ND-2900 D1676

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

WALMORE ROAD - JOHNSON PROPERTY,
SITE NUMBER 932101
TOWN OF WHEATFIELD, NIAGARA COUNTY

June 1989

Prepared for:
New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner
Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., Director

Prepared by:
Ecology and Environment Engineering, P.C.

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STATE OF NEW YORK
ALEXANDER H. WHITMAN, JR.
No. 063202-1
LICENSED PROFESSIONAL ENGINEER

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New York State Department
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Prepared by:

ecology and environment
engineering, p.c.
BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060

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1. EXECUTIVE SUMMARY

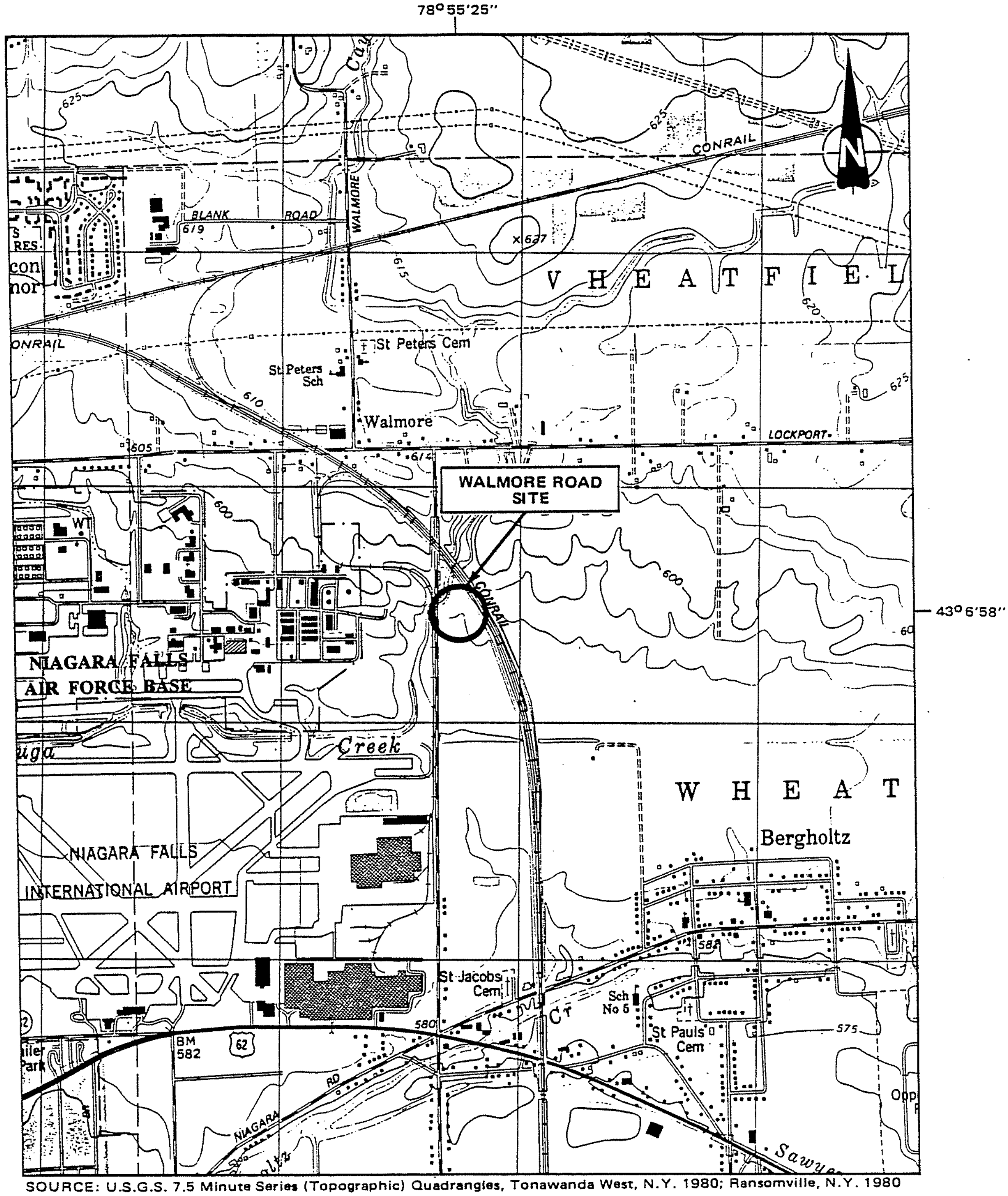
1.1 SITE BACKGROUND

The Johnson property on Walmore Road in the Town of Wheatfield (see Figures 1-1 and 1-2) received industrial waste for use as fill, many years ago (1979 or 1980), although the exact date is unknown. The fill material reportedly consisted of heat-treating salt, plastic tank sludge, fly ash, and scrap wood, and was reportedly generated by Bell Aerospace Textron Corporation (NYSDEC 1986). Bell Aerospace has no record of involvement at the site. Their manifest system did not start until 1981. According to the owner, Mr. Dean Johnson, the fill included graphite, hardened resin, crushed plastic battery cases and similar materials. A water line installed in 1980 through the fill material had corroded by 1984. Following this, a request was made by the owner for an investigation. The Niagara County Health Department inspected the site in 1984.

1.2 PHASE I EFFORTS

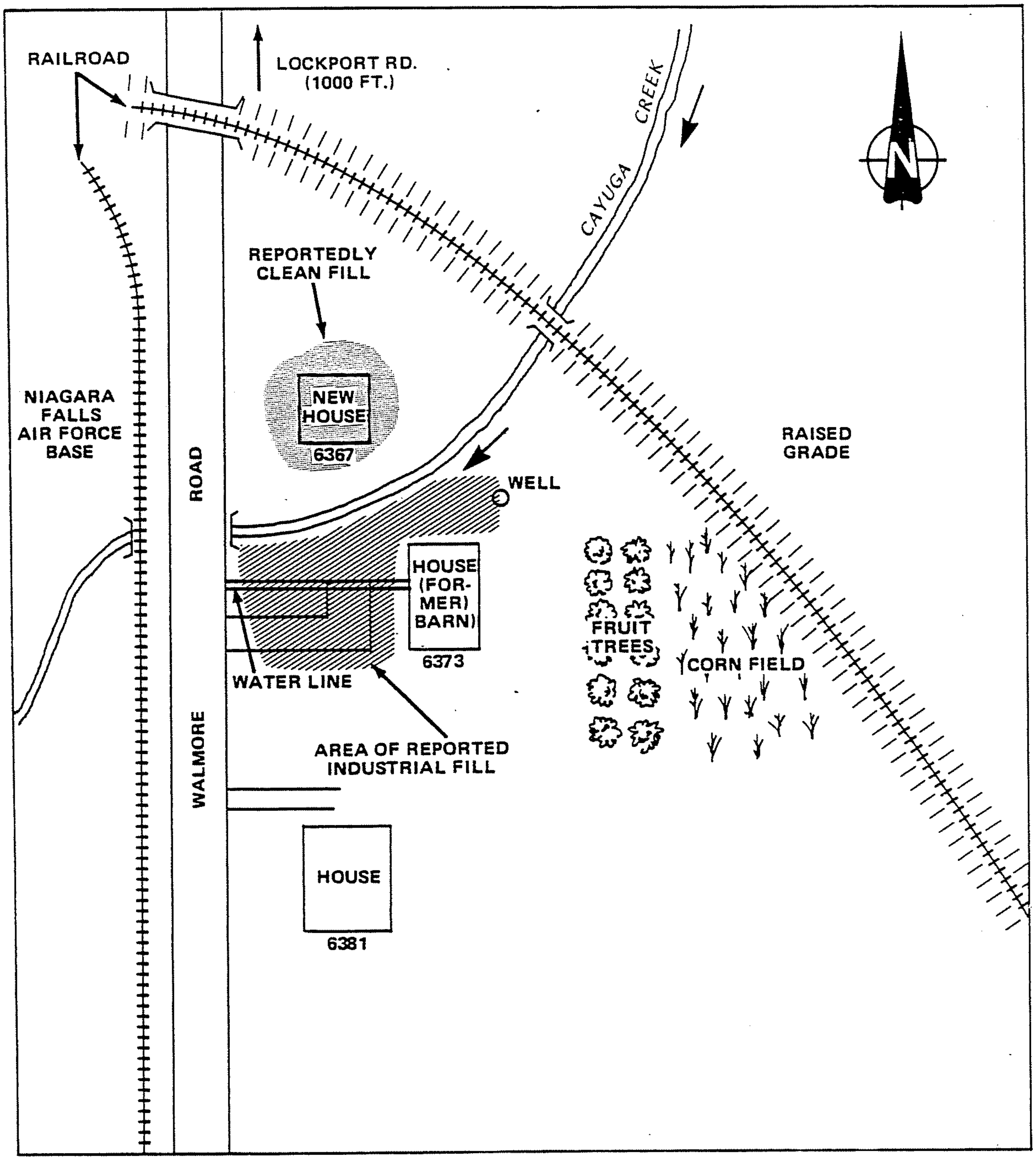
On June 24, 1987, Ecology and Environment, Inc. (E & E), conducted a site inspection in support of this investigation. Prior to the inspection, available state, federal, and municipal files were reviewed, and individuals having knowledge of the site were contacted. The site inspection consisted of a visual survey of the property that included:

- Overall site conditions; and
- Inspection of filled areas.



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Tonawanda West, N.Y. 1980; Ransomville, N.Y. 1980

Figure 1—1 LOCATION MAP



NOT TO SCALE

Figure 1—2 SITE MAP - WALMORE ROAD-JOHNSON PROPERTY

1.3 ASSESSMENT

There is very little visible evidence of fill materials at this site; no effects from the fill materials on the residents or the environment of the site have been reported. However, a water line through the fill corroded within five years. Mr. Woody Herman of the Wheatfield Water District reports that the main water line along Walmore Road is made of asbestos concrete and that the original water line at 6373 Walmore Road was made of copper. He indicates that no other customers along Walmore Road have had corrosion problems. However, the presence of a corroded water line does not necessarily indicate that hazardous wastes are present. A well on the site, used for irrigation only, was tested in 1984 by the Niagara County Health Department for halogenated hydrocarbons and metals. No contaminants were detected. No special capping or cover was used on the fill. The precise amount of fill is unknown and further investigation is recommended to accurately assess the overall health and environmental impacts, if any.

1.4 HRS SCORE

A preliminary application of the Hazard Ranking System (HRS) has been made to quantify the risk associated with this site. As the Phase I investigation is limited in scope, not all the information needed to fully evaluate the site is available. An HRS score was completed on the basis of the available data. Absence of necessary data may result in an unrealistically low HRS score.

Under the HRS, three numerical scores are computed to express the site's relative risk or damage to the population and the environment. The three scores are:

- S_M reflects the potential for harm to humans or the environment from migration of a hazardous substance away from the facility by routes involving groundwater, surface water, or air. It is a composite of separate scores for each of the three routes (S_{GW} = groundwater route score, S_{SW} = surface water route score, and S_A = air route score).

- S_{FE} reflects the potential for harm from substances that can explode or cause fires.

- S_{DC} reflects the potential for harm from direct contact with hazardous substances at the facility (i.e., no migration need be involved).

The preliminary HRS score was:

S_M = 2.76 (S_{GW} = 4.77; S_{SW} = 0; S_A = 0)
S_{FE} = not scored.
S_{DC} = 8.33

2

2. PURPOSE

This Phase I investigation was conducted under contract to the New York State Department of Environmental Conservation (NYSDEC) Superfund Program. The purpose of this investigation was to provide a preliminary evaluation of the potential environmental or public health hazards associated with filled materials at the Walmore Road site. This initial investigation consisted of a detailed file review of available information and a site inspection. This evaluation includes both a narrative description and preliminary HRS score. The investigation at this site focused on the section of the site where industrial wastes were reportedly landfilled. Based on this initial evaluation, a sampling program of the soil and water on site is proposed to better assess the potential hazards posed by the industrial wastes reportedly disposed on the site.

3

3. SCOPE OF WORK

The Phase I effort involved:

- The review of available information from state, municipal, and private files;
- Interviews with individuals knowledgeable of the site; and
- A physical inspection of the site.

State files reviewed were maintained by the NYSDEC Region 9 in Buffalo, New York. County files reviewed were maintained by Niagara County Department of Health. Mr. Michael Hopkins of the Niagara County Health Department was contacted in person on May 1, 1987, to discuss information maintained in the county files. The county file on the facility contained analytical results, an inspection report, and correspondence.

Debra Johnson, who owns the property adjacent to the Walmore Road-Johnson Property site, was interviewed on June 26, 1987. Information on water pipe corrosion and well water analytical results was provided by her. Dean Johnson was also contacted but provided no further information.

A site inspection was conducted by E & E on June 24, 1987. Residents and neighbors were interviewed at that time. No samples were collected by E & E, although monitoring of air quality was performed using an HNu photoionizing organic vapor detector. Photographs were taken and are included in Appendix A. A physical inspection of the site and review of pertinent USGS 7.5-minute topographic maps were completed. A summary of agencies contacted, along with contact persons and addresses, is presented in Table 3-1.

Table 3-1

SOURCES CONTACTED FOR THE PHASE I INVESTIGATION AT THE WALMORE ROAD-JOHNSON PROPERTY SITE

New York State Department of Environmental Conservation, Region 9
600 Delaware Avenue, Buffalo, New York 14202
Telephone Number: (716) 847-4585

- Division of Solid and Hazardous Waste
  Contact: Lawrence Clare, Ahmed Tayyebi
  Date Contacted: May 8, 1987
  Information: Analytical results; correspondence.

- Division of Regulatory Affairs
  Contact: Paul Eismann
  Date Contacted: May 8, 1987, and June 2, 1987
  Information: Permits; wetlands information.

- Division of Environmental Enforcement
  Contact: Joann Gould
  Date Contacted: May 6, 1987
  Information: Enforcement actions.

- Division of Water
  Contact: Rebecca Anderson
  Date Contacted: June 2, 1987
  Information: Floodplain locations.

- Bureau of Wildlife
  Contact: James R. Snider
  Date Contacted: June 2, 1987
  Information: Critical habitat locations.

New York State Department of Health
Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12237
Telephone Number: (518) 458-6310
Contact: Lani Rafferty
Date Contacted: April 5, 6, 1989
Information: File search for site history, correspondence, background information

New York State Department of Health
Regional Toxic Program Office
584 Delaware Avenue
Buffalo, New York 14202
Telephone Number: (716) 847-4365
Contact: Linda Rusin, Cameron O'Connor
Dates Contacted: May 5, 1987, June 4, 1987, April 13, 1989
Information: Contact with NYSDOH on May 5, 1987, indicated that files were being transferred from Albany to Buffalo so the files were not accessible. Further correspondence in June 1987 indicated that the office was newly established and file information was extremely limited; therefore, the county health departments were visited in lieu of NYSDOH. NYSDOH files were searched on April 13, 1989.

Niagara County Health Department
10th and East Falls Street, Niagara Falls, New York, 14302
Telephone Number: (716) 284-3128
Contact: Michael Hopkins, Paul Dicky
Dates Contacted: May 1, 1987, and May 5, 1987
Information: Inspection report; analytical results; correspondence.

Table 3-1 (Cont.)

Mrs. Debra Johnson
Property Owner, 6381 Walmore Road, Wheatfield, New York
Telephone Number: (716) 731-3396
Date Contacted: June 24, 1987
Information: Site history; analytical results.

Mr. Norman A. Walck
Water Supervisor
Town of Wheatfield
3113 Niagara Falls Boulevard
North Tonawanda, New York
Telephone Number: (716) 693-4262
Date Contacted: September 28, 1987
Information: Addresses of population using well water

Mr. Mark Haseley
Haseley Trucking Company
10315 Lockport Road
Niagara Falls, NY 14304
Telephone Number: (716) 297-1550
Date Contacted: May 9, 1988, May 23, 1988
Information: Composition of fill

Mr. Brian Smith
Bell Aerospace Textron
P.O. Box 1
Buffalo, NY 14240
Telephone Number: (716) 297-1000
Date Contacted: May 6, 1988, May 20, 1988
Information: Site history

4

4. SITE ASSESSMENT

4.1 SITE HISTORY

The property at 6373 Walmore Road is the site of a barn which was part of a farm encompassing nearby fields. Landfilling of industrial materials occurred adjacent to this property sometime during 1979 or 1980 when the barn was converted to a house. The NYSDEC Registry of Inactive Hazardous Waste Disposal Sites reported that the waste came from Bell Aerospace Textron and consisted of heat-treating salt, plastic tank sludge, fly ash, scrap wood, and clay (NYSDEC 1986). Bell Aerospace has no record of involvement at this site (Buzawa 1988). Bell's manifest system did not start until 1981 (Buzawa 1988). The property owner, Mr. Dean Johnson, reported that the fill consisted of graphite, hardened resins, and crushed plastic battery cases and was delivered by Haseley Trucking Company (Hopkins 1984a).

In 1979, the farmland near this site was leased to a Mr. Pfoul. Mr. Pfoul currently is leasing the land and uses it to raise corn. The barn at 6373 Walmore Road was converted to a residence by 1980. At this time a water line and septic tank were installed. The water line ran from the road to the residence through filled areas. In 1984, water pressure was being lost at the residence. The water line was excavated and found to be corroded, and was subsequently replaced by a PVC water line (Johnson 1987). Mr. Woody Herman of the Wheatfield Water District reports that the main water line along Walmore Road is made of asbestos concrete and that the original water line at 6373 Walmore Road was made of copper (Herman 1988). No other customers along Walmore Road have had corrosion problems; however, the presence of a corroded water line does not necessarily indicate that hazardous wastes are present. A dug well, 13 feet deep, is located approximately 100 feet northeast of the former barn (E & E 1987, Hopkins 1984b). Dean Johnson, owner of 6373 and 6367 Walmore Road, asked the Niagara County Health Department to inspect the filled areas of his property in 1984. Michael Hopkins of the Niagara County Health Department visited the site and collected a sample of water from the well at 6373 Walmore Road. This sample was analyzed by NYSDEC for total halogenated organics, lead, chromium, and cadmium. No contaminants were found (Hopkins 1985).

To distinguish this site from the nearby site on Lockport Road (No. 932094), a new registry number was assigned to this site in July 1987. The Walmore Road-Johnson Property site is now No. 932101.

4.2 SITE TOPOGRAPHY

The Walmore Road-Johnson Property site is located directly on the southern bank of Cayuga Creek between the Conrail railroad tracks and Walmore Road. The topography of the regional area, a lacustrine plain, is essentially flat at an elevation of 590 feet. Cayuga Creek has eroded a channel approximately 5 feet deep, and the Conrail tracks are elevated approximately 15 feet by fill. The lacustrine plain slopes upward slightly to the northeast rising 50 feet in 3 miles. The Niagara Escarpment is 3.5 miles to the north, and the Niagara River is 3 miles to the south. Cayuga Creek, which crosses the site, flows into the Niagara River. The site is on a 100-year floodplain according to FEMA flood insurance map #3605130001B.

The site is located in the Town of Wheatfield in an area which is predominantly rural. The Niagara Falls Air Force Base and International Airport is located 0.5 mile southwest of the site. There are no known critical habitats in the vicinity of this site (Snider 1987). Approximately 28 homes in the Town of Wheatfield use groundwater for drinking purposes (Walck 1987).

4.3 SITE HYDROLOGY

4.3.1 Regional Geology and Hydrology

The geology of the Niagara Falls area is well understood because of its simplicity and excellent exposures of bedrock along the Niagara River gorge and the Niagara escarpment.

The overburden in the Niagara Falls area is relatively thin. Three types of these unconsolidated deposits are present. The lowermost is glacial till and regolith, an unsorted mixture of boulders, clay, and sand deposited by glaciers, which directly overlies the bedrock. This is covered by clays, silts, and fine sands of lacustrine origin. These are the surface soils throughout most of the region. In isolated spots, sand and gravel deposits are found above the lacustrine soils. These were deposited by glacial melt streams and by wave action of the larger ancestors of the Great Lakes.

The bedrock in the Niagara Falls area consists of nearly flat-lying sedimentary rocks, including dolomite, shale, limestone, and sandstone units. The bedrock slopes southward approximately 30 feet per mile.

The entire region south of the Niagara escarpment, extending almost to Erie County, is directly underlain by the Lockport Dolomite. The Clinton and Albion groups underlie the Lockport but crop out only along the escarpment and in the gorge of the Niagara River. These units are underlain by the Queenston shale. This unit is the uppermost bedrock unit under the plain north of the escarpment.

Groundwater in the Niagara Falls area occurs in both the unconsolidated deposits and in the bedrock. The bedrock, specifically the Lockport Dolomite, is, however, the principal source of groundwater in the Niagara Falls area. Three types of bedrock openings contain the groundwater: bedding joints, vertical joints, and solution cavities.

The bedding joints, which transmit most of the water in the Lockport, and fractures along prominent bedding planes have been widened up to 1/8 inch by solution of the rocks. These joints extend several miles thus constituting effective water conduits.

The vertical joints are generally too short and sparse to account for significant groundwater storage and transmission, except in the top 10-25 feet of bedrock. Solution cavities, formed when gypsum is dissolved, are also not important components of the aquifer. Although they increase the storage capacity of the aquifer, they are isolated and do not contribute to groundwater transmission.

Two distinct sets of groundwater conditions exist in the Lockport Dolomite. The first is the upper 10 to 25 feet of the bedrock. This region is highly fractured resulting in moderate permeabilities. In some areas in the region, a confining layer of clay above this zone can produce artesian groundwater conditions. The second class of groundwater conditions is found deeper in the bedrock, where at least seven different permeable zones have been identified. These zones are surrounded by impermeable bedrock, and it is not likely that they are hydraulically connected (Johnston 1964).

4.3.2 Site Hydrogeology

The soils at this site are Schoharie silty clay loam of the Odessa-Lakemont-Ovid association (Higgins et al. 1972). These soils are fine textured and poorly drained. The soils are overlain by the industrial fill material at the Walmore Road-Johnson Property site.

Depth to bedrock at this site is not known. Borings have been made near the Carborundum plant 0.5 mile to the south, along Walmore Road. These borings indicated that the Lockport Dolomite bedrock was greater than 15 feet below the surface (Koszalka et al. 1985).

The well on site is screened in the overburden at a depth of 13 feet. Groundwater was encountered at 6 feet during sampling by the Niagara County Health Department in 1984.

Cayuga Creek transects the site. Fill material is believed to have been placed adjacent to the creek. Cayuga Creek may act as a groundwater discharge point.

4.3.3 Hydraulic Connections

The upper unconsolidated deposits constitute the aquifer of concern at this site due to their use for irrigation of fruit and vegetables grown on site. Water in these deposits is most likely hydraulically connected to Cayuga Creek, which flows through this site. Cayuga Creek, however, is not used for drinking water or recreation. After leaving the Walmore Road-Johnson Property site, the creek is inaccessible as it flows through the Niagara Falls Air Force Base/International Airport. Downstream from the airport, the creek has been posted as hazardous because of potential contaminant migration from the Love Canal and the former Charles Gibson disposal site near Pine Avenue (Koszalka et al. 1985).

Boreholes adjacent to the Carborundum plant approximately 0.5 mile to the south revealed lacustrine clay deposits of up to 10 feet thick (Koszalka et al. 1985). These deposits may isolate the aquifer of concern from the deeper regolith and bedrock aquifers.

4.4 SITE CONTAMINATION

One to three acres of the Walmore Road-Johnson Property site received up to 5 feet of industrial fill. The exact date and nature of the fill are unknown, although the owner recalls that the material included graphite, hardened resins, and plastic battery cases (Hopkins 1984). Other reported material consists of caustic heat-treating salt, plastic tank sludge, fly ash and scrap wood (NYSDEC 1986). Filled areas extend from Walmore Road, along the left bank of Cayuga Creek, to the areas north and east of the barn on site. In 1979, a water line was installed and by 1984, this water line had severely corroded (Johnson 1987).

In 1984, at the request of the owner, the Niagara County Health Department sampled a water well on the property and analyzed it for halogenated organic compounds and three metals: lead, cadmium, and chromium. None of these contaminants was found above detection limits (Hopkins 1985). A well on the adjacent property located to the south, 6381 Walmore Road, was sampled in 1985, apparently because of potential migration of pollutants from previous sludge landfilling operations on the Air Force Base across the road. The sample was tested for bacteria and found positive, although the Niagara County Health Department suspects this to be of incidental origin (Popovici 1985).

No soil sampling has been performed at the Walmore Road-Johnson Property site. Slag was noticed on the surface of alleged fill areas near Cayuga Creek by the E & E inspection team on June 24, 1987, and by Michael Hopkins of the Niagara County Health Department in 1984.

5

Narrative

5.1

5. PRELIMINARY APPLICATION OF THE HAZARD RANKING SYSTEM

5.1 NARRATIVE SUMMARY

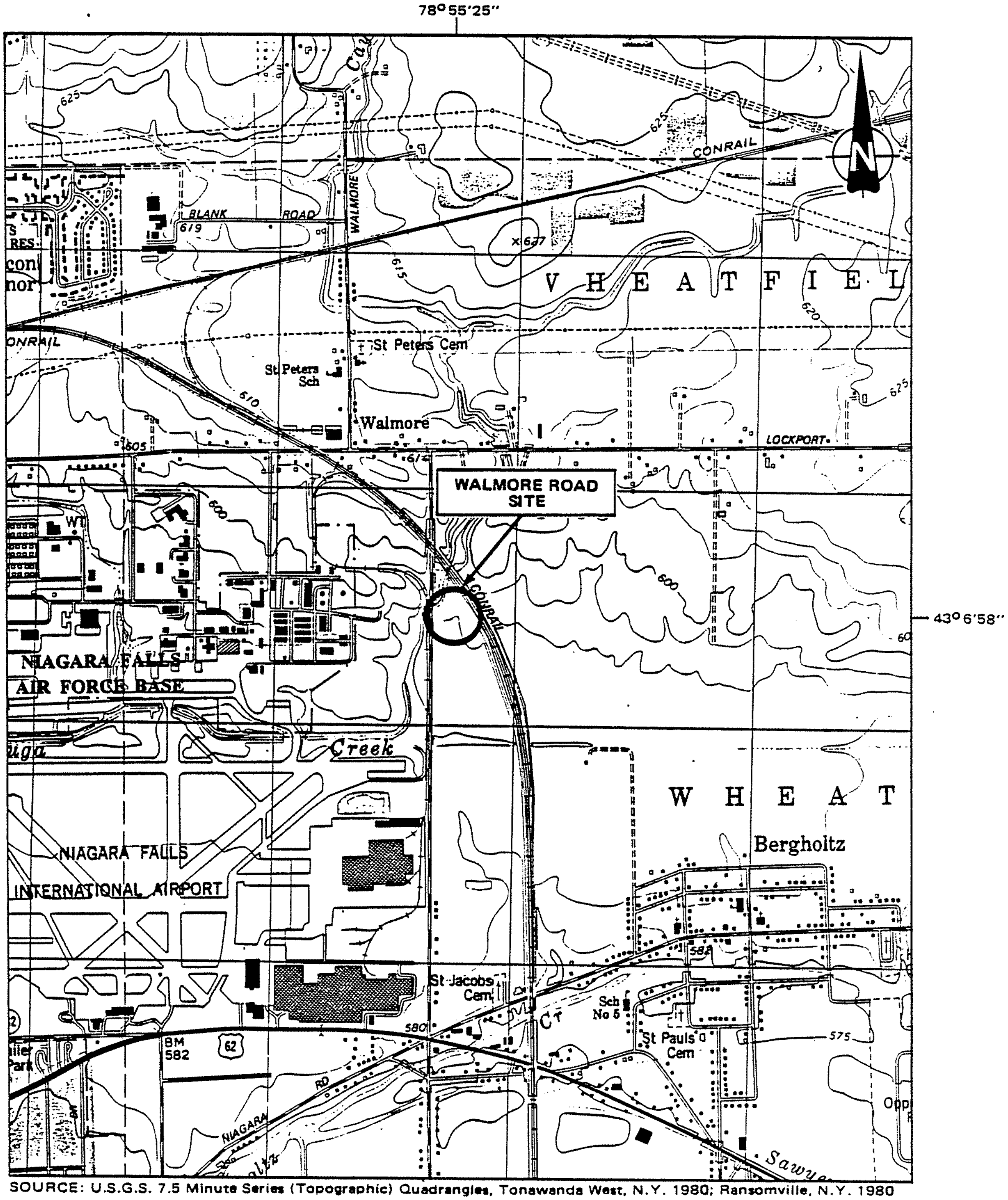
The Walmore Road-Johnson Property site covers 1 to 3 acres in the Town of Wheatfield, Niagara County (see Figure 5-1). The Town of Wheatfield is predominantly rural; total population within 2 miles of the site is 3,162 (General Sciences Corporation 1986). Approximately 28 homes in the Town of Wheatfield use ground water for drinking purposes (Walck 1987). The Johnson property is located directly on the southern bank of Cayuga Creek between the Conrail railroad tracks and Walmore Road. The site is located within a 100-year flood plain.

The Walmore Road-Johnson Property site reportedly received up to 5 feet of industrial fill including graphite, hardened resins, plastic battery cases, heat-treating salt, plastic tank sludge, fly ash, and scrap wood. The exact date of deposit and characteristics of the wastes are unknown. The fill may have been placed in 1979 or 1980 when the barn at 6373 Walmore Road was converted to a house. The property is a private residence owned by Mr. Dean Johnson.

The site is adjacent to Cayuga Creek, which is not used for drinking water or recreation because of prior downstream contamination from the Love Canal Superfund Site. In 1985, an on-site shallow well was sampled by NCHD for total halogenated organic compounds, lead, chromium, and cadmium. These parameters did not exceed minimum detection levels.

Location

5.2



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Tonawanda West, N.Y. 1980; Ransomville, N.Y. 1980

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 5—1 LOCATION MAP

5.3

HRS Worksheets

FIGURE 1

HRS COVER SHEET

Facility Name: Walmore Road - Johnson Property

Location: 6373 Walmore Road, Town of Wheatfield, New York

EPA Region: II

Person(s) in Charge of Facility: Dean Johnson
6373 Walmore Road
Town of Wheatfield, New York

Name of Reviewer: Jon Sundquist Date: August 6, 1987

General Description of the Facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action; etc.)

This site received graphite, hardened resin, crushed plastic battery cases and similar materials as fill material. The fill reportedly covers 1 to 3 acres, and is up to 5 feet deep. This site is located on private residential property on Walmore Road, Town of Wheatfield, Niagara County, New York. A well on site is used for occasional irrigation of residential fruit trees and concern is expressed that the well may become contaminated from the fill material. Further investigation of this site is recommended to further delineate any hazardous conditions.

