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Coal Combustion Residue Impoundment

Round 9 - Dam Assessment Report

Oklaunion Power Station

Wastewater Evaporation Pond 6 – WMU 001

American Electric Power

Vernon, Texas

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727

April 2011

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response the U.S. EPA is assessing the stability and functionality of coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the Oklaunion Power Station Wastewater Evaporation Ponds is based on a review of available documents and on the site assessment conducted by Dewberry personnel on Wednesday, February 23, 2011. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2, there are five (5) recommendations based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the Oklaunion Power Station Wastewater Evaporation Ponds are rated **POOR** for continued safe and reliable operation. These ratings are based only on the lack of critical studies and investigations available to the assessors to determine the inundation potential of the dams and potential for dam safety deficiencies or the future closure plans for the non-incised ponds. If the non-incised pond (Pond 6) is to remain open, the following recent and current information, studies and analysis are needed: breach analysis, and hydraulic and hydrological studies. If the non-incised pond (Pond 6) is in the process of being closed, a report indicating the closure plan and schedule needs to be submitted. Upon receipt of data showing adequate hydraulic and structural soundness or a proper closure plan the rating can be changed to satisfactory.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

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In early 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also after the February 23, 2011 field visit, additional information was received on March 22, 2011, by Dewberry & Davis LLC about the Oklaunion Power Station Wastewater Evaporation Ponds that was reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, February 23, 2011, and review of technical documentation provided by American Electric Power.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments appeared to be structurally sound based on Dewberry engineers' observations during the site visit. However, No geotechnical analyses were provided to Dewberry. Therefore, no determination can be made regarding Structural Soundness of the Management Unit.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

No hydrologic or hydraulic analyses were provided to Dewberry. Therefore, no determination can be made regarding Hydrologic/Hydraulic Safety of the Management Unit.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation was inadequate with the exception of original Plans and Specifications of the of the Management Unit. Engineering documentation provided and subsequently reviewed is included in Appendix A.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management unit provided by the Owner was a fairly accurate representation of what Dewberry observed in the field. Pond 6 is the only non-incised CCR pond that has been in service in the recent past. All other ponds on site either are incised or do not receive CCR. Also Pond 6 is in the process of being filled and eventually will be closed.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management unit required to conduct a thorough field observation. The visible parts of the embankment dikes observed had no signs of overstress,

significant settlement, shear failure, or other signs of instability. Embankments appeared structurally sound. There were no apparent indications of unsafe conditions or conditions needing remedial action. However, the only non incised pond (Pond 6) that received CCR appeared to be in the process of being filled and closed.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the fly ash management unit. There was no evidence of significant embankment repairs or prior releases observed during the field inspection. However, there is no Maintenance procedure documented.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. The management unit dikes are not instrumented. Based on a history of a current and regular inspection program and the fact that the only non-incised CCR pond (Pond 6) is in the process of being closed, installation of a dike monitoring system is not needed at this time. However, if Pond 6 is kept in operation a Surveillance and Monitoring Program should be documented.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is satisfactory with the exception of a Breach Analysis and Inundation Map or a closure plan and schedule for the non-incised CCR pond (Pond 6). Therefore, the Management Unit is rated POOR for continued safe and reliable operation until the receipt of the deficient documentation.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

We recommend AEP conduct a geotechnical analysis of the impoundment structure or provide a closure plan and schedule for Pond 6.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

We recommend AEP conduct a Hydraulic and Hydrologic study that includes a Breach Analysis and Inundation Map if Pond 6 is not closed in the near future

1.2.3 Recommendations Regarding the Supporting Technical Documentation

The following recommendation is warranted: if Pond 6 is to be closed the operator should provide a closure plan and schedule.

1.2.4 Recommendations Regarding the Maintenance and Methods of Operation

It is recommended that AEP develop and document a Maintenance and Methods of Operation Procedure, including checklists, or, as stated in Section 1.2.3, the plant should provide a closure plan and schedule for Pond 6.

1.2.5 Recommendations Regarding Continued Safe and Reliable Operation

The recommendations cited above, upon implementation, will ensure continued safe and reliable operation.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

David Scott, Oklaunion Power Station
William R. Smith, American Electric Power Service Company
Steve Lewis, American Electric Power
Kyle Shepard, P.E., Dewberry
Andrew Cueto, P.E. PMP, Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on February 23, 2011.

Andrew Cueto, P.E., PMP

Kyle Shepard, P.E.

2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Oklaunion Power Station is located at 12567 FM Rd 3430, Vernon, TX 76384, approximately three miles south-southeast of the intersection of Farm to Market Road 433 and Farm to Market Road 3430 in Wilbarger County, Texas

The plant is operated by American Electric Power Service Corporation and is a coal fired facility which features 17 total wastewater evaporation ponds with a total area of 335.9 acres: six (6) of the wastewater ponds contain some byproducts of the coal combustion process while the 11other ponds contain cooling tower blowdown. The six ponds containing CCR are primarily located in the south central portion of the plant site.

Of the six CCR ponds five are incised; the sixth has a side hill embankment (Pond 6) with a height of 20 feet and a pool area of 58 acres. In past operations, earthen fill dikes retain the waste until it is sufficiently dry to be hauled away and landfilled. The Wastewater Evaporation Pond 6 is located at the south-central edge of the main evaporation pond complex of the generating station. An aerial photograph of the impoundment is provided in Appendix A – Doc. 01.

The Oklaunion Power Station Wastewater Evaporation Pond 6 was reported to be in the process of being filled with non-CCR material and is in the process of being closed. The impoundment was reported to not have received CCR for over three (3) years). The construction documents were issued on March 1, 1983 and construction was complete in 1987 as noted in Document 2 and 3 of Appendix A.

The table below provides the dimensions of the embankment:

Table 2.1: Summary of Dam Dimensions and Size

	Northeastern Station Bottom Ash Basin
Dam Height (ft)	20 feet
Crest Width (ft)	20 feet
Length (ft)	3968 feet
Side Slopes (upstream) H:V	N/A
Side Slopes (downstream) H:V	3 : 1

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

The Fly Ash disposal process is a dry train procedure. AEP representatives preferred not to tour and inspect the Fly Ash disposal train directly. However, they did describe the process as follows:

1. Fly Ash is electrostatically precipitated and conveyed by gravity to a hopper,
2. The ash is then pneumatically conveyed into a holding silo,
3. The ash is then loaded via gravity feed into trucks (3rd party) to be transported to a landfill,
4. The ash is stockpiled to be either sold to a 3rd party for beneficial reuse or to be permanently disposed of in the landfill.

2.2.2 Bottom Ash

The Bottom Ash disposal process is a wet train procedure. Bottom ash is removed from the boiler and sluiced to the wastewater ponds.

2.2.3 Boiler Slag

Boiler slag is same as Bottom Ash. See entry above.

2.2.4 Flue Gas Desulfurization Sludge

Flue Gas Desulfurization (FGD) sludge process was inspected on Wednesday, February 23, 2011. FGD sludge is disposed of in a pond located to the Northeast of Pond 6. This pond is incised and was not investigated further.

2.3 SIZE AND HAZARD CLASSIFICATION

The classification for size, based on the height of the dam is “Small” and based on the storage capacity criterion is “Small” in accordance with the USACE Recommended Guidelines for Safety Inspection of dams ER 1110-2-106 criteria summarized in Table 2.2a.

Table 2.2a: USACE ER 1110-2-106 Size Classification		
	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

The State of Texas maintains a Dam Safety program through the Texas Commission on Environmental Quality (TCEQ). The only non incised pond (Pond 6) falls in the small category and is not a part of the Texas Dam inventory. Also, the American Electric Power Services Corporation Oklaunion Power Station Wastewater Evaporation Pond 6 dam is not in the National Inventory of Dams and therefore does not have an established hazard classification. Dewberry conducted a qualitative hazard classification based on the 2004 Federal Guidelines for Dam Safety classification system (shown in Table 2.2b).

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to Owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Loss of human life is not probable in the event of a catastrophic failure of the embankment and a failure of the embankment is expected to have a low economic and environmental impact. Therefore, Dewberry evaluated the Wastewater Evaporation Pond 6 as "**low hazard potential**".

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The data reviewed by Dewberry did not include the volume of residuals stored in Wastewater Evaporation Pond 6 at the time of inspection.

Table 2.3: Maximum Capacity of Unit	
Wastewater Evaporation Pond 6	
Surface Area (acre)[1]	58.0
Current Storage Capacity (cubic yards)[1]	Unknown *
Current Storage Capacity (acre-feet)	Unknown *
Total Storage Capacity (cubic yards)[1]	Unknown *
Total Storage Capacity (acre-feet)	Unknown *
Crest Elevation (feet)	Unknown *
Normal Pond Level (feet)	Unknown *

* Data was not provided by Utility

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

The embankment is earthen filled with sandy clay with trace gravel. The approximate minimum designed crest width is 20 feet, however, since Pond 6 is in the process of being closed, the current crest widths exceed 150 feet with a minimum of 80 feet at its narrowest point. Approximate embankment height is 20 feet. The embankment is anchored into original ground at a minimum depth of five (5) feet. In-situ earthen material was used in the construction of the embankment according to the original specifications.

2.5.2 Outlet Structures

Water generated by Wastewater Evaporation Pond 6 is evaporated from the pond leaving the waste ash in place. The Pond does not have an outlet structure.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

The American Electric Power Services Corporation Oklaunion Power Station is located southeast of Vernon Texas and south of Oklaunion Texas. Wastewater Evaporation Pond 6 is located on an unnamed tributary of Boggy Creek, Beaver Creek, Wichita River, and Red River. It cannot be determined if there is any critical infrastructure immediately downstream along the unnamed tributary, as this data was not provided by the Owner. Given the rural location of the plant, no critical infrastructure would be expected in the vicinity of the plant.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

Summary of Reports on the Safety of the Management Unit

Four quarterly inspection reports were provided by AEP:

- 2009 Dam & Dike Inspection Report, Wastewater Pond Complex, Oklaunion Power Plant, June 2009, Prepared by URS Corporation.
- Dam & Dike Inspection Report, Wastewater Pond Complex, Oklaunion Power Plant, Inspection Date: August 4, 2010, Prepared by William R. Smith, P.E.
- Inspection Report, Oklahoma Pond Complex, Inspected By: Pat Mackenzie and Steve Lewis / Oklaunion Power Plant, November 22, 2010.
- Inspection Report, Oklahoma Pond Complex, Inspected By: Pat Mackenzie and Steve Lewis / Oklaunion Power Plant, March 7, 2011.

3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

The State of Texas has a Dam Safety Program that is the responsibility of the Texas Commission on Environmental Quality (TCEQ); however, due to its small size, this dam is not permitted by the TCEQ.

Discharge from the impoundment is regulated by the Texas Commission on Environmental Quality (TCEQ). The TCEQ has issued a National Pollutant Discharge Elimination System Permit for the plant. Permit No. WQ0002574000 was originally issued September 13, 2004 and was re-issued on November 16, 2007.

3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The Oklaunion Power Station Wastewater Evaporation Pond 6 was constructed in 1987. It is a side hill embankment.

4.1.2 Significant Changes/Modifications in Design since Original Construction

- The upstream slope has been filled and compacted with native soil dredged from adjacent process water evaporation ponds. It was reported that this material did not contain CCR.
- Dewberry personnel onsite were informed that Evaporation Pond No. 6 is in the process of being closed.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

Notations have been made in the internal inspection reports over the past two years (2009 and 2010) of the following repairs / rehabilitation:

- Vegetation clearing
- Repair of eroded gullies on embankment slopes
- Removal of small trees from embankment slopes.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The Plant features 17 wastewater evaporation ponds. Eleven of these ponds receive cooling tower blowdown; no CCR is stored in these 11 ponds. Six of the ponds contain some byproducts of the coal combustion process. Five of these ponds are incised, and therefore have no embankments or dams. Only one evaporation pond is not incised - Pond 6. Earthen fill dikes retain the waste until it is sufficiently dry to be hauled away and landfilled or the waste is left in place and the ponds are closed as is the case with Evaporation Pond No. 6.

4.2.2 Significant Changes in Operational Procedures and Original Startup

No documents were provided to indicate any operational procedures have been changed.

4.2.3 Current Operational Procedures

Bottom Ash and boiler slag waste are wet conveyed to the Evaporation Pond Complex. Ash is deposited via sedimentation into the six CCR storage ponds. Ash sediment is currently stored in Pond No. 6, which will eventually be closed, and the ash reclaimed for beneficial use.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry of other notable events that have impacted the impoundment's operation.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Andrew Cueto, P.E. and Kyle Shepard, P.E. performed a site visit on Wednesday, February 23, 2011 in company with the participants.

The site visit began at 10:30 AM. The weather was cloudy and cool. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix C for additional site information. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

5.2 SOUTH EMBANKMENT

5.2.1 Crest

The crest of the South Embankment showed no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Figure 5.2.1-1 shows the conditions of the crest of the South Embankment.

Figure 5.2.1-1. Figure showing the South Embankment crest and outside slope conditions.

5.2.2 Upstream / Inside Slope

The South Embankment's inside slope has been filled up to the crest elevation with native soil, effectively eliminating this slope on the east end of the embankment. Figure 5.2.2-1 shows these areas.

Figure 5.2.2-1. Figure showing the South Embankment lack of inside slope.

5.2.3 Downstream / Outside Slope and Toe

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion. The outside slope of the South Embankment was covered with sparse overgrown vegetation. The outside slope appears to be in good condition. Figure 5.2.3-1 shows the general condition of the outside slope of the South Embankment.

Figure 5.2.3-1 general good condition of the outside slope of the South Embankment.

5.2.4 Abutments and Groin Areas

The outside slope of the abutments and groin were uniformly graded and covered with sparse grass. Erosion or uncontrolled seepage was not observed along either groin. Figure 5.2.4-1 shows the general condition of the Abutments and Groin.

Figure 5.2.4-1. Southern Groin.

5.3 EAST EMBANKMENT

5.3.1 Crest

The crest of the East Embankment showed no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Figure 5.3.1-1 shows the conditions of the crest of the East Embankment.

Figure 5.3.1-1. Figure showing the East Embankment crest and outside slope conditions.

5.3.2 Upstream / Inside Slope

The East Embankment's inside slope is non-existent with the waste in the pond being allowed to remain in place up to near the crest elevation of the embankment. The Pond appears to being allowed to fill up with solid ash waste working its way east to west. This condition can be viewed in Figure 5.3.2-1.

Figure 5.3.2-1. East Embankment, lack of inside slope.

5.3.3 Downstream / Outside Slope and Toe

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion. The outside slope of the East Embankment is the upstream slope of the Emergency Spillway. It is uniformly graded and covered with sparsely overgrown grass. Figure 5.3.3-1 shows the general condition of the East Embankment's crest, outside slope and groin.

Figure 5.3.3-1. Crest, outside slope and groin of East Embankment.

5.3.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion on the groins of the East Embankment. The top right-side of Figure 5.3.3-1 shows the general condition of the East Embankment's groin.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

The Overflow Structure is detailed in the original design drawings (See Appendix A – Doc 9). The structure is not on Wastewater Evaporation Pond No. 6, but is on Pond No. 7, immediately to the east of the East Embankment of Pond No. 6. Pond 6 is an evaporation pond with no outlet structures or spillways.

5.4.2 Outlet Conduit

No Outlet Conduit is present.

5.4.3 Emergency Spillway

See Overflow Structure, Paragraph 5.4.1 above.

5.4.4 Low Level Outlet

No Low Level Outlet is present.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No documentation has been provided about the flood of record.

6.1.2 Inflow Design Flood

No documentation has been provided concerning the design flood.

6.1.3 Spillway Rating

No spillway hydraulic data was provided for review.

6.1.4 Downstream Flood Analysis

No downstream flood analysis data was provided for review.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

No documentation has been provided. Therefore, the supporting documentation reviewed by Dewberry is inadequate.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

No documentation has been provided. Therefore, no assessment can be made.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Original stability and load case design analyses were not provided by the utility.

7.1.2 Design Parameters and Dam Materials

Documentation provided to Dewberry for review was the Specifications for Phase I Construction (Site Preparation) Oklaunion Power Station (Unit No. 1) (See Appendix A – Doc. 4).

7.1.3 Uplift and/or Phreatic Surface Assumptions

No documentation of uplift calculations was provided to Dewberry for review. Based on the Geotechnical Borings included in the Specifications for Phase I Construction (Site Preparation) Oklaunion Power Station (Unit No. 1), (See Appendix A – Doc. 2), the initial phreatic surface was assumed to be at the elevation measured in the borings.

7.1.4 Factors of Safety and Base Stresses

No documentation was provided to Dewberry for review regarding safety factors or base stresses.

7.1.5 Liquefaction Potential

The documentation reviewed by Dewberry did not include an evaluation of liquefaction potential. Foundation soil conditions do not appear to be susceptible to liquefaction.

7.1.6 Critical Geological Conditions

There was no documentation provided to Dewberry that included an evaluation of Critical Geological Conditions.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is inadequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall, no assessment of the structural stability of the dam can be made because no documentation was provided. Based on observations made during the February 23, 2010 field visit by Dewberry and the fact that the operator indicated that Pond 6 was being closed, a structural stability report and analysis could be waived if a closure plan and schedule was provided.

The following observations were made during the onsite inspection:

- The crest appeared free of depressions and no significant vertical or horizontal alignment variations were observed,
- There were no major scarps, sloughs, or bulging along the embankments,
- Boils, sinks, or uncontrolled seepage were not observed along the slopes, groins, or toes of the embankments.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

The facility is operated as a settling basin and storage of coal combustion ash residual deposits and bottom ash transport water.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

While no maintenance plan was supplied to Dewberry for review, based upon observations made during the February 23, 2010 site visit and discussions with Plant representatives, dam maintenance appears to be adequate.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

No documented operational procedures were supplied to Dewberry for review. However, a verbal description of maintenance procedures and methods was presented at time of inspection.

8.3.2 Adequacy of Maintenance

No record of Maintenance was supplied to Dewberry for review. It was observed that the existing operating procedures adequately maintain the Management Unit. It was recommended that these procedures be documented and put into checklists.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Quarterly Inspections

The plant surveillance procedures state, "Quarterly inspections shall be completed by Plant personnel and within 24 hours of unusual events, such as seismic activities or a "significant storm event". A significant storm event is defined as three inches or more of rainfall in 24 hours. Inspections should be documented in accordance to AEP Circular Letter CI-M-CL-010C."

9.2 INSTRUMENTATION MONITORING

No documentation was provided to Dewberry, nor was monitoring instrumentation seen during the site visit, to suggest that instrumentation monitoring was in place at Oklaunion Power Station.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

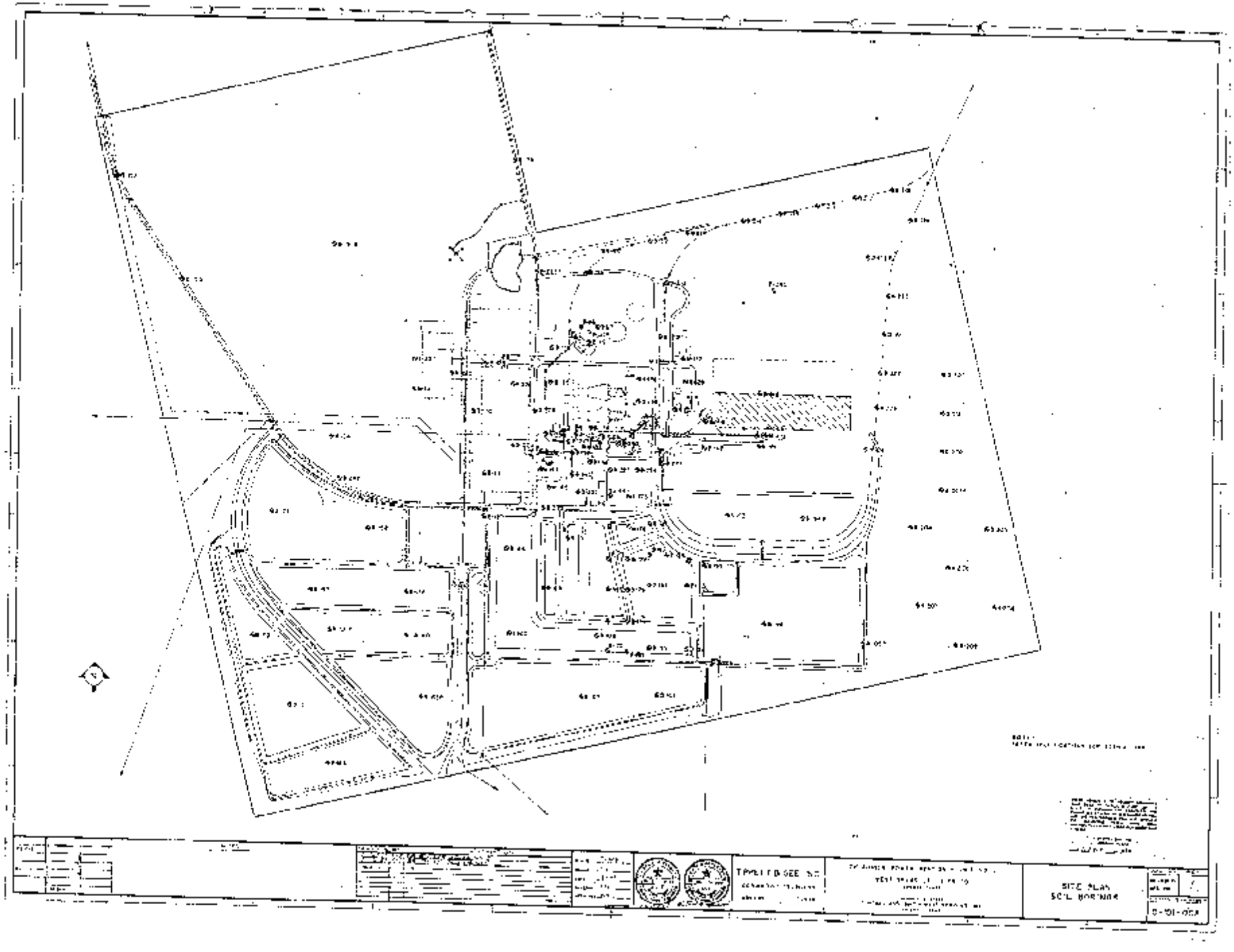
9.3.1 Adequacy of Inspection Program

Based on the data provided in the quarterly inspection reports reviewed by Dewberry, plus observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

An instrumentation monitoring program is not needed for the one non-incised pond, given the intention to close Pond 6 in the near future,


arm to Market Rd 3430
Farm to Market Rd 3430
Farm to Market Rd 3430



LOG OF BORING NO. B-108

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.2

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Very stiff reddish-brown silty clay, w/occasional coarse gravel and organic material								
5			-w/numerous weathered calcareous nodules at 3.0' (CL)								
			Soft reddish-brown sandstone, fine grained, thin bedding								
			-w/numerous soft bluish-gray sandstone laminations and inclusions at 6.0'		100						
10			Soft reddish-brown siltstone, thin flat bedding, w/numerous soft bluish-gray siltstone inclusions		100	99	35	16	10	$k_v = 3.06 \times 10^{-8}$ cm/sec	131
			-soft bluish-gray siltstone seams, gently dipped bedding at 11.0'								
15			-clayey at 13.0'								
			-high angle fractures		100						
			-soft reddish-brown claystone seam, thick bedding from 18.0-20.7'		100	92	31	16	10	$k_v = 3.30 \times 10^{-9}$ cm/sec	133
20			-soft bluish-gray sandy claystone seam from 20.7-21.0', coarse gravel		100						
					100						
25						86	29	14	8	$k_v = 3.12 \times 10^{-10}$ cm/sec	132
			-soft bluish-gray sandy claystone seam, w/fine gravel from 27.5-28.5'		100						
30			Very stiff reddish-brown silty clay (CL)								
			Soft reddish-brown claystone, thick bedding, w/occasional soft bluish-gray silty claystone inclusions								
35											

(Continued)

NFS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 24

LOG OF BORING NO. B-108 (Contd.)
OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			–w/numerous high angle fractures at 35.0'	79	80						
			–w/numerous high angle fractures								
45			–soft clayey shale seam from 43.0–44.0' –soft bluish–gray claystone seam from 44.8–45.1' –w/numerous high angle fractures	70	100						
50			–extremely slickensided								
55			–soft bluish–gray claystone seam, w/fine gravel from 57.0–57.6'	93	100						
60			–w/numerous slickensides, indurated								
65			–w/numerous high angle fractures	97	100						
70											

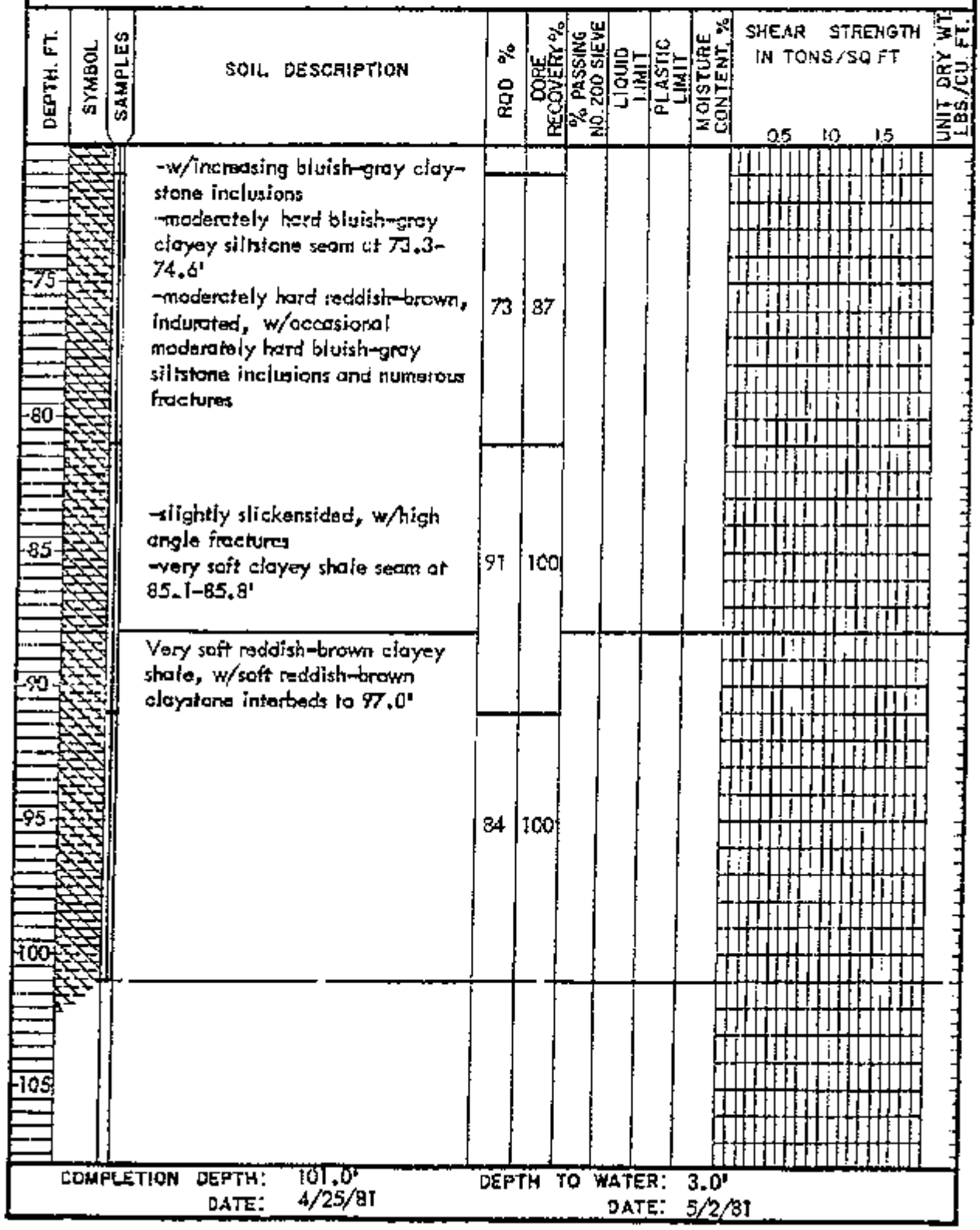
(Continued)

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 25

LOG OF BORING NO. B-108 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 101.0'
DATE: 4/25/81

DEPTH TO WATER: 3.0'
DATE: 5/2/81

NATIONAL SOIL SERVICES, INC.

PLATE 26

LOG OF BORING NO. B-167

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1191.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard tannish-brown silt, w/numerous fine roots							
			Hard dark brown silty clay, w/small weathered calcareous nodules							
5			-reddish-brown at 4.0'							
			-w/numerous calcareous and magnesium nodules at 5.0' (CL)							
			Soft reddish-brown silty claystone, thin gently dipped bedding	100						
10			-decreasing silt							
			-crossbedded, w/bluish-gray silty claystone seam at 9.0-9.3'	100						
15			-thick bedded	100						
			-thin flat bedding							
20				100						
25				100						
30										
35										

COMPLETION DEPTH: 25.0'
DATE: 5/21/81

DEPTH TO WATER: Caved at 2.2'
DATE: 6/23/81

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE B5

LOG OF BORING NO. B-168

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1194.8

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard light tan to brown clayey silt, w/numerous fine roots (ML)		87	43	14	11	$k=1 \times 10^{-7}$ cm/sec	115
5			Hard brown silty clay -w/numerous calcareous nodules at 3.0' -light brown, w/calcareous and magnesium nodules at 5.0' -reddish-brown, w/numerous pockets of weathered calcareous material and fine sand at 7.0' -w/occasional magnesium nodules and bluish-gray silty clay inclusions at 9.0' -w/calcareous filled fissures and inclusions at 11.0' (CL)	100						
15			Soft reddish-brown silty claystone, thin flat bedding, w/occasional bluish-gray silty claystone inclusions							
20			-crossbedded, w/occasional pyrite	100						
25			-thin flat bedding, w/occasional coarse sand pockets	60						
30										
35										

COMPLETION DEPTH: 25.0' DEPTH TO WATER: 5.0'
DATE: 5/15/81 DATE: 5/15/81

AFS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 06

LOG OF BORING NO. B-170

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

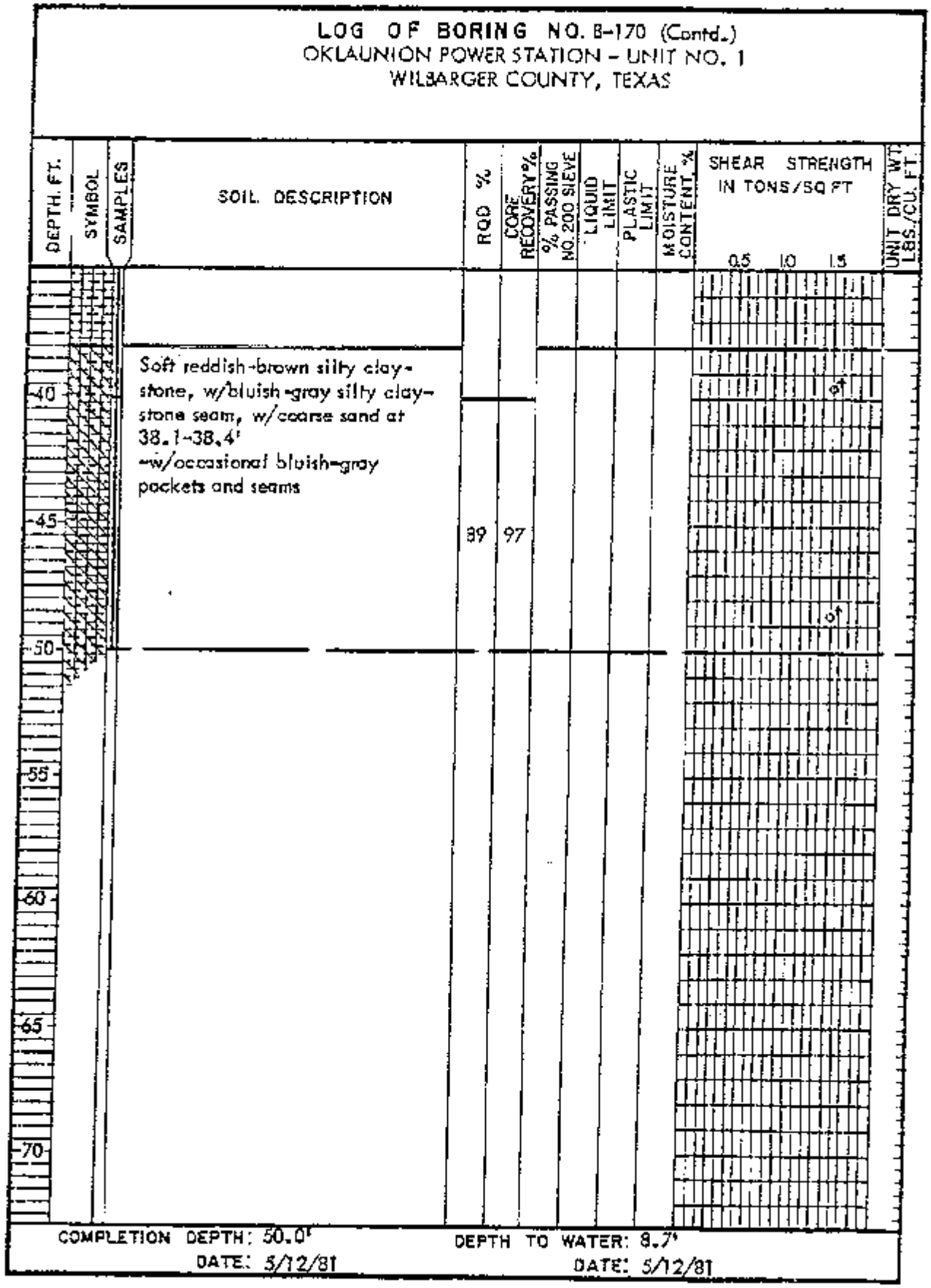
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1213.0								
			Hard brown silty clay, w/fine roots								
			-reddish-brown, w/occasional coarse sand and fine gravel, w/weathered calcareous nodules (CL)								
5			Soft reddish-brown silty clay-stone, w/numerous large bluish-gray silty claystone inclusions, w/some fine sand		100						
					100						
10			Hard reddish-brown silty clay, somewhat friable (CL)		100						
			Soft reddish-brown silty clay-stone, crossbedded, w/occasional bluish-gray silty claystone inclusions								
15			-crossbedded, w/occasional bluish-gray silty claystone laminations and very soft clay-stone and increasing silt at 14.0'		100						
20			-some fine sand		100						
			-w/numerous yellow inclusions, thick bedded, decreasing silt								
25					100						
30			-w/bluish-gray silty claystone seam at 30.1-30.4' w/coarse sand and fine gravel to 33.0'		100						
			Soft reddish-brown silty shale, w/occasional bluish-gray silty shale inclusions	85	100						
35											

(Continued)

AFS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 89

LOG OF BORING NO. B-170 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 90

LOG OF BORING NO. B-171
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1210.3

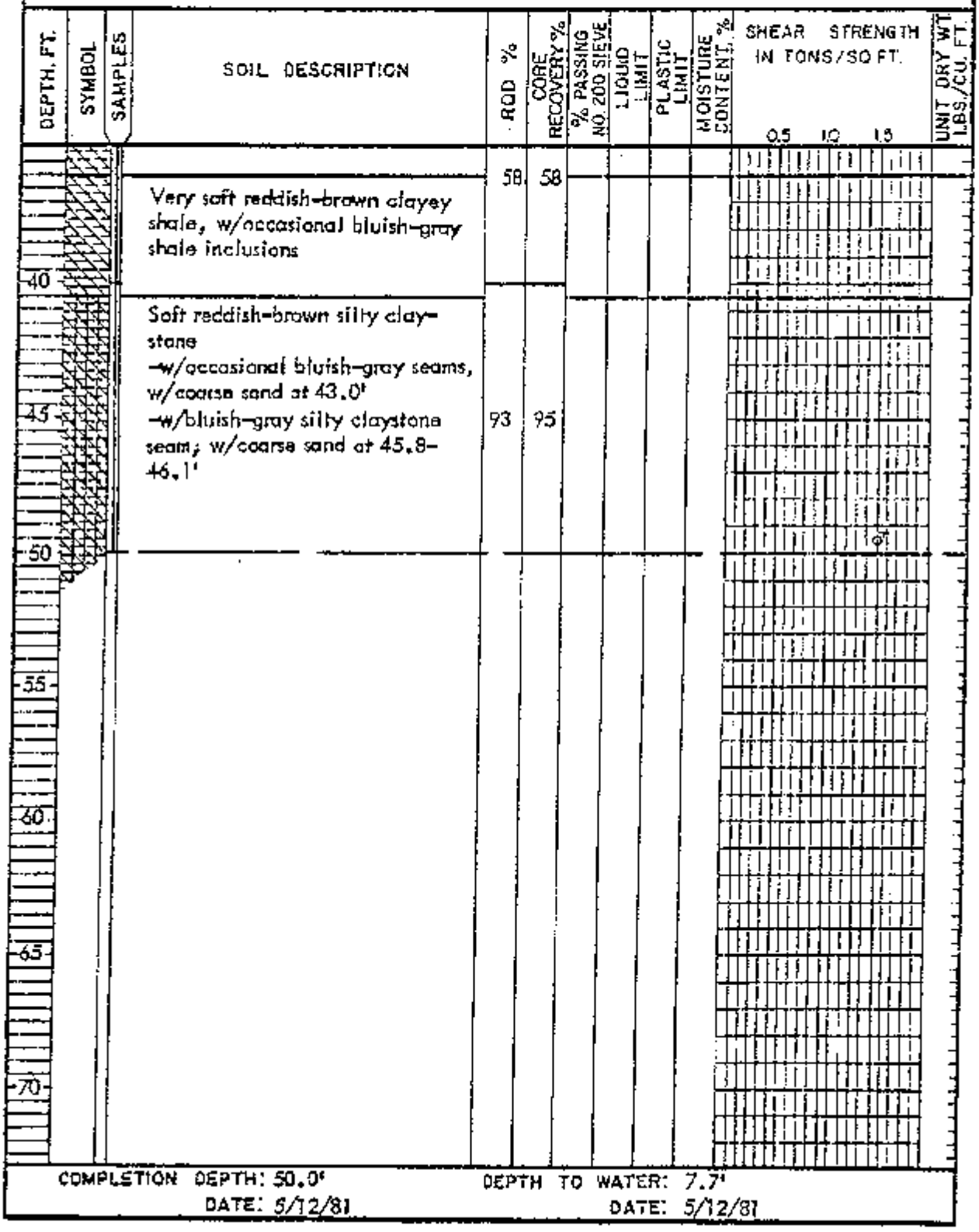
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard dark brown silty clay, w/weathered calcareous nodules and fine roots							qt	
			-increasing calcareous nodules at 3.0'							qt	
5			-brown and tan, w/pockets of fine sand at 5.0'		92					qt	
			-reddish-brown, w/occasional bluish-gray silty clay seams, crossbedding at 7.0' (CL)								
10			Soft reddish-brown silty clay-stone, w/soft to moderately hard clayey sandstone interbeds from 7.0-12.0'		100					qt	
			-w/bluish-gray silty claystone seams, w/coarse sand at 8.9-9.1'		100					qt	
15			-crossbedded at 11.0'								
			-w/some coarse sand and bluish-gray silty claystone inclusions at 15.0'								
20			-decreasing silt		100					qt	
			-thin flat bedding								
25			-w/bluish-gray silty claystone inclusions, crossbedded		100					qt	
30			-w/bluish-gray silty claystone seam at 30.0-31.0'		100					qt	
35										qt	

