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PRELIMINARY ASSESSMENT AND SITE INVESTIGATION FOR SEAWAY INDUSTRIAL PARK SANITARY LANDFILL TONAWANDA, NY

SEPTEMBER 1987

Prepared for

UNITED STATES DEPARTMENT OF ENERGY

OAK RIDGE OPERATIONS OFFICE

Under Contract No. DE-AC05-81OR20722

By

Bechtel National, Inc.

Oak Ridge, Tennessee

Bechtel Job No. 14501

EXECUTIVE SUMMARY

E-24689

This document consists of the Preliminary Assessment and Site Investigation EPA Forms 2070-12 and 2070-13. Although no site investigation was made pursuant to the completion of Form 2070-13, Site Investigation, several site investigations have been made in the past which provide substantial information with regards to the site. Also contained herein is information of site history, geology, and waste characteristics.

TABLE OF CONTENTS

E-24689

Preliminary Assessment/Site Investigation Forms
EPA Form 2070-12
EPA Form 2070-13

Attachment A
1.0 Site Location and History
2.0 Description of the Existing Environment
3.0 Climate
4.0 Geology and Soils
5.0 Hydrology
6.0 Landfill Management
7.0 Waste
7.1 Summary of Contamination

Attachment B Bibliography

Attachment C Aerial Photograph

Attachment D Site Location and Existing Environment

Attachment E Geology

Attachment F Sampling Locations and Results

E-24689

LIST OF ATTACHMENTS

Page	
C-1	Aerial Photograph of Seaway
C-2	Aerial View of Seaway and Surrounding Area
D-1	Site Location Map
D-2	Site Vicinity Map
D-3	Site Description Map as of July 1979
D-4	Land Ownership Map
D-5	Land Use Map
D-6	Population Distribution Within 1 Mile of the Site
E-1	Geologic Map of Tonawanda Area
E-2	Topographic Map of Seaway
E-3	Geologic Column
E-4	Groundwater Contour Map
F-1	Areas of External Radiation on Seaway in 1986
F-2	Surface Water Sample Locations
F-3	Surface Water Sample Results
F-4	Borehole Locations
F-5	Soil Sample Results
F-8	External Gamma Radiation in 1976
F-9	Radon Flux Measurements in 1976
F-10	Plan View of Seaway Showing Areas A, B, and C in 1976
F-11	Locations of Water and Mud Samples
F-12	Points on and Near Area of Known Contamination at Which Measurements were Taken (Area A) in 1976
F-13	Points on and Near Area of Known Contamination at Which Measurements were Taken (Areas B and C) in 1976
F-14	External Gamma Radiation Levels in Area A in 1976
F-15	External Gamma Radiation Levels in Areas B and C in 1976

F-16 Area of Elevated External Gamma Radiation in 1976 F-24689

F-17 External Gamma Radiation Levels on 400-ft Grid in 1976

F-18 Beta-Gamma Readings at the surface in 1976 (Area A)

F-19 External Gamma Radiation at the Surface on Area A in 1976

F-20 External Gamma Radiation Levels in 1976 (Areas B and C)

F-21 Estimated Radium Concentrations in Area A in 1976

F-22 Estimated Radium Concentrations in Areas B and C in 1976

E-24689

PRELIMINARY ASSESSMENT

(EPA FORM 2070-12)

E-24689

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Seaway Industrial Park Sanitary Landfill	River Road

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Tonawanda	NY		Eric		

09 COORDINATES LATITUDE ___ LONGITUDE ___

10 DIRECTIONS TO SITE (Starting from nearest public road)
Side entrance on River Road, just north of the South Grande Island Bridge, River Road is accessible via Grand Island Boulevard and Interstate Route 190 from either east or west bound lanes.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Seaway Industrial Park Development Co Inc.	765 Sheridan Dr.

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Tonawanda	NY	14150	(716)

07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)
Browning - Ferris, Inc.	262 Woodward Ave

09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
Tonawanda	NY	14150	(716) 693-5185

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 DATE ___/___/___ (MONTH DAY YEAR)
☒ NO

BY (Check all that apply)
☐ A EPA ☐ B EPA CONTRACTOR ☐ C STATE ☐ D OTHER CONTRACTOR
☐ E LOCAL HEALTH OFFICIAL ☐ F OTHER ___ (Specify)
CONTRACTOR NAME(S) ___

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

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

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
uranium ore refining residues

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

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
	Department of Energy	( )

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
			( )	___/___/___ (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

E-24689

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	

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 _____
CUBIC YARDS 6000
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	6000	yd³	

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
	refining residues &	999	landfill		
	tailings				
	radium				
	thorium				
	uranium				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	uranium ore	999	FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

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

See Attachment B

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: NY
02 SITE NUMBER:

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ✓ A GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED 1-100
02 OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
X POTENTIAL ALLEGED

01 X B SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED > 80,000
02 X OBSERVED (DATE 1976)
04 NARRATIVE DESCRIPTION
See Attachment A
POTENTIAL ALLEGED

01 X C CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED ≥ 10,000 w/i 1 mi²
02 X OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
POTENTIAL ALLEGED

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

01 X E DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED _____
02 OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See attachment A
X POTENTIAL ALLEGED

01 X F CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED _____ (Acres)
02 X OBSERVED (DATE 1976)
04 NARRATIVE DESCRIPTION
off-site, See Attachment A
☐ POTENTIAL ☐ ALLEGED

01 X G DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED 80,000
02 ☐ OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
X POTENTIAL ☐ ALLEGED

01 X H WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED _____
02 ☐ OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
X POTENTIAL ☐ ALLEGED

01 X I POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED _____
02 ☐ OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
X POTENTIAL ☐ ALLEGED

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

I. IDENTIFICATION
01 STATE: NY
02 SITE NUMBER:

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 [X] J DAMAGE TO FLORA — 02 [ ] OBSERVED (DATE _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

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

01 [ ] L CONTAMINATION OF FOOD CHAIN — 02 [ ] OBSERVED (DATE _____) — [ ] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

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

[X] N DAMAGE TO OFFSITE PROPERTY — 02 [X] OBSERVED (DATE _____) — [ ] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION drainage from site, See Attachment A

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

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

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: See Attachment A

IV. COMMENTS

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

See Attachment B

EPA FORM 2070-12 (7-81)

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SITE INVESTIGATION

(EPA FORM 2070-13)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Seaway Industrial Park Sanitary Landfill	

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Tonawanda	NY		Erie		

09 COORDINATES LATITUDE	LONGITUDE	10 TYPE OF OWNERSHIP (Check one)
__ __ __ __ __ . __	__ __ __ __ __ __ . __	☒ A PRIVATE ☐ B FEDERAL _____ ☐ C STATE ☐ D COUNTY ☐ E MUNICIPAL ☐ F OTHER _____ ☐ G UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
/ / (MONTH DAY YEAR)	☒ ACTIVE ☐ INACTIVE	1 Present (BEGINNING YEAR, ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A EPA ☐ B EPA CONTRACTOR _____ (Name of firm) ☐ C MUNICIPAL ☐ D MUNICIPAL CONTRACTOR _____ (Name of firm)

☐ E STATE ☐ F STATE CONTRACTOR _____ (Name of firm) ☐ G OTHER _____ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO
			( )

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO
			( )
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
			( )
			( )
			( )
			( )
			( )
			( )
-			

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☐ PERMISSION ☐ WARRANT		

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO
	Department of Energy	( )

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO	08 DATE
				/ / (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

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EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	

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 _____

CUBIC YARDS 6000

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	6000	yd^3	

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
	refining residues &				
	tailings	999	landfill		

V. FEEDSTOCKS (See Appendix for CAS numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	uranium ore	999	FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

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

See Attachment B

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: NY
02 SITE NUMBER:

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[X] POTENTIAL [ ] ALLEGED

01 [X] B SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED _____
02 [X] OBSERVED (DATE 1976)
04 NARRATIVE DESCRIPTION
See Attachment A
[ ] POTENTIAL [ ] ALLEGED

01 [X] C CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED _____
02 [X] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[ ] POTENTIAL [ ] ALLEGED

01 [ ] D FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
[ ] POTENTIAL [ ] ALLEGED

01 [X] E DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[X] POTENTIAL [ ] ALLEGED

01 [X] F CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED _____ (Acres)
02 [X] OBSERVED (DATE 1976)
04 NARRATIVE DESCRIPTION
offsite, due to drainage from site
See Attachment A
[ ] POTENTIAL [ ] ALLEGED

01 [X] G DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[X] POTENTIAL [ ] ALLEGED

01 [X] H WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[X] POTENTIAL [ ] ALLEGED

01 [X] I POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED _____
02 [ ] OBSERVED (DATE _____)
04 NARRATIVE DESCRIPTION
See Attachment A
[X] POTENTIAL [ ] ALLEGED

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	

II. HAZARDOUS CONDITIONS AND INCIDENTS (continued)

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

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

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

01 ☒ M UNSTABLE CONTAINMENT OF WASTES (Spills, Runoff, Standing liquids, Leaking drums) — 02 ☒ OBSERVED (DATE 1976) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED _____ 04 NARRATIVE DESCRIPTION See Attachment A

01 ☒ N DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE 1976) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION : runoff, See Attachment A

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

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

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: See Attachment A

IV. COMMENTS

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

See Attachment B

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A NPDES				
☐ B UIC				
☐ C AIR				
☐ D RCRA				
☐ E RCRA INTERIM STATUS				
☐ F SPCC PLAN				
☐ G STATE (Specify)				
☐ H LOCAL (Specify)				
☐ I OTHER (Specify)				
☐ J NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A SURFACE IMPOUNDMENT		
☐ B PILES		
☐ C DRUMS, ABOVE GROUND		
☐ D TANK, ABOVE GROUND		
☐ E TANK, BELOW GROUND		
☒ F LANDFILL	6000	yrd3*
☐ G LANDFARM		
☐ H OPEN DUMP		
☐ I OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A INCENERATION
- ☐ B UNDERGROUND INJECTION
- ☐ C CHEMICAL/PHYSICAL
- ☐ D BIOLOGICAL
- ☐ E WASTE OIL PROCESSING
- ☐ F SOLVENT RECOVERY
- ☐ G OTHER RECYCLING/RECOVERY
- ☐ H OTHER (Specify)

05 OTHER

- ☐ A BUILDINGS ON SITE

06 AREA OF SITE: 93 (Acres)

contaminated w/waste ≈ 36

07 COMMENTS * waste of concern amount.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A ADEQUATE, SECURE ☒ B MODERATE ☐ C INADEQUATE, POOR ☐ D INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE ☐ YES ☐ NO

02 COMMENTS

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

See Attachment B

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

D1 STATE	D2 SITE NUMBER
NY	

II. DRINKING WATER SUPPLY

D1 TYPE OF DRINKING SUPPLY (Check all applicable)

	SURFACE	WELL
COMMUNITY	A ☒	B ☐
NON-COMMUNITY	C ☐	D ☐

D2 STATUS

ENDANGERED	AFFECTED	MONITORED
A ☐	B ☒ (Possibly)	C ☐
D ☐	E ☐	F ☐

D3 DISTANCE TO SITE

A <1 (mi)

B _____ (mi)

III. GROUNDWATER

D1 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING ☐ B. DRINKING (Other sources available) COMMERCIAL INDUSTRIAL IRRIGATION (No other usable sources available) ☒ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Sufficient other sources available) ☐ D. NOT USED UNUSEABLE

D2 POPULATION SERVED BY GROUND WATER 1-100

D3 DISTANCE TO NEAREST DRINKING WATER WELL 0.5-3 (mi)

D4 DEPTH TO GROUNDWATER 3-8 (ft)

D5 DIRECTION OF GROUNDWATER FLOW Camillus: Southerly

D6 DEPTH TO AQUIFER OF CONCERN 60-65 (ft)

D7 POTENTIAL YIELD OF AQUIFER 1.4 mgd (gpd)

D8 SOLE SOURCE AQUIFER ☐ YES ☒ NO

D9 DESCRIPTION OF WELLS (including usage, depth, and location relative to population and buildings) unknown

10 RECHARGE AREA ☒ YES ☐ NO

COMMENTS See Attachment A

11 DISCHARGE AREA ☒ YES ☐ NO

COMMENTS See Attachment A

IV. SURFACE WATER

D1 SURFACE WATER USE (Check one)

☒ A. RESERVOIR RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

D2 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME	AFFECTED	DISTANCE TO SITE
Niagara River	☐ ?	<1 (mi)
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

D1 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 7,500 (NO. OF PERSONS)	B. 31,416 (NO. OF PERSONS)	C. 125,675 (NO. OF PERSONS)

D2 DISTANCE TO NEAREST POPULATION <0.5 (mi)

D3 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE unknown

D4 DISTANCE TO NEAREST OFF-SITE BUILDING <0.12 (mi)

D5 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g. rural, village, densely populated urban area)

See Attachment A

E-12,4689

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE: NY | 02 SITE NUMBER:

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A 10^{-6} – 10^{-8} cm/sec ☒ B 10^{-4} – 10^{-6} cm/sec ☐ C 10^{-4} – 10^{-3} cm/sec ☐ D GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B RELATIVELY IMPERMEABLE (10^{-4} – 10^{-6} cm/sec) ☒ C RELATIVELY PERMEABLE (10^{-2} – 10^{-4} cm/sec) ☐ D VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
80-90 (ft)	1-3 (ft) in 1979*	

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
+7 (in)	2.0-2.5 (in)	2.5 %	northeast	%

09 FLOOD POTENTIAL

SITE IS IN _____ YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE: A _____ (mi)

OTHER: B 0.67 (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

See Attachment A _____ (mi)

ENDANGERED SPECIES _____

13 LAND USE IN VICINITY

DISTANCE TO

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AGRICULTURAL LANDS: AG LAND
A <0.25 (mi)	B 0.5 (mi)	C _____ (mi)	D _____ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

See Attachment A

* - Some waste possibly buried by 40' of solid waste in C, also B may be covered with waste - See Attachment A

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sampling results)

See Attachment B

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☐ GROUND ☒ AERIAL

02 IN CUSTODY OF Department of Energy, Attachment
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS Attachment D, E, F

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

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

See Attachment B

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	

II. CURRENT OPERATOR (Provide if different from owner)			OPERATOR'S PARENT COMPANY (If applicable)		
01 NAME: Browning-Ferris Inc.	02 D+B NUMBER		10 NAME	11 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.): 262 Woodward Ave	04 SIC CODE		12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	
05 CITY: Tonawanda	06 STATE: NY	07 ZIP CODE: 14150	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER				

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)			PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)		
01 NAME: Niagara Landfill, Inc.	02 D+B NUMBER		10 NAME	11 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.): P.O. Box 56	04 SIC CODE		12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	
05 CITY: Kenmore	06 STATE: NY	07 ZIP CODE: 14217	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				
01 NAME	02 D+B NUMBER		10 NAME	11 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE		12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				
01 NAME	02 D+B NUMBER		10 NAME	11 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE		12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				

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

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Linde Air Product			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
P.O. Box 44			
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
Tonawanda	NY / 14150		
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
unknown			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

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

E-2.4689

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION
01 STATE: NY
02 SITE NUMBER:

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ E. CONTAMINATED SOIL REMOVED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ F. WASTE REPACKAGED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ G. WASTE DISPOSED ELSEWHERE — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☒ H. ON SITE BURIAL — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION Seaway is a sanitary landfill

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ L. ENCAPSULATION — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☒ N. CUTOFF WALLS — 02 DATE 1983 03 AGENCY _____
04 DESCRIPTION

01 ☒ O. EMERGENCY DIKING/SURFACE WATER DIVERSION — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☒ Q. SUBSURFACE CUTOFF WALL — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION
01 STATE: NY
02 SITE NUMBER

II. PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R BARRIER WALLS CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☒ S CAPPING/COVERING — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ T BULK TANKAGE REPAIRED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ U GROUT CURTAIN CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ V BOTTOM SEALED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ W GAS CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ X FIRE CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ Y LEACHATE TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ Z AREA EVACUATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ 1 ACCESS TO SITE RESTRICTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ 2 POPULATION RELOCATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

01 ☐ 3 OTHER REMEDIAL ACTIVITIES — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

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

See Attachment B

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE NY	02 SITE NUMBER

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION YES NO

02 DESCRIPTION OF FEDERAL STATE LOCAL REGULATORY ENFORCEMENT ACTION

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

See Attachment A

FORM 2070-13 (7-81)

ATTACHMENT A

1.0 BACKGROUND

1.1 Site Location and History

The Seaway Industrial Park, located in the Town of Tonawanda, New York, covers 93 acres, most of which has been used as a sanitary landfill for several years. Tonawanda is located about 9 miles north of Buffalo, New York (see Attachment D-1). The Seaway Sanitary Landfill serves private haulers of commercial, industrial, construction, and municipal wastes.

The site is located in a large industrial area, and the areas containing the radioactive residues of concern are more than 0.5 mile from the nearest residential dwellings. The landfill is owned by the Seaway Industrial Park Development Company, and is operated by Browning-Ferris, Inc. The Seaway property is bounded by Ashland Oil, Inc.; Agway Fuel, Inc.; River Road; Murphy Trucking Company, Inc.; Leffler Auto Parts; and property owned by Niagara-Mohawk Power Corporation (see Attachment D-4). There are no buildings onsite and there is little vegetation. Some parts of the site are at a higher elevation than the surrounding terrain.

The adjacent former Haist property received uranium ore refining residues from 1944 to 1946 from Linde Air Products (a Division of Union Carbide Corp.) also in Tonawanda. At that time Linde participated in the uranium ore refining operations of the Manhattan Engineer District. In 1974, approximately 6000 yd^3 of the residue, comprised essentially of low-grade uranium ore tailings, was excavated by Ashland Oil, Inc., the present owner of the former Haist property, and transported to the Seaway property. This residue was disposed of in areas A, B, and C indicated in Attachment D-3. Area A covers approximataely 10 acres, and areas B

and C together cover approximately two acres. The residue was left in small, isolated piles in areas B and C, but was spread to a depth of less than two feet in most places in area A.

Most of the drainage from Seaway flows north or northeast into drainage ditches or a creek and is eventually carried to the nearby Niagara River. Water that drains from the site to the northeast drains through brushland. The brushland area is frequently swampy presumably caused by a high groundwater table. Some of the drainage from the area just south of Murphy Trucking, Inc., flows down a steep incline toward River Road, and some of this run-off accumulates near Murphy Trucking, Inc. Drainage from the adjacent Ashland property normally flows northeast across Seaway and eventually into the Niagara River. However, incomplete culvert construction near the Ashland property allows run-off to accumulate in a low area near the southern boundary of Seaway.

The only point of vehicular access to the landfill is via an all weather access road which intersects River Road. After operating hours, a locked gate across the access road prevents unauthorized vehicle entry. While no additional fencing exists along the site perimeter, vehicular access is limited by topography and the absence of roadways. (Ref. 1)

2.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

2.1 Land Use & Population

As shown in Attachment D-5, the land use near the site is a mix of industrial, commercial, public and residential areas. The nearest residential areas are along Two-Mile Creek Road about 0.5 mile to the east and along River Road and in Grand Island,

approximately 0.5 mile to the west. Most of the residential area is on Grand Island and in Tonawanda. There are wetlands under the protection of the New York Department of Environmental Conservation approximately two-thirds of a mile southwest of the contaminated area. (Ref. 3) Within one mile there is a fly-ash dump, a drive-in theatre, portions of three parks, another solid waste disposal area, a fire tower, two marinas, and a sewage disposal facility. (Ref. 2)

Using aerial photography and city block data from the 1980 census, it is estimated that 1,282 people live within one mile of the site. Attachment D-6 shows the population distribution within one mile. The closest residents are the approximately 200 on Grand Island, who live between one-half and three-quarters of a mile from the site. The breakdown of population location by percentage is as follows:

Location	Percent
Grand Island	37.0
Tonawanda (southwest)	3.5
Tonawanda	59.5

Based on employment data from 1980, it is estimated that 7,150 people work within one mile of the site. (Ref. 2)

In 1979, 3 full-time employees and 10 part-time employees were required to perform the various tasks at the landfill. (Ref. 1)

2.2 Historic Sites and National Landmarks

According to the New York State Department of Historic Preservation and the New York State Museum's Cultural Education Center, there are no natural landmarks or resources of historic significance within one mile that have National Registry status.