Scores: S_M = 2.76 (S_{gw} = 4.77 S_{sw} = 0 S_a = 0)

S_{FE} = Not scored

S_{DC} = 8.33

Ground Water Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line $\boxed{4}$. If observed release is given a score of 0, proceed to line $\boxed{2}$.					
$\boxed{2}$ Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 [✓ 3]	2	6	6	
Net Precipitation	0 [✓ 1] 2 3	1	1	3	
Permeability of the Unsaturated Zone	0 1 [✓ 2] 3	1	2	3	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		12	15	
$\boxed{3}$ Containment	0 1 2 [✓ 3]	1	3	3	3.3
$\boxed{4}$ Waste Characteristics					3.4
Toxicity/Persistence	0 [✓ 3] 6 9 12 15 18	1	3	18	
Hazardous Waste Quantity	0 [✓ 1] 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score		4	26	
$\boxed{5}$ Targets					3.5
Ground Water Use	0 1 2 [✓ 3]	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 [✓ 10] 12 16 18 20 24 30 32 35 40	1	10	40	
	Total Targets Score		19	49	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			2,736	57,330	
$\boxed{7}$ Divide line $\boxed{6}$ by 57,330 and multiply by 100		S_{gw} =	4.77		

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line $\boxed{4}$. If observed release is given a value of 0, proceed to line $\boxed{2}$.					
$\boxed{2}$ Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 1 2 [✓ 3]	1	3	3	
1-yr. 24-hr. Rainfall	0 1 [✓ 2] 3	1	2	3	
Distance to Nearest Surface Water	0 1 2 [✓ 3]	2	6	6	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		14	15	
$\boxed{3}$ Containment	0 1 2 [✓ 3]	1	3	3	4.3
$\boxed{4}$ Waste Characteristics					4.4
Toxicity/Persistence	0 [✓ 3] 6 9 12 15 18	1	3	18	
Hazardous Waste Quantity	0 [✓ 1] 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score		4	26	
$\boxed{5}$ Targets					4.5
Surface Water Use	[✓ 0] 1 2 3	3	0	9	
Distance to a Sensitive Environment	[✓ 0] 1 2 3	2	0	6	
Population Served/Distance to Water Intake Downstream	[✓ 0] 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		0	55	
$\boxed{6}$* If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			0	64,350	
$\boxed{7}$ Divide line $\boxed{6}$ by 64,350 and multiply by 100		S_{sw} =	0		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line $\boxed{1}$ is 0, the S_a = 0. Enter on line $\boxed{5}$. If line $\boxed{1}$ is 45, then proceed to line $\boxed{2}$.					
$\boxed{2}$ Waste Characteristics					5.2
Reactivity and Incompatibility	0 [✓ 1] 2 3	1	1	3	
Toxicity	0 1 [✓ 2] 3	3	6	9	
Hazardous Waste Quantity	[✓ 0] 1 2 3 4 5 6 7 8	1	0	8	
	Total Waste Characteristics Score		7	20	
$\boxed{3}$ Targets					5.3
Population Within 4-Mile Radius	0 9 [✓ 12] 15 18 21 24 27 30	1	12	30	
Distance to Sensitive Environment	[✓ 0] 1 2 3	2	0	6	
Land Use	0 1 2 [✓ 3]	1	3	3	
	Total Targets Score		15	39	
$\boxed{4}$ Multiply $\boxed{1}$ x $\boxed{2}$ x $\boxed{3}$			0	35,100	
$\boxed{5}$ Divide line $\boxed{4}$ by 35,100 and multiply by 100		S_a =	0		

FIGURE 9
AIR ROUTE WORK SHEET

	S	S^2
Groundwater Route Score (S_{gw})	4.77	22.75
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_a$	▨	22.75
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}$	▨	4.77
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a} \Big/ 1.73 = S_M =$	▨	2.76

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Containment	1 3	1		3	7.1
$\boxed{2}$ Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
$\boxed{3}$ Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
	Total Targets Score			24	
$\boxed{4}$ Multiply $\boxed{1}$ x $\boxed{2}$ x $\boxed{3}$				1,440	
$\boxed{5}$ Divide line $\boxed{4}$ by 1,440 and multiply by 100		S_{FE} =	Not scored		

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Incident	[✓ 0] 45	1	0	45	8.1
If line $\boxed{1}$ is 45, proceed to line $\boxed{4}$ If line $\boxed{1}$ is 0, proceed to line $\boxed{2}$					
$\boxed{2}$ Accessibility	0 1 2 [✓ 3]	1	3	3	8.2
$\boxed{3}$ Containment	0 [✓ 15]	1	15	15	8.3
$\boxed{4}$ Waste Characteristics Toxicity	0 [✓ 1] 2 3	5	5	15	8.4
$\boxed{5}$ Targets					8.5
Population Within a 1-Mile Radius	0 1 [✓ 2] 3 4 5	4	8	20	
Distance to a Critical Habitat	[✓ 0] 1 2 3.	4	0	12	
Total Targets Score			8	32	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			1,800	21,600	
$\boxed{7}$ Divide line $\boxed{6}$ by 21,600 and multiply by 100		S_{DC} =	8.33		

FIGURE 12
DIRECT CONTACT WORK SHEET

5.4 HRS Documentation Records

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

Instructions: As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 80 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

Facility Name: Walmore Road-Johnson Property

Location: 6373 Walmore Road, Town of Wheatfield, NY

Date Scored: July 28, 1987

Person Scoring: Dennis Sutton

Primary Source(s) of Information (e.g., EPA region, state, FIT, etc.):

New York State, Region 9, Buffalo, New York
Niagara County Health Department, Niagara Falls, New York

Factors Not Scored Due to Insufficient Information:

Further investigation is needed to determine quantity of waste present and characteristics of the waste, if any.

Comments or Qualifications:

Fire and explosion score not calculated because the site has not been declared a fire hazard by a fire marshal. No soil sampling has been conducted at this site. Site is scored on the basis of available information. Fill is suspected to be hazardous; however, there is conflicting information concerning its composition.

D1676

GROUNDWATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (3 maximum):

None reported

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Unconsolidated glacial deposits - sands, clays, silts, also the Lockport dolomite
(Groundwater from this aquifer used for irrigation onsite)
Ref. No. 3

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

Approximately 6 feet for unconsolidated glacial deposits, and 30 to 35 feet to the Lockport dolomite
Ref. No. 3, 15

Depth from the ground surface to the lowest point of waste disposal/storage:

5 feet
Ref. No. 13

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

31 in/yr
Ref. No. 1

Mean annual lake or seasonal evaporation (list months for seasonal):

27 in/yr
Ref. No. 1

Net precipitation (subtract the above figures):

4 in/yr

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Schoharie silty clay loam and Odessa silty clay loam
Ref. No. 4

Permeability associated with soil type:

$4.4 \times 10^{-4} - 1.4 \times 10^{-5}$ cm/sec
Ref. No. 4

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Solid, powder, sludge
Ref. No. 1, 9

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Fill is placed directly in ground and covered with an unknown amount of soil and vegetation
Ref. No. 1

Method with highest score:

Landfill without liner
Ref. Nos. 1, 11

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Suspected wastes are caustic, plastic sludge and heat treating salts.
Ref. No. 9

Compound with highest score:

Unknown - for estimating purposes a value of 3 was assigned.

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0. (Give a reasonable estimate even if quantity is above maximum.):

Unknown - for estimating purposes, a value of 1 was assigned.
Ref. No. 9

Basis of estimating and/or computing waste quantity:

Hazardous wastes are suspected.
Ref. No. 9

* * *

5. TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Irrigation and drinking water
Ref. Nos. 5, 12

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Onsite
Ref. No. 11

Distance to above well or building:

Exact boundaries of fill are unknown, but this distance is less than 100 feet.
Ref. No. 11

Population Served by Groundwater Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

Well onsite used for occasional irrigation, approximately 28 wells within a 3-mile radius, used for drinking water, approximately 100 people.
Ref. Nos. 5, 12

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

1 acre estimate of fruit and vegetable production
1.5 people per acre x 1 acre = 1.5 people
Ref. Nos. 1, 11

Total population served by groundwater within a 3-mile radius:

100 to 110 people
Ref. Nos. 1, 11, 12

SURFACE WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

None reported

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

2%
Ref No. 2

Name/description of nearest downslope surface water:

Cayuga Creek
Ref. No. 2

Average slope of terrain between facility and above-cited surface water body in percent:

2%
Ref. No. 2

Is the facility located either totally or partially in surface water?

Yes - apparent filled area extends to banks of Cayuga Creek
Ref. No. 2, 11

Is the facility completely surrounded by areas of higher elevation?

No
Ref. No. 2

1-Year 24-Hour Rainfall in Inches

2.5 in
Ref. No. 1

Distance to Nearest Downslope Surface Water

Adjacent
Ref. No. 11

Physical State of Waste

Solid, powder, sludge
Ref. No. 6

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Landfill
Ref. No. 1

Method with highest score:

No liner
Ref. No. 1

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Unknown - suspected wastes are caustic plastic sludge and heat-treating salts
Ref. No. 9

Compound with highest score:

Unknown - for estimating purposes, a value of 3 was assigned
Ref. No 9

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (give a reasonable estimate even if quantity is above maximum):

Unknown - for estimating purposes, a value of 1 was assigned
Ref. No. 9

Basis of estimating and/or computing waste quantity:

Hazardous wastes are suspected
Ref. No. 9

* * *

5. TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

None
Ref. No. 5

Is there tidal influence?

No
Ref. No. 2

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

NA
Ref. No. 2

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

NA
Ref. No. 6

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

NA
Ref. No. 7

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

None within 3 miles downstream
Ref. No. 10

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

NA
Ref. No. 10

Total population served:

NA
Ref. No. 10

Name/description of nearest of above water bodies:

NA
Ref. No. 10

Distance to above-cited intakes, measured in stream miles:

NA
Ref. No. 10

AIR ROUTE

1. OBSERVED RELEASE

Contaminants detected:

None reported

Date and location of detection of contaminants:

NA

Methods used to detect the contaminants:

HNu photoionization detector

Rationale for attributing the contaminants to the site:

NA

* * *

2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

NA

Most incompatible pair of compounds:

NA

Toxicity

Most toxic compound:

Unknown - suspected wastes are caustic plastic sludge and heat-treating salts
Ref. No. 9

Hazardous Waste Quantity

Total quantity of hazardous waste:

Unknown - for estimating purposes, a value of 1 was assigned

Basis of estimating and/or computing waste quantity:

Hazardous wastes are suspected
Ref. No. 9

* * *

3. TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi [✓ 0 to 1 mi] 0 to 1/2 mi 0 to 1/4 mi

530
Ref. No. 8

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

NA
Ref. No. 6

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

NA
Ref. No. 6

Distance to critical habitat of an endangered species, if 1 mile or less:

NA
Ref. No. 7

Land Use

Distance to commercial/industrial area, if 1 mile or less:

0.1 mile
Ref. No. 2

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

NA
Ref. No. 2

Distance to residential area, if 2 miles or less:

0.1 mile
Ref. No. 2

Distance to agricultural land in production within past 5 years, if 1 mile or less:

NA
Ref. No. 4

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

NA
Ref. No. 4

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

NA
Ref. No. 14

FIRE AND EXPLOSION

1. CONTAINMENT

Hazardous substances present:

Unknown - suspected wastes are caustic plastic sludge
Ref. No. 9

Type of containment, if applicable

Landfill - no liner
Ref. No. 1

* * *

2. WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

NA

Ignitability

Compound used:

NA

Reactivity

Most reactive compound:

NA

Incompatibility

Most incompatible pair of compounds:

NA

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

Unknown
Ref. No. 9

Basis of estimating and/or computing waste quantity:

Hazardous wastes are suspected
Ref. No. 9

* * *

3. TARGETS

Distance to Nearest Population

0.1 mile
Ref. No. 2

Distance to Nearest Building

0.1 mile
Ref. No. 2

Distance to a Sensitive Environment

Distance to wetlands:

2.25 miles
Ref. No. 6

Distance to critical habitat:

NA
Ref. No. 7

Land Use

Distance to commercial/industrial area, if 1 mile or less:

0.1 mile
Ref. No. 2

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

NA
Ref. No. 2

Distance to residential area, if 2 miles or less:

0.1 mile
Ref. No. 2

Distance to agricultural land in production within past 5 years, if 1 mile or less:

NA
Ref. No. 4

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

NA
Ref. No. 4

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

NA
Ref. No. 14

Population Within 2-Mile Radius

3,162
Ref. No. 8

Buildings Within 2-Mile Radius

1,181
Ref. No. 8

DIRECT CONTACT

1. OBSERVED INCIDENT

Date, location, and pertinent details of incident:

None reported

* * *

2. ACCESSIBILITY

Describe type of barrier(s):

No barriers, waste covered with soil
Ref. No. 11

* * *

3. CONTAINMENT

Type of containment, if applicable:

Landfill without liner
Ref. Nos. 1, 11

* * *

4. WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Unknown - suspected wastes are caustic plastic sludge and heat-treating salts.
Ref. No. 9

Compound with highest score:

Unknown - for estimating purposes, a value of 1 was assigned.

* * *

5. TARGETS

Population within one-mile radius

530
Ref. No. 8

Distance to critical habitat (of endangered species)

NA
Ref. No. 7

REFERENCES

If the entire reference is not available for public review in the EPA regional files on this site, indicate where the reference may be found:

Reference Number	Description of the Reference
1	Uncontrolled Hazardous Waste Site Ranking System; A Users Manual. Document Location: E & E, Buffalo, New York.
2	USGS 7.5-Minute Topographical Map, 1980, Tonawanda West, New York, quadrangle. Document Location: E & E, Buffalo, New York.
3	Johnston, Richard H., 1964, Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resources Commission, Bulletin GW-53, 1964. Document Location: E & E, Buffalo, New York.
4	Higgins, B.A., P.S. Puglia, R.P. Leonard, T.D. Yoakum, W.A. Wirtz, Soil Survey of Niagara County, New York, USDA Soil Conservation Service, 1972. Document Location: E & E, Buffalo, New York.
5	Hopkins, Michael, personal communication, Niagara County Health Department, May 1, 1987. Document Location: E & E, Buffalo, New York.
6	New York State Department of Environmental Conservation, wetlands maps. Document Location: NYSDEC Region 9, Buffalo, New York.
7	Snider, James, personal communication, Wildlife Biologist, NYSDEC, Region 9, Buffalo, New York. Document Location: E & E, Buffalo, New York.
8	USEPA, Graphical Exposure Modeling System (GEMS), 1984. Document Location: E & E, Buffalo, New York.
9	New York State Department of Environmental Conservation, Division of Solid and Hazardous Waste, December 1986, Inactive Hazardous Waste Disposal Report. Document Location: E & E, Buffalo, New York.
10	New York Atlas of Community Water System Sources, 1982, New York Department of Health, Division of Environmental Protection, Bureau of Public Water Supply Protection. Document Location: E & E, Buffalo, New York.
11	Ecology and Environment Site Inspection Log Book and Photo Log. Document Location: E & E, Buffalo, New York.
12	Walck, Norman, personal communication, Town of Wheatfield Water Superintendent, 1987. Document Location: E & E, Buffalo, New York.
13	Hopkins, Michael, 1984b, Niagara County Health Department Investigation Report. Document location: E & E, Buffalo, New York.
14	Murtagh, W.J., 1976, The National Register of Historic Places, USDI National Park Service, Washington, DC. Document location: E & E, Buffalo, New York.
15	Niagara County Health Department, 1984, Service Request to Collect Well Samples at 6373 Walmore Road, Lockport, New York.

REFERENCE NO. 1

Uncontrolled Hazardous Waste Site Ranking System

A Users Manual

Kris W. Barrett
S. Steven Chang
Stuart A. Haus
Andrew M. Platt

August 1982

MTR-82W111

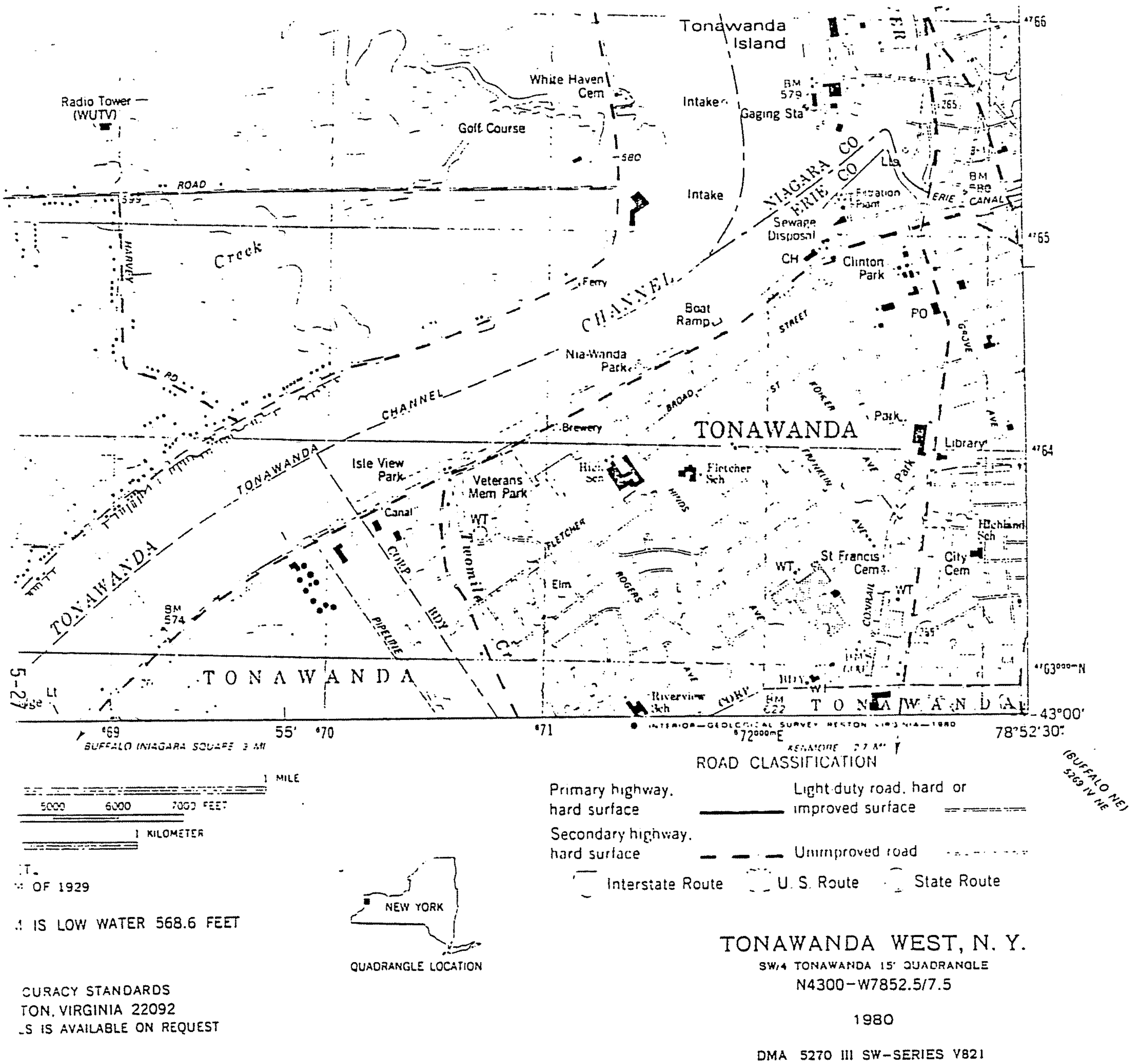
SPONSOR:
U.S. Environmental Protection Agency
CONTRACT NO.:
68-01-6278

The MITRE Corporation
Metrek Division
1820 Dolley Madison Boulevard
McLean, Virginia 22102

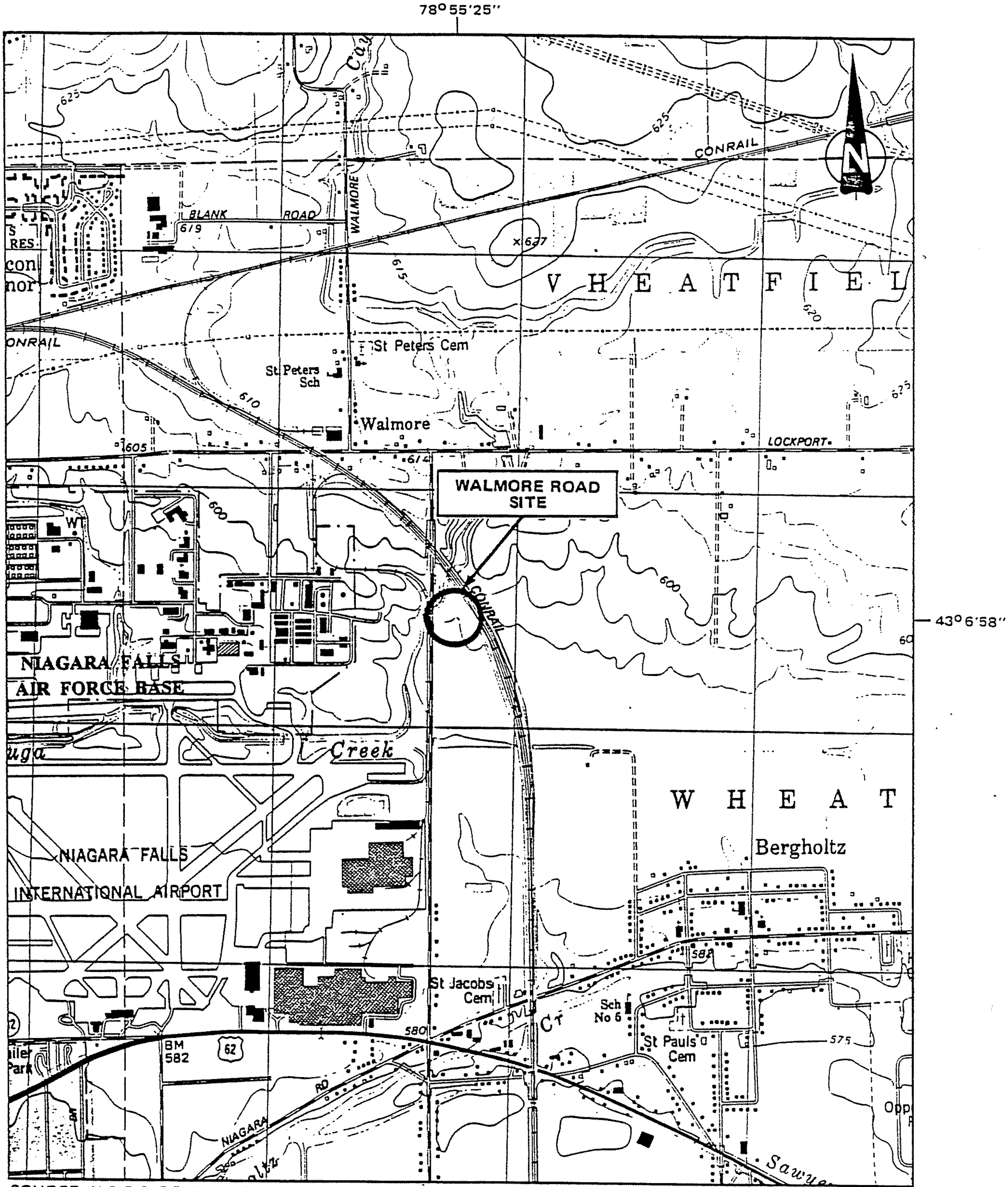
3 702 : - [illegible] -36

recycled paper
ecology and environment

REFERENCE NO. 2



Tonawanda Island
White Haven Cem
Radio Tower (WUTV)
Golf Course
Intake
Gaging Sta
BM 579
ROAD
Creek
HARVEY
NIAGARA CO
ERIE CO
Sewage Disposal
Filtration Plant
ERIE CANAL
CH
Clinton Park
Ferry
CHANNEL
Boat Ramp
PO
STREET
GROVE
Nia-Wanda Park
BROAD
ST
FOKER
Brewery
TONAWANDA
Park
Library
Isle View Park
Veterans Mem Park
Canal
High Sch
Fletcher Sch
Highland Sch
WT
St Francis Cem
City Cem
FLETCHER
Twomile
Elm
ROGERS
BM 574
PIPELINE
T O N A W A N D A
Riverview Sch
BM 622
43°00'
78°52'30"
55'
4766
4765
4764
4763000mN
69
70
71
72000mE
BUFFALO NE
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
1 MILE
5000
6000
7000 FEET
1 KILOMETER
OF 1929
IS LOW WATER 568.6 FEET
NEW YORK
QUADRANGLE LOCATION
CURACY STANDARDS
TON, VIRGINIA 22092
S IS AVAILABLE ON REQUEST
TONAWANDA WEST, N. Y.
SW/4 TONAWANDA 15' QUADRANGLE
N4300-W7852.5/7.5
1980
DMA 5270 III SW-SERIES V821



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Tonawanda West, N.Y. 1980; Ransomville, N.Y. 1980

SCALE

REFERENCE NO. 3

GROUND WATER IN THE NIAGARA FALLS AREA, NEW YORK

With Emphasis on the Water-Bearing Characteristics of the Bedrock

BY
RICHARD H. JOHNSTON
GEOLOGIST
U.S. GEOLOGICAL SURVEY

STATE OF NEW YORK
CONSERVATION DEPARTMENT
WATER RESOURCES COMMISSION

BULLETIN GW-53
1964

because studies made on the Lockport may contribute to a better understanding of the occurrence of ground water in bedrock generally. The Queenston Shale and Clinton and Albion Groups are poor aquifers in comparison to the Lockport Dolomite, and less is known of their water-bearing characteristics.

LOCKPORT DOLOMITE

Character and extent

The Lockport Dolomite is the uppermost bedrock formation in about one-third of the Niagara Falls area. Its outcrop area extends from the Niagara escarpment on the north to the southern boundary of the area covered by this report except in two small areas that may be underlain by the Salina Group. (See plate 3.) One of these areas is in the vicinity of the hamlet of Nashville and the other is in the extreme southeast corner. Because of a lack of rock outcrops in these areas the position of the contact between the Lockport and the Salina cannot be accurately determined. However, the Salina Group is not discussed as a separate water-bearing unit in this report because at most only a few feet of it occurs in the area. Continuous exposures of the Lockport are found along the gorge of the Niagara River and along the Niagara escarpment. The formation is about 150 feet thick in the southern part of the area but has been eroded to a thickness of only about 20 feet along the escarpment (pl. 2). The excellent exposures at Niagara Falls (fig. 5), where the Lockport forms the lip of the Falls, are shown in many geology textbooks as a classic example of flat-lying sedimentary rocks. Throughout most of the remainder of the area, which is relatively flat, the Lockport is concealed by a thin cover of glacial deposits.

As its name implies, the Lockport Dolomite consists mainly of dolomite; however, the formation also includes thin beds of limestone and shaly dolomite near the base. The Lockport consists of five lithologic types which, from top to bottom, are:

(a) brownish-gray, coarse- to medium-grained dolomite, locally saccharoidal with thin intervals of curved bedding (algal structures).

(b) gray to dark-gray, fine-grained dolomite, containing abundant carbonaceous partings.

(c) tannish-gray, fine-grained dolomite.

(d) light-gray, coarse-grained limestone containing abundant crinoid fragments (Gasport Limestone Member).

(e) light-gray shaly dolomite, laminated in part (DeCew Limestone Member of Williams, 1919).

Fisher (1960) divides the Lockport Dolomite into six units based on fossils as well as rock types. An excellent discussion of the stratigraphy of the

Lockport, including measured sections in the Niagara Falls area, is given in the recent thesis by Zenger [1].

The detailed breakdowns by Fisher and Zenger, although helpful for geologic mapping and correlating the Lockport with rocks of similar age elsewhere, are not necessary in descriptions of the water-bearing properties of the formation. For this purpose the Lockport is subdivided as follows (figure 5 and table 1): (1) upper and middle parts of the Lockport, and (2) lower part of the Lockport, including the Gasport Limestone Member and DeCew Limestone Member of Williams (1919).

Most of the beds in the Lockport are described as either "thick" (1 foot to 3 feet) or "thin" (1 inch to 1 foot). However, massive beds up to eight feet thick and very thin beds (1/4 to 1 inch) occur within the formation. The bedding is generally straight, but curved bedding occurs in some places in the upper part of the formation. The curved bedding is caused by dome-shaped algal structures called "stromatolites" (Zenger, p. 140). These reefs (bioherms), which occur as lens-like masses up to 50 feet across and 10 to 20 feet thick, contain no bedding.

Gypsum (calcium sulfate) is common in the Lockport, occurring chiefly as small irregularly shaped masses (commonly 1/2 to 5 inches in diameter) and as selenite. Sulfide minerals, particularly sphalerite (zinc sulfide), galena (lead sulfide), and pyrite (iron sulfide) occur as particles disseminated throughout the formation.

Water-bearing openings

Types.--Ground-water occurs in the Lockport Dolomite in three types of openings: (1) bedding joints which constitute at least seven important water-bearing zones, (2) vertical joints, and (3) small cavities from which gypsum has been dissolved. Of these, the bedding joints are the most important and transmit nearly all the water moving through the formation. The three types of openings were observed in the dewatered excavations for the conduits of the Niagara Power Project. (See the description of the power project in the Introduction and the location of the conduits in figure 3.) The rock faces along the four-mile length of the conduits provided an unequaled opportunity to study water-bearing openings in the entire stratigraphic thickness of the Lockport and to observe the lateral extent of these openings for a few thousand feet. At the time the observations were made (July - August 1960), approximately one-third of the length of the conduits was available for inspection by the writer.

---

[1] Zenger, D. H., 1962, Stratigraphy of the Lockport Formation (Silurian) in New York State: Unpublished doctoral thesis, Cornell University.

The bedding joints, which transmit most of the water in the Lockport, are fractures along prominent bedding planes which have been widened very slightly by solution of the rock. These planar openings persist laterally for distances of at least 3 to 4 miles. The separation along individual bedding joints is small (less than 1/8 inch). However, their continuity makes them effective "conduits" for movement of ground water. The large water-transmitting capacity of the bedding joints was shown by the fact that they supplied nearly all the ground-water seepage entering the conduit excavations. The almost continuous lines of seepage from bedding joints was strikingly apparent in the conduits. Figure 7 shows seepage from two bedding joints.

The bedding joints transmitting ground water comprise at least seven distinct water-bearing zones within the Lockport. These water-bearing zones could be traced laterally for distances of 1 to 4 miles. Figure 8 shows the stratigraphic position and part of the lateral extent of the seven zones. The water-bearing zones have been numbered from 1 to 7 from bottom to top. The three sections shown in figure 8 were surveyed by transit and then correlated on the following basis: (1) lithologic similarities, (2) laterally tracing seepage from individual water-bearing zones, and (3) in the case of section A, the distance above the Rochester Shale as shown by core holes. The correlation of water-bearing zone 6 between sections A and B has been changed slightly from an earlier published version (Johnston, 1962, fig. 110.2).

A water-bearing zone may consist of a single open bedding joint (for example zone 4, section C, fig. 8) or it may consist of an interval of rock measuring up to one foot in thickness containing several open bedding joints (zone 7, section A, fig. 8). Where the water-bearing zone consists of several joints, the open joint transmitting most of the water at one locality may "pinch out" laterally and be replaced by another open joint within the same zone elsewhere. For example, at section B (fig. 8) most seepage from water-bearing zone 6 came from a joint at the top of a thin-bedded interval; however, at section A all seepage came from a joint at the bottom of the interval. The opening along one bedding joint thus becomes closed while a parallel opening along an adjacent bedding joint becomes open.

The water-bearing zones occur most commonly within intervals of the Lockport containing thin beds from 1/4 to about 4 inches thick which are directly overlain by thick or massive beds. The thin beds generally contain open vertical joints, and at the intersection of such vertical joints with open bedding joints ground-water seepage is greatest. At a few such points water was observed to squirt from the openings into the conduit excavations in much the same manner as it would from a broken water pipe. It seems likely that open joints occur most commonly in thin-bedded intervals because the greater structural rigidity of the overlying thick or massive beds permits the joints to remain open.

Water-bearing zones occur less commonly within thick-bedded intervals. In such cases all seepage occurs from one distinct bedding joint rather than from several joints. Seepage from zone 4 at section C (fig. 8) came from one prominent bedding joint within an interval of beds averaging one foot in thickness. This bedding joint is open about 1/16 to 1/8 inch locally and appears to transmit as much ground water as any water-bearing zone in the Lockport.

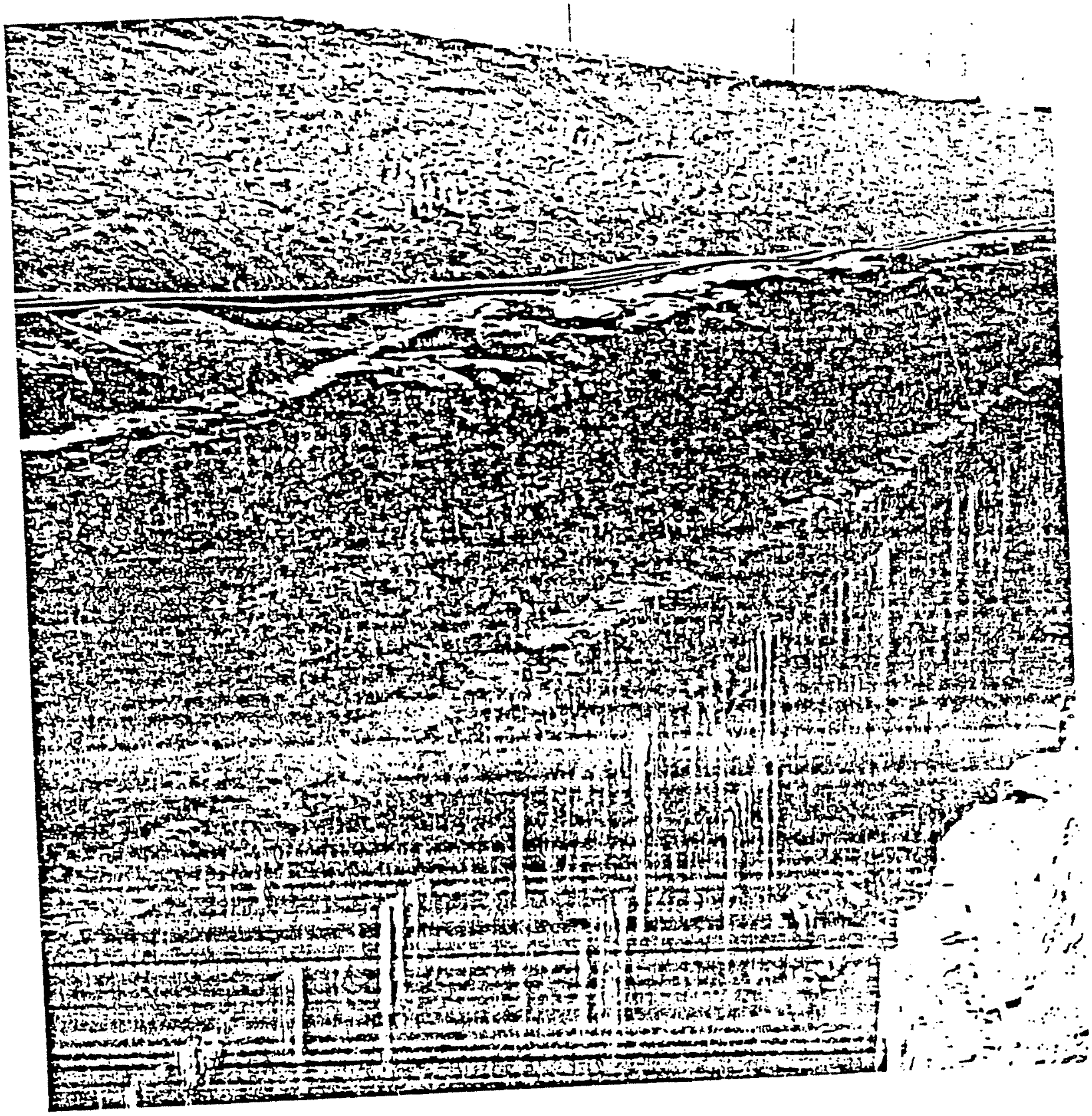


Figure 7.--Seepage from bedding joints in the Lockport Dolomite. View is of east wall of conduit number 1, looking south from Porter Rd. bridge. (Photograph by the Power Authority of the State of New York.)