(Continued)

NFS / NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 91

LOG OF BORING NO. B-171 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/12/81

DEPTH TO WATER: 7.7'
DATE: 5/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 92

LOG OF BORING NO. B-172
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

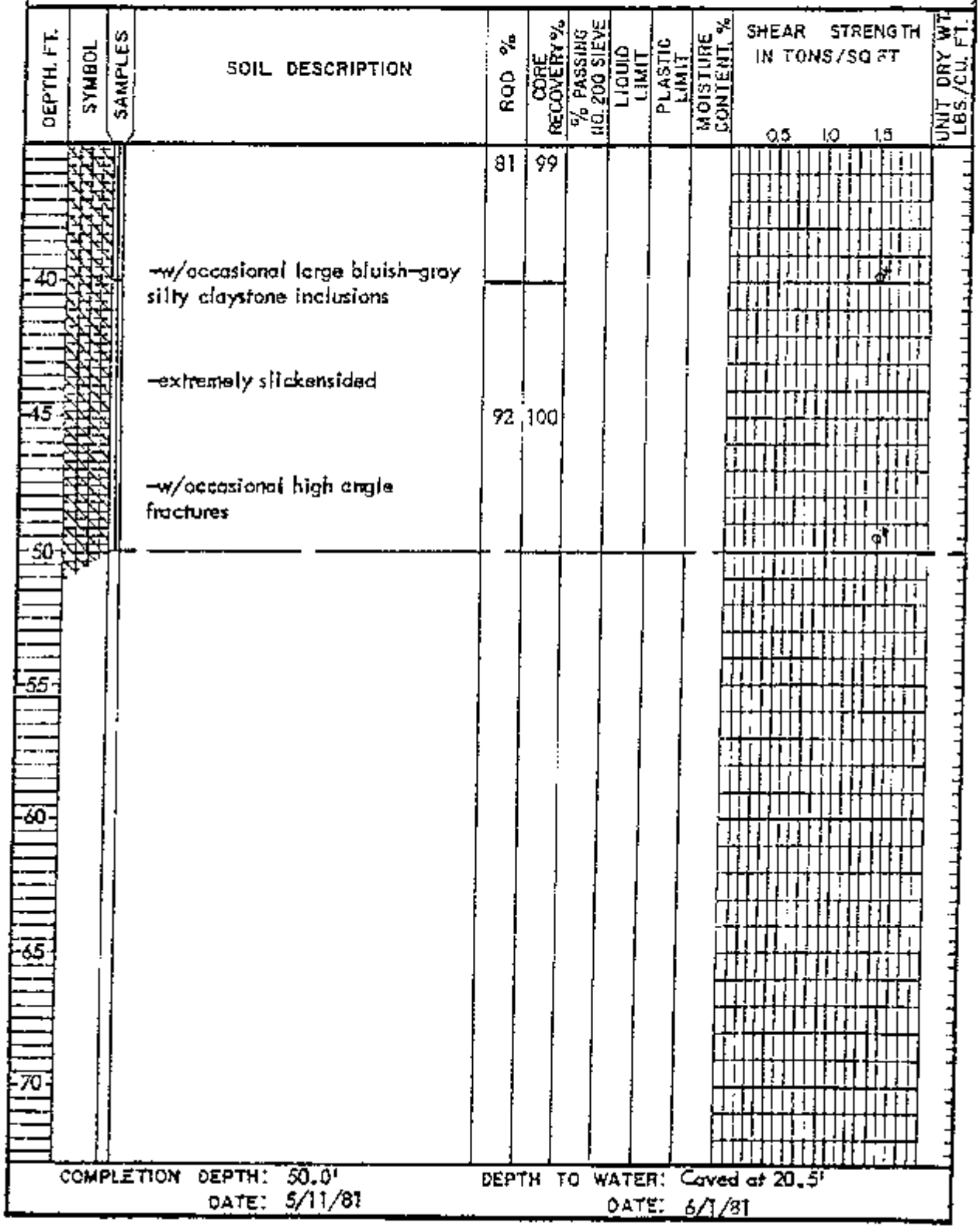
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION ELEVATION: 1207.4	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT 0.5 1.0 1.5	UNIT DRY WT LBS./CU. FT.
5			Very stiff reddish-brown silty clay, w/occasional fine gravel and organics -increasing silt and gravel at 3.0' -hard, increasing coarse sand and fine gravel, very friable -gravel seam at 5.0-6.0' (CL)		100						
10			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions -increasing silt and crossbedding		100						
15			-medium gently dipped bedding, w/moderately hard siltstone seam at 14.0-14.2' -w/occasional bluish-gray silty claystone seams and inclusions at 15.0'		100						
20			-thick bedding		100						
25			-w/numerous small bluish-gray silty claystone inclusions		100						
30			-decreasing silt -severe water loss at 30.0' -heavily fractured at 30.0-32.0'		100						
35											

(Continued)

WFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 93.

LOG OF BORING NO. B-172 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/11/81

DEPTH TO WATER: Caved at 20.5'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 94

LOG OF BORING NO. B-173

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	ROD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1203.9								
			Hard dark brown silty clay, w/calcareous and magnesium nodules and numerous fine roots (CL)								
5			Hard reddish-brown silty clay, increasing weathered calcareous nodules (CL)		100						
			Soft reddish-brown clayey siltstone, w/small bluish-gray clayey siltstone inclusions		98						
10			-slightly slickensided at 8.0'		100						
			-w/increasing claystone laminations, crossbedded at 11.0'								
			Soft reddish-brown silty claystone, w/bluish-gray silty claystone seam at 14.2-14.6'		95						
15											
20			-w/occasional bluish-gray silty claystone inclusions and seams		96						
25					100						
30			-crossbedded, w/numerous large bluish-gray silty claystone inclusions		100						
			-w/bluish-gray silty claystone seam at 33.0-33.5'								
35											

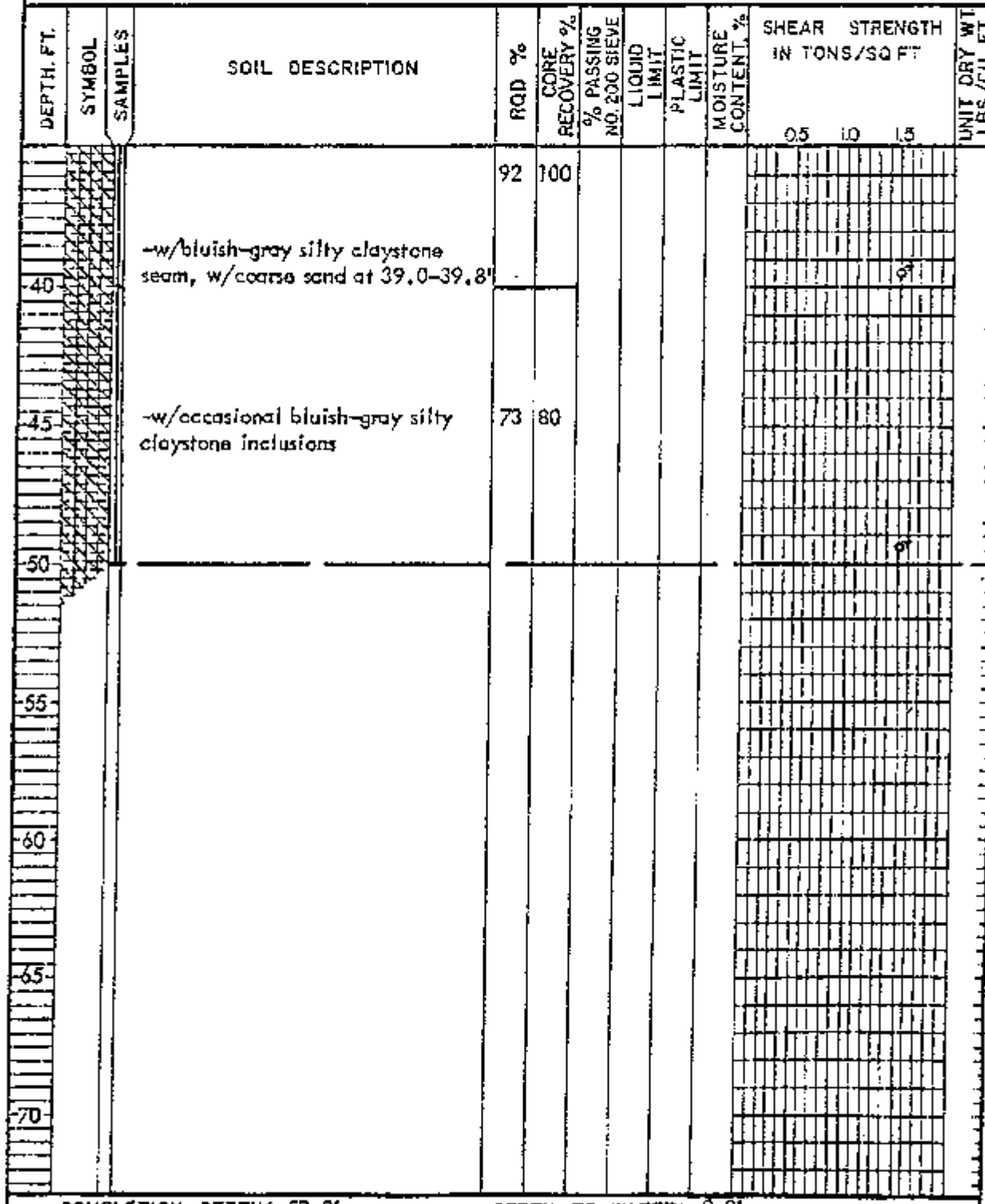
(Continued)

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 95

LOG OF BORING NO. B-173 (Contd.)

OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/14/81

DEPTH TO WATER: 9.9'
DATE: 5/14/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

PLATE 96

LOG OF BORING NO. B-174

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.6

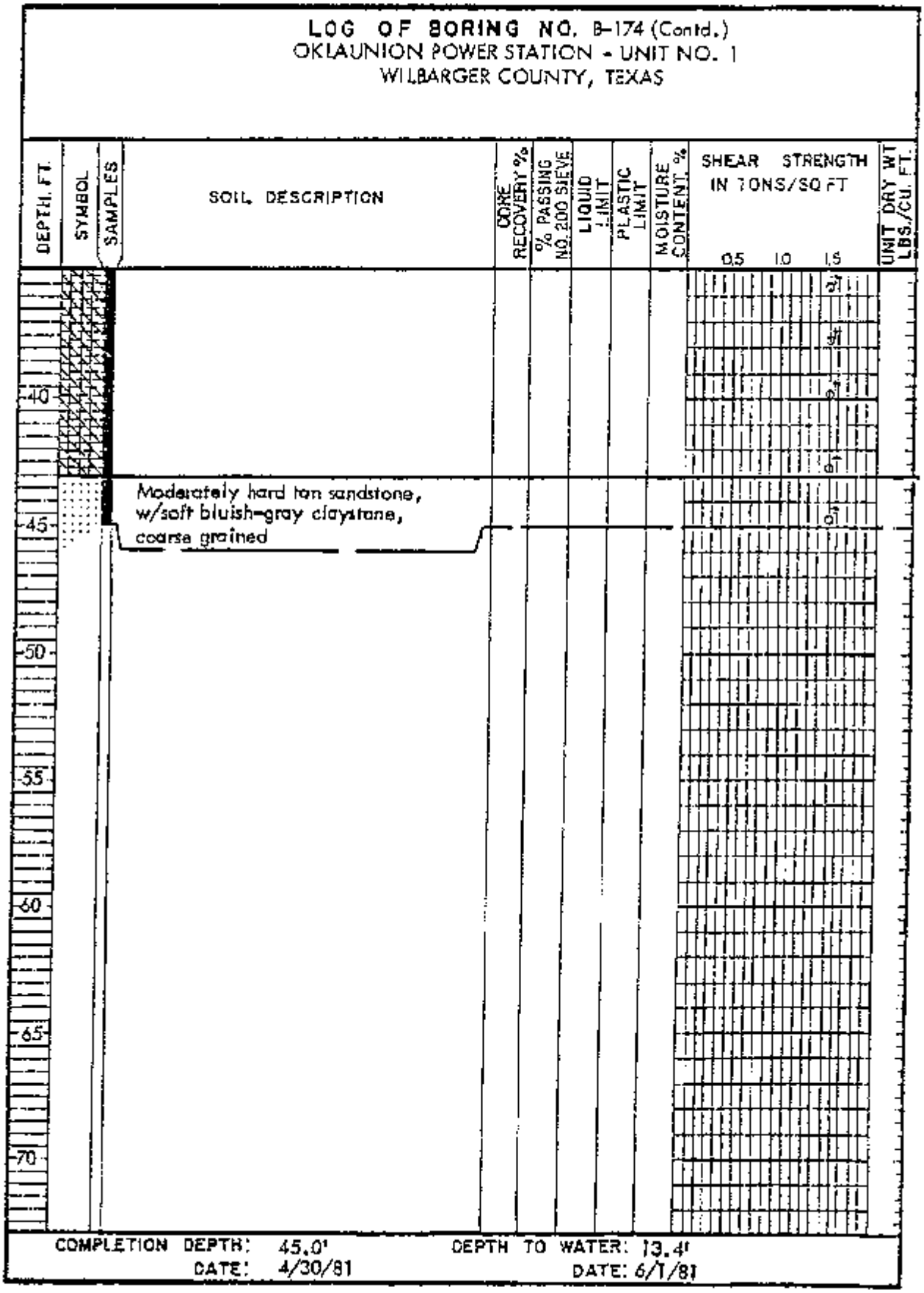
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard reddish-brown silty clay, w/numerous fine roots and calcareous nodules								
			-w/increasing weathered calcareous nodules at 3.0' (CL)								
5			Hard reddish-brown silty clay -w/large weathered calcareous nodules (CL)	80							
			Soft reddish-brown silty claystone, w/black coarse gravel seam at 8.0' w/numerous calcareous nodules, gravel pockets and occasional iron stained inclusions -decreasing silt	80	50/5"	89	34	14	11	c_v=5.0x10^{-1} cm/sec	123
10											
15											
			-w/occasional soft bluish-gray claystone inclusions	100							
20											
25				100	50/5"						
30											
				100							
35											

(Continued)

MW/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 97

LOG OF BORING NO. B-174 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 45.0'
DATE: 4/30/81

DEPTH TO WATER: 13.4'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 98

LOG OF BORING NO. B-176

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1210.9								
			Very stiff reddish-brown silty clay, w/some fine sand and calcareous nodules								
			-hard, w/fine gravel and calcareous nodules and magnesium nodules at 3.0' (CL)			96	46	17	13		
5			Soft reddish-brown silty claystone, thick bedded								
			-w/numerous seams of bluish-gray silty claystone inclusions		100	97	32	16	10		
10			-decreasing silt		100						
15			-crossbedded, slightly fractured and w/some fine sand								
					100						
20						99	30	16	9		132
25			-w/clay laminations, fissured		100						
30			-w/bluish-gray silty claystone seam at 29.5'		100						
35											

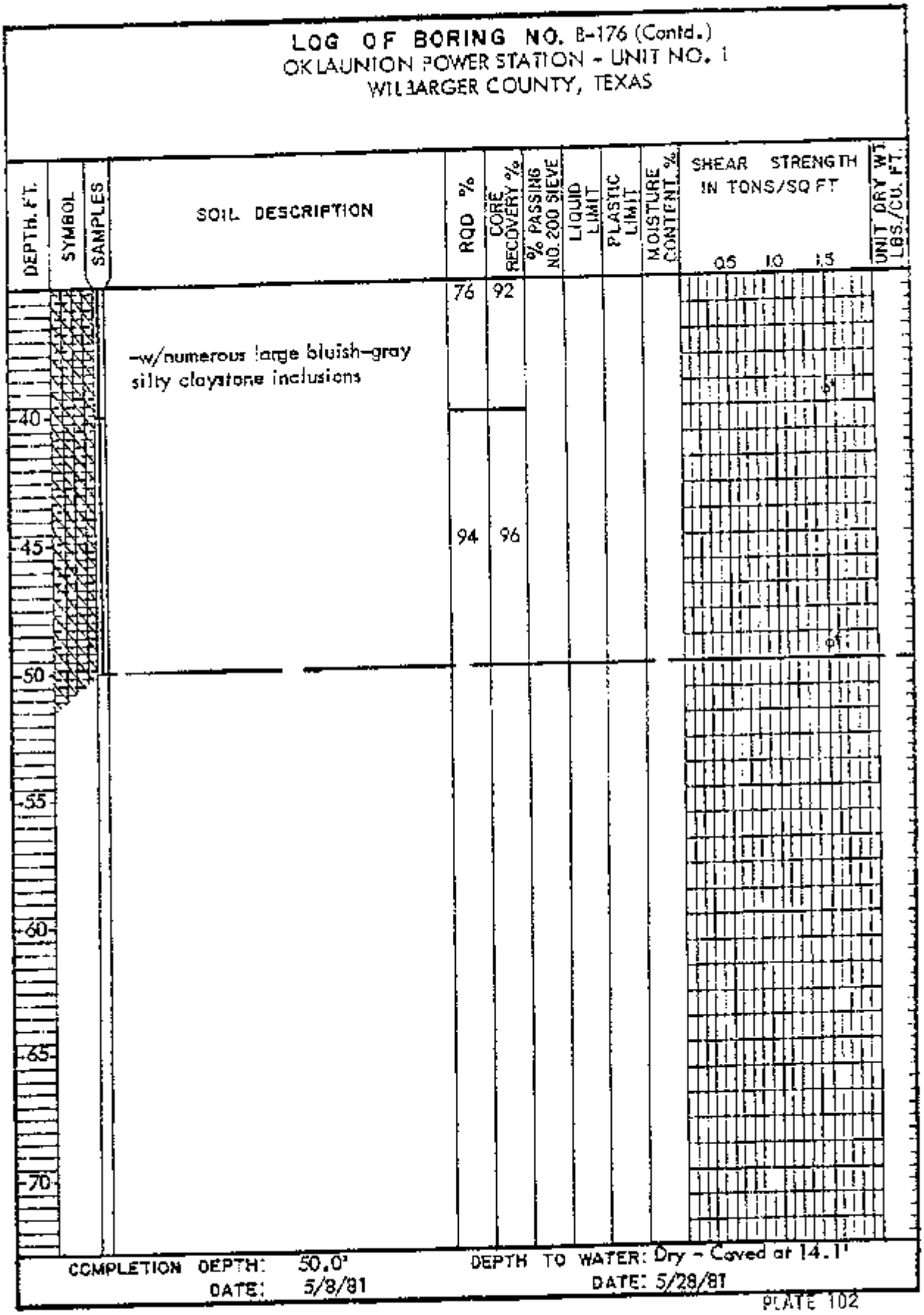
(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 101

LOG OF BORING NO. B-176 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/8/81

DEPTH TO WATER: Dry - Caved at 14.1'
DATE: 5/28/81

PLATE 102

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

LOG OF BORING NO. B-177 P

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1207.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY, %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Very stiff dark brown silty clay, w/numerous organic material (CL)								
5			Hard reddish-brown silty clay, decreasing silt, w/occasional fine gravel and roots -w/numerous weathered calcareous nodules at 4.0' (CL)	52							
10			Soft reddish-brown silty claystone, w/numerous weathered calcareous nodules -crossbedded, w/occasional soft bluish-gray silty claystone laminations and inclusions at 8.0' -thin gravel seam at 10.0'	100	50/3 seat						
15			Soft reddish-brown claystone, thick bedding, w/occasional soft bluish-gray claystone inclusions	100		100	46	18	13	$k_v = 4.5 \times 10^{-8}$ cm/sec	126
20				100							
25				100		99	34	15	10	$k_v = 2.90 \times 10^{-8}$ cm/sec	134
30				80							
35				100							
				100							
				60							

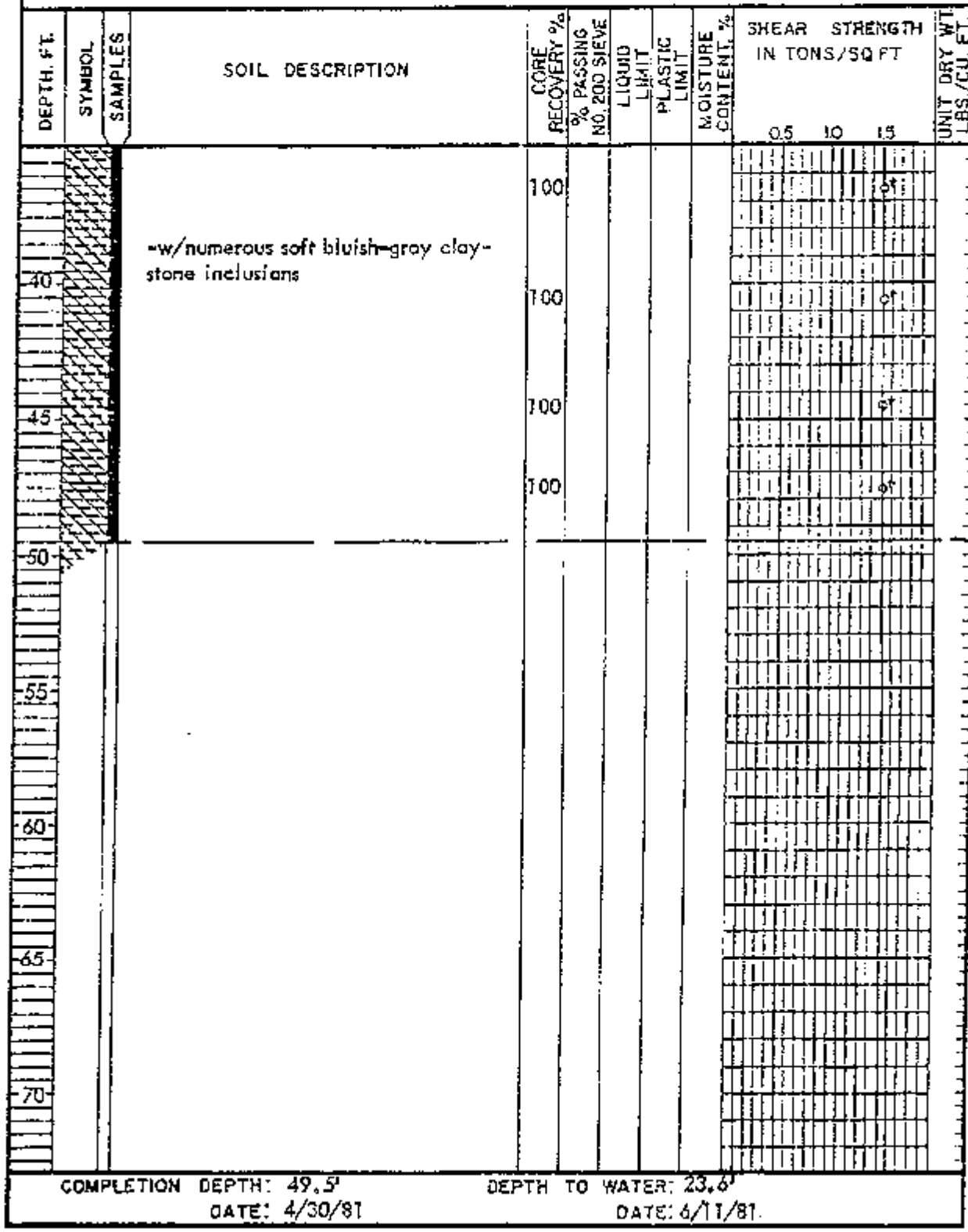
(Continued)

WES/NATIONAL SOIL SERVICES CONSULTING SYSTEMS

PLATE 103

LOG OF BORING NO. B-177(Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 49.5'
DATE: 4/30/81

DEPTH TO WATER: 23.6'
DATE: 6/11/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 104

LOG OF BORING NO. B-178

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1203.6

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Very stiff brown silty clay, w/numerous fine roots and organics (CL)								
5			Hard dark brown silty clay, w/weathered calcareous nodules -reddish-brown, w/soft pockets and occasional fine gravel at 4.0' -w/occasional gravel and bluish-gray silty clay inclusions -w/some fine sand, fissured at 7.0' (CL)		100					
10			Soft reddish-brown silty claystone, thick bedding -increasing silt, crossbedded, w/some fine sand at 12.0' -thick bedded, w/magnesium flakes at 15.0' -w/bluish-gray silty claystone seam at 16.5-16.8' -decreasing silt		100					
15											
20											
25			-increasing silt -w/small bluish-gray silty claystone inclusions		100						
30			-w/occasional large bluish-gray silty claystone inclusions		100						
35			-w/numerous bluish-gray silty claystone inclusions								

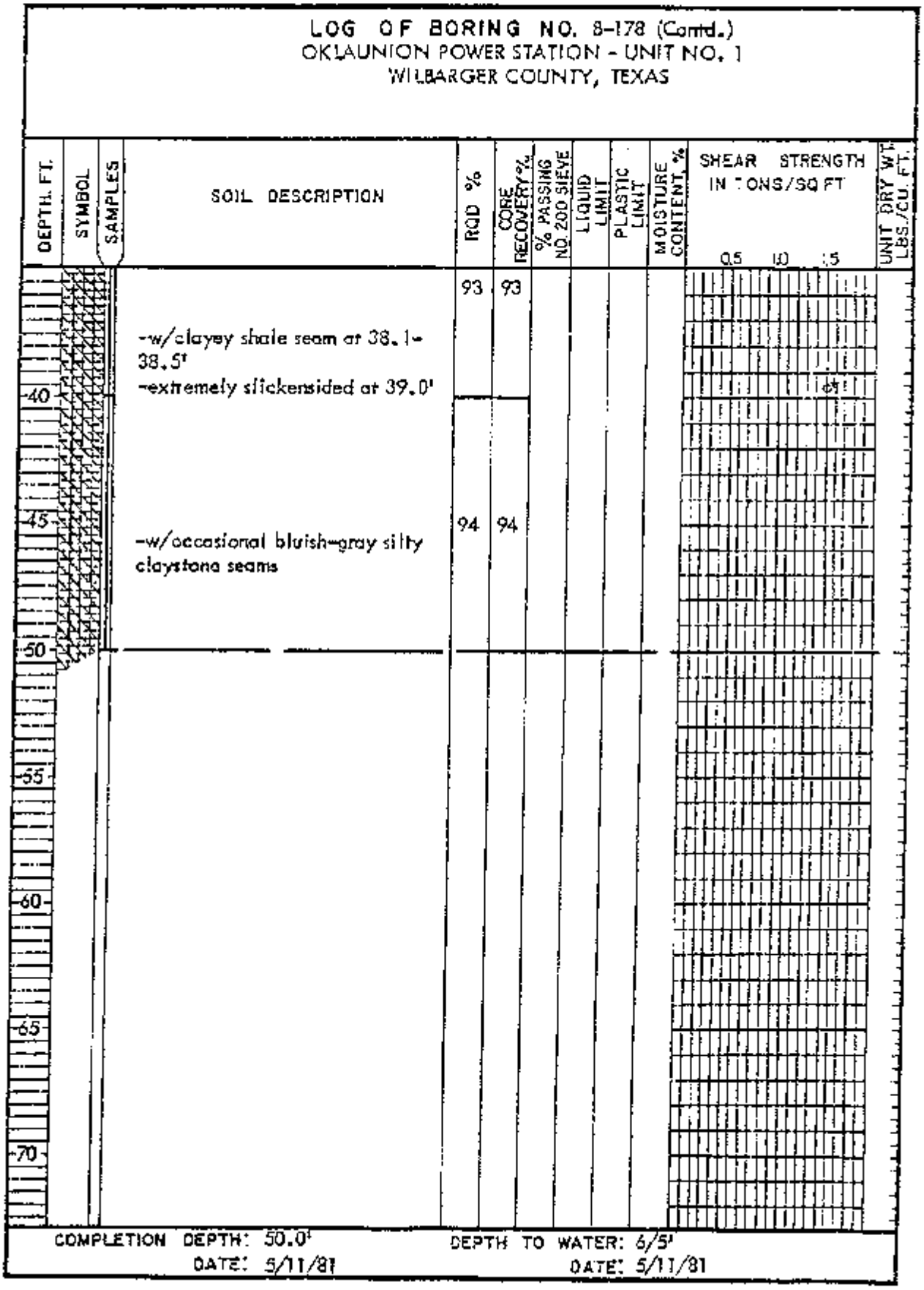
(Continued)

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 105

LOG OF BORING NO. B-178 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/11/81

DEPTH TO WATER: 6/5'
DATE: 5/11/81

NATIONAL SOIL SERVICES, INC.

PLATE 106

LOG OF BORING NO. B-179

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.2

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			Very stiff dark brown silty clay, w/numerous fine roots (CL)								
5			Hard reddish-brown silty clay, w/calcareous and magnesium nodules		100						
10			-w/occasional large calcareous and magnesium nodules		100						
15			-w/numerous bluish-gray silty clay inclusions (CL)		85						
20			Soft reddish-brown silty claystone, crossbedded, w/occasional bluish-gray silty claystone inclusions		100						
25			-increasing silt		100						
30			-thick bedded		100						
35			-thin flat bedding -w/numerous large bluish-gray silty claystone inclusions								

(Continued)

NES/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 107

LOG OF BORING NO. B-179 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			-w/bluish-gray silty claystone seam, w/coarse sand at 35.5-36.3' -slightly slickensided -w/occasional high angle fractures	100	100						
45			-w/occasional healed high angle fractures	100	100						
50											
55											
60											
65											
70											

COMPLETION DEPTH: 50.0'
DATE: 5/14/81

DEPTH TO WATER: 6.7'
DATE: 5/14/81

NATIONAL SOIL SERVICES, INC.

PLATE 108

LOG OF BORING NO. 8-180

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.4

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard brown clayey silt, -w/numerous calcareous nodules and fine roots								
			-w/large calcareous nodules at 3.0' (ML)			90	38	16	13		
5			Hard reddish-brown silty clay, w/numerous weathered calcareous nodules	80							
			-w/large calcareous nodules, coarse sand, and medium to coarse gravel at 6.0'								
10			-w/coarse gravel at 8.0' (CL)								
			Soft reddish-brown silty clay-stone, w/bluish-gray silty clay-stone inclusions		8/3"						
15											
				100							
20											
			-w/occasional high angle fractures								
			-w/bluish-gray clay seam at 24.5-25.5'	100							
25			Hard reddish-brown silty clay								
					8/4"						
30											
			-w/occasional bluish-gray silty clay inclusions (CL)	100							
35			Soft reddish-brown silty clay-stone, thin flat bedding								

(Continued)

NPS/NATIONAL PARK SERVICE

LOG OF BORING NO. B-180 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			-bluish-gray claystone, w/gravel at 36.0'	100						
			Hard reddish-brown silty clay (CL)	100						
40			Soft reddish-brown claystone, thick bedded	100						
			Very soft reddish-brown clayey shale, w/occasional small bluish-gray clayey shale inclusions	100						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 45.0'
DATE: 5/4/81

DEPTH TO WATER: 12.7'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.

PLATE 110

LOG OF BORING NO. B-181
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

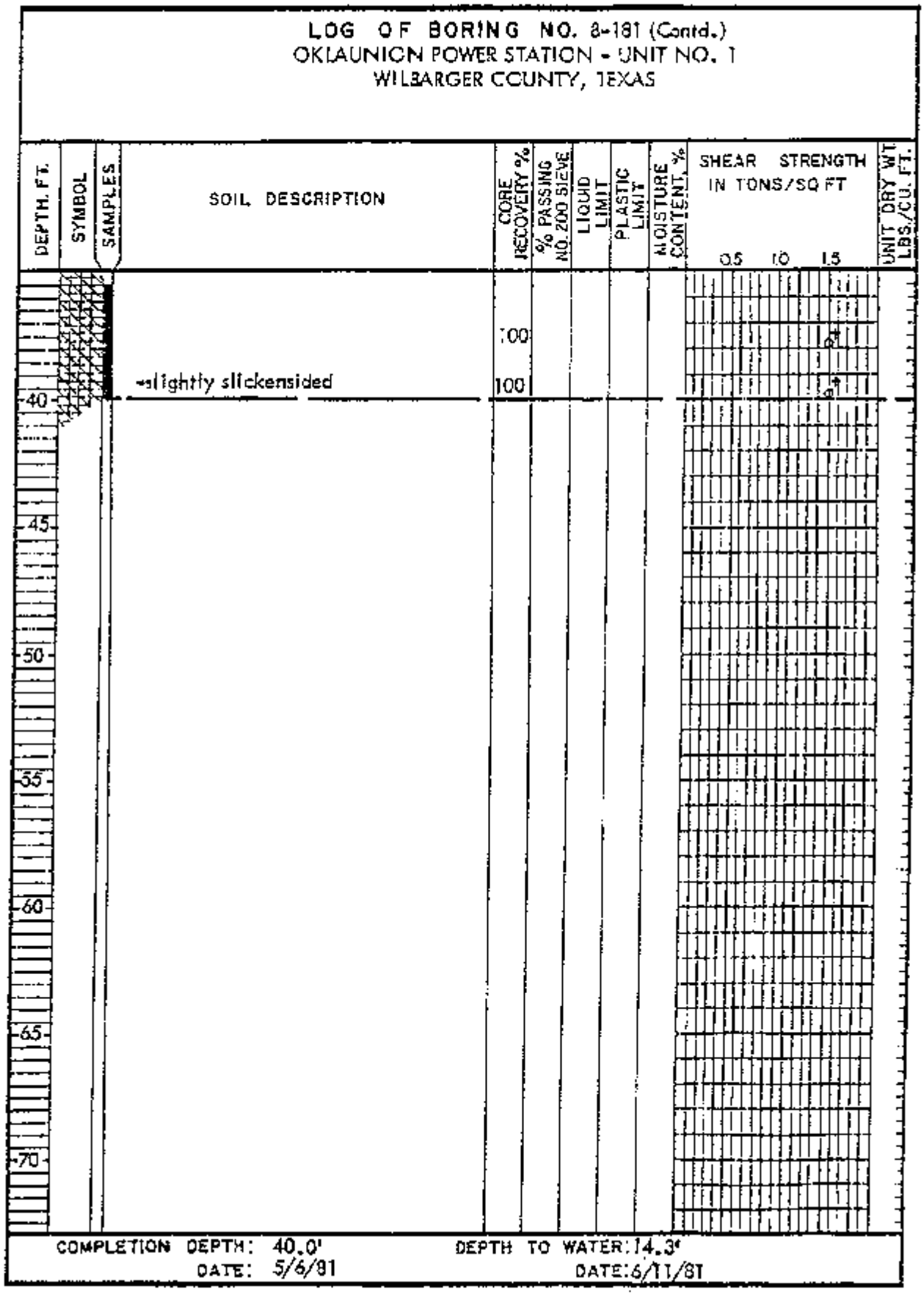
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1206.0								
			Hard dark brown silty clay, w/calcareous nodules and numerous fine roots (CL)								
5			Hard reddish-brown silty clay, w/numerous weathered calcareous pockets and black gravel (CL)								
10			Soft reddish-brown siltstone, w/thin gently dipped very soft claystone laminations -w/some coarse gravel at 8.0' -crossbedding at 8.3-8.7', w/occasional bluish-gray siltstone inclusions	80	50/4"						
15			Soft reddish-brown silty claystone, thick bedding, w/occasional bluish-gray silty claystone inclusions	100							
20				100	50/3						
25			-thin flat bedding	100							
30				100							
35			-w/moderately hard silty clay fragments								

(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 111

LOG OF BORING NO. B-181 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



NATIONAL SOIL SERVICES, INC. PLATE 112

LOG OF BORING NO. B-182

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY, %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1203.7								
			Hard brown silty clay, w/fine roots, occasional coarse sand and weathered calcareous nodules (CL)								
5			Hard reddish-brown silty clay, w/numerous weathered calcareous nodules	100							
			-extremely friable, w/fine gravel at 5.0'								
10			-w/some fine gravel and iron nodules at 7.0'	100		99	40	20	12	K_v=1.50x10^{-8} cm/sec	122
			-w/occasional bluish-gray silty clay inclusions at 10.0'								
			-w/bluish-gray silty clay pockets (CL)		5/6 seat						
15			Soft reddish-brown silty clay-stone, thin to medium bedding, w/numerous fine roots								
20				100		84	30	15	9		135
			-continuing bluish-gray pockets		5/5 seat						
25											
30			Very soft reddish-brown clayey shale	100							
			-w/bluish-gray silty clay inclusions								
			Soft reddish-brown silty clay-stone, thick bedded								
35			-slightly slickensided	100							

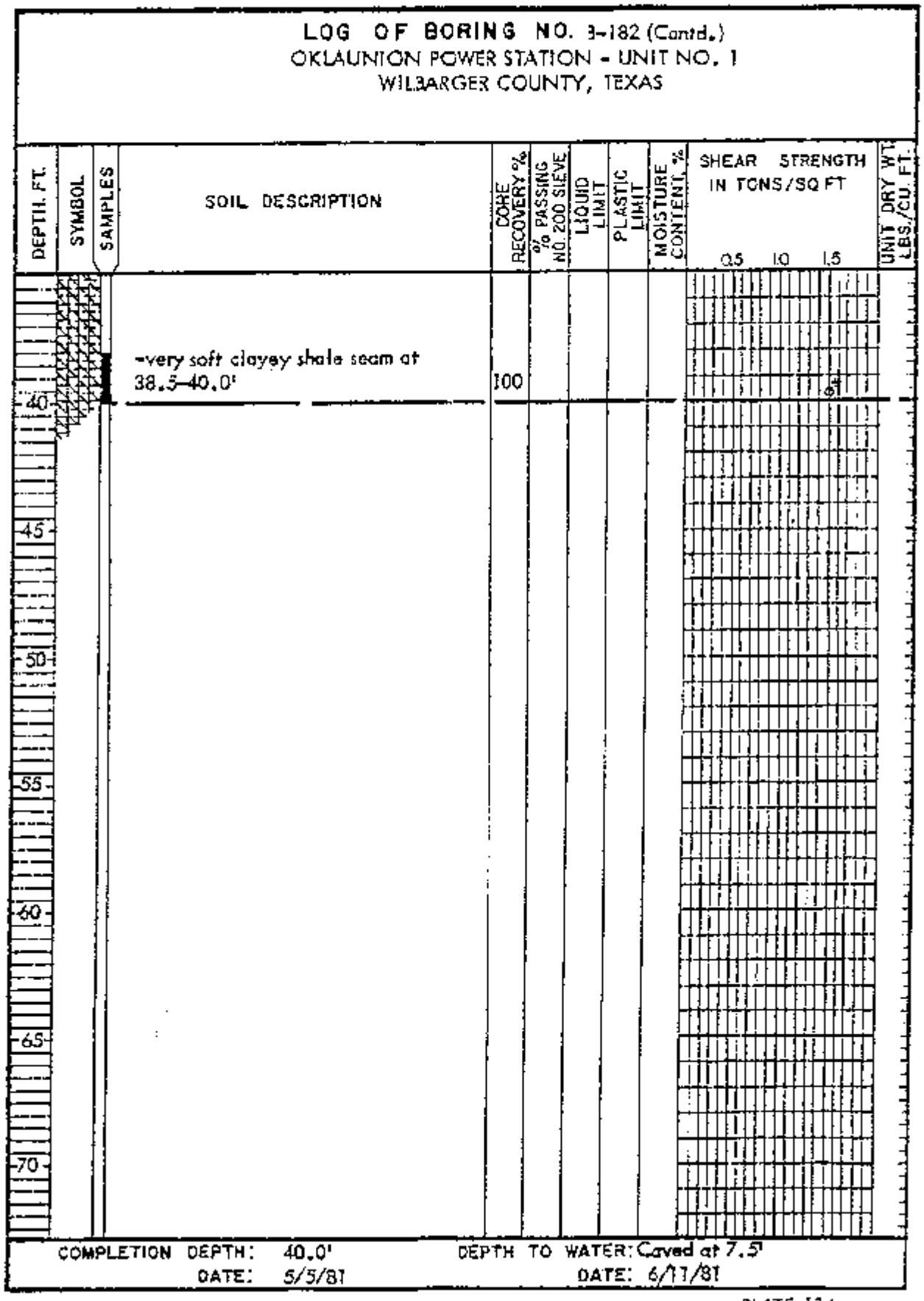
(Continued)

NRS/NATIONAL SOIL SERVICES

PLATE 112

LOG OF BORING NO. 3-182 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/5/81

DEPTH TO WATER: Caved at 7.5'
DATE: 6/11/81

NATIONAL COIL SERVICES, INC.

