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LANCASTER SANITARY LANDFILL
LANCASTER, NEW YORK

MONITORING WELL INSTALLATION,
ABANDONMENT & REPAIR
CERTIFICATION REPORT

GGE 98-1047

prepared for:
Gunville Energy Systems
2255 Bailey Avenue
Buffalo, New York 14211



January 29, 1999



**GLYNN
GEOTECHNICAL
ENGINEERING**

GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

January 29, 1999

New York State
Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

Attn: Ms. Mary McIntosh

Subject: Lancaster Sanitary Landfill
 Monitoring Well Installation, Abandonment
 and Repair Certification Report
 GGE 98-1047

Dear Ms. McIntosh:

The following report has been prepared to summarize the monitoring well installation, abandonment and repair efforts performed at the Lancaster Sanitary Landfill between November 3, 1998 and December 9, 1998.

All work was performed in accordance with the monitoring well installation, abandonment and repair specifications for the Lancaster Sanitary Landfill, with the exceptions and clarifications noted in this report. A copy of the specifications has been included for your reference.

In a November 2, 1998 correspondence, you noted that the specifications were generally acceptable, with the understanding that the source of potable water and area of drill rig decontamination would need to be addressed. The Lancaster Sanitary Landfill supplied an on-site source of potable water. This was city water and was the only water source used for drilling procedures. The drill rig decontamination area was located near the entrance to the landfill, in the roadway between the two main buildings. This site was chosen for its ideal drainage regime and gravel rich soil, which would allow for containment within the landfill of any potentially contaminated material removed from the drill rig.

A summary of the work performed by Natures Way and observed by Glynn Geotechnical Engineering (GGE) is as follows:

6503 Campbell Blvd., Lockport, New York 14094 (716) 625-6933 / fax (716) 625-6983

DOCFILE:98-1047/W



11-03-98

The piezometer at B-17 was abandoned. Tremie grout was placed to within 5 ft. of ground surface, allowing for the remaining 5 ft. to be backfilled with soil. An unsuccessful attempt was made at pressure flushing W-6.

11-04-98

Due to unsuccessful attempts at pressure flushing W-6 on the previous day, a roller bit was used to overdrill from 37 ft. to 49.6 ft. Material could be heard falling to the bottom of the hole and was assumed to be coming from below the casing at 36.5 ft.

11-06-98

A bentonite seal was placed in W-8 to separate the cascading water inflow from the lower portion of the well using a pneumatic packer, which was inflated at several depths to determine the proper depth to place the bentonite seal. After several inflations the ideal depth was found to be at 35 ft. The packer was then removed and bentonite was placed to a depth of 35 ft. On W-6, the depth was checked to determine the quantity of debris that had fallen into the well. Approximately 8 ft. of debris had fallen into the well, which needed to be cleaned out before a screen could be installed.

11-10-98

Sonotube forms were placed for concrete seals at W-15, W-16, W-3, W-A, W-D, W-E, W-G and W-H. The soil around the perimeters of the wells was regraded to promote drainage away from the wells. In W-6 and W-H, the metal casings could not be separated from the concrete seals, resulting in their removal along with the existing concrete seals. New casings will be installed with the new concrete seals.

11-13-98

Monitoring well 5A was installed to a depth of 32 ft., with continuous split spoon sampling performed throughout its depth. There was concern for a possibly contaminated zone from 9 ft. to 15 ft., but there was no evidence of this found in the split spoon sampling. The depths of the new concrete seals were checked on W-15, W-16, W-3, W-A, W-D, W-E, W-G and W-H to verify depths between 3 ft. 8 in. and 4 ft. 0 in.

11-23-98

Well development and hydraulic conductivity tests were performed on W-5A. Approximately 1.5 ft. of sand was added over the bentonite seal in W-8 to decrease turbidity when sampling.



11-30-98

Although a roller bit was used on 11-04-98 to clean out W-6, debris had fallen back into the hole by the time the screen was to be installed on 11-30-98. The hole was reopened to a depth of 50 ft., allowing for the well screen to begin at 49.5 ft. Well installation proved difficult due to several collapses within the hole. Any deviations from the standard well installation procedures are listed in GGE Field Observation Report #98-07.

12-09-98

Well development and hydraulic conductivity tests were performed on W-6 and a 6 ft. sign was installed adjacent to the well as a reference marker. A final inspection was made on all wells, with all work proving to be completed.

Although GGE was not present for every aspect of the construction on various wells, final inspections were made to ensure that work was properly completed. Miscellaneous elements observed on 12-09-98 include:

1. The 4 inch PVC riser on W-2 and W-3 was extended to approximately 30 inches above the concrete seal.
2. Concrete seals were added or replaced on W-2, W-3, W-4, W-4A, W-5A, W-15, W-15B, W-16, W-A, W-D, W-E, W-G, and W-H.
3. The protective casings on all wells were painted orange, with the well number/letter stenciled in black, fitted with a silver lid and locked with a pad lock.
4. The soils surrounding the wells were regraded when necessary to promote proper drainage.
5. The piezometers at W-15B were cut below the surface bends and fitted with caps.

Copies of the well development records and bore logs completed by Natures Way and Field Observation Reports (FOR's) completed by GGE have been included for your reference. Feel free to contact GGE if you should have any questions during your review.

Sincerely,

GLYNN GEOTECHNICAL ENGINEERING



Edward Lover
Senior Engineering Technician

/el





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GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

APPENDIX A

FIELD OBSERVATION REPORTS

LANCASTER SANITARY LANDFILL
LANCASTER, NEW YORK

MONITORING WELL INSTALLATION,
ABANDONMENT & REPAIR
CERTIFICATION REPORT

GGE 98-1047

January 29, 1999





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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-01 DATE: 11/03/98 PAGE: 1 OF 1
PROJECT: Lancaster Sanitary Landfill DAY: Tuesday
SUBJECT: Monitoring Well Drilling & Repairs PROJECT TIME: 2:10 pm - 5:40 pm
CLIENT: Gunville Energy Systems SITE TIME: 2:45 pm - 5:10 pm
WEATHER: 40's ° F & Clear PHOTOS: YES NO X

- I arrived on site at 2:45 pm.
- Piezometer B-17 had been overdrilled with 4.25 inch HSA to 30 ft. and entire piezometer removed including well point.
- GGE observed mixing of Tremie Grout and Tremie placement to bottom of hole. No water was observed when Tremie reached surface. Grout level did not drop with in auger.
- Individual auger flights were removed and hole Tremied to surface as each section was removed. Final sections were not Tremie filled when removed to permit final 5 ft. to be soil backfilled. Final 5 ft. soil was not added to permit curing and settling of grout overnight. Grouting complete at 4:00 pm.
- Attempted to pressure flush W-6 from 37 ft. to original 49 ft. depth without success. Water did not appear to fill up in hole. Possible rock blocking hole. Started efforts at 4:00 pm. Completed efforts at 5:00 pm.
- 3.75 inch roller bit to be used tomorrow to clear obstruction and ream hole to 49 ft.
- Left site at 5:10 pm.

PERSONNEL ON SITE / CONTACTED:

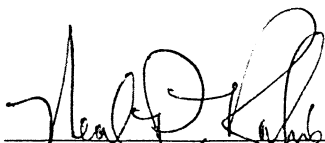
Bruce - Natures Way

Corey - Natures Way

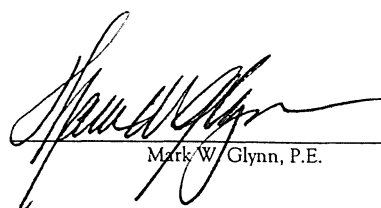
DISTRIBUTION:

DAILY MANHOURS: 3.50

REPORTED BY:


Neal P. Kochis

REVIEWED BY:


Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-02 DATE: 11/04/98 PAGE: 1 OF 1
PROJECT: Lancaster Sanitary Landfill DAY: Wednesday
SUBJECT: Site Monitoring Well Efforts - Drilling PROJECT TIME: 9:45 am - 3:15 pm
CLIENT: Gunville Energy Systems SITE TIME: 10:30 am - 2:30 pm
WEATHER: 40's ° F & Partly Sunny PHOTOS: YES NO X

- I arrived on site at 10:30 am.
- Observed overdrill of W-6 from 37 ft. to 49.6 ft. completed with 3-7/8" roller bit at 1:00 pm.
- Total depth below grade = 49.1 ft. (casing has additional 18 inch s.u. - total agrees with original boring.) Bottom of casing is 36.5. Material could be heard dropping to bottom of hole, assumed from just below casing. Water level at 40.5 ft.
- Rechecked B-17 Tremie grout level. New final grout level at 9.3 ft. with water at 7.4 ft. Additional grout was added to 4.6 ft. below grade.
- Packer for W-8 will not be available until probably Friday and screens for W-6 and W-5A will not be in until next week. Work on seals and casings will be done in between drilling operations.
- Per NYSDEC (Mary McIntosh), spoil/cuttings need to be containerized and can be stored on site for use as fill in depressed cap areas.
- Drill rig was returned to the decon area for cleaning at 2:30 pm.
- GGE left site at 2:30 pm.

