Bis (2-ethylhexyl) phthalate	0/5	
Butylbenzylphthalate	0/2	
Di-n-butylphthalate	0/5	
Di-n-octylphthalate	0/3	
N-nitrosodiphenylamine	0/3	
Metals		
Aluminum	0/8	
Arsenic	1/8	TP-Z
Barium	0/8	
Beryllium	0/6	
Calcium	2/8	TP-1 (Q&S), BH-1 (T&U)
Chromium	1/8	TP-1 (Q&S)
Cobalt	0/6	
Copper	2/8	TP-1 (Q&S), TP-Z
Iron	0/8	
Lead	0/8	
Magnesium	3/8	TP-1 (Q&S), BH-1 (T&U), BH-2 (V&W)
Manganese	0/8	
Mercury	2/6	TP-X,Y,Z, and TP-Z
Nickel	3/8	BH-1 (T&U), TP-X,Y,Z, and TP-Z
Potassium	0/8	
Selenium	0/6	
Sodium	0/8	
Vanadium	0/8	
Zinc	5/8	TP-1 (Q&S), BH-1 (T&U), BH-2 (V&W), TP-X,Y,Z, and TP-Z

TABLE 4.7

USGS STUDY
SUMMARY OF COMPOUNDS DETECTED* IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Site *Date*	*Site 108* *7/13/82*	*Site 109* *7/14/82*	*Most Stringent* *MCL (µg/L)*
Cyanide	280	--	100
Iron	170,000	--	300
Undecone	--	5	--

Note:

– Indicates no sample information.

TABLE 4.8

MALCOLM PIRNIE, INC. - PHASE II INVESTIGATION
ROUND 1 (NOV. 1985) GROUNDWATER SAMPLES* ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*Most Stringent MCL (µg/L)*	*MW-1*	*MW-2*	*MW-3*	*MW-4*	*MW-5*	*MW-6*	*MW-7*
CyanideFree	--	0.038	0.042	0.018	0.011	0.013	***	***
Cyanide-Total	100	0.730	0.740	0.196	0.021	0.030	0.189	0.089
Phenols	1	LT 0.010	0.060	0.520	LT 0.010	LT 0.010	LT 0.025	LT 0.025
Benzene	ND	LT 5.0	LT 5.0	84.0	LT 5.0	LT 5.0	LT 10	LT 10
Toluene	5	LT 5.0	LT 5.0	59.0	LT 5.0	LT 5.0	LT 10	LT 10
p-Xylene	5	LT 5.0	LT 5.0	19.0	LT 5.0	LT 5.0	***	***
m-Xylene/Chlorobenzene	5	LT 5.0	LT 5.0	62.0	LT 5.0	LT 5.0	LT 10	LT 10
O-Xylene	5	LT 5.0	LT 5.0	36.0	LT 5.0	LT 5.0	***	***
Acenaphthene	20	LT 7.0	LT 6.2	59.0	LT 6.0	LT 3.0	LT 10	LT 10
Acenaphthylene	--	LT 12.0	LT 11.0	450.0	LT 11.0	LT 5.0	LT 10	LT 10
Anthracene	50	LT 14.0	LT 15.0	173.0	LT 27.0	LT 12.0	LT 10	LT 10
Benzo(a)pyrene	ND	LT 26.0	LT 24.0	95.0	LT 58.0	LT 24.0	LT 10	LT 10
Benzo(ghi)perylene	--	LT 65.0	LT 59.0	78.0	LT 59.0	LT 24.0	LT 25	LT 25
Chrysene	0.002	LT 21.0	LT 19.0	9.0	88.0	LT 19.0	LT 10	LT 10
Fluoranthene	50	LT 14.0	LT 12.0	400.0	LT 16.0	LT 12.0	LT 10	LT 10
Fluorene	50	LT14.0	LT 12.0	99.0	LT 26.0	LT 12.0	LT 10	LT 10
Indeno (1,2,3-c,d) pyrene	0.002	LT 250.0	LT 229.0	95.0	LT 229.0	LT 229.0	LT 25	LT 25
Naphthalene	10	LT 13.0	LT 10.0	4,540.0	LT 36.0	LT 6.0	LT 10	LT 10
Phenanthrene	50	LT 12.0	LT 15.0	1,100.0	LT 11.0	LT 11.0	LT 10	LT 10
Pyrene	50	LT 24.0	LT 22.0	302.0	LT 22.0	LT 22.0	LT 10	LT 10
TOX	--	0.62	10.0	61.0	1.90	0.19	***	***
Arsenic	25						0.013	0.022
Copper	200						0.02	LT 0.01
Nickel	--						LT 0.01	0.05
Zinc	300						0.18	0.14

* All results in µg/L, except Cyanides, Phenols and metals (mg/L)
** Applies to sum of isomers
*** Parameter not analyzed
LT(x) Parameter not detected at associated x value

TABLE 4.9

MALCOLM PIRNIE, INC. - PHASE II INVESTIGATION
ROUND 2 (AUG. 1986) GROUNDWATER SAMPLES* ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Most Stringent MCL (µg/L)	*MW-1*	*MW-2*	*MW-3*	*MW-4*	*MW-5*	*MW-6*	*MW-7*
Cyanide-T	100	NA**	0.500	0.120	0.030	0.043	0.198	0.064
Phenols	1	NA	LT 0.010	0.050	LT 0.010	LT 0.010	LT 0.010	LT 0.010
Benzene	ND	NA	LT 5.0	6.7	LT 5.0	LT 5.0	LT 5.0	LT 5.0
Toluene	5	NA	LT 5.0	11.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0
Chlorobenzene	5	NA	LT 5.0	22.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0
1,4-Dichlorobenzene	5	NA	LT 5.0	29.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0
Total Xylenes	5	NA	LT 15.0	45.0	LT 15.0	LT 15.0	LT 15.0	LT 15.0
Acenaphthylene	--	NA	LT 44.0	146.0	LT 41.0	LT 45.0	LT 42.0	LT 43.0
Flurorantheне	50	NA	LT 27.0	37.0	LT 24.0	LT 27.0	LT 25.0	LT 26.0
Fluorene	50	NA	LT 50.0	110.0	LT 46.0	LT 51.0	LT 48.0	LT 49.0
TOX	N/A	NA	2.73	11.3	6.01	2.07	0.59	0.93

* All results in µg/L, except Cyanide-T and Phenols (mg/L)
** Well damaged, no sample
*** Applies to sum of para (1,4-) and ortho (1,2-) isomers
LT(x) Parameter not detected at associated x value
NA - Parameter not analyzed

TABLE 4.10

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - VOCs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-2*	*MW-2 dup*	*MW-2 dup*	*MW-2*	*MW-3*	*MW-3 dup*	*MW-3*
Sample ID	*W-2428-DT-004*	*W-2428-DT-005*	*W-2428-DT-006*	*W-2428-DT-017*	*W-2428-DT-007*	*W-2428-DT-008*	*W-2428-DT-032*
Date	*6/28/89*	*6/28/89*	*6/28/89*	*10/11/89*	*6/28/89*	*6/28/89*	*10/18/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	ND(5)	ND(5)	ND(5)	NA	ND(5)	ND(5)	NA
Acetone	ND(10)	ND(10)	ND(10)	NA	ND(10)	ND(10)	NA
1,2-Dichloroethene (total)	ND(5)	ND(5)	ND(5)	ND(1.0)	ND(5)	ND(5)	ND(1.0)
1,1,1-Trichloroethane	ND(5)	ND(5)	ND(5)	ND(1.0)	7D	8D	12.2D
Benzene	ND(5)	ND(5)	ND(5)	ND(1.0)	ND(5)	ND(5)	2.71AE
Toluene	ND(5)	ND(5)	ND(5)	ND(1.0)	ND(5)	ND(5)	ND(1.0)
Ethylbenzene	ND(5)	ND(5)	ND(5)	ND(1.0)	ND(5)	ND(5)	1.66E
Total Xylenes	ND(5)	ND(5)	ND(5)	ND(1.0)	ND(5)	ND(5)	ND(1.0)

Source	*MW3R-89*	*MW3R-89 dup*	*MW3R-89*	*MW-4*	*MW-4*	*MW-5*	*MW-5*
Sample ID	*W-2428-DT-033*	*W-2428-DT-034*	*W-2428-DT-049*	*W-2428-DT-015*	*W-2428-DT-058*	*W-2428-DT-019*	*W-2428-DT-053*
Date	*10/18/89*	*10/18/89*	*12/13/89*	*10/11/89*	*12/15/89*	*10/12/89*	*12/13/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	NA	NA	6.96*	NA	ND(5)	NA	8.04*
Acetone	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,1-Trichloroethane	11.4DE	10.6DE	12.2D	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Benzene	2.41AE	2.46AE	2.08A	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Toluene	1.10E	1.44E	1.24	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Ethylbenzene	ND(1.0)	1.80E	1.13	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Total Xylenes	2.34E	6.35DE	6.89D	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)

TABLE 4.10

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - VOCs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-6*	*MW-6*	*MW-7*	*MW-7 dup*	*MW-7*	*MW-7 dup*	*MW8-89*
Sample ID	*W-2428-DT-014*	*W-2428-DT-055*	*W-2428-DT-012*	*W-2428-DT-013*	*W-2428-DT-051*	*W-2428-DT-052*	*W-2428-DT-009*
Date	*10/10/89*	*12/13/89*	*10/9/89*	*10/9/89*	*12/13/89*	*12/13/89*	*6/30/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	NA	ND(5)	NA	NA	ND(5)	5.61*	ND(5)
Acetone	NA	NA	NA	NA	NA	NA	34*
1,2-Dichloroethene (total)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	6D
1,1,1-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(5)
Benzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	41AD
Toluene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	16D
Ethylbenzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	8D
Total Xylenes	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	27D

Source	*MW9-89*	*MW9-89*	*MW10-89*	*MW11-89*	*MW11-89*	*MW12-89*	*MW12-89*
Sample ID	*W-2428-DT-001*	*W-2428-DT-061*	*W-2428-DT-060*	*W-2428-DT-026*	*W-2428-DT-059*	*W-2428-DT-030*	*W-2428-DT-048*
Date	*6/26/89*	*12/19/89*	*12/19/89*	*12/19/90*	*12/19/89*	*10/18/89*	*12/12/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	ND(5)	ND(5)	ND(5)	NA	ND(5)	NA	ND(5)
Acetone	ND(10)	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,1-Trichloroethane	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Benzene	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Toluene	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Ethylbenzene	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Total Xylenes	ND(5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)

TABLE 4.10

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - VOCs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW13-89*	*MW13-89*	*MW13-89*	*MW14-89*	*MW14-89*	*MW15-89*	*MW15-89*
Sample ID	*W-2428-DT-016*	*W-2428-DT-046*	*W-2428-DT-047*	*W-2428-DT-010*	*W-2428-DT-063*	*W-2428-DT-025*	*W-2428-DT-054*
Date	*10/17/89*	*12/12/89*	*12/12/89*	*7/5/89*	*12/20/89*	*10/17/89*	*12/14/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	NA	ND(5)	ND(5)	ND(10)	5.15*	NA	ND(5)
Acetone	NA	NA	NA	240D	NA	NA	NA
1,2-Dichloroethene (total)	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)
1,1,1-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)
Benzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)
Toluene	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)
Ethylbenzene	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)
Total Xylenes	ND(1.0)	ND(1.0)	ND(1.0)	ND(10)	ND(1.0)	ND(10)	ND(1.0)

Source	*MW16-89*	*MW16-89*	*MW17-89*	*MW17-89*	*Most*
Sample ID	*W-2428-DT-020*	*W-2428-DT-062*	*W-2428-DT-002*	*W-2428-DT-057*	*Stringent*
Date	*10/17/89*	*12/19/89*	*6/27/89*	*12/15/89*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Methylene Chloride	NA	5.74*	ND(5)	ND(5)	5
Acetone	NA	NA	36*	NA	50
1,2-Dichloroethene (total)	ND(10)	ND(1.0)	ND(5)	ND(1.0)	5
1,1,1-Trichloroethane	ND(10)	ND(1.0)	ND(5)	ND(1.0)	5
Benzene	ND(10)	3.76A	ND(5)	ND(1.0)	ND
Toluene	ND(10)	ND(1.0)	ND(5)	ND(1.0)	5
Ethylbenzene	ND(10)	ND(1.0)	ND(5)	ND(1.0)	5
Total Xylenes	ND(10)	ND(1.0)	ND(5)	ND(1.0)	5

Notes:

All other TCL VOCs were not detected during Round 1 (June 1989) sampling.

* Also present in laboratory/reagent blank, indicating possible/probable laboratory contamination.

A The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D The associated value exceeded NYSDOH Drinking Water Standards (Sanitary Code Part 5).

ND Not detected above quantifiable limits stated in parentheses.

E The associated data is estimated due to outlying surrogate recoveries.

NA Not analyzed for the particular parameter as it was not included in the SSIs.

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-2*	*MW-2 dup*	*MW-2 dup*	*MW-2*	*MW-3*	*MW-3 dup*	*MW-3*
Sample ID	*W-2428-DT-004*	*W-2428-DT-005*	*W-2428-DT-006*	*W-2428-DT-017*	*W-2428-DT-007*	*W-2428-DT-008*	*W-2428-DT-032*
Date	*6/28/89*	*6/28/89*	*6/28/89*	*10/11/89*	*6/28/89*	*6/28/89*	*10/18/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	ND(10)	ND(10)	ND(10)	ND(3)	73D	100D	ND(3)
2-Methylnaphthalene	ND(10)	ND(10)	ND(10)	ND(3)	25	ND(10)	3.71
Acenapthylene	ND(10)	ND(10)	ND(10)	ND(3)	30	31	62.1D
Acenaphthene	ND(10)	ND(10)	ND(10)	ND(3)	ND(10)	ND(10)	19.2
Fluorene	ND(10)	ND(10)	ND(10)	ND(3)	45	49	112D
Phenanthrene	ND(10)	ND(10)	ND(10)	ND(3)	29	38	148D
Anthracene	ND(10)	ND(10)	ND(10)	ND(3)	ND(10)	ND(10)	17.1
Fluoranthene	ND(10)	ND(10)	ND(10)	ND(3)	34	16	21.3
Pyrene	ND(10)	ND(10)	ND(10)	ND(3)	21	15	11.2
Benzo(a)anthracene	ND(10)	ND(10)	ND(10)	ND(3)	ND(10)	ND(10)	ND(3)
Chrysene	ND(10)	ND(10)	ND(10)	ND(3)	ND(10)	ND(10)	ND(3)
Benzo(b)fluoranthene (1)	ND(10)	ND(10)	ND(10)	ND(3)	15	ND(10)	ND(3)
Benzo(k)fluoranthene (1)	ND(10)	ND(10)	ND(10)	ND(3)	15	ND(10)	ND(3)
Benzo(a)pyrene	ND(10)	ND(10)	ND(10)	ND(3)	ND(10)	ND(10)	ND(3)
Dibenzofuran	ND(10)	ND(10)	ND(10)	NA	34	37	NA
Benzo(g,h,i)perylene	NA	NA	NA	ND(3)	NA	NA	ND(3)
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	ND(3)	NA	NA	ND(3)
2-Chloronaphthalene	NA	NA	NA	ND(3)	NA	NA	ND(3)

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW3R-89*	*MW3R-89 dup*	*MW3R-89*	*MW-4*	*MW-4*	*MW-5*	*MW-5*
Sample ID	*W-2428-DT-033*	*W-2428-DT-034*	*W-2428-DT-049*	*W-2428-DT-015*	*W-2428-DT-058*	*W-2428-DT-019*	*W-2428-DT-053*
Date	*10/18/89*	*10/18/89*	*12/13/89*	*10/11/89*	*12/15/89*	*10/12/89*	*12/13/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	459ED	486ED	404D	ND(3)	ND(3)	ND(3)	ND(3)
2-Methylnaphthalene	57.1ED	80.6ED	33.5	ND(3)	ND(3)	ND(3)	ND(3)
Acenapthylene	64.0ED	83.1ED	40.1	ND(3)	ND(3)	ND(3)	ND(3)
Acenaphthene	55.5ED	72.3ED	34.2	ND(3)	ND(3)	ND(3)	ND(3)
Fluorene	124ED	154ED	61.2D	ND(3)	ND(3)	ND(3)	ND(3)
Phenanthrene	264ED	287ED	76.8D	ND(3)	ND(3)	ND(3)	ND(3)
Anthracene	55.0ED	36.8E	12.9	ND(3)	ND(3)	ND(3)	ND(3)
Fluoranthene	90.9ED	77.0ED	12.9	ND(3)	ND(3)	ND(3)	ND(3)
Pyrene	69.3ED	70.2ED	8.21	ND(3)	ND(3)	ND(3)	ND(3)
Benzo(a)anthracene	52.7ED	35.0E	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Chrysene	32.6E	18.8E	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Benzo(b)fluoranthene (1)	49.2E	27.0E	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Benzo(k)fluoranthene (1)	49.2E	27.0E	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Benzo(a)pyrene	28.8EA	13.2EA	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Indeno(1,2,3-c,d)pyrene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
2-Chloronaphthalene	16.7E	21.8E	9.34	ND(3)	ND(3)	ND(3)	ND(3)

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-6*	*MW-6*	*MW-7*	*MW-7 dup*	*MW-7*	*MW-7 dup*	*MW8-89*
Sample ID	*W-2428-DT-014*	*W-2428-DT-055*	*W-2428-DT-012*	*W-2428-DT-013*	*W-2428-DT-051*	*W-2428-DT-052*	*W-2428-DT-009*
Date	*10/10/89*	*12/13/89*	*10/9/89*	*10/9/89*	*12/13/89*	*12/13/89*	*6/30/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	1,900D
2-Methylnaphthalene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	19
Acenapthylene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Acenaphthene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Fluorene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Phenanthrene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Anthracene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Fluoranthene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Pyrene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Benzo(a)anthracene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Chrysene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Benzo(b)fluoranthene (1)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Benzo(k)fluoranthene (1)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Benzo(a)pyrene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(10)
Dibenzofuran	NA	NA	NA	NA	NA	NA	ND(10)
Benzo(g,h,i)perylene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	NA
Indeno(1,2,3-c,d)pyrene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	NA
2-Chloronaphthalene	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	NA