According to the Landmark Society, an affiliate of the Buffalo and Erie County Historical Society, there are no significant or unique unregistered structures of historic interest within one mile of the site. (Ref. 2)

2.3 Archeological Sites

Based on preliminary review of the site area and within one mile in any direction of the site, the New York State Archeologist's office considers the area in which the site is located to be sensitive. (Ref. 2) However, the possibility of an archeological find of significance is remote considering landfill management practices.

The New York State Division of Historical and Anthropological Services indicate two significant archeological sites. One site is located approximately one mile northeast of the site and another approximately one mile west. (Ref. 2)

2.4 Ecology

There are no known Federal- or State-listed endangered, threatened, or sensitive animal or plant species found on or near the property. However, because of the site's proximity to the Niagara River, the bald eagle and the osprey, both completely protected wildlife species, according to the New York State Division of Wildlife Conservation, may be seen periodically as migratory transients near the site. There are no documented nesting areas on or near the site. (Ref. 2)

3.0 CLIMATE

The climate of western New York is moist and continential and is influenced by the presence of Lake Erie to the west and Lake

Ontario to the north. Normal annual precipitation at the site ranges from 33 to 35.65 inches (Ref. 1, 2) and is fairly distributed throughout the year. Mean annual lake evaporation is 26 inches.

Heavy lake-effect snow squalls occur frequently as a result of cold, relatively dry air crossing the unfrozen Great Lakes. Annual snowfall at the nearby former Haist site is approximately 10 inches. (Ref. 2) Precipitation frequency data indicate that rainfall amounts at the site for events lasting 24 hours can, on the average, be between 2.0 and 2.5 inches once per year. (Ref. 4)

Temperatures in the region are also moderated by the presence of the Great Lakes. Tempertures at the nearby former Haist property site average about 47°F during the year, ranging from a mean January minimum of 18°F to a mean July maximum of 81°F. (Ref. 2)

Prevailing winds at the nearby Greater Buffalo International Airport are out of the southwest and west-southwest, across Lake Erie. Wind speeds average approximately 12 miles per hour, being slightly higher in the winter than during the remainder of the year. (Ref. 2)

4.0 GEOLOGY AND SOILS

4.1 Topography

The Seaway property is located in the Eastern lake section of the Central Lowland physiographic province. The characteristic landscape of this section consists of dissected and glaciated lowlands and escarpments. (Ref. 2)

The site is situated on a broad lowland on the southeast bank of the Niagara River. The elevation of the site is approximately 600 feet above mean sea level. (Ref. 2)

4.2 Soils

Native soils of the general area are shallow and typically saturated by a high water table. Recent alluvium and glacial till is characteristically exposed over much of the area. Drilling logs indicate that this alluvium and till consist predominately of red clay and gravelly clay to a depth of approximately 95 feet. The lower portion of this till grade generally to sand and gravel. (Ref. 2)

4.3 Geology

A map of the regional bedrock geology is given in Attachment E-1. Attachment E-2 provides a topographic map of the site and Attachment E-3 provides the geologic column under the site. As noted previously, the site is situated in a clayey alluvium and glacial till. At the site, this glacial till can be further subdivided into four units. The Upper Clayey Glacial Till consists predominately of clayey till with minor amounts of sand and gravel which outcrops over a majority of the site beneath the solid waste. The thickness of this unit at the site varies from 0 to 65 feet. (Ref. 5)

The glacial till closely resembles a glaciolacustrine deposit as a result of its clayey nature. It can be differentiated, however, by its heterogeneity and the absence of bedding. (Ref. 5)

The clayey surficial till has become mildly desiccated to a depth of 10 to 12 feet. The degree of desiccation seems to vary

inversely with depth from the surface. The till is typically hard to very stiff near the surface and becomes progressively softer with depth. As a result of dessication, there is a network of shrinkage cracks within the till which contain a gray clay and silt material of secondary origin and are generally very tight. The permeability of the glacial till was found to be approximately 1.6×10^{-8} centimeters per second (cm/sec). (Ref. 5)

Uncomformably underlying the Upper Clayey Glacial Till is the Glaciolacustrine Clay Unit. This unit is continuous across the site although its thickness varies from 5 to 45 feet, generally increasing toward the south. The unit consists of laminations of gray and red brown silt and silty clay that were apparently deposited in a glacial lake. The laminations are typically 1/16 to 1/32 inch in thickness. Minor amounts of "rafted" sand and gravel are indiscriminately scattered throughout the clay. The clay is generally soft to very soft. Laboratory testing by Woodward-Clyde Consultants in 1979 of the glaciolacustrine clay indicated that its permeability is approximately 1.6×10^{-8} cm/sec. The contact between the Upper Clay Glacial Till and the underlying Glaciolacustrine Clay Unit exhibits a disrupted structure which resulted when the glacial till was deposited over soft, unstable glacial lake deposits. (Ref. 2, 5)

The Basal Glaciolacustrine Unit consists of laminated clayey silt and sand. Its thickness varies from 0 to 7 feet over the site. The increased frequency of sand and silt beds within the Basal Glaciolacustrine Unit has the effect of increasing the permeability of the unit. The interbedded nature of the stratum gives rise to marked anisotropic properties. As might be expected,

the horizontal permeability would be considerably greater than the vertical permeability due to an alternating sequence of fine sand and clay beds. The contact with the overlying Glaciolacustrine Clay Unit is gradational and conformable, representing a alteration in the depositional environment of the extinct glacial lake. (Ref. 2, 5)

The lowest unit of the glacial till at the site has been termed the Lower Sandy Glacial Till. This unit consists of sandy glacial till, with variable amounts of silt, clay, and gravel. It also contains secondary gypsum in the basal part of the till near the contact with the underlying Camillus Shale. Its thickness varies over the site from 1 foot to 20 feet and appears to be continuous beneath the site. The glacial till is saturated, as are a majority of the overlying sediments. (Ref. 2, 5)

Underlying the Lower Sandy Glacial Till at Seaway is the Camillus Shale of the Salina Group. This Upper Silurian formation is approximately 400 feet thick in the area and consists of predominately of gray, red, and green thin-bedded shale and massive mudstone, Interbedded with the shale and mudstone are relatively thin beds of gypsum, dolomite, and limestone. (Ref. 2)

Recent alluvial deposits occur on the property, within two stream channels transecting the property in an east-west direction. The southern, and larger, channel is well exposed as it proceeds easterly across adjacent properties, ultimately to join Two-Mile Creek. The channel occupied by the stream is one of moderate relief, with the channel walls being only 15 to 20 feet above the channel floor. (Ref. 5)

The alluvial deposits are greater than 16 feet in thickness

along the eastern property line. The upper 12 feet of the Recent alluvium is generally fine-grained, consisting of dark gray organic clayey silt, underlain by brown silts and clays. The silt and clay is irregularly stratified and contained occasional 1/4 to 1/2 inch thick laminations of fine sand and silt. The basal five to six feet of the alluvium consists of gray coarse-to-fine sand of relatively high permeability. The surface exposure of the alluvial deposits is between 400 to 500 feet wide. (Ref. 5)

The northern stream channel is considerably smaller and less than four feet in thickness. (Ref. 5)

4.4 Seismicity

The Seaway site is located in a Zone 3 seismic area where destructive earthquakes may occur. This is due to the close proximity of the site to the St. Lawrence River, a seismically active region. (Ref. 2)

Three major earthquakes (intensity VI or greater on the Modified Mercalli Scale) have been centered in the region on recorded history. An intensity VI earthquake occurred on October 23, 1857 and again on Jaunary 1, 1966. On August 12, 1929, an earthquake occurred of intensity VIII. (Ref. 2)

5.0 Hydrology

5.1 Surface Water

Present drainage at the site is to the Niagara River via Two-Mile Creek. Overland flow from the front portion of the site is directed to drainage swales and a culvert which ultimately discharges to the Niagara River. Overland flow from the remainder of the site is to a drainage channel which crosses the central

portion of the site and to two other drainage channels which drain from the northeast edge of the property to Two-Mile Creek. (Ref. 1) The contaminated area is not in any floodplain. (Ref. 6).

5.2 Groundwater

Groundwater at the site occurs in one of three forms: (Ref. 2, 5)

(a) A groundwater table within the immediately underlying recent alluvial deposits,

(b) Largely immobilized, interstitial water within the underlying, relatively impermeable Upper Clayey Glacial Till and Glaciolacustrine Clay Unit, and

(c) Confined groundwater within the Camillus Shale, which is hydraulically connected in some locations to the Basal Glaciolacustrine Unit and the Lower Sandy Glacial Till.

Groundwater under unconfined conditions may be found within virtually all portions of the landfill. It is contained within the solid waste itself, which forms the surface of much of the property. It is also found in the permeable Recent alluvial deposits which locally underlie the landfill. The water table is variable due to seasonal fluctuations in response to different rates of recharge. (Ref. 5)

The base of the water-bearing zone within the fill area appears to correspond to the top of the underlying relatively impervious glacial till. Recharge by precipitation and discharge by seepage at the toe of the fill area has created groundwater mounds within the fill area, with the depth to groundwater being 3 to 8 feet over most of the site. Laboratory testing of samples of the clayey till units collected at the site indicate the hydraulic conductivity of the units to be between 10^{-8} to 10^{-10} feet per second. The Upper Clayey Glacial Till thus serves as an aquiclude in the immediate area. (Ref. 2, 6)

The approximate configuration of the groundwater table in the sanitary landfill in 1979 is shown in Attachment E-4. As can be seen, the groundwater contours indicate the presence of two groundwater mounds within each section of the landfill. The principal hydrogeologic circumstances leading to the development of a groundwater mound are peripheral groundwater discharge and vertical recharge to the groundwater system. As a result, the groundwater is moving radially outward from the focal point of the mound to ultimate discharge points around the periphery of the site. (Ref. 5)

The relatively impermeable nature of the clayey glacial units precludes significant downward percolation of water through the till into the underlying Camillus Shale. It has been estimated that the vertical seepage velocity of groundwater through the clayey units below the site is approximately 0.04 feet per year. (Ref. 2, 5)

The Camillus Shale is the most productive bedrock aquifer in the region. Water in this formation is produced primarily from solution cavities that have formed as the gypsum contained in the rock has dissolved. Yields from individual wells of greater than 1,000 gallons per minute from the Camillus Shale are not unusual in the Buffalo/Tonawanda area. Dupont has reported yields from 90 to 3,000 gallons per minute. (Ref. 2, 6)

Groundwater in the Camillus Shale generally exists under artesian conditions. Records of wells drilled near the site indicate that water rises to approximately 40 feet below the ground surface in wells completed in the shale. The transmissivity of the Camillus Shale is reported to vary from 7,000 to 80,000 gallons per

day per foot. Average hydraulic conductivities measured at these wells are in excess of 1 x 10^{-3} feet per second. The relatively high hydraulic conductivities can be attributed almost entirely to the gypsum solution cavities. (Ref. 2)

Although the Camillus Shale is the most productive bedrock aquifer in the region, it also contains the poorest quality water. Typically, in the area of the site, water from wells completed in the Camillus Shale has a total dissolved solids concentration ranging from 2,000 to 6,000 milligrams per liter (mg/l), sulfate concentration of 1,000 to 1,500 mg/l, and a chloride concentration of 1,500 to 2,000 mg/l. This high level of salinity precludes development of this water for domestic consumption without extensive and costly treatment. Use of this water is restricted to certain industries that can tolerate highly saline water. (Ref. 2)

The nearest wells are greater than 0.5 mile from the site. It is assumed that the wells only serve between 1 and 100 persons between 0.5 and 3 miles of the site because of its salinity.

6.0 LANDFILL MANAGEMENT

6.1 Cover and Cover Material

Placement of cover material occurs during various stages of landfill construction according to the July 1979 Engineering Report, and can be generalized as follows:

(a) daily cover - minimum of 6" of cover material placed and compacted above the waste received in any given working day.
(b) intermediate cover - a minimum of 12" of cover material placed and compacted above a completed phase of construction, not to receive additional wastes within 30 days.
(c) final cover - a minimum of 24" of cover material, placed,

and compacted above completed landfill grades.

According to the July 1979 Engineering Report, the cover material is primarily obtained in the form of foundry sands. Additional cover material is available from two other nearby properties:

(1) The Niagara Mohawk Power Company

(2) A 55-acre parcel belonging to the owner of the Seaway Industrial Park Sanitary Landfill.

The character of cover material presently in use generally makes it suitable for daily and intermediate cover. (Ref. 1)

As indicated in the July 1979 report, the radiologically contaminated soil removed from the former Haist property in 1974 had not been covered, since a decision on its ultimate disposition had not been made. In the 1986 walkover scan the original location of areas B and C could not be verified. Examination of topographic maps indicated that these areas had been covered with fill. (Ref. 7)

6.2 Leachate Generation and Control

The hydrogeologic investigation performed for the Seaway Landfill dated May 1979, thoroughly addresses the subject of leachate generation and potential impacts. To briefly summarize, the following conclusions were reached concerning this site: (Ref. 1, 5)

(1) The groundwater table within the landfill proper was found to be radially discharging around the landfill perimeter and the existing interior drainage channel, ultimately finding its way into the numerous surrounding drainage swales.

(2) Vertical migration of leachate was found to be occurring into the localized Recent alluvial deposits with the

likelihood of the majority of the discharge to the attendent surface water channels or topographical lows.

(3) Water quality data for sample points near Two-Mile Creek indicate that leachate discharged from the landfill is largely assimilated into the surface waters of the various drainage channels prior to emptying into Two-Mile Creek.

(4) Although the leachate from the landfill is a source of surface water contamination, sources of contamination other than the Seaway site should not be discounted. This aspect of the investigation is particularly evident in the vicinity of the adjacent sites with ultimate discharge to the Niagara River.

(5) A water balance analysis indicates that in an average climatic year, approximately 13 inches of precipitation infiltrates the landfill, thus generating a corresponding amount of leachate.

A perimeter cutoff wall was installed in 1983 to contain leachate in the landfill area. The wall is 30 to 48 inches thick, with an average of 30 to 36 inches thick, and 6 to 24 feet deep. The wall was completed a minimum of two feet into the underlying glaciolacustrine or clay-till deposits. It is located a uniform 55 feet inside the property boundary. A majority of the wall is constructed of soil bentonite (SB) slurry backfill. However, across the north side of the site a compacted clay cutoff wall was installed using 12 inch thick lifts and compacted with a vibratory sheepsfoot roller. The cutoff wall installed beneath the access road was constructed of concrete to accommodate heavy truck traffic. The laboratory permeability of the SB wall ranges from 3.6×10^{-8} to 2.2×10^{-7} cm/sec. The permeability of the clay ranges from 7.6×10^{-9} to 1.9×10^{-8} cm/sec. (Ref. 8)

A peripheral leachate collection system was also installed in 1983. The system consists of pump stations and collection drains with leachate laterals located at a maximum spacing of 200 feet or where leachate seepage was encountered. (Ref. 8)

The grading plan calls for improved and controlled drainage with the additional use of lined drainage swales. This will help reduce infiltration into the landfill and, as a result, leachate generation. (Ref. 1)

7.0 WASTE

Residues comprised of mostly low-grade uranium ore tailings and contaminated soil, an unconsolidated solid, were deposited on the Seaway property in 1974 in areas A, B, and C. The waste placed on the former Haist site, origin of the residues on Seaway, from a site map dated February 20, 1946 is as follows:

L-19 Sludges (Western ore tailings from 1943)	1.23% U_3O_8
P-78 Iron Cake	0.88% U_3O_8 5.57% V_2O_5
Pilot Plant Sludges	1.16% U_3O_8
L-19 Tailings	0.52% U_3O_8

Table 1 lists the composition of the Colorado ore raffinate. This raffinate may be similar to the composition of the tailings material placed on the former Haist property.

7.1 Summary of Contamination

In 1976, the average of external gamma radiation readings taken at one meter above the surface of the area of known contamination was approximately 36 uR/hr with readings varying between 8 to 80 uR/hr (see Attachment F-14 and F-15). Areas with the highest external gamma radiation levels are shown in Attachment F-16. Measurements made at 200 to 400 foot intervals in 1976 are given in Attachment F-17. Except for some drainage areas and a small region near the boundary of the former Haist property,

TABLE 1

COMPOSITION OF THE COLORADO RAFFINATE

	%
Al_2O_3	2.1
CaO	41.8
Co	0.13
Fe_2O_3	8.7
Halides	0.2
MgO	21.2
MnO_2	0.8
MoO_3	0.05
Na	0.5 - 5.0
Ni	0.10
P_2O_5	1.2
PbO	0.05
SO_3	15.8
SiO_2	5.4
Th	0.1 - 1.0
TiO_2	0.2
U	0.62
V_2O_5	1.1
Loss on Ignition	76.17

Ag, As, B, Ba, Be, Bi, Cd, Cr, Ga, In, K, Nb, Sb, Sn, Sr, W, Y, Zn and Zr - all less than 0.1% each.

The nitrate content of the Colorado raffinate is similar to that of Pitchblende raffinate.

external gamma levels on the site excluding areas A, B and C were in the range of 8 to 14 uR/hr. The mean background reading in the Tonawanda area was 11 uR/hr. (Ref. 9)

Beta-gamma readings taken in 1976 at the surface on area A are shown in Attachment F-18. Measurements averaged about 0.05 mrad/hr, with readings varying between 0.02 and 0.14 mrad/hr. The external gamma radiation measurements at the surface on area A (see Attachment F-19) averaged about 42 uR/hr, and the average of the external gamma radiation reading taken at the surface on areas B and C (see Attachment F-20) was approximately 37 uR/hr. (Ref. 9)

The concentrations of radium in mud samples taken in 1976 from the drainage paths leading from Ashland and Seaway to the Niagara River are given in Attachment F-11. The highest concentration of radium, 26.4 pCi/g, was found on the Seaway property just north of area A. The radium concentration in a sample taken from point D (see Attachment F-10), about 1700 feet north of area A, was 8.3 pCi/g. Point D is the intersection of two drains, one leading from near area A on Seaway and the other leading from the former Haist property. The low concentrations of radium found along the drain between D and the former Haist property suggest that most of the radium came from the residue on Seaway. At point E, about 2600 feet north of point D along a drain leading to the Niagara River, the radium concentration in the mud was found to be less than 2 pCi/g. (Ref. 9)

The concentraions of uranium, radium, and thorium in water samples taken in 1976 from Ashland and Seaway and from drainage paths leading to the Niagara River were found to be several orders of magnitude below the MPC_w (maximum permissible concentration,

(Ref. 9) However, sample W8 taken in Two-Mile Creek had a U-238 concentration of 39 pCi/l, which is greater than three times the background concentration. As a result, there is an observed release to the surface water in Two-Mile Creek according to EPA HRS scoring protocol. (Ref. 12)

Attachments F-21 and F-22 indicate the extent of radium in the soil in areas A, B, and C in 1976. In most parts of areas A, B, and C the contaminated soil extends from the surface to a depth of 0.5 to 2 feet. The average of the radium concentrations in the soil samples taken at a depth of 0 to 1 foot was approximately 15 pCi/g, and the average for depths of 1 to 2 feet was approximately 8 pCi/g. The highest concentration of radium found was 92.6 pCi/g in a sample taken from a small residue pile in area B. (Ref. 9)

Locations 81 and 82 (see Attachment F-12) are in an area containing some sediment which probably eroded from area A. Samples from these locations showed radium concentrations as high as 40 pCi/g in 1976. (Ref. 9)

The highest concentration of ^{238}U found in 1976 in the soil samples was 102 pCi/g. Background concentrations of ^{238}U and ^{226}Ra in the Tonawanda area are typically near 1 pCi/g. (Ref. 9)

The radiation levels based on the walkover scan conducted in 1986 are included in Attachment F-1. The walkover results indicated: (Ref. 7)

> Area "A" in the SE and SW area appears to have been disturbed by the placement of overburden and/or grading and shaping. In the NE section sloping towards the Niagara-Mohawk property, migration of material down the bank appears to have occurred. This migration was present in 1978 as evidenced by the small area of elevated external gamma radiation levels northeast of area A (see Attachment F-16). Dozer tracks were noted at various places in this area and appear to be created

in the past year.

