REMEDIAL DESIGN WORK PLAN

SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL (AWR) PROJECT

SITE PREPARATION

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD OHIO

MARCH 2000

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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1.0 Introduction

The Silos 1 and 2 Accelerated Waste Retrieval (AWR) Project is one of the initial steps in the remediation of the K-65 silos location within the OU4 area. Fluor Fernald has a contract with Foster Wheeler Environmental Corporation (FWENC) to design, construct, start-up and operate a system for retrieving and staging the K-65 material for final remediation.

The site preparation design package provides the design documentation necessary to prepare the AWR Project site for the facilities and infrastructure required for this project.

2.0 Purpose

The purpose of the AWR Site Preparation Package is to convey the requirements for site development and preparation for facilities and infrastructure associated with the AWR Project. The concepts and ideas presented herein have been developed into final design drawing, specifications, and calculations and are ready for construction. The AWR Site Preparation information has been developed to support the AWR Final detail design activities which are currently being finalized by FWENC. The process detail design information will be presented to the agencies in the Remediation Design Package. See section 7.0 for further details.

3.0 Remedial Design Site Preparation Scope

The following activities constitute the site preparation phase for the AWR project. Along with the description of the activity is a reference to the drawing or other document giving further details relative to that activity.

- Set up office trailers and construction facilities.
  (Drawing 05FCD012 Misc. Facilities Civil Site Layout)

- Erect erosion controls and temporary fencing.
  (Work Areas 1 and 2 and 3 and 4 from Stormwater Drainage Calculations, Stormwater System Drawings)

- Building access roads and gravel parking areas.
  (Drawing 06FCD001 Support Facilities Grading Plan Trailer Layout)

- Run site utilities.
  (Drawings 61FCD001 and 61FCD002 Sanitary Sewer System Layout Plan, Drawings 51FCD002 Domestic Water System Underground Layout Plan, Drawing 05FCD013 Miscellaneous Facility Tie-In Locations)

- Install facilities for storm water management.
  (Drawing 12FCD001 Storm Water System Overall Drainage Plan, Drawing 66FCD006 Storm Waster System Miscellaneous Details Sheet 1)

- Perform site grading and prepare laydown areas.
  (Drawing 05FCD014 Miscellaneous Facility Site Space Allocation)

- Perform excavations and prepare subgrade for foundations.
  (Drawing 12FCD002 Transfer Tank System Excavation Plan and Drawing 12FCD003 Transfer Tank System Site Layout Plan)

- Install gravel, vapor barriers, and mud slabs for foundations.
  (Drawings 12FCD005 thru 007 Transfer Tank System Cross Sections Sheet 1 thru 3)

- Install pre-cast sumps, reinforcing steel, embedded items, piping, and grounding related to the foundations.
  (Drawing 12FSD013 Transfer Tank System Sample Building FDN Embedded Plates)

- Place concrete mat foundation for the TTA/RCS/Sampling building.
  (Drawing 12FSD010 and 011 Transfer Tank System Concrete Slab, Sheets 1 and 2 and Drawing 12FSD016 Transfer Tank Area System Sample Building Foundations Sections and Details, Drawing 12FSD012 Transfer Tank System Sample Building Foundation Plan, Drawing 12FSD011 Transfer Tank System Sample Building Foundation Section, Drawing 20FSD005 Radon Control System Carbon Bed Building Foundation Plan, Drawing 20FSD014 Radon Control System Carbon Bed Building Foundation Section View, Plan Drawing 20FSD050 Radon Control System Air Handling Building Foundation, Drawing 20FSD065 Radon Control System Air Handling Building Foundation Section View)

4.0 Pre-Operational Environmental Control Plan

Attachment A of this document includes the Pre-Operational Environmental Control Plan. This plan provides the dust control, soil excavation, soil management, stormwater management and erosion control requirements for the AWR construction activities.

5.0 List of Drawings

Attachment B contains the following drawings, which depicts the site preparation design for the AWR Project.

- 12FSD005 - Transfer Tank System General Notes
- 12FSD010 - Transfer Tank System Concrete Slab - SH. 1
- 12FSD011 - Transfer Tank System Concrete Slab - SH. 2
- 12FSD012 - Transfer Tank System Concrete Tank Pads - SH. 1
- 12FSD013 - Transfer Tank System Concrete Tank Pads - SH. 2
- 12FSD016 - Transfer Tank System Base Slab & Foundations Sections & Details
- 12FSD017 - Transfer Tank System TTA Bldg. Tank Pad FDNS Sections
- 12FSD025 - Transfer Tank System SWRS Miscellaneous Foundations
- 20FSD005 - Radon Control System (RCS) Carbon Bed Building Foundation Plan
- 20FSD014 - RCS Carbon Bed Building Foundation Section View
- 20FSD050 - RCS Air Handling Building Foundation Plan
- 20FSD059 - RCS Air Handling Building Section View
- 20FSD065 - RCS Air Handling Building Foundation Section View
- 05FCD012 - Misc. Facilities Civil Layout
- 05FCD013 - Misc. Facilities Utility Tie-In Locations
- 05FCD014 - Misc. Facilities Site Space Allocation
- 06FCD001 - Support Facilities Grading Plan Trailer Layout
- 06FCD003 - Support Facilities Misc. Detail Trailer Layout
- 12FCD001 - Transfer Tank System Grading Plan
- 12FCD002 - Transfer Tank System Excavation Plan
- 12FCD003 - Transfer Tank Site System Site Layout Plan
- 12FCD005 - Transfer Tank System Cross Sections Sheet 1
- 12FCD006 - Transfer Tank System Cross Sections Sheet 2
- 12FCD007 - Transfer Tank System Cross Sections Sheet 3
- 51FCD002 - Domestic Water System Underground Layout Plan Sheet 2
- 51FCD003 - Domestic Water System Underground Piping Details
- 61FCD001 - Sanitary Sewer System Layout Plan
- 61FCD002 - Sanitary Sewer System Details
- 66FCD001 - Storm Water System Overall Drainage Plan
- 66FCD002 - Storm Water System SWRS-Drainage Plan Phase 1
- 66FCD003 - Storm Water System Trailer Area Drainage Plan
- 66FCD004 - Storm Water System FSMS Drainage Plan
- 66FCD006 - Storm Water System Misc. Details, Sheet 1
- 66FCD007 - Storm Water System Profiles

6.0 List of Specifications

Attachment C contains the following construction specifications that support the AWR Site Preparation activities.

- 02220 - Site Demolition
- 02300 - Earthwork
- 02302 - Excavation, Backfill, and Compaction for Utilities
- 02370 - Slope Protection and Erosion Control
- 02373 - Separation/Filtration Geotextiles
- 02510 - Water Distribution
- 02530 - Sanitary Sewer
- 02630 - Storm Drainage
- 02722 - Aggregate and/or Graded-Crushed Aggregate Base Course
- 02731 - Aggregate Surface Course
- 02924 - Seeding

7.0 Integration of Design Documentation

The design evolution utilized on the Accelerated Waste Retrieval (AWR) is as follows:

• Conceptual Design	issued	October 1999
• Preliminary Design	issued	December 1999
• 100% Site Prep Design	issued	April 2000
• Remedial Design Package	planned	May 2000
• Final Design Package	planned	May 2000

The Conceptual Design was reviewed by Fluor Fernald, Inc., Department of Energy (DOE), and the Silos Project Critical Analysis Team (CAT). The comment resolutions were woven into the AWR Preliminary Design Package. The Preliminary Design Package went through a formal review and comment period by Fluor Fernald, Inc., DOE, and the CAT. FWENC addressed these issues and finalized the Site Preparation information in April 2000. The Remedial Design Package information is currently being finalized and plans are to issue in May of 2000. The Remedial Design Package will consist of the following information developed during Preliminary Design.

- Process/System Description - high level summary of the systems and process controls.
- Finalized Process Flow Diagrams.
- Berm Excavation Plan - Layout the plan for excavating berm during construction and operation activities.
- Silo Penetration Plan - Define the process by which the Silo Dome will be breached to support camera installation and enlarging manways.
- Contingency Plan and Emergency Response.
- Sampling Plan.
- Silo Environmental Monitoring Plan

The Final Design is currently being completed. The Final Design Package is a compilation of detail design that supports the Remedial Design/Preliminary Design Packages.

8.0 Environmental Protection Agency (EPA) Involvement

After receiving the United States EPA and Ohio EPA approval of the Site Preparation and Remedial Design Packages for the AWR Project, a Final Design Report will be issued documenting the approved Certified for Construction Design. Any necessary changes to the design documented in the Final Design Report will be documented, reviewed, and approved through a formal change control process. Design Change Notices (DCNs) will be provided to the USEPA and OEPA for information. Any comments or concerns regarding proposed changes will be promptly addressed.

9.0 Response to comments

Attachment D includes the following Response to Comment documents:

- Response to Ohio EPA Written Comments on the Site Preparation Package received on March 14, 2000.
- Response to Ohio EPA Verbal Comments on the Site Preparation Package received March 14, 2000.
- Response to United States EPA Written Comments on the Site Preparation Package received February 7, 2000.

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Attachment A
Pre-Operational
Environmental Control Plan

PRE-OPERATIONAL ENVIRONMENTAL CONTROL PLAN

FOR THE

SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL (AWR) PROJECT

April 2000

1.0 INTRODUCTION

This Pre-operational Environmental Control Plan (ECP) describes the methods and controls that are to be incorporated into the site preparation construction phase of the Accelerated Waste Retrieval (AWR) Project to minimize the impacts of these project activities on the environment. These methods and controls, as described in Section 2.0, are intended to minimize the environmental impacts of fugitive dust, storm water, erosion, and secondary waste resulting from AWR Project site preparation construction activities at the U.S. Department of Energy (DOE) Fernald Environmental Management Project (FEMP) site. The information presented in this plan is excerpted from the overall AWR Project Environmental Control Plan (Document No. 40710-624-P621-10, Rev. 0) to be submitted as part of the Remedial Design Package for the AWR Project.

The Site Preparation activities covered by this plan are:

- Set-up of office trailers and construction facilities
- Installation of erosion controls and fencing
- Construction of access roads and gravel parking areas
- Installation of utilities
- Installation of storm water and drainage controls
- Site grading and lay down area preparation
- Excavation and subgrade for foundations
- Installation of gravel, vapor barriers, and mud slabs for foundations
- Installation of pre-cast sumps, reinforcing steel, embedded items, piping and grounding related to the foundations
- Place concrete mat foundations for the TTA and RCS buildings

Berm excavation and construction of the foundations for the retrieval superstructure will not take place as part of the site preparation activities covered under this plan. These activities will be addressed in the Environmental Control Plan submitted as part of the AWR Project remedial Design Package.

AWR Project activities are to be performed in compliance with applicable environmental laws and regulations. These laws and regulations, at both the federal and state level, have been incorporated into Applicable or Relative and Appropriate Requirements (ARARs) for the AWR Project. Detailed discussion of compliance with ARARs and other applicable functional area requirements is provided in the AWR Project Environmental Control Plan (Document No. 40710-624-P621-10, Rev. 0) to be submitted as part of the Remedial Design Package for the AWR Project.

Overall FEMP site environmental monitoring is performed by Fluor Fernald. Data or information collected by Foster Wheeler in performance of the AWR Project environmental control activities, as described herein, are to be made available to Fluor Fernald for support of the FEMP site environmental monitoring efforts and for assessing compliance with the project ARARs and FEMP functional area requirements. Information is to be provided to Fluor Fernald from Foster Wheeler via the interfaces described in the Project Management Plan, Document No. 40710-624-P621-01, for the AWR Project.

2.0 METHODS AND CONTROLS

This section describes the various methods and controls to be incorporated into the site preparation construction identified in Section 1 to minimize impacts on the environment. These impacts are mitigated through the use of controls associated with fugitive dust, wastewater, storm water, erosion, and secondary waste generation.

2.1 Fugitive Dust Control

The spread of fugitive dust is controlled during the site preparation construction for the AWR Project in compliance with applicable regulations and Best Available Technology (BAT) requirements for control of fugitive dust emissions. Site-specific BAT control measures for fugitive dust control at the FEMP have been developed by DOE and approved by OEPA. These control measures are documented in RM-0047, "FEMP Fugitive Dust Control Requirements."

Implementation of fugitive dust control measures for the AWR Project, consistent with RM-0047, is described in detail in the "Fugitive Dust Control Plan for the AWR Project" (Document No. 40710624-P6455-01) which is provided as Appendix A to this document.

BAT dust control/work practice strategies to be implemented during AWR site preparation construction activities include:

- Apply water or other dust suppression or crusting agents in sufficient quantity to prevent dust generation but limited so that the application does not result in migration of the agent beyond work area boundaries, ponding, or disruption of other portions of work.
- As soon as fugitive dust emissions are visible, BAT dust controls and/or work practices must be implemented or increased.
- If the standard is exceeded, all mechanical dust-generating activities in the observed area must cease immediately. An increase of BAT dust controls and/or work practices needs to be implemented to bring the fugitive emissions to, at a minimum, below the standard during dust-generating activities (including wind erosion).

Specific BAT dust controls and/or work practices include:

- Application of dust suppression materials approved by appropriate Fluor Fernald personnel such as: water, resin, or equivalent combination of surfactant or crusting agents.
- Minimizing unnecessary traffic in and around field activities.
- Limiting speed of vehicles or equipment to 15 miles per hour or less during operation.
- Reduction in rate of excavation.
- Minimize the height of drop during loading and unloading.

- Changing the method of excavation/transport (e.g., from a front-end loader dumping into a truck to a self-propelled pan).
- Application of appropriate dust suppression agents such as water or surfactants, to the materials being transported by truck load beds to ensure the transported materials will not become airborne. Cover truck load beds when transported materials are still likely to become airborne.
- Application of dust suppression agents such as surfactants or crusting agents to storage piles.
- Wheel wash at the point of origin prior to entering any defined paved or unpaved roadways.
- Remove clods, clumps, tracks, or visible deposits of soils, mud or other materials that could readily become visible fugitive emissions from paved and treated unpaved roadways/parking areas. Apply appropriate dust control measures to suppress the generation of visible dust that may result from the removal process.

In addition, AWR Project field activities will be continuously observed by project personnel for visible emissions. The number of pieces or type of dust suppression equipment in operation controlling visible dust emission in a designated area will not preclude stopping project field activities in that area. During backshifts and off periods, the onsite Utility Engineer will be responsible for monitoring appropriate areas for fugitive dust generation and initiation of appropriate actions to mitigate fugitive dust generation that is observed. These actions can include calling in project personnel to implement corrective measures identified in the Fugitive Dust Control Plan.

Mechanical dust generating field activities in an observed area shall cease immediately if a fugitive dust standard or site-specific limit is exceeded for that observed area. An increase in BAT dust controls and/or work practices needs to be implemented to bring the fugitive dust emissions to, at a minimum, below the standard or limit during dust generating activities (including wind erosion).

2.2 Storm Water Control

The existing FEMP Storm Water Pollution Prevention Plan (PL-3083, Rev. 0) defines current requirements for management of storm water, consistent with the FEMP NPDES Permit (permit No. 1IO0004*FD) within the project site. The AWR Project area is contained within two drainage watersheds. The following paragraphs describe the existing and proposed storm water control measures at the AWR Project site to ensure the segregation and proper management of uncontaminated and contaminated storm water. These control measures are outlined in greater detail in drawings 66FCD001 through 66FCD006 and in the Storm Water Drainage Plan provided as Appendix B of this document.

Existing—An existing perimeter channel collects runoff from the Silo domes and the surrounding berms. The perimeter channel consists of a combination of small rectangular concrete channels, concrete curb, grates, and pipes. The perimeter channel drains to the Waste Pit Area Runoff Control Sump which was installed as part of CERCLA Removal Action 2 and is located 1,000 feet west-northwest of the silos. The sump has a capacity of 350,000 gallons. This sump also receives drainage from the waste pits to the north. A 12-in. main leads from the sump into the Bio-Surge Lagoon, which discharges to the Advanced Wastewater Treatment (AWWT) facility.

Areas not surrounded by the perimeter channel ultimately drain to the Pilot Plant Drainage Ditch (PPDD), which runs south of the project area and enters Paddy's Run at NPDES outfall STRM 4005, and drains a total of approximately 78 acres. As illustrated on Drawing No. 66FCD001, the majority of this area reaches the PPDD via an existing stormwater basin at the southeast quadrant of the project area. A few culverts cross the southern perimeter road and discharge storm water to the PPDD.

Proposed—Control measures will be employed during implementation of AWR Project activities to assure that impacts to natural resources in the Paddy's Run corridor are minimized. As described in the subsequent sections of this Plan, excavation activities have been planned to minimize the area disturbed. No disturbance (excavation, removal of trees, etc) is planned in areas immediately adjacent to Paddy's Run. Erosion and sediment control measures will be employed during excavation to prevent impacts from stormwater runoff. Finally, as discussed in Section 2.2.2, drainage patterns will be maintained to prevent impacts to Paddy's Run due to spills or releases during the operational phase of the AWR Project.

AWR Project activities will not change or move existing drainage divides. Erosion and siltation in the concrete channels surrounding Silos 1 and 2 will be prevented through erosion and sediment control measures identified in Section 2.3. The perimeter road functions as the outer limit of operations. Rainfall will not directly contact the TTA process area since it is equipped with a roof and gutter system. Contaminated storm water from this area is not anticipated.

Stormwater drainage during and after AWR Project site preparation construction activities is illustrated on Drawing 66FCD001. Drainage from the Silo 1 and 2 domes and berms, and from the Silo 4 area, will continue to be collected by the existing trench system and discharged to the Waste Pit Area Runoff Control Sump (WPSRC). As detailed on drawing 66FCD002, silt fence and sediment traps will be utilized to prevent silt buildup in the trench system. The trench will be included in the erosion and sediment control inspections to provide additional assurance that it has not become obstructed. For the purpose of designing the drainage and stormwater

controls for the AWR project, the Project area has been divided into eight drainage areas. These drainage areas are summarized below.

