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# GEOTECHNICAL POST-CONSTRUCTION REPORT

NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

Volume 4

June-November 1985

Volume 5

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Bechtel Job 14501 Bechtel National, Inc. Advanced Technology Division

# VOLUME 4

INTERIM CAP CONSTRUCTION

AND

PERMEABILITY TESTING

JUNE-NOVEMBER, 1985

# TABLE OF CONTENTS

			Page
1.0	INT	RODUCTION	4-1
2.0	BAC	KGROUND	4-3
3.0	AVA	ILABLE INFORMATION	4-4
4.0	CON:	STRUCTION ACTIVITIES	4-5
5.0	INTE	ERIM CAP MATERIAL	4-7
		Clay Soil Material	4-7 4-8
	5.3	Topsoil	4-9
6.0	QUAL	LITY CONTROL	4-10
	6.2	Moisture Control Classification Testing	4-10 4-10 4-13 4-14 4-14
7.0	PERMI	EABILITY TESTING	4-16
	7.1 7.2 7.3	Background Laboratory Compacted Sample Field Permeability Testing	4-16 4-16 4-17
	7.4	Discussion of Results	4-19

# TABLE OF CONTENTS (Cont'd.)

		Page
8.0	INSPECTION OF INTERIM COVER	4-20
9.0	SUMMARY	4-21
10.0	REFERENCES	4-22

# APPENDICES

4-A	TECHNICAL SPECIFICATION FOR EARTHWORK
4-B	COMPACTION TEST REPORTS
4-C	COMPACTION CONTROL REPORTS
1-D	METHOD OF CALCULATION FIELD DEDMEADILITY TEST

#### 1.0 INTRODUCTION

Volume 4 of the Post-Construction Report contains the results of the remedial construction activities associated with the construction of the interim cap at the Niagara Falls Storage Site (NFSS) during June through November 1985. The functional objectives of the interim cap are to exclude surface water from the contained waste and to provide a barrier to radiation and radon emanation. The interim cap design consists of a surficial layer covering a low permeability clay blanket. The surficial layer, which consists of 1 foot of soil fill and 6 inches of topsoil, acts as a protective cover for the clay blanket. The clay blanket consists of 3 feet of compacted clay soil. Details of the functional and design concept of the interim cap are contained in the "Design Report for the Waste Containment Facility at the Niagara Falls Storage Site," (Reference 1).

The work performed for the interim cap during 1985 included rework of the northern section of the clay, clay cap placement in the southern section, and placement of the soil fill and topsoil layers in select areas.

Listed below are the entities involved with the construction of the interim cap.

Department of Energy: Owner.

<u>Bechtel National, Inc.</u>: Project Management Contractor: Interim cap design, construction inspection and management.

Sevenson Containment Corp.: Construction of interim cap.

<u>Parratt-Wolff, Inc.</u>: Laboratory and in-place testing of clay material.

<u>Eberline</u>, <u>Inc.</u>: On-site radiological survey and radiological safety for all site personnel.

In addition to the results of the construction activities, this volume of the Post-Construction Report also contains the results of a laboratory and field testing program of the clay material. The testing program included grain size analyses, Atterberg limits, and both field and laboratory permeability testing.

## 2.0 BACKGROUND

The construction of the interim cap is a part of the overall waste containment system for the low-level radioactive wastes stored at the NFSS. This waste containment system in general consists of a compacted clay cutoff wall keyed into an underlying natural clay layer, a compacted clay dike, and the interim cap. The cutoff walls and dikes were constructed in 1982 and 1983, and initial work on the interim cap was started in 1984. Details of the earlier work are contained in Volumes 1, 2, and 3 of the Post-Construction Report.

The dikes and cutoff walls were designed to provide an effective barrier against migration of ground water into the containment area, and to prevent ground water from migrating from the enclosed area. The major function of the interim cap is to exclude surface water from entering the contained wastes. The cap was designed to be a low permeability layer extending beyond the limits of the dike. A typical section of the cap is shown as Figure 4-1. The design permeability of the dike is  $1 \times 10^{-7}$  cm/sec (Reference 1).

## 3.0 AVAILABLE INFORMATION

The details regarding the design of the interim cap are contained in the "Design Report for the Waste Containment Facility at the Niagara Falls Storage Site," by Bechtel National, Inc. (Reference 1). A description of the previous years' construction activities associated with the cutoff walls, dikes and interim cap are contained in Volumes 1, 2, and 3 of the Post-Construction Report.

#### 4.0 CONSTRUCTION ACTIVITIES

The construction activities on the containment system in 1985 consisted of rework and completion of the northern section and initial construction of the southern section of the interim cap. The division between the northern and southern section is at about S 1150, as shown on Figure 4-2. All work on the interim cap during 1985 was performed by Sevenson Containment Corporation, under the continuous technical direction of Bechtel National, Inc. The work was also monitored on a periodic basis by a geotechnical engineer from Bechtel.

The work performed on the northern portion of the clay cap consisted of reworking the top of the clay placed the previous year, placing the 1 foot of soil material, and placement of the topsoil. The rework of the clay material was necessary due to the minor gully erosion that occurred during the winter and early spring. Over the entire northern section the upper 6 to 8 inches of clay were scarified and recompacted to the specification requirements. The technical requirements for the placement of the clay, soil, and topsoil are contained in Technical Specification for Earthwork Construction Specification No. 14501-115-37-C-01. The specification is included as Appendix A. Additional clay was also placed and compacted on the east and north slopes to decrease the existing slope angles. The work on the north end of the containment area was accomplished after the two retention ponds (Pond Nos. 1 and 2) were removed.

After all the clay cap work was completed, the 1-foot-thick soil layer was placed and compacted in two 6-inch lifts. The material was placed and compacted in accordance with Specification No. 14501-115-37-C-01. The requirements for the soil material are discussed in Section 5.0. Once the soil layer was completed the topsoil material had started to be placed. However, due to poor weather conditions

and the onset of winter, the topsoil was not compacted and could not be seeded. The material requirements for the topsoil are discussed in Section 5.0.

The placement of the clay cap on the southern sections was started in September 1985, after the compaction of the underlying contaminated material was completed. The work in the southern section was divided into the four phases shown on Figure 4-2. The initial clay material in Phase I area was pushed into place from the northern end and keyed into the existing clay cap material. The clay soil was delivered to the site by dump truck from a local borrow area, spread in 8-inch lifts and then compacted using a sheepsfoot drum roller. At the end of the day, the surface was rolled with a steel drum roller if rain was expected. If the surface was rolled, it would then be scarified prior to placing additional clay material. The work in Phase I was continued until the full 3 feet of clay was placed and compacted.

Upon completion of Phase I clay cap, work was started on Phases II, III, and IV. At the time work was stopped for the winter, the clay cap was only partially completed in Phases II, III, and IV. The depth of clay placed in Phases II and III varied from 2 to 3 feet, while the depth of clay in Phase IV averaged about 1 foot. In addition to the placement of the clay cap, the 1-foot soil cover was placed in the Phase I area. No placement of topsoil was accomplished in any part of the southern section of the waste containment area. However, it is important to note that for the first time all contaminated material was covered by at least 1 foot of clay. All soil work was stopped on November 2, 1985. Heavy rains after November 2 made it impossible for the contractor to remove material from the borrow area, and then subfreezing temperatures later in the month precluded any additional soil work.

#### 5.0 INTERIM CAP MATERIAL

The interim cap at NFSS consisted of three layers, the 3 feet of clay, the 1 foot of soil, and the 6 inches of topsoil. The material requirements are contained in Specification 14501-115-37-C-01 (Appendix A) and summarized below.

#### 5.1 CLAY

The material specification requirements for the clay material were as follows:

- o The plasticity index shall be not less than 10 nor more than 20
- o The liquid limit shall be not less than 30 nor more than 50
- o Gradation: 3/4-inch: 100 percent passing
  No. 200 Sieve: 70 percent passing

These specification requirements were selected to achieve a material which, when compacted, would have a permeability of less than  $1 \times 10^{-7}$  cm/sec. In addition, a material with a low plasticity was selected to minimize the shrink/swell potential due to any moisture content fluctuation of the clay soil. To further reduce the potential for shrink/swell, and to obtain the required low permeability, a compaction requirement of 95 percent of modified Proctor maximum density (ASTM D 1557) was specified. A moisture criterion of 1 to 3 percent above optimum moisture was also established. All clay was placed in maximum lifts of 8 inches.

The clay material that was used for the cap was taken from a local off-site borrow area. The location of the borrow area is shown on Figure 4-3. The borrow area was being excavated for use as a walleye fish hatchery. The material after excavation was transported to the site by truck.

The clay material is a dark brown silty clay soil. The soil is very typical for this region for the upper unconsolidated deposits identified as the brown clay unit. The properties and geologic history of this brown clay unit are described in the Geologic Report, Niagara Falls Storage Site, Lewiston, New York (Reference 2). The material used in the construction of the clay cap is from the same unit as the soil used for the construction of both the cutoff walls and dikes. The clay material was tested during the construction period to verify compliance with the technical specification. The test results are discussed in Section 6 of this report. If any appreciable amounts of sand, gravel, or deleterious matter were found in the clay material, that material was removed and stock piled at the borrow areas.

#### 5.2 SOIL MATERIAL

The material specification requirements for the soil material were as follows:

- o A pH between 5.5 and 7.6
- o Maximum size 2 inch
- o A plasticity index less than 15

The soil material was taken from the same borrow area as the clay and was generally found closer to the surface. The physical properties

were similar to the clay except that there were larger percentages of coarser material.

The compaction requirement for the soil layer was 85 percent of the modified Proctor (ASTM D 1557) maximum dry density. A moisture content of plus or minus 2 percent of optimum moisture was established for the placement of the soil. The required 12 inches of compacted soil was placed in two equal lifts.

#### 5.3 TOPSOIL

The material specifications for the topsoil were as follows:

- o A pH between 5.5 and 7.6
- o Organic content between 2 and 20
- o Maximum particle size 2 inch
  No. 200 sieve: 80 to 20 percent passing

The topsoil was taken from on-site stock piles. The stock piles were established when the area to the north of the containment system was cleared for the installation of three holding ponds.

The compaction requirement for the topsoil was 85 percent of the modified Proctor (ASTM D 1557) maximum dry density. A moisture content of plus or minus 2 percent of optimum moisture was established for the placement of the topsoil. The required 6 inches is placed in one lift. As previously noted in Section 4.0, the topsoil placement had just started prior to the stop of work in November 1985 due to rainy weather.

#### 6.0 QUALITY CONTROL

#### 6.1 GENERAL

Laboratory and field testing of the cap materials were performed to verify that the material met the specification soil classification requirements, and that the required degree of compaction was being obtained. In addition, field density tests were conducted on the clay material placed during 1984 to determine if there were any detrimental effects on the surface from being exposed during the winter. All laboratory and field density testing was conducted by Parratt-Wolff, Inc.

#### 6.2 COMPACTION CONTROL

The first area worked during 1985 was the northern section of the containment area. In this area, the previously placed clay was scarified and recompacted to the specification requirements. The material was compacted to 95 percent of the maximum density that was originally determined for the material in 1984 (Appendix 3-B, Volume 3). Two additional Proctor curves were developed to verify the 1984 test results. The average maximum density and optimum moisture for the four tests conducted in 1984 was 125.1 pounds per cubic foot, and 12.2 percent, respectively. The average for the two new tests was 127.3 pounds per cubic foot, and 11.0 percent. The two new Proctor curves are contained in Appendix B. The field density tests conducted on the recompacted clay (Test Nos. 52 through 63) are contained in Appendix C. All field density tests were conducted using the sand cone method in accordance with ASTM D 1556, except that the moisture content of the test sample was determined using the "Speedy Moisture Meter." All tests prior to No. 52 were conducted outside the containment area on other site work.

Once the in-place dry density was calculated from the sand cone test and moisture reading results, it was then compared to the maximum density determined from the Proctor test to determine the percent compaction. In order for a test area to be accepted, the in-place dry density had to equal or exceed 95 percent of the maximum density. Those areas that failed to obtain 95 percent were rejected. Any area that was rejected was either recompacted by additional passes of the roller or reworked and then recompacted. All areas that had failing tests were retested until a passing test was achieved. One exception is Test No. 57. The retest, Test No. 57A, was miscalculated at the time of the test and had been indicated to be a passing test. A later review of the field data by Parratt-Wolff, Inc. identified the mistake and indicated that the retest fell below the required 95 percent of maximum density. At the time the mistake was realized, the 1-foot soil layer had been placed and compacted. A review of the problem was made at that time, and based on the fact that all surrounding tests (six tests within 100-foot radius) had passed and that the area did receive further compaction during placement of the soil layer, no additional corrective action was taken.

It should also be noted that on September 23, 1985, due to the unavailability of the Parratt-Wolff, Inc. field technician, Sevenson contracted Empire Soils Investigations, Inc. to perform the field density testing for that day. These test results are also contained in Appendix C. The testing by Empire was performed using a nuclear gauge in accordance with ASTM D 2922. Two tests with the nuclear gauge were performed adjacent to previous sand cone tests for correlation purposes. The results indicated very good correlation between the sand cone and nuclear gauge.

After the northern section clay material was recompacted and accepted, the 1 foot of soil cover was placed in two 6-inch lifts. The in-place density of soil material was controlled using the sand cone test. Test Nos. 64 through 74 and Test No. 78 were performed on the soil material.

Three Proctor tests were conducted on the soil material prior to the start of placement. The average maximum density was 121 pounds per cubic foot with an optimum average moisture content of 11.1 percent. The average percent compaction of the 12 tests was 91 percent. All tests exceeded the 85 percent compaction requirement. All Proctor test results are contained in Appendix B and the field density tests are contained in Appendix C.

The placement of the clay material on the southern section was started on September 28, 1985 in the Phase I area. Prior to start of placement, a composite sample of soil was taken from three areas of the borrow site and was used to determine the maximum density and optimum moisture of the clay. The test results, which are contained in Appendix B, indicated a maximum density of 118.9 pounds per cubic foot and an optimum moisture content of 12.6 percent. The field density tests for the Phase I area are Test Nos. 75, 76, 77, 79 through 93, 95, 97, and 98. These results are contained in Appendix C. The average percent compaction of the clay material in the Phase I area was 97.2 percent of maximum density.

After completing the placement of the clay in the Phase I area, the soil material was placed and compacted. Three field density tests, Nos 94, 96, and 100 were conducted on the soil material. The Proctor tests that were used to determine the percent compaction were the same Proctors used for the northern section. The percent compaction of all three tests exceeded the required 85 percent of the maximum density.

The placement of clay material on Phase II was started on October 14; 1985. Prior to the start of clay placement, a second Proctor test was conducted on material from the borrow area. The test results, which are included in Appendix B, indicated a maximum density of 120.0 pounds per cubic foot and an optimum moisture content of 12.3 percent. A series of 14 field density tests were conducted on Phase

II (Test Nos. 106 through 110, 115, 116, 117, 121, 122, 124, 131, 132, and 133). The average percent compaction of the clay material in Phase II was 96.7 percent of maximum density.

The clay placement in Phases III and IV was started on October 29, 1985. Prior to stopping work about 2 feet of clay was placed in Phase III and about 1 foot in Phase IV. A total of seven field density tests were conducted during the placement (Test Nos. 124 through 128, 130 and 134). The Proctor test used to determine the percent compaction was the same as that used for Phase II. The average percent compaction was 96.6 percent of maximum density.

Clay placement was also performed along the northern and eastern boundary of the northern section of the clay cap. This work was conducted to flatten the slopes of the clay cap. The work at the northern end was performed after ponds 1 and 2 were removed. The compaction of the additional clay on both slopes was tested with the sand cone apparatus. Tests conducted on the east slope were Test Nos. 101, 102, 111, 113, 114, 118, and 119, and tests on the north slope were Test Nos. 103, 104, 105, 112, 120, and 123. The 13 tests had an average percent compaction of 96.3 percent of maximum density.

#### 6.3 MOISTURE CONTROL

The moisture of the clay material was monitored on a daily basis to verify compliance with the technical specification. The specification required the moisture content of the clay material to be 1 to 3 percent above the optimum moisture content. The moisture levels were checked using the speedy moisture meter. When the test results indicated that the moisture content was outside the required range, corrective actions were taken. Problems with moisture content during construction were typically due to the moisture content being high.

Moisture contents were also determined for each field density test. These moisture levels are indicated on the compaction control reports contained in Appendix C. A summary of the optimum moisture and measured moisture levels for the clay cap are shown in Table 4-1. As indicated in Table 4-1, the moisture levels in several cases exceeded the allowable range on the wet side. The higher moisture contents were allowed when the percent compaction exceeded the minimum requirements.

#### 6.4 CLASSIFICATION TESTING

The required classification properties of the clay material were stated in Section 5.0 and contained in Appendix A. To verify that the soil met these requirements, classification tests (grain size distribution and Atterberg limits) were run on each compaction test sample. The test results and specification limits are shown on Figure 4-4. As indicated on Figure 4-4, the test results were within specification limits except for a small percentage of material in the clay soil greater than 3/4 of an inch. All test samples can be classified as a CL (lean clay) material in accordance with the Unified Soil Classification System.

#### 6.5 STEP DENSITY TEST

A single step density test was conducted in September 1985 on the clay cap material placed during the 1984 construction season. The step density test was performed to determine if there was any detrimental effect on the clay cap due to the winter exposure. The concern was related to the fact that the clay material was left exposed during the winter without the 18 inches of soil and topsoil cover that is required as part of the short-term cover. The 18 inches

of cover was not placed during the 1984 construction season due to time and weather constraints.

The step density test was conducted by performing a series of inplace density tests at a given location. The tests were conducted at depths of 0, 6, 12, and 18 inches below the surface of the clay cap. All in-place density tests were made using a sand cone device and performed in accordance with ASTM D 1556. The results of the four tests are shown in Table 4-2. The step density test was conducted prior to the scarification and recompaction of the upper 8 inches of clay.

Classification tests (gradation and Atterberg limits) were also run on material collected at each depth. The classification test results, which are also summarized in Table 4-2, indicated the material to be very consistent at all depths.

As indicated from the density test results, there is virtually no difference in the in-place dry density with depth. It is assumed that any adverse effects due to winter exposure would have shown up in the form of reduced density readings in the uppermost sample, or possibly in the top two samples. This did not happen.

#### 7.0 PERMEABILITY TESTING

#### 7.1 BACKGROUND

The design and specification for the construction of the clay cap was based on achieving an in-place permeability equal to or less than 1 x  $10^{-7}$  cm/sec. During 1984, undisturbed samples were taken from the dikes and cutoff walls for laboratory permeability testing. Testing was also performed on laboratory compacted samples of the clay cap material placed during 1984 (see Section 6.5, Volume 3). The results of this previous testing indicated permeabilities of less than 1 x  $10^{-7}$  cm/sec. The average of the undisturbed samples was 2.80 x  $10^{-8}$  cm/sec and the average for the laboratory compacted samples was 1.35 x  $10^{-8}$  cm/sec. The laboratory compacted samples were compacted to 95 percent of maximum density.

During 1985, additional laboratory testing was performed on compacted samples of the clay material used for the clay cap. In addition to the laboratory testing, field permeability testing was conducted. The field tests were conducted in response to comments by the Illinois Geological Survey, the disinterested reviewer of the NFSS waste containment design, regarding possible variability in the measured permeability from laboratory tests to actual field conditions.

#### 7.2 LABORATORY COMPACTED SAMPLE TESTING

Permeability tests were conducted on two compacted samples of the clay cap material. The first sample was compacted to 95.5 percent of maximum density at a moisture content of 1.5 percent over optimum moisture. The second sample was compacted to 89.7 percent of maximum density at a moisture content of 1.5 percent over optimum moisture. The modified Proctor maximum density for the clay sample was 122.1 pounds per cubic yard at an optimum moisture content of 10.7 percent.

All testing was performed in a flexible wall permeameter using the procedure described in Reference 3. The testing was performed at Syracuse University under contract to Parratt-Wolff, Inc.

The test results indicated the sample compacted to 95.5 percent of maximum density, had a permeability of 6.0 x  $10^{-8}$  cm/sec, and the sample compacted to 89.7 percent of maximum density, had a permeability of 1.6 x  $10^{-7}$  cm/sec.

#### 7.3 FIELD PERMEABILITY TESTING

#### 7.3.1 General

Two field permeability tests were conducted during 1985 on the compacted clay cap. One test was performed on the northern portion of the clay cap that had been exposed to the weather during the winter season. The second test was performed on the southern section in the Phase II area. The second test was conducted approximately one month after the material had been placed. The field tests were performed using a double-ring infiltrometer apparatus with a covered inner ring and an open outer ring. A description of the test equipment is given below.

All field permeability testing was performed in conjunction with Professor D. E. Daniel of the University of Texas in Austin. Dr. Daniel was retained as a consultant to supervise and provide technical guidance for the testing. Dr. Daniel also provided the equipment required to perform the test.

#### 7.3.2 Test Equipment

The test equipment consists of two rings. The inner ring has a diameter of 5 feet while the outer ring, has a diameter of 7 feet.

Both rings were seated in circular slots cut approximately 4 inches into the clay surface and sealed with a cement and bentonite mortar. Each ring was connected to graduated cylinders to measure the inflow into the rings. A schematic drawing of the test equipment is shown on Figure 4-5.

The test is simply based on measuring the water inflow rate into the clay from inside the ring of known area. The test can be performed either as a single ring test or as a double ring test. As a single ring test, the inside ring was open to flow from the outer ring so the effective area was equal to the area enclosed by the outer ring. As a double ring test, the inner ring is completely isolated from the outer ring. Independent water levels and inflow into each ring are maintained. The calculated permeability is determined only from the inflow measurement into the inner ring. The outer ring serves two major purposes during this test. First, by keeping the area outside the inner ring saturated the flow from the inner ring remains basically one-dimensional (downward), and lateral spreading of the flow becomes insignificant. The test results can then be analyzed with only minor error by assuming one-dimensional flow. The second function of the outer ring is to insulate the inner ring, which eliminates problems with temperature fluctuations and evaporation.

# 7.3.3 <u>Test Results</u>

Once the test equipment is set up, the determination of the permeability is made by measuring the quantity of inflow into the ring or rings over a specific time period. Both tests were conducted until a near steady-state condition or saturation equilibrium had been obtained. The calculated permeability from the first test was 7.0 x  $10^{-7}$  cm/sec, and from the second test was 1.0 x  $10^{-7}$  cm/sec. A detailed procedure for calculating the permeability is contained in Appendix 4-D.

#### 7.4 DISCUSSION OF RESULTS

The permeability of the laboratory compacted samples is within the same order of magnitude as the laboratory tests performed the prior year. It is important to note that the clay material was from two different borrow areas and the testing was performed by two different testing agencies.

The field test results indicated permeabilities generally one order of magnitude higher than the laboratory tests. The higher permeabilities in the field tests are generally a reflection of the larger area used for the field tests in which minor imperfections may exist in the clay cap that were eliminated from the laboratory compacted samples. These imperfections could include the presence of clay clods, variation in soil fabric and structure using different compaction procedures or the presence of minor cracks or joints in the clay cap. The slightly higher field permeability measured for the clay placed the prior year may be an indication of the effect of the winter exposure on the clay structure. However, differences between calculated permeabilities within the same order of magnitude, as was the case here, can generally be considered insignificant.

#### 7.5 CONCLUSION

All laboratory tests indicated that the permeability of the clay compacted to 95 percent of maximum density was less than 1 x  $10^{-7}$  cm/sec. The field tests resulted in measured permeabilities within an order of magnitude of 1 x  $10^{-7}$  cm/sec. Therefore, it can be stated that the in-place permeability of the clay cap, dikes and cutoff walls is within one order of magnitude of 1 x  $10^{-7}$  cm/sec, which was assumed as the design value.

#### 8.0 INSPECTION OF INTERIM CAP

The inspection requirements for the completed interim cap are discussed in detail in the Closure/Post Closure Plan for the Interim Waste Containment Facility at the Niagara Falls Storage Site (Reference 4). Included in the inspections will be visual checks for surface erosion, shrinkage cracks, animal burrows, and deep-rooted vegetation. In addition, the top of the containment will be checked visually and by survey for depressions and subsidence. The inspections will be performed each fall and each spring. If any damage or deterioration is found, the interim cap will be reworked and recompacted as necessary.

## 9.0 SUMMARY

The continued construction of the interim cap was conducted between September and November 1985 by Sevenson Containment Corporation under the technical direction of Bechtel National, Inc. All work was performed in general compliance with the appropriate specification and design drawings. Field density tests indicated that the clay material and soil cover was compacted to or above the minimum specification requirements. Laboratory and field testing indicated that compacted clay material generally met the specification requirements, and had an in-place permeability within one order of magnitude of 1 x  $10^{-7}$  cm/sec.

#### 10.0 REFERENCES

- 1. Bechtel National, Inc. <u>Design Report for the Waste Containment</u>

  <u>Facility at the Niagara Falls Storage Site</u> (Draft), DOE/
  OR/20722-21, Oak Ridge, TN, December 1985.
- 2. Bechtel National, Inc. <u>Geologic Report, Niagara Falls Storage</u>
  <u>Site</u>, DOE/OR/20722-8, Oak Ridge, TN, June 1984.
- 3. Daniel, D. E., S. S. Trautwein, S. S. Boynton, and D. E. Foreman, "Permeability Testing With Flexible Wall Permeameters," <u>Geotechnical Testing Journal</u> GTJODS, Vol. 7, No. 3, September 1984, pp. 113-122.
- 4. Bechtel National, Inc. <u>Closure/Post-Closure Plan for the Interim</u>

  <u>Waste Containment Facility at the Niagara Falls Storage Site</u>

  (Draft), DOE/OR/20722-85, Oak Ridge, TN, November 1985.

TABLE 4-1

MOISTURE TEST RESULTS
FIELD DENSITY TESTS
CLAY CAP

	OPTIMUM	R	RANGE			
AREA	MOISTURE	SPEC.	ACTUAL	AVERAGE		
Phase I	12.6	13.6-15.6	12.1-16.1	14.5		
Phase II	12.6	13.6-15.6	(One Test)	18.2		
	12.3	13.3-15.3	13.9-17.8	15.7		
Phases III & IV	12.3	13.3-15.3	13.3-16.3	15.0		
North Slope	12.6	13.6-15.6	17.4-17.7	17.6		
	12.3	13.3-15.3	13.5-17.7	16.2		
East Slope	12.6	13.6-15.6	15.5-15.9	15.7		
	12.3	13.3-15.3	16.3-19.1	17.4		

TABLE 4-2
STEP DENSITY TEST RESULTS

# IN-PLACE DENSITY

STEP NO.	ELEVATION (FEET-MSL)	IN-PLACE WET DENSITY (PCF)	WATER CONTENT: (%)	IN-PLACE DRY DENSITY (PCF)
1	342.8	122.8	9.7	112.0
2	342.3	121.1	8.9	111.2
3	341.8	124.8	11.1	112.4
4	341.2	127.7	11.7	114.3

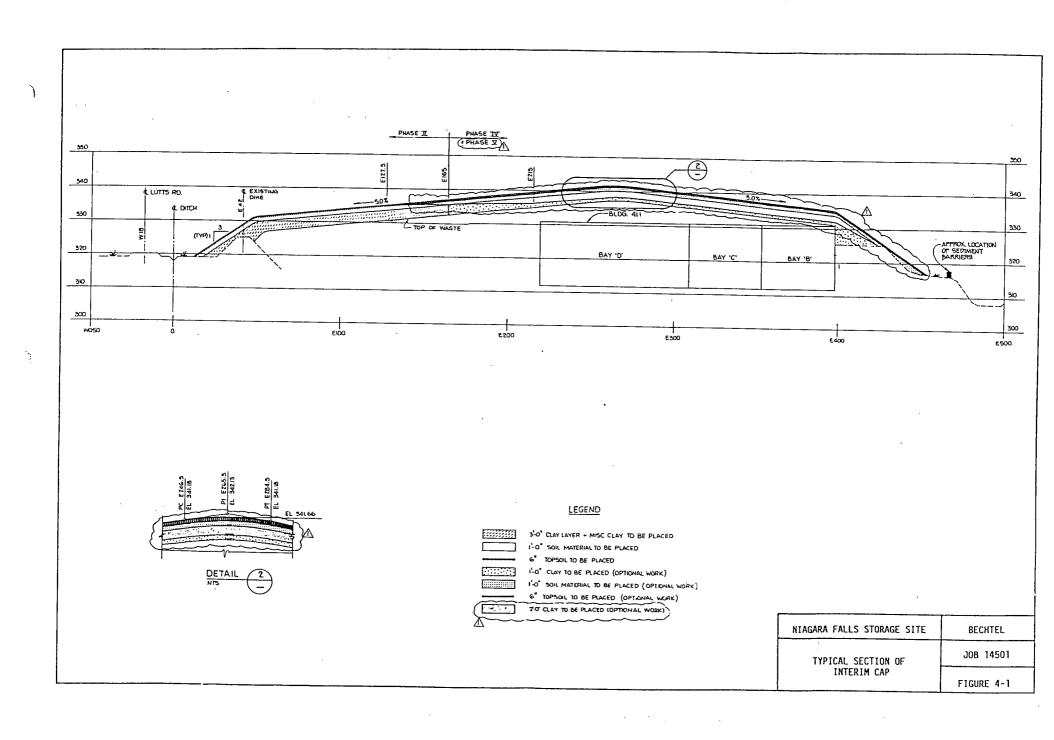
# CLASSIFICATION TEST RESULTS

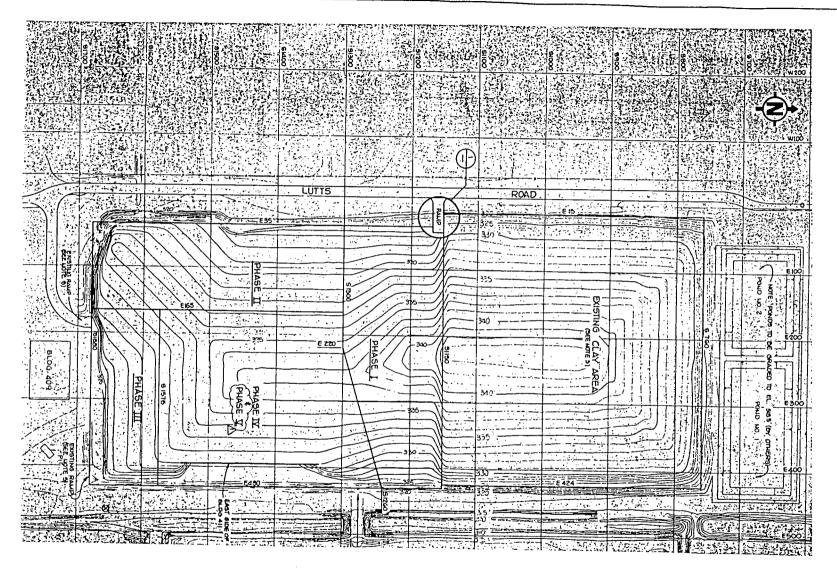
# SIEVE ANALYSIS

			SIEVE S	SIEVE SIZE - PERCENT PASSING							
STEP NO.	1-1/2"	3/4"	#4	_#8_	#16	#50	#100	#200			
1		100	97.6	96.0	94.2	90.0	87.7	82.7			
2	100	99.0	95.1	93.3	91.5	88.2	84.9	79.9			
3		100	95.1	93.7	92.5	91.5	87.5	82.5			
4		100	98.0	96.7	95.5	93.1	90.8	86.3			

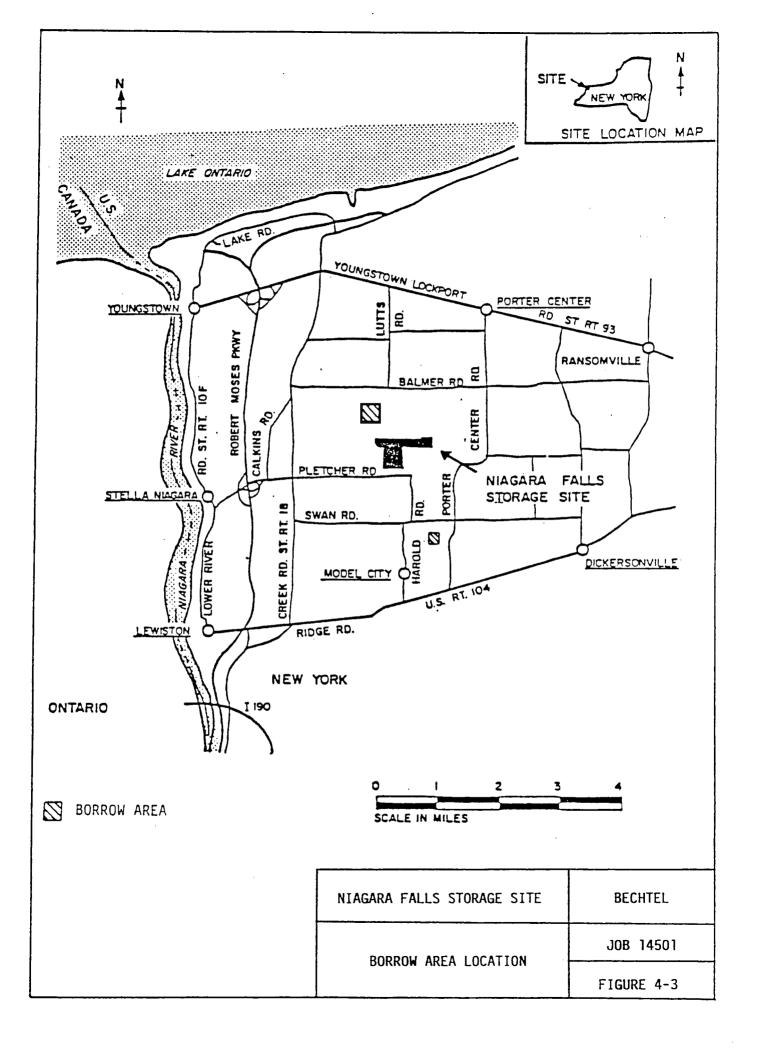
## ATTERBERG LIMITS

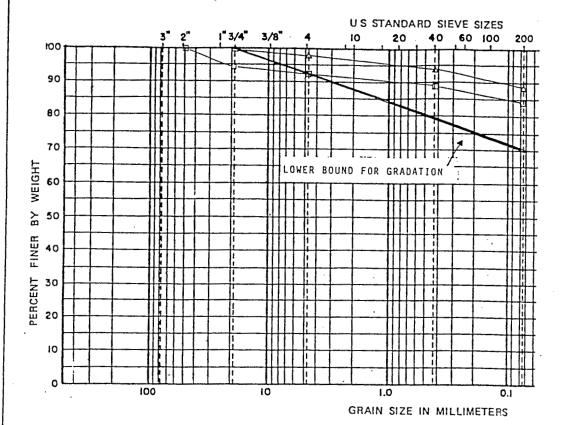
STEP NO.	<u>PL</u>	LL	<u> P I</u>
1	16	21	5
2	13	23	10
3	14	24	10
4	16	24	, 8





NIAGARA FALLS STORAGE SITE	BECHTEL		
INTERIM COVER SECTIONS	JOB 14501		
	FIGURE 4-2		





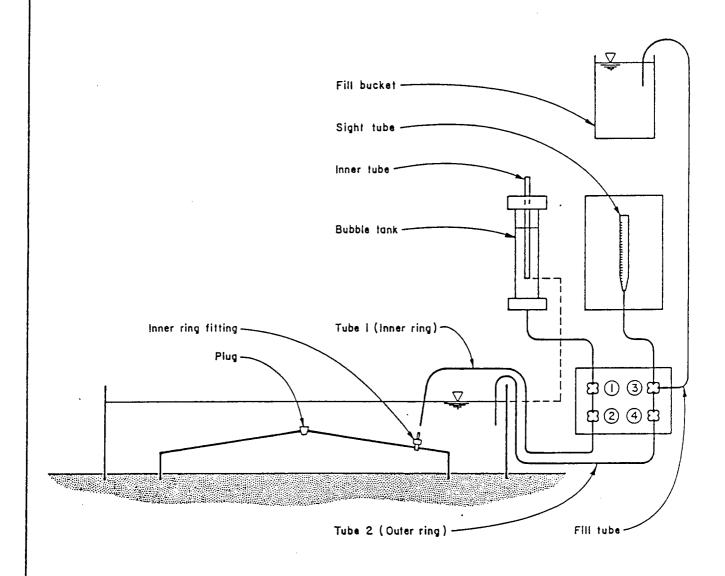
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DERS	COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE

Composite Sample U-X-Z

△ Sample UUUU

NIAGARA FALLS STORAGE SITE	BECHTEL	
CLASSIFICATION TEST RESULTS	JOB 14501	
	FIGURE 4-4	



NIAGARA FALLS STORAGE SITE	BECHTEL	
DOUBLE-RING	J0B 14501	
INFILTROMETER SYSTEM	FIGURE 4-5	

# APPENDIX 4-A

TECHNICAL SPECIFICATION

FOR

EARTHWORK

#### TECHNICAL SPECIFICATION

## FOR

## EARTHWORK

# LEWISTON, NEW YORK NIAGARA FALLS STORAGE SITE

#### CONTENTS

		Page
1.0	GENERAL	3
2.0	ABBREVIATIONS	3
3.0	QUALITY STANDARDS	3
4.0	SUBMITTALS	4
5.0	MATERIALS	4
6.0	FIELD OPERATIONS	9

# TECHNICAL SPECIFICATION

FOR

# EARTHWORK

# LEWISTON, NEW YORK NIAGARA FALLS STORAGE SITE

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A 3/12/85	Issued for Construction		CRI	J. I	- ( 4/2)	W159		
NO. DATE		REVISIONS	86	CHK.D	SUPV.	p i		
ORIGIN					JOB NO. 14501			
AT	EARTHWORK				Specification		REV.	
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1					SHEET	1 OF	19 .	

# TECHNICAL SPECIFICATION FOR FARTHWORK

# 1.0 GENERAL

This technical specification establishes the quality of workmanship required and defines how quality is measured for earthwork.

# 2.0 ABBREVIATIONS

The abbreviations listed below, where used in this specification, shall have the following meanings:

ASTM American Society for Testing and Materials

NYDOT New York Department of Transportation Standard Specifications, Construction and Materials

# 3.0 QUALITY STANDARDS

The Subcontractor shall control the quality of items and services to meet the requirements of this specification, applicable codes and standards, and other Subcontract Documents. Unless otherwise specified or shown, the following codes and standards of the latest issue at the time of Subcontract Bid shall apply to the extent indicated herein:

ASTM	D 1556	Standard Test Method for Density of Soil in Place by the Sand-Cone Method
ASTM	D 1557	Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-1b. Rammer and 18-in. Drop

Standard Test Method for Laboratory D 2216 ASTM Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures .Turf Establishment Section 610 NYDOT Sodding and Placing Erosion Control Section 612 NYDOT Materials Landscape Development Materials Section 713 NYDOT

# 4.0 SUBMITTALS

Engineering documentation requirements are summarized on Form 14501-DR, and are augmented by detailed requirements listed herein. Bechtel will determine if documentation is complete as submitted by the Subcontractor, and reserves the right to disapprove any materials, schedules, methods, equipment, plans, drawings, or other submittals that do not meet the Subcontract requirements.

#### 5.0 MATERIALS

#### 5.1 FILL MATERIAL

5.1.1 Fill material for earthwork construction shall be from off-site borrow source(s) approved by Bechtel. Subcontractor shall evaluate the area surrounding the borrow source(s) to ensure that the source is not in an area subject to disposal of hazardous waste materials. Borrow source areas shall be free of debris and disposed materials. Borrow source areas having evidence of being a disposal site or being adjacent to a disposal site shall not be approved. Designation and approval of

an area for obtaining fill material does not indicate that all material within the area is suitable. Only suitable material, as determined by Bechtel, from approved borrow sources shall be used.

- 5.1.2 All fill material shall be free from brush, roots, ice, frozen soil, refuse, and other deleterious materials.
- 5.1.3 Clay fill material shall be free of organic material and gravel or rocks, and shall meet the following requirements:
  - o The plasticity index shall be not less than 10 nor more than 20.
  - o The liquid limit shall be not less than 30 nor more than 50.
  - o The permeability shall not be greater than  $10^{-7}$  cm/sec.
  - o Gradation:

Sieve Size	by Weight
3/4-inch	100
No. 200 mesh	70

- 5.1.4 Soil material shall meet the following requirements:
  - o The pH of the material shall be between 5.5 and 7.6
  - o The maximum size rock shall be no larger than 2 inch size.

- o The plasticity index shall be less than 15.
- 5.1.5 Soil material shall be a well-graded material and shall be free from deleterious substances such as expansive clay, rubbish, and perishable or uncompactable material.
- 5.1.6 Tests to verify clay fill and soil material requirements will be performed by Bechtel when deemed necessary.
- 5.1.7 Topsoil shall meet the following requirements:
  - o The pH of the material shall be between 5.5 and 7.6.
  - o The organic content shall be not less than 2% nor more than 20%.
  - o Gradation:

Sieve Size	by Weight					
2 inch	100					
l inch	85 to 100					
1/4 inch	65 to 100					
No. 200 mesh	20 to 80					

5.1.8 Topsoil shall be free from refuse, any material toxic to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps or similar objects larger than two inches in greatest dimensions. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling operations.

- 5.1.9 Subcontractor shall be responsible for adding lime and fertilizer to the topsoil to support turf establishment.
- 5.1.10 Subcontractor shall submit samples of the topsoil material to the New York State Agricultural Department for analysis of contents. Results of said analysis shall be submitted to Bechtel for approval prior to use of materials. No topsoil material shall be used which contains weed parts or seeds unacceptable to the New York State Agricultural Department. Samples shall be obtained from each borrow source for every 3500 cubic yards.
- 5.1.11 Subcontractor shall submit the location of proposed borrow sources to Bechtel and provide assistance to Bechtel for obtaining representative samples of the borrow area.
- 5.2 FERTILIZER, SEED, AND MULCH
  - 5.2.1 Fertilizer shall be a standard quality commercial carrier of plant food elements and shall be in accordance with NYDOT Section 713-03, Fertilizer, Type No. 2. A delivery slip shall accompany the shipment of fertilizer indicating the number of bags and weight of each. The composition of the fertilizer shall appear on each bag or the delivery slip and shall be approved by Bechtel prior to use.

5.2.2 Grass seed and seed mixture shall be as follows:

Name	Percent by Weight of Pure live seed
Kentucky Bluegrass	60
Perennial Ryegrass	20
Fine Fescue	20

The seed shipment shall be accompanied by a weight slip and a certification by the supplier stating a minimum of 95 percent germination and purity of each kind of seed. The weight slips and supplier certification shall be submitted to Bechtel for approval prior to use.

5.2.3 Mulch and mulch anchoring materials shall be in accordance with NYDOT Section 713-07, Jute Mesh and NYDOT Section 713-09, Stakes for Pegging Sod and Jute Mesh.

## 5.4 SEDIMENT BARRIERS AND EROSION CONTROL

- 5.4.1 Sediment barriers shall consist of either baled hay, baled straw, or filter cloth. When baled hay or baled straw is used, each bale shall consist of no less than 5 cubic feet of material. When filter cloth is used, it shall be made expressly for use as a sediment barrier and shall be attached on the upstream side of posts.
- 5.4.2 Jute mesh or other material approved by Bechtel shall be used to control erosion. Jute mesh shall be in accordance with NYDOT Section 713-07, Jute Mesh and NYDOT Section 713-09, Stakes for Pegging Sod and Jute Mesh.

# 6.0 FIELD OPERATIONS

## 6.1 GENERAL

- 6.1.1 Subcontractor shall submit, for Bechtel's review, the proposed plans and methods for all earthwork operations at least three weeks prior to implementation. Submittals shall address proposed borrow sources, fill operations for clay, soil material, and topsoil, routing of haul trucks, compaction methods, construction water control, and sequence of operations.
- 6.1.2 Subcontractor shall, upon request, submit equipment information for all equipment, other than incidentals, to be used in all earthwork operations. Submittals shall address equipment specifications, make, model and proposed use.
- 6.1.3 Subcontractor shall perform surveys to establish locations, elevations (line and grade), and cross sections for all work required in this Subcontract. Line and grade for all locations shall be established in accordance with the grid coordinate system shown on the design drawings.
- 6.1.4 Existing observation wells, buildings, bench marks, earth dikes, or utilities shall not be damaged.

  Wells or utilities shall not be removed unless their removal is indicated on the design drawings.

  Any damage incurred on the above items shall be repaired or replaced at the expense of the Subcontractor.

# 6.2 REMOVAL OF CRUSHED STONE

- 6.2.1 Crushed stone material on the outside of the dike shall be removed within the limits shown on the design drawings. Crushed stone removal shall not exceed a depth into the clay dike of 0.2 foot.
- 6.2.2 In the event of over-excavation during removal of the crushed stone material, the over-excavated area shall be restored within 0.2 foot of bottom of existing crushed stone in the manner specified by Bechtel and at the expense of the Subcontractor.
- 6.2.3 Crushed stone material shall be stockpiled at the crushed stone stockpile area.

#### 6.3 REMOVAL OF CULVERTS

- 6.3.1 Culverts shall be removed at locations designated on the design drawings.
- 6.3.2 Excavated material shall be placed on-site as directed by Bechtel. The culverts and appurtenances shall be disposed of at the stockpile area for uncontaminated material.
- 6.3.3 The bank slopes and ditch grades shall be restored and regraded to meet existing grades and lines.
- 6.3.4 In the event of over-excavation during the removal of the culverts, the over-excavated area shall be restored to the proper lines and grades in the manner specified by Bechtel and at the expense of the Subcontractor.

#### 6.4 STOCKPILES

Material to be stockpiled shall be placed where shown on the design drawings. Stockpiled material shall be placed to provide natural drainage and a stable embankment. Stockpiled soils shall be compacted with a minimum of two passes of a Caterpillar D-8 or similar method approved by Bechtel. The maximum uncompacted lift thickness of soil shall be 12 inches. Stockpiled crushed stone material need not be compacted.

# 6.5 SEDIMENT BARRIERS

- 6.5.1 Sediment barriers shall be installed to minimize the amount of sediment leaving the work area and shall comply with State and Federal sedimentation laws.
- 6.5.2 Filter cloth barriers shall be installed in accordance with the manufacturer's written recommendations and shall be anchored by methods reviewed by Bechtel prior to use.
- 6.5.3 Baled hay or straw shall be laid end to end such that no gap exists between bales and securely fastened to the ground with at least two #4 reinforcing bars per bale. Reinforcing bars shall be a minimum of 2 1/2 feet long and shall be driven into each bale until flush with the top of the baled hay or straw.

# 6.6 CONSTRUCTION WATER CONTROL

- 6.6.1 Subcontractor shall keep the construction area dewatered during all fill activities. Runoff water which accumulates in the Waste Containment Area shall be pumped to the retention ponds or as directed by Bechtel.
- 6.6.2 During construction the top surface of the fill shall be sloped so that clean water flows away from the contaminated waste.
- 6.6.3 Subcontractor shall ensure that contaminated water, from the Waste Containment Area does not flow into or over uncontaminated areas. Areas which become contaminated as a result of inadequate surface drainage control shall be restored in the manner directed by Bechtel and such restoration shall be performed by and at the expense of the Subcontractor.

## 6.7 EXCAVATION

- 5.7.1 Subcontractor shall provide drainage ditches around the Interim Cap and shall excavate to lines and grades shown on the design drawings.
- 6.7.2 All roots, stumps, rock, and foreign matter in the excavation shall be removed. Unsuitable material encountered shall be removed and disposed of as directed by Bechtel.

- 6.7.3 Excavation performed to the depths below the elevations shown on the design drawings shall be restored to the proper elevations by the Subcontractor.
- 6.7.4 Unless otherwise directed by Bechtel, excavation tolerances shall be plus or minus 0.1 foot.

#### 6.8 SUBGRADE PREPARATION

The subgrade shall be scarified a minimum of 3 inches prior to placing fill material on existing surfaces. The scarified area shall be shaped to the lines and grades shown on the design drawings and compacted in accordance with this specification.

#### 6.9 FILL - GENERAL REQUIREMENTS

- 6.9.1 Areas to be filled will be released to the Subcontractor by Bechtel in satisfactory condition and in accordance with the schedule stated in the Subcontract. Contaminated material in the Waste Containment Area will be graded, compacted, and sealed (smooth rolled) by others prior to release. Any required rework of these areas, as determined by Bechtel, due to the Subcontractor's mistreatment or delay shall be performed by and at the expense of the Subcontractor.
- 6.9.2 Fill shall not be placed on snow, ice, or frozen ground surfaces. Clay, soil material, and topsoil shall not be placed when the temperature is 32°F or below.

- 6.9.3 Fill placement shall conform to the lines, grades, sections, and elevations shown on the design drawings. Grading tolerances shall be plus or minus 0.1 foot.
- 6.9.4 Moisture content tests will be performed by Bechtel on fill material in accordance with ASTM D 2216.

  Tests will be taken as deemed necessary with a minimum testing frequency of one test taken for each 500 cubic yards of fill placed or at least one test performed each day fill is placed.
- 6.9.5 Field density tests will be performed, by Bechtel, on fill material in accordance with ASTM D 1556.

  Tests will be taken as deemed necessary with a minimum testing frequency of one test taken for each 500 cubic yards of fill placed.
- 6.9.6 All density and moisture testing performed by Bechtel will be done without cost to the Subcontractor, provided that the Subcontractor shall at its expense furnish labor, equipment, and materials to assist Bechtel in preparing test areas, and obtaining samples for testing.
- 6.9.7 After placement but prior to compaction, fill material determined by Bechtel to be outside the moisture content limits stated herein, shall be moisture conditioned in place to within the specified moisture limits. Should Bechtel determine that it is impractical to condition the fill in place, it shall be removed and replaced

with material meeting the moisture limits. Such moisture conditioning or removal and replacement shall be by and at the expense of the Subcontractor.

- 6.9.8 Material satisfactorily placed and spread shall be compacted by rolling. Rolling shall be performed systematically on all portions of each area being compacted. Unless otherwise approved, all roller trips shall be made in parallel paths. To ensure complete coverage of the areas to be rolled, each pass of the roller shall overlap the adjacent pass by not less than 2 feet.
- 6.9.9 Subcontractor shall maintain compacted area and ensure that rain damage does not occur.
- 6.9.10 The compacted surface shall be sealed by leaving the top surface shaped and rolled to shed water at the end of each day's activity. At the beginning of each day's activity, the compacted surface shall be scarified a minimum of 3 inches prior to commencement of additional placement on this area.
- 6.9.11 Equipment which has become contaminated, as determined by Bechtel, shall be decontaminated by others at facilities provided by Bechtel, prior to its reuse on clean material.

## 6.10 PLACING CLAY FILL

6.10.1 Clay fill material shall be placed in the areas shown on the design drawings and shall have a loose lift thickness not to exceed 8 inches. Clay fill

shall be compacted to 95 percent of the maximum dry density as determined in accordance with ASTM D 1557.

- 6.10.2 Clay fill material shall be placed 1 percent to 3 percent wetter than the optimum moisture content as determined in accordance with ASTM D 1557.
- 6.10.3 The first lift of clay fill material placed in contact with contaminated material shall be spread in a manner that prevents contamination of equipment. Spreading of material shall be accomplished by pushing fill ahead of the spreading equipment thereby keeping the equipment on clean fill at all times. Alternate methods of fill placement shall be submitted to Bechtel for approval prior to use.
- 6.10.4 Clay fill material shall be placed and compacted in a manner that minimizes cross contamination between the clay fill and existing waste. Should the top surface of the first lift of clay fill become contaminated or the surface of any other lift of clay become contaminated as determined by Bechtel, the contaminated clay material shall be removed and replaced as directed by Bechtel at the expense of the Subcontractor.
- 6.10.5 Prior to Phase V, all exposed clay shall be scarified to a depth of 6 inches. The exposed clay surface shall then be recompacted.



6.10.6 Prior to placing soil material or topsoil in the Phase V area and adjacent areas, a miscellaneous clay layer shall be placed in accordance with section 6.11.4 to bring the clay to required grade as indicated on the design drawings.

# 6.11 PLACING SOIL MATERIAL

- 6.11.1 Soil material shall be placed in the areas shown on the design drawings, in two equal lifts, and shall be compacted to 85 percent of the maximum dry density as determined in accordance with ASTM D 1557.
- 6.11.2 Soil material shall be placed within plus or minus 2 percent of the optimum moisture content as determined in accordance with ASTM D 1557.
- 6.11.3 The procedure for spreading and compacting the soil material shall not produce displacement or other disturbance to the clay layer on which the soil material is placed.
- 6.11.4 Prior to the placement of the soil material, depressions and other cavities in the layer on which the soil material is to be placed that are greater than 0.1 foot shall be filled and compacted with the same material of the surrounding surface.

# 6.12 PLACING TOPSOIL

6.12.1 Topsoil shall be placed in the areas shown on the design drawings and shall have a loose lift

thickness not to exceed 8 inches. Topsoil shall be compacted to 85 percent of the maximum dry density as determined in accordance with ASTM D 1557. Topsoil shall not be overcompacted significantly in excess of 85 percent of the maximum dry density. The procedure for spreading and compacting the topsoil shall not produce displacement or other disturbance of the soil layer on which the topsoil is placed.

- 6.12.2 Topsoil shall be placed within plus or minus 2 percent of the optimum moisture content as determined in accordance with ASTM D 1557.
- 6.12.3 Prior to the placement of topsoil, depressions and other cavities in the layer on which topsoil is to be placed that are greater than 0.1 foot shall be filled and compacted with the same material of the surrounding surface.

#### 6.13 TURF ESTABLISHMENT

6.13.1 Turf shall be established in all areas where topsoil is placed. The topsoil shall be conditioned, fertilized, seeded, and mulched in accordance with NYDOT Section 610, Turf Establishment. Turf shall be also established in the drainage ditches around the Interim Cap, the culvert removal areas, and along both shoulders of Lutts Road within the limits shown on the design drawings.

- 6.13.2 Mulch materials shall be used to prevent erosion of soil and loss of seed on areas having slopes less than 30 percent. Placement of materials shall be in accordance with NYDOT Section 612, Sodding and Placing Erosion Control Materials.
- 6.13.3 Jute mesh shall be used to prevent erosion of areas having slopes greater than 30 percent. Placement of jute mesh shall be in accordance with NYDOT Section 612, Sodding and Placing Erosion Control Materials.
- 6.13.4 Prior to acceptance by Bechtel, Subcontractor shall mow seeded areas to a height of three inches when growth reaches an average height of six inches or when growth tends to smother seedlings.

# APPENDIX 4-B

PROCTOR TEST RESULTS

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MOLD + SAMPLE WT.	13.95	14.09	14.24	14.26	14.23		
MOLD WEIGHT	9.49	9.49	9.49	9.49	9.49		
WET SAMPLE WT.	4.46	4.60	4.75	4.77	4.74		
WET DENSITY, P.C.F.	133.8	138.0	142.5	143.1	142.2		
MOISTURE CONTENT	8:1	9.9	11.5	13.2	15.3		
DRY DENSITY, P.C.F.	123.8	125.6	127.8	126.4	123.3		
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SOIL LOCATION				<del></del>			
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1984 Clay Cap - C	Te Thas	e II £ III	1			<u>U</u>	
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SAMPLE NO.				CONTENT,	% OF DRY	WEIGHT
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MOLD WEIGHT		11.77	1.1.1.68	14.50		
	1013	10.17	10.12	10 10		1
WET SAMPLE WT.	<i>10.13</i> 4.30	10.13	10.13	10.13		
WET SAMPLE WT. WET DENSITY, P.C.F.	<i>10.13</i> 4.30 129.0	10.13 4.61 138.3	10.13 4.55 136.5	4.37		
	4.30	4.61	4.55	4.37 131.1		
WET DENSITY, P.C.F.	4.30	4.61 138.3	4.55 136.5	4.37		
WET DENSITY, P.C.F. MOISTURE CONTENT	4.30 129.0 6.5	4.61 138.3 4.7	4.55 136.5 13.4 120.4	4.37 131.1 16.2 112.8		
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WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Uncontamin  1984 Clay Cap  CLIENT Bechtel  PROJECT Niggara Fa	4.30 129.0 6.5 121.1 TTT nated - Pha Nation	4.61 138.3 4.7 126.1 al /nc	4.55 136.5 13.4 120.4 Br	4.37 131.1 16.2 112.8 OWN CL C Sand DATE 9/ CHECKE JOB NO.	Trace 1 685 TEST DBY D 1-0 NO.	F Grave/ TED BY VJT P Blas land 85042 TTT
WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Uncontamin  1984 Clay Cap  CLIENT Bechtel	4.30 129.0 6.5 121.1 TTT nated - Pho Nation Ils St	4.61 138.3 4.7 126.1 126.1 orage S	4.55 136.5 13.4 120.4 Br	4.37 131.1 16.2 112.8 1000 CL C Sand DATE 9/ CHECKE JOB NO. REPORT	77ace / 685 TEST DBY D 2-0	F Grave/ TED BY VJT P Blas land 85042

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STANDARD MODIFE	ED 🗶						
		116					
METHOD A 💥 B 🖽							
							+++++++++++++++++++++++++++++++++++++++
C D D T		OW					
MAXIMUM DRY DENSIT	-Y				+++++++	<b>5</b>	<del></del>
	*	DENSITY,					
OPTIMILE MOISTURE COM	*FNT	1 - 5 ;					
OPTIMUM MOISTURE CON	IENI	DRY	1-51=				+++++++
%							
PERFORMED IN ACCORDANCE	SE WITH	104					
ASTM D-155							
713177 \$ 155							
	<del></del>						
	<del></del> !						
	<u> </u>		WATER	CONTENT,	% OF DRY	WEIGHT	20
SAMPLE NO.	1	2	3	4	5-		
MOLD + SAMPLE WT.	13.93	14.19.	7.49	14.43	14.36	ļ	· · · · · · · · · · · · · · · · · · ·
MOLD WEIGHT WET SAMPLE WT.	10.20	10.20	10.20	10.20	10.20		
WET DENSITY, P.C.F.	3.73	3.99	4.24	4.23	4.16	}	-
MOISTURE CONTENT	111.9	114	127	126.9	124.8		
DRY DENSITY, P.C.F.	5.3	110.5	11.4	14.9	17.0		<del> </del>
	100.5	110	<u>IIF.I</u>	110.4	100.7		<del> </del>
SOIL LOCATION		<del></del>		Brown	F-CS	SAND S	ome S.H
Sampi	e V			To F	C Grav	e	
Sampi Uncontam	mate				6.85 TES		F.C.
			CHECKE	D BY . D	PBlas	land	
CLIENT Bechtel	ma / / / / / / / / / / / / / / / / / / /		JOB NO.		85042	2	
}	,		REPORT	NO	Y	<del></del>	
PROJECT Niagara F	ton 1	14	21,	•	F	parrat	t
Subcontract /					SHER RO EAST S		
	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>,,,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		т т	ELEPHONE AREA	CODE 315/437-1	429

		7	-					
· COMPACTION								
TEST REPORT								
IESI KEPOKI								
STANDARD MODIFI	ED 🔀	124						
11571105		101						
METHOD A 😫 B 🖂				<del>-   -   -   -   -   -   -   -   -   -  </del>		71Q - T		
0.5		L.						
C D D U		0 120						
MANUAL BEY BENCH	•••	1			1:11/1:11			
MAXIMUM DRY DENSIT		ISI		+				
P.C.F.		DENSITY.						
OPTIMUM MOISTURE CON	TENT	DRY						
		٥						
		112						
PERFORMED IN ACCORDANCE	E WITH	112						
ASTM D-1557								
	<u></u>		}					
						<del></del>		
	<del></del>					+++++		
	<del></del>		<b></b>	WATER	ONTENT,	14 % OF DRY	WEIGHT	8
SAMPLE NO.		2		3	4	10 01 0111	112/0/11	
MOLD + SAMPLE WT.	14.27	14.4	19	14.70	14.57			· ·
MOLD WEIGHT	10.12	IC.	12	10.12	10.12			
WET SAMPLE WT.	4.15	4	7	4.58	4.45			
WET DENSITY, P.C.F.	124.5	(3)		137.4				
MOISTURE CONTENT	(0.1	9.7	)	12.5	16.1	!		
DRY DENSITY, P.C.F.	117.3	Į.		122.1	115.0			
			<u> </u>	—\-     <u>                                 </u>			1	
SOIL LOCATION					Brown	SILT a	nd CLA	\ <b>Y</b>
Sam	ole lu	1		•	Tr. F-C			
Uncontamina			- نن	  -  -		5.85 TES		
				CHECKE	DBY	PBlas	land	
	1 1/ /		·- —		JOB NO.	<u> </u>	5042	
CLIENT Bechtel		•				NO		
PROJECT <u>Niagara Fa</u> <u>Lewista</u>	a//s S	toruş	(g ()	ग्रि		<u></u>	parra	
Lewisto	on A	14					nolff	_
Subcontract /						ISHER RD. EAST ELEPHONE AREA	SYRACUSE, N.Y.	13057
L								

		1									
COMPACTION					F						
TEST REPORT					1						
STANDARD I' MODIFIE	ED 🔀	-128									
METHOD A & B C		124									
C D D		P.C.F									
MAXIMUM DRY DENSIT	Y	DENSITY. F									
OPTIMUM MOISTURE CON	TENT	DAY C			Ø.						
PERFORMED IN ACCORDANCE  ASTM D-155		112						12			
		<u> </u>		,	ER C		VT. 9	% OF DR	Y WEIG	HT	
SAMPLE NO.		1 2		3		4		5	<b>_</b>		
MOLD + SAMPLE WT.	14.25			14.7		14.6		14.50	-		-
MOLD WEIGHT	10.12		12	10.1		10.1		10.12			
WET SAMPLE WT. WET DENSITY, P.C.F.	4.13	4.3		4.6		4.5		4.38	-	<del></del> :	
MOISTURE CONTENT	123.9	129		139.		135.		131.4	<del></del>		
DRY DENSITY, P.C.F.	5.5	119		124		13.8 118.0		16.2	+		
	117.7		. /	. 10.1		115.0	0_	113.1	+		
SOIL LOCATION							Si	LT and	CLAY	, L	ittle F.C
Samo	le Y				· = ·		- )an	d Tr. 1	F Gro	vel	
Samp Unconta	minat	ed						6.85 TES			TF
					CHECKED BY DP Blastand						
CLIENT Bechter					JOB NO. 2-85042 REPORT NO Y						
PROJECT Niagara Fa	ton N	14	(E_)	o <u>ite</u>	-				pan	ffin	ю
Subcontract 14	501-1	15-5	C' - ,	129			FISHER RD .EAST SYRACUSE, N.Y. 13057 TELEPHONE AREA CODE 315/437-1429				

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TEST REPORT  STANDARD T MODIFIED >	
122	
METHOD A 38 B	
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
MAXIMUM DRY DENSITY	
MAXIMUM DRY DENSITY  1/8.9 P.C.F.	
OPTIMUM MOISTURE CONTENT	
12.6 %	<del>                                    </del>
PERFORMED IN ACCORDANCE WITH	
ASTM D-1557 ICL	
	┣ <del>┊</del> ┩╫╫╫╫ ┡╡╃╫╫╫
WATER CONTENT, % OF DRY WEIGH	1T 20
SAMPLE NO. 1 2 3 4 5	
MOLD + SAMPLE WT. 14.04 14.30 14.54 14.67 14.42	
MOLD WEIGHT /0.18 /0.18 /0.18 /0.18	
WET SAMPLE WT. 3.86 4.12 4.36 4.49 4.24	
WET DENSITY, P.C.F. 115.8 123.6 13C.8 134.7 127.2	
MOISTURE CONTENT 4.5 7.4 1.0 13.9 18.7	
DRY DENSITY, P.C.F. 110.8 114.4 117.8 118.3 107.2	
SOIL LOCATION Red-Gray CLAY Som	ne Silt To
Composite Sample U.K. ? To Little F.M Gravel Tr.	
Uncontaminated DATE 9.3.85 TESTED BY	
Borrow Area - Proposed Fish Hating CHECKED BY DPBla	island
108 NO 1-8504	12
CLIENT Rechtel National III	
PROJECT Niagara Falls Storage ite PEPORTNO. U.X.	<u> </u>
	att
Lewiston, N.Y. wolf	Tinc
Subcontract 14501-115-50-129 FISHER RD. EAST SYRACUSE M TELEPHONE AREA CODE 315/4	
TELEPHONE AREA CODE 315/A	

COMPACTION							
TEST REPORT	122						
STANDARD   MODIF	MODIFIED 🛣						
METHOD A 🗷 B 🗆		118					
C D D		P.C.F.					
MAXIMUM DRY DENSI 120.0 P.C.F		DENSITY,					
OPTIMUM MOISTURE CON 12.3 %	ITENT	VIO 110					
PERFORMED IN ACCORDANG		106					
<u> </u>			8	I2 CONTENT,	16	20	
			VVAIEDI	JUNIENI.	% UP DRI	VVEILSEL	
SAMPLE NO.		2		1		112.0111	T
SAMPLE NO.  MOLD + SAMPLE WT.	13.79	2	3	4			
	13.79	13.91	3 13.97	13.68			
MOLD + SAMPLE WT.	13.79 9.47 4.32	13.91	3 13.97 9.47	4 13.68 9.47			
MOLD + SAMPLE WT. MOLD WEIGHT	9.47	13.91	3 13.97 9.47 4.50	4 13.68 9.47 4.21			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.	9,47 4.32	13.91 9.47 4.44	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.	9.47 4.32 129.6	13.91 9.47 4.44 133.2	3 13.97 9.47 4.50	13.68 9.47 4.21 1263 19.0			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT	9.47 4.32 129.6 9.9	13.91 9.47 4.44 133.2 11.5	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT	9.47 4.32 129.6 9.9	13.91 9.47 4.44 133.2 11.5	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263 19.0			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.	9.47 4.32 129.6 9.9	13.91 9.47 4.44 133.2 11.5 119.5	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263 19.0			
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Uncont	9.47 4.32 129.6 9.9 117.9	13.91 9.47 4.44 133.2 11.5 119.5	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263 19.0 106.1	-985 TES	TED BY	
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Uncont	9.47 4.32 129.6 9.9 117.9	13.91 9.47 4.44 133.2 11.5 119.5	3 13.97 9.47 4.50 135.0	13.68 9.47 4.21 1263 19.0 106.1	-985 TES	TED BY R	land
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Unconfidence  Clay -	9.47 4.32 129.6 9.9 117.9 (e UUU Aminator Pond	13.91 9.47 4.44 133.2 11.5 119.5	3 13.97 9.47 4.50 135.0 13.4 119.0	13.68 9.47 4.21 1263 19.0 106.1 DATE /C CHECKE JOB NO.	-985 TES DBY	TED BY R PBlass	land
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Clay -  CLIENT Bechlel  PROJECT Niagara	9.47 4.32 129.6 9.9 117.9 le UUU Aminate Pond Natio	13.91 9.47 4.44 133.2 11.5 119.5 119.5 mal, Inc.	3 13.97 9.47 4.50 135.0 13.4 119.0	13.68 9.47 4.21 1263 19.0 106.1 DATE /C CHECKE JOB NO.	1985 TES DBY	TED BY R PBlass 85042 UUUU	land
MOLD + SAMPLE WT.  MOLD WEIGHT  WET SAMPLE WT.  WET DENSITY, P.C.F.  MOISTURE CONTENT  DRY DENSITY, P.C.F.  SOIL LOCATION  Sample  Clay -  CLIENT Bechlel  PROJECT Niagara	9.47 4.32 129.6 9.9 117.9 E UUU Aminato Pond Natio	13.91 9.47 4.44 133.2 11.5 119.5 119.5 mal, Inc.	3 13.97 9.47 4.50 135.0 13.4 119.0	13.68 9.47 4.21 126.3 19.0 106.1  DATE /C CHECKE JOB NO. REPORT	985 TES DBY	TED BY R PBlass	t nc

# APPENDIX 4-C

COMPACTION CONTROL REPORTS



COMPAC	<u> TION</u>	CON	ITROL	REPORT
BE	CHTEL	NATI	ONAL	
	US DO	E NFS	S	

Job # L-85042						
Report #	16					
Date						

Test Method Sand Cone

8 Compaction Required 95%

TEST NO.	LOCATION & DATE	ELEVATION		WET	WATER CONTENT		PERCENT COMPACTION
	9/4/85		,				
52U	S 780 E 240	331	128.4	122.3	11.8	109.4	85.2 F
	9/5/85						
52 UA	Retest S 780	331	128.4	133.6	13.0	118.2	92.1 F
	E 245			[			
52UB	Retest S 790	332	128.4	135.2	11.6	121.1	94.3 F
	E 250			,			
52UC	Retest S 786	332	128.4	134.8	10.6	121.9	94.9 A
	E 260						
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					<del> </del>		<del> </del>
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-	<u> </u>		<del>                                     </del>	<del>}</del>	<del> </del>		<del> </del>
-				<del> </del>	<del> </del>		<del> </del>
	<del> </del>		<u> </u>	!			<u> </u>

	<del>-</del>		
tes:	Density Shown:	Lbs. Per Cubic Foot	Moisture Standard Count
	Water Content:	Percent of Dry Weight	Density Standard Count



COMPACTION	CONTROL	REMURT

BECHTEL NATIONAL, INC.