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW9-89*	*MW9-89*	*MW10-89*	*MW11-89*	*MW11-89*	*MW12-89*	*MW12-89*
Sample ID	*W-2428-DT-001*	*W-2428-DT-061*	*W-2428-DT-060*	*W-2428-DT-026*	*W-2428-DT-059*	*W-2428-DT-030*	*W-2428-DT-048*
Date	*6/26/89*	*12/19/89*	*12/19/89*	*10/17/89*	*12/19/89*	*10/18/89*	*12/12/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
2-Methylnaphthalene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Acenapthylene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Acenaphthene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Fluorene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Phenanthrene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Anthracene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Fluoranthene	ND(10)	ND(3)	ND(3)	8.76	ND(3)	ND(3)	ND(3)
Pyrene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	10.4R	ND(3)
Benzo(a)anthracene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Chrysene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Benzo(b)fluoranthene (1)	ND(10)	ND(3)	ND(3)	4.26	ND(3)	ND(3)	ND(3)
Benzo(k)fluoranthene (1)	ND(10)	ND(3)	ND(3)	4.26	ND(3)	ND(3)	ND(3)
Benzo(a)pyrene	ND(10)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Dibenzofuran	ND(10)	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
Indeno(1,2,3-c,d)pyrene	NA	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)
2-Chloronaphthalene	NA	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)	ND(3)

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW13-89*	*MW13-89*	*MW13-89 dup*	*MW14-89*	*MW14-89*	*MW15-89*	*MW15-89*
Sample ID	*W-2428-DT-016*	*W-2428-DT-046*	*W-2428-DT-047*	*W-2428-DT-010*	*W-2428-DT-063*	*W-2428-DT-025*	*W-2428-DT-054*
Date	*10/17/89*	*12/12/89*	*12/12/89*	*7/5/89*	*12/20/89*	*10/17/89*	*12/14/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	7.46	ND(3)
2-Methylnaphthalene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	4.69	ND(3)
Acenapthylene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	ND(3)	ND(3)
Acenaphthene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	ND(3)	ND(3)
Fluorene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	6.49	ND(3)
Phenanthrene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	15.6	ND(3)
Anthracene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	ND(3)	ND(3)
Fluoranthene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	30.9	ND(3)
Pyrene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	18.8	ND(3)
Benzo(a)anthracene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	17.2	ND(3)
Chrysene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	10.5	ND(3)
Benzo(b)fluoranthene (1)	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	19.0	ND(3)
Benzo(k)fluoranthene(1)	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	19.0	ND(3)
Benzo(a)pyrene	ND(3)	ND(3)	ND(3)	ND(10)	ND(3)	12.4A	ND(3)
Dibenzofuran	NA	NA	NA	ND(10)	NA	NA	NA
Benzo(g,h,i)perylene	ND(3)	ND(3)	ND(3)	NA	ND(3)	9.17	ND(3)
Indeno(1,2,3-c,d)pyrene	ND(3)	ND(3)	ND(3)	NA	ND(3)	14.3	ND(3)
2-Chloronaphthalene	ND(3)	ND(3)	ND(3)	NA	ND(3)	3.47	ND(3)

TABLE 4.11

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - BNAs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW16-89*	*MW16-89*	*MW17-89*	*MW17-89*	*Most*
Sample ID	*W-2428-DT-020*	*W-2428-DT-062*	*W-2428-DT-002*	*W-2428-DT-057*	*Stringent*
Date	*10/17/89*	*12/19/89*	*6/27/89*	*12/15/89*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Naphthalene	ND(3)	ND(3)	ND(10)	ND(3)	50
2-Methylnaphthalene	ND(3)	ND(3)	ND(10)	ND(3)	50
Acenapthylene	ND(3)	ND(3)	ND(10)	ND(3)	50
Acenaphthene	ND(3)	ND(3)	ND(10)	ND(3)	50
Fluorene	ND(3)	ND(3)	ND(10)	ND(3)	50
Phenanthrene	ND(3)	ND(3)	ND(10)	ND(3)	50
Anthracene	ND(3)	ND(3)	ND(10)	ND(3)	50
Fluoranthene	ND(3)	ND(3)	ND(10)	ND(3)	50
Pyrene	ND(3)	ND(3)	ND(10)	ND(3)	50
Benzo(a)anthracene	ND(3)	ND(3)	ND(10)	ND(3)	50
Chrysene	ND(3)	ND(3)	ND(10)	ND(3)	50
Benzo(b)fluoranthene (1)	ND(3)	ND(3)	ND(10)	ND(3)	50
Benzo(k)fluoranthene(1)	ND(3)	ND(3)	ND(10)	ND(3)	50
Benzo(a)pyrene	ND(3)	ND(3)	ND(10)	ND(3)	ND
Dibenzofuran	NA	NA	ND(10)	NA	50
Benzo(g,h,i)perylene	ND(3)	ND(3)	NA	ND(3)	50
Indeno(1,2,3-c,d)pyrene	ND(3)	ND(3)	NA	ND(3)	50
2-Chloronaphthalene	ND(3)	ND(3)	NA	ND(3)	50

Notes:

All other TCL BNAs were not detected during Round 1 (June 1989) sampling.

A The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D The associated value exceeded NYSDOH Drinking Water Standards (Sanitary Code Part 5).

ND Not detected above quantifiable limits stated in parentheses.

E The associated data is estimated due to outlying surrogate recoveries.

NA Not analyzed for the particular parameter as it was not included in the SSIs.

(1) Indistinguishable isomers, reported value is total concentration.

TABLE 4.12

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-2*	*MW-2 dup*	*MW-2 dup*	*MW-2 (filt.)*	*MW-2 (filt.) dup*	*MW-2 (filt.) dup*
Sample ID	*W-2428-DT-004*	*W-2428-DT-005*	*W-2428-DT-006*	*W-2428-DT-004*	*W-2428-DT-005*	*W-2428-DT-006*
Date	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Aluminum	163	226	98.5	ND(23.0)	35.1	ND(23.0)
Arsenic	1.9	2.1	1.4	3.6	3.8	3.3
Barium	48.9	51.3	49.4	47.0	47.0	42.8
Beryllium	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.70)	ND(0.70)	ND(0.70)
Calcium	120,000	120,000	123,000	149,000	140,000	140,000
Chromium	4.6	3.8	ND(3.8)	ND(6.2)	ND(6.2)	ND(6.2)
Cobalt	3.7	ND(3.3)	ND(3.3)	9.2	9.0	9.2
Copper	ND(7.3)	ND(7.3)	ND(7.3)	ND(7.2)	ND(7.2)	ND(7.2)
Iron	6,130A	6,290A	5,390A	15,800A	14,100A	14,800A
Lead	2.0	ND(0.90)	ND(0.90)W	ND(1.1)	ND(1.1)	ND(1.1)
Magnesium	12,700E	12,700E	12,800E	15,400E	14,600E	14,400E
Manganese	801A	894A	846A	1,510A	1,330A	1,420A
Mercury	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)X	ND(0.20)X	ND(0.20)X
Nickel	ND(18.6)	ND(18.6)	ND(18.6)	ND(35.8)	ND(35.8)	ND(35.8)
Potassium	2,810	2,460	1,950	6,190	6,200	5,970
Selenium	ND(10.0)E	ND(10.0)E	ND(10.0)Y	ND(16.0)	ND(16.0)	ND(16.0)
Silver	ND(4.9)	ND(4.9)	ND(4.9)	ND(5.7)	ND(5.7)	ND(5.7)
Sodium	10,700	10,500	10,000	12,500	11,800	12,100
Vanadium	ND(2.6)	ND(2.6)	ND(2.6)	8.1	7.8	8.2
Zinc	64.0	31.6	57.1	28.0	26.5	37.2

TABLE 4.12

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-3*	*MW-3 dup*	*MW-3 (filt.)*	*MW-3 (filt.) dup*	*MW8-89*	*MW8-89 (filt.)*
Sample ID	*W-2428-DT-007*	*W-2428-DT-008*	*W-2428-DT-007*	*W-2427-DT-008*	*W-2428-DT-009*	*W-2428-DT-009*
Date	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*	*6/28/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Aluminum	172	104	ND(23.0)	ND(23.0)	139	166
Arsenic	3.2	1.4	3.1	3.2	ND(1.2)	ND(1.2)
Barium	43.1	40.7	40.4	41.8	37.8E	39.4
Beryllium	ND(0.50)	ND(0.50)	ND(0.70)	ND(0.70)	3.6	ND(0.70)
Calcium	131,000	130,000	125,000	124,000	599,000E	626,000
Chromium	3.8	ND(3.8)	ND(6.2)	ND(6.2)	9.0	ND(6.2)
Cobalt	ND(3.3)	ND(3.3)	5.3	ND(3.9)	23.1	17.6
Copper	9.4	ND(7.3)	ND(7.2)	ND(7.2)	ND(7.3)	ND(7.2)
Iron	3,300A	2,900A	2,700A	2,590A	31,200EA	33,100A
Lead	11.8	ND(0.90)	ND(1.1)	ND(1.1)	ND(0.90)	1.4
Magnesium	19,500E	19,400E	18,000E	18,000E	53,300E	55,600
Manganese	1,070A	1,040A	1,050A	1,040A	2,340EA	2,430A
Mercury	ND(0.20)	ND(0.20)	ND(0.20)X	ND(0.20)X	ND(0.20)	ND(0.20)R
Nickel	ND(18.6)	ND(18.6)	ND(35.8)	ND(35.8)	ND(18.6)	ND(35.8)
Potassium	6,000	6,850	10,200	10,700	22,300	17,800
Selenium	ND(5.0)	ND(10.0)	ND(16.0)	ND(16.0)	ND(10.0)	ND(16.0)
Silver	ND(4.9)	ND(4.9)	ND(5.7)	ND(5.7)	5.4	ND(5.7)
Sodium	29,500B	29,800B	28,900B	28,100B	80,300EB	82,600B
Vanadium	ND(2.6)	ND(2.6)	4.6	5.0	77.8	64.0
Zinc	143	167	24	16.7	83.4E	87.9

TABLE 4.12

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW9-89*	*MW9-89 (filt.)*	*MW14-89*	*MW14-89 (filt.)*	*MW17-89*	*MW17-89 (filt.)*	*Most*
Sample ID	*W-2428-DT-001*	*W-2428-DT-008*	*W-2428-DT-010*	*W-2428-DT-010*	*W-2428-DT-002*	*W-2428-DT-002*	*Stringent*
Date	*6/26/89*	*6/26/89*	*6/26/89*	*6/26/89*	*6/26/89*	*6/26/89*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Aluminum	5,190	49.1	8770	40.2	127	26.5	
Arsenic	6.1	4.6	3.6	1.7	4.9	9.3	25
Barium	177	80.7	145E	62.5E	92.9	93.9	1,000
Beryllium	ND(0.50)	ND(0.70)	3.7	ND(0.50)	ND(0.50)	ND(0.70)	
Calcium	162,000	161,000	196,000E	132,000	199,000	207,000	
Chromium	4.2	ND(6.2)	23.3	ND(3.8)	ND(3.8)	ND(6.2)	50
Cobalt	ND(3.3)	ND(3.9)	12.2	4.2	ND(3.3)	5.5	
Copper	ND(7.3)	ND(7.2)	10.2	24.5	ND(7.3)	ND(7.2)	200
Iron	7,630A	52.3	11,500EA	28	5,330A	3,300A	300
Lead	2.7	ND(1.1)W	5.8E	ND(4.5)	ND(0.9)	ND(1.1)	25
Magnesium	28,600E	28,500E	57,200E	34,500	56,100E	58,600E	
Manganese	1,850A	1,540A	3,550EA	1,080A	847A	1,050A	300
Mercury	ND(0.20)	0.32X	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)X	2
Nickel	30.2	ND(35.8)	153	32.6	52.0	64.1	
Potassium	2,680	5,910	5,630	ND(1,740)	9,680	13,400	
Selenium	11.6CDB	ND(16.0)W	ND(10.0)	ND(10.0)C	ND(10.0)C	ND(16.0)	10
Silver	ND(4.9)	ND(5.7)	ND(4.9)	ND(4.9)	ND(4.9)	ND(5.7)	50
Sodium	7,360C	10,100	188,000EB	151,000B	137,000CB	142,000B	20,000*
Vanadium	10.4	9.2	38.5	7.2	3.0	7.6	
Zinc	60.2	19.2	72.1E	21.2	46.3	11.8	300

Notes:

All other TAL metals were not detected.

E The associated data is estimated due to chemical and/or physical interferences.

X The associated data is estimated due to holding time exceedences.

A The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D The associated value exceeded NYSDOH Drinking Water Standards (Sanitary Code Part 5).

B The associated value exceeded NYSDOH Raw Water Supply Standards (10NYCRR Part 170).

* Water containing more than 20,000 µg/L of sodium should not be used for drinking by people on severely restricted sodium diets (270,000 µg/L for moderately restricted).

ND Not detected above quantifiable limits stated in parentheses.

C The associated data is estimated due to outlying calibration data.

R Unusable data due to holding time exceedance.

W Indicates low spike recoveries and may reflect a low bias in results.

Y The associated data is unusable due to spike recoveries.

TABLE 4.13

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS - OTHER COMPOUNDS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW-2*	*MW-2 dup*	*MW-2 dup*	*MW-2*	*MW-3*	*MW-3 dup*	*MW-3*
Sample ID	*W-2428-DT-004*	*W-2428-DT-005*	*W-2428-DT-006*	*W-2428-DT-017*	*W-2428-DT-007*	*W-2428-DT-008*	*W-2428-DT-032*
Date	*6/28/89*	*6/28/89*	*6/28/89*	*10/11/89*	*6/28/89*	*6/28/89*	*10/18/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	230AB	259AB	254AB	620AB	79.6	79.0	220AB
Hexavalent Chromium	ND(10)	NA	NA	ND(10)	ND(10)	ND(10)	ND(10)
Oil and Grease	1,500	ND(1,000)	ND(1,000)	3,500	ND(1,000)	ND(1,000)	ND(1,000)

Source	*MW3R-89*	*MW3R-89 dup*	*MW3R-89*	*MW-4*	*MW-4*	*MW-5*	*MW-5*
Sample ID	*W-2428-DT-033*	*W-2428-DT-034*	*W-2428-DT-049*	*W-2428-DT-015*	*W-2428-DT-058*	*W-2428-DT-019*	*W-2428-DT-053*
Date	*10/18/89*	*10/18/89*	*12/13/89*	*10/11/89*	*12/15/89*	*10/12/89*	*12/13/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	120B	160B	ND(10)	60	30	40	44
Hexavalent Chromium	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Oil and Grease	4,800	3,900	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)

Source	*MW-6*	*MW-6*	*MW-7*	*MW-7 dup*	*MW-7*	*MW-7 dup*	*MW8-89*
Sample ID	*W-2428-DT-014*	*W-2428-DT-055*	*W-2428-DT-012*	*W-2428-DT-013*	*W-2428-DT-051*	*W-2428-DT-052*	*W-2428-DT-009*
Date	*10/10/89*	*12/13/89*	*10/9/89*	*10/9/89*	*12/13/89*	*12/13/89*	*6/30/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	320AB	300AB	90	70	167B	170B	3,730AB
Hexavalent Chromium	NA	ND(10)	ND(10)	ND(10)	ND(10)	50	ND(10)
Oil and Grease	7,100	ND(1,000)	3,700	ND(1,000)	ND(1,000)	ND(1,000)	7,400

TABLE 4.13

CRA SUPPLEMENTAL SITE INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS - OTHER COMPOUNDS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*MW9-89*	*MW9-89*	*MW10-89*	*MW11-89*	*MW11-89*	*MW12-89*	*MW12-89*
Sample ID	*W-2428-DT-001*	*W-2428-DT-061*	*W-2428-DT-060*	*W-2428-DT-026*	*W-2428-DT-059*	*W-2428-DT-030*	*W-2428-DT-048*
Date	*6/26/89*	*12/19/89*	*12/19/89*	*10/17/89*	*12/19/89*	*10/18/89*	*12/12/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	ND(10.0)	30	19	10	12	30	24
Hexavalent Chromium	20X	ND(10)	10	ND(10)	ND(10)	ND(10)	ND(10)
Oil and Grease	ND(1,000)	ND(1,000)	6,300	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)

Source	*MW13-89*	*MW13-89*	*MW13-89 dup*	*MW14-89*	*MW14-89*	*MW15-89*	*MW15-89*
Sample ID	*W-2428-DT-016*	*W-2428-DT-046*	*W-2428-DT-047*	*W-2428-DT-010*	*W-2428-DT-063*	*W-2428-DT-025*	*W-2428-DT-054*
Date	*10/17/89*	*12/12/89*	*12/12/89*	*7/5/89*	*12/20/89*	*10/17/89*	*12/14/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	2,750AB	1,690AB	1,720AB	48.4	21	250AB	147B
Hexavalent Chromium	ND(10)	ND(10)	ND(10)	20X	ND(10)	ND(10)	ND(10)
Oil and Grease	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)	NS	2,200	ND(1,000)

Source	*MW16-89*	*MW16-89*	*MW17-89*	*MW17-89*	*Most*
Sample ID	*W-2428-DT-020*	*W-2428-DT-062*	*W-2428-DT-002*	*W-2428-DT-057*	*Stringent*
Date	*10/17/89*	*12/19/89*	*6/27/89*	*12/15/89*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Cyanide	10	15	13.8	270AB	100
Hexavalent Chromium	ND(10)	10	20X	ND(10)	50
Oil and Grease	5,500	ND(1,000)	ND	ND(1,000)	

Notes:

ND - Not detected above quantifiable limit stated in parentheses
NS - No sample due to laboratory accident
NA - Not analyzed
X - The associated data is estimated due to holding time exceedance.
B - The associated value exceeded NYSDOH Raw Water Supply Standards (10NYCRR Part 170).
A - The associated value exceeded NYSDEC Class GA groundwater Standards (6NYCRR Part 703.5).

TABLE 4.14

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CRA ADDITIONAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS (ROUND 4) - SSIs
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Well #	*MW18-91*	*MW19-91*	*Most Stringent*
Date	*7-16-91*	*7-18-91*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*
SSI VOCs			
cis-1,2-Dichloroethene	7.68	ND(1)	5
SSI BNAs			
Acenaphthene	ND(5)	<80**D	50
Acenphthylene	ND(5)	<80**D	50
Anthracene	ND(5)	174D	50
Benzo(a)anthracene	ND(5)	493D	50
Benzo(a)pyrene	ND(5)	563D	ND
Benzo(b)&(k)fluoranthene	ND(5)	418D	50
Benmzo(g,h,i)perylene	ND(5)	714D	50
Chrysene	ND(5)	478D	50
Dibenzo(a,h)anthracene	ND(5)	405D	50
Fluoranthene	ND(5)	805D	50
Fluorene	ND(5)	117D	50
Indeno(1,2,3-cd)pyrene	ND(5)	553D	50
Napthalene	ND(5)	<80**D	50
Phenanthrene	ND(5)	511D	50
Pyrene	ND(5)	685D	50
Other Compounds			
Cyanide	36	12	100
Oil and Grease	3,800	44,000	

Notes:

ND(#) - Not detected above quantifiable limits stated in parentheses.
** - High quantifiable limits due to the necessary dilution of the sample.
D - The associated value exceeded the NYSDOH Drinking Water Standards (Sanitary Code Part 5)

TABLE 4.15

CRA ADDITIONAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS (ROUND 4) - METALS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Well #	*MW16-89*	*Most Stringent*
Date	*7-16-91*	*MCL*
Units	*µg/L*	*µg/L*
TAL Metals		
Arsenic	10	25
Cadmium	19A	10
Calcium	361,000	
Chromium	25	50
Copper	157	200
Iron	160,000A	300
lead	6	25
Magnesium	183,000	
Manganese	11,200A	300
Mercury	0.7	2
Nickel	73	
Potassium	5,880	
Silver	16	50
Sodium	183,000B	20,000*
Vanadium	4	
Zinc	30	300

Notes:

All other TAL metals were not detected.