PLATE 114

LOG OF BORING NO. B-183

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.9

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard brown silty clay, w/weathered calcareous and iron nodules								
			-reddish-brown at 3.0'								
			-w/occasional coarse sand and fine gravel, w/some fine roots at 4.0'	80							
5			-w/fine gravel and iron stains at 6.0'	80							
			-w/occasional bluish-gray silty claystone inclusions at 8.0'	80							
10			-w/numerous fissures (CL)								
			Soft reddish-brown silty clay-stone		50/3" seat						
			-w/some sand at 13.7'	100							
15											
				100							
20											
					50/4"						
			-w/decreasing silt	100							
25			-w/occasional bluish-gray silty claystone inclusions								
				100							
30			-crossbedded, w/some fine sand								
				100							
35											

(Continued)

NES/NATIONAL SOIL SERVICES

PLATE 115

LOG OF BORING NO. B-183 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			Very soft reddish-brown clayey shale -w/occasional gravel	80						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 40.0'
DATE: 5/5/81

DEPTH TO WATER: Caved at 3.8'
DATE: 6/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 116

LOG OF BORING NO. B-185

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.3

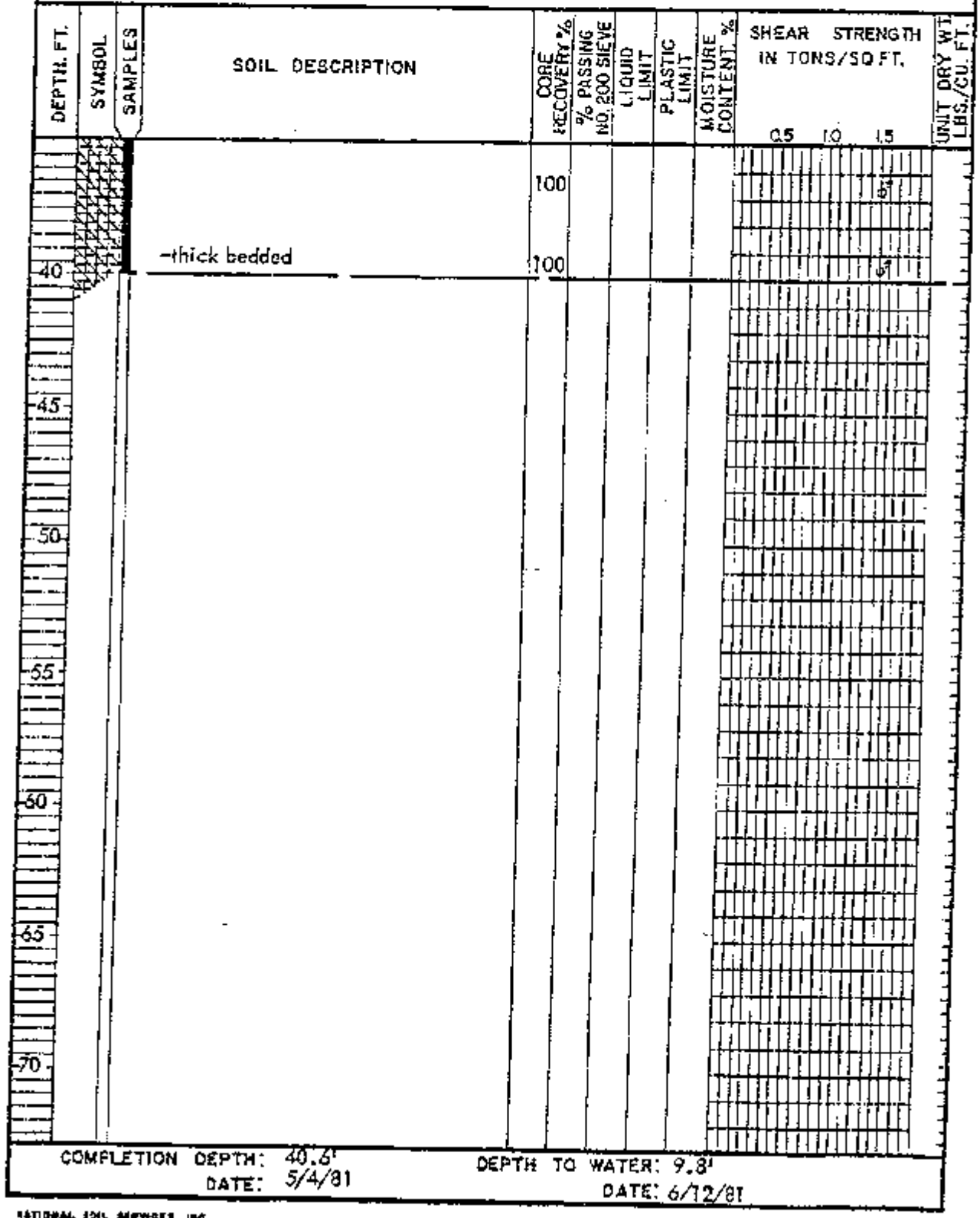
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT LBS./CU. FT.
			Hard tannish-brown clayey silt, w/numerous calcareous nodules and fine roots (ML)							qu	
			Hard brown silty clay, w/numerous pockets of calcareous nodules and gravel							qu	
5			-w/numerous fine gravel at 4.0'			72	39	15	11	k_v=1.20x10^{-8} cm/sec qu	130
			-w/numerous medium to coarse gravel and weathered calcareous nodules at 6.0' (CL)							qu	
10			Soft reddish-brown silty clay-stone, w/occasional calcareous filled fractures							qu	
			-w/occasional soft bluish-gray silty claystone inclusions		50/5"						
15			-medium bedding	100		76	30	14	10	k_v=4.36x10^{-9} cm/sec	130
20											
25				100							
					50/5"						
30											
35			-increasing silt, crossbedded								

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 117

LOG OF BORING NO. 8-185 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.6'
DATE: 5/4/81

DEPTH TO WATER: 9.8'
DATE: 6/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 118

LOG OF BORING NO. B-186

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1202.7

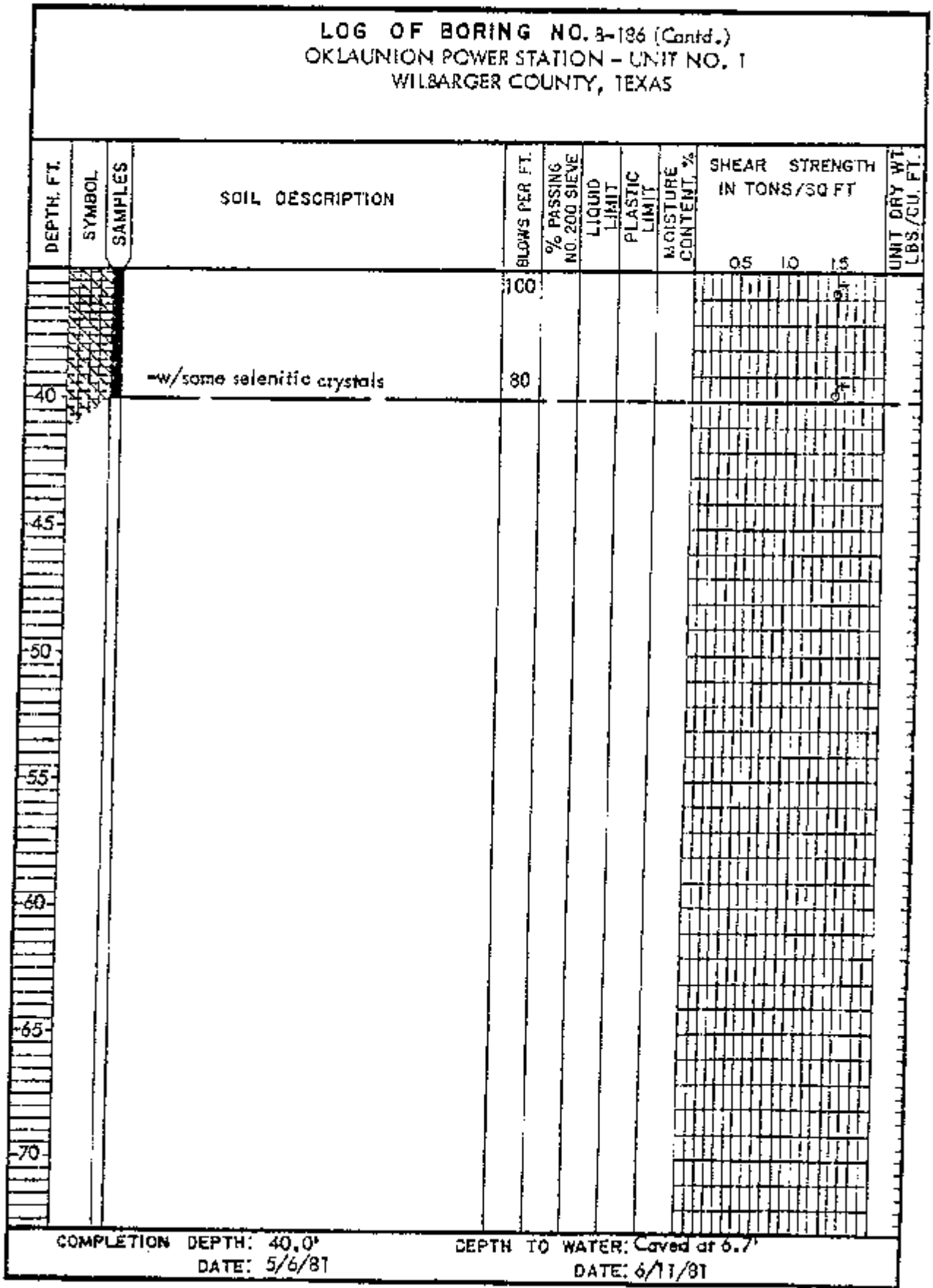
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard dark brown silty clay, w/weathered calcareous nodules (CL)								
5			Hard reddish-brown silty clay -w/numerous calcareous filled fissures and pockets at 4.0' -w/occasional calcareous nodules and coarse gravel at 6.0' -w/occasional bluish-gray silty clay inclusions	100							
10				100							
			(CL)		50/5"						
15			Soft reddish-brown claystone, thick bedded -w/occasional high angle fractures -w/occasional bluish-gray claystone seams and inclusions	100							
20											
			-w/occasional high angle fractures	100	50/4"						
25			-fine gravel seam at 26.0'								
30				100							
35			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions								

(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 119

LOG OF BORING NO. B-186 (Contd.)
OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/6/81

DEPTH TO WATER: Caved at 6.7'
DATE: 6/11/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 120

LOG OF BORING NO. B-190

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.0

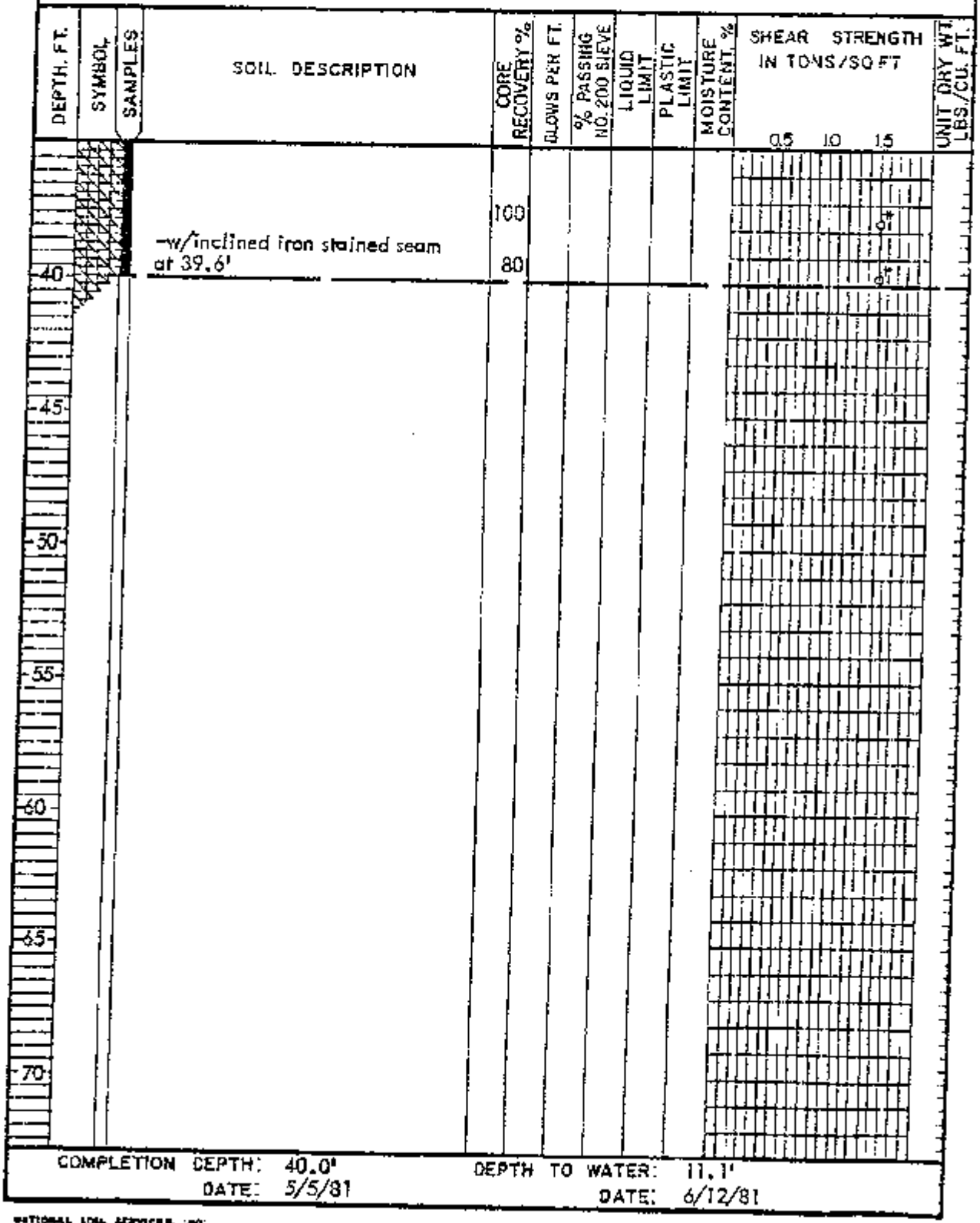
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY, %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard dark brown silty clay, w/numerous fine roots and calcareous nodules (CL)								
5			Hard reddish-brown silty clay, w/calcareous nodules								
			-w/calcareous nodules and fine gravel at 6.0'	80							
			-w/bluish-gray clay balls (CL)	80		100	35	16	10	$K_v = 4.13 \times 10^{-9}$ cm/sec	127
10			Soft reddish-brown silty clay-stone -w/clay balls	80	50/4"						
15			Very soft reddish-brown clayey shale, extremely slickensided	100		96	36	20	18	$K_v = 3.90 \times 10^{-8}$ cm/sec	116
20			Soft reddish-brown silty clay-stone, thick bedded, slightly slickensided	100	50/3"						
25			Soft reddish-brown clayey shale, slightly slickensided	100							
30			Soft reddish-brown silty clay-stone, thick bedded -w/occasional large bluish-gray silty claystone inclusions	100							
35											

(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 121

LOG OF BORING NO. B-190 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 122

LOG OF BORING NO. B-192

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1191.4

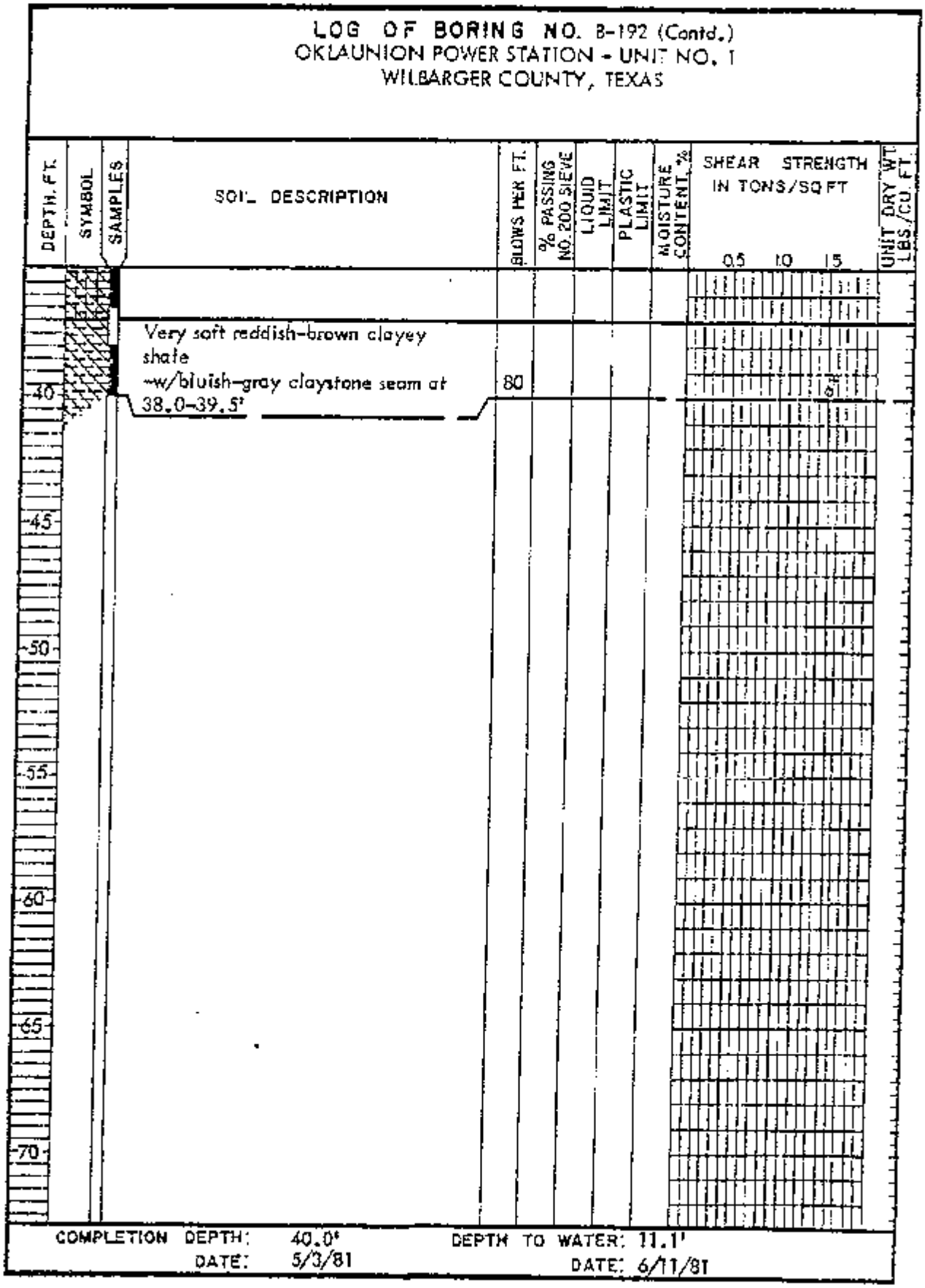
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			Hard tannish-brown clayey silt, w/calcareous nodules and fine roots (ML)								
5			Hard tannish-brown silty clay -w/occasional fine roots at 4.0' -reddish-brown, w/fine to coarse gravel at 5.0' (CL)	100		62	28	14	11	k_v=1.62x10^{-8} cm/sec	116
10			Soft reddish-brown silty clay-stone, thick bedded, w/bluish-gray silty claystone seam at 7.8-8.0'	80		94	33	20	13	k_v=1.74x10^{-8} cm/sec	126
15				40	50/3"						
20			Soft bluish-gray claystone, w/numerous coarse sand and fine gravel	100							
25			Soft reddish-brown silty clay-stone, w/occasional bluish-gray silty claystone inclusions	100		96	29	17	12	k_v=5.65x10^{-8} cm/sec	128
30			-thick bedded	100	50/3"						
35				100							

(Continued)

NES/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 123

LOG OF BORING NO. B-192 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/3/81

DEPTH TO WATER: 11.1'
DATE: 6/11/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 124

LOG OF BORING NO. B-195

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1196.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard light brown silty clay, w/fine roots and weathered calcareous nodules and some fine gravel -tan and reddish-brown, w/numerous magnesium nodules at 3.0' (CL)						(3.85)	
5			Soft reddish-brown silty claystone, thick bedded, w/occasional calcareous filled fissures -increasing silt and crossbedded at 6.0'	100	88	29	14	11		127
10			-w/bluish-gray silty claystone inclusions at 7.0' -slightly indurated at 8.0' -thick bedded at 10.0'	100						
15				40						
20			-w/decreasing silt	80						
25				80						
30			-w/bluish-gray silty claystone seam at 29.5-29.8'	60						
35				80						

COMPLETION DEPTH: 30.0'
DATE: 5/19/81

DEPTH TO WATER: 9.7'
DATE: 6/12/81

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 127

LOG OF BORING NO. B-224

OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1191.1

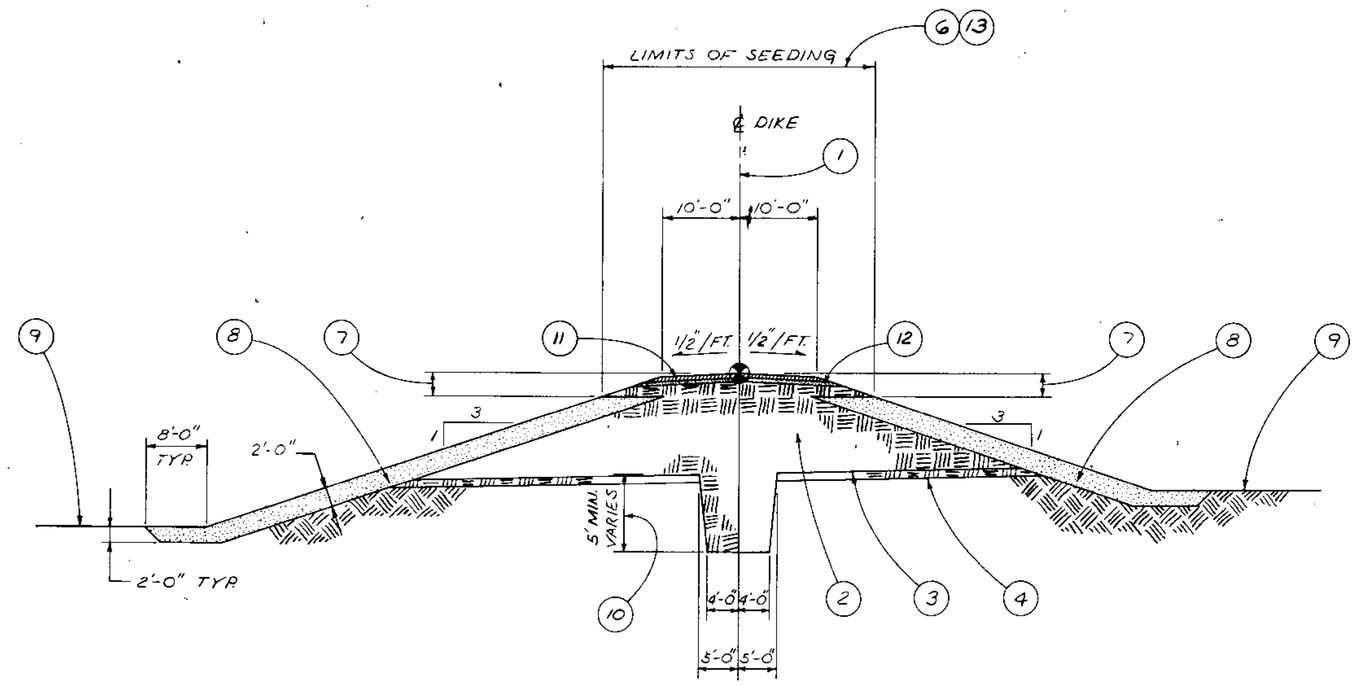
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard brown silty clay, w/numerous fine roots and magnesium nodules –reddish-brown, w/numerous weathered calcareous material –w/occasional magnesium and weathered calcareous nodules (CL)							
10			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions	100						
15										
20										
25										
30										
35										

COMPLETION DEPTH: 10.0'
DATE: 5/18/81

DEPTH TO WATER: 3.0'
DATE: 6/23/81

WFS/NATIONAL SOIL SERVICES

PLATE 166

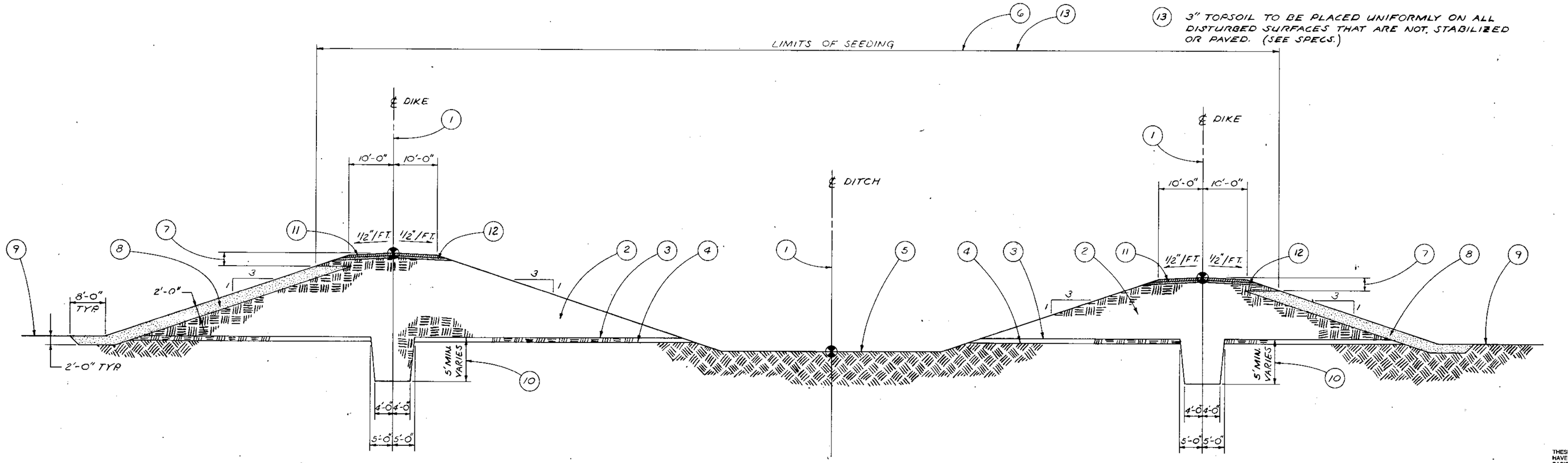


1 INTERIOR POND DIKE SECTION (TYPICAL)

SCALE: 1" = 10'-0"

LEGEND

1. ℄ ALIGNMENT AND FINISH GRADE, SEE ENLARGED SITE PLAN SECTION
2. STRUCTURAL BACKFILL, (SEE SPECS.)
3. STRIPPED SOIL PROFILE (SEE SPECS.)
4. 6" SCARIFY & COMPACT TO DENSITY PRIOR TO STRUCTURAL BACKFILL (SEE SPECIFICATIONS)
5. 50' FLAT BOTTOM DITCH NORMAL UNLESS OTHERWISE SHOWN ON ENLARGED SITE PLAN SECTION
6. CULTIVATE, SEED, FERTILIZE & MULCH ALL DISTURBED AREAS, EXCLUDING BASE COVERED & LIME STABILIZED AREAS (SEE SPECS.)
7. 3' MIN. FREEBOARD ~ TOP OF WATER ELEV. = TOP OF LIME STAB. (SEE ENLARGED SITE PLAN SECTION & SPECS.) EXCEPTION AT COLLECT. PONDS
8. THE INTERIOR SLOPES OF ALL PONDS WILL BE LIME STABILIZED TO A MIN. DEPTH OF 2'-0" PERPENDICULAR TO SURFACES (SEE SPECS., SECTIONS & DETAILS, AND ENLARGED SITE PLAN SECTION)
9. BOTTOM OF POND, REFER TO ENLARGED SITE PLAN SECTION FOR GRADE
10. KEY WAY TO BE CUT AS SHOWN, DEPTH WILL VARY TO PROJECT INTO SUITABLE IMPERVIOUS MATERIALS, AS DIRECTED BY AGENT'S REPRESENTATIVES & SPECS. FIVE FOOT MIN. DEPTH.
11. 6" FLEX BASE (SEE SPECS.)
12. 6" LIME STABILIZATION (SEE SPECS.)
13. 3" TOPSOIL TO BE PLACED UNIFORMLY ON ALL DISTURBED SURFACES THAT ARE NOT STABILIZED OR PAVED. (SEE SPECS.)



2 DIKE SECTION THRU DIVERSION DITCH (TYPICAL)

SCALE: 1" = 10'-0

THESE AS-BUILTS OR RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THESE DOCUMENTS AS A RESULT.

TIPPETT & GEE, INC.
ABILENE, TEXAS

DATE 6-1-87 BY J.L.W.

FOR INFORMATION ONLY

NOTES

REV	DATE	BY	DESCRIPTION
A	4-27-83	MLR	REVISED PER ADDENDUM "2"
1	6-1-87	LC	AS BUILT - NO CHANGE

SCALE AS NOTED
DRAWN MJL
DATE 3-1-83
CHECKED RDG
APPROVED JLW

STATE OF TEXAS — JAMES L. WEBB — 36841 — REGISTERED PROFESSIONAL ENGINEER

STATE OF TEXAS — William G. Holbrook — 15137 — REGISTERED PROFESSIONAL ENGINEER

TIPPETT & GEE, INC.
CONSULTING ENGINEERS
ABILENE TEXAS

OKLAUNION POWER STATION - UNIT NO. 1
WEST TEXAS UTILITIES CO.
ABILENE, TEXAS
PROJECT MANAGER
CENTRAL AND SOUTH WEST SERVICES, INC.
DALLAS, TEXAS

EVAPORATION PONDS, DETAILS & SECTIONS

JOB NO. OKI-565.10 OPS 1100
REV. 1
DRAWING NUMBER C-101-086

TIPPETT & GEE, INC.
CONSULTING ENGINEERS
ABILENE, TEXAS

OK1-559.10
(OPS-1022)

SPECIFICATIONS

FOR

PHASE I CONSTRUCTION (SITE PREPARATION)

OKLAUNION POWER STATION

UNIT NO. 1

DIVISION 1 - GENERAL

101. PROJECT DESCRIPTION

Central and South West Services, Inc., will construct a plant to be located in Wilbarger County, approximately four miles south of Oklaunion, Texas. The jobsite may be reached by a fair-weather road. A vicinity map showing both road and railroad locations is given on page 1-2.

102. PROJECT DATES

The unit is scheduled for Commercial Operation on December 1, 1986.

103. EQUIPMENT/MATERIALS SUBSTITUTION

Where specific brand names are used, they are a measure of quality only and equipment accepted as equal by Agent or Engineer may be substituted.

104. SITE CONDITIONS

Existing elevations are shown on the drawings. Solid lines are existing contours and dashed lines are proposed contours. Ambient temperature range is -5°F to 115°F. Seismic zone is "1".

201.02

Drawing Number	Revision	Title
C-102-073	0	Culvert Details
C-102-074	0	Collection Pond Overflow Details
C-102-075	0	Collection Pond Overflow Details
C-103-023	0	Barbed Wire Fence Details
C-103-024	0	Project Sign Elevation Sects. & Dets.
C-103-025	0	Fence Details
C-103-026	0	Fence Details
A-110-001	0	Prefabricated Guard Building

202. GENERAL SCOPE DEFINITION (CONTRACTOR)

The following is intended to provide a general definition of the scope of the Work under this Contract and shall not be construed as an itemized listing. Contractor shall be responsible for construction of complete facilities conforming in all respects to the details and requirements of this Specification, Drawings and other Contract Documents.

202.01 Clearing and grubbing of ground surfaces within the construction areas as delineated on the Drawings.

.02 Excavation, backfill, compaction and grading of generation plant area, chimney area, cooling tower area, switchyard area, perimeter fence area, pond areas, coal storage and handling areas.

.03 Construction of one (1) upper collection pond, one (1) lower collection pond, one (1) make up water supply pond, five (5) storage ponds and ten (10) evaporation ponds. Pond construction includes all excavation, backfills, embankments, slope protection, miscellaneous spillway and outfall structures, and any required linings.

.04 Construction of Jobsite railroad subgrade, plant access roads, roads and construction parking lot including all excavation, fills, subgrade preparation, lime stabilization, fly ash stabilization, surfacing, embankments and culverts.

.05 Final grading of all ground surface areas disturbed by the construction to provide uniform surfacing and effective drainage of ground areas.

.06 Construction of diversion ditches and required construction containment areas.

.07 Supply and erect one (1) prefabricated guard building complete with concrete slab foundations

401. JOBSITE WORK

401.01 Applicable Codes and Standards:

All references to the following publications are to be latest issue of each, together with the latest additions and/or amendments thereto, as of the effective date of Contract. References to the sponsoring agencies will be made in accordance with the abbreviations indicated.

ASTM - American Society for Testing and Materials Standard Specifications

ACI - American Concrete Institute

AASHTO - American Association of State Highway and Transportation Officials Standard Specifications

THD - Texas State Department of Highways and Public Transportation

TEX - Standard Specifications Texas State Department of Highways and Public Transportation, Test Method

.02 Lines and Grades:

Contractor shall employ a competent, licensed land surveyor to determine lines and elevations.

Contractor shall lay out lines and grades from existing property lines and bench marks on the Jobsite and be fully responsible for correctness of such lines and grades and for proper execution of the Work to such lines and grades. Contractor shall correct at its own expense all errors in the Work arising from its inaccuracy.

Agent reserves right to verify correctness of lines and grades during progress of the Work. Such verification by Agent will not relieve Contractor of its responsibility.

Contractor shall preserve and maintain all bench marks and reference points established by Agent. Should Contractor, during execution of the Work, destroy or remove any bench marks and/or reference points established by Agent, the cost to Agent of reestablishing these bench marks and/or reference points will be charged to Contractor.

401.03 Surface Preparation:

Prior to performing excavation or fill work, the ground surfaces within the construction area shall be cleared, grubbed and the topsoil removed.

401.03

a. Clearing:

Clearing is defined as removal and disposal of all trees, down timber, snags, brush, hedges, bushes and all other vegetation or organic materials, and also all rubbish, debris or other foreign or objectionable materials above ground surface, except removal of sod and topsoil.

b. Grubbing:

Grubbing is defined as removal and disposal of all stumps, large roots, buried logs and all other objectionable material from below ground surface. Explosives may be used only if specifically approved and their use shall conform to all applicable laws and safety regulations.

c. Disposal:

All materials from clearing and grubbing operations shall be promptly removed from the construction area and disposed of by and at the expense of Contractor. Accumulation of such materials on premises is not permitted. If Contractor desires to burn materials, the obtaining of a burning permit from the appropriate regulatory authorities shall be Contractor's responsibility.

d. Removal of Topsoil:

Topsoil in areas to be excavated or filled shall be removed, stockpiled and saved at various locations on the Jobsite near where it is to be reused. The depth of topsoil to be excavated or stripped is estimated to be six to twelve inches in depth. Stockpile locations shall be approved by Agent. Topsoil shall be carefully stripped, placed in stockpiles and kept clean and free of all foreign material. Topsoil shall be utilized where indicated on the Drawings and required by this Specification (reference Section 404.02, c.).

