CITY OF OLEAN INACTIVE LANDFILL

TOWN OF ISCHUA, NEW YORK

LANDFILL COVER REMEDIATION

CONSTRUCTION DOCUMENTATION REPORT

PREPARED BY

URS COMPANY, INC.

BUFFALO, NEW YORK

JANUARY 1986

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1.0 INTRODUCTION

This report is submitted to fulfill the requirements of the "Certification Letter" required by the New York Department of Environmental Conservation (NYSDEC), Region 9, for the construction of a remedial cover for the City of Olean Inactive Landfill located near the Olean City Airport, Town of Ischua, New York. The landfill cover remediation was carried out in accordance with Schedule A of the Order on Consent between the NYSDEC and the City of Olean (NYSDEC File No. 84-18). Actual construction was carried out by Site Contractors, Inc., of Orchard Park, New York, under contract with the City of Olean. URS Company, Inc. provided technical monitoring and quality control during construction. The actual field and laboratory tests were performed by Empire Soil Investigations, Inc., of Orchard Park, New York, under the direction of URS Company. Construction activities began on August 26, 1985, and were completed on October 4, 1985. On October 23, 1985, URS Company wrote a letter to the NYSDEC, Region 9, reporting that the remediation cover construction at the site had been completed. A copy of this letter is included in Appendix 1. Construction was carried out in accordance with the Cover Remediation Plan submitted to the NYSDEC by the City of Olean on December 27, 1984, and subsequently modified on June 3, 1985. The limits of as-built landfill cover and other site features are shown on Figure 1. Field and laboratory tests show that the completed work exceeds the minimum quality requirements, with a high degree of confidence in the test values.

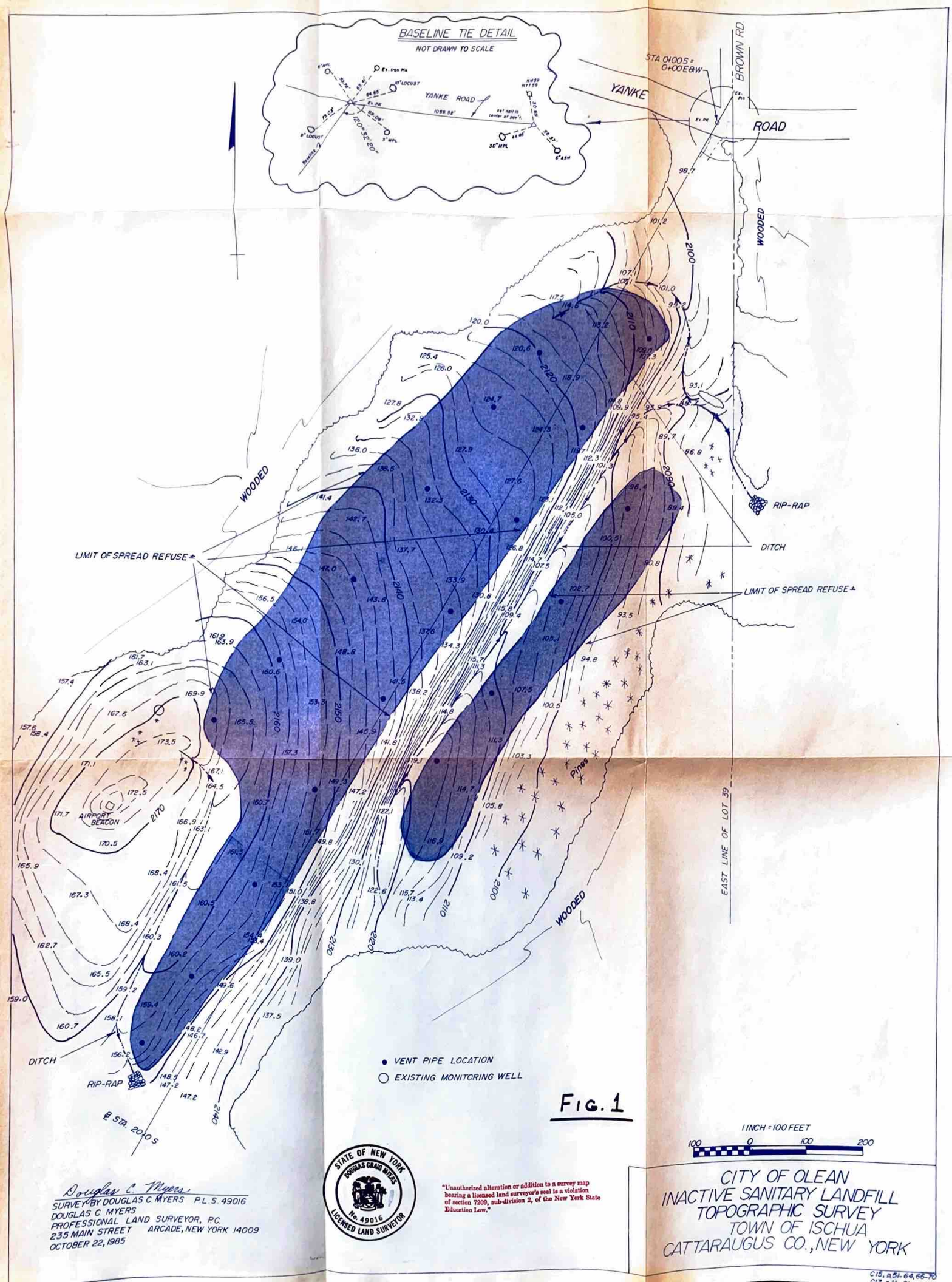

FIG. 1

1 INCH = 100 FEET

100 0 100 200

Douglas C. Myers

SURVEY BY DOUGLAS C. MYERS P.L.S. 49016
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OCTOBER 22, 1985

STATE OF NEW YORK
DOUGLAS CRAIG MYERS
No. 49016
LICENSED LAND SURVEYOR

"Unauthorized alteration or addition to a survey map bearing a licensed land surveyor's seal is a violation of section 7209, sub-division 2, of the New York State Education Law."

