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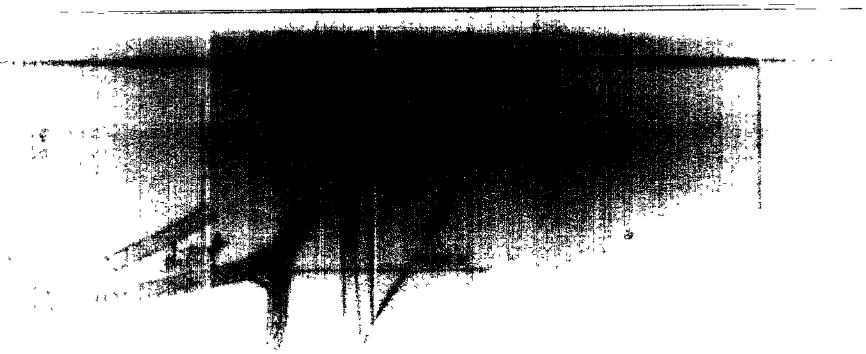

MARILLA STREET LANDFILL CLOSURE CONSTRUCTION MONITORING REPORT FOR THE CLARIFIER SLUDGE AREA

LTV Steel Company
Cleveland, Ohio

March 1992

Project No 0848-19-3

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PIRNIE

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2
CONSTRUCTION MONITORING REPORT
CLARIFIER SLUDGE AREA

LTV STEEL COMPANY
CLEVELAND, OHIO

MARCH 1992

STATE OF NEW YORK
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0848-19-3

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MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT
CLARIFIER SLUDGE AREA

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1.0 INTRODUCTION

1.1 BACKGROUND

LTV Steel Company (LTV) owns the Marilla Street Landfill, which is located on an approximate 100-acre parcel of property in the City of Buffalo, New York. Regional and vicinity maps illustrating the location of the landfill site are presented as Figures 1 and 2, respectively. The landfill is separated into five (5) fill areas: Basic Oxygen Furnace (BOF) Dust Area, Clarifier Sludge Area, Miscellaneous Debris and Fine Refuse Area, Fine Refuse Area and Railroad Fill Area, for a total of approximately 80 acres.

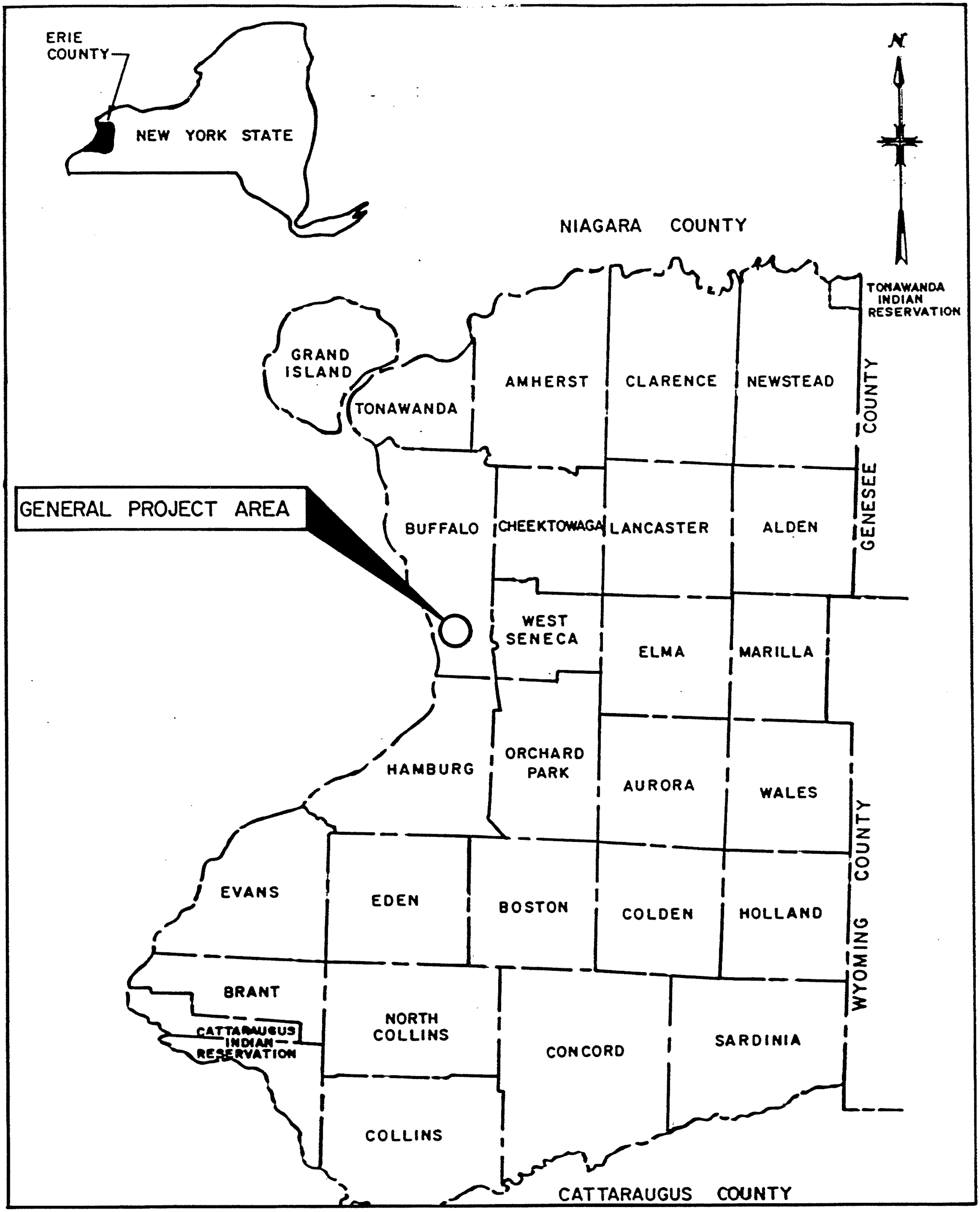
Construction activities in the Clarifier Sludge Area were performed under two separate contracts. Contract 1 was for the subgrade preparation work (in addition to constructing the final cover system in the BOF Dust Area). Contract 2 was for the construction of the final cover system. The same Contractor performed the work for both contracts.

Malcolm Pirnie, Inc. prepared Contract Documents dated May 1990 for construction of the final cover system for the approximate 11-acre Clarifier Sludge Area landfill. The Contract Documents were approved by the NYSDEC on July 6, 1990. The contract for construction was competitively bid and awarded to Beaver Excavating Company. Construction activities began in late July 1990 and were temporarily terminated due to winter conditions in December 1990. The cover system construction then resumed in May 1991 and was completed in July 1991. The Contractor demobilized from the site on July 26, 1991.

1.2 PURPOSE AND SCOPE

The purpose of this report is to present the observations and data collected during the construction of the final cover system for the Clarifier Sludge Area. Specifically, this construction monitoring report provides:

FIGURE 1



MARILLA STREET LANDFILL CLOSURE
CONSTRUCTION MONITORING REPORT
CLARIFIER SLUDGE AREA
REGIONAL MAP

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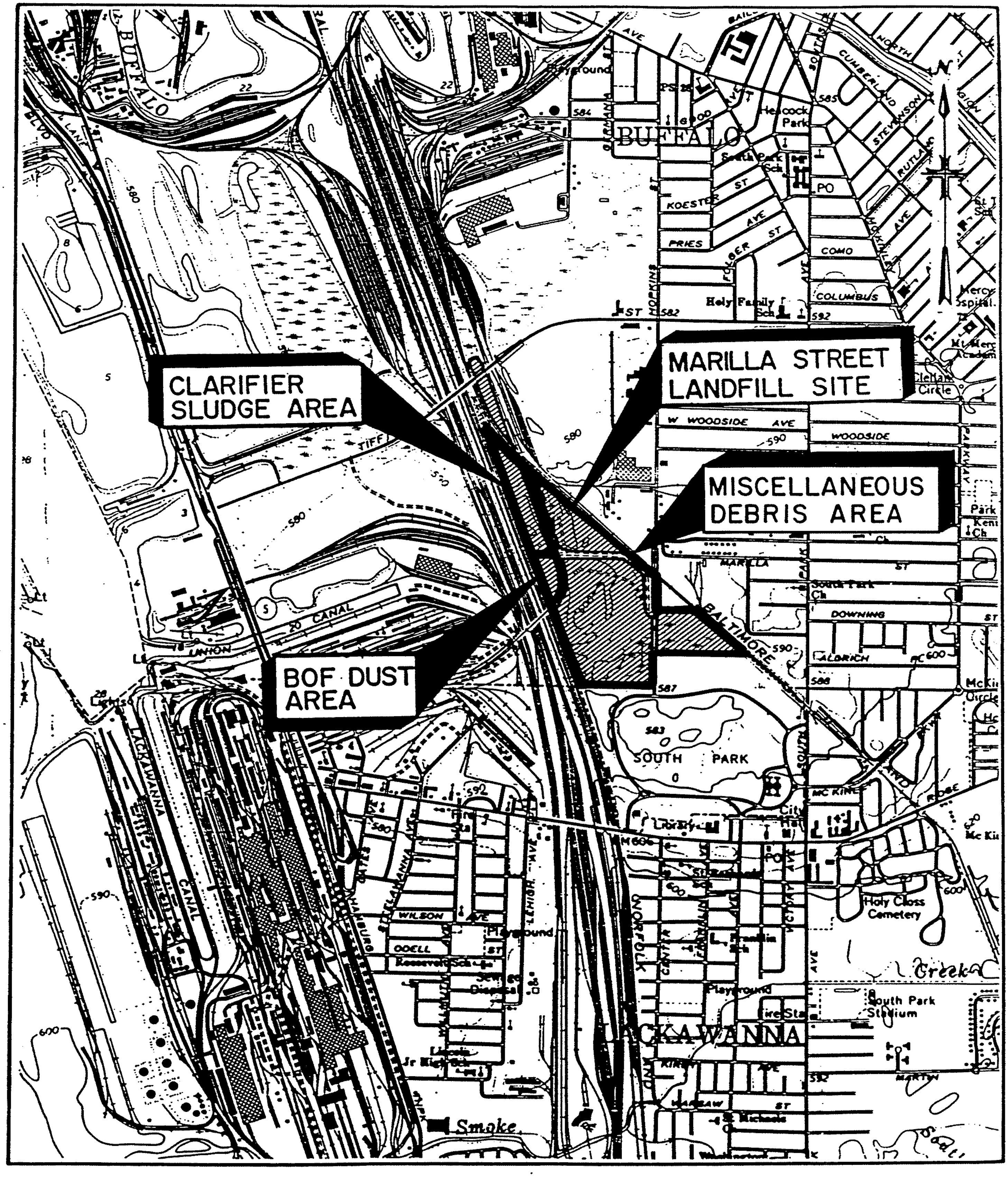
FIGURE 2



NOTE: TOPOGRAPHY TAKEN FROM 1965 BUFFALO S.E., N.Y. U.S.G.S. QUADRANGLE 7.5 MIN. SERIES.

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QUADRANGLE LOCATION

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CONSTRUCTION MONITORING REPORT
CLARIFIER SLUDGE AREA

VICINITY MAP

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- Daily construction logs indicating work done each day, weather conditions, field testing results, problems encountered and remedial activities undertaken to correct these problems;

- Laboratory test results;

- Survey data showing the elevations of the subgrade (prior to cover system construction) recompacted soil barrier layer, and topsoil layer;

- Color photographs depicting major project aspects; and

- Material and Construction Quality Assurance information.

2.0 FINAL COVER SYSTEM DESIGN

2.1 GENERAL

This section briefly describes the design of the final cover system for the Clarifier Sludge Area at the Marilla Street Landfill. The final cover system design consisted of the following components:

- Subgrade Preparation
- Gas Control Vents
- Recompacted Soil Barrier Layer
- Topsoil and Vegetative Growth
- Surface Water Control

2.2 SUBGRADE PREPARATION

The design subgrade elevations were achieved to the maximum extent possible by balancing cut and fill quantities. The fill mixture in the Clarifier Sludge Area is predominately composed of clarifier sludge (sludge generated at LTV's wastewater treatment plant), BOF slag, blast furnace slag and mixed rubble. The grades were designed to provide positive drainage of the landfill area. The original design grades called for a maximum slope of approximately 33 percent (1V on 3H) on the landfill side slopes and a minimum slope of six (6) percent on the uppermost area.

2.3 GAS CONTROL VENTS

The decomposition of the solid wastes contained in a landfill can lead to the production of various gases, of which methane is of most concern. The buildup and migration of methane gas must be controlled to prevent explosion hazards. Due to the inert nature of the waste disposed in the Clarifier Sludge Area, a gas venting system was not considered necessary; however, a passive gas venting system consisting of seventeen (17)

PVC pipes (6-inches in diameter) was designed to facilitate gas migration through the final cover system, in response to NYSDEC requests as a precautionary measure to prevent the buildup of any gases.

2.4 RECOMPACTED SOIL BARRIER LAYER

A nominal 18-inch thick recompacted soil barrier layer was designed to minimize leachate generation by reducing surface water infiltration into the landfill. The final cover system as a whole was designed to limit infiltration, promote surface water drainage and minimize erosion. The recompacted soil barrier layer was designed to achieve a maximum permeability of 1.0×10^{-7} cm/s.

2.5 TOPSOIL AND VEGETATION

A nominal 12-inch topsoil layer was designed to be placed over the barrier layer to support the establishment of vegetative growth (viz. grass). The grass mixture was designed specifically to prevent soil erosion and minimize long-term maintenance.

2.6 SURFACE WATER CONTROL

To minimize the potential for erosion and damage to the barrier layer, drainage ditches were designed for construction around the eastern periphery of the Clarifier Sludge Area. The final cover system was designed to extend through the bottom of all drainage ditches to further reduce surface water infiltration. Vegetative cover was also designed to be established in the drainage ditches to prevent surface soil erosion and ditch washout. In addition, all ditches were lined with an anti-erosion matting as an aid to turf establishment and to prevent soil and vegetative washout during periods of high rainfall. Riprap was designed to be placed in ditches where the slope exceeded 5 percent. The drainage system is designed for a 25-year, 24-hour storm.