US DOE NFSS

Test	Method	Sand	Cone
		50,.5	

% Compaction Required 95%

Job #	L-85042	
Report	# 17	
Date		

	UNCONTAMINATED	5 0	ompaction	required _			
TEST NO.	LOCATION & DATE	ELEVATION	MAXIMUM LAB DENSITY	IN-PLACE WET DENSITY	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
	9/11/85						
53U	S 1093 E 320	337	128.4	133.4	12.1	119.0	92.7 F
	9/12/85						
53UA	Retest S 1095						
	E 310	337	128.4	135.2	10.4	122.5	95.4 P
	9/13/85						
540	S 1050 E 186	343	126.0	125.9	8.4	116.1	92.2 F
54UA	Retest \$ 1030	343	126.0	129.2	10.1	117.3	93.1 F
	E 206						
55U	S 1050 E 114	335	121.0	133.2	12.2	118.7	98.1 P
l							
ļ 							
	<u> </u>						

	COMMENTS:	A=Approved; P=Passing: F=	-	
Notes:	Density Shown:	Lbs. Per Cubic Foot	Moisture Standard Count	-
	Water Content:	Percent of Dry Weight	Density Standard Count	



COMPA	CTION	CONTROL	PEPORT
CUMIEA	CILOIA	CUNIKUL	REPURI

Bechtel National, Inc.

US DOE NFSS

5 - 5 - 4	Cone
Sanu	Cone

% Compaction Required 95%

Test Method \_\_\_

Job # L-85042	
Report # 22	
Data	

UNCONTAMINATED - CLAY CAP

TEST	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	IN-PLACE WET DENSITY	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION	ON
56U	9/16 S960, E106	334	121.0	132.2	11.7	118.4	97.8	Р
57U	9/16 S980, E181	340	126.0	122.6	11.6	109.9	87.2	F
58U	9/17 S980, E320	338	126.4	129.8	8.7	119.4	94.5	F
59U	9/17 S920, E350	335	126.4	125.7	10.7	113.6	89.8	F
60U	9/17 S920, E218	343	126.0	132.7	11.9	118.6	94.1	F
61U	9/17 S920, E111	336	121.0	126.3	8.9	116.0	95.8	Р
Retes	t 57U-A 9/18							
	S980, E175	340	126.0	120.4	8.6	110.9	88.0	F
Retes	t 9/1854 U- B							
	S1062, E186	343	126.0	130.0	8.3	120.0	95.3	Р
Retes	t 9/18 58U-A	·						
	S977, E318	338	126.4	133.5	9.1	122.3	96.8	P
Retes	t 9/18 59U-A					•		
	S925, E346	335	126.4	125.6	8.9	115.3	91.2	F
Retes	t 9/18 60U-A							
	S927, E210	343	126.0	126.3	10.6	114.2	90.6	F
62U	9/18 S850, E334	335	126.4	131.2	9.4	119.9	94.9	Р
63U	9/19 S870, E034	321	121.0	128.0	16.1	110.3	91.1	F
Retes	t 9/19 59U-B							
	S920, E350	335	126.4	131.1	12.1	117.0	92.5	F
Retes	t 9/19 60U-B							
	S920, E215	343	126.0	132.2	11.9	118.2	93.8	F
Retes	st 9/20 59U-C							
	S920, E358	335	126.4	129.5	10.9	116.8	92.4	F
Retes	st 9/20 60U-C							
	S920, E220	343	126.0	130.6	11.4	117.2	93.0	F
				T				
		i .	1			1	1	

	COMMENTS: _	A=Approved, F=Failin	ig, P=Passing	
Notes:	Density Shown:	Lbs. Per Cubic Foot	Moisture Standard Count	
	Water Content:	Percent of Dry Weight	Density Standard Count	

# FIE! IN-PLACE DENSITY TEST ' PORT

SOILS INV	P STIGATI	RE

- ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 ☐ 635 JAMES STREET SYRACUSE NY 13203 315-472-9333

roje	ect: Nu	2422	F,11	<u> </u>	Drzge	₹.p	<u> </u>	R	leport No.
lier	ntS	<u> </u>						D	Date: Sept. 23, 1985
oni	tractor:	_5~	rom sur					Jo	ob No
Test Na.	Oate of Test	Depth or Elevation	In-place Density (pcf)	In-place Moisture [%]	% Compaction	Proctor Code		Locat	tion and Remarks
1	9/23	Grade	124.6	9.1	485	*1	\$.915	E.350	c/24 c2p
2	9/23	ارم برما موداستان دورسان	125.7	8.6	<b>19.7</b>	<del>*</del> -2	5,920°	5.150	c/24 <20
3	9/23	672 de	123.5	9.3	4 ). <b>9</b>	#-2	5.925	6,217 t	c/24 (20
4	7/23	27. 1. 1. C. C. 7.	123.7	2.2	45.4	***	5 9 29 <sup>2</sup>	13.2402	c 24 =2p
<u> </u>	9/23	ورياد	12/3,1	то.4	97.4	*-7	5:920	5-375-	(124 62)
, ,	9/22	المراجعة المراجعة	114.0	10.4	94-1	γ <b>⊬</b> -ι	s 850 <sup>2</sup> ,	r 330 <sup>2</sup>	CIZE CSO. SANOCUNEAU
,	9/23	المريدة	117-7	12.5	97.3	<b>≯</b> ⋅ 3	5 8 6 0 <sup>2</sup>	£ 034	c/2 (20-5) we (~65)
•	9/23	שריבושים בייבושים בייבושים	1101	14.4	91.0	<b>*</b> ~3	5 270°	E 034	Cl24 220-5) DDE ( MOST T
· ·	7/23	د المار	178A	11.7	98.2	<b>*</b> -3		E-DHD	clay cap slupe (ness
S		المتنتخ	121.2	11.7	100+	*-3	5960	, <del>2035</del> ;	clas can slupe Cusa
<u>.                                    </u>	9/42	Francis	V15.2	13.9	91-4	*-2	5 760-	£ 2ω;	clay cap North Slope
Ĺ	9/23	وتبيز	103.0	13.4	81.4	*-1	5750°	2 300°	clay can North slope
ctor de	Maximum Density (pa	Γ	itimum sture (%)				Materia	al Type and S	Source
t-	126.4	ن ر	. 2	Peo	6 PUR	5 V PP	NED BY	SIZVEW SUM	<i>c</i>
-2	126.0	12	. 4		1		2 4	٠,	·
3	121,0	13	. 9	١	•		.,	٠,	

Remarks: Nuclear Method Used

Method "10735 (4)" Direct Transmission

Technician Time: 900 mm

Technician: Para J. Armondu



COMPACTION	CONTROL	REPORT

 Bech	itel	Natio	na.	inc.	`
, U	S D	DE N	FSS		

Job #	L	-85042
Report	#	23
Date		

Test Method Sand Cone

% Compaction Required \_\_\_

rest NO.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	WET	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
Retes	t 9/23 60U-D						
	S925, E186	340	126.0	133.0	8.7	122.3	97.1 F
Retes	t 9/25 63U-A		<u> </u>		•		
	\$880, E032	325.5	121.0	129.2	12.4	114.9 -	95.0 F
		<u> </u>					
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	COMMENTS:	A=Approve	ed, F=Fail	ing, P=Pas	sing		
tes:	Density Shown:	Lbs. Per Cubic Foot Moisture Standard Count					<del></del>
	Water Content:	Percent of Dr	y Weight	Dens	sity Standa	rd Count	
				<del></del>	·		



# COMPACTION CONTROL REPORT

Bechtel National, Inc.

# US DOE NFSS

Job # _	L-	-85042
Report	#	24
Data		

Test Method Sand Cone

85%

% Compaction Required UNCONTAMINATED - SOIL MATERIAL

UNC	ONTAMINATED - SO		,	)		<del></del>	
TEST NO.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	WET	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
64U	9/19 S1097, E278	339.5	122.4	130.8	17.0	111.8	91.3 P
65U	9/20 S1000, E300	340.5	122.4	127.7	15.2	110.9	90.6 P
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	COMMENTS: _	A=Approved	, F=Failin	ng, P=Pas	sing		<del></del>
Notes:	Density Shown:					ard Count	
	Water Content:	Percent of Dry	weignt	Dens	ity Standa	ird Count	



COMPACTION	CONTROL	REPORT
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Bechtel National, Inc.

US DOE NFSS

Test	Method	Sand	Cone

Job # L-85042 Report # 25

Date

% Compaction Required 85% UNCONTAMINATED - SOIL MATERIAL

LOCATION	ELEVATION	LAB	WET		IN-PLACE DRY DENSITY	PERCENT COMPACTI	ON
9/21 S1224, E292	340	122.4	136.5	14.3	119.4	97.5	Р
9/21 S1079, E238	344	124.9	127.2	17.4	108.3	86.7	P
9/23 S1000, E307	2nd 2" Lift	115.3	120.4	13.0	106.5	92.4	Р
9/23 <b>S</b> 870, <b>E100</b>	1st 6" Lift	124.9	128.8	14.4	112.6	90.1	Р
9/25 S815, E361	1st 6" Lift	122.4	127.2	14.4	111.2	90.8	Р
9/25 \$900, E300	1st 6" Lift	122.4	126.5	17.1	108.0	88.3	P
9/26 S820, E034	325	124.9	. 129.8	15.5	112.4	90.0	P
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	9/21 S1224, E292 9/21 S1079, E238 9/23 S1000, E307 9/23 S870, E100 9/25 S815, E361 9/25 S900, E300 9/26 S820, E034	9/21 S1224, E292 340 9/21 S1079, E238 344 9/23 S1000, E307 2nd 2" Lift 9/23 S870, E100 1st 6" Lift 9/25 S815, E361 1st 6" Lift 9/25 S900, E300 1st 6" Lift 9/26 S820, E034 325	LAB   DENSITY	LAB   DENSITY   DENSITY	LAB   DENSITY   DENSITY   CONTENT	LAB   DENSITY   DENSITY   DRY   DENSITY	LAB   DENSITY   DENSITY   DRY   DENSITY   DE

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	COMMENTS:	A=Approv	/ed, F=Fa	iling, P=Pa	ssing	
	_					
Notes:	Density Shown:	Lbs. Per Cub	ic Foot	Mois	ture Stand	dard Count
	Water Content:	Percent of Dr	y Weight	Dens	sity Standa	ard Count



COMPACTION		
	National	•

US DOE NFSS

Job # L-85042
Report # 26
Date

Test Method \_\_\_\_Sand Cone

% Compaction Required 85% UNCONTAMINATED - SOIL MATERIAL

TEST NO.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY		WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
73U	9/28 S850, E350	2nd 6" Lift	115.3	122.8	17.4	104.6	90.7 P
74U	9/28 S800, E100	2nd 6" Lift	122.4	131.1	15.9	113.1	92.4 P
78U	9/30 S1100, E027	320.8	124.9	132.0	14.8	115.0	92.1 P
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	COMMENTS: _	A=Approv	red, F=Fai	ling, P=Pa	ssing		
Notes:	Density Shown:	Lbs. Per Cub	oic Foot	Mois	ture Stand	ard Count _	
	Water Content:	Percent of Dr	y Weight	Dens	ity Standa	rd Count _	
					•		



COMPACTION	CONTROL	REPORT

Bechtel National, Inc.

US DOE NFSS

Test Method	Sand Cone			
% Compaction	Required	95%		

Job #	L-	85042
Report	#	27
Data		

TEST NO.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	WET	WATER CONTENT		PERCENT COMPACTIO	N
75U	9/28 S1266, E103	1st 6" Lift						
		Phase I	118.9	127.9	17.6	108.8	91.5	F
Retes	t 9/28 75U-A	1st 6" Lift						
	S1275, E112	Phase I	118.9	133.7	14.2	117.1	98.5	Р
76U	9/28 S1250, E318	1st 6" Lift						
		Phase I	118.9	127.8	15.2	110.9	93.3	F
77U	9/28 S1204, E168	1st 6" Lift		•				
		Phase 1	118.9	131.2	13.4	115.7	97.3	P
Retes	t 9/30 76U-A	1st 6" Lift						
	S1238, E335	Phase I	118.9	131.2	13.4	115.7	97.3	P
79U	9/30 S1170, E096	2nd 6" Lift						
		Phase I	118.9	131.7	13.5	116.0	97.6	P
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	COMMENTS:	A=Approved, F=Failin		iling, P=Pa	ssing		
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Notes:	Density Shown:	Lbs. Per Cut	ic Foot	Mois	ture Stand	ard Count _	
	Water Content:	Percent of Dry Weight		Dens	ity Standa		
					•		



COMPACTION	

BECHTEL NATIONAL, INC.

USDOE NESS

Test	Method	Sand	Cone

% Compaction Required 95%

Job # <u>L-8</u>	5042
Report #	29
Date	

TEST NO.	LOCATION & DATE	ELEVATION	MAXIMUM LAB DENSITY	IN-PLACE WET DENSITY	WATER CONTENT		PERCENT COMPACTION
	10/2/85						
80U	S 1190 E 330	2nd Lift	118.9	128.7	15.2	111.7	93.9 F
	10/2/85	Phase I					
80UA	Retest \$ 1173	334.7	118.9	131.2	12.4	116.7	98.1 P
	E 328						
810	S 1260 E 124	3rd Lift	118.9	126.8	14.7	110.5	92.9 F
81 UA	Retest S 1250	Phase I	118.9	.130.7	16.6	112.1	94-3 F
	E 126						
81 UB	Retest \$ 1245	Phase I	118.9	136.5	15.5	118.2	99.4 P
	E 126						
	10/3/85					•	
82U	S 1240 E 260	3rd Lift	118.9	131.7	14.0	115.5	97.1 P
		Phase 1					
830	S 1240 E 376	3rd Lift	118.9	131.1	14.6	114.4	96.2 P
	·	Phase I				<del></del>	
840	S 1255 E 114	4th Lift	118.9	128.8	14.0	113.0	95.0 P
		Phase I				<del></del>	
85บ	S 1180 E 131	4th Lift	118.9	135.5	15.7	117.1	98.5 P
		Phase I				·	
86U	S 1207 E 327	4th Lift	118.9	133.3	16.1	114.8	96.6 P
		Phase I					
87U	S 890 E 447	317.7	118.9	117.9	10.7	106.5	89.6 F
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	COMMENTS: _	r-rasseu, A-Approveu, r-ra	arreu, w-warveu	
Notes :	•	Lbs. Per Cubic Foot Percent of Dry Weight	Moisture Standard Count  Density Standard Count	



# BECHTEL NATIONAL, INC.

US DOE NFSS

Job # _	L	-85042
Report	#	29 CONT
Date		

Test Method Sand Cone

% Compaction Required 95% #94U & #96U 85% Required

_للمحم	ntaminated - Clay C	ap #9	4U & #96U	85% Requi	red		
TEST NO.	LOCATION AND DATE	ELEVATION	MAXIMUM LAB DENSITY	WET	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
	10/4						
87UA	Retest S1000, E430	317.7	118.9	127.1	12.1	113.4	95.4 P
88U	S1260, E090	5th Lift	118.9	135.1	15.2	117.3	98.7 P
		Phase I					
89U	S1195, E274	5th Lift	118.9	133.7	15.0	116.3	97.8 P
		Phase I					
90U	S1190, E386	5th Lift	118.9	124.2	14.7	108.3	91.1 F
		Phase I					
91U	S1222, E080	6th Lift	118.9	130.8	15.1	113.6	95.5 P
		Phase I					
	10/7						
90UA	Retest S1194, E382	5th Lift	118.9	132.5	14.0	116.2	97.7 P
		Phase I		 <del> </del>			
92U	S1134, E440	320.8	118.9	121.1	13.5	106.7	89.7 F
92UA	Retest 51130, E445	320.8	118.9	131.6	13.4	116.0	97.6 P
93U	S1196, E228	F Grade	118.9	134.6	14.8	117.2	98.6 P
<u> </u>		Phase I					
94U	S 1265, E 128	1st 6" Lift	115.3	129.6	14.3	113.4	98.4 P
95U	S1195, E412	6th Lift	118.9	129.1	14.0	113.3	95.3 P
	10/8	Phase I		ļ			
96U	S1182, E381	1st Lift Soi	115.3	124.8	14.9	108.6	94.2 P
97U	S1210, E440	±322.5	118.9	135.4	16.1	116.6	98.1 P
	10/9			ļ			
98U	S1285, E252	6th Lift	118.9	128.7	15.1.	111.8	94.0 F
99U	S1290, E240	6th Lift	118.9	125.5	13.8	110.3	92.8 F
		Clay			ļ		

	COMMENTS: _	P=passing, F=failing, A	=approved, W=waived	
ivotes:	Density Shown:	Lbs. Per Cubic Foot	Moisture Standard Count	
•	Water Content:	Percent of Dry Weight	Density Standard Count	



COMPACTION CONTROL REPORT
BECHTEL NATIONAL, INC.
US DOE NESS
Test Method Sand Cone
0.5%

Job #	-85042
Report #	32
Date	

T	LOCATION 10/10/85	ELEVATION	MAXIMUM LAB DENSITY		WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
ou	\$1218, E350	F.G. Soil	122.4	134.6	17.0	115.0	94.0
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	COMMENTS: _				· <del></del>		

	COMMENTS: _		· · · · · · · · · · · · · · · · · · ·	
es:	·	Lbs. Per Cubic Foot Percent of Dry Weight	Moisture Standard Count	



BE	CHTE	NAT	IONAL,	INC
		NFSS		

Job #	L	-85042
Report	#	33
Date		

Test Method Sand Cone

% Compaction Required 95%

Uncontaminated - Clay Cap

TEST NO.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	IN-PLACE WET DENSITY	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTION
	10/11/85						
1010	S888, E440	323.4	118.9	135.1	15.5	117.0	98.4 p
102U	S1002, E439	323.7	118.9	133.7	15.9	115.4	97.0 P
	10/12/85						
98UA	S1285, E250 RETES	Top 6" Lif	t 118.9	134.0	15.7	115.8	97.4 P
99UA							
1030	S756, E179	322.8	118.9	133.9	17.7	113.8	95.7 P
	10/14/85						
1040	S745, E346	324.1	118.9	135.1	17.4	115.1	96.8 P
1050	S767, E154	328.3	126.0	134.1	13.5	115.5	91.7 F
106U	S1560, E022	321.0	118.9	138.3	18.2	117.0	98.4 .
Ĺ	10/16/85						
1070	S1364, E024	319.4	120.0	133.4	15.1	115.9	96.6 P
1080	\$1674, E052.5	321.3	120.0	135.1	16.8	115.7	96.4 P
109U	S1267, E028	321.0	120.0	132.3	15.3	114.7	95.6 P
	10/17/85						
1100	S1679, E114	322.0	120.0	136.0	16.8	116-4	97.0 P
1110	S1025, E423	325.5	120.0	136.7	17.0	116.8	97.4 P
112U	S745, E151	326.4	120.0	130.6	16.6	112.0	93.3 F
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	COMMENTS:	P=passed	A=approved	
	_	F=failed	W=waived	
Notes:	Density Shown:	Lbs. Per Cubic	Foot	Moisture Standard Count
	Water Content:	Percent of Dry	Weight	Density Standard Count



#### COMPACTION CONTROL REPORT

Bechtel National, Inc.

#### US DOE NFSS

Test Method Sand Cone	Test	Method	Sand	Cone
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% Compaction Required \_\_95%

Job # L	-85042
Report #	34
Date	

Uncontaminated - Clay Cap ITEST LOCATION ELEVATION MAXIMUM IN-PLACE WATER IN-PLACE **IPERCENT** NO. LAB WET CONTENT DRY COMPACTION DENSITY DENSITY DENSITY Retest 10/18 112U-A S745, E156 326.4 120.0 134.4 16.6 115.3 96.1 Р 113U 10/18 S1184, E414 330.8 120.0 130.1 18.3 F 110.0 91.7 114U 10/18 S960, E426 326.7 120.0 133.2 16.3 114.5 95.4 Р 115U 10/22 S1305, E131 2nd Lift 120.0 131.7 15.7 113.8 94.8 Α 116U 10/22 \$1430, E178 1st Lift 120.0 131.4 19.1 110.3 F 91.9 Retest 10/23 116U-A S1320, E078 336.3 120.0 133.2 18.8 112.1 93.4 F 117U | 10/23 S 1320, E078 329.7 120.0 135.1 17.8 114.7 Р 95.6 118U 10/23 S998, E430 326.3 120.0 136.5 16.8 116.9 P 97.4 119U | 10/25 S1125, E422 327.5 120.0 136.4 19.1 114.5 95.4 Р 120U | 10/25 S825, E418 328.0 120.0 118.3 21.4 97.4 81.2 F 121U 10/26 S1420, E230 1st Lift 120.0 132.0 15.2 114.6 Р 95.5 . . . -- . Retest 10/26 116U-B S1435, E110 1st Lift 120.0 133.1 16.4 114.3 95.3 Ρ 122U 10/28 \$1510, E0801st 6" Lift 120.0 132.7 14.2 116.2 96.8 P

	COMPLETE	D-Doord A	<b>A</b> ·			
	COMMENTS: _					— ∴ —
votes:	Density Shown: Water Content:			ture Stand ity Standa	ard Count _ erd Count	



COMPACTION CONTROL REPORT
Bechtel National, Inc.
US DOE NFSS

Job # _	<u>L</u>	-85042
Report	#	36
Date		

Test Method Sand Cone

% Compaction Required 95%

Uncor	ntaminated - Clay C	ар	·			<del>.</del>	<del>,</del>	
10.	LOCATION	ELEVATION	MAXIMUM LAB DENSITY	IN-PLACE WET DENSITY	WATER CONTENT	IN-PLACE DRY DENSITY	PERCENT COMPACTIO	N
123U	10/28 S755, E262	326.9	120.0	132.4	13.5	116.7	97.3	Р
Retes	t 10/29 105U-A							
	S764, E154	328.0	120.0	134.3	17.3	114.6	95.5	Р
Retes	t 10/29 113U-A							
	S1184, E414	330.8	120.0	134.3	17.7	114.1	95.1	Р
124U	10/29 S1625, E308	1st Lift	120.0	131.6	15.7	113.7	94.8	Α
125U	10/30 S1430, E385	1st Lift	120.0	132.3	14.7	115.3	96.1	Р
126U	10/30 S1610, E129	2nd Lift	120.0	138.0	16.0	119.0	99.2	P
Retes	t 10/31 120U-A							
	S825, E420	328.0	120.0	133.7	17.7	113.6	94.7	Α
1270	10/31 S1580, E285	2nd Lift	120.0	134.9	16.3	116.0	96.7	Р
128U	10/31 S1305, E308	330.0	120.0	135.5	14.9	117.9	98.3	Р
129U	10/31 S1350, E164	337.9	120.0	134.3	14.6	117.2	97.7	P
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	COMMENTS: _	P=Passed, A=Approved,	F=Failed, W=Waived	
es:	Density Shown:	Lbs. Per Cubic Foot	Moisture Standard Count	
	Water Content:	Percent of Dry Weight	Density Standard Count	



COMPACTION	CONTROL	REPURT

BECHTEL NATIONAL, INC.

US DOE NESS

Test	Method	Sand	Cone

% Compaction Required 95%

Job #	85042
Report #	_37
Date	

TEST NO.	LOCATION & DATE	ELEVATION	MAXIMUM LAB DENSITY	WET	WATER CONTENT		PERCENT COMPACTION
	11/1/85					-	
1300	S 1657 E 324	3rd Lift	120.0	132.3	14.2	115.9	96.5 P
		Clay					
		Phase III					
1310	S 1390 E 110	3347	120.0	134.9	13.9	118.4	98.7 P
		Phase 11					
	11/2/85						
1 32 U	S 1336 E 098	6th Lift	120.0	138.3	16.4	119.5	99.0 p
		Phase II	(For In-	place Perme	ability Te	st)	
1330	S 1335 E 114	6th Lift	120.0	136.6	16.3	117.5	97.9 P
		Phase 11	(For In-	place Perme	ability Te	st)	·
1340	S 1580 E 330	4th Lift	120.0	134.2	13.3	118.4	98.7 P
		Clay					
		Phase III					
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Notes: Density Shown: Lbs. Per Cubic Foot Moisture Standard Count		oproved; W=Waived	F=Failed; A=Ap	P=Passing; F	COMMENTS: _	
	 rd Count	Moisture Standa	ic Foot	Lbs. Per Cubi	Density Shown:	Notes:
Water Content: . Percent of Dry Weight Density Standard Count	d Count	Density Standar	y Weight	Percent of Dry	Water Content:	

# APPENDIX 4-D

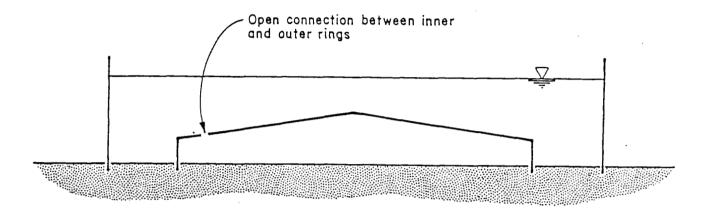
METHOD OF CALCULATION

FIELD PERMEABILITY TESTS

#### Calculation of Infiltration Rate and Permeability

#### Case 1 - Inner and Outer Rings Operating Together

The inner and outer rings can be operated together by leaving a direct hydraulic connection between water in the inner and outer rings. In essence, the system functions as if the inner ring were not there:



The diameter (D) area (A) of the outer ring are:

Douter = 7 ft = 213 cm  
Aouter = 
$$\pi D^2/4 = 35.753$$
 cm<sup>2</sup>

The infiltration rate (I) is the rate of flow per unit area of ring. The rate of flow (q) is the volume of flow (Q) per interval of time (t):

$$q = Q/t$$

The infiltration (I) is the rate of flow (q) per unit area

$$I = q/A = \frac{q}{A_{outer}} = \frac{Q}{tA_{outer}}$$

and has units of velocity. For instance, suppose we measure 20,000 ml (1 ml = 1 cm $^3$ ) of flow in 24 hours. It would be:

$$I = \frac{20,000 \text{ cm}^3}{[24/\text{hr x 60 min/hr x 60 sec/min}] \cdot 35.753 \text{ cm}^2}$$

$$= \frac{20,000 \text{ cm}^3}{(86.400 \text{ sec}) (35.753 \text{ cm}^2)} = 6.5 \text{ x 10-6 cm/sec}$$

We suggest measuring the amount of flow (Q) by measuring the change in height of water ( $\Delta H$ ) in the outer ring:

$$Q = A_{outer} \cdot \Delta H$$

Thus, for instance, if the water level drops 0.5 cm in 24 hours:

$$Q = Aouter \cdot \Delta H = (35.753 cm^2) \cdot (0.5 cm)$$
  
= 17.877 cm<sup>3</sup>

and

$$q = Q/t = \frac{17.877 \text{ cm}^3}{[24/\text{hr x 60 min/hr x 60 sec/min}] = 0.207 \text{ cm}^3/\text{se}}$$

and

$$I = q/A = \frac{0.207 \text{ cm}^3/\text{sec}}{35.753 \text{ cm}^3}$$
  
= 5.8 x 10<sup>-6</sup> cm/sec

Permeability may be estimated from the measurements using Darcy's law:

$$q = kiA$$

where:

q = rate of flow = Q/t

k = permeability

i = hydraulic gradient = 1.3 (dimensionless)

A = area of outer ring =  $^{A}$ outer = 35,753 cm<sup>2</sup>

Thus:

$$k = \frac{q}{iA}$$

Suppose, as in a previous example, 20,000 ml of water flowed into the ground over a period of 24 hours. We found earlier that:

$$q = Q/t = \frac{20,000}{24 \times 60 \times 60} = 0.231 \text{ cm}^3/\text{sec}$$

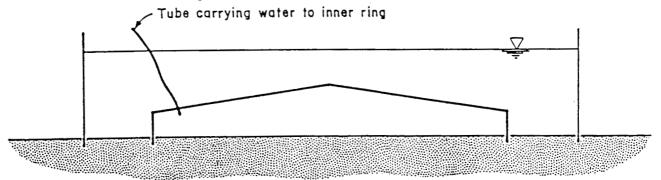
Thus:

$$k = \frac{0.231 \text{ cm}^3/\text{sec}}{1.3 \text{ x } 35,753 \text{ cm}^2} = 5.0 \text{ x } 10^{-6} \text{ cm/sec}$$

These permeability calculations are only valid if the material under the cover is substantially more permeable than the cover. If the material under the cover is not substantially more permeable than the cover itself, then the calculated permeability of the cover will be too low, i.e., the actual permeability of the cover will be larger than the calculated value.

#### Case 2 - Inner Ring Operated Separately

It is possible to isolate the flow into the inner ring from the flow into the outer ring:



The infiltration rates and permeabilities computed from flow to the inner ring should be more accurate than values computed from flow to the outer ring because: (1) there are no evaporative losses from the inner ring; (2) the precision of flow measurement is better; and (3) the flow is nearly one dimensional because flow that originates from the outer ring confines the seepage from the inner ring.

The calculations are similar:

$$q = Q/t$$

$$I = q/A = \frac{q}{A_{inner}}$$

$$A_{inner} = 18,241 \text{ cm}^{2}$$

$$k = \frac{q}{iA} = \frac{q}{i \text{ A}_{inner}} = \frac{q}{(1.3) (18,241 \text{ cm}^{2})}$$

#### VOLUME 5

# INTERIM CAP CONSTRUCTION,

# WASTE CONTAINMENT AREA MONITORING SYSTEM

AND

PERMEABILITY TESTING

MAY - NOVEMBER, 1986

# TABLE OF CONTENTS

			Page
1.0	INTRODUCTION	NC	5-1
2.0	BACKGROUN	D AND AVAILABLE INFORMATION	5-1
3.0	CONSTRUCTI	ON ACTIVITIES	5-2
4.0	INTERIM CAP	MATERIAL	5-3
	4.1 Clay		5-3
	4.2 Soil Mate	erial	5-4
	4.3 Topsoil		5-5
5.0	QUALITY CON	NTROL	5-5
	5.1 General		5-5
	5.2 Compact	ion Control	5-6
	5.3 Moisture	Control	5-7
	5.4 Classifica	ation Testing	5-7
	5.5 Step Den	sity Test	5-8
6.0	PERMEABILIT	Y TESTING	5-9
	6.1 Backgrou	nd	5-9
	6.2 Laborato	ry Compacted Sample Testing	5-9

# TABLE OF CONTENTS

			Page
	6.3	Discussion of Results	5-10
7.0	WAS	TE CONTAINMENT AREA MONITORING	5-11
	7.1	Pore Pressure Monitoring	5-11
	7.2	Ground Water Monitoring Wells	5-12
	7.3	Walkover Survey	5-14
8.0	SUM	MARY	5-14
9.0	REF	ERENCES	5-14

#### TABLES

- 5-1 Moisture Test Results Field Density Tests Clay Cap
- 5-2 Step Density Test Results
- 5-3 Permeability Test Results Laboratory Compacted Samples
- 5-4 Summary of Subsurface Monitoring Instruments

#### **FIGURES**

- 5-1 Locations of Trenches for Additional Waste
- 5-2 Final Topography South End Interim Cap
- 5-3 Borrow Area Locations
- 5-4 Classification Test Results
- 5-5 Locations of VWPTs and PPTs
- 5-6 Typical VWPT and PPT Installation
- 5-7 Vibrating Wire Scanner/Recorder Data

#### **APPENDICES**

- 5-A Technical Specification for Earthwork
- 5-B Field Density Tests
- 5-C Proctor Test Results
- 5-D° Permeability Test Results
- 5-E Soil Classification Tests
- 5-F Boring Logs
- 5-G Monitoring Well Construction Logs

1.0 INTRODUCTION

Volume 5 of the Post-Construction Report contains the results of the final remedial

construction activities associated with the construction of the interim waste containment

facility at the Niagara Falls Storage Site (NFSS). The work discussed in this volume was

performed between May and November 1986. The major work performed during this

period included completion of the interim cap and installation of the waste containment

monitoring system. The monitoring system consisted of three pneumatic pressure

transducers, thirteen vibrating wire pressure transducers, and eighteen pairs of monitoring

wells. The cap consists of 3 feet of compacted clay, 1 foot of soil, and 6 inches of

topsoil. The short term cap, which provides a barrier to radiation and radon emanation

and excludes surface water from entering the waste, has a design life of 25 to 50 years.

Listed below are the entities involved with the construction of the short term cap during

1986.

Department of Energy: Owner

Bechtel National, Inc.: Project Management Contractor

Sevenson Containment Corp.: Construction Contractor

Empire Soils Investigations Inc.: Laboratory and Field Testing, Monitoring Well

Installation Contractor

Eberline, Inc.: Radiological Survey and Safety Contractor

Hydro Group Inc.: Transducer Installation Contractor

2.0 BACKGROUND AND AVAILABLE INFORMATION

The completion of the multi-layer interim cap was the final step in finishing the short

term configuration of the waste containment facility at NFSS. The waste containment facility consists of a compacted clay cutoff wall that is keyed into an underlying natural

clay layer, a compacted clay dike, and the short term clay cover. The cutoff walls and

0326U 5-1 dikes were constructed in 1982 and 1983, and initial work on the cover was performed in 1984 and 1985. Details of the earlier work are contained in Volumes I through 4 of the Geotechnical Post-Construction Report.

The design requirements and basis of the design for the entire containment facility are contained in the "Design Report for the Interim Waste Containment Facility at the Niagara Falls Storage Site" (Reference !).

#### 3.0 CONSTRUCTION ACTIVITIES

The construction activities on the waste containment system during 1986 consisted of completion of the southern section (south of S 1150). At the end of the 1985 construction season the short term cap had been partially completed south of \$ 1150. The clay thickness varied between 1 foot and 3 feet in thickness in this area. During 1986, prior to completing the cap, a trench was cut into the cap over the area of the 411 Building. The trench was cut to place the residues from the cleanup of Pond 3 in the 411 Building. The cutting of the trenches and placing of the additional contaminated material made it necessary to change the final configuration of the cap to accommodate the additional material. As a result of this change the elevations at the south end of the waste containment facility were higher than the completed north end of the facility. Figure 5-1 shows the location of the two trenches cut into the waste containment facility and the final configuration at the south end. Figure 5-2 shows two cross sections through the area. After the trenches were cut and the material from Pond 3 was placed and compacted, work on completing the interim cap was started. Also during this time period the dewatering system within the 411 Building was removed. The piping and other contaminated equipment used as part of the dewatering system were buried in the waste containment area. All pipes were grouted full prior to being buried.

The initial step in completing the interim cap was the scarifying of the top 6 to 12 inches of clay placed during the prior year. The scarifying was necessary to remove small tension cracks and shallow erosion gullies that occurred in the clay over the winter and spring seasons. The clay was scarified to the maximum depth of the tension cracks and gullies. After scarification the clay was moisture conditioned and recompacted to the technical requirements of Technical Specification 14501-15-54-C-01. A copy of the specification is contained in Appendix 5-A.

Additional lifts of clay were then placed over the southern half of the interim cap in accordance with the technical specifications. The clay was placed in loose lifts of eight inches and compacted to a minimum of 95 percent of modified Proctor maximum dry density in accordance with ASTM D 1557. The lifts of clay were progressively placed until the required 3 feet minimum thickness had been placed over the entire area.

The clay soil, which was from an offsite borrow area, was delivered to the site by dump truck. The clay was compacted using a sheepsfoot drum roller. At the end of a given day, if rain was expected, the surface was rolled with a steel drum roller. If the surface was rolled, it would then be scarified prior to placing additional lifts.

Upon completion of the clay placement, a 1-foot soil cover was placed over the southern half of the waste containment area. The soil layer was placed in two equal lifts and compacted to a minimum of 85 percent of modified Proctor density in accordance with ASTM D 1557. The top layer of the interim cap was a 6-inch thick topsoil layer. The topsoil was compacted to a minimum density of 85 percent and not to exceed 90 percent of modified Proctor density. Both the soil and topsoil were compacted by track walking with a dozer. The topsoil after placement and compaction was raked and hand picked to remove the stones and roots. The side slopes were covered with jute mats to minimize erosion prior to final mulching, seeding, and fertilizing of the topsoil. The final work was completed in late October.

#### 4.0 INTERIM CAP MATERIAL

The interim cap at NFSS consisted of three layers, the 3 feet of clay, the 1 foot of soil, and the 6 inches of topsoil. The material requirements are contained in Technical Specification 14501-15-54-C-01 (Appendix 5-A) and summarized below.

#### 4.1 CLAY

The material specification requirements for the clay material were as follows:

- o The plasticity index shall be not less than 10 nor more than 20
- o The liquid limit shall be not less than 30 nor more than 50

o Gradation: 3/4-inch: 100 percent passing
No. 200 Sieve: 70 percent passing

These specification requirements were selected to achieve a material which, when compacted, would have a permeability of less than 1 x 10<sup>-7</sup> cm/sec. In addition, a material with a low plasticity was selected to minimize the shrink/swell potential due to any moisture content fluctuation of the clay soil. To further reduce the potential for shrink/swell, and to obtain the required low permeability, a compaction requirement of 95 percent of modified Proctor maximum dry density (ASTM D 1557) was specified. A moisture criterion of 1 to 3 percent above optimum moisture was also established. All clay was placed in maximum lifts of 8 inches.

The clay material that was used for the cap was taken from a local offsite borrow area. The location of the borrow area is shown on Figure 5-3. Also shown on Figure 5-3 are the borrow areas used for the past five years. The material after excavation was transported to the site by truck.

The clay material is a dark brown silty clay soil. The soil is very typical in this region of the upper unconsolidated deposits identified as the brown clay unit. The properties and geologic history of this brown clay unit were described in the Geologic Report, Niagara Falls Storage Site, Lewiston, New York (Reference 2). The material used in the construction of the clay cap is from the same unit as the soil used for the construction of both the cutoff walls and dikes. The clay material was tested during the construction period to verify compliance with the technical specification. The test results are discussed in Section 5.0 of this report. If any appreciable amounts of sand, gravel, or deleterious matter were found in the clay material, that material was removed and stockpiled at the borrow areas.

#### 4.2 SOIL MATERIAL

The material specification requirements for the soil material were as follows:

- o A pH between 5.5 and 7.6
- o A well-graded material
- o A plasticity index less than 15

The soil material was taken from the same borrow area as the clay and was generally found closer to the surface. The physical properties were similar to the clay except that there were larger percentages of coarser material.

The compaction requirement for the soil layer was 85 percent of the modified Proctor maximum dry density (ASTM D 1557). A moisture content of plus or minus 3 percent of optimum moisture was established for the placement of soil. The required 12 inches of compacted soil was placed in two equal lifts.

#### 4.3 TOPSOIL

The material specifications for the topsoil were as follows:

- o A pH between 5.5 and 7.6
- o Organic content between 2 and 20
- o Maximum particle size 2 inch
  No. 200 sieve: 80 to 20 percent passing

The topsoil was taken from onsite stockpiles. The stockpiles were established when the area to the north of the containment system was cleared for the installation of three holding ponds.

The compaction requirement for the topsoil was between 85 and 90 percent of the modified Proctor maximum dry density (ASTM D 1557). A moisture content of plus or minus 3 percent of optimum moisture was established for the placement of the topsoil. The required 6 inches was placed in one lift.

#### 5.0 QUALITY CONTROL

### 5.1 GENERAL

Laboratory and field testing of the cap materials were performed to verify that the clay, soil, and topsoil met the specification soil classification requirements, and that the required degree of compaction was being obtained. Additional laboratory testing was conducted to determine the permeability of laboratory compacted samples.

Compaction control of the clay cap was maintained by performing a series of field density tests on the compacted soil materials. A specific area was tested after the contractor had indicated that the compaction in the area had been completed. The test location was selected either by Bechtel or by the field technician from Empire Soils Investigations, Inc. The in-place wet density was determined using either the sand cone (ASTM D 1556) or a nuclear density gage (ASTM D 2922). The moisture content of the soil for the sand cone test was determined using the "Speedy Moisture Meter." A correlation between oven-dried moisture percentages and Speedy Moisture Meter readings was made prior to the start of work and then repeated during the construction period. After completing a field density test, the dry density of the soil was calculated and then compared to the maximum dry density of that material to determine the percent compaction. The maximum dry density and optimum moisture were determined in accordance with ASTM D 1557, modified Proctor density. In order for any area to be accepted the in-place density had to equal or exceed the minimum specification requirements. The topsoil also had a maximum density specification requirement. Any areas that failed to obtain the required percent compaction were rejected. Those areas that were rejected were either recompacted by additional passes of the roller or moisture conditioned, reworked, and then recompacted. After proper corrective action all areas that had failing tests were retested. On a few occasions areas that had marginally failing tests within I percent of required percent compaction were judged to be acceptable based on acceptable test results in the area immediately adjacent. An area was approved and the work allowed to proceed only after an acceptable test result was obtained.

Also during 1986, part of the work included the placement of the geotechnical instrumentation in the waste containment area. The details of this work are discussed later in this report. However, it was necessary to excavate three trenches into the cap to bury the cables from the instruments to the readout station. These trenches were backfilled in accordance with the specifications for the various soil layers. The backfill material was also tested to verify specification compliance.

A complete record of the field density tests is contained in Appendix 5-B. The data sheets contain the test number, date of test, location, elevation, in-place density and moisture, percent compaction, and the Proctor curve used to determine the percent compaction. The Proctor curves used for the various materials are contained in Appendix 5-C.

#### 5.3 MOISTURE CONTROL

The moisture content of the clay material was monitored on a daily basis to verify compliance with the technical specification. The specification required the moisture content of the clay material at time of compaction to be 1 to 3 percent above optimum moisture content. The moisture contents were determined using the Speedy Moisture Meter. When the test results indicated that the moisture content was outside the required range, corrective actions were taken. Corrective actions included scarifying and spreading to allow drying of materials that were too wet and adding water by sprinkling for clay soils that were too dry. In all cases, the clay materials were throughly mixed to assure a uniform moisture content distribution throughout each compacted lift.

Moisture contents were also determined for each field density test. These moisture contents are indicated on the compaction control reports contained in Appendix 5-B. A summary of the optimum moisture contents, the required specification range, and the measured moisture contents for the clay cap materials are shown in Table 5-1.

The moisture content tests performed in conjunction with the field density tests typically showed lower moisture levels than measured prior to placement and compaction. This reduction in moisture content indicates that possibly some drying due to sun and wind action had taken place during the spreading and compaction of the clay soils. This condition was observed to have occurred in the previous year's construction of the clay cap and was evaluated by performing a large-scale field permeability test. The results of this test showed satisfactory permeability values. In order to further study any possible variation of permeability with compaction moisture content, additional laboratory permeability testing will be performed at moisture contents below the specified range of 1 to 3 percent above optimum moisture. Based on the extremely low permeabilities measured in the testing performed to date, it is expected that the measured permeabilities will still be less than 1 x 10<sup>-7</sup> cm/sec criteria.

#### 5.4 CLASSIFICATION TESTING

The required classification properties for clay materials were summarized in Section 4 and are contained in Appendix 5-A. In order to verify that the soil met these requirements, classification tests (grain size distribution and Atterberg limits) were run on soil samples from each Proctor test. The laboratory test data sheets are contained in Appendix 5-C (shown on Proctor Test sheets) and Appendix 5-E (Soil Classification Tests).

The test results are plotted on Figure 5-4. This figure shows the specification limits as well as the individual test results. All these were either within or close to the specification limits, with the exception of the Atterberg limit test results on several clay samples. These tests exceeded the specification limits indicating a higher plasticity. It can be expected that these materials may be slightly more suspectible to volume change caused by moisture content variation. However, the permeability of these soils will typically be lower than other soils used for clay cap construction.

#### 5.5 STEP DENSITY TEST

A step density test was conducted in May 1986 on the clay cap material placed during the 1985 construction season. The purpose of this test was to identify any effect on the in-place density of the compacted clay material due to exposure to winter weather and to provide guidance on the extent of surface preparation prior to resuming construction. Due to time and weather constraints, the clay cap materials were not covered until the 1986 construction season with the 18 inches of soil and topsoil required as part of the short-term cover.

The step density test was conducted by performing a series of in-place density tests at the selected location. The tests were conducted at depths of 0, 6, 12, and 18 inches below the surface of the clay cap. The tests were made using a sand cone device in accordance with ASTM D 1556. The results of the tests are contained in Appendix 5-B (Report No. DT-2) and are summarized on Table 5-2.

The results of the step density test were compared with the results of compaction testing performed during initial clay placement in 1985 in order to assess the effects of winter exposure. Representative test results from the 1985 construction season were obtained from Appendix 4-C of Volume 4 of the Geotechnical Post-Construction Report and are shown on Table 5-2. With the exception of the upper sample (depth range 0-6 inches) in the step density test, the compacted clay material shows no change in density as a result of winter exposure. This minor surface disturbance due to erosion, weather effects and construction traffic was corrected as part of normal construction procedures. As described in Section 3.0, the top 6 to 12 inches of all clay cap areas that were not completed during the 1985 season, were scarified and recompacted as part of the initial work in 1986. The cap area where the step density test was located was scarified and recompacted on May 13, 1986 (See Density Test Report No. DT-4 in Appendix 5-B).

#### 6.0 PERMEABILITY TESTING

#### 6.1 BACKGROUND

The specification for the construction of the clay cap requires the soil material, when compacted, to have an in-place permeability equal to or less than  $1 \times 10^{-7}$  cm/sec. In order to verify this permeability value for the compacted material, laboratory tests were conducted on compacted samples of soil obtained from the borrow areas.

During 1984 and 1985, permeability testing was conducted on undisturbed field compacted and laboratory compacted samples of clay material. The results of this previous testing showed permeabilities of less than  $1 \times 10^{-7}$  cm/sec. The average for the undisturbed field compacted samples was  $2.8 \times 10^{-8}$  cm/sec and the average for the laboratory compacted samples was  $3.7 \times 10^{-8}$  cm/sec for soil compacted to at least 95% of maximum density.

In addition to the laboratory permeability tests, two field permeability tests were conducted in 1985. The tests were conducted using a large double-ring infiltrometer with an inner ring diameter of 5 feet and an outer ring diameter of 7 feet. The tests were performed on the compacted clay cap material in the waste containment area. The test locations were selected to be representative of the typical clay soils and construction methods used to place the cap materials. The results of the testing are contained in Volume 4 of the Geotechnical Post-Construction Report.

During 1986, additional laboratory testing was performed on compacted samples of the clay material used for the clay cap. The cap material used for cap construction in 1986 was obtained from a different borrow location in the area and the testing was performed to verify the acceptability of this material for use in the cap.

#### 6.2 LABORATORY COMPACTED SAMPLE TESTING

Permeability tests were conducted on four sets of samples from the 1986 borrow area - Boos Pit. The samples were selected from various locations throughout the borrow pit in order to provide indication of any variation in the permeability characteristics of the materials. One sample in each set was compacted to approximately 95 percent of

maximum density. The second sample in each set was compacted to 90 percent of maximum density to provide information on the variation in permeability with degree of compaction. All samples were compacted at a moisture content between 1 and 3 percent above the optimum moisture content. The maximum dry density and optimum moisture content for each set of samples was determined by performing a Proctor Test on the soil from each sample. The results of the Proctor Tests are contained in Appendix 5-C.

All testing was performed in a triaxial cell with the test specimen enclosed in a rubber membrane. A confining pressure was applied to the rubber membrane in order to minimize any leakage between the membrane and the soil sample. In testing soils of low permeability it is important to minimize any leakage to assure meaningful test results. The detailed test procedure for conducting the permeability tests is contained in Appendix 5-D.

All test results showed that the measured permeability is less than  $1 \times 10^{-7}$  cm/sec. A summary of the permeability test results and information on sample characteristics is shown in Table 5-3. The laboratory data sheets are contained in Appendix 5-D. The average permeability for samples compacted to about 95 percent of maximum density (the required field compaction criteria) was 5.3  $\times$  10<sup>-9</sup> cm/sec. The average permeability of samples compacted to about 90 percent of maximum density was 1.1  $\times$  10<sup>-8</sup> cm/sec. The average permeability, although slightly lower than the permeability for samples compacted to 95 percent of maximum density, is still less than the required permeability. Therefore, it can be concluded that the permeability of the clay material used for cap construction in 1986 is less than 1  $\times$  10<sup>-7</sup> cm/sec.

#### 6.3 DISCUSSION OF RESULTS

During the period of construction of the cutoff walls, dikes, and the clay cap, a series of field and laboratory tests have been run in order to demonstrate that the in-place permeability of the clay material met the specification requirement of less than  $1 \times 10^{-7}$  cm/sec. The tests have consisted of laboratory permeability tests on undisturbed and recompacted samples and large-scale field permeability tests on the actual clay cap. All laboratory tests have consistently shown a permeability of less than  $1 \times 10^{-7}$  cm/sec for the various sources of clay borrow material used. The field tests have shown measured permeabilities within an order of magnitude of  $1 \times 10^{-7}$  cm/sec.

Therefore, it can be concluded that the in-place permeability of the clay cap, dikes, and cutoff walls is within one order of magnitude of  $1 \times 10^{-7}$  cm/sec, which was set as the design value.

#### 7.0 WASTE CONTAINMENT AREA MONITORING

#### 7.1 PORE PRESSURE MONITORING

In the fall of 1986, 13 vibrating wire pressure transducers (VWPTs) and three pneumatic pressure transducers (PPTs) were installed to provide a means to monitor water levels within the waste containment area. The VWPTs are the primary instrumentation with the PPTs being utilized to provide a means to check to operation of the VWPTs.

The VWPT is a reliable and accurate device for measuring liquid pressures within the ground. The transducer converts fluid pressure to an electrical frequency signal which is transmitted to a remote reading station via cables. The instrument is designed for burial in soil material and is corrosion-resistant and immersion-proof. The sensing element is a small diameter steel wire, restrained at both ends, which vibrates at a natural frequency determined by the tension in the wire. One end of the wire is fixed to the transducer body. The other end is fastened to a thin flexible-steel diaphragm in contact with the fluid media. Flexure of the diaphragm due to changes in fluid pressure induces a change in the natural frequency. An integral electrical circuit drives the wire in constant oscillation at the natural frequency and senses any change in strain in the vibrating wire. A pickup sensor and data acquisition system provides the means to read and display the readings of the transducer.

The PPTs are used on this project to check the operation of the VWPTs. The PPT is a device that converts fluid pressure into pneumatic pressure which can be relayed to a remote reading station. The pore water pressure acts upon a flexible diaphragm having a negligible spring force. The force of the diaphragm due to the water pressure causes a valve to close. A reading is made by applying gas pressure in a chamber in the instrument until it balances against the pore water pressure.

The locations of the instruments are shown on Figure 5-5. The three PPTs were installed at the same elevation and in the same borehole as VWPTs 1, 9, and 13. The instrument number, site grid location, recorder channel, ground surface elevation, and instrument elevation are summarized in Table 5-4.

The instruments were installed in boreholes drilled to the base of the wastes. Each instrument was installed 6 inches above the bottom of the borehole, then embedded in 3 feet of sand. A 1-foot thick bentonite seal was placed above the sand and the remaining portion of the borehole filled with grout. A sketch showing the installation of a VWPT and a PPT in a borehole is shown in Figure 5-6. The instrument cables were buried in trenches and routed to the termination point in Building 403. During installation, the cable from VWPT at Borehole 10 was cut and the use of that instrument was terminated. A replacement instrument was installed in an adjacent borehole and designated as Borehole 10A. The installation of the instruments was performed on November 3 and 4, 1986, and the readings were started immediately.

The PPTs are read using a portable pneumatic indicator and the readings are recorded on data sheets. The VWPTs are read using a multi-channel data acquisition system that automatically records strain data from the vibrating wire transducers. The vibrating wire scanner/recorder has a built-in electrosensitive printer that is used to output the strain gauge readings. A typical printout is shown on Figure 5-7.

#### 7.2 GROUND WATER MONITORING WELLS

In addition to the VWPTs and PPTs, thirty-six (36) post-closure ground water monitoring wells were installed between September and November of 1986. The wells were installed by Empire Soils, Inc. under Bechtel's technical direction. The borings were logged and sampled by a Bechtel Geologist. The Boring Logs are given in Appendix 5-F. The ground water monitoring wells were installed to detect radioactive contamination of the ground water and to measure ground water levels. The scope of the well installation program included:

- Taking and classifying Standard Penetration Test (SPT) and Shelby Tube (ST) samples to determine the soil types encountered during drilling, and to provide samples for laboratory testing.
- o Installing ground water monitoring wells based on site geology, the prescribed well construction methods, and geometry of the waste containment structure.

Ground water monitoring wells were constructed following the completion of the drilling of each hole. The construction sequence was initiated by inserting a 2-inch inside diameter Type 316 stainless steel, wire wrapped, well screen and Type 316 riser casing through the hollow-stem auger to the bottom of the augered hole. Once set on the bottom of the hole, the riser pipe was cut so that 2 to 3 feet remained above the ground surface. Complete construction details as outlined in monitoring well logs are given in Appendix 5-G.

40

Following insertion of the screen and riser pipe, the hollow-stem augers were lifted 1-2 feet off the bottom of the hole. The filter pack was then poured from the top of the augers into the annulus between the augers and the screen. This method eliminated the need for centralizers. The augers were lifted in 5 feet intervals as filter pack was poured into the hole and given time to reach the bottom of the augers. The filter pack sand was poured slowly to avoid "bridging." Using the described method, the filter pack was placed to approximately 2 feet above the top of the well screen, as determined by "sounding" the top of the filter pack with a tape measure.

With the filter pack to the prescribed depth, the augers were withdrawn completely from the hole. Removal of the augers facilitated placing of the annular seal above the filter. The seal, consisting of bentonite pellets, was placed in the annulus above the filter pack. Soundings were taken with the tape measure to assure the bentonite pellets extended about 2 feet above the top of the filter pack.

Following placement of the bentonite seal, a thick mixture of cement-bentonite grout was used to backfill the remainder of the annulus, and complete the well seal up to the surface. Depending upon the presence or absence of water in the annulus, the grout slurry was either poured directly into the hole or was placed with a tremie pipe from the seal up to the surface using a rubber hose and a pump on the drill rig.

After the grout slurry was placed in the annulus to the surface, a 1.3 to 4 foot long 6-inch outside diameter carbon steel surface casing was set around the monitoring well. A steel cap designed by the Subcontractor and approved by Bechtel was then placed on the surface casing and secured with a padlock. Finally, as a confirmation of well operation, the monitor wells were developed by removing 3 or more times the volume of water within the well and/or until the discharged water showed insignificant turbidity.

#### 7.3 WALKOVER SURVEY

A walkover survey of the waste containment area was performed in the fall of 1986. This survey is intended to establish the baseline of the condition of the waste containment area and to provide the basis for determining whether any actions are required beyond normal maintenance activities.

The walkover survey was performed on November 17 and 18, 1986 by a team of engineering, geotechnical, construction, and site operations personnel. The team evaluated the cap condition for settlement or movement, cracking, undesired plant growth, or any other undesirable conditions. The survey team observed several minor conditions that were to be corrected. These were:

- o Localized areas of sparse grass on northern section of cap
- o Tire tracks on topsoil
- o Areas of large dirt clods
- o Poor drainage along toe of cap
- o Isolated areas of erosion in southern section of the cap.

A detailed description of the walkover survey and other elements of the performance monitoring system results for 1986 are contained in a separate report.

#### 8.0 SUMMARY

The construction of the interim cap and geotechnical instrumentation comprising the performance monitoring system was completed in 1986 under the technical direction of Bechtel National, Inc. All work was performed in general compliance with the appropriate specifications and design drawings. Field density tests indicated that the clay material and soil cover was compacted to the minimum specification requirements for density. Laboratory testing indicated that the clay material selected for construction of

the clay cap had a permeability of less than the  $1 \times 10^{-7}$  cm/sec design value. Additional permeability testing will be performed to evaluate the effect of compaction moisture content on the value of permeability.

# 9.0 REFERENCES

- 1. Bechtel National, Inc. <u>Design Report for the Interim Waste Containment Facility at</u> the Niagara Falls Storage Site, DOE/OR 20722-21, Oak Ridge, TN, May 1986.
- 2. Bechtel National, Inc. Geologic Report, Niagara Falls Storage Site, DOE/OR/20722-8, Oak Ridge, TN, June 1984.

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TABLE 5-1

#### MOISTURE TEST RESULTS FIELD DENSITY TESTS CLAY CAP

PROCTOR	OPTIMUM MOISTURE (2)	RANG	RANGE		
CODE	MOISTURE	SPEC.	ACTUAL	AVERAGE	
	(%)	(8)	(%)	(%)	
L-7	11.8	12.8-14.8	11.1-15.5	12.7	
L-9	11.9	12.9-14.9	13.2-16.7	14.6	
L-15(L-3) (3)	13.5	14.5-16.5	9.5-13.4	11.3	
L-17(L-5) (3)	14.6	15.6-17.6	9.6-15.1	12.9	
L-29	10.2	11.2-13.2	10.8-15.0	11.2	
L-30	12.0	13.0-15.0	14.3 (ONE TEST)	14.3	
L-31	12.0	13.0-15.0	13.4-17.1	14.8	

<sup>(1)</sup> SEE APPENDIX 5-C FOR PROCTOR TEST RESULTS

<sup>(2)</sup> PER ASTM D-1557

<sup>(3)</sup> BOTH NUMBERS ARE USED TO REFER TO PROCTOR TESTS

TABLE 5-2

# STEP DENSITY TEST RESULTS CLAY CAP MATERIAL

#### 1) STEP DENSITY TEST

LOCATION: S1333, E121 DATE: MAY 6, 1986

REF: APPENDIX 5-B, REPORT DT-2

STEP NO.	ELEVATION (FEET-MSL)	· IN-PLACE WET DENSITY (PCF)	WATER CONTENT (%)	IN-PLACE DRY DENSITY (PCF)
1	335.2	111.2	12.6	98.8*
2	334.7	132.8	12.9	117.6
3	334.2	134.5	13.9	118.1
4	333.7	134.2	14.3	117.4

2) FIELD DENSITY TESTS - INITIAL PLACEMENT 1985 REF: APPENDIX 4-C, REPORTS 36 AND 37

TEST	LOCATION	DATE	IN-PLACE WET DENSITY (PCF)	WATER CONTENT (%)	IN-PLACE DRY DENSITY (PCF)
129U	S1350,E164	10/31/85	134.3	14.6	117.2
132U	S1336,E098	11/2/85	138.3	16.4	119.5
133U	S1335,E114	11/2/85	136.6	16.3	117.5

<sup>\*</sup>UPPER 6-12 INCHES OF CLAY CAP WAS SCARIFIED AND RECOMPACTED PRIOR TO PLACEMENT OF ADDITIONAL CLAY OR SOIL COVER. SEE SECTIONS 3.0 AND 5.5 FOR DISCUSSION.

TABLE 5-3

PERMEABILITY TEST RESULTS
LABORATORY COMPACTED SAMPLES

		<del></del>	<del></del>			
TEST NUMBER	(2) SOURCE	DRY UNIT WEIGHT	MOISTURE CONTENT	PERCENT COMPACTION (1)	PERMEAB	ILITY @ 10 PSI
		(PCF)	(%)	(%)	( x 10 -	7 CM/SEC)
L-22	BOOS PIT	110.0	15.2	89.4	0.194	0.245
L-23	SAMPLE #1	114.8	15.1	93.3	0.0733	0.0835
L-33	BOOS PIT	107.7	15.1	88.6	0.107	0.126
L-32	SAMPLE #3	119.2	15.1	98.0	0.0489	0.0581
L-34	BOOS PIT	105.9	12.7	85.5	0.131	0.176
L-35	SAMPLE #7	122.2	13.0	98.7	0.0551	
L-37	BOOS PIT	108.3	18.5	89.3	0.0779	0.0716
L-36	SAMPLE #8	114.2	17.4	94.1	0.0221	0.0285

<sup>(1)&</sup>lt;sub>ASTM D-1557</sub>

<sup>(2)</sup> EMPIRE SOILS TEST NUMBER

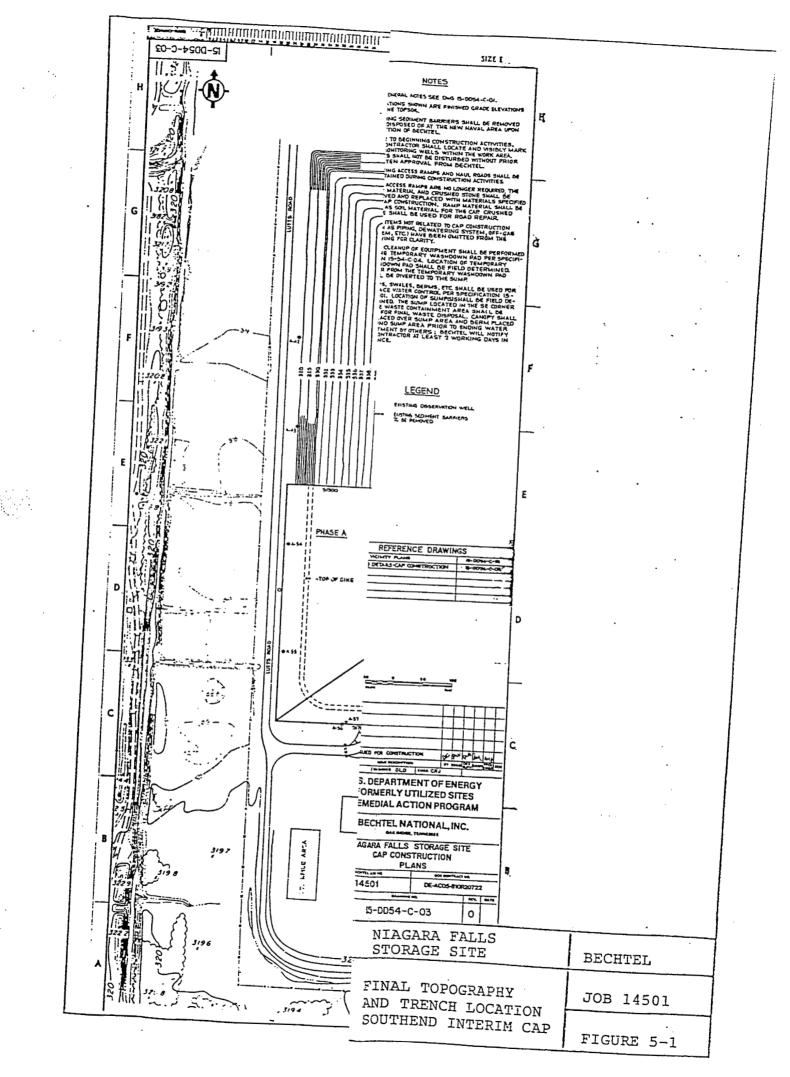
SUMMARY OF SUBSURFACE MONITORING INSTRUMENTS

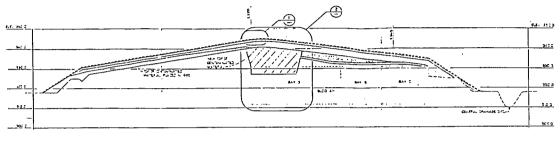
TABLE 5-4

(BOREHOLE) NUMBER	SOUTH 885	EAST	RECORDER CHANNEL	GROUND (CAP) SURFACE	
1	885			GROUND (CAP) BORFACE	INSTRUMENT
		100	11	. 335.2	321.7
2	885	220	12	341.4	321.2
3	885	360	13	335.6	320.6
4	1045	100	14	335.4	321.9
5	1045	235	15	344.9	321.1
6	1045	400	16	332.9	321.1
7	1205	100	17	335.3	321.1
8	1195	250	18	343.6	320.1
9	1205	400	19	334.8	323.1
10A	1460	130	10	338.9	328.1
11	1561	98	1	339.0	324.3
12	1560	265	2	341.4	329.9
13	1560	370	3	341.5	329.5

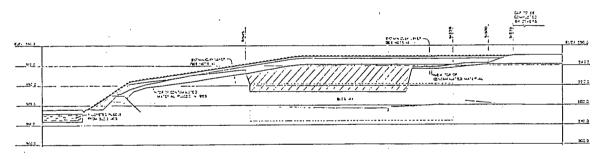
NOTES: 1) Instrument numbers are for VWPTs.