ND(#) - Not detected above quantifiable limits stated in parentheses.

A - The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

B - The associated value exceeded NYSDOH Drinking Water Standards (Sanitary Code Part 5).

* - Water containing more than 20,000 µg/L of sodium should not be used for drinking by people on severely restricted sodium diets (270,000 µg/L for moderately restricted sodium diets).

TABLE 4.16

CRA ADDITIONAL SITE INVESTIGATION
GROUNDWATER SAMPLE ANALYTICAL RESULTS (ROUND 5)
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Well #	*MW-7*	*MW-7 dup.*	*MW11-89*	*MW14-89*	*MW16-89*	*MW18-91*	*MW19-91*	*MW20-91*	*Most*
Date	*7-7-92*	*7-7-92*	*7-9-92*	*7-10-92*	*7-9-92*	*7-7-92*	*7-6-92*	*7-6-92*	*Stringent MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
SSI VOCs									
Acetone	ND(50)	ND(50)	685D	ND(50)	ND(50)	ND(50)	76D	ND(50)	50
SSI BNAs									
Acenaphthylene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	16	ND(10)	50
Anthracene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	17	ND(10)	50
Benzo(a)anthracene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	31	ND(10)	50
Benzo(a)pyrene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	29A	ND(10)	50
Benzo(b)&(k)fluoranthene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	26	ND(10)	50
Chrysene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	31	ND(10)	50
Dibenzofuran	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	11	ND(10)	50
Fluoranthene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	57D	ND(10)	50
Fluorene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	17	ND(10)	50
Phenanthrene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	55D	ND(10)	50
Pyrene	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	57D	ND(10)	50
Other Compounds									
Cyanide	37	26	4	8	6	40	4	ND(1)	100
Oil and Grease	ND(1,000)	ND(1,000)	8,300	ND(1,000)	9,100	ND(1,000)	2,200	2,200	–

Notes:

ND(#) - Not detected above quantifiable limits stated in parentheses.

A - The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D - The associated value exceeded the NYSDOH Drinking Water Standards (Sanitary Code Part 5)

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TABLE 4.17
SUMMARY OF SS1 PARAMETER EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*MCL Sample Exceedance/ Total Samples*	*MCL Exceedance Location*
VOC's		
1,2-dichloroethane	2/42	MW8-89, MW18-91
1,1,1-trichloroethane	4/42	MW-3(2), MW3R-89(2)
Benzene	4/55	MW8-89, MW-3(2), MW16-89
Toluene	3/55	MW8-89, MW-3(2)
Ethylbenzene	1/42	MW8-89
Total Xylenes	3/55	MW8-89, MW3(2)
BNA's		
Naphthalene	6/41	MW-3(3), MW3R-89(2), MW19-91
2-Methylnaphthalene	1/32	MW3R-89
Acenaphthlene	5/54	MW-3(3), MW3R-89, MW19-91
Acenaphthene	3/41	MW-3, MW-3R-89, MW19-91
Fluorene	6/54	MW-3(3), MW3R-89(2), MW19-91
Phenanthrene	6/48	MW-3(2), MW3R-89(2), MW19-91(2)
Anthracene	3/48	MW-3, MW3R-89, MW19-91
Fluoranthene	4/54	MW-3, MW3R-89, MW19-91(2)
Pyrene	4/48	MW-3, MW3R-89, MW19-91(2)
Benzo(a)anthracene	2/40	MW3R-89, MW19-91
Chrysene	3/48	MW-3, MW-4, MW19-91
Benzo(b)fluoranthene(1) & Benzo(k)fluoranthene(1)	1/41	MW19-91
Benzo(a)pyrene	2/48	MW-3, MW19-91
Benzo(g,h,i)perylene	2/35	MW-3, MW19-91
Indeno(1,2,3-c,d) pyrene	2/35	MW-3, MW19-91
2-Chloronaphthalene	0/26	
Cyanide	21/56	Site 108, MW-1, MW-2(4), MW-3(3), MW3R-89, MW-6(4), MW-7, MW-8, MW12-89(2), MW15-89(2), MW17-91
Hexavalent Chromium	0/32	

Notes:

* Indicates the number of MCL parameter exceedances at the identified well location.

TABLE 4.18

USGS STUDY
SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	Site 108 7/13/82 (µg/L)	*Site 109 7/14/82 (µg/L)*	*Most Stringent MCL (µg/L)*
pH	7.2	3.2	--
Specific Conductance	1,020	3,000	--
Temperature	26.2	21.0	--
Aluminum	NA	1,300	--
Antimony	NA	ND	--
Arsenic	NA	ND	25
Barium	NA	284	1,000
Beryllium	NA	ND	--
Cadmium	NA	3	10
Chromium	NA	1,100	50
Cobalt	NA	65	--
Copper	NA	724	200
Cyanide	30	NA	100
Iron	2,400	280,000	300
Lead	NA	120	25
Manganese	NA	5,040	300
Mercury	NA	0.3	2
Nickel	NA	244	--
Selenium	NA	ND	--
Silver	NA	ND	--
Tullerium	NA	ND	--
Vanadium	NA	ND	--
Zinc	NA	192	300
Di-n-butylphthalate	NA	ND	50
1,2-Dimethylbenzene	NA	26	50
Diethylphthalate	ND	NA	50
Benzoic Acid	ND	NA	--

TABLE 4.19

MALCOLM PIRNIE PHASE II INVESTIGATION
SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Location:	*SW-1 (µg/L)*		*SW-2 (µg/L)*		*SW-3 (µg/L)*		*SW-4 (µg/L)*		*Most Stringent MCL (µg/L)*
Date:	*11/85*	*8/86*	*11/85*	*8/86*	*11/85*	*8/86*	*11/85*	*8/86*	
Cyanide-free	53	NA	6.0	NA	14	NA	13	NA	–
Cyanide-Total	57	13	60	10	49	LT 4.0	33	8	100
Phenols	39	610	LT 10	LT 10	65	46	104	59	1
Benzene	48	33	LT 5.0	LT 5.0	7.7	7.8	7.0	34	ND
Toluene	24	12	LT 5.0	LT 5.0	20	17	14	87	5
m-Xylene/Chlorobenzene	9.0	NA	LT 5.0	NA	10	NA	6.0	NA	5
Ethylbenzene	NA	LT 5.0	NA	LT 5.0	NA	LT 5.0	NA	9.3	5
Chlorobenzene	NA	LT 5.0	NA	LT 5.0	NA	14	NA	30	5
o-Xylene	7.0	NA	LT 5.0	NA	12	NA	7.0	NA	5
1,4-Dichlorobenzene	NA	LT 5.0	NA	LT 5.0	NA	9.5	NA	22	4.7
Acenaphthene	11	NA	LT 7.0	NA	LT 16	NA	LT 15	NA	20
Acenaphthylene	50	NA	LT 12	NA	LT 26	NA	LT 26	NA	–
Anthracene	NA	208*	NA	LT 48	NA	LT 48	NA	LT 44	50
Benzo(a)pyrene	6.0	NA	LT 260	NA	LT 118	NA	LT 116	NA	50
Naphthalene	210	1050	LT 11	LT 82	LT 10	LT 82	LT 10	LT 76	10
TOX	24	38.7	0.02	1.89	0.45	3.07	1.7	3.56	–

Notes

* Anthracene and phenanthracene coelute as one peak on the gas chromatogram. The reported value could be a reflection of the concentration of one or both compounds.

NA Parameter not analyzed for.

LTx Parameter not detected at associated value of X.

TABLE 4.20

CRA SUPPLEMENTAL INVESTIGATION
SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*SW-5*	*SW-5*	*SW-5 dup*	*SW-6*	*SW-6 dup*	*SW-6*	*SW-8*	*SW-8*	*SW-9*
Sample ID	*SW-2428-DT-036*	*SW-2428-DT-075*	*SW-2428-DT-076*	*SW-2428-DT-037*	*SW-2428-DT-038*	*SW-2428-DT-079*	*SW-2428-DT-039*	*SW-2428-DT-074*	*SW-2428-DT-024*
Date	*10/19/89*	*12/20/89*	*12/20/89*	*10/19/89*	*10/19/89*	*12/20/89*	*10/19/89*	*12/20/89*	*10/16/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
VOCs									
Methylene Chloride	ND(10)			ND(10)	ND(10)		ND(10)		NA
Acetone	170*			160*	180*		200		NA
Benzene	ND(5)			6.9AD	7.0AD		ND(5)		ND(10)
Toluene	ND(5)			13D	14D		ND(5)		ND(10)
BNAs									
Fluoranthene	ND(10)			ND(10)	ND(10)		ND(10)		42.5
Pyrene	ND(10)			ND(10)	ND(10)		ND(10)		23.9
Phenol	ND(10)			ND(10)	ND(10)		10AB		NA
2-Methylphenol	ND(10)			ND(10)	ND(10)		10		NA
Metals									
Aluminum		157	149			198		203	
Antimony		ND(20)	ND(20)			ND(20)		ND(20)	
Arsenic		ND(5)	ND(5)			ND(5)		ND(5)	
Barium		26	24			45		ND(10)	
Beryllium		ND(1,000)	1			ND(1,000)		ND(1,000)	
Cadmium		ND(0.5)	ND(0.5)			ND(1,000)		ND(0.5)	
Calcium		87,000	100,000			146,000		212,000	
Chromium		ND(5)	ND(5)			108D		42	
Cobalt		ND(5)	ND(5)			ND(5)		ND(5)	
Copper		9	ND(5)			30		13	
Iron		820AD	830AD			1,640AD		810AD	
Lead		ND(5)	ND(5)			23		14	
Magnesium		20,500	22,300			27,300		22,100	
Mercury									
Manganese		960AD	800AD			5,000AD		1,200AD	
Nickel		160	47			520		280	
Potassium		7,700	8,550			10,700		12,900	
Sodium		212,000	240,000			614,000		1,210,000	
Vanadium									
Zinc		21	41			7		48	
Other Compounds									
Cyanide	20	51	42	10	20	1,680	10	33	90
Oil and Grease	1,300			ND(1,000)	ND(1,000)		1,000		15,400
Hexavalent Chromium	ND(10)			ND(10)	ND(10)		ND(10)		ND(10)

TABLE 4.20

CRA SUPPLEMENTAL INVESTIGATION
SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	*SW-9*	*SW-10*	*SW-10*	*SW-11*	*SW-11*	*SW-12*	*SW-12*	*SW-14*
Sample ID	*SW-2428-DT-090*	*SW-2428-DT-023*	*SW-2428-DT-069*	*SW-2428-DT-042*	*SW-2428-DT-086*	*SW-2428-DT-043*	*SW-2428-DT-089*	*SW-2428-DT-040*
Date	*3/15/90*	*10/16/89*	*12/20/89*	*10/19/89*	*3/15/90*	*10/19/89*	*10/19/89*	*10/19/89*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
VOCs								
Methylene Chloride		ND(10)		NA		NA		ND(10)
Acetone		80*		NA		NA		55*
Benzene		ND(5)		ND(1,000)		ND(1,000)		ND(5)
Toluene		ND(5)		ND(1,000)		ND(1,000)		ND(5)
BNAs								
Fluoranthene		ND(10)		ND(3)		ND(3)		ND(10)
Pyrene		ND(10)		4.83		6.58		ND(10)
Phenol		ND(10)		NA		NA		ND(10)
2-Methylphenol		ND(10)		NA		NA		ND(10)
Metals								
Aluminum	602		106		11,100		1,060	
Antimony	ND (20)		ND(20)		ND (20)		ND (20)	
Arsenic	7		5		ND (5)		ND (5)	
Barium	26		18		ND (10)		17	
Beryllium	ND (1)		ND(1,000)		3		ND (1)	
Cadmium	ND (0.5)		ND(0.5)		1.9		ND (0.5)	
Calcium	180,000		224,000		140,000		43,200	
Chromium	ND (5)		ND(5)		ND (5)		ND (5)	
Cobalt	84		ND(5)		179		89	
Copper	ND (5)		92		25		ND (5)	
Iron	1,180 AD		220		82,600 AD		1,120 AD	
Lead	ND (5)		23		ND (5)		ND (5)	
Magnesium	27,300		17,100		26,600		8,490	
Manganese	200 AD		460AD		1,080 AD		68	
Mercury	ND (1)				ND (1)		ND (1)	
Nickel	ND (5)		320		140		ND (5)	
Potassium	20,200		12,500		2,010		3,530	
Sodium	93,300 B		1,390,000		10,400		8,500	
Vanadium	ND (10)				ND (10)		ND (10)	
Zinc	110		16		600		90	
Other Compounds								
Cyanide		10	40	ND(10)		ND(10)		10
Oil and Grease		ND(1,000)		1,900		ND(1,000)		ND(1,000)
Hexavalent Chromium		ND(10)		ND(10)		ND(10)		ND(10)

TABLE 4.20

CRA SUPPLEMENTAL INVESTIGATION
SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source	***SW-14***	*SW-15*	*SW-15*	*SW-15 dup*	***SW-16***	*SW-17*	*SW-17 dup*	***SW-18***	*Most*
Sample ID	*SW-2428-DT-082*	*SW-2428-DT-041*	*SW-2428-DT-084*	*SW-2428-DT-085*	*SW-2428-DT-064*	*SW-2428-DT-066*	*SW-2428-DT-067*	*SW-2428-DT-068*	*Stringent*
Date	*3/15/90*	*10/19/89*	*3/15/90*	*3/15/90*	*12/19/89*	*12/19/89*	*12/19/89*	*12/19/89*	*MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
VOCs									
Methylene Chloride		NA			ND(10)	ND(10)	ND(10)	52	5
Acetone		NA			ND(50)	ND(50)	ND(50)	ND(50)	50
Benzene		ND(1,000)			6.4AD	ND(5)	ND(5)	ND(5)	ND
Toluene		ND(1,000)			ND(5)	ND(5)	ND(5)	ND(5)	5
BNAs									
Fluoranthene		ND(3)			ND(10)	ND(10)	ND(10)	ND(10)	50
Pyrene		9.13			ND(10)	ND(10)	ND(10)	ND(10)	50
Phenol		NA			ND(10)	ND(10)	ND(10)	ND(10)	1
2-Methylphenol		NA			ND(10)	ND(10)	ND(10)	ND(10)	50
Metals									
Aluminum	23,600		662	412	159	197	196	203	
Antimony	ND (20)		ND (20)	ND(20)	ND(20)	22	ND(20)	ND(20)	
Arsenic	ND (5)		ND (5)	ND(5)	ND(5)	ND(5)	ND(5)	5	25
Barium	ND (10)		66	ND (10)	45	27	28	35	1,000
Beryllium	4		ND (1)	ND (1)	1	ND(1)	1	ND(1)	
Cadmium	1.2		1.1	0.7	0.7	ND(0.5)	0.5	0.7	
Calcium	245,000		83,200	70,800	86,800	88,000	93,500	111,000	
Chromium	86D		ND (5)	27	9	8	11	6	50
Cobalt	329		174	154	ND(5)	ND(5)	ND(5)	16	
Copper	29		ND (5)	ND (5)	9	5	7	49	200
Iron	472,000AD		3,760AD	2,750AD	920AD	980AD	920AD	100	300
Lead	ND (5)		ND (5)	ND (5)	18	19	20	44	25
Magnesium	37,900		13,900	12,700	29,700	31,000	29,900	13,000	
Manganese	2,480 AD		150	260	3,520AD	220	720AD	880AD	300
Mercury	ND (1)		ND (1)	1					
Nickel	216		11	ND (5)	38	41	46	45	
Potassium	1,750		3,600	3,130	5,900	6,190	6,610	2,060	
Sodium	10,000		13,300	10,500	141,000	142,000	206,000	32,800	20,000
Vanadium	191		ND (10)	ND (10)					
Zinc	760		190	100	2.8	22	29	9.3	300
Other Compounds									
Cyanide		60			155	230	212	ND(10)	100
Oil and Grease		1,200			ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)	
Hexavalent Chromium		ND(10)			ND(10)	10	ND(10)	ND(10)	50

Notes:

All other TCL/TAL parameters were not detected.

* The associated value is estimated due to potential field contamination.

ND Not detected above quantifiable limits stated in parentheses.

NA Not analyzed for this particular parameter as it was not included in the SSIs.

A The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D The associated value exceeded NYSDOH Drinking Water Standards (Sanitary Code Part 5).

B The associated value exceeded NYSDOH Raw Water Supply Standards (10NYCRR Part 170).

TABLE 4.21

CRA ADDITIONAL SITE INVESTIGATION
(ROUND 3) SURFACE WATER ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Surface Water #	*SW-11*	*SW-12*	*SW-13*	*SW-14*	*SW-15*	*SW-15 dup.*	*Most*
Date	*7-9-92*	*7-8-92*	*7-8-92*	*7-8-92*	*7-8-92*	*7-8-92*	*Stringent MCL*
Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
VOCs							
Acetone	ND(50)	ND(50)	ND(50)	364 D	ND(50)	ND(50)	50
BNAs							
All compounds	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	50
Metals							
Aluminum	330	10	ND(5)	8,100	540	400	--
Arsenic	ND(2)	ND(2)	ND(2)	ND(2)	3	3	25
Barium	10	40	40	10	3	3	1,000
Calcium	113,000	101,000	105,000	489,000	106,000	106,000	--
Chromium	ND(10)	ND(10)	ND(10)	10	ND(10)	ND(10)	50
Cobalt	ND(5)	ND(5)	ND(5)	30	ND(5)	5	--
Copper	20	ND(10)	ND(10)	20	ND(10)	ND(10)	200
Iron	1,370 AD	3,360 AD	1,090 AD	161,000 AD	4,580 AD	4,330 AD	300
Lead	4	5	ND(2)	7	8	4	25
Magnesium	21,300	17,300	17,300	64,800	18,100	18,300	--
Manganese	140	480 AD	470 AD	3,910 AD	600 AD	600 AD	300
Nickel	ND(20)	ND(20)	ND(20)	100	ND(20)	ND(20)	--
Potassium	900	340	890	10,100	3,270	3,550	--
Selenium	4	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	--
Vanadium	10	10	10	80	20	20	--
Other Compounds							
Zinc	40	20	10	450	ND(10)	ND(10)	300
Silver	ND(5)	ND(5)	ND(5)	ND(5)	10	9	--
Sodium	7,870	8,630	7,940	11,600	12,200	12,300	20,000
Cyanide	138	ND(4)	ND(4)	12	30	28	100
Oil and Grease	2,000	1,900	ND(1,000)	ND(1,000)	ND(1,000)	ND(1,000)	--
Hexavalent Chromium	ND(10)	ND(10)	ND(10)	30	ND(10)	ND(10)	50

Notes:

ND(#) - Not detected above quantifiable limits stated in parentheses.