Drainage Area	Description	Outlet
1	Construction Trailer Area	Existing SE storm water basin at 18" outlet
2	Laydown Area	Existing SE storm water basin at CB-01
3	Assembly laydown/staging	Existing SE storm water basin at CB-01
4	TTA and RCS roof drains	Existing SE basin via 18" outlet
5	Area South of Silos 1 and 2	PPDD via CB-02
6	TTA control area	Basin at NE quadrant of project area
7	Silos 1 and 2 area	WPSRC sump via perimeter trench
8	Silo 4 area	WPSRC sump via existing drainage

These drainage areas, as well as the runoff coefficients and flows used to assure adequate capacity of the drainage system, are detailed on drawing 66FCD001. The calculations and rationale supporting the drainage plan are provided as Appendix B to this plan.

2.2.1 Employee Training

Construction personnel receive appropriate environmental and safety training based on their job requirements. Environmental awareness is raised by issuing periodic bulletins concerning such topics as spill control. Supervisors are responsible for providing on-the-job training with respect to hazardous materials handling and company environmental policy. This training is documented and records are kept onsite.

Work being performed on the AWR Project is required to comply with the environmental policies of the FEMP site. In addition, site personnel are to perform the work as specified in the applicable certified for construction (CFC) drawings and construction specifications.

Earthwork operations and general construction personnel are subject to normal industrial hazards, and therefore, appropriate precautions are to be taken. Employees are to be trained to follow appropriate Occupational Safety and Health Administration (OSHA) standards with regard to fall protection and trench safety. In addition, hazards involved in working around heavy equipment will be addressed during daily safety briefings, safe workplans, and in the project-Specific Health and Safety Plan. Specific safety measures to be employed include high visibility PPE, lights, and back-up alarms.

2.2.2 Spill Prevention Control and Countermeasures

The potential impact of a release resulting from failure of various AWR systems was considered during development of the stormwater drainage plan. The following three potential sources of release were evaluated.

1) Silo failure during retrieval
2) Failure of one of the TTA tanks
3) Failure of the Slurry transfer Line during retrieval

The potential impact of a failure at Silo 1 or 2 during retrieval is minimized by the design of the retrieval operation and by maintenance of the existing drainage system. First, the water flows to and from the silos during retrieval will be closely controlled to minimize the inventory of water in

the silo and to assure that the addition of water is stopped immediately upon a silo failure. Second, as will be outlined in the Berm Excavation plan to be submitted as part of the Remedial Design Package, excavation of the berms will be coordinated with the retrieval such that the level of material inside the silo will at all times be below the level of the berm outside the silo. Finally, as described in Section 2.3, drainage patterns and runoff controls will be maintained such that any release that was to escape the silo would be contained and directed to the WPSRC sump.

The release resulting from failure of one of the TTA tanks would be contained by the sealed concrete walls and floor of the TTA building. The floor drains to a sump which would be used to pump the contained material to an appropriate location, such as one of the other TTA tanks.

The transfer pipe used to transfer silo material from the Silo Waste Retrieval System to the TTA utilizes double-walled pipe to minimize the risk of pipe failure. As the transfer system will be designed to shut down in the event of a pipe failure, the amount of material potentially released in the event of a pipe failure would be limited to the inventory contained in the line – approximately 250 gallons, thus minimizing the likelihood that the release would drain beyond the project area. As illustrated on drawing 66FCD001, the majority of the area underneath the transfer line drains to the southeast stormwater basin. A valve will be installed at the outlet of the basin to allow any material that were to reach the basin to be contained before reaching the Pilot Plant Drainage Ditch.

The design and construction of hazardous material storage tanks (e.g., fuel tanks and chemical tanks) and secondary containment will conform to the CFC drawings and specifications. Tanks are to be located away from heavy traffic and protected with bollards as necessary. Containers five gallons in size (minimum) are required to be labeled with the appropriate Hazardous Identification Label (diamond) as identified in the National Fire Protection Association (NFPA) Code, NFPA-704.

Heavy equipment and mechanical equipment are to be maintained in good repair so as to minimize the release of engine, transmission, or other oils, engine coolants, or hydraulic fluids. Idle equipment is to be parked as far away from drainage channels as practical. A drip pan can be used under equipment that is leaking, with immediate action taken to repair the equipment or remove it from the FEMP site.

Fueling operations are to be performed with care, with allowances made for fuel expansion to prevent inadvertent small releases. Fuel tanks are to be contained within temporary dikes and inspected regularly. Spilled material is to be cleaned up as soon as practical, placed in appropriate containers, and managed accordingly.

If a spill occurs at the AWR Project site, safe and practical methods available are to be used to prevent material from entering storm water drainage channels. Spills are to be reported immediately to Fluor Fernald. Spill response kits containing absorbent material are to be available during construction, operations, and systems closure for the AWR Project and are to be located for easy access. Absorbent pillows, temporary earth dikes, or other means are to be readily available on-site for use, as appropriate, without risking personnel safety.

2.2.3 Inspections and Recordkeeping

The Construction Manager, or designee, is to conduct site inspections of the site during construction activities to confirm compliance with BMPs on a weekly basis, or within 24 hours of

a rainfall event exceeding 0.5 inches within a 24-hour period. Items to be inspected include, but are not limited to, the following:

- Conditions of erosion controls, such as:
  - Silt fences,
  - Drainage ways,
  - Gully formation,
  - Areas needing seeding or reseeding, and
  - Access roads.
- General housekeeping on-site;
- Evidence of silt build-up or obstruction of the Silos 1 and 2 perimeter trench
- Evidence of poor fueling practices or leaking fuel tanks;
- Evidence of leaks from other tanks or equipment; and
- Storm water channels inspected for oil sheen, debris, siltation, or other disturbance.

A written record of the inspection, including all notifications and deficiencies, is to be kept in the field office trailer and made available to FEMP personnel for review. Conditions noted during the inspections that require corrective action are to be repaired within 24 hours.

2.3 Erosion Control

Erosion controls are placed during the construction phase to minimize soil movement from excavated or disturbed areas. These controls are to be installed prior to the initiation of excavation in the affected areas. Erosion controls are detailed in Drawings 66FCD002, 66FCD003, 66FCD004, and 66FCD006 and Construction Specifications 02220, 02302, and 02370 for the AWR Project. These controls are based on standards specified in the FEMP Storm water Pollution Prevention Plan and the Ohio Department of Natural Resources (ODNR) Rainwater and Land Development Manual.

Several actions to lessen the environmental impact due to erosion are to be taken during AWR Project construction and operation:

- Every effort is to be made to keep disturbed areas to a minimum;
- Existing natural drainage is to be maintained where possible to avoid disturbing areas with vegetation;
- Silt fences are to be placed at the bottom of disturbed slopes and will be installed following the contours to the extent practical;
- Culvert entrances and exits are to be protected with riprap or geofabric;

- Disturbed areas to be idle for more than 45 days will be stabilized within 7 days of final work;
- Overseeding or reseeding (including fertilizing when necessary) are to be performed as necessary until vegetation is established;
- Silt is to be removed from diversion ditches and silt fences, as required by the applicable construction specifications, and at the end of construction. The silt will be disposed as excess soil;
- Erosion control measures are to be inspected at least weekly or within 24 hours of a rainfall event exceeding 0.5-in. within a 24-hour period; and
- Remediation of problems identified in the site inspections are to be completed within 24 hours.

2.6 Secondary Waste Management

It is expected that secondary waste generated by the site preparation activities governed by this plan will consist primarily of excavated soil. Excavation activities during AWR Project Site Preparation Construction activities will be implemented to minimize the volume of excess soil requiring disposal. The grading and excavation plans have been developed to minimize the area of soil disturbed. Wherever possible, excavated soil is used for fill within the project area. Specific practices used to control excavation activities include measures to prevent the spread of contamination due to excavation activities. Vehicles used to transport excess soil will be loaded within the controlled area and will be cleaned before exiting the area. Temporary working piles of soil to be used as backfill, as well as interim storage piles if needed, will be managed to prevent the spread of contamination and to assure control and segregation of soil for proper disposition.

Excavation activities for AWR Project site preparation construction activities consist of excavation for trailers and utility installation, preparation of laydown areas and excavation for the TTA and RCS building foundations. This excavation is estimated to generate approximately 6000 cubic yards of excess "meets-OSDF WAC Category 1" soil.

As documented in the "Phase II Soil Sampling Strategy for Area 7 Soils (Silos Project Area)," dated April 20, 1999, and approved by OEPA and USEPA, existing soil sampling data indicate that soil in the AWR Project Area meets the On-site Disposal Facility's (OSDF) waste acceptance criteria (WAC). The phase II Soil sampling strategy identifies locations in the staging area south of Silos 1 and 2 for additional uranium and technetium-99 samples. Additional OSDF WAC sampling locations in the proposed trailer area at the east end of the project area have been identified since the Phase II strategy was approved. These locations have been described to the Agencies in Variances/Field Change Notices.

Excavations will be monitored by a Fluor Fernald Waste Acceptance Organization (WAO) representative to ensure that OSDF WAC is met as described in the U.S. Dept. of Energy's WAC Attainment Plan for the OSDF. Excess soil will be characterized as either Category 1 (soil and soil-like material), Category 2 (debris), or Category 4 (organic or highly compressible). Materials will be segregated by OSDF category within the work area before being transported from the work area. FWENC will report the final volume of excess material generated to Fluor Fernald at the end of each normal working day.

As excess soil is generated and segregated into OSDF categories, it will be loaded into trucks within the project area and, if possible, transported directly to the OSDF. If interim storage of excess soil is required, the soil will be stored in the Temporary Excess Soil Staging Area north of the High Nitrate tank at the eastern edge of the Silos Project Area. If interim storage is required, separate piles will be maintained within this area for each OSDF category. Any piles will be constructed and managed in accordance with Specification 02302, Section 3.2.1.

All excess soil will be tracked by WAO through the use of the Field Tracking Log (FTL) to either the OSDF or, if necessary, to stockpiles within the Temporary Excess Soil Staging Area north of the High nitrate tank. If interim storage is necessary, any soil placed in the Temporary Excess Soil Staging Area will subsequently be manifested prior to dispositioning in the OSDF from the Temporary Excess Soil Staging Area. Additionally, any interim material movements (whether soil or debris) between Material Tracking Locations (MTLs) established by WAO, other than stockpiles, will be tracked by WAO using the FTL.

During construction and excavation, materials may be encountered which may not meet the OSDF WAC or Envirocare WAC. Upon discovery of these materials by FWENC, the Fluor Fernald Construction Manager shall be notified and will require further evaluation through the use of the Fluor Fernald's real-time monitoring and OSDF WAC Attainment Plan. Any OSDF above-radiological WAC material that meets the Envirocare WAC will be dispositioned to SP-7. No excavation of berm material is planned during site preparation construction activities. Excavation of berm material for construction of the Retrieval System Superstructure foundations, as well as excavation of the berm during retrieval, will be specified in detail in the Berm Excavation Plan submitted as part of the Remedial Design Package.

Construction Waste and Debris

Small quantities of other debris and waste, such as wood, vegetation and PPE, may also be generated during site preparation activities. These materials will be segregated by material type and characterization and surveyed by radiological Control personnel in accordance with procedure RP-0009, "Radiological Requirements For The Release Of Materials at the FEMP. They will be containerized and appropriately disposed in accordance with waste management procedures.

Unknown Debris Management

If any previously buried debris (e.g. conduit, piping, concrete) is encountered during excavation, excavation activity will be halted and the debris will be managed in accordance with Fluor Fernald Safe Work Plan requirements as outlined in ACR-002. The debris will be characterized and appropriately disposed before resuming the excavation.

APPENDIX A

FUGITIVE DUST CONTROL PLAN

FOSTER WHEELER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

FUGITIVE DUST CONTROL PLAN

DOCUMENT NO.
624-P6455-01, Rev. 0

FOR THE

SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL (AWR) PROJECT

SUBMITTED TO:

FLUOR FERNALD, INC.

CONTRACT NO. FSC 624

February 28, 2000

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: Date: 2/29/00

FOSTER WHEELER ENVIRONMENTAL CORPORATION

FUGITIVE DUST CONTROL PLAN

Revision 0

Recommended by:

John Lawson

Foster Wheeler Engineering Manager

2/28/00

Date

Approved by:

for Ed Nelson

Gary L. Galloway

Foster Wheeler Project Manager

2/28/00

Date

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ACRONYMS

AWR	Accelerated Waste Retrieval
BAT	Best Available Technology
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EC	Emergency Coordinator
FEMP	Fernald Environmental Management Project
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
RM	Requirements Manual
S&H	Safety and Health
TBD	to be determined

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1.0 INTRODUCTION

As part of the Accelerated Waste Retrieval (AWR) Project at the U.S. Department of Energy (DOE) Fernald Environmental Management Project (FEMP) site, Foster Wheeler is required to perform fugitive dust control and emissions control in accordance with Exhibit 6.4, "Fugitive Dust Control Requirements", of the AWR Contract. The FEMP requirements also include the development of a Fugitive Dust Control Plan for the AWR Project, which is to be prepared in accordance with Exhibit 6.4 of the AWR Contract, and provided to Fluor Fernald, Inc. (Fluor Fernald) 30 days prior to construction for compliance review.

1.1 Purpose of Plan

This Fugitive Dust Control Plan is to be implemented at the AWR Project site for those activities with the potential of generating fugitive dust, as described in Sections 2 and 3 of this Plan. The mitigation of fugitive dust for specific portions of the AWR Project will also be addressed in Safe Work Plans and related procedures for those portions of work scope.

To meet the AWR Contract and FEMP site requirements, this Fugitive Dust Control Plan includes:

- A listing of specific types and quantities of equipment to be used for dust suppression;
- A listing of proposed methods and materials that will be used to proactively suppress dust;
- The frequency that routine dust suppression shall take place;
- A narrative description of how AWR Project field personnel will implement this Plan and how they will monitor for excessive or visible dust (including how records will be kept and where they will be maintained); and
- A description of the notification process that Foster Wheeler intends for Fluor Fernald to utilize during non-work periods to inform Foster Wheeler of a dust alert.

1.2 Background

Best Available Technology (BAT) dust controls or work practices to be implemented at the FEMP site must be approved by the Ohio Environmental Protection Agency (OEPA). Some BAT dust control/work practice strategies include:

- Apply water or other dust suppression or crusting agents in sufficient quantity to prevent dust generation but limited so that the application does not result in migration of the agent beyond work area boundaries, ponding, or disruption of other portions of work.
- As soon as fugitive dust emissions are visible, BAT dust controls and/or work practices must be implemented or increased.

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- If the standard is exceeded (see Section 1.5 of this Plan), all mechanical dust-generating activities in the observed area must cease immediately. An increase of BAT dust controls and/or work practices needs to be implemented to bring the fugitive emissions to, at a minimum, below the standard during dust-generating activities (including wind erosion).

For each project at FEMP, a Fugitive Dust Control Plan is prepared to address the reasonably available control measures, such as wetting with limited amounts of water or other suitable dust suppression chemicals, that are necessary to prevent loose soil particles from becoming airborne in moderate to heavy winds. The potential for fugitive dust is the highest during soil removal, staging, stockpiling, and transporting activities associated with construction projects. Demolition activities can also generate fugitive dust.

The spread of fugitive dust must be controlled during the execution of the AWR Project to maintain compliance with applicable State of Ohio regulations for restricting emissions of fugitive dust (i.e., Ohio Administrative Code [OAC] 3745-17-08) and the FEMP site fugitive dust control requirements. The FEMP site requirements are specified in the FEMP Requirements Manual RM-0047, *Fugitive Dust Control Requirements* (Fluor Fernald 1997), which stipulates that each project at FEMP develop a project-specific plan to describe:

- How field activities will be monitored for fugitive dust releases;
- What methods will be used to control fugitive dust releases;
- What records will be kept and maintained; and
- What notification process will be used after discovering fugitive dust release.

1.3 Organization of Plan

This Fugitive Dust Control Plan has been prepared in accordance with Exhibit 6.4 of the AWR Contract and to be consistent with FEMP RM-0047, *Fugitive Dust Control Requirements*. In order to address each of the plan elements specified in Exhibit 6.4 of the AWR Contract and to meet the intent of FEMP RM-0047, this Plan is organized as follows:

- Section 1 – Introduction;
- Section 2 – Types and Quantities of Dust Suppression Equipment;
- Section 3 – Dust Suppression Methods and Materials;
- Section 4 – Frequency of Routine Dust Suppression;
- Section 5 – Implementation, Monitoring, and Recordkeeping;
- Section 6 – Dust Alert Notification for Non-Work Periods; and
- Section 7 – References.

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1.4 Definitions

The following are definitions of terms used in this Fugitive Dust Control Plan. These definitions have been taken from applicable guidance documents, FEMP site plans, and regulatory citations such as OAC 3745-17-01 and the Ohio Revised Code (ORC) 3704.01.

Best Available Technology (BAT) – Any combination of work practices, raw material specifications, throughput limitations, source design characteristics, an evaluation of the annualized cost per ton of pollutant removed, and air pollution control devices that have been previously demonstrated to the Director of Environmental Protection to operate satisfactorily in this state or other states with similar air quality on substantially similar air pollution sources.

Emit or emission – The release into the ambient air of an air contaminant.

Emission limitation or emission standard – A requirement that limits the quantity, rate, or concentration of emissions of air contaminants, including any requirement relating to the operation or maintenance of an air contaminant source.

Fugitive dust – Particulate matter that is emitted from any source by means other than a stack.

Fugitive dust source – Any source that emits fugitive dust or that emitted fugitive dust prior to the installation of any control equipment that was installed on or after February 15, 1972.