3.0 FINAL COVER SYSTEM MATERIALS AND CONSTRUCTION

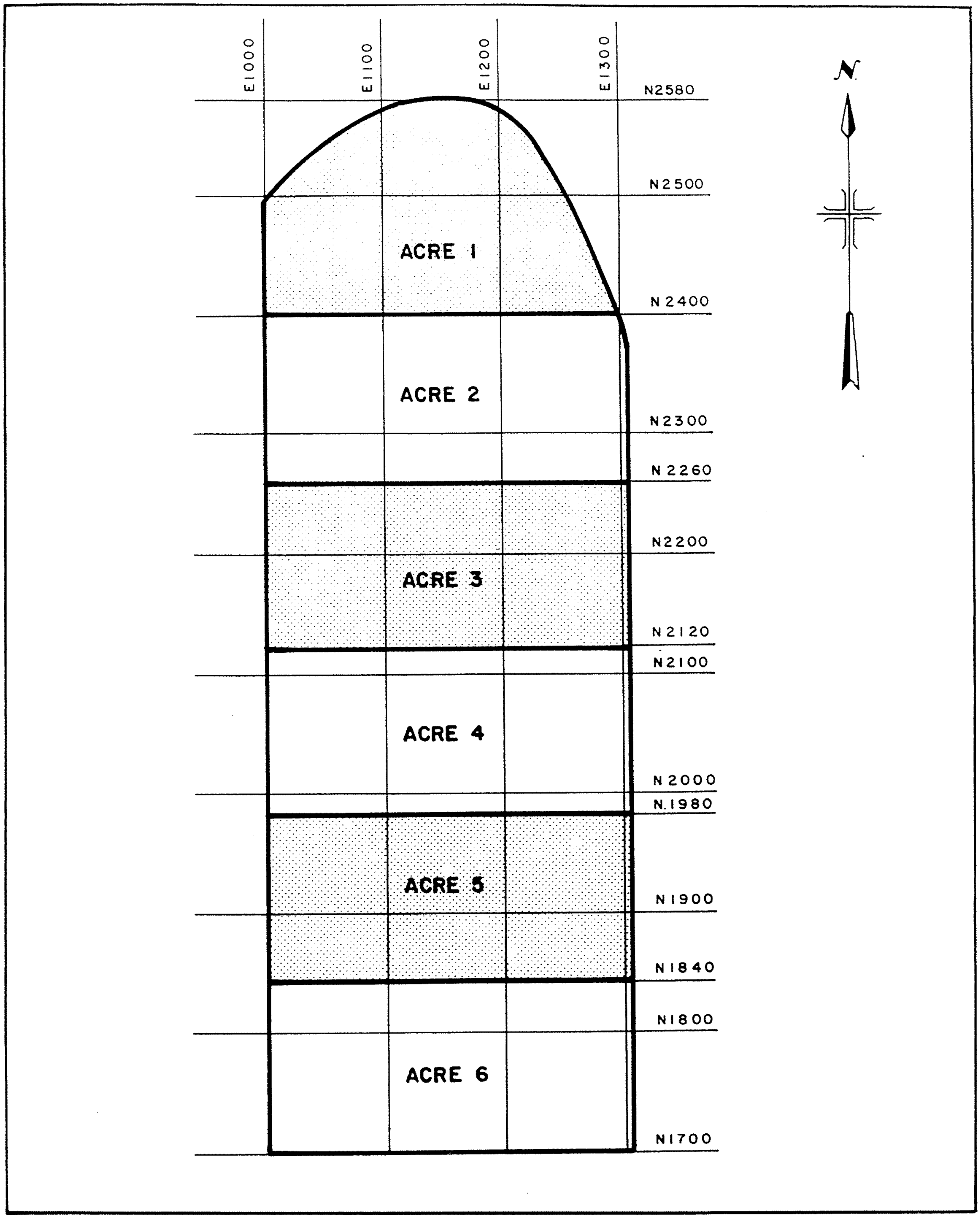
3.1 GENERAL

This section describes the various materials and methods of construction utilized for the final cover system construction in the Clarifier Sludge Area. Construction activities began July 24, 1990 with the collection of barrier layer material soil samples from the borrow area. The landfill surface was then divided into twelve areas, each approximately an acre in size, to help monitor and control construction quality assurance procedures and testing during the placement of the barrier layer material. See Figures 3A and 3B for the location of these areas in relation to the vertical and horizontal control grid system. Contract No. 2 also included simultaneous regrading of the Miscellaneous Debris Areas subgrade during construction of the Clarifier Sludge Area cover system.

3.2 SUBGRADE PREPARATION

Prior to initiation of subgrade preparation activities, the Clarifier Sludge Area was surveyed by the Contractor's licensed land surveyor to establish the existing elevations of the landfill surface prior to cover system construction. Subgrade preparation activities began on September 20, 1989. The Contractor began his construction activities on the south slope of the Clarifier Sludge Area by utilizing two Caterpillar D8N bulldozers to spread and regrade the fill material. Actual side slope grades varied from 20 to 35 percent with an overall average slope of approximately 31 percent. A minimum slope of four percent was established on the uppermost area to promote surface water run-off. The average slope of the upper landfill surface was approximately 8 percent. The subgrade was then compacted with a sheepsfoot roller and proof-rolled.

The Contractor's surveyor also established a grid system and baselines for the project to facilitate checking elevations and grades. Elevations of the completed subgrade were recorded at each grid intersection point for use at a later date to verify final cover system thickness.



QUALITY ASSURANCE TESTING AREAS
CLARIFIER SLUDGE AREA

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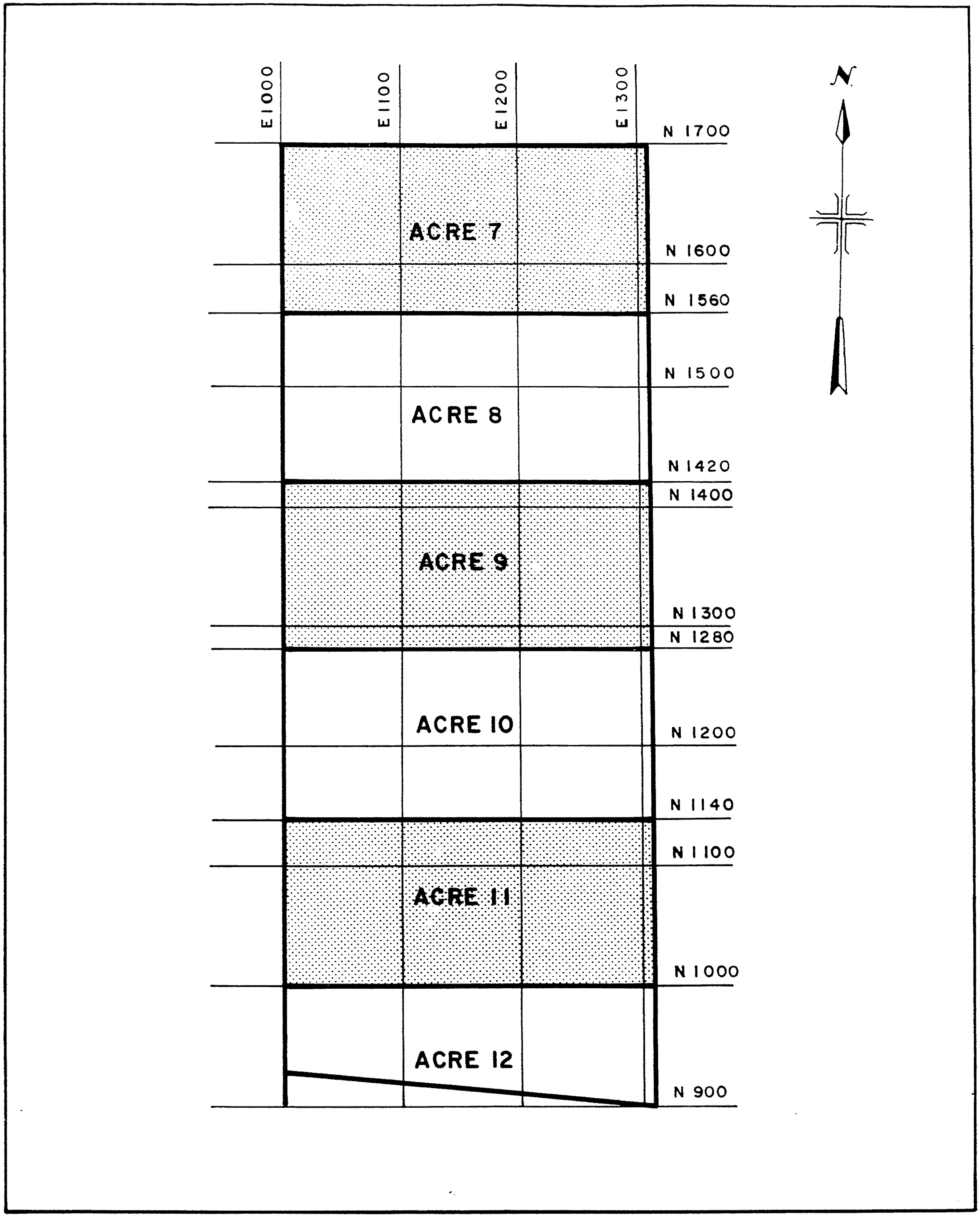

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QUALITY ASSURANCE TESTING AREAS
CLARIFIER SLUDGE AREA

LTV STEEL COMPANY

During the subgrade preparation work, two relatively significant modifications on the original design were required. One modification was required as a result of the location of the western property line. The other was the result of the discovery of unstable fill material located along the northernmost side slope. Each is discussed in more detail below.