A - The associated value exceeded NYSDEC Class GA Groundwater Standards (6NYCRR Part 703.5).

D - The associated value exceeded the NYSDOH Drinking Water Standards (Sanitary Code Part 5)

TABLE 4.22

SUMMARY OF SURFACE WATER SSI PARAMETERS AND METAL EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*MCL Sample Exceedance/ Total Samples*	*MCL Exceedance Location*
VOC's		
1,2-dichloroethane	0/12	
1,1,1-Trichloroethane	0/12	
Benzene	8/25	SW-6, SW-16, SW-1(2), SW-3(2), SW-4(2)
Toluene	8/25	SW-1(2), SW-3(2), SW-4(2), SW-6(2)
Ethylbenzene	1/16	SW-4
Total Xylenes	3/16	SW-1, SW-3, SW-4
BNA's		
Naphthalene	2/20	SW-1 (2)
2-Methynaphthalene	0/12	
Acenaphthlene	0/12	
Acenaphthene	0/12	
Fluorene	0/12	
Phenanthrene	0/12	
Anthracene	1/16	SW-1
Fluoranthene	0/17	
Pyrene	0/17	
Benzo(a)anthracene	0/12	
Chrysene	0/12	
Benzo(b)fluoroanthene and Benzo(k)fluoroanthene	0/12	
Benzo(a)pyrene	0/12	
Phenol	7/25	SW-1(2), SW-3(2), SW-4(2), SW-8
Methylphenol	0/17	
Benzo(g,h,i)perylene	0/12	
Indeno (1,2,3-cd) pyrene	0/12	
2-Chloronaphthalene	0/12	

TABLE 4.22

SUMMARY OF SURFACE WATER SSI PARAMETERS AND METAL EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*MCL Sample Exceedance/ Total Samples*	*MCL Exceedance Location*
Metals		
Arsenic	0/18	
Barium	0/18	
Cadium	0/13	
Chromium	2/18	Site 109, SW-6
Copper	1/18	Site 109
Iron	17/19	Site 108, Site 109, SW-5, SW-6, SW-8, SW-9, SW-11(2), SW-12(2), SW-13, SW-14(2), SW-15(2), SW-16, SW-17
Lead	2/18	Site 109, SW-18
Manganese	15/17	Site 109, SW-5, SW-6, SW-8, SW-9, SW-10, SW-11, SW-12, SW-13, SW-14(2), SW-15, SW-16, SW-17, SW-18
Zinc	1/17	SW-14
Other		
Cyanide	3/29	SW-16, SW-17, SW-11
Hexavalent Chromium	0/17	

TABLE 4.23

CRA SUPPLEMENTAL SITE INVESTIGATION
SEDIMENT ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Source:	SW-5	SW-6	SW-9	SW-9 (dup)	SW-11	SW-11 (dup)	SW-14	Field Blank	Sediment
Sample ID:	S-2428-DT-077	S-2428-DT-080	S-2428-DT-072	S-2428-DT-073	S-2428-DT-087	S-2428-DT-088	S-2428-DT-083	S-2428-DT-081	Screening
Date:	12/20/89	12/20/89	12/20/89	12/20/89	3/15/90	3/15/90	3/15/90	12/20/89	Value
VOCs (µg/kg)									
1,1,1-Trichloroethane	ND (20)	ND (20)	ND (20)	ND (20)	200	210	ND (20)	ND (20)	170 (2)
Methylene Chloride	2,500	2,090	2,010	1,300	950	890	580	4,840	265 (3)
1,2-Dichloroethene (total)	2,690	90	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	23 (3)
Benzene	40	190	160	60	ND (20)	ND (20)	680	240	570 (2)
Toluene	200	420	120	100	390	290	870	240	670 (2)
Total Xylenes	ND (20)	280	ND (20)	ND (20)	ND (20)	ND (20)	160	ND (20)	1,500 (3)
Ethylbenzene	ND (20)	110	ND (20)	ND (20)	100	ND (20)	ND (20)	ND (20)	3,600 (2)
BNAs (µg/kg)									
Acenaphthylene	ND (7,500)*	ND (6,000)*	2,120	1,960	ND (300)	ND (300)	173,000	ND (600)	4,000** (2)
Phenanthrene	8,350	125,000	ND (600)	ND (600)	3,300	ND (300)	22,400	ND (600)	1,200 (4)
Pyrene	9,620	ND (6,000)*	ND (600)	ND (600)	4,080	ND (300)	25,500	ND (600)	660 (2)
Anthracene	ND (7,500)*	36,600	ND (600)	ND (600)	ND (300)	ND (300)	2,280	ND (600)	4,000** (2)
Benzo(a) Anthracene	ND (7,500)*	20,800	ND (600)	ND (600)	5,300	ND (300)	10,300	ND (600)	4,000** (2)
Benzo (a) Pyrene					570		4,530		430 (2)
Benzo(b) Fluoranthene (1)	ND (7,500)*	39,900	ND (600)	ND (600)	1,490	ND (300)	ND (300)	ND (600)	4,000** (2)
Benzo(k) Fluoranthene (1)	ND (7,500)*	39,900	ND (600)	ND (600)	1,490	ND (300)	ND (300)	ND (600)	4,000** (2)
Chrysene	ND (7,500)*	32,000	ND (600)	ND (600)	720	ND (300)	5,770	ND (600)	4,000** (2)
DiBenz (a,h) Anthracene					ND (300)		3,430		4,000** (2)
Fluoranthene	ND (7,500)*	106,000	ND (600)	ND (600)	4,570	570	30,300	ND (600)	10,200 (4)
Fluorene	ND (7,500)*	194,000	ND (600)	ND (600)	ND (300)	ND (300)	900	ND (600)	540 (2)
Indeno (1,2,3-od) Pyrene					ND (300)	ND (300)	1,970		4,000** (2)
Naphthalene					ND (300)	ND (300)	810		480 (2)
Other Compounds (mg/kg)									
Oil and Grease	4,060	31.7	17.6	606	ND (1)	ND (1)	ND (1)	618	1,500 (3)

Notes:

All other SSI parameters, cyanide and Cr+6 were not detected.

* - High quantifiable limits due to dilution.

** - Value listed is that for total polycyclic aromatic hydrocarbons (PAHs).

(1) - Indistinguishable isomers, reported value is total concentration.

ND - Not detected above quantifiable limits stated in parentheses.

(2) - USEPA Ecotox Thresholds (Sediment Quality Benchmark, Effects Range Low).

(3) - Draft Minnesota Sediment Ecological Screening Criteria.

(4) - New York Benthic Aquatic Life Chronic Toxicity.

TABLE 4.24

CRA ADDITIONAL SITE INVESTIGATION
(ROUND 2) SEDIMENT ANALYTICAL RESULTS
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Sediment #:	*SW-11*	*SW-14*	*SW-14 dup.*	*Sediment*
Date:	*7-8-92*	*7-8-92*	*7-8-92*	*Screening*
Units:	*µg/kg*	*µg/kg*	*µg/kg*	*Value*
SSI VOCs				
Methylene Chloride	40.1	2,620	2,090	265 (1)
Toluene	11.8	ND (500)	ND (500)	670 (2)
SSI BNAs				
Acenaphthylene	ND (330)	680	790	4,000* (2)
Anthracene	ND (330)	1,000	940	4,000* (2)
Benzo(a)anthracene	ND (330)	4,700	4,700	4,000* (2)
Benzo(b)fluoranthene	480	5,900	6,200	4,000* (2)
Benzo(k)fluoranthene	440	7,300	5,900	4,000* (2)
Chrysene	340	5,400	5,300	4,000* (2)
Fluoranthene	400	7,200	6,700	10,200 (3)
Fluorene	ND (330)	510	580	540 (2)
Phenanthrene	ND (330)	4,400	4,100	1,200 (3)
Pyrene	460	9,200	8,000	660 (2)
Other Compounds				
Cyanide	2,400	30,300	21,900	0.1 (1)

Note:

ND (#) - Not detected above quantifiable limits stated in parentheses.
* - Value listed is that for total polycyclic aromatic hydrocarbons (PAHs).
(1) Draft Minnesota Sediment Ecological Screening Criteria.
(2) USEPA Ecotox Thresholds (Sediment Quality Benchmark, Effects Range Low).
(3) New York Benthic Aquatic Life Chronic Toxicity.

TABLE 4.25

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SUMMARY OF SEDIMENT SCREENING VALUES
REMEDIAL DESIGN INVESTIGATION REPORT
TONAWANDA COKE CORPORATION

	New York Benthic Aquatic Life Chronic Toxicity (1) (ug/kg)	*USEPA Ecotox Thresholds (2) a = SQB; b = ERL* (ug/kg)	*Minnesota Sediment Ecological Screening Criteria (3)* (ug/kg)
VOCS			
Benzene	na	570 a	--
1,2-Dichloroethene (total)	na	na	23
Ethylbenzene	na	3600 a	--
Methylene Chloride	na	na	265
Toluene	na	670 a	--
1,1,1-Trichloroethane	na	170 a	--
Xylenes (total)	na	na	1500
BNAs			
Acenaphthylene	na	4000 b*	--
Anthracene	na	4000 b*	--
Benzo(a)anthracene	na	4000 b*	--
Benzo(b)fluoranthene	na	4000 b*	--
Benzo(k)fluoranthene	na	4000 b*	--
Benzo(a)pyrene	na	430 b	--
dibenz(a,h)anthracene	na	4000 b*	--
Chrysene	na	4000 b*	--
Fluoranthene	10200	--	--
Fluorene	na	540 a	--
Indeno(1,2,3-cd)pyrene	na	4000 b*	--
Naphthalene	na	480 a	--
Phenanthrene	1200	--	--
Pyrene	na	660 a	--
Other Compounds			
Oil&Grease	na	na	1500
Cyanide	na	na	0.1

Notes:

All values shown are based on an assumed Total Organic Carbon content of 1percent.

* - Value listed is that for total polycyclic aromatic hydrocarbons (PAHs).

-- - Value exists from more appropriate jurisdiction.

(1) - New York Department of Environmental Conservation, "Technical Guidance for Screening Contaminated Sediments", July 1994.

(2) - USEPA ECO Update, "Ecotox Thresholds", Intermittent Bulletin, Volume 3, Number 2, January 1996.
a = SQB - Sediment Quality Benchmark
b = ERL - Effects Range - Low

(3) - Minnesota Pollution Control Agency, "Site Screening Evaluation: Sediment Ecological Screening Criteria", Working Draft, April 26, 1996.

TABLE 4.26

SUMMARY OF SEDIMENT PARAMETER EXCEEDANCES
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

Parameter	*# Sediment Screening Exceedances/ Total Sediment Samples*	*Exceedance Location*
VOCs		
Benzene	1/7	SW-14
1,2-Dichloroethene (total)	2/7	SW-5, SW-6
Ethylbenzene	0/7	
Methylene Chloride	6/7	SW-5, SW-6, SW-9 SW-11, SW-14 (2)
Toluene	1/7	SW-14
1,1,1-Trichloroethane	1/5	SW-11
Xylenes	0/7	
BNAs		
Acenaphthylene	1/7	SW-14
Phenanthene	5/7	SW-5, SW-6, SW-11, SW-14 (2)
Pyrene	4/7	SW-5, SW-11, SW-14 (2)
Anthracene	1/7	SW-6
Benzo(a)anthracene	4/7	SW-6, SW-11, SW-14 (2)
Benzo(a)pyrene	2/2	SW-11, SW-14
Benzo(b)fluoranthene and Benzo(k)fluoranthene	1/5	SW-6
Chrysene	3/7	SW-6, SW14 (2)
Acenaphthene	0/5	
Benzo(g,h,i)perylene	0/5	
2-Chloronaphthalene	0/5	
2-Methylnaphthalene	0/5	
Dibenzo(a,h)anthracene	0/2	
Fluoranthene	2/7	SW-6, SW-14
Fluorene	3/7	SW-6, SW-14 (2)
Ideno(1,2,3-cd)pyrene	0/2	
Naphthalene	1/2	SW-14
Other Compounds		
Cyanide	2/7	SW-11, SW-14
Oil & Grease	1/7	SW-5
Hexavalent Chromium	0/7	

TABLE 5.1

WATER QUALITY STANDARDS,
CRITERIA AND HEALTH ADVISORIES (µg/L)
REMEDIAL INVESTIGATION SUMMARY REPORT
TONAWANDA COKE CORPORATION

	New York (2)						USEPA Health Advisories (5)					
Chemical (1)	Surface		Groundwater		MCL (3)	WQC (4)	1 Day	10 Day	Longer 10 kg	Longer 70 kg	Life	Risk (6) 1 x 10^{-6}
Benzene *	1.0	(G)	ND		5	0.66	235	235	--	--	--	1.0
1,2-Dichloroethylene (Total)	50	(7)	50	(7)	70 (8)	--	2720	1000	1000	3500	350	NC
Ethylbenzene	50	(G)	50	(G)								
Toluene	50	(G)	50	(G)								
1,1,1-Trichloroethane	50	(G)	50	(G)								
Xylenes (Total)	50	(G)	50	(G)								
PAHs												
Fluoranthene (non-carc)	50	(G)	50	(G)								
Benzo (a) pyrene (Carc)	.002	(G)	--	--	--	0.028	--	--	--	--	--	--
Cyanide	100	(STD)	200	(STD)	--	200	220	220	220	750	750	
Chromium (+6)	50	(STD)	50	(STD)	--	50	1400	1400	240	840	170	

Oil & Grease
All units are ug/liter

Notes:

(1) * Indicates chemicals with an IRIS file.

(2) New York Surface Water and Groundwater (GW) Standards (STD) and Guidance (G).

(3) EPA Maximum Contaminant Level.

(4) EPA Water Quality Criteria (Federal Register 1980) - Fish and Water Consumption.
Carcinogens - 1 x 10^{-6} incremental risk of cancer.

(5) Health Advisors
1-day - Limit for a 10 kg child, single 1 liter exposure.
10-day - Limit for 10 kg child drinking 1 liter/day for 10 days.
Longer 10-kg - Limit for 10 kg child drinking 1 liter/day for months to years.
Longer 70-kg - Limit for 70 kg adult drinking 2 liters/day for months to years.
Lifetime: Limit for lifetime of consumption at levels noted for age groups.

(6) Risk - 1 x 10^{-6}: Concentration producing 1 x 10^{-6} incremental risk of cancer in a lifetime (IRIS)
NC - Non-Carcinogen
NA - Not available for these carcinogens. Use WQC value.

(7) Limit for trans-ISOMER.

(8) Proposed MCLG.

A

APPENDIX A

RI REPORT LETTER CORRESPONDENCE

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

Michael D. Zagata
Commissioner

November 27, 1996

#2428

Mr. Rick Kennedy, Esq.
Hodgson, Russ, Andrews, Woods & Goodyear
1800 One M&T Plaza
Buffalo, NY 14203

Dear Mr. Kennedy:

The Department is in receipt of your letter dated October 30, 1996 transmitting the Table of Contents for the proposed Tonawanda Coke Remedial Investigation (RI) Report. A review of this Table of Contents reveals it to be consistent with our recent discussions. Please recall that a discussion of Hazardous Waste generation and disposal was to be incorporated into the RI Report. Will this discussion be covered under the Site Background Section? Also, a discussion of sub-areas of the Site for reclassification purposes should be included in Sections 3.0 and 4.0.

Should you have any questions, please feel free to contact me at 851-7220.

Sincerely yours,

Glenn M. May

Glenn M. May, CPG
Engineering Geologist I

cc: Mr. Daniel King
Ms. Maura Desmond, Esq.

FILE COPY

CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510 Colby Office Fax: (519) 884-0525
(519) 725-3313 Bathurst Office (519) 725-1394

October 30, 1996

Reference No. 2428

Mr. Glen May
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Dear Mr. May:

Re: Tonawanda Coke Corporation

Consistent with an earlier discussion with Mr. Rick Kennedy, please find enclosed a Table of Contents for the proposed Tonawanda Coke RI.

Please review and provide comments to Mr. Kennedy or myself.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

C. Richard Hoekstra, P. Eng.

CRH/csm/1
Encl.

c.c. Rick Kennedy
Mark Kamholz
Jim Kay

TABLE OF CONTENTS

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Buffalo, NY 14203-2391
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FAX: 716-852-5185 GUARANTY

Albany
Boca Raton
Buffalo
New York
Rochester
Mississauga
(Toronto)

May 2, 1996

Maura C. Desmond, Esq.
Senior Attorney
Division of Environmental Enforcement
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Dear Ms. Desmond:

Re: **Tonawanda Coke Corporation;**
Inactive Hazardous Waste Disposal Site No. 915055

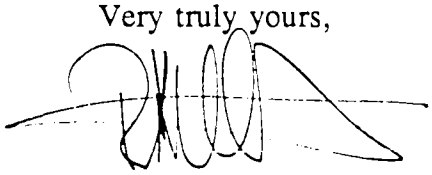
This is in response to your letter of March 28, 1996.

Tonawanda Coke Corporation ("TCC") will prepare a Remedial Investigation (RI) report for its River Road Facility. The RI report will consolidate and evaluate the significant data generated through previous studies; no additional data will be collected for the preparation of the draft RI report. The RI report will not include a detailed description of all of the waste streams generated by historic plant operations and the disposition of those wastes. That task is practically impossible and unnecessary given the comprehensive investigation and characterization of Site conditions. The RI report will include a discussion of identified, reported or suspected waste disposal areas at the Facility and the results of site characterization work in and around such areas. However, the RI report will not include an evaluation of each of those areas individually to determine whether any one or more of them poses a significant threat to the environment. That approach is inconsistent with the premise of all of the historic investigations at the Site, is inconsistent with the manner in which the Site is treated in the State's Registry and is unnecessary for making sound decisions as to whether conditions at the Facility require remediation.

Finally, the RI will include a discussion of the Allied Specialty Chemicals site (site number 915003-b) only to the extent that conditions reported there may account for contamination of the TCC Facility. The Allied Specialty Chemicals site has been delisted and it is not TCC's responsibility. Consequently, it will not be treated in any comprehensive way in the RI report.

