



NRG Texas Power LLC
Limestone Generating Station, Units 1 & 2

History of Construction of CCR Surface Impoundments

Prepared by



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EXHIBITS:

1. USGS Topographic Map Donie Quadrangle
2. CCR Surface Impoundment Area & Capacity Curves

ATTACHMENTS:

- A. Ebasco Services Incorporated Specifications (31 pages)
- B. Civil Design Criteria CDC-1 Site Improvements (13 pages)
- C. Civil Design Criteria CDC-2 Site Investigations, Excavation, and Foundation Design Parameters (9 pages)
- D. Detailed Dimensional Design Drawings (12 pages)
- E. CCR Surface Impoundment & Landfill Weekly Inspection Report (10 Pages)

1 PURPOSE

Pursuant to 40 CFR 257.73(c)(1), this document provides a history of construction for the applicable existing coal combustion residual (CCR) surface impoundments at NRG Texas Power LLC's (NRG) Limestone Generating Station. The following existing CCR surface impoundments are addressed herein:

- Unit 019 E Pond,
- Unit 003 Secondary E Pond,
- Unit ST-18, and
- Unit 002 Storm Water Pond.

NRG has evaluated the CCR landfill stormwater run-off pond (002) and determined that the subject surface impoundment does not meet the definition of a CCR surface impoundment based on EPA guidance. This determination is based on:

1. the fact that the CCR landfill stormwater run-off pond (002) is not designed primarily to hold an accumulation of CCR and liquid
2. the primary function of the landfill stormwater run-off pond (002) is not storage or disposal of CCR.

For the aforementioned reasons, NRG will no longer manage the CCR landfill stormwater run-off pond (002) as a CCR surface impoundment after October 17, 2016.

2 HISTORY OF CONSTRUCTION REQUIREMENTS PER 40 CFR 257

This document provides, to the extent feasible, the information to be included in a history of construction pursuant to 40 CFR 257.73(c)(1). Per 40 CFR 257.73(c)(1), "... the owner or operator of the CCR unit must compile a history of construction, which shall contain, to the extent feasible, the information specified in paragraphs (c)(1)(i) through (xi) of [Section 257.73]." The preamble to 40 CFR 257 clarifies the US EPA's intent for including the clause "to the extent feasible." The preamble states, the "EPA acknowledges that much of the construction history of the surface impoundment maybe [*sic*] unknown or lost." The preamble continues,

"EPA is using the phrase "to the extent available" and clarifying that the term requires the owner or operator to provide information on the history of construction only to the extent that such information is reasonably and readily available. EPA intends facilities to provide relevant design and construction information only if factual documentation exists. EPA does not expect owner or operators to generate new information or provide anecdotal or speculative information regarding the CCR surface impoundment's design and construction history."

Table 1 lists the information requested by 40 CFR 257.73(c)(1)(i) through 257.73(c)(1)(xi).

Readily available and applicable historical information (drawings, reports, historical aerial photographs, etc.) relevant to the CCR surface impoundments at the Limestone Generating Station have been gathered and reviewed. This document compiles the required information into a single history of construction document for the four aforementioned existing CCR surface impoundments.



Table 1: Requested Information for History of Construction

| 40 CFR Reference | Requested Information | Location in this Document |
|-------------------------|--|----------------------------------|
| § 257.73(c)(1)(i) | The name and address of the person(s) owning or operating the CCR unit. | Section 3 |
| § 257.73(c)(1)(i) | Name associated with the CCR unit. | Section 3 |
| § 257.73(c)(1)(i) | Identification number of the CCR unit if one has been assigned by the state. | Section 3 |
| § 257.73(c)(1)(ii) | The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7½ minute or 15 minute topographic quadrangle map of equivalent scale if a USGS map is not available. | Section 3, Exhibit 1 |
| § 257.73(c)(1)(iii) | A statement of the purpose for which the CCR unit is being used. | Section 3 |
| § 257.73(c)(1)(iv) | The name and size in acres of the watershed within which the CCR unit is located. | Section 3 |
| § 257.73(c)(1)(v) | Description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed. | Section 4 |
| § 257.73(c)(1)(vi) | A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit. | Section 4, Attachment A |
| § 257.73(c)(1)(vi) | The method of site preparation and construction of each zone of the CCR unit. | Section 4, Attachments A, B & C |
| § 257.73(c)(1)(vi) | The approximate dates of construction of each successive stage of construction of the CCR unit. | Section 4 |
| § 257.73(c)(1)(vii) | At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation. | Section 4, Attachment D |
| § 257.73(c)(1)(viii) | A description of the type, purpose, and location of existing instrumentation. | Section 6, Attachment F |
| § 257.73(c)(1)(ix) | Area-capacity curves of the CCR unit. | Section 5, Exhibit 2 |
| § 257.73(c)(1)(x) | Description of each spillway and diversion design features and capacities and calculations used in their determination. | Section 5 |
| § 257.73(c)(1)(xi) | Construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit. | Section 6 |

3 SITE DESCRIPTION & LOCATION

Federal CCR Rule Reference: 40 CFR 257.73(c)(1)(i), 40 CFR 257.73(c)(1)(ii), 40 CFR 257.73(c)(1)(iii), and 40 CFR 257.73(c)(1)(iv)

NRG owns and operates Limestone Generating Station, which is located approximately 130 miles north-northwest of Houston, Texas in the southeast corner of Limestone County and southwest corner of Freestone County, Texas. The CCR surface impoundments that require a history of construction are located in Freestone County. The Station's address is FM 39, Jewett, TX 75846.

The Station operates the following existing CCR surface impoundments as defined by 40 CFR 257.53:

- Unit BACP (Bottom Ash Cooling Pond),
- Unit 019 E Pond,
- Unit 003 Secondary E Pond,
- Unit ST-18, and
- Unit 002 Storm Water Pond.

As Unit BACP does not meet or exceed the specified size threshold in 40 CFR 257.73(b) due to its incised nature, Unit BACP will not be discussed any further herein. The State of Texas has not assigned identification numbers to these impoundments. Exhibit 1, included at the end of this document, shows the location of the four non-incised CCR surface impoundments on a reproduction of the United States Geological Survey's (USGS) 7.5-minute topographic map of the Donie Quadrangle, Texas.

Unit 019 E Pond serves as a settling basin for water received from FGD decanting/settling operations and excess flow from Unit ST-18 and Unit 002 Storm Water Pond.

Unit 003 Secondary E Pond is used for the stabilization of FGD residuals from the chloride purge storage tank, and wastewater from Unit 019 E Pond, which includes FGD wastewater and storm water containing FGD solids, bottom ash and fly ash. These materials are temporarily stored in the Unit 003 Secondary E Pond prior to final disposal in the onsite landfill.

Unit ST-18 serves as a settling basin for storm water run-off from the FGD stack out area.

Unit 002 Storm Water Pond functions as a run-off pond to collect and detain storm water from the uncapped active portions of the landfill.

The entire site is contained within the Sanders Creek-Navasota River watershed (Hydrologic Unit Code 12070103), which extends over approximately 245,000 acres of east central Texas.

4 HISTORICAL INFORMATION & STAGES OF CONSTRUCTION

Federal CCR Rule Reference: 40 CFR 257.73(c)(1)(v), 40 CFR 257.73(c)(1)(vi), 40 CFR 257.73(c)(1)(vii)

The following construction histories were developed for Unit 019 E Pond, Unit 003 Secondary E Pond, Unit ST-18 and Unit 002 Storm Water Pond through a review of historical design drawings and reports received from either NRG or other sources as noted. In accordance with 40 CFR 257.73(c)(1), this history was compiled using only references that were readily available at the time this document was written.

Physical and engineering properties of the foundation materials on which the CCR surface impoundments are constructed are described below:

- **Unit 019 E Pond:** Natural foundation materials for Unit 019 E Pond generally consist of approximately 7 feet of silty sand which is underlain by hard to stiff clay for approximately 30 feet in depth. Beneath the upper clay layer, the soil is cohesionless comprising of layers of sand. The cohesionless stratum has medium dense consistency.
- **Unit 003 Secondary E Pond:** Natural foundation material for Unit 003 Secondary E Pond generally consists of alternating layers of interbedded sands, silty sands, clayey sands, and clays. The consistency of the cohesive layers was generally very stiff to hard while the non-cohesive layers were generally medium dense to very dense.
- **Unit ST-18:** Natural foundation materials for Unit ST-18 generally consist of cohesionless silty sand and clayey sand with intermittent cohesive sandy fat clay and sandy lean clay. The cohesionless strata were medium dense to very dense. The cohesive strata had stiff to hard consistency.
- **Unit 002 Storm Water Pond:** The natural foundation material for Unit 002 Storm Water Pond generally consists of mostly silty sand, fine to medium grained, through a depth of 45 feet.

Original design specifications developed by Ebasco Services Incorporated are included herein as Attachment A. At the time these specifications were written, the CCR surface impoundments were assigned different names than are used by the Station at the time this history of construction document was prepared. Unit 019 E Pond is identified in Attachment A as the Emergency Pond, Unit 003 Secondary E Pond is identified as the Dewatering Sludge Solids Waste Disposal Area, Unit ST-18 is identified as a run-off pond, and Unit 002 Storm Water Pond is identified as a run-off pond. These Ebasco specifications provide insight of the original methods of construction, compaction criteria and dike material properties.

The beginning of Section 5.2 of Specification “Solid Waste Disposal System” discusses the clay liners’ required type, size, range, and physical and engineering properties. Furthermore, Section 5.2 describes several placement and compaction requirements for the pond clay liners. An excerpt from this section is provided below:

The clay liner shall be constructed of material obtained from on-site silty clays in so far as possible and shall be free of muddy material, organic matter, rubbish, debris or other unsuitable

materials. The gradation of the material shall consist of soil particles with a minimum of 85% passing through a No. 4 sieve and minimum of 55% passing a No. 200 sieve in accordance with ASTM D-422 or D-1140 as designated by the Purchaser. The permeability of the material shall be less than 1×10^{-7} cm/sec. The material's liquid limit shall be equal to or greater than 30 and the plasticity index equal to or greater than 15. The average moisture content for the clay liner material may vary from an average of plus three (3) to minus three (3) percent from optimum at the time of placement.

The area where the liner is to be placed shall be prepared by disking or scarifying to loosen the surface to a depth of twelve (12) inches and then compacted. Immediately after such scarifying and compaction, the first layer of material shall be placed and compacted. The clay liner shall be compacted to a minimum of 95 percent of the maximum density obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C).

The clay liner material shall be spread and leveled in layers not exceeding six (6) inches in thickness before compacting with sheepsfoot or wedgefoot rollers. The total liner thickness shall be three (3) feet as shown on the drawings.

Section 5.4 of Specification "Solid Waste Disposal System," titled "Runoff Ponds," states the following:

The clay liner for the [Unit 002 Storm Water Pond] and [Unit ST-18], ...shall meet the material, placement, and compaction requirements as specified in Section 5.2. A random fill shall be placed above the clay liner as shown on the design drawings.

Esbasco Specification "Performance of Excavation, Backfill, Filling and Grading," also included in Attachment A, provides additional technical requirements for the installation with regards to excavating, placing and compacting of fill material, and testing to ensure proper compliance with the stated requirements.

The original civil design criteria, Civil Design Criteria CDC-1 "Site Improvements" and CDC-2 "Site Investigations, Excavation, and Foundation Design Parameters," are also included herein as Attachment B and Attachment C, respectively. CDC-1 provides a description of the method of site preparation used to construct the impoundment dikes and lists requirements for clearing and grubbing of the native vegetation, excavation and backfill, and embankments, dams, dikes and channel construction. The CDC-1 states, "The placement and compaction procedure of the various types of fill will be established to yield the required in-place densities. The backfill is compacted to a minimum of 95 percent of the maximum density obtained in the Modified Proctor Compaction Test (ASTM D-1557, Method C)." The document continues, "Control tests of densities and moisture contents will be made as the work progresses to assure that required densities and moisture content are being achieved."

The CDC-2 also provides descriptions of the preliminary and detailed subsurface investigations, including associated laboratory tests. On the bottom of Page 5, this document confirms the compaction criteria previously stated and adds "In-situ soils are to be proof-rolled prior to placement of fill or construction of foundations."

Limestone Generating Station's Unit 1 and Unit 2 were commissioned in 1985 and 1986, respectively. The CCR surface impoundments were commissioned around the same time as the generating units. The following modifications were made to the impoundments after initial construction:

- In the winter of 1989 and 1990, repairs were performed to the liner of Unit 019 E Pond.
- In the year 2000, the crest elevation for Unit ST-18 was raised from 440 to 444 feet and the emergency spillway shown on the original design drawing was eliminated.
- In December 2015, the crest elevation for Unit 002 Storm Water Pond was raised from 430 to 434 feet.

Detailed dimensional drawings for these four CCR surface impoundments, as far as was available at the time of writing this document, have been included in Attachment D. Although five pond "Sections" are identified on drawing Hou-3037 M-113621S03, only the western most "Section" was actually constructed.

5 CURRENT CCR SURFACE IMPOUNDMENT CONFIGURATIONS

Federal CCR Rule Reference: 40 CFR 257.73(c)(1)(ix), and 40 CFR 257.73(c)(1)(x)

None of the four non-incised CCR surface impoundments have spillways or design diversion features; instead, the ponds are designed to contain all storm water run-on and process flows without overtopping the perimeter dikes. Original design capacities or calculations for the CCR surface impoundment's discharge piping could not be found in the available documentation from NRG. However, a detailed analysis of hydrologic and hydraulic capacities of these CCR surface impoundments was performed and concluded that each CCR surface impoundment is able to collect and control the inflow design flood events as required by 40 CFR 257.82.

Area-capacity curves for these non-incised CCR surface impoundments are included in Exhibit 2.

6 ACTIVE MAINTENANCE & SURVEILLANCE PROGRAMS

Federal CCR Rule Reference: 40 CFR 257.73(c)(1)(viii), and 40 CFR 257.73(c)(1)(xi)

Pursuant to 40 CFR 257.83, all CCR surface impoundments are examined by qualified personnel at intervals not exceeding seven days. Each examination includes an inspection of the impoundment perimeter dikes for any appearances of actual or potential structural weakness and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR surface impoundments. In addition to examining the perimeter dikes, the qualified personnel inspect the discharge of all outlets of hydraulic structures which pass underneath the base of or through the dike of the CCR surface impoundments for abnormal discoloration, flow or discharge of debris or sediment. Each 'weekly' inspection is documented on a form titled CCR Surface Impoundment & Landfill Weekly Inspection Report NRG – Limestone Station; the inspection form template is included in Attachment E. The weekly inspection reports are then placed in the Station's operating record as required by 40 CFR 257.105(g)(5).

Beyond 'weekly' inspections, the CCR surface impoundments at the Limestone Generating Station are inspected annually by a qualified professional engineer in compliance with 40 CFR 257.83(b). The first annual inspection was performed on November 11, 2015.

7 CONCLUSION

In compliance with 40 CFR 257.73(c)(1), this history of construction has compiled, to the extent feasible, the relevant historical and current information regarding Unit 019 E Pond, Unit 003 Secondary E Pond, Unit ST-18, and Unit 002 Storm Water Pond of the Limestone Generating Station.

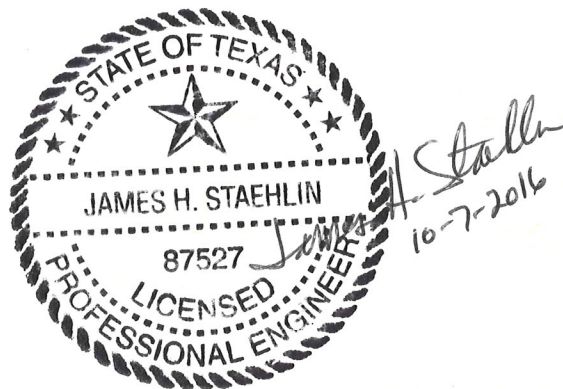
8 CERTIFICATION

I certify that this document was prepared by me or under my supervision and that I am a registered professional engineer under the laws of the State of Texas.

This document is released for use under the authority of James H. Staehlin, Texas PE # 87527 on October 7, 2016. Sargent & Lundy LLC Texas Registered Engineering Firm # F-2202.

Certified by: JAMES H. STAEHLIN Date: 10-7-2016

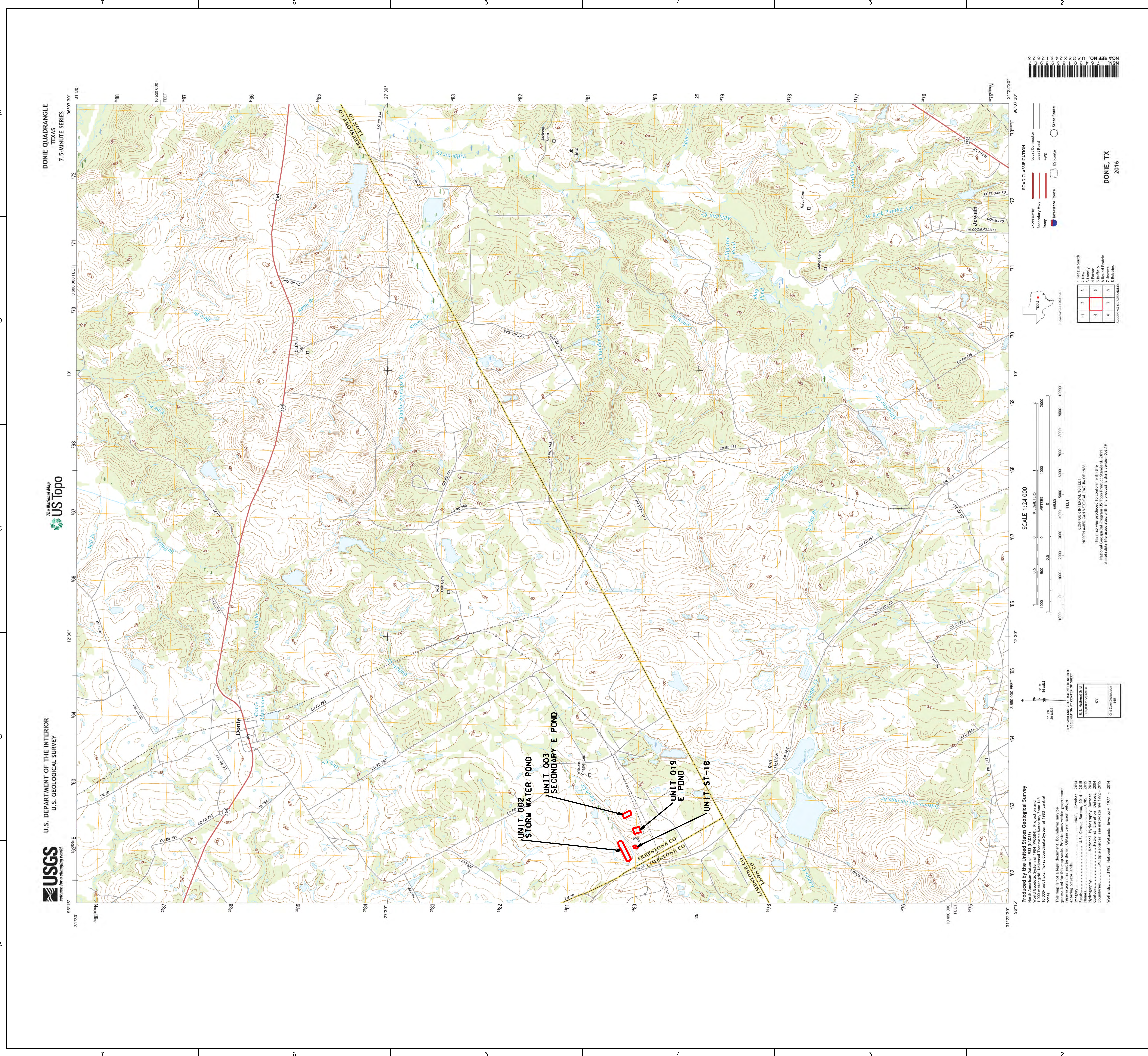
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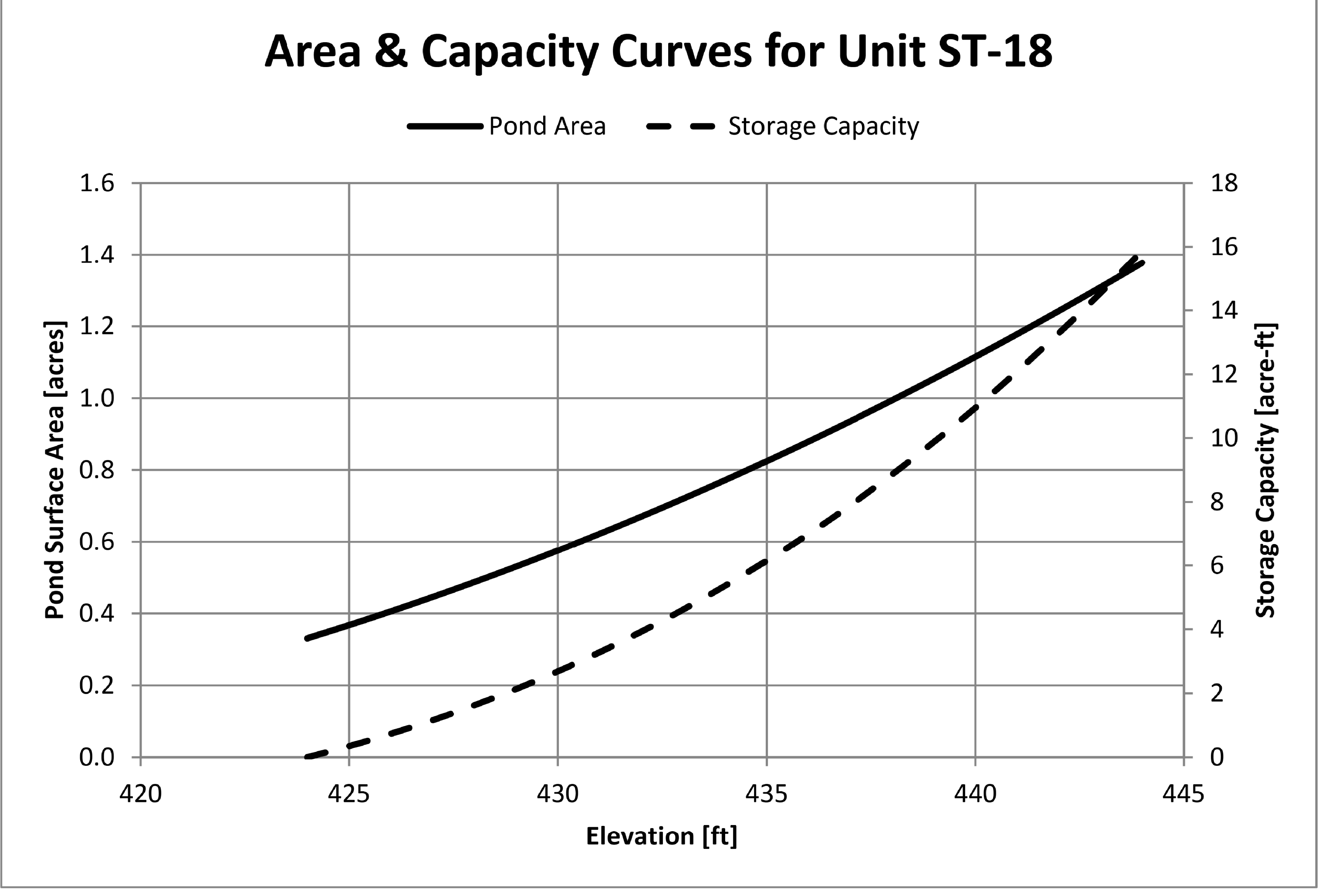
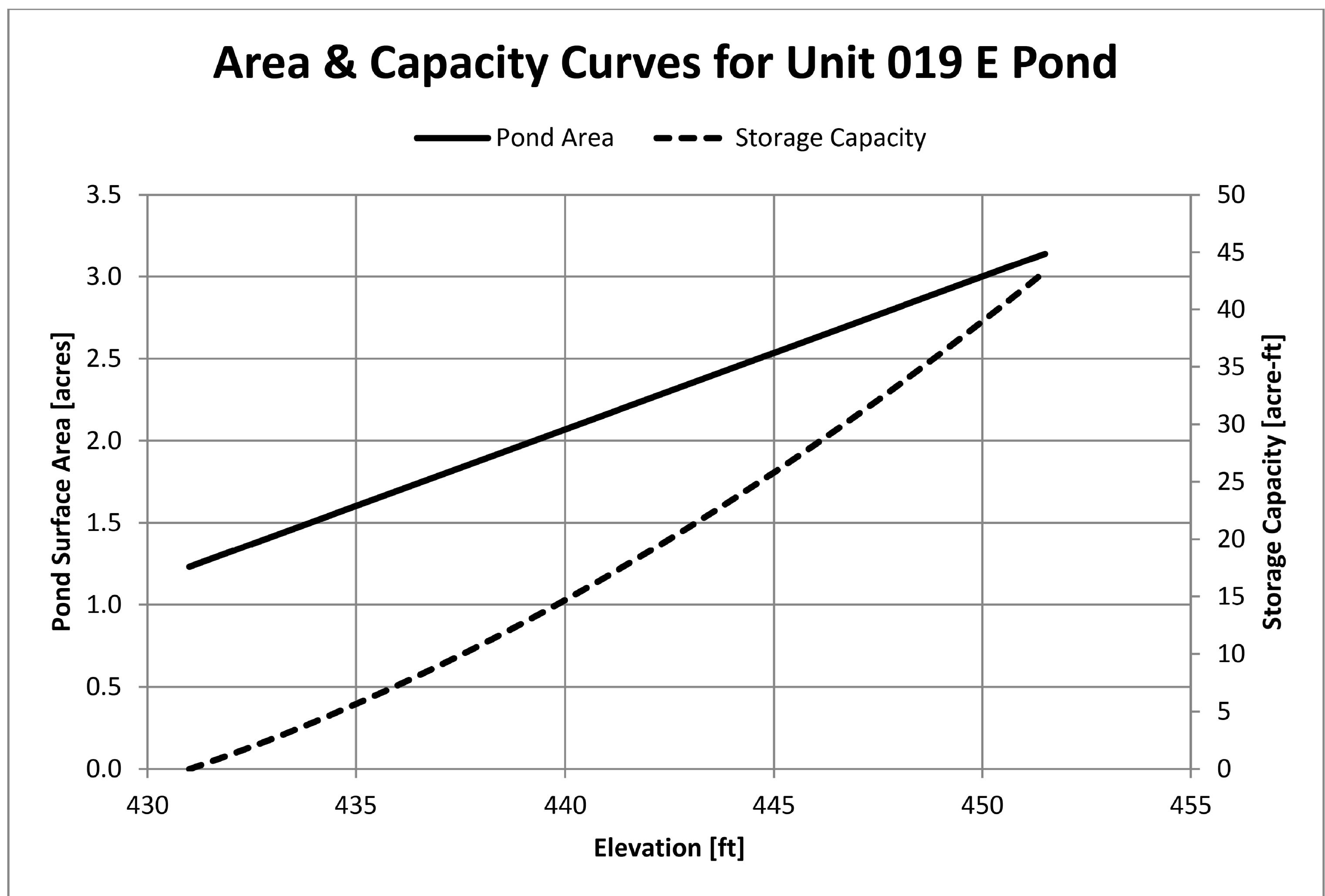
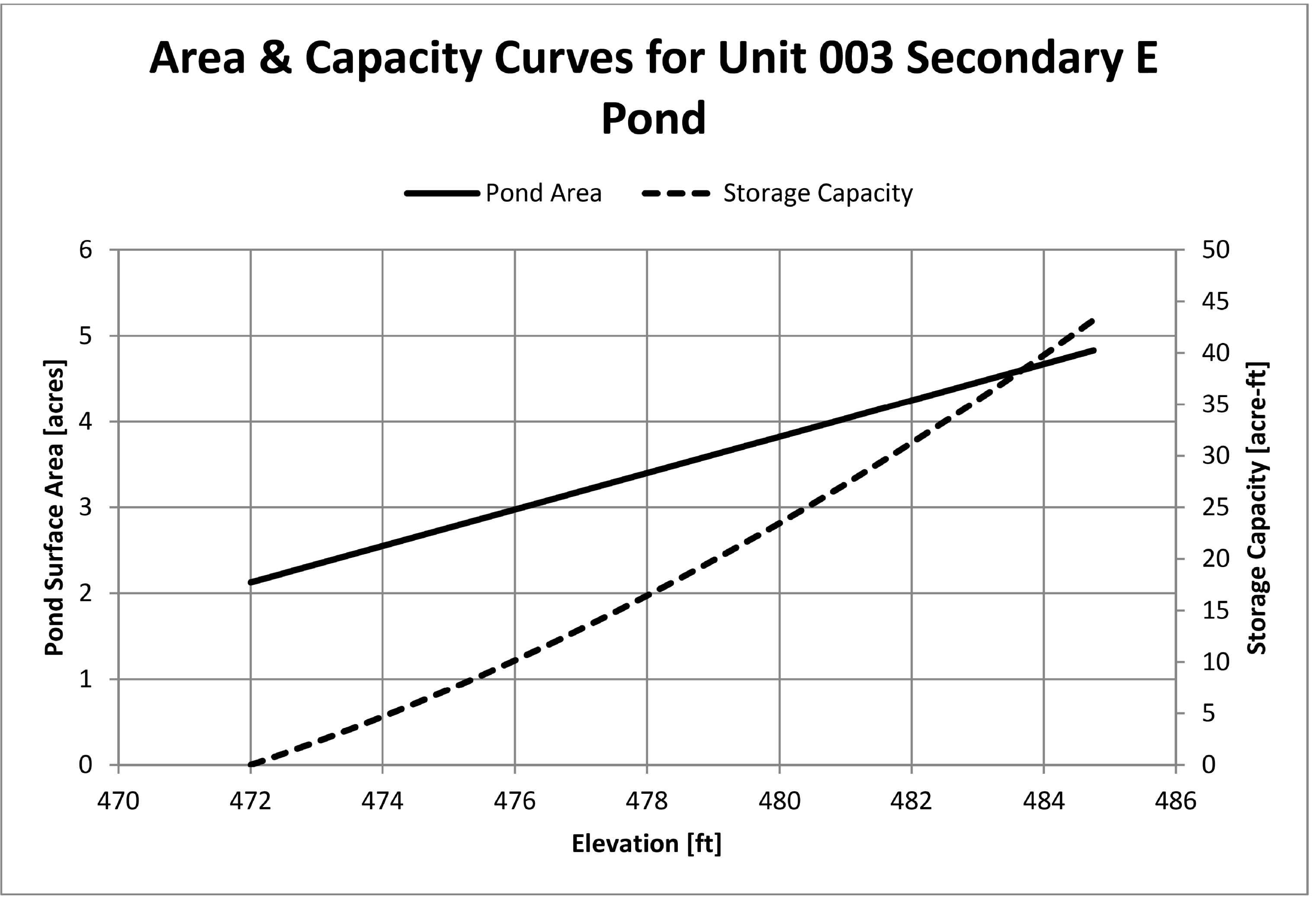
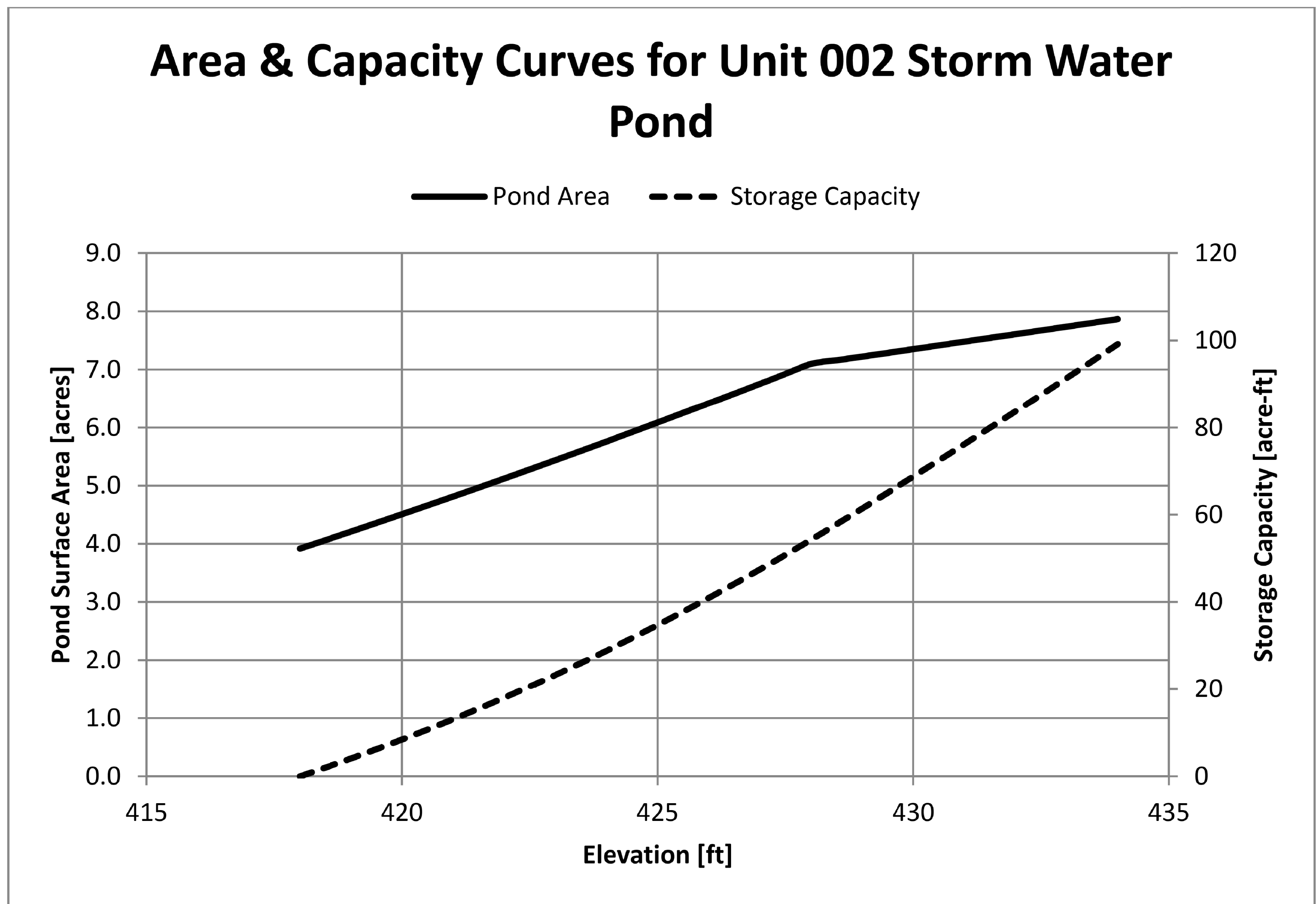
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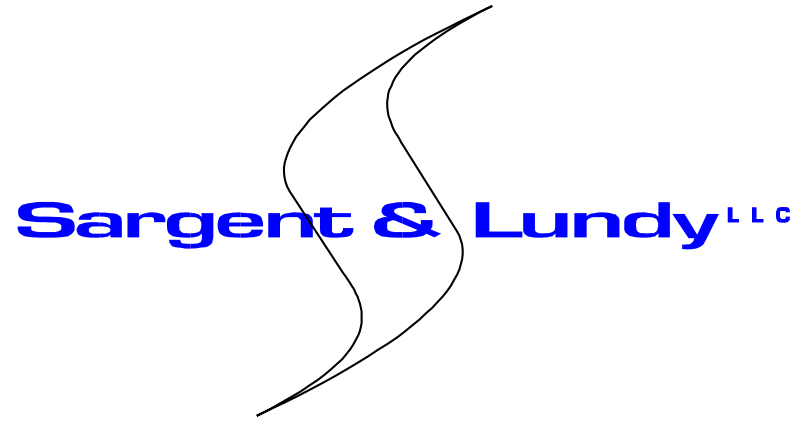


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| CAD FILE NAME: LIMESTONE-HISTORY-EXHBT 1.DGN PREPARED BY: J. FIFAREK REVIEWED BY: D. NELSON APPROVED BY: --- | | |
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| PROJECT LIMESTONE GENERATING STATION NRG TEXAS POWER LLC | | |
| DRAWING TITLE HISTORY OF CONSTRUCTION USGS TOPOGRAPHIC MAP DONIE QUADRANGLE | | |
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| REV. | DATE | DESCRIPTION |
| 0 | 10/07/2016 | FOR USE |
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| CAD FILE NAME: LIMESTONE-HISTORY-EXHBT 2.DGN PREPARED BY: J. FIFAREK REVIEWED BY: D. NIELSON APPROVED BY: --- | | |
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| PROJECT | | |
| LIMESTONE GENERATING STATION NRG TEXAS POWER LLC | | |
| DRAWING TITLE | | |
| HISTORY OF CONSTRUCTION CCR SURFACE IMPOUNDMENT AREA-CAPACITY CURVES | | |
| DRAWING NUMBER | | REVISION |
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ATTACHMENT A

EBASCO SERVICES INCORPORATED SPECIFICATIONS

1. Ebasco Specification No. Solid Waste Disposal System
2. Ebasco Specification No. Performance of Excavation, Backfill, Filling and Grading

Project Identification
No. HOU 3037 - 102408

EBASCO SERVICES INCORPORATED
EBASCO SPECIFICATION NO. _____
SOLID WASTE DISPOSAL
SYSTEM

PURCHASER: HOUSTON LIGHTING & POWER COMPANY
OWNER: HOUSTON LIGHTING & POWER COMPANY
OPERATING COMPANY: HOUSTON LIGHTING & POWER COMPANY
PROJECT: LIMESTONE ELECTRIC GENERATING STATION
UNIT NO: 1 & 2 NOMINAL MW 1500 (TOTAL)
LOCATION: LIMESTONE COUNTY, TEXAS

| <u>Specification Status</u> | <u>Date</u> | <u>Prepared By</u> | <u>Reviewed By</u> | <u>Pages Affected</u> |
|-----------------------------|-------------|--------------------|--------------------|-------------------------|
| Original | 9/29/81 | V Bolano <i>VB</i> | W Petroski | |
| R1 | 11/30/81 | V Bolano <i>VB</i> | W Petroski | 1,1,3,4,5,6,7,8,9,10,11 |
| R2 | | | | |
| R3 | | | | |
| R4 | | | | |

EBASCO SERVICES INCORPORATED

EBASCO SPECIFICATION

SOLID WASTE DISPOSAL SYSTEM

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1.0 Scope

1.1 General

The solid waste disposal system includes:

.11 Two bottom ash and stabilized solids disposal areas, designated as areas 1 and 2, including two runoff ponds

.12 A dewatered sludge solids waste disposal area with a runoff pond

.13 Stabilization facility

.14 Emergency pond

.15 Equipment maintenance area

R1
R1

The location of the above mentioned is shown on the following Ebasco drawing:
M-001601S03 Plot Plan

1.2 Site Specific

This specification covers the site preparation, construction, and reclamation of the solid waste disposal system. The work includes, but is not restricted to, the following items:

.21 Construction sequencing for bottom ash and stabilized solids disposal areas, and dewatered sludge solids waste disposal area

.22 Liner requirements for bottom ash and stabilized solids disposal areas, dewatered sludge solids waste disposal area, runoff ponds, and emergency pond

.23 Drainage system including ditches, dikes, and pipelines

.24 Haul roads for bottom ash waste disposal areas

.25 Testing requirements for proposed stabilized sludge liner

.26 Groundwater monitoring

.27 Ground preparation for soil bearing foundations

R1
R1
R1

It is not Purchaser's intent to specify all the technical requirements nor set forth those requirements adequately covered by applicable codes, specifications, and standards. Contractor shall furnish high quality work and materials to meet the requirements covered in this specification.

In addition to the general requirements of this specification, additional specific requirements pertaining to clearing, grubbing, and excavating in Ebasco Specifications "Clearing and Grubbing" (HOU-3037-101400) and "Excavation, Backfill, Filling, and Grading" (HOU-3037-102401) shall also apply.

2.0 Codes, Specifications and Standards

2.1 General

.01 Material and services furnished in accordance with this specification shall comply with the codes, specifications and standards listed in Paragraph 2.2. Later editions may be used by mutual consent in writing between Contractor and the Purchaser.

.02 Any conflict between this specification and the referenced codes, specifications and standards shall be immediately brought to the Purchaser's attention for written resolution.

2.2 Listing

ASTM - American Society for Testing and Materials

- D-422-72 Standard Method for Particle - Size Analysis of Soils
- D-423-72 Standard Test Method for Liquid Limit of Soils
- D-424-71 Standard Text Method for Plastic Limit and Plasticity Index of Soils
- D-698-78 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop
- D1140-71 Standard Test Method for the Amount of Material in Soils Finer than the No. 200 (75-mm) Sieve
- D1556-74 Standard Test Method for the Density of Soil in Place by the Sand-Cone Method
- D1557-78 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop
- D2167-77 Standard Test Method for Density of Soil in Place by the Rubber - Balloon Method
- D2216-80 Standard Test Method of Laboratory Determination of Moisture Content of Soil
- D2435-70 Standard Method of Test for One-Dimensional Consolidation Properties of Soils
- D2850-70 Standard Method of Test for Unconsolidated, Undrained Strength of Cohesive Soils in Triaxial Compression

- D2922-78 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- D2937-76 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
- D3017-78 Standard Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

OSHA - Occupational Safety and Health Administration

Regulation 29 CFR Part 1926 - Occupational Safety and Health Regulations for Construction (February 9, 1979)

Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges, 1972

3.0

Reference Drawings

| | | | | |
|---------------|------|-----|------|-----------------|
| M - 104604S00 | thru | S11 | AQCS | FDN |
| M - 113600S01 | thru | S03 | SWDA | Grading |
| M - 113605S01 | & | S02 | SWDA | Sanitary System |
| M - 113610S01 | thru | S06 | SWDA | Drainage |
| M - 113620S01 | thru | S08 | SWDA | Road and RR |
| M - 113621S01 | & | S02 | SWDA | Runoff Ponds |

4.0

Construction Sequencing of Waste Disposal Areas

4.1

General

During the initial construction phase, the stabilization facility, emergency pond, and equipment maintenance area shall be completed. The preparation of the initial cells to be used in both the bottom ash and stabilized solids disposal area 1, and the dewatered sludge solids waste disposal area shall be also completed, including associated runoff ponds, haul roads, and drainage systems. Following the start up of the plant a test section shall be designated in the bottom ash waste disposal area 1 cell to test the permeability and structural properties of the flue gas desulfurization solids stabilized with fly ash.

