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915000-

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

PRELIMINARY SITE CHARACTERIZATION
Buffalo Crushed Stone
Cities of Buffalo and Lackawanna
Erie County, New York

HANNA FURNACE SITE

PIN 5034.43.221 915029
City of Buffalo, Fuhrmann Blvd. - Hamburg
Turnpike and City of Lackawanna, Hamburg
Turnpike Arterial Route Map 192,
Parcels 238 & 239 Buffalo Crushed Stone, Inc.
Federal Project BRFI (120), Erie County

Prepared For:

Regional Real Estate Office
State of New York
Department of Transportation
125 Main Street
Buffalo, New York 14203

Prepared By:

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November 1988

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EXECUTIVE SUMMARY

The Buffalo Crushed Stone site has been used since the early 1900's for the storage of blast furnace slag prior to being processed and sold as construction material. The site is located in a medium density residential and active industrial area within the corporate limits of Buffalo and Lackawanna, New York.

No evidence of hazardous waste disposal was uncovered during this environmental assessment; however, four (4) empty drums were observed at various locations throughout the property. One drum was located within an abandoned building which had a floor that was apparently oil saturated.

An objective of this investigation was to equate this site to inactive hazardous waste sites presently on the registry of the NYSDEC. This was done by compiling a Hazard Ranking System (HRS) score for this site. Although oil stained areas and an asphalt spill were observed, the quantity of material was deemed insignificant for HRS scoring purposes. The waste used to generate the HRS score was blast furnace slag, based on its uncertain characteristics as a potentially hazardous waste. EP toxicity tests have been conducted on similar slag and did not indicate the presence of materials of a hazardous nature. The HRS scores for the site were determined to be: $S_M = (S_{gw} = 0, S_{sw} = 0, S_a = 0)$ or $S_M = 0$, $S_{FE} = 2.8$, $S_{DC} = 0$. It should be noted that the scores generated are preliminary in that they are based on a lack of analytical data for both surface soil and groundwater.

Based on available data and Recra's observations, it is unlikely that any significant environmental liabilities are associated with this site.

1.0 INTRODUCTION

The New York State Department of Transportation (NYSDOT) has contracted Recra Environmental, Inc. of Amherst, New York, to perform an environmental investigation similar in format to a Phase I Investigation conducted by the New York State Department of Environmental Conservation (NYSDEC), for the assessment of inactive hazardous waste sites.

A preliminary site characterization following the Phase I format was performed for a portion of the Buffalo Crushed Stone, Inc. property located at the foot of Steelawanna Avenue, Lackawanna, New York (Fig. 1-1). The specific portion of the property investigated is designated by NYSDOT as parcel Nos. 238 and 239 (Fig. 1-2, see also Reference 1). The northern section of the property is located within the corporate limits of the City of Buffalo. The site is located in an area that has been used for heavy industry, most notably iron and steel manufacture. The Hanna Furnace Corporation was located adjacent to the north border of the site, and the Bethlehem Steel Corporation site is approximately 0.7 miles to the west. The site has been used since the early 1900's for the storage of blast furnace slag by Buffalo Slag, and since 1983 by Buffalo Crushed Stone, Inc., the current site owner. The slag is processed and then sold as construction material.

No indication of hazardous waste disposal at the site was noted during the investigation, however, four (4) empty drums and three (3) piles of used tires were observed at various locations throughout the property during the site inspection (Figure 1-3). One (1) unlabeled drum was located inside a small abandoned building on-site (Figure 1-3, No. 8). The floor within the building appeared oil soaked, and a petroleum odor was detected. A second drum, located behind a pile of tires, was labeled as automatic transmission

fluid, and a third drum bore a DOT stencil and was marked as returnable for an $18.00 deposit. Both drums were empty, and in moderate to slightly rusted condition, respectively. Some pieces of heavy equipment in unusable condition, and a pile of used truck tires was located near two buildings that appeared to be garage facilities (Fig. 1-3). No sampling or chemical analyses have been conducted by Recra Environmental, Inc. at this site.

There are several known inactive hazardous waste disposal sites in the vicinity of the Buffalo Crushed Stone property that may impact the groundwater at the site. Hanna Furnace, NYSDEC I.D. #915029, is directly to the north. Approximately one-quarter mile to the northeast is NYSDEC Site I.D. #915047, where hazardous waste was landfilled by Republic Steel Co., and approximately one-half mile to the northeast is NYSDEC Site I.D. #915120, where Allied Chemical Co. landfilled hazardous waste (Fig. 1-4). Without groundwater monitoring wells on site, the absence of hazardous contaminants cannot be confirmed.

There are several wetland areas in close proximity to the site (Figure 1-5). Tifft Farms Nature Preserve is a recreational area and is located 0.6 miles to the north.

Flood insurance rate maps for the area (Figure 1-6) indicate the site is designated as Zone C (areas of minimal flooding).

As part of this preliminary site characterization, an initial Hazard Ranking System (HRS) score was developed.

The intent of the Hazard Ranking System (HRS) is to provide a method by which uncontrolled hazardous waste sites may be systematically assessed as to the potential risk that a site may pose to human health and the environ-

ment. The HRS is designed to provide a numerical value through an assessment of technical data and information, and relating that information with respect to:

- o migration of hazardous substances from the site (S_m)
- o risk involved with direct contact (S_{dc})
- o the potential for fire and explosion (S_{fe})

The risks involved with direct contact (S_{dc}) and the potential for fire and explosion (S_{fe}) are evaluated according to site specific information including toxicity of waste, quantity, site demographics, location with respect to sensitive habitats of wildlife, etc. Migration potential (S_m) is evaluated through the rating of factors associated with three routing modes: groundwater (S_{gw}), surface water (S_{sw}) and air (S_a). The scored value for each route is composited to determine the risk to humans and/or the environment from the migration of hazardous substances from the site (S_m).

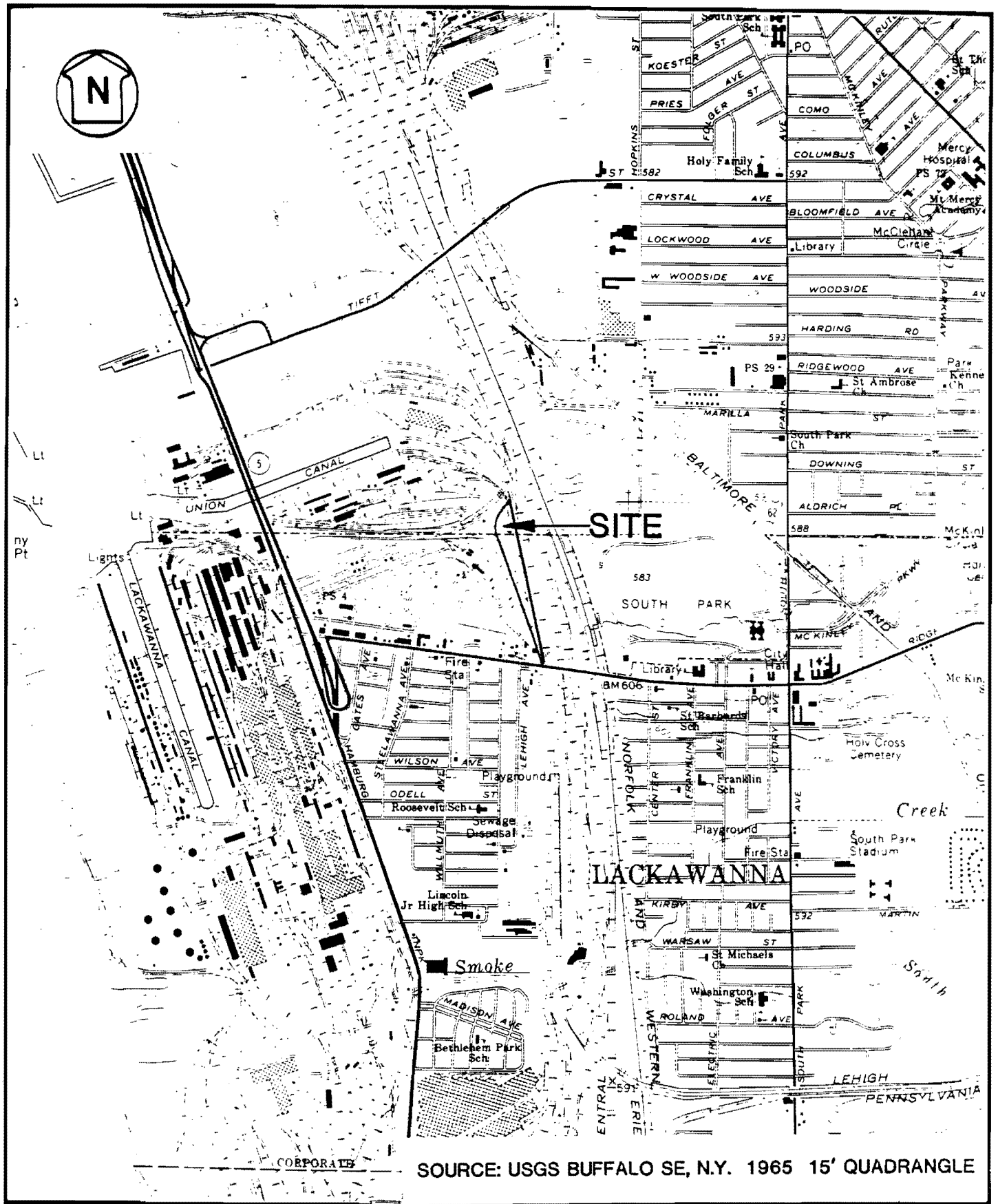
Based on information gathered during this investigation, the Buffalo Crushed Stone site was scored according to the Mitre Corporation Hazard Ranking System (HRS) and the following scores were obtained:

$S_M = (S_{gw} = 0;\ S_{sw} = 0;\ S_a = 0)$

$S_{FE} = 2.8$

$S_{DC} = 0$

These scores reflect the fact that blast furnace slag is not determined to be a hazardous waste (Reference 2, 3, 4).



SOURCE: USGS BUFFALO SE, N.Y. 1965 15' QUADRANGLE

Scale: 1:24,000		
	By	Date
Dwn.	KAS	9/88
Ckd.	RAC	11/88
Ap'vd.	RKW	11/88
Rev.		

NYSDOT

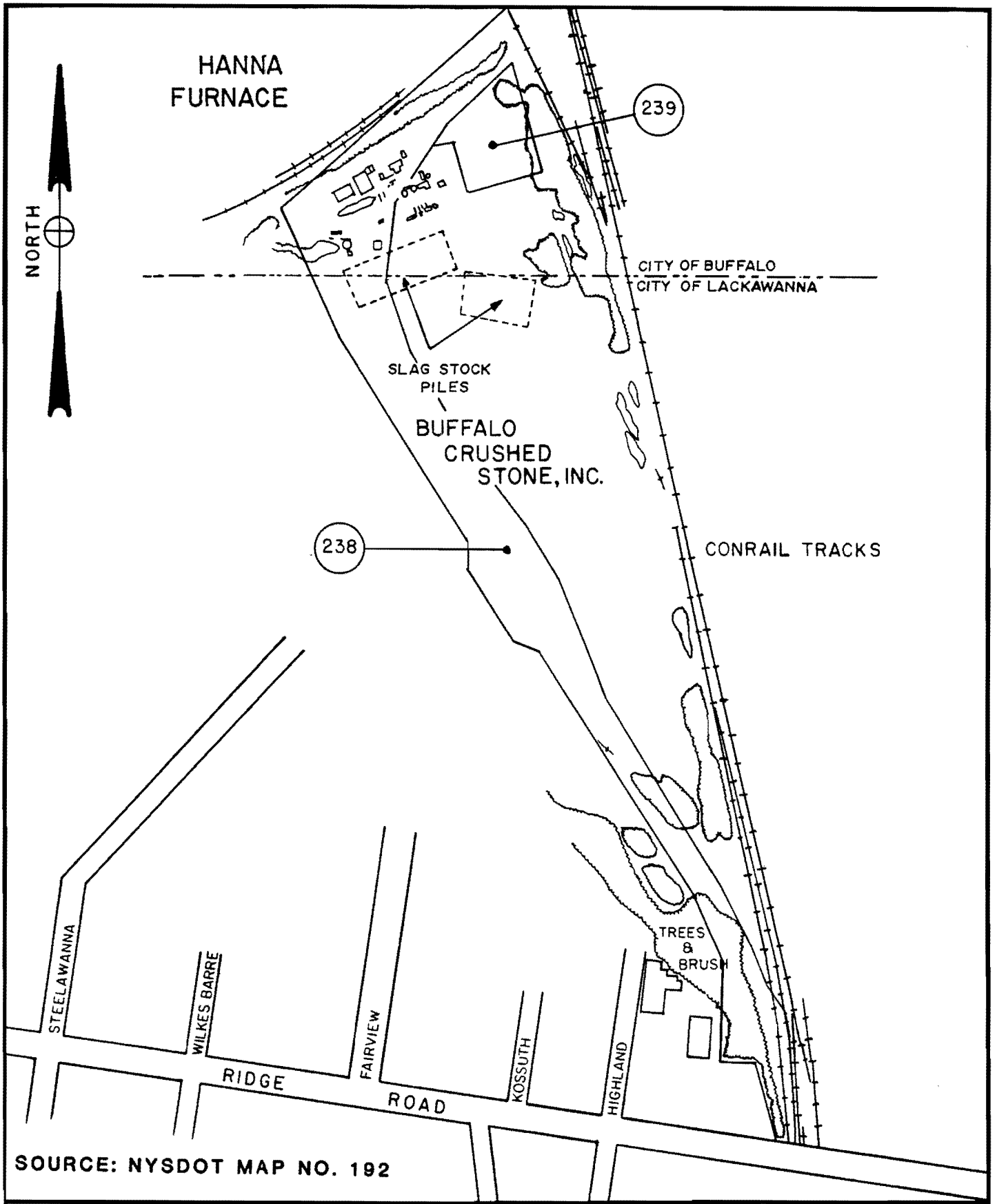
ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS

VICINITY MAP

Project No. 8C1364

A

FIGURE 1-1



SOURCE: NYSDOT MAP NO. 192

Scale: NTS			NYSDOT ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS
	By	Date	
Dwn.	KAS	10/88	
Ckd.	RAC	11/88	
Ap'vd.	RKW	11/88	
Rev.			
Project No. 8C1364			A FIGURE 1-2

SITE MAP

BRUNING 61160-1

NORTH

CONSOLIDATED RAIL CORP.

BUFFALO CRUSHED STONE, INC.

DRUM

DRUM

USED TIRES

SLAG STOCK PILES

SOUTH BUFFALO RAILROAD

BLDG. w/DRUM & OIL SOAKED FLOOR

USED TIRES

SLAG STOCK PILES

ASPHALT SPILL

USED TIRES & OLD EQUIPMENT

BOUNDARY LINE PARCEL 238

CITY OF BUFFALO

CITY OF LACKAWANNA

EXISTING FACILITIES (BCS)

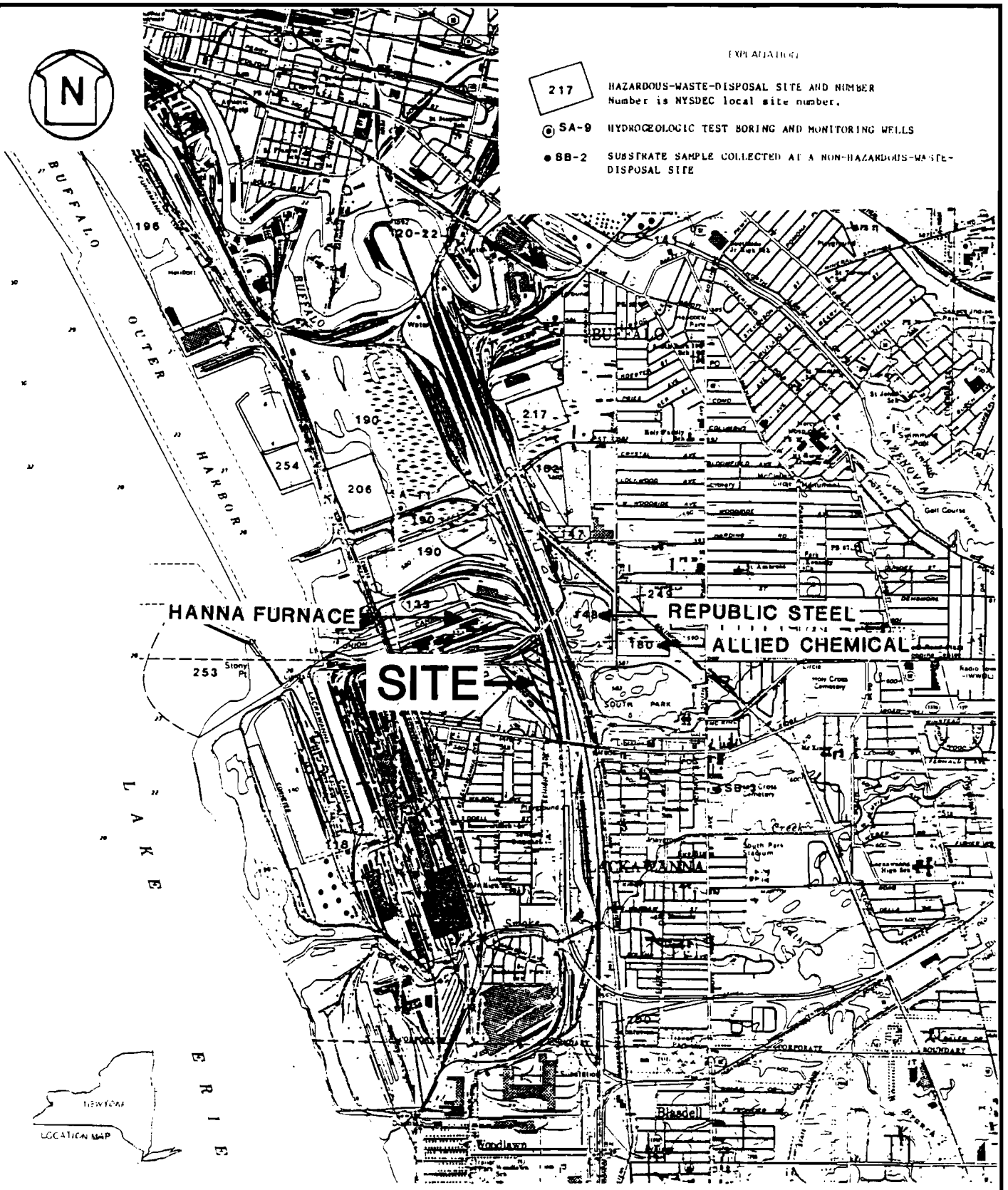
NO.	DESCRIPT.
1	STL.TANK
2	STL. TANK
3	1 STY. CONC. BLOCK BLDG.
4	CONC. SLAB
5	CONC. FNDS.
6	1 STY. CONC. BLDG.
7	STL. CONVEYOR
8	1 STY. CONC. BLOCK BLDG.
9	STL. TANK ON CONC. SLAB
10	STL. FRAME
11	CONC. FNDS. & STL. TANKS
12	1 STY. CONC. BLK. BLDG., CONC. SLAB
13	1 STY. STL. FRAME BLDG.
14	1 STY. STL. FRAME BLDG.
15	STL. TANK, CONC. SLAB & WALLS
16	1 STY. BRICK BLDG.
17	INGROUND STL. TANKS
18	CONC. RTN. WALLS 1 STL. TANK

SOURCE: NYSDOT MAP NO. 192

Scale: 1in. = 100ft.			NYSDOT ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS
	By	Date	
Dwn.	KAS	11/88	
Ckd.	[illegible]	11/88	
Ap'vd.	[illegible]	11/88	
Rev.			
Project No. 8C1364			B FIGURE 1-3

NORTHERN SECTION SITE MAP

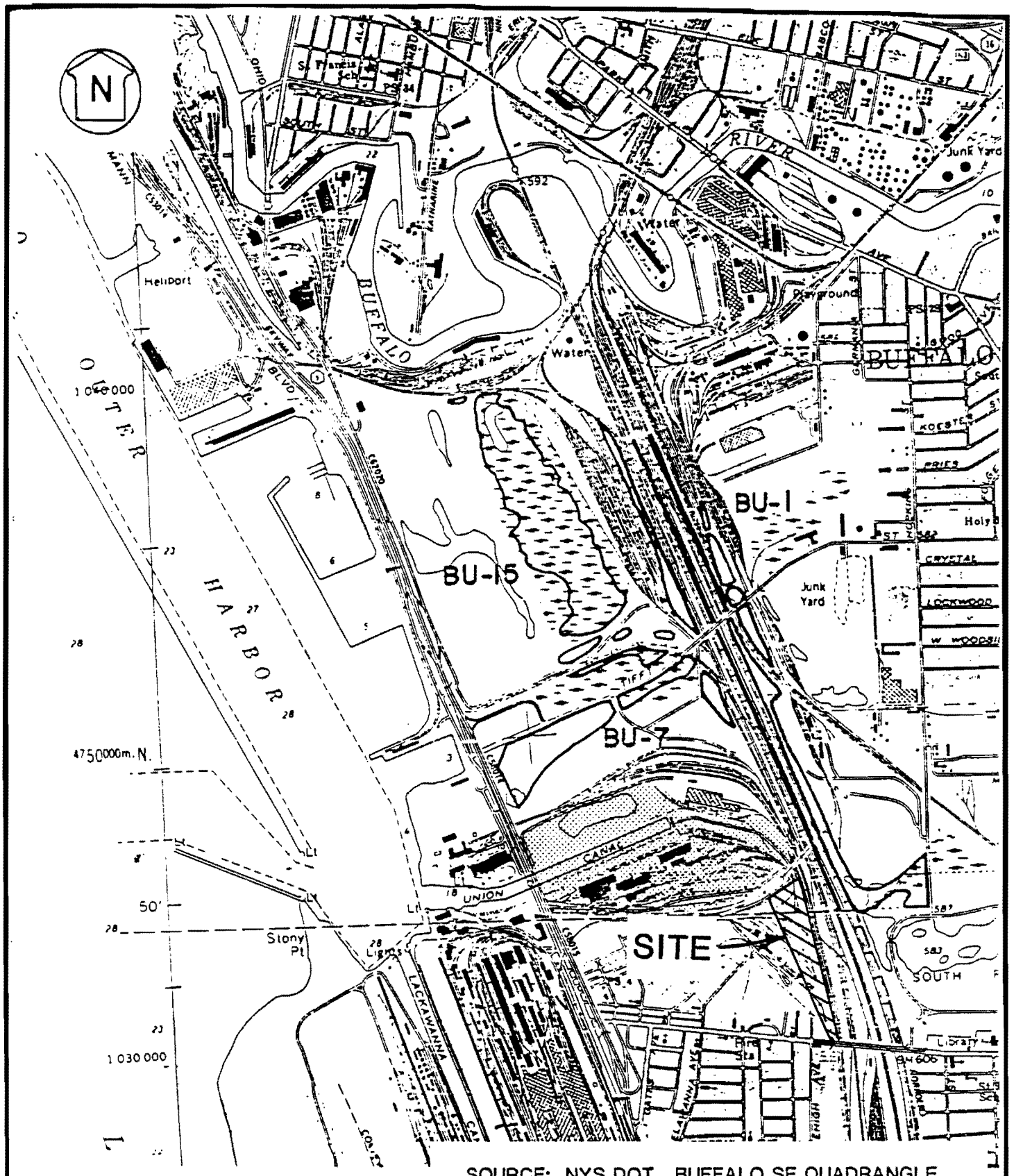
BRUNING 61160-1



SOURCE: EPA-905/4-85-001, MARCH 1985, PLATE 1

Scale: 1 in. = 0.65 mi.			NYSDOT ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS
	By	Date	
Dwn.	KAS	11/88	LOCATION MAP OF HAZARDOUS WASTE DISPOSAL SITES
Ckd.	RAC	11/88	
Ap'vd.	RKIN	11/88	
Rev.			Project No. 8C1364
			A FIGURE 1-4

BRUNING 61160-1



SOURCE: NYS DOT BUFFALO SE QUADRANGLE

Scale: 1:24,000		
	By	Date
Dwn.	LMM	2/88
Ckd.	RC	3/88
Ap'vd.	RKW	11/88
Rev.	KAS	9/88

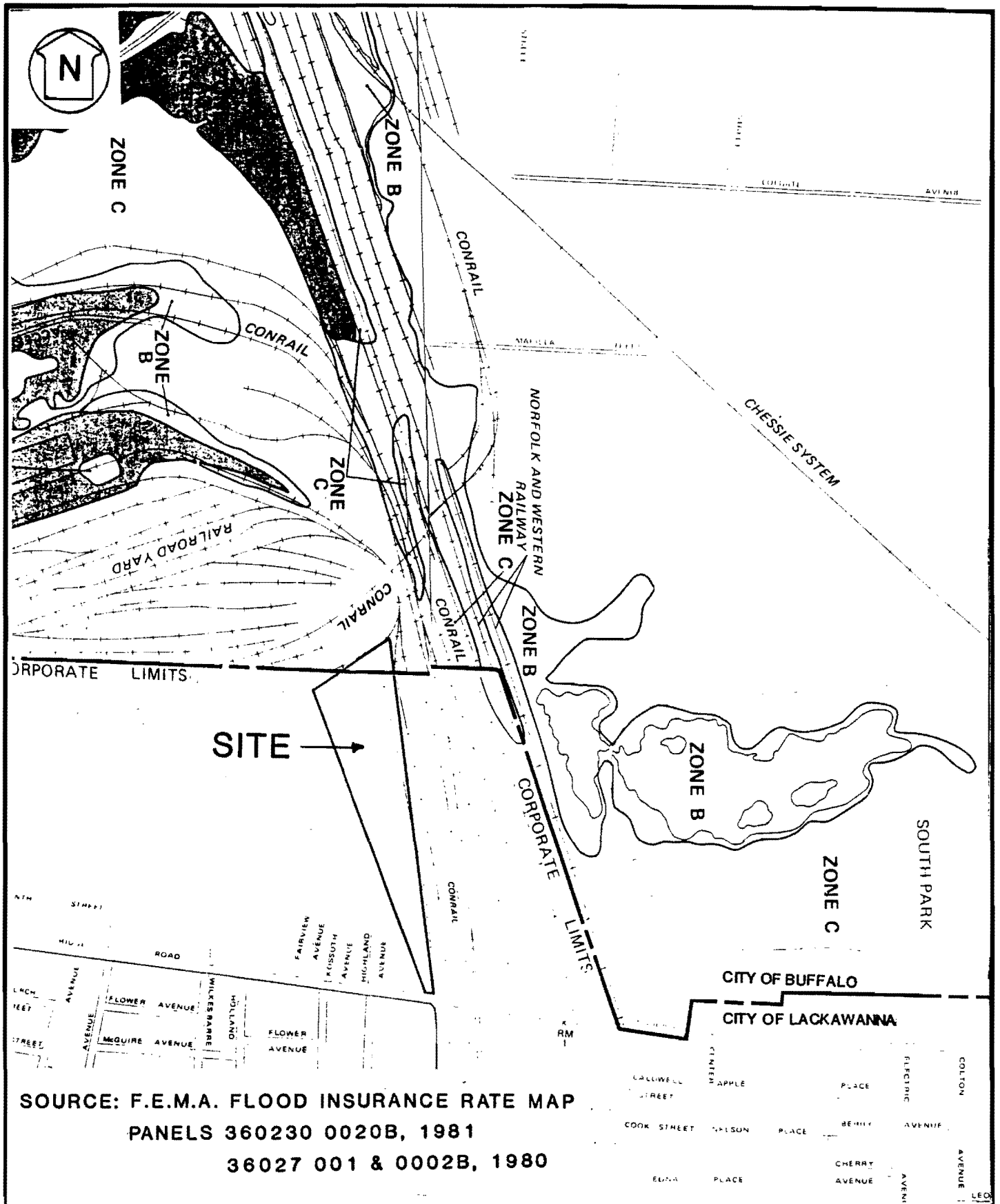
NYSDOT
ENVIRONMENTAL ASSESSMENT
OF BUFFALO CRUSHED
STONE PARCELS

WETLANDS MAP

Project No. 8C1364

A

FIGURE 1-5



SOURCE: F.E.M.A. FLOOD INSURANCE RATE MAP
PANELS 360230 0020B, 1981
36027 001 & 0002B, 1980

Scale: 1"≈800'		
	By	Date
Dwn.	KAS	10/88
Ckd.	RAL	11/88
Ap'vd.	RKW	11/88
Rev.		

NYSDOT

ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS

Project No. 8C1364

FLOOD ZONES

A FIGURE 1-6

2.0 PURPOSE OF THE PRELIMINARY SITE CHARACTERIZATION

The preliminary Site Characterization of Parcel Nos. 238 and 239 of the Buffalo Crushed Stone Site was conducted with the following objectives:

- Collect and review available site specific data and prepare a preliminary Hazard Ranking System (HRS) score.
- Perform a site reconnaissance and air monitoring survey.
- Evaluate whether available data are sufficient to complete a final HRS score.

The scope of the investigation was in accord with the terms of the contract, which included a preliminary site inspection, but no sampling activities or physical survey of the site.

3.0 SCOPE OF WORK

The Preliminary Site Characterization following the Phase I format for Parcel Nos. 238 and 239 of the Buffalo Crushed Stone site comprised several interrelated tasks as follows:

(a) Initially, a thorough data and records search was undertaken to compile all available information from identified sources. The information was reviewed and a preliminary description of the site's history was developed.

(b) A preliminary site inspection was conducted by the investigation team to familiarize personnel with the physical conditions of the site and its surroundings, to confirm reported site conditions, and to collect additional data (without performing actual sampling and analyses).

(c) The preliminary HRS documentation records were prepared using compiled information.

(d) An analysis of the adequacy of the available data was performed to determine what further investigation would be required to develop a final HRS score.

(e) Finally, the Preliminary Site Characterization report was prepared to document and summarize the activities and the results of the investigation.

During this investigation, several sources were contacted for information as shown in Table 1.