<sup>2)</sup> PPTs are installed in same borehole as VWPT 1, 9 and 13.



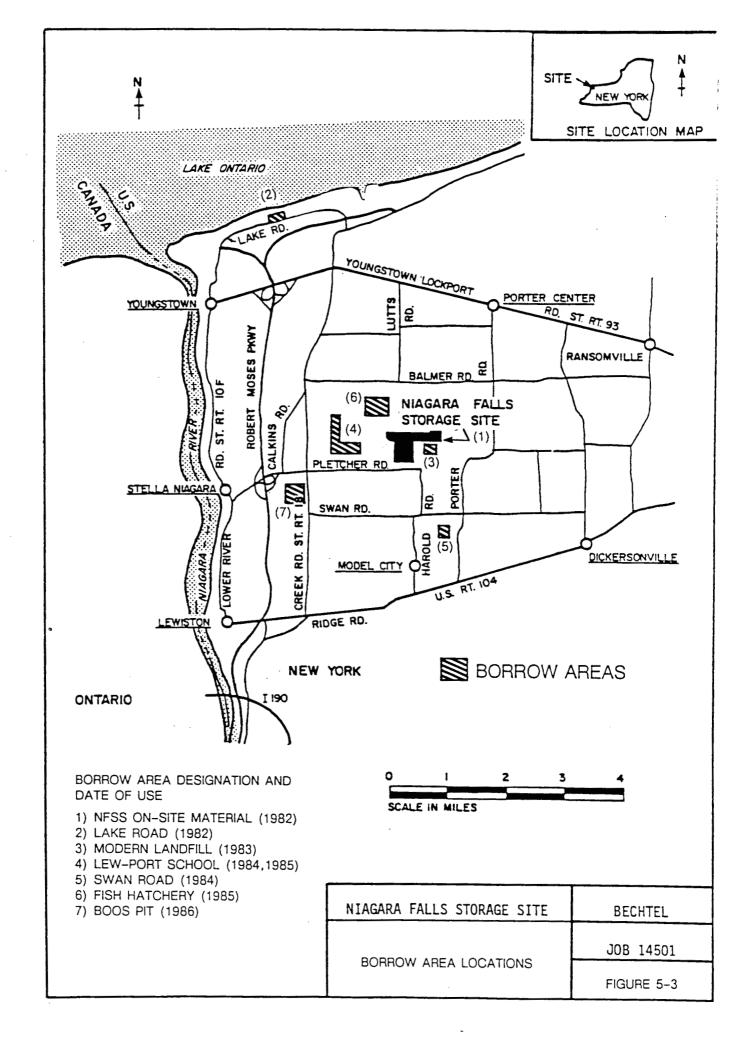


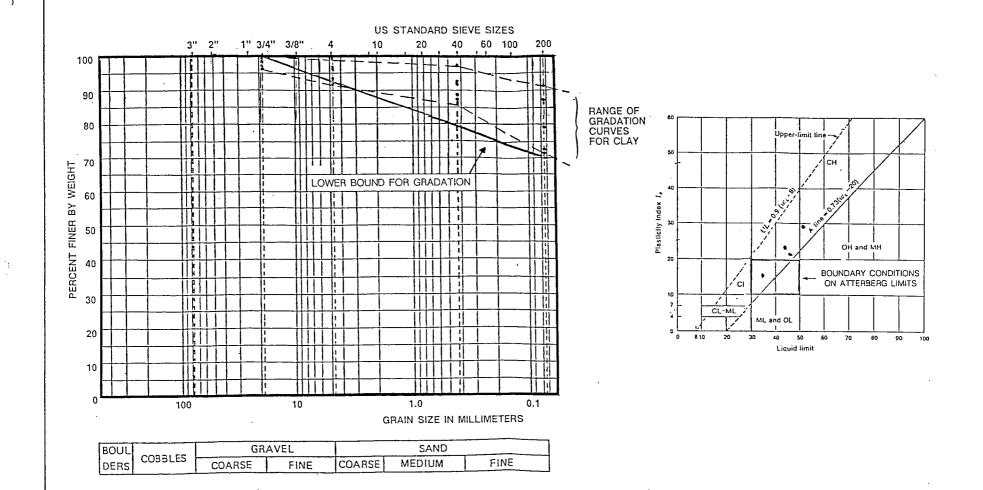
<u>報告でいる</u>(8480) 合きでは、(8480)



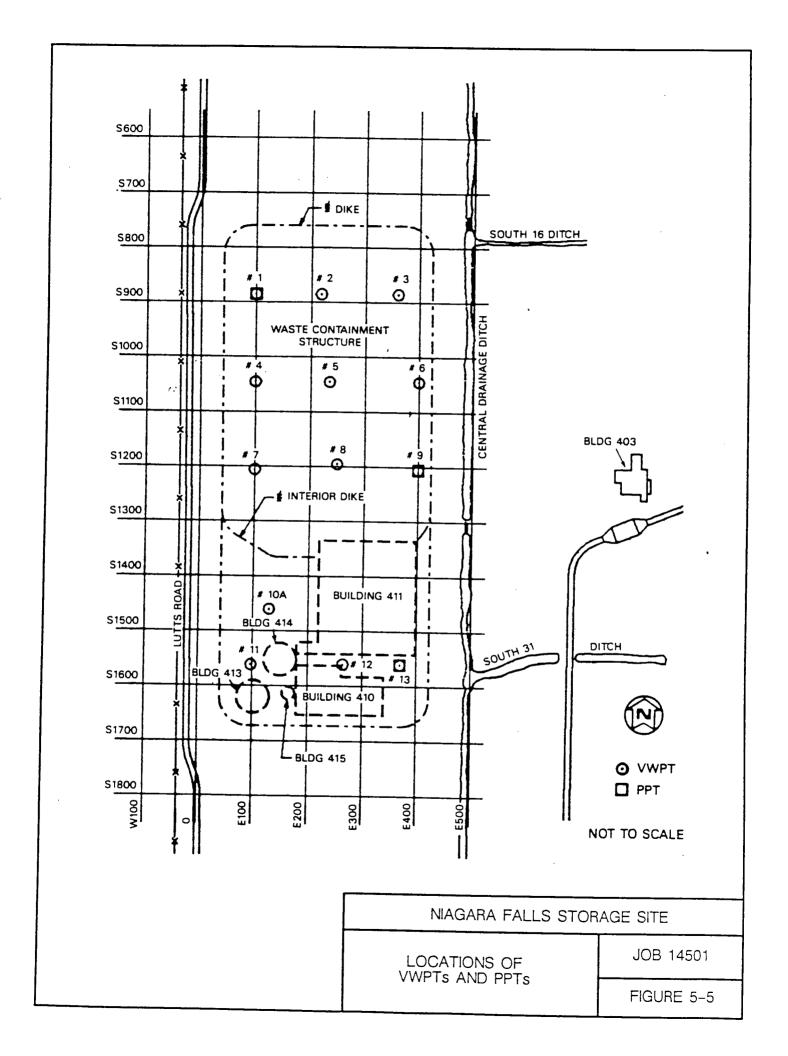
\$577.CN (\$ 273)

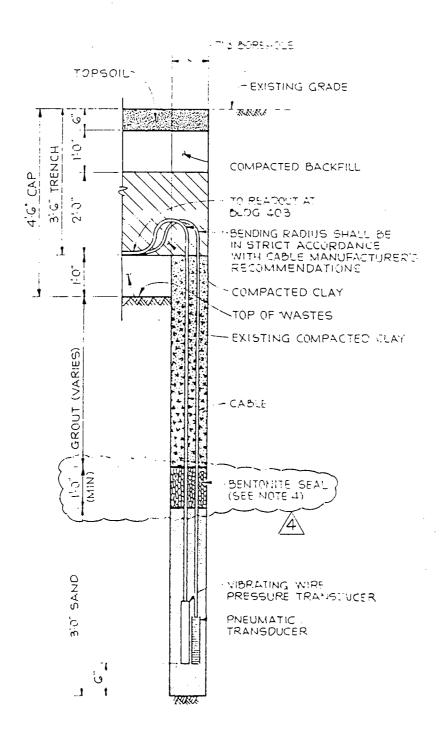
NIAGARA FALLS STORAGE SITE	BECHTEL
CROSS-SECTIONS SOUTHEND	JOB 14501
INTERIM CAP	FIGURE 5-2





NIAGARA FALLS STORAGE SITE	BECHTEL
C: ASSIFICATION TEST RESULTS	JOB 14501
עבאטנוז ונאוזטוו ובטו ווכטנוט	FIGURE 5-4





# BOREHOLE WITH TYPE II INSTALLATION NTS

NIAGARA FALLS STORAGE	SITE		
TYPICAL VWPT AND PPT	JOB 14501		
INSTALLATION	FIGURE 5-6		

```
11/22/86 12:00:09
                    CH01
                          +0684
                          +9667
                    TCH82
                    CH03
                          +0791
                    CH19
                           +2069
                    CH11
                          +0747
                    CH12
                           +0866
                    CH13
                           +0625
                    CH 14
                           +0675
                    CH15
                          +0667
                    CH16
                           +0860
                    CH17
                          +0923
                    CH18
                           +0823
                    CH19 +0797 ---
                          12:00:09 ← MILITARY TIME
                11/23/86
 DATE
                    CH01
                          +0685
                  CH02
                          +0667
                   CH03
                          +0791
                    CH10
                           +0067
                   1 CH11
                          +0747 ""
                   1 CH12
                          +0866
                    CH13
                          +0625
                    CH14
                           ÷0675
                    CH15
                          +0667
CHANNEL NO. _
                                           STRAIN IN MICROSTRAINS
                    CH16
                          +0880 ←
                    CH17
                          +0924
                   CH18
                          +0823
                          +0796 ····
                   CH19
               11/24/86
                          12:00:09
               ... CH01
                          +0684
                    CH02
                          +0667
                          +8798 ....
                   CH03
                          +0067 ""
                   CHi0
                   CH11
                          +0747
                   TCH12
                          +0866
                    CH13
                          +0625
                          +0674 T
                   CH14
                           +0667 T
                   CH15
                   CH16
                          +0860
                    CH17
                          +0923
                          +0823
                   CH18
                   CH19
                          +0796
                        NIAGARA FALLS STORAGE SITE
                                                   JOB 14501
                        VIBRATING WIRE
                         SCANNER/RECORDER DATA
                                                   FIGURE 5-7
```

## APPENDIX 5-A

## TECHNICAL SPECIFICAITON

FOR

EARTHWORK

## TECHNICAL SPECIFICATION

FOR

## EARTHWORK

## NIAGARA FALLS STORAGE SITE

AND

VICINITY PROPERTIES

LEWISTON, NEW YORK

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$\Delta$	2/14/86	Added Sect. 5.9 &	6.1.5; Revised Section 6.6.2	cel	auto	Ban	nris		
Δ	1/17/86	Issued for	Construction	CE	gw <sup>44</sup>	Ben	msg		
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	ORIGIN				JOB N	o. 145	01		
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				_		SHEET	1	OF	24

## TECHNICAL SPECIFICATION

## FOR

## EARTHWORK

## NIAGARA FALLS STORAGE SITE

AND

## VICINITY PROPERTIES

## LEWISTON, NEW YORK

## CONTENTS

		Page
1.0	GENERAL	3
2.0	ABBREVIATIONS	3
3.0	QUALITY STANDARDS	3
4.0	SUBMITTALS	4
5.0	MATERIALS	5
5.0	FIELD OPERATIONS	11

## TECHNICAL SPECIFICATION FOR EARTHWORK

#### 1.0 GENERAL

This technical specification establishes the quality of workmanship required for earthwork.

### 2.0 ABBREVIATIONS

The abbreviations listed below, where used in this specification, shall have the following meanings:

AASHTO American Association of State Highway and Transportation Officials

ASTM 'American Society for Testing and Materials

NYSDOT New York State Department of Transportation, Standard Specifications Construction and Materials

#### 3.0 QUALITY STANDARDS

The Subcontractor shall control the quality of items and services to meet the requirements of this specification, applicable codes and standards, and other Subcontract documents. Unless otherwise specified or shown, the following codes and standards of the latest issue at the time of Subcontract Bid shall apply to the extent indicated herein:

AASHTO T 217

Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester

ASTM	D 1556	Standard Test Method for Density of Soil in Place by the Sand-Cone Method
ASTM	D 1557	Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-1b. Rammer and 18-in. Drop
ASTM	D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
ASTM	D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NYSDOT	Section 610	Turf Establishment
NYSDOT	Section 612	Sodding and Placing Erosion Control Materials
NYSDOT	Section 713	Landscape Development Materials

#### 4.0 SUBMITTALS

- 4.1 Engineering documentation requirements are summarized on Form 14501-DR, and are augmented by detailed requirements listed herein. Bechtel will determine if documentation is complete as submitted by the Subcontractor, and reserves the right to disapprove any submittals that do not meet the Subcontract requirements.
- 4.2 Unless noted otherwise, all submittals to Bechtel shall be made at least three weeks prior to use or implementation.

#### 5.0 MATERIALS

#### 5.1 FILL MATERIAL - GENERAL

- 5.1.1 All fill materials for earthwork construction shall be obtained from on-site Bechtel stockpiles or when not available from on-site stockpiles shall be obtained from the Subcontractor's off-site borrow source(s) approved by Bechtel.
- 5.1.2 Unless noted otherwise, all fill materials shall be soils with maximum rock size of 2 inches and free from deleterious substances such as expansive clay, snow, ice, frozen soil, rubbish, and organic, perishable, or uncompactible material.
- 5.1.3 Borrow source areas shall be free of debris and organic materials. Designation and approval of an area for obtaining fill material does not indicate that all material within the area is suitable. Only suitable material, as determined by Bechtel, from approved on-site and off-site borrow sources shall be used.
- 5.1.4 Tests to verify fill material requirements will be performed by Bechtel when deemed necessary.
- 5.1.5 Subcontractor shall submit the location(s) of proposed off-site borrow sources(s) to Bechtel and provide assistance to Bechtel for obtaining representative samples of the borrow source(s).

#### 5.2 FILL MATERIAL FOR NON-CAP AREAS

Fill material for all areas outside of the Waste Containment Area cap shall be as specified in Section 5.1 of this specification.

#### 5.3 CLAY

- 5.3.1 Clay material for the Waste Containment Area cap shall be obtained from on-site Bechtel clay stockpile. This material may contain some rocks in excess of 3/4 inches. These rocks shall be removed by the Subcontractor.
- 5.3.2 Clay material shall meet the following specific requirements:
  - o The plasticity index shall be not less than 10 percent nor more than 20 percent.
  - o The liquid limit shall be not less than 30 percent nor more than 50 percent.
  - o The permeability shall not be greater than  $10^{-7}$  cm/sec.
  - o Gradation:

Sieve Size	Minimum Percent Passin by Weight	g _
3/4-inch No. 200 mesh	100 70	

#### 5.4 SOIL MATERIAL

Soil material for the Waste Containment Area cap shall meet the following requirements:

- o The pH of the material shall be between 5.5 and 7.6.
- o Soil shall be a well-graded material.
- o The plasticity index shall be less than 15 percent.

#### 5.5 TOPSOIL

- 5.5.1 Topsoil for the Waste Containment Area cap shall meet the following requirements:
  - o The pH of the material shall be between 5.5 and 7.6.
  - o The organic content shall be not less than 2 percent nor more than 20 percent.
  - o Gradation:

Sieve Size	Percent Passing by Weight
2 inch	100
1 inch	85 to 100
1/4 inch	65 to 100
No. 200 mesh	20 to 80

5.5.2 Topsoil shall be free from refuse, any material toxic to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps, or similar objects larger than two inches in greatest

dimensions. Sod and herbaceous growth such as grass and weeds shall be removed and disposed of.

- 5.5.3 Subcontractor shall submit samples of the topsoil material to the Niagara County Extension Service or a Bechtel-approved local laboratory for constituent analysis to obtain a recommended fertilizer mix and application rate to support turf establishment.

  Results of said analysis shall be submitted to Bechtel for approval.
- 5.5.4 Subcontractor shall submit samples of the topsoil material to the New York State Agricultural Department to determine whether plant parts are present that are not controllable by herbicides. Soil with plant parts not controllable with herbicides shall not be used. The herbicide program they recommend shall be implemented to ensure that topsoil contains no viable plants, plant parts, or seeds. Test results and recommendations shall be submitted to Bechtel for review.

#### 5.6 TURF FOR CAP

5.6.1 Fertilizer shall be a standard quality commercial carrier of plant food elements. Fertilizer mix and application rate shall be in accordance with the laboratory recommendations obtained as directed above. A delivery slip shall accompany each shipment of fertilizer indicating the number of bags and weight of each. The composition of the fertilizer shall appear on each bag or the delivery slip.

#### 5.6.2 Grass seed and seed mixture shall be as follows:

Name	Percent by Weight of Pure Live Seed
Kentucky Bluegrass	60
Perennial Ryegrass	20
Fine Fescue	20

The seed shipment shall be accompanied by a weight slip and a certification by the supplier stating a minimum of 95 percent germination and purity of each kind of seed. The weight slips and supplier certification shall be submitted to Bechtel for review. Grass seed mixture shall be obtained from a single supplier.

5.6.3 Mulch and mulch anchoring materials for slopes greater than 30% shall be in accordance with NYSDOT Section 713-07, "Jute Mesh," and NYSDOT Section 713-09, "Stakes for Pegging Sod and Jute Mesh."

#### 5.7 TURF FOR NON-CAP AREAS

- 5.7.1 Fertilizer shall be 5-10-10 (nitrogen, phosphoric acid, soluble potash) commercial designation and shall be a standard quality commercial carrier of plant food elements. A delivery slip shall accompany each shipment of fertilizer indicating the number of bags and weight of each. The composition of the fertilizer shall appear on each bag or the delivery slip.
- 5.7.2 Seed shall be a mixture of Kentucky 31 and Perennial Rye grass mixed to a 4:1 ratio by

weight. Each seed shipment shall be accompanied by a weight slip and a certification by the supplier stating a minimum of 95 percent germination.

## 5.8 SEDIMENT BARRIERS AND EROSION CONTROL

- 5.8.1 Sediment barriers shall consist of either baled hay, baled straw, or filter cloth. When baled hay or baled straw is used, each bale shall consist of no less than 5 cubic feet of material. When filter cloth is used, it shall be made expressly for use as a sediment barrier.
- 5.8.2 Jute mesh or other material approved by Bechtel shall be used to control erosion. Jute mesh shall be in accordance with NYSDOT Section 713-07, "Jute Mesh," and NYSDOT Section 713-09, "Stakes for Pegging Sod and Jute Mesh."

#### 5.9 TEMPORARY BARRICADE

- 5.9.1 The temporary barricade around off-site work areas shall be constructed of posts and snowdrift-type fencing.
- 5.9.2 Fencing shall be wire-bound, snowdrift-type fencing with slats that are minimum 4 feet high and approximately 3/8 inch by 1-1/2 inches and spaced approximately 2 inches apart, or an equal fencing material submitted to Bechtel for review. Fencing need not be new but shall be free of broken or rotted slats, broken wires, and other damage to the fence integrity.



5.9.3 Fence posts shall be metal or wooden posts of sufficient size to secure the fencing in place.



#### 6.0 FIELD OPERATIONS

#### 6.1 GENERAL

- 6.1.1 Subcontractor shall submit the proposed plans and methods for all earthwork operations for Bechtel's review. Submittals shall address proposed borrow sources; fill operations for clay, soil material, and topsoil; turf establishment; routing of haul trucks; compaction methods; construction water control; and sequence of operations.
- 6.1.2 Subcontractor shall, upon request by Bechtel, submit equipment information for all equipment, other than incidentals, to be used in all earthwork operations. Submittals shall address equipment specifications, make, model, and proposed use.
- 6.1.3 Subcontractor shall perform all surveys necessary to support Subcontractor activities. Line and grade for all locations shall be established in accordance with the grid coordinate system shown on the design drawings.
- 6.1.4 Unless noted otherwise, existing observation wells, buildings, bench marks, earth dikes, utilities, and other site improvements shall not be damaged or altered. Any damage incurred by the above items shall be repaired or replaced at the expense of the Subcontractor.

6.1.5 Temporary barricades shall be installed and maintained around the off-site work areas when Subcontractor personnel are not in the immediate work area. All fencing material shall be removed following backfilling of excavated area.

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#### 6.2 EXCAVATION OF CONTAMINATED MATERIALS

Contaminated material excavation shall be in accordance with Specification 14501-15-54-C-02, "Excavation of Contaminated Materials."

#### 6.3 REMOVAL OF CULVERTS

- 6.3.1 Culverts shall be removed at locations designated on the design drawings.
- 6.3.2 Excavated material shall be placed at Bechtel's on-site stockpiles. The culverts and appurtenances shall be placed in the Bechtel-designated on-site location.
- 6.3.3 In areas of culvert removal, the bank slopes and ditch grades shall be restored and graded to match existing grades and lines.
- 6.3.4 In the event of over-excavation during the removal of the culverts, the over-excavated area shall be restored to the proper lines and grades in the manner specified by Bechtel and at the expense of the Subcontractor.

#### 6.4 STOCKPILES

Material to be stockpiled shall be placed where shown on the design drawings. Stockpiled material shall be placed to provide natural drainage and a stable embankment. Stockpiled soils shall be compacted with a minimum of two passes of a Caterpillar D-8 or similar method approved by Bechtel. The maximum uncompacted lift thickness of soil shall be 24 inches.

#### 6.5 SEDIMENT BARRIERS

- 6.5.1 Sediment barriers shall be installed to minimize the amount of sediment leaving the work area and shall comply with local, State and Federal sedimentation laws.
- 6.5.2 Filter cloth barriers shall be installed in accordance with the manufacturer's written recommendations and shall be anchored by methods reviewed by Bechtel prior to use. Filter cloth shall be attached to the upstream side of posts.
- 6.5.3 Baled hay or straw shall be laid end to end such that no gaps exist between or beneath bales and securely fastened to the ground with at least two #4 reinforcing bars per bale. Reinforcing bars shall be driven into each bale until flush with the top of each bale.
- 6.5.4 Used sediment barrier materials shall be disposed of in the Organic Burial Areas.

#### 6.6 CONSTRUCTION WATER CONTROL

- 6.6.1 The Waste Containment Area shall be maintained in a dewatered condition during all activities.

  Subcontractor shall provide all equipment including pumps, hoses, fittings, fuel, electrical controls, etc. necessary to maintain sump(s) 24 hours a day. Runoff water which accumulates in the Waste Containment Area shall be pumped to the retention ponds as directed by Bechtel.
- 6.6.2 Berms, swales, sump(s), etc. shall be established and maintained within the Waste Containment Area to collect and retain surface runoff from the contaminated materials. Retention capacity of the sump(s) shall be at least 5,500 gallons per 10,000 square feet of open contaminated surface area.



- 6.6.3 During construction at all work areas, uncontaminated fill shall be sloped so that surface water flows away from the contaminated material.
- 6.6.4 Subcontractor shall at all times ensure that contaminated water does not flow into or over uncontaminated areas. Areas which become contaminated as a result of inadequate surface drainage control shall be immediately restored in the manner directed by Bechtel, and such restoration shall be performed at the expense of the Subcontractor. This applies to all work areas including the Waste Containment Area.

#### 6.7 FILL - GENERAL REQUIREMENTS

- 6.7.1 Fill shall not be placed on saturated soil, snow, ice, or frozen ground surfaces.
- 6.7.2 Clay, soil material, and topsoil shall not be placed when the temperature is  $32^{\circ}F$  or below.
- 6.7.3 Existing ground surfaces to receive fill shall be scarified to a depth of 3 inches and compacted in accordance with this specification prior to beginning fill placement.
- 6.7.4 Fill placement shall conform to the lines, grades, sections, and elevations shown on the design drawings. Grading tolerances shall be plus or minus 0.1 foot.
- 6.7.5 Moisture content tests will be performed by Bechtel on fill material in accordance with AASHTO T 217.

  Tests will be taken as deemed necessary by Bechtel.
- 6.7.6 In-place density tests will be performed by Bechtel on uncontaminated material in accordance with ASTM D 2922 and/or ASTM D 1556. In-place density tests will be performed by Bechtel on contaminated material in accordance with ASTM D 1556. Tests will be taken as deemed necessary by Bechtel with a minimum testing frequency of one test taken for each 500 cubic yards of fill placed.

- 6.7.7 All in-place density and moisture testing performed by Bechtel will be done without cost to the Subcontractor, provided that the Subcontractor shall at its expense furnish labor, equipment, and materials to assist Bechtel in accessing test areas, and obtaining samples for testing.
- 6.7.8 After placement but prior to compaction, fill material determined by Bechtel to be outside the moisture content limits stated herein, shall be moisture conditioned in place to within the specified moisture limits. Should Bechtel determine that it is impractical to condition the fill in place, it shall be removed and replaced with material meeting the moisture limits. Such moisture conditioning and/or removal and replacement shall be by and at the expense of the Subcontractor.
- 6.7.9 Material satisfactorily placed and spread shall be compacted by rolling. Rolling shall be performed systematically on all portions of each area being compacted. Unless otherwise approved, all roller trips shall be made in parallel paths. To ensure complete coverage of the areas to be rolled, each pass of the roller shall overlap the adjacent pass by not less than 2 feet. Where compaction does not meet the specified requirements, material shall be reworked and recompacted at the expense of the Subcontractor.

- 6.7.10 Subcontractor shall maintain compacted areas and ensure that weather damage does not occur. Damaged areas shall be reconditioned at the expense of the Subcontractor.
- 6.7.11 The compacted surface shall be sealed by leaving the top surface shaped and rolled to shed water at the end of each day's activities. At the beginning of each day's activities, the sealed surface shall be scarified to a minimum depth of 3 inches prior to commencement of additional placement on this area.

#### 6.8 UNCONTAMINATED WATER SUPPLY

Subcontractor may use as a clean water source, the existing water hydrant located at the southeast corner of the Waste Containment Area. Use of the water hydrant shall be coordinated with Bechtel to prevent scheduling conflicts with other Subcontractors. A backflow preventer shall be provided at the Subcontractor's expense and used to prevent backflow into the clean water system. The hydrant shut-off valve shall be operated only with a hydrant wrench. Any damage to a water hydrant shall be promptly repaired at the expense of the Subcontractor. Clean water is for leak testing water transfer line, washing equipment, dust control, and miscellaneous other activities as specified.

#### 6.9 PLACING CONTAMINATED MATERIAL

6.9.1 Unless noted otherwise, contaminated soil from on-site and off-site remedial action shall be

temporarily stockpiled in the North Pond as directed by Bechtel. No compaction efforts on that material will be required until it is placed in the Waste Containment Area for final disposal.

- 6.9.2 All contaminated material shall be finally placed within the Waste Containment Area as shown on the design drawings and shall have a loose lift thickness of not more than 12 inches. Contaminated material shall be compacted to at least 90 percent of the maximum dry density as determined in accordance with ASTM D 1557.
- 6.9.3 Contaminated material shall be finally placed within plus or minus 3 percent of the optimum moisture content as determined in accordance with ASTM D 1557.
- 6.9.4 The in-place contaminated materials within the Waste Containment Area limits shown on the design drawings shall be moisture conditioned and compacted to the line, grade, and elevation shown on the design drawings. If additional excavating, moisture conditioning, and compacting is deemed necessary, Bechtel may authorize additional excavation, moisture conditioning, and compaction.
- 6.9.5 Soil stabilization methods using various chemical additives or admixtures may be considered, but a work plan for such soil stabilization shall be submitted to Bechtel for review. The work plan shall include as a minimum a catalog cut of the proposed additives, methods and procedures for

preparing, mixing, and spreading the additives, and the quantity of the additives or admixtures (percent by weight of stabilized soil) to be used. For all materials including sludge and sediments from the ponds, work involving soil stabilization methods shall not begin until this work plan has been reviewed and accepted by Bechtel.

#### 6.10 PLACING CLAY

- 6.10.1 Clay material shall be placed in the Waste Containment Area as shown on the design drawings and shall have a loose lift thickness of not more than 8 inches. Clay shall be compacted using a sheepsfoot vibratory roller to at least 95 percent of the maximum dry density as determined in accordance with ASTM D 1557.
- 6.10.2 Clay material shall be placed 1 percent to 3 percent wetter than the optimum moisture content as determined in accordance with ASTM D 1557.
  Moisture content tests will be taken with a minimum testing frequency of one test taken for each 500 cubic yards of clay placed or at least one test performed each day clay is placed.
- 6.10.3 The first lift of clay fill material placed in contact with contaminated material shall be spread in a manner that prevents contamination of equipment. Spreading of clay material shall be accomplished by pushing the clay ahead of the spreading equipment thereby keeping the equipment

on clean material at all times. If so desired, alternate methods of clay placement shall be submitted to Bechtel for approval.

- 6.10.4 Clay material shall be placed and compacted in a manner that prevents cross contamination between the clay fill and existing waste. Should the top surface of the first lift of clay fill become contaminated or the surface of any other lift of clay become contaminated as determined by Bechtel, the contaminated clay material shall be removed, disposed of in the Waste Containment Area, and/or replaced with clean clay as directed by Bechtel at the expense of the Subcontractor.
- 6.10.5 Prior to the placement of the overlying soil material, any depressions in the clay layer on which the soil material is to be placed that are greater than 0.1 foot deep shall be scarified, filled and compacted with clay fill. No cracks or voids in the clay layer will be acceptable.
- 6.10.6 Clay placement shall not be complete until Bechtel has inspected the clay layer and approved it for subsequent placement of soil.
- 6.10.7 Equipment which becomes contaminated, as determined by Bechtel, will be decontaminated by others at facilities provided by Bechtel, prior to its reuse on clean material. Subcontractor shall remove loose soil, lubricants, and debris from equipment and transport equipment to the Bechtel-designated on-site washdown facilities.

#### 6.11 PLACING SOIL MATERIAL

- 6.11.1 Soil material shall be placed in the Waste Containment Area as shown on the design drawings, in two equal lifts, and shall be compacted to at least 85 percent of the maximum dry density as determined in accordance with ASTM D 1557.
- 6.11.2 Soil material shall be placed within plus or minus 3 percent of the optimum moisture content as determined in accordance with ASTM D 1557.
- 6.11.3 The procedure for spreading and compacting the soil material shall not displace or disturb the clay layer on which the soil material is placed.
- 6.11.4 Prior to the placement of the overlying topsoil, any depressions in the soil material layer on which topsoil is to be placed that are greater than 0.1 foot deep shall be scarified, filled, and compacted with soil material.

#### 6.12 PLACING TOPSOIL

6.12.1 Topsoil shall be placed in the Waste Containment Area as shown on the design drawings and shall have a loose lift thickness not to exceed 8 inches.

Topsoil shall be compacted to 85 percent and shall not exceed 90 percent of the maximum dry density.

The procedure for spreading and compacting the topsoil shall not displace or disturb the soil layer on which the topsoil is placed.

6.12.2 Topsoil shall be placed within plus or minus 3 percent of the optimum moisture content as determined in accordance with ASTM D 1557.

## 6.13 TURF ESTABLISHMENT - GENERAL AREAS

- 6.13.1 This section applies only to turf establishment in excavation areas, Organic Burial Area, New Naval Area, stockpile areas, pond removal areas, demolition areas, and culvert removal areas. Turf establishment for the Waste Containment Area is addressed in Section 6.14 of this specification.
- 6.13.2 Specific limits of turf establishment will be determined in the field by Bechtel.
- 6.13.3 Areas of turf establishment shall be scarified a minimum of 2 inches in depth to loosen soil prior to seeding. All areas shall be raked of rocks and debris.
- 6.13.4 Seeding shall be completed by hydroseeding or equal method submitted to Bechtel for review.
- 6.13.5 Fertilizer and seed mix shall be broadcasted at minimum rates of 20 pounds per 1000 square feet and 9 pounds per 1000 square feet, respectively.
- 6.13.6 Seeded area shall be covered with straw at a minimum rate of 100 pounds per 1000 square feet. The straw or other mulch material shall be watered into the soil upon placement to prevent loss from

- wind. Water used shall be potable and shall be obtained from Bechtel in accordance with Section 6.8 of this specification.
- 6.13.7 Jute mesh shall be used to prevent erosion or areas having slopes greater than 30 percent. Placement of jute mesh shall be in accordance with NYSDOT Section 612, "Sodding and Placing Erosion Control Materials."
- 6.13.8 Maintenance of seeded areas is not required.

#### 6.14 TURF ESTABLISHMENT - CAP

- 6.14.1 Turf shall be established on the cap to the Waste Containment Area indicated on the design drawings.
- 6.14.2 Area of turf establishment shall be conditioned, fertilized, seeded, and mulched in accordance with NYSDOT Section 610, "Turf Establishment."
- 6.14.3 Straw mulch shall be used to prevent erosion of soil and loss of seed on areas having slopes less than 30 percent. Placement of mulch materials shall be in accordance with NYSDOT Section 610, "Turf Establishment." Mulch shall be anchored by disking into the topsoil.
- 6.14.4 Jute mesh shall be used to prevent erosion on areas having slopes greater than 30 percent. Placement of jute mesh shall be in accordance with NYSDOT Section 612, "Sodding and Placing Erosion Control Materials."

6.14.5 Maintenance of turf is required for a period of one month after seeding. Turf shall be watered at a minimum rate of one inch of water per week for four weeks. Natural rainfall will be considered adequate provided that rain gauges are furnished and employed to document the rainfall rate. A minimum of 4 rain gauges shall be evenly spaced over the cap area (Phases A, B, and C). Water shall be obtained from the on-site uncontaminated water supply. The Subcontractor shall supply and operate all equipment, pipes, pumps, sprinklers, etc. necessary for the watering operation.

## APPENDIX 5-B

## FIELD DENSITY TESTS

- GENERAL NOTES
- ° TEST RESULTS

#### GENERAL NOTES:

- 1) Field density test numbers with a "U" suffix indicate tests performed on uncontaminated topsoil or clay for clay cap. Specific material is identified in Proctor Code material description for test.
- 2) Field density test numbers with a "C" suffix indicate tests performed on contaminated soil placed below the waste containment area clay cap.
- 3) Retests for field density tests are indicated with a letter suffix (i.e., 34A, 34B, 34C...)
- 4) A "M" suffix indicates only a moisture content test was obtained.



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☐ S-3858 SHELDON RD., P.O. BOX 229. ORCHARD PARK, NY 14127 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 ☐ 635 JAMES STREET, SYRACUSE, NY 13203 315-472-9333

					ooo oameo .	J.II.C.I.,	311A003E, 77 19209	
Proje	ct:!	Niagara	Falls	Stora	ge Site	#1450	01-115-SC-170 Report No. DT-1 REVISED	
ClientBechtel National						<del></del>	Date:5/2/86	
Contractor: Sevenson							Job No. <u>BT-86-81</u>	
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks	
10-	5/2	335.0	94.8	18.9	80.1	P=1	S1000, E318	
<del>-2U</del>	5/2	325.0	102.5	19.8	86.6	P=1	S1100, E426	
<del>-3U</del>	5/2	325.0	<del>104.5</del>	18.5	88.3	P=1	\$900, E426	
40	5/2-	326.0	78.4	22.0-	66.2	P-1-	\$750, E334	
- <del>5</del> U	5/2	326.0	93.9	22.2	79.3	P=1	<del>\$750, E194 -</del>	
<del>6U</del>	5/2	335.0	90.5	19.1	76.4	P-1	\$1000, E175	
1M	5/2	332.0	_	12.9	ů.	_	SIANN, Elan / Note: Moisture Meter	
2M	5/2	332.0	_	11.2	-	-	S1620, E320 /not_calibrated	
3M	5/2	330.0	_	13.3		_	S1480, E100 / per Bechtel method as of	
							this date.	
	-							
Proctor Code	Maximu Density (		ptimum isture (%)		<del></del>	<u> </u>	Material Type and Source	
P-1	118.4		1.4	Unco	ntamina	ted to	opsoil from sample taken from stockpile	
				Nort	n of por	nd #4	. Paratt-Wolff proctor 11/6/85, report no.	
				EEEEE used.				
Ll	·- <u>-</u>							
_	. Na	uclear	Method	used.			Respectfully submitted,	
Remar	ks:						_ EMPIRE SOILS INVESTIGATIONS, INC.	
		გ•	00 - 1	1:00			_	
	c <del>la</del> n Time	e:			Rosati	.lr	- James Millard, Carl Rosati, Jr.	
Technic	cian:						QUALITY CONTROL E ENGINEERING SPECIALTY SERVICES	

8/1 Form C

SOILS INVES	SE NSINC

☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

S-3858 SHELDON RD., P.O. BOX 229, ORCHARD PARK, NY 14127 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 ☐ 635 JAMES STREET, SYRACUSE, NY 13203 315-472-9333

Proje	ect:	Niagara	a Falls	Stora	ge Site	#145	01-115-SC-170 Report No. <u>DT-2</u>		
Clier	nt	Bechte <sup>*</sup>	l Natio	nal, I	nc.		Date: <u>5/6/86</u>		
Cont	ractor:	Se	evenson	L			Job No. <u>BT-86-81</u>		
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks		
1A	5/6	335.2	98.8	12.6	82.3	Х	All tests were taken at S1333. E121		
18	5/6	334.7	117.6	12.9	98.1	ļ	All moistures done with "speedy"		
10	5/6	334.2	118.1	13.9	98.4	Х	All moistures done with "speedy"		
10	5/6	333.7	117.4	14.3	97.8	Х	All moistures done with "speedv"		
							Proctor value of 120.0 pcf from Parratt-Wolff		
							test UUUU of 10/9/85.		
	·								
	·								
Proctor	Maximum Density (n	· · · · · · · · · · · · · · · · · · ·	timum	Motorial Type and Course					

Uncontaminated clay from Borrow Pit.

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120.0

EMI	PIRE
SOILS INVEST	IGATIONS INC

R/T Form C

- 1 ! 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
- [] S-3858 SHELDON RD., P.O. BOX 229, ORCHARD PARK, NY 14127 716-649-8110
- El 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
- LI RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
- ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 ☐ 635 JAMES STREET, SYRACUSE, NY 13203 315-472-9333

Project:	Niagara Falls Storage Site	#14501-115-SC-170	Report No.	DT-3 REVISED
Client _	Bechtel National, Inc.	·	Date:	5/8/86
	_			

Contractor: Sevenson					·		Job No. <u>BT-86-81</u>			
Test No.	Date of Test	Dept Eleva	in-place h or Density otion (pcl)		% Compaction	Proctor Code	Location and Remarks			
1UA	5/8	335	.0 105.9	16.4	89.4	P-1	-\$1000, E318' GGW Pass			
6UA	5/8	335	.0 100.8	18.1	85.1	P-1	S1000', E175' GGW pass			
5UA	5/8	326	.0 101.2	15.1	85.4	P-1	5750', E194', GGW pass			
<del>4UA</del>	5/8	326	.0 95.2	15.9	80.4	P-1	S750', E334', GGW fail			
70	5/8	325.	0 99.8	18.8	84.5	P-1	S900, E35, GGW Recompact and accept			
<del>-8U</del>	5/8	325.	0 703.5	13.2	87.4	P=1	S1100, E35, GGW Pass			
4MU	5/8	_		12.1	-	-	S1400, E120, GGW 12.3% optimum moisture			
5MU	5/8		_	13.2	-	-	S1450, E120, GGW 12.3% optimum moisture			
6MU	5/8		-	12.5	-	-	S1500, E120, GGN 12.3% optimum moisture			
7MU	5/8	-		13.1	-	-	S1550, E120, GGW 12.3% optimum moisture			
8MU	5/8	<u>-</u> -	-	12.0	-	-	S1550, E200, GGW 12.3% optimum moisture			
9MU	5/8	_		11.4		-	S1550, E250, GGW 12.3% optimum moisture			
Proctor Code	Maximur Density (p		Optimum Moisture (%)	Material Type and Source						
P-1	1 118.4 11.4		Paratt-Wolff proctor 11/6/85, Report EEEEE used.							

Respectfully submitted.

Remarks: All densities and moistures perfo	Ormed EMPIRE SOILS INVESTIGATIONS, INC.
by nuclear method.	-
Technician Time: 8:00 AM - 10:00 AM	-
Technician:James Millard	James Millard



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- 716-649-8110
- ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
- ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

					635 JAMES	STREET	SYRACUSE, NY 13203 315-472-9333
Proje	ect:	Niagara	<u>Falls</u>	Stora	ge Site	#1	4501-115-SC-170 Report No. DT-4
Clier	nt	Becht	<u>el Nat</u>	ional,	Inc.		Date:5/13/86
Cont	ractor:		Sevens	on			Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pci)	in-place Moisture [%]	ľ	Proctor Code	Location and Remarks
9U	5/13	338.0	118.0	12.3	98.3	Х	S1330, E130, 95% compaction required.
100	5/13	332.5	115.3	11.8	96.1	Х	S1390, E110, 95% compaction required.
110	5/13	335.2	117.3	12.5	97.8	Х	S1580, E330, 95% compaction required.
120	5/13	336.8	118.6	11.1	98.8	Χ	S1610, E130, 95% compaction required.
1 OMU	5/13	-	_	2.4	-	-	S1600, E200
11MU	5/13	_	-	2.9	-		S1500, E100
12MU	5/13	-	-	1.5	_	-	S1500, E210
			Avg.	2.3			
						-	
					<u> </u>		
Proctor Maximum Optimum Code Density (pcf) Moisture (%)							Material Type and Source
Х	X 120.0 12.3		.3	Parrat	t-Wolff	proc	tor done on 10/9/85, report UUUU, Job #
				L-8504	2		
				<del>,</del>			
			-				Respectfully submitted,
Remark	s:			<del></del>		<del></del>	EMPIRE SOILS INVESTIGATIONS, INC.
<del></del>				<del>.</del>			
Technic	ian Time:	11:	00 - 2	:30			
Technici	_	nes Mil					James Millard



ı	☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
1	☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
=	☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
₹	☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
Ξ	☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Contractor: Sevenson Job No. BT-86-81  Tett blate of Depth or In-place Density Five Compaction No. 1-8-1-8-1-8-8-8-8-8-8-8-8-8-8-8-8-8-8-8	Clier	it Be	echtel	Nation	al Inc	•			Date:6/20/86
Test   Date of   Depth or   In-place   Depth	Cont	ractor:		Seve	nson				
Detailty [pci]  Density [pci]  Molature [%]  Dated 10/9/85, report #UUUU  Respectfully submitted,  EMPIRE SOILS INVESTIGATIONS, INC.		1		r Density	Moisture	%		Lo	
octor Maximum Optimum Material Type and Source  L-1 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Holf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted, EMPIRE SOILS INVESTIGATIONS, INC.	1c -	6/20	330.8	114.7	10.6	95.6	L-1	S1481, E311	
Material Type and Source    120.0   12.3   Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042    Dated 10/9/85, report #UUUU	•								
Material Type and Source    120.0   12.3   Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042    Dated 10/9/85, report #UUUU									
Material Type and Source  [1] 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted,  Sand cone method EMPIRE SOILS INVESTIGATIONS, INC.									
Material Type and Source  [_1] 120.0								· · · · · · · · · · · · · · · · · · ·	
Material Type and Source  [1] 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted,  Material Type and Source  Materia									<del></del>
Material Type and Source  [1] 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted,  Material Type and Source  Materia									
Material Type and Source  [1] 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted,  Material Type and Source  Materia									
Material Type and Source  [1] 120.0 12.3 Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted,  Sand cone method EMPIRE SOILS INVESTIGATIONS, INC.									
Material Type and Source  [_1] 120.0									<del></del>
Material Type and Source    120.0   12.3   Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042    Dated 10/9/85, report #UUUU				-					
Material Type and Source    1			<del></del>						
Material Type and Source    120.0   12.3   Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042    Dated 10/9/85, report #UUUU	_								
Sample UUUU Uncontaminated clay-pond #7, from Paratt-Wolf job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted.  Sand cone method  EMPIRE SOILS INVESTIGATIONS, INC.				. ,	<u></u>			Material Type ar	nd Source
job #1-85042  Dated 10/9/85, report #UUUU  Respectfully submitted, EMPIRE SOILS INVESTIGATIONS, INC.  Sand cone method  EMPIRE SOILS INVESTIGATIONS, INC.							J Unc	ontaminated clay-	pond #7. from Paratt-Wolff
Respectfully submitted,  marks: Sand cone method EMPIRE SOILS INVESTIGATIONS, INC.  chnician Time: 8:00 - 4:00			•						
Respectfully submitted,  marks: Sand cone method EMPIRE SOILS INVESTIGATIONS, INC.  chnician Time: 8:00 - 4:00					Date	ed 10/9/	/85,	report #UUUU	
marks: Sand cone method EMPIRE SOILS INVESTIGATIONS, INC.			<u>-</u>		<del></del>				
chnician Time: 8:00 - 4:00			San	d cone r	nethod				
chinician time:	mark	s						EMPIRE SOILS I	NVESTIGATIONS, INC.
	hnici	an Time		8:00 -	4:00				
nnician: James Millard James Millard									



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD, EAST, ROCHESTER, NY 14621 716-342-5320

Proj	ect: <u>N</u>	iaqara	Falls	Storag	e Site	#145 <u>0</u>	NI-115-SC-170 Report No. DT-6 2nd. Revision
Clie	nt	<u>Bechtel</u>	Natio	nal, I	nc.		Date:6/23/86
Con	tractor:		Sevens	on			Job No. <u>BT-86-81</u>
Tast No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)		Proctor Code	Location and Remarks
<del>-20</del>	6/23	   333.9	   110.8	10.0	92.3*	<u>L-1</u>	S=1396 E250
<del>30</del>	6/23	333.1	112.3	10-	93.6*	L-1	S1410, E280
							* Denotes passing test. 90% required.
				-			
							·
Proctor	Maximur	n   On	timum				
Code	Density (p		sture [%]	<del></del>	<del> </del>		Material Type and Source
L-1	120.0		12.3	Sampl	e UUUU,	unco	ontaminated clay, pond #7 from Paratt-Wolff job
				#L-85	042, da	ted 1	0/9/85 report UUUU
	<del> </del>						
							Respectfully submitted,
Remar	ks:	Sand Co	ne Met	hod	<del></del>		EMPIRE SOILS INVESTIGATIONS, INC.
Technic	cian Time:	7:	00 - 1	1:30			
Technic	cian:	James M	lillard				James Millard
9/T Form (		SU	BSURFACE E	XPLORATIO	N @ CONSTRU	ICTION O	UALITY CONTROL . ENGINEERING SPECIALTY SERVICES



	585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555	
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716-649-8110

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☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-22
☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 201-225-0202

Proje	ect:!	Niagara	Falls	Stora	ne Site	#145	01-115-SC-170 Report No. DT-7 REVISED
Clier							Date:6/25/86
Cont	tractor:		Sevenso	on			Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcl)	In-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
<u>5C</u>	6/25	333.0	111.6	16.8	98.7	<del>L-1</del>	E294 S1360(passing test) 90% required
<del></del>			•				
<del></del>			`				
			•		· · · • · · · · · · · · · · · · · · · ·		
							,
				<del>-</del>			
roctor Code	Maximum Density (p	,	timum ture (%)			<del></del>	Material Type and Source
L-1	113.0		13.8	On-s	ite sil	ty cl	ay material from North pond(contaminated)
	<del></del>					<del></del>	
					<del>-</del>		
	<b>C</b> :	and-con	e metho	nd			Respectfully submitted,
emark	(s: <u>5</u>		C HICCH	<u> </u>			EMPIRE SOILS INVESTIGATIONS, INC.
chnic	ian Time:	12:	30 - 2:	:00			
	ian:						James Millard
		Su	SURFACE E	XPLORATIO	N E CONSTRU	CTION Q	UALITY CONTROL . ENGINEERING SPECIALTY SERVICES



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555	
S-5187 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075	716-849-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
☐ 1164 RIDGE RD. EAST. ROCHESTER, NY 14621 716-342-5320

	N S	iagar	a Fal					1-115-SC-170 Report No. DT-8 REVISED
								Date:6/26/86
	ractor:							Job NoBT-86-81
Test No.	Date of Test	Depti Eleva	in- n or De	piaca nsity pcij	in-piace Moisture (%)	% Compaction	Prector Code	
<del>-6C</del>	6/26	334	.0 11	1.6	16.2	98.7	L-4	S1494, E308, elev. 334.0
								90% required, passing test
			,					
								·
								·
								,
Proctor Code	Maximum Density (po	- 1	Optimun Moisture (					Material Type and Source
L-4	113.0		13	.5	0n-s	site cor	ntami	nated material from North pond
								Respectfully submitted,
Remark	s:	San	id-con	e me	thod			EMPIRE SOILS INVESTIGATIONS, INC.
								Lim the coled have brightions, had.
echnici	chnician Time:12:30 - 2:00							· ·
	chnician:James Millard							James Millard
/T Form C	UALITY CONTROL - ENGINEERING SPECIALTY SERVICES							



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	1164 RIDGE RD. EAST,	ROCHESTER,	NY 14621	716-342-5320	)

Proie	ect:						#14501-115-SC-170	Report No.	DT-9 REVISED
Clier		В	echtel	Nation	nal, Inc			Date:	
	ractor:				Sevenso			Job No	
Test No.	Date of Test	Dapth or Elevation	in-place Density (pcl)	in-place Moisture [%]	% Compaction	Proctor Cade	Lo	cation and Rema	
<del>7CA</del>	7/1	332.1	115.9	20.0	80.5	L-2	Retest of 70, fa	il due to exc	ess moisture
								<del></del>	
·.									
					_				
				•					
	-								
								<del></del>	
				l					
Proctor Code	Maximum Density (po	1 '	timum ture (%)				Material Type ar	nd Source	
L-2	113.0	1	3.5	Contar	ninated	clay	from North Pond		
						· · · · · · · · · · · · · · · · · · ·			
							Respectfully sub	mitted,	
Remark	s:Sa	nd-con	e	<del></del>			EMPIRE SOILS I	NVESTIGATION	IS, INC.
echnic	ian Time:	12	:15- 1:	:45					
	ian:	,	Millar	-d			James Mill	ard	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

716-649-8110

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202 ☐ 1164 RIDGE RD FAST ROCHESTER NY 14621 716-342-5320

					1164 RIDGE	RD. EAS	ST, ROCHESTER, NY 14621	/ 10-342-3320	
Proje	ect: <u>N</u>	liagara	Falls	Storag	<u>e Site</u>	#145	01-115-SC-170	Report No.	DT-10 REVISED
Clien	itB	Bechtel	Nation	al. Ir	1C	···-		Date:	7/7/86
Cont	ractor:	Se	venson				<u> </u>	Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation		in-place Moisture (%)		Proctor Code	Loc	cation and Rem	arks
10C	7/7	332.0	1 <del>06.7</del>	13.4	94.5	L-2	<del>\$1429, E230, pass</del>	<del>-</del>	
7CB	7/7	332.0	91.3	22.3	80.7	<u>L-2</u>	S1529, E224, fail	, 90% requir	red_
							Speedy used for m	oistures	
				_					
	-								
Proctor Code	Maximu Denzity (;		ptimum sture (%)		······································		Material Type ar	nd Source	:
L-2	113.		13.5	Con	taminat	od Si	ilty Clay from Nor	th nond	
		<u> </u>	13.5	1.00	Lamiliai	eu	Try Clay Trom Not		
							Respectfully sub	mitted	
Domar	be.	Sand co	ne use	d.			_ EMPIRE SOILS		INS INC
								231107110	
				.15			-		
		James					,	ames Millard	I
echni	cian:	- June 3	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<del> </del>					· · · · · · · · · · · · · · · · · · ·



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075

716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 20 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 201-225-0202

Proje	ect: <u>Ni</u>	agara	Falls S	Storage	Report NoDT_11_REVISED		
Clier	nt <u>Bech</u>	tel Na	tional.	Inc.		<del>_</del>	Date:7/3/86
Cont	ractor:			evenso	n		Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks
-8C	7/3	1 <del>335.7</del>	98.3	22.0	87.0	L-2	S1381, E344 Fail
<del>-9</del> C	7/3						S1417, E297 Pass
							90% Required
<del></del>		<u> </u>					
		·					
Proctor Code	Maximui Opensity (p		otimum sture (%)	·			Material Type and Source
L-2	113.0	1:	3.5		ımina tec	d cla	y from North pond
							·
L							Respectfully submitted,
emar	ks:S	and-Co	ne				EMPIRE SOILS INVESTIGATIONS, INC.
					:		•
echnic	ian Time	12:3	30 - 3:	30		_	
	ian				··		James MIllard
					= CONSTR	יכנוטא כ	DIALITY CONTROL # ENGINEERING SPECIALTY SERVICES



_	585 TROY-SCHENECTADY	MAHTAI OR	NY 12110	518-783-1555
_;	363 INCHISCHENCOINDI	NO., CALLANI,	141 12110	310700-133

716-649-8110

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-22 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	Project: Niagara Falls Storage Site #14501-115-SC-170 Report NoDT-12 REVISED_										
Clien	it	Bech	tel Nat	ional.	Inc.		Dat	e:	7/8/86		
Cont	ractor:	Se	venson	<u> </u>		•	Job	No	BT-86-81		
Test No.	Date of Test	Depth or Elevation		in-placs Moisture [%]	<b>1</b> %	Proctor Code	Location 90% Required	n and Rema	arks		
11c	7/8	334.1	103.5	14.8	91.6	1-2	<del>\$1405, E225, Pass (No</del>	orth-Sout	<del>h tren</del> ch)		
12C	7/8	333.0	105.2	15.6	93.1	1-2	S1441, E228, Pass(North-South trench)				
1 <del>30</del>	7/8	333.6	98.4	18.6	87.1	L-2	S1501, E230, Fail( North-South trench)		<del>h trenc</del> h)		
8CA	<del>7/8</del>	335.7	110.2	15.8	97.5	<u>2</u>	S1384,E344_, Pass	· · · · · · · · · · · · · · · · · · ·			
14C	7/8	334.6	110.7	16.3	98.0	<del>L 2</del>	<del>\$1400, E373 Pass</del> —				
-15C	7/8	335.0	97.7	21.2	86.4	L-2	<del>\$1500, E310 Fail</del>				
<del>16</del> C	7/8	335.0	98.7	18.6	87.4	L <del>-2</del>	<del>\$1480, E366, Fail</del>	·			
Proctor Code	Maximur Denzity (p		plimum sture (°c)	<del></del>			Material Type and So	urce			
L-2	113.0		3.5	Cont	aminate	d Sil	ty Caly from North po	nd			
					· · · · · · · · · · · · · · · · · · ·						
<u></u>			L	·							
	San	d cone	method	1			Respectfully submitte				
Remark	(S:						EMPIRE SOILS INVE	STIGATION	NS, INC.		
	<del></del> _	<del></del>	7:00 -	2.20							
Technic	ian Time				<del></del>						
Technic	ian:	James N	lillard				Jame	es Millard	d		



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	not:	Niana	ara Fal				501-115-SC-170 Report No. DT-13		
							Date: 6/30/86		
	tractor:						Job No BT-86-81		
Test	Date of	Depth or	In-place	in-place Moisture	%	Proctor			
No.	Test	Elevation	(pcl)	[%]	Compaction	<del>                                     </del>			
<del>-7€</del>	6/30	332.1	92.0	20+	81.4	L-2	S1529, E224, Fail		
			ļ <u>-</u>				Material is more than 3% away from optimum		
							moisture as per Bechtel specifications		
					-				
	۰	· <del>- ·- ·</del>							
		·- · · · · · · · · · · · · · · · · · ·							
							·		
Proctor	Maximur	<del></del>	ptimum	1					
Code	Density (p	1 -	isture (%)	· ·	·		Material Type and Source		
L-2	113.0	) .	13.5	Con	taminat	ed ma	terial from North pond.		
						<del> </del>			
							Respectfully submitted,		
Remar	ks:	Sand	cone me	ethod			EMPIRE SOILS INVESTIGATIONS, INC.		
							Zim nie doled ny ed Hon Holy, ny o.		
Took	ion T'		1:30 -	3:30		<del></del>			
	ian Time:						James Millard		
rechnic	chnician: James Millard James Millard  SUBSURFACE EXPLORATION & CONSTRUCTION QUALITY CONTROL & ENGINEERING SPECIALTY SERVICES								



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

	<del></del>						ST, ROCHESTER, NY 14621 716-342-5320
Proj	ect: <u>N</u>	iagara	Falls	Stárag	e Site	#1450	1-115-SC-170 Report No. <u>DT-14</u>
Clie	n <b>ę</b>	Bechte	el Nati	onal,	Inc.		Date:7/23/86
Con	tractor:		Sevens	on			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)		Proctor Code	Location and Remarks
<del>180</del>	7/23	335.2	110.9	13.4	98.2	L-2	S1450, E382 pass
<del>190</del>	7/23	335.6	104.9	14.8	92.8	L-2	S1498 E251 pass -
							90% required
							Moistures calculated by Speedy Method
							•
Proctor Code	Maximun Density (p	.	timum sture (%)				Material Type and Source
L-2	113.0	13	3.5	Conta	minated	clay	-silt from North pond
	<del></del>			· · · · · · · · · · · · · · · · · · ·			
							Respectfully submitted,
Remar	ks:	Sand-c	one		<del></del>		EMPIRE SOILS INVESTIGATIONS, INC.
		7•∩	0 - 8:3	30			
	cian Time:						
Technic	ian:		Janie	es Mil	idra		James Millard



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555	
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-81	10
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881	
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202	
☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14821 716-342-5320	

Proje	ect: N	iagara	Falls	Storag	e Site	#1450	1-115-SC-170	Report No.	DT-15	REVISED
Clier	nt	Beci	htel Na	tional	, Inc.					
Cont	ractor:	Sev	venson		··-		<del> </del>	Job No	BT-86-81	
Test No.	Date of Test	Dapth or Elevation	In-place Density (pcf)	lo-place Moisture (%)		Proctor Code	Lo	ocation and Rem		
20C	7/25	336.3	113.2	13.4*	100.0	1-2	<u>\$1433, E267 Pas</u>	· <u>·</u>	······································	
							90% required			
							*Speedy apparatu			
				1						
Proctor Code	Maximur Density (p	. 1 -,	otimum sture (%)			<u></u>	Material Type a	nd Source		
L-2	113.0		13.5	Contan	ninated	Silty	Clay from North	pond		
				0011001		3110	0.03 1.011 1101 211	polid		
		1	L	<del></del>			5			
Ja 1	(s:S	and-co	ne meth	nod			Respectfully sub			
nemark	(S	32					EMPIRE SOILS	INVESTIGATIO	NS, INC.	
		7 - 1	 00 - Ω•	15						
•	ian Time:					<del></del>	1 -	4:33		
echnic	ian:				IN ■ CONSTRU	JCTION Q	James 1	Millard  NG SPECIALTY SERVICES	· · · · · · · · · · · · · · · · · · ·	



	585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783	-1555	
	S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY	14075	716-649-8110
	105 CORONA AVENUE, GROTON, NY 13073 607-898-5881		
	RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837	201-225-0	202
_		_	

Proje	ect:	Niagara	a Falls				OI-115-SC-170	716-342-5320  Report No. 1 DT-16
Clien		Bechte	Natio	nal, I	nc.			Date:7/30/86
Cont	ractor:	Sev	/enson					Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pc()	in-place Moisture (%)	% Compaction	Proctor Cade	Lo	ocation and Remarks
24C	7/30	341.0	104.0	11.2	92.0	L-2	\$1480, E271, Pas	33
					; ;		90% required	
	 						Speedy apparatus	s used for moisture
	!							
		l 						
							·	
	٥							
roctor Code	Maximur Density (p	, -,	otimum sture (%)				Material Type a	nd Source
L-2	113.0		13.5	Conta	minated	Silt	y Clay from Nort	h Pond
							Respectfully sub	hmitted
emark	s: <u>San</u>	d Cone			<del></del> -			INVESTIGATIONS, INC.
chnici	ian Time:		12:45 -	3:30				
chnici	an:	James	s Milla	rd			James	Millard



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075

105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-22:

716-649-8110

201-225-0202

				= -	1164 RIDGE	RD. EAS	ST, ROCHESTER, NY 14821 716-342-5320				
Proje	ect: <u>Ni</u>	agara F	alls S	torage	Site #	<u>14501</u>	-115-SC-170 Report No. DT-17 REVISED				
Clier	nt	Bech	ntel Na	tional	, Inc.		Date:7/29/86				
Cont	ractor:	Sev	enson_			Job No. <u>BT-86-81</u>					
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	in-place Moisture [%]	1	Proctor Cade	. Essential and Holliday				
-220	7/29	341.3	116.0	13.2	100	L-2	<del>\$1450, E258, Pass</del>				
<del>-23</del> 0	7/29	340.9	113.6	12.6	100	L-2	S1390, E269 Pass				
							90% required				
							· ·				
Proctor Code	Maximur Density (p	,	timum sture (%)		······································	- <del></del>	Material Type and Source				
L-2	113.0		13.5	Contaminated Silty clay from North Pond							
	<del></del>										
							· .				
							Respectfully submitted,				
Remark	cs: S	and Cor	ne				EMPIRE SOILS INVESTIGATIONS, INC.				
						<del></del>	EMI THE GOILS HAVESTIGHTIONS, HAO.				
Technic	ian Timo	2:3	30 - 3:								
		James					James Millard				
	1011						=>				

SUBSURFACE EXPLORATION & CONSTRUCTION QUALITY CONTROL & ENGINEERING SPECIALTY SERVICES



	585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-	1555	
	S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 1	14075 716-649	<del>3</del> -8110
	105 CORONA AVENUE, GROTON, NY 13073 607-898-5881		
	RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837	201-225-0202	
П	1164 RIDGE RD, EAST, ROCHESTER, NY 14621 716-342-5320	)	

Proje	ect: <u>N</u>	liagara	Falls	Storag	e Site	#1450	11-115-SC-170 Report No. DT-24 REVISED						
Clien	ıtB	echtel	Nation	al, In	c.		Date:8/13/86						
Cont	ractor:		S	evenso	n	•	Job No8T-86-81						
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Practor Code	Location and Remarks						
15U-A	8/13	342.8	116.2	15.7	94.5	L-9	S1370, E280						
14U-A	8/13	  343.0 -	112.4	16.8	91.4	L-9	S1480, <u>E270</u>						
							* Denotes failing test. Moisture obtained by speedy.						
4.													
						Note: Test #14U-A was not indicative of proctoused. Test will be retabulated when value							
							from BOOS #3 is completed.						
1 6U	8/13	337.4	112.1	14.9	91.2	L <b>-</b> 9	S1330, E146 Troxler used						
14U-B		343.0_		. ,		- 1	S1480, E270 Troxler used.						
Proctor Code	Maximus Density (p	]	otimum sture (%)	1			Material Type and Source						
L-9	123.0		11.9	Clay (	cap_mat	erial	; BOOS #1 property						
					· · ·								
						·	Respectfully submitted,						
		nd cone		d used	•		EMPIRE SOILS INVESTIGATIONS, INC.						
		thod us .7:30-1		:45-4:4	<del></del>								
					<del>1</del> J		Carl Rosati, Jr						
R/T Form C							UALITY CONTROL . ENGINEERING SPECIALTY SERVICES						



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075

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☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

HOS COHONA AVENUE, GROTON, NT 13073 201-225-0202

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

				⊔	1164 HIDGE	HD. EA	51, HUCHESTEH, NT 14621 /16-342-3320
Proje	ect: Ni	agara F	alls S	torage	Site #	4501	-115-SC-170 Report No. DT-25 REVISE
Clier	it <u>Be</u>	chtel N	ationa	1, Inc	•		Date: <u>8/14/86</u>
Cont	ractor:	S	evenso	n			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture [%]	1	Proctor Code	Location and Remarks
14U-C	8/14	343.0	117.7	13.2	95.7	L-9	51480, E270, Sand cone used.
16U-A	8/14	337.4	106.7	19.5	86.8	L-9	S1330, E146, troxler used.
7U	8/14	338.3	120.3	13.3	100+	Α	S1310, E147, troxler used.
6U-B	8/14	337.4	110.2	18.2	89.6	L-9	S1330, E146, troxler used.
							* Denotes failing test
16U-C	8/14	337.4	114.0	14.5	92.7	L <b>-</b> 9	S1330, 'E146
18U	8/14	335.3	103.1	21.5	83.8	L-9	S1500, E120
			!				
Proctor Code	Maximus Density (p	,	otimum sture (%)				Material Type and Source
L-9	123.0	11	1.9	Clay c	ap mate	rial:	BOOS #1 property
4	120.0	12	2.3	Clay p	ond #7	1985	proctor
							Respectfully submitted,
Remarl	cs: S	and cor	ne meth	od and	Nuclea	r	EMPIRE SOILS INVESTIGATIONS, INC.
	hod us	ed.					Zim nie doled nitted hanholid, nid.
rechnic	ian Time	7:3	0'9:45	/3:00-	4:15		
		Carl Ro	sati.	Jr.			Carl Rosati, Jr.