CITY OF OLEAN
INACTIVE SANITARY LANDFILL
TOPOGRAPHIC SURVEY
TOWN OF ISCHUA
CATTARAUGUS CO., NEW YORK

C15, R51-64, 66-70

This report is organized into six sections. Section 2 discusses the landfill Cover Remediation Plan. Section 3 describes the construction of the landfill cover clay cap, including quality control test results. Sections 4 discusses construction of the gas vent system. Section 5 discusses construction of the site drainage and landscaping features. The actual field and laboratory test reports are included in Appendices 3, 4 and 5.

The report includes a discussion of the methods and equipment used in construction, of quality control requirements and tests, and of procedures and criteria used in accepting the constructed work. It discusses the corrective actions implemented when test results showed the work to be of unacceptable quality, and documents the results of retests conducted before final acceptance.

2.0 LANDFILL COVER REMEDIATION PLAN

A landfill Cover Remediation Plan was submitted by the City of Olean, in accordance with Schedule A of the Order on Consent (NYSDEC File No. 84-18) to the NYSDEC, Region 9, on December 27, 1984. Upon completion of the NYSDEC's review of the plan, a meeting was held in the DEC's office on June 3, 1985 to discuss, and resolve technical review comments. The meeting was attended by DEC staff, City of Olean officials, and URS Company. As a result, on June 13, 1985, the City submitted a modified plan to the NYSDEC . A copy of the modified plan is included in Appendix 2. The main technical features bearing upon the cover remediation are presented below:

- Remove vegetative cover from the landfill surface with minimum disturbance to existing cover. Remove boulders, and any stone larger than six (6) inches in largest dimension from the landfill cover.

- Fill in low spots in the landfill cover to provide continuous surface drainage.

- Install an 18-inch thick clay cap, using on-site soils, compacted in three 6-inch lifts.

- Apply 6 inches of topsoil using on-site material to the extent possible.

- Seed with perennial ryegrass and apply mulch.

- Construct diversion channels, gas vents, fences, gates, et al.

The plan stated that construction would be carried out in accordance with the NYSDEC QA/QC guidelines. (A draft copy of these guidelines, dated April 12, 1985, was made available to the City by the NYSDEC).

The City of Olean subsequently directed URS to prepare the engineering drawings and specifications for construction in accordance with the modified plan. These drawings and specifications were submitted to the City on July 25, 1985, and to the NYSDEC on July 26, 1985. A copy of the drawings (DWGS D-1107-1 and D-1108-1) is included in Appendix 2; the specifications are included by reference only.

3.0 CONSTRUCTION OF LANDFILL COVER CLAY CAP

A construction contract for the landfill cover remediation was awarded to Site Contractors, Inc., of Orchard Park, New York, on August 14, 1985. The Contractor began mobilizing equipment on August 24, 1985, and actual construction activities began on August 26, 1985. By October 4, 1985, all construction activities were completed. During this entire period, a URS inspector provided technical supervision of field activities, and directed quality control tests by Empire Soils. These tests were used in acceptance of work. Mr. Robert Mitrey of NYSDEC visited the construction site on September 19, 1985.

3.1 Soil Tests on Borrow Material

The clay cover was constructed of on-site material consisting of glacial and residual soils. These soils were classified as silty clays and clayey silts. The soils exhibited moderate to low plasticity and relatively low permeability. Investigation and testing of soils was carried out in three stages. During stage one, four test pits (TPB 1 through TPB 4) were excavated (on April 30, 1985) to assess suitability of the soils for the clay cap. Seven bulk soil samples were collected and tested. The test results showed that the soils were suitable for the intended use. The stage two investigation was conducted after the award of the construction contract, and delineation of the primary soil borrow area. On August 29, 1985, a total of 23 bulk soil samples was collected from 14 test pits located in the primary borrow area.

Laboratory tests were conducted on these samples in accordance with the NYSDEC suggested guidelines for QA/QC. The results of these tests were used in accepting the compacted clay cap. The stage three investigation was carried out during the progress of the construction. When it became apparent that the primary borrow area would not yield the required quantities of soil, a secondary borrow area was designated east of trench 3. Five shallow test pits were excavated here, and bulk soil samples were collected on September 16, 1985. A summary of laboratory test results from these investigations is presented in Table 1 and the actual test reports are included in Appendix 3.

A total of 35 mechanical analyses, 32 natural water content, and 2 Atterberg limit tests were performed on individual bulk samples. Using the results of these tests, similar soils were grouped together, compositing the individual bulk samples. These composite samples were then used to conduct 8 standard proctor, 6 mechanical analysis, 6 atterberg limits, and 7 permeability tests. The proctor compaction curves, established from these tests, were used to develop acceptance criteria for the compacted material.

3.2 Landfill Cover Grading

The landfill cover was stripped of all vegetation. In addition sufficient root zone was also stripped to prevent growth of vegetation through the new clay cap. This was accomplished by removing shrubs, small pine trees, weeds, and grass cover down to a depth of

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS ON BORROW SOIL

Sample	Group No.	Percent Passing #200 Sieve	Moisture Content (%)	Atterberg Limits			Max. Dry Density (ASTMD-698)	Optimum Water Content %	Permeability cm/sec
				Liquid Limit	Plastic Limit	Plasticity Index			
TPB-1	T1	46	14.6	---	---	---	122.0 lb/ft^3	12.0	3.0×10^{-8}
TPB-2 (1-5 ft.)		60	15.4	29	20	9			
TPB-3 (2-6 ft.)		46	15.4	37	25	12			
TPB-4 (2-5 ft)		59	17.1	---	---	---			
TPB-2 (6-10 ft.)	T2	45	---	---	---	---	122.0	11.9	
TPB-3 (6-10 ft.)		32	---	---	---	---			
TPB-4 (6-8 ft.)		61	---	---	---	---			
1A	1	51	13.4	47	32	15	111.0	17.2	3.93×10^{-8}
2A		55	18.3						
3A		57	17.0						
4A		81	20.9						
5A		83	17.7						
6A	2	46	10.7	38	27	11	117.7	14.5	2.1×10^{-8}
7A		81	12.2						

TABLE 1 (Cont.)