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TABLE 1
SOURCES CONTACTED FOR INFORMATION

SOURCE	DATE	CONTACT	TELEPHONE	ADDRESS	INFORMATION
NYSDEC-Region 9 Divison of Soild Hazardous Waste	9/9/88	John S. Tygert	(716) 847-4565	600 Delaware Avenue Buffalo, NY 14202	No DEC file on hazardous waste at site.
NYSDEC-Region 9 Division of Fish and Wildlife	9/9/88	Jim Sneider	(716) 847-4550	600 Delaware Ave. Buffalo, NY 14202	Endangered species information
U.S. Army Corps of Engineers	9/8/88 9/23/88	Walter Fray Richard Aguglia	(716) 876-5454	1776 Niagara St. Buffalo, NY 14207	Obtained flood maps
Buffalo Crushed Stone, Inc.	6/24/88 9/7/88 9/8/88 7/6/88 10/14/88 10/ /88	Richard Mirabelli Richard Ruggiero Gary Nelson Niel Long Joe Lorazzo	(716) 826-7310 (716) 683-4714 (716) 826-7310	2544 Clinton St. P.O. Box 710 Buffalo, NY 14224	Historical site information, slag chemical composition, slag processing methods property boundary information EP Toxicity date
Gateway Trade Center, Inc.	9/7/88	Daniel Bicz	(716) 826-2890	2544 Clinton St. Buffalo, NY 14224	Site access
Erie County Dept. of Environmental Planning	9/7/88	Jerome Miller	(716) 846-7583	95 Franklin St. Buffalo, NY 142	No health department concerns about slag
City of Lackawanna	9/12/88 9/16/88	Bruce Colello Isabell Hartenberg	(716) 827-6474	714 Ridge Road Lackawanna, NY 14218	Zoning information residential proximity, population date
NYSDOT Regional Real Estate Office	9/7/88 9/8/88	Murray Abbott	(716) 847-3195	125 Main St. Buffalo, NY 14203	Site maps, general maps
NYSDOT Engineering Dept	9/12/88	Fred Schultz			Parcel map, elevation information

4.0 SITE ASSESSMENT

4.1 Site History and Use

The site was owned and operated by Buffalo Slag Company from approximately 1913 to 1983, when the property was sold to Buffalo Crushed Stone, Inc. The site has been used from 1913 to the present for the storage of blast furnace slag (Reference 5). The slag stored at the site was produced as a by-product of iron manufacture by both the Hanna Furnace Corporation and Republic Steel Corporation. A weigh station and two buildings assumed to be garage facilities were the only buildings on site that appeared currently in use. A number of buildings and tanks that are no longer used and appear to be in poor condition are located in the northern portion of the site. Their reported age is 26 to 27 years. The larger tanks were reportedly used for the storage of asphalt or tar (Reference 5). There is an asphalt spill of approximately 150 square feet in area and 1 to 2 inches thick beneath a large tank covered with an unidentified insulation material that is peeling and exposed (Figure 1-3, No. 2). Near this tank are above-ground connections to an underground pipe system (see Appendix A, Exposure 23). The exact purpose of this system is unknown. The system may have been used for natural gas or fuel oil. Two tanks that have been removed from underground, may have been used for fuel storage. The location where these tanks were buried is not known. Two steel inground tanks with open tops and what appears to be a pump mechanism supported over one of the tanks are present in the northern portion of the site (Figure 1-3, No. 17). Both tanks are thought to contain water. Field measurements by Recra personnel on 6/24/88 yielded respective readings of 330 umhos/cm and 340 umhos/cm specific conductivity, with 7.0 and 7.14 pH. No readings were

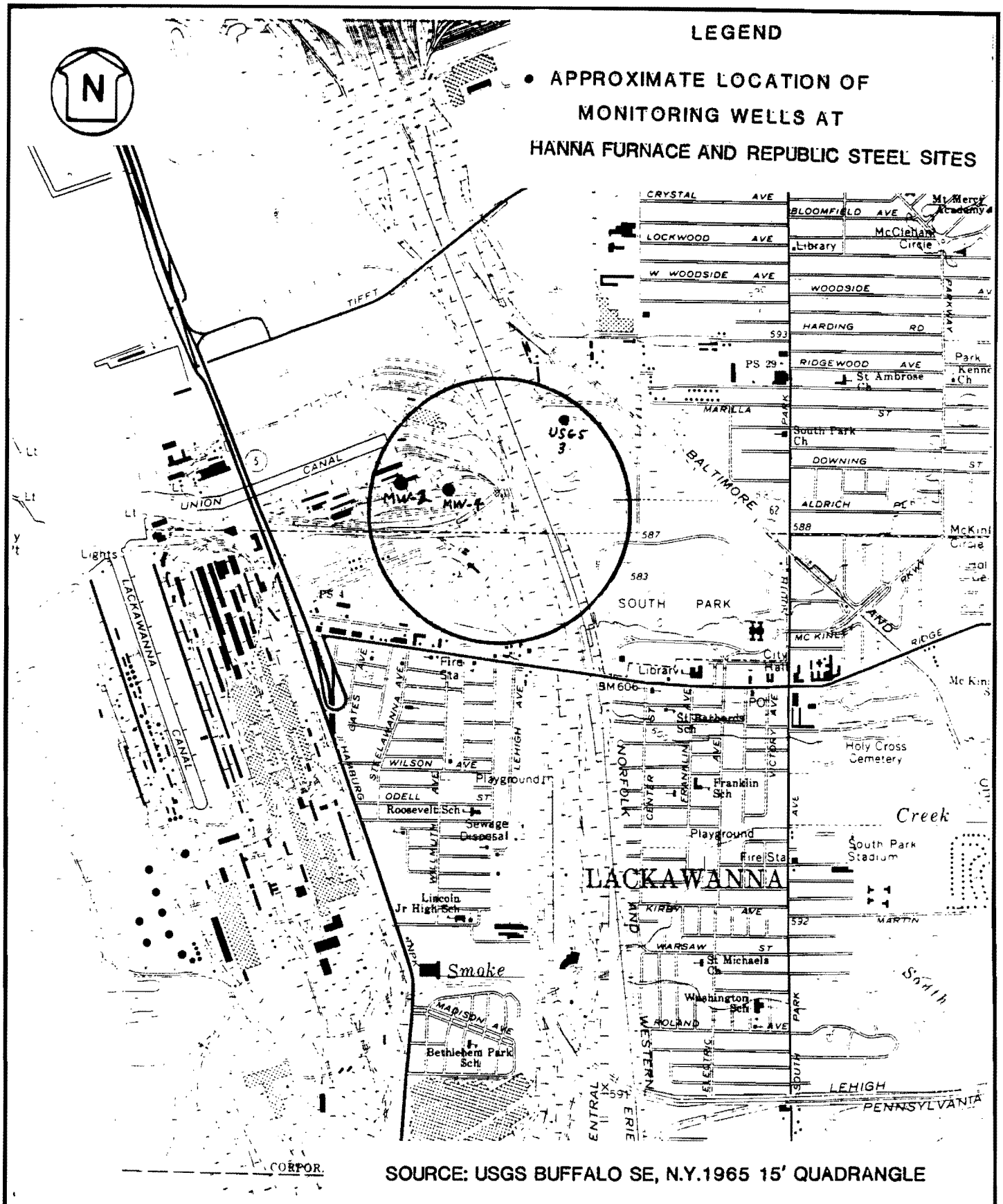
detected on the TIP photoionization unit (Reference 6).

Two types of slag stockpiled on-site are "hard" slag produced by Hanna Furnace, and "light weight" slag produced by Republic Steel. Both types of slag are purported to be identical in chemical composition, the difference being "hard" slag is air cooled, and "light weight" slag, is water cooled, resulting in slag pellets of decreased density. During production, any iron in sizeable amount that was tapped off with the slag is recovered from the slag before processing by magnetic separation using an electromagnetic crane. The two forms of slag are then mixed, crushed, and screened before being sold as "pelletized" slag, an ASTM (D1241-68) approved material for road base construction (Reference 7) and light weight embankment fill (Reference 8). The chemical composition and engineering specifications for Buffalo Crushed Stone slag is contained in Reference 8. The last delivery of slag on site occurred between 10 and 12 years ago, from Republic Steel. The remaining volume of slag on site is estimated at 500,000 to 750,000 tons.

There is no record of any hazardous waste being landfilled at the site.

4.2 Geology and Soil Cover

The bedrock underlying the site is the Levanna Shale Member of the Skaneateles Formation, of the Hamilton Group. The Hamilton Group is Middle Devonian in age. The Levanna Shale is described as a fissile, dark gray to olive gray, calcareous shale, and is about 45 feet thick at Lake Erie (Reference 9). Information on depth to bedrock and soil cover thickness and composition was obtained from existing boreholes within a 2,000 foot radius of the Buffalo Crushed Stone site (Fig. 4-1).



Scale: 1:24,000			NYSDOT ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS
	By	Date	
Dwn.	KAS	9/88	
Ckd.		11/88	
Ap'vd.			
Rev.			
Project No. 8C1364			A

EXISTING BOREHOLES WITHIN 2000 FT. OF BUFFALO CRUSHED STONE SITE

FIGURE 4-1

Depth to bedrock in borings at the adjacent Hanna Furnace, NYSDEC site I.D. #915029, was encountered between 22 and 48 feet (Reference 10).

The soil cover consists of an organic-clayey silt topsoil of varying thickness and slag fill creating a level surface at the site. The topsoil and fill is underlain by a layer of lacustrine clay and silts varying in thickness between 10 and 21 feet at Hanna Furnace (Reference 10), and between 8 to 20 feet thick at the Republic Steel landfill, NYSDEC site I.D. #915047 (Reference 10). A layer of glacial till was observed in boring MW-2 and MW-4 at Hanna Furnace, and in the boreholes at the Republic Steel landfill (Reference 10, 11) overlying the shale bedrock below the lacustrine sediments. This till is very dense, and is considered to have low permeability. Tills of this type are often described as aquitards (Reference 12).

4.3 Hydrogeology

The regional water table for the area occurs in the lacustrine clay and sand and gravel deposits at various depths. During wet seasons, a perched aquifer can develop above the relatively impermeable clay (Reference 11b). Groundwater was encountered at a depth of about 5 feet from the ground surface at an adjacent site (Hanna Furnace, Reference 10b).

Regional groundwater flow direction is westward toward Lake Erie. However, localized groundwater flow in the perched aquifer could possibly be to the east, towards South Park Lake.

Groundwater in the area is not used as a potable source. Drinking water for the area is obtained from Lake Erie (Reference 13). No water intakes are located within a three-mile radius of the site (Figure 4-2).

4.4 Surface Water

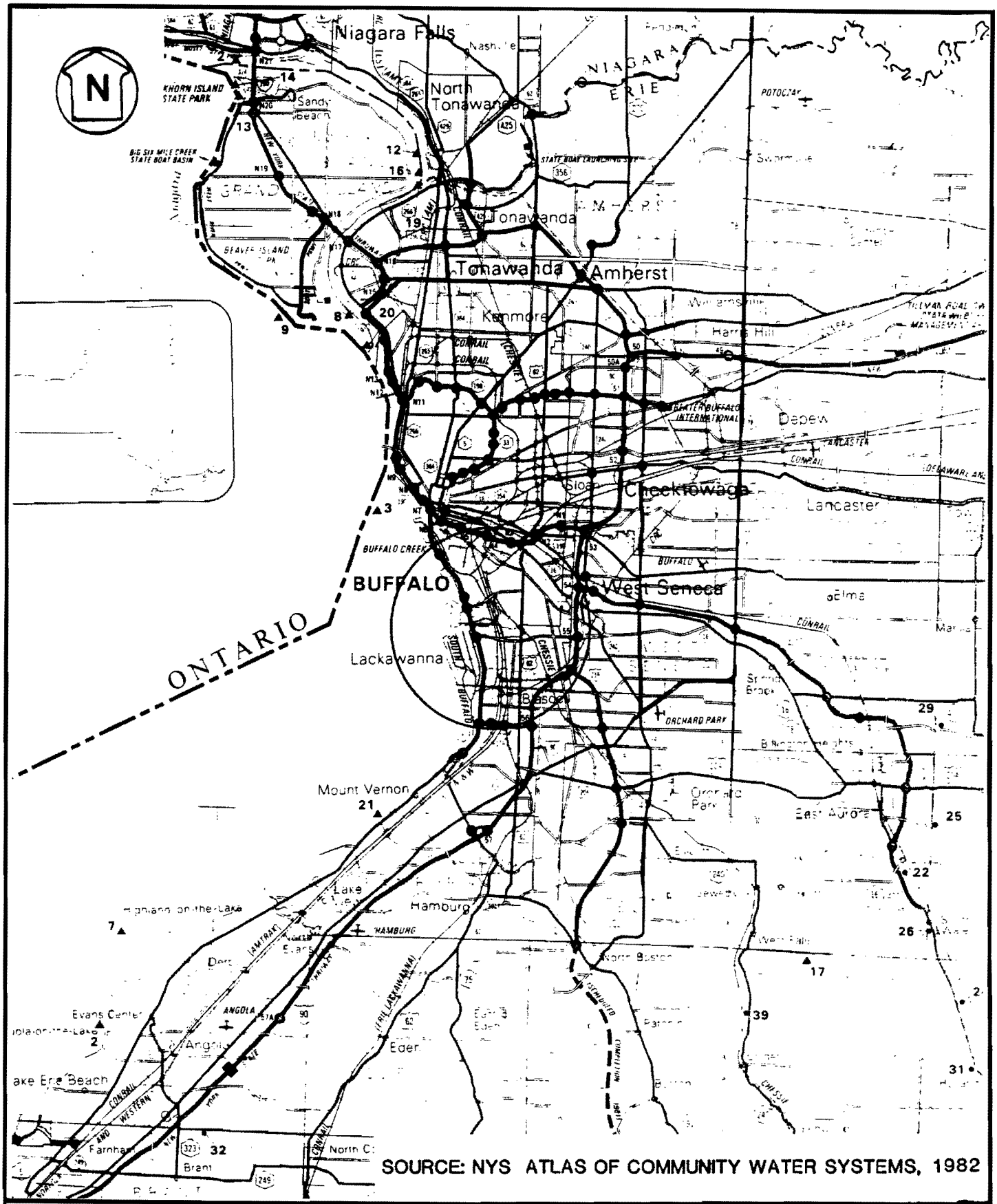
The nearest body of water to the Buffalo Crushed Stone site is South Park Lake, located approximately 800 feet to the east. South Park Lake is used for fishing and recreational purposes.

The Union Ship Canal is located approximately 1,800 feet northwest, and provides direct water access to the Buffalo Outer Harbor and Lake Erie, which are used for commercial and recreational purposes.

The wetlands of the Tifft Farms Nature Preserve, also a recreational area, is 0.6 mile to the north.

4.5 Land Use

The Buffalo Crushed Stone site is located in an area designated by the City of Lackawanna Department of Development as having a PL rating, which represents the zoning classification of Planned Industrial Park, heavy industry permitted. The site has been used since the early 1900's for the storage and processing of blast furnace slag, for eventual sale as a construction material.



Scale: 1:250,000			NYSDOT ENVIRONMENTAL ASSESSMENT OF BUFFALO CRUSHED STONE PARCELS	COMMUNITY WATER INTAKE MAP (3 MILE RADIUS)
	By	Date		
Dwn.	KAS	9/88		
Ckd.	RAC	11/89		
Ap'vd.	RKW	11/89		
Rev.			Project No. 8C1364	A FIGURE 4-2

Quickrete-Buffalo owns a 5 acre parcel of land within the Buffalo Crushed Stone, Inc. property. Quickrete manufactures dry cement products, all of which are reported as being non-hazardous. The Quickrete parcel of land is approximately 750 feet to the west of parcel No. 238, as designated by NYSDOT. The nearest residential area is adjacent to the south boundary of the site, along Ridge Road.

Tifft Farms Nature Preserve, a NYSDEC designated wetland, is located approximately 0.6 mile to the north. South Park is 0.15 mile to the east of the site. Both Tifft Farms and South Park are recreational land.

South Park is also listed in the National Register as part of the Cazenovia Park - South Park System, LI820430 (Olmstead Parks and Parkways Thematic Resources).

5.0 PRELIMINARY APPLICATION OF THE HAZARD RANKING SYSTEM

5.1 Narrative Summary

The Buffalo Crushed Stone, Inc. property located at the foot of Steelawanna Avenue in Lackawanna, New York, occupies approximately 72 acres. The eastern portion of this property is being acquired by NYSDOT for relocation of a portion of the South Buffalo Railway. The site has been used to stockpile blast furnace slag generated by Republic Steel and Hanna Furnace. There is no evidence that hazardous waste has ever been deposited on this site.

The Hazard Ranking System is designed to evaluate the potential migration and possible public danger from known or suspected hazardous wastes at a site on a numerical basis for comparison with other hazardous waste sites, so a uniform system can be established to evaluate the need for possible action for the site. The Buffalo Crushed Stone site is not on the NYS Registry of Inactive Hazardous Waste Sites.

5.2 HRS Work Sheets

Facility name: Buffalo Crushed Stone, Incorporated

Location: Foot of Steelawanna Avenue, Lackawanna, New York

EPA Region: II

Person(s) in charge of the facility: Current owner: Buffalo Crushed Stone, Inc., Richard Mirabelli, Vice President

2544 Clinton St., P.O. Box 710
Buffalo, NY 14224

Name of Reviewer: Kenneth A. Shisler, Jr. **Date:** 9/23/88

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.

From approximately 1913 to 1978, blast furnace slag, a by-product of iron manufacture at Republic Steel Co. and Hanna Furnace, has been stockpiled at the site for eventual sale as fill and base material used in road construction. Asphalt and tar were also used and stored on-site. Storage tanks used for this purpose remain. Underground tanks presumably used for storage have been removed from the ground and stored on the surface. Presently 500,000 to 750,000 tons of slag are stockpiled on-site. Slag is believed to be non-hazardous. Groundwater in the area is not used for drinking.

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

$S_{FE} = 2.8$

$S_{DC} = 0$

FIGURE 1

HRS COVER SHEET

RECRA ENVIRONMENTAL, INC.

Ground Water Route Work Sheet

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

FIGURE 2
GROUND WATER ROUTE WORK SHEET

RECRA ENVIRONMENTAL, INC.

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45	1	0	45	4.1
If observed release is given a score of 45, proceed to line 4 If observed release is given a score of 0, proceed to line 2					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 (1) 2 3	1	1	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	0	3	
Total Route Characteristics Score			9	15	
3 Containment	0 1 2 (3)	1	3	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	(0) 3 6 9 12 15 18	1	0	18	
Hazardous Waste Quantity	(0) 1 2 3 4 5 6 7 8	1	0	8	
Total Waste Characteristics Score			0	26	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	0 (1) 2 3	2	2	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			8	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	64,350	
7 Divide line 6 by 64,350 and multiply by 100		S_{sw} =	0		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

RECRA ENVIRONMENTAL, INC.

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
[1] Observed Release	(0) 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:	Photovac TIP (Total Ionizables Present) Photoionization Detector				
If line [1] is 0, the S_a = 0. Enter on line [5].					
If line [1] is 45, then proceed to line [2].					
[2] Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
[3] Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
Total Targets Score				39	
[4] Multiply [1] x [2] x [3]				35,100	
[5] Divide line [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})	0	0
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		0
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		0
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M$ =		0

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Containment	(1) 3	1	1	3	7.1
2 Waste Characteristics					7.2
Direct Evidence	(0) 3	1	0	3	
Ignitability	0 (1) 2 3	1	1	3	
Reactivity	(0) 1 2 3	1	0	3	
Incompatibility	(0) 1 2 3	1	0	3	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			2	20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 (4) 5	1	4	5	
Distance to Nearest Building	0 1 2 (3)	1	3	3	
Distance to Sensitive Environment	(0) 1 2 3	1	0	3	
Land Use	0 1 2 (3)	1	3	3	
Population Within 2-Mile Radius	0 1 2 3 4 (5)	1	5	5	
Buildings Within 2-Mile Radius	0 1 2 3 4 (5)	1	5	5	
Total Targets Score			20	24	
4 Multiply 1 x 2 x 3			40	1,440	
5 Divide line 4 by 1,440 and multiply by 100	S_{FE} = 2.8				

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet						
Rating Factor	Assigned Value (Circle One)		Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0) 45		1	0	45	8.1
If observed release is given a score of 45, proceed to line 4 If observed release is given a score of 0, proceed to line 2						
2 Accessibility	0 1 2 (3)		1	3	3	8.2
3 Containment	0 (5)		1	15	15	8.3
4 Waste Characteristics Toxicity	(0) 1 2 3		5	0	15	8.4
5 Targets						8.5
Population Within a 1-Mile Radius	0 1 2 3 4 (5)		4	20	20	
Distance to a Critical Habitat	0 1 (2) 3		4	8	12	
	Total Targets Score			28	32	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5				0	21,600	
7 Divide line 6 by 21,600 and multiply by 100		S_{DC} =		0		

FIGURE 12
DIRECT CONTACT WORK SHEET

5.3 HRS Documentation Sheets

DOCUMENTATION RECORDS FOR HAZARD RANKING SYSTEM

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference that will make the document used for a given data point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: Buffalo Crushed Stone

LOCATION: Foot of Steelawanna Avenue, Lackawanna, NY

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

None

Rationale for attributing the contaminants to the facility:

NA

* * *

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Shallow perched water table aquifer above lacustrine sediments.

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

Approx. 2 to 8 ft. below surface - Ground surface at BCS was leveled with slag base. Groundwater was encountered at the following depths at the adjacent Hanna Furance Site:
2.5 ft at MW-3 on 4-5-88
2.13 ft at MW-4 on 4-5-88,
North of BCS on Hanna Furnace site Ref. 11c

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

Unable to determine accurately without borehole information on site. Original ground surface elevation before slag was deposited on site, was 592 ft.(National Geodetic Vertical Datum). Present surface is 585 ft. The entire area has been leveled, and slag piled in large mounds in portions of the site.

Net Precipitation

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

U.S. Dept. of Commerce, National Climatic Center, (Climatic Atlas of the United States, 1979).
Mean annual percipitation is 36". Ref. 14

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

Mean annual lake evaporation is 27".

Net precipitation (subtract the above figures):

9" (36"-27" = 9")

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Lacustrine clay sediments and glacial till.
USGS field reconnaissance in EPA Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste Disposal sites. Mar. 1985, p.122 (EPA-905/4-85-001)
Ref. 11a

Permeability associated with soil type:

General permeability for these soil types are in the range of 10^{-10} to 10^{-4} cm/s Ref. 12b

10^{-9} to 10^{-6} cm/s vertical permeability of the clay has been reported. Ref. 10c

Physical State

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

Solid

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Uncovered piles

Method with highest score:

Uncovered piles

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Source: Buffalo Crushed Stone, Inc.
Material use and description

Compound with highest score:

NA

Composition of Slag	
CaO(lime)	38 to 44%
SiO_2(silica)	30 to 36%
Al_2O_3(alumina)	11 to 15%
MgO(magnesia)	10 to 14%
Mn(maganese)	.1 to .5%
S (sulphur)	1 to 2%
Fe (iron)	.3 to .6%

Preliminary score of zero has been assigned since presence of hazardous compounds has not been confirmed.

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):

Slag - 500,000 to 750,000 tons; however, since slag has not been determined to be a hazardous substance, a score of "0" has been assigned.

Basis of estimating and/or computing waste quantity:

9/8/88 - Site Inspection with Mr. Richard Mirabelli, Vice President, Buffalo Crushed Stone.
Visual estimate done by Mr. Richard Mirabelli

* * *

5 TARGETS

Ground Water Use

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

None

Distance to Nearest Well

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

None

Distance to above well or building:

NA

Population Served by Ground Water 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:

None - within 3 miles (NYS Atlas of Community Water Supply Systems, 1982) (see Figure 4-2)
Ref. 13

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):

0.0

Total population served by ground water within a 3-mile radius:

0.0

SURFACE WATER ROUTE

1 OBSERVED RELEASE

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

No samples have been taken

Rationale for attributing the contaminants to the facility:

NA

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

<1% - Large piles of slag have steep slope, but are permeable with no surface runoff associated with the piles.

Name/description of nearest downslope surface water:

South Park Lake (800')

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

less than 1,0%

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

No

Is the facility completely surrounded by areas of higher elevation?

No

1-Year 24-Hour Rainfall in Inches

2.1" (U.S. Department of Commerce Technical Paper No. 40)

Ref. 14

Distance to Nearest Downslope Surface Water

800 feet

Physical State of Waste

Solid

* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Uncovered piles

Method with highest score:

Uncovered piles

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated

NA

Compound with highest score:

NA

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):

NA

Basis of estimating and/or computing waste quantity:

NA

* * *

5 TARGETS

Surface Water Use

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

Commercial and Industrial shipping, recreational use
(Recra Environmental Site Inspections, 1988)

Is there tidal influence?

No

Distance to a Sensitive Environment

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

NA

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

0.6 mile or 3000 feet to the North is Tifft Farms Nature Preserve (USGS Topographic Map: Buffalo SE NY, 1965)

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

None within 1 mile (NYSDEC Region 9, Division of Fish and Wildlife files)

Ref. 15

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:

No water supply intakes within 3 miles
(NYS Atlas of Community Water Supply Systems, 1982)

(see Figure 4-2)

Ref. 13

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

None within 1 mile
(site is located in urban area)

Total population served:

None

Name/description of nearest of above water bodies:

NA

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

NA

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

None

Date and location of detection of contaminants:

Recra Environmental Site Inspection 6/24/88

Methods used to detect the contaminants:

Photovac Incorporated TIP (Total Ionizables Present)
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:

None

Hazardous Waste Quantity

Total quantity of hazardous waste:

NA

Basis of estimating and/or computing waste quantity:

NA

* * *

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

67,595 (Engineering Science and Dames & Moore Phase I Investigation of Hanna Furnace, Site No. 915029, January 1986; compiled from 1980 Census Data)

Distance to a Sensitive Environment

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

None within 2 miles

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

3000ft.(0.6mi.) to Tifft Nature Preserve (NYSDOT Wetlands, Map) Buffalo SE 1965 Quadrangle (Fig. 1-5)

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

None within 1 mile
(NYSDEC, Region 9, Division of Fish and Wildlife)
Ref. 15

Land Use

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

Site is located in industrial area zoned as PL (Planned Industrial Park) with heavy industry permitted.
(City of Lackawanna, Department of Development)
Ref. 16

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

3000 ft. North is Tifft Farms Nature Preserve
(USGS Topographic Map, Buffalo, SE, 1965)

Distance to residential area, if 2 miles or less:

0.0 - residential area is adjacent to southern boundary of site
Ref. 16

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

NA

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

NA

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

0.15 mi. to South Park, listed in the National Register as part of the Cazenovia Park - South Park System, LI820430(Olmsted Parks and Parkways Thematic Resources)
Our Lady of Victory Basilica, though not listed, is National Register eligible.

FIRE AND EXPLOSION

1 CONTAINMENT

Hazardous substances present:

Unidentified oil stained areas, asphalt spill. Ref. 18
Recra Environmental
Site Inspection 9/8/88

Type of containment, if applicable:

NA

* * *

2 WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

NA

Ignitability

Compound used:

Asphalt

Reactivity

Most reactive compound:

NA

Incompatibility

Most incompatible pair of compounds:

NA

* * *

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

25 cubic feet

Basis of estimating and/or computing waste quantity:

150 square feet x .167 feet (2 in.) = 25 cubic feet
Visual estimate of asphalt spill

Ref. 18

* * *

3 TARGETS

Distance to Nearest Population

Occupied buildings on-site are within 200 feet of the asphalt spill.

Ref. 18

Distance to Nearest Building

200 feet Ref. 18

Distance to Sensitive Environment

Distance to wetlands:

0.6 mile (USGS Buffalo, SE, NY 1965 Quadrangle)

Distance to critical habitat:

No critical habitats of endangered species in area. Ref. 15

Land Use

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

Site is in commercial/industrial area.

Ref. 16

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

0.6 mile to Tifft Farms Nature Preserve
(USGS Buffalo SE, NY 1965 Quadrangle)

Distance to residential area, if 2 miles or less:

0.0 Residential area is adjacent to southern boundary of site.
(USGS Buffalo SE, NY 1965 Quadrangle)

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

NA

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

NA

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

Yes, spire of Our Lady of Victory Basilica (National Register eligible) can be seen from the site.
Ref. 18
Photo #18

Population Within 2-Mile Radius

Estimated to be greater than 10,000 persons. Radius encompasses residential areas of South Buffalo and Lackawanna.
(USGS Buffalo SE, NY 1965 Quadrangle) Ref. 19

Buildings Within 2-Mile Radius

Estimated to be greater than 2,600 buildings.
(USGS Buffalo SE, NY 1965 Quadrangle)

DIRECT CONTACT

1 OBSERVED INCIDENT

Date, location, and pertinent details of incident:

NA

* * *

2 ACCESSIBILITY

Describe type of barrier(s):

Railway embankment, railway tracks. Site can be readily accessed by foot, automobile or rail.

Ref. 18

* * *

3 CONTAINMENT

Type of containment, if applicable:

Open piles; asphalt spill.

* * *

4 WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Slag, asphalt

Compound with highest score:

Slag = 0; Asphalt = 0 Ref. 17

* * *

5 TARGETS

Population within one-mile radius

No reliable data exists but an estimate of 6,000 persons was used.

Ref. 10

Distance to critical habitat (of endangered species)

No critical habitats of endangered species in area.