3.2.1 Property Line Location

The approximate property line location shown on the approved design plans was prepared using the best information that was available at the time the design documents were completed. It was the Contractor's responsibility to locate the actual property line in the field using a licensed Land Surveyor.

The Contractor's survey revealed that the west property line was actually located 27 feet east of the location shown on the design plans. The revised location, therefore, reduced the surface area of the Clarifier Sludge Area. This reduced the amount of materials required for construction of the final cover system and increased the volume of fill to be regraded. Grades and elevations were adjusted accordingly.

Fill materials located outside (west of) the property line were excavated and then incorporated into the subgrade of the Clarifier Sludge Area as required by the Contract Documents. This had the beneficial effect of improving wetland quality and increasing the wetland surface area.

3.2.2 North Slope Modifications

While regrading the subgrade on the northern slope of the Clarifier Sludge Area, a significant volume of unstable fill material was encountered near the bottom of the slope. Due to the large area and depth involved, the fine-grained texture of the material and its high moisture content, there was concern about the slope's stability. If the slope were cut back to the 1V:3H grade as designed, it was speculated that the increased amount of weight being placed at the top of slope could cause the entire slope to become unstable and result in a massive slide of waste material into the wetlands.

To minimize the potential for slope stability problems and reduce long-term maintenance requests, a revised grading plan incorporating a 1V:4H slope was developed and implemented. This required the placement of clean, off-site fill approximately 35 feet into the wetlands. A well-graded sand and gravel mixture from the Oliveri Gravel Pit in Orchard Park was used for this purpose.

Prior to proceeding with this work, the NYSDEC was contacted for permission to proceed. A copy of the wetlands permit along with the NYSDEC approval letter for modification of the permit is included in Appendix 2.

3.3 GAS CONTROL

The gas venting system was installed after completion of the final cover system construction. A backhoe was utilized to excavate holes approximately three feet deep into the waste. Nonwoven filter fabric (Carthage FX40 NW) was then placed into the holes prior to backfilling them with crushed stone. Fabric was also placed above the stone.

Vent pipes constructed of 6-inch Schedule 40 PVC were then extended approximately 1-1/2 feet into the gravel. Each pipe extends approximately three feet above the final cover system and is fitted with a 180° return bend and cap. Holes were drilled into each cap to allow the collected gas to escape.

The Contractor reconstructed the cover system above the gas vents by compacting the barrier layer material in 6-inch compacted lifts using a mechanical tamper. The topsoil was also replaced. The final locations of the gas vents are shown on the record drawings.

3.4 RECOMPACTED SOIL BARRIER LAYER

3.4.1 Material Evaluation

The material utilized for construction of the barrier layer was off-site material excavated from the "Wheatfield Lakes Project" mining area located in the Town of Wheatfield, New York. The project specifications for the soil barrier material required that it conform to the following general gradation requirements:

Sieve Size	Minimum Percent Passing By Weight
3-inch	100
No. 4	85
No. 200	50
0.002 MM	25

In addition, the material specifications required that the laboratory recompacted permeability of the soil be less than or equal to 1 x 10^{-7} cm/s. Although Atterberg Limits were not an acceptance requirement, they were monitored to aid in classifying the soils encountered and, in correlation with other soil properties, to help define the soils behavior (such as permeability and compactibility).

Moisture-density relationships were also developed during materials evaluation testing and were used as the primary indication of whether optimal moisture content and minimum compaction requirements were achieved during construction. All soil material evaluations were performed by the Malcolm Pirnie, Inc. Soils Testing Laboratory.

Prior to mining, the Contractor established baseline survey data for the mining site. Next, the mining site was divided into seven areas. Five test pits were excavated in each area and representative soil samples from each test pit were composited for laboratory analyses. The sketch included in Appendix 4.1 depicts the mining area layout with test pit locations.

Malcolm Pirnie personnel collected all soil samples of the barrier layer material for materials testing. Malcolm Pirnie Inc.'s soils laboratory then conducted the following analyses on the material to determine if it was acceptable for use as soil barrier layer material:

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TABLE 3-1

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT

BARRIER LAYER MATERIAL
SAMPLE NUMBER/COMPOSITE SUMMATION

SAMPLE NUMBER	COMPOSITE MAKE-UP
TP-1 TP-2 TP-3 TP-4 TP-5	Components of Composite #1
TP-6 TP-7 TP-8 TP-9 TP-10	Components of Composite #2
TP-11 TP-12 TP-13 TP-14 TP-15	Components of Composite #3
TP-16 TP-17 TP-18 TP-19 TP-20	Components of Composite #4
TP-21 TP-22 TP-23 TP-24 TP-25	Components of Composite #5
TP-26 TP-27 TP-28 TP-29 TP-30	Components of Composite #6
TP-31 TP-32 TP-33 TP-34 TP-35	Components of Composite #7

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TABLE 3-2

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT

BARRIER LAYER MATERIAL
GRAIN SIZE ANALYSES

COMPOSITE NUMBER	SAMPLE NUMBER	MOISTURE CONTENT %	PERCENT MINIMUM PASSING BY WEIGHT			
			3-INCH	NO. 4	NO.200	.002 mm
Specification			100.0	85.0	50.0	25.0
1	TP-1	40.4	100.0	98.9	98.8	62.7
	TP-2	36.4	100.0	99.0	98.4	52.2
	TP-3	40.0	100.0	99.0	98.9	52.8
	TP-4	32.6	100.0	98.1	97.7	41.5
	TP-5	34.9	100.0	99.0	98.7	56.2
2	TP-6	31.7	100.0	99.9	99.7	52.6
	TP-7	32.7	100.0	99.7	99.6	59.3
	TP-8	31.1	100.0	99.7	99.7	61.5
	TP-9	33.0	100.0	99.6	99.6	56.4
	TP-10	36.3	100.0	99.3	99.3	60.7
3	TP-11	22.0	100.0	99.1	99.1	49.1
	TP-12	33.9	100.0	99.4	99.2	47.4
	TP-13	38.0	100.0	99.4	99.2	49.7
	TP-14	32.1	100.0	99.8	99.4	54.5
	TP-15	35.0	100.0	99.8	99.8	59.6
4	TP-16	29.1	100.0	99.8	99.8	64.3
	TP-17	22.4	100.0	99.8	99.8	62.9
	TP-18	32.0	100.0	99.8	99.7	62.9
	TP-19	33.4	100.0	99.8	99.7	59.7

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TABLE 3-2 (continued)

BARRIER LAYER MATERIAL
GRAIN SIZE ANALYSES

COMPOSITE NUMBER	SAMPLE NUMBER	MOISTURE CONTENT %	PERCENT MINIMUM PASSING BY WEIGHT			
			3-INCH	NO. 4	NO.200	.002 mm
Specification			100.0	85.0	50.0	25.0
	TP-20	33.6	100.0	99.6	99.6	52.8
5	TP-21	22.9	100.0	99.5	99.4	61.1
	TP-22	18.2	100.0	99.1	98.9	61.6
	TP-23	23.6	100.0	99.3	99.3	60.1
	TP-24	18.9	100.0	99.5	99.5	61.0
	TP-25	17.6	100.0	99.5	99.5	52.0
6	TP-26	23.0	100.0	99.6	99.0	64.0
	TP-27	25.4	100.0	99.6	99.5	60.1
	TP-28	27.1	100.0	99.9	99.9	62.4
	TP-29	25.5	100.0	99.6	99.6	62.9
	TP-30	21.0	100.0	99.4	99.3	61.7
7	TP-31	23.8	100.0	99.6	99.6	64.8
	TP-32	17.0	100.0	99.8	99.8	58.9
	TP-33	20.3	100.0	99.6	99.5	57.4
	TP-34	27.4	100.0	99.7	99.7	64.4
	TP-35	22.5	100.0	99.7	99.7	63.2

