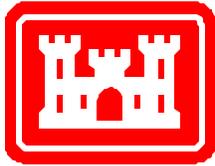


Memphis District

Invitation for Bid No. W912EQ-04-B-0002



**US Army Corps
of Engineers®**

Project Title:

LOWER CAMP CREEK FORCE MAIN

Location:

DESOTO COUNTY, MISSISSIPPI

Technical Specifications

**THIS IS AN UNRESTRICTED PROCUREMENT. HUBZone Evaluation
Preference Applies.**

NOVEMBER 2003

**LOWER CAMP CREEK FORCE MAIN
DESOTO COUNTY, MISSISSIPPI**

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GEOTECHNICAL REPORT BY BURNS COOLEY DENNIS, INC.

DIVISION 1 – GENERAL REQUIREMENTS

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**GENERAL INSTRUCTIONS
FOR THE TECHNICAL SPECIFICATIONS**

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SECTION 01001**GENERAL INSTRUCTIONS
FOR
THE TECHNICAL SPECIFICATIONS****PART 1 - GENERAL**

- 1.01 The following Technical Specifications represent the standards and requirements to be met by materials, equipment and workmanship incorporated into or relating to the Project.

These Specifications supersede the Drawings wherever information depicted by the Drawings may be incomplete, unclear or in conflict with the requirements of the Specifications.

- 1.02 When used in reference to the Contracting Officer or his authorized Representative, means visual observation of materials, equipment, or construction work, on an intermittent basis, to determine that the work is in conformance with the Contract Documents and the design intent. Such inspection does not constitute acceptance of the work, nor shall it be construed to relieve the Contractor from his responsibility for the means and methods of construction **or for safety on the construction site.**

- 1.03 Equal, or Approved Equal - when appearing in these specifications, means that submittals of materials, equipment or methods differing from a specific description in the specification may be reviewed by the Contracting Officer after Contract Award, to determine if the proposed substitute meets the test of apparent equivalence for application to the requirements of the project, and appears to possess the same performance qualities and characteristics and fulfill the utilitarian function without decrease in quality, durability, or longevity. No inference is intended that items must be identical in **all** respects if above conditions are satisfied. The decision of the Contracting Officer will be final. It remains the Contractor's responsibility for submittals to meet the requirements of the Specifications.

- 1.04 Approve - when used in reference to responses by the Contracting Officer to work performed, material, equipment, or methods used, means to give limited, or conditional or qualified approval to the work or use of material, equipment or methods; **the qualified condition being strict compliance with Contract Document and Specifications requirements.**

PART 2 – PRODUCTS (Not Applicable)**PART 3 – EXECUTION (Not Applicable)****PART 4 – COMPENSATION (Not Applicable)**

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01001-1**

DIVISION 1 – GENERAL REQUIREMENTS

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PART 4 – COMPENSATION (NOT APPLICABLE)

SECTION 01005**GENERAL CONSTRUCTION NOTES****PART 1 - GENERAL****1.01 UTILITY LOCATION**

Existing utility locations shown on the Drawings are approximate only. The Contractor shall coordinate the location (horizontal and vertical) of existing utilities (power, telephone, gas, etc.) with the appropriate utility company before construction begins.

1.02 UTILITY OR SERVICE LINES

Utility or service lines encountered during construction, whether shown on the Drawings or not, shall be protected by the Contractor and repairs necessary due to damage to same by the Contractor shall be at no additional cost to the Government.

1.03 UTILITY SERVICE CROSSINGS

The Contractor shall be responsible for verifying horizontal and vertical clearances on any utility service crossings before installation.

1.04 EXISTING VEGETATION

The Contractor shall fertilize, seed and mulch all areas where the existing vegetation was removed or disturbed during construction and not required to be solid sodded, or graveled.

1.05 FORCE MAIN

Force Main reach lengths may be varied in construction of project to conform to normal joint lengths.

1.06 TBM

TBM'S which are or may be in conflict with construction activities shall be relocated by Contracting Officer prior to commencement of construction in the immediate area.

1.07 STAKING

GPS Controls are shown on the drawings. All detailed construction staking will be provided by Contractor.

1.08 PRIVATE UTILITIES

All private utilities will be relocated or adjusted by the affected company to eliminate any conflict with the proposed improvements at no cost to the Contractor.

1.09 TESTING

Contractor shall be responsible for completing all sampling and testing of materials, and for submission of same to Contracting Officer for review prior to their use. This shall include select backfill, concrete, aggregates and other items as specified by the Contracting Officer. Such prior use testing shall be an absorbed item.

1.010 FENCING

Contractor shall repair any existing fence damaged, removed or disturbed during construction. The fence shall be restored to its original condition or better. Any fence repair shall be an absorbed cost.

1.011 TREES

Contractor is to preserve existing trees where possible.

PART 2 – PRODUCTS

2.01 MATERIALS

Contractor shall obtain and furnish to the Contracting Officer copies of manufactures certifications for all materials such as, sewer piping, casting, specials, seed and other items required by these specifications. Such certification shall state that the subject material meets the specified quality, grade, purity, class or weight, or that the subject material meets or exceeds the requirements of the applicable ASTM, AASHTO, MSHD or other standards. Certifications shall be submitted to the Contracting Officer prior to incorporation of the subject material into the project.

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PART 3 - EXECUTION (NOT APPLICABLE)

PART 4 - COMPENSATION (NOT APPLICABLE)

SECTION 01270**MEASUREMENT AND PAYMENT****PART I - GENERAL****1.01 LUMP SUM BID ITEMS****1.01.1 General**

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BID FORM and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.01.2 Lump Sum Bid Price Items**A. Mobilization/Demobilization****1. Measurement**

Measurement shall be at the percentage determined in accordance with Contract Clause "Payment for Mobilization and Demobilization" in Section 00700.

2. Payment

Payment shall be at the measured percentage of the lump sum bid price for "Mobilization/Demobilization".

B. Clearing and Grubbing**1. Measurement**

See Paragraph 4.01 of Section 02111 "Clearing and Grubbing" for measurement.

2. Payment

See Paragraph 4.02 of Section 02111 "Clearing and Grubbing" for payment.

C. Storm Water Control

1. Measurement

See Paragraph 401 of Section 01356 “Storm Water Pollution and Erosion Control Measures” for measurement.

2. Payment

See Paragraph 4.02 of Section 01356 “Storm Water Pollution and Erosion Control Measures” for payment

D. Seeding, Fertilizing and Mulching

1. Measurement

See Paragraph 4.01 of Section 02480 “Seeding, Fertilizing and Mulching” for measurement.

2. Payment

See Paragraph 4.02 of Section 02480 “Seeding, Fertilizing and Mulching” for payment.

1.02 UNIT PRICE BID ITEMS

1.02.1 General

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BID FORM and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

1.02.2 Unit Price Items

A. 24” Gate Valve and Box

1. Measurement

See Paragraph 4.01.9 of Section 02563 “SEWAGE FORCE MAIN” for payment.

2. Payment

See Paragraph 4.02.7 of Section 02563 “SEWAGE FORCE MAIN” for payment.

B. 2” Combination Air/Vacuum Valve w/Manhole

1. Measurement

See Paragraph 4.01.10 of Section 02563 “SEWAGE FORCE MAIN” for measurement.

2. Payment

See Paragraph 4.02.8 of Section 02563 “SEWAGE FORCE MAIN” for payment.

C. Tracer Wire Housing

1. Measurement

See Paragraph 4.01.13 of Section 02563 “SEWAGE FORCE MAIN” for measurement.

2. Payment

See Paragraph 4.02.11 of Section 02563 “SEWAGE FORCE MAIN” for payment.

D. Grouted Rip Rap (300# with geotextile fabric)

1. Measurement

See Paragraph 4.01.2 of Section 02272 “RIPRAP” for measurement.

2. Payment

See Paragraph 4.02.1 and 4.02.2 of Section 02272 “RIPRAP” for payment.

E. Fiberglass Utility Marker

1. Measurement

See Paragraph 4.01.12 of Section 02563 “SEWAGE FORCE MAIN” for measurement.

2. Payment

See Paragraph 4.02.10 of Section 02563 “SEWAGE FORCE MAIN” for payment.

F. Undercut Excavation

1. Measurement

See Paragraph 4.02.6 of Section 02563 “SEWAGE FORCE MAIN” for measurement.

2. Payment

See Paragraph 4.02.6 of Section 02563 “SEWAGE FORCE MAIN” for payment.

H. Backfill for Undercut Areas

1. Measurement

See Paragraph 4.01.5 of Section 02563 “SEWAGE FORCE MAIN” for measurement.

2. Payment

See Paragraph 4.02.5 of Section 02563 “SEWAGE FORCE MAIN” for payment.

I. 24” PVC Force Main (All Cuts)

1. Measurement

If the PVC pipe “LOT ONE” is awarded then measurement will be made in accordance with Paragraph 4.01.2 of Section 02563 “SEWAGE FORCE MAIN.”

2. Payment

If the PVC pipe “LOT ONE” is awarded then payment will be made in accordance with Paragraph 4.02.2 of Section 02563 “SEWAGE FORCE MAIN.”

J. 24” DIP Force Main (All Cuts)

1. Measurement

If the PVC pipe “LOT ONE” is awarded then measurement will be made in accordance with Paragraph 4.01.2 of Section 02563 “SEWAGE FORCE MAIN.”

2. Payment

If the PVC pipe "LOT ONE" is awarded then payment will be made in accordance with Paragraph 4.02.2 of Section 02563 "SEWAGE FORCE MAIN."

K. Ductile Iron Fittings

1. Measurement

If the PVC pipe "LOT ONE" is awarded then measurement will be made in accordance with Paragraph 4.01.3 of Section 02563 "SEWAGE FORCE MAIN."

2. Payment

If the PVC pipe "LOT ONE" is awarded then payment will be made in accordance with Paragraph 4.02.3 of Section 02563 "SEWAGE FORCE MAIN."

L. Select Bedding

1. Measurement

See Paragraph 4.01.5 of Section 02563 "SEWAGE FORCE MAIN" for measurement.

2. Payment

See Paragraph 4.02.5 of Section 02563 "SEWAGE FORCE MAIN" for payment.

M. 30" HDPE Force Main (All Cuts)

1. Measurement

If the HDPE pipe "LOT TWO" is awarded then measurement will be made in accordance with Paragraph 4.01.3 of Section 02563 "SEWAGE FORCE MAIN."

2. Payment

If the HDPE pipe "LOT TWO" is awarded then payment will be made in accordance with Paragraph 4.02.3 of Section 02563 "SEWAGE FORCE MAIN."

N. 24" Fiberglass RPM Pipe

1. Measurement

If the Fiberglass RPM pipe “LOT THREE” is awarded then measurement will be made in accordance with Paragraph 4.01.3 of Section 02563 “SEWAGE FORCE MAIN.”

2. Payment

If the Fiberglass RPM pipe “LOT THREE” is awarded then payment will be made in accordance with Paragraph 4.02.3 of Section 02563 “SEWAGE FORCE MAIN.”

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

PART 4 COMPENSATION (Not Applicable)

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUBMITTAL IDENTIFICATION

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SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1.02 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.02.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.02.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.02.3 Initial Submittal

The Contractor shall submit an original and five (5) copies of all submittals to

the Contracting Officer or his representative.

1.03 APPROVED SUBMITTALS

After approval by the Contracting Officer, two (2) approved copies of each submittal will be returned to the Contractor. The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for an error that may exist, as the Contractor is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, resubmitting for the purpose of substituting materials or equipment will not be considered unless accompanied by an explanation of why a substitution is necessary.

1.04 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.05 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

- 3.01.1 In accordance with the requirements of Section 01451, Paragraph 3.04.1, the Contractor shall have a Contractor's Quality Control (CQC) System Manager to assure quality control during all phases of construction. The System Manager shall be responsible for all submittals by the Contractor to the Contracting Officer's representative and shall be experienced in all phases of construction required for this contract. His qualifications shall be submitted to the Contracting Officer for approval. There will be no change on the Contractor's CQC System Manager without prior written approval of the Contracting Officer.
- 3.01.2 The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be

checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.02 SUBMITTAL REGISTER (ENG FORM 4288R)

At the end of this section is one set of ENG Form 4288R listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contracting officer will give the Contractor the submittal register as a diskette containing the computerized ENG Form 4288R and instructions on the use of the diskette. Columns "d" through "q" have been completed by the Government; the Contractor shall complete columns "a" and "r" through "t" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 15 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3.03 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (15 calendar days for FIO submittals; 30 calendar days for GA submittals and re-submittals; 45 calendar days for submittals requesting variation or deviation from contract requirements) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3.04 TRANSMITTAL FORM (ENG FORM 4025R)

The sample transmittal form (ENG Form 4025R) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.05 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

Procedures

Submittals shall be prepared as specified with the required number of copies and delivered to:

U.S. Army Corps of Engineers
Wynne Area Office
1932 N. Falls Boulevard
Wynne, Arkansas 72396

Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025R shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.06 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.07 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Four copies of the submittal will be retained by the Contracting Officer and two (2) copies of the submittal will be returned to the Contractor.

3.08 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.09 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to that shown:

<p>CONTRACTOR (Firm Name)</p> <p>_____ Approved</p> <p>_____ Approved with corrections as noted on submittal data and/or attached sheets(s)</p> <p>SIGNATURE: _____</p> <p>TITLE: _____</p> <p>DATE: _____</p>

PART 4 - COMPENSATION

4.01 PAYMENT

No separate payment. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

1. Section 1 will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals, mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications –also, a written statement to that effect shall be included in the space provided for "Remarks".
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS
SUBMITTED

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A -- Approved as submitted.</p> <p>B -- Approved, except as noted on drawings.</p> <p>C -- Approved, except as noted on drawings.
Refer to attached sheet resubmission required.</p> <p>D -- Will be returned by separate correspondence.</p> | <p>E -- Disapproved (See attached).</p> <p>F -- Receipt acknowledge.</p> <p>FX -- Receipt acknowledged, does not comply
as noted with contract requirements.</p> <p>G -- Other (<i>Specify</i>)</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

SUBMITTAL REGISTER

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Lower Camp Creek Force Main Desoto County, Mississippi	CONTRACTOR	SPECIFICATION SECTION: <p style="text-align: center; font-weight: bold;">02480</p>
---------------------------------------------------------------------------------	------------	-------------------------------------------------------------------------------------------

SECTION TITLE: SEEDING, FERTILIZING AND MULCHING			TYPE OF SUBMITTAL													CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS			
ACTIVITY NO a.	TRANSMITTAL NO b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	DRAWINGS f.	INSTRUCTIONS g.	SCHEDULES h.	STATEMENTS i.	REPORTS j.	CERTIFICATES k.	SAMPLES l.	RECORDS m.	MANUALS n.	O & M o.	INFORMATION ONLY p.	GOVERNMENT REVIEW q.	REVIEWER r.	SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CODE v.	DATE w.	SUBMIT TO GOVERNMENT x.	CODE y.	DATE z.		aa.		

SUBMITTAL REGISTER

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Lower Camp Creek Force Main Desoto County, Mississippi	CONTRACTOR	SPECIFICATION SECTION: <h2 style="text-align: center;">05500</h2>
---------------------------------------------------------------------------------	------------	--------------------------------------------------------------------------

SECTION TITLE: METAL FABRICATIONS			TYPE OF SUBMITTAL										CLASSIFICATION	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS						
ACTIVITY NO	TRANSMITTAL NO	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DRAWINGS	INSTALLATIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	MANUALS	INFORMATION	GOVERNMENT REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE	SUBMIT TO GOVERNMENT		DATE	REMARKS				
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.	
			1-03	Ladders	X									X													
			1-03	Bollards	X									X													
			1-03	Lintels	X									X													
			1-03	Ledge Angles	X									X													
			1.03	Welder Certificate						X				X													

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01355

ENVIRONMENTAL PROTECTION

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SECTION 01355**ENVIRONMENTAL PROTECTION****PART 1 GENERAL****1.01 REFERENCE**

The publications listed below form a part of this specification to the Basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 152 - 186	Pesticide Programs
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual
WETLAND MANUAL	Corps of Engineers Wetlands Delineation Manual Technical Report Y-87-1

1.02 DEFINITIONS**1.02.1 Environmental Pollution and Damage**

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

10.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.02.3 Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

10.2.4 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.02.5 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.02.6 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.02.7 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground-water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND

MANUAL or as indicated on the plans.

1.03 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

1.04 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

1.05 FEES AND PERMITS

The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor.

1.06 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G, [Construction]

The environmental protection plan

1.07 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues that the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor will address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues that are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.07.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.07.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- A. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental protection Plan.
- B. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable
- C. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection person
- D. Description of the Contractor's environmental protection personnel training program.
- E. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- F. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
- G. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- H. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- I. Drawing showing the location of borrow areas
- J. The Spill Control plan shall include the procedures, instructions, and reports

to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
 2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
 3. Training requirements for Contractor's personnel and methods of accomplishing the training.
 4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
 5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
 6. The methods and procedures to be used for expeditious contaminant cleanup.
- K. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic meters yards of tons along with the percent that was diverted.

- L. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources: The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.
- M. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- N. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.
- O. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the wastewater, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the wastewater. If disposal is to a sanitary sewer, the plan shall include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.
- P. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

1.07.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

1.08 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Contracting Officer, upon mutual agreement as to its accuracy and completeness shall sign this survey report. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings regardless of interference that their preservation may cause to the Contractor's work under the contract.

1.09 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations requested by the Contractor from the drawings, plans, and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.10 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 ENVIRONMENTAL PERMITS AND COMMITMENTS

The Contractor shall be responsible for obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.

3.02 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. The Contractor shall remove Stone, soil, or other materials displaced into uncleared areas.

3.02.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area that are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.02.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.02.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs) as indicated on the drawings as specified in Section 01356 STORM WATER POLLUTION PREVENTION MEASURES. BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation.

3.02.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed

by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering embankments for plant and/or work areas shall be controlled to protect adjacent areas.

3.03 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.03.1 Cofferdams, Diversions, and Dewatering Operations

- A. Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body.
- B. The Contractor shall comply with the State of Mississippi water quality standards and anti-degradation provisions.

3.03.2 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments.

3.03.3 Wetlands

The Contractor shall not enter, disturb, destroy, or allow discharge of contaminants into any wetlands except as authorized herein. The Contractor shall be responsible for the protection of wetlands shown on the drawings in accordance with paragraph ENVIRONMENTAL PERMITS, REVIEWS, AND APPROVALS. Authorization to enter specific wetlands identified shall not relieve the Contractor from any obligation to protect other wetlands within, adjacent to, or in the vicinity of the construction site and associated boundaries.

3.04 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

3.04.1 Particulates

The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other

work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance.

Sprinkling or other approved methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

3.04.2 Burning

The Contracting Officer will not allow burning on the project site unless specified in other sections of the specifications or authorized in writing. The specific time, location, and manner of burning shall be subject to approval.

3.05 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.05.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers that are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, and local laws and regulations] pertaining to the use of landfill areas.

3.05.2 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. Storage of fuel on the project site shall be accordance with all Federal, State, and local laws and regulations.

3.05.3 Waste Water

Disposal of wastewater shall be as specified below:

- A. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related wastewater off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.
- B. For discharge of ground water, the Contractor shall obtain a State or Federal permit specific for pumping and discharging ground water prior to surface discharging.
- C. Water generated from the flushing of lines after disinfection, or disinfection in conjunction with hydrostatic testing

3.06 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.07 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. The Contractor shall submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following will be included in the report:

- 3.07.1 Construction and Demolition (C&D) Debris Disposed = [_____] in cubic meters, cubic yards or tons, as appropriate.
- 3.07.2 Construction and Demolition (C&D) Debris Recycled = [_____] in cubic meters, cubic yards or tons, as appropriate.
- 3.07.3 Total C&D Debris Generated = [_____] in cubic meters, cubic yards or tons, as appropriate.
- 3.07.4 Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = [_____] in cubic meters, cubic yards or tons, as appropriate.

3.08 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such

discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.09 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.10 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.11 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.12 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.13 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

PART 4 COMPENSATION

4.01 Measurement

Measurement for Environmental Protection will not be made separately.

4.02 Payment

No Separate Payment. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01356

STORM WATER POLLUTION AND EROSION CONTROL MEASURES

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SECTION 01356**STORM WATER POLLUTION PREVENTION AND EROSION CONTROL MEASURES****PART 1 –GENERAL****1.01 REQUIREMENTS**

- 1.01.1 The applicable provisions of the General Conditions and of Division 1 – General Requirements govern all work specified in this Section.
- 1.01.2 The Contractor shall implement pollution and erosion control measures specified in this section in a manner which will meet the requirements of Section 01355 Environmental Protection, and the requirements of the National Pollution Discharge Elimination System (NPDES) Permit included with that section.
- 1.01.03 The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439 (1997)	Standard Terminology for Geosynthetics
ASTM D 4491 (1996)	Water Permeability of Geotextiles by Permittivity
ASTM D 4533 (1991; R 1996)	Trapezoid Tearing Strength of Geotextiles
ASTM D 4632 (1991; R 1996)	Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751 (1995)	Determining Apparent Opening Size of a Geotextile
ASTM D 4873 (1995)	Identification, Storage, and Handling of Geosynthetic Rolls

1.02 DESCRIPTION

- 1.02.1 This work shall consist of installing storm water pollution and erosion control measures on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, pumping water, and any other means appropriate to restrain flooding of site and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction activities, such as excavation work, may be delayed or covered to prevent freezing.
- 1.02.2 The temporary pollution and erosion control provisions measures specified herein shall be coordinated with the permanent pollution and erosion control features, to ensure economical, effective, and continuous control throughout the construction and post-construction period.
- 1.02.3 Since the Contractor is responsible for the construction means and methods,

which in turn are responsible for ensuring that construction does not harm the waters of Mississippi, the Contractor is solely responsible for ensuring that necessary actions are taken to ensure that no violations of the Waters of Mississippi are incurred.

- 1.02.4 Pollution and erosion control measures must be in place prior to the Contracting Officer approving any requests for payment from the Contractor.

1.03 SUBMITTALS

- 1.03.1 A Storm Water Pollution and Erosion Control Plan shall be submitted in accordance with the Contract Section 01355, the requirements of this Section Drawings, and BMD's of MDEQ.

- 1.03.2 The following shall be submitted in accordance with Section 01330 Submittal Procedures:

SD-07 Certificate:

Mill Certificate or Affidavit - Certificate attesting that the Contractor has met all specified requirements set forth in the SWPPP for the project and all BMP's as required by MDEQ and as outlined in the plans and other areas in the specifications.

1.04 EROSION AND SEDIMENT CONTROLS

The minimum controls and measures required are described below.

1.04.1 Stabilization Practices

The stabilization practices to be implemented shall include seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation, preservation of water resources, etc. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, backfill, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in the following paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

A. Unsuitable Conditions: Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

B. No Activity for Less Than 21 Days: Where construction activity will resume on a portion of the site within 21 days from when activities ceased

(e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

- C. Once all construction activity is ceased in an area permanently, all disturbed areas shall be seeded, mulched and protected from erosion. The contractor shall be responsible for re-seeding and mulching at no additional cost to the Government if seeds are eroded away by rain.

1.04.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices. Location and details of installation and construction are shown on the drawings.

- A. A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes have stabilized.
- B. A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.
- C. Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation. When the use of temporary sediment structures is to be discontinued, all sediment shall be removed and all excavation backfilled and properly compacted. The existing shall be restored to its natural or intended condition.
- D. Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion. Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing 5 cubic feet or more of material.
- E. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or in other areas where siltation and/or storm water runoff is a problem.

- F. Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

PART 2 - PRODUCTS

2.01 COMPONENTS FOR SILT FENCES

2.01.1 Filter Fabric:

The geotextile material shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE PHYSICAL PROPERTY TEST PROCEDURE STRENGTH REQUIREMENT (Metric)

Grab Tensile ASTM D 4632	445 N min.
Elongation (%)	30 % max.
Trapezoid Tear ASTM D 4533	245 N min.
Permittivity ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve) ASTM D 4751	20-100

FILTER FABRIC FOR SILT SCREEN FENCE PHYSICAL PROPERTY TEST PROCEDURE STRENGTH REQUIREMENT (English)

Grab Tensile ASTM D 4632	100 lbs. min.
Elongation (%)	30 % max.
Trapezoid Tear ASTM D 4533	55 lbs. min.
Permittivity ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve) ASTM D 4751	20-100

2.01.2 Silt Fence Stakes and Posts:

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.01.3 Mill Certificate or Affidavit:

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.01.4 Identification Storage and Handling:

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.02 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have minimum dimensions of 2 inches x 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

PART 3 - EXECUTION

3.01 PROJECT DRAWINGS

The project drawings show the minimum erosion and siltation control measures required for this job. If the Contractor desires to stockpile construction materials, stone, earth, etc. the locations of same and protection thereof shall be outlined in an Erosion Control Plan submitted to the Contracting Officer for review.

3.02 CONSTRUCTION REQUIREMENTS

3.02.1 The Contracting Officer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent directed by the Contracting Officer.

3.02.2 The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his

accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

- 3.02.3 Where erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, exceed 750,000 square feet without approval of the Contracting Officer.
- 3.02.4 The Contracting Officer will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- 3.02.5 Under no conditions shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area exceed 750,000 square feet without prior approval by the Contracting Officer.
- 3.02.6 The Contracting Officer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.
- 3.02.7 In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State, or Local agencies, the more restrictive laws, rules, or regulations shall apply.

3.03 CONSTRUCTION OF STRUCTURES

3.03.1 Temporary Berms

A temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately at 10-degree angle with a perpendicular to centerline. The top width of these berms may be

wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be constructed with a gradual slope to 1 side of the embankment to permit the placement of temporary berms and slope drains on only 1 side of the embankment.

3.03.2 Sediment Structures

- A. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.
- B. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and property compacted. The existing ground shall be restored to its natural or intended condition.

3.03.3 Temporary Seeding and Mulching

Temporary seeding and mulching shall be performed in accordance with Section 02480, Seeding and Mulching.

3.03.4 Baled Hay or Straw Erosion Checks

Baled hay or straw erosion checks shall be embedded in the ground 4 to 6 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose as determined by the Contracting Officer. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris cleanout will be considered routine maintenance.

3.03.5 Temporary Silt Fences

- A. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.
- B. The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the Contracting Officer. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the Contracting Officer. The silt fence becomes the property of the Contractor whenever the fence

is removed.

- 3.03.6 Under no circumstances will spent oil wastes be discharged anywhere on the site without the expressed written consent of the State of Mississippi.

3.04 MAINTENANCE

- 3.04.1 Throughout the period of construction activity, the Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. Any materials removed shall become the property of the Contractor. The following procedures shall be followed to maintain the protective measures.

A. Silt Fence Maintenance: Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02480.

B. Straw Bale Maintenance: Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02480.

- 3.04.2 The Contractor is responsible for complying with the requirements of the Mississippi Department of Environmental Quality for all erosion control during construction activity.

- 3.04.3 The Contractor is responsible for maintaining erosion control devices and reporting any maintenance as required by the Mississippi Department of Environmental Quality during construction activity.

3.05 EROSION CONTROL OUTSIDE PROJECT AREA

Temporary storm water pollution and erosion control shall include construction work outside of the project area where such work is necessary as a result of construction; such as borrow pit operations, haul roads, and equipment storage

3.06 INSPECTIONS

3.06.1 General:

The Contractor shall inspect disturbed areas of the construction site; areas used for storage of materials that are exposed to precipitation and that have not been finally stabilized; stabilization practices; structural practices; other controls; and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm producing 0.5 inches or more rainfall at the site. In areas that have been finally stabilized, such inspection shall be conducted at least once every month.

3.06.2 Inspections Details:

Disturbed areas and areas used for material storage Exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.06.3 Inspection Reports:

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.06.4 Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

On the first working day of each month the Contractor shall complete, sign, and submit the original form to the State of Mississippi, Office of Pollution Control (OPC) at the following address:

Chief, Environmental Permits Division
Mississippi Department of Environmental Quality, Office of Pollution Control
P.O. Box 10385
Jackson, Mississippi, 39289-0385

A copy of the State of Mississippi's Monthly Inspection Report and Certification Form for Erosion and Sediment Controls is attached to the end of this section. On the first working day of each month the Contractor shall also furnish one copy of the form submitted to the OPC to the Contracting Officer as part of the Contractor's daily CQC Report and attach a copy of the completed form to the Plan. Unless otherwise notified by the OPC, the Contractor shall submit the Monthly Inspection Report and Certification Forms for an additional two months after the final completion of all storm water pollution prevention measures required in this contract have been implemented.

PART 4 COMPENSATION

4.01 MEASUREMENT

Measurement for “STORM WATER POLLUTION AND EROSION CONTROL MEASURES” will be made as a percentage of the lump sum price for the amount of installed pipeline complete and in place with storm water pollution and erosion control measures to the total length of pipeline. The installation of pipeline and storm water pollution and erosion control measures has to be to the satisfaction of the Contracting Officer before measurement can be made for this work. For example, if half of the pipeline is installed with storm water pollution and erosion control measures and acceptable to the Contracting Officer then the measurement for payment for this item can be up to 50% of the lump sum for this bid item.

4.02 PAYMENT

Payment for “STORM WATER POLLUTION AND EROSION CONTROL MEASURES” will be made at the measured percentage of the lump sum under the item ‘STORMWATER CONTROL’ as listed on the bid form.

Part VII.