Ref. 15

5.4 USEPA Form 2070-12

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

EPA

I. IDENTIFICATION
01 STATE | 02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
Buffalo Crushed Stone	Foot of Steelawanna Avenue				
03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Cities of Buffalo & Lackawanna	NY		Erie		
09 COORDINATES LATITUDE	LONGITUDE				
N 4 5 0 0 0 . _	_ _ _ _ _ _ . _				

10 DIRECTIONS TO SITE (Starting from nearest public road)
Route 5 to Ridge Road to Steelawanna Avenue

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)			
Buffalo Crushed Stone, Inc.	2544 Clinton Street			
03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER	
Buffalo	NY	14224	(716) 826-7310	
07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)			
Same				
09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER	
			( )	

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: _____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: _____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: ___/___/___ (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: ___/___/___ (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES ☐ NO DATE 09 / 08 / 88 (MONTH DAY YEAR)

BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☒ F. OTHER: Recra Environmental, Inc. (Specify)
CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)
☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION
1913 (BEGINNING YEAR) | Present (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
Light weight slag - by-product of iron manufacture at Republic Steel
Hard slag - by-product of iron manufacture at Hanna Furnace

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
None that can be determined.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☐ C. LOW (Inspect on time available basis) ☒ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)		03 TELEPHONE NUMBER	
Richard Mirabelli	Buffalo Crushed Stone, Inc.		(716) 826-7310	
04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
Kenneth A. Shisler, Jr.	NYSDOT	Recra Environmental	(716) 691-2600	09 / 08 / 88 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☒ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER _____ (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE

(Measures of waste quantities must be independent)

TONS 750,000

CUBIC YARDS _____

NO. OF DRUMS _____

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			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
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)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None - dust nuisance reported to ECDEP

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ F. CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: _____ (Acres) 04 NARRATIVE DESCRIPTION

None

01 ☐ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

None

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES (Spills/runoff/standing liquids/leaking drums) — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

N/A

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

01 ☐ O CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

01 ☐ P ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Four empty drums were observed at various locations at the site. There was no evidence of spillage near the drums outside, however one drum (green paint) was located inside a small building where the floor appeared oil soaked. Oil odor was also present.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS Three piles of old tires were also observed.

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

Iron is magnetically separated by electromagnetic crane. Crushing and screening of slag is only processing of material.

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

Richard Marabelli, Vice President, Buffalo Crushed Stone, Inc.

6.0 ASSESSMENT OF DATA ADEQUACY

The data collected and evaluated during the Preliminary Site Characterization for the Buffalo Crushed Stone site is considered inadequate in the following areas:

- Waste Characteristics - no sampling or analyses have been made of the specific slag materials at the site to determine if it contains any hazardous substances.
- Observed Releases - no samples have been obtained from the groundwater resources at the site for the analysis of hazardous substances.

7.0 RECOMMENDATIONS

Based on available data and Recra's observations indicating little or no evidence of visible contaminants, it is unlikely that any significant environmental liabilities are, or are likely to be associated directly with this site.

It is recommended, however, that site specific data be acquired relative to leachabaility of on-site slag to ascertain whether said material could produce contravention of surface and/or groundwater quality or discharge standards. It is further recommended that the oil stained areas and exposed insulation material referenced in this report be sampled and analyzed to insure the absence of hazardous substances or constituents.

8.0 REFERENCES

1. NYSDOT City of Lackawanna Hamburg Turnpike Arterial Route, Map No. 192, Parcel Nos. 2388239 (6 sheets).

2. Documentation of 9/7/88 Telecon with Jerome Miller of Erie County Department of Environment and Planning (ECDEP).

3. 9/27/88 letter from Jerome Miller of ECDEP.

4. 10/21/88 letter from Joseph Laraiso of Buffalo Crushed Stone, Inc.

5. Documentation of 9/7/88 telecon and 9/8/88 interview with Richard Mirabelli of Buffalo Crushed Stone.

6. Memo to file from 6/24/88 and 7/7/88 Recra Environmental site inspections.

7. 1985 Annual Book of ASTM Standards, Section 4 Construction. Vol. 4.08, Soil and Rock; Building Stones, pp. 266-267.

8. Buffalo Crushed Stone, Inc.; technical slinger of slag properties.

9. Geology of Erie County by E.J. Buehler and I.H. Tesmer, Buffalo Society of Natural Sciences Bulletin, Vol. 21, No. 3, 1963, pp. 47-48, map.

10. Site Characterization and Environmental Assessment of Hanna Furnace, Buffalo, New York, by Recra Environmental, Inc., August 1988.

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

12. Groundwater by R.A. Freeze and J.A. Cherry, Prentice Hall, 1979.

13. New York State Atlas of Community Water System Sources, 1982.

14. U.S. Department of Commerce, National Climatic Center, Climatic Atlas of the United States, 1979, Figures 4 and 5.

15. Documentation of 9/9/88 telecon with Jim Snider of NYSDEC Region 9, Division of Fish and Wildlife.

16. Documentation of 9/12/88 telecon with Bruce Colello, City of Lackawanna Department of Development.

17. Hazardous Chemicals Data Book, G. Weisa, ed., Noyes Data Corporation, Park Ridge, New Jersey, 1980, p. 131.

18. Field Report and Photographic Log - Recra Environmental Site Inspection, 9/8/88.

19. 1980 U.S. Census Data.

REFERENCE 1

NYSDOT
City of Lackawanna
Hamburg Turnpike Arterial Route
Map No. 192
Parcel Nos. 238 & 239
(6 sheets)

CITY OF LACKAWANNA
HAMBURG TURNPIKE ARTERIAL ROUTE

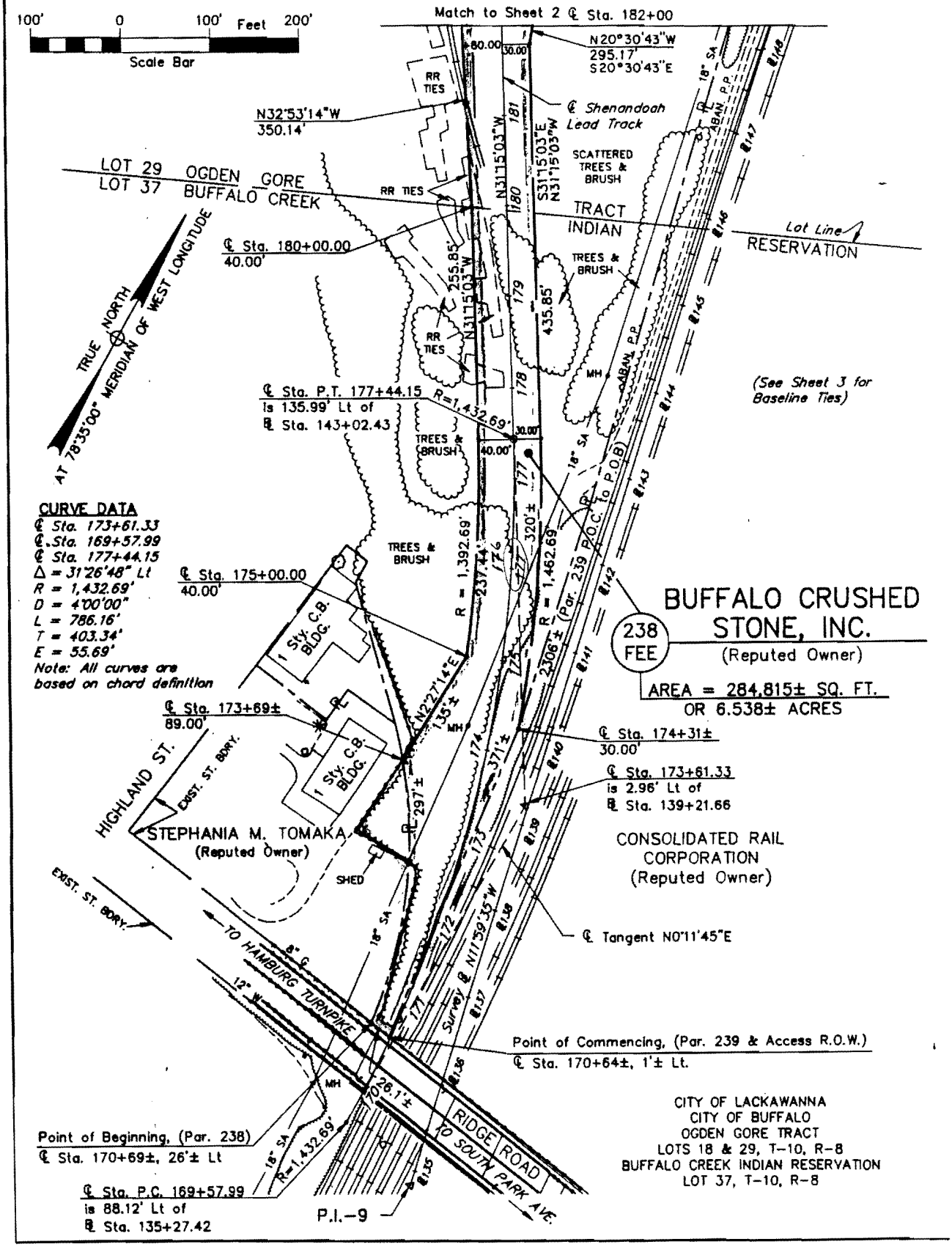
ERIE COUNTY

MAP NO. 192
PARCEL NOS. 238 & 239
SHEET 1 OF 6 SHEETS

Survey notes on file at New York State Department of Transportation Regional Office No. 5 Located at Buffalo, New York.

TRN 48
CC D L 9195 P 382

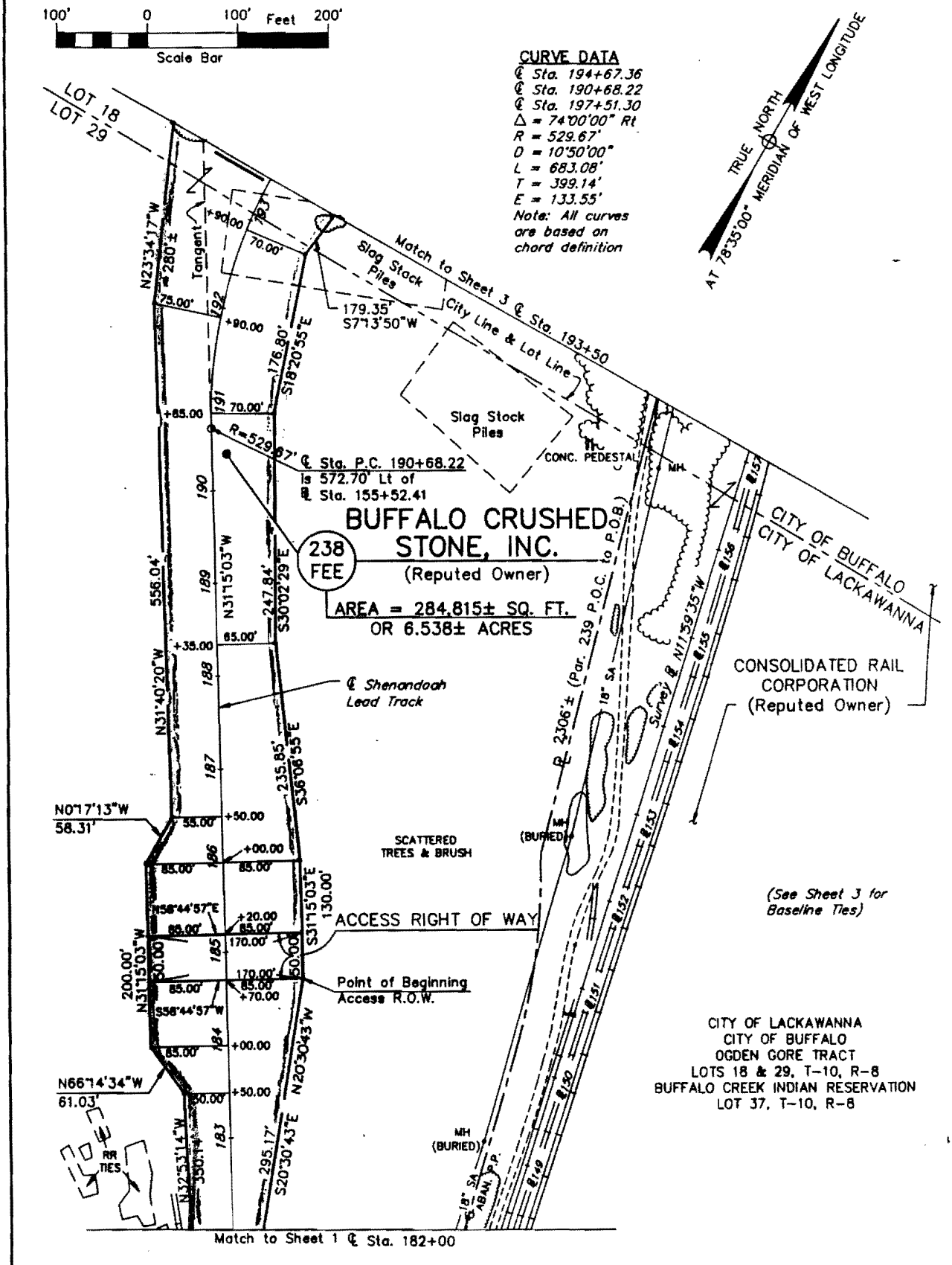
BUFFALO CRUSHED STONE, INC.
(Reputed Owner)



CITY OF LACKAWANNA
HAMBURG TURNPIKE ARTERIAL ROUTE

ERIE COUNTY

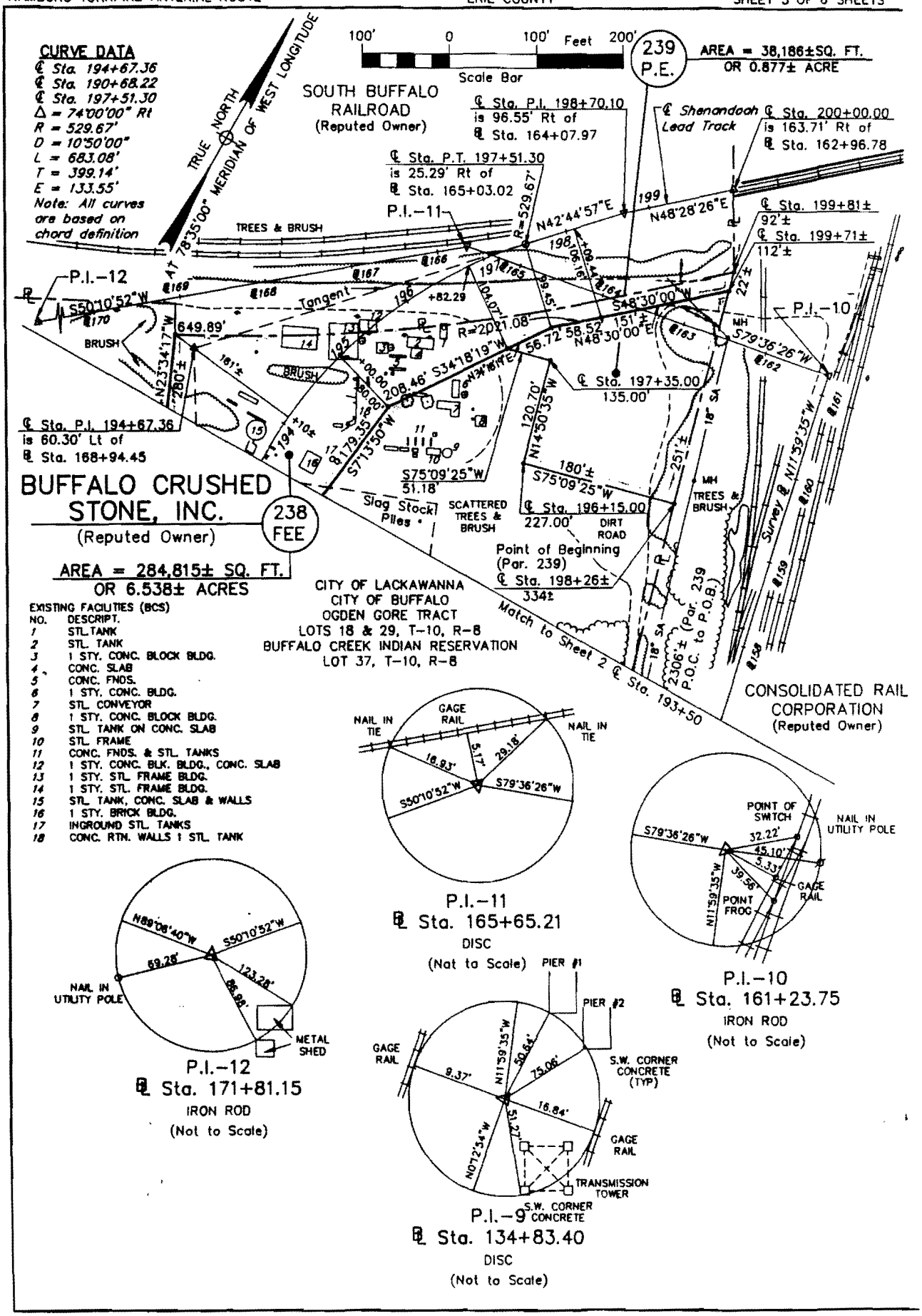
MAP NO. 192
PARCEL NOS. 238 & 239
SHEET 2 OF 6 SHEETS



CITY OF LACKAWANNA
HAMBURG TURNPIKE ARTERIAL ROUTE

ERIE COUNTY

MAP NO. 192
PARCEL NOS. 238 & 239
SHEET 3 OF 6 SHEETS



All that piece or parcel of property hereinafter designated as Parcel No. 238 situate in Lot No. 37, of the Buffalo Creek Indian Reservation, Lot No. 29 of the Ogden Gore Tract both in the City of Lackawanna, Lot No. 18 of the Ogden Gore Tract, City of Buffalo, Township No. 10, Range No. 8, County of Erie, State of New York as shown on the accompanying map and described as follows:

Parcel No. 238

Beginning at a point on the northerly boundary of the existing Ridge Road at its intersection with the division line between the property of Buffalo Crushed Stone, Inc. (Reputed Owner) on the east and the property of Stephania Tomaka (Reputed Owner) on the west said point being 26± feet distant westerly, measured radially from Station 170+69± of the hereinafter described centerline for the Shenandoah Lead Track; thence northerly and northwesterly along said division line 297± feet to a point 89.00 feet distant westerly measured radially from Station 173+69± of said centerline; thence through the property of Buffalo Crushed Stone, Inc. (Reputed Owner) the following nine courses and distances: (1) North 2°-27'-14" East, 135± feet to a point 40.00 feet distant westerly measured radially from Station 175+00.00 of said centerline; thence (2) northerly and northwesterly on a curve to the left having a radius of 1,392.69 feet, an arc distance of 237.44 feet to a point 40.00 feet distant southwesterly measured at right angles from Station 177+44.15 of said centerline; thence (3) North 31°-15'-03" West, 255.85 feet to a point 40.00 feet distant southwesterly measured at right angles from Station 180+00.00 of said centerline; thence (4) North 32°-53'-14" West, 350.14 feet to a point 50.00 feet distant southwesterly measured at right angles from Station 183+50.00 of said centerline; thence (5) North 66°-14'-34" West, 61.03 feet to a point 85.00 feet distant southwesterly measured at right angles from Station 184+00.00 of said centerline; thence (6) North 31°-15'-03" West, 200.00 feet to a point 85.00 feet distant southwesterly measured at right angles from Station 186+00.00 of said centerline; thence (7) North 0°-17'-13" West, 58.31 feet to a point 55.00 feet distant southwesterly measured at right angles from Station 186+50.00 of said centerline; thence (8) North 31°-40'-20" West, 556.04 feet to a point 75.00 feet distant southwesterly measured radially from Station 191+90.00 of said centerline; thence (9) North 23°-34'-17" West, 280± feet to the point of intersection of the division line between the property of Buffalo Crushed Stone, Inc. (Reputed Owner) on the southwest and the property of the South Buffalo Railway Company (Reputed Owner) on the northeast with the division line between the property of Buffalo Crushed Stone, Inc. (Reputed Owner) on the southeast and the property of South Buffalo Railway Company (Reputed Owner) on the northwest, said point being 161± feet distant westerly measured radially from Station 194+10± of said centerline; thence northeasterly along the last mentioned division line 649.89 feet to its point of intersection with the division line between the property of Buffalo Crushed Stone, Inc. (Reputed Owner) on the west and the property of Consolidated Rail Corporation (Reputed Owner) on the east, said point being 92± feet distant southeasterly measured at right angles from Station 199+81± of said centerline; thence southerly along the last mentioned division line 22± feet to a point 112± feet distant southeasterly measured at right angles from Station 199+71± of said centerline; thence through the property of Buffalo Crushed Stone, Inc. (Reputed Owner) the following eleven courses and distances: (1) South 48°-30'-00" West, 151± feet to a point 106.16 feet distant southeasterly measured at right angles from Station 198+09.44 of said centerline; thence (2) Southwesterly on a curve to the right having a radius of 2,021.08 feet, an arc length of 58.52 feet to a point 99.45 feet distant southeasterly measured at right angles from Station 197+51.30 of said centerline; thence (3) South 34°-18'-19" West, 208.46 feet to a point 80.00 feet distant easterly measured radially from Station 195+00.00 of said centerline; thence (4) South 7°-13'-50" West, 179.35 feet to a point 70.00 feet distant easterly measured radially from Station 192+90.00 of said centerline; thence (5) South 18°-20'-55" East, 176.80 feet to a point 70.00 feet distant northeasterly measured radially from Station 190+85.00; thence (6) South 30°-02'-29" East, 247.84 feet to a point 65.00 feet distant northeasterly measured at right angles from Station 188+35.00 of said centerline; thence (7) South 36°-06'-55" East, 235.85 feet to a point 85.00 feet distant northeasterly measured at right angles from Station 186+00.00 of said centerline; thence (8) South 31°-15'-03" East, 130.00 feet to a point 85.00 feet distant northeasterly measured at right angles from Station 184+70.00 of said centerline; thence (9) South 20°-30'-43" East, 295.17 feet to a point 30.00 feet distant northeasterly measured at right angles from Station 181+80.00 of said centerline; thence (10) South 31°-15'-03" East, 435.85 feet to a point 30.00 feet distant northeasterly measured at right angles from Station 177+44.15 of said centerline; thence (11) southeasterly and southerly on a curve to the right having a radius of 1,462.69 feet, an arc distance of 320± feet to a point on the last mentioned division line, said point being 30.00 feet distant easterly measured radially from Station 174+31± of said centerline; thence southerly along said last mentioned division line, 371± feet to its point of intersection with the said boundary, said point being 1± foot distant westerly measured radially from Station 170+64± of said centerline; thence westerly along said boundary, 26.1± feet to the point of beginning, being 284,815± square feet or 6.538 acres more or less.

Reserving, however, to the owner of the property described above, and such owner's successors or assigns only to an extent which will not interfere with the use of the property for railroad purposes, a permanent right, privilege and easement for vehicle and pedestrian access across, the above described Parcel No. 238 and for such purposes to maintain and operate a road and other appurtenances as may be deemed necessary for the proper operation thereof.

Such easement shall be exercised in and to, under, over and across all that piece or parcel of property hereinafter designated as ACCESS RIGHT OF WAY situate in Lot No. 29 of the Ogden Gore Tract, City of Lackawanna, Township No. 10, Range No. 8, County of Erie, State of New York as shown on the accompanying map and described as follows:

ACCESS RIGHT OF WAY

Commencing at a point on the northerly boundary of the existing Ridge Road at its intersection with the division line between the property of Buffalo Crushed Stone, Inc. (reputed owner) on the west and the property of Consolidated Rail Corporation (reputed owner) on the east, said point being 1± foot distant westerly measured radially from Station 170+64± of the hereinafter described centerline for the Shenandoah Lead Track; thence northerly along said division line, 371± feet to a point 30.00 feet distant easterly measured radially from Station 174+31± of said centerline; thence through the property of Buffalo Crushed Stone, Inc. (Reputed Owner) the following three courses and distances: (1) northerly and northwesterly on a curve to the left having a radius of 1,462.69 feet, an arc distance of 320± feet to a point 30.00 feet distant northeasterly measured at right angles from Station 177+44.15 of said centerline; thence (2) North 31°-15'-03" West, 435.85 feet to a point 30.00 feet distant northeasterly measured at right angles from Station 181+80.00 of said centerline; thence (3) North 20°-30'-43" West, 295.17 feet to the point of beginning, said point being 85.00 feet distant northeasterly measured at right angles from Station 184+70.00 of said centerline; thence continuing through the property of Buffalo Crushed Stone, Inc. (Reputed Owner) the following four courses and distances: (1) South 58°-44'-57" West, 170.00 feet to a point 85.00 feet distant southwesterly measured at right angles from Station 184+70.00 of said centerline; thence (2) North 31°-15'-03" West, 50.00 feet to a point 85.00 feet distant southwesterly measured at right angles from Station 185+20.00 of said centerline; thence (3) North 58°-44'-57" East, 170.00 feet to a point 85.00 feet distant northeasterly measured at right angles from Station 185+20.00 of said centerline; thence (4) South 31°-15'-03" East, 50.00 feet to the point of beginning, for said ACCESS RIGHT OF WAY.

ALSO

PERMANENT EASEMENT FOR RETENTION POND

A permanent easement to be exercised in, on and over the property above delineated and hereinafter described for the purpose of constructing, reconstructing and maintaining thereon a retention pond and appurtenances in and to all that piece or parcel of property hereinafter designated as Parcel No. 239 situate in Lot No. 18, Township No. 10, Range No. 8 of the Ogden Gore Tract, City of Buffalo, County of Erie, State of New York as shown on the accompanying map and described as follows:

Parcel No. 239

Commencing at a point on the northerly boundary of the existing Ridge Road at its intersection with the division line between the property of Buffalo Crushed Stone, Inc. (Reputed Owner) on the west and the property of Consolidated Rail Corporation (Reputed Owner) on the east, said point being 1± foot distant westerly measured radially from Station 170+64± of the hereinafter described centerline for the Shenandoah Lead Track; thence northerly along said division line, on five courses a total distance of 2,306± feet to the point of beginning, said point being 334± feet distant southeasterly measured at right angles from Station 198+26± of said centerline; thence through the property of Buffalo Crushed Stone, Inc. (Reputed Owner) the following six courses and distances: (1) South 75°-09'-25" West, 180± feet to a point 227.00 feet distant southeasterly measured radially from Station 196+15.00 of said centerline; thence (2) North 14°-50'-35" West, 120.70 feet to a point 135.00 feet distant southeasterly measured radially from Station 197+35.00 of said centerline; thence (3) South 75°-09'-25" West 51.18 feet to a point 104.07 feet distant southeasterly measured radially from Station 196+82.29 of said centerline; thence (4) North 34°-18'-19" East, 56.72 feet to a point 99.45 feet distant southeasterly measured at right angles from Station 197+51.30 of said centerline; thence (5) northeasterly on a curve to the left having a radius of 2,021.08 feet, an arc length of 58.52 feet to a point 106.16 feet distant southeasterly measured at right angles from Station 198+09.44 of said centerline; thence (6) North 48°-30'-00" East, 151± feet to a point on the said division line, said point being 112± feet distant southeasterly measured at right angles to Station 199+71± of said centerline; thence southerly 251± feet along, said division line to the point of beginning, being 38,186± square feet or 0.877 acre more or less.

Reserving, however, to the owner of any right, title or interest in and to the property described above, and such owner's successors or assigns, the right of using said property and such use shall not be further limited or restricted under this easement beyond that which is necessary to effectuate its purposes for, and as established by, the construction and as so constructed, the maintenance, of the herein identified project.

The above mentioned centerline for the Shenandoah Lead Track as shown on the accompanying map is established from the DeLeuw, Cather & Company of New York, Inc. 1987 survey baseline for the construction of the South Buffalo Railway Company Track Relocation as shown on a map and plan on file in the Office of the State Department of Transportation, a portion of said baseline being described as follows:

Beginning at PI-9 Station 134+83.40; thence North 11°-59'-35" West to PI-10 Station 161+23.75; thence South 79°36'-26" West to PI-11 Station 165+65.51; thence South 50°-10'-52" West to PI-12 Station 171+81.15.

All bearings referred to True North at the 78°-35'-00" Meridian of West Longitude.

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY MAP IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

I hereby certify that the property described and mapped above is necessary for this project and the acquisition thereof is recommended.

DATE September 8, 1988

Robert J. Russell
R.J. RUSSELL
Regional Director of Transportation
Region No. 5

STATE OF NEW YORK
VINCENT J. LAMARK
No. 49093
LICENSED LAND SURVEYOR

I hereby certify that this is an accurate description and map made from an accurate survey, prepared under my direction.

DATE September 2, 1988

Vincent J. Lamark
VINCENT J. LAMARK
Erdman, Anthony and Associates, Inc.
P.L.S. License No. 49093

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
DESCRIPTION AND MAP FOR THE ACQUISITION OF PROPERTY

CITY OF LACKAWANNA
HAMBURG TURNPIKE ARTERIAL ROUTE
ERIE COUNTY

Map No. 192
Parcel Nos. 238 & 239

BUFFALO CRUSHED STONE, INC.
(Reputed Owner)

Total Area = 323,001± Sq. Ft.
or 7.415± Acres

Descriptions and map of property showing (1) Parcel No. 238 to be acquired in fee except for the purposes of the rights described above; and (2) Parcel No. 239 in and to which an easement as hereinabove defined is to be acquired; each of which the Commissioner of Transportation deems necessary to be acquired by appropriation in the name of the people of the State of New York for purposes connected with the highway system of the State of New York pursuant to Sections 30 and 349-C of the Highway Law and the Eminent Domain Procedure Law.

There is excepted from this appropriation all the right, title and interest, if any, of the United States of America in or to said property.

Pursuant to statutes set forth above and the authority delegated to me by official order of the commissioner of transportation, the above descriptions and map are hereby officially approved; and said descriptions and the original tracing of this map are hereby officially filed in the office of the department of transportation.

DATE _____, 19__

_____
D.J. Gurnett
Director, Real Estate Division

I have compared the foregoing copy of descriptions and map with the original thereof, as filed in the office of the department of transportation and I do hereby certify the same to be a true and correct copy of said original and of the whole thereof.

_____
Real Estate Division

REFERENCE 2

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

September 20, 1988

Mr. Jerome L. Miller
Environmentalist - Hazardous Waste
County of Erie Department of
Environment and Planning
95 Franklin Street
Buffalo, New York 14202

Dear Mr. Miller:

The following letter is to serve as documentation for our telephone conversation on September 7, 1988, concerning the Buffalo Crushed Stone Steelawana Ave. location. If you feel any corrections or additions to this information are needed, please make them on the text of this letter. If you agree that the information is correct, please sign at the bottom of the page in the space indicated, and return it to me.

- o There is no health hazard associated with the slag stored at the Buffalo Crushed Stone facility.
- o The only complaints associated with the Buffalo Crushed Stone operations were for dust nuisance.
- o There are no health hazards associated with the leachate that is sometimes emitted by slag during periods of heavy rainfall.

Should you have any additional comments or questions, please feel free to contact me. Thank you very much for your time and effort.