SUMMARY OF LABORATORY TEST RESULTS ON BORROW SOIL

Sample	Group No.	Percent Passing #200 Sieve	Moisture Content (%)	Atterberg Limits			Max. Dry Density (ASTMD-698)	Optimum Water Content %	Permeability cm/sec
				Liquid Limit	Plastic Limit	Plasticity Index			
8A		61	9.5						
9A		88	14.8						
10A		85	20.4						
11A	3	75	16.5	41	29	12	109.0	18.6	4.04×10^{-8}
12A		64	16.3						
13A		82	7.0						
14A		79	19.4						
1B	4	29	10.8	39	26	13	121.5 lbs/ft^3	14.1	2.84×10^{-8}
2B		41	13.2						
3B		37	12.0						
4B		74	14.6						
5B		37	10.8						
10B	5	40	12.2	38	26	12	119.7 lb/ft^3	14.8	2.72×10^{-8}
11B		28	13.5						
13B		38	12.6						
14B		83	13.8						
15	6	60	14.1	31	21	10	117.0 lb/ft^3	14.2	---

TABLE 1 (Cont.)

SUMMARY OF LABORATORY TEST RESULTS ON BORROW SOIL

Sample	Group No.	Percent Passing #200 Sieve	Moisture Content (%)	Atterberg Limits			Max. Dry Density (ASTMD-698)	Optimum Water Content %	Permeability cm/sec
				Liquid Limit	Plastic Limit	Plasticity Index			
16		60	12.9						
17		58	12.1						
18		59	17.1						
19		62	15.2						

Note: (1) Permeability tests were conducted on samples compacted to 95 percent of the maximum dry density.

(2) For groups 1 through 6, Atterberg limits, dry density, and optimum moisture content, are reported for the composite samples only.

(3) Permeability test results are for the composite samples.

(4) Symbol -- indicates that test was not conducted.

approximately six inches. Over trench number 1, the existing soil cover was found to be less than six inches at several locations, and it appeared to be practically impossible to remove existing vegetation and root zone without disturbing the refuse. These areas were therefore treated with an approved herbicide (Roundup by Monsanto Chemicals). The limits of the existing refuse were subsequently established by excavating shallow backhoe test pits at approximately 100 foot intervals along the anticipated boundary of the refuse area, and marked with wooden stakes.

The stripped landfill surface was then graded by filling local depressions with clean, nonselect soil material to provide a regular sloped surface for drainage without ponding. The fill was compacted in 12-inch lifts to create a firm surface. Once a regularly sloped surface was attained, the entire area was proof-rolled with a minimum of two passes of a sheepsfoot roller to achieve a firm subgrade, and the site was ready for the clay cap. The operations sequence in general was as follows:

- The entire landfill cover was mowed.

- The area encompassing trenchs 1 and 2 was stripped, and the western 1/3 of the area prepared to receive the clay cap.

- While this area received the clay cap, the remaining center and eastern portions of the trench 1 and 2 area were graded

and prepared to receive the fill. The trench 3 area was stripped at the same time.

- Once trench 3 area stripping was completed, the surface was graded and prepared to receive the clay cap.

3.3 Placement and Compaction of Clay Cap

The clay cap over trenches 1, and 2 was constructed using soils from the primary borrow area, located south and west of the airport beacon. The clay cap over trench 3 was constructed using soil from the secondary borrow area, located east of trench 3. The construction of the clay cap started on September 6, 1985, and was completed on September 28, 1985.

The fill placement and compaction was carried out in accordance with contract specifications. The material for the first lift was placed over the approved subgrade, and resulting in uniform compacted lifts of about 9 inches in thickness. Lift thickness was controlled by placing wooden stakes at 100-foot intervals along the length of the trench. Any stone or rock larger than 6 inches in largest dimension was removed from the fill, and segregated zones of relatively coarser material were either removed from the fill, or reworked to create a well dispersed soil matrix.

The water content of the fill material was tested with a speedy moisture tester before compaction. The dry weather condition required

the addition of water to the fill in order to meet compaction requirements. The following acceptance criteria were set for the compacted fill:

- o A minimum dry density of 95 percent (or greater) of the maximum dry density determined using ASTMD-698 test procedures shall be achieved.

- o The placement water content shall be equal to or greater than a value of one percent below the optimum water content.

The compaction was done with a Case 1102 sheepsfoot compactor. The compactor was driven parallel to the longer axis of the landfill and the compaction continued until the compactor action indicated that sufficient compaction had been achieved. Nuclear density tests were then performed on the compacted surface, at randomly selected locations, to determine percent compaction and water content. If the test results showed that the required moisture and compaction criteria were met, the compacted area was approved for placement of the second lift. If, however, the test results failed, corrective action was implemented to remedy the situation as follows:

- o If the water content was below the acceptable value, water was added to the fill with a spray-bar-mounted water truck. The fill area was disked while the water was being added, to achieve uniform water content within practical limits. Once

the water content was raised to the acceptable value, the fill was compacted.

- If the water content was acceptable but the compaction was less than 95 percent, additional compator passes were made to increase compaction.

- All reworked areas were retested with either a nuclear density meter or a speedy moisture tester, and remedial action continued until the desired results were achieved. In areas where the test results showed that only marginal improvement was necessary to meet the acceptance criteria, the required remedial work was carried out, and the work was accepted on the basis of visual observation and judgement with no retest.