R1

4.2 Bottom Ash and Stabilized Solids Disposal Areas

The development of the bottom ash waste disposal cells in both areas 1 and 2 shall continue on a sequential basis. As a particular cell is being filled, the clearing, grubbing, placement of the liner, and drainage system for the adjoining cell shall commence. During the filling of a cell, all surface runoff from the cell shall be directed by dikes to a pipe which will discharge to the area's runoff pond. After a cell has been completed, including final soil cover and seeding, the drainage system shall be changed and set by sloping the ground surface, as shown on Drawing HOU-3037-M-113600S04, so as to have all the runoff directed towards the permanent perimeter drainage system. R1

The filling of a particular cell in the bottom ash waste disposal areas shall proceed as follows: R1

.01 Clearing and grubbing as per Ebasco Specification "Clearing and Grubbing" (HOU-3037-101400) such that the subgrade shall be free of roots, stumps, branches, organics or other deleterious materials which could puncture, damage or otherwise inhibit the liner from functioning properly.

.02 Placement of the clay or stabilized solids liner as specified in Section 5.2.

.03 Dumping, spreading, and compaction of flue gas desulfurization solids stabilized with fly ash and mixed with bottom ash.

The material shall be spread in layers of 12 inches maximum thickness and promptly compacted to a minimum density of 90 percent of the maximum obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C). Initial compaction shall be accomplished by using the weight of the spreading equipment passing over the waste material. Final compaction shall be accomplished by using a roller or vibratory compactor. R1

A test section shall be selected to determine the optimum number of passes required by the equipment to compact the stabilized flue gas desulfurization solids mixed with fly ash to 90 percent of the maximum density obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C).

No field testing program shall be required to ensure that the density requirements are being met. However, the Owner may implement a testing program, if deemed necessary, so as to ensure the design life of the area.

At the time of final filling, and prior to placing soil cover and seeding, the cell surface shall be sloped at a 1 percent grade to form a ridge running along the middle of the cell as shown on drawing HOU-3037-M-113600S04.

All bottom ash waste disposal cells shall not have side slopes steeper than one (1) vertical to three (3) horizontal. A terrace ten (10) feet wide shall be constructed for all slopes, for every 30 feet of vertical distance.

R1

.04 Placement and compaction of 24 inch waste cover stabilized flue gas desulfurization solids.

The cover lining shall be compacted to a minimum density of 95 percent of the maximum obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C).

The stabilized flue gas desulfurization solids shall be spread, leveled in layers not exceeding twelve (12) inches in thickness, and compacted using previously developed, optimized compaction methods.

R1

.05 Placement and firm compaction of 18 inch soil cover.

The material to be used for this cover shall be a SC type soil as per the Unified Soil Classification System. It shall be obtained, in so far as possible, from the on site clayey sands and shall have no more than 40 percent of the material passing the No. 200 sieve in accordance with ASTM D-1140.

The material shall be spread and leveled in layers not exceeding six (6) inches in thickness before compaction and shall be compacted to a minimum density of 90 percent of the maximum obtained in the modified Proctor Compaction Test, ASTM D-1557 (Method C).

R1

.06 Placement, loose compaction, and seeding of 12 inch final soil cover.

The material to be used for this cover shall be a CL material as per the Unified Soil Classification System and shall be obtained, in so far as possible, from the on site silty clays. The gradation, moisture content, liquid limit, and plasticity index shall meet the same requirements as for the clay liner in Section 5.2.

The material shall be compacted to a minimum density of 85 percent of the maximum obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C). The seeding shall conform to Item 164 of the Texas Highway Department Standard Specifications for Construction of Highways, Streets, and Bridges, 1972.

4.3 Dewatered Sludge Solids Waste Disposal Area

The dewatered sludge solids waste disposal area shall include five (5) cells each covering a two (2) acre area to be developed sequentially.

R1

The filling of a cell in the dewatered sludge solids waste disposal area shall proceed as follows:

.01 Clearing and grubbing as per Ebasco Specification "Clearing and Grubbing (HOU-3037-101400) such that the subgrade shall be free of roots, stumps, branches, organics or other deleterious materials which could puncture, damage or otherwise inhibit the liner from functioning properly.

.02 Placement of the clay liner as specified in Section 5.3.

.03 Dumping and spreading of dewatered sludge solids.

All dewatered sludge solids waste disposal cells shall not have side slopes steeper than one (1) vertical to three (3) horizontal. A terrace ten (10) feet wide shall be constructed for all slopes for every 30 feet of vertical distance. | R1

.04 Placement and firm compaction of 18 inch soil cover.

The material to be used for this cover shall be a SC type soil as per the Unified Soil Classification System. It shall be obtained, in so far as possible, from the on site clayey sands and shall have no more than 40 percent of the material passing the No. 200 sieve in accordance with ASTM D-1140. The material shall be spread and leveled in layers not exceeding six (6) inches in thickness before compaction and shall be compacted to a minimum density of 90 percent of the maximum obtained in the modified Proctor Compaction Test, ASTM D-1557 (Method C). | R1

.05 Placement, loose compaction, and seeding of 12 inch final soil cover.

The material to be used for this cover shall be a CL material as per the Unified Soil Classification System and shall be obtained, in so far as possible, from the on site silty clays. The gradation, moisture content, liquid limit, and plasticity index shall meet the same requirements as for the clay liner in Section 5.2.

The material shall be compacted to a minimum density of 85 percent of the maximum obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C). The seeding shall conform to Item 164 of the Texas Highway Department Standard Specifications for Construction of Highways, Streets, and Bridges, 1972.

5.0 Clay Liner

5.1 General

A clay liner shall be required for the cells in the bottom ash and stabilized solids areas and their runoff ponds, the dewatered sludge solids waste disposal area and its runoff pond, and the emergency pond. Upon appropriate authorization, alternate liner material may be used for future cells in the bottom ash and stabilized solids areas. | R1

5.2 Bottom Ash and Stabilized Solids Disposal Areas

R1

The clay liner shall be constructed of material obtained from on-site silty clays in so far as possible and shall be free of muddy material, organic matter, rubbish, debris or other unsuitable materials. The gradation of the material shall consist of soil particles with a minimum of 85% passing through a No. 4 sieve and minimum of 55% passing a No. 200 sieve in accordance with ASTM D-422 or D-1140 as designated by the Purchaser. The permeability of the material shall be less than 1×10^{-7} cm/sec. The material's liquid limit shall be equal to or greater than 30 and the plasticity index equal to or greater than 15. The average moisture content for the clay liner material may vary from an average of plus three (3) to minus three (3) percent from optimum at the time of placement.

The area where the liner is to be placed shall be prepared by discing or scarifying to loosen the surface to a depth of twelve (12) inches and then compacted. Immediately after such scarifying and compaction, the first layer of material shall be placed and compacted. The clay liner shall be compacted to a minimum of 95 percent of the maximum density obtained in the standard Proctor Compaction Test, ASTM D-698 (Method C).

The clay liner material shall be spread and leveled in layers not exceeding six (6) inches in thickness before compacting with sheepsfoot or wedgfoot rollers. The total liner thickness shall be three (3) feet as shown on the drawings.

R1

Should the field permeability tests on the flue gas desulfurization solids stabilized with fly ash yield permeabilities less than 1×10^{-7} cm per second, said stabilized solids shall be used for the lining of the remaining cells in the bottom ash waste disposal area 1 and the entire bottom ash waste disposal area 2.

R1

The method of placement and compaction for the flue gas desulfurization stabilized solids liner shall be the same as for the clay liner previously described in this section.

5.3 Dewatered Sludge Solids Waste Disposal Area

R1

The five (5) cells in the dewatered sludge solids waste disposal area shall have a clay liner meeting the material, placement, and compaction requirements specified in Section 5.2.

5.4 Runoff Ponds

The clay liner for the runoff ponds in the bottom ash and stabilized solids disposal areas, and the dewatered sludge solids waste disposal areas shall meet the material, placement, and compaction requirements as specified in Section 5.2. A random fill shall be placed above the clay liner as shown on the design drawings.

R1

5.5 Emergency Pond

The clay liner for the emergency pond shall also have a thickness of three (3) feet and meet all other material, placement, and compaction requirements specified in Section 5.2. The clay liner shall be sloped so as to direct the leachate to a sump to allow its removal from the emergency pond. A random fill shall be placed above the clay liner as shown on the design drawings.

R1

6.0 Drainage

6.1 General

Work shall include but not necessarily be limited to the construction and maintenance of temporary and permanent drainage, and sediment control for the solid waste disposal area. Such work will involve the construction of ditches, dikes, traps, slope drains, preparing slopes, compacting top soil, seeding and fertilizing to as to comply with this specification and drawing HOU-3037-M-113610S03, or as directed by the Engineer.

Temporary control measures shall be used to correct conditions which develop during construction and filling and have not been foreseen during the design stage.

6.2 Bottom Ash and Stabilized Solids Disposal Areas

R1

A permanent drainage system consisting of peripheral ditches and dikes shall be constructed in the bottom ash waste disposal area. The peripheral ditches shall serve to convey all runoff, from the finished reclaimed cells and all other cells which are neither being developed nor filled, to the area's natural runoff system. The ditches, dikes, stilling basins, catch basins and drop structures shall be as shown on the design drawings.

R1

The area's natural runoff system, Lynn Creek, shall be rerouted to the dimensions and elevations shown on the design drawings.

The runoff from the cell which is at any point being filled and from the cell being cleared and grubbed shall be directed to dikes within the disposal area, which shall be in turn conveyed to a pipe running along the area haul road and discharging to the area's runoff pond. The size and type of pipe shall be as shown on the design drawings.

As an area is filled and covered the drainage system shall be re-routed so as to discharge into the peripheral ditch system.

Maintenance shall be provided as needed for both the permanent and temporary ditch systems.

As construction of the cell rows proceeds towards the area's runoff pond, the temporary drainage system shall sequentially be routed towards the pipe by providing inlets at the new location and relocating pipe sections as required.

The seeded reclaimed cells shall have two sides sloped at a 1 percent grade to form a ridge running along the middle of the cell from east to west and allowing the surface runoff to be conducted via ditches on the edge to the permanent peripheral ditch.

7.0 Haul Roads

The main haul road thru the bottom ash waste disposal area 1 shall be an unsurfaced type, two lane, all weather, 42 feet right-of-way width designed for 85 ton truck capacity. The preliminary construction of these roads shall use native soil and be adequate to allow satisfactory passage for vehicles hauling materials to the cell being filled. Should the testing of the stabilized flue gas solids, as outlined in Section 8.2, yield satisfactory structural properties, the stabilized flue gas solids shall be used in completing, the construction of the haul road in area 1, and the entire area 2 haul road to the grades shown on the design drawings. |R1

The spurs leading from the main haul road to the various disposal cells within the area shall be constructed as needed. As a particular cell is being filled the road spur within the cell will be constantly raised and continuous maintenance of this road shall be provided by the on-site spreading equipment to ensure the satisfactory passage of the hauling trucks. A turn-around area shall be provided at the end of the spur. Once a cell is filled the haul road shall be covered and seeded as specified in Sections 4.2.05 and 4.2.06.

Periodic maintenance of these roads shall be performed so as to permit normal vehicular use at all times and shall include dust control.

8.0 Testing

8.1 Liner Testing

Field control testing of densities and moisture contents shall be conducted as the work progresses to assure that required densities, moisture contents and any other restrictions outlined in this specification are being achieved.

For the lining material in the bottom ash waste disposal area, one (1) density and moisture test shall be made for every 40,000 square feet of compacted fill area, however, at least one (1) density test shall be made for every area less than 40,000 feet placed in one day. |R1

For the lining material in the runoff ponds, emergency pond and dewatered sludge solids waste disposal area a minimum of one (1) density and moisture test shall be made for every 10,000 square feet of compacted fill area.

8.2 Stabilized Sludge Testing

Various laboratory testing including grain size, liquid limit, plasticity index, water content, density, compaction, strength and permeability shall be conducted on the flue gas desulfurization solids stabilized with fly ash. These tests shall be conducted at 0, 1, 3, 7, 14 and 28 days following the stabilization process. Chemical analyses shall also be performed for total alkalinity, total dissolved solids, alkalinity (phenolphthalein and methyl orange), calcium, magnesium, sulfates and sulfides.

Once the results of the material's structural properties are available, the Engineer will determine whether the stabilized sludge can be used as a liner and the optimum time period for placing it following the stabilization process.

The in situ permeability of the stabilized sludge and the compaction characteristics of the ash waste shall then be tested by selecting a square area in the first ash disposal cell of approximately 100 feet by 100 feet. A five (5) foot layer of the stabilized sludge shall be placed and disposal of ash continued. When the test portion is nearly filled, borings shall be drilled and undisturbed samples obtained to test the compaction characteristics of the ash waste. Piezometers shall then be installed at the depth of the stabilized sludge and field permeability tests conducted. The results of field and lab permeability shall be compared.

Additional testing may be required at the discretion of the Owner or Engineer.

9.0 Groundwater Monitoring System

A groundwater monitoring system shall be installed in the vicinity of the dewatered sludge solids waste disposal cells so as to comply with Texas Department of Water Resources Regulations (Groundwater Monitoring 156.22.12.001-.005, Texas Administrative Code Sections 335.191-.195).

R1

Three monitoring wells hydraulically downgradient and one monitoring well hydraulically upgradient shall be installed near the boundary of the area perimeter to the depth of the uppermost aquifer. In case the uppermost aquifer is not found within a 50 foot depth, the well shall be installed at a 50 foot depth.

A program shall be implemented to obtain and analyze samples from the installed groundwater monitoring system.

All monitoring wells shall be sampled and the samples analyzed to establish groundwater quality and to determine groundwater contamination on a quarterly basis.

The parameters to be established during the analysis shall meet the requirements of the Texas Department of Water Resources Regulations.

Monthly water samples shall be collected at least 12 months prior to the initiation of disposal operations and analyzed to establish baseline conditions against which to compare subsequent samples obtained during the operational life of the cell.

R1

10.0 Soil Bearing Foundations

Areas where foundations for buildings and other structures are to be located shall be cleared and grubbed as per Ebasco's Specification, "Clearing and Grubbing" (HOU-3037-101400) to the grade shown on the drawings, and as required to permit placement of concrete foundations and conduits.

Any existing unsuitable soils such as soft clays or loose sands shall be removed and replaced with either site sand fill or select sand fill as per Ebasco's Specification "Excavation, Backfill, Filling and Grading" (HOU-3037-102401). This material shall then be compacted to meet the requirements of the previously mentioned specification. Any other clays encountered on which foundations are to be placed shall be removed to a depth of two (2) feet, replaced with either a site sand fill or select sand fill and compacted. The Engineer shall inspect the bottom of the excavation prior to backfilling and compaction.

R1

The allowable bearing capacity shall not exceed two (2) tons per square foot. The requirements for soil bearing foundations can be upgraded by the Engineer.

Project Identification

No. HOU-3037-900001-2

EBASCO SERVICES INCORPORATED

EBASCO SPECIFICATION NO. _____

PERFORMANCE OF EXCAVATION, BACKFILLFILLING AND GRADINGPURCHASER: HOUSTON LIGHTING & POWER COMPANYOWNER: HOUSTON LIGHTING & POWER COMPANYOPERATING COMPANY: HOUSTON LIGHTING & POWER COMPANYPROJECT: LIMESTONE ELECTRIC GENERATING STATIONUNIT NO.: 1 & 2 NOMINAL MW 1500 (TOTAL)LOCATION: LIMESTONE COUNTY, TEXAS

SELLER: _____

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| R3 | | | | |
| R4 | | | | |

PERFORMANCE OF EXCAVATION, BACKFILL
FILLING AND GRADING

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1.0 CODES, SPECIFICATIONS AND STANDARDS

1.1 General

1.1.1 Material and services furnished in accordance with this specification shall comply with the codes, specifications and standards listed in Paragraph 1.2. Later editions may be used by mutual consent in writing between Contractor and the Owner.

1.1.2 Any conflict between this specification and the referenced codes, specifications and standards shall be immediately brought to the Owner's attention for written resolution.

1.1.3 In addition to the general requirements of this specification, all additional specific requirements pertaining to excavation and earthfill in Ebasco Specifications "Clearing and Grubbing" (HOU-3037-101400) and "Foundation Piling" (HOU-3037-102412) shall also apply.

1.2 Listing

ASTM - American Society for Testing and Materials

- D-422-63 Standard Method for Particle - Size Analysis of Soils
(1972)
- D-423-66 Standard Test Method for Liquid Limit of Soils
(1972)
- D-424-59 Standard Test Method for Plastic Limit and Plasticity
(1971) Index of Soils
- D-698-78 Standard Test Methods for Moisture-Density Relations of
Soils and Soil-Aggregate Mixtures using 5.5-lb (2.49-kg)
Rammer and 12-in. (305-mm) Drop
- D1140-54 Standard Test Method for the Amount of Material in
(1971) Soils Finer than the No. 200 (75-mm) Sieve
- D1556-64 Standard Test Method for the Density of Soil in Place
(1974) by the Sand-Cone Method
- D1557-78 Standard Test Methods for Moisture-Density Relations of
Soils and Soil-Aggregate Mixtures using 10-lb (4.54-kg)
Rammer and 18-in. (457-mm) Drop
- D2167-66 Standard Test Method for Density of Soil in Place by
(1977) the Rubber - Balloon Method
- D2216-71 Standard Test Method of Laboratory Determination of
Moisture Content of Soil

1.0 CODES, SPECIFICATIONS AND STANDARDS (Cont'd)

1.2 Listing (Cont'd)

ASTM - American Society for Testing and Materials (Cont'd)

D2922-78 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D2937-76 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method

D3017-78 Standard Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges, 1972.

2.0 TECHNICAL REQUIREMENTS

2.1 Excavation

Excavation shall be performed to the lines, grades and slopes shown on the drawings, and as required to permit placement of concrete foundations, piping, culverts or electrical conduits.

2.1.1 Slopes of all excavations shall be cut true and straight. All loose stones, boulders, roots, stumps and unstable material on the slopes shall be removed.

2.1.2 During the course of any excavation work located beyond the clearing, and grubbing lines shown on the drawings, extreme care shall be exercised to preserve and avoid damage to trees, shrubs and all other vegetation that will not hamper work progress.

2.1.3 All erosion and sediment control facilities for excavations, fills, and spoil areas shown on the drawings or required by the specifications shall be coordinated with and constructed prior to starting other work.

2.1.4 All permanent slopes shall be one vertical to two and one-half horizontal, (2½ on 1) unless otherwise noted. Temporary construction slopes will be left to the discretion of the Contractor subject to approval of the Owner unless specifically noted on the drawings.

2.1.5 Diversion channel slopes shall be one vertical to three horizontal, (3 on 1).

2.0 TECHNICAL REQUIREMENTS (Cont'd)

2.1 Excavation (Cont'd)

2.1.6 When soft and/or compressible soil is encountered at footing grades shown on the drawings, such soil shall be removed as directed by the Owner and replaced with suitable backfill material in accordance with paragraph 2.2.6 of this specification.

2.2 Disposition of Excavated Material

Immediately after grubbing and stump removal operations and before general excavation commences, topsoil shall be completely stripped in areas to be excavated, filled and graded. Topsoil is defined as the loamy dark surface or top layer of soil including fine roots, herbaceous vegetation and overlying grass, and is characterized by the presence of organic matter.

2.2.1 Topsoil shall be stockpiled at locations designated by the Owner, shaped to a smooth outline, and the material compacted by two (2) or three (3) passes of the hauling and spreading equipment.

2.2.2 Material shall be classified as specified in 2.3 and segregated by loads during the excavation and shall be placed directly in final locations or in temporary stockpiles, and later placed in the designated final locations in accordance with the drawings or as directed by the Owner. Insofar as it is practicable, all suitable materials resulting from excavations shall be used for permanent construction. Where practicable, materials suitable for use for construction shall be excavated separately from materials to be wasted.

2.2.3 After stockpiles have been completed, and when directed by the Owner, the Contractor shall sow the surfaces of the stockpiles, with grass seed furnished by Owner, and produce a stand of grass to prevent erosion.

2.2.4 Excavated materials which are unsuitable for use in accordance with this specification and the drawings or which are waste or excess material not required for construction shall be disposed of in the spoil areas shown on the drawings or as designated by the Owner. Spoil areas shall be brought to smooth lines and shaped to ensure drainage. As sections of the soil area are completed and when directed by the Owner, the Contractor shall sow grass seed, which has been furnished by Owner, on the surfaces of the completed areas to produce a stand of grass for erosion protection.

2.2.5 All waste material shall be disposed of in spoil areas in a manner which will avoid the necessity for rehandling or interference with other work. It shall be spread and graded in uniform layers and compacted with a minimum of four (4) passes by crawler-type tractors, smooth rollers or other equipment acceptable to Owner.

2.0 TECHNICAL REQUIREMENTS (Cont'd)

2.2 Disposition of Excavated Material (Cont'd)

2.2.6 Whenever unclassified materials are excavated beyond the lines shown on the drawings, the Owner may direct that such over excavation be backfilled. The type of backfill and placement of backfill shall be as directed by the Owner.

2.2.7 Clearing and Grubbing shall be in accordance with Ebasco Specification, "Clearing and Grubbing," (HOU-3037-101400).

2.3 Backfill

2.3.1 Select Sand Fill material shall be obtained from the excavation in the plant area and/or from the designated borrow areas. The sand shall be free of organic matter, rubbish, debris, or other unsuitable materials, and shall have no more than 15 percent of the material passing the No. 200 sieve in accordance with ASTM D1140. The maximum allowable size of select sand fill material shall be three (3) inches, and the following additional requirements shall be adhered to:

a - The moisture content at time of placing shall not vary more than plus or minus four (4) percent from the optimum moisture content specified, based on compaction test requirements.

b - Material with a higher moisture content than required for the specified compaction shall be spread on a dry area designated by the Owner and disc harrowed to reduce the moisture content by evaporation. Material with a lower moisture content than that required for the specified compaction shall be spread and sprinkled with water, then disc harrowed until the required moisture content is attained.

2.3.2 Site Sand Fill material shall be obtained from the on-site silty sands insofar as possible. The material shall be free of organic matter, rubbish, debris or other unsuitable materials, and shall have no more than 40 percent of the material passing the No. 200 sieve in accordance with ASTM D1140. The maximum allowable size of site sand fill material shall be three (3) inches. The moisture content at time of placing shall comply with the requirements of Paragraph 2.3.1. | R1

2.3.3 Clay Fill material shall be obtained from on-site silty clays insofar as possible, and shall be free of muddy material, organic matter, rubbish, debris or other unsuitable materials. The gradation of the material shall consist of soil particles with a minimum of 85 percent passing through a No. 4 sieve and a minimum of 55 percent fines passing a No. 200 sieve in accordance

2.0 TECHNICAL REQUIREMENTS (Cont'd)

2.3 Backfill (Cont'd)

2.3.3 (Cont'd)

with ASTM D-422 or D-1140 as designated by the Owner. The average moisture content for the clay fill material may vary from an average of plus four (4) to minus two (2) percent from optimum at the time of placement.

2.3.4 Crushed Stone material shall be furnished by Owner.

2.3.5 Random Fill material shall be free of stumps roots, brush, rubbish, organic topsoil and other objectionable material. While no specific requirements covering gradation, moisture content or size limitation for this material are presented herein, sources shall be obtained from on-site soils insofar as possible and shall be subject to the Owner's acceptance.

2.3.6 Spoil Fill material shall consist of soil unsuitable to meet the requirements of paragraphs 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.3.6. Generally spoil material will be that soil which is muddy, contains stumps, brush, rubbish, debris or other unsuitable material as determined by the Owner.

2.3.7 Special Random Fill shall comply with the material requirements as specified in paragraph 2.3.5 (Random Fill).

3.0 PLACING AND COMPACTING

Every effort shall be made to place backfill symmetrically and in uniform layers to prevent unnecessary eccentric loading on a structure of foundation. When a large number of lifts are required to complete a backfill operation and the elapsed time between placements is large, the surface of each lift should be sloped slightly to facilitate drainage and prevent ponding on the fill.

All necessary processing, including raking, crushing, removal of oversize material, mixing, and watering or aerating shall be performed in the stockpile of borrow pit. Only minor adjustments in water content will be permitted on the backfill after it has been placed.

Unless otherwise specified or directed by the Owner, hauling or compacting equipment shall be permitted no closer than three (3) feet to any structure or foundation during backfilling. In all areas closer than three (3) feet, or where work space is limited, portable equipment such as vibratory plates, rammers,

R1

R1

3.0 PLACING AND COMPACTING (Cont'd)

or pneumatic tampers shall be used. The equipment and procedures used shall be subject to the review.

Backfill material around masonry structures shall be placed no earlier than seven (7) days after the concrete has been placed.

Backfill shall be placed so as not to damage the waterproofing or its protective materials.

To prevent the buildup of large lateral earth pressures, compaction of fill adjacent to walls shall be conducted in such a manner that the direction of compaction is moving away from the wall. That is, compaction shall begin immediately adjacent to the wall, and then proceed in a direction away from the wall.

Backfill materials used at any location shall be those shown on the drawings, and shall conform to the following requirements:

3.1 Select Sand Fill

The area to be backfilled or filled shall be prepared by compacting the material in place at the bottom of the excavation to a minimum density of 95 percent of the maximum obtained in the modified Proctor Compaction Test ASTM D1557 (Method C).

3.1.1 In wet areas, placement shall begin with a layer or multiple layers of clean sand or gravel (less than 10 percent of the material passing No. 200 sieve). Wet areas are those where the in-situ moisture content is 10 percent or more above the optimum moisture content of the material as defined by the modified Proctor Compaction Test.

3.1.2 The select sand material shall be spread and leveled in layers not exceeding 15 inches in thickness before compaction. Select sand material will be compacted to a minimum density of 95 percent of the maximum obtained in the modified Proctor Compaction Test, ASTM D-1557 (Method C).

3.1.3 Any material which fails to meet the specified minimum density shall be recompacted. When the material is too dry to be compacted to the minimum required density it shall be sprinkled with water before recompacting.

3.1.4 The top surface of freshly placed and rolled layers ordinarily will not require additional preparation. Any placed material which has become too wet or in any other way has become unsuitable, as determined by Owner's tests, shall be disc harrowed and dried, or, at the Owner's option, removed and replaced with new fill. Any area from which select sand fill has been stripped shall be recompacted before new fill is placed. All layers within the width selected for placing shall be compacted to their full width.

3.0 PLACING AND COMPACTING (Cont'd)

3.1 Select Sand Fill (Cont'd)

3.1.5 Compaction shall be performed by means of vibratory drum roller imparting a minimum dynamic force of 40,000 pounds, or by other means acceptable to the Owner. The speed of the rolling equipment shall not exceed 1.5 miles per hour. The rolling and compaction shall be performed by rolling only in the forward direction unless the equipment is capable of reversing the rotation of the dynamic force in the opposite direction.

3.1.6 Any and all questions regarding the borrowing, preparation, placement and protection of the select sand fill shall be referred to the Owner for decision.

3.1.7 In small areas which cannot be reached with large scale mobile compaction equipment the select sand fill shall not contain material larger than three (3) inches in size, and it shall be compacted with a mechanical tamper, small vibratory plate, or other means to attain required compaction. These areas shall be compacted to the same minimum compaction as the rest of the fill and shall be brought up in lifts not greater than twelve (12) inches. Care shall be taken to ensure that the fill in these areas is integral with the rest of the fill.

3.2 Site Sand Fill

Placement and compaction of site sand fill shall comply with the requirements of Paragraph 3.1, except that the layer thickness shall not exceed twelve (12) inches.

3.3 Clay Fill

Clay material with a higher moisture content than required for placement shall be spread, prepared, blended or mixed on a dry area, dried by harrowing or by discing, and aerated prior to placement. Material with a lower moisture content than that required for placement shall have moisture added at the stockpiles.

3.3.1 The area to be backfilled or filled shall be prepared for clay material by discing or scarifying to loosen the entire surface of the clay to a depth of four (4) inches. Water shall be added, when necessary, to the material at the time of scarifying so that it shall be within plus four (4) to minus two (2) percent of the optimum water content as established by compaction tests. Immediately after such scarifying the first layer of material shall be placed over the base and compacted as specified in section 3.3.4. The top surface of freshly placed and rolled layers ordinarily will require no preparation other than moistening ahead of the new layer when the new material is drier than the optimum water content.

3.3.2 A "test section" is not required. However, the Owner will establish an optimum combination of equipment passes, placement moisture, and in-situ testing during the initial placement of clay fill, to yield the required in-place densities.

3.0 PLACING AND COMPACTING (Cont'd)

3.3 Clay Fill (Cont'd)

3.3.3 The clay material to be used as plant fill shall be spread and leveled in layers not exceeding nine (9) inches in thickness before compaction using sheepsfoot or wedgefoot rollers. Other types of rollers which the Contractor proposes to use shall be subject to Owner's acceptance. The fill shall be constructed to be uniformly dense and to meet the minimum density requirement.

3.3.4 Clay fill shall be compacted to a minimum of 95 percent of the maximum obtained in the standard Proctor Compaction Tests, ASTM D698 (Method C). Optimum conditions for moisture and density shall be determined by the Owner for various impervious materials excavated. The results of tests made during construction will be made available to Contractor.

3.3.5 Any lift of material of clay fill not meeting compaction requirements shall be recompacted and retested for compliance. No new material shall be placed until the underlying lift has been properly compacted and tested.

3.3.6 The moisture content of the clay material in each layer at time of compaction shall not vary by more than plus four (4) to minus two (2) percent of the amount of moisture required for the maximum degree of compaction determined by the Owner's tests, and the moisture content shall be uniform throughout the thickness of the layer. When required, water shall be applied to the material to be compacted by sprinkling the new material in place prior to rolling.

3.4 Crushed Stone

Compaction of crushed stone backfill may be performed by the passage of dozers or by surface vibrators, smoothrollers, power tampers or other equipment acceptable to the Owner.

3.4.1 Crushed stone material shall be compacted until there is no further (visual) movement on the crushed stone.

3.4.2 Where compaction of crushed stone backfill is performed by portable equipment, the material shall be deposited in horizontal layers which, after compaction, are not more than six (6) inches thick. Where compaction is performed using dozers, rollers or other similar equipment, the material may be deposited in layers which after compaction are not more than 12 inches thick.

3.5 Random Fill

Random fill shall be placed carefully so as not to injure structures or piping or disturb previously placed backfill of any type.

3.0 PLACING AND COMPACTING (Cont'd)

3.5 Random Fill (Cont'd)

3.5.1 Where random fill is placed in conjunction with drainage layers both materials shall be placed at the same rate. Care shall be taken to prevent mixing of material which would hamper the effectiveness of the drainage layer.

3.5.2 All material shall be deposited and graded so that cobbles, gravel and boulders will be well distributed and not concentrated in pockets or in any one layer. The fill material shall not be placed while frozen nor shall it be placed on frozen surfaces.

3.5.3 Random fill shall be compacted to a minimum of 85 percent of the maximum density obtained from the standard Proctor Compaction Test ASTM D698 (Method C).

3.6 Special Random Fill

Special random fill shall be placed in accordance with the provisions of random fill as described in paragraph 3.5 with three exceptions. The first exception is that the area to be back filled or filled shall be prepared by compacting the material in place at the bottom of the excavation to a minimum density of 95 percent of the maximum obtained in the modified Proctor Compaction Test ASTM D1557 (Method C) for sand materials or standard Proctor Compaction Test ASTM D698 (Method C) for clay materials. The second exception is that special random fill shall be compacted to a minimum of 95 percent of the maximum density obtained from the modified Proctor density test, ASTM D1557 (Method C) for the sand material or standard Proctor density test, ASTM D698 (Method C) for clay material. The third exception is that special random fill shall be spread and leveled in layers not exceeding 15 inches in thickness before compaction for sand materials or spread and leveled in layers not exceeding nine (9) inches in thickness before compaction for clay materials.

3.7 Spoil Fill

A spoil area(s) shall be designated by the Owner for all material deemed unsuitable of fill. Spoil shall be disposed of outside the limits of the excavation and backfill lines shown on the drawings. Spoil fill shall be compacted by two (2) or three (3) passes of the hauling equipment and shall be leveled to grade by scrapping. Provisions shall be made for drainage.

3.0 PLACING AND COMPACTING (Cont'd)

3.8 Erosion and Sediment Control

Contractor's work shall include but not necessarily be limited to furnishing and constructing berms, ditches, traps, drains, sediment control structures (ponds, dams) pumping, preparing slopes, compacting top soil and cleaning and maintaining sediment ponds to prevent sediment discharge into streams, rivers, lakes or canals. Extreme caution shall be exercised to minimize disturbance of natural areas.

3.9 Certificate of Compliance

Contractor shall furnish a Certificate of Compliance at the completion of his contract stating that all work and materials furnished comply with this Specification, and any accepted deviations that may occur were resolved during construction.

4.0 TESTS

4.1 Field Tests

Owner will make field control tests of densities and moisture contents as the work progresses to assure that required densities, moisture contents and plasticity restrictions are being achieved.

4.2 In-Place Density

In-place density will be tested by methods described in ASTM D2922, ASTM D1556, ASTM D2167, or ASTM D2937 to ensure that the backfill has been properly compacted.

4.2.1 The Owner will make a decision to allow in-situ testing by methods described in ASTM D2922 during construction of the test fill sections. The nuclear method shall be correlated to results obtained by methods described in ASTM D1556 or ASTM D2167. Owner may allow the nuclear method to control further compaction activities, however, for every 20 field tests provided by the nuclear method, there shall be one (1) check test by either the sand cone or rubber balloon method described in ASTM D1556 or ASTM D2167 respectively. Differences between the results shall not exceed tolerances set by the Owner and if the tolerances allowed are exceeded, Owner shall either order more check tests or disallow the use of the nuclear method of testing.

4.2.2 For select sand fill a minimum of one (1) density test shall be made in each layer for every 10,000 square feet of compacted fill area, however, at least one (1) density test shall be made for every area less than 10,000 square feet placed in one day. For site sand fill, clay fill, random fill, and special random fill

4.0 TESTS (Cont'd)

4.2. In-Place Density (Cont'd)

4.2.2 (Cont'd)

a minimum of one (1) density test shall be made for every 20,000 square feet of compacted fill area, however, at least one (1) density test shall be made for every area less than 20,000 square feet placed in one day. For crushed stone and spoil fill, no density testing is required. More tests may be run at the discretion of the Owner.

4.3 Moisture Content

4.3.1 The moisture content of soils shall be determined by the methods of ASTM D2216.

4.3.2 At the Owners option, the field moisture content may be determined by the methods of ASTM D3017, by using the "steady moisture tester," by microwave oven methods or by field stove methods provided that at least one (1) calibration or check test shall be performed after every ten (1) field moisture determinations for comparison with ASTM D2216.

4.3.3 The calibration or check tests for all moisture determination methods other than ASTM D2216 shall be performed on a similar soil for which the alternate method is used. If the calibration or check tests using ASTM D2216 indicates a deviation in moisture content or more than plus or minus two (2) percent from the alternate field method results, that alternate method shall be discontinued.

4.3.4 The Owner may reduce the calibration or check test frequency for each field moisture determination method in use, from one (1) in ten (10) to one (1) in twenty-five (25) when a review of the calibration curve indicates at least ten (10) successive check tests are within the stated tolerances.

SPECIFICATION/SECTION PLAN

FOR: Performance of Excavation, Backfill,
Filling, and Grading

9000001-2
SPEC. NUMBER

R2
REVISION

Limestone Electric Generating Station
PROJECT

DMR DBC 5/13/83
APPROVED
SITE ENGINEERING SUPERVISION

SP 4-19-83
APPROVED
SITE CONSTRUCTION SUPERVISION

Jay A. Kelly 2-21-83
APPROVED
SITE QUALITY CONTROL SUPERVISION

C.J. Kelly
AUTHOR

| ITEM * HOLD POINT + WITNESS POINT | SPEC. SECTION | FREQUENCY |
|---|------------------|-----------|
| EXCAVATION | | |
| Lines, grades & slopes | 2.1 | Optional |
| Slopes & loose material | 2.1.1 | Optional |
| Damage to environment | 2.1.2 | Optional |
| Erosion control | 2.1.3 | Optional |
| Slope angle | 2.1.4 | Optional |
| Channel slope angle | 2.1.5 | Optional |
| Soft material at footing grades | 2.1.6 | Optional |
| DISPOSITION OF MATERIAL | | |
| Removal of topsoil | 2.2 | Optional |
| Topsoil stockpiling & compaction | 2.2.1 | Optional |
| Material segregation, stockpiling & use | 2.2.2 | Optional |
| Stockpile, erosion control | 2.2.3 | Optional |
| Spoil Stockpile maintenance | 2.2.4 | Optional |
| Spoil area compaction | 2.2.5 | Optional |
| Backfill of over excavation | 2.2.6 | Optional |
| Clearing & grubbing | 2.2.7 | Optional |
| BACKFILL, MATERIAL REQUIREMENTS | | |
| Select sand fill (See Note #1) | 2.3.1 | Initial |
| Site sand fill (See Note #) | 2.3.2 | Initial |
| Clay fill (See Note #) | 2.3.3 | Initial |

SPECIFICATION / SECTION PLAN

FOR: Performance of Excavation, Backfill, Filling, and Grading
 Limestone Electric Generating Station
 PROJECT

9000001-2
 R2
 REVISION

| ITEM | * HOLD POINT + WITNESS POINT | SPEC. SECTION | FREQUENCY |
|---|------------------------------|---------------|-------------|
| Crushed stone | | 2.3.4 | Optional |
| Random Fill (See Note #) | | 2.3.5 | Daily |
| Spoil Fill | | 2.3.6 | Optional |
| Special Random Fill (See Note #) | | 2.3.7 | Daily |
| PLACING & COMPACTING | | | |
| Lift symmetry, eccentric loading | | Para. #1 | Optional |
| Material processing | | Para. #2 | Optional |
| Backfill adjacent to structures, method | | Para. #3 | Optional |
| Backfill adjacent to structures vs. curing time | | Para. #4 | Optional |
| Damage to waterproofing | | Para. #5 | Optional |
| Direction of compaction | | Para. #6 | Optional |
| Use of correct backfill on location | | Para. #7 | As Placed |
| SELECT SAND FILL PLACING & COMPACTON | | | |
| Compaction of bottom of excavation | | 3.1 | As Required |
| Moisture placement requirements | | 2.3.1.a | Refer 4.3 |
| Moisture control | | 2.3.1.b. | As Required |
| Backfill requirements on wet areas | | 3.1.1 | As Required |
| Lift thickness | | 3.1.2 | Each Lift |
| Compaction requirements | | 3.1.2 | Refer 4.2.2 |
| Failed compaction & densities | | 3.1.3 | As Required |
| Excessive moisture & stripped areas | | 3.1.4 | As Required |

SPECIFICATION / SECTION PLAN

FOR: Performance of Excavation, Backfill, Filling, and Grading
 Limestone Electric Generating Station PROJECT
 9000001-2 SPEC. NUMBER
 R2 REVISION

| ITEM + WITNESS POINT | SPEC. SECTION | FREQUENCY |
|---|------------------|-------------|
| Compaction equipment & technique | 3.1.5 | Optional |
| Questions regarding select sand fill | 3.1.6 | NA |
| Compaction in congested areas | 3.1.7 | Daily |
| SITE SAND FILL PLACEMENT & COMPACTION | | |
| Total requirements for placement & compaction | 3.2 | Refer 3.1 |
| CLAY FILL PLACEMENT & COMPACTION | | |
| Failed moisture | 3.3 | As Required |
| Scarification, moisture adjustment | 3.3.1 | As Required |
| Establishing placement parameters | 3.3.2 | Initial |
| Lift thickness | 3.3.3 | Each Lift |
| Compaction requirements | 3.3.4 | Refer 4.2.2 |
| Failed compaction | 3.3.5 | As Required |
| Moisture content requirements | 3.3.6 | Refer 4.3 |
| CRUSHED STONE, PLACEMENT & COMPACTION | | |
| Compaction equipment | 3.4 | Optional |
| Compaction requirements | 3.4.1 | Each Lift |
| Lift thickness | 3.4.2 | Each Lift |
| RANDOM FILL, PLACING & COMPACTION | | |
| Damage to adjacent structures, piping & fill | 3.5 | Optional |
| Placement in conjunction with drainage layers | 3.5.1 | Optional |
| Contaminated or frozen material | 3.5.2 | Each Lift |

SPECIFICATION / SECTION PLAN

FOR: Performance of Excavation, Backfill, Filling, and Grading
 Limestone Electric Generating Station
 PROJECT

9000001-2
 SPEC. NUMBER

R2
 REVISION

| ITEM + WITNESS POINT | SPEC. SECTION | FREQUENCY |
|--|------------------|-------------|
| Compaction requirements | 3.5.3 | Refer 4.2.2 |
| SPECIAL RANDOM FILL, PLACING & COMPACTING | | |
| Total requirements | 3.6 | 4.2 & 4.3 |
| SPOIL FILL, PLACEMENT & COMPACTION | | |
| Total requirements | 3.7 | Optional |
| EROSION & SEDIMENT CONTROL | 3.8 | Optional |
| CERTIFICATE OF COMPLIANCE | 3.9 | NA |
| PRODUCTION TESTING | | |
| Field testing requirements | 4.1 | 4.2 & 4.3 |
| In place density testing requirements | 4.2 | 4.2 & 4.3 |
| Density test correlations & tolerances | 4.2.1 | 4.2.1 |
| Density test frequencies | 4.2.2 | 4.2.2 |
| Moisture test method | 4.3.1 | 4.3.3 |
| Use of speedy moisture tester | 4.3.2 | 4.3.2 |
| Alternate moisture test & tolerance | 4.3.3 | 4.2 |
| Moisture check test frequency | 4.3.4 | 4.3.4 |
| Note #1: Subparts 2.3.1, 2.3.2, 2.3.3, 2.3.5 and 2.3.7 are executed for initial classification of soils. The above stated requirements are repeated at the inspectors discretion for validation as required. | | |

SPECIFICATION SECTION PLAN

FOR: Performance of Excavation, Backfill,
 Filling, and Grading
 Limestone Electric Generating Station
 PROJECT

9000001-2
 SPEC. NUMBER

R2
 REVISION

| ITEM * HOLD POINT + WITNESS POINT | SPEC. SECTION | FREQUENCY |
|--|------------------|-----------|
| Note #2: See attached site prep drawing and letter of clarification on sand cone vs nuclear guage correlation tolerance. | | |
| Note #3: See attached site prep drawing and memo clarifying entrance road compaction requirements. | | |
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ATTACHMENT B

CIVIL DESIGN CRITERIA CDC-1 SITE IMPROVEMENTS

HOUSTON LIGHTING & POWER COMPANY
LIMESTONE ELECTRIC GENERATING STATION
UNIT 1, 750 MW 1985 INSTALLATION
UNIT 2, 750 MW 1986 EXTENSION

CIVIL DESIGN CRITERIA

CDC-1

SITE IMPROVEMENTS

| <u>Status</u> | <u>Date</u> | <u>Prepared By</u> | <u>Reviewed By</u> | <u>Pages Affected</u> |
|---------------|-------------|-----------------------|---------------------|-----------------------|
| Original | 1/23/80 | W Broderick <i>WB</i> | A A Toth <i>aat</i> | |
| R1 | 4/5/85 | R Sullivan <i>RS</i> | R Kapadia <i>RK</i> | |
| R2 | | | | |
| R3 | | | | |
| R4 | | | | |

EBASCO SERVICES INCORPORATED
NEW YORK, NEW YORK

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1.0 SITE IMPROVEMENTS

1.1 General Plant Description

The plant site is located in Limestone County, Texas, approximately 130 miles NNW of Houston. It is a two unit installation for the Limestone Electric Generating Station of the Houston Lighting & Power Company.

