G-000-104.4

3001

APPLICATION FOR PERMIT TO INSTALL BIODNITRIFICATION SURGE LAGOON FACILITY - FMPC NOVEMBER 19, 1987

11/19/87

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APPLICATION

APPLICATION FOR PERMIT TO INSTALL BIODENITRIFICATION SURGE LAGOON FACILITY - FMPC

November 19, 1987

FEED MATERIALS PRODUCTION CENTER

WESTINGHOUSE MATERIALS COMPANY OF OHIO
P.O. Box 398704
Cincinnati, Ohio 45239-8704

REGULATORY COMPLIANCE
ENVIRONMENTAL COMPLIANCE
J. R. McDonald, P.E.

WASTE REMEDIATION AND ENVIRONMENTAL ENGINEERING
FLUID WASTE SYSTEMS ENGINEERING
M. F. Albert
D. J. Brettschneider, P.E.

Prepared for the
U. S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS OFFICE

For Office Use Only
Check Appropriate Box(es)

___ Air Discharge

___ Water Discharge to New Source Treatment Works

___ Solid Waste Disposal Facility

___ Hazardous Waste Disposal Facility

For Office Use Only

PTI Application No. _____

Date Received _____

Premise No. _____

3001

OHIO ENVIRONMENTAL PROTECTION AGENCY
Application for Permit to Install

U.S. Department of Energy, Feed Materials Production Center
Applicant's Name

P.O. Box 398705
Mailing Address

Cincinnati,	Hamilton	Ohio	45239	(513) 738-6200
City	**County**	**State**	**Zip Code**	**Telephone Number**

Mr. James A. Reafsnyder, Site Manager (513) 738-6357
Person to contact (Name and Title and Telephone Number)

The facilities are to be located within the 1,052 acre DOE Feed Materials Production Center at 7400 Willey Road, approximately 1/2 mile west of route 128.
Location of Proposed Facility (State the location as completely and precisely as possible)*

Village of Fernald, Crosby Township	Hamilton	45030
City or Township	**County**	**Zip Code**

Directions: A Permit to Install is required for new or modified sources of pollution under the provisions of OAC Rule 3745-31. An application cannot be considered complete unless all applicable questions are answered and the required information has been submitted. This application must be signed in accordance with OAC Rule 3745-31-04(B) or it cannot be accepted.

Applicants for permits involving air emissions or wastewater treatment facilities will be required to pay a permit to install fee as shown in Section 3745.11(B) and (C) of the Ohio Revised Code. This fee is payable fifteen days after the date of final issuance of the permit.

Name of new or modified source or facility: Biodenitrification Surge Lagoon

Product of new or modified source/facility: Wastewater Flow Equalization/Primary Settling

Will the proposed source/facility involve any of the following: Check all that apply.

A. ___ Air Discharge

B. X Wastewater Treatment Works

C. ___ Solid Waste Disposal Facility

D. ___ Hazardous Waste Disposal Facility

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*Example: "The source will be constructed on a 20 Acre plot to be located on Franklin Township Road No. 17, approximately 1 1/4 miles north of the intersection of State Route 99 and Franklin Township Road No. 17."

EPA 3150
6/8/82

The following information must be submitted [illegible] separate [illegible] to this application.

FOR ALL PERMITS TO INSTALL

1. Describe the product or service to be produced by the applicant along with a description of the proposed source/facility.

2. List the name and quantity of all materials and chemicals (solid, liquid, or gaseous) that will be used or produced by the source/facility.

3. State the reason for the application. Is this a new installation, modification to an existing source/facility, reconstruction of an existing source/facility, or startup of a source/facility that has been permanently shutdown for _____ years? (State number of years)

4. Has a previous Ohio EPA application or plan submission been filed for this source/facility? If so, state the date and type of the application previously submitted.

5. Will the proposed source/facility comply with all rules, laws, and regulations of Ohio EPA and U.S. EPA?

FOR AIR POLLUTION SOURCES

6. State the amount of each air contaminant (actual emissions) from each source in pounds per hour and tons per year at maximum and average conditions.

7. Are the proposed sources required to comply with the following federal requirements?
   i. New Source Performance Standards (NSPS)
   ii. National Emission Standards for Hazardous Air Pollutants (NESHAPS)
   iii. Prevention of Significant Deterioration (PSD)
   iv. Appendix "S" - Emission Offset Policy

8. Will the proposed sources employ best available technology?

9. Will the proposed sources cause the significant degradation of air quality?

10. Will the proposed sources interfere with the attainment and maintenance of the ambient air quality standards?

11. Describe any source monitoring, emission monitoring, or control equipment monitoring devices to be installed by the applicant.

12. Will the proposed sources involve the use of asbestos, benzene, beryllium, mercury, or vinyl chloride?

13. Complete and attach an anticipated construction schedule for each proposed source. (See attached).

14. Please include the estimated cost of any air pollution control equipment to be installed on the proposed sources.

15. An appendix for each air contaminant source must accompany this application. From the following description of the appendices, determine which should accompany your application.

Appendix A - Process: for sources not included in the other appendices.

Appendix B - Fuel-Burning Equipment: for any furnace, boiler, apparatus, and all appurtenances thereto, used in the process of burning fuel with the primary purpose of producing heat or power by indirect heat transfer.

Appendix C - Incinerator: for any equipment, machine, device, article, contrivance, structure or part of a structure used to burn refuse or to process refuse material by burning other than by open burning.

Appendix D - Surface Coating or Printing Operation: for a surface coating operation not included under Appendix K or for a printing operation.

Appendix E - Storage Tank: a storage tank for petroleum liquids.

Appendix H - Gasoline Dispensing Facility: any site where gasoline is dispensed to motor vehicle gasoline tanks from stationary storage tanks.

Appendix J - Loading Rack at a Bulk Gasoline Plant or Terminal: an operation for transferring gasoline to a delivery vessel.

Appendix K - Surface coating line: a coating line consists of one or more coating applicators, flash-off areas or ovens to be used for the following: an automobile or light-duty truck assembly plant; can manufacturing; coil-coating; fabric coating; large appliance coating; magnet wire coating; metal furniture coating; paper coating; vinyl coating.

Appendix L - Solvent Metal Cleaning: an operation employing solvent for cleaning metal surfaces; wipe-cleaning is excluded.

Appendix M - Fugitive Dust Emission Sources

General:

M1-1 - Plant Roadways and Parking Areas
M1-2 - Aggregate Storage Piles
M1-3 - Material Handling
M1-4 - Mineral Extraction

Iron and Steel Mills:

M2-1 - Coke Manufacturing
M2-2 - Iron Production
M2-3 - Steel Manufacture

M3 - Lime Plants
M4 - Power Plants
M5 - Grain Terminals
M6 - Country Grain Elevators
M7 - Gray Iron Foundries
M8 - Steel Foundries
M9 - Glass Manufacturing Plants
M10 - Fiberglass Manufacturing
M11 - Secondary Aluminum Processing Plants
M12 - Fertilizer Mixing/Blending Plants
M13 - Cement Manufacturing and Blending Plants
M14 - Ferroalloy Production
M15 - Metal Salvage Operations
M16 - Pulp and Paper Mills
M17 - Woodworking Operations
M18 - Aggregates Processing Plants
M19 - Coal Processing Plants
M20 - Brick and Related Clay Product Manufacturing Plants
M21 - Asphaltic Concrete Plants
M22 - Concrete Batching Plants
M23 - Sandblasting Operations
M24 - Petroleum Refineries
M25 - Agricultural Chemical Manufacturing Plants
M26 - Bulk Gasoline Terminals and Plants
M27 - Carbon Black Plants
M28 - Municipal Incineration
M29 - Salt Processing Operations
M30 - Galvanizing Plants

Appendix O - Dry Cleaning Facility

FOR WASTEWATER DISCHARGES

16. State the anticipated quality of all types of environmental pollutants to be discharged by the facility.

17. State in detail the method for disposal for all environmental pollutants listed in the question above. This should include a complete description of any control equipment to be employed.

18. If wastewater is to be discharged to a surface water, state the anticipated concentration (mg/l) and loading (lbs/day) in the discharge, and the effect this discharge will have on the surface water under critical conditions.

19. If wastewater is to be discharged to the groundwater, state the anticipated concentration (mg/l) and loading (lbs/day) in the wastewater, and the effect this wastewater will have on the groundwater.

20. If wastewater is to be discharged to a sewerage system, what will be the effect on the sewerage system and wastewater treatment system.

21. Describe any monitoring equipment to be installed at the facility.

22. Will the proposed source conform with area-wide waste management plans for wastewater treatment?

23. General plans for approval of the proposed source should be submitted to demonstrate compliance with OAC Rule 3745-31-05.

24. The following information should be included with the application (if applicable).

    i. Appendix G. Extended Aeration Wastewater Treatment Facility Data Sheet
    ii. Pump Station Data Sheet
    iii. Sanitary Sewer Data Sheet
    iv. Application for Approval of Plans for collection, treatment, and disposal of wastewater.

FOR SOLID WASTE DISPOSAL FACILITIES

25. State the anticipated quality of all types of environmental pollutants to be discharged by the facility.

26. State in detail the method for disposal for all environmental pollutants listed in the question above. This should include a complete description of any control equipment to be employed.

27. Describe any groundwater or surface stream monitoring systems to be installed at the facility.

28. State the local zoning requirements.

29. Will the proposed source conform with area-wide waste management plans for solid waste?

30. An Appendix F - Solid Wastes Disposal Facility must be included with this application.

Under OAC 3745-31-04, These signatures shall constitute personal affirmation that all statements or assertions of fact made in the application are true and complete, comply fully with applicable state requirements, and shall subject the signatory to liability under applicable state laws forbidding false or misleading statements.

James A. Reafsnyder 11/19/87

Authorized Signature (for facility) Date

James A. Reafsnyder
Site Manager

Title

U.S. Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239

Address

EPA 3150
6/8/82

Revision 0

3001

APPLICATION FOR PERMIT TO INSTALL

BIODENITRIFICATION SURGE LAGOON

FACILITY - FMPC

November 19, 1987

FEED MATERIALS PRODUCTION CENTER

WESTINGHOUSE MATERIALS COMPANY OF OHIO
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OAK RIDGE OPERATIONS OFFICE

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APPLICATION FOR PERMIT TO INSTALL

3001

Biodenitrification Surge Lagoon Facility.

FOR ALL PERMITS TO INSTALL

1. Describe the product or service to be produced by the applicant along with a description of the proposed source/facility.

The Feed Materials Production Center (FMPC) is a government-owned facility. Currently, Westinghouse Materials Company of Ohio (WMCO) manages the FMPC under prime contract with the United States Department of Energy (DOE).

The FMPC is located near the unincorporated town of Fernald, Ohio, approximately 32 km (20 mi) northwest of Cincinnati, Ohio (see Figure 1 in Appendix A). FMPC production operations cover approximately 136 acres in the center of a 1,050 acre site (see Figure 2 in Appendix A). Several rural communities and commercial operations lie within a 1-5 km (0.6-3 mi) radius of the plant.

At the FMPC, various chemical and metallurgical processes are utilized to reduce uranium oxides, uranium fluorides, and recycle materials to uranium ingots and billets. The ingots are extruded into tubular form on press facilities located at the RMI Company, Ashtabula, Ohio. The billets are shipped to other DOE sites. Some extrusions are returned to the FMPC for fabrication into fuel cores and target elements. These are used in nuclear reactors at other DOE sites.

The proposed facility consists of a Biodenitrification Surge Lagoon (BSL) with an approximate volume of 8.1 million gallons. The BSL will be used to equalize and settle process wastewater and waste pit area stormwater runoff flows for processing in the downstream Biodenitrification Facility (BDN). (See Appendix A for a detailed report of the Biodenitrification Surge Lagoon Facility.) The BSL design provides for a three-layer liner system to contain the wastewaters. The outer liner consists of 18 inches of a bentonite-soil mixture. The first and second inner liners are oil/solvent resistant, synthetic flexible membrane liners (FML) having a minimum thickness of 30 mils. Two underdrain collection systems have been provided for ensuring protection of the groundwater. The existing lower underdrain system is located between the bentonite-soil mixture and the first FML, and a proposed upper underdrain collection system is to be installed between the two FML liners. Separate collection sumps have also been provided so that any leakage through the FMLs can be individually collected, monitored and pumped back into the BSL.

2. List the name and quantity of all materials and chemicals (solid, liquid, or gaseous) that will be used or produced by the source/facility.

No chemicals will be used or produced in the subject facility. This facility will produce a solid waste material from the settling of solids contained in the wastewater. This solid waste is expected to consist primarily of carbonates and hydroxides of calcium and magnesium with minor quantities of iron, chromium, nickel, and uranium. The solid waste will also contain soil particles from stormwater runoff.

The quantity of solids which settle and accumulate in the BSL will depend on the Total Suspended Solids (TSS) in the process wastewaters, in stormwater runoff collected in the BSL, and in any recycled BDN effluent. The solids loading from process wastewaters has been estimated by an evaluation of historical data from 1984 to the present (see Appendix B). This data shows the volume of and the TSS in the wastewater that was pumped from the General Sump to the waste pit storage area for settling. The process wastewater flows from 1984 are judged to be more representative of future flows since projected future production levels are similar to those experienced in 1984. Therefore, the future process wastewater flow rate is expected to be approximately 67 gpm (0.10 MGD) with a solids loading of approximately 2450 lb./day (1110 kG/day). An additional solids loading of approximately 60 lb./day (27 kG/day) is expected from the TSS in stormwater runoff from the waste pit storage area (see Appendix C for calculations). The average flow of stormwater runoff from the waste pit storage area is estimated to be 23 gpm (0.033 MGD). The additional solids loading due to recycle of the treated BDN effluent is expected to be minimal.

The total estimated average solids loading to the BSL is projected to be 2510 lb./day (1140 kG/day) with a yearly average flow rate of 92 gpm (0.13 MGD). (Note, the 30 day average discharge flow from the BSL may be as high as 200 gpm.)

A maximum solids loading from a 10-yr./24-hr. storm event is estimated at 2200 lb. (1000 kG) for the waste pit area with a volume of runoff of 1.2 million gallons.

3. State the reason for the application. Is this a new installation, modification to an existing source/facility, reconstruction of an existing source/facility, or start-up of a source/facility that has been permanently shutdown for NA years (State number of years).

This application seeks an Ohio EPA Permit to Install (PTI) for an 8.1 million gallon Biodenitrification Surge Lagoon (BSL) facility at the Feed Materials Production Center (FMPC). This facility consist of an existing 8.8 million gallon lagoon (see Appendix G for drawings) and modifications to this lagoon (see Appendix H for drawings) which specifically includes the following: (1) A new flexible membrane liner

(FML) required by Order No. 2 of the Ohio EPA Director's Findings and Orders dated June 24, 1987; (2) An underdrain system between the new FML and the existing FML; (3) Permanent repairs to the existing FML; and (4) Modifications to the existing inlet and outlet piping. These modifications will reduce the existing 8.8 million gallon volume to approximately 8.1 million gallons.

4. Has a previous Ohio EPA application or plan submission been filed for this source/facility? If so, state the date and type of the application previously submitted.

An Application for a Permit to Install (PTI) entitled "Water Pollution Control Project" was submitted to the Ohio EPA on April 11, 1984. This project contained several wastewater quality improvement subprojects. The BSL was included as a portion of one of these subprojects. This application, officially Ohio EPA No. 05-1043, was revised and resubmitted on November 28, 1986, in two volumes entitled "Process Wastewater Biodenitrification Demonstration Facilities - FMPC" and "Coal Pile Runoff Collection and Stormwater/Spill Retention Facilities - FMPC". Per an Ohio EPA/WMCO/DOE meeting at the Southwest District Office on August 18, 1987, four PTI applications are to be submitted in place of the above. This PTI application is the second of those. It differs from previous submittals in that it addresses only the BSL. The sections which covered the BDN have been removed. The contents of this PTI are as described in Question No. 3.

5. Will the proposed source/facility comply with all rules, laws and regulations of Ohio EPA and U. S. EPA?

The proposed facilities have been designed to comply with all applicable rules, laws, regulations of the Ohio EPA and U. S. EPA. In particular, this document addresses Order No. 2 of the Ohio EPA Director's Findings and Orders dated June 26, 1987.

6-15. Not applicable (For Air Discharges, only).

FOR WASTEWATER DISCHARGES

16. State the anticipated quantity of all types of environmental pollutants to be discharged by the facility.

16.1 Water

Process wastewater and stormwater runoff from the waste pit surface area are proposed to be retained in the BSL for flow equalization and settling before processing through the downstream treatment facilities.

The BSL effluent pumps will have a varying discharge rate up to a maximum of 200 gpm (0.288 MGD). The average process wastewater flow is estimated at 67 gpm (0.096 MGD). The average stormwater runoff flow that is presently collected in the Clearwell is estimated to be 23 gpm (0.03 MGD).

An additional 8.3 gpm (0.012 MGD) of stormwater falls directly on the BSL, based upon 40 inches of precipitation per year (see Appendix E). However, for the Cincinnati Area, approximately 34 inches of water per year evaporates from open water surfaces. For the BSL, the evaporation rate is estimated to average 7.0 gpm. Therefore, a net 1.3 gpm of stormwater (that falls directly on the BSL) will be stored and processed in the downstream treatment facilities. The average BSL discharge of process wastewater and stormwater runoff collected in the Clearwell is estimated to be approximately 92 gpm (0.13 MGD).

During a peak rainfall year (rainfall of 52.76 inches occurred in 1979 compared to the normal 40 inches, see Appendix D), controlled runoff can be expected to increase the discharge flows from the BSL from 92 gpm to 105 gpm (0.15 MGD).

16.2 Solid Waste

The rate of solids accumulation in the BSL will depend on the efficiency of the upstream treatment of the process wastewater discharged to the BSL and the quantity of controlled stormwater runoff from the waste pit storage area that is discharged to the BSL. Most of the TSS in these wastewaters will settle and accumulate in the BSL and will be cleaned out on a regularly scheduled basis. The projected average solids loading from process wastewater discharged to the BSL (based on 1984 daily average) will be approximately 2450 lb./day (1110 kG/day). The solids loading to the BSL from stormwater runoff from the waste pit storage area is estimated at 60 lb./day (27 kG/day), (see Appendix C for calculations). The total estimated average solids loading to the BSL is expected to be approximately 2510 lb./day (1140 kG/day).

17. State in detail the method for disposal for all environmental pollutants listed in the question above. This should include a complete description of any control equipment to be employed.

17.1 Water

All retained process wastewater and waste pit area stormwater runoff will be pumped to the other downstream facilities for further treatment. The effect of the other downstream facilities on the NPDES permit will be discussed in PTIs for those facilities.

3001

17.2 Solid Waste

Solids will be removed from the BSL, dewatered, and packaged. Based on analytical results of sampling, the solids will either be furnaced for uranium recovery or processed in accordance with waste regulations of the DOE. (See Appendix A for a more complete description.)

18. If wastewater is to be discharged to a surface water, state the anticipated concentration (mg/l) and loading (lbs./day) in the discharge, and the effect this discharge will have on the surface water under critical conditions.

The new facility will not discharge collected water directly to any surface water. The water discharged from the BSL will be treated by other facilities prior to being discharged to Manhole No. 175 (NPDES Outfall Number 001). The other facilities will be addressed in PTIs for those facilities.

19. If wastewater is to be discharged to the groundwater, state the anticipated concentration (mg/l) and loading (lbs./day) in the wastewater, and the effect this wastewater will have on the groundwater.

The collected FMPC process wastewater and the stormwater runoff in the BSL are not to be discharged to the groundwater. In order to satisfy this requirement, a triple-layer liner system, including two separate underdrain collection systems, has been incorporated into the design/construction of the BSL.

20. If wastewater is to be discharged to a sewerage system, what will be the effect on the sewerage and wastewater treatment system?

There will be no wastewater discharge from this facility to any Publicly Owned Treatment Works (POTW). All wastewater and controlled waste pit area stormwater runoff will be discharged to other facilities as described in the report titled "FMPC NPDES Compliance Strategy for Process Wastewaters", issued to the Ohio EPA on August 31, 1987.

21. Describe any monitoring equipment to be installed at the facility.

The Biodenitrification Surge Lagoon (BSL) incorporates a bentonite-soil layer and two flexible membrane liners (FML) into a triple layer liner system. Between the liners are two (2) separate underdrain collection systems which serve to detect and collect any leakage through either FML. In so doing, each underdrain system functions as a monitor of its FML.

22. Will the proposed source conform with area-wide waste management plans for wastewater treatment?

This facility is a primary treatment facility with no direct discharge. It is compatible with with the "Comprehensive Water Quality Report for the Lower Mainstream of the Great Miami River (River Mile 92.5 - 0.9) Montgomery, Warren, Butler, and Hamilton Counties, Ohio." This Report is dated August, 1982 (Revised September, 1984) and was prepared by the Ohio EPA, Division of Water Pollution Control, Water Quality Management Section.

23. General plans for approval of the proposed source should be submitted to demonstrate compliance with OAC Rule 3745-31-05.

See accompanying report for plan approval (Appendix A).

24. The following information should be included with the application (if applicable).

---

i. Appendix G. Extended Aeration Wastewater Treatment Facility Data Sheet - not applicable.
ii. Pump Station Data Sheet - not applicable.
iii. Sanitary Sewer Data Sheet - not applicable.
iv. Application for Approval of Plans for Collection, Treatment and Disposal of Wastewater - not applicable.

3001

OHIO ENVIRONMENTAL PROTECTION AGENCY

APPLICATION FOR APPROVAL OF PLANS FOR TREATMENT AND DISPOSAL OF WASTEWATER

1. a) Name of facility U.S. DOE Feed Mateials Production Center (FMPC)

b) Address 7400 Willey Road, Fernald, Ohio ZIP 45030

c) Location of discharge Great Miami River

d) *Owner U.S. Department of Energy - Oak Ridge Operations Office

e) Address P.O. Box E, Oak Ridge Tennessee ZIP 37831

f) Responsible official Mr. James A. Reafsnyder, Site Manager Phone (513) 738-6357

2. Reason for project To provide flow equalization and primary settling for FMPC wastewater as required by Order No. 2, OEPA Findings & Orders, issued June 26, 1987

3. a) Designed by Westinghouse Materials Company of Ohio/Lockwood Greene Engineers Inc.

b) Address P.O. Box 398704, Cincinnati, Ohio ZIP 45239

c) Responsible official Dr. William A. Weinreich, Vice President & Technical Director Phone (513) 738-6711

4. Construction: begin May 1, 1988 complete October 1, 1988

Operation: start October 1, 1988 compliance NA

5. Operator of facility U.S. Department of Energy

6. Cost of completed treatment and disposal system $1,164,000 (Estimated Cost)*

7. Documents submitted with this application

X Report — X Area map of site and point(s) of discharge

Specifications — X Block diagram of treatment system

X Engineering drawings (provide titles and page numbers See drawing index

8. This treatment system has been designed for 8.1 million gallon holding capacity

9. This treatment system has been designed to produce the following effluent limits.

Not Applicable

10. Signature James A. Reafsnyder Title Site Manager Date 11/09/87

James A. Reafsnyder

*If the owner at the time of application, construction and/or operation is not the same, please explain on attachment.

TO BE COMPLETED BY OHIO EPA DISTRICT OFFICES

Date received _____ By _____ Fee $ _____ PAF _____

New facility — Public — Treatment — Pretreatment

Modify existing — Semi-public — Collection — Well

Replace existing — Industrial — Disposal — Other

OEPA FORM 4060 See reverse side for instructions

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*$522,000 Existing Biodenitrification Surge Lagoon and $642,000 Second Flexible Membrane Liner Installation.

INSTRUCTIONS FOR FILLING OUT APPLICATION FORM

Item 1. a, b — Name and address of project. If project does not have a name, use a relevant reference, such as "Market Street sanitary sewer" or "Howard Johnson's Wastewater Treatment Plant," and address or location of project.

1. c — Name of water body, sewer, drain, or treatment works receiving the discharge.

1. d, e — Corporate name and address of owner.

1. f — Name, title, and telephone number of the person responsible for providing personnel and budget to operate facility.

2. Briefly state why the facility was or is to be installed. If the facility has been ordered to be constructed by Ohio EPA, report date of orders.

3. Name, address, and name of the organization and official technically responsible for the design of the project.

4. Dates should reflect whether the facility is proposed, under construction, or has been completed.

5. Industrial: Name of the operating company, etc., if other than the one named in 1 a, d, f and 3 a, c above. Otherwise , specify which by reference.
Public or Semi-Public: Name and class license, if known, of operator in responsible charge and employment status (i.e., full-time, part-time, or contract).

6. Total cost of work relating to this application. Indicate whether estimated or actual cost.

7. In the case of industrial waste treatment facilities, refer to "Instructions for the Submission of Plans for Industrial Waste Treatment Facilities" (available from district offices).

8. Design flow.

9. Industrial: Show design monthly average/daily maximum effluent limits.
Public or Semi-Public: Show design 30 day average/7 day average effluent limits.

10. Signature of person authorized by the owner to submit plans.

FEE WORKSHEET

PAYER: Westinghouse Materials Company of Ohio

PROJECT NAME & COUNTY: Installation of the Biodenitrification Surge Lagoon Facility Feed Materials Production Center Hamilton County

ESTIMATED COST: $1,164,000 *

MULTIPLIED BY 0.2%(0.002): $2,328.00

SUBTOTAL: $2,328.00

PLUS $100.00: $2,428.00

PLAN FEE DUE: $2,428.00

(Not to exceed $5,000)

PERMIT TO INSTALL APPLICATION FEE: $15.00

TOTAL FEE DUE: $2,443.00

*Existing Biodenitrification Surge Lagoon	$522,000
Second Flexible Membrane Liner Installation	$642,000
Total Estimate Cost	$1,164,000

APPENDIX A

REPORT

ON

THE BIODENITRIFICATION SURGE LAGOON

FOR OHIO ENVIRONMENTAL PROTECTION AGENCY

U. S. DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

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A. SUMMARY

The U. S. Department of Energy, Feed Materials Production Center (FMPC) has been required by the Ohio EPA and NPDES Permit No. OH 0009580 to reduce the discharge levels of nitrates in FMPC wastewaters. The FMPC will use biodenitrification to reduce nitrates to acceptable levels. The Biodenitrification Surge Lagoon (BSL) facility, which is described in this report, will provide containment, flow equalization, and settling for process wastewater and waste pit area stormwater runoff prior to treatment at the Biodenitrification Facility (BDN). The BSL is a primary treatment facility for the BDN and as such, it will have no direct discharge to the environment and is not covered by any NPDES discharge limitations. The BSL is designed to eliminate/minimize the potential for release of contained materials to the groundwater or to Paddy's Run. Periodically, sediment will be removed from the BSL and disposed of in an approved manner.

The existing BSL was covered in PTI applications submitted on April 11, 1984, entitled "Water Pollution Control Project", Ohio EPA No. 05-1043, and November 26, 1986, entitled "Process Wastewater Biodenitrification Facilities - FMPC". Finding No. 12 of the Ohio EPA Director's Findings and Orders, issued June 26, 1987, states "the [synthetic] liner in the [existing] Biodenitrification Surge Lagoon has been found to contain numerous leaks and tears". Order No. 2 of the same document requires the DOE to install a new synthetic liner in the BSL by October 1, 1988. The BSL has been separated from the aforementioned PTIs. The original installation and the new liner installation are addressed in this report. A separate PTI application for the BDN facility will be submitted at a later date.

An 8.8 million gallon Biodenitrification Surge Lagoon (BSL) was constructed at the FMPC and readied for service in the fall of 1986. When water was placed into the lagoon for a final check of the installation, water leaked through the FML and was monitored by the underdrain collection system installed for detecting such leakage. Because of that leakage, a program was initiated by the FMPC to locate the leakage points. The "Report on Installation, Testing, Repairs, and Recommendations", February 23, 1987, detailing the results of that study, concluded that "the lagoon liner should be permanently repaired" and that " liner replacement or installation of a new liner over the existing liner may be required."

The Ohio EPA expressed concern about potential leakage through the bentonite-soil layer and requested either the installation of a lysimeter leak detection system beneath the BSL bentonite-soil layer or a groundwater interceptor trench to be constructed on the south and west perimeters of the BSL. These suggestions were deemed undesirable because of construction difficulties, operation difficulties, and/or the possibility of damaging the existing bentonite-soil liner during installation. The installation of a second underdrain system between the existing FML and a newly installed second FML is proposed in lieu of the suggested alternatives.

The final design includes permanent repair of the existing liner, installation of a new underdrain and liner over the existing liner, and modification of the existing inlet and outlet piping. Because of Ohio EPA's comments regarding the need for leak detection, the recommendation was added that a second leak detection underdrain system be installed between the existing liner and the new liner. This approach will ensure that wastewater placed in the lagoon is properly controlled. The installation of a new liner and underdrain system, which will meet BADT for synthetic FMLs, is addressed by this PTI Application.

B. DESCRIPTION OF WASTE GENERATING PROCESS

The FMPC is located near the unincorporated town of Fernald, Ohio, approximately 32 km (20 mi) northwest of Cincinnati, Ohio (Figure 1). FMPC production operations cover approximately 136 acres in the center of a 1,050 acre site (Figure 2). Several rural communities and commercial operations lie within a 1-5 km (0.6-3 mi) radius of the plant.

The FMPC is a large-scale, fully integrated facility for producing high purity uranium metal having several standard isotopic assays. This uranium is used in the fabrication of fuel cores and target elements for nuclear reactors operated by the United State Department of Energy (DOE). Although some derby metal (primary reduction product) is shipped directly to other DOE facilities most of the production is cast into ingots and billets. The ingots are center-drilled and surface-machined for extrusion into tubes on the DOE extrusion press facilities located at the RMI Company, Ashtabula, Ohio. Some extrusions are returned to the FMPC, where tube blanks undergo heat treating and fabrication into target element cores for use at other DOE facilities. The billets are surface machined and shipped directly to other DOE facilities.

A wide variety of chemical and metallurgical processes are utilized at the FMPC for the conversion of uranium oxides, fluorides, and recycle materials to machined uranium ingots and billets. Large-scale chemical operations at the FMPC consist of dissolving uranium recycle materials in nitric acid to produce a uranyl nitrate hexahydrate (UNH) feed solution for solvent extraction purification. Purified UNH solution is concentrated by evaporation and then thermally denitrated to uranium trioxide (UO_3), or orange oxide. Orange oxide is converted to uranium tetrafluoride (UF_4), commonly called green salt, for reduction to metal.

Metal processing steps begin with the conversion of green salt to elemental uranium (derby metal) by reducing UF_4 with magnesium metal. Metallic scrap and briquettes, recycled from subsequent fabrication operations, are combined with derby metal and melted in a graphite crucible. At the proper temperature, the melt is bottom-poured to a preheated graphite mold to form ingots, varying in weight, size, and shape according to their ultimate use.