SUBSURFACE EXPLORATION & CONSTRUCTION QUALITY CONTROL & ENGINEERING SPECIALTY SERVICES

Technician: \_\_



 ■ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110
 518-783-1555

 □ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
 716-649-8110

 □ 105 CORONA AVENUE, GROTON, NY 13073
 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

				<del></del> _	1164 RIDGE	RD. EAS	ST, ROCHESTER, NY 146	21 716-342-5320				
Proje	ect: <u>Ni</u>	iagara	Falls S	Storage	e Site #	±1450	I-115-SC-170	Report No.	DT-26			
Clier	nt <u>Be</u>	chtel	Nationa	al, Inc				Date:	8/15/86			
Conf	ractor:	S	evensor	1				Job No	BT-86-81			
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	is-place Moisture [%]	% Compaction	Proctor Code		Location and Remarks				
1 6UD	8/15	337.4	115.6	13.0	94.0	L-9	South 1330 a	nd East 146, 95	% required			
18UA	8/15				ł	j 1		nd East 120, 95				
								·				
Proctor Cade	Maximun Density (p	-	otimum sture (%)				Material Typ	e and Source				
L-9	123.0		11.9	Clay	cap mate	erial	: BOOS proper	ty				
	·	_		· <del>-</del>		<del></del> .						
			<u>-</u>	. <u>.</u>			<del></del>	<u> </u>				
	ks:Nu	ıclası I	Mathad	usad			Respectfully					
Remar	ks:nu	ic rear		4350.			EMPIRE SO	ILS INVESTIGATION	ONS, INC.			
rechnic	ian Time:	7:3	0-9:15/	1:15-2	2:30							
echnic	ian:	J	ames Ha	ındzlik	ζ		James	Handzlik				

SUBSURFACE EXPLORATION & CONSTRUCTION QUALITY CONTROL & ENGINEERING SPECIALTY SERVICES



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ect: <u>Nia</u>	gara	Falls	_ Report	No.	DT-27	REVISED							
Clier	ntE	Becht	el Nat	<u>ional; I</u>		_ Date: _	<del></del>	8/16/86						
Cont	ractor:		Sev	enson			····	_ Job No	)	BT-86-81				
Test No.	Date of Test	Depth Eleva		ity   Moisture		Proctor Code		Location and Remarks						
1 <u>6U-E</u>	8/16	337	.4 116	.2 13.	94.5	L <b>-</b> 9	South 1330 and	East 146	(PLS	SED)				
1 <u>8U-B</u>		335	.3 114	.8 15.	93.3	L-9	South 1500 and	East 120	(F	AILED)	··-			
		i												
			_											
										<del></del>				
Proctor Code	Maximun Density (po		Optimum Moisture (%	)	Material Type and Source									
L-9	123.0	)	11.9	Clay	Clay cap material: Boos property									
1 1		1		İ										

Remarks: Nuclear Method used.	Respectfully submitted, EMPIRE SOILS INVESTIGATIONS, INC.
Technician Time:11:00 - 12:15	
Technician:James Handzlik	James Handzlik



Project: Niagara Falls Storage Site #14501-115-SC-170

☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075

716-649-8110

Report No. DT-28

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837

201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Clier	nt	Bechte	1 Natio	onal,	Inc.			_ Date:	8/18/86
Cont	ractor:		Sevens	on_				_ Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	in-place Moisture (%)	% Compaction	Proctor Code		Location and Ren	narks
18UC	8/18	335.3	109.1	14.7	89.7	L-3	S1500, E120	(FAILED)	
								, 	
									_
	٥								
Proctor	Maximui		ıtimum -	1			Material Tree	C	
Code L-3 B-3	Density (p	ci) Moi:	iture (%)				<del> </del>	e and Source	
<del>8-3</del>	121.6		13.5	Clay	off sit	e B00	S property sam	pled from truc	<
							·		
				·			·		
							Respectfully	submitted,	
Remar	ks:	Nucle	ar Met	hod us	ed.	<del></del>	EMPIRE SOI	LS INVESTIGATIO	ONS, INC.
	· · · · · · · · · · · · · · · · · · ·								
rechnic	ian Time	9:30	- 10:	30		<u>-</u>			
	ian:						Jam	es Millard	
		su	BSURFACE E	XPLORATIO	N E CONSTR	UCTION Q	UALITY CONTROL ENGIN	EERING SPECIALTY SERVICE	ES



- ☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
- ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
- RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837
- ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ect. Ni	agara	Falls S	Storage	e Site #	1450	1-115-SC-170 Report No. DT-29 REVISED
•							Date: 8/19/86
	ractor:						Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	In-place Moisture (%)	% Compaction	Proctor Code	
20UN	8/19		114.1	12.1	93.8		S1425, E358(nuclear gage)
	8/19		116.4	9.5	95.7	L-3	S1425, E358, sand cone and speedy moistures
	8/19	335.3	118.3	10.9	97.2	L-3	S1500, E120, sand cone and speedy moistures
19UA	8/19	341.4	116.7	11.3	96.2	L-3	S1450, E300, Sand cone and speedy moistures
210	8/19	326.0	109.4	14.3	91.9	L-5	S1470, E402
						<u> </u>	95% required
Proctor Code	Maximum Density (p	, ,	otimum sture (%)		-		Material Type and Source
L <b>-</b> 3	121.6		13.5	BOOS	#3 proc	tor,	off-site from BOOS Property
L <b>-</b> 5	119.0		14.6	BOOS	#5 proc	tor,	off site from brownish gray clay
							•
							Respectfully submitted,
Remari	ks:						EMPIRE SOILS INVESTIGATIONS, INC.
							_
Technic	ian Time	7:00	- 10:	00			_
Technic			Millar	·d			James Millard



R/T Form C

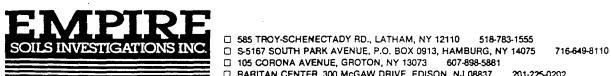
)	585 TROY-SCHENECTADY F	RD., LATHAM,	NY 12110	518-783-1555

☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-896-5881 ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837

Droi:	Ni Ni	agara	Falls		1164 RIDGE	RD. EA		TER, NY 1462		o. <u>DT-30</u>
Proje		Bechtel								
	ractor:		Seve	enson	•	-				BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place	in-place Moisture (%)	% Compaction	Proctor Code			Location and Re	<del></del>
21UA	8/20	326.0	115.4	13.4	94.9	L-3	S1470,	E402		
22U	8/20	331.1	115.8	13.6	97.3	L-5	S1400,	E060		
23U	8/20	319.5	112.9	14.8	94.9	L-5	\$1685,	E310		
							95% red	quired		
								· <del>-</del> · · ·		
						_				
						·				
Proctor Code	Maximum Density (po		timum ture (%)	<u></u>		···········	Ма	terial Type	and Source	
L-3	121.6	13.	5	BOOS	#3, cla	y fro	m off s	ite borr	ow pit on BOO	OS property
L-5	119.0	14.	6						ow pit on BO	
									1	
		· — ·					Res	pectfully s	submitted,	
Remark	(s:	Sand c	one us	ed					S INVESTIGAT	IONS INC
								2 5516		
Technic	ian Time:	8:00	-9:00/2	2:30-4	:00					
	ian:J					· - <del></del>		James M	lillard	

SUBSURFACE EXPLORATION & CONSTRUCTION QUALITY CONTROL & ENGINEERING SPECIALTY SERVICES



5	85 TROY	-SCHENECTADY	RD., LATHAM,	NY 12110	518-783-1555
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							300 McGAW		SON, NJ 08837 201-22 521 716-342-5320	
Proj						14501	-115-SC	-170	•	
Clie	ntB	echtel	Nation ———	al, In	c				Date:	8/21/86
Con	tractor:	S	evenson						Job No	BT-86-81
Test No.	Date of Test	Depth o		in-place Moisture (%)		Procter Code			Location and Re	marks
24U	8/21	337.	1 99.8	17.6	83.9	L-5	S1485,	E128		
250	8/21	341.	6 114.8	14.2	96.5	L-5	S1300,	E245		
260	8/21	327.	3 112.6	13.1	94.7	L-5	S1430,	E402(N	ote: Speedy m	pisture used to can-
2404	8/21	337.	1 100.8	15.6	84.7	L-5	vert to moistur S1485,	e appa		possible error in n
27U	8/21	344.:	3 115.9	12.2	97.4		S1325,			
28U	8/21	345.4	113.1	13.8	95.0	L-5	S1456,	E260		
							95% req	uired		•
									<del></del>	
	•		-		·					
		<del></del>								
		<del></del>						<del></del>		
Proctor	Maximur		)ptimum	l			<del></del>			
Code	Density (p		isture (%)				Mat	erial Typ	oe and Source	
L-5	119.0		14.6	BOOS	#5, cla	y fro	om off s	ite pro	perty owned by	B00S.
_				·		<del></del>		·		
							Res	ectfully	submitted,	
Remar	ks:	Sand c	one	<del></del>	<del></del>		. EMF	IRE SO	ILS INVESTIGATION	ONS, INC.
rechnic	cian Time:	7	:00 - 8	:30						
Coobaid	sian:	James	Millar	4				lamos M	lillard	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

		-					300 McGAW DRIVE, EDISON ST, ROCHESTER, NY 14621	716-342-5320	-0202
Proje	ect: Ni	iagara	Falls	Storage	e Site	#1450	1-115-SC-170	Report No.	DT-32
Clier	nt	Be	chtel	Nation	al, Inc	•		Date: 8/18	/86
Cont	ractor:		Sev	enson				Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code	L	ocation and Ren	
1800	8/18		109.1	14.7	89.7	1-3	S1500, E120		
190	8/18	lst. lift	104.0	18.0	85.5	1	S1450, E300		
1	8/18		111.5			i			
								·	
Proctor Code	Maximum Density (po		timum ture (%)			<del></del>	Material Type a	and Source	<del></del>
L-3	121.6	1	3.5	_Clay o	off site	e_B00	S property, samp	led from truc	k
							_	<del>-</del>	,
							Respectfully su	bmitted,	
Remark	s: <u>Nu</u>	clear	Method	used	· · · · -		EMPIRE SOILS	INVESTIGATIO	NS, INC.
<del></del>				<del></del>	<del></del>	<del></del> -			•
Technici	ian Time:	9:30-	10:30/2	2:30-3:	: 30	<del></del>			
Technici	an:	James 1	Millard	[			James Mi	llard	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5187 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14821 716-342-5320

Proiect:	Niagara Falls Storage Site #14501-115-SC-170	_ Report No.	DT-33 REVISED	
-	Bechtel National, Inc.	Date:	8/25/86	
Contract	Cauancan	_ Job No	BT-86-81	

Cont	ractor:		Sevens	OII			Job No		
Test No.	Date of Test	Depth or Elevation		in-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks		
-32C	8/25	334.0	107.3	14.1	95.0	L-2	S1570, E380, 90% required.		
38U	8/25	346.1	124.3	9.6	100.0+	L-5	S1390, E266		
39U	8/25	328.9	117.3	10.3	98.6	L <b>-</b> 5	S1600, E049		
40U	8/25	336.1	117.0	11.5	98.3	L-5	S1273, E346		
41U	8/25	328.2	106.4	11.3	89.4	L-5	S1660, E145		
42U	8/25	336.0	115.1	14.8	96.7	L-5	S1340, E374		
						•	95% required unless otherwise noted.		
							·		
Proctor Code	Maximun Density (p		ptimum sture (%)	Material Type and Source					
L-2	113.0		_	Contar	ninated	soil	with organic		
L-5	119.0		4.6	Clay, BOOS #5, from off-site BOOS property					

Remarks: Sand cone method used.	Respectfully submitted, EMPIRE SOILS INVESTIGATIONS, INC.
Technician Time: 7:00 - 10:30/2:30-3:30	
Technician: <u>James Millard</u> Subsuppace Exploration ■ Construction QUAI	James Millard



585	TROY-SCHENECTA	DY RD., LATHA	M. NY 12110	518-783-155

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 718-342-5320

BT-86-81

Project:	Niagara Falls Storage Site #14501-115-SC-170	Report No.	DT-34	REVISED
•		Date:		

Contractor: Sevenson Job No. \_\_\_\_\_ In-place In-place Date of Dapth or Density Moisture Test **Proctor** Location and Remarks No. Test Elevation (pcf) [%] Compaction Code \$1660, E145 95% required 119.0 10.5 100.0 L-5 328.2 41UA 8/26 \$1415, E328 95% required 114.5 14.1 96.2 L-5 43U 8/26 340.7 S1480, E404 95% required 115.6 13.9 97.2 L-5 44U 8/26 332.7 \$1680, E190 95% required 116.1 12.3 97.5 L-5 8/26 325.4 45U \$1560, E350 90% Required 108.5 14.0 96.0 8/26 33C 336.1 3-1

Proctor Code	Maximum Denzity (pci)	Optimum Maisture (%)				Material Type and Source
L-5	119.0	14.6	BOOS	#4 clay	y froi	π off-site borrow pit owned by BOOS
L-8	113.0	13.5	Conta	minated	soil	with organic

	Respectfully submitted,
Remarks:	EMPIRE SOILS INVESTIGATIONS, INC.
7:00 - 9:30	
Technician: James Millard	James Millard
SUBSUBEACE EXPLODED CONSTRUCTION C	HIALITY CONTROL - ENGINEERING SPECIALTY CERVICES



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

716-649-8110

					RARITAN C 1164 RIDGE					NJ 08837 201-225-0 716-342-5320	202
Proje	ect: <u>Nia</u>	agara F	alls S	torage	Site #	14501	-115-SC	-170		Report No.	DT-35
Clier	nt	Bechte	1 Nati	onal,_	Inc.					Date:	8/15/86
Cont	ractor:		Seven	son						Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	in-place Moisture (%)	% Compaction	Proctor Code			Lo	cation and Rem	
16UD	8/15	337.4	115.6	13.0	94.0	L-9	South	1330,	East	146	
18UA	8/15	335.3	103.3	20.3	84.0	L-9	South	500,	East	120	
		 	· · · · · · · · · · · · · · · · · · ·								
			<u>-</u>								· · · · · · · · · · · · · · · · · · ·
			·					<del></del> .		<del></del>	
							-			<del></del>	
										<del> </del>	<u> </u>
							·				·
				]							
Proctor Code	Maximum Density (po		timum ture (%)				Mat	erial T	ype ar	d Source	
L-9	123.0	11	.9	Clay	ey Silt	, som	e sand,	trac	e gra	vel, BOOS #1	
							Res	pectfu	lly sub	mitted,	
Remark	(s:	luc lear	Metho	d used	•				·	NVESTIGATION	NS, INC.
	· · · · · · · · · · · · · · · · · · ·										
echnic	ian Time:	7:	30-9:1	5/1:15	-2:45	·					

SUBSURFACE EXPLORATION - CONSTRUCTION QUALITY CONTROL - ENGINEERING SPECIALTY SERVICES

James Handzlik

Technician: \_

James Handzlik



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 716-649-8110

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ct: Nia	gara Fa	lls St	orage	Site #1	4501 <b>-</b>	115 <b>-</b> SC-	-170		Report No.	DT-36	REVISED
Clien	it	Bechtel	Natio	nal, I	nc.					Date:	8/16/8	36
Cont	ractor:	Ве	<u>chtel</u>							Job No	BT-86-81	
Test No.	Date of Test	Depth or Elevation	in-piace Density (pci)	in-place Moistura (%)	% Compaction	Practor Code			Lo	cation and Re	marks	
16U-l	8/16	337.4	116.2	13.9	94.5	L <b>-</b> 9	South	1330,	East	146		
18U-I	 38/16	335.3	114.8	15.1	93.3	L <b>-</b> 9	South	1500,	East	120		
										<del></del>		
												·
							· · · · · · · · · · · · · · · · · · ·					
										<del></del>		
Proctor	Maximu	1 -	otimum					aterial 1	Tyne ar	nd Source		
Code L-9	Density (p 123.0		11.9	Clay	vev Silt	sor				ivel, BOOS	#1	
	123.0		11.5		, , , , , , , ,				JC 910			<u> </u>
•		1	· · · · · · · · · · · · · · · · · · ·				Re	spectfu	illy sub	omitted,		
Remarl	ks:N	luclear	method	d used.		<del> </del>	. EN	IPIRE S	SOILS	INVESTIGATI	IONS, INC.	
	<del></del>			<u>.</u>								
echnic	ian Time	:	00 - 12	2:15			-					
echnic	ian:	James	Handz]	ik		<del> </del>		James	Hand	zlik		<u>-</u>



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-78
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☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-22

716-649-8110

201-225-0202 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Project:	Niagara Falls Storage Site #14501-115-SC-170	Report No.	DT-37	
Client _	Bechtel National, Inc.	Date:	8/22/86	
	•			

Job No. BT-86-81 Sevenson Contractor:

Cont	ractor:	<del></del>	Sevens	UN			JOD NO. <u>B1-00-81</u>
Test No.	Bate of Test	Depth or Elevation	1 -	in-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
31C	8/22	331.	93.6	20+	82.9	L <del>-</del> 2	Sump pit(90% required) S1580, E370
290	8/22	336.	113.4	15.1	95.4*	L-5	S1456, E368
24UB	8/22	337.	113.9	11.8	95.7*	L-5	S1485, E128
300	8/22	340.	114.8	14.8"	96.5*	L-5	S1288, E268
310	8/22	340.8	116.2	12.2	97.7*	L-5	S1410, E175
3211	8/22	329.0	116.6	12.8	98.0	L-5	S1352, E407
33U	8/22	331.8	113.8	13.6	95.7	L-5	S1288, E390
							95% required unless otherwise noted.
							* Indicates passing results
31CA	8/22	<del>- 331 (</del>	99.1	20.0+	87.6	L=2	Sump pit. \$1580, E370
34U_	8/22	341.9	116.0	12.4	97.5	L-5	S1340, E190
35U	8/22	_339_7	114.3	13.2	96.0	L-5	S1330, E325
Proctor Code							Material Type and Source
L-2	113.0		-	Сс	ntamina	ted o	organic topsoil from S.C.A.
L <b>-</b> 5	119.0.		14.6	ВС	OS #5,	clay	from off site property owned by BOOS
	95% required unless otherwise noted.   * Indicates passing results   Indicates passing results   * Indicates passing results   * Indicates passing results   * Indicates passing results   * Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates passing results   Indicates pas						

	Respectfully submitted,
Remarks: Sand cone	EMPIRE SOILS INVESTIGATIONS, INC.
Technician Time: _7:00-10:30/2:30-6:00	- -
Jim Millard	Jim Millard



]	585	TROY-SCHENECTADY	RD., LATHAM,	NY 12110	518-783-1555
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☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 ☐ 316-162-1630 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 44075 716- ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 ☐ CARITAN CENTER 300 McGAW DRIVE, EDISON, NJ 08837 .201-225-0202 716-649-8110

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 20 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320 ·

Project:	Niagara Falls Storage Site #14501-115-SC-170	Report No.	-172 DT-38-R5VISED
Client _	Bechtel National, Inc.		8/23/86
	_		

ractor:	Sev	enson					_ Job No	BT-86-8	1	
Date of Test	Depth or Elevation	In-place Bensity (pcf)	In-place Moisture (%)	% Compaction	Procter Code					
8/23	327.0	108.3	12.4	90.9	L-5	S1595, E038				
8/23	324.5	113.4	13.1	95.3	L <b>-</b> 5	S1680, E220				
						95% required				
							-			
						7				
					·					
						Material Type	and Source		:	•
119.0	1	4.6	BOOS	#5, pr	octor	, off-site clay	/ from proper	ty owned	by ВО	05
	Date of Test  8/23  8/23  Maximum Density (po	Date of Test Sevation  8/23 327.0  8/23 324.5  Maximum Density (pcf) Mois	Date of Test Elevation   In-place Bensity (pcf)   8/23   327.0   108.3   8/23   324.5   113.4	Date of Test   Depth or Elevation   In-place   Moisture [%]	Date of Test   Depth or Elevation   In-place   Housture   1/4   Compaction	Date of Test   Depth or Test   Depth or Elevation   Density (pcf)   Moisture (%)   Compaction   Code	Date of Test   Depth or Test	Date of Test   Depth or Test   Depth or Test   Depth of Test	Date of Test   Depth or Service   Depth or Test   Depth or Service   Depth or Test   Depth o	Date of Test   Depth or Test   In-place Elevation   Moisture (%)   Procter   Code   Location and Remarks

	Respectfully submitted,	ep invisuomitte		
Remarks: Sand cone	EMPIRE SOILS INVESTIGATIONS INVESTIGATIONS			
Technician Time:2:00 - 3:30	b.			
Technician:James Millard	James Millard	James Mariland		
SUBSURFACE EXPLORATION # CONSTRUCT	ON QUALITY CONTROL . ENGINEERING SPECIALTY SI	ERVICESTRUL # ENGINEERING SPEC		



3	585 TROY	SCHENECTADY	RD.,	LATHAM,	NY 1	2110	518-783	-1555
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□ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
□ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
□ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
□ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

					1164 RIDGE	RD. EA	ST, ROCHESTER, NY 14621 716-342-5320
Proje	ect:^	liagara	Falls	Stora	ge Site	#145	01-115-SC-170 Report No. <u>DT-39</u>
Clien	ıt	Bechte	1 Natio	onal,	Inc.		Date: 8/27/86
Cont	ractor:	<del>-</del>	Sevens	son			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	In-place Moisture (%)	% Compaction	Prector Code	
460	8/27	332.1	119.8	11.4	100.0+	L-5	S1510, E062
47U	8/27	329.0	117.3	11.2	98.6+	L-5	S1650, E350
480	8/27	334.3	112.7	14.0	94.7	<b>L-</b> 5	S1460, E397 - Fail (USF \( \D\))
490	8/27		115.4			1	S1654, E306
500	8/27	333.2	113.2	14.3	95.1	L-5	S1660, E075
							Speedy Apparatus used for moistures.
							95% required
			_			-	
				ĺ			
Proctor Code	Maximum Density (pr		timum sture (%)				Material Type and Source
L-5	119.0	1	4.6	BOOS	#5, cl	ay fr	rom off-site borrow pit
						·	
		— <u> </u>					Dognosti uliv subscitto d
Remark	· c ·	Sand c	one				Respectfully submitted,
nemark							EMPIRE SOILS INVESTIGATIONS, INC.
Technic	ian Time:	. 7	:00-9:	30/2:30	0-3:30	· · · ·	-
	ian:		s Milla	ard			James Millard
. 55/11110					N E CONSTRI	UCTION C	DUALITY CONTROL   ENGINEERING SPECIALTY SERVICES

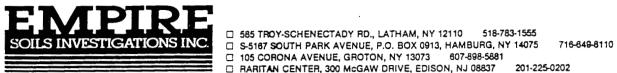
R/T Form C



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 718-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

===				0	1164 RIDGE	HD, EAS	ST, ROCHESTER, NY 14621	716-342-5320	
Proje	ct: Ni	agara	Falls S	Storage	e Site #	1450	1-115-SC-170	Report No.	DT-40
		-			Date:	8/30/86			
Conti	ractor:		Sevenso	n				Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	In-place Moisture (%)		Proctor Code	Lo	cation and Rer	narks
580	8/30	342.2	119.2	12.6	96.2	L-7	S1519, E270		
590	8/30	342.1	110.4	15.2	89.1	L-7	S1550, E155		
570/	06\8	344.8	119.4	12.3	96.4	L-7	\$1310, E255		
60U	8/30	342.7	120.0	11.5	96.9	L-7	S1490, E301		
							95% Required, un	less otherwi	de noted
Proctor Code	Maximur Density (p		otimum sture (%)				Material Type a	nd Source	
L-7	123.8		11.8	воох	#7, cla	y fro	om off-site borrov	v pit	
	<del></del>								
		· · · · · · · · · · · · · · · · · · ·					Respectfully sut	omitted,	
Remark	(s:	Sand-co	one				EMPIRE SOILS	INVESTIGATION	ONS, INC.
echnic	ian Time	12:3	30 - 2:	00					
echnic	ian:	James	Milla	rd			James Mi	illard	
		e.	IBCHDEACE	EVOL OB 4 TI	ON E CONSTR	UCTION	NIAL ITY CONTROL - ENGINEERS	NO COECIAL TV CEOVIC	56

SUBSURFACE EXPLORATION - CONSTRUCTION QUALITY CONTROL - ENGINEERING SPECIALTY SERVICES



					105 CORON RARITAN C	IA AVEN	UE, GROTON 300 McGAW ST, ROCHES	, NY 13073 DRIVE, ED	ISON, 1	07-898-5881 NJ 08837 201-22 716-342-5320	5-0202	
Proje	ect: Nia	agara F	Falls S	otrage	Site #	14501	-115-SC	-170		Report No.	. <u>DT</u>	-41
Clier	nt <u>Be</u>	echtel	Nation	al, In	с					Date: <u>9/2</u>	/86	
Cont	ractor:		Seven	son					Job No	BT-86-	81	
Test No.	Date of Test	Depth or Elevation	,	in-place Moisture (%)	1	Proctor Code		-	Lo	ocation and Re	marks	
610	9/2	334.1	117.9	12.3	95.2	L-7	S1599 <b>,</b>	E380				
590	A 9/2	342.1	117.8	11.1	95.1	L-7	S1550,	E155				
-35C	9/2	337.0	104.1	10.9	92.1	<u>L-2</u>	S1550,	E340(	<del>90% 1</del>	required)		
							95% red	uired	unle	ess otherwi	se note	d
		<u> </u>										
												-
Proctor Code	Maximun Density (pr		ptimum sture (%)				Mat	terial Ty	pe ar	nd Source		
L-7	123.8	1	1.8	BOOS	#7 Clay	from	ı off-si	te bor	row	pit		
L-2	113.0			Proct	or valu	e for	contam	inated	soi	il as per To	m Leach	1
							Res	pectfull	y sub	omitted,		
Remarl	ks: <u>. S</u>	and-co	ne				_ EMI	PIRE SC	OILS	INVESTIGATI	ONS, INC	Э.
							-					
Technic	ian Time:	7:00	0 - 9:0	0								
Technic	ian:	James	s Milla	rd				Jame	s Mi	llard		

Project: Niagara Falls Storage Site #14501-115-SC-170



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075

716-649-8110

Report No. \_\_DT-42

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837

201-225-0202 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Clien	tBe	echtel	Nation	al, In	IC .		Date:9/5/86
Conti	ractor:		Sevens	on			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation		In-place Moisture (%)		Proctor Code	Location and Remarks
620	9/5	344.	104.9	16.3	84.8	L-7	S1304, E230
63U	9/5				88.7	<u>L-7</u>	S1330, E048
640	9/5	334.	119.1	15.3	96.2	<u>L</u> -7	S1350, E100
<del>-36C</del>	9/5	342.1	101.8	12.4	90.1	<u> L-2</u>	S1520, E375(90% required)
				·			95% required unless otherwise noted
					·		
		· -					
	0						
Proctor Code	Maximun Density (p		ptimum (sture (%)	<del></del>			Material Type and Source
L-7	123.8		11.8	B00S	#7, off	-site	e clay
L-2	113.0		_	Proct	tor valu	ie as	per Tom Leach
							Respectfully submitted,
Remark	(s: <u>Nu</u>	clear	Method	used.			EMPIRE SOILS INVESTIGATIONS, INC.
Technic	ian Time:	2:	30 - 4:	30			_
Technic			mes Mil				James Millard
D.7.5	<del></del>	s	UBSURFACE	EXPLORATIO	ON CONSTR	QUALITY CONTROL B ENGINEERING SPECIALTY SERVICES	



□ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
 □ S-5187 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 718-849-8110
 □ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
 □ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

1 1164 RIDGE RD EAST ROCHESTER NY 14821 718-342-5320

<del></del>					1164 RIDGE	RD. EA	ST, ROCHES	STER, NY 1	4621 716-3 <b>42-5320</b>	
Proje	ect: Ni	iagara	Falls	Storage	e Site #	<u> 1450</u>	1-115-S	C-170	Report No.	DT-43
Clien	ıt	Becht	el Nat	ional,	Inc.				Date:8/2	8/86
Cont	łactor:	S	evenso	1					Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code			Location and Rem	arks
510	8/28	337.8	115.7	13.2	97.2	L-5	S1610,	E099		
520	8/28	333.4	114.4	12.8	96.1	L-5	S1332,	E396		
<del>-34C</del>	8/28	340.7	101.8	12.0	90.1	<del>L-2</del> -	S1540,	E300		
530	8/28	345.3	117.1	14.8	94.5	L-7	S1412,	E208		
54U	8/28	336.9	119.6	15.5	96.6	L-7	S1620,	E160		
<del>-55U</del>	8/28	6"bel grade		11.1	89.7	BNI-1	<del>\$1223,</del>	E748,	90% required	
							95% red	quired	unless otherwise	noted.
	_									
Proctor Code	Maximum Density (p		ptimum sture (%)				Ma	iterial Ty	pe and Source	
L-5	119.0	14	.6	B00S	#5, Clay	y fro	m off-s	ite bo	rrow pit	
L-2	113.0	_							as per Tom Leach	
L-7	123.8	11	rud B.						rrow pit	
BNI-	1 126.5	5 11	<b>.</b> 7	On-sit	te clay Stockpil	from	S180-0-	spectful	ly submitted,	
Remark	ks: <u>S</u> a	and Con	e				- EM	IPIRE S	OILS INVESTIGATIO	NS, INC.
		7					-			
	ian Time				)()		-	.l.	mes Milland	
Technician: James Millard James Millard										



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Project: Niagara Falls Storage Site #14501-115-SC-170	Report No.	DT-44
ClientBechtel National, Inc.	Date:	6/23/86

Job No. \_\_\_BT-86-81 Sevenson Contractor: in-place in-place Test Date of Depth or Density Moisture Proctor Location and Remarks (pcf) (%) Compaction No. Test Elevation Code \$1480, E270, pass 339.0 113.6 90% required, passing test

Proctor Code	Maximum Denzity (pcf)	Optimum Moisture (%)	Material Type and Source
*	124.2	10.5	From Paratt-Wolf proctor 6/8/85, report #F Job #L-85-042

	Respectfully submitted,
Remarks:	EMPIRE SOILS INVESTIGATIONS, INC.
Technician Time: 7:00-9:00	
Technician:James Millard	James Millard



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225 716-649-8110

201-225-0202

Proje	ect: N	iagara					st, ROCHESTER, NY 14621 716-342-5320  1-115-SC-170 Report No. DT-45
-		Becht		Date:7/25/86			
Cont	ractor:	Sev	enson				Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	In-place Density (pcl)	in-place Moisture (%)		Proctor Code	Location and Remarks
<del>-20C</del>	7/25	336.3	113.2	13.4	100.0	L-2	S1433, E267, pass
<del>-21c</del>	7/25	340.9	111.8	14.2	99.0	L-2	S1400, E243, 90% required
							* Speedy apparatus used for moistures
		_				,	
Proctor Code	Maximum Density (p	1 7	itimum sture (%)				Material Type and Source
L-2	113.0	13	.5	Contam	inated	silty	clay from North Pond
				<del> </del>			·
							Respectfully submitted,
Remark	s:Sar	nd-cone	metho	<u>d</u>			EMPIRE SOILS INVESTIGATIONS, INC.
rechnici	an Time:	7:00	- 3:3	0			James Millard
		James M					

SUBSURFACE EXPLORATION CONSTRUCTION QUALITY CONTROL ENGINEERING SPECIALTY SERVICES



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ct: <u>N</u>	iagara	Falls :	Storag	e Site_	<u>#1450</u>	]-115-SC-17	70	Report No.	DT-46
Client Bechtel National, In						l, In	<u>c.</u>		Date:8/:	29/86
Contractor:			Seve	nson					Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks			arks
56U	8/29	334.0	120.0	12.2	96.9	L-7	S1350, E30	00		
53UA	8/29	345.3	112.7	11.8	95.1	L-7	S1412, E20	08		
57U	8/29	344.8	110.8	14.8	89.5	L-7	S1310, E25	55		
				-			95% requir	red unl	ess otherwise	noted.
				% required unless otherwise noted. eedy apparatus used for moistures						
						_			<u> </u>	
								<del>(8</del>	<del></del>	
Proctor Code	Maximum Optimum Density (pcf) Moisture (%)			Materia	ıl Type aı	nd Source				
L-7	123.8	11.8		BOOS #7, off-site clay from borro					ow pit owned	by BOOS
						<del></del>				A 977
J							Respect	tfully sut	omitted,	
lemark	(s:	Sand-co	ne	· <u>-</u>			. EMPIRE	SOILS	INVESTIGATIO	NS, INC.
echnic	ian Time		:00-9:0	0/2:30	-4:30					
echnic	ian:	Jar	nes Mil	lard			Ja	mes Mi	llard	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Project: Niagara Falls Storage Si	ite #14501-115-SC-170	Report No.	DT-47
Client Bechtel National, Inc.	· · · · · · · · · · · · · · · · · · ·	Date: 9/10	/86
Contractor: Sevenson		lob No	BT-86-81

Cont	ractor:		<u>Se</u>	venson					_ Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code			Location and R	lemarks
62UA	9/10	344.5	103.4	16.1	83.5	L-7	S1304 <b>,</b>	E230		
63UA	9/10	329.1	103.9	15.6	83.9	17	\$1330,	E <b>04</b> 8		
	. i	-								
						· · · · · · · · · · · · · · · · · · ·			<del></del>	
								•		
							<del></del>	<del></del>		
							<del>-</del>			
Proctor Code	Maximun Density (p					e and Source				
L-7	123.8		11.8 Cla		Clay from BOOS #7, off-site borrow pit					
· ·	<del></del>									
	· 									

		Respectfully submitted,				
Remarks: Nucl	ear method used.	EMPIRE SOILS INVESTIGATIONS, INC.				
「echnician Time: _	7:00-10:15/11:15-12:45					
echnician:	James Handzlik	James Handzlik				
R/T Form C	SUBSURFACE EXPLORATION @ CONSTRUCTION Q	UALITY CONTROL . ENGINEERING SPECIALTY SERVICES				



	S-5167 S 105 CO RARITA	SOUTH F RONA AV N CENTI	NECTADY F PARK AVEN PENUE, GRO ER, 300 McO EAST, ROC	UE, P.O. B OTON, NY SAW DRIV	OX 0913, 13073 E, EDISC	HAMBL 607-89 N, NJ 0	8-5881	14075 201-225	 -649-8	:110
٠		C 2 1 -	<b>#3.4503</b>	775 0						••

Proje	ct:	Niaga	ara Fal	ls Sto	rage Si	4501-115-SC-170	Report No.	DT-48				
Clien	t	Вес	chtel N	lationa	l, Inc.		<del></del>	Date:	9/10/86			
Conti	ractor:		Sev	enson				Job No	BT-86-81			
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks					
<del>37C</del>	9/10	340.0	106.5	17.4	94.2	L-8	S1500, E350					
					- 12		* Contaminated ar	·ea				
								# - * * * * * * * * * * * * * * * * * *				
						-						
Proctor Code	Maximum Density (p	1 .	timum sture (%)		<del></del>	<del>-                                    </del>	Material Type ar	nd Source				
L-8	113.0		13.5	Claye	y Silt,	Con	taminated materia	1				
							Respectfully sub	omitted.				
Remark	s: Sand	cone m	ethod					INVESTIGATIO	NS. INC.			
echnic	ian Time:	7:1	00-10:1	5/11:1	5-12:45							
echnic			Handz1	ik				James Handzli	k			



Ti chniciani

J. MILLOKA

D 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-763-1555

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ect: _1	liagara	Falls	Storac	01-115-SC-170	Report No	DT-49	REVISED 12/24/8		
Clien	ıt	Bech	tel Nat	ional,	Inc.		•	Date:	9/11/86	
Cont	ractor:		Sevens	on				Job No	BT-86-81	·- ·-
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	in-place Moisture (%)	% Compaction	Precter Code	L 95% required	ocation and Re		
63UB	9/11	329,1	116.4	11.8	94.1	L-7	S1330, E048	······································		
62UB	9/11	344.5	116.2	13.8	93.9	L-7	S1304, E230			·
65U	9/11	333.7	121.8	12.6	98.4	L-7	\$1630, E290			
66U	9/11	334.0	100.1	11.0	80.9	<u>L-7</u>	S1540, E404		···	
67U	9/11	329_8	113.4	10.6	91_6_	L-7	_ S1350, E416			
68U	9/11	326.1	101.9	8.2	82_3	L-7	S1450, E426_			
									·	
								•		
								<del></del>		
0							<del></del>			
Proctor Code	Maximum Density (pr	)	timum ture (%)				Material Type a	and Source		
7	123.8	1	1.5	Clay	from BO	00S #	7, off-site borro	ом pit		
					,			· · · · · · · · · · · · · · · · · · ·		
	<del></del>				•					
							Respectfully su	bmitted,		
emark:	s:S	and-co	ne meth	юd			EMPIRE SOILS	INVESTIGAT	IONS, INC.	
	···					<del></del>				
echnici	an Time:	10:0								
echnicia	an:		s Milla				UALITY CONTROL . ENGINEER	James Milla		



R/T Form C

585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783	-1555	
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY	14075	716-649-8110
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881		
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837	201-225-0	202
1104 DIDGE DD EAST DOCHESTED NV 14621 716 242 622	^	

Proje	ect:N	iagara	Falls	Storag	e Site	#1450	1-115-50-170	Report No.	DT-50		
Clien		echtel	Nation	al, In	c.			Date:	9/15/86		
Cont	ractor:		Sev	enson	1			_ Job No	BT-86-81		
Test No.	Date of Text	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compact <del>io</del> n	Proctor Code	Location and Remarks				
69U	9/15	340.1	102.8	13.0	83.8	*	S1540, E310				
700	9/15	338.7	109.4	14.2	89.2	*	S1620, E102				
							95% required				
								·			
Proctor Code	Maximus Bensity (p	,	otimum sture (%)	1			Material Type and Source				
*	122.6		_	Δν.	erage of		& L-7 as per T				
	122,			7.0	iruge or		u z / us per i	om Leach			
	-										
							Respectfully s	submitted.			
lemark	(s:S	and-con	e metho	odb	·			_S INVESTIGATIO	NS, INC.		
								- 1	•		
echnic	ian Time	:	<u> 15 - 11</u>	:00							
echnic	ian:	James	Handz1	i k				James Handzli	k		
		SI	BSURFACE	XPI OBATIO	N # CONSTRI	ICTION O	HALITY CONTROL - ENGINE	FRING SPECIALTY SERVICES	s		



R/T Form C -----

☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-849-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

Proje				Stora	ige Site		ST, ROCHESTER, NY 14621 501-115-SC-170	716-342-5320 Report No	T DT-51 <u>REVISED</u>
Clien	tB	<u>lechtel</u>	Nation	al, In	ic.			Date:	
Cont	ractor:			-	Sevens	on		Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Cade	Lo	ocation and Re	marks
710	9/17	337.0	120.8	12.1	98.6	*	S <sub>1585</sub> , E <sub>380</sub>		
720	9/17	335.7	117.0	11.3	95.4	*	S1588, E375		
73U	9/17	340.9	116.6	13.8	95.1	*	S1527, E322		
74U	9/17	342.9	119.7	13.6	97.6	*	S1520, E320		
69UA	9/17	340.1	116.7	13.3	95.2	*	S1540, E310		
70UA	9/17	338.7	116.1	15.1	94.7	*	S1620, E102	· · · · · · · · · · · · · · · · · · ·	
							95% required		
									•
	.								
Proctor Code	Maximum Density (p		timum ture (%)	-			Material Type a	nd Source	
*	122.6		-	Aver	rage of	B-1 a	and B-7 as per To	m Leach	
							Respectfully sub	omitted,	\
lemark:	s:	Sand	-cone			<del></del> -	EMPIRE SOILS	INVESTIGATI	ONS, INC.
						<del></del>			
		9:							
echnici	an:	James					J.	ames Millard	

TO CONTRACT THE PROPERTY OF TH



□ 5	85 TROY-S	CHENECTADY	RD., 1	LATHAM,	NY 1	12110	518-783	-1555
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- ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 716-649-8110
- ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Project: Niagara Falls Storage Site #14501-115-SC-170	Report NoDT-52
ClientBechtel National, Inc.	Date:9/18/86
Contractor: Sevenson	Job No. <u>BT-86-81</u>

Cont	ractor:		evensu	11				<b>J</b> OD NO	D1-00-01	
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	In-place Moisture (%)	% Compaction	Proctor Code	95%	Location and Re	emarks	
750	9/18	342.0	97.4	14.8	84.8	*	S1500,	E350		
76U	9/18	335.3	93.6	15.8	76.4	*	\$1536,	E405		
							·			
			-							
			·							
Proctor Code							Mate	rial Type and Source		
*	122.6	-	-	Average of Bl and B7 as per Tom Leach						
			,							

		Respectfully submitted,
Remarks:	Sand-cone method	EMPIRE SOILS INVESTIGATIONS, INC.
Technician Time	7:15 - 10:45	
	James Handzlik	James Handzlik
	SUBSURFACE EXPLORATION  CONSTRUCT	TION QUALITY CONTROL # ENGINEERING SPECIALTY SERVICES



R/T Form C

☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-
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☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ct: <u>N</u>	iagara	Falls	Storag	e Site	#1450	1-115-SC-17	70	Report N	0	DT-53
Clien	t	Becht	el Nat	ional,	Inc.				Date:	9/19/86	
Conti	ractor:		Seven	son					Job No.	BT-86-	-81
Test No.	Date of Test	Dapth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code		Lo	ocation and F	Remarks	
77U	9/19	343.6	104.4	15.4	85.2	*	S1502, E34	15			
78U	9/19	333.0	109.4	14.2	89.2	*	S1625, E38	35			
79U	9/19	332.6	104.7	16.1	85.1	L-9 #	S1285, E40	00			
77UA	9/19	343.6	102.7	16.6	83.8	*	S1502, E34	15		<u></u>	
											·
										.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
										. <del></del>	
Proctor Code	Maximur Density (p		otimum sture (%)				Materia	i Type a	ınd Source		
AAG.	122.6		_	BOOS a	iverage	prod	ctor BOOS #	l and	B00S #7		
B00S #	123.0		. 11.8	B00S #	41 (	L-9)					
	140.0					_:					
		+		• .			Respect	Hully en	bmitted,	, Total Inc. 1981	
Do	Sand	l-cone i	method							TIONS INC	
hemark	.s. <u>Janu</u>		ne riina				. EMPIRE	SOILS	INVESTIGA	110145, 1140	J.
T '		7	•00 0•0	20/4.00	) [.45	<del></del>					
		:7 James			7-5:45		.al,	mes Ha	ndzlik		
Technician: James Handzlik									1142111		<del></del>

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	585 TROY-SCHENECTADY	Pn '	LATHAM	NV	12110	518-783-1555
Ų	585 INUT-SCHENECIAUT	HU.,	LAIMAM,	NI	12110	310-703-1333

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

					1164 RIDGE	RD. EAS	AST, ROCHESTER, NY 14621 716-342-5320
Proje	ct: <u>Nia</u>	igara F	alls_St	orage	Site #1	4501	-115-SC-170 Report NoDT-54
Clien	itB	<u>Bechtel</u>	Nation	nal. In	nc.		Date: 9/24/86
Cont	ractor:		Sevens	son			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	in-place Moisture [%]	% Compaction	Proctor Code	
82U	9/24	lst. Nift	121.9	11.1	97.5	L-26	S1400, E200
					_		
·							
						-	·
						-	
Proctor	Maximur	, ,	otimum				Material Type and Source
<b>Code</b>	Density (p		sture (%)		Da	D:+	
L-20	125.0	- 1	.5		DOTTOW	PIC	SM #1 (Soil material)
						·	
							Respectfully submitted,
lemark	s: <u>S</u> ā	and con	e metho	od	<del></del>		EMPIRE SOILS INVESTIGATIONS, INC.
echnic	ian Time:	2:0	0 - 3:	15			-
echnic	ian:		James	-		ICTION C	James Handzlik  QUALITY CONTROL   ENGINEERING SPECIALTY SERVICES
		SU	BSUHFACE !	EXPLURATIO	IN E CONSTRU	JUTION C	QUALITY CONTROL M ENGINEERING SPECIALTY SERVICES

R/T Form C



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

716-649-8110

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225 

1164 RIDGE RD	. EAST,	ROCHESTER,	NY	14821		716-342-5320
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Proje	ect: Ni	agara 1	Falls S	torage	Site #	14501	-115-SC-170	_ Report No	DT-55	REVISED
Clier	nt	Ве	echtel	Nation	al, Inc			Date:	9/11/86	12/24/86
Cont	ractor:		Se	venson				_ Job No	BT-86-81	
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code	95% required	Location and Re	emarks	
53UB	9/11	329.1	116.4	11.8	94.1	L-7	S1330, E048			
52UB	9/11	344_5_	116:2	15.8	93.9	L-7	S1304, E230			
<u>55U</u>	9/11	333.7	121.8	12.6	98.4	L-7	\$1630, E290			
56U	9/11	334.0	100.1	11.0	8 <u>0.9</u>	L-7	S1540, E404			
ا ــ67U ــ	67U 9/11 329.8 113.4 10.6 91.6 L-7 \$1350.						S1350, E416	····		
58U	9/11	326.1	101.9	8.2	82_3	L-7	S1450, E426	·····		
								·		<u>.</u>
Proctor	Maximun	1 Op	timum				·	· · · · · · · · · · · · · · · · · · ·		
Code	Density (pr	ct) Mois	ture (%)			<del></del>	Material Typ	e and Source		
L-7	123.8	11	.5	Clay	from B	00S #	7, off-site bo	rrow pit		
									<del></del>	
							Respectfully	submitted,		
Remark	s:	Sand-c	one		· · · · · · · · · · · · · · · · · · ·		EMPIRE SOI	LS INVESTIGATI	ONS, INC.	
<del></del>	<del></del>		0.00	2.00						
			0:00 -		<del></del>	<del></del>				
echnici	an:		S Milla BSURFACE E		N # CONSTRU	CTION O	James 1	fillard  EERING SPECIALTY SERVICE		<del></del>



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555	
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075	716-649-811
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881	

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

1164 RIDGE	RD.	EAST,	ROCHESTER, N	IY 14621	716-342-5320

Proje	ect: N	iagara	Falls S	Storage	Site #	1450	1-115-SC-170	Report No	DT-56 REVISED
Clier	nt	Bechte	l Natio	nal,	Date:	9/17/86			
Cont	ractor:	S	evenson	1				Job No	BT-86-81
Test No.	Date of Test	Bepth or Elevation	in-place Density (pcl)	in-pizce Moisture [%]	% Compaction	Proctor Code	L	ocation and R	<del></del>
710	9/17	337.0	120.8	12.1	98.6	*	S1585, E380		
72U	9/17	335.7	117.0	11.3	95.4	*	S1588, E375		
73U	9/17	340.9	116.6	13.8	95.1	*	S1527, E322		
74U	74U 9/17 342.9 119.7 13.6 97.6 * \$1520, E320								
69UA	9/17	340.1	116.7	13.3	95.2	*	S1540, E310		
70UA	9/17	338.7	116.1	15.1	94.7	*	S1620, E102		
							95% required		
								·	
	٠								
									1,
Proctor Code	Maximum Density (pr		limum lure (%)			<u> </u>	Material Type a	and Source	
*	122.6		_	Ave	erage of	F K-1	& B-7 as per To	m Leach	
						, <u></u>	· · · · · · · · · · · · · · · · · · ·		
							5		
<b>7</b> 1		Sand	d-cone	method	i		Respectfully su		
nemark	s:				<del></del>	<del></del>	EMPIRE SOILS	SINVESTIGAT	IONS, INC.
		9:15-	- 12.00		<del> </del>				
echnici	an:	lames M	rilard				James M	illard	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555 ☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881 ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proj	ect: <u> </u>	liagara	<u>Falls</u>	Storag	<u>e Site</u>	#1450	)1-115-S	<u>C-170</u>	Report No.	DT-57
Clie	nt	Be	chtel N	<u>lationa</u>	1, Inc.				Date:	9/22/86
Con	tractor:		Sevens	on			· ·	·	Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	In-place Moisture (%)	1			Location and Ren	narks	
79UA	9/22	332.6	112.1	16.1	91.1	L-9	S1285,	E400	· — — — — — — — — — — — — — — — — — — —	
810	9/22	341.1	120.8	14.3	96.9		S1198,	E254		
77UB	9/22	343.6	114.6	14.6	94.5	<del>*-2</del> 8	\$1502,	E345		
78UA	9/22	333.0	119.4	15.2	97.4	*	S1625,	E385		
79UB	9/22	332.6	117.8	16.7	95.8	L-9	\$1285,	E400		
							···			
	,					• ]		·		
								- <del></del>		
					-			············	· · · · · · · · · · · · · · · · · · ·	
								·	· · · · · · · · · · · · · · · · · · ·	
Proctor Code	Maximum Density (pr	r	timum ture (%)				Mat	erial Typ	e and Source	
L-9	123.0		11.9	B00S #	l, clay	ey s	ilt, som	e sand	, trace gravel	
L-30	124.7		12.0	Clay w	uith sil	t, tr	ace sar	ıd, Sou	th Trench	
L-28 121.3 14.0 BOOS #8  * 122.6 BOOS Average Proctor										
*	122.6			submitted,						
Remark	s: San	d-cone	method						LS INVESTIGATIO	NIS INIC
							<b>2.</b> 7711	001	LO MILO MUATIO	110, 1110.
Technic	ian Time:	7:00-	10:00/3	:15-4:	45					-
	ian:						Ja	mes Hai	ndzlik	
		. –			CONSTRU		<u></u> _			<del></del>



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

							ST, ROCHES		1 716-342-5320	-0202
Proj	ect: <u>Ni</u>	agara	Falls (	Constru	ction P	rojec	t #1450	1-115-S	2- Report No.	DT-58
	nt									9/25/86
Con	tractor:		Sevenso	n .			·		_ Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code			Location and Rem	
<del>-83U</del>	9/25	lst.	119 7	16-1	95.8	1-26	<del>\$1325</del> ,	F280		
840		6"belo	W				S1200,			
		lst.			Ü					
<del>85U</del>	9/25	LITE	120.8	14.9	90.0	L-20	<del>\$1600,</del>	LIUU		<del></del>
	-									
								-	·	
										1510
										1
								-		
Proctor Code	Maximum Density (p	- P	timum ture (%)	<u> </u>			Mat	erial Type	and Source	
L-26	125.0		11.5	BOOS E	Borrow P	it, S	SM#1(soi	1 mater	ial)	
L-30	124,7		12.0	Trace	clay, s	ilt,	and san	d, Sout	h trench	
						•	Resp	ectfully s	submitted,	
lemari	ks: <u>San</u>	id-cone	method	l					.S INVESTIGATIO	NS, INC.
	·							-		
echnic	ian Time:	2:30 -	<u>- 4:30</u>							
echnic	ian:	James	s Handz	lik				James	Handzlik	



585 TROY-SC	HENECTADY	RD., LA	THAM, NY	12110	518-783-1555	

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

								DRIVE, EDISC TER, NY 1462	DN, NJ 08837 201-225 1 716-342-5320	5-0202	
Proj	ect: Ni	agara	Falls (	Constru	ction F	rojec	t Site		Report No.	DT-59	
Clie	nt	Bechte Bechte	1 Natio	onal, I	nc.				_ Date:9	/26/86	
Con	tractor:		Sevenso	n					_ Job No	BT-86-81	
Test No.	Date of Test	Depth or Elevation	, ,	in-place Moisture (%)		Proctor Code			Location and Rer	marks ·	_
860	9/26	342.9	111.4	8.4	89.2	L-31	<del>\$1040</del> ,	E229			
<del>87</del> U	9/26		118.3	13.4	94.7	L-31	<del>\$1004,</del>	E408			
<del>88U</del>	9/26	lst. Lift	117.1	14.8	93.7	L-26	<del>\$1500,</del>	E260			
<del>89U</del>	9/26		122.7	11.1	98.2	L-26	\$1620,	E280			
	·										
	٥								·		
							<u> </u>				
Proctor Code	Maximun Density (p		itimum sture (%)	<del></del>		<u>- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1-</u>	Mat	erial Type	and Source		_
L-26	125.0		11.5	B00S	Borrow	Pit,	Soil ma	iterial,	SM#1		
L-31	124.9		12.0					Trench			
							Res	pectfully s	submitted,		
Remari	ks:	Sand-	cone m	ethod				·	S INVESTIGATIO	ONS. INC.	
	-77									•	
Technic	ian Time:	1:1	5 - 3:0	00							
	ian. J							James	Handzlik		



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-849-8110 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

1164 RIDGE	RD. EAST,	ROCHESTER,	NY 14621	718-342-5320

•							1-115-SC-170 Report No. DT-60
Clier	nt	Becn			inc.		Date: 10/6/86
Cont	ractor:		Sever	ison			Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
<del>93</del> U	10/6	2nd. Lift	121.2	11.2	96.9	SM-1	<del>\$1520,</del> E376
94U	10/6		119.7	10.6	95.8	SM-1	\$1400, E360
							85% required
·							
-							
							·
octor ode	Maximum Density (pc		timum ture (%)	<del></del> 1	<del></del>		Material Type and Source
M-1	125.0		1.5	Soil	materia	al fro	om BOOS property
							Respectfully submitted,
mark	s:Sa	nd-cone	<u> </u>				EMPIRE SOILS INVESTIGATIONS, INC.
		0.00					
	an Time:		- 3:30				
hnici	an:		James M				James Millard  UALITY CONTROL ■ ENGINEERING SPECIALTY SERVICES



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

716-649-8110

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-22: 201-225-0202

					1164 RIDGE	RD. EAS	ST, ROCHESTER, NY 14621 716-342-5320
Proje	ect: Ni	agara f	alls S	torage	Site #	14501	-115-SC-170 Report No. DT-61
							Date:10/2/86
Cont	ractor:		Seven	son			Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density	In-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks
90U	10/2	28"bel	ow e110.8	14.7	86.6	L-29	S880, E200, 95% required
B6UA	10/2	324.9	111.6	13.6	89.4		S1040, E229,
910	10/2	328.6	105.5	15.6	84.4	L-26 E-36	S1497, E424
90UA	10/2	28"bel surfac	ow e 119.7	15.0	93.5	L-29	See above, 95% required, 85% required
							unless otherwise noted, speedy meter used for
							moistures.
92U	10/2	12"bel surfac		15.3	88.6	* 7:31	S1040, E230, (1984 clay)
							Tests #86UA and 90U are in the Geotech trenches
							for hydro-group
Proctor Code	Maximu Density (j		ptimum sture (%)		<del></del>		Material Type and Source
L-29	128.0		10.2	Cla	y, trace	e sil	t and sand, North trench
L-31	124.9		12.0	Cla	y, trace	e Sil	t, Middle trench
L <b>-</b> 26	125.0		11.5	B00:	S SM#1		
							Respectfully submitted,
Remar	ks:	Sand-co	ne met	hod	<u>.,.</u>		EMPIRE SOILS INVESTIGATIONS, INC.
Technic	cian Time	7:00 :	7 - 2:15	D			
Technic	cian:	James M	<u>lillard</u>		<del> </del>		James Millard

SUBSURFACE EXPLORATION - CONSTRUCTION QUALITY CONTROL - ENGINEERING SPECIALTY SERVICES



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

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RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

					1164 HIDGE	HD. EAS	51, ROCHESTER, NY 14621	/16-342-5320				
Proje	ect: N	liagara	Falls	Storag	e Site	#1450	1-115-SC-170	Report No.	DT-62			
Clien	nt	,,	Ве	chtel	Nationa	1, / I	nc.	Date:	10/7/86			
Cont	ractor:		Se	venson				Job No				
Test No.	Date of Test	Depth or Elevation	in-place Density (pcl)	In-place Moisture [%]	% Compaction	Practor Code	Lo	ocation and Rem	narks			
-95U	10/7	322.7	112.3	15.1	89.8	± <del>-</del> 26	S1450, E440(85%	required)				
-96U	10/7	329.4	110.2	<del>-14-3</del>	88.2	- <del>L</del> -26	S1364, E420 (85%	% required)				
97U	10/7	326.5	111.7	13.0			S1665, E300(85%	required)				
<del>98</del> U	10/7	24"bel grade		15.6	84.5	L-29 L-1	<del>588</del> 0, F165(95% r	required)				
							· · · · · · · · · · · · · · · · · · ·					
Proctor Code	Maximun Density (p		timum ture (%)				Material Type a	nd Source				
-26	125.0		11.5	B00S	SM-1 (So	il ma	iterial) Borrow P	it QV 41				
-26 29 -7	9 1 128.0 10.2 1984 Clay(trench material)					material) S880						
				<del></del>				······				
							Respectfully sub	bmitted,				
lemark	(s:S	and cor	<u>ne meth</u>	od			EMPIRE SOILS	INVESTIGATIO	NS, INC.			
				- 20								
echnic	ian Time:		30 - 6									
echnici	chnician:James HandzlikJames Handzlik											



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-7	83-1555	
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, N	Y 14075	716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073

RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

				0	1184 RIDGE	RD. EAS	ST, ROCHESTER, NY 14821	716-342-5320		
Proje	ct: Ni	agara f	alls S	torage	Site #	14501	-115-SC-170	Report No.	DT-63	
Clien	t Be	chtel N	<u>Nationa</u>	1, Inc				Date:1	0/10/86	
Cont	ractór:		lydro G	roup		·		Job No.	BT-86-81	
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture [%]		Proctor Code	Lo	cation and Rem	narks	
3.00	10/10	18"bel	ow 220 4	72.5	06.3	L-29	5000 F100			
	10/10	20"bel	ow			L-31	S880, E190			
100UA	10/10	grade	109.1	17.1	87.3	<del>L-2</del>	S969, E432(retes	t)		
					-					
									•	
								<del></del>		
						_				
				_						
Proctor Code	Maximur Density (p		ptimum sture (%)				Material Type ar	nd Source		
L-31	124.9	1	2.0	Midd	le tren	 ch(S1	040) 1984 clay			
L-29			0.2							
1	128.0		0.2	North trench, S880, 1984 clay						
1										
							Respectfully sub	omitted,	•	
Remarl	ks: <u>Sand</u>	d-cone	method			<del></del>	EMPIRE SOILS	INVESTIGATIO	DNS, INC.	
		٠. ٠	10 10	•00		-	-			
Technic	ian Time						- Caul Dagat	i lu		
Technic	ian:	Udri	Rosat	ı, ur.			Carl Rosat	i, dr.		



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-78	3-1555	
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY	14075	716-649-8110
105 CORONA AVENUE, GROTON, NY 13073 607-898-5881		
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837	201-225-02	202

☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 2 ☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ect: <u>N</u>	iagara	Falls	Storag	e Site	<u>#1450</u>	1-115-SC-170	Report No	DT-64	REVISED 12/24/86
Clien	ıt	Вес	htel N	<u>ationa</u>	l. Inc.			Date:10/8/8	86	
Cont	ractor:	Hyd	lro-Gro	ир				Job NoBI-	86-81	
Test No.	Date of Test	Bepth or Elevation	in-place Denzity (pcf)	in-place Moisture (%)				Location and Remark	ks	
990	10/8	18" Down	99.3	20.0+	79.5	4-31	S1040, E130		<del></del>	
1000	10/8	20" Down	112.5	15.8	90.1	L-31 *	S969, E432	•		
							95% required		·	
							<u> </u>			
							· · · · · · · · · · · · · · · · · · ·			- · · · · · · · · · · · · · · · · · · ·
							·			
									<u> </u>	
Proctor Code	Maximu Density (p		timum sture (%)				Material Typ	e and Source		· · · · · · · · · · · · · · · · · · ·
<u>1*31</u>	124.9		12.0	1984	Clay a	s per	G.G.W.	·····		
	<del></del> -		-	<del></del>	<u>-</u>				<del></del>	· · · · · · · · · · · · · · · · · · ·
								<del></del>		
							Respectfully	submitted,		
Remark	ıs: Sa	ind-cone	2				EMPIRE SO	ILS INVESTIGATIONS	S, INC.	
Technic	ian Time	. 12:00	) - 1:1	5						
rechnic			Milla	rd				James Millard		



585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555
S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
105 CORONA AVENUE, GROTON, NY.13073 607-898-5881
RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202
1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

					110411000	110. EA	31, NOONESTEN, NT 14021	1100-12 0020	
Proje	ct:	Niagar	a Fall	s Stor	age Sit	e #14	501-115-SC-170	Report No.	DT-65
Clien	t	Bechtel	Natio	nal, I	nc.			Date:10/9	/86
Contr	actor:		Hydro-	Group				Job No	BT-86-81
Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	in-place Moisture [%]	% Compaction			cation and Rema	
98UA	10/9	24" Down	120.2	14.8	93.9	L-29 5	S880, E165		
1010	10/9	11	123.7	10.8	96.7	L-29 <del>5</del>	S880, E255		
,									
									٠.
Proctor Code	Maximus Density (p		otimum sture (%)				Material Type ar	nd Source	
L-29	128.0		0.2	Clay p	roctor	from	1984 material, as	per B.N.I.	
							Respectfully sub	mitted	
emark	.s. S	and-co	ne						NE INC
CIIIAIK							EMPIRE SOILS	INVESTIGATIO	43, INC.
		:10	:15 - 1	2:00			-		
		James					James Milla	and	
ecnnic	ian:	ounies.	- TITTAL	<u>u</u>				LI U	



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110
☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881
☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837 201-225-0202

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ct: _N	iagara	Falls	Storag	e Site	#1450	1-115-SC-170 Report No. <u>DT-66</u>
Clien	tB	echtel	Nation	al, In	c.		Date:10/23/86
Cont	ractor:	Se	evenson				Job NoBT-86-81
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks
-118U	10/23	top of dike		14.8	96.8	1	Pond 3, N.E. corner repair - WASTE COUT: AKEA
1190	10/23	T2"be grade		15.2	73.3	Ŀ26	S1550, E440
	i						
		<u></u>					
					-		
Proctor Code	Maximun Density (p		otimum sture (%)				Material Type and Source
1	124.0	-		B.N.I.	. On-sit	te mai	terial
له-26 ڪ	125.0	11	.5	B0 <b>0</b> S	SM-1		
	<del></del> -						
							Respectfully submitted,
Remark	(s:N	uclear	method	l used.			EMPIRE SOILS INVESTIGATIONS, INC.
[echnic			15 - 5:				
							Carl Rosati, Jr.



☐ 585 TROY-SCHENECTADY RD., LATHAM, NY 12110 518-783-1555

☐ S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110 ☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881

201-225-0202 ☐ RARITAN CENTER, 300 McGAW DRIVE, EDISON, NJ 08837

☐ 1164 RIDGE RD. EAST, ROCHESTER, NY 14621 716-342-5320

Proje	ect: Ni	agara l	Falls S	torage	Site#	14501		EVISED 2/24/86		
Clier	nt <u>Be</u>	chtel I	lationa	l, Inc	•		Date:10/17/86			
Cont	ractor:		Sevenso	n_			Job No. <u>BT-86-81</u>			
Test No.	Date of Test	Depth or Elevation	In-place Density (pci)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks			
1 <del>06U</del>	10/17	329.3	110.6	13.9	88.4	SM-1	<del>  S1612, E042, S</del> evenson-Contractor (85%)			
1070	10/17	337.8	116.0	11.6	97.4	B <b>-</b> 5	S1485, E141, Hydro-Group 95%			
108U	10/17	328,9	! 107.4	14.1	85.9	SM-1	\$1575, E426, Sevenson, 85%			
<del>109U</del>	10/17	32 <u>6.3</u>	106.7	12.7	85.3	SM-1	S1680, E422, Sevenson, 85%			
							Speedy used for moistures			
			i							
								<u>-</u>		
				_						
			_					· · ·		
			_					<del> </del>		
								<u>-</u> -		
Proctor Code	Maximum Density (po		timum ture (%)		_ ·		Material Type and Source			
SM-1	125.	0 -	11.5	Soil	materia	l off	f-site pit			
B-5	119.	0 1	14.6	(QV-3	5) B00S	#5,	off-site clay			
							Respectfully submitted,			
Remark	s:Sa	nd-cone	2			<del></del>	EMPIRE SOILS INVESTIGATIONS, INC.			
	·	10.	:00 - 1	2 • 00						
	ian Time:	<del></del>	<del></del>							
Technic	ian:	<u>James M</u>	<u>lillard</u>			`	James_Millard			



A/T Form C

585 TROY-SCHENECTADY RD., LATHAM, NY 12110	518-783-1555

S-5167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716-649-8110

☐ 105 CORONA AVENUE, GROTON, NY 13073 607-898-5881☐ RARITAN CENTER. 300 McGAW DRIVE, EDISON, NJ 08837

				= 0	1164 RIDGE	RD. EA	ST, ROCHESTER, NY 14621 716-342-5320
•						<u>4501-</u>	115-SC-170 Report No. DT-68 REVISED 12/24/86
			lationa		•		Date: 10/21/86
Cont	ractor:		Sevenso	n		<del></del>	Job No. <u>BT-86-81</u>
Test No.	Date of Test	Depth or Elevation	in-place Density (pcf)	in-place Moisture [%]	% Compaction	Proctor Code	Location and Remarks
1100	10/21	final grade	100.7	10.1	86.1	10-	<del>\$1300, E3</del> 50
1110	10/21	1	103.1	12.9	88.2		<del>- S1400, E420, E. Slop</del> e
<del>112U</del>	10/21		оw <del>e]]0.5</del>	12.0	86.3	1:29	S802, E420
<del>113U</del>	10/21	final grade	100.7	12.6	86.1	10	-\$1600, E376-
<del>114U</del>	10/21	11	100.5	12.1	85.9	10	S1380, E150
<del>115</del> 0	10/21	n	105.5	12.4	90.2	10	S1480, E120(Tire tracks)
<del>116</del> U	10/21	41	103.6	13.5	88.6	10	<del>\$1430, E029, W. slop</del> e
<del>117</del> 0	10/21	11	102.9	13.9	87.9	10	\$1550, E245, S. slope
						_	required compaction between 85% and 90%
						-	unless otherwise noted
Proctor Code	Maximus Density (p	. (	ptimum sture (%)				Material Type and Source
10	117.0		12.8	Parat	t-Wolff	Proc	tor for topsoil
绍	128.0		10.2	1984	Clay(pr	octor	by Empire) from North trench
							Respectfully submitted,
Remark	s:9	:30 -	12:30		-		EMPIRE SOILS INVESTIGATIONS, INC.
							· · · · · · · · · · · · · · · · · · ·
Technic	ian Time						
	ian:	,	ames Mi				James Millard
			JBSURFACE E	EXPLORATION	N E CONSTR	JCTION C	UALITY CONTROL ■ ENGINEERING SPECIALTY SERVICES

APPENDIX 5-C

PROCTOR TEST RESULTS

COMPACTION							
TEST REPORT							
TEST REPORT	-						
STANDARD - MODIFIE	122						
METHOD A S B		118					
C D D		P.C.F.					
MAXIMUM DRY DENSIT	Y	DENSITY					
OPTIMUM MOISTURE CON 12.3 %	TENT	) 110 H					
PERFORMED IN ACCORDANCE	EIMITH						
_	ł	10/					
ASTM D 1557		106					
•							
				++++++	<u> </u>	20	1-1-1-1-1-1-1
			WATER (	CONTENT,	% OF DRY	WEIGHT	
SAMPLE NO.		2	3	4			
MOLD + SAMPLE WT.	13.79	13.91	13.97	13.68		-	
MOLD WEIGHT	9.47	9.47	9.47	9.47			
WET SAMPLE WT.	4.32	4.44	4.50	4.21			
WET DENSITY, P.C.F.	129.6	133.2	135.0	1263			
MOISTURE CONTENT	9.9	11.5	13.4	19.0			
DRY DENSITY, P.C.F.	117.9	119.5	119.0	106.1			
SOIL LOCATION			·	<u> </u>			
Sampl	e UUL	<i>iU</i>				*	
Unconte				DATE 10985 TESTED BY RGC			
Clay -	_			CHECKED BY DPBlasland			
	- · · · ·			JOB NO L-85042			
CLIENT Bechlel		,		REPORT NO. UUUU			
PROJECT Niagara						parrat	t
-Lew	iston, A	V.Y.		wolffine			
Subcontract	14501.	7 - 1/5-5C - 129  FISHER RD., EAST SYRACUSE, N.Y. 13057 TELEPHONE AREA CODE 315/437-1429					
	77307	775 -50	-/2 /	<u> </u>	ELEPHONE AREA	315/47/14	

#### COMPACTION **TEST REPORT** MODIFIED X STANDARD METHOD A X B C .. D ! ' MAXIMUM DRY DENSITY 1184 P.C.F. OPTIMUM MOISTURE CONTENT 11.4 PERFORMED IN ACCORDANCE WITH ASTM D-1557 WATER CONTENT, % OF DRY WEIGHT SAMPLE NO. MOLD + SAMPLE WT. 14.38 14.53 14.45 14.13 10.12 10.12 MOLD WEIGHT 10.12 10.12 4.33 WET SAMPLE WT. 4.01 4.26 4.41 WET DENSITY, P.C.F. 120.3 127.8 132.3 129.9 MOISTURE CONTENT 9.6 13.9 7.2 17.5 DRY DENSITY, P.C.F. 116.6 116.2 112.2 110.6

SOIL LOCATION Uncontaminated

Topsoil

Sampled from Stockpile

North of Pond #4

DATE 11/6/85 TESTED BY RGC

CHECKED BY D.P. Blasland

JOB NO. L-85042

REPORT NO. EEEEE

PROJECT Niagara Falls Storage Site

Lewiston, New York

Subcontract 14501-115-5C-129



FISHER RD., EAST SYRACUSE, N.Y. 13057 TELEPHONE AREA CODE 315/437-1429

# COMPACTION TEST REPORT

STANDARD

MODIFIED X

METHOD A X

В

C : : D . :

MAXIMUM DRY DENSITY

(17.0 P.C.F.