401.04 Excavation:

Excavation is defined to include all incidental clearing, all disposal of excavated materials, all protection, sheeting, shoring, bracing, all dewatering, and preparation of bearing areas as required to properly install and complete the Work, regardless of portions of Work for which required, and regardless of nature of materials, encountered in excavating.

401 04

a. Protection and Support:

Banks at excavations shall be protected and supported, where necessary or where requested, so that the banks and bottoms will be maintained and adjacent structures or other construction will be protected from damage caused by an earth movement.

b Bearing Areas:

b.01 Bearing areas for all foundations shall be inspected and approved by Agent before any concrete is placed. If bearing areas are not suitable, Contractor may be requested to carry the excavations deeper to more suitable bearing material.

.02 All foundations shall be placed on undisturbed soil unless otherwise indicated or approved.

401.05 Structural Backfill:

Structural backfill includes general backfilling around all Work excavated by Contractor, and also all other backfill indicated on Drawings as by Contractor. All backfill or ordinary fill shall be classified as structural backfill as defined herein unless indicated otherwise on the Drawings.

a. Material:

Unless indicated otherwise on the Drawings, all backfill material shall be approved materials previously excavated at the Jobsite or materials obtained from approved borrow pits and shall be free of sod and topsoil or other deleterious or foreign matter. This material shall be approved by Agent.

b. Compaction:

Backfill shall be built up to the grade elevations indicated on the Drawings or as directed, with suitable moisture control and compaction throughout placing. All backfill soils and embankments, unless indicated otherwise on the Drawings, shall be compacted equal to or greater than 95 percent of the maximum dry unit weight as defined by the Standard Compaction Test (ASTM D-698) for plastic clays and the THD Method (TEX-113E) for sandy clays, clayey sands, silty sands and sands. The moisture content may vary from two percent dry of optimum to four percent wet of the optimum when compacted. The thickness of backfill lifts shall not exceed 9".

401.05

c. Inspection and Testing:

Contractor shall perform all backfill testing necessary to ensure the Work meets the specified requirements. Agent will conduct a quality control test monitoring program in addition to Contractor's basic testing program. Failure of backfill to meet the specified densities will be cause for rejection, and Contractor will be required to remove and replace all backfill not meeting these requirements at no additional cost to Agent.

d. Backfill Sand:

Backfill sand shall be a free-flowing clean sand of fairly uniform gradation. Clay and soil content shall be absent in any quantities that in the opinion of Agent makes use of the material undesirable. The sand shall be vibratory compacted greater than 95 percent of the maximum dry unit weight obtained using THD Compaction Test Method (TEX-113E).

e. Embankments:

Embankments are defined as any fill section. This definition includes the pond embankments, railroad embankments, road embankments or any area requiring a build-up of soil.

Prior to construction of any embankment, the foundation area shall be stripped to remove the topsoil, roots and weak surface soils. The stripping depth will be six to twelve inches, except in areas of uneven topography or in existing stock ponds and gullies. For these areas it will be necessary to strip to a deeper depth to remove the excessively wet and weak soils. All stumps and large roots shall be removed to a depth of two feet. All stripped areas shall be inspected by the on site testing laboratory and Agent's representative to determine if additional excavation is required to remove weak or otherwise objectionable materials that would adversely affect the intended integrity of the embankment.

After completion of stripping, the exposed soils shall be scarified to a depth of nine inches; the moisture shall be adjusted to two to four percentage points above optimum, and the soils recompacted. The optimum moisture value, compaction density and construction of embankment shall be as defined in the Structural Backfill Section 401.05 of this Specification.

f. Cut and Fill Slopes:

All slopes except pond slopes shall have a maximum inclination of 2.5 horizontal to 1.0 vertical or as indicated on the Drawings.

401.05
f. All exposed slope surfaces shall be cultivated, seeded and mulched as defined in the Seeding Section 404.02.

401.06 Grading:

Consists of rough grading and finish grading as follows:

a. Rough Grading:

Cut, fill, spread and level during course of Work to elevations indicated.

b. Finish Grading:

After all excavation, backfill, compaction and rough grading has been completed, all ground surface areas disturbed by Contractor shall be finish graded. The grading shall be finished to the contours and elevations indicated on the Drawings and shall provide a smooth uniform surfacing free of debris, foreign matter, objectionable stones, clods, lumps, pockets or high spots and properly drained to provide effective drainage of the ground areas. Finish elevations shall be within two inches (plus or minus) of those elevations shown on the Drawings in all areas except the power block (turbine generator area, boiler, scrubber, and chimney) and the switchyard area. Finish elevation for the power block and switchyard area shall be within one inch (plus or minus).

c. An excess of backfill materials is anticipated. This excess material shall be utilized in a manner acceptable to Agent. The excess backfill shall be placed at locations approved by Agent. Disposal areas that are proposed by Contractor and approved by Agent shall be shaped, compacted and seeded as directed by Agent. Disposal areas that affect pond capacities or plant operations will not be approved. Seeding and compaction of backfill shall be included in the total Contract Price. Unit prices are not applicable to the disposal of excess backfill.

401.07 Pond Construction:

Pond construction shall conform to the shapes, locations and dimensions as shown on the Drawings, to this Specification and the items described as follows:

a. Criteria:

Construction of all ponds shall conform to current criteria established by the Texas Department of Water Resources (TDWR) relative to waste ponds.

401.07

b. Slopes:

Interior and exterior slopes shall be no steeper than 3.0 horizontal to 1.0 vertical.

c. Pond Bottoms:

Elevation of pond bottoms for the evaporation ponds, makeup supply pond and the collection ponds are indicated by existing contours or excavated to elevations shown on the Drawings - whichever is lowest. The finish grades or elevations of pond bottoms for the five (5) storage ponds shown on the Drawings reflect finish grades

Pond bottoms in cut areas shall be scarified to a depth of nine inches. The moisture content shall be adjusted to between two to four percentage points above the optimum value. Then the scarified subgrade shall be compacted. The optimum moisture value and compaction density shall be as defined in the Structural Backfill Section 401.05. Within 48 hours of compacting the pond bottom, a 12-inch layer of semi-compacted clay shall be spread over the entire bottom of each pond bottom in cut areas only to preserve the moisture content of the subgrade. Semi-compacted clay is defined as being greater than 90 percent of the maximum dry unit weight as defined by THD test method TEX-113E. The top of the semi-compacted clay shall be set at finish grade; therefore, for cut areas, Contractor shall overexcavate pond bottoms one foot to properly achieve finish grade.

d. Pond Embankments:

Pond embankments shall be constructed as defined in the Embankments Section 401.05.

e. Lime Stabilization of Slopes:

The slopes shall be lime stabilized as indicated on the Drawings. The percent lime and method of placement of lime shall be as defined in the Lime Stabilization Section 404.03. The lime stabilized materials shall be placed in lifts such that the thickness of the lime stabilized materials is two feet measured perpendicular to the slope.

f. Seeding:

The pond slopes shall be seeded as indicated on the Drawings and as required by this Specification. The seeding shall be as defined in the Seeding Section 404.02

401.07
g. Pervious Soils:

All pond bottoms and side slopes must have a permeability coefficient less than 1×10^{-7} cm/sec. Out of numerous permeability tests conducted during the initial soils investigation only one site demonstrated a permeability coefficient greater than 1×10^{-7} cm/sec and was considered pervious.

In the event that zones of pervious soils are disclosed in the pond bottoms or side slopes, these pervious zones must be removed by overexcavation to a depth of two feet and replaced with impervious materials. The placement and compaction of these impervious materials shall be as defined in Structural Backfill Section 401.05. The total contract price shall provide for excavating 50,000 cubic yards of pervious materials and replacing with 50,000 cubic yards of impervious materials. Unit prices shall be utilized for quantities above or below the 50,000 cubic yards that is included in the total Contract Price. The unit prices per cubic yard means to excavate one cubic yard of pervious materials and replace with one cubic yard of impervious materials.

401.08 Erosion and Sediment Control Requirements:

Contractor shall implement erosion and sediment control procedures as defined herein and shown on the Drawings.

a. Limitations:

The rainfall runoff from construction activities has the following limitations: 1) Total suspended solids - daily maximum of 50 milligrams per liter and 2) pH - between 6.0 and 9.0.

Contractor is required to conduct earthwork operations in such a manner than these limitations are met. To meet these limitations, Contractor shall comply with the following procedures:

b. Procedures:

Contractor shall conduct earthwork operations in the following sequence:

b.01 First - Contractor shall construct the three diversion ditches. Currently, approximately 1500 acres of surface area off the Jobsite drain through the Jobsite. Also, there is considerable acreage in the Unit No. 2 evaporation pond area that will be unaffected by Contractor. These areas must be allowed to flow through the plant site unimpeded and unaltered.

401.08
b.02 Second - Secondly and concurrently to the first procedure, Contractor shall construct improvement to the diversion ditches to force certain area runoff into the diversion ditches. Accordingly, it is necessary to construct some of the access road with drainage structures to allow drainage of the Unit No. 2 evaporation pond area into diversion ditch number 2. It is also necessary to construct a portion of the railroad berm in Sections 42, 44, 45, 56, 57 and 58 to force runoff water from the north of the Jobsite to flow through diversion ditch number 1. Similarly, some of the west berms of evaporation ponds numbers 8, 9 and 10 must be constructed to force runoff water from the west of the Jobsite to flow into diversion ditch number 3. Contractor shall make all necessary improvements to the diversion ditches to allow areas that are unaffected by construction to flow through the plant site unimpeded and unaltered.

.03 Third - Contractor shall construct the makeup water supply pond, the upper and lower collection ponds, evaporation pond number 4 and other ponds sufficiently to allow their use as sediment ponds. Contractor shall add temporary construction berms and diversion ditches as required such that runoff from all earthwork activities would drain into one of these ponds. Contractor may also install permanent drainage features as necessary to achieve these drainage/collection requirements.

.04 Fourth - Contractor can then execute any required earthwork activity - if the rainfall runoff is directed into one of the sediment ponds.

c. Pumping Requirements:

As water and sediment builds up in a particular sediment pond and the water has been clarified (contains less than 50 milligrams of suspended solids per liter) and as directed by Agent, it shall be pumped out by Contractor. The water shall be pumped into a diversion ditch or an existing stream that leaves the Jobsite.

Additionally, Contractor shall cooperate with Agent by pumping water between sediment ponds if required and as directed by Agent.

d. Cleanout of Sediment Ponds:

When all Work has been completed, Contractor shall pump out sediment ponds after they meet the required limitations and remove sediment if necessary to establish the required pond bottom elevations. Spoil areas for sediment shall be determined by Agent.

404.02

d. Sideoats Grama (El Reno) and 5 pounds per acre of Caucasion Bluestem.

e. Fertilization:

Fertilizer rates, seed purity, and seed germination rates will be in accordance with current THD Specifications, Item 164 and Item 166. The fertilizer shall have an analysis of 16-20-0 and shall be applied uniformly at the average rate of 300 pounds per acre.

404.03 Lime Stabilization:

Where indicated on the drawings lime stabilized materials shall be provided in accordance with the following procedure:

Excavate the existing clay soils to the depth indicated on the drawing and stockpile the excavated material.

Scarify the top six inches of the subgrade to receive lime stabilized materials, add moisture as required and compact to a density not less than 95 percent of the maximum dry unit weight as defined by the THD Compaction test, (TEX-113E) and ASTM D-698. The moisture content should be between optimum and four percent above optimum at the time of compaction.

Treat the excavated clays with the required percentage of lime, (approximately 4% by dry weight) add water as necessary, and recompact at a moisture content between optimum and four percent above optimum, as defined by the THD compaction test, TEX-113E and ASTM D-698. The fills should be placed in loose lifts not exceeding nine (9) inches in thickness and compacted to a minimum density of 95 percent of the maximum as determined above. Failure to have adequate moisture content during mixing and compaction shall be cause for rejection of the Work.

Lime treatment (pulverization, incorporation of lime, repulverization, curing, etc.,) shall be accomplished in accordance with the applicable provisions of Item 260 of the THD Standard Specifications for Construction of Highways, Streets, and Bridges, 1972 Edition.

Seal the treated area of road beds and foundation areas with an asphalt membrane using .40 gallons of asphalt per square yard of surface - if the lime stabilized materials are to be left exposed for more than seven (7) days. Sealing with asphalt is not required for the lime stabilization areas on pond slopes.

601. GENERAL

Agent has previously conducted a subsurface soil investigation. This section provides Contractor with information pertaining to the results of that investigation.

602. POSSIBLE HARD MATERIALS

The subgrade soils are hard. These soils may prove difficult to excavate and difficult to use as backfill materials. From the soil borings operations, it is anticipated that ordinary earth moving equipment can excavate the materials without blasting, even though blasting may prove advantageous to Contractor. It also appears that these hard soils should break down rapidly when exposed to sunlight and could then be broken apart and used as backfill material.

It is incumbent upon Contractor to satisfy himself as to his own ability to excavate and compact these hard soils. Arrangements can be made by Contractors to bring equipment on site to experiment with these soils prior to submitting proposals.

603. GEOTECHNICAL DATA

603.01 At the end of this section there are copies of the borings made at the Jobsite. The location of the borings are shown on the Drawings. This information is furnished for Contractor's convenience. Contractor will be permitted to make his own soil investigations, but same shall be made at no cost to Agent.

.02 From these logs, Contractor should determine the materials which Contractor will be excavating and compacting, apparent water table levels, possible sources of usable backfill materials and other pertinent information associated with his different construction techniques.

603.03 The following information is included hereinafter:

a. Rock and soil classification.

b. Maps of boring locations.

c. Various soil profiles.

d. Boring numbers.

603.04 The following is a listing of the boring logs which follow:

B-101P
B-102
B-103P
B-104
B-105P
B-106
B-107P
B-108
B-109P
B-114
B-116
B-117
B-118P
B-119
B-120
B-122
B-123
B-125
B-126
B-129
B-131
B-132
B-134
B-135
B-136
B-137P
B-138
B-139
B-140
B-141
B-142
B-143
B-144
B-145
B-146
B-147
B-149
B-150
B-151
B-152
B-153
B-154
B-155
B-156
B-157
B-158
B-159
B-160
B-161
B-162P
B-163
B-164
B-165
B-166
B-167
B-168
B-169P
B-170
B-171
B-172
B-173
B-174
B-175
B-176
B-177P
B-178
B-179
B-180
B-181
B-182
B-183
B-185
B-186
B-190
B-192
B-193
B-194P
B-195
B-196
B-198
B-199
B-200
B-201
B-202
B-203P
B-204
B-205
B-206
B-207
B-208
B-209
B-210
B-211
B-212
B-213
B-214
B-215
B-216
B-217
B-218
B-219
B-220
B-221
B-222
B-223
B-224
B-225P
B-226
B-227
B-228
B-229
B-230
B-231
B-232
B-233
B-234
B-235
B-236
B-237
B-239
B-240
B-241
B-242
B-243
B-244

LOG OF BORING NO. B-108

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.2

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Very stiff reddish-brown silty clay, w/occasional coarse gravel and organic material								
			-w/numerous weathered calcareous nodules at 3.0' (CL)								
5			Soft reddish-brown sandstone, fine grained, thin bedding								
			-w/numerous soft bluish-gray sandstone laminations and inclusions at 6.0'		100						
10			Soft reddish-brown siltstone, thin flat bedding, w/numerous soft bluish-gray siltstone inclusions		100	99	35	16	10	$k_v = 3.06 \times 10^{-8}$ cm/sec	131
			-soft bluish-gray siltstone seams, gently dipped bedding at 11.0'								
15			-clayey at 13.0'								
			-high angle fractures		100						
			-soft reddish-brown claystone seam, thick bedding from 18.0-20.7'		100	92	31	16	10	$k_v = 3.30 \times 10^{-9}$ cm/sec	133
20			-soft bluish-gray sandy claystone seam from 20.7-21.0', coarse gravel		100						
					100						
25						86	29	14	8	$k_v = 3.12 \times 10^{-10}$ cm/sec	132
			-soft bluish-gray sandy claystone seam, w/fine gravel from 27.5-28.5'		100						
30			Very stiff reddish-brown silty clay (CL)								
			Soft reddish-brown claystone, thick bedding, w/occasional soft bluish-gray silty claystone inclusions								
35											

(Continued)

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PLATE 24

LOG OF BORING NO. B-108 (Contd.)
OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS

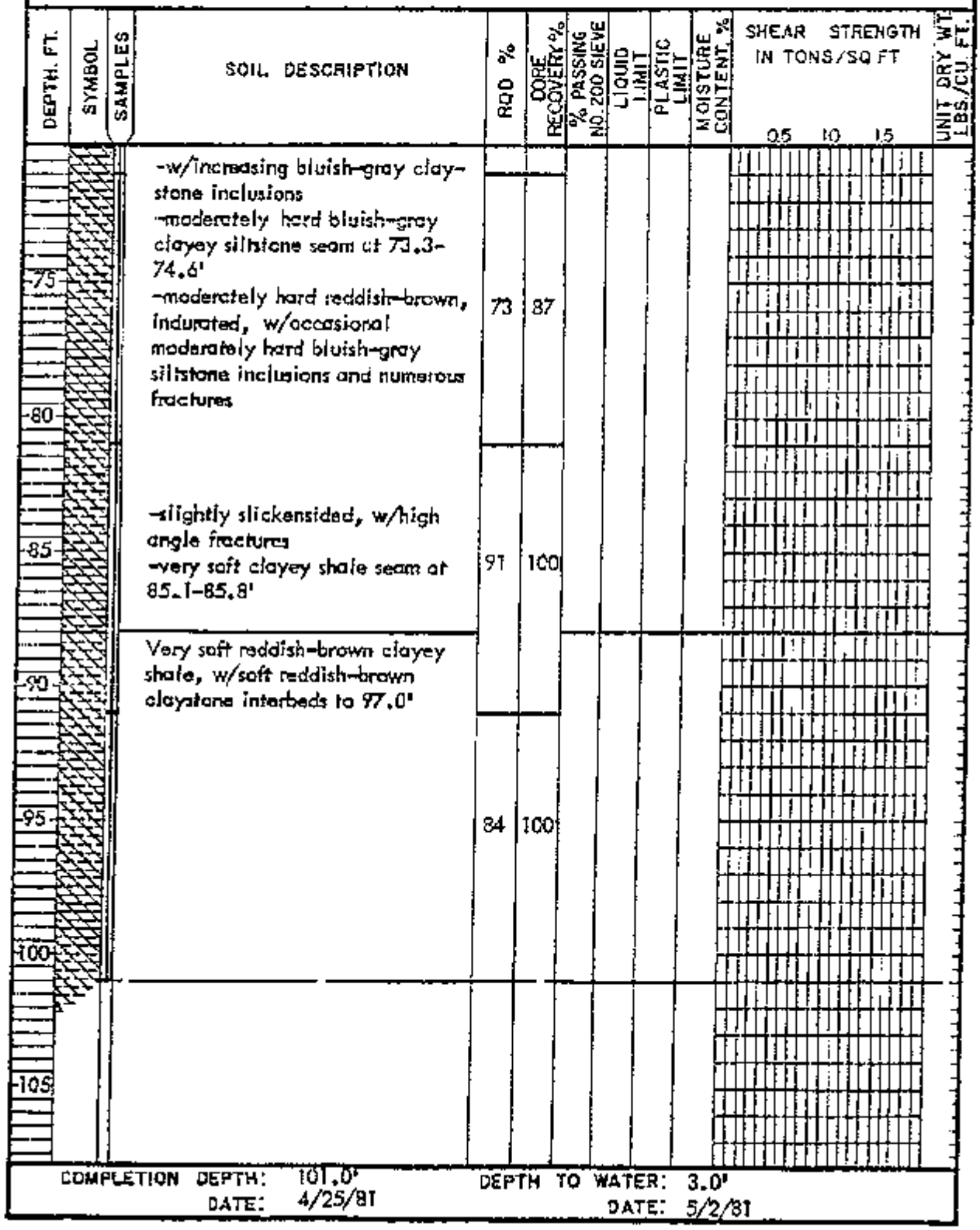
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			–w/numerous high angle fractures at 35.0'	79	80						
			–w/numerous high angle fractures								
45			–soft clayey shale seam from 43.0–44.0' –soft bluish–gray claystone seam from 44.8–45.1' –w/numerous high angle fractures	70	100						
50			–extremely slickensided								
55			–soft bluish–gray claystone seam, w/fine gravel from 57.0–57.6'	93	100						
60			–w/numerous slickensides, indurated								
65			–w/numerous high angle fractures	97	100						
70											

(Continued)

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 25

LOG OF BORING NO. B-108 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 101.0'
DATE: 4/25/81

DEPTH TO WATER: 3.0'
DATE: 5/2/81

NATIONAL SOIL SERVICES, INC.

PLATE 26

LOG OF BORING NO. B-167

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1191.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard tannish-brown silt, w/numerous fine roots							
			Hard dark brown silty clay, w/small weathered calcareous nodules							
5			-reddish-brown at 4.0'							
			-w/numerous calcareous and magnesium nodules at 5.0' (CL)							
			Soft reddish-brown silty claystone, thin gently dipped bedding	100						
10			-decreasing silt	100						
			-crossbedded, w/bluish-gray silty claystone seam at 9.0-9.3'							
15			-thick bedded	100						
			-thin flat bedding							
20				100						
25				100						
30										
35										

COMPLETION DEPTH: 25.0'
DATE: 5/21/81

DEPTH TO WATER: Caved at 2.2'
DATE: 6/23/81

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PLATE B5

LOG OF BORING NO. B-168

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1194.8							
			Hard light tan to brown clayey silt, w/numerous fine roots (ML)		87	43	14	11		115
5			Hard brown silty clay -w/numerous calcareous nodules at 3.0' -light brown, w/calcareous and magnesium nodules at 5.0' -reddish-brown, w/numerous pockets of weathered calcareous material and fine sand at 7.0' -w/occasional magnesium nodules and bluish-gray silty clay inclusions at 9.0' -w/calcareous filled fissures and inclusions at 11.0' (CL)	100					
15			Soft reddish-brown silty claystone, thin flat bedding, w/occasional bluish-gray silty claystone inclusions							
20			-crossbedded, w/occasional pyrite	100						
25			-thin flat bedding, w/occasional coarse sand pockets	60						
30										
35										

COMPLETION DEPTH: 25.0' DEPTH TO WATER: 5.0'
DATE: 5/15/81 DATE: 5/15/81

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PLATE 06

LOG OF BORING NO. B-170

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

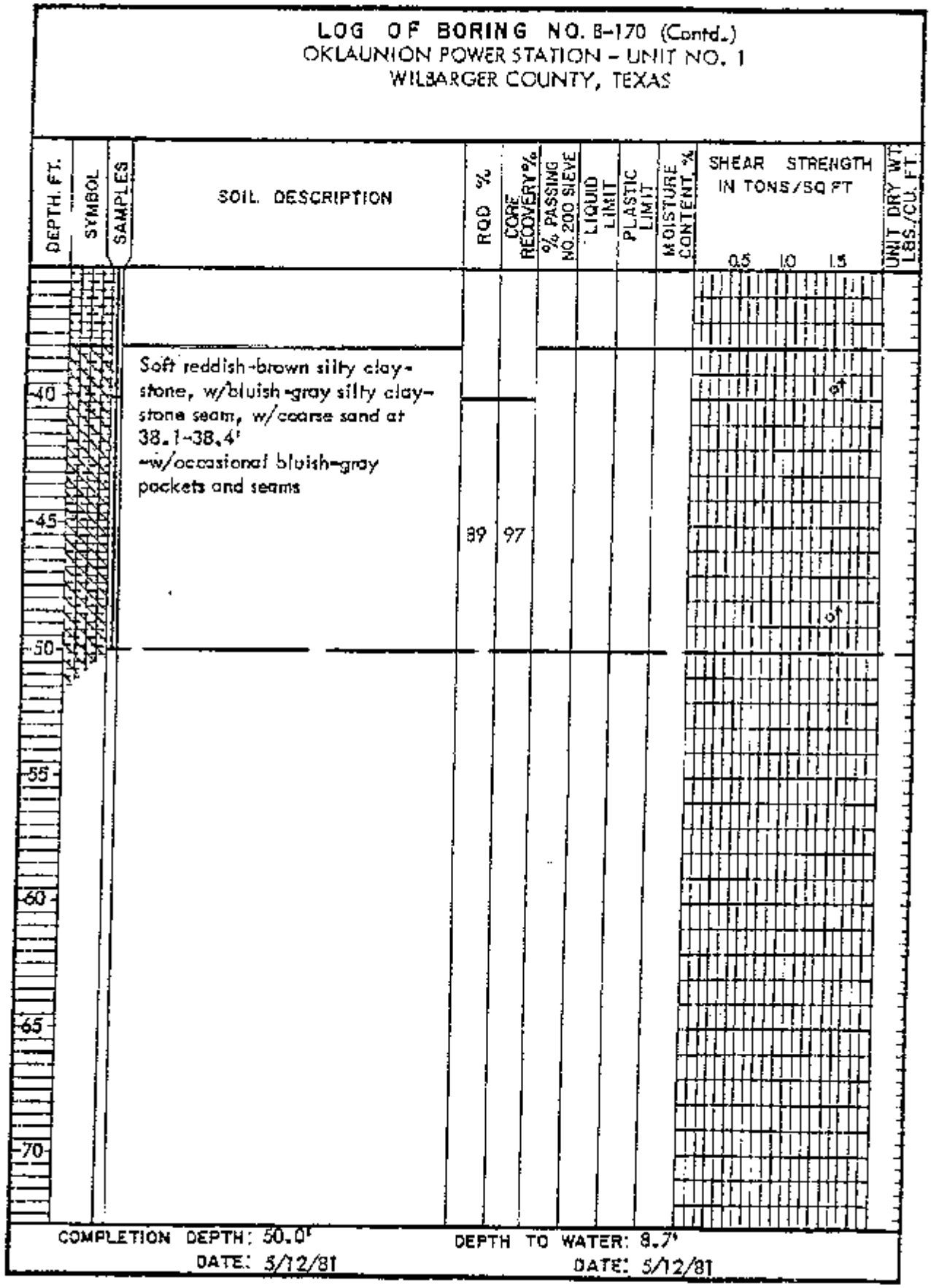
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1213.0								
			Hard brown silty clay, w/fine roots								
			-reddish-brown, w/occasional coarse sand and fine gravel, w/weathered calcareous nodules (CL)								
5					100						
			Soft reddish-brown silty clay-stone, w/numerous large bluish-gray silty claystone inclusions, w/some fine sand		100						
10			Hard reddish-brown silty clay, somewhat friable (CL)		100						
			Soft reddish-brown silty clay-stone, crossbedded, w/occasional bluish-gray silty claystone inclusions								
15			-crossbedded, w/occasional bluish-gray silty claystone laminations and very soft clay-stone and increasing silt at 14.0'		100						
20			-some fine sand		100						
			-w/numerous yellow inclusions, thick bedded, decreasing silt								
25					100						
30			-w/bluish-gray silty claystone seam at 30.1-30.4' w/coarse sand and fine gravel to 33.0'		100						
			Soft reddish-brown silty shale, w/occasional bluish-gray silty shale inclusions	85	100						
35											

(Continued)

AFS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 89

LOG OF BORING NO. B-170 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 90

LOG OF BORING NO. B-171
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1210.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard dark brown silty clay, w/weathered calcareous nodules and fine roots							qt	
			-increasing calcareous nodules at 3.0'							qt	
5			-brown and tan, w/pockets of fine sand at 5.0'		92					qt	
			-reddish-brown, w/occasional bluish-gray silty clay seams, crossbedding at 7.0' (CL)							qt	
10			Soft reddish-brown silty clay-stone, w/soft to moderately hard clayey sandstone interbeds from 7.0-12.0'		100					qt	
			-w/bluish-gray silty claystone seams, w/coarse sand at 8.9-9.1'		100					qt	
15			-crossbedded at 11.0'							qt	
			-w/some coarse sand and bluish-gray silty claystone inclusions at 15.0'							qt	
20			-decreasing silt		100					qt	
			-thin flat bedding							qt	
25			-w/bluish-gray silty claystone inclusions, crossbedded		100					qt	
30			-w/bluish-gray silty claystone seam at 30.0-31.0'		100					qt	
35										qt	

(Continued)

NFS / NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 91

LOG OF BORING NO. B-171 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT LBS./CU. FT.
40			Very soft reddish-brown clayey shale, w/occasional bluish-gray shale inclusions	58	58						
45			Soft reddish-brown silty clay-stone -w/occasional bluish-gray seams, w/coarse sand at 43.0' -w/bluish-gray silty claystone seam; w/coarse sand at 45.8-46.1'	93	95						
50											
55											
60											
65											
70											

COMPLETION DEPTH: 50.0'
DATE: 5/12/81

DEPTH TO WATER: 7.7'
DATE: 5/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 92

LOG OF BORING NO. B-172
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

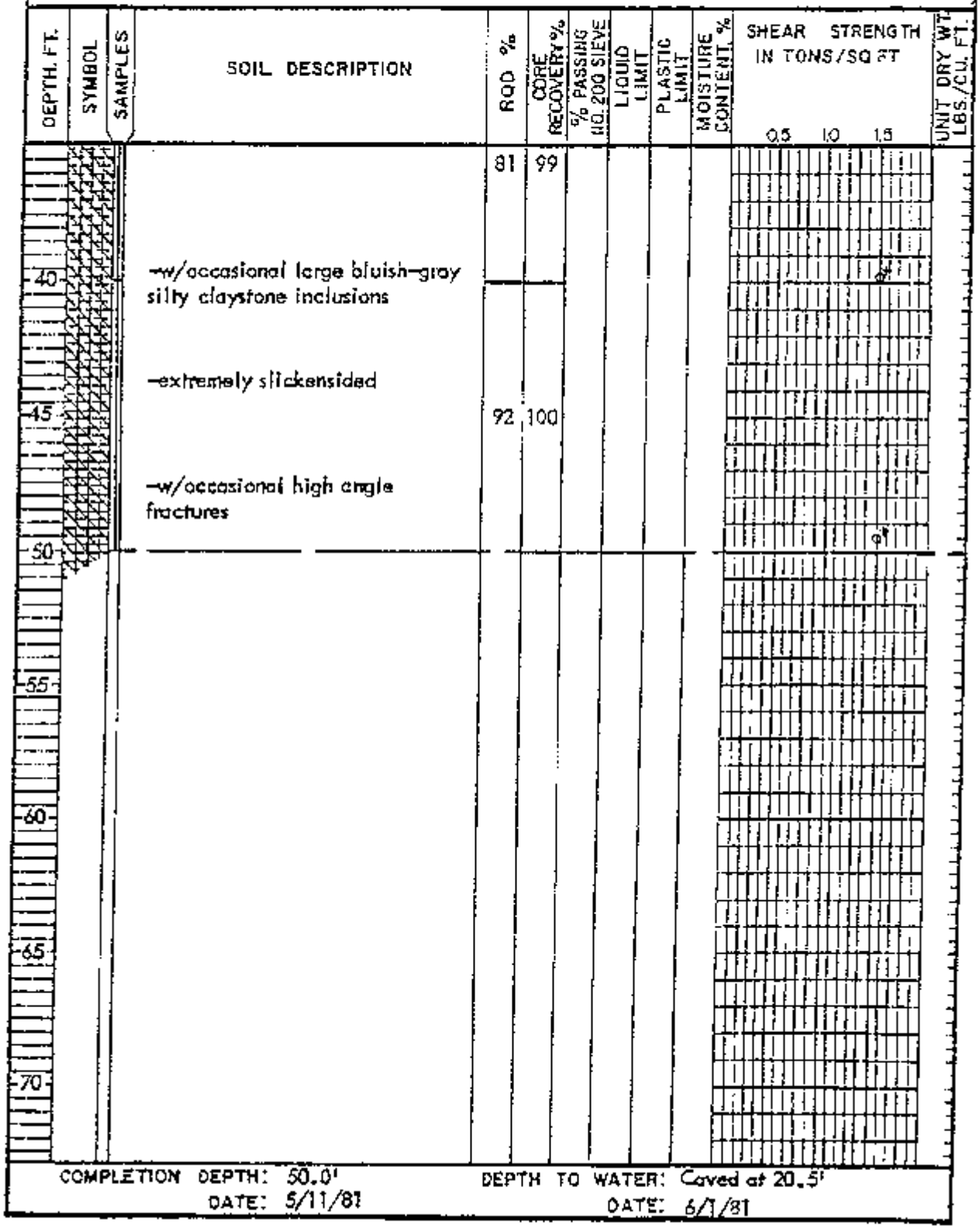
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION ELEVATION: 1207.4	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT 0.5 1.0 1.5	UNIT DRY WT LBS./CU. FT.
5			Very stiff reddish-brown silty clay, w/occasional fine gravel and organics -increasing silt and gravel at 3.0' -hard, increasing coarse sand and fine gravel, very friable -gravel seam at 5.0-6.0' (CL)		100						
10			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions -increasing silt and crossbedding		100						
15			-medium gently dipped bedding, w/moderately hard siltstone seam at 14.0-14.2' -w/occasional bluish-gray silty claystone seams and inclusions at 15.0'		100						
20			-thick bedding		100						
25			-w/numerous small bluish-gray silty claystone inclusions		100						
30			-decreasing silt -severe water loss at 30.0' -heavily fractured at 30.0-32.0'		100						
35											

(Continued)

WFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 93.