**MONTHLY INSPECTION REPORT AND CERTIFICATION FORM
FOR EROSION AND SEDIMENT CONTROLS**

Inspections must be done weekly and
after a Two-Year, 24-Hour Rainfall (4 inches at the Tenn. Border to 6 inches on the Gulf Coast)

Construction Storm Water General NPDES Permit No. MSR10 _____ County: _____
(Fill in your Certificate of Coverage Number & County where Project is Located)
(Please Print)

Owner and/or Prime Contractor:

Project Name: _____

Street Address: _____

City: _____

Startup Date: _____

Inspection Log

Date and Time	After a 2-Year, 24-Hour Rain?	Rain Gauge Measurement (inches)	Any Deficiencies Observed?	Inspector(s)
_____	Yes or No	_____	Yes or No	_____
_____	Yes or No	_____	Yes or No	_____
_____	Yes or No	_____	Yes or No	_____
_____	Yes or No	_____	Yes or No	_____
_____	Yes or No	_____	Yes or No	_____

Deficiencies Noted During any Inspection (give date(s); attach additional sheets if necessary):

Corrective Action Taken or Planned (give date(s)); (attach additional sheets if necessary):

Based upon this inspection which I or personnel under my direct supervision conducted, I certify that all erosion and sediment controls have been implemented and maintained, except for those deficiencies noted above, in accordance with the Storm Water Pollution Prevention Plan filed with the Office of Pollution Control and sound engineering practices as required by the above referenced permit.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Authorized Name (Print)

Signature

Date

These reports shall be submitted as required in the permit, to:

Chief, Environmental Permits Division
MS Department of Environmental Quality, Office of Pollution Control
P.O. Box 10385
Jackson, Mississippi 39289-0385

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

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SECTION 01451**CONTRACTOR QUALITY CONTROL****PART 1 GENERAL**

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1994a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.02 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)**PART 3 EXECUTION**

3.01 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence.

3.02 QUALITY CONTROL PLAN

3.02.1 General

The Contractor shall furnish for review by the Government, not later than 15 calendar days after receipt of Notice of Award of the contract, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the

Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 15 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.02.2 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- A. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project manager or someone higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.
- B. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- C. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.
- D. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.
- E. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

- F. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- G. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
- H. Reporting procedures, including proposed reporting formats.
- I. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.02.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.02.4 Notification of Changes

After acceptance of the QC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.03 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the Quality Control Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual

understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.04 QUALITY CONTROL ORGANIZATION

3.04.1 CQC System Manager

The Contractor shall identify an individual within his organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be subject to acceptance by the Contracting Officer. The full time CQC System Manager's sole responsibility is to insure compliance with contract plans and specifications.

3.04.2 CQC Staff

A staff shall be maintained under the direction of the CQC System Manager to perform all CQC activities. An alternate will be identified to serve in the absence of the CQC System Manager. The staff must be of sufficient size to ensure adequate CQC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned CQC responsibilities and must be allowed sufficient time to carry out these responsibilities. The CQC plan will clearly state the duties and responsibilities of each staff member. All CQC Staff members or replacements shall be subject to acceptance by the Contracting Officer.

3.04.3 Additional Requirement

In addition to the above requirements, the CQC System Manager, and his alternate, and also includes individuals appointed as alternates, shall complete the course entitled "Construction Quality Management for Contractors" This course is periodically offered by the Memphis District as well as other Corps Districts.

3.05 SUBMITTALS

Submittals shall be in accordance with SECTION 01330 – SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.06 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of work, as follows:

3.06.1 Preparatory Phase

- A. This phase shall be performed prior to beginning work on each definable feature of work and shall include:
- B. A review of each paragraph of applicable specifications.
- C. A review of the contract drawings.
- D. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- E. A check to assure that provisions have been made to provide required control inspection and testing.
- F. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- G. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- H. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- I. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.
- J. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- K. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.06.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work.

The following shall be accomplished:

- A. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.
- B. Verification of full contract compliance. Verify required control inspection and testing.
- C. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels is appropriate.
- D. Resolve all differences.
- E. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- F. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- G. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.06.3 Follow-Up Phase

Daily checks shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.06.4 Additional Preparatory and Initial Phases

As determined by the Government, additional preparatory and initial phases may be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, on-site production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.07 TESTS

3.07.1 Testing Procedure

- A. The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:
- B. Verify that testing procedures comply with contract requirements.
- C. Verify that facilities and testing equipment are available and comply with testing standards.
- D. Check test instrument calibration data against certified standards.
- E. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- F. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.07.2 Testing Laboratories

All testing of soil, gravel, aggregate, stone, concrete, asphalt and backfill shall be performed by a testing laboratory validated by the Material Testing Center (MTC) of the Corps of Engineers and paid for by the Contractor as an absorbed cost.. Refer to the MTC website

www.wes.army.mil/SL/MTC/ValStatesTbl.htm for a complete and current list of validated commercial laboratories. If the Contractor proposes to use a commercial laboratory that is not validated or set up an on-site laboratory, he shall make arrangements for validation by contacting the Material Testing Center at Waterways Experiment Station, Vicksburg, Mississippi, telephone number, 601-634-3610 or 601-634-2496, www.wes.army.mil/SL/MTC/inspection.htm. The Government will not be responsible any costs associated with the validation of laboratories that are not currently validated. The validation process could take 60 to 90 days or more. The Contractor shall be responsible for determining the amount of time required for the validation of the proposed laboratory and

accounting for this event in his progress schedule. If the Contractor elects to use a non-validated laboratory, work requiring testing shall not commence until the laboratory has been validated by MTC.

A. Capability Check

The Contracting Officer reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

B. Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor. There will be no extension of time allowed due to necessity to perform capability rechecks.

3.07.3 Testing Services

The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.07.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered by the Contractor to a location specified by the Contracting Officer.

3.08 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in the SPECIAL CONTRACT REQUIREMENTS entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to

ascertain that all deficiencies have been corrected and so notify the Government. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.09 DOCUMENTATION

3.09.1 The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- A. Contractor/subcontractor and their area of responsibility.
- B. Operating plant/equipment with hours worked, idle, or down for repair.
- C. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- D. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- E. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- F. Submittals reviewed, with contract reference, by whom, and actions taken.
- G. Off-site surveillance activities, including actions taken.
- H. Job safety evaluations stating what was checked, results, instructions or corrective actions.
- I. Instructions given/received and conflicts in plans and/or specifications.
- J. Contractor's verification statement.

3.09.2 These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the

date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

PART 4 - COMPENSATION

4.01 PAYMENT

No separate payment. Payment for this work is incidental to the lump sum and unit bid prices in the Bid Form.

END OF SECTION

01451-10

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01452

PROJECT SIGN, BARRICADES, AND TRAFFIC CONTROL SIGNS

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4.01 PAYMENT

SECTION 01452**PROJECT SIGN, BARRICADES, AND TRAFFIC CONTROL SIGNS****PART - 1 GENERAL****1.01 SCOPE**

The work covered by this section consists of furnishing, erecting, maintaining, and removing project signs, barricades, and traffic control signs.

1.02 PROJECT SIGN

The Contractor shall furnish, erect, and maintain one double-faced project sign, at the specific location designated by the Contracting Officer. The sign shall be constructed of 3/4-inch A-C exterior plywood or 22 gage metal, mounted on a substantial framework of 2-inch material. Size, lettering, color and paint shall conform to the details shown on the drawing "Project Sign" included at the end of this section. Upon request, the Government will furnish without cost to the Contractor two decals of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The sign shall be removed upon completion of all other construction work under the contract and will become the property of the Contractor.

1.03 BARRICADES AND TRAFFIC CONTROL SIGNS

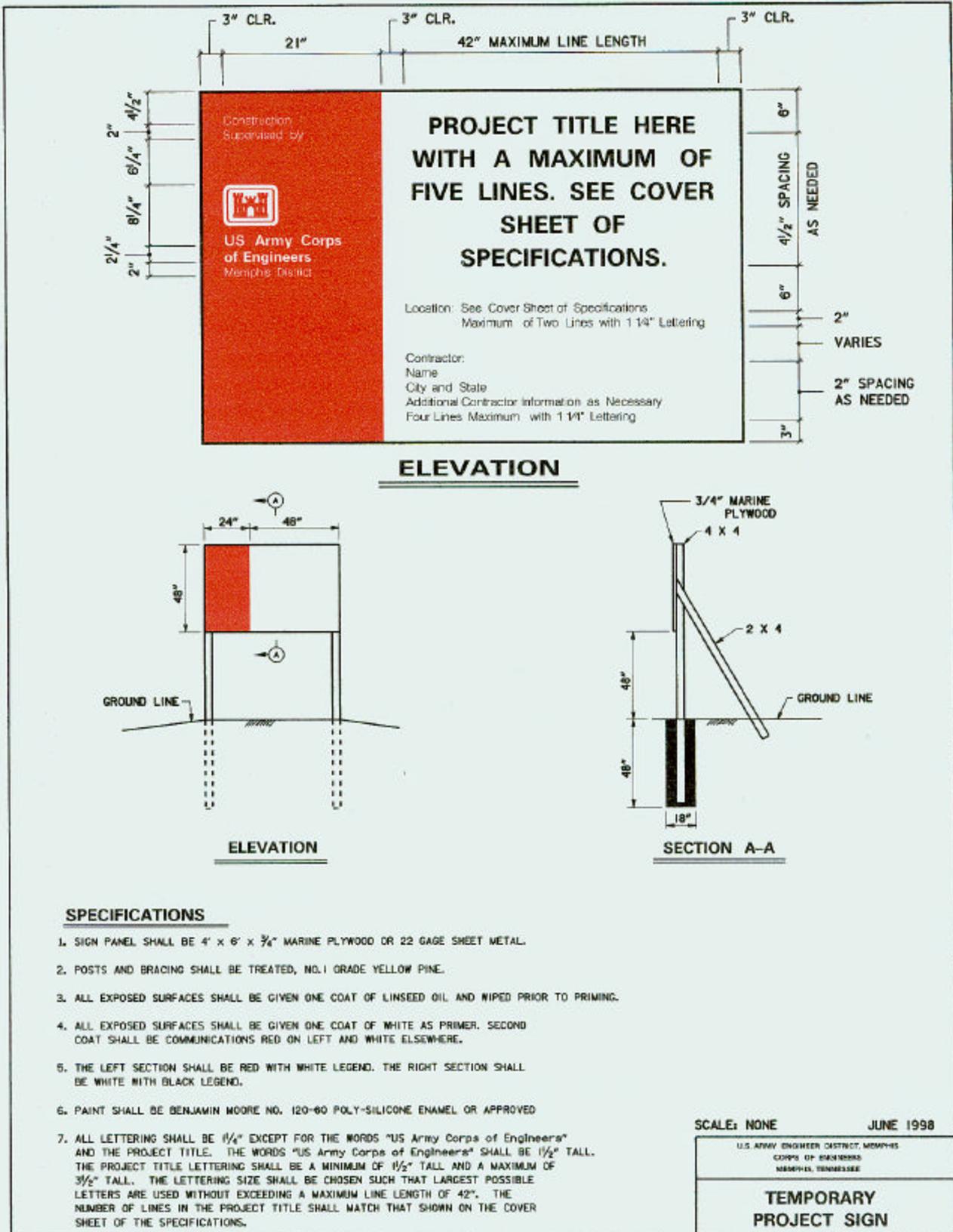
Barricades and traffic control signs shall be those as recommended by the Contracting Officer during construction and conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways," Current Edition.

1.04 PAYMENT

No separate payment will be made for erecting, maintaining and removing project signs, barricades, and traffic control signs and all costs in connection therewith will be considered an incidental obligation of the Contractor.

PART - 2 PRODUCTS (Not Applicable)**PART - 3 EXECUTION (Not Applicable)****PART - 4 COMPENSATION****4.01 PAYMENT**

No separate payment. Payment for all work within section shall be incidental to the lump sum and unit bid prices in the Bid Form.



DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01781

OPERATION AND MAINTENANCE DATA

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SECTION 01781**OPERATION AND MAINTENANCE DATA****PART 1 GENERAL****1.01 SUBMISSION OF OPERATION AND MAINTENANCE DATA**

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01330, "Submittal Procedures."

1.01.1 Package Quality:

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.01.2 Package Content:

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.

1.01.3 Changes to Submittals:

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.02 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES**1.02.1 Operating Instructions:**

Include specific instructions, procedures, and illustrations for the following phases of operation:

A. Safety Precautions:

List personnel hazards and equipment or product safety precautions for all operating conditions.

B. Operator Prestart:

Include procedures required to set up and prepare each system for use.

- C. Startup, Shutdown, and Post-Shutdown Procedures: Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.
 - D. Normal Operations: Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.
 - E. Emergency Operations: Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.
 - F. Operator Service Requirements: Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.
 - G. Environmental Conditions: Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.
- 1.02.2 Preventive Maintenance: Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.
- A. Lubrication Data: Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":
 1. A table showing recommended lubricants for specific temperature ranges and applications.
 2. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
 3. A Lubrication Schedule showing service interval frequency.
 - B. Preventive Maintenance Plan and Schedule: Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and

annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.02.3 Corrective Maintenance (Repair):

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs.

A. Troubleshooting Guides and Diagnostic Techniques:

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

B. Wiring Diagrams and Control Diagrams:

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

C. Maintenance and Repair Procedures: Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

D. Removal and Replacement Instructions: Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

E. Spare Parts and Supply Lists: Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.02.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.02.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.02.6 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.

A. Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

B. Personnel Training Requirements: Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

C. Testing Equipment and Special Tool Information: Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

D. Contractor Information: Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization most convenient to the project site. Provide the name, address, and

telephone number of the product, equipment, and system manufacturers.

1.03 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data package specified below for individual technical sections. The required information for each O&M data package is as included in 1.03.2.

1.03.1 See Section 02563, Combination Air Vacuum Valve, Paragraph 2.01.6, Operating and Maintenance Manual

1.03.2 Data Package

- A. Safety precautions
- B. Operator prestart
- C. Startup, shutdown, and post-shutdown procedures
- D. Normal operations
- E. Emergency operations
- F. Operator service requirements
- G. Environmental conditions
- H. Lubrication data
- I. Preventive maintenance plan and schedule
- J. Troubleshooting guides and diagnostic techniques
- K. Wiring diagrams and control diagrams
- L. Maintenance and repair procedures
- M. Removal and replacement instructions
- N. Spare parts and supply list
- O. Corrective maintenance man-hours
- P. Parts identification
- Q. Warranty Information
- R. Personnel training requirements
- S. Testing equipment and special tool information
- T. Contractor information

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

PART 4 COMPENSATION

4.01 PAYMENT

No separate payment. Paid for in the lump sum and unit bid prices in the Bid Form.

**END OF SECTION
01781-5**

DIVISION 2 – SITEWORK

SECTION 02111

CLEARING AND GRUBBING

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SECTION 02111**CLEARING AND GRUBBING****PART 1 - GENERAL**

1.01 DESCRIPTION

- 1.01.1 This item shall consist of the removal and satisfactory disposal of trees, except those that may be designated to remain in place, stumps, logs, snags, brush, weeds and other perishable or objectionable material within the limits of project site to include the permanent easement and all temporary easements as shown on the plans.
- 1.01.2 When specified on the Bid Form as lump sum, this item shall include costs for incidental work required on other non-related items specifically detailed on the Drawings but not listed separately on the Bid Form, which is subsidiary to the completion of that item of work in accordance with the Contract Documents.
- 1.01.3 This work shall include the stripping and stockpiling of topsoil, stump removal, felling of trees, clearing of brush and other operations as may be detailed herein or indicated on the Drawings.
- 1.01.4 See Section 02563, Paragraph 1.06.2B.

PART 2 - MATERIALS

2.01 GENERAL

- 2.01.1 Materials cleared from the site, including merchantable timber, if any, shall become the property of the CONTRACTOR for his disposal unless otherwise noted elsewhere in the Specifications.
- 2.01.2 The Contractor shall provide equipment of whatever nature is needed to complete the work to the satisfaction of the Contracting Officer. Equipment deemed by the Contracting Officer to be inadequate for the work must be removed from the site.

PART 3 - EXECUTION

3.01 GENERAL

- 3.01.1 Clearing and grubbing shall be completed a satisfactory distance in advance of earthwork for site preparation, roadways, pipe laying operations etc. and such

operations shall not be started until the cleared and grubbed area has been reviewed by the Contracting Officer.

- 3.01.2 The Contractor shall be responsible for obtaining permits for hauling, dumping, burning, disposal and other operations, as may be required by Local, State and Federal requirements.
- 3.01.3 The Contractor shall remove and dispose of all buildings and foundations, structures, fences and other obstructions, any portions of which are on the right of way, except utilities and those for which other provisions have been made for removal. All designated salvageable material shall remain the property of the Government or Government designated entity and shall be removed, without unnecessary damage, in sections or pieces which may be readily transported and shall be stacked at specified storage areas by the Contractor within the project's limits or hauled to a designated maintenance storage yard and stacked. All materials designated not to be salvaged may be destroyed or disposed of off the project outside the limits of view with written permission of the property owner on whose property material is placed. Copies of all agreements with property owners are to be furnished to the Contracting Officer prior to initiating work. Basements or cavities left by structure removal shall be filled to the level of the surrounding ground and, if within the prism of construction, shall be compacted to the approximate density of the surrounding ground.
- 3.01.4 The Contractor shall maintain local access to all properties fronting along the project for the duration of the work

3.02 CLEARING AND GRUBBING

- 3.02.1 When necessary to completely remove grass and small roots from the areas to be covered by earth fill, such as roadways, levees, or other site construction, such areas shall be stripped to sufficient depth to remove same, to the extent directed by the Contracting Officer.
- 3.03.2 Felling of trees and other clearing operations shall be conducted in a manner that prevents damage to trees that are to remain and to protect existing improvements, structures, utility lines or other items.

3.03 DISPOSAL OF MATERIALS

- 3.03.1 All merchantable timber shall become the property of the CONTRACTOR for his disposal unless otherwise noted.
- 3.03.2 Burying of stumps, trees, logs, snags or other vegetative materials will not be permissible within the project site limits unless otherwise provided for in these Specifications.

- 3.03.3 When permitted by the Contracting Officer, on designated projects, perishable material shall be burned within cleared areas. When on site burning is not permitted, perishable material shall be completely removed from project site to disposal areas provided by the Contractor and approved by the Contracting Officer. Piles for burning shall be placed in the center of cleared areas, shall be limited in size so that no damage to remaining trees or other vegetation will occur and shall be burned by forced air pit burning. The Contractor will be responsible for obtaining all permits required and for controlling fires in compliance with all Federal, State and Local laws and regulations for burning. Sufficient watchmen and fire extinguishers shall be provided for constant care of burning material. The Contractor shall submit to the Contracting Officer for review, his method of burning and appropriate precautions for protection of the adjacent areas. The Contractor shall notify the local firefighting unit in advance of burning operations. The Contractor shall furnish and maintain adequate firefighting equipment and personnel at the site during burning operations.
- 3.03.4 Ashes resulting from burning and incombustible materials such as green roots and debris shall be removed to designated disposal areas provided by the CONTRACTOR and approved by the CONTRACTING OFFICER.
- 3.03.5 Materials which are stripped from the project site which are not suitable for reuse shall be disposed of by the Contractor at a location provided by him and approved by the Contracting Officer.
- 3.03.6 The cost of hauling, stockpiling and disposal of material shall be included in the Contract Price bid for Clearing and Grubbing.

PART 4 COMPENSATION

4.01 MEASUREMENT

Measurement for "CLEARING AND GRUBBING" will be made as a percentage of the lump sum price for the amount of cleared and grubbed pipeline complete to the total length of pipeline. The clearing and grubbing has to be to the satisfaction of the Contracting Officer before measurement can be made for this work. For example, if half of the pipeline is cleared and grubbed as outlined in this specification and is acceptable to the Contracting Officer then the measurement for payment for this item can be up to 50% of the lump sum for this bid item.

4.02 PAYMENT

Payment for "CLEARING AND GRUBBING" will be made at the measured percentage of the lump sum for this bid item.

END OF SECTION
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DIVISION 2 – SITEWORK

SECTION 02220

DEWATERING

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SECTION 02220**DEWATERING****PART 1 - GENERAL****1.01 SCOPE**

The work provided for herein consists of furnishing all plant, labor, material and equipment and performing all operations required for designing, furnishing, installing and operating a system or systems to dewater the excavation area; maintaining the area free from water during construction operations; and removing the system.

1.02 QUALITY CONTROL

- A. The Contractor shall establish and maintain quality control for all dewatering operations to assure compliance with contracting requirements and maintain records of his quality control for all construction operations, including but not limited to the following:
- (1) Fabrication and workmanship.
 - (2) Installation, operation and removal.
 - (3) Monitoring free water surface and piezometric elevations.
 - (4) Measuring effluent from dewatering system.
 - (5) Monitoring of sanding.
- B. A copy of these records and tests, as well as the corrective action taken, shall be furnished the Government. Reports of operation and inspection shall include the following data: piezometer elevations, river stages, time of operation of each well, effluent discharge, sanding rates during pump test, problems encountered, proposed actions, and any other pertinent data.

1.03 GENERAL

- A. All permanent work under this contract except as otherwise specified shall be carried on in areas free of water. The Contractor shall design, furnish, install, operate and maintain such facilities necessary to accomplish the following:
1. Collect and dispose of all surface water in the protected area regardless of source.
 2. Control and dispose of all surface water around the periphery of the excavation areas to prevent such water from entering the excavation.
 3. Lower and maintain the water table at least 5 feet below the bottom of the excavation, and at least 2 feet below the side slopes for concrete structures.
 4. Lower and maintain the water table at least 1.5' below the bottom of the trench or undercut areas before pipeline placement.
 5. Install and monitor construction piezometers

1.04 DEFINITIONS

- A. Dewatering: Dewatering defines the lowering of the ground water below the slopes and bottom of the excavation to ensure dry, firm working conditions and the reduction to safe levels of any hydrostatic uplift pressures in any confined foundation strata and/or aquifers which is necessary to ensure the stability and integrity of the foundation.
- B. Dewatering System: Dewatering System defines the machinery, equipment and appurtenances necessary for and related to the accomplishment of dewatering, and the collection and disposal of all surface water within the protected area.
- C. Unwatering: Unwatering is defined as the process of removing all water within an excavation.

1.05 DESIGN

The dewatering system shall be designed and sealed by a professional engineer paid by the Contractor using accepted professional methods of engineering design consistent with the best current practice. The Contractor shall perform necessary tests and/or analyses of the water and soil environment at the site to satisfy himself that the materials used in his system will not corrode or otherwise deteriorate to such an extent that the system will not perform satisfactorily during the life of the contract. The dewatering plan shall be submitted to the Contracting Officer for review prior to construction of any facilities for dewatering purposes.

1.06 DEWATERING REQUIREMENTS

- A. The dewatering system for the excavation areas as shown on the plans shall be of a type and capacity to accomplish all requirements specified herein.
 - 1. The dewatering system shall be designed, installed and operated to dewater the excavation for gravity interceptors, influent pump station, influent manhole and other structures where groundwater is encountered during excavation.
 - 2. The system shall be of such capacity that it will lower and maintain the free water and piezometric levels, to an elevation at least 5 feet below all earth slopes and excavation surfaces lying within the area, inclusive of the interior slopes of the cofferdam embankments proper. The system shall have sufficient capacity to accomplish this desired result allowing for normal variations in soil properties and foundation conditions.
 - 4. The water level shall be maintained continuously at or below the necessary elevations so that construction operations can be performed without interruption due to wet conditions.
 - 5. No upward or vertical or lateral flow of ground water into the work area will be permitted at any time. The dewatering system shall be designed, constructed and operated at all times so as to prevent movement and/or

pipings of the foundation, excavation slopes and fill materials. The system shall be operated as necessary during dewatering and unwatering so as to maintain piezometric levels, within the dewatered area, at or beneath the elevation of the water level in the excavation.

6. The system shall consist of wells, well-points, sumps, sump pumps, ditches and necessary appurtenances capable of intercepting seepage before it exits on any interior surface or excavation face and of providing control of surface water all consistent with the design sealed by a professional engineer paid for by the Contractor. The required dewatering shall be accomplished by using a system to lower the piezometric level as required above to prevent flooding of bedding or base materials and fresh concrete. Protection of all slopes will be required to prevent erosion under normal surface runoff and construction conditions.
7. Initial unwatering of an excavation need not be accomplished by sumping alone, but may utilize sumping in addition to positive dewatering accomplished with a system meeting the requirements above. Initial unwatering shall at all times fulfill the requirements of above.
8. Burying of headers will be allowed only in areas and to depths absolutely necessary for protection against damage at construction equipment crossing. The effluent from the dewatering system will be required to be discharged into the nearest waterbody where positive drainage away from the site can be accomplished. The water shall be controlled to prevent erosion or damage to the existing natural ground.
9. A system of construction piezometers will be required to monitor free water surface elevations and piezometric elevations to evaluate the effectiveness of the dewatering system in fulfilling the requirements specified herein. Piezometers shall be of adequate numbers and in suitable arrangements and depths for determining the free water surface elevations and piezometric elevation over the area. A minimum of three piezometers shall be installed with the dewatering system. The piezometer construction shall consist of PVC riser pipe and screen (ASTM 1785, Schedule 40). Care shall be taken during construction to ensure that the piezometers are not damaged. The piezometers will be removed after the completion of construction. See paragraph 3.02 for submittal and approval of piezometer details and installation procedures. The Contractor shall make a minimum of one reading per piezometer, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These piezometer readings, along with corresponding short fork creek stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.

9. The system shall include mechanical means for measuring the effluent from each well as well as the total effluent of the dewatering system. Devices and technique used in measurement shall be acceptable to the Contracting officer. The Contractor shall make a minimum of one reading per instrument, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These instrument readings, along with corresponding creek stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.
10. The system shall be designed, installed and operated in a manner which will preclude removal of materials from the foundation by the pumping operation (hereafter referred to as "sanding"). After installation, each well shall be individually pump-tested at maximum design flow to verify acceptability with respect to sanding. Any well or wellpoint segment found sanding at a rate exceeding one pint per 25,000 gallons of effluent during the individual pump-test of maximum design flow shall be replaced in a manner acceptable to the Contracting Officer, and at no additional cost to the Government.
11. The rate of unwatering the excavation shall not exceed 5 feet per day for the first 10 feet and one foot per day thereafter until completely unwatered.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INITIAL TESTING

Upon installation of the system, the Contractor shall test and evaluate the completed system to demonstrate to the satisfaction of the Contracting Officer that the system is, in fact, capable of performing the intended dewatering operation as outlined herein. This testing shall include complete falling head tests to be conducted on each piezometer.

3.02 REVIEW OF SYSTEM DESIGN AND PERFORMANCE

The Contractor shall submit to the Contracting Officer, for review, details of his proposed dewatering facilities, including the type of system, planned layout and sizes of wells, headers, including all lengths requiring burial, collectors, ditches, piezometers, sumps and pumps; capacities of standby pumping and power supply facilities; number, type, location, proposed method of installation, and proposed methods of testing of piezometers; facilities for measuring the flow of water pumped from each well of the dewatering system; facilities for monitoring of sanding; provisions for disposal of water riverside of the mainline levee from the dewatering system; and plan of operation. This submittal shall include the design capacity of each well at the design stage, and shall be submitted no later than 30 days prior to installation of the system. The

Contractor's proposed dewatering facilities will be reviewed for general design concept. The Contractor retains full responsibility for design, installation, operation, safety and performance of the system, facilities, and its components. The Contractor shall install the entire dewatering system and shall make no reduction to the planned system without the prior written approval of the Contracting Officer. If during the progress of the work, the installed dewatering system proves inadequate to meet the requirements specified, including piezometers, the Contractor shall, at his expense, furnish, install and operate such additional dewatering facilities and/or make such changes, either in features of the system or the plan of operation, as may be necessary to perform the required dewatering in a satisfactory manner. Such changes and additions shall be approved in writing by the Contracting Officer prior to being made.

3.03 MAINTENANCE AND SERVICING

The Contractor shall be responsible for the maintenance, servicing and repairs of the entire dewatering system and appurtenances during the life of the contract, including replacement of any and all wells, and piezometers found performing unsatisfactorily.

3.04 STANDBY PUMPING EQUIPMENT POWER

A. The Contractor shall furnish standby pumping equipment power as follows:

1. Diesel or liquid petroleum gas prime movers for pumps shall have 50% standby equipment.
2. Portable electric generators shall have 100% connected standby equipment.
3. Commercial electric power, if available, shall have 100% standby electric generating equipment.

3.05 REMOVAL

The dewatering facilities required to maintain a dry condition within the protected area shall be maintained until completion of the work within the protected area, and then shall be completely removed. However, no dewatering facilities of any kind shall be removed without prior approval of the Contracting Officer. All wells, pumps and appurtenances employed in the dewatering system and all materials other than earth shall remain the property of the Contractor, and shall be removed by him from the site of the work. All holes shall be plugged as follows: The riser pipes for all wells and piezometers shall be completely removed and filled with bentonite-cement grout. However, the screens of the deep well system may remain upon approval of the Contracting Officer. Plugging shall be accomplished by inserting a grout pipe to the full depth of the well or riser pipe and the grout either poured or pumped in as the riser pipe is removed. The grout for plugging the hole shall consist of a mixture of portland cement, bentonite, and water proportioned as directed by the Contracting Officer. The water percentage may be varied for a more effective plugging job. The grouting of abandoned wells and piezometer riser pipes in lieu of removing them will not be permitted unless approved by the Contracting Officer.

PART 4 – COMPENSATION

4.01 MEASUREMENT

Measurement for “DEWATERING” shall not be made separately.

4.02 PAYMENT

No separate payment for “DEWATERING” will be made. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

DIVISION 2 – SITEWORK

SECTION 02272

RIPRAP

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SECTION 02272

RIPRAP

PART 1. GENERAL

1.01 SCOPE OF WORK

In accordance with the requirements of this Section, the Contractor shall furnish and place stone riprap of the type to the depth designated and in reasonably close conformity with the lines, grades and thicknesses shown on the Drawings.

The work shall consist of furnishing and placing geotextile fabric under all riprap.

PART 2 - PRODUCTS

2.01 STONE AND GROUTED RIPRAP

2.01.1 Aggregate for stone shall be dense, free of clay or shale seams, resistant to the actions of air and water, approximately rectangular in shape, and suitable in all other respects for the purpose intended. Quality requirements for rock to be furnished under these Specifications will be checked or tested by the Contracting Officer prior to use and subsequently if deemed appropriate.

2.01.2 Stone for riprap shall meet the requirements for size by weight of the mass as follows:

Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Section 705, 300 Lbs. Rip-Rap.

Weight	Percent (by weight of the mass)
300 lbs to 60 lbs	80%
20 lbs to 59 lbs.	10%
5 lbs to 19 lbs	10%

This gradation sets out minimum requirements for the large stone per size designation. The Contractor shall furnish material well graded with the smaller stones such that a homogeneous blanket of riprap will result with all interstices reasonably well filled with rock.