OPTIMUM MOISTURE CONTENT
12.8 %

PERFORMED IN ACCORDANCE WITH

ASTM .D-1557 ....

						_			
	120								
u.	(16								
DRY DENSITY, P.C.F	112					7			
DRY	801					-			
	104					**************************************			
	8 12 16 20 WATER CONTENT, % OF DRY WEIGHT								

SAMPLE NO.	1	2	3	4	Ţ	
MOLD + SAMPLE WT.	14.15	14.34	14.54	14.28		
MOLD WEIGHT	10.13	10.13	10.13			
WET SAMPLE WT.	4.02	4.21	4.41	4.15		
WET DENSITY, P.C.F.	120.6	126.3	132.3	124.5		
MOISTURE CONTENT	9.2	10.7	13.7	18.8		
DRY DENSITY, P.C.F.	110.4	114.1	116.4	104.8		
			i		 ļ	

SOIL LOCATION Uncontaminated

Topsoul

From Stockpile West of Fond #5

CLIENT Bechtel National, Inc.

PHOJECT Niagana Falls Storage Site

Lewiston, New York

Subcontract 14501-115-50-129

CHECKED BY D.P. Blasland

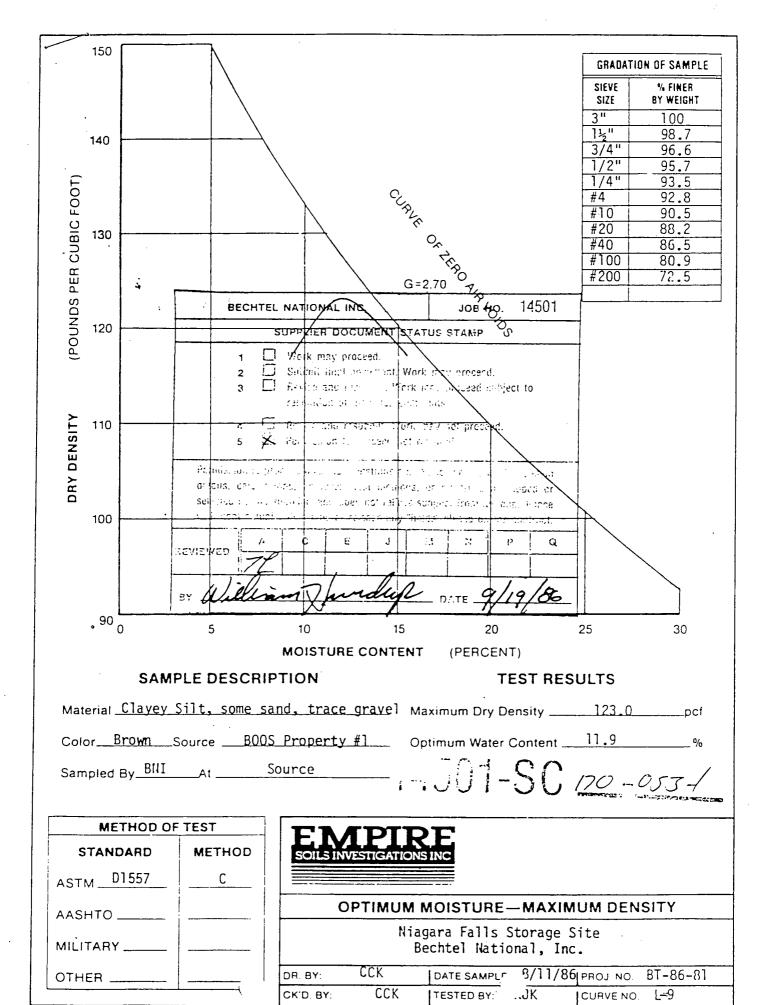
JOB NO. 1-85042

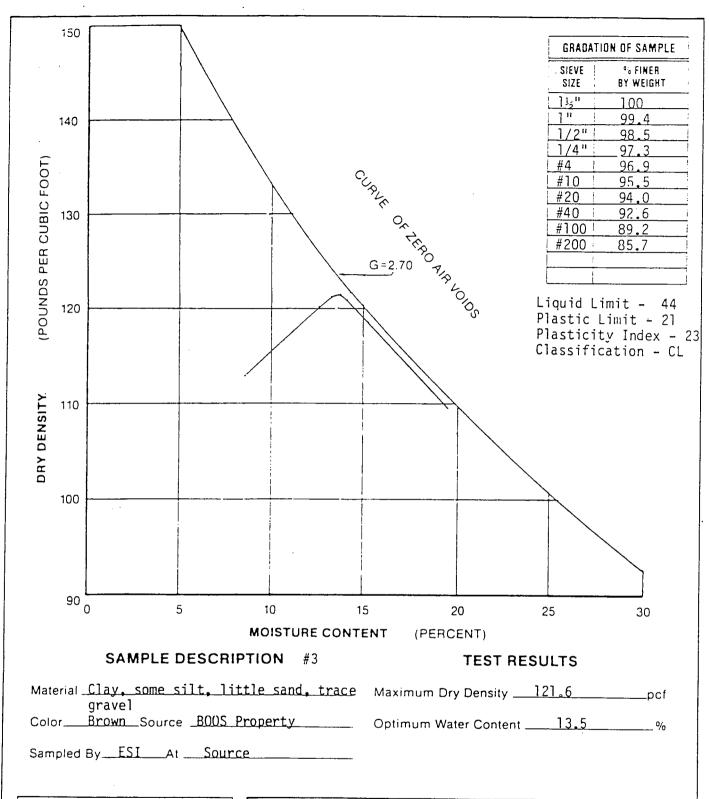
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FISHER RD . EAST SYRACUSE, N.Y. 13057 TELEPHONE AREA CODE 315/437-1429

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00				\	//	/		C/81								7
BICE	130				$\rightarrow$	7	7	16	, O							7
(POUNDS PER CUBIC FOOT)						//		G=2.	80 75 2.70 = 2.60	_						1
PER							//-	G=	2.70 <sup>^</sup> C	7/S						_
NDS	100						7	1/2	2.60	12	0,					_
POU	120	· Karaba	ВЕСН	TEL NATIO	DNAL	NC.		X/	OB NO.	1.4	501	7	-			
							NT STAT	1 1	12 6	. 14	501	-				
			1 2	☐ Work	may g	rocced.			1	7	_	1				
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DRY DENSITY			4	resident Parties	ror. or and re	Hidaaji Suhais	er sei . Work	ւսեն. `								
BY I			5	.s. : .s.	and to	#160/191	e work <sub>di</sub> . Cast wit	हर्म ( <u>e) )</u> च उत्तर	preoz <b>y</b> d.							
	100	Permi.	Lime );	გაგინგუ <u>ქტ</u>			- · ·	1-1-1	0.000	7						
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				al constant	S C1 15		117 10000	7 P18.598	d en liic <del></del>	osner .	cı.					
		REVIEWED	1/2	7			[.1	14	F	,	Q				$\supseteq$	
	90 (	W	ille	am	NO.	STUP	RECON	15 TENT	9/19	7/24	(IVE		25		30	
		SAMP	LE D	ESCRIF			, ——				TES	T RES	ULTS			
Mat	erial <u>(</u>	Clayey S	ilt.	contami	nated	i mat	erial	_ M	aximun	n Dry	Densi	ty1	13.0		pcf	
ſ	•	<u>rown</u> s					<del></del>	- ÓI	ptimum	n Wate	er Con	itent _	3.5	<u>,</u>	%	
Sam	npled	ву	At .	No	rth p	ond	<del></del>	÷			•	レタ	131	7		
											8	3-3			-	
	ME	THOD OF	TEST		F	7:	ЛP	TE	F				/	6-	86	7
ł I	STANI		ME.	THOD	SC	OILS II	VESTIC	ATION	SINC				6-1	•	/	/
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AAS	нто.						OPTIN						IUM DE	ENSI	ry/	
MILI	ITARY								gara F echtel							
ОТН	ER _				DR.		CCK		DATE	SAMP	<u> </u>		PROJ. N		36-81 -8	





METHOD OF	TEST
STANDARD	METHOD
ASTM <u>D1557</u>	A
AASHTO	
MILITARY	
OTHER	

CK'D BY

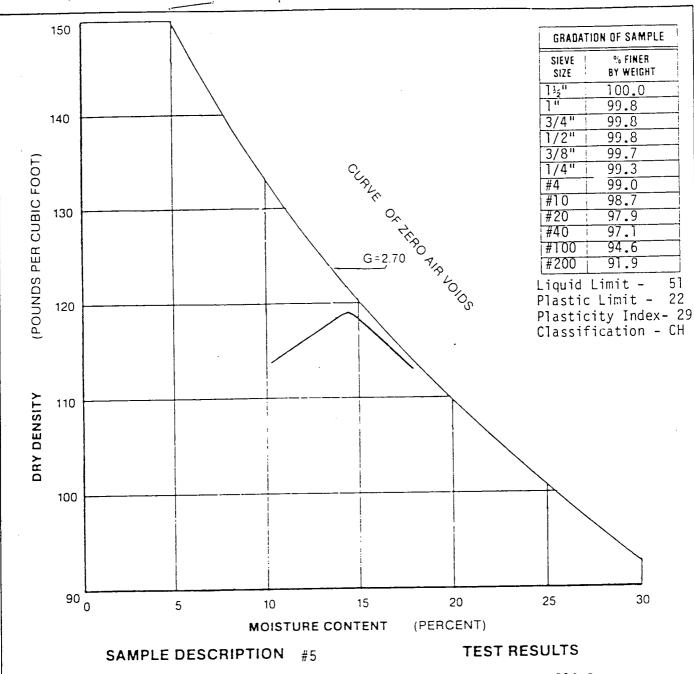
CCK

EMPIRE SOILS INVESTIGATIONS INC						
	OPTIM	JM MOISTURE—MAXIMUM DENSITY				
	Niagara	Falls Storage Site #14501-115-SC-170 Bechtel National, Inc.				
DR BY	PJA	DATE SAMPLED. 8/12/86 PROJ NO. BT-86-81				

TESTED BYPR & RK

CURVE NO.

L-15



Material Silty Clay, trace sand, trace gravel	Maximum Dry Density	119.0	pcf
ColorBrownSourceBOOS Property	Optimum Water Content	14.6	%
Sampled By Client At Center West at-1' to -	3'		

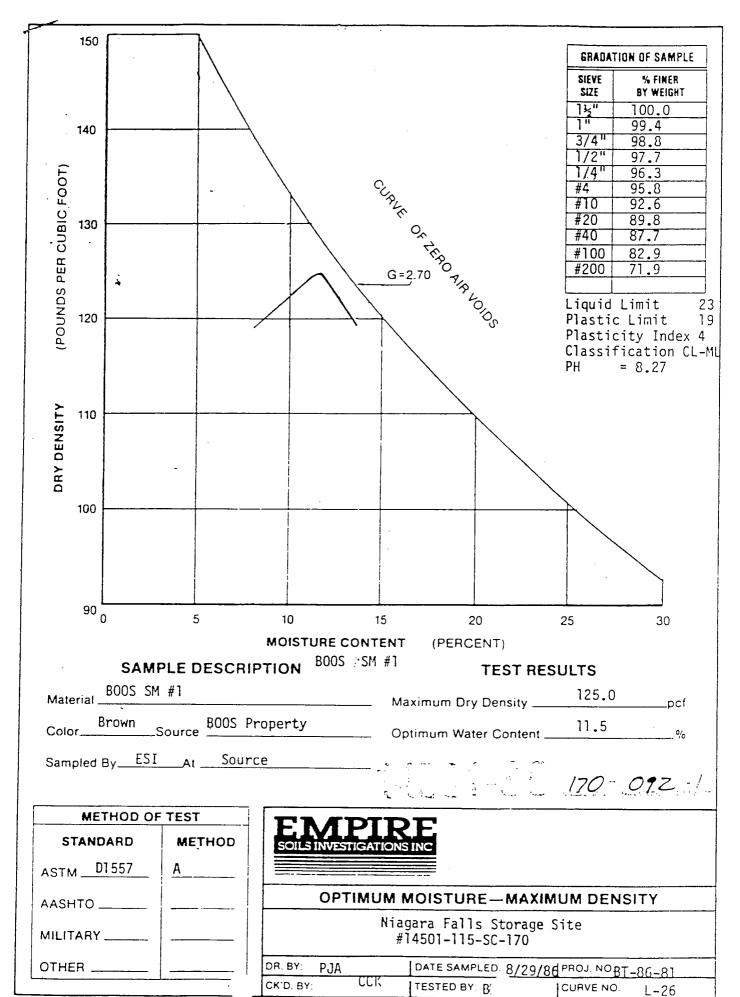
METHOD OF TEST						
STANDARD	METHOD					
ASTM	A					
AASHTO	! 					
MILITARY						
OTHER						

EMPIRE SOILS INVESTIGATIONS INC.

# OPTIMUM MOISTURE—MAXIMUM DENSITY

Niagara Falls Storage Site #14501-115-SC-170 Bechtel National, Inc.

DR. BY. PJA	DATE SAMPLET 8/15/86   PROJ NO BT-86-81	
CK'D BY CCK	TESTED BY: PS & MC   CURVE NO. L-17	



QV 41 & QV52

**D0T** 

OS P:

DEN

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11

GRADATION OF SAMPLE SIEVE % FINER SIZE BY WEIGHT 100 98.7 97.0 96.3 3/4" 1/2" 95.6 1/4" 94.0 #4 93.5 #10 92.4 #20 89.8 #40 88.3 #100 ; 84.0 #200 79.2

Liquid Limit 34 Plastic Limit 19 Plasticity Index 15 Classification CL. 8.3

30

Color Brown Source On site BNI stockpile Optimum Water Content 11.7

DR BY	PJA	DATE SAMPLED 8/	12/86  PROJ NOBT-	-86-81
CK.D BA	CCK	TESTED BY	CURVE NO	L-27



# CONSTANT HEAD PERMEABILITY TESTING WITH BACKPRESSURE SATURATION DESCRIPTION OF TEST PROCEDURE

#### I. DESCRIPTION OF TEST APP/RATUS

The permeability test is performed in a triaxial cell, where the test specimen is enclosed in a latex rubber membrane, sealed at base and cap with rubber 0-rings. Filter paper, porous stones, and drainage leads facilitate the application of hydrostatic pressure to both ends of the specimen.

Pressure is generated by self-compensating mercury columns capable of delivering pressures up to about 140 pounds per square inch. Three mercury columns are used. One provides a backpressure to ensure saturation of the test specimen. The second column is set at a higher pressure to produce a hydrostatic gradient across the length of the specimen. The third column provides the cell confining pressure, which acts on the rubber membrane to prevent passage of water up along the sides of the specimen.

Water flow to and from the specimen is measured by means of volume change units with graduated burettes containing contrasting colored fluid to facilitate reading of the interface meniscus. Burettes of various sizes are on hand with graduations ranging from 0.05 to 0.2 cubic centimeter.

#### II. SPECIMEN PREPARATION

#### A. Undisturbed Specimens

Undisturbed specimens usually are prepared from 3 inch outside diameter thin wall tube samples. A section of tube sample approximately 5 to 6 inches long is extruded from the tube. The specimen ends are carefully trimmed in a miter box so that they are plane and square with the longitudinal axis of the specimen. Length and diameter is measured by calipers. Two sets of measurements are made at 90° spacing. The diameter is measured near each end of the specimen. The average of the measured dimensions are computed and recorded on the test form.

#### B. Compacted Specimens

Compacted specimens are generally remolded in a 4 inch diameter compaction mold. Unless otherwise specified\*the specimen is compacted to about 95 percent of maximum dry density, as determined by the Standard Moisture-Density test (ASTM Designation D 698-70, Methods A or C), at a moisture content corresponding to 95 percent compaction on the wet side of the optimum moisture content. Maximum particle size permitted for this specimen size is three-quarter inch.

The specimen is weighed to verify that its density is reasonably close to the intended value, is carefully extruded from the compaction mold and the surface is examined for excessive pitting or other signs of poor compaction before placement in the triaxial cell.

<sup>\*</sup>See Section 6.2 of the main report for compaction criteria.

#### III. TEST PROCEDURE

After the apparatus is assembled, and the triaxial cell is filled with deaired water, cell pressure and backpressure is gradually applied until the preset pressure levels on the self-compensating mercury columns are reached.

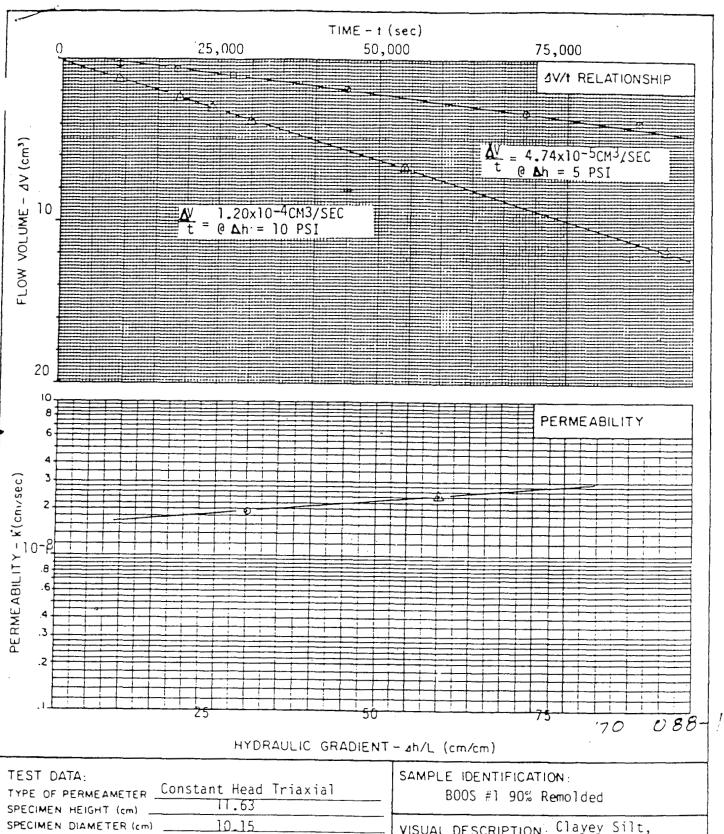
The test is conducted in two separate stages. the first stage a uniform backpressure is applied to both ends while the specimen is saturating and adjusting to the net confining pressure (the difference between the total cell pressure and the backpressure). Routinely, on specimens initially close to saturation, a backpressure of 50 pounds per square inch is used. Compacted specimens generally require a backpressure of 80 pounds per square inch for complete saturation. For undisturbed specimens the cell pressure generally is selected to duplicate the existing overburden pressure at the sample location, thus minimizing consolidation effects. Unless other considerations govern, the net confining pressure is selected so that it is at least 5 pounds per square inch greater than the highest gradient pressure to be used during the permeability test stage. It must be ascertained that all flow due to saturation and consolidation has ceased before the permeability test stage is initiated. With the range of pressures utilized this usually is accomplished within a 16 to 24 hour pressurization period.

In the second stage of the test a hydrostatic gradient is established across the length of the sample by increasing the pressure at the base of the specimen while maintaining the backpressure at the top. The rate of flow

through the specimen is determined by burette readings, at timed intervals, on a volume change unit inserted in the gradient pressure line. The flow rate is routinely determined for two different gradient pressures. For fairly impervious soils gradient pressures 5 and 10 pounds per square inch higher than the backpressure generally are applied. Gradient pressures on the order of 1 to 2 pounds per square inch are used for more pervious materials. At each gradient pressure the permeability test stage is conducted for a sufficient period of time to accurately determine the flow rate.

The Permeability Test Report form contains all pertinent sample identification and specimen data. Graphical presentations are given of the data upon which the flow rate determination was made at the respective gradient pressures, as well as the permeability at the respective hydraulic gradients applied during the test.

Aside from the self-compensating mercury column pressure system and the twin burette triaxial volume change unit used for flow measurement the procedure described above is similar to "Permeability Tests with Backpressure" in U.S. Army Corps of Engineers EM 1110-2-1906, Appendix VII (7), pp. VII-17 to VII-22.



DRY UNIT WEIGHT (pcf) \_ 110.0 MOISTURE CONTENT BEFORE TEST (%) \_\_\_ 15.2 MOISTURE CONTENT AFTER TEST (%) \_\_\_ 18.0 MAXIMUM DRY DENSITY (ASTM D \_ 1557 (pcf) 123.0 PTIMUM MOISTURE CONTENT (%) 95 ELL CONFINING PRESSURE (psi) \_\_\_ TEST PRESSURE (psi) \_\_\_85\_\_ BACK PRESSURE (psi) 80. 08 DIFFERENTIAL HEAD (psi) 1.0 PERMEABILITY (cm/sec)  $1.94 \times 10 - 8$  2.45 x 10 - 8

VISUAL DESCRIPTION: Clayey Silt, some sand, trace gravel



EMPIRE SOILS INVESTIGATIONS, INC.

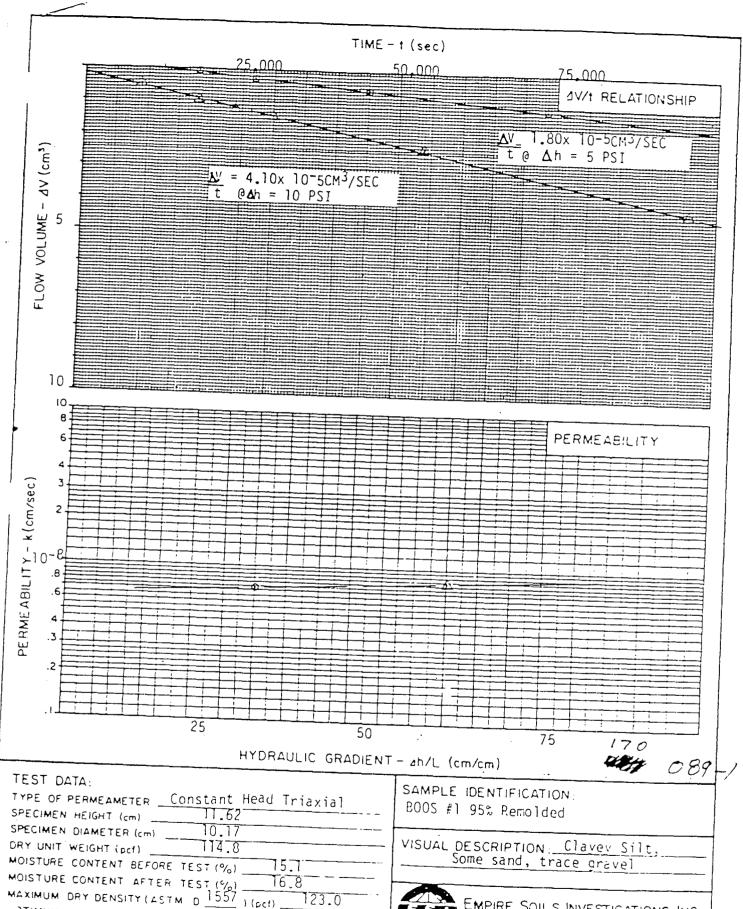
PERMEABILITY TEST REPORT

Niagara Falls Storage Site #14501-115-SC-170

L-82

DATE 7/29/65

PROJ. NO 87-86-01



MAXIMUM DRY DENSITY (ASTM D 1557 ) (pcf) TIMUM MOISTURE CONTENT (%) \_ CELL CONFINING PRESSURE (psi) 95 95 TEST PRESSURE (psi) <del>2</del>5 90 BACK PRESSURE (psi) 08 80 DIFFERENTIAL HEAD (DSI) 10 PERMEABILITY (cm/sec) 7\_33x10-9 - 8\_35 x10=9



EMPIRE SOILS INVESTIGATIONS, INC.

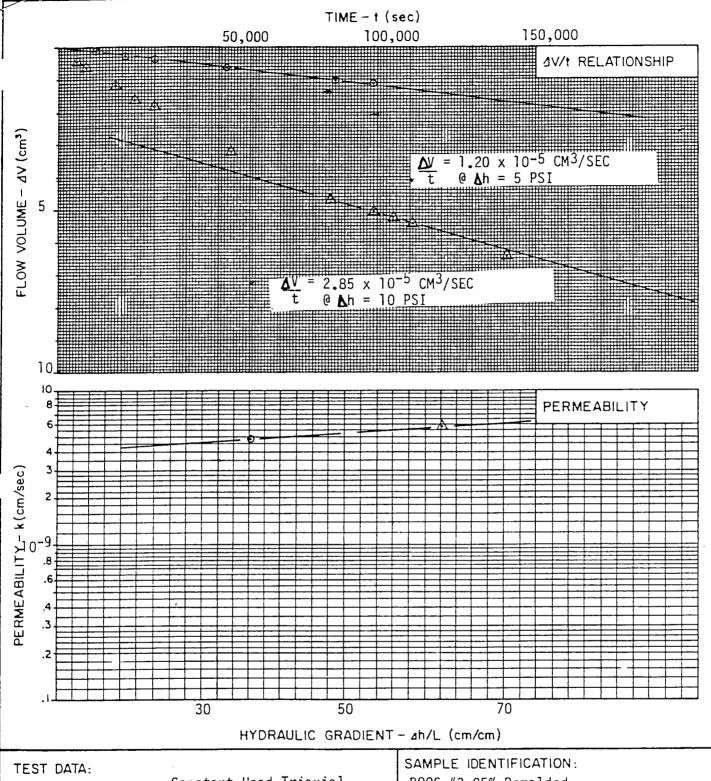
PERMEABILITY TEST REPORT

Miagara Falls Storage Site =14501-115-SC-170

L-23

9/13/86 3120

PACUNCET-SELE



TEST DATA:  TYPE OF PERMEAMETER Constant H SPECIMEN HEIGHT (cm) 11.67	ead Triaxial
30 10	
DRY UNIT WEIGHT (pcf) 119.2	
MOISTURE CONTENT BEFORE TEST (%)	15.1
MOISTURE CONTENT AFTER TEST (%)	16,9
MAXIMUM DRY DENSITY (ASTM D 1557	) (pcf) 121.6
OPTIMUM MOISTURE CONTENT (%)	13.5
CELL CONFINING PRESSURE (psi)95	95
TEST PRESSURE (psi) 85	90
BACK PRESSURE (psi) 80	80
DIFFERENTIAL HEAD (psi) 5	0 10
PERMEABILITY (cm/sec) 4.89x1	0 5.81x 10 <sup>-9</sup>

SAMPL	.E	IDE N	ΓΙΕΙCATION:
RUUC	#2	05%	Domo I dod

VISUAL DESCRIPTION: Clay, some silt, little sand, trace



📤 Empire Soils Investigations, Inc.

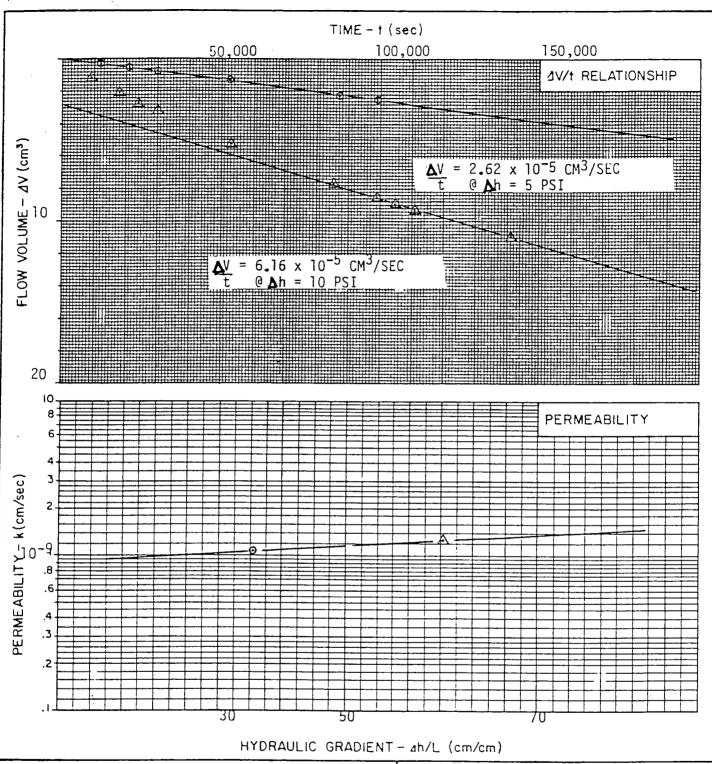
PERMEABILITY TEST REPORT

Niagara Falls Storage Site #14501-115-SC-170

Bechtel National, Inc.L-32

9/29/86 DATE:

PROJ. NO.: BT-86-81



TEST DATA:	
TYPE OF PERMEAMETER _ Constant Head Tri	axial
SPECIMEN HEIGHT (cm) 11.58	
SPECIMEN DIAMETER (cm) 10.14	
DRY UNIT WEIGHT (pcf) 107.7	
MOISTURE CONTENT BEFORE TEST (%) 15.1	
MOISTURE CONTENT AFTER TEST (%) 20.3	
MAXIMUM DRY DENSITY (ASTM D 1557) (pcf)	121.6
OPTIMUM MOISTURE CONTENT (%)	13.5
CELL CONFINING PRESSURE (psi) 95	95
TEST PRESSURE (psi) 85	90
BACK PRESSURE (psi) 80	80
DIFFERENTIAL HEAD (psi) 5	10
PERMEABILITY (cm/sec) 1.07 x 10-8	1.26 x10-8

SAMPLE IDENTIFICATION: BOOS #3, 90% Remolded

VISUAL DESCRIPTION:
Clay, some silt, little sand, trace

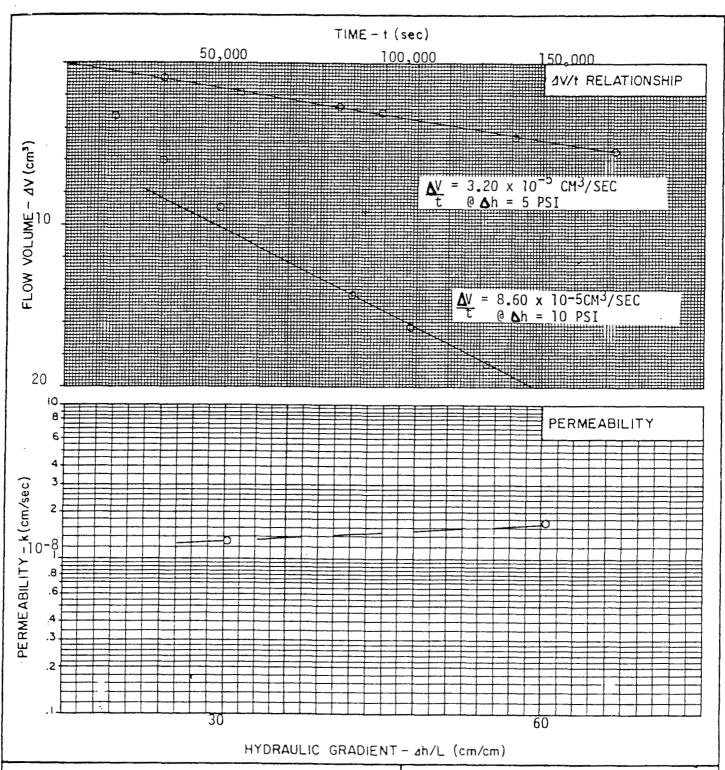


EMPIRE SOILS INVESTIGATIONS, INC.

PERMEABILITY TEST REPORT

Niagara Falls Storage Site #14501-115-SC-170 Bechtel National, Inc. L-33

DATE 9/29/86 TRROING BT-86-8T



TEST DATA: TYPE OF PERMEAMETER Constant Head Triaxial 11.66 SPECIMEN HEIGHT (cm) 10.15 SPECIMEN DIAMETER (cm) 105.9 DRY UNIT WEIGHT (pcf) \_ 12.7 MOISTURE CONTENT BEFORE TEST (%) \_ MOISTURE CONTENT AFTER TEST (% 123.8 MAXIMUM DRY DENSITY (ASTM D 1557) (pcf) 11.8 OPTIMUM MOISTURE CONTENT (%) 95 CELL CONFINING PRESSURE (psi) 85 90 TEST PRESSURE (psi) 80 80 BACK PRESSURE (psi) 5 10 DIFFERENTIAL HEAD (psi)  $1.31_{\times}10^{-8}$ 1.76 x 10-8 PERMEABILITY (cm/sec)

SAMPLE IDENTIFICATION: BOOS #7, 90% Remolded

VISUAL DESCRIPTION: Silty Clay, little sand, trace gravel



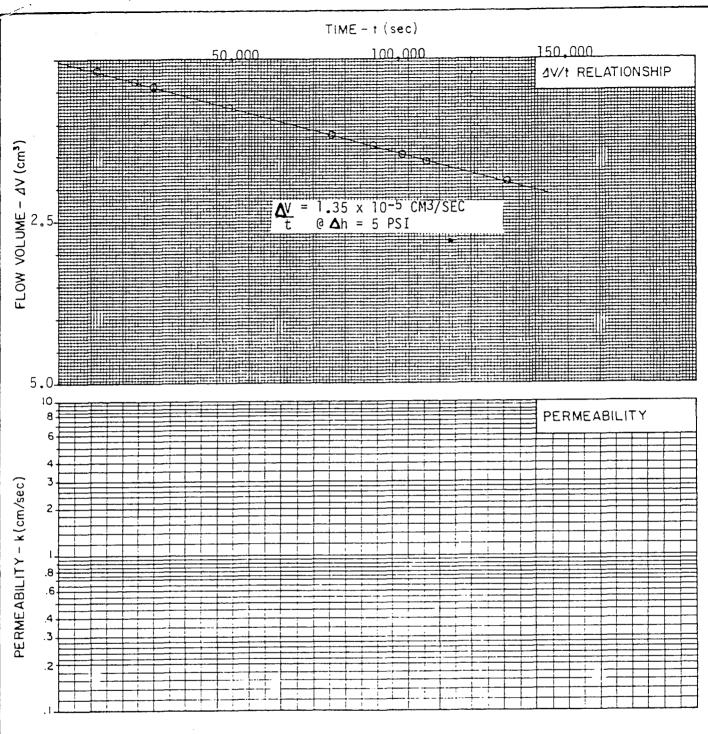
EMPIRE SOILS INVESTIGATIONS, INC.

PERMEABILITY TEST REPORT

Niagara Falls Storage Site #14501-115-SC-170

PROJ. NO.: BT-86-81 9/29/86 DATE:

Bechtel National, Inc.L-34



# HYDRAULIC GRADIENT - 4h/L (cm/cm)

TEST DATA: TYPE OF PERMEAMETER Constant Head Triaxial	
SPECIMEN HEIGHT (cm)	
SPECIMEN DIAMETER (cm)	
DRY UNIT WEIGHT (pcf) 122.2	
MOISTURE CONTENT BEFORE TEST (%)	
MOISTURE CONTENT AFTER TEST (%) 17.2	
MAXIMUM DRY DENSITY (ASTM D 1557) (pcf) 123.8	
OPTIMUM MOISTURE CONTENT (%)	
CELL CONFINING PRESSURE (psi)95	
TEST PRESSURE (psi) 85	
BACK PRESSURE (psi)	
DIFFERENTIAL HEAD (psi)	-9
PERMEABILITY (cm/sec)	

SAMPLE IDENTIFICATION:

B00S #7, 95% Remolded

VISUAL DESCRIPTION:\_

Silty clay, little sand, trace gravel



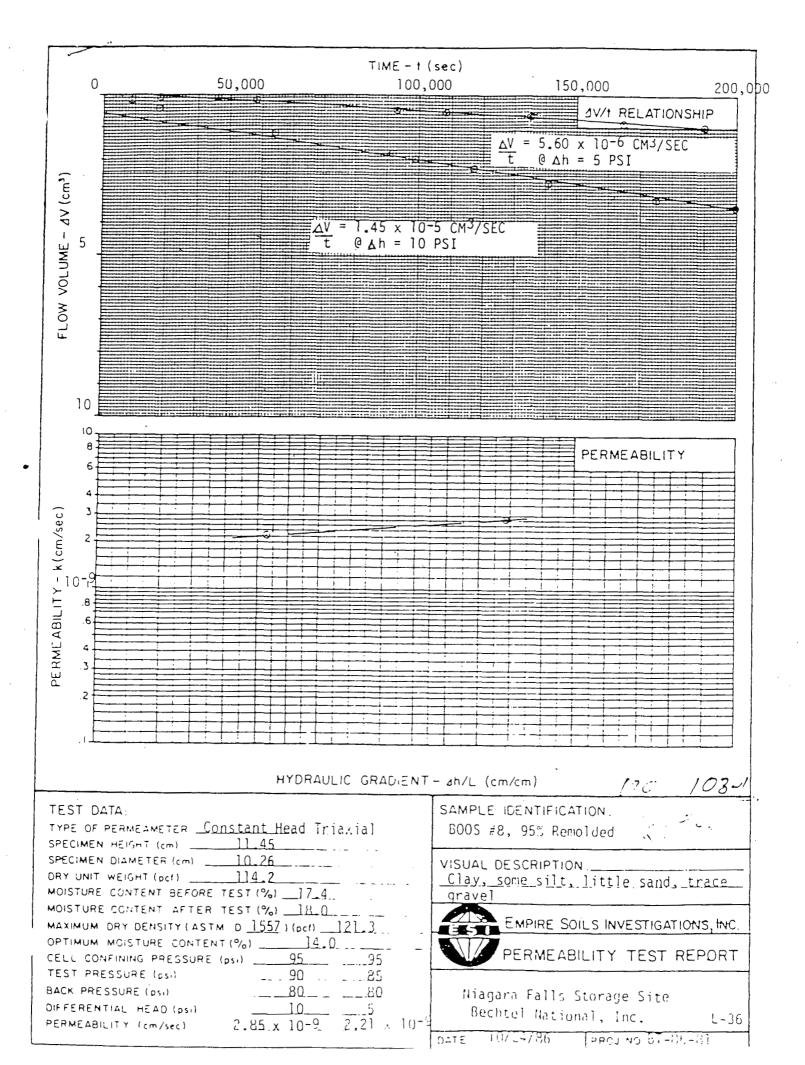
EMPIRE SOILS INVESTIGATIONS, INC.

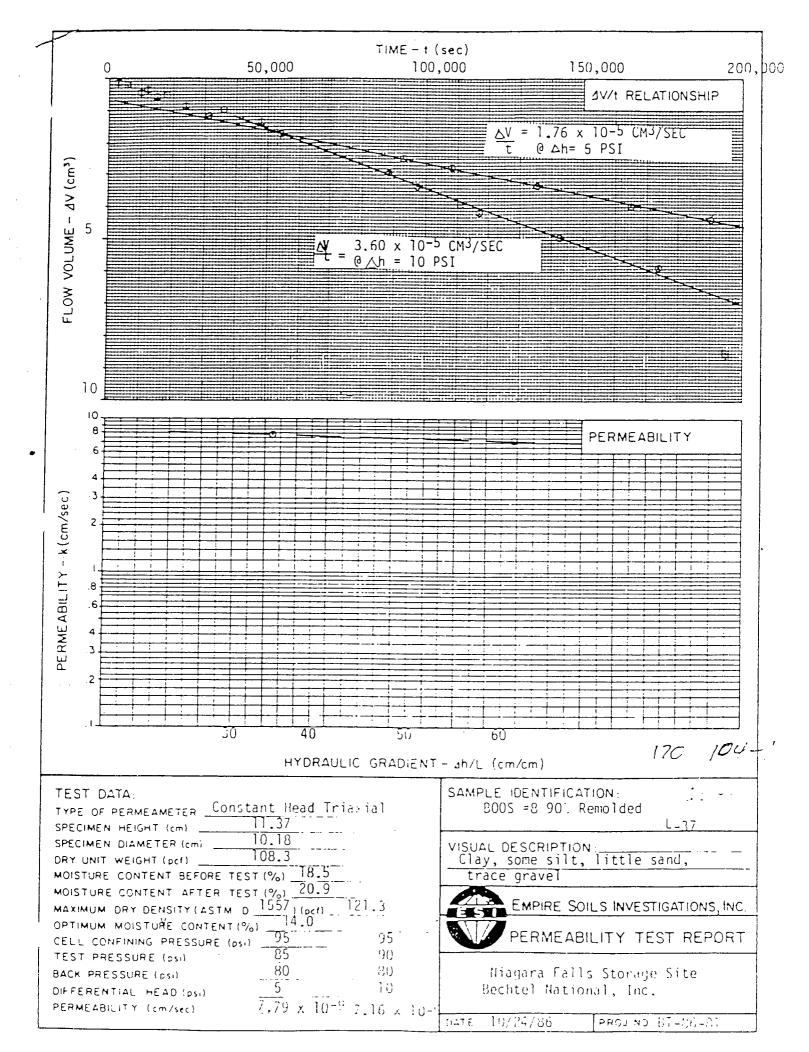
PERMEABILITY TEST REPORT

Niagara Falls Storage Site #14501-115-SC-170

Bechtel National, Inc L-35

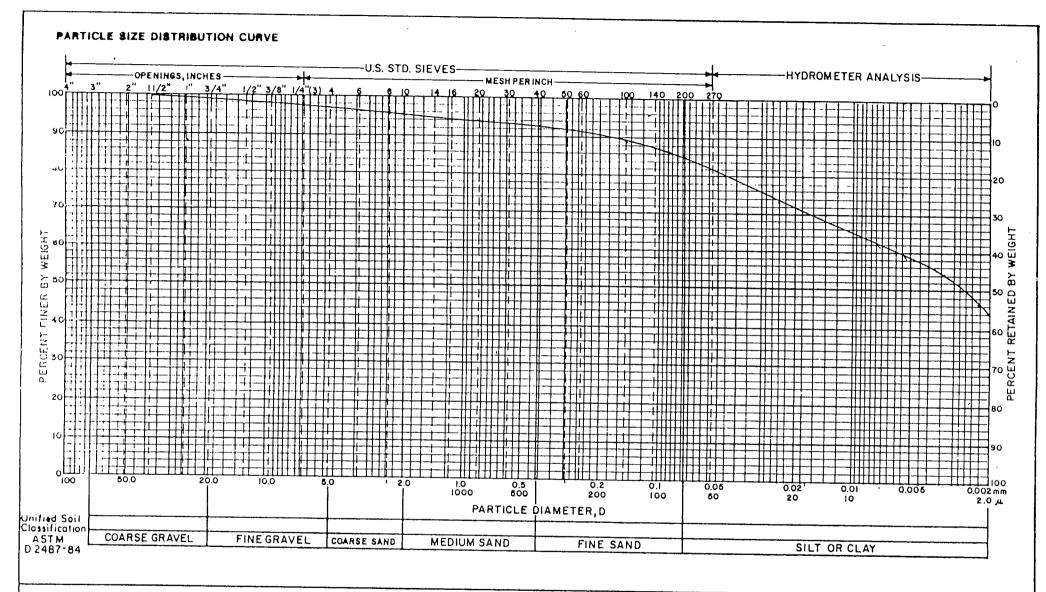
9/29/86 PROJ. NO. BT-86-8T





### APPENDIX 5-E

## SOIL CLASSIFICATION TESTS



#### SAMPLE INFORMATION. BOOS #3

Clay, some Silt, little sand, trace gravel

3.1% - Gravel 26.8% - Silt 58.9% - Clay 11.2% - Sand

Liquid Limit -

Plastic Limit -

Plasticity Index- 23

Classification - CL

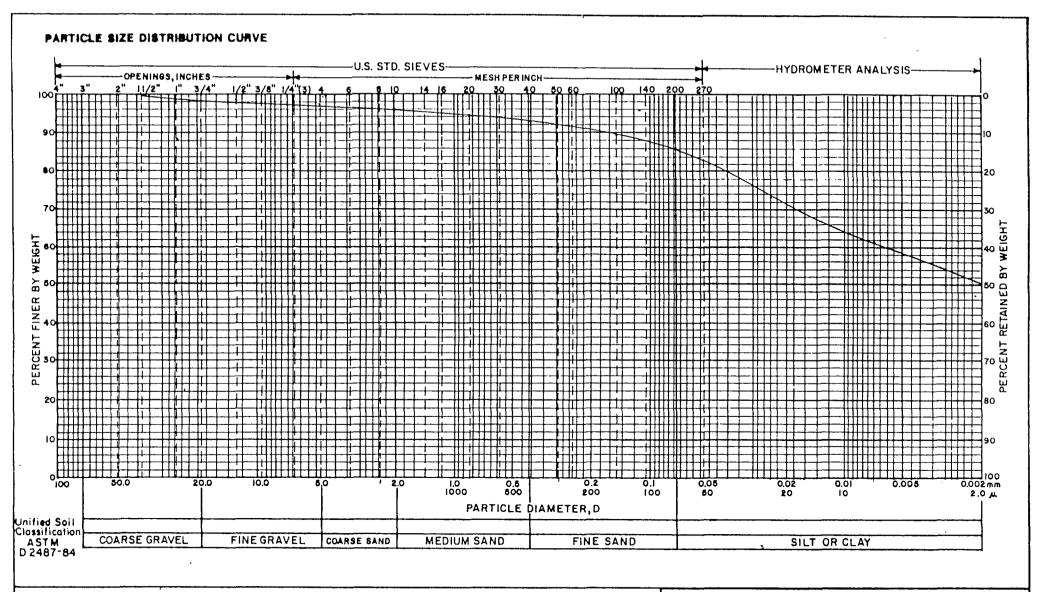
#### **PARTICLE SIZE ANALYSIS**

L-15

Niagara Falls Storage Site #14501-115-SC-17 Bechtel National, Inc.

DR. BY: CCK CK'D. CCK DATE: 8/15/86 PROJ. NO.BT-86-81

Insufficient Sample Size per ASTM D 422



SAMPLE INFORMATION: BOOS #8

Clay, some Silt, little sand, trace gravel

2.3% - Gravel

11.6% - Sand

Liquid Limit - 46 Plastic Limit - 25

27.6% - Silt 58.5% - Clay

Plastic Limit - 25 Plasticity Index 21

Classification (

Insufficient Sample Size per ASTM D 422



# PARTICLE SIZE ANALYSIS

Niagara Falls Storage Site #14501-115-SC-170

Bechtel National, Inc.

L-28A

DR.BY: CCK CK'D. CCK DATE: 9/29/86 PROJ. NO. BT-86-61

APPENDIX 5-F
BORING LOGS



	G		LOGIC			LOG		PROJECT		FL	ISRAP	JOB NO. 14501-115	SHEET NO.	HOLE NO.
SITE		WAS	FSS - W STE CONT	EST OF AINMEN	١T		COORDINATE	:S		S	1114 E005	ANGLE	FROM HERIZ.	BEARIIG N/A
9/1	9/86	- 1	<b>U</b> PLETED 0/20/86	DRALL	£R	EMPIRE	SOILS	D			D MODEL HOLE SIZE OV E B-55 12" & 7"	ERBURGEN (FT.) 47.0	ROCK (FT.) 0.05	47.05'
CORE	RECOV	ERYOTT	J%		BOXES V/A	SAMPL 1-S	γ. (Cc	21.95	NG G	ROUNE 31	9.3 DEPTH/EL. GROUND WATER NONE OBSE		DEPTH/EL. TOP 0	F RDCK /272.3
			EIGHT/FALL NCHES		CAS	NG LEFT	N HOLES DIA.	VLENGTH WELL	<del></del> _	•	S. BALONE /A	. ATKINSON	<del></del>	<del></del>
AMPLE TYPE TO DIAMETER	SAUPLER ADVANCE LENGTH CORE RUN	PLE RECOVERY RE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	LOSS III SP.M.	WATER RESSURE TESTS 1.S. J. J. S. J. J. S. J. J. S. J. J. S.	TIME III MANUTES	ELEVATION	DEPTH	PRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFIC	HOITA	WAT WAT CILL	ES ONE ER LEVELS, ER RETURIL RACTER OF
~~ ~ ¥	319	3 8	S IE	1883 1843 1843	SND 6.	360 6	319.3	0			A A 2 A . FT Ch T . Dat VIANENS	rr Vr. Law		LING, ETC.
SS 2	24	2	35	6	15	20 21	:			1	0.0-3.0 FT SET (ML):MODERATE BROWN (IOYR574) WITH LITTLE LITTLE FINE TO COARSE GRAVI	CLAY,	WITH 12	ADVANCED X 6 1/4 OW STEN
							316.3	3.0 -		2	FILL. 3.0-8.0 FT SAND (SM): MODERA	ATE BROWN	AUGER Stinger	WITH 6 IN. PLUG.
								5 -			(5YR3/4), SILTY, FINE TO COAR BECOMING FINER WITH DEPTH, T CLAY, WET, MEDIUM DENSE TO	O SANDY	BELOW Bording Using	ADVANCED
SS 2	24	12	11	4	5	6/8					, , , , , , , , , , , , , , , , , , ,	J, 11 1	HOLLOW	
							311.3	8.0		ST_	8.0-16.0 FT CLAY (CL): PALE E			
_								10			(5YR5/2), SILTY, TRACE OF FINI NEDIUM SAND, NOIST TO SATUR STIFF, HIGHLY PLASTIC.			
ST 3	24	24									•	•		
										3				
						7		15						
SS 2	24	12	6	3	3	3/3	303.3	16.0		_	16.0-20.0 FT CLAY (CL): BROWN (5YR5/D, VERY SOFT, VERY PLA	NISH GRAY		
										4	TO SATURATED.	•	18 TO 2	
	$\dashv$					14	299.3	20 =			20.0-23.5 FT CLAYEY SILT (MI		GRAVEL COBBLES	
SS 2	24	12	29	7	.f.	16				$\dashv$	GRAYISH RED TO PALE BROWN SOME MEDIUM SAND, LITTLE CO VERY STIFF, MOIST.		DRILLING	•
							295.8	23.5	Щ	اد	23.5-38.0 FT <u>CLAY (CL);</u> SOFT,	STICKY	OF B IN	ED 20 FT DIA.PVC FOR CASING
SS 2	24	24	3			2		25			GRAY WITH DISSEMINATED MEDIL CDARSE-GRAINED SAND, WET, SA	JM- TO	TO 19.6	FT DEPTH.
2			-		•	/ 3				$\dashv$	DECREASES WITH DEPTH			
								=		6				
SS 2	24	24	2			1		30						
4	+		-			2		‡		-				
								}			•			
	S=SPL	IT SPO	ON, ST=SIÆI	BY TUBE		SITI	284.3 E	35	NE S	<u></u>	WEST OF		IKOLE NO.	
			PITCHER: C								ITATHWENT	····		A1-WO



GEOLOGIC	DRILL LOG	PROJECT	FUSRAP	1	OB NO.   SHEET   14501-115   2	HOLE HOLE OF 2 . OW-IA
SAMPLE TIPE AND DAMETER SAMPLE ADVANCE LENGTH CORE RIN CORE RECOVERY CORE RECOVERY TO THE RECOVERY N PERCENT CORE RECOVERY	LOSS C.P.M. S173234 PRESSURE TIME TIME TIME TIME TIME TIME TIME TIM	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATI	ION	NOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRILING ETC.
SS 24 24 4	0 2 2	20 13				
6 6 120/6	12076	281.3 38	IIII SUBROL	TO FT GRAVEL (GM); BLAC NOED TO ROUNDED, IN A OWN CLAYEY SILT, MOIST	MATRIX OF	
3 3 100/3 6 6 120/6	1 1 1	45	/ <del>47.0-47</del>	ONAL GRAY GREEN CLAY H O.O. FT SHALE: MOIST, RED AY GREEN, WEATHERED.		
		272.3 — 47.05	BOTTO	OF BORING AT 47.05 F		OBSERVATION WELL RISTALLED TO 46.5 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
ss=split spoom st=shei d=denmisom p=ptchem (			NFSS - WEST WASTE CONTAIN	MENT .	ŀ	OW-1A



		E0	LOGIC	)	DRII	LL	LOG		PROJECT	T	-	FUSRAP			· · · ·		JOB NO.		SHEET	NO. OF 1	HOLE NO.
SITE	NFS		EST OF	CC			ſ	COORDINAT	ES			\$1110	E	005				ANGLE	FROM 90		BEAR <b>NG</b> N/A
	30/86	1	WPLETED 0/21/86	6	DRALLI	ER		SOILS		DRALL M		AND 11008 E B-45			HOLE SIZE	OVE	RELIRDEN		RCCX	ETJ N/A	TOTAL DEPTH
		<b>1/A</b>				BOXES /A	SAMPL 1-S		P OF CAS 321.49	SING		IND EL.	D	EPTH/E	NONE O		VED		DEPTH	/EL. TOP OF	
140	LBS/	30 I	EIGHT/FALI NCHES	L		CAS	OBS	N HOLEIDIA ERVATION	LENGTH WELL			LOGGE	D BY		A. A	TKI	NOSh		L		
K 5	ANCH NEW NEW	VERY ERY	S 18.		FF	WATER Essura				,	T									NOTE	S Ore
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLOWS  "" PERCENT CORE RETOVERY	5		TESTS	<u> </u>	ELEVATION	DEP TH	GRAPHIC LOG	SAMPLE		DE	SCRIPTI	ON AND CLAS	SFICA	TION			WATE WATE	R LEVELS, R RETURN, ACTER OF
3 3	SAM	3 8	3 15		≥ ₹ 3 1 6	PRESSURE P.S.I	260 C.	319.3	0	8											U.G. ETC.
														T: SE	E DESCRIP	rion	ON				
ج ا										}											
STEM FLIGHT-AUGERS.																					
LIGHT									5 -	}											
TEN										1											
IN. DIA. HOLLOW									10 -												
7 IN. D																					
									-												
								304.3	15 -												
\$\$ 2	24	24	3		1	ı	2/1					15.0-17 WET (	O FI	CLA	Y (CH): SOF	T, ST	icky,				
								302.3 -	†17 <b>.</b> 0 -		7	вотто	M OF	BORI	NG AT 17.0	FT.	<del></del>		_	OBSERVA	TION WELL
																				INSTALLE FT DEPTI	D TO 16.7 H. SEE
																				CONSTRUC	TION WELL CTION
																				LUG FUR	DETAILS.
									=												ļ
									=												
																					İ
									=												
									=												
	S=SPLT D=DEHN	SON <sub>i</sub> P	NST=SHEL PITCHER: 0	LBY ≔OTi	TUBE;		SITE		NFSS	- WES	 T (	OF CON	TAIN	ÆNT					HK	OLE NO.	
																					DV-1B



		SE0	LOGIC	DR	ILL	LOG			F	USRAP		JOB NO. 14501		SHEET NO. 1 OF 2	HOLE NO.		
SITE		WAS	FSS - W	TAINME	NT		COORDINATE					E004				FROM HORIZ.	BEARING N/A
9/1	M 18/86		MPLETED 9/26/86	DRE	LER	EMPIRE	SOILS	D			NO MODEL E B-55		6-1/4"	OVERBURDEN 45.		ROCK (FT.)	TOTAL DEPTH
		N/A			e boxes N/A	8-S 2-S	S 32	OF CASE	NG G		9.4		13.0			CEPTH/EL. TOP	OF ROCK 5' /273.9
			EIGHT/FALL NCHES		CAS		N HOLELDIA./ ERVATION				LOGGED B		S. BALONE	/A. ATKIN	SON		
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLOWS "" PERCENT CORE RECOVERY	LOSS IN G.P.M.	TESTS TESTS TESTS AND 6	Ε	ELEVATION	DEPTH	GRAPHC LOG	SALPLE		DESCRIPTI	OH AND CLASS	FICATION			OTES ON A ATER LEVELS, ATER RETURN, HARACTER OF RELING, ETC.
SS 2	24	18	16	5	2ND 6*	12 12 12	319.4	0		ı	YELLOWIS IN PART,	H BROW VERY S DARSE S	EY SILT(M N(10YR5/4) TIFF, DRY, 1 AND, VARIES	VERY SILT LITTLE FIN	r E-grav	EL. WISH	
SS 2 24 24 19 9 8 18 312.4 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0												FT SILT RAY (5Y) ,STIFF, I DED GR. WH TO	Y CLAY(CL) R5/I) TO MO DRY TRACE AVEL AND I GRAY MOTT	DERATE BRI FINE FINE SAND, LING.VERTIC	AL		
ST 3	24	24						10		S	7.0-19.0 MEDIUM: TO HIGHL TRACE TO	FT SILT SANDY,P Y PLAS D LITTL	Y CLAY(CL ALE BROWN TIC, WET TO E FINE SUE	): VERY FIN STIFF,MODE STURAT	E-TO RATEL ED.	Y	
ss 2	24	24	12	2	5	7/7		15		3	GRAVEL (	5YK5/2	).				
ST 3	24	24			-		300.4	19.0		S T 2	19.0-40.7	FT CL7	Y(CL), BROV RY SOFT, H	NISH-GRAY			
SS 2	24	13	li	2	3	8 6				4		WET, WIT	H NO GRAN				
				-	-			25			FRAGMENT 25.0 FT. GRAY BRO	TS IN CL 26.5-26 DWN, VEF	EW GREENIS AY, TRACE L7 FT THIN IY FINE, SIL' L SILTY BA	OF SAND B LAYER OF TY, CLAYEY			
SS 2	24	24	11	6	6	5 4		30		5							
SS 2	24	24	7	2	3	4 4	284.4	35		6	·						
	SSESPLIT SPOON, STESHELBY TUBE; SITE WEST OF WASTE CONTAINMENT HOLE N															HOLE NO.	OW-2A



	G	ΕO	LOGIC	DRI	LL I	_0G	1	ROJECT			FUSRAP	JOB NO. 14501-115	SHEET 2	NO. OF 2	HOLE NO. OW-2A
SAMPLE TYPE AND DANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLONS TO PERCENT CONE PECCOVERY	1055 N 1059, 1059,	WATER PRESSUR TESTS TEST	TME N N NAVIES	ELEVATION 284.4	35	GRAPHIC LOG	SAMPLE	DESCRPTION AND CLASSIF	CATION	1 - <del>-</del>	HÓN VAT TAT CHJ	FES ON: FER LEVELS, FER RETURN. FRACTER OF LLING. ETC.
SS 2	24	24	24	2	100/5°	18 35 35 35 35 35 35 35 35 35 35 35 35 35	278.7 278.0 277.5 275.9 273.9 -273.4			7 B	40.7-4L4 FT CLAYEY SILT(UL) WET.  41.4-4L9 FT SILT(ML):RED, WEL SAND AND GRAVEL MIXTURE, S.  41.9-43.5 FT CLAYEY SILT(ML) A FEW GRAVEL FRAGMENTS, WE  43.5-45.5 FT SAND(SM): BROWN TRACE OF SILT, SOME FINE GR GRAVEL AT BEDHOCK CONTACT;  45.5-46.0 FT SHALE: BRICK RE GREENISH GRAY ZONES.  BOTTOM OF BORING AT 46.0	L GRADED, ATURATED. ERED WITH ET, SOFT. FINE TO MEDI AVEL, WITH LAR SATURATED. D WITH OCCASI	ONAL	OBSERV/ INSTALL FT; SEE	
			L STESHELBY PTCHER OF O			SITE	· .	VES"	TOF	WAS	TE CONTAINMENT		HO	E NO.	OW-2A



	(	EO	LOGIC	DR	LL	LOG		PROJECT		FU	SRAP			JOHE NO. 14501		SHEET NO.	HOLE NO.
SITE		WAS	FSS - W STE CON	EST OF	NT		COGRDINATE	S			S924	E007			AHGLE	FROM HORIZ.	BEARING N/A
BEG	JN 29/86	,	WPLETED 0/22/86	DRaL	LER	ENPIRE	SOILS	D			D MODEL E B-55		HOLE SIZE	OVERBLIRDEN		ROCK (FTJ N/A	TOTAL DEPTH
COR	E RECOV	ERYCFT	J'20		e boxes N/A	SAMPI 2-9		P OF CASI	NG G	ROUNE 31	9. 2	DEPTH/E	L. GROUND WA'	TER		DEPTH/EL. TOP O	F ROCK
	PLE HAL		EIGHT/FALL IN.	1.	CAS	ING LEFT	N HOLE: DIA.	/LENGTH	<u> </u>		LOGGED 8	Yı	A. A		<del></del> -	L	
SAMPLE TYPE	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAUPLE BLOWS TO PERCENT COME RECOVERT	LOSS N S. P. L.	WATER PRESSURI TESTS TESTS		ELEVATION 319.2	О БЕРТН	GRAPHC LOG	SAMPLE	<b>!</b>	DESCRIPTI	ON AND CLASS	FICATION		WAT WAT CHAI	ES ON ER LEVELS, ER RETURN, RACTER OF LUNG, ETC.
555 6 IN. HOLLOW STEW FLIGHT AUGER.	24	14	20	10	8	3 4	301.2	5 10 15 15 18.0		1	6.0-18.0 WITH OCC	LOG OW-	YEY SILT: G BLACK ROG AY: SOFT GR	RAY BROWN CK FRAGME!	1TS.	NO WATI DETECTE DRILLING	D DURMG
							- 299.2	20-			ВОТТОМ	OF BOR	ING AT 20.0	) FT.		INSTALI FT; SEE OBSERV CONSTR LOG FO	ATION WELL
			OHL ST=SHEL =PITCHERI O		:	SIT	E	NFSS	- WES	ST O	F CONTA	INFENT	<u> </u>			IKOLE NO.	OW-2B



	G	EOL	OGIC	DRII	LL	LOG		PROJECT		Fl	JSRAP		1450	1-115	SHEET HO		HOLE NO.
SITE			NFSS				COORDINATE	25			S731 E026			ANGLE	FROM HORI	<b>z.</b>	BEARING N/A
BEGUN	3/86		PLETED 0/22/86	DRELL	ER	EMPIRE	SOILS	Di			ID MODEL E B-55	HOLE SIZE	OVERBURDE		ROCK OFT.		TOTAL DEPTH 42.0'
		ERYOFT.		CORE	BOXES	2-S	7 3	P OF CASE 21.67		OUN	DEPTH/E	L GROUND WA IE OBSERVI	TER		DEPTH/EL	TOP OF	
			OCHES		CAS	ing left OBS	N HOLEIDA ERVATION	ZENGTH WELL			LOGGED BY:	. BALONE	/A. ATKI	INSON			
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAUPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS NOT COME RECOVERY	1 LOSS 14 14 16 LOSS	WATER RESSURE TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS TESTS		ELEVATION 319.2	O EFFE	GRAPHC LOG	SAMPLE	DESCRIPTI	ON AND CLASS	SEICATION			WATE WATE CHAR	S ON. ER LEVELS, ER RETURN, MACTER OF LING, ETC.
SS 2	24	2	8		3	5/7		-		1	0.0-19.0 FT. SIL COARSE SAND, A (5YR4/2).			OF	W IN	ITH 12	ADVANCED X 6 1/4 IOLLOW LIGER.
SS 2	24	ъ	19	6	8	II B		5 -		2	5.0-7.0 FT SU- SOME CLAY, TR/ TOSATURATED, I 7.0-10.0 FT SU- MEDIJM SAND, P BROWN 5YR3/4.	CE OF GRA IOD. BROWN TY CLAY, SI LASTIC, SATI	VEL, WET 5YR3/4. DNE FINE	TO	A IN	DVANCE	8 FT HOLE ED LISING 7 DW STEN
ST 3	24	24						10 -		ST I	nie u o et ve	N COET A	AV LUGULY	,		חוו ו בס	REPORTS
ST 3	24	24						15		ST 2	12.5-M.O FT VE PLASTIC, SATUR 15 FT VERY SOI SATURATED, VEF BROWNISH GRAY IN ST 2.	ATED, PALE T CLAY, WE Y HIGHLY F	BROWN 5Y ET TO PLASTIC,	'R5/2.	V. S. F.	ERY SO TARTIN T.	DFT SQNL G AT 12.5 ED 18 FT
SS 2	24	ю	23	п	<b>i</b> 5	8 7	300.2	20 -		3	19.0-23.0 FT SI SATURATED RED SAND WITH SOM GRAVEL.	BROWN, SIL	TY, YERY	FINE	C T A		TOR CASING THE OF 18 FT OUTED
						3	296.2	23.0 <u> </u>			23.0-40.5 FT C WET, PLASTIC, R RED, SILTY CLAY CLAY TYPICALL	ED GRAY, G 'AND CLAY	RAY AND '; RED SILT	Υ			
SS 2	24	24	6	2	3	4				4	LOCALLY CONTAIND GRAVEL.	ains dissem	UNATED SA	UND			
SS 2	24	7	7	5	3	4 4		30 -		5							
			oon, st=sh P=Pttd=ERi			2	284.2 TE	35		N	FSS				HC	LE NO.	OW-3A



	GEOLOGIC DRILL LOG								PROJECT JUST AP 14501-115							
SAMPLE TYPE AND DIAMETER				Γ	WATER RESSURE TESTS		ELEVATION 284.2	E 是 35	GRAPHIC LOG	SAMPLE	TESCRIPTION AND CLASSIFIC			WATI WATI	OW-3A  ES CAR ER LEVELS. ER RETURN. NACTER OF LING. ETC.	
SS 2	24	24	5	0	3	2 5		-		6						
SS 2	20	24	70	12	30	40 85	278.7 — 277.2—	40.5-		7	AO.5-41.9 FT SANDY GRAVEL ( ROUNDDED AND SUBROUNDED, F GRAVEL IN MATRIX OF RED SA SILT, MOIST, DENSE TO VERY D 41.9-42.0 FT SHALE: WEATHERS GREEN.  BOTTOM OF BORING AT 42.0	PEBBLE SIZE INDY CLAYEY ENSE. ED, RED AND		HISTALL FT DEP OBSERV CONSTRI	ATION WELL	
			oon, st-sh P-patcher			St	TE .				NFSS			HOLE NO.	DW-3A	



GEOLOGIC DRILL LO	FUSRAP 14501-115	ET NO. HOLE NO. 1 OF 1 OW-38
SITE NESS - NORTHWEST OF WASTE CONTAINMENT		10° N/A
9/25/86 9/25/86 DRILLER EMP.	RE SOILS MOBILE B-55 7° 16.0	N/A TOTAL DEPTH
	PLES EL. TOP OF CASING GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. GROUND WATER DEPTH/EL. GROUND WATER DEPTH/EL. GROUND WATER	TH/EL. TOP OF ROCK N/A
	FT IN HOLE: DUL/LENGTH LOGGED BY: BSERVATION WELL A. ATKINSON	
AND DUMETER AND DUMETER SAUPLE RECOVERY CORE RECOVERY CORE RECOVERY SAUPLE BLOWS 'N' FRECENT CORE RECOVERY RECO	ELEVATION ELEVATION AND CLASSFICATION STATES AND STATES	NOTES ONS WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
7 IN, HOLLOW STEM FLIGHT AUGERS,	0.0-i0.0 FT: SEE DESCRIPTION ON BORING LOG OW-3A.	NO WATER DETECTED DURING DRILLING.
SS 24 24 8 2 3 5	10.0-13.6 FT SILTY CLAY (CL): BROWN, WITH SOME MEDIUM-GRAINED SAND AND BLACK ROUNDED GRAVEL; SGFT, MOIST.	
SS 24 21 10 4 6 4 SS 24 13 8 3 4 4	3 306.1 13.6 13.6-16.0 FT CLAY (CH): SOFT, WET, STICKY, GRAY TO RED GRAY CLAY WITH A FEW BLACK GRAVEL SIZE FRAGMENTS.	-
	BOTTOM OF BORING AT 16.0 FT.	OBSERVATION WELL INSTALLED TO 15.9 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS=SPLIT SPOON; ST=SIELBY TUBE; D=DENNISON; P=PTTCHER; C=OTHER	SITE NFSS - NORTHWEST OF WASTE CONTAINMENT	HOLE NO.