Sincerely,

RECRA ENVIRONMENTAL, INC.

Kenneth A. Shisler Jr.

Kenneth A. Shisler, Jr.
Staff Geologist

KS/pb

Jerome L. Miller

Audubon Business Centre • 10 Hazelwood Drive, Suite No. 106 • Amherst, New York 14150 • (716) 691-2600

REFERENCE 3

County of Erie

DENNIS T. GORSKI
COUNTY EXECUTIVE

DEPARTMENT OF ENVIRONMENT AND PLANNING

RICHARD M. TOBE
COMMISSIONER

ENVIRONMENTAL COMPLIANCE SERVICES

September 27, 1988

Mr. Ken Shisler
RECRA Environmental Inc.
Audobon Business Center
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

Dear Mr. Shisler:

In regard to your recent letter concerning our conversation on the Buffalo Crushed Stone Steelawanna Avenue location, I am afraid I am unable to sign the statements for the following reasons.

Since our department has done no study and has no available data, I cannot state that the slag stored at that location is not producing any health hazard through its presence or the leachate it generates.

For the record, the only complaints from this facility that we are aware of concern the generation of excessive dust from trucks leaving and entering the facility.

Very truly yours,

Jerome L. Miller

JEROME L. MILLER
Environmentalist - Hazardous Waste

JLM:ems

REFERENCE 4

BUFFALO CRUSHED STONE, INC.
CONSTRUCTION MATERIALS

2544 Clinton St., P.O. Box 710, Buffalo, NY 14224
(716) 826-7310

October 21, 1988

Mr. Kenneth A. Shisler, Jr.
Staff Geologist
Recra Environmental, Inc.
10 Hazelwood Drive
Suite 106
Amherst, New York 14150

Dear Mr. Shisler:

Blast furnace slag stockpiled at the Buffalo Crushed Stone, Inc., Steelawanna Avenue site consists of "light weight" slag and "hard" slag that were produced as a by product of iron manufacture from the Republic Steel Co. and Hanna Furnace Corporation, respectively.

Although no specific analyses have been conducted on the slag stockpiled at the Steelawanna Avenue site, Buffalo Crushed Stone, Inc. has had EP Toxicity analyses performed on similar blast furnace slag produced by Bethlehem Steel Co., and stockpiled by Buffalo Crushed Stone, Inc. in Woodlawn.

The EP Toxicity analyses of the slag produced by Bethlehem Steel Co., did not indicate the presence of materials of a hazardous nature.

Very truly yours,

Joseph S. Laraiso

JSL:kls

REFERENCE 5

1/L9504.1

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

RFM

☐ H.K. ☐ P.T. ☐ R.C. ☐ M.G. ☐ J.L. ☐ G.H. ☐ V.P. ☐ V.B. ☐ T.P. ☐ P.S. ☐ J.C. ☐ S.J. ☐ S.C.

SEP 15 1988

☐ FID/PLT ☐ ALL KEY

DIRECTIONS: No. of copies: COPIES MADE & CIRCULATED BY

☐ None-Circul. orig. to above

☐ Individ. copies for above

THIS COPY FOR

September 13, 1988

Mr. Richard Marabelli
Vice President
Buffalo Crushed Stone, Inc.
2544 Clinton Street
P.O. Box 710
Buffalo, NY 14224

SEP 23 1988

Dear Mr. Marabelli:

In order to provide a written record of our background information search, all interviews, personal or telephone, must be documented.

Below is a synopsis of our telephone conversation of 9/7/88, and personal interview at the Steelawanna Avenue Site on 9/8/88, regarding the history of the Buffalo Crushed Stone property located at the foot of Steelawanna Avenue, Lackawanna, New York. If the information contained herein is correct, please sign this letter at the bottom in the space provided and return it to the undersigned. If you feel any corrections are necessary, please make them on the text of this letter.

- The Steelawanna Avenue slag storage site was operated by Buffalo Slag Company from approximately 1913 until 1983, when the operation was sold to Buffalo Crushed Stone, Inc.

- The site has been used primarily for the storage of hard slag and light weight slag, which is crushed, mixed and screened on site, and is sold as ASTM approved construction material for road and parking lot base fill.

- There have been no materials other than slag landfilled at the Steelawanna Avenue location, to the best of my knowledge. (CSP)

- Asphalt and tar are no longer stored or used at the site, however, old tanks that were used for this purpose are still located on site.

- o There are no underground tanks currently at the site, to the best of my knowledge.
- o Iron recovery from the slag is accomplished by magnetic separation, and there are no other refining processes used.

Should you have any further questions or comments, please feel free to contact me. Thank you for you time and effort.

Sincerely,

RECRA ENVIRONMENTAL, INC.

Kenneth A. Shisler, Jr.

Kenneth A. Shisler, Jr.
Staff Geologist

Richard F. Marabelli

Richard Marabelli

REFERENCE 6

Notes from 6/24/88 and 7/7/88
Recra Environmental Site Inspections

1/9960.6.1

FILE

Robert E. Steiner

November 30, 1988

Buffalo Crushed Stone, Steelawanna Avenue Site

A site visit was done on 6/24/88 by Recra personnel Robert E. Steiner. Inspected buildings and tanks at northern part of site; noticed most of site is covered by large piles of slag, known as light weight slag. These piles extend to the southern part of the site, where some are covered with some vegetation. It was said that this material was brought in during the 1970's from Republic Steel. The facility used to be known as Buffalo Slag. The light weight slag is mixed with hard slag and the product is often used as fill in highway construction by County and State authorities. Below is a brief description of some of the buildings and tanks that have been there for the last 26 or 27 years. The tanks were said to have been used to store asphalt (tar).

17: Two in-ground tanks with open tops, they stick up about two feet and extend 10 feet below ground. They are about 4-5 feet in diameter and have 5-6 feet of water in them. Field measurements on water yielded conductivity reading of 330,340 umhos/cm and pH readings of 7.0, 7.14. The water was clear with some rust particles in it. No readings on TIP unit.

15: This is a large tank about 20 feet high that appears to be empty. No readings were obtained with TIP.

18: This is a fairly small tank on top of a pile of slag. The tank seems to be empty, but there is some tar residue on the outside.

2: This is a large tank that seems to have been purchased and there is a large puddle of tar about 1 inch thick around the tank.

9: This tank also has a puddle of tar around it.

There are four tanks next to Tank #9, two of which (a,b) are underground tanks that have been removed and placed on top of the ground. Tank "a" seems to have a small amount of liquid in it and a rading of >400 ppm on TIP was registered. Tank "b" seems to be empty but an odor can be detected and the TIP registered >2,000 ppm.

The buildings on-site are made of sheet metal and block walls and concrete floors. There is some debris in some of them, but nothing of real concern.

There was a pile of asphalt road debris located to the east of Tank #2 on 6/24. On 7/7 the piles had been moved 100-200 feet east and the material had been crushed.

Near the northeastern part of the site is a sanitary manhole that is filled near the top with water. Thee was a slight hydrocarbon smell evident but the TIP did not pick up anything. A water sample was collected and specific conductance was 390, pH was 7.73.

Directly adjacent to Buffalo Crushed Stone, on the west side, is Quikrete, which produces dry cement products. The southern end of the site near Ridge Road is bordered by a fence. In the vicinity of Ridge Road is a church and a United Way building.

The main areas of concern are the tanks, especially the ones where there has been leakage. There is also underground piping next to the tanks. The sanitary sewer may be of concern as well as adjacent landfills located to the east.

The surface water run-off direction seems to be to the east and south, but water probably runs off in all directions from the large piles of slag.

On 7/7, I talked with some people along Ridge Road who said they remember seeing the trucks transporting the material (slag) to and from the site, and that they never saw anything else being brought or buried on-site.

Information on the makeup of the slag is being forwarded to Recra by Gary Nelson, phone number 683-4714. The majority of the information was obtained from Dick Marabelli, phone number 826-7310. We need to obtain information from him as to where the underground tanks are buried. Don Bicz originally showed the site, phone number 826-2890. He should be contacted if further site visits are needed.

REFERENCE 7

1985 Annual Book of ASTM Standards
Section 4 Construction

Volume 4.08 Soil and Rock; Building Stones, pp. 266-267

Designation: D 1241 – 68 (Reapproved 1979)

An American National Standard

Standard Specification for MATERIALS FOR SOIL-AGGREGATE SUBBASE, BASE, AND SURFACE COURSES[1]

This standard is issued under the fixed designation D 1241; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the quality and grading of the following materials for use in the construction of subbase, base, and surface courses: sand - clay mixtures; gravel; stone or slag screenings; sand; crusher-run coarse aggregate consisting of gravel, crushed stone, or slag combined with soil mortar; or any combination of these materials. The requirements are intended to cover only materials having normal or average specific gravity, absorption, and gradation characteristics. Where other materials are to be used, appropriate limits suitable to their use must be specified.

2. Types

2.1 The following types of mixtures are specified:

2.1.1 *Type I*—Mixtures consisting of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 (75-μm) sieve and conforming to the requirements of Table 1 for Gradation A, B, C, or D.

2.1.2 *Type II*—Mixtures consisting of natural or crushed sand with fine mineral particles passing a No. 200 (75-μm) sieve, with or without stone, gravel, or slag, and conforming to the requirements of Table 1 for Gradation E or F.

3. General Requirements

3.1 *Coarse Aggregate*—Coarse aggregate retained on a No. 10 (2.00-mm) sieve, for use in Type I and Type II mixtures, shall consist of hard, durable particles or fragments of stone, gravel, sand, or slag; materials that break up when alternately frozen and thawed or wetted and dried shall not be used. Coarse aggregate shall have a percentage of wear, by the Los Angeles test, of not more than 50.

NOTE 1—A higher or lower percentage of wear may be specified by the engineer, depending upon the materials available for the work.

3.2 *Fine Aggregate*—Fine aggregate passing a No. 10 (2.00-mm) sieve, for use in Type I and Type II mixtures, shall consist of natural or crushed sand and fine mineral particles passing the No. 200 (75-μm) sieve. The fraction passing the No. 200 sieve shall not be greater than two thirds of the fraction passing the No. 40 (425-μm) sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6.

3.3 The composite soil-aggregate material of Types I and II shall be free of vegetable matter and lumps or balls of clay and shall conform to the grading requirements of Table 1.

4. Subbase Materials

4.1 Soil - aggregate materials for subbase shall conform to the requirements of Section 3 for Type I, Gradation A, B, C, or D, or for Type II, Gradation E or F. The type and grading desired shall be specified.

NOTE 2—Where local experience has shown that, in order to prevent damage by frost action, it is necessary to have lower percentages of the subbase materials passing the No. 200 (75-μm) sieve than are required by Table 1, the engineer should specify such lower percentages.

[1] This specification is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D 18.08 on Special and Construction Control Tests.

Current edition effective Sept. 13, 1968. Originally issued 1952. Replaces D 556, D 557, D 1241 – 64 T.

5. Base-Course Materials

5.1 Soil - aggregate materials for base course shall conform to the requirements of Section 3 for Type I, Gradation A, B, C, or D, or for Type II, Gradation E or F. The type and grading desired shall be specified.

NOTE 3—Where local experience has shown that, in order to prevent damage by frost action, it is necessary to have lower percentages of the base-course materials passing the No. 200 (75-μm) sieve than are required by Table 1, the engineer should specify such lower percentages.

6. Surface-Course Materials

6.1 Soil - aggregate materials for surface course shall conform to the requirements of Section 3 for Type I, Gradation C or D; or for Type II Gradation E or F. The type and grading shall be specified.

NOTE 4—Where it is planned that the soil - aggregate surface course is to be maintained for several years without bituminous surface treatment or other superimposed impervious surfacing, the engineer should specify a minimum of 8 percent passing the No. 200 (75-μm) sieve instead of the minimum percentages shown in Table 1 for Gradation C, D, or E, and should specify a maximum liquid limit of 35 and plasticity index range from 4 to 9, instead of the limits given in 3.2.

7. Moisture Content

7.1 All materials shall contain moisture sufficient to ensure that the design density requirements will be obtained when the materials are compacted.

8. Admixture

8.1 Calcium chloride used for the control of moisture shall conform to all the requirements of ASTM Specification D 98, for Calcium Chloride.[2]

9. Test Methods

9.1 Sample the material and determine the properties enumerated in this specification in accordance with the following ASTM methods:

9.1.1 *Sampling*—Practice D 75, Sampling Aggregates.[2]

9.1.2 *Sieve Analysis*—Test Method C 117, for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing,[3] and Method C 136, Sieve Analysis of Fine and Coarse Aggregates.[3]

9.1.3 *Percentage of Wear*—Test Method C 131, for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.[3]

9.1.4 *Surveying and Sampling Soils for Highway Subgrades*—Recommended Practice D 420, for Investigating and Sampling Soil and Rock for Engineering Purposes.[4]

9.1.5 *Preparing Soil Samples*—Method D 421, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.[4]

9.1.6 *Liquid Limit*—Test Method D 423, for Liquid Limit of Soils.[5]

9.1.7 *Plastic Limit and Plasticity Index*—Test Method D 424, for Plastic Limit and Plasticity Index of Soils.[5]

[2] *Annual Book of ASTM Standards*, Vol 04.03.
[3] *Annual Book of ASTM Standards*, Vol 04.02.
[4] *Annual Book of ASTM Standards*, Vol 04.08.
[5] Discontinued, see *1983 Annual Book of ASTM Standards*, Vol 04.08.

REFERENCE 8

BUFFALO CRUSHED STONE, INC.
Buffalo Slag
CONSTRUCTION MATERIALS

2544 Clinton St., P.O. Box 710, Buffalo, NY 14224
(716) 826-7310

JUL -8 1988

July 6, 1988

RECRA Environmental
10 Hazelwood Drive
Suite 106
Amherst, N.Y. 14150

Attn: Bob Steiner

Dear Bob,

Enclosed you will find our technical slinger which discusses some of the properties of the slag at Steelawanna avenue.

The slinger was prepared as a marketing brochure, so some of the information tends towards that vein. However, it does contain some good, accurate technical information.

Please call if you need any further information.

Sincerely,

Buffalo Crushed Stone, Inc.

Gary D. Nelson

Gary D. Nelson, Quality Control

GDN/g

BUFFALO CRUSHED STONE, INC.
Buffalo Slag
CONSTRUCTION MATERIALS

2544 Clinton St., P.O. Box 710, Buffalo, NY 14224
(716) 826-7310

EXPANDED BLAST FURNACE SLAG

(Plant: Lackawanna, New York)

I. Typical Sieve Analysis

Sieve	% Passing
2"	100% *
1"	99%
1/2"	98%
1/4"	95%
1/8"	65%
#16	30%
#30	17%
#50	10%
#100	8%
#200	4%

* Some plus 2" size particles and "fusion cakes" exist in the raw stock depending on furnace feed burden. These chunks break up during handling.

2. Moisture Conditions

-Supersaturated = 25%
-Saturated Surface Dry = 17%
-Available Surface = 8%
-"As is" Stockpile = 10% - 20%

3. Laboratory Theoretical Densities. ASTM C-29 Method

Dry	58 #/cu.ft. loose 65 #/cu.ft. compact
S.S.D.	63 #/cu.ft. loose (usually as received) 69 #/cu.ft. compact
Saturated	67 #/cu.ft. loose 75 #/cu.ft. compact

4. Laboratory Relative Densities. ASTM D2049 Method

Minimum - 55 #/cu.ft.
Maximum - 82 #/cu.ft.

5. Other Properties

Specific Gravity

Bulk S.S.D.	1.4
Apparent Oven Dry	1.7
Bulk Impregnated	1.2

Solid Weight (no voids)	91 #/cu.ft.
Fineness Modulus	3.25
4 Cycle Magnesium Sulfate Soundness	30% to 40% loss *

* This is not an applicable test of weathering or disintegration for this type slag aggregate. This material is chemically, and not mechanically, attacked by magnesium and sodium salt solutions. The attack is similar to the sulfate action on Portland Cement Concrete and doesn't simulate freeze/thaw characteristics for which it is intended. For this reason, concrete specimens are not subject to salt tests as an indication of weathering ability. Because it is cooled so quickly, this type of slag is almost amorphous (no real crystalline structure), and has approximately the same calcium silicate and calcium alumino silicate chemistry as Portland Cement (in fact, ground Pelletized Slag is an ASTM approved substitute for some types of Portland Cement). Therefore, both materials react similarly to magnesium or sodium salt attack.

II. CHEMICAL PROPERTIES

CaO (Lime)	38% to 44%
SiO_2 (Silica)	30% to 36%
Al_2O_3 (alumina)	11% to 15%
MgO (magnesia)	10% to 14%
Mn (manganese)	.1% to .5%
S (sulphur)	1% to 2%
Fe (iron)	.3% to .6%

The PH value of slag is 7-9. Slag is often considered to be acidic in nature. This is not the case. The large proportion of calcium renders the material a basic nature.

III. COMPACTION THEORY AND FACTORS

Pelletized slag is formed by controlling a stream of water added to the slag as it passes over a rotating steel drum, throwing the rapidly expanding slag into the air for further cooling into semi-spherical shapes. This cooling of the slag solidifies it so quickly that the crystals do not form and grow. The energy non-expelled remains latent, making it more aggressive in it's reaction as a hydraulic cementing material. The expanded slag appears friable and porous. Microscopic examination of the minus 200 mesh particles shows them to be glassy, porous, and irregular. This physical structure leads people to believe that the material will crush easily under compaction equipment. While some larger particles can be crushed between the fingers, when placed on grade the slag appears to develop a cushioning effect which resists breaking. Though some degradation does occur, it tends to be superficial, confined to larger sizes in the field, and smaller particles in the lab.

Experience has shown that several characteristics of clinker are desirable for a good fill material. Among these are an adequate amount passing the ½" and #200 sieves, long grading, and sufficient moisture for compaction purposes.

Finally, good compaction techniques must be practiced for the material to perform as desired. Experience and the use of proper density tests such as the Sand Cone should be the best guidelines. Good results have been obtained when 8" to 10" loose lifts are placed and rolled. The testing agencies and several Engineering firms and contractors in the area have a lot of experience with this material. Their information, as well as our own, could prove invaluable when specifications are to be met. Use of Proctor tests (ASTM D1557 and D698) are doubtful in that slag is more of a non-cohesive material and does not achieve a true optimum moisture-density relationship. Satisfactory laboratory design and field control techniques by using ASTM D2049 "Relative Density of Cohesionless Soils" are proving to be quite reliable.

IV. GRADE FILLING AND BACKFILLING

Pelletized slag should be recognized as a superior fill for bringing in low lying ground up to elevation. It weighs about 1000#/cy. yd. less than conventional fills. It compacts readily and provides quick drainage, as well as high load-bearing capacity immediately after placement and compaction. Pelletized slag can provide stable fill for all types of structural buildings and highways. It is excellent for erosion control and minutely affected by freeze/thaw. When properly compacted, the particles cement together, forming a porous homogenous mass which after a short time is very solid and stable. Pelletized slag tends to neutralize acid soil waters, which makes it an excellent material for backfilling around steel structures or iron pipe. Plentiful in supply, easy to handle and surprisingly low in cost, pelletized slag is unsurpassed.

V. OTHER ADVANTAGES

1. Economic - Pelletized slag allows for an additional material source and bid item. It is more than just competitive to all other aggregate forms. Also, trucking volumes would be less, with a resultant total project saving.

2. Strength - Although we do not have specific information on the immediate and latent strength of this material, we would anticipate CBR value's in excess of 100% on specimens immediately after compaction. From tests on granulated slag products, increases of 350% on the original CBR have been observed. Pelletized slag is closely related to granulated slag.

3. Insulative - The lighter weight can provide an insulative quality

to the base course items which can be important in this region.

4. Ecology - Today's national theme calls for conserving the depletion of fuel energy and our remaining natural minerals. Pelletized slag is an artificial, re-cycled aggregate.

5. Other key words - Angular, Bond & Shear, Cemetitous, Stability, Durability, Lightweight, Permeable, Freeze/thaw, Non-Corrosive.

VI. CURRENT ACCEPTANCE OF PELLETIZED SLAG

Granulated slag is used in Ohio and Pennsylvania for their Specification items 703.7 and 351 respectively. Granulated slag is closely related to our pelletized slag as far as structure is concerned, and it is identical chemically. The only difference is that granulated is cooled even quicker than pelletized.

Pelletized slag is used by the New York State Department of Transportation for specification item 203.0303, Lightweight Embankment Fill. Also, the City of Buffalo, various other municipalities, as well as private concerns have all used pelletized slag.

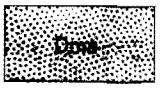
A list of jobs is included with this information.

REFERENCE 9

Geology of Erie County
E.J. Buehler and I.H. Tesmer
Buffalo Society of Natural Sciences Bulletin
Volume 21, No. 3, 1963, pp. 47-48, map

Mid

Levanna Shale Member, dark-gray calcareous shale, Stafford Limestone Member, massive, fossiliferous limestone at base.



Marcellus Formation

Oatka Creek Shale Member, black calcareous shale with some calcareous concretions.

50'

Onondaga Limestone

Moorehouse Limestone Member, light-gray limestone containing numerous corals and considerable dark-gray chert nodules; Nedrow Member, intermixed light-gray limestone and dark-gray chert; Edgecliff Member, light-gray limestone with some light-gray chert nodules, locally represented by a coral bioherm.

UNCONFORMITY

Upper Silurian

Akron Dolostone

Light-gray dolostone

Bertie Formation

Williamsville Member, light-gray argillaceous limestone; Scajaquada Member, interbedded dark-gray shale and argillaceous limestone; Falkirk Member, light-gray dolostone; Oatka Member, dark-gray shale with argillaceous limestone at base containing eurypterids.

Camillus Shale

Gray shale containing large amounts of gypsum

SILURIAN

Contact

Inferred Contact

45'

GEOLOGIC MAP OF ERIE COUNTY, NEW YORK BEDROCK GEOLOGY

by Edward J. Buehler and Irving H. Tesmer

1963

Scale $\frac{1}{62500}$

1 0 1 2 3 4 Miles

CONTOUR INTERVAL 20 FEET

DEVONIAN

Upper Devo.

Seneca Group

West Falls Formation

Nunda Sandstone Member, Dwn, *massive siltstones with some thin siltstones and silty shales; Angola Shale Member*, Dwa, *medium light-gray to light-gray shale containing a little black shale, a few thin siltstones and many calcareous nodules of various sizes; Rhinestreet Shale Member*, Dwr, *black shale containing some gray and dark-gray shale, many large septaria and some small nodules.*

Sonyea Formation

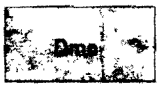
Cashaqua Shale Member, gray and olive-gray shale containing many discoidal calcareous nodules and septaria; Middlesex Shale Member, black shale at base.

Genesee Formation

West River Shale Member, dark-gray shale with some very thin beds of black shale and siltstones; Genundewa Limestone Member, thin limestone containing Styliolina fissurella; Penn Yan Shale Member, thin unit of dark-gray shale; Geneseo Shale Member, thin unit of black shale at base.

Middle Devonian

Hamilton Group



Moscow Formation

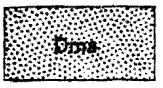
Windom Shale Member, medium-gray to olive-gray calcareous shale with many calcareous concretions; Kashong Shale Member, thin unit of soft gray shale at base. Thin lenses of Leicester Pyrite sometimes occur between the Moscow and Genesee Formations.

Ludlowville Formation

Tichenor Limestone Member, thin, massive, fossiliferous, resistant limestone occurs at top; Wanakah Shale Member, medium-gray, fossiliferous, calcareous shale with some calcareous concretions; Ledyard Shale Member, dark-gray calcareous shale; Centerfield Limestone Member, thin, massive limestone unit at base.

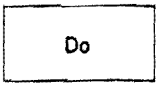
Skaneateles Formation

Levanna Shale Member, dark-gray calcareous shale; Stafford Limestone Member, massive, fossiliferous limestone at base.



Marcellus Formation

Oatka Creek Shale Member, black calcareous shale with some calcareous concretions.



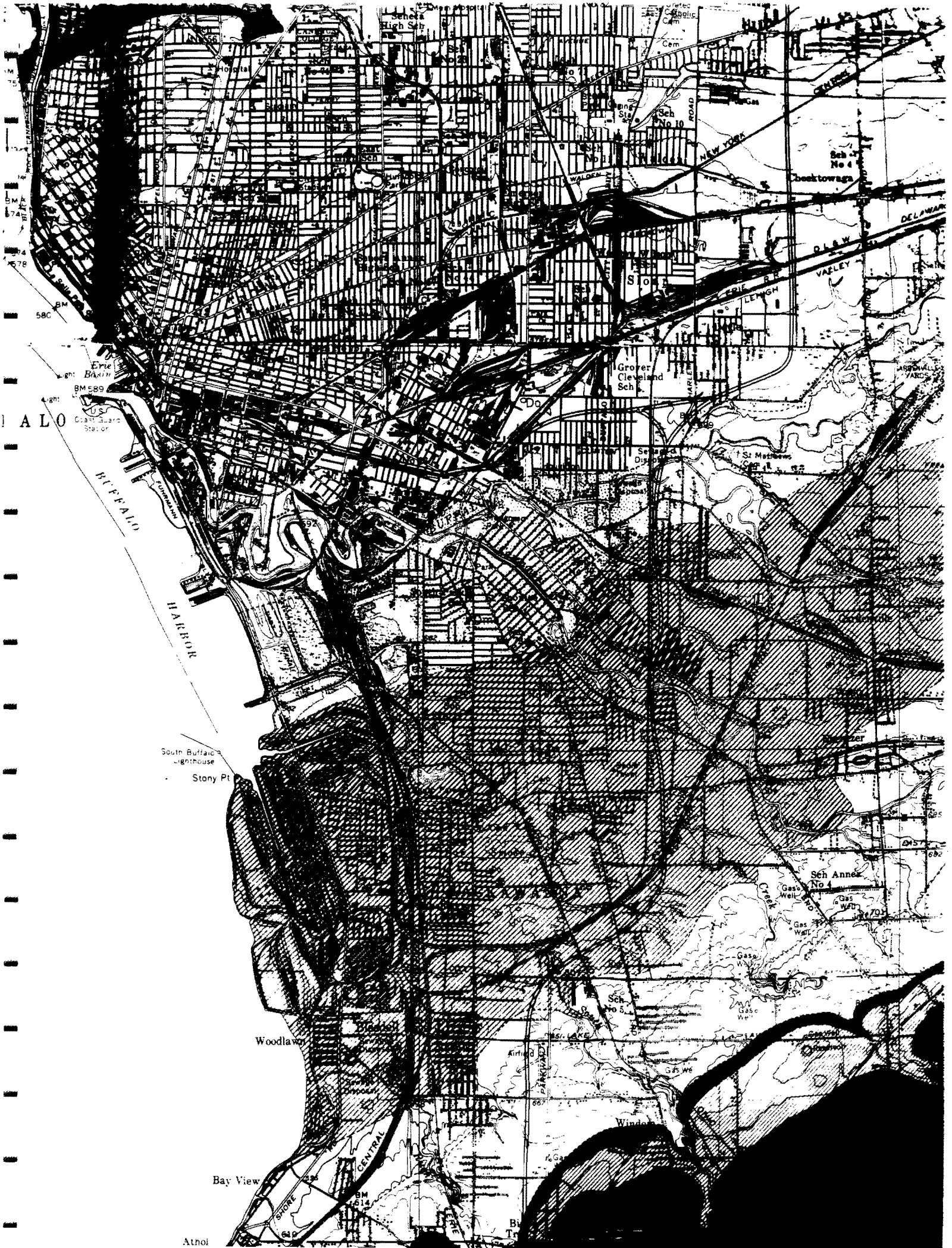
Onondaga Limestone

Moorehouse Limestone Member, light-gray limestone containing numerous corals and considerable dark-gray chert nodules; Nedrow Member, intermixed light-gray limestone and dark-gray chert; Edgecliff Member, light-gray limestone with some light-gray chert nodules, locally represented by a coral bioherm.

UNCONFORMITY

Akron Dolostone

Light-gray dolostone


Seneca High Sch
Cemetery
Catholic Cem
Hospital
Gas
Sch No 10
NEW YORK
Sch No 4
Cheektowaga
DELAWARE
LACKAWANNA
VALLEY
ERIE
LEHIGH
Grover Cleveland Sch
Erie Basin
BM 589
U.S. Coast Guard Station
BUFFALO
HARBOR
TURNPIKE
St Matthews Cem
Cemetery
South Buffalo Lighthouse
Stony Pt
Sch Annex No 1
Gas Well
Creek
Sch No 5
Woodlawn
Airfield
Parkway
CENTRAL
Bay View
SHORE
BM 614
Athol

Productella dumosa Hall
Protoleptostrophia perplana (Conrad)
Rhipidomella vanuxemi Hall
Schizobolus concentricus (Vanuxem)
Schuchertella arctostriata (Hall)
Spinulicosta spinulicosta Hall
Trematospira gibbosa Hall
Tropidoleptus carinatus Conrad
Truncalosia truncata Hall

ANNELID (?)
Spirorbis sp.

MOLLUSKS
Gastropods

Bembexia capillaria rustica (Conrad)
Loxonema sp.
Mourlonia itys (Hall)
M. lucina (Hall)
Platyceras (Orthonychia) attenuatum Hall
Pleurotomaria sp.

Cephalopods

Michelinoceras (?) *eriense* (Hall)
M. (?) *exile* (Hall)
Nephriticeras bucinum (Hall)
Protokionoceras fenestrulatum (Clarke)
Spyroceras aegea (Hall)
Striacoceras typum (Saemann)

Pelecypods

Actinopteria muricata Hall
Cypricardinia indenta Conrad
Leptodesma marcellense Hall
Palaeaneilo sp.
Panenka lincklaeni Hall
P. mollis Hall
Pterinopecten exfoliatus Hall
Pterochaenia fragilis (Hall)

Cricoconarida

Styliolina fissurella (Hall)
Tentaculites gracilistriatus Hall

ARTHROPODS

Onychochilus nitidulus (?) Clarke
Primitiopsis punctulifera (Hall)

Trilobites

Greenops boothi (Green)
Otarion craspidota (Hall and Clarke)
Phacops rana (Green)

Levanna Shale Member

TYPE REFERENCE: Cooper (1930, p. 217).