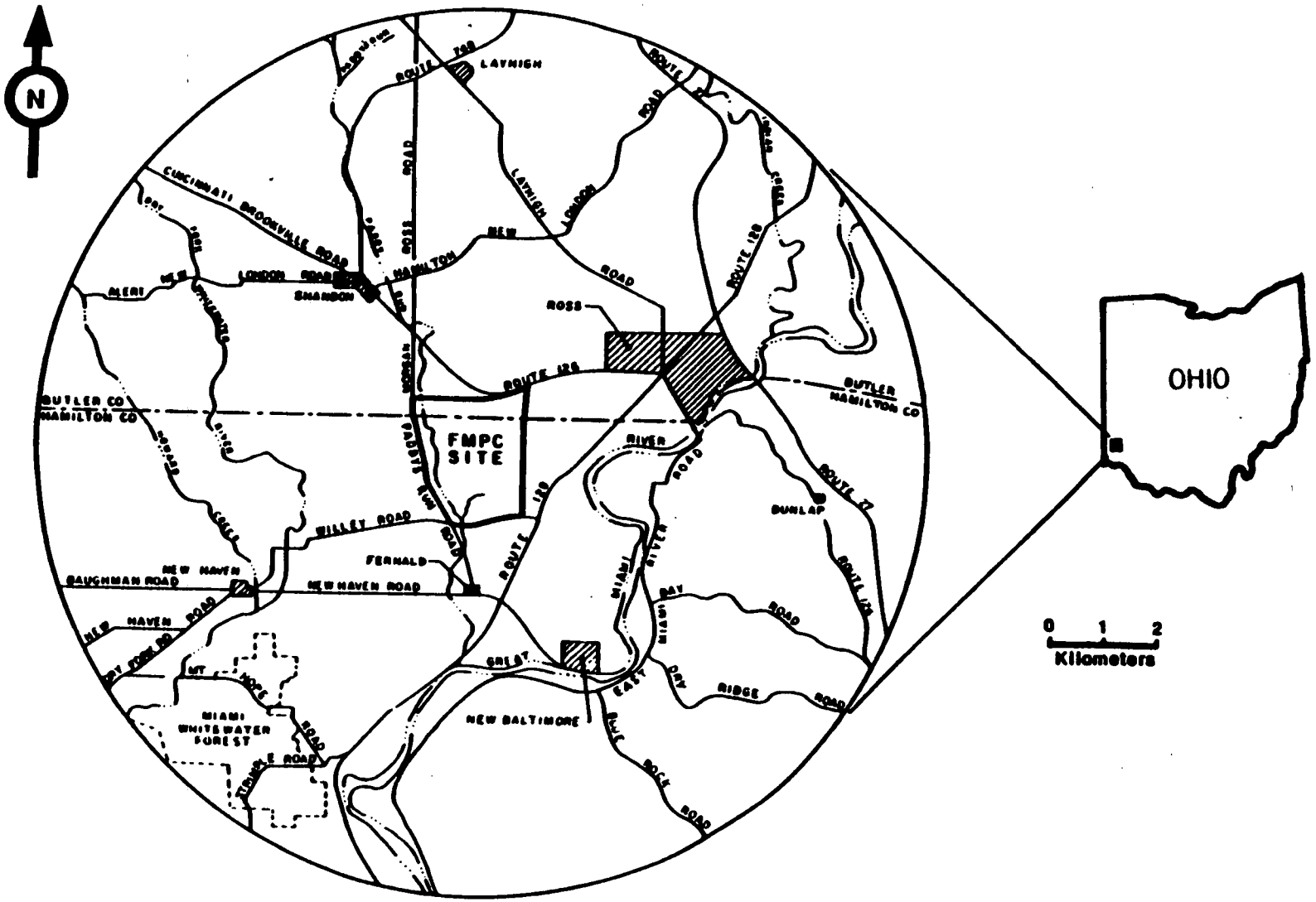

FIGURE 1: *FMPC Area Map*

Water Pollution Control System at FMPC

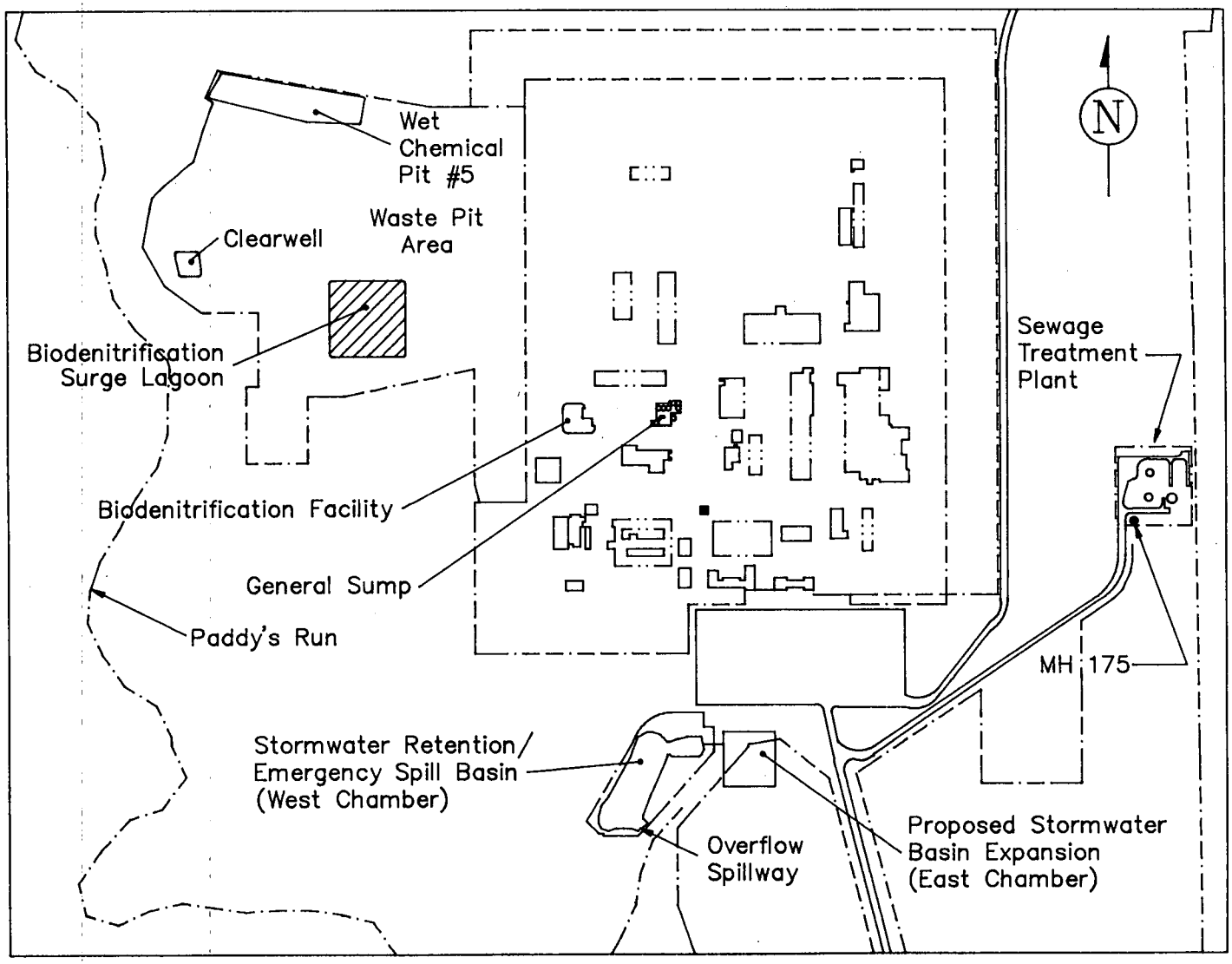

Figure 2. FMPC Site Map

This map is not drawn to scale.

Wastewaters generated by the above operations include raffinate from extraction purification, filtrates from solids recovery, spent acids and acidic rinse waters from pickling, and spent coolants from machining, washdown water, contaminated rainwaters, and other miscellaneous waste streams generated from each of the chemical and metals plants.

C. DESCRIPTION OF EXISTING WASTE TREATMENT FACILITIES

Since the beginning of production operations in 1952, the FMPC has operated various waste treatment facilities in order to minimize the impact of site operations on the surrounding area and receiving streams. The waste treatment facilities which will be affected by the proposed installation are shown in Figure 3.

C.1 Sitewide Process Waste Treatment

Currently, process wastewater treatment at the FMPC begins with precipitation/filtration of waste streams for uranium recovery within the individual plant treatment systems (A) (see Figure 3) which consist of the refinery, chemical and metal production plants. The effluent (B) from each plant is collected at the General Sump (C) for further pH adjustment, flocculation and settling. Clear decant (D) is pumped to the BSL (T) or if it meets all NPDES and FMPC limitations, to Manhole No. 175 (E) for discharge through a 4200 ft. underground gravity flow pipe to the plant outfall (F) in the Great Miami River. The tank heels, (G) containing precipitated and settled solids, are pumped to Plant 8 (H) for filtration on rotary vacuum precoat filters. The clarified filtrate (J) is pumped to the Biodenitrification Surge Lagoon (T) via the General Sump (C). The waste stream (U) is then pumped to the Biodenitrification (BDN) Facility (V) for nitrate removal. Effluent (W) from the BDN Facility is then treated for TSS and biochemical oxygen demand (BOD) in the FMPC Sewage Treatment Plant (X). (See the "FMPC NPDES Compliance Strategy for Process Wastewater", issued to Ohio EPA August 31, 1987.) The treated wastewater is then sent to Manhole No. 175 for discharge. Solids (I) removed from Plant 8 (H) which contain low, nonrecoverable concentrations of uranium are processed in accordance with low-level waste regulations of the DOE.

D. DESCRIPTION OF FACILITY

D.1 Biodenitrification Surge Lagoon

The facility will consist of the existing BSL and the proposed modifications which include permanent repair of the existing FML, an additional inner Flexible Membrane Liner (FML) with a separate underdrain system, and modifications to the existing inlet and outlet piping of the BSL. The second FML provides for greater assurance that the BSL will not leak any contained wastewater to the environment.

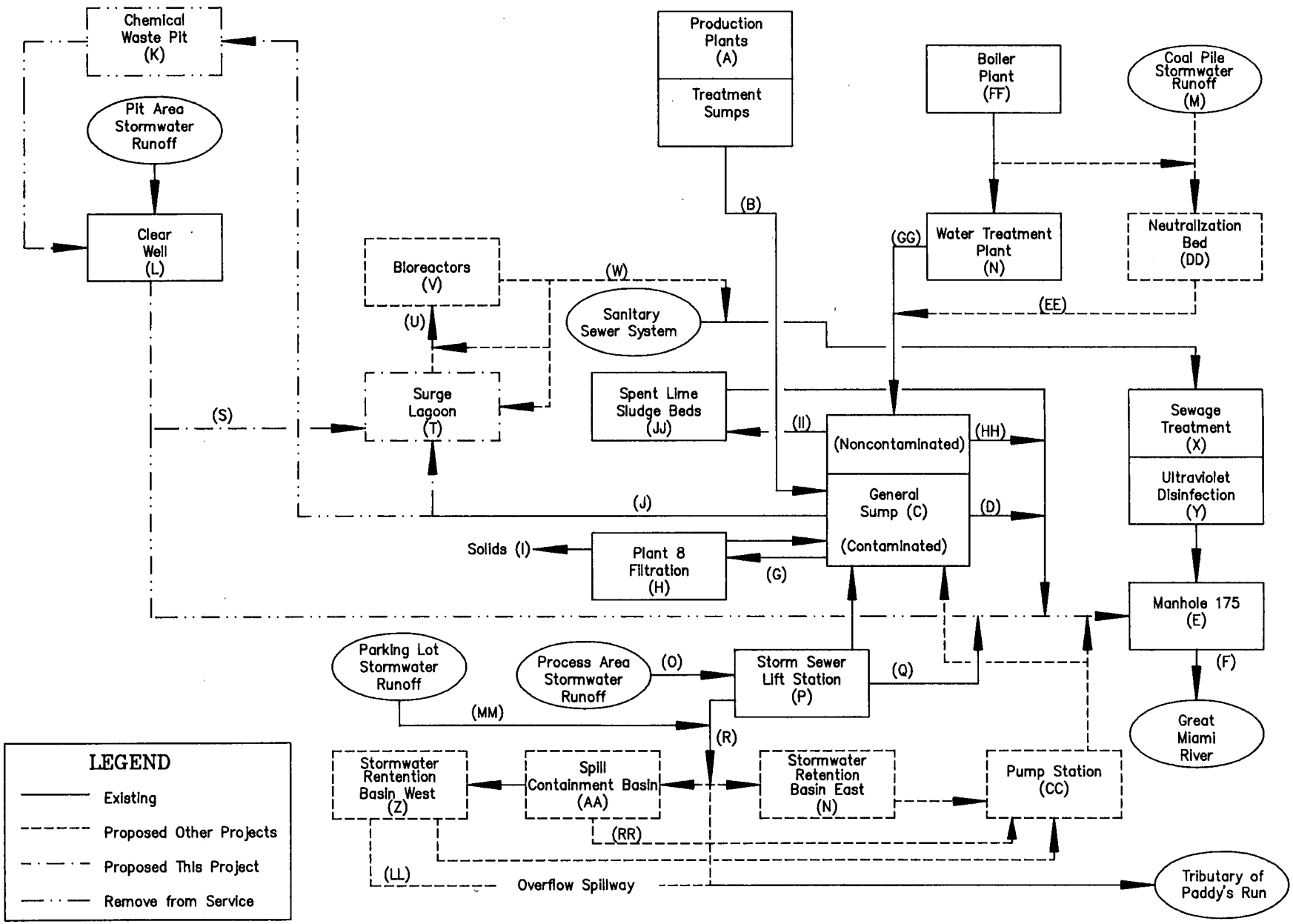

Figure 3. FMPC Waste Treatment Flow Diagram

D.1.1 Constructed Facilities

The existing BSL is an 8.8 million gallon equalization and settling lagoon having a double liner system. The inner liner (the liner in direct contact with the water) is an ultraviolet light and oil/solvent resistant, synthetic FML with a thickness of 40 mils. The outer liner is 18 inches of a bentonite-soil mixture. Between the liners there is an underdrain collection system. The underdrain collection system collects and detects any leakage through the synthetic liner. The underdrain flow drains by gravity to an inspection sump where it is collected and pumped back into the BSL.

D.1.2 Modifications Proposed to be Constructed

The proposed construction will consist of permanent repair of the existing FML, installation of a second (primary) FML and underdrain system over the existing FML, and modifications to the inlet and outlet piping. This will provide a triple-layer liner system. The new upper primary liner will consist of an ultraviolet light resistant, oil/solvent resistant, weather resistant, bondable synthetic, flexible membrane liner (FML) with a minimum thickness of 30 mils. A separate underdrain collection system has been incorporated beneath the new FML. The collection system will detect and collect any leak through the new synthetic liner. The underdrain water will flow by gravity to a new sump where it can be monitored before being pumped back into the BSL. This system serves to virtually eliminate the potential for any environmental impact to groundwater or to Paddy's Run due to leakage through the flexible membrane liner. A partial loss of volume in the BSL will be lost due to the proposed construction. The remaining volume will be reduced from 8.8 million gallons to approximately 8.1 million gallons.

D.2 Operation and Maintenance

D.2.1 Operation of the BSL

Wastewater will enter the BSL in its northwest corner. Discharge water will flow by gravity to the existing pump sump located at the southeast corner of the BSL. Water collected in the sump will then be pumped to the BDN facility for further treatment. A minimum operating level of approximately 2.4 million gallons (volume that covers the bottom of the BSL) will be maintained to provide for flow equalization and solids settling. The liner system is designed to prevent leakage, however, the threshold for repair for the integrity of the FML liner systems is a value of greater than 126 gallons per day based on 40 gallons/acre/day. If leakage exceeds this quantity, determined by the sum of the two underdrain collection systems, leak detection measures will be initiated and the source(s) of leakage in the top liner will be repaired.

D.2.2 Solids Loading.

The BSL will produce a solid waste material from the settling of suspended solids. The rate at which solids settle and accumulate in the BSL will depend on the Total Suspended Solids (TSS) in the process wastewaters and in the stormwater runoff collected in the waste pit storage area. The process wastewater solids loading in the BSL has been determined by an evaluation of data from 1984 to the present (see Appendix B). Table 1 lists a summary of the data on the wastewaters that were discharged from the General Sump.

Table 1.

Year	Volume (Gallons (gpm))	Weighted Avg. TSS (mG/L)	Mass Load (kG/day)
1984	35,277,500 (67)	3200	1110
1985	27,531,500 (53)	3500	1025
1986	21,790,800 (42)	2510	590
1987*	7,687,400 (49)	2550	655

*Partial year, January - April

This data shows the volume and the TSS in the wastewater that was pumped from the General Sump to the waste pit storage area for settling. The process wastewater flows from 1984 are judged to be more representative of future flows since projected future production levels are similar to those experienced in 1984. Therefore, the future process wastewater flow rate is expected to be approximately 67 gpm (0.10 MGD) with a solids loading of approximately 2450 lb./day (1110 kG/day). An additional solids loading from the TSS in stormwater runoff discharged to the BSL from the waste pit storage area is expected to be approximately 60 lb./day (27 kG/day) (see Appendix C for calculations). The average flow of stormwater runoff from the waste pit storage area is estimated to be 23 gpm (0.033 MGD). The additional solids loading due to recycle of the treated BDN effluent is expected to be minimal.

The estimated average flow from stormwater that falls directly on the BSL, based on 40 inches/year (see Appendix D), is estimated to be 8.3 gpm (0.012 MGD). The estimated average rate of evaporation from the BSL water surface is 7.0 gpm (0.01 MGD). Therefore, the net average flow of stormwater that falls directly on the BSL is 1.3 gpm (0.002 MGD) (see Appendix E).

The total estimated average solids loading to the BSL is projected to be 2510 lb./day (1140 kG/day) with a yearly average flow rate of 92 gpm (0.13 MGD). (Note, the 30 day average discharge flow from the BSL may be as high as 200 gpm.)

A maximum solids loading from a 10-yr./24-hr. storm event is estimated at 2200 lb. (1000 kG) for the waste pit area with a volume of runoff of 1.2 million gallons (see Appendix C).

D.2.3 Proposed Solids Removal Method.

During the readiness review for the Biodenitrification Surge Lagoon in September, 1986, a plan was initiated for determining a technique for removal of lagoon sludges. Methods investigated were limited to those which would not disturb the integrity of the synthetic flexible membrane liners and will not require the BSL to be removed from service during cleanout.

Visits to observe various types of hydraulic dredges in operation were made to gain the information necessary for preparation of a plan of action for acquiring sludge removal equipment at the FMPC.

Plans are underway to clean out the basin on a demonstration test basis. Once the demonstration test is completed, a decision will be made on whether to purchase equipment similar to the equipment used in the demonstration test or to continue subcontracting this work. The demonstration test will use equipment similar to the following BADT (best available demonstrated technology) facilities for sediment removal:

- o Mini-dredge for withdrawing sediments in a slurry form.
- o Portable trailer mounted slurry treatment system consisting of:
  - Gravity Settler for solids settling, and
  - Belt Filter Press and auxiliary equipment for sludge dewatering.
- o Decanted water and filtrate will be returned to the BSL.

D.2.4 Maintenance of the BSL.

The maintenance of the BSL is based on a maximum number of cleanouts of one per year. Using the data for 1984 (see Appendix C), the estimated maximum once per year cleanout will result in an accumulated sediments volume of approximately 750,000 gallons. This represents an average depth of approximately 13.5 inches of sediment. The dry solids content of the sediment has been estimated to be approximately 15%. If the solids loading in the BSL is significantly less than 500,000 gallons per year, the cleanout schedule will be extended.

These values are slightly different than the 500,000 gallon, 1 year cleanout that was presented in the report of Order No. 4 of the Ohio EPA Director's Findings and Orders (submitted to Ohio EPA June 1, 1987). The reason for this difference is the use of the 1984 data as the reference data instead of the average of 1984 data through the present. The additional 250,000 gallons will not significantly affect the performance or operation of the BSL, because with an minimum operating level of 2.4 million gallons (1.65 MG remaining

operating volume) there will still be greater than 12 days of retention time at 92 gpm. This will allow for adequate settling of TSS.

The solids removed from the BSL will be treated as a low level radioactive waste. The solids will be analyzed for EP toxicity and uranium content. If the uranium content is high enough to economically recover the uranium, the solids will be recovered through existing facilities. If the solids are found not to be economically recoverable, then the solids will be processed in accordance with waste regulations of the DOE.

E. AUXILIARY FACILITIES

E.1 Biodenitrification Surge Lagoon Transfer Pump Station

The Biodenitrification Lagoon Transfer Pump Station is provided with two pumps. The pumps are vertical, cantilever mounted, centrifugal sump pumps rated at 210 gpm each. The existing pump station is located on the southeast side of the BSL. The inlet piping to the pump station will be modified to provide a more leakproof seal between the piping and the FMLs. The outlet pipe will also be raised up from the bottom of the lagoon to minimize the possibility of transporting settled solids into the pumping station.

E.2 West (Existing) BSL Lower Underdrain Pump Station

The existing BSL Underdrain Pump Station has a pump rated at 60 gpm. Startup controls are manual. The underdrain pump station is located to the west of the BSL. The underdrain pump sump contains any collected underdrain flow from between the existing FML and the bentonite-soil mixture. The inflow waters have been, and will continue to be, pumped back into the BSL.

E.3 South (Proposed Addition) BSL Upper Underdrain Pump Station

The new underdrain pump station will be located to the south of the BSL. The underdrain pump sump will contain any collected underdrain flow from between the existing FML and the new FML liner. The inflow waters will be pumped back into the BSL. The pump is designed to discharge at 100 gpm. Startup controls will be 'Hand-Off-Automatic' (HOA). The manual hand start will be used to monitor the leakage from the BSL upper liner on a regularly scheduled basis.

DRAWING INDEX

3001

Drawing No.	Revision No.	Title
General		
18B-1920-X-00262	0	Cover Sheet
Existing Biodenitrification Surge Lagoon		
18B-1920-S-00289	0	Surge Lagoon Pump Station & Inspection Sump - Plans & Sections
18B-1920-G-00295	2	Surge Lagoon Plan
18B-1920-G-00296	2	Surge Lagoon Plan
18B-1920-G-00297	0	Lagoon Cross Sections
18B-1920-P-00299	3	Plans & Sections - Surge Lagoon Sump, Pump Station, and Structures
Proposed Modifications to the Biodenitrification Surge Lagoon		
C001	C	Site Plan 1 of 4
C002	D	Site Plan 2 of 4
C003	C	Site Plan 3 of 4
C004	C	Site Plan 4 of 4
C005	C	Details
C006	C	Flexible Membrane Liner Details
C007	C	Details

APPENDIX B

HISTORICAL DATA

EFFLUENT FROM THE GENERAL SUMP SENT TO THE WASTE PIT STORAGE AREA

(JANUARY 1984 THROUGH APRIL 1987)

FLOW RATES AND TOTAL SUSPENDED SOLIDS DATA
FOR WASTEWATER PUMPED TO PIT #5 DURING 1984

3001

MONTH	DAY	% SETTLED (4-HR TEST)	VOLUME (GALLONS)	TSS (MG/L)	LOADING (KG)	DAY	LOAD/DAY (KG/DAY)	VOLUME (GAL/DAY)
JAN	1 - 5	3	297000	1375	1545.699	5	309.1398	59400
	6 - 12	1	405000	1126	1726.073	7	246.5819	57857.14
	13 - 19	1.4	398500	2170	3273.059	7	467.5799	56928.57
	20 - 29	2.5	767000	2871	8334.785	10	833.4785	76700
FEB	30 - 2	9	462700	3847	6737.326	4	1684.331	115675
	2 - 9	5	987600	3847	14380.33	7	2054.334	141085.7
	10 - 17	1.3	987600	4332	16193.30	8	2024.162	123450
	18 - 29	1.5	979100	5522	20463.94	12	1705.328	81591.66
MAR	1 - 8	1.2	866000	687	2251.855	8	281.4819	108250
	8 - 15	1.5	925000	2213	7747.989	7	1106.855	132142.8
	16 - 22	2.5	919000	654	2274.883	7	324.9833	131285.7
	23 - 29	8	772500	1173	3429.749	7	489.9641	110357.1
APR	30 - 5	1.3	623200	843	1988.478	7	284.0683	89028.57
	6 - 12	1.5	865000	2922	9566.701	7	1366.671	123571.4
	13 - 20	1.3	873000	503	1662.065	8	207.7581	109125
	21 - 27	4.5	896000	1837	6229.928	9	692.2142	99555.55
MAY	30 - 5	4.9	556000	931	1959.252	6	326.5420	92666.66
	6 - 10	4	833000	849	2676.816	5	535.3632	166600
	11 - 18	2.8	882500	3548	11851.25	8	1481.406	110312.5
	19 - 31	9	1399000	2946	15599.70	13	1199.977	107615.3
JUN	1 - 7	12	606000	2006	4601.182	7	657.3117	86571.42
	8 - 14	3.4	479500	7267	13188.93	7	1884.133	68500
	15 - 21	15	754500	2641	7542.121	7	1077.445	107785.7
	22 - 28	15	675000	4605	11765.19	7	1680.742	96428.57
JUL	29 - 5	15	551500	1959	4089.270	7	584.1814	78785.71
	5 -12	3	737000	4534	12647.79	7	1806.828	105285.7
	12 - 17	4	159600	206	124.4417	5	24.88834	31920
	20 - 25	3.5	1173000	174	772.5260	8	96.56575	146625
AUG	26 - 2	1.7	641500	5186	12592.00	8	1574.001	80187.5
	3 - 9	2.1	589000	2384	5314.806	7	759.2580	84142.85
	10 - 16	1.1	697000	2254	5946.378	7	849.4826	99571.42
	17 - 23	4.5	605000	1414	3237.953	7	462.5648	86428.57
	24 - 30	4.1	585000	3100	6864.097	7	980.5853	83571.42
SEP	31 - 6	1	556000	1460	3072.511	7	438.9302	79428.57
	7 - 14	3	740000	8907	24947.61	8	3118.452	92500
	15 - 21	2	485000	2429	4458.976	7	636.9965	69285.71
	21 - 28	4	860000	7053	22958.22	7	3279.745	122857.1
OCT	28 - 4	13	512000	1085	2102.643	6	350.4405	85333.33
	5 - 11	24	561000	2167	4601.375	7	657.3393	80142.85
	11 - 18	10	656000	6107	15163.43	7	2166.205	93714.28
	18 - 25	1	546000	7991	16514.28	7	2359.182	78000
	26 - 31	8	492000	596	1109.883	6	184.9805	82000
NOV	31 - 8	40	755500	3023	8644.472	8	1080.559	94437.5
	8 - 15	25	611500	385	891.0930	7	127.2990	87357.14
	15 - 28	25	1476000	2065	11536.45	14	824.0323	105428.5
DEC	30 - 6	15	636900	13431	32377.66	7	4625.380	90985.71
	7 - 13	1	851500	3242	10448.73	7	1492.675	121642.8
	14 - 3	1.8	1589800	6474	38956.60	21	1855.076	75704.76
SUM		325.4	35277500	148341	426363.8	369		
AVERAGES		6.88	95602.98	3193.130	3193.130		1109.531	95996.27

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FLOW RATES AND TOTAL SUSPENDED SOLIDS DATA
FOR WASTEWATER PUMPED TO PIT #5 DURING 1985

MONTH	DAY	% SETTLED (4-HR TEST)	VOLUME (GALLONS)	TSS (MG/L)	LOAD (KG)	DAY	LOAD/DAY (KG/DAY)	VOLUME (GAL/DAY)
JAN	3 - 10	3.4	715500	6656	18025.56	7	2575.080	102214.2
	11 - 17	3	642500	1508	3667.248	7	523.8926	91785.71
	18 - 31	4	1219000	3027	13966.32	14	997.5943	87071.42
FEB	1 - 7	3.5	652000	1077	2657.842	7	379.6917	93142.85
	8 - 14	2.4	722000	1509	4123.749	7	589.1071	103142.8
	15 - 22	5.2	653000	1735	4288.234	8	536.0293	81625
	22 - 28	9	808500	2550	7803.439	6	1300.573	134750
MAR	1 - 3	3.8	684000	1158	2997.992	3	999.3308	228000
	8 - 14	17	662000	1915	4798.358	11	436.2143	60181.81
	15 - 22	51	623500	1646	3884.473	8	485.5591	77937.5
	23 - 28	20	438000	3091	5124.352	6	854.0587	73000
APR	28 - 5	23	953000	1947	7023.033	8	877.8791	119125
	6 - 11	9	610000	1180	2724.443	6	454.0738	101666.6
	12 - 18	30	543500	3507	7214.416	7	1030.630	77642.85
	18 - 25	3.4	711600	1192	3210.539	7	458.6485	101657.1
	25 - 30	9	356500	1166	1573.345	5	314.6690	71300
MAY	1 - 9	2.4	939000	2830	10058.14	9	1117.571	104333.3
	10 - 16	6	652000	5790	14288.67	7	2041.239	93142.85
	17 - 31	5.9	857800	6105	19821.54	15	1321.436	57186.66
JUN	1 - 6	2.6	434000	2566	4215.142	6	702.5237	72333.33
	7 - 13	2	482500	1058	1932.185	7	276.0265	68928.57
	14 - 20	5	471500	4954	8841.044	7	1263.006	67357.14
	21 - 30	4.5	741800	2034	5710.888	10	571.0888	74180
JUL	1 - 4	7	476000	1501	2704.291	4	676.0729	119000
	5 - 11	3	456800	6055	10469.02	7	1495.574	65257.14
	12 - 31	7	698700	4390	11609.70	20	580.4852	34935
AUG	1 - 8	16	685500	4589	11906.69	8	1488.337	85687.5
	9 - 15	20	602000	6023	13723.82	7	1960.546	86000
	16 - 22	6	605500	2617	5997.686	7	856.8123	86500
	22 - 31	11	628500	23190	55166.05	9	6129.561	69833.33
SEP	1 - 5	25	278750	7757	8184.168	5	1636.833	55750
	6 - 12	25	381000	4736	6829.714	7	975.6735	54428.57
	13 - 19	4.8	292500	4407	4879.044	7	697.0063	41785.71
	20 - 30	3.7	911000	4301	14830.42	11	1348.220	82818.18
OCT	1 - 11	4	395000	5659	8460.629	11	769.1481	35909.09
	12 - 20	2	437000	1768	2924.351	9	324.9279	48555.55
	21 - 31	2.6	706500	1360	3636.779	11	330.6163	64227.27
NOV	1 - 7	15	489000	3893	7205.417	7	1029.345	69857.14
	7 - 14	3	738000	2936	8201.216	7	1171.602	105428.5
	15 - 21	7	567000	2867	6152.854	7	878.9791	81000
	22 - 30	2.5	825000	1596	4983.709	9	553.7455	91666.66
DEC	1 - 5	5	367500	3259	4533.228	5	906.6456	73500
	5 - 12	5	538500	2619	5338.104	7	762.5863	76928.57
	13 - 20	3.9	467500	4498	7959.154	8	994.8943	58437.5
	21 - 31	0.5	411000	3043	4733.797	11	430.3452	37363.63
SUM		404.1	27531450	163265	368380.8	362		
AVERAGES		8.63	76053.73	3535.10	3535.103		1024.530	81479.43

FLOW RATES AND TOTAL SUSPENDED SOLIDS DATA
FOR WASTEWATER PUMPED TO PIT #5 DURING 1986

3001

MONTH	DAY	% SETTLED (4-HR TEST)	VOLUME (GALLONS)	TSS (MG/L)	LOAD (KG)	DAY	LOAD/DAY (KG/DAY)	VOLUME (GAL/DAY)
JAN	1 - 10	1.4	538500	3244	6611.993	10	661.1993	53850
	11 - 16	3.5	319800	4179	5058.441	6	843.0735	53300
	17 - 23	2.4	533800	2172	4388.380	7	626.9114	76257.14
	24 - 31	5	516000	3034	5925.584	8	740.6980	64500
FEB	2 - 6	4	538000	1611	3280.527	6	546.7546	89666.66
	7 - 13	1.5	415000	217	340.8581	7	48.69402	59285.71
	14 - 20	2	384000	2128	3092.920	7	441.8457	54857.14
	21 - 28	2	432500	1259	2060.998	8	257.6248	54062.5
MAR	1 - 6	1.3	308000	2807	3272.344	6	545.3907	51333.33
	7 - 13	2	481300	2816	5129.964	7	732.8521	68757.14
	14 - 31	2.6	918500	1557	5412.945	18	300.7191	51027.77
APR	1 - 3	2	185500	2527	1774.250	4	443.5627	46375
	4 - 10	3	346300	3454	4527.314	7	646.7592	49471.42
	11 - 17	1.5	364700	1777	2452.952	7	350.4217	52100
	18 - 24	1	440000	1995	3322.473	7	474.639	62857.14
	25 - 30	5	302500	3488	3993.629	6	665.6048	50416.66
MAY	1 - 8	2	500500	904	1712.530	8	214.0663	62562.5
	9 - 15	3.5	451500	909	1553.415	7	221.9164	64500
	16 - 22	3	351500	928	1234.636	7	176.3766	50214.28
	23 - 31	2	369500	1336	1868.472	9	207.6080	41055.55
JUN	1 - 6	2	342000	2742	3549.436	6	591.5727	57000
	7 - 12	1.5	422000	2770	4424.437	6	737.4063	70333.33
	13 - 19	1.5	453000	392	672.1251	7	96.01788	64714.28
	20 - 30	4	505500	3530	6754.010	11	614.0009	45954.54
JUL	1 - 10	2	553500	1570	3289.146	10	328.9146	55350
	11 - 17	2.8	605500	2450	5614.952	7	802.1361	86500
	18 - 31	2	326700*	4721	5837.797	14	416.9855	23335.71
AUG	1 - 7	1.2	570300	3457	7462.230	7	1066.032	81471.42
	8 - 14	0.5	407000	2541	3914.397	7	559.1996	58142.85
	15 - 30	2	831100	2505	7880.012	16	492.5007	51943.75
SEP	2 - 11	1	481900	3111	5674.437	11	515.8579	43809.09
	12 - 19	1	435600	2035	3355.198	8	419.3997	54450
	20 - 30	2.5	854300	717	2318.437	11	210.7670	77663.63
OCT	1 - 9	1.5	622100	2846	6701.329	9	744.5921	69122.22
	9 - 17	1	341900	3442	4454.262	8	556.7828	42737.5
	20 - 23	0.5	299600	1635	1854.067	6	309.0111	49933.33
	24 - 31	1	460000	2962	5157.138	8	644.6422	57500
NOV	1 - 6	1	728000	2692	7417.752	6	1236.292	121333.3
	7 - 13	0.5	496100	4752	8923.013	7	1274.716	70871.42
	14 - 20	1.5	331400	7879	9883.015	7	1411.859	47342.85
	21 - 29	1	757800	3516	10084.84	9	1120.538	84200
DEC	1 - 4	1	555400	907	1906.685	5	381.3370	111080
	5 - 11	1	506700	7161	13733.79	7	1961.970	72385.71
	12 - 18	0.5	424000	1607	2578.977	7	368.4254	60571.42
	19 - 31	1	782000	2105	6230.526	13	479.2712	60153.84
SUM		86.2	21790800	116387	206686.6	365		
AVERAGE		1.90	59700.82	2505.96	2505.955		588.5988	61652.22

FLOW RATES AND TOTAL SUSPENDED SOLIDS DATA
FOR WASTEWATER PUMPED TO PIT #5 (AND THE BSL) DURING 1987

MONTH	DAY	% SETTLED (4-HR TEST)	VOLUME (GALLONS)	TSS (MG/L)	LOAD (KG)	DAY	LOAD/DAY (KG/DAY)	VOLUME (GAL/DAY)
JAN	1 - 8	1	338000	1497	1915.157	8	239.3946	42250
	9 - 15	0.5	350200	1427	1891.498	7	270.2140	50028.57
	16 - 22	1	485700	2060	3787.051	7	541.0073	69385.71
	23 - 31	1	477600	1957	3537.700	9	393.0778	53066.66
FEB	1 - 5	1	882500	2669	8915.160	5	1783.032	176500
	6 - 19	1.5	676600	3405	8719.970	14	622.8550	48328.57
	20 - 24	1	384500	1674	2436.226	5	487.2453	76900
	24 - 28	2	421000	1221	1945.645	4	486.4112	105250
MAR	1 - 5	1	431500	650	1061.597	5	212.3195	86300
	5 - 12	0.5	365300	2054	2839.984	7	405.7120	52185.71
	13 - 19	4.5	475500	1407	2532.272	7	361.7532	67928.57
	19 - 31	4.5	843500	1555	4964.566	12	413.7139	70291.66
APR	1 - 9	2.5	700000	4876	12918.96	9	1435.440	77777.77
	10 - 20	3.9	855500	5102	16520.62	11	1501.874	77772.72
SUM		25.9	7687400	31554	73986.41	110		
AVERAGES		2.11	69885.45	2542.77	2542.767		653.8608	75283.28

APPENDIX C

WASTE PIT AREA STORMWATER RUNOFF CALCULATIONS

Solids Loading and Maintenance Calculations for BSL

3001

Given: To maximize the estimate of solids loading, assume all collected stormwater has the following:

Avg. Influent TSS = 226 mg/L

Avg. Effluent TSS = 10 mg/L

Net TSS = 216 mg/L

Yearly Runoff Volume (see attached table for summary):

For combined drainage areas the Clearwell and Pits 5 and 6:
Area = 5.1 acres
Runoff Coefficient = 1.0

For combined drainage areas Pits 1, 2, 3, and 4:
Area = 14.7 acres
Runoff Coefficient = 0.4

Given 40 inches rainfall per year.

