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REPORT

Phase II Investigation
Water Treatment Plant – Eastern Area

City of Niagara Falls
Niagara Falls, New York

April 2002

O'BRIEN & GERE
ENGINEERS, INC.

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James R. Heckathorne, P.E.
Vice President

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1. Introduction

O'Brien & Gere Engineers, Inc. (O'Brien & Gere) was retained by the City of Niagara Falls to complete a Phase II Investigation in the Eastern Area Site (the site) of the City of Niagara Falls Water Treatment Plant (WTP). This site is currently classified as Class 2a in the New York State Department of Environmental Conservation (NYSDEC) Registry of In-Active Hazardous Waste Sites (site code #932080A). This classification signifies that sufficient data does not exist to allow the NYSDEC to evaluate whether or not the site poses a threat to human health and the environment. The purpose of this Phase II Investigation is to evaluate whether historic site operations have impacted soil and ground water quality and to evaluate whether Eastern Area site fill is hazardous waste as defined by 6 NYCRR Part 371 and Federal Register 261.24.

The site, which encompasses approximately 11 acres, is located within the City of Niagara Falls Corporate Limits immediately south of Buffalo Avenue between 55th and 56th Streets (See Figure 1). The Robert Moses Parkway is located to the south between the site and the Niagara River. Immediately east of the site is the de-listed Buffalo Avenue site, the location of the new City of Niagara Falls WTP (see Figure 2). West of the site is the former City of Niagara Falls WTP property. Additional investigations and remediation of the western portion of the WTP are covered under the Occidental S-Area Requisite Remedial Technology (RRT) Stipulation (O'Brien & Gere, 1995).

1.1. Site description

The topography of the site is generally flat with surface elevations ranging from 568 to 578 ft above/ mean sea level. Presently, the majority of the site is a vacant field. Two small structures, a pump house and a sludge thickener tank, are present. A small portion of the site is also used for storage of various construction materials utilized by the City (i.e. extra water piping, valves, fire hydrants, gravel backfill, and other related material). The site is fenced and access is limited to authorized personnel only with check in required at a guard house.

The site is a former wetland area that was filled between the 1930's and the 1950's. The fill was placed in this area to reclaim land to facilitate construction in the area. Miscellaneous wastes, such as construction debris and incinerator refuse, were reportedly used for this purpose. The construction debris and incinerator waste consisted of glass, brick, and

wood fragments, ash, and cinders (O'Brien & Gere, 1991a). Additionally, shot rock fill was disposed at the site between 1958 and 1963 during the construction of the New York Power Authority water intake conduits. (NYSDEC, 1994).

The site was previously used for storage of materials. Roll-off boxes, storage boxes and barrels are evident in a 1970 aerial photograph (see Appendix A). The aerial photograph indicates that these activities were limited to the central portion of the site (O'Brien & Gere, 1991a).

The unconsolidated deposits identified at the site from the ground surface downward are lacustrine clay, miscellaneous fill, river alluvium, and glacial till (CEC, 1983). Beneath the glacial till, bedrock was encountered. Information from the adjacent Buffalo Avenue Site Investigation indicated that the ground water flow direction is to the south, towards the Niagara River (O'Brien & Gere, 1991a). Additional information pertaining to the site geology and hydrogeology are discussed in Section 3.1.

1.2. Previous investigations

Clayton Environmental Consultants, Inc. (CEC) completed a ground water investigation of the Eastern Area site in 1983. The objective of the investigation was to evaluate if ground water at the site had been affected. The analytical results indicated that elevated concentrations of inorganics, benzene, several SVOCs, alpha-BHC, and TOC were detected in several monitoring wells. Additionally, low levels of phthalates (a common plasticizer) were detected in surface and subsurface soil samples analyzed. CEC recommended that further investigations be completed to distinguish the source of these compounds (CEC, 1983).

As part of the Buffalo Avenue Site Investigation completed by O'Brien & Gere in 1991, one monitoring well and three soil borings were completed in the Eastern Area site. The ground water analyses indicate that several inorganics, as well as BHC were detected above New York State Class GA standards. Additionally, chlorinated benzene compounds, polynuclear aromatic hydrocarbons (PAHs), tetrachloroethane, phthalates and several pesticides were detected in the subsurface soil (O'Brien & Gere, 1991a).

1.3. Report organization

This Phase II Report is divided into four sections. The contents of each section of this report are summarized below.

- Section 1 includes the introduction, site description, previous investigations, and the report organization.
- Section 2 describes background data, previous investigation results, and the field methods utilized in this investigation.
- Section 3 discusses site geology and hydrogeology, and the results of the ground water, soil, and fill analysis.
- Section 4 presents a summary of the results as well as conclusions.

2. Investigation

2.1. Background information review

A background information review was completed to evaluate historic disposal practices at the site. This review also focused on areas for potential migration of contaminants onto and off the site. Documents reviewed as part of this investigation were obtained from the City of Niagara Falls and listed in the References section of this report. The majority of these documents were completed in conjunction with the Occidental "S Area" investigations on the western part of the former water treatment plant property and adjoining "S Area" site to the west.

One of the items of interest, was a set of maps and drawings from a 1989 Malcolm Pirnie (Malcolm Pirnie, 1989) report. Specifically, construction and layout of the filtered water reservoir, located between Filtration Plant "A" and Filtration Plant "B" on the former WTP facility and the various underground pipes and ditches were reviewed. The shoreline changes that have occurred over the past 80 years are illustrated on these maps and were reviewed to evaluate the filling that has taken place (Appendix E).

Additionally, an aerial photograph of the site dated 1970 was reviewed for evidence of historic activities on the site. The photograph revealed that the site was used for the storage of materials, such as roll-off boxes, barrels and storage boxes. A copy of this photograph is included as Appendix A.

Specific information related to the types of fill that were placed on the Eastern Area site was not found during this information review.

2.2. Previous investigation results

As previously mentioned, CEC was retained by the City of Niagara Falls in 1983 to complete a ground water investigation in the Eastern Area site. As part of the investigation, twelve subsurface soil samples and six surface soil samples were collected and analyzed. Low levels of phthalates (a common plasticizer) and tetrachloroethane were detected in surface and subsurface soil samples collected at the site.

Twelve monitoring wells designated as B-1 through B-12 were also installed as part of the CEC study (Figure 2). Ground water samples

were collected from each well on two occasions. Information noted during well installation indicated that fill material with strong odors was detected along the southern portion of the site. The majority of the wells were screened below the fill material on top of bedrock. Low levels of organics and inorganics were detected in several wells. The report recommended that further investigations be completed at the site.

As part of the Buffalo Avenue Site Investigation completed by O'Brien & Gere in 1991, three soil borings designated as SB-38, SB-39, and SB-40 were also completed in the Eastern Area site (see Figure 2). The data indicated the presence of chlorinated benzene compounds which are indicative of S-Area related compounds. The highest concentrations were detected at soil boring SB-40 located in the southern portion of the property. Specifically, hexachlorobenzene at 19,000 µg/Kg and 1,2,4-trichlorobenzene at 3,500 µg/Kg were detected. Concentrations of PAHs were detected at SB-40 as well as soil borings SB-38 and SB-39. The concentrations of total PAHs ranged from 656 µg/Kg at SB-40 to 4,841 µg/Kg at SB-38.

Shallow monitoring well MW-16S was installed in the Eastern Area site as part of the Buffalo Avenue Site Investigation (see Figure 2). The well was installed within the fill material. The analytical results from MW-16S indicate that soluble (filtered) manganese was present at concentrations below New York State Class GA standards. In addition, low levels of pesticides including beta-BHC and alpha-BHC were detected. No volatile organic compounds (VOCs) or semivolatile compounds (SVOCs) were detected.

2.3. Field procedures

To further evaluate the shallow ground water chemistry in the Eastern Area site, six additional ground water monitoring wells were installed at the site as part of this investigation. Six surface soil samples were also collected and analyzed to evaluate surface soil chemistry. In addition, composite samples of the miscellaneous fill material were collected and analyzed for TCLP parameters as outlined in 40 CFR Part 261.

The field methods utilized during this investigation were completed in accordance with the protocols presented in the New Water Treatment Plant Site Suitability Assessment Work Plan and the New Water Treatment Site Acquisition Investigation Work Plan (O'Brien & Gere, 1991 b, c). These work plans were approved by the NYSDEC in 1991. The laboratory analyses completed as part of this investigation contained sufficient documentation and Quality Assurance/Quality Control samples to allow for validation of these data. A usability assessment was completed on these data in lieu of validation as agreed to by NYSDEC.

2.3.1. Ground water monitoring well installation

Six shallow ground water monitoring wells were installed in February 1995 to further evaluate the geology, hydrogeology, and ground water chemistry at the site. The wells, designated as OBG-1 through OBG-6, were installed at the locations shown on Figure 3. The rationale for locating each well is as follows:

- Monitoring well OBG-1 was located in the northern end of the site to evaluate up gradient conditions at the site.

- Monitoring well OBG-2 was located on the northwest side of the site where the 1970 historical aerial photograph indicated roll-off boxes and storage containers were placed. Currently, miscellaneous construction equipment is located in this area.

- Monitoring well OBG-3 was installed near the northeast portion of the site where the 1970 historical aerial photograph indicated roll-off boxes and storage containers in this area.

- Monitoring well OBG-4 was installed in the southwest portion of the site near the sedimentation basin.

- Monitoring well OBG-5 was installed near the southeast portion of the site where odors were noted in fill material during the previous investigation completed by CEC.

- Monitoring well OBG-6 was installed adjacent to the southern property boundary where odors were noted in the fill material during the previous investigation completed by CEC.

Monitoring wells were installed using a truck mounted drill rig and 4 1/4 inch inside diameter (I.D.) hollow stem augers. Split spoon soil samples were collected continuously in accordance with ASTM method D-1586-84.

The soil samples were described by the on-site O'Brien & Gere hydrogeologist. The soil description included moisture content, color, density, and grain size distribution. Each soil sample was screened in the field using a photoionization detector (PID). A portion of each soil sample was placed in a glass jar and covered with aluminum foil. Each sample was allowed to equilibrate at a temperature of 70°F. A PID with a 10.2 eV lamp was then used to monitor the headspace of each sample. Soil descriptions and PID readings are contained in Appendix B.

The six wells were installed to screen the first encountered ground water, which generally occurred in the fill. The wells were constructed using 2-inch I.D. flush joint, 0.010-inch slotted PVC well screen attached to an appropriate length of PVC riser pipe. A washed graded silica sand was placed around the well screen and extended a minimum of 2 ft above the screened interval. A bentonite pellet seal with a minimum thickness of 2 ft was placed on top of the sand pack. A Portland cement/bentonite grout

was installed from the bentonite seal to the ground surface. The wells were secured with a locking steel protective casing. Following completion, each a licensed surveyor surveyed monitoring well for location and elevation. Well construction specifications for each monitoring well are presented in Table 1 and illustrated on the soil boring logs presented in Appendix B.

Upon completion, the newly installed monitoring wells were developed to remove fine grained materials that may have settled around the well screen during installation and to enhance the well's hydraulic connection with the surrounding aquifer. The wells were developed using a stainless steel bailer for a period of two hours or until the pH and specific conductance stabilized. The turbidity of the water removed was greater than 50 nephelometric turbidity units (NTUs).

Drilling equipment was decontaminated prior to initiating activities, between each well location, and at the completion of the field program. Decontamination fluids, drill cuttings and purge water generated during installation, sampling, and development were placed in labeled New York State Department of Transportation (NYSDOT) approved 55-gallon drums, and were temporarily stored at a designated location at the WTP. Samples of the drums were collected for characterization. Laboratory results are presented in Appendix C. The water will be discharged to the City of Niagara Falls Waste Water Treatment Plant (WWTP) in accordance with applicable regulations. The drill cuttings will be placed in the near-by S-Area landfill.

2.3.2. Ground water sampling

Ground water samples were collected from each newly installed monitoring well on one occasion. The sampling was completed between February 14 and 17, 1995.

Prior to sampling, ground water elevations were obtained from each well using an electronic water elevation probe. This data was used to calculate the amount of water to be purged in order to obtain representative samples. Prior to sampling each well, three well volumes were removed using a decontaminated stainless steel bailer attached to dedicated polypropylene rope. Following the removal of each well volume pH, specific conductance and temperature were recorded. Specific details of the ground water sampling effort are found on the ground water sampling field logs contained in Appendix D.

Samples collected for VOC analyses were collected first. Ground water samples for soluble inorganic analyses were filtered in the field using a 0.45-micron filter prior to preservation. Samples requiring pH adjustment were checked in the field using pH paper. Samples were immediately transferred to coolers packed with ice. Proper chain of custody documentation was maintained.

Ground water samples were submitted to O'Brien & Gere Laboratories, Inc. for analyses according to NYSDEC Analytical Services Protocol (ASP) with Superfund deliverables. The following analyses were completed:

- VOCs via NYSDEC ASP method 91-1
- SVOCs via NYSDEC ASP method 91-2
- PCB/pesticides via NYSDEC ASP method 91-3.
- Target Analyte List (TAL) Inorganics via ASP methodologies.
- Total Cyanide via SW846 method 9010.

Four S-Area indicator parameters were also quantified as part of the SVOCs analysis: 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene. Samples could not be analyzed for 1,2,3,5-trichlorobenzene as proposed by the NYSDEC. This compound could not be distinguished from other compounds. Analytical results are presented in Tables 2 through 5.

Quality Assurance/Quality Control (QA\QC) samples were collected. These samples included a field duplicate, equipment blank, matrix spike and matrix spike duplicate. A laboratory trip blank was also included in each cooler that contained samples for VOC analyses.

The bailer was decontaminated between each location using an alconox wash, methanol rinse and a final distilled water rinse. Purge water and decontamination fluids generated during sampling were contained and disposed as described in Section 2.3.1.

2.3.3. Surface soil sampling

Six surface soil samples, designated as SS-1 through SS-6, were collected from the Eastern Area site at the locations shown on Figure 3. The sampling program was completed to evaluate whether the surface soil has been affected by previous activities at the site and to evaluate potential adverse impacts to human health.

Surface soil sampling locations were chosen based on a review of previous sample analytical data, the 1970 aerial photograph, and field observations noted during this investigation:

- Surface soil sample SS-1 is located on the southeastern side of the site. Fill, such as brick, cinders, and wood were noted near this location during site reconnaissance.

- Surface soil sample SS-2 is located on the southwestern portion of the site.

- Surface soil samples SS-3 and SS-4 are located in the southern portion of the site. Field screening data obtained during the

installation of monitoring wells OBG-5 and OBG-6 indicated PID readings above background in this area.

- Surface soil samples SS-5 and SS-6 are located near the eastern boundary of the site directly west of the adjacent site. These locations were selected to evaluate if constituents identified at SB-33 and MW-7S, located on the adjacent site, were present in the surface soil in this part of the Eastern Area site.

Surface soil samples were collected by driving a split-spoon sampler from 0 to 2 ft below grade. The soil sample submitted to the laboratory was a composite of the 0-2 ft split spoon. Surface soil descriptions are included on Table 6. Each split spoon was cleaned using an alconox wash, methanol rinse and a final distilled water rinse. Samples were immediately transferred to coolers packed with ice. Proper chain of custody documentation was maintained.

The samples were submitted to O'Brien & Gere Laboratories, Inc. for the following analyses:

- SVOCs via NYSDEC ASP method 91-2.
- PCB/pesticides via NYSDEC ASP method 91-3.
- Target Analyte List (TAL) Inorganics via ASP methodologies.
- Cyanide via SW846 method 9010.

Quality Assurance/Quality Control (QA\QC) samples were collected. These samples included a field duplicate, equipment blank, matrix spike and matrix spike duplicate.

Analytical results are presented in Tables 7 through 9.

2.3.4. Fill sampling

Five soil borings were completed at the Eastern Area site to collect samples of fill present in the Eastern Area site for hazardous waste characteristic testing to evaluate whether material present in the Eastern Area site is characteristic of hazardous waste as defined in 6 NYCRR Part 371. These borings were completed during the week of February 5, 1996. The soil boring locations, designated as SB-1 through SB-5, are illustrated on Figure 3.

Soil boring locations were selected based on the thickness of fill material deposited in the eastern portion of the WTP property. A fill thickness contour map was prepared using available data to aid in the selection of the boring locations and total number of borings completed (Figure 5). These locations were approved by the NYSDEC in a letter dated January 19, 1996.

- Soil boring SB-1 is located approximately 75 ft north-northeast of OBG-3 (see Figure 3). SB-1 was installed to a depth of 10 ft.

Miscellaneous fill was present from the ground surface to a depth of approximately 9.3 ft. At 9.3 ft below grade the clay unit was encountered.

- SB-2 is located approximately 15 ft northwest of OBG-4. SB-2 was installed to a depth of 14 ft. Miscellaneous fill was found to be present to a depth of approximately 12.5 ft below grade. At 12.5 ft the alluvium sand was encountered.

- SB-3 was installed approximately 150 ft south of OBG-3. SB-3 was terminated at 18 ft below grade. Miscellaneous fill was present to a depth of approximately 14.5 ft below grade, where alluvium was encountered.

- SB-4 was installed approximately 145 ft south of OBG-4. SB-4 was terminated at a depth of 14 ft. Miscellaneous fill was present to a total depth of approximately 13 ft below grade, where alluvium was encountered.

- SB-5 was installed approximately 80 ft north - northeast of OBG-6. SB-5 was terminated at a depth of 18 ft. Miscellaneous fill was present from the ground surface to a depth of 15 ft. Alluvium was encountered at approximately 15 ft.

Soil boring locations were adjusted in the field to account for the recently installed sludge line for the new water treatment plant and the heavy congestion of utilities, both overhead and underground, near the pump house. The movement of these boring locations were all in concurrence with the on-site NYSDEC representative, Glenn May.

The soil borings were completed using hollow stem auger drilling methods. Continuous split-spoon soil samples were collected from the ground surface to the base of the fill material, in accordance with ASTM method D-1586-84. Field screening included the use of a PID to monitor the headspace of each sample as described in section 2.3.1. Samples for analyses were selected based on PID readings and visual inspection. Subsequent to completion the boreholes were grouted to the ground surface with a mixture of soil cuttings and cement/bentonite grout. Soil descriptions and PID readings are found in Appendix B.

Subsurface fill composite samples were submitted to O'Brien & Gere Laboratories, Inc. for analysis according to the constituents outlined in 40 CFR part 261 using TCLP. The following analyses were completed:

- VOCs via TCLP 8240
- SVOCs via TCLP 8270
- Pesticides via TCLP 8080
- Inorganics via TCLP 6010/7470

Quality Assurance/Quality Control (QA/QC) samples were collected. QA/QC samples included a matrix spike, matrix spike duplicate and a

blind duplicate. A trip blank was deemed not necessary given the higher detection limits associated with the TCLP methods. NYS category B deliverables were provided by the laboratory.

Drilling equipment was decontaminated prior to initiating activities, between each boring location, and at the completion of the field program. The split spoon was decontaminated between each sample interval using an alconox wash, methanol rinse solution, and a final potable water rinse. Decontamination fluids generated during sampling were contained and disposed of as described in Section 2.3.1.

The stainless steel bowls and spoons, used for sample collection, were decontaminated with an alconox/water scrub, a distilled water rinse, and a methanol rinse. The grab sample was collected directly from the split spoon and placed in a head space free jar for the volatile fraction of the analysis. The composite sample was homogenized in the stainless steel bowl with the stainless steel spoon, and transferred into the appropriate sample jars for the SVOCs, inorganics, and pesticide analyses. The sample jars were labeled for proper sample identification and stored on ice in a cooler. The chain-of-custody form was then completed.

2.3.5. Ground water elevations

Ground water elevations were collected three times during the Phase II Investigation. The first set of water levels were collected in February 1995 and consisted of the six Eastern Area site wells installed by O'Brien & Gere. In February 1996 and September 1996, ground water elevations were collected from fifteen of the S-Area overburden wells and the five remaining Eastern Area site wells. This was completed to assist in further evaluating the flow direction over a larger area. During this field task it was observed that well OBG-1 had been abandoned and the surface casing and PVC stickup of OBG-2 was not plumb, likely as a result of the construction activities for the new Water Treatment Plant.

To evaluate impacts to ground water flow conditions due to recent modifications to the site, a set of ground water data collected in May 2000 by Miller Springs Remedial Management was obtained.

3. Investigation results

3.1. Site geology and hydrogeology

Information obtained from the previous investigation completed at the site by CEC, as well as information from the newly installed monitoring wells and soil borings, were used to evaluate the site geology. The borings logs from the previous investigations and the newly installed wells and borings are contained in Appendix B.

The unconsolidated deposits identified at the site in descending order from the ground surface are generally fill; lacustrine clay; river alluvium; and glacial till. Beneath the till, a dolostone bedrock is present (CEC, 1983). In areas where the topography required filling, shot rock fill generally overlies miscellaneous fill. A cross-section illustrating the general stratigraphy of the site is presented as Figure 4.

The lacustrine clay consists of reddish brown and gray clay with silt lenses. This layer occurs near the ground surface at OBG-1 installed on the northern portion of the site and slopes sharply to the south. At monitoring wells OBG-3 and B-12, and soil boring SB-1, the clay layer was encountered at 10, 30, and 9.3 ft below ground surface (bgs), respectively. This unit was not detected at other monitoring wells or soil borings as these borings were not installed deep enough to encounter this unit. However, at the new WTP Site, the lacustrine clay was encountered beneath the entire site ranging in thickness from approximately 6 ft to 22 ft.

The shot rock fill, which was disposed of on-site from 1958 to 1963, consists of gravel-size angular dolostone in a matrix of red brown to gray brown sand, silt and clay. Where present, this fill overlies miscellaneous fill waste. No fill, either miscellaneous or shot rock, is present at OBG-1. The thickness of the shot rock fill varies from 4 ft at OBG-2 to 8 ft at OBG-6. The thickness tends to vary at each monitoring well and soil boring location, generally increasing in thickness to the south.

Miscellaneous fill, reportedly placed on-site between the 1930's and 1950's, was encountered from near the ground surface, to several feet below grade at each well and soil boring, with the exception of OBG-1. The miscellaneous fill is generally olive green, black, or gray in color and consists of reworked sand and gravel with ash, charred wood, glass, cinders, slag, and other materials. While the overall fill thickness tends to increase to the south toward the Niagara River, the greatest thickness of miscellaneous fill occurs in the central portion of the site. The

thickness of the miscellaneous fill varies from 3 ft at OBG-2 at the northern portion of the site to 12.5 ft at OBG-4, SB-2 and SB-3 located near the south portion of the site. The logs for the earlier borings completed by ESI did not differentiate between the shot rock and miscellaneous fill.

As illustrated by Figure 5 the total thickness of fill (shot rock and miscellaneous fill) generally increases towards the south. Total fill thickness ranges from 3 ft at OBG-2 to 16 ft at OBG-6 located adjacent to the southern boundary of the site.

Alluvium consisting of olive-gray interbedded fine sand and silt was encountered beneath the fill in the southern portion of the site. The northern extent of alluvium is near SB-2. SB-2 is located approximately 15 ft north-northeast of OBG-4. At soil boring SB-2, the top of the alluvium was encountered at 12.5 ft bgs. The boring was terminated at the base of the fill. The thickness of the alluvium at OBG-4 is at least 6 ft. However, the boring was terminated prior to reaching the base of this deposit. At monitoring well B-12, located approximately 150 ft south of OBG-4, the thickness of the alluvium is approximately 13 ft (17 to 30 ft bgs). At monitoring well B-1, located near the southern property boundary, the thickness of the alluvium is approximately 20.5 ft (15 to 35.5 ft bgs). These data indicate that the thickness of alluvium increases to the south, which is consistent with the location of the Niagara River.

Information from the ground water investigation completed by CEC indicated that beneath the lacustrine clay or alluvium, a glacial till is present on top of bedrock. The till was encountered at depths ranging from 32 ft bgs at B-12 to 35.5 ft bgs at B-1 (see Appendix B). The thickness of the till ranges from approximately 3 ft at monitoring wells B-1 and B-3 to 7 ft at monitoring well B-12. A detailed description of the glacial till was not presented in the ground water investigation completed by CEC in 1983.

The bedrock underlying the site occurred at depths ranging from 32 ft bgs at B-3 to 39 ft bgs at B-12 (CEC, 1983). The bedrock is the Upper Silurian Lockport Group (Rickard and Fisher, 1970). This group is 150 to 200 ft thick and consists of the Guelph, Oak Orchard, Eramosa and Goat Island Dolostones and the Gasport Limestone. The bedrock unit beneath the site is the Oak Orchard Formation. Wells that fully penetrate the Oak Orchard at the nearby Occidental Chemical Companies S-Area indicate that this formation averages 90 to 95 in thickness (Malcolm Pirnie, 1989). The upper portion of bedrock, as observed at the adjacent new WTP Site, is highly fractured and contains both horizontal bedding planes and vertical fractures (O'Brien & Gere, 1991a).

Ground water elevation data were collected from each newly installed monitoring well on three occasions. These data are summarized on Table 1. The data indicate that the depth to ground water varies between 3.5 to 10 ft below the ground surface. Ground water flow maps of the Eastern Area site were prepared for ground water elevation data collected in March 1995 and February 1996 and are presented as Figures 6 and 7,

respectively. Figure 6 illustrates that ground water flow direction is in March 1995 was generally to the south towards the Niagara River. Figure 7 illustrates ground water flow over a larger area of the former Water Treatment Plant property, which includes the Eastern Area and Western Area. As illustrated on this figure, ground water mounding was occurring northwest of the Eastern Area site between Treatment Plant A and Treatment Plant B in February 1996. Ground water flow is was generally radial around a mound. This is evidenced by the gradient proximal to the mounded area is constant in all directions at 0.011 ft/ft. However, the hydraulic gradient in the central and southern portion of the Eastern Area site is 0.008 ft/ft, and is more representative of the overall flow gradient and direction.

The following conditions were presumed to impact ground water flow in 1995 and 1996.

- The Water Treatment Plant (WTP) Filtered Water Reservoir lies between Treatment Plant A and Treatment Plant B (Figure 6) on the western side of the WTP. The Filtered Water Reservoir is approximately 190 ft by 190 ft and 20 ft deep. The depth of this structure extends below the water table. Backfill and disturbed subsurface conditions will effect ground water flow patterns. Shallow ground water will tend to accumulate in more permeable material, such as backfill around foundations. Shallow ground water is mounded around the Reservoir and forced to flow radially away from and around the sides of the Reservoir. Additionally, this structure is approximately 50 years old. The potential exists for leakage to occur from this structure given its age. A constant water loss from this Filtered Water Reservoir, although never documented, would account for the accumulation of water and the resulting mounding effect observed in this area. The mounding could also be caused by accumulation of water infiltrating through the soils from precipitation.

- Many underground pipes exist on the Western side of the WTP (see Appendix E). Pipes were originally installed at the site prior to 1915 and have been continuously added to the property over the years. As part of the installation trenches were likely excavated and backfill, consisting of previously excavated material or various types of crushed stone, was placed in the trenches. The pipes and trenches have been extended to the eastern side of the WTP. These activities will result in more permeable zones within the overburden and fill. This will provide a more direct conduit for migration of ground water from the western to the eastern side of the site. Therefore, the potential for ground water containing S-Area contamination to migrate toward the Eastern Area site is increased.

- Over the period of 1915 to 1985 the shoreline has significantly changed as illustrated by the figure included in Appendix E (Malcolm Pirnie 1989). The most drastic of these changes occurred between 1915 and 1935. From 1915 to 1933 the shoreline was built southward, leaving a channel located approximately 160 ft east from

the pumping station which extended east approximately 170 ft prior to turning south and heading out to the Niagara river. This area was filled in between 1933 and 1935. This former channel would create a hydraulic avenue for the migration of S-Area contamination onto the Eastern Area site.

Figure 8 presents a ground water flow map of the western and eastern parcels for May 2000 which was prepared by Miller Springs Remedial Management, Inc. in conjunction with the ongoing S-area remedial program. As indicated by this flow map, ground water flow in May 2000 was to the south under a hydraulic gradient of 0.01 ft/ft. The mounding condition observed in 1996 is no longer occurring. This is likely due to the removal of the filter water reservoir and the capping of the western parcel following demolition of the buildings.

The ground water contours at the southern end of the site show influence of the ground water collection trench installed as part of the S-area remedial program. The contours indicate that the trench is effectively intercepting ground water migrating from the Eastern Parcel. Further discussion of this trench is provided in Section 4 of this report.

3.2. Analytical results

3.2.1. Data usability

A data usability assessment was performed in accordance with *Guidance for Data Usability in Risk Assessment* (USEPA Office of Emergency and Remedial Response 1992). The overall goal of this assessment was to evaluate the potential cumulative effects of data quality issues on the final data generated by the laboratory. Additionally, an assessment of the need for a complete data validation was performed.

The data usability assessment was performed on the samples collected during this investigation. The data were collected according to the scope of work specified in the Work Plan. The analytical methods specified in the scope of work were performed according to method criteria.

Additional questions that were answered during the data usability assessment involved various factors that could potentially impact the data quality. Chain of custody was maintained. Field and analytical laboratory records were complete. The laboratory performed a typical level of review for this type of data package deliverable.

The laboratory method detection limits met method criteria; however, not all laboratory detection limits met regulatory standards.

The parameters that had detection limits greater than the regulatory limits are as follows:

Analyte	Regulatory Standard/Guidance (µg/L)	Method Detection Limit (µg/L)
Hexachlorobenzene	0.35	0.71
Pentachlorophenol	1	4.02
Benzo(a)anthracene	0.002	1.13
Chrysene	0.002	0.58
Benzo(b)fluoranthene	0.002	1.14
Indeno(1,2,3-cd)pyrene	0.002	0.63

It should be noted, however that the regulatory limits identified are guidance values.

While these laboratory detection limits do not meet regulatory standards, they did meet the sensitivity requirements of the analytical methods. This may affect the ability to interpret results with respect to standards and criteria; however, this deviation does not represent a significant impact to overall data quality, and does not in itself, necessitate a complete data validation.

Data quality with respect to precision was evaluated through the analysis of field and laboratory duplicate samples. Relative percent differences were calculated for field and laboratory duplicates and, for this investigation, the data were 100% usable with respect to precision.

Data quality with respect to accuracy is indicated by matrix spikes, laboratory control samples and surrogate recoveries. The acid fraction of one subsurface soil for SVOCs analyses was determined to be unusable based on matrix spike recoveries less than 10 %. The results for two PCB/pesticides analytes were determined to be unusable in one surface soil sample based on matrix spike recoveries less than 10 %. Therefore, data usability with respect to accuracy was 99% for SVOCs analyses and greater than 99% for PCB/pesticides.

The calculations for data usability are presented below:

Total # analytes per SVOC analyses = 88
Total # SVOC analyses =17 samples
Total # of SVOC analytes analyzed =1496

Rejected SVOC compounds (acid fraction in one sample) = 14
Data Usability Calculation =

$$1496 - 14/1496 \, X \, 100 = 99.06\%$$

Total # analytes per PCB/pesticide analyses = 28
Total # PCB/pesticide analyses = 17 samples
Total # of PCB/pesticide analytes analyzed = 476

Total of rejected PCB/pesticides = 2
Data Usability Calculation =

$$476 - 2/476 \, X \, 100 = 99.57\%$$

Holding times, sample preservation, and blank sample results are indicators of the representativeness of the analytical data. Data usability with respect to representativeness was unaffected by low level blank contamination detected in some blanks associated with these samples and for this investigation, the data were 100% usable with respect to representativeness.

Comparability is maintained provided that the analytical methods remained the same over time. A major component of comparability is the use of standard reference materials for calibration and QC. These standards are compared to other unknowns to verify their concentrations. Since standard analytical methods and reporting procedures as specified in the Work Plan were consistently used by the laboratory, the data usability with respect to comparability was not affected.

Data usability with respect to completeness is the percentage of sample results that have been determined to be usable during the data evaluation process. Data usability with respect to completeness was greater than 99% overall.

Data completeness is calculated as follows for each individual method:

$$\% \text{ Completeness} = \frac{\text{Total Number of sample results "usable" for qualitative and quantitative purposes}}{\text{total number of samples}}$$

(Number of total sample results = number of analytes per sample X number of samples)

Based on the results of the usability assessment, a further complete data validation is not needed for these samples to be used as part of this investigation.

3.2.2. S-Area Indicator Compounds

As stated in section 1.1 of this document, the site is bounded to the west by the former City of Niagara Falls WTP. The soils and ground water at the WTP site have been documented to contain compounds associated with the Occidental Chemical Corporation S-Area, which is located adjacent to the western boundary of the property. Under the Stipulation and Judgement Approving Settlement Agreement (United States District Court, 1983, S-Area Landfill), Occidental is required to remediate the S-Area and the western portion of the former WTP property. Compounds identified by the NYSDEC to be indicators of S-Area materials (Appendix F) include:

VOCs: vinyl chloride, 1,2-dichloroethene, trichloroethene, benzene, tetrachloroethene, and chlorobenzene.

SVOCs: 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, 2,4,5- trichlorophenol, hexachlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene, 1,2,3,4-tetrachlorobenzene, octachlorocyclopentene and total organic halides (TOX).

In the discussions of the analytical results which follow, the VOCs and SVOCs have been subdivided into groups. For VOCs, the S-Area indicator compounds are discussed separately from the other VOCs detected. The SVOCs have been subdivided into three groups for clearer presentation of the results: S-Area indicator compounds, polynuclear aromatic hydrocarbons (PAHs), and other SVOCs.

3.2.3. Ground Water

Volatile organic compounds

Other volatile organic compounds

Other volatile organic compounds detected on-site include chloroform, 2-butanone, 1,1,1-trichloroethane, toluene, xylene, 1,1-dichloroethane and carbon disulfide. Acetone was detected at low concentrations in each well with the exception of OBG-3. Acetone, which was detected in the associated blank samples, is generally considered a laboratory introduced contaminant, and is therefore not considered to be present in the ground water and will not be discussed. The ground water VOC data are presented in Table 2.

The data indicate that along the western and southern portions of the site, total "other" VOC concentrations ranged from 0.7 to 20 µg/L at monitoring wells OBG-2, OBG-4, OBG-5 and OBG-6 (see Figure 59).

Other VOCs detected in OBG-2, OBG-4, OBG-5 and OBG-6 at concentrations below NYS Class GA standards include 1,1-dichloroethane, 2-butanone, and 1,1,1-trichloroethane. Additionally, carbon disulfide, for which no standard exists, was detected at a concentration of 1 µg/L in OBG-6.

The analytical results indicate that petroleum related compounds were detected at OBG-2, located in the northwest portion of the site. Specifically, toluene was detected at 5 µg/L, ethylbenzene at 1 µg/L, and xylene at 8 µg/L. The concentrations of toluene and xylene equal or exceed the standard of 5 µg/L. The compounds 2-butanone and 1,1,1-trichloroethane were detected at 5 and 1 µg/L, respectively. The concentrations of 1,1,1-trichloroethane and ethylbenzene are below NYS Class GA standards.