I suggest that Dan King call Mark Kamholz and Jim Kay to discuss these key concepts and attempt to work out the basic framework for preparing the RI report.

Very truly yours,



Rick W. Kennedy

RK/tmk
Copies to: Mark L. Kamholz
James Kay ✓

130386

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

2479

Michael D. Zagata
Commissioner

March 28, 1996

Rick Kennedy, Esq.
Hodgson, Russ, Andrews, Woods & Goodyear
1800 One M&T Plaza
Buffalo, New York 14203-2391

Dear Mr. Kennedy:

Tonawanda Coke Corporation, Site No. 915055

This letter is in follow-up to our teleconference of March 1, 1996 concerning the Tonawanda Coke facility. Participating in the teleconference were Daniel King, Glenn May, and Maura Desmond, NYSDEC; Mark Kamholtz, Tonawanda Coke Corporation; Rick Kennedy, Hodgson, Russ, Andrews, Woods & Goodyear; and James Kay, Conestoga Rovers and Associates. The purpose of this teleconference was to propose actions to continue to progress toward the resolution of the outstanding issues regarding the Tonawanda Coke Corporation inactive hazardous waste site.

As presented in the December 1, 1995 meeting of the above-noted parties, Tonawanda Coke's evaluation of the environmental data from the site suggests that the entire 160-acre site may not present a significant threat to public health or the environment and that site reclassification is warranted. The Department's evaluation of existing information suggests that reclassification of certain portions of the site appears appropriate. Based upon these evaluations, there may now be an opportunity to clarify and focus attention on areas within the site where hazardous wastes remain a concern, and to eliminate those areas where such issues may not be of immediate concern.

In this light, it is proposed that Tonawanda Coke prepare a Remedial Investigation Report based upon plant operational history and the analytical data base that presently exists for the site. The RI Report will serve to consolidate and evaluate the significant data generated through previous studies; no additional data need be collected at this time. Should the RI Report identify data gaps, a supplemental study could be negotiated. Most importantly, the RI Report can provide the foundation for site reclassification decisions and establish the focus for further actions to address hazardous wastes at the site.

Should Tonawanda Coke choose to proceed with an RI study, the following elements should be included:

- A detailed description of historical plant operations and how wastes generated by those operations relate to the nine hazardous wastes listed in 6 NYCRR Part 371.

- A detailed evaluation of existing analytical data and whether the data supports a significant threat determination. Instead of evaluating the site as a whole, however, a separate evaluation should be completed for each of the following areas:

  - The former 108 site between the Niagara River and River Road,
  - The former 109 site along the main plant entrance,
  - The former 110 site in the northeastern portion of the plant property,
  - The main plant area, including the coal piles, and
  - The former Allied Specialty Chemical site (Site number 915003b).

  Evaluation of the main plant area should focus on issues and concerns raised by the Department's Division of Water, while evaluation of the former Allied Specialty Chemical site should focus on the organic contamination detected in site groundwater and how this contamination may relate to former coking operations and disposal practices by Allied.

I look forward to your response to this proposal. Please feel free to contact me at 716/851-7050 should you wish to discuss it further. If further technical details regarding the RI Report need discussion, please contact Dan King or Glenn May at 716/851-7220.

Very truly yours,

Maura C. Desmond
Senior Attorney
Division of Environmental
Enforcement

MCD:md:lk
A:D503.7

cc: Dan King, DEC
Glenn May, DEC
Mark Kamholtz, Tonawanda Coke
Jim Kay, Conestoga Rovers

(100 2)

APPENDIX B

TEST PIT/BOREHOLE STRATIGRAPHIC LOGS
CRA SUPPLEMENTAL SITE INVESTIGATION AND
CRA ADDITIONAL SITE INVESTIGATION

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-11)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: NORTHEAST PART OF PLANT (SITE 110)

HOLE DESIGNATION: TP-M
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	GROUND SURFACE	609.6				
1.0	Black Cinders, wood, coke, cable, moist, FILL		TEST PIT BACKFILL	1BS		
2.0						
3.0						
	Red-brown silty Clay, moist, NATIVE	606.1				
4.0	END OF HOLE @ 3.5 FT. BGS					
5.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 3.5 ft. BGS). 2. TP-N and TP-M samples were composited together in field. 3. Backfilled testpit.					
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1BS) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-12)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: NORTHEAST PART OF PLANT (SITE 110)

HOLE DESIGNATION: TP-N
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE VALUE
	GROUND SURFACE	606.9				
1.0	Black Cinders, trace brick, trace gravel, moist, FILL		TEST PIT BACKFILL			
2.0	Wet	604.9		1BS		
3.0						
4.0						
5.0	Gray silty Clay, moist, NATIVE	601.9				
	END OF HOLE @ 5.0 FT. BGS					
6.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 5.0 ft BGS).					
7.0	2. TP-N and TP-M samples were composited together in field.					
	3. Backfilled testpit.					
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-13)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WEST OF RIVER ROAD (SITE 108)

HOLE DESIGNATION: TP-Q
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE VALUE
	GROUND SURFACE	580.6				
1.0	Brown Silt, subangular and subrounded gravel, black rubber hose, wood, trace vegetation, trace cinders, trace slag, trace coal, trace red-brown silty Clay (0.0 to 2.0 ft. BGS), dry to moist, FILL		TEST PIT; BACKFILL			
2.0	Yellow and orange brick fragments (2.0 to 6.0 ft. BGS)	578.6				
3.0						
4.0						
5.0				1BS		
6.0						
7.0						
8.0	Yellow grease tube broke open by backhoe, wet	572.6				
9.0						
10.0	END OF HOLE @ 10 FT. BGS	570.6				
11.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 10.0 ft. BGS). 2. TP-S and TP-Q samples were composited together in field. 3. Testpit started filling up with water, unable to see bottom. Stopped backhoe at 10.0 ft. BGS, not at native. 4. Backfilled testpit.					
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1BS) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-14)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WEST OF RIVER ROAD (SITE 108)

HOLE DESIGNATION: TP-S
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE RECOVERY
	GROUND SURFACE	580.0				
1.0	Brown Silt, subangular gravel, brick fragments, plastic, wood, metal, paper, concrete, glass, some red-brown silty clay, trace vegetation, dry to moist, FILL		TEST PIT BACKFILL			
2.0						
3.0						
4.0						
5.0				1BS		
6.0						
7.0						
8.0	Black silty medium Sand, subangular gravel, slag, cinders, wood fragments,, rock fragments, metal, wet, FILL	572.0				
9.0						
10.0						
	END OF HOLE @ 10.5 FT. BGS	569.5				
11.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 10.5 ft. BGS).					
12.0	2. TP-S and TP-Q samples were composited together in field.					
	3. Testpit started filling up with water, unable to see bottom. Stopped backhoe at 10.5 ft. BGS, not at native.					
13.0	4. Backfilled testpit.					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-15)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WESTERN PART OF COAL PILE

HOLE DESIGNATION: TP-T
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE VAPOR
	GROUND SURFACE	602.1				
1.0	Black Cinders, coke, moist, FILL		TEST PIT	1BS		
	Wet	600.5	BACKFILL			
2.0	Red-brown silty Clay, moist, NATIVE	599.7				
3.0	END OF HOLE @ 2.4 FT. BGS					
	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 2.4 ft. BGS). 2. TP-U and TP-T samples were composited together in field. 3. Backfilled testpit.					
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1BS) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-18)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: TP-U

PROJECT NO.: 2428
DATE COMPLETED: JUNE 19, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: BACKHOE

LOCATION: WESTERN PART OF COAL PILE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE WATER
	GROUND SURFACE	603.9				
1.0	Black Cinders, coke, trace slag, moist, FILL		TEST PIT BACKFILL	1BS		
2.0						
3.0						
4.0						
	Wet	599.3 599.2				
5.0	Red-brown silty Clay, moist, NATIVE					
	END OF HOLE @ 4.7 FT. BGS					
6.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 4.7 ft. BGS). 2. TP-U and TP-T samples were composited together in field. 3. Testpit started filling up with water. 4. Backfilled testpit.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-17)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: EASTERN PART OF COAL PILE

HOLE DESIGNATION: TP-V
DATE COMPLETED: JUNE 19, 1989
DRILLING METHOD: BACKHOE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE VALUE
	GROUND SURFACE	601.9				
1.0	Black Cinders, coke, moist, FILL		TEST PIT BACKFILL	1BS		
2.0						
3.0	Red-brown silty Clay, moist, NATIVE END OF HOLE @ 2.5 FT. BGS	599.4				
4.0	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 2.5 ft. BGS). 2. TP-V and TP-W samples were composited together in field. 3. Backfilled testpit.					
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1BS) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-18)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: TP-W

PROJECT NO.: 2428
DATE COMPLETED: JUNE 19, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: BACKHOE

LOCATION: EASTERN PART OF COAL PILE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE TYPE
	GROUND SURFACE	604.6				
	Black Cinders, coke, moist, FILL		TEST PIT	1BS		
1.0			BACKFILL			
	Red-brown silty Clay, moist, NATIVE	603.0				
2.0	END OF HOLE @ 1.6 FT. BGS					
	NOTES: 1. Collected and submitted sample for chemical analysis (0.0 to 1.6 ft. BGS).					
3.0	2. TP-V and TP-W samples were composited together in field.					
	3. Backfilled testpit.					
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1BS) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG. (L-19)
(OVERBURDEN)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: BHT-89

PROJECT NO.: 2428
DATE COMPLETED: OCTOBER 16, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: WESTERN PART OF COAL PILE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	602.1				
1.0	Black CINDERS and COKE, dry, Fill		6.5"ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		2
2.0	Red-brown silty CLAY, dry to moist, gray mottling	599.9				
3.0				2SS		18
4.0	Same, except vertical seam of black cinders and coke	598.1				
	Red-brown silty CLAY, dry to moist, Native	597.5				
5.0				3SS		17
6.0	END OF HOLE ● 6.0 FT. BGS	596.1				
	NOTES: 1. Collected and submitted sample for chemical analysis (4.6 to 6.0 ft. BGS). 2. BH-T and BH-U samples were composited together in the lab. 3. At completion, borehole was grouted to ground surface.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(1-20)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WESTERN PART OF COAL PILE

HOLE DESIGNATION: BHU-89
DATE COMPLETED: OCTOBER 16, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	603.9				
1.0	Black CINDERS and COKE, dry, Fill		6.5"ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		17
2.0						
3.0	Gray-black CLAY and SILT, trace cinders, trace vegetation, dry to moist	600.9		2SS		22
4.0	Red-brown silty CLAY, moist, Native, gray mottling	599.9				
5.0	Same, except trace small gravel, trace silt seams, stiff	598.6		3SS		7
6.0						
7.0				4SS		11
8.0	END OF HOLE @ 8 FT. BGS	595.9				
9.0	NOTES: 1.Collected and submitted sample for chemical analysis (6.0 to 8.0 ft. BGS). 2.BH-T and BH-U samples were composited together in the lab. 3.At completion, borehole was grouted to ground surface.					
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-21)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: EASTERN PART OF COAL PILE

HOLE DESIGNATION: BHV-89
DATE COMPLETED: OCTOBER 16, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	GROUND SURFACE	601.9				
1.0	Black CINDERS and COKE, dry, Fill		6.5"ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		43
2.0		599.9				
3.0	Green, orange and gray silty CLAY, some silt pockets, trace small gravel, moist, Native, mottled plastic			2SS		9
4.0	Red-brown silty CLAY, some small gravel, some silt pockets, moist, gray mottling, sti	597.9				
5.0				3SS		27
6.0	Same, except dry to moist	595.9				
7.0				4SS		26
8.0	END OF HOLE @ 8 FT. BGS	593.9				
9.0	NOTES: 1.Collected and submitted sample for chemical analysis (6.0 to 8.0 ft. BGS). 2.BH-W and BH-V samples were composited together in the lab. 3.At completion, borehole was grouted to ground surface.					
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-22)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: BHW-89

PROJECT NO.: 2428
DATE COMPLETED: OCTOBER 16, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: EASTERN PART OF COAL PILE
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (inches)
	GROUND SURFACE	604.6				
	Black CINDERS and COKE, dry, Fill		6.5"ø BOREHOLE			
1.0			CEMENT/BENTONITE GROUT	1SS		22
2.0	Gray, black, red-brown silty CLAY, some cinders and coke, trace vegetation, dry to moist	602.6				
3.0				2SS		10
4.0	Red-brown silty CLAY, trace vegetation, trace small gravel, trace silt seams, moist, gray mottling, stiff	600.3				
5.0				3SS		9
6.0	Gray-black, red-brown silty CLAY, moist	598.6				
	Black SILT and CINDERS, trace gravel, dry	598.4				
	Red-brown silty CLAY, moist, Native, gray mottling	598.3				
7.0				4SS		17
8.0						
9.0				5SS		29
10.0	Same, except trace gravel, no mottling	594.6				
11.0				6SS		26
12.0	END OF HOLE ● 12 FT. BGS	592.6				
13.0	NOTES: 1. Collected and submitted sample for chemical analysis (10.0 to 12.0 ft. BGS). 2. BH-W and BH-V samples were composited together in the lab. 3. At completion, borehole was grouted to ground surface.					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-24)

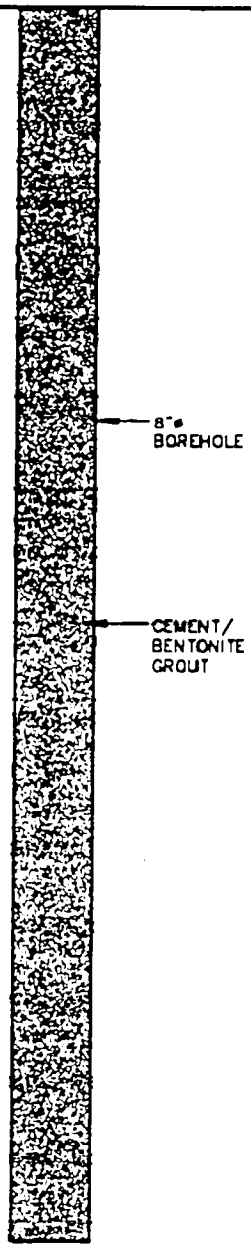
PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: BHZ-91

PROJECT NO.: 2428
DATE COMPLETED: JUNE 17, 1991

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 4 1/4" ID HSA

LOCATION: WEST OF RIVER ROAD IN SITE 108
CRA SUPERVISOR: J. WILLIAMS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	579.4			
	Black fine SAND, some silt, some brick fragments, little wood, dry, FILL		1SS		24
2.5	Black SILT and fine SAND, little fine to coarse gravel, concrete and brick, trace wood, moist	577.4	2SS		14
5.0	Dark brown SILT, little clay and fine to coarse gravel, trace fine sand, concrete and cinders, moist	575.4	3SS		4
	Brown SILT, some clay and cinders, little fine to coarse gravel, trace wood, moist		4SS		3
7.5	Black fine SAND, little silt and clay, trace fine to medium gravel, moist	571.4	5SS		4
10.0	Gray fine to coarse GRAVEL and CONCRETE FRAGMENTS, wet	569.4	6SS		8
12.5	Black VEGETATION, some silt and clay, little fine to medium gravel, wet, NATIVE	566.9	7SS		7
	Same, except no gravel, brown and black		8SS		6
15.0	Gray SILT, some vegetation, little clay and fine sand, wet	563.4	9SS		3
17.5	Gray fine SAND, some silt, little vegetation, wet	561.4	10SS		2
20.0	Same, except trace silt, no vegetation		11SS		3
22.5	Same, except fine to medium grained		12SS		5
25.0	Same, except medium to coarse grained, little fine to coarse gravel		13SS		5
27.5	Gray coarse SAND and fine GRAVEL, WET		14SS		3
30.0	Gray fine GRAVEL, little coarse sand, wet		15SS		4
32.5	Same, except fine to coarse grained, some medium to coarse sand		16SS		53
	Gray CLAY, trace fine gravel, moist	547.9			
	END OF HOLE @ 32.0 FT. BGS	547.4			



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

C

(28)

APPENDIX C

MONITORING WELL STRATIGRAPHIC AND INSTRUMENTATION LOGS
CRA SUPPLEMENTAL SITE INVESTIGATION AND
CRA ADDITIONAL SITE INVESTIGATION

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-23)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: 10' WEST OF MW-3

HOLE DESIGNATION: MW3R-89
DATE COMPLETED: OCTOBER 16, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	610.8 608.6				
1.0	Black SILT, SLAG, CINDERS and COKE, some vegetation, some small gravel, moist, Fill		CEMENT/BENTONITE GROUT	1SS		9
2.0	Same, except wet	606.6	6.5"ø BOREHOLE BENTONITE PELLET SEAL			
3.0			SAND PACK	2SS		11
4.0	Same, except trace vegetation, trace sub-angular gravel	604.6	2.0"ø STAINLESS STEEL PIPE			
5.0			WELL SCREEN	3SS		23
6.0	Same, except some coarse sand	602.6				
	Red-brown silty CLAY, moist, Native, plastic	602.3				
7.0				4SS		6
8.0	END OF HOLE @ 8.0 FT. BGS NOTES: 1. At completion, a 2.0" ID observation well was installed to 6.2 ft. BGS.	600.6				
9.0			SCREEN DETAILS: Screened interval: 4.2 to 6.2' BGS Length - 2.0' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 2.5 to 8.0' BGS Material - # 2 SAND			
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-1)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW8-89

PROJECT NO.: 2428
DATE COMPLETED: JUNE 14, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: WEST OF RIVER ROAD
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser)	578.99				
	GROUND ELEVATION	576.7				
1.0	Brown Silt, some fine to medium sand, wood fragments, subangular gravel, trace brick, trace slag, trace silty clay, trace vegetation, trace cinders, moist, FILL		CEMENT/BENTONITE GROUT; 8.5"ø BOREHOLE	1SS		5
2.0	Brown silty fine Sand, subangular gravel, some cinders, moist to wet	574.7				
	Black Cinders, some slag, plastic, moist	574.2	2.0"ø BLACK STEEL PIPE			
3.0				2SS		24
4.0	Red, brown and black silty Clay, cinders, slag, moist, tar odor	572.7	BENTONITE PELLET SEAL			
5.0	Black Silt and Cinders, trace slag, moist, tar odor	571.7		3SS		13
6.0	Black Silt and Cinders, subangular gravel, trace slag, trace red-brown silty clay, wet, tar odor	570.7				
7.0			SAND PACK	4SS		20
8.0	Gray-black Silt, cinders, slag, plastic, wax, wood fragments, brick, glass, wet, slight tar odor	568.7				
9.0			WELL SCREEN	5SS		7
10.0	END OF HOLE @ 10.0 FT. BGS	566.7				
	NOTE At completion a 2.0" ID observation well was installed to 10.0 ft. BGS.		SCREEN DETAILS: Screened interval: 8.0' to 10.0' BGS Length - 2' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 5.5' to 10.0' BGS Material - QROC-2			
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(1-2)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW9-89