LOG OF BORING NO. B-172 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/11/81

DEPTH TO WATER: Caved at 20.5'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 94

LOG OF BORING NO. B-173
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	ROD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1203.9								
			Hard dark brown silty clay, w/calcareous and magnesium nodules and numerous fine roots (CL)								
5			Hard reddish-brown silty clay, increasing weathered calcareous nodules (CL)		100						
			Soft reddish-brown clayey siltstone, w/small bluish-gray clayey siltstone inclusions		98						
10			-slightly slickensided at 8.0'		100						
			-w/increasing claystone laminations, crossbedded at 11.0'								
			Soft reddish-brown silty claystone, w/bluish-gray silty claystone seam at 14.2-14.6'		95						
15											
20			-w/occasional bluish-gray silty claystone inclusions and seams		96						
25					100						
30			-crossbedded, w/numerous large bluish-gray silty claystone inclusions		100						
			-w/bluish-gray silty claystone seam at 33.0-33.5'								
35											

(Continued)

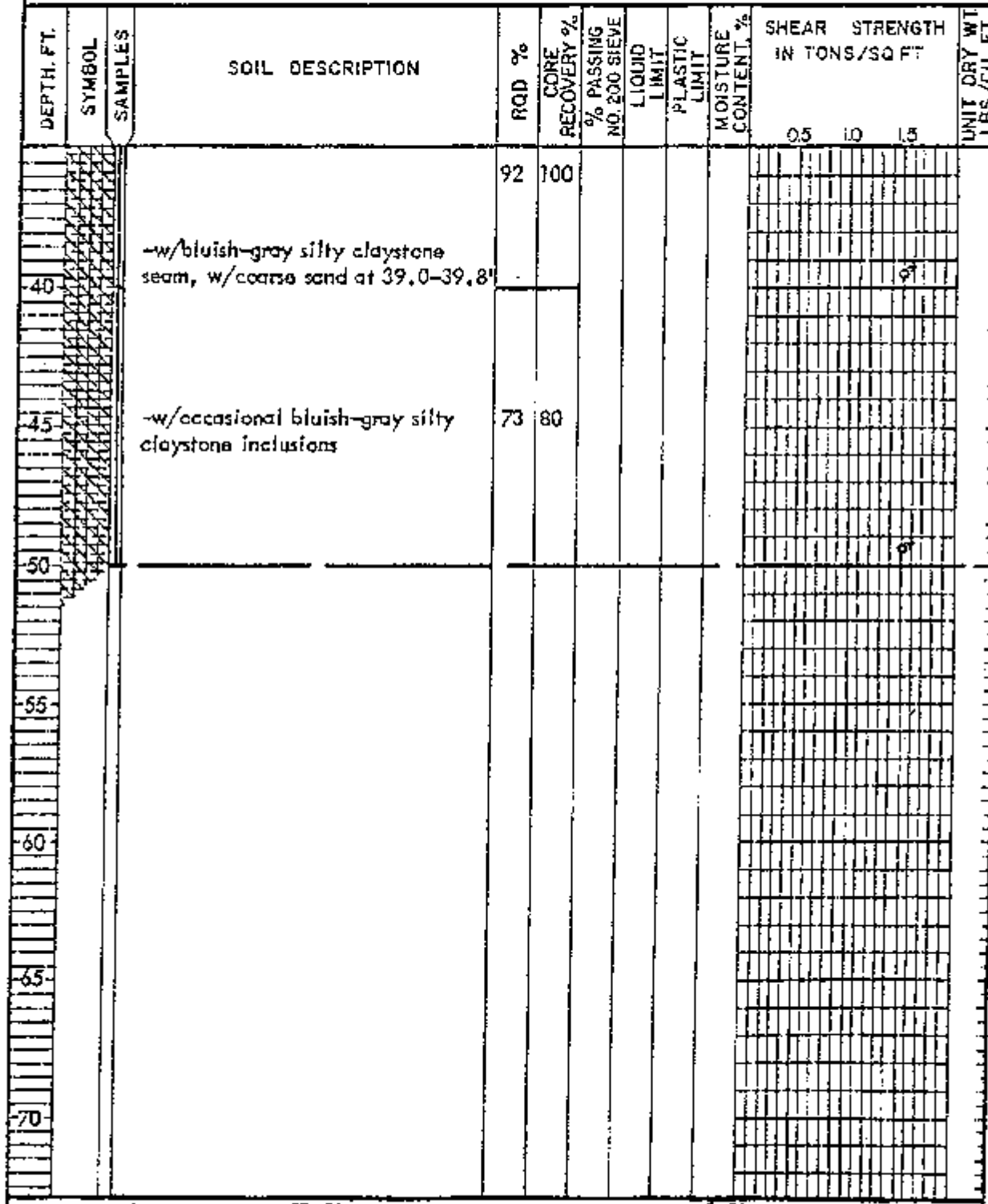
NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 95

LOG OF BORING NO. B-173 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1

WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/14/81

DEPTH TO WATER: 9.9'
DATE: 5/14/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

PLATE 96

LOG OF BORING NO. B-174

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.6

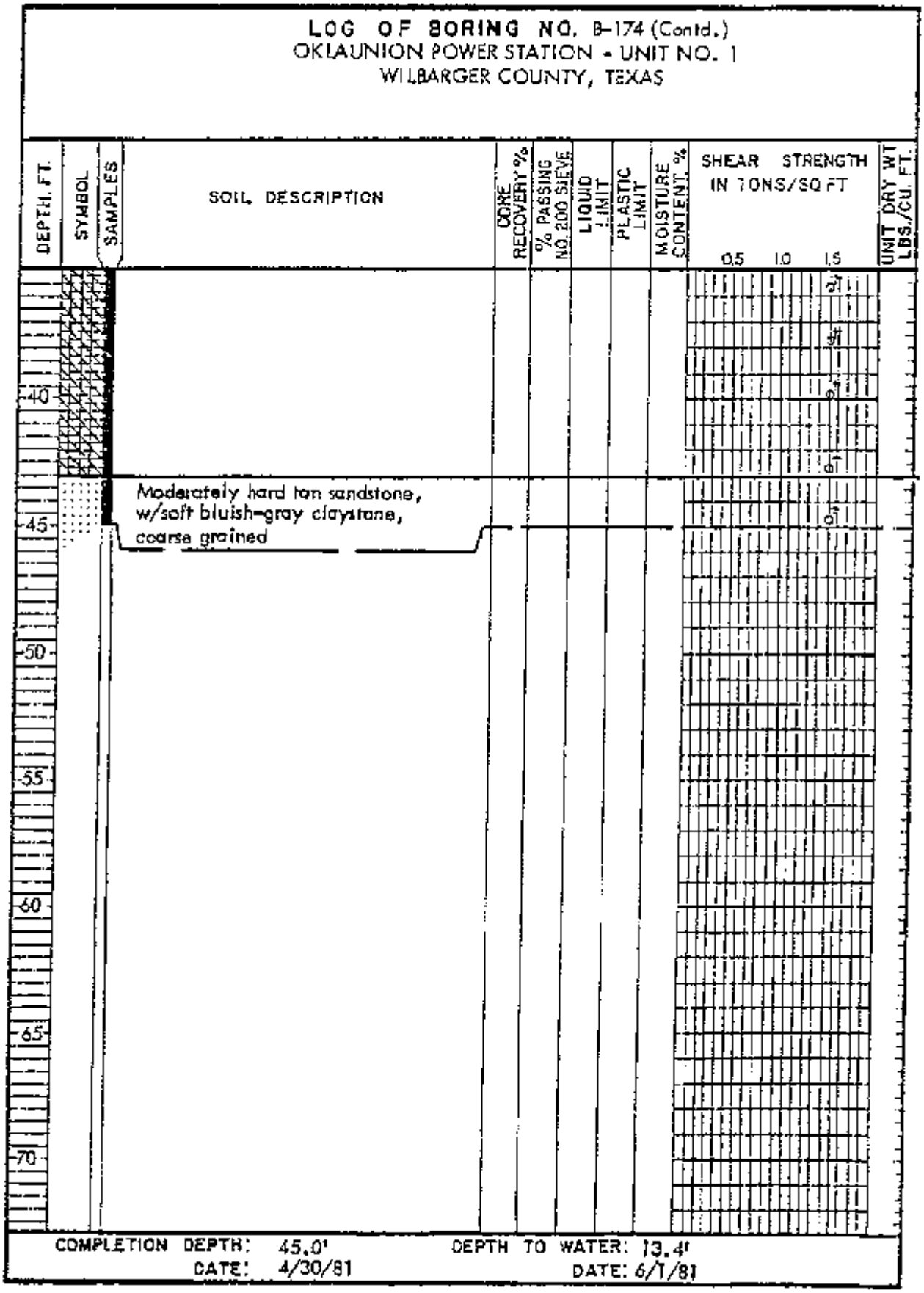
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Hard reddish-brown silty clay, w/numerous fine roots and calcareous nodules								
			-w/increasing weathered calcareous nodules at 3.0' (CL)								
5			Hard reddish-brown silty clay -w/large weathered calcareous nodules (CL)								
			Soft reddish-brown silty claystone, w/black coarse gravel seam at 8.0' w/numerous calcareous nodules, gravel pockets and occasional iron stained inclusions -decreasing silt	80						c_v=5.0x10^{-1} sq cm/sec	
10				80	50/5"	89	34	14	11		123
15											
20			-w/occasional soft bluish-gray claystone inclusions	100							
25				100	50/5"						
30											
35				100							

(Continued)

MW/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 97

LOG OF BORING NO. B-174 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 45.0'
DATE: 4/30/81

DEPTH TO WATER: 13.4'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 98

LOG OF BORING NO. B-176

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1210.9								
			Very stiff reddish-brown silty clay, w/some fine sand and calcareous nodules								
			-hard, w/fine gravel and calcareous nodules and magnesium nodules at 3.0' (CL)			96	46	17	13		
5			Soft reddish-brown silty claystone, thick bedded								
					100						
10			-w/numerous seams of bluish-gray silty claystone inclusions			97	32	16	10		
			-decreasing silt		100						
15			-crossbedded, slightly fractured and w/some fine sand								
					100						
20											
						99	30	16	9		132
25			-w/clay laminations, fissured		100						
30			-w/bluish-gray silty claystone seam at 29.5'		100						
35											

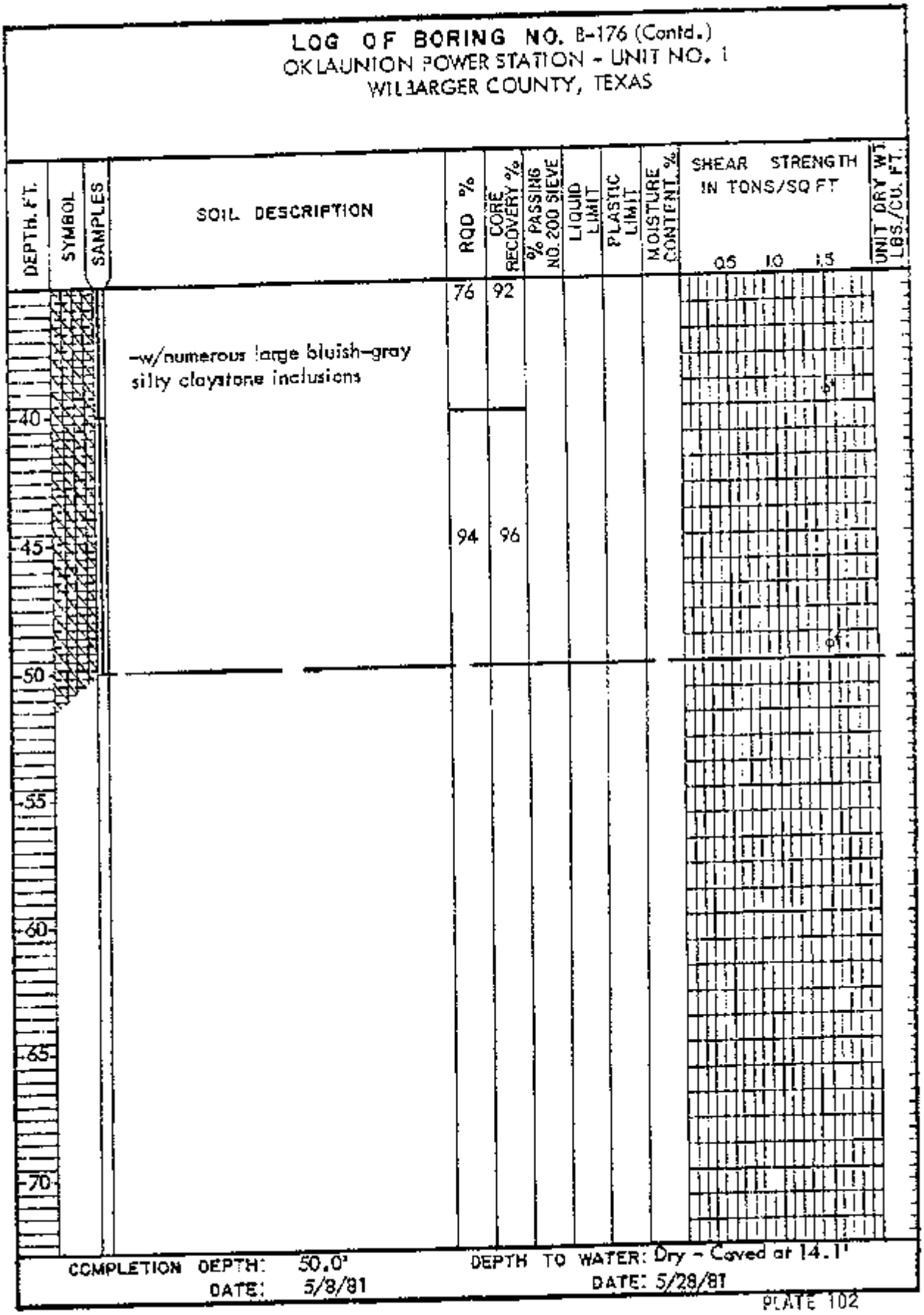
(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 101

LOG OF BORING NO. B-176 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 50.0'
DATE: 5/8/81

DEPTH TO WATER: Dry - Caved at 14.1'
DATE: 5/28/81

PLATE 102

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

LOG OF BORING NO. B-177 P

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1207.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Very stiff dark brown silty clay, w/numerous organic material (CL)								
5			Hard reddish-brown silty clay, decreasing silt, w/occasional fine gravel and roots -w/numerous weathered calcareous nodules at 4.0' (CL)	52							
10			Soft reddish-brown silty claystone, w/numerous weathered calcareous nodules -crossbedded, w/occasional soft bluish-gray silty claystone laminations and inclusions at 8.0' -thin gravel seam at 10.0'	100	50/3 seat						
15			Soft reddish-brown claystone, thick bedding, w/occasional soft bluish-gray claystone inclusions	100		100	46	18	13	$k_v = 4.5 \times 10^{-8}$ cm/sec	126
20				100							
				100		99	34	15	10	$k_v = 2.90 \times 10^{-8}$ cm/sec	134
25				100							
				80							
30				100							
				100							
35				60							

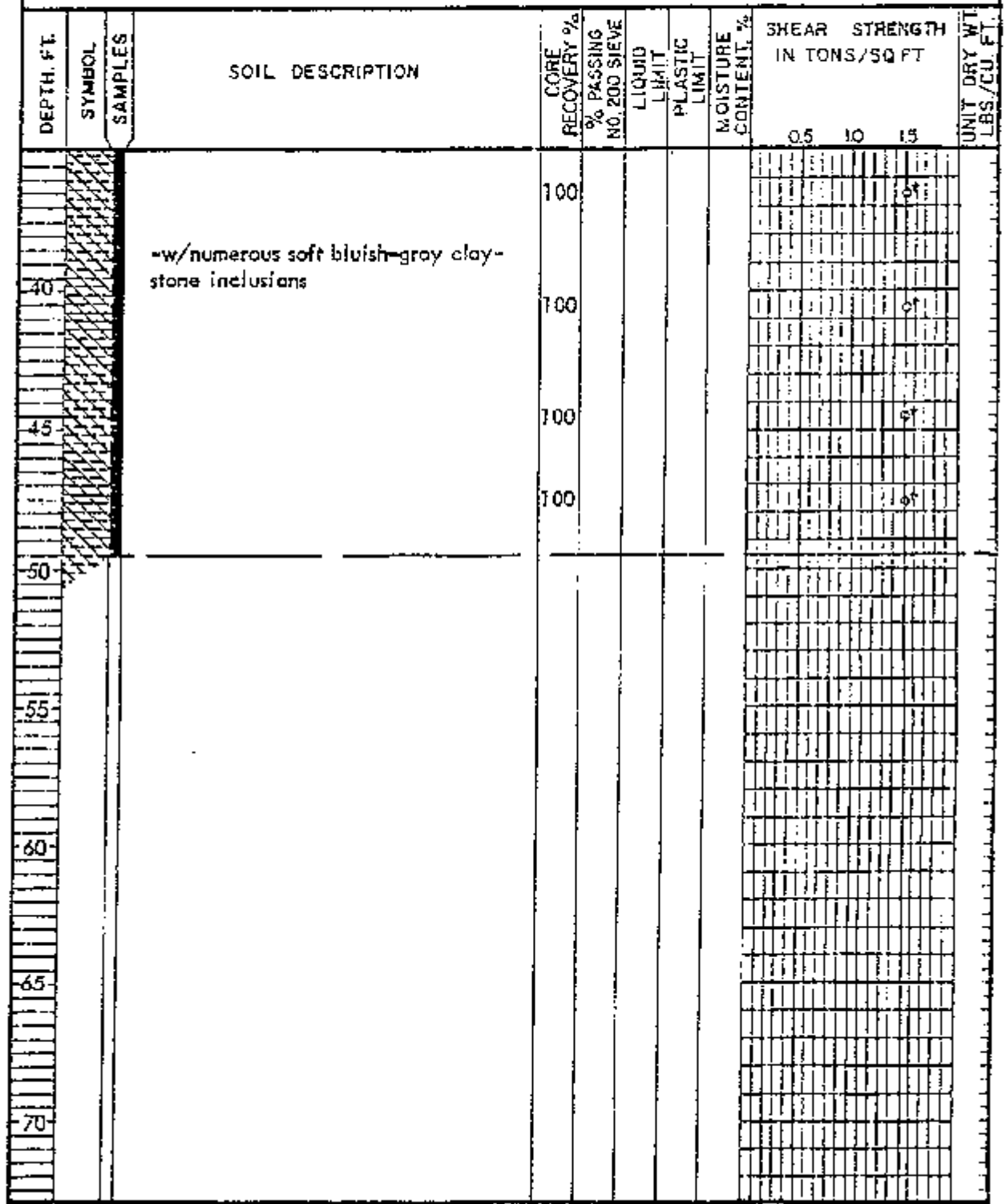
(Continued)

WES/NATIONAL SOIL SERVICES CONSULTING DIVISION

PLATE 103

LOG OF BORING NO. B-177(Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 49.5'
DATE: 4/30/81

DEPTH TO WATER: 23.6'
DATE: 6/11/81

NATIONAL SOIL SERVICES, Inc.
CONSULTING ENGINEERS

PLATE 104

LOG OF BORING NO. B-178

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1203.6								
			Very stiff brown silty clay, w/numerous fine roots and organics (CL)								
5			Hard dark brown silty clay, w/weathered calcareous nodules -reddish-brown, w/soft pockets and occasional fine gravel at 4.0' -w/occasional gravel and bluish-gray silty clay inclusions -w/some fine sand, fissured at 7.0' (CL)		100						
10			Soft reddish-brown silty claystone, thick bedding -increasing silt, crossbedded, w/some fine sand at 12.0' -thick bedded, w/magnesium flakes at 15.0' -w/bluish-gray silty claystone seam at 16.5-16.8' -decreasing silt		100						
15											
20											
25			-increasing silt -w/small bluish-gray silty claystone inclusions		100						
30			-w/occasional large bluish-gray silty claystone inclusions		100						
35			-w/numerous bluish-gray silty claystone inclusions								

(Continued)

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 105

LOG OF BORING NO. 8-178 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			-w/clayey shale seam at 38.1-38.5' -extremely slickensided at 39.0'	93	93						
45			-w/occasional bluish-gray silty claystone seams	94	94						
50											
55											
60											
65											
70											

COMPLETION DEPTH: 50.0'
DATE: 5/11/81

DEPTH TO WATER: 6/5'
DATE: 5/11/81

NATIONAL SOIL SERVICES, INC.

PLATE 106

LOG OF BORING NO. B-179

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample and Core LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.2

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
0			Very stiff dark brown silty clay, w/numerous fine roots (CL)								
5			Hard reddish-brown silty clay, w/calcareous and magnesium nodules		100						
10			-w/occasional large calcareous and magnesium nodules		100						
15			-w/numerous bluish-gray silty clay inclusions (CL)		85						
20			Soft reddish-brown silty claystone, crossbedded, w/occasional bluish-gray silty claystone inclusions		100						
25			-increasing silt		100						
30			-thick bedded		100						
35			-thin flat bedding -w/numerous large bluish-gray silty claystone inclusions								

(Continued)

NPS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 107

LOG OF BORING NO. B-179 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	RQD %	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			-w/bluish-gray silty claystone seam, w/coarse sand at 35.5-36.3' -slightly slickensided -w/occasional high angle fractures	100	100						
45			-w/occasional healed high angle fractures	100	100						
50											
55											
60											
65											
70											

COMPLETION DEPTH: 50.0'
DATE: 5/14/81

DEPTH TO WATER: 6.7'
DATE: 5/14/81

NATIONAL SOIL SERVICES, INC.

PLATE 108

LOG OF BORING NO. B-180

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1198.4								
			Hard brown clayey silt, -w/numerous calcareous nodules and fine roots								
			-w/large calcareous nodules at 3.0' (ML)			90	38	16	13		
5			Hard reddish-brown silty clay, w/numerous weathered calcareous nodules	80							
			-w/large calcareous nodules, coarse sand, and medium to coarse gravel at 6.0'								
10			-w/coarse gravel at 8.0' (CL)								
			Soft reddish-brown silty clay-stone, w/bluish-gray silty clay-stone inclusions		8/3"						
15											
				100							
20											
			-w/occasional high angle fractures								
			-w/bluish-gray clay seam at 24.5-25.5'	100							
25			Hard reddish-brown silty clay								
					8/4"						
30											
			-w/occasional bluish-gray silty clay inclusions (CL)	100							
35			Soft reddish-brown silty clay-stone, thin flat bedding								

(Continued)

NPS/NATIONAL PARK SERVICE

LOG OF BORING NO. B-180 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			-bluish-gray claystone, w/gravel at 36.0'	100						
			Hard reddish-brown silty clay (CL)	100						
40			Soft reddish-brown claystone, thick bedded	100						
			Very soft reddish-brown clayey shale, w/occasional small bluish-gray clayey shale inclusions	100						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 45.0'
DATE: 5/4/81

DEPTH TO WATER: 12.7'
DATE: 6/1/81

NATIONAL SOIL SERVICES, INC.

PLATE 110

LOG OF BORING NO. B-181
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

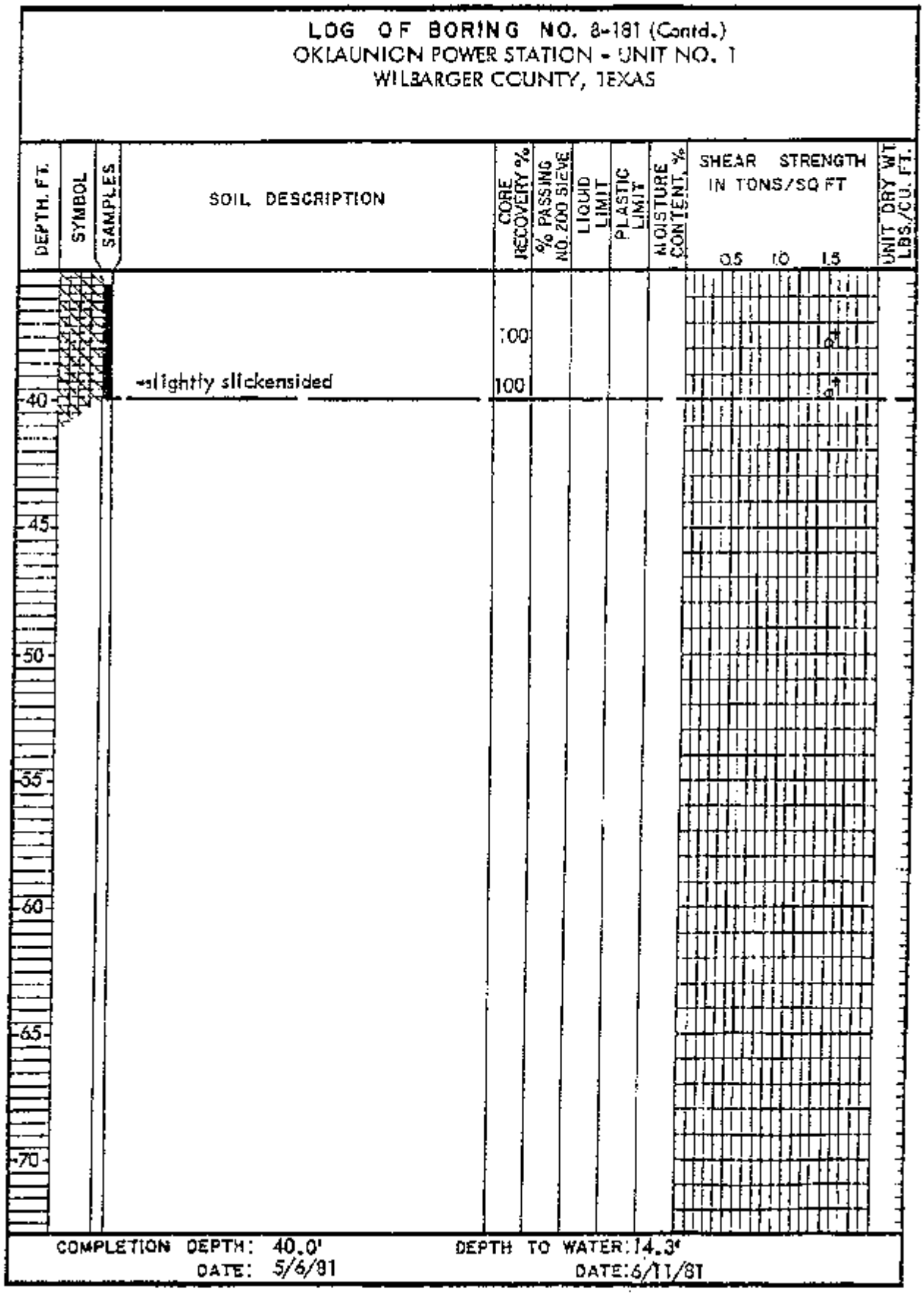
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1206.0								
			Hard dark brown silty clay, w/calcareous nodules and numerous fine roots (CL)								
5			Hard reddish-brown silty clay, w/numerous weathered calcareous pockets and black gravel (CL)								
10			Soft reddish-brown siltstone, w/thin gently dipped very soft claystone laminations -w/some coarse gravel at 8.0' -crossbedding at 8.3-8.7', w/occasional bluish-gray siltstone inclusions	80	50/4"						
15			Soft reddish-brown silty claystone, thick bedding, w/occasional bluish-gray silty claystone inclusions	100							
20				100	50/3						
25			-thin flat bedding								
30				100							
35			-w/moderately hard silty clay fragments	100							

(Continued)

SOIL/MATERIAL SOIL SERVICES CONSULTING ENGINEERS

PLATE III

LOG OF BORING NO. B-181 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



LOG OF BORING NO. B-182

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY, %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
			ELEVATION: 1203.7								
			Hard brown silty clay, w/fine roots, occasional coarse sand and weathered calcareous nodules (CL)								
5			Hard reddish-brown silty clay, w/numerous weathered calcareous nodules	100							
			-extremely friable, w/fine gravel at 5.0'								
10			-w/some fine gravel and iron nodules at 7.0'	100		99	40	20	12	K_v=1.50x10^{-8} cm/sec	127
			-w/occasional bluish-gray silty clay inclusions at 10.0'								
			-w/bluish-gray silty clay pockets (CL)		5/6" seat						
15			Soft reddish-brown silty clay-stone, thin to medium bedding, w/numerous fine roots								
20				100		84	30	15	9		135
			-continuing bluish-gray pockets		5/5" seat						
25											
30			Very soft reddish-brown clayey shale	100							
			-w/bluish-gray silty clay inclusions								
			Soft reddish-brown silty clay-stone, thick bedded								
35			-slightly slickensided	100							

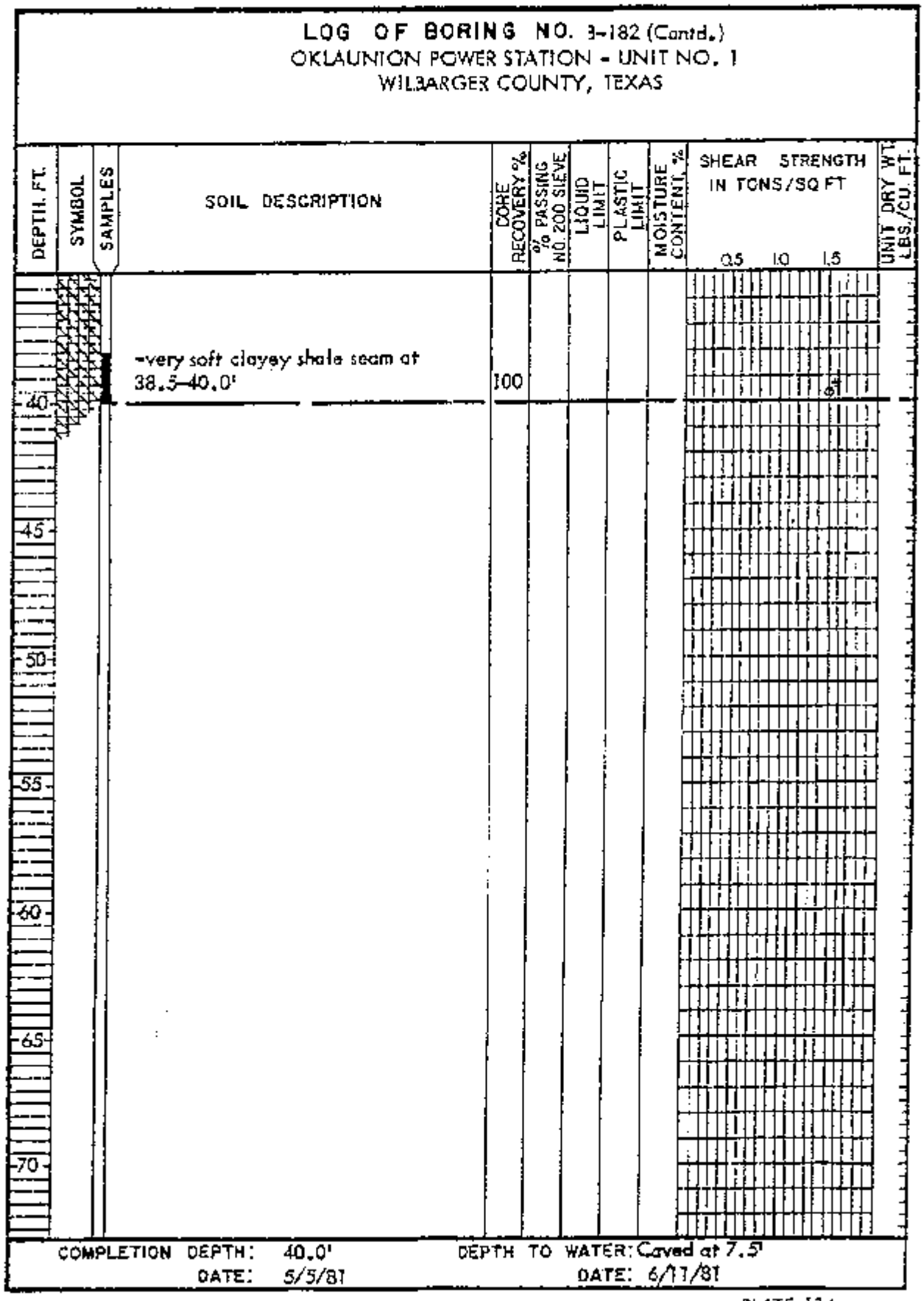
(Continued)

NPS/NATIONAL SOIL SERVICES

PLATE 112

LOG OF BORING NO. 3-182 (Contd.)

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/5/81

DEPTH TO WATER: Caved at 7.5'
DATE: 6/11/81

NATIONAL COAL SERVICES, INC.

PLATE 114

LOG OF BORING NO. B-183
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1201.9

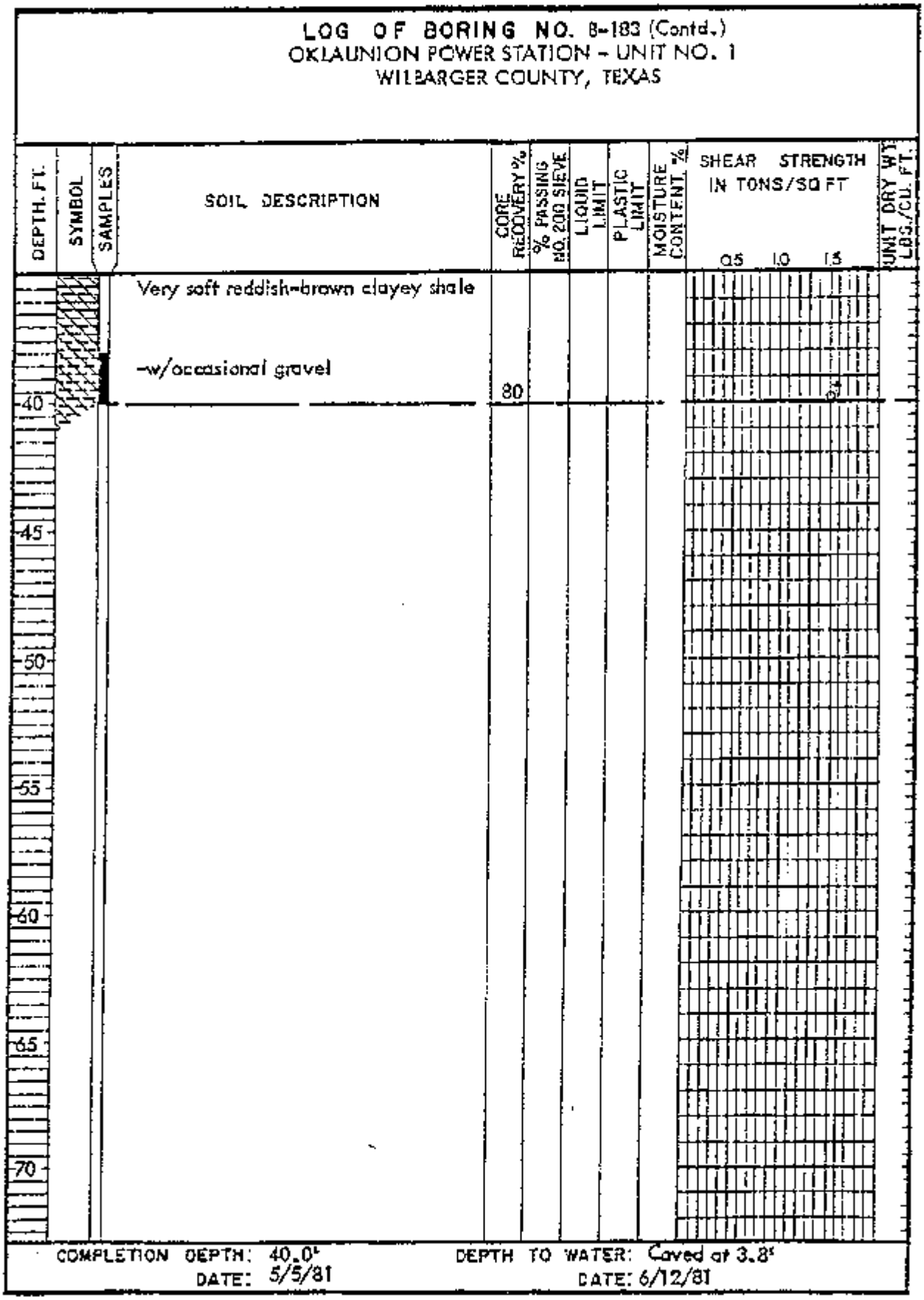
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard brown silty clay, w/weathered calcareous and iron nodules								
			-reddish-brown at 3.0'								
5			-w/occasional coarse sand and fine gravel, w/some fine roots at 4.0'	80							
			-w/fine gravel and iron stains at 6.0'	80							
			-w/occasional bluish-gray silty claystone inclusions at 8.0'	80							
10			-w/numerous fissures (CL)								
			Soft reddish-brown silty clay-stone		50/3" seat						
			-w/some sand at 13.7'	100							
15											
				100							
20											
					50/4"						
			-w/decreasing silt	100							
25			-w/occasional bluish-gray silty claystone inclusions								
			-crossbedded, w/some fine sand	100							
30											
				100							
35											

(Continued)

NES/NATIONAL SOIL SERVICES

PLATE 115

LOG OF BORING NO. B-183 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/5/81

DEPTH TO WATER: Caved at 3.8'
DATE: 6/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 116

LOG OF BORING NO. B-185
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.3

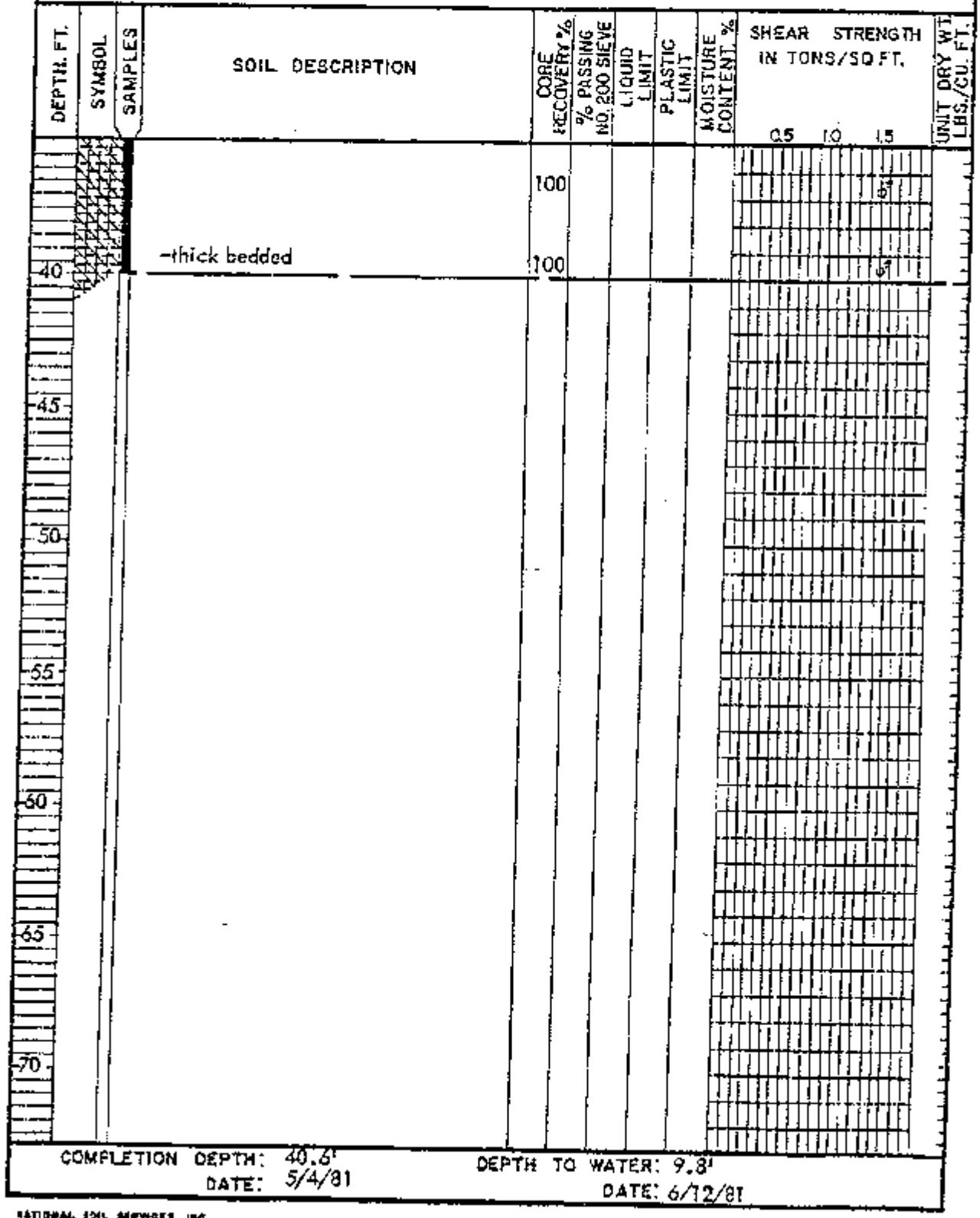
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT LBS./CU. FT.
			Hard tannish-brown clayey silt, w/numerous calcareous nodules and fine roots (ML)								
5			Hard brown silty clay, w/numerous pockets of calcareous nodules and gravel			72	39	15	11	k_v=1.20x10^{-8} cm/sec	130
			-w/numerous fine gravel at 4.0'								
			-w/numerous medium to coarse gravel and weathered calcareous nodules at 6.0' (CL)								
10			Soft reddish-brown silty clay-stone, w/occasional calcareous filled fractures								
					50/5"						
15			-w/occasional soft bluish-gray silty claystone inclusions								
			-medium bedding	100		76	30	14	10	k_v=4.36x10^{-9} cm/sec	130
20											
				100							
25											
					50/5"						
30											
35			-increasing silt, crossbedded								

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 117

LOG OF BORING NO. 8-185 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.6'
DATE: 5/4/81

DEPTH TO WATER: 9.8'
DATE: 6/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 118