Monitoring wells OBG-1 and OBG-3, located in the northern portion of the site, also contained low levels of VOC at concentrations below NYS Class GA standards. At upgradient well OBG-1, only chloroform was detected at a concentration of 0.9 µg/L. At OBG-3, 2-butanone and 1,1,1-trichloroethane were detected at 3 and 0.6 µg/L, respectively.

S-Area volatile organic compounds

S-Area VOCs were detected in the western and southern portions of the site at concentrations ranging from 24.6 µg/L to 134 µg/L. These concentrations are significantly higher than the total non S-Area VOCs identified. S-Area VOCs detected include, 1,2-dichloroethene, trichloroethene, benzene, tetrachloroethene and chlorobenzene. Vinyl chloride was not present in the ground water. No S-Area VOCs were detected in the northern and eastern portions of the site (Table 2 and Figure 9).

Chlorobenzene, an S-Area VOC, was detected at concentrations exceeding NYS Class GA standards at monitoring wells OBG-4, OBG-5 and OBG-6. The concentrations ranged from 21 µg/L at OBG-6 to 130 µg/L at OBG-4. Chlorobenzene was not detected at OBG-1, OBG-2 and OBG-3.

Benzene was detected at OBG-4 and OBG-5 at concentrations of 2 µg/L, which exceeds the NYS standard of 0.7 µg/L. The compound 1,2-dichloroethene (total) was detected below standards in wells OBG-4, OBG-5, and OBG-6 at concentrations of 2, 0.6, and 1 µg/L, respectively. Trichloroethene and tetrachloroethene were detected below standards in well OBG-6 at concentrations of 0.6 and 2 µg/L, respectively.

Semivolatile organic compounds

PAHs

PAHs detected in the ground water include phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, naphthalene, 2-methylnaphthalene,and chrysene. Results are presented on Table 3. PAHs were not detected in wells OBG-1, OBG-3, OBG-4 and OBG-5. Low concentrations of PAHs were detected in wells OBG-2 and OBG-6, located on the west and south portions of the site, respectively. At wells OBG-2 and OBG-6, total concentrations were 2.8 and 14 µg/L, respectively. Individual concentrations ranged from 0.8 to 4 µg/L.

Other SVOCs

Other SVOCs were detected at monitoring wells OBG-4, OBG-5 and OBG-6 located on the southern and western portion of the site. The compounds detected include 4-methylphenol and 3,3-dichlorobenzidiene at concentrations between 0.9 and 5 µg/L. No standards exist for 4-methylphenol and 3,3'dichlorobenzidine. SVOCs were not detected in monitoring wells OBG-1, OBG-2 and OBG-3.

S-Area SVOCs

The data indicate that the highest total concentrations of S-Area SVOCs were detected in monitoring wells OBG-2, OBG-5 and OBG-6, located on the southern and western portions of the site (Table 3). S-Area compounds detected at these locations include 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene. The total concentration of these compounds ranged between 29 and 81 µg/L (see Figure 9 and Table 12). At monitoring wells OBG-3 and OBG-4, located on the east and west sides of the site, the total S-Area SVOCs detected were 1 µg/L of 1,2,4,5-tetrachlorobenzene and 1 µg/L of 1,4-dichlorobenzene. No S-Area compounds were detected in the northern portion of the site at OBG-1.

At OBG-2, located in the northwest portion of the site, 29 µg/L of total S-Area indicator parameters were detected. 1,2,4-trichlorobenzene was detected at 7 µg/L and 1,2,3,4-tetrachlorobenzene was detected at 15 µg/L. Both these compounds exceed ground water standards of 5 µg/L. Other compounds detected below standards include 1,3-dichlorobenzene, 1,4-dichlorobenzene and 1,2,4,5-tetrachlorobenzene at concentrations of 4, 1, and 2 µg/L, respectively. In addition, 1,2,3,4-tetrachlorobenzene was detected at 15 µg/L. No standards or guidelines exist for this compound.

At OBG-5, the only S-Area SVOCs detected include 1,3-dichlorobenzene and 1,4-dichlorobenzene at 30 and 25 µg/L, respectively. These concentrations exceed the Class GA respective standards.

At monitoring well OBG-6, the following S-Area indicator parameters were detected above Class GA standards: 1,4 -dichlorobenzene (46 µg/L), 1,2-dichlorobenzene (9 µg/L), and 1,2,4-trichlorobenzene (7 µg/L) and 1,2,3,4-tetrachlorobenzene (15 µg/L).

At monitoring well OBG-3, located along the northeast portion of the site, the only S-Area indicator parameter detected was 1,2,4,5-tetrachlorobenzene at a concentration of 1 µg/L. At OBG-4, located in the western portion of the site, 1,4-dichlorobenzene was detected below standards at 1 µg/L.

Inorganics

Samples for inorganics were collected for both total (unfiltered) and soluble (filtered) analyses. Results of these analyses are presented on Table 4. Filtered samples were collected from each well since the ground water exhibited turbidity values greater than 50 NTU at each location. Ground water samples that exhibit elevated NTU readings generally contain suspended sediment, which in turn contains inorganics. As required by the analytical procedures, ground water samples are preserved with nitric acid. In samples with sediment, the preservation causes inorganics in the sediment to solubilize into the water. In our opinion, samples for inorganic analyses collected from monitoring wells

with a high turbidity are not considered representative of those inorganics which migrate with the ground water system. Therefore, filtered samples, where the sediment is removed prior to preservation, are analyzed to better assess the contribution of suspended sediments to the ground water quality results.

The result of the total (unfiltered) sample analyses indicate concentrations of arsenic, barium, chromium, copper, iron, lead, magnesium, manganese, sodium, mercury, and zinc in various monitoring wells at concentrations above NYS Class GA standards (see Table 4). The results of the soluble (filtered) sample analyses indicate that only iron, magnesium, sodium and manganese were detected above Class GA standards. It is likely that the elevated concentrations of other inorganics in the unfiltered samples are due to sediment in these samples.

In general, higher concentrations of soluble iron, magnesium and sodium were detected in monitoring wells screened in the fill material than the upgradient well where no fill material was encountered. This suggests that some of these inorganics are associated with the fill material.

PCB/pesticides

The results of the PCB/pesticide analyses are presented on Table 5. The data indicate that no PCBs were detected. Low levels of pesticides were detected in each ground water monitoring well with total pesticide concentrations ranging from 0.0131 to 0.34 µg/L (see Table 5 and Figure 9). The data indicate that the highest concentrations of pesticides were detected in the southern and western portions of the site at monitoring wells OBG-2, OBG-4 and OBG-6.

A total of thirteen pesticides were detected which include: alpha-BHC, beta-BHC, delta-BHC, lindane, heptachlor, heptachlor epoxide, endosulfan I, dieldrin, 4,4'-DDE, 4,4'-DDT, methyloxychlor, endrin ketone, and endrin aldehyde. In general, the Class GA standard, if it exists, is non-detect. Therefore where Class GA standards exist, the detected compound is above the standard. Detected concentrations ranged from a minimum of 0.001 µg/L of dieldrin at OBG-2 to 0.26 µg/L of delta-BHC at OBG-6.

Beta-BHC and its related isomers, including alpha-BHC and delta-BHC, were detected at the highest concentrations. The total concentrations of these compounds at OBG-2, OBG-4 and OBG-6 ranged from 0.129 µg/L at OBG-2 to 0.34 µg/L at OBG-6. These compounds were not detected in upgradient well OBG-1. At OBG-3, located along the eastern site boundary, the concentrations of beta-BHC and its related isomers were 0.0132 µg/L, which is approximately one order of magnitude less than levels found in the southern portion of the site.

The other pesticides, excluding beta-BHC and its related isomers, were detected at concentrations ranging from non-detect to 0.18 µg/L. The concentrations tend to increase in the southern portion of the site

Total S-Area Compounds

To further evaluate the distribution of the S-Area compounds, the VOC and SVOCs compounds were totaled together. This summation is presented on Table 12. The data indicate that Total S-Area constituents in ground water range from non-detect to 135 µg/L. The data indicate that the highest concentrations of S-Area compounds are present in the southern portions of the site at monitoring wells OBG-4, OBG-5 and OBG-6. In this area, the total S-Area indicator compound concentrations range from 88.6 to 135 µg/L. OBG-2, located along the western portion of the site, contained 29 µg/L of S-Area compounds consisting only of SVOCs. Lower concentrations of S-Area indicator compounds were noted in the northern and eastern portions of the site. At OBG-1, located near the north property line, no S-Area compounds were detected and at OBG-3, located along the eastern portion of the site, only 1 µg/L of S-Area compounds were detected.

3.2.4. Surface soil

Semivolatile organic compounds

PAHs

PAHs were detected in each surface soil sample. The highest concentrations were generally found at the southern end of the site. The data summarized on Table 7 indicate that PAH compounds are detected at six surface soil locations. PAH compounds detected include: naphthalene, 2-methylnapththalene, acenaphthalene acenaphthene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene. The total concentrations of these compounds ranged from 321 to 7,003 µg/Kg which are below the typical background concentrations in the Niagara Falls area.

Background concentrations discussed herein were excerpted from a letter from the Niagara County Health Department (NCHD) to the NYSDEC (NCHD, 1987). This letter is included in Appendix G. The background information indicates that the most prevalent SVOCs detected in Niagara Falls surface soils are PAHs including benzo(b)fluoranthene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene at concentrations up to 10,000 µg/Kg.

Concentrations of benzo(a)anthracene, chrysene and benzo(a)pyrene were found above the TAGM 4046 cleanup goals at SS-1, SS-2, SS-3, and SS-5 locations.

Other SVOCs

Other SVOCs detected included di-n-butylphthalate, 3,3'-dichlorobenzidine, carbazole, dibenzofuran and, 2,4,6-trichlorophenol. The concentrations ranged from 19 µg/Kg of dibenzofuran at SS-2 to 470 µg/Kg of 3,3'-dichlorobenzidine at SS-1. Total concentrations ranged

from 26 to 681 µg/Kg at SS-4 and SS-1, located in the southwest and southeast portions of the site, respectively.

S-Area Indicator Parameters
S-Area indicator parameters were detected in five of the six surface soil samples (see Table 13). The concentrations of total S-Area indicator parameters ranged from 57 µg/Kg at SS-6, located in the northeastern portion of the site, to 5390 µg/Kg at SS-3 in the southern portion of the site.

The S-Area indicator parameters detected included 1,4-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobenzene, 1,2,4-trichlorobenzene, hexachlorobutadiene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene, and 1,2,3,4-tetrachlorobenzene. Concentrations of the majority of these compounds were generally less than the typical Niagara Falls background concentration of 100 µg/Kg with the exception of hexachlorobenzene, 1,2,3,4-tetrachlorobenzene, 1,2,4-trichlorobenzene and 1,2,4,5-tetrachlorobenzene. The highest concentrations of these compounds were detected in the southern portion of the site with the exception of SS-4, where no S-Area compounds were detected.

Hexachlorobenzene concentrations in the southern portion of the site ranged from 840 µg/Kg at SS-2 to 2400 µg/Kg at SS-1. These concentrations are above the TAGM 4046 cleanup objective of 410 µg/Kg. In the northern portion of the site, the hexachlorobenzene concentrations ranged from 28 to 380 µg/Kg. In the southern portion of the site, 1,2,3,4-tetrachlorobenzene was detected at concentrations ranging from 270 µg/Kg at SS-2 to 3000 µg/Kg at SS-3. In the northern portion of the site, 1,2,3,4-tetrachlorobenzene concentrations ranged from 24 to 180 µg/Kg. The compound 1,2,4- trichlorobenzene was detected above 100 µg/Kg only at SS-1 and 1,2,4,5-tetrachlorobenzene was only detected at locations SS-1 and SS-3 above 100 µg/Kg. There are no TAGM 4046 cleanup goals for these compounds. Both of these samples were collected from the southeast portion of the site.

Hexachlorobutadiene was detected at surface soil sample SS-3. The concentration ranged from 440 to 690 µg/Kg in the duplicate sample collected at this location. TAGM 4046 does not contain a cleanup objective for this compound.

Inorganics
Inorganic surface soil concentrations were compared to TAGM 4046 recommended soil cleanup objectives and typical background concentrations of soils from New York State using references by Bowen, (1979), Shacklette and Boerngen (1984), Shacklette et al (1971), and Walsh et al (1977). The data indicate that concentrations are within the typical background range with a few exceptions.

Concentrations of chromium, copper, lead, magnesium, mercury, and zinc were above the TAGM 4046 recommended cleanup objectives. Copper, lead, magnesium, and mercury were also detected in each

sample at concentrations above the typical background range (see Table 8). Copper concentrations ranged from 22 mg/Kg at SS-3 to 97 mg/Kg at SS-5. Lead ranged from 14.5 mg/Kg at SS-4 to 161 mg/Kg at SS-5. Magnesium was detected at concentrations ranging from 42,300 mg/Kg at SS-3 to 10,500 mg/Kg at SS-4. Mercury was detected at concentrations ranging from 0.54 mg/Kg at SS-3 to 4.7 mg/Kg at SS-5.

In addition to the inorganics discussed above, nickel and selenium were detected above typical background concentrations in several samples. Nickel was detected at 30 mg/Kg at SS-5, which is above the typical concentration of 25 mg/Kg. Selenium was detected at SS-4 and SS-5 at concentrations of 0.7 and 0.73 mg/Kg. These concentrations are above the typical concentration of 0.125 mg/Kg.

PCB/pesticides

The PCB/pesticide analytical data are presented on Table 9. The data indicate that no PCBs were detected in the Eastern Area site. The data indicate that highest total concentrations of pesticides were detected in the southern portion of the site when compared to the northern portion of the site. The highest concentration in the southern portion of the site was 1,080 µg/Kg at SS-2 and the highest concentration in the northern portion of the site was 61.7 µg/Kg at SS-5.

Primary pesticides detected were beta-BHC and its related isomers. Background information from the NCHD indicate that background concentrations of beta-BHC and its related isomers in Niagara Falls surface soils are found at concentrations up to 1000 µg/Kg (see Appendix F). Gamma-BHC was detected at one location at a concentration of 4.2 µg/Kg and delta-BHC was detected at one location at 12 µg/Kg (O'Brien & Gere, 1991a).

The data indicate that beta-BHC and its related isomers (alpha-BHC and delta-BHC) were found at concentrations significantly below the background concentration of 1000 µg/Kg with the exception of SS-2, where beta-BHC and its related isomers were detected slightly above the Niagara Falls area background concentration at 1080 µg/Kg. In this sample, alpha and beta-BHC were above the TAGM 4046 level. SS-2 is located in the south-central portion of the site.

Other pesticides detected at low concentrations included: 4,4'DDE, 4,4'-DDD, dieldrin, G-chlordane, endosulfan-1, heptachlor epoxide, and Lindane. The concentrations ranged from 0.12 µg/Kg to 14 µg/Kg. The highest concentrations were found in the southern portion of the site.

3.2.5. Fill

Subsurface soils – fill material

Subsurface soils were collected on two occasions in the Eastern Area site. As part of the Buffalo Avenue Site Investigation completed in 1991, subsurface soil samples were collected from borings designated as SB-

38, SB-39 and SB-40 located on the Eastern Area property (See Figure 2). Selected soil samples were analyzed for VOCs, SVOCs, inorganics and PCBs/pesticides (see Tables 10A through 10D). Samples collected from shot rock are designated with a "SR" and samples collected from the miscellaneous waste fill were designated with a "W".

Additional subsurface soil samples were collected from the site in 1996 to evaluate if the fill material is characteristic of hazardous waste as defined by 40 CFR Part 261 and 6NYCRR Part 371. The results of these analyses are summarized on Table 11.

Volatile organic compounds

Other VOCs

Four samples from SB-38 through SB-40 were submitted for VOC analyses. At SB-40W toluene was detected at 0.1 µg/Kg. With the exception of this low concentration of toluene, no other VOCs were detected in subsurface soils.

S-Area VOCs

S-Area VOCs detected include 1,2-dichloroethene (total), trichloroethene and tetrachloroethene. The highest concentrations of the S-Area compounds were found to be present in the southern portion of the site.

At SB-38W, SB-39W and SB-40SR, the only S-Area VOC detected was tetrachloroethene at concentrations of 1, 30 and 1100 µg/Kg, respectively. The compounds 1,2-dichloroethene (total), trichloroethene and tetrachlorethene were detected at SB-40W at concentrations of 5, 13 and 30 µg/Kg, respectively. These levels are below their respective TAGM 4046 cleanup objectives.

Each boring is located on the east portion of the Eastern Area site, with SB-38 to the northeast, SB-39 in the central portion and SB-40 in the southeast portion.

Semivolatile organic compounds

PAHs

PAH compounds were detected in each of the three soil borings locations at concentrations ranging from 656 µg/Kg at SB-40SR to 4841 µg/Kg at SB-38W. No PAHs were detected at SB-40W. The highest concentrations of PAHs were detected in the northern portion of the site. PAH compounds can be attributed to incomplete combustion and may also be associated with fill material. PAHs identified include: naphthalene 2-methylnaphthalene, acenaphthene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)pyrene, and fluorene. Benzo(a)pyrene, detected in samples 38W and 39W, was the only identified constituent that exceeded the recommended cleanup objective per TAGM 4046.

Other SVOCs

Other SVOCs were detected in each of the samples analyzed at concentrations ranging between 820 µg/Kg at SB-38W to 1820 µg/Kg at SB-40SR. The primary compounds detected were bis(2-ethylhexyl)phthalate and di-n-butylphthalate, which are common plasticizers. The only other SVOCs detected were dibenzofuran at 59 µg/Kg in SB-39 W, butylbenzenylphalate at 210 µg/L in SB-38W, and hexachloroethane at 310 µg/Kg in SB-40SR.

S-Area SVOCs

S-Area SVOCs include hexachlorobutadiene, hexachlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene and 1,2,4-trichlorobenzene. S-Area SVOCs were only detected in the southern portion of the site at SB-40SR and SB-40W at concentrations of 40,500 and 7,023 µg/Kg, respectively. No S-Area SVOCs were detected at SB-38W or SB-39W.

The data collected from SB-40 indicate that higher concentrations of S-Area compounds were detected in the sample collected from "shot rock" (2-5 ft bgs) when compared to the sample collected from the miscellaneous waste material (5-12 ft). The S-Area SVOCs detected at the highest concentrations were 1,2,4-trichlorobenzene, hexachlorobutadiene, and hexachlorobenzene at individual concentrations ranging from 1600 to 19000 µg/Kg. The concentrations of 1.2,4-trichlorobenzene and hexachlorobenzene at SB-40 were above the cleanup objectives as outlined in TAGM 4046.

Inorganics

Inorganic analyses results were compared to TAGM 4046 recommended soil cleanup objectives and to typical background concentrations of soils from New York State using references by Bowen (1979), Shacklette et al (1984), Shacklette et al (1971), and Walsh et al (1977). Arsenic, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel and zinc were detected in one or more samples at concentrations exceeding typical background concentrations. Concentrations of copper, lead, mercury, nickel, and zinc were above the TAGM 4046 cleanup goals.

Pesticides/PCBs

No PCBs were detected at any soil boring location. Several pesticides were detected in the subsurface soil samples. The highest concentrations were observed in the shot rock sample from SB-40. Of the detected compounds, one or more of the following compounds were found at concentrations above the TAGM 4046 soil cleanup objectives in one or more of the soil samples: lindane, aldrin, heptachlor epoxide, and 4,4 DDT.

TCLP analyses

Subsurface soil samples were collected from SB-1 through SB-5 and analyzed for TCLP volatile organics (VOCs), semivolatile organics (SVOCs), inorganics, and pesticides.

TCLP lead and TCLP mercury were detected (see Table 11). TCLP lead was detected at concentrations of 0.9 mg/l, 2.6 mg/l and 4.9 mg/l in SB-1, SB-3 and SB-4, respectively. These concentrations are below 5 mg/l, which is the level for characteristic hazardous waste as set forth by 40 CFR Part 261. TCLP mercury was detected at one location. At SB-2, mercury was detected at a concentration of 0.0006 mg/l. This value is less than 0.2 mg/l as set forth by 40 CFR Part 261.

TCLP volatile organics (VOCs), semivolatile organics (SVOCs) and pesticides were not detected in any subsurface fill samples.

4. S-area ground water collection and planned freeze/thaw beds

4.1. S-area ground water collection trench

As stated in Section 1, Occidental Chemical Corporation's S-Area is located to the west of the former City of Niagara Falls WTP. Under the RRT Stipulation for this site, Occidental Chemical Corporation installed a ground water collection trench along the southern boundary of the Occidental site which was extended to the eastern side of the former WTP property as shown on Figure 11. The collection trench was installed to between 30 and 32 ft below grade on the southern side of the site. The trench is backfilled with gravel and intercepts the shallow ground water system migrating from the eastern area site. Collected water is transmitted to the S-Area site for treatment. This system minimizes the potential for offsite migration of impacted ground water from the Eastern Area site. Pertinent portions of the collection system design are included as Exhibit A.

4.2. Future property use

The City of Niagara Falls operates a new WTP on the property immediately to the east of the Eastern Area site. The capacity of the WTP is 35 mgd. As part of the water treatment process, approximately 280 tons of dry solids are estimated to be produced annually. The City of Niagara Falls has completed a pilot scale study and a preliminary design for a freeze/thaw facility to be used to dewater the solids prior to disposal. The City is planning to place the freeze/thaw beds on the Eastern Area site due to the area requirements and proximity to the WTP.

The preliminary design layout for the planned freeze/thaw beds is shown on Figure 11. The design calls for 2 beds with a total area of 3.4 acres. As shown on Figure 11, the beds would cover the majority of the Eastern Area Site.

The beds would be constructed of a polyethylene liner sandwiched between two layers of geotextile to minimize the potential for puncture. The beds will also have a stone base topped with asphalt pavement. The pavement would facilitate removal of the solids when needed. A new pump station and piping would be constructed to transfer the sludge to the pads for dewatering.

Placement of the freeze thaw beds and associated support structures on the Eastern Area site would cover a large portion of the ground surface of the property and limit exposure to surface soils that may contain levels of constituent above NYSDEC clean up objectives. In addition, the use of the property will continue to be for municipal activities associated with the WTP.

5. Summary and conclusions

5.1. Summary

The overburden materials at the Eastern Area site, in descending order from the ground surface, are fill, lacustrine clay, alluvium, glacial till and bedrock. In the northern quarter of the site, the lacustrine clay was found to be present at the ground surface. Fill was not present in this area. In the southern three-quarters of the site, fill was encountered at the ground surface and extended to depths ranging from 3 ft to 16 ft below grade. The thickest fill was generally found in the southernmost portion of the site. This is consistent with the historical filling that took place along the shoreline of the Niagara River.

In 1995 and 1996, ground water flow in the Eastern Area site was generally south to southeast, with radial flow at the northwestern portion of the WTP property. This flow direction was primarily a function of a ground water mounding condition in the vicinity of the Filtered Water Reservoir located on the western portion of the WTP property. The radial ground water flow pattern caused by this mound will result in the potential for ground water to migrate from the western to the eastern portion of the WTP site. This potential for ground water migration is further enhanced by the presence of fill channels and piping backfill within the western and eastern WTP property.

As indicated on Figure 8, ground water flow in May 2000 was to the south under a hydraulic gradient of 0.01 ft/ft. The mounding condition observed in 1996 is no longer occurring. This is likely due to the removal of the filter water reservoir and the capping of the western parcel following demolition of the buildings.

The ground water contours at the southern end of the site show influence of the ground water collection trench installed as part of the S-area remedial program. The contours indicate that the trench is effectively intercepting ground water migrating from the Eastern Parcel.

The analytical data indicate that VOCs and SVOCs are the primary constituents detected in ground water, although low levels of pesticides were also detected. Surface soils also contained detectable levels of SVOCs and pesticides. The areal distribution of these compounds in both media is similar, with highest concentrations observed in the southern portion of the site. TCLP analysis of fill samples showed that lead and mercury were detected; however, concentrations were below the

maximum allowable TCLP regulatory levels. The following discusses in more detail the distribution of VOCs, SVOCs, inorganics and pesticides/PCBs in the media sampled:

Analytical results for VOCs and SVOCs were divided into groups of compounds including, S-Area indicator parameters where they were identified to be present. S-Area compounds are those associated with the Occidental Chemical Corporation S-Area, which is located adjacent to the western boundary of the WTP property.

Volatile organic compounds
VOCs were detected in ground water and subsurface soil samples. Surface soil samples were not analyzed for VOCs. The data indicate that the highest concentrations of VOCs detected in the ground water were at monitoring wells OBG-2, OBG-4, OBG-5 and OBG-6 located in the southern and western portions of the site. The total VOC concentration at these locations ranged between 20 and 134.7 µg/L, with individual compounds above NYS Class GA standards in at least one well. S-Area VOCs accounted for a majority of the VOCs detected, with concentrations ranging from 24.6 to 134 µg/L. The S-Area VOCs were found to be present exclusively in the southern half of the site. In the northern and northeast portion of the site (wells OBG-1 and OBG-3), total VOC concentrations were 0.9 and 3.6 µg/L, respectively. No S-Area VOCs were detected in ground water samples in the northern portion of the site.

Semivolatile organic compounds
SVOCs were detected in ground water, surface soil and subsurface soil. SVOCs were not detected in the fill TCLP analyses. The identified compounds were divided into 3 groups for discussion: PAHs, other SVOCs and S-Area SVOCs.

Low levels of PAHs were detected in ground water samples collected in the western and southern portions of the site. Total concentrations of PAHs ranged from 2.8 to 14 µg/L. In the surface soil samples, PAH compounds were detected in each soil sample. The highest concentrations were found in the southern portion of the site. Total concentrations ranged from 321 to 7,003 µg/Kg. Subsurface soil samples collected during the Buffalo Avenue Site Investigation detected PAH compounds in each of the three soil borings. PAH concentrations ranged from 656 to 4841 µg/Kg, with highest concentrations located in the northern boring, SB-38.

"Other" SVOCs were detected in the ground water on the southern half of the site at total concentrations of 0.9 to 6 7 µg/L. The only exceedance of ground water standards was found at OBG-6. "Other" SVOCs detected in the surface soil samples ranged from 26 µg/Kg at SS-4 to 681 µg/Kg at SS-1. Total concentrations of other SVOCs in the subsurface soil samples ranged from 820 to 1820 µg/Kg, with highest concentrations at SB-40, located in the southern portion of the site. No "other" SVOCs exceeded the cleanup goals listed in TAGM 4046.

S-Area SVOCs were primarily detected in the southern portion of the site. Total concentrations of 55 and 81 µg/L were detected in ground water at wells OBG-5 and OBG-6. Ground water standards for one or more S-area indicators were exceeded in wells OBG-2, OBG-5, and OBG-6. Surface soil S-Area SVOCs ranged in concentration from non-detect in the southwest corner of the site to 5390 µg/Kg in the southeast corner of the site. No specific distribution pattern was observed. Cleanup objectives presented in TAGM 4046 were exceeded for at least one compound at locations SS-1, SS-2, and SS-3. In the subsurface soil analyzed S-Area SVOCs were only detected in the southern portion of the site at concentrations ranging from 7,023 to 40,500 µg/Kg. The majority of the S-area SVOCs were detected in the southern portion of the site in soil boring SB-40 with TAGM 4046 cleanup goals exceeded for two compounds.

Inorganics

Results of total (unfiltered) sample analyses indicated elevated concentrations of ten inorganic compounds. Soluble (filtered) sample analyses indicate only four compounds were detected above Class GA standards suggesting that the inorganics found in the unfiltered samples were associated with suspended sediment. The four compounds identified in the filtered samples included iron, magnesium, sodium and manganese. In general, higher concentrations of inorganics were detected in ground water samples from monitoring wells screened in the fill material.

In surface soil samples, several inorganic compounds were detected above the typical background range and TAGM 4046 cleanup levels. There was no general pattern of occurrence observed. Exceedances of TAGM values occurred for copper, lead, magnesium, mercury, and zinc.

Subsurface soil samples collected during the Buffalo Avenue Site Investigation (SB-38, SB-39 and SB-40) contained levels of copper, lead, mercury, nickel, and zinc above TAGM 4046 cleanup goals. TCLP results for subsurface soil samples contained lead and mercury at concentrations of non-detect to 4.9 mg/Kg and non-detect to 0.0006 mg/Kg, respectively. Both compounds were detected at levels below the maximum allowable concentration as presented in 40CFR, Part 261. The distribution of inorganics concentrations in both surface soil and subsurface soil was sporadic through out the site.

Pesticides/PCBs

PCB compounds were not detected in any of the media sampled. Pesticides were detected in ground water, surface soil and subsurface soil.

Pesticides were not detected in the TCLP analysis of the fill samples.

In the ground water samples, fourteen pesticides were detected at concentrations ranging from 0.0131 to 0.34 µg/L. Highest

concentrations of these pesticides were detected in the southern and western portions of the site and were predominantly associated with delta BHC and its related isomers. Concentrations of at least one pesticide compound were above the ground water standards in each of the wells with the exception of OBG-3.

In surface soils, the highest concentrations of pesticides were detected in the southern portion of the site. At surface soil sample SS-2, located in the southern portion of the site, the total pesticide concentration detected was 1080 µg/Kg. Two pesticide compounds in this sample exceeded TAGM 4046 cleanup objectives. The highest total pesticide concentration in the northern portion of the site was 61.7 µg/Kg at SS-5.

In the subsurface soil samples collected on the Eastern Area site during the Buffalo Avenue Site Investigation, pesticides were detected in each boring. Total concentrations ranged between 223.5 and 7,274 µg/Kg. Concentrations detected were the highest in the southeast portion of the site. TAGM 4046 cleanup objectives were exceeded for at least one compound at each of the locations.

5.2. Conclusions

Part 371.1 of 6 NYCRR identifies which solid wastes are subject to regulation as hazardous wastes under Parts 370 through 373, 375 and 376 of 6 NYCRR. Under Part 371, *Identification and Listing of Hazardous Wastes*, criteria for identifying the characteristics of hazardous waste are presented. These criteria include characteristics of waste, and origin of wastes. Therefore, to evaluate whether the fill material in the Eastern Area site is a hazardous waste, analytical laboratory testing was performed.

Analyses were completed on the fill material for TCLP as defined in part 371.3 and 40 CFR part 261. The results of these analyses indicate that the Eastern Area site solid waste was below the regulatory levels listed in Part 371.3 Table 1.

The ground water in the southern portion of the Eastern Area site contained concentrations of VOCs and SVOCs above ground water standards. These VOCs and SVOCs are largely those identified as S-Area indicator compounds. It is suspected that the presence of these compounds in the ground water is the result of migration from the western portion of the WTP where S-Area compounds are known to be present. Installation of the S-area ground water collection trench across the southern (downgradient) side of the site should minimize the potential for offsite migration of these compounds.