Area "B" could not be found by surface scanning. Comparison of the 1976 with the 1986 topographical map indicates that this area is now under fill material to an undetermined depth. The presence or absence of the original contaminated material could not be verified.

Area "C" could not be found by surface scanning. Comparison of the 1976 with the 1986 topographical map indicates that this area is now under fill material, possibly up to 40 feet in some areas. The presence or absence of the original contaminated material could not be verified.

Area of drainage onto Niagara-Mohawk property as indicated on the Oak Ridge National Lab. survey still exists on the NE side in the drainage ditch. Evidence of road work and bank shaping appears to have disturbed some of this area. Possible migration of this area may have extended farther onto the Niagara-Mohawk property.

Area adjacent to Ashland 1 (former Haist property) property in the SW corner has been disturbed due to installation of a 4 foot bentonite wall around the Seaway property and by shaping of a drainage ditch in the area. Much of this area could not be located. Some contamination was observed in the bottom of the ditch. Most of this area is now clay covered.

E-24689

ATTACHMENT B

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1. Niagara Landfill, Inc., Engineering Report Seaway Industrial Park Sanitary Landfill, Tonawanda, New York, by Wehran Engineering, P.C., and RECRA Research Inc., July 1979.
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6. Bechtel National, Inc., Preliminary Engineering Evaluation of Remedial Action Alternatives for the Seaway Industrial Park, Tonawanda, NY, (FUSRAP), FBDU 409-312, December 1981.
7. Bechtel National, Inc., Walkover Scan of Seaway, Ashland 1, and Ashland 2, Tonawanda, NY, July 28 - August 12, 1986, TMA/Eberline
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9. Department of Energy, Formerly Utilized MED/AEC Sites Remedial Action Program, Seaway Industrial Park, Tonawanda, NY, Final Report, by Oak Ridge National Lab., May 1978.

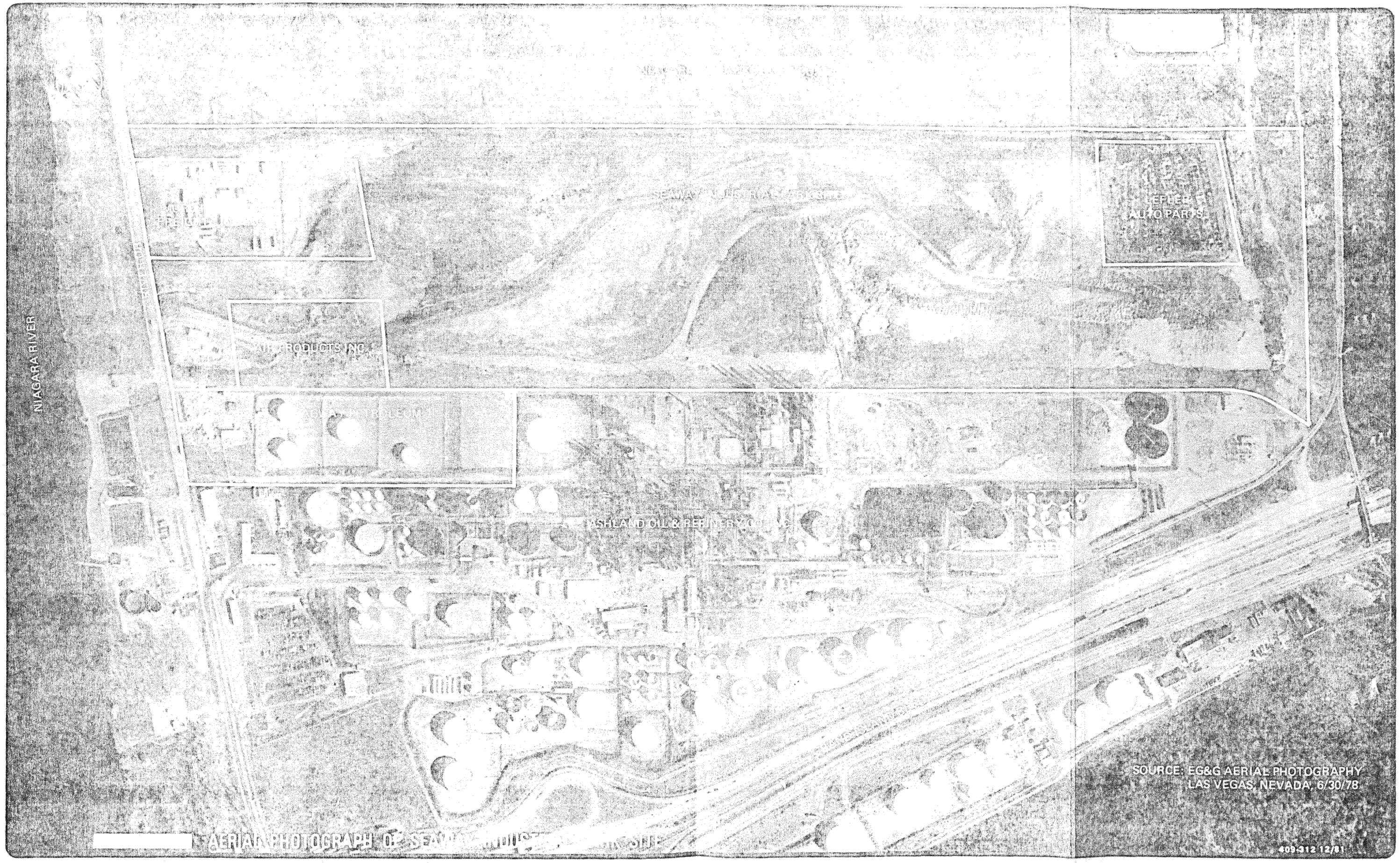
10. "Appendix A - Uncontrolled Hazardous Waste Site Ranking System - Users Manual", Environmental Reporter, Federal Laws, pp. 101:1018-1039.

11. Department of Energy, Modified Hazard Ranking System for Sites with Mixed Radioactive and Hazardous Waste - User Manual, PNL-5841/UC-70, April 1986.

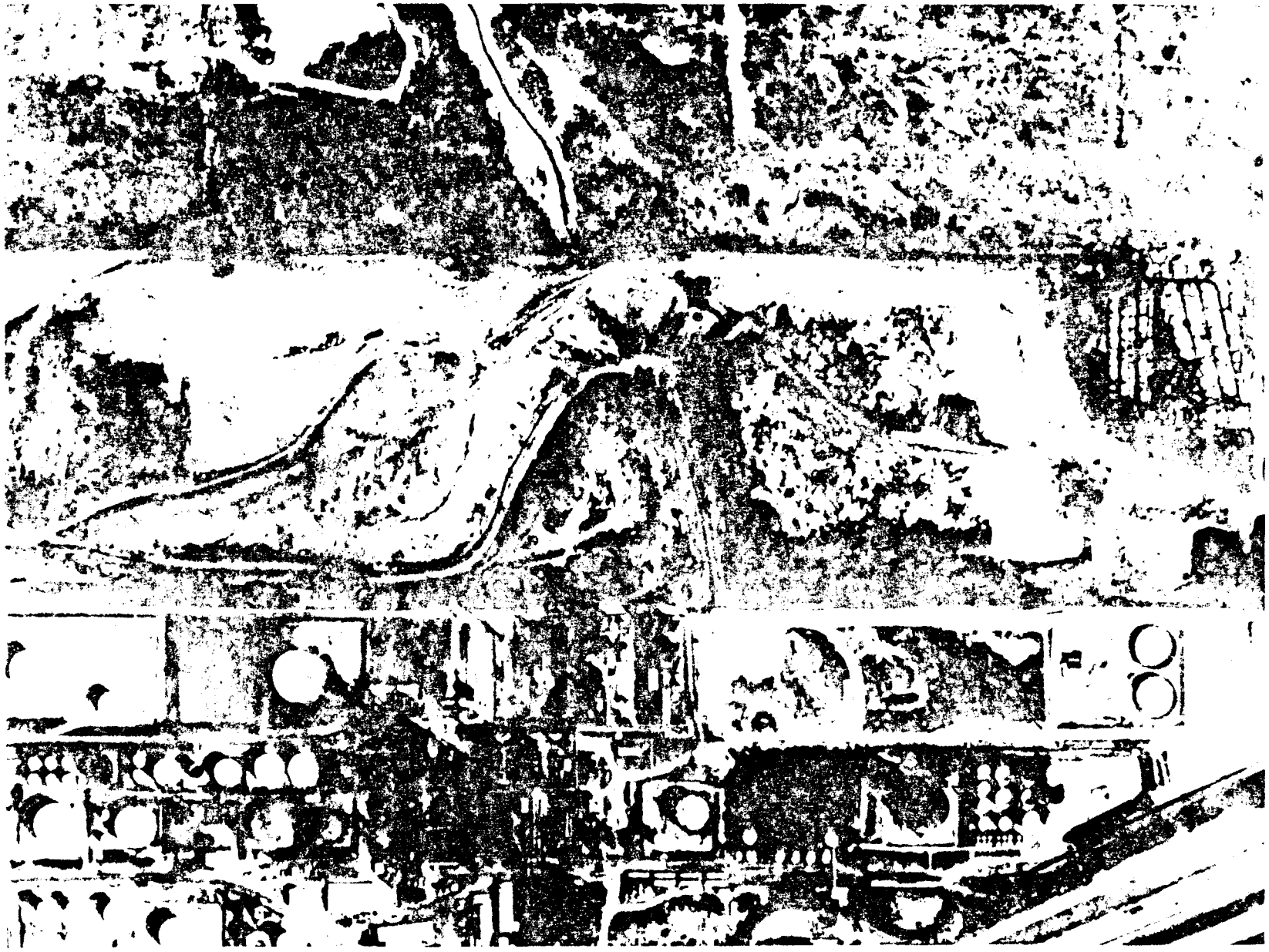
12. Personal Communication; Felica Barnett, Environmental Protection Agency, July 15, 1987,

E-24689

ATTACHMENT C



AERIAL PHOTOGRAPH OF SEAWAY INDUSTRIAL SITE



Aerial photograph of Seaway and surrounding area.
(Ref. 9)

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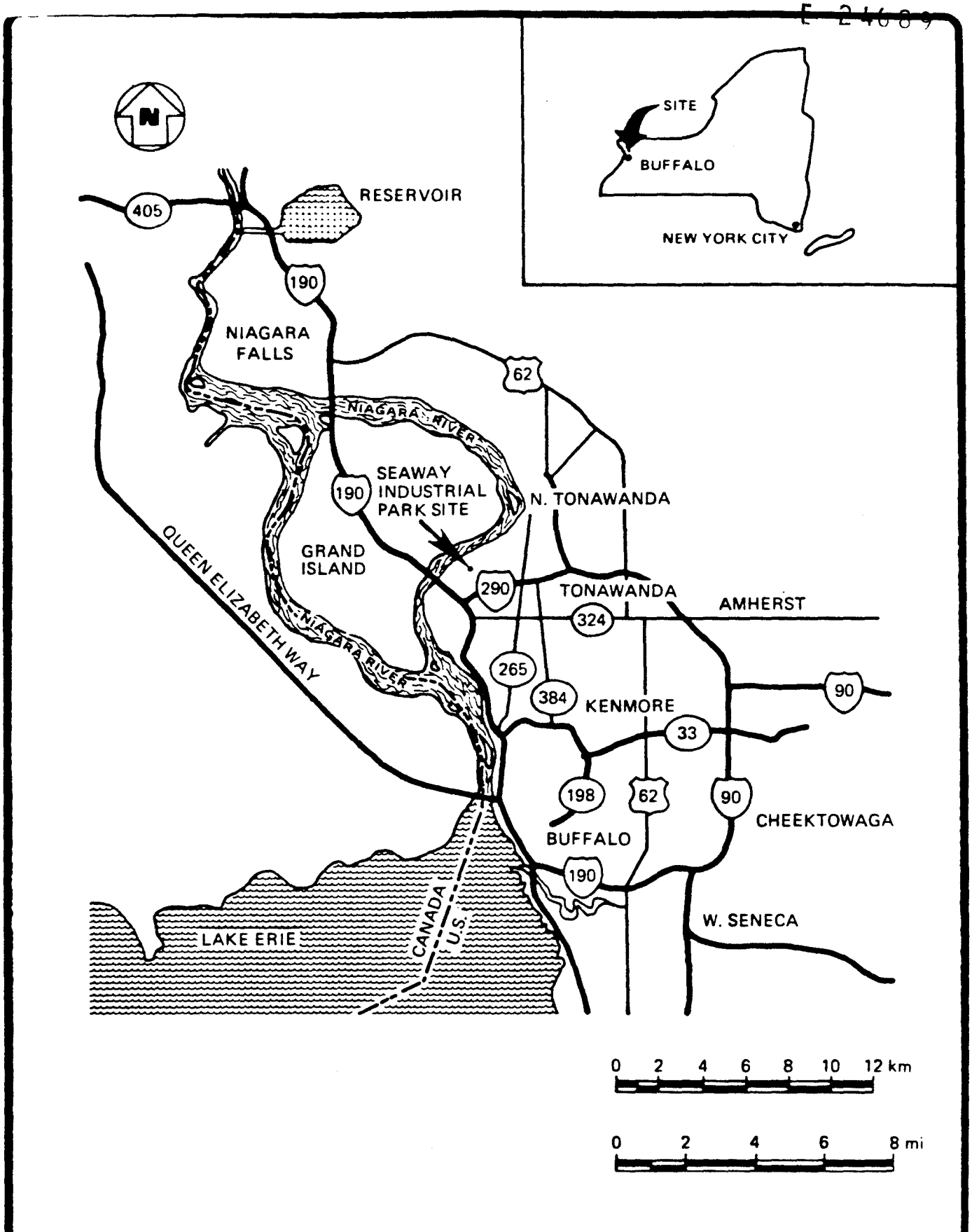
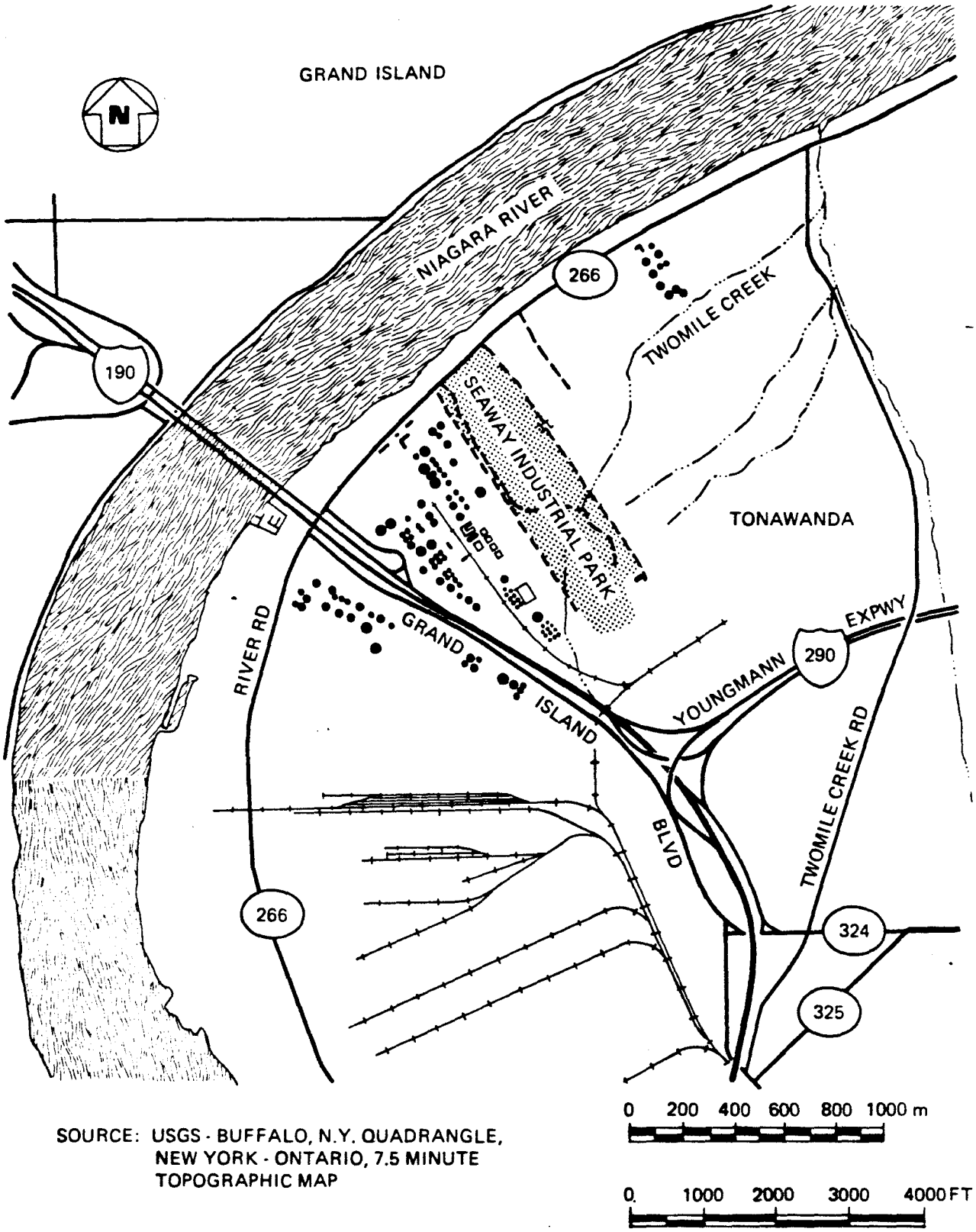
ATTACHMENT D



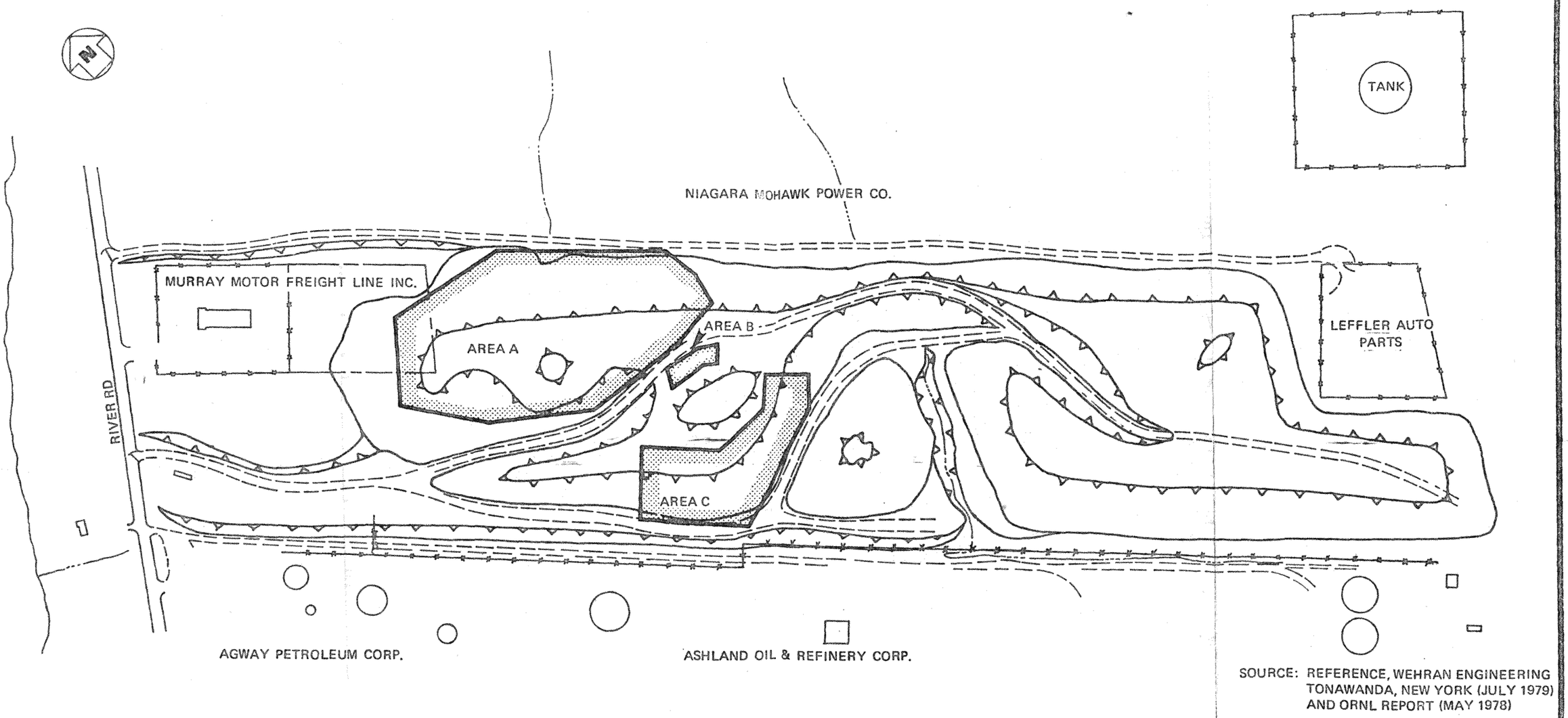
SITE LOCATION MAP
(Ref. 6)