Yearly Volume, V = CqA

Vol.=((0.4)x(40.")/(12"/ft))x((14.7 acres)x(43,560 ft^2/acre)x(7.4805 gal/ft^3)+

((1.0)x(40.")/(12"/ft))x((5.1 acres)x(43,560 ft^2/acre)x(7.4805 gal/ft^3)

Volume = 11,926,131 gallons for the waste pit area

Total Solids Loading:

Lb of Solids/Year = (Yearly Storm Flow) x (Net TSS Concentration)

Lb of Solids/Year = (11,926,131 gal/yr)(216 mg/L)(8.34 lb./10^6gal/mg/L)

Lb of Solids/Year (Stormwater Runoff) = 21,484 lbs./Year (or 59 lb/day)

Lb of Solids/Year (Process Wastewater using 1984 data) = 893,194 lbs/Yr. (or 2,447 lb/day)

Total Estimated Solids Loading = 914,678 lbs/Year (or 2,506 lb/day)

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Sediment Accumulation Rate:

Assuming 15% dry solids content in sediment;

15% = 150,000 (8.34 #/10^6 gal/mg/l) = 1.25 lbs. Dry Solids/gal. Sediment

Sediment Accum. Rate = Total Solid Loading / Solids Content in Sediment

Sediment Accum. Rate = (914,678 #/yr.)/(1.25 lbs/gal. sediment)

Sediment Accum. Rate = 731,742 Gallons Sediment/year @ 15% Solids

Cleanout Frequency:

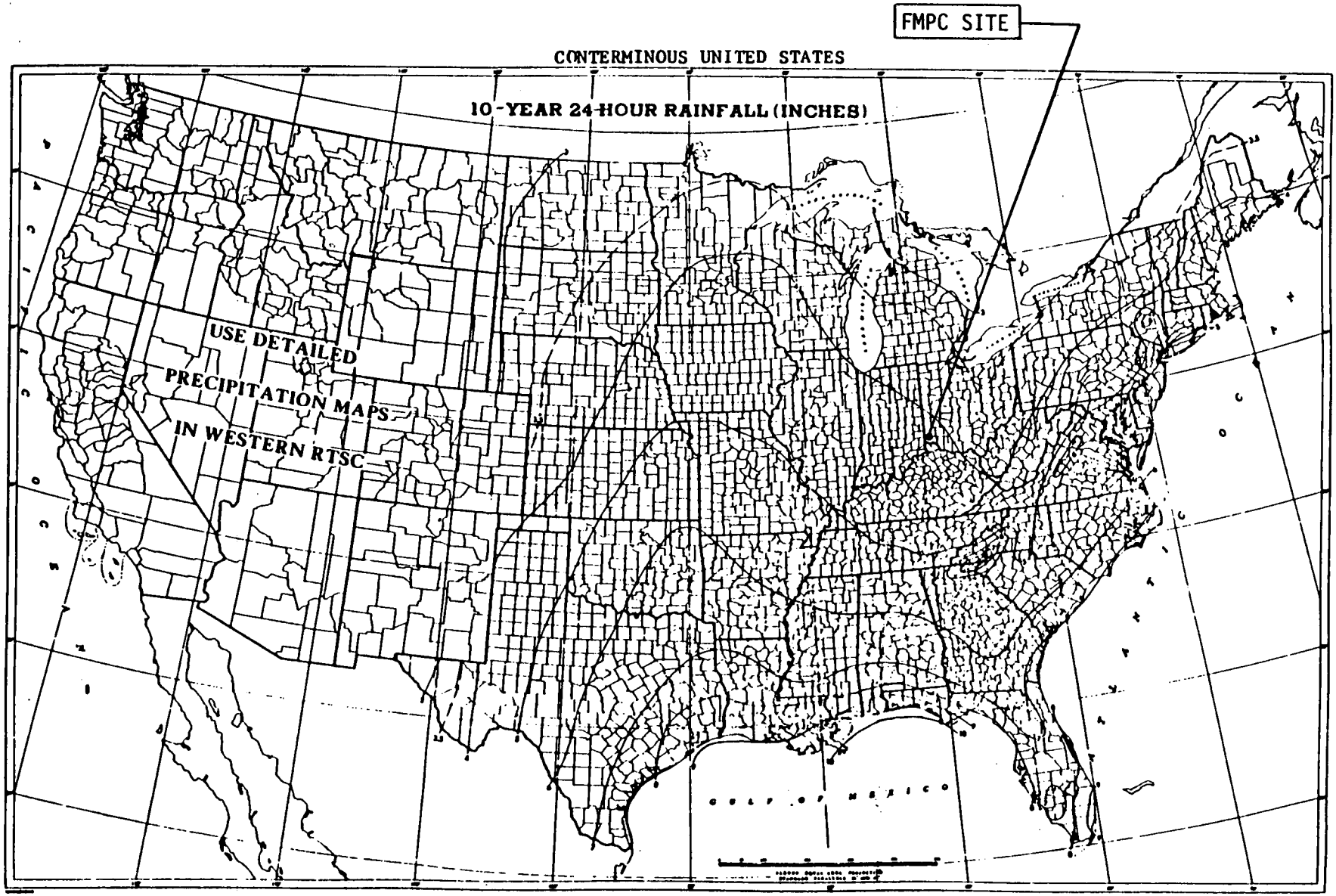
Basis for cleanout is once per year frequency

@ 15% Solids Content: 1.0 years x 731,742 gal./yr. = 750,000 gallons

WASTE PIT AREA STORMWATER RUNOFF CALCULATIONS SUMMARY TABLE

YEAR	INCHES ~	CLEARWELL	PIT 5	PIT 6	PIT 1,2,3	PIT 4	TOTAL FLOW
	ACRES=	0.52	3.9	0.68	11.7	3	
	COEFF=	1	1	1	0.4	0.4	
1	2.5	35300.47	264753.5	46162.16	317704.3	81462.64	745383.2
2	3	42360.57	317704.3	55394.59	381245.1	97755.17	894459.8
5	3.6	50832.69	381245.1	66473.51	457494.2	117306.2	1073351.
10	4.1	57892.78	434195.8	75705.95	521035.0	133598.7	1222428.
TOTAL YEAR	40	564807.6	4236057.	738594.6	5083269.	1303402.	11926131
	GPD=	1547.418	11605.63	2023.546	13926.76	3570.965	32674.33
	GPM=	1.074596	8.059470	1.405240	9.671364	2.479836	22.69050
1979	52.76	744981.3	5587359.	974206.3	6704831.	1719187.	15730567

~ SEE ATTACHED REFERENCE TABLES FOR 24-HOUR RAINFALL



Prepared by U. S. Weather Bureau

TABLE OH-1

3001

OHIO
24-HOUR RAINFALL (inches)

County	Frequency 1	2	5	10	25	50	100
Adams	2.5	2.8	3.5	4.0	4.6	5.0	5.5
Allen	2.3	2.7	3.3	3.8	4.3	4.8	5.2
Ashland	2.2	2.4	3.1	3.5	4.0	4.5	4.7
Ashtabula	2.1	2.3	3.0	3.5	4.0	4.5	4.7
Athens	2.3	2.5	3.3	3.8	4.3	4.7	4.9
Auglaize	2.4	2.7	3.4	3.9	4.4	4.9	5.2
Belmont	2.2	2.5	3.2	3.7	4.3	4.7	4.9
Brown	2.5	2.9	3.6	4.1	4.7	5.1	5.6
Butler	2.5	2.9	3.6	4.1	4.7	5.2	5.6
Carroll	2.2	2.4	3.1	3.6	4.1	4.6	4.8
Champaign	2.4	2.7	3.4	3.9	4.4	4.9	5.2
Clark	2.4	2.7	3.4	3.9	4.5	4.9	5.3
Clermont	2.5	2.9	3.6	4.1	4.7	5.1	5.6
Clinton	2.5	2.8	3.5	4.0	4.6	5.0	5.4
Columbiana	2.2	2.4	3.2	3.7	4.2	4.6	4.8
Coshocton	2.2	2.4	3.2	3.6	4.1	4.6	4.8
Crawford	2.2	2.5	3.2	3.6	4.1	4.6	4.8
Cuyahoga	2.1	2.2	3.0	3.4	3.9	4.4	4.6
Darke	2.4	2.8	3.5	4.0	4.5	5.0	5.5
Defiance	2.3	2.6	3.3	3.8	4.3	4.8	5.1
Delaware	2.3	2.5	3.3	3.7	4.2	4.7	4.9
Erie	2.2	2.4	3.1	3.5	3.9	4.4	4.7
Fairfield	2.3	2.5	3.3	3.7	4.3	4.7	4.9
Fayette	2.4	2.7	3.4	3.9	4.5	4.9	5.2
Franklin	2.3	2.6	3.3	3.8	4.3	4.7	5.0
Fulton	2.2	2.6	3.2	3.7	4.2	4.6	5.0
Gallia	2.4	2.6	3.4	3.8	4.4	4.9	5.1
Geauga	2.1	2.3	3.0	3.5	3.9	4.4	4.6
Greene	2.4	2.8	3.5	4.0	4.6	5.0	5.4
Guernsey	2.2	2.4	3.2	3.7	4.2	4.6	4.8
Hamilton	2.5	3.0	3.6	4.1	4.8	5.2	5.7
Hancock	2.3	2.6	3.3	3.7	4.2	4.7	5.0
Hardin	2.3	2.7	3.3	3.8	4.3	4.8	5.1
Harrison	2.2	2.4	3.2	3.7	4.2	4.7	4.9
Henry	2.3	2.6	3.3	3.7	4.2	4.7	5.0
Highland	2.5	2.8	3.5	4.0	4.6	5.0	5.4
Hocking	2.3	2.5	3.3	3.8	4.3	4.8	4.9
Holmes	2.2	2.4	3.1	3.5	4.0	4.5	4.7
Huron	2.2	2.4	3.1	3.5	4.0	4.5	4.7
Jackson	2.4	2.6	3.4	3.8	4.4	4.9	5.1
Jefferson	2.2	2.5	3.2	3.7	4.2	4.7	4.9
Knox	2.2	2.4	3.2	3.6	4.1	4.6	4.8
Lake	2.1	2.2	3.0	3.4	3.9	4.4	4.6
Lawrence	2.4	2.7	3.4	3.9	4.5	4.9	5.2
Licking	2.3	2.5	3.2	3.7	4.2	4.6	4.8
Logan	2.3	2.7	3.4	3.8	4.4	4.8	5.2

THE FMPC SITE IS LOCATED ON THE BORDER BETWEEN HAMILTON AND BUTLER COUNTIES

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Ohio 24-Hour Rainfall (inches)-Con't

	Frequency						
County	1	2	5	10	25	50	100
Lucas	2.2	2.5	3.2	3.6	4.1	4.6	4.9
Lorain	2.1	2.3	3.0	3.4	3.9	4.4	4.6
Madison	2.4	2.7	3.4	3.9	4.4	4.8	5.1
Mahoning	2.2	2.4	3.1	3.6	4.1	4.6	4.8
Marion	2.3	2.6	3.2	3.7	4.4	4.7	4.9
Medina	2.1	2.3	3.0	3.5	3.9	4.4	4.6
Meigs	2.3	2.6	3.3	3.8	4.4	4.8	5.0
Mercer	2.4	2.8	3.4	3.9	4.5	5.0	5.4
Miami	2.4	2.8	3.5	4.0	4.5	5.0	5.4
Monroe	2.3	2.5	3.3	3.8	4.3	4.8	5.0
Morgan	2.3	2.5	3.2	3.7	4.2	4.7	4.9
Morrow	2.3	2.5	3.2	3.6	4.1	4.6	4.8
Montgomery	2.5	2.8	3.5	4.0	4.6	5.0	5.5
Muskingum	2.2	2.4	3.2	3.6	4.2	4.6	4.8
Noble	2.3	2.5	3.2	3.7	4.2	4.7	4.9
Ottawa	2.2	2.5	3.1	3.6	4.0	4.5	4.8
Paulding	2.3	2.7	3.4	3.8	4.4	4.8	5.2
Perry	2.3	2.5	3.2	3.7	4.2	4.7	4.9
Pickaway	2.4	2.6	3.4	3.8	4.4	4.8	5.0
Pike	2.4	2.7	3.4	3.9	4.5	4.9	5.2
Portage	2.1	2.3	3.1	3.5	4.0	4.5	4.7
Preble	2.5	2.9	3.6	4.1	4.6	5.1	5.6
Putnam	2.3	2.7	3.3	3.8	4.3	4.8	5.1
Richland	2.2	2.4	3.1	3.6	4.0	4.5	4.7
Ross	2.4	2.7	3.4	3.9	4.4	4.9	5.1
Sandusky	2.2	2.5	3.1	3.6	4.1	4.5	4.8
Scioto	2.4	2.7	3.5	3.9	4.5	5.0	5.3
Seneca	2.2	2.5	3.2	3.6	4.1	4.6	4.8
Shelby	2.4	2.8	3.4	3.9	4.5	4.9	5.3
Stark	2.2	2.3	3.2	3.6	4.0	4.5	4.7
Summit	2.1	2.3	3.0	3.5	3.9	4.4	4.6
Trumbull	2.1	2.4	3.1	3.6	4.1	4.6	4.7
Tuscarawas	2.2	2.4	3.1	3.6	4.1	4.6	4.8
Union	2.3	2.6	3.3	3.8	4.3	4.8	5.0
Van Wert	2.3	2.7	3.4	3.9	4.4	4.9	5.3
Vinton	2.3	2.6	3.3	3.8	4.4	4.8	5.0
Warren	2.5	2.9	3.5	4.0	4.7	5.1	5.5
Washington	2.3	2.5	3.3	3.8	4.3	4.7	5.0
Wayne	2.2	2.3	3.2	3.5	4.0	4.5	4.7
Williams	2.3	2.6	3.3	3.8	4.3	4.7	5.1
Wood	2.2	2.6	3.2	2.7	4.2	4.6	4.9
Wyandot	2.3	2.6	3.2	3.7	4.2	4.7	4.9

Source: U.S. Department of Commerce, Weather Bureau, "Technical Paper No. 40, Rainfall Frequency Atlas of the United States", May, 1961.

APPENDIX D

PRECIPITATION FOR CINCINNATI (GREATER CINCINNATI AIRPORT), OHIO

PRECIPITATION (inches)

CINCINNATI. (GREATER CINCINNATI AIRPORT) OHIO

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1956	2 50	5 32	4 19	4 09	7 04	4 98	3 90	2.31	2 29	1 54	1.91	2.56	43.83
1957	3 08	2 79	1 44	5 62	5 74	2 68	2 44	3 74	3 20	2 34	6 25	5 98	45 30
1958	2 34	0 61	1 73	3 49	5 33	5 19	7.54	2 52	3 67	1 46	2 67	0 68	37 23
1959	7 61	3 18	2 52	2 33	2 92	5 85	2.77	1 80	1 88	3 05	4 04	3.03	40.98
1960	2 48	3 49	1 14	1.32	3 22	6.16	3.15	5 21	1 07	4 00	2 33	1.73	35 30
1961	1 87	3 56	4 76	2 81	7.31	2 28	5 11	1.07	0 97	1 88	3 36	3 39	38 37
1962	3 98	5 58	4 25	1 26	3 64	4 40	8 36	2.14	2 67	2 87	2 37	1 36	42.88
1963	2 04	1 09	9 91	2 01	2 73	1 59	4 34	1 83	0 18	0 25	0 94	1 08	27 99
1964	2 88	1 98	12 18	6.73	1 13	4 32	2 56	2 25	1 65	0 59	2 63	4 92	43 88
1965	3 11	5 07	2 86	4 90	1.46	0 95	4 42	3 24	6 06	3 81	1 26	1 19	38 33
1966	3 84	3 73	1 22	5 38	2 42	2.52	4.06	4 31	3.13	0 57	4 18	3 31	38 67
1967	0 75	1 86	3 63	3 66	5 64	1 72	4.99	0 77	1.79	2 65	3 84	3 94	35 24
1968	1 79	0 64	4 28	3 47	9 48	2 43	7.50	2.26	2 16	1 35	3 21	4 01	42.54
1969	4 64	1 27	1 42	3 59	2 05	4 91	3 28	2 15	2 87	1 53	3 67	2 59	33 97
1970	1 27	1.68	4 71	7 19	1 88	5 73	3 47	2.96	3 87	2 44	2 29	3 32	40 81
1971	2 47	5 89	2 55	1 04	3 31	5.18	3 70	3 45	6 56	1 44	1 68	3 39	40 66
1972	1 96	2 20	3 68	5 89	6.02	2 41	1 50	2 64	5 96	2 55	6 26	4 23	45 30
1973	1 79	1.58	6 11	5 81	3 46	6 27	7 16	2 62	2 63	4.39	4 95	2 66	49.43
1974	3 65	1 63	4 39	5 08	5 53	4 38	3 82	5.75	4 44	1 07	4 19	2.83	46.76
1975	4 05	3 38	6 76	4.16	3.11	5.09	1.62	1.97	3 64	4 59	2.50	3 36	44.23
1976	3 00	2 37	2 14	1 21	1.80	5 94	2 33	4.36	1.95	3 85	0 83	0.51	30.29
1977	1 90	1 29	4 52	4 16	1 53	7.36	1.90	5.45	1 80	3 74	3 90	4.00	41 55
1978	4 52	0 25	1.99	2 28	5 30	6 63	6 86	4 41	0.43	5 03	2 67	6 46	46.83
1979	3 68	3 77	2 05	4 90	4 00	5 92	5.49	4 90	8 61	1 77	4 86	2 91	52 76
1980	2 26	1 04	4 50	1 96	4 59	4.13	5.51	4 19	1 83	3.28	2 58	1.26	37.13
1981	0 57	3 86	1 72	5 05	5 07	3 34	3 66	2.15	1 47	2 33	2 94	2.39	34.55
1982	7 17	1 17	4 67	2 18	4 60	3 61	2.44	7.71	1 27	0.99	5.08	4 25	45 14
1983	1 56	1 14	2 02	4 84	8 89	2 22	1 96	3.23	1.22	8.60	4.20	2 84	42 72
1984	0 75	2 40	3 61	4 88	4 82	2 11	2 57	3.30	3.50	3 85	6 00	4 21	42.00
1985	1 68	2 25	6 90	1 34	6 18	4 55	3.59	2.02	0.76	5.83	7.51	1.52	44.13
Record Mean	3.33	2.77	3 91	3.56	3.99	4.02	4.09	3.04	2.80	2.74	3.45	3.02	40.73

APPENDIX E

BIODENITRIFICATION SURGE LAGOON

RAINFALL AND EVAPORATION CALCULATIONS

3001

BSL RAINFALL CALCULATIONS

GIVEN

BSL Surface Area = 4 acres (approximately)

Yearly Rainfall, q = 40 inches

Runoff Coefficient = 1.0

Yearly Volume, V = CqA

ESTIMATED VOLUME TO BE CONTROLLED

Volume = (1.0)(40 inches/(12 in/ft)(4 acres)(43560 sq ft/acre) x (7.48 gal/cu ft)

= 4,344,674 gallons/year

BSL EVAPORATION CALCULATIONS

GIVEN

The average yearly evaporation from Open-Water-Surfaces (see attached 'Plate 12' form the U.S. Weather Bureau) for Cincinnati, Ohio =

= 34 inches/year

The average yearly rainfall = 40 inches/year

NET EVAPORATION RATE

The fraction of rainfall that evaporates = (34 in/yr)/(40 in/yr)

= 0.85

Therefore, the yearly net average rainfall that falls on the BSL and will be stored/controlled in the BSL =

= (4,344,674 gal/year)(1 - 0.85) = 651,700 gallons/year

= 1.3 gpm

PLATE 2 – DISTRIBUTION OF PRECIPITATION

Precipitation is the water that falls on the surface of the land as rain, snow, and sleet. The map shows lines, called contours or isohyets, that connect points of equal precipitation. The numbers on the contours represent the average number of inches of water falling on the land in a year.

The amount of precipitation in any particular locality usually varies from year to year, but over a long period, its average is more or less constant. The average annual precipitation in the United States is different from place to place owing to the great size of the continental land mass, the long mountain chains that partly block the flow of moist air, the presence of open seas on three sides, and the directions of flow of air masses.

Precipitation is the basic source of the nation's water supply. The total amount received in an average year is 1,570 trillion gallons, which is equivalent to a layer of water about 30 inches thick over the entire country.

Among the heaviest rainfalls ever observed in the United States were 1.23 inches in one minute in Unionville, Maryland; 12 inches in 42 minutes in Holt, Missouri; and 19 inches in 70 minutes in Rockport, West Virginia.

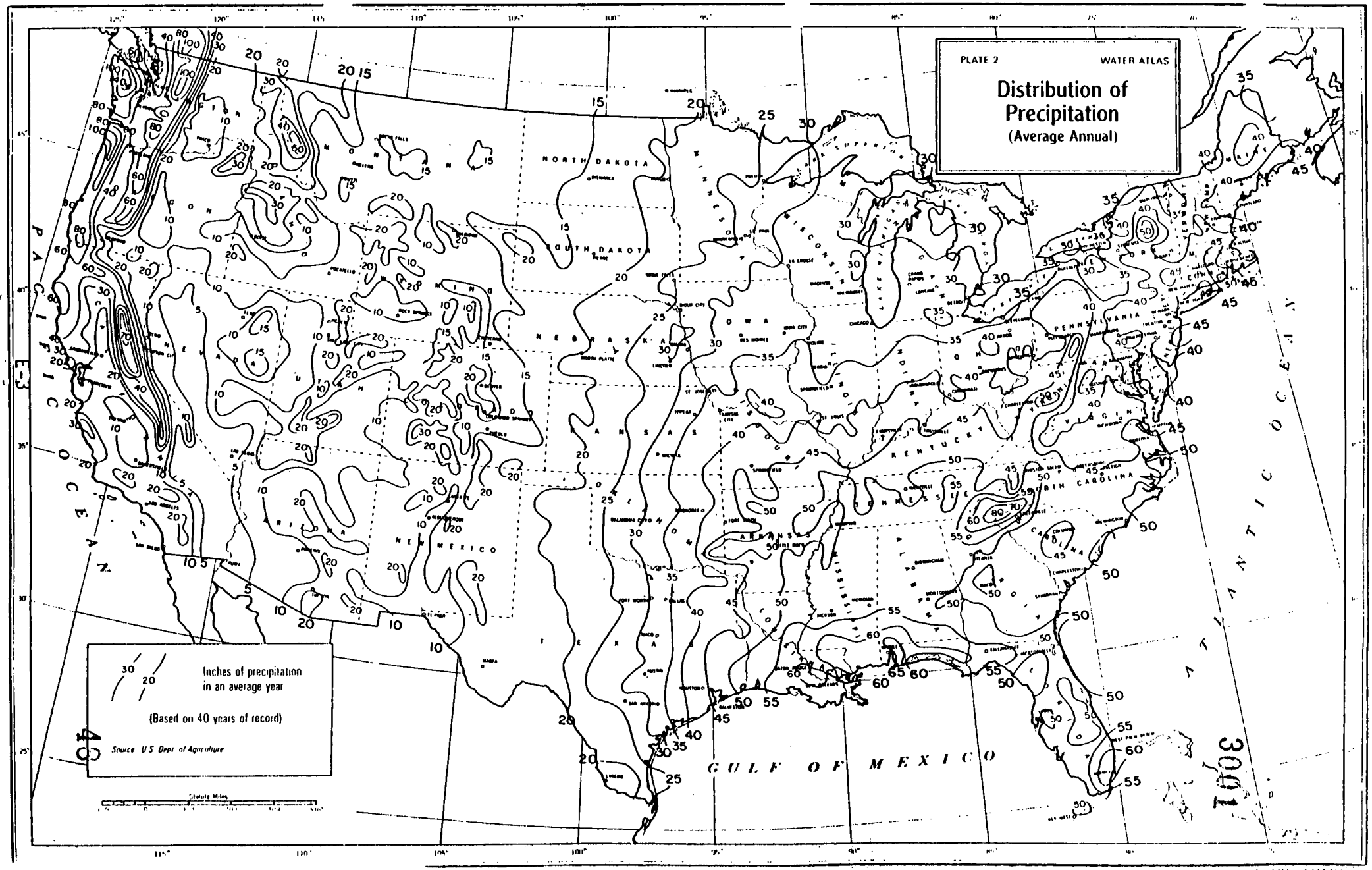


PLATE 2
WATER ATLAS
Distribution of Precipitation
(Average Annual)
Inches of precipitation in an average year
(Based on 40 years of record)
Source U.S. Dept. of Agriculture
Statute Miles
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
IOWA
MINNESOTA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
ARKANSAS
MISSOURI
NEW MEXICO
ARIZONA
TEXAS
PENNSYLVANIA
NORTH CAROLINA
SOUTH CAROLINA
VIRGINIA
MARYLAND
DELAWARE
NEW JERSEY
NEW YORK
MAINE
3001

PLATE 12 – EVAPORATION FROM OPEN-WATER SURFACES

One of the most important ways in which water from precipitation is lost after it has reached the land surface is through evaporation back to the atmosphere. The map shows by contours the average amount of water in a typical year that would be evaporated from an open lake or river surface. This quantity is surprisingly high in the warmer regions of the country. It is as much as 86 inches in southern California and 80 inches in parts of southwestern Texas. The lowest annual rates of evaporation are in the extreme northern parts of Maine and along the coast of the State of Washington.

In many parts of the nation, the number of inches of water evaporated each year from an open body of water is greater than the inches of local precipitation. This discrepancy is explained by the fact that a lake usually receives, from streams and from seepage of ground water, far more water than falls on the lake surface itself. Thus, loss of water by evaporation can be a serious water-supply problem in places where water is stored in lakes or reservoirs. Evaporation consumes a major portion of the available fresh-water supply of the entire nation, and its annual rate of eight trillion gallons in the Western States could supply 20 cities the size of New York. Evaporation from open-water surfaces is often combined with the use of water by vegetation, in order to arrive at estimates of the total water loss (see Plate 13).

A great deal of research is being conducted in many parts of the world on ways of retarding evaporation. Experiments thus far seem to indicate that a substantial reduction can be accomplished by spreading thin chemical films over the surface of the water.

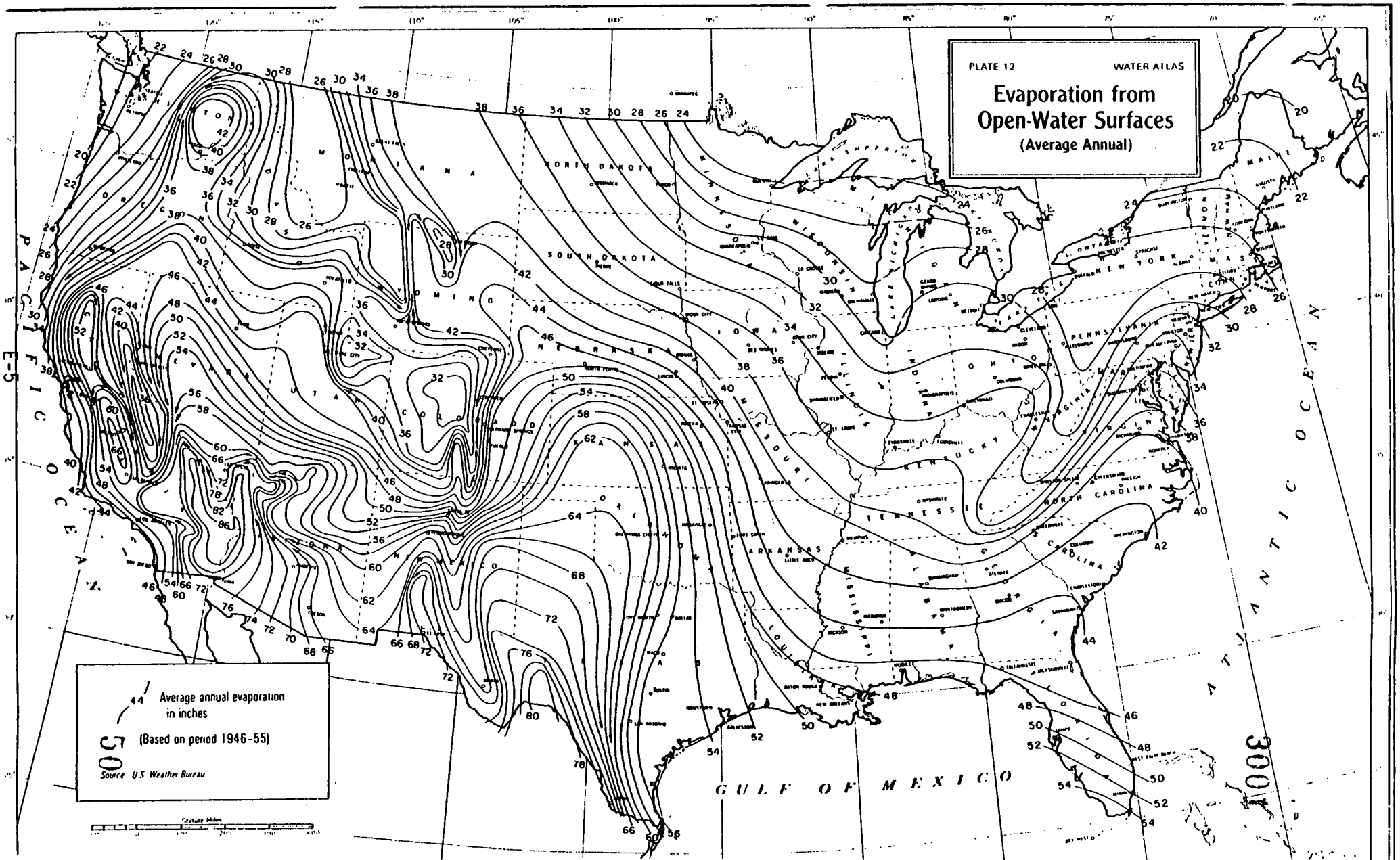


PLATE 12
WATER ATLAS
Evaporation from Open-Water Surfaces
(Average Annual)
Average annual evaporation in inches
(Based on period 1946-55)
Source U.S. Weather Bureau
Statute Miles
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
NEW MEXICO
COLORADO
UTAH
NEVADA
ARIZONA
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
TENNESSEE
KENTUCKY
OHIO
INDIANA
ILLINOIS
WISCONSIN
MICHIGAN
PENNSYLVANIA
NEW YORK
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
MAINE
MASS.
CONN.
VERMONT
NEW HAMPSHIRE
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO

APPENDIX F

INCREMENTAL RETENTION VOLUMES

FOR THE BIODENITRIFICATION SURGE LAGOON

BSL STAGE-STORAGE

3001

EXISTING BSL

HEIGHT (FEET)	ELEVATION (FEET)	TOP WIDTH (FEET)	TOP LENGTH (FEET)	VOLUME (CF)	VOLUME (GAL)
0	572	303	0	0	0
0.5	572.5	306	26.5	2029.544	15182.00
1	573	309	53	8206.856	61391.38
1.5	573.5	312	79.5	18664.95	139623.1
2	574	315	106	33536.84	250872.3
2.5	574.5	318	132.5	52955.56	396134.0
3	575	321	159	77054.11	576403.3
3.5	575.5	324	185.5	105965.5	792675.0
4	576	327	212	139822.7	1045944.
4.5	576.5	330	238.5	178758.9	1337206.
5	577	333	265	222907.0	1667455.
5.5	577.5	336	291.5	272400.0	2037688.
6	578	339	318	327879.8	2452705.
*TOP OF SLANTED BOTTOM					
6.5	578.5	342	321	382199.4	2859042.
7	579	345	324	437500.0	3272718.
7.5	579.5	348	327	493788.6	3693785.
8	580	351	330	551072.3	4122296.
8.5	580.5	354	333	609358.2	4558304.
9	581	357	336	668653.4	5001862.
9.5	581.5	360	339	728964.9	5453022.
10	582	363	342	790299.8	5911837.
10.5	582.5	366	345	852665.1	6378361.
11	583	369	348	916068.0	6852646.
11.5	583.5	372	351	980515.4	7334746.
12	584	375	354	1046014.	7824712.
12.5	584.5	378	357	1112572.	8322598.
13	585	381	360	1180196.	8828457.
*MINIMUM FREEBOARD WILL BE 3 FEET - REFERENCE SECTION 104.15 "RECOMMENDED STANDARDS FOR SEWAGE WORKS", 1987 ED.					
13.5	585.5	384	363	1248892.	9342341.
14	586	387	366	1318669.	9864304.
14.5	586.5	390	369	1389532.	10394398
15	587	393	372	1461490.	10932676
15.5	587.5	396	375	1534548.	11479191
16	588	399	378	1608715.	12033997

PROPOSED BSL
(VOL = EXISTING - 1 FT)

HEIGHT (FEET)	ELEVATION (FEET)	TOP WIDTH (FEET)	TOP LENGTH (FEET)	VOLUME (CF)	VOLUME (GAL)
0	572.94	309	0	0	0
0.06	573	309.36	3.18	29.55176	221.0619
0.56	573.5	312.36	29.68	2602.465	19467.74
1.06	574	315.36	56.18	9425.357	70506.38
1.56	574.5	318.36	82.68	20633.01	154345.2
2.06	575	321.36	109.18	36360.21	271992.5
2.56	575.5	324.36	135.68	56741.74	424456.6
3.06	576	327.36	162.18	81912.39	612745.6
3.56	576.5	330.36	188.68	112006.9	837867.9
4.06	577	333.36	215.18	147160.1	1100831.
4.56	577.5	336.36	241.68	187506.8	1402645.
5.06	578	339.36	268.18	233181.8	1744316.
5.56	578.5	342.36	294.68	284319.8	2126854.
6.06	579	345.36	321.18	341055.6	2551266.
6.12	579.06	345.72	324.36	348246.4	2605057.
*TOP OF SLANTED BOTTOM					
6.56	579.5	348	327	400302.9	2994466.
7.06	580	351	330	457739.7	3424122.
7.56	580.5	354	333	516183.6	3861311.
8.06	581	357	336	575641.5	4306086.
8.56	581.5	360	339	636120.6	4758500.
9.06	582	363	342	697627.9	5218605.
9.56	582.5	366	345	760170.5	5686455.
10.06	583	369	348	823755.4	6162102.
10.56	583.5	372	351	888389.7	6645599.
11.06	584	375	354	954080.6	7137000.
11.56	584.5	378	357	1020835.	7636356.
12.06	585	381	360	1088660.	8143721.
*MINIMUM FREEBOARD WILL BE 3 FEET - REFERENCE SECTION 104.15 "RECOMMENDED STANDARDS FOR SEWAGE WORKS", 1987 ED.					
12.56	585.5	384	363	1157562.	8659148.
13.06	586	387	366	1227550.	9182689.
13.56	586.5	390	369	1298629.	9714398.
14.06	587	393	372	1370807.	10254327
14.56	587.5	396	375	1444091.	10802529
15.06	588	399	378	1518489.	11359058