The plant grade for this site is established at 450.0 feet above sea level. The ground level and contours in the vicinity of the plant site are shown on U.S. Geological Survey Map (Farrar, Texas Quad Sheet) with the scale of 1:24000. The site is underlain by the Calvert Bluff Formation of the Wilcox Group. This formation consists primarily of fine grained alluvial sediments ranging from medium sand to clay.

A well water system provides cycle makeup and supply for the potable water system. Wells are provided by HL&P. Cooling tower makeup is pumped with Lake Limestone, located approximately seven miles away by pipeline to the plant.

Lignite fuel is delivered to the plant from the mine area by overland conveyor. Provisions will also be designed for future truck delivery.

On site storage of bottom ash and scrubber sludge is provided. Ash pond and stabilized sludge areas are designed for a 35 year ultimate storage capacity including dikes and staged development per the requirements of CDC-13.

R1

1.2 Site Plan

a) Site Plan drawing M-101609 is developed by Civil in concert with Project's development of the Enlarged Site and Plot Plans described below. This Site Plan drawing shows the overall site including the following at a scale of 1"=800':

- Property acquisition line
- Contour lines (topography)
- Location of make-up (M-U) Water Intake at Lake Limestone
- Routing of the M-U water pipe line from Lake Limestone to plant
- Transmission Line Routing
- Location of Northerly limits of lignite deposits
- Routing and interface point between plant and mainline for railroad

1.0 SITE IMPROVEMENTS (Cont'd)

1.2 Site Plan (Cont'd)

b) Enlarged Site Plan - Plant area drawing M-001600 developed by Projects covers the main arrangement features for areas of proximity to the main plant and includes the following at a scale of 1"=600':

- Property limits
- Wind Rose
- Overall plant arrangement
- True North & Texas Grid North
- Coordinates of Plant Reference Lines & Base Lines
- General location of plant buildings, liquid storage areas, cooling towers, lignite storage piles and waste disposal areas.

1.3 Plot Plan

The plot plan drawing M-001601 developed by Projects shows the plant layout within the confines of the property lines to a larger scale and in greater detail than the site plan drawings. The plot drawing includes:

- A scale of 1"-100', showing a more prominent plan of the plan complex including all components and buildings and their relation to each other
- Space to be allocated for future use in the vicinity of the new plant
- Access roads and railroads in the vicinity of the plant
- Grid coordinates of the steam generator and turbine
- Tie-in to column line locations of the main structures with the site coordinates
- Circulating water and make-up water piping in the cooling tower and main plant vicinity
- Lignite storage and handling facilities
- Limestone unloading, storage and handling facilities
- Solid waste handling and disposal facilities

R1

1.0 SITE IMPROVEMENTS (Cont'd)

1.4 General Improvements

General improvements to the plant site include the work of clearing, grubbing, excavation, backfilling, grading, drainage, and erosion and sediment control. Also included are the construction of access roads, railroads, walks, parking facilities, dams, dikes, embankments, and foundation preparation. The site plan and plot plan drawings described above, provide the basis for developing the requirements and extent of the site improvement work.

R1

2.0 DESIGN BASIS

2.1 Clearing and Grubbing

"Clearing" includes the cutting of all trees to within one (1) foot of the groundline and the disposal of the trees, limbs, branches, slash, deadfalls, wood fencing, wood structures and other debris or encumbrances present in the areas to be cleared that are free to float. "Clearing and grubbing" includes the complete removal and disposal of all standing trees including their root systems, all brush, bushes, shrubs, stumps, vines, and their root systems, logs, trees cut by others, wood fencing, wood structures, debris rubbish or encumbrances that are free to float.

The clearing and grubbing drawing shows the exact limits for "clearing", and "clearing and grubbing", based on the site and plot plans and on construction requirements.

Clearing and grubbing must comply with all Federal and State laws and local ordinances including those concerning disposal of materials. Erosion and sediment control is provided.

2.2 Excavation and Backfill

The work of excavation, backfill, filling and grading includes:

- a) the removal and storage or disposal of all earth, sand, gravel, rock, boulders, debris and other materials at stockpile locations or in spoil areas;
- b) erecting and maintaining substantial barricades around excavations where required for safety;
- c) backfilling of all unauthorized overexcavations
- d) care and removal of all surface water, rainwater and groundwater seeping or flowing into the excavations by means of ditching, damming, pumping or other suitable means;

2.0 DESIGN BASIS (Cont'd)

2.2 Excavation and Backfill (Cont'd)

- e) the foundation preparation in advance of concrete placement under the plant structures.

Equipment and services shall comply with all Federal and State laws, EPA requirements, and local ordinances. In addition, requirements are established for meeting or adhering to specified "Standard Specification" or "Tentative Specifications" of the American Society for Testing and Materials (ASTM). These include standards for the classification of soils as well in-place and laboratory density testing of soils.

The location and extent of the work to be done is illustrated on the appropriate excavation and backfill drawings.

2.3 Dewatering

The operation and maintenance of a temporary dewatering system is the contractor's responsibility if dewatering is required by the excavation and backfill requirements for this site. The general purpose of a dewatering system is to lower and control ground water levels and hydrostatic pressures to permit all excavation and construction to be performed in the dry.

2.4 Erosion and Sediment Control

Erosion and sediment control will be provided to limit the quantity and rate of discharge of turbid water into the streams and waterways at the site.

Permanent erosion control features are incorporated into the project at the start of construction. Temporary control measures are used to control erosion and sediment discharges that develop during normal construction practices but are not associated with permanent control features of the project.

2.5 Embankments, Dams, Dikes & Channels

The design of embankments, dams, dikes and channels for this plant is a function of site topography and soil characteristics. Stripping and preparation of embankment foundations and the placement of embankment material are described in the specifications and on the drawings.

2.0 DESIGN BASIS (Cont'd)

2.5 Embankments, Dams, Dikes, & Channels (Cont'd)

Fill material and placement techniques are established based on site conditions and structural requirements. Cut-off trenches are provided if applicable. Backfilling of impervious material is provided for if required.

Slope protection is provided on faces of all embankments, dams, dikes, and channels for protection of slopes against the action of wind, wave and erosion.

2.6 Plant Roads, Bridges, Walks, Parking

Roads are provided for plant access and construction access. A plant loop system of roads is provided around the main plant buildings. Access roads are provided to the major outlying structures such as the coal handling system, bottom ash pond, stabilized sludge area, circulating water system structures and other facilities. Walks adjacent to buildings are provided to serve the outside equipment.

Bridges or culverts are provided as necessary for access roads where the roads cross water or drainage facilities.

Adequate parking facilities for the operating staff, visitors, and other employees are provided, as required, in such areas as adjacent to the gate house, the service building, the coal crusher house, the coal unloading station as well as the control building.

The access roads and all loop roads for the plant are designed for H-20 truck loading in accordance with AASHTO standards and Ebasco design guides. Grades are limited to 6% maximum. Length of vertical curves are limited to 50 feet minimum. Horizontal curves are limited to centerline radii to 40 feet minimum.

2.7 Railroads

Permanent railroad tracks are provided from the existing main rail line to the plant area for delivery of lignite, limestone, materials, and equipment. Within the plant area, sidings are provided for lignite and limestone delivery stabilized sludge removal, maintenance and equipment delivery, service to light oil tanks and liquid chlorination tanks with the necessary bypass and cross-over tracks. Refer to Plot Plan Drawing No. HOU-3037-M-001601.

2.0 DESIGN BASIS (Cont'd)

2.7 Railroads (Cont'd)

Railroad lines are designed in accordance with AREA standards and Ebasco design guides. Grades are limited to 1% entering and 1.5% exiting the plant and curves are limited to a minimum radii of 410 feet unless local railroad criteria stipulate otherwise.

2.8 Drainage

The plant area is provided with two isolated drainage systems to handle contaminated and uncontaminated water. The contaminated drainage system handles liquid discharges from equipment and storage areas which might be contaminated with oil and/or chemicals. The uncontaminated drainage system provides for safe discharge of uncontaminated storm water.

Diversion ditches are provided around the bottom ash pond, the stabilized sludge area, and the main plant area to provide for safe dissipation of storm water from surrounding areas. The main plant area is also provided with a storm drainage system. No provision will be made to spill any water from the bottom ash impoundment during the operational life of the plant. Prior to abandonment of the bottom ash pond, after 35 years of operation, the bottom ash will be covered with top soil and seeded, and a spillway structure constructed to accommodate runoff after the recycling of water ceases. However, during the operational life of the pond an emergency overflow device will be provided to ensure structural stability of the embankment. This emergency overflow provision is designed to prevent overtopping due to a more severe rainfall intensity event than called for by operational design requirements.

The rainfall intensity for the plant area is based on a 25 year, 24 hour storm as defined in Weather Bureau Technical Paper No. 40. Emergency spillways for structures other than the bottom ash pond are designed for a more severe rainfall, 50 year, 24 hour storm. The "rational method" as outlined in Ebasco design guide is used for estimating runoff.

The storm drain lines are designed to run 75 percent full. The flow velocity in the storm drain lines is set for a maximum of 8 feet per second and a minimum of 3 feet per second. Catch basins or manholes are provided at changes in alignment or grade, at drain line junctions, and located so as not to exceed 300 feet.

Drainage ditches have a minimum slope of 0.002.

2.9 Fencing

Security fencing is provided around the main plant area and substation as shown on the Plot Plan. The perimeters of the plant area, the electrical substation, the ash pond, and stabilized sludge areas are provided with an 8 foot high chain link security fence with barbed wire arms. Gates for access are provided at roads, railroads, and walkways.

3.0 CONSTRUCTION FEATURES

3.1 Clearing and Grubbing

All "clearing", and "clearing and grubbing", and handling of debris proceeds in a manner that avoids interference with other work in progress. Extreme care is taken to preserve and avoid damage to trees, shrubs and other vegetative cover in areas outside the limits defined on the drawings. Any practical means for performing the work may be employed including such equipment as tractors and chains, bulldozers with brush hooks or rakes or ax and chain saw. Products of the "clearing", and "clearing and grubbing" work are completely and immediately disposed of. Adequate equipment and personnel for fire prevention and control are provided. All grubbing holes and depressions are backfilled, compacted and graded to conform to the surrounding ground contours.

3.2 Excavation and Backfill

All excavation is made in the order of progress required by the construction program. During the course of all excavation work, extreme care is exercised to preserve and avoid damage to trees, shrubs and all other vegetation which does not directly hamper work progress. Only approved access roads are used. The discharge into natural streams or ponds of gasoline, oil or any other waste material is prohibited.

Insofar as it is practicable, all suitable materials resulting from open-cut excavations shall be used for permanent construction. All waste or excess material is disposed of in a manner which will avoid the necessity of rehandling or the interference with other work.

The bottom excavations will be proof rolled prior to the initiation of backfill operations. The placement and compaction procedure of the various types of fill will be established to yield the required in-place densities. The backfill is compacted to a minimum of 95 percent of the maximum density obtained in the Modified Proctor Compaction Test (ASTM D-1557, Method C).

Control tests of densities and moisture contents will be made as the work progresses to assure that required densities and moisture content are being achieved. The soils control program assures that all controlled backfills comply with design requirements and specifications.

The soils control activities are performed primarily in four areas of the project. These four major areas are the borrow areas, stockpile area, the construction area and the soils in laboratory. The activities performed in each of these areas are integrated in accordance with the specifications. Records are maintained to provide quality assurance for the complete soils control program.

3.0 CONSTRUCTION FEATURES (Cont'd)

3.3 Dewatering

The dewatering system, if required for construction, shall achieve the following:

- a) minimize the disturbance to the foundation soils in the vicinity of the wells;
- b) the wells, screens, filters and pumps are surged and developed such that fines or sands being removed for the entire system are minimized; and
- c) upon completion of the dewatering requirements, the wells shall be completely grouted.

Observation wells (piezometers) are provided to monitor the elevation of the ground water and piezometric water levels continuously during operations. Provision for emergency flooding of excavations is required.

3.4 Erosion and Sediment Control

Every effort is made to minimize erosion from excavation and embankment construction operation by:

- a) the construction of temporary berms, dikes and diversion ditches;
- b) limiting the disturbance of natural areas to the absolute minimum required;
- c) implementing measures of erosion control described in the EPA publications EPA-R2-72-015 and EPA-62513-76-003 (See References); and
- d) sequencing of excavation and embankment construction to maintain natural traps on eroded material.

All slopes freshly excavated and shaped are raked along the contour lines. Slopes not shaped to final grade are also raked across the slopes if they are to be exposed for more than 24 hours. Slopes shaped to the final grade, as well as all disturbed areas to remain exposed during a period of critical erosion, are immediately protected by seeding and mulching.

3.5 Embankments, Dams, Dikes & Channels

Protection against flooding from storms and large flows in washes is provided for.

3.0 CONSTRUCTION FEATURES (Cont'd)

3.5 Embankments, Dams, Dikes & Channels

All soft or unstable material shall be excavated to establish a stable foundation. Upon completion of excavation and initial preparation the foundations will be inspected and mapped.

Operations affecting the materials and installation of the embankment dikes will be subject to quality assurance surveillance.

3.6 Plant Roads, Bridges, Walks, Parking

The main access roads are 24 feet wide with 6 foot wide shoulders. The plant loop roads and other access roads are 20 feet wide with 4 foot wide shoulders. The roads are built of reinforced concrete on a base of stabilized local soil. The base consists of a 6 inch base coarse of crushed aggregate on compacted and rolled subgrade. The roads are crowned approximately 2 inches for drainage.

Concrete and/or crushed stone walks 5 feet wide are provided in the vicinity of the building and equipment outside the main plant. The parking areas are surfaced with reinforced concrete.

3.7 Railroads

The railroads is constructed of crushed stone ballast 10 inches thick placed beneath the ties on the well compacted and rolled subgrade. The ties for the railroad track support are 6 inch x 8 inch x 8 feet - 6 inch wood treated by creosote petroleum solution. Track for all railroads are 115 pound AREA rail.

3.8 Drainage

All storm water runoff from within the coal storage and reclaimer area is drained to the contaminated waste water basin.

Concrete pits with grating are provided at the main and auxiliary transformers of sufficient capacity to retain all transformer oil. All storm water runoff collected in these pits is conveyed to the contaminated drainage system.

Concrete pipe is used for all storm drain lines. Unreinforced concrete pipe is used for drain lines up to 10 inches in diameter. Reinforced concrete pipe is used for drain lines 12 inches and over.

3.0 CONSTRUCTION FEATURES (Cont'd)

3.9 Fencing

Fabric and framing are of galvanized steel and are installed in accordance with industry standards. Line posts are spaced a maximum of 10 feet on centers. Pull posts and gate posts are installed as required.

4.0 REFERENCES

4.1 Codes and Standards

Equipment, services, material fabrication and testing will conform strictly to codes, specifications and standards as indicated. In general, the latest revision of the following codes and standards apply:

- a) Occupational Safety and Health Standards, OSHA Regulation 29 CFR Part 1910 (November 7, 1978);
- b) American Society for Testing Materials - ASTM
- c) American Concrete Institute (ACI) 318 "Building Code Requirements for Reinforced Concrete."

4.2 Guides and Criteria

Weather Bureau Technical Paper No. 40.

Ebasco Concrete - Hydraulic Design Guide.

Ebasco CDC-2, "Site Investigation, Excavation and Foundation Design Parameters", Project Identification No. HOU-3037-102200.

EPA-R2-72-015, "Guideline for Erosion and Sediment Control Planning and Implementation", August 1972.

EPA-62513-76-003, "Erosion and Sediment Control Surface Mining in the Eastern U.S., Volume 1 and 2", October 1976.

4.3 Ebasco Specifications

"Clearing and Grubbing", Project Identification No. HOU-3037-101400

"Subsurface Investigation & Drilling", Project Identification No. HOU-3037-102400

"Excavation & Backfill", Project Identification No. HOU-3037-102401

"Embankments, Dams, Dikes & Channels", Project Identification No. HOU-3037-102408

4.0 REFERENCES (Cont'd)

4.4 Reference Drawings

| | | |
|---|-----------------|----|
| Enlarged Site Plan - Plant Area | HOU-3037-001600 | R1 |
| Plot Plan | HOU-3037-001601 | |
| Grading | HOU-3037-101600 | |
| Drainage | HOU-3037-101602 | |
| Paving Plan | HOU-3037-101603 | |
| Plant Roads | HOU-3037-101604 | |
| Railroads & Unloading Areas | HOU-3037-101605 | |
| Erosion & Sediment Control, Plans & Sect. | HOU-3037-101606 | |
| Erosion & Sediment Control, Settling Pond | HOU-3037-101607 | |
| Erosion & Sediment Control, Inlet & Discharge | HOU-3037-101608 | |
| Site Plan | HOU-3037-101609 | R1 |
| Holding Basin Area Roads, Grading & Drainage | HOU-3037-101610 | |
| Holding Basin Infl. & Distrib. Struc. M & R | HOU-3037-101611 | |
| Holding Basin Area Excavation Plan | HOU-3037-101612 | |
| Coal Pile Seepage Control | HOU-3037-101620 | |
| Foundation Investigation - Profiles | HOU-3037-102605 | |
| Boring Plan | HOU-3037-102610 | |
| Excavation & Backfill | HOU-3037-102620 | |
| Manholes & Trenches | HOU-3037-102625 | |



ATTACHMENT C

CIVIL DESIGN CRITERIA CDC-2 SITE INVESTIGATIONS, EXCAVATION, AND FOUNDATION DESIGN PARAMETERS

Project Identification

No. HOU-3037-102200

HOUSTON LIGHTING & POWER COMPANY
LIMESTONE ELECTRIC GENERATING STATION
UNIT 1, 750 MW 1985 INSTALLATION
UNIT 2, 750 MW 1986 EXTENSION

CIVIL DESIGN CRITERIA

CDC - 2

SITE INVESTIGATIONS, EXCAVATION,
AND FOUNDATION DESIGN PARAMETERS

| <u>Status</u> | <u>Date</u> | <u>Prepared By</u> | <u>Reviewed By</u> | <u>Pages Affected</u> |
|---------------|-------------|-----------------------|---------------------|-----------------------|
| Original | 2/28/80 | W Broderick | A A Toth <i>pat</i> | |
| R1 | 1/22/81 | D Broderick <i>DB</i> | A A Toth <i>pat</i> | 1,2,4,5,6,7 |

EBASCO SERVICES INCORPORATED
NEW YORK, NEW YORK

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1.0 GENERAL DESCRIPTION

At the beginning of a project, a subsurface investigation program is designed to evaluate the proposed power plant site in relation to the soil and/or rock materials which are present and what properties they possess. This knowledge is gained partly by reference to geologic and engineering literature, but mainly by extracting, examining, and testing representative samples.

The site investigation program, then, consists of drilling borings and obtaining soil and/or rock samples. Based on the information obtained from the boring logs and the laboratory testing of selected samples, foundation profiles are developed under all plant related structures including main plant structures, coal storage and handling facilities, solid waste disposal areas, and cooling tower basins. The design data required for plant grading, foundation type, slope stability analysis, seepage analysis, embankment design, and borrow area definition is developed.

2.0 DESIGN BASIS

2.1 Subsurface Investigations

The subsurface investigation is performed in two phases. Phase One is a preliminary exploration program while Phase Two is a more detailed boring and sampling program. Each phase includes field and laboratory testing for classification and strength determinations of in-situ materials.

2.1.1 Preliminary Exploration

The program is preceded by a fact-finding survey to determine available information on soil conditions near the site and on the behavior of other structures in the vicinity. This includes, but is not limited to, maps and publications of state and federal geological surveys or reports of soil surveys prepared in connection with agriculture or highway construction, technical journals and published reports.

The boring program consists of 10 to 20 borings in the main plant area and 30 to 40 borings in the remaining areas on the site, depending on the extent of the solid waste disposal area requirements.

Most soil deposits can be appropriately explored by means of a split-barrel sampler and standard penetration tests carried out in holes made by wash-boring methods. The properties of fairly uniform deposits of soft clay and plastic silt are investigated by field vane tests or by obtaining continuous samples in thin-walled tubes and performing appropriate laboratory tests. Erratic deposits are examined by means of standard penetration tests combined with enough tube borings to permit interpretation of the penetrometer data. Standard penetration tests are appropriate for sands. Rotary or percussion core barrels are normally used to sample rock, and special peat samplers are available for highly organic deposits.

2.0 DESIGN BASIS (Cont'd)

2.1 Subsurface Investigations (Cont'd)

2.1.1 Preliminary Exploration (Cont'd)

The boring logs show pertinent data, such as soil classifications, standard penetration blow counts, and ground water elevations, as observed during drilling operations. Samples are also taken in the bedrock. The core recovery and Rock Quality Designation (RQD) values are shown on the boring logs.

This phase of investigation program also includes the development of generalized geologic conditions, topographic surveys, including aerial photographs and detailed contour maps.

The information obtained from the Phase One boring program is utilized to assess general characteristics of various strata and to determine siting of the plant structures, solid waste disposal areas, and other facilities. Possible borrow area locations are also identified.

R1

2.1.2 Detailed Exploration

The detailed subsurface investigation program includes borings at the location of all the major plant structures, the coal storage and coal handling areas, the solid waste disposal areas and the make-up water pipeline corridor. The drilling and sampling techniques employed during Phase Two are similar to that developed during Phase One.

R1

The Phase Two drilling and soil sampling program more fully defines the various strata, groundwater information and quality of deposits. It establishes the location and extent of borrow areas for the various soils used in embankments, determines strength and settlement properties, and established permeability values for in-situ and recompacted soils.

If the borings encounter rock and the conditions are such that the structures may be founded on rock, cores are obtained to make sure that sound bedrock, rather than a boulder or a piece of detached rock, has been reached. If there is evidence of solution channels or deep weathering, the cores should be continued into sound bedrock.

As the exploratory program develops, it may be advisable to obtain large-diameter undisturbed samples from critical strata, to conduct load tests, to construct test pits, to make field pumping tests or to conduct other special tests.

Sufficient data should be obtained to permit consideration of various practical foundation types and for the possibility that there may be changes in preliminary structural layouts, including column spacing and loadings.

2.0 DESIGN BASIS (Cont'd)

2.1 Subsurface Investigations (Cont'd)

2.1.3 Laboratory Tests

The laboratory tests performed on representative undisturbed and recompact samples include but is not limited to:

- classification tests, such as water content, grain size analysis, Atterberg limits, specific gravity, void ratio and density;
- permeability;
- relative density;
- strength determinations, such as unconfined compression, direct shear and triaxial shear;
- and consolidation.

2.2 Foundations

Based on subsurface investigation data, a technical and economic evaluation is performed to determine the type of foundation to be used for the plant. The normal approach to foundation determination for the plant structures is to select a single type of foundation concept for each site. However, based on economic evaluations, different types of foundations for the various structures may also be considered.

The following types of foundations are considered:

- pile foundations with individual pile caps;
- mat foundations on controlled compacted backfill;
- mat foundations on in-situ soils;
- mat foundations on piles;
- individual spread footings on controlled compacted backfill;
- individual spread footings on in-situ soils
- concrete caissons.

The principal considerations in designing pile foundations are:

- the probable relative depths, characters, consistencies and load carrying capabilities of the various strata.

2.0 DESIGN BASIS (Cont'd)

2.2 Foundations (Cont'd)

- Selection studies, by means of an adequate dynamic pile-driving formula, for suitable types of piles and driving equipment.
- A study of the static-friction values required to be developed, in the strata selected for load carrying, based on the embedded surface areas of pile.

If a pile foundation is selected, the type of piling and its load carrying capacity is verified by a pile test program. The types of piles considered are: step tapered piles; tube piles and mandrel piles.

R1

The principal considerations in designing plant structures supported by controlled compacted backfill are: deep-seated settlement; placement; and compaction of the fill.

In general, the maximum allowable bearing capacity specified for the plant structures is 4,000 lbs/sq ft (psf) for dead plus live load and 6,000 psf for dead plus live plus wind (or earthquake) loads.

2.3 Dams, Dikes and Embankments

Stability must be considered in the design of all earth structures. The factors which affect slope stability include failure criteria, plant geometry, non-homogeneity of soil layers, tension cracks, dynamic loading or earthquakes, and seepage flow.

The slopes for all embankments are analyzed using both the slip circle analysis and the Army Corps of Engineers sliding wedge analysis. Allowable factors of safety range from 1.0 to 1.5 depending upon design conditions.

2.0 DESIGN BASIS (Cont'd)

2.3 Dams, Dikes and Embankments (Cont'd)

Seepage from the solid waste disposal areas is controlled by encapsulating all bottom ash in an impervious layer of stabilized sludge. The seepage is modeled using horizontal and vertical flow nets. Seepage from the pond is controlled to meet the criteria of the State agency responsible for review and approval of the plant ash pond. | R1

3.0 CONSTRUCTION FEATURES

3.1 Foundations

The foundations for most plant structures are established below the surface of the selected plant grade. The natural terrain is first cleared and grubbed, then cut and backfilled, as required, to the design foundation grades. Shallow excavations can be made without supporting the surrounding material if there is adequate space to establish slopes at which the material can stand. The steepness of the slope is a function of the type and character of the soil or rock, the climatic and weather conditions, the depth of the excavation, and the length of time it must remain open. Sheet piling and bracing may be required in certain areas and conditions where vertical cuts are inappropriate.

When the depth of excavation is greater than the distance to the free water surface in a pervious soil having a coefficient of permeability greater than about 10^{-3} cm/sec, the soil must be drained to permit construction of foundations in the dry. If the coefficient of permeability of the soil is within the range of 10^{-3} to 10^{-5} cm/sec, the quantity of water that seeps into the excavation may be inconsequential but drainage may still be required to maintain the stability of the sides and bottom of the excavation. If the coefficient of permeability is smaller than about 10^{-7} cm/sec, the soil is likely to possess sufficient cohesion to overcome the influence of the seepage forces and major drainage may not be required.

The most suitable materials for backfilling are well-graded sands and gravels, possibly containing a small percentage of fines. However, most inorganic soils are acceptable with the exception of highly plastic swelling clays and clays at natural moisture contents well above the Standard Proctor optimum in localities where the climatic conditions preclude drying by manipulation and exposure to the atmosphere. Cohesionless silts and very fine uniform sands are also undesirable because they are difficult to compact.

Fill is placed in layers, not thicker than 12 inches after compaction and compacted to 95 percent of the maximum Modified Proctor density by equipment suited to the type of soil. The placement moisture content should be close to the optimum value corresponding to the type of soil and compaction procedures being used. In-situ soils are to be proof-rolled prior to placement of fill or construction of foundations.

3.0 CONSTRUCTION FEATURES (Cont'd)

3.1 Foundations (Cont'd)

Exterior footings must be carried below the frost level. Footings, piles, piers must be carried into the fill or the natural ground until adequate support was found. In the case of pile foundations, a pile load test will be conducted.

3.2 Dams, Dikes and Embankments

The solid waste disposal area embankments are constructed from flue gas desulfurization sludge mixed with fly ash to form stabilized sludge. The design of the solid waste disposal area embankments are in compliance with the published regulatory requirements and codes.

R1

The embankment slopes are designed and constructed as a function of stability and material requirements. The required soil compaction criteria for dams, dikes, and embankments is 95 percent of the maximum Standard Proctor density. All exposed slopes are covered with topsoil and seeded to provide erosion protection. Additional slope protection is provided if required, based on the wave run-up analysis.

A monitoring program is established to measure settlement, seepage horizontal movement, groundwater levels and quality. Data is obtained before the start of construction, during construction, and during plant operation.

In zoned embankments, the impervious core or liner, required for seepage control, is generally constructed from the soils obtained at the site, however, in some cases, synthetic material liners are also used. The impervious core or liner is adequately tied into an impervious in-situ clay strata or treated impervious strata which covers the entire pond area.

4.0 REFERENCES

4.1 Codes and Standards

American Society for Testing and Materials (ASTM)

4.2 Ebasco Specifications

HL&P No.

| | |
|-------------------------------------|-----------------|
| Clearing & Grubbing | HOU-3037-101400 |
| Subsurface Investigation & Drilling | HOU-3037-102400 |
| Excavation & Backfill | HOU-3037-102401 |
| Solid Waste Disposal System | HOU-3037-102408 |
| Pile Test Program | HOU-3037-102410 |
| Piling | HOU-3037-102412 |

|R1

ATTACHMENT D

HISTORICAL DESIGN DRAWINGS

| Item | Drawing Number | Title | Revision |
|------|-----------------------|--|----------|
| 1 | HOU-3037 M-113620 S03 | Solid Waste Disposal Area Sludge Stabilization Facility Roads, Paving & Drainage – Plan | 6 |
| 2 | HOU-3037 M-113620 S05 | Solid Waste Disposal Area Sludge Stabilization Facility Drainage – Sects & Dets | 7 |
| 3 | HOU-3037 M-113621 S01 | Solid Waste Disposal Area Runoff Pond- Area 1 Plan, Sect, & Dets Sh. 1 | 4 |
| 4 | HOU-3037 M-113621 S02 | Solid Waste Disposal Area Runoff Pond- Area 1 Plan, Sect, & Dets Sh. 2 | 3 |
| 5 | HOU-3037 M-113621 S03 | Solid Waste Disposal Area Dewatered Sludge Solids Disposal Area & Runoff Pond – Plan & Sect. | 3 |
| 6 | HOU-3037 M-113621 S04 | Solid Waste Disposal Area Drainage Structures Stilling Basins – Plans & Sects – M & R | 1 |
| 7 | HOU-3037 M-113621 S05 | Solid Waste Disposal Area Drainage Structures Headwalls – Plans & Sects – M & R | 1 |
| 8 | HOU-3037 M-113621 S06 | Solid Waste Disposal Area 002 Pond Pump Foundation Plan, Sections & Details | 1 |
| 9 | HOU-3037 M-049600 S30 | Yard Piping Sheet No. 30 | 8 |
| 10 | HEP-14037 | S.W.D.A. Dewatered Sludge Solids Disposal Area & Runoff Pond Initial Grading Sect. 1 | -- |
| 11 | SK-DZ1 | Solid Waste Disposal Area Emergency Pond Liner Repairs | B |
| 12 | -- | 002 Pond Embankment Project As-Built | -- |

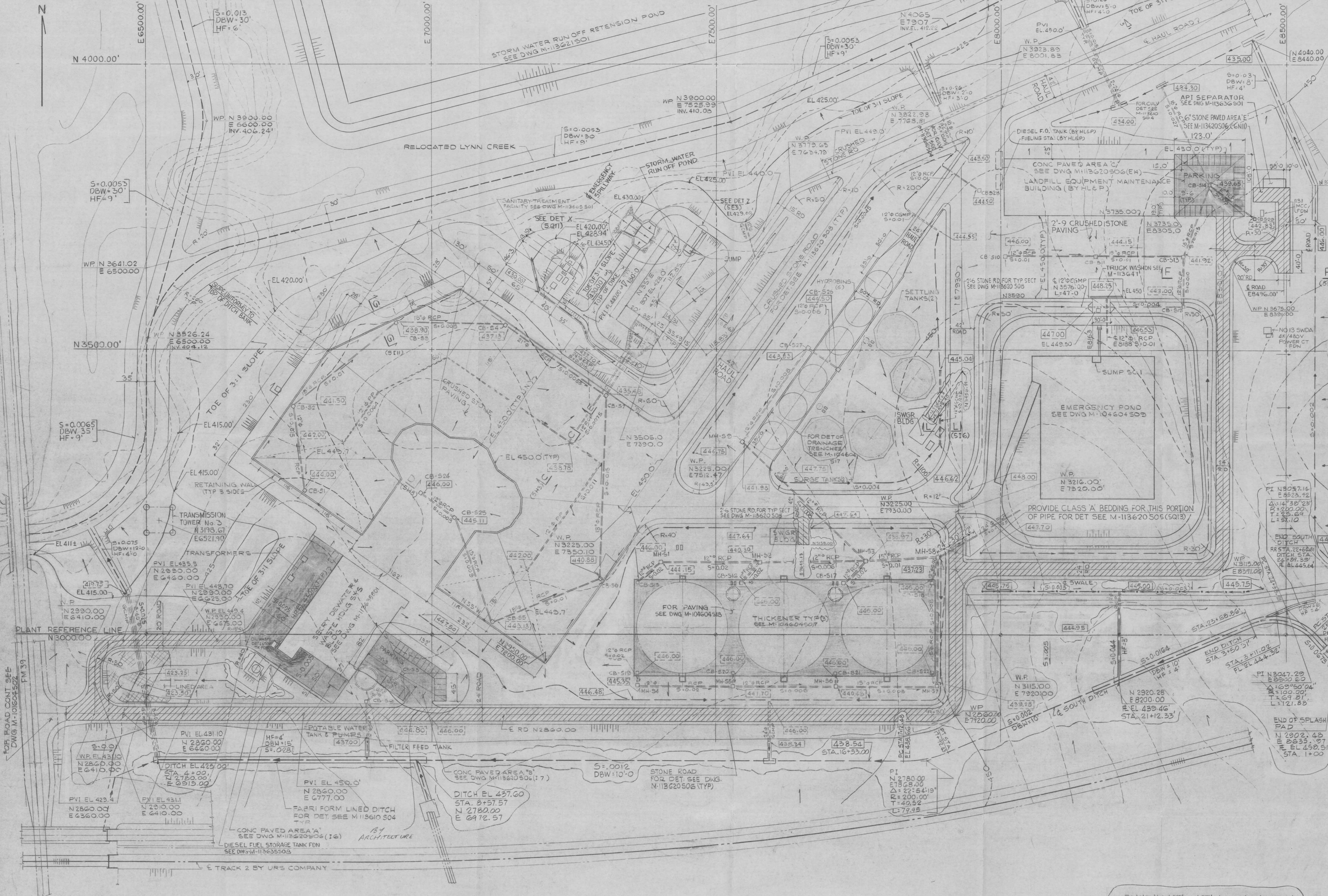
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|----|----------|----------|------|-----|-------------|
| 1 | 7-21-84 | | PSH | HM | [Signature] |
| 2 | 12-27-84 | | B.F. | SKB | [Signature] |
| 3 | 5-14-85 | | PSH | HM | [Signature] |
| 4 | 6-29-85 | | BF | SKB | [Signature] |
| 5 | 12-9-85 | | HM | SKB | [Signature] |
| 6 | 12-14-85 | | PSH | HM | [Signature] |

NOTES
 FOR QUANTITIES SEE M-113620 S05 & S06
 FOR ROADS AND CONCRETE PAVING SEE NOTES ON DWG M-101604 S01.
 ALL VERTICAL CURVES FOR ROADS TO BE 100' LONG. GEODETIC EL 450.00 CORRESPONDS TO PLANT REFERENCE EL 100.00.
 TOP OF DITCH BANK TO BE AT LEAST 1'-0" ABOVE TOP OF FABRIFORM LINING (HF).
 [Symbol] DENOTES 6" CRUSHED STONE ROAD OR PAVING
 [Symbol] DENOTES CONCRETE PAVING
 FOR HAUL ROAD DUST CONTROL PAVING SEE M-113620 S07 FOR GRADING NOTES SEE DWG M-113600 S04 FOR DRAINAGE NOTES SEE DWG M-101600 S01

REFERENCE DRAWINGS:

| | |
|--|--------------|
| BAR BENDING SCHEDULE | B-148620-130 |
| ENLARGED SITE PLAN PLANT AREA (MECH) | M-001600 |
| PLOT PLAN SH 3 (MECH) | M-001601 S03 |
| GRADING & DRAINAGE - GENERAL PLAN | M-101600 S01 |
| GRADING & DRAINAGE - PLANT AREA | M-101600 S02 |
| SECTS & DETS SH 1 | M-101602 S01 |
| ROADS - PLAN | M-101604 S01 |
| SITE PLAN | M-101603 |
| SWDA - GRADING PLAN | M-113600 S04 |
| SWDA - DRAINAGE PLAN | M-113600 S03 |
| SWDA - RAILROAD SPUR PLAN SECTS & DETS | M-113620 S04 |
| SWDA - SLUDGE STABILIZATION FACILITY DRAINAGE - SECTS & DETS | M-113620 S05 |
| SWDA - SLUDGE STABILIZATION FACILITY ROADS AND PAVING - PLAN, SECTS & DETS | M-113620 S06 |
| SWDA - HAUL ROADS PLAN | M-113620 S07 |
| SWDA - HAUL ROAD SECTS & DETS | M-113620 S08 |
| SWDA - RUNOFF POND AREA 1 PLAN, SECTS & DETS | M-113621 S01 |
| SWDA - DEWATERED SLUDGE SOLIDS DISPOSAL AREA - PLAN SECTS & DETS | M-113621 S03 |
| AQCS SWDA DRAINAGE TRENCHES PLAN SECTS & DETS | M-104604 S17 |
| SWDA DRAINAGE SECT & DET SH 1 | M-113610 S04 |
| SWDA SECONDARY DEWATERING & WASTE HANDLING SYSTEM SH 1 | M-113635 S01 |
| AQCS - SWDA THICKENER FOUNDATION SH 1 | M-104604 S01 |
| SWDA - SANITARY TREATMENT FACILITY | M-113605 S01 |
| SWDA - API SEPARATOR - MASONRY | M-113636 S01 |
| SWDA - API SEPARATOR AREA MISC EQUIP FNS | M-113636 S03 |
| SWDA - STORM WATER RUN OFF POND STACK AREA SUMP STRUCTURE | M-113622 S01 |
| AQCS SWDA THICKENER AREA PAVING PLAN, SECTS & DETAILS | M-104604 S18 |
| HYDROBIN SWGR BLDG - PLAN & SECT (HVAC) | M-057789 |

ALL WORK BY SWDA FDN CONTRACTOR EXCEPT AS NOTED



PLAN - SLUDGE STABILIZATION FACILITY

| NO | DATE | REVISION | BY | CH | APPROVED |
|----|--------|----------|----|-----|-------------|
| 7 | 5-7-84 | | VP | SKB | [Signature] |

REVISIONS:
 1. (12-15) DRAINAGE DITCH;
 2. (14) TANK LOC. & GRADING; (14-11) GRADING & DRAINAGE DITCHES;
 3. (15, 17, 18) DITCH EL & SLOPE; ADD: (13, 16) NOTES;
 DEL: (12) CATCH BASIN;
 TRANSFER REVISION TO HLP

| | | | | | |
|----|--------|----------------------|-------------|-------------|-------------|
| NO | DATE | REVISION | BY | CH | APPROVED |
| 8 | 5-1-85 | ADDTL. ROADS INCORP. | [Signature] | [Signature] | [Signature] |

WORK THIS DWG WITH DWGS M-113610 S03, M-113620 S03 & M-113620 S06.