Material handling/vehicle traffic on storage piles – Includes activities such as loading in and loading out of materials, excavation, and vehicle traffic on storage piles. Fugitive emissions created by the above activities on storage piles shall be subjected to the standard defined in Section 2 of RM-0047. Fugitive emissions that cannot be distinguished between material handling activities and wind erosion will also be subjected to the standard defined in Section 2 of RM-0047.

Opacity – The degree to which emissions reduce the transmission of light and obscure the view of the background.

Particulate emissions – Particulate matter measurable by the applicable test methods in Appendix A of Title 40 of the Code of Federal Regulations (CFR), Part 60, "Standards of Performance for New Stationary Sources".

Particulate matter – Any material, except water in uncombined form, that is or has been airborne, and exists as a liquid or a solid at standard conditions.

Paved roadway or paved parking area – A predetermined area designed and improved specifically for vehicle traffic. Improvements to the predetermined area include the application of materials such as asphalt or concrete that forms a firm level surface for travel.

Unpaved roadway or unpaved parking area – A predetermined area designed and improved specifically for vehicle traffic. Improvements to the predetermined area include

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the application of gravel, shredded shingles, cinders, compaction, etc., to the delineated area.

Visible particulate (fugitive) emissions – Visible airborne particulates that are generated from the operation of heavy equipment, equipment wheels or tracks, any tools, or vehicle wheels. Visible particulate emissions are also those generated by wind erosion. Regulatory methods that will be used for visual determination of fugitive emissions are Method 9 of 40 CFR 60, Appendix A (to be used by Fluor Fernald) and Method 22 (to be used by Foster Wheeler).

Wind erosion of storage piles – Fugitive emissions from storage piles strictly created by the wind (and not the material handling equipment or vehicle traffic).

1.5 FEMP Site-Specific Limits and OEPA Standard

For the AWR Project, Foster Wheeler must comply with the following FEMP site-specific limits and OEPA standard for fugitive dust emissions:

- Visible particulate emissions from any paved roadway or paved parking area shall not exceed one minute during any sixty-minute observation period (FEMP RM-0047).
- Visible particulate emissions from any unpaved roadway, unpaved parking area, project field activities, or wind erosion from storage piles shall not exceed three minutes during any sixty-minute observation period (FEMP RM-0047).
- Visible particulate emissions from project field activities/areas shall not exceed twenty percent (20%) opacity as a three-minute average (OAC 3745-17-07[B][1]).

In accordance with Exhibit 6.4 of the AWR Contract, Foster Wheeler is required to verify compliance with the FEMP site-specific limits for visible particulate emissions using Method 22 of 40 CFR 60, Appendix A, "Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares". Fluor Fernald will provide opacity monitoring for the AWR Project to verify compliance with the OEPA standard for visible particulate emissions and forward the resulting information to Foster Wheeler (see Section 5.2 of this Plan).

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2.0 TYPES AND QUANTITIES OF DUST SUPPRESSION EQUIPMENT

In accordance with OAC 3745-17-08, *Restriction of Emission of Fugitive Dust*, the use of water or other suitable dust suppression chemicals is required for the control of fugitive dust from the demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land. As part of the AWR Project, activities associated with the potential generation of fugitive dust include:

- Soil excavation associated with the placement of foundations, roadway/parking area, culverts, and trailers;
- Berm excavation around Silos 1 and 2;
- Loading, transporting, and unloading of excavated soils;
- Demolition of pump house on Silo 4 bridge;
- Installation of doorways in Silo 4 concrete;
- Onsite mixing and placement of surrogate material in Silo 4; and
- Concrete penetrations of Silos 1 and 2.

In accordance with RM-0047, *Fugitive Dust Control Requirements*, the number of pieces or type of dust suppression equipment in operation controlling visible dust emission in a designated area will not prevent the stopping of project field activities in that area, if warranted, or impede equipment working in that area. Foster Wheeler plans to use potable water to the extent possible in controlling fugitive dust emissions associated with soil excavations and concrete demolition/penetration activities for the AWR Project. Water will be available at the site in either a water tanker truck (approximately 3,500-gallon capacity) with spray bar attachment or various water hoses and water spray cans, depending on the activity and respective potential for dust generation. If dust suppression materials other than water are to be used, then Foster Wheeler will seek Fluor Fernald approval of such materials prior to use.

Minimal amounts of water will be used in the cases of concrete penetrations and minor demolition work. Other dust control measures or BAT work practices include the use of trucks with covered beds for the loading, transporting, and unloading of excavated soil at the AWR Project site. Further discussion relating to dust suppression methods and materials is provided in Section 3 of this Plan. In addition, Safe Work Plans and related procedures that are developed for specific portions of the AWR Project will address mitigation measures associated with potential fugitive dust generation, and therefore, are not detailed in this Plan.

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3.0 DUST SUPPRESSION METHODS AND MATERIALS

This section describes the BAT methods and materials to be used for dust suppression for respective field activities as part of the AWR Project. AWR Project personnel shall proactively suppress dust releases from field activities by applying BAT dust control (such as the application of water, dust suppression agents, or other appropriate methods approved by appropriate Fluor Fernald personnel) and/or implementing BAT work practices at the beginning and during field activities. Water is the proposed dust suppression material for the AWR Project.

3.1 Soil Excavation and Handling

As part of the AWR Project, field activities include the excavation, removal, and handling of soil associated with placement of facility foundations, silo berm removal, and the development of roadway/parking area and associated drainage improvements. The following BAT dust controls and/or work practices for these types of AWR Project activities are to be applied progressively as environmental conditions dictate:

- Work areas, stockpiles, working piles, etc., shall be appropriately controlled before the end of each shift.
- In dry conditions, dust control shall be initiated before each work shift and during lunch breaks.
- Application of dust suppression materials approved by appropriate Fluor Fernald personnel such as water, resin, or equivalent combination of surfactant or crusting agents. Water is the proposed dust suppression material for the AWR Project.
- Minimize the amount of unnecessary traffic in and around field activities.
- Limit speed of vehicles or equipment to 15 miles per hour (mph) or less during operation. The speed limit shall be reduced, as required, to minimize dust generation.
- Reduce rate of excavation.
- Minimize the height of drop during loading and unloading.
- When feasible, change method of excavation/transport (e.g., from a front-end loader dumping into a truck to a self-propelled pan).
- Apply appropriate dust suppression agents such as water or surfactants (approved by Fluor Fernald) to the materials being transported by truckload beds to ensure the transported materials will not become airborne.
- Soil and like material shall not be visible above the vehicle's body. Change configuration of material being transported (i.e., place less in truck) as necessary.
- Cover truckload beds when transported materials are still likely to become airborne.

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- Apply dust suppression agents such as surfactants or crusting agents to interim storage piles.
- If practical, storage piles shall be covered with a tarpaulin, plastic, etc.
- Soils in work areas and placed in piles shall be rolled at the end of each workday.
- For areas of extended periods of inactivity, vegetate area if protective cover or periodic application of surfactant or crusting agents prove ineffective. This activity is considered as a last resort measure.

Mechanical dust-generating field activities in an observed area shall cease immediately if a fugitive dust standard or site-specific limit is exceeded for that observed area. An increase in BAT dust controls and/or work practices needs to be implemented to bring the fugitive dust emissions to, at a minimum, below the standard or limit during dust generating activities (including wind erosion). In accordance with OAC 3745-17-07(B)(1), the standard visible particulate emissions from AWR Project field activities shall not exceed twenty percent (20%) opacity as a three-minute average.

3.2 Materials/Equipment Hauling and Vehicle/Equipment Traffic

AWR Project activities will involve the hauling of materials and equipment at the FEMP site and the associated vehicle/equipment traffic. Whether these activities are performed on paved or unpaved surfaces (see Section 1.4, Definitions), the following BAT practices and measures are to be applied progressively as environmental conditions dictate to minimize fugitive dust:

- Wheel wash at the point of origin prior to entering any defined paved or unpaved roadways.
- Any clods, clumps, tracks, or visible deposits of soil or mud from *paved* roadways or parking areas shall be swept or otherwise removed, applying appropriate dust control measures to suppress the generation of visible dust that may result from the sweeping or removal process.
- Any clods, clumps, tracks, or visible deposits of soil or mud from *unpaved* roadways or parking areas shall be removed, as practical, applying appropriate dust control measures to suppress the generation of visible dust that may result from the removal process.
- Apply appropriate dust control mechanism such as water or surfactants to the materials being transported by truck load beds to ensure the transported materials will not become airborne. Cover truckload beds when transported materials are still likely to become airborne.
- Minimize the amount of unnecessary traffic on roadways, parking areas, and areas around field activities and limit speeds to 15 mph or less. Reduce speed limit, as required, to minimize dust generation.
- Roadway shoulders shall be maintained.

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On *paved* roadways and parking areas (see Section 1.4, Definitions), no visible particulate emissions are allowed except for a period of time not to exceed one minute during any sixty-minute observation period. On *unpaved* roadways and parking areas (see Section 1.4, Definitions), no visible particulate emissions are allowed except for a period of time not to exceed three minutes during any sixty-minute observation period.

3.3 Other AWR Project Field Activities

The AWR Project includes some field activities that are not readily defined by the categories of work described in Sections 3.2 and 3.3. Safe Work Plans and procedures will be developed for specific portions of the AWR Project, including some with potential dust-generating work activities, that will include mitigation measures for fugitive dust generation.

For example, the onsite mixing and placement of surrogate material in Silo 4 will be performed in accordance with an approved Safe Work Plan that addresses specifically how the material is carefully mixed, controlled, and placed in the silo. Other field activities described in various AWR Project Safe Work Plans include the following:

- Demolition of pump house on Silo 4 bridge;
- Installation of doorways in Silo 4 concrete; and
- Concrete penetrations of Silos 1 and 2.

In all cases, BAT dust controls and/or work practices are to be applied progressively as environmental conditions dictate to minimize fugitive dust. AWR Project personnel shall proactively suppress dust releases from field activities by applying BAT dust control (such as the application of water, dust suppression agents, or other appropriate methods approved by appropriate Fluor Fernald personnel) and/or implementing BAT work practices at the beginning and during field activities. Water is the proposed dust suppression material for the field activities identified above.

As with other AWR Project field activities, any mechanical dust-generating field activities in an observed area shall cease immediately if a fugitive dust standard or site-specific limit is exceeded for that observed area. An increase in BAT dust controls and/or work practices needs to be implemented to bring the fugitive dust emissions to, at a minimum, below the standard or limit during dust generating activities (including wind erosion). In accordance with OAC 3745-17-07(B)(1), the standard visible particulate emissions from AWR Project field activities shall not exceed twenty percent (20%) opacity as a three-minute average.

4.0 FREQUENCY OF ROUTINE DUST SUPPRESSION

In accordance with RM-0047, *Fugitive Dust Control Requirements*, AWR Project personnel should continuously observe field activities for visible emissions. At the start of each day and periodically throughout the day, AWR Project personnel (both Fluor Fernald and Foster Wheeler) are to tour paved/unpaved roads, parking areas, storage piles, and active AWR Project field activities to proactively apply BAT fugitive dust control and/or work practices to minimize dust generation. Before fugitive emissions are visible, BAT dust controls and/or work practices are to be implemented or increased.

If FEMP site limits are exceeded, then all mechanical dust-generating activities, including traffic on roadways in the observed area, shall be ceased immediately. An increase of BAT dust controls and/or work practices are to be implemented immediately to bring the fugitive emissions, as a minimum, below the limit during dust-generating activities (including wind erosion). BAT practices and measures are to be applied progressively as environmental conditions dictate to minimize fugitive dust. Fluor Fernald must concur that the method to suppress the fugitive dust has been appropriately executed by Foster Wheeler before work can restart.

5.0 IMPLEMENTATION, MONITORING, AND RECORDKEEPING

This section describes how AWR Project personnel will implement this Fugitive Dust Control Plan, including the monitoring for excessive or visible dust and how records will be kept and maintained. Safe Work Plans and related procedures will also be developed for specific portions of the AWR Project that include work activities such as the onsite mixing and placement of surrogate material, concrete penetrations of silos, etc., and will address mitigation measures associated with potential fugitive dust generation.

5.1 Plan Implementation

This Fugitive Dust Control Plan is to be implemented at the AWR Project site for those activities with the potential of generating fugitive dust, as described in Sections 2 and 3 of this Plan. The Project Manager for the AWR Project has the ultimate responsibility for the proper implementation of this Plan and the accuracy of its content over the course of the AWR Project.

A controlled copy of this Plan will be maintained at the AWR Project site and will be available for reference over the course of the AWR Project. During the construction phase of the AWR Project (including mobilization), the Construction Manager has the direct responsibility for the implementation of this Plan. During the operations/ maintenance/system closure phase, the Operations/Maintenance/System Closure Manager has this responsibility. The Foster Wheeler Site Safety and Health (S&H) Representative for the AWR Project is the primary person responsible for ensuring the proper fugitive dust observations are conducted at the site.

5.2 Monitoring

AWR Project personnel at the site are required to observe field activities for visible emissions. The Foster Wheeler Site S&H Representative is the primary person at the site responsible for ensuring this requirement is met for the AWR Project. Personnel involved in performing compliance surveillance (i.e., monitoring) to ensure that fugitive dust from AWR Project field activities are meeting fugitive dust standards or limits are required to have the following Fluor Fernald-provided training:

- 40 CFR 60 Appendix A, Method 22 "Visual Determination of Fugitive Emissions from Material Sources and Smoke Emission from Flares".

In accordance with RM-0047, *Fugitive Dust Control Requirements*, Fluor Fernald provides opacity monitoring for each project at FEMP and forwards respective information to the contractor performing work. Foster Wheeler is required to provide continuous monitoring of AWR Project field activities for visible fugitive dust, and keep records as described in the next section.

5.3 Recordkeeping

When performing visible emission monitoring for paved and unpaved roadways, paved and unpaved parking areas, and wind erosion from storage piles, Foster Wheeler will document and submit to Fluor Fernald daily the visual determination of fugitive emissions form (see Appendix

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B, "Method 22- Visual Determination of Duration Period for Fugitive Emissions"). AWR Project files including these daily records are maintained in accordance with the *Records Management Plan*, Document No. 624-P621-04, for the AWR Project.

The Foster Wheeler Site S&H Representative, or designee, will keep field records regarding fugitive dust emissions as part of his/her daily field logbook. Appendix A provides an example form that will be completed by the Foster Wheeler Site S&H Representative, or designee, as a daily record of fugitive dust control activities at the AWR Project site. Instructions for completing the form are also provided in Appendix A. This form is to be completed each time an application of dust suppression material is performed. The forms are submitted to Fluor Fernald on a weekly basis.

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6.0 DUST ALERT NOTIFICATION FOR NON-WORK PERIODS

At least one AWR Project personnel, typically the Foster Wheeler Emergency Coordinator (EC), will be on-call during non-work periods seven days per week, including holidays, to respond to the generation of visible dust during off-hours. Table 6-1 provides a list of the primary and alternate contacts for the AWR Project personnel that will be on-call during non-work periods for the different phases of the AWR Project.

Table 6-1. On-Call Contacts for the AWR Project

Contact	AWR Project Phase	Phone Number	Cellular/Pager Number
Primary			
Construction Manager[1]	Construction[2]	TBD[3]	TBD
Alternate			
Project Manager	Construction	TBD	TBD
Site S&H Representative	Construction	TBD	TBD
Primary			
Senior Shift Supervisor[1]	Operations/Maintenance/ System Closure	TBD	TBD
Alternate			
Project Manager	Operations/Maintenance/ System Closure	TBD	TBD
Site S&H Representative	Operations/Maintenance/ System Closure	TBD	TBD

Notes:
[1] Denotes the Foster Wheeler EC for respective phase of the AWR Project.
[2] Construction includes mobilization activities.
[3] TBD = To be determined, upon relocation of AWR Project personnel to the FEMP site during mobilization of field activities for the AWR Project.

Dust suppression is to begin no more than two (2) hours after notification by Fluor Fernald during non-work periods. Foster Wheeler will apply enough BAT dust control material to bring the fugitive dust below the applicable standard or site-specific limit. In addition, the on-call personnel identified in Table 6-1 who responded to the dust alert will not leave the FEMP site without Fluor Fernald concurrence that sufficient controls are in place in accordance with this Fugitive Dust Control Plan.

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7.0 REFERENCES

The following references were consulted in the development of this Fugitive Dust Control Plan:

- Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A – Test Methods.
- (Fluor Fernald 1997), FEMP Requirements Manual RM-0047, "Fugitive Dust Control Requirements", Revision 0, August 22, 1997.
- Ohio Administrative Code (OAC), Chapter 3745-17, "Emissions of Particulate Matter", Approved Edition, Anderson Publishing Company, September 5, 1999.
- Ohio Revised Code (ORC), Chapter 3704, "Air Pollution Control", Anderson Publishing Company, October 15, 1999.

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APPENDICES

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APPENDIX A

CONTROL OF FUGITIVE DUST EMISSIONS
DAILY RECORD

Date: _____

Time	Area Treated (see sketch)	Treatment Method	Application Rate	Equipment Operator

Instructions:

Enter on form the following:

- Identification of area that was treated and/or cleaned. Record using sketch on back of form, or by attaching similar diagram at appropriate scale.
- The time and date the designated area was treated and/or cleaned.
- The manner the designated area was treated and/or cleaned.
- The application rate of dust suppression material (as a minimum, the tank truck load capacity and number of truckloads applied per unit of time per area, or segment, to which applied.
- The equipment operator (as a minimum, the name of the Contractor or subcontractor firm).