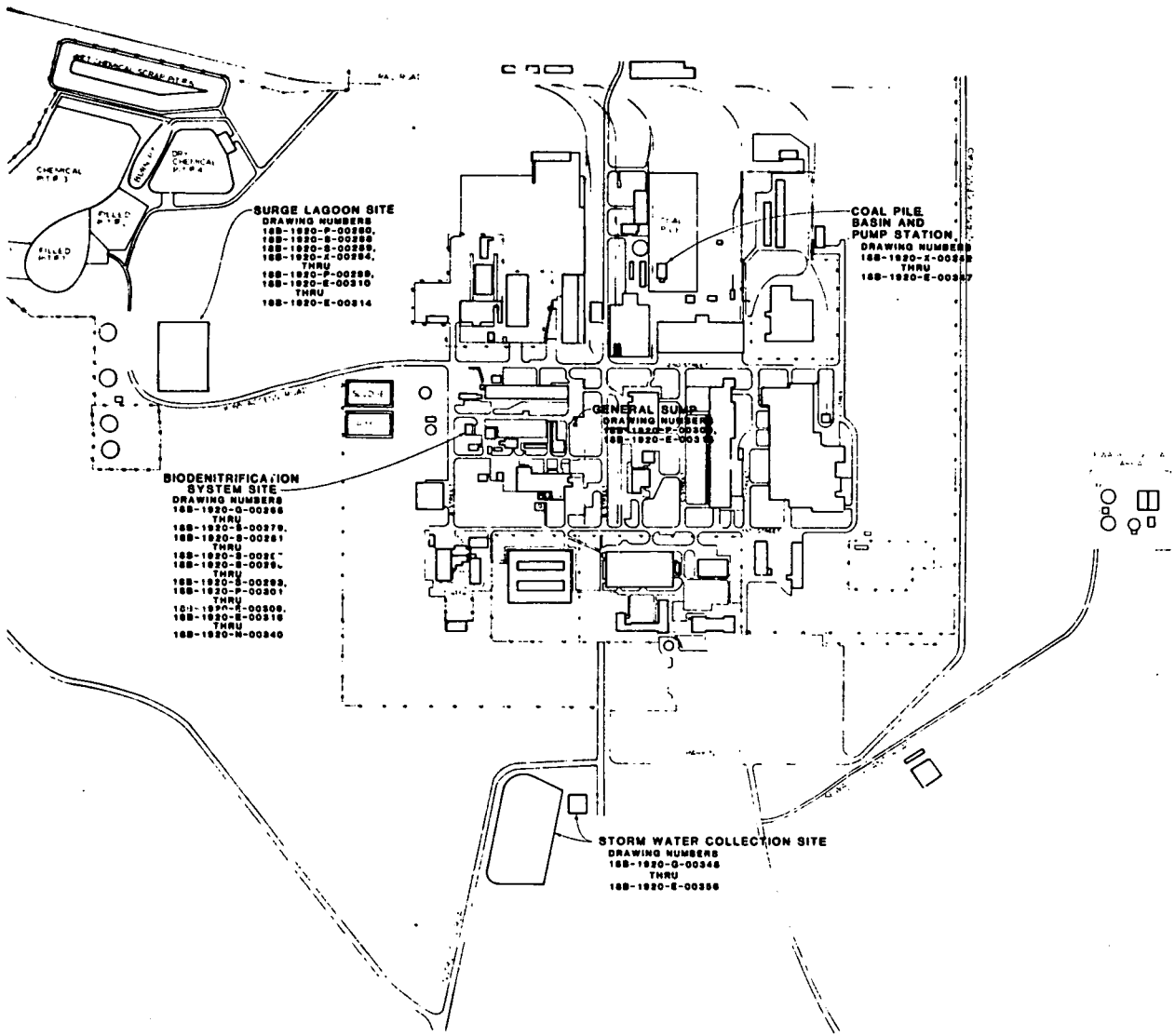
APPENDIX G

DRAWINGS FOR EXISTING

BIODENITRIFICATION SURGE LAGOON

UNITED STATES DEPARTMENT OF ENERGY

WATER POLLUTION CONTROL - FMPC



GENERAL NOTES

1. SEE DWG. NO. X-00263 FOR LIST OF DWGS.

0	CERTIFIED FOR CONSTRUCTION		
NO.	ISSUE OR REVISION PURPOSE DESCRIPTION		

UNITED STATES DEPARTMENT OF ENERGY

WILEY & WILSON

WATER POLLUTION CONTROL

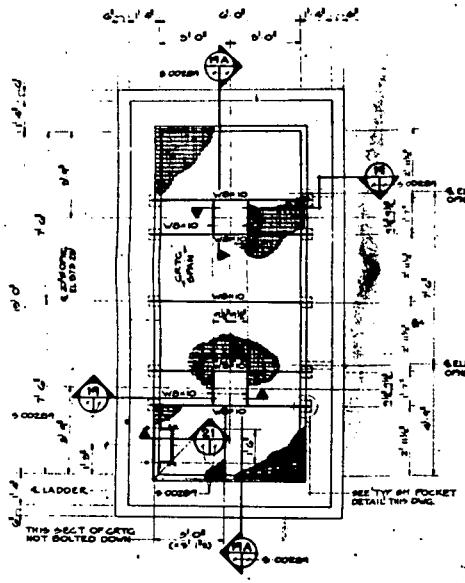
BIODENITRIFICATION SYSTEM
COAL PILE RUNOFF
STORM WATER COLLECTION
COVER SHEET

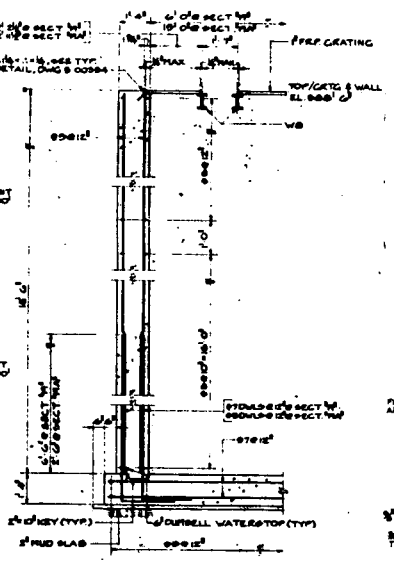
DRAWN BY PHJR | DATE 1/20/84 | ENGINEERED BY | DATE 1/20/84 | CHECKED BY | DATE 1/20/84

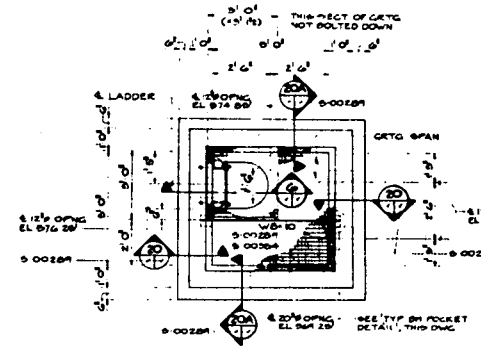
PLANT FMPC | BLDG. NA | FOR NA | SCALE NA | SIZE U

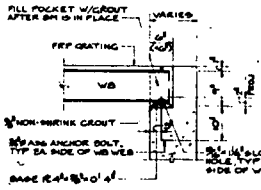
CONTRACT NO. 83-D-146

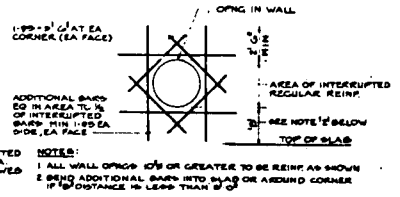
15B-1920-X-00292 | REV. NO. 0

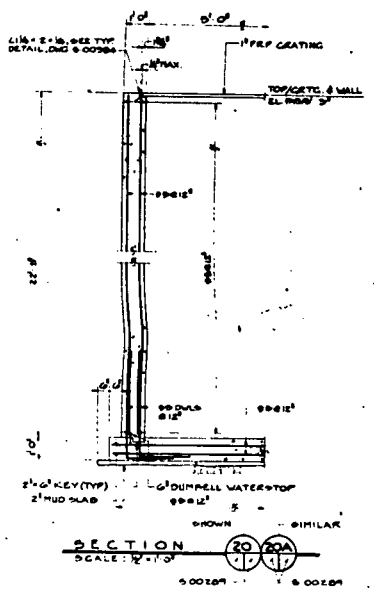


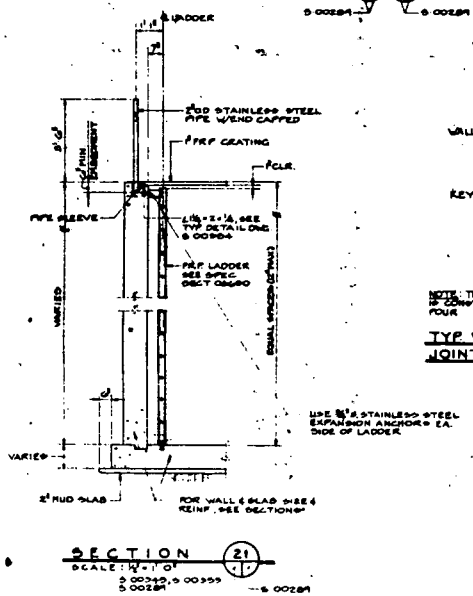


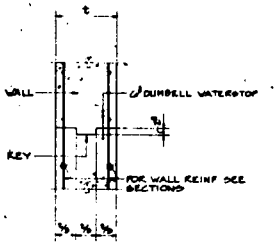


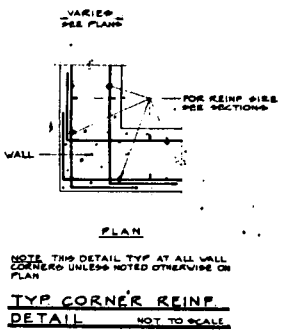












NOTES:

1. SEE DWG No. C-00262 FOR COVER SHEET & LOCATION PLAN.
2. SEE DWG No. X-00269 FOR LIST OF DWGS.
3. SEE DWG No. S-00287 FOR STRUCTURAL GENERAL NOTES.
4. SEE DWG No. C-00249 & C-00246 FOR LOCATION OF STRUCTURES.
5. SEE DWG No. S-00364 FOR TYPICAL CURB ANGLE DETAIL.
6. SEE DWG No. E-00312 FOR ELECTRICAL CONDUIT OPENINGS.
7. COAT ALL STEEL AND INTERIOR CONCRETE SURFACES OF SURGE LAGOON INSPECTION SUMP AND SURGE LAGOON PUMP STATION WITH CORROSION PROOF COATING (SPEC SECTION 09812) IN LIEU OF FINISH SYSTEMS SPECIFIED IN SPEC. SECTION 09900.
8. SEE DWG No. P-00291 FOR LAGOON INLET AND OUTLET STRUCTURE REINF.
9. SEE DWG No. X-00258 FOR PIPE SLEEVE DETAILS.

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	ORIG	DRAWN	CHK'D	APPR'D
0	CERTIFIED FOR CONSTRUCTION				

UNITED STATES
DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC01-83DC00094 A.E. WO 83109

PROJECT NAME
WATER POLLUTION CONTROL

DRAWING TITLE
BIODENITRIFICATION SYSTEM
SURGE LAGOON PUMP STATION AND
INSPECTION SUMP - PLANS AND SECTIONS

DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE

PLANT	BLDG	FLOOR	SCALE		SHEET
FNPC	N/A	N/A	N/A		U

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | DRAWING APPROVED

A.E. DATE | ENG DATE | DOE DATE

PROJECT NO. 83-D-146 | DRAWING NUMBER 180-1020-S-00288 | REV. NO. 0

MATCH LINE DWG. NO. G-00296

MARSH AREA

UNDERDRAINS

BOTTOM OF LAGOON

TOP OF DIKE

LAGOON INLET STRUCTURE

LAGOON UNDERDRAIN INSPECTION SUMP

EXISTING TEST WELL NO 2

EXISTING TEST WELL NO 1

ROAD

RIDGE OF DATUM NOW PAVEMENT

PLAN

SCALE 1"=50'

GENERAL NOTES

AND FIELD ACCEPTANCE ASSURE QUALIFIED GEOTECHNICAL PERSONNEL SHALL BE PRESENT TO OBSERVE THE SUBSTRIPPING AND RECONTOURING.

IF POSSIBLE THE DRAINAGE TRENCH SHALL REMAIN OPEN/USABLE UNTIL THE BOTTOM SOIL-BENTONITE LINER IS IN PLACE. WHEN THE TRENCH IS DECOMPRESSED BACKFILLING SHALL BEGIN AT THE EAST END USING DRY ON-SITE COHESIVE SOIL. THE BACKFILL SHALL BE PLACED IN HORIZONTAL LIFTS WITH EACH LIFT COMPACTED WITH HAND TAMPERS TO 95% LEAST 95% STANDARD PROCTOR DENSITY.

IF AREA FILL DRAINS ARE LOCATED DURING CONSTRUCTION, THE GEOTECHNICAL ENGINEER SHALL BE SUPERVISED PERIODICALLY AND SHALL DETERMINE WHAT ACTION IS REQUIRED.

ANY LEACHATE OR WATER ACCUMULATION IN THE INSPECTION SUMP SHALL BE PUMPED INTO THE SURGE LAGOON BY PORTABLE PUMP. NO DISCHARGE TO PADDYS RUN SHALL BE PERMITTED.

FOR NOTES AND LEGEND INFORMATION FOR NEW SIGNS AND RING BOY STATION, SEE DWG. 168-1110-G-00296.

A TEMPORARY DRAINAGE TRENCH SHALL BE EXCAVATED FROM THE EAST TO THE WEST END PERIMETRY SOUTH OF THE SOUTH LEVEE OF THE SURGE LAGOON BOTTOM. THE TRENCH SHALL EXTEND ABOUT 5 FT. BELOW GRADE WITH SLOPE AND DRAINAGE TO THE WEST. A SUMP SHALL BE CREATED AND CONTINUOUS PUMPING PROVIDED TO THE CLEAR WELL BY THE CONTRACTOR. THE PURPOSE OF THIS TRENCH IS TO COLLECT SURFACE WATER AND LOWER THE WATER LEVEL IN THE PERIMETRY AREA.

FOLLOWING EXCAVATION OF THE TRENCH DRAIN, THE CONTRACTOR SHALL EXCAVATE THE UPPER 6 FT. OF SOFT WET SOIL FROM THE SOUTH 50 TO 60 FT. OF THE BOTTOM AREA. A REPRESENTATIVE OF THE GEOTECHNICAL THERAPIST SHALL BE PRESENT TO IDENTIFY ADDITIONAL AREAS OF UNDERCUTTING. ON-SITE DRY FILL MATERIAL SHALL BE SPREAD AND COMPACTED THE WEST. IT SHALL BE APPROXIMATELY 18" THICK AND BE COMPACTED TO A REASONABLE DENSITY 90% STANDARD PROCTOR. DEPENDING UPON THE PERFORMANCE OF THE FIRST LIFT THE SECOND LIFT MAY ALSO HAVE TO BE 18" THICK FOR SATISFACTORY COMPACTION. THE TOP FOOT SHALL BE PLACED IN MAXIMUM 6" THICK LIFTS WITH THE LIFTS COMPACTED TO 95 % TO 98 % STANDARD PROCTOR DENSITY.

IN THE REMAINDER OF THE SURGE AREA THE SURFACE SHALL BE SCARIFIED ABOUT 2" TO 3" DEEP, MOISTENED IN PLACE, AND THEN SMOOTH WHEEL ROLLED TO SEAL THE SURFACE. THERE MAY BE ISOLATED AREAS REQUIRING ADDITIONAL RECONTOURING.

LOCKWOOD GREENE

PREPARED BY LOCKWOOD GREENE

APPROVED FOR REVISION

0528 3 16 84

REV NO.	ISSUE OR REVISION PURPOSE DESCRIPTION	A.E.	CHK	APP.
2	HEALTH & SAFETY REQUIREMENT MODIFICATIONS			
1	REMOVED INSPECTION SUMP OUTLET PIPE & ADDED GENERAL NOTE 10 11 & 12			
0	CERTIFIED FOR CONSTRUCTION			

UNITED STATES DEPARTMENT OF ENERGY

THIS DRAWING WAS PREPARED BY

WILEY & WILSON

ARCHITECTS - ENGINEERS - PLANNERS

LYNCHBURG, VIRGINIA

JOB CONTRACT NO. DE-AC05-80OR20604 PROJECT NO. A & E NO. 83-146

WATER POLLUTION CONTROL

ORIGINAL TITLE

BIODENITRIFICATION SYSTEM SURGE LAGOON PLAN

DRAWN BY	DATE	DESIGNED BY	DATE	CHECKED BY	DATE
TILLA	1/12/84				

PLANT	BLDG	FLOOR	SCALE
FMPC	N/A	N/A	1"=50'

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | APPROVED

PROJECT NO 83-D-146

DRAWING NUMBER 168-1020-G-00296

REV NO 2

GENERAL NOTES

1. SEE DWG. NO. S-00694 FOR COVER SHEET AND LOCATION PLAN.
2. SEE DWG. NO. S-00695 FOR LIST OF DWGS.
3. SEE DWG. NO. S-00694 FOR HORIZONTAL & VERTICAL CONTROL.
4. SEE DWG. NO. S-00694 FOR LEGEND & ABBREVIATIONS.
5. SEE DWG. NO. S-00697 FOR TYPICAL SECTION OF LAGOON AND CROSS-SECTIONS.
6. SEE DWG. NO. S-00698 FOR DETAILS OF TYPICAL LINER ANCHORAGE AND CONNECTION, TYPICAL ROAD SECTION.
7. SEE DWG. NO. P-00699 FOR DETAILS OF OUTLET STRUCTURE AND PUMPING STATIONS.
8. SEE DWG. NO. P-00680 FOR METHANOL TANK STORAGE AREA.
9. SHALL SHALL BE UNDERCUT TO DEPTH DETERMINED BY SOILS CONSULTANT DURING EXAMINATION. APPROXIMATE LIMITS ARE 1 FOOT AT 972 CONTOUR TO 4 FOOT UNDERCUT AT 970 CONTOUR. ENTIRE AREA INSIDE 970 CONTOUR SHALL BE UNDER 4 FEET.
10. PROVIDE 1/2" TAP IN CB-6/7-14 AND CONNECT FRAM-1/2"-A USING CORPORATION STOP (MUELLER H-10048 OR APPROVED EQUAL.)
11. SEE DWG. NOS. E-00695, E-00696, & E-00698 FOR ELECTRICAL.
12. SEE DWG. NO. C-2 FOR GENERAL DETAILS, FRAME BUOY STATION DETAILS, RING DESIGNATION TABLE AND MOUNTING DETAIL.
13. SEE DWG. 180-RED-E-00699, SD-1 FOR LIGHT POLE DETAIL.
14. LIFESAVING BUOY LOCATED ON PLAN TO BE A FULL 30" X 18" LONG FIBERGLASS BOAT (SEARS GAMEFINDER-16 OR APPROVED EQUAL. BUOY TO EQUIPPED WITH APPROPRIATE GAROLOC'S AND LOOP CAPS.

LEGEND

NEW CONTOUR
NEW RING MOUNTED ON STL POSTS
NEW LIGHT POLE
RING BUOY STATION MOUNTED ON NEW LIGHT POLE

SIGN KEY

LIMITS OF FILL
TOP OF DIKE
BOTTOM OF LAGOON
UNDERDRAINS
MAKON AREA
LAGOON OUTLET STRUCTURE
LAGOON PUMPING STATION
METHANOL TANK
CONCRETE RETAINING WALLS
OVERHEAD POWER & TELE TO BE RELOCATED
MATCH LINE DWG. NO. S-00695

PLAN
SCALE: 1"=60'

DETAIL OF SEEPAGE COLLAR
NOT TO SCALE

(THICK FRP SEEPAGE COLLAR (SOLVENT WELD TO FRP PIPE)
10" FRP PIPE

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

2	REVISED RING BUOY LEGEND	
1	HEALTH & SAFETY REQUIREMENT MODIFICATIONS	
0	CERTIFIED FOR CONSTRUCTION	

UNITED STATES
DEPARTMENT OF ENERGY

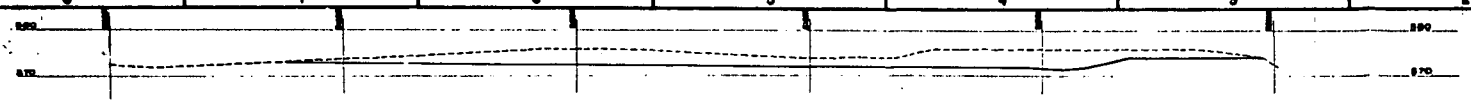
THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

WATER POLLUTION CONTROL

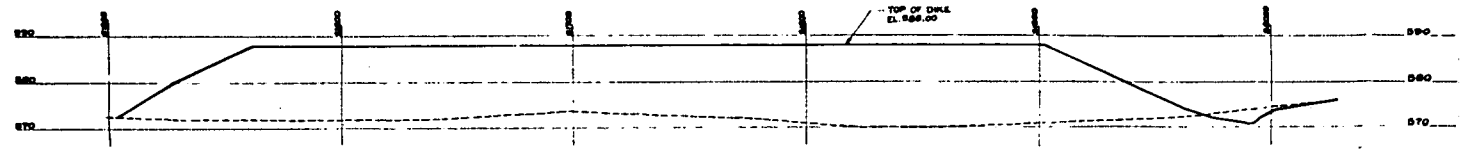
BIODENITRIFICATION SYSTEM
SURGE LAGOON PLAN

63-D-146

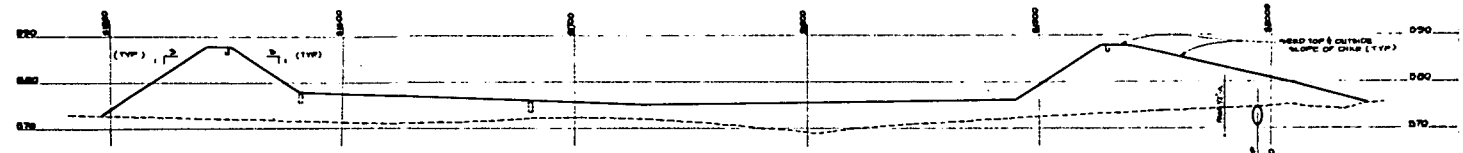
180-1020-G-00700 2



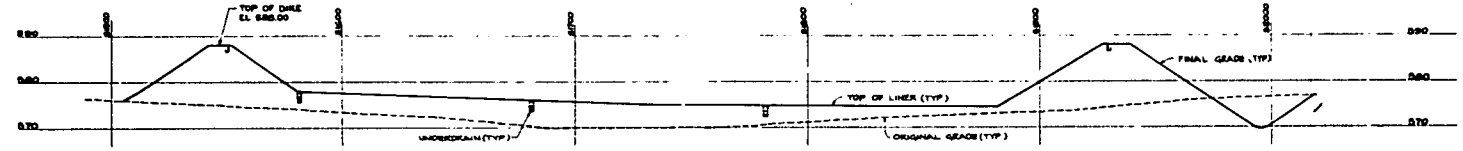
E 2716 GRID LINE



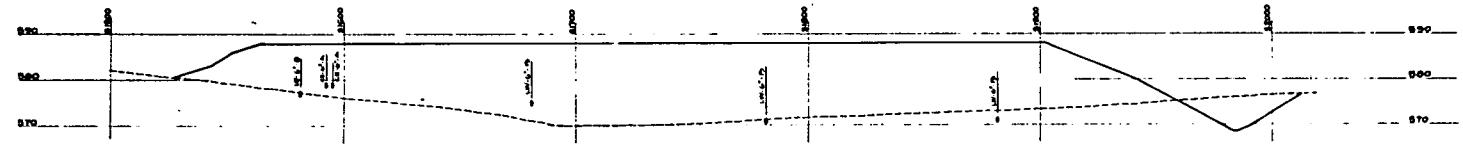
E 2664 GRID LINE



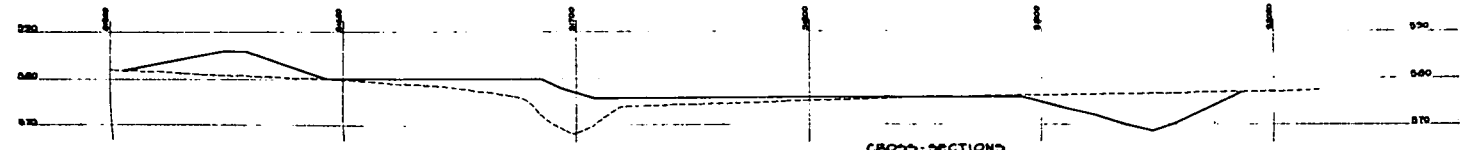
E 2622 GRID LINE



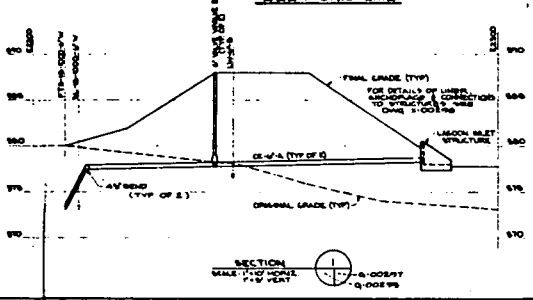
E 2300 GRID LINE



E 2255 GRID LINE

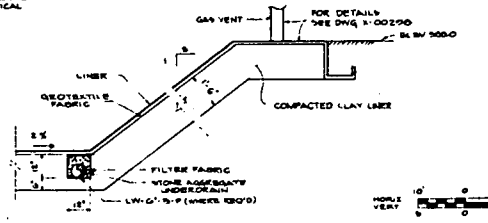


E 2217 GRID LINE



SECTION
SCALE: 1"=10' HORIZ
1"=5' VERT

CROSS-SECTIONS
SCALE: 1"=20' HORIZONTAL
1"=10' VERTICAL



TYPICAL SECTION
NOT TO SCALE

GENERAL NOTES

1. SEE DWG NO X-00324 FOR SOIL MAST RELATION PLAN.
2. SEE DWG NO X-00263 FOR LIST OF DWGS.
3. SEE DWG NO X-00264 FOR HORIZONTAL & VERTICAL DATUM CONTROL.
4. SEE DWG NO X-00204 FOR LEGEND & ABBREVIATIONS.
5. SEE DWG. NOS Q-00290 & Q-00296 FOR PLAN OF LAGOON

RESIDUAL CUT MATERIAL	= 4,692 C.Y.
UNDERCUT MATERIAL	= 11,087 C.Y.
TOTAL CUT	= 15,779 C.Y.
FILL MATERIAL	= 7,967 C.Y.
CLAY LINER MATERIAL	= 8,690 C.Y.

NOTE: THE BENTONITE MIXTURE FOR CLAY LINER IS 6 PERCENT OF THE MIX'S DRY WEIGHT. THE MINIMUM APPLICATION RATE OF BENTONITE TO MORA TYPES FROM WORK AREA ARE AS FOLLOWS:
1) MOTTLED BROWN SILTY CLAY WITH TRACE SAND = 10 LB/SF
2) BROWN CLAYEY SILT = 11 LB/SF
3) GRAY SANDY SILTY CLAY = 6 LB/SF

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	DRAWN	CHECKED
0	CERTIFIED FOR CONSTRUCTION			

UNITED STATES DEPARTMENT OF ENERGY

3001

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
ANNANDALE, VIRGINIA

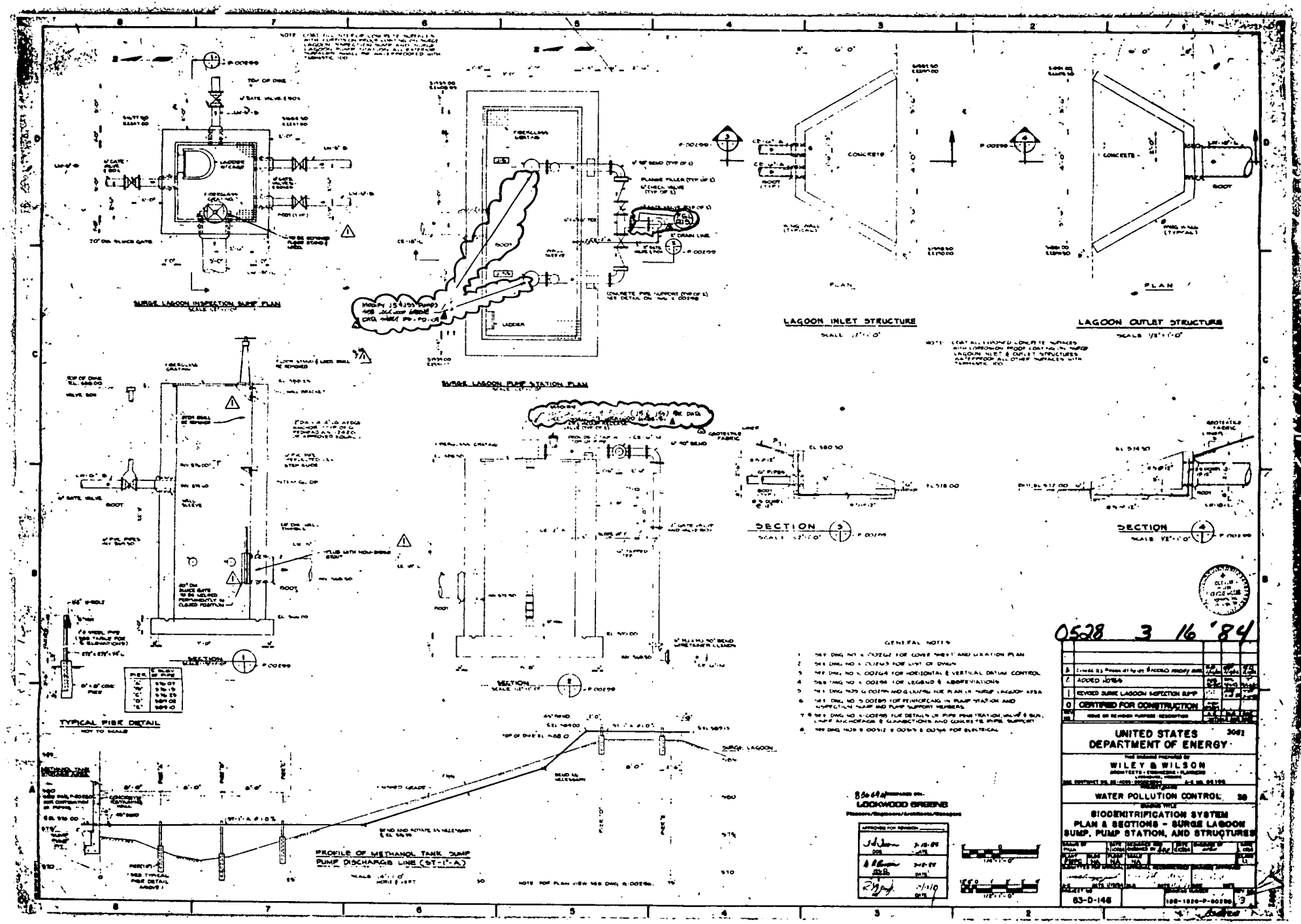
WATER POLLUTION CONTROL

BIODENITRIFICATION SYSTEM
LAGOON CROSS-SECTIONS

58

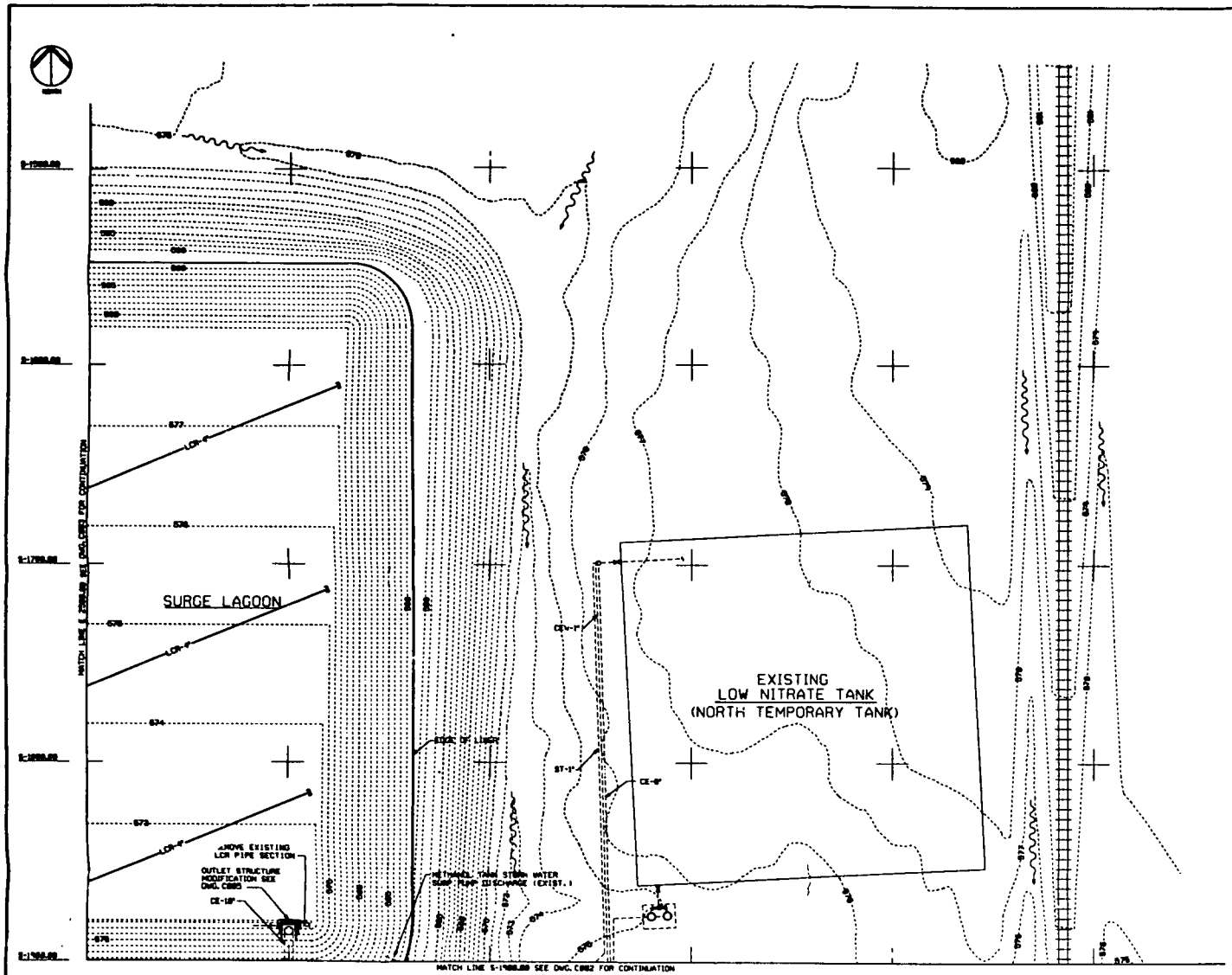
DRAWN BY: PAJA | DATE: 11/29/83 | DESIGNED AND ENGINEERED BY: PAJ | DATE: 11/29/83 | DRAWN BY: | DATE | CHECKED BY: | DATE | SCALE: 1"=10'