Vertical joints, excluding those mentioned above which are associated with open bedding joints in thin-bedded intervals, are not important water-bearing openings in the Lockport, except within the top few feet of rock. Two prominent sets of vertical joints exist in the Niagara Falls area; one set oriented N. 65° E. and the other N. 30° W. These joints are fractures in the rock which must be widened by solution before they can become effective water-bearing openings. Such widening is apparent in outcrops of the Lockport. For example, open vertical joints are particularly prominent in the rock cliffs of the Niagara River Gorge and the Niagara escarpment. The width of these joints in many areas exceeds several inches. However, in fresh exposures of the Lockport, such as the conduit excavations, vertical joints are tight and often not apparent to the eye except in the upper few feet of the rock.

Cavities formed by solution of gypsum occur in the Lockport Dolomite. These cavities range in size from 1/16 inch or less to 5 inches but are generally less than one inch in size. The cavities are formed by the dissolving of gypsum by percolating ground water, and there is a complete range in the development of cavities from voids containing no gypsum to pin-point openings in gypsum nodules. The cavities are most abundant in the top 10 to 15 feet of rock but they also occur along water-bearing zones in the lower part of the rock (for example, water-bearing zone 3, section C, fig. 8). In the upper part of the rock, the abundance of cavities locally gives a vuggy appearance to the dolomite.

The cavities in the Lockport resulting from solution of gypsum increase the ability of the Lockport to store water (porosity) but probably have little effect on the water-transmitting ability of the formation. This is because the water-transmitting ability (or permeability) is dependent upon the size of the continuous openings rather than the size of isolated openings. Thus, the relatively thin but continuous bedding joints determine the permeability of the Lockport rather than the larger but isolated cavities resulting from solution of gypsum.

The character and interrelationships of the three types of water-bearing openings described above result in two distinct sets of ground-water conditions in the Lockport Dolomite: (1) a moderately permeable zone at the top of rock, generally 10 to 15 feet thick, characterized by both vertical and bedding joints that have been widened by solution and by gypsum cavities, and (2) the remainder of the formation consisting of seven permeable zones (composed of bedding joints) surrounded by essentially impermeable rock.

Areal extent.--Relatively little is known about the areal extent of the seven water-bearing zones in the Lockport Dolomite, except as observed in the conduits (fig. 8). Many of the individual bedding joints tend to "pinch out" laterally, and be replaced by adjacent joints in the same zone. Such "pinching out" of joints transmitting water was observed in the conduits. Observations in the conduits and data from wells suggest that a few of the zones may persist for tens of miles. The water-bearing zones of greatest areal extent are those which occur at distinct lithologic breaks in the formation. Zone 1, occurring at the base of the Lockport (fig. 8), is frequently reported to be a water-bearing zone by drillers throughout the area. Zone 2, which occurs at the contact between coarse-grained limestone (Gasport Member) and shaly dolomite (DeCew Limestone Member of Williams, 1919) is the source of most of the springs along the Niagara escarpment. Other water-bearing zones, not located at contacts between distinct lithologic units, probably tend to pinch out within a few miles. In summary, at any point in the area, a number of water-bearing zones parallel to bedding exist in the Lockport. All such zones, however, are not necessarily equivalent to the seven water-bearing zones observed in the conduit excavations at Niagara Falls.

It was also noted in the conduit excavations that there were places, even along the most prominent water-bearing zones, where no seepage was occurring. Many such places doubtless represent natural supports for the overlying rock because no extensive horizontal opening below the earth's surface can exist for any great distance. Little is known either about the nature or the size of these support areas or the distance between them. The available data suggest, however, that they encompass an area of at least a few square feet and are separated by a few tens of feet. It may be expected that with depth the size of the supports increases and the distance between them decreases.

The occurrence of ground water principally in zones parallel to bedding is probably characteristic of flat-lying Paleozoic carbonate rocks in many other places. This type of occurrence was reported by Trainer and Salvas (1962, p. 42) in the Beekmantown Dolomite near Massena, N. Y. They observed that "... The openings which are horizontal or gently dipping, and most of which are probably joints or other fractures parallel to the bedding of the rocks, are wider and more numerous than the steeply dipping openings." Although the Beekmantown Dolomite is of an older geologic age than the Lockport, certain similarities exist between the two formations: (1) both units consist of indurated Paleozoic dolomite and limestone; (2) both units are gently dipping, neither having been subjected to extensive folding and faulting which would result in the development of more prominent vertical joints or fractures associated with faulting; (3) both units were subjected to scouring by ice during glaciation within the last 10,000 to 15,000 years and thus, the extensive solution features common to limestones and dolomites in unglaciated areas have not had time to develop. It seems probable that any flat-lying carbonate rock, possessing the characteristics just stated, will contain ground water principally within joints parallel to bedding.

Origin of water-bearing openings.--The origin and the sequence of development of both the vertical joints and bedding joints are of considerable importance in developing an understanding of the occurrence of water in bedrock. Although it was not possible to investigate the origin or the development during this study, speculations based on fundamental principles of geology, especially regarding the origin of the bedding joints, may be worthwhile.

It is widely recognized that joints are formed by forces which tend to pull the rock apart (tension joints) or slide one part of the rock past an adjacent part (shear joints); see, for example, the discussion by Billings (1954, p. 115). The vertical joints were probably formed by a combination of tension and shear forces during or following the folding of the Appalachian Mountains about 200 million years ago. The bedding joints represent tension fractures that formed as a result of expansion of the rock in a vertical direction during more recent geologic time. The Lockport as recently as 200 million years ago was doubtless buried under thousands of feet of other rocks in the Niagara Falls area just as it is at the present time in the southern part of New York State. During the erosion of the overlying rocks the Lockport expanded vertically. The expansion caused fracturing to occur along bedding planes which are natural planes of weakness in the rock and which are approximately parallel to the land surface. Vertical joints, being at right angles to the land surface were little affected by the removal of the overlying rock.

The bedding joints may have been further expanded by stresses produced in the rock during the recession of the glaciers 10 to 15 thousand years ago. The melting of several thousand feet of ice was doubtless accompanied by an expansion of the rock. This expansion either resulted in an enlargement of existing bedding-plane openings or the formation of new openings along other bedding planes.

In recent geologic times, chemical solution of the rock has widened both the vertical and bedding joints. In the already well-developed openings along bedding joints, slight widening by solution has occurred to depths of 100 feet or more. Enlargement of vertical joints, in contrast, is generally restricted to the upper 10 to 15 feet of rock. Cavities formed by solution of gypsum exist where water moving along joints in the Lockport came into contact with gypsum. Gypsum is much more soluble than dolomite; thus, openings formed by the solution of gypsum are wider than other openings along joints. Water moving down vertical joints has dissolved the gypsum to a depth of about 15 feet leaving irregularly-shaped cavities, and water moving along bedding joints has dissolved gypsum to depths of at least 70 feet.

Water-bearing characteristics

Ground water exists in the Lockport Dolomite under artesian, semi-artesian, and unconfined conditions. Unconfined conditions occur where the water table is the upper surface of the zone of saturation within an aquifer. The water table in an unconfined aquifer moves freely upward as water is added to storage, or downward as water is taken from storage. In contrast, an artesian aquifer contains water which is confined by an overlying impermeable bed and which is under sufficient pressure to rise above the top of the aquifer. The level to which water in an artesian aquifer will rise forms an imaginary surface which is called a piezometric surface. Water levels in artesian aquifers change in response to pressure changes on the aquifer rather than to changes in the amount of water stored in the aquifer.

Both artesian and water-table conditions exist in the Lockport. However, artesian conditions predominate. Figure 9 illustrates the occurrence of both artesian and water-table conditions in the Lockport. The wells shown in the diagram are cased through the clay and silt, but are open holes in the bedrock. A packer is installed in each well which tapped water at two or more distinct levels. The packers make possible the measurement of two distinct water levels in each well; a water level above the packer reflecting conditions in the upper part of the rock and a water level below the packer reflecting conditions in the lower part of the rock.

In the upper part of the rock, either artesian or water-table conditions may exist locally. The clay and silt overlying the Lockport are less permeable than the rock and thus act as a confining bed. Artesian conditions exist where the water in the Lockport has sufficient head to rise above the bottom of the overlying clay and silt. In contrast, unconfined (or water-table) conditions exist where the water level occurs within the fractured upper part of the rock, as at well 309-901-5 in figure 9. Locally a "washed till" or dirty gravel zone occurs just above the top of rock. In these localities good connection probably exists between the bedrock and the overlying till or gravel, and the upper part of the rock and washed till zone together form a continuous semi-confined aquifer.

In the lower part of the rock, artesian conditions occur exclusively. The seven water-bearing zones in the Lockport are surrounded by essentially impermeable rock and therefore act as separate and distinct artesian aquifers. The hydraulic nature of the water-bearing zones was observed during the drilling of observation wells in the vicinity of the Niagara Power Project. These wells, whose locations are shown in plate 1, were drilled to observe the effects of the reservoir on ground-water levels in the area. The piezometric level for each successively lower water-bearing zone is lower than for the zone just above it in most of the wells. The reasons for this will be discussed in the section entitled "Ground-Water Movement and Discharge." During construction, the water level in the wells progressively declined in a steplike sequence as the wells were drilled deeper--that is, when a well had been drilled through the uppermost water-bearing zone, the water level in the well remained approximately at a constant level until the next lower zone was penetrated, at which time the water level abruptly declined to the piezometric level of the next lower zone. The difference between the piezometric levels of any two water-bearing zones is large, and in some places is comparable to the distance between zones. If no packer is installed in a well tapping two water-bearing zones, the upper zone will continue to drain into the well indefinitely. This condition exists in a few of the power project observation wells. In these wells the sides of the well remain wet from the level of the upper zone down to the water level in the well. The nature of the water-bearing zones as described above substantiates the reports by drillers and others of "finding water and losing it" in a well, or of wells with "water running in the top and out the bottom." These phenomena occur in some wells tapping two or more water-bearing zones in the Lockport Dolomite.

A well drilled into the Lockport may penetrate several water-bearing zones, but only one of the zones may be hydraulically effective at the site of the well. This is the case for wells 309-901-1, 3, and 5 shown in figure 9. These wells are open below the packers to zones 1, 2, and 3. However, because the water levels observed below the packers in these three wells apparently represents the piezometric surface of zone 3, zones 1 and 2 are not believed to contain effective openings at the sites of the wells. A well also may be drilled through the section occupied by several zones and not be open to any of them. For example, well 309-901-7 shown in figure 9, is apparently open only to the weathered zone at the top of rock.

Yield and specific capacity of wells

The yield of a well in the Lockport Dolomite depends mainly upon which water-bearing zone or zones are penetrated and the degree to which the bedding joints comprising the zones are open to the well. Near the top of rock, the number of open vertical joints and gypsum cavities penetrated may also be important. The average yield of 56 wells tapping the upper and middle parts of the Lockport (which includes water-bearing zones 4 through 7) is 31 gpm (gallons per minute). In contrast, 15 wells penetrating only the lower 40 feet of the Lockport (which includes water-bearing zones 1, 2, and 3) have an average yield of 7 gpm. The yields of individual wells range from less than 1 gpm to 110 gpm. (These figures do not include a few exceptionally high yield wells which obtain water by induced infiltration from the Niagara River and which are discussed in a following paragraph.) Wells tapping the same water-bearing zone may have different yields. For example, wells 309-901-3 and 309-901-5, which are 500 feet apart and tap water-bearing zones 1 through 4 (fig. 9) yielded 7 gpm and 39 gpm, respectively, before the packers were installed. The bedding joints comprising the water-bearing zones are thus more open at well -5 than at well -3.

Increases in yield during drilling in the Lockport Dolomite occur abruptly rather than gradually. As drilling proceeds through the rock, relatively little increase in the yield of a well will be observed until a water-bearing zone is tapped. At that time a marked increase in yield usually occurs. For example, during the drilling of well 308-901-7, the bailing rate abruptly increased from 12 to 50 gpm when water-bearing zone 5 was tapped. During the drilling of well 308-900-21, three distinct increases in yield were observed. The yield, which was 3 gpm at 17 feet (water-bearing zone 7), increased to 9 gpm at 22 feet (an open vertical? joint or solution cavity?) and abruptly increased to 30 gpm at 34 feet (water-bearing zone 6).

Wells in an area about a half mile wide adjacent to the Niagara River above the falls have substantially higher yields than wells elsewhere in the area. The higher yields in this area are caused by two conditions: (1) the Lockport Dolomite is thickest in the area, and (2) more importantly, conditions are favorable for the infiltration of water from the Niagara River. The greater thickness of the Lockport provides the maximum number of water-bearing zones to supply water to the wells. The Niagara River provides an unlimited source of recharge to the water-bearing zones.

Evidence that a substantial part of the water pumped is supplied by induced infiltration from the Niagara River is indicated by the high yields, which exceed 2,000 gpm at some wells, and the chemical character of the water. The chemical composition of the water in well 304-901-6 (which has been pumped at 2,100 gpm) is more similar to Niagara River water than "typical" ground water in the Lockport. (See the following discussion of the chemical character of water and figure 11.) Similar infiltration of Niagara River water into the bedrock at Tonawanda, N. Y., a few miles south of Niagara Falls, was described by Reck and Simmons (1952, p. 19-20).

Infiltration from the river can occur where pumping has lowered ground-water levels below river level to such an extent that a hydraulic gradient is created between the river and the wells. The amount of the infiltration depends on the gradient and the nature of the hydraulic connection between the river and Lockport. The hydraulic connection is controlled by the character of the river bottom. Throughout most of its length in the Niagara Falls area the bottom of the river is covered by a layer of unconsolidated deposits including both till and clay and silt. This layer was found to be from 10 to 20 feet thick in the vicinity of the Niagara Falls water-system intake. (See logs 304-900-i and -j in figure 19.) In the section of the river occupied by rapids, extending a half mile or more above the falls, th bottom has been scoured clean by the river. Where the layer of unconsolidated deposits is present its low permeability greatly retards infiltratio Where the layer is thin or absent infiltration can readily occur.

One of the most striking features in plate 2 is that all wells yielding more than 1,000 gpm are located in a narrow band that intercepts the river about two miles east of the falls. This band trends in a northeasterly direction roughly parallel to one of the two major directions of vertical jointing. Thus, the very high yields may be caused by a greater abundance of vertical joints within the band of high-yielding wells. Vertical joints provide avenues through which water could readily move from the river downward to the bedding joints comprising the water-bearing zones in the Lockport Dolomite.

Wells in the Lockport Dolomite are almost always adequate for domestic needs of a few gallons per minute. Supplies of 50 to 100 gpm, which are adequate for commercial uses and small public supplies, can be obtained in much of the area underlain by the upper part of the Lockport (pl. 2). Large supplies (over 1,000 gpm), as previously noted, are available only in a small area adjacent to the Niagara River.

Wells inadequate for domestic needs are occasionally reported. All wells that are perennially inadequate are located near the Niagara escarpment and therefore tap only the lowest and least permeable water-bearing zones (1, 2, and 3) in the Lockport. Throughout the area a few shallow wells that derive nearly all their water from a single water-bearing zone become inadequate during the summer and autumn of some dry years. Such is the case with well 308-853-1. This well is 27 feet deep and reportedly obtained over 50 gpm from a water-bearing zone 17 feet below land surface. During the drought in 1960, this zone was dewatered as the water table declined in the fall of the year, and the yield of the well quickly declined to less than 1 gpm. The inadequacy of some wells in the Lockport Dolomite can normally be overcome by deepening the well until it penetrates one or more lower water-bearing zones.

Information on the specific capacity of a well is more meaningful than a simple statement of yield. The specific capacity is the yield per unit drawdown, generally expressed as gallons per minute per foot of drawdown. For example, well 307-903-1 was pumped at 20 gpm with 54 feet of drawdown which indicates a specific capacity of 0.37 gpm per foot. The yield and the drawdown for a number of wells in the Lockport are shown in plates 2 and 3. These data must be used with care as they apply only so long as no part of the formation is dewatered.

As water-bearing zones in the Lockport are dewatered, the specific capacity declines. The decline in specific capacity caused by dewatering a water-bearing zone is shown by the data obtained during a pumping test on well 309-859-1. This well was pumped at 2.2 gpm with 5.0 feet of drawdown for 70 minutes--specific capacity of 0.44 gpm per foot. After 70 minutes, water-bearing zone 3 was partially dewatered and a drawdown of 8.2 feet was required to maintain the pumping rate of 2.2 gpm. This indicates a specific capacity of 0.27 gpm per foot. At the time the well was drilled, it was bailed at 3 gpm with a drawdown of about 60 feet. Thus, during the bailing the entire 42 feet of Lockport penetrated by the well was dewatered. The specific capacity of the well with the Lockport dewatered is 0.07 gpm per foot (3 gpm with 42 feet of drawdown) compared to 0.44 gpm per foot with no dewatering.

water from the Queenston are usually found in two areas--(1) in a band about two miles wide immediately north of the Niagara escarpment, and (2) in areas immediately adjacent to streams. Both these areas are believed to be places of ground-water discharge--that is, areas where ground water is moving upward from the Queenston to discharge naturally.

The origin of the salty water in the Queenston is unknown. In commenting on a similar occurrence of salty water in the bedrock in northern St. Lawrence County, N. Y., Trainer and Salvas (1962, p. 103) suggest three causes for the salty water in that area: (1) connate water, (2) the Champlain Sea, and (3) evaporite deposits. They conclude that the Champlain Sea, which covered the area about 10 or 20 thousand years ago, is the most likely source. This source is not applicable to the Niagara area, however, because the Champlain Sea did not extend into the area. Furthermore, it is unlikely that the salty water in the Niagara area is derived from evaporite beds because no such deposits are known to exist in the Queenston. Nor do any salt beds occur in the bedrock formations overlying the Queenston Shale (fig. 5) in the Niagara Falls area. The nearest salt beds occur about 40 miles to the southeast in the Salina Group which overlies the Lockport Dolomite. However, it is very improbable that salty water from the Salina beds has entered the Queenston Shale because (1) the salt beds themselves act as impermeable barriers to water moving downward from the Salina to the Queenston, and (2) it is more likely that salty water from the Salina would be discharged at points between the outcrop areas of the two formations.

Although direct evidence is lacking, the writer believes that the salty water in the Queenston Shale is most likely derived from connate water. The discharge of connate water begins as soon as a deeply buried bed is brought up into the zone of circulating ground water. The Queenston rocks were deposited as a sea-bottom clay about 350 million years ago, and have been deeply buried throughout most of the intervening time. During some thousands of years of Recent geologic time, connate water has been flushed from the upper several hundred feet of the Queenston. However, it is probable that flushing of the deeper part of the formation is continuing at present.

OCCURRENCE OF WATER IN UNCONSOLIDATED DEPOSITS

The unconsolidated deposits in the Niagara Falls area are not important sources of water. These deposits may be classified into two types based on their water-bearing properties: (1) coarse-grained materials of high permeability (sand and gravel), and (2) fine-grained materials of very low permeability (glacial till and lake deposits). The unconsolidated deposits in the Niagara Falls area are predominantly of the fine-grained type. However, the lack of sand and gravel deposits in the Niagara Falls area, other than a few deposits of very limited thickness and extent, has severely limited the development of large ground-water supplies in the area. Most large ground-water supplies in New York State are derived from sand and gravel deposits.

Table 2 shows selected chemical constituents from wells tapping unconsolidated deposits. Water from the different types of unconsolidated deposits is not easy to differentiate on the basis of quality because many wells tap more than one type of deposit. Thus, water samples from such wells are mixtures of water from two or more deposits. In general, water from the unconsolidated deposits is very hard, but not so highly mineralized as water from the bedrock. A complete analysis of water from well 312-859-1, which taps both till and lake deposits, is listed in table 9. This is a calcium bicarbonate water, very hard (568 ppm of total hardness) containing a moderately high chloride content (105 ppm). Water from the unconsolidated deposits generally has a wide range in chloride content. Those wells which yield water with a high chloride content are probably affected either by (1) local pollution, or by (2) upward discharge of saline water from the underlying bedrock.

SAND AND GRAVEL

Sand and gravel is found in small isolated hills and in a narrow "beach ridge" which crosses the area along an east-west line (pl. 3). The sand and gravel deposits are of limited areal extent, generally thin, and occur as topographic highs. The deposits commonly consist of two lithologic types: (1) fine-grained reddish-brown sand, and (2) coarse sand and pebbles with a matrix of fine to medium sand. The origin of both the beach ridge and small hills of sand and gravel is associated with glaciation in the Niagara Falls area. The small hills are kames, i.e. hills of sand and gravel formed originally against an ice front by deposition from sediment-laden melt-water streams. The long, narrow beach ridge is believed to represent a former shore line of glacial Lake Iroquois. This large lake, the predecessor of the present Lake Ontario, existed in the Niagara Falls area near the end of the Ice Age. The sand and gravel composing the beach ridge apparently was produced from pre-existing material by wave action at the shore which winnowed out most of the silt and clay originally contained in the glacial deposit.

Although the sand and gravel deposits in the Niagara Falls area are much more permeable than the other unconsolidated deposits or the bedrock, their occurrence as small topographic highs permits them to drain rapidly. As a result, ground water generally occurs only within a thin zone at the base of the sand and gravel. This is shown in the cross section of the beach ridge in figure 12. It can be seen that the water table is only a few feet above the base of the sand and gravel. Extensive pumping of any of the wells shown would quickly dewater the sand and gravel. In general, wells in the beach ridge and kames will yield only the small amounts of water required for domestic and small-farm needs.

Moderate supplies of ground water can be obtained from a sand and gravel deposit (probably a kame) just east of Lockport, N. Y. (pl. 3). This is the largest sand and gravel deposit in the area, measuring 1 1/2 by 3/4 miles in size. The thickness of the deposit is highly variable because of the hummocky nature of the land surface, but probably averages 60-70 feet. Some notion of the ability of this deposit to yield water is shown by the yield of 165 gpm pumped from a sand pit during excavation. One large-diameter supply well has been constructed in this deposit. This well (311-838-3) was reportedly pumped at a rate of 200 gpm for 24 hours in 1956.

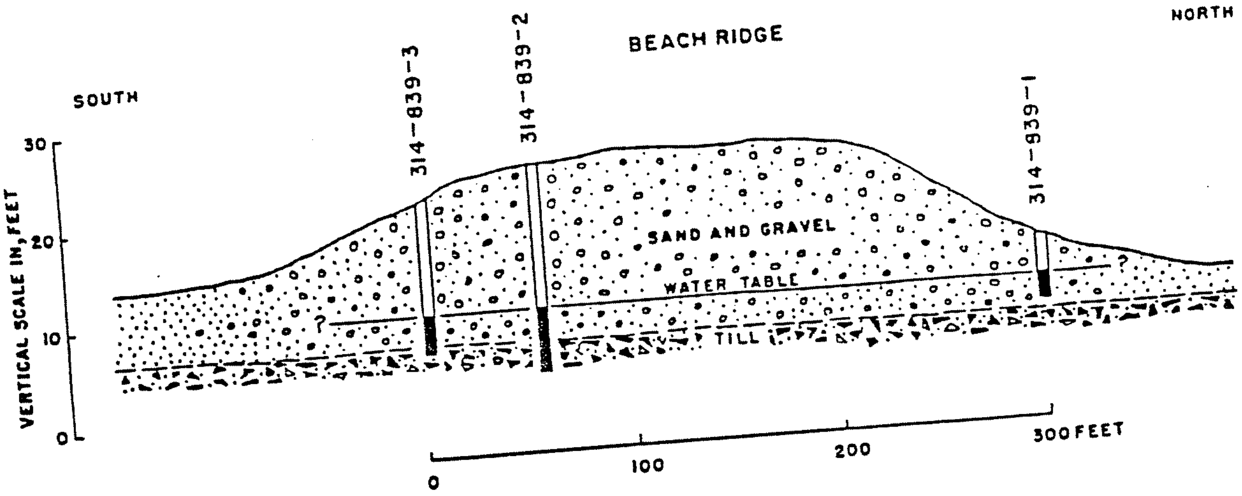


Figure 12.--Cross section of sand and gravel "beach ridge" through wells 314-839-1, -2, and -3.

LAKE DEPOSITS

Lake deposits consisting of silt, clay, and fine sand occur throughout the Niagara Falls area. These deposits are predominantly composed of laminated silt and clay which is characteristically dense and compact. Thin beds of fine sand (locally called quicksand) occur in the lake deposits. The clay, silt, and sand were deposited in lakes which existed in the area at the close of the Pleistocene Epoch (10,000 to 15,000 years ago). The lakes, which formed in the wake of the melting ice sheet, provided large bodies of quiet water for the slow accumulation of fine-grained deposits. Thus, the lake deposits are found at the surface nearly everywhere in the Niagara Falls area. The deposits are thinnest in the area south of the Niagara escarpment where they rarely exceed 20 feet in thickness. On the lake plain north of the escarpment the deposits average 30 to 40 feet in thickness; however, locally they vary from 0 to 90 feet in thickness. The greater thickness on the lake plain results from the persistence of a lake in this area (glacial Lake Iroquois) after the area south of the escarpment was above water.

The silt and clay have extremely low permeability and yield little water to wells. The thin beds of fine sand have comparatively greater permeability. Wells which tap only clay and silt will yield less than 100 gpd; those wells tapping sand beds yield more water and are usually adequate for domestic or very small agricultural needs. The lake deposits are utilized for water supplies only in the lake plain (north of the Niagara escarpment); to the south of the escarpment the deposits are too thin and are underlain by the much more permeable Lockport Dolomite.

The impermeable nature of the silt and clay was shown by a recovery test conducted on well 315-859-1. This well is believed to penetrate only clay and silt. After being pumped dry, the well required 4 1/2 months for the water level to rise to its static level 13 feet above the bottom. The permeability of the clay and silt, as calculated from the recovery data, was 0.04 gallons per day per square foot. The well was originally intended to provide water for a domestic supply, but was inadequate. In contrast, well 315-859-2, which is located about 500 feet to the south, provides an adequate domestic supply. This well undoubtedly penetrates a thin bed of sand.

GLACIAL TILL

A thin veneer of glacial till lies between the lake deposits described above and the bedrock throughout nearly all of the Niagara Falls area. The till is a mixture containing mostly sandy silt with boulders, pebbles, and some clay. The till was deposited directly by the ice sheet and is composed of rock which was quarried by the advancing ice, then ground up, and "plastered down" beneath the ice. The till cover in the Niagara Falls area is generally less than 10 feet thick. The greatest thickness of till (30 to 40 feet) is found in the moraines in the eastern part of the area. These features are the low ridges which trend approximately east-west located in the area southeast of Lockport and south of Medina (pl. 3). The moraines are composed of debris which was piled up in front of the advancing ice front. The moraines in the Niagara Falls area are believed to represent four minor readvances of the ice sheet during its retreat from the area (Kindle and Taylor, 1913, p. 10).

The poorly sorted nature of the till causes it to have very low permeability. An indication of the low permeability was obtained from a "slug" test on well 309-900-8. This well penetrates 7.5 feet of lake clay and silt and 1.5 feet of glacial till, and is cased through the lake deposits. The permeability of the till at this well was determined to be 23 gallons per day per square foot. This value for permeability may be too high because the well bottomed at the top of the Lockport Dolomite. Thus an open joint in the rock could have contributed to the yield of the well. However, the value for permeability may be representative of the "washed till-top of rock" aquifer tapped by many dug wells in the Niagara Falls area.

Yields adequate for domestic needs are obtained from till wells which tap: (1) sand lenses within the till, (2) the relatively permeable ("washed") zone at the top of rock, or (3) the sandy till making up the moraines. Wells which do not tap these more permeable horizons in the till are often inadequate to supply even domestic needs. Such inadequate wells yield less than 100 gpd.

separating Lake Erie from Lake Ontario. The winds are thus less moisture-laden than if they had passed over the lakes. Even those winds which may be moisture-laden (from evaporated lake water) may retain most of their moisture until they reach the more hilly areas east of Lake Ontario. The Niagara escarpment appears to have a local effect on the amount of precipitation also. As can be seen from the precipitation data given in table 5, Lewiston (elevation 320 feet), which is located below the escarpment, receives less precipitation than Lockport (elevation 520 feet), which is at the escarpment. Table 5 also shows that precipitation is fairly evenly distributed throughout the year. Within a given year, however, large variations from the average figures listed may occur. Note that the minimum monthly precipitation for each month during the 25-year period is between 1/2 and 1/20 the average precipitation for that month. However, the minimum annual precipitation (1941) is more than 1/2 the average annual precipitation. Average annual temperature is 48°F at Lewiston. The length of the growing season averages 160 days.

GROUND WATER

A part of the rain and snow falling on the Niagara Falls area seeps into the ground and continues downward to the water table to become ground water. The ground water is in constant, but generally very slow, movement from points of recharge to points of discharge. Ultimately all ground water in the area is discharged into Lake Ontario or the Niagara River either directly or via small tributary streams. The Niagara Falls area is, in effect, a peninsula-shaped catchment area in which the ground-water reservoir is being repeatedly replenished by precipitation, and constantly discharging to the surrounding surface-water bodies. This section of the report describes: (1) recharge to the unconsolidated deposits and the bedrock, (2) movement and discharge of ground water in the area, and (3) changes in storage in the ground-water reservoir as shown by water-level fluctuations.

RECHARGE

The source of nearly all the ground-water recharge in the Niagara Falls area is precipitation; however, a small amount of recharge also occurs in the area beneath and immediately adjacent to the Niagara Power Project reservoir by infiltration from the reservoir. Recharge of ground water means simply the addition of water (or quantity added) to the zone of saturation (Meinzer, 1923, p. 46). The rate and amount of recharge depends mainly upon the permeability of the soil, the amount of precipitation, and the soil-moisture condition at the time of precipitation. The rate of infiltration of water into the soil increases with increase of permeability. In the relatively small part of the Niagara Falls area underlain by sand and gravel, infiltration rates are greatest. However, throughout most of the area underlain by glacial till and lake clays and silts infiltration rates are low and surface runoff is high.

Table 5.--Monthly precipitation at Lewiston and Lockport, N. Y., 1936-60
(Data from reports of U.S. Weather Bureau)

Month	Lewiston (1 mile north of; elevation 320 feet)		Lockport (2 miles northeast of; elevation 520 feet)	
	Average (inches)	Minimum (inches)	Average (inches)	Minimum (inches)
January	1.98	0.59 (1946)	2.38	0.67 (1946)
February	2.35	.54 (1947)	2.52	.85 (1947)
March	2.49	.63 (1958)	2.56	.71 (1958)
April	2.66	.83 (1946)	2.80	.91 (1946)
May	3.08	.71 (1941)	3.26	.94 (1936)
June	2.18	.66 (1953)	2.41	.33 (1953)
July	2.44	1.15 (1955)	2.70	.90 (1954)
August	2.57	.21 (1948)	2.97	.36 (1948)
September	2.97	.46 (1941)	2.92	.14 (1941)
October	2.55	.47 (1947)	2.85	.60 (1938)
November	2.33	.75 (1939)	2.62	.64 (1939)
December	2.02	.39 (1958)	2.39	.71 (1943)
Annual	29.62	17.64 (1941)	32.38	19.75 (1941)

The mechanism of recharge to the Lockport Dolomite is of primary concern in this report because this bedrock unit is by far the most important aquifer in the Niagara Falls area. As discussed previously, most ground water occurs in the Lockport within seven relatively permeable zones parallel to bedding which are separated by essentially impermeable rock. Recharge to these water-bearing zones occurs by one of two mechanisms: (1) downward movement of water through vertical joints or (2) recharge directly to the water-bearing zones at the outcrop of the bedding joints composing the zones.