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APPENDIX B

METHOD 22 – VISUAL DETERMINATION OF DURATION PERIOD OF FUGITIVE EMISSIONS FORM

METHOD 22 – VISUAL DETERMINATION OF DURATION PERIOD OF FUGITIVE EMISSIONS

OUTDOOR LOCATION

Company	Observer
Location	Team
Co. Rep.	Date
Sky Condition	Wind Direction
Precipitation	Wind Speed
Project	Activity observed

Dust abatement operations _____
(i.e., water spray, tarping, or slow speeds)

Souce(s) of dust emissions _____
(i.e., earthmoving equipment, trucks, wind entrainment)

Other observations _____

Attach map of area being observed or draw sketch in space below (use FEMP site drawing from RM-0047) indicating area being observed. Indicate observer's position relative to source, emission points, and the sun.

OBSERVATIONS	Clock Time	Observation period duration (min:sec)	Accumulated emission time (min:sec)
Beginning			
End			

Notes:

Note: Method 22 is described in Appendix A of 40 CFR 60. Training is provided by Fluor Fernald.

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APPENDIX B

STORMWATER DRAINAGE CALCULATIONS

ATTACHMENT 1

FOSTER WHEELER ENVIRONMENTAL CORPORATION
CALCULATION COVER SHEET

Sheet 1 of 6

PROJECT FDF SITE 142 AREA SUBJECT STORMWATER DRAINAGE

CLIENT FLUOR DANIEL FERNALD

CALCULATION NO. CA-FSC624-FC-001 PROJECT NO. FSC 624

NO OF SHEETS 6 + 19 (ATTACH. A) DESIGN LEVEL

CALCULATION BY OTHERS ____ YES X NO PREPARER M. HUGHES

REVIEWED BY ____ DATE ____

ASSUMPTIONS THAT REQUIRE CONFIRMATION ____ YES X NO

ASSUMPTIONS CONFIRMED BY ____ DATE ____

PRINT NAME, DATE AND INITIAL

Rev No	Affected Sheets	Prepared by Date	Checked by Date	Verified by Date
0	All	M. Hughes MSH 1/13/00	V. BHATT 1/13/00	
0	ATTACH. A	M. Hughes MSH 1/13/00	V. Bhatt 1/18/00	
1	2,5,6,7	M. Hughes 3/23/00	V. Bhatt 3/23/00	
1	A2, A7, A8, A9, A15, A23	M. Hughes 3/23/00	V. Bhatt 3/23/00	

-1- FOSTER WHEELER ENVIRONMENTAL CORPORATION								
PROJECT: Fernald Silos 1 and 2 AWR					SUBJECT: Stormwater Drainage			
Revision	1							Sheet 2 of 7
By / Date	MSH	3/23/00						Project No: 2122.0308
Ch / Date	[illegible]	3/23/00						Calc: CA-FSC624-FC-001

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Criteria:

The purpose of this calculation is to analyze existing and proposed stormwater drainagefor the Silos 1 & 2 project area at the U.S. Department of Energy facility in Fernald, Ohio. The calculations are developed to ensure the existing FEMP Stormwater System (SWS) together with any improvements and modifications required to support the AWR project meets the specific requirements of the Technical Requirements Document (TRD). Design and analysis includes calculations of pre- and post-development storm flows to determine the change in flow and loading to the existing AWR project area storm drainage system and to determine the need for modifications, if necessary, to the existing SWS..

Specific requirements for the Storm Water System (SWS) are listed in Section 2.3.2.1 of the Technical Requirements Document (Reference 7) and are attached as part of this report. This calculation supports the Storm Water System Drainage Plan submitted for EPA Approval Drawings 66FCD001 through 66FCD006 . Drawing 66FCD005 has been deleted and is not part of this Package. R1

Applicable Codes, Standards and Regulations:

1. Location and Design Manual Volume 2 – Drainage Design, April 1992. Ohio Department of Transportation (ODOT).
2. Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Seventeenth Edition, 1995. American Association of State Highway and Transportation Officials (AASHTO).
3. Construction and Material Specifications, January 1997. Ohio Department of Transportation (ODOT).
4. Rainwater and Land Development (Standards for Stormwater Management, Land Development and Urban Protection), Second Edition, January 1996. Dan Mecklenburg, Ohio Department of Natural Resources (ODNR).

Methodology:

The rational method, Q = CIA, will be used to determine storm water runoff for each drainage area. Then Manning's equation ($V = 1.49 \times R^{0.67} \times S^{0.5} / n$) will be used to determine the capacities for concrete drainage channel segment around Silos 1 and 2.. Manning's equation can be applied to ditches and culverts equally to determine velocity. The distance from the K-65 trench to the drainage culvert south of the drainage areas is approximately 280 feet. Time of travel is approximately 4 minutes for each drainage area at a general slope of .01 ft/ft, so a duration time of ten minutes is used to obtain rainfall intensities. Rainfall intensity for 10 minutes of a 10-year storm is approximately 5.4 inches per hour 6.6 inches per hour for the 25-year storm (Reference 4).

Assumptions:

1. The existing FEMP SWS in the AWR Project Area currently meets the technical requirements for the SWS as specified in the Technical Requirements Document (TRD) Reference 7.

2. Site Layout and Grading will be revised as necessary to facilitate existing Project Area drainage per Final Construction Drawings.

3. Activities related to the AWR Project are not anticipated to generate contaminated storm water. However, Areas 7 & 8 are located within "potentially contaminated" areas as designated by FEMP and therefore stormwater from these areas will continue to be collected by the existing concrete perimeter ditch system and conveyed to the Bio-Surge

lagoon for handling by the existing site SWS as "potentially contaminated" stormwater. This is consistent with the currently acceptable approach.

4. Capacity calculations for Areas 1, 2, 3, 4, & 5 are based on 2 headwaters (i.e., 24 inches of stormwater above the invert of a 12 dia. pipe), at discharge culverts CB-01, CB-02 and the 18" dia. storm pipe located in the southeast portion of the east perimeter trench. R1

Applicable Background Data:

1. Waste Pit Area Stormwater Control, EH&S Improvements project, A.M. Kinney Inc, (Revision 0, CFC, December 1990), Revision 1, As-built, August 1993:
   - Drawing 40A-4445-G-00055, Location Plan, 1"=100'
   - Drawing 40A-4445-G-00056, Site Plan, 1"=100'
   - Drawing 40A-4445-G-00057, Grading Plan #1, 1"=100'
   - Drawing 40A-4445-G-00058, Grading Plan #2, 1"=100'
   - Drawing 40A-4445-G-00063, Trench Drain Profiles, 1"=33' H and 1"=10' V
   - Drawing 40A-4445-G-00065, Site Details, scale as shown
2. Drawing 94X-5900-G-00898, Civil Utility Plan, Layout of Utilities and Tie-ins, Parsons, Revision 5, As-built, September 1997.
3. Underground Utilities, Fernald Environmental Restoration Management Corporation, April 1998:
   - Grid 31A, Drawing 22A-5500-P-00804, Revision 6, 1"=60'
   - Grid 31B, Drawing 22A-5500-P-00805, Revision 7, 1"=40'
4. Silos Infrastructure Project, Fluor Daniel Northwest, Project 40315, <as-built eventually>, <later 1999>:
   - Drawing 94X-6100-G-02210, Plan & Profile #1, 1"=50' H and 1"=5' V
   - Drawing 94X-6100-G-02211, Plan & Profile #2, 1"=50' H and 1"=5' V
   - Drawing 94X-6100-G-02212, Plan & Profile #3, 1"=50' H and 1"=5' V
   - Drawing 94X-6100-G-02213, Cross sections #1, 1"=10'
   - Drawing 94X-6100-G-02214, Cross sections #2, 1"=10'
   - Drawing 94X-6100-G-02215, Cross sections #3, 1"=10'
   - Drawing 94X-6100-G-02216, Cross sections #4, 1"=10'
   - Drawing 94X-6100-G-02217, Cross sections #5, 1"=10'
   - Drawing 94X-6100-G-02214, Trench Drain Profiles, 1"=33' H and 1"=10' V

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References:

1. Hydraulic Design of Highway Culverts, FHWA Hydraulic Design Series No. 5, Federal Highway Administration, September 1985.
2. Soil Conservation Service Technical Release No. 55, Urban Hydrology for Small Watersheds, 1986.
3. Technical Paper No. 40, Rainfall Frequency Atlas of the US for Durations From 30 Minutes to 24 Hours & Return Periods From 1 to 100 Years, Weather Bureau, May 1961.
4. NOAA Technical Memorandum NWS Hydro-35, Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States, National Oceanic and Atmospheric Administration, June 1977.
5. Construction Castings, Neenah Foundry Company, Catalog "R", 11th Edition, Neenah Wisconsin.
6. RFP No. F98P168407, Part 7, Technical Requirements Document (TRD), Revision 1, February 1999. Contract FSC 624, Silos 1 and 2 Accelerated Waste Retrieval Project, Fluor Daniel Fernald (FDF).
7. RFP No. F98P168407, Part 6, Statement of Work (SOW), Revision 1, February 1999. Contract FSC 624, Silos 1 and 2 Accelerated Waste Retrieval Project, Fluor Daniel Fernald (FDF).

Calculations: (see attached calculations sheets in Attachment A)

The AWR project is divided into 8 sub-areas consistent with the overall drainage plan and topography of the site (see Drawings 66FCD001 through 66FCD006).

Area #	Pre-development runoff	Post-development runoff	Outlet capacity
1	2.81 cfs (to the east)	4.09 cfs + 3.16 cfs = 7.25cfs	14.0 cfs
2	1.88 cfs	2.35 cfs	11.0 cfs
3	1.56 cfs	1.94 cfs	11.0 cfs
4	2.35 cfs	4.58cfs (3.16 to the east)	11.0 cfs
5	2.40 cfs	3.00 cfs	11.0 cfs
6	0.86 cfs	N/A	N/A
7	13.39 cfs (silo area)	13.05 cfs (silo area)	53.2 cfs
8	1.12 cfs	1.12 cfs	53.2 cfs

R

Stormwater from Area 7 is ultimately conveyed to the Bio-surge lagoon by an existing concrete perimeter ditch and a 21" dia. Culvert. The northeast quadrant of Area 7 drains to the concrete perimeter ditch and north to the lagoon. The southeast and southwest quadrants drain to the 21" dia. RCP via the concrete perimeter ditch and catch basin outlet at the road. The northwest quadrant drains to the 21" RCP via a trench drain crossing the perimeter road. The limiting flow of the concrete perimeter ditch surrounding the Silos occurs from the K-65 ditch north to the lagoon due to a 0.5% slope through this area. Increased slope translates to greater capacities. The capacity of this section of perimeter ditch is 41.7 cfs. The capacity of the 21" dia. culvert pipe, at 0.5% slope, draining the rest of the concrete perimeter ditch is 11.5 cfs (see attached nomograph, sheet A13 of A19). The total stormwater outlet capacity for Area 7 is 53.2 cfs and no other sub areas drain to Area 7. Area 8 is subject to minimal grading and construction activities which will not alter the existing SWS drainage for this area. Area 6 will be subjected to minimal grading and construction activities and the storm water drainage from this area flows along and away from the K-65 trench to the north and does not contribute runoff to either CB-01 or CB-02. Areas 1 through 5 are calculated using the Rational Method. From the K-65 trench to the south perimeter ditch is approximately 280', therefore overland sheet flow has not transformed into shallow trench flow. Time of travel (Tt) was calculated at 0.06 hours using the TR 55 Method which uses a 2 year, 24-hr. rainfall. R1

Conclusions:

The construction of the Silos 1 and 2 AWR Project will proceed in phases within 8 specific project drainage areas. The Stormwater Drainage Plan presented on Drawings 66FCD001 through 66FCD004 and Drawing 66FCD006 represents an overall plan to convey stormwater consistent with the TRD requirements and to prevent siltation and erosion for the entire project duration as well as the permanent stormwater drainage configuration. The calculations show the capacity of the existing SWS is adequate to handle the Post-development flows resulting from the Project activities for each of the 8 project areas. A total of nearly 8.0 acres will be disturbed during the construction of the project. Over half of this area will be minor grading with less than 1 foot of cut/fill in designated clean areas. Major earthwork will be required to construct foundations for the buildings, superstructure, and silo excavation. However, proper soil and erosion control, and other protective measures consistent with the specific requirements of the TRD will be employed. This should prevent contaminated stormwater from leaving the site. In addition, stormwater generated during each phase of excavation will be handled by the existing perimeter ditches. The two existing storm drainage culverts at the southern perimeter road provide sufficient capacity to handle the runoff from Areas 2 & 3, surface runoff from Area 4, and Area 5. The roof drainage from the TTA Building will be directed to the Eastern Perimeter drainage ditch by way of the existing, unused 12" storm pipe and then through the proposed 18" pipe into the detention

basin at the southeast portion of the Site. During construction of the TTA and RCS buildings, storm water will be removed from the excavation from a sump and pumped to the existing manhole in Area 4 and then to the east perimeter ditch. This will also be the method for removing stormwater when the slabs are being placed. The inlet and outlet protection at the ends of the pipes will remove the little amount of sediment involved in this procedure. The inlet and outlet protection will be maintenanced as noted on the drawings and in the Specifications. The post-development runoff is greater in each of the five areas, with diversion of the roof drainage through the existing storm drain to the perimeter ditch to the east the stormwater runoff into the perimeter ditch to the south increases only slightly from 8.19 cfs to 8.71 cfs. A 12" culvert pipe at two headwaters is capable of 5.5 cfs of flow, therefore the 2 12" dia. pipes in the south perimeter ditch have a combined capacity of 11.0 cfs. The 18" culvert pipe at the east perimeter at 2 headwaters is capable of 14.0 cfs of flow. The assumption is that this drainage system was originally designed to handle the flow from the area of the new TTA building. Since all the developed areas are to be treated with a gravel surface over a geotextile fabric, the chance of siltation and erosion in these areas is not considered to be significant. In the Silos 1 and 2 area, the configuration shown on the grading plan is the worst case scenario. The silt fence directs any narrow channel flow generated during a design storm from the southeast and southwest quadrants to the sedimentation basins at the southwest corner. These sediment basins have a storage capacity of approximately 50.0 cy to protect an area of less than 1 acre. Other areas around the silos are bounded by gravelled areas with silt fence protecting the concrete perimeter ditch from siltation. Further soil and erosion control measures will be deployed as noted on the Stormwater Drainage Plan Drawings and in the Construction Specifications. Proposed modifications to the existing SWS are also shown on the Drawings and are made to facilitate existing drainage paths on the site.

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ATTACHMENT A

Written description (SWS) Section 2.3.2.1	Sheet A2	
SWS Requirements 001 through 010	Sheet A3	
SWS Requirements 011 through 020	Sheet A4	
Calculations	Sheet A5 to A12	
Figure 11.6 Flow in Pipes	Sheet A13	
Chart 7 Pipe Culvert Chart	Sheet 14	
Rainfall Intensity Zone Map	Sheet A15	
Rainfall Intensity Duration Curves	Sheet A16	
Drawing 66FCD001, Rev 0	Sheet A17 **	R1
Drawing 66FCD002, Rev 1	Sheet A18 **	
Drawing 66FCD003, Rev 1	Sheet A19 **	
Drawing 66FCD004, Rev B	Sheet A20 **	
Drawing 66FCD006, Rev 1	Sheet A21 **	

** - 11" x 17" sheets

2.3.2.1 Stormwater System

The Contractor shall provide facilities to prevent the introduction into any stream, lake, aquifer, or other body of water, of any substances or materials which may pollute or degrade the water or be deleterious to fish and wildlife.

The potential for generation of contaminated stormwater, including any run-on and run-off, shall be minimized by process design and operation. Contaminated run-off could come from areas that are in direct contact with residue or have a high potential of coming in contact with residue, such as storage pads and stockpile areas. The quantity of contaminated stormwater from the AWR Project area shall be minimized by segregating clean area run-off from potentially contaminated run-off. Clean run-off could include building roof drainage and run-off from areas of fixed contamination. "Clean" stormwater shall be routed to the stormwater collection basin south of the project area. Clean stormwater shall not be discharged to the AWWT Facility.

Areas used for management of materials that could contribute to contaminated stormwater shall be protected from precipitation and stormwater run-on and run-off, to the extent practicable, in the design. Contaminated stormwater shall not be discharged with "clean" stormwater. Contaminated stormwater shall be contained and sampled prior to discharge into the existing WWS. Contaminated stormwater shall meet the wastewater acceptance criteria and other requirements identified in Section 2.3.2.2 for wastewater, including the limit on flow, prior to discharge to the AWWT facility.

New SWS shall be designed in accordance with FEMP site policy and Ohio stormwater requirements. The site Stormwater Pollution Prevention Plan, RM-0039 (Part 7 - Section 3.0) is used to satisfy the requirements of the FEMP National Pollutant Discharge Elimination System (NPDES) Permit. Stormwater control design details, construction methods, and materials shall be in accordance with Ohio approved stormwater standards. As referenced in the SPPP, stormwater management, as well as erosion and sediment control during construction, shall comply with the latest version of ODNR Rainwater and Land Development Manual (Part 7 - Section 5.0); the U.S. Technical Paper 40 (Part 7 - Section 5.0) may be used for levels for storm events at the FEMP.

Storm drain systems not directly connected to the SWS (if any), with catchments less than 160 acres, may be designed by the Rational Method. Stormwater control systems designed by the Rational Method shall use rainfall frequencies found in Technical Paper No. 40 (Part 7 - Section 5.0) and NWS Hydro-35 (Part 7 - Section 5.0). Those storm drain systems directly connected to an existing SWS shall be designed by Soil Conservation Service methods (e.g., TR-55, TR-20).

Environmental releases shall be avoided to the extent possible. Any spills or other unplanned releases to the environment shall be immediately reported to FDF and cleaned up to minimize the release of contaminants to the environment.