PROJECT NO.: 2428
DATE COMPLETED: JUNE 13, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: NORTHWEST PART OF PLANT
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE % RECOVERY
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	604.92 602.8				
1.0	Black Silt, cinders, vegetation fibers, wet, FILL Orange-red Brick, dry Gray-white coarse Sand, moist Gray-black Silt and Slag, some small sub-angular gravel, moist	602.5 602.5 602.2 602.0	CEMENT/BENTONITE GROUT 2.0" ø BLACK STEEL PIPE BENTONITE PELLET SEAL	1SS		57
2.0	Gray Silt and Slag, trace red-brown silty clay, wet	600.8	6.5" ø BOREHOLE			
3.0			WELL SCREEN	2SS		10
4.0			SAND PACK			
	Red-brown silty Clay, trace silt pockets, trace subrounded gravel, gray mottling, moist, NATIVE	598.7				
5.0				3SS		37
6.0	END OF HOLE @ 6.0 FT. BGS NOTE: At completion a 2.0" ID observation well was installed to 4.0 ft. BGS.	596.8	SCREEN DETAILS: Screened interval: 2.0' to 4.0' BGS Length - 2' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 1.8' to 6.0' BGS Material - QROC-2			
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-3)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW10-89

PROJECT NO.: 2428
DATE COMPLETED: JUNE 13, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: NORTHWEST PART OF PLANT
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) 605.54 GROUND ELEVATION 603.9					
1.0	Black, tan, yellow and brown coarse Sand, some silt, some angular gravel, brick fragments, wet to moist, FILL Brown-black fine Silt, slag, some angular gravel, dry	602.9	CEMENT/BENTONITE GROUT BENTONITE PELLET SEAL	1SS		30
2.0	Gray Slag, some silt, wet	601.9	2.0"ø BLACK STEEL PIPE			
3.0			6.5"ø BOREHOLE	2SS		29
4.0	Gray-black Silt, some angular gravel, trace slag, trace gray silty clay, wet	599.9	WELL SCREEN			
5.0	Red-brown silty Clay, trace silt pockets, trace subrounded gravel, gray mottling, moist, NATIVE	599.4	SAND PACK	3SS		21
6.0	END OF HOLE @ 6.0 FT. BGS NOTE: At completion a 2.0" ID observation well was installed to 4.5 ft. BGS.	597.9	SCREEN DETAILS: Screened interval: 2.5' to 4.5' BGS Length - 2' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 2.0' to 6.0' BGS Material - QROC-2			
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (◯) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(1-4)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW11-89

PROJECT NO.: 2428
DATE COMPLETED: JUNE 13, 1989

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 6 1/2" OD HSA

LOCATION: NORTHWEST PART OF PLANT
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N/A (REC)
	REFERENCE ELEVATION (Top of Riser) 603.77 GROUND ELEVATION 602.0					
1.0	Brown Silt, some vegetation, trace gravel, wet, FILL Black Cinders and Slag, trace subangular gravel, wet	601.8	CEMENT/BENTONITE GROUT BENTONITE PELLET SEAL 2.0"ø STAINLESS STEEL PIPE 8.5"ø BOREHOLE	1SS		12
2.0	Black Silt, some cinders, trace vegetation, trace gravel, wet	600.0				
	Red-brown silty Clay, trace subangular gravel, gray and olive green mottling, moist, NATIVE	599.9	WELL SCREEN			
3.0				2SS		24
4.0			SAND PACK			
5.0				3ST		
6.0	END OF HOLE @ 6.0 FT. BGS	596.0	SCREEN DETAILS: Screened interval: 1.5' to 3.5' BGS Length - 2' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 1.0' to 6.0' BGS Material - QROC-2			
7.0	NOTES: 1. At completion a 2.0" ID observation well was installed to 3.5 ft. BGS. 2. A shelby tube sample was collected from 4.0 to 6.0 ft. BGS and submitted for permeability testing. 3. The 2.1 to 4.0 ft. BGS sample was submitted for chemical analysis.					
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(1-5)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: NORTH PART OF PLANT

HOLE DESIGNATION: MW12-89
DATE COMPLETED: JUNE 12, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE TYPE	N VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	609.19 606.3				
1.0	Black Cinders and Coke, trace red-brown silty clay, trace orange medium grained sand, moist, FILL		CEMENT/BENTONITE GROUT	1SS		11
2.0	Tan medium Sand, some black cinders, moist	604.3	BENTONITE PELLET SEAL			
	Black Cinders, some subangular to subrounded gravel, wet	604.1				
3.0	Gray-black silty Clay, trace cinders, moist	603.1	2.0"ø BLACK STEEL PIPE	2SS		3
4.0	Black Cinders, subrounded to subangular gravel, wet	602.3	6.5"ø BOREHOLE WELL SCREEN			
5.0	Red-brown silty Clay, trace silt pockets, gray and olive green mottling, moist, NATIVE	601.3	SAND PACK	3SS		8
6.0	END OF HOLE @ 6.0 FT. BGS	600.3				
	NOTE: At completion a 2.0" ID observation well was installed to 5.0 ft. BGS.		SCREEN DETAILS: Screened interval: 3.0' to 5.0' BGS Length - 2' Diameter - 2" Slot # 10 Material - Stainless Steel Sand pack interval: 2.5' to 6.0' BGS Material - QROC-2			
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(1-6)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: NORTHEAST PART OF PLANT

HOLE DESIGNATION: MW13-89
DATE COMPLETED: JUNE 12, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	608.39 606.2				
1.0	Black Cinders, subrounded gravel, moist, FILL		CEMENT/BENTONITE GROUT	1SS		7
2.0	Gray-brown silty Clay, some gravel, some coke, trace brick fragments, moist	604.2	BENTONITE PELLET SEAL			
3.0	Black Cinders, subrounded gravel, wood fragments, wet	603.5	2.0"ø BLACK STEEL PIPE	2SS		11
4.0	Black Cinders, subrounded and subangular gravel, wet	602.2	6.5"ø BOREHOLE			
5.0			WELL SCREEN	3SS		6
6.0	Red-brown silty Clay, gray mottling, moist, NATIVE Red-brown silty Clay, moist	600.7 600.2	SAND PACK	4ST		
7.0						
8.0	END OF HOLE @ 8.0 FT. BGS	598.2				
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES:
1. At completion a 2.0" ID observation well was installed to 5.0 ft. BGS.
2. A shelby tube sample was collected from 6.0 to 8.0 ft. BGS and submitted for permeability testing.
3. The 5.5 to 6.0 ft. BGS sample was submitted for chemical analysis.

SCREEN DETAILS:
Screened interval:
4.0' to 6.0' BGS
Length - 2'
Diameter - 2"
Slot # 10
Material - Stainless Steel
Sand pack interval:
3.0' to 8.0' BGS
Material - QROC-2

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-7)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: NORTHEAST PART OF PLANT

HOLE DESIGNATION: MW14-89
DATE COMPLETED: JUNE 14, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	REFERENCE ELEVATION (Top of Riser)	605.57				
	GROUND ELEVATION	603.6				
1.0	Brown gray Silt and Slag, trace red-brown silty clay, vegetation, wet, FILL		CEMENT/BENTONITE GROUT; BENTONITE PELLET SEAL	1SS		17
2.0	Some with some subangular gravel, wet	601.6	2.0" ø STAINLESS STEEL PIPE			
	Red-brown silty Clay, trace silt pockets, trace vegetation fibers, gray mottling, moist, NATIVE	601.5	6.5" ø BOREHOLE; WELL SCREEN	2SS		15
3.0						
4.0			SAND PACK			
5.0				3ST		
6.0	END OF HOLE @ 6.0 FT. BGS	597.6				
	NOTES: 1. At completion a 2.0" ID observation well was installed to 4.0 ft. BGS. 2. A shelby tube sample was collected from 4.0 to 6.0 ft. BGS and submitted for permeability testing. 3. The 2.1 to 4.0 ft. BGS and 4.0 to 6.0 ft. BGS samples were submitted for chemical analysis.		SCREEN DETAILS: Screened interval: 2.0' to 4.0' BGS; Length - 2'; Diameter - 2"; Slot # 10; Material - Stainless Steel; Sand pack interval: 1.5' to 6.0' BGS; Material - QROC-2			
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-8)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WEST OF COAL PILES IN PLANT

HOLE DESIGNATION: MW15-89
DATE COMPLETED: JUNE 13, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser)	605.99				
	GROUND ELEVATION	603.8				
	Black Cinders, wet to moist, FILL		CEMENT/BENTONITE GROUT			
1.0			BENTONITE PELLET SEAL	1SS		16
2.0	Dry to moist	601.8	2.0" ϕ BLACK STEEL PIPE			
			6.5" ϕ BOREHOLE			
3.0	Gray-brown silty Clay, some cinders, moist	600.8	SAND PACK	2SS		29
	Red-brown silty Clay, trace silt pockets, olive green and gray mottling, moist, NATIVE	600.5	WELL SCREEN			
4.0	END OF HOLE @ 4.0 FT. BGS	599.8				
	NOTE: At completion a 2.0" ID observation well was installed to 4.0 ft. BGS.					
5.0			SCREEN DETAILS: Screened interval: 2.0' to 4.0' BGS; Length - 2'; Diameter - 2"; Slot # 10; Material - Stainless Steel; Sand pack interval: 1.5' to 4.0' BGS; Material - QROC-2			
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (○) WATER FOUND ▽ STATIC WATER LEVEL ▼

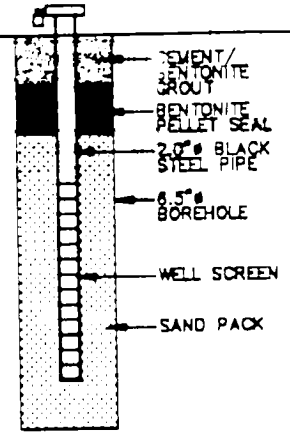
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-9)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WEST OF COAL PILES IN PLANT

HOLE DESIGNATION: MW16-89
DATE COMPLETED: JUNE 13, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	603.46 599.9				
	Black Cinders and Silt, vegetation, wet, FILL	599.6				
	Orange, red-brown silty Clay, cinders, vegetation, moist, FILL	599.0				
1.0	Red-brown silty Clay, trace silt pockets, trace small subangular gravel, olive green and gray mottling, moist, NATIVE			1SS		12
2.0						
3.0				2SS		19
4.0	END OF HOLE @ 4.0 FT. BGS	595.9				
	NOTE: At completion a 2.0" ID observation well was installed to 3.5 ft. BGS.					
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						



SCREEN DETAILS:
Screened interval:
1.5' to 3.5' BGS
Length -2'
Diameter -2"
Slot # 10
Material - Stainless Steel
Sand pack interval:
1.0' to 4.0' BGS
Material - QROC-2

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE: REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-10)

PROJECT NAME: TONAWANDA COKE CORPORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORPORATION
LOCATION: WEST OF PLANT ENTRANCE

HOLE DESIGNATION: MW17-89
DATE COMPLETED: JUNE 13, 1989
DRILLING METHOD: 6 1/2" OD HSA
CRA SUPERVISOR: D. TARNOWSKI

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND ELEVATION	579.15 576.9				
1.0	Black Silt, vegetation, subangular gravel, wet, FILL Brown clayey Silt, trace cinders, trace sub-angular gravel, dry to moist	576.5	CEMENT/BENTONITE GROUT 8.5"ø BOREHOLE	1SS		16
2.0	Gray and red-brown Silt and silty Clay, cinders, slag, subangular gravel, moist	574.9	BENTONITE PELLET SEAL			
3.0			2.0"ø BLACK STEEL PIPE	2SS		15
4.0	Brown and gray silty Clay, trace cinder, some subangular gravel, moist	572.9	WELL SCREEN SAND PACK			
5.0	Olive green-gray silty Clay, trace silt pockets, orange mottling, vegetation fibers, moist, NATIVE	572.0		(3SS)		3
6.0	END OF HOLE @ 6.0 FT. BGS	570.9				
7.0	NOTE: 1. At completion a 2.0" ID observation well was installed to 5.0 ft. BGS. 2. A shelby tube sample was collected from 6.0 to 8.0 ft. BGS from a borehole 5.0 ft. east of MW17-89 and was submitted for permeability testing. 3. The 4.9 to 6.0 ft. BGS sample was submitted for chemical analysis.					
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened interval:
3.0' to 5.0' BGS
Length - 2'
Diameter - 2"
Slot # 10
Material - Stainless Steel
Sand pack interval:
2.5' to 6.0' BGS
Material - QROC-2

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

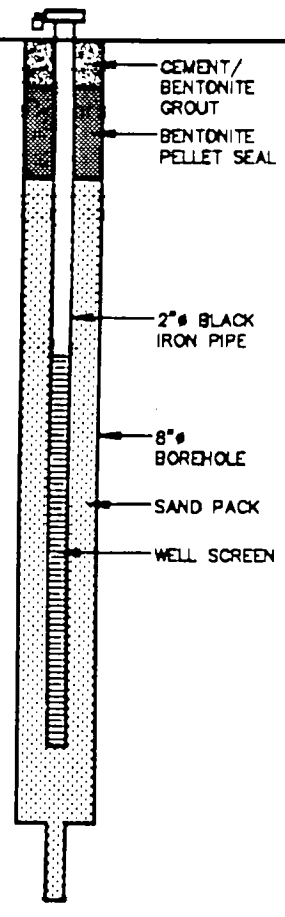
(L-25)

PROJECT NAME: TONAWANDA COKE CORORATION
PROJECT NO.: 2428
CLIENT: TONAWANDA COKE CORORATION
LOCATION: NORTHEAST CORNER OF SITE 108

HOLE DESIGNATION: MW18-91
DATE COMPLETED: JUNE 19, 1991
DRILLING METHOD: 4 1/4" ID HSA
CRA SUPERVISOR: J. WILLIAMS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL
	REFERENCE ELEVATION (Top of Riser)	572.20
	GROUND SURFACE	570.2
2.5	Black COAL, moist, FILL Gray coarse GRAVEL, some concrete, moist Gray fine to coarse GRAVEL, little coarse sand, moist to wet	569.7
5.0	Gray fine SAND, some silt, little clay and vegetation, moist, NATIVE Same, except little silt, no clay	566.2
7.5	Dark gray fine to medium SAND, little vegetation, trace silt, wet	
10.0	Same, except no vegetation	
12.5	Same, except no silt	
15.0		
17.5		
20.0		
22.5	END OF HOLE @ 22.0 FT. BGS NOTES: 1. At completion a 2.0" ID observation well was installed to 18.0 ft BGS.	548.2
25.0		
27.5		
30.0		
32.5		

MONITOR INSTALLATION



SCREEN DETAILS:
Screened Interval:
8.0 to 18.0' BGS
Length -10.0'
Diameter -2.0"
Slot # 10
Material -Stainless Steel
Sand pack interval:
3.5 to 22.0' BGS
Material -QROC #2

SAMPLE NUMBER	STATE	N VALUE
1SS		32
2SS		94
3SS		2
4SS		2
5SS		7
6SS		6
7SS		13
8SS		7
9SS		11
10SS		9
11SS		15

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-26)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW19-91

PROJECT NO.: 2428
DATE COMPLETED: JUNE 18, 1991

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 4 1/4" ID HSA

LOCATION: OFFSITE, NORTH OF SITE 110
CRA SUPERVISOR: J. WILLIAMS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE N VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	607.17 605.4				
1.0	Black COAL, some cinders, little red brick, little coarse gravel, moist, FILL		CEMENT/ BENTONITE GROUT BENTONITE PELLET SEAL	1SS		14
2.0	Black fine to coarse GRAVEL, some coal and cinders, moist	603.4	2"ø BLACK IRON PIPE SAND PACK			
3.0	Reddish brown CLAY, little silt, moist, NATIVE	602.1	8"ø BOREHOLE	2SS		4
4.0	END OF HOLE @ 4.0 FT. BGS NOTES: 1. At completion a 2.0" ID observation well was installed to 3.8 ft BGS.	601.4	WELL SCREEN SCREEN DETAILS: Screened Interval: 1.8 to 3.8' BGS Length -2.0' Diameter -2.0" Slot # 10 Material -Stainless Steel Sand pack interval: 1.5 to 4.0' BGS Material -QROC #2			
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-27)

PROJECT NAME: TONAWANDA COKE CORPORATION
HOLE DESIGNATION: MW20-91

PROJECT NO.: 2428
DATE COMPLETED: JUNE 18, 1991

CLIENT: TONAWANDA COKE CORPORATION
DRILLING METHOD: 4 1/4" ID HSA

LOCATION: OFFSITE, NORTHEAST OF SITE 110
CRA SUPERVISOR: J. WILLIAMS

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	605.33 603.5				
1.0	Black COAL, some gravel and cinders, little vegetation and roots, moist, FILL		CEMENT/ BENTONITE GROUT BENTONITE PELLET SEAL 2"ø BLACK IRON PIPE	1SS		12
2.0	Black COAL, some cinders, some medium to coarse gravel, moist		8"ø BOREHOLE SAND PACK			
3.0	Reddish brown CLAY, little silt, moist	600.5		2SS		6
4.0	END OF HOLE @ 4.0 FT. BGS NOTES: 1. At completion a 2.0" ID observation well was installed to 3.5 ft BGS.	599.5	WELL SCREEN SCREEN DETAILS: Screened Interval: 1.5 to 3.5' BGS Length -2.0' Diameter -2.0" Slot # 10 Material -Stainless Steel Sand pack interval: 1.5 to 4.0' BGS Material -QROC #2			
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

D

APPENDIX D

ANALYTICAL SUMMARY TABLES

ALLIED SPECIALTY CHEMICAL SITE

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	RI MW-1 **12/1/88** ug/l	PRGWI [2] MW-1 **10/11/90** ug/l	PRGWI [2] MW-1 **9/30/91** ug/l	PRGWI [2] MW-1 **12/9/91** ug/l	PRGWI [2] MW-1 **3/5/92** ug/l	PRGWI [2] MW-1 **6/5/92** ug/l	RI MW-2 **12/1/88** ug/l	RI MW-3 **12/1/88** ug/l	RI MW-4 **12/1/88** ug/l	Ground [1] Water Standard ug/l
INORGANIC PRIORITY POLLUTANTS										
Antimony	ND						ND	ND	ND	3*
Arsenic	11.6	ND	1.9	ND	11.9	4.9	ND	ND	ND	25
Beryllium	6						ND	ND	2J	3*
Cadmium			ND	ND	ND	ND				10
Chromium	117	39	33.1	103	429	169	ND	ND	ND	50
Copper	ND		14.9	49.1	37.1	19.7	17J	ND	17J	200
Cyanide	585	2200	2000	1800		580	2580	730	1120	100
Lead	1.6J		5.3	15.1	4.3	4.5	ND	27.8	ND	25
Mercury			0.25	ND	0.2	ND				2
Nickel	18						ND	ND	ND	
Zinc	167		247	658	960	452	20	175	31J	300
INORGANIC NONPRIORITY POLLUTANTS										
Aluminum	3740						173J	1870	179J	
Barium	ND						20J	ND	26J	1000
Calcium	359000						271000	190000	294000	
Cobalt										
Iron	463000						5080	2280	750	300
Magnesium	78500						148000	42300	155000	35000*
Manganese	9440						7500	1350	5170	300
Potassium	10300						7300	ND	1300J	
Silver	29						13	ND	11	50
Sodium	56400						19000	64300	23000	20000
Vanadium	66						ND	ND	11J	

