3121 Butterfield Road, Oak Brook, Illinois 60523

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436336

May 29, 2002

RECEIVED
MAY 31 2002
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Mr. Tom Daugherty
Indiana Department of Environmental Management
Office of Land Quality
100 N. Senate Avenue
Indianapolis, IN 46206-6015

Subject: **Slurry Wall Reconstruction - CQA Acceptance Report**
Gary Sanitary Landfill
Gary, Indiana

Telephone
630 574 2006
Facsimile
630 574 2007

Dear Mr. Daugherty:

On behalf of the City of Gary Department of Environmental Affairs, Earth Tech is submitting 3 copies of the report referenced above for your review and approval.

The repair to the slurry wall, discussed in late 2001 and early 2002, has been completed as of early May 2002. The work performed and results obtained are contained in the attached report. As follow-up to your January 30, 2002 letter, this CQA Report is being submitted within 30 days of construction completion.

If you have any questions, please call me at (630) 574-2006

Sincerely,

Earth Tech, Inc.

Andrew J. Querio, P E
Project Manager

attachment

cc: Ms Daniela Klesmith (IDEM)
Ms. Rose Myers (IDEM)
Dorreen Carey (City of Gary Department of Environmental Affairs)
Bob Strimbu (City of Gary Department of Environmental Affairs)
Mr Otho Lyles / Dan Buss (Northlake)

L \WORK\Gary\44567\ENGR\wall repair cover letter doc

engineering and technology tech for the planet

Construction Quality Assurance Acceptance Report

RECEIVED

MAY 3 1 2002

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Slurry Wall Repair
Gary Landfill
Gary, Illinois

Prepared for
The City of Gary, Indiana
Department of Environmental Affairs

Prepared by.
Earth Tech, Inc.
3121 Butterfield Road
Oak Brook, IL 60523
(630) 574-2006

May 29, 2002

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LIST OF ATTACHMENTS

1. Daily CQA Field Reports
2. Field Density Test Report (Nuclear Density Testing)
3. Laboratory Test Results
4. Photo Documentation, Slurry Wall Repair
5. Record Drawings

Certification of CQA Officer

I hereby affirm that the information provided by Earth Tech, Inc., contained within this Construction Acceptance Report covering the Slurry Wall Repair at Gary Landfill, is accurate and complete to the best of my knowledge and belief, and that the construction has been performed in substantial conformance with the engineering design.

ANDREW J. QUERIO
REGISTERED
No.
10000070
STATE OF
INDIANA
PROFESSIONAL ENGINEER

5/29/02

Andrew J. Querio, P.E.
CQA Officer

Date

Indiana Professional Engineering Registration Number: PE10000070
Expires: 7/31/02

1.0 Background

Gary Landfill, as with most landfills, has a landfill gas-monitoring program for fugitive gas in the soil outside of the limits of waste. Gas is monitored via a series of perimeter wells, where gas, can be detected. At gas probe GP-4, landfill gas migration monitoring indicated that fugitive gas was present in the soil.

A soil-bentonite slurry cut-off wall had been constructed in the past as a barrier to offsite migration of landfill gas and leachate. It was suspected that a portion of the slurry wall was missing along its top in the vicinity of GP-4. Test holes were made and confirmed the presence of a gap in the slurry wall. A detailed solution for execution of repairs to the slurry wall was transmitted to the Permits Branch at the Indiana Department of Environmental Management via letter dated January 10, 2002. The concept for the repair as described in the letter and implemented here was for the top of the slurry wall to be repaired by placement of a compacted clay plug. Design calculations enclosed in the letter demonstrated that the provided clay material would serve as a functional replacement of the slurry wall.

2.0 Reference Construction Documents

- Letter to IDEM: Containment Effectiveness, Compacted Clay Wall vs. Soil-Bentonite Slurry Wall, Gary Landfill – prepared by Earth Tech, Inc., dated January 10, 2002

- Specifications and CQA requirements included in the letter report referenced above

3.0 Construction Summary

Earth Tech provided continuous and full-time CQA monitoring and observation of repairs as performed by Northlake Excavation and Demolition. Inc. (Gary, Indiana). Work occurred on April 25 and 26, 2002, and May 3, 2002, and is documented by this report.

The location of the slurry wall repair was previously located and identified by field stakes on the East edge of the site near gas probe GP-4. The marked location for excavation was a line of about 70 feet in length, running in a north-south orientation, with the north limit approximately 5 feet south of GP-4. A Tractor Backhoe was used to unearth the top of the existing soil-bentonite slurry cutoff wall. The excavated trench was through sandy soil that had little cohesive strength so that as the depth of the trench increased, so too did the width. For this reason it was decided that the slurry wall repair would be done in sections defined in length by the reach of the track hoe. The missing top of the slurry wall was located and followed down to a depth of approximately 7 feet. Isolated perched water from off site began to seep into the trench, so the first lifts of the clay repair were placed as two 1-foot thick lifts. Subsequent lifts were placed, compacted, and tested in 6-inch lifts. The compacted clay plug was placed to a width of approximately 5-feet or more

The excavation continued south from the end of the first repair (30 feet south of GP-4) for another 20 feet. The top of the slurry wall was exposed and capped with clay as before. The maximum depth was about 6 feet and likewise experienced some ground water infiltration. The first lift was placed 1-foot thick, after which succeeding lifts placed were in 6-inch increments.

On the second day of operations, the third repair section continued from 50 to 70 feet south of GP-4, where the top of the existing slurry wall was found largely intact. The final trench depth here was only about 4 feet and no offsite groundwater seepage was observed. All lifts were placed in 6-inch increments, each of which were compacted and tested as before. A final lift was placed across the entire area of the repair, after which the surface was roughly graded.

Compaction of the clay was performed by pressure applied by a sheep's hoof roller compactor and/or the track hoe scoop.

The third day of activities involved the application of black dirt topsoil. The surface was restored to blend with existing grades. Seed and straw was then applied to the location of the slurry wall repair to complete the repairs.

The Earth Tech CQA Monitor's daily field reports are provided in Attachment 1.

4.0 Construction Quality Assurance Activities

The CQA monitor observed excavation of soils overlying the existing slurry wall and visually inspected construction of clay plug repair. In-situ soil tests were performed using a nuclear density gauge, test method ASTM D2922, to verify the repair met project specifications for percent compaction and moisture content. A copy of the nuclear density test gauge calibration certificate is included in the Earth Tech CQA Monitor's first daily report. A total of 28 tests were performed for the 11 lifts, which satisfies the project requirement of one test per lift. Generally, the initial lift placed was compacted but was not tested; testing was conducted on the subsequent lifts placed. Results of field nuclear density tests are provided in Attachment 2. All test results met the project requirements of greater than or equal to 95% of the maximum standard proctor dry density, and greater than or equal to the optimum moisture content, to a maximum of +4%.

Moisture control during compaction was verified by water content measurements made with the nuclear density gauge and by performing laboratory moisture content tests (oven dry method) on soil samples obtained at randomly selected nuclear density gauge test locations. Density values were verified using laboratory results from Shelby tube samples to check the density values obtained with the nuclear density gauge. A comparison of the two methods can be found in Table 1. Dry densities obtained with the nuclear density gauge averaged 5.5 pounds per cubic foot lower than those obtained utilizing the laboratory procedure. Moisture contents measured by the moisture/density gauge averaged 2.1 percent higher than the laboratory moisture contents. The results are reasonable and represent the accuracy one would expect using these test procedures.

Table 1
Comparison of Density Tests/Nuclear Gauge vs. Lab Results

Moisture/Density	Moisture/Content		Dry Density (pcf)	
Gauge Test Number	Laboratory	M/D Gauge	Laboratory	M/D Gauge
1-4	17.9	19.7	112.1	106.1
3-5	15.7	18.1	115.2	110.2
Average	16.8	18.9	113.7	108.2
Difference		2.1		5.5

5.0 Laboratory Testing of Construction Materials

5.1 Pre-Construction Testing

The geotechnical laboratory of Great Lakes Soil and Environmental Consultants in Burr Ridge, Illinois performed pre-construction testing of the clay material delivered to the site for repair of the slurry wall. Three bulk samples were evaluated for grain size, Atterburg limits, standard proctor, and permeability. Laboratory reports of pre-construction testing are provided in Attachment 3 and results are summarized in Table 2. The pre-construction test results met the project specifications. (Please note that the original specification stated in the 1/10/02 letter report indicated LL≥25%; this specification was mistakenly incorrectly stated. An LL value ≥20% is a more typical specification referenced for clay, and therefore, was intended for this project. All LL values were greater than or equal to 22 and are therefore considered acceptable. In addition, the original specification stated in the 1/10/02 letter report indicated Clay Content ≥25% at 0.002 mm size; this specification was also mistakenly incorrectly stated. A Clay Content value ≥20% at 0.005 mm size is a more typical specification referenced for clay, and therefore, was intended for this project. All Clay Content values were greater than or equal to 37% at 0.005 mm size, and also were greater than 25% at 0.002 mm size, and are therefore considered acceptable)

Table 2
Enterprise Trucking Clay

Sample ID	Passing #200 (%)	Liquid Limit (%)	Plasticity Index	Clay Content greater 0.005 mm (%)	USCS	Max. Dry Density (pcf)	Optimum Moisture (%)	Permeability (cm/sec)
S#1	78.4	26	12	50.2	CL	112.0	17.0	2.1×10^{-8}
S#2	71.2	22	10	37.1	CL	119.5	13.5	6.4×10^{-8}
S#3	61.1	23	11	41.9	CL	117.0	13.5	9.1×10^{-8}

5.2 Construction Testing

A bulk sample of clay material that was placed in the repair was tested for grain size, Atterburg limits, and standard proctor. Laboratory test results are included in Attachment 3 and results are summarized in Table 3. The project specifications were met.

In addition, two undisturbed tube samples (ST-1 and ST-2) were taken and tested for permeability. Results indicate permeabilities $\leq 1 \times 10^{-7}$ cm/sec were achieved (approximately 5×10^{-8} cm/sec achieved). Laboratory test results are included in Attachment 3. The project specifications were met.