Once the first lift was accepted and approved, the second lift was constructed in the same manner as the first lift. A summary of daily weather conditions during the construction period is presented in Table 2. A summary of construction equipment is presented in Table 3.

3.4 Soil Tests During Clay Cap Construction

Clay cap construction was carried out in accordance with the NYSDEC suggested guidelines for QA/QC requirements. Cap acceptability was determined by testing in-place density and moisture content with a nuclear densitometer supplemented by Speedy Moisture Tester and visual

observations. A total of 202 nuclear density tests were performed, of which 44 tests failed the moisture criteria and 54 tests failed the compaction criteria. In addition, URS field inspector routinely performed soil moisture determinations using a Speedy Moisture Tester prior to compaction of fill. Results of 14 such tests are reported with the data. The fill areas showing placement moisture less than one percent below optimum were disked. Water was added to increase the moisture while disking. Compaction was not performed until it was determined (using Speedy Moisture Tester) that the soil had attained desired moisture content. The areas failing compaction tests were subjected to an additional number of compactor passes until compaction criteria were met or exceeded, as confirmed by retest results and visual observations on compactor performance. In cases where percent compaction was only slightly below 95 percent, compaction was approved after making additional compactor passes without retest.

The location of field tests is shown on Figures 2 and 3 and a summary of test results is presented in Table 4. Frequency distribution plots of the test results, used in approving the compacted fill are shown in Figures 4 and 5. The plots show that all the accepted tests met or exceeded the quality control requirements. A statistical analysis of accepted test results indicates a confidence level of greater than 99 percent in the quality of data. The actual test reports are included in Appendix 3.

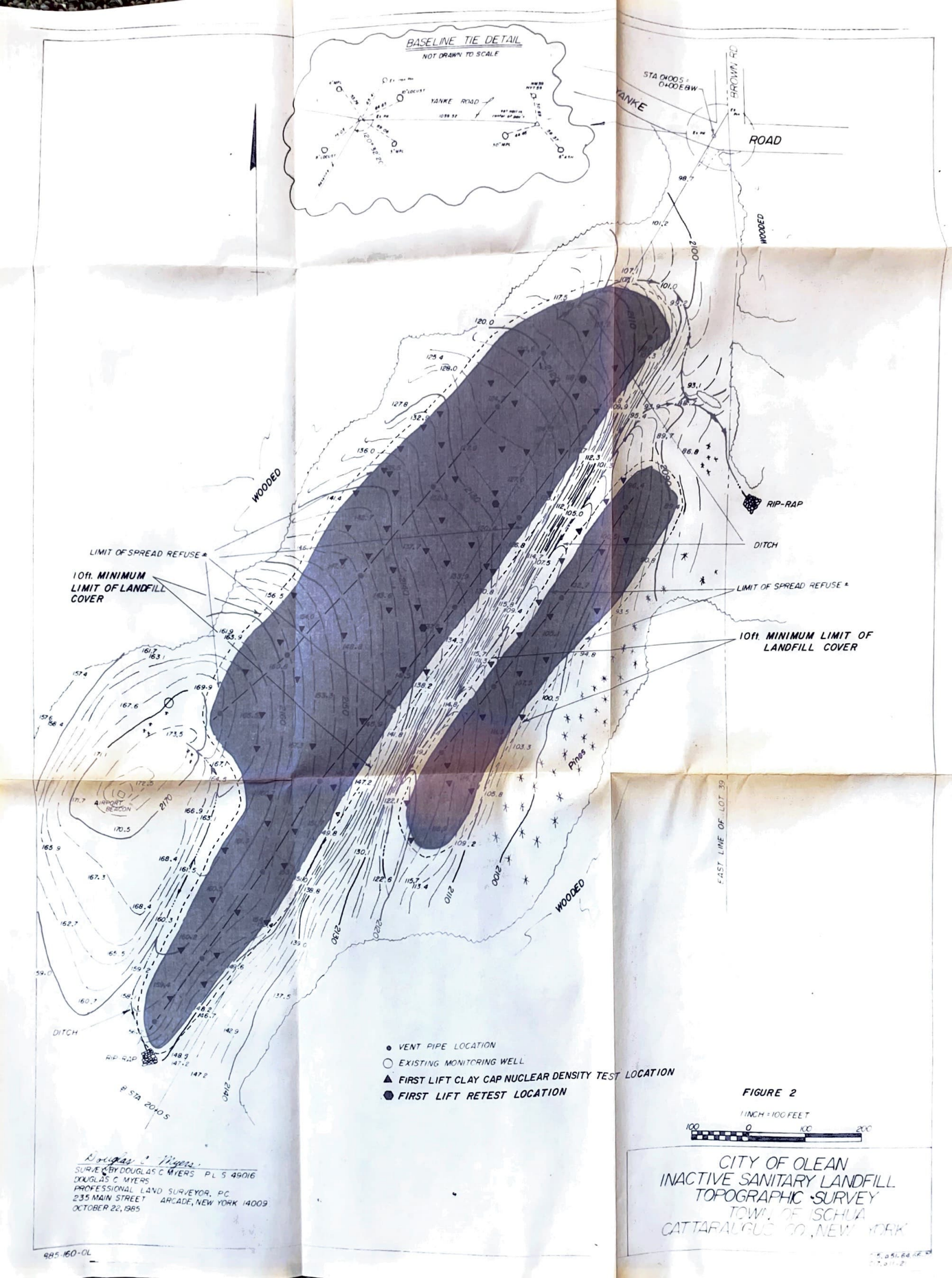

FIGURE 2

1 INCH = 100 FEET

100 0 100 200

Douglas C. Myers.