PERSONNEL ON SITE / CONTACTED:

Bruce - Natures Way

Corey - Natures Way

Mary McIntosh - NYSDEC

DISTRIBUTION:

DAILY MANHOURS: 3.00

REPORTED BY:

Neal P. Kochis

REVIEWED BY:

Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 REPORT NO.: 98-03 DATE: 11/06/98 PAGE: 1 OF 1
PROJECT: Lancaster Sanitary Landfill DAY: Friday
SUBJECT: Monitoring Well Alteration PROJECT TIME: 8:45 am - 1:30 pm
CLIENT: Gunville Energy Systems SITE TIME: 9:15 am - 12:45 pm
WEATHER: 35 ° F & Overcast PHOTOS: YES NO X

- I arrived on site at 9:15 am to observe the placement of a bentonite seal in monitoring well 8.
- The total depth of the well was 57.2 ft. with water found at 56.1 ft. Water was known to be cascading from the upper portion of the well and draining from the lower portion. The cascading water was found to start at 21.25 ft. below the surface elevation.
- A 2.75 inch diameter, 2.8 ft. long pneumatic packer (inflatable to 4 inch diameter) was inserted into the well and inflated at 30 ft. and 33 ft. Both attempts at sealing the well were unsuccessful. The packer was brought to the surface to ensure it was functioning properly. After looking the packer over, it was inserted into the well again and successfully inflated at 35 ft. Water was then allowed to collect over the packer, eventually stabilizing after approximately 1.5 hours at 23.1 ft. The water would not rise to the point of cascading at 21.25 ft. due to fractures located from 23 to 23.5 ft.
- The packer was then removed and the well was sealed with bentonite pellets to a depth of 35 ft. from the surface. A 6 inch layer of fine sand will be placed over the bentonite at a later date to decrease turbidity when sampling.
- On a previous date, monitoring well 6 was installed without a screen, where pieces of rock could be heard falling to the bottom of the well. The depth of the well was checked to see how much rock had fallen to the bottom. The initial depth of the well was 49.1 ft., and the actual depth now was found to be 41.3 ft. Therefore the well will have to be cleaned before the screen is installed.
- GGE left the site at 12:45 pm.

PERSONNEL ON SITE / CONTACTED:

Bruce - Natures Way
Dale Gramza - Natures Way
Mary McIntosh - NYSDEC

DISTRIBUTION:

DAILY MANHOURS: 4.75

REPORTED BY:

Edward Lover

REVIEWED BY:

Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-04 DATE: 11/10/98 PAGE: 1 OF 1
PROJECT: Lancaster Sanitary Landfill DAY: Tuesday
SUBJECT: Site Monitoring Well Efforts - Inspection PROJECT TIME: 11:30 am - 2:45 pm
CLIENT: Gunville Energy Systems SITE TIME: 12:05 am - 2:00 pm
WEATHER: 50's ° F & Light Rain PHOTOS: YES NO X

- I arrived on site at 12:05 pm.
- Checked depth of grout at abandoned B-17; measured at 5'9" below grade.
- Inspected new and replacement concrete seals at several monitoring well locations. 36 inch diameter sonotubes were installed as forms to receive concrete for new seals. Old concrete seals were fully removed to the bottom of sonotube placement with no visible signs of disturbance to existing casings. The following efforts were observed:

W-15	Sonotube installed around existing casing to 3 ft. depth and perimeter soil regraded to promote runoff away from well - no concrete placement yet.
W-15A	Three piezometers cut off at grade, extensions added, new 8 inch steel casing added with sonotube setup like W-15.
W-16	Sonotube setup like W-15.
W-3	Work in progress. 42 inch ± deep sonotube set in place, grading in progress.
W-A	Sonotube setup like W-15.
W-D	Sonotube setup like W-15.
W-E	Sonotube setup like W-15.
W-G	Existing casing came out with concrete seal. Sonotube placed to 3 ft. depth around PVC riser. New casing will need to be installed.
W-H	Similar condition as W-G.

- GGE informed Natures Way that specifications require 4 ft. sonotube depth versus 3 ft. Natures Way agreed to revise.
- GGE placed large rock approximately 25 ft. south of W-5 to denote proposed W-5A installation point.
- GGE left site at 2:00 pm.

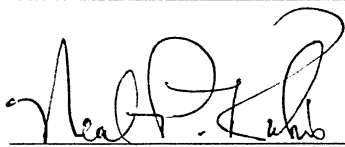
PERSONNEL ON SITE / CONTACTED:

Kevin Haig - Natures Way
Dale Gramza - Natures Way (per telecon)

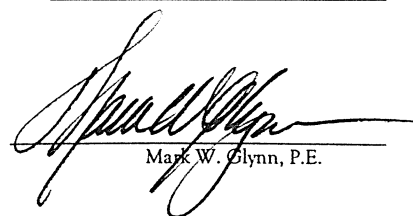
DISTRIBUTION:

DAILY MANHOURS: 3.25

REPORTED BY:


Neal P. Kochis

REVIEWED BY:


Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-05 DATE: 11/13/98 PAGE: 1 OF 2
PROJECT: Lancaster Sanitary Landfill DAY: Friday
SUBJECT: Monitoring Well Installation Observation PROJECT TIME: 8:45 am - 6:00 pm
CLIENT: Gunville Energy Systems SITE TIME: 9:30 am - 5:15 pm
WEATHER: 40 - 45 ° F & Sunny PHOTOS: YES NO X

- I arrived on site at 9:30 am.
- Continuous split spoon sampling was performed at the location of MW-5A to a total depth of 32 ft. There was no contamination found in the questionable zone from 9 to 15 ft., with the exception of a few naturally occurring zones of oxidation.
- A general log of the boring is as follows:

0 - 4 ft.	Previously excavated.
4 - 8 ft.	Moist, brown silt, trace rock fragments (weathered shale), stiff, trace of roots from 6 - 8 ft.
8 - 10 ft.	Damp, stiff, brown silt, trace rock fragments.
10 - 20 ft.	Damp, brown silt grading to fine sand with depth, occasional zones of oxidation.
20 - 24 ft.	Damp, dense, brown fine sand, slight trace of rock.
24 - 26 ft.	Very dense, damp, brown fine sand, some gravel, trace of oxidation.
	Water at 26 ft.
26 - 30 ft.	Medium to fine sand and gravel, wet.
30 - 32 ft.	Fine brown sand, slight trace of gravel, wet.
- Since no contamination was found, a standard 10 ft. screen was used beginning at a depth of 31.5 ft.

PERSONNEL ON SITE / CONTACTED:

Dale Gramza - Natures Way

Bruce - Natures Way

Corey - Natures Way

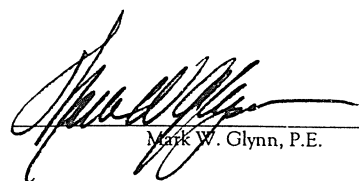
DISTRIBUTION:

DAILY MANHOURS: 9.00

REPORTED BY:


Edward Lover

REVIEWED BY:


Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047

REPORT NO.: 98-05

DATE: 11/13/98

PAGE: 2 OF 2

- Well installation was performed in accordance with the Lancaster Sanitary Landfill Monitoring Well Installation Specifications.
- Depth of concrete surface seals were checked on all uncompleted wells with results ranging from 3'8" to 4'0".
- Boring samples were taken back to GGE office
- Left site at 5:15 pm.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-06 DATE: 11/23/98 PAGE: 1 OF 2
PROJECT: Lancaster Sanitary Landfill DAY: Monday
SUBJECT: Monitoring Well Installation Observation PROJECT TIME: 10:00 am - 2:30 pm
CLIENT: Gunville Energy Systems SITE TIME: 10:45 am - 1:45 pm
WEATHER: 45 ° F & Partly Sunny, Very Windy PHOTOS: YES NO X

- I arrived on site at 10:45 am and met with Dale Gramza of Natures Way.
- Well development of 5-A and hydraulic conductivity tests were both performed in accordance with the specifications. The total depth of well 5-A was measured to be 32.2 ft., with a static water level of 27.1 ft. from the top of the concrete seal. The well water volume was found to be approximately one gallon, resulting in approximately five gallons of water being bailed for development.
- Wells W-5A, W-3, W-2, W-4A, W-6, W-E and W-D need pea gravel installed in the casings.
- Wells W-3, W-5A, W-2, W-4, W-4A, W-E, W-D and W-6 have not had drainage holes drilled above the concrete seals.
- Many wells will require a second coat of paint along with the removal of excess concrete that was splashed on the casings.
- The spoils around B-17 have not been removed or graded at this time.
- 6 inches of sand was to be added to the bottom of well W-8. Too much sand was accidentally added, resulting in approximately 1.5 ft. of sand in the bottom of the well. Dale figures the sand must have been hung up in the well and all released at one time, resulting in him adding more than he thought he had.