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TABLE 3-3

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT

BARRIER LAYER MATERIAL
ATTERBERG LIMIT TEST RESULTS

SAMPLE NUMBER	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX
TP-1	41	21	20
TP-2	37	19	18
TP-3	35	20	15
TP-4	32	18	14
TP-5	37	21	16
TP-6	39	21	18
TP-7	41	23	18
TP-8	43	22	21
TP-9	42	23	19
TP-10	42	21	21
TP-11	37	19	18
TP-12	35	19	16
TP-13	39	21	18
TP-14	40	20	20
TP-15	42	22	20
TP-16	44	24	20
TP-17	45	23	22
TP-18	45	23	22
TP-19	45	24	21
TP-20	44	22	22
TP-21	42	22	20

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TABLE 3-3 (continued)

**BARRIER LAYER MATERIAL
ATTERBERG LIMIT TEST RESULTS**

SAMPLE NUMBER	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX
TP-22	44	22	22
TP-23	42	23	19
TP-24	42	23	19
TP-25	40	22	18
TP-26	46	23	23
TP-27	46	22	24
TP-28	43	23	20
TP-29	44	22	22
TP-30	42	22	20
TP-31	46	22	24
TP-32	46	22	24
TP-33	47	22	25
TP-34	48	22	26
TP-35	45	22	23

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TABLE 3-4

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT

BARRIER LAYER MATERIAL
PROCTOR CURVE AND RECOMPACTED PERMEABILITY RESULTS

SAMPLE NUMBER	OPTIMUM MOISTURE CONTENT	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT	MAXIMUM DRY DENSITY	RECOMPACTED PERMEABILITY	PERCENT COMPACTION OF MODIFIED PROCTOR
	% (Modified)	pcf (Modified)	% (Standard)	pcf (Standard)	cm/sec	%
COMP 1	15.0	117.0	19.7	107.7	7.3 E-9	92.1
COMP 2	17.3	114.8	20.8	104.5	3.8 E-9	93.2
COMP 3	15.0	116.8	20.5	106.8	1.2 E-8	91.6
COMP 4	16.4	115.1	21.4	105.9	3.3 E-9	97.3
COMP 5	14.7	117.5	20.4	106.9	6.3 E-9	88.0
COMP 6	16.4	116.9	20.8	105.7	4.6 E-9	93.7
COMP 7	15.4	116.1	20.4	104.7	6.3 E-9	90.4

Test	Method	Frequency
Grain Size	ASTM 421, 422	1 per 1,000 cu. yd.
Moisture Content	ASTM D 2216	1 per 1,000 cu. yd.
Atterberg Limits (Liquid and Plastic Limit)	ASTM D 4318	1 per 1,000 cu. yd.
Modified Proctor Test	ASTM D 1557	1 per 5,000 cu. yd.
Standard Proctor Test	ASTM D698	1 per 5,000 cu.yd.
Recompacted Permeability	Current Literature	1 per 5,000 cu. yd.
Specific Gravity	ASTM D854	1 per 5,000 cu. yd.

28,500

The Clarifier Sludge Area is 11 acres in size. It received a minimum of 18 inches of recompacted barrier layer material during final cover system construction. Table 3-1 summarizes which individual samples comprise the various soil composites. Thirty-five (35) Grain Size, thirty-five (35) Moisture Content, thirty-five (35) Atterberg Limits, seven (7) Modified and Standard Proctor Curves, seven (7) Recompacted Laboratory Permeability Tests, and seven (7) Specific Gravity Tests were performed to demonstrate conformance of the barrier material soil with the Contract Documents. A summary of the particle size analyses and moisture contents, Atterberg Limits, moisture-density relationships/laboratory permeabilities are presented in Tables 3-2, 3-3, and 3-4 respectively. The laboratory test reports for particle size analysis, moisture-density relationships, and laboratory recompacted permeability tests are presented in Appendix 4.

3.4.2 Placement and Compaction

Prior to placing barrier layer soil on the Clarifier Sludge Area, two test patches were constructed at the landfill to determine the compactive effort required for construction and to check the suitability of the material. The test patch results were sent to the NYSDEC for review on August 21, 1990 and approved on August 23, 1990 (see Appendix 3).

Vargo Trucking performed the mining and transportation of material for Beaver Excavating. Tandem-end dump trucks were utilized to move soil from the mining area to the landfill where it was dumped and then graded by bulldozers to approximately 8-inch loose lifts. Lift thickness was controlled by grade stakes set in a 100-foot grid pattern and tied into the previously established grid system. Beaver Excavating placed the soil in three (3), nominal six (6)-inch (after compaction) lifts, to form a recompacted barrier layer eighteen (18) inches thick. Each lift was compacted with a sheepsfoot roller to achieve a minimum density of not less than 90 percent of the Modified Proctor dry density as determined by ASTM D 1557. The moisture content of the soil was adjusted as necessary using either a water truck or by spraying the loose lift area with a hose to achieve a moisture content greater than optimum as determined by representative Proctor moisture-density relationships.

Upon completion of all three lifts and prior to placement of the topsoil, a final survey was performed on the recompacted soil barrier layer. The final grades were compared against the initial grades on the approved subgrade to confirm a minimum barrier layer thickness of 18 inches.

Placement of all three lifts of barrier layer material, along with 12 inches of topsoil over Areas 1 through 6, were completed prior to the Contractor's winter shutdown in December 1990. These areas had been tested for moisture-density and permeability and had been determined to be acceptable at the time of shutdown.

Construction activities resumed for the 1991 season on May 23, 1991. Placement of all three lifts of barrier layer material over Areas 7 through 12 was completed in June 1991. All of the areas completed in 1991 were tested for moisture-density and permeability and were determined to be acceptable.

3.5 TOPSOIL AND VEGETATIVE GROWTH

3.5.1 Topsoil

The Contractor began topsoil delivery from the mining area in Orchard Park, New York on August 1, 1990. Topsoil was transported to the Clarifier Sludge Area via dump trucks and placed on the top segment of the landfill. The material was then spread over the landfill with the Case 1150E bulldozer. Topsoil placement activities were completed in July 1991.

The Contractor's surveyors then performed a topographic survey verifying that a minimum of 12-inches of topsoil were placed.

3.5.2 Vegetative Growth

Landscaping and Reclamation Specialists, Inc., a subcontractor for Beaver Excavating, began the seeding operation on August 22, 1991. After the topsoil layer was raked of debris and stones, the subcontractor applied a starter fertilizer (10-10-10) and reworked and loosened the soil. Once the surface was prepared, a hydroseed slurry consisting of seed, fertilizer and wood mulch was applied. The entire surface of the Clarifier Sludge Area was seeded with approximately 100 lbs/acre of seed conforming to the following mixture:

Name of Grass	Application Rate
Perennial Ryegrass	10 lbs/acre
Kentucky Bluegrass	20 lbs/acre
Strong Creeping Red Fescue	20 lbs/acre
Chewings Fescue	20 lbs/acre
Hard Fescue	20 lbs/acre
White Clover	10 lbs/acre

In addition, drainage ditches were seeded with approximately 62 lbs/acre of the following seed mixture to help prevent ditch erosion:

Name of Grass	Application Rate
Tall Fescue (Kentucky 32)	20 lbs/acre
Creeping Red Fescue	20 lbs/acre
Red Top	4 lbs/acre
Empire Birdsfoot Trefoil	8 lbs/acre
Garrison Creeping Foxtail	10 lbs/acre

After the seeding was completed, biodegradable anti-erosion matting manufactured by North American Green, Type S-75, was used to line ditches with slopes less than 5 percent.

3.6 SURFACE WATER CONTROL

The Contractor placed biodegradable anti-erosion matting manufactured by North American Green, Type S-75, on the perimeter ditches with slopes less than 5%. On ditch slopes greater than 5%, nonbiodegradable anti-erosion matting manufactured by Mirafi, type 140N, was placed along with riprap to control erosion.

4.0 CONSTRUCTION MONITORING DOCUMENTATION

4.1 GENERAL

This section describes the field and laboratory testing activities used during construction of the final cover system. Survey control procedures used to measure the construction lines and grades are also discussed.