Limited stormwater control facilities shall be provided to the Contractor for the collection of stormwater from the Contractor's process facility location . Existing stormwater control features and facilities are shown on the following: the topographic map illustrated in Figure C-4 (Appendix C - Section C.2), drawing 40A-4455-G-00056 (Part 7 - Section 1.4), and drawing 94X-5900-G-00898 (Part 7 - Section 1.4). The Contractor, using assigned FDF personnel, shall maintain this system until project completion. In particular, the Contractor shall maintain the drainage ditches and other stormwater appurtenances in the project area in a manner that ensures continued operation of the SWS pursuant to its design standards. For example, any sediment build-up that affects run-off flow below design capacities shall be removed and managed by the Contractor.

Table 2-9 provides system requirements for the SWS. Regulatory requirements for the control of stormwater are listed in the ARARs in Appendix B.

Table 2-9 Stormwater System Requirements

Requirement Number	Requirement
SWS-001	Provide controlled stormwater drainage, collection, and segregation of contaminated stormwater from uncontaminated liquids.
SWS-002	Ensure that drainage basins, curbs, and catch or retention basins have efficient and adequate drainage.
SWS-003	Ensure that the existing drainage pattern is maintained by providing culverts (or other controls) as needed for the SWRS, RCS, and the TTA, which are located in potentially contaminated area.
SWS-004	Ensure that AASHTO and ODOT standards for paving, surfacing methods, materials, and design are observed. Where conflict exists between the AASHTO or ODOT standards and the ODNR Rainwater and Land Development manual, the ODNR manual shall take precedence.
SWS-005	Ensure that appropriate design storm events for Hamilton County are used in designing new culverts, analyzing existing culverts and identifying drainage differences, maintenance problems, and other impacts caused by changes in the current system.
SWS-006	Stormwater management systems for secondary containment areas for K-65 material, wastewater, hazardous substance or hazardous material tanks, and contaminated stormwater shall be designed for the 25-year, 24-hour storm. Stormwater controls for all other uncontaminated stormwater shall be designed for the 10-year, 24-hour storm.
SWS-007	Install erosion matting, check dams, riprap lining, or other methods specified in the ODNR Rainwater and Land Development manual (Part 7 - Section 5.0) to limit erosion, as appropriate to control excessive stormwater velocities.
SWS-008	Through design, minimize the use of stone or other materials needed to control erosion in the ditches.
SWS-009	Ensure that the road side ditches do not overtop the roads for the design storm.
SWS-010	Include measures to minimize and mitigate erosion and sediment transport in the runoff controls from the distributed areas.

Table 2-9 Stormwater System Requirements

Requirement Number	Requirement
SWS-011	Design storm drainage in accordance with the ODNR Rainwater and Land Development manual.
SWS-012	Ensure that drainage is by open ditch systems, and make use of existing drainage structures such as culverts and catch basins when possible.
SWS-013	Minimize ditch size by flooding the road shoulder if necessary.
SWS-014	Perform side slope and ditch design in accordance with the ODNR Rainwater and Land Development manual. Ditch checks may be placed where required. Ditch design shall not impact nearby underground utilities.
SWS-015	Ensure that earthwork conforms to ODNR Rainwater and Land Development manual standards and complies with the FDF waste management standards, discussed in Section 5.0.
SWS-016	Ensure that design changes and temporary modifications prevent erosion and control sediment during and subsequent to construction.
SWS-017	Using seed or mulch, stabilize areas disturbed during construction that are not surfaced or covered with riprap. Ensure that revegetation, seeding, and soil supplements conform to ODNR Rainwater and Land Development manual standards.
SWS-018	Ensure that open course stormwater drainage channels have low velocities that are non-erosive and limit sediment accumulation.
SWS-019	Ensure that construction areas and exposed soil, unworked and left exposed for thirty days or more are seeded per ODNR Rainwater and Land Development manual standards and FDF waste management requirements.
SWS-020	Contaminated stormwater shall be contained and characterized prior to discharge tothe AWWT facility. Contaminated stormwater shall meet the wastewater acceptance criteria in Table 2-10a and other requirements identified in Section 2.3.2.2 for wastewater including the limit on flow prior to discharge to the AWWT facility.

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PROJECT AWR CALC# CA-FSC624-FC-001

SUBJECT STORM WATER RUNOFF, PRE-EXISTING CONDITIONS

$Q = CiA$ (RATIONAL METHOD)

ASSUME t_c = 10 MIN

10 YR, 24-HR STORM: i = 5.4 IN./HR
25 YR, 24-HR STORM: i = 6.6 IN./HR

AREA 1

A = 1.30 AC
C = 0.40 (TURF)
i = 5.4 (10 YR, 24 HR)
$Q = 0.40(5.4)(1.30) = 2.81$ CFS

AREA 2

A = 0.87 AC
C = 0.40
i = 5.4
$Q = 0.40(5.4)(0.87) = 1.88$ CFS

AREA 3

A = 0.72 AC
C = 0.40
i = 5.4
$Q = 0.40(5.4)0.72 = 1.56$ CFS

AREA 4

A = 1.09 AC
C = 0.40
i = 5.40
$Q = 0.40(5.4)(1.09) = 2.35$ CFS

AREA 5

A = 1.11 AC
C = 0.40
i = 5.4
$Q = 0.40(5.4)(1.11) = 2.40$ CFS

AREA 6

A = 0.40 AC
C = 0.40
i = 5.4
$Q = 0.40(5.4)(0.4) = 0.86$ CFS

AREA 7 $A = 2.83$ AC

COMPOSITE C: 2.59 (0.70) (STEEP, GRASSED)

0.12 (0.90)(2) (SILO ROOFS)

$\Rightarrow \frac{2.59(0.70) + 0.12(0.90)(2)}{2.85} = 0.72$ | R_1

$i = 6.6$ (POTENTIALLY CONTAMINATED)

$Q = 0.72(6.6)(2.83) = 13.39$ CFS

AREA 8 $A = 0.37$ AC

COMPOSITE C: $\pi(41)^2 = 0.12(0.90)$ (SILO)

0.25 (0.40) (GRASS)

$C = \frac{0.12(0.90) + 0.25(0.40)}{0.37} = 0.56$

$Q = 0.56(6.6)(0.37) = 1.37$ CFS

SOUTH PERIMETER RD

$12' \times 355' = 0.10$ AC, $C = 0.90$

$Q = 0.90(5.4)0.10 = 0.48$ CFS

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PROJECT RWR CALC # CA-FSC624-FC-001

SUBJECT STORM WATER RUNOFF, POST-DEVELOPMENT CONDITIONS

$Q = CiA$ (RATIONAL METHOD)

ASSUME $t_c = 10$ MIN

10 YR, 24-HR STORM: $i = 5.4$ IN/HR

25 YR, 24-HR STORM: $i = 6.6$ IN/HR

AREA 1 $A = 1.30$ AC (W/ ROADWAY)

COMPOSITE C: $\frac{(60 \times 12)(7) + (60 \times 225)2 + 12(290)}{43{,}560} = 0.26$ (ROAD) $C = 0.90$ (TRAILERS)

1.12 AC (GRAVEL) $C = 0.50$

$C = \frac{0.26(0.90) + 1.04(0.50)}{1.30} = 0.58$

$Q = 0.58(5.4)(1.30) = 4.09$ CFS

AREA 2 $A = 0.87$ AC

$C = 0.50$ (GRAVEL)

$i = 5.4$

$Q = 0.50(5.4)(0.87) = 2.35$ CFS

AREA 3

$A = 0.72$ AC

$C = 0.50$ (GRAVEL)

$i = 5.4$

$Q = 0.50(5.4)(0.72) = 1.94$ CFS

AREA 4 $A = 1.09$ AC

COMPOSITE C: $\frac{185 \times 180}{43{,}560} = 0.76$ AC (ROOFS) $C = 0.90$ (69% OF AREA)

0.33 AC (GRAVEL) $C = 0.50$

$C = \frac{0.76(0.90) + 0.33(0.50)}{1.09} = 0.78$

$Q = 0.78(5.4)(1.09) = 4.58$ CFS

(3.16 CFS, ROOF DRAIN, TO AREA 1)

000054

R1

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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PROJECT AWR CALC # CA-FSC624-FC-001

SUBJECT STORM WATER RUNOFF, POST DEVELOPMENT CONDITIONS

AREA 5

A = 1.11 AC
C = 0.50 (GRAVEL)
i = 5.40
Q = 0.50(5.4)(1.11) = 3.00 CFS

AREA 6

THIS AREA DOES NOT CONTRIBUTE RUNOFF TO THE STORM WATER SYSTEM (SWS) SOUTH OF THE K-65 TRENCH. DEVELOPMENT IN THIS AREA IS MINIMAL AND STORM WATER RUNOFF INCREASE WILL BE INSIGNIFICANT. R1

AREA 7

A = 2.83 AC
70' X 220' = 0.35 AC, C = 0.50 (GRAVEL)
20' X 200' = 0.09 AC, C = 0.90 (CONC., RAIL)
$\pi(40)^2$ = 0.12 AC, C = 0.90 (SILOS)
2.83 - 0.35 - 0.09 - 0.12 - 0.12 = 2.15 AC, C = 0.70 (STEEP GRASSED)

$$C = \frac{0.35(0.50) + 0.09(0.9) + (0.24)(0.9) + 2.15(0.70)}{2.83}$$

C = 0.70
Q = 0.70(6.6)(2.83) = 13.05 CFS

AREA 8

DEVELOPMENT IN THIS AREA CONSISTS OF THE ADDITION OF A JOB TRAILER.
A = 60 X 12 = 0.02 AC, C = 0.90
Q = 0.90(6.6)0.02 = 0.10 CFS
THE ADDITION OF 0.10 CFS TO THE SWS DOES NOT REPRESENT A SIGNIFICANT IMPACT. R1

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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PROJECT AWR CALC # CA-FSC624-FC-001

SUBJECT STORM WATER RUNOFF, POST DEVELOPMENT

SOUTH PERIMETER RD
Q = 0.48 CFS | R1

9.19 CFS TOTAL TO SOUTH PERIMETER DITCH
(2.35 + 1.94 + 1.42 + 3.00 + 0.48) | R1

TIME OF TRAVEL (FOR SHEET FLOW < 300')

FROM TR-55 $T_t = \dfrac{0.007(nL)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$

WHERE

T_t = TRAVEL TIME (HRS)
n = MANNING'S ROUGHNESS COEFFICIENT
L = FLOW LENGTH (FT)
P_2 = 2yr., 24-HR RAINFALL (IN)
S = SLOPE OF HYDRAULIC GRADE LINE (FT/FT)

R1

$n = 0.011$
$L = 280'$
$P_2 = 3.8$ IN
$S = 577 - 575 = 2'$ FALL IN $280' = 0.0071$ FT/FT

$\therefore T_t = \dfrac{0.007[0.011(280)]^{0.8}}{(3.8)^{0.5}(0.0071)^{0.4}} = 0.064$ HR (3.8 MIN)

ATTACHMENT H

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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CHKD. BY _____ DATE _____ OFS NO. _____ DEPT. NO. _____

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PROJECT AWR CALC # CA-FSC624-FC-001

SUBJECT PERIMETER TRENCH CAPACITIES

K-65 TRENCH → NORTH ("A")

1' BOT DEPTH VARIES (1' MIN SIDES)	9+97.30 INV = 576.90	7+68.80 INV = 575.76	228.50' 1.14' FALL S = 0.50%

K-65 TRENCH → SOUTH ("B")

	10+02.70 576.40	11+58 574.50	155.30 1.9' S = 1.22%
1' BOTTOM 1.5' SIDES			
	11+58 574.50	12+15.27 569.40	57.27' 5.1 S = 8.91%
1' BOT 1.5' SIDES			
	12+15.27 569.40	14+41.50 567.50	226.23' 1.9' S = 0.84%
	14+41.50 567.50	15+30.10 565.50	88.60' 2.0' S = 2.26'
	15+30.10 565.50	15+47.40 569.41	17.3' 0.09' S = 0.52%

BEGIN 21" ϕ RCP : 146.0' @ 0.5%

$$Q_{(CFS)} = \frac{1.486}{n} R_H^{2/3} \sqrt{S_o}\ A$$

$n = 0.012$ (UNFINISHED CONC. CHANNEL)

R_H (FLOWING FULL) $= A/P$ $A = 1\ FT^2$ $P = 3\ FT$ $R_H = 0.33$

$S_o = 0.50\%$ $A = 1$

∴ LIMITING FLOW, TRENCH "A"

$$Q = \frac{1.486}{0.012}(0.33)^{0.67}\sqrt{0.50}(1)$$

$Q = 41.67$ CFS

∴ LIMITING FLOW TRENCH "B" $S = 0.52\%$

$$Q = \frac{1.486}{0.012}(0.375)^{0.67}\sqrt{0.52}(1.5)$$

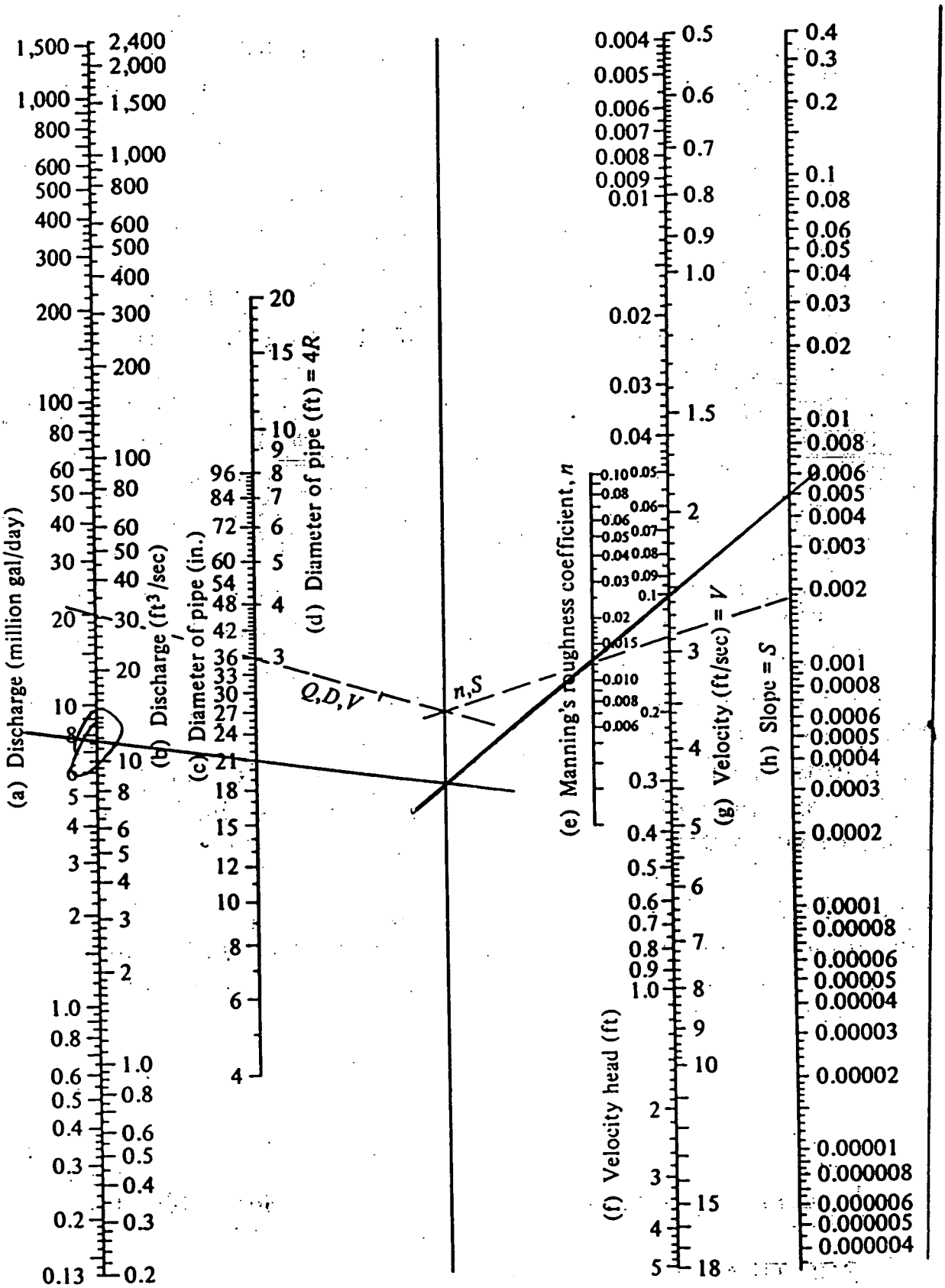
$Q = 69.43$ CFS

CAPACITY OF 21" ϕ RCP @ $S = 0.50\%$ (SEE ATTACHED CHART)

$Q = 11.5$ CFS

FWENC 581D 10/96

ATTACHMENT A
A13 OF A21 2918



R1

Fig. 11-6. *Flow in pipes (Manning's formula). (After "Design and Construction of Sanitary Storm Sewers," ASCE Manuals and Reports on Engineering Practice, No. 37, 1970.)*