2.02 GEOTEXTILE FABRIC

2.01 The filter cloth material used as a base for rip-rap shall be pervious sheets of strong, rot-proof plastic fabric meeting the following Specifications:

Physical Property	Test Method (latest Revision)	Acceptable Test Results
Tensile Strength, wet, lbs.	ASTM D-1682	200 (min.)
Elongation, wet, %	ASTM D-1682	40 (min.)
Coefficient of Water Permeability, cm/scc	Constant Head	.03 (min.)
Puncture Strength, lbs.	ASTM D-751	100 (min.)
Pore Size - EOS	Corps of Contracting Officers	40 (max.)
U.S. Standard Sieve	CW-02215	

2.02.2 The Contractor shall furnish a certified laboratory test report from an approved testing laboratory with each shipment of materials. Laboratory test reports shall include actual numerical test data obtained on this product.

2.02.3 Pins may be any commercially available pin 6 inches in length capable of retaining a washer.

2.02.4 Washers may be any commercially available washer 2 inches in diameter and compatible with the pin.

2.02.5 The pins and washers shall be manufactured from corrosion resistant metal material.

2.03 GROUT

Grout for riprap shall consist of one part Portland Cement and three (3) parts of sand approved by the Contracting Officer thoroughly mixed with water to product grout having a thick, creamy consistency. Portland Cement shall conform to Section 03300, Paragraph 2.01.1.

2.04 SUBMITTALS

Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures

PART 3 - CONSTRUCTION REQUIREMENTS

3.01 SUBGRADE PREPARATION:

3.01.1 Prior to placement of the geotextile fabric or the placement of riprap, the slopes or ground surface shall be shaped to the lines and grades indicated on the Drawings or directed by the Contracting Officer, and shall be thoroughly compacted by use of mechanical or hand tamps. Unless otherwise stipulated or directed, slopes shall not be steeper than the natural angle of repose of the material upon which riprap is to be placed.

3.01.2 The outer edges and the top of the riprap where the construction terminates shall be formed so that the surface of the riprap will be embedded and even with the surface of the adjacent slope or ground, and the bottom of the riprap shall be placed at least two feet below the natural ground surface unless otherwise directed.

3.02 INSTALLATION OF GEOTEXTILE FABRIC:

3.02.1 Placing Filter Fabric:

Filter fabric shall be placed on the prepared and compacted subgrade within the limits shown on the plans for stone rip-rap. The filter fabric shall be laid loosely without wrinkles or creases. When more than one width or length of filter fabric is necessary, the joints shall be overlapped a minimum of 24 inches. Securing pins with washers shall be inserted through both strips of overlapped material and into the materials beneath until the washer bears against the fabric and secures it firmly to the base material. These securing pins shall be inserted through the overlapped fabric at not greater than 2 foot intervals along a line through the midpoint of the overlap. If the fabric is torn or damaged, a patch overlapping the edges of the damaged area by 2 feet shall be sewn securely to the fabric with a continuous, monofilament, rot-proof material.

3.03 PLACING LOOSE RIPRAP:

3.03.1 Riprap stone shall be as large as can be conveniently placed in a layer of the required depth. In layers two feet (2') or less in depth. Weight of the stones, with the exception of small stones and spalls used to chink interstices, shall be in accordance with Paragraph 2.01.2 of this Section.

3.03.2 The bed for the riprap shall be shaped and trimmed to provide even surfaces. A footing trench shall be excavated along the toe of the slope.

- 3.03.3 When the required riprap is less than twenty inches (20") in depth, stone shall be placed by hand. Stone shall be placed to provide a minimum of voids.
- 3.03.4 The larger stones shall be placed in the toe return, foundation course, and on the outer surface of the riprap.
- 3.03.5 Stones shall be placed with their longitudinal axis normal to the face of the embankment and so arranged that each rock above the foundation course has at least a three (3) point bearing on the underlying stones. Bearing on smaller stones shall be chinked with small stones and spalls. The finished surface shall be even and tight and shall not vary from the planned surface by more than three inches (3") per foot of depth.
- 3.03.6 When the required riprap is twenty inches (20") or more in depth, the stones may be placed by dumping and spread in layers by bulldozers or other suitable equipment.
- 3.03.7 Random riprap shall not be less than eighteen inches (18") in thickness.
- 3.04 GROUTED RIPRAP
- 3.04.1 The stones shall be the size as designated in Paragraph 2.01 in this specification and shall be placed in the same manner as specified above for Loose Riprap, care being taken during placing to keep earth or sand from filling the spaces between the stones.
- 3.04.2 After the stones are in place, the stones shall be thoroughly wet and the spaces between them shall be completely filled with grout from bottom to top. The surface shall be swept with a stiff broom.
- 3.05 CLEANUP

Upon completion of the Work, the Contractor shall clean the surface of the riprap, remove and dispose of all surplus material and debris, and leave the site in a neat and presentable condition.

PART 4 COMPENSATION

4.01 MEASUREMENT

- 4.01.1 Loose Stone Riprap
Per ton installed to the nearest tenth (1/10).
- 4.01.2 Grouted Riprap
Per ton installed to the nearest tenth (1/10).
- 4.01.3 Grout

Measurement for grout for grouted riprap shall not be made separately but shall be considered an absorbed item for each unit installed of each.

4.01.4 Geotextile

Measurement for Geotextile fabric shall not be made separately, but shall be considered an absorbed item for each unit installed.

4.01.5 Water

Shall not be measured

4.02 PAYMENT

4.02.1 General: Payment for loose stone riprap and grouted riprap shall be made at the Contract Unit Price per ton complete in place and accepted; which price shall be full compensation for furnishing, hauling and placing all riprap and slope protection materials; for all excavation, subgrade preparation, geotextile fabric in place, and backfilling; for all grouting specified; and for all materials, equipment, tools, labor and incidentals necessary to complete the work in accordance with the Contract Documents.

4.02.2 Grout, water, tamping, and other items incident to completion of the slope protection shall not be measured and no separate payment shall be made for such items.

DIVISION 2 – SITEWORK

SECTION 02480

SEEDING, FERTILIZING AND MULCHING

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SECTION 02480**SEEDING, FERTILIZING AND MULCHING****PART 1 - GENERAL**

1.01 QUALITY ASSURANCES

Conform to the requirements and regulations of the Mississippi Department of Agriculture.

PART 2 - PRODUCTS

2.01 MATERIALS

2.01.1 Topsoil

- A. Furnish, at expense, sufficient topsoil to properly install all work as specified herein, and as shown on the drawings, if the quantity of stored topsoil is inadequate.
- B. Topsoil furnished will be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity, obtained from naturally well-drained areas and not excessively acid or alkaline nor containing toxic substances which may be harmful to plant growth. It will be without admixture of subsoil, cleaned and reasonably free from clay lumps, stones, stumps, roots or similar substances two inches or more in diameter, debris or other objects which might be a hindrance to planting operations.

2.01.2 Lime

Ground limestone (Dolomite) containing not less than 85 percent of total carbonates and ground to such a fineness that 50 percent will pass through a 100-mesh sieve and 90 percent will pass through a 20-mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

2.01.3 Commercial Fertilizer:

13-13-13 formula, 13% nitrogen, 13% phosphoric acid, 13% potash, conforming to the applicable state fertilizer laws, uniform in composition, dry and free flowing, and delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

2.01.4 Water

Clean, fresh potable water.

2.01.5 Grass Seed

- A. The requirements of the Mississippi Department of Agriculture apply. No "below standard" seed will be acceptable.
- B. Grass seed furnished under these specifications will be packed in new bags that are sound and not mended.

2.02 SUBMITTALS

Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 3 – EXECUTION

3.01 INSTALLATION

Proceed immediately, when other work has progressed sufficiently, to commence work on planting, including placing of topsoil to finished grade. Thereafter, conduct the planting operation under favorable weather conditions during the next season or seasons which are specified herein. Plant only within the period specified herein.

3.02 TIME OF SOWING

3.02.1 The grass seed percentages listed below indicate quantity by weight percent.

A. Fall

Seed mixture for Fall seeding will be 60% Kentucky 31 Fescue, 30% annual rye grass, and 10% white clover, sown during the period of September 15 to December 1 at the rate of 90 pounds per acre.

B. Spring

Seed mixture for Spring seeding will be 70% Kentucky 31 Fescue, 10% annual rye grass, and 20% unhulled Bermuda grass when applied from April 1 to July 1 at a rate of 90 pounds per acre.

C. Summer

Seed mixture for summer seeding will be 50% hulled Bermuda and 50% unhulled Bermuda when applied from July 1 to September 15 at a rate of 90 pounds per acre.

D. Do not seed during windy weather, nor when the ground surface is frozen, wet or otherwise non-tillable. No seeding shall occur during December 1 to April 1 without written approval of the Contracting Officer.

3.03 SEEDING

3.03.1 Plant all disturbed areas with vegetative cover where sodding is not to occur.

- 3.03.2 Grade and uniformly compact the subsoil so that it will be parallel to the proposed finished grade.
- 3.03.3 After subgrade soil has been prepared, spread the topsoil evenly thereon and lightly compact. Spread no topsoil in a frozen or muddy condition.
- A. Bring areas to be seeded to finished grade and smooth.
 - B. Scarify and smooth areas where the topsoil has not been removed and remove sticks, stones and rubbish.
- 3.03.4 Soil Improvements:
- A. Provide a PH test of soils at least every 3000 feet to determine application rate. Lime application shall be at the required rate to the areas being prepared for planting to obtain a PH between 6.5 and 7.0.
 - B. Apply commercial fertilizer at the rate of 1000 pounds per acre to the areas being prepared for planting.
- 3.03.5 Planting
- Immediately before any seed is to be sown, scarify the ground as necessary and rake until the surface is smooth, friable and of uniformly fine texture. Seed evenly at the rate designated in Section 3.02, lightly rake, roll with a 200-pound roller, and water with a fine spray. The method of seeding may be varied as required to establish a smooth, uniform turf composed of the grasses specified.
- 3.03.6 Mulching
- Cover all seeded areas with a 1-inch minimum thickness layer of weed-free straw or other approved mulch, and wet thoroughly.
- 3.04 MAINTENANCE & ACCEPTANCE
- 3.04.1 Maintain the grass seeding, without additional compensation, for not less than 90 days after finishing the sowing, and then until final completion of the Contract. Regrade, reshape, protect, sprinkle, remove obnoxious weeds and perform such other work required to produce a satisfactory condition. Grass coverage will be 90% minimum for acceptance. No eroded areas will be allowed.
- 3.04.2 Re-seed all grass that does not show satisfactory growth or a uniform stand in accordance with the provisions and requirements set out herein, at no cost to the Government.

3.05 CLEAN-UP

Refer to Section 00800.

PART 4 – COMPENSATION

4.01 MEASUREMENT

Measurement for seeding, fertilizing and mulching for pipeline that has been finished graded to drain and treated with the appropriate seed, fertilizer and mulched as indicated in this section shall be paid for as a percent of completed pipeline to the total length of the pipeline. Pipeline measurement for payment is subject to acceptance requirements in paragraph 3.04.

4.02 PAYMENT

Payment for seeding, fertilizing and mulching shall be at the percentage determined in 4.01 of the contract lump sum price shown on the Bid Form for this item.

DIVISION 2 – SITEWORK

SECTION 02561

INTERIOR COATING FOR DUCTILE IRON SEWER PIPE

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SECTION 02561**INTERIOR COATING FOR DUCTILE IRON SEWER PIPE****PART 1 - GENERAL****1.01 DESCRIPTION**

Ductile iron pipe and fittings shall have a ceramic epoxy lining on the interior and a bituminous coating on the exterior except for 6 inches back from the spigot end. The bituminous coating shall not be applied to the first 6 inches of the exterior of the spigot ends. Ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall be as cast without ever having been lined prior to the application of the specified lining. Ductile iron sewer pipe or fittings furnished for this project must not have been lined prior to the awarding of the contract for this project.

PART 2 - MATERIAL

Brand name(s) items in this sub-section are used to set a standard of quality. It is not intended to restrict the Contractor from offering an equal item from another source(s) of supply.

2.01 LINING MATERIAL

The material used for the lining shall be a 2-component amine cured epoxy of at least 87% solids. Protecto 401 by Vulcan Painters, Birmingham, Alabama; or Permite 9043, Type II glass-filled epoxy by Permite Corporation, Atlanta, Georgia, are the standard of quality. Any products submitted must be accompanied by certified test data reflecting the ability of the material to perform per these Specifications. The following are the minimum requirements to be met:

- 2.01.1 A permeability rating of zero permeance when a film of at least 40 mils is tested according to ASTM D 1663-72 (reapproved 1979) or a permeability rating of 0.0 perms when measured using Method A of ASTM E96-66, procedure A with a test duration of 42 days.
- 2.01.2 The material shall contain at least 20% by volume of ceramic quartz pigment in the dried film.
- 2.01.3 The following test must be run on ductile iron panels with the results certified by the lining material supplier of the material being submitted.

TEST	RATING/METHOD
1. Direct Impact	ASTM D-2794

- | | | |
|----|-----------------------------------------------------------------------------|----------------------|
| 2. | 3% Sulfuric Acid
Immersion at 120 ⁰ F | ASTM D-714-56 (1974) |
| 3. | 25% Sodium Hydroxide
Immersion at 140 ⁰ F | ASTM D-714-56 (1974) |
| 4. | Deionized Water
Immersion at 160 ⁰ F | ASTM D-714-56 (1974) |
| 5. | Moisture and Ultraviolet Light
Cycle 8 hours light/4 hours 100% humidity | ASTM G5377 |

2.02 SUBMITTALS

Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures

PART 3 - EXECUTION

3.01 APPLICATION

3.01.1 Applicator

The lining shall be applied by a competent firm with at least a 5-year history of applying linings to the interior of ductile iron pipe and fittings.

3.01.2 Surface Preparation

Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Areas where oil, grease or other substances which can be removed by solvent is present shall be solvent cleaned using the guidelines outlined in SSPC-1 solvent cleaning. After the surface has been made free of grease, oil or other substances, areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The blast media shall strike the surface at a minimum angle of 45. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc. are removed from the surface. Only slight stains and specks of tightly adhering oxides may be left on the surface. Areas where rust reappears before coating must be reblasted to remove rust.

3.01.3 Lining

After the surface preparation and within 8 hours of surface preparation, the barrel of the pipe from the inside shoulder of the gasket groove to the end of the interior spigot shall receive minimum coating of 24 mils dry film thickness of the protective lining. If flange fittings of pipe are included in the project, the linings must not be used on the face of the flange; however, full face gaskets must be

used to protect the ends of the pipe. Fittings shall be lined with a minimum of 24 mils of the protective lining. Push-on type fittings shall be lined from the gasket groove to the gasket groove. The 24 mils system shall not be applied in the gasket grooves.

3.01.4 Coating of Gasket and Spigot Ends

Due to the tolerances involved, the gasket groove and spigot end up to 6 inches back from the end of the spigot end must be coated with a minimum of 10 mils dry of protective coating. This coating shall be applied by brush to ensure coverage. Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. Materials for the gasket groove and spigot end shall be applied after the application of the lining.

3.01.5 Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied in excess of the dry thickness per coat recommended by the lining manufacturer in printed literature. The time between coats shall never exceed that time recommended by the lining material manufacturer. No material shall be used for lining which cannot be recoated with itself without roughening of the surface after 4 hours cure @ 100⁰F. If the lining must be recoated beyond the lining material manufacturer's recommended recoat time, the surface of the existing lining shall be roughened sufficiently to prevent delamination between coats.

3.02 INSPECTION AND CERTIFICATION

3.02.1 INSPECTION

- A. Ductile iron pipe shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness rating.
- B. The barrel of all pipe and fittings shall be pinhole-detected with a non-destructive 2,500 volt pinhole test.
- C. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date.

3.02.2 CERTIFICATION

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified, and that the material was applied as required by the specification.

3.03 FIELD APPLICATION

3.03.1 SURFACE PREPARATION

- A. The damaged or abraded area shall be brushed vigorously with a wire brush or sanded with coarse sandpaper to remove all loose material. After the surface has been cleaned, care should be taken to remove all dust from the cleaning operation. This can be accomplished by blowing off with compressed air or by brushing with a dry brush.

- B. Lining material shall be mixed thoroughly in strict accordance with manufacturer's recommendations. After the material has been thoroughly mixed, apply to the prepared surface by either brush, roller or airless spray. The material will be applied in one or two coats, as directed by the Contracting Officer, depending on the size of the damaged area and whether it goes to the substrate or not.

PART 4 – COMPENSATION

4.01 PAYMENT

No separate payment will be made for “INTERIOR COATING FOR DUCTILE IRON SEWER PIPE”. Payment for work in this section shall be made and included in the bid items that are applicable for this work.

END OF SECTION
02561-4

DIVISION 2 – SITEWORK

SECTION 02563

SEWAGE FORCE MAIN

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SECTION 02563**SEWAGE FORCE MAIN****PART 1 GENERAL****1.01 DESCRIPTION****1.01.1 General**

The work to be performed under this section of the Specifications shall consist of furnishing labor, equipment, materials, and performing operations in connection with the excavation, dewatering, trenching, installation and backfilling of sanitary sewage force main. Place, joint, and test pipe, fittings, couplings and adaptors, as shown on the Drawings and specified herein.

1.01.2 Materials installed as a part of the work shall include the pressure pipe, trenching, appurtenances, specials, bends, tees and other items such as bedding, sand, gravel, thrust blocking, etc.

1.01.3 Contractor shall use one of the three piping systems with material specified herein. Allowable piping systems are as follows:

- A. PVC pipe and fittings with Ductile Iron Pipe (DIP) and fittings under creek crossings.
- B. High Density Polyethylene Pipe (HDPE) and fittings.
- C. Fiberglass Reinforced Polymer Mortar Pipe (RPM) and fittings.

1.02 SUBMITTALS

1.02.1 The Contractor shall submit manufacturers manuals, specifications, catalog sheets, tests and other information for pipe, fittings, valves, select bedding and backfill and other material requested for review by the Contracting Officer for apparent conformance to these Specifications. Wherever "approved equal" appears in this Specification, material may be reviewed to determine if the proposed substitute meets the test of apparent equivalence for use in this project. The Contracting Officer decision for "equal" approvals shall be final.

1.02.2 See Section 01330, Submittal Procedures

1.03 INSPECTION

When the term “inspection” is used in this Specification, it means visual observation of materials, equipment and construction methods, on an intermittent basis, to determine that the work is in conformance with the Contract Documents and the design intent. Such inspection does not constitute acceptance of the work, nor shall it be construed to relieve the Contractor in any way from his responsibility for the means and methods of construction **or for safety on the construction site.**

1.04 CONTRACTOR’S PERFORMANCE HISTORY

- 1.04.1 The Contractor shall submit his performance history in laying the type of force main pipe included in this contract. His performance record shall include the name, cost and location of each project, and the names, addresses and telephone numbers of his references relative to each project.
- 1.04.2 Supervisory Personnel Performance History. The Contractor shall include the specific work experience and references of his Superintendent and Foremen he proposes to use on this project relative to laying the type of force main pipe in this contract. The selected personnel shall be experienced of at least 8 years in this type of work.

1.05 CONTRACTOR’S EQUIPMENT

The Contractor shall provide and maintain the equipment necessary to prosecute the work in an orderly and safe manner. The equipment shall consist of suitable units designed or selected to perform and expedite the work and incidental items of construction.

1.06 PROTECTION OF PROPERTY

1.06.1 General

Existing power lines, telephone lines, pavements, trees, property corners or monuments, shrubbery, fences, water mains, gas mains, sewers, cables, conduits, ditches, embankments and other structures in the vicinity of the work not authorized to be removed shall be supported and protected from injury by the Contractor during the construction and until completion of the work affecting them. The Contractor shall be liable for damages done to such existing facilities and structures, as herein provided, and he shall save the Government harmless from liability or expense for injuries, damages or repairs to such facilities. No additional compensation will be allowed for any operations of the Contractor in completing the work near, over, under or around existing utilities unless otherwise specified.

1.06.2 Underground Utilities

- A. The type, size, location and number of known underground utilities have been shown on the Drawings as could best be determined; however, no

guarantee is made as to the true type, size, location or number of such utilities. It shall be the responsibility of the Contractor to verify the existence and location of underground utilities along the route of the work. The omission from, or the inclusion of utility locations on the Drawings is not to be considered **as the nonexistence of or a definite location of** existing underground utilities. The Contract unit prices bid shall provide full and complete compensation for operations necessary to complete the work in accordance with the Drawings and Specifications in working near, over, under or around existing utilities unless specified otherwise.

- B. All utilities located along the force main right-of-way are to remain in place and operative during construction. At least 10 days before beginning work in the vicinity of a utility, the Contractor shall call the “**Call Before You Dig**” number (1-800-227-6477) and advise them as to when and where he proposes to start working in areas where utilities are located. The Contractor shall exercise special care when working in the vicinity of utilities to prevent damage thereto or injury to the Contractor’s employees or others. Any damage to the utilities or interruptions of service occasioned by the Contractor’s operations shall be repaired and the service restored promptly at his expense.
- C. In the event the Contractor elects to have utilities relocated for his own convenience, he shall make his own arrangements with utility owners for the rerouting and replacement to their permanent location after completion of the work adjacent thereto. All costs associated with utility relocation for the Contractor’s convenience shall be at his expense.

1.06.3 Relocation of Existing Utilities

- A. The Contractor shall notify the Owner or Owners of the existing utilities, whether above the ground or underground; prior to proceeding with trench excavation whenever such trenching operations are within ten feet (10') of any existing utility.
- B. In the event that during construction it is determined that underground utilities, including sanitary sewers, water mains, gas mains, telephone cables, storm sewers, etc., and above ground utility facilities require relocation, the Contractor shall notify the utility Owner well in advance of his approach to such utility so that arrangements for such relocation by the Owner or the Owners of the affected utility can be completed without delay to the Contractor's work.

- C. Should a utility be damaged in the trenching operations, the Contractor shall immediately notify the Owner of the utility and the Contracting Officer. If the damaged utility transports hazardous material, electricity, or type material carried is not known, the Contractor shall also notify appropriate Emergency Operations Agency and Law Enforcement Agency. **The Contractor shall not attempt to make repairs unless so authorized, in writing, by the affected utility owner. Duplicate copies of written authorization given to the Contractor to make repairs shall be filed with the Contracting Officer and shall be so worded as to save harmless the Government of responsibility relative to the sufficiency of the repairs.**

1.06.4 Landscape Vegetation

Reasonable care shall be taken during construction to avoid damage to landscape vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

PART 2 PRODUCTS

2.01 PRESSURE PIPE AND APPURTENANCES

2.01.1 PVC Pipe and Fittings

- A. All PVC pipe greater than (12") inches in diameter for force mains shall conform to the latest edition of AWWA C-905 and shall be made from Class 12454-A or B materials per the latest edition of ASTM D-1784. Pipe shall be a minimum of DR 25 unless otherwise specified, for a working pressure rating of 165 PSI. Pipe and fittings shall be tested for minimum 150 PSI water working pressure. All pipe shall conform with the outside diameter (OD) dimensions of ductile iron pipe to facilitate use of DIP fittings, standard cast iron valves and specials (refer to paragraph 2.01.2.C of this specification for requirements for fittings). All joints shall be elastomeric seals conforming to the latest edition of ASTM F-477. All pipe shall bear the seal of the National Sanitation Foundation (NSF). All jointing shall be made in accordance with the manufacturer's recommendations.
- B. For PVC pipe 6" and larger all fittings shall be ductile iron with restrained joints and lined in accordance with Section 02561. All pipe joints within the below listed distances, in both directions from the apex of the fitting, shall be restrained for horizontal offset conditions.

Pipe size	Type fitting	Length to be restrained (R)
24"	11-1/4°	7'
24"	22-1/2°	14'
24"	45°	29'
24"	90°	71'

- C. For vertical offset conditions, all fittings shall be ductile iron with restrained joints. All pipe joints within the below listed distances, in both directions from the apex of the fitting, shall be restrained for vertical offset conditions.

Pipe size	Type fitting	Length to be restrained Highside Fitting (R)	Length to be restrained Lowside Fitting (R)
24"	11-1/4°	21'	8'
24"	22-1/2°	43'	15'
24"	45°	89'	32'
24"	90°	N/A	N/A

- D. Restraint for PVC pipe (AWWA C905) at the bell shall consist of the following: The restraint shall be manufactured of ductile iron conforming to ASTM A536. A ring shall be utilized on the PVC bell. A restraint ring, incorporating a plurality of individually actuating gripping surfaces, shall be used to grip the pipe and a sufficient number of bolts shall be used to connect the bell ring and the gripping ring. The combination shall have a minimum working pressure rating equivalent to the pipe. The restraint shall be the Series 2800 as manufactured by EBAA Iron, Inc. or Contracting Officer approved equal.

2.01.2 Ductile Iron Pipe and Fittings

- A. Ductile iron pipe shall be centrifugally cast in metal or sand lined molds manufactured in accordance with the latest edition of ANSI A21.51 (AWWA C 151). Pipe shall be pressure Class 200 Ductile Iron unless otherwise specified. Pipe and fittings shall be tested for minimum 150 PSI water working pressure, laying conditions type 2 flat bottom trench without blocking, tamped, backfilled and under five (5) feet of cover. Pipes and fittings shall be factory coated on the outside with coal tar enamel conforming to the latest edition of ANSI A 21.5. **Pipe shall be lined inside in accordance with requirements of Technical Specification Section 02561 contained herein. Ductile iron pipe installed pursuant to these specifications shall be encased with a**

minimum 8 mil thick loose polyethylene encasement, in accordance with the latest edition of ANSI/AWWA C-105

- B. For Ductile iron pipe 6" and larger all fittings shall be ductile iron with restrained joints. All pipe joints within the below listed distances of the fitting shall be restrained for horizontal offset conditions.

Pipe size	Type fitting	Length to be restrained (R)
24"	11-1/4°	8'
24"	22-1/2°	16'
24"	45°	34'
24"	90°	83'

- C. For vertical offset conditions all fittings shall be ductile iron with restrained joints. All pipe joints within the below listed distances, in both directions from the apex of the fitting, shall be restrained for vertical offset conditions.

Pipe size	Type fitting	Length to be restrained Highside Fitting (R)	Length to be restrained Lowside Fitting (R)
24"	11-1/4°	26'	8'
24"	22-1/2°	52'	16'
24"	45°	107'	34'
24"	90°	N/A	N/A

- D. Ductile iron pipe bell restraint shall consist of a wedge action restraint ring on the spigot joined to a split ductile iron ring behind the bell. The restraint ring shall have individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The restraint ring and its wedging components shall be made of a minimum grade of 60-42-10 ductile iron conforming to ASTM A536. The wedges shall be heat treated to a minimum hardness of 370 BHN. Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges. The split ring shall be made of a minimum grade of 60-42-10 ductile iron conforming to ASTM A536. The connecting tie rods that join the two rings shall be made of low alloy steel that conforms to ANSI/AWWA C111/A21.11. The assembly shall have a rated pressure, with a minimum two to one safety factor of 350 psi in sizes sixteen inch and below and 250 psi in sizes eighteen inch through thirty-six inch. The product shall be the Series 1700 Megalug restraint harness as manufactured by EBAA Iron, Inc. or Contracting Officer approved equal.

- E. Joints for ductile cast iron pipe shall be slip-on type unless otherwise specified. Joints for fittings, valves and specials shall be mechanical joints, except where shown by the Drawings to be flanged. Slip-on pipe joint for ductile cast iron pipe shall conform to the latest edition of ANSI A 21.11 (AWWA C 111). Lubricants shall be non-toxic and shall be specifically manufactured for the pipe utilized. Mechanical joint pipes shall conform to the latest edition of ANSI A21.10 (AWWA C110). Flanged ductile iron shall conform to the latest edition of ANSI A21.15 (AWWA C115)
- F. Fittings shall be compact ductile iron and shall conform to the latest edition of AWWA C-110 for ductile iron fittings. The minimum wall thickness of the fittings shall be determined consistent with manufacturer recommendations for applicable trench conditions and depth of cover. Fittings shall be tar coated outside in accordance with the latest edition of AWWA C-104 (ANSI 21.4). **Fittings shall be lined inside in accordance with requirements of Technical Specification Section 02561 contained herein.**
- G. All connections made between ductile iron fittings (C-905) or flanged end ductile and plain end PVC pipe shall be restrained with a mechanical joint restraint gland. The mechanical joint restraint shall be incorporated into the design of the follower gland. The restraint mechanism shall consist of a plurality of individually-actuated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. The gland shall be such that it can replace the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of latest version. Twist off nuts, sized same as tee-head bolts, shall be used to insure proper actuating of restraining devices.
- The restraining glands shall have a pressure rating equal to that of the pipe on which it is used. The restraining glands shall have been tested to ASTM F1674-96, be listed by Underwriters Laboratories, and be approved by Factory Mutual. The restraint shall be EBAA Iron Series 2000 PEC with EBAA-Seal Gasket or Contracting Officer approved equal. Test certifications shall be submitted to the Contracting Officer.
- H. All connections made between ductile iron fittings or flanged end ductile and plain end ductile iron shall be restrained with a mechanical joint restraint gland. Restraint device shall conform to ANSI/AWWA C111/A21.11 or ANCI/AWWA C153/A21.53 and shall conform to the following:

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

Design

1. Restraint devices for nominal pipe sizes 3 inch through 48 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
2. The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

Material

1. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
2. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
3. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.
4. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

Tractability

1. An identification number consisting of year, day, plant and shift (YYDDD)(plant designation)(Shift number), shall be cast into each gland body.
2. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.
3. Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.
4. All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

Installation

1. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.
2. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

Approvals

1. Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" inch size) and Approved by Factory Mutual (3" through 12" inch size).
2. Mechanical joint restraint shall be Megalug Series 1100 DEC with EBAA-Seal Gasket produced by EBAA Iron Inc. or Contracting Officer approved equal.