4.2 ON-SITE SUPERVISION

Malcolm Pirnie personnel were on-site on a daily basis during construction to observe the construction activities, take field measurements, and to perform, record and summarize on-site testing results. Daily inspector's reports were prepared by Malcolm Pirnie personnel to document the construction activities. The inspector reports (for the period of July 24, 1990 through August 26, 1991) are included in Appendix 5. Weekly status reports to the NYSDEC are included in Appendix 6.

4.3 SURVEY DATA

Beaver Excavating Company utilized their on-staff licensed Professional Land Surveyor to perform all survey work required for the final cover system construction at the Marilla Street Landfill. All survey work is referenced to the 100-foot x 100-foot horizontal grid system and bench marks established for the project. Spot elevations are shown on the survey plan sheets in Appendix 10 for the top of the finished subgrade, recompacted soil barrier layer, and topsoil layer. Thicknesses for each layer are tabulated in Appendix 7.

4.4 CONSTRUCTION QUALITY ASSURANCE TESTING

4.4.1 General

Thickness verification was performed for each layer of the final cover system (see Appendix 7 for survey data). Survey data confirmed that in all locations, the minimum design thickness for each layer of the cover system was achieved. Additional field construction quality assurance testing was required for the recompacted soil barrier layer. These additional quality assurance tests are discussed in detail below in Sections 4.4.2 and 4.4.3.

4.4.2 Recompacted Soil Barrier Layer

Malcolm Pirnie on-site personnel conducted the following construction quality assurance tests during the placement of the soil barrier layer material.

Test	Method	Frequency
In-place Moisture/Density Tests	ASTM D2922-81 D3017-78	Minimum of 9 tests per acre per lift.
Undisturbed Laboratory Permeability Tests (Shelby-tube tests)		Minimum of 1 test per 1 acre per lift

In-place moisture-density testing was performed by Malcolm Pirnie on-site personnel in accordance with ASTM D2922-81 and D3017-75. A Troxler 3411 Nuclear Densitometer was used to measure the in-place moisture content and dry density of the recompacted cover material during construction. The major acceptance criteria for the in-place recompacted barrier soil layer was a dry density of not less than 90% of the Modified Proctor maximum dry density as determined by ASTM D 1557 plus an in-place moisture content that was wet of optimum. In addition, in accordance with the QA Plan and recent NYSDEC recommendations, the measured in-place moisture content and density were considered acceptable only as long as eighty percent (80%) of the data plotted above a line on a graph which was determined by the line of optimums less two (2) percent moisture and all points plotted above a line which was determined by the line of optimum less four (4) percent moisture. Representative modified and standard Proctor curves were used. The line of optimums was a curve which passed through the maximums of both the standard and modified Proctor curves parallel to the curve of zero air voids. The daily inspector reports containing the in-place moisture-density test results and applicable Proctor curve plots are

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TABLE 4-1

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
8/30/90	1/1	A1-1-1	95.5
		A1-1-2	90.8
8/31/90		A1-1-3	92.5
		Al-1-4	94.7
		A1-1-5	96.6
		A1-1-6	94.3
		A1-1-7	91.1
		A1-1-8	93.2
9/12/90		A1-1-9	95.2
9/4/90	2/1	A1-2-1	92.5
		A1-2-2	96.2
		A1-2-3	94.0
		A1-2-4	93.1
		A1-2-5	96.4
		A1-2-6	96.8
9/14/90		A1-2-7	94.0
		A1-2-8	95.8
9/25/90		A1-2-9	96.7
		A1-2-10	98.4
9/27/90	3/1	A1-3-1	97.0
		A1-3-2	92.6
		A1-3-3	97.1
		A1-3-4	94.4
		A1-3-5	93.6
		A1-3-6	94.0
		A1-3-7	94.2
		A1-3-8	92.9
		A1-3-9	94.3
		A1-3-10	92.3

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
9/11/90	1/2	A2-1-1	96.3
		A2-1-2	96.6
		A2-1-3	92.9
9/12/90		A2-1-4	93.6
		A2-1-5	90.9
		A2-1-6	94.4
		A2-1-7	90.1
		A2-1-8	97.9
		A2-1-9	93.2
		A2-1-10	95.4
9/13/90	2/2	A2-2-1	96.1
		A2-2-2	93.8
		A2-2-3	95.0
		A2-2-4	96.1
		A2-2-5	100.1
		A2-2-6	91.0
9/14/90		A2-2-7	96.3
		A2-2-8	98.3
		A2-2-9	99.4
		A2-2-10	98.9
9/27/90	3/2	A2-3-1	97.8
		A2-3-2	92.4
		A2-3-3	92.0
		A2-3-4	94.9
9/28/90		A2-3-5	93.3
		A2-3-6	95.3
		A2-3-7	96.3
		A2-3-8	95.8
		A2-3-9	90.8
		A2-3-10	94.5

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TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
9/4/90	1/3	A3-1-1	93.7
		A3-1-2	91.4
		A3-1-3	92.4
9/11/90		A3-1-4	92.2
9/14/90		A3-1-5	97.0
9/17/90		A3-1-6	98.9
9/18/90		A3-1-7	100.3
		A3-1-8	95.2
		A3-1-9	94.9
		A3-1-10	96.5
9/18/90	2/3	A3-2-1	96.0
		A3-2-2	97.5
9/20/90		A3-2-3	97.1
		A3-2-4	97.8
		A3-2-5	97.7
		A3-2-6	96.1
		A3-2-7	94.5
		A3-2-8	98.6
9/27/90		A3-2-9	97.0
		A3-2-10	93.1
9/28/90	3/3	A3-3-1	91.8
		A3-3-2	95.1
		A3-3-3	94.1
		A3-3-4	92.8
		A3-3-5	93.8
		A3-3-6	95.8
		A3-3-7	93.4
		A3-3-8	93.1
		A3-3-9	97.2
		A3-3-10	93.7

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
9/4/90	1/4	A4-1-1	95.5
		A4-1-2	95.8
10/2/90		A4-1-3	94.1
10/2/90		A4-1-2A	97.4
10/3/90		A4-1-1A	91.1
		A4-1-4	97.3
10/6/90		A4-1-5	94.2
		A4-1-6	93.0
		A4-1-7	93.4
		A4-1-8	93.3
		A4-1-9	93.1
		A4-1-10	99.8
10/30/90	2/4	A4-2-1	91.8
		A4-2-2	93.6
		A4-2-3	90.8
10/31/90		A4-2-4	93.3
		A4-2-5	92.0
		A4-2-1A	94.9
11/1/90		A4-2-6	95.7
		A4-2-7	94.2
		A4-2-8	100.0
		A4-2-9	94.2
		A4-2-10	90.2
11/1/90	3/4	A4-3-1	92.0
		A4-3-2	95.4
11/2/90		A4-3-3	96.0
		A4-3-4	92.4
11/3/90		A4-3-5	93.9
		A4-3-6	94.5
11/16/90		A4-3-7	94.2
11/30/90		A4-3-8	93.8
		A4-3-9	92.2
		A4-3-10	93.3
		A4-3-11	92.9
		A4-3-12	94.6
		A4-3-13	95.3

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TABLE 4-1 (continued)

BARRIER LAYER MATERIAL IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
10/3/90	1/5	A5-1-1	94.6
		A5-1-2	97.4
		A5-1-3	93.6
10/6/90		A5-1-4	94.9
		A5-1-5	96.4
10/16/90		A5-1-6	94.3
		A5-1-7	93.0
		A5-1-8	96.8
		A5-1-9	96.6
		A5-1-10	97.5
10/30/90	2/5	A5-2-1	96.9
		A5-2-2	92.9
		A5-2-3	92.6
		A5-2-4	94.5
10/31/90		A5-2-5	96.3
		A5-2-6	92.8
11/1/90		A5-2-7	94.6
		A5-2-8	92.6
		A5-2-9	90.2
		A5-2-10	92.6
11/1/90	3/5	A5-3-1	95.3
11/2/90		A5-3-2	95.1
		A5-3-3	95.2
		A5-3-4	95.0
11/3/90		A5-3-5	96.5
		A5-3-6	93.1
		A5-3-7	96.1
		A5-3-8	94.6
12/1/90		A5-3-9	96.8
		A5-3-10	94.9
		A5-3-11	94.7
		A5-3-12	97.6
		A5-3-13	97.7