CHART 7 ATTACHMENT A
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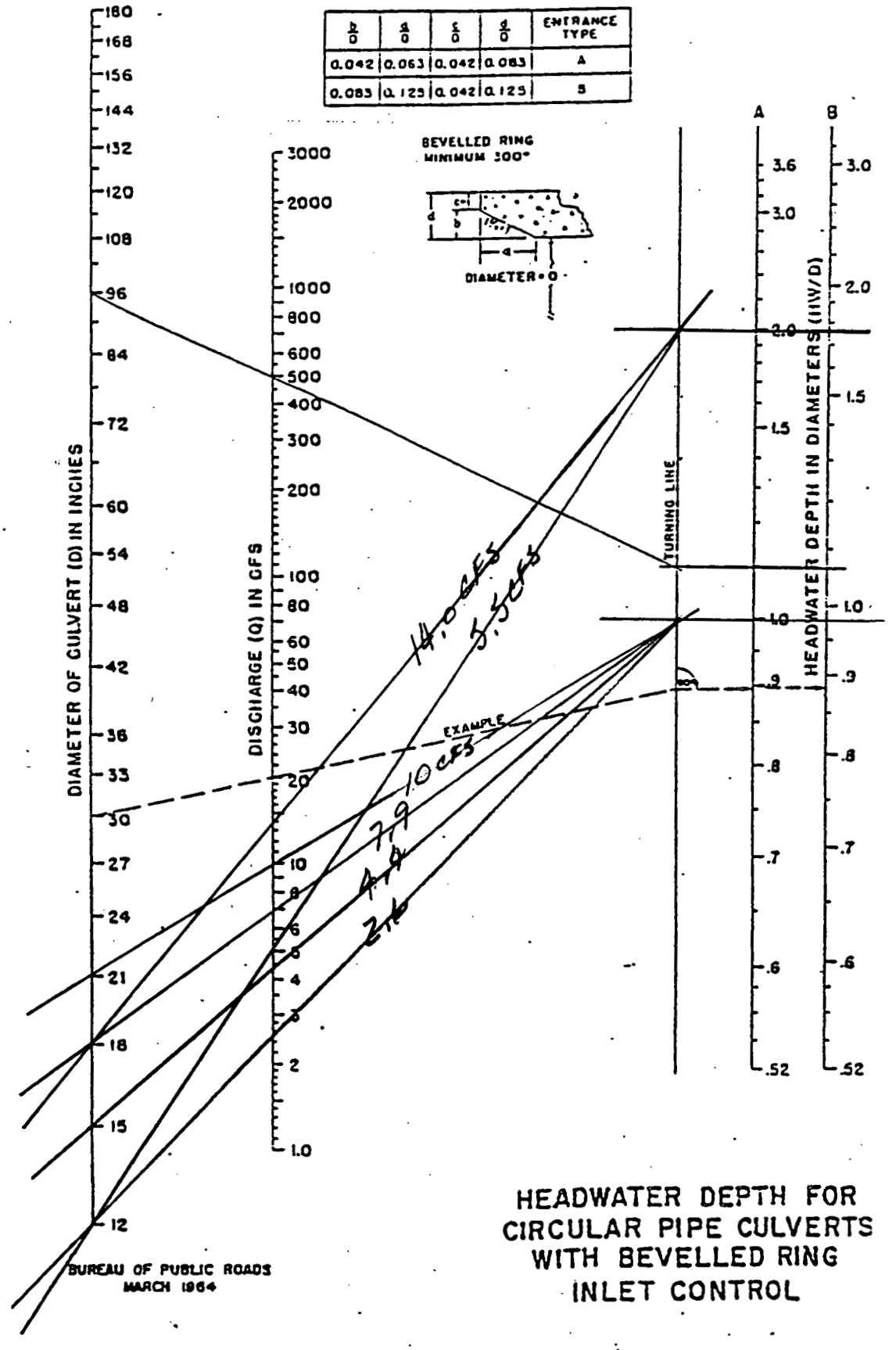


b/D	a/D	c/D	d/D	ENTRANCE TYPE
0.042	0.063	0.042	0.083	A
0.083	0.125	0.042	0.125	B

BUREAU OF PUBLIC ROADS
MARCH 1964

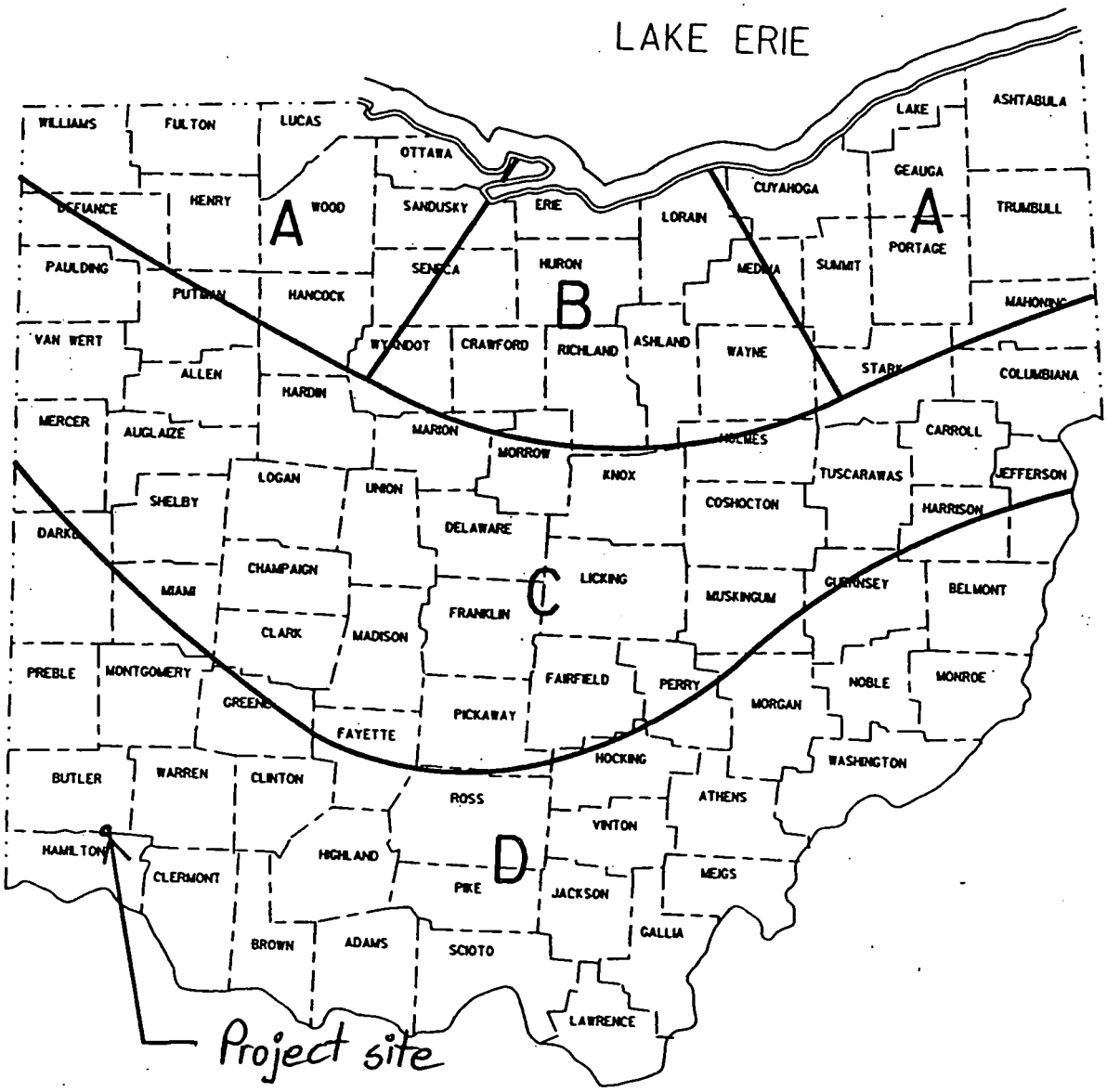
HEADWATER DEPTH FOR CIRCULAR PIPE CULVERTS WITH BEVELLED RING INLET CONTROL

000061

FOSTER WHEELER ENVIRONMENTAL CORPORATION								
PROJECT: Fernald Silos 1 and 2 AWR					SUBJECT: Stormwater Drainage			
Revision	1							Sheet A15 of A21
By / Date	MSH	3/23/00						Project No: 2122.0308
Ch / Date								Calc: CA-FSC624-FC-001

2918

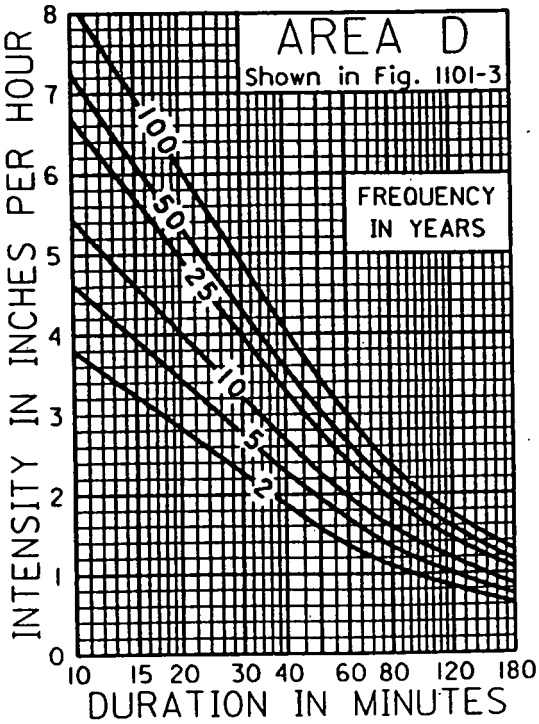
RAINFALL INTENSITY ZONE MAP	1101-3
	REFERENCE SECTION 1101.24



000062

FOSTER WHEELER ENVIRONMENTAL CORPORATION								
PROJECT: Fernald Silos 1 and 2 AWR					SUBJECT: Stormwater Drainage			
Revision	1							Sheet A16 of A21
By / Date	MSH	3/23/00						Project No: 2122.0308
Ch / Date								Calc: CA-FSC624-FC-001

-- 2918

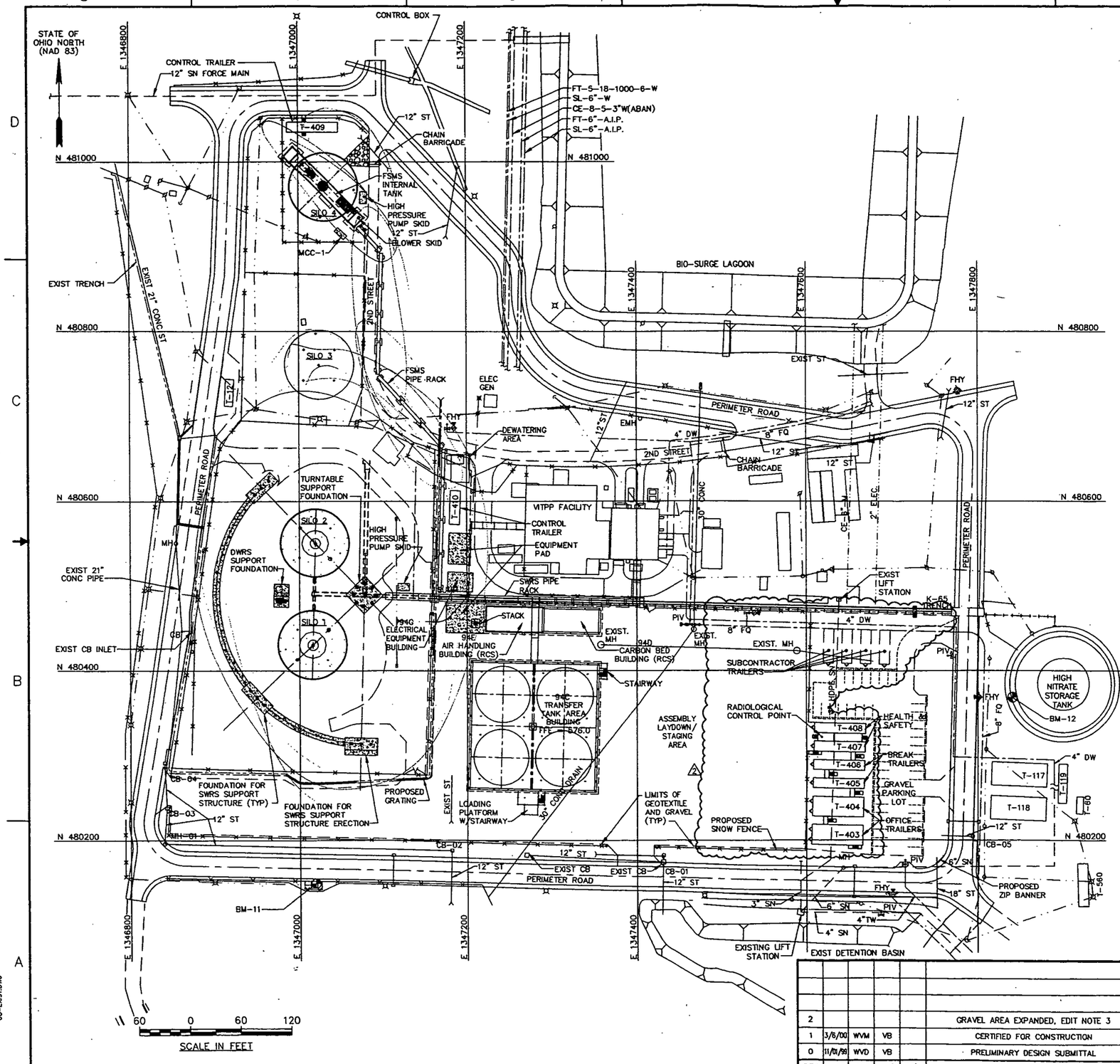


Attachment B
Drawings

Reviewers:

Please note that under certain conditions the silt fencing does not turn up on the ends to form a dam. In these cases, the fencing turns toward an established catch basin to avoid pooling in access points from the road to the process areas. See Drawings D002 and D003. Fluor Fernald, Inc. will be available to discuss this and any other issues/concerns at your discretion.

Dennis A. Nixon
(513) 648-4800



NOTES:

HOLD — 1. SEE DRAWING 05FCD011 FOR GENERAL NOTES AND LEGEND.

2. HORIZONTAL AND VERTICAL CONTROL SHALL BE ESTABLISHED BY USING THE FOLLOWING CONTROL POINTS:
BM-11 – N 480,149.27, E 1,347017.97, ELEV. 569.91
BM-12 – N 480,369.05, E 1,347,841.96, ELEV. 578.70

3. EXISTING FEATURES OBTAINED FROM INFORMATION PROVIDED BY FLUOR FERNALD, INC., DRAWING NO. 94X-6100-G-02209, TITLED: SITE PLAN AND GENERAL NOTES, DATED: 6/24/98, LAST REVISION: 11/17/99.

4. SUBCONTRACTOR TO VERIFY LOCATIONS OF EXISTING FEATURES.

000065

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
2					GRAVEL AREA EXPANDED, EDIT NOTE 3
1	3/6/00	WVM	VB		CERTIFIED FOR CONSTRUCTION
0	11/01/99	WVD	VB		PRELIMINARY DESIGN SUBMITTAL

RPE

DRAWN BY — DATE
DESIGNED BY — DATE
CHECKED BY — DATE
APPROVED BY — DATE
APPROVED BY — DATE

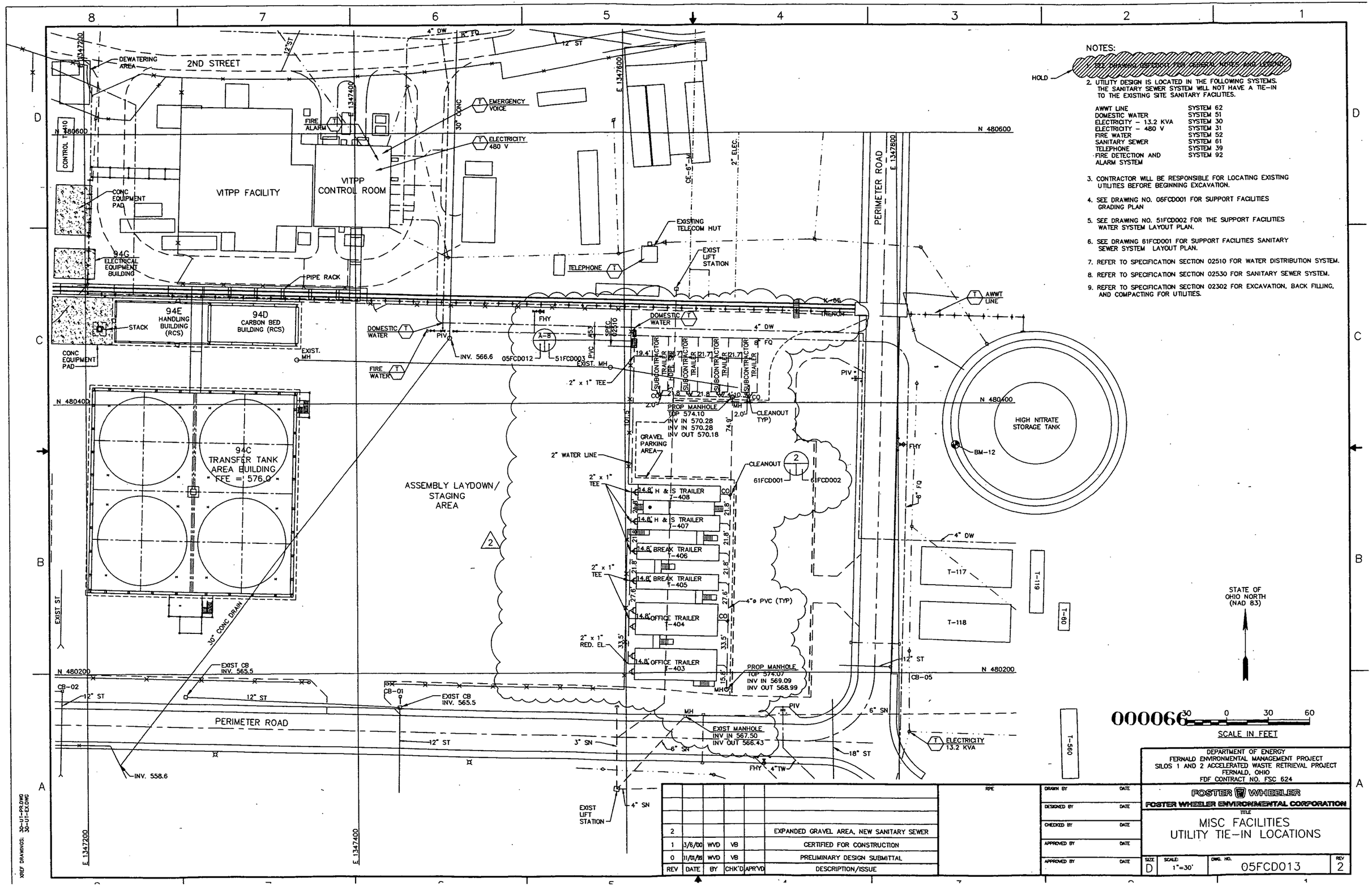
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
MISC FACILITIES
CIVIL SITE LAYOUT