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OCTOBER 22, 1985

CITY OF OLEAN
INACTIVE SANITARY LANDFILL
TOPOGRAPHIC SURVEY
TOWN OF ISCHUA
CATTARAUGUS CO., NEW YORK

985-160-OL

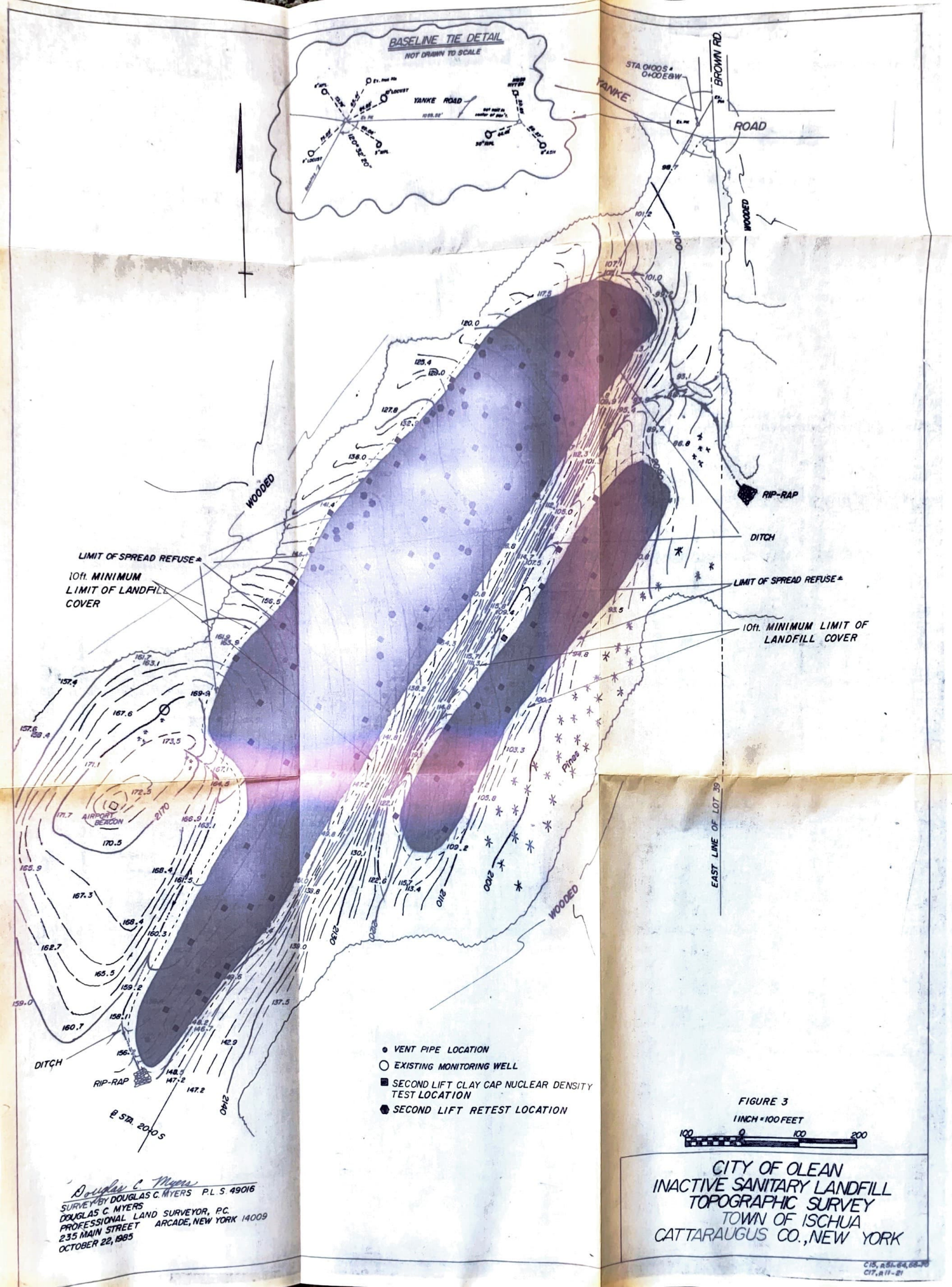


FIGURE 3

1 INCH = 100 FEET

100 0 100 200

CITY OF OLEAN
INACTIVE SANITARY LANDFILL
TOPOGRAPHIC SURVEY
TOWN OF ISCHUA
CATTARAUGUS CO., NEW YORK

Douglas C. Myers P.L.S. 49016

SURVEY BY DOUGLAS C. MYERS
DOUGLAS C. MYERS
PROFESSIONAL LAND SURVEYOR, P.C.
235 MAIN STREET ARCADE, NEW YORK 14009
OCTOBER 22, 1985

C15, R8I-84, 68-70
C17, R11-21

3.5 Permeability Tests on Compacted Clay

A total of twenty-three (23) Shelby tube samples was taken at twelve (12) locations across the site. At ten (10) locations, two tubes were pushed: a primary tube for testing and a second tube as backup, in case the primary tube sample was found to be disturbed or damaged. At the eleventh location (on Trench 3), only a primary tube (Sample 11A) was taken due to the shortage of tubes resulting from a damaged tube at location 9. The tubes were pushed with a backhoe for the entire thickness of the cap, allowed to rest, twisted and carefully pulled. The hole created by the Shelby tube was filled with bentonite pellets or on-site clay to assure that cover integrity was not compromised.

Samples were then extruded from the tubes to prepare eleven (11) test specimens. The test specimens were saturated using the backpressure method, and tested for permeability under constant head.