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TABLE 4-1 (continued)

BARRIER LAYER MATERIAL IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
10/6/90	1/6	A6-1-1	91.0
		A6-1-2	96.6
10/16/90		A6-1-3	95.2
		A6-1-4	92.8
		A6-1-5	93.9
		A6-1-6	95.0
10/17/90		A6-1-7	98.6
		A6-1-8	94.0
		A6-1-9	97.4
		A6-1-10	95.8
10/31/90	2/6	A6-2-1	95.3
		A6-2-2	93.0
		A6-2-3	92.6
		A6-2-4	93.8
		A6-2-5	90.5
		A6-2-6	92.6
11/1/90		A6-2-7	91.6
		A6-2-8	95.2
		A6-2-9	95.9
		A6-2-10	96.7
11/2/90	3/6	A6-3-1	95.5
		A6-3-2	94.1
		A6-3-3	92.3
11/3/90		A6-3-4	95.0
		A6-3-5	93.4
		A6-3-6	96.3
		A6-3-7	95.3
12/1/90		A6-3-8	94.0
		A6-3-9	92.1
		A6-3-10	93.3
		A6-3-11	93.2
		A6-3-12	93.4
		A6-3-13	95.2

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
5/23/91	1/7	A7-1-1	97.4
		A7-1-2	98.9
		A7-1-3	92.8
		A7-1-4	92.2
		A7-1-5	92.8
5/24/91		A7-1-6	94.6
		A7-1-7	93.1
		A7-1-8	92.0
5/30/91		A7-1-9	95.3
		A7-1-10	94.7
5/28/91	2/7	A7-2-1	94.1
		A7-2-2	94.1
		A7-2-3	94.9
		A7-2-4	96.3
5/29/91		A7-2-5	96.4
		A7-2-6	96.0
		A7-2-7	97.2
		A7-2-8	93.2
5/30/91		A7-2-9	91.8
		A7-2-10	94.4
5/31/91	3/7	A7-3-1	94.3
		A7-3-2	97.0
		A7-3-3	92.8
		A7-3-4	94.0
6/1/91		A7-3-5	96.2
		A7-3-6	95.9
		A7-3-7	100.6
		A7-3-8	96.2
6/4/91		A7-3-9	98.8
		A7-3-10	95.0

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TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
5/23/91	1/8	A8-1-1	96.9
		A8-1-2	93.5
		A8-1-3	94.7
5/24/91		A8-1-4	95.0
		A8-1-5	93.2
		A8-1-6	92.0
		A8-1-7	94.2
		A8-1-8	91.6
		A8-1-9	95.9
		A8-1-10	92.6
5/28/91	2/8	A8-2-1	92.1
		A8-2-2	92.3
		A8-2-3	94.8
		A8-2-4	94.1
5/29/91		A8-2-5	96.3
		A8-2-6	96.3
		A8-2-7	95.8
		A8-2-8	95.1
5/30/91		A8-2-9	92.4
		A8-2-10	91.6
5/31/91	3/8	A8-3-1	93.8
		A8-3-2	96.0
		A8-3-3	95.9
		A8-3-4	93.1
		A8-3-5	94.2
		A8-3-6	94.4
		A8-3-7	95.9
		A8-3-8	97.2
		A8-3-9	96.8
		A8-3-10	95.6

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
5/23/91	1/9	A9-1-1	92.3
		A9-1-2	93.2
		A9-1-3	91.8
5/24/91		A9-1-4	96.1
5/28/91		A9-1-5	94.5
		A9-1-6	90.9
		A9-1-7	96.3
		A9-1-8	93.6
		A9-1-9	95.6
		A9-1-10	94.1
5/28/91	2/9	A9-2-1	94.4
		A9-2-2	95.1
		A9-2-3	95.6
		A9-2-4	96.5
5/30/91		A9-2-5	98.4
		A9-2-6	94.1
		A9-2-7	92.9
		A9-2-8	98.5
		A9-2-9	90.3
		A9-2-10	94.2
5/31/91	3/9	A9-3-1	95.4
		A9-3-2	94.5
		A9-3-3	94.9
		A9-3-4	90.8
		A9-3-5	93.0
		A9-3-6	94.9
		A9-3-7	97.8
		A9-3-8	92.9
		A9-3-9	99.1
		A9-3-10	100.1

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TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
6/1/91	1/10	A10-1-1	94.4
6/3/91		A10-1-2	93.2
		A10-1-3	95.3
		A10-1-4	96.6
		A10-1-5	97.1
6/4/91		A10-1-6	90.4
		A10-1-7	96.6
		A10-1-8	96.3
		A10-1-9	90.7
6/26/91		A10-1-10	96.7
6/5/91	2/10	A10-2-1	94.0
		A10-2-2	93.1
		A10-2-3	98.0
		A10-2-4	92.7
		A10-2-5	97.4
		A10-2-6	93.8
		A10-2-7	98.8
		A10-2-8	92.0
		A10-2-9	91.4
6/26/91		A10-2-10	94.3
6/6/91	3/10	A10-3-1	93.8
		A10-3-2	93.9
		A10-3-3	94.7
		A10-3-4	95.1
6/7/91		A10-3-5	91.3
		A10-3-6	100.6
		A10-3-7	95.2
		A10-3-8	95.2
6/14/91		A10-3-9	94.7
6/26/91		A10-3-10	96.4

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
6/1/91	1/11	A11-1-1	90.5
		A11-1-2	92.7
6/3/91		A11-1-3	94.8
6/4/91		A11-1-4	95.4
		A11-1-5	92.0
		A11-1-6	94.1
		A11-1-7	102.0
		A11-1-8	95.9
		A11-1-9	96.6
		A11-1-10	96.3
6/5/91	2/11	A11-2-1	96.9
		A11-2-2	93.1
		A11-2-3	95.2
		A11-2-4	96.6
		A11-2-5	97.5
		A11-2-6	96.5
6/6/91		A11-2-7	91.9
		A11-2-8	96.6
		A11-2-9	97.1
		A11-2-10	93.7
6/6/91	3/11	A11-3-1	91.2
		A11-3-2	93.9
6/12/91		A11-3-3	95.5
		A11-3-4	95.1
6/13/91		A11-3-5	97.8
		A11-3-6	97.2
		A11-3-7	96.6
		A11-3-8	96.2
		A11-3-9	96.0
6/14/91		A11-3-10	98.0
6/19/91	1/12	A12-1-2	94.3
		A12-1-2	96.9
		A12-1-3	94.6
		A12-1-4	96.1
6/20/91		A12-1-5	91.6

Area 12 < 1 acre in size

TABLE 4-1 (continued)

BARRIER LAYER MATERIAL
IN-PLACE DENSITY TEST RESULTS

DATE	LIFT/AREA	TEST NO.	% OF MAX. MODIFIED PROCTOR DENSITY
6/20/91	2/12	A12-2-1	94.4
		A12-2-2	93.1
		A12-2-3	96.3
		A12-2-4	95.9
		A12-2-5	92.8
6/20/91	3/12	A12-3-1	96.2
		A12-3-2	94.6
6/21/91		A12-3-3	99.7
		A12-3-4	97.3
		A12-3-5	92.0

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TABLE 4-2

MARILLA STREET LANDFILL CLOSURE
CONTRACT NO. 2

CONSTRUCTION MONITORING REPORT
UNDISTURBED LABORATORY PERMEABILITY RESULTS

Specification: Permeability to be ≤ 1.0 x 10^{-7} cm/sec.