PROJ. NO. 83-0-146 | SUBMITTED FOR APPROVAL: | DATE | APPROVED: | DATE | ACCEPTED FOR CONSTRUCTION: | DATE | DRAWING NUMBER: 100-1020-0-00297 | REV. NO. 0


SURGE LAGOON INSPECTION SUMP PLAN
SURGE LAGOON PUMP STATION PLAN
LAGOON INLET STRUCTURE
LAGOON OUTLET STRUCTURE
PLAN
SECTION
TYPICAL PIPE DETAIL
PROFILE OF METHANOL TANK SUMP PUMP DISCHARGE LINE (ST-1-A)
GENERAL NOTES
LOOKWOOD GREENE
0528 3 16 '84
UNITED STATES DEPARTMENT OF ENERGY
WILEY & WILSON
WATER POLLUTION CONTROL
BIODENITRIFICATION SYSTEM
PLAN & SECTIONS - SURGE LAGOON SUMP, PUMP STATION, AND STRUCTURES
ADDED NOTES
REVISED SURGE LAGOON INSPECTION SUMP
CERTIFIED FOR CONSTRUCTION
83-D-146

APPENDIX H

DRAWINGS FOR THE PROPOSED MODIFICATIONS TO THE BIODENITRIFICATION SURGE LAGOON

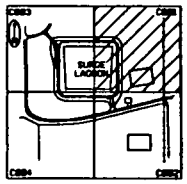


SITE PLAN
SCALE: 1"=20'

LEGEND

EXISTING		NEW
575	CONTOURS	575
575.24	SPOT ELEVATION	575.24
	STRUCTURES	
S 1734.95 E 2765.82	COORDINATES	S 1734.95 E 2765.82
NA	PUMP	
LCR	LEACHATE COLLECTION REMOVAL PIPING	LCR
	PIPING	
	RAILROAD	NA
	ROADWAY	NA
	BENCH MARK	NA
	FENCE	NA
	POWER POLE	NA
	VALVE	
MAH	METHANOL	MAH
SD	STORM DRAIN	SD
ST	STORM SEWER	ST
CE	CONTAMINATED SEWER	CE
	CHECK VALVE	NA
FT	FILTRATE EFFLUENT	FT
SL	SUMP LINE	SL
NA	ELECTRICAL	E
NA	SURFACE RUNOFF FLOW	
NA	BENTONITE	

NOTE:
FOR GENERAL NOTES SEE DWG.C002



KEY PLAN

C	ISSUED FOR PTI	
B	ISSUED FOR 100% REVIEW	
A	ISSUED FOR 90% REVIEW	

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE

SURGE LAGOON LINER REPLACEMENT

SITE PLAN
1 OF 4

SURGE LAGOON LINER REP. SITE PLAN

J. WATERS

NA

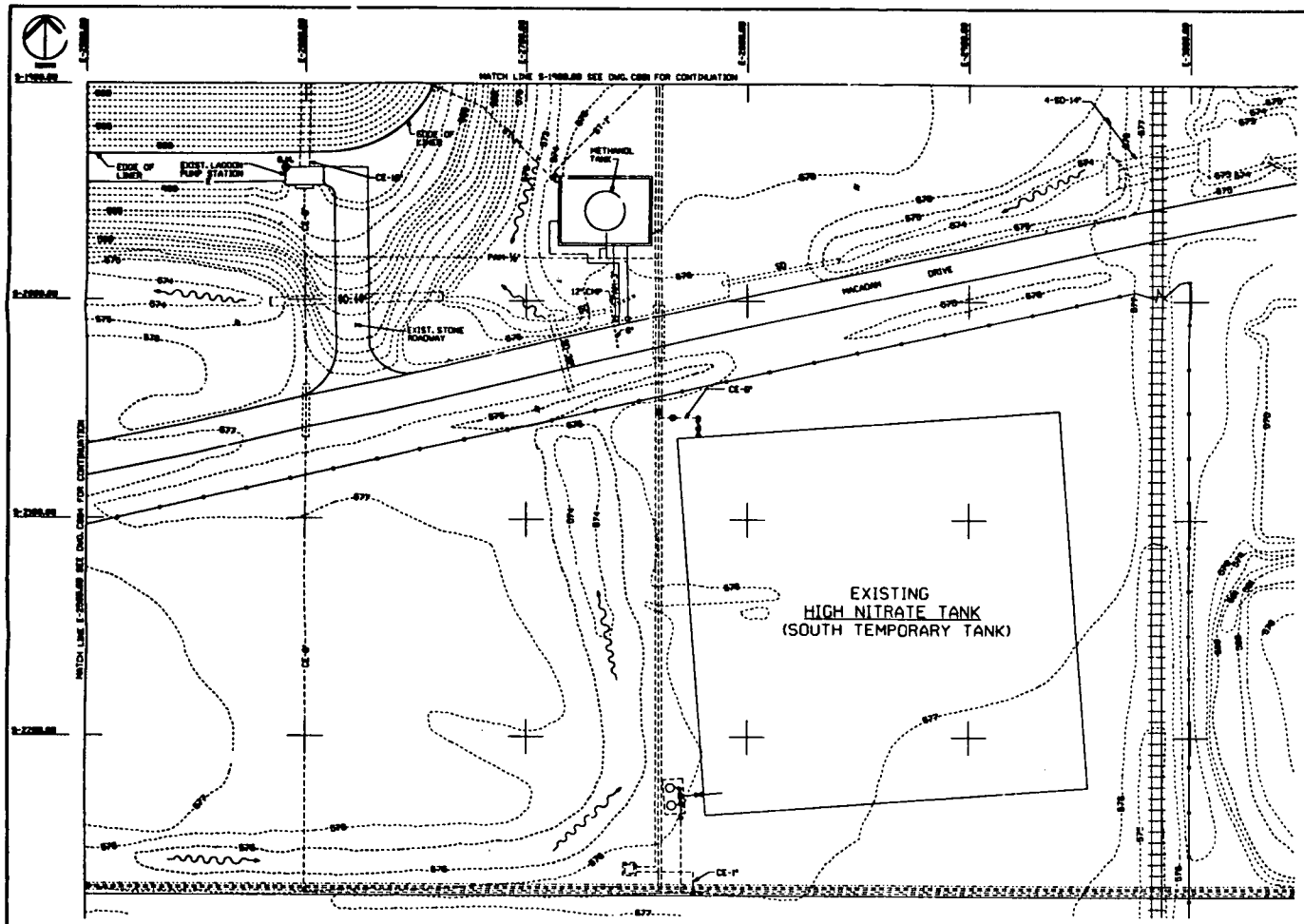
C001 C

SECTION & DETAIL KEY

TYPICAL PIPELINE DESIGNATION

FILE NAME: 17655C ROBIN TAYLOR 17:41:48 27-OCT-87

FILE NAME: 05-41188.1538/970BRC.001

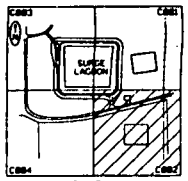


SITE PLAN
SCALE: 1"=20'

NOTE:
1. FOR LEGEND SEE DWG. C881.

GENERAL NOTES

1. ALL VERTICAL DATUM BASED ON THE ELEVATION OF THE EXISTING PUMP STRUCTURE FLOOR AS BEING ELEVATION 880.25 FT. SEE DRAWING C882 FOR BENCH MARK LOCATION.
2. DISPOSAL OF DEBRIS TO BE AS DIRECTED BY THE OPERATING CONTRACTOR.
3. ALL CONCRETE UNLESS NOTED OTHERWISE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS AND CONTAIN AIR ENTRAINMENT OF 6%.
4. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4" (EXCEPT IN CONCRETE PLACED BE-SIDE FALSE WORK).
5. COAT INTERIOR OF SUMP WITH PLASTAR. COAT SHALL BE A MINIMUM OF 16 MIL DRY FILM THICKNESS AFTER A TWO-COAT APPLICATION.
6. THE UNDERDRAIN COLLECTION PIPING SHALL BE 4" SCHEDULE 40 PVC. DRILL 1/4" HOLES 45 DEGREES BELOW CENTERLINE ON BOTH SIDES OF PIPE. HOLES SHALL BE SPACED 4" ALONG LENGTH OF PIPE. PIPE SHALL NOT BE ATTACHED TO EXISTING LINER. ROCK TO BE INSTALLED ON LATERALS AS SHOWN ON DETAIL 4, DRAWING C887.
7. APPROXIMATELY 198 HOLES SMALLER THAN 1" HAVE BEEN LOCATED. ALL TEMPORARY PATCHES (OVER SOME OF THE 198 HOLES) SHALL BE REMOVED. THE LINER SURFACE CLEANED, AND PATCHES OF THE SAME MATERIAL (40 MIL EPDM) WELDED OVER THE HOLES. APPROXIMATELY 58 FT OF EXISTING LINER SEAMS MAY NEED TO BE WELDED.
8. THE EXISTING INLET AND OUTLET STRUCTURES SHALL BE MODIFIED AS DETAILED ON DRAWING C887. THE PATCHES REQUIRED ON THE EXISTING LINER AT THESE LOCATIONS, AND AT THE NEW UNDERDRAIN PENETRATION LOCATION, SHALL BE MADE WITH THE SAME MATERIAL AS THE EXISTING LINER.
9. THE NEW LINER SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND DRAWINGS. EXTREME CARE SHALL BE TAKEN TO PREVENT PUNCTURING THE EXISTING LINER DURING PLACEMENT OF THE SAND FOR THE UNDERDRAIN COLLECTION SYSTEM. PLACEMENT OF THE WASHED SAND LAYER SHALL BE ACCOMPLISHED WITHOUT THE USE OF WHEELED OR TRACKED VEHICLES IN THE LAGOON. SPREADING THE SAND SHALL BE ACCOMPLISHED USING WOODEN TROWELS, ETC. METAL BOOTS OR SHARP-EDGED TOOLS WILL NOT BE ALLOWED. THE CONTRACTOR MAY PROPOSE ALTERNATE METHODS FOR THE ENGINEERS APPROVAL.
10. TEMPORARY ANCHORS SHALL BE USED DURING REPAIRS OF THE EXISTING LINER AND PLACEMENT OF THE NEW LINER. THE ANCHORS SHALL BE USED TO PREVENT DAMAGE TO THE LINERS DUE TO WIND OR OTHER FORCES.
11. THE PLANAR FLUID FLOW MAT SHALL BE EXTRUDED DIAMOND-SHAPED POLYETHYLENE NET. (5.2 IN.) MADE WITH A NON-WOVEN POLY-PROPYLENE FABRIC BONDED ON EACH SIDE. THE MAT SHALL HAVE A HYDRAULIC TRANSMISSIVITY OF 0.60 SQ. METERS PER SECOND AT A PRESSURE OF 1000 PSF. MAT MATERIAL SHALL BE PLACED UNDER ALL LINER MATERIAL ON SIDE SLOPES.
12. THE CONTRACTOR SHALL INSTALL THE NEW LINER IN LARGE FACTORY-WELDED SECTIONS, ACCORDING TO THE SPECIFICATIONS, TO LIMIT THE NUMBER OF FIELD SEAMS REQUIRED.



KEY PLAN

FLOWING MEDIUM ABBREVIATION — SPECIFICATION SUBSECTION OF SECTION 15
PO-R-001
PIPE SIZE

TYPICAL PIPELINE DESIGNATION

D	REVISED GENERAL NOTES
C	ISSUED FOR PTI
B	ISSUED FOR 100% REVIEW
A	ISSUED FOR 90% REVIEW

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE

SURGE LAGOON LINER REPLACEMENT

SITE PLAN
2 OF 4

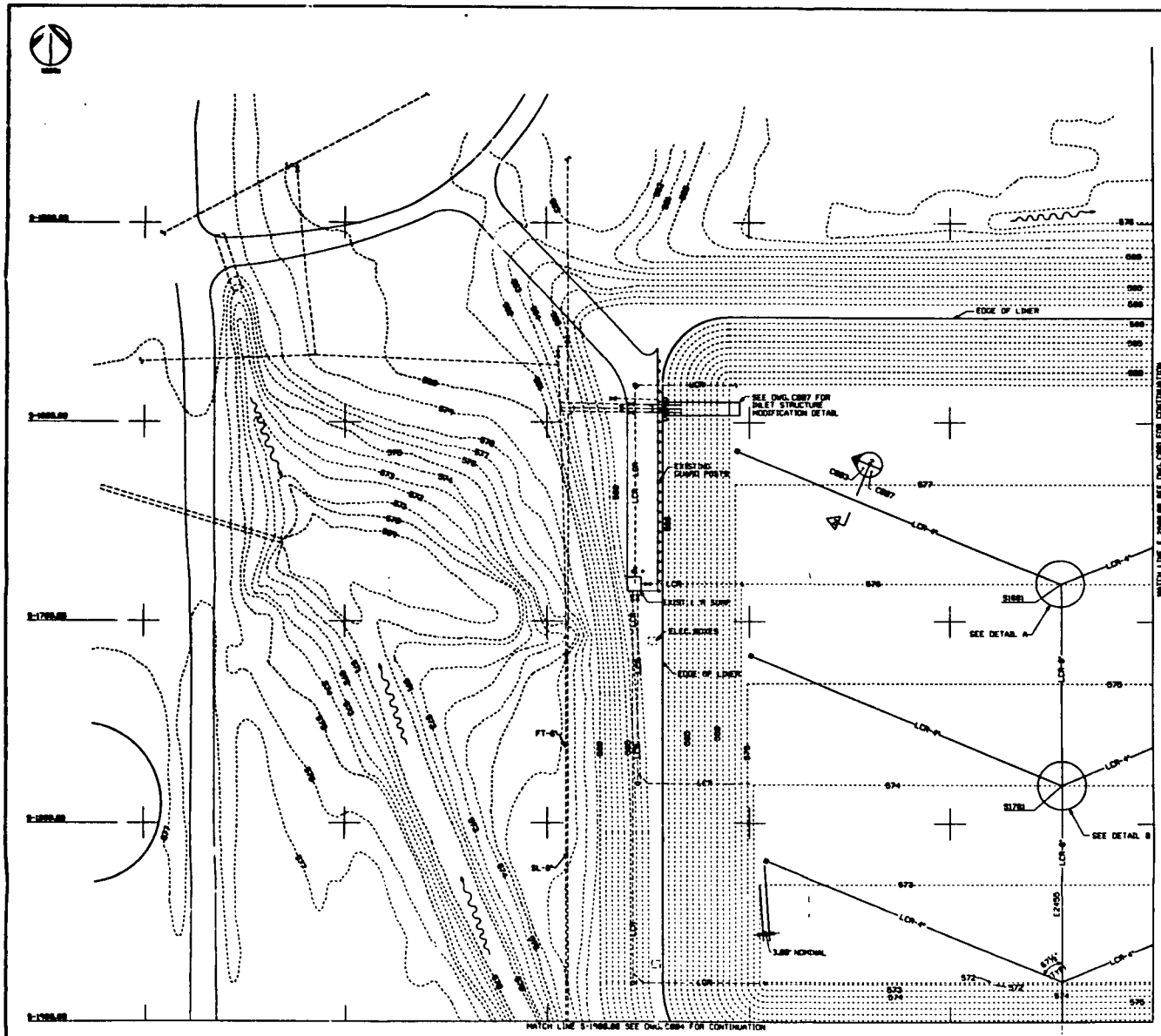
SURGE LAGOON LINER REP. SITE PLAN

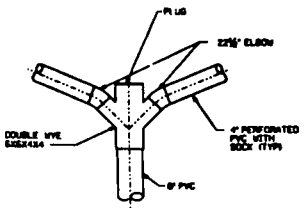
JEFF WATERS

C882 D

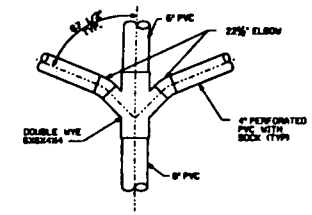
PRF NAME: 17B050C ROBIN TAYLOR 19880813 27-OCT-87

NOTES:
FOR LEGEND SEE DWG. C004.
FOR GENERAL NOTES SEE DWG. C002.

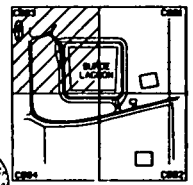




DETAIL A
NOT TO SCALE



DETAIL B
NOT TO SCALE



KEY PLAN

C	ISSUED FOR PII	
B	ISSUED FOR 100% REVIEW	
A	ISSUED FOR 90% REVIEW	

UNITED STATES DEPARTMENT OF ENERGY

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Las Vegas, Nevada

SURGE LAGOON LINER REPLACEMENT

SITE PLAN
3 OF 4

SURGE LAGOON REP. SITE PLAN

JEFF WATERS

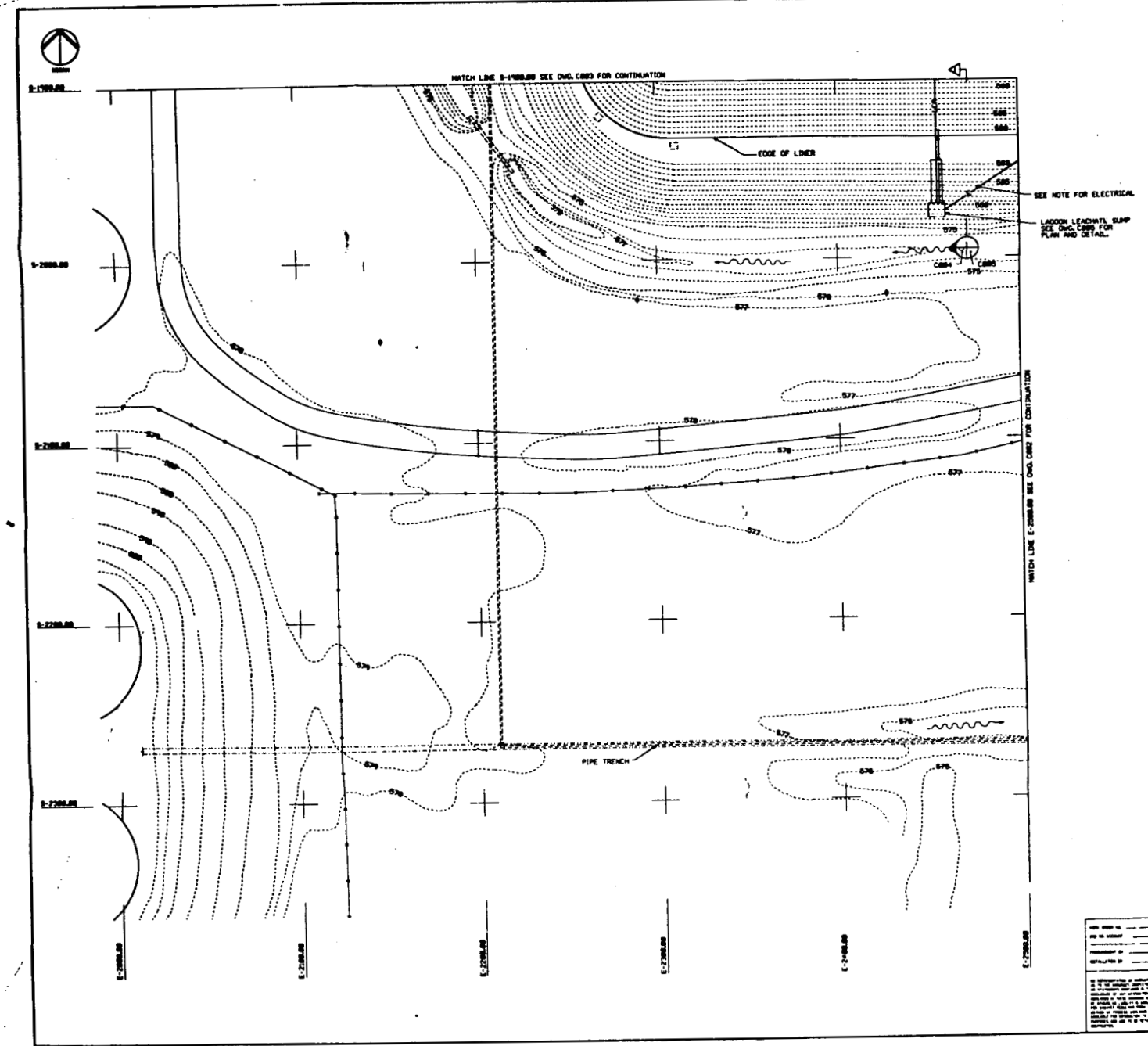
PWC | NO | 3 | C | P | T | P | U

NA

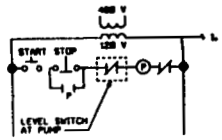
C003 | C

FILE NAME: 0341U8L1T3B7B0B0C.003

NAME: 078503C ROBIN TAYLOR 1%14/09 27-OCT-87



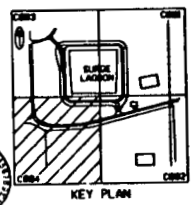
NOTES:
1. FOR LEGEND SEE DWG. C[illegible].
2. FOR GENERAL NOTES SEE DWG. C002.



LEACHATE PUMP DIAGRAM

NOTES:

1. 3/C #12, #120 POWER AND 2/C #12 CONTROL TO MOTOR STARTER MOUNTED AT LAGOON PUMPING STATION. COMBINATION MOTOR STARTER TO BE NEMA 3R, SIZE 1 WITH CPT, O.L. & 20A, CIRCUIT BREAKER, AND START STOP P.B.S. MOUNT STARTER OR TEMPORARY POWER MOTOR STARTER. RACK CONTROL TO BE PER LEACHATE PUMP DIAGRAM, THIS DWG.
2. PUMP TO BE SUPPLIED WITH CONTROL PANEL AND LEVEL SWITCHES WHICH WILL PERFORM THE FOLLOWING:
   1. PROVIDE RUN TIME OF PUMP OPERATION.
   2. PROVIDE HAND/OFF/AUTOMATIC PUMP CONTROL.
   3. PROVIDE LOW LIQUID LEVEL PUMP CUT-OFF.



KEY PLAN

C	ISSUED FOR PTI
B	ISSUED FOR 100% REVIEW
A	ISSUED FOR 90% REVIEW

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Co. Rep. Tennessee

SURGE LAGOON LINER REPLACEMENT

SITE PLAN
4 - 4

SURGE LAGOON LINER SITE PLAN

J. WATERS

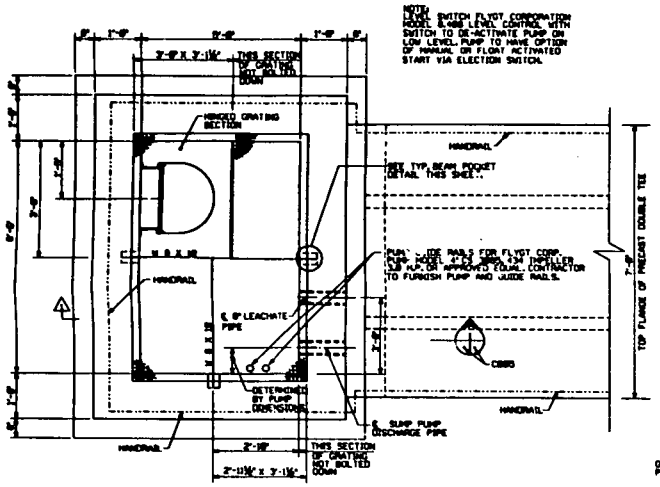
FMPC

NA

C004 C

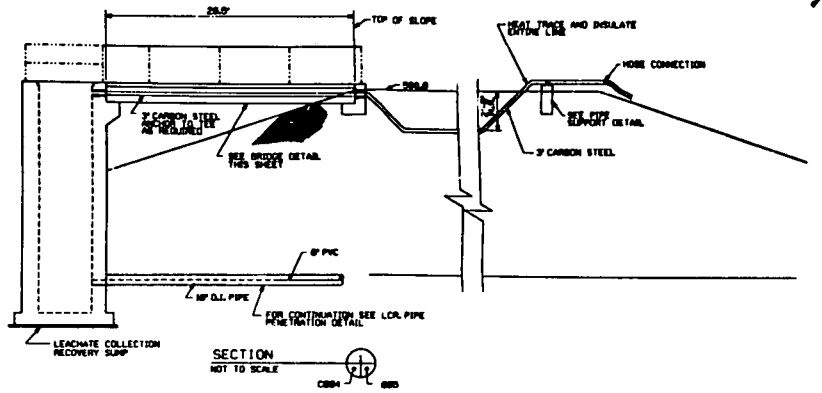
FILE NAME 054\CIRL\3\87900\C.004

27-OCT-87

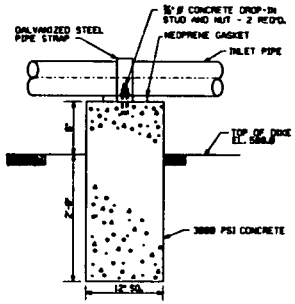


PLAN-SURGE LAGOON LEACHATE SUMP
NOT TO SCALE

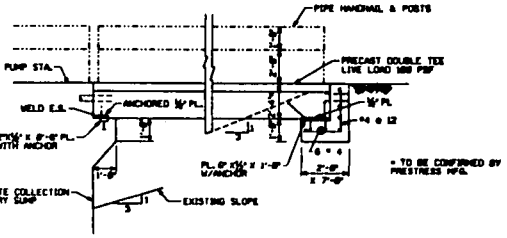
NOTE:SUPPORT TO BE 5'-0" LONG



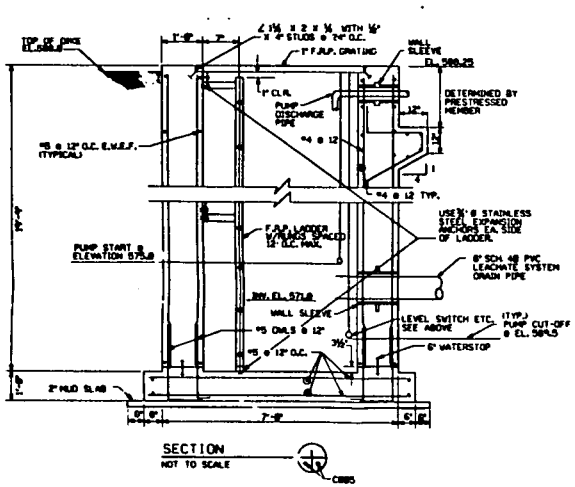
SECTION
NOT TO SCALE



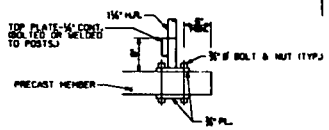
PIPE SUPPORT DETAIL
NOT TO SCALE



BRIDGE DETAIL
NOT TO SCALE

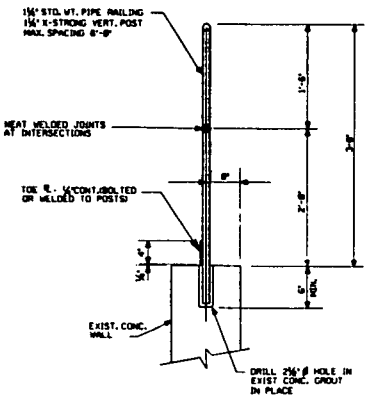


SECTION
NOT TO SCALE
C005

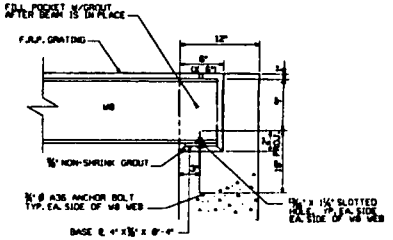


BRIDGE HANDRAIL CONNECTION

NOTE:
PRECAST CONCRETE DOUBLE TEE TO HAVE:
A. 2" THICK FLANGE
B. STEMS TO BE 4'-0" O.C.
C. CONCRETE TO BE 5,000 PSI @ 28 DAY
D. WALKING SURFACE TO HAVE BROOM FINISH
E. ½" PLATES TO BE CAST IN EACH END OF EACH STEM.
F. FLANGE TO BE 7'-0" WIDE.