TYPE LOCALITY: Near Levanna, east shore of Cayuga Lake, Cayuga County, New York; Auburn quadrangle.

TERMINOLOGY: See Cooper (1930). Wood (1901, pp. 153-154) referred to approximately three feet of shale and shaly limestone above the Stafford as Marcellus. Grabau (1898, pp. 65-66) used the term Upper Marcellus and Houghton (1914, pp. 21-23) applied the name Cardiff to beds now called Levanna. Luther (1914, pp. 14-16) also used the term Cardiff Shale but for only the lower beds of the Levanna. He called the upper beds of the Levanna the Skaneateles Shale.

AGE AND CORRELATION: Middle Devonian (Erian). The Levanna correlates with the Delphi Station, Pompey and Butternut Members of the Skaneateles Formation in central New York.

THICKNESS: The Levanna thickens eastward from about 45 feet at Lake Erie to 80 feet at the eastern edge of the county.

LITHOLOGY: The Levanna is a fissile shale, dark gray or black near the bottom, and lighter olive gray near the top. There are some calcareous beds and some pyritiferous concretions.

PROMINENT OUTCROPS: Lake Erie shore between Bayview and Hamburg Town Park; Cazenovia Creek west of Ebenezer; Buffalo Creek between Gardenville and Blossom.

CONTACTS: The contact with the underlying Stafford Limestone Member is usually fairly sharp. The upper contact with the Centerfield Limestone Member of the Ludlowville Formation cannot be seen in Erie County.

PALEONTOLOGY: Most of the following species were listed by Grabau (1898) and Wood (1901, pp. 139-181) from beds termed "Upper Marcellus" by them and now recognized as Levanna:

PLANTS

various spores

COELENTERATES

Aulocystis dichotoma (Grabau)

BRACHIOPODS

Ambocoelia umbonata (Conrad)
Atrypa reticularis (Linnaeus)
Chonetes lepidus Hall
C. mucronatus Hall
C. setigerus (Hall)
Leiorhynchus limitare (Vanuxem)
Meristella barrisi Hall
Mucrospirifer mucronatus (Conrad)
Spinulicosta spinulicosta Hall
Truncalosia truncata (Hall)

MOLLUSKS

Gastropods

Paracyclas lirata (Conrad)
Serpulospira laxus (Hall)

Cephalopods

Centroceras marcellense (Vanuxem)
Protokionoceras fenestrulatum (Clarke)
Spyroceras aegea (Hall)

Pelecypods

Lunulicardium curtum Hall
Nuculites triqueter Conrad
Pterochaenia fragilis (Hall)

Cricoconarida

Styliolina fissurella (Hall)
Tentaculites gracilistriatus (Hall)

ARTHROPOD

Trilobite

Phacops rana (Green)

LUDL

TYPE REFERENCE: Hall (1

TYPE LOCALITY: The origir
New York (Genoa quadran
that a reference section be
County, New York; Auburi

TERMINOLOGY: In westerr
Formation are recognized:
Wanakah Shale, and Tiche
Cooper *et al.* (1942, p. 178

AGE AND CORRELATION: M

THICKNESS: 65 - 130 feet.

LITHOLOGY: The Ludlowvil

PROMINENT OUTCROPS: L
Creek; Eighteenmile Creek
Creek near Windom; Cazc
Creek in the town of Elma;

CONTACTS: The lower cont
ber, cannot be seen in Erie
Formation is usually fairly
Tichenor Limestone Membe

PALEONTOLOGY: The Lud
including coelenterates, spc
pods, cephalopods, worms,
plants are also preserved.

Cent

TYPE REFERENCE: Clarke

TYPE LOCALITY: Shaffer Cr
New York; Canandaigua qu

TERMINOLOGY: See Cooper

AGE AND CORRELATION: M
the Ludlowville Formation.
placed at the top of the S
Member is widespread and i

THICKNESS: 4.5 feet.

REFERENCE 10

Site Characterization and Environmental Assessment
Hanna Furnace, Buffalo, New York
by Recra Environmental, Inc., August 1988

2/8282

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

SITE CHARACTERIZATION AND ENVIRONMENTAL ASSESSMENT HANNA FURNACE, BUFFALO, NEW YORK VOLUME I

PIN 5034.43.221
City of Buffalo - Arterial Route
Fuhrmann Blvd. - Hamburg Turnpike
Fed. Proj. BRF-1(120), Erie County
Map 326, Parcels 353, 354, 355
A.S. #87-44
Compt. No. D002483
Federal Employee I.D. 16-1263663

Prepared For

Regional Real Estate Office
State of New York
Department of Transportation
125 Main Street
Buffalo, New York 14203

Prepared By

Recra Environmental, Inc.
Audubon Business Centre
10 Hazelwood Drive, Suite No. 106
Amherst, New York 14150

August 1988

1.2.4 Zoning and Land Use

The site is located in an industrial-zoned area (Figure 1-6). The closest residential area is located approximately 0.25 miles southeast of the site in the City of Lackawanna. Within one mile of the site, the population is estimated at 6,000 persons. Land east, west, and directly south of the site is zoned for industrial uses. Approximately 0.5 miles to the north and 0.5 miles to the southeast lies the Tifft Farms Nature Preserve and South Park, respectively; both are public recreation sites.

1.2.5 Topography

The site is positioned east of Lake Erie within the Eastern Lake Section of the Central Lowlands physiographic province. It is relatively flat and has an average elevation of approximately 600 feet above mean sea level. The site is generally covered with fill material which supports some vegetative cover. Union Ship Canal approximately bisects the site into a northern and southern portion. The surface topography generally slopes towards the canal. Much of the land north of the canal was originally a swamp with an average depth of approximately twelve (12) feet. Flue ash and furnace debris from previous on-site pig iron production was used to fill this area. Presently, the northern portion contains a topographic ramp which is approximately 25 feet high at the northwest end and tapers to a nominal level to the east. Much of this feature is composed of black flue ash and construction debris. Various shallow indentations are filled with water throughout the northern portion of the site. Water depths in these ponds seldom exceed more than a few inches.

of fine to coarse sand and gravel. This unit is the uppermost natural soil encountered below ground surface. Based on the test boring data, the organic clayey silt layer appears to be thickest in the central portion of the site (MW-6) and thins laterally to the east and west. No measurable amounts of this material were encountered in MW-4 which is located in the southeastern portion of the site.

Grain size analyses of the organic clayey silt samples collected from MW-2 and MW-6 indicate that about 50 percent by weight of this material is silt and clay. Due to the stiffness and grain size of this unit, it does not appear to be conducive to groundwater flow.

Lacustrine Clay - The lacustrine clay unit was deposited when the Lake Erie Plain was occupied by glacial Lake Warren (approximately 11,000 to 12,000 years ago). This unit appears to underly the entire site. Test boring data suggest that this unit's thickness ranges from 10 feet (MW-7) to 21 feet (MW-4) and consists of medium to stiff, gray to brown silty clay to clayey silt.

Grain size analyses of lacustrine clay samples collected from MW-4 and MW-7 indicate that the composition of this material is primarily silt and clay. Due to the stiffness and composition of this unit, it appears that is is not conducive to groundwater flow.

Sand and Gravel Unit - This unit was only encountered in borings MW-2 and MW-4 and was found between the lacustrine clay and bedrock. It is very dense, fine to coarse sand and/or gravel and ranges in thickness from two (MW-2) to five feet (MW-4). The high density of this material indicates that it is probably glacial till.

Although sand and gravel deposits are generally good water transducers, the high density of tills restricts groundwater flow by limiting available pore space. Thus, it appears that this unit is not conducive to groundwater flow.

Bedrock-Levanna Shale - The bedrock underlying the site is a Middle Devonian shale (deposited approximately 375 million years ago), reportedly to be the Levanna Shale Formation (see Reference 3). This black sedimentary rock is fissile (easily broken along cleavage plains) and generally easily augered. This latter condition is evidenced by the fact that the augers were able to advance beyond the point where shale was first encountered in MW-7. During drilling at this location, shale fragments were collected in the split spoon sampler between 22 and 48 feet below ground surface. The shale retained by the split spoon sampler was layered with thin seams of silty clay.

4.0 GROUNDWATER

This section discusses groundwater flow in the on-site fill materials. Groundwater flow in the remaining geologic formations at the site was not studied and, thus, is not addressed herein.

4.1 Groundwater Conditions

Groundwater at the site was encountered in the fill materials at a depth of about five feet from ground surface. This water bearing zone is considered to be unconfined. Hence, this horizon is called the upper unconfined water bearing zone. This zone appears to be separated from the lower sand and gravel and bedrock formations by the lacustrine clay unit which appears to be continuous across the site, although additional data are required for confirmation.

A potentiometric surface contour map representing the groundwater conditions in this upper unconfined zone is presented as Figure 4-1. This map has been prepared utilizing linear interpolation methods between monitoring wells, the water level in the Union Ship Canal and an interpretation of site geology. The contour map is based upon groundwater and surface water level measurements made on April 5, 1988 which are included in Appendix C, Table 1. As indicated on Figure 4-1, the groundwater flow direction for this date in the upper unconfined zone was generally towards the Union Ship Canal from the north, south and east.

The hydraulic gradient at the site could only be computed for the areas between the monitoring wells and the Union Ship Canal (see Figure 2-3). The hydraulic gradient on the south side of the canal ranged from 0.013 to 0.026. The hydraulic gradient on the north side of the canal was

TABLE 3-1

SUMMARY OF HANNA FURNACE SITE GROUNDWATER MONITORING WELL ELEVATIONS

Monitoring Well #s	Top of Protective Casing Elevation (ft., SD)	Ground Surface Elevation (ft., SD)	Depth of Boring (ft., BGS)	Well Screen Elevation (ft., SD)	Sand Pack Elevations (ft., SD)
HF-1	586.5	582.6	15.5	577.1-572.1	579.1-572.1
HF-2	586.0	582.9	36.5	579.9-574.9	580.4-574.4
HF-3	587.7	583.9	14.0	578.9-573.9	580.9-573.4
HF-4	588.8	585.5	39.0	582.5-577.5	583.5-576.0
HF-5	584.0	581.0	34.0	576.0-571.0	578.0-570.5
HF-6	584.8	581.4	12.0	576.4-571.4	578.4-570.9
HF-7	584.4	581.2	48.0	577.2-572.2	578.2-571.7

NOTES:
1. These data have been compiled based upon survey data obtained by Klettke Land Surveyors on April 5, 1988.
2. All elevations shown are referenced to site.
3. SD - Site Datum
4. BGS - Below Ground Surface

APPENDIX C

TABLE 1

STATIC WATER LEVELS FOLLOWING WELL DEVELOPMENT AND PRIOR TO SAMPLING

Well	Time	Date	Water Level (ft)(T.O.C.)
MW-1	1200	02-16-88	10.30
	1345	04-05-88	9.32
MW-2	1130	02-16-88	6.00
	1352	04-05-88	5.21
MW-3	1115	02-16-88	8.40
	1356	04-05-88	6.32
MW-4	1100	02-15-88	6.83
	1401	04-05-88	5.97
MW-5	1045	02-16-88	8.48
	1407	04-05-88	7.55
MW-6	1030	02-16-88	11.50
	1412	04-05-88	8.67
MW-7	1000	02-16-88	8.20
	1416	04-05-88	7.83

REFERENCE 11

Preliminary Evaluation of Chemical Migration
to Groundwater and the Niagara River
From Selected Waste Disposal Sites

E.J. Koszalka, J.E. Paschal, Jr.
T.S. Miller and P.B. Duran
EPA-905/4-85-001, March 1985

To assess the effects of each site on the Niagara River would require evaluation of geohydrologic and plume characteristics of each site by periodic, long-term monitoring. Specific knowledge of the following would be required:

1. Type and extent of unconsolidated material and bedrock units.

2. Vertical and horizontal permeability for pertinent geologic units. (Horizontal and vertical permeabilities are not equal.)

3. Rate and direction of ground-water flow (based on potentiometric gradients and saturated thickness of units.)

4. Effect of manmade disturbances such as conduits, storm drains, sanitary sewers, water lines, retaining walls, etc., on rate or direction of flow.

5. Sources, extent, and characteristics of chemical plumes, including contaminant concentrations and time and spatial variation.

6. Contaminants' degree of mixing and rate of leaching.

7. Chemical interactions, changes, and attenuation between site and river.

Method of Computation

An analytical approach for calculating discharges to the river would use Darcy's law, expressed by the following equation:

$$v = \frac{ki}{n} \qquad (1)$$

where: v = average linear velocity of ground-water movement
k = permeability of the material
i = hydraulic gradient
n = the effective porosity of the material

The equation can be used if the values are known and have small variability. A two-dimensional sketch showing these relationships in a ground-water system is given in figure 2. Some estimated values for these variables in the Erie-Niagara County area are given below.

Permeability.--Permeability tests on the porous fill and sand from some sites yielded mean values of about 10^{-3} cm/s. The vertical permeability of the clay units at the sites ranged from 10^{-6} to 10^{-9} cm/s; no data on horizontal permeabilities are available. Clay is highly anisotropic owing to the internal structure and alignment of the platey minerals that form it; therefore, horizontal permeability within clay can exceed the vertical permeability a hundredfold Sand stringers in clay may increase both horizontal and vertical permeability of a given unit.

Hydraulic gradient.--The hydraulic gradients in the areas studied are poorly defined. During the test-drilling phase of the study in 1982, perched water was encountered above a clay unit at many sites, and the regional water table was encountered within the clay. The differences in hydraulic head between the

perched water and the water table varied considerably among sites--generally from 0.5 to 5 ft, although greater differences occurred at some sites.

The vertical hydraulic gradient is calculated by dividing the difference between water levels at two wells in the same unit by the saturated thickness of the unit (fig. 2). Horizontal hydraulic gradients is calculated by dividing the difference between water-level altitude in two wells by the distance (L) between the wells (fig. 2). In general, the horizontal gradients at the sites studied are relatively small except in areas where geologic conditions or artificial recharge have caused ground-water mounding.

Effective porosity.--The effective porosity (the fraction of interconnected pore space available for fluid transmission) of the materials at the sites studied is estimated to range from 0.3 to 0.7. Fill and sand porosity ranges from 0.3 to 0.4, and clay porosity ranges from 0.5 to 0.7.

Flow velocity.--Substituting the maximum and minimum values for the variables discussed above into equation 1 yields the ranges of horizontal and vertical velocity of ground water given below:

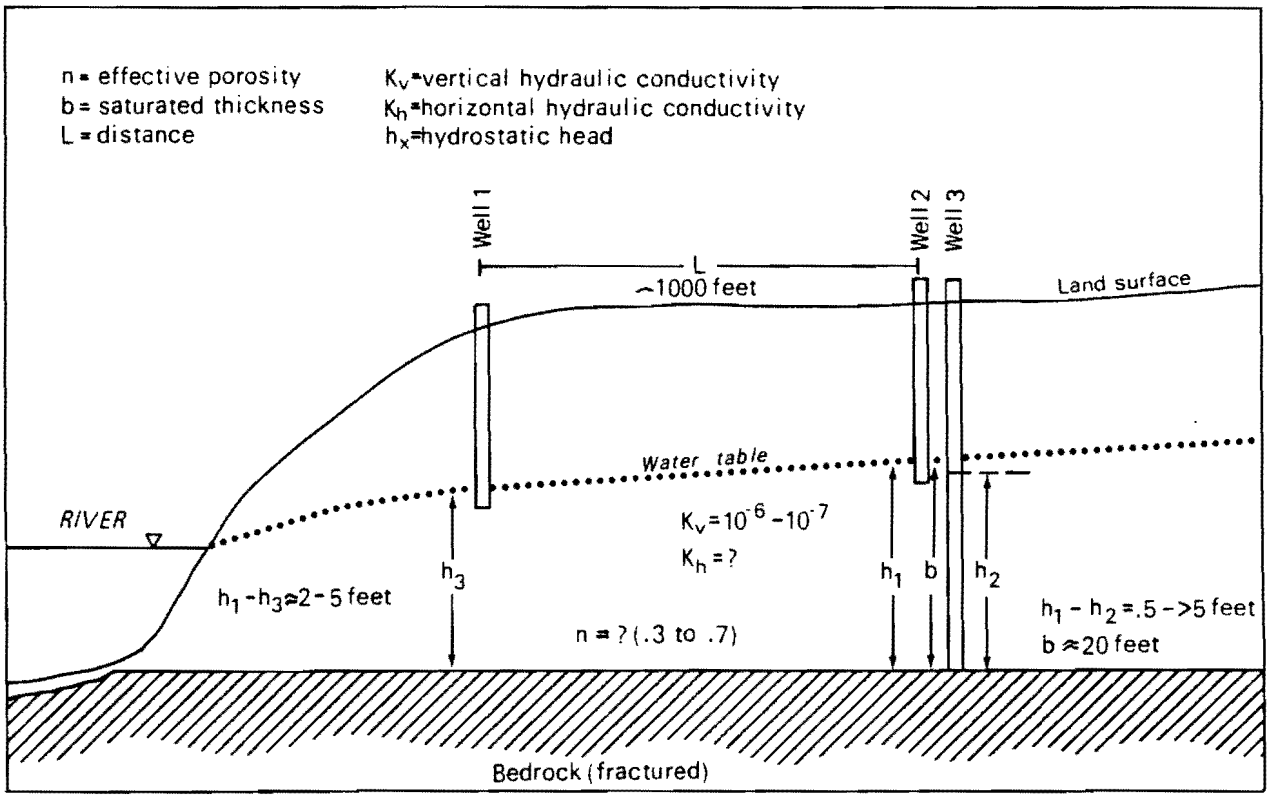


Figure 2. Horizontal and vertical ground-water gradients in a generalized hydrologic cross section.

Vertical velocity:

$$Vmax = \frac{ki}{n} = \frac{(2.8 \times 10^{-3} \text{ ft/d})\ (\frac{5 \text{ ft}}{20})}{0.3} = 2.4 \times 10^{-3} \text{ ft/d}$$

$$Vmin = \frac{ki}{n} = \frac{(2.8 \times 10^{-6} \text{ ft/d})\ (\frac{5 \text{ ft}}{20})}{0.7} = 1 \times 10^{-6} \text{ ft/d.}$$

Horizontal velocity:

$$Vmax = \frac{(2.8 \times 10^{-1} \text{ ft/d})\ (.005 \text{ ft})}{0.3} = 0.005 \text{ ft/d}$$

$$Vmin = \frac{(2.8 \times 10^{-3} \text{ ft/d})\ (.002 \text{ ft})}{0.7} = 8 \times 10^{-6} \text{ ft/d.}$$

The calculations indicate that ground-water movement in the area studied is relatively slow and ranges over three orders of magnitude. The application of such a wide range may be inappropriate for specific site analysis; local geologic and hydrologic variations could change the velocities substantially.

Contaminant flux.--To assess the rate of contaminant discharge to the river from equation (1), multiply the velocity by the cross-sectional area of a site and by the effective porosity, then by appropriate conversion factors to obtain discharge, in gal/d (eq. 2). Then multiply the flow rate by the chemical concentration and appropriate conversion factors to obtain the flux of contaminants, in lb/d (eq. 3).

$$Q = vAn \times \frac{7.48 \text{ gal}}{\text{ft}^3} \qquad (2)$$

where: Q = flow rate, in gal/d;
v = average linear velocity, in ft/d;
A = cross-sectional area, in ft^2;
n = effective porosity.

$$F = QC \times 3.785 \frac{\text{L}}{\text{gal}} \times \frac{\text{lb}}{4.54 \times 10^8 \text{ µg}} \qquad (3)$$

where: F = flux of contaminants, in lb/d;
Q = flow rate, in gal/d;
C = concentration, in µg/L.

Again, note that the calculations are only an example and should not be used as measures of contamination from the sites.

REGIONAL HYDROLOGIC EVALUATION

This section describes hydrogeologic character--the unconsolidated deposits and bedrock units, the ground-water conditions, and the general ground-water quality--of the three study areas. The individual waste-disposal sites in each area are described in the appendices.

BUFFALO AREA

Geology

The Buffalo study area (pl. 1) consists of units of sedimentary bedrock composed of shale, limestone, and dolomite overlain by unconsolidated deposits of clay, sand, and till. The bedrock units are of Silurian and Devonian age; the unconsolidated deposits are primarily of Pleistocene age. The extent of the sedimentary bedrock units is shown in figure 3; the distribution of the unconsolidated units is shown in figure 4.

The bedrock units of concern in this study are: Camillus Shale, Bertie Limestone, and Akron Dolomite (described as one unit); Onondaga Limestone; Marcellus Shale, and the Skaneateles Formation. The unconsolidated deposits of interest are of glacial origin and consist of a glaciolacustrine clay-sand deposit, end-moraine deposits, and an outwash-terrace-delta gravel deposit.

Bedrock Units.--The oldest sedimentary bedrock unit encountered in this study is the Camillus Shale of Silurian age (fig. 3), which occurs only in the northern part of the Buffalo area. This unit has been described by LaSala (1968) as a gray, red, and green thin-bedded shale containing massive mudstone; the unit also contains beds and lenses of gypsum approaching 5 ft in thickness. Subsurface information indicates a dolomitic mudrock to be interbedded within the unit also. The Camillus Shale, estimated to be about 400 ft in thickness, dips southward throughout the area at approximately 40 ft/mi. Information from gypsum miners indicates that the dip of the formation is undulatory within a range of a few feet.

Two other units of Silurian age overlie the Camillus Shale--the Bertie Limestone and the overlying Akron Dolomite. The Bertie Limestone is a gray and brown dolomite with some interbedded shale; the Akron Dolomite is a greenish-gray and buff fine-grained dolomite (LaSala, 1968). The Bertie Limestone, the thicker of the two units, ranges from 50 to 60 ft thick, whereas the Akron Dolomite is estimated to be 8 ft thick. Both formations dip southward, as does the underlying Camillus Shale.

The Onondaga Limestone of middle Devonian age overlies this limestone-dolomite unit; the two units are separated by an unconformity or an erosional contact. The Onondaga Limestone consists of three members. The lowest, which overlies the Akron Dolomite, is a gray, coarse-grained limestone generally a few feet thick. This member, according to Buehlor and Tesmer (1963), grades laterally into reef deposits, thereby increasing its thickness. The middle member consists of a gray limestone and blue chert and reaches a thickness of 40 to 45 ft. The upper member is a dark gray to tan limestone ranging in thickness from 50 to 60 ft. The overall thickness of the Onondaga Limestone is approximately 110 ft.

The Marcellus Shale overlies this limestone unit; the formation is described by LaSala (1968) as being black and fissile. The unit ranges in thickness from 30 to 55 ft and dips generally southward at 40 ft/mi. The uppermost unit within the study area is the Skaneateles Formation. It is olive-gray to dark-gray and black, fissile shale with calcareous beds. The lower 10 feet of the unit is gray limestone. Total thickness is 60 to 90 feet. This unit is found in the southernmost part of the study area.

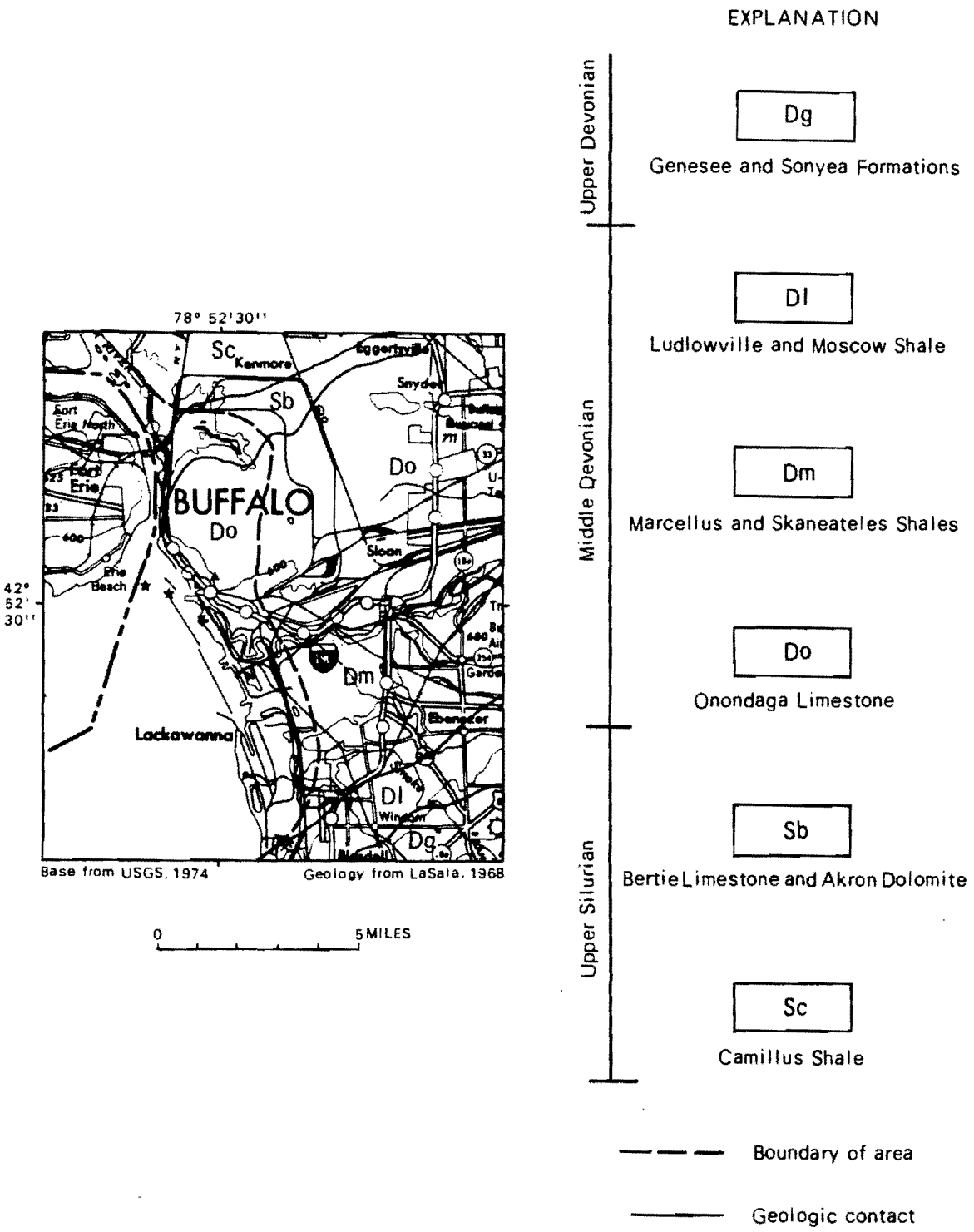


Figure 3. Bedrock geology of the Buffalo area. (Modified from La Sala, 1968.)

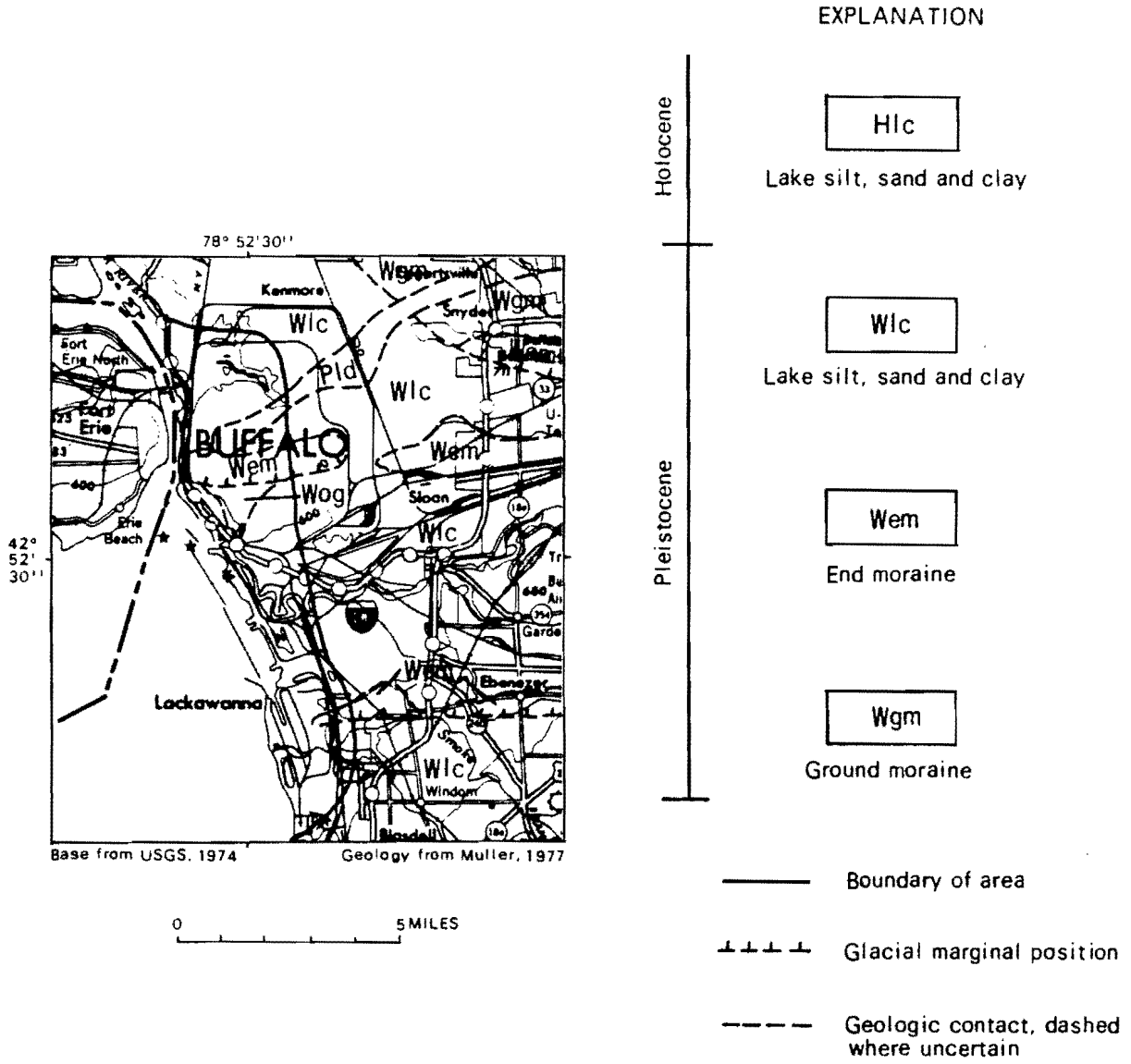


Figure 4. Surficial geology of the Buffalo area. (Modified from Muller, 1977.)