409-312 12/81



SOURCE: USGS - BUFFALO, N.Y. QUADRANGLE, NEW YORK - ONTARIO, 7.5 MINUTE TOPOGRAPHIC MAP

SITE VICINITY MAP (Ref. 6) 409-312 12/81

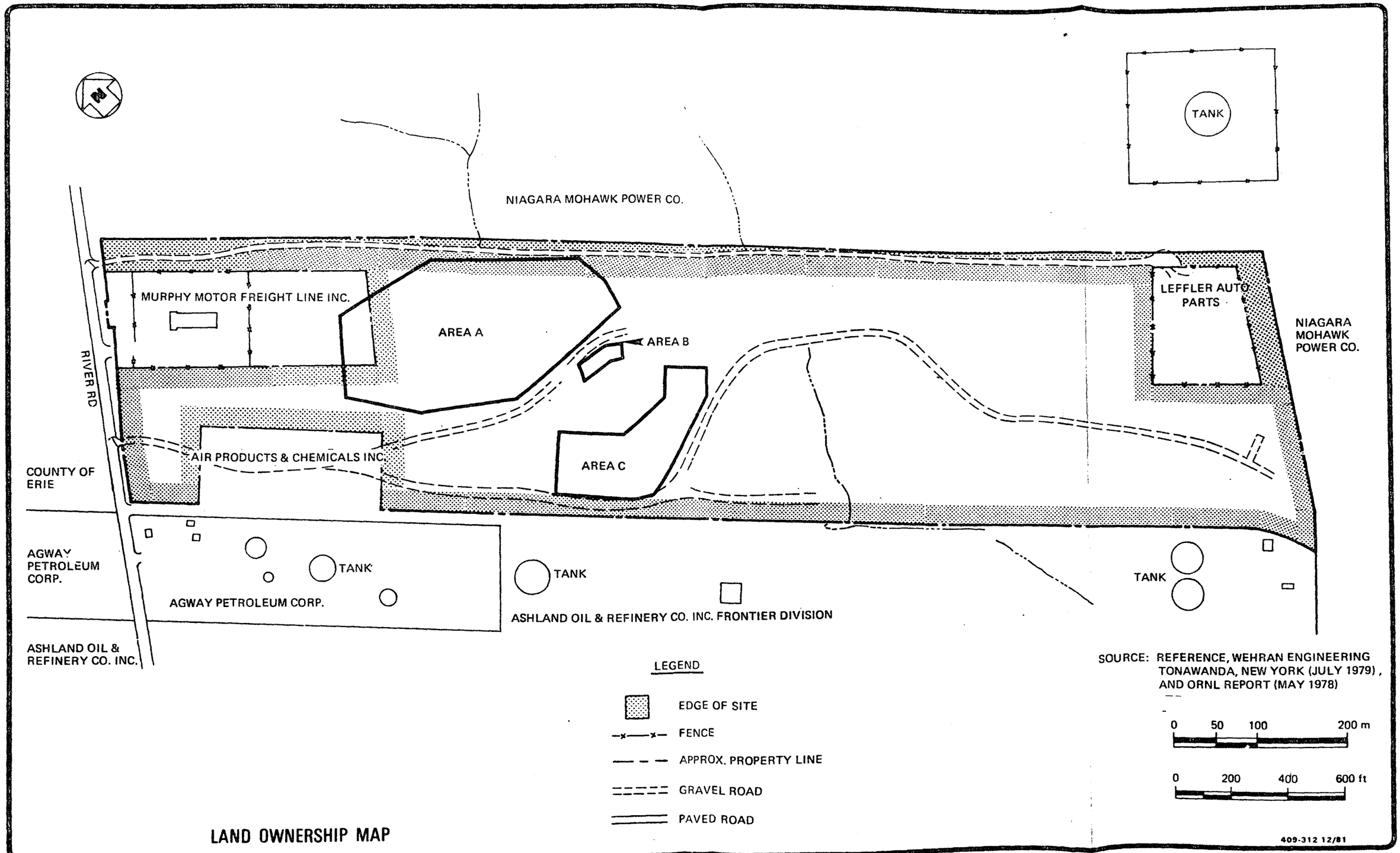


LEGEND

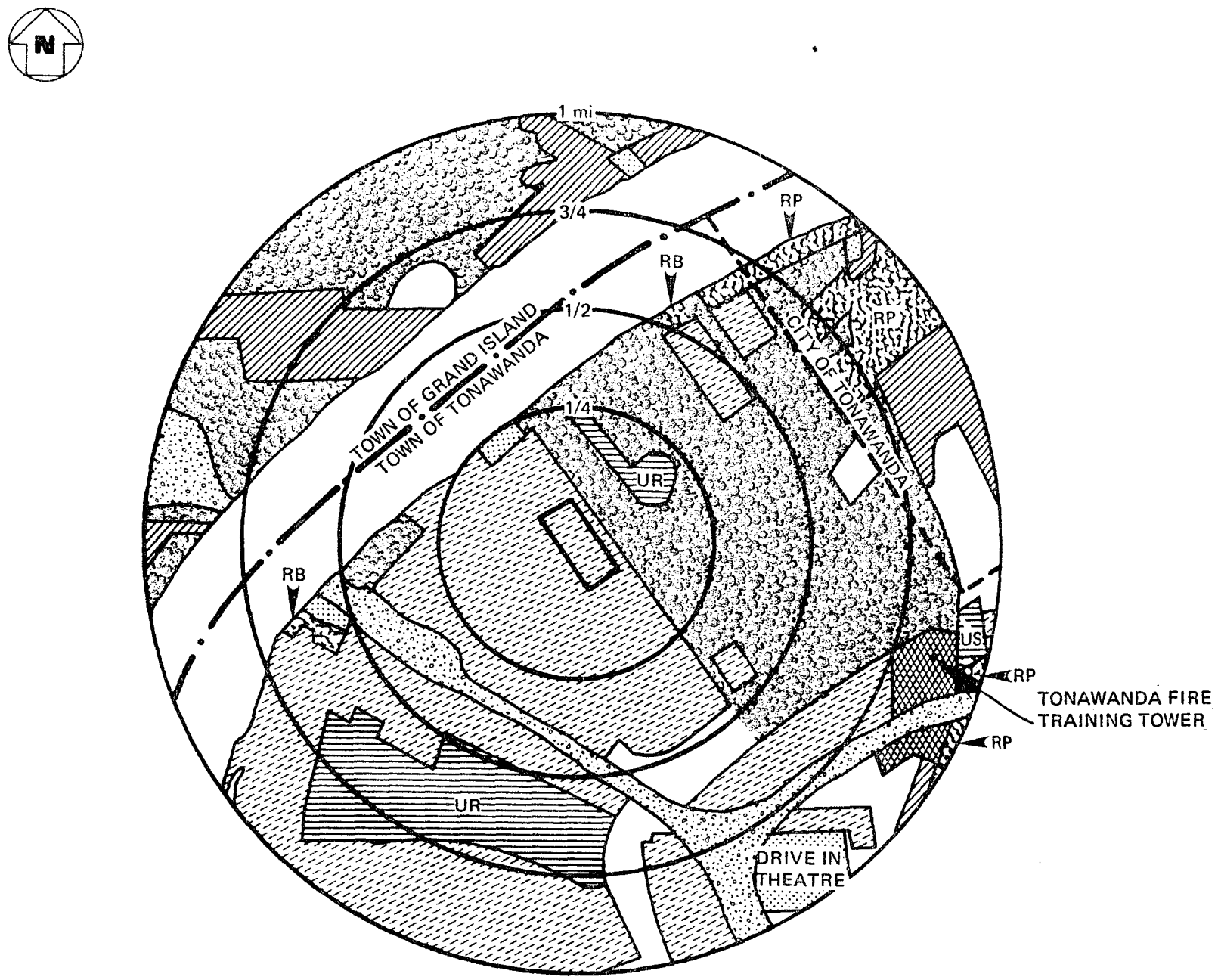
- CONTAMINATED AREAS
- SUDDEN CHANGE IN SLOPE (DOWNWARD)
- FENCE
- GRAVEL ROAD
- PAVED ROAD

SITE DESCRIPTIVE MAP AS OF JULY 1979

409-312 12/81



LAND OWNERSHIP MAP



LEGEND

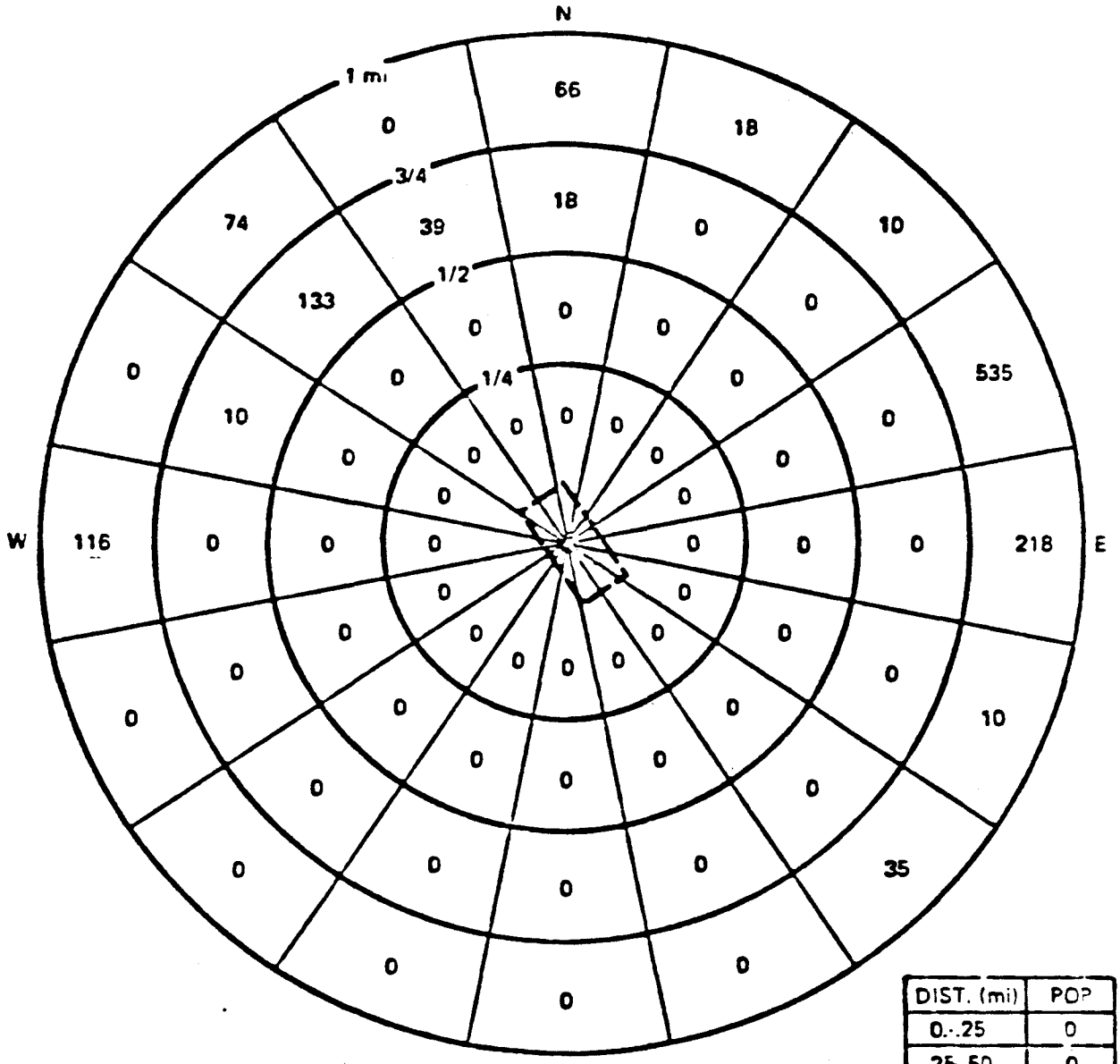
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PUBLIC
- RECREATION — RB - MARINA AND BOAT LAUNCHING SITES; RP - PARKS
- TRANSPORTATION
- BUSHLAND
- UTILITIES — US - SEWAGE TREATMENT; UR - SOLID WASTE
- VACANT
- TOWN BOUNDARIES
- CITY LIMITS
- APPROXIMATE EXTENT OF CONTAMINATION
- 1/4 APPROXIMATE DISTANCE FROM CONTAMINATED AREA

0 500 1000 1500 m

0 1/4 1/2 3/4 1 mi

LAND USE MAP

409-312 12/81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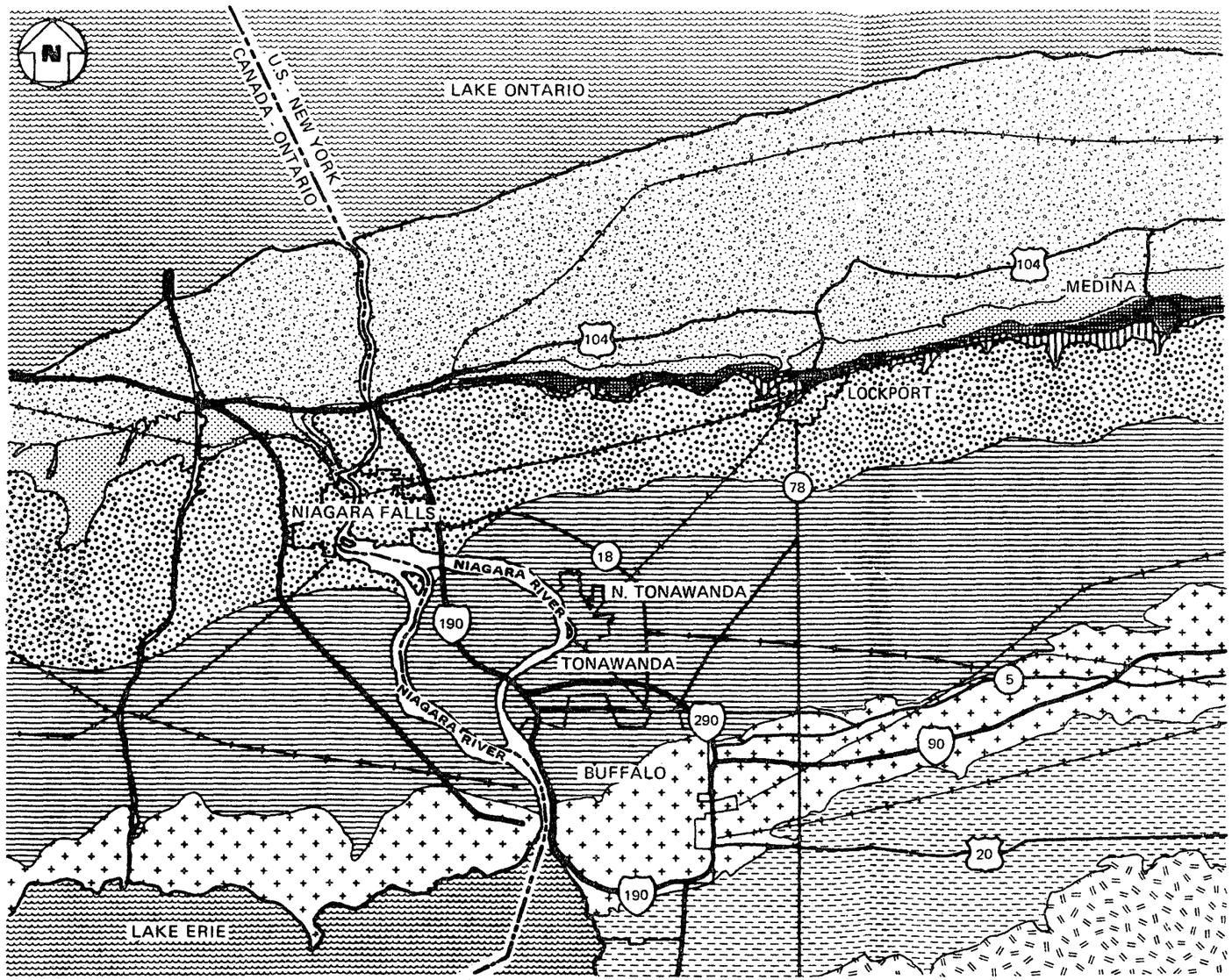
ATTACHMENT E



LEGEND

MEDINA GROUP AND QUEENSTON FORMATION
(800 FT)

QUEENSTON SHALE.

THOROLD SANDSTONE; GRIMSBY FORMATION–SANDSTONE, SHALE; POWER GLEN AND CABOT HEAD SHALES; WHIRLPOOL SANDSTONE.

CLINTON GROUP
(100-150 FT)

DECEW DOLOSTONE; ROCHESTER SHALE; IRONDEQUOIT AND MERRITON LIMESTONE.

IRONDEQUOIT LIMESTONE; ROCKWAY DOLOSTONE; HICKORY CORNERS LIMESTONE; NEAHGA SHALE; KODAK SANDSTONE.

LOCKPORT GROUP
(150-200 FT)

GUELPH, OAK ORCHARD, ERAMOSA, AND GOAT ISLAND DOLOSTONES; GASPORT LIMESTONE–LOCAL BIOHERMS.

AKRON DOLOSTONE AND SALINA GROUP
(400-700 FT)

AKRON DOLOSTONE; BERTIE FORMATION–DOLOSTONE, SHALE. CAMILLUS, SYRACUSE, AND VERNON FORMATIONS–SHALE, DOLOSTONE, SALT, AND GYPSUM.

ONONDAGA AND BOIS BLANC LIMESTONES
(150 FT)

ONONDAGA LIMESTONE–SENECA, MOREHOUSE (CHERTY), AND CLARENCE LIMESTONE MEMBERS, EDGECLIFF CHERTY LIMESTONE MEMBER, LOCAL CORAL BIOHERMS; BOIS BLANC LIMESTONE–SANDY, THIN, DISCONTINUOUS.

HAMILTON GROUP
(200-500 FT)

MOSCOW FORMATION–WINDOM AND KASHONG SHALES, MENTETH LIMESTONE MEMBERS.
LUDLOWVILLE FORMATION–DEEP RUN SHALE, TICHENOR LIMESTONE, WANAKAH AND LEDYARD SHALES, CENTERFIELD LIMESTONE MEMBERS.
SKANEATELES FORMATION–LEVANNA SHALE, STAFFORD LIMESTONE MEMBERS.
MARCELLUS FORMATION–OATKA CREEK SHALE MEMBER.

WEST FALLS GROUP
(400-950 FT)

ANGOLA AND RHINESTREET SHALES.