GEOLOGIC	DRILL LOG	PROJECT	T FUSRAP	Joe No. 14501-1	15 1 0F 2 OW-4A
SITE NESS - NOF WASTE CONTA		COORDINATES	S720 E	172 AN	IGLE FROM HORIZ. BEARING 90° N/A
BECUM COMPLETED 9/17/86 9/26/86	DRILLER EMPIRE	SOILS	DRALL MAKE AND MODEL MOBILE B-55	HOLE SIZE OVERBURDEN IFT	0.3 40.6'
CORE RECOVERYOFT./20 N/A	N/A 1-S	EL TOP OF CAS		DEPTH/EL. GROUND WATER 6.0' /311.6	DEPTH/EL. TOP OF ROCK 40.3 /277.3
SAMPLE HALMER WEIGHT/FALL 140 LBS/30 INCHES	CASING LEFT	IN HOLE: DIA. /LENGTH ERVATION WELL		S. BALONE /A. ATKINSO	)N
SAMPLE TYPE AND DIAMETER SAMPLER ADVANCE LENGTH CORE RIAN CORE RECOVERT CORE RECOVERT THE BLOWS THE PREMIT CORE RECOVERY	WATER PRESSUME TESTS  A G G G G G G G G G G G G G G G G G G	ELEVATION E	STIPLE CO.	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS. WATER RETIRAL CHARACTER OF OPILLING, ETC.
SS 24 20 16	5 8 8 5 8 8	317.6 0	BROWN ( SAND AN VERY ST	FT SHITY CLAY (CL) MODERATE SYR3/4), WITH LITTLE COARSE D TRACE OF FUNE GRAVEL, MOIST, IFF, FILL.	BORING ADVANCED WITH 12 X 6 1/4 INL HOLLOW STEM AUGER WITH 6 INL STINGER PLUG.
SS 24 24 9	2 4 5 3	314.6 3.0	(5YR3/4) FINE TO LITTLE 1	T SAND (SP): MODERATE BROWN TO GRAYISH BROWN (5YR3/2). COARSE, TRACE OF FINE GRAVEL O TRACE SILT, SATURATED, LOOS IM DENSE.	BELOW 20 FT HOLE ADVANCED WITH 7
SS 24 24 20	7 8 14	306.6 ILO 304.6 IS.5	PALE GR SATURAT 13.5-30.5 (5YR4/I),	FT SELT (SM); FINE, SANDY, AYISH BROWN (SYR4/2), WET TO ED.  FT CLAY (CL); BROWNISH GRAY WET TO SATURATED, TRACE MEDIUM TO COARSE SAND, VERY	
SS 24 24 WEIGHT	OF RQDS. 3 5	20 -	ST SOFT AN	D VERY HIGHLY PLASTIC, IAL PEBBLES.	INSTALLED 20 FT OF 8 IN. PVC
SS 24 24 6	3 3 5	25 -	5		CASING TO 19.7 FT AND GROUTED ANNULUS, 9/17/86.
SS 24 24 17	i 5 i2 8	287. 1 30.5 285. 1 32.5 282.6 35	GRAY BRI SATURATI 32.5-38.5 LAYERS	FT SILTY GRAVELLY SAND (GP) DWN, VERY FINE-GRAINED, ED. FT CLAY (CL): ALTERNATING OF SOFT GRAY CLAY AND REDDIS RY FINE SAND WITH SOME FINE	
SS=SPLIT SPOON, ST=SHELI D=DENNISON; P=PITCHER; O=			NESS - NORTH OF WASTE CONTAINMEN		HOLE NO.



### ### DESCRIPTION AND CLASSIFICATION  #### ###############################	SHEET 5 2	T NO.	HOLE NO. OW-4A
SS 2 24 24 7 1 3 4 279.1 38.5 40.3 FT GRAVEL (GM): ROLANDED IN RED, CLAYEY SILT MATRIX.  277.0 40.6 FT SHALE: RED AND GREENISH GRAY.		MOTES WATES WATES CHARA	CONN R LEVELS, R RETURN, LCTER OF NG, ETC.
SS 13 13 152/7 42 52 RED, CLAYEY SILT MATRIX.  277. 0 40.6 RED, CLAYEY SILT MATRIX.  40.3-40.6 FT SHALE: RED AND GREENISH GRAY.			
BOTTOM OF BORING AT 40.6 FT.		-	
SS-SPLIT SPOON ST-SIGLEY TURE, DOCEMING ON PRITCIPER WASTE CONTAINMENT		INSTALL FT DEP OBSERV CONSTR	ATION WELL



	- (	EΟ	LO	GIC	DF	RILL	LOG	<u></u>	PRO_EC	.T		FI	JSRAP		<del></del>	J08 N0	1-115	SHEET	NO. OF 1	HOLE NO.
SITE		WAS	FSS STE	- N	ORTH AINME	OF NT		COORDINA	TES					 E177	<del></del>	1430		FROM H	OR17.	OW-4B BEARING
8ECU 9/2	N 6/85	Ç¢	XPLE			LLER	EMPIR	E SOILS		DREL L		AN	D MODEL B-45		HOLE SIZE	OVERBLERGEN		RCCK (F	L	N/A TOTAL DEPTH
CORE	RECOV				ca	RE BOXES	SAMPI 1-5	1	OP OF CA		GRO	ÜN	7.5	DEPTHVE	L. GRUUND W	ATER BSERVED	<u> </u>	•	N/A EL. TOP OF	
SAUP 140	LE HALA	MER N	EIGHT NCHI	/FALL	l		SING LEFT	N HOLE, DIA	./LENGTH				LOGGED BY	r.		TKINSON		<u></u>	N/	'A
W ~	벌충	Ĕ≿	6	lu		WATER PRESSUR		1			T	T	<u></u>		, A. A	HICHIAN				··· <u>···</u>
LE TYP	R ADVA	RECOVE	1E BLOY	ENT COP	-	TESTS	<del>,                                     </del>	ELEVATION	H1 430	GRAPHIC LOG	2 (0.11.2)	4	1	DESCRIPTIO	DH AHD CLAS	SEICATION			WATE	S OHL R LEVELS. R RETURN.
ONY S	SAMPLER ADVANCE LENGTH CORE RUN	SAUPLE RECOVERY	SAMP	PER S	121 6.	PRESSURE P.S.I	2 GSE TIME	317.5	0	N SER		•							CILLR	ACTER OF
					E1 6.	2ND 6	3RD 6*	311.5	0	<del> </del>	$\dagger$	$\dagger$	0.0-15.0 LOG OW-	FT: SEE	DESCRIPTI	ON ON BORI	NG		NO WATE	
ایم										1			200 0	14.					DETECTEI DRILLING.	D DURING
N. HOLLOW STEM FLIGHT AUGER.		i								1										
FLIGHT									5 -	1										
STEM										1										
#01																				
									10 -											
-																				
									-											
SS 2	24	24		3	1	ı	2/2		15 -		ı	- !	5.0-17.0 F STICKY, GR	T CLAY	(CH): SOF	T, WET, F SAND.				
-		1		+			-	- 300.5 -	-0.17	///					IG AT 17.0					
																		1 2	NSTALLE	TION WELL D TO 16.6
																		0	T DEPTI BSERVA MARTRIA	TION WELL CTION LOG
																			OR DETA	
										İ										
									=											
																				İ
								İ	= =											
									=											
					Y TUBE;		SITE	l		NFSS	<u></u>	NO	RTH OF					HOLE	. NO.	
	DEHNIS	MI PE	riidi		) I HER					WASTE	CO	NŢ	AINHENT							W-4B



1		ርፑሶ	LOGIC	ומח	H	100		PROJECT	-	_				J08 NO.		SHEET H	0.	HOLE NO.
sn			FSS - NI			LUU	COORDINATI	s .		F	USRAP			14501		FROM HO	0F 2	OW-5A BEARNG
DE.	ZUN	WAS	TE CONT	AINHEN	IT						S564 E229					900		N/A
9/	18/8	6 1	0/20/86			EMPIRE	SOILS				NO HODEL E B-55		E SIZE	OVERBLEDEN 42.		ROCK (F	. B	TOTAL DEPTH 44.3'
		N/A			BOXES	541491 2-5	د ا 1	of CAS 19.59					OBSERVE	ER D -9/18/	86	DEPTH/E	1. TOP OF	ROCK
			EIGHT/FALL NCHES		CAS	OBS.	N HOLEIDIA. ERVATION	VLENGTH WELL			LOGGED BY:	S. B	ALONE	/A. ATKI	NO2N	1		
SAMPLE TYPE	SAMPLER ADVANCE	SAMPLE RECOVERY	SAMPLE BLOWS  TO PERCENT CORE RECOVERY	FA LOSS IN IN IC.P.M.	WATER RESSURE TESTS FS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		ELEVATION	O DEPTH	GRAPHC LOG	SIMPLE	DESCI	артаан а	HD CLASSI	FICATION			WATE WATE CILAR	S DA R LEVELS, R RETLEN, ACTER OF WAG, ETC.
SS 2	24	20	35	8	18	17/15	316.5	0.8		1	0.0-0.8 FT ( 5/2), STIFF, D MODERATE YE SOME MEDIUM	RY, SOL LLOW	JĒ FINE Brown (	GRAVEL AI	ID		WITH 12 PL DIA 1	
\$5	24	12	¥	4	5	6		5 -			O.8-14.0 FT BROWN (5YR4 ONGHAOTTLING HARD, LITTLE SLIGHTLYTO	SLTY ( /4) WIT SLIGH SUBRO	LAY (CL H MEDIUM ILY MOS UNDED F	): MODERAT T LIGHT GR ST, STIFF T INE GRAVE	YAY O			UGER WITH 6 SER PLUG.
2						8		-		4								
ST 3	24	24						10 -		S T								
ST 3	24	24					303.3	14.0		S	I4.0-3L3 FT C GRAY, VERY SO PLASTIC.TRACE	FT, VEI OF FU	RY HIGHL JE GRAVI	.Y El in Bott		Al	UTTL#IGS BOUT 14 ROWN, MO	FT ARE
3										2	OF SHELBY TU	BE SAN	IPLE, SA	TURATED.			AY, HIGI ASTIC.	ILY
SS 2	24	24	4	2	2	2/3		20 -		3						OF CA Al	8 N.D	) 19.8 FT
\$\$ 2	24	24	6	4	3	3/3		25 -		4						AC MI		
SS 2	24	24	ю	2	4	6/3	286. D	30 -		1	31.3-33.5 FT S (CLUL): GRAY E	ROWN I	WITH SU	rroi inden				
								33.5		-	ROUNDED BLAC 33.5-36.0 FT	K PEBB	LE GRAV	ÆL.				
			HL ST=SIELE PITCIERI O=			SITE	282.3	35 🕹		- 1	STICKY, GRAY.	<del></del>				HOL	E NO.	
			- HOIEM O	VINER					WASTE	CDI	TAINMENT							W-5A



Notes of the pressure   Note		G	EO	LOGIC	DRIL	LL L	0G	P	ROECT			FUSRAP	JOB NO. SHE	ET NO.		DIE NO.
SS 24 M 9 2 3 6 7 281.3 36.0 6 36.0-42.5 FT GRAYEL (ML): ROUNDED TO SUBROURDED, REDDISH, SETY CLAY TO CLAYEY SET MATRIX; SOLIE VERY FINE SAND, MOIST.  SS 18 20 72 12 29 43 42.5 7 44.3 FT SHALE: BRICK RED, DRY TO MOIST.  0.3 0.3 SAMPLER DROPPED. 273.0 44.3 8 BOTTOM OF BORING AT 44.3 FT. OBSERVATION WELL CONSTRUCTION LOG	SAUPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLONS "N" PERCENT CONE RECOVERY	LOSS NA CARA	TESTS	TME N MHJTES		DEPTH		SAMPLE	DESCRIPTION AND CLASSIFIC	ATION		NOTES WATER WATER CHARA	GHE LEVELS, RETURN, CTER OF
SUBROUNDED, REDDISH, SLTY CLAY TO CLAYEY SRT MATRIX; SOME VERY FINE SAND, MOIST.  274.8 42.5-44.3 FT SHALE: BRICK RED, DRY TO MOIST.  273.0 44.3 BOTTOM OF BORNING AT 44.3 FT.  OBSERVATION WELL PROPED.  OBSERVATION WELL PROPERLY OF THE SET OF	SS 2	24	14	9	2		6/7		36.0-		6	36 0-42 5 ET CRAVEL (VIII) DOI	שמבת דה	+-		
274.8 42.5 44.3 FT SHALE: BRICK RED, DRY TO  0.3 0.3 SAMPLER DROPPED.  273.0 44.3 BOTTOM OF BORWIG AT 44.3 FT.  BOTTOM OF BORWIG AT 44.3 FT.  OBSERVATION WELL OWNSTRUCTION LOG			20	72	Ю	20					-	LLAYEY SILI MAIRIX; SOME VE	AY TO RY FINE			
0.3 0.3 SAMPLER DROPPED.  273.0 44.3 BOTTOM OF BORING AT 44.3 FT.  BOTTOM OF BORING AT 44.3 FT.  OBSERVATION WELL PLANTAGE BRICK RED, DRY TO  OBSERVATION WELL CONSTRUCTION LOG	2	B	20	12	<u> </u>	23			40 -		-					
BOTTOM OF BORNG AT 44.3 FT.  BOTTOM OF BORNG AT 44.3 FT.  OBSERVATION WELL PISTALLED TO 43.4 FT DEPTH. SEE GESERVATION WELL CONSTRUCTION LOG		0.3	0.3	SANP	LER DRO	PPED.					٥	42.5-44.3 FT <u>Shale:</u> Brick red Moist.	DRY TO			
SSASPIT SPANIL STAGUE BY THER. SITE MFSC - MORTH OF							SITE	7273.0	44.3					PASS FOR CO. FOR	TALLE DEPTH SERVA NSTRUK R GETA	D TO 43.4 H. SEE TION WELL CTION LOG
SS-SPLIT SPOON, ST-SHELBY TUBE, D-OTHER SITE NESS - NORTH OF HOLE NO. OW-5A							SITE	1		NFS WAST	\$ ·	- NORTH OF CONTAINMENT		HOLE N	۵.	OW-5A



CEUI OCIC	DRILL LOG	PF	RO_ECT		ICD LD			J08 NO.	 SHEET NO.	HOLE NO.
SITE NESS - NO	ORTH OF	COORDINATES			JSRAP	<del></del>	<del></del>	14501	 FROM HORIZ	OW-5B BEARING
WASTE CONT BEGUN COMPLETED	AINMENT		DREL MA			E232		Talifaci and	 904	N/A
9/26/86 9/26/86	EMPIR	E SOILS	I		E B-55		HOLE SIZE	OVERBURDEN	ROCK (FTJ N/A	TOTAL DEPTH
CORE RECOVERYOTIZO N/A	N/A 1-5	55 319	3.68	ROUNE 31	7.1		L. GROUND WA NONE OF		DEPTH/EL. TOP O	F ROCK
SAMPLE HAMAIER WEIGHT/FALL 140 LBS/30 INCHES	083	N HOLE: DIAL/LE SERVATION W	ELL ELL	· ·	LOGGED 8	Yı	A. A	TKINSON		
SAMPLE TYPE AND DAMETER SAMPLER ADVANCE LENGTH CORE RUN GONE RECOVERY SAMPLE BLOWS " PERCENT CORE RECOVERY	WATER PRESSURE TESTS  N. C. S. S. S. S. S. S. S. S. S. S. S. S. S.	ELEVATION 317.1	CO DEPTH	SAMPLE		DESCRIPTII	ON AND CLASS	SFICATION	WAT WAT CHA	ES ON. ER LEVELS, ER RETURN, RACTER OF LING, ETC.
T BY HOLLOW STEW FLIGHT AUGER,	4 4 3 3		5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		15.0-17.0 STICKY 6	FT CLA RAY CL	y (Ch): SOF	RACE OF SAF	OBSERV.	ATION WELL ED TO 15.9 TH. SEE ATION WELL
SS=SPLIT SPOOM ST=SHEL D=DEMNISON P=PTICLER: 0		E	NFSS	- 5	SOUTH OF	ıT.				OW-58

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L		E0	LOGIC	DRI	LL I	LOG		PROJECT		F	USRAP			JOB NO. 14501		SHEET I	¥0. )F 2	HOLE NO.
SITE	NF	- 22	EAST OF	BLDG.	409		COORDINATE	S	·		S1709 E	330		•	ANGLE	FROM HO	RiZ.	BEARING N/A
BEQ.	7/86		MPLETED 0/15/86	DRALL	ER	EMPIRE	SOILS	D			NO MODEL .E B-55		HOLE SIZE	OVERBURDEN		ROCK OF	LT 1.7	TOTAL DEPTH
CORE		ERYOFT	J%		BOXES L/A	SAMPL 2-S	ο	OF CASI 22.34	NG G		0 EL. 9.7	DEPTH/EL	. GROUND WA				1. TOP OF	
			NCHES		CASI	NG LEFT	N HOLEIDIA.		J		LOGGED BY		BALONE	/A. ATKIN	SON	1		
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAUPLE BLOWS  "A"  PERCENT CORE  RECOVERY	E LOSS F IN F LP M.	WATER RESSURE TESTS TESTS	380 8 N N N N N N N N N N N N N N N N N N N	ELEVATION	O DEPTH	GRAPHIC LOG	SALPLE	ום	ESCRIP TIO	IN AND CLASS	FICATION			WATE WATE CHAR	S ON: R LEVELS, R RETURN, ACTER OF ING, ETC.
\$\$ \$4 2	24	24	28	8	14	14 21		-		_	ROOTS, MO GRAYISH E	NST, SL Brown(5			OWN	1	WITH 12 N. DIA H	OLLOW
2S 2	24	24	29	Н	16	I3 16	. 215 7	-		2	(SYR5/4) I						STEM AL	IGER.
SS 2	24	24	25	8	9	16	315.7 314.7	5 -		3	MEDIUM S. WITH BROW	AND, WE VN (IOY)	T, MODERA R5/4).	E DECOMPO TE YELLOW				
T2 3	24	24								X ST	5.0-9.5 F MOTTLING,	T SILTY MOIST,	CLAY (CL	): TRACE GI WN (5YR5/4	RAY 1).			
SS 2	24	24	1 4	5		6 8	310.2	9.5		4	CLAY, MOIS SAND, TRA	T, LITTI CE OF	(ML): SOME E Subrou Subrounde	NDED FINE ID FINE GRA	AVEL,			
\$\$ 2	24	12	18	8	ġ	9 9				5	MOTTLING. PLASTIC, C	ASTIC, SILT P LAY PO	TRACE OF ORTION IS ORTION MOD	ERATE			$\nabla$	
SS 2	24	24	3	1	1	2/3	305.1	14.6		6	POLE GRAY	ISH BE	MWO?	BROWN AN	ID 5YR	4/2	7	
12 3	24	24								ST 2	VERY HIGH	ILY PLA IR SANI	Y (CH): VEI ISTIC, WET D, BROWNISI	TO SATURA	ATED,		0 17 FT	PVC OR CASING DEPTH
SS 2	24	24	6	4	3	3/4		20		7						A	IND GROU INNULUS. JELOWE 17	
																A R		USING 7
SS 2	24	24	2	0	-	2		25 –		8	OCCASIONA BROWN CLA	L FRAG AY IN G	MENTS OF RAY CLAY.	STIFF, RED				
							292.7	27.0			27.0-39.5 Brown, Mei Rounded (	FT <u>CLA</u> DIUM DE RAVEL:	YEY SILT NSE WITH THIN LAYE					
\$\$ 2	24	16	24	9	9	20		30 -		3								
							284.7	35			33.5 FT BI CONTAINS FRAGMENTS SUBROUNDE	OCCASIO S IN AD	DHAL ANGLE DITION TO	ISE AND Lar Rock Rounded <i>A</i>	UND.			
			on steshel Pitcher o		-	झा		NF SS	S - EA	ST	OF BLDG.	409				но	LE NO.	0W-6Y



GEOLOGIC DRIL	L LOG	PROJECT			FUSRAP	JOB NO. 14501-115	SHEET	NOL of 2	HOLE NO. OW-6A
METER ADVANCE CORE RIN RECOVERY COVERY COVERY TOWE NERT	ATER SSIRE ESTS  ELEVATION 284.7	8	901 DMW2	SAMPLE	DESCRIPTION AND CLASSIFIC		1 2	HOTE WATE WATE CHAR	S DAL R LEVELS, R RETURN. ACTER OF HIG. ETC.
<del>      _   _   _   _   _   _   _  </del>	0/6	35		ю		·			
4 4 10074 10074 3 3 10073 10073 ASS	280.2	39.5 40.2	шш	]E	39.5-40.2 FT SHALE: HIGHLY W RED BROWN.  BOTTOM OF BORING AT 40.2 F				
		45 50 55 60 65 70 75 75			BUTTOM OF BORNAG AT 40.2 F	Τ.		FT DEP OBSERVA CONSTRI	THON WELL
SS=SPLIT SPOON, ST=SHELBY TUBE, D=DE144SON, P=PTCHER; 0=0THER	SITE	NFS:	S - E	AS7	OF BLDG. 409		HO	LE NO.	OM-6Y



SITE NESS - SOUTH OF COORDINATES ANGLE FROM H	HCRIZ. BEARING
WASTE CONTAINMENT S1712 E332 90°	
BEGUN COMPLETED DRELER EMPIRE SOILS DRELL MAKE AND MODEL HOLE SIZE DVERBURDEN (FT.) ROCK (	N/A 17.0'
	/EL. TUP OF ROCK
SAMPLE HAMMER WEIGHT/FALL CASING LEFT IN HOLE: DIAL/LENGTH LOGGED BY: 140 LBS/30 INCHES OBSERVATION WELL A. ATKINSON	
	NOTES CILL WATER LEVELS,
AMPLE TO DUMETER AND ELECOVERY TESTS SAMPLE BLOWER TESTS AND THE SAMPLE BLOWER TESTS A	WATER CEVELS, WATER RETURN, CHARACTER OF ORALING, ETC.
SE 24 24 PUSHED  304.4  15  304.4  17.0  10.0-IS.0 FT: SEE DESCRIPTION ON BORING LOG OW-6A.  15.0-IS.3 FT SAND (SM): SATURATED, GRAY BROWN, SILTY, VERY FINE SAND. SATURATED, GRAY BROWN, SILTY, VERY FINE SAND. SATURATED, GRAY IN STICKY, SATURATED, GRAY LAY MATRIX. SATURATED, GRAY LIN STICKY SOFT GRAY CLAY MATRIX. SEB-IG.D FT SAND (SM): SATURATED, BROWN, SILTY, CLAYEY, VERY FINE SAND. III.0-IT.0 FT CLAY (CH): SOFT, STICKY, SATURATED, BROWN, SILTY, CLAYEY, VERY FINE SAND. III.0-IT.0 FT CLAY (CH): SOFT, STICKY, SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY CLAY (CH): SOFT, STICKY, SATURATED, SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY CLAY (CH): SOFT, STICKY, SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY CLAY (CH): SOFT, STICKY, SATURATED, GRAY CLAY (SATURATED, GRAY). SATURATED, GRAY CLAY (CH): SOFT, STICKY, SATURATED, GRAY CLAY (SATURATED, GRAY).	GBSERVATION WELL INSTALLED TO 16.7 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SSESPLIT SPOON, STESIELBY TUBE; SITE NESS - SOUTH OF 16 DEDBUSON, PEPITCHER, CEOTHER WASTE CONTAINMENT	OW-EB



•	(	GE0	LOGIC	DRI	LL	LOG		PROJECT		F	USRAP	JOB NO. 14501-115	SHEET NO.	HOLE NO. OW-7A
SITE			OUTHE AS				COORDINATE	Š			S1867 E419		FRION HORIZ.	BEARING N/A
8E GU	N 6/86		MPLETED 0/15/86	DRILL	.ER	EMPIRE	SOILS	ı		Œ AI		1	ROCK OFT.	TOTAL DEPTH
	RECO	VERYOF		CORE	BOXES	SAVE	ES EL. TOP	OF CAS 19.87		ROUN	D EL. DEPTH/EL GROUND WATER 6.66 NONE OBSE		0.3 DEPTH/EL. TOP O	
			EIGHT/FALL NCHES			2-9 ING LEFT OBS	N HOLE, DIA., ERVATION	/LENGTH	L		LOGGED BY:  S. BALONE /A	L		/A
<u>μ</u> «	2 2	₹ ¥	۲ ا	P	WATER RESSURE									
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RLN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "H" PERCENT CORE RECOVERY		TESTS PLESSON 6.	TAKE NATES	ELEVATION 316.6	O DEPTH	GRAPHIC LOC	SAMPLE	DESCRIPTION AND CLASSIFIC	ATION	WAT WAT CHA	ES ON ER LEVELS, ER RETURN, RACTER OF LING, ETC.
SS 2	24	24	45	12 121 6.	22	23 24	316.4	-		1	O.O-O.3 FT CLAY ICL): GRAVEL STIFF TO HARD, DRY TO MOIST BROWN (5YR3/4), ROADBED MA O.3-8.5 FT: SILTY CLAY ICL): I	. MODERATE	WITH 12 1/4 IN. 1	MALLETER
							·	5 -			MOIST, STIFF TO SLIGHTLY PLA MOTTLED RED BROWN TO RUS OF SUBROUNDED PLATY TO SE FINE GRAVEL WITH VARING THIC	ASTIC, T COLOR, TRACE MISPHERICAL, CKNESSES OF	WITH 6 INLSTRIN	STEM AUGER GER PLUG DF AUGER.
ST 3	24	22						-		T2	OXIDATION RINDS, TRACE OF DA TO BLACK 5 NN GREANIC NOD NODERATE BROWN (5YR3/4).	irk brown	USING 7 HOLLOW	ADVANCED IN. STEM
	24	24					308.2	8.5		-	8.5-29.0 FT: CLAY (CH):BROWNI (5YR4/I), WET TO SATURATED, HIGHLY PLASTIC. NO SILT OR G MATERIAL.	VERY SOFT.		PLASTIĆ,
ST 3								1 1 1		2			CLAY. INSTALLI OF 8 IN CONDUCT	ED 12 FT DIA.PVC OR CASING
SS 2	24	24	2	0	0	2/3		15 -		2	TRACE OF SAND BELOW 15.0 F	Τ.	AND	T DEPTH
SS 2	24	24	2			1/2		20 -					21.44	
						2								
SS 2	24	24	5	1	1	1/		25 -		•	26.0 FT: THIN LAYER OF RED B SILTY, VERY FINE SAND.	Rown,		
20						72	287.7	29,0 30		4	29.0-39.0 FT <u>GRAVEL (CM);</u> SUB TO ROUNDED GRAVEL IN MATRIX	OF VERY		
SS 2	24	20	123	25	51	97			5	١.	DENSE,RED BROWN, CLAYEY SILT ABSENT FROM SAMPLE AT 35,0 FLECKS OF GRAY-GREEN CLAY I	TO 36.4 FT.		
	142:2	n sea	ON STESHEL	BY TIRE.		SITE	281.6	35			· · · · · · · · · · · · · · · · · · ·		HOLE NO.	
			÷PΠΩ±Rι Φ				<u> </u>	IFSS -	SOUTH	E AS	ST OF BLDG. 409		INCE NO.	OW-7A



GEOLOGIC DRILL L	OG		T NO. HOLE NO. OW-7A		
STAN STAN STAN STAN STAN STAN STAN STAN	ELEVATION 281.6	HLAGE 155	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON TA  WATER LEVELS, WATER RETURN, CHARACTER OF DRILING, ETC.
17 17 147/11 32 47	250	133	6		
4 4 100/4 100/4	277.7	39.6	-7-	39.0-39.6 FT SHALE: WEATHERED RED BROWN SHALE.	
SS-SPLIT SPOOM, ST=SHELBY TUBE,	STE	39.6		BOTTOM OF BORING AT 39.6 FT.	OBSERVATION WELL INSTALLED TO 39.6 FT; SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
D-DENNISON PERTCHER GEOTHER		NFSS - SO	UTHE	AST OF BLDG. 409	HOLE NO.



GEOLOGIC DRILL L	OG	PRO_ECT	FUSRAP JOB NO. 14501	SHEET NO. HOLE NO115 1 OF 1 OW-78
SITE NESS - SOUTH OF WASTE CONTAINMENT	COORDINAT		1870.5 E419.5	ANGLE FROM HORIZ. BEARING 90° N/A
13, 30, 30	MPIRE SOILS	DRELL MAKE	AND MODEL HOLE SIZE OVERBURDEN LE B-55 7" 13.0	FTJ RCCX FTJ TOTAL DEPTH
CORE RECOVERYOTI/X) CORE BOXES N/A N/A	SAMPLES EL. TO		IND EL. DEP'HZEL GROUND WATER NONE OBSERVED	DEPTH/EL. TOP OF ROCK
SAMPLE HANNER WEIGHT/FALL CASHK 140 LBS/30 INCHES	OBSERVATION	LENGTH WELL	LOGGED BY: A. ATKINSON	
SAMPLE TYPE AND DIMETER SAMPLE RADVANCE LENGTH CORE RUN CORE RECOVERY CORE RECOVERY FRACENT CORE PRECENT PRECE	ELEVATION  316.6	CO DEPTH GRAPHC LOG	DESCRATION AND CLASSIFICATION	NOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRALLING, ETC.
SS 24 14 5 3 2 3		5	O.O-IO.O FT: SEE DESCRIPTION ON BORING LOG OW-7A.  IO.O-I3.O FT: CLAY (CID: SOFT, STICKY, WET GRAY CLAY WITH BLACK SUBROUND)	
	303.6 -	13.0	BOTTOM OF BORING AT 13.0 FT.	OBSERVATION WELL INSTALLED TO 39.6 FT; SEE CONSTRUCTION LOG FOR DETAILS.
SS-SPIT SPANE ST-SLEIBY TIRE.	SITE			
SS=SPLIT SPOON; ST=SNELBY TUBE; D=DENNUSON; P=PITCHER; O=OTHER	SITE	NESS - WASTE CO	SOUTH OF NTAINMENT	HOLE NO.



		GEC	LOGIC	DR	ILL	LOG		PROLECT	r	FŁ	ISRAP			JOB NO. 14501	-115	SIEET	NO. OF 2	HOLE NO.
SIT		WA	NFSS - E STE CONT	AST OF AINMEN	TT		COORDINATE	s			5818	E620				FROM 1	IORIZ.	BEARING N/A
BEI 11	/10/8		OMPLETED 11/11/86	DRIL	LER	EMPIR	E SOILS		DRELL MA		AD-2		HOLE SIZE	OVERBLIRDEN		ROCK	£TJ 2.6	TOTAL DEPTH
1.		N/A			E BOXES	SAME	~4   >:	OF CAS	ING G	ROUND 317	EL.	DEPTHUE	L. GROUND WA			DEPTH.	/EL. TOP OF	ROCK
14(	LBS	/30 ]	NCHES		CAS	ING LEFT	N HOLE, DIA./ SERVATION				LOGGED E			SOLLO		L		
SAMPLE TYPE	SAMPLER ADVANCE	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	N 6.9 M	WATER RESSURE TESTS		ELEVATION 317.69	O DEPTH	GRAPHC LOG	SAMPLE	···	DESCRIPTI	DH AND CLASS	FICATION			WATE WATE CILLR	S OM R LEVELS, R RETURIL ACTER OF IIII, ETC.
							316.69	ro			GRAY, HI GRAVEL. LO-IO.D BROWN ( BROWN ( MODERA)	FT. SLT 5YR3/4) BOYR4/21 FELY PL	Y CLAY (CL TO DARK Y , FIRM, MOIS ASTIC. WITH	WITH SOME  I: MODERATE  ELLOWISH  T,  A TRACE TO			FROM O. FT WITH HOLLOW FLIGHT	NUGER.
\$5 2	24	14	18	9	7	li /20		5 -			SILI ANI SUBROLII DIAMETEI	IDED GRA	ANDONLY S AVELS UP T	CATTERED, O 1/2 NL			KS SINT	
SS 2	24	18	3	2	2	1/2	307.69	10 -		2	(5YR4/D, Plastic,	MOIST, S SOFT TO F SILT S	TICKÝ, HIGHL MODERATE SIZE PARTICI	WNISH GRAY .Y LY HARD, FE LES, AND SO	w		DRILLING VERY FAS SMOOTH A	CILLA TO
5T 3	24	24						15 -	S	T								
\$\$ 2	24	6	4	1	2	2/2		-		3								
								20 -										
SS 2	24	16	1	2	2	2/4		25 -										
SS 2	24	24 IT SP00	3	Y TIRE.	1	2 3	282.69	30	5	(5	Y4/D ANI	O VERY	COMES OLIVI SOFT AND	E GRAY STICKY.				
			PITCHERI O					NFSS	- EAST	0F	CONTAI	NIENT				HiO	LE NOL	A8-W



	G	EOL	OGIC	DRII	LLL	.0G	PI	ROLECT			FUSRAP 14501-115	SHEET 2	NO. OF 2	DM-8V HOTE NOT	
SAMPLE TIPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAUPLE BLONS "N" PERCENT CONE RECOVERY	ા ા ડિડડ જ દુમ્ય,	WATER TESTS TESTS	S THE S NAUTES	elevation 282.69	를 35	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	.ASSIFICATION			
ST 3	24			SI V		<u> </u>	282.19	35.5		ST 2	35.5-42.0 FT. GRAVELLY SANDY SILT(SM): DARK REDDISH BROWN (IDR3/4),				
SS 2	24	24	100	40	34	105		40 -	****	6	MODERATELY TO HIGHLY CONSOLIDATED, WET TO MOIST, SAND IS FINE-TO MEDIUM-GRANED, WITH SOME SUBROUNDED TO SUBANGULAR, HARD GRAVELS UP TO 3/4 WICH.		TUBE	ED SHELBY NIMHG ST E *ST-2.	
155							275.69	12.0			42.0-44.6 FT. <u>WEATHERED SHALE:</u> MODERATE REDDISH BROWN (10R4/6), MODERATELY HARD, FISSILE.			IOO LB. R DURING SS E #7.	
/SS 2	0.1	0.1		50/1*			273.09-	44.6		7	BOTTOM OF BORING AT 44.6 FT.		RISTAL DEPT CONSTI DETAIL SEE OF WELL I	SSERVATION OG FORLL	
			Poone Stesi Repertance			5	ATE.	N.	FSS -	E.	IST OF CONTAINMENT		INCE NO.	A8-WO	



	G	EOL	OGIC	: DI	RILL I	LOG	-	PROJECT		FU	SRAP			JOB NO.		SIEET 1	NO. OF I	HOLE NO.		
SITE	NFSS	- EA	IST WAS	TE CO	BMMIATHC	INT	COORDNATE	COORDINATES S822 E620 ANGLE FROM 9										BEARGG N/A		
BECU 11/1	IN COMPLETED DRILLER EMPIRE						SOILS									ROCK OF	MA 12.0'			
CORE		ECOVERYOFT / 20 CORE BOXES SAMPLES EL. TOP OF CASING N/A N/A SS-2 318.97									OUND EL.   DEPTH/EL GROUND WATER   CEPTH/EL TOP OF ROCK   317.82   NONE OBSERVED-11/11/86   N/A									
												LOGGED BY:  JOHN SOLLO								
177E ETER	ADVANCE DRE RUN	COVERY	BLOWS CORE		WATER PRESSURE TESTS		ELEVATION	<b>4</b>	87 :	SALPLE		NET CO OT	ION AND CLAS	EIEIA TION			NOTES CIN WATER LEVELS,			
SAMPLE TYPE AND DIANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAUPLE RECOVERY	SAUPLE BLONS 'N' PERCENT COPE RECOVERY	105S	PRESSURE PASSURE	SE TIME SO NEW PROPERTY.	317.82	O 55 PT	CPAPHC LOG	148							WATER RETURN, CHARACTER OF DRILLING, ETC.			
							316,82	1.0			10 BLAC	K. NUME T CLA	Y CLAY (CL ROUS ORGA Y (CL): MOT	NIC MATER TLED				ADVANCED LO TO 12.0 INCH		
SS 2	24	12	54	14	24	30 38				ı	YELLOWIS GRAY TO	H BROY ORAN	WN (SYR3/4) WN (IOYR4/2 GE BROWN, W	) AND MOT IODERATELY	1		HOLLOW STEM FLIGHT AUGER.			
								5 -			SILTY, WI SAND AN	TH SOM	TO STIFF, S IE SUBROUN /ELS.	DED COARS	E					
ST 3	24	24						-		S T										
SS 2	24	ח	16	16	4	8 6		10 -		2										
						Ta	- 305.82 -	12.0				OF BO	RING AT 12.	O FT.			INSTALL DEPT OF FOR CO DETAILS OBSERV LOG FO	ATION WELL ED TO A F U.9 FT. NSTRUCTION S SEE ATION WELL R DETAILS.		
			OON: ST=SH P=PITCHER			sı	IE		NF WASTE	22 400	EAST OF NTAINMEN	IT		_			HOLE NO.	B8W0		



														<del></del> г				1
	G	EOL	OGIC	DRI	LL L	.0G		PROJECT		F	USRAP			JOB NO 1450	1-115	1	)F 2	OW-9A
ZUE	NFS	s - I	EAST OF	CONTA	INÆNT	ſ	COGRONATES				S1018	E620			ANGLE	90°		BEARGE N/A
BEGLIN		- 1	PLETED 1/8/86	DRALL	ER i	EMPIRE	SOILS	۵			NO MODEL RAD-2		HOLE SIZE	OVERBURDEN 40.		ROCK C	FTJ 0.3	TOTAL DEPTH
CORE		ERYUFT.	/%)		BOXES	SAMPLE ST-	]   7,	OF CASE	NG G		D EL. 7.24	1	L. GROUND WA		/86	DEPTH/	40.8	F ROCK /276.44
			IGHT/FALL ICHES		CASI	NG LEFT	N HOLEIDA./ ERVATION				LOGGED E	Y.	HOL	N SOLLO		1		
SAMPLE TYPE AND DIEMETER	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAWPLE BLOWS  "IN"  PERCENT CORE  RECOVERY	F S-zi	WATER RESSURE TESTS		ELEVATION	0.ЕРТН	GRAPHC LOG	SAMPLE		DESCR#11	ON AND CLAS	SFICATION			WAT WAT CHA	ES ONE ER LEVELS, ER RETURN, RACTER OF LING, ETC,
ν ₹.	SAU	3 8	2) 185	12 LOSS 12 C. P.M.	200 6	SS THE N N N S MRUTES	317.24	0			א ז-נא	ET ÉLAN	(CL): VER	Y DARK CR	ĀŸ			
							316.24 312.24	1.0			SILTY A	ND NUME FT CLAY OFT, SIL	ROUS ORG ( (CL): DARI TY WITH TI	ANICS. ( BROWN,	_		SAMPLE AS SHO	S COLLECTED
SS 2	24	10	38	10	IB	20/ /34	J12.24	5 -		1	BROWN SLIGHTL TO 15%	5YR3/4 Y TO MI FEW SU	TY CLAY (C ), MOIST, FIR DDERATELY BROUNDED	IM. PLASTIC S LIGHT TO E	SILT UP			
								10-					THOUGHT. : GRAY TO		ORANGE.	•		
\$S 2	24	15	.7	3	3	4 6		-		2								
SS	24	21		3	3	5/	303.74	13.5 -		7	(5YR5/2 HIGHLY	STICKY PLASTIC,	AY (CL): PA , WET MODE , SOFT, TRA SUBROUNDE	RATELY TO CE OF SILT				
-	24	21	8	J	J	6		-			(5YR4/I)	A HTIW	Y BECOMES TRACE OF	VERY	GRAY			
ST 3	24	20						20 -		Ť	FINE-GR	AINED SA	AND BLEBS.					
SS 2	24	20	4	l	ı	3/4		25 -		4								
SS 2	24	17	8	3	3	5 6	286.24	30 -		5	PALE BI VERY FI CONSOLI COMPRIS IFT. IN	ROWN (5) NE-GRAU DATED E 10-157 MAXIMUN	RAVELY SAM YRS/2), WET WED, MODER TO DENSE, OF LAYER SIZE. SAN	GENERALI ATELY GRAVELS AND ARE D IS	ΞŸ			G BECCMES R AT 32.5
			OON; ST=SH			SI	282.24 TE	35 - NFSS-1	<u>141 M.</u> East i	L_! DF '	ANGULA WASTE CE		S 5-15% OF ENT	LATER.	-		HOLE NO.	OW-9A
_	- 00				·												l	U# 77



JOB NO. SHEE	T NO.   HOLE NO.
GEOLOGIC DRILL LOG FUSRAP 14501-115 2	2 of 2 OW-9A
WATER PRESSURE TESTS  RANDER STATE ON THE STATE OF THE ST	NOTES ON WATER LEVELS, WATER RETURN CHARACTER OF DRILLING, ETC.
SS 24 18 48 17 20 28 AT 40.0 FT. SILT BECOMES VERY DENSE AND WELL CONSOLIDATED WITH GRAYISH GREEN GOG4/2) WEATHERED SHALE	VERY SLOW DRILLING AT 39.5 FEET.
FRAGMENTS.  40.8-4IJ FT WEATHERED SHALE:MODERATE REDDISH BROWN (10R475), MODERATELY HARD AND FISSILE WITH SOME GREENISH	USED 300 LB. HAMMER AT SS
SS 14 14 83 22 33 50/2 276.44 40.8 7 7 GRAY SHALE.	SAMPLE #7.
BOTTON OF BORNIC AT 4LIFT.	OBSERVATION WELL HISTALLED TO 40.3 FT. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS=SPLIT SPOON, ST=SHELBY TUBE; SITE NESS-EAST OF WASTE CONTAINMENT DEDENMISON, PERTICHER OF OTHER	HOLE NO.



ł	G	EOL	OGIC	DRII	LL I	LOG		PROJECT		۴U	ISRAP			JOB NO. 14501		SHEET N	10. )F J	HOLE NO.
SITE	NFS:	S - 1	EAST OF	CONTAI	INMEN	T .	COGROMATE	\$		SI	013.5	E620			ANGLE	FROM HO	RIZ.	BEARING N/A
BEGUN		1	MPLETED 1/10/86	DRILLI	ER	EMPIRE	SOILS	1	DRILL MAI		NODEL AD-2		HOLE SIZE	OVERBLIRDEN		ROCK OF	T.)  /  <b>A</b>	TOTAL DEPTH
CORE	re cove	RYFT.	./'20		BOXES /A	SAMPLE ST-	1   21	8.82	ING G	ROUND 317	7.31		L GROUND WA		1/86	DEPTH/E	L.TOP OF	ROCK
			EIGHT/FALL NCHES	•	CASI		N HOLEIDIA.				LOGCED	3Yı	чног	SOLLO	-			
SAMPLE TYPE AND DUNETER	SAMPLER ADVANCE LENGTH CORE RUN	SAUPLE RECOVERY	SAUPLE BLOWS 'N' PERCENT CORE RECOVERY	PF	WATER RESSURE TESTS BENEFICE SELECTION OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF T		ELEVATION	C) RFPTH	GRAPHC LOG	SMPLE	, V-1 V		ON AND CLASS		Òν		WATE WATE CHAP DREE	ES ON ER LEVELS, ER RETURN, MACTER OF LIND, ETC.
SS 2	24	23	ಲ	16	26	34 52	316.31	1,0		-	GRAY T MODERA 1.0-M.6 BROWN MOTTLE FIRM TO A TRAC	O DARK TELYSOF FT. CLA (10YR4/2 D ORANG ) STIFF. E OFCLA	Y CLAY (CL BROWN, MOIS T, MUMEROU Y (CL); DARN ) TO PALE E BROWN T SLIGHTLY P Y AND FEW	ST, S ORGANIC: C REDDISH BROWN AND O LIGHT G LASTIC, WIT ISOLATED	S. RAY, H		FROM O FT.WITH DIA HOL AUGER.	O TOI4,6 7 IN. LOW STEM 5 COLLECTED
ST 3	24	24								ST	DIAMETE AT 6.2	R. FT., 6.8	AVELS UP FT., AND 7. FINE-GRAIN	2 FT. TRAC				
SS 2	24	24	ļi	5	5	6		10 -		2	SAND S		TIBL OTTAL					
SS 2	24	18	6	4	3	3 4	200 71-			3	GRAY (5	YR4/D AI	CLAY BECC ND SOFT AI ING O 14.6	ND STICKY.	HZW			
							-302.71-									[ ] 	NSTALL DEPTH ( FEET. SE DBSERV, CONSTRI	E ATION WELL
			DONE STESHE P-PITCHERI			sn	E	NFSS	- EAS	ST D	F CONT	TNMENT				IK	OLE NO.	0¥-98



	G	EOL	.OGIC	DRII	LI	_0G		PROJECT		FU	SRAP			JOB NO. 14501		1	OF 2	HOLE NO.
SITE	NFSS	- E	AST OF	CONTAI	NMENT		COORDINATE	2			1219	E619			ANGLE	FROM F		BEARING N/A
BEGUN		- 1	PLETED	DRALL	ER	EMPIRE	SOILS	D	RELL MAKE		MODEL AD-2		HOLE SIZE	OVERGURDEN		ROCK (	6.3	TOTAL DEPTH 40.3'
11/5 COR€	RECOVE		1/6/87 /20		BOXES	SHPLE	S EL. TOF	of CASI 320. 1	NG GRO	UND	EL.	DEPTH/E	L. GROUND WA 35' /3	TER		.1	EL. TOP OF	<u> </u>
	E HAVA	IER NE	ICHT/FALL ICHES		_		N HOLELDUL RVATION	/LENGTH	<u> i . `</u>		LOGGED	871	<del></del>	I SOLLO		<u>.l</u>		
-				_	WATER			T		Т	1	······································						
SAMPLE TYPE AND DAMETER	SAMPLER ADVANCE LENGTH CORE RUN	UMPLE RECOVERS	SAMPLE BLOWS  TH  PERCENT CORE  RECOVERY	1055 H E.M.	HESSING LESIS	TME IN MENUTES	ELEVATION	DEPTH	CRAPHC LOC	SAMPLE		DESCRIPTI	OH AID CLAS	SIFICATION	•		WATI WATI CILLI	ES ONN ER LEVELS, ER RETURIL RACTER OF LING, ETC.
_	בוג	310		RI 6.	54D €.	360 6	318.91	0		+	0.0-2.5	FT. SIL.T	Y CLAY (FI	I.L): LOOSE,				ADVANCED
		-					316.41			1	BROWN, COMPA 2.5-5.4 BROWN, TRACE	SLIGHTLY CTED.FEW FT.SILT MOIST T OF SILT A	TO MODES COBBLES Y CLAY (CI O WET, FIRM AND SAND. TY SAND (S	RATELY AND BOULD D: MODERAT I, WITH	ERS. E			
SS 2	24	18	35	20	16	19 20	313.51 312.92			<u> </u>	YELLO! FINEGR	MISH BROM AINED, LO	WN UOYR5/ OSE TO SL WET TO MO	II, VERY IGHTLY			SAMPLE AS SHO	S COLLECTED
								10 -		_ '	6.0-10 (5YR3. TO M	V4) DENSE XDERATEL	AY (CL): MO AND STIFF Y PLASTIC, L, SUBANGL	, SLIGHTLY TRACE OF	SILT.		USED 3 HAMMER SAMPLE	FOR SS
\$\$	24	21	46	21	20	23/25	308.11	10.8		2	MODE CONS GRAD GRAV SUBA	RATE BRO OLIDATED, ED SAND ELS ARE NGULAR I	RAVELLY S. WWN (5YR3/ MOIST; VER MAKES UP LIGHT TO I TO SUBROUP DIMENSION.	4), MODERA IY FINE TO 10% OF LA DARK GRAY, ID AND AVE	FUIE YER HARD,		DRILLIN	2.0 TO 18.0 G IS ROUGH COVERABLE
SS 2	24	13	40	17	20	20 15		15 -		3	FROM BECOM 2L2-2 GRAY	16.6 TO LE DARK 25.0 FT. S ISH RED (	21.2 FT. SA REDDISH BE SLTY GRAV IOR4/2), LO	NDS AND S OWN (IOR3/ ELLY SAND: OSE TO	'4) <b>.</b>	·		
- ST-	13	13				21	297.81	20 - 21-2		F2 L	TO M Suba Diane	EDIUM GR NGULAR (	SOLIDATED, LAINED SANI GRAVELS UF T MAKES U	), WITH HAR ' TO 3/4 H	ach in			
25	24	18	38	เข	- 17	24	007 -	3.5		4	25.0- GRAY CONS MEDIL	27.5 FT. ISH RED ( OLIDATED IM GRAINE	SILTY GRAY 5R4/2), WE DENSE, VE DENSE, VE	T, MODERAT RY FINE TO AKES UP 10	ELY -15% 0	F		•
SS 2	24	16	37	17	20	17	293.91 291.41			5	27.5- (5YR PLAS	30.0 FT. 4/I), WET, TIC,SOFT	CLAY (CL)	BROWNISH DHIGHLY ATELY SOF	GRAY T, TRAI	CE		G EASIER
SS 2	24	24	13	3	7	7/9				6	BR07 30.0	IN SAND.	CLAYEY SI	T (ML): PA	LE		27.0 FI	IOOTH AT EET.
ST - 3-	16	14				<u> </u>	288.91	30 -	1	ST 2-	WELL	CONSOL	2), MOIST, A DATED, DEN ND <5% SM	SE WITH 10-	15%			
							286.91 258.91	32.0	-		GRAY 32.0- MODE DENS	ELS. -40.0 FT. RATE RE	SANDY SIL DDISH BROW LL CONSOLI	T (ML): N (10174/6),	VERY	н	-	
			POON STESH PEPITCHER			S	TE		SS - EA	LI ST		TAINME					HOLE NO.	QV-1QA



			1	GIC	DRI	WATER	_0G	[	ROJECT			FUSRAP 14	1 MO. SHEET N 1501-115 2 c	
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLOWS	PERCENT CORE	LOSS N G.P.M.	TESTS	THE N	ELEVATION 258.91	35´	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	•	NOTES ON WATER LEVELS WATER RETURN CHARACTER OF DRILLING, ETC.
1	16	14	<del> </del>	78	25	28	50/4				7			
\ <u>ধ্</u>	4	4		50/4	50/4			- 278.61 <i>-</i> -	40 3		8	40.0-40.3 FT. SHALE: WEATHERED, REDDISH BROWN GOR3/4), VERY DE FISSILE, FRAGNENTED WITH SOME S	NSE, SILT.	
												BOTTOM OF BORNAG AT 40.3 FT.		OBSERVATION WINSTALLED TO A FEET. SEE OBSERVATION WINSTALLED TO THE PROPERTY OF THE PROPERTY O
l	SS=SP D=0E	LIT SP	CON	ST=5H	ELBY TUB	E)	sr	TE		cc	لِـا	ST OF CONTAINMENT	н	OLE NO.



	0	EO	LOGIC	DRI	LL I	LOG		PROJECT		FL	ISRAP			JOB NO. 14501	-115	SIEET	NO. OF 1	HOLE NO.
SITE	NF\$	55 -	EAST OF	CONTA	INMEN	T	COGRONATE	S		5	31214	E620			ANGLE	FRCM F		BEARRIG N/A
BEGI 11.	н /6/85	1	MPLETED 11/7/86	DRILL	.ER	EMPIRE	SOILS	DI			D MODEL		HOLE SIZE	OVERBLEDEN		ROCK (	FTJ N/A	TOTAL DEPTH 29.0'
COR	RECOV	ERYET	J%	- 1	BOXES V/A	SALPL SI-		OF CASE 20.13	ic Ci		EL. 3.60	DEPTHA	L. GROUND WA	TER 317.60		DEPTH	EL. TOP O	L
			EIGHT/FALL NCHES	1	EAS	NG LEFT	N HOLE: DIA.				LOGGED B	Ϋ́ε	10H	SOLLO		1	-	
E 2	YANG	VERY	2 E	P	WATER RESSURE TESTS				8		1							ES CAL
SAMPLE TYPE	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLONS "N" PERCENT CORE RECOVERY	LOSS N F.P.K.	挺	THE N N	ELEVATION	HLL	жирис 100	SAMPLE		DESCRATI	IÚN AND CLASS	SFICATION			WAT! CHAF	ER LEVELS, ER RETURN, PACTER OF LUNG, ETC.
-	히를	3 8	N 18	RI 6.	2ND 6:	380 6	318.60	0	3		0.0-8.0	FT. SEE	BORING LO	g descript	IÓN			ADVANCED
								5			OF BORI			o sesona i			FROM D FT WITH HOLLOW AUGER.	.O TO 29.0 7 IN. DIA STEM 5 COLLECTED
ST 3	24	23								\$ T								
SS 2	24	и	28	8	В	15 10	310.6	8.0		1	BROWN (	10YR5/2	TO PALE I	CYELLOWISH BROWN T. TRACE OF			$\nabla$	
							307.6	11.0			SILT, WIT AND FEW	H FEW SMALL	ISOLATED S SUBROUNDE	ANDY BLEBS ED GRAVELS	5		-₹-	11/7/86
								15 -			PALE BE DENSE, M	ROWN (5 101ST, M	YR5/2) MOD ODERATELY	AYEY SILT: ERATELY SANDY IN F DED GRAVEL:				
SS 2	24	5	54	. 39	30	24 21				2								
						19		20										
2S 2	24	16	36	5	17	27	297.6	21.0	1111	3	GRAYISH	RED (10)	R4/2) WET,	LY SAND(GP DENSE,	_			
								25 -			MODERAT FINE GRA 10-15% SL	ELY CO UNED, WI UBANGUL	NSOLIDATED TH TRACE (	, VERY FINE OF CLAY AN COUNDED GR	0			
SS 2	24	10	35	3	ಕ	20/22				4								
SS 2	24	14	16	9	8	8 11	290.6	28.0		5				OWNISH GRA	ΙΥ	_		
							- 289.6	29.0		١	PLASTIC, OF SILT, BLEBS,	MODERA WITH FE	WET, HIGHLY TELY SOFT W ISOLATEI	TO SOFT, T SANDY	RACE	_/	INSTALL DEPTH ( SEE OBS WELL LO DETAILS	
			XXII STESIEI PEPITOIERI			617	E .	NFSS	- EAS	ST (	F CONTA	INMENT					HOLE NO.	0W-10B



	C	EO	LOGIC	DR	LL I	LOG		PROJECT		FU	ISRAP			JOB NO. 1450:	-115	SHEET	NO. OF 2	HOLE NO.
SITE			FSS - E TE CONT				COORDINATE	S		2	1419 8	624			ANCLE	FROM H		BEARING N/A
9EGU	N 4/86	- 1	HPLETED 11/5/86	DRI	LER	EMPIRE	SOILS	ſ	A A		NODEL RAD-2		HOLE SIZE	OVERBURDEN		ROCK (	1.2	TOTAL DEPTH
CORE	RECOV	ERY(FT	<i>s</i> 0		BOXES N/A	SAMPL SI- SS-	]   3	OF CAS	NG G	ROUND 317	EL. 7.84	DEPTH/E	L. GROUND W	ATER /310.8			36.0'	ROCK /281.84
			ECHT/FALL NCHES	Ł	CAS	NG LEFT	IN HOLE: DIA., ERVATION				LOGGED BY	'a	J0H	N SOŁLO		1		
TYPE VETER	ADVANCE OPE RUN	COVERY	BLOWS T CORE	f	WATER RESSURE TESTS		ELEVATION	DEP TH	81.0	SAMPLE	·	\F¢¢ClDT	ON AND CLAS	CECICA YIOU	<del></del>		WATE	IS OHI ER LEVELS,
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENCTH CORE RUN	SAMPLE R	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	151 E. E. ¥.	PPESSURE P.A.I	280 e. 3 ≅ M 3 E M	317.84	0	CPUAPHIC LOG	73							CHAR	er return, Lacter of LNG, etc.
		-					315.34	2.5			BROWN M CONSOLID ORGANIC 2.5-ILO F (5YR5/2),	OIST LO ATED ,! DEBRIS. T CLAY MOIST,	NOSE TO S WITH NUME (CL): PAL FIRM TO S	Rous  E brown	WITH		FEET US HOLLOW FLLIGHT SAMPLES	O TO 37.2 ING 7 INCH STEM AUGERS. 5 COLLECTED
SS 2	24	4	48	12	18	30 42		5 -		-	25% GRAV	/ELS UF	YO 3 IN	CH IN DIAME	rer.		AS SHOW	in. 11/5/86
								10 -			CONCENTI	RATION	OF GRAVE	LS AT 7.5	ੀ.		ROUGH E FROM 5. FEET.	OFFILLING O TO BLO
\$5 2	24	ю	15	5	8	7/6	306.84	ILO -		2	(GM): MOD VERY FIN	ERATE E-GRAIN	ED, MODER	R3/4), WET, ATELY DENS				FAST AND GINNING AT T.
SS	24	18	7	3	3	4 /	301.84	15 -		_	TO 2 INC.	HES IN	DIAMETER	ED GRAVELS IN A SILTY	UP		USED A HALLMER	
2	٥	10	*	-	3	/ 1		16.0		3	GRAY (5Y SOFT, STI TO HIGHL	R4/0, S CKY, MO Y PLAS	IST TO WE TIC. SLIGHT	ROWNISH ODERATELY T, MODERAT LY SILTY B HARD GRAV	Ì			
\$\$ 2	24	24	5	ı	ı	1/1		20 -		4								
ST								25 -		s								
3	24	24								I								
SS 2	24	20	8	ı	4	1/7	289.94	27.9		_	(GMD: DAR)	( REDDI:	SH BROWN	AYEY SLT QOR3/40), AND WELL			HARD AN	BECOMES D SLOW AT
			·				282.84	30			CONSOLIDA CLAY AND	ATED, M 20% H VELS L	HTIW,T210	10% GRAY NGULAR, DAR	K		28.0 FEE	Τ.
			DON, ST-SHE P=PITCHERs		<u> </u>	  आ		35   NFSS	- FA'	n	F CONTA	INNENT		<del> </del>			IOLE NO.	
	D-MEN	- Mucan	L-MICHER	O-0 INEK								- / 10 - ML   1						OW-11A



GEOLOGIC DRILL LOG	PROJECT		_	FUSRAP	JOB, NO. SHEET 14501-115 2	NO. HOLE NO. OF 2 OW-11A
SAMPLE TTPE AND DAMPLE TTPE AN	2	GRAPHIC LOC	SAMPLE	DESCRIPTION AND CLASSIFICA		MOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS 5 5 50/5' 50/5' 281.8			-6-	36.0-37.2 FT SHALE: WEATHERE GREEN GOGG/2) TO REDDISH BRI	D, PALE	
280.6	37.2			GREEN GOGG/2) TO REDDISH BR		
CS-CPH IT S DAYAL ST-SLET BY TIBE. STE						OBSERVATION WELL INSTALLED TO 36.9 FT. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS-SPLIT SPOON; ST-SHELBY TUBE; STE D-DENNISON: P-PITCHER; O-OTHER	NF S	S - E	AS	T OF CONTAINMENT		OM-11V



	G	E0	LOGIC	DR	LL	LOG		PROJECT		Fl	JSRAP			јов но. 14501	-115	SHEET	NO. OF 1	HOLE NO.
SITE	NFS	s -	EAST OF	CONTA	INMEN	T	COGRDINATE	S			51414	E624		1	ANGLE	FROM H		BEARING N/A
BEGUN	5/86	- 1	WPLETED 11/5/86	DFaL	LER	EMPIRE	SOILS				D HODEL		HOLE SIZE	OVERBURBEN		ROCK (	FTJ N/A	TOTAL DEPTH
CORE	RECOVE	RYFT.	_/x)		BOXES N/A	SALELI SI- SS-	EL. TOP	of CAS	e4G C		D EL. 7.75		L.GROUND WA E OBSERVE	TER		l	EL. TOP OF	l
			EIGHT/FALL NCHES		CAS	NG LEFT	N HOLEIDIA. ERVATION	LENGTH WELL			LOGGED B			SOLLO		I		
SALPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLOWS 'N' PERCENT CORE RECOVERY	SSO1	WATER RESSURE TESTS	TANE N AMELITES	ELEVATION	O SEPTH	GRAPHC LOG	SAMPLE	. <b>L</b>	DESCRIPTI	OH AND CLASS	FICATION			WATE WATE CHAR	S ON A CR LEVELS, CR RETLAN, WACTER OF WING, ETC.
ST 3	24	20		ZI 6.	2HQ 6*	340 6	315.34	2.5 -		S	BROWN, L CONSOLIL 2.5-6.5 (5YR5/2) MOIST.	OOSE TO CLAY  FT CLAY  MOTTLE  MOTALE	YEY SILT (X O SLIGHTLY UMEROUS OF Y (CL): PALE ED, FIRM TO DDERATELY UP TO 1/4	RGANICS. BROWN STIFF, PLASTIC.			FT WITH HOLLOW FLIGHT	O TO 14.0 7 IN. DIA STEM AUGERS. COLLECTED
SS 2	24	17	82	12	48	34 55	311.34	6.5			6.5-13.0 MODERAT WELL CO HARD SU	FT GRA E BROW NSOLIDA BANGUL	VELLY SAN N (5YR4/4) TED. MOIST AR, DARK GF GRAINED, BR	DENSE AND WITH 10-207 RAY GRAVEL	- %			
\$\$ 2	24	4	16	10	В	B /7	704.04			2								
ST 3	24	24					304.84 -301.84-	13.0 15 –		S T 2	(5YR4/1),	FIRM TO TH ~5%	Y (CL): BRO D DENSE, SU SMALL SUE ELS.	.TY,			PUSHED : TUBE SA 14.0 TO : FEET.	MPLER FROM
											ВОТТОМ	OF BOR	ING AT 16.0	FT.		1	INSTALLEI FT DEPTI	TION WELL
			ONLST=SiÆL ≃PITCIÆRiO		1	প্রা		NFSS	- EAS	T D	CONTAI	NWENT				H	KOLE NO.	OW-11B