Table 3
Clay Placed in Repair

Sample ID	% Passing #200	Liquid Limit	Plasticity Index	Clay Content greater 0.005 mm (%)	USCS	Max. Dry Density (pcf)	Optimum % Moisture
CS-1	72.3	25	12	43.3	CL	114.5	14.5

6.0 Conclusions

In summary, based upon our observations and test results, Earth Tech concludes that the work represented by this report is in substantial conformance with generally accepted construction practices and the approved repair as proposed in the January 10, 2002 letter.

Attachment 1

Daily CQA Field Reports

EARTH TECH

A TYCO INTERNATIONAL LTD COMPANY

Daily CQA Field R.

Daily CQA Summary Rep

Owner: City of Gary

Project: Slurry Wall Reconstruction

Project No: 44567.01.01

Report No: 1

Page 1 of 4

Date: Apr 25, 2002

Weather: AM: Sunny & windy PM: Sunny & windy

Temp (°F): High: 55 Low: 40 Rain: N/A

Contractor(s): Northlake Excavation and Demolition

Contractor(s) Super(s): Dan Buss

Moisture Density Gauge Calibration Density: 2835 Moisture: 678

CQA Personnel on-Site	Hours	Equipment Used	No
R. McCormack	8	BOMAG BW 172 PC-2 Compactor	1
A Querio	9	DAEWOO SLAR 220 LC-V Trackhoe	1
E. Efein	6	Troxler Model 3440, SN: 23590	1

Type of Inspection: Observation & Troxler nuclear density test. (Troxler calibration certificate is attached)

Procedures Used: Troxler used to measure properties of compacted clay backfill in 6" lift increments

Location of Construction: East side of Gary landfill, adjacent and south of GP-4.

Location of Samples Taken: One shelby tube (ST-1), Horizontal sample of lift #4

EARTH TECH

A TYCO INTERNATIONAL LTD COMPANY

Daily CQA Field Report

Daily CQA Summary Report

Project: Gary Landfill Slurry Wall Reconstruction Report No.: 1

Date Apr 25, 2002 Page 2 of 4

Materials Used Clay from on site stockpile.

Results of CQA Activities and Summary of Test Data Area of slurry wall repair is adjacent to Burr St. on the East edge of landfill property. The staked out line for excavation is about 70 ft in length, running North-south with the North end approximately 5 ft south of GP-4. A trackhoe began excavating at the North end of the staked out line. Excavation proceeded down to make contact with the existing slurry wall. Excavation followed the slurry wall top down to about 7 ft below side walk elevation. At approximately 20 ft south of GP-4 the top of the slurry wall turned toward the surface. At this time excavation stopped to allow application of clay backfill. The first lifts were placed in two one-foot thick lifts in part to block water infiltrating from the East. Density tests were taken for each subsequent 6 inch lift. Excavation then continued from 30-50 ft south of GP-4, which was similarly backfilled and tested.

Summary of Meetings Held Spoke with IDEM official who arrived on site to observe repair progress. Attached is a copy of his field report.

Meeting Attendees

Gary Wagner (IDEM)
Robert McCormack (ET)
Sam Efein (ET)
Andy Querio (ET)

Signatures

Robert W. McCormack
CQA Technician

Andrew J. Querio
CQA Officer

#59

AGUINAGA TECHNICAL SERVICES INC

SERIAL NO: 23590 DATE: 02-11-02

DENSITY STANDARD COUNT: 2,884

DEPTH	COUNT AT 1.752 g/cc	COUNT AT 2.151 g/cc	COUNT AT 2.648 g/cc	--- A ---	--- B ---	--- C ---
BS	1,217	826	552	3.25953	1.29725	-0.08635
50	4,166	2,734	1,679	10.49585	1.18318	-0.12464
100	4,215	2,614	1,479	12.94504	1.27083	-0.06541
150	3,398	1,975	1,023	13.45996	1.40314	-0.02699
200	2,362	1,263	604	14.31340	1.65380	-0.02997
250	1,489	742	333	12.92605	1.86273	-0.02221
300	893	411	188	14.58745	2.25157	-0.02755

WHERE: DENSITY IN g/cc $= \frac{1}{B} * \mathrm{Ln}\left(\frac{A}{R + C}\right)$

$R = \text{RATIO} = \frac{\text{COUNT}}{\text{STD CNT}}$

MOISTURE STANDARD COUNT: 697

COUNT AT 0.000 g/cc	COUNT AT 0.384 g/cc	--- F ---	--- E ---
32	293	0.97404	0.04591

WHERE: MOISTURE IN g/cc $= \frac{(R - E)}{F}$

This instrument was found to be mechanically sound and electronically stable, both prior to and after its calibration. All data listed above, apply to this instrument only. The calibration was performed at:

AGUINAGA TECHNICAL SERVICES
1924-C Calumet Drive
Sheboygan, WI 53081

Recalibrate in accordance with manufacturer recommendations.

REPORT AND COMMENTS OF AGRICULTURAL AND SOLID WASTE COMPLIANCE

State Form 47272 (R / 1-00) / IN-IRCF-8-95

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Page _____ of _____

Date (*month, day, year*) 4/25/02	Time ☐ AM ☐ PM	County Lake
Name of facility Gary Landfill		
Location Gary		
Permit number ☐☐ — ☐☐		Or Non-permitted ☐
Inspected by Brian Wagner		

Comments

Missing Slurry Wall Construction

The slurry wall along the east perimeter of the landfill was being repaired. A section approximately 75' in length and 6 – 7 feet deep was reconstructed. Earth Tec was contracted to act as project manager for construction of a compacted clay barrier where the "missing" slurry wall was located.

The existing soil was excavated from 2' south of monitoring well for a distance of approximately 75' to the south. The soil was excavated to depth where the slurry wall was identified by visual observation (approximately 6 – 7').

Clay was compacted using the excavator and a Bomag 172 sheepsfoot compactor. Due to seepage into the excavation the lower 2' of compaction was constructed using the excavator only. The width of the clay plug was generally a minimum of 5' with widening as required to support the excavator.

Quality Control included undisturbed samples and in-situ field density testing.

Received by

EARTH TECH

A TYCO INTERNATIONAL LTD COMPANY

Daily CQA Field R

Daily CQA Summary Re

Owner: City of Gary

Project: Slurry Wall Reconstruction

Project No: 44567.01.01

Report No: 2

Page 1 of 2

Date: Apr 26, 20

Weather: AM Overcast PM N/A

Temp (°F): High 55 Low 40 Rain N/A

Contractor(s): Northlake

Contractor(s) Super(s): Dan Buss

Moisture Density Gauge Calibration: Density 2833 Moisture 676

CQA Personnel on-Site	Hours	Equipment Used	No
R. McCormack	4	BOMAG BW 172 PC-2 Compactor	1
A. Querio	8	DAEWOO SLAR 220 LC-V Trackhoe	1
		Troxler Model 3440, SN: 23690	1

Type of Inspection: Observation & Troxler nuclear density test.

Procedures Used: Troxler to evaluate dry density, % moisture content, and % compaction of optimal for back fill clay repair material

Location of Construction: East edge of landfill between property fence and Burr St., just south of GP-4.

Location of Samples Taken: One shelby tube was taken from the 5th lift of the third excavation portion. One bulk sample of clay was also taken.

EARTH TECH

A TYCO INTERNATIONAL LTD COMPANY

Daily CQA Field Rep

Daily CQA Summary Repor

Project Gary land fill Slurry Wall

Report No. 2

Date Apr 26, 2002

Page 2 of 2

Materials Used Clay from on site stock pile

Results of CQA Activities and Summary of Test Data Continued excavation of material over slurry wall, Started today's excavation at approximately 50' south of GP-4. The slurry wall was found intact approx. 2 ft below the surface. Excavation progressed along top of existing slurry wall and south about 20 ft. The slurry wall top did not vary appreciably, however the track hoe made inadvertant contact which required excavation to a depth of about 4 ft. Troxler tests were performed on 6" lift intervals of recompacted clay fill. Compacting was performed by a combination of the track hoe scoop pressure and the BOMAG compactor. One final lift was applied and compacted across the entire length of the repair

Summary of Meetings Held N/A

Meeting Attendees

N/A

Signatures

CQA Technician

CQA Officer

EARTH TECH
A TYCO INTERNATIONAL LTD COMPANY

Daily CQA Field R
Daily CQA Summary Re

Report No 3
Page 1 of 2
Date May 3, 2002

Owner City of Gary
Project Slurry wall Reconstruction
Project No 44567.01.01

Weather AM Cloudy PM Partly Cloudy
Temp (°F) High 60 Low 45 Rain NA

Contractor(s) Northlake
Contractor(s) Super(s) Dan Buss

Moisture Density Gauge Calibration Density NA Moisture NA

CQA Personnel on-Site	Hours	Equipment Used	No
R. McCormack	4	Track-type Dozer	1
A. Quelio	8		

Type of Inspection Observation

Procedures Used Visual inspection & documentation

Location of Construction East side of landfill, just south of GP 4

Location of Samples Taken NA

EARTH TECH

A tyco INTERNATIONAL LTD COMPANY

Daily CQA Field Repo

Daily CQA Summary Report

Project: City of Gary

Report No: 3

Date: May 3, 2002

Page 2 of 2

Materials Used: Top soil, seed, and straw

Results of CQA Activities and Summary of Test Data: Loads of black dirt top soil was applied and spread out to match existing grades. Grass seed was then applied, after which straw laid out, to cover the entire area of the slurry wall repair.

Summary of Meetings Held: N/A

Meeting Attendees

N/A

Signatures

CQA Technician

CQA Officer

Attachment 2

Field Density Test Report
(Nuclear Density Testing)

Field Density Test Report (Nuclear Density Test)

EARTH TECH

A tyco INTERNATIONAL LTD COMPANY

Page 1 of 3

Date: Apr 25, 2002 | Project: Slurry Wall Repair | Computer Backcheck: N/A

Daily Report No.: 1 | Project No: 44567.01.01

Technician: R. McCormack | Computer Entry: N/A

Test Number	Retest Ref No	Location / Description	North Coordinate	East Coordinate	Lift	Probe Depth (Inches)	Wet Density (Pcf)	Dry Density (Pcf)	Moisture (Pcf)	Moisture (%)	Opt. Moisture Req (%)	Proctor (Pcf)	% Compaction
1-1		10 to 35 S. of GP-4			1	12	NA	110.0	NA	18.9	17.0	112.0	99
1-2		"			2	6		106.2		19.9			95
1-3		"			3	6		107.8		18.3			96
1-4	ST-1	"			4	6		106.1		19.7			95
1-5		"			5	6		107.5		19.0			96
1-6		"			6	6		108.1		18.9			97
1-7		"			7	6		109.7		17.8			98
1-8		"			8	6		108.5		19.9			97
1-9		"			9	6		109.4		18.2			98
1-10		"			10	6		110.1		17.6			98
1-11		"			11	6		110.6		18.8			99

* Project Requirements: 95 Min. % Compaction 17.0 Min. % Moisture Req.