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TABLES

Table 1

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Eastern/Western Area Monitoring Well Specifications

WELL NO.	GROUND ELEVATION (FT)	TOP OF PVC CASIN ELEVATION (FT)	WELL DEPTH (FT)	SCREEN INTERVAL (FT) Below Ground	GROUND WATER ELEVATIONS (FT) 3/28/95	2/8/96	9/18/96
OBG-1	573.04	575.83	17.45	15.0 - 5.0	569.83	Abandoned	Abandoned
OBG-2	570.06	574.22	17.46	15.0 - 5.0	565.29	564.79	565.42
OBG-3	571.64	574.35	17.5	15.0 - 5.0	564.06	563.77	564.00
OBG-4	573.94	577.21	20.36	17.0 - 7.0	563.94	566.64	563.82
OBG-5	578.64	576.22	19.74	17.0 - 7.0	563.79	563.51	563.74
OBG-6	573.34	576.33	20.36	17.0 - 7.0	563.78	563.79	563.73
OW262	575.0	574.85	24.1	24.1 - 19.1	--	563.37	--
OW274	572.6	572.51	8.5	8.5 - 3.5	--	565.00	Dry
OW276	572.0	571.81	8.5	8.5 - 3.5	--	564.15	564.14
OW279	571.0	570.92	8.5	8.5 - 3.5	--	574.59	568.85
OW280	570.0	570.32	9.1	9.1 - 4.1	--	568.20	566.53
OW281	570.8	571.14	9.0	9.0 - 4.0	--	568.47	568.49
OW282	571.6	571.15	12.7	12.7 - 5.7	--	566.02	567.43
OW283	572.2	572.10	13.5	13.5 - 8.5	--	569.77	568.97
OW285	570.3	570.06	10.3	10.3 - 5.3	--	567.82	568.96
OW286	571.2	570.93	11.2	11.2 - 6.2	--	568.96	567.16
OW289	573.6	574.43	18.0	18.0 - 8.0	--	567.83	569.46
OW290	575.3	575.17	19.8	19.8 - 14.8	--	567.10	568.18
OW294	575.1	574.60	30.0	30.0 - 25.0	--	563.97	564.90
CW11A	575.1	574.76	26.0	26.0 - 11.0	--	567.42	566.92
CW13A	574.2	573.57	16.5	16.5 - 1.5	--	565.55	566.46

Notes: * - Elevation based on East Parkway Survey Baseline.
** - Western area monitoring well elevations converted (from Hooker Chemical Datum) to USGS Datum (1929).
-- - Not Collected

Table 2

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Volatile Organic Compounds

Location:		OBG-1	OBG-2	OBG-3	OBG-3 BLD DUP	OBG-4	OBG-5	OBG-6	EQUIPBLK	QCTRPBLK	MW-16S
Date Collected:		2/15/95	2/14/95	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	2/14/95	9/91
	NYS GA Standards										
Chloromethane	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Bromomethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Vinyl chloride*	2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Chloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Methylene chloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Acetone	50 #	14	14	10 U	9 J	12	13	12	9 J	9 J	NA
Carbon disulfide	60	10 U	10 U	10 U	10 U	10 U	10 U	1 J	10 U	10 U	NA
1,1-Dichloroethene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
1,1-Dichloroethane	5	10 U	10 U	10 U	10 U	0.7 J	10 U	10 U	10 U	10 U	ND
1,2-Dichloroethene (total)*	5	10 U	10 U	10 U	10 U	2 J	0.6 J	1 J	10 U	10 U	ND
Chloroform	100	0.9 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
1,2-Dichloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
2-Butanone	50 #	10 U	5 J	3 J	2 J	10 U	4 J	10 U	10 U	10 U	NA
1,1,1-Trichloroethane	5	10 U	1 J	0.6 J	10 U	10 U	0.7 J	10 U	10 U	10 U	ND
Carbon tetrachloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Bromodichloromethane	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
1,2-Dichloropropane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
cis-1,3-Dichloropropene	0.4 *	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Trichloroethene*	5	10 U	10 U	10 U	10 U	10 U	10 U	0.6 J	10 U	10 U	ND
Dibromochloromethane	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
1,1,2-Trichloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Benzene*	1	10 U	10 U	10 U	10 U	2 J	2 J	10 U	10 U	10 U	ND
trans-1,3-Dichloropropene	0.4 *	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Bromoform	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
4-Methyl-2-pentanone	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA
2-Hexanone	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA
Tetrachloroethene*	5	10 U	10 U	10 U	10 U	10 U	10 U	2 J	10 U	10 U	ND
1,1,2,2-Tetrachloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Toluene	5	10 U	5 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Chlorobenzene*	5	10 U	10 U	10 U	10 U	130	31	21	10 U	10 U	ND
Ethylbenzene	5	10 U	1 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Styrene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA
Xylenes (total)	5	10 U	8 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	ND
Total VOCs		0.9	20	3.6	2	134.7	38.3	25.6	ND	ND	ND
Total "S" Area Indicators		ND	ND	ND	ND	134	33.6	24.6	ND	ND	ND
Total TICs		ND	ND	ND	ND	ND	75 JN	46 JN	ND	60 JN	NA

Notes: Concentration units in ug/L (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
* - applies to the sum of cis-and trans-1,3 dichloropropene

NA - Not analyzed.
- Guidance value.
TICs - Tentatively Identified Compounds
* - "S" Area Indicator Parameter
NE - Not Established

Table 3

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Semivolatile Organic Compounds

Location:		OBG-1	OBG-1 RE	OBG-2	OBG-3	OBG-3 BLD DUP	OBG-4	OBG-5	OBG-6	EQUIPBLK	MW-16S
Date Collected:		02/15/95	2/15/95	2/14/95	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	9/91
	NYS GA Standards										
Phenol	1	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
bis(2-Chloroethyl)ether	1	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2-Chlorophenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
1,3-Dichlorobenzene(*)	3	10 U	10 U	4 J	11 U	11 U	10 U	30	11 U	13 U	ND
1,4-Dichlorobenzene(*)	3	10 U	10 U	1 J	11 U	11 U	1 J	25	46	13 U	ND
1,2-Dichlorobenzene(*)	3	10 U	10 U	10 U	11 U	11 U	10 U	11 U	9 J	13 U	ND
2-Methylphenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,2'-Oxybis(1-Chloropropane)	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
4-Methylphenol	***	10 U	10 U	10 U	11 U	11 U	4 J	0.9 J	5 J	13 U	ND
N-Nitroso-di-n-propylamine	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Hexachloroethane	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Nitrobenzene	0.4	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Isophorone	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2-Nitrophenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4-Dichlorophenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
bis(2-Chloroethoxy)methane	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4-Dichlorophenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
1,2,4-Trichlorobenzene(*)	5	10 U	10 U	7 J	11 U	11 U	10 U	11 U	7 J	13 U	ND
Naphthalene (**)	10 #	10 U	10 U	2 J	11 U	11 U	10 U	11 U	1 J	13 U	ND
4-Chloroaniline	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Hexachlorobutadiene(*)	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
4-Chloro-3-methylphenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2-Methylnaphthalene (**)	NE	10 U	10 U	0.8 J	11 U	11 U	10 U	11 U	11 U	13 U	ND
Hexachlorocyclopentadiene(*)	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4,6-Trichlorophenol	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4,5-Trichlorophenol(*)	***	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
2-Chloronaphthalene (**)	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2-Nitroaniline	5	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
Dimethylphthalate	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Acenaphthylene (**)	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,6-Dinitrotoluene	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
3-Nitroaniline	5	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
Acenaphthene (**)	20 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4-Dinitrophenol	***	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
4-Nitrophenol	***	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND

Table 3

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Semivolatile Organic Compounds

Location:		OBG-1	OBG-1 RE	OBG-2	OBG-3	OBG-3 BLD DUP	OBG-4	OBG-5	OBG-6	EQUIPBLK	MW-16S
Date Collected:		02/15/95	2/15/95	2/14/95	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	9/91
	NYS GA Standards										
Dibenzofuran	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
2,4-Dinitrotoluene	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Diethylphthalate	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
4-Chlorophenyl-phenylether	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Fluorene (**)	50#	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
4-Nitroaniline	5	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
4,6-Dinitro-2-methylphenol	***	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
N-Nitrosodiphenylamine	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
4-Bromophenyl-phenylether	***	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Hexachlorobenzene(*)	0.04	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Pentachlorophenol	***	26 U	26 U	25 U	27 U	28 U	25 U	27 U	27 U	32 U	ND
Phenanthrene (**)	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	2 J	13 U	ND
Anthracene (**)	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Carbazole	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Di-n-butylphthalate	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Fluoranthene (**)	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	3 J	13 U	ND
Pyrene (**)	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	4 J	13 U	ND
Butylbenzylphthalate	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
3,3'-Dichlorobenzidine	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	1 J	13 U	ND
Benzo(a)anthracene (**)	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	2 J	13 U	ND
Chrysene (**)	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	2 J	13 U	ND
bis(2-Ethylhexyl)phthalate	5	10 U	10 U	13 B	4 BJ	4 BJ	2 BJ	2 BJ	6 BJ	4 BJ	ND
Di-n-octylphthalate	50 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Benzo(b)fluoranthene (**)	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Benzo(k)fluoranthene (**)	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Benzo(a)pyrene (**)	ND	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Indeno(1,2,3-cd)pyrene (**)	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Dibenzo(a,h)anthracene (**)	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
Benzo(g,h,i)perylene (**)	NE	10 U	10 U	10 U	11 U	11 U	10 U	11 U	11 U	13 U	ND
1,3,5-Trichlorobenzene	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	1 J	13 U	ND
1,2,3-Trichlorobenzene(*)	5	10 U	10 U	10 U	11 U	11 U	10 U	11 U	1 J	13 U	ND
1,2,4,5-Tetrachlorobenzene(*)	5	10 U	10 U	2 J	1 J	1 J	10 U	11 U	3 J	13 U	ND
1,2,3,4-Tetrachlorobenzene(*)	5	10 U	10 U	15	11 U	11 U	10 U	11 U	15	13 U	ND

Table 3

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Semivolatile Organic Compounds

Location:	NYS GA Standards	OBG-1	OBG-1 RE	OBG-2	OBG-3	OBG-3 BLD DUP	OBG-4	OBG-5	OBG-6	EQUIPBLK	MW-16S
Date Collected:		02/15/95	2/15/95	2/14/95	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	9/91
Total "S" Area Indicators		ND	ND	29	1	1	1	55	81	ND	ND
Total PAHs		ND	ND	2.8	ND	ND	ND	ND	14	ND	ND
Other SVOCs		ND	ND	ND	ND	ND	4	0.9	7	ND	ND
Total TICs		44 J	78 JN	830 JN	171 JN	60 JN	207 JN	847 JN	870 JN	60 J	ND
Total TICs in Blanks		20 BJ	38 BJN	50 BJN	30 BJN	30 BJN	20 BJN	40 BJN	50 BJN	70 BJN	ND

Notes: Concentration units in ug/L (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
NE - Not established.

RE - The sample was reanalyzed due to a surrogate failure or blank failure, yielding the same results as the first analysis
TICs - Tentatively Identified Compounds.
(*) - "S" Area Indicator Parameters
- NYS Guidance Value
** - PAH Compound
*** - Total phenolic compounds 1 ug/L

Table 4

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Inorganics

		Location:	OBG-1		OBG-1		OBG-2		OBG-2		OBG-3		OBG-3 BLD DUP		OBG-3 BLD DUP		OBG-4		OBG-4	
		Date Collected:	2/17/95		2/17/95		2/14/95		2/14/95		2/14/95		2/14/95		2/14/95		2/14/95		2/14/95	
			Unfiltered		Filtered		Unfiltered		Filtered		Unfiltered		Filtered		Unfiltered		Filtered		Unfiltered		Filtered	
	NYS Class GA Standards																			
Aluminum	NE		75000	P	43.5	BP	35900	P	35.6	BP	1170	P	30	UP	3000	P	41.3	BP	28100	P	42.3	BP
Antimony	3		1.6	BP	6.4	BP	3.1	BP	6.2	BP	2.6	BP	3.2	BP	3.1	BP	5.5	BP	4.4	BP	3.1	BP
Arsenic	25		19.2	P	2.3	BP	9.5	BP	2	UP	2	UP	2	UP	2	UP	2	UP	29	P	2	UP
Barium	1000		574	P	94.6	BP	295	P	39.5	BP	64	BP	51.5	BP	79.3	BP	50.7	BP	296	P	72.7	BP
Beryllium	3 #		4	BP	0.27	BP	2.1	BP	0.31	BP	0.32	BP	0.29	BP	0.44	BP	0.43	BP	1.8	BP	0.4	BP
Cadmium	5		2	BP	0.5	UP	0.94	BP	0.5	UP	0.78	BP	0.69	BP	1.1	BP	0.63	BP	7.3	P	0.5	UP
Calcium	NE		276000	EP	54600	P	269000	EP	197000	P	327000	EP	336000	P	341000	EP	320000	P	272000	EP	243000	P
Chromium	50		110	EP	4.1	BP	52.6	EP	4.1	BP	6.7	BE	4.6	BP	10.8	EP	8.2	BP	56.7	EP	3.4	BP
Cobalt	NE		60.9	P	1.1	BP	28.7	P	4.2	BP	4.8	BP	3.6	BP	6.3	BP	3.1	BP	29	BP	2.6	BP
Copper	200		96.1	P	6	BP	53.4	P	7.5	BP	3.2	BP	1	UP	6.4	BP	2.9	BP	103	P	1	UP
Iron	300		121000	EP	8.9	BE	54500	EP	27.1	BE	6380	EP	5510	EP	9130	EP	5120	EP	63200	EP	4360	EP
Lead	25		28.7	EP	2	UP	34.5	EP	2	UP	6.1	EP	2	UP	11.6	EP	2	UP	138	EP	2	UP
Magnesium	35,000 #		80900	EP	36900	EP	82200	EP	96200	EP	63800	EP	56400	EP	64500	EP	55500	EP	55900	EP	42700	EP
Manganese	300		2520	EP	80.4	EP	1280	EP	313	EP	437	EP	415	EP	500	EP	394	EP	996	EP	336	EP
Mercury	0.7		0.2	UC	0.2	UC	1.2	CV	0.2	UC	0.2	UC	0.2	UC	0.2	UC	0.2	UC	2.1	CV	0.2	UC
Nickel	100		121	EP	2.3	BP	57.6	EP	5.6	BP	7.5	BE	3.3	BP	10	BE	5.9	BP	63.1	EP	1.5	BP
Potassium	NE		25200	EP	4060	BE	20400	EP	9260	EP	13800	EP	14100	EP	14800	EP	14000	EP	62500	EP	53400	EP
Selenium	10		3	UP	3	UP	3	UP	3	UP	3	UP	3	UP	3	UP	3	UP	3	UP	3	UP
Silver	50		1	UP	1	UP	1	UP	1	UP	1	UP	1	UP	1	UP	1	UP	1	UP	1	UP
Sodium	20000		23300	EP	19600	P	49700	EP	53100	P	45600	EP	42100	P	45900	EP	41300	P	627000	EP	528000	P
Thallium	0.5 #		3	UP	3	UP	3	UP	4.1	BP	3	UP	3.6	BP	3	UP	3.8	BP	3	UP	3	UP
Vanadium	0.5 #		138	EP	1	UP	64.9	EP	1	UP	2.4	BE	1	UP	5.4	BE	1	UP	55.4	EP	1	UP
Zinc	5000 #		290	EP	1.7	BP	157	EP	5.4	BP	56	EP	32.6	P	101	EP	33.8	P	1090	EP	2	BP
Cyanide	200		NR		NR		10	UC	NR		10	UC	NR		10	UC	NR		10	UC	NR	

NOTES:
Concentration units in ug/L (ppb).
J - Estimated value.
U - The analyte was analyzed for but not detected.
N - Spiked sample recovery not within control limits.
B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
P - Analyzed by ICP techniques.
N - Spike sample recovery not within control limits.
C - Analyzed by Manual Apectrophotometric techniques.
CV - Manual Cold Vapor AA.
NR - Not requested.
NE - Not established.
* - Duplicate analysis not within control limits.
# Guidance value.

Table 4

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - Inorganics

	Location:	OBG-5	OBG-5	OBG-6	OBG-6	EQUIPBLK	EQUIPBLK	MW-16S	MW-16S
	Date Collected:	2/15/95	2/15/95	2/15/95	2/15/95	2/15/95	2/15/95	9/91	9/91
		Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
	NYS Class GA Standards								
Aluminum	NE	40100 P	31.7 BP	59500 P	38.6 BP	30 UP	30 UP	NA	NA
Antimony	3	4.1 BP	4.6 BP	1.6 P	4.2 BP	1.6 BP	1 UP	NA	NA
Arsenic	25	61.8 P	2 UP	215 P	2.6 BP	2 UP	2 UP	NA	NA
Barium	1000	888 P	143 BP	4780 P	257 P	1 UP	1 UP	NA	NA
Beryllium	3 #	3.3 BP	0.35 BP	4.6 BP	0.24 BP	0.1 UP	0.11 BP	NA	NA
Cadmium	5	4.4 BP	0.5 UP	36.6 P	0.5 UP	0.5 UP	0.5 UP	NA	NA
Calcium	NE	322000 EP	246000 P	324000 EP	148000 P	30.5 BE	24.4 BP	ND	ND
Chromium	50	128 EP	4 BP	275 EP	4.1 BP	7 BE	1 UP	NA	NA
Cobalt	NE	51.7 P	2.7 BP	91.1 P	2.4 BP	1 UP	1 UP	NA	NA
Copper	200	234 P	1 BP	2250 P	1.4 BP	1 UP	1 UP	NA	NA
Iron	300	150000 EP	18400 EP	480000 EP	8570 EP	189 EP	23.4 BE	NA	ND
Lead	25	935 EP	2 UP	5470 EP	2 UP	2 UE	2 UP	640 J	NA
Magnesium	35,000 #	59200 EP	37700 EP	77100 EP	42400 EP	10 UE	10 UE	NA	NA
Manganese	300	1570 EP	464 EP	2770 EP	173 EP	2.3 BE	1 UE	702	298 J
Mercury	0.7	1.6 CV	0.2 UC	27.6 CV	0.2 UC	0.2 UC	0.2 UC	7.6	ND
Nickel	100	107 EP	2 BP	272 EP	1.6 BP	4.2 BE	1 UP	NA	NA
Potassium	NE	23100 EP	15600 EP	38100 EP	26900 EP	100 UE	100 UE	NA	NA
Selenium	10	3 UP	3 UP	8.7 P	3 UP	3 UP	3 UP	NA	NA
Silver	50	1 UP	1 UP	7.4 BP	1 UP	1 UP	1 UP	NA	NA
Sodium	20000	67400 EP	65100 P	119000 EP	1110000 P	43.8 BE	86.5 BP	NA	NA
Thallium	0.5 #	3 UP	3 UP	3 UP	3 UP	3.5 BP	3.5 BP	NA	NA
Vanadium	0.5 #	99 EP	1 UP	134 EP	1 UP	1 UE	1 UP	NA	NA
Zinc	5000 #	1810 EP	1.2 BP	12100 EP	1 UP	1 UE	1 UP	NA	NA
Cyanide	200	10 UC	NR	10 UC	NR	10 UC	NR	NA	NA

Table 5

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water - PCB/Pesticides

Location:		OBG-1	OBG-2	OBG-3	OBG-3 BLD DUP	OBG-4	OBG-5	OBG-6	OBG-6 DL	EQUIPBLK	MW-16S
Date Collected:		2/17/95	2/14/95	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	2/15/95	9/91
	NYS GA Standards										
alpha-BHC	0.01	0.053 U	0.029 JP	0.056 U	0.057 U	0.084	0.062 P	0.08 P	0.035 JP	0.063 U	0.008
beta-BHC	0.04	0.053 U	0.1	0.0084 J	0.057 U	0.17	0.055 U	0.061 U	0.61 U	0.063 U	0.011
delta-BHC	0.04	0.053 U	0.051 U	0.0048 JP	0.0056 JP	0.054 U	0.023 JP	0.26 P	0.61 U	0.063 U	ND
Lindane	0.05	0.053 U	0.0063 J	0.056 U	0.057 U	0.0052 JP	0.055 U	0.061 U	0.61 U	0.063 U	ND
Heptachlor	0.04	0.015 BJP	0.0016 JP	0.056 U	0.057 U	0.054 U	0.055 U	0.061 U	0.61 U	0.063 U	ND
Aldrin	ND	0.053 U	0.051 U	0.056 U	0.057 U	0.054 U	0.055 U	0.061 U	0.61 U	0.063 U	ND
Heptachlor epoxide	0.03	0.053 U	0.005 JP	0.056 U	0.057 U	0.054 U	0.055 U	0.061 U	0.61 U	0.063 U	ND
Endosulfan I	NE	0.053 U	0.051 U	0.0018 JP	0.0043 JP	0.054 U	0.055 U	0.061 U	0.61 UB	0.0053 JP	ND
Dieldrin	0.004	0.11 U	0.001 JP	0.11 U	0.11 U	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
4,4'-DDE	ND	0.0037 JP	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
Endrin	ND	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
Endosulfan II	NE	0.056 BJ	0.1 UB	0.0072 BJP	0.0034 BJP	0.11 UB	0.11 UB	0.12 UB	1.2 UB	0.0058 BJP	ND
4,4'-DDD	ND	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
Endosulfan sulfate	NE	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
4,4'-DDT	ND	0.018 JP	0.1 UB	0.11 UB	0.11 UB	0.11 UB	0.11 UB	0.12 UB	1.2 UB	0.0018 BJP	ND
Methoxychlor	35.0	0.53 U	0.51 U	0.56 U	0.57 U	0.54 U	0.55 U	0.61 U	0.18 JP	0.63 U	ND
Endrin ketone	5.0	0.028 JP	0.1 U	0.11 U	0.0032 JP	0.11 U	0.11 U	0.12 U	1.2 U	0.13 U	ND
Endrin aldehyde	5.0	0.11 U	0.0045 JP	0.11 U	0.11 U	0.031 JP	0.11 U	0.12 U	1.2 U	0.13 U	NA
A-Chlordane	0.1	0.053 U	0.051 U	0.056 U	0.057 U	0.054 U	0.055 U	0.061 U	0.61 U	0.063 U	ND
G-Chlordane	0.1	0.053 U	0.051 U	0.056 U	0.057 U	5.4 U	0.055 U	0.061 U	0.61 U	0.063 U	NA
Toxaphene	0.06	5.3 U	5.1 U	5.6 U	5.7 U	1.1 U	5.5 U	6.1 U	61 U	6.3 U	NA
PCB-1016	0.1	1.1 U	1 U	1.1 U	1.1 U	2.2 U	1.1 U	1.2 U	12 U	1.3 U	NA
PCB-1221	0.1	2.1 U	2 U	2.2 U	2.3 U	1.1 U	2.2 U	2.4 U	24 U	2.5 U	NA
PCB-1232	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	12 U	1.3 U	NA
PCB-1242	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	12 U	1.3 U	NA
PCB-1248	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	12 U	1.3 U	NA
PCB-1254	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	12 U	1.3 U	NA
PCB-1260	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	12 U	1.3 U	NA
Total Pesticides		0.0497	0.1474	0.015	0.0131	0.29	0.085	0.34	0.215	0.0053	0.019

Notes: Concentration units in ug/L (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
P - Analyzed by ICP techniques.
ND - Not detected.
NE - Not established.
DL - Dilution.

Table 6

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil Descriptions

Sample #	Blow Counts/ 6 Inches	Description
Eastern Area		
SS-1	9-7-7-7	Dry to damp, med. to dark brown, med dense SILT, some very fine sand, littleclay, trace fine to med. angular gravel, trace organics (plant roots), trace cinders.
SS-2	8-5-5-5	Dry to dark, med. brown, med. dense SILT, some very fine sand, little clay trace white ash, trace fine to med. angular grvael, trace plant roots (organics).
SS-3	20-17-8-9	Dry to damp, med. brown, med. dense SILT, some very fine to fine sand, little clay, trace white ash, trace cinders, trace fine angular gravel.
SS-4	24-12-9-8	Dry to damp, med. brown, med. dense SILT, some very fine to fine sand, little clay, trace fine angular gravel.
SS-5	19-36-12-6	Dry to damp, med. to dark brown, dense SILT and fine SAND, some fine to coarse gravel, little clay, trace white ash, trace orange brick fragments.
SS-6	6-5-4-8	Dry to damp, gray to brown, loose SILT, some very fine to fine sand, little clasy, little fine to med. angular gravel, little cinders.

Table 7

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil - Semivolatile Organic Compounds

Location:		SS-1	SS-2	SS-3	SS-3 BLD DUP	SS-3 BLD DUP R	SS-4	SS-5	SS-5 RE	SS-6	SS-6 RE
Date Collected:		2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	TAGM 4046										
Phenol	30	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
bis(2-Chloroethyl)ether	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2-Chlorophenol	800	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,3-Dichlorobenzene(*)	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,4-Dichlorobenzene(*)	NE	65 J	84 J	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,2-Dichlorobenzene(*)	NE	460 U	27 J	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2-Methylphenol	100	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,2'-Oxybis(1-Chloropropane)	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
4-Methylphenol	900	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
N-Nitroso-di-n-propylamine	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Hexachloroethane	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Nitrobenzene	200	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Isophorone	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2-Nitrophenol	330	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,4-Dichlorophenol	400	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
bis(2-Chloroethoxy)methane	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,2,4-Trichlorobenzene(*)	NE	180 J	73 J	380 U	380 U	46 J	390 U	410 U	410 U	400 U	400 U
Naphthalene (**)	13000	87 J	42 J	380 U	380 U	380 U	54 J	45 J	40 J	400 U	400 U
4-Chloroaniline	220	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Hexachlorobutadiene(*)	NE	460 U	400 U	440 U	690 U	490 U	390 U	410 U	410 U	400 U	400 U
4-Chloro-3-methylphenol	240	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2-Methylnaphthalene (**)	36400	86 J	64 J	380 U	380 U	380 U	45 J	44 J	37 J	400 U	400 U
Hexachlorocyclopentadiene(*)	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,4,6-Trichlorophenol	NE	86 J	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,4,5-Trichlorophenol(*)	100	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
2-Chloronaphthalene (**)	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2-Nitroaniline	430	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
Dimethylphthalate	2000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Acenaphthylene (**)	41000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,6-Dinitrotoluene	1000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
3-Nitroaniline	500	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
Acenaphthene (**)	50000	40 J	20 J	380 U	380 U	380 U	390 U	43 J	40 J	400 U	400 U
2,4-Dinitrophenol	400	1100 U	1000 U	960 U	950 U	950 U	970 U	1000 U	1000 U	1000 U	1000 U
4-Nitrophenol	100	1100 U	1000 U	960 U	950 U	950 U	970 U	1000 U	1000 U	1000 U	1000 U

Table 7

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil - Semivolatile Organic Compounds

Location:		SS-1	SS-2	SS-3	SS-3 BLD DUP	SS-3 BLD DUP R	SS-4	SS-5	SS-5 RE	SS-6	SS-6 RE
Date Collected:		2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	TAGM 4046										
Dibenzofuran	6200	49 J	19 J	360 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
2,4-Dinitrotoluene	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Diethylphthalate	7100	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
4-Chlorophenyl-phenylether	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Fluorene (**)	50000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
4-Nitroaniline	NE	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
4,6-Dinitro-2-methylphenol	NE	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
N-Nitrosodiphenylamine	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
4-Bromophenyl-phenylether	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Hexachlorobenzene(*)	410	2400	840	1000	1400	1200	390 U	380 J	280 J	400 U	28 J
Pentachlorophenol	1000 or MDL	1100 U	1000 U	960 U	950 U	960 U	970 U	1000 U	1000 U	1000 U	1000 U
Phenanthrene(**)	50000	660	260 J	60 J	50 J	45 J	51 J	460	330 J	240 J	190 J
Anthracene(**)	50000	140 J	69 J	380 U	380 U	380 U	390 U	130 J	82 J	48 J	36 J
Carbazole	NE	76 J	63 J	380 U	380 U	380 U	390 U	53 J	35 J	400 U	400 U
Di-n-butylphthalate	8100	460 U	400 U	34 J	59 J	55 J	26 J	410 U	410 U	47 J	40 J
Fluoranthene(**)	50000	1100	540	110 J	220 J	160 J	58 J	750	440	320 J	220 J
Pyrene(**)	50000	930	440	110 J	450	380 J	42 J	900	760	360 J	340 J
Butylbenzylphthalate	50000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
3,3'-Dichlorobenzidine	NE	470	210 J	78 J	260 J	130 J	390 U	310 J	170 J	120 J	72 J
Benzo(a)anthracene(**)	220	590	310 J	67 J	260 J	180 J	30 J	450	320 J	180 J	130 J
Chrysene(**)	400	640	400 J	79 J	290 J	210 J	41 J	480	340 J	190 J	150 J
bis(2-Ethylhexyl)phthalate(**)	50000	460 U	400 U	380 U	170 BJ	120 BJ	78 BJ	410 U	120 BJ	150 BJ	400 U
Di-n-octylphthalate(**)	50000	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Benzo(b)fluoranthene(**)	1100	540	300 J	--	380 U	280 J	390 U	410 U	330 J	400 U	400 U
Benzo(k)fluoranthene(**)	1100	850	290 J	380 U	380 U	230 J	390 U	410 U	300 J	400 U	400 U
Benzo(a)pyrene(**)	61 or MDL	610	240 J	380 U	380 U	230 J	390 U	410 U	290 J	400 U	400 U
Indeno(1,2,3-cd)pyrene(**)	3200	360 J	130 J	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Dibenzo(a,h)anthracene(**)	14	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
Benzo(g,h,i)perylene(**)	50000	370 J	120 J	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,3,5-Trichlorobenzene	NE	460 U	400 U	380 U	380 U	380 U	390 U	410 U	410 U	400 U	400 U
1,2,3-Trichlorobenzene(*)	NE	27 J	400 U	380 U	380 U	26 J	390 U	410 U	410 U	400 U	400 U
1,2,4,5-Tetrachlorobenzene 1)(*	NE	140 J	60 J	49 J	300 J	310	390 U	33 J	39 J	400 U	400 U
1,2,3,4-Tetrachlorobenzene(*)	NE	1000	270	550	3000	2200	--	160 J	180 J	24 J	29 J

Table 7

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil - Semivolatile Organic Compounds

Location:	SS-1	SS-2	SS-3	SS-3 BLD DUP	SS-3 BLD DUP R	SS-4	SS-5	SS-5 RE	SS-6	SS-6 RE
Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
Total "S" Area Indicators	3812	1354	2039	5390	4272	ND	573	499	24	57
Total PAH Concentrations	7003	3225	426	1270	1715	321	3302	3309	1338	1066
Other SVOCs	681	292	112	319	185	26	363	205	167	112
Total TICs	12800 JN	2800 JN	5200 BJN	3800 JN	9400 JN	200 J	400 J	800 JN	0	800 JN
Total TICs in Blanks	40000 BJ	30000 BJ	30000 BJN	40000 BJ	30000 BJ	30000 BJ	40000 BJ	30000 BJ	30000 BJ	20000 BJ

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
RE - The sample was reanalyzed due to a surrogate failer, yielding the same results as the first ananalysis
DL - Dilution.
TICs - Tentatively Identified Compounds.
Max Concentration Detected at Buffalo Avenue Site
(O'Brien & Gere, 1991a)
(*) - "S" Area Indicator Parameters.
(**) - Polynuclear Aromatic Hydrocarbons.

Table 8

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil - Inorganics

		Location:	SS-1		SS-2		SS-3		SS-3 BLD DUP		SS-4		SS-5		SS-6	
		Date Collected:	2/10/95		2/10/95		2/10/95		2/10/95		2/10/95		2/10/95		2/10/95	
	TAGM 4046	Typical Range														
Aluminum	19200	1000-25000	5410	P	11300	P	6600	P	5550	P	10000	P	12600	P	8250	P
Antimony	SB	—	1.8	BNP	0.45	BNP	1.1	BNP	1	BNP	0.23	UNP	2.4	BNP	1.5	BNP
Arsenic	7.5 or SB	3 - 12	6.1	P	4.3	P	3.4	P	2	BP	3.7	P	5.7	P	4.3	P
Barium	300 or SB	15 - 600	194	P	133	P	103	P	62.5	P	78.5	P	175	P	90.3	P
Beryllium	1 or SB	0 - 1.75	0.59	BP	0.67	BP	0.46	BP	0.36	BP	0.6	BP	0.74	BP	0.51	BP
Cadmium	1 or SB	0.01 - 2.0	0.14	UP	0.31	BP	0.12	UP	0.18	BP	0.12	UP	0.23	BP	0.41	BP
Calcium	SB	130 - 35000	31100	P	56900	P	73000	P	94500	P	39800	P	57800	P	59800	P
Chromium	10 or SB	1.5 - 40	25.1	EP	18.6	EP	16.3	EP	10.3	EP	18.3	EP	32	EP	21.7	EP
Cobalt	30 or SB	2.5 - 60	4.5	BP	10	BP	6.5	BP	5.8	BP	9.2	BP	10.5	BP	7.1	BP
Copper	25 or SB	<1 - 15	40.9	P	31.5	P	30.5	P	22	P	25.4	P	97.1	P	30.5	P
Iron	2000 or SB	17500 - 25000	12500	P	20600	P	14200	P	11000	P	19100	P	24600	P	16000	P
Lead	30 or SB	1 - 12.5	60.1	P*	37	P*	54.7	P*	38.5	P*	14.5	P*	161	P*	68.3	P*
Magnesium	SB	2500 - 6000	11600	P*	19700	P*	31100	P*	42300	P*	10500	P*	17000	P*	25500	P*
Manganese	SB	50 - 5000	385	P	504	P	387	P	466	P	417	P	464	P	592	P
Mercury	0.1	0.042 - 0.066	1.8	NCV*	0.84	NCV*	0.54	NCV*	4.1	NCV*	0.15	NCV*	4.7	NCV*	2.6	NCV*
Nickel	13 or SB	0.5 - 25	12.9	P	24.4	P	16.3	P	13.6	P	20.7	P	30	P	17.2	P
Potassium	SB	8500 - 43000	1360	BEP	2990	EP	1990	EP	1730	EP	1960	EP	3440	EP	1940	EP
Selenium	2 or SB	<0.1 - 0.125	0.82	UP	0.73	UP	0.69	UP	0.69	UP	0.7	BP	0.73	P	0.72	UP
Silver	SB		0.27	UP	0.24	UP	0.23	UP	0.23	UP	0.23	UP	0.24	UP	0.24	UP
Sodium	SB	6000 - 8000	2820	EP	419	BEP	443	BEP	519	BEP	362	BEP	587	BEP	334	BEP
Thallium	SB	—	0.82	UP	0.73	UP	0.69	UP	0.69	UP	0.7	UP	0.73	UP	0.72	UP
Vanadium	150 or SB	25 - 60	10.7	BP	22.3	P	15.3	P	11.6	P	19.6	P	26.6	P	18.5	P
Zinc	20 or SB	37 - 60	113	P	149	P	130	P	127	P	78.1	P	264	P	208	P
Cyanide	NE	—	0.68	UC	1.4	C	0.58	UC	0.57	UC	0.58	UC	0.61	UC	0.62	C
% Total Solids			73.1		82.4		86.7		87.4		86.1		81.8		83.2	

Notes: Concentration units in mg/kg (ppm).
J - Estimated value.
U - The analyte was analyzed for but not detected.
N - Spiked sample recovery not within control limits.
B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the COntract Required Detection Limit (CRDL).
P - Analyzed by ICP techniques.
E - The report value is estimated due to the presence of interference
SB - Soil background not established
N - Spiked sample recovery not within control limits
C - Analyzed by Manual Apectrophotometric techniques.
CV - Manual Cold Vapor AA.
ND - Not detected.
* - Duplicate analysis not within control limits.
-Maximum Concentration Detected in De-listed Portion of Buffalo Avenue Site.
-Typical Range from New York State (Bowen, 1979, Shacklette and Boergen, 1984, Shacklette et al 1971 and Walsh 1978).