0 10 20 km

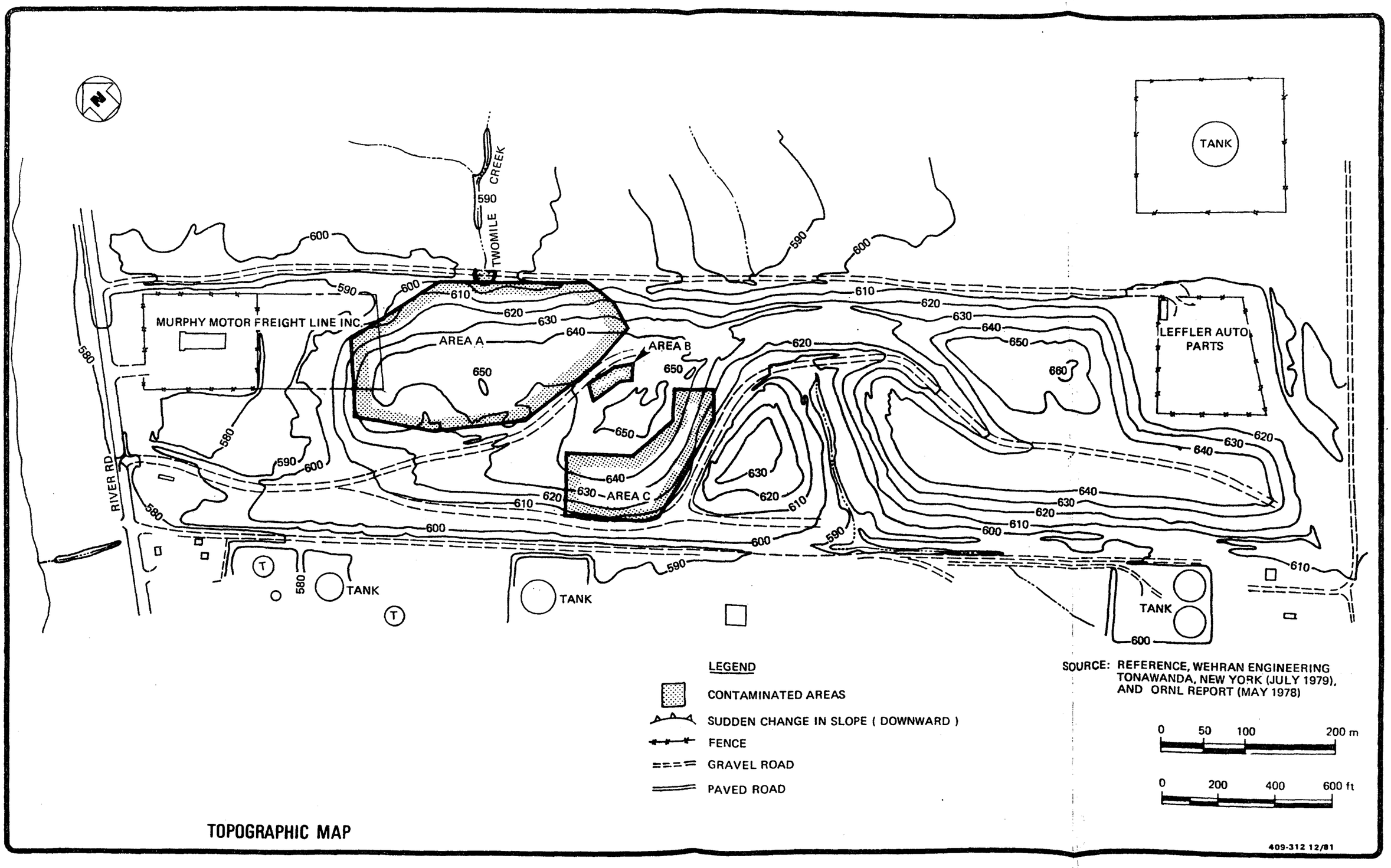
0 5 10 15 mi

SOURCE:
NY STATE MUSEUM OF SCIENCE

409-312 12/81

GEOLOGIC MAP OF BUFFALO-TONAWANDA AREA

(Ref. 6)



TOPOGRAPHIC MAP

PERIOD	EPOCH	FORMATION	COLUMNAR SECTION	APPROXIMATE THICKNESS IN FEET	CHARACTER
QUATERNARY	RECENT	FILL		0-60	SOLID WASTE, FLY ASH, DEMOLITION DEBRIS, INDUSTRIAL WASTES; PERMEABLE
		UNCONFORMABLE			
		ALLUVIUM		0-17	ORGANIC SILT, AND SILT AND CLAY GRADING TO C/F SAND AT BASE; SAND IS PERMEABLE
		DISCONFORMITY			
	PLEISTOCENE (WISCONSIN)	UPPER CLAYEY GLACIAL TILL		0-65	CLAYEY GLACIAL TILL, WITH MINOR AMOUNTS OF SAND AND GRAVEL, LENTICULAR BODY OF LAMINATED CLAY ALONG NORTHERN PERIMETER; DESICATION CRACKS IN UPPER 10-12 FEET, HIGHLY IMPERMEABLE.
		UNCONFORMABLE			
		GLACIOLACUSTRINE CLAY UNIT		5-45	LAMINATED CLAY WITH OCCASIONAL LAMINAE OF SILT, SOFT; HIGHLY IMPERMEABLE
		CONFORMABLE			
		BASAL GLACIOLACUSTRINE UNIT		0-7	LAMINATED CLAYEY SILT AND SAND, SOFT-LOOSE; MARGINALLY PERMEABLE
		UNCONFORMABLE			
		LOWER, SANDY GLACIAL TILL		1-19	SANDY GLACIAL TILL, WITH VARIABLE AMOUNTS OF SILT, CLAY AND GRAVEL, SECONDARY GYPSUM; MARGINALLY PERMEABLE
		UNCONFORMABLE			
UPPER SILURIAN		CAMILLUS SHALE		200±*	GRAY SHALE; GRAY OR BROWN DOLOMITE; VERY THIN BEDS OF GYPSUM; PERMEABLE ALONG BEDDING PLANES AND VERTICAL JOINTS

*UPPER 10 FEET PENETRATED IN DRILLING

GEOLOGIC COLUMN

(Ref. 5)

SOURCE: REFERENCE, WEHRAN ENGINEERING (MAY 1979)

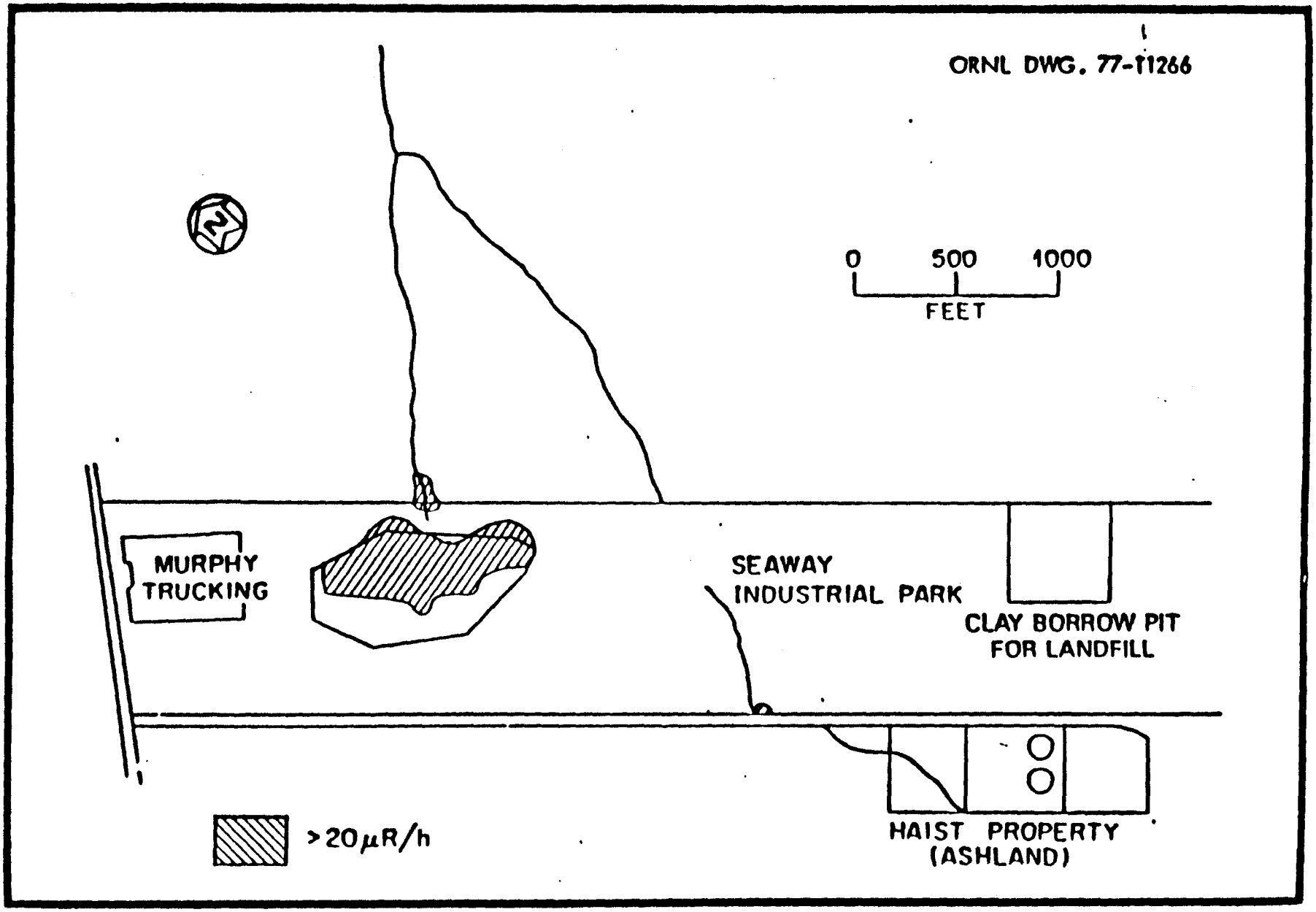
0 50 100 200 m

0 200 400 600 ft

GROUND WATER CONTOUR MAP

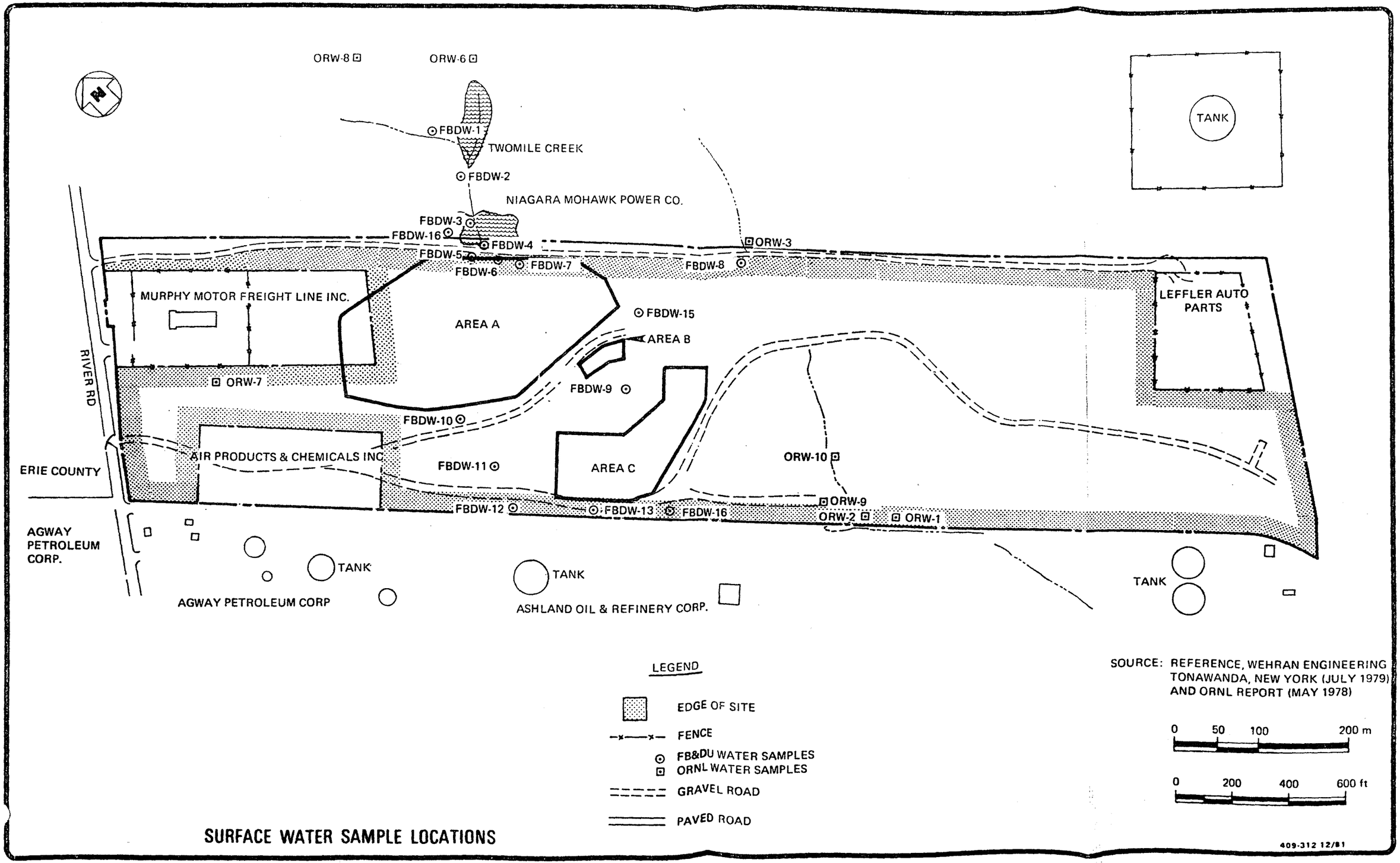
409-312 12/81

ATTACHMENT F



AREAS OF ELEVATED EXTERNAL RADIATION ON SEAWAY BASED ON 1986 SURVEY

(Ref. 7)



SURFACE WATER SAMPLE LOCATIONS

(Ref.6)

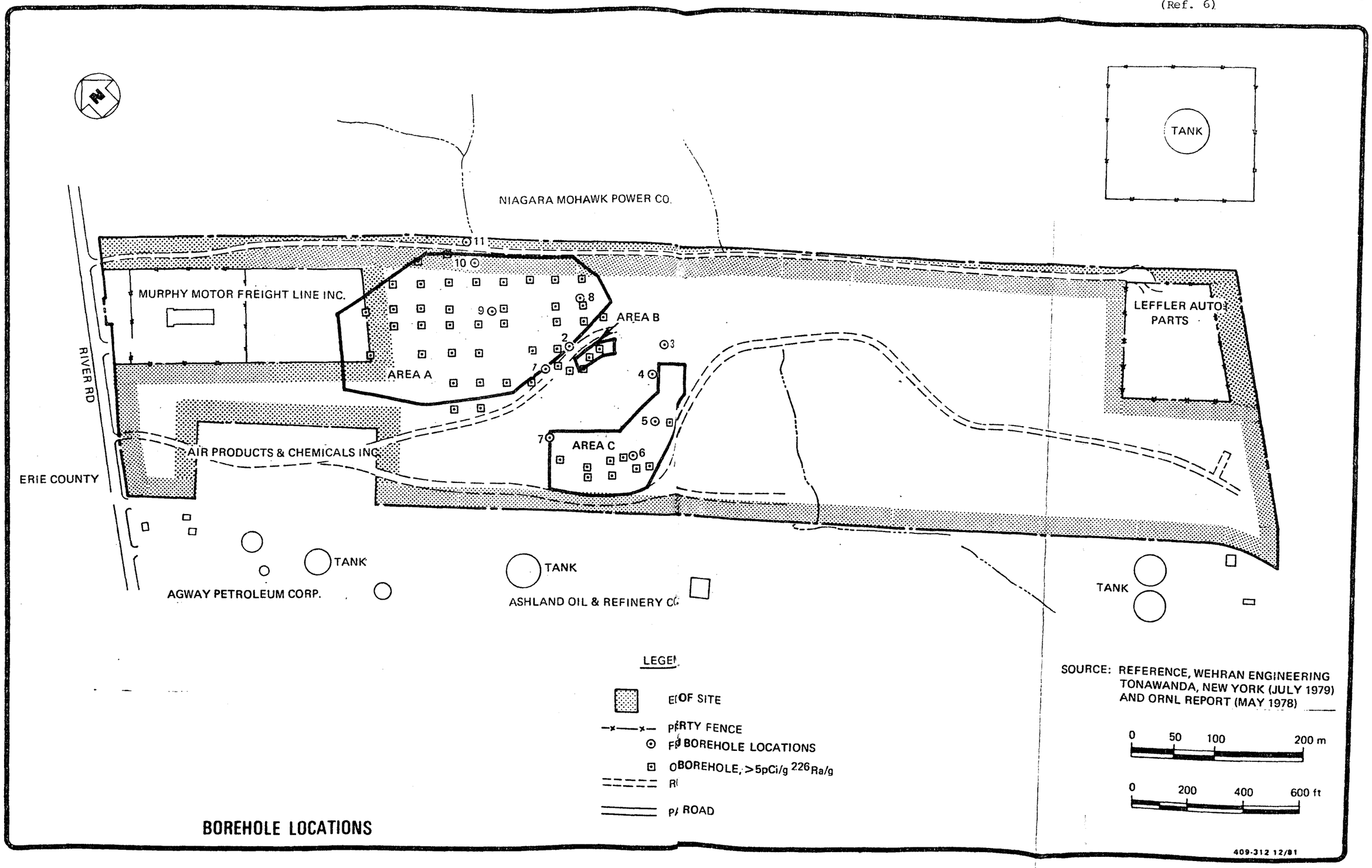
TABLE 4-3

SURFACE WATER SAMPLES*

Sample No.	^{226}Ra (pCi/l)	^{238}U (pCi/l)
SWS-1	<0.6	3.3
SWS-2	<0.6	3.3
SWS-3	<0.6	10.0
SWS-4	2.0	2.3
SWS-5	6.0	27.0
SWS-6	<0.6	17.0
SWS-7	<0.6	17.0
SWS-9	<0.6	3.3
SWS-10	<0.6	17.0
SWS-11	<0.6	3.3
SWS-12	<0.6	<3.3
SWS-13	<0.6	3.3
SWS-14	<0.6	50.0
SWS-15	<0.6	50.0
SWS-16	4.9	20.0

*See Figure 4-1 for location.