Eleven (11) permeability tests were conducted, of which ten (10) yielded permeability values between 9.66×10^{-8} cm/sec and 1.68×10^{-8} cm/sec. The eleventh test (Tube 11A) yielded a permeability value of 4.16×10^{-5} cm/sec. The Shelby tube sample for this test specimen was described to be loose and crumbly, suggesting the possibility of either disturbance during sampling and transportation or presence of uncompacted clay soil in the cap. Since there was no backup tube, four (4) additional Shelby tubes were pushed in the immediate vicinity of the tube 11A location on November 14, 1985. The soil technician and URS

field inspector described the soil conditions encountered during sampling to be firm and relatively uniform. (The tubes were driven with a sledge hammer). A randomly selected tube (tube 12A) was used to prepare a test specimen, which showed a permeability value of 2.39 x 10^{-8} cm/sec. It was therefore concluded that sample 11A had been disturbed either during sampling or during transportation to the laboratory, and that the quality of the clay cap was acceptable.

A summary of test results, in the form of frequency distribution plot, is presented in Figure 6. Statistical analysis shows a mean permeability value of 8.86 x 10^{-8} cm/sec with a standard deviation of 6.96 x 10^{-8}. Test 11A was treated as an outlier in this analysis for the reasons discussed above. The test results are presented in Appendix 5.

4.0 CONSTRUCTION OF GAS VENT SYSTEM

The gas vent system was constructed in general accordance with the engineering drawings. After the clay cap was constructed, and topsoil spread, a 16-inch wide trench was excavated by a trencher. The trench penetrated a minimum of 12 inches into the underlying refuse. A minimum 6 inches of gravel was subsequently placed at the bottom of the trench. (A gradation analysis of the gravel is presented in Table 5.) A 4-inch diameter, perforated PVC header pipe, with two rows of 1/2-inch diameter holes spaced 5 inches apart was placed over the gravel bed and was then covered with gravel up to a height of 6 inches above the crown of the pipe. A MIRAFI filter fabric was placed over this gravel, and the remainder depth of the trench was filled with the same compacted clay used for construction of the cap. Six inches of topsoil was placed over the clay, and the surface was graded to blend with the surrounding area.

A 4-inch diameter, 4-foot high PVC vent pipe was connected to the perforated pipe, using a T-connection every 200 feet along the vent system. A plastic bird screen was placed over the vent pipe to prevent entry of foreign objects.

EMPIRE
SOILS INVESTIGATIONS INC

TABLE 5

PROJECT: Olean Landfill

CLIENT: URS Company, Inc.

DATE: October 24, 1985

PROJECT NO: BT-85-157

REPORT NO: L-3

REPORT OF MATERIAL TESTING

Material: Sample Screened Gravel from the Old Spencer Haley Pit on Route 16, Olean, New York, identified as Item 4 gravel. Sample obtained by Empire Soils Investigations, Inc. from on site stockpile.

Mechanical Analysis: ASTM D-422, Dry.

Sieve Size	Percent Finer
2"	100
1½"	98.7
1"	87.7
3/4"	75.2
1/2"	63.6
3/8"	56.5
1/4"	47.2
#4	40.2
#10	29.8
#20	14.2
#40	6.3
#100	2.7
#200	1.5

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

Charles C. Keipper

Charles C. Keipper
Laboratory Manager

sll

5.0 SITE DRAINAGE AND LANDSCAPING

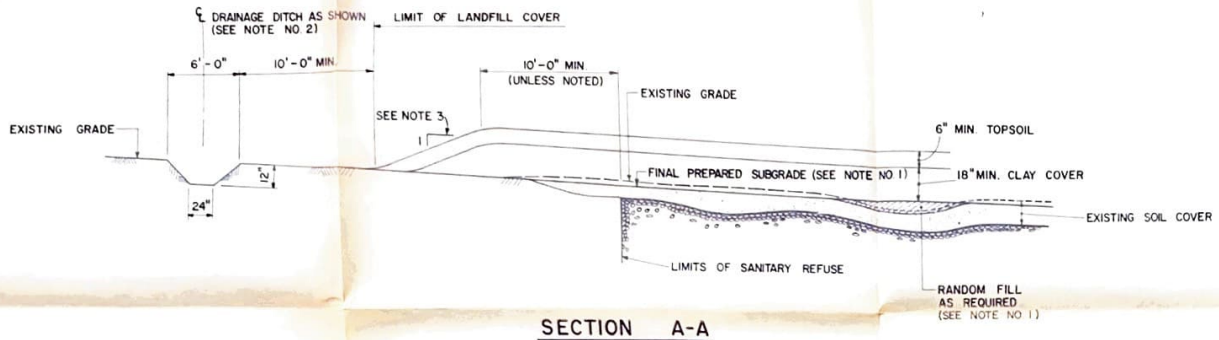
5.1 Site Drainage

As shown on the as-built drawing (Figure 1), drainage ditches were constructed around the landfill to improve site drainage. A minimum longitudinal slope of 0.3 percent was maintained for the ditches, and the surface was then seeded. To prevent erosion, stone riprap was placed at the ends of the newly excavated ditches.