PERSONNEL ON SITE / CONTACTED:

Dale Gramza - Natures Way

DISTRIBUTION:

DAILY MANHOURS: 4.50

REPORTED BY:

Edward Lover

REVIEWED BY:

Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047

REPORT NO.: 98-06

DATE: 11/23/98

PAGE: 2 OF 2

- Natures Way will have all the wells completed by the end of 11/24/98, with the exception of well W-6.
- Left site at 1:45 pm.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 EPORT NO.: 98-07 DATE: 11/30/98 PAGE: 1 OF 2
PROJECT: Lancaster Sanitary Landfill DAY: Monday
SUBJECT: Monitoring Well Installation Observation PROJECT TIME: 9:30 am - 3:45 pm
CLIENT: Gunville Energy Systems SITE TIME: 10:15 am - 3:00 pm
WEATHER: 60 ° F & Overcast PHOTOS: YES NO X

- I arrived on site at 10:15 am.

- Although MW-6 was drilled on a previous date to a depth of 49.5 ft., a screen was not installed resulting in the hole becoming clogged with rock debris to a depth of 41.0 ft. The rock debris was cleaned out with a roller bit to a depth of 50.0 ft., resulting in a screen being installed at 49.5 ft. As sand was being placed around the screen, the hole managed to collapse in on itself several times. After each collapse, the hole had to be cleaned out by running water through a tremie pipe. Fortunately, the sections that collapsed did not exceed 1.5 ft., making for easy removal. Due to the numerous hole collapses, the sand pack and bentonite had to be installed as quickly as possible, resulting in the sand pack being installed one foot higher than intended. The sand should go to 38 ft. and instead it goes to 37 ft. There was also no fine silica sand pack between the bentonite and the sand pack around the seal. Due to the previous casing that was present, three measuring tapes were lost, resulting in three 1/8 inch pieces of galvanized steel buried in the hole, ranging in length from 2 ft. to 6 ft.

- With exception to the instances previously noted, all other aspects of the well installation were in accordance with site specifications.

- Grout depth will be checked after it is cured, along with gravel installation at a later date.

PERSONNEL ON SITE / CONTACTED:

Bruce - Natures Way

Corey - Natures Way

DISTRIBUTION:

DAILY MANHOURS: 4.50

REPORTED BY:

Edward Lover

REVIEWED BY:

Mark W. Glynn, P.E.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 REPORT NO.: 98-07 DATE: 11/30/98 PAGE: 2 OF 2

- A site inventory was taken to verify the completion of the remaining wells on site. All wells have been completely installed including paint and stenciled lettering, with the exception of W-E which is missing a metal cap and the remainder of W-6.
- The new metal cap should arrive some time this week.
- Left site at 3:00 pm.



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FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 REPORT NO.: 98-08 DATE: 12/09/98 PAGE: 1 OF 2
PROJECT: Lancaster Sanitary Landfill DAY: Wednesday
SUBJECT: Monitoring Well Inspection PROJECT TIME: 9:00 am - 3:15 pm
CLIENT: Gunville Energy Systems SITE TIME: 9:45 am - 2:15 pm
WEATHER: Sunny, 40 ° F PHOTOS: YES NO X

- I arrived on site at 9:45 am and met with Dale Gramza of Nature's Way.
- Well development and hydraulic conductivity tests were performed on W-6. After the well was developed and approximately 3.5 well volumes were bailed out of the well, three attempts were made to test the hydraulic conductivity. Immediately after the last bail was removed, the water level was measured and on all three occasions the water level was higher than the initial static water level. The hydraulic conductivity could still be measured as the water level dropped back to static, but this is the opposite of what should happen. Two possible explanations for this could be either that the recharge is so fast that the water actually rises past the static water level, or natural gas is bubbling up through the water resulting in strange fluctuations in the water table. A strong natural gas odor was noticed today and during well installation.
- The top of the grout seal placed during well installation was found to be 13 ft. below grade. Dale had some cement with him which was used to fill the seal up to grade. Unfortunately, the cement was not quick setting so the gravel could not be installed. Dale said he will place the gravel someday on his way home.

PERSONNEL ON SITE / CONTACTED:

Dale Gramza - Nature's Way

DISTRIBUTION:

DAILY MANHOURS: 6.25

REPORTED BY:

Edward Lover

REVIEWED BY:

Mark W. Glynn, P.E.



FIELD OBSERVATION REPORT

PROJECT NO.: 98-1047 REPORT NO.: 98-08 DATE: 12/09/98 PAGE: 2 OF 2

- A metal sign approximately 6 ft. high was placed directly behind W-6.
- All other wells passed the final inspection and were fitted with padlocks, in which one set of keys was given to Glynn Geotechnical Engineering. Locks were supplied by the Lancaster Landfill.
- Although the hydraulic conductivity test did not perform as expected with the bail and recovery method, the test did perform as expected using the slug and recovery method.
- Left site at 2:15 pm.



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APPENDIX B

WELL DEVELOPMENT DATA AND BORING LOGS

LANCASTER SANITARY LANDFILL
LANCASTER, NEW YORK

MONITORING WELL INSTALLATION,
ABANDONMENT & REPAIR
CERTIFICATION REPORT
GGE 98-1047

January 29, 1999

NATURE'S WAY

Environmental Consultants & Contractors, Inc.

3553 Crittenden Road
Crittenden, New York 14038

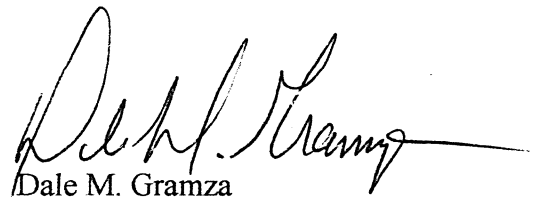
Phone: (716) 937-6527
Fax: (716) 937-9360

Mr. Neal Kochis, P.E.
Glynn Geotechnical
6503 Campbell Boulevard
Lockport, New York 14094

Mr. Kochis,

The enclosed information pertains to the Lancaster Sanitary Landfill, Lancaster, New York. Included are tables containing well data for well numbers W-5A and W-6, as well as boring logs and well installation diagrams for wells W-5A, W-6, and W-8. If there are any questions or comments please call.

I appreciated the opportunity of working with you, and I look forward to future opportunities. We here at NWECC, Inc. wish you a happy holiday season and new year.



Dale M. Gramza
Manager of Geologic Services
NWECC, Inc.


12-28-98

NATURE'S WAY

Environmental Consultants & Contractors, Inc.