(Ref. 6)



BOREHOLE LOCATIONS

(Ref. 6)

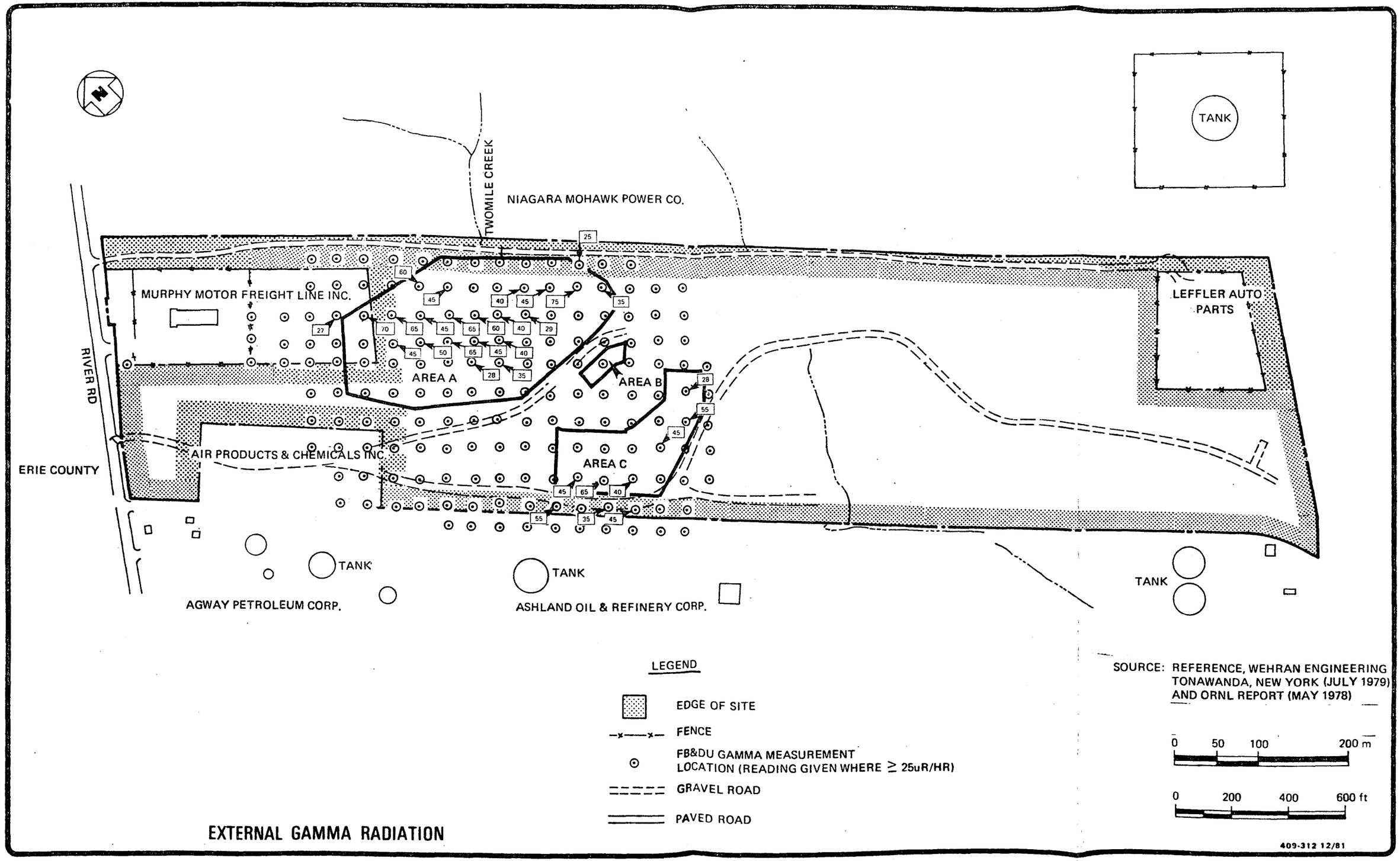
SOIL SAMPLE CONCENTRATIONS*

Sample No.	Borehole No.	Sample Depth (ft)	^{226}Ra (pCi/g)	^{238}U (pCi/g)
1	DH-1	0-1	0.26	0.83
2		1-2	0.28	0.43
3		2-3	0.40	0.20
4		3-4	0.18	0.03
5		4-5	0.19	0.17
6		5-6	0.42	0.33
7		6-7	0.57	0.20
8		7-8	0.30	0.40
9		8-9	0.16	0.17
10		9-10	0.46	0.30
11		10-11	0.55	0.10
12	DH-2	0-1	0.44	1.03
13		1-2	0.30	1.2
14		2-3	0.37	0.47
15		3-4	0.55	2.3
16		4-5	0.45	0.20
17		5-6	0.51	2.6
18		6-7	0.32	0.33
19		7-8	0.15	1.2
20	DH-3	0-1	1.25	0.37
21		1-2	0.82	5.7
22		2-3	3.5	9.7
23		3-4	4.1	2.8
24		4-5	1.8	1.8
26	DH-4	0-1	1.5	2.2
27		1-2	2.0	2.3
28		2-3	1.6	3.7
29		3-4	1.7	1.2
30		4-5	0.95	0.60
31		5-6	0.25	0.13
32	DH-5	0-1	0.62	0.77
33		1-2	1.2	0.87
34		2-3	0.97	1.1
35		3-4	0.84	3.3
37	DH-6	0-1	5.6	5.7
38		1-2	2.3	13.0
39		2-3	4.2	6.7
40		3-4	15.0	6.3
42		5-6	5.3	9.3

Sample No.	Borehole No.	Sample Depth (ft)	^{226}Ra (pCi/g)	^{238}U (pCi/g)
43	DH-7	0-1	0.74	0.77
44		1-2	1.4	0.90
45		2-3	8.2	5.7
46		3-4	22.0	13.0
47		4-5	3.6	4.3
48		5-6	1.9	2.1
49		6-7	0.56	1.3
50		7-8	1.6	1.7
51		8-9	2.9	1.7
52		9-10	0.72	2.1
53		10-11	0.29	1.0
54	DH-8	0-1	141.0	74.0
55		1-2	46.0	25.0
56		2-3	9.6	29.0
57		3-4	15.0	21.0
65	DH-9	0-1	4.8	26.0
66		1-2	22.0	21.0
67		2-3	5.8	8.0
68		3-4	4.1	4.0
69		4-5	6.9	17.0
70		5-6	10.4	12.0
71		6-7	<0.20	9.7
72	DH-10	0-1	0.79	19.0
73		1-2	5.5	5.7
74		2-3	3.0	1.8
75		3-4	0.12	0.87
76		4-5	1.6	0.67
77		5-6	0.40	1.2
78		6-7	0.32	0.63
79		7-8	0.50	0.40
80		8-9	0.60	0.33
81		9-10	0.20	0.67
82		10-11	0.57	0.33
83	DH-11	3-4	0.61	0.93
84		4-5	1.6	1.4
85		5-6	0.52	0.77
86		6-7	0.66	0.57
87		7-8	0.36	0.57
88		8-9	0.64	0.43
89		9-10	0.97	0.43
90		10-11	0.68	1.5

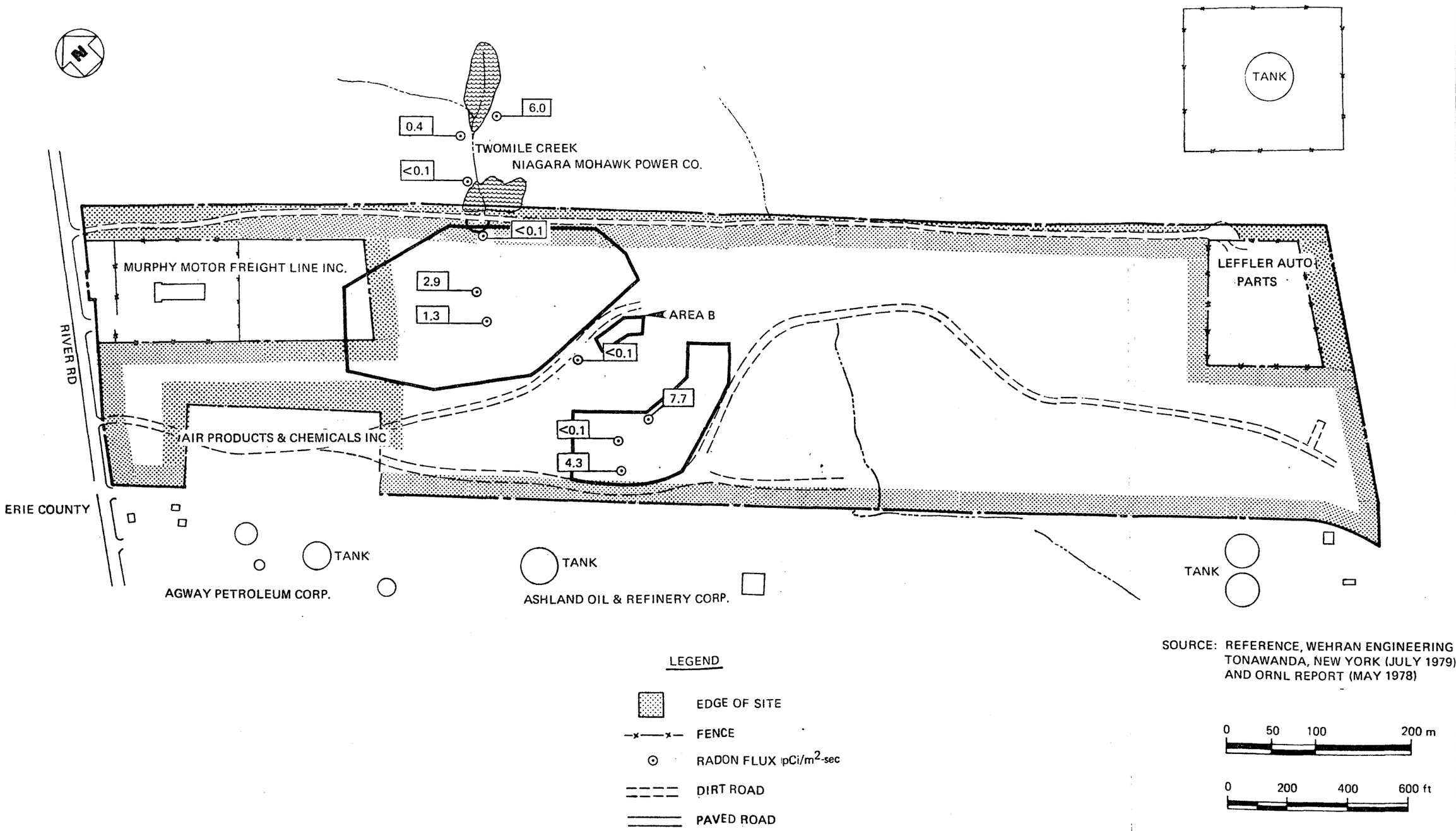
Sample No.	Borehole No.	Sample Depth (ft)	^{226}Ra (pCi/g)	^{238}U (pCi/g)
SS-1		Surface	3.8	2.9
SS-2		Surface	1.2	1.3
SS-3		Surface	0.78	0.27
SS-4		Surface	1.04	0.43
SS-5		Surface	0.75	0.37
SS-6		Surface	0.60	0.27

*See Figure 4-2 for locations.



EXTERNAL GAMMA RADIATION

(Ref. 6)

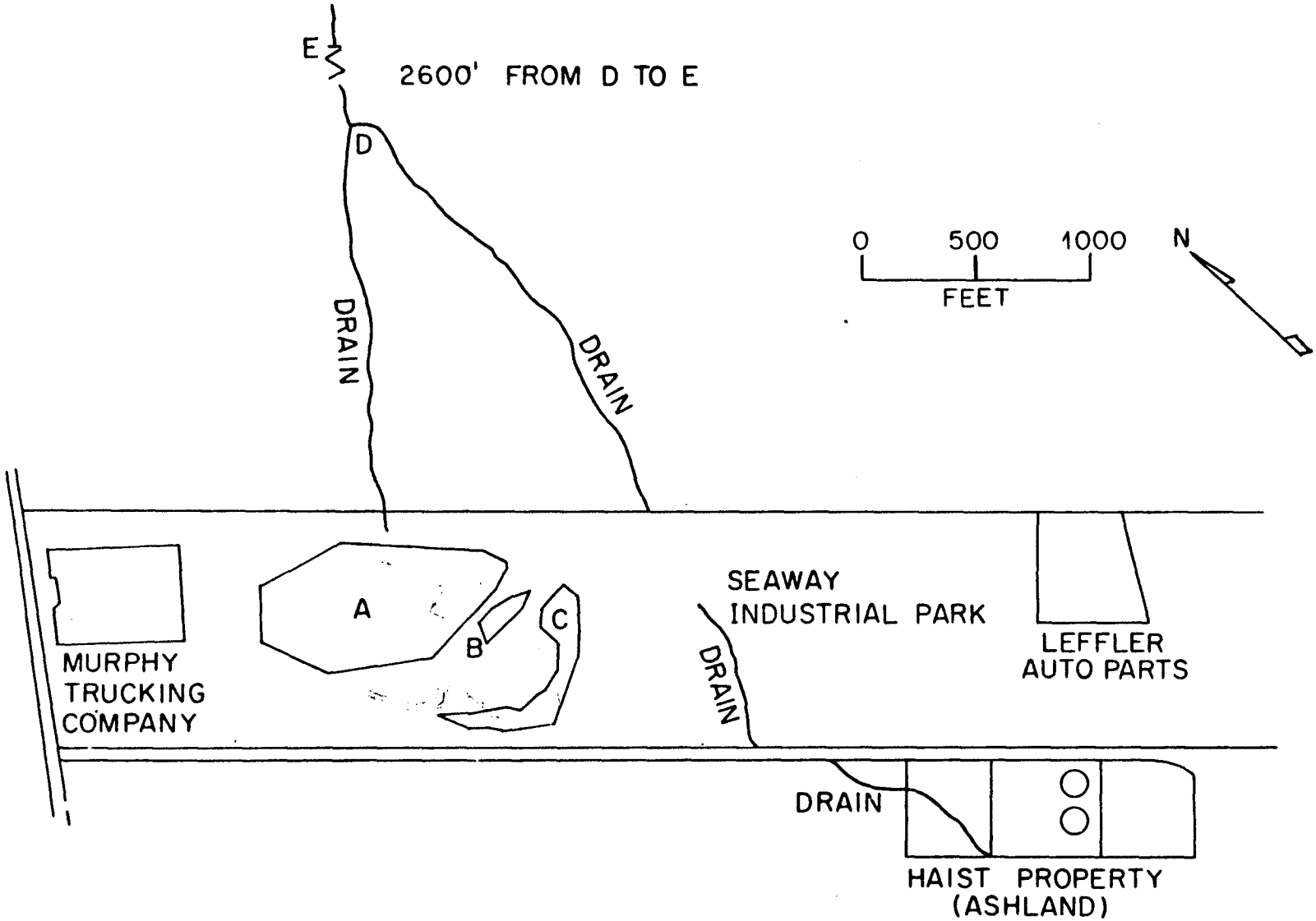


SOURCE: REFERENCE, WEHRAN ENGINEERING TONAWANDA, NEW YORK (JULY 1979) AND ORNL REPORT (MAY 1978)

RADON FLUX MEASUREMENTS

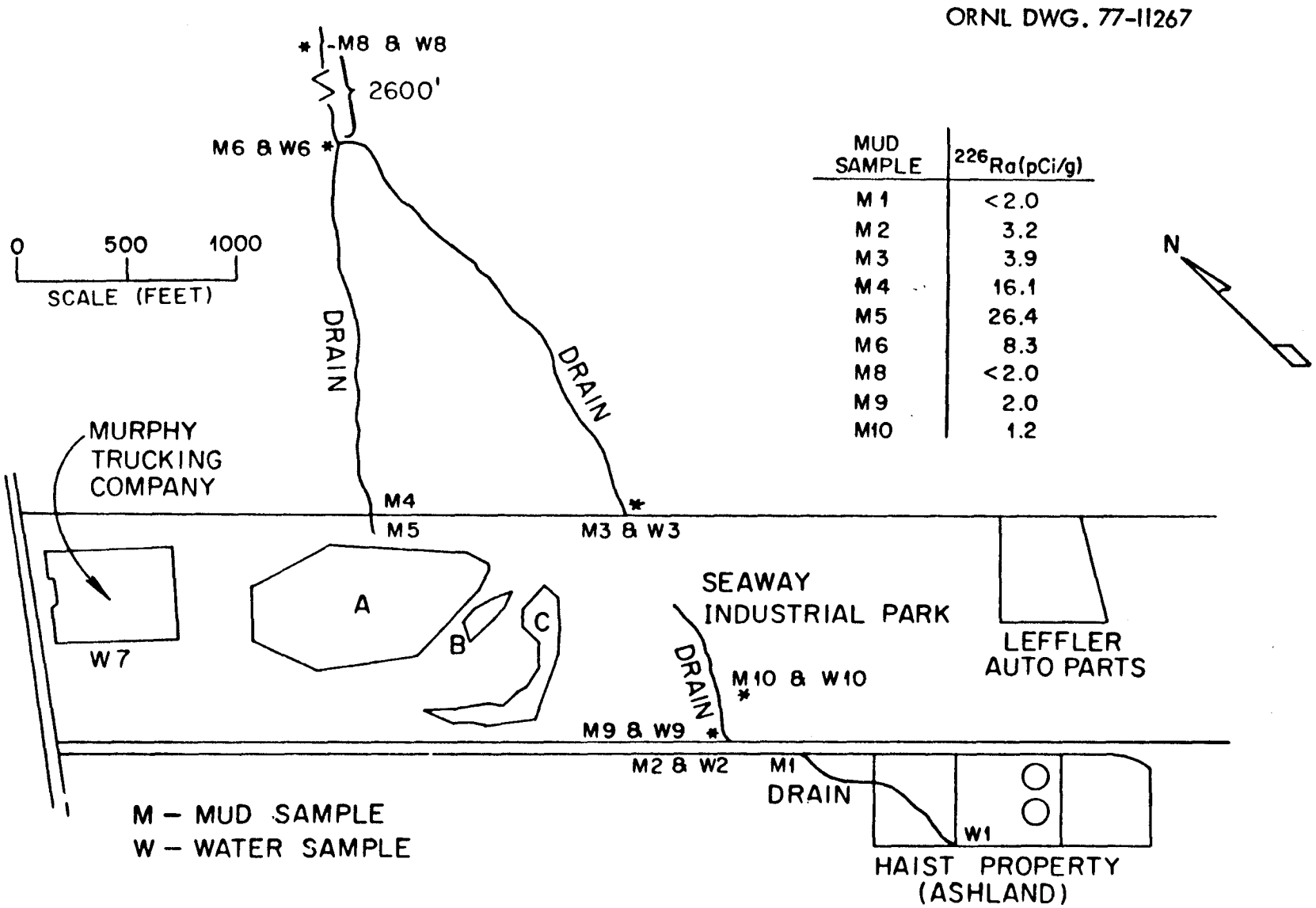
409-312 12/81

ORNL DWG. 77-11266



Plan view of Seaway Industrial Park showing three areas (A, B, C) where radioactive residues were dumped.

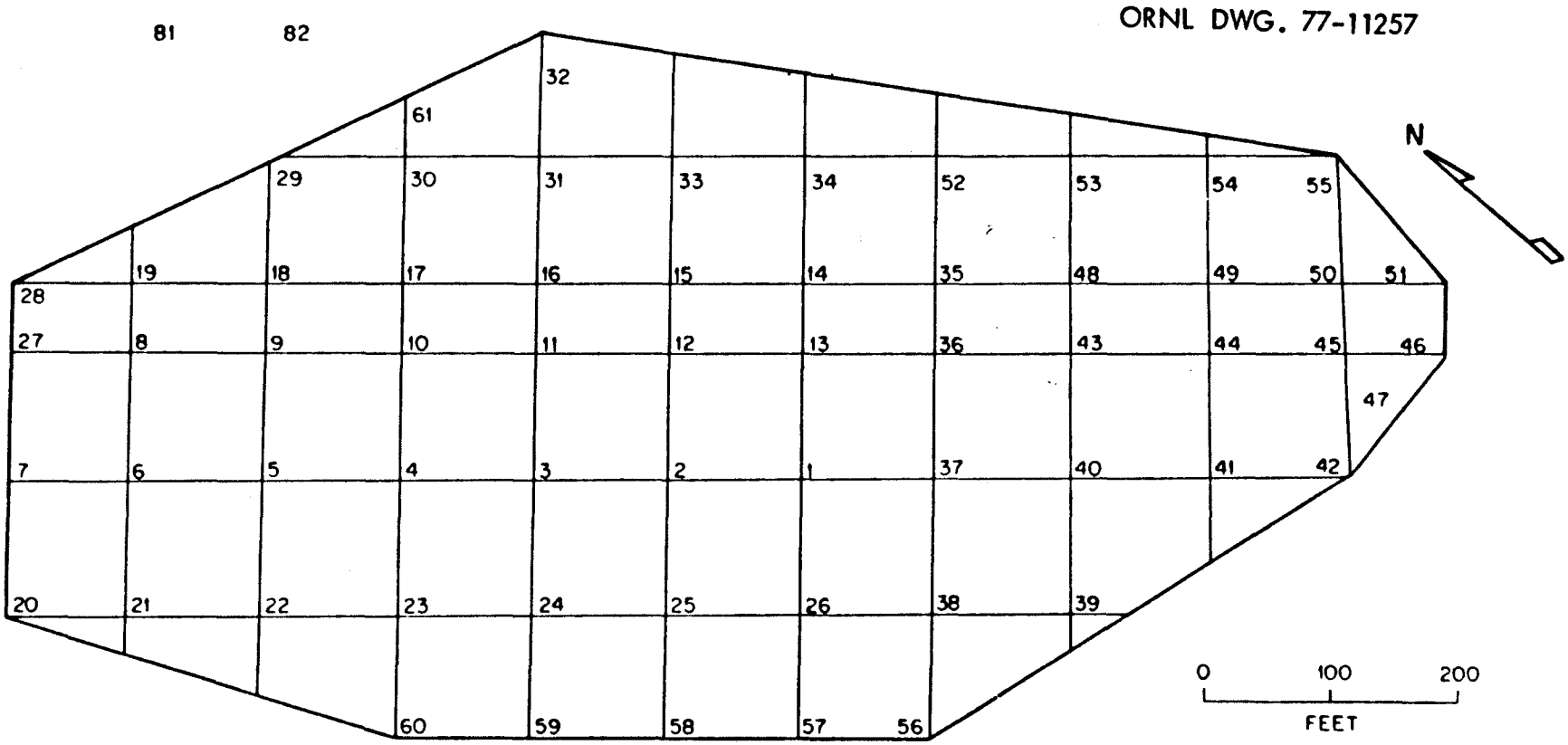
(Ref. 9)



MUD SAMPLE	^{226}Ra (pCi/g)
M1	<2.0
M2	3.2
M3	3.9
M4	16.1
M5	26.4
M6	8.3
M8	<2.0
M9	2.0
M10	1.2

Locations of water and mud samples and concentrations of ^{226}Ra in mud samples (pCi/g).