Several lines of evidence suggest that recharge to the Lockport Dolomite occurs predominantly at the outcrop of the water-bearing zones. The lack of persistent open vertical joints in the Lockport as observed in the conduit excavations, suggests that vertical joints are not important avenues for downward movement of water. However, this is not conclusive evidence in itself because on an areal basis, many vertical joints, although apparently tight, might be able to transmit appreciable quantities of water when considered as a whole even though each joint singly might transmit a very small quantity of water. More conclusive evidence of a negligible movement of water along vertical joints is the occurrence of "dry" open bedding joints below the "wet" bedding joints comprising the water-bearing zones in the Lockport (fig. 8). This phenomenon could not occur if permeable vertical joints connected the "dry" and "wet" bedding joints. It seems probable that the "dry" bedding joints exist because they receive little or no recharge in their outcrop area. This lack of recharge would be particularly applicable to those bedding joints cropping out along the Niagara escarpment where there is very little opportunity for recharge.

The most important indication that recharge to the water-bearing zones of the Lockport Dolomite occurs at the outcrop of the zones, is the alignment of water levels approximately parallel to the dip of the zones themselves. This alignment of water level is shown for water-bearing zone 3 in figure 9.

The wells shown in the cross section are adjacent to the reservoir of the Niagara Power Project; however, the water levels shown were measured prior to flooding of the reservoir. If recharge to the water-bearing zones did occur throughout the area by downward movement through vertical joints, the gradient along the zones would steepen in the downdip direction rather than continue roughly parallel to the dip of the zones--that is, if it is assumed that there is no increase in transmissibility downdip. This steepening of the hydraulic gradient would be required in order to transmit the ever-increasing amounts of water supplied to the zone by the vertical joints. No such steepening of the gradient was observed.

In summary, it appears that recharge occurs principally at the outcrop of the water-bearing zones in the Lockport Dolomite and that water then moves down the dip of the zone with a relatively constant loss of head. Recharge is probably not limited to the actual line of outcrop of a zone, however, but occurs throughout the area where the zone is reached by the enlarged vertical joints that occur in the upper few feet of the rock.

Little is known about the recharge to the other bedrock formations underlying the Niagara Falls area. It is probable that a very small amount of water moves downward from the Lockport Dolomite into the Rochester Shale and the underlying bedrock units. As was pointed out in the preceding discussion, however, vertical openings even in the Lockport Dolomite appear to transmit relatively little water except in the upper few feet of the rock. Therefore, movement of water from the Lockport into the underlying formations probably occurs only along widely spaced major vertical joints. Some of the water in the deeper bedrock units in the Niagara Falls area may also be derived from recharge to these beds in the area to the south. Such water would move through the Niagara area toward the Niagara gorge and Lake Ontario both of which are regional discharge areas.

GROUND-WATER MOVEMENT AND DISCHARGE

Ground water moves from points of high head to points of low head (or potential), in other words from points where the water table or piezometric surfaces are highest to points where they are lowest. The direction of ground-water movement in the upper few feet of bedrock and in the unconsolidated deposits (where water-table conditions exist) is shown by the configuration of the water table. The direction of movement in the remainder of the bedrock is shown by the configuration of the piezometric surfaces associated with each of the artesian water-bearing zones in the different bedrock formations.

As discussed previously, each of the seven water-bearing zones in the Lockport is a distinct artesian aquifer with an associated piezometric surface. To show in detail the ground-water movement in the Niagara Falls area, it would be necessary to construct a water-table map, and piezometric maps for each of the water-bearing zones. Such maps are not included in this report because water levels could be measured in relatively few wells and because of the difficulty of differentiating between water levels which represent the water table and water levels which represent the piezometric surfaces associated with each of the several water-bearing zones. In a few wells constructed with packers, such as shown in figure 9, it was possible to measure separate water levels associated with the water table and with distinct water-bearing zones. In wells not equipped with packers, which includes all domestic and industrial wells in the area, a measured water level is an average of the heads of the different water-bearing openings penetrated by the well. Such an average water level represents neither the water table nor the piezometric surface of a single water-bearing zone.

Nearly all water-level data that could be used in determining direction of ground-water movement were obtained from wells in the vicinity of the pumped-storage reservoir. These data show that in general the configuration of the water table follows the surface of the land, being highest under hills and in interstream tracts and lowest in stream valleys. The configuration of the piezometric surfaces associated with each water-bearing zone in the Lockport has little relationship to the land surface. The piezometric surfaces are approximately parallel to the slope of the water-bearing zones. The disparity in the configuration of the water table and the piezometric surfaces is shown in figure 9, which was previously referred to in the discussion of artesian and water-table conditions in the Lockport. As shown in the figure, the water table slopes from all directions toward Fish Creek, whereas the piezometric surface for water-bearing zone 3 slopes to the south away from the creek. Thus, ground-water movement in the upper fractured part of rock and in the overlying unconsolidated deposits is toward the creek, but movement along water-bearing zone 3 and, presumable in the other water-bearing zones, is to the south toward the upper Niagara River.

Figure 14 shows the inferred direction of ground-water movement in the upper water-bearing zones of the Lockport Dolomite. This figure is based on adequate data only in the vicinity of the reservoir. Because only a few scattered water-level observations are available for the area south of the reservoir, the flow lines in that area are based largely on the fundamental principles governing ground-water movement.

It may be observed in figure 14 that ground water in the Lockport Dolomite moves north toward the Niagara escarpment in a narrow area parallel to the escarpment. This northerly direction of ground-water movement is shown by (1) the location of springs near the base of the Lockport along the escarpment (pl. 1), and (2) the decline of water levels in wells in the direction of the escarpment. A divide in the water table and in the upper fractured part of the rock apparently exists at a distance of 1,000 to 2,000 feet south of the escarpment. The existence of this divide is shown by the reversal of hydraulic gradient in the area. The gradient is toward the escarpment in the area less than 1,000 feet south of the escarpment. However, a hydraulic gradient to the southeast (approximately parallel to the dip of the beds in the Lockport) was observed in wells located over 2,500 feet south of the escarpment.

Prior to the start of the investigation it was assumed that water in the Lockport Dolomite in the western part of the Niagara Falls area moved west to the gorge to discharge. It was observed very early in the study, however, that there was practically no evidence of seepage on the sides of the gorge. The lack of seepage could be explained by (1) assuming that the water moving toward the gorge was intercepted by enlarged vertical joints parallel to the gorge, or (2) assuming that there was little or no movement of water toward the gorge.

Because the city of Niagara Falls and the area along the gorge north of the city is supplied by the Niagara Falls municipal water system, very few wells suitable for water-level observations were found in the area. The only wells readily accessible for water-level measurements were in the vicinity of the power station and canal. The data from these wells indicate that water moves toward the gorge. The width of the area supplying water to the gorge, however, could not be determined. Indirect information relative to this problem was derived from the water-level measurements in the vicinity of the reservoir. It was found that if the slope of the piezometric surface for a specific water-bearing zone (for example, zone 3 in figure 9) was extended to the south, the pressure reached the level of the upper Niagara River a short distance south of the reservoir. This does not prove but certainly strongly suggests that under natural (pre-power project) conditions the water in the Lockport Dolomite turned west to discharge into the Niagara River gorge, roughly midway between the escarpment and the upper Niagara River (fig. 14). The absence of seepage on the sides of the gorge, therefore, is believed to be attributable to enlarged vertical joints parallel to the gorge.

Ground-water movement as it probably existed in 1962 may be summarized as follows: (1) water moves northward in a narrow area parallel to the Niagara escarpment, (2) water moves southward (downdip) in the area around the reservoir (which acts as a recharge mound and tends to deflect the water moving from the north), (3) water moves into the canal, conduits, and area of industrial pumping to discharge, and (4) water moves toward the gorge in the southwestern part of the area.

On the lake plain, north of the Niagara escarpment, ground water moves in a generally northward direction toward Lake Ontario. The water table is located within the lake deposits about 3 to 10 feet below the surface. The water table very nearly parallels the land surface and slopes regionally toward Lake Ontario with a gradient of 5 to 20 feet per mile. It also slopes toward the streams crossing the lake plain in a narrow area adjoining each stream. The direction of ground-water movement in the Lockport Dolomit in the eastern part of the Niagara Falls area is not known.

WATER-LEVEL FLUCTUATIONS

Fluctuations of ground-water levels reflect changes in the amount of water stored in an aquifer. A decline in water level shows a decrease in storage in the aquifer, and means simply that discharge from the aquifer is exceeding recharge. A rise in water level indicates the reverse situation--recharge is greater than discharge. In wells tapping unconfined aquifers, water-level fluctuations show changes in the position of the water table. In wells tapping artesian aquifers, water-level fluctuations show changes in artesian pressure.

Natural fluctuations

Water-level fluctuations of natural origin can be broadly classified as either short- or long-term fluctuations. The short-term fluctuations are produced mainly by changes in atmospheric pressure, ocean tides, and earth tides. Fluctuations due to atmospheric pressure and earth tides occur in the Niagara Falls area but are of relatively little importance in the description of the ground water. Such short-term fluctuations are observed only in wells tapping artesian aquifers. Long-term fluctuations are largely a product of climate, particularly precipitation and temperature. The long-term fluctuations in water levels show changes in the natural rate of recharge to an aquifer compared to its rate of discharge to springs and stream beds.

The most noticeable fluctuation of ground-water levels in the Niagara Falls area are seasonal fluctuations. In general, water levels in the area reach their peak during the spring of the year (March and April) because of the large amount of recharge provided by snow melt and precipitation. Water levels generally decline throughout the summer because most of the precipitation is lost by evaporation and the transpiration of plants. Such water loss is characteristic of the summer growing season. During other seasons substantial amounts of water pass through the soil zone and continue downward to the water table. Water levels generally reach their yearly lows near the end of the growing season during September or October. Thereafter, water levels begin to rise and this rise is more or less continuous through March or April. Because the amount of precipitation is normally evenly spaced throughout the year in the Niagara Falls area (table 4), seasonal fluctuations are more a product of air temperature than of precipitation. The air temperature controls whether precipitation falls as snow or rain, whether the ground is frozen at the time of precipitation, and the length of the growing season; all of these are factors that affect water levels.

SPRINGS

Springs are not widely utilized as ground-water supplies in the Niagara Falls area. Springs are common along the Niagara escarpment but rarely occur elsewhere in the area. (See plates 1 and 3.)

Most of the springs along the escarpment originate near the base of the Lockport Dolomite. The source is nearly always seepage from bedding joints at the contact between the DeCew Limestone Member of Williams (1919) and the Gasport Limestone Member of the Lockport (water-bearing zone 2 in fig. 8). The springs occur where vertical joints intersect the water-bearing zone. Enlargement of both vertical and bedding joints is common at the springs, and in some cases has proceeded to the point where small caves have developed.

Springs are uncommon along the cliffs of the Niagara River Gorge. This lack of springs probably results from the development of extensive open vertical joints parallel to the face of the gorge. These joints drain water readily from the Lockport Dolomite through the underlying rocks and talus to the river. (See figure 6.)

Notable exceptions to the lack of springs along the gorge are springs 309-902-2Sp and -3Sp which are located just south of the Niagara escarpment (pl. 1). These springs are located in caves developed by solution of the shaly dolomite of the DeCew Member of Williams (1919) of the Lockport. The source of the springs, like the source of most springs along the escarpment, are bedding joints at the contact between the DeCew and Gasport Members (water-bearing zone 2 in fig. 8). Extensive solution features, such as sink holes, exist in the area drained by these two springs. Fish Creek, which crosses the area, loses water as it flows across the bedrock, and apparently contributes a major part of the water discharging from the springs. Dye introduced into Fish Creek reappeared at the springs, 1,000 feet away, 38 minutes after introduction (personal communication from C. P. Benziger of Uhl, Hall & Rich). The yield of these springs is therefore highly variable; the yields varying from about 15 gpm during dry periods to reportedly thousands of gallons per minute following heavy rains or periods of melting snow. The water from springs 309-902-2Sp and -3Sp is polluted by nearby septic tanks as shown by the strong odor of sewage and the sudsy character of the water.

The yield of single springs in the Niagara Falls area ranges from about 2 to 30 gpm during the dry parts of the year. The yields of most springs increase following rains but not nearly so much as the increase noted for springs 309-902-2Sp and -3Sp in the discussion above. Spring 310-859-6Sp is the only spring in the area utilized as a water supply on a year-round basis. This spring provides an adequate domestic supply for a trailer court with eight families.

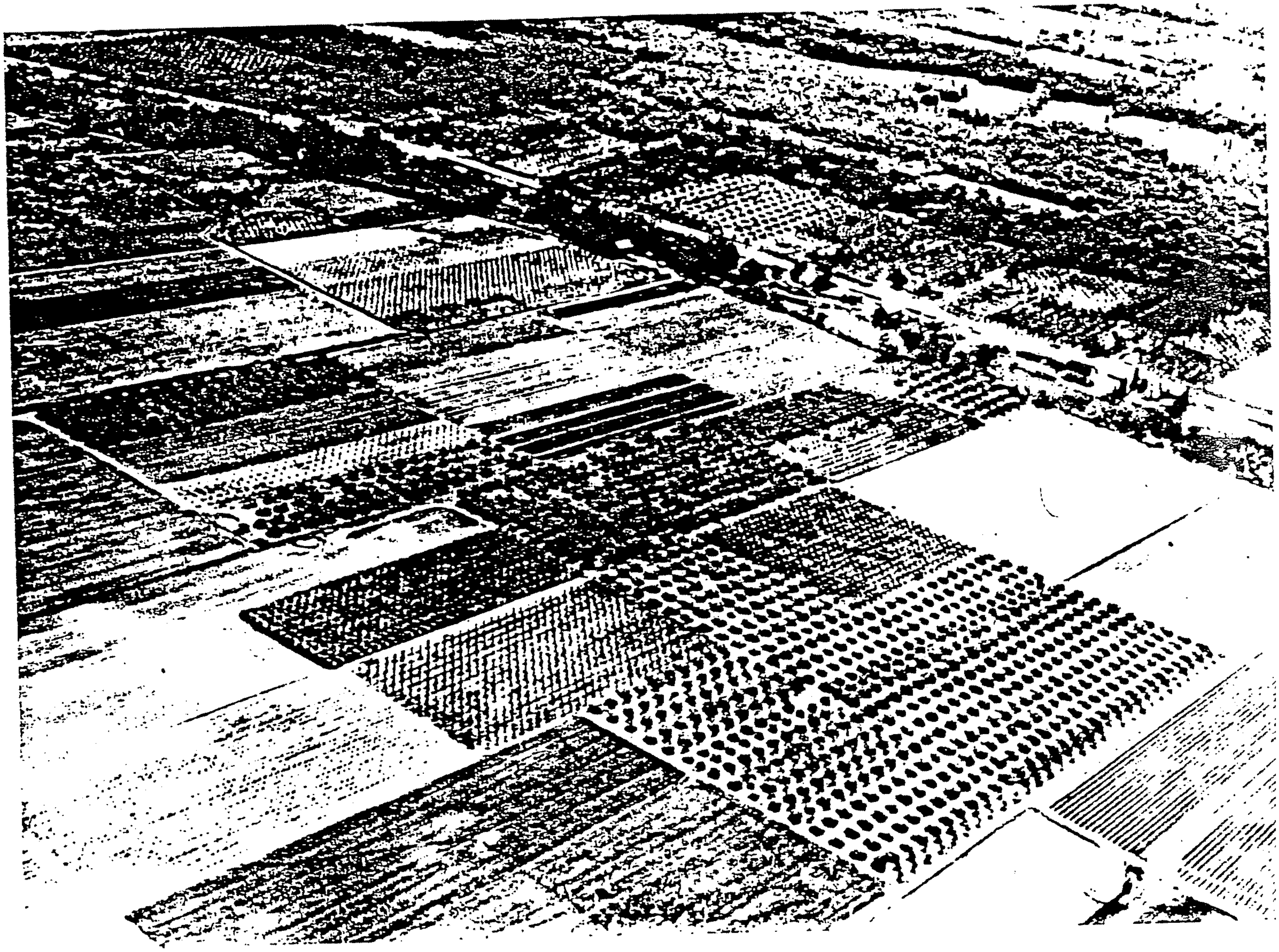
PRESENT UTILIZATION

An estimated 10 mgd (million gallons per day) of ground water was obtained from wells in the Niagara Falls area during 1961-62. This figure contrasts with an estimated 60 mgd of water obtained from surface sources

REFERENCE NO. 4

SOIL SURVEY OF

Niagara County, New York



NIAGARA COUNTY SOIL & WATER
CONSERVATION DISTRICT
FARM HOME CENTER 4497 LAKE AVE.
LOCKPORT, NEW YORK 14094

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Cornell University Agricultural Experiment Stati

Issued October 1972

in the northwestern part of the county near the village of Youngstown. Three smaller areas also occur.

This association makes up about 15 percent of the county. About 32 percent of this is Rhinebeck soils, 10 percent is Ovid soils, and 9 percent is Madalin soils. The remaining 49 percent consists of minor soils.

The Rhinebeck soils are deep and are somewhat poorly drained. These soils typically have a silt loam surface layer, a silty clay or silty clay loam subsoil, and underlying material of varved silt and clay. They occupy the broad areas within the association and are slightly dissected by erosion in a few places, especially in areas that border Lake Ontario.

The Ovid soils occupy the slightly elevated areas where there has been some reworking of the fine-textured lake deposits and the glacial till or glacial beach deposits. The Ovid soils are deep and somewhat poorly drained. They typically have a silt loam surface layer and a silty clay loam subsoil and are underlain by loamy glacial till. Some coarse fragments are generally in and below the surface layer.

The Madalin soils occupy the more nearly level, more depressional areas within the broad, level lake plain. They are deep and poorly drained to very poorly drained. Madalin soils typically have a dark silt loam surface layer that is high in organic-matter content, a silty clay subsoil, and underlying material of varved silt and clay.

The minor soils are mainly of the Collamer, Hudson, and Niagara series. These soils are intermingled with the major soils in this association. The Collamer and Hudson soils occupy knolls or higher elevations and are intermingled with the Ovid soils. The Niagara soils are mainly nearly level.

This association has a medium value for farming. Much of it is idle or is cropland that is not used intensively. A fairly small acreage that is close to Lake Ontario is used intensively for fruit. The area near Youngstown is in community development, mostly for rural homes. The acreage in grapes is increasing, especially near the Model City area in the town of Lewiston.

Natural drainage is the principal concern in town and country planning and in farm development. The flatness of the area is the biggest factor to consider in planning artificial drainage. The soils in most of the association can be drained readily by installing adequate surface ditches. Tile lines help in draining some of the wet, coarser textured inclusions. The major need is group drainage projects that provide suitable outlets.

If drainage is adequate, this association has a good potential for apples, grapes, pears, and other fruit. Peaches and cherries normally are not suited. Some vegetables can be grown intensively, but maintaining soil tilth is difficult. Grain and hay crops are suited if drainage is adequate. The need for lime is generally small.

Natural drainage and slow permeability are the two most limiting factors for community development. Sanitary sewers and adequate surface drainage are needed. In many places the soils are unstable because they formed in deep lake deposits.

About 85 percent of the acreage is in open land. The forested areas consist mostly of scattered farm woodlots. Some of the idle land is reverting to ash, soft maple, and other native hardwoods. Ope land wildlife is plentiful in many areas. Pheasant and rabbits are the most commonly hunted wildlife species, and there is a potential for wetland wil life. Recreation in this association consists mostly of hunting, fishing, camping, and golfing. Scenic areas are confined mostly to the part of the association that borders the Niagara River and Lak Ontario.

11. Odessa-Lakemont-Ovid association

Deep, somewhat poorly drained to very poorly draine soils having a fine textured or moderately fine te tured subsoil that is dominantly reddish in color

This is the largest soil association in Niagar County. It consists of level or nearly level soil on lake plains south of the limestone escarpment (fig. 5). There are two large areas that are dotte with small knolls and ridges of till. The largest area is west of the Barge Canal, and the other are is in the same topographical position as the larger area but is east of the Barge Canal.

This association makes up about 21 percent of t county. About 24 percent of this is Odessa soils, 14 percent is Lakemont soils, and 11 percent is Ovi soils. The remaining 51 percent consists of minor soils.

The Odessa soils are deep and somewhat poorly drained. They typically have a silty clay loam surface layer, a silty clay subsoil, and clay and sil underlying material. These soils are level and occupy the broad areas between the poorly drained, depressional areas and the slightly elevated till ridges.

The Lakemont soils are level to slightly depres sional and are generally adjacent to the better drained Odessa soils. Lakemont soils typically hav a silty clay loam surface layer, a silty clay subsoil, and underlying material of clay and silt. They have a darker surface layer than the Odessa soils and show more indications of wetness.

The Ovid soils are nearly level to gently undulating and are on till landscapes at slightly higher elevations above the lake plain. They are deep and somewhat poorly drained. Ovid soils typically have a silt loam surface layer, a silty cla loam subsoil, and underlying material of loamy glacial till.

The minor soils are mainly of the Churchville, Cayuga, Cazenovia, Fonda, and Hilton series. Also included are some areas of shallow muck. In many places the moderately well drained Hilton and Cazen ovia soils occupy the higher parts of the knolls an

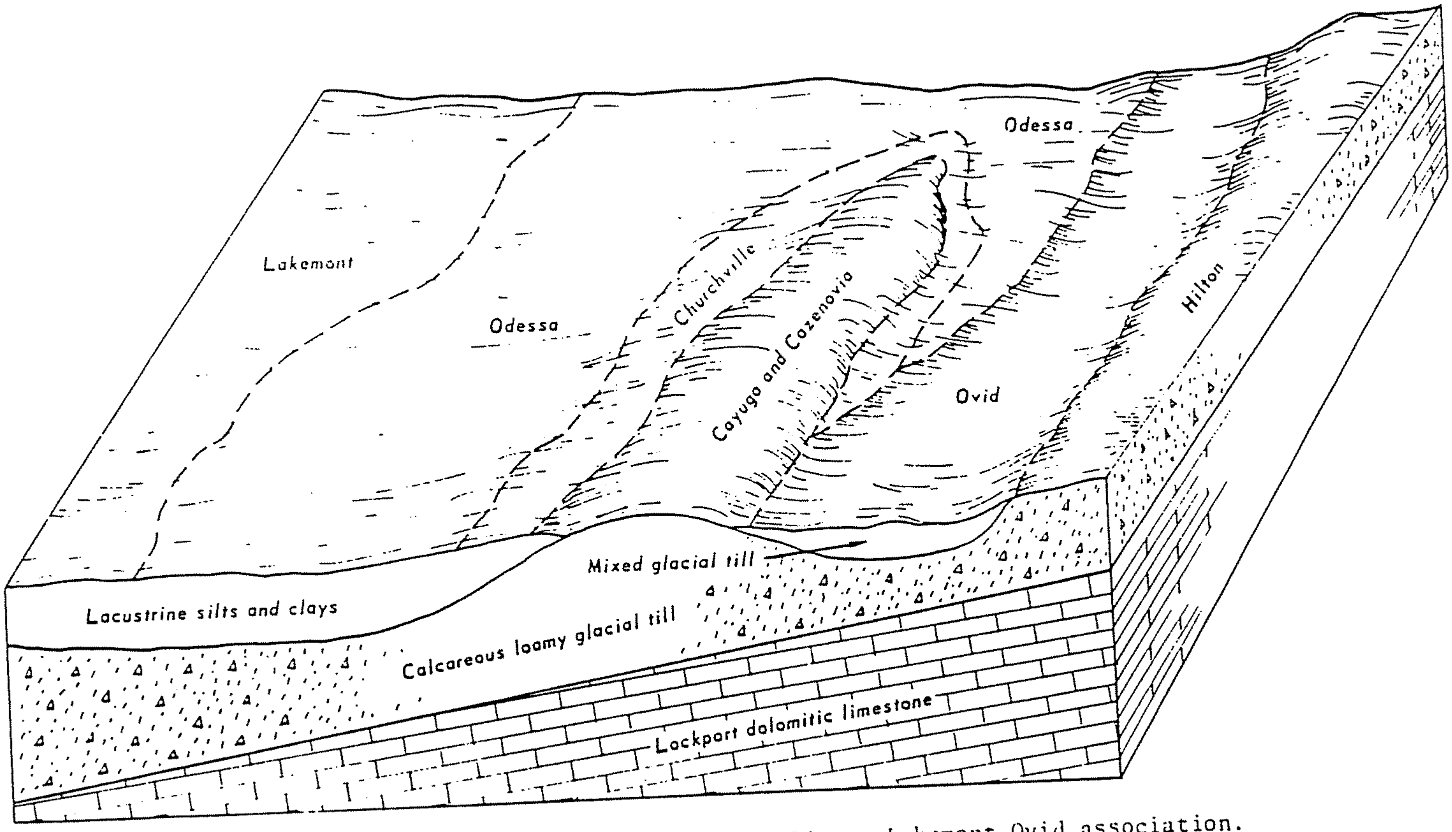


Figure 5.--Typical cross section of the Odessa-Lakemont-Ovid association.

till ridges that are scattered throughout the association. Around the fringes of these areas, where lacustrine clays overlap the till, are the somewhat poorly drained Churchville soils and the moderately well drained Cayuga soils. The very poorly drained Fonda soils and the shallow muck occupy some of the deeper depressions in the lake plain.

This association has a fairly low value for farming. Much of it is idle or cropland that is not intensively used. Communities are being rapidly developed in the western part of the association near Niagara Falls and in areas south of Lockport. The Conservation Needs Inventory for 1958 indicated that 58 percent of this association is cropland, 6 percent is pasture, 4 percent is forest, 14 percent is urban or built-up areas, and 18 percent is open land (6).

Natural drainage is the main concern in town and county planning and in agricultural development. The flatness of the area and the generally fine texture of the soils are the main factors to consider before installing artificial drainage. The biggest need is for group drainage projects that provide suitable outlets.

If adequately drained, the soils in this association have a good potential for grain and for dairy cattle and other livestock. The texture of the soils is generally too fine for most vegetable crops. If the soils are cultivated intensively, they are difficult to till because they crust, clod, and compact. Most fruit crops are damaged by frost in this association. The need for lime is small.


LAKE
79°00'
WILSON
CAMBRIA
Cambria Center
Bench Ridge
Shawnee
Pekin
Sanborn
WHEATFIELD
St. Johnsburg
Bergholtz
PORTER
Porter Center
Youngstown
LEWISTON
Lewiston
TUSCARORA INDIAN RESERVATION
RESERVOIR
NIAGARA
NIAGARA FALLS
Niagara Falls
NIAGARA JUNCTION
Ransomville
North Ridge
East Branch Twelvemile Creek
Twelvemile
Sixmile Creek
Fourmile
Creek
Bull Creek
Cayuga Creek
Gill Creek
ROBERT MOSES PKY
NIAGARA RIVER
CENTRAL
PENN
ERIE
CENTRAL LACKAWANNA
The Whirlpool
Goat I
CANADA
ONTARIO
NIAGARA FALLS
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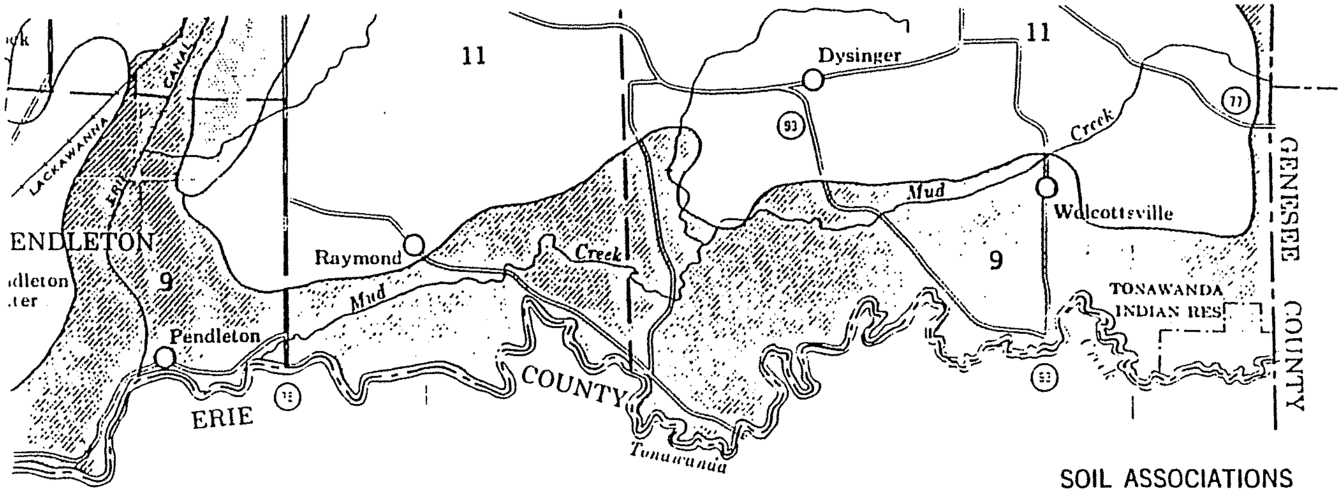


SOIL ASSOCIATIONS

AREAS DOMINATED BY SOILS FORMED IN GLACIAL TILL

1	Appleton-Hilton-Sun association: Deep, moderately well drained to very poorly drained soils having a medium-textured subsoil
2	Hilton-Ovid-Ontario association: Deep, well-drained to somewhat poorly drained soils having a medium-textured or moderately fine textured subsoil
3	Lockport-Ovid association Moderately deep and deep, somewhat poorly drained soils having a fine textured or moderately fine textured subsoil

AREAS DOMINATED BY SOILS FORMED IN GRAVELLY GLACIAL OUTWASH OR IN BEACH AND BAR DEPOSITS

4	Howard-Arkport-Phelps association: Deep, somewhat excessively drained to moderately well drained soils having a medium-textured to moderately coarse textured subsoil, over gravel and sand
5	Otisville-Altmar-Fredon-Stafford association. Deep, excessively drained to poorly drained soils having a dominantly medium-textured to coarse-textured subsoil, over gravel and sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SANDS

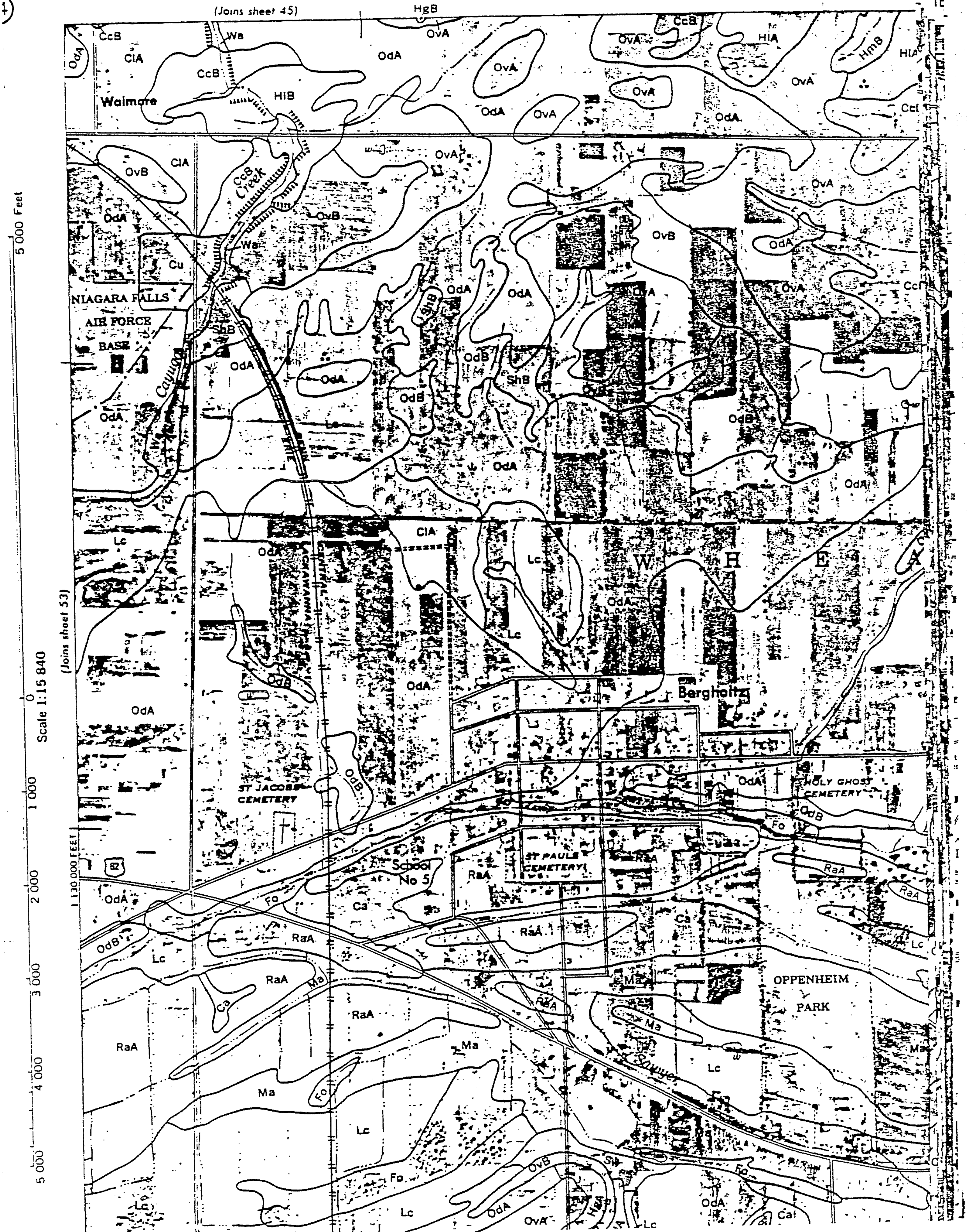
6	Minoa-Galen-Elnora association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured, moderately coarse textured, or coarse textured subsoil, over fine and very fine sand
7	Claverack-Cosad-Elnora association: Deep, moderately well drained and somewhat poorly drained soils having a coarse-textured subsoil, over clay or fine sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SILTS AND VERY FINE SANDS

8	Niagara-Collamer association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured to moderately fine textured subsoil
9	Canandaigua-Raynham-Rhinebeck association: Deep, somewhat poorly drained to very poorly drained soils having a dominantly medium-textured to fine-textured subsoil

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID CLAYS AND SILTS

10	Rhinebeck-Ovid-Madalin association: Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly brown or olive in color
11	Odessa-Lakemont-Ovid association: Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly reddish in color


(Joins sheet 45)
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CcB
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NIAGARA FALLS
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Bergholtz
ST JACOBS
CEMETERY
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HOLY GHOST
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Scale 1:15 840
0
1 000
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3 000
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1 130 000 FEET

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, is a general guide to the slope class. Symbols without a slope letter are for those soils or miscellaneous land types where slope is not significant to use and management. A final number 3 in the symbol indicates that the soil is eroded.