2.01.3

Polyethylene Pipe and Fittings

- A. The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Government or its Authorized Representative. An acceptable standard of manufacturer shall be "Chevron Phillips Chemical Company LP". Qualified Manufacturers shall be approved by the Contracting Officer. Manufacturer's literature shall be provided for approval.

- B. Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408 high density polyethylene meeting cell classification 345464C for black or 345464E for stripes per ASTM D 3350: meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D 1248; and shall be listed in the name of the pipe and fitting Manufacturer in Plastic Pipe Institute TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73° F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.
- C. In addition to straight lengths of pipe, there shall be furnished all bends, tees, reducers, adapters, beveled pipe closures, etc., required for complete pipeline construction as shown on the plans, or required by field conditions. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusing outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.
- D. The Approved Manufacturer shall produce polyethylene pipe and fittings. Products made by subcontractors or Manufacturer's distributors are not acceptable.
- E. All Polyethylene pipe shall be manufactured to the requirements of ASTM F714 and AWWA C906-99 (IPS). Specific pipe for this project shall be 30" OD, DR 11.0. Each production lot of pipe shall be tested for dimensions and ring tensile strength. Testing Certifications for production lots for the material to be used on the Project shall be submitted to the Contracting Officer.
- F. Permanent identification of the piping service shall be provided by co-extruding color stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed on the pipe outside surface shall not be acceptable. IPS sized pipes shall have four equally spaced, longitudinal color stripes. DIPS size pipes shall have three equally spaced pairs of longitudinal color stripes. The stripe color shall be green.
- G. Polyethylene fittings and custom fabrications shall be molded or fabricated by the Approved Pipe Manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating

as the mating pipe. Reduced pressure-rated (de-rated) fabricated fittings are prohibited.

- H. Molded polyethylene fittings shall meet the requirements of ASTM D2683 for socket-type fittings, or ASTM D3261 for butt-type fittings
- I. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.
- J. Joints for polyethylene pipe shall be of the type listed below and shall be make by the Contractor in accordance with the manufacturer's directions and as specified herein.
 - (a) Thermal butt-fusion

Joints between plain end pipes and fittings shall be made by butt fusion. The butt fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer, one in the same. Internal beads **shall** be removed, external beads do not have to be removed. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The persons making heat fusion shall have at least 8 years of experience in the required fusion and qualifications shall be submitted to the Contracting Officer for approval prior to providing such work. The Contractor shall maintain records of trained personnel, and shall certify that training was received on the specific procedures by the Approved Manufacturer not more that 12 months before commencing construction. The Manufacturer's Engineer shall inspect the fusion in the field at the beginning of the butt fusion process and at least 5 additional times during the life of the contract to ensure that proper procedures are being followed. The inspection shall be in the presence of the Contracting Officer or his representative. Any deviations from the proper procedures shall be reported to the Contracting Officer and the Contractor and the necessary steps to remedy the faulty procedure shall be made. All costs for this inspection shall be considered an absorbed item of the contract.

The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator during the life of the contract. For the benefit of the Contracting Officer, the Contractor shall field

verify field fusion quality by making and testing a trial fusion at least 10 times during the life of the construction period to ensure quality. There shall be one test made after the first butt fusion is made and the remaining 9 times shall be performed at the request and the time chosen by the Contracting Officer or his representative. Additional tests shall be made by the Contractor for him/her to ensure quality control of his personnel. The test fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. A test strap that is at least 6" or 15 pipe wall thicknesses long on each side of the fusion, and 1-1/2 wall thicknesses (at least 1") wide is cut out of the trial fusion pipe. Certified test reports shall be submitted to the Contracting Officer. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness. Transitions between unlike wall thickness shall be made by a transition nipple or by mechanical means or electrofusion.

(b) Flanged Joints

Flange adapters shall be as made by Chevron Phillips chemical Company or Contracting Officer's approved equal. All MJ's shall use heavy duty performance pipe kits. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.

Flange adapters shall be fitted with back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

MJ Adapters shall be provided with Stainless Steel stiffeners.

A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where a MJ Adapter is used.

2.01.4 Fiberglass Reinforced Polymer Mortar Pipe

2.01.4.1 References

- A. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
- B. AWWA C950 - AWWA Standard for Fiberglass Pressure Pipe.
- C. ASTM D4161 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- D. ASTM D2412 -Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

2.01.4.2 Materials

- A. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
- B. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
- C. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
- D. Additives: Resin additives, such as curing agents, pigments dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.

- E. Elastomeric Gaskets: Gaskets shall be supplied by approved gasket manufacturers and be suitable for the service intended

2.01.4.3 Manufacture and Construction

- A. Manufacturer: The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Government or its Authorized Representative. An acceptable standard of manufacturer shall be "Hobas Pipe USA, Inc." or "Amitech USA". Qualified Manufacturers shall be approved by the Contracting Officer. Manufacturer's literature shall be provided for approval. The Government or its designated representative shall be entitled to inspect pipes or witness the pipe manufacturing.

Pipe: Manufacture pipe to result in a dense, nonporous, corrosion-resistant, consistent composite structure. The pipe nominal pressure class (PN) shall be equal to or greater than the maximum sustained operating pressure of the line. The maximum transient (operating plus surge) pressure of the line shall not exceed the pipe nominal pressure class by more than 40%. Specific pipe for this project shall be 24", Class 150/72

- B. In addition to straight lengths of pipe, there shall be furnished all bends, tees, reducers, adapters, beveled pipe closures, etc., required for complete pipeline construction as shown on the plans, or required by field conditions. Fiberglass fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. All fittings and custom fabrications shall be fully rated for the same or greater internal pressure as the mating pipe.
- C. Joints: Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain joint water-tightness. The joints must meet the performance requirements of ASTM D4161. Tie-ins, when needed, may utilize gasket-sealed mechanical couplings. The Manufacturer shall inspect the jointing in the field at the beginning of the jointing process and at least 3 additional times during the life of the contract to ensure that proper procedures are being followed. The inspection shall be in the presence of the Contracting Officer or his representative. Any deviations from the proper procedures shall be reported to the Contracting Officer and the Contractor and the necessary steps to remedy the faulty procedure shall

be made. All costs for this inspection shall be considered an absorbed item of the contract.

- D. Fittings: Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Unbalanced thrust forces shall be restrained with thrust blocks or other suitable methods. Fiberglass tees, wyes, laterals, or other similar fittings shall be fully encased in reinforced concrete designed to withstand the pressure forces. The manufacturer recommendations for concrete encasement shall be followed and the adequate amount of encasement of concrete shall be provided as part of the installation. Thrust blocks shown on the drawings are the minimum requirement and additional concrete encasement may be required in accordance with the manufacturer's recommendations.

2.01.4.4 Dimensions

- A. Diameters: The actual outside diameter (18" to 48") of the pipes shall be in accordance with AWWA C950. For other diameters, OD's shall be per manufacturer's literature.
- B. Lengths: Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.
- C. End Squareness: Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".

2.01.4.5 Testing

- A. Tensile Strength: Pipe hoop tensile strength for pressure pipe shall be verified as specified in applicable standard (ASTM D3754 or AWWA C950) or by random burst testing at the same sampling frequency. All pipes shall be capable of withstanding a test pressure of two (2) times the maximum sustained operating pressure of the line without leaking or cracking.
- B. Deflection of the pipe shall be determined by acceptable means recommended by the pipe manufacturer. The pipe deflection after 24 hours of all backfilling and removal of dewatering systems, if used shall not exceed 3% of the original pipe diameter. Pipe deflection after 30 days shall not exceed 4% of the original pipe diameter. Maximum long-

term pipe deflection shall not exceed 5% of the original pipe diameter. Failure of these deflection test along the pipe to be selected by the Contracting Officer shall be cause for rejection of pipeline areas that fail and will require replacement.

2.01.5 Valves

- A. Gate valves shall comply with the latest edition of AWWA C-509 as manufactured by Mueller, or Contracting Officer approved equal. Gate valves shall be iron body, encapsulated high strength cast iron wedge, resilient seat, non-rising stem, and shall open counterclockwise. All gate valves shall have a maximum working pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. Gate valves shall be equipped with mechanical joint connections unless otherwise specified. Force main gate valves shall be equipped with boxes and protected as detailed on the Drawings.

2.01.6 Combination Air Release Valves and Air & Vacuum Valves

- A. Combination air valves shall be Val-Matic Series as detailed on the drawings, or Contracting Officer approved equal, automatic float operated suitable for pressures up to 150 psig. The valves shall perform the function of air release and air/vacuum valves. The valves shall allow unrestricted venting or reentry of air thru it, during filling or draining of the force main, to prevent vacuum. An internal baffle shall protect the shutoff float from direct air flow, and internal linkage, stems and floats shall be of stainless steel. Valve shall be equipped with inlet and blowoff valves, quick disconnect couplings and 5 feet of heavy duty, sunlight stable hose for backflushing. Vacuum relief valves shall be furnished with a removable vacuum check valve.
- B. Valve Manholes
 - 1. Valves shall be enclosed in a manhole as detailed on the drawings.
 - 2. Manholes associated with force main shall be a standard precast manhole, conforming to ASTM C478 with crystalline sealer additive similar or equal to Xypex. Steps shall be copolymer plastic spaced at 16". Joint material shall be preformed flexible mastic conforming to Federal Specification SS-S-210-A. Concrete shall have 4000 PSI 28 day strength. Rim and cover shall be as detailed on the Drawings.

2.01.7 Tapping Service Saddle

The connection of the air/vacuum valves to PVC or ductile iron shall be made by tapping service saddle for large diameter pipes model 366 as manufacturer by Smith-Blair, Inc. or Contracting Officer approved equal. Threaded outlet shall be sized per the detail of the air/vacuum release valve in the contract drawings. The saddle body shall be Ductile Iron ASTM A536. The tapped insert shall conform to ASTM A536 and to AWWA standards. Hemispherical washers shall conform to ASTM A536. The gaskets shall be NSF 61 Nitrile (Buna N) concave wedge gasket. Compounded to resist oil, acids, alkalies, most (aliphatic) hydrocarbon fluids, water and many chemicals. The straps shall be stainless steel. Studs shall be high strength low alloy and Nuts shall be stainless steel. Finish shall be fusion bonded Flexi-Coat Epoxy or equivalent. For HDPE pipe a transition fitting to a 24" ductile iron sleeve will have to be provided on each side of the air/vacuum valve for use of saddle. Saddle is not rated for use on HDPE pipe. Tapping saddles shall have a minimum working pressure rating of 200 psi.

2.01.8 Marking Tape

Shall be detectable underground marker tape, 2" wide, with "CAUTION SEWER" printed continuously along its length. Shall be green with silver-colored trim and lettering, or other color combination acceptable to the Contracting Officer.

2.01.9 Tracer Wire

Tracer wire shall be #12 solid copper wire type THHN or THWN VW-1 600V, gasoline and oil resistant insulated, wire taped to the top of each joint of pipe. Tracer wire housings shall be located every 1000' or as otherwise shown on the drawings.

2.01.10 Fiberglass Utility Markers

Fiberglass utility markers (66"L x 3-3/4" W) as supplied by Forestry Suppliers, or Contracting Officer approved equal, shall be installed at locations indicated on the Plans. The color of utility marker shall be green. The following label shall be provided and affixed to each utility marker as shown at the end of this specification section.

2.02 DUCTILE IRON FLANGED PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to AWWA C115 and C110 standards. Flanged pipe shall be Class 53 as per AWWA C150. All pipe and fittings shall be lined in accordance with Section 02561 contained herein.
- B. Flange joints shall be flat face type meeting ANSI B 16.1 Class 125 requirements. Flange gaskets shall be full face type per AWWA C111 to provide positive sealing for the flange joints. Thickness shall be 1/8 inch unless otherwise indicated. Assembly bolts shall be square headed carbon steel machine bolts with hexagon nuts per ANSI B 18.2. Thread shall conform to ANSI B 1.1. Bolt length shall be such that after joints are assembled, the bolts shall protrude through the nuts, but not more than 1/2 inch.

2.03 SELECT BEDDING AND BACKFILL

Native material excavated from the trench shall be used for bedding, backfill over pipe embedment zone and backfill for undercut areas for PVC pipe under normal circumstances where allowed by the Contracting Officer.

Select bedding for PVC pipe shall be provided where called for by the Contracting Officer and in additional areas where requested by the Contractor and deemed appropriate by the Contracting Officer. Select bedding may not be used as a means of avoiding trench dewatering. Select bedding and backfill for PVC pipe shall meet either of the following characteristics:

- Type A: A well graded washed gravel.
- Type B: A sand-clay material with a maximum liquid limit (LL) of 30 and a plasticity index (PI) of less than 10.
- Type C: A silty-clay material with a maximum liquid limit (LL) of 30 and a plasticity index (PI) of 5-15.

Testing costs incurred for tests required to verify that material meets the above Specification shall be borne by the Contractor

Select bedding material indicated below shall be used for HDPE and CC Fiberglass RPM pipe. Native materials shall be used for backfill above the embedment zone for HDPE and CC Fiberglass RPM pipe. Testing costs incurred for tests required to verify that material meets this Specification shall be borne by the Contractor.

- 2.03.1 Select granular material for pipe bedding shall be a mixture of coarse concrete aggregate and coarse river-run sand. The mixture shall consist of two (2) parts coarse concrete aggregate conforming with ASTM Standard Specification C-33 to one (1) part coarse sand. The bedding material shall be thoroughly blended by the Contractor to produce a well-graded uniform mixture prior to placement in the trench. Prior to blending, the coarse concrete aggregate shall conform with the gradation sizing Number 467 specified in Table 2 of ASTM Standard Specification C-33 as follows:

GRADING REQUIREMENTS FOR COARSE AGGREGATE
(ASTM C-33. TABLE 2, SIZE 467)

<u>SIEVE SIZE</u>	<u>PERCENT PASSING BY WEIGHT</u>
2 Inch	100
1-1/2 Inch	95 - 100
3/4 Inch	35 - 70
3/8 Inch	10 - 30
Number 4	0 - 5

The grading limits for fine aggregate shall be as follows:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING BY WEIGHT</u>
3/8 Inch	100
Number 4	95 - 100
Number 8	80 - 100
Number 16	50 - 90
Number 30	30 - 70
Number 50	3 - 30
Number 100	0 - 5

- 2.03.2 Select material for backfilling undercut areas where native soils are not suitable or available shall be select sand-clay material meeting the following gradation limits.

<u>SIEVE SIZE</u>	<u>PERCENTAGE (BY WEIGHT) PASSING SQUARE MESH SIEVES</u>
No. 10	30 - 100

The material passing the No. 10 sieve shall meet the following:

No. 10	100
No. 40	20 - 85
No. 60	15 - 70
No. 200	8 - 40

The material passing the No. 40 sieve shall meet the following:

Liquid Limit	25 Max.
Plasticity Index (P.I.)	NP to 6 Max.

2.04 ANCHORAGE/RESTRAINT

Provide anchorage as follows for all fittings and joints subject to blowing off of the line under pressure.

2.04.1 Acceptable Anchorage/Restraint

Joints and Fittings for PVC and Ductile Iron materials shall be restrained with restrained joints as described in 2.01.1 and 2.01.2 of this specification. Joints and Fittings for Polyethylene and Fiberglass materials shall be restrained and anchored with Concrete Thrust Blocks as detailed on the contract drawings and as described in this specification.

2.04.2 Concrete

Anchorage shall be 3000 psi (28 day strength) concrete in accordance with Section 03300, "Cast-in-Place Concrete".

2.04.3 Restrained Joints

Joints for PVC and Ductile Iron shall be restrained as specified in 2.01.1 and 2.01.2 of this specification. Provide corrosion protection for all restraining material subject to submergence, or in direct contact with earth and not encased in concrete with epoxy coating or per manufacturer's instructions.

PART 3 EXECUTION

3.01 GENERAL

3.01.1 Install force mains, where shown on Drawings, in compliance with manufacturer's instructions. PVC pipe shall be installed in accordance with ASTM D-2321. Ductile iron pipe shall be installed in accordance with AWWA C-151. Unless otherwise specified by the Contracting Officer, Force Main pipe shall be installed on a prepared trench bottom using select bedding throughout.

3.01.2 Where indicated by the Drawings, force main shall be laid on grade to prevent air entrapment. Air release valves and air/vacuum valves shall be installed at grade changes as shown on the Drawings. When required by Drawings, grade shall be maintained by using an appropriate laser system. Placement tolerance shall be \pm 1 tenth (.1) foot from the elevation shown by the laser.

3.02 CONTRACTOR'S RESPONSIBILITY

- 3.02.1 The Contractor shall be responsible for the condition of excavations made by him. Slides and cave ins shall be removed without extra compensation, at whatever time and under whatever circumstances that may occur. **The Contractor is solely responsible for maintaining safe working conditions.**
- 3.02.2 Installation of sheeting, shoring and bracing shall be the responsibility of the Contractor. Shoring left in place shall not entitle the Contractor to claims for extra compensation.

3.03 INSPECTION

Pipe specials and jointing materials must be inspected for conformance to these Specifications immediately prior to use. Remove from site of work, materials not conforming with these Specifications. Protect pipe against impact shocks and free fall. Keep pipe clean at all times.

3.04 JOINTING

- 3.04.1 Preparatory to making pipe joints, clean the surfaces of the portion of pipe to be jointed of dirt and foreign matter and then paint with factory made jointing lubricants, primers, adhesives and other materials in accordance with the pipe or joint manufacturer's recommendations.
- 3.04.2 As soon as possible after the joint is made and the pipe is aligned, place sufficient approved backfill material along each side of the pipe to prevent movement from line or grade. Keep trenches free of water and as dry as possible during bedding, laying and jointing.

3.05 OBSERVATION & INSPECTION

Do not cover any pipe joints prior to observation by the Contracting Officer.

3.06 COVER

Maintain forty two inches (42") minimum bury along force main unless otherwise shown on Drawings or directed by the Contracting Officer.

3.07 CARE

Provide temporary bulkheads at the open end of the pipe to prevent the entrance of dirt, water or foreign objects into the line during construction. Lay each section of pipe upon a shaped pipe bed such that the full length of the pipe barrel bears directly on the trench bottom. Recesses should be excavated to accommodate pipe bells or joints.

3.08 HYDROSTATIC TEST

- 3.08.1 The procedures in the following paragraphs shall be provided by the Contractor on the first 3000 feet of pipe laid and then at the completion of the pipe laying as a minimum. The hydrostatic test on this first 3000 feet test section shall determine the initial quality of the Contractor's work prior to completing the entire pipeline. The Contractor may choose to test sections of the pipeline instead of the entire pipeline if desired after this initial 3000 feet. If the test section fails or any other sections fail, the Contractor at his expense, shall remove and replace those components that failed until a passing test is accomplished. Also, the Contractor's procedures and installation shall be reviewed and refined to ensure quality workmanship. Failure to do so may cause termination of contract.
- 3.08.2 After the pipe is laid and the line flushed, it shall be filled with water, with care being exercised to expel all air from the pipe. During the test period pipe, valves, fittings, and joints shall be examined carefully for defects. Observed leaks or defective pipe shall be satisfactorily repaired or replaced, at the expense of the Contractor, and the test repeated until the section tested is within the limits specified. The entire system or parts thereof shall be tested under hydrostatic pressure of 150 psi, for a period of 4 hours. Repairs shall be made using approved materials and new replacement fittings, specials, or gaskets where leakages occur.
- 3.08.3 Leakage shall be measured by an approved calibrated meter through which the water required to maintain test pressure shall be pumped. Testing shall be performed in the presence of the Contracting Officer, or his authorized representative and the Contracting Officer shall be notified at least 24 hours in advance of the start of the test.
- 3.08.4 The Contractor shall furnish the water, pump, pipe connections, fittings, gauges, meters, and necessary apparatus and shall furnish all labor and work required to make the tests. Costs of testing shall be borne by the Contractor and testing operations shall remain in operation until approved by the Contracting Officer. Allowable leakage shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe, at the specified test pressure for the specified test time.
- 3.08.5 After testing has been completed and the force main accepted, test water may be left in the force main until the South Fork Wastewater Treatment Plant comes on line, after which it will be discharged through the treatment plant. The depressurization of the pipeline shall be done by the Contractor.

3.09 CLEAN-UP

The job site shall be maintained in a neat, and sanitary manner during construction. As portions of the work are completed, excess excavation, bricks, concrete, pipe and other materials shall be removed and disposed of by the Contractor in a manner acceptable to the Contracting Officer.

3.10 SEPARATION FROM WATER LINES

There shall be a ten (10) foot horizontal separation between sanitary sewer mains and parallel water mains, and an eighteen (18) inch vertical separation between the bottom of a water line crossing over the top of a sewer main. In instances where such separation is not possible, special precautions, as determined by the Contracting Officer, shall be taken by the Contractor to prevent contamination of waterworks facilities.

3.11 PROVING

Upon completion of the hydrostatic pressure test, the force main shall be proved by "pigging" in accordance with the recommendations of the polyfoam pig manufacturer. Contractor shall supply the material and labor to successfully complete the test.

3.12 SITE PREPARATION

- 3.12.1 The Contractor shall prepare, on a timely basis, rights-of-way, easements and sites indicated on the Drawings for construction of the wastewater improvements. The work shall include clearing and grubbing, removal of structures and obstructions, and the removal of permanent surfaces and landscaping items designated to be restored upon completion of the installation.
- 3.12.2 Clearing and grubbing shall conform to the requirements specified in Section 02111 and shall include the removal of trees, roots, vegetation, structures and obstructions unless separate pay items are specifically provided for on the Bid Form. The completion of clearing and grubbing shall leave the site clear and free from undesirable obstructions, ready for trench excavation.
- 3.12.3 The removal of permanent surfaces and the subsequent restoration of the surfaces shall be as set forth below and in other sections herein where applicable.

3.13 SELECTED STRIPPING

In landscaped, agricultural or cultivatable areas, the top twelve inches (12") of the ground shall be stripped and stockpiled for subsequent replacement after backfilling the pipe trench. The Contractor shall strip an area that will include the open limits of the trench plus the area that will be used to stockpile all suitable backfill material from the trench excavation. The stripped material shall be stockpiled in an area that will not hinder or endanger the construction process. The location and manner of stockpiling shall be reviewed by the Contracting Officer.

3.14 EXCAVATION AND TRENCHING

- 3.14.1 Excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the Drawings or as otherwise specified. Excavation shall be done by open cut from the surface except when tunneling or boring is specified or directed in writing by the Contracting Officer. Trench width shall be kept as narrow as practical to provide a safe working area and to minimize excavation, and shall be maintained in strict compliance with OSHA regulations.
- 3.14.2 Dewatering will be required along the proposed pipeline especially near creeks and tributaries. Water table levels shall be maintained below the trench bottom or undercut areas as shown on the drawings before pipe placement will be allowed. Refer to Section 02220 "DEWATERING" for requirements.
- 3.14.3 During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave ins. Excavated materials not required or not suitable for backfill shall be removed and wasted as directed by the Contracting Officer. Grading shall be done, as necessary, to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other approved methods. Temporary sheeting and shoring shall be used where necessary for the protection of the work and for the **safety of the personnel.**
- 3.14.4 Trenches for force main pipe and other appurtenances shall be excavated to provide a minimum cover of 42" and of only such width as necessary for proper laying of the pipe. The net width of the trench at and below the top of the pipe shall be at least the pipe O.D. plus twelve inches but not more than the pipe O.D. plus twenty four inches. The width of the trench above this level may be as wide as necessary for sheeting, bracing, shoring or **for proper safe performance of the work.**
- 3.14.5 The sides of the trench shall be maintained in strict compliance with OSHA regulations.
- 3.14.6 The bottom of the trench shall be carefully graded, formed and aligned according to these Specifications. The bottom of the trench shall be hollowed under each pipe joint to conform to the shape of the pipe, and holes shall be cut for the bells and/or joint assembly, allowing the body of the pipe a uniform contact and support throughout its entire length.
- 3.14.7 The Contractor shall leave a minimum 2 foot berm width on each side of the trench between the trench and the excavated earth, to allow the free passage of

workmen, the Contracting Officer's representative and to permit work in a safe, expeditious and satisfactory manner.

3.14.8 No more than three hundred (300) feet of trench shall be opened in advance of the completed sewer, nor shall more than one hundred (100) feet be left unfilled except by permission from the Contracting Officer. In special cases, the Contracting Officer, when so requested by the Contractor, may waive the distance restriction to which the trench may be opened by notifying the Contractor in writing.

3.14.9 During trenching operations, the Contractor shall exercise care when near or passing through the Camp Creek spoil bank levee. Any damage to the spoil bank levee by the Contractor shall be restored to its original condition. Restoration of the spoil bank shall be the cost of the Contractor.

3.14.10 The Contractor shall exercise care during his trenching operations to maintain the integrity of the spoil bank levee of Camp Creek. The Contractor shall notify the Contracting Officer immediately after a bank cave-in or slide occurs. He will prepare a plan for repair of the bank and submit it to the Contracting Officer. The cost of said repair shall be borne by the Contractor.

3.15 SHEETING, SHORING AND BRACING

3.15.1 Sheeting, shoring, and bracing shall be furnished, placed and maintained by the Contractor as may be required to support the sides of the excavation. The Contractor shall be fully responsible for the sufficiency of such supports to prevent movement which can injure or delay the work or endanger or cause damage to adjacent pavements, buildings or other structures, channels and drainage structures, **or create undue hazards to workmen.** Where in the opinion of the Contracting Officer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place. **The material and installation requirements for sheeting, shoring and bracing shall be in accordance with applicable sections of the Mississippi Standard Specifications for Road and Bridge Construction, 1990 Edition.**

3.15.2 Sheeting, shoring and bracing which are not ordered by the Contracting Officer to be left in place shall be removed in such manner as not to endanger the constructed sewer or other structures, utilities or property. Voids left or caused by the withdrawal of sheeting shall be immediately refilled with sand by tamping with tools specifically adapted to the purpose, by watering, or otherwise as may be directed.

3.16 EXCAVATED MATERIAL

- 3.16.1 Excavated material from trench and structure excavation suitable for backfill shall be placed compactly on the sides of the excavation and kept up so as not to endanger the work and be of as little inconvenience as possible to the public travel and abutting property, and so that free access is maintained to fire hydrants and water valves in the vicinity of the work. Material encountered in the excavation which, in the opinion of the Contracting Officer, is not suitable for use in the work, shall be removed and wasted as directed and shall not be stockpiled along the side of the excavation.
- 3.16.2 The disposal of surplus and unsuitable excavation shall be the responsibility of the Contractor at his own expense. Surplus and unsuitable material not to be used in the construction of the project shall not be left on the right-of-way or easement of the project, nor adjacent thereto, except by written permission of the affected property owner.

3.17 JOINTING DISSIMILAR PIPES

Suitable water-tight adaptor couplings, acceptable to the Contracting Officer, shall be used for connecting dissimilar pipes. For connection of HDPE piping to the DI gate valves at the beginning and terminus of the pipeline shall be made with molded transitions from the subject pipe diameter to the required diameter of the DI valve. The appropriate MJ Adapter shall be used for this connection. Straps shall be stainless steel. No separate payment for adaptor couplings will be made.

3.18 CONCRETE THRUST BLOCKING

- 3.18.1 Prior to placing concrete, inspect the pipe and fittings for alignment and rigidity.
- 3.18.2 Pour concrete blocking before pressure testing and arrange it so that the pipes and fitting joints shall be accessible for repair.
- 3.18.3 Blocking shall not be placed until all fittings and forms have been inspected. Bearing areas shall be as indicated on the plans.
- 3.18.4 Handle all concrete in such a manner to avoid segregation, separation or loss of ingredients, or the displacement of the pipe.
- 3.18.5 Concrete blocking shall be placed on undisturbed soil. The Contractor, at his expense, shall provide 20 tests from an independent testing laboratory of the bearing capacity of undisturbed soils to be used for bearing of selected thrust blocks. The test shall be made with both a pocket penetrometer and a hand-operated shear vane. The location of the tests shall be selected by the Contracting Officer or his representative. Tests shall be made in the presence of and reported to the same.

- 3.18.6 Place concrete in continuous horizontal layers not exceeding 24". Place each layer so that the previous placed layer is still plastic.

3.19 BACKFILLING

- 3.19.1 Excavate trenches to the lines indicated and detailed on the drawings. The trench subgrade shall consist of firm, stable, non-organic, debris-free soil. Select bedding base material shall be placed on the subgrade throughout, as detailed on the drawings, and compacted to 90% standard Proctor maximum dry density (ASTM D 698). Hand excavate the base material to provide uniform and continuous bearing and support of the pipe between bell holes, with ample bell holes at each joint to facilitate proper jointing and to permit bells from bearing on the base material. The pipe manufacturer's recommendations shall be adhered to for all bedding and backfill operations. HDPE shall specifically adhere to the requirements of ASTM D 2774 "Standard Practice for Underground Installation of Thermoplastic Pressure Pipe".
- 3.19.2 In locations where trench excavation exposes unsuitable material, as classified by these specifications, or in the judgement of the Contracting Officer, the subgrade shall be undercut as directed by Contracting Officer for the full design width of the trench and backfilled with select backfill material as detailed on the Construction Drawings and specified in Paragraph 2.03.2 of this section. Such undercutting and select bedding material will be compensated in accordance with the requirement of Part 4, hereafter. **Acceptable bedding and backfill material from on-site sources will not be considered for payment.**
- 3.19.3 Backfill shall consist of stockpiled excavated material placed as indicated on the detail shown in the construction drawings. As pipe is laid and suitably bedded, trenches and excavation shall be promptly backfilled to a level one-foot above the top of the pipe in relatively thin lifts and compacted to a minimum of 90% Standard Proctor Maximum Dry Density (ASTM D 698). From one foot above the top of the pipe, backfill shall be placed in 12" lifts and compacted as specified hereinbefore. Backfill shall be placed and tamped equally and thoroughly along each side of the pipe in a manner to avoid displacement of or damage to the pipe.
- 3.19.4 Tamping: The backfill shall be placed in equal thickness lifts, each lift being thoroughly compacted to the density specified. Each lift of the backfill material shall have proper moisture content to permit compaction to this density.
- A. Bedding shall be tested at the spring line every 750 feet alternating sides each time. After the pipe has been laid and backfilled to one foot above the top of the pipe, the Contractor's testing laboratory shall conduct one density test for every 1000 linear feet or as directed by the Contracting Officer. In succeeding 12" lifts, density tests shall be

conducted at 1500 foot intervals. Backfill failing density test shall be reworked by the Contractor until the specified test results are achieved.