Field Density Test Report (Nuclear Density Test)

EARTH TECH
A tyco INTERNATIONAL LTD COMPANY

Page 2 of 3

Date: Apr 25, 2002
Daily Report No.: 1
Technician: R. McCormack
Project: Slurry Wall Repair
Project No: 44567 01.01
Computer Entry: N/A
Computer Backcheck: N/A

Test Number	Retest Ref No	Location / Description	North Coordinate	East Coordinate	Lift	Probe Depth (Inches)	Wet Density (Pcf)	Dry Density (Pcf)	Moisture (Pcf)	Moisture (%)	Opt Moisture Req. (%)	Proctor (Pcf)	% Com-paction
2-1		30-50 Ft S. GP4			1	6	NA	111.5	NA	17.6	17.0	112.0	100
2-2					2	6		109.2		17.8			98
2-3					3	6		107.2		18.7			96
2-4					4	6		107.5		18.4			96
2-5					5	6		108.0		19.7			96
2-6					6	6		106.8		19.9			95
2-7					7	6		109.2		18.2			98
2-8					8	6		106.1		19.6			95
2-9					9	6		108.2		19.6			97
2-10					10	6		111.3		18.9			99

* Project Requirements 95 Min. % Compaction 17.0 Min. % Moisture Req.

Field Density Test Report (Nuclear Density Test)

EARTH TECH

A tyco INTERNATIONAL LTD COMPANY

Date. Apr 26, 2002 Project Slurry Wall Repair Computer Backcheck: N/A

Daily Report No.. 2 Project No. 44567.01.01

Technician. R. McCormack Computer Entry: N/A

Test Number	Retest Ref No	Location / Description	North Coordinate	East Coordinate	Lift	Probe Depth (Inches)	Wet Density (Pcf)	Dry Density (Pcf)	Moisture (Pcf)	Moisture (%)	Opt. Moisture Req. (%)	Proctor (Pcf)	% Com-paction
3-1		50-70 Ft South GP4			1	6	NA	107.4	NA	19.6	17.0	112.0	96
3-2					2	6		107.3		19.5			96
3-3					3	6		108.4		19.1			97
3-4					4	6		110.4		16.7			99
3-5	3T-2				5	6		110.2		18.1			98
3-6					6	6		109.9		18.7			98
3-7					7	6		110.0		17.5			98

* Project Requirements 95 Min. % Compaction 17.0 Min. % Moisture Req.

Attachment 3

Laboratory Test Results

Pre-Construction Testing

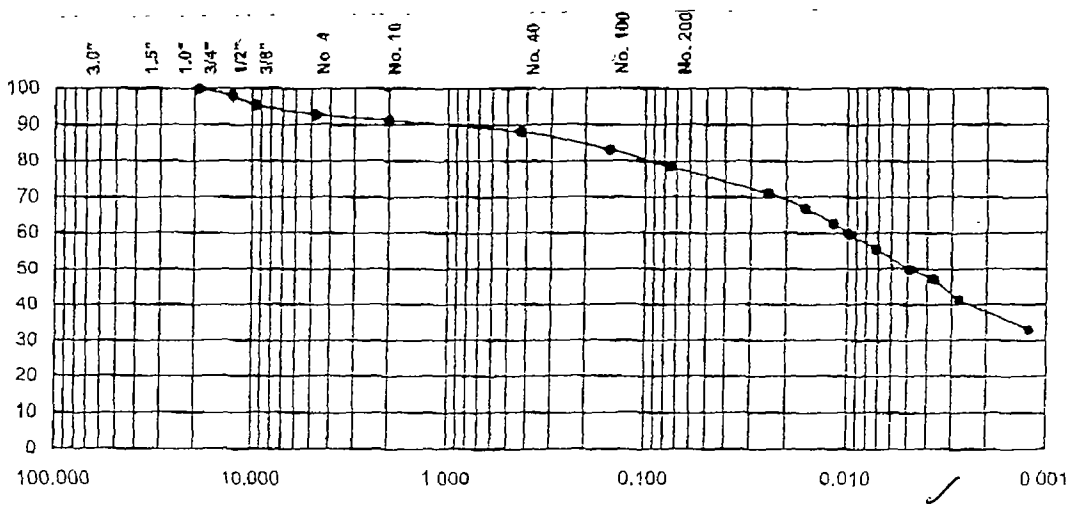
Enterprise Trucking
Sample #1

Great Lakes Soil & Environmental Consultants, Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945

GRAIN SIZE ANALYSIS (ASTM D422)

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.: Mr. Andy Querio						
File No.	2315	**Sample #**	S#1	**Date Tested**	2/1/2002	**Tested by**	AK
						Qc by	SM

Sample Location	Northside of Stock Pile
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)



% + 3"	% Gravel	% Sand	% Silt	% Clay
0.0	7.2	14.4	28.2	50.2

Sieve Size	Percent Passing
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	98.1
3/8"	95.6
No. 4	92.8
No. 10	91.3
No. 40	88.0
No. 100	83.0
No. 200	78.4

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
26	14	12

Soil Classification:	CL
Soil Description:	Lean Clay with Sand
System:	USCS

Remarks:

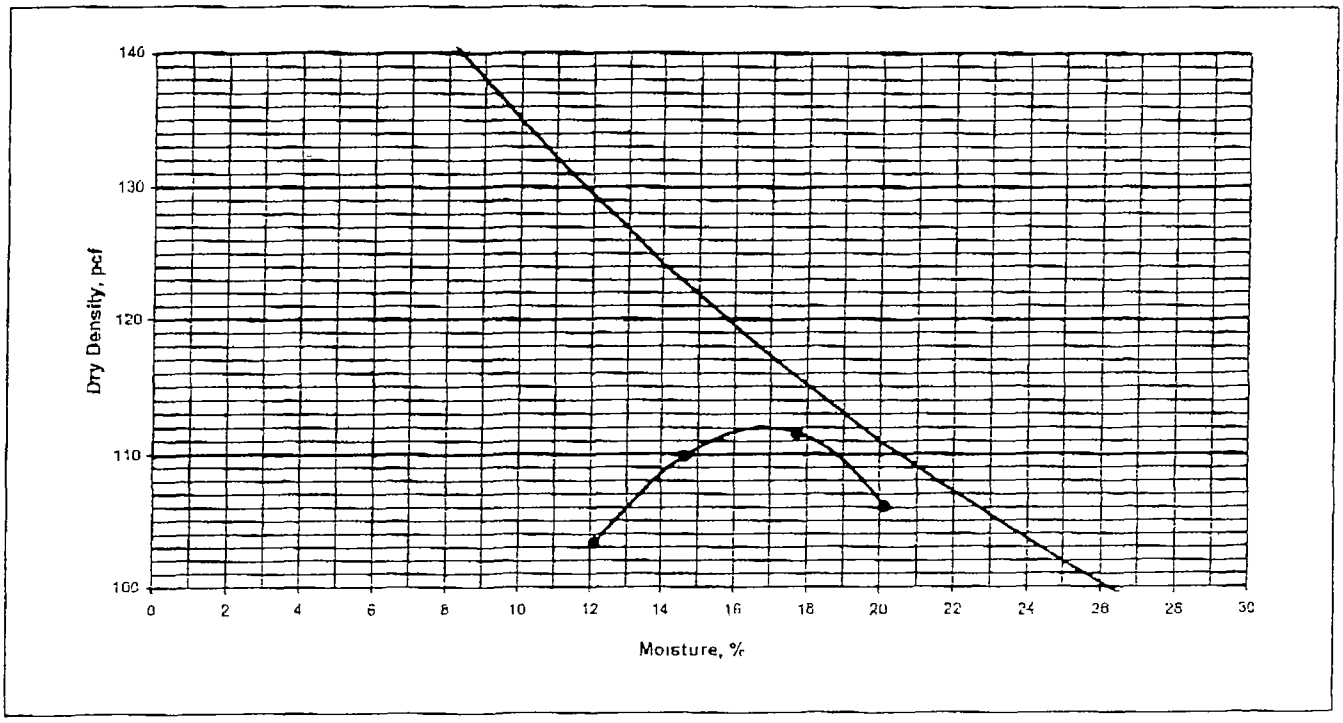
Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.. Mr. Andy Querio						
File No.	2315	Sample #	S#1	Date Tested	2/1/2002	Tested By	AK
						Qc By	SM

Sample Location	Northside of Stock Pile								
Sample Description	Gray Clay (ENTERPRISE TRACKING CLAY)								
Type of Proctor	Standard	Method:	A	Mold Size, in.	4	Hammer Weight, lb.	5.5	Drop, in.	12
No. of Layers	3	No. of Blows per Layer			25				



Zero Air Void Curve Specific Gravity 2.76

Results

Maximum Dry Density, pcf	112.0	Optimum Moisture Content, %	17.0	Natural Moisture Content, %	18.3

Remarks

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax. (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook IL 60523 Attn.: Mr Andy Querio						
File #	2315	**Date Tested**	2/7/2002	**Tested by:**	AK	**QC by:**	SB
Sample ID:	S#1		**Location**	Northside Stock Pile			
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)						

Specimen Data

Initial

Diameter:	10.16	cm	Area, A:	81.1	sq cm
Height, L:	5.79	cm	Volume, V:	469.4	cu cm
Mass of Sample:	957.7	g	Moisture Content:	19.0	%
			Wet Density	127.3	pcf
			Dry Density	107.0	pcf