Γ		GF	OLOG	10	DR		LOG		PROJECT						JOB NO		SEET	HO.	HOLE NO.
sn			NFSS -	· E/	AST OF			COORDINAT	ES		F	USRAP			1450	1-115		0F 2	OW-12A
	ZIN		STE CO		DRAL					DRALL MA		S1619	E621	HOLE SIZE	OVERBURDEN		90	٥	N/A
	/3/86 E RECO	[	11/3/0	86	CORE	BOXES		E SOILS	P OF CAS			R AD-2	laga	7*	36.		RCCX	2.3	38.3'
SAL		N/A	WEIGHT/F/	411		N/A	SS	7   -	320.42			8.78		28.0'	ter /290.78		DEPTH	36.0'	
			INCHES				089	N HOLE: DIA ERVATION	WELL			LOGGED B	<i>(</i> 1	70H	N SOLLO		•		
E 5	VANCE		OWS S		P	WATER RESSURE	E			,					-				
1314	SAMPLER ADVANCE LENGTH CORE RUN	3	SAMPLE BLOWS  W  PERCENT CORE	ECOVER		TESTS	2	ELEVATION	DEP TH	RAPHE LOG	Sample	ı	escr <b>e</b> tu	ON AND CLAS	SFICATION			WATE	s on: R Levels, R Return,
3	SES	344		-	દા હ રુકે કુ	SESS C	280 €. 21 = 22 ± 23 ± 23 ± 23 ± 23 ± 23 ± 23 ± 23	318.78	0	8									ACTER OF IHG, ETC.
				1						1111		0.0-5.0 I	T. CLAY	YEY SILT (I MODERATEL	LL): DARK				
					İ							CONSOLID GRAVELS.	ATED, M	OIST FEW	. T Subangulai	?			
-	┼-	-	-	+			16	313.78	5 -			5.0-12.0	TAIA	(CL): GRA	VICIT DEN				
SS 2	24	24	29		7	13	20				11	GOR4/2), (	UOIST. A	ODERATEL	Y PLASTIC, EW HARD, D.	<b>NDV</b>			
												GRAY SUE	BANGULA	R GRAVELS	S UP TO 1/	2 INCH			
								•											BECOMES T 8 FEET.
ST 3	24	24							10 =		TZ								
SS				+	$\dashv$			306.78	12.0	$\mathcal{A}$	1	12.0-12.7 F	T. SAND	Y CLAY (C	TS-				
2	24	24	2	$\perp$	1	1	<u>/</u>	306.08	12.7		2	MODERATE Moderate	BROWN LYSOFT	(5YR4/D.	STICKY, WET				
									15 -		1	NUMEROUS	BLEBS	OF FINE, B	ROWN SAND		_		
									}		(	5YR4/1), W	ET. SOF	T TO FIRM NIGHLY PLA					
									}			SOLATED : Occasiona	BLEBS ( L HARD.	OF LIGHT B SUBANGU	IROWN SAND AR TO				
									1		5	SUBROLINGE	D GRAV	ELS UP TO	0 1/2 INCH.				
SS 2	24	24	2		-				20 -										İ
	$\dashv$	-		-			2		3										
									Ź										l
-	+	$\dashv$		_	+	- ,			25									RILLING IS	D ROUGH
SS 2	24	21	5		1	2 3			Z	∕/ 4	G	rading to	) SET. 1	LOOSE TO	E GRAINED, SLIGHTLY			7 27 FEE	
									Z		C	DNSOLIDAT DR4/6).	ED, MOD	ERATE REI	DDISH BROW			V 11/	3/86
						_	:	289.78	29.0		14	LOUISH BR	DWN ((C)	23/4). VER'	(CM): DARK Y DENSE		RI	INITANO CO	)ARSE
SS 2	4 4	4	70	4	7 3	32	/ 1		30		SL	ad metit ( Tbronndei	ONSOLI O GRAVE	DATED; HAR LS UP TO	D, INCHIN		SA	IND AT 2 ILLING RO	9.0 FT.
+	+	+			+	+	27				- Fil	he graine	D SAND	Y MATRIX.	T AND VER	Υ			
			İ					285.28	33.5		/ RE	:DDISH BRI	OWN (101	Y SAND (SI R3/4) FINE	GRAINED				
s	S=SPLIT	SPOO	NG ST=SIE	LBY	TURF.		SITE		35 -:		L MI	MST, TRAC	E OF S	ELY CONSC LT.	LEDATED,				
	-DENNG	SON P	PITCIER	0=0T	HER				NFSS -	EAST	0F	CONTAIN	MENT				HOLI	E NO.	1-12A



GEOLOGIC DRILL LOG	PROJECT FU	ISRAP 14501-115 2	NO. HOLE NO. OF 2 OW-12A
SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE RECOVERY SAMPLE RECOVERY SAMPLE RECOVERY THE	A   A   A   A	DESCRIPTION AND CLASSIFICATION	NOTES CAN MATER LEVELS, MATER RETURN, CHARACTER OF GRALING, ETC.
ST 283.78 3  2  2  2  2  2  2  2  2  2  2  2  2  2	35   ST   36.0   6 36	5.0-38.3 FT. <u>Shale:</u> Weathered, Dark Eddish Brown (1083/4) and Greenish	
SS 10 10 50 /4 30 50 /4	<u> </u>	RAY(5G6/1), MODERATRLY HARD, DENSE, SSRE WITH SOME SW.T.	
280,48		OTTOM OF BORING AT 38.3 FT.	OBSERVATION WELL INSTALLED TO 37.7 FT. SEE GESERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS-SPLIT SPOOM ST-SHELBY TUBE; D=DENESSOM P=PTTCHER; 0=0THER	NFSS - EAST OF	CONTAINMENT	DLE NO. DW-12A



	0	EO	LOGIC	DRI	LL I	LOG		PROJECT		FL	ISRAP			JOB NO. 14501	-115	SIEET	NO. OF 1	HOLE NO.
SITE	NF\$	55 -	EAST OF	CONTA	INMEN	T	COGRONATE	S		5	31214	E620			ANGLE	FRCM F		BEARRIG N/A
BEGI 11.	н /6/85	1	MPLETED 11/7/86	DRILL	.ER	EMPIRE	SOILS	DI			D MODEL		HOLE SIZE	OVERBLEDEN		ROCK (	FTJ N/A	TOTAL DEPTH 29.0'
COR	RECOV	ERYET	J%	- 1	BOXES V/A	SALPL SI-		OF CASE 20.13	ic Ci		EL. 3.60	DEPTHA	L. GROUND WA	TER 317.60		DEPTH	EL. TOP O	L
			EIGHT/FALL NCHES	1	EAS	NG LEFT	N HOLE: DIA.				LOGGED B	Ϋ́ε	10H	SOLLO		1	-	
E 2	YANG	VERY	2 E	P	WATER RESSURE TESTS				8		1							ES CAL
SAMPLE TYPE	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLONS "N" PERCENT CORE RECOVERY	LOSS N F.P.K.	挺	THE N N	ELEVATION	HLL	жирис 100	SAMPLE		DESCRATI	IÚN AND CLASS	SFICATION			WAT! CHAF	ER LEVELS, ER RETURN, PACTER OF LUNG, ETC.
-	히를	3 8	N 18	RI 6.	2ND 6:	380 6	318.60	0	3		0.0-8.0	FT. SEE	BORING LO	g descript	IÓN			ADVANCED
								5			OF BORI			o sesona i			FROM D FT WITH HOLLOW AUGER.	.O TO 29.0 7 IN. DIA STEM 5 COLLECTED
ST 3	24	23								\$ T								
SS 2	24	и	28	8	В	15 10	310.6	8.0		1	BROWN (	10YR5/2	TO PALE I	CYELLOWISH BROWN T. TRACE OF			$\nabla$	
							307.6	11.0			SILT, WIT AND FEW	H FEW SMALL	ISOLATED S SUBROUNDE	ANDY BLEBS ED GRAVELS	5		-₹-	11/7/86
								15 -			PALE BE DENSE, M	ROWN (5 101ST, M	YR5/2) MOD ODERATELY	AYEY SILT: ERATELY SANDY IN F DED GRAVEL:				
SS 2	24	5	54	. 39	30	24 21				2								
						19		20										
2S 2	24	16	36	5	17	27	297.6	21.0	1111	3	GRAYISH	RED (10)	R4/2) WET,	LY SAND(GP DENSE,	_			
								25 -			MODERAT FINE GRA 10-15% SL	ELY CO UNED, WI UBANGUL	NSOLIDATED TH TRACE (	, VERY FINE OF CLAY AN COUNDED GR	0			
SS 2	24	10	35	3	ಕ	20/22				4								
SS 2	24	14	16	9	8	8 11	290.6	28.0		5				OWNISH GRA	ΙΥ	_		
							- 289.6	29.0		١	PLASTIC, OF SILT, BLEBS,	MODERA WITH FE	WET, HIGHLY TELY SOFT W ISOLATEI ING AT 29.0	TO SOFT, T SANDY	RACE	_/	INSTALL DEPTH ( SEE OBS WELL LO DETAILS	
			XXII STESIEI PEPITOIERI			617	E .	NFSS	- EAS	ST (	F CONTA	INMENT					HOLE NO.	0W-10B



	C	EO	LOGIC	DR	LL I	LOG		PROJECT		FU	ISRAP			JOB NO. 1450:	-115	SHEET	NO. OF 2	HOLE NO.
SITE			FSS - E TE CONT				COORDINATE	S		2	1419 8	624			ANCLE	FROM H		BEARING N/A
9EGU	N 4/86	- 1	HPLETED 11/5/86	DRI	LER	EMPIRE	SOILS	ſ	A A		NODEL RAD-2		HOLE SIZE	OVERBURDEN		ROCK (	1.2	TOTAL DEPTH
CORE	RECOV	ERY(FT	<i>s</i> 0		BOXES N/A	SAMPL SI- SS-	]   3	OF CAS	NG G	ROUND 317	EL. 7.84	DEPTH/E	L. GROUND W	ATER /310.8			36.0'	ROCK /281.84
			ECHT/FALL NCHES	Ł	CAS	NG LEFT	IN HOLE: DIA., ERVATION				LOGGED BY	'a	J0H	N SOŁLO		1		
TYPE VETER	ADVANCE OPE RUN	COVERY	BLOWS T CORE	f	WATER RESSURE TESTS		ELEVATION	DEP TH	81.0	SAMPLE	·	\F¢¢ClDT	ON AND CLAS	CECICA YIOU	<del></del>		WATE	IS OHI ER LEVELS,
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENCTH CORE RUN	SAMPLE R	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	151 E. E. ¥.	PPESSURE P.A.I	280 e. 3 ≅ M 3 E M	317.84	0	CPUAPHIC LOG	73							CHAR	er return, Lacter of LNG, etc.
		-					315.34	2.5			BROWN M CONSOLID ORGANIC 2.5-ILO F (5YR5/2),	OIST LO ATED ,! DEBRIS. T CLAY MOIST,	NOSE TO S WITH NUME (CL): PAL FIRM TO S	Rous  E brown	WITH		FEET US HOLLOW FLLIGHT SAMPLES	O TO 37.2 ING 7 INCH STEM AUGERS. 5 COLLECTED
SS 2	24	4	48	12	18	30 42		5 -		-	25% GRAV	/ELS UF	YO 3 IN	CH IN DIAME	rer.		AS SHOW	in. 11/5/86
								10 -			CONCENTI	RATION	OF GRAVE	LS AT 7.5	ੀ.		ROUGH E FROM 5. FEET.	OFFILLING O TO BLO
\$5 2	24	ю	15	5	8	7/6	306.84	ILO -		2	(GM): MOD VERY FIN	ERATE E-GRAIN	ED, MODER	R3/4), WET, ATELY DENS				FAST AND GINNING AT T.
SS	24	18	7	3	3	4 /	301.84	15 -		_	TO 2 INC.	HES IN	DIAMETER	ED GRAVELS IN A SILTY	UP		USED A HALLMER	
2	٥	10	*	-	3	/ 1		16.0		3	GRAY (5Y SOFT, STI TO HIGHL	R4/0, S CKY, MO Y PLAS	IST TO WE TIC. SLIGHT	ROWNISH ODERATELY T, MODERAT LY SILTY B HARD GRAV	Ì			
\$\$ 2	24	24	5	ı	ı	1/1		20 -		4								
ST								25 -		s								
3	24	24								I								
SS 2	24	20	8	ı	4	1/7	289.94	27.9		_	(GMD: DAR)	( REDDI:	SH BROWN	AYEY SLT QOR3/40), AND WELL			HARD AN	BECOMES D SLOW AT
			·				282.84	30 -			CONSOLIDA CLAY AND	ATED, M 20% H VELS L	HTIW,T210	io'x gray Ngular, dar	K		28.0 FEE	Τ.
			DON, ST-SHE P=PITCHERs		<u> </u>	  आ		35   NFSS	- FA'	n	F CONTA	INNENT		<del> </del>			IOLE NO.	
	D-MEN	- Mucan	L-MICHER	O-0 INEK								- / 10 - ML   1						OW-11A



GEOLOGIC DRILL LOG	PROJECT		_	FUSRAP	JOB, NO. SHEET 14501-115 2	NO. HOLE NO. OF 2 OW-11A
SAMPLE TTPE AND DAMPLE TTPE AN	2	GRAPHIC LOC	SAMPLE	DESCRIPTION AND CLASSIFICA		MOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS 5 5 50/5' 50/5' 281.8			-6-	36.0-37.2 FT SHALE: WEATHERE GREEN GOGG/2) TO REDDISH BRI	D, PALE	
280.6	37.2			GREEN GOGG/2) TO REDDISH BR		
CS-CPH IT S DAYAL ST-SLET BY TIBE. STE						OBSERVATION WELL INSTALLED TO 36.9 FT. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS-SPLIT SPOON; ST-SHELBY TUBE; STE D-DENNISON: P-PITCHER; O-OTHER	NF S	S - E	AS	T OF CONTAINMENT		OM-11V



	G	E0	LOGIC	DR	LL	LOG		PROJECT		Fl	JSRAP			јов но. 14501	-115	SHEET	NO. OF 1	HOLE NO.
SITE	NFS	s -	EAST OF	CONTA	INMEN	T	COGRDINATE	S			51414	E624		1	ANGLE	FROM H		BEARING N/A
BEGUN	5/86	- 1	WPLETED 11/5/86	DFaL	LER	EMPIRE	SOILS				D HODEL		HOLE SIZE	OVERBURBEN		ROCK (	FTJ N/A	TOTAL DEPTH
CORE	RECOVE	RYFT.	_/x)		BOXES N/A	SALELI SI- SS-	EL. TOP	of CAS	e4G C		D EL. 7.75		L.GROUND WA E OBSERVE	TER		l	EL. TOP OF	l
			EIGHT/FALL NCHES		CAS	NG LEFT	N HOLEIDIA. ERVATION	LENGTH WELL			LOGGED B			SOLLO		I		
SALPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	CORE RECOVERY	SAMPLE BLOWS 'N' PERCENT CORE RECOVERY	SSO1	WATER RESSURE TESTS	TANE N AMELITES	ELEVATION	O SEPTH	GRAPHC LOG	SAMPLE	. <b>L</b>	DESCRIPTI	OH AND CLASS	FICATION			WATE WATE CHAR	S ON A CR LEVELS, CR RETLAN, WACTER OF WING, ETC.
ST 3	24	20		ZI 6.	2HQ 6*	340 6	315.34	2.5 -		S	BROWN, L CONSOLIL 2.5-6.5 (5YR5/2) MOIST.	OOSE TO CLAY  FT CLAY  MOTTLE  MOTALE	YEY SILT (X O SLIGHTLY UMEROUS OF Y (CL): PALE ED, FIRM TO DDERATELY UP TO 1/4	RGANICS. BROWN STIFF, PLASTIC.			FT WITH HOLLOW FLIGHT	O TO 14.0 7 IN. DIA STEM AUGERS. COLLECTED
SS 2	24	17	82	12	48	34 55	311.34	6.5			6.5-13.0 MODERAT WELL CO HARD SU	FT GRA E BROW NSOLIDA BANGUL	VELLY SAN N (5YR4/4) TED. MOIST AR, DARK GF GRAINED, BR	DENSE AND WITH 10-207 RAY GRAVEL	- %			
\$\$ 2	24	4	16	10	В	B /7	704.04			2								
ST 3	24	24					304.84 -301.84-	13.0 15 –		S T 2	(5YR4/1),	FIRM TO TH ~5%	Y (CL): BRO D DENSE, SU SMALL SUE ELS.	.TY,			PUSHED : TUBE SA 14.0 TO : FEET.	MPLER FROM
											ВОТТОМ	OF BOR	ING AT 16.0	FT.		1	INSTALLEI FT DEPTI	TION WELL
			ONLST=SiÆL ≃PITCIÆRiO		1	প্রা		NFSS	- EAS	T D	CONTAI	NWENT				H	KOLE NO.	OW-11B



Γ		GF	OLOG	10	DR		LOG		PROJECT						JOB NO		SEET	HO.	HOLE NO.
sn			NFSS -	· E/	AST OF			COORDINAT	ES		F	USRAP			1450	1-115		0F 2	OW-12A
	ZIN		STE CO		DRAL					DRALL MA		S1619	E621	HOLE SIZE	OVERBURDEN		90	٥	N/A
	/3/86 E RECO	[	11/3/0	86	CORE	BOXES		E SOILS	P OF CAS			R AD-2	laga	7*	36.		RCCX	2.3	38.3'
SAL		N/A	WEIGHT/F/	411		N/A	SS	7   -	320.42			8.78		28.0'	ter /290.78		DEPTH	36.0'	
			INCHES				089	N HOLE: DIA ERVATION	WELL			LOGGED B	<i>(</i> 1	70H	N SOLLO		•		
E 5	VANCE		OWS S		P	WATER RESSURE	E			,					-				
1314	SAMPLER ADVANCE LENGTH CORE RUN	3	SAMPLE BLOWS  W  PERCENT CORE	ECOVER		TESTS	2	ELEVATION	DEP TH	RAPHE LOG	Sample	ı	escr <b>e</b> tu	ON AND CLAS	SFICATION			WATE	s on: R Levels, R Return,
3	SES	344		-	દા હ રુકે કુ	SESS C	280 €. 21 = 22 ± 23 ± 23 ± 23 ± 23 ± 23 ± 23 ± 23	318.78	0	8									ACTER OF IHG, ETC.
				1						1111		0.0-5.0 I	T. CLAY	YEY SILT (I MODERATEL	LL): DARK				
					İ							CONSOLID GRAVELS.	ATED, M	OIST FEW	. T Subangulai	?			
-	┼-	-	-	+			16	313.78	5 -			5.0-12.0	TAIA	(CL): GRA	VICIT DEN				
SS 2	24	24	29		7	13	20				11	GOR4/2), (	UOIST. A	ODERATEL	Y PLASTIC, EW HARD, D.	<b>NDV</b>			
												GRAY SUE	BANGULA	R GRAVELS	S UP TO 1/	2 INCH			
								•											BECOMES T 8 FEET.
ST 3	24	24							10 =		TZ								
SS				+	$\dashv$			306.78	12.0	$\mathcal{A}$	1	12.0-12.7 F	T. SAND	Y CLAY (C	TS-				
2	24	24	2	$\perp$	1	1	<u>/</u>	306.08	12.7		2	MODERATE Moderate	BROWN LYSOFT	(5YR4/D.	STICKY, WET				
									15 -		1	NUMEROUS	BLEBS	OF FINE, B	ROWN SAND		_		
									}		(	5YR4/1), W	ET. SOF	T TO FIRM NIGHLY PLA					
									}			SOLATED : Occasiona	BLEBS ( L HARD.	OF LIGHT B SUBANGU	IROWN SAND AR TO				
									1		5	SUBROLINGE	D GRAV	ELS UP TO	0 1/2 INCH.				
SS 2	24	24	2		-				20 -										İ
	$\dashv$	-		-			2		3										
									Ź										l
-	+	$\dashv$		_	+	- ,			25									RILLING IS	D ROUGH
SS 2	24	21	5		1	2 3			Z	∕/ 4	G	rading to	) SET. 1	LOOSE TO	E GRAINED, SLIGHTLY			7 27 FEE	
									Z		C	DNSOLIDAT DR4/6).	ED, MOD	ERATE REI	DDISH BROW			V 11/	3/86
						_	:	289.78	29.0		14	LOUISH BR	DWN ((C)	23/4). VER'	(CM): DARK Y DENSE		RI	INITANO CO	)ARSE
SS 2	4 4	4	70	4	7 3	32	/ 1		30		SL	ad metit ( Tbronndei	ONSOLI O GRAVE	DATED; HAR LS UP TO	D, INCHIN		SA	IND AT 2 ILLING RO	9.0 FT.
+	+	+			+	+	27				- Fil	he graine	D SAND	Y MATRIX.	T AND VER	Υ			
			İ					285.28	33.5		/ RE	:DDISH BRI	OWN (101	Y SAND (SI R3/4) FINE	GRAINED				
s	S=SPLIT	SPOO	NG ST=SIE	LBY	TURF.		SITE		35 -: :		L MI	MST, TRAC	E OF S	ELY CONSC LT.	LEDATED,				
	-DENNG	SON P	PITCIER	0=0T	HER				NFSS -	EAST	0F	CONTAIN	MENT				HOLI	E NO.	1-12A



GEOLOGIC DRILL LOG	PROJECT FU	ISRAP 14501-115 2	NO. HOLE NO. OF 2 OW-12A
SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE TIPE SAMPLE RECOVERY SAMPLE RECOVERY SAMPLE RECOVERY THE	A   A   A   A	DESCRIPTION AND CLASSIFICATION	NOTES CAN MATER LEVELS, MATER RETURN, CHARACTER OF GRALING, ETC.
ST 283.78 3  2  2  2  2  2  2  2  2  2  2  2  2  2	35   ST   36.0   6 36	5.0-38.3 FT. <u>Shale:</u> Weathered, Dark Eddish Brown (1083/4) and Greenish	
SS 10 10 50 /4 30 50 /4	<u> </u>	RAY(5G6/1), MODERATRLY HARD, DENSE, SSRE WITH SOME SW.T.	
280,48		OTTOM OF BORING AT 38.3 FT.	OBSERVATION WELL INSTALLED TO 37.7 FT. SEE GESERVATION WELL CONSTRUCTION LOG FOR DETAILS.
SS-SPLIT SPOOM ST-SHELBY TUBE; D=DENESSOM P=PTTCHER; 0=0THER	NFSS - EAST OF	CONTAINMENT	DLE NO. DW-12A



ſ		G	ΕO	LOGIC	: Df	RILL	LOG		PROJECT		FL	JSRAP	<u> </u>		JOB NO.		SHEET N	Ø. OF 1	HOLE NO. DW-12B
SI	TE	NFS:	5 - 8	EAST OF	CONT	AINMEN	ſ	COORDINAT	ES			S1612 E	617		<u>I</u>	ANGLE	FROM НО 90°	RIZ.	BEARING N/A
	GIN 1/4	/86		MPLETED 11/4/86		MLLER	EMPIRE	SOILS	ſ	ARILL MA		NODEL R AD-2		HOLE SIZE	OVERBURDEN		ROCK OF	LT  /	TOTAL DEPTH
CC	RE F		ERYGET	J2)	C	re boxes N/A	SAMPLI SI-	ES EL TO	2 OF CAS	r÷G G	ROUNE 318	EL. 3. 93		L. GROUND WA E OBSERVE	TER D = 11/4.	 /86	DEPTH/E	L. TOP O	F ROCK /A
				EIGHT/FALL NCHES		CAS	ING LEFT	N HOLE DIA			-	LOGGED BY	ı	инац	SOLLO		ı	•	
SAMPLE TYPE	AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	WPLE RECOVERY	SAMPLE BLONS 'N' PERCENT CORE RECOVERY	LOSS	WATER PRESSURE TESTS  HISSING	TIKE N MAUTES	ELEVATION	DEPTH	сварис 1.00	SAMPLE	C	ESCRIPTIO	ON AND CLASS	SEICATION			WAT! WAT! CHA!	ES ON EER LEVELS, EER RETURN, CACTER OF LING, ETC.
$\vdash$	-	212	30		SI 6	5 2ND 6.	3RD 6	318.93	0	11111		0.0-UFT.	CLAYE	Y SILT (ML	): DUSKY			BORING	ADVANCED
2	5	24	20	12	3	6	6 6	317.83	li :			MODERAT	ELY FIR	IN (IOYR2/2 IM WITH 25	ī, MOIST % CLAY,		F	Fron O Ft Usin	.0 TO 11.0 G 7 In.
S	S	24	21	34	8	14	20 40		5 -		2	YELLOWIS MODERAT	.CLAY H BROW E BROW	<u>(CL):</u> MOTTI IN (IOYR6/2 IN (5YR3/4)	LED PALE 2) TO 1, FIRM TO S T, TRACE O		F S	LIGHT	LOW STEN AUGERS. S COLLECTED WN.
S <sup>3</sup>	r	24	23								ST I	SILT WITH	I FEW	HARD, SUBR IN DIAMET	OUNDED GR	AVELS			
S: 2	S	24	24	14	5	8	6 5	310.13	B.8		3	7.0 FEET 8.8-12.2	T. CLA	Y (CI ): LIGH	D (5R4/2) /		) F	EET HO	
S! 2	3   3	24	24	4	3	2	2/2		10 -		4	FIRM, SLIG OCCASION YELLOWIS	HTLY S ALLY L H ORAN	TICKY, WET ILTY IN PAI KOTTLED RE IGE WITH FE	RT.	D <b>,</b>	] 0	NCH TR ROLLER	
								- 306. 73	12.2			BOTTOM		ING AT 12.2	· FT.		F	NSTALL T DEPT DBSERV CONSTRU	ATION WELL
				on st=sie =Pitcieri			SITE		NFSS	- EAS	ST 0	F CONTAI	NMENT				нса	LE NO.	OW-12B



	(	EO	LOGIC	DR	ILL I	_0G		PROJECT		F	USRAP		<del></del> -	JOB NO. 14501		SHEET 1	но. 0F 2	HOLE NO.
SITE	NFSS	s - s	OUTH OF	CONT	/INMEN	ī	COORDINATE	S			1888.5	E095	-	• • • • • • • • • • • • • • • • • • • •	ANGLE	FROM F		BEARING N/A
BEGU	6/86	1	MPLETED 0/31/86	DREL	LER	EMPIRE	SOILS	D	RILL M		NO MODEL B-45		HOLE SIZE	OVERBLEDEN		ROCK	FTJ 0.6	TOTAL DEPTH
CORE		ERYOFT.	J'20		E BOXES	SMPL ST-	9 1 7	21.54	NG		ND EL.		L. GROUND WA E OBSERVE	TER D - 10/6	/86	оєрти.	/EL. TOP CO	ROCK /279.34
			EIGHT/FALL NCHES	L	CASI	NG LEFT	N HOLEIDA ERVATION		J		LOGGED BY		. ATK INSO	Z NHOLV N	OLLO	1		
TYPE ETER	NDVANCE RE RUN	COVERY	BLOWS CORE ERY	ı	WATER PRESSURE TESTS			=	8	SMPLE							WATI	ER LEVELS,
SAMPLE TYPE AND DIANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RI	SAUPLE BLOWS "N" PERCENT CORE RECOVERT	IN LOSS	PRESSURE	SE THE SE WINTES	319.84	O PEPTH	STANAC LOG	7	•	iescrap II	ON AND CLAS	SIFICATION			CHAF	ER RETURN, EACTER OF LING, ETC.
				- S1 - 9		30 8	316.84	3.0 -			3.0-7.5 1 STIFF, DE	AY WIT	Y (CL): STI H ROCK FR /CLAYEY OTTLED BRO AY SILT AN	AGMENTS.  SILT (ML):	SILT.		INSTALL FT DEP	ATION WELL ? JCTION
\$\$ 2	24	18	34	7	н			-		ŀ								
ST 3	24	6	SAMPLE IN A JA	R			312.34	7.5		STO	CLAY WIT GRAY,CLA	H A FE YEY SII	W GRAVEL LT ALONG	STIFF BROW FRAGNENTS APPARENT ONG ROOT	5,		WITH 10	
ST 3	24	19					· ·	10 -		S	Some Rob Becomes	DT MAT SOFT	ERIALS PRI TOWARD BO	ESENT. CLA OTTOM OF 2	Y ZONE.		WITH PL DEPTH (	
SS 2	24	24	7	4	3		307.74	-		2	SATURAT AND POCI	D GRA (ETS O	Y CLAY WI F BROWN C	LAY /SILTY	CLAY		FEET.	
TZ 3	24	24	_					15 -		S T 2	ZONES AI 16.0-16.6	ID OCC. FT.: SL	ASIONAL GR JBROUNDED	AND BROW RAVELLY ZO TO ROUNDE	NES		DOUND	ADVANCED
\$\$ 2	24	24	6	3	3					3	GRAVEL I	N GRAY	CLAY MAT	'Rix.			WITH 7 DIAMETE	NCH R HOLLOW UGER BELOW
SS 2	24	ю	7	3	4			20 -		4							OF 8 IN	TOR CASING
								25 –		S	RED (5R4.	/D, SAT	LERATED, FIN	ZONE, GRAYI IE-GRAINED	SH			
\$1 3	24	24						1		[3]	SUBANCUL	AR SAI	Y CONSOLI 4D UP TO T (ML): GR	50%.				
	24	16	25	8	15		290.74	28.9		5	REDDISH E MODERATE GRAY (N4:	ROWN Ly Coi Rock	(10R4/2), DE NSOLIDATED FRAGMENTS				SLOWER	BECOMES AND
\$\$ 2	24	13	32	12	14		289.84	30 -		6	REDDISH E FINE- TO CONSOLIDA	FT SII ROWN MEDIUM TED, T	IY SAND NOR3/4), WE	ET, VERY MODERATELY LAY WITH	1		SLIGHTLY	′ ROUGH.
			DONE STESHE PEPITCHERI			SIT	285.84 284.84	34.0 35 NFSS	- SC	НТИ		AR GRA	AVELS UP	TO 3/4 IN.	IN .		HOLE NO.	Ω₩-13A



		۳۸۱	۸۸۱۸	וומת	1 1	00	PF	O.ECT			EIROAD	JOB NO. SHEET		HOLE NO. OW-13A
			OGIC	וואט	WATER	UU					FUSRAP	14501-115 2	OF 2	G# 17W
SAUPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS  TO  PERCENT CORE RECOVERT	LOSS H C.P.M.	TESTS	TME Pi MHUTES	ELEVATION 284.84	32 HT73	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICA	ATION .	WATE WATE CHAR	S ON THE LEVELS. IR RETURN. ACTER OF ING. ETC.
SS 2	5	5	100 +	100/5*			204.01	-	*   *	L,	34.0-40.5 FT <u>CLAYEY GRAVE</u> (GLI): MODERATE REDDISH BROW VERY DENSE AND WELL CONSO MOIST, SUBANGLILAR TO SUBRO	N (IOR4/5), LIDATED,	DRILLING SLOW F 41FEET.	rom 35 to
∕SS 2	4	4	50 +	50/4"				-		H	MANS 1, SUBARMALLAR 10 SUBRU UP TO 20% AND UP TO 1 INCI- SIZE, TRACE OF CLAY THROUGH GRAVELS ARE HARD AND DARK	I IN MAXILIULI I OUT.	USED 3 HAMMER	00 1B. : OH SS S *B AND 9.
SS 2		-	50 +	50/1"			279.34 - 278.74 -	40.5- 40.5- 41.1-	4114	Į <sub>e</sub>	40.5-4LIFT <u>WEATHERED SHAL</u> REDDISH BROWN (10R3/4), FISSU CHIPS IN WEATHERED SHALE II	LE, HARD ATRIX.	SAMPLE	7. ONN 9.
								-			BOTTOM OF BORNAG AT ALLET.		,	
													INSTALL SEE OBS WELL CO	TION WELL ED TO 4LIFT. ERVATION INSTRUCTION DETAILS.
			POOHL ST=S IL P=PITCHE				SITE	N	<del>-</del> FSS -	so	AUTH OF CONTAINMENT	·	HOLE NO.	0₩-13A



П	(	EO	LOGIC	DRI	LL I	LOG		PROJECT		Fl	JSRAP			JOB NO.		SHEET	NO.	HOLE HO.
SITE		N	SS - SO TE CONT	OUTH O	F		COGROINATE	S			51890	E 090	<del></del> -	1		FROM 90	HCRIZ.	BEARING N/A
BEGU 11/	и 3/86	03	MPLETED 11/3/86	DRIL	LER	EMPIRE	SOILS	٥		KE AN	R AD-2		HOLE SIZE	OVERBURDEN		ROCK		TOTAL DEPTH
1	RECOV	i		,	E BOXES	SAMPL 2-S		of case 21.09		ROUNE			EL GROITED WA NE OBSERVI	TER		DEPTH	I/EL. TOP OF	
	LE HAM	MER W	EIGHT/FALL NCHES			ING LEFT	IN HOLE, DIA.	/LENGTH			LOGGED I			I SOLLO		<u> </u>		
	Т.	1 :	T		WATER	_				П	1							
SAUPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	WPLE RECOVER	SAUPLE BLOWS "N" PERCENT CORE RECOVERY	Loss H.P.3	TESTS	TILE N NAUTES	ELEVATION	DEPTH	GRAPHE LOG	SAMPLE		DESCRIPTI	ION AND CLASS	SFICATION			WATE WATE CILAR	S ONE R LEVELS, R RETURN, ACTER OF UNG, ETC.
~	ZI3	310	5 16	51 6	SMD 9.	3RD 6	320.15	0			<u> </u>	FT.CF	e descript	ואו או				<del></del>
T IN HOLLOW STEM AUGER.							310.15	5			BORING	LOG OW	-i3A.				FROM 0	ADVANCED .O TO 14.0 1 7 HL DIA STEN
\$\$ 2	24	16	18	17	10	8 7	309.25	10.57		1	10.0-10.3 (5YR5/2 (DEHSE.T	, MOIST,	AY (CL): PA MODERATEL SILT.	LE BROWN Y PLASTIC,				POON COLLECTED AND 12.0
SS 2	24	24	9	5	5	4/3	308.15 307.45	12.0		2	YELLOW	BROWN	LT/SAND (G (10YR5/4), V LIGHTLY CO	ERY FINE-		_//	FT.	
							- 306.15 -	14.0			TRACE C 10.9-12.0 15YR5/2: TRACEOF 12.0-12.7 LIGHT T LOOSE T GRAINS 12.7-14.0 BROWN MOIST, H SEL T.	F BROWN FT CL , SOFT, ' , SET A FT SA D DARK O SLIGH ARE SUB FT C1 (5YR5/2) GHLY PL		LE BROWN PLASTIC, ND. ECKLED -GRAINED, LIDATED, MC DITLED PAL EED (5R6/2) EE, TRACE C	SIST,		INSTALL FT .SEI OBSERV CONSTR	ATION WELL
1			ON ST=SHEL ≃PITCHERL (		l	SiT	E				SOUTH O		·				HOLE NO.	0V-138



	G	EO	LOGIC	DR	LL	LOG		PROJECT		FU	ISRAP			108 NO.	-115		)F 2	HOLE NO.
SITE	NFS	S -	WEST OF	LUTTS	RDAD		COORDINATE		<u></u>			/152			ANGLE	FROM HOP	ŧΩ.	BEARNIG N/A
EGU	7/86		MPLETED 0/27/86	DRaL	LER	EMPIRE	SOILS		DRILL MAX		B-45		HOLE SIZE	OVERBURDEN		ROCK (FT	. 1	TOTAL DEPTI
		I/A			E BOXES	SAUP 105 1-5	$\frac{5}{1}$ 3	20.52	ING G		EL. 3.98		4.0' /		<del>-</del>	DEPTH/E		
			EIGHT/FALL NCHES		- CAS	OBS	N HOLEIDIA. ERVATION	vlength WELL			LOGGED 8		ATK INSO	N /JOHN S	OLLO			
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RIN	SAMPLE RECOVERY CORE RECOVERY	SAUPLE BLOWS  ** PERCENT CORC RECOVERY	IN LOSS	WATER PRESSURE TESTS 15:15:15:15:15:15:15:15:15:15:15:15:15:1	TINE INCITES	ELEVATION 318.98	O DEPTH	GRAPHC LOG	SAMPLE		DESCRIPTII	ON AND CLASS	SEICATION	-		WATI WATI CHAI	ES ON ER LEVELS, ER RETURN, RUCTER OF LING, ETC.
							316.98 315.48	2.0			2.0-3.5 SILTY, S		<u>/ (CL);</u> Dafi AY.	(BROWN,		A	IS GROO BSERV SEE GO ELL LO OR DE	COMPLETED UND WATER ATION WELL BSERVATION OGREPORT TAILS. OVANCED
SS 2	24	18	15	12	7	8 18	313:58 312:78 31:98	5 5.4 6.2 7.0		- /	WITH OC 5.4-6.2 Brown (	CASIONAL FT CLAY 10YR4741	, SILTY CL.	IGMENTS. TLED GRAY AY WITH	AND	- S	NTH 7 TEM A 7.0 FT. UBSEON	IN. HOLLOW UGERS TO HOLE JENTLY
SS 2	24	24	14	5	7	7	309.78	9.2	///	2	6.2-7.0 SATURA	FT <u>SAN</u> TED, SIL 1	TED FINE G D (SM): DAF TY, GRAVELI P): FINE TO	K BROWN. Y FINE SAI	<b>1</b> D.	II	1. AUGE T THEN IF 8 IN.	WITH 12 R TO 17.0 1 17.5 FT DIA PVC
SS 2	18	8	li.	25	6	5	30 <del>6</del> .48	12.5 -		3	WELL GF AND GRA B.8; SAN	RADED SA NY MOTT DIS SA	AND WITH I LED CLAY TURATED.	NCH BROWN LAYER AT	I ABOUT	[ 92		FOR CASHIG TALLED.
T2 3	24	24								ST	(5YR3/4)	CLAY N	Y (CH); STI ITH SOME Y (CH): BR(	GRAY MOTT	LING.			
SS 2	24	24	3	2	ı	2/2		15 -		4	SOME SA	, MODER. IND AND	ATELY STA ROCK FRA	F CLAY WIT	ſH			
22	24	6	7	3	3	4/5		20 -		5	SOFT, ST OCCASION PLASTIC,	ICKY, SA NAL SAN SAND A NAR TO	TUKATED ( ID AND GRA NO GRAVEL SUBROUND	VEL, HIGHLY		FI   F   H		
-						/ -		-								, A	UTTING: RE HIGI LASTIC,	
SS 2	24	14	Ю	35	55	45 27		25 -		6						S	ATURAT	ED, MEDIUN SILTY CLAY
S 2	24	8	25	14	17	8 4		30 -			CLAY BE ZONE FR			N (5YR5/2)	BH			
			DON, STESIE PEPITOIERU			প্রা	283.98 E	35		ST 5	OF LUTTS					но	LE NO.	



Г	C	ΕNI	OGIC	DRII		NG	PI	OJECT			FUSRAP JOB HO. 5	HEET	NO. GF 2	HOLE NO. GW-14A
SAMPLE TYPE AND DIAMETER	7		E BLONS NE ENT CONE	T	WATER PRESSURE TESTS		ELEVATION	HI DEPTH	SPLANTC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	2	HOTE WATE CLIAN	IS DIA TR LEVELS, IR RETURN. MACTER OF MIG. ETC.
SS 2	24	16	11	3	5	-	283,98	35 -		В	/37.5-4L5 FT SU.TY SAND (SM): PALE			
2	24	10		,	J		281.48	37.5 - -			BROWN (SYR5/2) DENSE, MOIST, FINE TO MEDIUMGRAINED, SUBANGULAR TO SUBROUND IN A CLAYEY SILT MATRIX OF ABOUT 10%. FEW LAYER GRAVELS UP TO 1/2 IN. IN SIZE.			
SS 2	24	19	66	40	26		277.48	40 - 41.5 - -		9	4L5-44.7 FT GRAVELLY SAND (GP): DARK REDDISH BROWN (KOR3/4), MODERATELY STUFF, MOUST, DENSE, FINE TO MEDIUM GRADUED, SUBROUNDED SAND WITH ABOUT 20% LAYER GRAVEL UP TO 5/8 IN. IN			ATION RATE
/\$\$ 2	2	2	100 +	100 /2				-		10	MAXIMUM SIZE IN A CLAYEY SILT MATRIX, GRAVEL COMPRISE 15% OF SAMPLE COLLECT.		FT.	IGER AT 38
							- 274. 1B-				44.7-44.8 FT SHAIE: WEATHERED, GRAYISH GREEN, MODERATE HARD.  BOTTOM OF BORING AT 44.8 FT.		INSTALI FT. SEE WELL C	ATION WELL ED TO 44.7 OBSERVATION CHISTRICTICN R DETAILS.
			Poon, ST=S & P=PtTchE				SITE	N	FSS -	¥I	ST OF LUTTS ROAD		HOLE NO.	OW-14A



	G	EOl	_0GI	IC	DRII	LL L	.0G		PROJECT		F	USRAP			лов мо. 14501	-115	1	OF 1	HOLE NO. OW-14B
SITE	NFS	s - 1	WEST	OF L	LUTTS	ROAD		COGROMATE	\$			S809 1	v153			ANGLE	FROM H		BEARING N/A
8ECUM 10/2			WALETED 0/28/		DRILL	ER E	MPIRE	SOILS	Di			NO MODEL R AD-2	- 1	HOLE SIZE	OVERBURDEN 15.		ROCK O	LT- N/A	TOTAL DEPTH
CORE	RECOVE N	RYOT.	J'20			BOXES L/A	2-5 1-5	2   4	OF CASE 20.73	HG C		D EL. 9.43	DEPTH/	EL. GROUND WA			DEPTH/	EL. TOP OF	ROCK A
			NCHES			CASI	C LEFT	N HOLEIDIA. ERVATION	/LENGTH WELL			LOGGED B	Yı	10H	1 SOLLO				
SAMPLE TYPE AND DIENETER	SAMPLER ADVANCE LENGTH CORE RUN	RECOVERY	SAMPLE BLOWS	DVERY	PI	WATER RESSURE TESTS		ELEVATION	рертн	PRAPHIC LOG	SAUPLE	<u> </u>	DESCRIPT	'IDII AHD CLAS	SFICATION			WATI WATI	ES CHI ER LEVELS, ER RETURN, RACTER OF
SALP AND D	SAMPLE LENGTH	SAMPLE	PER PER	F. F.	S = 3	PPESSURE P. P.S.I	S TIME S N P WAUTES	319.43	0	GRAF									LING, ETC.
					ZI 6°	2ND 6'	380.6	5,5.1	-			0.0-ELII LOG OW		DESCRIPTIO	n on Borin	G		WITH 7 HOLLOW	OVANCED IN. DIA STEM AUGER O TO 10.0
SS 2	24	2	38		22	19	19/24		5 -										
							/ 24		-		H								
									10 -						ALE BROWN ZONES OF L				
ST 3	24	14									ST I	/ BROWN	ISH GRA	Y (5YR6/I)	TO LIGHT B PLASTIC, DEN	ROWN		PUSHED	3 IN.
SS 2	24	15	23		5	6	17 /17		-		2	COARS IN MAX	E SAND UMUM S	AND GRAVE	K VERY FINE EL UP TO 3 L ARE GRAY BROUNDED.	/4 IN.		SHELBY 10.0 TO CONTINU	TUBE FROM 12.0 FT. 1ED WITH TO 15.1FT.
	4			+				-304.33 -			T			IORING AT I				ADOLK	10 83111
							S.	TÉ.										INSTALL SEE OB! WELL CO	ATION WELL LED TO 15.1 FT. SERVATION ONSTRUCTION R DETAILS.
					BY TUB		SI	TE	NFS:	s - W	EST	סר נטדו	S RUAI	)				HOLE NO.	0A-14B



	(	GE0	LOGIC	: DR	RILL	LOG		PROJECT	r	— F	USRAP		<del></del>	JOB NO 1450	1-115	SHEET NO.	HOLE NO. 2 OW-15A
SITE	NF:	SS -	WEST OF	LUTT	S ROAD		COORDINATE	s			S1039	W153	<del></del>	<del>                                   </del>		FROM HCRIZ.	BEARING N/A
BEGU	N '8/86	1	UPLETED 0/29/86	1	LLER	EMPIRE	SOILS	1		KE A	NO MODEL 8-45		HOLE SIZE	OVERBURDEN		ROCK OFTJ	TOTAL DEPTH
	RECO	VERYOFT N/A			RE BOXES	SAMPL 11-SS	T I	of CAS 20.30		ROLL	8.84	4	L GROUND WA E OBSERVE	TER	·	DEPTH/EL. T	DP OF ROCK 6' /274.24
	LE HAI	LALER W	EIGHT/FALL NCHES			ING LEFT	N HOLEIDIA.	LENGTH			LOGGED E	<u> </u>		TKINSON		177.	7214.24
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SANPLE BLOWS "PERCENT CORE RECOVERY	LOSS E.P.V	WATER PRESSURE TESTS  LINE SOLUTION 2ND 6	<del></del>	FLEVATION	жьтя	CRAPHIC LOG	SAMPLE	1	DESCRIPTI	ON AND CLASS				NOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
~ <del>~</del>	314	3 8	W IE	21.6	3 K Z	3R0 5	318.84	0	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u> </u>	TT NIA	אנאריט	V NONWAL T			
							316.84	2.0			2.0-6.3 TAN/YE MODERA DENSE (	RGANIC FT CLA LOW BR IELYPLA LAY WIT	(CH): DARI OWN (5YR4) STIC, STIFF, H SOME GR	( BROWN , /3), MODERATE AVEL, LOCA	TO LY	WITH SYE 17.5 THE WITH AND	ING ADVANCED  1 7 IN HOLLOW  M AUGER TO  FT. HOLE  N REAMED  112 IN AUGERS  18 FT OF 8
SS 2	24	22	26	7	12	20	312.54	5 - 6.3		1	TOP, BE(	COMING I	ND GRAY MI NETTER WITH O (SC/SM):	H DEPTH. YELLOWISH		COM	IA. PVC DUCTOR CASHIG ALLED.
22		<u> </u>	ı,r		-	7				2	BROWN	IOYR <del>4/3,</del> Sand.	4/4), CLAYE MODERATEL	EY, SILTY,			
2 5T 3	16	14	15	16	8	6	309.54 308.84	9.3		TZ		OWN (5Y	<u>Y (CH):</u> R4/I), PLAS T CLAY.	TIC,			
SS 2	24		4	2	2	2	307.34	11.5		3		FT SANL	(SNI): TAN	SILTY,			
ST 3	24	24	•	-		2		15 -		TZ	11.5-39.1 F WET. GRA	T <u>CLAY</u> Y-BROWN	(CH); SOFT, I (5YR4/I) C ED SAND AI IGE TO L25	HTIW YAL			
SS 2	18	18	4	1	2	2		-		1	GRAVEL	SIZE RAI	NGE TO L25	in. Dia.	-		
S 2	24	24	7	2	2	3 4		20 -		5							
-								25 -									
SS 2	24	24	6	9	3	3 3				6				•			
SS .	24	16	7	WH	WH	WH 7		30 -		7	32 FT ଘ	RADES T	o: Medium (	GRAY (NZ)		DBH I	ER INDICATES
						1 ===	283.84	35			SETY CL VERYSMA	AY, WET, LL (PIN )	HIGHLY PLA HEAD SIZE) ROWN (IOR4	ASTICITY. OF GRAY (	N5) RY.		GE IN
			ONLST≈SHE PITCHERI			SIT	<u> </u>	NFS:	S - ₩E	ST	OF LUTT:	ROAD				HOLE A	ea. OW-15A



	(	EO	LOGIC	DRI	LL l	.0G	P	ROJECT			FUSRAP	лов но. 14501-115	SHEET 2	NO. OF 2	HOLE NO. OW-15A
SAUPLE TYPE	SAMPLER ADVANCE LENGTH CORE REN	SANPLE RECOVERY	SAMPLE BLOWS THE PERCENT DONE RECOVERY	LOSS N G.P.M.	WATER TESTS TESTS	TME N MRVTES	ELEVATION 283.84	35	BEARTHC LOG	SAMPLE	DESCRIPTION AND CLASSIFE	CATION		WATE WATE CHAS	S ONE OR LEVELS, OR RETURN, LACTER OF
\$3	24	24	5	WH	WH	WH 5	240.01	-				· · · · · · · · · · · · · · · · · · ·		AS OBS WELL. S COMPLE	COMPLETED ERVATION EE WELL TION REPORT
SS		10	BS		74	55 /		40 -			391-42.3 FT MODERATE BROWN TO MODERATE RED-BROWN (IOF TOCOARSE SHITY SAND AND G GRAINS SUBROUND TO ANGULA	R4/6), FINE RAVEL, WET.			DRILLING ES CHANGE
2   SS   2	127	18	99 62	80	34	50 32 60	275.34 274.24	1			42.3-43.5 FT MODERATE BROW TO MODERAT RED-BROWN GOR- SANDAND GRAVEL IN A CLAYE MATRIX, DRY TO MOIST. GRAINS	1/6), COARSE Y SILT S		HAMMER	300 LB DURING SS •10 AND
255, 2				50/			273.34	45.5			SUBROUNDED TO ANGULAR.SOM GREENISH-GRAY (566/I) MOTTLE PRESENT.  43.5-44.6 FT DARK REDDISH B (MOR3/4), SILTY FINE TO MEDIUM LITTLE FINE TO MEDIUM GRAVE 44.6-45.5 FT SHALE; DARK REI (MOR3/4) AND GREENISH-GRAY IN (SG6/I), VERY SOFT, SEVERELY DRY.  BOTTOM OF BORING AT 45.5 II	ROWN M SAND, EL, DRY. DDISH-BROWN NOTTLED WEATHERED,		OBSERVA INSTALLE FT. SEE WELL CO LOG FOR WH=SAMPI UNDER ST WEIGHT O	TION WELL D TO 45.5 OBSERVATION NSTRUCTION DETAILS.  ER ADVANCED ATIC F HAMMER.
			ON STESHEL PITCHER O		·	SITE		NF	SS -	VE S	T OF LUTTS ROAD		t	IOLE NO.	OW-15A



_	_	<u> </u>	0010	חחי		^^		PRO_ECT						JOB NO		SIEET		HOLE NO. OW-158
	G	FOL	OGIC	UKI	LL L	.06	COORDONATE	•		FU	SRAP			1450	1-115	FROM H	OF 1	DW-15B
SITE	NFS:	5 - 1	NEST OF	בדדען	ROAD							W152	<b>.</b>	-	<u>.</u>	909	) 	N/A
DECLIN	9/86	- 1	PLETED 0/29/86	DRALI	LER (	MPIRE	SOILS	DRI			NOOEL AD-2		HOLE SIZE	OVERBURDEN		ROCK 0	FTJ N/A	TOTAL DEPTH
_	RECOVE	RYOT.			BOXES	SALPLE	יר ו כ	of CASIN	1	ROUND	EL. 1.82	CEPTH/E	L. GROUND WA'			CEPTH/	EL. TOP C	F ROCK
C ALAPI		/A	CHT/FALL		N/A I CASU	2-5	N HOLE: DIA.	20.12 /LENGTH	l_	210	LOGGED B	Yı .				<u> </u>		
			ICHES			OBSI	ERVATION	WELL					D. MI	DDLETON				
SAMPLE TYPE AND DILVETER	SAMPLER ADVANCE	SAMPLE RECOVERY	SAMPLE BLOWS  "N" PERCENT CORE RECOVERY		WATER PRESSURE TESTS	S31	ELEVATION	H1 430	GRAPHIC LOG	SAMPLE		DESCIRPT	IGN AND CLASS	SEICATION			CIU WA WA	IES ON INTERPRETARIL RAUTER OF
3 2	SAM	SOR	3 5	12 LOSS	PRESSURE P.S.I	311 35 N N 15 15 N N 15 15 15 15 15 15 15 15 15 15 15 15 15	318.82	0	83.									LING, ETC.
ST 3	20	12						1 1 1		ST I	0.0-10.0 COMPLE		E BORING LO	OG OW-158	FOR		USING DIA HO AUGER. SNELBY AND 2	r Tubes I Not Fushed
-ST- 3	4	4						5		ST 2							TO PE	IN END OF
SS 2	24	12	6	2	2	4 5	306.82	10			RED(IOR OCCASI GRAVEL	4/2), ME ONAL PI , SUBROI	ILTY CLAY EDIUM PLAS ECC OF FIN UNDED. DRING AT 12	TICITY,MO	SH IST,		DODING	COMPLETED
											BUITUM	A UF BU	MING AT IZ	U FI.			AS OB WELL. COMPL	SERVATION SEE WELL ETION REPORT ETAILS.
	\$2:2	PLIT S	POCH ST=SI	ELBY T	UBE;	1 -	SITE	NECO	l	FST	OF LUT	IS RN≜	n			-	HOLE NO	OW-15B
	D=0	ENNISO	4 P-PIT CHEE	i o=othi	ER .												1	04-120



													,		···		
	G	EOL	OGIC	DRI	LL I	.0G		PROJECT		F	ISRAP		JOB NO. 14501	-115	SHEET NO. 1 OF	2	HOLE NO. OW-16A
SITE	NFS:		EST OF				COORDOLATE				31212 W159				FROM HORD		BEARING N/A
BEGUN 10/	i 9/86		PLETED 0/21/86	DRILL	ER [	MP IRE	SOILS	]:	ORELL MAK		B-45	OLE SIZE	OVERBURDEN		ROCK (FT.)		TOTAL DEPTH 45.2'
CORE		ERYGT.	/'0		BOXES	SAMPU 10-S	S   7	of cas 20.63	BNG GI		3.78 DEPTH/EL.	5.5' /			DEPTH/EL.		ROCK /273.68
			CHES	·	CASU		N HOLE DIA		<b>-</b>		LOGGED BY:	A. A	TKINSON			-	_
TYPE	ADVANCE OFF RUN	COVERY	BLOWS 1 COME	P	WATER RESSURE TESTS		ELEVATION	DEP TH	<b>30</b> 1 o	SAMPLE	DESCRATION	AUD FLAS	SEVATION			WATE	IS OH R LEVELS, ER RETURN,
SAMPLE TYPE AND DUAKTER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLONS TO THE PERCENT COPE RECOVERY	E LOSS E H F E.P.M.	SPRESSURE P.S.I	THE SE THE SE IN	318.78	<b>8</b> 0	CRAPHC LOG	NS.						CHAF	LUCTER OF
											0.0-4.0 FT CLAY (5YR4/4), SILTY, S FINE GRAVEL; ORG	ANDY CLA	IOZ HTIW YA	Æ.			
SS 2	24	18	25	16	14	11	314.78 313.98 313.28	4.8 5.5		  -	4.0-4.8 FT CLAY (5YR4/1) CLAY. 4.8-5.5 FT SILT					<u></u>	10/9/86
						<b>/</b>	311.78	7			(5YR5/2) SILT TO (00YR5/5) SILT FR 5.5-7.0 FT CLAY	5.3 FT, 1 0M 5.3 F (CL): BRO	(ELLOWISH T T TO 5.5 F WN (5YR4/4	T			
SS 2	24	24	5	2	3	2/3	309.48	9.3		2	SLTY CLAY WITH 7.0-9.3 FT SAND (5YR3/3), SLIGHTL FINE TO MEDIUM	(SM): DAF Y SILTY	K BROWN		19 19	.5 FT . DIA 1	OVANCED TO USING 7 HOLLOW LIGERS, HOLE
ST 3	24	24				2 /				T2 	9.3-34.9 FT CLA WET CLAY WITH	Y (CH):SOI SUBROUND	ED TO ROLL			EN R	EAMED FT USING
2	24	24	5	2	3	2		15 -		3	GRAVEL COMMON: (5YR5/2) TO ABO (5YR4/I) BELOW K	UT 10 FT,			DI CI	GHT-B AMETE HADUC	ICH 'R PVC TOR CASHIG
5S 2	18	7	43	26	£5	2		13		4	HIGH PERCENTAGE	OF ROCK	S AND GRA	VEL.		CH40) 0 20.0	INSTALLED ) FT.
SS 2	18	3	<b>33</b>	Э	И	(9		20 -		5							
								-									
SS 2	24	24	- 5	3	7	8 5		25 -		6	OCCASIONAL THIN	RED BRO	WN CLAY LA	YERS.			
						7 5		-									
SS 2	24	16	22	6	ł	11 8		30 -		7							·
								-									
	20.22	417 CA	OON, ST=SH	ELBY TIE	Œ.	S	283.78 TE	35	1//	Н	·-			<u></u> .	HO	£ NO.	<del></del>
			PITCHER					NFS	5 - ₩E	ST	OF LUTTS ROAD						OW-16A

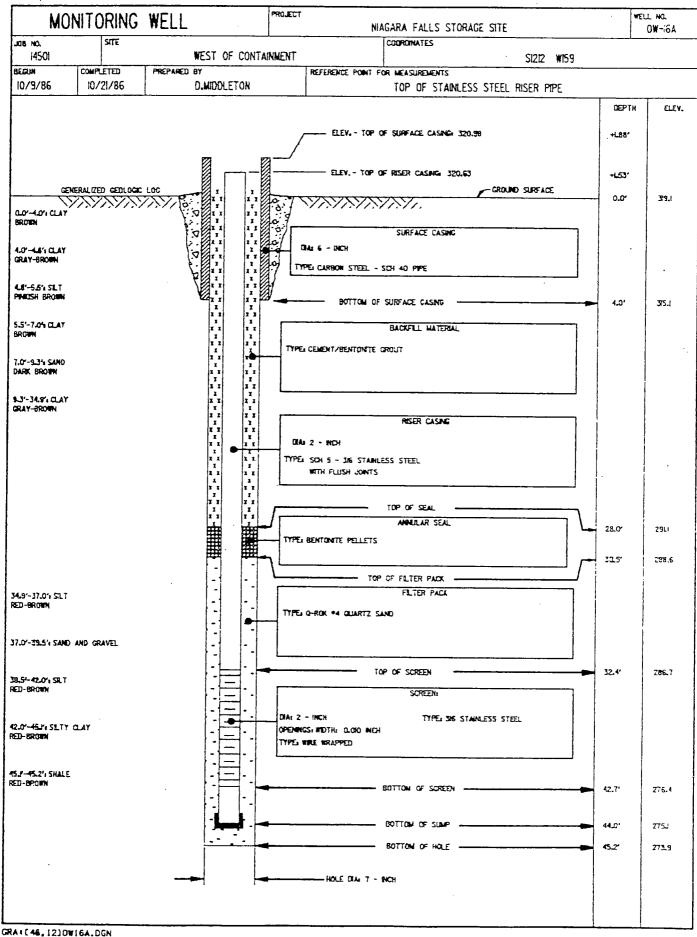


THE STATE OF THE S	70															
Notes of water levels.   Notes of water leve		G	EOL	.OGIC	DRI	LL I	.0G	F	ROJECT			FUSRAP				HOLE NO.
SS   24   II   3I   3   IO   2I / IO   281.78   37.0   37.5   37.0   3	SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CONG. RECOVERY	LOSS N C.P.M.	TESTS	Γ			GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFI	CATION		WAT CHA	ER LEVELS, ER RETURN. RACTER OF
281.78 281.78 37.0 37.0 37.0 37.0 37.0 37.0 37.0 37.0			$\vdash$				I	253.10	122	1111	я	34 9-37 A ET CILTY CAND (S	Mi VEDY		CUID	NO 60 WE
SS   9   9   100 +   53   100/3   273.58   45.2   45.2   57   58   58   58   58   58   58   58		2.1		5.		.ug		281.78	37.0		•	FINE; SUBROUNDED GRAVEL IN (10R3/6), SILT, VERY FINE SAN 37.0-39.5 FT SAND/GRAVEL ( SUBROUNDED, MEDIUM TO COA	RED BROWN D MATRIX. GM):		RUNS I HAS TO OUT PI	NTO AUGERS, D BE FLUSHED NOR TO
276.78  276.78  276.78  276.78  42.0  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT CONTAINING LARGE FRAGMENTS OF GRAY GREEN, VERY FINE-GRADNED, SOFT SANDSTONE; VERY STIFF, VERY DENSE.  45.1-45.2 FT SHALE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT CONTAINING LARGE FRAGMENTS OF GRAY GREEN, VERY FINE-GRADNED, SOFT SANDSTONE; VERY STIFF, VERY DENSE.  45.1-45.2 FT SHALE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAY /CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLAYEY SLT (CL/ML): RED BROWN SLT Y CLA	SS 2	18	18	195	35	HO.	85	279.28	39.5 - 40 -	4   M	9	39.5-42.0 FT SILT/SAND (SM) VERY DENSE, RED BORWN (SYR	3/4)SILT AND			
GREEN, VERY FINE-GRAINED, SOFT  SANDSTONE; VERY STIFF, VERY DENSE.  45.2  45.2  45.2  GREEN, VERY FINE-GRAINED, SOFT  SANDSTONE; VERY STIFF, VERY DENSE.  45.3-45.2 FT SHAIE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  45.3-45.2 FT SHAIE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  G								276.78	42.0			COARSE SAND AND GARVEL.  42.0-45.FT SLITY CLAY/CLAY (CL/ML): RED BROWN SELTY CL	YEY SILT LAY /CLAYEY			
ASJUNCE VERT STORE, VERT DENSE.    ASJUNCE VERT STORE, VERT DENSE.   HAUDER FOR SS	SS	9	٩	100 +	53	100/3			-		2				HSED 3	IOO I B
WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  BOTTOM OF BORING AT 45.2 FT.  BUSTALLED TO 44.0 FT DEPTH SEE OBSERVATION WELL CONSTRUCTION LOG	2		_			1007 0		- 273.58-	45.2	$ZZ_{4}$	Н	SANDSTONE; VERY STIFF, VERY	DENSE.		HANNE	R FOR SS
BOTTOM OF BORING AT 45.2 FT.  BUSTALLED TO 44.0 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG									] -				in,	- 1		ES #9 AND
												BOTTOM OF BORING AT 45.2	† I.		PISTAL FT DEF OBSERV CONSTR	LED TO 44.0 PTH. SEE /ATION WELL RUCTION LOG
SS=SPLIT SPOON; ST-SHELBY TUBE; STE NESS - WEST OF LUTTS DOAD HOLE NO.				P=PffCHER					INF.		WE C	T OF LUTTS ROAD				OW-16A



		G	E0	LOGI	CI	DRIL	LI	_0G		PROJECT		FI	JSRAP			JOB NO. 14501-11	1	OF 1	HOLE NO. 0V-168
10/22/86   10/22/86   EMPTRE SOILS   ACKER AD-2   7"   13.2   N/A   13.2	SITE	NFSS	s - 1	ÆST OF	LL	STTL	ROAD		COGRAMATE	ES		9	51211	1153		ANGI			I.
N/A					6	DROLLI	IR :	EMPIRE	SDILS	٥						1	ROCK		TOTAL DEPTH
SAMPLE MAJACIN SIGNATION WELL  CASSING LETT IN HOLE OBJECTION WELL  DESCRIPTION AND CLASSFRATION  MOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING AT 13.2 FT.  D. MIDDLETON  MOTES ON WATER RETURN. CHARACTER OF OBJECTION ON BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION. WELL  OCCUPANTION OF BORING AT 13.2 FT.  D. MIDDLETON  MOTES ON WATER CHARACTER OF OBJECTION ON BORING CHARACTER OF OBJECTION OF BORING CHARACTER OF OBJECTION OF BORING AT 13.2 FT.  OCCUPANTION OF BORING AT 13.2 FT.  OBSERVATION WELL  OBSERVATION WEL	CORE			J%)		ı		SAMPL 2-S	5		NG G			DEPTH/E			G€PTH		
### 19   19   19   19   19   19   19   1					.L	l	CASI	NG LEFT	IN HOLE: DIA.	/LENGTH WELL			LOGGED BY	ſ.	D. 1	IIDDLETON	<u> </u>		
ST 24 24	F 13	DVANCE RE RIN	DOVERY	CORE	<u> </u>	PF	ESSURE	<del></del>		_	281	<u> </u>							
ST 24 24	SAMPLE AND DIAM	SAMPLER A	SAMPLE REC	SAMPLE I	KECON 105S	z Y	PRESSURE P.S.I	T N N			CRAMIC	SALLS	ı	DESCRIPTI	ON AND CLA	SSFICATION		WATE	er returil Liliter of
SS 24 14 20 10 10 9 307.74   II.O 10 - 11   1   9.4-II.O FT SAND (SM): GRAYISH RED (JORR4/2), FINE TO COARSE, TRACE OF GRAYEL WET. II.O-13.2 FT SILTY CLAY (CL): BROWNONISH GRAY (5YR4/U), TRACE OF MEDILIM TO COARSE SAND, NOIST, MEDILIM PLASTICITY.  BOTTOM OF BORING AT 13.2 FT. OBSERVATION WEI CONSTRUCTION LCC					2	1 6	200 6	340 6							DESCRIPTI	ÓN ÓN BÒRING		WITH 3.7 HOLLOW	5 RI. DIA
SS 2 4 14 20 10 10 9 307.74   II.0	ST 3	24	24							5 -		ST							
SS 2 4 4 20 10 10 9 10 10 9 10 10 9 10 10 9 10 10 10 9 10 10 10 9 10 10 10 9 10 10 10 9 10 10 10 9 10 10 10 10 9 10 10 10 10 10 10 10 10 10 10 10 10 10	CUTTINGS																		
SS 2 24 7 15 7 8 7 5  305.54 13.2 2   II.O-i3.2 FT SILTY CLAY (CL): BROWONISH GRAY (5YR4/D), TRACE OF MEDILIM TO COARSE SAND, NOIST, MEDILIM PLASTICITY.  BOTTOM OF BORING AT 13.2 FT. OBSERVATION WEI DISTALLED TO 13. FT DEPTH. SEE OBSERVATION WEI CONSTRUCTION LC	SS 2	24	И	20	-	10	ю	/ /	307.74	11.0			(JORR4/2)	, FINE T					
BOTTOM OF BORING AT 13.2 FT.  BOTTOM OF BORING AT 13.2 FT.  OBSERVATION WEL  OBSERVATION WEL  CONSTRUCTION LO	SS 2	24	7	15		7	8	. , ,	- 305.54 -	13.2		2	BROWONIS MEDIUM	T SILT H GRAY 10 COAF	(5YR4/0,	TRACE OF			
															ING AT 13.	2 FT.		INSTALLE FT DEPT OBSERVA CONSTRL	ED TO 13.2 TL SEE THON WELL ICTION LOG
SS-SPLIT SPOON, ST=SIELBY TUBE; SITE NFSS - WEST OF LUTTS ROAD OW-16B								\$1	E	NFSS	- <b>W</b> E	L st (	OF LUTTS	ROAD	<u></u>				NU 160