Table 9

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil - PCB/Pesticides

Location:		SS-1	SS-1 DL	SS-2	SS-2 DL	SS-3	SS-3 BLD DUP	SS-4	SS-5	SS-5 DL	SS-6
Date Collected:		2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	TAGM 4046										
alpha-BHC	110	15	15 J	390 EP	410 J	1.9 U	3 P	0.69 J	2 U	20 U	0.36 JP
beta-BHC	200	52 EP	88 P	540 E	670	10 P	20 P	0.72 J	34 EP	56 P	3.8
delta-BHC	300	2.3 U	27 P	15 JP	610 U	1.9 U	1.9 U	1.9 U	2 U	5.7 JP	2 U
Lindane	60	2.3 U	23 UB	28 BP	31 BJ	1.9 U	1.9 U	1.9 U	2 U	20 UB	0.22 JP
Heptachlor	100	4 BP	23 UB	20 UB	610 UB	1.9 UB	2.4 BP	0.17 BJP	2 UB	20 UB	0.3 BJP
Aldrin	41	2.3 U	23 U	20 U	610 U	1.9 U	1.9 U	1.9 U	2 U	20 U	2 U
Heptachlor epoxide	20	2.3 U	23 U	20 U	610 U	1.9 U	1.9 U	1.9 U	0.62 JP	20 U	1.6 J
Endosulfan I	900	2.3 U	23 U	20 U	610 U	2.7 P	1.2 JP	1.9 U	2 U	20 U	2 U
Dieldrin	44	9.9	14 BJ	41 U	1200 U	3.8 U	3.8 U	3.9 U	4.1 U	41 U	0.21 JP
4,4'-DDE	2100	14 P	22 BJP	17 BJP	1200 UB	2.7 JP	6.4 P	3.9 U	4.1 U	3.8 BJP	4 U
Endrin	100	4.6 U	46 UB	41 U	1200 U	3.8 U	3.8 U	3.9 U	4.1 U	41 U	4 U
Endosulfan II	900	4.6 UB	46 UB	41 UB	1200 UB	3.8 UB	3.8 UB	3.9 UB	4.1 UB	2.8 BJP	4 UB
4,4'-DDD	2900	4.6 U	46 UP	41 UB	1200 UB	3.8 U	3.8 U	3.9 U	4.1 U	41 UB	0.12 JP
Endosulfan sulfate	100	30 BP	55 BP	16 BJP	27 BJP	8 BP	8.7 BP	3.9 UB	1.8 BJP	41 UB	0.97 BJP
4,4'-DDT	2100	4.6 UB	330 BP	75 BP	98 BJ	32 BP	51 BP	3.9 UB	2.3 BJP	12 BJP	1.3 BJP
Methoxychlor	10000	23 UB	230 U	200 U	6100 U	19 UB	19 UB	19 UB	20 UB	200 U	1.6 BJP
Endrin ketone	NE	4.6 UB	46 UB	41 UB	1200 UB	3.8 UB	3.8 UB	3.9 UB	4.1 UB	41 UB	4 UB
Endrin aldehyde	NE	4.6 U	46 UB	41 UB	1200 UB	3.8 U	3.8 U	3.9 U	4.1 U	41 UB	4 U
A-Chlordane	540	2.3 UB	23 UB	20 UB	610 UB	0.74 BJP	1.9 UB	1.9 UB	0.42 BJP	20 UB	0.67 BJP
G-Chlordane	540	2.3 U	3.9 JP	20 U	610 U	1.3 JP	2.4 P	1.9 U	2 U	20 U	2 U
Toxaphene	NE	230 U	2300 U	2000 U	61000 U	190 U	190 U	190 U	200 U	2000 U	200 U
PCB-1016	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U
PCB-1221	1000	91 U	910 U	810 U	24000 U	77 U	79 U	78 U	81 U	810 U	80 U
PCB-1232	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U
PCB-1242	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U
PCB-1248	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U
PCB-1254	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U
PCB-1260	1000	46 U	460 U	410 U	12000 U	38 U	38 U	39 U	41 U	410 U	40 U

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
P - Analyzed by ICP techniques.
E - The flag identifies compounds whose concentrations exceed the calibration range of the GCMS instrument for that specific analysis
DL - Dilution.
ND - Not detected.
Maximum Concentration Detected at the De-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Table 10A
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Volatile Organic Data

	TAGM 4046	SB-38W (2-4)	SB-39W (2-4)	SB-40SR (2-4)	SB-40W (6-8)
CHLOROMETHANE		11 U	12 U	1400 U	12 U
BROMOMETHANE		11 U	12 U	1400 U	12 U
VINYL CHLORIDE*		11 U	12 U	1400 U	12 U
CHLOROETHANE		11 U	12 U	1400 U	12 U
METHYLENE CHLORIDE		5 U	6 U	680 U	6 U
ACETONE		11 U	12 U	1400 U	19 U
CARBON DISULFIDE		5 U	6 U	680 U	6 U
1,1-DICHLOROETHENE		5 U	6 U	680 U	6 U
1,1-DICHLOROETHANE		5 U	6 U	680 U	6 U
1,2-DICHLOROETHENE (TOTAL)*		5 U	6 U	680 U	5 J
CHLOROFORM		5 U	6 U	680 U	6 U
1,2-DICHLOROETHANE		5 U	6 U	680 U	6 U
2-BUTANONE		11 U	12 U	1400 U	12 U
1,1,1-TRICHLOROETHANE		5 U	6 U	680 U	6 U
CARBON TETRACHLORIDE		5 U	6 U	680 U	6 U
VINYL ACETATE		11 U	12 U	1400 U	12 U
BROMODICHLOROMETHANE		5 U	6 U	680 U	6 U
1,2-DICHLOROPROPANE		5 U	6 U	680 U	6 U
CIS-1,3-DICHLOROPROPANE		5 U	6 U	680 U	6 U
TRICHLOROETHENE*	700	5 U	6 U	680 U	13
DIBROMOCHLOROMETHANE		5 U	6 U	680 U	6 U
1,1,2-TRICHLOROETHANE		5 U	6 U	680 U	6 U
BENZENE*		5 U	6 U	680 U	6 U
TRANS-1,3-DICHLOROPROPANE		5 U	6 U	680 U	6 U
BROMOFORM		5 U	6 U	680 U	6 U
4-METHYL-2-PENTANONE		11 U	12 U	1400 U	12 U
2-HEXANONE		11 U	12 U	1400 U	12 U
TETRACHLOROETHENE*	1400	1 J	30	1100	30
1,1,2,2-TETRACHLOROETHENE		5 U	6 U	680 U	6 U
TOLUENE		5 U	6 U	680 U	0.1 J
CHLOROBENZENE*		5 U	6 U	680 U	6 U
ETHYLBENZENE		5 U	6 U	680 U	6 U
STYRENE		5 U	6 U	680 U	6 U
TOTAL XYLENES		5 U	6 U	680 U	6 U
Total "S" Area		1	30	1100	48

Notes: Data from Buffalo Avenue Site Investigation Report; O'Brien & Gere Engineers, Results presented in ug/kg (ppb)
U - Compound Analyzed but not detected
J - Indicates an estimated value (GC/MS only)
B - Analyte is found in the associated blank as well as in the sample.
RE - Sample reanalyzed due to quality control assurances.
* - "S" Area Indicator

Table 10B
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Semivolatile Organic Data

	TAGM 4046	SB-38W (2-6)	SB-39W (2-11)	SB-40SR (2-5)	SB-40SR (2-5) DL	SB-40W (5-12)
Phenol		800 U	920 U	740 U	7400 U	850 U
bis(2-Chloroethyl)ether		800 U	920 U	740 U	7400 U	850 U
2-Chlorophenol		800 U	920 U	740 U	7400 U	850 U
1,3-Dichlorobenzene*		800 U	920 U	740 U	7400 U	850 U
1,4-Dichlorobenzene*	8500	800 U	920 U	49 J	7400 U	55 J
Benzyl Alcohol		800 U	920 U	740 U	7400 U	850 U
1,2-Dichlorobenzene*		800 U	920 U	740 U	7400 U	68 J
2-Methylphenol		800 U	920 U	740 U	7400 U	850 U
bis(2-Chloroisopropyl)ether		800 U	920 U	740 U	7400 U	850 U
4-Methylphenol		800 U	920 U	740 U	7400 U	850 U
N-Nitroso-di-n-propylamine		800 U	920 U	740 U	7400 U	850 U
Hexachloroethane		800 U	920 U	310 J	7400 U	850 U
Nitrobenzene		800 U	920 U	740 U	7400 U	850 U
Isophorone		800 U	920 U	740 U	7400 U	850 U
2-Nitrophenol		800 U	920 U	740 U	7400 U	850 U
2,4-Dimethylphenol		800 U	920 U	740 U	7400 U	850 U
Benzoic Acid		3900 U	4500 U	3600 U	36000 U	4100 U
bis(2-Chloroethoxy)methane		800 U	920 U	740 U	7400 U	850 U
2,4-Dichlorophenol		800 U	920 U	740 U	7400 U	850 U
1,2,4-Trichlorobenzene*	3400	800 U	920 U	3500	3500 J	3400
Naphthalene**		100 J	150 J	740 U	7400 U	850 U
4-Chloroaniline		800 U	920 U	740 U	7400 U	850 U
Hexachlorobutadiene*	NE	800 U	920 U	14000 J	18000	1600
4-Chloro-3-Methylphenol		800 U	920 U	740 U	7400 U	850 U
2-Methylnaphthalene**		800 U	160 J	740 U	7400 U	850 U
Hexachlorocyclopentadiene*		800 U	920 U	740 U	7400 U	850 U
2,4,6-Trichlorophenol		800 U	920 U	740 U	7400 U	850 U
2,4,5-Trichlorophenol*		3900 U	4500 U	3600 U	36000 U	4100 U
2-Chloronaphthalene**		800 U	920 U	740 U	7400 U	850 U
2-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
Dimethyl phthalate		800 U	920 U	740 U	7400 U	850 U
Acenaphthylene**	50000	800 U	920 U	740 U	7400 U	850 U
2,6-Dinitrotoluene		800 U	920 U	740 U	7400 U	850 U
3-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
Acenaphthene**		62 J	41 J	740 U	7400 U	850 U
2,4-Nitrophenol		3900 U	4500 U	3600 U	36000 U	4100 U
4-Nitrophenol		3900 U	4500 U	3600 U	36000 U	4100 U
Dibenzofuran	6200	800 U	59 J	740 U	7400 U	850 U
2,4-Dinitrotoluene		800 U	920 U	740 U	7400 U	850 U
Diethylphthalate		800 U	920 U	740 U	7400 U	850 U
4-Chlorophenyl-phenylether		800 U	920 U	740 U	7400 U	850 U
Fluorene**		99 J	920 U	740 U	7400 U	850 U
4-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
4,6-Dinitro-2-methylphenol		800 U	4500 U	3600 U	36000 U	4100 U
N-Nitrosodiphenylamine		3900 U	920 U	740 U	7400 U	850 U

Table 10B
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Semivolatile Organic Data

	TAGM 4046	SB-38W (2-6)	SB-39W (2-11)	SB-40SR (2-5)	SB-40SR (2-5) DL	SB-40W (5-12)
4-Bromophenyl-phenylether		800 U	920 U	740 U	7400 U	850 U
Hexachlorobenzene*	410	800 U	920 U	18000 J	19000	1900
Pentachlorophenol		3900 U	4500 U	3600 U	36000 U	4100 U
Phenanthrene**	50000	780 J	570 J	67 J	7400 U	850 U
Anthracene**	50000	150 J	99 J	740 U	7400 U	850 U
Di-n-butylphthalate		800 U	110 J	110 J	7400 U	140 J
Fluoranthene**	50000	920	670 J	150 J	7400 U	850 U
Pyrene**	50000	640 J	490 J	130 J	7400 U	850 U
Butylbenzylphthalate		210 J	920 U	740 U	7400 U	850 U
3,3-Dichlorobenzidine		1600 U	1800 U	1500 U	15000 U	1700 U
Benzo(a)anthracene**		410 J	310 J	740 U	7400 U	850 U
Chrysene**		360 J	320 J	100 J	7400 U	850 U
bis(2-Ethylhexyl)phthalate	50000	610 J	710 J	1400	1200 J	200 J
Di-n-octylphthalate		800 U	920 U	740 U	7400 U	850 U
Benzo(b)fluoranthene**	1100	490 J	380 J	150 J	7400 U	850 U
Benzo(k)fluoranthene**	1100	260 J	180 J	59 J	7400 U	850 U
Benzo(a)pyrene**	220	370 J	260 J	740 U	7400 U	850 U
Indeno(1,2,3-cd)pyrene**		800 U	920 U	740 U	7400 U	850 U
Dibenzo(a,h)anthracene**		800 U	920 U	740 U	7400 U	850 U
Benzo(g,h,i)perylene**		200 J	120 J	740 U	7400 U	850 U
Total "S" Area Indicators		ND	ND	35549	40500	7023
Total PAHs		4841	3750	656	ND	ND
Other SVOCs		820	879	1820	1200	1240

Notes: Data from Buffalo Avenue Site Investigation Report; O'Brien & Gere Engineers, Inc; 1991C
Results presented in ug/kg (ppb)
U - Compound Analyzed but not detected
J - Indicates an estimated value (GC/MS only)
B - Analyte is found in the associated blank as well as in the sample.
RE - Sample reanalyzed due to quality control assurances.
* - "S" Area Indicator
** - PAH Compound

Table 10B
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Semivolatile Organic Data

	TAGM 4046	SB-38W (2-6)	SB-39W (2-11)	SB-40SR (2-5)	SB-40SR (2-5) DL	SB-40W (5-12)
Phenol		800 U	920 U	740 U	7400 U	850 U
bis(2-Chloroethyl)ether		800 U	920 U	740 U	7400 U	850 U
2-Chlorophenol		800 U	920 U	740 U	7400 U	850 U
1,3-Dichlorobenzene*		800 U	920 U	740 U	7400 U	850 U
1,4-Dichlorobenzene*	8500	800 U	920 U	49 J	7400 U	55 J
Benzyl Alcohol		800 U	920 U	740 U	7400 U	850 U
1,2-Dichlorobenzene*		800 U	920 U	740 U	7400 U	68 J
2-Methylphenol		800 U	920 U	740 U	7400 U	850 U
bis(2-Chloroisopropyl)ether		800 U	920 U	740 U	7400 U	850 U
4-Methylphenol		800 U	920 U	740 U	7400 U	850 U
N-Nitroso-di-n-propylamine		800 U	920 U	740 U	7400 U	850 U
Hexachloroethane		800 U	920 U	310 J	7400 U	850 U
Nitrobenzene		800 U	920 U	740 U	7400 U	850 U
Isophorone		800 U	920 U	740 U	7400 U	850 U
2-Nitrophenol		800 U	920 U	740 U	7400 U	850 U
2,4-Dimethylphenol		800 U	920 U	740 U	7400 U	850 U
Benzoic Acid		3900 U	4500 U	3600 U	36000 U	4100 U
bis(2-Chloroethoxy)methane		800 U	920 U	740 U	7400 U	850 U
2,4-Dichlorophenol		800 U	920 U	740 U	7400 U	850 U
1,2,4-Trichlorobenzene*	3400	800 U	920 U	3500	3500 J	3400
Naphthalene**		100 J	150 J	740 U	7400 U	850 U
4-Chloroaniline		800 U	920 U	740 U	7400 U	850 U
Hexachlorobutadiene*	NE	800 U	920 U	14000 J	18000	1600
4-Chloro-3-Methylphenol		800 U	920 U	740 U	7400 U	850 U
2-Methylnaphthalene**		800 U	160 J	740 U	7400 U	850 U
Hexachlorocyclopentadiene*		800 U	920 U	740 U	7400 U	850 U
2,4,6-Trichlorophenol		800 U	920 U	740 U	7400 U	850 U
2,4,5-Trichlorophenol*		3900 U	4500 U	3600 U	36000 U	4100 U
2-Chloronaphthalene**		800 U	920 U	740 U	7400 U	850 U
2-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
Dimethyl phthalate		800 U	920 U	740 U	7400 U	850 U
Acenaphthylene**	50000	800 U	920 U	740 U	7400 U	850 U
2,6-Dinitrotoluene		800 U	920 U	740 U	7400 U	850 U
3-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
Acenaphthene**		62 J	41 J	740 U	7400 U	850 U
2,4-Nitrophenol		3900 U	4500 U	3600 U	36000 U	4100 U
4-Nitrophenol		3900 U	4500 U	3600 U	36000 U	4100 U
Dibenzofuran	6200	800 U	59 J	740 U	7400 U	850 U
2,4-Dinitrotoluene		800 U	920 U	740 U	7400 U	850 U
Diethylphthalate		800 U	920 U	740 U	7400 U	850 U
4-Chlorophenyl-phenylether		800 U	920 U	740 U	7400 U	850 U
Fluorene**		99 J	920 U	740 U	7400 U	850 U
4-Nitroaniline		3900 U	4500 U	3600 U	36000 U	4100 U
4,6-Dinitro-2-methylphenol		800 U	4500 U	3600 U	36000 U	4100 U
N-Nitrosodiphenylamine		3900 U	920 U	740 U	7400 U	850 U

Table 10B
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Semivolatile Organic Data

	TAGM 4046	SB-38W (2-6)	SB-39W (2-11)	SB-40SR (2-5)	SB-40SR (2-5) DL	SB-40W (5-12)
4-Bromophenyl-phenylether		800 U	920 U	740 U	7400 U	850 U
Hexachlorobenzene*	410	800 U	920 U	18000 J	19000	1900
Pentachlorophenol		3900 U	4500 U	3600 U	36000 U	4100 U
Phenanthrene**	50000	780 J	570 J	67 J	7400 U	850 U
Anthracene**	50000	150 J	99 J	740 U	7400 U	850 U
Di-n-butylphthalate		800 U	110 J	110 J	7400 U	140 J
Fluoranthene**	50000	920	670 J	150 J	7400 U	850 U
Pyrene**	50000	640 J	490 J	130 J	7400 U	850 U
Butylbenzylphthalate		210 J	920 U	740 U	7400 U	850 U
3,3-Dichlorobenzidine		1600 U	1800 U	1500 U	15000 U	1700 U
Benzo(a)anthracene**		410 J	310 J	740 U	7400 U	850 U
Chrysene**		360 J	320 J	100 J	7400 U	850 U
bis(2-Ethylhexyl)phthalate	50000	610 J	710 J	1400	1200 J	200 J
Di-n-octylphthalate		800 U	920 U	740 U	7400 U	850 U
Benzo(b)fluoranthene**	1100	490 J	380 J	150 J	7400 U	850 U
Benzo(k)fluoranthene**	1100	260 J	180 J	59 J	7400 U	850 U
Benzo(a)pyrene**	220	370 J	260 J	740 U	7400 U	850 U
Indeno(1,2,3-cd)pyrene**		800 U	920 U	740 U	7400 U	850 U
Dibenzo(a,h)anthracene**		800 U	920 U	740 U	7400 U	850 U
Benzo(g,h,i)perylene**		200 J	120 J	740 U	7400 U	850 U
Total "S" Area Indicators		ND	ND	35549	40500	7023
Total PAHs		4841	3750	656	ND	ND
Other SVOCs		820	879	1820	1200	1240

Notes: Data from Buffalo Avenue Site Investigation Report; O'Brien & Gere Engineers, Inc; 1991C
Results presented in ug/kg (ppb)
U - Compound Analyzed but not detected
J - Indicates an estimated value (GC/MS only)
B - Analyte is found in the associated blank as well as in the sample.
RE - Sample reanalyzed due to quality control assurances.
* - "S" Area Indicator
** - PAH Compound

Table 10C
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Inorganic Data

	TAGM 4046	TYPICAL RANGE **	SB-38W (2-6)	SB-39W (2-11)	SB-40W (5-12)	SB-40SR (2-5)
ALUMINUM	SB	1,000-25,000	10800	16200	10300	9030
ANTIMONY	SB	—	5.8 J	3.2 J	7.7 J	1.1 UJ
ARSENIC	7.5 or SB	3-12	9.7 J	21.3 J	9.9 J	3.4 J
BARIUM	300 or SB	15-600	168	246	131	105
BERYLLIUM	1 or SB	0-1.75	1.3 U	1.4 U	1.3 U	1.1 U
CADMIUM	1 or SB	0.01-2.0	1.5 U	2.2 U	1.3 U	1.1 U
CALCIUM	SB	130-35,000	34800	45900	10400	81800
CHROMIUM	10 or SB	1.5-40	40.2 J	31.3 J	20.1 J	16.1 J
COBALT	30 or SB	2.5-60	12.5 UJ	19.3 J	15.4 J	13.3 J
COPPER	25 or SB	<1-15	152	59.4	47.8	22.7
IRON	2000 or SB	17,500-25,000	26400	27800	69700	17600
LEAD	30 or SB	1-12.5	164 J	212 J	434 J	52.0 J
MAGNESIUM	SB	2,500-6,000	10800	11000	1850	21800
MANGANESE	SB	50-5,000	416 J	582	308 J	1070
MERCURY	0.1	0.042-0.066	0.91	2.1	0.19 U	1.7
NICKEL	13 or SB	0.5-25	47.3	42.0	44.8	28.4
POTASSIUM	SB	8,500-43,000	1430	2530	991	2340
SELENIUM	2 or SB	<0.1-0.125	1.2 R	1.4 R	1.4 R	1.1 R
SILVER	SB		5.4	5.0	1.6 U	1.4 U
SODIUM	SB	6,000-8,000	1140 U	839 U	839 U	686 U
THALLIUM	SB	—	1.2 U	1.4 U	1.4 U	1.1 U
VANADIUM	150 or SB	25-60	32.6	40.6	39.8	22.9 J
ZINC	20 or SB	37-60	638 J	403 J	202 J	107 J
CYANIDE	NE	—	1.2 U	1.4 U	1.5	1.1 U
TCLP Lead	5		0.138 S	0.458 S	0.9	
EPTOX Lead	5		0.02 N	0.32 N	0.77 N	

Notes:

Data from Buffalo Avenue Site Investigation Report; O'Brien & Gere Engineers, Inc; 1991C
Results presented in mg/kg (ppm). TCLP & EPTOX results in mg/L (ppm).
U - Compound Analyzed but not detected
J - Indicates an estimated value (GC/MS only)
B - Indicates a value greater than or equal to the instrument detection limit but less than the contract required detection limit.
* - Referenced from Bowen (1979), Shacklette et al (1984), Shacklette et al. (1971), Walsh et. al. (1977)

Table 10D
Phase II Investigation
Water Treatment Plant Eastern Area
Niagara Falls, New York

Previous Soil Boring Pesticide/PCB Data

	TAGM 4046	SB-38W (2-6)	SB-39W (2-11)	SB-40SR (2-5)	SB-40W (5-12)
alpha-BHC	110	20 U	23 U	180 U	110 U
beta-BHC	200	20 U	23 U	34 J	110 U
delta-BHC	300	7.5 J	23 U	180 U	110 U
gamma-BHC (lindane)	60	100 J	23 U	180 U	110 U
Heptachlor	100	20 U	23 U	180 U	110 U
Aldrin	41	20 U	750	520	110 U
Heptachlor epoxide	20	20 U	23 U	1400	50 J
Endosulfan I	900	20 U	65	420	110 U
Dieldrin	44	40 U	45 U	360 U	220 U
4,4'-DDE	2100	12 J	45 U	360 U	220 U
Endrin	100	40 U	41 J	360 U	220 U
Endosulfan II	900	40 U	12 J	360 U	220 U
4,4'-DDD	2900	40 U	45 U	2700	350
Endosulfan sulfate	100	52	45 U	360 U	220 U
4,4'-DDT	2100	52 J	71 J	2200	220 U
Methoxychlor	10000	200 U	230 U	1800 U	1100 U
Endrin ketone	NE	40 U	45 U	360 U	220 U
alpha-chlordane	540	200 U	230 U	1800 U	1100 U
gamma-chlordane	540	200 U	230 U	1800 U	1100 U
Toxaphene	NE	400 U	450 U	3600 U	2200 U
Aroclor-1016	1000	200 U	230 U	1800 U	1100 U
Aroclor-1221	1000	200 U	230 U	1800 U	1100 U
Aroclor-1232	1000	200 U	230 U	1800 U	1100 U
Aroclor-1242	1000	200 U	230 U	1800 U	1100 U
Aroclor-1248	1000	200 U	230 U	1800 U	1100 U
Aroclor-1254	1000	400 U	450 U	3600 U	2200 U
Aroclor-1260	1000	400 U	450 U	3600 U	2200 U
Total Pesticides		223.5	939	7274	400

Notes:
Data from Buffalo Avenue Site Investigation Report; O'Brien & Gere Engineers, Inc; 199
Results presented in ug/kg (ppb)
U - Compound Analyzed but not detected
J - Indicates an estimated value (GC/MS only)

Table 11

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

TCLP Analyses

Location: / Date Collected:	Maximum Concentration Per Part 261 *	SB-1 (6-8') 2/6/96	SB-2 (12-12.5') 2/6/96	SB-3 (6-8') 2/6/96	SB-4 (10-12') 2/6/96	Blind Dup. SB-4 (10-12') 2/6/96	SB-5 (12-14') 2/7/96)
Pyridine	5.0	0.083 U	0.11 U	0.088 U	0.085 U	0.087 U	0.091 U
1,4-Dichlorobenzene	7.5	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
2-Methylphenol	-----	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
3&4-Methylphenol	-----	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
Hexachloroethane	0.13	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
Nitrobenzene	2.0	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
Hexachlorobutadiene	0.5	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
2,4,6-Trichlorophenol	2.0	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
2,4,5-Trichlorophenol	400.0	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
2,4-Dinitrotoluene	0.13	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
Hexachlorobenzene	0.13	0.008 U	0.011 U	0.009 U	0.008 U	0.009 U	0.009 U
Pentachlorophenol	-----	0.004 U	0.006 U	0.004 U	0.004 U	0.004 U	0.004 U
Vinyl chloride	0.2	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
1,1-Dichloroethene	0.7	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chlorobenzene	100.0	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloroethane	0.5	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform	6.0	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Benzene	0.5	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Trichloroethene	0.5	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
2-Butanone	-----	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Tetrachloroethene	0.7	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Carbon tetrachloride	0.5	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromofluoromethane (surrogate)	-----	101	94	101	101	100	99
Toluene (surrogate)	-----	96	95	96	96	96	96
Bromofluorobenzene (surrogate)	-----	96	88	95	95	95	95

Table 11

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

TCLP Analyses

Location: / Date Collected:	Maximum Concentration Per Part 261 *	SB-1 (6-8') 2/6/96	SB-2 (12-12.5') 2/6/96	SB-3 (6-8') 2/6/96	SB-4 (10-12') 2/6/96	Blind Dup. SB-4 (10-12') 2/6/96	SB-5 (12-14') 2/7/96)
Arsenic	5.0	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Barium	100.0	10 U	10 U	10 U	10 U	10 U	10 U
Cadmium	1.0	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chromium	5.0	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Lead	5.0	0.9	0.5 U	2.6	0.5 U	4.9	0.5 U
Mercury	0.2	0.0005 U	0.0006	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Selenium	1.0	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Silver	5.0	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Lindane	0.4	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U
Heptachlor	0.008	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U
Heptachlor epoxide	-----	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U	0.00025 U
Endrin	0.02	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Methoxychlor	10.0	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Chlordane	0.03	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Toxaphene	0.5	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
2,4,5,6-Tetrachloro-m-Xylene (surr	-----	86	88	77	83	69	91
Decachlorobiphenyl (surrogate)	-----	61	72	64	66	62	47

Notes: Results reported in ppm.
Surrogate results reported in percentage.
J - Estimated value.
U - Not detected.
* - 40CFR Part 261 Identification and Listing of Hazardous Waste.

Table 12

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Ground Water "S" Area

WELL NO.	"S" AREA VOLATILE ORGANIC COMPOUNDS	"S" AREA SEMIVOLATILE ORGANIC COMPOUNDS	TOTAL "S" AREA COMPOUNDS
OBG-1	ND	ND	ND
OBG-2	ND	29	29
OBG-3	ND	1	1
OBG-4	134	1	135
OBG-5	33.6	55	88.6
OBG-6	24.6	81	105.6

Notes: Concentrations in ug/l (ppb)
ND - Not Detected

Table 13

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Surface Soil

SURFACE SOIL LOCATION	"S" AREA VOLATILE ORGANIC COMPOUNDS	"S" AREA SEMIVOLATILE ORGANIC COMPOUNDS	TOTAL "S" AREA COMPOUNDS
SS-1	NA	3812	3812
SS-2	NA	1354	1354
SS-3	NA	5390	5390
SS-4	NA	ND	ND
SS-5	NA	573	573
SS-6	NA	57	57

Notes: Concentrations in ug/kg (ppb)
ND- Not Detected
NA - Not Analyzed

Table 14

Phase II Investigation
Water Treatment Plant - Eastern Area
Niagara Falls, New York

Subsurface Soil - TCLP Analysis

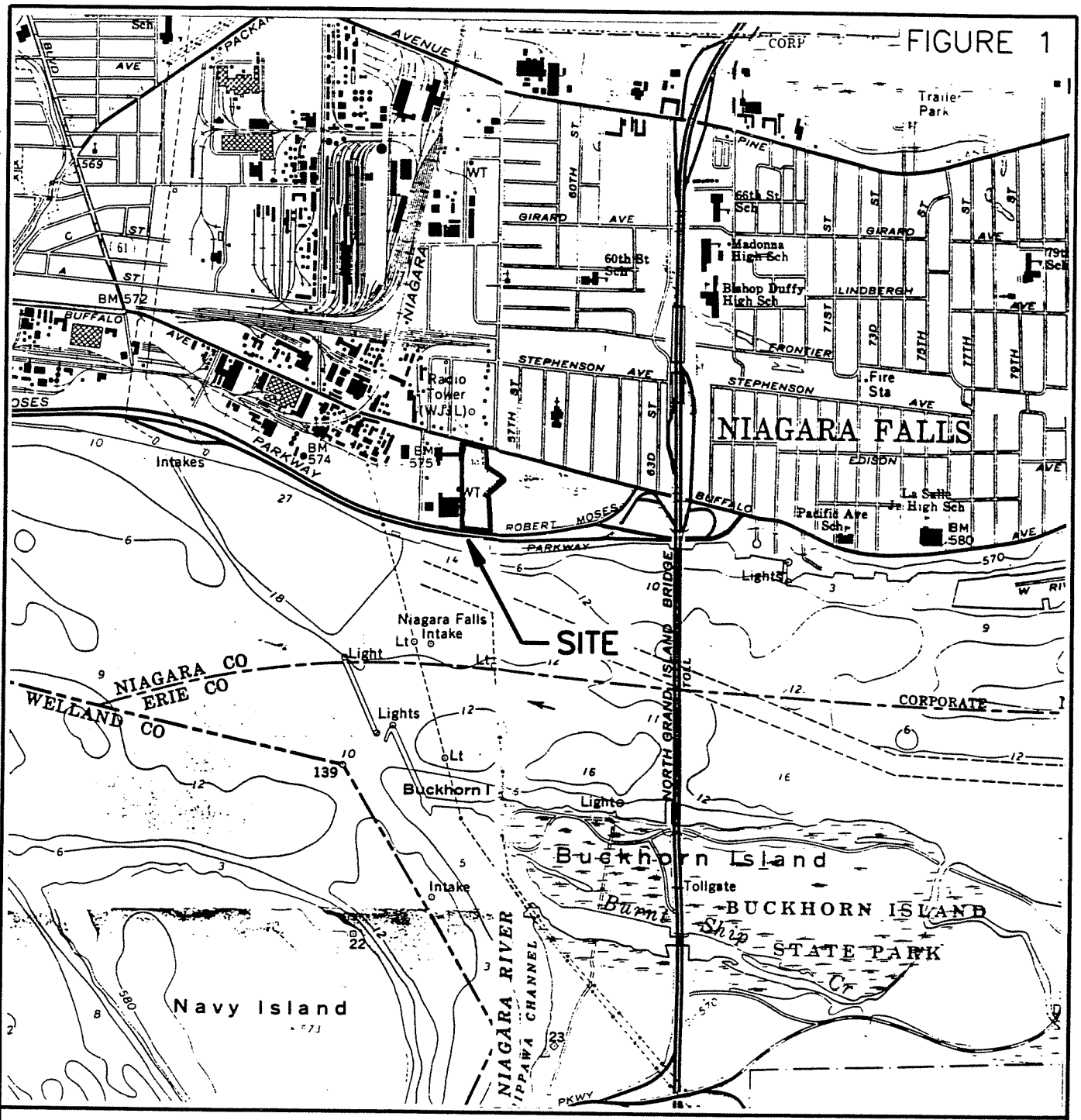
SOIL BORING LOCATION	"S" AREA VOLATILE ORGANIC COMPOUNDS	"S" AREA SEMIVOLATILE ORGANIC COMPOUNDS	TOTAL "S" AREA COMPOUNDS
SB-1	ND	ND	ND
SB-2	ND	ND	ND
SB-3	ND	ND	ND
SB-4	ND	ND	ND
SB-5	ND	ND	ND

Notes: Concentrations in ug/kg (ppb)
ND- Not Detected
NA - Not Analyzed

FIGURES

H:\PROJECTS\111111\76\8X11 SF: 1=1

FIGURE 1



PHASE II INVESTIGATION
WATER TREATMENT PLANT–EASTERN AREA
NIAGARA FALLS, NEW YORK

SITE LOCATION MAP

0 2000 4000

APPROX. SCALE IN FEET

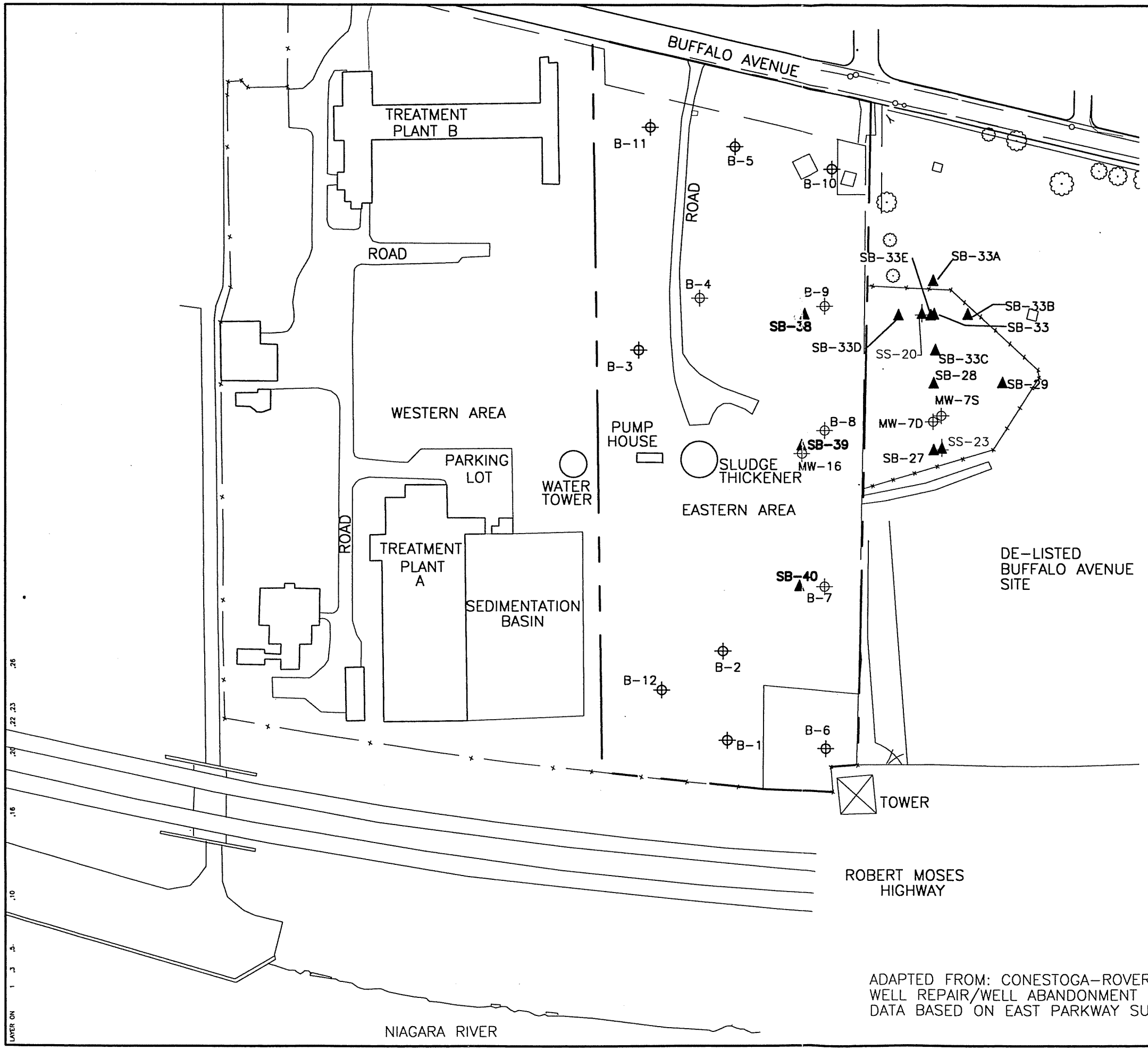
ADAPTED FROM USGS NIAGARA FALLS, NEW YORK AND TONAWANDA WEST QUADRANGLE 7.5 MINUTE SERIES

1736.078.001F
APRIL/18/95

LAYER ON 1,2,3

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 2



I:\DV12\PROJECTS\1736078\DWG\FIGURE3 SF: 1=150

LAYER ON 1 .3 .5 .10 .16 .20 .22 .23 .26

LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- EXISTING MONITORING WELL
- SOIL BORING LOCATION
- SURFACE SOIL SAMPLE LOCATION

ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

OCT. 1996

PHASE II INVESTIGATION
ONE-ACRE SITE-BUFFALO AVE.
NIAGARA FALLS, NEW YORK

PREVIOUS SAMPLE LOCATIONS

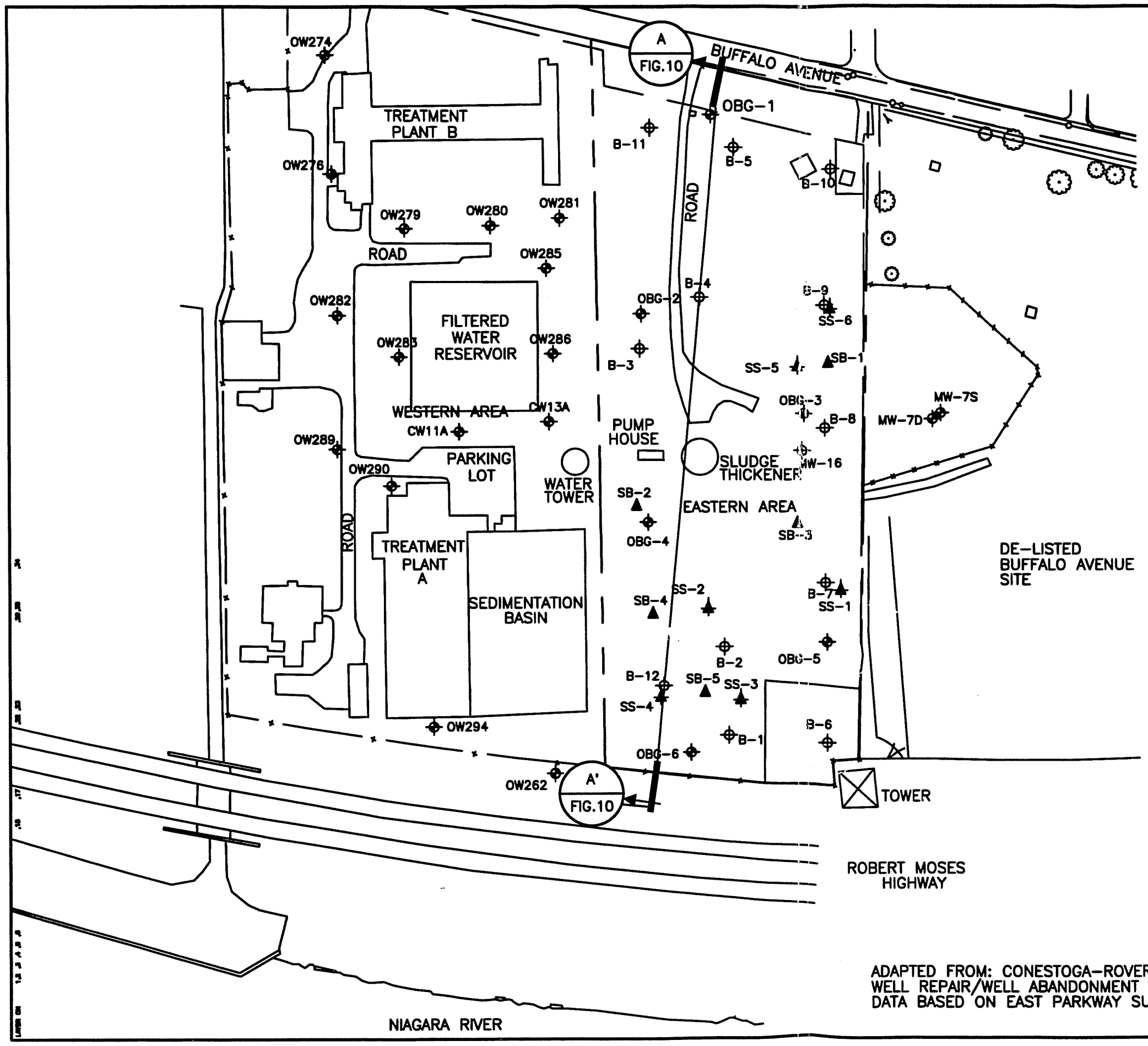
150 0 150

APPROX. SCALE IN FEET

1736.078-02F

O'BRIEN & GERE ENGINEERS,INC.