Final

Diameter:	10.10	cm	Area, A:	80.1	sq cm
Height, L:	5.70	cm	Volume, V:	456.7	cu cm
Mass of Sample:	964.30	g	Moisture Content.	20.2	%
			Wet Density	131.8	pcf
			Dry Density	109.6	pcf
			Deg of Saturation	98.3	

Test Data

Permeant	De-aired Tap Water	
Cell Pressure	80.0	psi
Top Pressure	75.0	psi
Bottom Pressure	77.0	psi
Gradient.	24.3	

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings Outflow cc	Burette Readings Inflow cc	Outflow/Inflow Ratio	Fluid Temp oC	Permeability cm/sec
2/7/2002	11:30 AM	0	0	1.76	5.38		20.0	---
2/7/2002	12:40 PM	4200	4200	2.00	5.14	1.0	20.0	2.48E-08
2/7/2002	1:35 PM	3300	7500	2.12	5.00	0.9	20.0	1.87E-08
2/7/2002	2:40 PM	3900	11400	2.28	4.84	1.0	20.0	1.83E-08
2/7/2002	3:45 PM	3900	15300	2.46	4.66	1.0	20.0	2.09E-08

Average Permeability = 2.1E-08 cm/sec

Remarks:

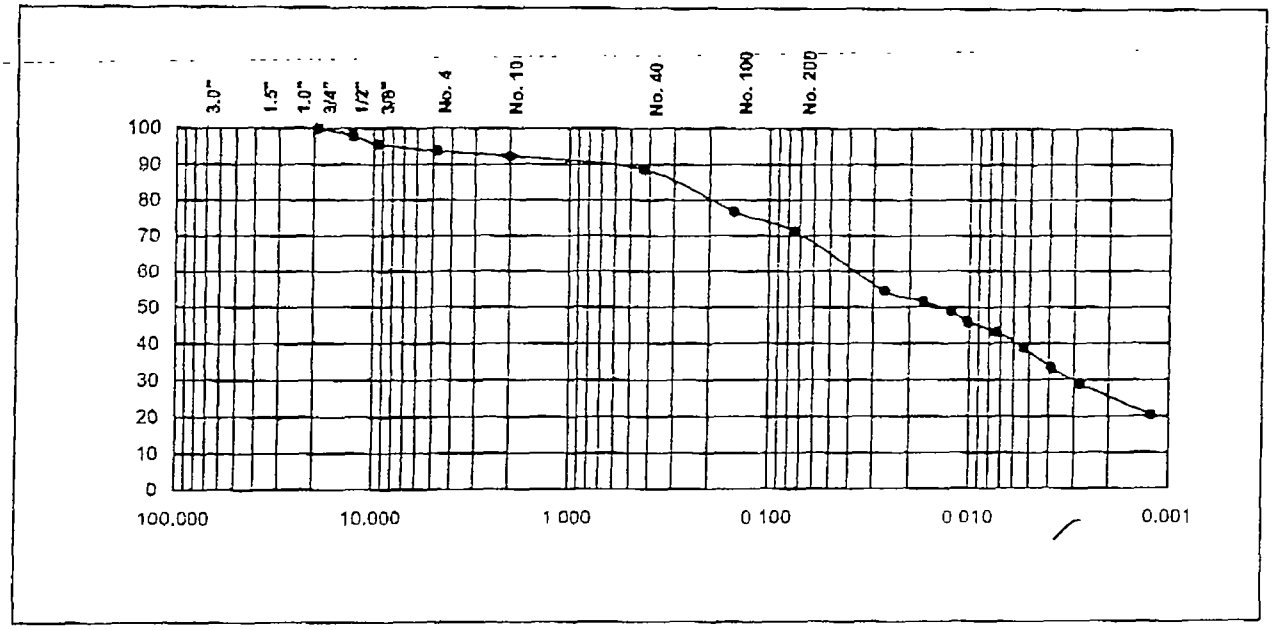
Enterprise Trucking
Sample #2

Great Lakes Soil & Environmental Consultants, Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph. (630) 321-0944 Fax. (630) 321-0945

GRAIN SIZE ANALYSIS (ASTM D422)

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.: Mr. Andy Querio						
File No.	2315	Sample #	S#2	Date Tested	2/18/2002	Tested by	MC
						Qc by	SM

Sample Location	~~Northside~~ Stock Pile
Sample Description	Gray Clay (ENTERPRISE TRACKING CLAY)



% + 3"	% Gravel	% Sand	% Silt	% Clay
0.0	6.3	22.5	34.1	37.1

Sieve Size	Percent Passing
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	98.0
3/8"	95.6
No. 4	93.7
No. 10	92.2
No. 40	88.6
No. 100	76.8
No. 200	71.2

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
22	12	10

Soil Classification:	CL
Soil Description:	Lean Clay with Sand
System:	USCS

Remarks.

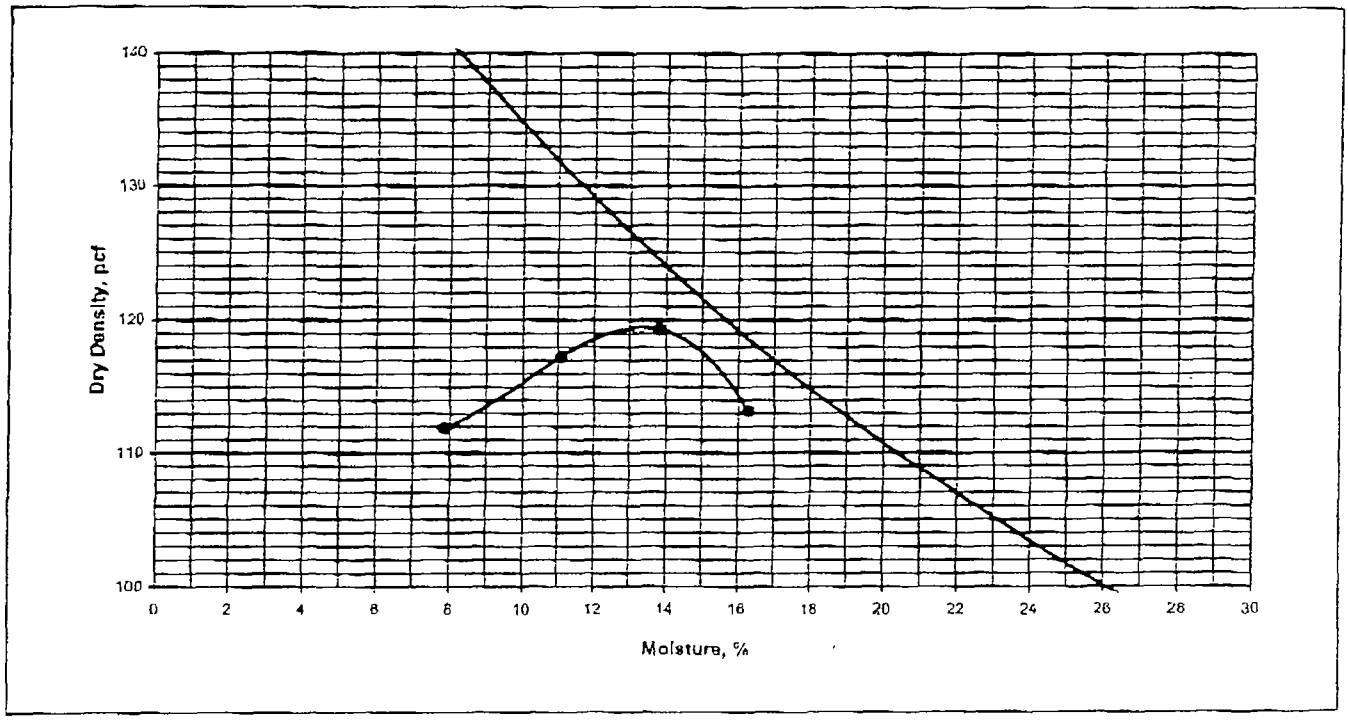
Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.: Mr Andy Querio						
File No.	2315	**Sample #**	S#2	**Date Tested**	2/19/2002	**Tested By**	AK
						Qc By	SM

Sample Location	~~Northside~~ Stock Pile								
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**			25				



Zero Air Void Curve Specific Gravity: 2.75

Results

Maximum Dry Density, pcf	119.5	Optimum Moisture Content, %	13.5	Natural Moisture Content, %	

Remarks

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph. (630) 321-0944 Fax. (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn : Mr. Andy Querio						
File #	2315	**Date Tested**	2/26/2002	**Tested by:**	AK	**QC by:**	SB
Sample ID:	S#2		**Location**	[redacted] Stock Pile			
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)						

Specimen Data

Initial

Diameter	10.16	cm	Area, A:	81.1	sq cm
Height, L:	5.82	cm	Volume, V:	471.8	cu cm
Mass of Sample.	991.0	g	Moisture Content:	-15.5	%
			Wet Density	131.1	pcf
			Dry Density	113.6	pcf

Final

Diameter.	10.15	cm	Area, A:	80.9	sq cm
Height, L:	5.80	cm	Volume, V:	469.3	cu cm
Mass of Sample:	993.30	g	Moisture Content:	19.1	%
			Wet Density	132.1	pcf
			Dry Density	110.9	pcf
			Deg of Saturation	95.9	

Test Data

Permeant:	Dealred water	
Cell Pressure	80.0	psi
Top Pressure	75.0	psi
Bottom Pressure	77.0	psi
Gradient:	24.2	

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings Outflow cc	Burette Readings Inflow cc	Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
2/26/2002	11:05 AM	0	0	2.54	5.42		20.0	---
2/26/2002	12:10 PM	3900	3900	3.32	4.78	1.2	20.0	7.55E-08
2/26/2002	2:02 PM	6720	10620	4.18	3.94	1.0	20.0	8.19E-08
2/26/2002	3:12 PM	4200	14820	4.60	3.40	0.8	20.0	6.80E-08
2/26/2002	4:10 PM	3480	18300	4.84	3.08	0.8	20.0	5.06E-08

Average Permeability = 6.4E-08 cm/sec

Remarks:

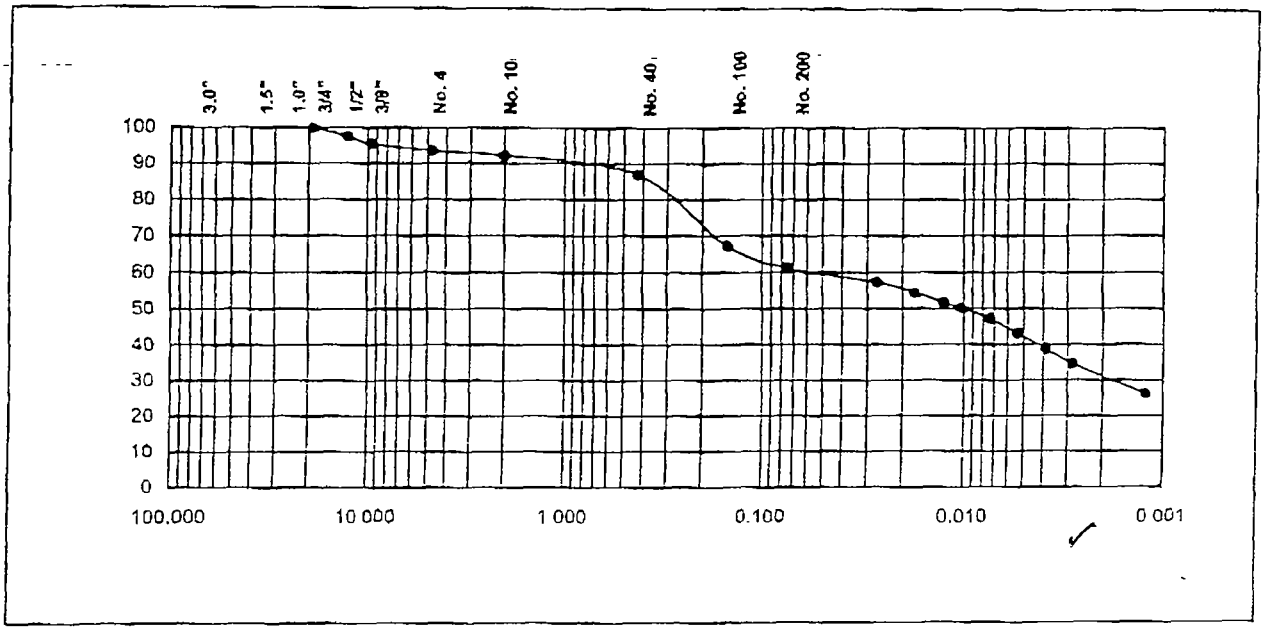
Enterprise Trucking
Sample #3

Great Lakes Soil & Environmental Consultants, Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax (630) 321-0945

GRAIN SIZE ANALYSIS (ASTM D422)

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn., Mr Andy Querio						
File No.	2315	**Sample #**	S#3	**Date Tested**	2/18/2002	**Tested by**	MC
						Qc by	SM

Sample Location	~~East Side~~ Stock Pile
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)



% + 3"	% Gravel	% Sand	% Silt	% Clay
0.0	6.4	32.5	19.3	41.9

Sieve Size	Percent Passing
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	97.6
3/8"	95.4
No. 4	93.8
No. 10	92.2
No. 40	87.0
No. 100	67.2
No. 200	61.1

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
23	12	11

Soil Classification:	CL
Soil Description:	Sandy Lean Clay
System:	USCS

Remarks.

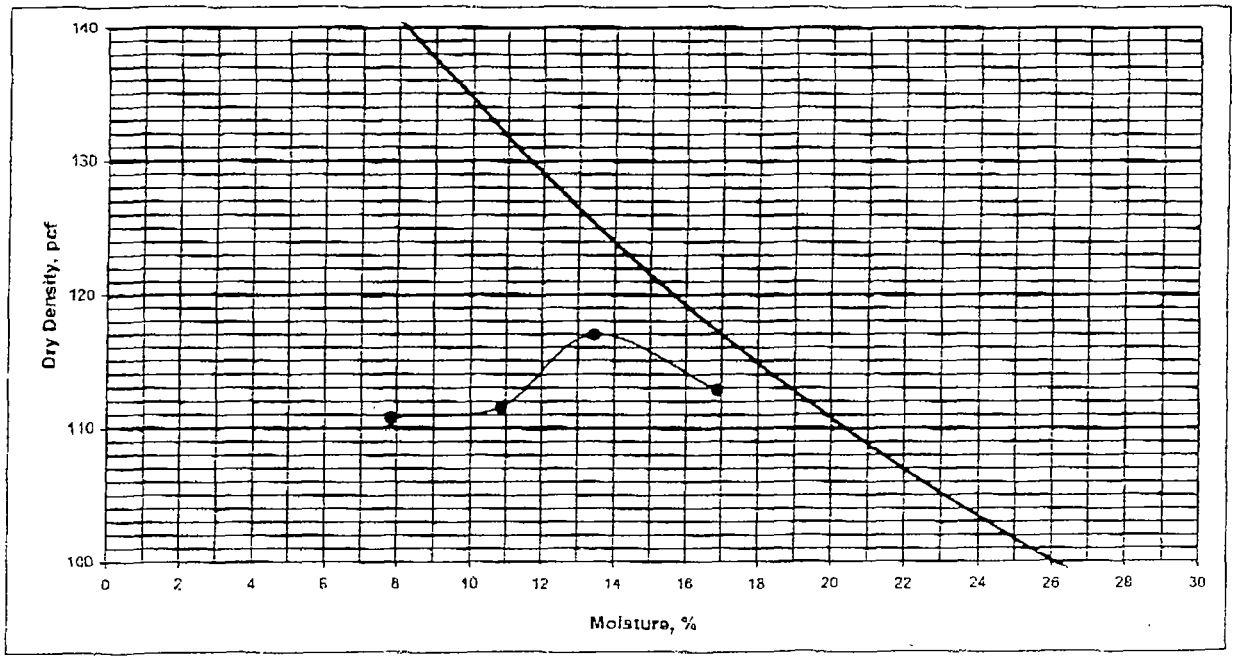
Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.: Mr. Andy Querio						
File No.	2315	Sample #	S#3	Date Tested	2/19/2002	Tested By	AK
						Qc By	SM

Sample Location	~~East Side~~ Stock Pile								
Sample Description	Grey Clay (ENTERPRISE TRUCKING CLAY)								
Type of Proctor	Standard	Method:	A	Mold Size, in.	4	Hammer Weight, lb.	5.5	Drop, in.	12
No. of Layers	3	No. of Blows per Layer			25				



Zero Air Void Curve Specific Gravity 2.75

Results

Maximum Dry Density, pcf	117.0	Optimum Moisture Content, %	13.5	Natural Moisture Content, %	

Remarks

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph. (630) 321-0944 Fax. (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Gary Landfill						
Client	Earth Tech, Inc 3121 Butterfield Road, Oak Brook, IL 60523 Attn.. Mr Andy Quarlo						
File #	2315	Date Tested	2/25/2002	Tested by:	AK	QC by:	SB
Sample ID:	S#3		Location	~~East Side~~ Stock Pile			
Sample Description	Gray Clay (ENTERPRISE TRUCKING CLAY)						

Specimen Data

Initial

Diameter:	10.15	cm	Area, A:	80.9	sq cm
Height, L:	5.82	cm	Volume, V:	470 9	cu cm
Mass of Sample	970.8	g	Moisture Content:	15.5	%
			Wet Density	126.6	pcf
			Dry Density	111.4	pcf

Final

Diameter:	10.10	cm	Area, A:	80 1	sq cm
Height, L:	5 82	cm	Volume, V:	466.3	cu cm
Mass of Sample:	964.00	g	Moisture Content:	16.7	%
			Wet Density	131.7	pcf
			Dry Density	112.8	pcf
			Deg of Saturation	89.2	

Test Data

Permeant:	De-aired Tap Water	
Cell Pressure	80.0	psi
Top Pressure	75 0	psi
Bottom Pressure	77.0	psi
Gradient.	24 2	

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings Outflow cc	Burette Readings Inflow cc	Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
2/25/2002	12:45 PM	0	0	3.94	3 74		20.0	---
2/25/2002	1:40 PM	3300	3300	4 58	3.12	1.0	20 0	1.00E-07
2/25/2002	2.40 PM	3600	6900	5.26	2.50	1 1	20.0	9 63E-08
2/25/2002	3:51 PM	4260	11160	5 82	1.88	0.9	20 0	8.93E-08
2/25/2002	4:45 PM	3240	14400	6.20	1.50	1.0	20 0	7 63E-08

Average Permeability = 9.1E-08 cm/sec

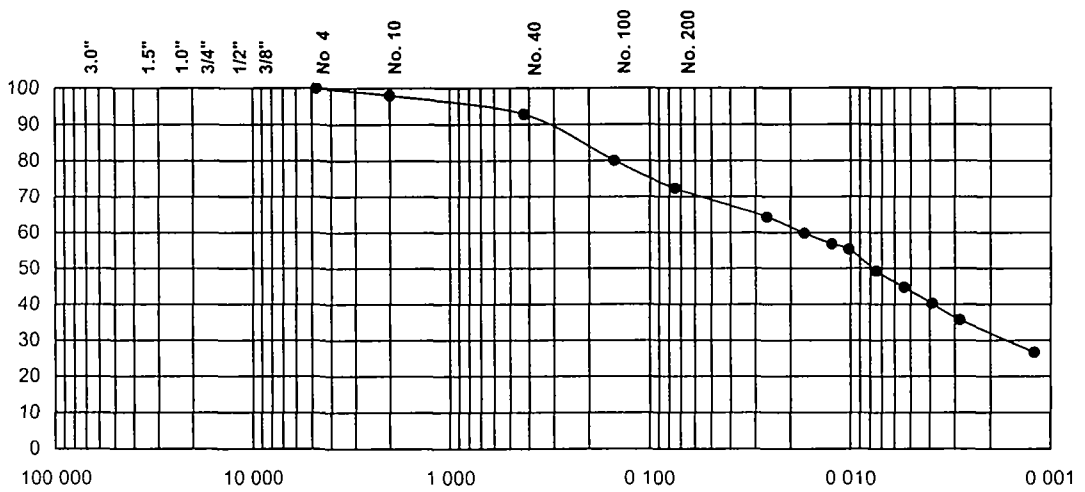
Remarks:

Construction Testing

	Great Lakes Soil & Environmental Consultants, Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945	**GRAIN SIZE ANALYSIS (ASTM D422)**

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.: Mr. Andy Querio						
File No.	2315	**Sample #**	CS-1	**Date Tested**	4/30/2002	**Tested by**	MC
						Qc by	SM

Sample Location	
Sample Description	Gray Clay



% + 3"	% Gravel	% Sand	% Silt	% Clay
0 0	0 0	27.7	29 1	43.3

Sieve Size	Percent Passing
3 0"	100 0
1 5"	100 0
1 0"	100 0
3/4"	100 0
1/2"	100 0
3/8"	100 0
No 4	100 0
No 10	97 9
No 40	92 8
No 100	80 0
No 200	72 3

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
25	13	12

Soil Classification:	CL
Soil Description:	Lean Clay with Sand
System:	USCS

Remarks

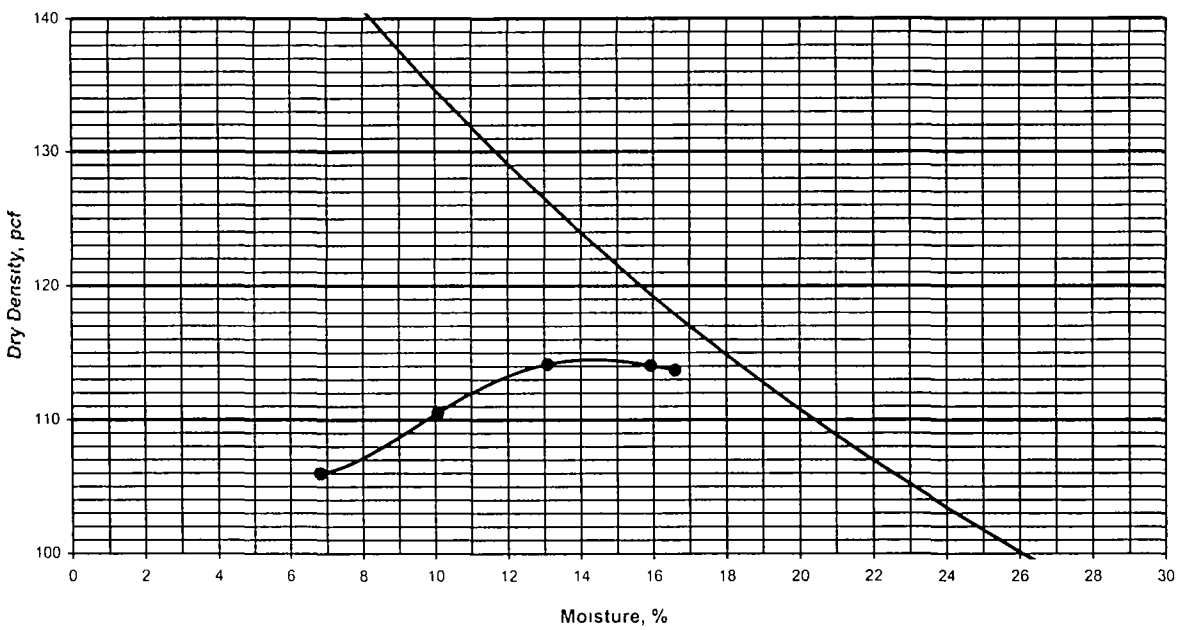
Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Gary Landfill						
Client	Earth Tech, Inc. 3121 Butterfield Road, Oak Brook, IL 60523 Attn.. Mr. Andy Querio						
File No.	2315	**Sample #**	CS-1	**Date Tested**	4/30/2002	**Tested By**	NP
						Qc By	SM

Sample Location									
Sample Description	Gray Clay								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5 5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**			25				



Zero Air Void Curve Specific Gravity 2 75

Results

Maximum Dry Density, pcf	114.5	**Optimum Moisture Content, %**	14.5	**Natural Moisture Content, %**	17.4

Remarks

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Gary Landfill						
Client	Earth Tech, Inc 3121 Butterfield Road, Oak Brook, IL 60523 Attn Mr Andy Querio						
File #	2315	**Date Tested**	5/3/2002	**Tested by:**	AK	**QC by:**	SM
Sample ID:	ST-1		**Location**				
Sample Description	Dark grayish brown clay						

Specimen Data

Initial

Diameter	7 10	cm	Area, A	39 6	sq cm
Height, L	6 70	cm	Volume, V	265 3	cu cm
Mass of Sample	561 8	g	**Moisture Content**	**17.9**	%
			Wet Density	**132 2**	pcf
			Dry Density	**112 1**	pcf

Final

Diameter	7 05	cm	Area, A	39 0	sq cm
Height, L	6 65	cm	Volume, V	259 6	cu cm
Mass of Sample	561 10	g	**Moisture Content**	**18.6**	%
			Wet Density	**134 9**	pcf
			Dry Density	**113 7**	pcf
			Deg of Saturation	**100 5**	

Test Data

Permeant	De-aired Tap Water	
Cell Pressure	80 0	psi
Top Pressure	75 0	psi
Bottom Pressure	77 3	psi
Gradient	24 1	

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings Outflow cc	Burette Readings Inflow cc	Outflow/Inflow Ratio	Fluid Temp oC	Permeability cm/sec
5/3/2002	1 15 PM	0	0	2 90	5 24		20 0	---
5/3/2002	2 15 PM	3600	3600	3 14	5 00	1 0	20 0	6 39E-08
5/3/2002	3 15 PM	3600	7200	3 35	4 78	1 0	20 0	5 97E-08
5/3/2002	4 15 PM	3600	10800	3 56	4 58	1 1	20 0	5 52E-08
5/3/2002	5 15 PM	3600	14400	3 76	4 37	1 0	20 0	5 89E-08

Average Permeability = **5.9E-08** cm/sec

Remarks

	Great Lakes Soil & Environmental Consultants, Inc 333 Shore Drive, Burr Ridge, IL 60521 Ph (630) 321-0944 Fax (630) 321-0945	**COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)**

Project	Gary Landfill						
Client	Earth Tech, Inc 3121 Butterfield Road, Oak Brook, IL 60523 Attn. Mr Andy Querio						
File #	2315	**Date Tested**	5/3/2002	**Tested by:**	AK	**QC by:**	SM
Sample ID:	ST-2		**Location**				
Sample Description	Dark grayish brown clay						

Specimen Data

Initial

Diameter	7 05	cm	Area, A	39 0	sq cm
Height, L	6 72	cm	Volume, V	262 3	cu cm
Mass of Sample	560 5	g	**Moisture Content.**	**15.7**	**%**
			Wet Density	**133 3**	**pcf**
			Dry Density	**115.2**	**pcf**

Final

Diameter	7 10	cm	Area, A	39 6	sq cm
Height, L	6 70	cm	Volume, V	265 3	cu cm
Mass of Sample	560 70	g	**Moisture Content**	**17.0**	**%**
			Wet Density	**131.9**	**pcf**
			Dry Density	**112 8**	**pcf**
			Deg of Saturation	**89 4**	

Test Data

Permeant	De-aired Tap Water	
Cell Pressure	80 0	psi
Top Pressure	75 0	psi
Bottom Pressure	77 3	psi
Gradient	24 1	

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp oC	Permeability cm/sec
				Outflow cc	Inflow cc			
5/3/2002	1 15 PM	0	0	2 96	5 12		20 0	---
5/3/2002	2 15 PM	3600	3600	3 12	4 92	0 8	20 0	5 44E-08
5/3/2002	3 15 PM	3600	7200	3 28	4 75	0 9	20 0	4 69E-08
5/3/2002	4 15 PM	3600	10800	3 44	4 59	1 0	20 0	4 47E-08
5/3/2002	5 15 PM	3600	14400	3 60	4 43	1 0	20 0	4 53E-08

Average Permeability = **4.8E-08** cm/sec

Remarks:

Attachment 4

Photo Documentation
Slurry Wall Repair

Photo Documentation
Slurry Wall Repair

Photo # 1 (Facing south). Site before repair work began. View is looking south with Burr St. on the left and Gary Landfill on the other side of the fence. GP-4 is the 3 ft tall rectangular structure protruding from the grass in the lower right corner of the photo.

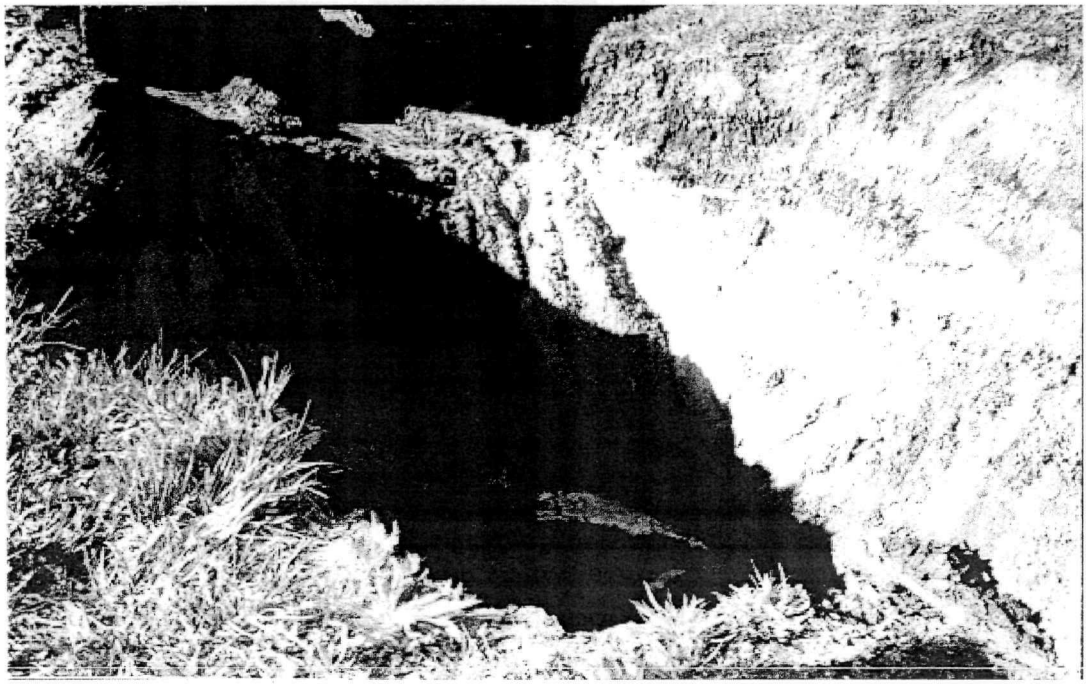


Photo # 2 (Facing southwest). Excavation at approximately 6 feet in depth with offsite groundwater accumulation. GP-4 is just out side of the photo, but would be near the lower right.