SIZE D | SCALE: 1"=60' | DWG. NO. 05FCD012 | REV 2

XREF DRAWINGS: 60-PROP.DWG 60-EXIST.DWG


2ND STREET
DEWATERING AREA
VITPP FACILITY
VITPP CONTROL ROOM
CONTROL TOWER
CONC EQUIPMENT PAD
94G ELECTRICAL EQUIPMENT BUILDING
PIPE RACK
94E HANDLING BUILDING (RCS)
94D CARBON BED BUILDING (RCS)
STACK
94C TRANSFER TANK AREA BUILDING FFE = 576.0
FIRE ALARM
EMERGENCY VOICE
ELECTRICITY 480 V
TELEPHONE
EXISTING TELECOM HUT
EXIST LIFT STATION
DOMESTIC WATER
FIRE WATER
PIV
INV. 566.6
05FCD012
51FCD003
EXIST. MH
2" x 1" TEE
PROP MANHOLE TOP 574.10 INV IN 570.28 INV IN 570.28 INV OUT 570.18
GRAVEL PARKING AREA
CLEANOUT TYP)
CLEANOUT
61FCD001
61FCD002
2" WATER LINE
ASSEMBLY LAYDOWN/ STAGING AREA
14.8' H & S TRAILER T-408
14.8' H & S TRAILER T-407
14.8' BREAK TRAILER T-406
14.8' BREAK TRAILER T-405
14.8' OFFICE TRAILER T-404
14.8' OFFICE TRAILER T-403
2" x 1" RED. EL.
4"ø PVC (TYP)
PROP MANHOLE TOP 574.07 INV IN 569.09 INV OUT 568.99
PERIMETER ROAD
AWWT LINE
HIGH NITRATE STORAGE TANK
BM-12
T-117
T-118
T-119
T-160
T-560
EXIST CB INV. 565.5
CB-02
CB-01
CB-05
INV. 558.6
EXIST MANHOLE INV IN 567.50 INV OUT 566.43
ELECTRICITY 13.2 KVA
EXIST LIFT STATION
4" SN
STATE OF OHIO NORTH (NAD 83)
SCALE IN FEET
NOTES:
HOLD
SEE DRAWING 05FCD001 FOR GENERAL NOTES AND LEGEND
2. UTILITY DESIGN IS LOCATED IN THE FOLLOWING SYSTEMS. THE SANITARY SEWER SYSTEM WILL NOT HAVE A TIE-IN TO THE EXISTING SITE SANITARY FACILITIES.
AWWT LINE SYSTEM 62
DOMESTIC WATER SYSTEM 51
ELECTRICITY - 13.2 KVA SYSTEM 30
ELECTRICITY - 480 V SYSTEM 31
FIRE WATER SYSTEM 52
SANITARY SEWER SYSTEM 61
TELEPHONE SYSTEM 39
FIRE DETECTION AND ALARM SYSTEM SYSTEM 92
3. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
4. SEE DRAWING NO. 06FCD001 FOR SUPPORT FACILITIES GRADING PLAN
5. SEE DRAWING NO. 51FCD002 FOR THE SUPPORT FACILITIES WATER SYSTEM LAYOUT PLAN.
6. SEE DRAWING 61FCD001 FOR SUPPORT FACILITIES SANITARY SEWER SYSTEM LAYOUT PLAN.
7. REFER TO SPECIFICATION SECTION 02510 FOR WATER DISTRIBUTION SYSTEM.
8. REFER TO SPECIFICATION SECTION 02530 FOR SANITARY SEWER SYSTEM.
9. REFER TO SPECIFICATION SECTION 02302 FOR EXCAVATION, BACK FILLING, AND COMPACTING FOR UTILITIES.
000066
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
MISC FACILITIES UTILITY TIE-IN LOCATIONS
SIZE D
SCALE: 1"=30'
DWG. NO. 05FCD013
REV 2
2 EXPANDED GRAVEL AREA, NEW SANITARY SEWER
1 3/6/00 WVD VB CERTIFIED FOR CONSTRUCTION
0 11/01/99 WVD VB PRELIMINARY DESIGN SUBMITTAL
REV DATE BY CHK'D APR'VD DESCRIPTION/ISSUE
XREF DRAWINGS: 30-UT-PR.DWG 30-UT-EX.DWG

2918

LEGEND:

SILOS 1 & 2 SPACE ALLOCATION AREAS

SILO 3 SPACE ALLOCATION AREAS

STATE OF OHIO NORTH (NAD 83)

CONTROL BOX

12" SN FORCE MAIN

12" ST

CHAIN BARRICADE

FT-5-18-1000-6-W
SL-6"-W
CE-8-5-3"W(ABAN)
FT-6"-A.I.P.
SL-6"-A.I.P.

SILO 4

SILO 3

SILO 2

SILO 1

EXIST TRENCH

EXIST 21" CONC ST

2ND STREET

BIO-SURGE LAGOON

EXIST ST

PERIMETER ROAD

ELEC GEN

FHY

EMH

4" DW

8" FO

12" ST

CHAIN BARRICADE

SILOS 1&2 WASTE REMOVAL

SURROGATE LAYDOWN

VITPP FACILITY

VITPP CONTROL ROOM

30" CONC

2" ELEC.

CE-5"

EXIST LIFT STATION

K-65 TRENCH

CRANE ACCESS

EXIST 21" CONC PIPE

EXIST CB INLET

EXIST MH

PIV

TRANSFER TANK AREA

ASSEMBLY LAYDOWN/ STAGING AREA

TRAILERS

HIGH NITRATE STORAGE TANK

BM-12

T-117

T-118

T-119

T-560

SS MODULE ASSEMBLY AREA

CB-01

CB-02

CB-04

CB-05

EXIST CB

6" SN

18" ST

3" SN

4" SN

4"TW

BM-11

EXISTING LIFT STATION

EXIST DETENTION BASIN

MATCHLINE

N 481000

N 480800

N 480600

N 480400

N 480200

E 1346800

E 1347000

E 1347200

E 1347400

E 1347600

E 1347800

SCALE IN FEET

60 0 60 120

MATCHLINE

N 479800

N 479600

N 479400

STAGING & STORAGE

NOTE:
AREA SHOWN TO BE USED ONLY FOR EQUIPMENT/MATERIAL LAYDOWN OR STAGING AND SHALL BE LIMITED TO THE CURRENTLY DISTURBED AREA. IF ANY STORAGE OF EQUIPMENT/MATERIAL WILL CHANGE CURRENT RUNOFF PATERNS, APPROPRIATE EROSION CONTROL METHODS SHALL BE UTILIZED TO PREVENT IMPACT TO THE WETLANDS AREA TO THE WEST.

000067

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0					CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY DATE
DESIGNED BY DATE
CHECKED BY DATE
APPROVED BY DATE
APPROVED BY DATE

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
MISC FACILITIES
SITE SPACE ALLOCATION

SIZE	SCALE:	DWG. NO.	REV
D	1"=60'	05FCD014	0

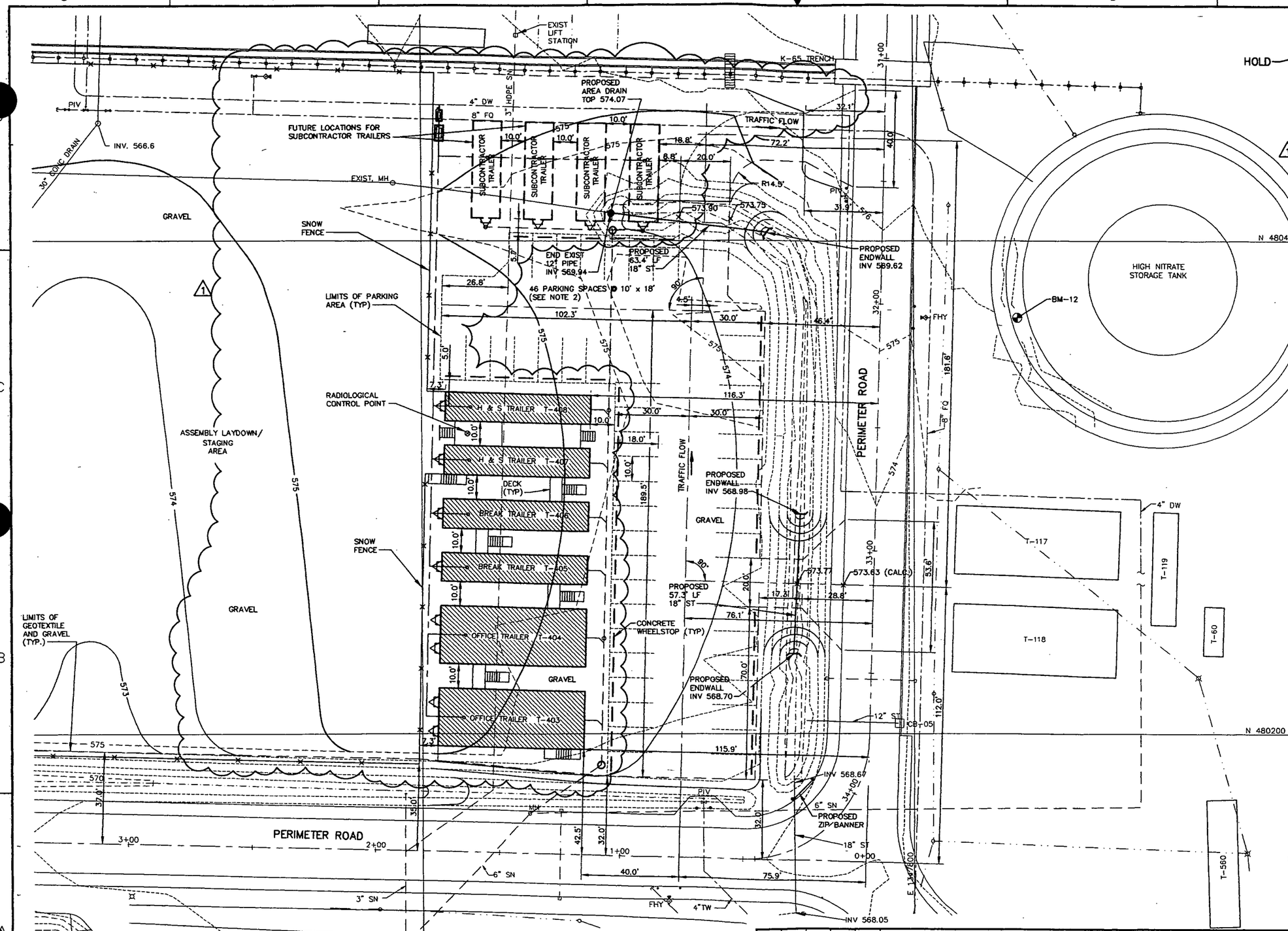
XREF DRAWINGS: 80-PROP 80-EXIST

2918

NOTES:

HOLD — SEE DRAWING 06FCD001 FOR GENERAL NOTES AND LEGEND

2. CONCEPTUAL PARKING SPACES INDICATE APPROXIMATE NUMBER OF VEHICLES. THE GRAVEL PARKING LOT WILL NOT BE STRIPED OR OTHERWISE PARTITIONED.
3. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
4. ALL EROSION CONTROL MEASURES WILL BE INSTALLED AT THE BEGINNING OF EXCAVATION AND MAINTAINED FOR THE DURATION OF THE PROJECT.
5. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED AS SOON AS PRACTICAL, REFER SPECIFICATION SECTION 02924.
6. REFER TO SPECIFICATION SECTION 02300 FOR EARTHWORK.
7. BM-12 LOCATION: N 480,369.05 E1,347,841.96 ELEV. 578.70
8. REFER TO SPECIFICATION SECTION 02373 FOR SEPARATION FABRIC.
9. REFER TO SPECIFICATION SECTION 02731 FOR AGGREGATE SURFACE COURSE.
10. REFER TO SPECIFICATION SECTION 02630 FOR STORM DRAINAGE.
11. CONTRACTOR RESPONSIBLE FOR LOCATING EXISTING FEATURES WITH SURVEY TIE-INS AS NECESSARY.



STATE OF OHIO NORTH (NAD 83)

000068

20 0 20 40
SCALE IN FEET

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					EXPANDED GRAVEL AREA, NEW SANITARY SEWER
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

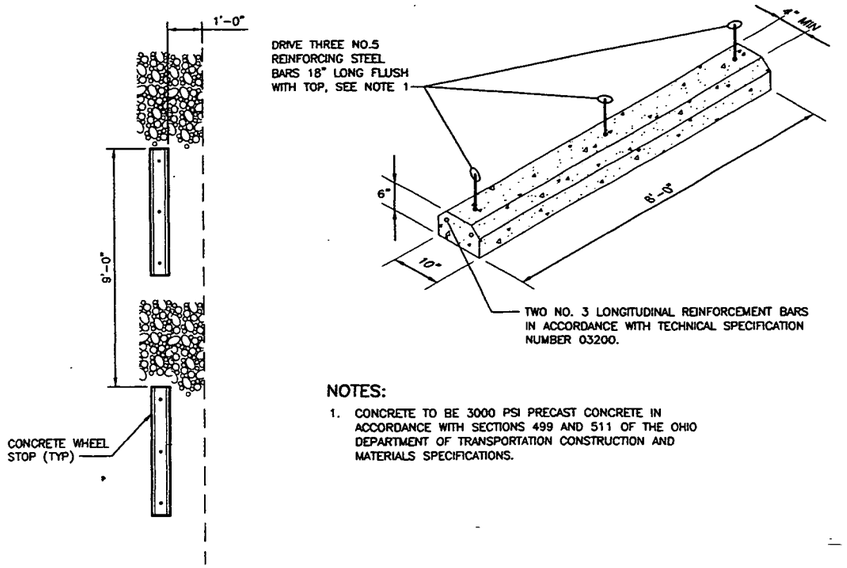
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
SUPPORT FACILITIES
GRADING PLAN
TRAILER LAYOUT

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	06FCD001	1

2918

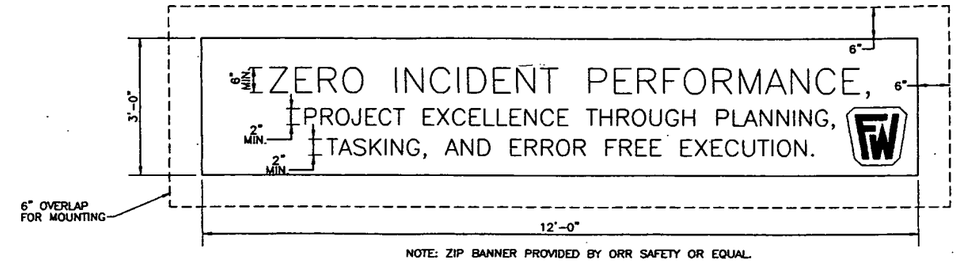


NOTES:

1. CONCRETE TO BE 3000 PSI PRECAST CONCRETE IN ACCORDANCE WITH SECTIONS 499 AND 511 OF THE OHIO DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIALS SPECIFICATIONS.

CONCRETE WHEEL STOP DETAIL

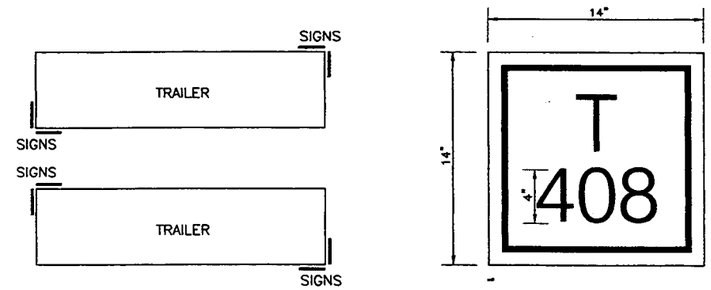
NOT TO SCALE



NOTE: ZIP BANNER PROVIDED BY ORR SAFETY OR EQUAL.

ZIP BANNER DETAIL

NOT TO SCALE

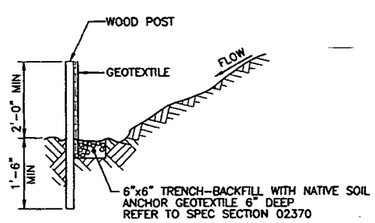


NOTES:

1. TRAILER INDENTIFICATION MARKING SHALL CONSIST OF A PAINTED, 14-INCH BY 14-INCH ORANGE SQUARE, BORDERED BY A 1-INCH BLACK BORDER, AND THE INDENTIFICATION MARKING IN BLACK CHARACTERS, 1/2-INCH OR WIDER AND AT LEAST 4-INCHES HIGH WITHIN THE ORANGE SQUARE.
2. MATERIAL SHALL BE PLYWOOD OR OTHER SUITABLE MATERIAL.
3. FWENC WILL PROVIDE TRAILER NUMBERS.