HOUSTON LIGHTING & POWER CO.
 LIMESTONE ELECTRIC GENERATING STATION
 UNIT 1, 750 MW 1985 INSTALLATION
 UNIT 2, 750 MW 1986 EXTENSION

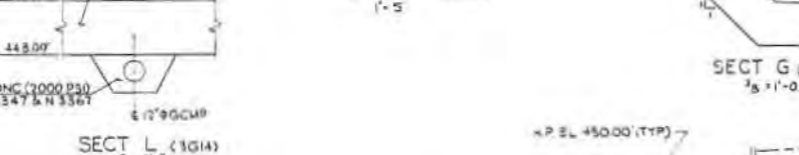
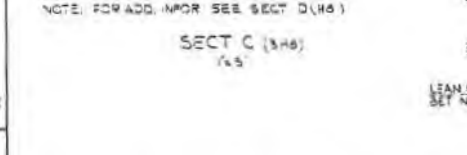
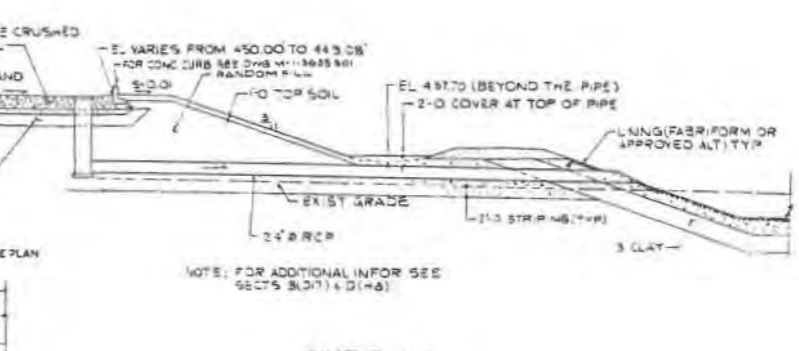
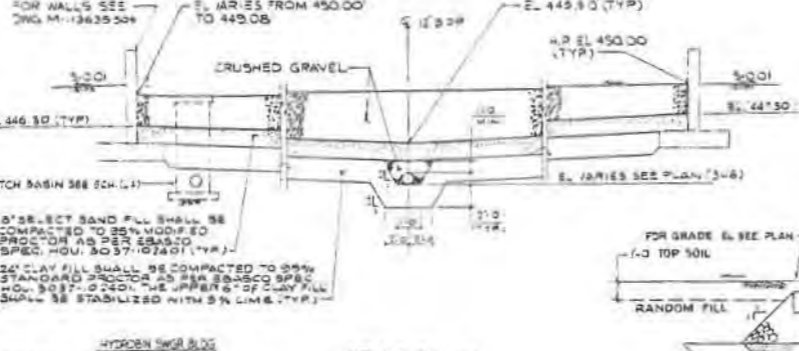
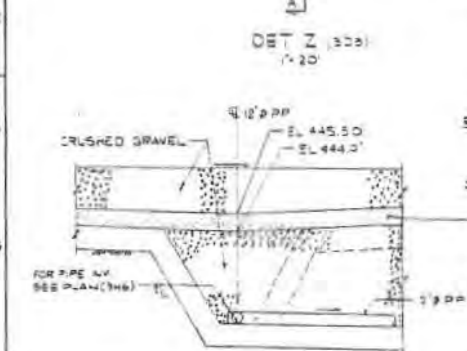
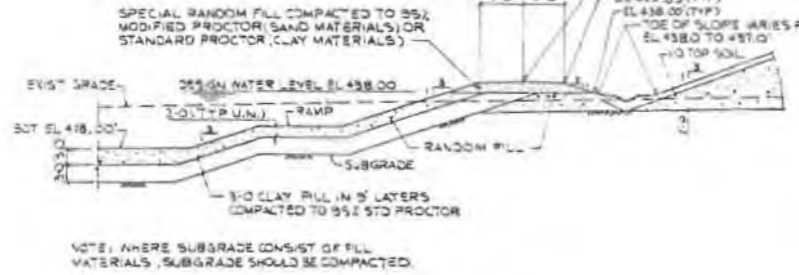
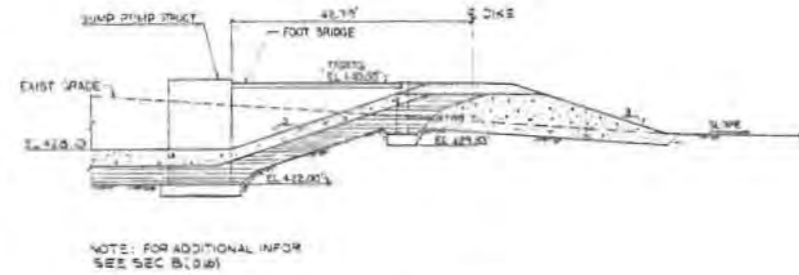
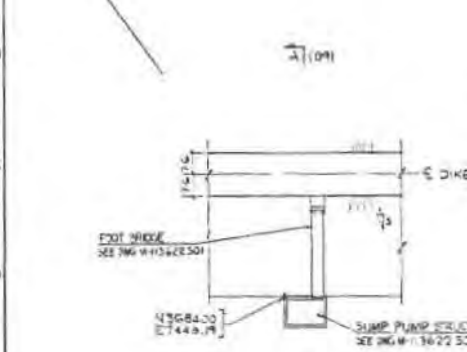
SOLID WASTE DISPOSAL AREA
 SLUDGE STABILIZATION FACILITY
 ROADS, PAVING & DRAINAGE - PLAN

EBASCO SERVICES INCORPORATED

| | | | | |
|-------|--------------|-------------|------|--------|
| SCALE | 1" = 60' | APPROVED | DATE | 6/1/85 |
| DIV | CIVIL | [Signature] | | |
| DR | PAVING, POND | [Signature] | | |
| CH | P.S. HUNG | SKB | | |

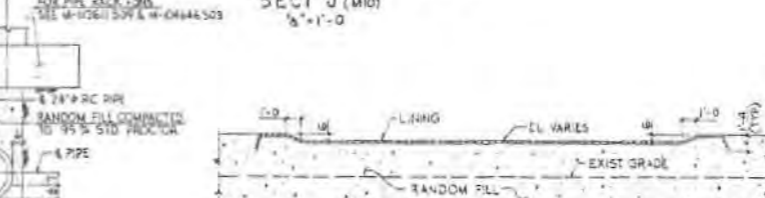
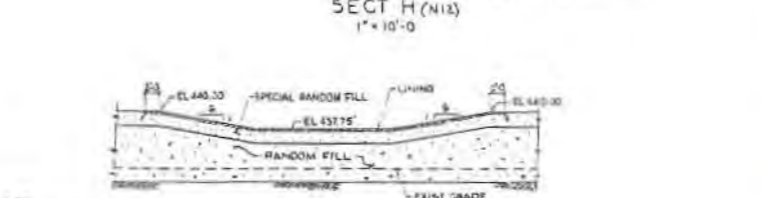
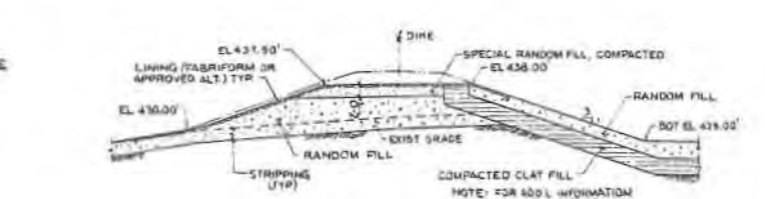
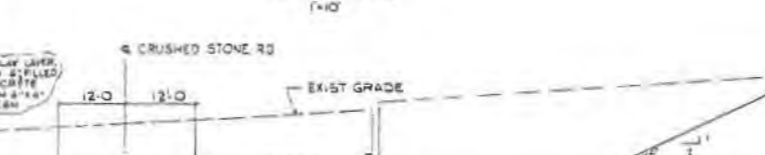
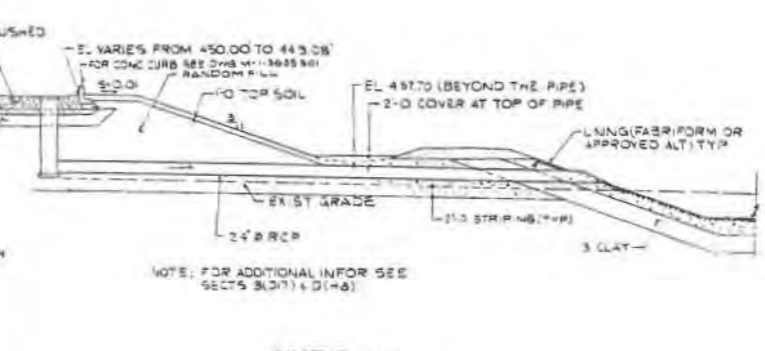
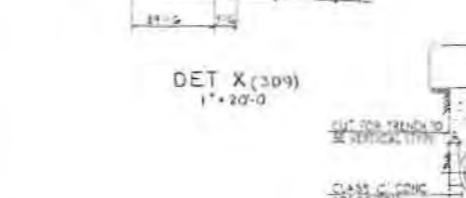
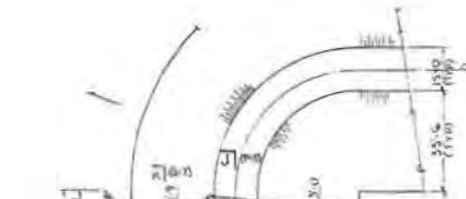
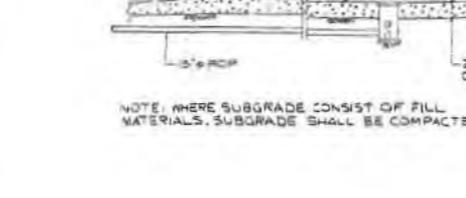
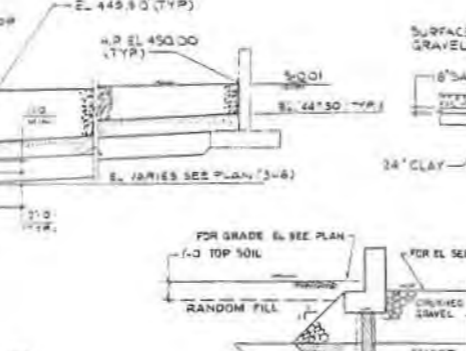
HOU-3037
 M-113620 S03

| NO | DATE | REVISION | BY | CH | APPROVED |
|----|---------|----------|----|-----|-------------|
| 1 | 7-24-84 | | PK | SKB | [Signature] |
| 2 | 8-1-84 | | PK | SKB | [Signature] |
| 3 | 8-1-84 | | PK | SKB | [Signature] |
| 4 | 8-1-84 | | PK | SKB | [Signature] |
| 5 | 8-1-84 | | PK | SKB | [Signature] |
| 6 | 8-1-84 | | PK | SKB | [Signature] |



| MARK | TYPE | N.P. LOCATION NORTH | EAST | FRAME COVER TYPE | DEPTH | BASE | R/C PIPE DIA | REINFORCING BARS | REMARKS |
|---------|------|---------------------|---------|------------------|--------|--------|--------------|------------------|-----------------------|
| CB-5-1 | 1 | 3246.02 | 6708.10 | A | 449.00 | 6.67 | 44.83 | 16" 5'-0" | |
| CB-5-2 | 1 | 3200.39 | 6757.37 | | | 6.67 | 439.83 | 8'-0" | |
| CB-5-3 | 1 | 3553.50 | 6943.46 | | | 2.67 | 433.83 | 12'-0" | |
| CB-5-4 | 1 | 3549.85 | 7156.39 | | | 4.67 | 433.83 | 14'-0" | |
| CB-5-5 | 1 | 3070.63 | 7107.85 | | | 6.67 | 439.83 | 8'-0" | |
| CB-5-6 | 1 | 3096.22 | 7296.28 | | | 10.67 | 437.83 | 16" 6'-0" | |
| CB-5-7 | 1 | 3476.53 | 7312.71 | | | 4.02 | 434.73 | | 20-AC4017b 36-AC4017b |
| CB-5-8 | 1 | 2930.00 | 6950.00 | | | 6.67 | 443.83 | 16" 5'-0" | |
| CB-5-9 | 1 | 1381.00 | 6888.00 | | | 449.00 | 6.57 | 441.83 | 6'-0" |
| CB-5-10 | 1 | 3462.00 | 5007.00 | | | 149.00 | 6.57 | 444.00 | 4'-0" |
| CB-5-11 | 1 | 3662.00 | 5161.00 | | | 5.57 | 442.00 | 5'-0" | |
| CB-5-12 | 1 | 3575.00 | 6320.00 | | | 446.00 | 4.67 | 440.00 | 4'-0" |
| CB-5-13 | 1 | 3461.00 | 6118.00 | | | 449.00 | 2.67 | 430.00 | 5'-0" |
| CB-5-14 | 1 | 3790.00 | 6146.00 | | | 449.00 | 10.67 | 435.00 | 12'-0" |
| CB-5-15 | 1 | 1083.00 | 7359.00 | | | 449.00 | 4.67 | 443.83 | 8'-0" |
| CB-5-16 | 1 | 3073.00 | 7544.00 | | | | | | |
| CB-5-17 | 1 | 3073.00 | 7724.00 | | | | | | |
| CB-5-18 | 1 | 1093.00 | 7581.00 | | | | | | |
| CB-5-19 | 1 | 2930.00 | 7359.00 | | | | | | |
| CB-5-20 | 1 | 1930.00 | 7930.00 | | | | | | |
| CB-5-21 | 1 | 2930.00 | 7710.00 | | | | | | |
| CB-5-22 | 1 | 1930.00 | 7561.00 | | | 449.00 | | 443.83 | |
| CB-5-23 | 1 | 3075.00 | 6300.00 | | | 447.19 | | 442.00 | |
| CB-5-24 | 1 | 1380.00 | 6950.00 | | | 449.00 | 4.67 | 444.73 | 4'-0" |
| CB-5-25 | 1 | 1208.00 | 7041.00 | | | 449.00 | 4.67 | 442.73 | 8'-0" |
| CB-5-26 | 1 | 1463.12 | 7710.92 | | | 448.83 | 4.67 | 441.66 | 4'-0" |
| CB-5-27 | 1 | 1496.22 | 7659.66 | | | 446.73 | 4.67 | 441.56 | 4'-0" |
| CB-5-28 | 1 | 3750.00 | 7960.00 | | | 449.00 | 6.67 | 446.00 | 8'-0" |
| CB-5-29 | 1 | 3724.00 | 8452.00 | A | 449.00 | 6.67 | 439.83 | 16" 5'-0" | |
| MH-5-1 | 1 | 3127.00 | 7402.00 | B | 449.00 | 6.67 | 447.19 | 16" 5'-0" | |
| MH-5-2 | 1 | 3127.00 | 7576.00 | | | 6.67 | 438.19 | 16" 10'-0" | |
| MH-5-3 | 1 | 5132.00 | 7716.00 | | | 7.5 | 437.72 | | 20-AC4017b 26-AC4017b |
| MH-5-4 | 1 | 2713.00 | 7559.00 | | | 6.67 | 447.19 | 16" 6'-0" | |
| MH-5-5 | 1 | 2913.00 | 7930.00 | | | 10.67 | 438.19 | 1'-0" | |
| MH-5-6 | 1 | 2913.00 | 7710.00 | | | 10.67 | 438.19 | 1'-0" | |
| MH-5-7 | 1 | 2913.00 | 7690.00 | | | 12.67 | 436.19 | 16" 2'-0" | |
| MH-5-8 | 1 | 3137.00 | 7870.00 | | | 12.77 | 435.98 | | 22-AC4017b 28-AC4017b |
| MH-5-9 | 1 | 2837.31 | 7840.39 | B | 449.00 | 6.67 | 440.19 | 16" 5'-0" | |

* FOR DETAILS OF CATCH BASINS & MANHOLES SEE DRAWING M-110602 S02 REBAR MARKS AC13 AC204 AC405 AC406 AC407 AND AC408 CORRESPOND TO K06 K05 K06 K07 K08 AND K09 RESPECTIVELY AS SHOWN ON M-110602 S02



QUANTITIES (NET BY FIELD UNLESS NOTED)

| | | |
|--|----|------|
| CONCRETE CLASS 'A' (3500 PSI) | 65 | CUYD |
| CONCRETE CLASS 'C' (1800 PSI) | 7 | CUYD |
| CONCRETE CLASS 'B' (2000 PSI) | 17 | CUYD |
| FOR REIN. STEEL SEE BAR SCHEDULE | | |
| SCHEDULE 40-48-50-55-60-65-70-75-80-85-90-95-100-105-110-115-120-125-130-135-140-145-150-155-160-165-170-175-180-185-190-195-200-205-210-215-220-225-230-235-240-245-250-255-260-265-270-275-280-285-290-295-300-305-310-315-320-325-330-335-340-345-350-355-360-365-370-375-380-385-390-395-400-405-410-415-420-425-430-435-440-445-450-455-460-465-470-475-480-485-490-495-500-505-510-515-520-525-530-535-540-545-550-555-560-565-570-575-580-585-590-595-600-605-610-615-620-625-630-635-640-645-650-655-660-665-670-675-680-685-690-695-700-705-710-715-720-725-730-735-740-745-750-755-760-765-770-775-780-785-790-795-800-805-810-815-820-825-830-835-840-845-850-855-860-865-870-875-880-885-890-895-900-905-910-915-920-925-930-935-940-945-950-955-960-965-970-975-980-985-990-995-1000-1005-1010-1015-1020-1025-1030-1035-1040-1045-1050-1055-1060-1065-1070-1075-1080-1085-1090-1095-1100-1105-1110-1115-1120-1125-1130-1135-1140-1145-1150-1155-1160-1165-1170-1175-1180-1185-1190-1195-1200-1205-1210-1215-1220-1225-1230-1235-1240-1245-1250-1255-1260-1265-1270-1275-1280-1285-1290-1295-1300-1305-1310-1315-1320-1325-1330-1335-1340-1345-1350-1355-1360-1365-1370-1375-1380-1385-1390-1395-1400-1405-1410-1415-1420-1425-1430-1435-1440-1445-1450-1455-1460-1465-1470-1475-1480-1485-1490-1495-1500-1505-1510-1515-1520-1525-1530-1535-1540-1545-1550-1555-1560-1565-1570-1575-1580-1585-1590-1595-1600-1605-1610-1615-1620-1625-1630-1635-1640-1645-1650-1655-1660-1665-1670-1675-1680-1685-1690-1695-1700-1705-1710-1715-1720-1725-1730-1735-1740-1745-1750-1755-1760-1765-1770-1775-1780-1785-1790-1795-1800-1805-1810-1815-1820-1825-1830-1835-1840-1845-1850-1855-1860-1865-1870-1875-1880-1885-1890-1895-1900-1905-1910-1915-1920-1925-1930-1935-1940-1945-1950-1955-1960-1965-1970-1975-1980-1985-1990-1995-2000-2005-2010-2015-2020-2025-2030-2035-2040-2045-2050-2055-2060-2065-2070-2075-2080-2085-2090-2095-2100-2105-2110-2115-2120-2125-2130-2135-2140-2145-2150-2155-2160-2165-2170-2175-2180-2185-2190-2195-2200-2205-2210-2215-2220-2225-2230-2235-2240-2245-2250-2255-2260-2265-2270-2275-2280-2285-2290-2295-2300-2305-2310-2315-2320-2325-2330-2335-2340-2345-2350-2355-2360-2365-2370-2375-2380-2385-2390-2395-2400-2405-2410-2415-2420-2425-2430-2435-2440-2445-2450-2455-2460-2465-2470-2475-2480-2485-2490-2495-2500-2505-2510-2515-2520-2525-2530-2535-2540-2545-2550-2555-2560-2565-2570-2575-2580-2585-2590-2595-2600-2605-2610-2615-2620-2625-2630-2635-2640-2645-2650-2655-2660-2665-2670-2675-2680-2685-2690-2695-2700-2705-2710-2715-2720-2725-2730-2735-2740-2745-2750-2755-2760-2765-2770-2775-2780-2785-2790-2795-2800-2805-2810-2815-2820-2825-2830-2835-2840-2845-2850-2855-2860-2865-2870-2875-2880-2885-2890-2895-2900-2905-2910-2915-2920-2925-2930-2935-2940-2945-2950-2955-2960-2965-2970-2975-2980-2985-2990-2995-3000-3005-3010-3015-3020-3025-3030-3035-3040-3045-3050-3055-3060-3065-3070-3075-3080-3085-3090-3095-3100-3105-3110-3115-3120-3125-3130-3135-3140-3145-3150-3155-3160-3165-3170-3175-3180-3185-3190-3195-3200-3205-3210-3215-3220-3225-3230-3235-3240-3245-3250-3255-3260-3265-3270-3275-3280-3285-3290-3295-3300-3305-3310-3315-3320-3325-3330-3335-3340-3345-3350-3355-3360-3365-3370-3375-3380-3385-3390-3395-3400-3405-3410-3415-3420-3425-3430-3435-3440-3445-3450-3455-3460-3465-3470-3475-3480-3485-3490-3495-3500-3505-3510-3515-3520-3525-3530-3535-3540-3545-3550-3555-3560-3565-3570-3575-3580-3585-3590-3595-3600-3605-3610-3615-3620-3625-3630-3635-3640-3645-3650-3655-3660-3665-3670-3675-3680-3685-3690-3695-3700-3705-3710-3715-3720-3725-3730-3735-3740-3745-3750-3755-3760-3765-3770-3775-3780-3785-3790-3795-3800-3805-3810-3815-3820-3825-3830-3835-3840-3845-3850-3855-3860-3865-3870-3875-3880-3885-3890-3895-3900-3905-3910-3915-3920-3925-3930-3935-3940-3945-3950-3955-3960-3965-3970-3975-3980-3985-3990-3995-4000-4005-4010-4015-4020-4025-4030-4035-4040-4045-4050-4055-4060-4065-4070-4075-4080-4085-4090-4095-4100-4105-4110-4115-4120-4125-4130-4135-4140-4145-4150-4155-4160-4165-4170-4175-4180-4185-4190-4195-4200-4205-4210-4215-4220-4225-4230-4235-4240-4245-4250-4255-4260-4265-4270-4275-4280-4285-4290-4295-4300-4305-4310-4315-4320-4325-4330-4335-4340-4345-4350-4355-4360-4365-4370-4375-4380-4385-4390-4395-4400-4405-4410-4415-4420-4425-4430-4435-4440-4445-4450-4455-4460-4465-4470-4475-4480-4485-4490-4495-4500-4505-4510-4515-4520-4525-4530-4535-4540-4545-4550-4555-4560-4565-4570-4575-4580-4585-4590-4595-4600-4605-4610-4615-4620-4625-4630-4635-4640-4645-4650-4655-4660-4665-4670-4675-4680-4685-4690-4695-4700-4705-4710-4715-4720-4725-4730-4735-4740-4745-4750-4755-4760-4765-4770-4775-4780-4785-4790-4795-4800-4805-4810-4815-4820-4825-4830-4835-4840-4845-4850-4855-4860-4865-4870-4875-4880-4885-4890-4895-4900-4905-4910-4915-4920-4925-4930-4935-4940-4945-4950-4955-4960-4965-4970-4975-4980-4985-4990-4995-5000-5005-5010-5015-5020-5025-5030-5035-5040-5045-5050-5055-5060-5065-5070-5075-5080-5085-5090-5095-5100-5105-5110-5115-5120-5125-5130-5135-5140-5145-5150-5155-5160-5165-5170-5175-5180-5185-5190-5195-5200-5205-5210-5215-5220-5225-5230-5235-5240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| | |

| NO | DATE | REVISION | BY | CH | APPROVED |
|----|---------|----------|-----|----|-------------|
| 1 | 9-21-82 | | SKB | JK | [Signature] |
| 2 | 2-16-83 | | SKB | JK | [Signature] |
| 3 | 6-29-83 | | SKB | JK | [Signature] |
| 4 | 8-21-84 | | SKB | JK | [Signature] |

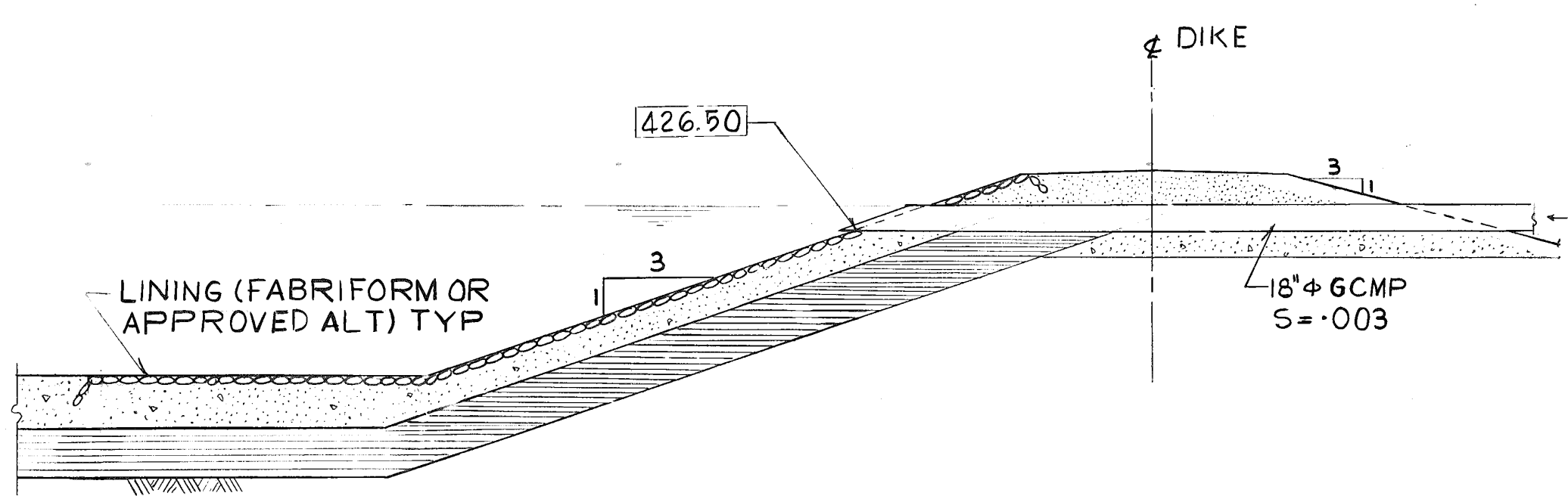
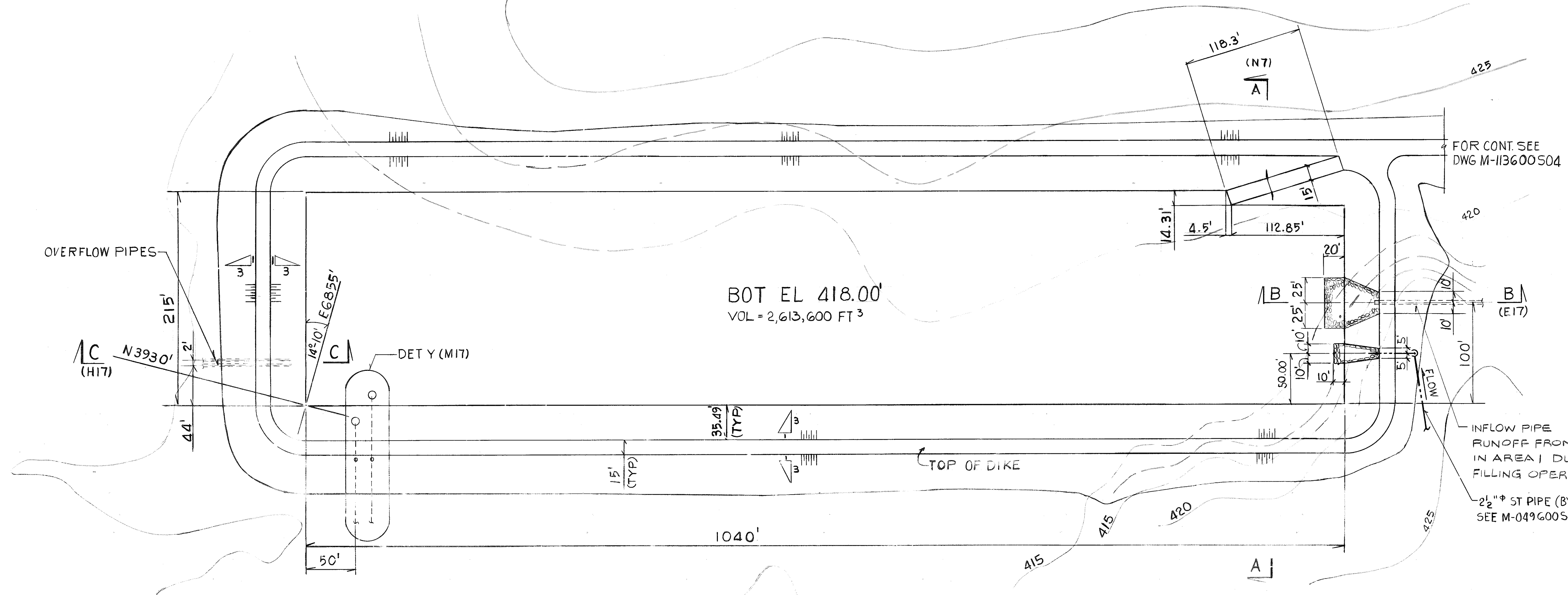
REV: (H13, P12, L20) DWG NO: (D13, F14) NOTE: (J16)
 DIM. ADD: (F6, E22, P13, P17, J20) NOTE: (L20) REF DWG.
 DEL: (C20) NOTE

ADDED: (O20) NOTE.

ADD: (E12) PIPE & LINING, (E20) QUANT, (F14) NOTE, (L20) REF DWG.

ADD: (C20) NOTES
 TRANSFER REVISION TO H L & P

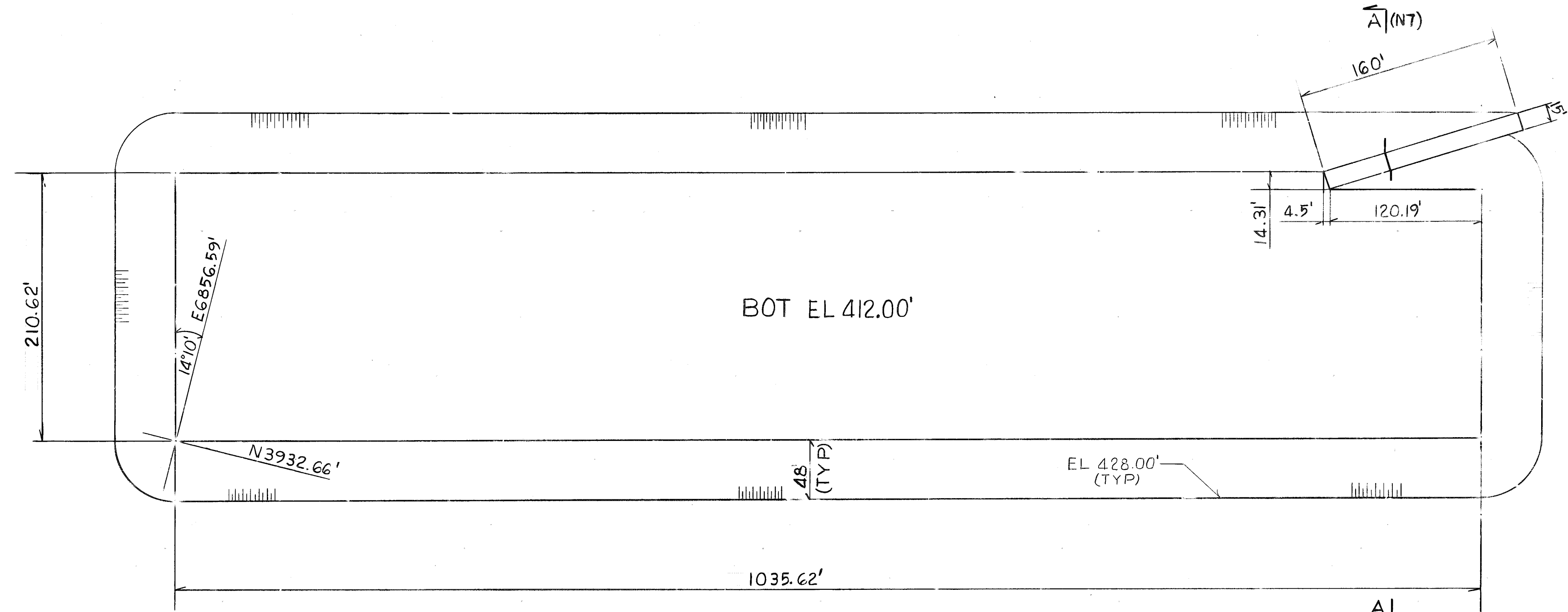
After the construction of this drainage and the adjacent modifications are required to be made to this drawing as shown by Houston Lighting and Power Company (HLP). HLP shall be responsible for the maintenance of this drawing and for the coordination of all design changes. All design change orders (DCOs) and field originated changes which have been considered for the project on prior editions of this drawing are identified in the drawing revision block. All DCO's and field originated changes identified in this drawing are identified in the drawing revision block. All DCO's and field originated changes identified in this drawing are identified in the drawing revision block.



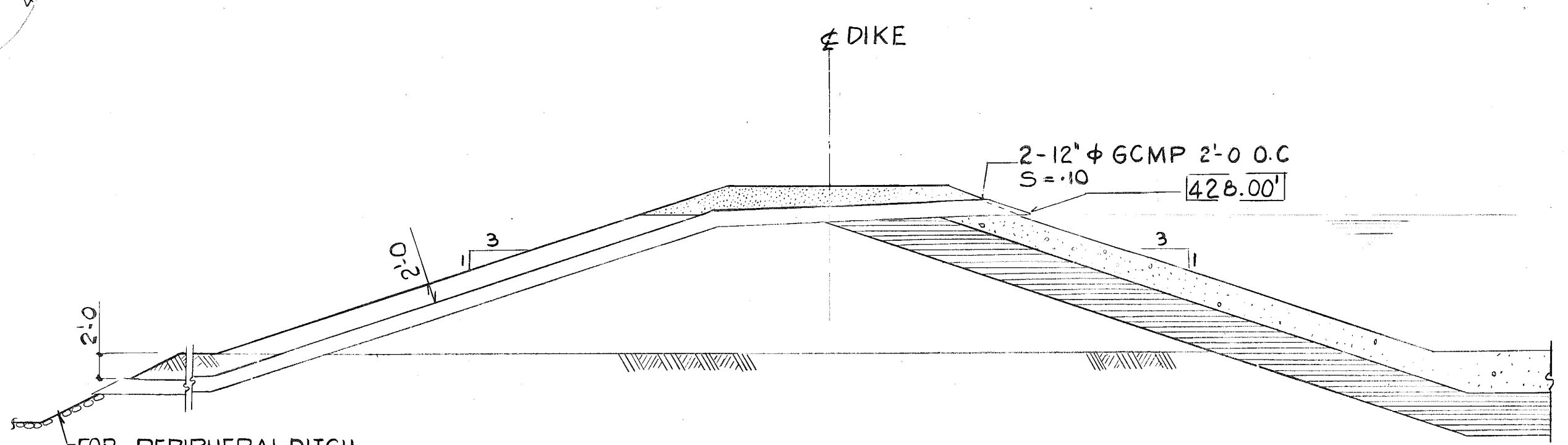
QUANTITIES (NET BY FIELD UNLESS NOTED)

| | |
|--|-------------|
| CONCRETE CLASS 'A' (3500 PSI) | 11 CU YD |
| REINFORCEMENT BARS #6 (CUT BY FIELD) | 264 LIN FT |
| SPECIAL RANDOM FILL | 4000 CU YD |
| RANDOM FILL | 74000 CU YD |
| CLAY | 36500 CU YD |
| 12" φ G.C.M.P. 5x11 CORR 16GA BITUM COATED | BY FIELD |
| 18" φ " & FULLY PAVED | |
| LINING (FABRIFORM W/FILTER POINTS @ 8" O.C. OR APPROVED ALTERNATE) | 3235 SF |
| MORTAR (FOR FABRIFORM) | 45 CU YD |
| 36" φ G.C.M.P. TRASH RACK W/ANTI VORTEX DEVICE | 2 REQ |
| 48" φ MANHOLE W/SLIDE GATE FOR 18" G.C.M.P. | 2 REQ |
| SEEP RING FOR 18" φ G.C.M.P. (1'-6" SQ) | 4 REQ |

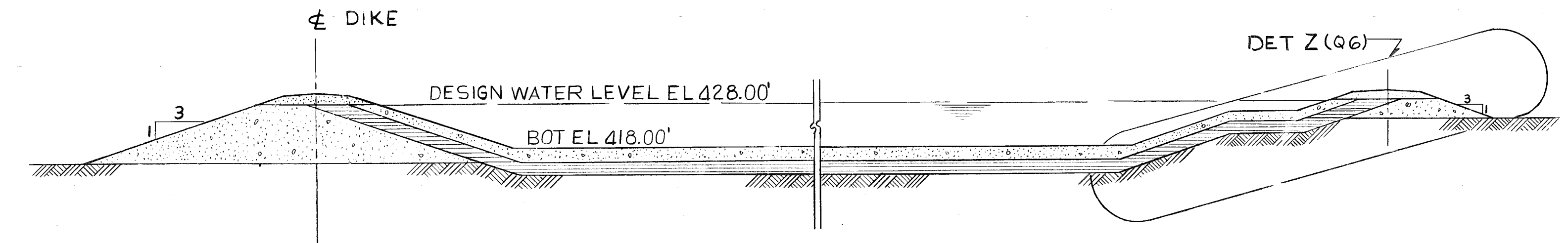
PLAN RUNOFF POND - AREA 1
1" = 60'



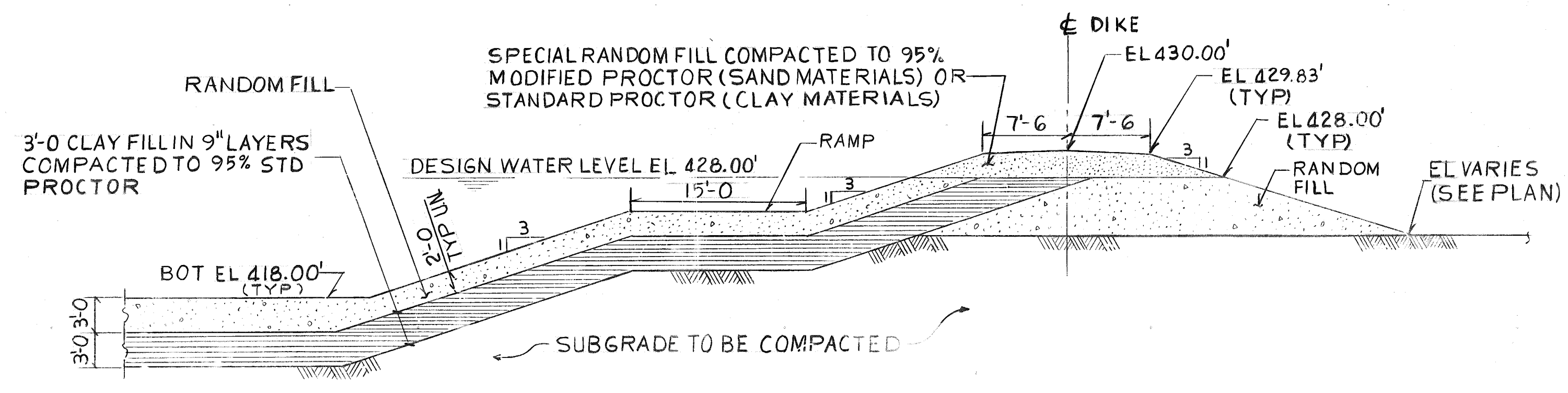
SUBGRADE OUTLINE
1" = 60'



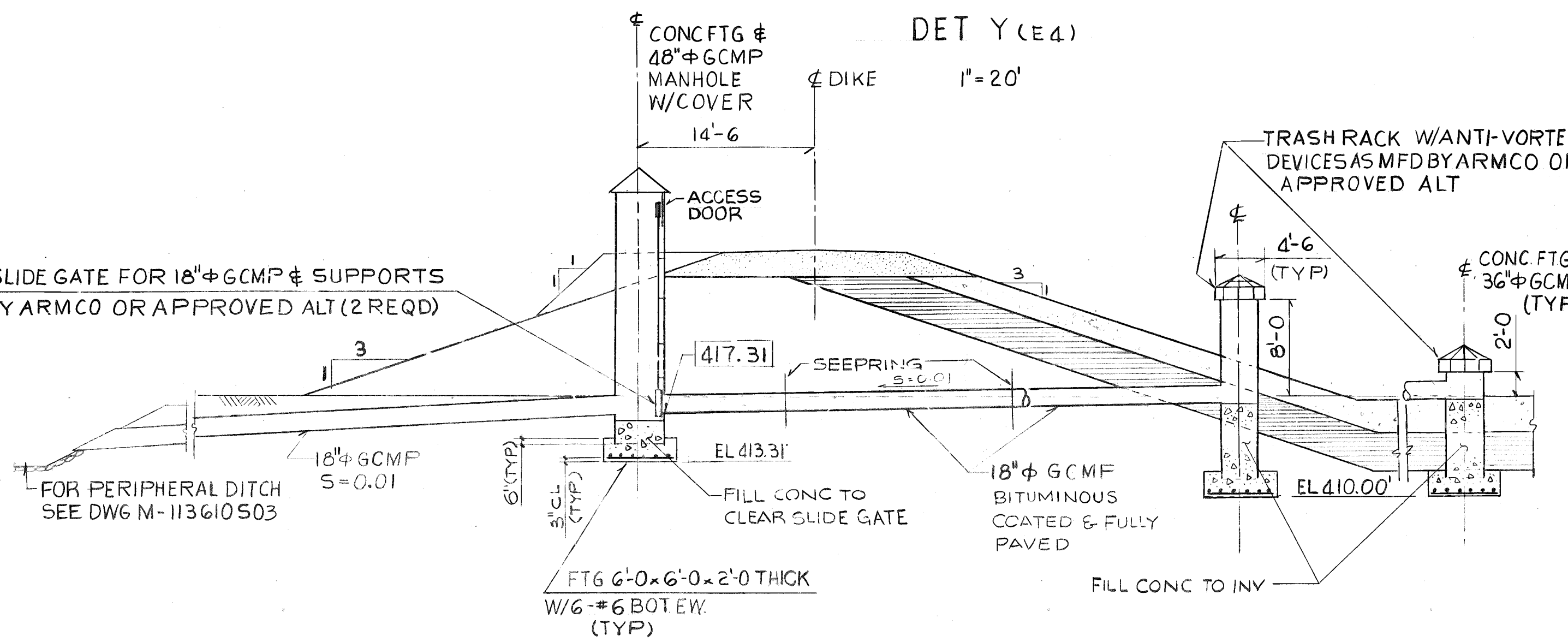
SECT C (D2)
18" = 1'-0'