LOG OF BORING NO. B-186

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1202.7

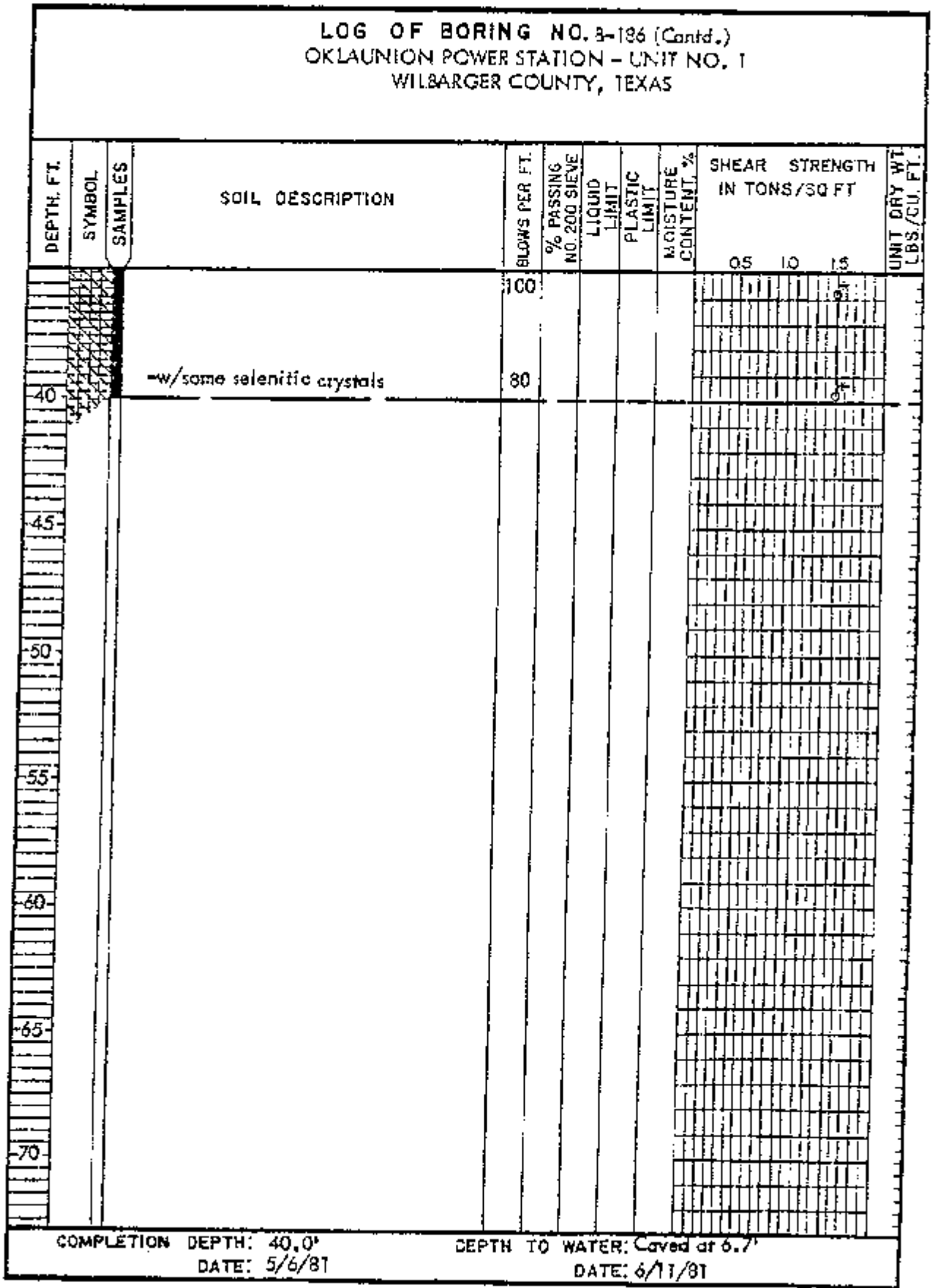
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard dark brown silty clay, w/weathered calcareous nodules (CL)								
5			Hard reddish-brown silty clay -w/numerous calcareous filled fissures and pockets at 4.0' -w/occasional calcareous nodules and coarse gravel at 6.0' -w/occasional bluish-gray silty clay inclusions	100							
10			(CL)	100	50/5"						
15			Soft reddish-brown claystone, thick bedded -w/occasional high angle fractures -w/occasional bluish-gray claystone seams and inclusions	100							
20											
25			-w/occasional high angle fractures -fine gravel seam at 26.0'	100	50/4"						
30				100							
35			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions								

(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 119

LOG OF BORING NO. B-186 (Contd.)
OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/6/81

DEPTH TO WATER: Caved at 6.7'
DATE: 6/11/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 120

LOG OF BORING NO. B-190

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1198.0

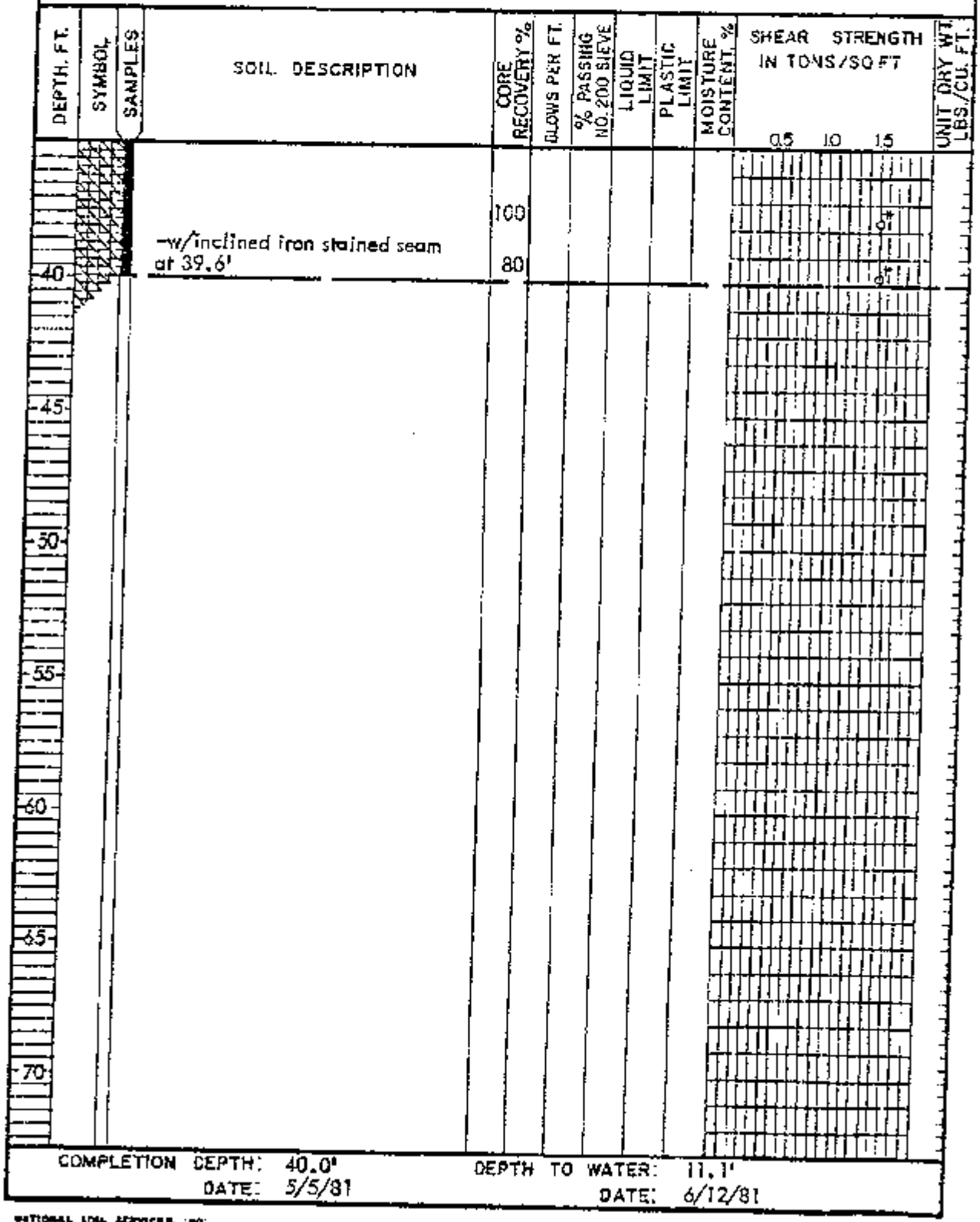
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY, %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard dark brown silty clay, w/numerous fine roots and calcareous nodules (CL)								
5			Hard reddish-brown silty clay, w/calcareous nodules								
			-w/calcareous nodules and fine gravel at 6.0'	80							
			-w/bluish-gray clay balls (CL)	80		100	35	16	10	$k_v = 4.13 \times 10^{-9}$ cm/sec	127
10			Soft reddish-brown silty clay-stone -w/clay balls	80	50/4"						
15			Very soft reddish-brown clayey shale, extremely slickensided	100		96	36	20	18	$k_v = 3.90 \times 10^{-8}$ cm/sec	116
20			Soft reddish-brown silty clay-stone, thick bedded, slightly slickensided	100	50/3"						
25			Soft reddish-brown clayey shale, slightly slickensided	100							
30			Soft reddish-brown silty clay-stone, thick bedded -w/occasional large bluish-gray silty claystone inclusions	100							
35											

(Continued)

NPS/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 121

LOG OF BORING NO. B-190 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/5/81

DEPTH TO WATER: 11.1'
DATE: 6/12/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 122

LOG OF BORING NO. B-192

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1191.4

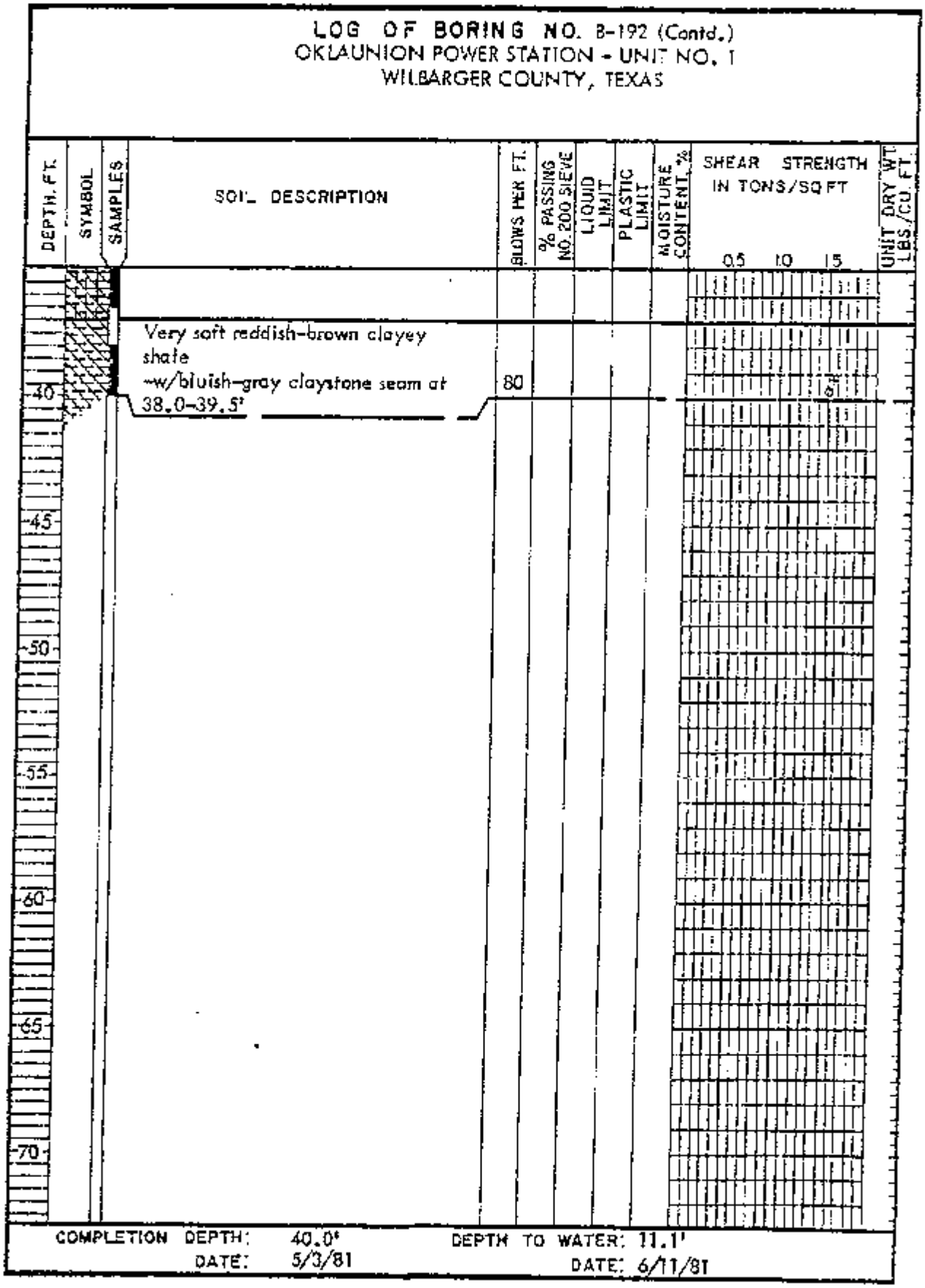
DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 1.0 1.5)	UNIT DRY WT LBS./CU. FT.
			Hard tannish-brown clayey silt, w/calcareous nodules and fine roots (ML)								
5			Hard tannish-brown silty clay -w/occasional fine roots at 4.0' -reddish-brown, w/fine to coarse gravel at 5.0' (CL)	100		62	28	14	11	K_v=1.62x10^{-8} cm/sec	116
10			Soft reddish-brown silty clay-stone, thick bedded, w/bluish-gray silty claystone seam at 7.8-8.0'	80		94	33	20	13	K_v=1.74x10^{-8} cm/sec	126
15				40	50/3"						
20			Soft bluish-gray claystone, w/numerous coarse sand and fine gravel	100							
25			Soft reddish-brown silty clay-stone, w/occasional bluish-gray silty claystone inclusions	100		96	29	17	12	K_v=5.65x10^{-8} cm/sec	128
30			-thick bedded	100	50/3"						
35				100							

(Continued)

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 123

LOG OF BORING NO. B-192 (Contd.)
OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS



COMPLETION DEPTH: 40.0'
DATE: 5/3/81

DEPTH TO WATER: 11.1'
DATE: 6/11/81

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

PLATE 124

LOG OF BORING NO. B-195

OKLAUNION POWER STATION - UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 3

ELEVATION: 1196.3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard light brown silty clay, w/fine roots and weathered calcareous nodules and some fine gravel -tan and reddish-brown, w/numerous magnesium nodules at 3.0' (CL)							
5			Soft reddish-brown silty claystone, thick bedded, w/occasional calcareous filled fissures -increasing silt and crossbedded at 6.0'	100	88	29	14	11	(3.85)	127
10			-w/bluish-gray silty claystone inclusions at 7.0' -slightly indurated at 8.0' -thick bedded at 10.0'	100						
15				40						
20			-w/decreasing silt	80						
25				80						
30			-w/bluish-gray silty claystone seam at 29.5-29.8'	80						
35										

COMPLETION DEPTH: 30.0' DEPTH TO WATER: 9.7'
DATE: 5/19/81 DATE: 6/12/81

NES/NATIONAL SOIL SERVICES CONSULTING ENGINEERS

PLATE 127

LOG OF BORING NO. B-224

OKLAUNION POWER STATION – UNIT NO. 1
WILBARGER COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: See Plan of Borings, Plate 3

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	CORE RECOVERY %	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT (0.5 / 1.0 / 1.5)	UNIT DRY WT LBS./CU. FT.
			ELEVATION: 1191.1							
5			Hard brown silty clay, w/numerous fine roots and magnesium nodules –reddish-brown, w/numerous weathered calcareous material –w/occasional magnesium and weathered calcareous nodules (CL)							
10			Soft reddish-brown silty claystone, thick bedded, w/occasional bluish-gray silty claystone inclusions	100						
15										
20										
25										
30										
35										

COMPLETION DEPTH: 10.0'
DATE: 5/18/81

DEPTH TO WATER: 3.0'
DATE: 6/23/81

WFS/NATIONAL SOIL SERVICES

PLATE 166

2009 DAM & DIKE INSPECTION REPORT
WASTEWATER POND COMPLEX

GERS-09-025

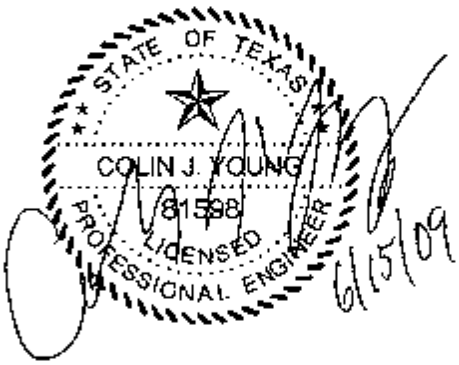
OKLAUNION POWER PLANT

AMERICAN ELECTRIC POWER
VERNON, TEXAS

PREPARED BY
URS CORPORATION
9400 AMBERGLEN BLVD.
AUSTIN, TEXAS 78717

June 2009

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as Professional Engineer is affixed below:



Colin Young
Texas License No. 81598
URS Corporation
Texas Firm No. 3162

ANNUAL DAM AND DIKE INSPECTION REPORT
OKLAUNION POWER STATION
WASTEWATER POND COMPLEX
YEAR 2009
GERS-09-025

INTRODUCTION

AEPSC (American Electric Power Service Corporation) Civil Engineering manages the Dam and Dike Inspection and Maintenance Program (DIMP) at AEP facilities. As part of DIMP, staff from the Geotechnical Engineering Section conducts dam and dike inspections annually. The 2009 inspection of the wastewater pond complex dikes at the Oklaunion Power Plant was performed by URS Corporation. Messrs Colin Young, P.E. and Lance Finnefrock were accompanied by Messrs. William Smith, P.E., and Kenneth Patton, P.E. of AEP. This report was prepared by Mr. Colin Young, P.E. and serves as a summary of the inspection and an assessment of the general conditions of the facility

Mr. Kenneth Patton, P.E. of AEP Plant Engineering Region 5, was the facility contact for the inspection. The inspection was performed on April 2, 2009. Weather conditions were very windy, with temperatures in the 50's and 60's.

General Information

The Oklaunion Power Plant is owned by American Electric Power and is located at 12567 FM Rd 3430, Vernon, TX 76384. The plant is a coal-fired facility, which features a number of wastewater evaporation ponds containing cooling tower blowdown. A few of the wastewater ponds also contain some byproducts of the coal combustion process. Earthen fill dikes retain the waste until it is sufficiently dry to be hauled away and landfilled. The plant has 11 wastewater evaporation ponds, with a total area of 335.9 acres. Two proposed evaporation ponds at the northwest corner of the site would have a total area of 54.6 acres. In addition, there is one make-up water supply pond (52.8 ac.), a coal pile runoff pond (27.3 ac.), and a wastewater/sludge pond (22.6 ac.).

SUMMARY OF VISUAL OBSERVATIONS

The summary of the visual observations presented herein uses terms to describe the general appearance or condition of an observed item, activity or structure. Their meaning is understood as follows:

Good:	A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.
Fair or satisfactory:	A condition or activity that generally meets what is minimally expected or anticipated from a design or maintenance point of view.
Poor:	A condition or activity that is generally below what is minimally expected or anticipated from a design or maintenance point of view.
Minor:	A reference to an observed item (e.g., erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance condition is below what is normal or desired, but which is not currently causing concern from a structure safety or stability point of view.
Significant:	A reference to an observed item (e.g. erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance program has neglected to improve the condition. Usually, conditions that have been identified in previous inspections, but have not been corrected.
Excessive:	A reference to an observed item (e.g., erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

Results of the visual inspection performed on April 2, 2009 are summarized below. Pond water elevation is presented in the instrumentation data section of this report. The inspection focused on the exterior western and southern dikes, as these were the only locations where dike failure could lead to uncontrolled release of impounded water off-site.

Outfall Spillway

The outfall spillway is located on the south slope of Wastewater Evaporation Pond #7, and runs adjacent to the east slope of Pond #6. Brush and trees were recently cleared from the channel area, leaving behind disturbed soil and minimal vegetative cover. Several small

trees remain in the concrete-lined spillway chute itself, situated on the south downstream slope of Pond #7.

Wastewater Evaporation Pond #6

Pond #6 is located at the south-central edge of the site. No signs of slope failure, slumping, or seepage were observed on the downstream slope. Vegetative cover on the east downstream slope of Pond #6 is very poor due to recent tree clearing. At the southwest corner of the pond, vegetative cover is also very poor and excessive erosion gullies (up to 2 feet deep) (Photographs 2-6) have developed on the downstream slope extending from the crest. Aside from the potential threat of headcutting, the crest of the dam appeared to be in good condition with no unusual deformation or misalignment.

Wastewater Evaporation Pond #7

Pond #7 is located on the southeastern corner of the site. The crest of the dam appeared to be in good condition with no unusual deformation or misalignment. No evidence of slope failure, slumping, or seepage was observed on the downstream slope (Photograph 1). Vegetative cover on the south downstream slope is fair to poor. As previously mentioned, there are trees growing in the outfall spillway on the downstream slope. Wave action has resulted in significant erosion on its upstream slope, with near vertical scarps observed a short distance above the break height of the waves.

Wastewater Evaporation Pond #8

Pond #8 is located near the western boundary of the site and adjacent to Pond #9. There were no observed signs of slope failure, slumping, or seepage on the downstream slope. Vegetative cover ranges from fair to very poor, and minor to significant erosion is widespread. Areas of excessive erosion (Photographs 11-14) are found at the northwest corner of the pond, where erosion gullies, scarps, and sloughs are present on the downstream slope. Additionally, channelization due to stormwater runoff at the north of the pond is starting to cut away at the toe of the slope, which could eventually lead to stability concerns if left unaddressed. The crest did not exhibit any unusual deformation or misalignment, but erosion rills and gullies have begun headcutting at the downstream edge of the crest.

Wastewater Evaporation Pond #9

Pond #9 is located near the southwest corner of the site and adjacent to Pond #10. No evidence of slope failure, slumping, or seepage was observed on the downstream slope. The quality of vegetative cover on the downstream slopes of Pond #9 generally ranges from fair to poor. However, the occurrence of minor to significant erosion rills and gullies was widespread on these slopes (Photograph 7), even where vegetation would be considered

acceptable. Erosion is excessive in localized areas of very poor vegetative cover, including slough (shallow slide) areas and gullies up to 1 foot deep. The crest did not exhibit any unusual deformation or misalignment, but erosion rills and gullies have begun headcutting at the downstream edge of the crest.

Wastewater Evaporation Pond #10

Most of Pond #10 is an at-grade impoundment; the southeast corner is the only location at which there is a dike. Vegetative cover on the downstream slope is generally poor, with minor erosion rills. No evidence of slope failure, slumping, or seepage was observed on the downstream slope, and the crest is in good condition

CONCLUSIONS AND RECOMMENDATIONS

There was no evidence of significant distress that would indicate immediate concern regarding the integrity of the wastewater pond dikes. As such, it is concluded that the dikes are performing as designed with respect to water retention, but not with respect to erosion control. It appears that a widespread erosion problem is negatively affecting the exterior slope of the main containment dike around ponds 6 through 10. Several items should be addressed in order to mitigate/prevent future or current progressive deficiencies. The recommendations presented below address those items as well as the continued care and routine maintenance of the facility:

1. Any erosion gullies and slough areas that are encountered should be stabilized as soon as possible. Erosion gullies and slough areas may be stabilized by re-dressing the slope and placing riprap or revegetating depending on the slope gradients and propensity for concentrated water flow.

2. The upstream erosion at Pond #7 should be mitigated as soon as possible, and can be achieved either by placing rip rap on the slope or by constructing a wall to dissipate wave energy.

3. Vegetation should be established on the bare slopes of Wastewater Evaporation Ponds # 6, 8, 9, and 10. The soils in the area are highly erosive as evidenced by the deep gullies. The U.S. Dept. of Agriculture Natural Resource Conservation Service (NRCS) office can provide suitable seed mix design for the local climate and soils

4. The earth fill slopes of the dikes should be maintained free of excessive brush and woody vegetation. It appears that AEP has been diligent in these efforts, however, it is important to establish a grass cover as soon as possible after disturbing the ground for brush cutting activities. Grassed areas should be mowed regularly to prevent the growth of woody vegetation.

5. The small trees near the toe of the outfall spillway at Pond #7 should be removed.

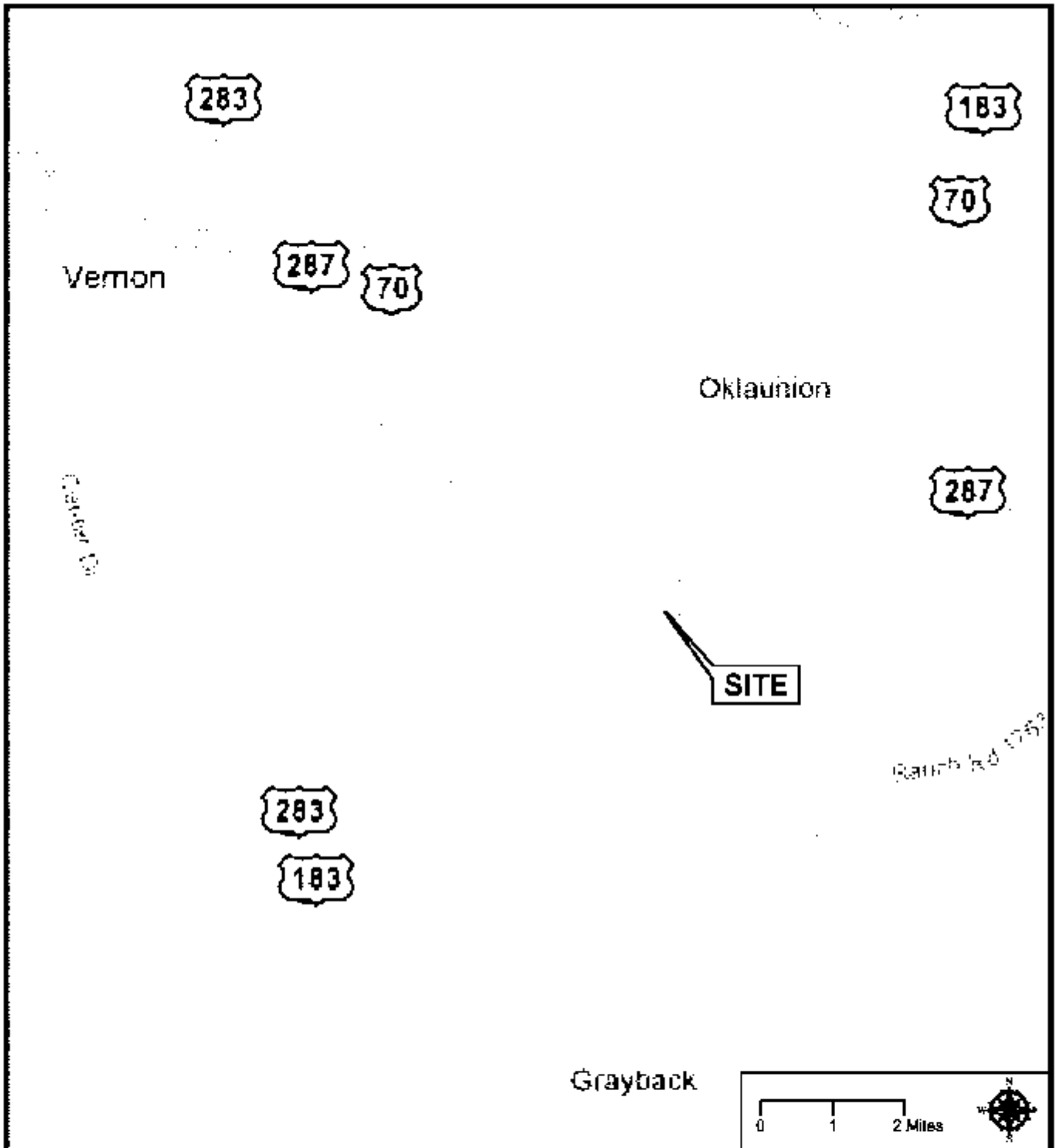
6. Monitoring procedures and maintenance activities should be implemented in coordination with the AEP Geotechnical Engineering Group.

7. If allowable under state environmental regulation, URS recommends that AEP consider utilizing some of the water that would otherwise go to evaporation ponds to irrigate the slopes of the dikes. This would promote the growth of healthy grass ground cover, thus reducing future erosion damage. If implemented, it should be done after the presently eroded areas are repaired and re-seeded.

Based on the inspection and review of relevant documents, URS Corporation believes that the Oklaunion Power Station wastewater ponds have a general satisfactory appearance and are currently in satisfactory condition. Inspections and monitoring should continue. If you have any questions with regard to this report, please do not hesitate to contact Mr. Colin J. Young, P.E. at 512.419.5903.

APPENDIX A

VICINITY MAP AND PLAN VIEW



Source: 2009 Google Maps

AEP OKLAUNION POWER PLANT
WILBARGER COUNTY, TX

URS

URS Corporation
9400 Amberglen Blvd
Austin, Texas 78729

PLANT INSPECTION
VICINITY MAP

5.07.2009	1 - 4 MILES
11X9103	3.0

GENERAL SITE PLAN

OKLAUNION POWER STATION - UNIT NO. 1

AMERICAN ELECTRIC POWER

NO	DESCRIPTION	DATE	DR	BY	APP
1	GENERAL REVISIONS	3/14/02	TDA		
2	GENERAL REVISIONS	8/31/02	TDA		
3	GENERAL REVISIONS	5/9/03	JS		
4	GENERAL REVISIONS	2/10/05	JS		
5	GENERAL REVISIONS	2/10/2005	DSW		

SCALE IN FEET

400' 0 400' 800'

SPILL HISTORY CURRENT

APPENDIX B

INSPECTION PHOTOGRAPHS

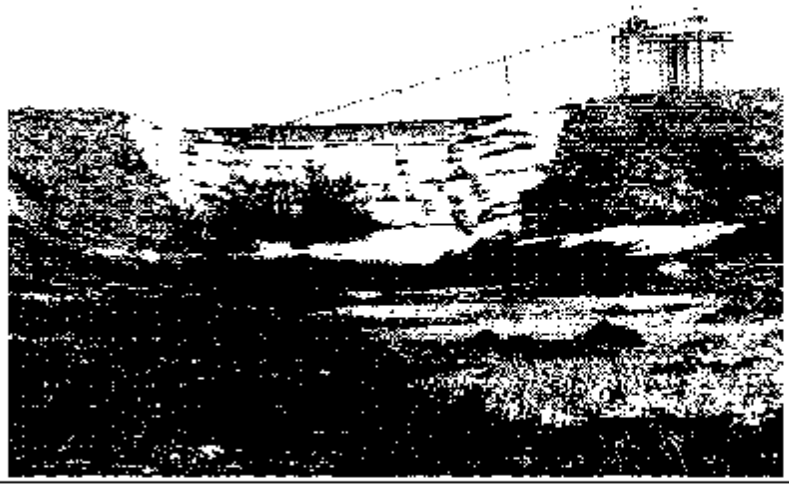
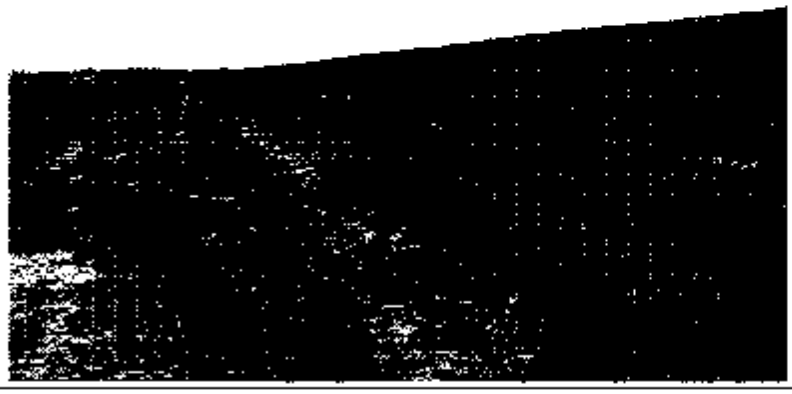
Photo # 1 Spillway on downstream side of Wastewater Evaporation Pond #7.	
Photo # 2 Erosion gullies on east downstream bank of Wastewater Evaporation Pond #6.	
Photo # 3 Toe of south embankment for Pond #6, looking west.	

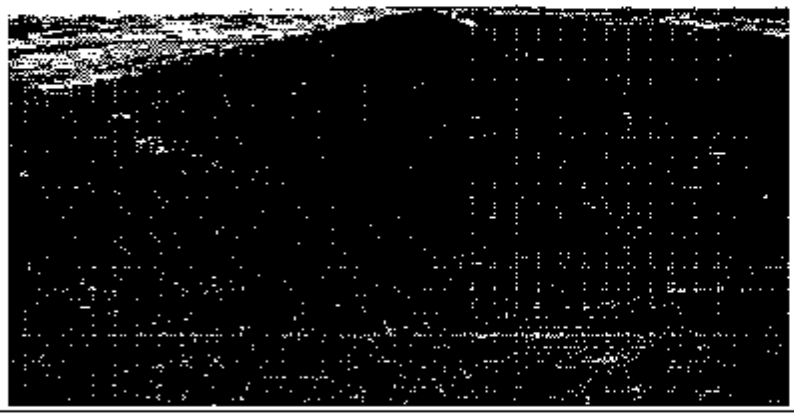
Photo # 4	
South crest and downstream slope of Pond #6, looking east.	
Photo # 5	
Erosion gullies on downstream slope at southwest corner of Pond #6.	

Photo # 6	
Close up view of erosion gullies on Pond #6.	

Photo # 7	
Downstream side of west embankment at Wastewater Evaporation Pond #9. Notice erosion gullies.	

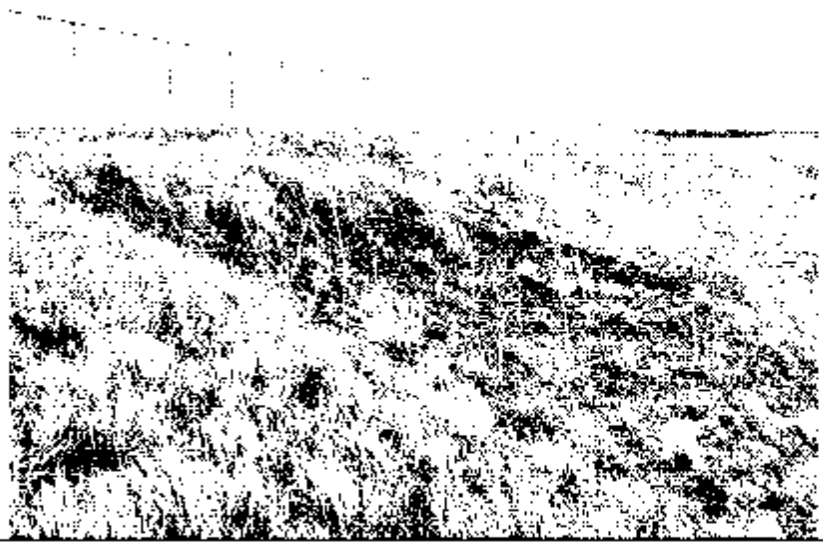
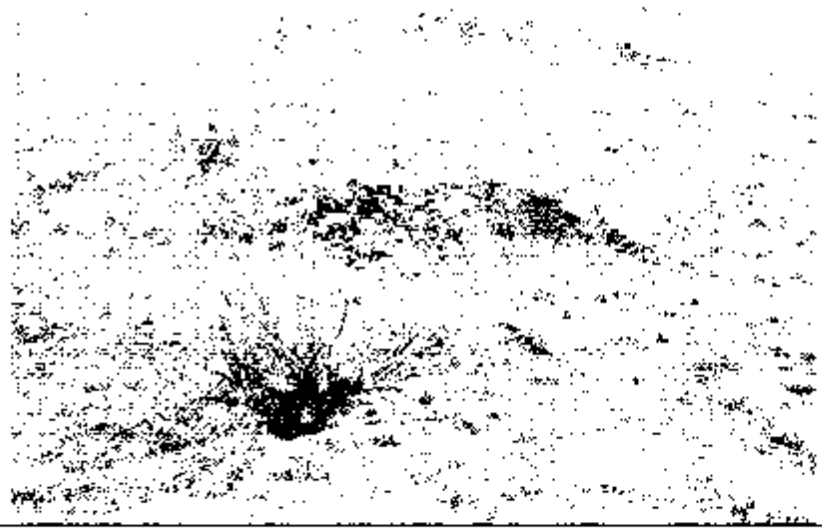
Photo # 8	
West downstream slope on southern end of Wastewater Evaporation Pond #8. Notice erosion gullies.	
Photo # 9	
Erosion scarp on west embankment at southern end of Pond #8.	

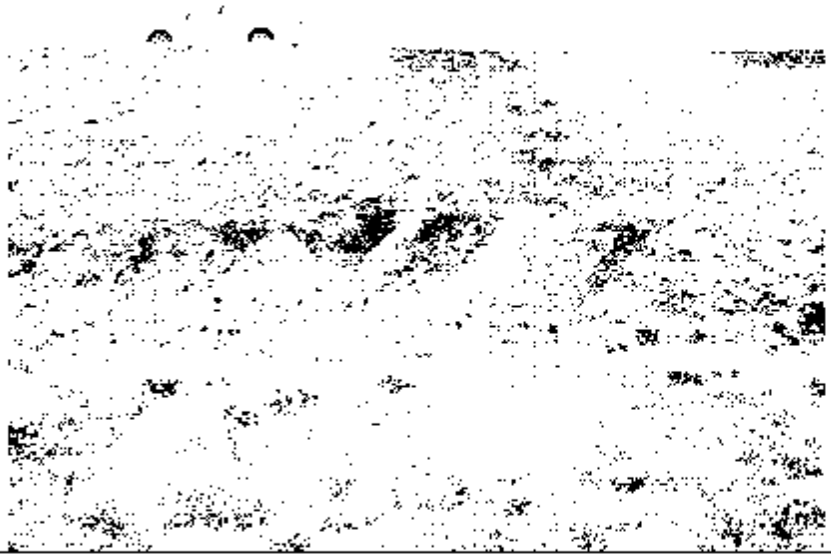
Photo # 10	
Erosion gullies on west embankment at southern end of Pond #8.	
Photo # 11	
Erosion slough on west embankment at northern end of Pond #8.	

Photo # 12	
Close up view of erosion slough on west embankment at northern end of Pond #8.	

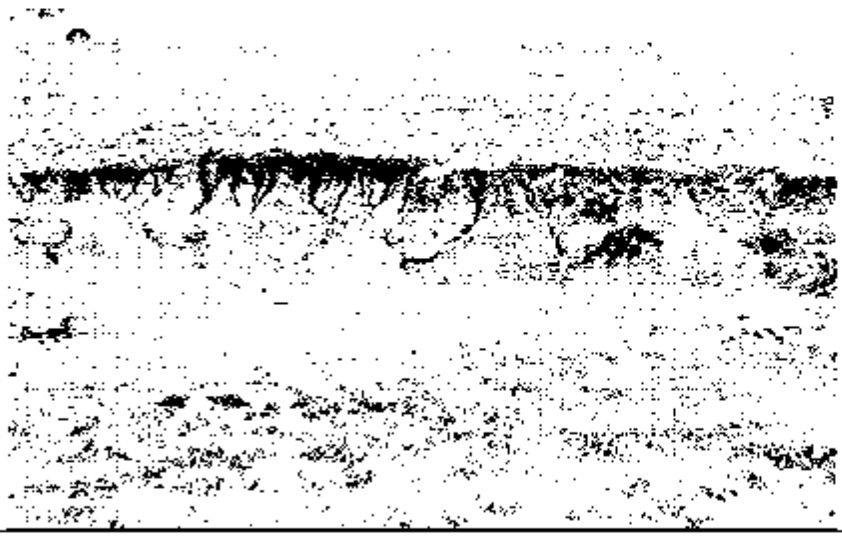
Photo # 13	
Erosion scarp on west embankment at northern end of Pond #8.	

Photo # 14	
Erosion channel at northern toe of embankment for Pond #8.	