FIGURE 3



LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- EXISTING MONITORING WELL
- MONITORING WELL (OBG)
- SOIL BORING LOCATION
- SURFACE SOIL SAMPLE LOCATION

ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

SEPT./30/96

PHASE II INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

EASTERN AREA MONITORING WELL, SURFACE SOIL AND SOIL BORING LOCATION MAP

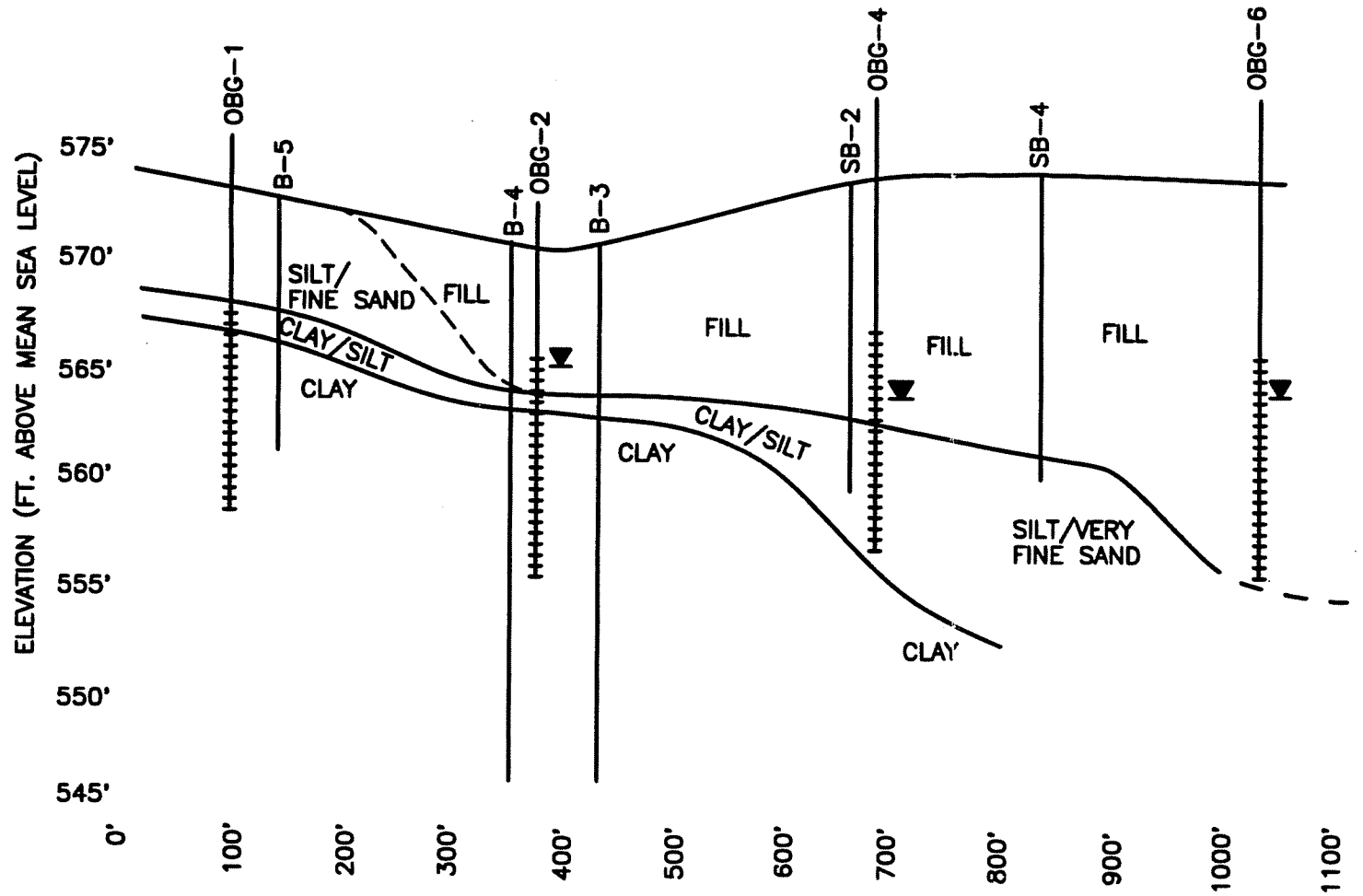
150 0 150

APPROX. SCALE IN FEET

1736.078-00F

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 4



SECTION A
N.T.S.
FIG 3

LEGEND:

▼ GROUND WATER ELEVATION (9/18/96)

PHASE II INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

EASTERN AREA GEOLOGIC CROSS-SECTION A-A'

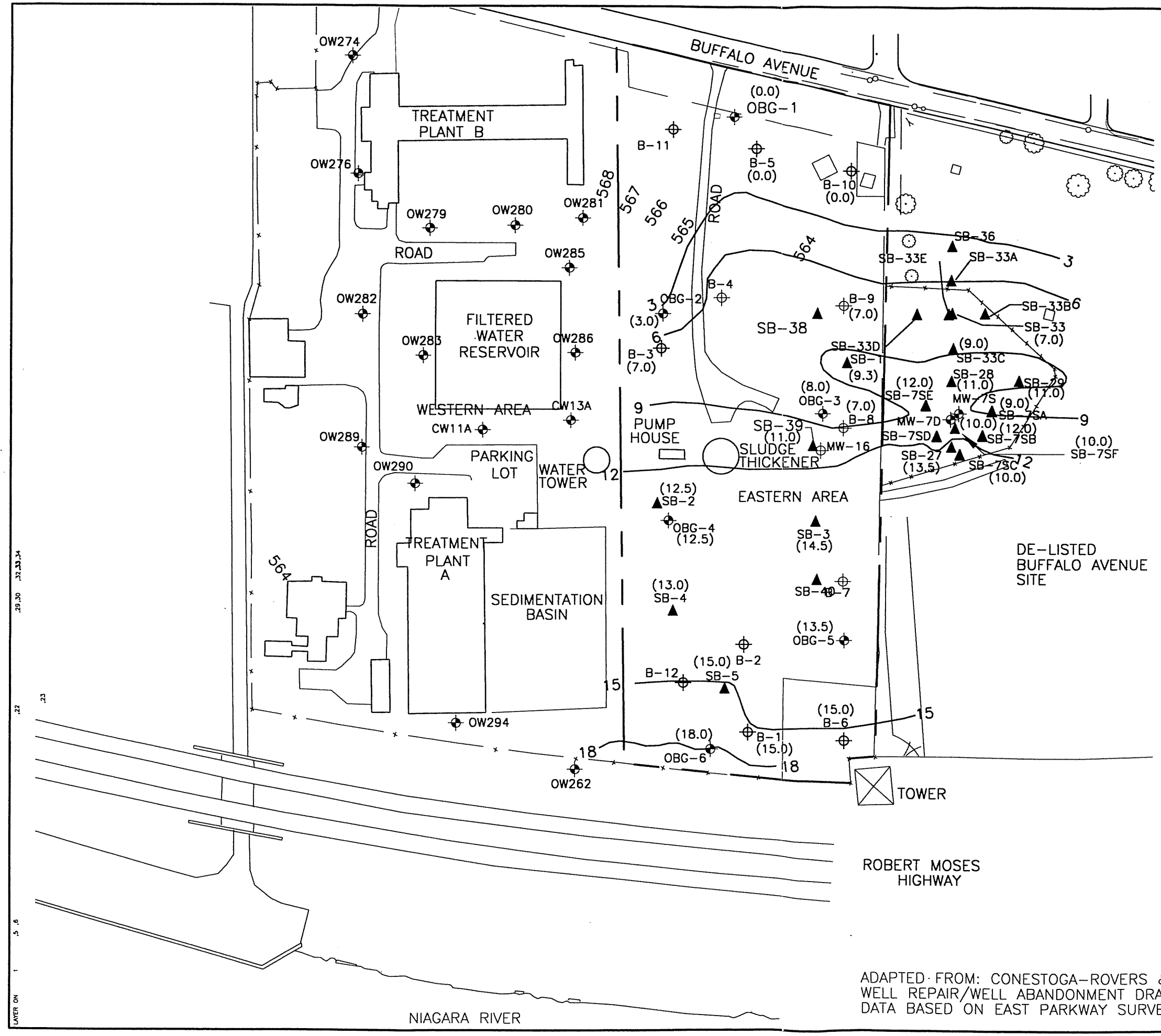
100 0 100

APPROX. SCALE IN FEET
VERTICAL EXAGGERATION = 20X

1738.078-11F

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 5



LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- EXISTING MONITORING WELL
- MONITORING WELL (OBG)
- SOIL BORING LOCATION
- SURFACE SOIL SAMPLE LOCATION
- (9.0) THICKNESS OF FILL IN FEET (NO DIFFERENTIATION BETWEEN FILL TYPES)

PHASE II INVESTIGATION
ONE-ACRE SITE-BUFFALO AVE.
NIAGARA FALLS, NEW YORK

FILL THICKNESS MAP

150 0 150

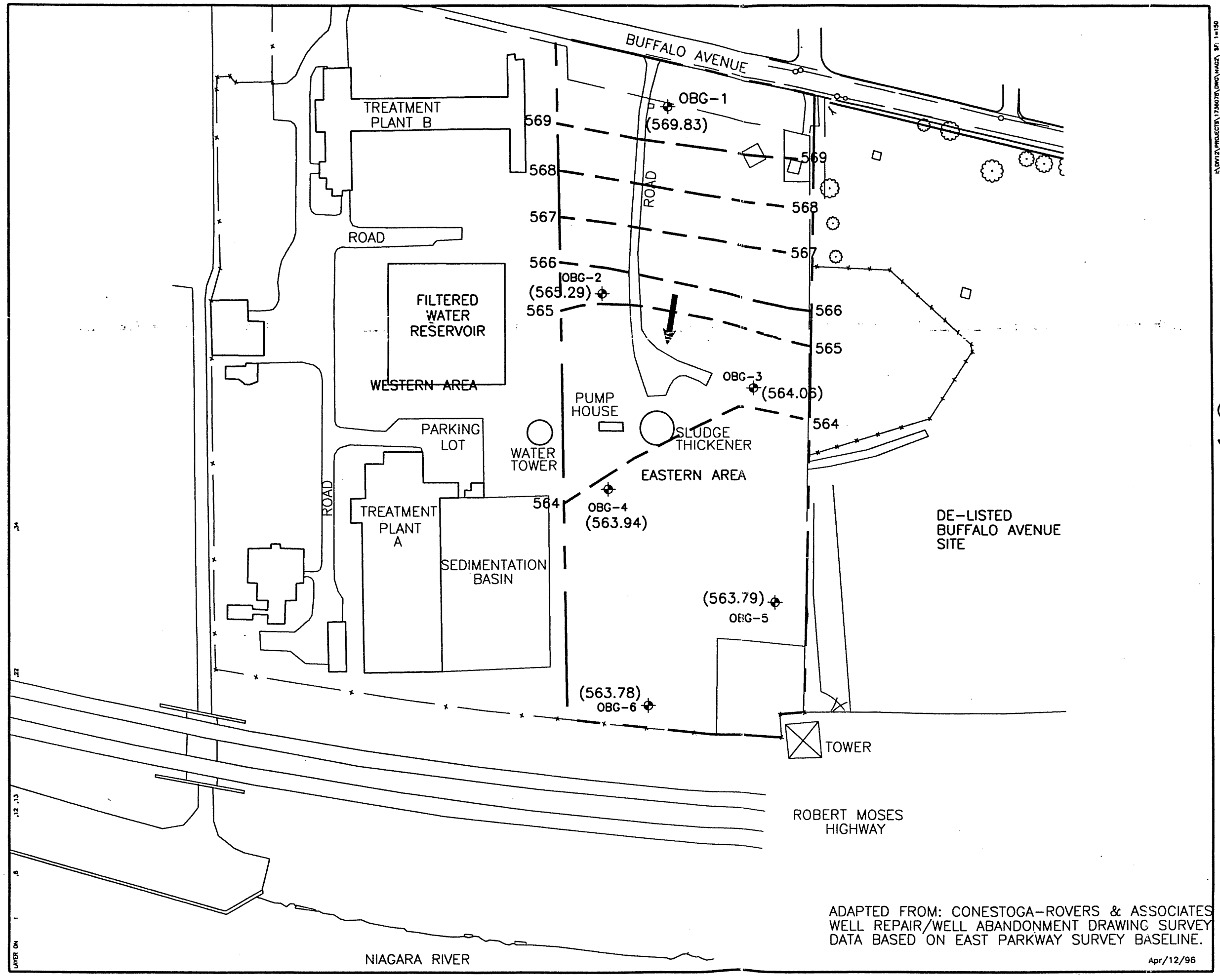
APPROX. SCALE IN FEET

ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

1736.078-09F

O'BRIEN & GERE ENGINEERS,INC.

FIGURE 6



LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- MONITORING WELL (OBG)
- (564.06) GROUND WATER ELEVATION (FT.)
- GROUND WATER FLOW DIRECTION
- 565 GROUND WATER ELEVATION CONTOUR

ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

Apr/12/96

PHASE II INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

SHALLOW GROUND WATER FLOW MAP (3/28/95)

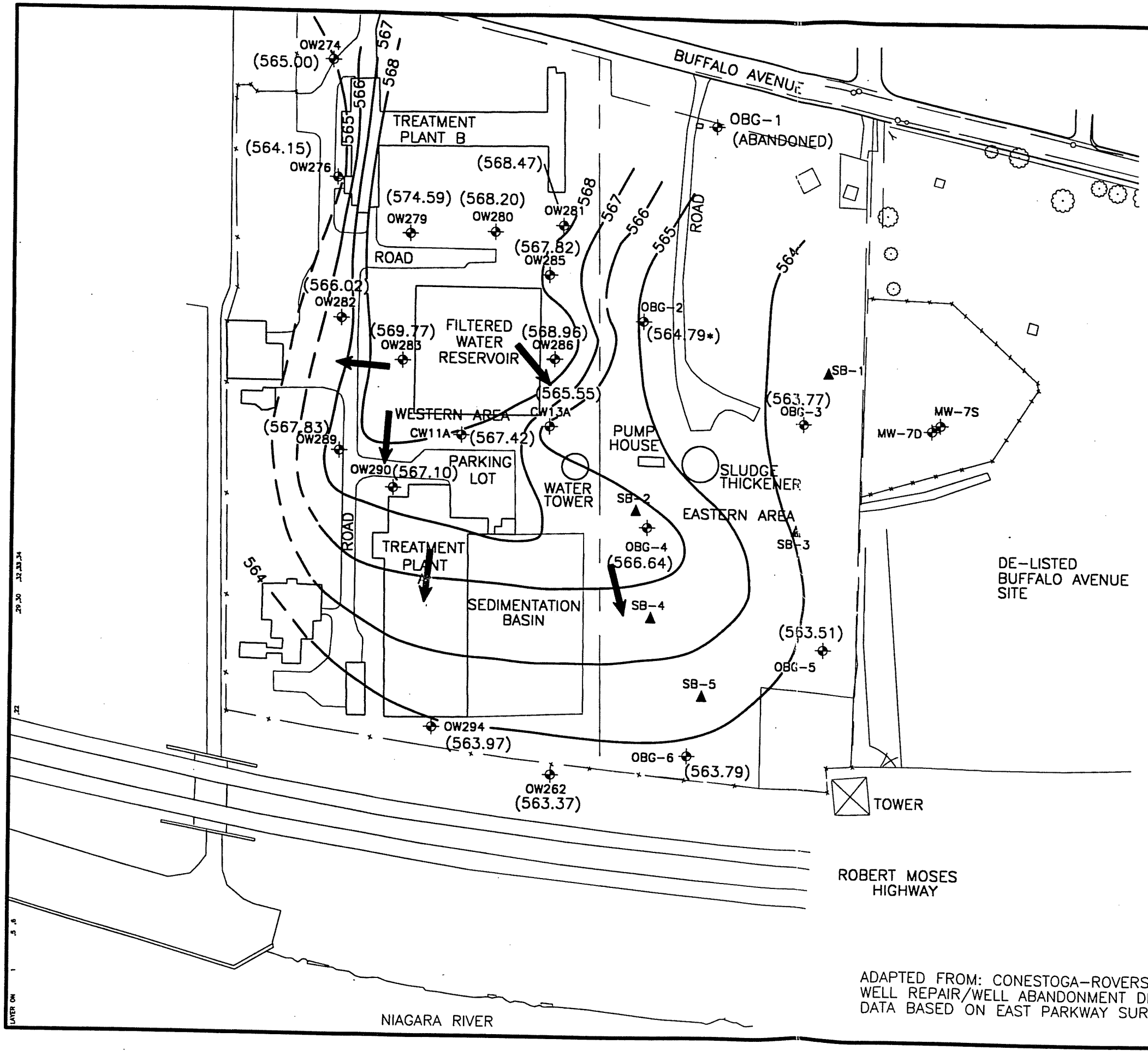
150 0 150

APPROX. SCALE IN FEET

1736.078-11F

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 7



ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

SEPT/30/96

LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- MONITORING WELL (OBG)
- (563.77) SHALLOW GROUND WATER ELEVATION
- 567 SHALLOW GROUND WATER ELEVATION CONTOUR
- GROUND WATER FLOW DIRECTION

* - OBG-2 WAS DAMAGED DURING SITE ACTIVITIES. RESURVEYING WAS COMPLETED.

PHASE II INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

SHALLOW GROUND WATER FLOW MAP (2/8/96)

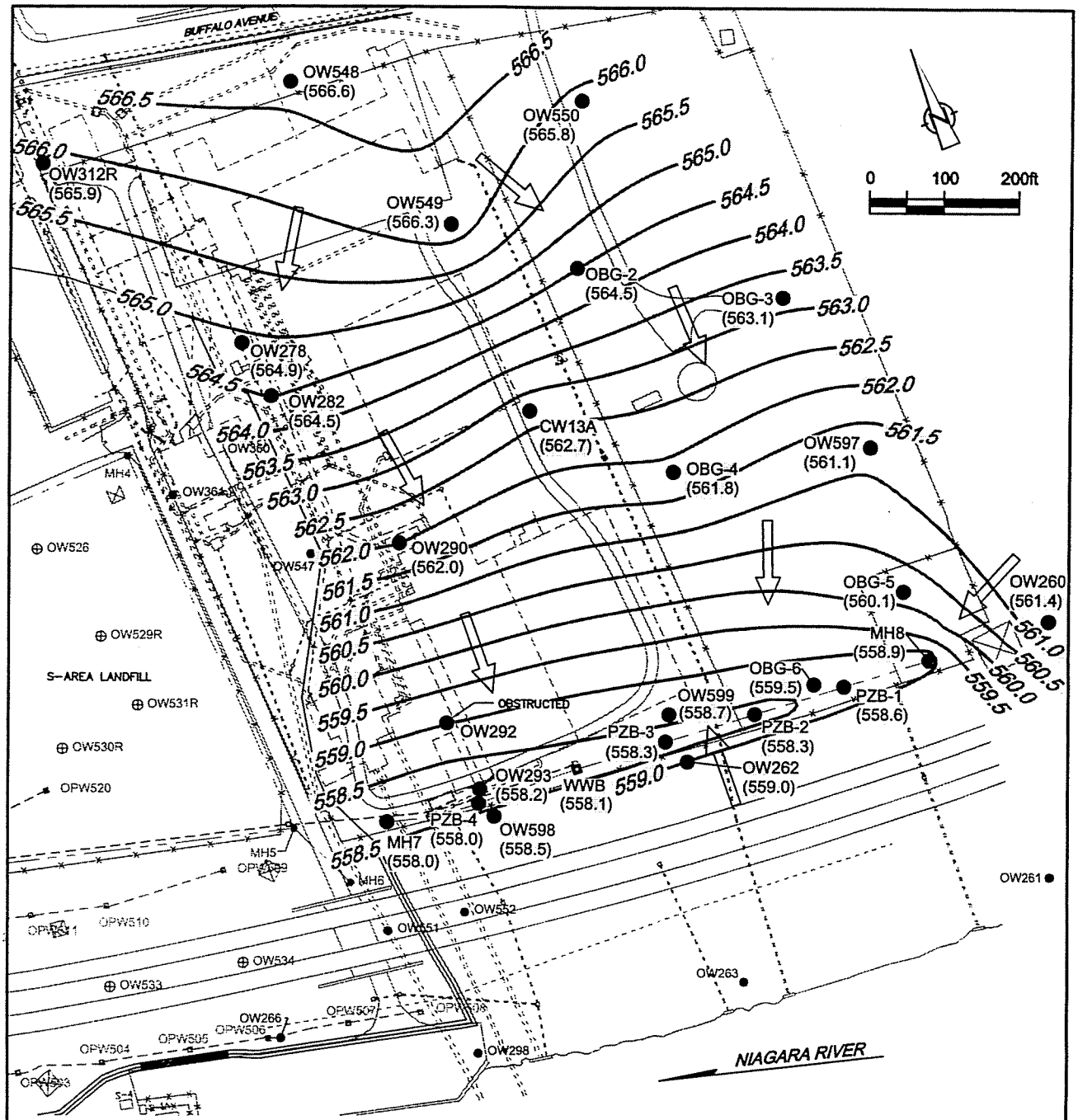
150 0 150

APPROX. SCALE IN FEET

1736.078-09F

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 8



GROUNDWATER CONTOURS - MAY 2000
FORMER DWTP OVERBURDEN GROUNDWATER STUDY
S-AREA REMEDIAL PROGRAM
Miller Springs Remedial Management, Inc.

01769-00(239)GN-WA004 MAR 08/2001

FIGURE 9

BUFFALO AVENUE

OBG-1

TREATMENT PLANT B

ROAD

FILTERED WATER RESERVOIR

WESTERN AREA

OBG-2

OBG-3

MW-7S

MW-7D

PUMP HOUSE

PARKING LOT

WATER TOWER

SLUDGE THICKENER

EASTERN AREA

OBG-4

TREATMENT PLANT A

SEDIMENTATION BASIN

DE-LISTED BUFFALO AVENUE SITE

OBG-5

OBG-6

TOWER

ROBERT MOSES HIGHWAY

NIAGARA RIVER

OBG-2	
VOCs: TOTAL "S" AREA	ND
VOCs: OTHER VOCs	20 ug/L
SVOCs: TOTAL "S" AREA	29 ug/L
SVOCs: PAHs	2.8 ug/L
SVOCs: OTHER SVOCs	ND
INORG: Pb	34.5(ND) mg/L
INORG: Cr	52.6(4.1) mg/L
INORG: Ar	9.5(ND) mg/L
TOTAL PEST.	0.147 ug/L

OBG-1	
VOCs: TOTAL "S" AREA	ND
VOCs: OTHER VOCs	0.9 ug/L
SVOCs: TOTAL "S" AREA	ND
SVOCs: PAHs	ND
SVOCs: OTHER SVOCs	ND
INORG: Pb	28.7 (ND) mg/L
INORG: Cr	110 (4.1) mg/L
INORG: Ar	19.2 (2.3) mg/L
TOTAL PEST.	0.049 ug/L

OBG-3	
VOCs: TOTAL "S" AREA	ND
VOCs: OTHER VOCs	3.6 ug/L
SVOCs: TOTAL "S" AREA	1 ug/L
SVOCs: PAHs	ND
SVOCs: OTHER SVOCs	ND
INORG: Pb	11.6(ND) mg/L
INORG: Cr	10.8(8.2) mg/L
INORG: Ar	ND(ND) mg/L
TOTAL PEST.	0.015 ug/L

OBG-4	
VOCs: TOTAL "S" AREA	134 ug/L
VOCs: OTHER VOCs	0.7 ug/L
SVOCs: TOTAL "S" AREA	1 ug/L
SVOCs: PAHs	ND
SVOCs: OTHER SVOCs	4 ug/L
INORG: Pb	138(ND) mg/L
INORG: Cr	56.7(3.4) mg/L
INORG: Ar	29(ND) mg/L
TOTAL PEST.	0.29 ug/L

OBG-5	
VOCs: TOTAL "S" AREA	33.6 ug/L
VOCs: OTHER VOCs	4.7 ug/L
SVOCs: TOTAL "S" AREA	55 ug/L
SVOCs: PAHs	ND
SVOCs: OTHER SVOCs	0.9 ug/L
INORG: Pb	935(ND) mg/L
INORG: Cr	128(4) mg/L
INORG: Ar	61.8(ND) mg/L
TOTAL PEST.	0.085 ug/L

OBG-6	
VOCs: TOTAL "S" AREA	24.6 ug/L
VOCs: OTHER VOCs	1 ug/L
SVOCs: TOTAL "S" AREA	81 ug/L
SVOCs: PAHs	14 ug/L
SVOCs: OTHER SVOCs	7 ug/L
INORG: Pb	5470(ND) mg/L
INORG: Cr	275(4.1) mg/L
INORG: Ar	215(2.6) mg/L
TOTAL PEST.	0.34 ug/L

ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

SEPT/30/96

LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- EXISTING MONITORING WELL
- MONITORING WELL (OBG)

ND NON-DETECT
NA NOT ANALYZED
( ) FILTERED (DISSOLVED) METALS
VOCs VOLITILE ORGANIC COMPOUNDS
SVOCs SEMIVOLITILE ORGANIC COMPOUNDS
INORG INORGANIC COMPOUNDS

PHASE II INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

GROUND WATER CHEMISTRY MAP

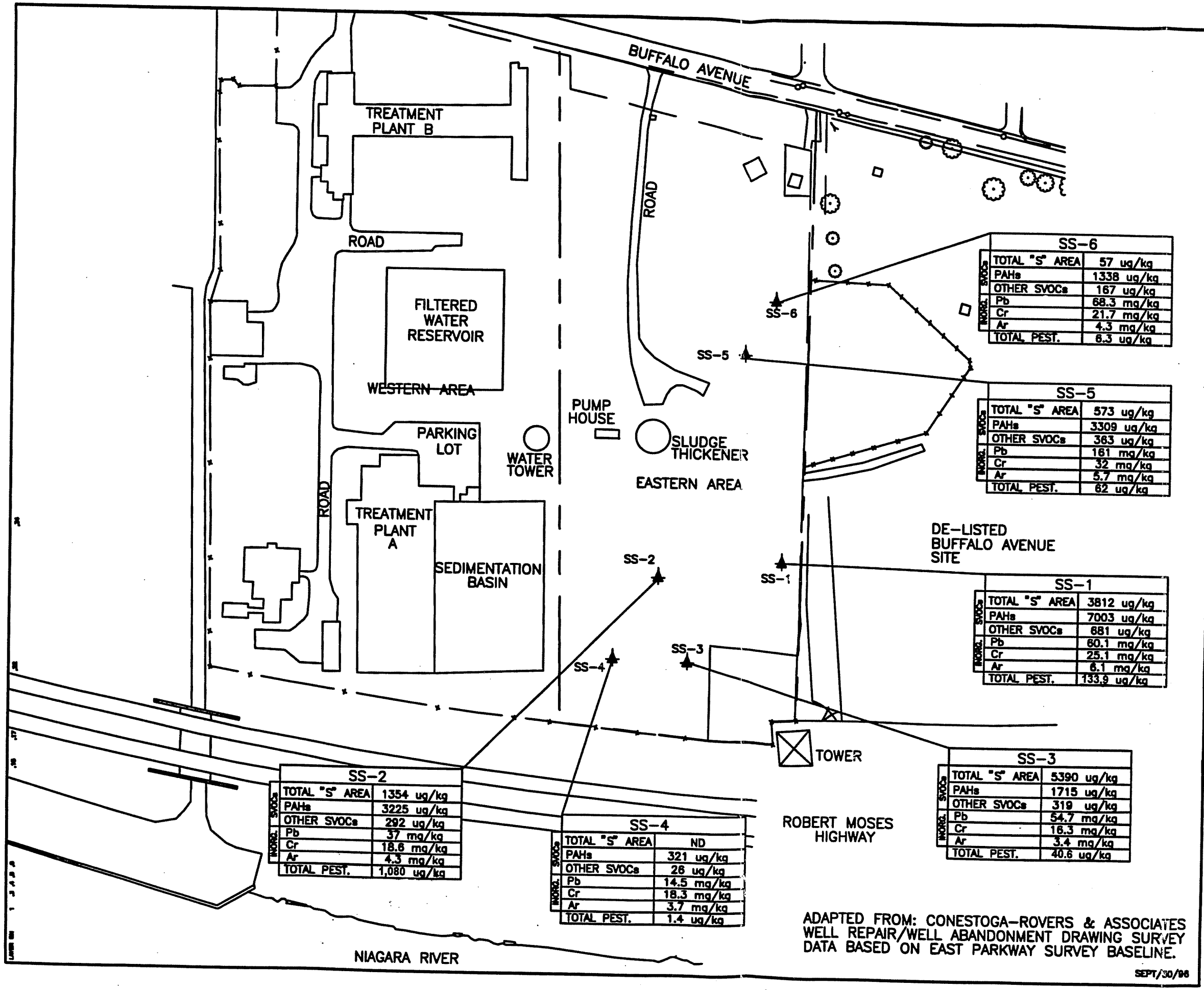
150 0 150

APPROX. SCALE IN FEET

1736.078-07F

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 10



LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- SURFACE SOIL SAMPLE LOCATION

ND – NON DETECT

SVOCs – SEMIVOLITILE ORGANIC COMPOUNDS

INORG – INORGANIC COMPOUNDS

PHASE II INVESTIGATION
WATER TREATMENT PLANT–EASTERN AREA
NIAGARA FALLS, NEW YORK

SURFACE SOIL CHEMISTRY MAP

150 0 150

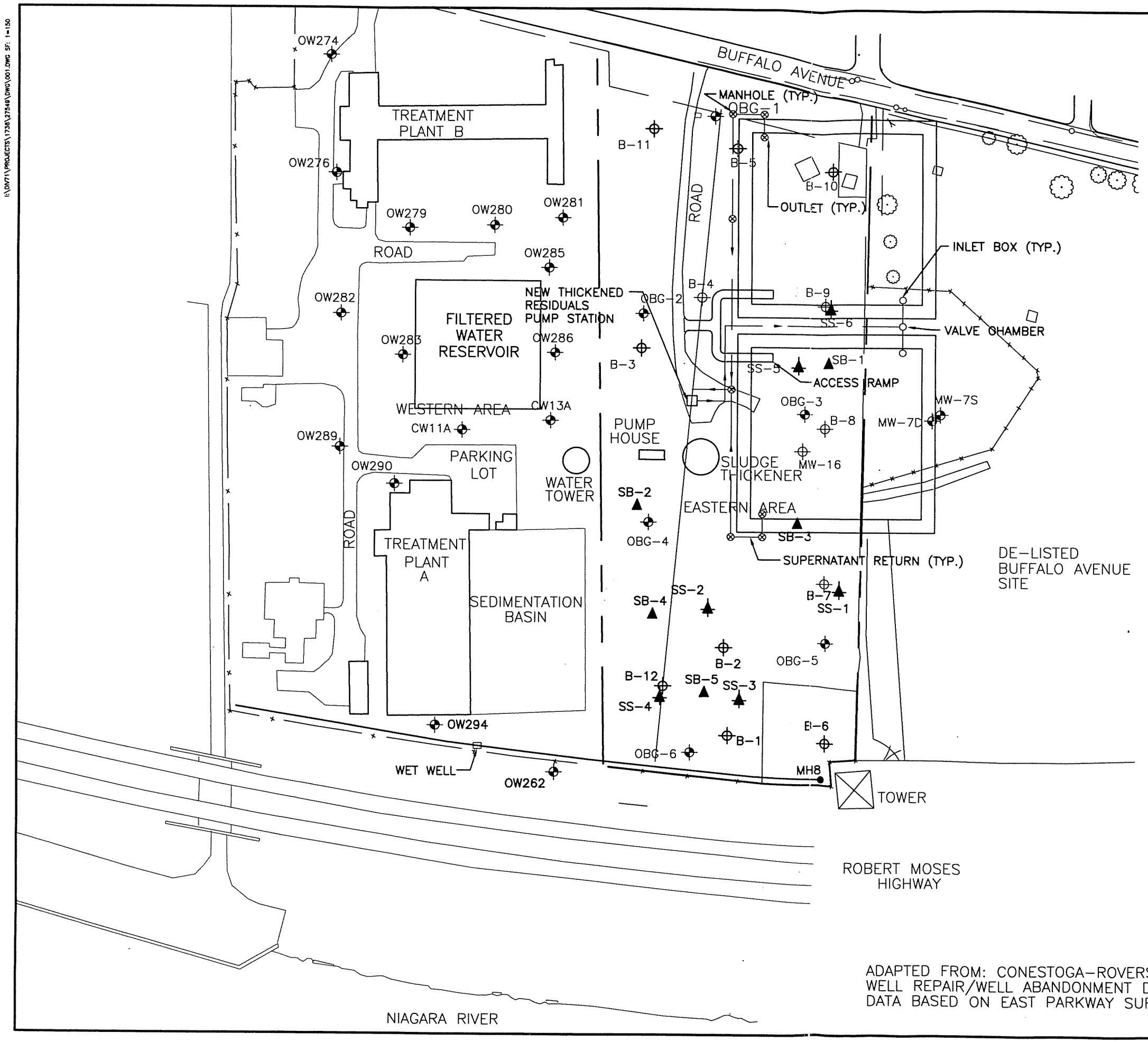
APPROX. SCALE IN FEET

1736.078-03F

O'BRIEN & GERE ENGINEERS, INC.