SYMBOL	NAME
d	Alluvial land
	Altmar loamy fine sand
n	Altmar gravelly fine sandy loam
A	Appleton gravelly loam, 0 to 3 percent slopes
pA	Appleton silt loam, 0 to 3 percent slopes
rB	Arkport very fine sandy loam, 0 to 6 percent slopes
rC	Arkport very fine sandy loam, 6 to 12 percent slopes
sA	Arkport fine sandy loam, gravelly substratum, 0 to 2 percent slopes
sB	Arkport fine sandy loam, gravelly substratum, 2 to 6 percent slopes
oA	Bombay fine sandy loam, 0 to 2 percent slopes
oB	Bombay fine sandy loam, 2 to 6 percent slopes
rA	Brockport silt loam, 0 to 4 percent slopes
o	Canandaigua silt loam
b	Canandaigua silty clay loam
cA	Cayuga and Cazenovia silt loams, 0 to 2 percent slopes
CcB	Cayuga and Cazenovia silt loams, 2 to 6 percent slopes
cC	Cayuga and Cazenovia silt loams, 6 to 12 percent slopes
eA	Cazenovia gravelly silt loam, 0 to 3 percent slopes
CeB	Cazenovia gravelly silt loam, 3 to 8 percent slopes
CgA	Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes
gB	Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes
Ch	Cheektowaga fine sandy loam
ClA	Churchville silt loam, 0 to 2 percent slopes
lB	Churchville silt loam, 2 to 6 percent slopes
mA	Claverack loamy fine sand, 0 to 2 percent slopes
mB	Claverack loamy fine sand, 2 to 6 percent slopes
CnA	Collamer silt loam, 0 to 2 percent slopes
CnB	Collamer silt loam, 2 to 6 percent slopes
oB	Colonie loamy fine sand, 0 to 6 percent slopes
s	Cosad fine sandy loam
u	Cut and fill land
DuB	Dunkirk silt loam, 2 to 6 percent slopes
DuC3	Dunkirk silt loam, 6 to 12 percent slopes, eroded
vD3	Dunkirk and Arkport soils, 12 to 20 percent slopes, eroded
ElA	Elnora loamy fine sand, 0 to 2 percent slopes
ElB	Elnora loamy fine sand, 2 to 6 percent slopes
aA	Farmington silt loam, 0 to 8 percent slopes
Fo	Fonda mucky silt loam
Fr	Fredon gravelly loam
nA	Galen very fine sandy loam, 0 to 2 percent slopes
nB	Galen very fine sandy loam, 2 to 6 percent slopes
Ha	Hamlin silt loam
HgA	Hilton gravelly loam, 0 to 3 percent slopes
HgB	Hilton gravelly loam, 3 to 8 percent slopes
HlA	Hilton silt loam, 0 to 3 percent slopes
HlB	Hilton silt loam, 3 to 8 percent slopes
HmA	Hilton and Cayuga silt loams, limestone substratum, 0 to 3 percent slopes
HmB	Hilton and Cayuga silt loams, limestone substratum, 3 to 8 percent slopes
HoA	Howard gravelly loam, 0 to 3 percent slopes
HoB	Howard gravelly loam, 3 to 8 percent slopes
HoC	Howard gravelly loam, 8 to 15 percent slopes
HsB	Hudson silt loam, 2 to 6 percent slopes
HrC3	Hudson silty clay loam, 6 to 12 percent slopes, eroded
HuF3	Hudson soils, 20 to 45 percent slopes, eroded
LaB	Lairdsville silt loam, 0 to 6 percent slopes
Lc	Lakemont silty clay loam
Ld	Lamson very fine sandy loam
Lg	Lamson fine sandy loam, gravelly substratum
Lo	Lockport silt loam
Ma	Madalin silt loam
Md	Madalin silt loam, loamy subsoil variant
Me	Made land
Mf	Massena fine sandy loam
Mn	Minoa very fine sandy loam
Ms	Muck, shallow
NaA	Niagara silt loam, 0 to 2 percent slopes
NaB	Niagara silt loam, 2 to 6 percent slopes
OdA	Odessa silty clay loam, 0 to 2 percent slopes
OdB	Odessa silty clay loam, 2 to 6 percent slopes
OnB	Ontario loam, 2 to 8 percent slopes
OnC	Ontario loam, 8 to 15 percent slopes
OnC3	Ontario loam, 8 to 15 percent slopes, eroded
OnD3	Ontario loam, 15 to 30 percent slopes, eroded
OoA	Ontario loam, limestone substratum, 0 to 3 percent slopes
OoB	Ontario loam, limestone substratum, 3 to 8 percent slopes
OsA	Otisville gravelly sandy loam, 0 to 3 percent slopes
OsB	Otisville gravelly sandy loam, 3 to 8 percent slopes
OvA	Ovid silt loam, 0 to 2 percent slopes
OvB	Ovid silt loam, 2 to 6 percent slopes
OwA	Ovid silt loam, limestone substratum, 0 to 3 percent slopes
OwB	Ovid silt loam, limestone substratum, 3 to 8 percent slopes
PsA	Phelps gravelly loam, 0 to 5 percent slopes
RaA	Raynham silt loam, 0 to 2 percent slopes
RaB	Raynham silt loam, 2 to 6 percent slopes
RbA	Rhinebeck silt loam, 0 to 2 percent slopes
RbB	Rhinebeck silt loam, 2 to 6 percent slopes
RhA	Rhinebeck silty clay loam, sandy substratum, 0 to 2 percent slopes
RhB	Rhinebeck silty clay loam, sandy substratum, 2 to 6 percent slopes
Rk	Rhinebeck silt loam, thick surface variant
RoA	Rock land, nearly level
RoF	Rock land, steep
ShB	Schoharie silty clay loam, 2 to 6 percent slopes
St	Stafford loamy fine sand
Su	Stafford loamy fine sand, gravelly substratum
Sw	Sun silt loam
Wa	Wayland silt loam

WORKS

Highways and roads

Dual ....

Good motor ......

Poor motor ......

Trail ....

Highway markers

National Interstate

U. S. ....

State or county ..

Railroads

Single track .....

Multiple track ..

Abandoned ......

Bridges and crossings

Road ....

Trail ....

Railroad ....

Ferry ....

Ford ....

Grade ....

R. R. over ......

R. R. under .....

Tunnel ....

Buildings ....

School ....

Church ....

Mine and quarry ..

Gravel pit ....

Power line ....

Pipeline ....

Cemetery ....

Dams ....

Levee ....

Tanks ....

Well, oil or gas ....

Forest fire or lookout

Windmill ....

REFERENCE NO. 5

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

October 8, 1987

Mr. Dennis Sutton
Ecology & Environment, Inc.
195 Sugg Road
P.O. Box D
Buffalo, New York 14225

Dear Dennis:

Attached are the signed interview forms you request. Please note that I added several comments as footnotes for clarification.

Contact me with any questions at 284-3126.

Sincerely,

Michael Hopkins
Assistant Public
Health Engineer

MH:lj

Attach.

Footnotes:

1) The Erie Barge Canal is intermittent in the Lockport area. This section is dewatered during the winter months.

2) The drinking water supply is over 10 miles away.

3) We believe that 4 families use groundwater for drinking at Witmer and Pennsylvania Avenue. These homes may be connected to public water in the future. A line is now available for hook up.

4) It is noted that the wells referred to in #3 are seperated from the Frontier Bronze site by the PASNY Conduits which should be a total sink and barrier to groundwater flow.

5) The irrigation well referred to is used only casually and occasionally to water fruit trees.

6) We are unaware of a fire official certifying any site in Niagara County to be a fire or explosion hazard. We do not feel that any of the sites listed constitues a fire threat.

7) I assume that the location drawings provided are only approxiamte site locations. Most overestimate the site area.

ecology and environment, inc.
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183
International Specialists in the Environment

October 2, 1987

Mr. Michael Hopkins
Niagara County Department
of Health
10th and East Falls Street
Niagara Falls, New York 14302

Dear Mr. Hopkins:

On several occasions during the course of the Phase 1 investigations, E & E has contacted the Niagara County Department of Health to obtain information in regard to various characteristics of the sites under investigation. The DEC requires that all information contained in Phase 1 reports be fully documented. We ask you to review the information your department has provided, as presented in this letter, and sign this document to acknowledge that you have provided this information and that it (with any corrections or qualifications) is correct to the best of your knowledge.

<u>Ross Steel</u>

1) No hazardous waste is expected to be on site.
2) Groundwater is not used for irrigation within a 3-mile radius of the site.
3) Surface water within 3 miles of this site is used for commercial, industrial, and recreational purposes.
4) The drinking water intakes are upstream of site.

<u>Dussault Foundry</u>

1) There is no use of groundwater within 3 miles of site.
2) The surface water within 3 miles downstream of site is used for recreation (Erie Canal). (*1)

<u>Town of Lockport Landfill</u>

1) There is no use of groundwater within 3 miles of site.
2) The Erie Canal (surface water) is used for recreation near this site. (*1)
3) The drinking water intakes are located in the Niagara River (*2), located upstream of this site.

SKW Landfill

1) The drinking water surface intakes are located upstream of this site.
2) Groundwater is used within a 3 mile radius of this site for drinking water. * 3
3) The surface water downstream (Niagara River) is used for recreation (Maid of Mist, fishing).

Diamond Shamrock

1) There is no groundwater used within a 3 mile radius of this site.

Roblin Street

1) There is no use of groundwater within a 3 mile radius of this site, drinking or irrigation.

Electro Minerals U. S. (formerly Carborundum Bldg. 82)

1) The water supply intakes are located upstream of this site.

Frontier Bronze

1) There is no suspected hazardous waste disposal present at this site.
2) Groundwater for drinking purposes is used by a neighborhood approximately 2.5 miles to the NW, at the intersection of Pennsylvania and Witmer Road. Two families, roughly 8 people, use groundwater for drinking purposes. *

Walmore Road

1) The well on site is used for irrigation. * 5
2) Approximately 1 acre of area is irrigated by this groundwater well.
3) There is no use of surface water 3 miles downstream of this site.

New York Power Authority Road Site

1) Hazardous waste is not suspected to be disposed of on site.
2) There is no land irrigated with groundwater within 3 miles of site.

I would also like you to confirm the fact that no fire official has declared any of the following sites a fire or explosion hazard: * 6

o SKW Alloys Landfill - Witmer Road, Town of Niagara.
o Dussault Foundry - Washburn Street, Lockport.
o Frontier Bronze - New Road, City of Niagara Falls.
o Staufer Chemical, North Love Canal - Town of Lewiston.

- Electro Minerals, U.S., Inc., (formerly Carobrundum Bldg. #82), Buffalo Avenue, City of Niagara Falls.
- Ross Steel Co. - Pine Avenue, Niagara Falls (now the site of the New York Power Authority water intake conduit right-of-way).
- Roblin Steel Company - Oliver Street, North Tonawanda.
- LaSalle Expressway - specifically near Love Canal.
- Diamond Shamrock, now Occidental Petroleum Corp., Ohio Street, Lockport, New York.
- Town of Lockport Landfill - East Canal Street, Lockport, New York.
- Power Authority Road Site - New Road, Lewiston, New York (across from Hyde Park Landfill).
- 64 Street South (owned by Russo Chevrolet) - 64th and Niagara Falls Blvd., Niagara Falls.
- Walmore Road, 6373 Walmore Road, Town of Wheatfield, New York.

I certify that I provided the above information to Ecology and Environment, Inc., and It is correct to the best of my knowledge.
Subject to foot notes & comments provided

Michael E Hopkins
Signature

10/7/87
Date

Please find maps enclosed to assist you in locating these sites. If you have any questions regarding the above, please contact me at 633-9881.

Thank you very much for your time and assistance in our ongoing investigations.

Sincerely,

Dennis Sutton

oio

recycled paper
ecology and environment

REFERENCE NO. 6

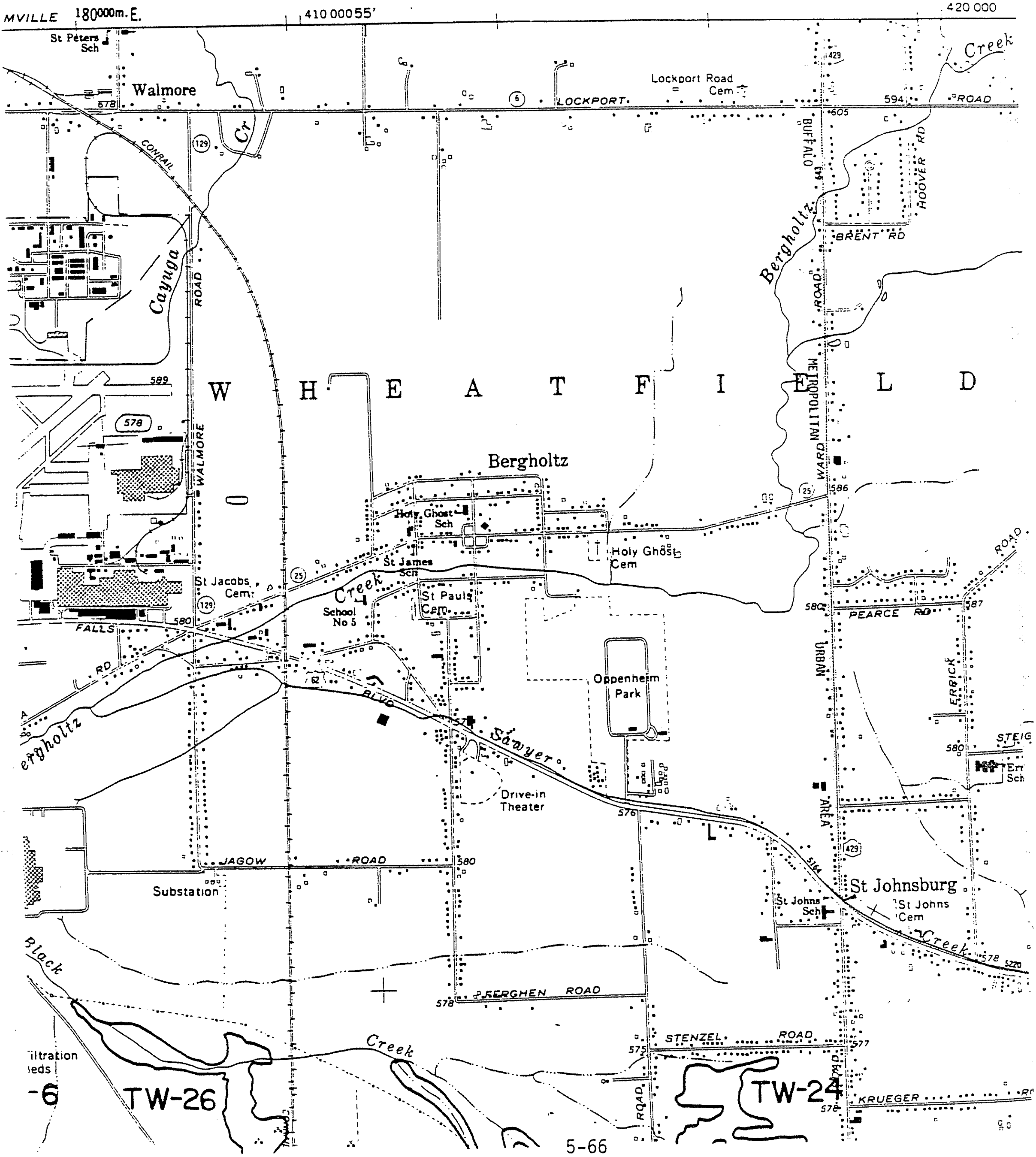
Freshwater Wetlands Classification Sheet

December 5, 1984

Niagara County
Map 14 of 18
Tonawanda West Quadrangle

Wetlands Identification Code	Municipality	Classification
TW-1	Niagara Town	II
TW-3	Niagara Town, City of Niagara Falls	II
TW-4	Wheatfield, City of North Tonawanda	II
TW-6	Wheatfield	II
TW-24	Wheatfield	II
TW-25	Wheatfield, City of North Tonawanda	II
TW-26	Wheatfield	II
TE-1 (formerly TE, TW-1)	Wheatfield	II
TE-15 (formerly TE, TW-15)	City of North Tonawanda	II

TONAWANDA WEST QUADR
NEW YORK
7.5 MINUTE SERIES PLANIME
SW/4 TONAWANDA 15' QUADRANGLE



REFERENCE NO. 7

CONTACT REPORT

AGENCY : New York State Department of Environmental Conservation, Region 9
ADDRESS : 600 Delaware Ave., Buffalo, NY 14202
PHONE : (716)847-4550
PERSON CONTACTED : James Snider, Senior Wildlife Biologist
TO : Jon Sundquist
DATE : June 2, 1987
SUBJECT : Critical Wildlife habitats near potential hazardous waste sites in Niagara County

In preparation of Phase 1 reports on potential hazardous waste sites in New York for the NYSDEC, information about nearby critical wildlife habitats is necessary. The following information is provided by Mr. James Snider of the Bureau of Wildlife, NYSDEC Region 9.

Except for the seasonal appearance of migratory birds, including, possibly the bald eagle, there are no critical habitats of endangered species within 2 miles of the suspected waste sites listed below:

- SKW Alloys
  Witmer Road at Maryland Ave.
  Niagara Falls, NY
- Dussault Foundries
  2 Washburn Street
  Lockport, NY
- North Love Canal
  Near Cleghorn Drive
  Lewiston, NY
- Carborundum Building 82
  Buffalo Ave.
  Niagara Falls, NY
- Ross Steel Company
  4237 Pine Ave.
  Niagara Falls, NY
- Frontier Bronze
  4870 Packard Rd.
  Niagara Falls, NY
- Roblin Steel
  101 East Ave.
  N. Tonawanda, NY

- LaSalle Expressway
  Niagara Falls, NY
- Diamond Shamrock
  Ohio Ave.
  Lockport, NY
- Town of Lockport Landfill
  Canal Road
  Lockport, NY
- Power Authority Road
  Lewiston, NY
- 64th Street South
  Chevy Place
  Niagara Falls, NY
- Walmore Road
  Walmore Rd., 0.5 miles south of Lockport Road
  Wheatfield, NY

James R. Snider
Signature

July 27, 1987
Date

REFERENCE NO. 8

GSC-TR8705

DRAFT

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 1. CORE MANUAL

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
EXPOSURE EVALUATION DIVISION
Task No. 3-2
Contract No. 68023970
Project Officer: Russell Kinerson
Task Manager: Loren Hall

Prepared by:

GENERAL SCIENCES CORPORATION
6100 Chevy Chase Drive, Suite 200
Laurel, Maryland 20707

Submitted: February, 1987

1. INTRODUCTION

The Graphical Exposure Modeling System (GEMS) is an interactive computer system developed by General Sciences Corporation under the auspices of the Modeling Section in the Exposure Evaluation Division (EED), Office of Toxic Substances (OTS) of the Environmental Protection Agency (EPA). It provides a simple interface to environmental modeling, physiochemical property estimation, statistical analysis, and graphic display capabilities, with data manipulation which supports all of these functions. An overview of the basic GEMS components is shown in Figure 1-1. The system is installed on the OTS VAX 11/780 computer in Research Triangle Park, North Carolina, and is accessible through dial-up lines.

GEMS is being developed to support integrated exposure analyses at OTS. Its purpose is to provide environmental researchers and analysts with a set of sophisticated tools to perform exposure assessments of toxic substances without requiring them to become familiar with most aspects of computer science or programming.

GEMS is designed under a unique concept which integrates the computerized tools of graphics, mapping, statistics, file management, and special functions such as modeling and physiochemical property estimation, under a user-oriented and simple-to-learn interface. GEMS prompts the user or provides a menu for each action to be performed. The following features provide users with great flexibility during the GEMS execution:

- HELP commands - When you are using the GEMS system, you may not always have a user's manual readily available and/or you may need to see the format and type of a command or an answer before you enter it. Various HELP commands are available in GEMS which provide such information.
- Recovering from errors - If you enter a command or a response incorrectly, the system issues an error message and reprompts you for the correct information.
- Built-in defaults for model execution - GEMS is designed to guide inexperienced users through the execution of selected models. Default responses are usually available when you cannot specify a choice or supply an input to a prompt during model execution.
- Data management of modeling results - Data generated from execution of the SESOIL, ISC, SWIP, or AT123D models may be stored automatically in GEMS. These data may be accessed or analyzed via GEMS' file management, graphics, and statistics operations.

The purpose of this document is to describe GEMS from the user's point of view. It is intended as a comprehensive guide to the use of GEMS for personnel who have no specialized knowledge of computer programming. However, a working knowledge of environmental modeling is necessary for complete and accurate use of the system.

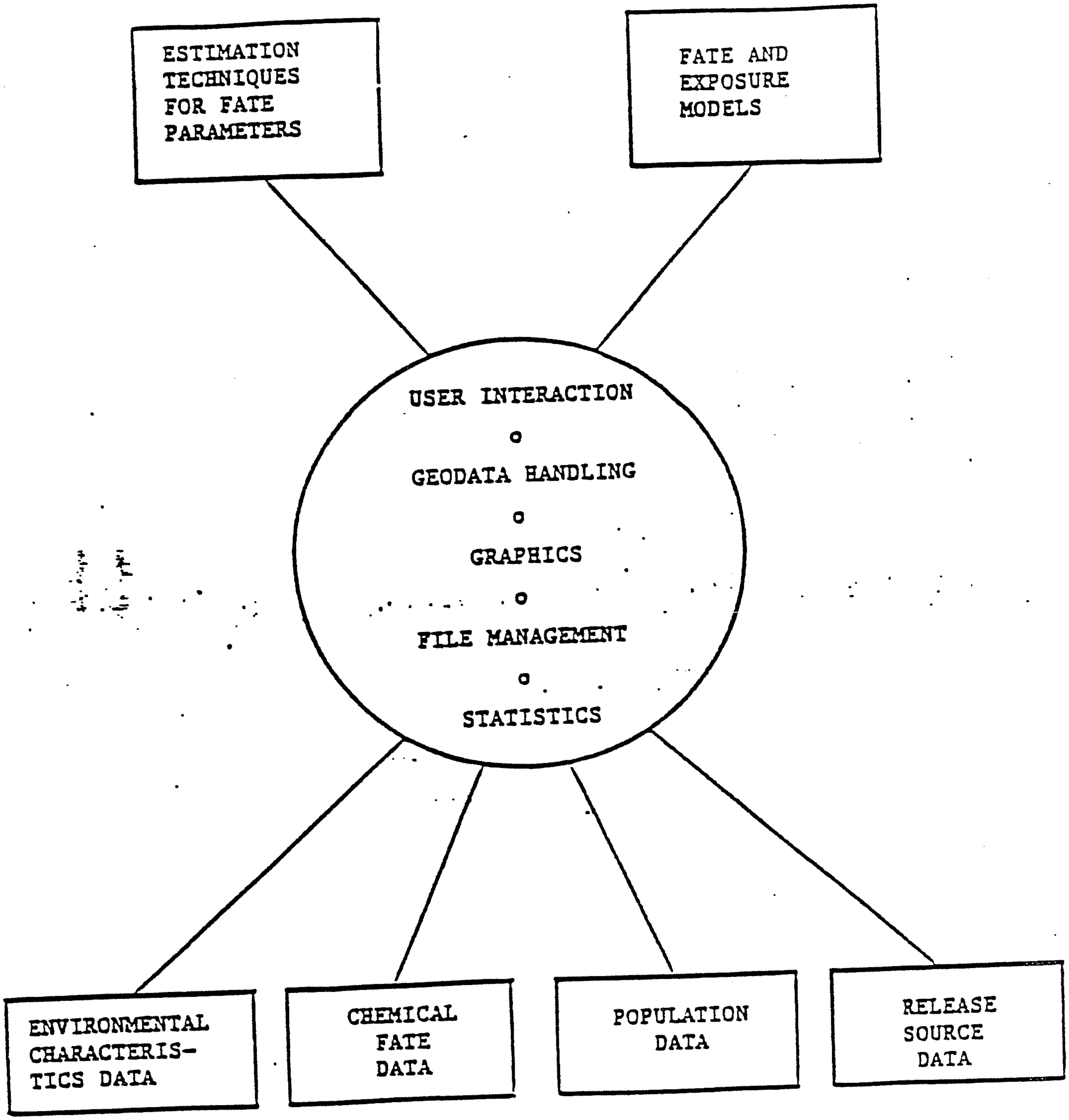


FIGURE 1-1. Components of the Graphical Exposure Modeling System (GEMS)

Since the last draft of the GEMS User's Guide, completed in June, 1984, the GEMS system has gone through a number of modifications and enhancements. It is no longer feasible to hold all sections in one single volume. This revised user's guide is designed in a modular fashion of six separate volumes described briefly below. In addition, GEMS has been adapted to function on an IBM PC/XT or AT. This prototype called PCGEMS has many of the same capabilities of the mainframe GEMS. These include environmental modeling procedures such as ENPART and AT123D as well as property estimation procedures such as CLOGP and AUTOCHEM. The prototype PCGEMS works in large part through interface with the OTS VAX 11/780 on which GEMS resides, a user's guide for PCGEMS will be available in the near future.

Volume 1: Core-Manual

This volume is a reference manual and introduction for first-time users. In addition to Section 1 - Introduction, a functional description of GEMS is presented in Section 2, a detailed guide to the use of the system is presented in Section 3, and summaries of the VAX operating environment and system and frequently used utilities are presented in Section 4. Two sample runs are given in the attachment to provide users with information in order to interact with the GEMS system, to generate a dataset, and subsequently, produce a map from the dataset.

Volume 2: Modeling

This volume consists of all GSC prepared user's manuals to GEMS models, grouped according to media. User's manuals are available for the following models: SESOIL, AT123D, SWIP, ENPART, TOX-SCREEN, INPUFF, and ISC/GAMS. A user's manual for EXAMS II model will be available later this year. Refer to Section 2.2 for further information.

Volume 3: Graphics and Geodata Handling

This volume contains two GEMS operations, Graphics and Geodata Handling. The Graphics operation contains a variety of graphics procedures which may be used to display results from modeling runs or from datasets. The Geodata Handling operation contains procedures that perform geographic data manipulation and generate maps of U.S. states or counties. Refer to Section 2.3 for further information.

Volume 4: Data Manipulation

This volume contains descriptions of GEMS system-installed datasets and two GEMS operations - File Management, and Utilities. Refer to Section 2.4 for further information.

Volume 5: Estimation

This volume consists of user's manuals for SFILES, FAP, CLOGP, and AUTOCHEM. These estimation programs may be used to provide estimated physiochemical properties for model input or for other environmental fate analyses. Refer to Section 2.5 for further information.

Volume 6: Statistics

This volume contains information on the GEMS Statistics operation which includes the Descriptive Statistics procedure and procedures to produce simple or multiple regression and contingency tables. Refer to Section 2.6 for further information.

REFERENCE NO. 9

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE
INACTIVE HAZARDOUS WASTE DISPOSAL REPORT

CLASSIFICATION CODE: 2a
REGION: 9
SITE CODE: 93209
EPA ID: NYD98053

NAME OF SITE : Walmore Road - Johnson Property
STREET ADDRESS: 6373 Walmore Road
TOWN/CITY: Wheatfield
COUNTY: Niagara
ZIP: 14304

SITE TYPE: Open Dump- Structure- Lagoon-X Landfill- Treatment Pond-
ESTIMATED SIZE: 2 Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: Mr. Dean Johnson
CURRENT OWNER ADDRESS.: 6373 Walmore Road Wheatfield, NY 14304
OWNER(S) DURING USE...: Unknown
OPERATOR DURING USE...: Various vendors (see DEC Report)
OPERATOR ADDRESS......: See Above
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From Unknown To Unknown

SITE DESCRIPTION:
Bell Aerospace Textron used this site to dispose of heat treating salt - caustic, plastic tank sludge, fly ash, scrapwood and clay. A Niagara County Health Dept. letter dated February 15, 1985 indicates that a water sample from a private well near the site did not contain THD, Lead , Chromium, or cadmium above the minimum detection level.

HAZARDOUS WASTE DISPOSED: Confirmed- Suspected-X

TYPE	QUANTITY (units)
Heat treat salt - caustic plating	Unknown

SITE CODE: 932094

ANALYTICAL DATA AVAILABLE:
Air- Surface Water- Groundwater-X Soil- Sediment- None-

CONTRAVENTION OF STANDARDS:
Groundwater- Drinking Water- Surface Water- Air-

LEGAL ACTION:

TYPE..: None State- Federal-
STATUS: Negotiation in Progress- Order Signed-

REMEDIAL ACTION:

Proposed- Under design- In Progress- Completed-
NATURE OF ACTION: None

GEOTECHNICAL INFORMATION:
SOIL TYPE: Not Known
GROUNDWATER DEPTH: Not Known

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Limited data on the soil at this site. More investigation may be needed.