SECT A (C11, H11)
1" = 20'



DET Z (M10)
18" = 1'-0'



SECT D (I17)
18" = 1'-0'

NOTES:
 FOR SPECIFICATIONS ON FILL MATERIAL AND GRADE OF COMPACTION SEE EBASCO SPECIFICATION HOU-3037-102401 EXCAVATION, BACKFILL, FILLING AND GRADING. GEODETIC EL 450.00' CORRESPONDS TO PLANT REFERENCE EL 100.00'.
 CONCRETE SHALL BE CLASS 'A' (3500 PSI) SEE EBASCO SPECIFICATION HOU 3037-148401 'CONCRETE MASONRY'.
 CONSTRUCTION, WHERE NOT SPECIFICALLY COVERED BY EBASCO SPECIFICATIONS, SHALL MEET THE STANDARDS OF ACI 318-77 AND ACI 301-72. IN THE EVENT OF CONFLICT BETWEEN THESE ACI STANDARDS ACI 301-72 SHALL GOVERN.
 STEEL FOR CONCRETE REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF EBASCO SPECIFICATIONS HOU 3037-148402
 FOR GALV CORRUGATED METAL PIPE NOTES SEE DWG M-113610504
 ALL GALV CORRUGATED METAL PIPES SHALL BE BITUMINOUS COATED UNLESS NOTED OTHERWISE

LEGEND:
 G.C.M.P. DENOTES GALVANIZED CORRUGATED METAL PIPE
 (000.00) DENOTES INVERT ELEVATION

The below listed DCN's and PCN's have not been incorporated as of the last Ebasco Revision.
 NONE

REFERENCE DRAWINGS:

| | |
|--------------------------------|-------------|
| PLOT PLAN SH 3 (MECH) | M-00601503 |
| SWDA GRADING PLAN SH 4 | M-113600504 |
| SWDA DRAINAGE PLAN | M-113610503 |
| SWDA DRAINAGE SECT & DETS SH 1 | M-113610504 |
| YARD PIPING SH ST (MECH) | M-049600557 |

| | PBOA AWARD | | |
|-----|-----------------|------------------------------|----|
| | PBOA BID | | |
| | FUG AWARD | | |
| | FUG BID | | |
| | SITE PREP AWARD | | |
| 1A | 8-29-82 | SITE PREP BID EAST PSH | |
| REV | DATE | CONSTRUCTION CONTRACT ISSUES | BY |

HOUSTON LIGHTING & POWER CO.
 LIMESTONE ELECTRIC GENERATING STATION
 UNIT 1, 750 MW 1985 INSTALLATION
 UNIT 2, 750 MW 1986 EXTENSION
 SOLID WASTE DISPOSAL AREA
 RUNOFF POND - AREA I
 PLAN, SECT & DETS SH.1

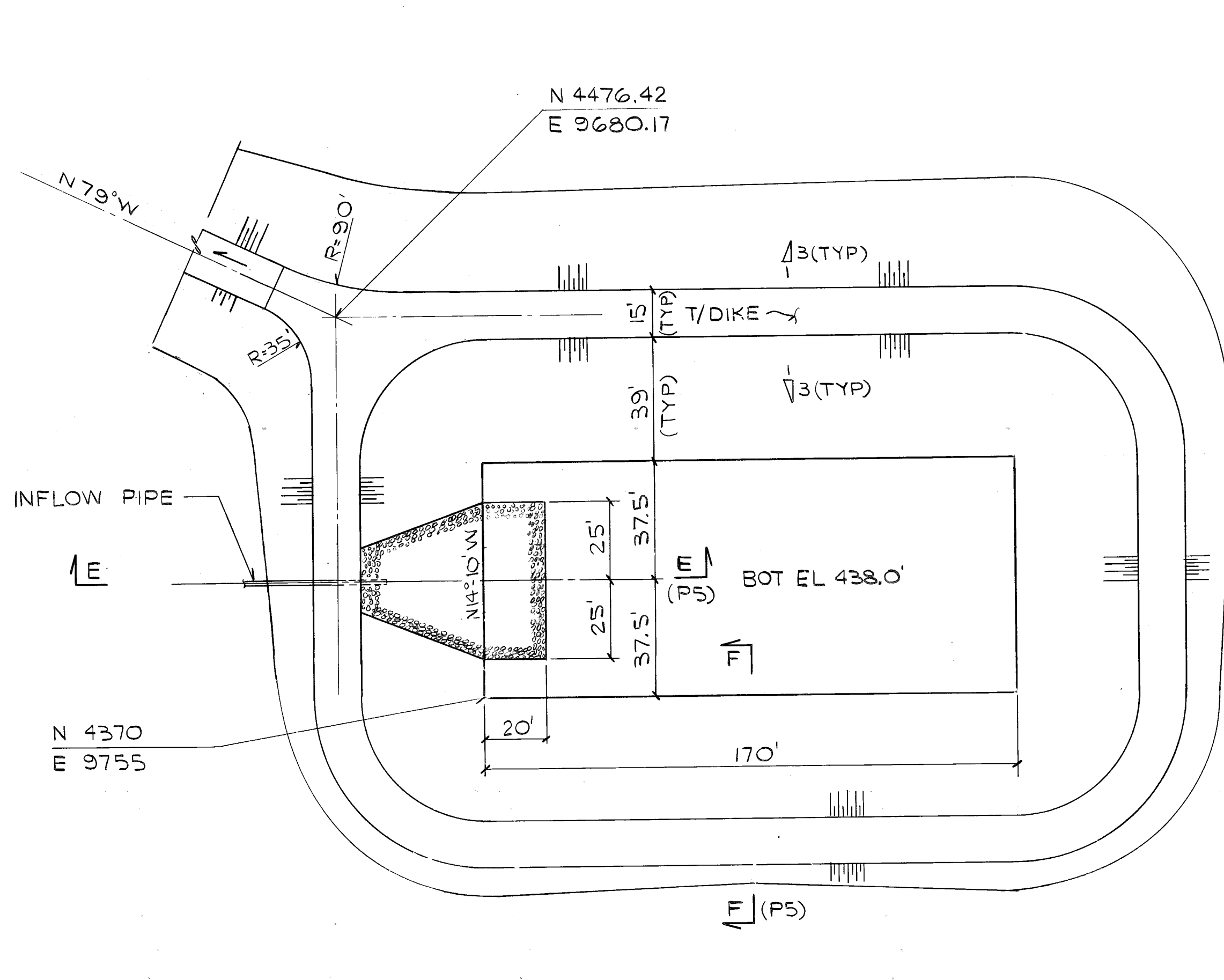
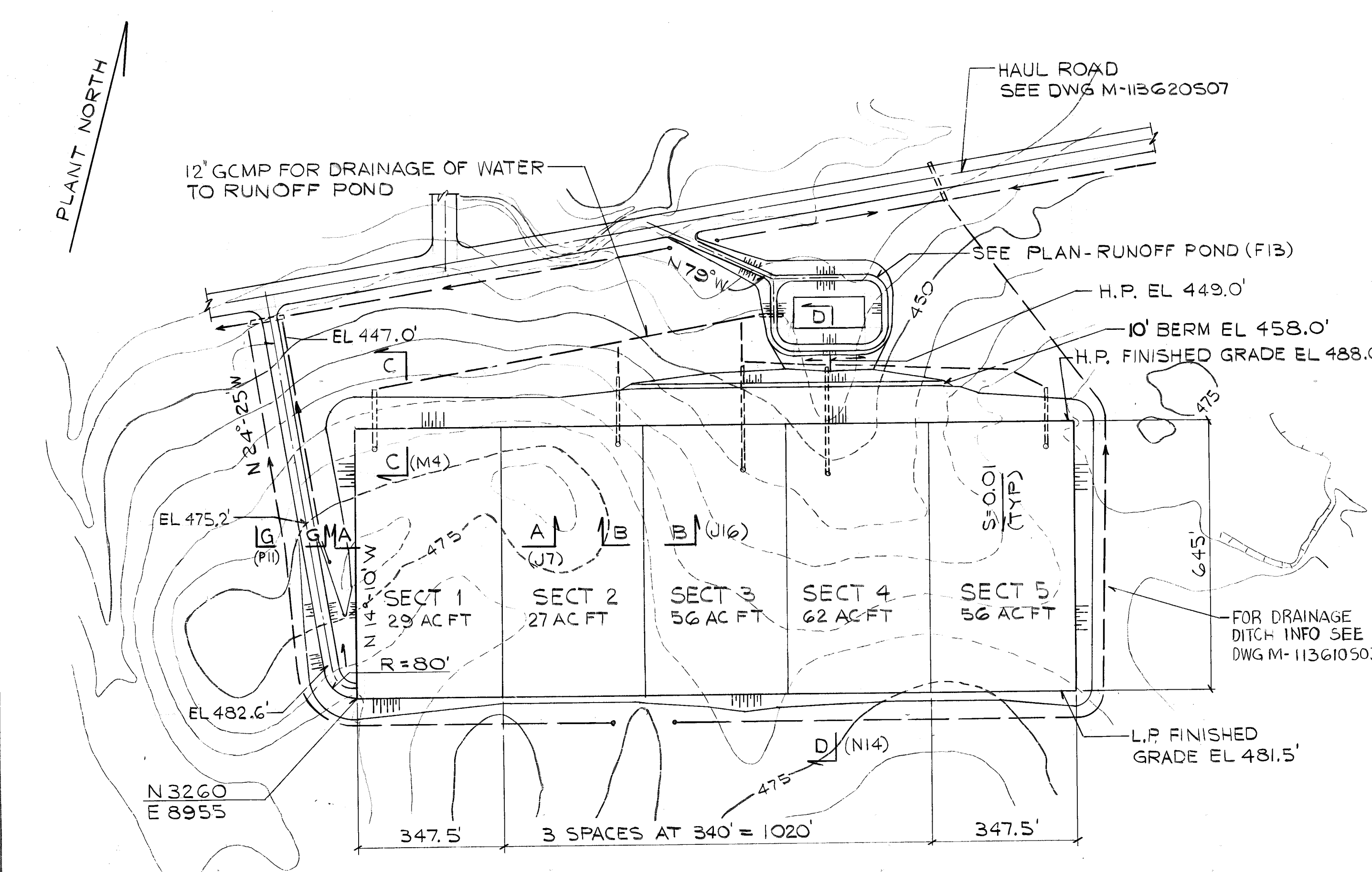
EBASCO SERVICES INCORPORATED

| | | |
|----------------|-------------|--------------|
| SCALE AS NOTED | APPROVED | DATE |
| DR. R. GUPTA | [Signature] | NOV 1982 |
| CH. H. MAH | [Signature] | M-113621 S01 |

| NO | DATE | REVISION | BY | CH | APPROVED |
|----|----------|---|----|-----|-------------|
| 1 | 12-15-82 | | BF | SKB | [Signature] |
| 2 | 2-28-83 | REV: (C1-E2, E2-E7, E7-B6, B6-C1) DITCHES. ADD: (E3) NOTE | BF | SKB | [Signature] |
| 3 | 8-21-84 | REV: (I 20) NOTE. | BF | SKB | [Signature] |

ADD: (B20 K20) NOTES
TRANSFER REVISION TO H L & P

After Rev. 3, 8-21-84, this drawing, full responsibility for the maintenance of this drawing and for subsequent modifications shall be assumed by the client. The Engineer shall be notified immediately of any changes to this drawing. All changes shall be approved by the Engineer. All work shall be done in accordance with the specifications and drawings. All work shall be done in accordance with the specifications and drawings. All work shall be done in accordance with the specifications and drawings.



LEGEND:
 [Pattern] INDICATES DEWATERED SLUDGE SOLIDS WASTE.
 [Symbol] INDICATES PIPE INVERT ELEVATION.
 FOR OTHER LEGEND SEE DWG M-113600505.

QUANTITIES: (NET BY FIELD UNLESS NOTED)

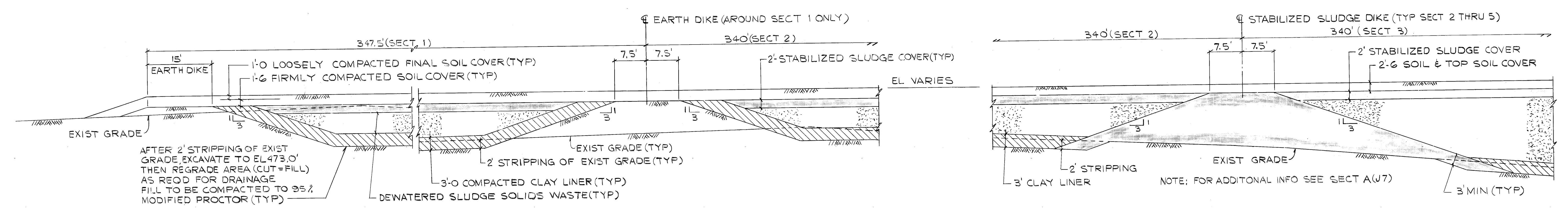
| DEWATERED SLUDGE SOLIDS WASTE DISPOSAL AREA | |
|---|---------------|
| STRIPPING (2'-0") | 48,340 CU YD |
| CLAY (3'-0" LINER, ALL SECTIONS) | 66,530 CU YD |
| EARTH DIKING | 21,140 CU YD |
| STABILIZED SLUDGE (2' COVER & DIKING) | 150 AC FT |
| DEWATERED SLUDGE SOLIDS WASTE (ALL SECT) | 230 AC FT |
| SOIL & TOP SOIL COVER (2'-6") | 123,080 CU YD |
| 12' BITUM COATED GCMF (RUNOFF WATER DRAIN FOR ACTIVE DISPOSAL SECT) | AS REQD |
| SEEP RINGS FOR 12' GCMF (5'-0" SO) | AS REQD |

RUNOFF POND

| | |
|---|-------------|
| SPECIAL RANDOM FILL | 1,295 CU YD |
| CLAY (3'-0" LINER) | 3,685 CU YD |
| LINING (FABRIFORM W/FILTER POINT @ 8" O.C. OR APPROVED ALTERNATE) | 2,530 SF |
| MORTAR (FOR FABRIFORM) | 36 CU YD |

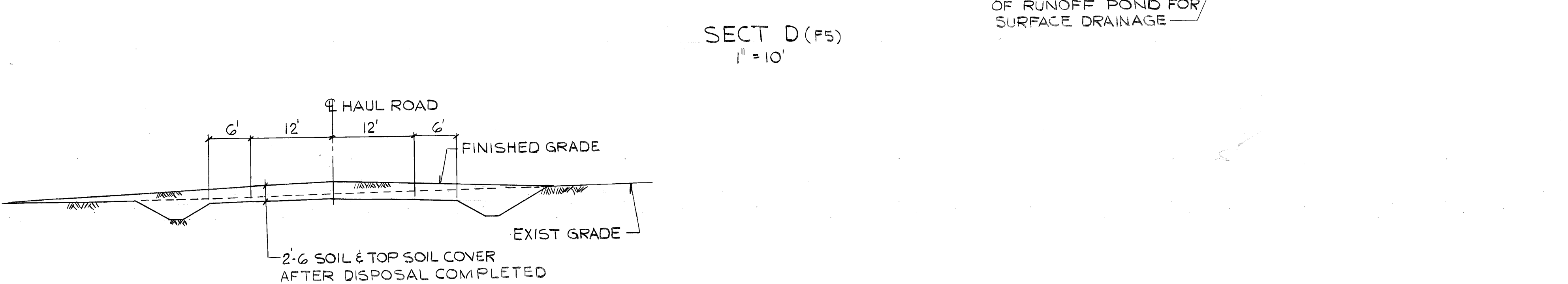
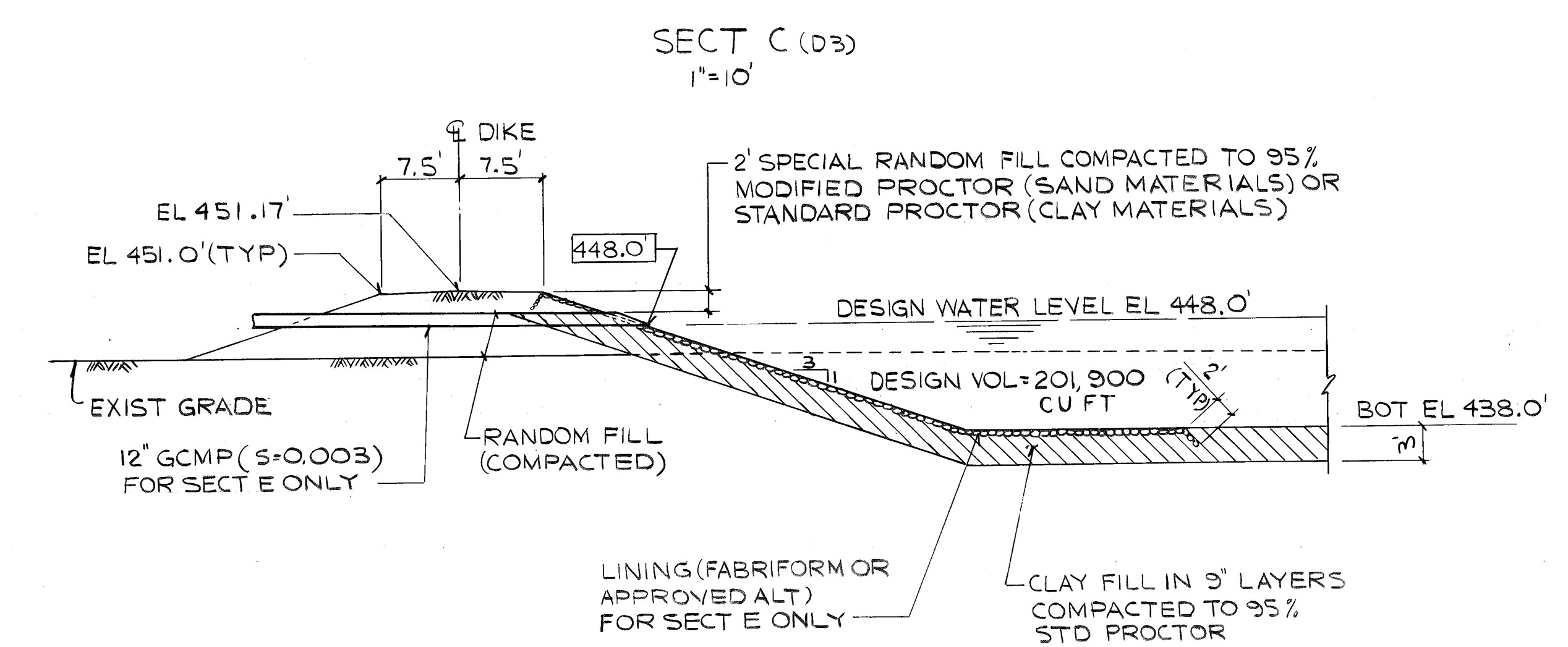
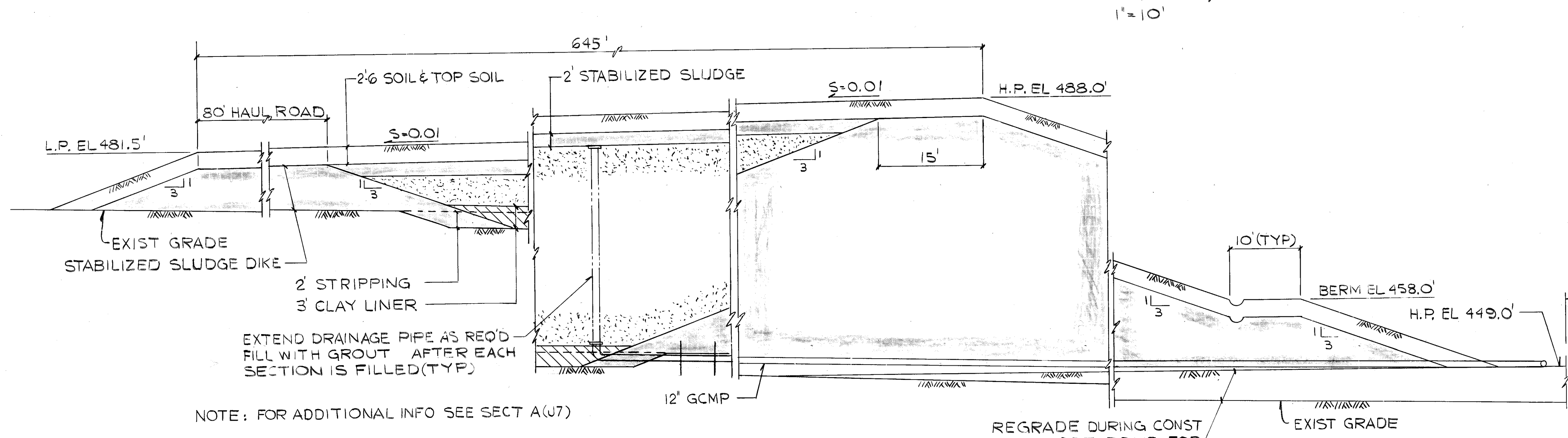
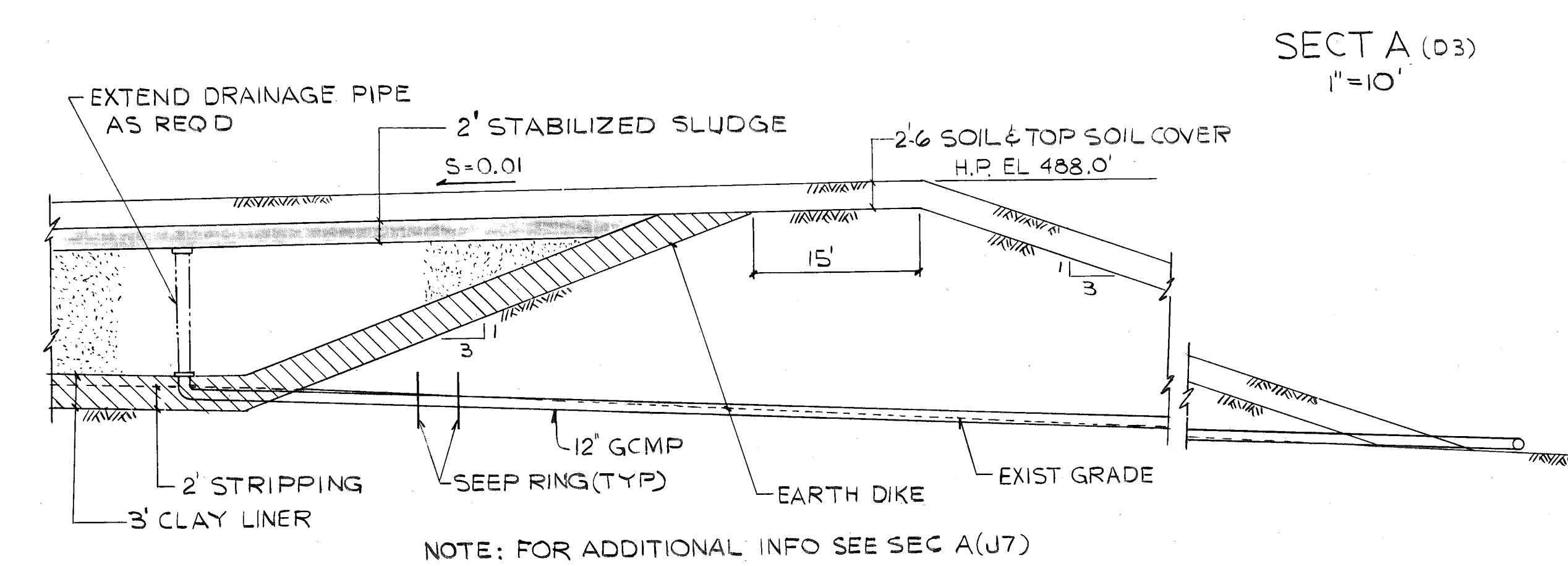
PLAN - DEWATERED SLUDGE SOLIDS WASTE DISPOSAL AREA
1" = 200'

PLAN - RUNOFF POND
1" = 30'



NOTES:
 GROUND WATER MONITORS MAY BE ADDED LATER, IF SO ADVISED BY H L & P, IN THE VICINITY OF THE DEWATERED SLUDGE SOLIDS WASTE DISPOSAL SECTIONS IN ACCORDANCE WITH EBASCO SPECIFICATION HOU-3037-102408 "SOLID WASTE DISPOSAL SYSTEM".
 GEODETIC EL 450.00' CORRESPONDS TO PLANT REFERENCE EL 100.00'
 FOR ADDITIONAL NOTES & REFERENCE DRAWINGS SEE DWG M-113600504.

The below listed DCN's and PCN's have not been incorporated as of the last Ebasco Revision.
 NONE



| REV | DATE | CONSTRUCTION CONTRACT ISSUES | BY |
|-----|--------|------------------------------|----|
| 1A | 5-4-82 | SITE PREP BID EAST | AR |

ALL WORK BY SWOA FOR CONTR. EXCEPT FOR SLUDGE

WORK THIS DWG WITH DWSS M-113600504 & M-113620507

HOUSTON LIGHTING & POWER CO.
 LIMESTONE ELECTRIC GENERATING STATION
 UNIT 1, 750 MW 1985 INSTALLATION
 UNIT 2, 750 MW 1986 EXTENSION

SOLID WASTE DISPOSAL AREA
 DEWATERED SLUDGE SOLIDS DISPOSAL AREA & RUNOFF POND - PLAN & SECT.

| EBASCO SERVICES INCORPORATED | |
|------------------------------|---------------|
| SCALE AS NOTED | APPROVED |
| DIV CIVIL | DATE 08-21-84 |
| DR. F. OMID | |
| CH S. BHALLA | |