I:\DW71\PROJECTS\1736\27549\DWG\001.DWG SF: 1=150

FIGURE 11



ADAPTED FROM: CONESTOGA-ROVERS & ASSOCIATES WELL REPAIR/WELL ABANDONMENT DRAWING SURVEY DATA BASED ON EAST PARKWAY SURVEY BASELINE.

LEGEND

- SITE BOUNDARY PER RRT STIPULATION
- FENCE
- EXISTING MONITORING WELL
- MONITORING WELL (OBG)
- SOIL BORING LOCATION
- SURFACE SOIL SAMPLE LOCATION
- S-AREA GW COLLECTION TRENCH
- PROPOSED FREEZE/THAW BEDS

PHASE II INVESTIGATION
ONE-ACRE SITE-BUFFALO AVE.
NIAGARA FALLS, NEW YORK

S-AREA TRENCH AND PLANNED FREEZE / THAW BEDS

150 0 150
APPROX. SCALE IN FEET

JUNE 2001
1736.078-0DF

O'BRIEN & GERE
ENGINEERS,INC.

APPENDICES

Appendix A

1970 Aerial Photograph

Map 1970 Scale: 1" = 200'
1" = 200'

Appendix B

Soil Boring Logs and Monitoring Well Completion Diagrams

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG-1

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, NY

File No.: 1736.078

Sampler: 2"Split Spoon

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location:

Start Date: 2/6/95
End Date: 2/6/95

Boring Company: SJB Services Inc.
Foreman: Ken Swinnich
OBG Geologist: Chawn O'Dell

Screen / Riser

Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	1-1-2-1	2.0/1.0	3	Damp, medium to dark brown, loose, SILT, some very fine sand, little clay, trace organics (plant roots).			0.0
1									
2	2	2-4	2-1-2-2	2.0/1.3	3	Damp to wet, medium brown, loose SILT and very fine SAND, little clay.			0.0
3									
4	3	4-6	1-2-3-3	2.0/1.5	5	Damp, olive with orange mottling, loose SILT, changing to CLAY, some silt, little very fine sand, trace shell fragments.			0.0
5									
6	4	6-8	3-4-3-3	2.0/2.0	7	Wet, brown with orange and olive mottling loose, very fine sand, some silt, trace clay.			0.0
7									
8	5	8-10	4-6-8-10	2.0/2.0	14	Damp, red to red brown, medium dense CLAY, little silt, little very fine sand.			0.0
9									
10	6	10-12	6-9	2.0/2.0	19	Damp to wet, red brown medium dense, CLAY, little silt.			0.0
			10-13						
11									
12	7	12-14	53-30	2.0/2.0	41	Wet, red brown, dense CLAY, little silt.			0.0
			11-10						
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Bentonite to 1.5 ft.; Grout to the surface; 2.5 ft to stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG-2

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, NY

File No.: 1736.078

Sampler: 2"Split Spoon

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location:

Start Date: 2/9/95
End Date: 2/9/95

Boring Company: SJB Services Inc.
Foreman: Ken Swinnich
OBG Geologist: Chawn O'Dell

Screen / Riser | Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm
0	1	0-2	11-11	2.0/0.8	20	Dry, brown to gray, medium dense, SILT, some very fine sand, little medium to coarse sand, little fine to medium angular gravel.			0.1
			9-8						
1									
2	2	2-4	5-3-1-1	2.0/0.2	4	Dry to damp, dark brown to black, loose, fine to ocarse SAND, little fine gravel. Poor recovery.			0.5
3									
4	3	4-6	2-1-1-1	2.0/1.0	2	Wet, orange, brown, black, loose, SILT to fine SAND, some white ash, some cinders, little fine angular gravel, trace red brick, trace glass fragments.			0.7
5									
6	4	6-8	2-1-5-7	2.0/1.2	6	Wet as above to 7.0 ft., then olive SILT, some clay, little very fine sand.			0.2
7									
8	5	8-10	4-5-6-6	2.0/1.6	11	Moist, brown to olive green, medium dense, silty CLAY.			0.0
9									
10	6	10-12	2-2-2-3	2.0/1.5	4	Wet, brown to olive green, loose, CLAY, little silt.			0.0
11									
12	7	12-14	3-3-4-3	2.0/2.0	7	Wet, brown to olive green, loose, CLAY, little silt.			0.0
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Sand Pack to 3.0 ft.; Bentonite to 1.0 ft.; Grout to the surface; 2.5 ft. of stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG-3

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, NY

File No.: 1736.078

Sampler: 2"Split Spoon

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location:

Start Date: 2/7/95
End Date: 2/7/95

Boring Company: SJB Services Inc.
Foreman: Ken Swinnich
OBG Geologist: Chawn O'Dell

Screen / Riser — Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm
0	1	0-2	4-4-5-7	2.0/1.3	9	Damp, dark brown, loose, very fine SAND, some silt, little fine sand, trace fine angular gravel, trace red brick fragments, trace wood and white ash.			0.2
1									
2	2	2-4	6-3-4-3	2.0/1.0	7	Damp, dark brown to red brown, loose, very fine SAND, some silt, little fine to medium gravel (shot rock-dolomite), trace red brick, trace white ash, trace burnt wood and multi-colored particles.			0.4
3									
4	3	4-6	3-3-3-7	2.0/0.7	6	Wet, dark brown to black, loose SILT and very fine sand, fine to coarse angular gravel.			0.5
5									
6	4	6-8	3-2-1-1	2.0/1.5	3	Wet to saturated, reddish brown to black, loose SILT and fine SAND, some multi-colored glass fragments, little white ash, little black cinders.			1.2
7									
8	5	8-10	2-1-2-2	2.0/1.0	3	Wet, medium brown, loose, fine SAND and SILT, little clay, turning to CLAY, little silt at tip of spoon.			1.4
9									
10	6	10-12	3-7	2.0/1.5	18	Wet, brown to reddish brown, medium dense, CLAY, little silt.			0.4
11			11-11						
12	7	12-14	4-8-9-8	2.0/1.4	17	Wet, brown to reddish brown, medium dense CLAY, little silt.			0.3
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Sand Pack to 3.0 ft.; Bentonite to 1.0 ft,; Grout to the surface; 2.5 ft. of stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG-4

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, NY

File No.: 1736.078

Sampler: 2"Split Spoon

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location:

Start Date: 2/7/95
End Date: 2/7/95

Boring Company: SJB Services Inc.
Foreman: Ken Swinnich
OBG Geologist: Chawn O'Dell

Screen / Riser — Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm
0	1	0-2	6-6-8	1.7/1.6	14	Damp, medium to dark brown, medium dense, SILT, some very fine sand, little fine to medium angular gravel, trace white ash and red brick fragments. Spoon refusal at 1.7 ft. Coarse gravel at spoon tip.			0.8
			50/0.2						
1									
2	2	2-4	—			No spoon driven. Augered through gravel/concrete?			—
3									
4	3	4-6	3-6-8-11	2.0/1.5	14	Damp, medium to dark brown, medium dense, SILT to fine SAND, little fine to medium angular gravel, trace white ash, trace cinders.			0.2
5									
6	4	6-8	4-5-8-10	2.0/1.8	13	Wet, medium dense, dark brown, medium to coarse SAND, some white ash, some cinders, little multi-colored glass.			0.3
7									
8	5	8-10	2-2-3-4	2.0/1.0	5	Wet, loose, reddish to dark brown, fine SAND, some medium to coarse sand, some cinders, little white ash, trace slag, trace fine angular gravel.			0.2
9									
10	6	10-12	1-1	2.0/1.0	2	Wet, medium brown to gray, loose, SILT and very fine SAND, some white ash, little cinders, trace shell fragments, multi-colored fragments.			2.1
			WOH-1						
11									
12	7	12-14	1-1-2-1	2.0/1.0	3	Same as above to 12.5 ft. then olive, loose SILT and very fine SAND, little fine sand,			1.8
13									
14	8	14-16	1-2-1-1	2.0/1.8	3	Saturated, olive, loose, SILT and fine SAND.			2.2
15									
16	9	16-18	1-1	2.0/1.9	2	Same as above.			0.0
			WOH-1						
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Bentonite to 3.0 ft.; Sand pack to 5.0 ft.; Grout to the surface; 2.5 ft. of stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG-5

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, NY

File No.: 1736.078

Sampler: 2"Split Spoon

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location:

Start Date: 2/8/95
End Date: 2/8/95

Boring Company: SJB Services Inc.
Foreman: Ken Swinnich
OBG Geologist: Chawn O'Dell

Screen = Riser ☐ \ Grout ▒ Sand Pack ■ Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm
0	1	0-2	3-4-5-3	2.0/1.3	9	Dry to damp, medium brown, loose SILT, little very fine sand, trace fine angular gravel, trace organics (plant roots).			0.3
1									
2	2	2-4	4-5-5-3	2.0/1.5	10	Same as above, little medium SAND.			0.0
3									
4	3	4-6	3-3-2-2	2.0/1.7	4	Damp, orange, white, gray, loose ASH and very fine sand, little cinders, little fine angular gravel, trace silt.			0.0
5									
6	4	6-8	1-1-2-2	2.0/0.7	3	Moist, as above.			0.7
7									
8	5	8-10	1-1-2-1	2.0/1.3	3	Wet, as above, some cinders.			0.3
9									
10	6	10-12	1-1-1-1	2.0/1.5	2	Saturated, brown to gray, loose, very fine SAND and SILT, some cinders, little white ash, little orange brick, trace shell fragments.			1.1
11									
12	7	12-14	1-1-1-5	2.0/1.0	2	As above to 13.5 ft. then olive to gray, SILT and fine SAND, trace organics.			0.9
13									
14	8	14-16	3-5-7-8	2.0/1.5	12	Saturated, olive, medium dense, SILT and fine SAND, trace shell fragments.			0.2
15									
16									
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Sand pack to 5.0 ft.; Bentonite to 3.0 ft.; Grout to the surface; 2.5 ft. of stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING OBG-6
Client: City of Niagara Falls East Area Investigation Proj. Loc: Niagara Falls, NY File No.: 1736.078	Sampler: 2"Split Spoon Hammer: 140 lbs. Fall: 30"	Page 1 of 1 Location: Start Date: 2/8/95 End Date: 2/8/95
Boring Company: SJB Services Inc. Foreman: Ken Swinnich OBG Geologist: Chawn O'Dell		Screen / Riser; Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	5-8	2.0/1.3	18	Dry, medium brown to orange at top of spoon, medium dense very fine SAND and SILT, little angular fine to medium gravel, trace organics (plant roots).			1.1
			10-12						
1									
2	2	2-4	5-3-2-2	2.0/1.2	5	Moist, medium brown, loose, fine SAND, some silt, little medium to coarse gravel (angular), trace clay.			2.1
3									
4	3	4-6	3-5-3-2	2.0/1.5	8	Damp to wet, medium brown, loose, SILT and very fine SAND, little fine to medium angular gravel, little clay.			4.1
5									
6	4	6-8	4-3-4-4	2.0/1.5	7	Same as above, wet.			31.0
7									
8	5	8-10	4-5-6-8	2.0/1.8	11	Wet, dark brown to black, medium dense, CINDERS, some white ash, little glass fragments, little fine angular gravel, little fine to medium sand, trace silt.			32.5
9									
10	6	10-12	3-2-2-2	2.0/1.5	4	Saturated, black, loose CINDERS, some glass, fragments, little silt, little fine angular gravel.			12.5
11									
12	7	12-14	8-12	2.0/1.3	26	Same as above, medium dense.			240
			14-9						
13									
14	8	14-16	2-3-3-2	2.0/0.6	6	Same as above, moderate odor, loose.			220
15									
16	9	16-18	2-2-3-2	2.0/0.4	5	Same as above, odor.			170
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Sand pack to 5.0 ft.; Bentonite to 3.0 ft.; Grout to the surface; 2.5 ft. of stickup.
HS - Headspace

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
	12-2-82				

ESI FIELD LOG

HOLE NO. K-1
GRD. ELEV.
G.W. DEPTH

SHEET 1 OF 1

PROJECT NIAG. FALLS
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1		20				WET		FILL	
10-12	2		9				WET		ORG. SAND & SILT	(STRONG ODOR)
15-17	3		10				WET		SILT & SAND SOME ORG.	
20-22	4		8							
25-27	5		9							
30-32	6		17							
35-37	7		125						35.5 TOP OF TILL	
38.5	REFUSAL								TILL	

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N — No. blows to drive "spoon "with lb. pin wt. falling "per blow.
C — No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
	12-3-04				

ESI FIELD LOG

HOLE NO. B-2
GRD. ELEV.
G.W. DEPTH

SHEET 1 OF 1

PROJECT NIAG FALLS
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1		8				M	10 BR	SILT & CLAY FILL	
10-12	2		5				W	BL WH	CINDERS & FILL	(MED. ODOR)
15-17	3		24				W	GY	SAND, SILT, ORG.	VIRGIN MAT.
~~20-22~~	~~4~~								AUGERED TO 24.0	
~~25-27~~	~~5~~								INSTALLED 2" V.P. @ 24.0'	

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N — No. blows to drive "spoon "with lb. pin wt. falling "per blow.
C — No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
	12-11-A				

ESI FIELD LOG

HOLE NO. B-3

GRD. ELEV.

G.W. DEPTH

SHEET 1 OF 1

PROJECT

LOCATION NAD Fall

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	10		5						FILL	
10-12.2			9				MOIST		CLAY	
15-17.3			5				WET			
20-21.4		WOH							CLAY	2" W. PT 31.5/2.5
25-25.5		WOH								
28.5-28.6		WOH							29.5 TILL	
									32.6 HARD REFUSAL	

NOTATION: SIZE CORE

SIZE SHELBY TUBE

SIZE AUGER

N = No. blows to drive "spoon "with lb. pin wt. falling "per blow.
C = No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
	2-13-92				

ESI FIELD LOG

HOLE NO. B-9
GRD. ELEV.
G.W. DEPTH

SHEET 1 OF 1
PROJECT LOCATION Niagara Falls

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
										3.95 ft S.U.
										Ground level
										Cement Grout
									Stiff Clay	
										Bent. Seal
									Till	5 ft S.S. Johnson Screen
									34.5 Auger Refusal Auger + Spoon	Bentonite plug

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N — No. blows to drive " spoon " with lb. pin wt. falling " per blow.
C — No. blows to drive " casing " with lb. weight falling " per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
12/4/92					
12/7/92					

ESI

FIELD LOG

HOLE NO. P-3

GRD. ELEV.

G.W. DEPTH

SHEET 1 OF 1

PROJECT City of Niagara Falls

LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	5	5	7	5		W	Br	Silty U.F. Sand	
10-12	2						Mst	Gy	Clay	
									B.O.H. 12.0	

NOTATION: SIZE CORE

SIZE SHELBY TUBE

SIZE AUGER

N = No. blows to drive "spoon "with lb. pin wt. falling "per blow.

C = No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
12/9/81					
12/9/81					

ESI FIELD LOG

HOLE NO. B-6
GRD. ELEV.
G.W. DEPTH

SHEET ____ OF ____

PROJECT City of Niagara Falls
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	5	7	6	6		M	Gr Br	Crushed Stone Clay -	Fill
10-12	2	14	9	8	8		M	Gr	Clay & Gravel -	Fill
15-17	3	5	6	-	-		W	Br	f. Sand	
20-22	4	2	2	2	2		W	Gr	Silty f. Sand	
									B.O.H. 22.0	

NOTATION: SIZE CORE ____
SIZE SHELBY TUBE ____
SIZE AUGER ____
N — No. blows to drive ____" spoon ____" with ____ lb. pin wt. falling ____" per blow.
C — No. blows to drive ____" casing ____" with ____ lb. weight falling ____" per blow.

SOIL CLASSIFICATIONS BY: ____
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: ____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME

ESI FIELD LOG

HOLE NO. B-1

GRD. ELEV.

G.W. DEPTH

SHEET 1 OF 1

PROJECT

LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
1	1	1	2				M	BR	FILL	
2	2	2	4						FILL STRONG ODOR	
3							BL			
4								GY	SAND, SILT ORG.	
5		1	4							
6										
7		2	4				W	RU	SOFT CLAY	2" P. W. TO 36.5
8										
9										
10	6	11	17							
									33.5 TILL	
11	7	50								
									39.5 REFUSAL	

NOTATION: SIZE CORE

SIZE SHELBY TUBE

SIZE AUGER

N = No. blows to drive "spoon "with lb. pin wt. falling " per blow.

C = No. blows to drive "casing "with lb. weight falling " per blow.

SOIL CLASSIFICATIONS BY:

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
11/10/82					

ESI
FIELD LOG

HOLE NO. B-87
GRD. ELEV.
G.W. DEPTH

SHEET 1 OF
PROJECT City of Niagara Falls
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	2	2	1	1		&	Gr	Ashes	
10-12	2	3	4	3	3		m	BR	Clay & Silt	
15-17	3	2	1	2	2		m	BR GR	Clay	
20-22	4	1	1	1	1		m	BR	Clay	
25-27	5	1	1	1	4		m	BR	Clay	
29-31	6	1	1	1	1		m/w	BR	Clay / Till @ 31.0	
35-37	7	11	26	37	64		m/w	D	Silty Clay w/Gravel / Rock F.. B.O.H 37.0	

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N — No. blows to drive "spoon "with lb. pin wt. falling "per blow.
C — No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
12/11/84					

ESI FIELD LOG

HOLE NO. B-7
GRD. ELEV.
G.W. DEPTH

SHEET ____ OF ____ PROJECT City of Niagara Falls
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	2	2	5	5		W	Br	Fill	
10-12	2	4	4	5	6		m	Br	Clay	
									B.O.H. 12.0	

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N = No. blows to drive ___" spoon ___" with ___ lb. pin wt. falling ___" per blow.
C = No. blows to drive ___" casing ___" with ___ lb. weight falling ___" per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. B-10
4/14/92							GRD. ELEV.
							G.W. DEPTH

SHEET _____ OF _____ PROJECT City of Niagara

LOCATION _____

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	2	4	7	9		W	BR	Silt Clay	
10-12	2	7	8	11	13		m	Br	Clay	
15-17	3	1	2	2	2		m	Br	Clay	
20-22	4	1	1	1	1		m	Br	Clay	
25-27	5	24/4"	50/6"	1	1		m	Br	Clay	
30-32	6	15	21	50/5"			D	Br	Silty Clay w/Gravel - Till	
37.0	7	100/4"							No Rec.	
									B.O.H. 34.0	

NOTATION: SIZE CORE _____

SIZE SHELBY TUBE _____

SIZE AUGER _____

N — No. blows to drive ____" spoon ____" with ____ lb. pin wt. falling ____" per blow.

C — No. blows to drive ____" casing ____" with ____ lb. weight falling ____" per blow.

SOIL CLASSIFICATIONS BY: _____

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME
12/14/82					

ESI FIELD LOG

HOLE NO. TS-11
GRD. ELEV.
G.W. DEPTH

SHEET ____ OF ____

PROJECT City of Niagara Falls
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
5-7	1	5	6	7	8		W	Br	Silty F. Sand	
10-12	2	7	9	14	16		Dy	Gy	Clay	
									B.O.H 12.0	

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N = No. blows to drive ___" spoon ___" with ___ lb. pin wt. falling ___" per blow.
C = No. blows to drive ___" casing ___" with ___ lb. weight falling ___" per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME

ESI FIELD LOG

HOLE NO. B-16
GRD. ELEV.
G.W. DEPTH

SHEET ____ OF ____ PROJECT LOCATION NIAG. FALLS

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
									FILL	
5-7	1	2	4							
10-12	2		4						ODOR	
15-17	3		4							
							W	GY	SAND x ORG SILT	
20-22	4		3							
25-27	5		21							2" S.S. W.P. TO 36.0'
30-32	6		14				M	RD	C + SC	
35-37	7		7				M	RD	TILL	
									REFUSAL 39'	36

NOTATION: SIZE CORE
SIZE SHELBY TUBE
SIZE AUGER
N = No. blows to drive "spoon "with lb. pin wt. falling "per blow.
C = No. blows to drive "casing "with lb. weight falling "per blow.

SOIL CLASSIFICATIONS BY:
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG SB-1

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, New York

File No.: 1736.078

Sampler: 2" Split Barrel
Hammer: 140 lbs.
Fall: 30"

Page 1 of 1
Location: Approx. 75 ft North - Northwest of OBG-3
Start Date: 2/6/96
End Date: 2/6/96

Boring Company: SJB Services, Inc.
Foreman: Jeff Leavell
OBG Geologist: Chawn O'Dell

Screen = \ Grout
Riser ▒ Sand Pack
■ Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HNU ppm	Field Testing UV
0	1	0-2'	20-35	2/0.5'	50	Dark yellowish brown (10YR 4/2), moist (frozen), very dense, fine to medium SAND, some silt, little fine angular gravel, trace black cinders			0.0	
			15-9							
1										
2	2	2-4'	6-4	2'/0.5'	8	Grayish brown (5YR 3/2), moist, loose, fine to medium SAND, some silt, little coarse sand, trace fine subangular to angular gravel, little orange brick fragments			0.0	
			4-2							
3										
4	3	4-6'	6-4	2'/1.8'	8	Dusky yellowish brown (10YR 2/2), wet, loose, medium SAND and ASH (white/black) little fine sand, trace fine angular gravel			0.0	
			4-5							
5										
6	4	6-8'	5-4	2'/1.9'	7	Dark yellowish brown (10YR 4/2), saturated, loose, fine to medium SAND, some coarse sand, some white ash, little fine angular gravel			0.0	
			3-3							
7										
8	5	8-10'	2-3	2'/1.5'	6	Dark yellowish brown (10YR 4/2), saturated, loose, fine to medium SAND, some coarse sand, some white ash, little fine angular gravel to approximately 9.3 ft, then pale brown (5YR 5/2), moist, firm SILT, some clay, little very fine sand			0.0	
			3-5							

The borehole was backfilled to the surface with a mixture of cuttings and cement/bentonite grout.

CPO:ers/sb-1

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING OBG SB-2
Client: City of Niagara Falls East Area Investigation Proj. Loc: Niagara Falls, New York File No.: 1736.078	Sampler: 2" Split Barrel Hammer: 140 lbs. Fall: 30"	Page 1 of 1 Location: Approx. 15 ft North - Northeast of OBG-4 Start Date: 2/6/96 End Date: 2/6/96
Boring Company: SJB Services, Inc. Foreman: Jeff Leavell OBG Geologist: Chawn O'Dell		Screen / Riser; Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HNU ppm	Field Testing UV
0	2	0-2'	22-40'	2'/2'	90	Pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4) mottling, damp (frozen), extremely dense medium SAND, some fine sand, little subangualr to angular coarse sand to fine gravel, little black cinder and brick fragments (orange).			0.0	
			50-24							
1										
2	2	2-4'	12-16	2'/1.5'	31	Dark yellowish brown (10YR 4/2), moist, dense, fine to medium SAND, some silt, little coarse sand, little brick fragments and white ash, trace clay			1.1	
			15-12							
3										
4	3	4-6'	4-4	2'/1.1'	11	Dark yellowish brown (10YR 4/2), moist, dense, fine to medium SAND, some silt, little coarse sand, little brick fragments and white ash, trace clay to approximately 5 ft, then white/black ash and cinders, little orange brick fragments			5.6	
			7-3							
5										
6	4	6-8'	2-1	2'/0.7'	2	Dark yellowish orange (10YR 6/6), and very pale orange (10YR 8/2), and grayish brown (5YR 3/2), mottling, wet very loose, ash and brick fragments, some glass fragments, little fine to coarse sand			3.4	
			1-1							
7										
8	5	8-10'	1-1	2'/0.3'	2	White (N9) and black (N1), saturated, very loose, ASH, some cinder			4.2	
			1-1							
9										
10	6	10-12'	WOH-1	2.0'/0.2'	2	White (N9) and black (N1), saturated, very loose, ASH, some cinder			3.9	
			1-1							
11										
12	7	12-14'	2-3	2.0/1.6'	6	White (N9) and black (N1), saturated, very loose, ASH, some cinder to approximately 12.5 ft, then olive gray (5Y 4/1), fine SAND, some medium sand, little silt, trace organics			6.4	
			3-4							

The borehole was backfilled to the surface with a mixture of cuttings and cement/bentonite grout.

CPO:ers/sb-2

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG SB-3

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, New York

File No.: 1736.078

Sampler: 2" Split Barrel
Hammer: 140 lbs.
Fall: 30"

Page 1 of 1
Location: Approx. 150 ft South of OBG-3
Start Date: 2/6/96
End Date: 2/6/96

Boring Company: SJB Services, Inc.
Foreman: Jeff Leavell
OBG Geologist: Chawn O'Dell

Screen / Riser — Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HNU ppm	Field Testing UV
0	1	0-2'	48-36	2'/2'	78	Pale yellowish brown (10YR 6/2), moist (frozen), very dense, fine to medium SAND, little fine angular gravel, little silt			0.0	
			42-21							
1										
2	2	2-4'	18-18	2'/1.5'	36	Dark yellowish brown (10YR 4/2), moist, dense SILT, some fine sand, little angular gravel, trace clay, trace glass fragments			0.9	
			18-17							
3										
4	3	4-6'	5-4	2'/1.2'	8	Dark yellowish brown (10YR 4/2), moist, loose SILT, some clay, little fine sand, trace fine angular gravel			1.2	
			4-4							
5										
6	4	6-8'	8-10	2'/1.4'	18	Dark yellowish brown (10YR 4/2), moist, medium dense SILT, some clay, little fine sand, trace fine angular gravel to 7.5 ft, then black (N1) and white (N9) saturated, ASH and CINDERS to 8 ft			7.1	
			8-6							
7										
8	5	8-10'	4-3	2'/0.4'	4	Black (N1) and white (N9) saturated, very loose ASH little fine to coarse sand, trace fine angular gravel			0.8	
			1-2							
9										
10	6	10-12'	2-2	2'/0.5'	4	Dark yellowish brown (10YR 4/2), saturated, loose, fine to coarse SAND, some black/white ash, little orange brick fragments, trace fine angular gravel			0.6	
			2-2							
11										
12	7	12-14'	1-1	2'/0.5'	3	Dark yellowish brown (10YR 4/2), saturated, loose, fine to coarse SAND, some black (N1) and white (N9) ash, little orange brick fragments, trace fine angular gravel			1.2	
			2-3							
13										
14	8	14-16'	3-3	2'/2'	5	Dark yellowish brown (10YR 4/2), saturated, loose, fine to coarse SAND, some black (N1) and white (N9) ash, little orange brick fragments, trace fine angular gravel to 14.5 ft, then olive gray (5Y 4/1), saturated, loose, fine SAND, some medium sand, little silt, trace organics			2.1	
			2-3							
15										
16	9	16-18'	3-3	2'/1.8'	7	Olive gray (5Y 4/1), saturated, loose, fine SAND, some medium sand, little silt, trace organics			5.2	
			4-3							

The borehole was backfilled to the surface with a mixture of cuttings and cement/bentonite grout.

CPO:ers/sb-3

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING OBG SB-4

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, New York

File No.: 1736.078

Sampler: 2" Split Barrel

Hammer: 140 lbs.

Fall: 30"

Location: Approx. 145 ft South-Southwest of OBG-4
Start Date: 2/6/96
End Date: 2/6/96

Boring Company: SJB Services, Inc.
Foreman: Jeff Leavell
OBG Geologist: Chawn O'Dell

Screen / Riser — Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HNU ppm	Field Testing UV
0	1	0-2'	14-30	2'/2'	65	Moderate brown (5YR 4/4), damp (frozen), very dense, fine SAND, some very fine sand, little angular coarse sand, trace angular fine gravel			0.0	
			35-20							
1										
2	2	2-4'	8-9	2'/0.5'	18	Moderate brown (5YR 4/4), damp, medium dense, very fine to fine SAND, some silt, little clay, trace fine angular gravel			1.7	
			9-11							
3										
4	3	4-6'	5-2	2'/0.9'	5	Grayish black (N2) and white (N9), moist, loose ASH and CINDER, little fine angular gravel			1.2	
			3-6							
5										
6	4	6-8'	11-7	2'/0.1'	11	Poor recovery, gravel lodged in split spoon tip			0.3	
			4-3							
7										
8	5	8-10'	3-5	2'/0.4'	15	Poor recovery, gravel lodged in spoon tip, grayish black (N2) and white (N9) saturated medium dense ASH and CINDER little fine angular gravel			0.1	
			10-3							
9										
10	6	10-12'	1-1	2'/0.5'	3	Black (N1), saturated loose, ASH, some wood fragments and glass fragments			2.1	
			2-1							
11										
12	7	12-14'	1-1	2'/1.7'	6	Black (N1), saturated, very loose, glass and wood fragments, some ash to approximately 13 ft, then olive gray (5Y 4/1), saturated, loose, fine SAND, some medium sand, little silt, trace organics			1.9	
			5-6							

The borehole was backfilled to the surface with a mixture of cuttings and cement/bentonite grout.

CPO:ers/sb-4

O'BRIEN & GERE ENGINEERS, INC

TEST BORING LOG

REPORT OF BORING OBG SB-5

Client: City of Niagara Falls
East Area Investigation
Proj. Loc: Niagara Falls, New York

File No.: 1736.078

Sampler: 2" Split Barrel

Hammer: 140 lbs.

Fall: 30"

Page 1 of 1
Location Approx. 80 ft North - Northeast of OBG-6
Start Date: 2/7/96
End Date: 2/7/96

Boring Company: SJB Services, Inc.
Foreman: Jeff Leavell
OBG Geologist: Chawn O'Dell

Screen = | Riser | Grout | Sand Pack | Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HNU ppm	Field Testing UV
0	1	0-2'	40-30	2'/0.7'	42	Dark yellowish brown (10YR 4/2), damp, (frozen) dense, fine to medium SAND, some very fine sand, little silt, trace subangular coarse sand, trace organics (plant roots).			1.2	
			12-8							
1										
2	2	2-4'	8-25	1.2'/1.0'	75+	Dark yellowish brown (10YR 4/2), damp, very dense SILT, some fine to medium sand, little subangular coarse sand, little clay, trace angular coarse gravel lodged in split spoon tip			1.1	
			50/0.2							
3										
4	3	4-6'	3-4	2'/0.2'	10	Poor recovery, gravel lodged in split spoon tip			0.7	
			6-9							
5										
6	4	6-8'	14-12	2'/0.1'	22	Poor recovery, gravel lodged in split spoon tip			3.2	
			10-8							
7										
8	5	8-10'	2-1	2'/0.0'	2	No recovery			–	
			1-1							
9										
10	6	10-12'	1-1	2'/0.3'	2	Black (N1), saturated, very loose, CINDERS some glass and wood fragments			6.4	
			1-1							
11										
12	7	12-14'	1-1	2'/1.2'	2	Black (N1), saturated, very loose, CINDERS some glass and wood fragments			7.7	
			1-1							
13										
14	8	14-16'	1-1	2'/1'	5	Black (N1), saturated, very loose, CINDERS some glass and wood fragments to 15 ft then olive gray (5Y 4/1), saturated, loose, fine SAND, some medium sand, little silt, trace organics			7.9	
			4-6							
15										
16	9	16-18'	3-4	2'1.6'	9	Olive gray (5Y 4/1), saturated loose, fine SAND, some medum sand, little silt, trace organics			0.0	
			5-4							

The borehole was backfilled to the surface witha mixture of cuttings and cement/bentonite grout.

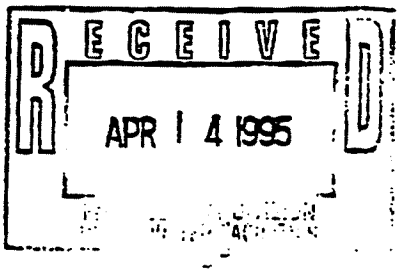
CPO:ers/sb-5

Appendix C

Purge Water and Decontamination Fluids Laboratory Characterization

O'BRIEN & GERE
ENGINEERS, INC.

April 13, 1995



Mr. Al Zaepfel
Industrial Monitoring Coordinator
City of Niagara Falls
Wastewater Treatment Plant
P. O. Box 69
Niagara Falls, New York 14302

Re: City of Niagara Falls
Eastern Area

File: 1736.078

Dear Al:

In accordance with our recent conversations, enclosed are the results of the laboratory analysis performed on a composite water sample obtained from five 55-gallon drums located at the City of Niagara Falls Water Treatment Plant. The sample was composited from a grab from each one of the drums. As requested, the sample was analyzed for metals, PCB's, organics, pH, and SOC.

These drums contain water collected during ground water sampling activities at the one-acre Eastern Area adjacent to the construction site for the City's new water treatment plant. On behalf of the City of Niagara Falls Water Treatment Plant, we are requesting permission to discharge approximately 275 gallons of water to the Niagara Falls Wastewater Treatment Plant via a sanitary sewer in Buffalo Avenue.

If you have any questions or require additional information, please do not hesitate to contact me.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Robert P. Lannon, Jr., P.E.
Managing Engineer

RPL:bk

cc: Mr. Robert E. Game, City of Niagara Falls
Mr. Richard R. Roll, City of Niagara Falls
Ms. Karen L. Moran, O'Brien & Gere Engineers, Inc.
Ms. Deborah Y. Wright, O'Brien & Gere Engineers, Inc.