SAMPLE NUMBER			PERMEABILITY (cm/sec)
Area 1	Lift	1	2.7 E-8
		2	1.9 E-8
		3	2.9 E-8
Area 2	Lift	1	1.8 E-8
		2	2.0 E-8
		3	4.3 E-8
Area 3	Lift	1	1.2 E-8
		2	1.2 E-8
		3	1.9 E-8
Area 4	Lift	1	1.2 E-8
		2	1.4 E-8
		3	1.5 E-8
Area 5	Lift	1	8.7 E-9
		2	9.0 E-9
		3	1.3 E-8
Area 6	Lift	1	1.0 E-8
		2	1.1 E-8
		3-1	2.5 E-7*
		3-2	6.7 E-8
Area 7	Lift	1	9.3 E-9
		2	1.4 E-8
		3	1.1 E-8
Area 8	Lift	1	1.7 E-8
		2	5.1 E-9
		3	3.9 E-8
Area 9	Lift	1	2.6 E-8
		2	3.0 E-8
		3	2.6 E-8

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TABLE 4-2 (continued)

UNDISTURBED LABORATORY PERMEABILITY RESULTS

SAMPLE NUMBER			PERMEABILITY (cm/sec)
Area 10	Lift	1	2.6 E-8
		2	1.2 E-8
		3	1.6 E-8
Area 11	Lift	1	2.7 E-8
		2	1.2 E-8
		3	3.3 E-8
Area 12	Lift	1	4.5 E-8
		2	1.9 E-8
		3	1.4 E-8

* Initial tube failure was determined to be due to deformation of the sample during extraction caused by a stone in the sample. Duplicate tube was tested with acceptable results.

presented in Appendix 5. Table 4-1 summarizes the density results from the inspector reports. In all cases, the material was wet of optimum during compaction activities.

Three hundred fifty-six (356) nuclear densitometer moisture/density tests were performed over the landfill surface area (or an average of 10.8 tests per acre-lift). Thirty-six (36) Shelby tube soil samples (or an average of 1.1 tests per acre per lift) for undisturbed permeability testing were collected by Malcolm Pirnie on-site personnel. The acceptability criteria regarding the permeability of the in-place recompacted soil barrier layer was less than $1x10^{-7}$ cm/s. Undisturbed laboratory permeability test results are presented in Appendix 8.1 and summarized in Table 4-2.

The sample and test locations of all construction quality assurance field tests are referenced to the grid system established for the project. A tabular listing indicating the sample and test locations for each of the three (3) lifts for the final cap construction are presented in Appendix 8.2.

4.5 CONSTRUCTION PHOTOGRAPHS

Color photographs of major project aspects are presented in Appendix 9.

4.6 SHOP DRAWINGS/RECORD DRAWINGS

Completed copies of the approved shop drawings necessary for the final cover system construction at the Marilla Street Landfill Clarifier Sludge Area may be reviewed at the Malcolm Pirnie, Inc., Buffalo, New York office, for a period of one year after acceptance of the project by LTV Steel Company. Record drawings prepared by the Contractor are presented as Appendix 10 of this report.

4.7 NOTATION OF DEVIATIONS

4.7.1 Property Line Location

The approximate western property line location shown on the approved closure plans was plotted using the best information that was available at the time the closure documents were prepared. It was the Contractor's responsibility to locate the actual property line in the field during construction using a licensed Land Surveyor.

The Contractor's survey revealed that the west property line was actually located 27 feet east of the location shown on the approved closure plans. The revised location, therefore, reduced the surface area of the Clarifier Sludge Area. This reduced the amount of materials required for construction of the final cover system and increased the volume of subgrade to be regraded. Grades were adjusted accordingly.

Fill materials located outside (west of) the property line were excavated and then incorporated into the subgrade of the Clarifier Sludge Area as required by the Contract Documents. This had the beneficial effect of improving the quality of the wetlands and increasing the wetland surface area.

4.7.2 Monitoring Well Extensions

Monitoring well number 3A, located in the northeast corner of the Clarifier Sludge Area, was not extended through the final cover system as required by the Contract Documents as it was accidentally damaged beyond repair during construction activities. This well was plugged with grout and abandoned according to NYSDEC guidelines.

4.7.3 Maintenance Terraces

Although not included on the NYSDEC approved design plans, the conceptual closure plans dated June 1988 included a provision for construction of maintenance terraces for every 20 feet of vertical rise. As described in the March 7, 1990 letter to the NYSDEC (see Appendix 11), the maintenance terraces were eliminated from the final design for the following reasons:

- The new Part 360 regulations that went into effect in December 1988 no longer require maintenance terraces for routine landfill closures.
- Experience has shown that terraces are not normally necessary where slopes are 33 percent or less. The maximum design slope on this landfill was 33 percent. A major portion of the site has slopes less than this. Consequently, erosion and surface water runoff problems are expected to be minimal. Any problems that do occur can be mitigated via routine maintenance.

- There was a significant construction cost reduction associated with eliminating the terraces.

As previously mentioned, elimination of the terraces is a deviation from the conceptual closure plans only (not the NYSDEC-approved design plans).

4.7.4 North Slope Modifications

While regrading the subgrade on the northern slope of the Clarifier Sludge Area, a significant volume of unstable fill material was encountered. Due to the large area and depth involved, the fine-grained texture of the material and its high moisture content, there was concern about the slope's stability. If the slope was cut back to the 1V:3H grade as designed, which would result in an increased amount of weight being placed at the top of the slope, the entire slope would become unstable and slide into the wetlands.

To prevent this from occurring and to provide long-term slope stability for the landfill in an environmentally-sound manner, a revised grading plan incorporating a 1V:4H slope was utilized. This required the placement of clean, off-site fill approximately 35 feet into the wetlands.

Prior to proceeding with this work, the NYSDEC was contacted for permission to proceed. A copy of the wetland permit approval letter is included in Appendix 2.

4.7.5 Final Grades

The landfill was designed to have a maximum surface slope of approximately thirty-three (33) percent and a minimum slope of approximately four percent. The landfill side slopes actually varied from 20 to 35 percent with an average side slope of 31 percent. The minimum slope on the top area of the landfill was actually four percent, with an average top area slope of 8 percent.

4.7.6 Final Cap Transition Detail at Wetlands Ditch

The approved design plans show a final cap transition detail at the wetlands ditch with the barrier layer and topsoil layers feathering out to equal the subgrade elevation at the west property line. The Contractor's Record Drawings indicate that at the west property line adjacent to the wetlands ditch, the barrier layer is 18 inches and the topsoil layer is 12 inches in thickness and both layers feather out to meet the subgrade elevation beyond the property line. The actual constructed transition is therefore more conservative due to the full thickness of the final cover system materials than shown on the design plans.

5.0 DECLARATION

Malcolm Pirnie personnel monitored the 1989/1990/1991 final cover system construction at the Marilla Street Landfill - Clarifier Sludge Area according to generally accepted practices. Based on the field observations made by Malcolm Pirnie personnel, field and laboratory test data, and data provided by the Contractor, the construction observed at the site complied with the Closure Plan approved by the NYSDEC, the QA/QC Plan and the Contract Documents. Notations of deviations from these documents are discussed in Section 4.7. Limitations to this report are contained in Appendix 1.

LTV Steel Company

By Hand Delivery

June 5, 1992

New York State Department of
Environmental Conservation
Region 9
270 Michigan Avenue
Buffalo, NY 14023-2999

Attention: Mr. Dennis R. Weiss, P.E.
Environmental Engineer

Subject: LTV Steel Co. Marilla Street Landfill
ID No. 15532
Erie County - Buffalo, NY
Clarifier Sludge Area - Final Cover System
Construction Report

Dear Mr. Weiss:

In accordance with 6NYCRR Section 360-2.13 (t), please find enclosed for your review and approval three (3) copies of the subject Construction Monitoring Report. This report confirms that the final cover system has been constructed in accordance with Section 3.0 of the approved Clarifier Sludge Area Closure Plan submitted by LTV Steel Company in correspondence dated June 21, 1988.

Should you have any questions or require additional information, feel free to contact me at 216/429-6539.

Sincerely,

R. A. Voytko

R. A. Voytko
Environmental Management Engineer

RAV/dcr

Enclosure

RECEIVED

JUN 5 1992