3553 Crittenden Road
Crittenden, New York 14038

Phone: (716) 937-6527

Fax: (716) 937-9360

LANCASTER LANDFILL

Gunville Road

Lancaster, New York

Glynn Geotechnical

6503 Campbell Blvd.

Lockport, New York

Well Number: W5A

Well Depth: 33.6'

Date: 11/23/98

1 ½" Tephlon Bailer

Well Purging and Sampling

Well Volume Number	Purging Time	Initial Water Level	Gallons Removed From Well	Comments
1	11:00am	28.55feet	.8	Cloudy Light Brown
2			.8	
3			.8	
4			.8	
5			.8	

Rising Head After Bailing

Test 1

Clock Time	Depth in feet
0	31.1
.5min	30.4
1min	29.65
1.5min	29.15
2min	28.82
2.5min	28.75
3min	28.73
4min	28.70
5min	28.65
6min	28.63
7min	28.61
8min	28.60
9min	28.59
10min	28.57

Falling Head Test

Test 2

Clock Time	Depth (ft)
0	28.30
.5min	28.45
1min	28.48
1.5min	28.50
2min	28.51
2.5min	28.51
3min	28.52
3.5min	28.52
4min	28.52
4.5min	28.52
5min	28.52

Clock Time	Depth (ft)
0	28.35
.5min	28.41
1min	28.45
1.5min	28.48
2min	28.49
2.5min	28.49
3min	28.50
3.5min	28.51
4min	28.51
4.5min	28.51
5min	28.51

Falling head test- place ½ 30" long solid pvc slug down hole

LANCASTER LANDFILL
Gunville Road
Lancaster, New York
Glynn Geotechnical

Well Number: W-6
Well Depth: 38.6'
Date: 12/9/98
1 1/2" Tephlon Bailer

Purging and Sampling

Well Volume Number	Purging Times	Initial H2O Level (ft)	Gallons Removed From Well	Comments
1		38.6	1.5	Water cloudy Grey Brown becoming clear after the first well volume
2		38.6	1.5	
3		38.6	1.5	
4		38.6	1.5	After pulling 3 well volumes the water level was at 36.95 Remove additional well volumes
5		38.6	1.5	
6		38.6	1.5	
7		38.6	1.5	

Recharge Rate

Test 1				Test 2			
Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	36.75	2.5min	36.74	0	37.5	2.5min	37.36
.5min	36.7			.5min	37.37	3min	37.40
1min	36.7			1min	37.35	3.5min	37.38
1.5min	36.7			1.5min	37.35	4min	37.40
2min	36.73			2min	37.35		

Rising Head

Clock Time	Depth (feet)	Clock Time	Depth (feet)
0	37.6	5min	37.46
.5min	37.43	6min	37.48
1min	37.38	7min	37.50
1.5min	37.38	8min	37.52
2min	37.38	9min	37.54
2.5min	37.39	10min	37.55
3min	37.40	12min	37.60
3.5min	37.42	14min	37.63
4min	37.44	16min	37.64
4.5min	37.45	20min	37.70

Falling Head

Clock Time	Depth (feet)	Clock Time	Depth (feet)
0	36.7	6min	37.53
.5min	37.18	7min	37.54
1min	37.30	8min	37.54
1.5min	37.36	9min	37.55
2min	37.40	10min	37.55
3min	37.43	15min	37.60
3.5min	37.45	min	
4min	37.48	min	
4.5min	37.50	min	
5min	37.50	min	

NATURE'S WAY

Environmental Consultants & Contractors, Inc.

3553 Crittenden Road
Crittenden, New York 14038

Office: (716) 937-6527

Fax: (716) 937-9360

HOLE NO. W-5A

SURF. ELV. _____

PROJECT 98-239

LOCATION Gunnville Road

Lancaster Sanitary Landfill

Lancaster, NY

CLIENT Glynn Geotech

DATE STARTED 11/13/98 COMPLETED 11/13/98

DEPTH FEET	SAMPLE NO.	BLOWS ON SAMPLER						DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
		0	6	12	18	24	N			
		0	6	12	18	24	N	Extremely moist brown very gravelly (SILTY-SAND) with 40 to 50 % gravel very fine to coarse size sand little silt compact in place weakly stratified		Note: Test pit excavated to 4.0 feet before drilling - to allow for the installation of 3' by 4' surface seal.
		1	7					2.5		
5				10				Moist brown (CLAYEY-SILT) with 3 to 5 % mostly fine size gravel little clay very stiff Blocky soil structure with gray silt coated ped faces		
					18					
						26				
	2	8						6.5		
				27						
					47					
						50/4"		Moist brown (SILT) with 1 to 3 % mostly fine size gravel trace clay very dense blocky soil structure with occ fine size roots along gray silt coated ped faces		
	3	10								
				41						
					60					
10						50/4"				
	4	18						12.0		
				42						
					61					
						50/5"		Moist brown (SILT) with 1 to 3 % gravel with trace very fine size sand very dense very weakly bedded with occasional iron staining along bedding planes and vertical desiccation cracks		
	5	10								
				30						
					40					
						59				
	6	12						18.0		
15				35						
					45					
						62		Extremely moist brown (SILTY-SAND) with 3 to 5 % gravel with very fine size sand little silt very dense in place weakly bedded with iron staining noticed		
				34						
					36					
						48				
	8	18								
				38						
					46					
20						60				

2" pvc riser pipe
Cement bentonite grout

16.0
16.5

- 1) Very fine size sand
- 2) Bentonite seal
- 3) 2" pvc riser pipe

2

19.5

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

LOGGED BY Dale M. Gramza

SHEET 1 OF 2

Environmental Consultants & Contractors, Inc.

Fax : (716)937-9360

SURF. ELV.

LOCATION Gunnville Road

Lancaster, NY

DATE STARTED 11/13/98 COMPLETED 11/13/98

Sample Recovery Table	
Sample #	Recovery
1	1.0
2	1.5
3	1.5
4	1.6
5	1.8
6	1.7
7	1.9
8	1.8
9	1.7
10	1.8
11	1.2
12	2.0
13	2.6
14	1.8

LOGGED BY Dale M. Gramza

SHEET 2 OF 2

NATURE'S WAY

Environmental Consultants & Contractors, Inc.

3553 Crittenden Road
Crittenden, New York 14038

Office: (716) 937-6527

Fax: (716) 937-9360

SURF. ELV. _____

HOLE NO. W-6

PROJECT 98-239

LOCATION Gunnville Road

Lancaster Sanitary Landfill

Lancaster, NY

CLIENT Glynn Geotech

DATE STARTED 11/13/98 COMPLETED 11/30/98

DEPTH FEET	SAMPLE NO.	BLOWS ON SAMPLER					DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
		0	6	12	18	24			
							Open hole		
15							Advance 3 7/8 inch roller cone through rock debris		Water level 11/30/98 31.0' ground level
30							Roller coning completed at 50.0 feet	2" pvc riser pipe	
								Cement bentonite grout	
								1	33.5
								2	34.0
								1	37.0
									37.5
									39.5
45								3	
								4	
									49.5
									50.0
60									

- 1) Very fine size sand
- 2) Bentonite seal
- 3) 2" 6 slot continuous wrap pvc screen - #1 size sand

N = NUMBER OF BLOWS TO DRIVE _____ " SPOON _____ " WITH _____ lb. WT. FALLING _____ " PER BLOW.

LOGGED BY Dale M. Gramza

SHEET 1 OF 1

Environmental Consultants & Contractors, Inc.

Fax : (716)937-9360

SURF. ELV. _____

Packer Test and Seal Bottom of Casading Well Lancaster, NY

DATE STARTED 11/06/98 COMPLETED 11/06/98

N = NUMBER OF BLOWS TO DRIVE _____ " SPOON _____ " WITH _____ lb. WT. FALLING _____ " PER BLOW.

LOGGED BY Dale M. Gramza SHEET 1 OF 1



**GLYNN
GEOTECHNICAL
ENGINEERING**
GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

APPENDIX C

PROJECT SPECIFICATIONS

LANCASTER SANITARY LANDFILL
LANCASTER, NEW YORK

MONITORING WELL INSTALLATION,
ABANDONMENT & REPAIR
CERTIFICATION REPORT
GGE 98-1047

January 29, 1999



**GLYNN
GEOTECHNICAL
ENGINEERING**
GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

MONITORING WELL INSTALLATION,
ABANDONMENT & REPAIR SPECIFICATIONS

LANCASTER SANITARY LANDFILL LANCASTER, NEW YORK

GGE 98-1047

prepared for:

Gunville Energy Systems
2255 Bailey Avenue
Buffalo, New York 14211

October 1998

TECHNICAL PROVISIONS

I. QUANTITIES AND LOCATIONS:

A. General:

The approximate number, location, depth, and/or details of each required work item is indicated in the Scope of Work Section I. of the General Provisions and supplemented by the attached Wehran site plan drawing, Figures A - D and included bore logs. The actual number, location, depths and details of the borings and maintenance/repair efforts are subject to change, depending on the field conditions, and will be directed in the field by the Contractor with concurrence of the Engineer as necessary.