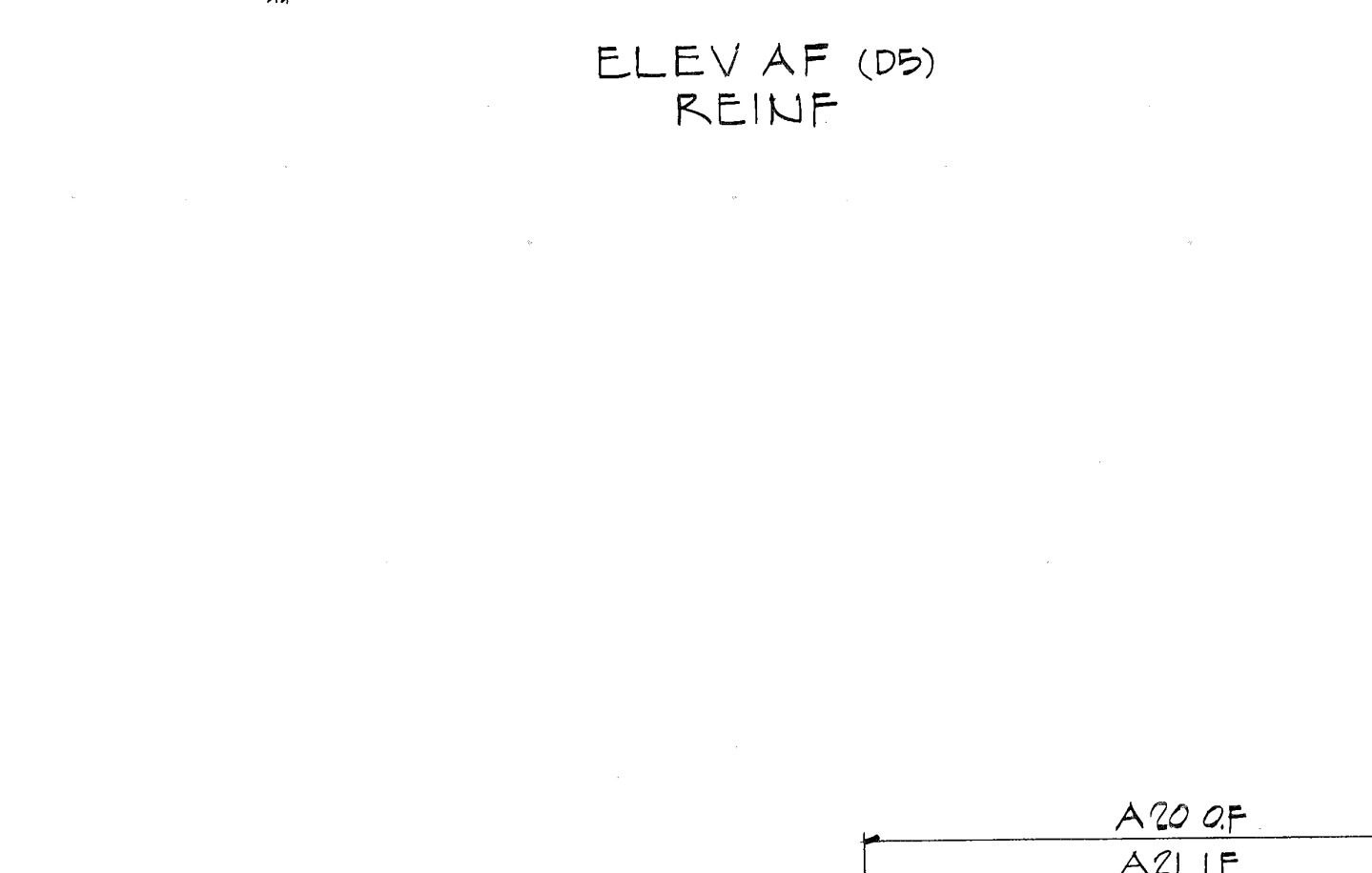
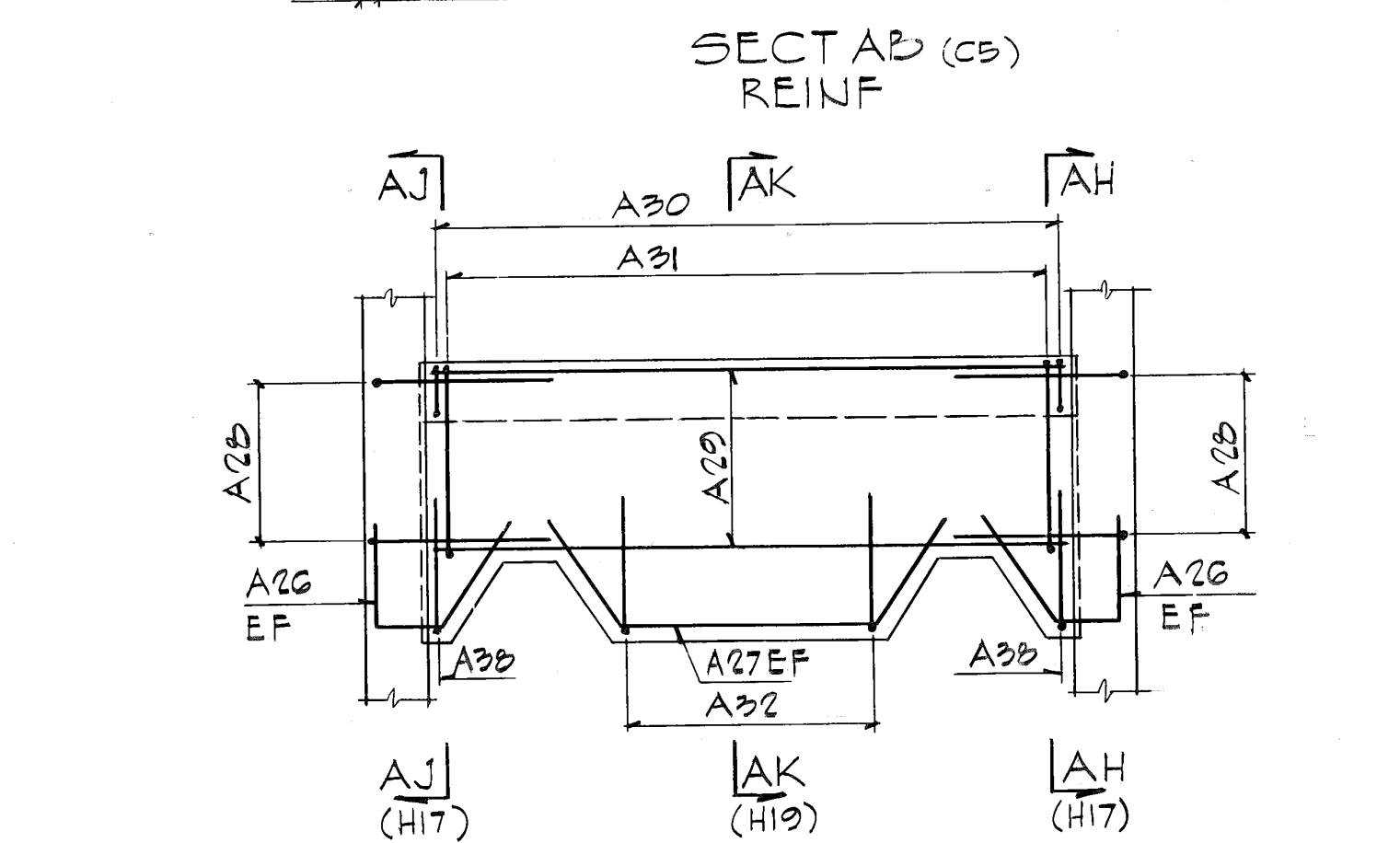
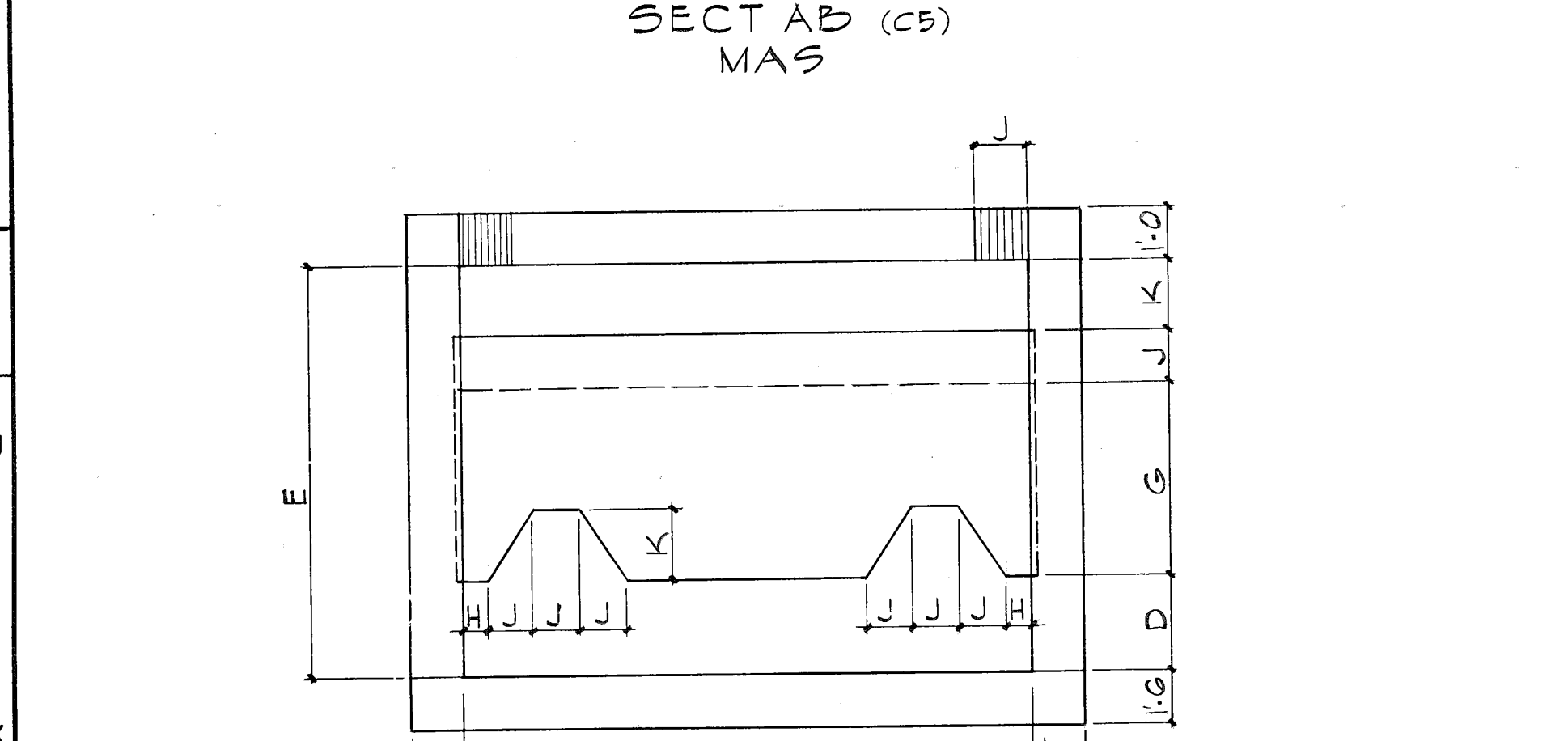
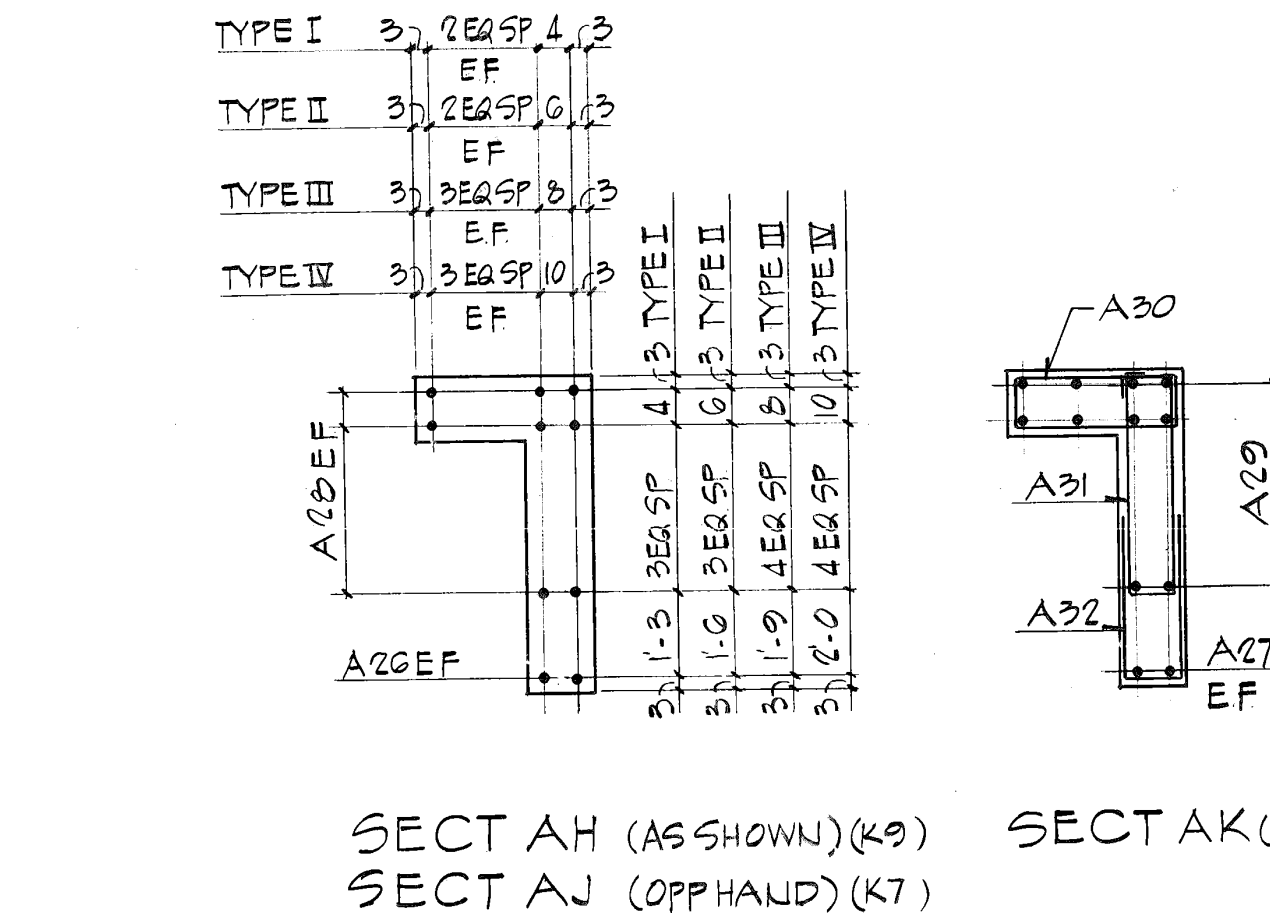
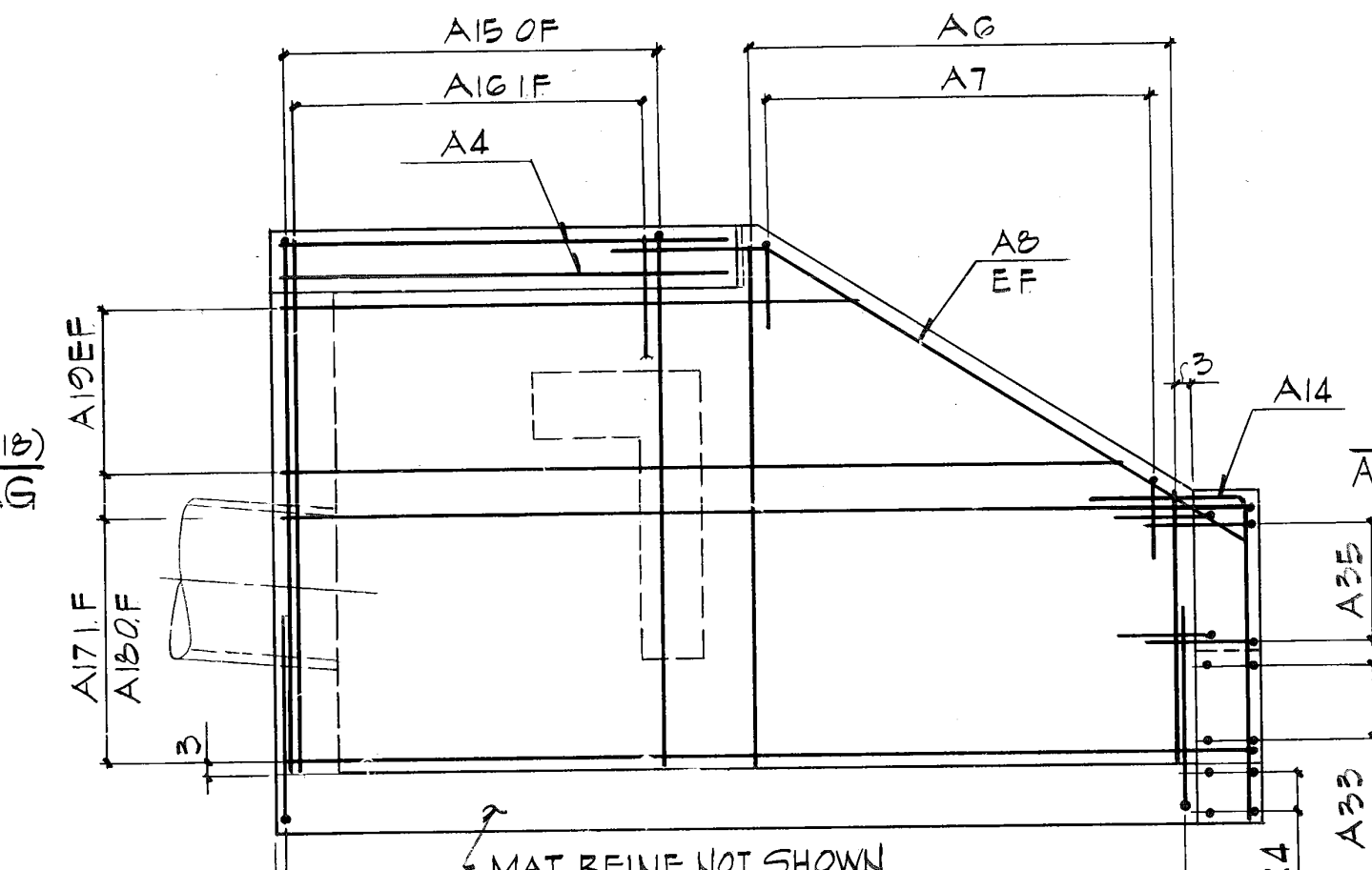
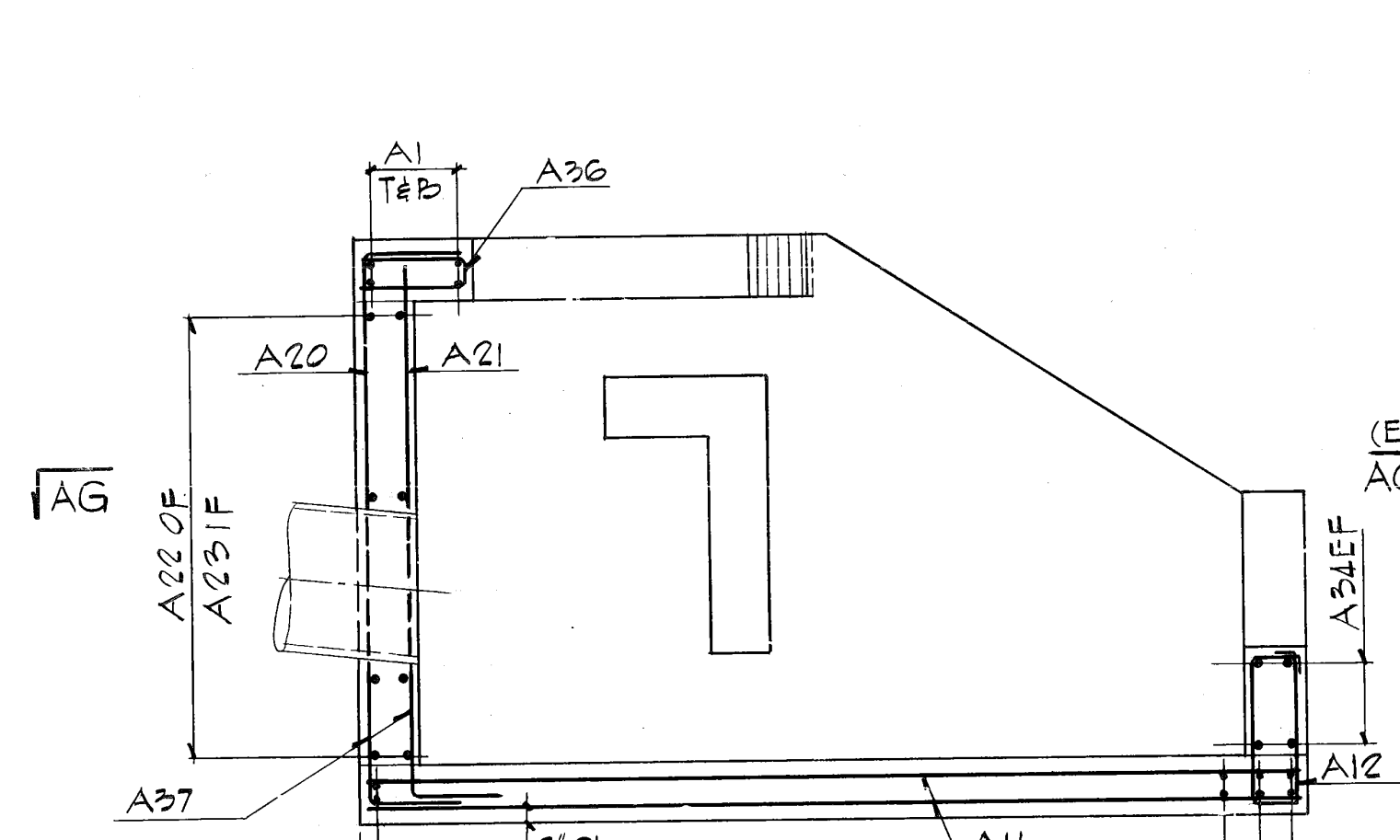
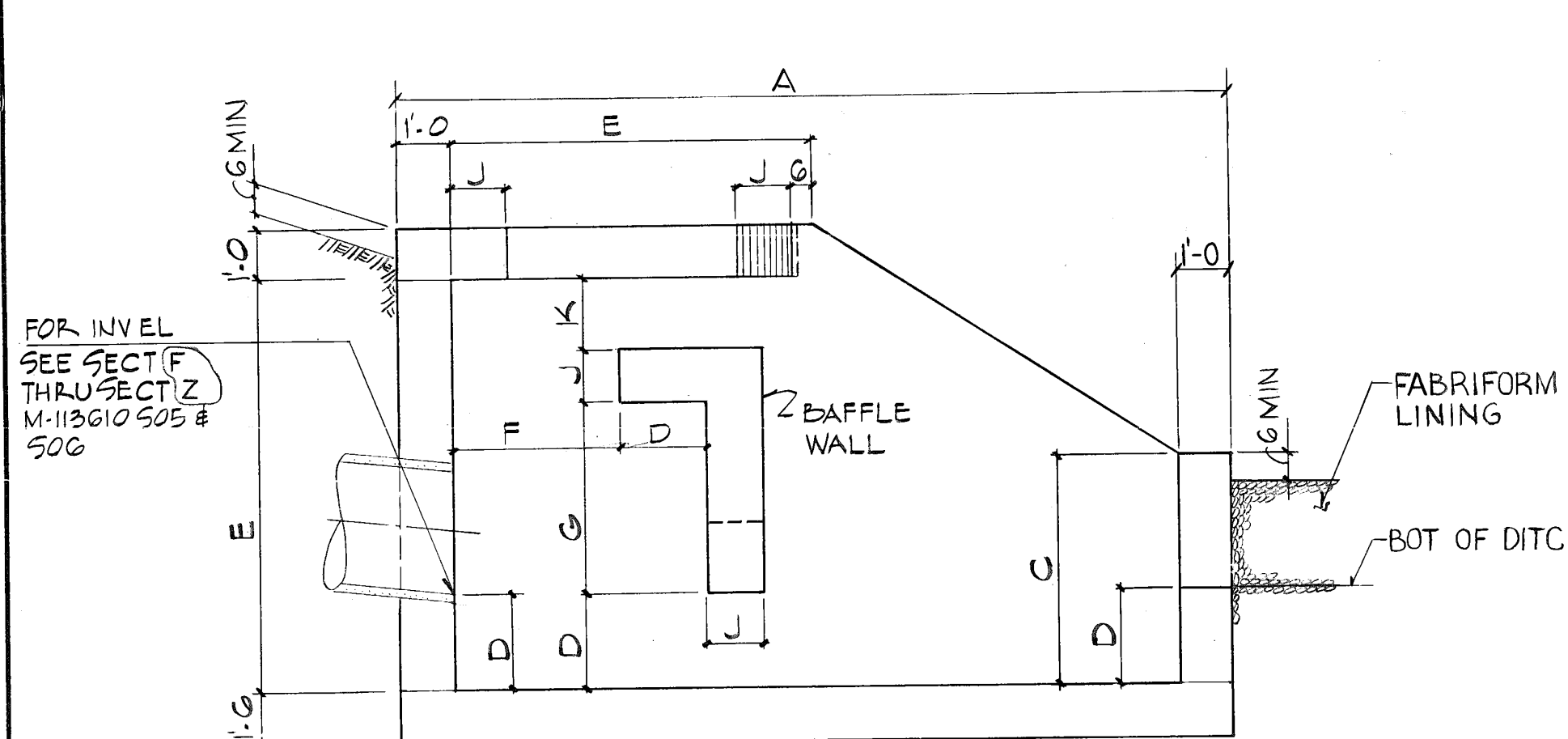
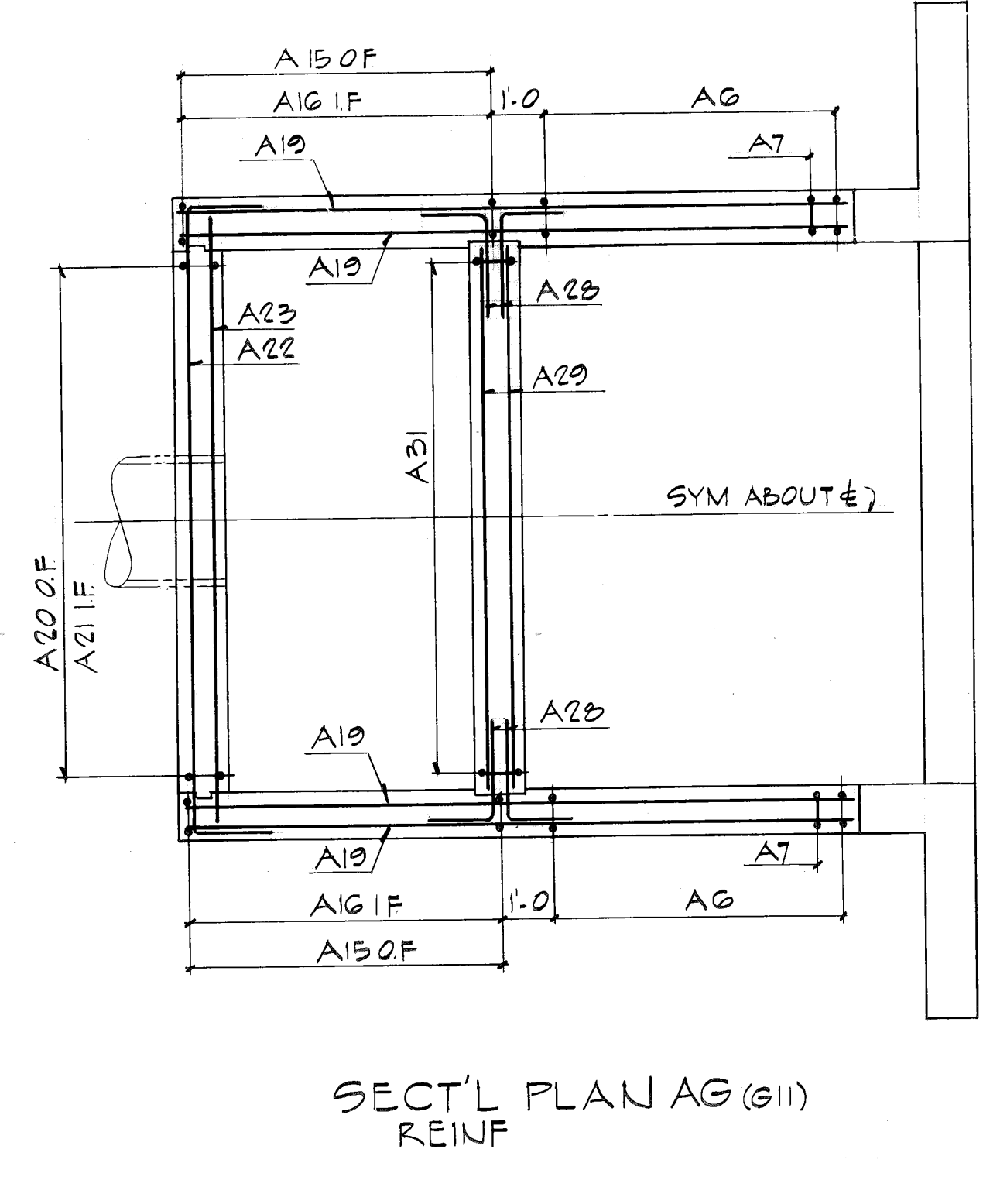
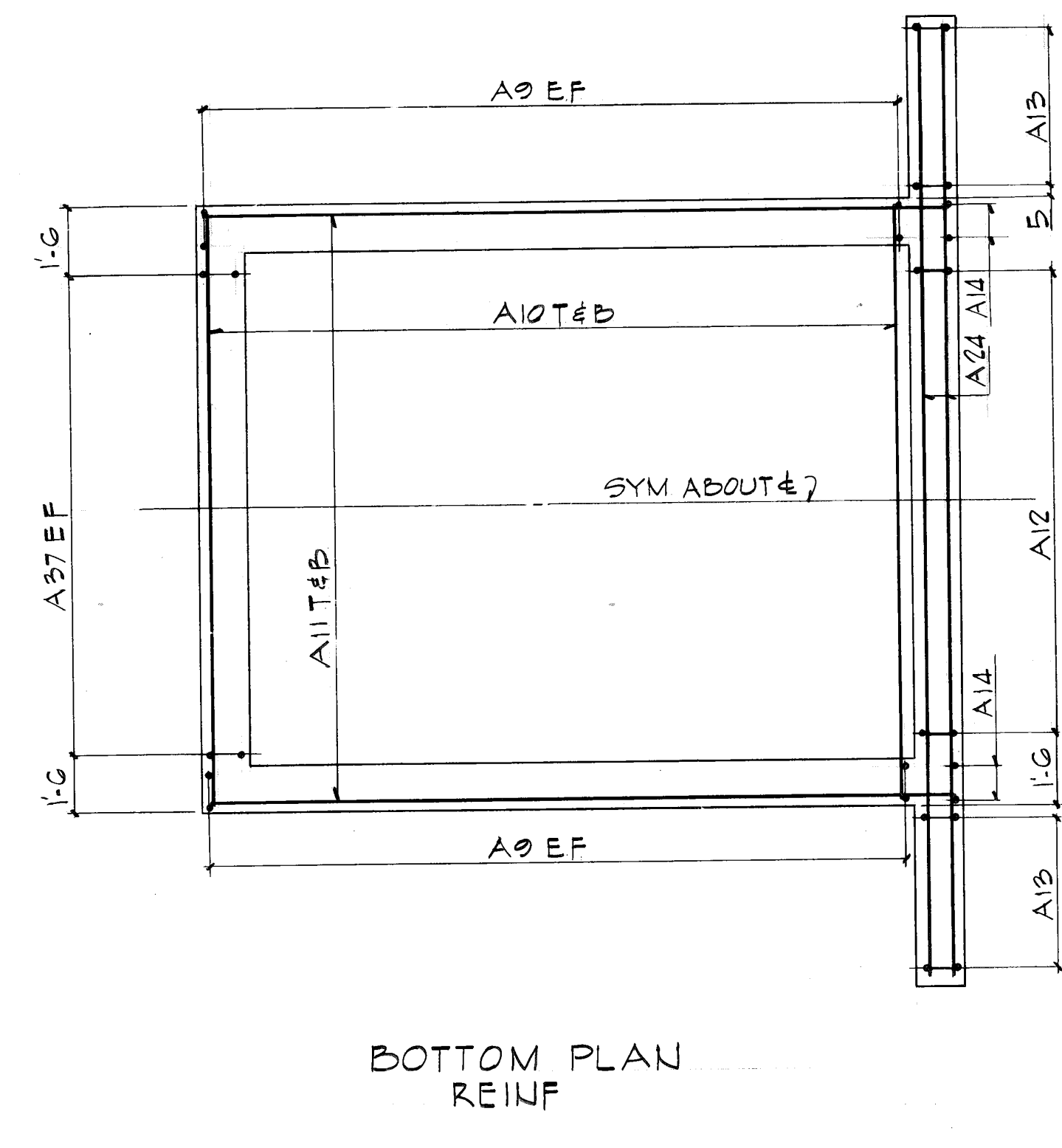
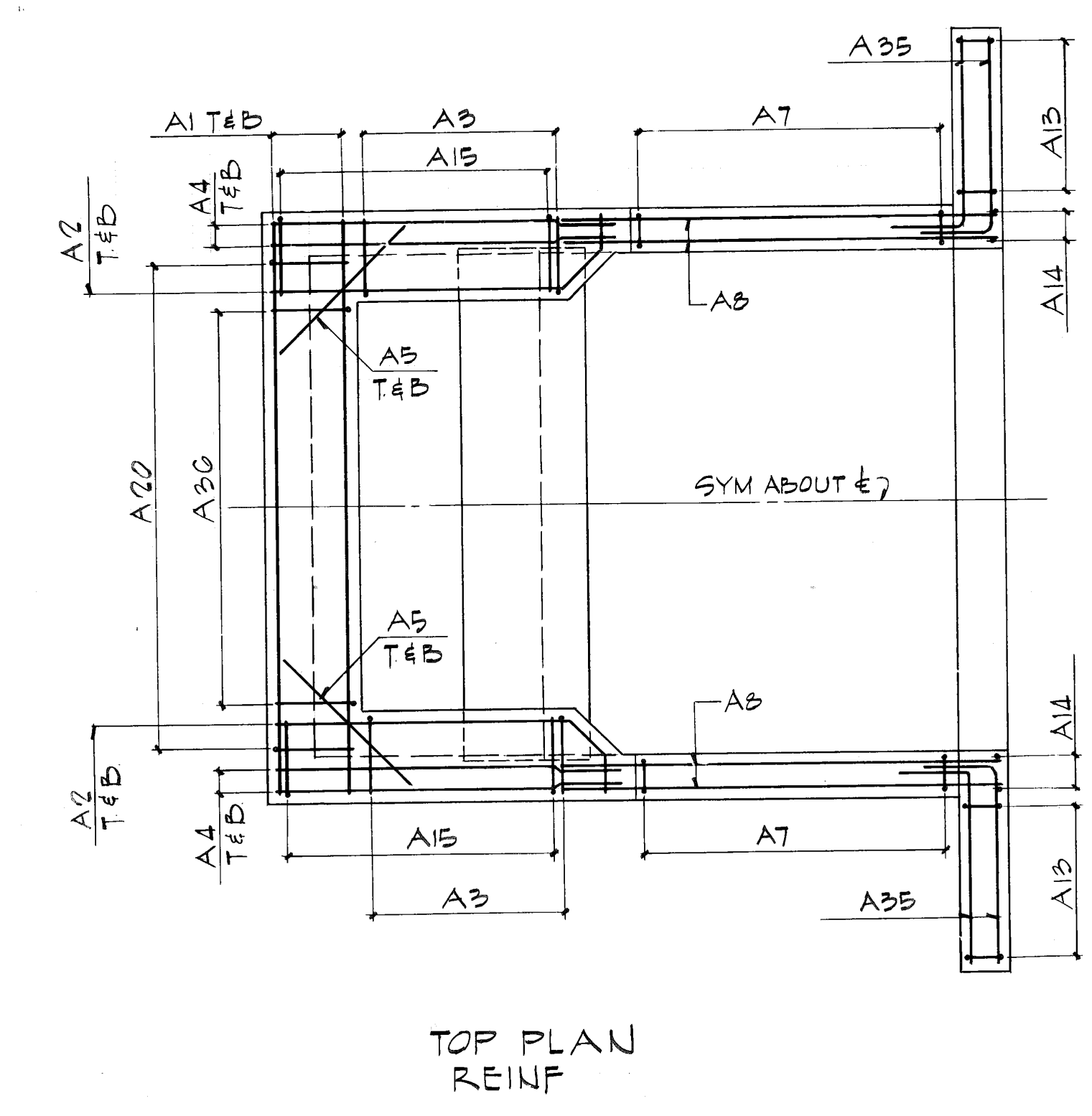
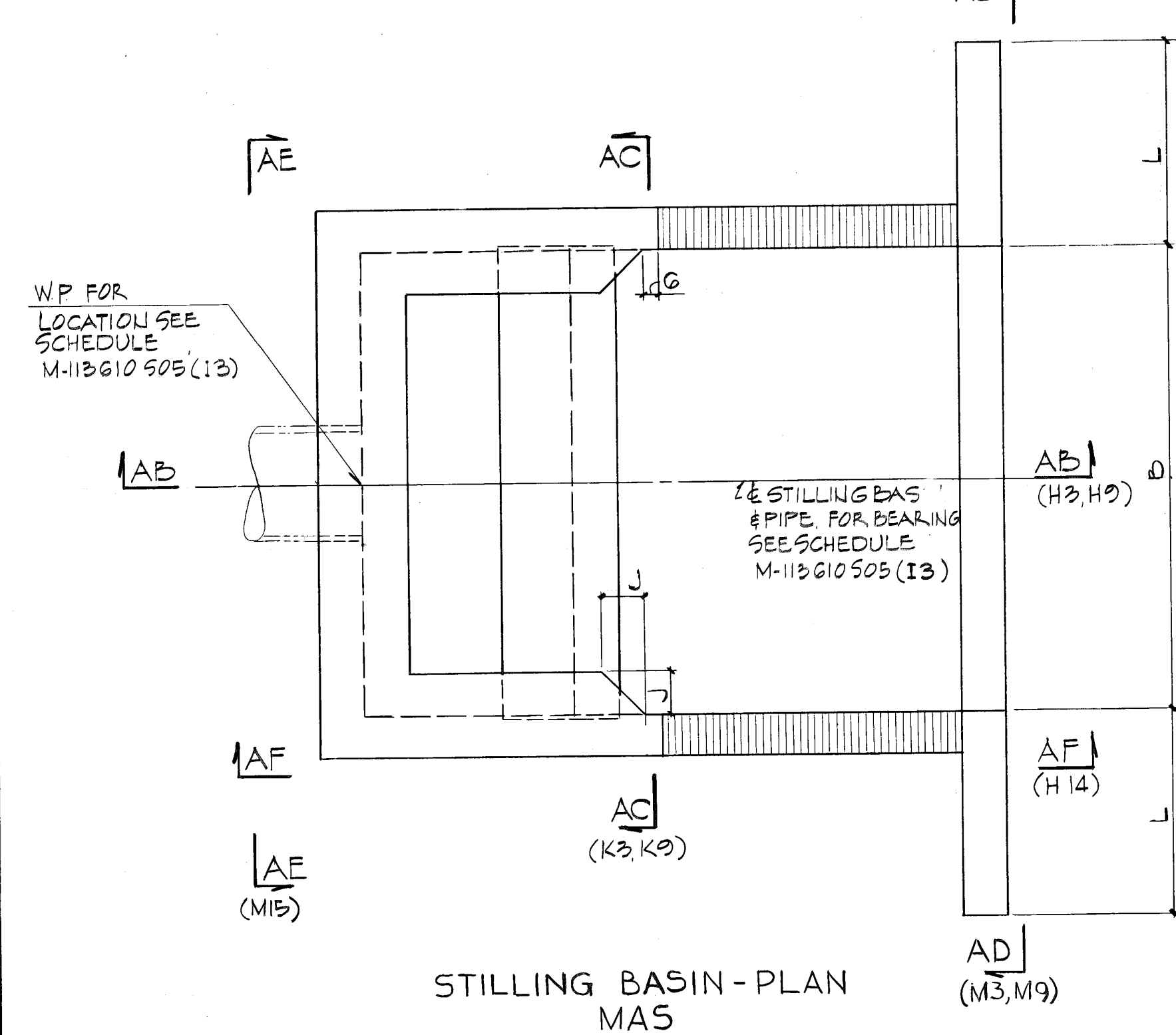
| | |
|-----|--------------|
| DIV | HOU-3037 |
| CH | M-113621 S03 |

HOU-3037-M-113621S04

| NO | DATE | REVISION | BY | CHK | APPROVED |
|----|---------|----------|----|-----|-------------|
| 1 | 8-21-84 | | EK | SKB | [Signature] |

REV: (G) SECT MARK, ADD: (A20, H20) NOTES, TRANSFER REVISION TO H L & P.

After the 1st revision, the drafter, full responsibility for the maintenance of this drawing and for subsequent modifications shall be assigned to the drafter, as shown by the signature and initials of the drafter. All changes incorporated in this drawing shall be identified in the drawing revision block. All work and these field changes shall be identified in the drawing revision block. All work and these field changes shall be identified in the drawing revision block.



QUANTITIES (NET, BY FIELD UNLESS NOTED)
 CONCRETE CLASS 'A' (2500 PSI) 689 CU YD
 FOR REINFORCING STEEL SEE BAR BEENDING SCHEDULE B-148620-13A

NOTES:
 FOR SPECIFICATIONS FOR STEEL FOR CONCRETE REINFORCING BARS AND FOR BAR DETAILS SEE BAR BEENDING SCHEDULE B-148620-13A.
 FOR ADDITIONAL NOTES SEE M-113621S03.
 FOR LOCATION OF STILLING BASINS SEE DWG M-113621S05.

The below listed RCN's and RCM's have not been incorporated as of the last Ebasco Revision.
 NONE

NOTE:
 GROUND FLOOR EL. 100.00' IS EQUAL TO GEODETIC EL. 450.00'

REFERENCE DRAWINGS:
 SWDA GRADING PLAN M-113621S04
 SWDA DRAINAGE PLAN M-113621S03
 SWDA DRAINAGE SECTS & DETS SH 2 M-113621S05
 SWDA DRAINAGE SECTS & DETS SH 3 M-113621S02
 BAR BEENDING SCHEDULE B-148620-13A

| REV | DATE | CONSTRUCTION CONTRACT ISSUES | BY |
|-----|------|------------------------------|----|
| | | PBOA AWARD EAST | |
| | | PBOA BID EAST | |
| | | FUG AWARD | |
| | | FUG BID | |
| | | SITE PREP AWARD | |
| | | SITE PREP BID | |

| TYPE | A | B | C | D | E | F | G | H | J | K | L |
|------|--------|--------|-------|-------|--------|-------|-------|-------|--------|-------|-------|
| I | 15'-4" | 10'-0" | 5'-0" | 1'-0" | 7'-0" | 5'-4" | 3'-0" | 0'-5" | 0'-10" | 1'-3" | 5'-0" |
| II | 15'-0" | 12'-0" | 6'-0" | 2'-0" | 9'-0" | 4'-0" | 4'-0" | 0'-6" | 1'-0" | 1'-0" | 7'-0" |
| III | 20'-0" | 14'-0" | 7'-0" | 2'-4" | 10'-0" | 4'-0" | 5'-3" | 0'-7" | 1'-2" | 1'-0" | 8'-4" |
| IV | 23'-4" | 16'-0" | 8'-0" | 2'-0" | 12'-0" | 5'-4" | 6'-0" | 0'-8" | 1'-4" | 2'-0" | 9'-0" |

| TYPE | NO REQD | CONC QTY PER BASIN | REINF STEEL WT PER BASIN |
|------|---------|--------------------|------------------------------|
| I | 3 | 26 CU YD | 5695 LBS (B-148620-13A SH2) |
| II | 2 | 40 CU YD | 7490 LBS (B-148620-13A SH3) |
| III | 6 | 53 CU YD | 9410 LBS (B-148620-13A SH4) |
| IV | 3 | 69 CU YD | 11715 LBS (B-148620-13A SH5) |

| TYPE | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | A20 | A21 | A22 | A23 | A24 | A25 | A26 | A27 | A28 | A29 | A30 | A31 | A32 | A33 | A34 | A35 | A36 | A37 | A38 | |
|------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| I | 3AC17 8T4B | 1AC27 T4B | 6AC27 E12 | 2AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | | |
| II | 3AC17 8T4B | 1AC27 T4B | 6AC27 E12 | 2AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | |
| III | 3AC17 8T4B | 1AC27 T4B | 6AC27 E12 | 2AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B |
| IV | 3AC17 8T4B | 1AC27 T4B | 6AC27 E12 | 2AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B | 1AC27 T4B |

HOUSTON LIGHTING & POWER CO.
 LIMESTONE ELECTRIC GENERATING STATION
 UNIT 1, 750 MW 1985 INSTALLATION
 UNIT 2, 750 MW 1986 EXTENSION
 SOLID WASTE DISPOSAL AREA
 DRAINAGE STRUCTURES
 STILLING BASINS - PLANS & SECTS - M & R

Ebasco Services Incorporated

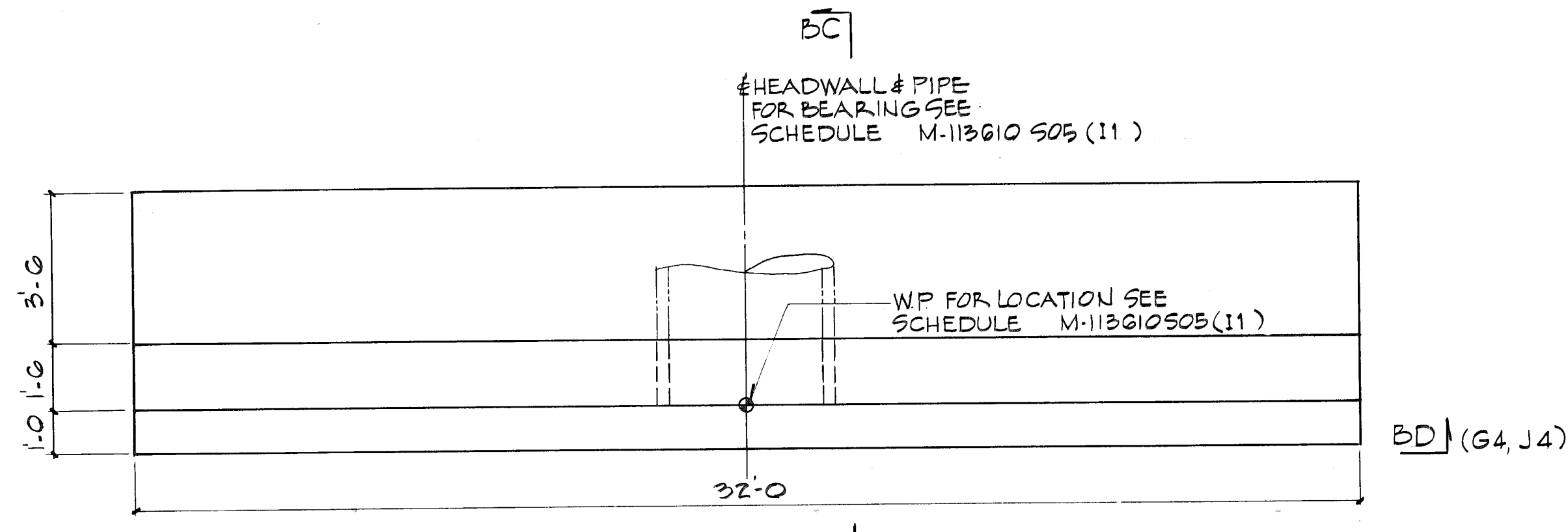
SCALE NTS APPROVED DATE 10/1/84
 DIV. CIVIL Edgely J. Edwards
 DR. M. SHERZER W. J. Sherzer
 CH. H. MAH SKB M. H. Mah

HOU-3037
 M-113621S04

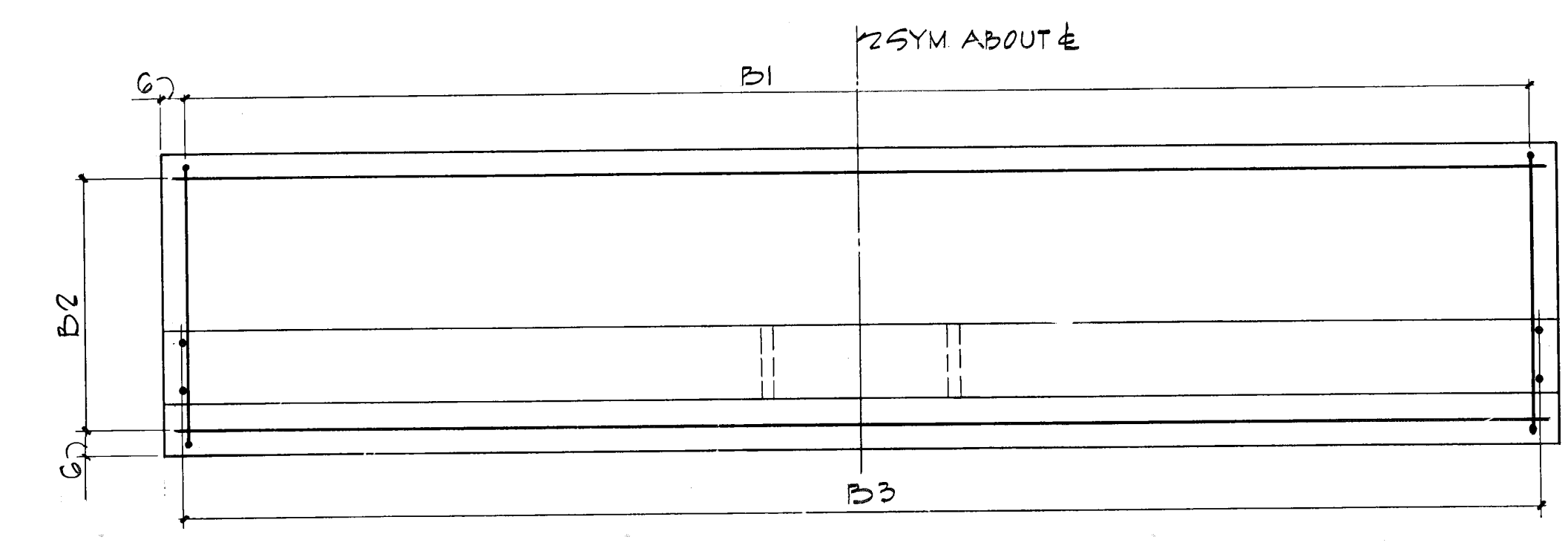
| NO | DATE | REVISION | BY | CH | APPROVED |
|----|---------|----------|----|-----|-------------|
| 1 | 8-21-84 | | EK | SKB | [Signature] |

REV: (D9, E8) SECT MARK. ADD: (A20, H20) NOTES.
TRANSFER REVISION TO H L & P.

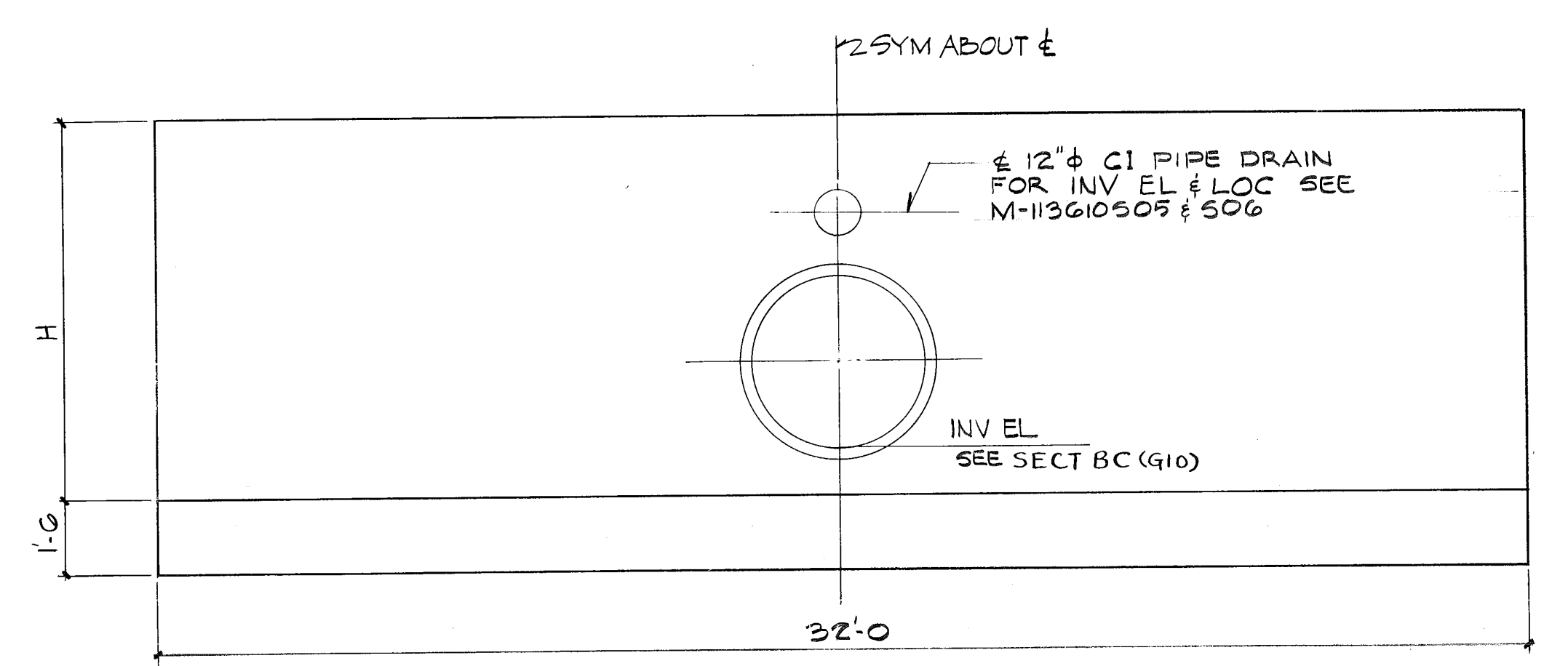
After the issue of this drawing, full responsibility for the maintenance of this drawing and for subsequent modifications shall be assumed by the drafter. It is the responsibility of the drafter to ensure that all drawings are maintained in accordance with the Houston Lighting & Power Company (HL&P) Standard Drawing Procedures. All drawings shall be maintained in accordance with the Houston Lighting & Power Company (HL&P) Standard Drawing Procedures. All drawings shall be maintained in accordance with the Houston Lighting & Power Company (HL&P) Standard Drawing Procedures.