HANDRAIL DETAIL
NOT TO SCALE



TYPICAL BEAM POCKET DETAIL
NOT TO SCALE

SECTION & DETAIL KEY

C	ISSUED FOR PTI
B	ISSUED FOR IBRX REVIEW
A	ISSUED FOR SRX REVIEW

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

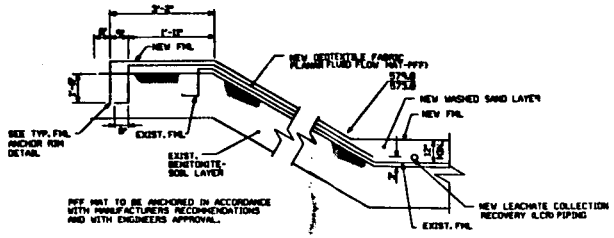
SURGE LAGOON LINER REPLACEMENT

DETAILS 63

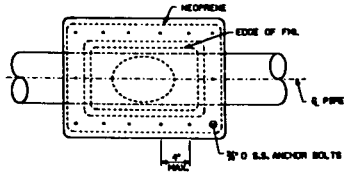
SUR. LAG. LIN. REP. DETAILS

B. TAYLOR
FMPC
NA
C005 C

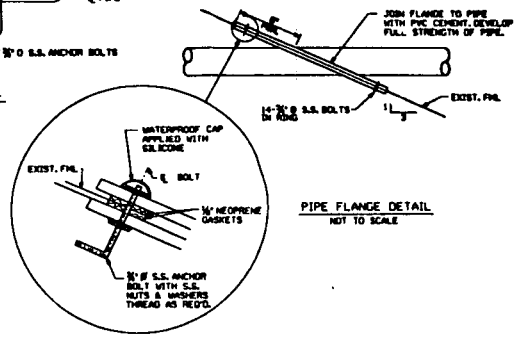
PRF NAME: 1785505C ROBIN TAYLOR 26117-06 27-OCT-87



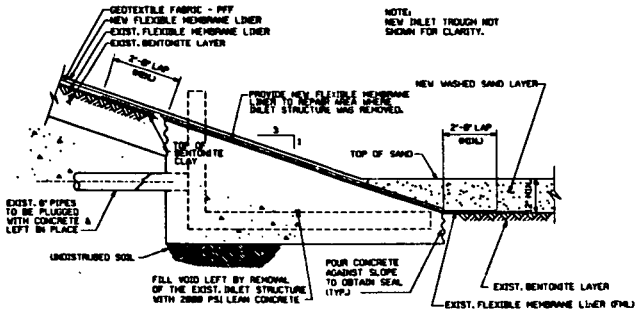
TYPICAL FLEXIBLE MEMBRANE LINER SLOPE DETAIL
NOT TO SCALE



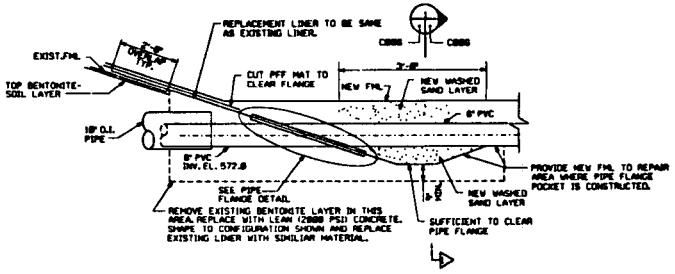
PIPE FLANGE DETAIL
NOT TO SCALE



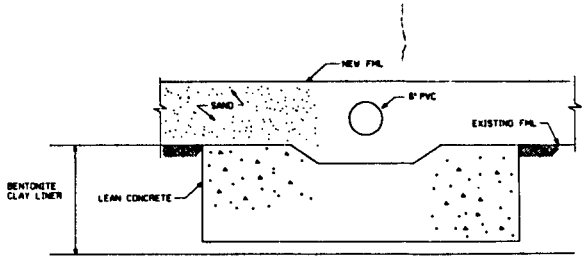
PIPE FLANGE DETAIL
NOT TO SCALE



INLET STRUCTURE MODIFICATION
NOT TO SCALE



LCR PIPE PENETRATION DETAIL
NOT TO SCALE



SECTION

C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE

SURGE LAGOON LINER REPLACEMENT

FLEXIBLE MEMBRANE LINER DETAILS

SUR. LAG. LINER REP. DETAILS

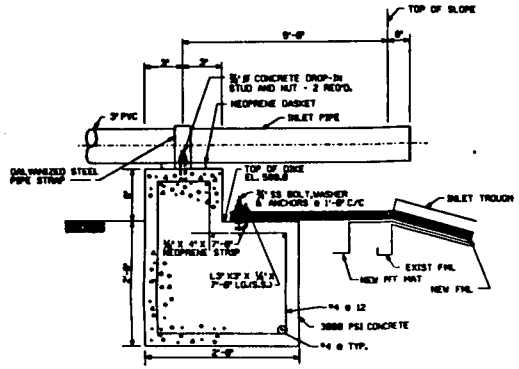
R. TAYLOR

NA

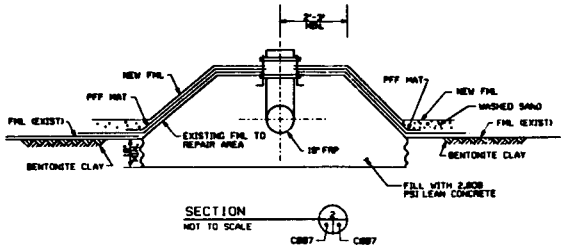
C006 C

FILE NAME: 0341GRP13518780006C.007

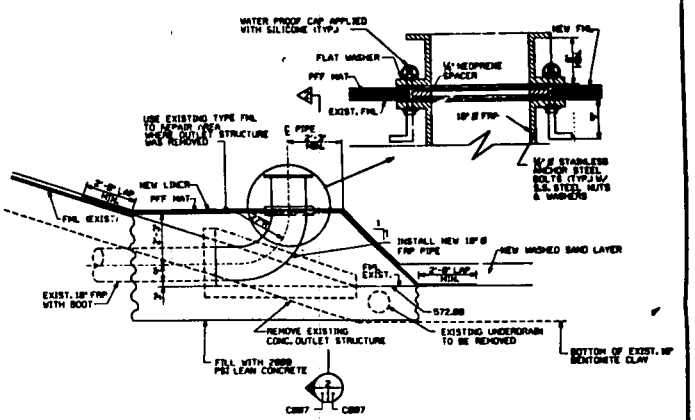
NAME: 17855070 ROBIN TAYLOR 21:29:19 27-OCT-87



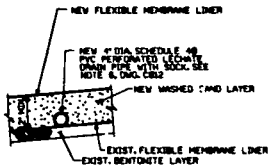
INLET PIPE SUPPORT DETAIL
NOT TO SCALE
C087



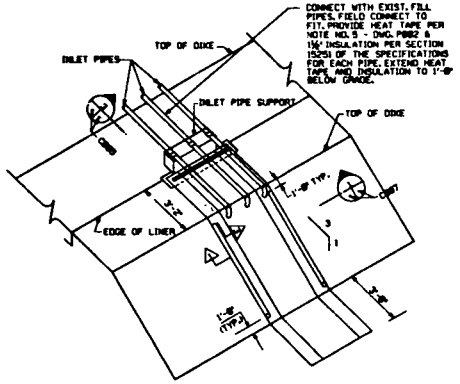
SECTION
NOT TO SCALE
C087 C087



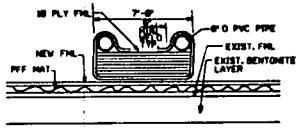
OUTLET STRUCTURE MODIFICATION
NOT TO SCALE
C087 C087



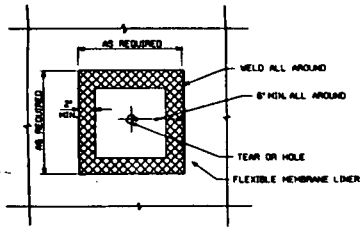
SECTION
NOT TO SCALE
C083 C087



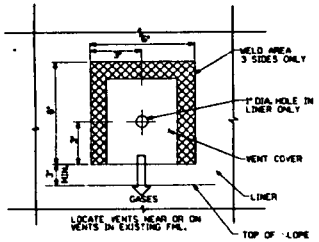
TYPICAL INLET TROUGH
NOT TO SCALE



SECTION
NOT TO SCALE
C087



TYPICAL FLEXIBLE MEMBRANE LINER REPAIR DETAIL
NOT TO SCALE



TYPICAL GAS VENT DETAIL
NOT TO SCALE

SECTION & DETAIL KEY

C	ISSUED FOR PFI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

UNITED STATES
DEPARTMENT OF ENERGY

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

SURGE LAGOON LINER REPLACEMENT

DETAILS

SUR. LAG. LIN. REP. DETAILS

R. TAYLOR

F.WPC

NA

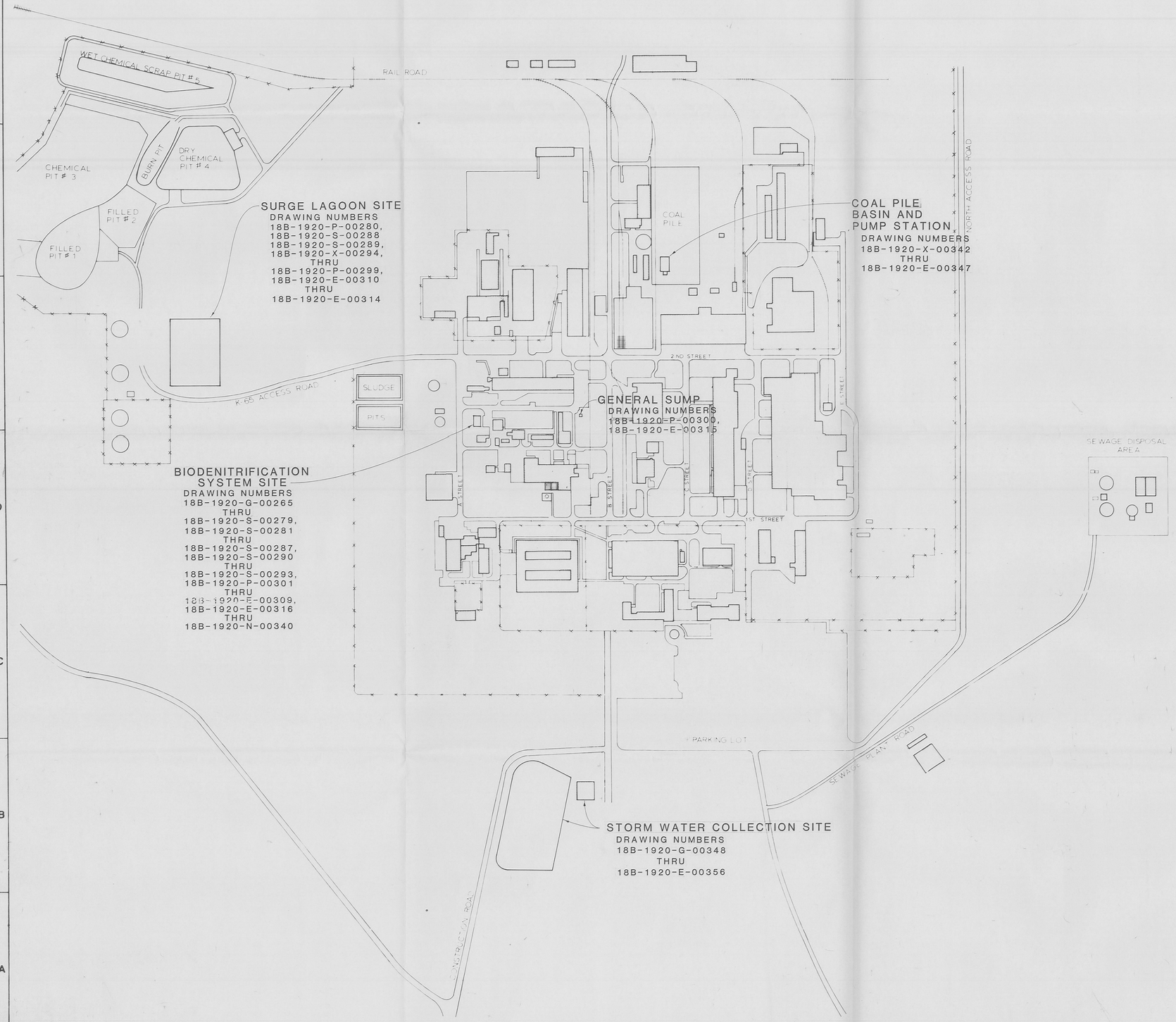
C087 C

FILE NAME

22x34 27-OCT-87

UNITED STATES DEPARTMENT OF ENERGY

WATER POLLUTION CONTROL - FMPC



GENERAL NOTES

1. SEE DWG. NO. X-00263 FOR LIST OF DWGS.

REV NO	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	NLO	DOE
0	CERTIFIED FOR CONSTRUCTION	WDK 1/13/84	CWO 2/23/84	RWR 2/23/84

INITIALS AND DATE

3001

UNITED STATES DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC05-830R20994 A-E NO. 83100, 83101, 83102

PROJECT NAME
WATER POLLUTION CONTROL

DRAWING TITLE
BIODENITRIFICATION SYSTEM
COAL PILE RUNOFF
STORM WATER COLLECTION
COVER SHEET

54

DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
PHJR	1/10/84	WDK	1/10/84	WDK	1/10/84

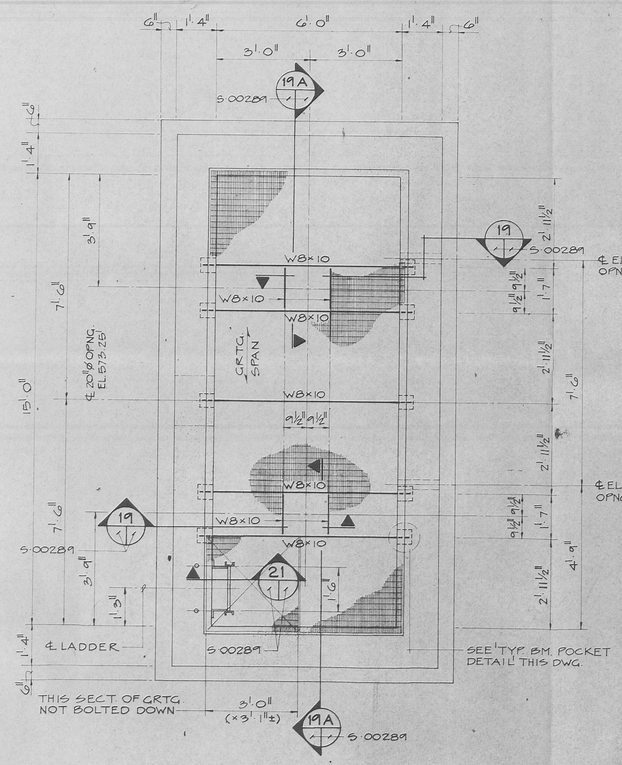
PLANT	BLDG	FLOOR	SCALE	CLASS
FMPC	NA	NA	NA	U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
W. K. Kingsford	C. W. Ostendorf	R. W. Rucker
A-E DATE 1/13/84	NLO DATE 2/13/84	DOE DATE 2/23/84

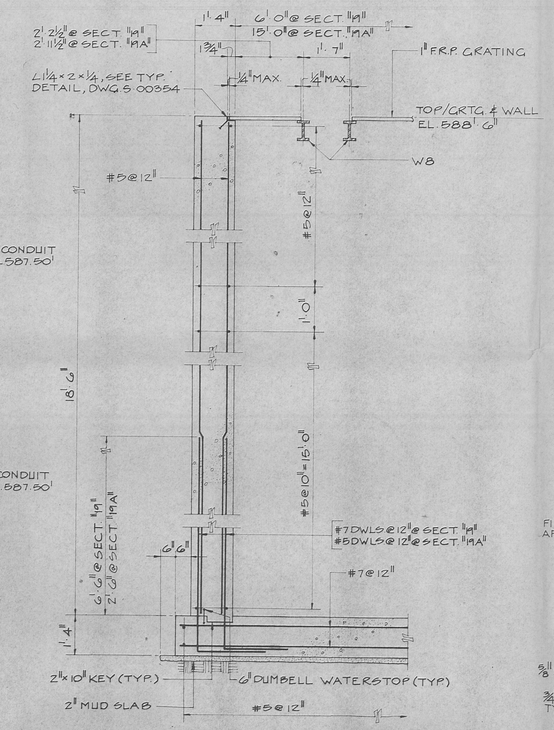
PROJECT NO	DRAWING NUMBER	REV NO
83-D-146	18B-1920-X-00262	0

NOV 1987 PRINTED LOCKHEED ENGINEERS Engineers, Inc. Oak Ridge, TN

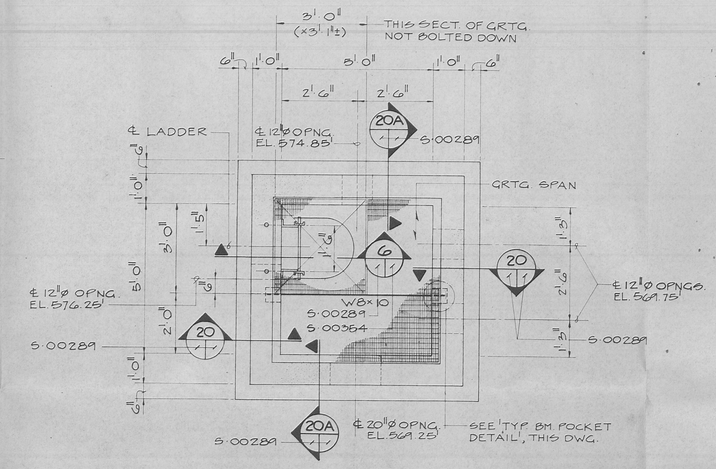
3001



PLAN • SURGE LAGOON PUMP STATION
SCALE: 1/2" = 1'-0"



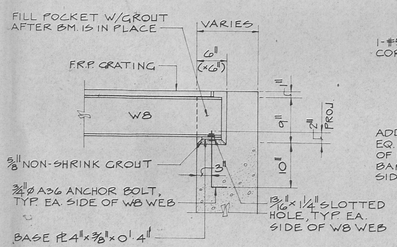
SECTION
SCALE: 1/2" = 1'-0"
SHOWN 19 / 1 — SIMILAR 19A / 1
S-00289 — S-00289



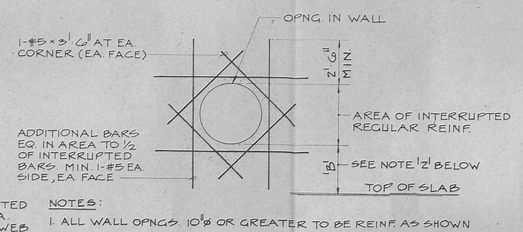
PLAN • SURGE LAGOON INSPECTION SUMP
SCALE: 1/2" = 1'-0"

NOTES:

1. SEE DWG. No. X-00262 FOR COVER SHEET & LOCATION PLAN.
2. SEE DWG. No. X-00263 FOR LIST OF DWGS.
3. SEE DWG. No. S-00287 FOR STRUCTURAL GENERAL NOTES.
4. SEE DWG. No. G-00295 & G-00296 FOR LOCATION OF STRUCTURES.
5. SEE DWG. No. S-00354 FOR TYPICAL CURB ANGLE DETAIL.
6. SEE DWG. No. E-00312 FOR ELECTRICAL CONDUIT OPENINGS.
7. COAT ALL STEEL AND INTERIOR CONCRETE SURFACES OF SURGE LAGOON INSPECTION SUMP AND SURGE LAGOON PUMP STATION WITH CORROSION PROOF COATING (SPEC. SECTION 09812) IN LIEU OF FINISH SYSTEMS SPECIFIED IN SPEC. SECTION 09900.
8. SEE DWG. No. P-00299 FOR LAGOON INLET AND OUTLET STRUCTURE REINF.
9. SEE DWG. No. X-00298 FOR PIPE SLEEVE DETAILS.

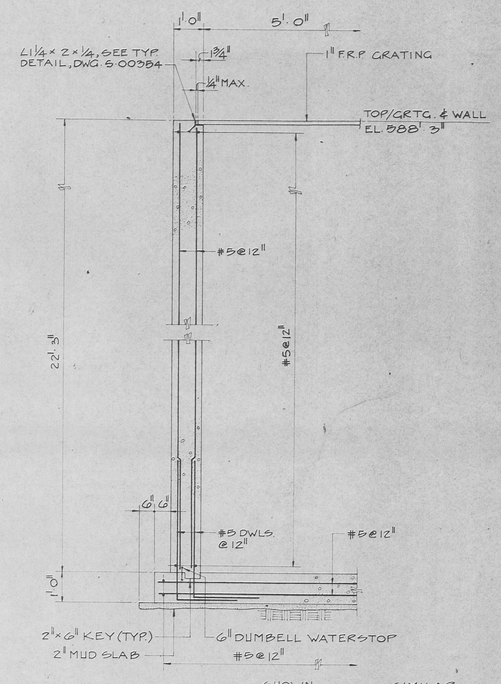


TYP. BEAM POCKET DETAIL
SCALE: 1" = 1'-0"

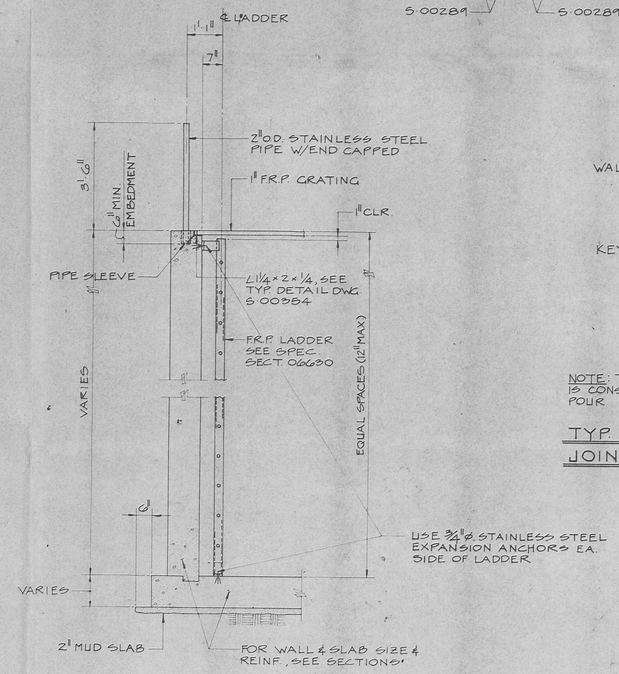


NOTES:
1. ALL WALL OPNGS. 10"ø OR GREATER TO BE REINF. AS SHOWN
2. BEND ADDITIONAL BARS INTO SLAB OR AROUND CORNER IF "B" DISTANCE IS LESS THAN 3'-0"

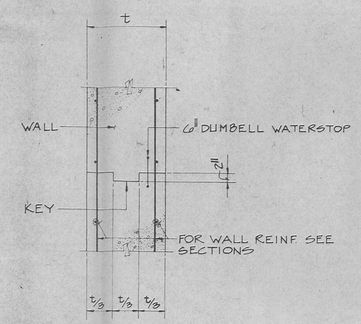
TYP. WALL OPENING DETAIL
NOT TO SCALE



SECTION
SCALE: 1/2" = 1'-0"
SHOWN 20 / 1 — SIMILAR 20A / 1
S-00289 — S-00289

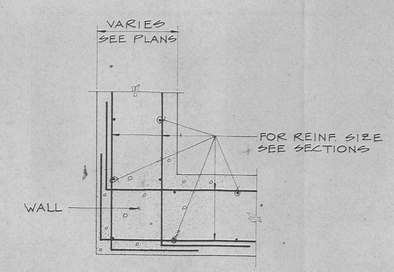


SECTION
SCALE: 1/2" = 1'-0"
21 / 1
S-00345, S-00353, S-00289 — S-00289



NOTE: THIS DETAIL TYP. WHERE A WALL IS CONSTRUCTED USING MORE THAN ONE POUR

TYP. WALL CONSTRUCTION JOINT DETAIL
SCALE: 1" = 1'-0"



PLAN

NOTE: THIS DETAIL TYP. AT ALL WALL CORNERS UNLESS NOTED OTHERWISE ON PLAN

TYP. CORNER REINF. DETAIL
NOT TO SCALE

REV NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	NLO	DOE
0	CERTIFIED FOR CONSTRUCTION	WSK 1/13/84		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY 3001

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC05-83OR20994 A-E NO. 83100

PROJECT NAME: WATER POLLUTION CONTROL

DRAWING TITLE: BIODENITRIFICATION SYSTEM SURGE LAGOON PUMP STATION AND INSPECTION SUMP – PLANS AND SECTIONS 55

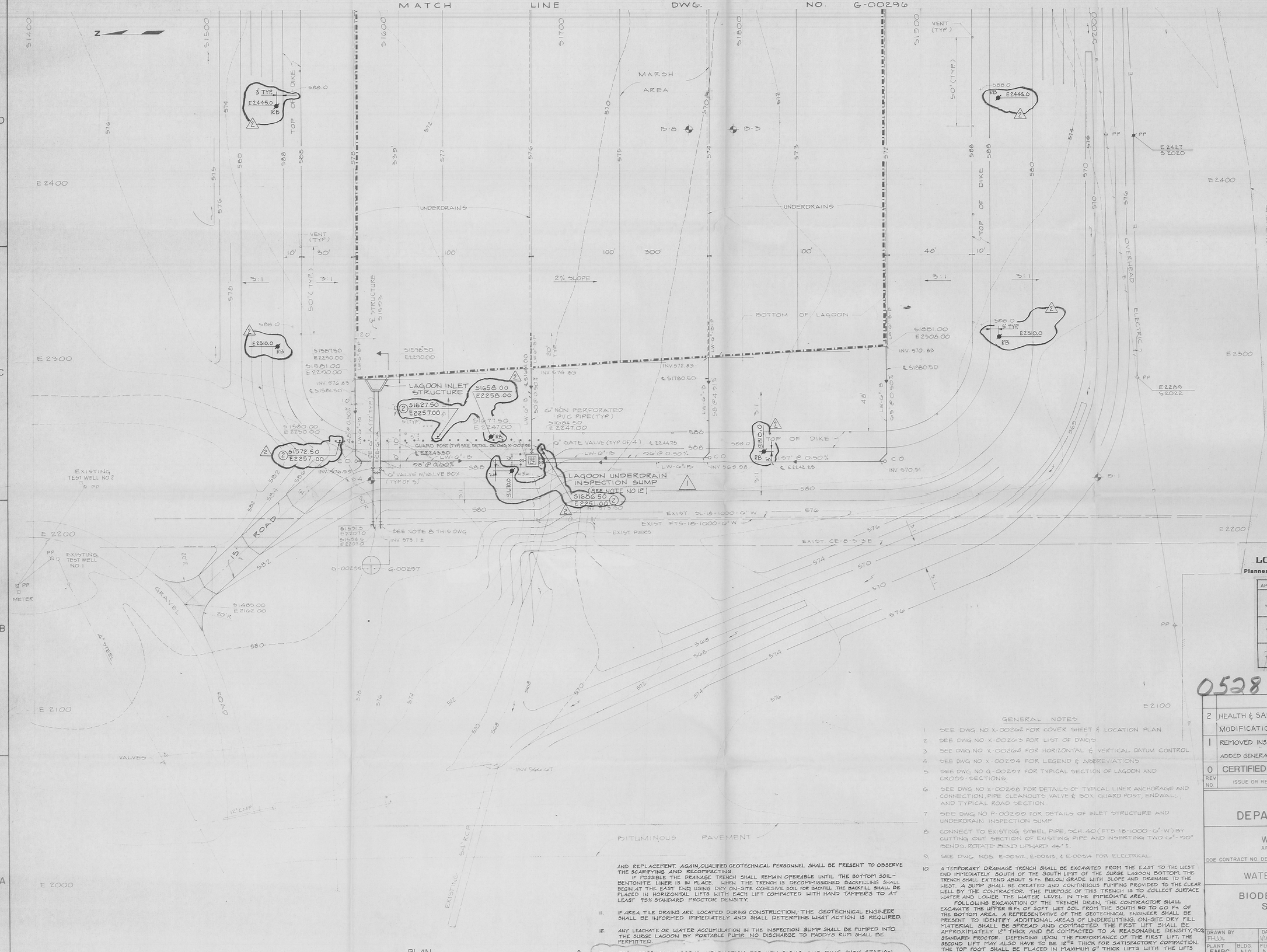
DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
JDS	1/10/84	SAC	1/10/84	C.A.G. WSK	1/10/84

PLANT	BLDG	FLOOR	SCALE	CLASS
FMPC	N/A	N/A	N/A	U

SUBMITTED FOR APPROVAL: WSK Lynchburg Plant — A-E DATE 1/13/84
APPROVAL RECOMMENDED: NLO DATE
DRAWING APPROVED: DOE DATE

PROJECT NO. 83-D-146 — DRAWING NUMBER 18B-1920-S-00289 — REV. NO. 0

3001



PLAN
SCALE: 1" = 20'

GENERAL NOTES

1. SEE DWG NO X-00262 FOR COVER SHEET & LOCATION PLAN
2. SEE DWG NO X-00263 FOR LIST OF DWGS
3. SEE DWG NO X-00264 FOR HORIZONTAL & VERTICAL DATUM CONTROL
4. SEE DWG NO X-00294 FOR LEGEND & ABBREVIATIONS
5. SEE DWG NO G-00297 FOR TYPICAL SECTION OF LAGOON AND CROSS-SECTIONS.
6. SEE DWG NO X-00298 FOR DETAILS OF TYPICAL LINER ANCHORAGE AND CONNECTION, PIPE CLEANOUTS VALVE & BOX, GUARD POST, ENDWALL, AND TYPICAL ROAD SECTION.
7. SEE DWG NO P-00299 FOR DETAILS OF INLET STRUCTURE AND UNDERDRAIN INSPECTION SUMP
8. CONNECT TO EXISTING STEEL PIPE, SCH. 40 (FTS-18-1000-6"-W) BY CUTTING OUT SECTION OF EXISTING PIPE AND INSERTING TWO 6"-90° BENDS. ROTATE BEND UPWARD 45°±.
9. SEE DWG NOS. E-00312, E-00313, & E-00314 FOR ELECTRICAL.
10. A TEMPORARY DRAINAGE TRENCH SHALL BE EXCAVATED FROM THE EAST TO THE WEST END IMMEDIATELY SOUTH OF THE SOUTH LIMIT OF THE SURGE LAGOON BOTTOM. THE TRENCH SHALL EXTEND ABOUT 5 Ft. BELOW GRADE WITH SLOPE AND DRAINAGE TO THE WEST. A SUMP SHALL BE CREATED AND CONTINUOUS PUMPING PROVIDED TO THE CLEAR WELL BY THE CONTRACTOR. THE PURPOSE OF THIS TRENCH IS TO COLLECT SURFACE WATER AND LOWER THE WATER LEVEL IN THE IMMEDIATE AREA.
    FOLLOWING EXCAVATION OF THE TRENCH DRAIN, THE CONTRACTOR SHALL EXCAVATE THE UPPER 3 Ft. OF SOFT WET SOIL FROM THE SOUTH 80 TO 60 Ft OF THE BOTTOM AREA. A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL BE PRESENT TO IDENTIFY ADDITIONAL AREAS OF UNDERCUTTING. ON-SITE DRY FILL MATERIAL SHALL BE SPREAD AND COMPACTED. THE FIRST LIFT SHALL BE APPROXIMATELY 12" THICK AND BE COMPACTED TO A REASONABLE DENSITY, 90% STANDARD PROCTOR. DEPENDING UPON THE PERFORMANCE OF THE FIRST LIFT, THE SECOND LIFT MAY ALSO HAVE TO BE 12"± THICK FOR SATISFACTORY COMPACTION. THE TOP FOOT SHALL BE PLACED IN MAXIMUM 6" THICK LIFTS WITH THE LIFTS COMPACTED TO 95% TO 98% STANDARD PROCTOR DENSITY.
    IN THE REMAINDER OF THE BASIN AREA THE SURFACE SHALL BE SCARIFIED ABOUT 4" TO 6" RECOMPACED IN PLACE, AND THEN SMOOTH WHEEL-ROLLED TO SEAL THE SURFACE. THERE MAY BE ISOLATED AREAS REQUIRING ADDITIONAL UNDERCUTTING AND REPLACEMENT. AGAIN, QUALIFIED GEOTECHNICAL PERSONNEL SHALL BE PRESENT TO OBSERVE THE SCARIFYING AND RECOMPACTING.
    IF POSSIBLE THE DRAINAGE TRENCH SHALL REMAIN OPERABLE UNTIL THE BOTTOM SOIL-BENTONITE LINER IS IN PLACE. WHEN THE TRENCH IS DECOMMISSIONED BACKFILLING SHALL BEGIN AT THE EAST END USING DRY ON-SITE COHESIVE SOIL FOR BACKFILL. THE BACKFILL SHALL BE PLACED IN HORIZONTAL LIFTS WITH EACH LIFT COMPACTED WITH HAND TAMPERS TO AT LEAST 95% STANDARD PROCTOR DENSITY.
11. IF AREA TILE DRAINS ARE LOCATED DURING CONSTRUCTION, THE GEOTECHNICAL ENGINEER SHALL BE INFORMED IMMEDIATELY AND SHALL DETERMINE WHAT ACTION IS REQUIRED.
12. ANY LEACHATE OR WATER ACCUMULATION IN THE INSPECTION SUMP SHALL BE PUMPED INTO THE SURGE LAGOON BY PORTABLE PUMP. NO DISCHARGE TO PADDYS RUN SHALL BE PERMITTED.
13. FOR NOTES AND LEGEND INFORMATION FOR NEW SIGNS AND RING BUOY STATION, SEE DWG. 18B-1920-G-00296

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Atlanta / Dallas / New York / Oak Ridge / Spartanburg
Athens / Ludwigshafen

APPROVED FOR REVISION 2

DOE	DATE
WMCO OD	DATE
AE	DATE

PREPARED BY:
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

APPROVED FOR REVISION 1

DOE	DATE
WMCO OD	DATE
AE	DATE

OCT 1987 PRINTED LOCKWOOD GREENE Engineers, Inc. Oak Ridge, TN

0528 3 16 84

REV NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	NLO	DOE
		INITIALS AND DATE		
2	HEALTH & SAFETY REQUIREMENT MODIFICATIONS	WFH	SC	
1	REMOVED INSPECTION SUMP OUTLET PIPE & ADDED GENERAL NOTE 10 11 & 12		ARE 7-12-85	TJS 7-12-85
0	CERTIFIED FOR CONSTRUCTION	11/13/84		

3001

UNITED STATES
DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC05-83OR20994 A-E NO. 83100

PROJECT NAME
WATER POLLUTION CONTROL

DRAWING TITLE
BIODENITRIFICATION SYSTEM
SURGE LAGOON PLAN

56

DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
FHWr	1/10/84		1/10/84		1/10/84

PLANT	BLDG.	FLOOR	SCALE		CLASS
FMPC	NA	NA	1" = 20'		U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE 1/13/84	NLO DATE	DOE DATE

PROJECT NO.	DRAWING NUMBER	REV. NO.
83-D-146	18B-1920-G-00295	2

3001

GENERAL NOTES

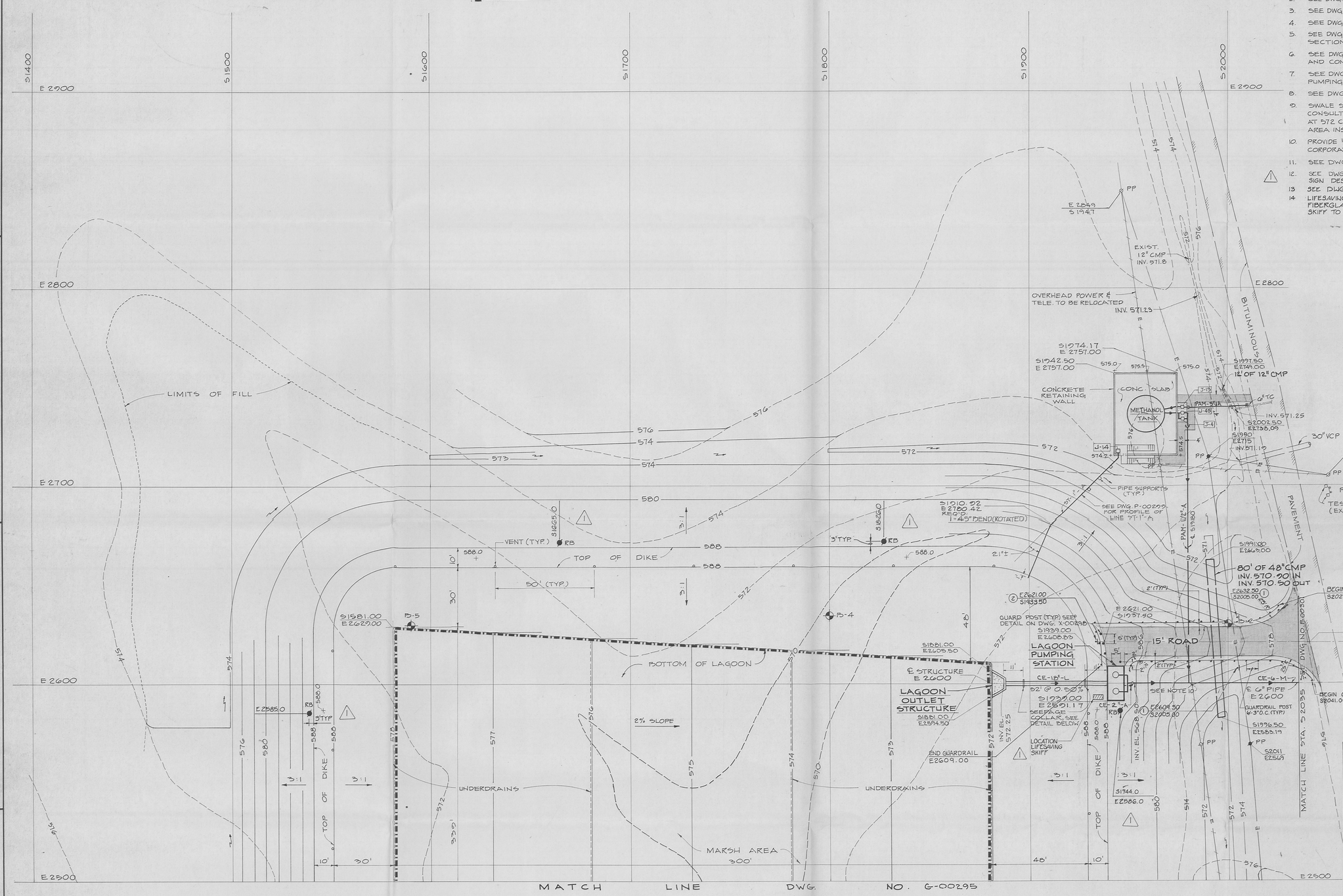
1. SEE DWG. NO. X-00262 FOR COVER SHEET AND LOCATION PLAN.
2. SEE DWG. NO. X-00263 FOR LIST OF DWGS.
3. SEE DWG. NO. X-00264 FOR HORIZONTAL & VERTICAL DATUM CONTROL.
4. SEE DWG. NO. X-00294 FOR LEGEND & ABBREVIATIONS.
5. SEE DWG. NO. G-00297 FOR TYPICAL SECTION OF LAGOON AND CROSS-SECTIONS.
6. SEE DWG. NO. X-00298 FOR DETAILS OF TYPICAL LINER ANCHORAGE AND CONNECTION, TYPICAL ROAD SECTION
7. SEE DWG. NO. P-00299 FOR DETAILS OF OUTLET STRUCTURE AND PUMPING STATIONS.
8. SEE DWG. NO. P-00280 FOR METHANOL TANK STORAGE AREA.
9. SWALE SHALL BE UNDERCUT TO DEPTH DETERMINED BY SOILS CONSULTANT DURING EXCAVATION. APPROXIMATE LIMITS ARE ZERO AT 572 CONTOUR TO 4 FOOT UNDERCUT AT 570 CONTOUR. ENTIRE AREA INSIDE 570 CONTOUR SHALL BE UNDER 4 FEET.
10. PROVIDE 1/2" TAP IN CE-6"-M AND CONNECT PAM-1/2"-A USING CORPORATION STOP (MUELLER H-10045 OR APPROVED EQUAL.)
11. SEE DWG. NOS. E-00312, E-00313, & E-00314 FOR ELECTRICAL.
12. SEE DWG. NO. C2 FOR GUARDRAIL DETAILS, RING BUOY STATION DETAILS, SIGN DESIGNATION TABLE AND MOUNTING DETAIL.
13. SEE DWG. 18B-1920-E-00355, REV. 1, FOR LIGHT POLE DETAIL.
14. LIFESAVING SKIFF LOCATED ON PLAN TO BE A MIN. OF 12' LONG FIBERGLASS BOAT (SEARS GAMEFISHER-12 OR APPROVED EQUAL. SKIFF TO EQUIPPED WITH APPROPRIATE OARLOCKS AND WOOD OARS.