(Ref. 9)

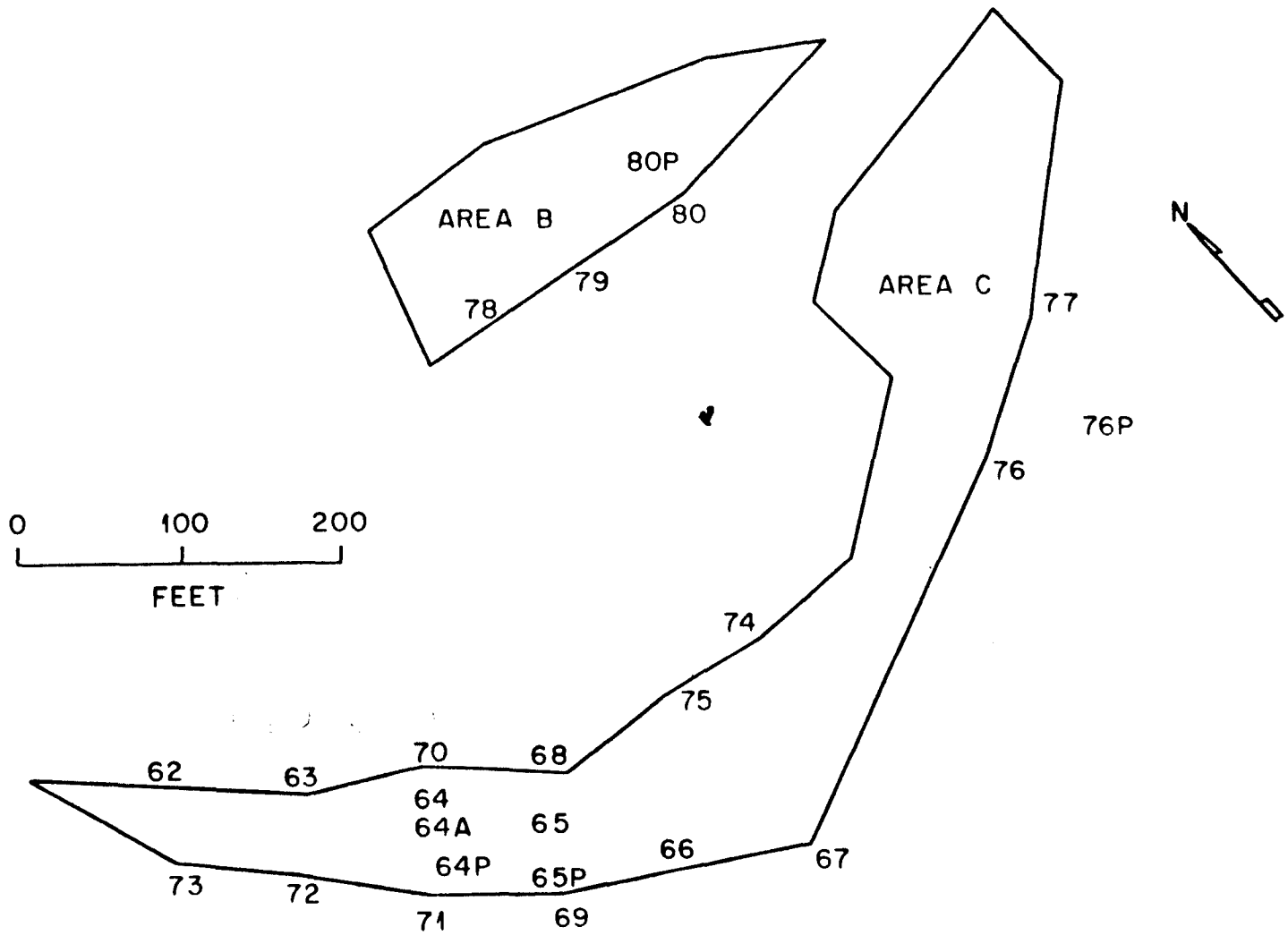


Points on and near area of known contamination at which measurements were taken (Area A).

(Ref. 9)

F-246 89

ORNL-DWG 76-19879



Points on and near area of known contamination at which measurements were taken (Areas B and C).

(Ref. 9)

E-24689

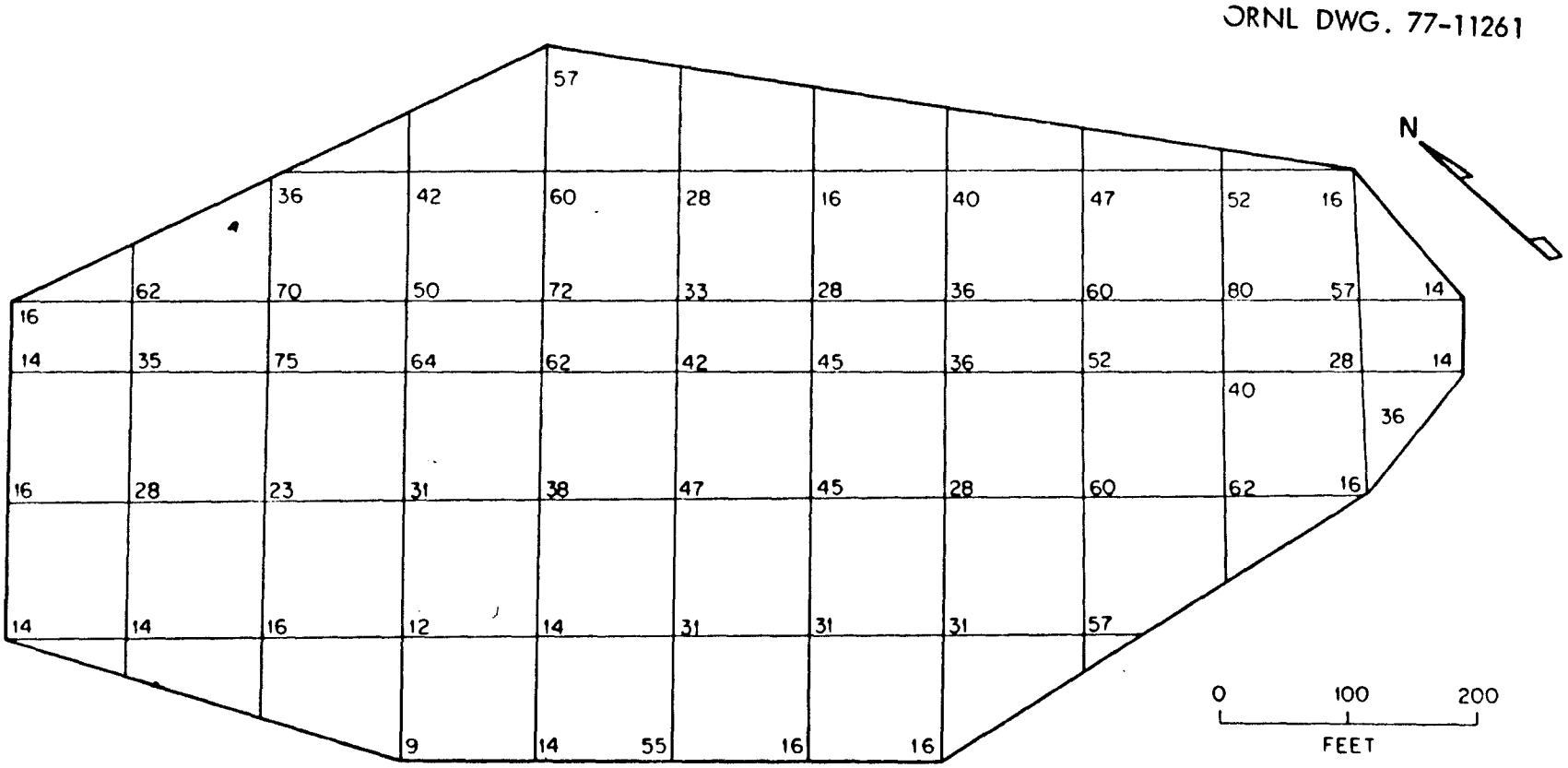
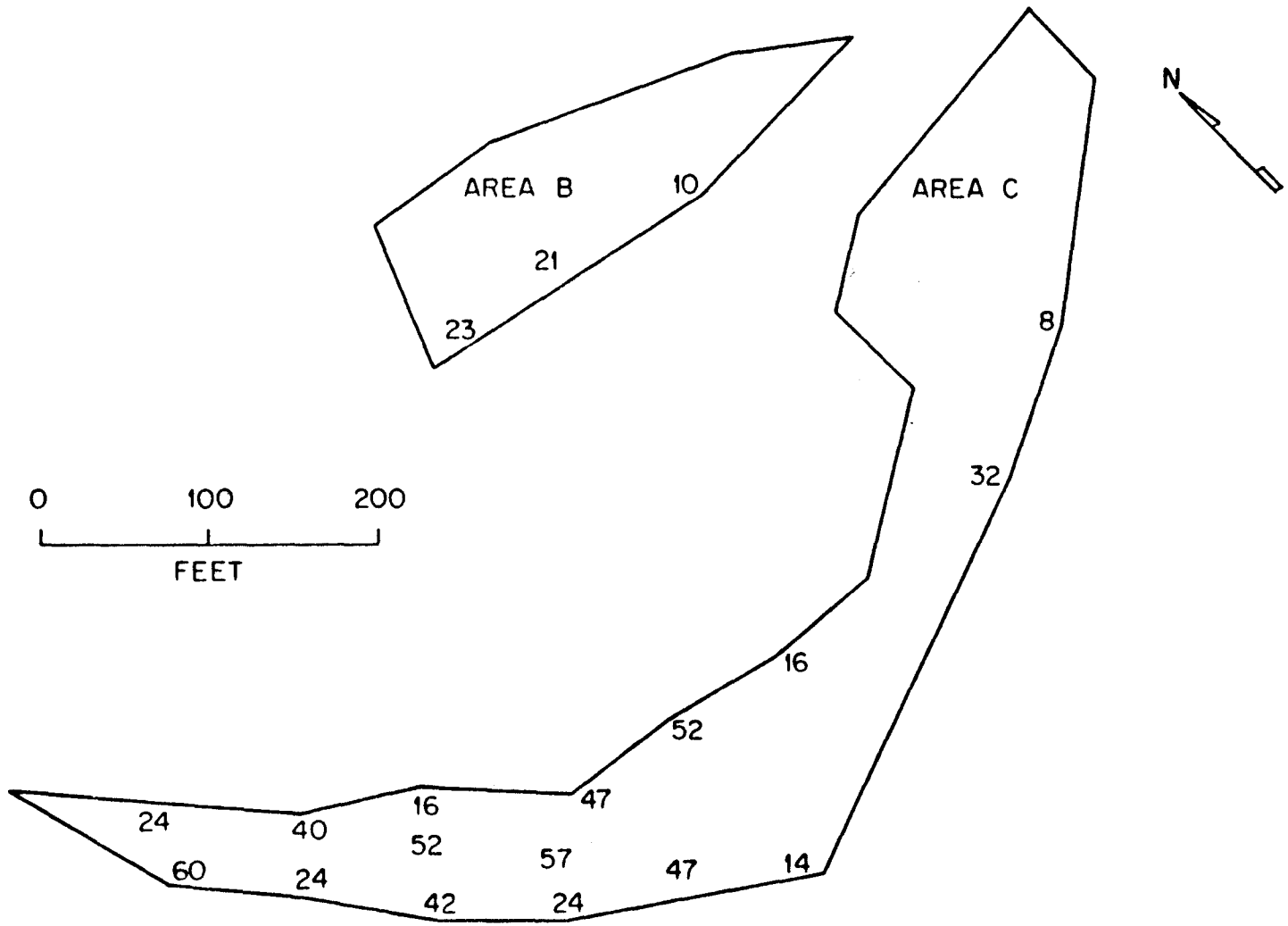


Fig. 7. External gamma radiation levels (in μR/hr) at 1 m above surface (Area A). (Ref. 9)

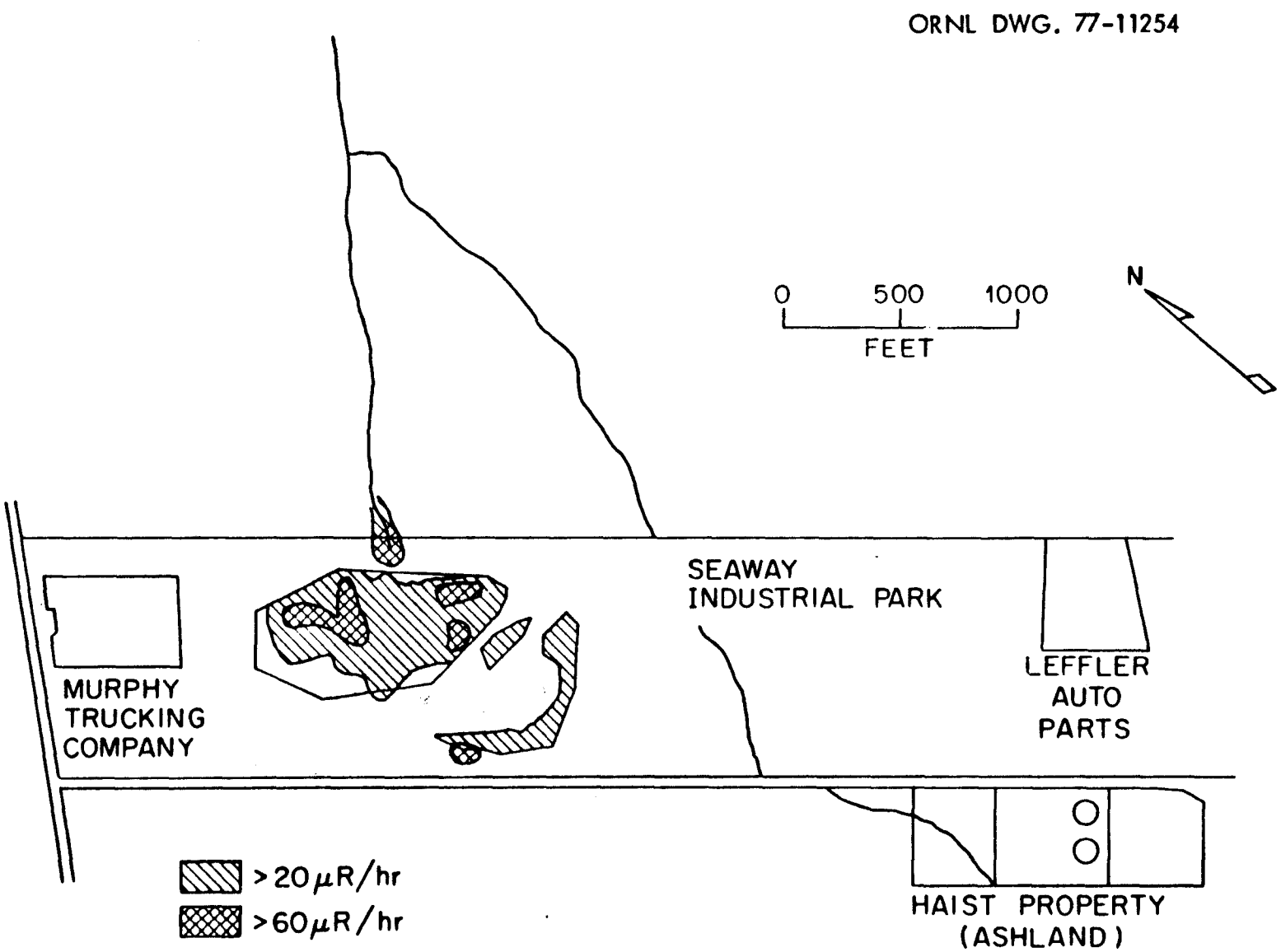
F-24689

ORNL DWG. 77-11255



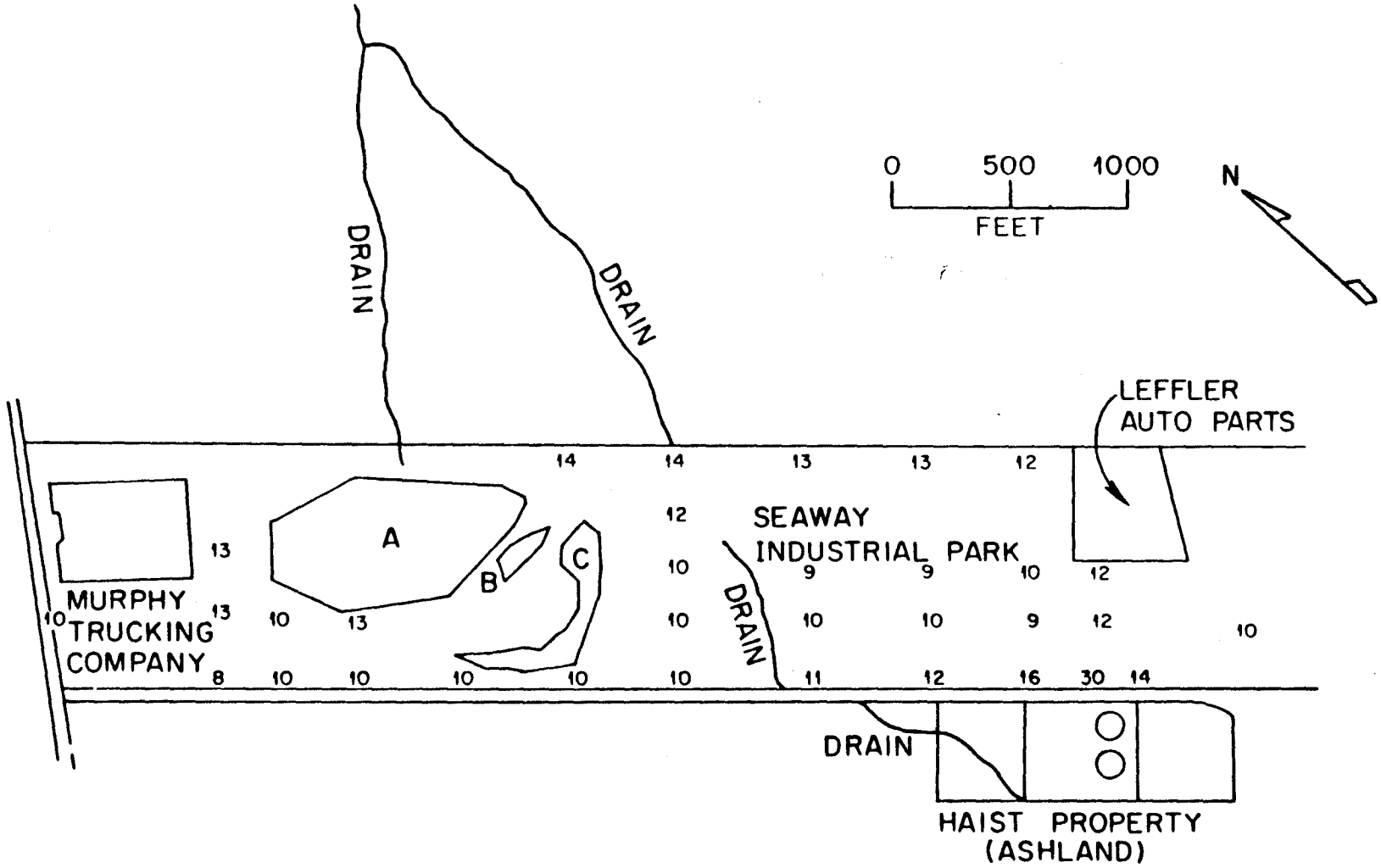
External gamma radiation levels (in μR/hr) at 1 m above surface (Areas B and C). (Ref. 9)