Photo Documentation
Slurry Wall Repair

Photo # 3 (Facing southwest and down). The existing slurry wall is exposed and can be seen here as the bluish gray colored material in the sandy soil.

Photo # 4 (Facing south). The clay repair material is placed in lifts of 6 inches thick and receives compaction from the downward pressure of the track hoe scoop.

Photo Documentation
Slurry Wall Repair

Photo # 5 (Facing southwest). The clay repair material is placed in lifts of 6 inches thick and achieves compaction by using a sheep's hoof roller compactor.

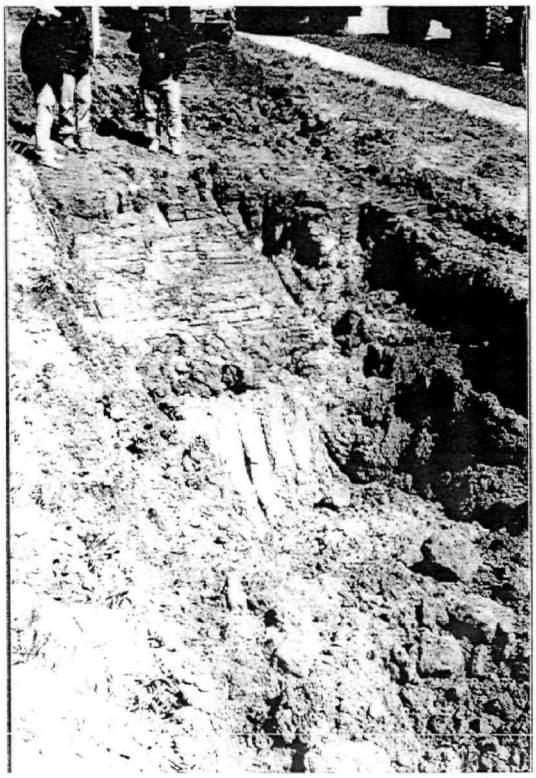


Photo # 6 (Facing north east). The repair to the slurry wall was made in three increments. The second repair increment is being excavated here. Where the people are standing is the first repair increment, which has received compacted clay repair material.

Photo Documentation
Slurry Wall Repair

Photo # 7 (Facing southeast). After compaction a smooth surface was made using the track hoe scoop where in-situ soil testing was performed with nuclear density test equipment.

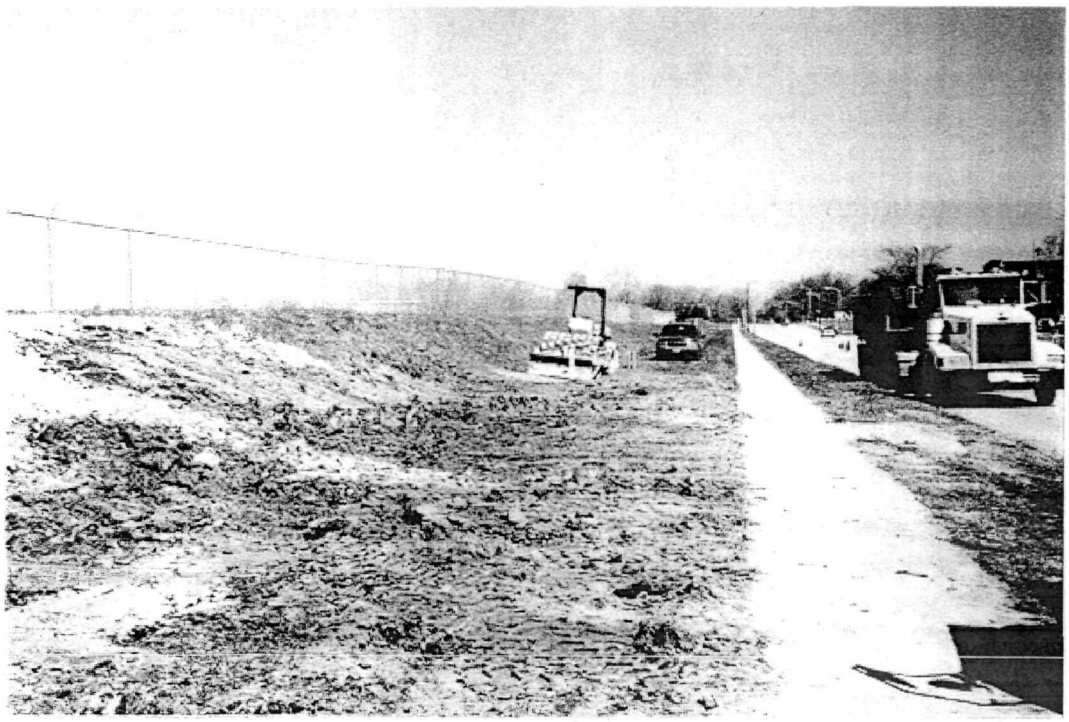


Photo # 8 (Facing north). The final lift of clay was placed across the entire area of repair and compacted. Rough grading was made in preparation for placement of topsoil.

Photo Documentation
Slurry Wall Repair

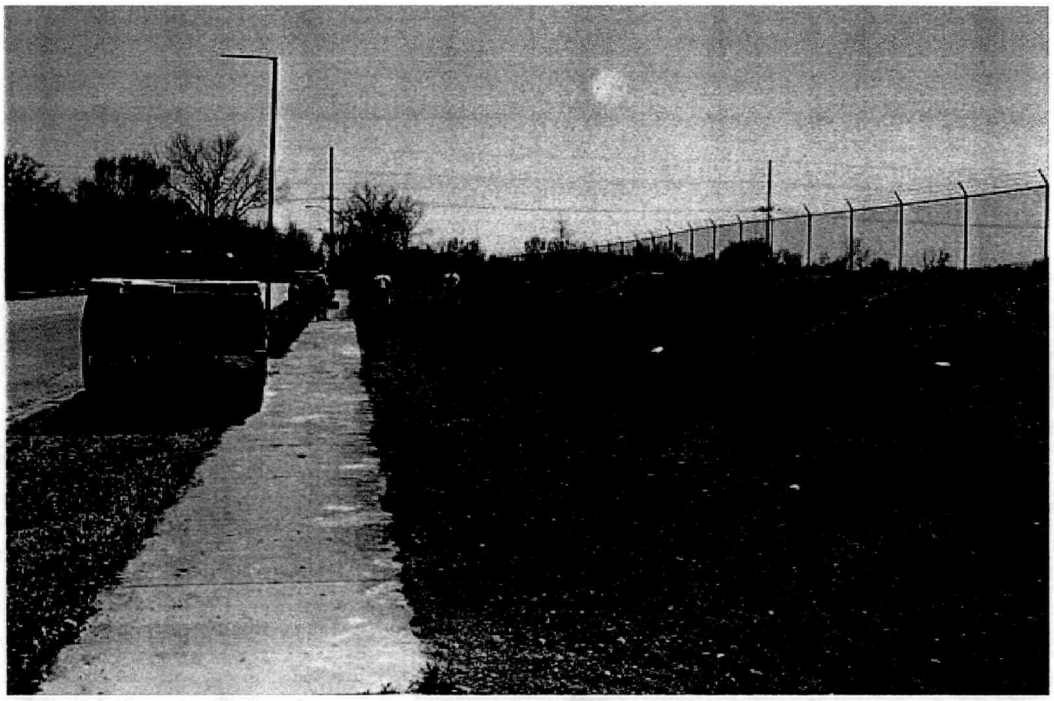


Photo # 9 (Facing south). Topsoil was placed and spread to transition smoothly with former grades. Then grass seed was applied to areas devoid of vegetation.

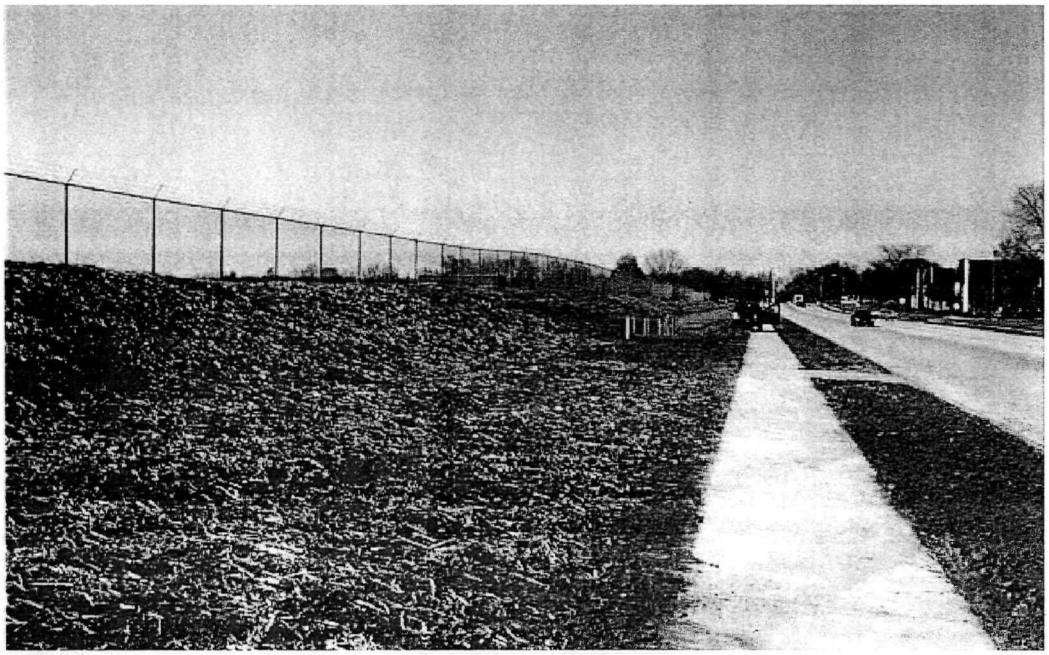


Photo # 10 (Facing north). Straw was applied to complete the seeding activities.