O'Brien & Gere Engineers, Inc., an O'Brien & Gere Company
800 Main Street / Niagara Falls, NY 14301 / (716) 284-2844 FAX (716) 284-2414
and offices in major U.S. cities

ACTS TESTING LABS, INC
25 Anderson Road
Buffalo, NY 14225-4928
Tel (716) 897-3300
Fax (716) 897-0873

Technical Report #5B-1679E R
Project # 1736.076
Project Name: City Niagara Falls Water T. Plant
REVISED

Mr. Robert P. Lannon, Jr.
O'BRIEN & GERE ENGINEERS, INC.

SUBJECT:

Analysis of one (1) water sample for various parameters. The sample was received on March 13, 1995.

RESULTS:

See Pages Two and Three.

EXPERIMENTAL:

Organochlorine Pesticides in water were determined according to United States Environmental Protection Agency Method 608: Organochlorine Pesticides and PCBs.

Polychlorinated Biphenyls (PCBs) in water were determined according to United States Environmental Protection Agency Method 608: Organochlorine Pesticides and PCBs.

Priority Pollutant Purgeables in Water were determined according to United States Environmental Protection Agency Method 624: Purgeables.

Priority Pollutant Semi-volatile compounds in water were determined according to United States Environmental Protection Agency Method 625: Base/Neutrals and Acids.

The analyses were determined according to procedures listed in "Standard Methods for the Examination of Water and Wastewater," 17th Edition, 1989.

ACTS TESTING LABS

EPA 625

	ACTS #5B-1679E COMPOSITE DRUM #1,2,3,4,5
2-Chlorophenol	< 1
1,3-Dichlorobenzene	< 1
1,4-Dichlorobenzene	< 1
1,2-Dichlorobenzene	< 1
2,4-Dichlorophenol	< 10
1,2,4-Trichlorobenzene	< 1
Naphthalene	< 1
Hexachlorobutadiene	< 1
4-Chloro-3-methylphenol	< 1
Hexachlorocyclopentadiene	< 1
2,4,6-Trichlorophenol	< 1
Dimethyphthalate	< 1
Acenaphthene	< 1
N-Nitrosodiphenylamine	< 1
Hexachlorobenzene	< 1
Phenanthrene	< 1
Dibutylphthalate	< 1
Fluoranthene	< 1
Pyrene	< 1
Butyl Benzyl Phthalate	< 1
Benzo(a)anthracene	< 1
Chrysene	< 1
Dichlorotoluene	< 1*
Trichlorotoluene	< 1*
Tetrachlorobenzene	< 1*
Dichlorobenzotrifloride	< 1*

EPA 608

Heptachlor	< 0.05
Endosulfan sulfate	< 0.05
PCB 1016	< 0.25
PCB 1221	< 0.25
PCB 1232	< 0.25
PCB 1242	< 0.25
PCB 1248	< 0.25
PCB 1254	< 0.25
PCB 1260	< 0.25
Mirex	< 0.10
Dechlorane	< 1.0

* Estimated Values

RESULTS:

	ACTS #5B-1679E COMPOSITE DRUM #1,2,3,4,5
Cadmium, Total	< 0.005
Chromium, Total	< 0.01
Copper, Total	< 0.01
Cyanide, Total	< 0.003
Lead, Total	< 0.03
Nickel, Total	< 0.01
Phenols, Total	0.044
Phosphorus, Total	< 0.05
pH, Total	9.10
Mercury, Total	< 0.0002
Zinc, Total	1.03
Total Suspended Solids	48.0 (68.0)*
Soluble Organic Carbon	3.1

Results are reported as milligrams per liter (mg/L).
*Duplicate

EPA 624	ACTS #5B-1679E COMPOSITE DRUM #1,2,3,4,5	
Benzene	0.5	o
Toluene	< 0.5	
Ethylbenzene	< 0.5	
M,P-Xylenes	< 1	
O-Xylene	< 0.5	
Vinyl Chlorine	< 0.5	
1,1-Dichloroethene	< 0.5	
Methylene Chloride	43B	o
Trans 1,2-Dichloroethene	< 0.5	
Chloroform	0.6	o
1,1,1-Trichloroethane	< 0.5	
Carbon Tetrachloride	< 0.5	
Trichloroethene	< 0.5	
Bromodichloromethane	< 0.5	
trans 1,3 Dichloropropene	< 0.5	
cis 1,3-Dichloropropene	< 0.5	
1,1,2-Trichloroethene	< 0.5	
Tetrachloroethane	< 0.5	
Dibromochloromethane	< 0.5	
Chlorobenzene	12	o
Bromoform	< 0.5	
1,1,2,2, Tetrachloroethane	< 0.5	
2-Chlorotoluene	< 0.5	
4-Chlorotoluene	< 0.5	

B-Found in method blank at 30.0 ug/L
Results are reported as micrograms per liter (ug/L).

ACTS TESTING LABS, INC.

Charles E. Hartke
Manager, Chemistry Laboratory

ACTS TESTING LABS, INC.

Elizabeth R. Hausler, Supervisor
Gas Chromatography Laboratory

ACTS TESTING LABS, INC.

Lisa M. Clerici, Supervisor
Wet Chemistry Laboratory

cme

City of Niagara Falls, New York

P.O. Box 69, Niagara Falls, NY 14302-0069

April 27, 1995

Mr. Robert P. Lannon, Jr., P.E.
O'Brien & Gere Engineers, Inc.
800 Main Street
Niagara Falls, NY 14301

Dear Mr. Lannon:

The City has completed the review of your request to discharge 275 gallons of drummed wastewater from the Water Treatment Plant site. The wastewater was generated as a result of groundwater sampling activities.

Based on the insignificant pollutant load the City hereby grants permission to discharge this wastewater.

Sincerely,

DEPARTMENT OF WASTEWATER FACILITIES

Albert C. Zaepfel
Industrial Monitoring Coordinator

ACZ:md
cc: R. Roll
Quarterly Report to NYSDEC, USEPA
File 39A
\58.95

Appendix D

Ground Water Sampling Field Logs

O'BRIEN & GERE ENGINEERS, INC. — Ground Water Sampling Log

Date: 2/14/95
Site Name: City of Niagara Falls E. Area
Site Location: Niagara Falls, NY
Personnel: PETER LORETTO
Weather: Sunny 18°
Well #: OBG-1
Project #:
Excavation Method: BAILER

Depth of Well * 17.45 ft.
Depth of Water * 14.49 ft.
Length of Water Column 2.96 ft.
Volume of Water in Well .48 gal.(s)
3X Volume of Water in Well 1.45 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 1.3 gal.(s)
Did well go dry? yes
(Other, Specify)

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ]

Water parameters:

Temperature Readings			pH Readings			Conductivity Readings		
		Initial			4.0 Standard			84 S Standard
					7.0 Standard			1413 S Standard
					10.0 Standard			
		Initial 46			Initial			Initial
after .50	(gal.)	45.5	after	(gal.)	6.48	after	(gal.)	369
after 1.0	(gal.)	45.9	after	(gal.)	7.20	after	(gal.)	335
after 1.3	(gal.)		after	(gal.)	7.07	after	(gal.)	375
after	(gal.)		after	(gal.)		after	(gal.)	
after	(gal.)		after	(gal.)		after	(gal.)	

Water Sample:

Time Collected 2/15/95 -0800

Physical Appearance (prior to sampling)		Physical Appearance (after sampling)	
Color	Brown	Color	Silty Brown
Odor	None	Odor	none
Turbidity (> 100 NTUs)	X 100	Turbidity (> 100 NTUs)	7100
Sheen/Free Product	None	Sheen/Free Product	None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES:

O BRIEN & GERE ENGINEERS, INC. — Ground Water Sampling Log

Date: 2/14/95
Site Name: City of Niagara Falls E. Area 1 Acre Inv.
Site Location: N. Niagara Falls
Personnel: PETER LORETTO
Weather: Sunny 18°
Well #: OB6-2
Project #:
Excavation Method: BAILER

Depth of Well * 17.46 ft.
Depth of Water * 7.47 ft.
Length of Water Column 9.99 ft.
Volume of Water in Well 1.63 gal.(s)
3X Volume of Water in Well 4.88 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 5.0 gal.(s)
Did well go dry? NO
(Other, Specify)

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ]

Water parameters:

Temperature Readings		pH Readings		Conductivity Readings	
	Initial	4.0 Standard		84 S Standard	
	Initial	7.0 Standard		1413 S Standard	
	Initial	10.0 Standard			Initial
after 1.75 (gal.)	31.0		Initial	after (gal.)	598
after 3.25 (gal.)	43.0	after (gal.)	6.95	after (gal.)	660
after 5.0 (gal.)	44.2	after (gal.)	6.58	after (gal.)	971
after (gal.)		after (gal.)	6.47	after (gal.)	
after (gal.)		after (gal.)		after (gal.)	
		after (gal.)		after (gal.)	

Water Sample:

Time Collected 1245

Physical Appearance (prior to sampling)		Physical Appearance (after sampling)	
Color	Dark Brown	Color	Brown
Odor	None	Odor	None
Turbidity (> 100 NTUs)	Too	Turbidity (> 100 NTUs)	Too
Sheen/Free Product	None	Sheen/Free Product	None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES:

O'BRIEN & GERE ENGINEERS, INC. — Ground Water Sampling Log

Date 2/14/95
Site Name City of Niagara Falls E. Area, 1 acre inv.
Site Location Niagara Falls, NY
Personnel PETER LORETTO

Weather Sunny 18°
Well # ORG-3
Project #
Excavation Method BAILER

Depth of Well * 17.50 ft.
Depth of Water * 10.28 ft.
Length of Water Column 7.22 ft.
Volume of Water in Well 1.18 gal.(s)
3X Volume of Water in Well 3.53 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 4.0 gal.(s)
Did well go dry? NO
(Other, Specify)

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ]

Water parameters:

Temperature Readings			pH Readings			Conductivity Readings		
			4.0 Standard			84 S Standard		
			7.0 Standard			1413 S Standard		
			10.0 Standard					
	Initial		Initial			Initial		
after 1.3	(gal.)	12.9	after	(gal.)	6.02	after	(gal.)	1006
after 2.6	(gal.)	44.0	after	(gal.)	6.04	after	(gal.)	1024
after 4.0	(gal.)	44.7	after	(gal.)	6.02	after	(gal.)	1033
after	(gal.)		after	(gal.)		after	(gal.)	
after	(gal.)		after	(gal.)		after	(gal.)	

Water Sample:

Time Collected 1420

Physical Appearance (prior to sampling)		Physical Appearance (after sampling)	
Color	Lt brown	Color	Lt brown
Odor	None	Odor	None
Turbidity (> 100 NTUs)	200	Turbidity (> 100 NTUs)	200
Sheen/Free Product	None	Sheen/Free Product	None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES: Blind Duplicate Taken here

Ground Water Sampling Log

Date 2/14/95
Site Name City of Niagara Falls S. Area 1 Acre Inv.
Site Location Niagara Falls, NY
Personnel PETER LORETTO

Weather Sunny 18°
Well # MW-4
Project #
Excavation Method BAILER

Depth of Well * 20.36 ft.
Depth of Water * 13.21 ft.
Length of Water Column 7.15 ft.
Volume of Water in Well 1.17 gal.(s)
3X Volume of Water in Well 3.5 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 3.5 gal.(s)
Did well go dry? NO

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ] (Other, Specify)

Water parameters:

Temperature Readings	
Initial	
after 1.2 (gal.)	45.7
after 2.4 (gal.)	45.8
after 3.5 (gal.)	44.3
after ____ (gal.)	
after ____ (gal.)	

pH Readings	
4.0 Standard	
7.0 Standard	
10.0 Standard	
Initial	
after ____ (gal.)	6.47
after ____ (gal.)	6.27
after ____ (gal.)	6.32
after ____ (gal.)	
after ____ (gal.)	

Conductivity Readings	
84 S Standard	
1413 S Standard	
Initial	
after ____ (gal.)	2820
after ____ (gal.)	2172
after ____ (gal.)	1940
after ____ (gal.)	
after ____ (gal.)	

Water Sample:

Time Collected 1606

Physical Appearance (prior to sampling)
Color Black/grey
Odor None
Turbidity (> 100 NTUs) > 100
Sheen/Free Product None

Physical Appearance (after sampling)
Color Blackish/grey
Odor None
Turbidity (> 100 NTUs) > 100
Sheen/Free Product none

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES: MS / MSD Taken here

O'BRIEN & GERE ENGINEERS, INC. — Ground Water Sampling Log

Date 2/15/95
Site Name City of Niagara Falls, E. Area, 1 acre Inv.
Site Location Niagara Falls, NY
Personnel PETER LORETTO

Weather Cloudy ~~Sunny~~ 18°
Well # OBG-5
Project #
Excavation Method BAILER

Depth of Well * 19.74 ft.
Depth of Water * 12.33 ft.
Length of Water Column 7.41 ft.
Volume of Water in Well 1.21 gal.(s)
3X Volume of Water in Well 3.62 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 4 gal.(s)
Did well go dry? NO
(Other, Specify)

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ]

Water parameters:

Temperature Readings			pH Readings			Conductivity Readings		
		Initial			4.0 Standard			84 S Standard
after 1.3	(gal.)	49.1			7.0 Standard			1413 S Standard
after 2.6	(gal.)	44.7			10.0 Standard			Initial
after 3.0	(gal.)	44.6			Initial		after ____	(gal.) 9.83
after ____	(gal.)		after ____	(gal.) 5.59			after ____	(gal.) 10.21
after ____	(gal.)		after ____	(gal.) 4.61			after ____	(gal.) 10.10
			after ____	(gal.) 4.72			after ____	(gal.)
			after ____	(gal.)			after ____	(gal.)
			after ____	(gal.)				

Water Sample:

Time Collected 0945

Physical Appearance (prior to sampling)
Color Blackish Gray
Odor V. Slight organic
Turbidity (> 100 NTUs) Yes
Sheen/Free Product None

Physical Appearance (after sampling)
Color Blackish Gray
Odor Same
Turbidity (> 100 NTUs) Yes
Sheen/Free Product No

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES:

Ground Water Sampling Log

Date 2/16/95
Site Name City of Niagara Falls E. Area / Love Env.
Site Location Niagara Falls NY
Personnel PETER LORETTO

Weather Sunny 18°
Well # OBG-6
Project #
Excavation Method BAILER

Depth of Well * 20.36 ft.
Depth of Water * 12.46 ft.
Length of Water Column 7.90 ft.
Volume of Water in Well 1.29 gal.(s)
3X Volume of Water in Well 3.86 gal.(s)

Water Volume /ft. for:
2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed before sampling 4.0 gal.(s)
Did well go dry? NO
(Other, Specify)

* Measurements taken from [X] Top of Well Casing [ ] Top of Protective Casing [ ]

Water parameters:

Temperature Readings		
		initial
after 1.3	(gal.)	45.3
after 2.6	(gal.)	49.6
after 4.0	(gal.)	46.9
after	(gal.)	
after	(gal.)	

pH Readings		
4.0 Standard		
7.0 Standard		
10.0 Standard		
		initial
after	(gal.)	6.97
after	(gal.)	5.53
after	(gal.)	5.12
after	(gal.)	
after	(gal.)	

Conductivity Readings		
84 S Standard		
1413 S Standard		
		initial
after	(gal.)	0.90
after	(gal.)	737
after	(gal.)	683
after	(gal.)	
after	(gal.)	

Water Sample:

Time Collected 1050

Physical Appearance (prior to sampling)		Physical Appearance (after sampling)	
Color	BLACK	Color	Black
Odor	yes	Odor	Strong
Turbidity (> 100 NTUs)	Yes	Turbidity (> 100 NTUs)	Yes
Sheen/Free Product	Spotty	Sheen/Free Product	Spotty

Parameters of Samples:

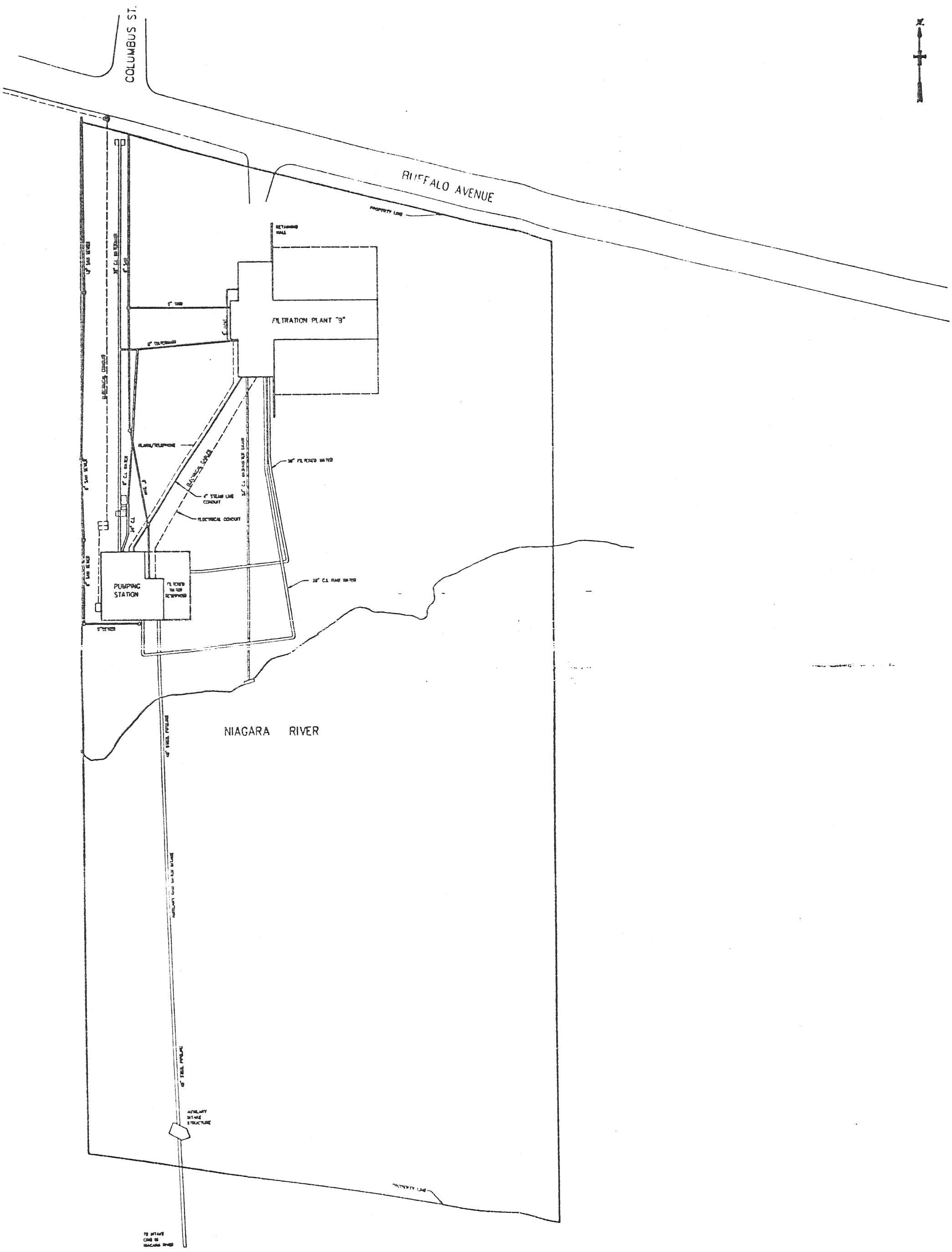
Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductuctivity

NOTES:

Appendix E

1989 Malcolm Pirnie Report Shoreline and Underground Utility Maps

PLATE 2



MALCOLM

CITY OF NIAGARA FALLS, NEW YORK

SITE PLAN

MALCOLM PIRNIE, INC.

DATE MARCH 1979

MALCOLM PIRNIE

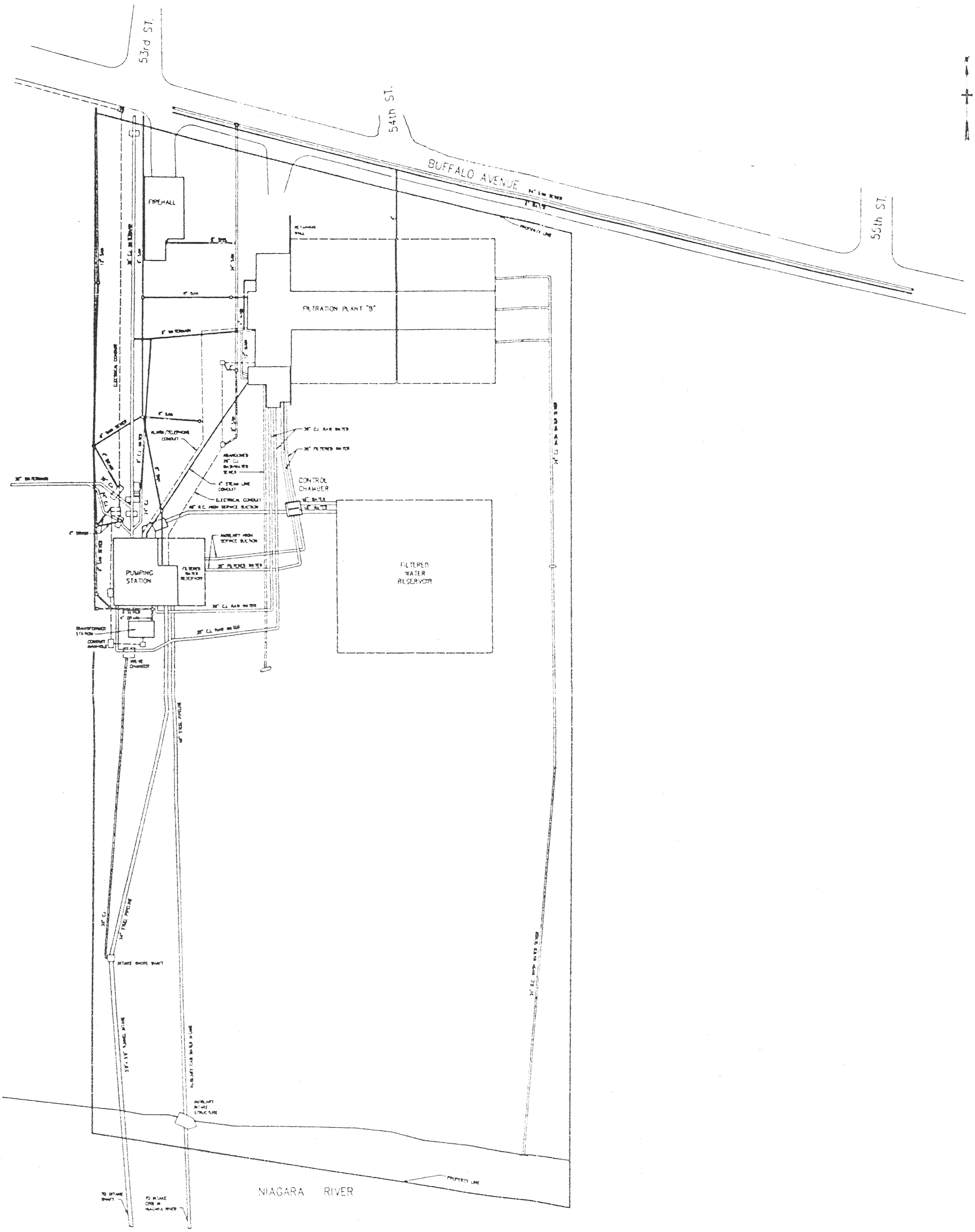
CITY OF NIAGARA FALLS, NEW YORK

WATER TREATMENT PLANT

SITE PLAN
CIRCA 1935
SCALE: 1" = 80'

MALCOLM PIRNIE INC.
DATE MARCH 1988
SHEET 3 OF 17
DWG. NO. 03312-89.003-0

PLATE 4



MALCOLM PIRNIE

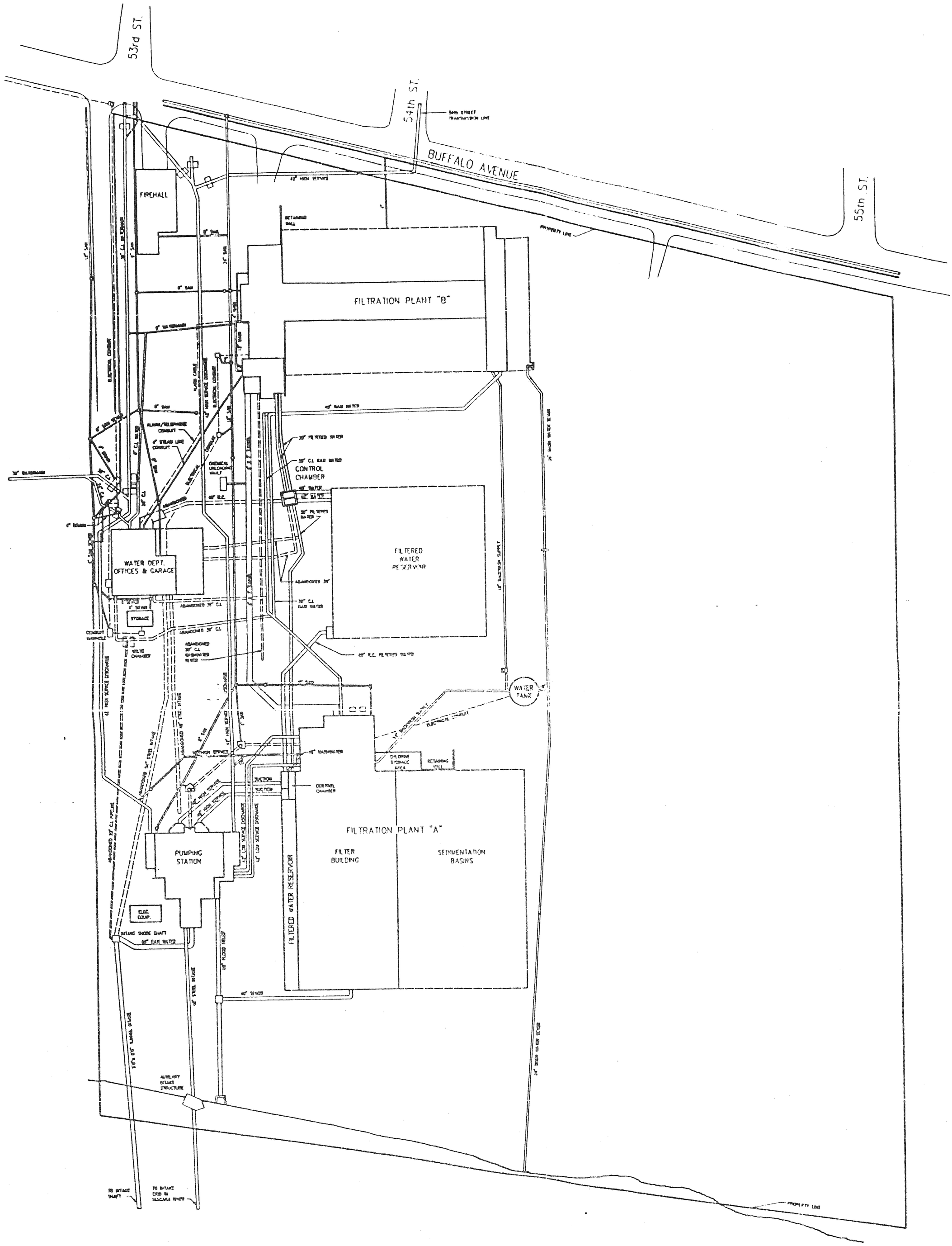
CITY OF NIAGARA FALLS, NEW YORK

WATER TREATMENT PLANT

SITE PLAN
CIRCA 1943
SCALE: 1" = 80'

MALCOLM PIRNIE, INC.
DATE MARCH 1988
SHEET 1 OF 12
SHEET NO. 03371-89.004-0

PLATE 5



MALCOLM PIRNIE

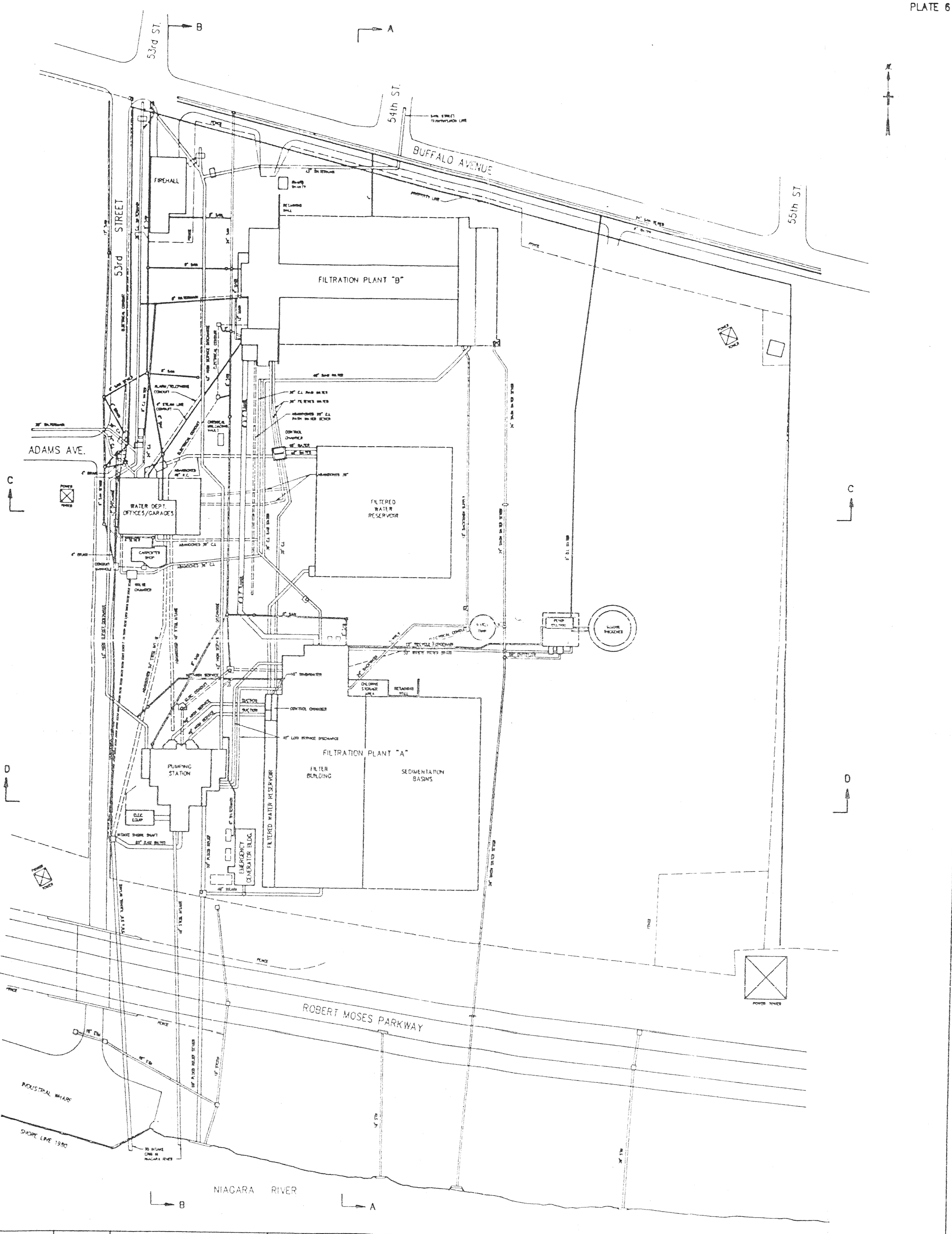
CITY OF NIAGARA FALLS, NEW YORK

WATER TREATMENT PLANT

SITE PLAN
CIRCA 1955
SCALE: 1" = 80'

MALCOLM PIRNIE, INC.
DATE MARCH 1989
SHEET 5 OF 12
PROJ. NO. 03377-89.005-0

PLATE 6



MALCOLM PIRNIE

CITY OF NIAGARA FALLS, NEW YORK

WATER TREATMENT PLANT

SITE PLAN
CIRCA 1985

SCALE: 1" = 80'

MARCH 1988

Appendix F

DEC "S" Area and Buffalo Avenue Site
Analytical Tables

TABLE 1 S-AREA SITE SPECIFIC PARAMETERS
Vinyl Chloride
1,2-dichloroethene, Total
Trichloroethylene
Tetrachloroethylene
Benzene
Chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,2,3,4-tetrachlorobenzene
1,2,4,5-tetrachlorobenzene
Hexachlorobutadiene
Octachlorocyclopentene
Total Organic Halides (TOX)
Hexachlorocyclopentadiene
Hexachlorobexzene
2,4,5-Trichlorophenol

:ers/div12/5notes&d/table1

TABLE 2
BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	B-2	B-3	B-6	B-7	B-8	B-8	B-9	B-10	B-11	B-12	SB-38	SB-39	SB-40	SB-40
Date Sampled	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	5/16/91	5/16/91	5/17/91	5/17/91
Sample Depth	15'-17'	20'-22'	20'-22'	30'-32'	5'-7'	10'-12'	10'-12'	25'-27'	5'-7'	30'-32'	2'-6'	2'-11'	2'-5'	5'-12'
Sample Description	Native	Native	Native	Native	Ashes	Native	Native	Native	Native	Native	Ashes	Ashes	Shot Rock	Ashes
Depth to Native Deposits	12.0	9.0	12.0	15.0	N/A	8.0	8.0	0.0	0.0	16.0	N/A	N/A	N/A	N/A
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
S-Area SSPL Volatiles														
1,2-Dichloroethene (Total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5J
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
Tetrachloroethane	ND	ND	ND	ND	72	ND	ND	ND	ND	ND	1J	30	1100	30
Other TCL Volatiles														
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1J
S-Area SSPL Semivolatiles														
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	68J
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	49J	55J
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3500	3400
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18000J	1900
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14000J	1600
Other TCL Semivolatiles														
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	310J	ND
Phthalates														
Bis(2-ethylhexyl)phthalate	0.6	0.5	0.7	0.9	ND	1.0	1.0	0.6	1.0	0.9	610J	710J	1400	200J
Di-n-octylphthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110J	110J	140J
Butylbenzylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210J	ND	ND	ND
Polyaromatic Hydrocarbons														
2-Methynaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	160J	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	62J	41J	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	99J	ND	ND
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	410J	310J	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	490J	380J	150J	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	260J	180J	59J	ND
Benzo(a)pryene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	370J	260J	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200J	120J	ND	ND

TABLE 2
BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	B-2	B-3	B-6	B-7	B-8	B-8	B-9	B-10	B-11	B-12	SB-38	SB-39	SB-40	SB-40
Date Sampled	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	1983 *	5/16/91	5/16/91	5/17/91	5/17/91
Sample Depth	15'-17'	20'-22'	20'-22'	30'-32'	5'-7'	10'-12'	10'-12'	25'-27'	5'-7'	30'-32'	2'-6'	2'-11'	2'-5'	5'-12'
Sample Description	Native	Native	Native	Native	Ashes	Native	Native	Native	Native	Native	Ashes	Ashes	Shot Rock	Ashes
Depth to Native Deposits	12.0	9.0	12.0	15.0	N/A	8.0	8.0	0.0	0.0	16.0	N/A	N/A	N/A	N/A
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Polyaromatic Hydrocarbons (Continued)														
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	360J	320J	100J	ND
Dibenzofuran	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	59J	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	99J	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	920	670J	150J	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100J	150J	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	780J	570J	67J	ND
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	640J	490J	130J	ND
S-Area SSPL Pesticides														
Beta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	34J	ND
Delta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.5J	ND	ND	ND
Gamma-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100J	ND	ND	ND
Other TCL Pesticides														
4,4'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2700	350
4,4'-DDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12J	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	52J	71J	2200	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	750	520	ND
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1400	50J
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	65	420	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12J	ND	ND
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	52	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	41J	ND	ND
Inorganic Compounds														
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	164000J	212000J	434000J	52000J
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	910	2100	ND	1700

ug/kg	Micrograms/kilograms or parts per billion (ppb)
ND	Non-detect
J	Estimated concentration
N/A	Not analyzed
*	Exact sampling date not known

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	SB-27	SB-27	SB-28	SB-28	SB-29	SB-29	SB-30	SB-30	SB-32	SB-33	SB-33	MW-6D
Date Sampled	5/14/91	5/14/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	11/20/87
Sample Depth	2'-5'	5'-13.5'	2'-5'	5'-11'	4'-7'	7'-11'	2'-11.5'	11.5'-12'	2'-4'	2'-4'	4'-7'	1'-3'
Sample Description	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Shot Rock	Ashes	Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
S-Area SSPL Volatiles												
Benzene	ND	ND	ND	ND	ND	ND	ND	0.9J	ND	ND	ND	1.9J
Chlorobenzene	ND	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	10	0.9J	ND	ND	ND	ND
Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	0.3J	0.3J	2J	8.6
Other TCL Volatiles												
2-Butanone	ND	ND	ND	ND	ND	ND	ND	34	ND	ND	ND	8.6J
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND	ND	ND
Chloroform	ND	0.8J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	2J	0.8J	ND	ND	ND	ND	2J	1J	2J	ND	5.9
Total Xylenes	ND	ND	0.1J	ND	ND	ND	ND	ND	ND	1J	ND	3.3J
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.4
Vinyl Acetate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-Area SSPL Semivolatiles												
1,2-Dichlorobenzene	ND	380J	ND	200J	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	730J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	2300	ND	390J	120J	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	900	ND	280J	140J	ND	ND	ND	ND	ND	ND	ND
Other TCL Semivolatiles												
Phenol	ND	ND	ND	ND	ND	ND	ND	4700	ND	17J	ND	ND
Phthalates												
Bis(2-ethylhexyl)phthalate	400J	430J	32000J	200J	560J	290J	650J	290J	360J	130J	610J	300J
Di-n-butylphthalate	ND	ND	130J	ND	ND	110J	370J	240J	130J	110J	ND	ND
Di-n-octylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polyaromatic Hydrocarbons												
2-Methynaphthalene	ND	560J	78J	170J	370J	47J	110J	73J	37J	ND	17000	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	82J	ND
Acenaphthene	ND	340J	ND	550J	330J	ND	ND	59J	ND	36J	11000	ND
Acenaphthylene	ND	320J	ND	97J	200J	ND	ND	ND	ND	ND	620J	ND
Polyaromatic Hydrocarbons (Cont.)												