E-24689



Area of elevated external gamma radiation.
(Ref. 9)

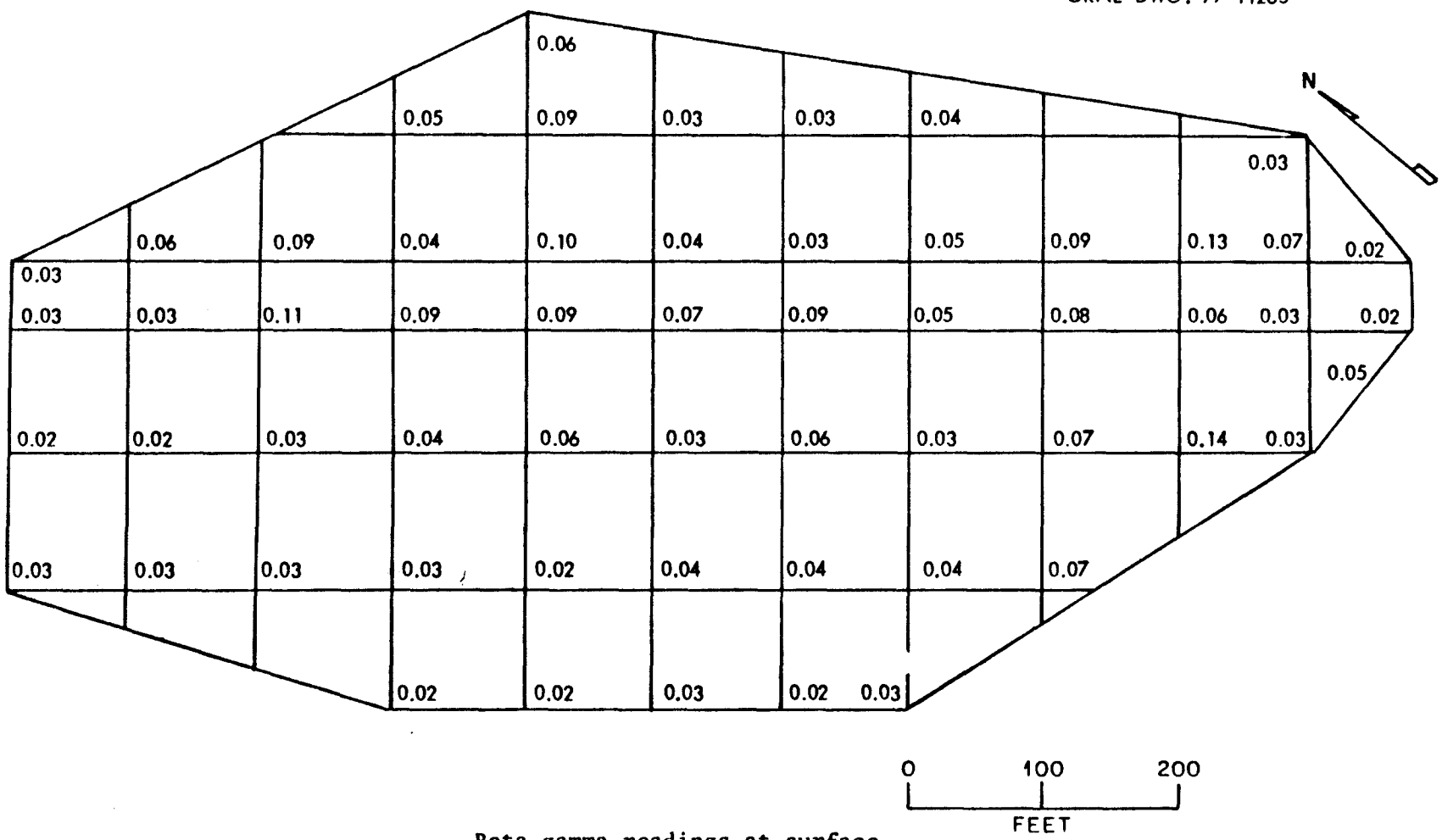
ORNL DWG. 77-11264



External gamma radiation levels (in μR/hr) at 1 m above surface on 400-ft grid.
(Ref. 9)

E-24689

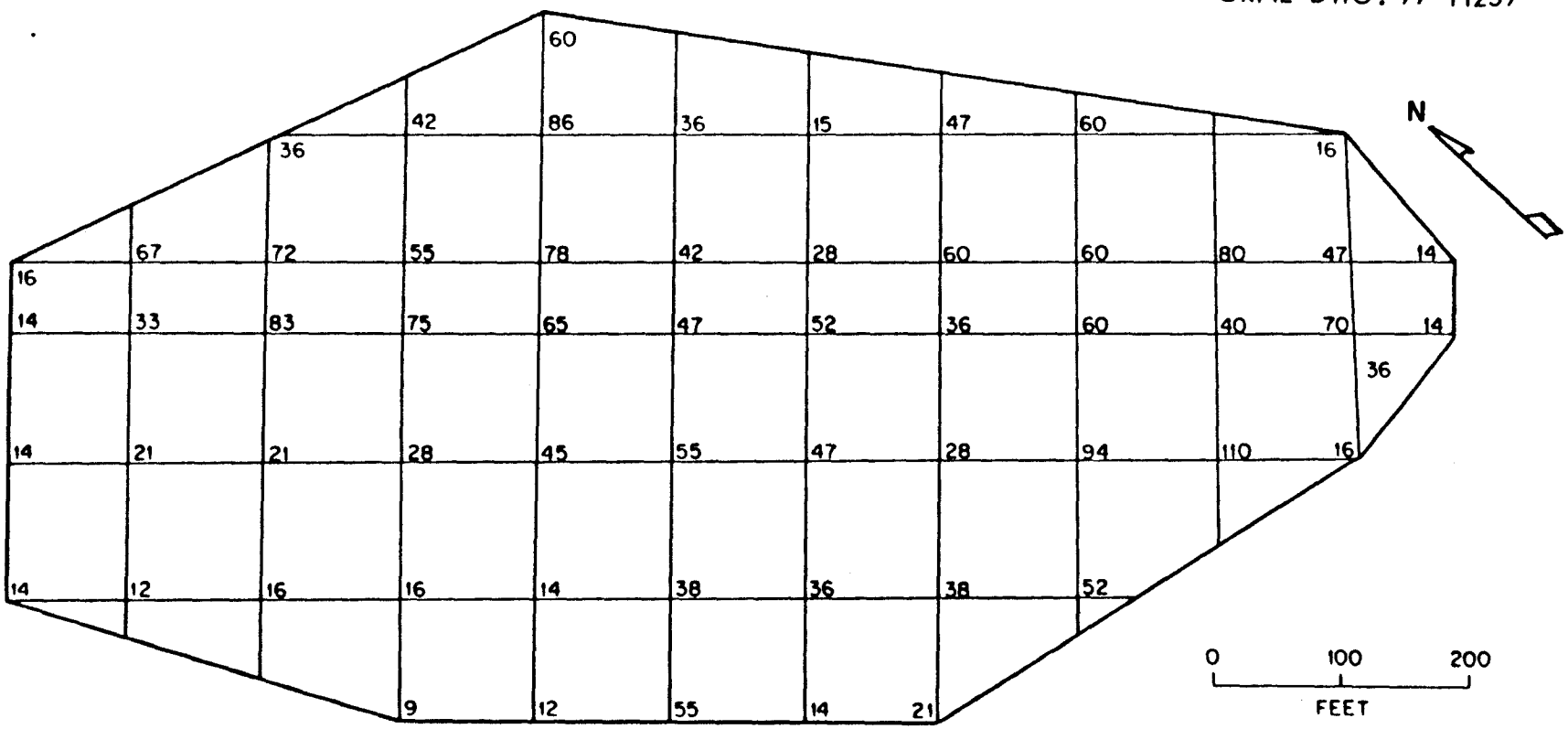
ORNL DWG. 77-11265



Beta-gamma readings at surface (in mrad/hr).

(Ref. 9)

ORNL DWG. 77-11259

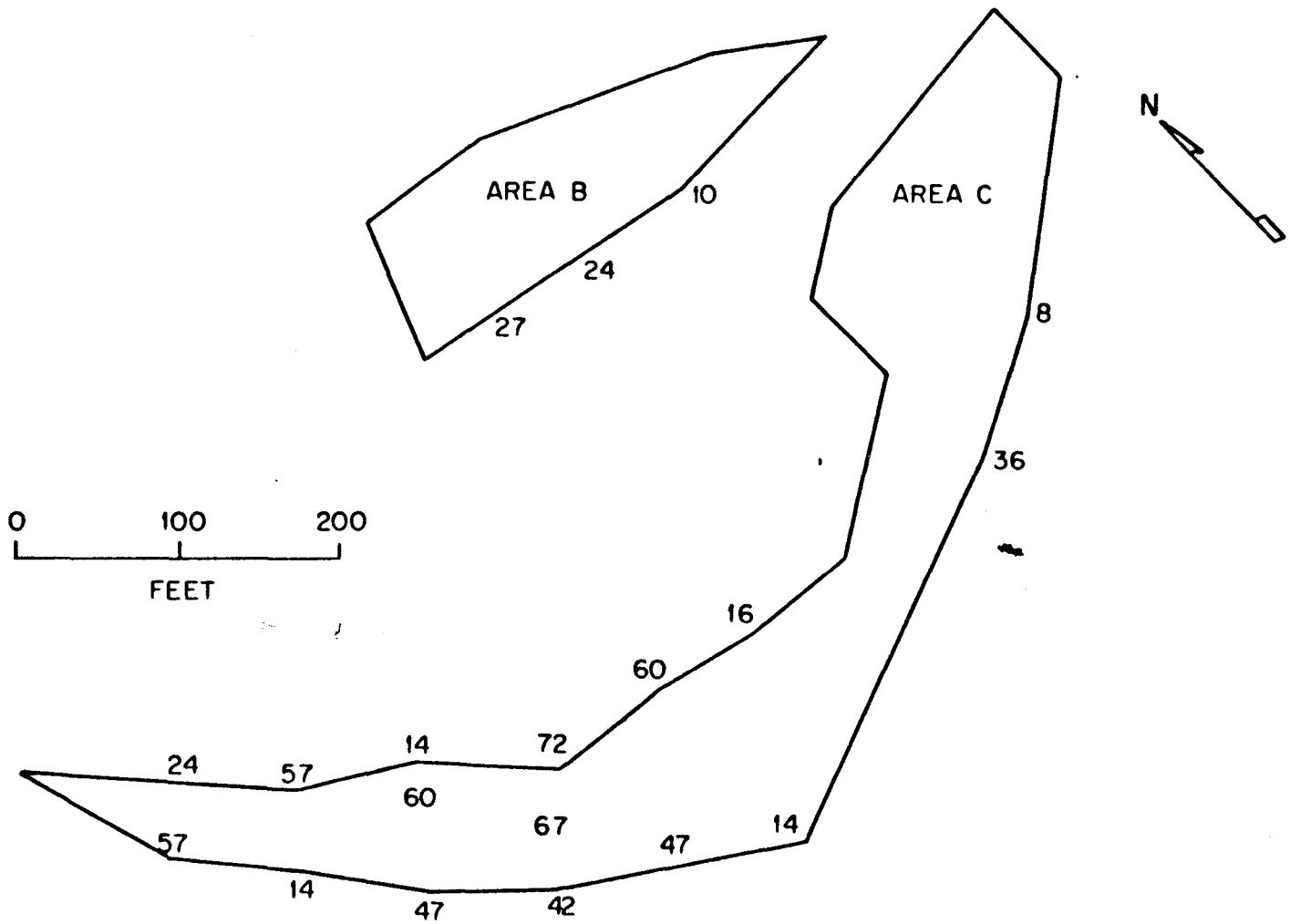


External gamma radiation (in μR/hr) at the surface on Area A.

(Ref. 9)

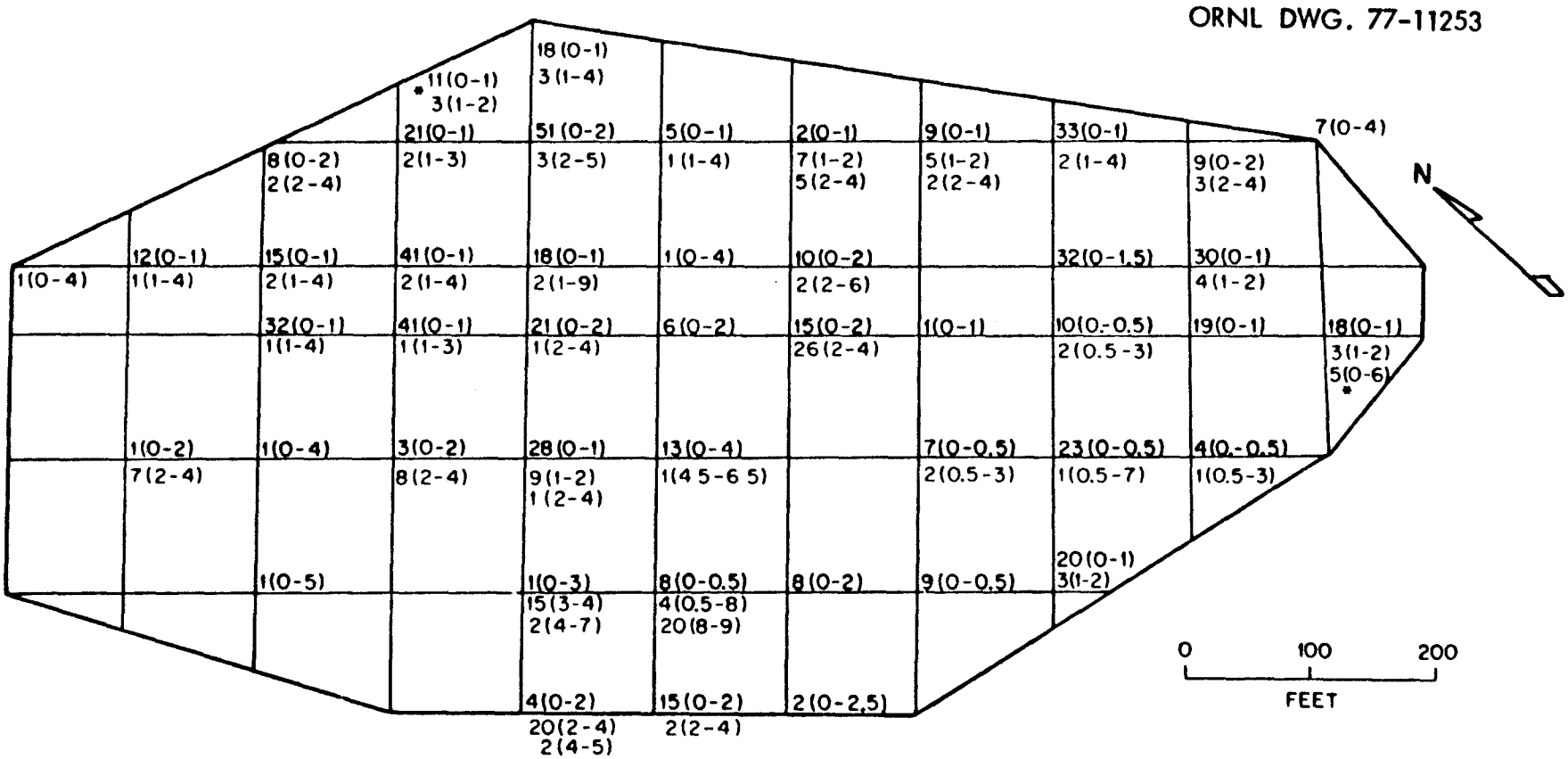
F-24689

ORNL DWG. 77-11258



External gamma radiation levels (in μR/hr) at the surface on and near Areas B and C.
(Ref. 9)

ORNL DWG. 77-11253

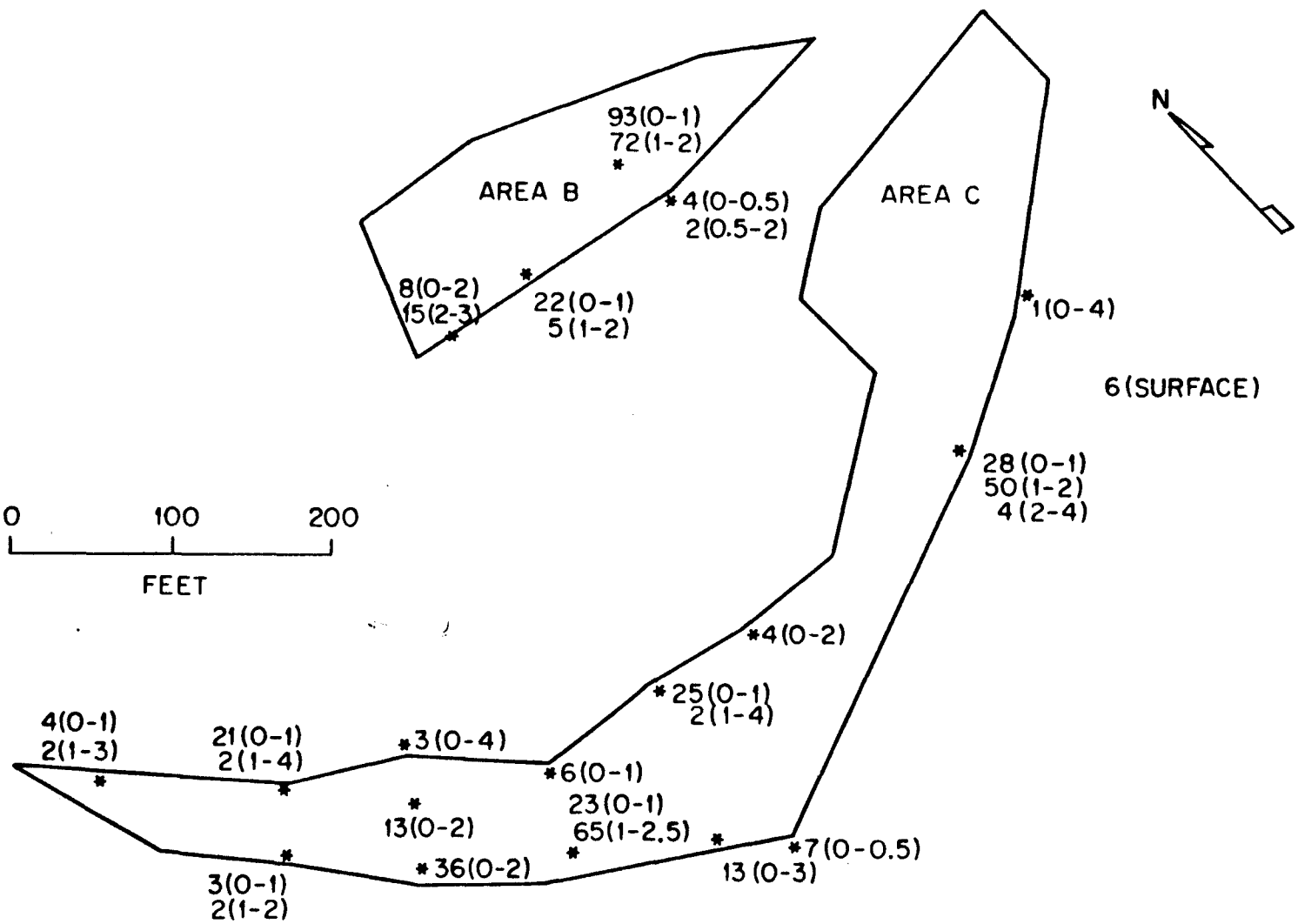


Radium concentrations in Area A estimated from loggings and soil sample analyses [legend u(v-w) indicates u pCi/g from a depth of v ft to a depth of w ft].

(Ref. 9)

E-24689

ORNL DWG. 77-11260



Radium concentrations in Areas B and C estimated from loggings and soil sample analyses [legend u(v-w) indicates u pCi/g from a depth of v ft to a depth of w ft].

(Ref. 9)