II. MOBILIZATION AND DEMOBILIZATION

Mobilization shall consist of the delivery to the initial work site of all personnel, equipment and supplies to be furnished by the Contractor/Driller. Demobilization shall consist of the removal from the final work site of all personnel, equipment and materials after completion of the work.

III. PROCEDURE

A. General Requirements (Ref. 6NYCRR Part 360-2.11(a)(8)(i)):

1. The Contractor shall employ appropriate construction techniques to prevent leakage of groundwater or contaminants along the well annulus.
2. The Contractor shall take every precaution during drilling and construction of monitoring wells to avoid introducing contaminants into a borehole. Only potable water of known chemistry may be used in drilling monitoring wells unless otherwise approved by the Engineer.
3. The Contractor shall properly decontaminate all equipment placed into the borings before use at the site and between boreholes. The initial cleaning at the site must ensure that no contaminants from the last site drilled will be introduced into the borings. All equipment must be steam cleaned between holes. Where possible, up-gradient wells should be drilled first.
4. Drilling muds, air systems and drilling lubricants shall not be used.
5. Well borings must have an inside diameter at least two inches larger than the outside diameter of the casing and screen to ensure that a tremie may sufficiently place material around the well casing. Borings shall be drilled with a minimum of 4 ¼ inch inside diameter hollow stem auger. Soil samples shall be obtained on a continuous basis using a standard split barrel sampler starting from the ground surface. For borings into bedrock, advance the auger to the top of rock and collect rock cores to the appropriate depth. After coring, the boring shall be reamed with a roller bit of sufficient size as to produce the required 2 inch annulus.

TECHNICAL PROVISIONS

B. Soil Borings and Soil Sampling

Soil samples shall be obtained on a continuous basis using a standard split barrel sampler. Sampling shall start at the ground surface. All samples shall be preserved in accordance with the applicable requirements under Preserving Samples and Cores. The procedure described in ASTM D-1586, 1984, Penetration Test and Split Barrel Sampling of Soils and ASTM D-4220, Preserving and Transporting of Soil Samples shall be followed. Refusal of the soil sampler shall be one hundred (100) blows with a penetration of less than two inches (2").

C. Coring of Rock

The Driller shall exercise particular care in coring to minimize damage or erosion of cored materials. A non-rotating split inner barrel may be required for adequate recovery of cored glacial till. The procedure described in ASTM D-2114, 1983, "Diamond Core Drilling for Site Investigation" shall be followed. Selected borings to be advanced to recover bedrock core or till core beyond soil sampler refusal will be determined in the field by the Engineer. (See also TP Section VI.)

B. Groundwater Levels

1. The level at which groundwater is first encountered in the borings shall be noted. Groundwater levels shall be measured before and after the casing or drive pipe is pulled. Each water level reading shall be recorded showing the date and time the reading was made, the depth of the drive pipe or casing, and the depth to water. Any loss or gain of water in the boring, except that caused by deliberately introducing water and/or inserting or removing of tools shall be recorded. **Twenty-four (24) hour water level readings shall be obtained for all well installation borings**, except as directed by the Engineer.
2. All water level readings and related data shall be recorded on the boring logs under "Remarks". If necessary, additional forms shall be used for recording groundwater data.

IV. ABANDONED BORINGS AND FALSE STARTS

A. Abandoned Borings

Borings that are abandoned or lost before reaching the required depth, or from which unsatisfactory cores are being obtained shall be supplemented by other borings adjacent to the original in order that satisfactory cores, monitoring wells and the required information can be obtained. Penetration to the depth where the original boring was abandoned may be made by any method selected by the Contractor that in the opinion of the Engineer will permit satisfactory samples were not obtained in the original boring. No payment will be made for supplementary borings that are required to be made to replace borings that were abandoned or from which satisfactory samples were not obtained because of mechanical failure of drilling and sampling equipment, negligence on the part of the Contractor, or other preventable cause for which the Contractor is responsible. However, payment will be made for acceptable portions of these supplementary borings below the depths or outside the reaches for which payment was made for original boring. (See abandonment procedures in Section X.)

TECHNICAL PROVISIONS

B. False Starts

It is intended that borings will clear all embedded pipes, rock anchors, and underground structures. However, should the Contractor be unable to complete any boring because obstacles or obstructions are encountered which the Contractor considers to be of an unusual nature and that failure to penetrate them is not the fault of the Contractor's methods or equipment, a false start will be allowed. In such cases, if directed by the Engineer, another boring will be made in the adjacent vicinity. All core runs taken in the boring, and the length of the false start measured from the original exposed surface to the lowest elevation penetrated, will be paid for at the Contract Unit Price bid in the Proposal for the particular type boring performed, provided, however, that the Contractor shall submit to the Engineer a complete record and samples of all false starts. (See abandonment procedures in Section X.)

V. SPLIT SPOON DRIVE SAMPLES

A. Advanced Soil Borings

Each boring shall be advanced by hollow stem auger methods to the sampling elevation. Hollow stem augers shall be of sufficient diameter to allow the passage of this walled tubes, and NX or NQ wireline coring equipment, without introduction of overburden soils in the rock boring.

B. Sampling Procedure & Storage

1. Continuous sampling will be employed.
2. Before taking each sample, the boring shall be cleaned out to the sampling elevation using equipment that will ensure that the material to be sampled is not disturbed by the operation. In saturated sands and silts, the drill bit shall be withdrawn slowly to prevent loosening of the soil around the borehole. When a casing is used, it shall not be advanced below the top elevation of the next sample.
3. Samples shall be taken using a split-barrel sampler conforming to the requirements of ASTM D-1558. The cutting edge shall be maintained in good condition and replaced as required.
4. With the sampler resting on the bottom of the borehole, the sampler shall be driven with blows from a 140 lbs. drive hammer falling 30 inches until either a penetration of 18 inches has been achieved or 100 blows have been applied for penetration of 2 inches or less which shall be considered refusal.
5. Samples shall be placed in glass jars with threaded caps upon recovery. Preserved samples shall be suitably boxed, marked and identified with legible labels including the project name, hole #, location and jar #.

VI. VERTICAL CORE BORING IN ROCK, NX DOUBLE TUBE
OR NO WIRELINE CORE BARRELS

A. General

The purpose of the borings in rock is to obtain NX - or NQ-size cores for classification. The coring is to be performed at the locations indicated in Section I.A of the General Provisions, and as directed by the Engineer. Procedures outlined in ASTM D-2113-83 shall be followed.

B. Criteria

The core shall be a minimum diameter of two and one-eighth inches for the NX Double Tube Core Barrel, or one and seven-eighths inches for the NQ Wireline Core Barrel. Bedrock coring shall be made in two (2) runs. The first run shall extend through the top 24 inches of rock. The second run shall extend from 2 feet to 7 feet. A complete description shall be required for each run (i.e. recovery, etc.).

C. Equipment

The coring shall be done with an NX size Series M Double Tube Core Barrel non-rotating inner barrel, as standardized by the Diamond Core Drilling Manufacturer's Association, or an NQ Wireline Core Barrel, with non-rotating inner barrel.

D. Sampling Procedure & Storage

1. The general procedure shall be as specified in Section V.B "Split Spoon Sampling". In addition, the core shall be withdrawn at the first sign of blockage or grinding. If core recovery is poor or breakage is excessive, the Contractor shall make every effort to improve the recovery and sample quality by changing bit types and alternating drilling rates, by shortening runs, or by whatever other methods are required.
2. The core recovered shall be placed in clean wooden or metal core boxes, each having a hinged top with a hook and eye clasp, divided into separate compartments running the full length of the box and having the same width as the core. Core shall be placed in these boxes in such a manner that the various strata are in the same relative position in the core box as they are in the ground. The order of placing cores shall be the same in all core boxes. The top of each core obtained and its true depth shall be clearly and permanently marked in each box.
3. Wherever core is lost, or at any cavity, or whenever core is removed for testing or other purposes, a wooden spacer shall be placed in its place in the core box and notation made of the length of hole not represented in the box and the date, purpose, and person who removed core if such is the case.