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-5 10/11/90 ug/l	PRGWI [2] MW-5 9/30/91 ug/l	PRGWI [2] MW-5 12/9/91 ug/l	PRGWI [2] MW-5 3/5/92 ug/l	PRGWI [2] MW-5 6/5/92 ug/l	PRGWI MW-6 5/17/91 ug/l	PRGWI [2] MW-6 9/30/91 ug/l	PRGWI [2] MW-6 12/9/91 ug/l	PRGWI [2] MW-6 3/5/92 ug/l	Ground [1] Water Standard ug/l
INORGANIC PRIORITY POLLUTANTS										
Antimony										3*
Arsenic	26.1		10.2	5.7			12.9	5.8	11.5	25
Beryllium										3*
Cadmium			5.8	4.1			ND	8.9	ND	10
Chromium	130		85.9	49.5		279	189	117	228	50
Copper			65.7	18.6			159	67.5	218	200
Cyanide	737		1200		600	2020	10000	6500	2400 †	100
Lead			240	2.7			174	130	252	25
Mercury			0.3	ND			2.4	1.1	3.5	2
Nickel										
Zinc			83.5	15.6			667	323	492	300
INORGANIC NONPRIORITY POLLUTANTS										
Aluminum										
Barium										1000
Calcium										
Cobalt										
Iron										300
Magnesium										35000*
Manganese										300
Potassium										
Silver										50
Sodium										20000
Vanadium										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-6 6/5/92 ug/l	PRGWI MW-7 5/17/91 ug/l	PRGWI [2] MW-7 9/30/91 ug/l	PRGWI [2] MW-7 12/9/91 ug/l	PRGWI [2] MW-7 3/5/92 ug/l	PRGWI [2] MW-7 6/5/92 ug/l	PRGWI MW-8 5/17/91 ug/l	PRGWI [2] MW-8 9/30/91 ug/l	PRGWI [2] MW-8 12/9/91 ug/l	Ground [1] Water Standard ug/l
INORGANIC PRIORITY POLLUTANTS										
Antimony										3*
Arsenic	18		95.1	46.6	28.2	66.5		5.4	1.9	25
Beryllium										3*
Cadmium	7.7		10.9	ND	ND	ND		ND	5.5	10
Chromium	306	354	164	354	176	253	55.3	17.9	17.8	50
Copper	274		373	227	215	457		30.1	13.8	200
Cyanide	4800	2670	20000	9500	1100 ‡	6800	1050	850	1100	100
Lead	410		753	390	320	587		12.5	10.9	25
Mercury	3.9		5	2.8	4.2	4.7		0.25	ND	2
Nickel										
Zinc	535		754	732	687	680		116	36	300
INORGANIC NONPRIORITY POLLUTANTS										
Aluminum										
Barium										1000
Calcium										
Cobalt										
Iron										300
Magnesium										35000*
Manganese										300
Potasslum										
Silver										50
Sodium										20000
Vanadium										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-8 3/5/92 ug/l	PRGWI [2] MW-8 6/5/92 ug/l								Ground [1] Water Standard ug/l
INORGANIC PRIORITY POLLUTANTS										
Antimony										3*
Arsenic	3.4	1.7								25
Beryllium										3*
Cadmium	ND	4.4								10
Chromium	13	11								50
Copper	25.9	7.3								200
Cyanide	680 [3]	500								100
Lead	21.9	13.8								25
Mercury	ND	ND								2
Nickel										
Zinc	1841	63.9								300
INORGANIC NONPRIORITY POLLUTANTS										
Aluminum										
Barium										1000
Calcium										
Cobalt										
Iron										300
Magnesium										35000*
Manganese										300
Potassium										
Silver										50
Sodium										20000
Vanadium										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	RI MW-1 **12/1/88** ug/l	PRGWI [2] MW-1 **10/11/90** ug/l	PRGWI [2] MW-1 **9/30/91** ug/l	PRGWI [2] MW-1 **12/9/91** ug/l	PRGWI [2] MW-1 **3/5/92** ug/l	PRGWI [2] MW-1 **6/5/92** ug/l	RI MW-2 **12/1/88** ug/l	RI MW-3 **12/1/88** ug/l	RI MW-4 **12/1/88** ug/l	Ground [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS										
Acrolein										
Benzene	460	180	140	190	130	140	1J	ND	ND	ND
Chlorobenzene	ND						ND	ND	ND	5
1,4-Dichlorobenzene	ND						ND	ND	ND	4.7
1,2-Dichloroethane	ND						ND	ND	ND	5
Chloroform	1J						ND	ND	ND	100
2,4-Dimethylphenol	37J						ND	ND	ND	1**
1,1,1-Trichloroethane	ND						ND	ND	ND	5
1,2-Transdichloroethene	ND						ND	ND	ND	5
Ethylbenzene	53	25	32	34	33	35	ND	ND	ND	5
Methylene chloride	42						12	14	11	5
Tetrachloroethylene	ND						ND	ND	4J	5
2,4-Dinitrotoluene	ND						ND	ND	ND	
Fluoranthene	ND	5	4	ND	ND	5	ND	ND	ND	50*
Naphthalene	5200	3300	41	1200	870	1100	ND	ND	ND	10*
N-nitrosodiphenylamine	ND	ND					ND	ND	3J	50*
Bis(2-ethylhexyl)phthalate	ND	ND					14	9J	ND	50
Di-n-butyl phthalate	ND						5J	ND	ND	50
Di-n-octyl phthalate	ND						ND	ND	ND	50*
Butylbenzyl phthalate	ND						ND	ND	ND	50*
Benzo(a)anthracene	ND						ND	ND	ND	0.002*
Benzo(a)pyrene	ND						ND	ND	ND	ND
Benzo(b)fluoranthene	ND						ND	ND	ND	0.002*

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-5 10/11/90 ug/l	PRGWI [2] MW-5 9/30/91 ug/l	PRGWI [2] MW-5 12/9/91 ug/l	PRGWI [2] MW-5 3/5/92 ug/l	PRGWI [2] MW-5 6/5/92 ug/l	PRGWI MW-6 5/17/91 ug/l	PRGWI [2] MW-6 9/30/91 ug/l	PRGWI [2] MW-6 12/9/91 ug/l	PRGWI [2] MW-6 3/5/92 ug/l	Ground [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS										
Acrolein										
Benzene	ND	ND	ND	ND	ND	130	110	75	95	ND
Chlorobenzene										5
1,4-Dichlorobenzene						ND				4.7
1,2-Dichloroethane										5
Chloroform										100
2,4-Dimethylphenol										1**
1,1,1-Trichloroethane										5
1,2-Transdichloroethene										5
Ethylbenzene	ND	ND	ND	ND	ND	52	37	20	37	5
Methylene chloride										5
Tetrachloroethylene										5
2,4-Dinitrotoluene										
Fluoranthene	ND	ND	ND	ND	ND	56J	16	6	19	50*
Naphthalene	ND	ND	ND	ND	ND	2100	240	800	340	10*
N-nitrosodiphenylamine	ND					ND				50*
Bis(2-ethylhexyl)phthalate	ND					ND				50
Di-n-butyl phthalate						ND				50
Di-n-octyl phthalate						ND				50*
Butylbenzyl phthalate						ND				50*
Benzo(a)anthracene						29J				0.002*
Benzo(a)pyrene						22J				ND
Benzo(b)fluoranthene						ND				0.002*

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	PRGWI [2] MW-6 **6/5/92** ug/l	PRGWI MW-7 **5/17/91** ug/l	PRGWI [2] MW-7 **9/30/91** ug/l	PRGWI [2] MW-7 **12/9/91** ug/l	PRGWI [2] MW-7 **3/5/92** ug/l	PRGWI [2] MW-7 **6/5/92** ug/l	PRGWI MW-8 **5/17/91** ug/l	PRGWI [2] MW-8 **9/30/91** ug/l	PRGWI [2] MW-8 **12/9/91** ug/l	Ground [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS										
Acrolein										
Benzene	86	40	45	2	18	13	ND	ND	ND	ND
Chlorobenzene										5
1,4-Dichlorobenzene		ND					ND			4.7
1,2-Dichloroethane										5
Chloroform										100
2,4-Dimethylphenol										1**
1,1,1-Trichloroethane										5
1,2-Transdichloroethene										5
Ethylbenzene	29	7	7	ND	2	1	ND	ND	ND	5
Methylene chloride										5
Tetrachloroethylene										5
2,4-Dinitrotoluene										
Fluoranthene	17	25J	ND	5	ND	3	ND	ND	ND	50*
Naphthalene	38	770	140	100	72	85	ND	ND	ND	10*
N-nitrosodiphenylamine		ND					ND			50*
Bis(2-ethylhexyl)phthalate		ND					4J			50
Di-n-butyl phthalate		ND					0.9J			50
Di-n-octyl phthalate		ND					ND			50*
Butylbenzyl phthalate		ND					ND			50*
Benzo(a)anthracene		18J					ND			0.002*
Benzo(a)pyrene		16J					ND			ND
Benzo(b)fluoranthene		13J					ND			0.002*

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-8 3/5/92 ug/l	PRGWI [2] MW-8 6/5/92 ug/l								Ground [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS										
Acrolein										
Benzene	ND	ND								ND
Chlorobenzene										5
1,4-Dichlorobenzene										4.7
1,2-Dichloroethane										5
Chloroform										100
2,4-Dimethylphenol										1**
1,1,1-Trichloroethane										5
1,2-Transdichloroethene										5
Ethylbenzene	ND	ND								5
Methylene chloride										5
Tetrachloroethylene										5
2,4-Dinitrotoluene										
Fluoranthene	ND	ND								50*
Naphthalene	ND	ND								10*
N-nitrosodiphenylamine										50*
Bis(2-ethylhexyl)phthalate										50
Di-n-butyl phthalate										50
Di-n-octyl phthalate										50*
Butylbenzyl phthalate										50*
Benzo(a)anthracene										0.002*
Benzo(a)pyrene										ND
Benzo(b)fluoranthene										0.002*

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	RI MW-1 **12/1/88** ug/l	PRGWI [2] MW-1 **10/11/90** ug/l	PRGWI [2] MW-1 **9/30/91** ug/l	PRGWI [2] MW-1 **12/9/91** ug/l	PRGWI [2] MW-1 **3/5/92** ug/l	PRGWI [2] MW-1 **6/5/92** ug/l	RI MW-2 **12/1/88** ug/l	RI MW-3 **12/1/88** ug/l	RI MW-4 **12/1/88** ug/l	Ground [1] Water **Standard** ug/l
ORGANIC PRIORITY POLLUTANTS (CONTINUED)										
Benzo(k)fluoranthene	ND						ND	ND	ND	0.002*
Chrysene	ND						ND	ND	ND	0.002*
Acenaphthene	ND	14	13	11	12	11	ND	ND	ND	20*
Anthracene	ND	9	7	6	ND	7	ND	ND	ND	50*
Benzo(ghi)perylene	ND						ND	ND	ND	
Fluorene	52J	64	51	42	43	39	ND	ND	ND	50*
Phenanthrene	59J	41	35	31	30	34	ND	ND	ND	50*
Dibenzo(a,h)anthracene	ND						ND	ND	ND	
Indeno(1,2,3-cd)pyrene	ND						ND	ND	ND	0.002*
Pyrene	ND	4	ND	5	ND	5	ND	ND	ND	50*
Acenaphthylene	49J	37	22	23	14		ND	ND	ND	
Toluene	170	84	36	53	49	72	ND	ND	ND	5
Vinyl chloride	ND						ND	ND	ND	2
Dieldrin										ND
Heptachlor epoxide										ND
Alpha-BHC										ND
Phenols	37J	ND					ND	ND	ND	1**
ORGANIC NONPRIORITY POLLUTANTS										
Diethyl phthalate	ND						ND	ND	ND	50*
Benzoic acid	ND						ND	ND	ND	
Acetone	150B						15B	61B	19B	
Carbon disulfide	7J						ND	ND	ND	
Total xylenes	340	410	186	240	250	300	ND	ND	ND	5

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-5 10/11/90 ug/l	PRGWI [2] MW-5 9/30/91 ug/l	PRGWI [2] MW-5 12/9/91 ug/l	PRGWI [2] MW-5 3/5/92 ug/l	PRGWI [2] MW-5 6/5/92 ug/l	PRGWI MW-6 5/17/91 ug/l	PRGWI [2] MW-6 9/30/91 ug/l	PRGWI [2] MW-6 12/9/91 ug/l	PRGWI [2] MW-6 3/5/92 ug/l	Ground [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS (CONTINUED)										
Benzo(k)fluoranthene						ND				0.002*
Chrysene						32J				0.002*
Acenaphthene	ND	ND	ND	ND	ND	ND	11	7	12	20*
Anthracene	ND	ND	ND	ND	ND	32J	12	6	15	50*
Benzo(ghi)perylene						ND				
Fluorene	ND	ND	ND	ND	ND	98J	46	29	40	50*
Phenanthrene	ND	ND	ND	ND	ND	170J	67	40	58	50*
Dibenzo(a,h)anthracene						ND				
Indeno(1,2,3-cd)pyrene						ND				0.002*
Pyrene	ND	ND	ND	ND	ND	76J	11	9	30	50*
Acenaphthylene	ND	ND	ND	ND	ND	33	18	8	11	
Toluene	ND	ND	ND	ND	ND	61	26	15	17	5
Vinyl chloride										2
Dieldrin										ND
Heptachlor epoxide										ND
Alpha-BHC										ND
Phenols	ND					ND				1**
ORGANIC NONPRIORITY POLLUTANTS										
Diethyl phthalate										50*
Benzoic acid										
Acetone										
Carbon disulfide										
Total xylenes	ND	ND	ND	ND	ND	240	143	83	126	5

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-6 6/5/92 ug/l	PRGWI MW-7 5/17/91 ug/l	PRGWI [2] MW-7 9/30/91 ug/l	PRGWI [2] MW-7 12/9/91 ug/l	PRGWI [2] MW-7 3/5/92 ug/l	PRGWI [2] MW-7 6/5/92 ug/l	PRGWI MW-8 5/17/91 ug/l	PRGWI [2] MW-8 9/30/91 ug/l	PRGWI [2] MW-8 12/9/91 ug/l	Ground [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Benzo(k)fluoranthene		27J					ND			0.002*
Chrysene		19J					ND			0.002*
Acenaphthene	6	ND	5	ND	ND	ND	ND	ND	ND	20*
Anthracene	13	11J	ND	ND	ND	ND	ND	ND	ND	50*
Benzo(ghi)perylene		ND					ND			
Fluorene	31	30J	14	7	7	7	ND	ND	ND	50*
Phenanthrene	57	49J	11	13	9	8	ND	ND	ND	50*
Dibenzo(a,h)anthracene		ND					ND			
Indeno(1,2,3-cd)pyrene		ND					ND			0.002*
Pyrene	28	20J	ND	9	ND	3	ND	ND	ND	50*
Acenaphthylene	4	ND	ND	ND	ND	ND	ND	ND	ND	
Toluene	14	16	13	ND	4	4	ND	ND	ND	5
Vinyl chloride										2
Dieldrin										ND
Heptachlor epoxide										ND
Alpha-BHC										ND
Phenols		ND					ND			1**
ORGANIC NONPRIORITY POLLUTANTS										
Diethyl phthalate										50*
Benzoic acid										
Acetone										
Carbon disulfide										
Total xylenes	110	32	26	ND	8	6	ND	ND	ND	5

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-8 3/5/92 ug/l	PRGWI [2] MW-8 6/5/92 ug/l								Ground Water [1] Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Benzo(k)fluoranthene										0.002*
Chrysene										0.002*
Acenaphthene	ND	ND								20*
Anthracene	ND	ND								50*
Benzo(ghi)perylene										
Fluorene	ND	ND								50*
Phenanthrene	ND	ND								50*
Dibenzo(a,h)anthracene										
Indeno(1,2,3-cd)pyrene										0.002*
Pyrene	ND	ND								50*
Acenaphthylene	ND	ND								
Toluene	ND	ND								5
Vinyl chloride										2
Dieldrin										ND
Heptachlor epoxide										ND
Alpha-BHC										ND
Phenols										1**
ORGANIC NONPRIORITY POLLUTANTS										
Diethyl phthalate										50*
Benzoic acid										
Acetone										
Carbon disulfide										
Total xylenes	ND	ND								5