STATE   NEST OF LUTTS ROAD   COMMANDED   STATE   NUMBER   ROAD   NOT   COMMANDED   NUMBER		(	GEC	LOGIC	DR	ILL	LOG		PROJECT		— Е	LISRAP		<del></del>	J08 NO.		SHEET NO.	HOLE NO. 2 OW-17A
TOTAL DISTRICT PRODUCTION   TOTAL DATA AND WORD   TOTAL DATA AND	SITE	NF	- 22	WEST O	F LUTT	S ROA	D	COORDNATE	ES				WISS	<del></del>	114301		FROM HORIZ.	BEARING
Comparison   Com			ł			LER	EMPIR	E SOILS			KE AI	O MODEL		1			ROCK (FT.)	TOTAL DEPTH
A	CORE		VERYO		COR		8-	LES EL TO	OF CAS		ROUN	EL.		L. GROLAID WA	TER	D	DEPTH/EL. TO	P OF ROCK
### ### ### ### ### ### ### ### ### ##	54P 140	LE HA	/30 ]	NOCHES	,	_ '	ING LEFT	N HOLE, DIA.	/LENGTH		31		Y:		<del></del>		40.0	)' /278.99 
SS   24   21   32   11   14   16   313.29   5.4   11   1.5   5.4   1.5   5.5   24   24   25   24   16   18   8   307.99   1.0   1.5   1.	<u> </u>		1	<del></del>	Τ.				1	Т	П	<u> </u>	<u> </u>		TKINSON		<del></del>	
SS   24   21   32   11   14   16   312.59   5.4   17   17   17   17   17   17   17   1	SAMPLE TYPE AND DIAMETER	LENGTH CORE R	CORE RECOVER	PERCENT COR	25 12 10 S. N. N. N. N. N. N. N. N. N. N. N. N. N.	P.S.J.RE S.L.S.J.RE SLS31	N HE	740.00		GRAPHC LOG	Sample		DESCRIPTI	ON AND CLASS	efication .			MATER LEVELS, MATER RETURN, CHARACTER OF
2 24 24 25 24 16 16 8 307.99  SS 24 24 25 24 16 16 8 307.99  SS 24 24 20 14 21 5 5 5 303.49  SS 24 24 24 25 24 26 27 3 303.49  SS 25 24 24 26 27 3 303.49  SS 26 24 24 26 27 3 303.49  SS 26 24 24 26 27 3 303.49  SS 26 24 24 26 27 3 303.49  SS 26 24 24 26 37 3 303.49  SS 26 24 24 25 37 3 303.49  SS 26 24 24 36 37 3 303.49  SS 26 24 24 36 37 3 303.49  SS 26 24 24 36 37 3 303.49  SS 27 24 24 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 27 24 24 38 37 4 4 37 3 303.49  SS 28 24 24 38 37 4 4 37 3 303.49  SS 29 24 24 38 39 30 30 30 30 30 30 30 30 30 30 30 30 30	SS	24	21	70			н		5			SILTY CL PLASTIC,	AY, MED MOIST, S	KAN STIFF, I SOME ORGAN	MODERATEL) NCS AT	ſ	HAMM *7 AI 10/10/ WATEI NO LE	ER DURING SS ND SS *8. /86 SOME R IN HOLE BUT EVEL COULD BE
2	2	21	21	32		14	16	313.09 312:59	5.4		\	SILT WITH HIGHLY WI 6.4-ILO F GOYR4/2)	I SILTS EATHERI T SAND SATUR	COJE FRAGI D SILTSTON (SND: BROW ATED, DENSI	ENTS (MAY VE BOLLLDER VN E SILTY	8).	HOLE WITH HOLL	TIME. ADVANCED 7 INCH OW STEM
ST   ST   ST   ST   ST   ST   ST   ST	SS 2	24	24	25	24	16	_ /	307.99	1 4			ZONE, VEF	RY FINE	GRAINED IN	LOWER PAR	OF RT.		j
SS 24 20 14 21 5 5 5 303.49 15 7 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 24 24		8	7					306.29				WET, GRAY 12.7-13.5 F BROWN, GR	/-BROWN T <u>SILT</u> MAVELLY	(SMD: THIN SAUDY SE	LAY. LAYER OF T.	<del></del>		
3 24 24 8 4 4 3 20 21	SS 2	24	20	14	21	5	_ /	303.49	15 –		3	GRAVEL AI RED-BROWI	nd troci N. Densi	FRAGMEN	S N		FT OF UP INS	SAND RUNS IDE AUGERS
\$\frac{55}{2} 24 24 8 4 4 4 3 \\ \$\frac{55}{3} 24 24 8 4 4 2 2 2 3 \\ \$\frac{55}{3} 24 24 4 2 2 3 \\ \$\frac{55}{3} 24 24 24		24	24								2   1	VET, GRAY PLASTIC L	-BROWN OCALLY	(5YR4/I) CL CONTAINS	.AY, DESSIMINATI	ED AVES	N THES	S AREA.
2 24 24 4 2 2 3 30 ST ST SPOOM ST-SHELBY TUBE. STE	SS 2	24	24	8	4	4	/		20		4 6	.ESS GRAY CONTAINS	Y-BROWA REDDISH	I, MORE GRA I BROWN (10	(Y WITH DEF R4/6) CI AYF	PTH, FY		
3 24 24 24 286.99 32.0 ST. ST. ST. ST. ST. ST. ST. ST. ST. ST.	SS 2	24	24	4	2	2			25									
3 24 24 24 286.99 32.0 32.0 32.0 FT SAND (SND): SATURATED, BROWN (5YR3/4), SILTY, VERY FINE SAND WITH SOME MEDIUM AND COARSE SAND.	T.								30									
SS-SPLIT SPOOM ST-SHELBY TUBE. STE		24   3	24						12.0	33	] Bi	rown (syf	₹3/4), SI	LTY, YERY	FINE SAND			
D-DEHAUSONU P-PITCHERI D-OTHER NFSS - WEST OF LUTTS ROAD OW-17A	\$5	-SPLIT	SP00 SON: P	N ST-SHELB PITCHERI O-	ry Tube, Other		প্লাচ		NFSS	- VES	T OF	LUTTS	ROAD				HOLE NO.	0¥-174



		GE(	OLOGI	C	DRI	LL I	LOG			PROJECT		 F1	JSRAP			JOB NO.		SIEET	NC. OF 1	HOLE NO. DW-12B
SIT	N.F	ss -	EAST O	F C	ONTA	INMENT	•	COORD	MATE	s			S1612 E	617		<u>I</u>	ANGLE	FROM 90		BEARING N/A
BEG 11	iin /4/8		OMPLETED 11/4/8		DRILL	ER	EMPIRE	SOIL	S	D			D MODEL		HOLE SIZE	OVERBURDEN		ROCK	GTJ N/A	TOTAL DEPTH
COF	E REC	OVERYO	7./20			BOXES N/A	SAUPLI SS-	ES EL		OF CASI	¥6 C		ει. 8.93		L. GROUND WA	TER D = 11/4.	 /86	DEPTH	/EL. TOP O	F ROCK /A
			WEIGHT/FAI INCHES	LL	<del>-1</del>	CAS	NG LEFT				<u>-</u>	-	LOGGED BY	ı	инац	SOLLO		1		
SAMPLE TYPE	SAMPLER ADVANCE	WPLE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE	RECOVERY	2 X 3	WATER RESSURE TESTS 	TINE N MANUTES	ELEVA	TION	ОСРТН	GRAPHC LOG	SAMPLE	C	ESCRIPTIO	DN AND CLASS	SIFICATION			WAT! WAT! CHL	ES Ora ER LEVELS, ER RETURN, PACTER OF LING, ETC.
$\vdash$					ST 6.		3RD 6	318.		0 -			0.0-LIFT.	CLAYE	Y SILT (ML	). DUSKY	<del></del>			ADVANCED
2	24	20	12	+	3	6	δ	317.	. 83	1.1		$\parallel \downarrow$	MODERATI MUN AND NUM	LY FIR	N (IOYR2/2 M WITH 25: ORGANICS	% CLAY,			FT USIN	.O TO N.O G 7 N. LOW STEN
SS 2	24	21	34		8	14	20 40			5		2	I.I-8.B FT YELLOWIS MODERAT MODERAT	. <u>CLAY</u> H BROW E BROW ELY PL	(CL): MOTTI IN (IOYR6/2 N (5YR3/4) ASTIC, MOIS	2) TO ), FIRM TO S T, TRACE O	F		FLIGHT	AUGERS. S COLLECTED
ST 3	24	23								-		ST	UP TO 3.	4 INCH	IN DIAMET					
SS 2	24	24	14		5	8	6 5	310.	13	B.83		3	7.0 FEET 8.8-12.2 I	T. CLA	Y (Cl ): LIGH	D (5R4/2) /			FEET HO	
2 22	24	24	4		3	2	2/2			10 -		4	FIRM, SLIG OCCASION YELLOWIS	HTLY S ALLY W H ORAN	GE WITH FE	,SOFI IO RT. EDDISH AND EW ISOLATE	D <b>.</b>		BUVANCE BICH TR ROLLER	
								- 306.	73 -	2.2			SUBROUNG BOTTOM		ING AT 12.2	P.FT.			INSTALL FT DEPT OBSERVA CONSTRU	ATION WELL
			l Poon: ST=Si P=PITCIER			<u>l</u>	SITE			NFS5	- EAS	. I ST 0	F CONTAI	NMENT					KLE NO.	OW-12B



	(	EO	LOGIC	DR	LL I	_0G		PROJECT		F	USRAP			JOB NO. 14501		SHEET 1	но. 0F 2	HOLE NO.
SITE	NFSS	s - s	OUTH OF	CONT	INMEN	ī	COORDINATI	S			1888.5	E095	-	• • • • • • • • • • • • • • • • • • • •	ANGLE	FROM F		BEARING N/A
BEGU	6/86	1	MPLETED 0/31/86	DREL	LER	EMPIRE	SOILS	D	RILL M		NO MODEL B-45		HOLE SIZE	OVERBLEDEN		ROCK (	FTJ 0.6	TOTAL DEPTH
CORE		ERYOFT.	J'20		BOXES N/A	SMPL ST-	y j ,	P OF CASI 21.54	NG		ND EL. 9. 84		L. GROUND WA E OBSERVI	TER D - 10/6	/86	DEPTH	EL. TOP O	F ROCK /279.34
			EIGHT/FALL NCHES	L	CASI	NG LEFT	N HOLE: DIA ERVATION		J		LOGGED BY		. ATK INSO	Z NHOLV N	OLLO	1		
1YPE ETER	NDVANCE RE RUN	OVERY	BLOWS CORE ERY	ı	WATER PRESSURE TESTS			2	8	7.5							WAT	ES ONE ER LEVELS,
SAMPLE TYPE AND DIANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RI	SAUPLE BLOWS "N" PERCENT CORE RECOVERT	IN LOSS	PPESSURE	SE THE SE WINTES	319.84	EPTE C	STANAC LOG	SAMPLE	•	escrip II	ON AND CLAS	SIFICATION			CHA	ER RETURN, EACTER OF LING, ETC.
				- S1 - 9	AND E	30 8	316.84	3.0 -			3.0-7.5 F STIFF, DE	AY WIT	Y (CL): STI H ROCK FR /CLAYEY OTTLED BRO AY SILT AN	AGMENTS.  SILT (ML):	SILT.		INSTALL FT DEP	ATION WELL ? JCTION
\$\$ 2	24	18	34	7	И			-		ŀ								
ST 3	24	6	SAMPLE IN A JA	R			312.34	7.5		STO	CLAY WIT GRAY,CLA	H A FE	W GRAVEL T ALONG	STIFF BROW FRAGNENTS APPARENT ONG ROOT	5,		WITH 10	
ST 3	24	19					·	10 -		S	SOME ROBECOMES	OT MAT SOFT	ERIALS PRI TOWARD BO	ESENT. CLA OTTOM OF 2	Y ZONE.		WITH PL DEPTH	
SS 2	24	24	7	4	3		307.74	-		2	SATURATI AND POCI	ED GRA KETS OI	Y CLAY WI F BROWN C	LAY /SILTY	CLAY		FEET.	
TZ 3	24	24	_					15 -		S T 2	ZONES AI 16.0-16.6	ND OCC. FT.: SL	ASIONAL GF JBROUNDED	AND BROW RAVELLY ZO TO ROUNDE	NES	•	DOOME	ADVANCED
\$\$ 2	24	24	6	3	3					3	GRAVEL I	N GRAY	CLAY MAT	'Rix.			WITH 7 DIAMETE	INCH TR HOLLOW LIGER BELOW
SS 2	24	10	7	3	4			20 -		1						•	OF 8 IN	TOR CASING
57								25 –		S	RED (5R4.	/D, SAT		ZONE, GRAYI IE-GRAINED DATED.	SH			
3	24	24								3	SUBANCUL	AR SAI	ID UP TO	50%.				
SS 2	24	16	25	8	15		290.74	28.9		5	MODERATE	LY CON	FRAGMENTS	NSE, I, WITH DARK I UP TO 20		1	SLOWER	BECOMES AND
SS 2	24	13	32	12	14		289.84	30 -		6	30.0-34.0 REDDISH E FINE- TO CONSOLIDA	FT SU BROWN MEDIUM ATED, T	TY SAND (IOR3/4), WE	ET, VERY MODERATELY LAY WITH	1		2FiPHIF)	/ ROUGH.
			DON STESHE PEPITCHERI		E <sub>1</sub>	SIT	285.84 284.84	34.0 35 -	- SC	НТИ		AR GRA	AVELS UP	TO 3/4 IN.			HOLE NO.	0₩-13A



		۳۸۱	۸۸۱۸	וומת	1 1	20	PR	OECT			EIROAD	TEET SHEET		HOLE NO. OW-13A
			OGIC	וואט	WATER	UU					FUSRAP	14501-115 2	of 2	G# 17W
SAUPLE TYPE AND DIANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLONS  NO PERCENT CORE PECCONENT	LOSS H C.P.M.	TESTS	TME Pi MHUTES	ELEVATION CONTRACT	32 HT73	GRAPHIC LOG	SAMPLE	description and classific	ATION .	WATE WATE CHAR	S ON THE LEVELS. IR RETURN. ACTER OF ING. ETC.
SS 2	5	5	100 +	100/5*			284.84	-		L,	34.0-40.5 FT <u>CLAYEY GRAVE</u> (GH): MODERATE REDDISH BROW VERY DENSE AND WELL CONSTRUCTION	N OOR4/5), XLXDATED,	DRILLING SLOW F 41FEET.	rom 35 to
∕SS 2	4	4	50 +	50/4"				-		H	MOIST, SUBANGLILAR TO SUBRO UP TO 20% AND UP TO I INC SIZE, TRACE OF CLAY THROUG GRAVELS ARE HARD AND DARK	HIN MAXILIULI HOUT.	USED 3	CALSS
<u>_</u>	,	•					279.34 - 278.74	40 - 40.5 41.1	4114		40.5-4LIFT WEATHERED SHAL REDDISH BROWN (10R3/4), FISSI	E: DARK	SAMPLE	.e dha 8≢ 2
SS 2		ı	50 +	50/1"			210.17	'''' <u>-</u>		Įε	CHIPS IN WEATHERED SHALE M BOTTOM OF BORNIG AT 411 FT	ATRIX.		
													INSTALL SEE OBS WELL CO	TICH WELL ED TO 4LIFT. ERVATION INSTRUCTION DETAILS.
			POOM: \$7=\$				ATE	N	FSS -	SC	NTH OF CONTAINMENT		HOLE NO.	0¥-13A



	(	E0	LOGIC	DRI	LL I	LOG		PROJECT		FL	JSRAP			JOB NO.		SHEET	NO. OF 1	HOLE NO.
SITE		N	FSS - SO TE CONT	OUTH O	<u></u>	-	COGROINATE	s			51890	E 090	<del></del> -	1		FROM 90	HCRIZ.	BEARING N/A
BEGU 11/	и 3/86	03	MPLETED 11/3/86	DRIL	ER	EMPIRE	SOILS	٥		KE AN	R AD-2		HOLE SIZE	OVERBURDEN		ROCK		TOTAL DEPTH
1	RECOV			,	BOXES	SALPL 2-S	- 1	of case 21.09		ROUNE			EL GROITED WA NE OBSERVI	TER		DEPTH	/EL. TOP OF	L
	LE HAM	MER W	EIGHT/FALL NCHES			NG LEFT	IN HOLEIDIA.	LENGTH		J.,	LOGGED I			I SOLLO		<u> </u>		
	Т.	1 .	T		WATER	_		T		П	1						1	
SAUPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	MPLE RECOVER	SAUPLE BLOWS "N" PERCENT CORE RECOVERY	Loss H.P.	TESTS	TINE N NAUTES	ELEVATION	DEPTH	GRAPHC LOG	SAMPLE		DESCRIPTI	ION AND CLASS	SFICATION			WATE WATE CILAR	S ONE OR LEVELS, OR RETURN, NACTER OF LUG, ETC.
~	ZI3	30	S 18	51 6:	2ND 6.	3RD 6	320.15	0		$\coprod$	<u> </u>	FT.CF	e descript	מא מא				<del></del>
T IN HOLLOW STEM AUGER.							310.15	5			BORING	LOG OW	-i3A.				FROM 0	ADVANCED .O TO 14.0 I 7 HL DIA STEM
\$\$ 2	24	16	18	17	10	8 7	309.25	10.57		1	10.0-10.3 (5YR5/2 Defise.t	, MOIST,	AY (CL): PA NODERATEL SILT.	LE BROWN Y PLASTIC,				POON COLLECTED AND 12.0
SS 2	24	24	9	5	5	4/3	308.15 307.45	12.0		2	YELLOW	BROWN	LT/SAND (G (10YR5/4), V LIGHTLY CO	ERY FINE-		_//	FT.	
							- 306.15 -	14.0			TRACE C 10.9-12.0 15YR5/2: TRACEOF 12.0-12.7 LIGHT T LOOSE T GRAINS 12.7-14.0 BROWN MOIST, H SEL T.	F BROWN FT CL , SOFT, ' , SET A FT SA D DARK O SLIGH ARE SUB FT C1 (5YR5/2) GHLY PL		LE BROWN PLASTIC, ND. ECKLED -GRAINED, LIDATED, MC DITTLED PAL EED (5R6/2) EE, TRACE C	E		INSTALL FT .SEI OBSERV CONSTR	ATION WELL
1			ON, ST=SHEL P=PITCHERL (		<u>l</u>	SIT	E				SOUTH O		·				HOLE NO.	0V-138



	G	EO	LOGIC	DR	LL	LOG		PROJECT		FU	ISRAP			108 NO 1450	1-115		OF 2	HOLE NO.
SITE	NFS	S -	WEST OF	LUTTS	RDAD		COORDINATE		<u></u>			W152			ANGLE	FROM HO	KIZ.	BEARWIG N/A
EGU	7/86		MPLETED 0/27/86	DRaL	LER	EMPIRE	SOILS		TRELL MAY		B-45		HOLE SIZE	OVERBURDEN		ROCK (F	1.1	TOTAL DEPTI
		I/A			E BOXES	105	$\frac{5}{1}$ 3	20.52	ING G		EL. 3.98		4.0' /		<del></del>		L. TOP C	
			EIGHT/FALL NCHES		CAS	OBS	N HOLEIDIA. ERVATION	vength WELL			LOGGED 8		ATK INSO	N /JOHN S	OLLO			
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RIN	SAMPLE RECOVERY CORE RECOVERY	SAUPLE BLOWS  ** PERCENT CORC RECOVERY	IN LOSS	WATER RESSURI TESTS 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	TIN N	ELEVATION 318.98	O DEPTH	GRAPHC LOG	3 Tames		DESCRIPTI	ON AND CLASS	SEICATION	-		WAT: WAT: CHAI	ES ON ER LEVELS, ER RETURN, RACTER OF LING, ETC.
							316.98 315.48	2.0			2.0-3.5 SELTY, S		<u>/ (CI ):</u> DAF( AY.	(BROWN,			AS GRO DBSERV SEE GI WELL LO FOR DE	COMPLETED UND WATER ATION WELL BSERVATION OGREPORT TAILS. DVANCED
SS 2	24	18	15	12	7	8 18	313:58 312:78 31:98	5 5.4 6.2 7.0		-	WITH OCC 5.4-6.2 BROWN (	CASIONAL FT CLAY 10YR4741	, SILTY CL.	AGMENTS. TLED GRAY AY WITH	AND		WITH 7 STEM A 7.0 FT. SUBSECH	IN. HOLLOW UGERS TO HOLE JENTLY
SS 2	24	24	14	5	7	7	309.78	9.2	///	2	6.2-7.0 SATURA	FT <u>San</u> TED, SIL 1	TED FINE G D (SM): DAF TY, GRAVELI P): FINE TO	IK BROWN. Y FINE SA	ND.		n. Auge 'T Thei of 8 in	WITH 12 R TO 17.0 N 17.5 FT DIA PVC
SS 2	18	8	li.	25	6	5	30 <del>6</del> .48	12.5 -		3	WELL GRAAND GRA B.B; SAN	RADED SA NY MOTT D IS SA	AND WITH I LED CLAY TURATED.	INCH BROWN LAYER AT	ABOUT	į e		TOR CASHIG TALLED.
T2 3	24	24								ST	(5YR3/4)	CLAY N	Y (CH); STI ITH SOME IY (CH): BR(	GRAY MOTT	LING.			
SS 2	24	24	3	2	ı	2/2		15 -		4	(SYR5/2) SOME SA	, MODER.	ATELY STA ROCK FRA	F CLAY WI GMENTS.	TH			
22	24	6	7	3	3	4/5		20 -		5	SOFT, ST OCCASION PLASTIC,	FICKY, SA NAL SAN , SAND A JLAR TO	TUKATED ( ID AND GRA IND GRAVEL SUBROUND	VEL, HIGHL'		F F H		
-						/ -		-								_ A	UTTING RE HIGH LASTIC	
SS 2	24	14	Ю	35	55	45 27		25 -		6						S	ATURAT	TED, MEDIUN SILTY CLAY
S 2	24	8	25	14	17	8 4		30 -			CLAY BE ZONE FRO			N (5YR5/2)	M			
			DON, STESIE PEPITOIERU			গ্র	283.98 E	35		T.	OF LUTTS					HC	NE NO.	



Г	C	ΕNI	OGIC	DRII		NG	PI	OJECT			FUSRAP JOB HO. 5	HEET	NO. GF 2	HOLE NO. GW-14A
SAMPLE TYPE AND DIAMETER	7		E BLONS NE ENT CONE	T	WATER PRESSURE TESTS		ELEVATION	PEPTH .	SPLANTC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	2	HOTE WATE CLIAN	IS DIA TR LEVELS, IR RETURN. MACTER OF MIG. ETC.
SS 2	24	16	11	3	5		283,98	35 -		В	/37.5-4L5 FT SU.TY SAND (SM): PALE			
2	24	10		,	J		281.48	37.5 - -			BROWN (SYR5/2) DENSE, MOIST, FINE TO MEDIUMGRAINED, SUBANGULAR TO SUBROUND IN A CLAYEY SILT MATRIX OF ABOUT 10%. FEW LAYER GRAVELS UP TO 1/2 IN. IN SIZE.			
SS 2	24	19	66	40	26		277.48	40 - - 41.5 - -		9	4L5-44.7 FT GRAVELLY SAND (GP): DARK REDDISH BROWN (KOR3/4), MODERATELY STUFF, MOUST, DENSE, FINE TO MEDIUM GRADUED, SUBROUNDED SAND WITH ABOUT 20% LAYER GRAVEL UP TO 5/8 IN. IN			ATION RATE
/\$\$ 2	2	2	100 +	100 /2				-		10	MAXIMUM SIZE IN A CLAYEY SILT MATRIX, GRAVEL COMPRISE 15% OF SAMPLE COLLECT.		FT.	IGER AT 38
							- 274. 1B-				44.7-44.8 FT SHAIE: WEATHERED, GRAYISH GREEN, MODERATE HARD.  BOTTOM OF BORING AT 44.8 FT.		INSTALI FT. SEE WELL C	ATION WELL ED TO 44.7 OBSERVATION CHISTRICTICN R DETAILS.
			Poon, ST=S & P=PtTchE				SITE	N	FSS -	¥I	ST OF LUTTS ROAD		HOLE NO.	OW-14A



	G	EOl	_0GI	IC	DRII	LL L	.0G		PROJECT		F	USRAP			лов мо. 14501	-115	1	OF 1	HOLE NO. OW-14B
SITE	NFS	s - 1	WEST	OF L	LUTTS	ROAD		COGROMATE	\$			S809 1	v153			ANGLE	FROM H		BEARING N/A
8ECUM 10/2			WALETED 0/28/		DRILL	ER E	MPIRE	SOILS	Di			NO MODEL R AD-2	- 1	HOLE SIZE	OVERBURDEN 15.		ROCK O	LT- N/A	TOTAL DEPTH
CORE	RECOVE N	RYOT.	J'20			BOXES L/A	2-5 1-5	2 ا د	OF CASE 20.73	HG C		D EL. 9.43	DEPTH/	EL. GROUND WA			DEPTH/	EL. TOP OF	ROCK A
			NCHES			CASI	C LEFT	N HOLEIDIA. ERVATION	/LENGTH WELL			LOGGED B	Yı	10H	1 SOLLO				
SAMPLE TYPE AND DIENETER	SAMPLER ADVANCE LENGTH CORE RUN	RECOVERY	SAMPLE BLOWS	DVERY	PI	WATER RESSURE TESTS		ELEVATION	рертн	PRAPHIC LOG	SAUPLE	<u> </u>	DESCRIPT	'IDII AHD CLAS	SFICATION			WATI WATI	ES CHI ER LEVELS, ER RETURN, RACTER OF
SALP AND D	SAMPLE LENGTH	SAMPLE	PER PER	F. F.	S = 3	PPESSURE P. P.S.I	S TIME S N P WAUTES	319.43	0	GRAF									LING, ETC.
					ZI 6°	2ND 6'	380.6	5,5.1-	-			0.0-ELII LOG OW		DESCRIPTIO	n on Borin	G		WITH 7 HOLLOW	OVANCED IN. DIA STEM AUGER O TO 10.0
SS 2	24	2	38		22	19	19/24		5 -										
							/ 24		-		H								
									10 -						ALE BROWN ZONES OF L				
ST 3	24	14									ST I	/ BROWN	ISH GRA	Y (5YR6/I)	TO LIGHT B PLASTIC, DEN	ROWN		PUSHED	3 IN.
SS 2	24	15	23		5	6	17 /17		-		2	COARS IN MAX	E SAND UMUM S	AND GRAVE	K VERY FINE EL UP TO 3 L ARE GRAY BROUNDED.	/4 IN.		SHELBY 10.0 TO CONTINU	TUBE FROM 12.0 FT. 1ED WITH TO 15.1FT.
	4			+				-304.33 -	-15.1		T			IORING AT I				ADOLK	10 83111
							S.	TÉ.										INSTALL SEE OB! WELL CO	ATION WELL LED TO 15.1 FT. SERVATION ONSTRUCTION R DETAILS.
					BY TUB		SI	TE	NFS:	s - w	EST	סר נטדו	S RUAI	)				HOLE NO.	0A-14B



	(	GE0	LOGIC	: DR	RILL	LOG		PROJECT	r	— F	USRAP		<del></del>	JOB NO 1450	1-115	SHEET NO.	HOLE NO. 2 OW-15A
SITE	NF:	SS -	WEST OF	LUTT	S ROAD		COORDINATE	s			S1039	W153	<del></del>	<del>                                   </del>		FROM HCRIZ.	BEARING N/A
BEGU	N '8/86	1	UPLETED 0/29/86	1	LLER	EMPIRE	SOILS	1		KE A	NO MODEL 8-45		HOLE SIZE	OVERBURDEN		ROCK OFTJ	TOTAL DEPTH
	RECO	VERYOFT N/A			RE BOXES	SAMPL 11-SS	ľ	of CAS 20.30		ROLL	8.84	4	L GROUND WA E OBSERVE	TER	·	DEPTH/EL. T	DP OF ROCK 6' /274.24
	LE HAI	LALER W	EIGHT/FALL NCHES			ING LEFT	N HOLEIDIA.	LENGTH			LOGGED E	<u> </u>		TKINSON		177.	0 /2:4.24
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SANPLE BLOWS "PERCENT CORE RECOVERY	LOSS E.P.V	WATER PRESSURE TESTS  LINE SOLUTION 2ND 6	<del></del>	FLEVATION	жьтя	GRAPHIC LOG	SAMPLE	1	DESCRIPTI	ON AND CLASS				NOTES ONE WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
~ <del>~</del>	314	3 8	W IE	21.6	3 K Z	3R0 5	318.84	0	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u> </u>	TT NIA	אנאריט	V NONWAL T			
							316.84	2.0			2.0-6.3 TAN/YE MODERA DENSE (	RGANIC FT CLA LOW BR IELYPLA LAY WIT	(CH): DARI OWN (5YR4) STIC, STIFF, H SOME GR	( BROWN , /3), MODERATE AVEL, LOCA	TO LY	WITH SYE 17.5 THE WITH AND	ING ADVANCED  1 7 IN. HOLLOW  M AUGER TO  FT. HOLE  N REAMED  112 IN. AUGERS  18 FT OF 8
SS 2	24	22	26	7	12	20	312.54	5 - 6.3		1	TOP, BE(	COMING I	ND GRAY MI NETTER WITH O (SC/SM):	H DEPTH. YELLOWISH		COM	IA. PVC DUCTOR CASHIG ALLED.
22		<u> </u>	ı,r		-	7				2	BROWN	IOYR <del>4/3,</del> Sand.	4/4), CLAYE MODERATEL	EY, SILTY,			
2 5T 3	16	14	15	16	8	6	309.54 308.84	9.3		TZ		OWN (5Y	<u>Y (CH):</u> R4/I), PLAS T CLAY.	TIC,			
SS 2	24		4	2	2	2	307.34	11.5		3		FT SANL	(SNI): TAN	SILTY,			
ST 3	24	24	•	-		2		15 -		TZ	11.5-39.1 F WET. GRA	T <u>CLAY</u> Y-BROWN	(CH); SOFT, I (5YR4/I) C ED SAND AI IGE TO L25	HTIW YAL			
SS 2	18	18	4	1	2	2		-		1	GRAVEL	SIZE RAI	NGE TO L25	in. Dia.	-		
S 2	24	24	7	2	2	3 4		20 -		5							
-								25 -									
SS 2	24	24	6	9	3	3 3				6				•			
SS .	24	16	7	WH	WH	WH 7		30 -		7	32 FT ଘ	RADES T	o: Medium (	GRAY (NZ)		DBH I	ER INDICATES
						1 ===	283.84	35			SETY CL VERYSMA	AY, WET, LL (PIN )	HIGHLY PLA HEAD SIZE) ROWN (IOR4	ASTICITY. OF GRAY (	N5) RY.		GE IN
			ONLST≈SHE PITCHERI			SIT	<u> </u>	NFS:	S - ₩E	ST	OF LUTT:	ROAD				HOLE A	ea. OW-15A



	(	EO	LOGIC	DRI	LL l	.0G	P	ROJECT			FUSRAP	лов но. 14501-115	SHEET 2	NO. OF 2	HOLE NO. OW-15A
SAUPLE TYPE	SAMPLER ADVANCE LENGTH CORE REN	SANPLE RECOVERY	SAMPLE BLOWS THE PERCENT DONE RECOVERY	LOSS N G.P.M.	WATER TESTS TESTS	TME N MRVTES	ELEVATION 283.84	35	BEARTHC LOG	SAMPLE	DESCRIPTION AND CLASSIFE	CATION		WATE WATE CHAS	S ONE OR LEVELS, OR RETURN, LACTER OF
\$3	24	24	5	WH	WH	WH 5	240.01	-				· · · · · · · · · · · · · · · · · · ·		AS OBS WELL. S COMPLE	COMPLETED ERVATION EE WELL TION REPORT
SS		10	BS		74	55 /		40 -			391-42.3 FT MODERATE BROWN TO MODERATE RED-BROWN (IOF TOCOARSE SHITY SAND AND G GRAINS SUBROUND TO ANGULA	R4/6), FINE RAVEL, WET.			DRILLING ES CHANGE
2   SS   2	127	18	99 62	80	34	50 32 60	275.34 274.24	1			42.3-43.5 FT MODERATE BROW TO MODERAT RED-BROWN GOR- SANDAND GRAVEL IN A CLAYE MATRIX, DRY TO MOIST. GRAINS	1/6), COARSE Y SILT S		HAMMER	300 LB DURING SS •10 AND
255, 2				50/			273.34	45.5			SUBROUNDED TO ANGULAR.SOM GREENISH-GRAY (566/I) MOTTLE PRESENT.  43.5-44.6 FT DARK REDDISH B (MOR3/4), SILTY FINE TO MEDIUM LITTLE FINE TO MEDIUM GRAVE 44.6-45.5 FT SHALE; DARK REI (MOR3/4) AND GREENISH-GRAY IN (SG6/I), VERY SOFT, SEVERELY DRY.  BOTTOM OF BORING AT 45.5 II	ROWN M SAND, EL, DRY. DDISH-BROWN NOTTLED WEATHERED,		OBSERVA INSTALLE FT. SEE WELL CO LOG FOR WH=SAMPI UNDER ST WEIGHT O	TION WELL D TO 45.5 OBSERVATION NSTRUCTION DETAILS.  ER ADVANCED ATIC F HAMMER.
			ON STESHEL PITCHER O		· 	SITE		NF	SS -	ÆS	T OF LUTTS ROAD		t	DLE NO.	OW-15A



	_	<u> </u>	0010	חחי		^^		PRO_ECT						JOB NO		SHEET		HOLE NO. OW-158
	G	FOL	OGIC	UKI	LL L	.06	COORDONATE	•		FU	SRAP			1450	1-115	FROM H	OF 1	DW-15B
MIE	NFS:	S - 1	WEST OF	בדדען	ROAD							W152	T		<u>.</u>	909	) 	N/A
D/2	9/86		PLETED 0/29/86	DREL	LER (	MPIRE	SOILS	DRI			NODEL RAD-2		HOLE SIZE	OVERBURDEN		ROCK 0	FTJ N/A	TOTAL DEPTH
	RECOVE	RYOT.			BOXES	SALPLE	יר ו כ	of CASIN	1	ROUND	EL. 3.82	CEPTH/E	L. GROUND WA'			DEPTH/	EL. TOP C	F ROCK
ALAPI		/A	CHT/FALL		N/A I CASU	2-5	N HOLE: DIA.	20.12 /LENGTH	l_	210	LOGGED 8	<u> </u> Yı				<u>l</u>		
			NCHES			OBSI	ERVATION	WELL					D. MI	DDLETON				
SAMPLE TYPE AND DILVETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS  "N" PERCENT CORE RECOVERY		WATER PRESSURE TESTS		ELEVATION	H1 430	GRAPHIC LOG	SAMPLE		DESCILATI	ICH AND CLASS	SEICATION			CIU WA WA	IES ON INTERPRETARIL RAUTER OF
3 2	SAM	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 15	12 LOSS	PRESSURE P.S.I	280 % M N M 812 M	318.82	0	83.									LING, ETC.
TST 3	20	12						1 1 1		ST I	0.0-10.0 COMPLE		E BORING LO	OG OW-158	FOR		USING DIA HO AUGER. SNELBY AND 2	r Tubes I Not Fushed
-ST- 3	1	4						5 -		ST. 2							TO PE	IN END OF
SS 2	24	12	6	2	2	4 5	306.82	10			RED(IOR OCCASI GRAVEL	4/2), ME ONAL PI , SUBROI		TICITY,MO	SH IST,		DODING	COMPLETED
											BUITU	A UF BU	PRING AT 12	U FI.			AS OB WELL. COMPL	SERVATION SEE WELL ETION REPORT ETAILS.
	\$2.2	PLIT S	POCH ST=SI	ELBY TI	LIBE;	1	SITE	NE CC	l	EST	OF LUT	TS RDA	n			-	HOLE NO	
	<b>D</b> =0	ENNISO	N. P-PITCHET	i o=othi	ER												<u> </u>	OW-15B



											<del></del>						
	G	EOL	OGIC	DRI	LLI	.0G		PROJECT		F	ISRAP		JOB NO. 14501-		SHEET NO. 1 OF	2	HOLE NO. OW-16A
SITE	NFSS		EST OF				COORDMATE				1212 W159				FROM HORIZ. 90°		BEARING N/A
BEGUN 10/	3/86		PLETED 0/21/86	DRILL	ER [	MP IRE	SOILS	][	DRELL MAI			7° OVER	BURDEN (		ROCK (FT.)		TOTAL DEPTH 45.2'
CORE		RYGT.	/'0		BOXES	SAMPU 10-S	S   7	of cas 20.63	ING G		DEPTH/EL. GRO 3.78	OUND WATER .5' /313.	28		DEPTH/EL. T		поск 273.68
			ICHES	··	CASU		N HOLE, DIA.		······································		LOGGED BY:	A. ATKIN	ISON			-	_
TYPE	ADVANCE ORE RUN	EDOVERY	BLOWS 1 COME VERY	P	WATER RESSURE TESTS		ELEVATION	DEP TH	367 c	SAMPLE	DESCRIPTION A	ባህ ኒ፣ ፕሪሪዲሊፕ	Tires				S OH: R LEVELS, R RETURN,
SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SALPLE RECOVERY	SAMPLE BLONS TO THE PERCENT CORE RECOVERY	E LOSS	SPRESSURE P.S.I	TAKE BENEFES PENENTES	318.78	0	CRAPHC LOG	ηS						CHUR	AUTER OF DIG, ETC.
											0.0-4.0 FT CLAY (C (5YR4/4), SILTY, SAN FINE GRAVEL; ORGANI	DY CLAY W	MOZ HTI	Ε			
SS 2	24	18	25	16	14	11	314.78 313.98 313.28	4.8 <sub>-</sub> 5.5		_	4.0-4.8 FT CLAY (CI (5YR4/1) CLAY. 4.8-5.5 FT SILT (NL					<u>Z</u> .	0/9/86
					••	/	311.78	7			(5YR5/2) SILT TO 5. (00YR5/5) SILT FROM 5.5-7.0 FT CLAY (C	3 FT, YELLO 5.3 FT TO L): BROWN 0	DWISH T/ ) 5.5 FT 5YR4/4)	<u>.                                    </u>			
SS 2	24	24	5	2	3	2/3	309.48	9.3 10 -		2	SLTY CLAY WITH RE 7.0-9.3 FT SAND (S (5YR3/3), SLIGHTLY	M): DARK BE SILTY SATU	ROWN	TING.	19.5 11.	FT DIAH	VANCED TO LISING 7 OLLOW
ST 3	24	24				2				T2 	FINE TO MEDIUM SAI 9.3-34.9 FT CLAY ( WET CLAY WITH SUE GRAVEL COMMON; BR	CHI:SOFT, S' BROUNDED T	TO ROLIN		THE TO	EN RE	JGERS. HOLE AMED T USING GER.
2	24	24	5	2	3	2		15 -		3	(SYR5/2) TO ABOUT (SYR4/I) BELOW IO F	10 FT, GRA			EIG DIA COI	HT-BU Metei Bouct	CH R PVC TOR CASHIG
5S 2	18	7	43	26	£5	2				4	HIGH PERCENTAGE OF	F ROCKS AN	ID GRAV	EL.		H40) I 20.0	NSTALLED FT.
66																	
SS 2	18	3	33	19	И	19		20 -		5							
								-									
\$\$ 2	24	24	5	3	7	8 15		25 -		6	OCCASIONAL THIN RE	D BROWN C	LAY LA	YERS.			
SS 2	24	16	22	6	ł	11 8		30 -		7							
							283.78	35									
i			OON, ST=SH P=PITCHER			SI			is - W	ST	OF LUTTS ROAD	·	<del></del>		HOLE	HO.	OW-16A

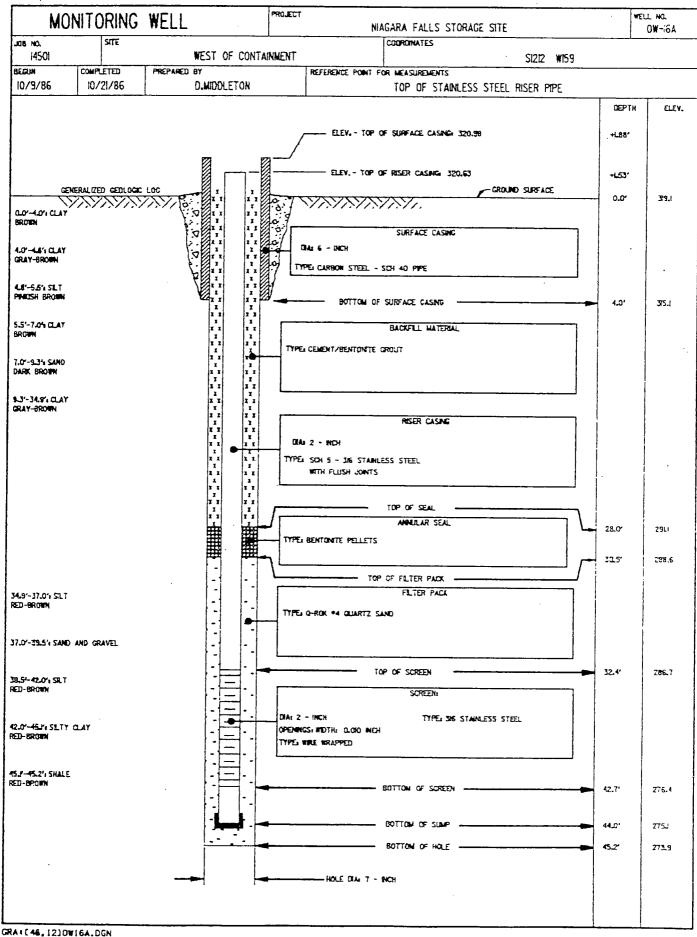


THE STATE OF THE S	70	_													
Notes of water levels.   Notes of water leve		G	EOL	.OGIC	DRI	LL I	.0G	F	ROJECT			FUSRAP			HOLE NO.
SS   24   II   3I   3   IO   2I / IO   281.78   37.0   3	SAUPLE TYPE AND DAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CONG. RECOVERY	1088 1088 1088	TESTS	Γ			GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFI	CATION	WAT CHA	ER LEVELS, ER RETURN. RACTER OF
281.78 281.78 37.0 37.0 37.0 37.0 37.0 37.0 37.0 37.0			$\vdash$				I	253.10	122	11111	я	34 9-37 A ET CILTY CAND (S	M. VEDY	CUID	WD 60 WE
SS   9   9   100 +   53   100/3   273.58   45.2   45.2   57   58   58   58   58   58   58   58		<u>-5-1</u>		5.		.ug		281.78	37.0	* *	•	FINE; SUBROUNDED GRAVEL IN (10R3/6), SILT, VERY FINE SAN 37.0-39.5 FT SAND/GRAVEL ( SUBROUNDED, MEDIUM TO COA	RED BROWN D MATRIX. GM):	RUNS I HAS TO OUT PI	NTO AUGERS, D BE FLUSHED BOR TO
276.78  276.78  276.78  276.78  42.0  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT CONTAINING LARGE FRAGMENTS OF GRAY GREEN, VERY FINE-GRADNED, SOFT SANDSTONE; VERY STIFF, VERY DENSE.  45.1-45.2 FT SHALE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT CONTAINING LARGE FRAGMENTS OF GRAY GREEN, VERY FINE-GRADNED, SOFT SANDSTONE; VERY STIFF, VERY DENSE.  45.1-45.2 FT SHALE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  COARSE SAND AND GARVEL.  42.0-45JFT SLTTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY / CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY/CLAYEY SLT (CL/ML): RED BROWN SLTY CLAY (CL/ML): RED BROWN SLTY CLAYEY SLT (CL/ML): RED BROWN SLTY CLAYEY SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML): RED BROWN SLT (CL/ML):	SS 2	8	18	195	35	HO.	85	279.28	39.5 - 40 -	<b>4   M</b>	9	39.5-42.0 FT SILT/SAND (SM) VERY DENSE, RED BORWN (SYR	3/4)SILT AND		
GREEN, VERY FINE-GRAINED, SOFT  SANDSTONE; VERY STIFF, VERY DENSE.  45.2  45.2  45.2  GREEN, VERY FINE-GRAINED, SOFT  SANDSTONE; VERY STIFF, VERY DENSE.  45.3-45.2 FT SHAIE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY FINE-GRAINED, SOFT  USED 300 LB. HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  45.3-45.2 FT SHAIE: RED BROWN, WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN, VERY STIFF, VERY DENSE.  HAMMER FOR SS  SAMPLES #9 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  GREEN #1 AND 10.  G								276.78	42.0			COARSE SAND AND GARVEL.  42.0-45.FT SLITY CLAY/CLAY (CL/ML): RED BROWN SELTY CL	YEY SILT LAY /CLAYEY		
ASJUNCE VERT STORE, VERT DENSE.    ASJUNCE VERT STORE, VERT DENSE.   HAUDER FOR SS	22	9	9	100 +	53	100/3			=		10			IISFD :	ΙΩΩ 1 B.
WEATHERED SHALE.  BOTTOM OF BORING AT 45.2 FT.  BOTTOM OF BORING AT 45.2 FT.  OBSERVATION WELL PLISTALLED TO 44.0 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG	2							- 273.58-	45.2	$ZZ_{4}$	Ц	SANDSTONE; VERY STIFF, VERY	DENSE.	 HANNE	R FOR SS
BOTTOM OF BORING AT 45.2 FT.  BUSTALLED TO 44.0 FT DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG	İ								] -				in,		CULA E= Z:
												BOTTOM OF BORING AT 45.2	FI.	PISTAL FT DEF OBSERV CONSTR	LED TO 44.0 PTH, SEE VATION WELL RUCTION LOG
SS-SPLIT SPOONS ST-SHELBY TUBES SITE NECC - WEST OF LITTE DOWN HOLE NO.				P=PITCHER							WE.	T OF LUTTS ROAD			OW-16A



NFSS   MEST OF LUTTS ROAD		G	E0	LOGIO	] (	ORIL	LI	_0G		PROJECT		F	USRAP			JOB NO. 14501-115		OF 1	HOLE NO. OW-168
10/22/86	SITE	NFS:	s - 1	ÆST DF	LU	ITTS I	ROAD		COGRAMATE	ES			S1211 1	1153		ANGL			l.
MA	BECUM 10/2				6	DRALLE	TR :	EMPIRE	SDILS	٥						1	ROCK		TOTAL DEPTH 13.2'
Common   C	CDRE			J%)		ι		SAMPL 2-5	5		NG G			DEPTH/E			DEP1H		
New York   State   S						L	CASI	NG LEFT	IN HOLE: DIA.	/LENGTH WELL			LOGGED 81	ſ.	D. 1	IIDDLETON			
CO-9.4 FT: SEE DESCRIPTION ON BORING:  ST 24 24 24	F 13	DVANCE RE RIN	DOVERY	SLOWS CORE	5	PR	ESSURE			_	201	<u> </u>							
CO-9.4 FT: SEE DESCRIPTION ON BORING:  ST 24 24 24	SAMPLE AND DIVIN	SAMPLER A	SAMPLE REC	SAMPLE I	TOSS TEMP	r r	PPESSURE P.S.I	T N N			GRAPHIC	aus.	ı	DESCRIPTI	ON AND CLA	SSFICATION .		WATE CHAR	er returil, Lauter of
\$5 24 M 20 10 10 9 307.74   10   10   10   10   10   10   10   1	CUTTINGS					I 6.	280 6	340 6							DESCRIPTI	ÓN ÓN BÒRING		WITH 3.7 HOLLOW	5 RL DIA
SS 24 7 15 7 8 7 5  305.54 13.2 11.0 1 10 9 307.74 11.0 1 10 9 307.74 11.0 1 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ST 3	24	24							5 -		ST							
2 24 M 20 10 10 10 9 9 10 10 10 9 9 10 10 10 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10	CUTTINGS																		
SS 2 24 7 15 7 8 7 5 305.54 13.2 LIGHTLY INDEED TO COARSE SAND, NOIST, MEDIUM PLASTICITY.  BOTTOM OF BORING AT 13.2 FT.  OBSERVATION WELL DISTALLED TO 13.2 FT DETILL CONSTRUCTION LOG FOR DETAILS.	SS 2	24	И	20	[-	10	ю	/ /	307.74	11.0			(IORR4/2)	, FINE T					
SS-SPLIT SPOON STI-SLEEDY TUBES STEEL MESS.  OBSERVATION WELL RISTALLED TO 13.2 FT. DEPTH. SEE OBSERVATION WELL CONSTRUCTION LOG FOR DETAILS.	SS 2	24	7	15		7	8	. , ,	- 305.54 -	13.2		2	U.O-13.2 F Browonis Medium 7	T SILT H GRAY 10 COAF	(5YR4/0,	TRACE OF			
SS-SELII SPOOR SI-SIELEI 1008															ING AT 13.	2 FT.		FT DEPT OBSERVA CONSTRU	ED TO 13.2 TH SEE THON WELL ICTION LOG
DEDENGEN PERIODER NT 33 - NC 31 UP LUI 13 KUAD ON-168							1	SIT	E	NFSS	- WE	L st	OF LUTTS	ROAD	<u></u>				NU 160







STATE   NEST OF LUTTS ROAD   COMMANDED   STATE   NUMBER   ROAD   NOT   COMMANDED   NUMBER		(	GEC	LOGIC	DR	ILL	LOG		PROJECT		F	LISRAP		<del></del>	J08 NO.		SHEET NO.	HOLE NO.
TOTAL DISTRICT PRODUCTION   TOTAL DATA AND WORD   TOTAL DATA AND	SITE	NF	- 22	WEST O	F LUTT	S ROA	D	COORDNATE	ES				WISE	<del></del>	114301		FROM HORIZ.	BEARING
Comparison   Com			ŧ			LER	EMPIR	E SOILS			KE AI	O MODEL		1			ROCK (FT.)	TOTAL DEPTH
A	COFE		VERYO		COR		8-	LES EL TO	OF CAS		ROUN	EL.		L. GROLAID WA	TER	0	DEPTH/EL. TOP	OF ROCK
### ### ### ### ### ### ### ### ### ##	54P 140	LE HALL	44ER 1	NOCHES	,	_ '	ING LEFT	N HOLE, DIA.	/LENGTH				Y:		<del></del>		40.0	/ /278.99
SS   24   21   32   11   14   16   313.29   5.4   11   1.5   5.4   1.5   5.5   24   24   25   24   16   18   8   307.99   1.0   1.5   1.	<u> </u>		1	<del></del>	Τ.				1	Т	П	<u> </u>	<u> </u>		TKINSON		<del></del>	
SS   24   21   32   11   14   16   312.59   5.4   17   17   17   17   17   17   17   1	SAMPLE TYPE AND DIAMETER	ENGTH CORE R	CORE RECOVER	PERCENT COR	25 12 10 SX N N N N N N N N N N N N N N N N N N	P.S.J.RE S.L.S.J.RE SLS31	N HE	740.00		GRAPHC LOG	3 lanvs		DESCRIPTI	ON AND CLASS	efication .		C	ATER LEVELS, ATER RETURN, KARACTER OF
2 24 24 25 24 16 16 8 307.99  SS 24 24 25 24 16 16 8 307.99  SS 24 24 20 14 21 5 5 5 303.49  SS 24 24 24 25 24 26 27 3 303.49  SS 24 24 24 25 24 26 3 303.49  SS 25 24 24 24 25 3 303.49  SS 26 24 24 25 3 303.49  SS 26 24 24 25 3 303.49  SS 26 24 24 36 307.99  SS 26 24 27 30 14 31 5 5 5 303.49  SS 26 24 24 36 307.99  SS 303.49  SS	SS	24	21	70			н		5			SILTY CL PLASTIC,	AY, MED MOIST, S	KAN STIFF, I SOME ORGAN	MODERATEL) NCS AT	ſ	HAMMI *7 AN IO/IO/ WATER NO LE	ER DUBUNG SS D SS ®8. 86 SOME I IN HOLE BUT VEL COULD BE
2	2	21	21	32		14	16	313.09 312:59	5.4			SILT WITH HIGHLY WI 6.4-ILO F GOYR4/2)	I SILTS EATHERI T SAND SATUR	COJE FRAGI D SILTSTON (SND: BROW ATED, DENSI	ENTS (MAY VE BOLLLDER VN E SILTY	8).	HOLE WITH HOLLO	TIME. ADVANCED 7 INCH DV STEM
ST   ST   ST   ST   ST   ST   ST   ST	SS 2	24	24	25	24	16	_ /	307.99	1 4			ZONE, VEF	RY FINE	GRAINED IN	LOWER PAR	OF RT.		
SS 24 20 14 21 5 5 5 303.49 15 7 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 24 24		8	7					306.29				WET, GRAY 12.7-13.5 F BROWN, GR	/-BROWN T <u>SILT</u> MAVELLY	(SMD: THIN SAUDY SE	LAY. LAYER OF T.			
3 24 24 8 4 4 3 20 21	SS 2	24	20	14	21	5	_ /	303.49	15 –		3	GRAVEL AI RED-BROWI	nd troci N. Densi	FRAGMEN	S N		FT OF UP INSI	SAND RUNS DE AUGERS
\$\frac{55}{2} 24 24 8 4 4 4 3 \\ \$\frac{55}{3} 24 24 8 4 4 2 2 2 3 \\ \$\frac{55}{3} 24 24 4 2 2 3 \\ \$\frac{55}{3} 24 24 24		24	24								2   1	VET, GRAY PLASTIC L	-BROWN OCALLY	(5YR4/I) CL CONTAINS	.AY, DESSIMINATI	ED AVES	IN THUS	AREA.
2 24 24 4 2 2 3 30 ST ST SPOOM ST-SHELBY TUBE. STE	SS 2	24	24	8	4	4	/		20		4 6	.ESS GRAY CONTAINS	Y-BROWN REDDISH	I, MORE GRA I BROWN (10	(Y WITH DEF R4/6) CI AYF	TH, Y		
3 24 24 24 286.99 32.0 32.0-37.0 FT SAND (SND: SATURATED, BROWN (5YR3/4), SILTY, VERY FINE SAND WITH SOME MEDIUM AND COARSE SAND.	SS 2	24	24	4	2	2			25									
3 24 24 24 286.99 32.0 32.0 32.0 FT SAND (SND): SATURATED, BROWN (5YR3/4), SILTY, VERY FINE SAND WITH SOME MEDIUM AND COARSE SAND.	T.								30									
SS-SPLIT SPOOM ST-SHELBY TUBE. STE		4 2	24						12.0	33	] 8	rown (syf	₹3/4), SI	LTY, YERY	FINE SAND			
D-DEHAUSONU P-PITCHERI D-OTHER NFSS - WEST OF LUTTS ROAD OW-17A	\$5	-SPLIT	SP00 SONL P	N ST-SHELB PITCHERI O-	ry Tube, Other		প্লাচ		NFSS	- VES	T OF	LUTTS	ROAD				HOLE NO.	∩U-17A



GE	OLOGIC	DRI	LL I	_0G	r	ROJECT			FUSRAP	дов но. — Sa 14501-115	EET 1	NO. OF 2	HOLE NO. OW-17A
SAMPLE TIPE AND DAMETER SAMPLES ADVANCE LENGTH CORE REIN SAMM F RECOVERY	SAMPLE BLOWS W PERCENT CONE RECOVERY	77-d-5 N SSD1	MATER MESSIM TESTS	TIME	ELEVATION 283.99	35 HL438	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICA	<del> </del>		HOTE WATE WATE	IS ON PR LEVELS, PR RETURNL ACTER OF UNG. ETC.
SS 24	6 19	8	8	" "		-	1:1:	6		<del></del>	_	CHANGE	DRILL RIGS
				- "	281.99	37.0 <u>-</u>			37.0-40.0 FT SILT (ML): RED CO SILT WITH SOME GRAY-CREEN F AND A FEW FOREIGN ROCK FRA	RAGMENTS		WITH HO	LE AT 36.5 FEET.
$\begin{bmatrix} SS \\ 2 \end{bmatrix}$ 2	100/2	Ю0/2			278.99	40	Щ	7	40.0-42.5 FT SHALE; HIGHLY WE	ATHEREN	_		
SS 6				$\overline{}$					TO DECOMPOSED RED SHALE.	ATTEMED			
2 6	6 10/6	10/6		}	- 276. 49-	42.5		8	BOTTOM OF BORING AT 42.5 FE		$\dashv$		
25-SPLT S	POON, ST×SHELI	TUBE,		SITE							J. F. W. L.	NSTALLE T. SEE FELL CON OG FOR	TION WELL D TO 42.0 OBSERVATION USTRUCTION DETAILS.
	PEPTICHER OF					NFS	S - 1	ES	T OF LUTTS ROAD		HOL	E NO.	OW-17A



STE NFSS - MEST (  BEGIN COMPLETE: 10/16/86 10/16/ CORE RECOVERYOTI/O N/A  SAMPLE HAMMER WEIGHT/F 140 LBS/30 INCHES  WHATE BLOOK AND THE STORY SAMPLE HAMMER WEIGHT/F 140 LBS/30 INCHES  THE STORY SAMPLE HAMMER WEIGHT/F 140 LBS/30 INCHES  THE STORY SAMPLE HAMMER WEIGHT/F 140 LBS/30 INCHES	/86 E E CORE BOXES N/A FALL CASIN		DRILL P OF CASING 20.29	ACKER	AD-2	HOLE SIZE C	VERBURDEN (		ROM HORIZ.	BEARING N/A
10/16/86 10/16/ CORE RECOVERYOTI./20 N/A SAMPLE HAMMER WEIGHT/F. 140 LBS/30 INCHES	/86 E E CORE BOXES N/A FALL CASIN	SAMPLES EL. TON 1-SS 3	P OF CASING 20.29	ACKER GROUND	AD-2	1		נדז	BACH (ET )	
N/A SAMPLE HAMMER WEIGHT/FO 140 LBS/30 INCHES	N/A FALL CASIA	1-5S 3	20. 29		EL GEPTH/EL		16.9		N/A	16.9'
140 LBS/30 INCHES	S			310.	.85	NONE OBS			DEPTH/EL. TOP OF N.	
NAMETER RADVANCE CORE RIM RECOVERY RECOVERY RECOVERY RECOVERY RECOVERY		DUSCRYATION			LCCCED BY:	A. ATK	CINSON			
NAO HAMINA	MATER PRESSURE TESTS  ST. C. S. S. S. S. S. S. S. S. S. S. S. S. S.	ELEVATION	DEPTH	SAMPLE LOG	DESCRIPTIO	DH AHD CLASSE	CATION		WATE WATE CHAF	IS ON: IR LEVELS, IR RETURN, MACTER OF LING, ETC.
SS 24 22 3		318.85	1 1 -		0.0-14.5 FT: SEE LOG OW-17A. 4.5-16.9 FT CLAY WET GRAY CLAY.	Y (CH): SÖFT,	STICKY,	<b>G</b>	OBSERVA	TION WELL
\$S=SPLIT SPOOM; ST=	=SHELBY TUBE;	SITE							FT DEPT GBSERVA CONSTRU	D TO 16.9 H. SEE TION WELL
SS=SPLIT SPOON, ST= D=DENNISON, P=PITCH		MIL	NFSS -	WEST OF	LUTTS ROAD				· 1	0¥-178



	(	E0I	OGIC	DRI	LL I	LOG		PROJECT		FU	ISRAP	•		лов но. 14501		SHEET N	а УF 2	HOLE NO.
SITE	NF	ss -	WEST DF	נעזדי	ROAD	)	COORDINATE	S	- <b></b>	s	1619	¥154			ANGLE	FROM HOP	82.	BEARING N/A
10/2	N 29/86		MPLETED 0/29/86	DRILL	<b>ER</b>	EMPIRE	SOILS	D			AD-2		HOLE SIZE	OVERBURDEN		ROCK (FT	.8	TOTAL DEPTH
COPE		ERYGET.	./3U		DOXES V/A	3-5 8-5	l   74	OF CASI 21.09	NG G	ROUND 319	EL. 1.88	DEPTH/E	L GROUND WA			DEPTH/EL		F ROCK /272.88
			DIGHT/FALL VICHES		CAS		N HOLEIDIAL				LOGGED B	Ϋ́ε	HOL	SOLLO		·		
SALPLE TOPE AND DANETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLOWS  "F PERCENT CONE RECOVERT	LOSS N C.P.M.	WATER RESSURE TESTS	N N N N N N N N N N N N N N N N N N N	ELEVATION	HLASI	GRAPHIC LOG	SMALE	•	DESCRIPTI	DN AND CLASS	SEICATION			WATI WATI CHAR	ES ONE ER LEVELS, ER RETURN, VACTER OF LING, ETC.
	בוג	30		ET 6.	2MD 6*	380 6	319.88	1.5			BROWN ( STIFF, NU FRAGMEN 1.5-6.5 F (5YR5/2) BROWNISI	SYR2/2 MEROUS ITS. T. CLAY WITH M H GRAY	CHO: PALE OTTLED ZO (SYRG/D AN	IST, MEDIUM SOME ROCK BROWN WES OF LIGH D DUSKY Y	aT .	S.		VANCED NCH HOLLOW IGER.
SS 2	24	16	26	8	12	20	313.38	6.5		-	MODERAT GRAVELS ABOUT # 6.5-9.5	IELY PL 5 UP TO 5% VERY FT. SAN	WELL CONS ASTIC, FEW 3/8 IN. DI DARK SIL O (SIO: MOD	SUBROUNDE L CONTAINS L SEAMS. ERATE BROW			ELBY	
T2 E	24	7					310.38	9.5-		ST	MEDILINI NEAR 9.0 9.5-15.5	GRAINED D <u>FEET.</u> FT. <u>SLT</u>	, MOIST, VER FEW VER) Y SAND (SA (IOR4/2), MO	SELTY SEA	<b></b>	IB. FE Di	.O, AND ET. RELL CL	AT 9.5, 29.5 Ittings Saturated
\$5 2	24	ß	30	20	16	H 12		1		2	VERYFINE SIZE PAR SUBANGU	: Graine RTICLES Lar to	D WITH ABO AND 10-15% SUBROUNDI SE TO MEDII	OUT 10% CLA SMALL ED GRAVELS		AI FE Di	ND MUC EET. RELLING	SLIGHTLY ROM 12.5
SS 2	24	11	22	14	10	14	304.38	15.5		_	(5YR5/2) YELLOWIS DENSE, M	MOTTLE SH IN PA IODERAT	AY (CH): PA ED SLIGHTLY ART, SATURA ELY PLASTI R TO SUBRO	' GRAY AND NTED, VERY C, WITH ABO		Di	ASIER	BECOMES
SS 2	24	2	11	9	5	6 5		20 -		4								
SS 2	24	4	fl .	2	5	6 5		25 -		5								
ST 3 SS 2	24	24	30	6	15	15 18	286.88	30 -		3 6	REDDISH FINE-GRA MOIST, W SUBANGL GRAVELS	BROWN BROWN BAR TC BLAR TC BUP TO	AND (SMD: M (IOR4/6), VI ENSE WELL CE OF SILT ) SUBROUND 1 3/4 INCH GRAYISH GR	ERY FINE TO CONSOLIDAT AND 10-20 ED, DARK GI IN DIAMETER	ED. Z Ray E.			
			ONE STESHO		,	SIT	284.88 E	35 1 MFSS	- WE	ST C		RED SHA	LE FRAGNE			HOL	E MO.	OW-18A



GEOLOGIC DRILL LO	G PROJEC	ст	FUSRAP J08 HO. 14501-11	SHEET HO. HOLE HO.
			15 2 OF 2 OW-18A	
SAMPLE TYPE AND DAMETER AND DAMETER AND DAMETER SAMPLE RECOVERY CORE RECOVERY TO SAMPLE R	ELEVATION E S	8	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRELING, ETC.
SS 22 22 76 30 31 45	1	7		USED 300 LB. HAMMER DURING SS *8
50/	45		38.6-47.0 FT. SAMDY SET (ML): MODERATE BROWN (5YR4/4), DENSE, MOIST, OCCASIONAL COARSE SAND AND GRAVELS I TO 25%. SAND IS FINE TO MEDILIN GRANED AND SUBANGULAR. GRAVELS ARE SUBROUNDED GRAY WITH A MAXIMUM SIZE INCH. TRACE OF CLAY THROUGHOLIT.  47.0-47.8 FT. SHALE: WEATHERED, MODERATE REDDISH BROWN (10R4/6),	UP DRILLING AT 36.7 FT. GRAYELS AND CORRESS MAYES
/SS 3 3 50/3 50/3	272.88 47.0		HIGHLY WEATHERED TO DECOMPOSED, FISSILE, MODERATELY HARD.  BOTTOM OF BORTNG AT 47.8	OBSERVATION WELL INSTALLED. SEE OBSERVATION WELL LOG REPORT FOR CONSTRUCTION DETAILS.
SS-SPLIT SPOON ST-SHELBY TUBE; D-DEPOSON P-PITCHER D-DTHER	HOLE NO.			



GEOLOGIC DRILL LOG PROLECT FUSRAP											JOB NO. 14501			EET HO. HOLE NO. OW-18B					
SITE	I MECE - MECT DE LUTTE DOAR											FROM 90							
BEGUI 10/3	N 30/85	- 1	MPLETED 0/30/86	DRILL	ER	EMPIRE	SDILS	D			R AD-2		HOLE SIZE	OVERBURDEN		ROCK	FTJ N/A	TOTAL DEPTH	
CORE RECOVERYOTA/XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX								ELL TOP OF CASING GROUND EL. DEPTH/EL GROUND WATER						TER		DEPTH/EL. TOP OF ROCK			
	SAMPLE HAMMER WEIGHT/FALL CASING LEFT IN HOLE-DUL/LENGTH LOGGED BY: 140 LBS/30 INCHES OBSERVATION WELL JOHN SOLLD																		
SAMPLE TYPE AND DIAMETER	SAMPLER ADYANCE LENGTH CORE RUN	CORE RECOVERY	SAUPLE BLOWS  "F" PERCENT COME RECOVERT	2 T T T T T T T T T T T T T T T T T T T	TESTS TESTS		ELEVATION	Ser F		SAMPLE	DESCRIPTION AND CLASSIFICATION						MOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILING, ETC.		
~ S ~ S T N. HOLLOW STEN FLIGHT ALIGER.	24 15	9 18	33 30	12	2mp 6:	18 20 I6	306.64 304.84 303.64 303.04	13.0			I3.0-14.8 00R4/2! CONSOL WITH IN DESE, SIZE, I6.0-16.6 COARSE	FT SRL, WDATED VH FEW (A. D) FT SALT (UDR3/4), WET, SALT, CRAINED CRAINED	T (ML): GRA: ET, MODERA FERY FINE S 5/2) GRAVEL  ND (SM): DA VERY FINE Y WITH ABC RAVELS UP  AY (CH): BRC FT, HIGHLY TRACE OF	TELY AND MAKES S UP TO U  RK REDDISH -GRAINED, OUT 20% TO 1/2 IN. II  DWNISH GRAY PLASTIC, MEDIUM TO	UP 2		FT WITH HOLLOW AUGER.  LUTTINGS VERY MO FT.  SLIGHT C AUGER A SPLIT SF FROM B. FT.  OBSERV. UNSTALL FT, SEE OBSERV. CONSTRI	O TO 16.6 7 IN DIA STEM  O/30/86 6 BECOME 1ST AT 8.0  CHATTER OF T 12.5 FT.  POON TAKEN 0 TO 16.5  ATION WELL ATION WELL	
SS-SPLIT SPOON, ST=SHELBY TUBE; D=DENNISON; P=PITCHER; O=OTHER  STE  NFSS - WEST OF LUTTS ROAD										HOLE NO.	OW-188								

## APPENDIX 5-G MONITORING WELL CONSTRUCTION LOGS