VII. CONSTRUCTION OF MONITORING WELLS (Ref. 6NYCRR Part 360-2.11(a)(8)(ii))

- A. Well screens and risers shall be constructed of schedule 40 polyvinyl chloride (PVC). Joints, caps, and end plugs are to be secured by welds, threads with Teflon tape, or force fittings. Solvents and glues or other adhesives are prohibited. Caps must be vented to allow for proper pressure equalization. The inside diameter of each well screen or riser pipe must be nominally two (2) inches in diameter and must allow for proper development. A permanent mark shall be made at the top of the riser pipe to provide a datum for subsequent water level measurement.
- B. Well screens shall be factory constructed non-solvent welded/bonded continuous slot wire wrap screens of a material appropriate for long term monitoring without contributing contaminants to or removing contaminants from the groundwater. The slot size of the screen must be compatible with the grain size of the sand pack.
- C. The sand pack shall consist of clean, inert, siliceous material whose grain size is based upon a representative sieve analysis of the screened horizon. The silica sand shall be placed into the borehole to a depth of no more than 6 inches above the bottom of the hole. Subsequently, the slotted screen, end cap and riser pipe, shall be threaded together at the collar of the boring and gradually lowered in.
- D. Once the well is installed to a predetermined depth, the annular space around the well screen shall be backfilled to a depth of 1.5 feet above the top of the well screen. Another six (6) inches of fine grained silica sand pack (100% passing a No. 30 sieve and less than 2% passing a No. 200 sieve) shall then be backfilled to a depth of two (2) feet above the top of the screen. All sand pack materials must be placed using the tremie method and must avoid bridging. The elevation of the silica sand shall be continually monitored during installation by a measuring tape fitted with a weighted tamper at the end.
- E. A minimum three (3) feet of bentonite shall be placed over the sand pack using a tremie. A six (6) to twelve (12) inch fine grain sand pack shall be placed above the bentonite seal to minimize grout infiltration. If pellets or chips are used, allow sufficient time for full hydration of the bentonite before overlying materials are placed.
- F. A cement/bentonite grout mixture or bentonite alone shall be added to the hole with a tremie pipe, filling the remaining annular space to grade. This grout mixture must set up without being diluted by formation water and must displace water in the annular space to ensure a continuous seal. Casing must be left in the hole before grouting to prevent caving.
- G. After grouting, a minimum four (4) inch square, five (5) feet long, protective steel casing with a locking cap shall be installed over the PVC riser. The riser pipe and protective casing shall have a minimum stickup of 24 to 30 inches above the ground surface at each well location. A permanent mark is to be placed on the riser for a measurement datum. The Owner shall provide a marker to identify the well number. A $\frac{1}{4}" \pm$ drain hole shall be drilled at the base of the protective casing. A $\frac{1}{4}" \pm$ vent hole shall be located near the top of the protective casing to prevent explosive gas build up and allow water levels to respond naturally to barometric pressure changes.

TECHNICAL PROVISIONS

G. (con't)

The annulus of the protective casing should be filled with pea gravel. A locking cap must be installed with one to two inches clearance between the top of the well cap and the bottom of the locking cap when in the locked position and a weather resistant padlock must be placed on the protective casing and duplicate keys provided.

- H. A concrete surface seal designed to last throughout the planned life of the monitoring well must be constructed. The surface seal must extend 4' below grade to prevent potential well damage. The top of the seal must be constructed by pouring the concrete into a pre-built 30" square form or 30" diameter "Sono-tube" (or equal). The seal must be designed to prevent surface runoff from ponding and entering the well casing.

VIII. WELL DEVELOPMENT PROCEDURE (Ref. 6NYCRR Part 360-2.11(a)(8)(iii))

- A. All monitoring well installations must be developed by the Contractor as soon as possible after installation but not before the well seal and grout have set (minimum 24 hours). Water must not be introduced into the well for development unless warranted by geologic conditions. All water removed must be properly managed by the Contractor. Development must not disturb the strata above the water bearing zone or damage the well.
- B. Every precaution must be taken to ensure that development activities do not introduce contaminants into the well. The entire vertical screened interval must be developed. The Engineer may require multiple attempts at well development to increase the likelihood that sediment free water can be obtained for sampling. The Contractor shall be responsible for reporting all data concerning monitoring well development in a typed summary to the Engineer.
- C. After completing well development, the Contractor will be responsible for in-situ hydraulic conductivity testing of all new installations. The testing method must not introduce contaminants into the well. The Contractor shall be responsible for proper management of any water removed from the wells during the course of the testing. The Contractor shall report all data collected and hydraulic conductivity calculations in a typed test data report.
- D. The test data report shall include the well number and date of test, type of test (rising, falling, other), stickup of well, static water level, all measured values of the water level along with the respective time increment, all calculations, and the graphical representation of the data. The suggested method for determination of hydraulic conductivity will be a slug test using the methodology noted in Section IX.

IX. HYDRAULIC CONDUCTIVITY TESTING (Slug Test Procedure)

- A. Utilizing a length of solid "slug" made up of an inert chemical substance, with sufficient volume to displace a minimum of 2.5 feet of water within the well casing, a calibrated flat tape water level indicator that measures water level to the hundredth of a foot, and a stopwatch, the in-situ hydraulic conductivity test shall be performed in this manner:

TECHNICAL PROVISIONS

1. A static water level shall be measured to the nearest hundredth of a foot immediately prior to the testing of the monitoring well from a datum point on the well. The time at which the static water level was taken as well as the static water level shall be recorded on a field test log.
 2. A clean, chemically inert "slug" shall be lowered into the monitoring well and placed at a depth such that the "slug" shall remain completely covered with water throughout the duration of the test and not impede the flow of water within the well casing or screen.
 3. Measurements of water level (head) changes shall be made to adequately complete a response curve that will allow for the calculation of the hydraulic conductivity of the well. These measurements shall also be made to the nearest hundredth of a foot as measured from the datum point of the well. The time intervals for the measurements shall be selected by the Engineer. Measurements along with the time interval of the reading shall be recorded in a field test log.
 4. The testing shall be complete when the water level (head) within the well has recovered to within 10% of the static water level as calculated from the first water level reading of the test (H_0).
 5. The "slug" will be removed from the well and the water level (head) will again be monitored as previously mentioned until the water level has recovered to within 10% of the original static water level. All results and associated data shall be recorded on a field test log.
 6. A graphical representation shall be generated on a semi-log graph with the Y axis (logarithmic) having the calculated head ratio and the X axis having the time in minutes for each rising and falling head test performed. A line or lines shall be drawn to represent trends within the data.
 7. Hydraulic conductivity shall be calculated using the Hvorslev (1951) method.
- B. All tests shall be reviewed by the Engineer for any problems that may have arisen during the test, which may prompt a retest of the hydraulic conductivity if necessary. Copies of the Field Test Logs must be supplied upon completion of the work.
- X. ABANDONMENT OF MONITORING WELLS (Ref. 6NYCRR Part 360-2.11(a)(8)(vi))**
- A. All soil borings and/or rock cores which are not completed as monitoring wells and other abandoned wells must be fully sealed as directed by 6 NYCRR Part 360 regulations and as herein specified to prevent contaminant migration through the borehole.
 - B. The Contractor shall remove the protective casing, if present, from each well in a manner which minimizes disturbance to the well.
 - C. The Contractor shall over-drill the well using a minimum 4¼ inch inside diameter (I.D.) hollow stem auger with outward facing cutting teeth to a minimum of two (2) feet below the total depth of the original boring or over-reaming tool with a pilot bit approximately similar in size to the inside diameter of the well material.

TECHNICAL PROVISIONS

- D. Following over-drilling, the Contractor shall withdraw the well materials from within the auger and measure well elements to confirm complete removal. All casing and well installations within the upper five (5) feet of the boring, or within five (5) feet of the proposed level of excavation, must be removed. If complete removal below this point can not be attained, perforate any casing elements left in place.
- E. For wells not advanced into rock, material brought up on auger shall be observed by Engineer for signs of well elements. When rock over-drilling is necessary for wells advanced into rock, flush completed bore holes with potable water of known chemistry and pump out. Collect samples of flush water for inspection by Engineer for signs of well elements.
- F. The Contractor shall seal the borehole by pressure injection with cement bentonite grout using a tremie pipe to fill the inside of the auger to the ground surface or the proposed excavation level. The screened interval of the borehole must be sealed separately and tested to ensure its adequacy before sealing the remainder of the borehole. Additional grout shall be added, as required, as the augers are removed to maintain the level of grout within five (5) feet of the ground surface or proposed excavation level. The upper five (5) feet must be backfilled with appropriate native materials and compacted to avoid settlement.