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	RI MW-1 **12/1/88** ug/l	PRGWI [2] MW-1 **10/11/90** ug/l	PRGWI [2] MW-1 **9/30/91** ug/l	PRGWI [2] MW-1 **12/9/91** ug/l	PRGWI [2] MW-1 **3/5/92** ug/l	PRGWI [2] MW-1 **6/5/92** ug/l	RI MW-2 **12/1/88** ug/l	RI MW-3 **12/1/88** ug/l	RI MW-4 **12/1/88** ug/l	Ground [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Dibenzofuran	41J	ND					ND	ND	ND	
2-Methylnaphthalene	470	340	82	210	320	300	ND	ND	ND	
2-Methylphenol	ND						ND	ND	ND	1**
4-Methylphenol	46J	ND					ND	ND	ND	1**
Tetradecanoic Acid										
Pentadecanoic Acid										
Hexadecanoic Acid										
2-Hexanone	ND						ND	ND	ND	50*
Styrene	85B						ND	ND	ND	5
4-Methyl-2-pentanone										
4-Chloroaniline	ND						ND	ND	ND	
1,2-dimethylbenzene										
Vinyl acetate	ND						ND	ND	ND	
Oil and grease										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-5 10/11/90 ug/l	PRGWI [2] MW-5 9/30/91 ug/l	PRGWI [2] MW-5 12/9/91 ug/l	PRGWI [2] MW-5 3/5/92 ug/l	PRGWI [2] MW-5 6/5/92 ug/l	PRGWI MW-6 5/17/91 ug/l	PRGWI [2] MW-6 9/30/91 ug/l	PRGWI [2] MW-6 12/9/91 ug/l	PRGWI [2] MW-6 3/5/92 ug/l	Ground [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Dibenzofuran	ND					ND				
2-Methylnaphthalene	ND	ND	ND	ND	ND	460	140	180	200	
2-Methylphenol						ND				1**
4-Methylphenol	ND					ND				1**
Tetradecanoic Acid										
Pentadecanoic Acid										
Hexadecanoic Acid										
2-Hexanone										50*
Styrene										5
4-Methyl-2-pentanone										
4-Chloroaniline						ND				
1,2-dimethylbenzene										
Vinyl acetate										
Oil and grease										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION **DATE** UNITS	PRGWI [2] MW-6 **6/5/92** ug/l	PRGWI MW-7 **5/17/91** ug/l	PRGWI [2] MW-7 **9/30/91** ug/l	PRGWI [2] MW-7 **12/9/91** ug/l	PRGWI [2] MW-7 **3/5/92** ug/l	PRGWI [2] MW-7 **6/5/92** ug/l	PRGWI MW-8 **5/17/91** ug/l	PRGWI [2] MW-8 **9/30/91** ug/l	PRGWI [2] MW-8 **12/9/91** ug/l	Ground [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Dibenzofuran		ND					ND			
2-Methylnaphthalene	34	180	73	43	30	25	ND	ND	ND	
2-Methylphenol		ND					ND			1**
4-Methylphenol		ND					ND			1**
Tetradecanoic Acid										
Pentadecanoic Acid										
Hexadecanoic Acid										
2-Hexanone										50*
Styrene										5
4-Methyl-2-pentanone										
4-Chloroaniline		ND					ND			
1,2-dimethylbenzene										
Vinyl acetate										
Oil and grease										

TABLE 4.15
GROUNDWATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	PRGWI [2] MW-8 3/5/92 ug/l	PRGWI [2] MW-8 6/5/92 ug/l								Ground [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)										
Dibenzofuran										
2-Methylnaphthalene	ND	ND								
2-Methylphenol										1**
4-Methylphenol										1**
Tetradecanoic Acid										
Pentadecanoic Acid										
Hexadecanoic Acid										
2-Hexanone										50*
Styrene										5
4-Methyl-2-pentanone										
4-Chloroaniline										
1,2-dimethylbenzene										
Vinyl acetate										
Oil and grease										

1 Ambient Water Quality Standards and Guidance Values (NYSDEC, 1990).
2 A complete analytical parameter list was not supplied.
* Groundwater guidance value.
** Total phenols standard.
B Compound detected in blank.
D The reported value is less than the Contract-Required Detection Limit, but is greater than or equal to the Instrument Detection Limit.
E The reported value is estimated due to the presence of interference.
J Estimated value. Value is below the compound quantification limit.
‡ Filtered sample; unfiltered sample was not analyzed.
ND Not detected
Blank spaces indicate that the compound was not analyzed for.

TABLE 4.16
SURFACE WATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE: LOCATION: DATE: UNITS:	Allied RI SW-01 9/27/88 ug/l	Allied RI SW-02 9/27/88 ug/l	Allied RI SW-03 9/27/88 ug/l	Surface [1] Water Standard ug/l
INORGANIC PRIORITY POLLUTANTS				
Antimony	ND	ND	ND	3*
Arsenic	12	9.3	ND	50
Beryllium	ND	ND	3J	3*
Cadmium	ND	ND	ND	10*
Chromium	14	ND	ND	50
Copper	20J	173	ND	200
Cyanide			83.5	100
Lead	31.1	150	ND	50
Mercury	ND	0.1J	0.1J	2
Nickel	ND	ND	ND	
Zinc	110	721	49	300
INORGANIC NONPRIORITY POLLUTANTS				
Aluminum			1170	
Barium			131J	1000
Calcium			89500	
Cobalt			ND	
Iron			18800	300
Magnesium			32700	35000
Manganese			1250	300
Potassium			5300	
Silver	17	12	15	50
Sodium			32200	
Vanadium			ND	

TABLE 4.16
SURFACE WATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE: LOCATION: DATE: UNITS:	Allied RI SW-01 9/27/88 ug/l	Allied RI SW-02 9/27/88 ug/l	Allied RI SW-03 9/27/88 ug/l	Surface [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS				
Acrolein				
Benzene			ND	0.7*
Chlorobenzene			ND	20
1,4-Dichlorobenzene			ND	30
1,2-Dichloroethane			ND	
Chloroform			ND	0.2
2,4-Dimethylphenol			ND	1**
1,1,1-Trichloroethane			ND	5*
1,2-Transdichloroethene			ND	
Ethylbenzene			ND	5*
Methylene chloride			ND	5*
Tetrachloroethylene			ND	0.7*
2,4-Dinitrotoluene				
Fluoranthene			ND	50*
Naphthalene			45	10
N-nitrosodiphenylamine			ND	50*
Bis(2-ethylhexyl)phthalate			3J	4*
Di-n-butyl phthalate			ND	50*
Di-n-octyl phthalate			ND	50*
Butylbenzyl phthalate			ND	50*
Benzo(a)anthracene			ND	0.002*
Benzo(a)pyrene			ND	0.002*
Benzo(b)fluoranthene			ND	0.002*

TABLE 4.16
SURFACE WATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE: LOCATION: DATE: UNITS:	Allied RI SW-01 9/27/88 ug/l	Allied RI SW-02 9/27/88 ug/l	Allied RI SW-03 9/27/88 ug/l	Surface [1] Water Standard ug/l
ORGANIC PRIORITY POLLUTANTS (CONTINUED)				
Benzo(k)fluoranthene			ND	0.002*
Chrysene			ND	0.002*
Acenaphthene			ND	20
Anthracene			ND	50*
Benzo(ghi)perylene			ND	
Fluorene			ND	50*
Phenanthrene			ND	50*
Dibenzo(a,h)anthracene			ND	
Indeno(1,2,3-cd)pyrene			ND	0.002*
Pyrene			ND	50*
Acenaphthylene			ND	
Toluene			ND	5*
Vinyl chloride			ND	0.3*
Dieldrin			ND	0.0009*
Heptachlor epoxide			ND	0.009*
Alpha-BHC			ND	
Phenols			ND	1**
ORGANIC NONPRIORITY POLLUTANTS				
Diethyl phthalate			ND	50*
Benzoic acid			ND	
Acetone			11B	
Carbon disulfide			ND	
Total xylenes			ND	5*

TABLE 4.16
SURFACE WATER ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE: LOCATION: DATE: UNITS:	Allied RI SW-01 9/27/88 ug/l	Allied RI SW-02 9/27/88 ug/l	Allied RI SW-03 9/27/88 ug/l	Surface [1] Water Standard ug/l
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)				
Dibenzofuran			ND	
2-Methylnaphthalene			4J	
2-Methylphenol			ND	1**
4-Methylphenol			ND	1**
Tetradecanoic Acid				
Pentadecanoic Acid				
Hexadecanoic Acid				
2-Hexanone			ND	50*
Styrene			ND	50
4-Methyl-2-pentanone				
4-Chloroaniline			ND	
1,2-dimethylbenzene				
Vinyl acetate				
Oil and Grease				

1 Ambient Water Quality Standards and Guidance Values (NYSDEC, 1990).
* Surface water guidance value.
** Total phenols standard.
B Compound detected in blank.
J Estimated value. Value is below the compound quantification limit.
ND Not detected.
Blank spaces indicate that the compound was not analyzed for.

TABLE 4.17
SEDIMENT ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	Allied RI SD-01 9/27/88 ug/g	Allied RI SD-02 9/27/88 ug/g	Allied RI SD-03 9/27/88 ug/g	Sediment [1] Criteria @ 1% C ug/g
INORGANIC PRIORITY POLLUTANTS				
Antimony	ND	ND	ND	2.0
Arsenic	9.3	24.2	16.4	6.0
Beryllium	1.3J	1.8J	1.3J	
Cadmium	ND	14.6	ND	0.6
Chromium	25.7	87.4	40.4	26.0
Copper	37.7	1290	40.4	16.0
Cyanide			3.6	
Lead	72.3	804	123	31.0
Mercury	0.33	4.0	0.42	0.15
Nickel	14.2J	28.3	29.5	16.0
Zinc	184	4280	211	120.0
INORGANIC NONPRIORITY POLLUTANTS				
Aluminum			25400	
Barium			148	
Calcium			18300	
Cobalt			ND	
Iron			27700	2.0%
Magnesium			9560	
Manganese			491	460.0
Potassium			3620	
Silver			8.3	1.0
Sodium			ND	
Vanadium			44.6	

TABLE 4.17
SEDIMENT ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	Allied RI SD-01 9/27/88 ug/g	Allied RI SD-02 9/27/88 ug/g	Allied RI SD-03 9/27/88 ug/g	Sediment [1] Criteria @ 1% C ug/g
ORGANIC PRIORITY POLLUTANTS				
Acrolein				
Benzene			0.071	0.6
Chlorobenzene			ND	3.5
1,4-Dichlorobenzene			ND	12.0
1,2-Dichloroethane			ND	12.0
Chloroform			ND	
2,4-Dimethylphenol			ND	
1,1,1-Trichloroethane			ND	
1,2-Transdichloroethene			ND	
Ethylbenzene			0.004J	
Methylene chloride			0.009BJ	
Tetrachloroethylene			ND	0.8
2,4-Dinitrotoluene			ND	
Fluoranthene			ND	1020
Naphthalene			ND	
N-nitrosodiphenylamine			ND	
Bis(2-ethylhexyl)phthalate			4.3BJ	199.5
Di-n-butyl phthalate			ND	
Di-n-octyl phthalate			ND	
Butylbenzyl phthalate			ND	
Benzo(a)anthracene			ND	1.3
Benzo(a)pyrene			ND	1.3
Benzo(b)fluoranthene			ND	1.3

TABLE 4.17
SEDIMENT ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	Allied RI SD-01 9/27/88 ug/g	Allied RI SD-02 9/27/88 ug/g	Allied RI SD-03 9/27/88 ug/g	Sediment [1] Criteria @ 1% C ug/g
ORGANIC PRIORITY POLLUTANTS (CONTINUED)				
Benzo(k)fluoranthene			ND	1.3
Chrysene			ND	1.3
Acenaphthene			ND	140
Anthracene			ND	
Benzo(ghi)perylene			ND	
Fluorene			ND	
Phenanthrene			ND	120
Dibenzo(a,h)anthracene			ND	
Indeno(1,2,3-cd)pyrene			ND	1.3
Pyrene			ND	
Acenaphthylene			ND	
Toluene			ND	
Vinyl chloride			ND	0.07
Dieldrin			ND	9.0
Heptachlor epoxide			ND	0.03
Alpha-BHC			ND	0.06
Phenols			ND	0.6
ORGANIC NONPRIORITY POLLUTANTS				
Diethyl phthalate			ND	
Benzoic acid			ND	
Acetone			0.16B	
Carbon disulfide			0.003J	
Total xylenes			ND	

TABLE 4.17
SEDIMENT ANALYTICAL RESULTS FOR THE ALLIED SPECIALTY CHEMICAL SITE

SOURCE LOCATION DATE UNITS	Allied RI SD-01 9/27/88 ug/g	Allied RI SD-02 9/27/88 ug/g	Allied RI SD-03 9/27/88 ug/g	Sediment [1] Criteria @ 1% C ug/g
ORGANIC NONPRIORITY POLLUTANTS (CONTINUED)				
Dibenzofuran			ND	
2-Methylnaphthalene			ND	
2-Methylphenol			ND	0.6
4-Methylphenol			ND	0.6
Tetradecanoic Acid				
Pentadecanoic Acid				
Hexadecanoic Acid				
2-Hexanone			ND	
Styrene			ND	
4-Methyl-2-pentanone			ND	
4-Chloroaniline			ND	
1,2-dimethylbenzene				
Vinyl acetate			ND	
Oil and Grease				

1 Technical Guidance for Screening Contaminated Sediments (NYSDEC, 1994).
B Compound detected in blank.
J Estimated value. Value is below the compound quantification limit.
ND Not detected.
Blank spaces indicate that the compound was not analyzed for.

APPENDIX E

RECOVERY TEST LOGS

CRA SUPPLEMENTAL SITE INVESTIGATION

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-3
Date:	6/28/89
Depth of Water:	4.10 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	3.8 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
14:49	0	4.10
14:50	1	4.10
14:51	2	4.09
14:52	3	4.09
14:53	4	4.09

Well:	MW3R-89
Date:	10/18/89
Depth of Water:	6.01 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	2.35 inches

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
12:24	0	6.01
12:25	1	6.01

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-4
Date:	10/10/89
Depth of Water:	4.32 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	9.6 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
13:20	0	12.10
13:21	1	12.01
13:22	2	11.94
13:23	3	11.88
13:24	4	11.82
13:25	5	11.77
13:26	6	11.74
13:27	7	11.70
13:28	8	11.67
13:29	9	11.63
13:30	10	11.60
13:40	20	11.37

Well:	MW-5
Date:	10/10/89
Depth of Water:	9.00 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	4.4 inches

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
11:14	0	12.62
11:15	1	12.58
11:16	2	12.56
11:17	3	12.53
11:18	4	12.51
11:19	5	12.49
11:20	6	12.48
11:21	7	12.46
11:22	8	12.44
11:23	9	12.43
11:24	10	12.42
11:34	20	12.32
11:44	30	12.26
14:06	172	11.98

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-6
Date:	10/10/89
Depth of Water:	10.57 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	5.5 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
09:27	0	14.98
09:28	1	14.67
09:29	2	14.41
09:30	3	14.14
09:31	4	13.86
09:32	5	13.57
09:33	6	13.27
09:34	7	13.06
09:35	8	12.85
09:36	9	12.66
09:37	10	12.50
09:47	20	11.45
09:57	30	10.91
10:07	40	10.61

Well:	MW-7
Date:	10/10/89
Depth of Water:	9.22 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	5.1 inches

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
15:12	0	1.00
15:13	1	0.83
15:14	2	0.76
15:15	3	0.71
15:16	4	0.67
15:17	5	0.65
15:22	10	0.58
15:27	15	0.55
15:32	20	0.54
15:37	25	0.53
15:42	30	0.53

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-8-89
Date:	06/30/89
Depth of Water:	8.34 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	3.95 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
10:45	0	10.22
10:46	1	10.00
10:47	2	9.82
10:48	3	9.65
10:49	4	9.49
10:50	5	9.39
10:51	6	9.29
10:52	7	9.19
10:53	8	9.12
10:54	9	9.05
10:55	10	8.99
10:56	11	8.95
10:57	12	8.9
10:58	13	8.87
10:59	14	8.83
11:00	15	8.8
11:01	16	8.77
11:02	17	8.76
11:03	18	8.74

Well:	MW-9-89
Date:	10/10/89
Depth of Water:	4.45 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	1.67 inches

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
14:22	0	5.55
14:23	1	5.53
14:24	2	5.51
14:25	3	5.50
14:26	4	5.50
14:31	9	5.49
14:36	14	5.48
14:41	19	5.47
14:51	29	5.47
15:01	39	5.47
15:11	49	5.47
15:21	59	5.46

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-10-89
Date:	10/13/89
Depth of Water:	5.35 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	0.79 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
08:59	0	<6.56
09:00	1	<6.56
09:01	2	<6.56
09:02	3	<6.56
09:03	4	<6.56
09:04	5	6.55
09:05	6	6.51
09:06	7	6.48
09:07	8	6.45
09:08	9	6.42
09:09	10	6.40
09:19	20	6.32

Well:	MW-11-89
Date:	10/12/89
Depth of Water:	2.93 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	2.34 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
11:02	0	5.60
11:03	1	5.22
11:04	2	5.00
11:05	3	4.87
11:06	4	4.79
11:07	5	4.74
11:08	6	4.71
11:09	7	4.67
11:10	8	4.64
11:12	10	4.6
11:22	20	4.47
11:32	30	4.43

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-12-89
Date:	10/13/89
Depth of Water:	5.34 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	2.55 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
09:33	0	7.86
09:34	1	7.46
09:35	2	7.15
09:36	3	6.75
09:37	4	6.39
09:38	5	6.13
09:39	6	5.93
09:40	7	5.77
09:41	8	5.68
09:42	9	5.59
09:52	19	5.37

Well:	MW-13-89
Date:	10/11/89
Depth of Water:	2.93 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	2.94 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
14:41	0	5.33
14:42	1	5.31
14:43	2	5.32
14:44	3	5.32
14:45	4	5.32
14:46	5	5.32
14:47	6	5.32
14:48	7	5.32
14:49	8	5.32
14:50	9	5.32
14:51	10	5.32
15:05	24	5.3
15:15	34	5.3

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-14-89
Date:	07/07/89
Depth of Water:	2.75 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	3.22 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
09:21	0	6.27
09:22	1	6.20
09:23	2	6.19
09:24	3	6.17
09:25	4	6.16
09:26	5	6.14
09:27	6	6.13
09:28	7	6.13
09:33	12	6.09
09:38	17	6.07
09:43	22	6.04

Well:	MW-15-89
Date:	07/07/89
Depth of Water:	2.75 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	3.22 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
14:30	0	6.06
14:31	1	5.82
14:32	2	5.58
14:34	4	5.42
14:35	5	5.36
14:36	6	5.29
14:37	7	5.24
14:38	8	5.2
14:39	9	5.16
14:49	19	4.67
14:59	29	4.06

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-16-89
Date:	10/12/89
Depth of Water:	3.82 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	3.24 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
13:32	0	6.65
13:33	1	6.47
13:34	2	6.37
13:35	3	6.28
13:36	4	6.21
13:37	5	6.16
13:38	6	6.1
13:39	7	6.06
13:40	8	6.02
13:41	9	6
13:42	10	5.97
13:52	20	5.74
14:02	30	5.56
14:07	35	5.47

Well:	MW-17-89
Date:	06/27/89
Depth of Water:	4.31 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches
Saturated Length:	2.94 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
11:39	0	<7.0
11:40	1	7.23
11:42	3	7.20
11:43	4	7.18
11:44	5	7.17
11:45	6	8-Jan
11:46	7	7.13
11:47	8	7.11
11:48	9	7.09
11:49	10	7.07
06/30/89		
11:15	4276	4.95

RECOVERY TEST LOG - TONAWANDA COKE CORPORATION

Well:	MW-2
Date:	06/28/89
Depth of Water:	3.09 ft. BTOC
Well Diameter:	2.0 inches
Borehole Diameter:	8.5 inches (assumed)
Saturated Length:	5.24 feet

Time	*Elapsed Time (min)*	*Depth of Water (ft. BTOC)*
11:25	0	6.65
11:26	1	6.47
11:27	2	6.37
11:28	3	6.28
11:29	4	6.21
11:30	5	6.16