- B. In areas where restoration work is required, the backfill above the one (1) foot cover level shall be compacted to the subgrade level or as directed and maintained to eliminate voids and future settlement. Special compaction procedures involving 95% density on 6" lifts are required at such locations and at other locations shown on the Drawings.
- C. Landscape and cultivatable areas shall be restored by the replacement of the stockpiled topsoil stripping to a depth of at least twelve inches (12"). Provide for the free flow of drainage.

- 3.19.5 Marking Tape: Marking tape shall be placed continuously along the force main above the center of the pipe and to a depth of not less than 18 inches.
- 3.19.6 Tracer Wire: Tracer wire shall be placed on the of the force main pipe and securely taped at least once to every joint of pipe.
- 3.19.7 Fiberglass Utility Markers: Fiberglass Utility Markers shall be installed of sufficient depth at locations indicated on the Plans.

3.20 MAINTENANCE AND REPLACEMENT OF EXISTING FACILITIES

- 3.20.1 The Contractor shall maintain all existing travelways along the pipeline. Where the pipeline is in or crosses travelways, the surface shall be restored as quickly as practical after backfilling the trench. The disturbed travelways shall be maintained at the Contractor's expense until settlement has subsided.
- 3.20.2 The Contractor shall restore all permanent fences, storm drainage facilities and other permanent items to their original condition at his expense. Fences removed shall be replaced "in-kind" or better at the Contractor's expense.

3.21 MAINTENANCE OF SITE

The Contractor shall prevent, control and correct dust nuisance or muddy conditions developing on roadways as a result of his operation. No payment for maintenance of the site shall be made but shall be considered as a subsidiary obligation of the Contractor.

3.22 FINAL CLEAN-UP

- 3.22.1 After the backfill is completed, the Contractor shall dispose of surplus material, dirt and rubbish from the site. Surplus dirt shall be disposed of in Contractor furnished and approved disposal areas or in on site areas as directed by the Contracting Officer.

- 3.22.2 After work is completed, the Contractor shall remove tools and other equipment used by him, leaving the entire site free, clear and in clean condition.

PART 4 COMPENSATION

4.01 MEASUREMENT

4.01.1 GENERAL

MEASUREMENT SHALL ONLY BE MADE OF ITEMS SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE PROJECT DRAWINGS AND SPECIFICATIONS AND LISTED ON THE APPROPRIATE SCHEDULE OF THE BID FORM. NO MEASUREMENT OR PAYMENT SHALL BE MADE OF ITEMS OR ACTIVITIES NOT LISTED AND SUBSIDIARY TO COMPLETION OF THE WORK, NOR OF ADDITIONAL ITEMS OR QUANTITIES INSTALLED OR ACTIVITIES PERFORMED FOR THE CONTRACTOR'S CONVENIENCE (SUCH AS ADDITIONAL FITTINGS OR UTILIZING SHEETING).

4.01.2 Force Main

Shall be measured per linear foot installed of size and type specified on the Bid Form. Measuring will be along the centerline of the completed installation. No deductions will be made for space occupied by valves or fittings. Only one lot of pipe will be used for the entire project.

4.01.3 Ductile Iron Fittings

Shall be measured by the pound of bare body weight only where listed as a separate item on the bid form. Fittings installed in addition to those being required by the alignment shown on the Drawings will only be measured if the Contracting Officer gives written permission prior to installation. No weight allowance shall be made for bolts, glands or specials.

Where Ductile Iron Fittings are not included in the schedule for a particular type of pipe and may be required, no separate measurement will be made for fittings and shall be considered absorbed into the bid price per linear foot of pipeline.

4.01.4 Anchorage/Restraint shall not be measured for payment but shall be considered absorbed.

4.01.5 “Select backfill for undercut areas” and “select bedding” hauled in from off site shall be measured by the cubic yard of material in place. “Backfill for undercut areas” and “bedding” from on-site sources will not be measured for payment.

- 4.01.6 Trench excavation and backfill for pipe installation shall not be measured for separate payment and shall be an absorbed cost item.
- 4.01.7 Undercut Excavation shall be measured by the cubic yard as directed and approved by the Contracting Officer.
- 4.01.8 Connections to existing manholes, existing structures or existing pipelines shall be not measured for payment.
- 4.01.9 Valves and Boxes shall be measured per each, including concrete encased pipe bollards.
- 4.01.10 Combination Air/Vacuum Valves shall be measured per each and shall include manholes.
- 4.01.11 Repair and replacing of fencing off all types and materials will be not be measured separately and shall be an absorbed item.
- 4.01.12 Fiberglass utility markers will be measured per each complete and installed in place with label affixed.
- 4.01.13 Tracer wire housings shall be measured per each complete and installed. Tracer wire shall not be measured for payment but shall be an absorbed cost.
- 4.01.14 Dewatering shall be measured as determined in Section 02220 "DEWATERING" of the specifications.
- 4.01.15 Sheeting and shoring shall not be measured for payment but shall be an absorbed cost.

4-02 PAYMENT

4.02.1 GENERAL

PAYMENT FOR EACH OF THE ITEMS LISTED HEREIN SHALL CONSTITUTE FULL COMPENSATION FOR FURNISHING MATERIALS, LABOR, TOOLS, EQUIPMENT, INCIDENTALS, SPECIALS, TESTING, JOINTING AND PERFORMING WORK NECESSARY FOR THE INSTALLATION OF THE SPECIFIED ITEM IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.

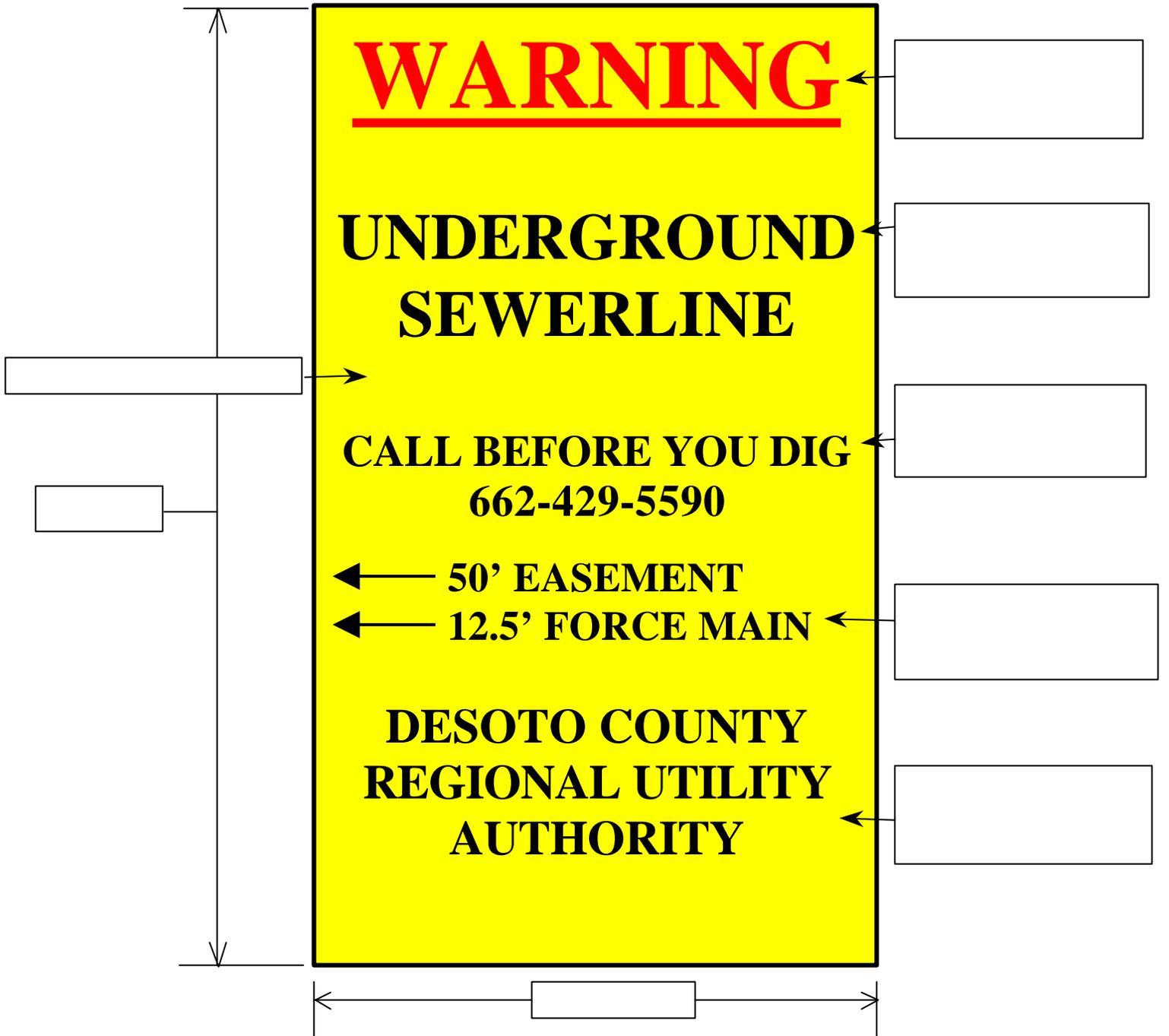
4.02.2 Force Main

Shall be paid for at the Contract Unit Price per linear foot for the size and type indicated including excavation and backfill specified on the Bid Form. For Fiberglass RPM and HDPE pipe shown on the Bid Form, the costs of ductile iron fittings, where required, shall be included in the contract unit price. No separate payment will be made for any fittings for Fiberglass RPM and HDPE piping.

- 4.02.3 Payment for ductile iron fittings for the PVC pipeline only shall be made at the Contract Unit Price per pound. No separate payment for ductile iron fittings for Fiberglass RPM and HDPE pipe will be made. Anchorage/Restraint shall not be paid for separately.
- 4.02.4 No separate payment for connections to existing manholes, structures or pipelines. Payment shall be included in the unit price per linear foot of force main in the Bid Form.
- 4.02.5 Select backfill for undercut areas and Select bedding hauled in from off-site sources shall be paid at the contract unit price for each item per cubic yard in place and accepted. No separate payment will be made for excavated material used on site for backfill for undercut areas or for bedding. Only material that has been preapproved per paragraph 4.02.6 below by the Contracting Officer will be included for payment.
- 4.02.6 Undercut Excavation shall be paid for at the contract unit bid price per cubic yard, including disposal of undercut material. Only material that has been approved by the Contracting Officer prior to being excavated will be included for payment.
- 4.02.7 Gate Valves and Boxes shall be paid for at the Contract Unit Price per each including pipe bollards.
- 4.02.8 Combination Air/Vacuum Valves shall be made at the Contract Unit Price for each size. If the Bid Form specifies installation with manhole or pit then no separate payment shall be made for bedding, foundation, pit structure, service saddle, tapped plug or other accessories.
- 4.02.9 Fencing repair or replacement shall not be paid for separately and shall be considered an absorbed item.
- 4.02.10 Fiberglass Utility Markers shall be paid for at the contract unit price per each as specified on the Bid Form.
- 4.02.11 Tracer Wire and Housings shall be paid for at the contract unit price per each as specified on the Bid Form. There shall be no separate payment for

tracer wire. This shall be included in the unit price per linear foot at force main in the Bid Form.

- 4.02.12 No separate payment shall be made for Marking Tape and shall be considered an absorbed item.
- 4.02.13 Dewatering shall be paid for as determined in Section 02220 "DEWATERING" of the specifications.
- 4.02.14 Sheeting and Shoring shall not be paid for separately and shall be considered an absorbed item.
- 4.02.15 Anchorage/Restraint shall not be paid for separately and shall be considered an absorbed item.



DIVISION 3 – CONCRETE

SECTION 03100

CONCRETE FORMWORK

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SECTION 03100**CONCRETE FORMWORK****PART 1 GENERAL**

1.01 DESCRIPTION

Formwork for cast-in-place concrete, complete with shoring, bracing and anchorage.

1.02 SPECIFICATION STANDARDS

1.02.1 Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited by abbreviations noted below.

A. ACI 347 - "Recommended Practice for Concrete Formwork".

B. ACI 301 - "Specifications for Structural Concrete".

1.03 SPECIAL REQUIREMENTS

1.03.1 The General contractor shall lay out and mark the location of all walls and partitions so that mechanical and electrical conduits, inserts and sleeves will be properly located.

1.03.2 Contractor is cautioned that all exposed concrete work is to be carefully finished and exposed corners or edges must be sharp and clean. Warps and discoloration on surface will not be accepted.

1.04 SUBMITTALS

1.04.1 Manufacturer's literature describing products.

1.04.2 Samples: Only as requested.

PART 2 PRODUCTS

2.01 GENERAL

2.01.1 Form Design and Shoring: The design and engineering of the formwork and shoring, as well as its construction and installation, shall be the responsibility of the Contractor. Formwork shall be designed for loads and lateral pressures outlined in ACI 347 and wind loads as required by the applicable controlling building codes. Design considerations, allowable stresses and other applicable requirements shall conform to ACI 347 and the controlling local building code.

- 2.01.2 Allowable Tolerances: Formwork shall produce concrete within the following tolerance limits unless otherwise noted.
- A. Tolerances for formed surfaces for buildings shall conform to ACI 301.
 - B. Tolerances for elevator shafts shall be as required by ANSI/ASME Safety Code for Escalators and Elevators.
 - C. Tolerances for formed surfaces for all other concrete structures shall conform to those outlined in ACI 347, unless otherwise noted.
- 2.01.3 Cooperation: Fully cooperate with other trades and other sections for the installation of embedded items. Provide suitable templates, inserts, and sleeves for setting items not placed in the forms.

2.02 MATERIALS

- 2.01.1 Forms shall be plywood, metal, fiber glass, and/or lumber, as specified below. Form materials furnished shall be new, except that metal and fiber glass forms previously used elsewhere will be permitted, provided that they are free of objectionable holes, dents, distortions, and other defects. After initial use on this project, form materials may be reused thereon provided they will produce acceptable concrete surfaces.
- A. Forms for round columns shall be spirally constructed of laminated plies of fiber similar to Sonotube Fiber Forms manufactured by Sonoco Products Company, or an approved equal.
 - B. Framing, backing, bracing, shoring, and other formwork shall be No. 2 Common or better lumber.
 - C. Smooth surface forms shall be used for all exterior and interior exposed concrete surfaces including, but not limited to, walls, columns, ceilings, beams, steps, tank and basin interiors, and slab edges and be moisture resistant commercial standard Douglas fir concrete form type plywood, at least five ply, bearing APA grade trade-mark, unless otherwise approved.
 - D. Unfinished surface forms may be used for all exterior and interior concealed concrete, except tank and basin interiors, and may be No. 2 Common or better lumber, metal or other type of form material except that wood forms shall be used for all surfaces that are to be plastered.
 - E. Earth forms may be used as side forms of footings where soil conditions are suitable and approved by the Contracting Officer.

- 2.02.2 Form Ties shall be of the snap tie type which can be removed to at least 1-1/2 inches below concrete surfaces leaving an opening no larger than the tie rod diameter, without cones.
- A. Provide ties with integral water stops for all structures which are intended to contain water or other liquid and/or to prevent intrusion of ground or other water.
- 2.02.3 Form sealer shall be non-staining mineral oil or other approved coating.
- A. Form release agent for surfaces intended to receive an applied coating or finish must be compatible with the applied coating or finish.
- B. Form coating for potable water containing structures shall be non-toxic after 30 days and not introduce objectionable taste or odor into the water.

PART 3 EXECUTION

3.01 CONSTRUCTION

- 3.01.1 Construct and erect forms to types, shapes, lines, and grades shown on the drawings with as few joints as practical to insure straight, plumb, level, and smooth concrete surfaces with all angles sharp and true to line and to facilitate safe form removal without damage to concrete. Forms shall have sufficient strength to safely support all construction loads, with no appreciable bulging, sagging, movement, or leakage of mortar, and be clean of all debris at time of concreting.
- 3.01.2 Camber forms where necessary to maintain specified tolerances.
- 3.01.3 Provide 3/4 by 3/4 inch chamfer strips, unless noted otherwise, in formwork at exposed external corners, including but not limited to those on columns, beams, walls, slab edges, and equipment bases, but not including those on steps.
- 3.01.4 Bevel, marker and rustication strips shall be applied in straight lines and secured to prevent displacement.
- 3.01.5 Provide temporary cleanouts and openings in wall and column forms as required for effective removal of loose dirt, debris, and waste material; for inspection of reinforcement; for introduction of vibrators; and where necessary to limit the free fall of the concrete to less than four feet.
- 3.01.6 Slab Forms
- A. Establish levels and set screeds.

- B. Depress slabs where required to receive special floor finishes.
- C. Slope to drain where required or shown or noted.

3.01.7 Earth forms for footings shall be cut to sizes and elevations indicated. If dry, all earth or rock surfaces shall be moistened prior to concrete placement.

- A. Provide forms for footings wherever concrete cannot be placed against solid earth excavation.
- B. Contact face of forms shall be coated with approved coating; or wood forms may be thoroughly wetted except in freezing weather. Oil coating must be applied and excess wiped off before placing reinforcement.

3.02 OPENINGS IN CONCRETE CONSTRUCTION

3.02.1 Formed Openings: Provide these where required for mechanical, electrical, and other work.

3.02.2 Cutting Openings: Where openings are required in new in-place or existing concrete construction, cut these only at locations approved by the Contracting Officer:

- A. Small opening for pipes, conduits, etc.: cut these with suitable rotary core type drills, without spalling the concrete; do not use star drills, chisels, or similar impact type tools, unless otherwise approved.
- B. Large holes for ducts, equipment, doorways, windows, etc.: chip these through the concrete one-half way through each side, to prevent unnecessary spalling and damage to the concrete.

3.03 REMOVAL OF FORMS

Remove forms only with approval, and in a manner that will insure complete safety of the structures. Where the structure as a whole is supported by shores, the forms for beam and girder sides, columns, and similar vertical surfaces may be removed after 24 hours, provided that the concrete has hardened sufficiently to prevent its injury by form removal. Do not in any case remove supporting forms or shoring until the structural members have acquired sufficient strength to safely support their weight and the load which will be placed thereon. Use every precaution to avoid spalling or otherwise damaging concrete by form removal.

3.04 INSERTS AND FASTENING DEVICES FOR OTHER WORK

- 3.04.1 Provide for installation of inserts, hangars, metal ties, anchors, bolts, dowels, nailing strips, grounds, and other fastening devices required for attachment of other work.
- 3.04.2 Other metal items embedded in concrete work are specified under other Divisions of these Specifications. Check Drawings and Specifications carefully for items embedded in concrete work prior to each pour.

PART 4 COMPENSATION

4.01 PAYMENT

- 4.01.1 There shall be no separate payment made for “CONCRETE FORMWORK”. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

DIVISION 3 – CONCRETE

SECTION 03200

CONCRETE REINFORCEMENT

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SECTION 03200**CONCRETE REINFORCEMENT****PART 1 GENERAL****1.01 DESCRIPTION**

The work required under this Section consists of Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete, complete with tie wire, bar supports, splices and other reinforcing devices.

1.02 SPECIFICATION STANDARDS

- 1.02.1 Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work in this section where cited below:

ASTM - American Society for Testing and Materials.

ACI - American Concrete Institute's.

ACI 315 - "Details and Detailing of Concrete Reinforcement."

ACI 318 - "Building Code Requirements for Reinforced Concrete."

CRSI - Concrete Reinforcing Steel Institute's.

CRSI - "Manual of Standard Practice."

CRSI - "Reinforcing Bar Splices."

CRSI - "Placing Reinforcing Bars."

1.03 SUBMITTALS

- 1.03.1 See Section 01330, "Submittal Procedures".

- 1.03.2 Manufacturer's literature describing products, if requested.

- 1.03.3 Shop Drawings: Show bending and placing details, size, and location of reinforcing steel. Include diagrammatic wall elevations at scale to show clearly position and erection marks of bars including marginal bars around openings with dowels, splices, etc. in accordance with ACI 315 and CRSI Manual of Standard Practice.

- 1.03.4 Certified Mill Test Reports.

- 1.03.5 Samples if required by Contracting Officer.

1.04 STORAGE AND HANDLING

- 1.04.1 Store reinforcing and accessories in manner to prevent rusting and fouling with grease, dirt, or other bond-weakening coatings.
- 1.04.2 Take precautions to maintain identification after bundles are broken.

PART 2 PRODUCTS

2.01 REINFORCING STEEL

- 2.01.1 All reinforcement shall be detailed and fabricated in accordance with ACI 315 and CRSI "Manual of Standard Practice."
- 2.01.2 Reinforcing bars, except column spirals shall be deformed bars conforming to ASTM A615 "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," Grade 60 as indicated on the drawings.
- 2.01.3 Spiral Reinforcement shall be plain bars conforming to ASTM A615, Grade 60; or plain cold drawn steel wire conforming to ASTM A82-85 with a minimum yield strength of 70,000 psi.
- 2.01.4 Welded Wire Fabric shall conform to ASTM A185.

2.02 REINFORCING BAR SUPPORTS

- 2.02.1 Bar supports shall be provided as recommended in Chapter 3 of CRSI "Manual of Standard Practice."
 - A. All bar supports in contact with formwork for surfaces which will be exposed to view; be exposed to weather; receive acoustical plaster or paint; and interior surfaces of structures which will normally contain water: CRSI Class 1, plastic-protected, or CRSI Class 2, stainless steel protected, as approved.
 - B. For other areas, unless otherwise indicated: CRSI Class 3, bright basic.
 - C. On ground: concrete blocks, or if required, wire bars Class 3 with sand plates.
 - D. Tie wire shall be black annealed wire, 16-1/2 gauge minimum.

PART 3 EXECUTION

3.01 PLACEMENT

- 3.01.1 Place reinforcing steel in accordance with the recommended practices in "Placing Reinforcing Bars" by CRSI, as indicated on the drawings and outlined herein
- 3.01.2 Do not bend or straighten any reinforcing steel in a manner which will weaken or damage the material, nor heat reinforcing steel for bending or straightening.
- 3.01.3 All splices of reinforcement, minimum concrete cover, placing tolerances and bar spacings shall conform to ACI 318 and to recommended practices in "Reinforcement Anchorages and Splices" by CRSI.

3.02 SUPPORTS

- 3.02.1 Reinforcing steel shall be accurately placed, in the forms adequately supported and secured against displacement within the tolerances outlined in ACI 318.
- 3.02.2 Provide spaces, chains, bolsters, and other metal accessories to support all reinforcing steel and secure it in proper position before and during concrete placement.
- 3.02.3 Splices shall be as indicated on the drawings. Generally splice bottom bars at points of support and top bars at mid-span of slabs, beams, and girders. Avoid splices at points of maximum tensile stress. Stagger horizontal and vertical splices.
- 3.02.4 Reinforcing steel shall not be welded.

3.03 PROTECTION AGAINST RUST

- 3.03.1 Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
- 3.03.2 Remove protective materials and clean reinforcement as required before preceding with concrete placement.
- 3.03.3 Prior to concrete placement, verify reinforcement has been properly bent, positioned, and secured in accordance with drawings; and remove ice, oil, grease, dirt, or other bond-weakening coatings.

3.04 INSPECTION

Reinforcing for any pour shall be completely placed and inspected by the Contracting Officer prior to starting the pour.

PART 4 COMPENSATION

4-01 PAYMENT

4.01.1 There shall be no separate payment made for “CONCRETE REINFORCEMENT”. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

END OF SECTION
03200-4

DIVISION 3 – CONCRETE

SECTION 03300

CAST-IN-PLACE CONCRETE

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SECTION 03300**CAST-IN-PLACE CONCRETE****PART 1 GENERAL****1.01 SECTION INCLUDES**

Cast-in-place concrete joints, expansion joint fillers, water stops, and anchorage items including slots, inserts, anchors, and bolts etc. for sanitary sewer structures and buildings.

1.02 RELATED SECTIONS

- 1.02.1 Section 02200 - Earthwork.
- 1.02.2 Section 03100 - Concrete Formwork.
- 1.02.3 Section 03200 - Concrete Reinforcement.

1.03 REFERENCE STANDARDS AND CODES

1.03.1 Published Specifications, standards, tests, or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:

- 1. ASTM - American Society for Testing and Materials.
- 2. ACI - American Concrete Institute's.
- 3. FS - Federal Specifications.

1.03.2 Materials and work shall conform to the requirements of standards, codes, and recommended practices required in this section. In conflicts between industry standards, required standards and this specification, or this specification and the local building code, the more stringent requirement shall govern.

- 1. Applicable Standards and Codes:
 - a. ACI 301 - "Specifications for Structural Concrete for Buildings."
 - b. ACI 318 - "Building Code Requirement for Reinforced Concrete."
 - c. ASTM C94 - "Standard Specification for Ready-Mixed Concrete."

1.04 QUALITY ASSURANCE

Concrete work shall conform to all requirements of ACI 301 "Specifications for Structural Concrete for Buildings", except as modified and supplemented herein.

1.05 SUBMITTALS

- 1.05.1 See Section 01330, "Submittal Procedures".
- 1.05.2 Manufacturer's literature describing products.
- 1.05.3 Contractor shall prepare and submit preliminary mix design for each class of concrete specified a minimum of 14 days prior to concrete production.
- 1.05.4 Contractor shall name his source of supply for concrete materials and submit representative samples of aggregates and cement and reports of quality tests for approval.
- 1.05.5 Other samples only as requested.

1.06 STORAGE OF MATERIALS

Store concrete materials in a manner which will effectively segregate each type of material from each other, prevent contamination of materials, and protect the materials from damage by weather and other causes.

1.07 INSPECTION AND TESTING

- 1.07.1 The Contracting Officer and testing laboratory shall have free access to all points where concrete materials are stored, proportioned or mixed, and all materials, equipment and methods used shall be subject to their inspection, tests, and approval.
- 1.07.2 A Corps of Engineer's certified testing laboratory shall perform following services:
 - A.. Test of Portland Cement, one test for each separate carload or certified mill test reports of cement.
 - B. Test gradation of coarse and fine aggregates.
 - C. Design and test all mixtures (with admixtures included) to be used on project.
 - D. If concrete materials are batched away from the project site and mixed on the project or transported to project in mixer or agitator trucks, laboratory inspection shall be provided at job site for checking materials deliveries and concrete consistencies on all pours in excess of 24 cubic yards and on others if required by the Contracting Officer.
 - E. Cast, cure, and test cylinders of the concrete actually placed on the job, all in accordance with ASTM C31 and ASTM C39, and as follows:

1. Quantity of test cylinders required: at least four cylinders of each day's concrete placing, but not less than four cylinders for each 100 cubic yards of concrete placed, and not less than four cylinders for each 5,000 square feet of surface area of concrete placed.
 2. Testing requirements: Test one laboratory and one field cured cylinder at seven days; test one laboratory and one field cured cylinder at 28 days.
- F. Slump tests, using ASTM C143, of concrete sample for each strength test and whenever in the Contracting Officer's opinion consistency of concrete appears to vary.
 - G. Test for air content of normal weight concrete sample for each cylinder in accordance with ASTM C173.
 - H. Test for air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567
 - I. Determine temperature of concrete sample for each strength test.
 - J. Test reports shall be promptly furnished by the laboratory to the Contractor and the Contracting Officer.
 - K. Daily reports of pouring shall be furnished, giving the date, location, and yardage of pour, specifying materials, proportions, consistencies and class of concrete used, the test cylinder number representing pour, and the weather conditions prevailing.

PART 2 PRODUCTS

2.01 MATERIALS

- 2.01.1 Cement: ASTM C150, Type I or Type II, unless otherwise approved. Use only one brand of cement throughout the project unless otherwise approved by the Contracting Officer. All cement shall have a maximum of 8 percent tre-calcium aluminate.
- 2.01.2 Aggregates for normal weight concrete shall conform to ASTM C33:
 - A. Coarse aggregate: Crushed limestone. Maximum size $\frac{3}{4}$ inch.
 - B. Fine aggregate: Clean, natural sand.

- 2.01.3 Aggregates for lightweight concrete shall be expanded shale type conforming to ASTM 330.
- A. Coarse aggregates: Uniformly graded from $\frac{3}{4}$ inches to No. 4.
 - B. Fine aggregates: A blend of lightweight fines, ASTM C330 and natural sand, ASTM C33.
- 2.01.4 Water: Clean and potable, free from impurities detrimental to concrete.
- 2.01.5 Admixtures: Use only when conditions of use are approved, or as specified elsewhere in these specifications.
- A. Water reducing admixture: The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.
 - B. Water reducing, retarding admixture: The admixture shall conform to ASTM C494, Type D, and not contain more chloride ions than are present in municipal drinking water.
 - C. High range water reducing admixture (superplasticizer): The admixture shall conform to ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - D. Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 - E. Air Entraining Admixture: Conform to ASTM C260.
 - F. Calcium Chloride: Calcium chloride, thicyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
 - G. Certification: Written conformance to above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Contracting Officer.
- 2.01.6 Bonding Compound: The compound shall be a polyvinyl acetate, rewettable type.

- 2.01.7 Epoxy Adhesive: The compound shall be a two component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.
- 2.01.8 Non-Shrink Non-Metallic Grout: Factory premixed grout containing mineral aggregates and requiring only addition of water at the site. The grout shall conform to CRD-621, "Corps of Engineers Specifications for Non-Shrink Grout".
- 2.01.9 Curing Materials:
- A. Waterproof Paper: ASTM C171, Type 1, regular.
 - B. Sheet Plastic: Polyethylene, 4 mils thick, fungus resistant.
- 2.01.10 Curing and Sealing Compound: The Compound shall conform to Federal Specification TT-C-800A, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per square cm. when applied at a coverage rate of 300 square feet per gallon. Manufacturer's certification required.
- 2.01.11 Dissipating Resin Curing Compound: The compound shall be a dissipating resin type compound, conforming to ASTM C309, Type I. The film must chemically break down in a two to four week period after application.
- A. Curing compounds shall not be used on any surface against which additional concrete or other cementitious materials are to be bonded.
- 2.01.12 Expansion Joint Fillers:
- A. ASTM D1751 - "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)."
 - B. ASTM D1752 - "Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction."
 - C. Verify compatibility of joint filler with sealant specified.
- 2.01.13 Joint Sealant: Joint sealants shall be of high quality material similar to Precora Corporation's Synthacalk? GC-2+or approved equal. All joint surfaces shall receive a prime coat of Precora Corporation's Synthacalk? P-53+ or approved equal.
- 2.01.14 Anchorage Items: Cast-in-place slots, bolts, and inserts for anchoring masonry

finish and mechanical items to concrete shall be of the types indicated and/or required to accommodate the subsequently installed fastening devices.