LEGEND

- NEW GUARDRAIL
- NEW SIGN MOUNTED ON STL. POST(S)
- NEW LIGHT POLE
- RB — RING BOUY STATION MOUNTED ON NEW LIGHT POLE

SIGN KEY

- SIGN
- (1) SIGN DESIGNATION NO.



PLAN
SCALE: 1" = 20'

APPROVED FOR REVISION	
DOE	DATE
OC	DATE
AE	DATE

1" THICK FRP SEEPAGE COLLAR (SOLVENT WELD TO FRP PIPE)

18" FRP PIPE

DETAIL OF SEEPAGE COLLAR
NOT TO SCALE

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Planners/Engineers/Architects/Managers
Atlanta / Dallas / New York / Oak Ridge / Spartanburg
Athens / Ludwigshafen

APPROVED FOR REVISION 1	
DOE	DATE
WMCO -OG-	DATE
AE	DATE

20' 0 20'

REV NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	NLO	DOE
2	REVISED RING BOUY LEGEND			
1	HEALTH & SAFETY REQUIREMENT MODIFICATIONS			
0	CERTIFIED FOR CONSTRUCTION			

INITIALS AND DATE

OCT 1987 PRINTER LOCKWOOD GREENE Engineers, Inc. Oak Ridge, TN

UNITED STATES DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC05-83OR20994 A-E NO. 83100

PROJECT NAME
WATER POLLUTION CONTROL

DRAWING TITLE
BIODENITRIFICATION SYSTEM
SURGE LAGOON PLAN

57

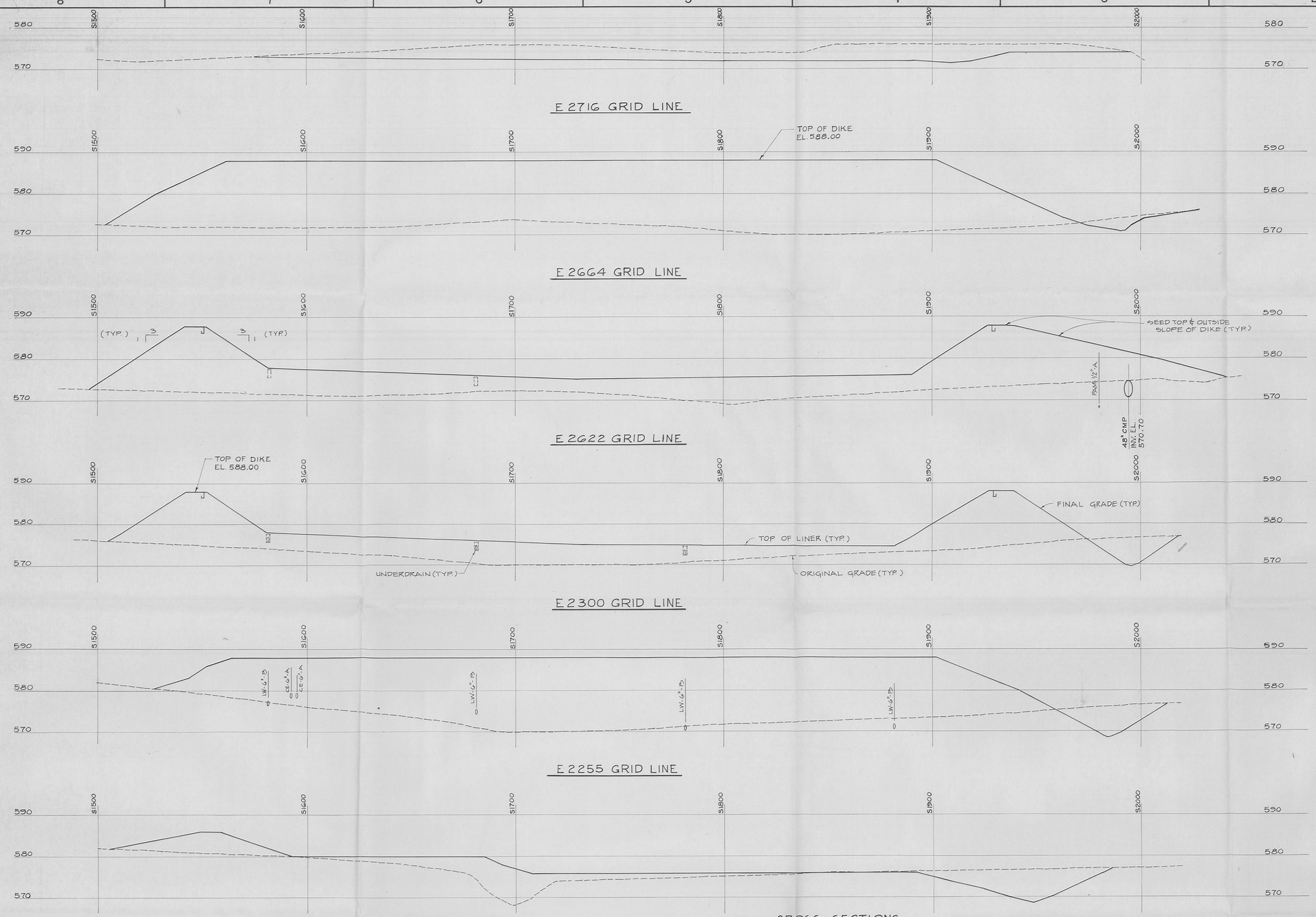
DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
FHUR	1/10/84	WJE	1/10/84	CWW	1/10/84

PLANT	BLDG.	FLOOR	SCALE	CLASS
FMPC	NA	NA	1" = 20'	U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE 1/13/84	NLO DATE 1/26/84	DOE DATE 2/27/84

PROJECT NO.	DRAWING NUMBER	REV. NO.
83-D-146	18B-1920-G-00296	2

A&E SUPPLY CO. 58411



GENERAL NOTES

1. SEE DWG. NO. X-00262 FOR COVER SHEET & LOCATION PLAN.
2. SEE DWG. NO. X-00263 FOR LIST OF DWGS.
3. SEE DWG. NO. X-00264 FOR HORIZONTAL & VERTICAL DATUM CONTROL.
4. SEE DWG. NO. X-00204 FOR LEGEND & ABBREVIATIONS.
5. SEE DWG. NOS. G-00295 & G-00296 FOR PLAN OF LAGOON.

REGULAR CUT MATERIAL	= 4,692 C.Y.
UNDERCUT MATERIAL	= 11,687 C.Y.
TOTAL CUT	= 16,379 C.Y.
FILL MATERIAL	= 73,067 C.Y.
CLAY LINER MATERIAL	= 8,698 C.Y.

NOTE: THE OPTIMUM BENTONITE MIXTURE FOR CLAY LINER IS 8 PERCENT OF THE SOIL'S DRY WEIGHT. THE MINIMUM APPLICATION RATE OF BENTONITE TO SOILS TAKEN FROM STORM BASIN AREA ARE AS FOLLOWS:
1) MOTTLED BROWN SILTY CLAY WITH TRACE SAND → 4.0 LB/SY.
2) BROWN CLAYEY SILT → 4.1 LB/SY.
3) GRAY SANDY SILTY CLAY → 4.8 LB/SY.

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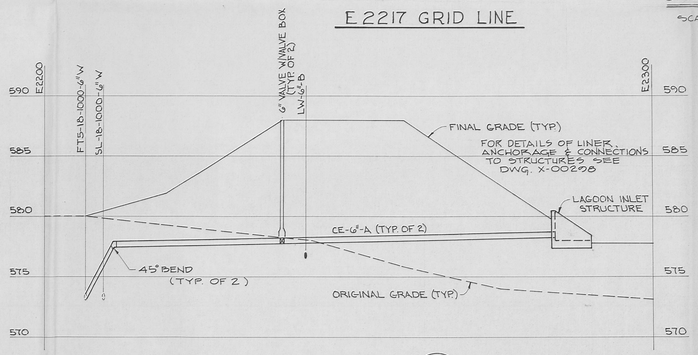
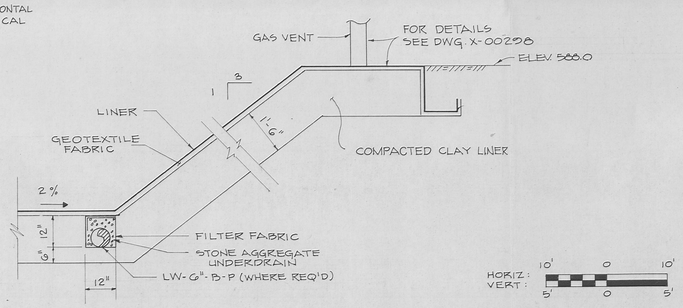


SECTION 1
SCALE: 1"=10' HORIZ. 1"=5' VERT.
G-00297
G-00295

CROSS-SECTIONS

SCALE: 1"= 20' HORIZONTAL 1"=10' VERTICAL



TYPICAL SECTION

NOT TO SCALE

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	NLO	DOE
0	CERTIFIED FOR CONSTRUCTION	11/15/84	11/26/84	12/3/84

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY 3001

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA

DOE CONTRACT NO. DE-AC05-83OR20994 A-E NO. 83100

PROJECT NAME
WATER POLLUTION CONTROL

DRAWING TITLE
BIODENITRIFICATION SYSTEM
LAGOON CROSS-SECTIONS

58

DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
FHJR	1/10/84	AWR	1/10/84	WBS	1/10/84

PLANT	BLDG.	FLOOR	SCALE	CLASS
FMPC	NA	NA	NA	U

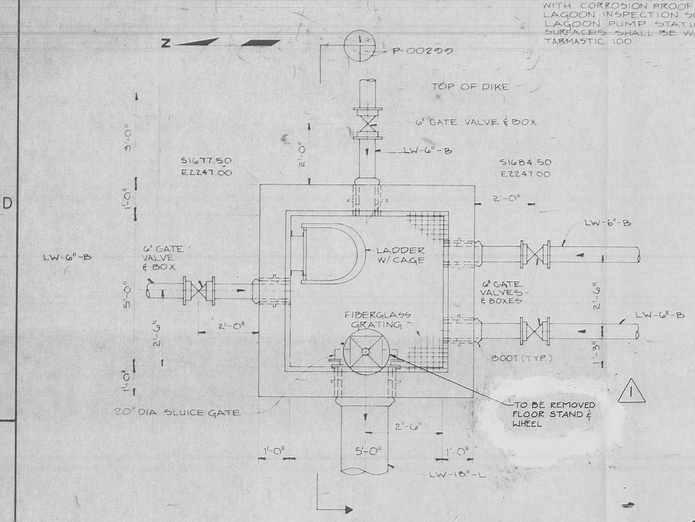
SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE 11/15/84	NLO DATE 12/3/84	DOE DATE 12/3/84

PROJECT NO.	DRAWING NUMBER	REV. NO.
83-D-146	18B-1920-G-00297	0

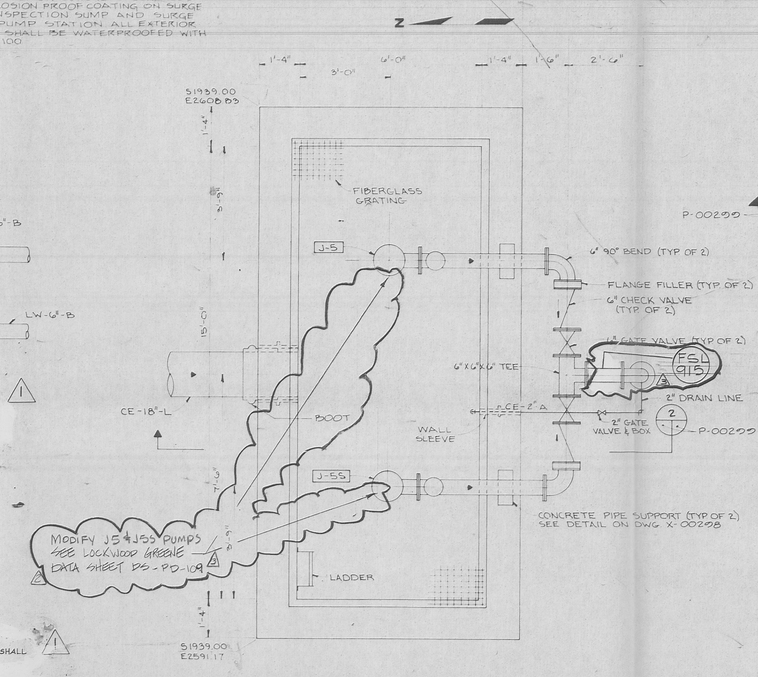
3001

A&E SUPPLY CO. 58411

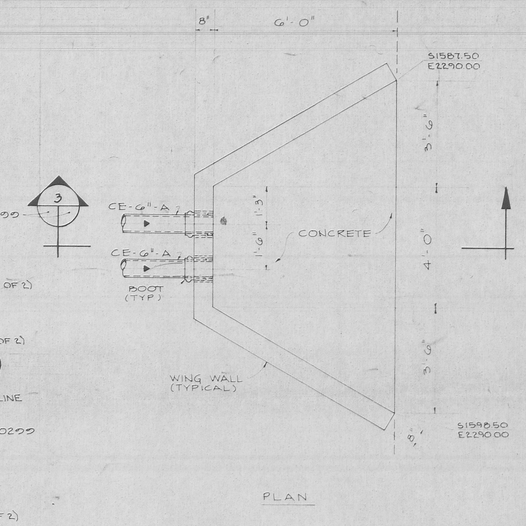
NOTE COAT ALL INTERIOR CONCRETE SURFACES WITH CORROSION PROOF COATING ON SURGE LAGOON INSPECTION SUMP AND SURGE LAGOON PUMP STATION. ALL EXTERIOR SURFACES SHALL BE WATERPROOFED WITH TARMASTIC 100



SURGE LAGOON INSPECTION SUMP PLAN
SCALE: 1/2" = 1'-0"

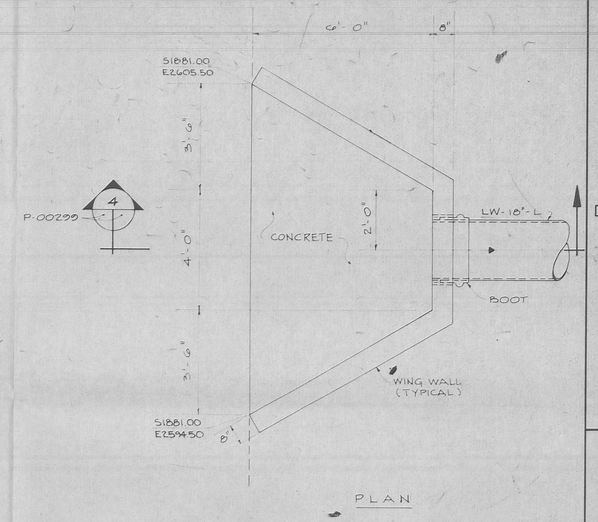


SURGE LAGOON PUMP STATION PLAN
SCALE: 1/2" = 1'-0"



PLAN

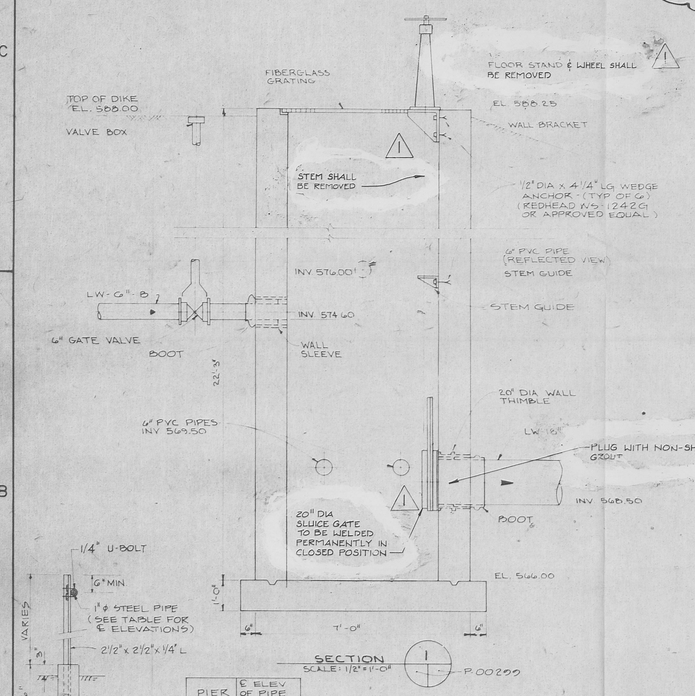
LAGOON INLET STRUCTURE
SCALE: 1/2" = 1'-0"



PLAN

LAGOON OUTLET STRUCTURE
SCALE: 1/2" = 1'-0"

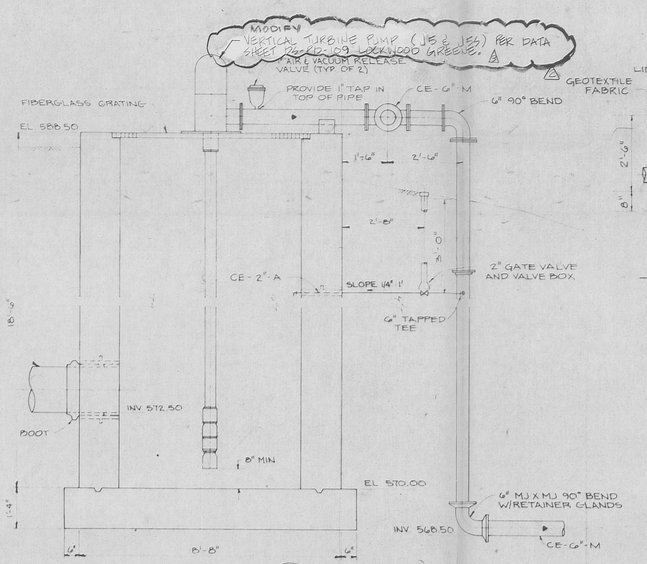
NOTE COAT ALL EXPOSED CONCRETE SURFACES WITH CORROSION PROOF COATING ON SURGE LAGOON INLET & OUTLET STRUCTURES. WATERPROOF ALL OTHER SURFACES WITH TARMASTIC 100



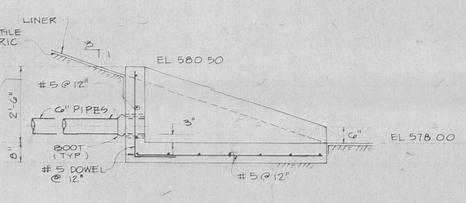
PIER	℄ ELEV OF PIPE
"A"	576.07
"B"	576.15
"C"	576.23
"D"	580.02
"E"	580.10

SECTION 1
SCALE: 1/2" = 1'-0"
P-00299

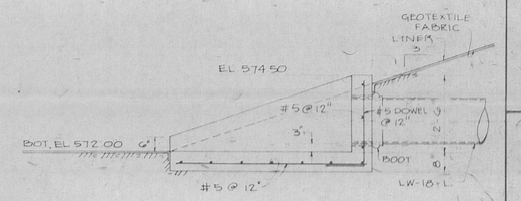
TYPICAL PIER DETAIL
NOT TO SCALE



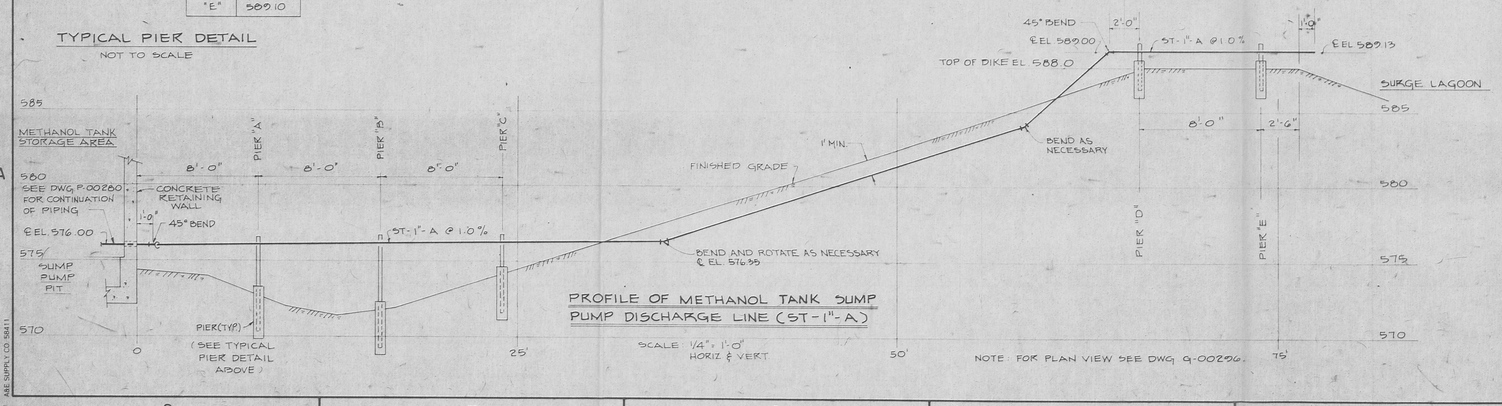
SECTION 2
SCALE: 1/2" = 1'-0"
P-00299



SECTION 3
SCALE: 1/2" = 1'-0"
P-00299



SECTION 4
SCALE: 1/2" = 1'-0"
P-00299



PROFILE OF METHANOL TANK SUMP PUMP DISCHARGE LINE (ST-1"-A)
SCALE: 1/4" = 1'-0" HORIZ & VERT

NOTE: FOR PLAN VIEW SEE DWG. P-00296

GENERAL NOTES

1. SEE DWG. NO. X-00262 FOR COVER SHEET AND LOCATION PLAN.
2. SEE DWG. NO. X-00263 FOR LIST OF DWGS.
3. SEE DWG. NO. X-00264 FOR HORIZONTAL & VERTICAL DATUM CONTROL.
4. SEE DWG. NO. X-00294 FOR LEGEND & ABBREVIATIONS.
5. SEE DWG. NOS. G-00295 AND G-00296 FOR PLAN OF SURGE LAGOON AREA.
6. SEE DWG. NO. S-00289 FOR REINFORCING IN PUMP STATION AND INSPECTION SUMP AND PUMP SUPPORT MEMBERS.
7. SEE DWG. NO. X-00298 FOR DETAILS OF PIPE PENETRATION, VALVE & BOX, LINER ANCHORAGE & CONNECTIONS, AND CONCRETE PIPE SUPPORT.
8. SEE DWG. NOS. E-00312, E-00313, E-00314 FOR ELECTRICAL.

836490 PREPARED BY:
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

APPROVED FOR REVISION	
J. Wilson DOE	7-12-85 DATE
D. Booper NLO ~~CCO~~ ND	7-15-85 DATE
R. Hughes AE	7/12/85 DATE

5' 0 5' 1/4" = 1'-0"

12" 6" 0 1' 2' 3' 4' 1/2" = 1'-0"

0528 3 16 84

REV NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	NLO	DOE
3	CHANGE D.S. # FROM 107 TO 109 & ADDED MODIFY NOTE	EB 2/12/86	[illegible] 3/14/86	RD 2/11/86
2	ADDED NOTES	PHB 8-85	DOC 9/14/85	T 9/14/85
1	REVISED SURGE LAGOON INSPECTION SUMP	[illegible]	DAB 7-18-85	TJT 7-18-85
0	CERTIFIED FOR CONSTRUCTION	[illegible] 1/13/84	[illegible]	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY 3001

THIS DRAWING PREPARED BY
WILEY & WILSON
ARCHITECTS • ENGINEERS • PLANNERS
LYNCHBURG, VIRGINIA
DOE CONTRACT NO. DE-AC05-83OR20994 A-E NO. 83100

PROJECT NAME
WATER POLLUTION CONTROL 59

DRAWING TITLE
BIODENITRIFICATION SYSTEM
PLAN & SECTIONS - SURGE LAGOON
SUMP, PUMP STATION, AND STRUCTURES

DRAWN BY	DATE	DESIGNED AND CHECKED BY	DATE	CHECKED BY	DATE
FHJ	1/10/84	DJR	1/10/84	[illegible]	1/10/84

PLANT	BLDG	FLOOR	SCALE		CLASS
FMPC	NA	NA	NA		U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
[illegible]	[illegible]	[illegible]
A-E DATE 1/13/84	NLO DATE [illegible]	DOE DATE

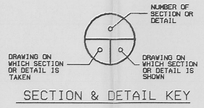
PROJECT NO. 83-D-146
DRAWING NUMBER 18B-1920-P-00299
REV. NO. 3

836490

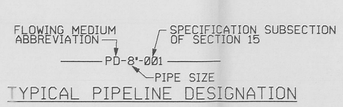
A&E SUPPLY CO. 10811

3001

SITE PLAN
SCALE: 1"=20'



SECTION & DETAIL KEY

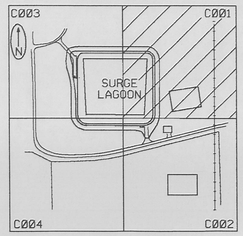


TYPICAL PIPELINE DESIGNATION

LEGEND

EXISTING		NEW
575	CONTOURS	575
575.24	SPOT ELEVATION	575.24
	STRUCTURES	
S 1734.25 / E 2785.02	COORDINATES	S 1734.25 / E 2785.02
NA	PUMP	
LCR	LEACHATE COLLECTION REMOVAL PIPING	LCR
	PIPING	
	RAILROAD	NA
	ROADWAY	NA
	BENCH MARK	NA
	FENCE	NA
	POWER POLE	NA
	VALVE	
PAM	METHANOL	PAM
SD	STORM DRAIN	SD
ST	STORM SEWER	ST
CE	CONTAMINATED SEWER	CE
	CHECK VALVE	NA
FT	FILTRATE EFFLUNENT	FT
SL	SUMP LINE	SL
NA	ELECTRICAL	E
NA	SUFACE RUNOFF FLOW	
NA	BENTONITE	

NOTE:
FOR GENERAL NOTES SEE DWG.C002



KEY PLAN

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

INITIALS AND DATE

3001

UNITED STATES
DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05-81-OR2-8676 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
SITE PLAN
1 OF 4 61

OPERATING CONTRACTOR CODE
SURGE LAGOON LINER REPLACEMENT SITE PLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
J. WATERS	7-87	CEM	10/87	K.L. Gannell	10/87

PLANT	BLDG.	FLOOR	SCALE	1	48	49	50	TYPE	CLASS
FMPC			1"=20'	3	C	P	T	P	U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

NA

PROJECT	WORK ORDER NO.	DRAWING NUMBER	REV. NO.
		C001	C

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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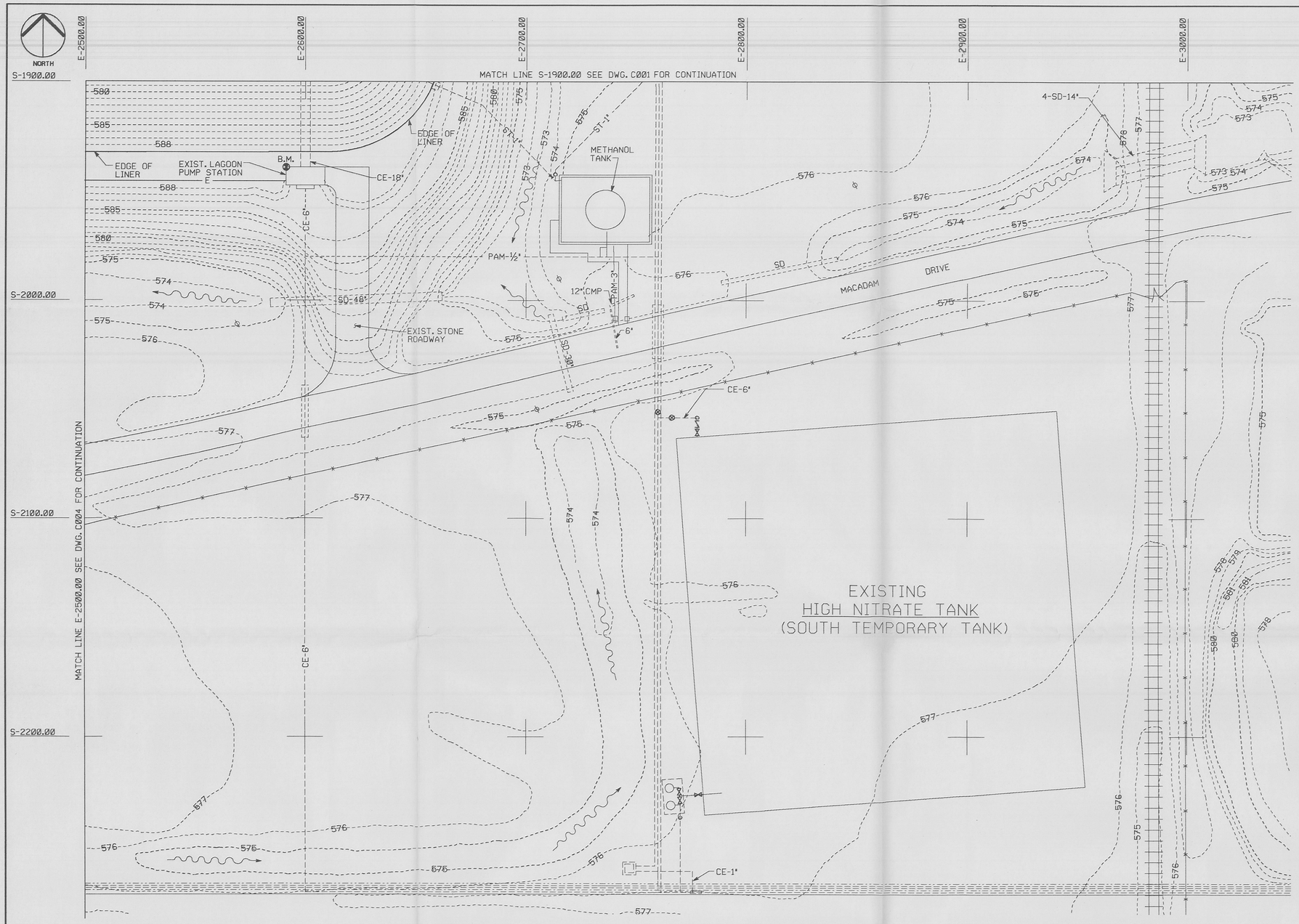
OCT 1987 PLANTED LOCKWOOD GREENE Engineers, Inc. Oak Ridge, TN

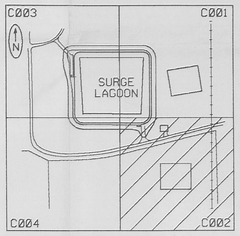


SITE PLAN
SCALE: 1"=20'

NOTE:
1. FOR LEGEND SEE DWG. C001.