No additional data on the bedrock units within the Buffalo area were obtained. The geology of the units is summarized by La Sala (1968) in his report about ground-water resources of the Erie-Niagara basin.

Unconsolidated Deposits.--The unconsolidated units (fig. 4) consist of glacial material deposited during the latter part of the Pleistocene epoch. The main unconsolidated unit in the Buffalo area is a glaciolacustrine clay-sand deposit consisting of silt, fine to medium sand, and clay and containing laminae of alternating sand and clay.

Two other unconsolidated deposits of lesser extent are present in the area--an end-moraine deposit and a small area of outwash, terrace, and delta gravel. The end-moraine material, which consists of ablation and lodgment tills or poorly sorted gravel that contain more than 20 percent carbonate and crystalline clasts, was deposited at the edge of an ice sheet by meltwater either at the end of an advance or during a stillstand of glacial retreat. The outwash, terrace, and delta gravels, which consist of well-sorted pebbles and cobbles with sand, contain more than 30 percent carbonate and crystalline clasts. The material was deposited by meltwater streams forming coalescent aprons near the ice sheet or as stream terraces or terrace remnants.

Three test holes were drilled to bedrock in the Buffalo area to help define the subsurface geology; their locations are shown in plate 1. The geologic descriptions are as follows:

Boring no.	Depth (ft)	Description
SA-9	0 - 1.5	Topsoil
	1.5 - 6.5	Sand, brown
	6.5 - 11.5	Clay, sandy, with gravel, dark brown
	11.5 - 25.5	Clay, sand with clay, gray, wet at 11.5 ft
	25.5	Bedrock
SA-10	0 - 1.5	Topsoil
	1.5 - 6.5	Clay, sandy, red
	6.5 - 11.0	Clay, some gravel, red
	11.0	Bedrock, material was dry throughout
SA-11	0 - 16.5	Fill, black, ground water at 10 ft
	16.5 - 21.5	Clay, silty, green
	21.5 - 36.5	Clay, silty, gray-green
	36.5 - 60.0	Clay, silty, pinkish-gray
	60.0	Bedrock

The geologic information from these test holes, combined with the data from the waste-disposal sites, enables a general characterization of the area.

The unconsolidated deposits, primarily the glaciolacustrine clay, tend to decrease in thickness toward the east and north, where bedrock rises to less than 5 ft below land surface. Also, the clay unit is generally less than 2 ft below land surface except where it has been removed by landfilling and waste-disposal operations or urbanization.

Aquifer Lithology and Water-Bearing Characteristics

The ground-water system within the Buffalo area consists of a fractured bedrock aquifer and an overlying aquifer of unconsolidated deposits.

Bedrock aquifer.--The bedrock aquifer consists of all the bedrock units discussed previously. The main sources of water are the fractures and solution cavities. The specific-capacity and transmissivity values of selected bedrock aquifer units are shown below.

Bedrock unit[1]	Specific capacity[2] (gal/min)/ft		Transmissivity[2] (gal/d)/ft	
	Min	Max	Min	Max
Akron Dolomite	2	13	4,000	25,000
Camillus Shale	4	83	7,000	70,000

[1] Position of units is shown in figure 3.
[2] Data from LaSala (1968)

The specific capacity of a well is the rate of discharge of water from the well divided by the drawdown of the water level within the well. If the specific capacity is constant except for the time variation, it is roughly proportional to the transmissivity of the aquifer. Transmissivity is the rate at which water is transmitted through a unit width of the aquifer under a unit hydraulic gradient.

The data above indicate that these two properties differ considerably within and among the units. This variation reflects the amount and size of the fractures and solution cavities.

Unconsolidated aquifer.--The unconsolidated aquifer consists of a glaciolacustrine clay and sand and gravel deposits. The thicker unit is the glaciolacustrine clay. The test drilling during the summer of 1982 encountered the water table at various depths within the clay, and saturated sand stringers up to 3 inches thick were common. These stringers were not large, however, and generally thinned out within a few feet.

A seasonal water table above the clay unit was observed during wet periods but not during the summer. This water table is formed by the ponding of infiltrated precipitation above the relatively impermeable clay. As the water mounds upward, gradients toward natural or manmade topographic lows develop and eventually discharge to nearby surface-water bodies. As the season becomes drier and warmer, vegetation increases and takes up the remaining ground water through transpiration.

The hydrologic properties of the unconsolidated aquifer within the Buffalo area are also described in consultants' reports for Buffalo Color Corporation (sites 120-122), Bethlehem Steel Corporation (site 118), and the Alltift Landfill (site 162).

The general range of hydraulic conductivity was 0.0328 to 155.8 ft/d. The larger value can be attributed to slag fill material, which would have a considerably greater permeability than the glaciolacustrine clay. A permeability test was performed on a clay sample from the Alltift landfill; the permeability ranged from 1.6×10^{-4} to 1.8×10^{-4} ft/d.

The rate of ground-water movement within the unconsolidated aquifer at the Buffalo Color Corporation (sites 120-122) was calculated and ranges from 0.02 to 0.06 ft/yr.

The direction of ground-water movement in the unconsolidated aquifer is generally toward the major surface-water bodies--Lake Erie, Niagara River, and Buffalo River (fig. 4). The ground-water flow pattern is dissected in the northern part of the area, where impermeable bedrock is less than 5 ft below land surface, as indicated in figure 4. This unsaturated zone diverts the flow northward and southward.

Ground-Water Quality

The quality of ground water in the bedrock aquifer in the Buffalo area has been documented by LaSala (1968), who included maps showing the concentration ranges for sulfate, hardness, and chloride. Sulfate concentrations given in that report ranges from 100 to 500 ppm and hardness (as $CaCO_3$) from 150 to 1,000 ppm; chloride concentrations range from 100 to 1,500 ppm, and specific conductance ranges from 1,000 to 9,000 µmho/cm.

To estimate background water quality in the Buffalo area, a water sample was collected from the unconsolidated deposits in the fall of 1982 and analyzed for priority pollutants. The observation well was on Seneca Street (well SA-9, pl. 1), in the eastern part of the area just east of the Buffalo city line, and was screened above the bedrock contact. The results are given in table 14. Cadmium, lead, and zinc exceeded USEPA drinking-water criteria; minor amounts of some organic compounds were also detected. Additional sampling of the ground water in the unconsolidated aquifer would be needed to define the quality of water in this aquifer in the Buffalo area.

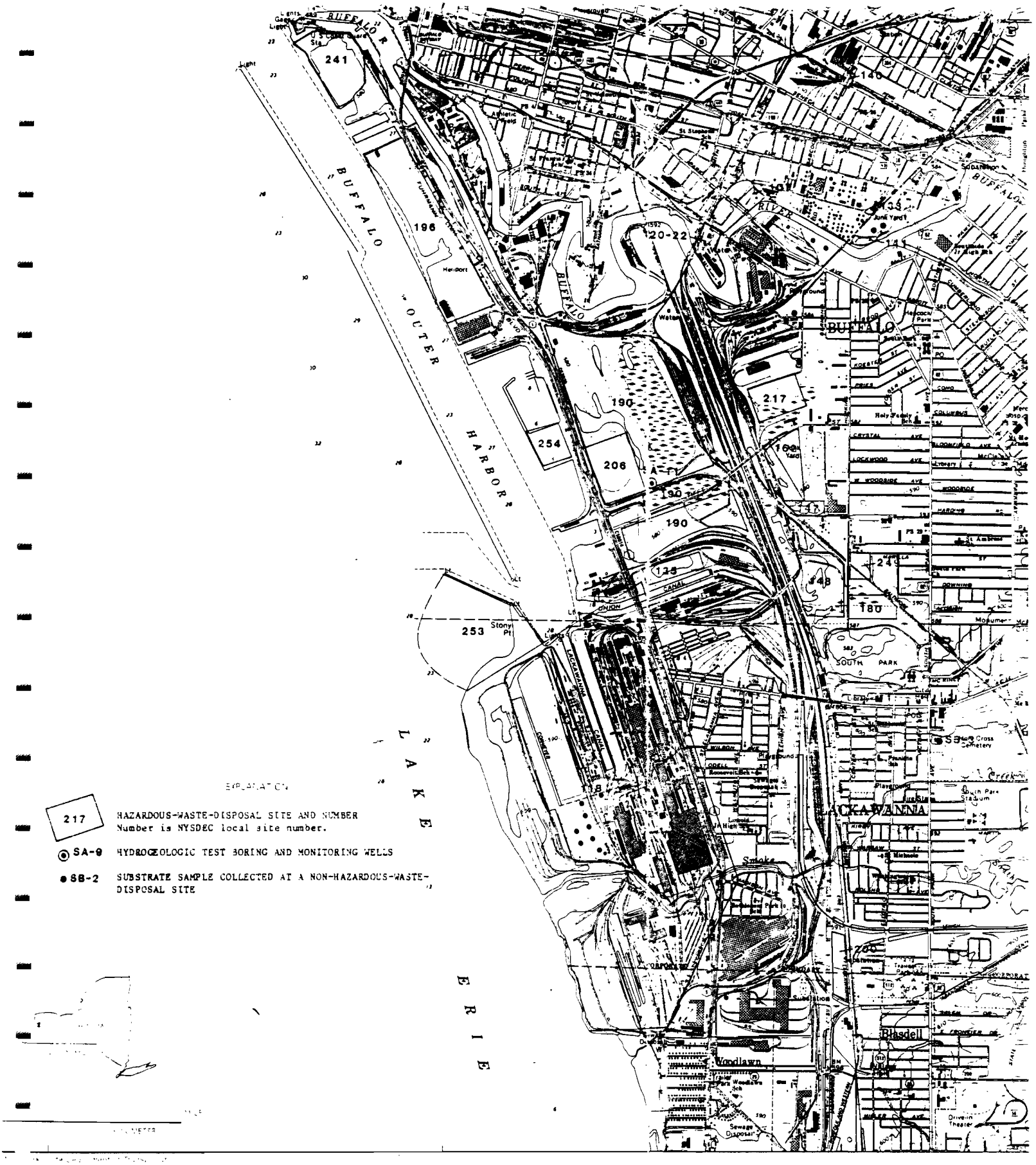
Three substrate samples were collected in the Buffalo area at localities not affected by waste-disposal sites to compare their concentrations of heavy metals with those in substrate samples from waste-disposal sites. Results are given in table 13.

Table 13.--Heavy-metal concentrations in samples from undisturbed soils in Buffalo, N.Y., June 1, 1983
[Locations shown in pl. 1. Concentrations in µg/kg.]

Location	Sample number	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Forest Lawn Cemetery	SB-1	5,000	8,000	7,000	20,000	100	10,000	31,00
Martin Luther King Park	SB-2	5,000	8,000	10,000	40,000	90	20,000	42,00
Holy Cross Cemetery[1]	SB-3	9,000	30,000	40,000	290,000	280	40,000	160,00

[1] This location is downwind from a major industrial area.

LIST OF SITES STUDIED



LOCATION OF HAZARDOUS-WASTE-DISPOSAL SITES IN THE BUFFALO AREA, N

PRELIMINARY EVALUATION OF HYDROGEOLOGY AND CHEMICAL MIGRATION TO GROUND WATER

AT SELECTED WASTE-DISPOSAL SITES WITHIN 3 MILES

OF THE NIAGARA RIVER IN ERIE AND NIAGARA COUNTIES, NEW YORK

132. FEDDERS AUTOMOTIVE COMPONENT COMPANY (Literature review) NYSDEC 915024

General information and chemical-migration potential.--The Fedders Automotive Component Company is at the intersection of Tonawanda Street and Scajaquada Creek Expressway in the city of Buffalo (pl. 1). Waste oil was spread on the ground as a dust suppressant at a rate of about 165 gal/yr. The waste oils are reported to have been light lubricating oils or hydraulic fluids, not transformer oils. No monitoring has been undertaken.

The site consists of glacial lacustrine clay underlain by Onondaga Limestone at a depth of 40 to 60 ft.

No hydrologic or chemical information are available. Thus, the potential for contaminant migration is indeterminable.

135. HANNA FURNACE CORPORATION (USGS field reconnaissance) NYSDEC 915029

General information and contaminant-migration potential.--The Hanna Furnace Corporation site, in the southern part of the city of Buffalo, is used for the disposal of brick, slag, scrap metal, concrete, earth, rubble, and "flue dust" consisting of iron, iron oxide, alumina, silica, carbon, and magnesium.

The potential for vertical migration of contaminants is probably limited because the site is underlain by a thick clay unit. The potential for lateral dispersion of contaminants could not be evaluated, but the chemical data indicate some potential for horizontal migration of contaminants away from the site. The actual potential is indeterminable.

Geologic information.--The site consists of fill overlying units of sand and clay that are underlain by limestone bedrock, which begins approximately 25 ft below land surface. The U.S. Geological Survey drilled seven test borings in August 1982. The locations are shown in figure A-5; the geologic logs are as shown on page 105.

Hydrologic information.--Ground water was encountered at a depth of approximately 5 ft. Land-surface altitude is estimated to be 580 ft above NGVD; thus the water-table altitude was 575 ft above NGVD.

Chemical information.--The U.S. Geological Survey collected a soil sample from each test boring for chromium, copper, iron, and lead analyses; results are given in table A-6. The results indicate that the sample from borehole 1 may have been collected on the disposal site and therefore is not indicative of contaminant migration. No other samples except sample 2, which had an elevated copper concentration, exceeded the concentrations in samples from undisturbed areas.

The risks involved with direct contact (S_{dc}) and the potential for fire and explosion (S_{fe}) are evaluated according to site specific information including toxicity of waste, quantity, site demographics, location with respect to sensitive habitats of wildlife, etc. Migration potential (S_m) is evaluated through the rating of factors associated with three routing modes: groundwater (S_{gw}), surface water (S_{sw}) and air (S_a). The scored value for each route is composed to determine the risk to humans and/or the environment from the migration of hazardous substances from the site (S_m).

Based on information gathered during this investigation, the Buffalo Crushed Stone site was scored according to the Mitre Corporation Hazard Ranking System (HRS) and the following scores were obtained:

$S_m = (S_{gw} = 0; S_{sw} = 0; S_a = 0)$

$S_{fe} = 0$

$S_{dc} = 0$

These scores reflect the fact that blast furnace slag is not determined to be a hazardous waste (Reference ~~#~~2, ~~#~~3, ~~#~~4), and the oil stained area and asphalt spill were of insignificant quantity to score.

Boring no.	Depth	Description
1	0 - 2.5	Topsoil and fill.
	2.5 - 4.0	Fill material, black, organic smell.
	4.0 - 15.0	Clay, light green, tight, dry.
		SAMPLE: 2.5 ft.
2	0 - 1.0	Topsoil and fill.
	1.0 - 2.0	Rust-colored debris and gravel.
	2.0 - 3.5	Gravel roadbed fill with coarse sand.
	3.5 - 5.5	Sand, coarse, dark, wet.
	5.5 - 6.5	Clay, greenish.
		SAMPLE: 3.5 ft.
3	0 - 2	Topsoil and "coal dust", dark brown to black.
	2 - 12	Sand, black, coarse, wet 5 ft.
	12 - 15	Clay, olive, tight, dry.
		SAMPLE: 6.5 ft.
4	0 - 1.0	Topsoil, red.
	1.0 - 3.5	Sand, light gray, coarse.
	3.5 - 4.0	Pea rock, light green-blue.
	4.0 - 6.0	Sand, reddish, coarse, with clay, wet.
		SAMPLE: 5.5 ft.
5	0 - 3.0	Topsoil, dark brown to dark red.
	3 - 4.0	Sand, reddish, coarse.
	4.0 - 4.5	Sand, light-colored, coarse, damp.
	4.5 - 6.0	Sand, reddish, coarse, "iron ore", damp.
		SAMPLE: 6 ft.
6	0 - 1.0	Topsoil, dark brown to red.
	1.0 - 3.0	Black, fine material.
	3.0 - 3.5	Same, but light gray.
	3.5 - 5.5	Sand, red, coarse, damp, some clay.
		SAMPLE: 5.5 ft.
7	0 - 0.5	Topsoil.
	0.5 - 1.5	Clay, red.
	1.5 - 4.0	Sand, red, coarse, with gravel, damp.
	4.0 - 6.0	Looks exactly like "Sakrete."
	6.0 - 6.5	Sand, black, coarse, wet.
	6.5 - 10.5	Same, with slag.
		SAMPLE: 10 ft.

Table A-6.--Analyses of substrate samples from Hanna Furnace, site 135, Buffalo, N.Y., August 2, 1982.
[Locations shown in fig. A-5. Concentrations are in µg/kg.]

Constituents	Sample number and depth below land surface (ft)				
	1 (2.5)	(Split)	2 (3.5)	3 (6.5)	4 (5.5)
Chromium	400,000††	(380,000††)	7,000	6,000	3,000
Copper	170,000††	(160,000††)	92,000††	4,000	11,000
Iron	83,000,000	(71,000,000)	21,000,000	8,700,000	3,700,000
Lead	40,000	(70,000)	60,000	10,000	20,000

Constituents	Sample number and depth below land surface (ft)		
	5 (6)	6 (5.5)	7 (10)
Chromium	4,000	10,000	3,000
Copper	11,000	28,000	12,000
Iron	4,200,000	6,000,000	5,000,000
Lead	30,000	30,000	10,000

†† Exceeds concentrations in samples from undisturbed soils in the Buffalo area. Undisturbed soils were not analyzed for iron.

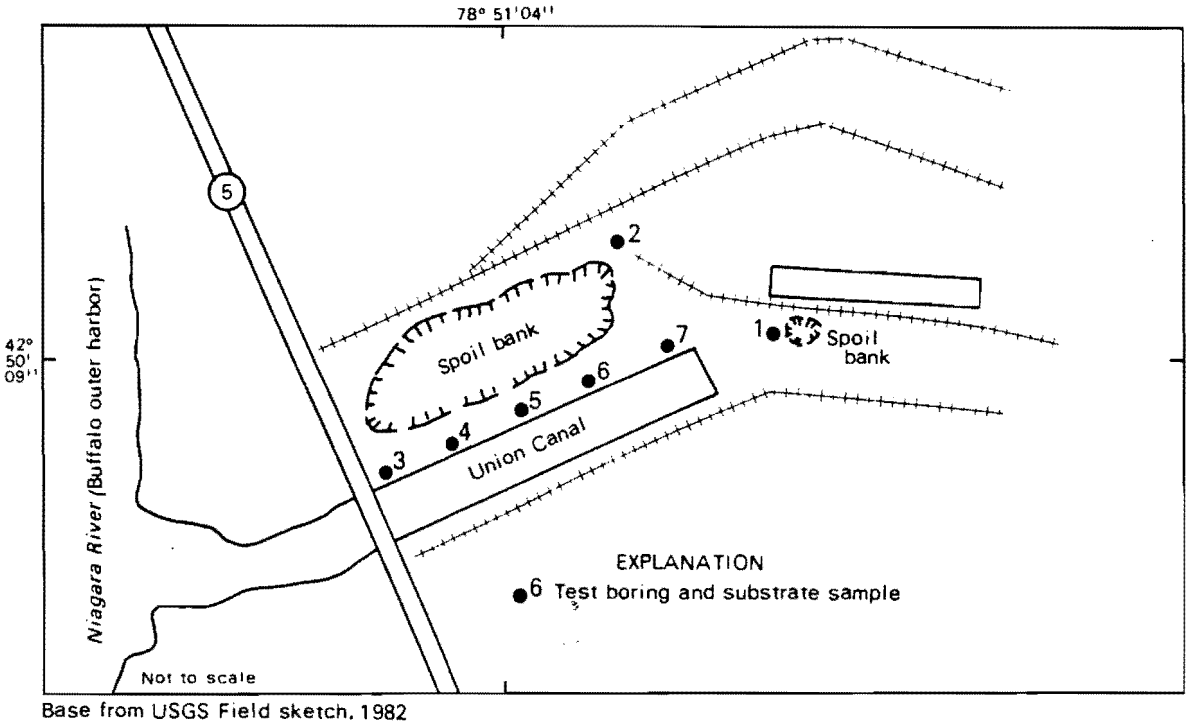


Figure A-5. Location of sampling holes at Hanna Furnace Corporation, site 135, Buffalo.

148. REPUBLIC STEEL (USGS field reconnaissance) NYSDEC 915047

General information and contaminant-migration potential.--The Republic Steel landfill, in the southern part of the city of Buffalo, has been used since 1930 for disposal and storage of precipitator dust, clarifier sludge, railroad ties, checker bricks, scrap wood, roll scale, blast-furnace dust, BOF brick, refuse, and miscellaneous debris.

Geologic and preliminary chemical data collected by the U.S. Geological Survey indicate a limited potential for contaminant migration. One water sample indicates contamination by ethylbenzene and phenol. The potential for contaminant migration is indeterminable.

Geologic information.--The site is underlain by a layer of lacustrine sediments ranging in thickness from 8 to more than 20 ft overlying a dense silty till that overlies shale bedrock.

Hydrologic information.--Water levels in five deep monitoring wells during August 1979 and February 1982 are shown in table A-12. The potentiometric surface at those times is depicted in figure A-11; both maps show the general direction of ground-water flow to be westward toward the Niagara River.

Chemical information.--The U.S. Geological Survey collected six ground-water samples from two shallow wells and from four deep wells on the site and a surface-water sample from a drainage ditch. All ground-water samples were analyzed for USEPA priority pollutants; results are given in table A-13. Concentrations of iron in the samples were higher than the USEPA criterion for drinking water or the New York State standard for ground water. Lead was higher than the New York State standard in all samples, and manganese in sample 3A was higher than the standard. Phenol in sample 2A was much higher than the State standard. The samples contained two organic priority pollutants, six organic nonpriority pollutants, and three organic compounds potentially of natural origin.

Table A-12.--Water levels in five deep monitoring wells on Republic Steel, site 148, Buffalo, N.Y.[1]
[Well locations are shown in fig. A-11.]

Well number	Water level (feet above sea level)	
	August 1979	February 1982
1	dry	dry
2	579.56	dry
3	580.49	581.57
4	dry	579.93
5	583.10	582.86

[1] August 1979 data from McPhee, Smith, Rosenstein Engineers, P.C. February 1982 data from Malcolm Pirnie Associates.

Table A-13.--Analyses of ground-water and surface-water samples from Republic Steel, site 148, Buffalo, N.Y., July 22-23, 1982.
[Locations shown in fig. A-11. Concentrations are in µg/L; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number and depth below land surface (ft)			
	Surface water	Ground water		
	1	2 (24.8)	2A (4.3)	3A (14.9)
pH	7.8	9.2	11.4	8.0
Specific conductance (umho/cm)	1,430	608	2,125	900
Temperature (°C)	27.0	10.2	17.0	10.5
Inorganic constituents				
Aluminum	--	357	662	--
Antimony	--	--	--	--
Arsenic	--	--	14†	--
Barium	224	--	--	532
Beryllium	--	--	--	--
Cadmium	--	--	--	--
Chromium	30	17	37	46
Cobalt	--	--	--	--
Copper	--	--	--	--
Iron	373†	1,080†	829†	2,220†
Lead	53†	51†	36†	40†
Manganese	24	90	72	1,000†
Mercury	--	--	--	--
Nickel	--	--	--	--
Selenium	--	--	--	--
Silver	--	--	--	--
Tin	--	--	--	--
Tellurium	--	--	--	--
Vanadium	--	--	--	--
Zinc	--	26	18	46
Organic compounds				
Priority pollutants				
Ethylbenzene**	--	--	LT	--
Phenol	--	--	40†	--

[1] Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semiquantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analysts.

† Exceeds USEPA criterion for maximum permissible concentration in drinking water or the NYS standard for maximum concentration in ground water.

** Volatile found in GC/MS extractions. Concentration probably higher than that detected.

Table A-13.--Analyses of ground-water and surface-water samples from Republic Steel, site 148, Buffalo N.Y., July 22-23, 1982 (continued)
[Locations shown in fig. A-11. Concentrations are in µg/L; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number and depth below land surface (ft)			
	Surface water	Ground water		
	1	2 (24.8)	2A (4.3)	3A (14.9)
Organic compounds (continued)				
Nonpriority pollutants				
2,3-Dichloro-2-methyl butane[1]	LT	14	--	--
1,3-Dimethylbenzene[1]	--	24	--	20
3-Hexanol[1]	--	24	--	--
4-Methyl-2-pentanol[1]	--	13	--	--
1-(2-butoxyethoxy)-ethanol[1]	52	370	--	650

	Ground water		
	4 (19.7)	5 (17.7)	5A (4.6)
pH	11.2	7.5	7
Specific conductance (umho/cm)	710	1,025	3,625
Temperature (°C)	10.0	10.5	14.5
Inorganic constituents			
Aluminum	--	--	--
Antimony	--	--	--
Arsenic	--	--	--
Barium	158	--	--
Beryllium	--	--	--
Cadmium	--	--	4
Chromium	39	52	37
Cobalt	--	--	--
Copper	--	--	--
Iron	264	276,000†	23,400†
Lead	20	17	19
Manganese	26	574†	8,520†
Mercury	--	--	--
Nickel	--	--	--
Selenium	--	--	--
Silver	--	--	--
Tin	--	--	--
Tullerium	--	--	--
Vanadium	--	--	--
Zinc	--	17	33

Table A-13.--Analyses of ground-water and surface-water samples from Republic Steel, site 148, Buffalo N.Y., July 22-23, 1982 (continued)
[Locations shown in fig. A-11. Concentrations are in µg/L; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number and depth below land surface (ft)		
	Ground water		
	4 (19.7)	5 (17.7)	5A (4.6)
Organic compounds			
Nonpriority pollutants			
1,3-Dimethylbenzene[1]	—	5.6	--
Cyclohexanol[1]	16	LT	--
Hexahydro-2H-azepho-2-one[1]	25	--	--
1-(2-butoxyethoxy)-ethanol[1]	--	150	--
Cyclohexanone[1]	78	--	--
2-Hexanone[1]	--	LT	--

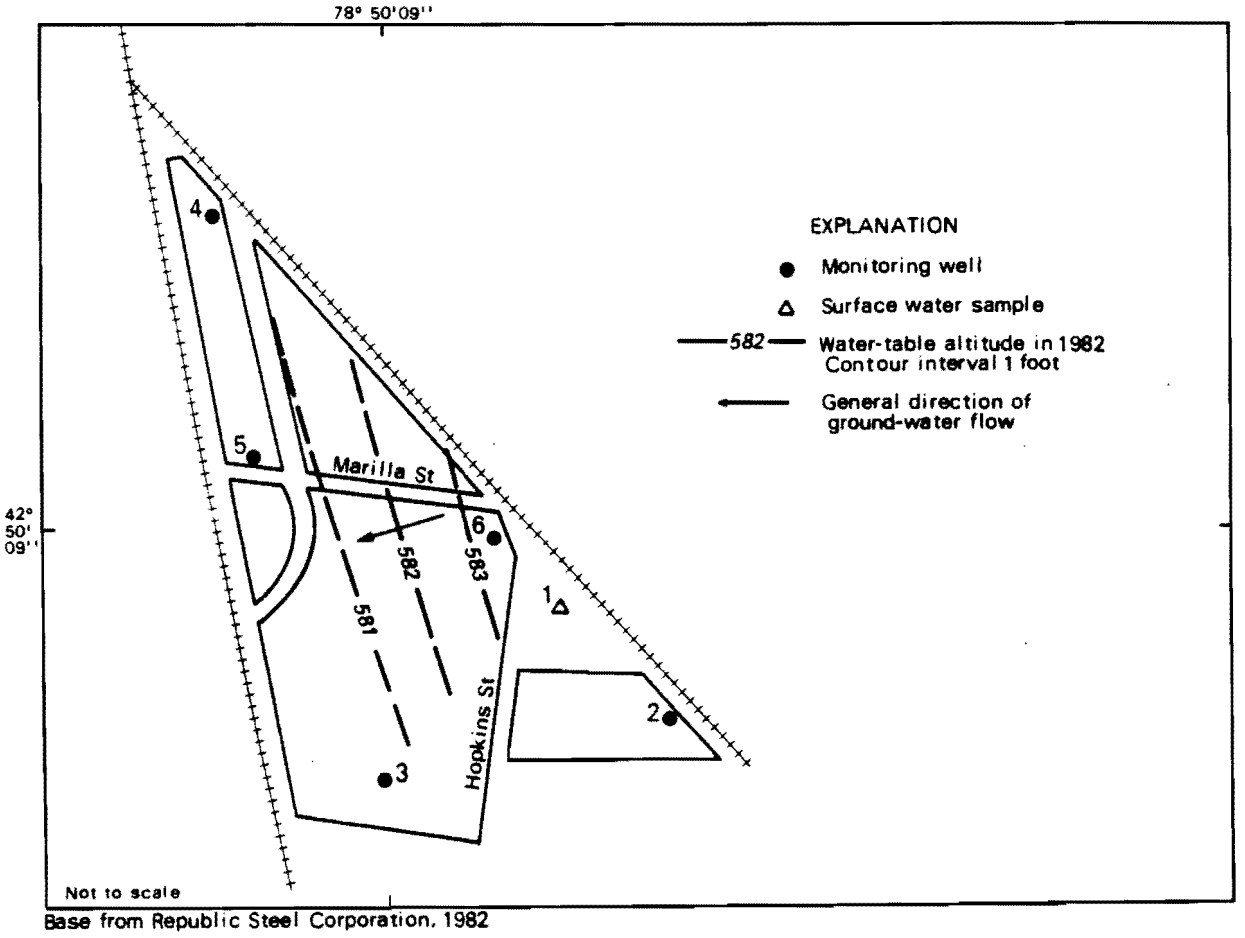


Figure A-11. Potentiometric surface and location of sampling holes at Republic Steel, site 148, Buffalo, August 1979 and February 1982.

180. HOPKINS STREET (Literature review) NYSDEC 915011

General information and contaminant-migration potential.--The Hopkins Street site, in the city of Buffalo, is reported to have been used as a landfill in the early and mid-1970's. Aerial photographs from these years indicate disposal operations to have been small and to have caused no major changes in the physical setting of the site.