DAM & DIKE INSPECTION REPORT

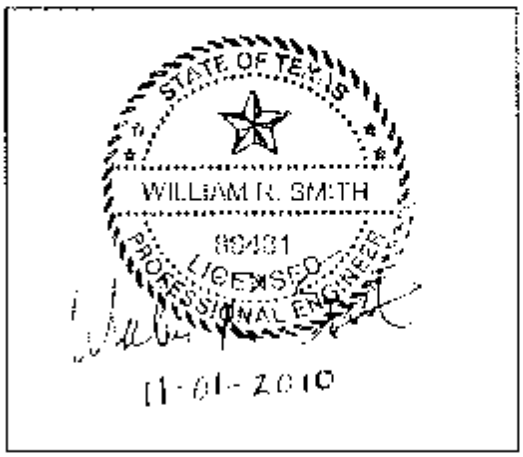
OKLAUNION POWER STATION
WASTEWATER POND COMPLEX
VERNON, TX

INSPECTION DATE August 4, 2010

PREPARED BY _____ **DATE** 11-29-2010
William R. Smith, P.E.

REVIEWED BY _____ **DATE** 11/30/2010
Gary F. Zych, P.E.

APPROVED BY _____ **DATE** 11/30/2010
Gary F. Zych, P.E.
Manager – Geotechnical Engineering



PROFESSIONAL ENGINEER
SEAL & SIGNATURE

DAM AND DIKE INSPECTION REPORT
OKLAUNION POWER STATION
WASTEWATER POND COMPLEX
YEAR 2010
GERS-10-040

INTRODUCTION

American Electric Power Service Corporation's (AEPSC) Civil Engineering Division administers the Oklaunion Power Station Dam Inspection and Maintenance Program (DIMP). As part of the DIMP, staff from the Geotechnical Engineering Services Section periodically conducts dam and dike inspections. The 2010 inspection of the wastewater pond complex dikes at Oklaunion Station was performed by Mr. William R. Smith, P.E. of AEPSC Civil Engineering. The report presents a summary of the inspection and an assessment of the condition of the facilities.

The inspection was performed on August 4, 2010. Mr. Steve Lewis, maintenance supervisor at the Oklaunion Plant, was the facility contact and provided access and coordination activities. Weather conditions were clear with good visibility, winds were from the southwest at approximately 1 to 5 mph and temperatures ranging between 90 and 95°F. Inspection observations were briefly discussed with Mr. Lewis after completion of the field work.

General Information

The Oklaunion Power Station is owned by American Electric Power and is located at 12567 FM Rd 3430, Vernon, TX 76384. The plant is a coal-fired facility, which includes a number of wastewater evaporation ponds containing cooling tower blowdown. A few of the wastewater ponds also contain some by-products of the coal combustion process.

Earth-fill dikes retain plant wastes until they are sufficiently dry to be hauled away and landfilled. The plant has 13 wastewater evaporation ponds, with a total area of 385.9 acres. In addition, there is one make-up water supply pond (52.8 ac.), a coal pile runoff pond (27.3 ac.), and a wastewater/sludge pond (22.6 ac.). A facility map and plan view are provided in Appendix A.

For reference purposes in this report, the main evaporation pond complex area refers to the group of ponds located on the south side of the plant access road. Two recently constructed diked ponds, #12 and #13, are situated north of the plant access road separately from the main evaporation pond complex area.

SUMMARY OF VISUAL OBSERVATIONS

The summary of the visual observations presented herein uses terms to describe the general appearance or condition of an observed item, activity or structure. The meaning of these terms is understood as follows:

Good:	A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.
Fair/Satisfactory:	A condition or activity that generally meets what is minimally expected or anticipated from a design or maintenance point of view.
Poor:	A condition or activity that is generally below what is minimally expected or anticipated from a design or maintenance point of view.
Minor:	A reference to an observed item (e.g. erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is normal or desired, but which is not currently causing concern from a structure safety or stability point of view.
Significant:	A reference to an observed item (e.g. erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance program has neglected to improve the condition. Usually, conditions that have been identified in previous inspections, but have not been corrected.
Excessive:	A reference to an observed item (e.g., erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

Results of the visual inspection performed on August 4, 2010, are summarized below, with inspection photographs included as Appendix B. The inspection focused on the exterior western and southern dikes, impounding the main complex area, and the dikes enclosing the newly constructed Ponds #12 and #13 as these were the only locations where dike failure could lead to uncontrolled release of impounded water off-site.

Outfall Spillway

The outfall spillway is located on the south dike of Wastewater Evaporation Pond #7, and the discharge channel runs adjacent to the east dike of Pond #6. The spillway has been

blocked by a concrete wall, approximately 4 ft. in height, built across the spillway channel at the control section.

The spillway control section is in generally in poor condition with extensive cracking of concrete elements. A general view of the spillway control section is provided in Photo 1 and a closer view showing the extensive cracking of the concrete is shown in Photo 2, taken in March 2010. The shore protection revetment of stacked, sand-cement mix paper bags, shown in Photo 1, was added in front of the spillway control section and extending along the shoreline beyond the spillway in both the left and right directions in 2009. This revetment was added to provide wave erosion protection and to replace the front portion of the control section that had previously been undermined from wave erosion and broken off as shown in Photo 3, taken in May 2008.

The spillway discharge channel was in generally fair condition. All brush and trees noted in the downstream channel during the 2009 inspection had been cleared. However, the channel bed was barren of a protective grass cover because of the recent clearing as depicted in Photo 4.

Wastewater Evaporation Pond #1

Pond #1 is located at the northwest corner of the main evaporation pond complex area. The upstream slope of this embankment was under construction, being relined with a compacted clay and HDPE composite liner system, at the time of inspection. As a consequence, the crest and upstream slope were not observed.

The downstream slope was in generally fair condition. There were no observed signs of slope failure, slumping, or seepage on the slope. Vegetative cover was well-established but about 2 feet in height precluding a thorough inspection of the slope. Significant erosion from stormwater runoff was observed to have cut the toe of the slope along the entire slope. This is shown in Photo 5. This could eventually lead to stability concerns if left unaddressed.

Wastewater Evaporation Pond #6

Pond #6 is located at the south-central edge of the main evaporation pond complex area. The upstream slope has been buried with solid waste materials to the crest and is not visible as shown in Photos 6 and 7. The crest of the dam appeared to be in good condition with no unusual cracking, rutting, settlement, deformation, or misalignment. Photos 6 and 7 provide views of the crest.

The downstream slope was in overall fair condition. No signs of slope failure, slumping, or seepage were observed on the downstream slope. However, vegetative cover on the downstream (east and south) slopes of Pond #6 was in fair to poor condition at the time of inspection. The slopes had been seeded with native, perennial grasses in March 2010, shown in Photo 8, but the vegetation at the time of inspection consisted of dead grasses and live weeds 2 to 3 feet in height as shown in Photos 9 and 10. No erosion gullies, as

observed during the 2009 inspection, were noted on the downstream slopes; however, the excessively high vegetation made observation of the entire slope very difficult.

Wastewater Evaporation Pond #7

Pond #7 is located on the southeast corner of the main evaporation pond complex area. The upstream slope was in generally fair to poor condition. As noted in the Outfall Spillway section of this report, shore protection revetment in the form of stacked, sand-cement mix paper bags was added in front of the spillway control section that extends along the shoreline beyond the spillway in both the left and right directions as shown in Photo 1. This revetment was added to replace the failed front section of the spillway control section and to provide wave erosion protection for the upstream slope in the area. The stacked-bag revetment itself was in good condition and is providing shore protection within the armored area. However, the soil shoreline immediately beyond each end of the revetment was significantly eroded with embankment material sloughing as shown in Photos 11 through 13. The slope area above the revetment was very sparsely vegetated or barren and had many erosion rills developing as shown in Photo 13.

The downstream slope was in generally fair condition. No evidence of erosion, slope failure, slumping, or seepage was observed on the slope. However, vegetative cover on the slope was 2 to 3 feet in height and sparse in some areas at the time of inspection as shown in Photos 14 and 15. The crest of the dam appeared to be in good condition with no unusual cracking, rutting, settlement, deformation, or misalignment.

Wastewater Evaporation Pond #8

Pond #8 is located near the western boundary of the main evaporation pond complex area, adjacent to and immediately north of Pond #9. The upstream slope of this embankment is covered with a high-density polyethylene (HDPE) liner and was not directly observable. No undulations, bulges, depressions, or undue stresses on the liner were observed. The crest of the embankment appeared to be in fair condition with no unusual cracking, settlement, deformation, or misalignment. However, at this location the crest has no surface cover of gravel to provide protection from rutting due to vehicular traffic and there is very little, if any, access to the area by vehicle during inclement weather conditions because of the slippery road surface.

The downstream slope was in generally fair condition. There were no observed signs of slope failure, slumping, or seepage on the slope. Vegetative cover ranged from fair to poor with very similar features along the central and southern portions of the slope as those noted for the downstream slope at Pond #6 (recent seeding but dead emergent grasses and live weeds 2 to 3 feet in height). A typical view of the southern portion of the slope is provided in Photo 16. Along the northern portion of the slope, erosion rills have begun to develop in a sparsely vegetated area as shown in Photo 17. An area of significant erosion at the toe of the slope due to stormwater runoff was observed at the northern end of the pond as shown in Photo 18. This could eventually lead to stability concerns if left unaddressed.

Wastewater Evaporation Pond #9

Pond #9 is located near the southwest corner of the main evaporation pond complex area, adjacent to and immediately north of Pond #10. The upstream slope of this embankment is covered with an HDPE liner and was not directly observable. No undulations, bulges, depressions, or undue stresses on the liner were observed. The crest of the embankment appeared to be in fair condition with no unusual cracking, rutting, settlement, deformation, or misalignment. However, at this location the crest has no surface cover of gravel to provide protection from rutting due to vehicular traffic and there is very little, if any, access to the area by vehicle during inclement weather conditions because of the slippery road surface.

The downstream slope was in generally fair condition. There were no observed signs of seepage on the slope. Vegetative cover ranged from fair to poor with very similar features as those noted for the downstream slopes at Ponds #6 and #8 (recent seeding but dead emergent grasses and live weeds 2 to 3 feet in height). A typical view of the slope is provided in Photo 19. One area of sparse vegetation and incipient slumping was noted at the northern end of the slope near the southern border of adjacent Pond #8. This area is depicted in Photo 20.

Wastewater Evaporation Pond #10

Pond #10 is located at the southwest corner of the main evaporation pond complex area. The upstream slope of this embankment is covered with an HDPE liner and was not directly observable. No undulations, bulges, depressions, or undue stresses on the liner were observed. The crest of the embankment appeared to be in fair condition with no unusual cracking, rutting, settlement, deformation, or misalignment. However, at this location the crest has no surface cover of gravel to provide protection from rutting due to vehicular traffic and there is very little, if any, access to the area by vehicle during inclement weather conditions because of the slippery road surface. A view of the crest from the southwest corner of the pond, looking north is provided in Photo 21.

The downstream slope was in generally fair condition. No evidence of erosion, slope failure, slumping, or seepage was observed on the slope. Vegetative cover ranged from fair to poor with very similar features as those noted for the downstream slopes at Ponds #6, #8, and #9 (recent seeding but dead emergent grasses and live weeds 2 to 3 feet in height). A typical view of the slope is provided in Photo 22.

Wastewater Evaporation Pond #12

Pond #12 is situated north of the plant access road at a location separate from the main evaporation pond complex area. The pond was constructed during the latter part of 2009. The upstream slope of this embankment is covered with an HDPE liner and was not directly observable. No undulations, bulges, depressions, or undue stresses on the liner

were observed. The crest of the embankment appeared to be in good condition with no unusual cracking, rutting, settlement, deformation, or misalignment.

The downstream slope was in generally fair condition. No evidence of erosion, slope failure, slumping, or seepage was observed on the slope. Vegetative cover ranged from fair to poor. A view of the south downstream slope, with the vegetation in fair condition, is provided as Photo 23. A view of the north downstream slope and crest, with the vegetation on the slope in poor condition, is provided as Photo 24.

Wastewater Evaporation Pond #13

Pond #13 is situated north of the plant access road at a location separate from the main evaporation pond complex area. The pond was constructed in 2010 with construction complete prior to the date of inspection. The upstream slope of this embankment is covered with an HDPE liner and was not directly observable. No undulations, bulges, depressions, or undue stresses on the liner were observed. The crest of the embankment appeared to be in good condition with no unusual cracking, rutting, settlement, deformation, or misalignment. A view of the crest, in good condition, is provided as Photo 25.

The downstream slope was in generally good condition. No evidence of erosion, slope failure, slumping, or seepage was observed on the slope. Vegetative cover was generally good with some minor areas of sparse vegetation. Vegetation height was about 4 to 5 inches. A view of the south downstream slope is provided as Photo 26.

CONCLUSIONS AND RECOMMENDATIONS

Based on the visual observations during the dike inspection at Oklaunion Station, the dikes containing the main evaporation pond complex area and Pond #12 are generally in fair condition, and the dikes containing Pond #13 are in good condition. A summary of our conclusions and recommendations for general maintenance and continued monitoring, as well as any recommendations for remedial activities, is provided as follows.

There was no evidence of significant distress that would indicate immediate concern regarding the integrity of the wastewater pond dikes. As such, it is concluded that the dikes are performing as designed. There were significant areas where the establishment and control of vegetation has been somewhat problematic, but the widespread erosion problems over exterior slope of the main containment dike around ponds 6 through 10 noted in the 2009 report had been addressed through an extensive program of regrading and seeding with native perennial grasses. Recent communication with the plant, since the date of inspection, indicates that areas where dead grasses were observed during the inspection are re-emerging with native grass species that were in the original seed mix, and that the dead grasses referred to in this report were from a species in the mix that was

used to establish a quick first-year cover that was stressed by the dry conditions prior to the inspection.

Recommendations for General Maintenance and Monitoring Activities

- Any erosion gullies and slough areas that are encountered should be stabilized as soon as possible. Erosion gullies and slough areas may be stabilized by re-dressing the slope and placing riprap or revegetating depending on the slope gradients and propensity for concentrated water flow.

- The earth fill slopes of the dikes should be maintained free of excessive brush and woody vegetation. It is important to establish a grass cover as soon as possible after disturbing the ground for brush cutting activities.

- Grassed areas should be mowed regularly. Mowing at least twice per year and maintaining vegetation height at a maximum of 6 to 8 inches is recommended. High vegetation obstructs visual observations during inspection, encourages burrowing animal activity, and thins the ground cover by decreasing vegetation stem density and encouraging the growth of annual grasses and other invasive weeds. Any areas that are not accessible to mowing equipment should be controlled by the use of weed trimmers, power brush-cutters, or other suitable vegetation control processes.

- Any animal burrows on the dikes should be filled with an impervious material or cementious grout, dressed with topsoil, and regraded followed by seeding any disturbed ground with native grasses to establish a complete ground cover for erosion protection.

- Monitoring procedures, maintenance activities, and reporting should be implemented in coordination with AEP Civil Engineering.

Recommendations for Specific Remedial Activities

- Shore protection beyond the ends of the revetment around the spillway at Wastewater Pond #7 should be added to prevent further erosion of the dike at these two locations. Extension of the revetment is not recommended since this would likely transfer the problem to the ends of the new revetment. We recommend regrading to a uniform slope and installing riprap shore protection over a geotextile or gravel filter layer.

- An engineering analysis should be performed to verify that the blocking of the spillway at Wastewater Pond #7 will not cause the dikes to be overtopped during a severe storm if this has not been performed.

- The discharge channel at the spillway at Wastewater Pond #7 should be seeded with native, non-invasive perennial grasses for the entire length where it is

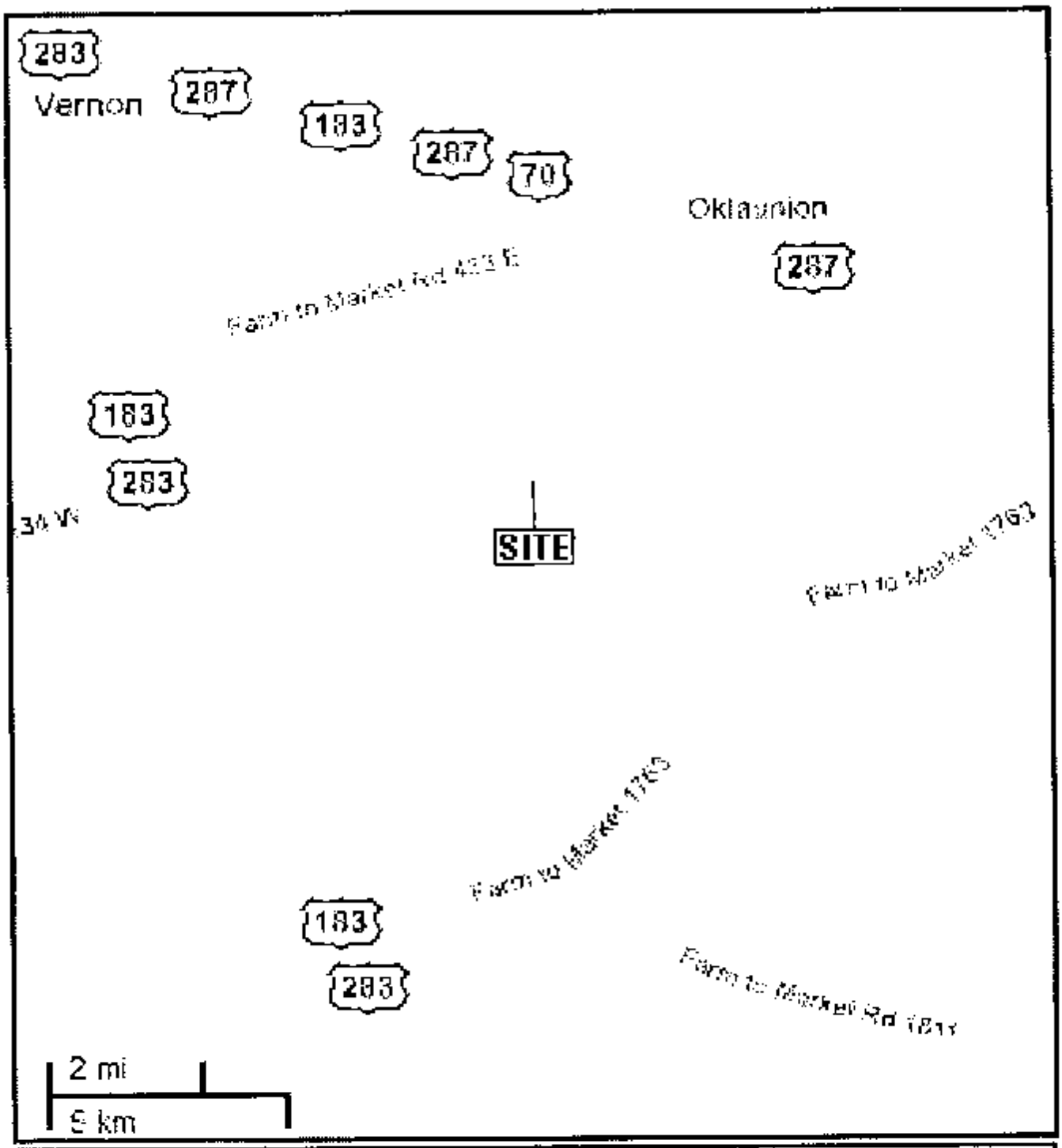
adjacent to the east dike of Wastewater Pond #7 to suppress the growth of woody vegetation, invasive weeds and annual grasses. The barren upstream slope at Pond #7, extending about 250 feet left of the spillway where the embankment meets natural ground and about 150 feet to the right of the spillway, should be regraded and similarly seeded to prevent further development of erosion rills.

- Erosional features identified in this report, specifically the cutting away at the toes of the slopes at Ponds #1 and #8, and the incipient slumping at the north end of Pond #9 should be regraded to a uniform slope, with any eroded material replaced with suitable compacted fill, and seeded with native, non-invasive perennial grasses to suppress the growth of woody vegetation, invasive weeds and annual grasses.

If you have any questions with regard to this report, please do not hesitate to contact Mr. William R. Smith, P.E. at 614-716-2906 (Audinet: 200-2906) or Gary Zych, P.E. at 614-716-2917 (Audinet: 200-2917).

APPENDIX A

VICINITY MAP AND PLAN VIEW

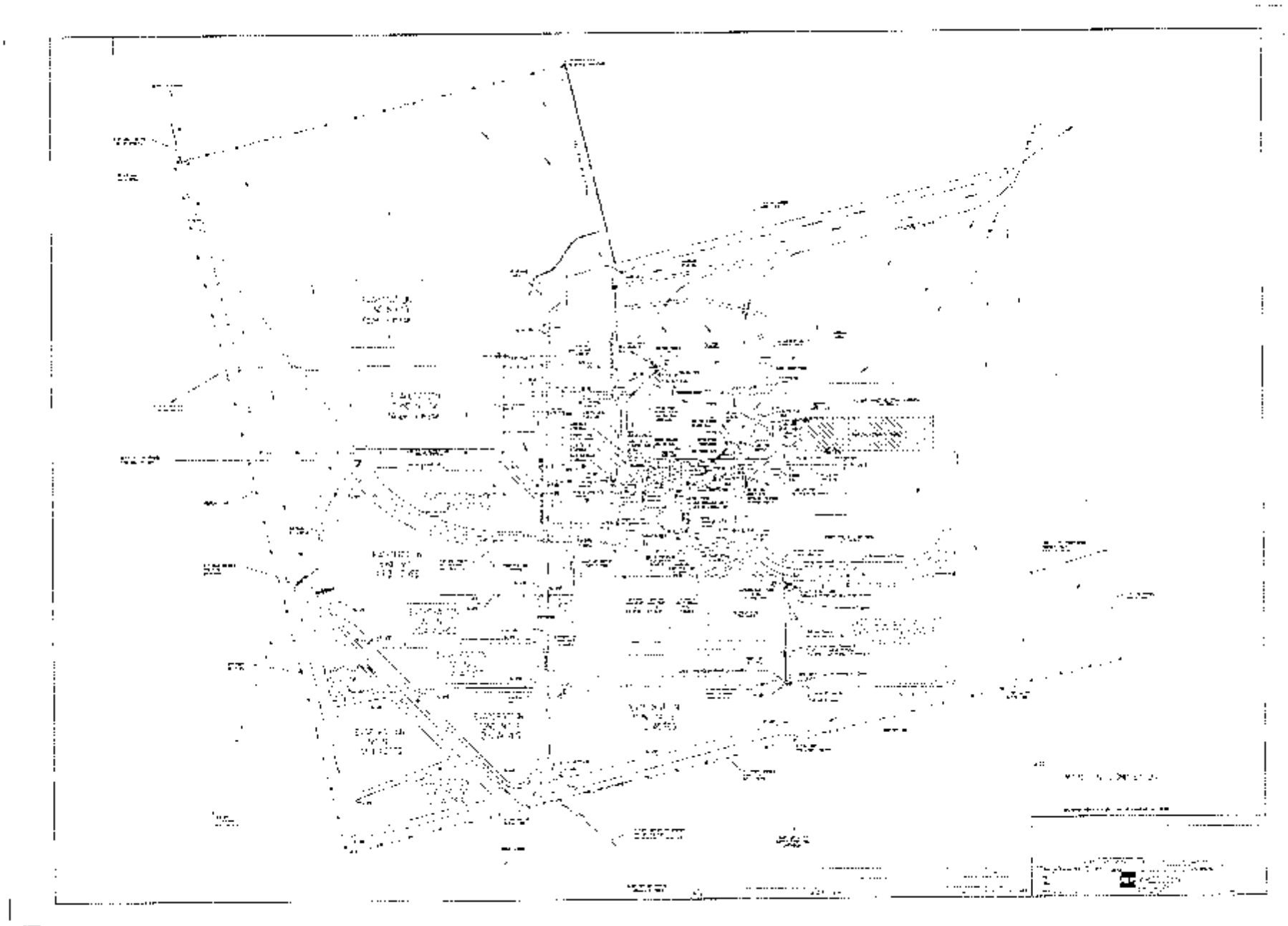


©2010 Gongle – Map data ©2010 Google

AEP OKLAUNION POWER PLANT
WILBARGER COUNTY, TX

PLANT INSPECTION VICINITY MAP

DATE: 10/25/2010

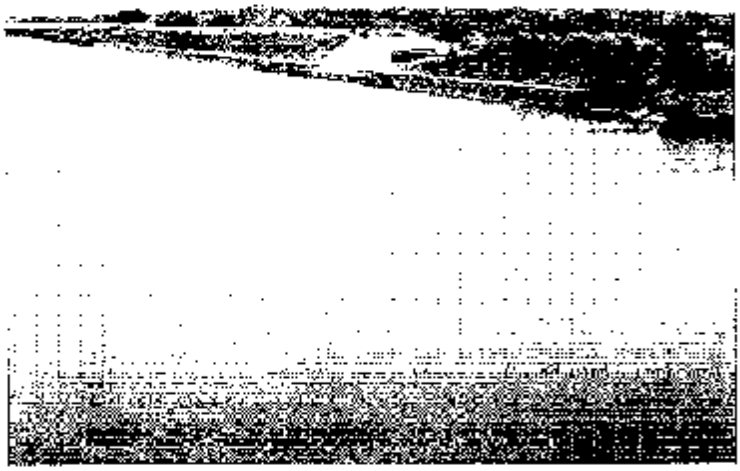


APPENDIX B

INSPECTION PHOTOGRAPHS

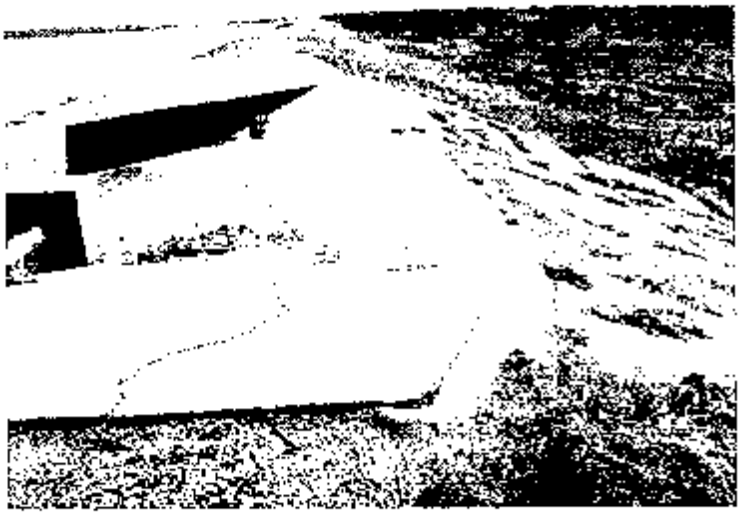
APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

Photo 1



General view of Pond #7 spillway area showing the control section blocked by a concrete wall and recently installed shore protection revetment, in front, in good condition but erosion progressing beyond revetment.

Photo 2



Pond #7 photo taken in March 2010 showing spillway control section in generally poor condition with extensively cracked concrete elements. The concrete wall blocking potential flow through the spillway is at the left in the photo.

Photo 3

Pond #7 photo taken in May 2008 showing failed front of spillway control section that was replaced in 2009 with the revetment shown in Photo 1.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

Photo 4

The discharge channel downstream of the spillway was cleared of woody vegetation and brush. However, the channel was barren.

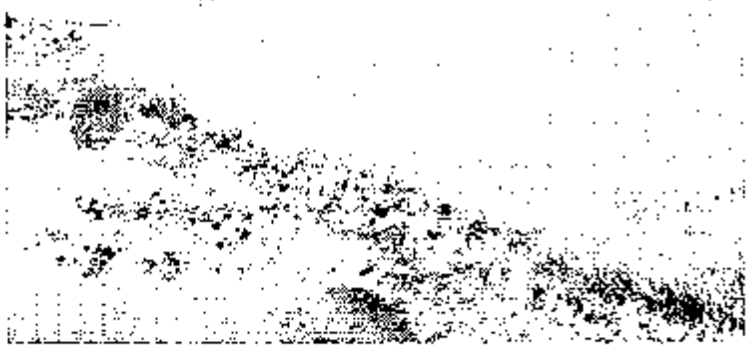


Photo 5

Typical view of downstream slope at Pond #1 looking north. Note significant erosion cutting along the toe of the slope.

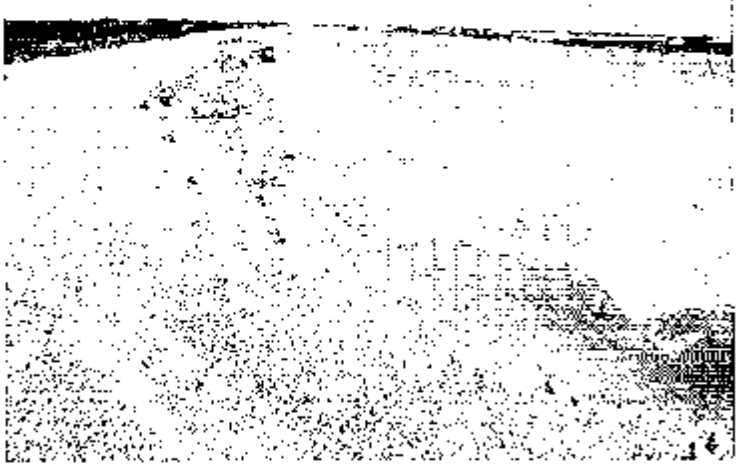


Photo 6

Crest and buried upstream slope of Pond #6 looking west from near the southeast corner of the pond.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

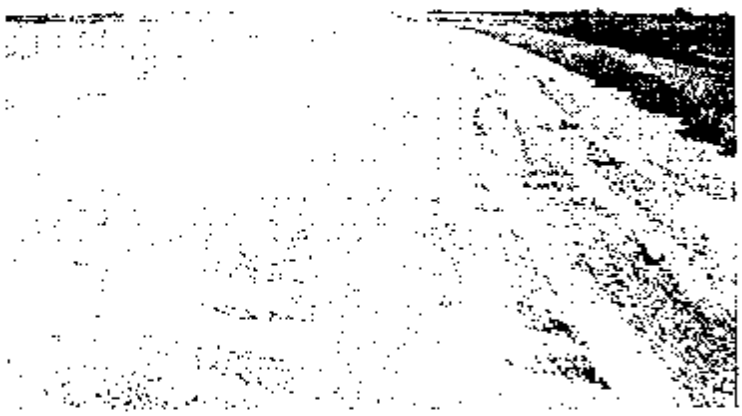


Photo 7

Crest and buried upstream slope of Pond #6 looking east from near the southwest corner of the pond.

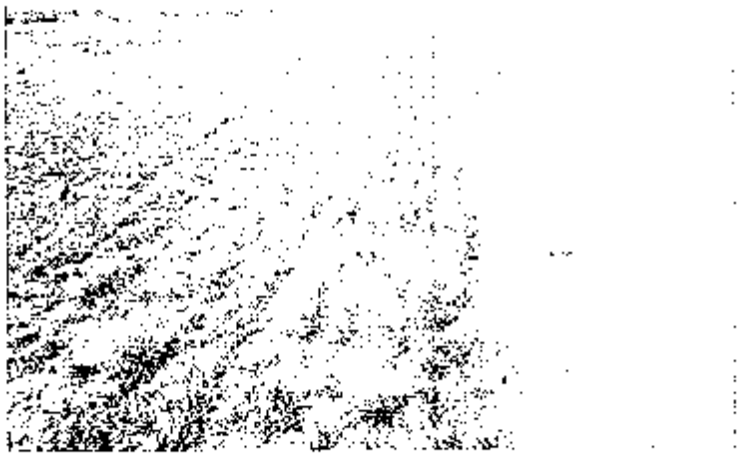


Photo 8

Downstream slope of east dike at Pond #6 in March 2010 seeded with native, perennial grasses.

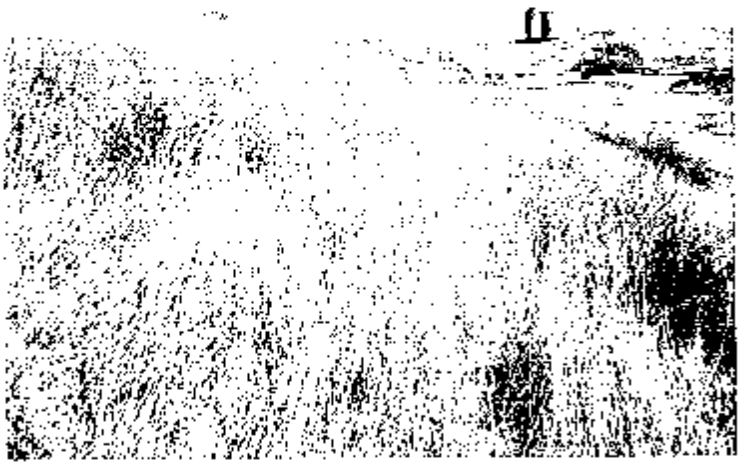


Photo 9

Downstream slope of east dike at Pond #6 at time of inspection with vegetative cover of dead grasses and live weeds 2 to 3 feet in height.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

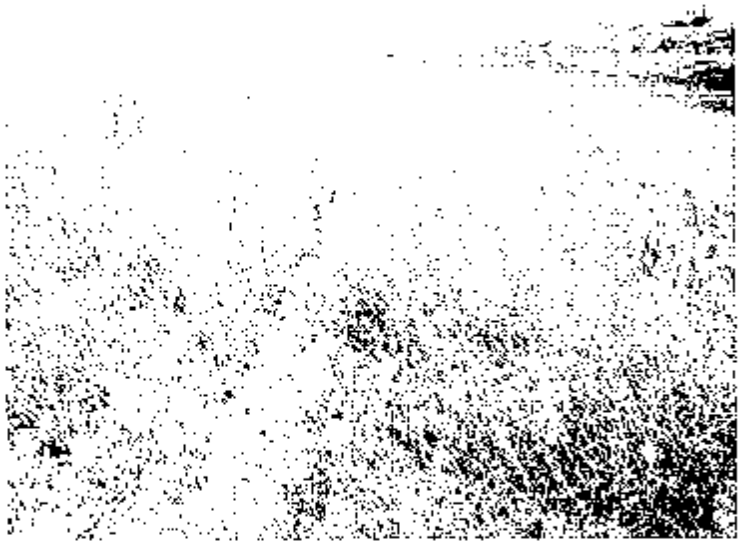


Photo 10

Downstream slope of south dike at Pond #6 at time of inspection with vegetative cover of dead grasses and live weeds 2 to 3 feet in height. The biodegradable cord from recent seed matting installation is visible in the photo foreground.

Photo 11

Pond #7 upstream slope at spillway area with significant erosion progressing around the western end of the shore protection revetment. The western end of the revetment is at the bottom right in the photo.

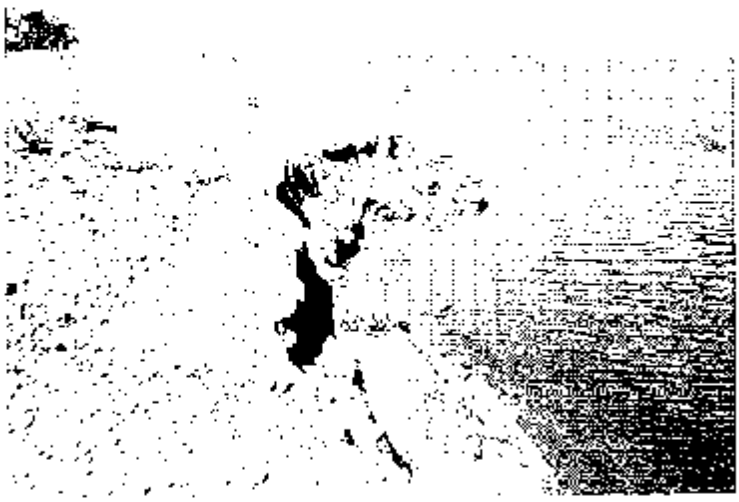


Photo 12

Pond #7 upstream slope immediately east of the revetment-reinforced spillway area, looking west, with significant wave erosion progression and barren slope.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

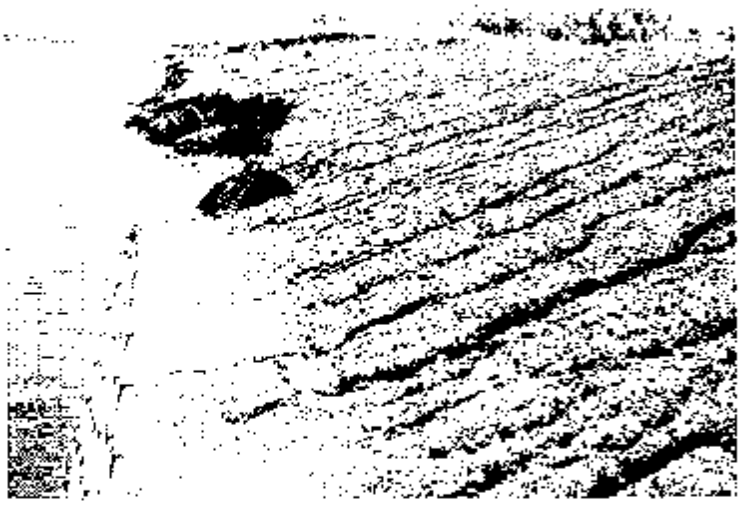


Photo 13

Pond #7 upstream slope area above the east end of the shore protection revetment around the spillway, looking east, with many erosion rills forming on the barren ground and embankment erosion beyond the end of the revetment (opposite view from Photo 12).

Photo 14

Downstream slope at Pond #7 with grass cover at 2 to 3 feet in height over most of the slope and some sparsely vegetated areas with a cover of broomweed and other native weedy vegetation.

Photo 15

Downstream slope at Pond #7 near spillway discharge channel with grass cover at 2 to 3 feet in height and sparsely vegetated areas with a cover of broomweed and other native weedy vegetation.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

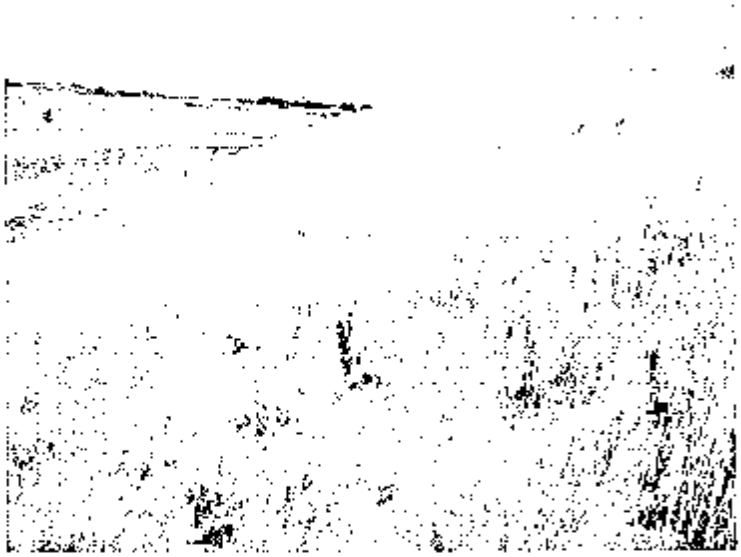


Photo 16

Southern portion of downstream slope at Pond #8 with vegetative cover of dead grasses and live weeds 2 to 3 feet in height.