ASSESSMENT OF HEALTH PROBLEMS:

Medium	Contaminants Available	Migration Potential	Potentially Exposed Population	Need for Investigation
Air	Unlikely	Likely	Yes	Medium
Surface Soil	Likely	Highly Likely	Yes	High
Groundwater	Likely	Unlikely	Yes	Medium
Surface Water	Likely	Highly Likely	No	Medium

Health Department Site Inspection Date : 5/85

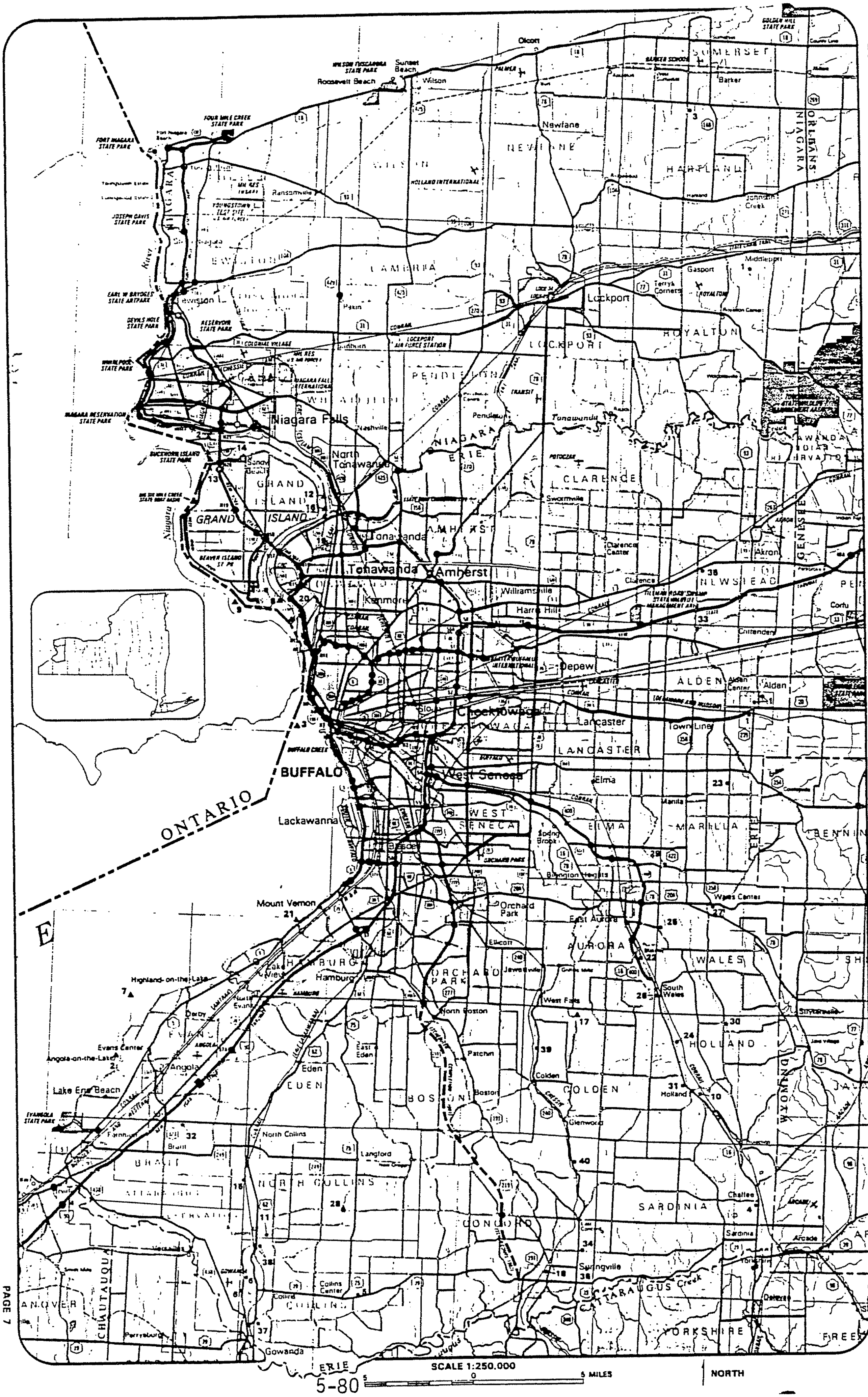
MUNICIPAL WASTE ID:

REFERENCE NO. 10

LOCATION OF COMMUNITY WATER SYSTEM SOURCES-1982

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

ERIE and NIAGARA COUNTIES



ERIE COUNTY

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
Municipal Community			
	Akron Village (See No 1 Wyoming Co, Page 10)	3640	
1	Alden Village	3460	Wells
2	Angola Village	8500	Lake Erie
3	Buffalo City Division of Water	357870	Lake Erie
4	Caffee Water Company	210	Wells
5	Collins Water District #3	704	Wells
6	Collins Water Districts #1 and #2	1384	Wells
7	Erie County Water Authority (Sturgeon Point Intake)	375000	Lake Erie
8	Erie County Water Authority (Van DeWater Intake)	NA	Niagara River - East Branch
9	Grand Island Water District #2	9390	Niagara River
10	Holland Water District	1670	Wells
11	Lawtons Water Company	138	Wells
12	Lockport City (Niagara Co)		Niagara River - East Branch
13	Niagara County Water District (Niagara Co)		Niagara River - West Branch
14	Niagara Falls City (Niagara Co)		Niagara River - West Branch
15	North Collins Village	1500	Wells
16	North Tonawanda City (Niagara Co)		Niagara River - West Branch
17	Orchard Park Village	3671	Pipe Creek Reservoir
18	Springville Village	4169	Wells
19	Tonawanda City	18538	Niagara River - East Branch
20	Tonawanda Water District #1	91269	Niagara River
21	Wanakah Water Company	10750	Lake Erie
Non-Municipal Community			
22	Aurora Mobile Park	125	Wells
23	Bush Gardens Mobile Home Park	270	Wells
24	Circle B Trailer Court	50	Wells
25	Circle Court Mobile Park	125	Wells
26	Creekside Mobile Home Park	120	Wells
27	Donnelly's Mobile Home Court	99	Wells
28	Gowanda State Hospital	NA	Clear Lake
29	Hillside Estates	160	Wells
30	Hunters Creek Mobile Home Park	150	Wells
31	Knox Apartments	NA	Wells
32	Maple Grove Trailer Court	72	Wells
33	Millgrove Mobile Park	100	Wells
34	Perkins Trailer Park	75	Wells
35	Quarry Hill Estates	400	Wells
36	Springville Mobile Park	114	Wells
37	Springwood Mobile Village	132	Wells
38	Taylors Grove Trailer Park	39	Wells
39	Valley View Mobile Court	42	Wells
40	Villager Apartments	NA	Wells

NIAGARA COUNTY

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
Municipal Community			
	Lockport City (See No 12, Erie Co)	25000	
1	Middleport Village	2000	Wells (Springs)
	Niagara County Water District (See No 13, Erie Co)	48	
2	Niagara Falls City (See also No 14 Erie Co)	77384	Niagara River - East Branch
	North Tonawanda City (See No 16 Erie Co)	36000	
Non-Municipal Community			
3	Country Estates Mobile Village	28	Wells

REFERENCE NO. 11

a product of

J. L. DARLING CORPORATION
TACOMA, WASHINGTON 98421 U.S.A.

"Rite in the Rain"®
WEATHERPROOF

MEMO

NOTEBOOK NO. 391

Walmore Rd - Johnson Property

Walmore Rd - Johnson Property 6/24/87

June 24, 1987

Weather: Sunny, very hot (80's)

Arrive at 6373 Walmore Rd at 12:25 P.m.

Personnel: Jon Sundquist

Dennis Sutton

Nobody home at 6373 Walmore.

Talked with Mrs. John Stoll of 6367 Walmore

Has lived on property only few months

Has noticed nothing out of ordinary.

Returned to 6373 at 12.40.

Frame 9 – shot along Cayuga creek, looking east from Walmore Rd.

Front lawn leveled, appears to be filled

Culvert pipe extends near road into creek (for roadside drainage)

Sparse grass, apparently recently seeded (grows in rows & clumps.)

Straw on ground between grass blades.

Some bare spots

Topsoil looks clay-ey

Stream bank more lushly vegetated (8" grow)

6/24/87

[illegible] 6/24/89

C. k Cx. 13 between level front lawn
and stream bank.
Many rocks in deposit
F[illegible] of slag found on stream bank

Frame 10 → small pile of possible fill material
clayey with asphalt, concrete, wood scraps.

Chicken-wired rocks along creek 30 ft
and further from road for drainage

Frame 11 → well, Water is in well now

Lots of big rocks (10" or so) on surface
of property between creek & RR
rear of property

Frame 12: Front yard looking west
from near house.
Talked with Lisa McKenzy, 6331 Walmore Rd.
Noticed nothing unusual, lived here since Apr. 12

Addendum: Dennis Sutton

Cayuga Creek forms west boundry of 6373 Walmore Rd.

This creek is observed for the length of the property for any signs of leachate or discolorization - none was observed at this time - fill material was observed on the banks. Proceeding behind the house on site (east), observed were fruit trees and a cultivated corn field. This field extended to the RR tracks berm which formed the east boundry of the site.
A groundwater well was observed on site.
no stressed vegetation was noted.

The alleged fill area is located east of the house at 6373 Walmore. The area makes up the front yard area which appears built up in relation to the Cayuga Creek and the adjacent area.

REFERENCE NO. 12

N. TONA.
693-4262

TOWN OF WHEATFIELD WATER DISTRICT

Norman A. Walck
Water Superintendent

3113 NIAGARA FALLS BOULEVARD
N. TONAWANDA, NEW YORK 14120

September 30, 1987

John Sundquist
Ecology and Environment Inc.
195 Holtz Dr. P. O. D
Buffalo, N. Y. 14225

Dear Sir:

According to our records the listed addresses below, which are withing the Wheatfield Water District, are on private water systems. To the best of my knowledge about 99% are on well water.

Lockport Road

2080
2669
3454
3601
3660
3846
3892
3920
3926
3942

Raymond Road

3260

Townline Road

6322
7496

Shawnee Road

6080
6460
6765
6777
6913
7194

Hoover Road

6022
6689
7114

Nia. Falls Blvd.

3125

Ward Road

6046
6186
6826

Jagow Road

2420

Errick Road

6682

If there are any questions, do not hesitate to call me.

Very truly yours,

Norman A. Walck
Water Superintendent

NAW:mm

REFERENCE NO. 13

Code Activity 0
Code Location 0 sheet 1 of
Service Request No.
ate Received Complaint 11/13/

NIAGARA COUNTY
DEPARTMENT OF HEALTH

ervice Request Well Water Supply / Landfill Concerns
)riginator of Complaint Dean Johnson Address 6373 Walmore Rd. - Twn. Whe
)wner Address 731-3888
)ccupant Address

te	Hours	REPORT OF INVESTIGATION
1/13/84		Writer received call from Mr. Dean Johnson who resides at above address across from the Airbase entrance. Mr. Johnson is aware of the current investigation being conducted on the base regarding a former landfill site. Mr. Johnson has a ~~[illegible]~~ depository in his property noted to consist of flyash. He has a well on site that used to supply drinking water but is now only used for watering and [illegible] purposes. Mr. Johnson is concerned about the airbase landfill, his property and well water supply. Told him we would set appointment and examine property and his problem.
		Phone 731-3888 Thur AM to set appointment.
84	2pm	I met with Mr. Johnson. He informed me that:
		1) Portions of his property are filled with industr waste materials including graphite, hardened resins, plastic battery cases, ect.
		2) The filled areas are up to 5 feet deep.
		3) He believes that the area was filled by Hasely Trucking.
		4) There is a well on the property used for irrigation washing cars, ect but not for drinking

recycled paper Protect our environment

5-89 Date Abated By

REFERENCE NO. 14

The National Register of Historic Places

1976

Irene Lewishon to carry forward their work in drama and dance with local children. *Multiple public/private:* NHL.

NIAGARA COUNTY

Lewiston. **FRONTIER HOUSE,** 460 Center St., 1824–1826. Stone, 3 1/2 stories, rectangular; gabled roof with stepped gables, paired chimneys, and balustrade; off-center and center entrances, full-width front porch with hipped roof, regular fenestration, oval windows in gables; N kitchen wings. Federal elements. Built as a tavern for Joshua Fairbanks and Benjamin and Samuel Barton, local prominent businessmen. *Private.*

Lewiston. **LEWISTON MOUND,** Lewiston State Park, Hopewellian affinities (c. 160). Oval burial mound. Partially investigated. *County.*

Lewiston vicinity. **LEWISTON PORTAGE LANDING SITE,** Prehistoric–19th C.. Gently sloping ravine leading from river remains of path used by travelers to avoid Niagara Falls. Archeological explorations yielded artifacts from Indian to British occupation, indicating this was a heavily used access point to a vital overland route. *State.*

Lockport. **LOWERTOWN HISTORIC DISTRICT,** Roughly bounded by Erie Canal and New York Central RR., 19th–20th C.. Primarily residential district, with some religious and commercial buildings and warehouses; facing the canal are 2 1/2-story brick and stone residences with Greek Revival and Italianate elements built in the 1830's; off the canal are 1–2-story frame structures with additions and modern siding built mid-19th C. and some stone structures: notable are the Gothic Revival former Christ Episcopal Church (1854) and the Italianate Vine Street School (1864). Systematic development of the village began after canal opened; district was Lockport's social, commercial, and industrial center, 1830's–1860's. *Multiple public/private:* HABS.

Lockport. **MOORE, BENJAMIN C., MILL (LOCKPORT CITY HALL; HOLLY WATER WORKS)** , Pine St. on the Erie Canal, 1864. Coursed rubble, 2 1/2 stories over basement on sloping site, trapezoidal shape, hipped roof sections with cross gables, interior chimney; front center entrance with transom and pediment on pilasters, triple round arched windows in gables, rock-faced stone lintels and sills, ashlar quoins; interior altered; rear 2-story addition 1893. Built as a flour mill, converted c. 1885 to a water pumping plant; adapted as city hall 1893; one of few survivors of 25 industrial buildings once clustered along this section of Erie Canal. *Municipal.*

Niagara Falls. **DEVEAUX SCHOOL COMPLEX,** 2900 Lewiston Rd., 1855–1888. Educational complex; contains 3 connected structures–Van Rensselaer Hall (1855–1857), Patterson Hall (1866), and Munro Hall (1888); and outbuildings–barn, shed, and gymnasium. Gothic Revival elements Founded by Judge Samuel DeVeaux as an Episcopal school for poor and orphaned boys, later became a prominent preparatory school, closed, 1971. *Private.*

Niagara Falls. **NIAGARA FALLS PUBLIC LIBRARY,** 1022 Main St., 1902–1904, E. E. Joralemon, architect. Stone, yellow brick; 1 story, rectangular with semielliptical rear bow, flat roof with parapet, slightly projecting center entrance bay with pedimented double doorway, pedimented windows, string courses; fine interior detail intact. Neo-Classical Revival elements. One of many public libraries endowed by Andrew Carnegie. *Public.*

Niagara Falls. **NIAGARA RESERVATION,** 1885. Includes the falls, Goat Island and other islets, paths, and an observation tower. In establishing a reservation of over 400 acres, New York became the first state to use eminent domain powers to acquire land for aesthetic purposes. *State:* NHL.

Niagara Falls. **SHREDDED WHEAT OFFICE BUILDING,** 430 Buffalo Ave., 1900. Steel frame, brick; 5 stories, rectangular, flat roof, center entrance, 5 paired window bays, segmental arched basement windows, wide parapet; interior featured 4th-floor auditorium and 5th-floor cafeteria; doubled glazed windows. Commercial style. Administrative office building of original Shredded Wheat factory complex, developed by Henry D. Perky. *Private.*

Niagara Falls. **U.S. CUSTOMHOUSE,** 2245 Whirlpool St., 1863. Stone, 2 1/2 stories, square, hipped roof, arched window and door openings on W facade; built into railroad embankment, S side opens onto railroad tracks; renovated, 1928. Continues to serve as customs office for trains from Canada. *Private:* HABS.

Niagara Falls. **WHITNEY MANSION,** 335 Buffalo Ave., 1849–1851. Limestone, 2 1/2 stories, L-shaped, intersecting gabled roof sections; original section has off-center entrance with full-width Ionic portico; 19th C. side addition has front bay window and gabled dormer with 3 round arched windows. Greek Revival. Built according to 1830's design by Solon Whitney, son of Gen. Parkhurst Whitney, village founder and prominent hotel and tavern owner. *Private.*

Youngstown vicinity. **OLD FORT NIAGARA,** N of Youngstown on NY 18, 1678. Complex of stone buildings bounded by stone walls, earthworks, and a moat; restored. Original fort built in 1678; altered 1725–1726 and 1750–1759. Held alternately by French, British, and Americans in struggle for control of continent; strategically located in commanding the Great Lakes from Lake Erie to Ontario and in covering approaches to western NY. *State:* NHL.

ONEIDA COUNTY

Boonville. **ERWIN LIBRARY AND PRAT HOUSE,** 104 and 106 Schuyler St., 1890, C. L. Vivian (Erwin Library); 1875, J. B. Lathrop (Pratt House). Erwin Library limestone, story, gabled and hipped roofs, square tow with pyramidal roof contains recessed arched entrance. Romanesque. Pratt House brick, 3 stories, mansard roof with dormers and centr tower crowned with iron cresting and spir ornate bracketed cornices and metal linte original interior wall coverings, fixtures, and woodwork. Second Empire. *Private.*

Boonville. **FIVE LOCK COMBINE AN LOCKS 37 AND 38, BLACK RIVER CANAL (BOONVILLE GORGE PARK)** , NY 46, 19th–20th C.. Section of the abandoned Blac River Canal (built mid-19th C.) runnin through rugged terrain of Boonville Gorge, contains locks 37 and 38 and a 5-lock combine (locks 39–43); canal was 42' deep; locks, 90' by 15', which accommodate 70-ton boats, wer built 1895–early 1900's. Canal built to connec Black River Valley to Erie Canal provided water supply for Erie Canal, allowed expansion of valley's lumbering industry, and fostere growth of towns. *State/county:* HAER.

Clinton. **HAMILTON COLLEGE CHAPEL,** Hamilton College campus, 1827, Philip Hooker, architect. Coursed rubble, 3 stories rectangular, low pitched roof, interior chimney modillion cornice, front and rear parapet; front slightly projecting 4-story clock tower with 3-stage frame belfry—2 stories, each with columns and entablature, surmounted by octagonal cupola; front center double-door entrance with round arched window above, flanked by tall round arched windows, blind decorative frame panels; limestone ashlar quoins, lintels, and sills; side elevations with 2 tiers of windows; apse added 1897; interior altered. Federal. Multipurpose classroom and chapel building designed by Philip Hooker; unusual 3-story interior plan attributed to John H. Lothrop, a trustee. *Private.*

Clinton. **ROOT, ELIHU, HOUSE,** 101 College Hill Rd., 1817. Frame, clapboarding; 2 stories, irregular shape, gabled roof, interior chimneys, pedimented arched portico, off-center entrance with semielliptical fanlight and side lights, 2-story pilasters dividing bays in flush-sided main facade, pedimented rear porch; side additions; restored, 1900's. Federal. Home of Elihu Root, U.S. Secretary of War largely credited with conceptual foundation for 20th C. development of American Army, Secretary of State, U.S. senator, and winner of 1912 Nobel Peace Prize. *Private; not accessible to the public:* NHL.

Rome. **ARSENAL HOUSE,** 514 W. Dominick St., c. 1813–1814. Brick, 2 1/2 stories, rectangular, gabled roof, pairs of bridged interior end chimneys above single gable steps, central pedimented gable with elliptical window, 2 vertical elliptical windows in gabled ends between chimneys, stone sills and lintels; later front porch with large modillion blocks, chamfered

REFERENCE NO. 15

NIAGARA COUNTY
DEPARTMENT OF HEALTH

Code Activity ....
Code Location ....
Service Request No. ....
ate Received Complaint ....

Service Request ...... Collect Well Samples
Originator of Complaint Dean Johnson ...... Address 6373 Walmore Rd, Wheat
Owner " " ...... Address " " " "
Occupant ...... Address ......

ate	Hours	REPORT OF INVESTIGATION
1/8/	8 10:30 AM	I collected samples from the above ~~yard~~ property. One 1-liter Glass jar and 1 - 2 liter plastic jug were filled. No odor ~~&~~ or color were noted in the well The well is a dug well 13' deep water depth is estimated to have been about 6' Several pieces of slag ect were observed in the yard at this time.

5-94

Date Abated .... By ......

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932101

II. SITE NAME AND LOCATION

01 Site Name (Legal, common, or descriptive name of site)	02 Street, Route No., or Specific Location Identifier
Walmore Road - Johnson Property	6373 Walmore Road

03 City	04 State	05 Zip Code	06 County	07 County Code	08 Cong. Dist.
Town of Wheatfield	NY	14304	Niagara		

09 Coordinates
Latitude 43 06 58.N
Longitude 078 55 25.W

10 Type of Ownership (Check one)
[X] A. Private [ ] B. Federal ______ [ ] C. State [ ] D. County
[ ] E. Municipal [ ] F. Other ______ [ ] G. Unknown

III. INSPECTION INFORMATION

01 Date of Inspection
6 / 24 / 87
Month Day Year

02 Site Status
[ ] Active
[X] Inactive

03 Years of Operation
1979 or 1980 | 1980
Beginning Year Ending Year
[ ] Unknown

04 Agency Performing Inspection (Check all that apply)
[ ] A. EPA [ ] B. EPA Contractor ______ (Name of Firm) [ ] C. Municipal [ ] D. Municipal Contractor ______ (Name of Firm)
[ ] E. State [X] F. State Contractor E & E* (Name of Firm) [ ] G. Other ______ (Specify)

05 Chief Inspector	06 Title	07 Organization	08 Telephone No.
Dennis Sutton	Geologist	E & E	(716) 633-9881

09 Other Inspectors	10 Title	11 Organization	12 Telephone No.
Jon Sundquist	Chemical Engineer	E & E	(716) 633-9881
			( )
			( )
			( )
			( )

13 Site Representatives Interviewed	14 Title	15 Address	16 Telephone No.
			( )
Debra Johnson	Adjacent Property Owner	6381 Walmore Road/ 2 Cranston St., Worcester, MA	( )
			( )
			( )
			( )

17 Access Gained By (Check one)
[X] Permission
[ ] Warrant

18 Time of Inspection
12:30

19 Weather Conditions
Temp. 85°F, Sunny, Clear Sky, Warm, Winds - 0-5 mph

IV. INFORMATION AVAILABLE FROM

01 Contact	02 Of (Agency/Organization)	03 Telephone No.
Walter E. Demick	NYSDEC	(518) 457-9538

04 Person Responsible for Site Inspection Form	05 Agency	06 Organization	07 Telephone No.	08 Date
Michael Hanchak		E & E	(716) 633-9881	7 / 30 / 87 Month Day Year

EPA Form 2070-13 (7-81)

*Ecology and Environment, Inc.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932101

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 Physical States
(Check all that apply)

[X] A. Solid
[X] B. Powder, Fines
[X] C. Sludge
[ ] D. Other ______________ (Specify)
[ ] E. Slurry
[ ] F. Liquid
[ ] G. Gas

02 Waste Quantity at Site
(Measure of waste quantities must be independent)

Tons ______
Cubic Yards ______
No. of Drums ______

Unknown

03 Waste Characteristics (Check all that apply)

[ ] A. Toxic
[ ] B. Corrosive
[ ] C. Radioactive
[ ] D. Persistent
[ ] E. Soluble
[ ] F. Infectious
[ ] G. Flammable
[ ] H. Ignitable
[ ] I. Highly volatile
[ ] J. Explosive
[ ] K. Reactive
[ ] L. Incompatible
[ ] M. Not applicable

III. WASTE TYPE

Category	Substance Name	01 Gross Amount	02 Unit of Measure	03 Comments
SLU	Sludge			This property has been reportedly
OLW	Oily waste			backfilled with graphite, hardened
SOL	Solvents			resins, plastic battery cases,
PSD	Pesticides			heat-treating salts, fly ash,
OCC	Other organic chemicals			plastic tank sludge, and scrap wood
IOC	Inorganic chemicals			to a depth of 5 feet. The amount
ACD	Acids			and characteristics of the waste
BAS	Bases			are unknown.
MES	Heavy Metals			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 Category	02 Substance Name	03 CAS Number	04 Storage/Disposal Method	05 Concentration	06 Measure of Concentration

V. FEEDSTOCKS (See Appendix for CAS Numbers)

Category	01 Feedstock Name	02 CAS Number	Category	01 Feedstock Name	02 CAS Number
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Department files, Niagara Falls, New York.
New York State Department of Environmental Conservation, Division of Solid and Hazardous Waste, Inactive Hazardous Waste Disposal Report.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 State	02 Site Number
NY	932101

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. Groundwater Contamination — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
03 Population Potentially Affected 530 — 04 Narrative Description:

Potential exists if waste is hazardous and leachate enters groundwater system. Well on site was sampled, no contaminants were detected.

01 [X] B. Surface Water Contamination — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
03 Population Potentially Affected ________ — 04 Narrative Description:

Potential exists if waste is hazardous and leachate enters Cayuga Creek, adjacent to site. Surface water is not currently used.

01 [ ] C. Contamination of Air — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

No potential exists; fill is covered with soil and vegetation.

01 [ ] D. Fire/Explosive Conditions — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

No potential exists; waste is covered with soil and vegetation.

01 [ ] E. Direct Contact — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

No potential exists, waste is covered by soil and vegetation.

01 [X] F. Contamination of Soil — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
03 Area Potentially Affected 1-3 (Acres) — 04 Narrative Description:

Potential exists - fill material is in direct contact with soil.

01 [X] G. Drinking Water Contamination — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
03 Population Potentially Affected 100 — 04 Narrative Description:

Potential exists
Wells in area are used for drinking water.

01 [ ] H. Worker Exposure/Injury — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
03 Workers Potentially Affected Unknown — 04 Narrative Description:

No potential exists; waste is covered with soil and vegetation.

01 [ ] I. Population Exposure/Injury — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

No potential exists; fill material is covered with soil and vegetation.

D167

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 State NY

02 Site Number 932101

II. HAZARDOUS CONDITIONS AND INCIDENTS (Cont.)

01 [ ] J. Damage to Flora — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged

04 Narrative Description:

No potential exists, waste is covered with soil and vegetation.

01 [ ] K. Damage to Fauna — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged

04 Narrative Description:

No potential exists, waste is covered with soil and vegetation.

01 [X] L. Contamination of Food Chain — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged

04 Narrative Description:

Potential exists if waste is hazardous and migrates from soil or water to flora in fruit orchard, cornfield and vegetable garden. Well on site is used for irrigation.

01 [X] M. Unstable Containment of Wastes (Spills/Runoff/Standing liquids, Leaking drums) — 02 [ ] Observed (Date ________) [ ] Potential [X] Alleged

03 Population Potentially Affected 15

04 Narrative Description:

Waste is covered by soil and vegetation, waste used for fill material. Residents in the immediate vicinity potentially affected - 3 houses plus one lot used for farming = 4 x 3.8 = 15

01 [X] N. Damage to Offsite Property — 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged

04 Narrative Description:

Potential exists if waste is hazardous and leaches from fill area into adjacent stream and properties.

01 [ ] O. Contamination of Sewers, Storm Drains, WWTPs — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged

04 Narrative Description:

No potential exists, no storm sewers are located near site.

01 [ ] P. Illegal/Unauthorized Dumping — 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged

04 Narrative Description:

No potential exists, this site is a private residence.

05 Description of Any Other Known, Potential, or Alleged Hazards

III. TOTAL POPULATION POTENTIALLY AFFECTED 530 (within one mile)

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E site inspection 6/87. Niagara County Health Department files, Niagara Falls, New York.
Town of Wheatfield, Water District, Wheatfield, New York.

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932101

II. PERMIT INFORMATION

01 Type of Permit Issued (Check all that apply)	02 Permit Number	03 Date Issued	04 Expiration Date	05 Comments
[ ] A. NPDES				
[ ] B. UIC				
[ ] C. AIR				
[ ] D. RCRA				
[ ] E. RCRA Interim Status				
[ ] F. SPCC Plan				
[ ] G. State (Specify)				
[ ] H. Local (Specify)				
[ ] I. Other (Specify)				
[X] J. None				

III. SITE DESCRIPTION

01 Storage Disposal (Check all that apply)	02 Amount	03 Unit of Measure	04 Treatment (Check all that apply)	05 Other
[ ] A. Surface Impoundment			[ ] A. Incineration	[X] A. Buildings On Site
[ ] B. Piles			[ ] B. Underground Injection	1
[ ] C. Drums, Above Ground			[ ] C. Chemical/Physical	
[ ] D. Tank, Above Ground			[ ] D. Biological	
[ ] E. Tank, Below Ground			[ ] E. Waste Oil Processing	
[ ] F. Landfill			[ ] F. Solvent Recovery	06 Area of Site
[ ] G. Landfarm			[ ] G. Other Recycling Recovery	
[ ] H. Open Dump			[ ] H. Other (Specify)	1-3 Acre
[X] I. Other fill material (Specify)	8,000- 24,000 cu yds			

07 Comments

It is not known if fill material contains any hazardous constituents.

IV. CONTAINMENT

01 Containment of Wastes (Check one)

[ ] A. Adequate, Secure [ ] B. Moderate [X] C. Inadequate, Poor [ ] D. Insecure, Unsound, Dangerous

02 Description of Drums, Diking, Liners, Barriers, etc.

Waste was used for fill material - placed directly on land surface and covered.

V. ACCESSIBILITY

01 Waste Easily Accessible: [X] Yes [ ] No

02 Comments:

Waste covered by soil and vegetation but the thickness of cover is unknown.

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Department files, Niagara Falls, New York.
E & E site inspection 6/87.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State	02 Site Numbe
NY	932101

II. DRINKING WATER SUPPLY

01 Type of Drinking Supply (Check as applicable)	Surface	Well	02 Status Endangered	Affected	Monitored
Community	A. [X]	B. [ ]	A. [ ]	B. [ ]	C. [X]
Non-community	C. [ ]	D. [X]	D. [ ]	E. [ ]	F. [ ]

03 Distance to Site

A 5.5 (mi)

B 1/2 mile (m

III. GROUNDWATER

01 Groundwater Use in Vicinity (Check one)

[ ] A. Only Source for Drinking

[X] B. Drinking (Other sources available) Commercial, Industrial, Irrigation (No other water sources available)

[ ] C. Commercial, Industrial, Irrigation (Limited other sources available)

[ ] D. Not Used, Unuseable

02 Population Served by Groundwater 100 - 110

03 Distance to Nearest Drinking Water well 0.10 (mi

04 Depth to Groundwater 6 (ft)

05 Direction of Groundwater Flow Southwest

06 Depth to Aquifer of Concern 13 (ft)

07 Potential Yield of Aquifer Unknown (gpd)

08 Sole Source Aquifer [ ] Yes [X] N

09 Description of Wells (Including usage, depth, and location relative to population and buildings)

One well on site used for irrigation of garden and fruit trees.
Wells within 3 miles of site are used for drinking, depths and aquifers may vary. Wells occur in semi-rural residential areas.

10 Recharge Area

[X] Yes
[ ] No

Comments: Unconsolidated deposits aquifer is recharged with precipitation

11 Discharge Area

[X] Yes
[ ] No

Comments: Some discharge may occur into Cayuga Creek

IV. SURFACE WATER

01 Surface Water (Check one)

[ ] A. Reservoir Recreation Drinking Water Source

[ ] B. Irrigation Economically Important Resources

[ ] C. Commercial, Industrial

[X] D. Not Currentl Used

02 Affected/Potentially Affected Bodies of Water

Name:	Affected	Distance to Site
Cayuga Creek	[ ]	0 (mi
Niagara River	[ ]	3.5 (mi
	[ ]	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 Total Population Within

One (1) Mile of Site	Two (2) Miles of Site	Three (3) Miles of Site
A. 530 No. of Persons	B. 3,162 No. of Persons	C. 26,743 No. of Persons

02 Distance to Nearest Population 0.1 (mi)

03 Number of Buildings Within Two (2) Miles of Site 1,181

04 Distance to Nearest Off-Site Building 1/10 (mi)

05 Population Within Vicinity of Site (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Site is located in a semi rural area. Niagara Falls Air Force Base is adjacent to Walmore Road. The city of Niagara Falls is approximately 1-1/2 miles to the southwest.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State
NY

02 Site Numbe
932101

VI. ENVIRONMENTAL INFORMATION

01 Permeability of Unsaturated Zone (Check one)

[ ] A. 10^{-6} - 10^{-8} cm/sec [X] B. 10^{-4} - 10^{-6} cm/sec [ ] C. 10^{-4} - 10^{-3} cm/sec [ ] D. Greater Than 10^{-3} cm/sec

02 Permeability of Bedrock (Check one)

[ ] A. Impermeable (Less than 10^{-6} cm/sec)
[ ] B. Relatively Impermeable (10^{-4} - 10^{-6} cm/sec)
[X] C. Relatively Permeable (10^{-2} - 10^{-4} cm/sec)
[ ] D. Very Permeable (Greater than 1C cm/sec)

03 Depth to Bedrock
Unknown (ft)

04 Depth of Contaminated Soil Zone
Unknown (ft)

05 Soil pH
5.6 - 7.6

06 Net Precipitation
4 (in)

07 One Year 24-Hour Rainfall
2.5 (in)

08 Slope
Site Slope 2 %
Direction of Site Slope NW
Terrain Average Slop 2 %

09 Flood Potential
Site is in 100 Year Floodplain

10
[ ] Site is on Barrier Island, Coastal High Hazard Area, Riverine Floodway

11 Distance to Wetlands (5 acre minimum)

ESTUARINE A. NA (mi)
OTHER B. 2-1/4 (mi)

12 Distance to Critical Habitat (of Endangered Species)

NA (mi)

Endangered Species:

13 Land Use in Vicinity

Distance to:

COMMERCIAL/INDUSTRIAL A. 1/10 (mi)
RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES B. 0 (mi)
AGRICULTURAL LANDS
PRIME AG LAND C. 0 (mi)
AG LAND D. 0 (mi)

14 Description of Site in Relation to Surrounding Topography

This site is located in an essentially flat area, but the property is bounded on the northwest by Cayuga Creek and a Conrail railroad track embankment to the northeast. Rainwater runoff is expected to enter Cayuga Creek, which flows southwest to Niagara River. Walmore Road forms the western site boundary.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

USGS 7.5 minute topographic maps, Ransomville and Tonawanda West Quads
Uncontrolled Hazardous Waste Site Ranking System, A User's Manual
FEMA - Flood Insurance Maps
Soil Survey of Niagara County, New York
New York State DEC Region 9, Wildlife Section
Graphic Exposure Modeling System, 6/87, EPA, Federal Plaza, New York, New York.
Niagara County Department of Health, Niagara Falls, New York.
Town of Wheatfield Water Department, Wheatfield, New York.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932101

II. SAMPLES TAKEN

Sample Type	01 Number of Samples Taken	02 Samples Sent to	03 Estimated Date Results Available
Groundwater		No samples taken during site inspection	
Surface Water			
Waste			
Air			
Runoff			
Spill			
Soil			
Vegetation			
Other			

III. FIELD MEASUREMENTS TAKEN

01 Type	02 Comments
Air	Air monitoring was performed on site with an HNu photoionization detector while conducting a site inspection. No readings above background were noted.