- 2.01.15 Vapor Barrier: 10 mil (1.0 mm thick) clear polyethylene film, type recommended for below grade application.
- 2.01.16 Waterproofing: Waterproofing material shall be Duramem 700-SM or Contracting Officer approved equal.
- 2.01.17 Waterstop: Waterstops shall be of the sizes indicated on the plans.
- 2.01.18 Non-Slip Aggregate: Aluminum oxide type.

2.02 PROPORTIONING

- 2.02.1 Proportioning of ingredients for each class of concrete required shall be in accordance with ACI 301 Method 1, laboratory trial batches, or Method 2, past field experience using materials to be employed on the project to produce placability, durability, specified strengths and properties specified.
 - A. This section shall propose mix designs prepared in accordance with Method 1 (trial batches) or Method 2 (field experience) of ACI 301.
 - B. If trial batches are used, this section shall instruct Laboratory to base mix designs on use of materials tested and approved by the Testing Agency.

2.03 CONCRETE QUALITIES REQUIRED

- 2.03.1 Strength: Specified compressive strength at 28 days shall be 4,000 psi unless specifically noted to otherwise elsewhere in the contract documents.
 - A. Average strength shall exceed specified compressive strength as required in accordance with ACI 318.
- 2.03.2 Water-Cement Ratio: All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.40 by weight. All concrete subjected to deicers and/or required to be watertight shall have a maximum water-cement ratio of 0.45.
- 2.03.3 Minimum Cement Content:
 - A. 5-1/2 sacks per cubic yard for coarse aggregate size No.467 (1-1/2 maximum).
 - B. Six sacks per cubic yard for coarse aggregate size No. 57 (one inch maximum) or No. 67 (3/4 inch maximum).

- 2.03.4 Air Content: All concrete subjected to freezing and thawing after curing and/or required to be watertight shall be air entrained. Total air content as determined in accordance with ASTM C173 shall be:
- A. 5 (?1) percent for coarse aggregate size No. 467 (1-1/2 inch maximum).
 - B. 6 (? 1) percent for coarse aggregate size No. 57 (one inch maximum) or No. 67 (3/4 inch maximum).
 - C. All interior slabs to receive a surface hardener or subject to abrasion shall have a maximum total air content of three percent.
- 2.03.5 Slump: As determined by ASTM C143 for concrete to be vibrated:
- Slabs and walls: four inches maximum, two inches minimum.
- 2.03.6 Lightweight Structural Concrete:
- A. Lightweight concrete shall have a minimum compressive strength of 3,000 psi at 28 days as noted on the drawings. Maximum air dry unit weight shall be 110 pounds per cubic foot. Minimum cement factor shall be 6.2 sacks per cubic yard, unless otherwise approved.
 - B. Lightweight concrete shall be air entrained and contain six percent plus or minus one percent total air as determined by ASTM C231.
 - C. Lightweight concrete shall otherwise conform to requirements of normal weight concrete.

PART 3 EXECUTION

3.01 PRODUCTION OF CONCRETE

Concrete shall be ready-mixed, batched, mixed, and transported in accordance with ASTM C94, "Standard Specification for Ready-Mixed Concrete."

- 3.01.1 Plant equipment and facilities shall conform to "Certification of Ready Mixed Concrete Production Facilities (Checklist with Instructions)" of the National Ready Mixed Concrete Association.

3.02 PREPARATION

- 3.02.1 Approval: Prior to placing concrete, give the Contracting Officer sufficient advance notice of each proposed placing. Do not place any concrete on any

subgrade or in any formwork until the subgrade, formwork, reinforcing steel, anchor bolts, and other embedded items for the placement involved have been inspected and approved by the Contracting Officer.

- 3.02.2 Bonding and Grouting: Before depositing new concrete on or against concrete which has set, treat existing concrete surfaces which will receive additional concrete, as follows: thoroughly roughen existing concrete surfaces and remove laitance, foreign matter, and loose particles; retighten forms at junction of existing and new concrete; dampen (but do not saturate) existing concrete surfaces; and slush existing concrete surface with cement-sand grout of proportions similar to those of the concrete. Grout coat shall be as thick and practicable on vertical surfaces, and at least 1/2 inch thick on horizontal surfaces. Place new concrete before grout has attained its initial set.
- 3.02.3 Install construction joints at locations indicated on drawings: Except where indicated, no construction joints will be permitted without prior specific approval. Vertical construction joints in wall footings shall be reduced to a minimum. Construction joints in slabs and walls, where permitted, shall be located and made so that the strength and usefulness of the structure will not be impaired. Except where shown otherwise, provide keyways at all construction joints as indicated on the plans. Metal keyways are not permissible.
- A. Unless otherwise indicated, the spacing of the joints shall not exceed the following in any horizontal direction: Suspended slabs, 20 feet; other slabs on grade, 50 feet; walls, 50 feet.
- 3.02.4 Expansion joints shall be provided at locations indicated on drawings. Joint filler shall be as specified. Do not permit reinforcement or other embedded metal items bonded to concrete (except dowels bonded on only one side of joint) to extend through any expansion joint.
- 3.02.5 Contraction joints shall be formed in walls with removable strips placed in the forms and in slabs with an early entry dry cut system, both to the depth indicated on the plans.
- A.. Contraction joints may be formed, tooled or sawed approximately equal to 1/4 the thickness of slab.
- B. The spacing of the joints shall be as shown on the drawings.
- C. All joints shall be sealed with a joint sealant as specified herein.
- 3.02.6 Placing Embedded Items: Expansion joint material, waterstops and other embedded items shall be positioned accurately and securely against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent entry of concrete into

voids.

- 3.02.7 Anchor bolts shall be set with templates according to approved shop drawings.
- 3.02.8 Slabs on grade shall be placed on properly leveled and thoroughly compacted sub-grades or granular fill, as indicated. All sub-soils for slabs shall be approved before placing concrete. At locations indicated provide one layer of vapor barrier material, lapped at joints a minimum of 24" inches.
- 3.02.9 Except where shown otherwise, chamfer all exposed concrete edges $\frac{3}{4}$ ".
- 3.02.10 Install waterstops in all expansion joints, construction joints and control joints in each structure designed to contain water or other liquid, or designed to prevent intrusion of water or other liquid, as indicated and/or as required to provide watertight structures. Arrange all waterstops to provide continuous seals in all joints between the separate concrete placements in each structure. Carefully fit all waterstops to form turns, tees, crosses, and other arrangements as required to provide a complete, continuous water seal in all joints subject to leakage. Heat weld all joints in waterstops, and install as recommended by the manufacturer.
- A. Waterstop shall be securely held in position so that it will not be displaced during concreting. Exercise care to avoid contamination of waterstop surface by form coatings or other substances which would adversely affect bonding.
- 3.02.11 Concrete Foundations for Mechanical and Electrical Equipment: Provide concrete pads required under all mechanical equipment. Set bolts, anchors, piping, etc., in concrete as required by manufacturer of equipment used. See mechanical and electrical drawings and details for size, design, and location of equipment requiring concrete pads. Pads shall be trowel finished on all top exposed surfaces.

3.03 PLACEMENT

- 3.03.1 Conveying: Convey concrete from mixer to forms as rapidly as practicable without segregation or loss of ingredients, continuously and at such a rate that no unfinished area will be left exposed or unworked before the concrete takes its initial set. Do not deposit concrete initially set. Cast concrete within one hour after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.
- 3.03.2 Take precautions to avoid damage to under-slab waterproofing and displacement of reinforcement and formwork.
- 3.03.3 Chute Placement: When concrete is conveyed by chute, maintain a continuous

flow of concrete. Chute shall be of metal or metal-lined wood, with sections set at approximately the same slope, which shall not be less than one vertical to three horizontal, and not more than one vertical to two horizontal. Discharge end of chute shall be provided with a drop chute to prevent segregation. If height of discharge end of chute is more than three times the thickness of the layer being deposited, but not more than four feet above surface of concrete in forms, use a spout with its lower end maintained as near surface of deposit as practicable. When pouring is intermittent, chute shall discharge into a hopper. Clean chutes thoroughly before and after each run. Discharge waste materials and flushing water outside forms. Raised runways for wheeling concrete to place shall be provided when necessary.

- 3.03.4 Deposit concrete in approximately horizontal layers of 12 to 18 inches as near as possible to its final position. Do not allow concrete to drop vertically more than 3 or 4 feet, nor through a cage of reinforcing steel except when an elephant trunk or tremie is used.
- A. Elephant trunks or tremies shall be used in deep walls and columns to prevent free fall of concrete and to allow placement through cage of reinforcement.
- 3.03.5 Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage or laitance through forms.
- 3.03.6 Interruption in casting longer than 45 minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the Contracting Officer directs; clean forms and reinforcement as necessary to receive concrete at later time.
- 3.03.7 Continuously place concrete in units between construction joints so that each unit will be monolithic in construction. Concrete placement rate shall be such that surface of concrete not carried to construction joints will not have attained initial set before additional concrete is placed in the construction unit involved.
- A. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at same time as slabs. In walls of structures having door, window, or other openings, lifts of individual pours shall terminate at the tops or bottoms of the openings. Other lifts shall terminate at levels indicated, or to conform to structural requirements or architectural details, or both, as approved. Special provisions shall be made for joining successive pours as detailed or as approved. At least 48 hours shall elapse before placing concrete in the adjoining unit at each construction joint.
- 3.03.8 Compaction: During and immediately after depositing concrete, compact each layer by mechanical internal vibrating equipment supplemented by hand spading,

rodding, and tamping, as required. Do not use vibrators to transport concrete inside of forms. Form vibrators shall not be used. Internal vibrators shall maintain not less than 5,000 impulses per minute when submerged in the concrete; maintain at least one vibrator as a stand-by. Limit vibrator duration to the time necessary to produce satisfactory consolidation without causing objectionable segregation. Do not insert vibrator into lower courses which have begun to set. Apply vibrators at uniformly spaced points not farther than the visible effectiveness of the machine. Vibrate thoroughly all concrete at all waterstops to insure their complete embedment in solid concrete.

3.03.9 Hot Weather Concreting: Conform to ACI 305R and following requirements when mean daily temperature rises above 85 degrees Fahrenheit.

- A. Temperature of concrete as placed shall be lowest temperature practicable but not higher than 85 degrees Fahrenheit, unless approved otherwise by the Contracting Officer.
- B. Crushed ice in lieu of water will be approved to maintain concrete below maximum temperature.
- C. Addition of water-reducing retarders will be permitted only if the Contracting Officer approves and mix is redesigned.
- B. Concrete shall be discharged within 45 minutes after adding water.

3.03.10. Cold Weather Concreting: Conform to ACI 306R and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.

- A. Reinforcement, forms, or ground to receive concrete shall be completely free from frost.
- B. Minimum temperature of concrete as placed shall be 50 degrees Fahrenheit.
- C. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum seven day period after placement.
- D. Only the specified non-corrosive, non-chloride accelerator may be used. Calcium chloride, thicyanates, or admixtures containing more than 0.05 percent chloride ions are not permitted.

3.04 REPAIR OF SURFACE DEFECTS

3.04.1 Fin and Protrusion Removal: Immediately after form removal, remove fins and other unnecessary protrusions, flush with concrete surfaces.

3.04.2 Filling and Patching: Surface defects including tie holes, shall be repaired immediately after form removal using one of the following appropriate methods.

A. For concrete surfaces to receive rubbed finish: As soon as practicable after form removal, fill and patch tie holes, honeycombs, voids, and other unnecessary holes, as follows:

1. Remove all loose material.
2. Wet concrete for 8 hours before patching.
3. Mop surface to receive patch, with slurry of cement and water.
4. Fill with "dry" grout of sand and cement in the same proportions as those of the concrete, except with only enough water added to provide a mix that will "ball" in the hand. Force grout into cavities with the greatest practicable pressure.
5. Finish surface to match adjacent area.
6. Cure fill as specified under curing.

B. For concrete surfaces to receive waterproof coating and finish: as soon as practicable after form removal, fill and patch tie holes, honeycombs, voids, and other unnecessary holes with commercially prepared patching material. Standard Dry Wall Products "Thorite" or as approved, which has high bonding characteristics; 5,000 psi minimum 28 day strength; recommended by the manufacturer for use in contact with potable water without emitting objectionable tastes or odors to the water; and compatible with the Waterproof Coating and Finish specified above. Apply patching material in strict accordance with the manufacturer's printed instructions. All surfaces shall be approved by the Contracting Officer prior to application of coatings.

3.05 FINISHING OF FORMED SURFACES

3.05.1 Immediately after forms have been removed and concrete surfaces have been repaired as specified under "Repair of Surface Defects" concrete surfaces shall be given one or more of the following finishes in locations indicated or specified hereinafter. When completed the finished exposed concrete surfaces shall be free of defects, with corners, jambs, rises, and angles straight, plumb, true to line, and level, as applicable.

3.05.2 Rubbed Finish: Immediately after form removal, completely rub and finish the concrete surfaces with abrasive stones, as required to obtain uniform and approved surface texture and color.

- 3.05.3 Related Unformed Surfaces: Tops of walls or buttresses, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and be floated to a texture reasonably consistent with that of the formed surfaces. Continue final finish on formed surfaces uniformly across the unformed surfaces.
- 3.05.4 Waterproof Coating and Finish: Remove all form release products and membrane curing compounds and apply a waterproof coating. Coating shall be as recommended by the manufacturer for this application and shall bond securely to the concrete surfaces.
- A. Waterproof coating shall be Standard Dry Wall Products “Thoroseal” mixed with Acryl 60 bonding agent, or approved equal waterproof coating, applied in two coats in strict accordance with the manufacturer’s printed instructions to produce a sand textured finish.
 - B. This finish coating for aesthetic purposes shall be applied to all exposed exterior concrete and one foot below low water surfaces of all concrete structures.

3.06 CONCRETE SLAB FINISHES

- 3.06.1 General: Finish concrete slabs as specified below. Dusting of wearing surfaces with dry materials will not be permitted. In preparation for finishing, strike slabs off true to the required elevations and grades of the finished slabs. Slabs shall be level, except where drains occur or slopes are indicated, in which case the slabs shall be pitched to the drains or sloped, as applicable. Floors shall be flat and achieve a flatness, F_f of 25 as per ASTM E 1155. Floors shall be level and achieve a levelness, F_l of 15 as per ASTM E 1155.
- 3.06.2 Wood Float Finish: Finish slabs by screeding and floating with straight edges to bring the surface to the required finished elevation. While the concrete is still green but sufficiently hard to bear a man's weight without deep imprint, wood float the surface to a true even plane with no coarse aggregate visible using sufficient pressure on the wood floats to bring moisture to the surface.
- 3.06.3 Steel Trowel Finish: First wood float finish the slabs as specified in the paragraph above. Then hand finish the concrete with a steel trowel to produce a smooth impervious surface free from trowel marks.
- 3.06.4 Machine Finish: Suitable machines may be used to finish the concrete, provided that they produce satisfactory final finishes at least equal to those normally obtained by the hand finishing methods specified above.
- 3.06.5 Broom Finish. Finish concrete surface with wood float finish as specified above,

then broom surface to provide a light grit finish. Broom finish is required on all exterior slabs, pavements and sidewalks.

3.06.6 Roughened Finish: First wood finish the slab as specified above. Rake surface to provide a coarse finish with exposed aggregate of 1/2" maximum amplitude.

3.07 WATERTIGHTNESS OF CONCRETE STRUCTURES

3.07.1 All concrete structures which are intended to contain water or other liquids and/or prevent entry of water into the structure, shall be strictly watertight.

3.07.2 Promptly repair and permanently leakproof all cracks and other defects through which water or other liquids leak before and during the guarantee period, as approved.

3.08 CURING

3.08.1 General: Take curing measures immediately after casting and extend period according to the Contracting Officer's recommendation based upon prevailing temperature, wind, and relative humidity.

- A. Keep concrete continuously moist for minimum 14 days after casting.
- B. Maintain concrete temperature at minimum 50 degrees Fahrenheit for seven days after casting.
- C. Avoid alternate wetting and drying and fluctuations of concrete temperature.
- D. Protect fresh concrete from direct rays of sun, rain, drying winds, soiling, and damage.
- E. Do not permit curing method to affect adversely finishes or treatments applied to finished concrete.

3.08.2 Curing Methods for Slabs: Cure all concrete surfaces with one or a combination of the following methods. Where a specific curing procedure is not specified, at the Contractor's selection, one or more of the following methods shall be used.

- A. Water curing: Keep concrete surfaces continuously wet with clean water during the curing period by immersion, maintaining a continuous flow of water over the surface, continuous spraying, continuous sprinkling or a combination of these. For all curing methods, the difference in temperature between the water used for curing and the concrete shall not exceed 20 degrees Fahrenheit.
- B. Wet coverings: Cover the concrete surfaces with burlap, cotton mats, sand, earth, or other suitable moisture retaining materials and keep these materials saturated during the curing period. Lap all fabrics at least 8 inches at all joints. On exposed concrete, do not

use any type covering which will discolor the concrete surface. Waterproof coverings: As soon as possible after finishing, thoroughly wet the concrete surfaces and cover the concrete surfaces with waterproof paper or plastic film immediately after wetting.

- E. For a period of at least 8 hours after the concrete has taken its initial set, maintain a continuous flow of clean water over the concrete surface under the covering. Lap all joints in the covering at least 8 inches and provide weights and other means and methods to keep the waterproof covering in direct contact with the concrete during the curing period.
- F. Membrane forming curing compounds: An approved liquid membrane forming curing compound may be used after one of the curing methods specified above has been used for at least 24 hours after the concrete has taken its initial set. The membrane forming curing compound shall be applied in strict accordance with the manufacturer's printed instructions. Apply in two coats at right angles to each other at a rate of 200 square feet coverage per gallon per coat unless otherwise recommended by the manufacturer. Apply coats uniformly and free of pinholes, gaps, puddles, and runs.
 - 1. Membrane forming curing compound used on potable water containing structures shall be nontoxic and taste and odor free.

3.08.3 Curing Methods for Walls: Cure all concrete walls as follows: Keep forms wet during the period forms are required to remain in place. Immediately after formed concrete has taken its initial set, start a gentle uniform flow of clean water over concrete to thoroughly wet all concrete surfaces and formwork and maintain this flow of water until forms are removed. Immediately after form removal, cure concrete surfaces with one of the curing methods specified.

PART 4 - COMPENSATION

4.01 PAYMENT

4.01.1 There shall be no separate payment made for "CAST-IN-PLACE CONCRETE". Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

DIVISION 4 – MASONRY

(NOT USED)

DIVISION 5 – METALS

SECTION 05500

METAL FABRICATIONS

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3.03 INSTALLATION

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SECTION 05500**METAL FABRICATIONS****PART 1 - GENERAL****1.01 SECTION INCLUDES**

Shop fabricated steel items not included in other sections.

1.02 REFERENCES

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.
- B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2000a.
- C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2000.
- D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2000.
- E. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
- F. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2000.
- G. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2000.
- H. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 2000.
- I. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
- J. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2002.
- K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1982 (Ed. 2000).
- M. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2000).

1.03 SUBMITTALS

- A. See Section 00800 - Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Welders' Certificates: Submit certification for welders employed on the project,

verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A 283.
- D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M) galvanized to ASTM A 153/A 153M for galvanized components.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish. See Drawings.
- B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; prime paint finish.
- D. Lintels: As detailed; prime paint finish.
- E. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

F. All items shall receive finish paint coat as specified in Section 09900.

2.04 FINISHES - STEEL

- A. Prepare surfaces to be primed in accordance with SSPC-SP2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.
- D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.

PART 3 - EXECUTION

3.01 EXAMINATION

Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- C. Provide separation for dissimilar metals.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

PART 4 – COMPENSATION

4.01 PAYMENT

- 4.01.1 There shall be no separate payment made for “METAL FABRICATIONS”. Payment for all work in this section shall be incidental to the lump sum and unit bid prices in the Bid Form

END OF SECTION
05500-3

DIVISION 6 – WOOD AND PLASTICS
THRU
DIVISION 8 – DOORS AND WINDOWS
(NOT USED)

DIVISION 9 – FINISHES

SECTION 09900

PAINTS AND COATINGS

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4.01 PAYMENT

SECTION 09900**PAINTS AND COATINGS****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- 1.01.1 Surface preparation.
- 1.01.2 Field application of paints.
- 1.01.3 See Schedule - Surfaces to be Finished, at end of Section.

1.02 REFERENCES

- 1.02.1 ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2000.
- 1.02.2 ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 1997).

1.03 DEFINITIONS

- 1.03.1 Conform to ASTM D 16 for interpretation of terms used in this section.

1.04 SUBMITTALS

- 1.04.1 See Section 800 for submittal procedures.
- 1.04.2 Samples: Submit two paper chip samples, 12 x 12 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- 1.04.3 Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available.

1.05 DELIVERY, STORAGE, AND PROTECTION

- 1.05.1 Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- 1.05.2 Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- 1.05.3 Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

- 1.06.1 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- 1.06.2 Do not apply exterior coatings during rain or snow, or when relative humidity

is outside the humidity ranges required by the paint product manufacturer.

- 1.06.3 Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- 1.06.4 Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.01 PAINTS AND COATINGS - GENERAL

- 2.01.1 Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
 - A. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 - B. For good flow and brushing properties.
 - C. Capable of drying or curing free of streaks or sags.

2.02 PAINT SYSTEMS - EXTERIOR

- 2.02.1 Paint type A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 - A. One coat of alkyd primer.
 - B. Gloss: Two coats of alkyd enamel; .
- 2.02.2 Paint type B - Galvanized Metals, Alkyd, 3 Coat:
 - A. One coat galvanize primer.
 - B. Semi-gloss: Two coats of alkyd enamel.

2.03 PAINT SYSTEMS – INTERIOR (NOT APPLICABLE)

2.04 ACCESSORY MATERIALS

- 2.04.1 Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
- 2.04.2 Patching Material: Latex filler.
- 2.04.3 Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.01 EXAMINATION

- 3.01.1 Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- 3.01.2 Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- 3.01.3 Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- 3.02.1 Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- 3.02.2 Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- 3.02.3 Marks: Seal with shellac those which may bleed through surface finishes.
- 3.02.4 Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- 3.02.5 Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- 3.02.6 Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- 3.02.7 Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
- 3.02.8 Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- 3.02.9 Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- 3.02.10 Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3.03 APPLICATION

- 3.03.1 Apply products in accordance with manufacturer's instructions.
- 3.03.2 Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- 3.03.3 Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- 3.03.4 Vacuum clean surfaces of loose particles.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT (NOT APPLICABLE)

3.05 SCHEDULE - SURFACES TO BE FINISHED

- 3.05.1 Do Not Paint or Finish the Following Items:
- A. Items fully factory-finished unless specifically noted.
 - B. Fire rating labels, equipment serial number and capacity labels.
- 3.05.2 Paint the surfaces described in PART 2, Paint Systems.
- 3.05.3 Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
- A. Paint all insulated and exposed pipes, conduit, boxes, and hangers, brackets, collars and supports occurring in finished areas to match background surfaces, unless otherwise indicated.
 - B. Paint shop-primed items occurring in finished areas.
 - C. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - D. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- 3.05.4 Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.06 SCHEDULE - PAINT SYSTEMS

- 3.06.1 Steel Fabrications: Finish all surfaces exposed to view.
- A. Exterior: Type A, gloss; finish all surfaces, including concealed surfaces, before installation.
- 3.06.2 Shop-Primed Metal Items: Finish all surfaces exposed to view.
- A. Finish the following items:
 1. Exposed metal fabrications
 2. Bollards
 3. Exposed Metal Piping/Tubing

PART 4 – COMPENSATION

4.01 PAYMENT

There shall be no separate payment for “PAINTS AND COATINGS”. Payment for all work included in this section shall be incidental to the lump sum and unit bid prices in the Bid Form.

END OF SECTION
09900-4

DIVISION 10 – SPECIALTIES

THRU

DIVISION 16 – ELECTRICAL

(NOT USED)

BURNS COOLEY DENNIS, INC.

GEOTECHNICAL CONSULTANTS

551 SUNNYBROOK ROAD
RIDGELAND, MS 39157

BUS: (601) 856-9911
FAX: (601) 856-9774

POST OFFICE BOX 12828
JACKSON, MS 39236

April 25, 2003

Waggoner Engineering, Inc.
2475 Memphis Street
Hernando, Mississippi 38632

Report No. 03096

Attention: Mr. Tracy Huffman, P.E., P.L.S.

**Geotechnical Investigation
Lower Camp Creek Force Main
and Byhalia Road Pump Station
Desoto County, Mississippi**

Gentlemen:

Submitted here is the report of our geotechnical investigation for the above-captioned project. The investigation was performed in general accordance with our proposal No. 03001P-30 dated March 26, 2003.

We appreciate the opportunity to be of service on this project. If you should have any questions concerning this report, please do not hesitate to call us.

Very truly yours,

BURNS COOLEY DENNIS, INC.

C. Brad Ormon
C. Brad Ormon, E.I.

G. Thomas Dunlap
G. Thomas Dunlap, P.E., R.P.G.

GTD/cbo

Copies Submitted: (4)

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INTRODUCTION AND PURPOSE

Plans are being made by Waggoner Engineering, Inc. to construct the Lower Camp Creek Force Main and Byhalia Road Pump Station in Desoto County, Mississippi. Site plans and profiles illustrating the layout and invert elevations of the proposed force main and pump station were provided to Burns Cooley Dennis, Inc. by Mr. Tracy Huffman and Mr. Ben Womble, representatives of Waggoner Engineering, Inc. The proposed pump station is located just south of the intersection between Byhalia Road and the existing Camp Creek Canal. The proposed 24-in. ID force main will be approximately 28,800 ft long and generally extends from the pump station at Byhalia Road to the new Short Fork Sewage Treatment Plant, approximately paralleling the existing Camp Creek Canal. The proposed force main will be constructed using HDPE, iron or PVC pipe and there are no known large steel pipelines along the proposed alignment.

Based on the pipeline profile provided by Waggoner Engineering, Inc., the existing ground surface along the proposed pipeline alignment ranges from about El. 273 ft at the pump station to about El. 247 ft near the new treatment plant. The bedding level for the pipeline will generally range from approximately 5 ft to 7 ft below the ground surface; however, a deeper bedding level will be required at several creek and tributary crossings along the proposed alignment. It is our understanding that the pipe will be bedded at least 5 ft below the bottom of each creek and tributary. Open cut excavation is being planned for these crossings. Thrust blocks will be used for resistance of unbalanced forces at the angle points. The invert elevation for the proposed pump station is El. 236.0, approximately 33 ft below the existing ground surface. Consequently, significant dewatering will be required to construct the pump station in the dry. The specific purposes of this investigation were:

- 1) to make exploratory soil borings within the area of the proposed pump station and along the planned alignment for the proposed pipeline;
 - 2) to evaluate pertinent physical properties of the soils encountered in the borings by means of visual examination of the samples and laboratory tests performed on selected representative samples;
- and

3) after analysis of the soil boring and laboratory test data collected by Burns Cooley Dennis and considering three borings previously completed in the vicinity of the alignment by Aquaterra Engineering, to provide guideline recommendations for design and construction of the proposed pump station and pipeline.

FIELD INVESTIGATION

Subsurface soil conditions at the proposed location of the pump station and along the proposed alignment of the pipeline from Byhalia Road to Bright Road were explored by means of three borings (B-1, B-2 and B-3) made with a truck-mounted drill rig. Borings 1, 2 and 3 were located in the field by means of hand-held global positioning system (GPS) equipment based on coordinates furnished to Burns Cooley Dennis, Inc., by Waggoner Engineering, Inc. Ground surface elevations at the boring locations were also provided by Waggoner Engineering, Inc. A fourth boring was planned along the proposed alignment for the pipeline between Bright Road and the new treatment plant, but could not be drilled due to poor access and site conditions. Consequently, subsurface soil conditions along the proposed alignment for the pipeline between Bright Road and the new treatment plant were evaluated based on graphical logs of three borings (B-32, B-36 and B-58) made by Aquaterra Engineering prior to our investigation. The approximate locations of the borings relative to the proposed centerline of the new pipeline and existing site features are illustrated on Figures 1 and 2 of this report.

A synopsis of the Unified Soil Classification System is presented on Figure 3 along with symbols and terminology typically utilized on graphical soil boring logs. Graphical logs of Borings 1, 2 and 3 illustrating the types of soils and stratification encountered with depth below the ground surface at the individual boring locations are presented on Figures 4 through 6. Graphical logs submitted by Aquaterra Engineering for Borings 32, 36 and 58 are presented in Appendix A as Figures A-1 through A-3. Graphical profiles of the borings relative to the existing ground surface are presented on Figure 7 to aid in visualizing subsurface stratification. Tabulated adjacent to the individual profiles for each boring are liquid and plastic limits, water contents, cohesions, dry unit weights, field standard penetration test (SPT) blow counts, and percentages of fines passing the No.

200 sieve. It should be noted that Borings 32, 36 and 58 were drilled and the graphical logs were prepared by Aquaterra Engineering according to their procedures which are not discussed in the following paragraphs.