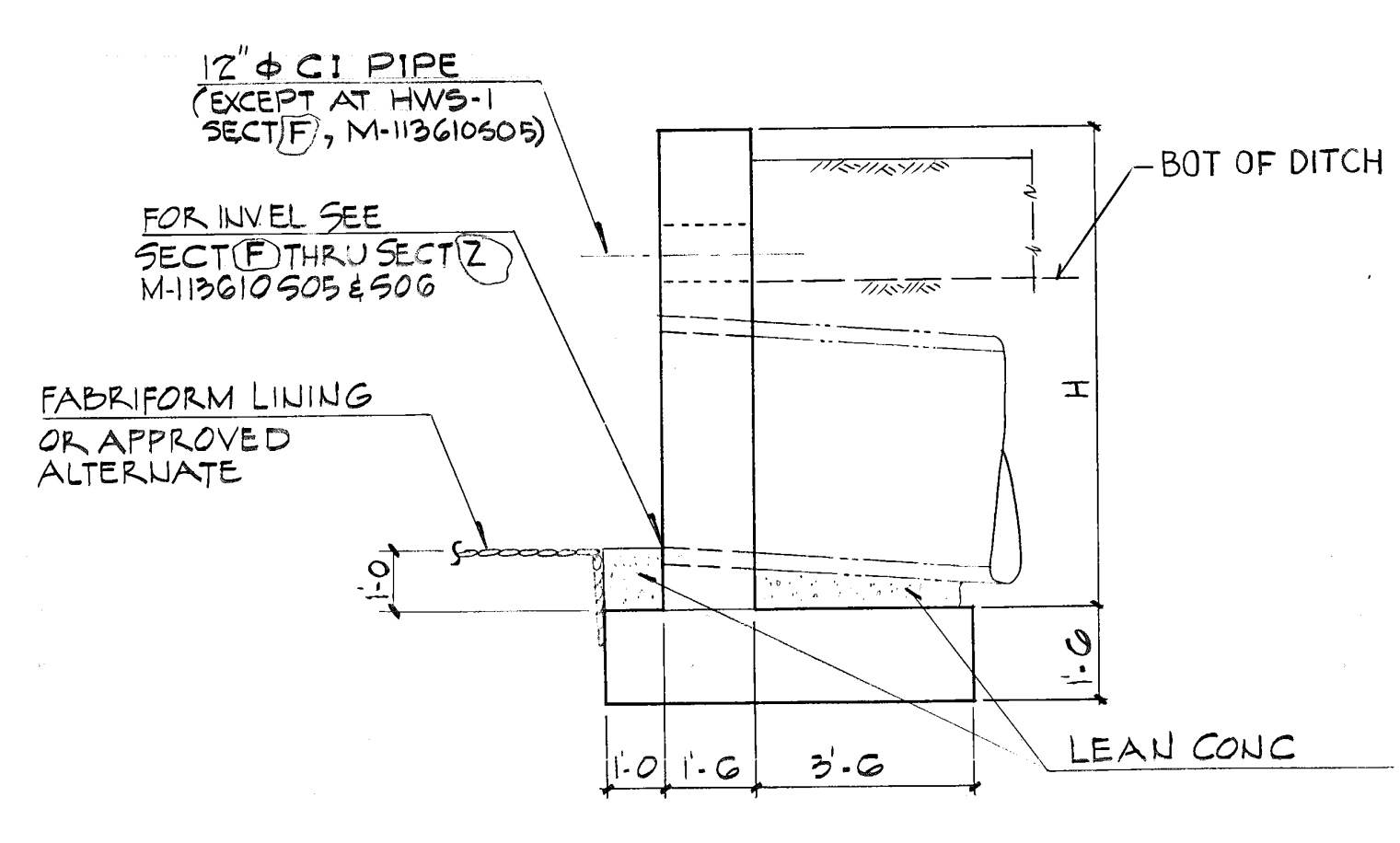
HEADWALL - PLAN MAS



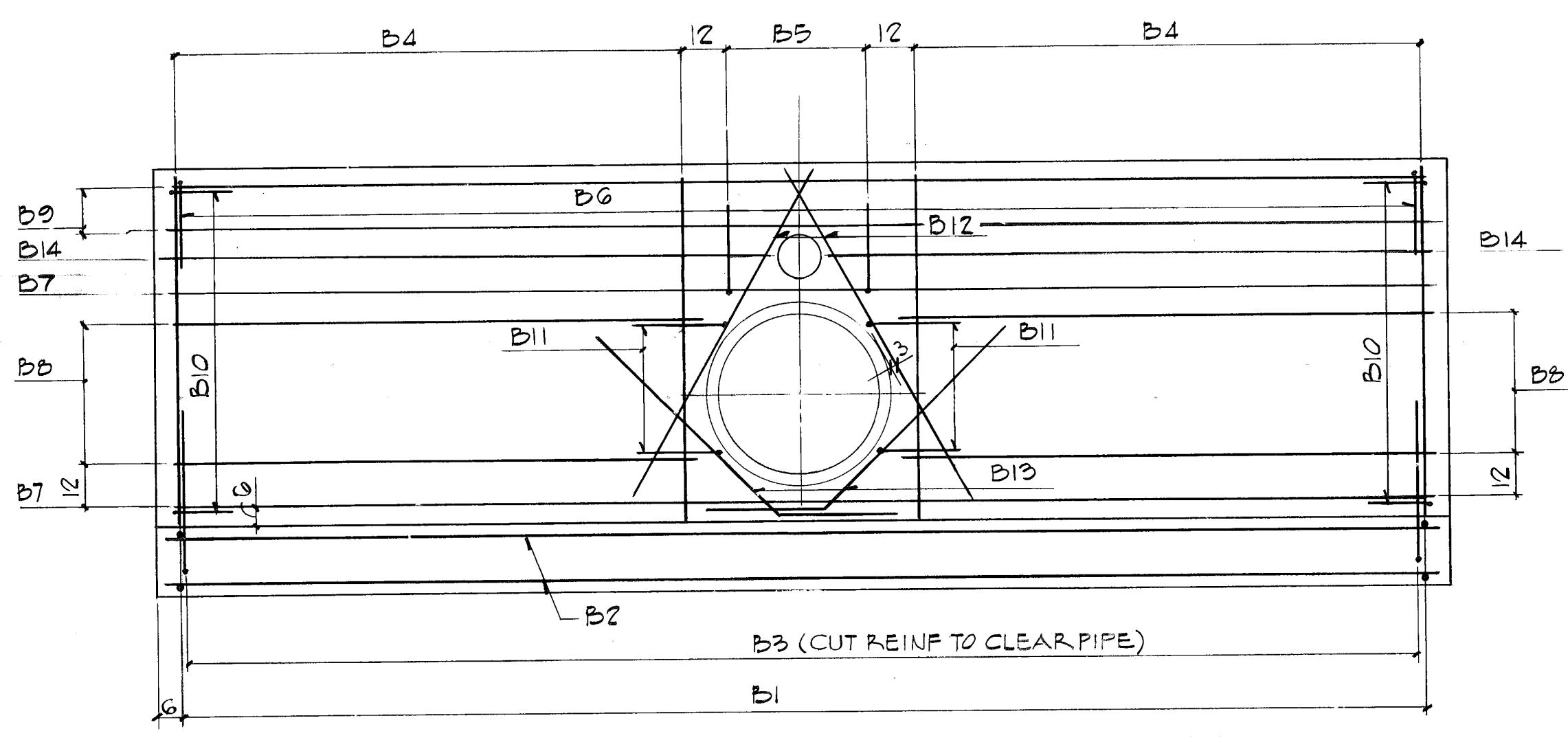
HEADWALL - PLAN REINF



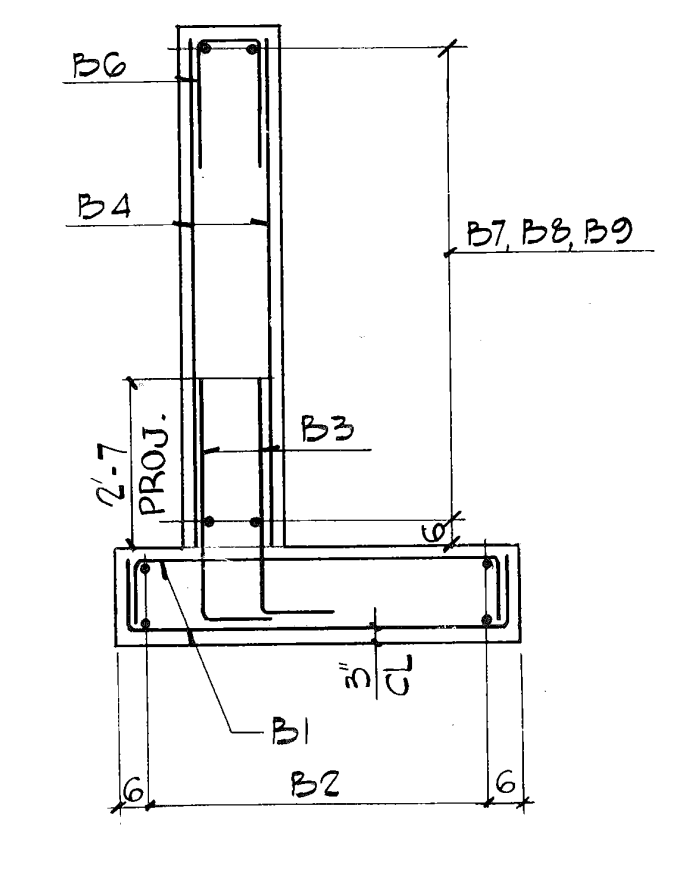
ELEV BD (C7) MAS



SECT BC (C8) MAS



ELEV BD (C7) REINF



SECT BC (C8) REINF

QUANTITIES (NET BY FIELD UNLESS NOTED)
CONCRETE CLASS 'A' (3500 PSI) 472 CU YD.
FOR REINFORCING STEEL SEE BAR BENDING SCHEDULE B-148620-13B
12" C.I. PIPE 1'-6" LONG 18 REQ'D

NOTES:
FOR SPECIFICATIONS FOR STEEL FOR CONCRETE REINFORCING BARS AND FOR BAR DETAILS SEE BAR BENDING SCHEDULE B-148620-13B
FOR ADDITIONAL NOTES SEE M-101600 509
FOR LOCATION OF HEADWALLS SEE DWG M-113610 505

The below listed DCN's and PCN's have not been incorporated as of the last Ebasco Revision.
NONE

NOTE:
GROUND FLOOR EL. 100.00' IS EQUAL TO GEODETIC EL. 450.00'

REFERENCE DRAWING:
SWDA GRADING PLAN M-113600 504
SWDA DRAINAGE PLAN M-113610 503
SWDA DRAINAGE SECTS & DETS SH 2 M-113610 505
SWDA DRAINAGE SECTS & DETS SH 3 M-113610 506
BAR BENDING SCHEDULE B-148620-13B

| TYPE | H | CONC PIPE Ø |
|------|--------|-------------|
| V | 8'-0" | 42" |
| VI | 10'-0" | 42" |
| VII | 8'-0" | 54" |

| TYPE | WP REQ'D | CONC QTY PER HEADWALL | REINF STEEL WGT PER HEADWALL |
|------|----------|-----------------------|------------------------------|
| I | 8 | 25 CU YD | 3865 LBS (B-148620-13B SH 2) |
| II | 2 | 28 CU YD | 4225 LBS (B-148620-13B SH 3) |
| III | 9 | 24 CU YD | 3880 LBS (B-148620-13B SH 4) |

| TYPE | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 | B13 | B14 * |
|------|----------------------------|---------------------------|-------------------------|--------------------------|---------------------|----------------------|------------------|--------------------------|------------------------|-----------------------|-----------------------|------------------|------------------|------------------|
| I | 32-AC201 #6 @ 12" T & B | 6-AC202 #6 @ 12" T & B | 32-AC203 #6 @ 12" EF | 2-4-AC204 #6 @ 12" EF | 4-AC205 #6 @ 12" | 32-AC206 #6 @ 12" | 1-AC207 #6 EF | 2-4-AC208 #6 @ 12" EF | 3-AC209 #6 @ 12" EF | 2-4-AC210 #6 @ 12" | 2-4-AC211 #6 @ 12" | 2-AC212 #6 EF | 2-AC213 #6 EF | 1-AC214 #6 EF |
| II | 32-AC221 #6 @ 12" T & B | 6-AC222 #6 @ 12" T & B | 32-AC223 #6 @ 12" EF | 2-4-AC224 #6 @ 12" EF | 4-AC225 #6 @ 12" | 32-AC226 #6 @ 12" | 1-AC227 #6 EF | 2-4-AC228 #6 @ 12" EF | 3-AC229 #6 @ 12" EF | 2-4-AC230 #6 @ 12" | 2-4-AC231 #6 @ 12" | 2-AC232 #6 EF | 2-AC233 #6 EF | 1-AC234 #6 EF |
| III | 32-AC241 #6 @ 12" T & B | 6-AC242 #6 @ 12" T & B | 32-AC243 #6 @ 12" EF | 2-4-AC244 #6 @ 12" EF | 4-AC245 #6 @ 12" | 32-AC246 #6 @ 12" | 1-AC247 #6 EF | 2-4-AC248 #6 @ 12" EF | 3-AC249 #6 @ 12" EF | 2-4-AC250 #6 @ 12" | 2-4-AC251 #6 @ 12" | 2-AC252 #6 EF | 2-AC253 #6 EF | 1-AC254 #6 EF |

* OMIT AT HWS-1 (SECT A, M-113610 505)

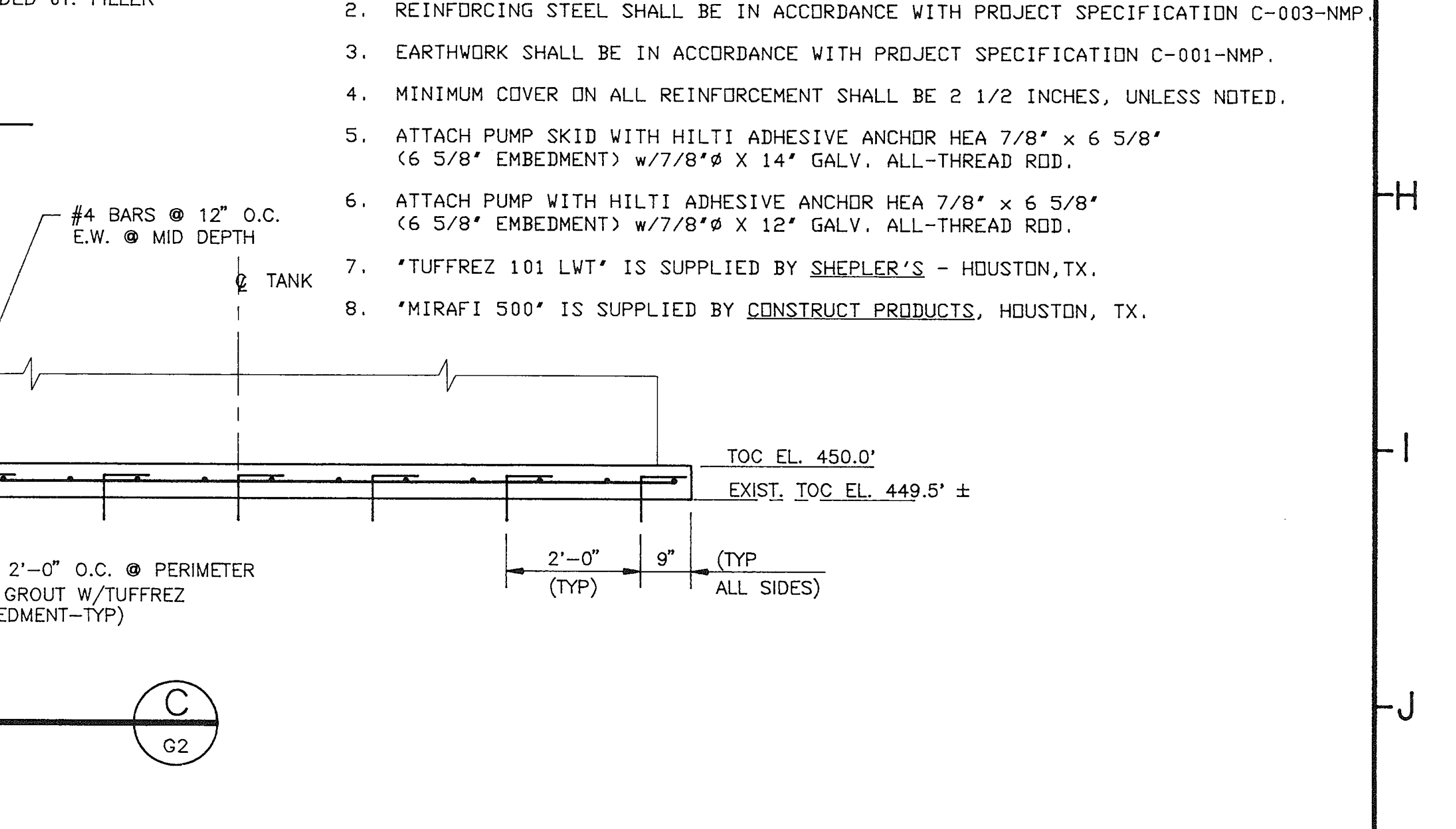
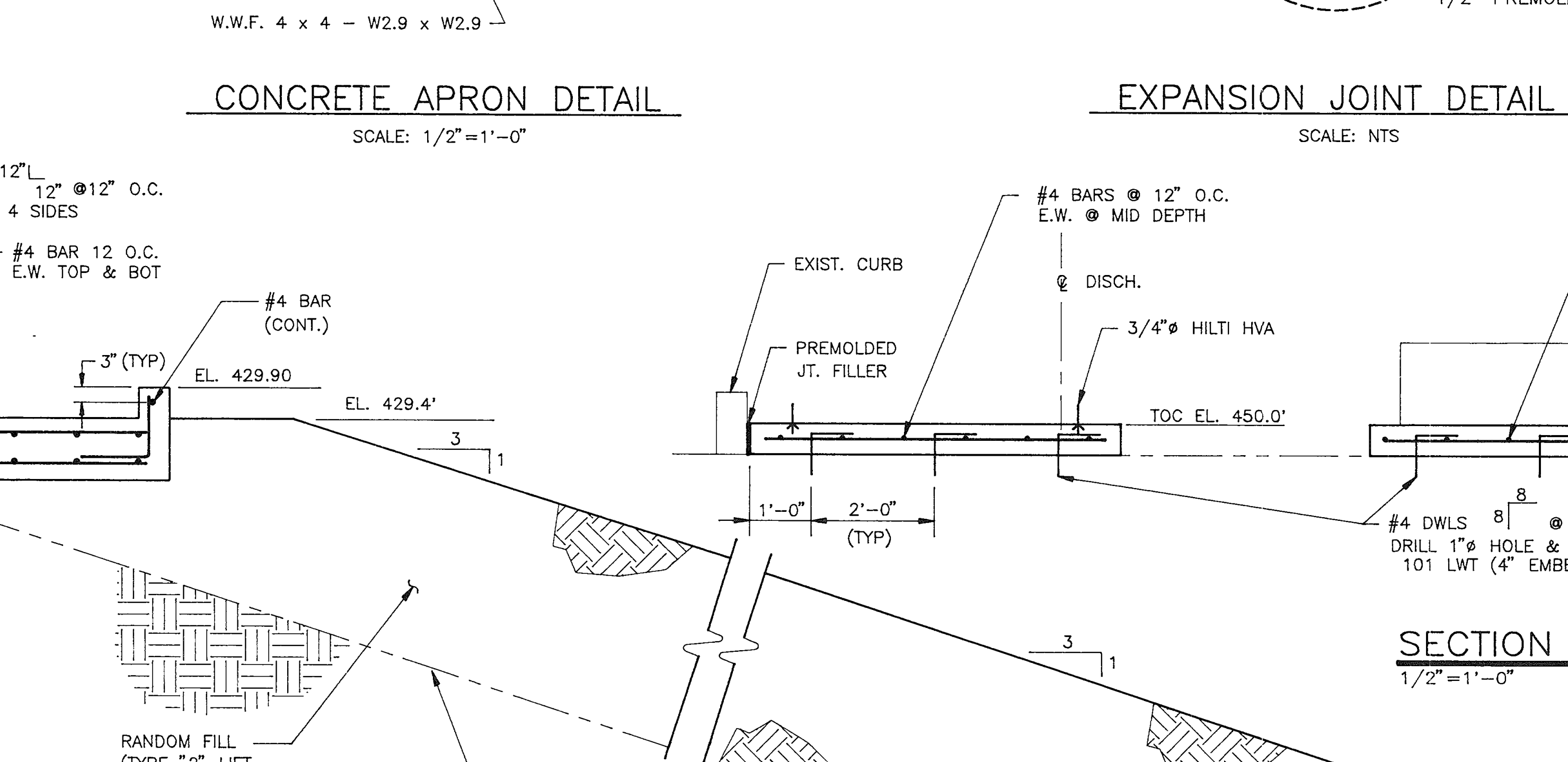
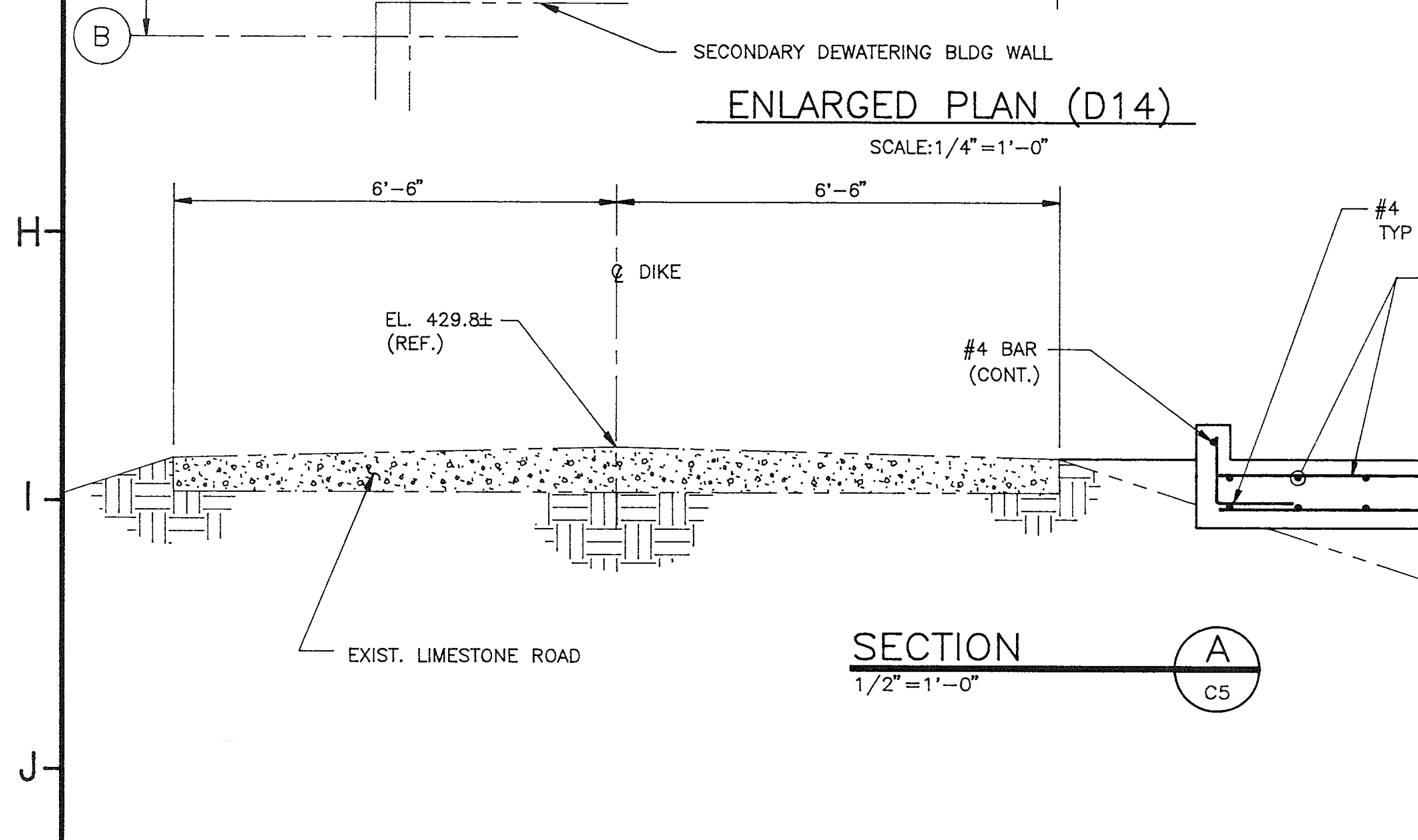
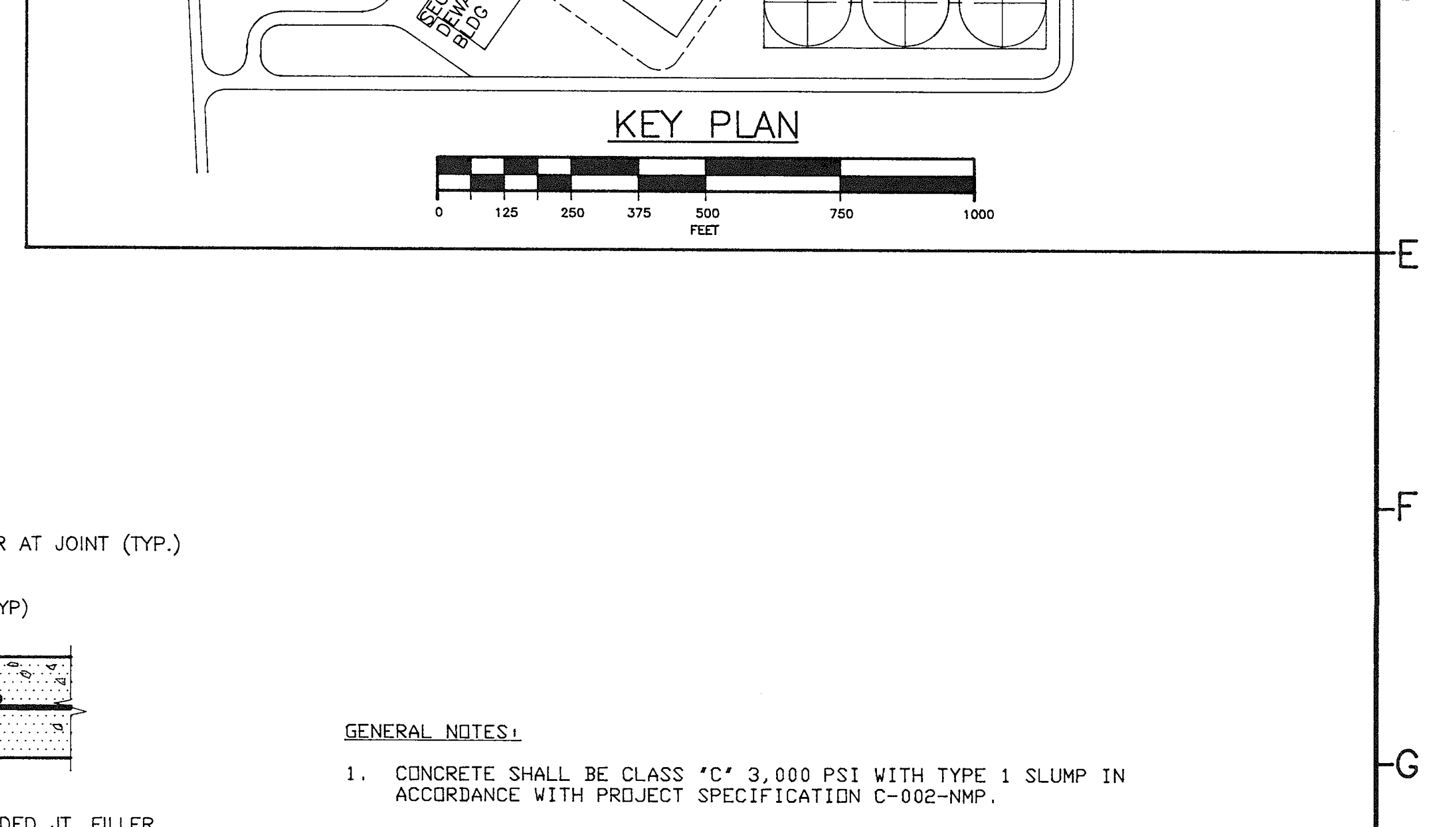
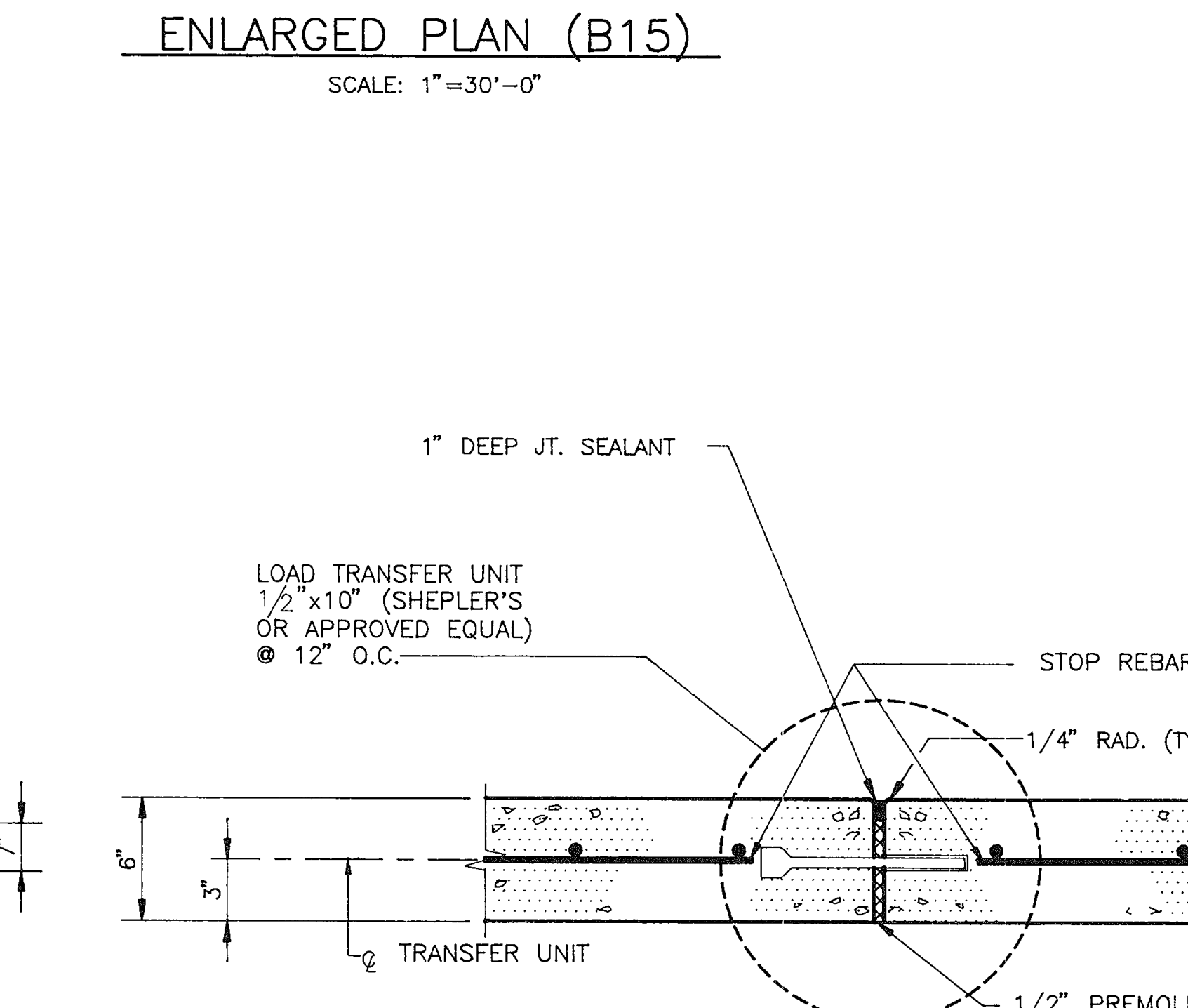
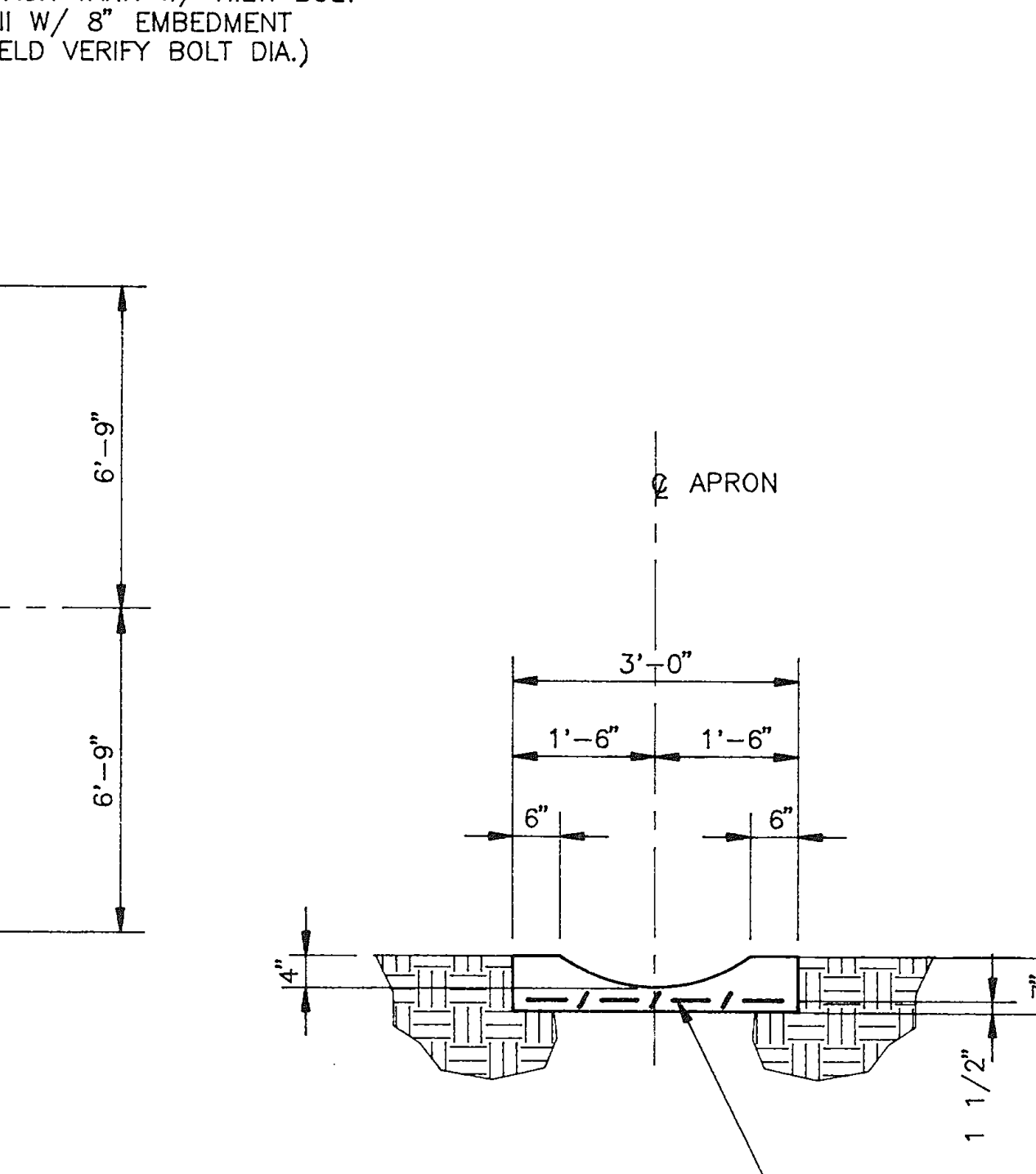
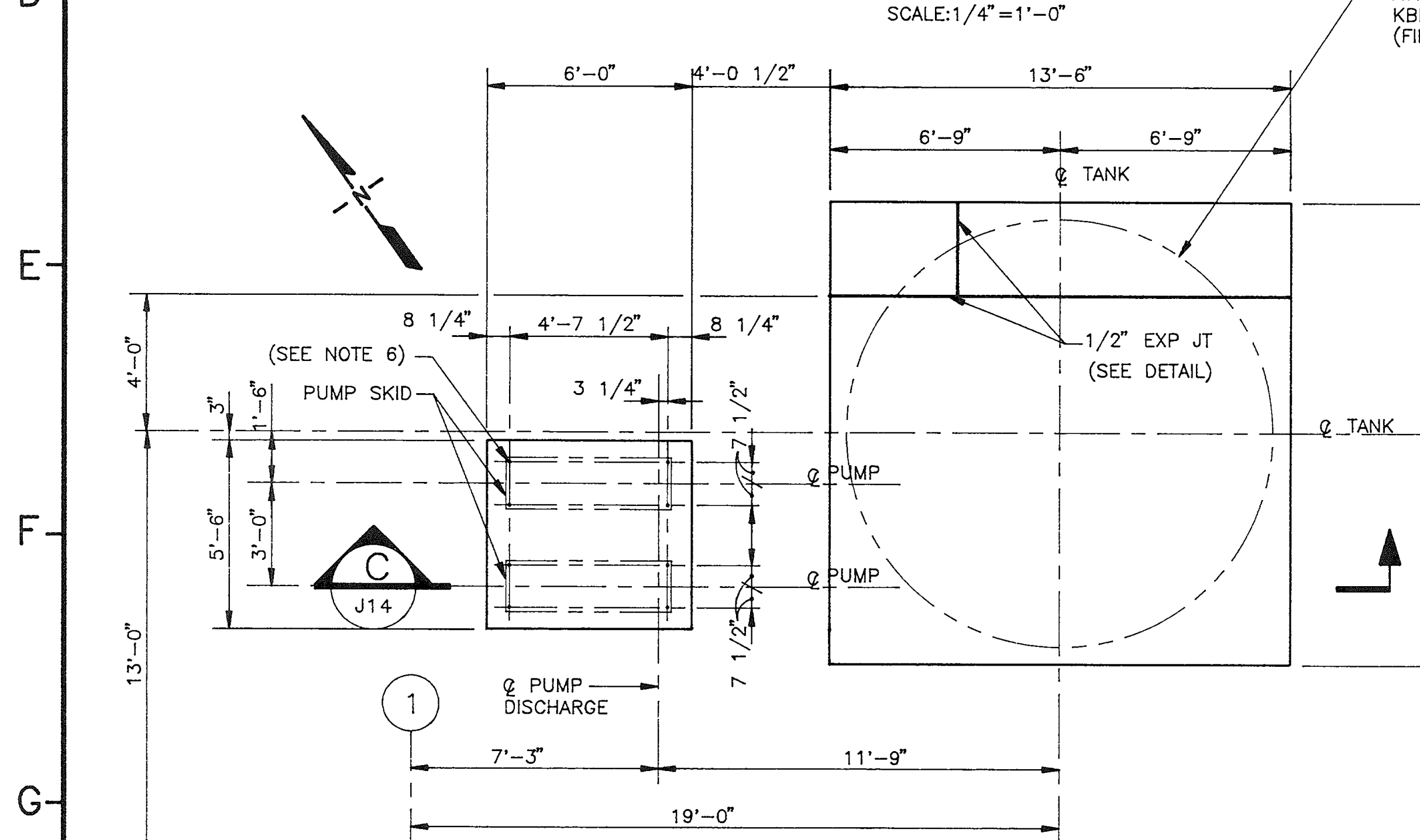
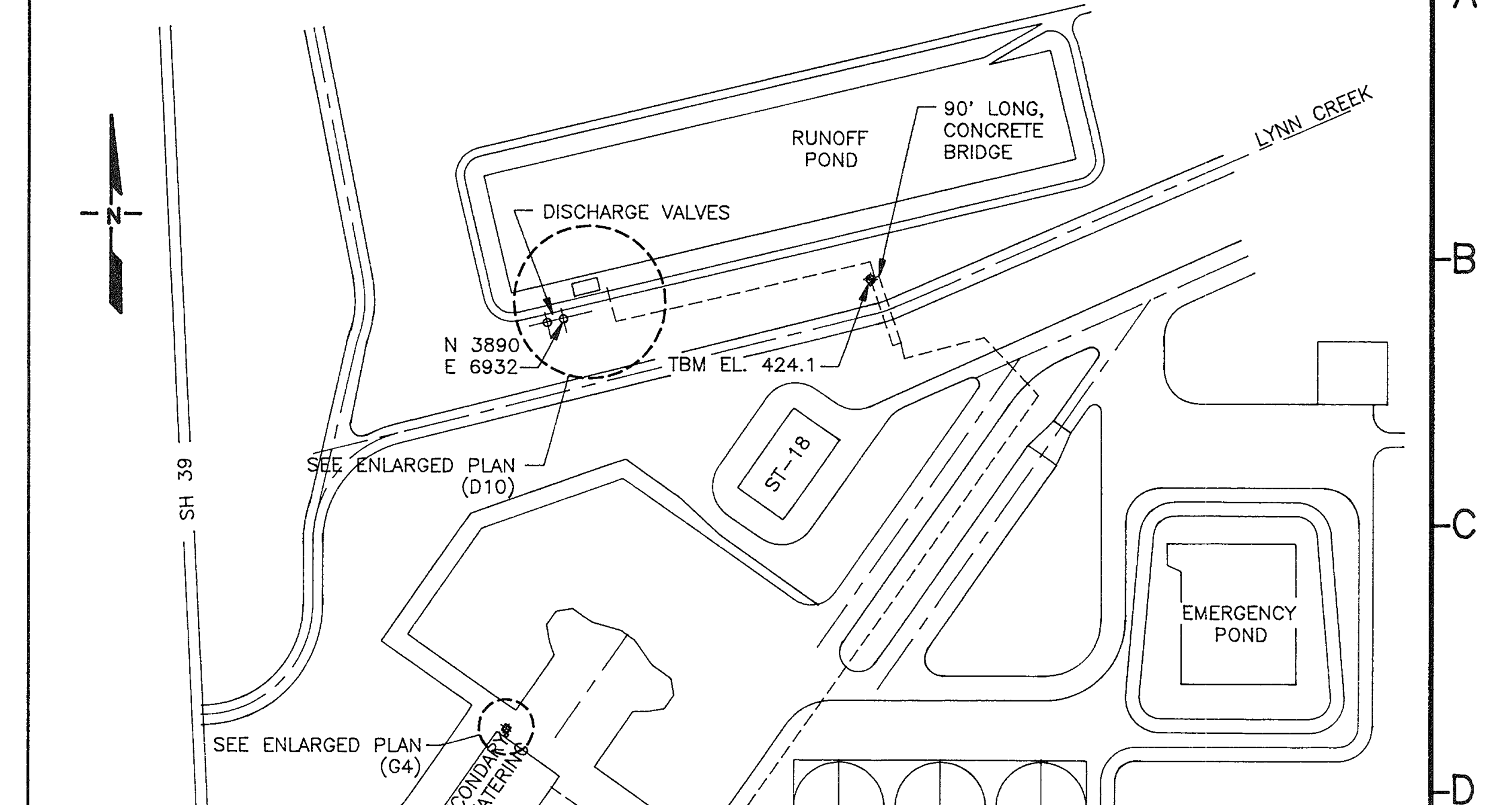
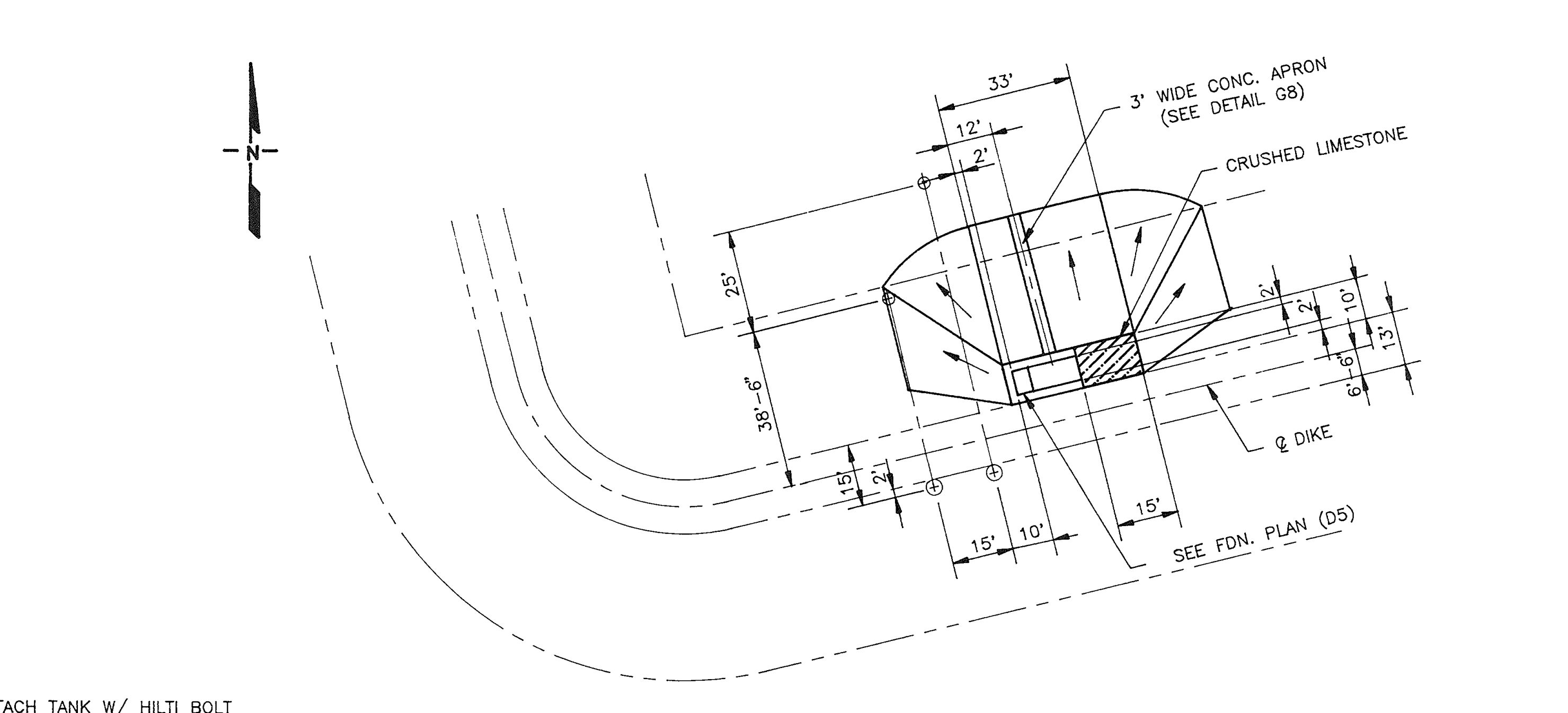
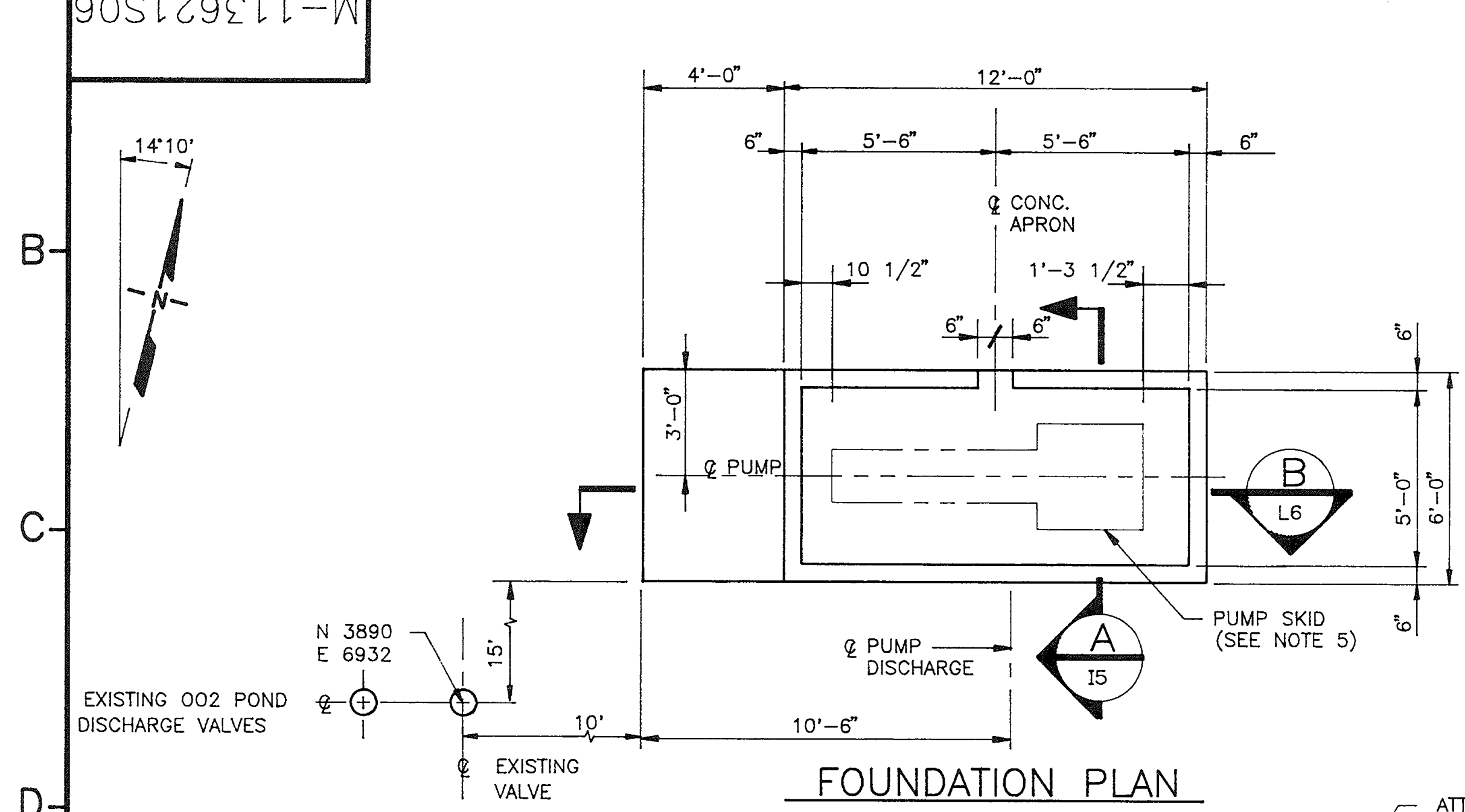
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|-----|-----------------|------------------------------|----|
| | PBOA BID EAST | | |
| | FUG AWARD | | |
| | FUG BID | | |
| | SITE PREP AWARD | | |
| | SITE PREP BID | | |
| REV | DATE | CONSTRUCTION CONTRACT ISSUES | BY |