IV. PHOTOGRAPHS AND MAPS

01 Type ☒ Ground ☐ Aerial

02 In Custody of Ecology and Environment
(Name of organization or individual)

03 Maps
☒ Yes
☐ No

04 Location of Maps
New York State DEC, Region 9, and Ecology and Environment, Buffalo

V. OTHER FIELD DATA COLLECTED (Provide narrative description of sampling activities)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Dept. files
E & E site inspection 6/87

D167c

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932101

II. CURRENT OWNER(S)			PARENT COMPANY (If applicable)		
01 Name Dean Johnson	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 4425 Miller Road	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code 14304	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code

III. PREVIOUS OWNER(S) (List most recent first)			IV. REALTY OWNER(S) (If applicable, list most recent first)		
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Dept. files

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932101

II. CURRENT OPERATOR (Provide if different from owner)

01 Name
02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)
04 SIC Code
05 City
06 State
07 Zip Code
08 Years of Operation
09 Name of Owner

OPERATOR'S PARENT COMPANY (If applicable)

10 Name
11 D+B Number
12 Street Address (P.O. Box, RFD #, etc.)
13 SIC Code
14 City
15 State
16 Zip Code

III. PREVIOUS OPERATOR(s) (List most recent first; provide only if different from owner)

01 Name
02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)
04 SIC Code
05 City
06 State
07 Zip Code
08 Years of Operation
09 Name of Owner During This Period

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 Name
11 D+B Number
12 Street Address (P.O. Box, RFD #, etc.)
13 SIC Code
14 City
15 State
16 Zip Code

01 Name
02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)
04 SIC Code
05 City
06 State
07 Zip Code
08 Years of Operation
09 Name of Owner During This Period

10 Name
11 D+B Number
12 Street Address (P.O. Box, RFD #, etc.)
13 SIC Code
14 City
15 State
16 Zip Code

01 Name
02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)
04 SIC Code
05 City
06 State
07 Zip Code
08 Years of Operation
09 Name of Owner During This Period

10 Name
11 D+B Number
12 Street Address (P.O. Box, RFD #, etc.)
13 SIC Code
14 City
15 State
16 Zip Code

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 State NY

02 Site Number 932101

II. ON-SITE GENERATOR

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

III. OFF-SITE GENERATOR(S)

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

IV. TRANSPORTER(S)

01 Name
Haseley Trucking Company

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

56106

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State	02 Site Number
NY	932101

II. PAST RESPONSE ACTIVITIES

01 [ ] A. Water Supply Closed 02 Date ________ 03 Agency ________
04 Description:

01 [ ] B. Temporary Water Supply Provided 02 Date ________ 03 Agency ________
04 Description:

01 [ ] C. Permanent Water Supply Provided 02 Date ________ 03 Agency ________
04 Description:

01 [ ] D. Spilled Material Removed 02 Date ________ 03 Agency ________
04 Description:

01 [ ] E. Contaminated Soil Removed 02 Date ________ 03 Agency ________
04 Description:

01 [ ] F. Waste Repackaged 02 Date ________ 03 Agency ________
04 Description:

01 [ ] G. Waste Disposed Elsewhere 02 Date ________ 03 Agency ________
04 Description:

01 [ ] H. On Site Burial 02 Date ________ 03 Agency ________
04 Description:

01 [ ] I. In Situ Chemical Treatment 02 Date ________ 03 Agency ________
04 Description:

01 [ ] J. In Situ Biological Treatment 02 Date ________ 03 Agency ________
04 Description:

01 [ ] K. In Situ Physical Treatment 02 Date ________ 03 Agency ________
04 Description:

01 [ ] L. Encapsulation 02 Date ________ 03 Agency ________
04 Description:

01 [ ] M. Emergency Waste Treatment 02 Date ________ 03 Agency ________
04 Description:

01 [ ] N. Cutoff Walls 02 Date ________ 03 Agency ________
04 Description:

01 [ ] O. Emergency Diking/Surface Water Diversion 02 Date ________ 03 Agency ________
04 Description:

01 [ ] P. Cutoff Trenches/Sump 02 Date ________ 03 Agency ________
04 Description:

01 [ ] Q. Subsurface Cutoff Wall 02 Date ________ 03 Agency ________
04 Description:

D1676

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State NY

02 Site Number 932101

II. PAST RESPONSE ACTIVITIES (Cont.)

01 [ ] R. Barrier Walls Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] S. Capping/Covering 02 Date ______ 03 Agency ______
04 Description:

01 [ ] T. Bulk Tankage Repaired 02 Date ______ 03 Agency ______
04 Description:

01 [ ] U. Grout Curtain Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] V. Bottom Sealed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] W. Gas Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] X. Fire Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Y. Leachate Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Z. Area Evacuated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 1. Access to Site Restricted 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 2. Population Relocated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 3. Other Remedial Activities 02 Date ______ 03 Agency ______
04 Description:

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

56106

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Numbe 932101

II. ENFORCEMENT INFORMATION

01 Past Regulatory/Enforcement Action [ ] Yes [X] No

02 Description of Federal, State, Local Regulatory/Enforcement Action

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

D16

6

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

After assessing the information gathered for this site and applying it to an HRS worksheet, it is determined that the existing information is not adequate to accurately score the site, and that further investigations are necessary to determine a proper HRS score.

Since no sampling of any kind (except one well water sample collected in 1985) from the landfill area is known to have taken place, E & E recommends a screening program consisting of several soil and water samples collected at a depth of at least 5 feet into the disposal area and analyzed for priority pollutants and hazardous waste characteristics of ignitability, reactivity, corrosivity, and EP Toxicity. A more comprehensive sampling program could be undertaken if hazardous wastes are found.

These data can be used to generate a more accurate HRS score.

7

7. REFERENCES

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__________, Niagara County Health Department, February 15, 1985, personal communication to Mr. Dean Johnson, 6373 Walmore Road, Wheatfield, New York.

__________, personal communication, 1987, Niagara County Health Department.

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Johnston, R.H., 1964, Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resources Commission, Bulletin GW-53.

Koszalka, E.J., J.E. Paschal, T.S. Miller, P.B. Duran, March 1985, *Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste Disposal Sites*, USEPA, EPA-905/4-85-001.

Murtagh, William, 1976, *The National Registry of Historic Places*, U.S. Department of the Interior, National Parks Service, Washington, D.C.

New York State Department of Environmental Conservation, December 1986, Division of Solid and Hazardous Waste, Disposal Report.

Popovici, Michael, Niagara County Health Department, January 15, 1985, personal communication to Mr. James Johnson, 6381 Walmore Road, Niagara Falls, New York.

Rusin, Linda, 1987, personal communication, New York State Department of Health, Buffalo, New York.

Snider, James, 1987, personal communication, Wildlife Biologist, NYSDEC, Region 9, Buffalo, New York.

USGS, 7.5-minute topographical map, 1980, Tonawanda West, New York quadrangle.

Walck, Norman, 1987, personal communication, Town of Wheatfield Water Superintendent.

Appendices

APPENDIX A

PHOTOGRAPHIC RECORDS

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: New York State Department of Conservation

E & E Job No.: ND2031

Camera: Make

SN:

Photographer: Dennis Sutton

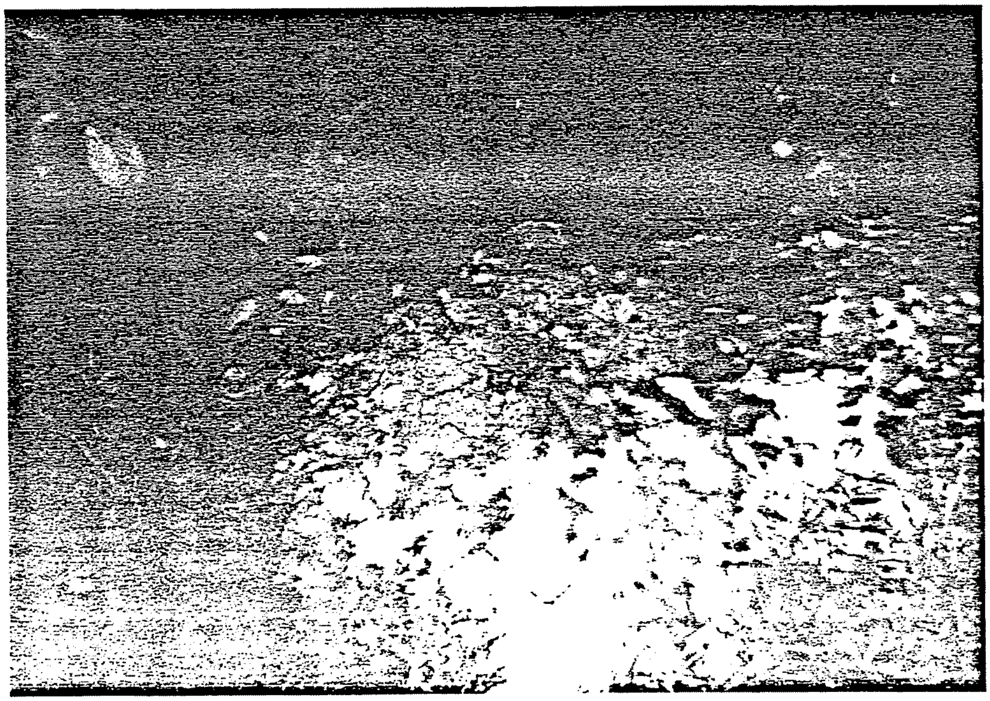
Date/Time: 6-24-87/12:30

Lens: Type:

SN:

Frame No.: 9

Comments*: View east from Walmore Road; Cayuga Creek on left. Filled area on right. 6373 Walmore Road residence in background.



Photographer: Dennis Sutton

Date/Time: 6-24-87/12:35

Lens: Type:

SN:

Frame No.: 10

Comments*: Small pile of possible fill material on bank to the north of residence. Asphalt, concrete, wood scrap is evident.

*Comments to include location

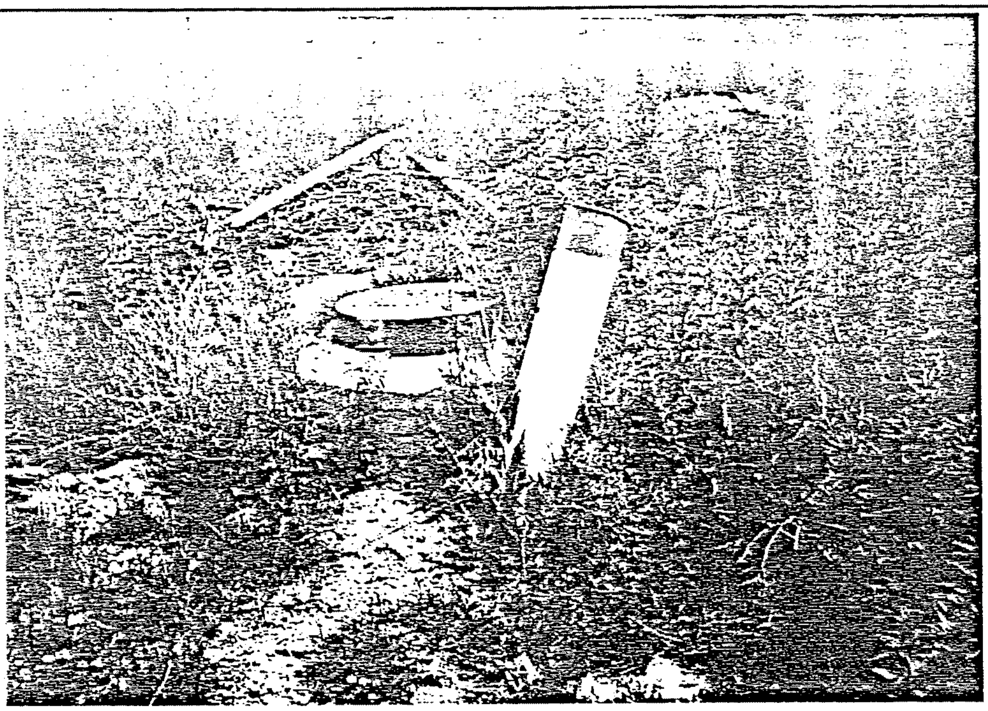
PHOTOGRAPHIC RECORD

Client: New York State Department of Conservation

E & E Job No.: ND2031

Camera: Make

SN:



Photographer: Dennis Sutton

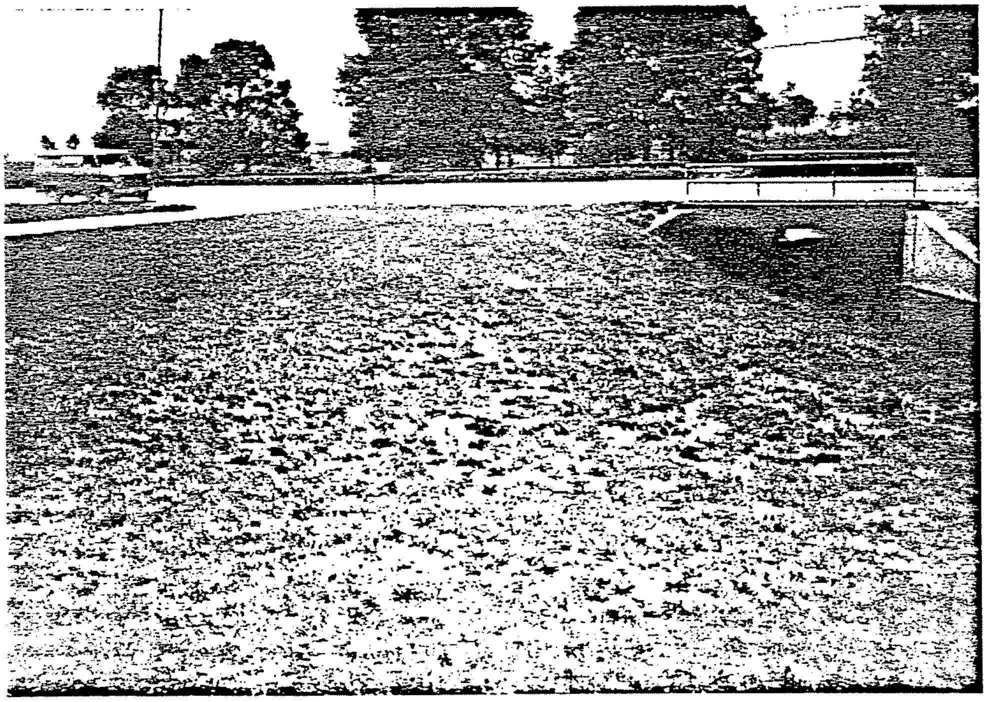
Date/Time: 6-24-87/12:40

Lens: Type:

SN:

Frame No.: 11

Comments*: Water well located 50 feet NW of residence. Water was observed in well. Railroad embankment in distant background.



Photographer: Dennis Sutton

Date/Time: 6-24-87/12:35

Lens: Type:

SN:

Frame No.: 12

Comments*: View of frontyard containing fill material. View is to the west from the vicinity of the residence. Cayuga Creek is to the right.

*Comments to include location

D1676

ecology and environment, inc.

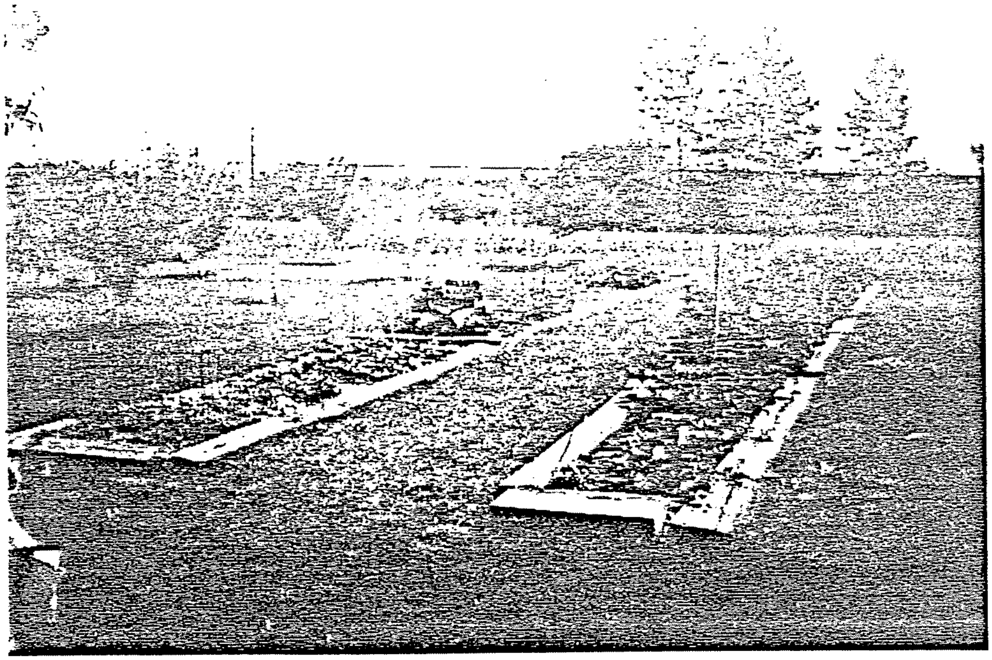
PHOTOGRAPHIC RECORD

Client: New York State Department of Conservation

E & E Job No.: ND2031

Camera: Make

SN:



Photographer: Dennis Sutton

Date/Time: 6-24-87/12:49

Lens: Type:

SN:

Frame No.: 13

Comments*: View to the east from east side of residence showing healthy vegetable garden and orchard. These crops reportedly irrigated with well water.

*Comments to include location

APPENDIX B

UPDATED INACTIVE HAZARDOUS WASTE DISPOSAL SITE REGISTRY FORM

47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

Priority Code: 2a Site Code: 932101

Name of Site: Walmore Road - Johnson Property Region: 9

Street Address: 6373 Walmore Road

Town/City: Wheatfield County: Niagara

Name of Current Owner of Site: Dean Johnson

Address of Current Owner of Site: 4425 Miller Road, Niagara Falls, NY 14304

Type of Site: [ ] Open Dump [ ] Structure [ ] Lagoon
[X] Landfill [ ] Treatment Pond

Estimated Size: 1-3 acre(s)

Site Description:

One to 3 acres of this site received up to 5 feet of industrial fill, including graphite, hardened resin, and plastic battery cases. Analysis of a private water well on site showed no total halogenated organic compound, lead, chromium, or cadmium contamination.

Hazardous Waste Disposed: [ ] Confirmed [X] Suspected

Type and Quantity of Hazardous Wastes Disposed:

Type	Quantity (Pounds, Drums, Tons, Gallons)
Graphite	Unknown
Hardened resins	Unknown
Plastic battery cases	Unknown
Plastic Tank sludge	Unknown
Fly Ash	Unknown
Heat-Treating salt	Unknown

Time Period Site was Used for Hazardous Waste Disposal:

Unknown, 19___ To __________, 19___

Owner(s) During Period of Use: Dean Johnson

Site Operator During Period of Use: Dean Johnson

Address of Site Operator: 6373 Walmore Road, Wheatfield, New York

Analytical Data Available: [ ] Air [ ] Surface Water [X] Groundwater
[ ] Soil [ ] Sediment [ ] None

Contravention of Standards: [ ] Groundwater [ ] Drinking Water
[ ] Surface Water [ ] Air

Soil Type: Schoharie silty clay loam

Depth to Groundwater Table: 6 feet

Legal Action: Type: None [ ] State [ ] Federal

Status: [ ] In Progress [ ] Completed

Remedial Action: [ ] Proposed [ ] Under Design
[ ] In Progress [ ] Completed

Nature of Action: __________

Assessment of Environmental Problems:

Unknown

Assessment of Health Problems:

Unknown

Person(s) Completing This Form:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Name:
Title:
Name:
Title:
Date:

NEW YORK STATE DEPARTMENT OF HEALTH

Name:
Title:
Name:
Title:
Date:

APPENDIX C

PHOTOCOPIED REFERENCES

The National Register of Historic Places

1976

Irene Lewishon to carry forward their work in drama and dance with local children. *Multiple public/private:* NHL.

NIAGARA COUNTY

Lewiston. **FRONTIER HOUSE**, 460 Center St., 1824–1826. Stone, 3 1/2 stories, rectangular; gabled roof with stepped gables, paired chimneys, and balustrade; off-center and center entrances, full-width front porch with hipped roof, regular fenestration, oval windows in gables; N kitchen wings. Federal elements. Built as a tavern for Joshua Fairbanks and Benjamin and Samuel Barton, local prominent businessmen. *Private.*

Lewiston. **LEWISTON MOUND**, Lewiston State Park, Hopewellian affinities (c. 160). Oval burial mound. Partially investigated. *County.*

Lewiston vicinity. **LEWISTON PORTAGE LANDING SITE**, Prehistoric–19th C.. Gently sloping ravine leading from river remains of path used by travelers to avoid Niagara Falls. Archeological explorations yielded artifacts from Indian to British occupation, indicating this was a heavily used access point to a vital overland route. *State.*

Lockport. **LOWERTOWN HISTORIC DISTRICT**, Roughly bounded by Erie Canal and New York Central RR., 19th–20th C.. Primarily residential district, with some religious and commercial buildings and warehouses; facing the canal-are 2 1/2-story brick and stone residences with Greek Revival and Italianate elements built in the 1830's; off the canal are 1–2-story frame structures with additions and modern siding built mid-19th C. and some stone structures: notable are the Gothic Revival former Christ Episcopal Church (1854) and the Italianate Vine Street School (1864). Systematic development of the village began after canal opened; district was Lockport's social, commercial, and industrial center, 1830's–1860's. *Multiple public/private:* HABS.

Lockport. **MOORE, BENJAMIN C., MILL (LOCKPORT CITY HALL; HOLLY WATER WORKS)** , Pine St. on the Erie Canal, 1864. Coursed rubble, 2 1/2 stories over basement on sloping site, trapezoidal shape, hipped roof sections with cross gables, interior chimney; front center entrance with transom and pediment on pilasters, triple round arched windows in gables, rock-faced stone lintels and sills, ashlar quoins; interior altered; rear 2-story addition 1893. Built as a flour mill, converted c. 1885 to a water pumping plant; adapted as city hall 1893; one of few survivors of 25 industrial buildings once clustered along this section of Erie Canal. *Municipal.*

Niagara Falls. **DEVEAUX SCHOOL COMPLEX**, 2900 Lewiston Rd., 1855–1888. Educational complex; contains 3 connected structures–Van Rensselaer Hall (1855–1857), Patterson Hall (1866), and Munro Hall (1888); and outbuildings–barn, shed, and gymnasium. Gothic Revival elements. Founded by Judge Samuel DeVeaux as an Episcopal school for poor and orphaned boys; later became a prominent preparatory school; closed, 1971. *Private.*

Niagara Falls. **NIAGARA FALLS PUBLIC LIBRARY**, 1022 Main St., 1902–1904, E. E. Joralemon, architect. Stone, yellow brick; 1 story, rectangular with semielliptical rear bow, flat roof with parapet, slightly projecting center entrance bay with pedimented double doorway, pedimented windows, string courses; fine interior detail intact. Neo-Classical Revival elements. One of many public libraries endowed by Andrew Carnegie. *Public.*

Niagara Falls. **NIAGARA RESERVATION**, 1885. Includes the falls, Goat Island and other islets, paths, and an observation tower. In establishing a reservation of over 400 acres, New York became the first state to use eminent domain powers to acquire land for aesthetic purposes. *State:* NHL.

Niagara Falls. **SHREDDED WHEAT OFFICE BUILDING**, 430 Buffalo Ave., 1900. Steel frame, brick; 5 stories, rectangular, flat roof, center entrance, 5 paired window bays, segmental arched basement windows, wide parapet; interior featured 4th-floor auditorium and 5th-floor cafeteria; doubled glazed windows. Commercial style. Administrative office building of original Shredded Wheat factory complex, developed by Henry D. Perky. *Private.*

Niagara Falls. **U.S. CUSTOMHOUSE**, 2245 Whirlpool St., 1863. Stone, 2 1/2 stories, square, hipped roof, arched window and door openings on W facade; built into railroad embankment, S side opens onto railroad tracks; renovated, 1928. Continues to serve as customs office for trains from Canada. *Private:* HABS.

Niagara Falls. **WHITNEY MANSION**, 335 Buffalo Ave., 1849–1851. Limestone, 2 1/2 stories, L-shaped, intersecting gabled roof sections; original section has off-center entrance with full-width Ionic portico; 19th C. side addition has front bay window and gabled dormer with 3 round arched windows. Greek Revival. Built according to 1830's design by Solon Whitney, son of Gen. Parkhurst Whitney, village founder and prominent hotel and tavern owner. *Private.*

Youngstown vicinity. **OLD FORT NIAGARA**, N of Youngstown on NY 18, 1678. Complex of stone buildings bounded by stone walls, earthworks, and a moat; restored Original fort built in 1678; altered 1725–1726 and 1750–1759. Held alternately by French, British, and Americans in struggle for control of continent; strategically located in commanding the Great Lakes from Lake Erie to Ontario and in covering approaches to western NY. *State:* NHL.

ONEIDA COUNTY

Boonville. **ERWIN LIBRARY AND PRATT HOUSE**, 104 and 106 Schuyler St., 1890, C. L. Vivian (Erwin Library); 1875, J. B. Lathrop (Pratt House). Erwin Library: limestone, 1 story, gabled and hipped roofs; square tower with pyramidal roof contains recessed arched entrance. Romanesque Pratt House: brick, 3 stories, mansard roof with dormers and central tower crowned with iron cresting and spire, ornate bracketed cornices and metal lintels; original interior wall coverings, fixtures, and woodwork. Second Empire. *Private.*

Boonville. **FIVE LOCK COMBINE AND LOCKS 37 AND 38, BLACK RIVER CANAL (BOONVILLE GORGE PARK)** , NY 46, 19th–20th C.. Section of the abandoned Black River Canal (built mid-19th C.) running through rugged terrain of Boonville Gorge; contains locks 37 and 38 and a 5-lock combine (locks 39–43); canal was 42' deep; locks, 90' by 15', which accommodate 70-ton boats, were built 1895–early 1900's. Canal built to connect Black River Valley to Erie Canal provided water supply for Erie Canal, allowed expansion of valley's lumbering industry, and fostered growth of towns. *State/county:* HAER.

Clinton. **HAMILTON COLLEGE CHAPEL**, Hamilton College campus, 1827, Philip Hooker, architect. Coursed rubble, 3 stories, rectangular, low pitched roof, interior chimney, modillion cornice, front and rear parapet; front slightly projecting 4-story clock tower with 3-stage frame belfry -2 stories, each with columns and entablature, surmounted by octagonal cupola; front center double-door entrance with round arched window above, flanked by tall round arched windows, blind decorative frame panels; limestone ashlar quoins, lintels, and sills; side elevations with 3 tiers of windows; apse added 1897; interior altered. Federal. Multipurpose classroom and chapel building designed by Philip Hooker; unusual 3-story interior plan attributed to John H. Lothrop, a trustee. *Private.*

Clinton. **ROOT, ELIHU, HOUSE**, 101 College Hill Rd., 1817. Frame, clapboarding; 2 stories irregular shape, gabled roof, interior chimneys; pedimented arched portico, off-center entrance with semielliptical fanlight and side lights, 2-story pilasters dividing bays in flush-sided mair facade, pedimented rear porch; side additions restored, 1900's. Federal. Home of Elihu Root, U.S. Secretary of War largely credited with conceptual foundation for 20th C. developmen of American Army, Secretary of State, U.S senator, and winner of 1912 Nobel Peace Prize. *Private; not accessible to the public:* NHL.