5.2 Landscaping

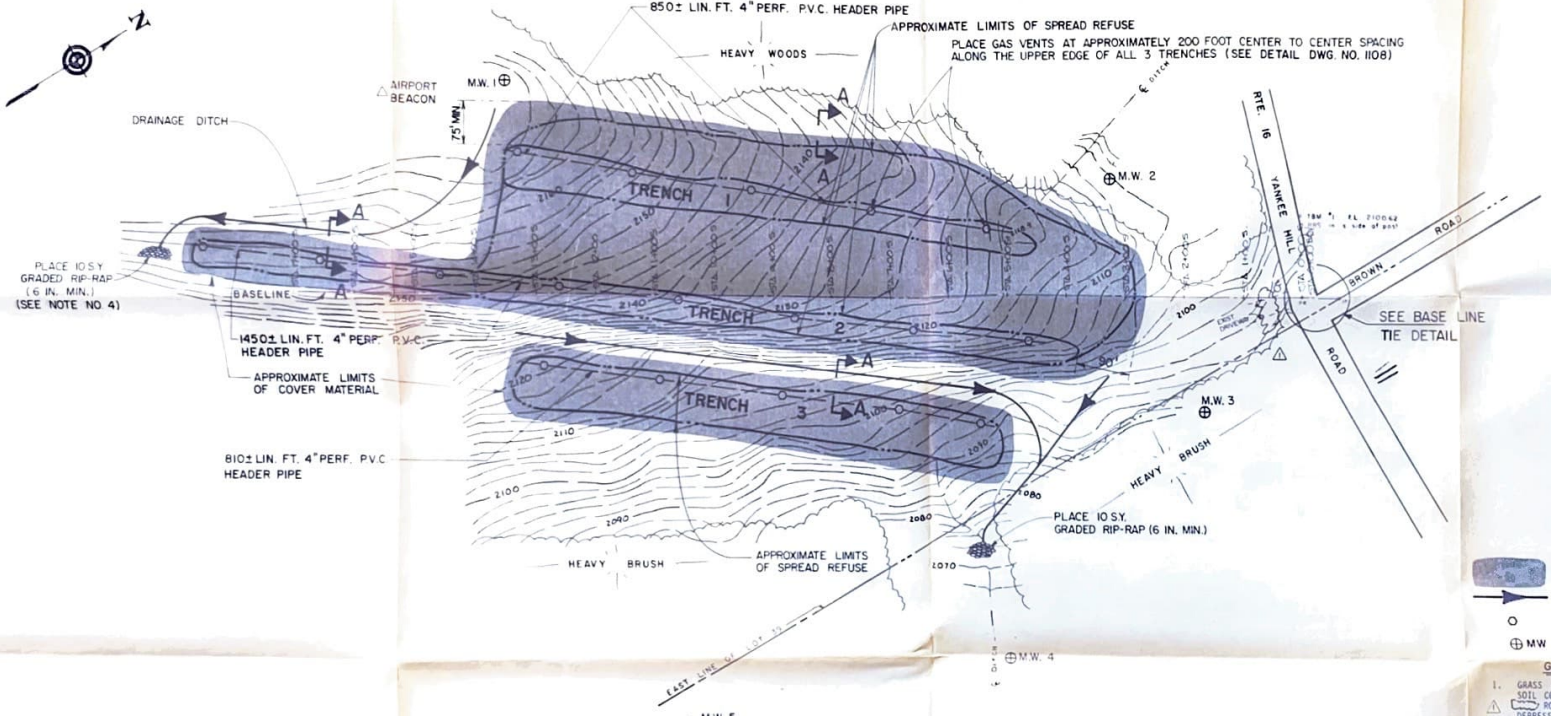
Six inches of on-site topsoil was spread over the landfill cap. Since the natural pH of the topsoil was found to be approximately 5.5, as much as 3 tons of agricultural limstone per acre of topsoil was added in the borrow area, raising the pH close to 6.5. After the topsoil was spread, stones and large roots were removed using a "stone wisk", and a 10-10-10 mix of fertilizer was applied.

The surface was subsequently seeded using a dry batch seeder and a minimum of 35 lbs. of perennial rye grass seed. Hay mulch was spread using a hydroseeding system and the mulch was anchored using a crimping machine.

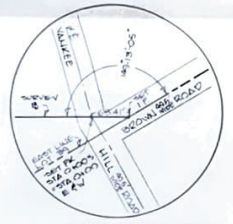


SECTION A-A

NOT TO SCALE



PLAN



BASE LINE TIE DETAIL

LEGEND

- COVER
- DRAINAGE DITCH
- GAS VENTS
- ⊕ M.W. MONITORING WELLS (EXISTING)

GENERAL NOTES

1. GRASS AND VEGETATION ON THE EXISTING SOIL COVER SHALL BE STRIPPED TO REMOVE ROOTS AND VEGETATION. EXISTING DEPRESSIONS SHALL BE FILLED IN WITH COMPACTED RANDOM FILL TO PREPARE FINAL GRADE AND POSITIVE DRAINAGE.
2. THE DRAINAGE DITCH SLOPE SHALL FOLLOW THE NATURAL GROUND SLOPE BUT SHALL NOT BE LESS THAN 0.3 PERCENT.
3. MAXIMUM SIDE SLOPE FOR COVER IS 3H:1V.
4. THE LOCATION OF THE LANDFILL TRENCHES AND SPREAD REFUSE SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL LOCATE THE ACTUAL LIMITS OF THE LANDFILL REFUSE BY A MEANS WHICH WILL CREATE AS LITTLE DISTURBANCE TO THE BURIED WASTE AS POSSIBLE.

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
1	8/26/85	REVISED DATE & NOTE 1, DELETE FENCE			

REVISIONS

DESIGNED BY: J.S.F.
DRAWN BY: R.S.G.
CHECKED BY: J.S.
PROJ. ENGR: J.S.