XI. REMOVAL OF OLD CONCRETE SEALS

- A. Disturbance of monitoring well should be minimized during removal of concrete seal. Consider the following:
 - 1. Do not push, pull or otherwise apply direct force to the well casing or monitoring well riser pipe at any time.
 - 2. Preclude introduction of contaminants into the riser pipe.
 - 3. If excavation around the seal is warranted, limit depth of excavation to 4 ft.±.
 - 4. Hand operated pneumatic tools will be permitted to aid in concrete removal.
 - 5. Near complete removal of the concrete is expected. Small portions of concrete adhered to casing/riser may be left in-place as deemed acceptable by the Engineer.

XII. PAINING OF MONITORING WELL CASINGS

- A. Furnish and install all monitoring well casing painting as described in General Provisions, Section I. A. and as herein specified.
- B. Submit product data (manufacturers descriptive data fully describing product).
- C. Materials: "Rust Reformer" rust inhibitor by Rust-Oleum or approved alternate. Rust-Oleum oil-based paint or approved alternate; color - Aluminum.

TECHNICAL PROVISIONS

D. Surface Preparation

1. Use a wire brush to remove dirt, loose paint and surface rust to the greatest extent possible on the exterior of the casing and lid.
2. Remove residual dust and debris with a damp cloth.

E. Application

1. Apply rust inhibitor to exterior surfaces per manufacturers recommendations. Do not apply to interior surfaces. Allow sufficient time to dry (approximately 24 hours).
2. Apply paint per manufacturers recommendations with a brush or roller. Spray painting is not permitted. Do not paint interior surfaces.
3. Apply second coat after first coat has dried.

XIII. SIGNAGE

A. Furnish and install all monitoring wells signs as described in General Provisions, Section I. A. and as herein specified.

B. Materials:

- 1½" x 1½" x 3/16" galvanized steel angle.
- ¼" dia. A 307 bolts and nuts.
- 4" x 8" x 1/8" galvanized steel plate.
- 2" weather resistant, permanent, adhesive lettering or stencil painted lettering.

C. Construct and install signs as shown on Figure D (attached).

XIV. RECORDS

A. General:

1. Complete and accurate, typed drilling logs must be provided by the Contractor. For soils, all logs must contain a description of matrix and clasts, mineralogy, roundness, color, appearance, odor, and behavior of materials using the Unified Soil Classification System (USCS). A clear description of the system used must be included with the logs.
2. All well logs must contain drilling information as observed in the field including: moisture content; location of water table during drilling; water loss during drilling; depths to significant changes in material and rock; samples recovery measured in tenths of a foot; hammer blow counts and other pertinent comments including: method of drilling used; anomalous features within the well; and the use and descriptions of drilling fluids or additives, including the source and calculated and actual amounts of materials used.

TECHNICAL PROVISIONS

3. Logging of rock must describe the lithology, mineralogy, degree of cementation, color, grain size, and any other physical characteristics of the rock; percent of recovery and rock quality designation (RQD); other primary and secondary features, and contain all drilling observations and appropriate details required for soils boring logs. A clear photographic record of all labeled cores must also be taken and submitted with the logs.
4. Monitoring Well installation reports must contain a diagram of the completed well, all pertinent details on well construction, a description of the materials used, and elevations of all well features.

B. Responsibility

The responsibility of the Contractor or Engineer or the keeping of separate drilling records by the Contractor or Engineer shall not relieve the Contractor of the responsibility for the work specified in this section. Payment will not be made for any work for which the required records have not been furnished by the Contractor.

XV. STORAGE AND SUBMISSION OF SAMPLES AND ROCK CORES

A. General:

The Contractor shall be solely responsible for preserving all samples in good condition until delivered to storage and accepted by the Engineer. He shall keep samples from freezing and from undue exposure to the weather. Samples permitted to freeze, even partially, shall be replaced by the Contractor at his expense. The Contractor shall keep all descriptive labels and designations on sample boxes clean and legible until final acceptance by the Engineer. The Contractor shall comply with all requests of the Engineer concerning the care and protection of samples.

B. Submission of Samples:

All core boxes and sample jars and boxes shall become the property of the Owner and the cost thereof shall be included in the Contract Unit Prices.

XVI. EQUIPMENT AND CREW TIME (STAND-BY)

A. General:

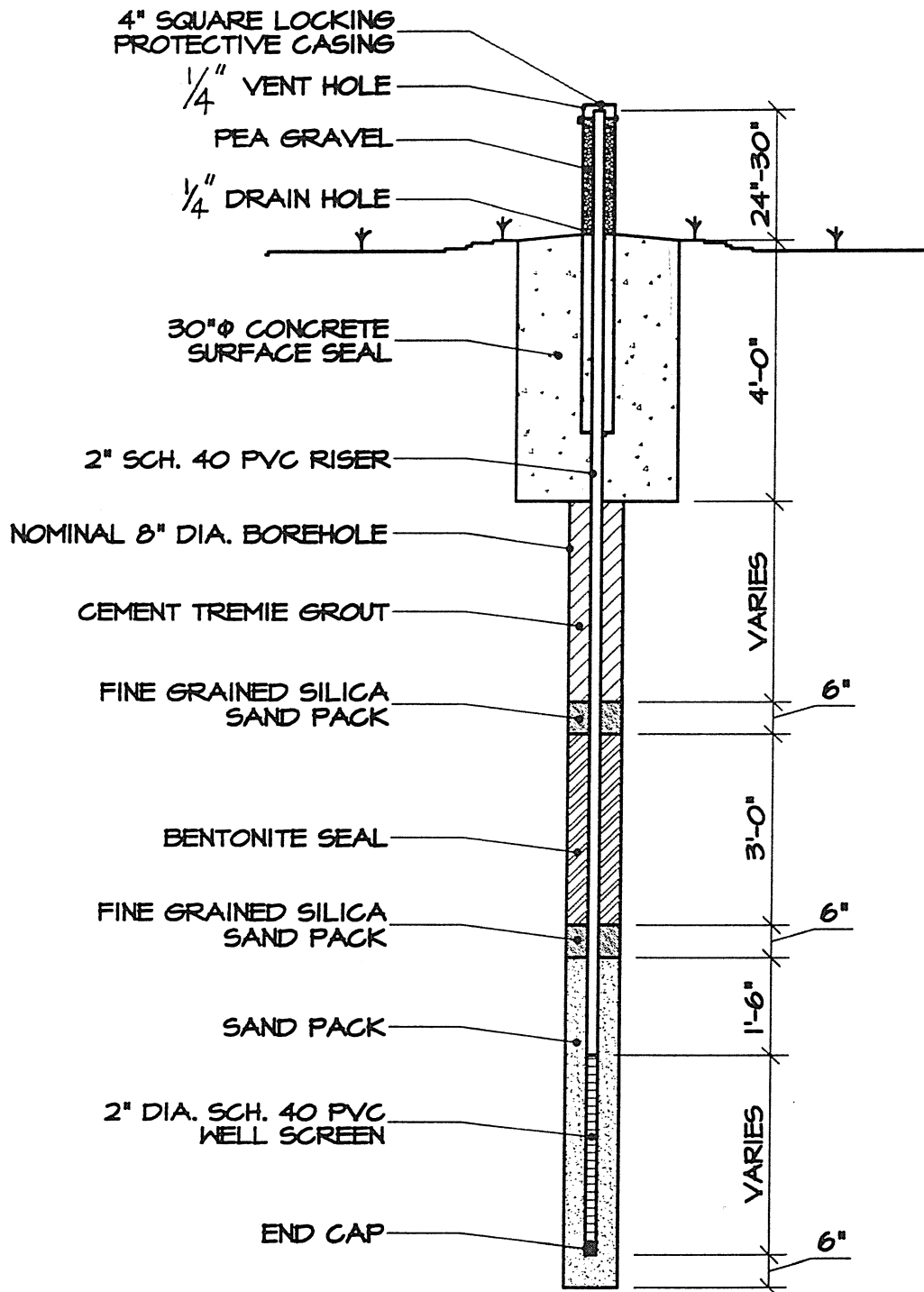
In the event that the drilling equipment and crew are out of production during the course of the boring program not through the cause or fault of the Contractor, the Contractor will be entitled to compensation under this item. Measurement of this item is to be made by the Engineer.