HOUSTON LIGHTING & POWER CO.
LIMESTONE ELECTRIC GENERATING STATION
UNIT 1, 750 MW 1985 INSTALLATION
UNIT 2, 750 MW 1986 EXTENSION
SOLID WASTE DISPOSAL AREA
DRAINAGE STRUCTURES
HEADWALLS - PLANS & SECTS - M & R

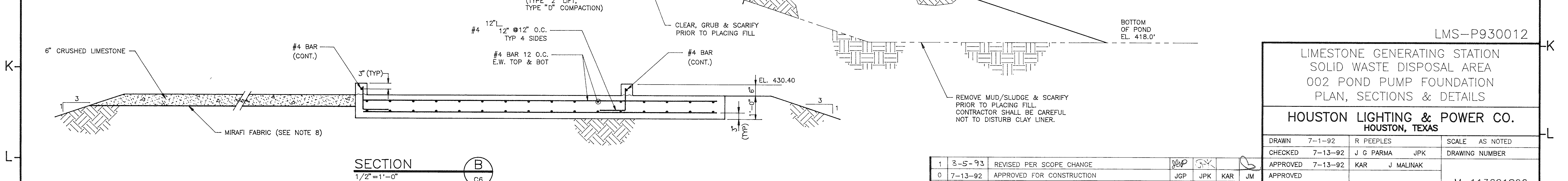
EBASCO SERVICES INCORPORATED

| SCALE | APPROVED | DATE |
|----------------|-------------|--------------|
| 1/8" = 1'-0" | [Signature] | May 18, 1984 |
| DIV. CIVIL | [Signature] | HOU-3037 |
| DR. M. SHERZER | [Signature] | M-113621 S05 |
| CH. H. MAH | SKB | |

A 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 A



- GENERAL NOTES:**
- CONCRETE SHALL BE CLASS 'C' 3,000 PSI WITH TYPE 1 SLUMP IN ACCORDANCE WITH PROJECT SPECIFICATION C-002-NMP.
 - REINFORCING STEEL SHALL BE IN ACCORDANCE WITH PROJECT SPECIFICATION C-003-NMP.
 - EARTHWORK SHALL BE IN ACCORDANCE WITH PROJECT SPECIFICATION C-001-NMP.
 - MINIMUM COVER ON ALL REINFORCEMENT SHALL BE 2 1/2 INCHES, UNLESS NOTED.
 - ATTACH PUMP SKID WITH HILTI ADHESIVE ANCHOR HEA 7/8" x 6 5/8" (6 5/8" EMBEDMENT) w/7/8" x 14" GALV. ALL-THREAD ROD.
 - ATTACH PUMP WITH HILTI ADHESIVE ANCHOR HEA 7/8" x 6 5/8" (6 5/8" EMBEDMENT) w/7/8" x 12" GALV. ALL-THREAD ROD.
 - *TUFFREZ 101 LWT* IS SUPPLIED BY SHEPLER'S - HOUSTON, TX.
 - *MIRAFI 500* IS SUPPLIED BY CONSTRUCT PRODUCTS, HOUSTON, TX.



LMS-P930012

LIMESTONE GENERATING STATION
SOLID WASTE DISPOSAL AREA
002 POND PUMP FOUNDATION
PLAN, SECTIONS & DETAILS

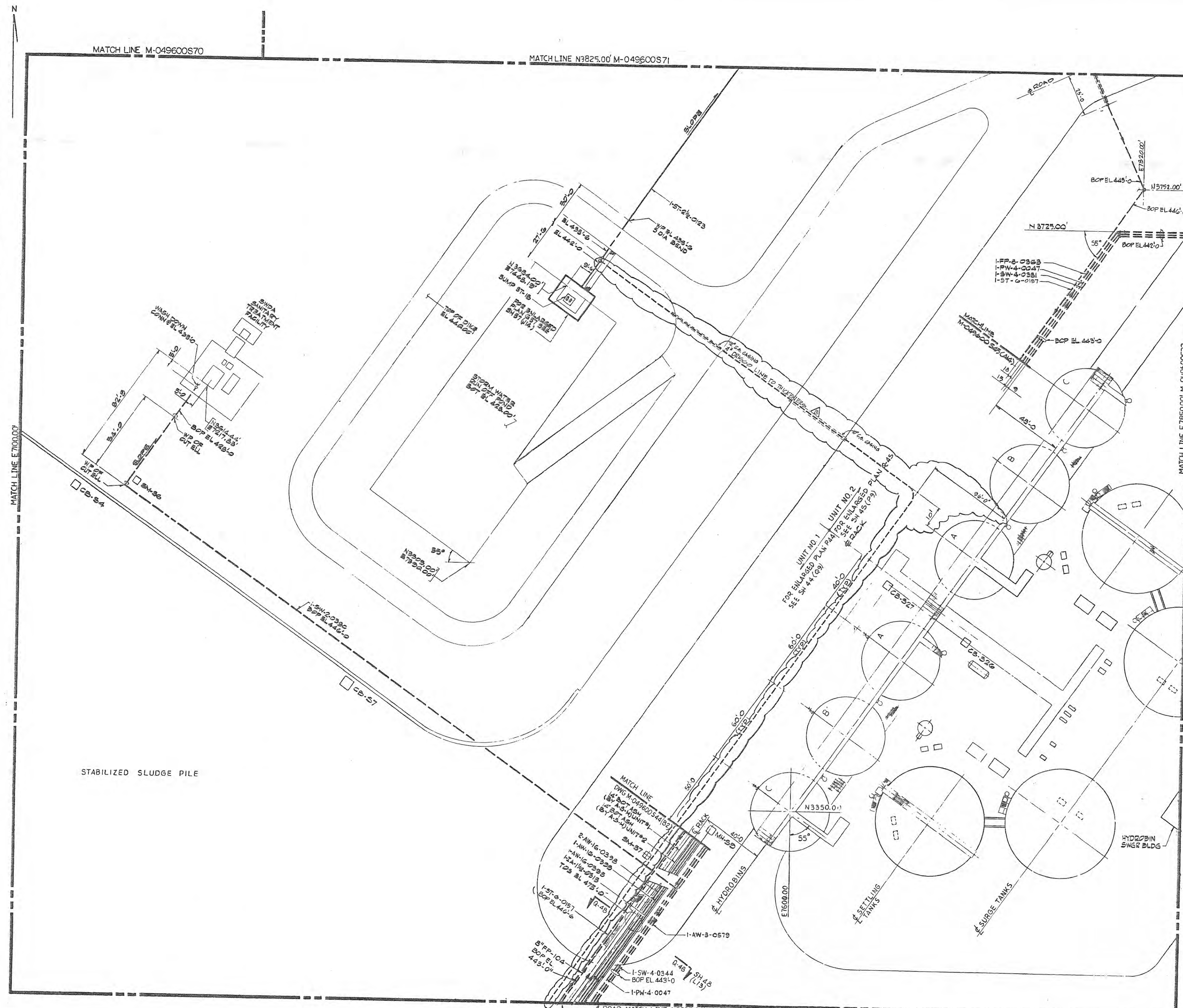
HOUSTON LIGHTING & POWER CO.
HOUSTON, TEXAS

| | | | | |
|----------|---------|-----------|-----------|----------------|
| DRAWN | 7-1-92 | R PEEPLES | SCALE | AS NOTED |
| CHECKED | 7-13-92 | J G PARMA | JPK | DRAWING NUMBER |
| APPROVED | 7-13-92 | KAR | J MALINAK | |
| NO. | DATE | REVISION | BY | CHK. |

FILE NAME: 11362156

| | | | | | | | |
|---|---------|---------------------------|-----|-----|-----|----|--|
| 1 | 3-5-93 | REVISED PER SCOPE CHANGE | JGP | JPK | KAR | JM | |
| 0 | 7-13-92 | APPROVED FOR CONSTRUCTION | JGP | JPK | KAR | JM | |

| NO | DATE | REVISION | BY | CH | APPROVED |
|----|---------|--|----|----|----------|
| 7 | 3/0/83 | ISSUED FOR LMS-1980 (2 MIC WATER BALANCE PROJECTS) | AM | MR | SKK |
| 8 | 1/16/83 | REVISED THE FIELD SYMBOLS FOR LMS-1980001 | BR | MR | RJD |



NOTES
 1. FOR GENERAL NOTES AND SYMBOLS SEE DWG M-049260.
 2. THE FOLLOWING FIRE PROTECTION EQUIPMENT WILL BE FIELD PURCHASED AND PIPING WILL BE ADJUSTED TO SUIT IN FIELD: POST INDICATOR VALVES, FIRE HYDRANTS AND CURB BOX VALVES.

The below listed DC's and FC's have not been incorporated as of the last Ebasco Revision.

- NONE
- REFERENCE DRAWINGS
- KEY PLAN DWG M-04960051A
 - PLOT PLAN DWG M-001601503
 - FLOW DIAGRAM
 - BOTTOM ASH HANDLING SYSTEM DWG M-029260501
 - FLOW DIAGRAM
 - SERVICE & WELL WATER SYSTEM DWG M-020260503
 - FLOW DIAGRAM
 - POTABLE WATER SYSTEM DWG M-077260
 - FLOW DIAGRAM
 - COMPRESSED AIR SYSTEM DWG M-023261504
 - FLOW DIAGRAM
 - FIRE PROTECTION SYSTEM DWG M-078260501
 - FLOW DIAGRAM
 - SOLID WASTE DISPOSAL
 - AREA SLUDGE STABILIZATION
 - FACILITY ROADS, PAVING & DRAINAGE PLAN DWG M-119260503
 - SWDA YARD DUCT RUNS SH.3 DWG M-158787 503

PBCA & PLS CONTRACTOR SCOPE AS NOTED ON M-049260 TO SITE
 PREP FOR REFERENCE
 BALANCE OF WORK BY SWDA CONTRACTOR

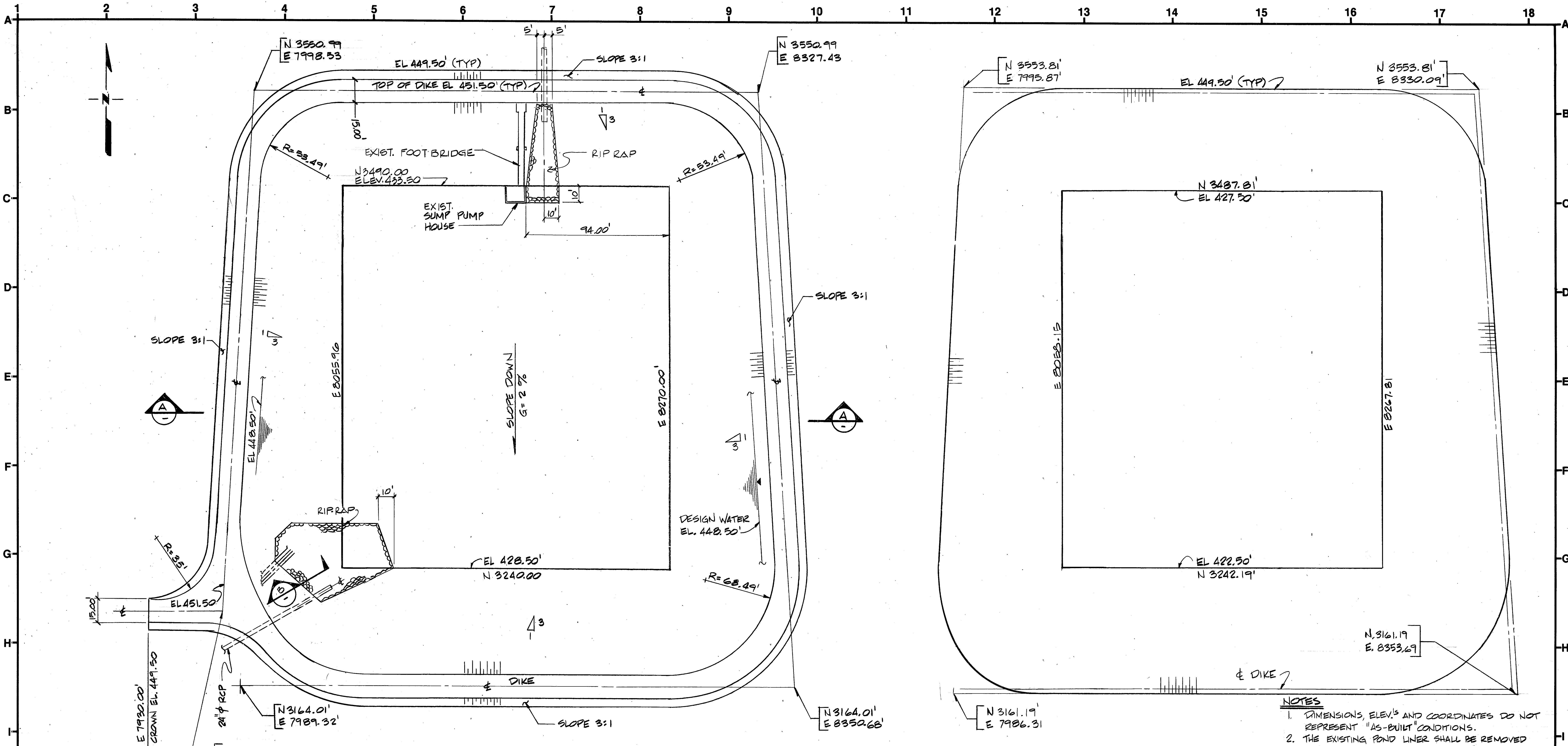
NOTE: GROUND FLOOR EL. 100.00' IS EQUAL TO GEODETIC EL. 450.00'

FILE# 04960030

HOUSTON LIGHTING & POWER CO.
 LIMESTONE ELECTRIC GENERATING STATION
 UNIT 1, 750 MW 1985 INSTALLATION
 UNIT 2, 750 MW 1986 EXTENSION
 YARD PIPING
 SHEET NO. 30

EBASCO SERVICES INCORPORATED

SCALE 1" = 20'-0" APPROVED DATE 8/4/82
 DIV. MECHANICAL DR. R. FRIEDMAN CH. D. ABRUSCATO
 M-049600530



PLAN
SCALE: 1" = 30'-0"

SUBGRADE OUTLINE
SCALE: 1" = 30'-0"

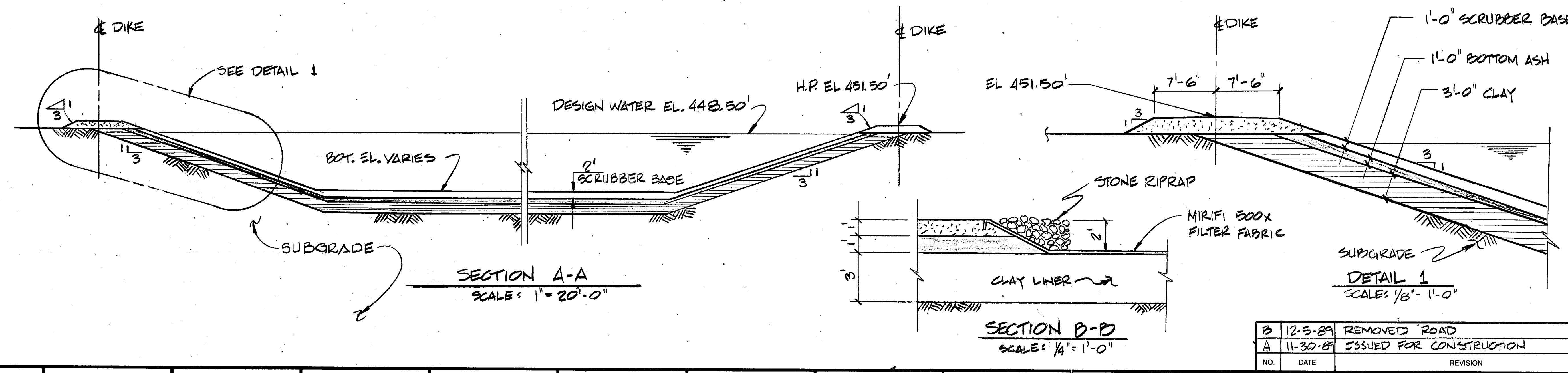
- NOTES**
1. DIMENSIONS, ELEV. AND COORDINATES DO NOT REPRESENT "AS-BUILT" CONDITIONS.
 2. THE EXISTING POND LINER SHALL BE REMOVED COMPLETELY, STOCKPILED IN SUDA-CELL 6, AND UTILIZED FOR CONSTRUCTION OF THE FINAL LIFT OF CELL 6 CLAY LINER.
 3. THE NEW CLAY LINER SHALL BE A MIN. OF 3' AND INSTALLED PER SPECIFICATION C-101.
 4. BOTTOM ASH AND SCRUBBER BASE MAY BE INSTALLED IN A SINGLE LIFT UTILIZING 2 PASSES OF THE COMPACTION EQUIP.
 5. THE EXISTING FABRIFORM SHALL BE REMOVED AND REPLACED W/ROCK RIP-RAP IN ACCORDANCE WITH SPECIFICATION C-101.

LIMESTONE ELECTRIC GENERATING STATION
SOLID WASTE DISPOSAL AREA
EMERGENCY POND LINER REPAIRS

HOUSTON LIGHTING & POWER CO.
HOUSTON, TEXAS

| | | |
|-------------------|------------------|----------------|
| DRAWN 11-28-89 | D.F. DZIERSKI | SCALE AS NOTED |
| CHECKED 11-29-89 | J.J. [Signature] | DRAWING NUMBER |
| APPROVED | | |
| APPROVED 11-30-89 | J. [Signature] | SK-DZ1 |

| NO. | DATE | REVISION | BY | CH. | APP. | APP. |
|-----|----------|-------------------------|-----|-----|-------------|-------------|
| B | 12-5-89 | REMOVED ROAD | DFD | TLS | [Signature] | [Signature] |
| A | 11-30-89 | ISSUED FOR CONSTRUCTION | DFD | TLS | [Signature] | [Signature] |



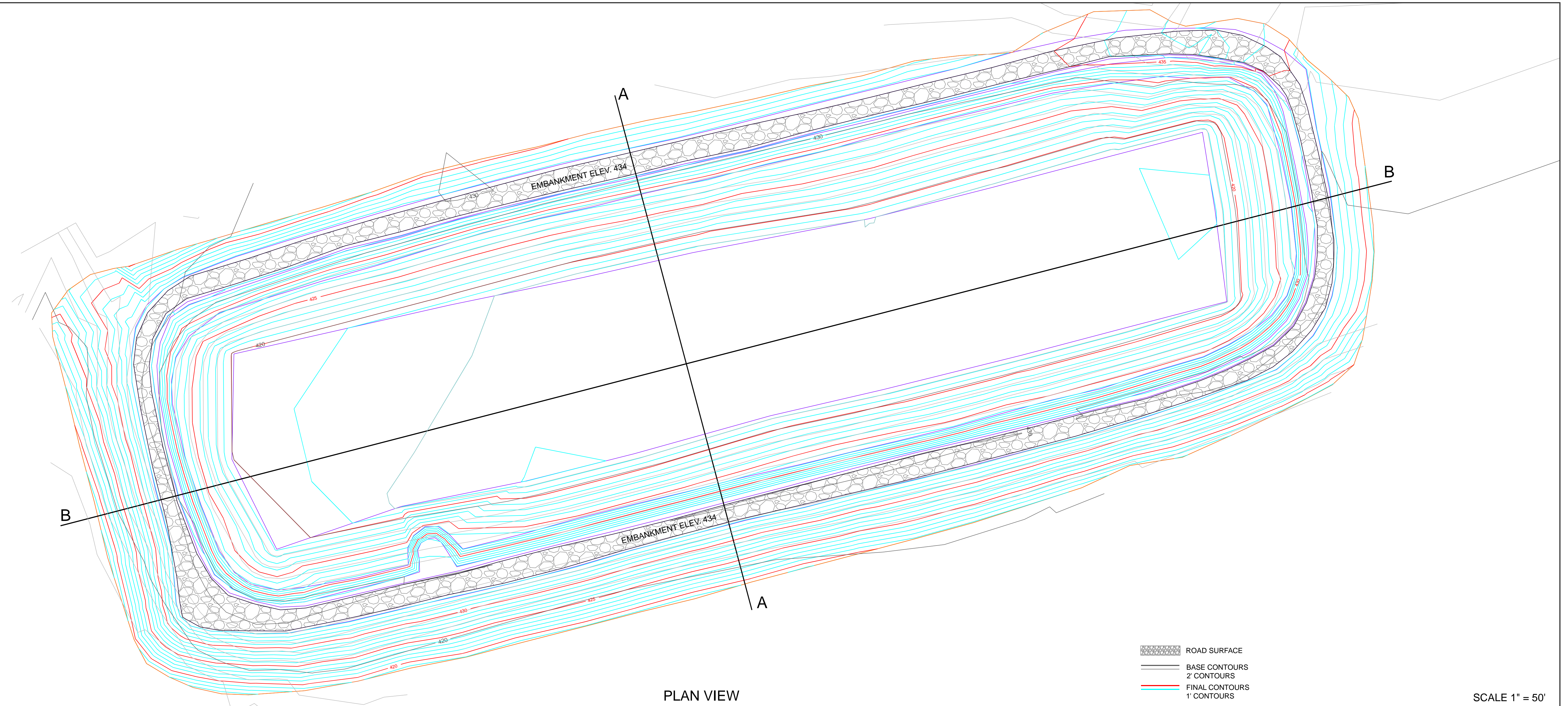
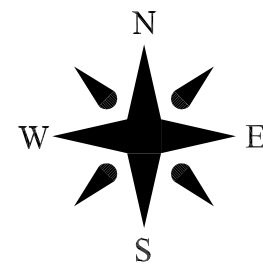
SECTION A-A
SCALE: 1" = 20'-0"

SECTION B-B
SCALE: 1/4" = 1'-0"

DETAIL 1
SCALE: 1/8" = 1'-0"

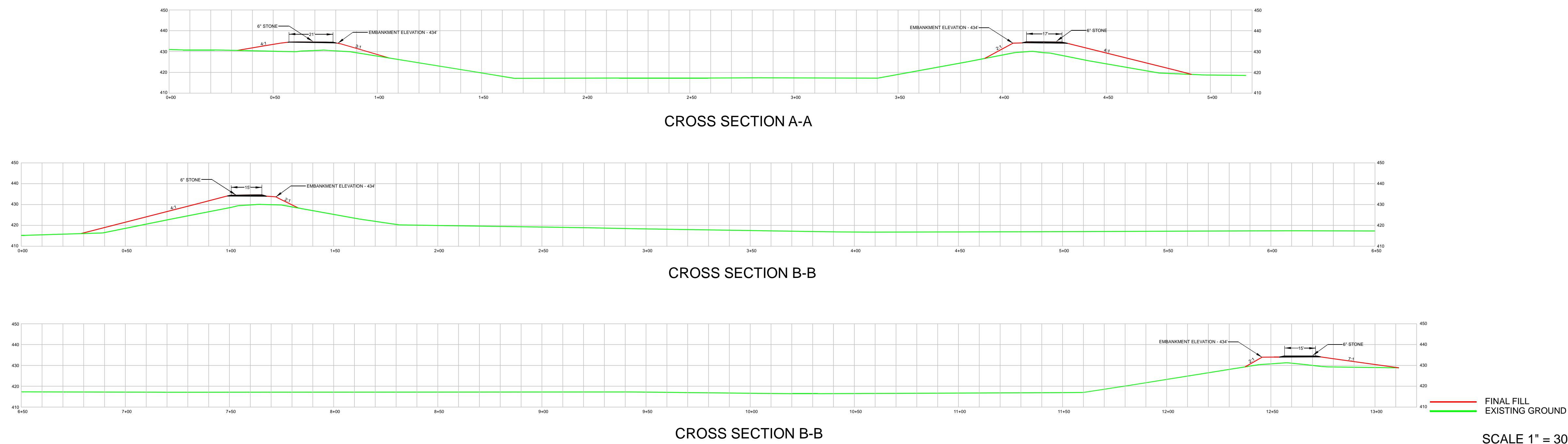
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

A B C D E F G H I J K L



PLAN VIEW

SCALE 1" = 50'



SCALE 1" = 30'

| | |
|--|-------|
| LIMESTONE ELECTRIC GENERATING STATION | |
| JEWETT | TEXAS |
| 002 POND EMBANKMENT PROJECT AS-BUILT | |
| FEBRUARY 2016 | |
| Prepared by: HEADWATERS RESOURCES 4037 FM 39 JEWETT, TX 75846 | |



ATTACHMENT E

**CCR SURFACE IMPOUNDMENT & LANDFILL
WEEKLY INSPECTION REPORT**

CCR Surface Impoundment & Landfill Weekly Inspection Report

NRG – Limestone Electric Generating Station

Weekly Inspection to be performed by Qualified Person no more than seven days after prior inspection.

Form to be completed and signed neatly in ink.

If conditions warrant repairs or maintenance, document needs in comment sections.

Italicized items may warrant contacting an engineer.

If conditions warrant a communication with an engineer, document call or meeting on page eight.

Attach photographs appropriate to supplement observations to report.

See Chapter 5 of “Guidelines for Operations and Maintenance of Dams in Texas”, published by the Texas Commission on Environmental Quality for discussion and examples of the items of concern indicated below.

Review 40 CFR 257.83(a) and 40 CFR 257.84(a) for CCR Rule requirements for impoundments and landfills, respectively.

Inspector(s): _____

Current Inspection: Date: ____/____/20____. Day of week _____ at _____ AM; PM

Weather at Time of Inspection: _____

Unit BACP

Is water present in the pond? Yes; No Water Level _____ ft

Crest of Embankment (Ground Surface Around Pond):

General Condition: Good; Fair; Poor (Include additional pages for notes as needed)

Concerns Identified: None;

Longitudinal Cracks in soil; *Vertical Displacement of soil*;

Cave-in on Crest/Sinkhole

Ruts; Ponded Water

Comments: _____

Exposed Concrete Walls:

General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)

Concerns Identified: None;

Large Cracks; *Misalignment of wall*; *Spalls*; *Evidence of Reinforcing Corrosion*;

Bulging; *Rotational Failure*

Comments: _____

Unit 019 E pond

Is water present in the pond? Yes; No Water Level _____ ft

Crest of Embankment (Ground Surface Around Pond):

General Condition: Good; Fair; Poor (Include additional pages for notes as needed)

Concerns Identified: None;

Longitudinal Cracks in soil; *Vertical Displacement of soil*;

Cave-in on Crest/Sinkhole

Ruts; Ponded Water

Comments: _____

External (Downstream) Slopes:

General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)

Concerns Identified: None;

Slide or Slough; *Transverse Cracks*; *Cave-in or Collapse*;

Longitudinal Cracks; *Slump (localized area)*;

Erosion; Trees or Brush; Rodent Activity (Burrows);

Misalignment; *Bulging*; *Rotational Failure*; *Free Flowing Water*;

Moist Area: Inadequate Erosion Protection (Vegetation or Rip Rap);

Standing Water at Toe

Comments: _____

Internal (Upstream) Slopes:

General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)

Concerns Identified: None;

Sinkholes; *Large Cracks*; *Slide, Slump or Slip*;

Scarp, Bench or Too Steep; Inadequate Erosion Protection (Vegetation or Rip Rap);

Erosion;

Misalignment; *Bulging*; *Rotational Failure*;

Trees or Brush; Rodent Activity (Burrows)

Comments: _____

Unit 019 E pond continued on Page 3

Unit 019 E pond (continued)

Seepage Through External (Downstream) Slopes, or Toe of Slopes:

Seepage Amount: None Observed; Minor Seepage; Significant Flow (**Contact ENGINEER**)

Concerns Identified: None;
 Significant Flow and/or Muddy Water Exiting from Dike);
 Stream of Water Exiting Through Cracks near Crest; Seepage Water as Boil;
 Large Wet Area; Marked Change in Vegetation; Bulge in Large Wet Area;
 Trampoline, Large Soft or Bouncy Area;

Contact Engineer Immediately if ANY of the Seepage Conditions Listed Above are Observed.

Saturation Observed ___ ft. above toe of slope;
 Minor Seepage noted at _____

Comments: _____

Unit 002 Storm Water pond

Is water present in the pond? Yes; No Water Level _____ ft

Crest of Embankment:

General Condition: Good; Fair; Poor (Include additional pages for notes as needed)

Concerns Identified: None;
 Longitudinal Cracks; Vertical Displacement; Cave-in on Crest,
 Transverse Cracks; Misalignment; Low Area;
 Trees or Brush; Rodent Activity (Burrows); Erosional Gully; Ruts;
 Ponded Water; Drying Cracks;
 Inadequate Erosion Protection (Vegetation);
 Marginal Freeboard; Inadequate Freeboard

Comments: _____

Unit 002 Storm Water pond continued on Page 4

Unit 002 Storm Water pond (continued)

External (Downstream) Slopes:

- General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)
- Concerns Identified: None;
- Slide or Slough; Transverse Cracks; Cave-in or Collapse;
 - Longitudinal Cracks; Slump (localized area);
 - Erosion; Trees or Brush; Rodent Activity (Burrows);
 - Misalignment; Bulging; Rotational Failure; Free Flowing Water;
 - Moist Area: Inadequate Erosion Protection (Vegetation or Rip Rap);
 - Standing Water at Toe

Comments: _____

Internal (Upstream) Slopes:

- General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)
- Concerns Identified: None;
- Sinkholes; Large Cracks; Slide, Slump or Slip;
 - Scarp, Bench or Too Steep; Inadequate Erosion Protection (Vegetation or Rip Rap);
 - Erosion;
 - Misalignment; Bulging; Rotational Failure;
 - Trees or Brush; Rodent Activity (Burrows)

Comments: _____

Seepage Through External (Downstream) Slopes, or Toe of Slopes:

- Seepage Amount: None Observed; Minor Seepage; Significant Flow (**Contact ENGINEER**)
- Concerns Identified: None;
- Significant Flow and/or Muddy Water Exiting from Dike);
 - Stream of Water Exiting Through Cracks near Crest; Seepage Water as Boil;
 - Large Wet Area; Marked Change in Vegetation; Bulge in Large Wet Area;
 - Trampoline, Large Soft or Bouncy Area;
- Contact Engineer Immediately if ANY of the Seepage Conditions Listed Above are Observed.**
- Saturation Observed ___ ft. above toe of slope;
 - Minor Seepage noted at _____

Unit 002 Storm Water pond continued on Page 5

Unit 002 Storm Water pond (continued)

Comments: _____

Unit ST - 18

Is water present in the pond? Yes; No Water Level _____ ft

Crest of Embankment:

- General Condition: Good; Fair; Poor (Include additional pages for notes as needed)
- Concerns Identified: None;
- Longitudinal Cracks; Vertical Displacement; Cave-in on Crest,
 - Transverse Cracks; Misalignment; Low Area;
 - Trees or Brush; Rodent Activity (Burrows); Erosional Gully; Ruts;
 - Ponded Water; Drying Cracks;
 - Inadequate Erosion Protection (Vegetation);
 - Marginal Freeboard; Inadequate Freeboard

Comments: _____

External (Downstream) Slopes:

- General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)
- Concerns Identified: None;
- Slide or Slough; Transverse Cracks; Cave-in or Collapse;
 - Longitudinal Cracks; Slump (localized area);
 - Erosion; Trees or Brush; Rodent Activity (Burrows);
 - Misalignment; Bulging; Rotational Failure; Free Flowing Water;
 - Moist Area: Inadequate Erosion Protection (Vegetation or Rip Rap);
 - Standing Water at Toe

Comments: _____

Unit ST - 18 Continued on Page 6

Unit ST – 18 (continued)

Internal (Upstream) Slopes:

- General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)
- Concerns Identified: None;
- Sinkholes; Large Cracks; Slide, Slump or Slip;
 - Scarp, Bench or Too Steep; Inadequate Erosion Protection (Vegetation or Rip Rap);
 - Erosion;
 - Misalignment; Bulging; Rotational Failure;
 - Trees or Brush; Rodent Activity (Burrows)

Comments: _____

Seepage Through External (Downstream) Slopes, or Toe of Slopes:

- Seepage Amount: None Observed; Minor Seepage; Significant Flow (**Contact ENGINEER**)
- Concerns Identified: None;
- Significant Flow and/or Muddy Water Exiting from Dike);
 - Stream of Water Exiting Through Cracks near Crest; Seepage Water as Boil;
 - Large Wet Area; Marked Change in Vegetation; Bulge in Large Wet Area;
 - Trampoline, Large Soft or Bouncy Area;

Contact Engineer Immediately if ANY of the Seepage Conditions Listed Above are Observed.

- Saturation Observed ___ ft. above toe of slope;
- Minor Seepage noted at _____

Comments: _____

Unit 003 Secondary E pond

Is water present in the pond? Yes; No Water Level _____ ft

Crest of Embankment:

General Condition: Good; Fair; Poor (Include additional pages for notes as needed)

Concerns Identified: None;

Longitudinal Cracks; Vertical Displacement; Cave-in on Crest;

Transverse Cracks; Misalignment; Low Area;

Trees or Brush; Rodent Activity (Burrows); Erosional Gully; Ruts;

Ponded Water; Drying Cracks;

Inadequate Erosion Protection (Vegetation);

Marginal Freeboard; Inadequate Freeboard

Comments: _____

External (Downstream) Slopes:

General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)

Concerns Identified: None;

Slide or Slough; Transverse Cracks; Cave-in or Collapse;

Longitudinal Cracks; Slump (localized area);

Erosion; Trees or Brush; Rodent Activity (Burrows);

Misalignment; Bulging; Rotational Failure; Free Flowing Water;

Moist Area; Inadequate Erosion Protection (Vegetation or Rip Rap);

Standing Water at Toe

Comments: _____

Internal (Upstream) Slopes:

General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)

Concerns Identified: None;

Sinkholes; Large Cracks; Slide, Slump or Slip;

Scarp, Bench or Too Steep; Inadequate Erosion Protection (Vegetation or Rip Rap);

Erosion;

Misalignment; Bulging; Rotational Failure;

Trees or Brush; Rodent Activity (Burrows)

Unit 003 Secondary E pond continued on page 8

Unit 003 Secondary E pond (continued)

Comments: _____

Seepage Through External (Downstream) Slopes, or Toe of Slopes:

Seepage Amount: None Observed; Minor Seepage; Significant Flow (**Contact ENGINEER**)

Concerns Identified: None;
 Significant Flow and/or Muddy Water Exiting from Dike);
 Stream of Water Exiting Through Cracks near Crest; Seepage Water as Boil;
 Large Wet Area; Marked Change in Vegetation; Bulge in Large Wet Area;
 Trampoline, Large Soft or Bouncy Area;

Contact Engineer Immediately if ANY of the Seepage Conditions Listed Above are Observed.

Saturation Observed ___ ft. above toe of slope;
 Minor Seepage noted at _____

Comments: _____

Unit 004 Landfill

Crest of Landfill Slopes:

- General Condition: Good; Fair; Poor (Include additional pages for notes as needed)
- Concerns Identified: None;
- Longitudinal Cracks; Vertical Displacement; Cave-in on Crest,
 - Transverse Cracks; Misalignment;
 - Trees or Brush; Rodent Activity (Burrows); Erosional Gully; Ruts;
 - Ponded Water; Drying Cracks;
 - Inadequate Erosion Protection (Vegetation)

Comments: _____

Exposed Slopes:

- General Condition: Good; Fair; Poor (Include Additional Pages for Notes as needed)
- Concerns Identified: None;
- Slide or Slough; Transverse Cracks; Cave-in or Collapse;
 - Longitudinal Cracks; Slump (localized area);
 - Erosion; Trees or Brush; Rodent Activity (Burrows);
 - Misalignment; Bulging; Rotational Failure; Free Flowing Water;
 - Moist Area: Inadequate Erosion Protection (Vegetation or Rip Rap);
 - Standing Water at Toe

Comments: _____

Seepage Through Exposed Slope Face, or at Toe of Slopes:

- Amount: None Observed; Minor seepage; Significant flow (Call ENGINEER)
- Concerns Identified: None; Different Vegetation Growth Indicates Concerns; Standing water at toe;
- Saturation Observed ___ ft. above toe of slope;
 - Minor Seepage noted at _____;
 - Soil in water flow (Call Engineer Immediately)

Comments: _____