URS Company, Inc. CONSULTING ENGINEERS NEW YORK NEW JERSEY

JOB No. 35082

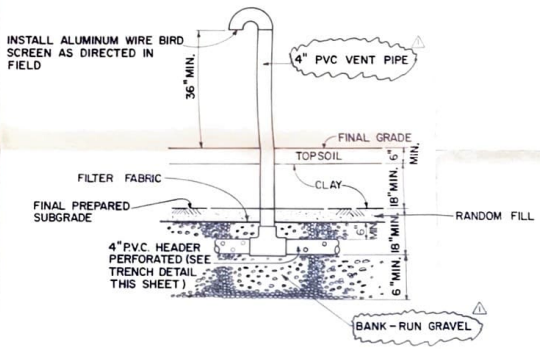
STATE OF NEW YORK KENNETH M. KEAN No. 41611 LICENSED PROFESSIONAL ENGINEER

CITY OF OLEAN
CATTARAUGUS COUNTY NEW YORK

CITY OF OLEAN
INACTIVE SANITARY LANDFILL
COVER REMEDIATION

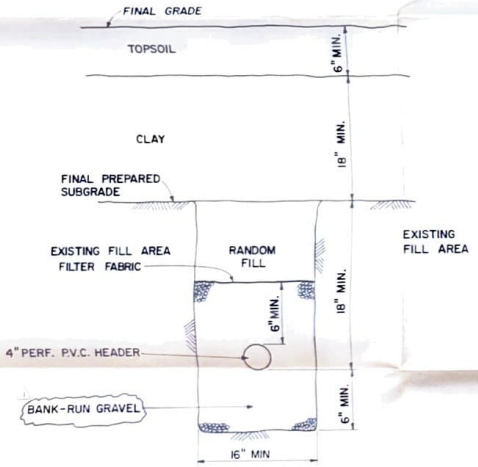
SANITARY LANDFILL
SITE AND COVER PLAN

Scale: 1"=100' Date: JULY 25 1985 DWG. NO. D-1107-1



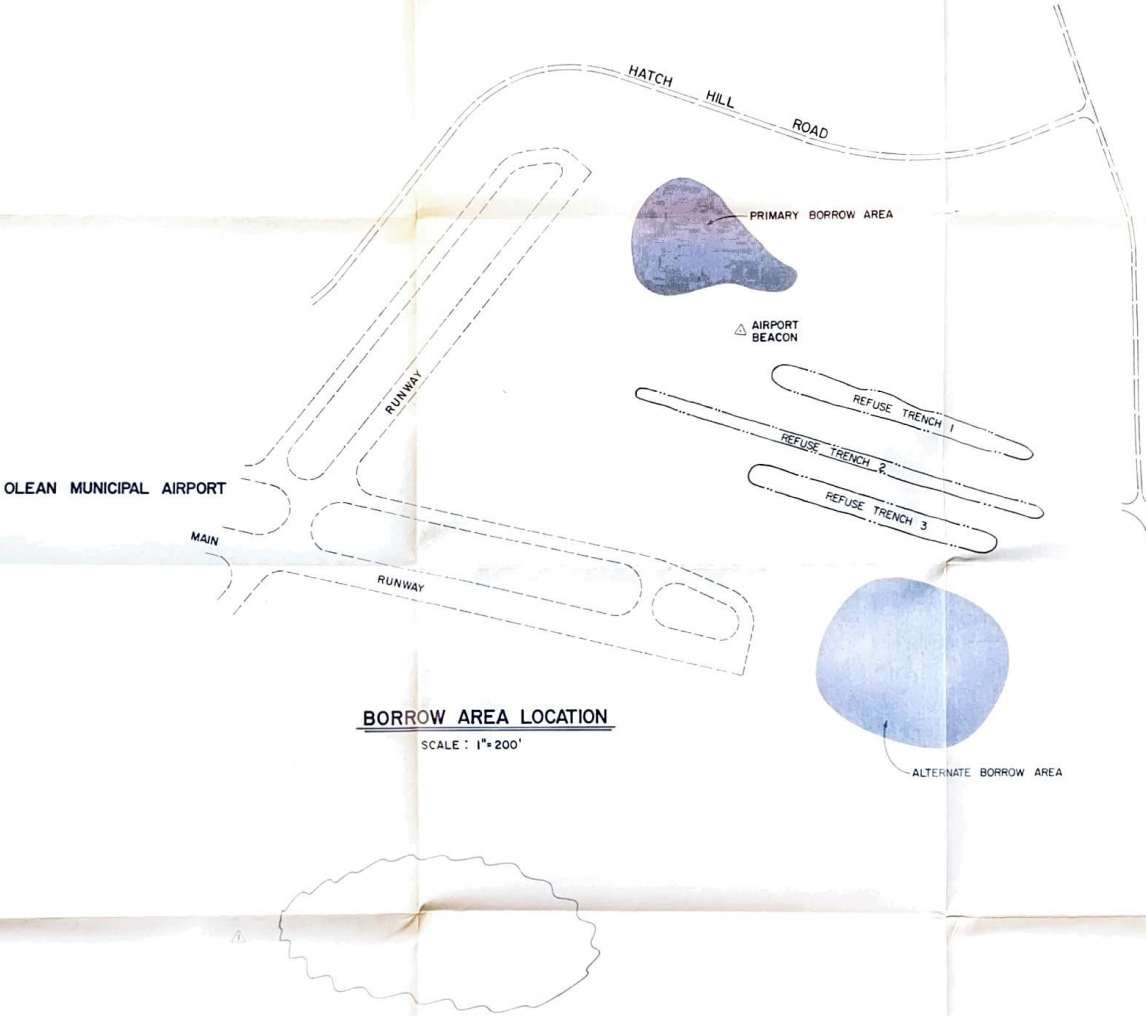
GAS VENT DETAIL

NOT TO SCALE



VENT HEADER TRENCH DETAIL

NOT TO SCALE



BORROW AREA LOCATION

SCALE : 1"=200'

NOTE:
LOCATION OF BORROW AREAS ARE APPROXIMATE. EXACT LOCATIONS TO BE DETERMINED IN FIELD.

NO	DATE	DESCRIPTION	NO	DATE	DESCRIPTION
1	12/15/95	REVISED DATE, DETAILS & DELETE FENCE			

REVISIONS

DESIGNED BY: J.S.F.
DRAWN BY: F.J.G.
CHECKED BY: J.S.F.
PROJ ENGR: V.S.

URS Company, Inc.
CONSULTING ENGINEERS
NEW YORK NEW JERSEY

JOB No. 35082

CITY OF OLEAN
CATTARAUGUS COUNTY NEW YORK

CITY OF OLEAN
INACTIVE SANITARY LANDFILL
COVER REMEDIATION

BORROW AREA LOCATIONS AND MISCELLANEOUS DETAILS

Scale AS NOTED | Date JULY 25, 1995 | DWG. NO. D-1108-1