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	SB-27	SB-27	SB-28	SB-28	SB-29	SB-29	SB-30	SB-30	SB-32	SB-33	SB-33	MW-6D
Date Sampled	5/14/91	5/14/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	5/15/91	11/20/87
Sample Depth	2'-5'	5'-13.5'	2'-5'	5'-11'	4'-7'	7'-11'	2'-11.5'	11.5'-12'	2'-4'	2'-4'	4'-7'	1'-3'
Sample Description	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Ashes	Shot Rock	Shot Rock	Ashes	Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Anthracene	ND	1800	ND	1200	920	ND	43J	160J	ND	81J	14000	ND
Benzo(a)anthracene	ND	6000	200J	2800	2500	250J	130J	540J	80J	370J	36000J	ND
Benzo(b)fluoranthene	ND	6000	230J	3500	3000	260J	140J	790J	110J	440J	50000J	ND
Benzo(k)fluoranthene	ND	2200	120J	1800	1600	110J	65J	380J	ND	220J	17000	ND
Benzo(a)pryene	ND	4200	130J	2300	510J	170J	73J	590J	ND	300J	32000J	ND
Benzo(g,h,i)perylene	ND	1000	ND	610J	390J	ND	ND	390J	ND	ND	8600	ND
Chrysene	ND	4600	190J	3000	2200	250J	140J	590J	ND	380J	31000J	ND
Dibenzo(a,h)anthracene	ND	250J	ND	260J	160J	ND	ND	110J	ND	ND	590J	ND
Dibenzofuran	ND	1500	ND	500J	610J	ND	ND	65J	ND	ND	6000	ND
Fluorene	ND	2000	ND	750J	760	ND	ND	ND	ND	ND	11000	ND
Fluoranthene	ND	15000J	310J	5400	4200	490J	290J	1100	140J	630J	62000J	ND
Indeno(1,2,3-cd)pyrene	ND	1400	ND	740J	670J	ND	ND	430J	ND	96J	13000	ND
Naphthalene	ND	1100	ND	580J	740J	69J	ND	130J	ND	ND	15000	ND
Phenanthrene	ND	14000J	250J	4700	3900	460J	310J	730J	100J	410J	52000J	ND
Pyrene	ND	10000	280J	4200	3600	410J	220J	760J	120J	500J	57000J	ND
S-Area SSPL Pesticides												
Beta-BHC	ND	ND	ND	2900J	2200J	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	ND	ND	ND	30J	6.8J	ND	ND	ND	ND	ND	35J	ND
Gamma-BHC	ND	ND	ND	120	16J	ND	ND	ND	ND	ND	ND	ND
Other TCL Pesticides												
4,4'-DDD	ND	ND	17J	ND	ND	ND	ND	13J	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	27J	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	56	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	5J	ND	22	ND	ND	3.6J	3.6J	7.5J	ND	ND
Dieldrin	ND	ND	ND	56	ND	ND	ND	ND	10J	ND	ND	ND
Heptachlor	ND	ND	ND	16J	19	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	14J	21	ND	ND
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	10J	ND	ND
Endrin	ND	ND	ND	95	37J	ND	ND	ND	ND	7.5J	ND	ND
TCL PCBs												
Aroclor-1242	ND	2200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number Date Sampled Sample Depth Sample Description	SB-27 5/14/91 2'-5' Shot Rock	SB-27 5/14/91 5'-13.5' Ashes	SB-28 5/15/91 2'-5' Shot Rock	SB-28 5/15/91 5'-11' Ashes	SB-29 5/15/91 4'-7' Shot Rock	SB-29 5/15/91 7'-11' Ashes	SB-30 5/15/91 2'-11.5' Shot Rock	SB-30 5/15/91 11.5'-12' Ashes	SB-32 5/15/91 2'-4' Shot Rock	SB-33 5/15/91 2'-4' Shot Rock	SB-33 5/15/91 4'-7' Ashes	MW-6D 11/20/87 1'-3' Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Inorganic Compounds												
Lead	47300	179000	88100	371000J	175000J	14100J	63400	N/A	76000	121000J	1510000J	DNU
Mercury	620	3600	670	5100	2800	ND	640	1200	ND	400	850	ND

ug/kg	Micrograms/kilograms or parts per billion (ppb)
ND	Non-detect
J	Estimated concentration
DNU	Data not useable due to QA/QC problems

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	MW-6D	MW-6D	MW-7S	MW-7S	MW-7D	MW-7D	MW-7D	MW-8D	MW-8D	MW-8D	MW-8D
Date Sampled	11/20/87	11/20/87	11/18/87	11/18/87	11/17/87	11/17/87	11/17/87	11/16/87	11/16/87	11/16/87	11/16/87
Sample Depth	5'-6'	14'-16'	8'-10'	10'-12'	1'-3'	7'-8'	15'-17'	0'-6'	9'-16'	22'-26'	29'-33'
Sample Description	Native	Native	Ashes	Cinders	Misc. Fill	Ashes	Native	Misc. Fill	Native	Native	Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
S-Area SSPL Volatiles											
Benzene	ND	ND	ND	ND	1.3J	1.6J	1.4J	1.4J	2.4J	1.7J	1.4J
Chlorobenzene	ND	ND	81	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other TCL Volatiles											
2-Butanone	ND	1.8J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	6.1J	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	4.8J	1.4J	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	3.6J	ND	ND	ND	1.8J	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND	ND	9.4J	ND	ND	3.7J	4.9J
S-Area SSPL Semivolatiles											
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	101J	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other TCL Semivolatiles											
Phenol	ND	ND	ND	ND	79J	ND	ND	ND	ND	ND	ND
Phthalates											
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	350J	800	900	474.5J	440J	680	1000
Di-n-butylphthalate	ND	ND	ND	ND	870B	110JB	ND	1158.1B	41000B	ND	140JB
Di-n-octylphthalate	ND	ND	ND	ND	100J	270J	ND	ND	ND	ND	ND
Polyaromatic Hydrocarbons											
2-Methynaphthalene	ND	ND	ND	ND	510J	260J	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	1600	980	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polyaromatic Hydrocarbons (Continued)											

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	MW-6D	MW-6D	MW-7S	MW-7S	MW-7D	MW-7D	MW-7D	MW-8D	MW-8D	MW-8D	MW-8D
Date Sampled	11/20/87	11/20/87	11/18/87	11/18/87	11/17/87	11/17/87	11/17/87	11/16/87	11/16/87	11/16/87	11/16/87
Sample Depth	5'-6'	14'-16'	8'-10'	10'-12'	1'-3'	7'-8'	15'-17'	0'-6'	9'-16'	22'-26'	29'-33'
Sample Description	Native	Native	Ashes	Cinders	Misc. Fill	Ashes	Native	Misc. Fill	Native	Native	Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Anthracene	ND	ND	3300J	ND	4200	2800	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND	ND	6100	3000	ND	ND	141J	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	4300	2800	116J	ND	140J	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	2000	1200	ND	ND	ND	ND	ND
Benzo(a)pryene	ND	ND	ND	ND	4400B	2400B	ND	ND	91JB	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	2700	1600	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	5800	3100	138J	ND	180J	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	1100	450J	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	1300	900	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	1500	1200	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	6800	5400	280J	ND	320J	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	2800	1500	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	1800	690	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	9400	7800	390J	ND	170J	ND	ND
Pyrene	ND	ND	ND	ND	7600	5600	310J	ND	68J	ND	ND
S-Area SSPL Pesticides											
Beta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other TCL Pesticides											
4,4'-DDD	ND	ND	ND	ND	ND	ND	ND	292	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	9J	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PCBs											
Aroclor-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 3
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number Date Sampled Sample Depth Sample Description	MW-6D 11/20/87 5'-6' Native	MW-6D 11/20/87 14'-16' Native	MW-7S 11/18/87 8'-10' Ashes	MW-7S 11/18/87 10'-12' Cinders	MW-7D 11/17/87 1'-3' Misc. Fill	MW-7D 11/17/87 7'-8' Ashes	MW-7D 11/17/87 15'-17' Native	MW-8D 11/16/87 0'-6' Misc. Fill	MW-8D 11/16/87 9'-16' Native	MW-8D 11/16/87 22'-26' Native	MW-8D 11/16/87 29'-33' Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Inorganic Compounds											
Lead	DNU	DNU	DNU	DNU	DNU	DNU	DNU	DNU	DNU	DNU	DNU
Mercury	ND	ND	8.8	5.6	DNU	ND	ND	ND	DNU	ND	ND

ug/kg	Micrograms/kilograms or parts per billion (ppb)
ND	Non-detect
J	Estimated concentration
DNU	Data not useable due to QA/QC problems

TABLE 4
WATER TREATMENT PLANT PROPERTY
ADJACENT TO THE BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES

Borehole/Well Number	280	281	284	285	286	287	291	294	294
Date Sampled	5/13/87	5/7/87	6/1/87	5/11/87	5/13/87	6/5/87	6/18/87	5/27/87	5/27/87
Sample Depth	4'-8'	4'-8'	6'-8'	4'-8'	4'-8'	6'-20.8'	2'-19.8'	12'-30'	30'-32'
Sample Description	Native	Native	Native	Misc Fill	Slag/Misc	Ash/Misc	Ash/Slag	Ashes	Native
Parameter	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
S-Area SSPL Volatiles									
Chlorobenzene	ND	ND	ND	24	ND	39	33	18	ND
S-Area SSPL Semivolatiles									
Trichlorobenzene, Total	ND	ND	ND	ND	201	ND	1400	333	ND
Tetrachlorobenzene, Total	ND	ND	ND	ND	580	ND	1190	5360	158
Hexachlorobenzene	410	ND	ND	128	1700	1000	463	8450	267
Octachlorocyclopentene	ND	ND	ND	ND	ND	ND	ND	971	ND
Hexachlorocyclodecane, Total	ND	ND	ND	ND	267	ND	ND	13200	291
Perchloropentacyclodecane	ND	ND	ND	ND	ND	ND	ND	633	ND
Miscellaneous Analyses									
Total Organic Carbon	ND	ND	ND	ND	ND	59000	ND	46000	ND
Total Organic Halides	ND	ND	ND	ND	200	300	200	25000	100

ug/kg Micrograms/kilograms or parts per billion (ppb)
ND Non-detect
Note: Samples were only analyzed for S-Area Site Specific Parameters.

TABLE 5
BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN SHALLOW GROUNDWATER SAMPLES

Well Number Date Sampled Screened Interval Material Screened	B-1 12/7/82, 1/26/83 29.0-34.0 Native	B-2 12/7/82, 1/26/83 19.0-24.0 Native	B-3 12/7/82, 1/26/83 26.5-31.5 Native	B-4 12/7/82, 1/26/83 29.0-34.0 Native	B-5 12/7/82, 1/26/83 5.0-10.0 Native	B-6 12/7/82, 1/26/83 17.0-22.0 Native	B-7 12/7/82, 1/26/83 31.5-36.5 Native	B-8 12/7/82, 1/26/83 29.0-34.0 Native	B-9 12/7/82, 1/26/83 7.0-12.0 Native	B-10 12/7/82, 1/26/83 28.0-33.0 Native	B-11 12/7/82, 1/26/83 5.0-10.0 Native	B-12 12/7/82, 1/26/83 31.0-36.0 Native	MW-16S 9/19/91 5.0-15.0 Ash/Native	Ground-* Water Standard
Parameter	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
S-Area SSPL Volatiles														
Benzene	11	11	16	ND	100	ND	ND	ND	29	ND	ND	ND	ND	ND
TCL Semivolatiles														
2-Methylpantane	24	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	NS
4-Hydroxyl-4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	200	ND	ND	ND	ND	N/A	NS
Hexanoic Acid	ND	ND	ND	ND	ND	ND	70	ND	ND	ND	ND	ND	N/A	NS
Octanoic Acid	ND	ND	100	ND	ND	ND	400	ND	ND	ND	ND	ND	N/A	NS
Caprolactam	ND	ND	ND	ND	ND	ND	800	ND	ND	ND	ND	ND	N/A	NS
Phenol	20	10	20	ND	20	10	75	40	40	10	10	10	ND	1
Phthalates														
Bis(2-ethylhexyl)phthalate	30	ND	100	300	43	ND	100	310	ND	100	70	ND	ND	50
Di-n-butylphthalate	ND	ND	15	ND	ND	12	11	15	ND	ND	ND	ND	ND	50
S-Area SSPL Pesticides														
Alpha-BHC	ND	0.05	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND	0 008	ND
Beta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.051J	ND
Other TCL Pesticides														
Heptachlor Epoxide	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan	ND	ND	ND	ND	ND	ND	ND	ND	0.29	ND	ND	ND	ND	NS
Inorganic Compounds														
Lead	ND	400	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	640J	25
Mercury	66	140	72	ND	510	53	310	120	220	100	3	56	7.6	2
Miscellaneous Analyses														
Total Organic Carbon	40600	74600	58800	ND	110000	16200	36400	65200	203000	10300	41800	10600	N/A	NS
Total Organic Halides	81	139	21	ND	38	63	27	16	37	25	30	493	N/A	NS

* Ambient Water Quality Standards and Guidance Values. Standards or guidance values are for Class GA waters.
NS No standard
ug/l Micrograms/liter or parts per billion (ppb)
J Estimated concentration
ND Non-detect
N/A Not analyzed

TABLE 6
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN SHALLOW GROUNDWATER SAMPLES

Well Number Date Sampled	MW-6S 12/10/87	MW-6S 6/91	MW-7S 12/10/87	MW-7S 6/91	MW-7S 9/91	MW-8S 12/9/87	MW-8S 6/91	MW-8S 9/91	Ground-* Water Standard
Screened Interval Material Screened	4.0-8.0 Alluvium		5.0-12.0 Ash/Cinders			11.0-21.0 Alluvium			
Parameter	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
S-Area SSPL Volatiles									
Benzene	ND	ND	1.7JB	0.8J	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	N/A	6	ND	ND	ND	5
S-Area SSPL Semivolatiles									
1,3-Dichlorobenzene	ND	ND	ND	6J	N/A	ND	ND	N/A	5
1,4-Dichlorobenzene	ND	ND	ND	6J	N/A	ND	ND	N/A	4 7
Other TCL Semivolatiles									
Benzoic Acid	ND	ND	1200	ND	N/A	ND	ND	N/A	NS
Phthalates									
Bis(2-ethylhexyl)phthalate	2700B	ND	2200B	ND	N/A	410B	ND	N/A	50
S-Area SSPL Pesticides									
Alpha-BHC	ND	ND	ND	0.064J	0.81	ND	ND	ND	ND
Beta-BHC	ND	0.09	ND	ND	0.093	ND	ND	ND	ND
Delta-BHC	ND	ND	2 76	ND	0.017	ND	ND	ND	ND
Gamma-BHC	ND	0 046J	ND	ND	ND	ND	0.049J	ND	ND
Other TCL Pesticides									
Aldrin	ND	ND	1.67	ND	0.071	ND	ND	ND	NS
Heptachlor Epoxide	ND	ND	0.12	ND	0.008	ND	ND	ND	ND
Endosulfan I	0.01J	ND	4.38	ND	0.034	ND	ND	ND	NS
Endrin	ND	ND	ND	ND	0.013	ND	ND	ND	ND
Inorganic Compounds									
Lead	DNU	78J	8861	1040J	979	DNU	4J	N/A	25
Mercury	ND	ND	50.6	0.6	N/A	2.1	0.5	N/A	2

* Ambient Water Quality Standards and Guidance Values. Standards or guidance values are for Class GA waters.
ug/l Micrograms/liter or parts per billion (ppb)
ND Non-detect
NS No standard
B Compound detected in blank
J Estimated concentration
N/A Not analyzed
DNU Data not useable do to QA/QC problems.

TABLE 7
WATER TREATMENT PLANT PROPERTY
ADJACENT TO THE BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN SHALLOW GROUNDWATER SAMPLES

Well Number Date Sampled Screened Interval Material Screened	CW-11A 3/3/88 11.0-26.0 F/A/C	CW-13A 3/8/88 1.5-16.5 Fill	OW-261 4/22/88 22.8-27.8 Alluvium	OW-262 4/19/88 27.4-32.4 Alluvium	OW-263 4/22/88 21.0-26.0 Alluvium	OW-280 3/25/88 4.1-9.1 A/C	OW-281 3/22/88 4.0-9.0 Clay	OW-284 3/22/88 4.0-9.0 F/A/C	OW-285 3/23/88 5.3-10.3 F/A/C	OW-286 3/23/88 6.2-11.2 F/A/C	OW-287 3/25/88 9.8-20.8 F/A	OW-291 3/24/88 8.3-20.5 F/A/C	OW-294 3/9/88 25.0-30.0 Alluvium	Ground-* Water Standard
Parameter	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
S-Area SSPL Volatiles														
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	ND	5
S-Area SSPL Semivolatiles														
Trichlorobenzene, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND	34	ND	180	ND	5
Tetrachlorobenzene, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	47	ND	5
Miscellaneous Analyses														
Total Organic Carbon	ND	ND	ND	ND	ND	ND	ND	24000	ND	ND	ND	ND	ND	NS
Total Organic Halides	1900	100	300	ND	600	100	ND	ND	ND	300	100	700	ND	NS

* Ambient Water Quality Standards and Guidance Values Standards or guidance values are for Class GA waters.
ug/l Micrograms/liter or parts per billion (ppb)
ND Non-detect
NS No standard
F/A/C Fill/Alluvium/Clay
F/A Fill/Alluvium
A/C Alluvium/Clay
Note: Samples were only analyzed for S-Area Site Specific Parameters.

TABLE 2
THE ONE ACRE BUFFALO AVENUE SITE, 932080B
SUMMARY OF COMPOUNDS DETECTED IN BEDROCK GROUNDWATER SAMPLES

Well Number	MW-6D	MW-6D	MW-6D	MW-7D	MW-7D	MW-7D	MW-8D	MW-8D	MW-8D	Ground-*
Date Sampled	12/10/87	6/91	9/91	12/10/87	6/91	9/91	12/10/87	6/91	9/91	Water
Screened Interval	32.0-42.0			34.0-44.0			35.0-45.0			Standard
Material Screened	Till/Bedrock			Till/Bedrock			Bedrock			
Parameter	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
S-Area SSPL Volatiles										
Benzene	1.5JB	ND	ND	1.5J	ND	ND	1.2J	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	5	2.7	ND	3J	3 3	5
Trichloroethene	ND	ND	ND	1.2J	ND	ND	ND	ND	ND	5
Phthalates										
Bis(2-ethylhexyl)phthalate	65B	ND	N/A	95B	ND	N/A	74B	ND	N/A	50
Di-n-butylphthalate	25	ND	N/A	ND	ND	N/A	ND	ND	N/A	NS
S-Area SSPL Pesticides										
Gamma-BHC	ND	0 086	ND	ND	0 16	N/A	ND	0.045	N/A	ND
Other TCL Pesticides										
Heptachlor Epoxide	1.8J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Inorganic Compounds										
Lead	DNU	12J	N/A	DNU	16.9J	22 0	DNU	132J	N/A	25
Mercury	ND	ND	N/A	0.2	ND	N/A	0.3	ND	N/A	2

* Ambient Water Quality Standards and Guidance Values. Standards or guidance values are for Class GA waters.
ug/l Micrograms/liter or parts per billion (ppb)
ND Non-detect
NS No standard
J Estimated concentration
B Compound detected in blank
N/A Not analyzed
DNU Data not useable do to QA/QC problems

TABLE 9
WATER TREATMENT PLANT PROPERTY
ADJACENT TO THE BUFFALO AVENUE SITE, 932080A
SUMMARY OF COMPOUNDS DETECTED IN BEDROCK GROUNDWATER SAMPLES

Well Number Date Sampled Screened Interval Material Screened	OW-200 8/26/87 30.6-46.2 Bedrock	OW-200 9/1/87 46.2-61.0 Bedrock	OW-201 10/8/87 31.5-46.3 Bedrock	OW-201 10/9/87 46.3-61.3 Bedrock	OW-202 10/27/87 37.0-52.0 Bedrock	OW-202 10/28/87 52.0-67.0 Bedrock	OW-215 12/9/87 37.7-55.6 Bedrock	OW-215 12/10/87 55.6-70.6 Bedrock	OW-216 1/21/88 30.8-45.8 Bedrock	OW-216 1/26/88 45.8-60.8 Bedrock	Ground-* Water Standard
Parameter	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
S-Area SSPL Volatiles											
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	6580	5
S-Area SSPL Semivolatiles											
Trichlorobenzene, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND	3880	5
Tetrachlorobenzene, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND	3230	5
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	216	5
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	0.35
Octachlorocyclopentene	ND	ND	ND	ND	ND	ND	ND	ND	ND	246	NS
S-Area SSPL Pesticides											
Total BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	282	ND
Miscellaneous Analyses											
Total Organic Carbon	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Total Organic Halides	ND	ND	ND	ND	ND	ND	400	ND	ND	37000	NS

* Ambient Water Quality Standards and Guidance Values. Standards or guidance values are for Class GA waters.
ug/l Micrograms/liter or parts per billion (ppb)
ND Non-detect
NS No standard
Note: Samples were only analyzed for S-Area Site Specific Parameters.

Appendix G

Niagara Falls Background Concentrations (Letter from NCHD to NYSDEC Dated 1987)

NIAGARA COUNTY
HEALTH DEPARTMENT
HUMAN RESOURCES BUILDING
MAIN POST OFFICE BOX 428
10th AND EAST FALLS STREET
NIAGARA FALLS, NEW YORK 14302

December 4, 1987

New York State DEC
50 Wolf Road
Room 222
Albany, New York 12233

Attention: Mr. Omar Nagi

Dear Mr. Nagi:

This letter is a response to your request for information on background concentrations of various substances in Niagara Falls area soil. As we discussed, this department has access to the results of thousands of soil sample analyses from the Niagara Falls area. We have compiled background profiles for arsenic, chromium, copper, lead and zinc. That information was previously provided to you. While we have not formally compiled background profiles for other compounds, we have observed fairly consistent patterns of occurrence for the following parameters:

1) BHC/HCCH - We have observed that one or more isomers occur in concentrations of up to 1 ppm each in about one sample in ten of soils from the Niagara Falls area. The occurrence seems to be sporatic, without pattern and in both surface and subsurface soils. The occurrence of this substance seems to be distributed throughout the area and we have no scenario as to what the source of this substance is.

2) DDT/DDE/DDD: These compounds are detected in about one sample in ten to twenty in concentrations of up to 0.5 ppm for DDT and 0.3 ppm for DDE and DDD. When they are detected the concentrations are typically in a ratio of about 3:2:1 (DDT: DDE: DDD). The compound have rarely been reported in samples collected at depths exceeding 12 inches in the Niagara Falls area. It appears that when these compounds are detected that they are remanents of historic DDT pesticide application.

3) Other Pesticides: Other pesticide compounds are occassionally detected in area soil samples in small concentrations. Our policy has been to regard such detections as background if they occur in less than 10% of the samples, in concentrations less than .5 ppm and where the compound cannot be attributed to any specific source.

4) PAH and Related Compounds: One or more of these compounds in concentrations up to 10 ppm each are commonly reported in nearly all surface (less than 12 inches) soil samples from the Niagara Falls area. These compounds are also reported in 10% of the deeper samples at concentrations up to 1 ppm each. Concentrations are higher when ash or asphalt pieces are present in the sample. Phthlate compounds are common in all area soil samples. We assume these compounds have been deposited as airborne particles from combustion sources, vehicle emission, industrial processes, etc. and they seem to be present throughout the Niagara Falls area.

5) Chlorobenzene Compounds: Various chlorobenzene compounds are detected in area soils occassionally in concentrations less than 0.1 ppm. We have noted a trend that these compounds are detected fairly commonly in the less than 1 ppb range when detection limits are adequately low. Several scenarios have been suggested as to the possible source of these contaminants.

6) Phenol: 5 to 10% of the general soil samples taken in this area report phenol in the 0.5 to 1 ppm range. Total recoverable phenolics are reported in about 75% of the samples in detectable quantities.

7) Other Semi-volatile Compounds: Other semi-volatile compounds occur only occassionally (less than 5% of the samples), in particular, other acid extractable semi-volatile compounds occur only rarely in quantities over 2 to 3 times detection limits.

8) Methylene Chloride/Acetone: These compounds have been reported in most soil samples from the Niagara Falls area in concentrations up to 0.15ppm and occassionally much higher These "detections" have often been attributed to the laboratory error or sampling problems but their is still some controversy as to whether or not this is completely correct. It probably was a more substantial factor in older analyses where these compounds were even more predominate. Reports of the occurrence of these compounds is equally common in both shallow and deep soils.

9) Toulene/Benzene - Toulene is reported inabout 20% of area soil samples and benzene in about 10%, both in concentrations up to about 20 to 30 ppb. Petroleum product use may be responsible for some of this substance.

10) Other Volatiles: Other volatile compounds are rarely observed as "background".

11) Metals: Data and curves for several metals were previously provided. In addition to these we note that antimony is reported in about 10% of samples, usually less than 2 to 3 times the detection limits. Cadmium is detected in 30 to 50% of soil samples, with an average concentration of about 4 ppm (using non-dectectable reports as zero for averaging). We would typically consider cadmium over 10 ppm as elevated. Mercury is detected in about 50% of soil samples. We have previously used 0.1 to 0.2 ppm as a typical background range for mercury.

The above guidelines should be considered flexible and not yet fully documented, but we have compared data from several area studies (USGS "Preliminary Evaluation of Chemical Migration to Groundwater and Niagara River..." 1984; NUS, Investigation of eighteen sites in LaSalle Area, Niagara Falls, 1986: Woodward Clyde, Soil sampling from proposed Texas Brine Corporation ROW, 1986; NCHD, Investigation of surface soil contamination at Gratwick Park, 1986) and there seems to be a general agreement of these data sets and the guidelines given above. The above data sets comprise over 500 individual soil samples from the area.

Please note that reference to background in the above discussion refers to both naturally occurring substances and man-made substances which are typically present across a wide area and not apparently related to a localized source such as a particular disposal site or industrial process.

I hope that you find the above guidelines useful. Feel free to contact me with any questions at 716-284-3128.

Sincerely,

Michael E. Hopkins
Ass't. Public Health Engineer

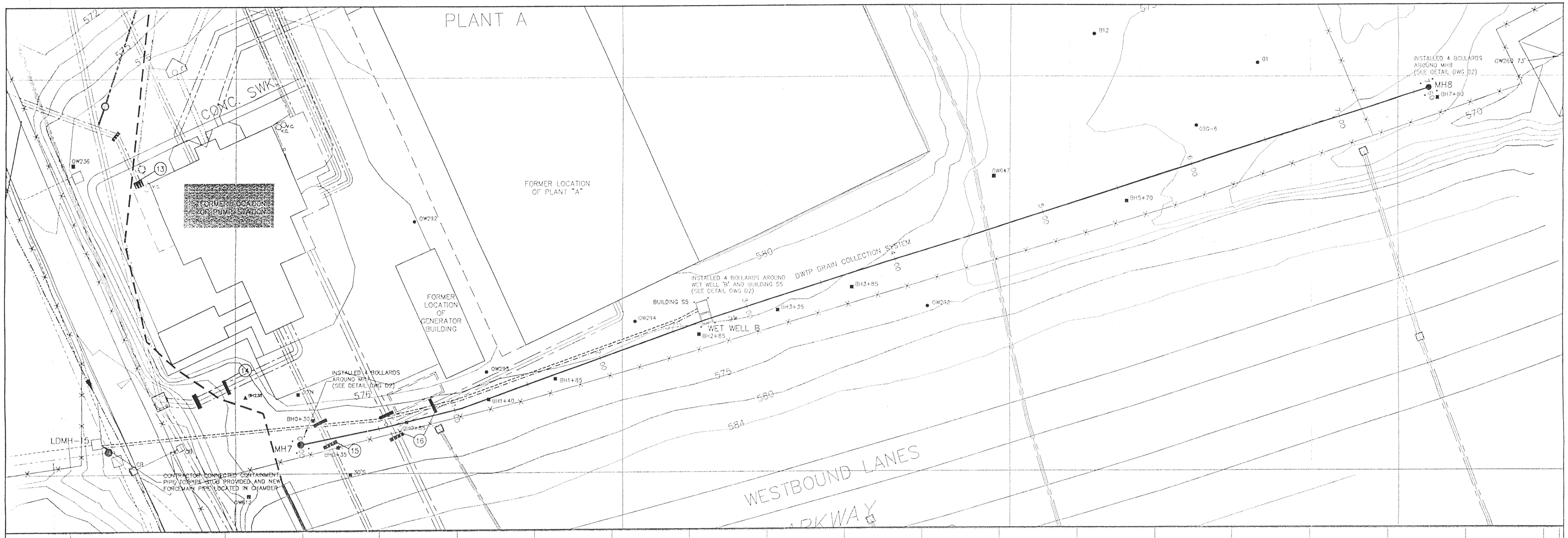
MEH:lj

cc: Messrs. Vaughan & Devald
Mr. Tygert - DEC - Buffalo
Ms. L. Rusin -NYSDOH - Buffalo
Mr. R. Tramantano - NYSDOH - Albany

EXHIBITS

Exhibit A

Pertinent S-Area Ground Water Recovery Trench Design Drawings



Tie & Forcemain Inverts	565.2		565.8	568.4		544.0	544.0	543.5	543.5	543.0	543.0	542.5	542.5	542.0	542.0	542.0	541.5	541.5	Piezometer (570.0')	541.0	541.0	541.0	541.1	541.2	541.3	541.4	541.5	541.6	541.7	541.8	541.9	542.0	542.1	542.2	542.3	542.4	542.5	542.6	542.6	542.7	542.8	542.9	543.0	543.1	543.2	543.45	Sewer & Forcemain Inverts
Utility Inverts		563.55 566.83					566.60		561.80																						561.40																	Utility Inverts
Chainage	-1+31		0+68	0+50	0+25	0+00	0+14	0+20	0+40	0+57	0+60	0+80	1+00	1+20	1+40	1+60	1+80	2+00	2+20	2+40	2+60	2+68	2+80	3+00	3+20	3+40	3+60	3+80	4+00	4+20	4+40	4+60	4+80	5+00	5+20	5+40	5+60	5+80	6+00	6+20	6+40	6+60	6+80	7+00	7+20	7+40	7+60	7+80	8+00	Chainage

LEGEND

- UTILITY PLUG
- DWTP COLLECTION SYSTEM AND STATION
- WET WELL 'B' ELECTRICAL CABLES AND FORCEMAIN
- OVERBURDEN BARRIER WALL
- FENCE
- GROUND CONTOUR
- OVERBURDEN BARRIER WALL WITH SHEET PILE SUPPORT
- STORM SEWER
- SANITARY SEWER
- WATER MAIN
- EXTRACTION SYSTEM WELL & FORCEMAIN
- POWER CONDUIT
- GAS MAIN
- PIEZOMETER CAP STORM SEWER
- S-AREA DRAIN COLLECTION SYSTEM
- OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- BOREHOLE

GENERAL NOTES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS SEWERS AND OTHER UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

№	Revision	Date	Initial
0	AS RECORDED DRAWINGS	APRIL 2000	CRH

Approved

5-3-00

STATE OF NEW YORK RICHARD J. SNYDER LICENSED PROFESSIONAL ENGINEER No. 66242

Occidental Chemical Corporation
S-Area Remedial Program

CRA
CONESTOGA-ROVERS & ASSOCIATES

DWTP CLOSURE/REMEDIAL ACTIVITIES

DWTP COLLECTION SYSTEM PLAN AND PROFILE

Drawn by: PMB	Scale: HORIZ. 1"=30' VERT. 1"=6'	Date: APRIL 2000	File №: 003	Rev.№: 0
Designed by: PMB				
Checked by: CRH	Field book:	Project №: 01769	Drawing №: P3-RD	

01769-00(231)G-№003 APR 17/2000