Rome. **ARSENAL HOUSE**, 514 W Dominic St., c. 1813–1814. Brick, 2 1/2 stories, rectangular, gabled roof, pairs of bridged interior end chimneys above single gable steps, central pedimented gable with elliptical window, 2 vertica elliptical windows in gabled ends betwee chimneys, stone sills and lintels; later front porch with large modillion blocks, chamfered

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

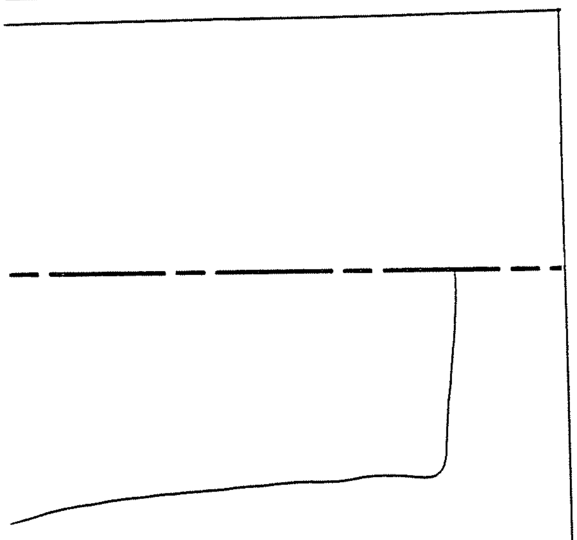
TOWN OF
WHEATFIELD,
NEW YORK
NIAGARA COUNTY

PANEL 1 OF 9

COMMUNITY-PANEL NUMBER
360513 0001 B

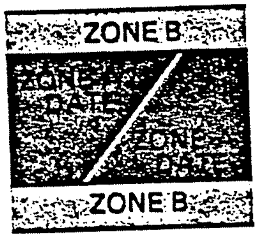
EFFECTIVE DATE:
JULY 16, 1981

federal emergency management agency
federal insurance administration



KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary



Base Flood Elevation Line With Elevation In Feet**	~~~~513~~~~
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

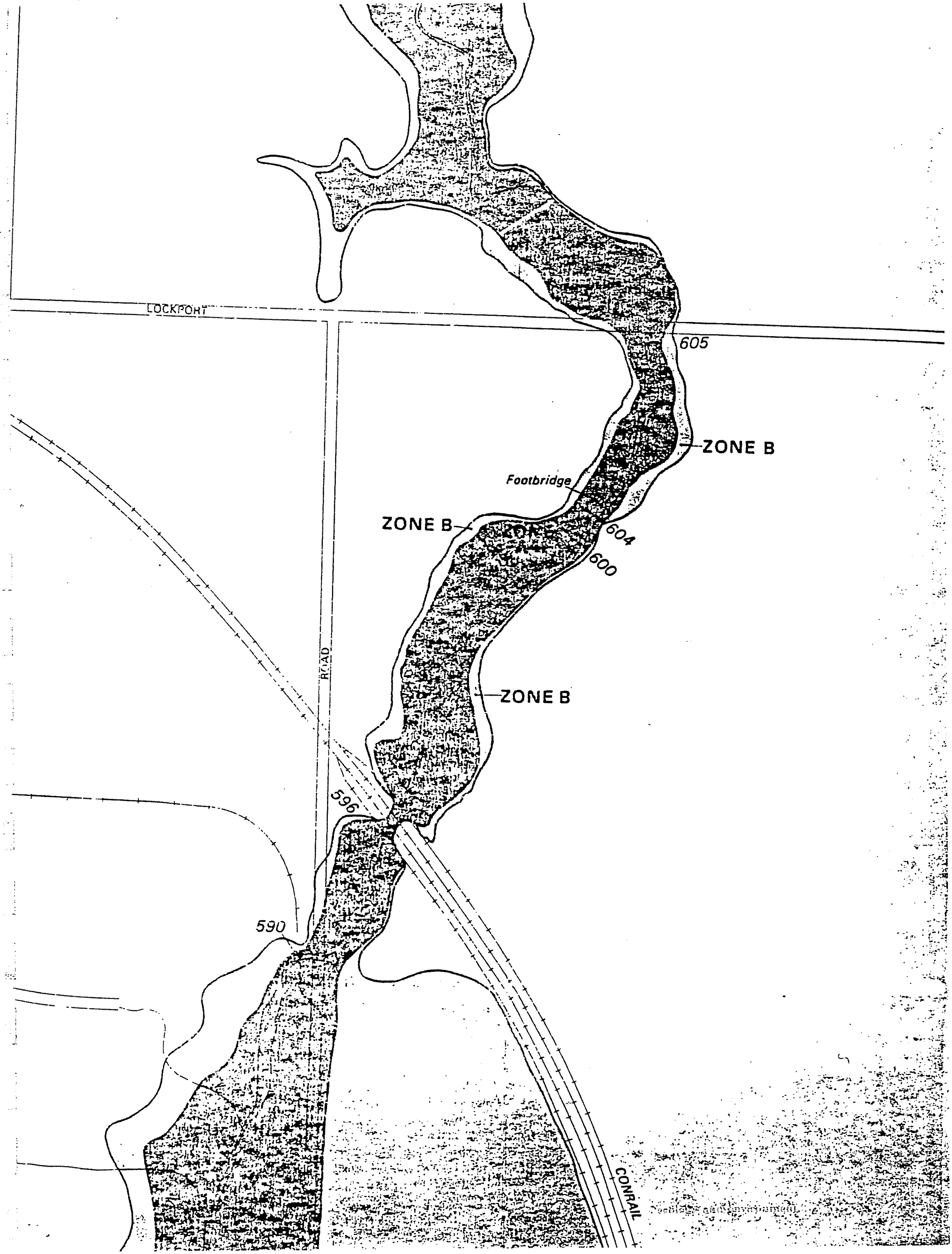
NOTES TO USER

Certain areas not in the special flood hazard areas ~~(zones A and V)~~ may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JANUARY 16, 1974

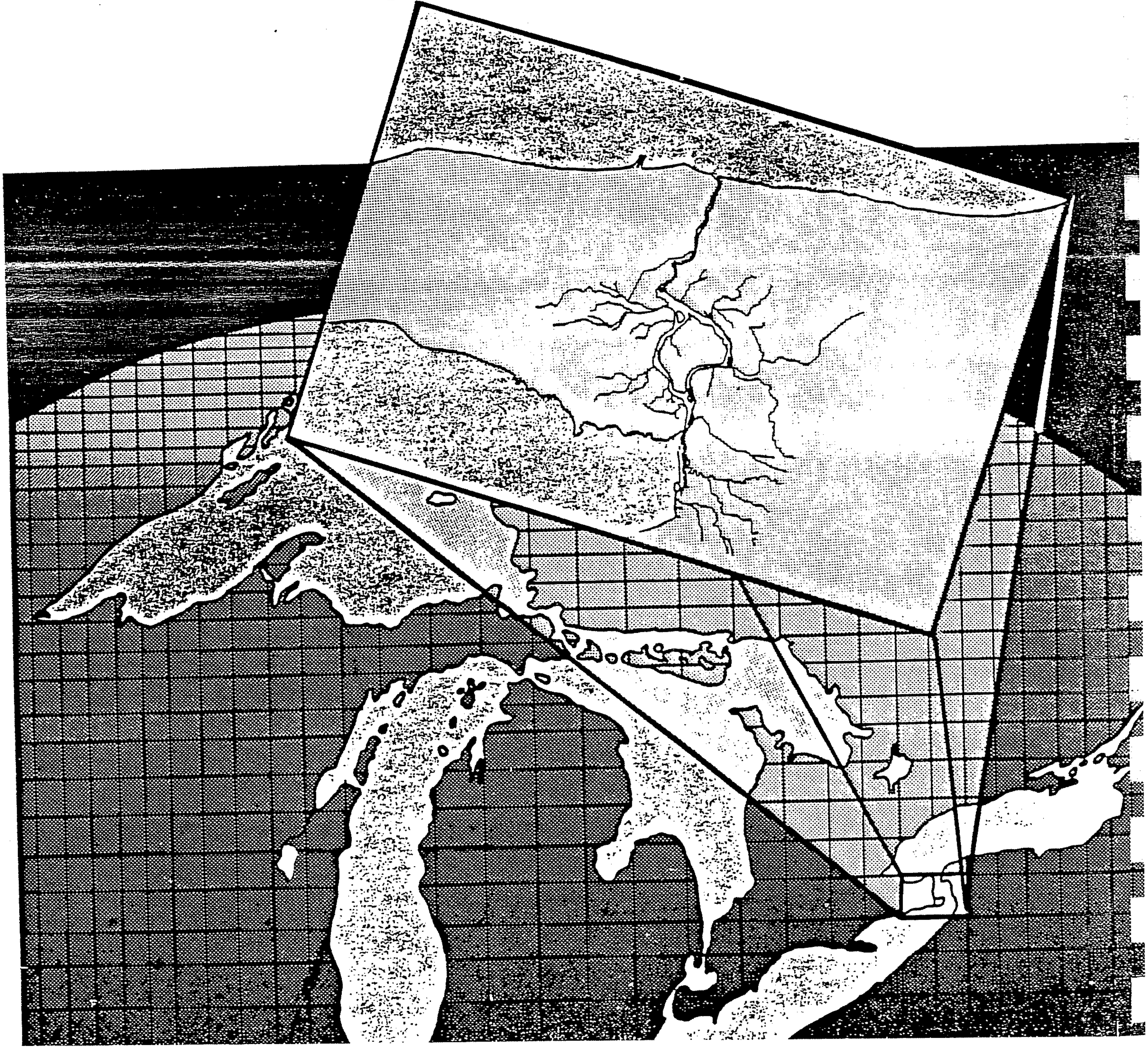

LOCKPORT
ROAD
605
ZONE B
Footbridge
ZONE B
604
600
ZONE B
596
590
CONRAIL

United States
Environmental Protection
Agency

Great Lakes National
Program Office
536 South Clark Street
Chicago, Illinois 60605

EPA-905/4-85-001
March 1985

Preliminary Evaluation Of Chemical Migration To Groundwater and The Niagara River from Selected Waste-Disposal Sites



8. CARBORUNDUM, BUILDING 82 (Literature review) NYSDEC 932048-b

General information and chemical-migration potential.--Building 82 is at Carborundum's Buffalo Avenue Plant in Niagara Falls. The area south of Building 82 is used as a transfer point for general waste products, which include silicon dust and fibers. The waste is sent away for disposal. No geologic, hydrologic, or chemical information is available. The potential for contaminant migration is indeterminable.

9. CARBORUNDUM--ABRASIVE DIVISION (Literature review) NYSDEC 932007

General information and chemical-migration potential.--The Carborundum-Abrasive Division site, in the town of Wheatfield, was an open dump used during 1968-76 to dispose of 800 to 1,600 pounds of phenols and 400 tons of solidified resins, floor sweepings, and waste fillers, including calcium carbonate, clays, and animal glue. This site has been remediated through the installation of a clay cap, which was joined to the silty clay around the site. The potential for contaminant migration is indeterminable.

Geologic information.--The site consists of clay and silty fill underlain by a silty lacustrine clay, which is in turn underlain by a discontinuous layer of till. These units overlie bedrock of Lockport Dolomite. A geologic cross section is shown in figure C-4.

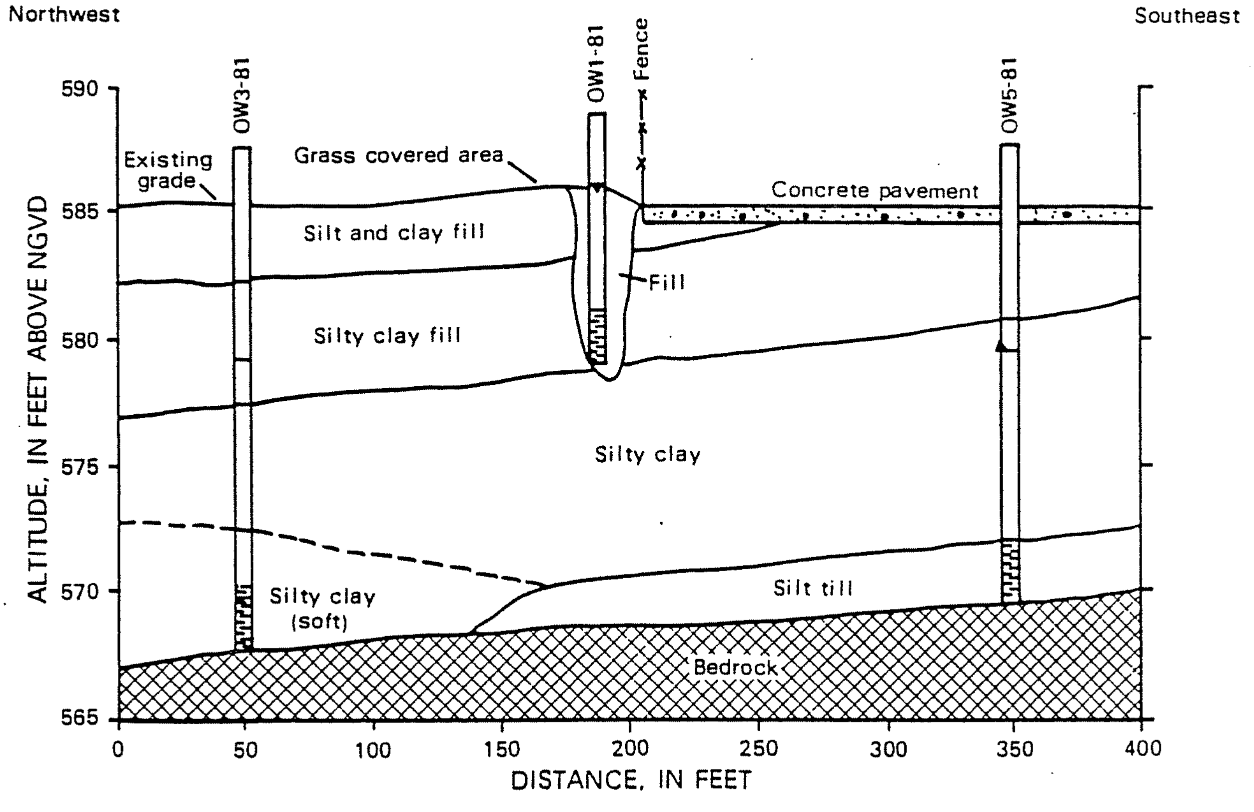
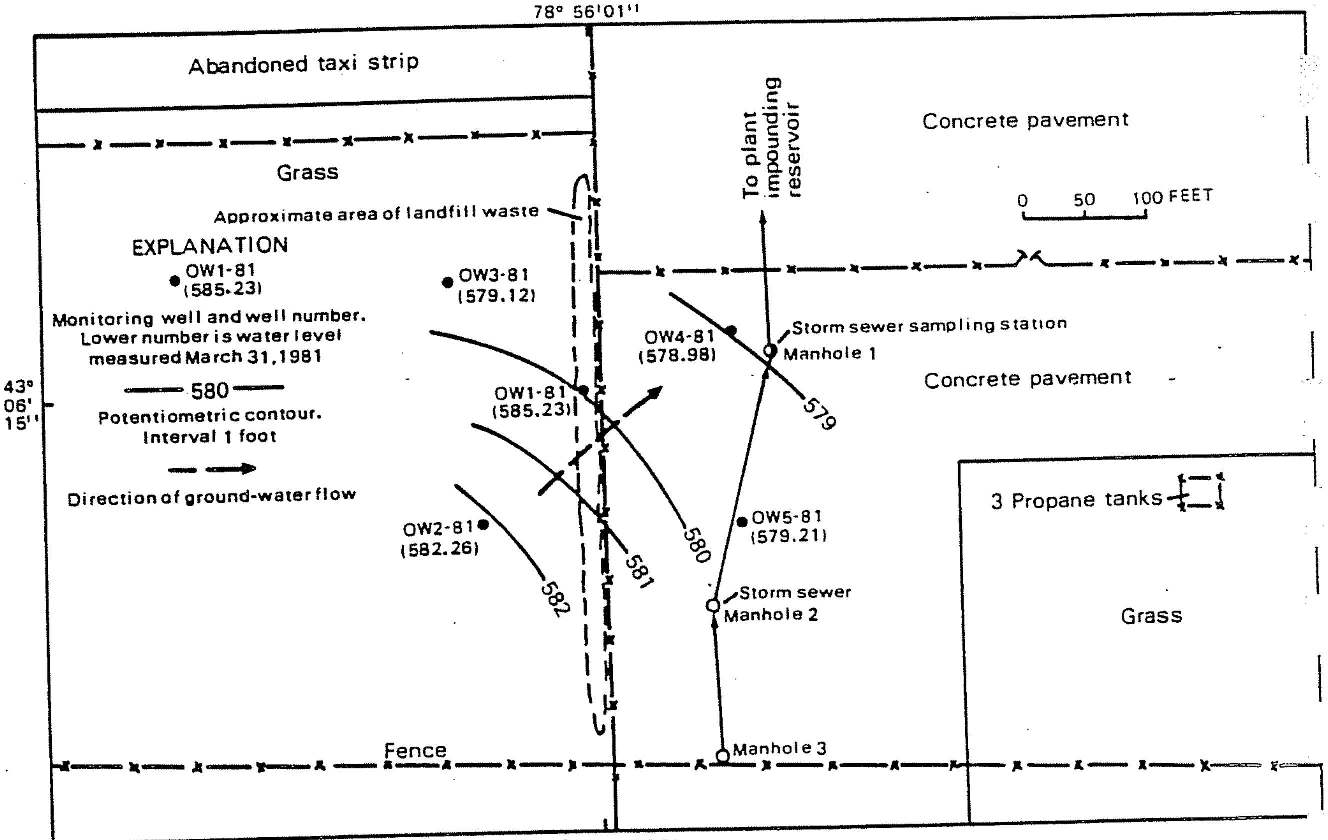


Figure C-4. Geologic cross section of formations underlying Carborundum-Abrasive Division, site 9, Wheatfield. (Modified from Conestoga-Rovers and Assoc., 1981.)

Hydrologic information.--The property owners installed five monitoring wells on the site; locations are shown in figure C-5. Water-level measurements taken 1981 indicate ground-water flow to be northeastward. The potentiometric contours and direction of ground-water flow are given in fig. C-5.



Base and data from Conestoga-Rovers and Associates, 1981

Figure C-5. Potentiometric surface at the overburden-bedrock interface and location of monitoring wells at Carborundum-Abrasive Division, site 9, Wheatfield.

Chemical information.--Advanced Environmental Systems collected eight groundwater samples from each of the five monitoring wells and three manholes five times from February through November 1981 for phenol analysis; results are s in table C-4.

Source of data.--Conestoga-Rovers and Associates, 1981, Hydrogeologic invest tion, Landfill site, Carborundum: Toronto City, 25 p., 1 append.

COPY

NIAGARA COUNTY
HEALTH DEPARTMENT
5467 UPPER MOUNTAIN ROAD
LOCKPORT, NEW YORK 14094

PATRICIA M. POWELL
Public Health Director
716-439-6129

January 15, 1985

Mr. James Johnson
6381 Walmore Road
Niagara Falls, New York 14304

Re: Unsafe Private Water Supply
6381 Walmore Road
Town of Wheatfield

Dear Mr. Johnson:

On January 8, 1985, Mr. Stimson of this department made a sanitary survey of the well utilized as a source of private water supply for your residence at the above location. During this inspection, a sample of water was collected and submitted to the Niagara County Laboratory for bacterial examination. It is reported that organisms of the coliform group were present at the time of sampling, indicating that the supply was contaminated and unfit for human consumption at the time of sampling.

Inas much as the report of the survey indicates that this well is properly constructed and properly located with respect to known sources of pollution, it is quite possible that the contamination in this supply is of incidental origin. We would, therefore, suggest that this well be thoroughly disinfected in accordance with the enclosed instructions and this office notified so that a new sample may be taken. Until such time as a sanitary survey, confirmed by a bacterial analysis, indicates that this supply is of a safe sanitary quality, all water from it should be boiled before being used for human consumption, or culinary purposes.

Very truly yours,

Michael Popovici
Supervisory Public
Health Sanitarian

MP/cg
Enclosures

ecology and environment, inc.

195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL 716-632-4491, TELEX 91-9183

International Specialists in the Environment

July 6, 1987

Mrs. Debbie Johnson
2 Cranston Street
Worcester, MA 01602

Dear Mrs. Johnson:

Thank you for calling last Friday, June 26, 1987 to provide information to Ecology and Environment, Inc. (E & E) concerning the Johnson property on Walmore Road in the Town of Wheatfield. To restate our role, E & E is working under a contract from the New York State Department of Environmental Conservation (DEC) to investigate suspected waste disposal sites in western New York. The Johnson property (specifically 6373 Walmore Road) is on the registry of such sites at the request of the owner, Mr. Dean Johnson, who suspected that industrial wastes may have been used as fill during the development of the property. For future reference, the DEC site code for this property is 932094. Any questions about the site or this investigation should be referred directly to the DEC.

With this letter, we would like to confirm the information you provided us over the telephone. This information is listed in Attachment 1. To provide sufficient documentation of this information, the DEC requires that we ask you to sign this document, acknowledging that the information (with any changes you may note) is correct to the best of your knowlege.

Thank you for your assistance in this investigation.

Sincerely,

Jon Sundquist

Jon Sundquist

Attachment 1

Dean Johnson owns the property at 6373 Walmore Road (converted barn) and 6367 Walmore Rd. (Ranch-style house)

JAMES + DEBRA ~~Debbie~~ Johnson own~~s~~ the property at 6381 Walmore Rd. (2 story farm house)

Debbie Johnson is Dean Johnson's sister-in-law

Debbie Johnson's father-in-law owns the property ~~between~~ ON THE SO : OF 6381 ~~the railroad embankment and~~ Walmore Road

- This land is leased to a farmer named Pfoul
- This farmer has farmed the land since at least 1979

The barn at 6373 Walmore Road was converted to a residence in ~~1980~~ APPROX. 1979 + 1980.

- Water line and septic tank installed at that time
- Water line runs from the road to the barn, parallel to the driveway on its north side

The water line had completely corroded and was leaking by 1984

- Water line was replaced with POSSIBLE PVC piping
- Replacement work performed by Mr. Pete seeger, a licensed plumber *
- OUTSIDE Plumbing at both 6367 and 6381 Walmore Road is in accordance with Town water regulations

*ORIGINAL INS PLUMBING DONE P SEEGER, NOT SURE ON REPLACE WORK OR OUTSI PLUMBING.

A military agency has tested the water in the well on the property AT 6381 WALMORE RD.

- Analytical results were sent to Debbie Johnson
- Military agency indicated they were testing because of a leaking fuel tank and possible buried transformers on the air force base across Walmore Road from the property

Debra J. Johnson
Signature

7/22/87
Date

MILITARY ANALYTICAL RESULTS ENCLOSED.

recycled paper

ecology and environment

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

MONITORING and SUPPORT LABORATORY

Location:
4626 Royal Avenue
Niagara Falls, New York

P.O. Box 165
Niagara Falls, N.Y. 14304
(716) 285-8883

February 28, 1985

COPY

236-2043

Mr. Dermont Smyth
Engineering Office
914 TAC ALFT GP (AFRES)
Niagara Falls Intl Aprt
Niagara Falls, New York 14304-5320

Dear Mr. Smyth:

The oil and grease calculation I quoted to you over the telephone was in error. When I recalculated, I found the oil and grease to be virtually none. The flask used had actually lost weight, not gained, and I miscalculated it as a positive number.

My sincere apologies for this error.

Very truly yours,

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

Marlene C. Moyer

MCM/mb

This explains why we did not receive the report til now.
Please go thru me if you have questions of the lab.
Dermott Smyth
236-2043.

ANALYSIS OF ONE
WATER SAMPLE

COPY

Report Prepared For

NIAGARA FALLS TACTICAL AIRLIFT GROUP

By

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

W. Joseph McDoug

W. Joseph McDougall, Ph.D.
Technical Evaluation

February 1, 1985
AES - Report APH

P.O. No.
F30617-85-M-0234

COPY

SCOPE OF WORK

Under the direction of Mr. Smyth, this wor s performed to fulfill an analytical requirement for the ara Falls Tactical Airlift Group Facility.

RECEIPT OF SAMPLE

At 1:15 p.m., on January 7, 1985, Mr. Char Calvert of Advanced Environmental Systems, Inc. sample he groundwater well at the TAG Facility. Mr. Calvert the rectly transported the sample to the Advanced Environme l Systems laboratory.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

COPY

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: NIA AIR BASE A.E.S. JOB CODE 01APH

ANALYSIS	METHOD	REF	SAMPLE IDENTIFICATION	
			DETERMINABLE LIMITS	1/7/85 WELL WATER
TDS	160.1	3	1	324
OIL & GREASE	503A	6	1	BDL
TOC	415.1	3	0.1	7.22
POX*	9020	5	5 PPB	BDL
TOX*	9020	5	5 PPB	29.2
PHENOLS	420.1	3	0.01	BDL

TDS - Total Dissolved Solids
TOC - Total Organic Carbon
POX - Purgible Organic Halidea
TOX - Total Organic Halidea.

*Results reported in micrograms/liter, or ppb

MARLENE C. MOYER
WET CHEMISTRY DIVISION

COPY

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - METALS
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: NIA AIR BASE   A.E.S. JOB CODE 01APH

ANALYSIS	METHOD	REF	SAMPLE IDENTIFICATION	
			DETERMINABLE LIMITS	11 1/7/85 WELL WATER
LEAD	239.1	3	0.10	BDL

MICHAEL J. SIMPSON
METALS DIVISION

Walmore Rd.
Section 27

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

February 15, 1985

Mr. Dean Johnson
6373 Walmore Road
Niagara Falls, NY 14304

Dear Mr. Johnson:

Attached is a copy of the laboratory report submitted to this department from the Department of Environmental Conservation with the results of the analysis of water from your well. Please note that the Total Halogenated Organics (THO) concentration as well as the concentrations of Lead, Chromium and Cadmium were below detection limits.

Based on these results and considering that the well is not used for drinking water supply, this department sees no reason for concern regarding possible toxic contaminants in the well water. The water should be suitable for its present uses, which I understand to be as irrigation and washwater.

Please feel free to contact me with any questions.

Sincerely,

Michael E. Hopkins

Michael E. Hopkins
Ass't. P.H. Engineer

MEH:cs
Attachment

cc: Mr. P. Buechi/DEC-9
Mr. J. J. Devald

Mr. Peter Bucchi
Dr. Frances Yang F.Y.
Analytical Result of a Groundwater Sample from Town of Wheatfield
February 11, 1985

A water sample (DEC-91) was submitted for THO and metals analysis on January 7, 1985, The sample was taken from Johnson residence, 6373 Walmore Road, by Niagara County Health Department.

Result:

Sample Designation	THO	Lead	Chromium	Cadmium
DEC-91	n.d.	n.d.	n.d.	n.d.

FY:jlw

cc: Mr. Mike Hopkins - NCHD

[illegible]

[illegible]
[illegible]

NIAGARA COUNTY HEALTH DEPARTMENT

MEMORANDUM

DATE: December 6, 1984

TO: Peter Buechi

FROM: Mike Hopkins

SUBJECT: JOHNSON PROPERTY - 6373 WALMORE ROAD, WHEATFIELD, NY

In response to a complaint received from Mr. Dean Johnson of 6373 Walmore Rd., this department has begun an investigation of an apparent inactive disposal site at that address. According to Mr. Johnson, the site was filled with graphi hardened resin, crushed plastic battery cases and similar materials by the Hasely Trucking Company many years ago. The fill is reportedly five feet deep in some areas. An area of one to three acres may be involved. A site sketch is attached.

It seems likely that this site may be the site listed in the Disposal Site Registry as the"Walmore Road Site" which was previously believed to be located 1000 to 1200 feet north of 6373 Walmore Road. It appears likely that two distinct sites are present. The description of the waste materials present at both locations is similar (i.e., mainly graphite).

There is a well on the Johnson property which is used to water fruit trees, etc., but not for drinking water. It would be possible to sample water from this well.

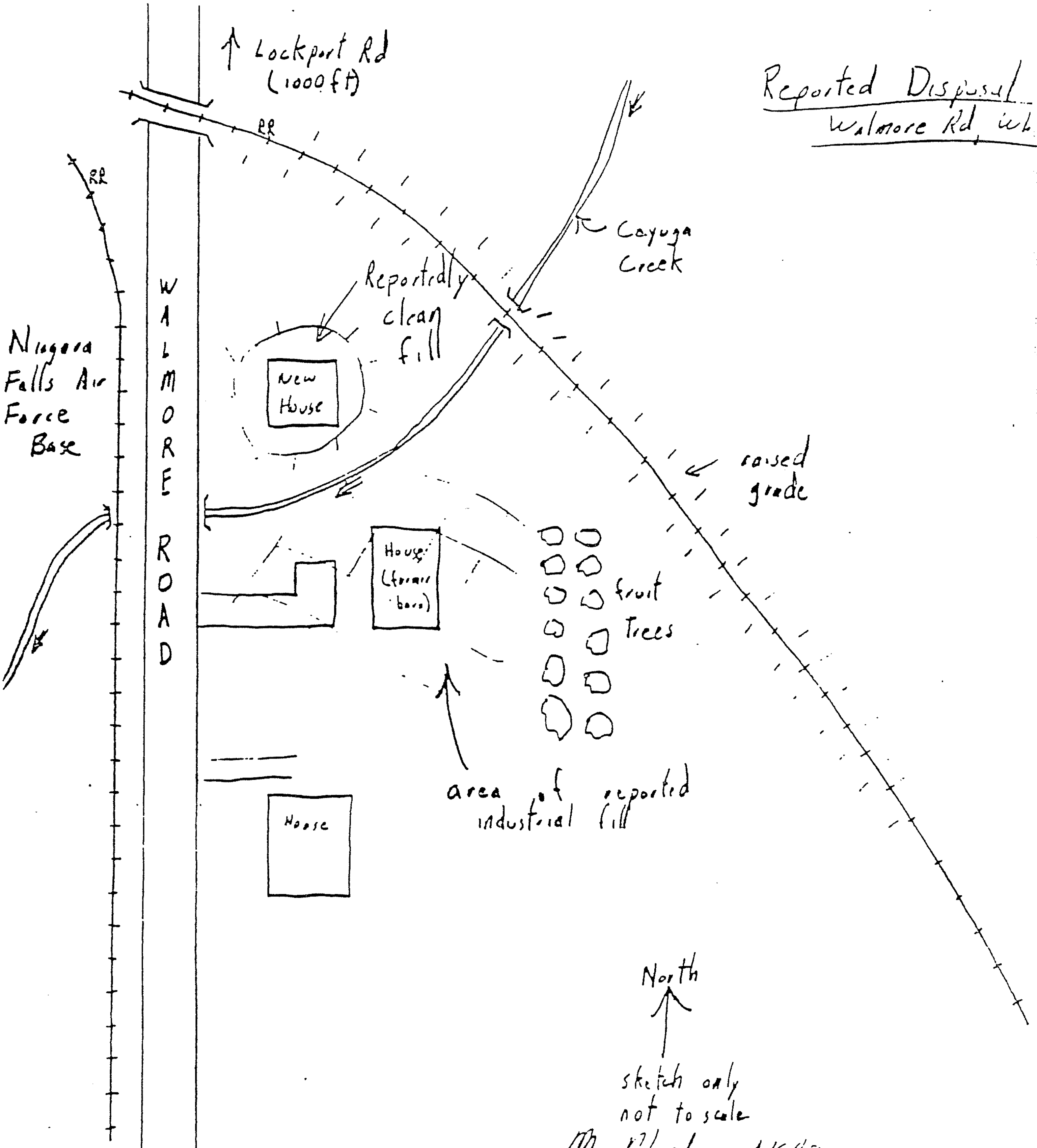
Since it appears that there is evidence that waste materials are present beneath or adjacent to an occupied dwelling, this department recommends that samples be collected and analyzed. This department could collect the samples but does not currently have the resources to have the samples analyzed. We are therefore requesting that your department consider having one or more samples from this site analyzed. At a minimum, we feel that analysis of a well water sample for THO and heavy metals would be appropriate.

If DEC can arrange for analysis of samples from this site, please contact me so that arrangements for sampling can be made.

MEH:cs
Attachment

cc: Mr. M. N. Vaughan
Mr. A. Tyebbi/DEC-9

Reported Disposal
Walmore Rd, WL



sketch only
not to scale

M Hopkins NCHD
12/4/84

ecology and environment, inc.

BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

May 9, 1988

Woody Herman
Town of Wheatfield Water District
3113 Niagara Falls Boulevard
North Tonawanda, NY 14120

Dear Mr. Herman:

Thank you for providing the information concerning the water distribution system along Walmore Road in the Town of Wheatfield. Ecology and Environment is currently investigating the fill at 6373 Walmore Road for the New York State Department of Environmental Conservation (DEC). For the purpose of our contract with the DEC, we must have written confirmation of the information you provided to me over the telephone on May 6, 1988. I have listed the points we discussed on Attachment 1. If these statements on the attachment are correct to the best of your knowledge, please acknowledge this and return it to us. If you can recall anything else about the fill at this site, such as its extent, color, odor and whether the entire length or just portions of the copper distribution line was corroded, we would like to learn of this information.

Sincerely yours,

Jon Sundquist

JS:bf-06
Attachment

Attachment I

- The material of construction of the water main along Walmore Road in the Town of Wheatfield is Asbestos Concrete.
- Distribution lines to residences along the road are usually constructed of copper.
- The copper distribution line to 6373 Walmore Road corroded and had to be replaced with PVC.
- The cause of the corrosion apparently was the fill in which it was buried, as no other customers along Walmore Road have had such problems.
- The fill had the appearance of cinders.

This information is correct to best of my knowledge.

Signature

[illegible]
Date

ecology and environment, inc.
BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

May 20, 1988

Mr. Brian Smith
Bell Aerospace Textron
P.O. Box 1
Buffalo, New York 14240

Dear Mr. Smith:

Thank you for speaking with me last week concerning the suspected waste disposal site at 6373 Walmore Road in Wheatfield. As I mentioned on the telephone, E & E is currently under contract to the DEC to conduct a Phase 1 investigation of this property to determine whether the fill present there poses a threat to human health or the environment. As per our conversation, I am including a copy of the DEC Inactive Hazardous Waste Disposal Site registry form that indicates that the waste may have come from Bell Aerospace. I am also including a copy of the Niagara County Health Department memorandum that initially identified this properly as a site of possible concern.

I am sorry I didn't follow up on our telephone conversation earlier. I had been trying to track down references that indicated that the fill was emplaced in 1980. Unfortunately, no such documentation could be found. Thus, contrary to what I indicated on the telephone, it is not known precisely when the area was filled.

We would appreciate any information Bell Aerospace may have concerning this site. Your assistance in the investigation is greatly appreciated.

Sincerely yours,

Jon Sundquist bf

[redacted]

JS:bf-9

Bell Aerospace Textron
Division of Textron Inc.

Post Office Box One
Buffalo, New York 14240-0001
716/297-1000

29 July 1988

Jon Sundquist
Ecology and Environment, Inc.
Buffalo Corporate Center
368 Pleasantview Drive
Lancaster, NY 14086

Dear Mr. Sundquist:

I am writing in response to your May 20, 1988 letter to Brian Smith.

While we would like to provide assistance we are unable to do so at this time. We have no record of involvement at this site. Our manifest system started in 1981, after the period in question.

Sincerely,

Carl G. Buzawa
Vice President - Division Counsel

cla

Engineering Systems for Tomorrow

CONTACT REPORT

O: NYSDEC Team Leaders - Phase I's
ROM: Mark Sienkiewicz
RE: New York State Department of Health (NYSDOH)
DATE: May 5, 1987
ONTACT: Ms. Linda Russen
ELE: 716-847-4500
XC: Mckosky, Ferris, Farrell, Handzik, File ND-~~2000~~

the NYSDOH has just recently established an office Buffalo to address hazardous waste sites in Western New York. the office and personnel will be directe by Linda Russen.

the NYSDOH files for these sites were kept in Albany but are in the process of being forwar to the Buffalo office. After talking with Ms. Rus I have forwarded a formal request to her an should have approval to inspect the files by May 13.

Two other NYSDOH employees may be key contacts. Matt Forcucci was E+E's EPA Information Office Person in Niagra Falls. Cameron O'Conner worked for the Erie County Dept. of Environmental Planning and inspected many of the Erie Co. site

As soon as I recieve a reply from Ms Russen, I will contact the team members concerning procedure for inspections of the files.

STATE OF NEW YORK
DEPARTMENT OF HEALTH
Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 12237

David Axelrod, M.D.
Commissioner

Rec'd 6-11-87
Amg

June 4, 1987

A. Mark Sienkiewicz
Ecology & Environment, Inc.
195 Sugg Road
P.O. Box D
Buffalo, N.Y. 14225

Dear Mr. Sienkiewicz:

Your request to access our files has been reviewed and approved by Mr. Donald Macdonald, Records Access Officer. Please note that a photocopy fee of $.25 per page will be assessed. Payment should be submitted by check and made payable to the New York State Health Department.

To arrange a date and time to review these files, please contact my secretary at 847-4365.

The Regional Toxic Program Offices within the NYS Health Department are newly established and file information at this time is limited. You may wish to contact the County Health Departments for additional information.

Sincerely,

Linda J. Rusin /jzp

Linda J. Rusin
Program Research Specialist III
Bureau of Toxic Substance Assessment

/jzp

cc: L. Violanti

CC:

D. Sutton
J. Sinquist
C. Yamarino
P. Gunther
M. Hanchak

Secretary's name is
Joan Amg