Boring 1 was advanced in-the-dry to an approximate depth of 20 ft using a 4-in. diameter short-flight auger, then advanced to the 40-ft completion depth using rotary wash drilling procedures. Borings 2 and 3 were advanced by dry augering to respective completion depths of 10 ft and 20 ft using a 4-in. diameter short-flight auger. Representative samples of the soils encountered during drilling were obtained from Borings 1, 2 and 3 at approximate 0.5 ft to 5 ft intervals of depth. Relatively undisturbed samples of some of the fine-grained soils encountered at Boring 1 were obtained by pushing a 3-in. OD thin-walled Shelby tube sampler approximately 2 ft into the soil. Representative disturbed samples of the remaining soils encountered at Borings 1, 2 and 3 were obtained directly from the auger cuttings or by driving a standard 2-in. OD split-spoon sampler 18 in. into the soil with a 140-lb hammer falling freely a distance of 30 in. Standard penetration test (SPT) blow counts resulting from split-spoon sampling are recorded under the "Blows Per Ft" column of the graphic logs. The blow counts recorded on the logs are for the final 12 in. of split-spoon penetration into the soil. Where the soil was too strong for full sampler penetration, the number of blows for the actual distance driven is recorded. The depths at which the Shelby tube, split-spoon and auger cutting samples were taken are illustrated by the appropriate symbols under the "Samples" column of the graphic boring logs.

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. Each Shelby tube sample was extruded in the field. A representative, approximate 6 in. long portion of each Shelby tube sample was sealed with melted paraffin in a cylindrical cardboard container to prevent moisture loss and structural disturbance. An additional portion of each Shelby tube sample and representative portions of the split-spoon and auger cutting samples were sealed in glass jars to provide material for visual examination and testing in the laboratory.

Observations were made continuously during auger drilling to detect free water entering the open boreholes. Selected boreholes were allowed to remain open for observation periods of 15 to 20 minutes and the depth to the water level in the open boreholes was measured after the observation

period. A piezometer was installed in Boring 1 and the water level was measured after an observation period of 24 hours. Notes pertaining to groundwater observations are included at the bottom right corner of the graphic boring logs.

In compliance with Mississippi Department of Environmental Quality regulations, Borings 1 were filled from bottom-to-top with pumped-in cement-bentonite grout after completion of drilling and sampling. Boring 3 was also filled from bottom-to-top with pumped-in cement-bentonite grout. Boring 2 was plugged with soil cuttings after completion of drilling and sampling.

LABORATORY INVESTIGATION

Laboratory tests were performed on selected, representative samples from Borings 1, 2 and 3 to assist in evaluating the strengths, classifications and volume change properties of the soils encountered. The types of laboratory tests performed are described in the following paragraphs. In addition to the laboratory tests described, all samples were visually examined and classified in the laboratory by a geotechnical engineer. The laboratory test data submitted by Aquaterra with the graphical logs for Borings 32, 36 and 58 was also utilized in evaluating the subsurface soils. It should be noted that the laboratory test data submitted with the graphical logs for Borings 32, 36 and 58 resulted from laboratory tests performed by Aquaterra Engineering according to their procedures which are not discussed in the following paragraphs.

The undrained shear strength characteristics of the fine-grained soils encountered in the borings were investigated by means of field and laboratory estimates of consistency and from the results of one (1) unconfined compression test performed on a selected Shelby tube sample. The result of the unconfined compression test in terms of cohesion is plotted as a small open circle in the data section of the graphic log. The water content and dry density were also determined for the unconfined compression specimen. The water content is plotted as a small shaded circle in the data section of the log. The dry density is tabulated to the nearest lb per cu ft under the "Dry Density" column of the graphic log.

The classifications and volume change properties of the fine-grained soils encountered in the borings were investigated by means of two (2) sets of Atterberg liquid and plastic limit tests. In

accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of liquid and plastic limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading. The proximity of the natural water content to the plastic limit is also an indicator of soil strength. The results of the liquid and plastic limit tests are plotted as small crosses interconnected by dashed lines in the data section of the graphic boring logs.

To aid in classifying sandy soils and fine-grained soils containing some sand, tests were performed on two (2) samples to determine the percent fines passing the No. 200 sieve. The percentages of fines resulting from those tests are tabulated at the appropriate depths under the far right column of the graphic boring logs.

Twenty-three (23) additional water content tests were performed to corroborate field classifications and to extend the usefulness of the plasticity and SPT blow count data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the logs to illustrate a continuous profile with depth.

Additionally, select samples were submitted to Southern Technical Services to perform tests to determine pH, soluble sulfates, and chloride ion content. The results of the testing are tabulated on Figure 8.

GENERAL SOIL CONDITIONS

Subsurface soils encountered within the 40-ft maximum completion depth of the borings made for this investigation include topstratum alluvial deposits consisting of alternating layers of clays (CH), silty clays (CL), silts (ML), clayey silts (ML) and sandy silts (ML) underlain by substratum alluvial deposits consisting of silty sands (SM), slightly silty sands (SP-SM) and sands (SP). General descriptions of subsurface soils encountered in the borings are provided in the

following paragraphs. It should be noted that the graphical logs prepared and submitted by Aquaterra Engineering for Borings 32, 36 and 58 were utilized to develop the following subsurface soil descriptions. The graphical logs for Borings 1, 2 and 3 presented on Figures 4 through 6 and for Borings 32, 36 and 58 presented in Appendix A on Figures A-1 through A-3 should be referred to for specific soil conditions encountered at each boring location. Stick logs of the borings are shown in profile on Figure 7 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick logs are liquid and plastic limits, water contents, cohesions, dry densities, field standard penetration test (SPT) blow counts, and percentages of fines passing the No. 200 sieve.

Subsurface Soil Conditions

The ground surface at all of the boring locations was found to be underlain by topstratum alluvial deposits consisting of alternating layers of clays (CH), silty clays (CL), silts (ML), clayey silts (ML) and sandy silts (ML). The alluvial topstratum soils extend to approximate depths of 27 ft, 22.5 ft and 29 ft at the locations of Borings 1, 32 and 36, respectively, and to the respective completion depths of Borings 2, 3 and 58. Expansive clays (CH) were encountered from the ground surface to an approximate depth of 4 ft at the location of Boring 36. The expansive clays (CH) are classified as soft with respect to consistency and are considered to have very low strength and high settlement potential. Silty clays (CL), silts (ML), clayey silts (ML) and sandy silts (ML) were encountered at various intervals of depth at all of the boring locations. The silty clays (CL) are generally classified as medium stiff or firm and stiff with respect to consistency and the silts (ML), clayey silts (ML) and sandy silts (ML) are classified as loose to medium dense with respect to relative density. However, very stiff silty clays (CL) were encountered from 4 ft to 6.5 ft at the location of Boring 2 and are considered to have high strength, and low settlement potential. The medium stiff or firm silty clays (CL) and the loose clayey silts (ML) are generally considered to be relatively weak and compressible with low to low-moderate strength and low-moderate to moderate settlement potential. The stiff silty clays (CL) and the medium dense silts (ML), clayey silts (ML) and sandy silts (ML) are generally considered to be moderately strong with low-moderate to moderate strength and low to low-moderate settlement potential. The silty clays (CL), silts (ML), clayey silts (ML) and sandy silts (ML) are considered to have very low shrink/swell potential or are nonexpansive, while the expansive clays (CH) have moderate shrink/swell potential.

The topstratum alluvial soils at the locations of Borings 1, 32 and 36 were found to be underlain by substratum alluvial soils consisting of silty sands (SM), slightly silty sands (SP-SM) and sands (SP). The alluvial substratum soils extend to the respective completion depths of Borings 1, 32 and 36. The substratum sands (SM, SP-SM and SP) are classified as medium dense and very dense with respect to relative density and are generally considered to be moderately strong to strong with moderate to very high strength and low to very low settlement potential. The substratum sands (SM, SP-SM and SP) are considered to be nonexpansive.

Groundwater

Free water was encountered at approximate depths of 18 ft, 1 ft, 2 ft, 8 ft and 13 ft during auger drilling at the locations of Borings 1, 2, 32, 36 and 58, respectively. Boring 58 caved-in at an approximate depth of 12.5 ft during the observation period. The water levels in Borings 2 and 36 stabilized at approximate depths of 1 ft and 5.2 ft after observation periods of 20 and 15 minutes, respectively. The water levels in Boring 32 and the piezometer installed in Boring 1 remained at respective depths of 2 ft and 16 ft after a 24-hour observation period. Some sloughing was observed at an approximate depth of 16 ft in Boring 1 during the observation period. Notable free water was not encountered during auger drilling at the location of Boring 3, but could be present as slow seepage which could accumulate into excavations that are left open for an extended period of time. It should be noted that perched groundwater conditions can occur in the topstratum and substratum soils encountered in the borings. In our opinion, shallow perched groundwater conditions will be influenced primarily by rainfall and surface drainage. Groundwater conditions will be influenced by nearby bodies of water such as the existing Camp Creek Canal and small creeks and ponds along the alignment. In addition, surficial soils can become saturated and weak to relatively shallow depths during periods of prolonged and heavy rainfall.

DISCUSSION AND RECOMMENDATIONS

Plans are being made by Waggoner Engineering, Inc. to construct the Lower Camp Creek Force Main and Byhalia Road Pump Station in Desoto County, Mississippi. The proposed pump

station is located just south of the intersection between Byhalia Road and the existing Camp Creek Canal. The proposed 24-in. ID force main will be approximately 28,800-ft long and generally extends from the pump station at Byhalia Road to the new Short Fork Sewage Treatment Plant, approximately paralleling the existing Camp Creek Canal.

Borings 1, 2 and 3 were made by Burns Cooley Dennis, Inc. and were utilized to evaluate the subsurface soils at the location of the pump station and along the proposed alignment of the pipeline between Byhalia Road and Bright Road. Borings 32, 36 and 58 were made by Aquaterra Engineering prior to our investigation and were utilized to evaluate the subsurface soils along the proposed alignment of the pipeline between Bright Road and the new treatment plant. The following subsections of this report include guideline recommendations pertaining to the geotechnical-related aspects of design and construction for the proposed pump station and pipeline.

Pump Station

Boring 1 was made within the area planned for construction of the pump station. The subsurface soils encountered at the location of Boring 1 are generally considered to be weak to strong. Relatively weak and compressible medium stiff silty clay (CL) and loose clayey silts (ML) were encountered from the ground surface to about 4 ft and from about 16 ft to 22 ft at the location of Boring 1. The remaining subsurface soils encountered at the location of Boring 1 are generally considered to be moderately strong to strong. The silty clays (CL), silts (ML) and sands (SM, SP-SM, SP) are generally considered to have low shrink/swell potential or are nonexpansive. Groundwater seepage was encountered during auger drilling at an approximate depth of 18 ft and the hole was sloughing at an approximate depth of 16 ft. The water level in the piezometer installed in the borehole was measured at an approximate depth of 16 ft below the ground surface after a 24-hour observation period.

It is our understanding that the invert elevation for the proposed pump station is El. 236.0, approximately 33 ft below the existing ground surface. Consequently, significant dewatering and monitoring will be required to construct the pump station in the dry. Our recommendations for the geotechnical-related aspects of design and construction of the new pump station are included in the following subsections.

Foundation Design. Based on the subsurface soils encountered at the location of Boring 1 and an invert elevation of El. 236.0 ft, the pump station will bear in the medium dense to very dense silty sands (SM). A net allowable bearing capacity of 2,500 lbs per sq ft can be used to dimension the foundation mat for the pump station bearing within the medium dense to very dense silty sands (SM).

Earth Pressure Recommendations. We recommend that the walls of the pump station be designed using an equivalent unit weight of 100 lbs per cu ft. This recommended lateral earth pressure considers the backfill soils will consist of the existing soils removed during excavation. We consider these soils can become saturated and the walls will be unyielding, producing an at-rest earth pressure condition. Lateral pressures may also be imposed on the walls by surcharge loading at the surface. If surcharge loads are anticipated, an additional lateral uniform pressure can be computed as 50 percent of the uniform vertical stress applied at the ground surface.

Uplift Conditions. The proposed pump station structure should be checked for uplift when the water table lies coincident with a maximum anticipated flood level for the site. If the situation is possible for the pump station to be empty during this flood event, it should be considered. Differing methods are available for evaluating and designing against excess uplift pressures. Forces resisting uplift could consist of the total weight of the concrete and the backfill soils overlying the projected portions or lip of the foundation mat. A total soil weight of 120 lbs per cu ft can be used in the analysis. If needed for stability an allowable shear strength of 250 lbs per sq ft can be utilized along a vertical shear plain projected above the edge of the foundation mat.

Excavation and Backfill. The excavation required for construction of the mat foundation and walls for the new pump station should be performed according to applicable OSHA regulations. Stability of the excavation will be the responsibility of the excavating contractor. A detailed slope stability analysis is beyond the scope of this study as the means of excavation are not known at this time. However, for conservative planning purposes, a type C soil condition can be assumed for applying OSHA construction recommendations. Efforts should be made where possible to cover the

slopes and to route storm waters away from slope faces. Soil and groundwater seepage encountered during excavation could differ from those encountered at the location of Boring 1, so the excavation slopes and bottom should be closely monitored during construction activities.

The subsurface soils encountered at the location of Boring1 are generally considered to be suitable backfill provided they are debris-free and not too wet. Some processing by drying may be required to utilize these soils as backfill. Backfill should be compacted to a minimum 95 percent standard Proctor maximum dry density (ASTM D 698) in maximum 5-in. lifts using small light tampers. The backfill should be compacted within 3 percentage points of the optimum moisture content.

It should be noted that the silts (ML) and silty clays (CL) are highly susceptible to pumping under wet conditions. The construction techniques and types of equipment utilized and site drainage provided during construction will have a great effect on the performance of these soils throughout the project. It should be recognized that soils which are demonstrated to be stable can become unstable if they are disturbed by construction traffic or exposed to rainfall.

Groundwater Control. As discussed previously, groundwater seepage was encountered during auger drilling at an approximate depth of 18 ft and the hole was sloughing at an approximate depth of 16 ft. The water level in the piezometer installed in the borehole was measured at an approximate depth of 16 ft below the ground surface after a 24-hour observation period. It is likely the presence and quantity of water seepage will be influenced by the season of the year the construction is performed and the water level in the existing Camp Creek Canal and nearby creeks and ponds. Groundwater control will be the responsibility of the excavating contractor. The silty clays (CL) are considered to exhibit generally low permeability while the clayey silts (ML) and silts (ML) will exhibit permeabilities ranging from low to moderate. The sandy silts (ML) will have greater permeability than the upper silts and the lower sands will exhibit very high permeabilities. For planning purposes, we expect that the groundwater piezometric level must be lowered several feet below the excavation base by some form of active dewatering. Removing and/or controlling water retained within the upper topstratum soil zone may require additional effort. The actual extent of needed groundwater seepage control must be evaluated during excavation and should be monitored closely during construction.

Force Main

Subsurface soils encountered within the 40-ft maximum completion depth of the borings made along the proposed alignment of the pipeline are generally considered to be weak to strong. Relatively weak and compressible soft clays (CH), medium stiff or firm silty clays (CL) and loose clayey silts (ML) were encountered within various depth intervals at all of the boring locations. The remaining soils are generally considered to be moderately strong to strong. The silty clays (CL), silts (ML) and sands (SM, SP-SM, SP) encountered in the borings are generally considered to have very low shrink/swell potential or are nonexpansive, while the clays (CH) are considered to have moderate shrink/swell potential.

Free water was encountered at approximate depths of 18 ft, 1 ft, 2 ft, 8 ft and 13 ft during auger drilling at the locations of Borings 1, 2, 32, 36 and 58, respectively. Boring 58 caved-in at an approximate depth of 12.5 ft and sloughing was observed at an approximate depth of 16 ft at Boring 1. The water levels in the borings stabilized at depths ranging from 1 ft to 16 ft after the respective observation periods at each boring. Notable free water was not encountered during auger drilling at the location of Boring 3, but could be present as slow seepage which could accumulate into excavations that are left open for an extended period of time. The clays (CH) will exhibit a low permeability, while the remaining soils exhibit the same permeabilities previously discussed.

The proposed pipeline will be constructed using HDPE, iron or PVC pipe and there are no known large steel pipelines along the proposed alignment. Based on the pipeline profile provided by Waggoner Engineering, Inc., the existing ground surface along the proposed pipeline alignment ranges about El. 273 at the proposed pump station to El. 247 ft near the new treatment plant. The bedding level for the pipeline will generally range from approximately 5 ft to 7 ft below the ground surface for the alignment parallel to the existing Camp Creek Canal; however, a deeper bedding level will be required at several creek and tributary crossings along the proposed alignment. It is our understanding that the pipe will be bedded at least 5 ft below the bottom of each creek and tributary. Thrust blocks will be used for resistance of unbalanced forces at the angle points. The following subsections of this report include guideline recommendations pertaining to the geotechnical-related aspects of design and construction for the proposed pipeline.

Trenching and Excavation. Considering the subsurface soils encountered at the boring locations and the planned invert elevations for the pipeline, the bottom of the excavation for the pipeline will generally be in medium stiff to stiff silty clays (CL) and loose to medium dense silts (ML) and clayey silts (ML). Relatively weak and compressible medium stiff silty clays (CL) and loose clayey silts (ML) were encountered at or near the established pipe invert elevations at the locations of Borings 1, 3, 32, 36 and 58. It should be recognized that exceptions to the soil conditions indicated at specific boring locations will be encountered during construction. In comparison to areas where the soils are generally found to be relatively strong, more trench bracing and/or flatter excavation slopes will be required at locations where weaker soils are encountered.

As indicated previously, groundwater seepage was encountered within all of the borings made for this investigation with the exception of Boring 3. This groundwater is considered to be seepage from saturated topstratum soils and/or perched water within the topstratum soils. Based on the subsurface soil conditions encountered at the boring locations and the planned pipeline invert elevations, excavation at and for some distance beyond all of the borings may encounter saturated silts (ML), silty clays (CL) and clays (CH) with permeable seams or zones. Although significant groundwater may not have been encountered to the planned pipeline invert elevations at all of the boring locations, we recommend that flow of groundwater under hydrostatic pressure into the bottom and sides of the trench excavation be considered before and during construction along the entire alignment. Removing and/or controlling water retained within the upper topstratum soil zone may require additional effort. It should be noted that the possibility of encountering significant groundwater will increase at creek and tributary crossings. Consequently, some form of active dewatering may be required to lower the groundwater piezometric level during excavation at the creek and tributary crossings. The actual extent of needed groundwater seepage control must be evaluated during excavation and should be monitored closely during construction.

A detailed analysis of slope stability for trench excavations is beyond the scope of this investigation. We recommend that trenching and excavation for the treated water transmission pipeline comply with current OSHA regulations. We recommend that the contractor be given complete responsibility for the adequacy and safety of trenching and excavation. Also, the contractor should be required to furnish all sheeting, shoring and bracing necessary to support the sides of trenches and excavations. A suitable sliding trench box or shield could also possibly be utilized.

Sheeting and shoring should be removed in a manner that will not cause voids or significant weakening or loosening of natural or backfill soils. Special care should be taken in trenching and excavation operations to prevent damage to any existing structural features, pavements or facilities located adjacent to the trenches/excavations.

We recommend that the specifications require the contractor to develop and implement measures to control all groundwater encountered as necessary to achieve a stable excavation and a stable surface for support of the pipe and also to achieve the required compaction of the bedding and backfill soils.

It should be noted that the silts (ML) and silty clays (CL) are highly susceptible to pumping under wet conditions. The construction techniques and types of equipment utilized and site drainage provided during construction will have a great effect on the performance of these soils throughout the project. It should be recognized that soils which are demonstrated to be stable can become unstable if they are disturbed by construction traffic or exposed to rainfall.

Bedding and Backfill. Relatively weak and compressible medium stiff silty clays (CL) and loose clayey silts (ML) were encountered at or near the established pipe invert elevations at the locations of Borings 1, 3, 32, 36 and 58. It should be recognized that the soils that were relatively strong at the time of our investigation can become weak while being excavated and/or disturbed in the presence of groundwater. Also, piezometric pressures that cause upward flow into the trench bottom during the excavation process can cause weakening of the soils. Therefore, the extent of any weak or unstable soils along the bottom of the trench can only be determined during construction. All weak or unstable soils extending below the trench bottom should be overexcavated for the full design width of the trench to depths determined during construction in the specific reaches where such conditions are encountered. Areas of overexcavation should be backfilled with suitable excavated soils. The classification and compaction of the backfill soils should meet the recommendations provided subsequently for materials placed as bedding around the pipe.

Moderately expansive clays (CH) were encountered from the ground surface to an approximate depth of 4 ft at the location of Boring 36. Considering the depth at which the expansive clays (CH) were encountered, they should not be of significant concern during construction. However, should expansive clays (CH) be encountered within 3 ft below the invert elevation of the

pipeline, we recommend they be overexcavated and replaced with select fill as required to provide a minimum 3-ft thick buffer of nonexpansive clayey soils between the pipe and the expansive clays (CH). The select fill should consist of nonorganic, debris-free silty clays (CL) or sandy clays (CL) having a liquid limit less than 45 and a plasticity index (PI) within the range of 10 to 24. It should also be understood that the magnitude of pipe movements can be increased by water emerging from leaking joints causing the clays (CH) to swell.

The design width of the pipe trench should be established with consideration given to providing sufficient horizontal space between the pipe and the trench walls to permit proper compaction of bedding soils up to the top of the pipe. As compared to compaction by hand tamping, a greater horizontal space will be required for compaction with hand-held mechanical compactors. A greater horizontal space will also be required for installation with a trench box, shield or sheeting.

In the following discussion the term "bedding" refers to fill soils placed within the vertical zone from the bottom of the trench to a level of 1 ft above the top of the pipe. The term "backfill" refers to fill soils placed between the top of the bedding soils and the ground surface. We recommend that materials used for bedding consist of nonorganic and debris-free soils that are not too wet or too dry and have a liquid limit not greater than 50. The liquid limit of 50 will exclude the use of the clays (CH). Any imported materials used for bedding should consist of either silty clays (CL), sandy clays (CL) or sands (SM, SC, SP-SM and SP). Additionally, silts (ML), clayey silts (ML) and sandy silts (ML) can be utilized as backfill since they represent a significant amount of natural soils available locally to the area. The contractor should be allowed to select whichever of these material types best suits the subsurface soil and groundwater conditions and the required groundwater control as necessary to perform the work. The existing site soils removed during construction can be used as backfill provided they are not too wet or too dry prior to placement as fill.

The pipe should initially be bedded in 4-in. to 6-in. of suitable bedding soils placed over the bottom of the trench. This initial lift and each successive bedding lift up to a level of 1 ft above the top of the pipe should have a minimum loose thickness of 6 in. or less and should be compacted to not less than 92 percent of standard Proctor maximum dry density (ASTM D 698) by hand tamping or by utilizing a hand-held mechanical compactor. The moisture content within the bedding soils should be as required to provide a firm and stable condition for compaction. The bedding soils should be brought up simultaneously at the same level on both sides of the pipe.

The proposed pipeline will primarily cross areas that are undeveloped, but some portions of the line may extend into developed areas. A variation in compaction requirements is considered to be appropriate for these two general conditions. Backfill placed above the level of the bedding materials should consist of the same types of soil utilized for bedding. In undeveloped areas, the backfill should be compacted in relatively thin lifts to not less than 85 percent of standard Proctor maximum dry density. In developed areas where existing or future construction is planned, the backfill soils should be compacted in relatively thin lifts to not less than 95 percent of standard Proctor maximum dry density. Excavations should be backfilled as soon as practicable. Special care and planning will be required in the areas of the existing Camp Creek Canal and any other lakes or ponds while excavating along the embankments to prevent instability of the embankments.

The final surface at the top of the backfill over the pipeline should be sloped to provide effective and rapid drainage of rainfall and surface water away from the pipe alignment. Assuming future settlement will occur within the backfill, we recommend that the backfill materials generally be crowned or mounded along the length of the pipeline in undeveloped areas at least 12 in. higher at the centerline and sloped downward to natural ground levels. The surface at the top of the backfill in developed areas should be monitored for settlement and maintained to provide drainage away from the alignment.

Soil Parameters. Pipeline strength design considers stresses produced by a combination of internal pressure and external loads. The external loads include dead or earth loads due to the weight of backfill soils over the pipe and live loads imposed by highway trucks, trains, construction traffic and other structures. Dead or earth loads are normally calculated by the Marston equations for specific section dimensions of the pipe, trench and embankment and for specific or estimated backfill parameters. Recommended soil parameters for calculation of earth or dead loads on the pipe are as follows:

Soil Description	Unit Weight (pcf)
Backfill soils compacted to 85 percent of standard Proctor density	115
Backfill soils compacted to 90 percent of standard Proctor density	120
Backfill soils compacted to 95 percent of standard Proctor density	125

Ratio of lateral to vertical earth pressure, $K = 0.4$

Coefficient of sliding friction between fill materials and trench walls, $\mu = 0.33$

Settlement ratio, $R_{sd} = 0.8$

In calculation of earth loads, additional earth loads may result from future construction over the pipeline, such as widening of roadways and railroad embankments.

Live loads imposed on pipes by highway trucks, construction equipment and buildings or other structures over or adjacent to the pipeline can be calculated using Boussinesq equations (with appropriate impact factors for dynamic loading) or they can be obtained from published tables in design manuals of the AWWA and others. Live loads which may be imposed by heavy construction equipment should be given special consideration, and certain limitations should be set forth in the project specifications. These limitations should establish a minimum depth (or depths) of earth cover over the top of the pipe before construction equipment is permitted to cross the pipe, in conjunction with the maximum wheel load allowed for the minimum or greater depths of earth cover.

For calculations predicting the deflection of buried flexible pipe, the modulus of soil reaction, E' , can be approximated by a value of about 400 lbs per sq in. for the previously recommended bedding condition.

Thrust Blocks. Unbalanced forces are developed in pressure pipelines with changes in direction of flow or cross-sectional area and with termination of the pipeline. All of these forces are resisted by frictional drag from the dead weight of earth cover and the filled pipe, and some of these forces are also resisted by passive soil pressures along the outer side of pipe at direction changes. If this type of resistance is not adequate for the developed thrust forces, then it must be supplemented by increasing the frictional drag of the pipeline. It is our understanding that thrust blocks will be utilized for resistance of unbalanced forces at the angle points. Considering the subsurface soils encountered at the boring locations, we recommend that a net allowable bearing capacity of 1,000 lbs per sq ft be used for design of the thrust blocks to resist unbalanced forces. It should be recognized that this is a "net" allowable bearing capacity; therefore, the overburden to the midpoint of the block face can be added back into the capacity for a given configuration.

pH, CHLORIDES AND SULFATES TESTING

One sample was selected from each of Borings 1, 2 and 3 and submitted to Southern Technical Services to perform tests to determine pH, soluble sulfates, and chloride ion content. The results of the testing are tabulated on Figure 8. The pHs of the three samples were found to range between 4.0 and 5.9. The results of the tests for chlorides indicated that the chlorides range from 23.9 to 93.4 parts per million. The results of the tests for sulfates range from less than 20 to 145 parts per million.

REPORT LIMITATIONS

The analyses, conclusions and recommendations discussed in this report are based on conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of subsurface conditions throughout the areas investigated. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, Burns Cooley Dennis, Inc., should be notified immediately in order that we may evaluate the effects, if any, on the recommendations provided

Burns Cooley Dennis, Inc., should be retained for a general review of project plans and specifications. It is advised that we be retained to observe earthwork construction for the project in order to help confirm that our recommendations are valid or to modify them accordingly. Burns Cooley Dennis, Inc., cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report has been prepared for the exclusive use of Waggoner Engineering, Inc., for specific application to the geotechnical aspects of design and construction for the Lower Camp Creek Force Main and Byhalia Road Pump Station to be constructed in Desoto County, Mississippi. The only warranty made by us in connection with the services provided is we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended.