TECHNICAL PROVISIONS

XVII. MEASUREMENT AND PAYMENT

A. General:

The Contract Unit Price for each item shall include the furnishing of all labor, materials, equipment, plant, facilities and services and the performance of all work. Payment for these items shall include compensation for putting down boreholes; obtaining, preserving, packing, marking and submitting samples; performing necessary tests; compiling and submitting records; and costs of shipping samples. No other payments for any specified or indicated work or for any work reasonably implied therefrom will be made. No payment will be made for work abandoned without authorization of the Engineer or for work for which satisfactory samples and/or data are not submitted.



GSE FILE: 98-1047

7-24-98

**LANCASTER LANDFILL
OVERBURDEN WELL
DETAIL**

NO SCALE

FIGURE:

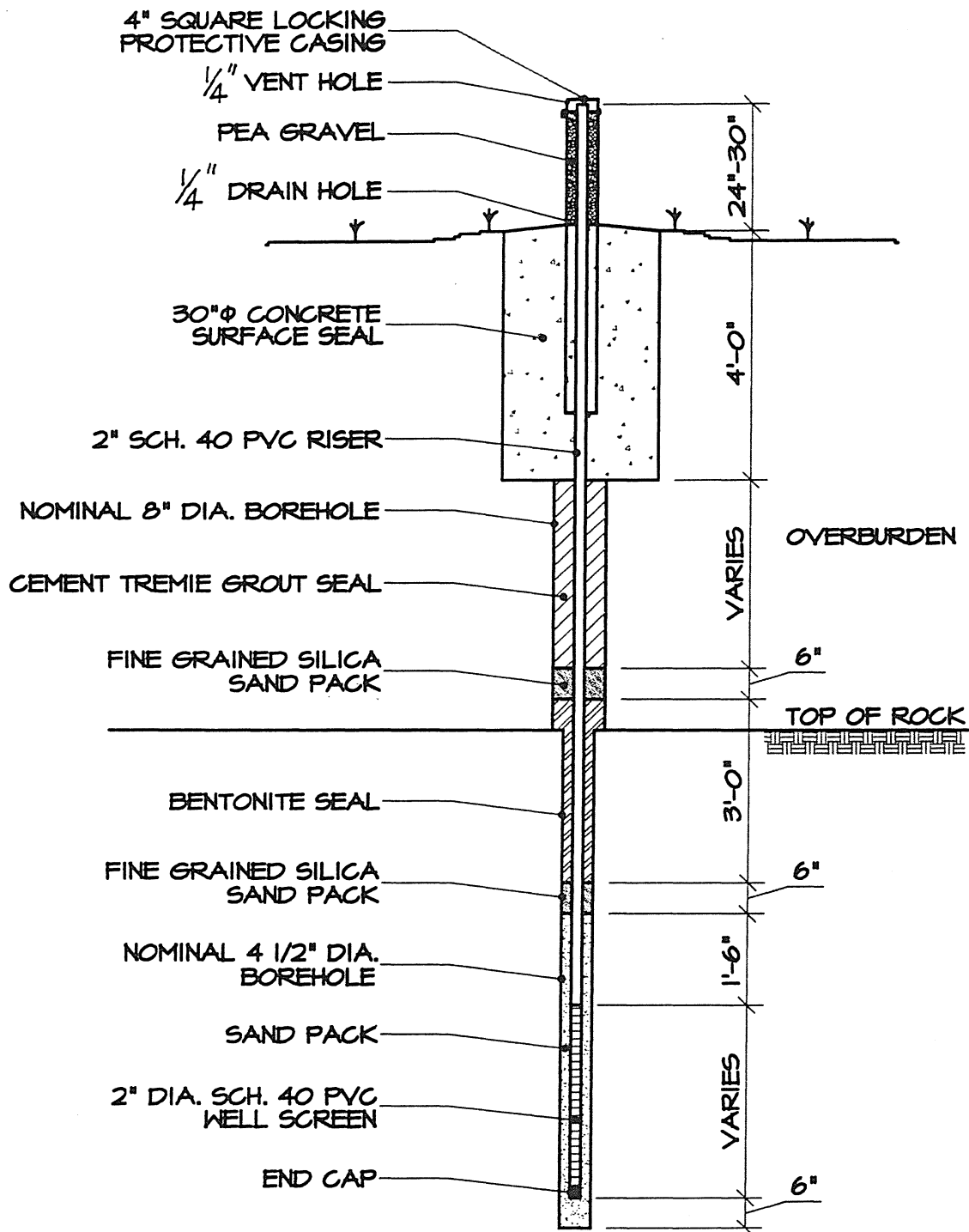
A

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7-24-98

LANCASTER LANDFILL
BEDROCK WELL
DETAIL

NO SCALE

FIGURE:

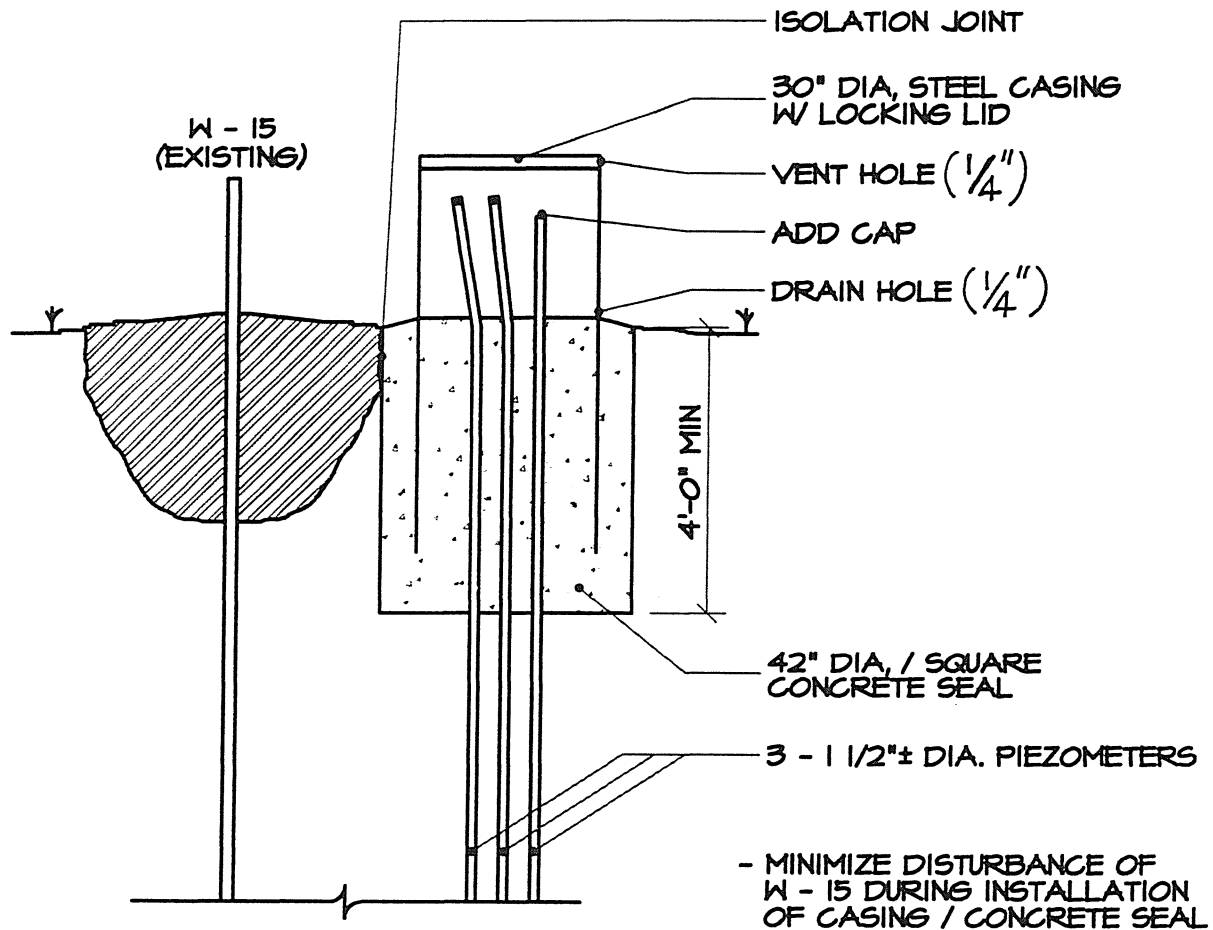
B

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SEE FILE 98-1047

7-27-98

LANCASTER LANDFILL
PIEZOMETER CLUSTER
CASING & SEAL DETAIL
NO SCALE

FIGURE:

C

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