No chemical monitoring has been recommended by NYSDEC, and the potential for chemical migration is indeterminable.

Geologic information.--No geologic data are available.

Hydrologic information.--No ground-water data are available. However, comparison of aerial photographs from past years with 1982 field observations indicates a change in drainage and grade; also a pond has formed on the site. The pond is probably perched upon fill or material of low permeability and does not reflect ground-water conditions.

Chemical information.--No chemical data are available.

184. KELLY ISLAND (Literature review) NYSDEC 915095

General information and contaminant-migration potential.--Kelly Island is a peninsula bounded by the Buffalo River, City Ship Canal, and Ohio Street. Most of the fill consists of demolition material, earth, and cinders. The area was extensively developed before the early 1900's, leaving little room for hazardous-waste-disposal operations.

The site is in direct hydraulic contact with the Buffalo River and the City Ship Canal; thus contaminants, if present, would migrate readily. However, no hazardous waste is known to have been buried at the site; therefore, NYSDEC has not recommended chemical monitoring. The potential for contaminant migration from this site is indeterminable.

Geologic information.--Construction borings from along Ganson Street (pl. 1) indicated a mixture of gravel, sand, silt, clay, cinders, and wood to a depth of 10 ft along the length of the site.

Hydrologic information.--No hydrologic data are available.

Chemical information.--No chemical data are available.

249. ALLIED CHEMICAL (HURWITZ-RANNE) HOPKINS STREET (USGS field reconnaissance) NYSDEC 915120

General information and chemical-migration potential.--The Hopkins Street site, in the southern part of the city of Buffalo, consists of two parcels of land having different owners. Site information indicates that neither area was used for disposal or lagooning, but NYSDEC received information that burial trenches had been operated on both areas.

Geologic data indicate a limited potential for contaminant migration from the northern property. Vertical migration of contaminants on the southern property is unlikely because the site is underlain by clay. Organic priority pollutants and a high chromium concentration suggest a possibility of contaminant migration, but the potential is indeterminable at this time.

Geologic information.--The two sites consist of 3 to 4 ft of fill and debris underlain by extensive clay. The U.S. Geological Survey drilled six test holes in August 1982 and another six in May 1983. Locations are shown in figure A-23. The geologic logs are as follows:

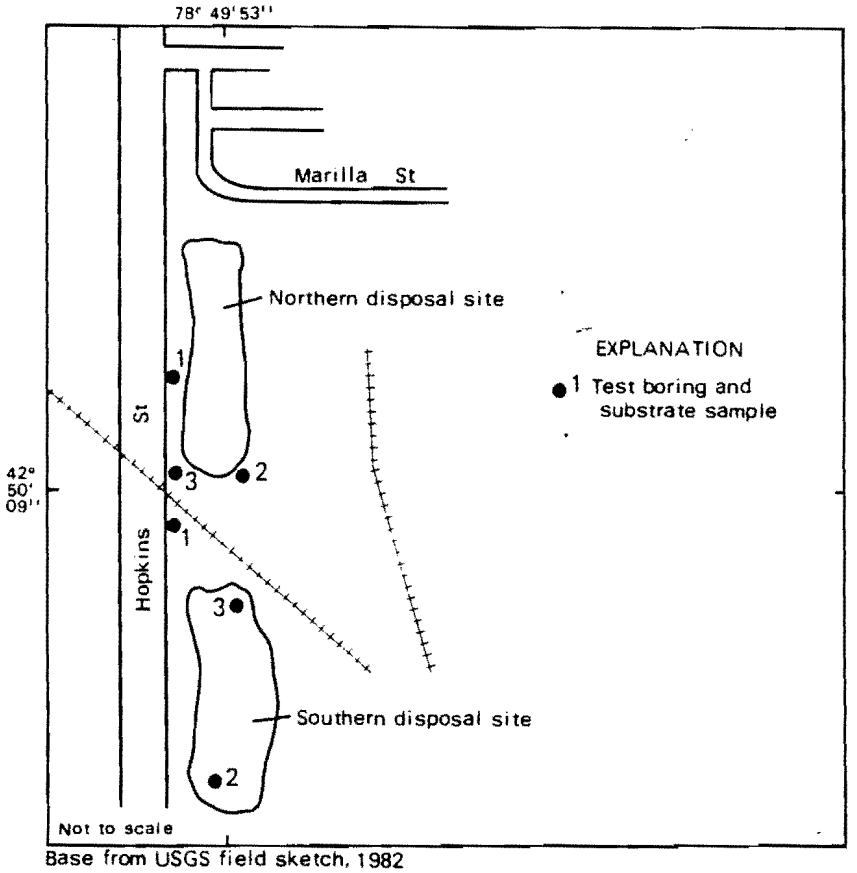


Figure A-23. Location of sampling holes at Allied Chemical, Hurwitz-Ranne Hopkins Street, site 249, Buffalo.

South Property

Boring no.	Depth (ft)	Description
1	0 - 3.5	Topsoil, dark brown.
	3.5 - 4.0	Clay, sand, with oily fluid.
		SAMPLE: 3.5 ft.
2	0 - 3.0	Fill, slag.
	3.0 - 5.0	Clay, dark green to yellow, wet.
		SAMPLE: 4 ft.
3	0 - 2.5	Topsoil, gray, gravel, turning. green at 1.0 ft.
	2.5 - 3.0	Clay, greenish, gray.
		SAMPLE: 2.5 ft.

North Property

Boring no.	Depth (ft)	Description
1	0 - 2.5	Topsoil and fill.
	2.5 - 3.0	Clay, green, tight.
	3.0 - 4.0	Clay, greenish-gray, wet.
		SAMPLE: 3 ft.
2	0 - 4.0	Fill, debris.
	4.0 - 5.0	Clay, green, wet.
	5.0 - 6.5	Clay, yellow, wet.
		SAMPLE: 4 ft.
3	0 - 3.0	Fill, debris, black.
	3.0 - 3.5	Hard zone, rock, and gravel.
	3.5 - 4.5	Clay, green, wet.
	4.5 - 6.5	Clay, yellow.
		SAMPLE: 3.5 ft.

Hydrologic information.--Test-boring data indicate a perched water table within the clay unit 3 to 4 ft below land surface. The altitude of this water table is approximately 580 ft above NGVD.

Chemical information.--The U.S. Geological Survey collected a soil sample from each test boring for chromium, iron, and organic compound analysis; results are given in table A-26. The samples contained 28 organic priority pollutants. The Erie County Department of Environment and Planning sampled the site; PCB's were detected in surface soils.

Table A-26.--Analyses of substrate samples from Allied Chemical (Hurwitz-Ranne), site 249, Hopkins Street, Buffalo, N.Y.
[Locations shown in fig. A-23. Concentrations are in µg/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number and depth below land surface (ft)		
	North Property		
	1	2	3
First sampling (8-11-82)	(3.0)	(4.0)	(3.5)
Inorganic constituents			
Chromium	30,000	180,000††	340,000††
Iron	10,000,000	28,000,000	29,000,000

	South Property			
	1	Duplicate	2	3
	(3.5)	sample	(4.0)	(2.5)
Chromium	30,000	(20,000)	180,000††	3,000
Iron	10,000,000	(10,000,000)	21,000,000	3,700,000

	Sample number (depths are same as in first sampling)					
	North Property			South Property		
Second sampling (5-18-83)	1A	2A	3A	1A	2A	3A
Organic compounds						
Priority pollutants						
Benzene	LT	19.1**	22.6	3.4	27.9	10.6
Methylene chloride	--	314**	538	--	313	--
Toluene	--	--	LT	--	2.8	--
Heptachlor	--	--	LT	--	--	--
2,4-Dimethylphenol	--	--	--	*	--	--
Phenol	--	--	--	*	--	--
Pentachlorophenol	--	--	--	--	--	* **
Acenaphthene	*	*	*	*	*	*
1,2-Diphenylhydrazine as azobenzene	--	--	--	--	--	*
Fluoranthene	*	* **	*	*	*	*

[1] Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semiquantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analysts.

†† Exceeds concentrations in samples from undisturbed soils in the Buffalo area. Undisturbed soils were not analyzed for iron.

* Compounds detected but not quantified--Holding time exceeded before GC/MS acid- and base-neutral extractable compounds were extracted.

** Surrogate recoveries were outside the acceptance limits.

Table A-26.--Analyses of substrate samples from Allied Chemical (Hurwitz-Ranne), site 249, Hopkins Street, Buffalo, N.Y. (continued)
[Locations shown in fig. A-23. Concentrations are in µg/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number (depths are same as in first sampling)					
	North Property			South Property		
Second sampling (continued)	1A	2A	3A	1A	2A	3A
Organic compounds (continued)						
Priority pollutants (continued)						
Naphthalene	*	*	*	*	*	*
Bis(2-ethylhexl) phthalate	*	--	--	--	*	--
Di-n-butyl/phthalate	*	* **	*	*	*	*
Diethyl/phthalate	*	--	--	--	--	*
Di-n-octyl/phthalate	--	--	--	*	--	--
Benzo(a)anthracene	*	* **	*	*	*	*
Benzo(a)pyrene	*	* **	*	*	*	*
Benzo(b)fluoranthene and benzo(k)fluoranthene	*	* **	*	*	*	*
Chrysene	*	* **	*	*	*	*
Acenaphthylene	*	*	*	*	--	--
Anthracene	--	--	--	*	--	--
Benzo(ghi)perylene	*	* **	*	*	*	--
Fluorene	--	*	*	*	--	--
Phenanthrene	--	--	--	*	--	--
Dibenzo(a,h)anthracene	*	* **	*	*	--	--
Indeno(1,2,3-cd)pyrene	*	* **	*	*	*	*
Pyrene	--	* **	*	*	*	*
N-nitrosodiphenyl-amine	--	--	--	*	--	--
Nonpriority pollutants						
Acetone	--	328**	696	--	--	--
2-Butanone	--	--	165	--	--	--
Carbon disulfide	--	55.5**	100	13.4	121	--
O-xylene	--	31.2**	--	--	--	--
4-Methylphenol	--	--	--	*	*	--
Dibenzofuran	*	*	*	*	*	*
2-Methylnaphthalene	*	*	*	*	*	*
2-Hexanone	--	--	--	--	*	*
4-Methyl-2-pentanone	--	--	--	--	*	*
Tetrahydrofuran[1]	--	*	*	--	*	--
3,2,1-Bicyclooctane[1]	--	*	--	--	--	--
2-Methylphenol	--	--	--	*	--	--
Cis-octahydropentelene[1]	--	*	--	--	--	--
Cis-1,2-dimethylcyclo-hexane[1]	--	*	--	--	--	--
Ethylcyclohexane[1]	--	*	--	--	--	--
2,6,6-Trimethyl-(3.1.1) bicyclo-hept-2-ene[1]	--	*	--	--	--	*

Table A-26.--Analyses of substrate samples from Allied Chemical (Hurwitz-Ranne), site 249, Hopkins Street, Buffalo, N.Y. (continued)
[Locations shown in fig. A-23. Concentrations are in µg/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number (depths are same as in first sampling)					
	North Property			South Property		
Second sampling (continued)	1A	2A	3A	1A	2A	3A
Organic compounds (continued)						
Nonpriority pollutants (continued)						
6,6-Dimethyl-2-methylene-bicyclo-(3.1.1)-heptane[1]	—	*	--	--	--	--
1,2,3-Trimethycyclo-hexane[1]	--	*	--	--	--	--
2-Methylnaphthalene[1]	--	--	--	*	--	--
1,8-Dimethyl-naphthalene[1]	--	--	--	*	--	--
Carbazole[1]	--	--	--	*	--	--
3-Methylphenanthrene[1]	--	--	--	*	--	--
9-Methylphenanthrene[1]	--	--	--	*	--	--
2-Phenylnaphthalene[1]	--	--	--	*	--	--
1-Methylpyrene[1]	--	--	--	*	--	--
7-Methyl-benzo(a)-anthracene[1]	--	--	--	*	--	--

253. SMALL BOAT HARBOR CONTAINMENT SITE (USGS field reconnaissance)

General information and contaminant-migration potential.--This site lies along Lake Erie south of the Small Boat Harbor in the city of Buffalo and is operated by the Niagara Frontier Transportation Authority. The site was used for disposal of dredge spoils from the Buffalo River, Buffalo Harbor, and the Black Rock Canal (fig. A-24). This site was the first of three containment sites constructed and was a prototype for other containment sites--Times Beach (site 241) and Buffalo Harbor (site 254).

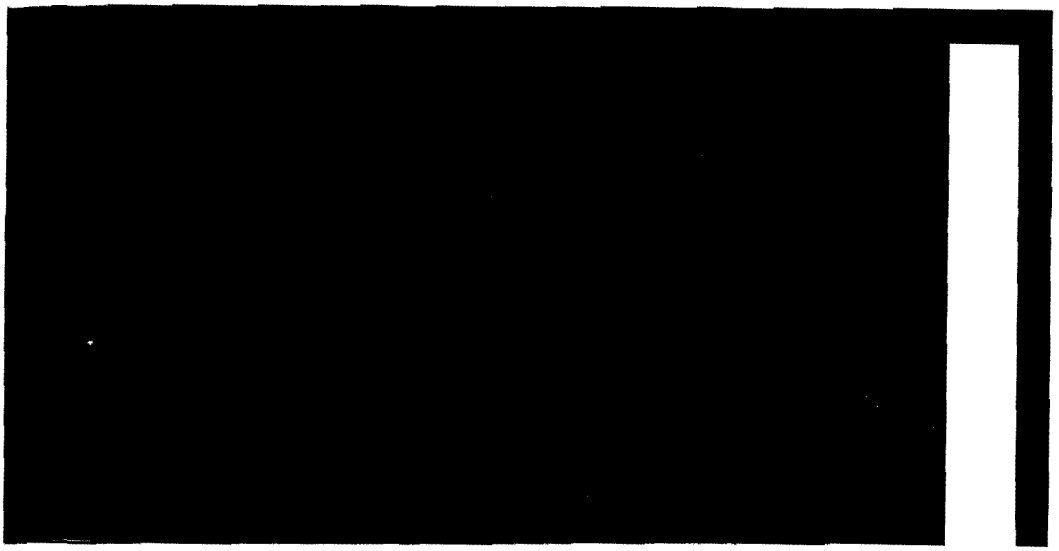
If the barrier is similar to the one at the Times Beach containment site (site 241), it would not prevent water from entering or leaving the site, and any leachate produced within the site would readily enter Buffalo Harbor. Therefore, this site has potential for contaminant migration. Additional water-quality monitoring would be needed to define the rate of contaminant migration.

Geologic information.--The dredged sediments on the area consist of sand, silt, and clay. The underlying bedrock is Onondaga Limestone overlain by natural lake deposits of silt and clay.

Hydrologic information.--The U.S. Geological Survey installed three monitoring wells in the area in 1982. The well data and geologic logs are as follows:

REFERENCE 12

Groundwater, R.A. Freeze and J.A. Cherry
Prentice Hall, 1979
pp. 150-151, p. 29



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GROUNDWATER

Prentice-Hall, Inc.
Englewood Cliffs, New Jersey 07632

some areas. In comparison to aquifers of glaciofluvial origin, these aquifers of glaciolacustrine origin are generally of minor importance.

Glacial till is the most abundant material that was deposited on the land surface during Pleistocene time. In the Precambrian Shield region, till is generally sandy, with variable amounts of silt and little clay. Sandy till forms local aquifers in some areas. In the regions of sedimentary bedrock in North America, glacial erosion produced till that generally has considerable silt and clay and therefore has low permeability. Till layers of this type are aquitards.

Figure 4.3 is a schematic diagram of the occurrence of aquifers and aquitards in the Midwest and Great Plains regions of North America. Most aquifers in these regions are composed of glaciofluvial sand and gravel confined by deposits of till or glaciolacustrine silt or clay. The aquifers occur as extensive blanket bodies or as channel deposits in surface or buried valleys. The deposits of sand and gravel in buried valleys form aquifers that are generally many tens of kilometers long and several kilometers wide. The largest buried valleys are many tens of kilometers wide. In many cases there are no surface indications of the presence of buried valley aquifers. The overlying till is usually some tens of meters thick or less, but occasionally may be on the order of a hundred meters thick.

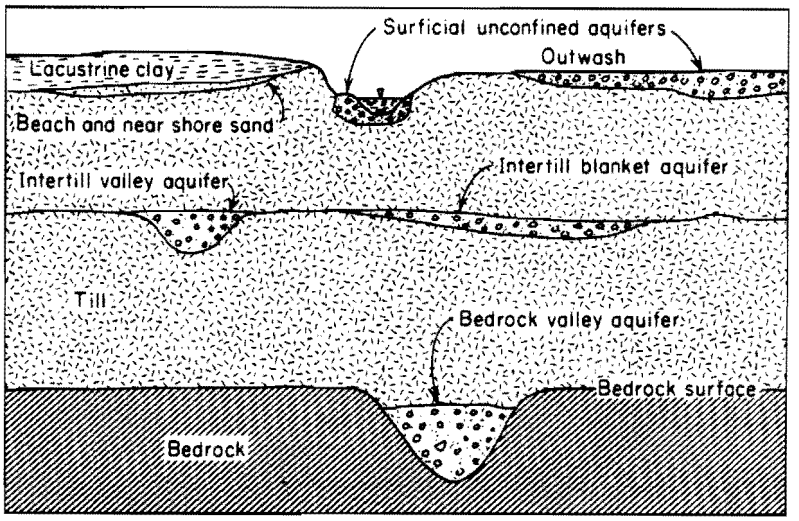


Figure 4.3 Schematic diagram of aquifer occurrence in the glaciated regions of the Midwest and Great Plains physiographic provinces.

Many of the meltwater rivers that formed aquifer deposits were braided in the manner shown in Figure 4.2(a); others flowed in deep channels or valleys eroded in glacial terrain or in sedimentary bedrock. Examples of aquifers that originated in valleys and as blanket deposits are included in Figure 4.3.

In addition to the classical types of meltwater deposits laid down by rivers of

meltwater flowing beyond the margin of glaciers, many glaciated areas have deposits of sand and gravel that formed on top of masses of stagnant ice during episodes of glacial retreat. These deposits are known as collapsed outwash, stagnant-ice outwash, or ice-contact deposits. An example of this type of deposit is illustrated in Figure 4.4. Sand and gravel aquifers of this origin occur at the surface or buried beneath till deposited during periods of ice readvance.

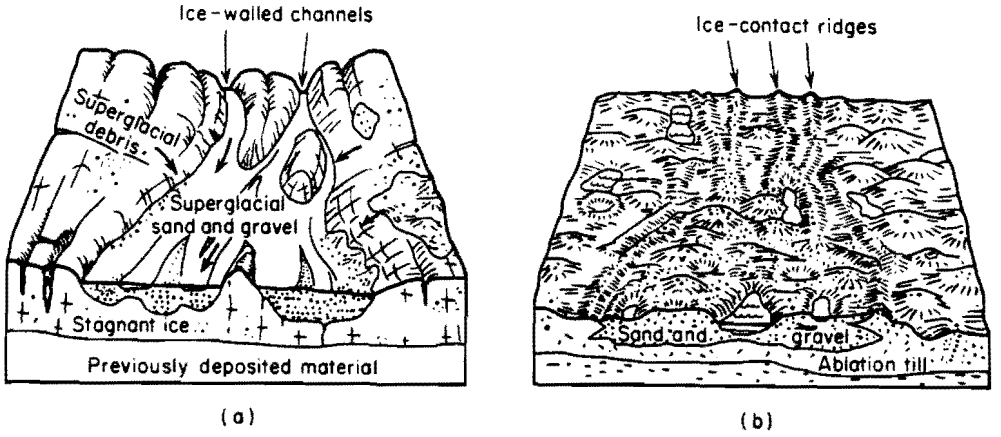


Figure 4.4 Formation of collapsed outwash in an environment of continental glacier stagnation (after Parizek, 1969).

Dense, fine-grained glacial till, and deposits of glaciolacustrine silt and clay are the most common aquitards in most of the northern part of the United States and in the southern part of Canada. These deposits have intergranular hydraulic conductivities that are very low, with values typically in the range 10^{-10}–10^{-12} m/s. With a hydraulic gradient of 0.5, which is near the upper limit of gradients observed in these aquitards, and a hydraulic conductivity of 10^{-11} m/s, nearly 10,000 years would be required for water to flow through a 10-m-thick unfractured layer of this material. Extensive deposits of clayey till or glaciolacustrine clay can cause isolation of buried aquifers from zones of near-surface groundwater flow.

In the Great Plains region, in parts of the American Midwest, and in southern Ontario, it has been observed that in some locations deposits of clayey or silty till and glaciolacustrine clay have networks of hairline fractures. These features are sometimes referred to as *fissures* or *joints*. The fractures are predominantly vertical or nearly vertical. The distance between the fractures varies from several centimeters to many meters. Infillings of calcite or gypsum are common. The soil matrix adjacent to the fractures is commonly distinguished by a color change caused by different degrees of oxidation or reduction. In some areas thin rootlets are observed along the fractures to depths of 5–10 m below ground surface. In some cases the fractures pass through successive layers of till and clay. In other cases they are restricted to individual layers.

Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

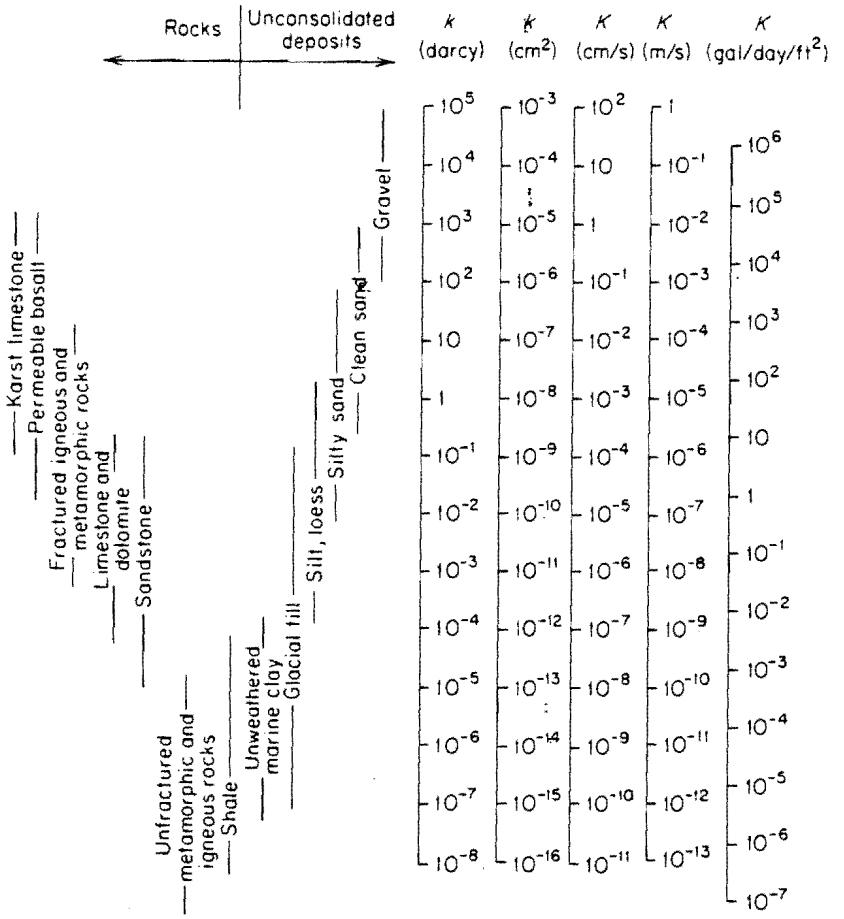


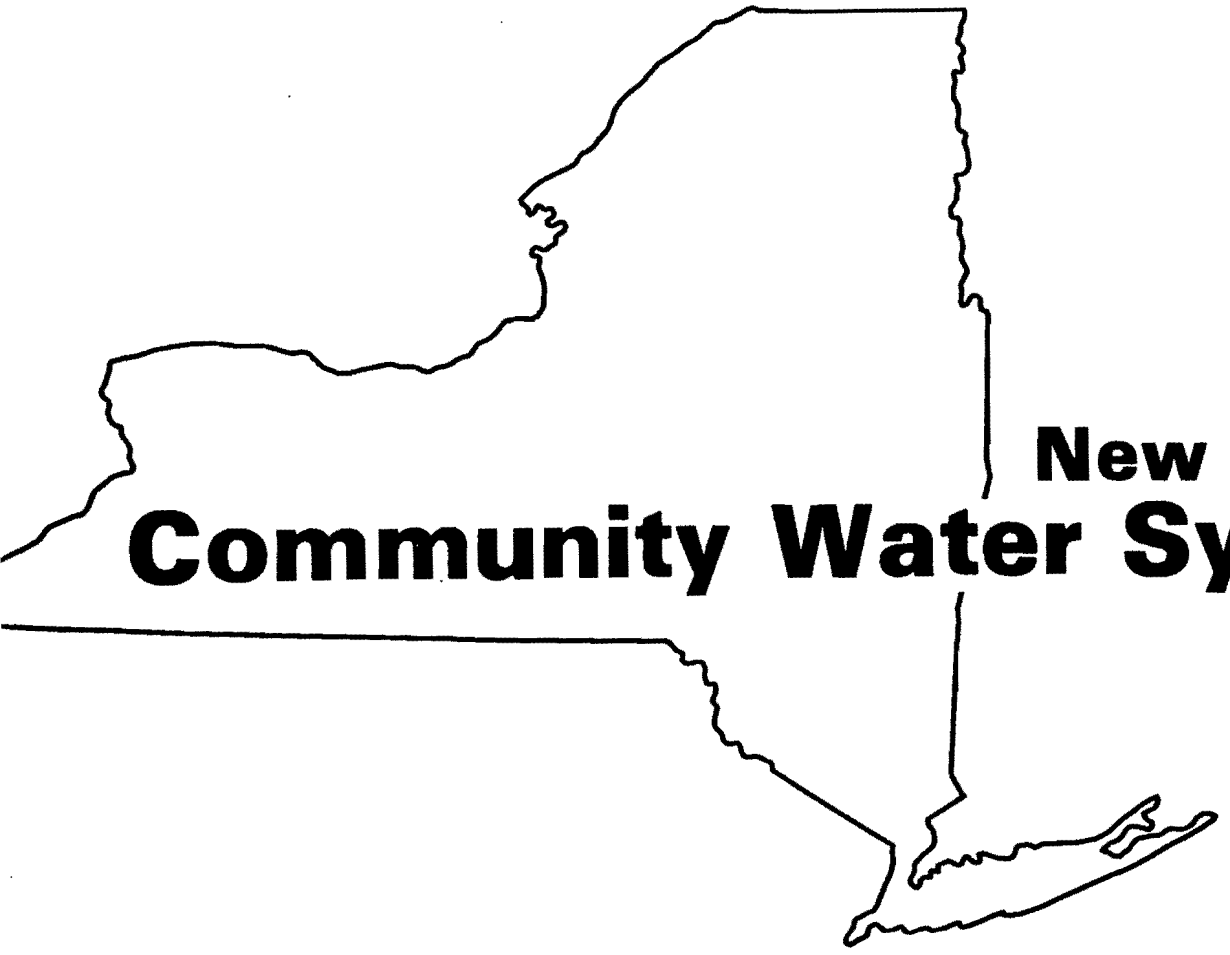
Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, k*			Hydraulic conductivity, K		
	cm^2	ft^2	darcy	m/s	ft/s	U.S. gal/day/ft^2
cm^2	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft^2	9.29×10^{2}	1	9.42×10^{10}	9.11×10^{5}	2.99×10^{6}	1.71×10^{12}
darcy	9.87×10^{-9}	1.06×10^{-11}	1	9.66×10^{-6}	3.17×10^{-5}	1.82×10^{1}
m/s	1.02×10^{-3}	1.10×10^{-6}	1.04×10^{5}	1	3.28	2.12×10^{6}
ft/s	3.11×10^{-4}	3.35×10^{-7}	3.15×10^{4}	3.05×10^{-1}	1	6.46×10^{5}
U.S. gal/day/ft^2	5.42×10^{-10}	5.83×10^{-13}	5.49×10^{-2}	4.72×10^{-7}	1.55×10^{-6}	1

*To obtain k in ft^2, multiply k in cm^2 by 1.08×10^{-3}.