FIGURES

LEGEND
⊕ BURNS COOLEY DENNIS, INC.
⊞ AQUATERRA BORINGS



B-36
TREATMENT PLANT
B-32

B-58
CAMP CREEK CANAL

BRIGHT ROAD

BYHALIA ROAD

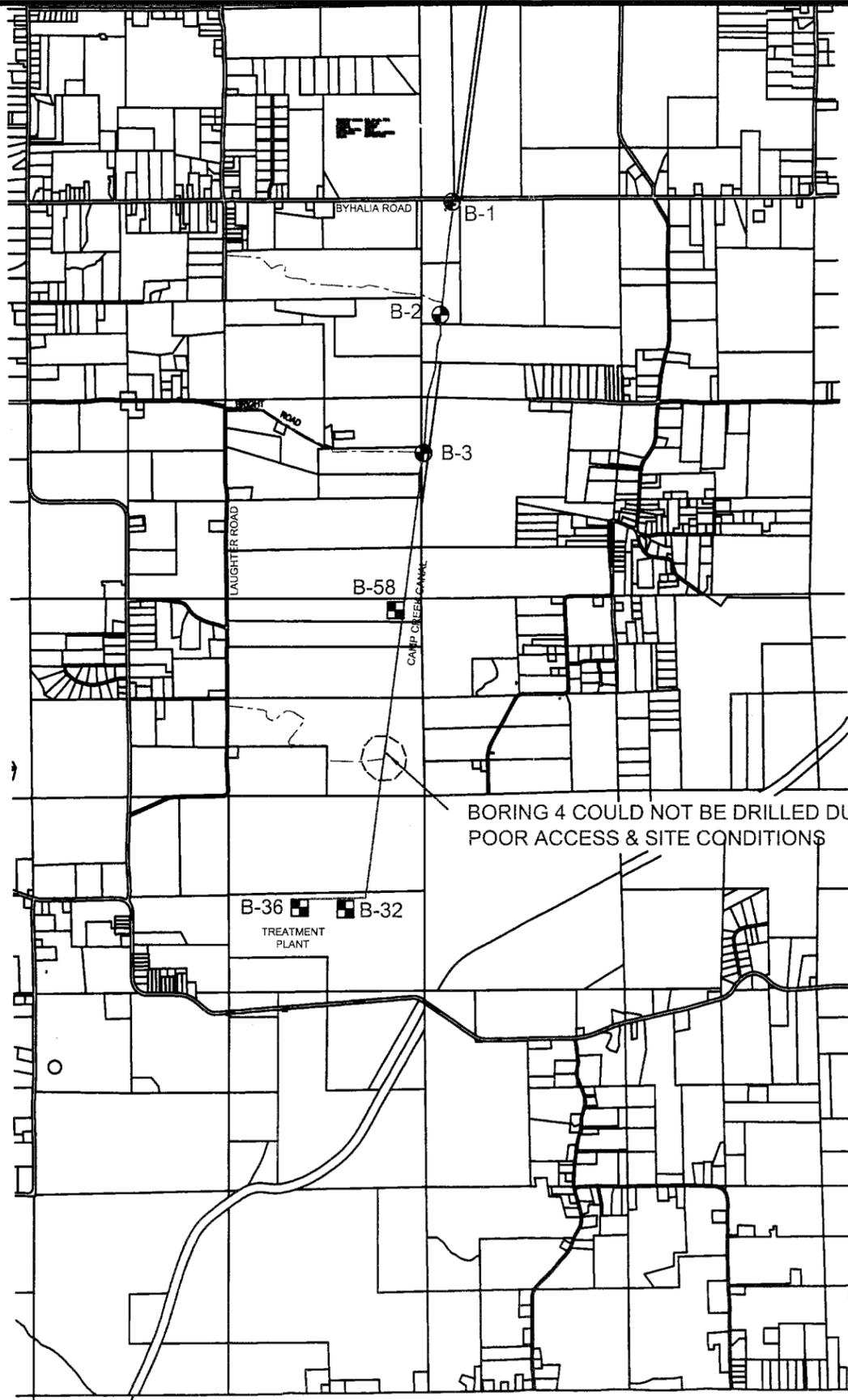
⊞
BORING 4 COULD NOT BE DRILLED DUE TO
POOR ACCESS & SITE CONDITIONS

B-3

B-2

B-1

Boring Locations		
LOWER CAMP CREEK FORCE MAIN AND BYHALIA ROAD PUMP STATION DESOTO COUNTY, MISSISSIPPI		
BURNS COOLEY DENNIS, INC. 551 SUNNYBROOK ROAD RIDGELAND, MISSISSIPPI 39157		
JOB NO. 03096	SCALE: 1" = 2000'	FIGURE 1



LEGEND

- BURNS COOLEY DENNIS, INC
- AQUATERRA BORINGS

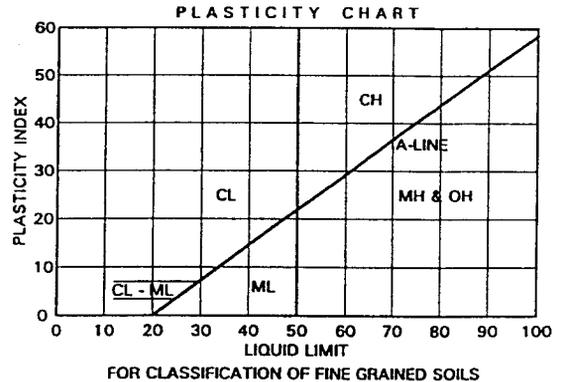
<h2>Boring Locations</h2>		
LOWER CAMP CREEK FORCE MAIN AND BYHALIA ROAD PUMP STATION DESOTO COUNTY, MISSISSIPPI		
BURNS COOLEY DENNIS, INC. 551 SUNNYBROOK ROAD RIDGELAND, MISSISSIPPI 39157		
JOB NO. 03096	SCALE: 1"=4000'	FIGURE 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL & LETTER	DESCRIPTION		
COARSE-GRAINED SOILS More than half of material larger than No. 200 sieve size	GRAVELS More than half of coarse fraction larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE		
			GP POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE		
		Gravels with fines (Appreciable amount of fines)	GM SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE		
			GC CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE		
	SANDS More than half of coarse fraction smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW WELL GRADED SAND, GRAVELLY SAND		
			SP POORLY GRADED SAND, GRAVELLY SAND		
		Sands with fines (Appreciable amount of fines)	SM SILTY SAND, SAND-SILT MIXTURE		
			SC CLAYEY SAND, SAND-CLAY MIXTURE		
			FINE-GRAINED SOILS More than half of material smaller than No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50	ML SILT WITH LITTLE OR NO PLASTICITY
					ML CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY
CL SILTY CLAY, LOW TO MEDIUM PLASTICITY					
CL SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)					
SILTS AND CLAYS Liquid limit greater than 50	MH SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY				
	CH CLAY, HIGH PLASTICITY				
HIGHLY ORGANIC SOILS		OH ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY			
		PT PEAT, HUMUS, SWAMP SOIL			

TERMS CHARACTERIZING SOIL STRUCTURE

- Slickensided** - Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
- Fissured** - Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
- Laminated** - Composed of thin alternating layers of varying color and texture.
- Calcareous** - Containing appreciable quantities of calcium carbonate.
- Parting** - Paper thin (less than 1/8 inch).
- Seam** - 1/8 inch to 3 inch thickness.
- Layer** - Greater than 3 inches in thickness.

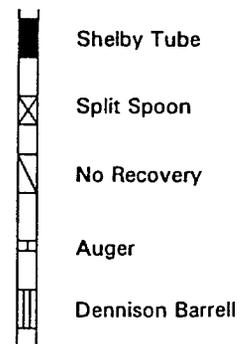


DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS		FINE-GRAINED SOILS	
PENETRATION RESISTANCE, N		PENETRATION RESISTANCE, N	
DENSITY	Blows per Foot	CONSISTENCY	Blows per Foot
Very loose	0 - 4	Very Soft	0 - 1
Loose	5 - 10	Soft	2 - 4
Medium Dense	11 - 30	Medium Stiff	5 - 8
Dense	31 - 50	Stiff	9 - 15
Very Dense	> 50	Very Stiff	16 - 30
		Hard	> 30

PARTICLE SIZE IDENTIFICATION		RELATIVE COMPOSITION	
Cobbles	- Greater than 3 inches	Slightly	5 - 15%
Gravel	- Coarse - 3/4 inch to 3 inches	With	16 - 29%
	- Fine - 4.76 mm to 3/4 inch	Sandy	30 - 50%
Sand	- Coarse - 2 mm to 4.76mm	(or gravelly)	
	- Medium - 0.42 mm to 2 mm		
	- Fine - 0.074 mm to 0.42 mm		
Silt & Clay	- Less than 0.074 mm		

SAMPLE TYPES (Shown in Sample Column)

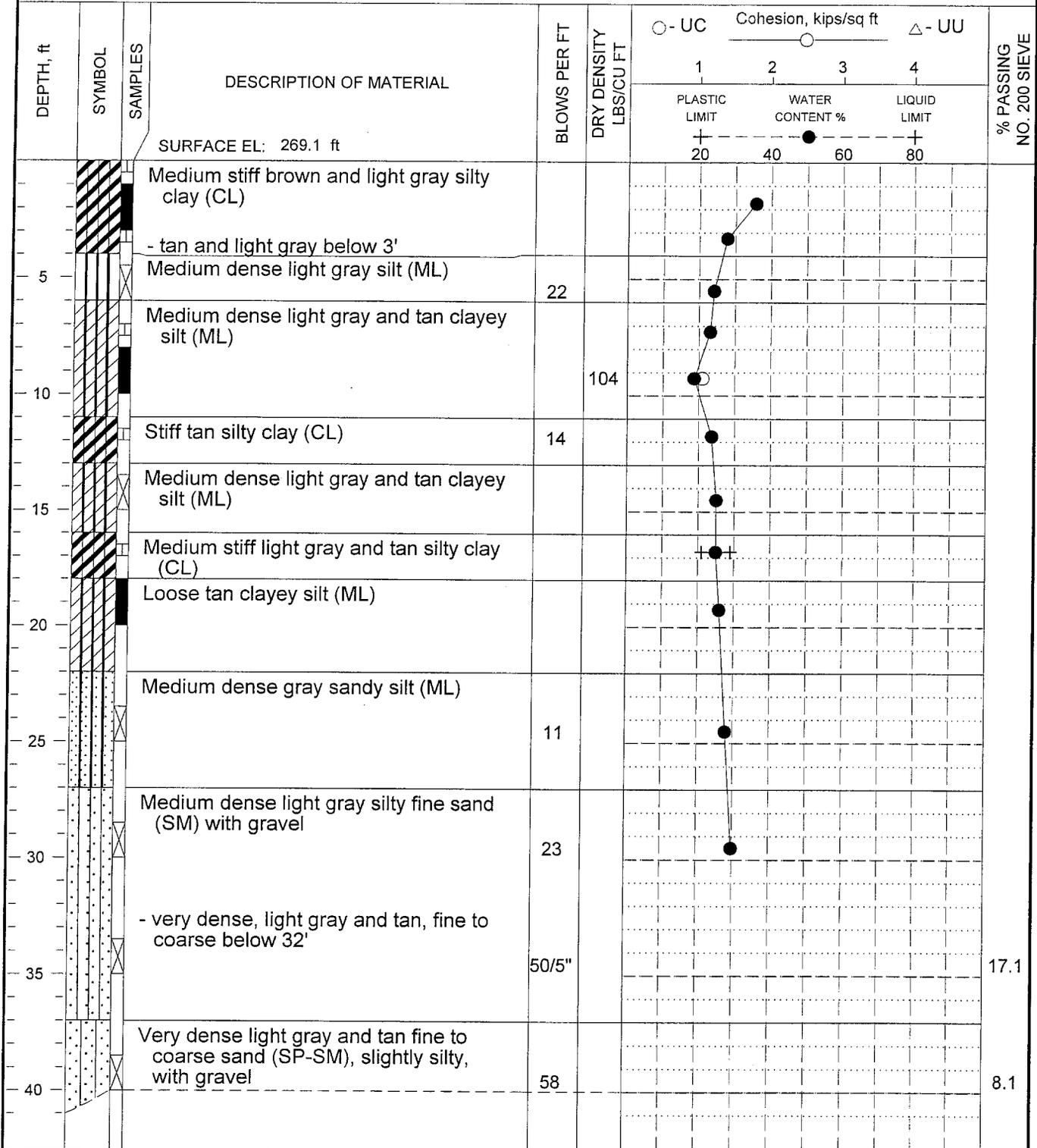


CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS

LOG OF BORING NO. 1
 LOWER CAMP CREEK FORCE MAIN
 AND BYHALIA ROAD PUMP STATION
 DESOTO COUNTY, MISSISSIPPI

TYPE: 4" Short-flight auger to 20',
 then rotary wash to completion.

LOCATION: See Figure 1



BORING DEPTH: 40 ft
 DATE: 03/11/03

COMMENTS: Installed piezometer and grouted borehole full depth after completion of drilling and sampling.

GROUNDWATER DATA: Free water encountered at 18' during auger drilling. Borehole sloughed at 16' after a 20-minute observation period. Water level in piezometer at 16' after 24 hours.

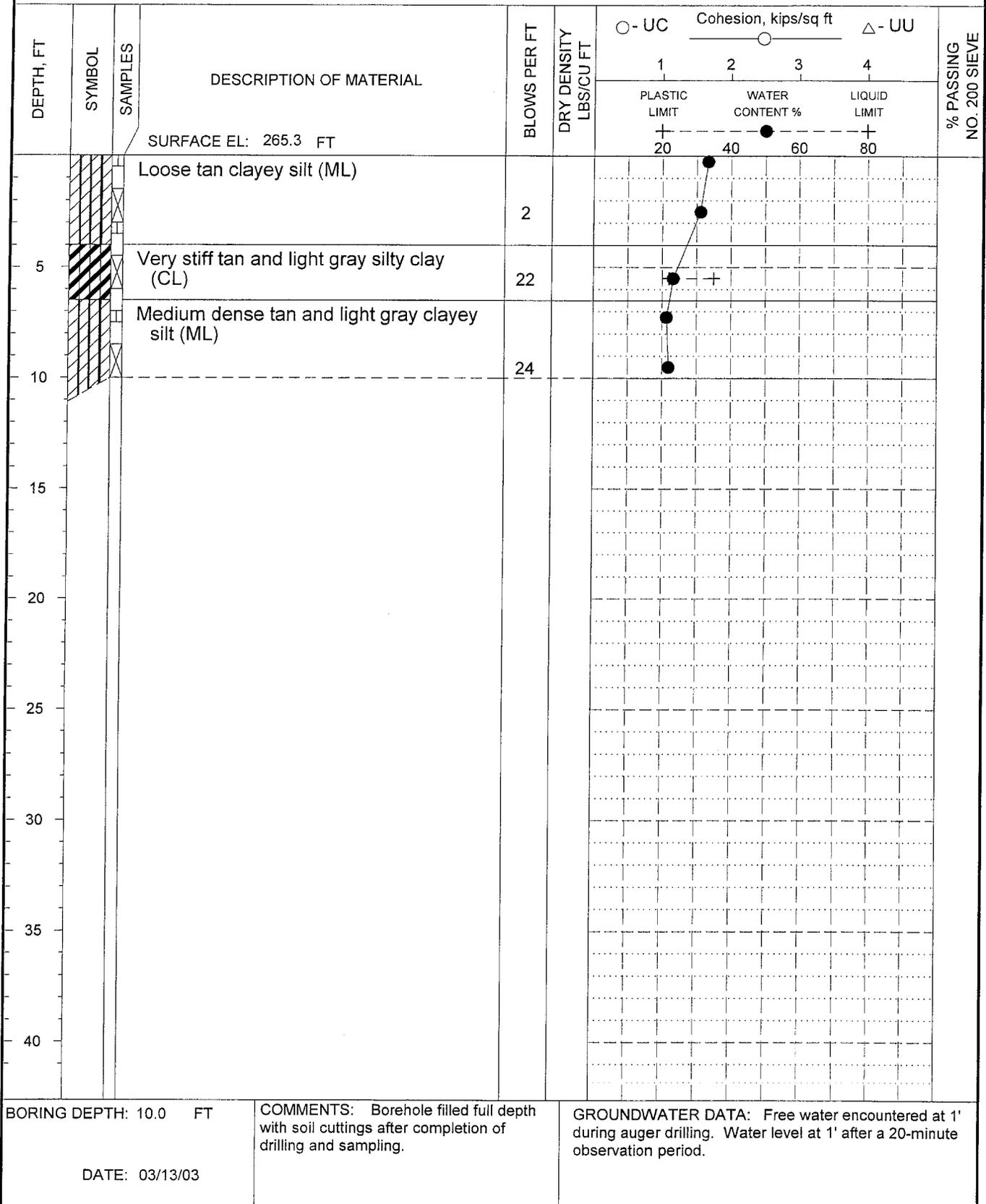
03096 TD ar

FIGURE 4

LOG OF BORING NO. 2
 LOWER CAMP CREEK FORCE MAIN
 AND BYHALIA ROAD PUMP STATION
 DESOTO COUNTY, MISSISSIPPI

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



03096 TD ar

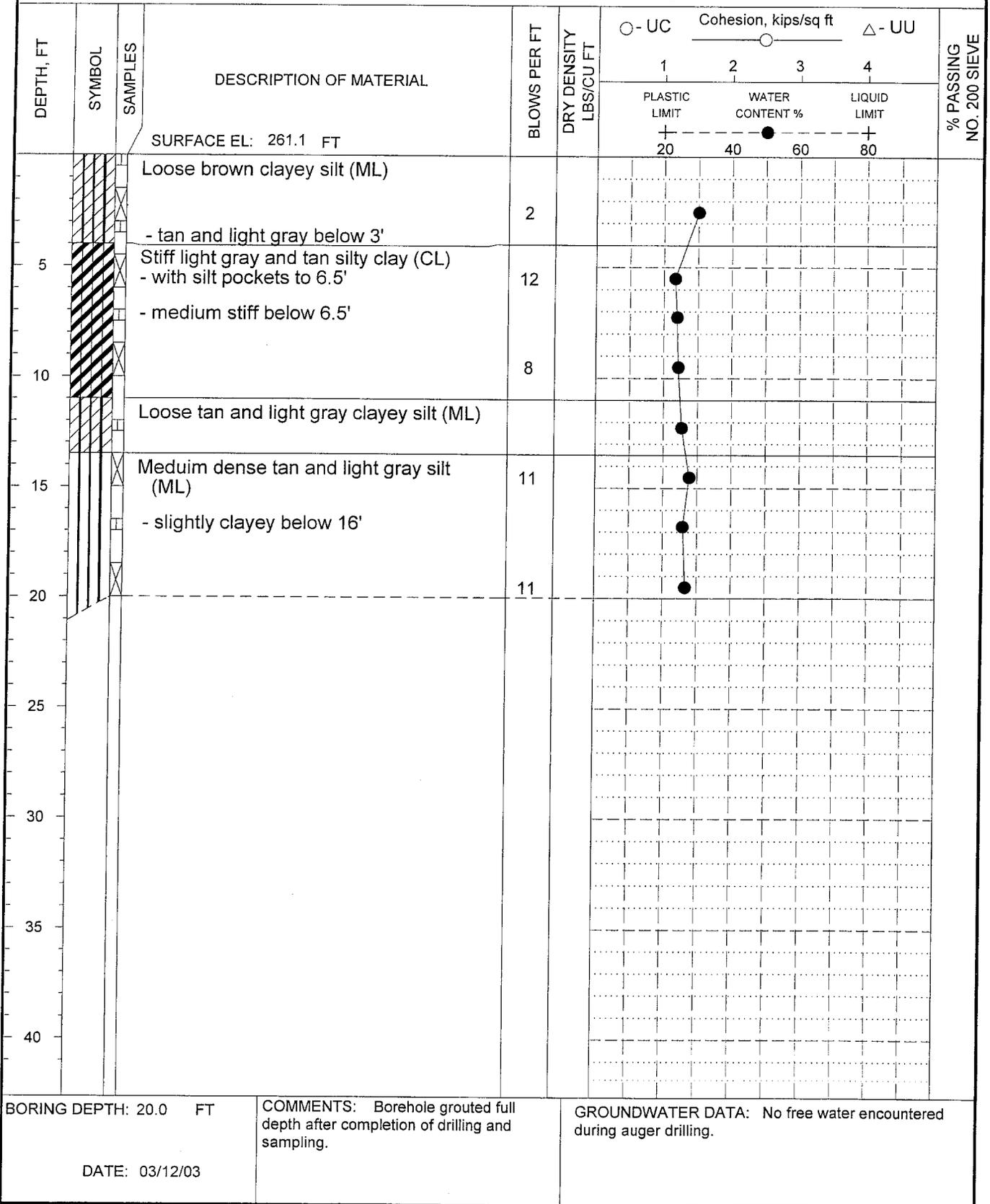
FIGURE 5

LOG OF BORING NO. 3

LOWER CAMP CREEK FORCE MAIN
AND BYHALIA ROAD PUMP STATION
DESOTO COUNTY, MISSISSIPPI

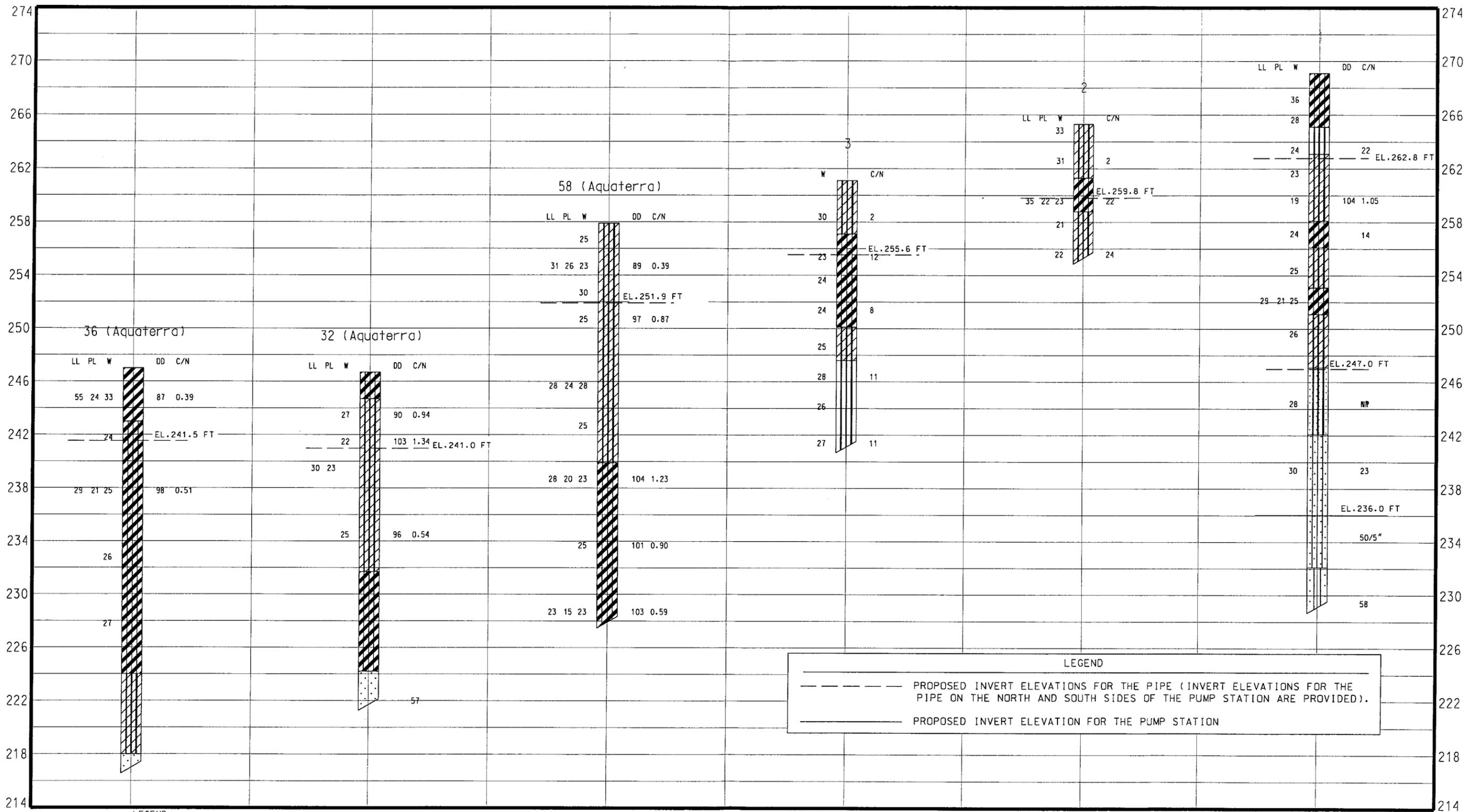
TYPE: 4" Short-flight auger

LOCATION: See Figure 1



03096 TD ar

ELEVATION IN FEET



LEGEND:
 LL = Liquid Limit
 PL = Plastic Limit
 W = Water Content
 DD = Dry Density (pcf)
 C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
 % -200 = % Passing No. 200 Sieve

NOTE: See Figure 2 for boring log legend.
 Ground surface elevations and invert elevations at all of the boring locations were provided to Burns Cooley Dennis, Inc. by Waggoner Engineering, Inc.
 The profiles for Borings 36, 32, and 58 are based on the graphical logs and laboratory test data submitted by Aquaterra Engineering.

LEGEND
 - - - - - PROPOSED INVERT ELEVATIONS FOR THE PIPE (INVERT ELEVATIONS FOR THE PIPE ON THE NORTH AND SOUTH SIDES OF THE PUMP STATION ARE PROVIDED).
 ——— PROPOSED INVERT ELEVATION FOR THE PUMP STATION

SUBSURFACE PROFILE			
LOWER CAMP CREEK FORCE MAIN AND BYHALIA ROAD PUMP STATION DESOTO COUNTY, MISSISSIPPI			
Job No.	03096	Date	4/28/03
Figure	7		

SOUTHERN TECHNICAL SERVICES INC.



**CHEMISTS – BACTERIOLOGISTS
BIOLOGISTS – ENVIRONMENTAL SCIENTISTS**
1627 WESTHAVEN BLVD.
JACKSON, MS 39209
(601) 922-8652

BURNS, COOLEY, DENNIS ENGINEERING, INC.
P.O. BOX 12828
JACKSON, MS 39236
ATTN: MR. TOMMY DUNLAP

REPORT OF TESTS ON SOIL SAMPLE(S) RECEIVED FROM YOU 03-18-03.

SAMPLE ID: PRJ 03096

STS LOG NO(S): 0303017-19

SAMPLE ID	pH,SU	SULFATES, SO ₄ PPM	CHLORIDES Cl, PPM	
B-1 S-7 9'	4.4	<20.0	23.9	
B-2 S-3 3.5'	4.0	<20.0	23.9	
B-3 S-8 15'	5.9	145	93.4	

TEST PROCEDURES: *Methods for Soil Analysis, ASTM D-2974.*

DATE ANALYZED: 03/19-21/03 by GMC/JKB.

Gene M. Coxwell
National Registry of Environmental Professionals
Registration # 840

APPENDIX A

SOIL BORING LOG

PROJECT: Geotechnical Investigation
 DeSoto County WWTF Alternate Sites
 DeSoto County, Mississippi

No. B-32
 SHEET 1 OF 1

FILE: 522113
 DATE: 05/24/02
 DRILLER: R. Warren
 TECH.: B. Martin
 ENGINEER: B. Martin

CLIENT: Waggoner Engineering, Inc.
 Hernando, MS

FIELD DATA			LABORATORY DATA						LAT: 34 48' 30.2 N LONG: 89 53' 26.5 W Location: N: 1931441.1 E: 2429471.5		Soil Type	
Depth (feet)	Samples	Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Percent Fines	Natural Moisture Content and Atterberg Limits				Plasticity Index
					Moist	Dry		Plastic Limit	Moisture Content	Liquid Limit		
DESCRIPTION												
			0.6 (T)									Firm tan and light gray silty clay (CL)
			0.3 (T)	0.94	114	90		27				Loose tan and light gray clayey silt (ML)
5			0.8 (T)	1.34	126	103		22				- medium dense below 4'
			0.9 (T)					23 30			7	- loose below 6'
			0.9 (T)									
10			0.6 (T)	0.54	120	96		25				- loose below 11'
			0.7 (T)									Firm tan and light gray silty clay (CL)
			1.1 (T)									- stiff, with sand and ferrous nodules below 18'
20												Very dense gray sand (SP)
25												Boring Terminated at 25'
<small>STRATA BOUNDARIES MAY NOT BE EXACT</small>												
Groundwater Level Data			Advancement Method						Notes			
∇ Initially Encountered at 2' ▼ Static level at 2' after 1 day			0' - 6' - Short-flight Auger 6' - 25' - Rotary Wash									
			Abandonment Method									
			Cement/ Bentonite Grout									

AQ LOG 522113.GPJ AQUATERR.GDT 6/10/02

FIGURE A-1

SOIL BORING LOG

PROJECT: Geotechnical Investigation
 Short Fork Creek WWTF Flinn Site
 DeSoto County, Mississippi

No. B-36
 SHEET 1 OF 1

FILE: 522113
 DATE: 6/04/02
 DRILLER: R. Warren
 TECH.: C. Dawkins
 ENGINEER: D. Coleman

CLIENT: EAI/WEI
 Jackson, Mississippi

FIELD DATA			LABORATORY DATA					LAT: 34 48' 30.6N LONG: 89 53' 41.3 W Location:		Soil Type	
Depth (feet)	Samples Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Other	Natural Moisture Content and Atterberg Limits				Plasticity Index
				Moist	Dry		Plastic Limit	Moisture Content	Liquid Limit		
							20 40 60 80				Surface Elevation: 246.8 ±
											DESCRIPTION
		.500 (T)	0.393	116	87			24 55 33		31	Soft tan and light gray clay (CH) - with ferrous nodules
5	▽	1.300 (T)									- wet seam encountered at 3'
	▽										Firm tan and light gray silty clay (CL)
10		.700 (T)	0.512	122	98			21 29 25		8	- with sand seams below 8'
15		1.300 (T)									- stiff below 13'
20		1.400 (T)						27			
25											Medium dense brown and dark gray clayey silt (ML)
30											Medium dense gray sand (SP) Boring Terminated at 30'
35											
40											
45											
50											
Groundwater Level Data			Advancement Method			Notes					
▽ Initially Encountered at 8'			0' - 25' - Short-flight Auger								
▽ Rise to 5' 2" after 15 minutes			25' - 30' - Rotary Wash								
			Abandonment Method								
			Cement/ Bentonite Grout								

STRATA BOUNDARIES MAY NOT BE EXACT

AQ LOG 522113 DESOTO CO. WWTF.GPJ AQUATERR.GDT 8/23/02



FIGURE A-2

SOIL BORING LOG

PROJECT: Geotechnical Investigation
 Short Fork Creek WWTF Flinn Site
 DeSoto County, Mississippi

No. B-58
 SHEET 1 OF 1

FILE: 522113
 DATE: 7/30/02
 DRILLER: R. Warren
 TECH.: C. Dawkins
 ENGINEER: D. Coleman

CLIENT: EAI/WEI
 Jackson, Mississippi

FIELD DATA			LABORATORY DATA						LAT: 34 49' 50.0N LONG: 89 53' 10.0W Location:		Soil Type
Depth (feet)	Samples Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Other	Natural Moisture Content and Atterberg Limits			Plasticity Index PI	
				Moist	Dry		Plastic Limit	Moisture Content	Liquid Limit		
DESCRIPTION											
5		1.50 (P) 1.50 (P) 1.00 (P)	0.394	109	89		25 28 30			5	Medium dense tan and clayey silt (ML) - loose below 4' - medium dense below 8'
10		2.50 (P) 1.00 (P)	0.868	121	97		25			4	
15		1.00 (P) 2.00 (P)					22 23 25				
20		2.00 (P)	1.230	128	104		20 23 25			8	Stiff tan and light gray silty clay (CL) - firm below 23'
25		2.50 (P)	0.896	126	101		25				- gray below 28.5'
30		0.50 (P)	0.586	127	103		15 23 25			8	
35											Boring Terminated at 30'
40											
45											
50											
Groundwater Level Data			Advancement Method						Notes		
▽ Initially Encountered at 13' ▼ Cave-in at 12' 6"			0' - 16': Short-flight Auger 16' - 30': Rotary Wash						STRATA BOUNDARIES MAY NOT BE EXACT 		
			Abandonment Method								
			Backfilled with Cement/Bentonite Grout and Soil Conditions								

AQ LOG 522113 DESOTO CO. WWTF.GPJ AQUATERR.GDT 8/23/02

FIGURE A-3