Attachment 5

Record Drawings

WALL RECONSTRUCTION AREA
E4500
E5000
N6000
N5500
BURR STREET
WEST 19TH STREET
WEST 21ST STREET
PARKING
PKNG
CONC
V-103
608.58
0
200'
N

FIGURE 1

EARTH TECH

A tyco INTERNATIONAL LTD COMPANY

FIGURE 2

CALCULATION SHEET

PAGE ____ OF ____

PROJECT NO ____

CLIENT CITY OF GARY, IN.

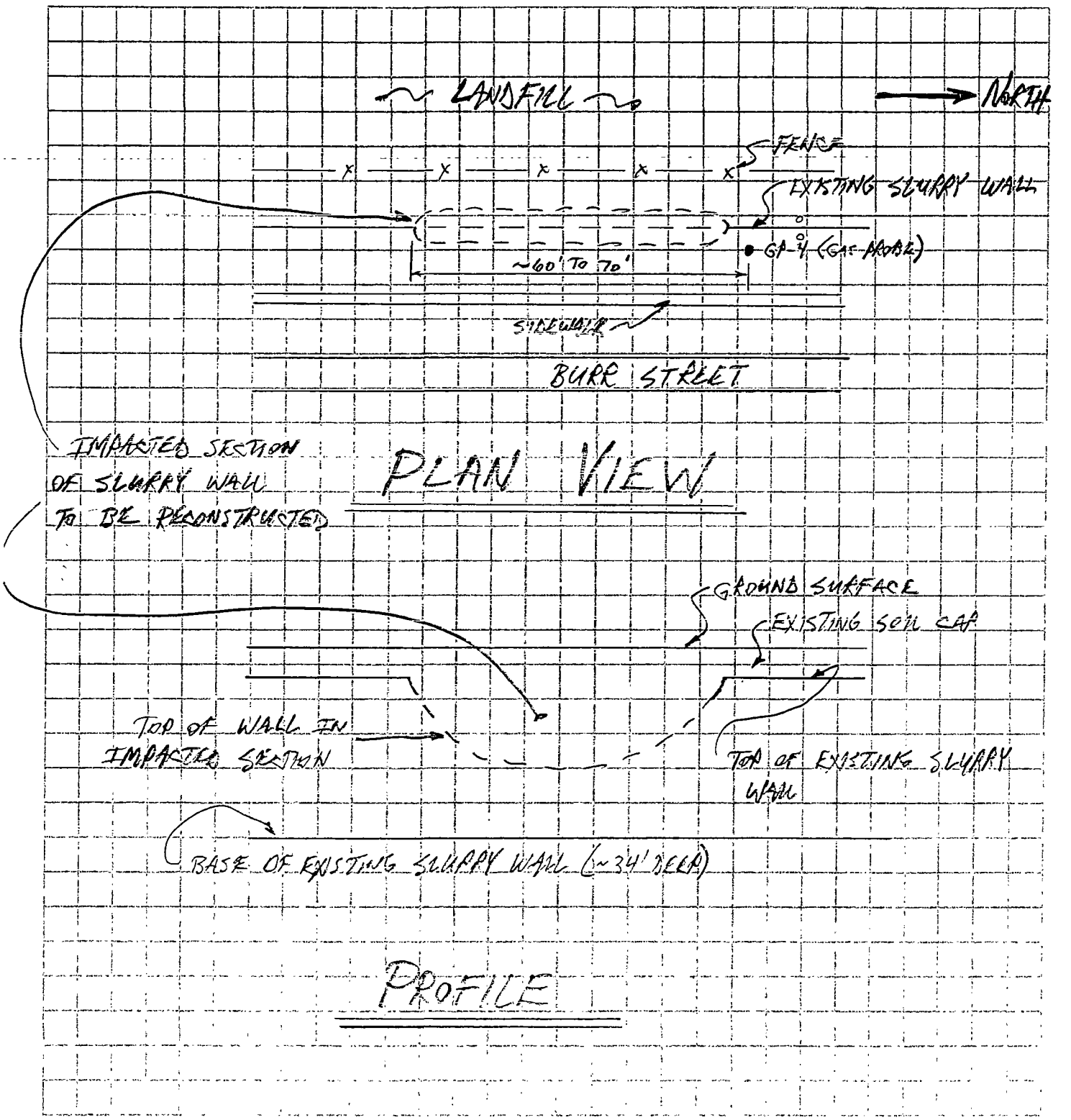
SUBJECT SLURRY WALL REPAIR

PROJECT GARY LANDFILL

Prepared By ATQ DATE 5/24/02

Reviewed By ____ DATE ____

Approved By ____ DATE ____



EARTH TECH

A tyco INTERNATIONAL LTD COMPANY

FIGURE 3

CALCULATION SHEET

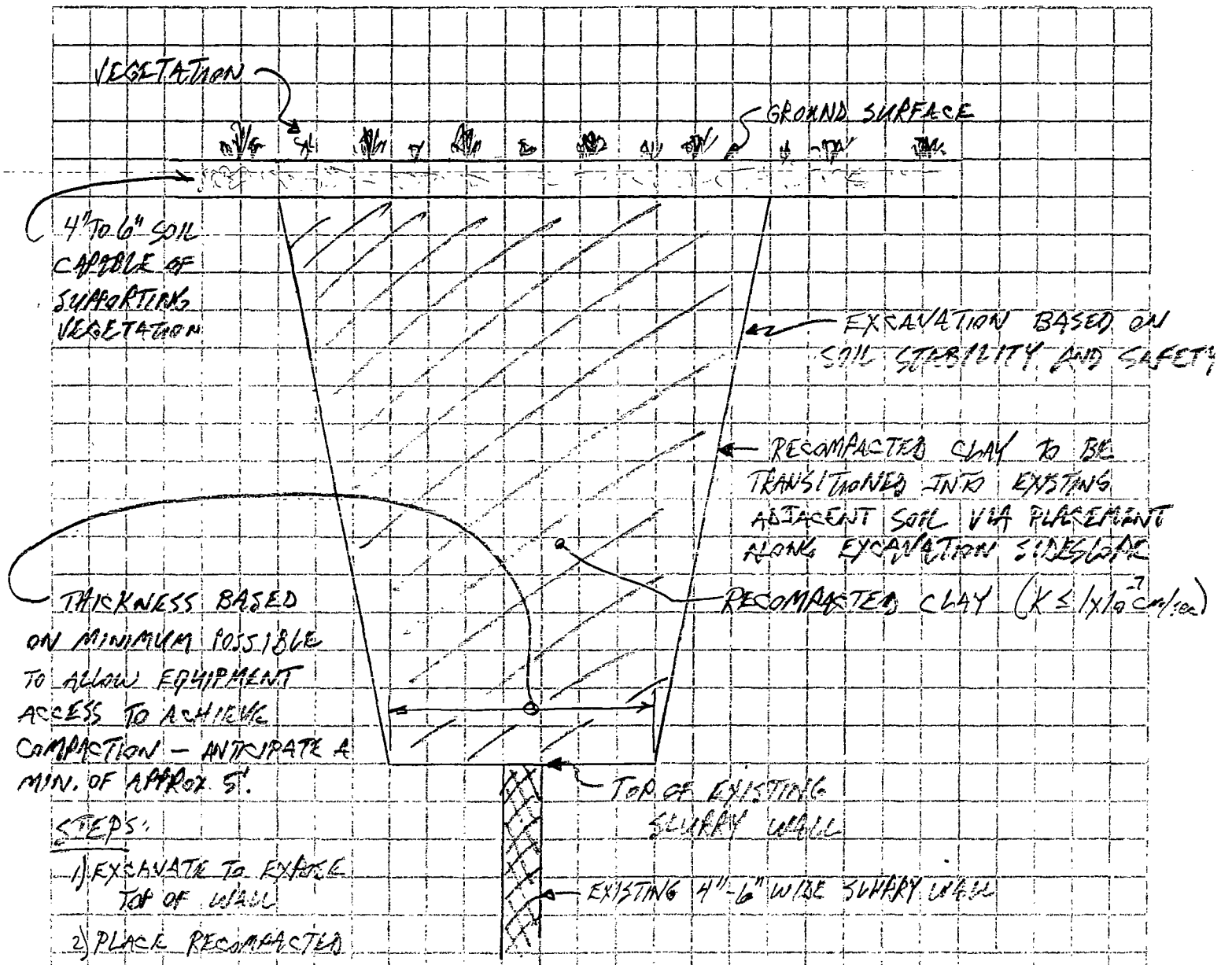
PAGE ____ OF ____

PROJECT NO. ____

CLIENT CITY OF GARY, IN. SUBJECT SLURRY WALL REPAIR Prepared By AJQ DATE 5/24/02

PROJECT GARY LANDFILL Reviewed By ____ DATE ____

Approved By ____ DATE ____



STEPS:

1) EXCAVATE TO EXPOSE TOP OF WALL
2) PLACE RECOMPACTED CLAY IN EXCAVATION
3) PLACE TOPSOIL AND SEED

WALL REPAIR DETAIL

Site Gary Development Corp LF County Lake

Activity Cover LF & certify closed

Date	Notes
8.09.99	Site inspection & meeting w/ RR representative - See file report
~~9.24.99~~	~~Final approval letter sent for 6 SI/acre~~
11.08.99	Site inspection w/ Greg Overtoom & Jeff Sewell - did GPS on GWM wells
12.08.99	Meeting w/ Adriane & Aaron - see notes in file
3-10-00	Meeting @ NWRO - See notes
4-07.00	Site meeting - See notes
4.12.00	Teleconference call w/ Adriane - see notes
5-08.00	Site meeting w/ DNR & Railroad - see notes
5-23-00	Met Larry Osterholz (DNR) at office in Remsselaer
5.31.00	Committee meeting @ NWRO - See notes

04 Aug. '10

Probable GDC site near the airport.

TOPS 35500