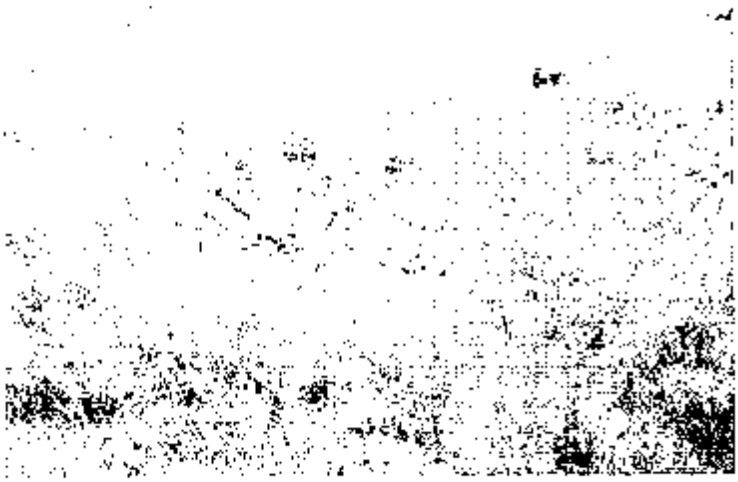


Photo 17

Northern portion of downstream slope at Pond #8 with development of erosion rills at a barren area.

Photo 18

Significant erosion cutting at the toe of the north end of the downstream slope at Pond #8.

APPENDIX B
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

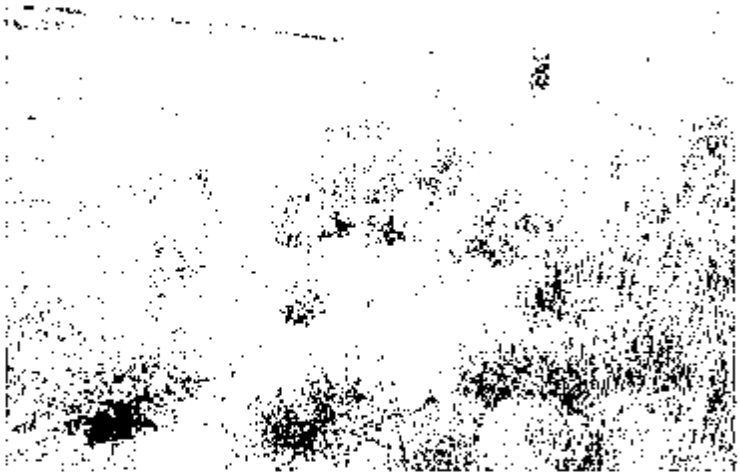


Photo 19

Downstream slope of west dike at Pond #9 with vegetative cover of dead grasses and live weeds 2 to 3 feet in height along with some sparsely vegetated areas.

Photo 20

Sparsely vegetated area with incipient slumping at the north end of the western dike at Pond #9, looking north.

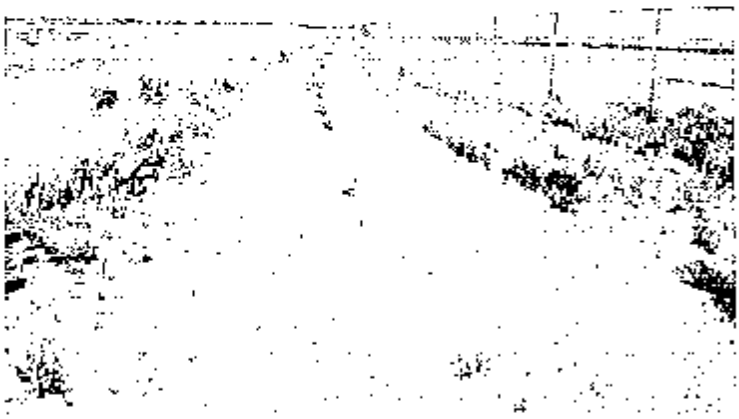


Photo 21

View of crest of western dike from southwest corner of Pond #10 looking north. The crest along the west side of Ponds #8, #9, and #10 has no surface cover of gravel.

APPENDIX C
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

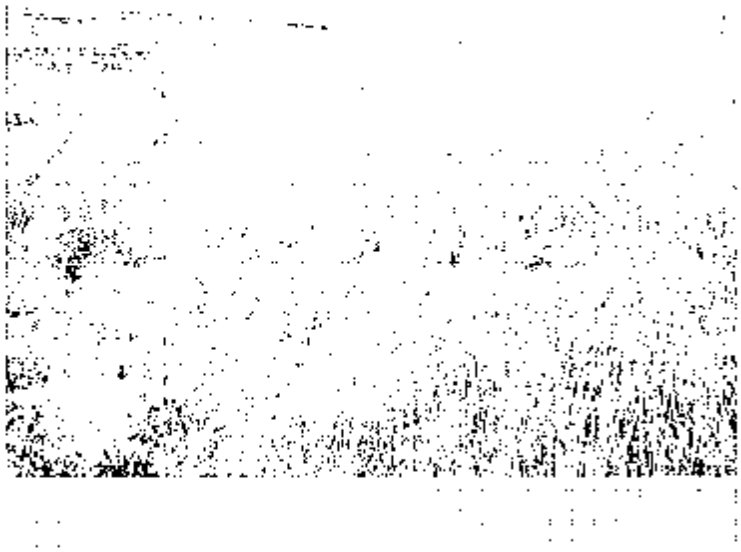


Photo 22

Downstream slope of west dike at Pond #10 with vegetative cover of dead grasses and live weeds 2 to 3 feet in height and a sparsely vegetated area in the photo foreground.

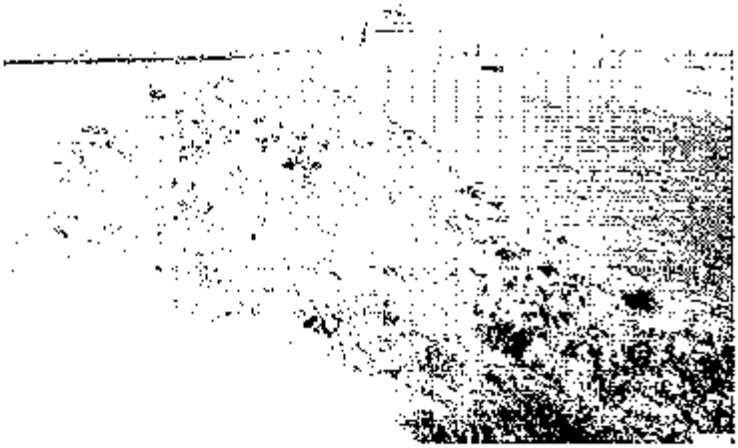


Photo 23

Downstream slope of south dike at Pond #12 with recently planted vegetation in fair condition.

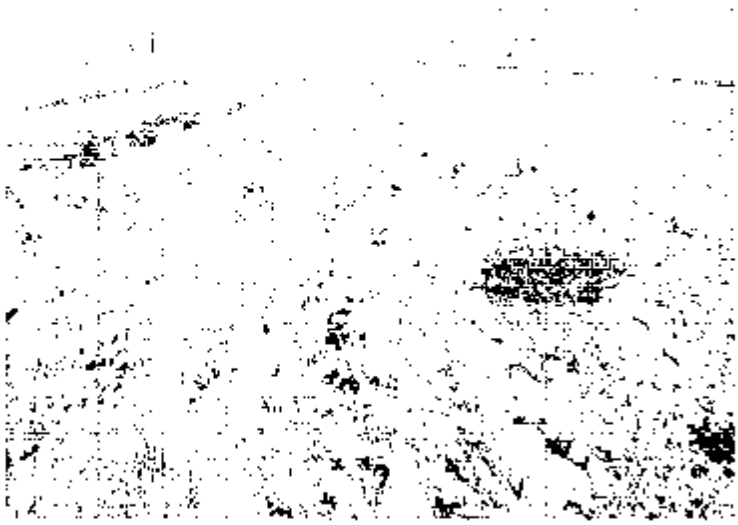


Photo 24

Downstream slope and crest of north dike at Pond #12 with recently planted vegetation in poor condition and crest in good condition.

APPENDIX D
OKLAUNION WASTEWATER POND COMPLEX
DIKE INSPECTION PHOTOGRAPHS

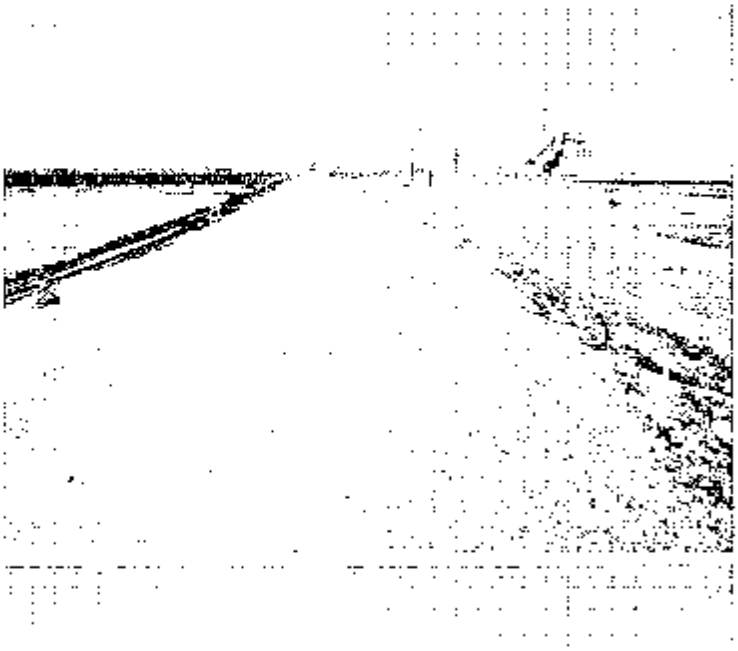
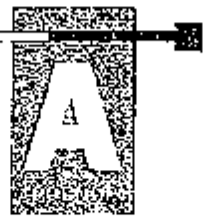


Photo 25

Crest of south dike at Pond #13 in good condition.

Photo 26

Downstream slope of south dike at Pond #13 with recently planted vegetation in good condition.



Appendix A: Inspection Report

Inspection Results—Dam Conditions

Dam Name: OKLAUNION POND COMPLEX Inventory No:
Name of Inspectors: Pat Mackenzie, Steve Lewis - OKLAUNION
Name of Contacts:
Date of Inspection: Start Time: 12:30 End Time: 2:30 Weather: Clear, 45°F

Crest level (at center) above water:
Service spillway level ☐ Above or ☐ Below water:
Emergency spillway level above water:
Ground Moisture Condition: ☒ Dry ☐ Damp ☐ Wet ☐ Snow ☐ Other:

Crest of Embankment General Condition: ☐ Good ☐ Fair ☐ Poor Width:
Problems Noted: ☐ None ☐ Rutting ☐ Erosion ☐ Poor Drainage Height:
☐ Trees ☐ Depressions ☐ Bulges ☐ Livestock Damage ☐ Cracks Length:
☐ Misalignment of Crest ☐ Misalignment of Utility Poles ☐ Misalignment of Fences or Rails ☐ Sinkhole ☐ Burrows
☐ Breached ☐ Other:
Comments:

Pond 7 and Makeup Pond
Upstream Embankment General Condition: ☒ Good ☐ Fair ☐ Poor Slope:
Problems Noted: ☐ None ☐ Rip-Rap ☐ Erosion ☐ Too Steep ☐ Burrows ☐ Trees ☐ Cattails ☐ Depressions
☐ Bulges ☐ Livestock Damage ☐ Slides ☐ Concrete Decay ☐ Cracks ☐ Sinkhole ☐ Benching
☐ Misalignment of Rip-rap ☐ Open Joints in Concrete
Comments: Pond 7 north bank some erosion will add Rip Rap when funds become available.

Pond 8 and 9
Downstream Embankment General Condition: ☐ Good ☐ Fair ☐ Poor Slope:
Problems Noted: ☐ None ☐ Slonghing ☐ Erosion ☐ Too Steep ☐ Burrows ☐ Trees ☐ Cattails ☐ Depressions
☐ Bulges ☐ Livestock Damage ☐ Slides ☐ Concrete Decay ☐ Cracks ☐ Sinkhole ☐ Other:
Comments:
Erosion and bare spots on east bank, not getting any worse. To be repaired in 2011
Pond 1 some slight erosion at NW corner.

Seepage on Downstream Slope Amount: ☐ Major ☐ Moderate ☐ Minor ☐ None Found
Problems Noted: ☐ None ☐ Saturation Starts at _____ ☐ Slump Embankment ☐ Presence of Sediment in Flow
☐ Cattails at Toe of Dam ☐ Surface Water at Toe of Dam ☐ Seepage Associated with Sloughing ☐ Continuous Flow
☐ Sporadic Flow
Comments: _____

Downstream Hazard Conditions ☐ Narrow Canyon ☐ Wide Canyon ☐ Lightly Sloping Prairie ☐ Farmland
☐ Large Trees and Forest ☐ Brushy and Scrubby Forest ☐ No Homes ☐ Lightly Populated ☐ Moderately Populated
☐ Densely Populated ☐ Industrial ☐ Businesses Estimated number of homes:
Comments: _____

Service Inlet Structure General Condition: ☐ Good ☐ Fair ☐ Poor
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Steel Corrosion ☐ Concrete Spalling ☐ Concrete Cracking
☐ Reinforcement Corrosion ☐ Missing Pans ☐ Timber Decay ☐ Leakage Below Water Level ☐ Inoperable Valve
☐ Other: _____
Comments: _____

Service Outlet Structure General Condition: ☐ Good ☐ Fair ☐ Poor
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Corrosion of Conduit ☐ Presence of Sediment in Flow
☐ Inaccessible ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Misalignment of Walls/Slabs
☐ Open Joints
Comments: _____

Pond 7

Service Spillway Condition: ☑ Good ☐ Fair ☐ Poor Depth: _____ Width: _____
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Trees ☐ Burrows ☐ Back-Cutting Erosion ☐ Inaccessible
☐ Livestock Damage ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Damaged Water-stops
☐ Open Joints ☐ Sinkholes ☐ Holes in Spillway Chute ☐ Seepage ☐ Misalignment of Walls/Slabs ☐ Damaged Gates
☐ Nonfunctional Gates ☐ Lubrication of Gates ☐ Testing of Gates
Comments: Spillway in good condition.

Emergency Spillway Condition: ☐ Good ☐ Fair ☐ Poor Depth: _____ Width: _____
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Trees ☐ Burrows ☐ Back-Cutting Erosion ☐ Inaccessible
☐ Livestock Damage ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Damaged Water-stops
☐ Open Joints ☐ Sinkholes ☐ Holes in Spillway Chute ☐ Seepage ☐ Misalignment of Walls/Slabs ☐ Damaged Gates
☐ Nonfunctional Gates ☐ Lubrication of Gates ☐ Testing of Gates
Comments: _____

Pond 11

Other Items ☐ Major road along crest of dam ☐ Private road or driveway along crest of dam
☐ Vehicle bridge along crest of dam ☐ Culverts built into crest of dam
☐ Pipeline immediately downstream from dam - Type of pipeline: _____
☐ Water supply line in crest of dam ☐ Other: _____
Comments: Silt fence on east side of Pond 11 has been repaired.

Repair Items Ranked by Priority
Item 1: _____
Item 2: _____
Item 3: _____
Item 4: _____

Security Issues ☐ Vehicle Accessible ☐ Vehicle Gates ☐ Vehicle Fences and Railing ☐ Pedestrian Accessible
☐ Pedestrian Gates and Fences ☐ Obscured from Surveillance ☐ Locks ☐ Breaches in Fence ☐ Evidence of Pests
☐ Graffiti ☐ Security System
Comments: _____

Operational Procedures ☐ SOP Available Location Kept: On-line and Maint Supervisor's Office
☒ Logbook Location of Logbooks: Planners Office
☐ Major Events Noted ☐ Staff Training Topics of Training: _____
☐ Manual Gate Operations ☐ Powered Gate Operations ☐ Automated Gate Operations
Comments: _____

Communications ☐ Directory Available ☒ 24-Hour Coverage ☐ Telephone Available at Dam
☐ Cell Phone Coverage—Provider: _____
Comments: _____

Emergency Action Plan ☐ Available ☐ Filed with TCEQ ☐ Change in Downstream Hazard
Frequency of Updates: _____ Date of Last Revision: _____
Date of Last Exercise: _____
N/A
Comments: _____

Instrumentation ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational ☐ Data Collected
N/A
☐ Data Analyzed ☐ Adequately Protected
Comments: _____

N/A **Early Warning System** ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational
Frequency of Maintenance: _____ Date of Last Exercise: _____
Comments: _____

N/A **Reservoir Drawdown Capability** Method of Drawdown: _____
Maximum Drawdown: _____ ft Frequency of Testing: _____
Comments: _____

N/A **Backup Power** ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational
Frequency of Maintenance: _____ Date of Last Exercise: _____
Comments: _____

Inspection Monitoring Form

Date _____ Time _____

Name of Dam _____

Inspector _____

Item Being Monitored _____

_____

_____

Extent of Area _____

_____

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_____

Current Description _____

_____

_____

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Change From Previous Inspections _____

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Appendix A: Inspection Report

Inspection Results—Dam Conditions

Dam Name: OKLAUNION POND COMPLEX Inventory No:
Name of Inspector/s: Pat Mackenzie, Steve Lewis - OKLAUNION
Name of Contact/s:
Date of Inspection: 11/22/10 Start Time: 12:30 PM End Time: 2:30 PM Weather: Clear, 60° F

Crest level (at center) above water:
Service spillway level ☐ Above or ☐ Below water:
Emergency spillway level above water:
Ground Moisture Condition: ☒ Dry ☐ Damp ☐ Wet ☐ Snow ___ ☐ Other:

Crest of Embankment General Condition: ☐ Good ☐ Fair ☐ Poor Width:
Problems Noted: ☐ None ☐ Rutting ☐ Erosion ☐ Poor Drainage Height:
☐ Trees ☐ Depressions ☐ Bulges ☐ Livestock Damage ☐ Cracks Length:
☐ Misalignment of Crest ☐ Misalignment of Utility Poles ☐ Misalignment of Fences or Rails ☐ Sinkhole ☐ Burrows
☐ Breached ☐ Other:
Comments:

Pond 7 and Make Up Pond

Upstream Embankment General Condition: ☒ Good ☐ Fair ☐ Poor Slope:
Problems Noted: ☐ None ☐ Rip-Rap ☐ Erosion ☐ Too Steep ☐ Burrows ☐ Trees ☐ Cattails ☐ Depressions
☐ Bulges ☐ Livestock Damage ☐ Slides ☐ Concrete Decay ☐ Cracks ☐ Sinkhole ☐ Benching
☐ Misalignment of Rip-rap ☐ Open Joints in Concrete
Comments: Pond 7 : Work complete at NE Corner and Around Spillway - Berm Built Up and Rip Rap Added to Prevent Erosion
Make Up Pond : Rip Rap added to entire South Side
Pond 1 : Work complete in filling bare spots and eroded areas around berm.

Downstream Embankment General Condition: ☐ Good ☐ Fair ☐ Poor Slope:
Problems Noted: ☐ None ☐ Sloughing ☒ Erosion ☐ Too Steep ☐ Burrows ☐ Trees ☐ Cattails ☐ Depressions
☐ Bulges ☐ Livestock Damage ☐ Slides ☐ Concrete Decay ☐ Cracks ☐ Sinkhole ☐ Other:
Comments: Pond 6 & 7, erosion and bare spots on east bank are not getting worse, to be repaired in 2011.

Seepage on Downstream Slope Amount: ☐ Major ☐ Moderate ☐ Minor ☐ None Found
Problems Noted: ☐ None ☐ Saturation Starts at _____ Slope Embankment ☐ Presence of Sediment in Flow
☐ Cattails at Toe of Dam ☐ Surface Water at Toe of Dam ☐ Seepage Associated with Sloughing ☐ Continuous Flow
☐ Sporadic Flow
Comments: _____

Downstream Hazard Conditions ☐ Narrow Canyon ☐ Wide Canyon ☐ Lightly Sloping Prairie ☐ Pastureland
☐ Large Trees and Forest ☐ Brushy and Shrubby Forest ☐ No Homes ☐ Lightly Populated ☐ Moderately Populated
☐ Densely Populated ☐ Industrial ☐ Businesses Estimated number of homes:
Comments: _____

Service Inlet Structure General Condition: ☐ Good ☐ Fair ☐ Poor
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Steel Corrosion ☐ Concrete Spalling ☐ Concrete Cracking
☐ Reinforcement Corrosion ☐ Missing Parts ☐ Timber Decay ☐ Leakage Below Water Level ☐ Inoperable Valve
☐ Other: _____
Comments: _____

Service Outlet Structure General Condition: ☐ Good ☐ Fair ☐ Poor
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Corrosion of Conduit ☐ Presence of Sediment in Flow
☐ Inaccessible ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Misalignment of Walls/Slabs
☐ Open Joints
Comments: _____

Pond 7

Service Spillway Condition: ☑ Good ☐ Fair ☐ Poor Depth: _____ Width: _____
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Trees ☐ Burrows ☐ Back-Cutting Erosion ☐ Inaccessible
☐ Livestock Damage ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Damaged Water-stops
☐ Open Joints ☐ Sinkholes ☐ Holes in Spillway Chute ☐ Seepage ☐ Misalignment of Walls/Slabs ☐ Damaged Gates
☐ Nonfunctional Gates ☐ Lubrication of Gates ☐ Testing of Gates
Comments: Spillway is good condition. Rip Rap has been added to both sides of Spillway

Emergency Spillway Condition: ☐ Good ☐ Fair ☐ Poor Depth: _____ Width: _____
Problems Noted: ☐ None ☐ Blockage ☐ Not Located ☐ Trees ☐ Burrows ☐ Back-Cutting Erosion ☐ Inaccessible
☐ Livestock Damage ☐ Concrete Cracking ☐ Concrete Spalling ☐ Reinforcement Corrosion ☐ Damaged Water-stops
☐ Open Joints ☐ Sinkholes ☐ Holes in Spillway Chute ☐ Seepage ☐ Misalignment of Walls/Slabs ☐ Damaged Gates
☐ Nonfunctional Gates ☐ Lubrication of Gates ☐ Testing of Gates
Comments: _____

Other Items ☐ Major road along crest of dam ☐ Private road or driveway along crest of dam
☐ Vehicle bridge along crest of dam ☐ Culverts built into crest of dam
☐ Pipeline immediately downstream from dam - Type of pipeline: _____
☐ Water supply line in crest of dam ☐ Other: _____
Comments: _____

Repair Items Ranked by Priority
Item 1: Pond #19 erosion and bare spots to be repaired in 2011
Item 2: Silt Fence at East Side of Pond 11 to be replaced in Mid-Dec 2010
Item 3: _____
Item 4: _____

Security Issues ☐ Vehicle Accessible ☐ Vehicle Gates ☐ Vehicle Fences and Railing ☐ Pedestrian Accessible
☐ Pedestrian Gates and Fences ☐ Obscured from Surveillance ☐ Locks ☐ Breaches in Fence ☐ Evidence of Parties
☐ Graffiti ☐ Security System
Comments: _____

Operational Procedures ☐ SOP Available Location Kept: On Line and Maint Supervisor's Office
☒ Logbook Location of Logbook: Planner's Office
☐ Major Events Noted ☐ Staff Training Topics of Training: _____
☐ Manual Gate Operations ☐ Powered Gate Operations ☐ Automated Gate Operations
Comments: _____

Communications ☐ Directory Available ☒ 24-Hour Coverage ☐ Telephone Available at Dam
☐ Cell Phone Coverage—Provider: _____
Comments: _____

Emergency Action Plan ☐ Available ☐ Filed with TCEQ ☐ Change in Downstream Hazard
Frequency of Update: _____ Date of Last Revision: _____
Date of Last Exercise: _____
Comments: N/A

Instrumentation ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational ☐ Data Collected
☐ Data Analyzed ☐ Adequately Protected
Comments: N/A

N/A

Early Warning System ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational

Frequency of Maintenance: _____ Date of Last Exercise: _____

Comments: _____

N/A

Reservoir Drawdown Capability Method of Drawdown: _____

Maximum Drawdown: _____ cfs Frequency of Testing: _____

Comments: _____

N/A

Backup Power ☐ Present ☐ Adequately Maintained ☐ Inadequately Maintained ☐ Operational

Frequency of Maintenance: _____ Date of Last Exercise: _____

Comments: _____

Inspection Monitoring Form

Date _____ Time _____

Name of Dam _____

Inspector _____

Item Being Monitored _____

_____

_____

Extent of Area _____

_____

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_____

Current Description _____

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Change From Previous Inspections _____

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Site Name:	**OKLAUNION POWER STATION**	**Date:**	**February 23, 2011**
Unit Name:	**WASTERWATER EVAPORATION POND 6**	**Operator's Name:**	**AMERICAN ELECTRIC POWER**
Unit I.D.:	**WMU 001**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Kyle Shepard & Andy Cueto	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A	N/A	Is water entering inlet, but not exiting outlet?	N/A	N/A
5. Lowest dam crest elevation (operator records)?	X		Is water exiting outlet, but not entering inlet?	N/A	N/A
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	N/A	N/A
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A	N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A	N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	N/A	N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	N/A	N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	N/A	N/A	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
	All active ponds on this site were incised. One pond that has not been active for 3 years was not incised but was in the process of being closed.

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit	TX0087815	**INSPECTOR**	
Date	11.16.2007		
Impoundment Name	WASTEWATER EVAPORATION POND NO. 6		
Impoundment Company	AMERICAN ELECTRIC POWER		
EPA Region	REGION 6		
State Agency (Field Office) Address	1977 INDUSTRIAL BOULEVARD, ALBILENE, TEXAS 79602-7833		
Name of Impoundment	WASTEWATER EVAPORATION POND NO. 6		

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☒

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☐	☒

IMPOUNDMENT FUNCTION: WASTEWATER AND RESIDUAL STORAGE / EVAPORATION POND

Nearest Downstream Town Name: NO TOWN WITHIN A 18 MILE RADIUS

Distance from the impoundment: ±18 MILES

Location:

Latitude	34	Degrees	04	Minutes	47.99	Seconds	**N**
Longitude	99	Degrees	10	Minutes	45.00	Seconds	**W**

State **County**

	Yes	No
Does a state agency regulate this impoundment?	☐	☒

If So Which State Agency?

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

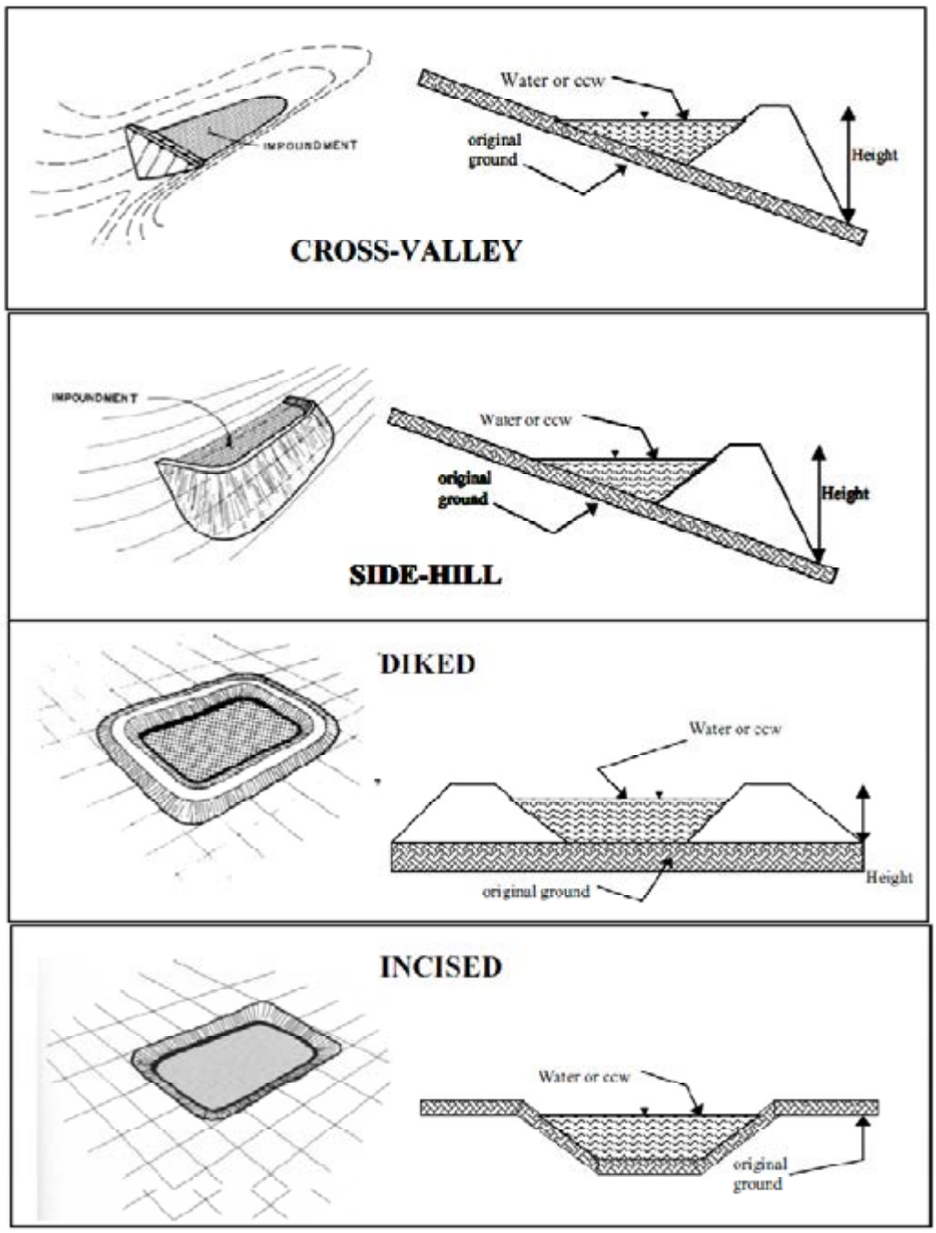
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

UPON VISUAL INSPECTION, THERE WAS NO SIGHT OF ANY POSSIBLE BREACHING OR OVERTOPPING OF THIS IMPOUNDMENT.

CONFIGURATION:



☐ Cross-Valley ☒ Side-Hill ☐ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	20	**Embankment Material**	IN-SITU SOIL
Pool Area (ac)	58	**Liner**	IN-SITU SOIL
Current Freeboard (ft)	3	**Liner Permeability**	N/A

TYPE OF OUTLET (Mark all that apply)

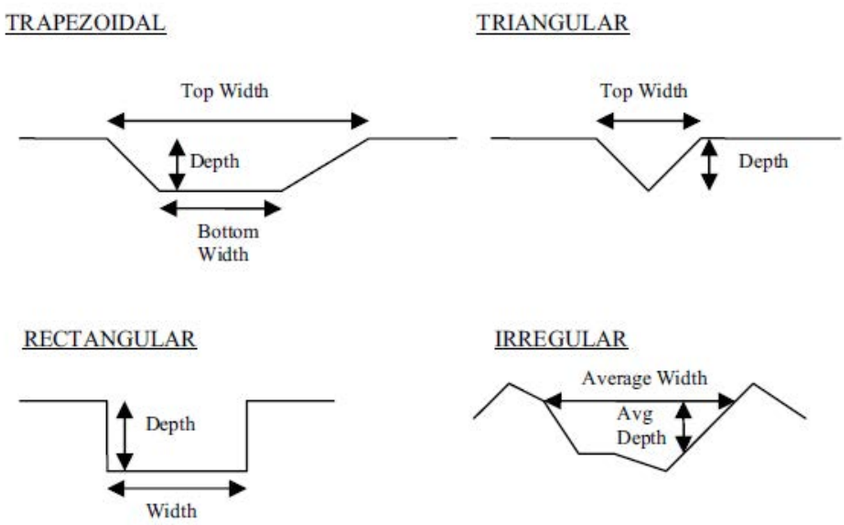
☐ **Open Channel Spillway**

- ☐ Trapezoidal
- ☐ Triangular
- ☐ Rectangular
- ☐ Irregular

depth (ft)

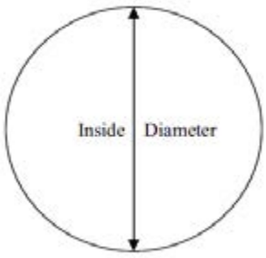
average bottom width (ft)

top width (ft)



☐ **Outlet**

18” inside diameter
(SDR 17 – smooth lined – 19.5” OD)



Material

- ☐ corrugated metal
- ☐ welded steel
- ☐ concrete
- ☐ plastic (hdpe, pvc, etc.)
- ☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☒

☒ **No Outlet** EVAPORATION POND ONLY

☐ **Other Type of Outlet**
(specify):

The Impoundment was Designed By **TIPPETT & GEE:**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

NO

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

YES

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

NO

AEP- Oklaunion

Available Information Checklist

Coal Combustion Residuals Impoundment (CCRI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
1. Descriptive Information:			
a) Impoundment Capacity (Normal & Max)	X		
b) Impoundment Surface Area	X		
c) Hazard Classification	X		
d) Freeboard (Normal & Min)	X		
e) Maximum Dam Height	X		
f) Dam Crest Elevation	X		
g) Crest Width	X		
h) Upstream Slope Inclination	X		
i) Downstream Slope Inclination	X		
j) Spillway Type, Size, & Crest Elevation			X
k) Outlet Condit Type, Size, & Max Flow Capacity			X
l) Historical Maximum Pond Elevation	X		
m) Year Built	X		
n) Design Life	X		
o) Specific Wastes Permitted in Impoundment	X		
p) Other (describe)			
2. Regional Map showing CCWI & schools, hospitals, etc. w/i 5 mi downgradient		X	
3. Management Unit Dwgs:			
a) Plans	X		
b) Sections	X		
c) Elevations	X		
d) Other (describe) (maybe closed - may include a LOI for closing)	X		
4. Design Information:			
a) Name of Designer of Record	X		
b) Design Assumptions		X	
c) Design Analyses (Including Hydrologic/Hydraulic & Slope Stability Analyses		X	

Dewberry

Available Information Checklist (Continued)

Coal Combustion Residuals Impoundment (CCRI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
d) Spillway Design Flood or Design Basis			X
e) Slope Stability Factors of Safety		X	
f) Design Soil Properties and Parameters	X		
g) Other (describe)			
5. Permits:			
a) NPDES? **Number?** TX0087815	X		
b) Dam Safety - Operating Permit? **Number?** n/a			X
c) Other (describe) WQ0002574000 - unknown permit no.			
6. Subsurface Information:			
a) Geology		X	
b) Geotechnical Report		X	
c) Test Boring Logs	X		
d) Subsurface Profiles		X	
f) Other (describe)			
7. Monitoring Information:			
a) Observation Wells/Piezometer Readings			X
b) Seepage Readings			X
c) Settlement Readings			X
d) Alignment Readings			X
e) Inclinometer Readings			X
f) Time vs Reading Graphs			X
g) Other (describe)			
8. Instrumentation Dwgs:			
a) Location Plan			X
b) Section Views			X
c) Other (describe)			

Available Information Checklist (Continued)

Coal Combustion Residuals Impoundment (CCRI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
9. Operation, Maintenance, & Surveillance:			
a) Operating Procedures	X		
b) Maintenance Procedures	X		
c) Inspection Procedures	X		
d) Third Party Inspection Reports	X		
e) Other (describe)			
10. Miscellaneous:			
a) Construction Documentation/Foundation Prep	X		
b) Spills or Releases		X	
c) Repairs			X
d) Inundation Map		X	
e) Other (describe)			
f) Emergency Action Plan	X		

NOTE:
All data is to be furnished on CD to Dewberry by end of March 2011.

Available Information Checklist - Addendum

Coal Combustion Residuals Impoundment (CCRI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
11. Coal Combustion Residuals Handling Equipment Train:			
a) Fly Ash (dry train - described below)			
• **Generation & Collection Methods; Equipment**	X		
• **Transport to Storage Methods; Equipment; Containment Methods**	X		
• **Storage Methods; Equipment; Containment Methods**	X		
• **Transport to Disposition Methods; Equipment; Containment Methods**	X		
b) Bottom Ash (wet train)			
• **Generation & Collection Methods; Equipment**	X		
• **Transport to Storage Methods; Equipment; Containment Methods**	X		
• **Storage Methods; Equipment; Containment Methods**	X		
• **Transport to Disposition Methods; Equipment; Containment Methods**	X		
c) Boiler Slag (same as Bottom Ash)			
• **Generation & Collection Methods; Equipment**	X		
• **Transport to Storage Methods; Equipment; Containment Methods**	X		
• **Storage Methods; Equipment; Containment Methods**	X		
• **Transport to Disposition Methods; Equipment; Containment Methods**	X		
d) Flue Gas Desulfurization Sludge (inspected)			
• **Generation & Collection Methods; Equipment**	X		
• **Transport to Storage Methods; Equipment; Containment Methods**	X		
• **Storage Methods; Equipment; Containment Methods**	X		
• **Transport to Disposition Methods; Equipment; Containment Methods**	X		
Note: AEP representatives preferred not to tour and inspect the Fly Ash disposal train. However they did describe the process below.			

Fly Ash Disposal Process (dry train):

1. Fly ash is electrostatically precipitated and conveyed by gravity to a hopper
2. The ash is then pneumatically conveyed to a holding silo
3. The ash is then loaded via gravity feed into trucks
4. The ash is stock piled there to be either sold to a 3rd party for beneficial reuse or to be permanently disposed of in the landfill

Appendix C – Additional Photographs

Figure C-1. Additional incised CCR pond #21

Figure C-2. Additional incised CCR pond #22

Figure C-3. Additional incised CCR pond #23

Figure C-4. Additional incised CCR pond #7