REFERENCE 13

New York State Atlas of
Community Water System Sources
1982

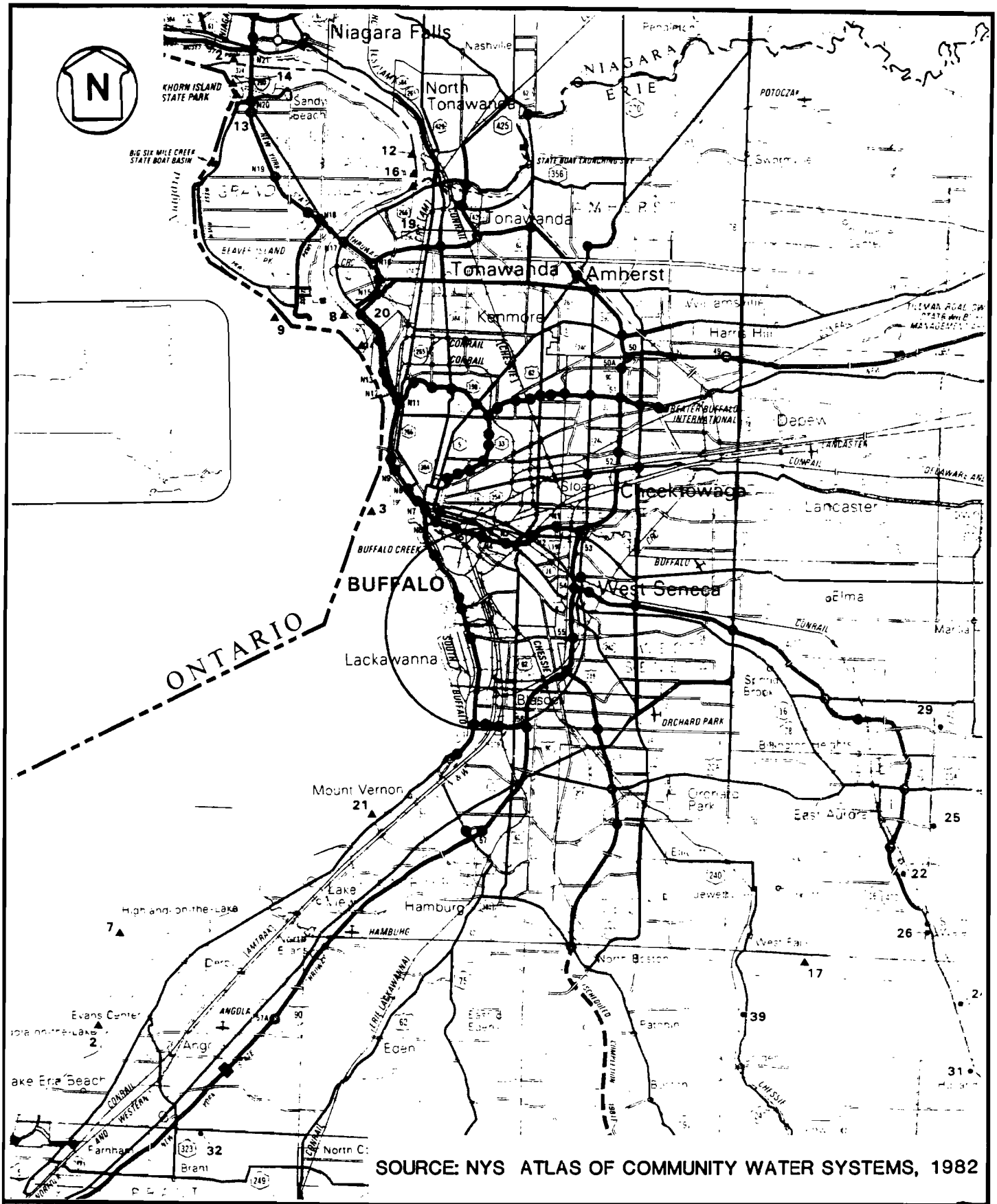


New York State Atlas of Community Water System Sources 1982

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

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



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	By	Date
Dwn.	KAS	9/88
Ckd.	RAC	11/88
Ap'vd.	RKW	11/88
Rev.		

NYSDOT
ENVIRONMENTAL ASSESSMENT
OF BUFFALO CRUSHED
STONE PARCELS

COMMUNITY WATER
INTAKE MAP
(3 MILE RADIUS)

Project No. 8C1364

A

FIGURE 4-2

REFERENCE 14

U.S. Department of Commerce
National Climatic Center
Climatic Atlas of the United States
1979
Figures 4 and 5

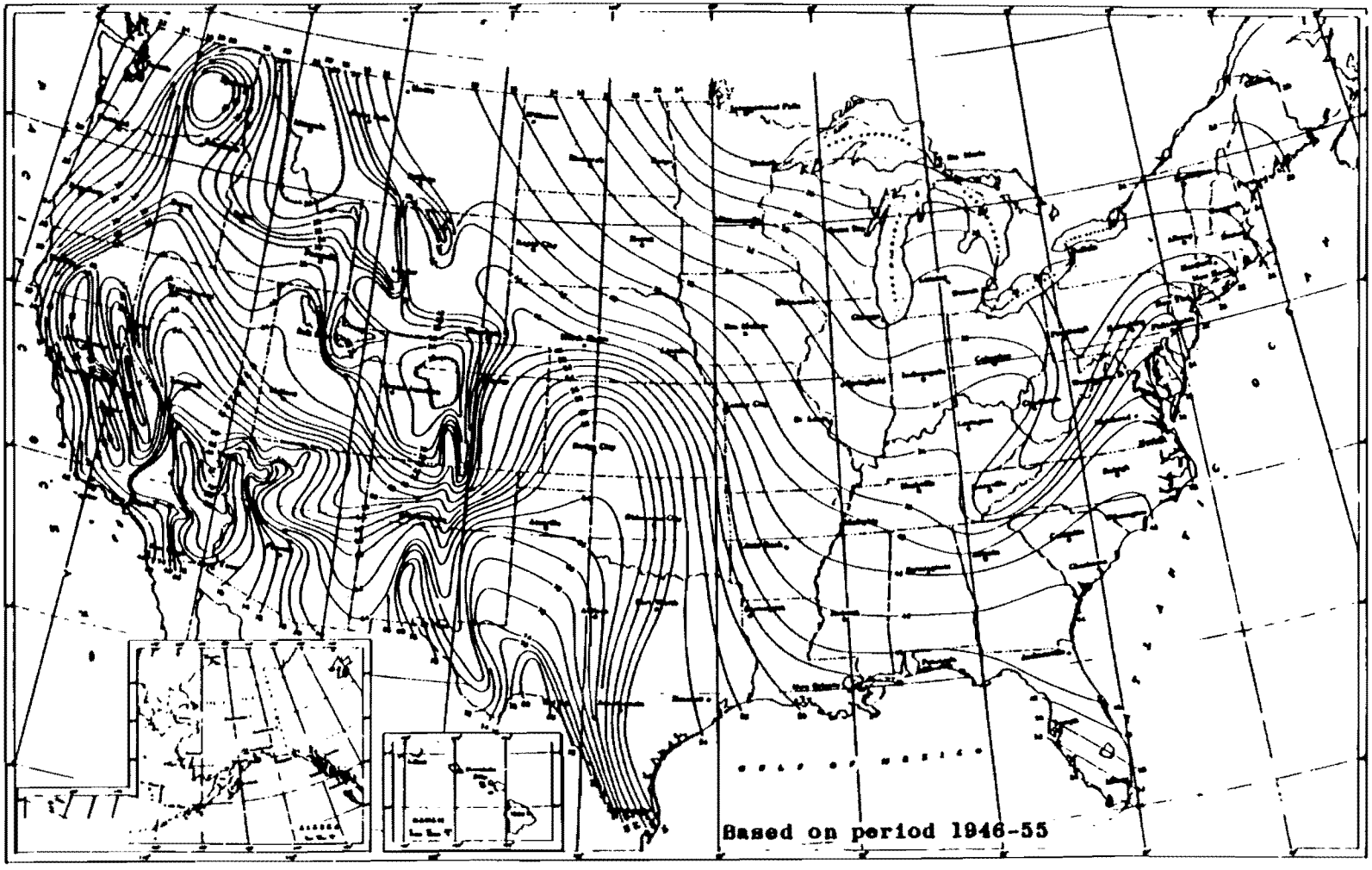

Figure 4

Mean Annual Lake Evaporation (In Inches)

Source: Climatic Atlas of the United States, U.S. Department of Commerce, National Climatic Center, Ashville, N.C., 1979.

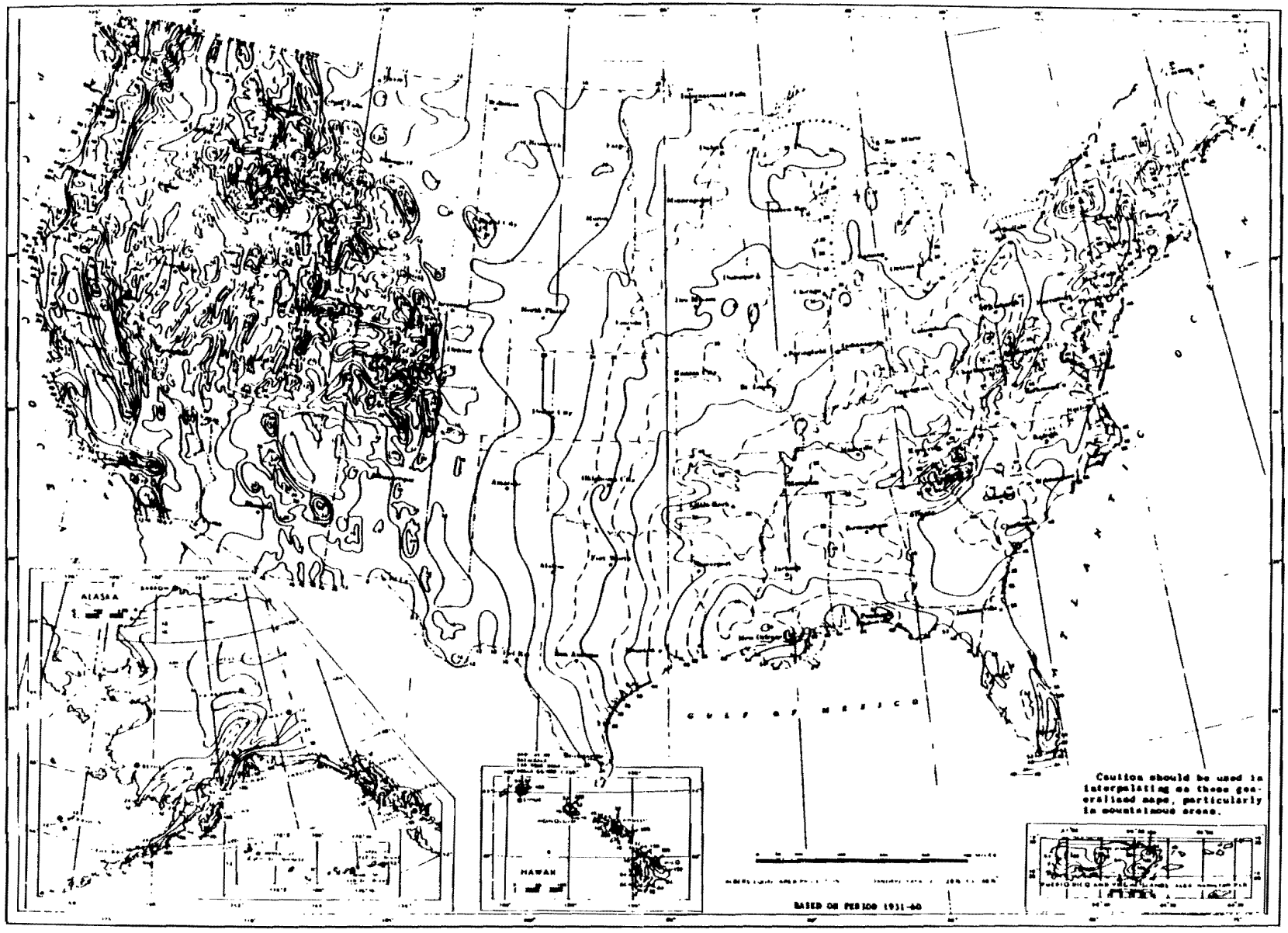

Figure 5

Normal Annual Total Precipitation (inches)

National Climatic Center

REFERENCE 15

1/L9504.2

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

September 13, 1988

Mr. James R. Snider
New York State Department
of Environmental Conservation
Region 9
Division of Fish and Wildlife
600 Delaware Avenue
Buffalo, NY 14202

Dear Mr. Snider:

The purpose of the following letter is to serve as documentation for our telephone conversation on 9/9/88. Please make any corrections or additions you feel are needed. If you agree with the information below, please sign at the bottom of the page in the space provided, and return the letter to the undersigned. A site location map is enclosed for your use.

- There are no critical habitats of endangered species or national wildlife refuges within one mile of the indicated Buffalo Crushed Stone property, located at the foot of Steelawanna Avenue (see map).

- The site may be near the migration routes in the spring and summer seasons of the Bald Eagle and the Peregrine Falcon.

If you have any questions or comments, please feel free to contact me. Thank you very much for your time and effort.

Sincerely,

RECRA ENVIRONMENTAL, INC.

Kenneth A. Shisler Jr.

Kenneth A. Shisler, Jr.
Staff Geologist

James R. Snider
James R. Snider

Audubon Business Centre • 10 Hazelwood Drive, Suite No. 106 • Amherst, New York 14150 • (716) 691-2600

REFERENCE 16

1/L9504.3

16

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

September 13, 1988

Mr. Bruce Colello
City of Lackawanna
Department of Development
714 Ridge Road Room 311
Lackawanna, NY 14218

Dear Mr. Colello:

The following letter is to serve as documentation of information obtained during our telephone conversation on 9/12/88. If any corrections are required, please make them on the text of this letter. If you agree that the information is correct, please sign at the bottom of the page in the space indicated, and return it to the undersigned.

- Buffalo Crushed Stone, Inc.'s Steelawanna Avenue location is zoned with a PL rating (Planned Industrial Park) with heavy industry permitted.

- The nearest residential area is located directly adjacent to the Steelawanna Avenue site.

Should you have any further questions or comments, please feel free to contact me. Thank you very much for you time and effort.

Sincerely,

RECRA ENVIRONMENTAL, INC

Kenneth A. Shisler Jr.

Kenneth A. Shisler, Jr.
Staff Geologist

Bruce L. Colello
Bruce Colello

REFERENCE 17

Hazardous Chemicals Data Book
G. Weiss, ed., Noyes Data Corporation
Park Ridge, NJ, 1980, p. 131

ASP ASPHALT

Common Synonyms
Asphaltic bitumen
Bitumen
Petroleum asphalt

Thick liquid (generally heated) Dark Brown to black Tar odor

May float or sink in water. Rubbery solid is produced when cooled.

Stop discharge if possible.
Avoid contact with liquid.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.

Extinguish with water, dry chemical, foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

LIQUID
Will burn skin and eyes.

Flush affected areas with plenty of water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
FOULING TO SHORELINE.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Asphalt cements
Asphaltic bitumen
Bitumen
Petroleum asphalt

3.2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not pertinent

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1999; 3.3/1999

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Dark brown to black

4.3 **Odor:** Tarry

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing; face and eye protection when handling hot material

5.2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin.

5.3 **Treatment for Exposure:** Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing, and the patient should be taken immediately to a hospital.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** None observed

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 300°F—550°F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 400°F - 700°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Johns-Manville Co
Greenwood Plaza
Denver, Colo. 80217

2 Sun Oil Co
1608 Walnut St.
Philadelphia, Pa. 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Each of the following is available in several grades: asphalt cement, rapid-curing liquid asphalt, medium-curing liquid asphalt, slow-curing liquid asphalt (road oil), emulsified asphalt, inverted asphaltic emulsion, oxidized (air-blown) asphalt

10.2 **Storage Temperature:** Elevated

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A-T-U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAB Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) 1.00 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** 70 dynes/cm = 0.07 N/m at 77 °C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

REVISED 1978

Reference 18

Field Report and
Photographic Log
Recra Environmental Site Inspection
9/8/88

1/9960.18.1

FILE

Ken Shisler

November 30, 1988

Buffalo Crushed Stone, Steelawanna Avenue Site
9/8/88 Site Inspection

Present: Ken Shisler - Recra
Richard Mirabelli - V.P., Buffalo Crushed Stone, Inc.

Spoke with Mr. Mirabelli about slag, he reports no hazards associcated with it. Said slag was obtained from two sources: "light weight" slag from Republic Steel; "hard" slag from Hanna Furnace. Last delivery was from Republic Steel 10-12 years ago. Slag is sold as road construction material. Only processing of slag is crushing and screening. Iron is magnetically separated.

Tanks present on-site are no longer used. Previously used to store asphalt.

Asphalt spill beneath tank with peeling and exposed insulation material; spill about 150 square feet in area, 1 to 2 inches thick.

Can see spire of Our Lady of Victory Basilica from site.

Mr. Mirabelli does not know purpose of underground pipe system. Possibly used for asphalt or oil or natural gas.

Empty drums found on-site: (1) in small building, (2) behind pile of old tires, (3) farther along track side from (2), (4) crushed drum along dirt roadway near garage.

Access to site is unrestricted.

Photographic log attached.

PHOTOGRAPHIC LOG

Exposure #	Description
15,16,17	Facing West, sequence showing large above ground tank and shack, 2 inground steel tanks, 2 tanks (possibly fuel) that have been removed from underground, 2 above ground (possibly fuel) tanks, large storage tank.
18,19,20	Facing East, sequence showing slag stock piles being worked, railroad line visible in background - note spire of Basilica; slag stock piles.
21	Facing Northeast, abandoned buildings, asphalt storage tank.
22	Asphalt spill beneath tank in Exp. #21.
23	Underground piping system - unknown purpose.
24	Drum in small building, floor appears oil soaked.
25	Drum with DOT stencil.

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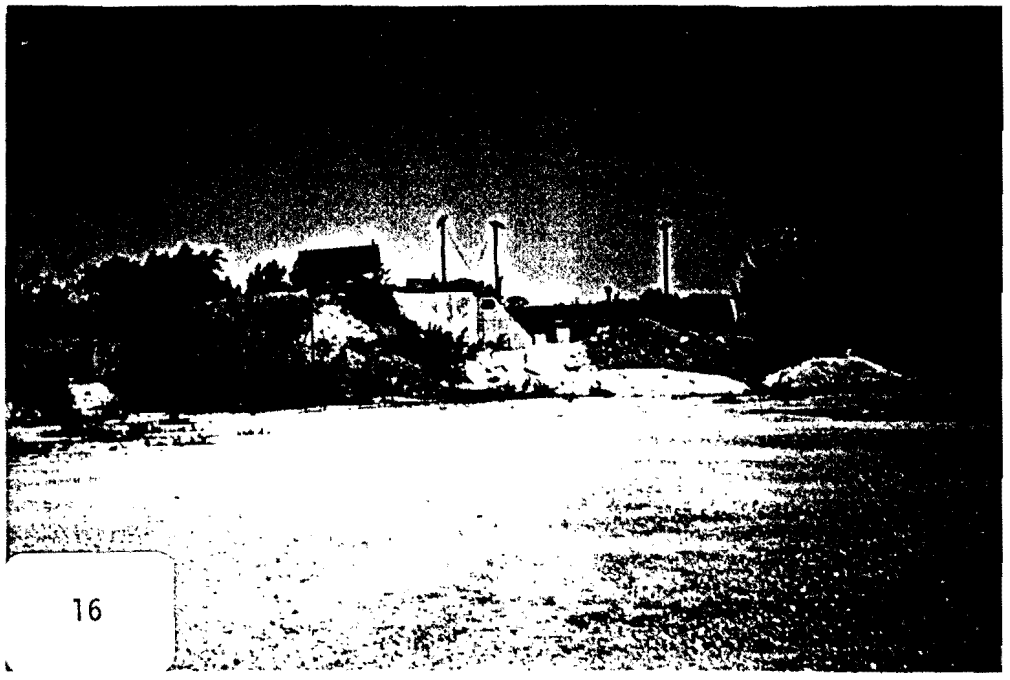

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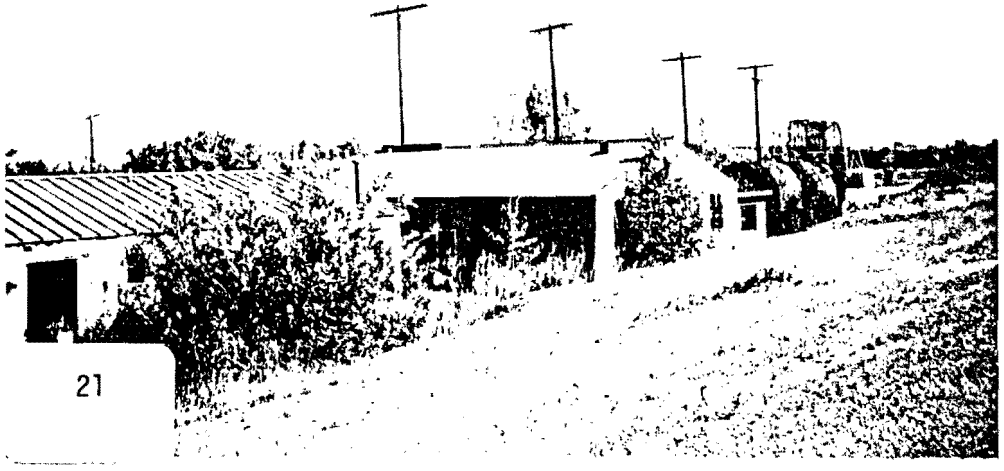

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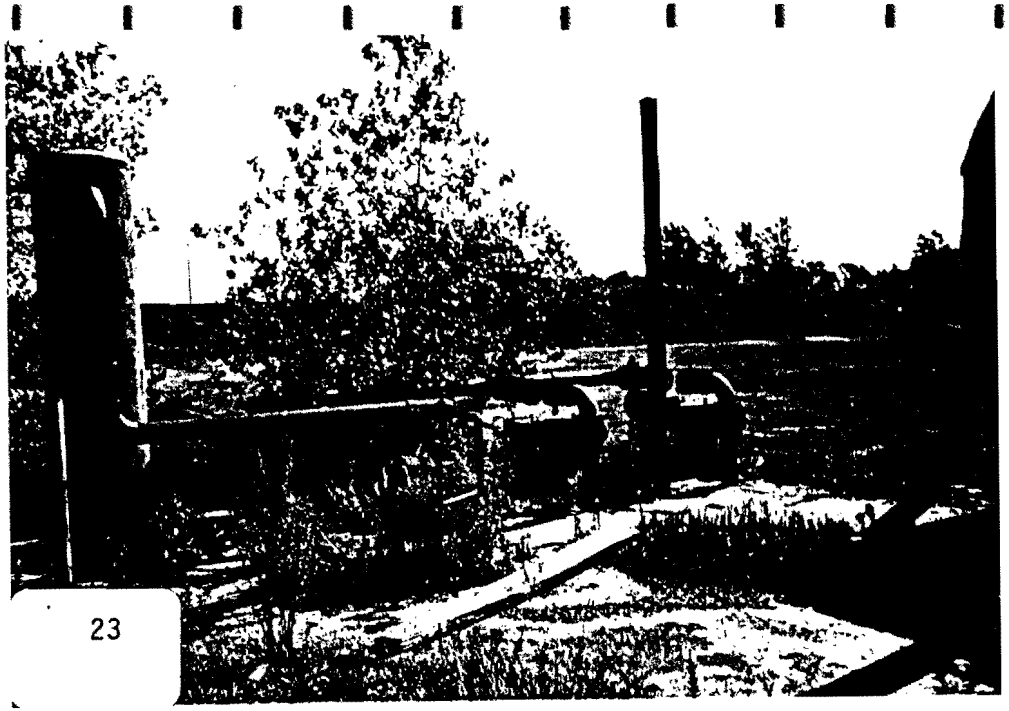

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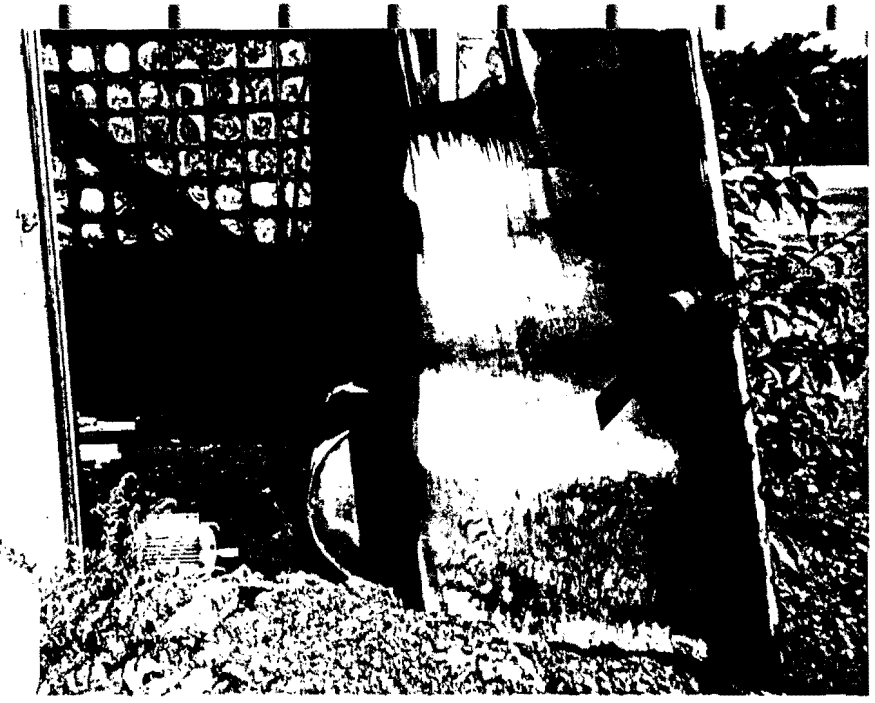

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Reference 19

1980 U.S. Census Data

NEW YORK

Census Code	Name	G.U. Code	Population 100%-80	7-82	7-84	7-86	PCI 1979	1985	T	Sub	Rec	p
36027090	RHINEBECK TO	333001401600	7062	6937	7078	7120	7152	12470	3	0	2	3
360270903050	RHINEBECK	332001400800	2542	2492	2502	2710	8390	14522	4	0	0	0
36027095	STANFORD TOW	333001401700	3319	3443	3649	3840	7461	12067	3	0	0	0
36027100	UNION VALE T	333001401800	2658	2704	2835	2920	6952	11589	3	0	0	0
36027105	WAPPINGER TO	333001401900	26776	26622	27068	26950	8336	13477	3	0	2	3
36027110	WASHINGTON T	333001402000	4382	4335	4481	4640	9008	15030	3	0	2	3
360271102275	MILLBROOK	332001400300	1343	1341	1376	1350	8360	14036	4	0	0	0
36029	ERIE COUNTY	331001501400	1015472	997691	986013	964700	7094	10543	2	30	62	0
36029 0900	DEPEW	332001500600	19819	19361	19530	19340	6790	9934	8	0	0	0
36029 3995	WILLIAMSVILL	332001501800	6017	5886	5815	5620	9356	14090	8	0	0	0
36029005	ALDEN TOWN	333001500100	10093	10011	9939	9830	6106	9016	3	0	2	3
360290050040	ALDEN	332001500200	2488	2451	2504	2470	6912	10345	4	0	0	0
36029010	AMHERST TOWN	333001500200	108706	108493	108987	109500	9494	14381	3	0	2	3
36029015	AURORA TOWN	333001500300	13872	13695	13593	13540	8078	12413	3	0	2	3
360290150965	EAST AURORA	332001500700	6803	6743	6664	6500	7680	12206	4	0	0	0
36029020	BOSTON TOWN	333001500400	7687	7681	7866	7960	7926	11271	3	0	0	0
36029025	BRANT TOWN	333001500500	2437	2353	2334	2240	5933	8462	3	0	2	3
360290251180	FARNHAM	332001500800	404	363	368	370	5537	8113	4	0	0	0
360290300450	BUFFALO	332001500500	357870	348035	338982	324820	5929	8840	3	0	0	0
36029035	CHEEKTOWAGA	333001500600	109442	106982	106038	103350	7090	10271	3	0	4	3
360290353405	SLOAN	332001501500	4529	4342	4589	4640	6633	9978	4	0	0	0
36029040	CLARENCE TOW	333001500700	18146	18335	18397	18780	8632	13256	3	0	0	0
36029045	COLDEN TOWN	333001500800	3128	3124	3150	3140	6902	10169	3	0	0	0
36029050	COLLINS TOWN	333001500900	5037	4841	4800	5150	5657	8556	3	0	2	3
360290501395	GOWANDA (PT.	332000500700015	849	795	775	760	6826	10795	4	0	0	2
36029055	CONCORD TOWN	333001501000	8171	8199	8306	8330	6487	9546	3	0	2	3
360290553525	SPRINGVILLE	332001501600	4285	4286	4283	4240	6502	9927	4	0	0	0
36029060	EDEN TOWN	333001501100	7327	7293	7302	7290	7138	10234	3	0	0	0
36029065	ELMA TOWN	333001501200	10574	10345	10251	10210	8486	12657	3	0	0	0
36029070	EVANS TOWN	333001501300	17961	18220	18292	18230	6444	9268	3	0	2	3
360290700115	ANGOLA	332001500300	2292	2250	2243	2220	6185	9283	4	0	0	0
36029075	GRAND ISLAND	333001501400	16770	16788	16636	16510	8361	12320	3	0	0	0
36029080	HAMBURG TOWN	333001501500	53270	53378	53594	53240	7545	10884	3	0	3	3
360290800335	BLASDELL	332001500400	3288	3292	3263	3250	7264	10977	4	0	0	0
360290801470	HAMBURG	332001500900	10582	10401	10588	10580	8230	12256	4	0	0	0
36029085	HOLLAND TOWN	333001501600	3446	3458	3499	3480	5949	8873	3	0	0	0
360290901830	LACKAWANNA	332001501100	22701	22019	21743	21380	6723	9328	3	0	0	0
36029095	LANCASTER TO	333001501700	30144	29972	30217	29880	7005	10523	3	0	3	3
360290951910	LANCASTER	332001501200	13056	13091	13385	13410	6998	10693	4	0	0	0
36029100	MARILLA TOWN	333001501800	4861	4907	4955	4840	7000	10537	3	0	0	0
36029105	NEWSTEAD TOW	333001501900	7231	7242	7378	7390	6454	9278	3	0	2	3
360291050025	AKRON	332001500100	2971	2902	2901	2920	6422	9331	4	0	0	0
36029110	NORTH COLLIN	333001502000	3791	3748	3745	3750	5792	8289	3	0	2	3
360291102540	NORTH COLLIN	332001501300	1496	1489	1503	1530	5547	8146	4	0	0	0
36029115	ORCHARD PARK	333001502100	24359	24016	23789	23350	8922	13401	3	0	2	3
360291152710	ORCHARD PARK	332001501400	3671	3570	3544	3470	10026	15364	4	0	0	0
36029120	SARDINIA TOW	333001502200	2792	2790	2837	2780	6175	8996	3	0	0	0
360291253610	TONAWANDA	332001501700	18693	18470	18403	18240	6698	9922	3	0	0	0
36029130	TONAWANDA TO	333001502300	91269	88808	86782	83800	7943	11595	3	0	2	3
360291301800	KENMORE	332001501000	18474	17962	17789	17290	7461	11071	4	0	0	0
36029135	WALES TOWN	333001502400	2844	2886	2956	2930	7264	10550	3	0	0	0
36029140	WEST SENECA	333001502500	51210	49966	49589	49160	7159	10463	3	0	0	0
36031	ESSEX COUNTY	331001601500	36176	36357	36654	36300	5798	9055	2	18	32	0
36031 3240	SARANAC LAKE	332001700600016	1462	1475	1435	1430	6769	10485	8	0	0	2
36031005	CHESTERFIELD	333001600100	2398	2323	2380	2500	5728	9615	3	0	2	3