GENERAL NOTES

1. ALL VERTICAL DATUM BASED ON THE ELEVATION OF THE EXISTING PUMP STRUCTURE FLOOR AS BEING ELEVATION 588.25 FT. SEE DRAWING C002 FOR BENCH MARK LOCATION.
2. DISPOSAL OF DEBRIS TO BE AS DIRETED BY THE OPERATING CONTRACTOR.
3. ALL CONCRETE UNLESS NOTED OTHERWISE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS AND CONTAIN AIR ENTRAINMENT OF 6%.
4. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4' (EXCEPT IN CONCRETE PLACED BENEATH FMLS).
5. COST INTERIOR OF SUMP WITH FLAKETAR. COAT SHALL BE A MINIMUM OF 16 MIL DRY FILM THICKNESS AFTER A TWO-COAT APPLICATION.
6. THE UNDERDRAIN COLLECTION PIPING SHALL BE 4' SCHEDULE 40 PVC. DRILL 1/4' HOLES 45 DEGREES BELOW CENTERLINE ON BOTH SIDES OF PIPE. HOLES SHALL BE SPACED 6' ALONG LENGTH OF PIPE. PIPE SHALL NOT BE ATTACHED TO EXISTING LINER. SOCK TO BE INSTALLED ON LATERALS AS SHOWN ON DETAIL 4, DRAWING C007.
7. APROXIMATELY 190 HOLES SMALLER THAN 1' HAVE BEEN LOCATED. ALL TEMPORARY PATCHES (OVER SOME OF THE 190 HOLES) SHALL BE REMOVED, THE LINER SURFACE CLEANED, AND PATCHES OF THE SAME MATERIAL (40 MIL FLEXALON, HDPE) WELDED OVER THE HOLES. APPROXIMATELY 50 FT OF EXISTING LINER SEAMS MAY NEED TO BE WELDED.
8. THE EXISTING INLET AND OUTLET STRUCTURES SHALL BE MODIFIED AS DETAILED ON DRAWING C007. THE PATCHES REQUIRED ON THE EXISTING LINER AT THESE LOCATIONS, AND AT THE NEW UNDERDRAIN PENETRATION LOCATION, SHALL BE MADE WITH THE SAME MATERIAL AS THE EXISTING LINER.
9. THE NEW LINER SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND DRAWINGS. EXTREME CARE SHAL BE TAKEN TO PREVENT PUNCTURING THE EXISTING LINER DURING PLACEMENT OF THE SAND FOR THE UNDERDRAIN COLLECTION SYSTEM. PLACEMENT OF THE WASHED SAND LAYER SHALL BE ACCOMPLISHED WITHOUT THE USE OF WHEELED OR TRACKED VEHICLES IN THE LAGOON. SPREADING THE SAND SHALL BE ACCOMPLISHED USING WOODEN TROWELS, ETC. METAL SHOVELS OR SHARP-EDGED TOOLS WILL NOT BE ALLOWED. THE CONTRACTOR MAY PROPOSE ALTERNATE METHODS FOR THE ENGINEERS APROVAL.
10. TEMPORARY ANCHORS SHALL BE USED DURING REPARATION OF THE EXISTING LINER AND PLACEMENT OF THE NEW LINER. THE ANCHORS SHALL BE USED TO PREVENT DAMAGE TO THE LINERS DUE TO WIND OR OTHER FORCES.
11. THE PLANAR FLUID FLOW MAT SHALL BE EXTRUDED DIAMOND-SHAPED POLYETHYLENE NET. (0.2 IN.) MADE WITH A NON-WOVEN POLY-PROPYLENE FABRIC BONDED ON EACH SIDE. THE MAT SHALL HAVE A HYDRAULIC TRANSMISSIVITY OF 0.03 SQ. METERS PER SECOND AT A PRESSURE OF 1000 PSF. MAT MATERIAL SHALL BE PLACED UNDER ALL LINER MATERIAL ON SIDE SLOPES.
12. THE CONTRACTOR SHALL INSTALL THE NEW LINER IN LARGE FACTORY-WELDED SECTIONS, ACCORDING TO THE SPECIFICATIONS, TO LIMIT THE NUMBER OF FIELD SEAMS REQUIRED.



KEY PLAN

FLOWING MEDIUM ABBREVIATION — PD-8"-001 — SPECIFICATION SUBSECTION OF SECTION 15
PIPE SIZE

TYPICAL PIPELINE DESIGNATION

NOV 1987 PRINTED LOCKWOOD GREENE Engineers, Inc. Oak Ridge, TN

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
D	REVISED GENERAL NOTES			
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY 3001

THIS DRAWING PREPARED BY
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05 81-OR2-8676 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
SITE PLAN
2 OF 4

62

OPERATING CONTRACTOR CODE
SURLAGLINREPSITEPLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JEFF WATERS	7-87		10/87	R.C. Grannell	10/87

PLANT	BLDG.	FLOOR	SCALE	1	48	45	50	TYPE	CLASS
FMPC			1"=20'	3	C	P	T	P	U

SUBMITTED FOR APPROVAL — A-E — DATE
APPROVAL RECOMMENDED — OPERATING CONTRACTOR — DATE
DRAWING APPROVED — DOE — DATE
NA

PROJECT | WORK ORDER NO. | DRAWING NUMBER C002 | REV. NO. D

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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NORTH

S-1500.00

S-1600.00

S-1700.00

S-1800.00

S-1900.00

EDGE OF LINER

SEE DWG. C007 FOR INLET STRUCTURE MODIFICATION DETAIL

EXISTING GUARD POSTS

EXIST. LCR SUMP

ELEC. BOXES

EDGE OF LINER

FT-6"

SL-6"

3.00' NOMINAL

C003

C007

S1681

SEE DETAIL A

S1781

SEE DETAIL B

E2455

67½° TYP.

LCR-4"

LCR-6"

LCR

MATCH LINE E 2500.00 SEE DWG. C001 FOR CONTINUATION

MATCH LINE S-1900.00 SEE DWG. C004 FOR CONTINUATION

℄ HEADER E2455

E-2000.00

E-2100.00

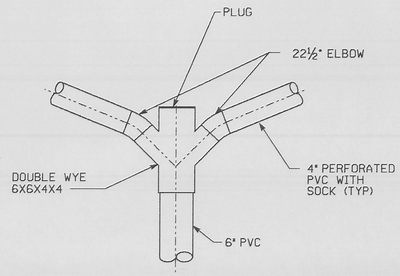
E-2200.00

E-2300.00

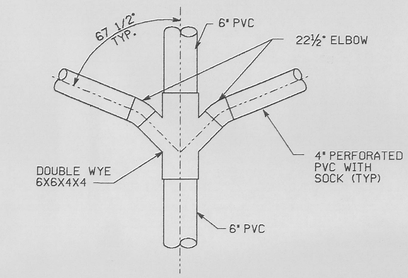
E-2400.00

E-2500.00

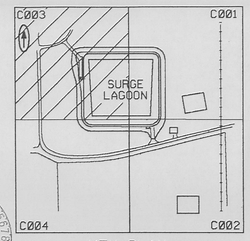
NOTE:
FOR LEGEND SEE DWG. C001.
FOR GENERAL NOTES SEE DWG. C002.



DETAIL A
NOT TO SCALE



DETAIL B
NOT TO SCALE



KEY PLAN

OCT 1967 PRINTED LOCKWOOD GREENE Engineers, Inc. Oak Ridge, TN

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
			INITIALS AND DATE	
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

UNITED STATES DEPARTMENT OF ENERGY 3001

THIS DRAWING PREPARED BY
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05 81-OR2-8676 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
SITE PLAN
3 OF 4 63

OPERATING CONTRACTOR CODE
SURGE LAGOON LINER REPLACEMENT SITE PLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JEFF WATERS		CSH	10/8/87	Cannadh	10/87

PLANT	BLDG.	FLOOR	SCALE	1	48	49	50	TYPE	CLASS
FMPC			1"=20'	3	C	P	T	P	U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	NA DOE DATE

PROJECT	WORK ORDER NO.	DRAWING NUMBER	REV. NO.
		C003	C

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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NORTH

MATCH LINE S-1900.00 SEE DWG. C003 FOR CONTINUATION

S-1900.00

S-2000.00

S-2100.00

S-2200.00

S-2300.00

E-2000.00 E-2100.00 E-2200.00 E-2300.00 E-2400.00 E-2500.00

MATCH LINE E-2500.00 SEE DWG. C002 FOR CONTINUATION

EDGE OF LINER

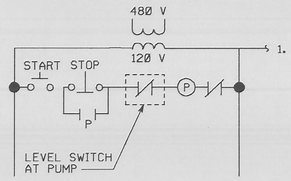
SEE NOTE FOR ELECTRICAL

LAGOON LEACHATE SUMP SEE DWG. C005 FOR PLAN AND DETAIL.

C004 C005

PIPE TRENCH

NOTE:
1. FOR LEGEND SEE DWG. C001.
2. FOR GENERAL NOTES SEE DWG. C002.



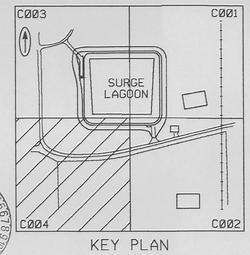
LEACHATE PUMP DIAGRAM

NOTES:

1. 3/C #12, #12G POWER AND 2/C #12 CONTROL TO MOTOR STARTER MOUNTED AT LAGOON PUMPING STATION. COMBINATION MOTOR STARTER TO BE NEMA 3R, SIZE 1 WITH CPT, O.L.'S, 20A. CIRCUIT BREAKER, AND START STOP P.B.'S. MOUNT STARTER ON TEMPORARY POWER MOTOR STARTER RACK. CONTROL TO BE PER LEACHATE PUMP DIAGRAM, THIS DWG.

2. PUMP TO BE SUPPLIED WITH CONTROL PANEL AND LEVEL SWITCHES WHICH WILL PERFORM THE FOLLOWING:

   1. PROVIDE RUN TIME OF PUMP OPERATION.
   2. PROVIDE HAND/OFF/AUTOMATIC PUMP CONTROL.
   3. PROVIDE LOW LIQUID LEVEL PUMP CUT-OFF.



KEY PLAN

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REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

UNITED STATES DEPARTMENT OF ENERGY

THIS DRAWING PREPARED BY
LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05 81-OR2-8676 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
SITE PLAN
4 - 4

OPERATING CONTRACTOR CODE
SURGE LAGOON LINER REPLACEMENT

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
J. WATERS			10/87		10/87

PLANT	BLDG.	FLOOR	SCALE	48	49	50	TYPE	CLASS
FMPC			1-20	3	C	P	T	P	U

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	NA DOE DATE

PROJECT	WORK ORDER NO.	DRAWING NUMBER	REV. NO.
		C004	C

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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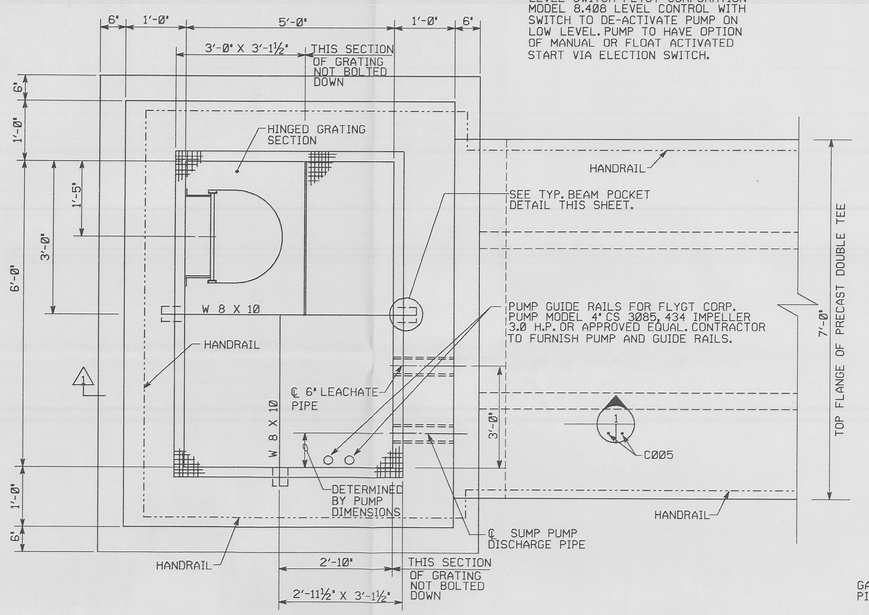
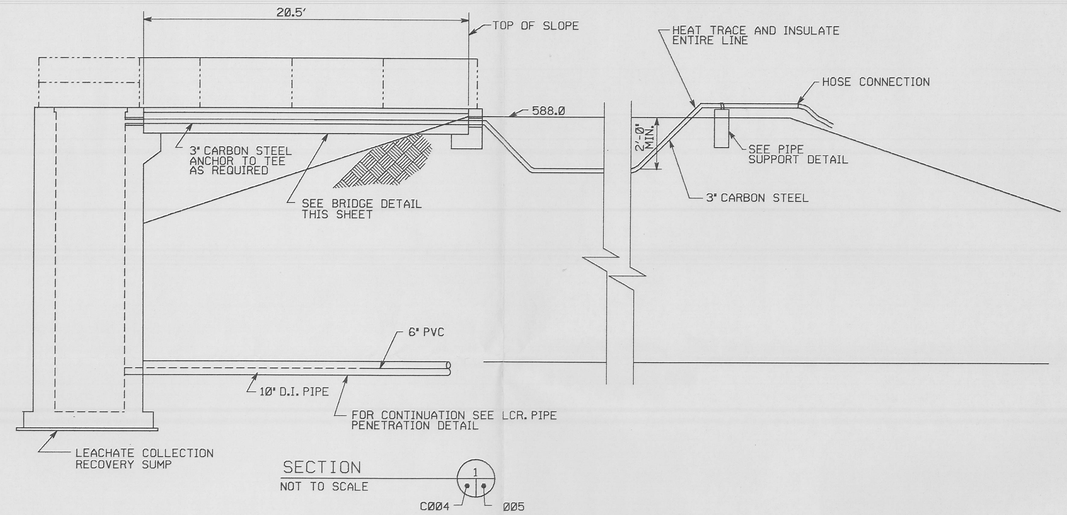
NOTE:
LEVEL SWITCH FLYGT CORPORATION MODEL 8.408 LEVEL CONTROL WITH SWITCH TO DE-ACTIVATE PUMP ON LOW LEVEL. PUMP TO HAVE OPTION OF MANUAL OR FLOAT ACTIVATED START VIA ELECTION SWITCH.



PLAN · SURGE LAGOON LEACHATE SUMP
NOT TO SCALE

NOTE: SUPPORT TO BE 5'-0" LONG



SECTION
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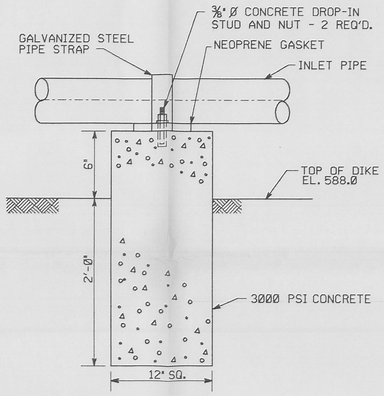
C004 — 1 — 005



PIPE SUPPORT DETAIL
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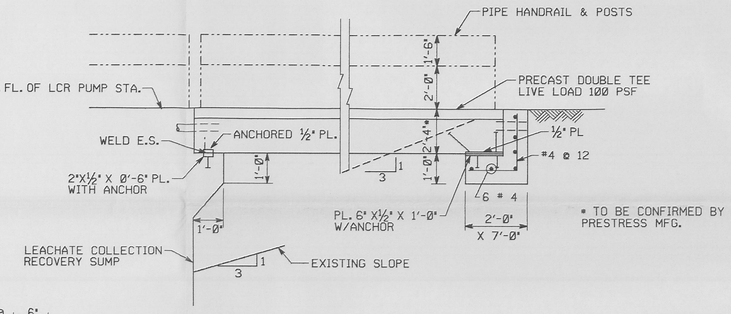
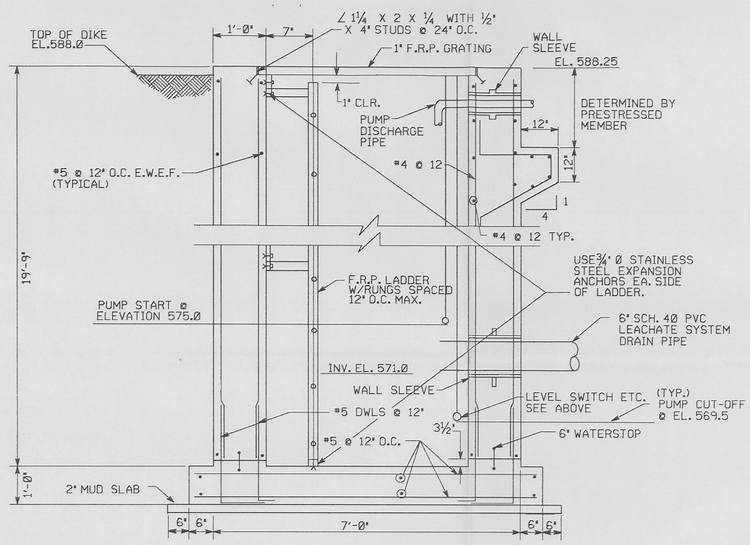
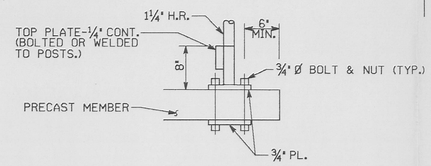


* TO BE CONFIRMED BY PRESTRESS MFG.

BRIDGE DETAIL
NOT TO SCALE

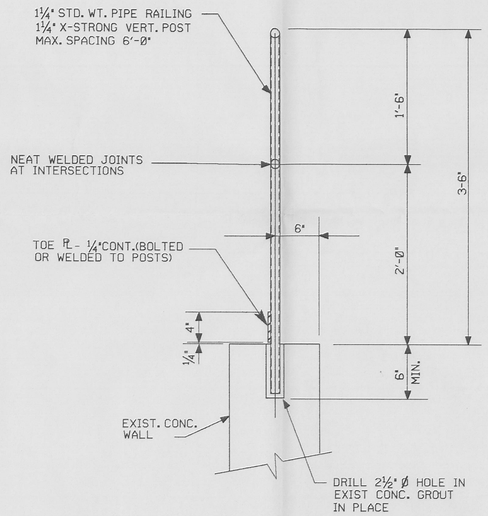


SECTION
NOT TO SCALE
1 — C005



BRIDGE HANDRAIL CONNECTION

NOTE:
PRECAST CONCRETE DOUBLE TEE TO HAVE:
A. 4" THICK FLANGE
B. STEMS TO BE 4'-0" C/C.
C. CONCRETE TO BE 5,000 PSI @ 28 DAY
D. WALKING SURFACE TO HAVE BROOM FINISH
E. ½" PLATES TO BE CAST IN EACH END OF EACH STEM.
F. FLANGE TO BE 7'-0" WIDE.



HANDRAIL DETAIL
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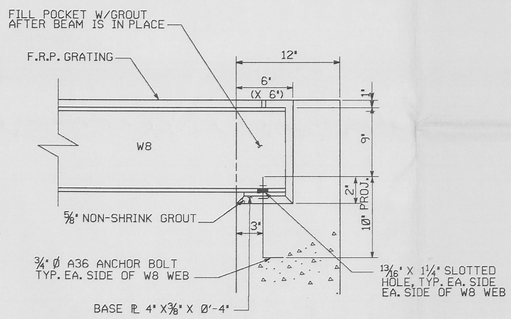
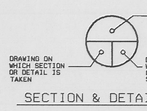


TYPICAL BEAM POCKET DETAIL
NOT TO SCALE



SECTION & DETAIL KEY

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

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UNITED STATES
DEPARTMENT OF ENERGY

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LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05 81-OR2-8676 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
DETAILS 65

OPERATING CONTRACTOR CODE
S.U.R. L.A.G. L.I.N. R.E.P. D.E.T.A.I.L.S.

PLANT	BLDG.	FLOOR	SCALE						
DRAWN BY R. TAYLOR	DATE		DESIGNED, CHECKED BY	DATE 10/87	CHECKED BY R.C. Connell	DATE 10/87			
FMPC			NOTED						

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE
		NA

PROJECT	WORK ORDER NO.	DRAWING NUMBER	REV. NO.
		C005	C

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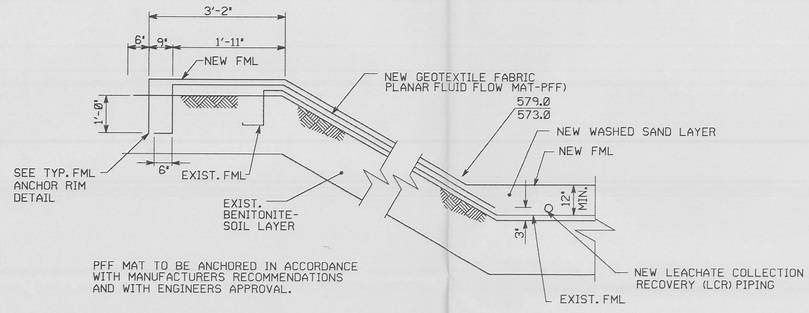
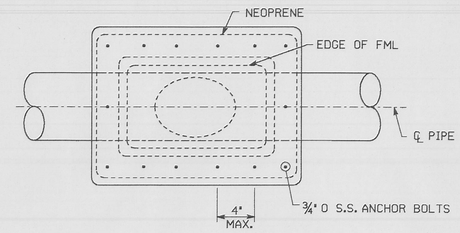
PRF NAME: I785505C ROBIN TAYLOR 20:17:06 27-OCT-87

FILE NAME QS4:[100,135]8785501C.005



TYPICAL FLEXIBLE MEMBRANE LINER SLOPE DETAIL

NOT TO SCALE



PIPE FLANGE DETAIL

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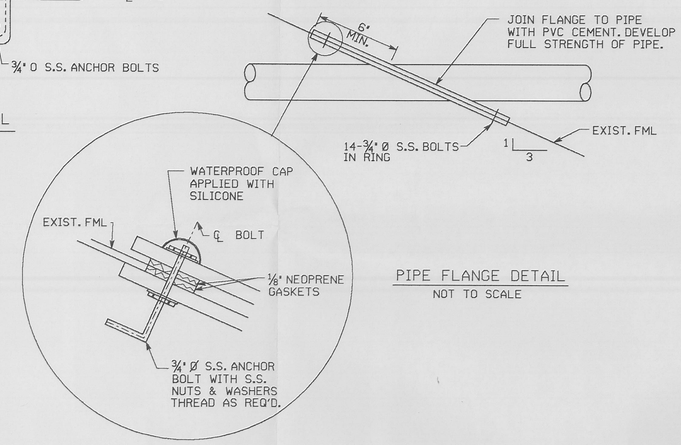

PIPE FLANGE DETAIL

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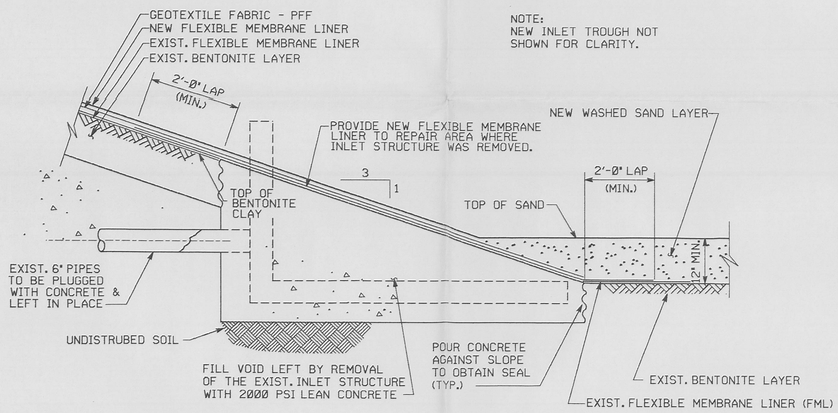
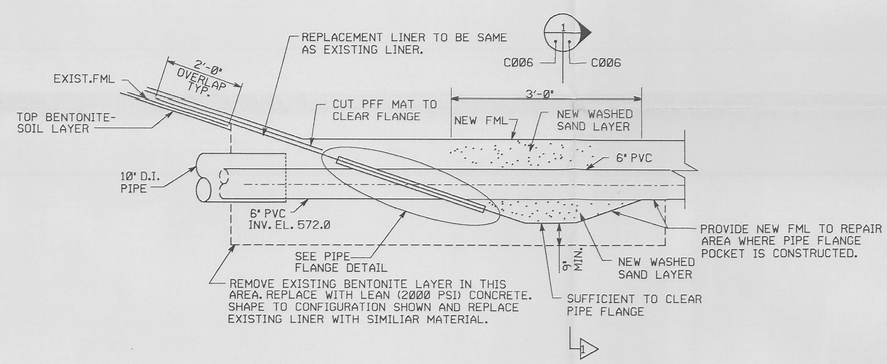


NOTE:
NEW INLET TROUGH NOT
SHOWN FOR CLARITY.

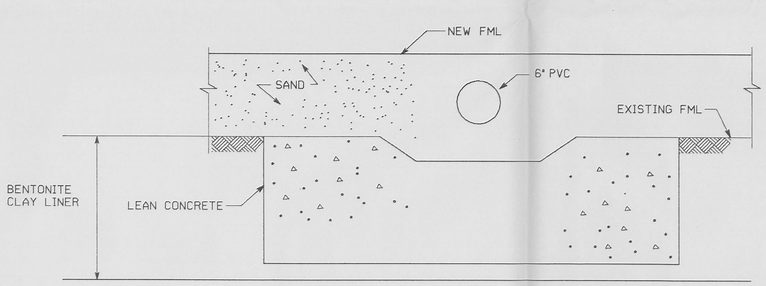
INLET STRUCTURE MODIFICATION

NOT TO SCALE



LCR PIPE PENETRATION DETAIL

NOT TO SCALE



SECTION 1 C006

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
C	ISSUED FOR PTI			
B	ISSUED FOR 100% REVIEW			
A	ISSUED FOR 50% REVIEW			

INITIALS AND DATE

UNITED STATES
DEPARTMENT OF ENERGY

3001

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Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05-81-OR2-8076 A-E NO. 87855.01

PROJECT NAME
SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE
FLEXIBLE MEMBRANE LINER
DETAILS 66

OPERATING CONTRACTOR CODE
SUR LAG LIN REP DETAILS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
R. TAYLOR		CEN	10/87	R. Burnell	10/87

PLANT	BLDG.	FLOOR	SCALE	1	48	49	50	TYPE	CLASS
FMPC			NOTED						

SUBMITTED FOR APPROVAL — A-E — DATE
APPROVAL RECOMMENDED — OPERATING CONTRACTOR — DATE
DRAWING APPROVED — NA — DOE — DATE

PROJECT | WORK ORDER NO. | DRAWING NUMBER C006 | REV. NO. C

WORK ORDER NO.
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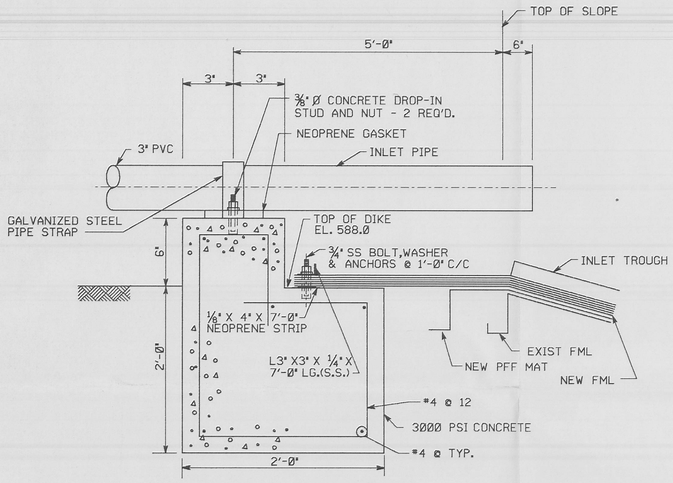
Oak Ridge, TN



INLET PIPE SUPPORT DETAIL (3 / C007)
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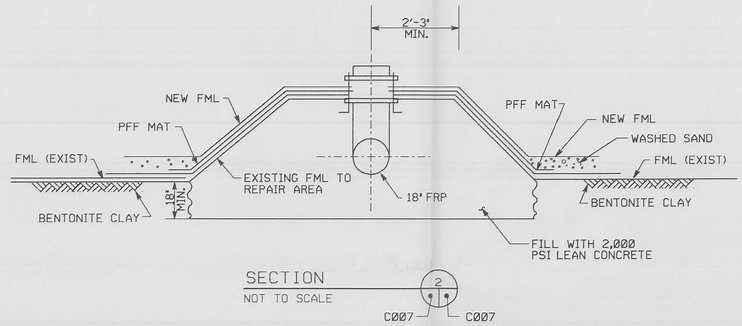

SECTION (2 / C007 — C007)
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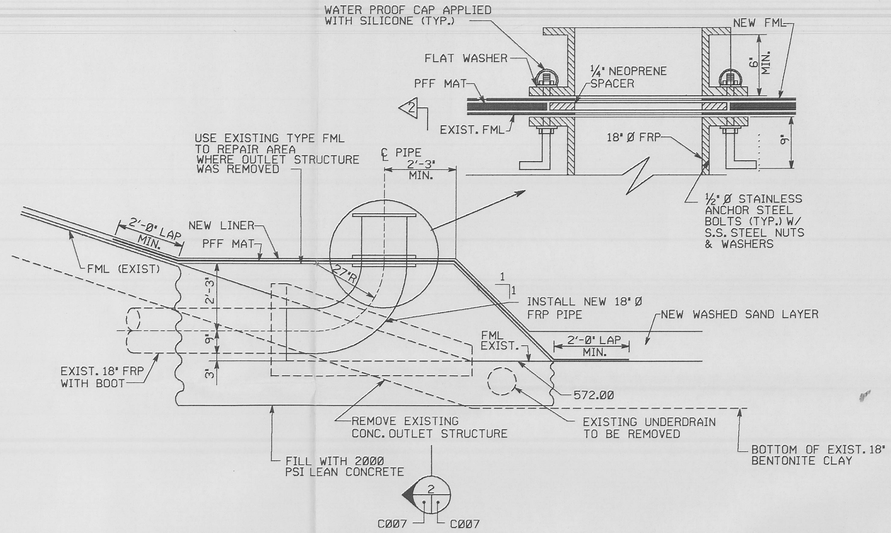
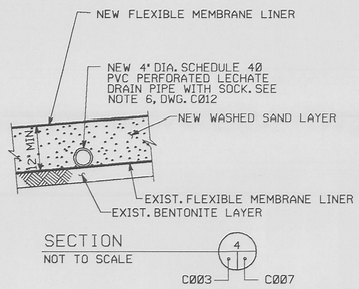


OUTLET STRUCTURE MODIFICATION (2 / C007 — C007)
NOT TO SCALE



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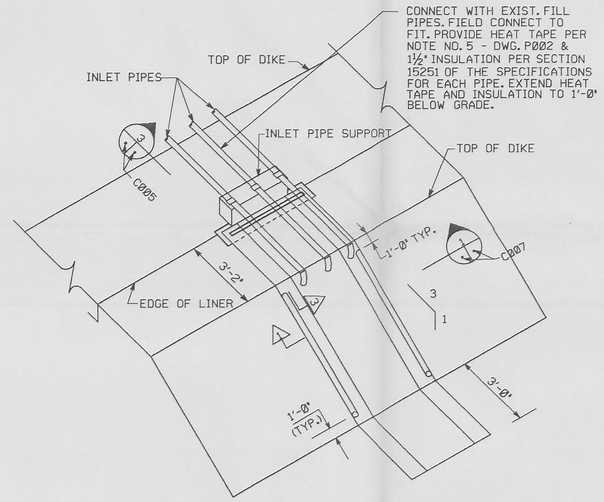

TYPICAL INLET TROUGH
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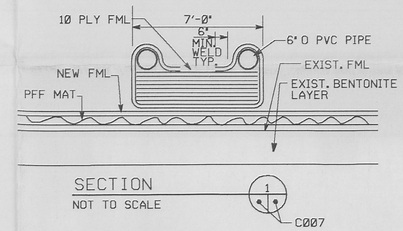

SECTION (1 / C007)
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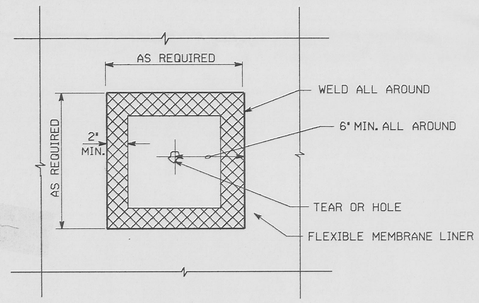
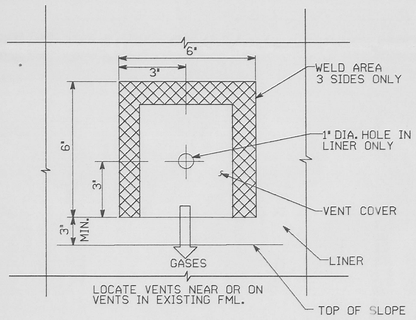


TYPICAL FLEXIBLE MEMBRANE LINER REPAIR DETAIL
NOT TO SCALE



TYPICAL GAS VENT DETAIL
NOT TO SCALE

SECTION & DETAIL KEY

REV. NO.	ISSUE OR REVISION PURPOSE-DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		
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A	ISSUED FOR 50% REVIEW			

WORK ORDER NO.
2ND NO. ACCOUNT
PROCUREMENT BY
INSTALLATION BY

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UNITED STATES DEPARTMENT OF ENERGY 3001

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LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Oak Ridge, Tennessee

DOE CONTRACT NO. DE-AC05 81-OR2-8676 A-E NO. 87855.01

PROJECT NAME: SURGE LAGOON LINER REPLACEMENT

DRAWING TITLE: DETAILS

67

OPERATING CONTRACTOR CODE: SURGE LAGOON LINER REPLACEMENT

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
R. TAYLOR		CEM	10/87	R. Gannell	10/87

PLANT	BLDG.	FLOOR	SCALE	1	48	49	50	TYPE	CLASS
FMPC			NOTED						

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	NA DOE DATE

PROJECT	WORK ORDER NO.	DRAWING NUMBER	REV. NO.
		C007	C

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PRF NAME: I785508C ROBIN TAYLOR 22:05:48 27-OCT-87

FILE NAME OS4:[100,1353]8785501C.008