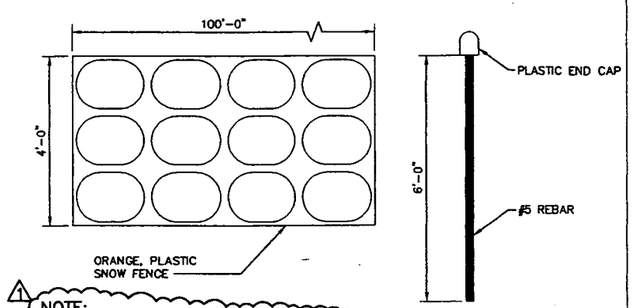
TRAILER NO. SIGN MOUNTING DETAIL

NOT TO SCALE



SILT FENCE DETAIL

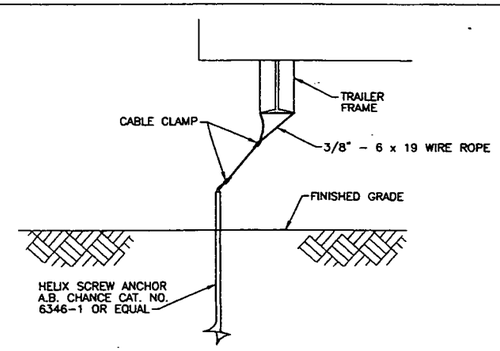
NOT TO SCALE



NOTE:
#5 REBAR WITH PLASTIC CAP, SPACED 8.5' APART.

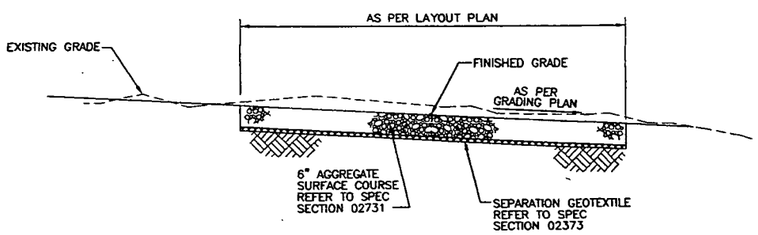
SNOW FENCE DETAIL

NOT TO SCALE



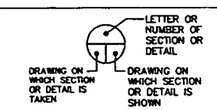
TRAILER ANCHORING DETAIL

NOT TO SCALE



TYPICAL GRAVEL DRIVE SECTION

NOT TO SCALE



SECTION & DETAIL KEY

000069

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					MINOR DETAIL EDIT
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

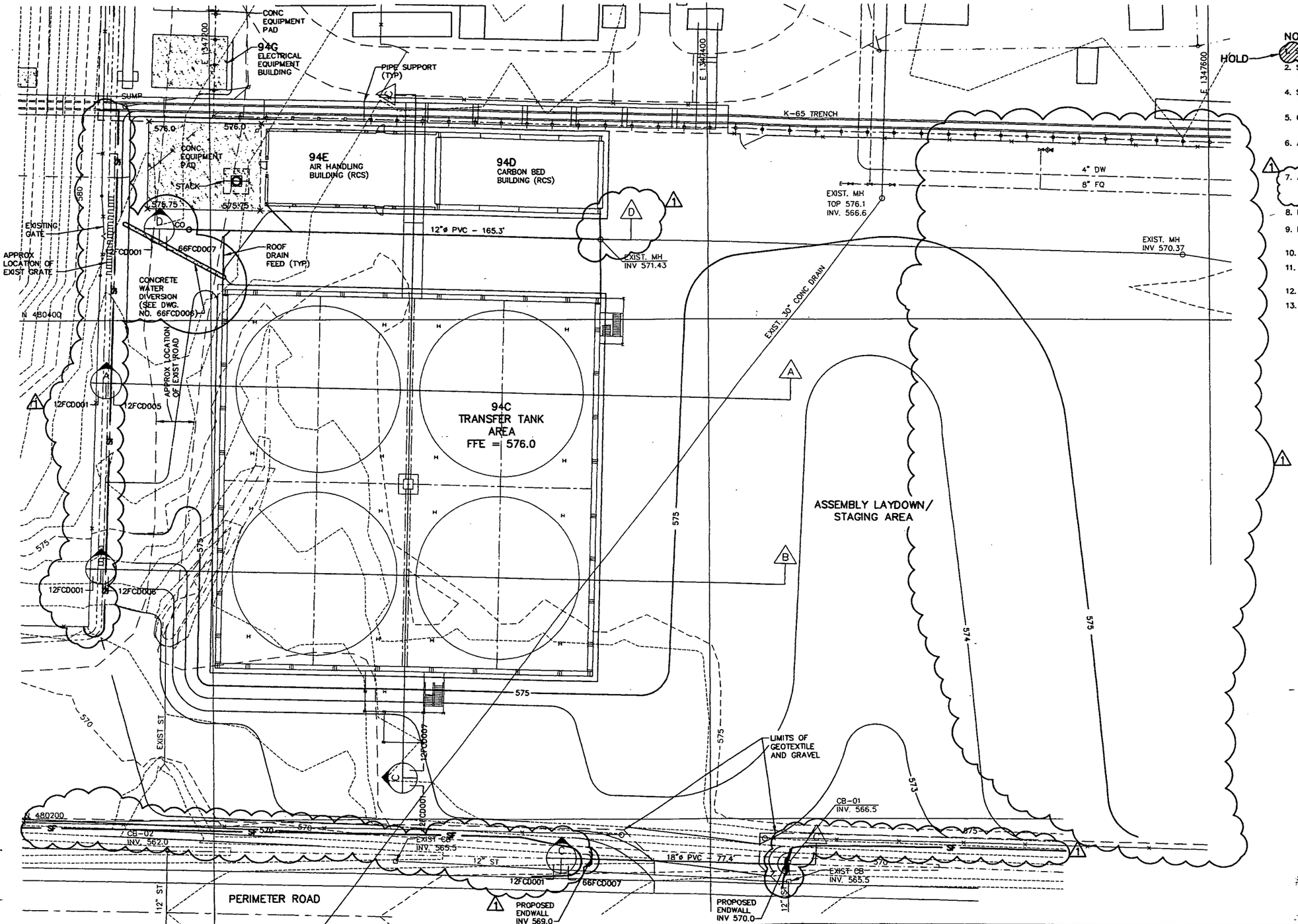
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
SUPPORT FACILITIES
MISC DETAILS
TRAILER LAYOUT

SIZE	SCALE:	DWG. NO.	REV
D	AS SHOWN	06FCD003	1

2918



NOTES:

1. SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND
2. SEE DRAWING 66FCD002 FOR STORM WATER SYSTEM DRAINAGE PLAN.
4. SEE DRAWING 66FCD007 FOR STORM WATER SYSTEM PROFILES.
5. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
6. ALL EROSION CONTROL MEASURES WILL BE INSTALLED AT THE BEGINNING OF EXCAVATION AND MAINTAINED FOR THE DURATION OF THE PROJECT.
7. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED AS SOON AS PRACTICAL, REFER TO SPECIFICATION SECTION 02924.
8. REFER TO SPECIFICATION SECTION 02300 FOR EARTHWORK.
9. BM-11 LOCATION: N 480,149.27 E 1,347,017.97 ELEV. 569.91
10. REFER TO SPECIFICATION SECTION 02373 FOR SEPARATION FABRIC.
11. REFER TO SPECIFICATION SECTION 02731 FOR AGGREGATE SURFACE COURSE.
12. REFER TO SPECIFICATION SECTION 02630 FOR STORM DRAINAGE.
13. CONTRACTOR RESPONSIBLE FOR LOCATING EXISTING FEATURES WITH SURVEY TIE-INS.

HOLD

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1.					EXPANDED GRAVEL AREA, ADDED SILT FENCE
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

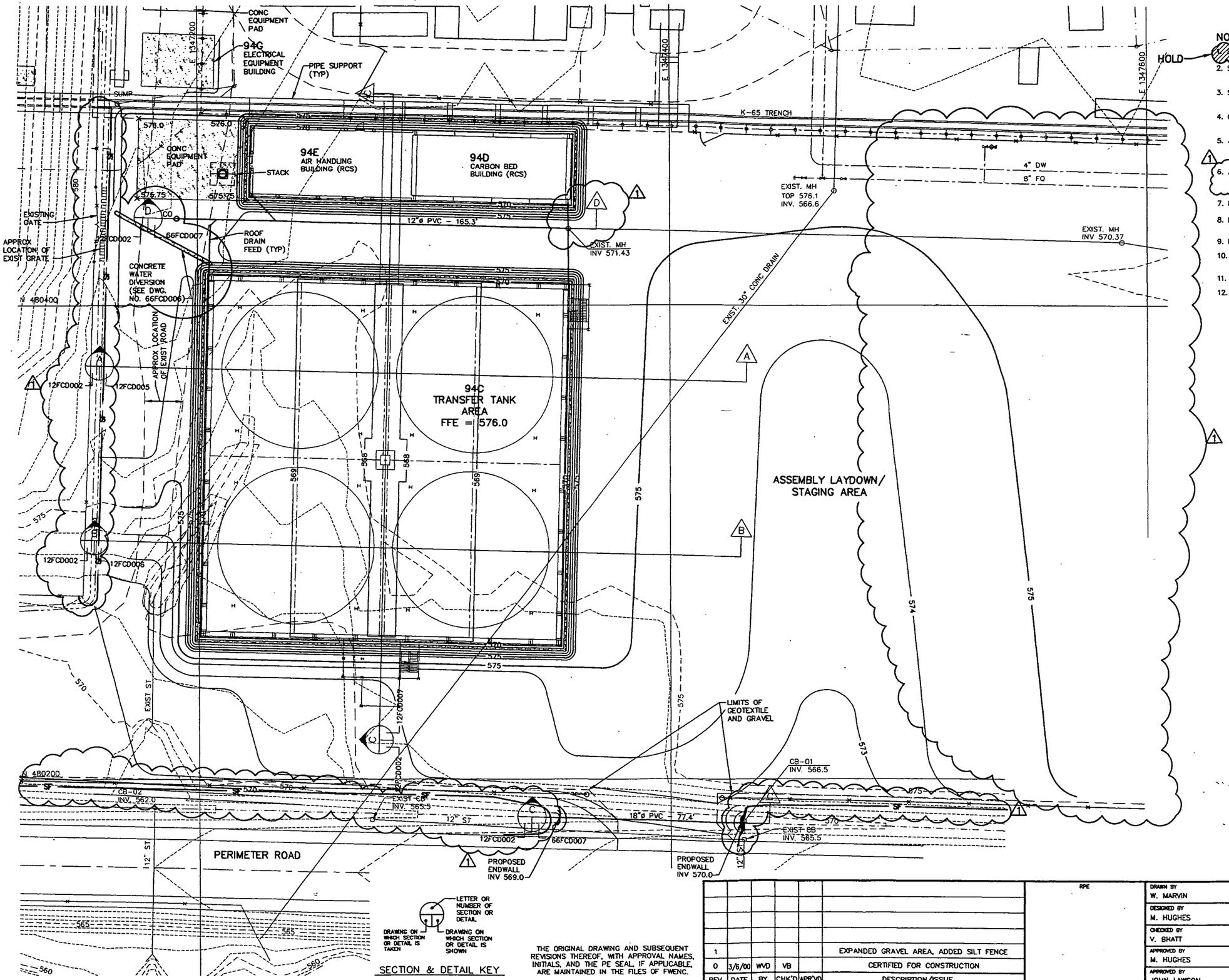
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM GRADING PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	12FCD001	1

XREF DRAWINGS: 20-PRO 20-EX

2918



000071

NOTES:

1. SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND. HOLD
2. SEE DRAWING 66FCD002 FOR STORM WATER SYSTEM DRAINAGE PLAN.
3. SEE DRAWING 66FCD007 FOR STORM WATER SYSTEM PROFILES.
4. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
5. ALL EROSION CONTROL MEASURES WILL BE INSTALLED AT THE BEGINNING OF EXCAVATION AND MAINTAINED FOR THE DURATION OF THE PROJECT.
6. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED AS SOON AS PRACTICAL, REFER TO SPECIFICATION SECTION 02924.
7. REFER TO SPECIFICATION SECTION 02300 FOR EARTHWORK.
8. BM-11 LOCATION: N 480,149.27 E 1,347,017.97 ELEV. 569.91
9. REFER TO SPECIFICATION SECTION 02373 FOR SEPARATION FABRIC.
10. REFER TO SPECIFICATION SECTION 02731 FOR AGGREGATE SURFACE COURSE.
11. REFER TO SPECIFICATION SECTION 02630 FOR STORM DRAINAGE.
12. CONTRACTOR RESPONSIBLE FOR LOCATING EXISTING FEATURES WITH SURVEY TIE-INS.

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					EXPANDED GRAVEL AREA, ADDED SILT FENCE
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

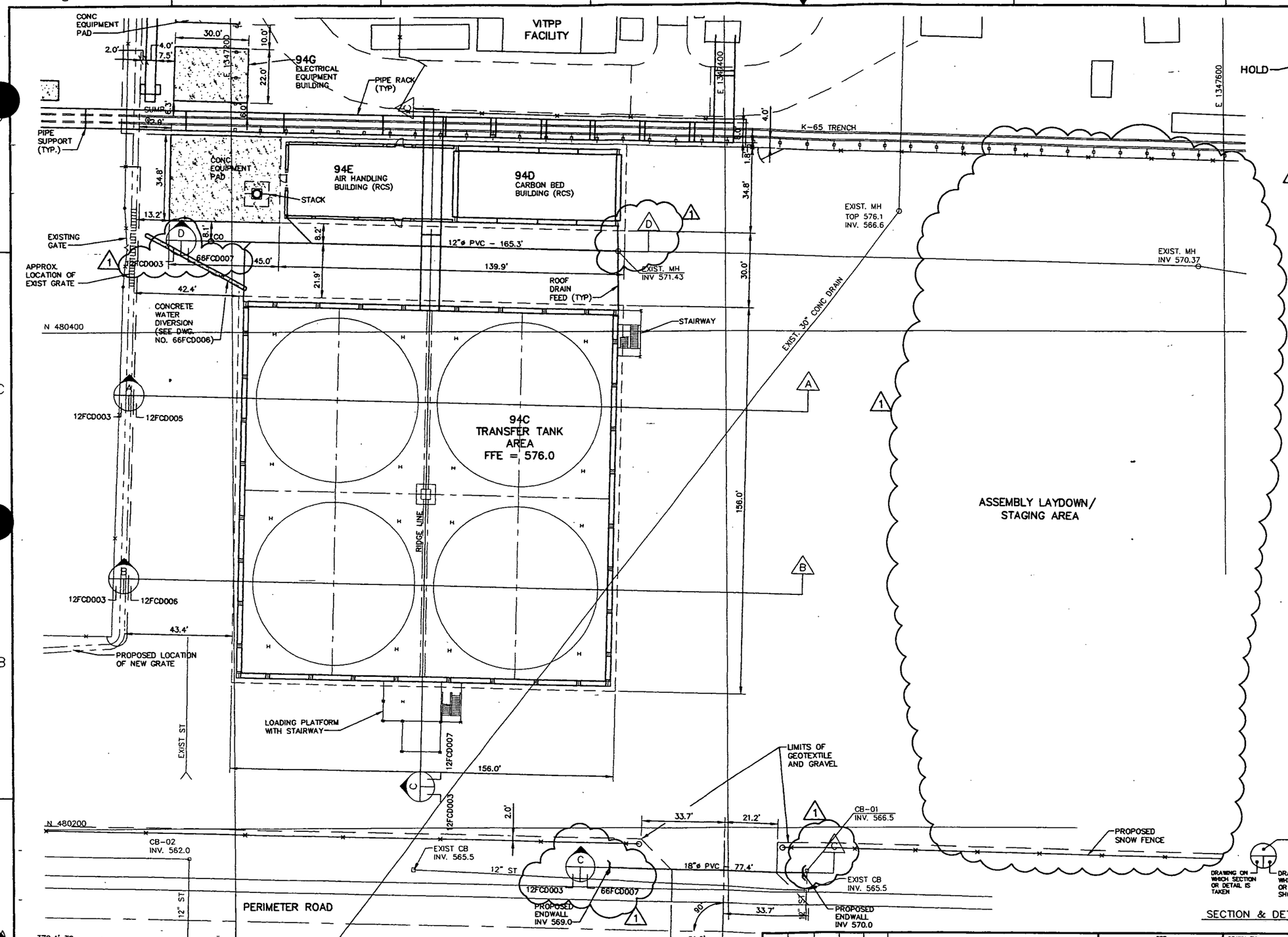
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM EXCAVATION PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	12FCD002	1

XREF DRAWINGS: 20-PR 20-EX

2918



000072

NOTES:

HOLD — SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND.

2. SEE DRAWING 66FCD002 FOR STORM WATER SYSTEM DRAINAGE PLAN.
3. SEE DRAWING 66FCD007 FOR STORM WATER SYSTEM PROFILES.
4. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
5. ALL EROSION CONTROL MEASURES WILL BE INSTALLED AT THE BEGINNING OF EXCAVATION AND MAINTAINED FOR THE DURATION OF THE PROJECT.
6. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED AS SOON AS PRACTICAL. REFER TO SPECIFICATION SECTION 02924.
7. REFER TO SPECIFICATION SECTION 02300 FOR EARTHWORK.
8. BM-11 LOCATION: N 480,149.27 E 1,347,017.97 ELEV. 569.91
9. REFER TO SPECIFICATION SECTION 02373 FOR SEPARATION FABRIC.
10. REFER TO SPECIFICATION SECTION 02731 FOR AGGREGATE SURFACE COURSE.
11. REFER TO SPECIFICATION SECTION 02630 FOR STORM DRAINAGE.
12. CONTRACTOR RESPONSIBLE FOR LOCATING EXISTING FEATURES WITH SURVEY TIE-INS.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					EXPANDED GRAVEL AREA, REVISED DIMENSIONS
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

PE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

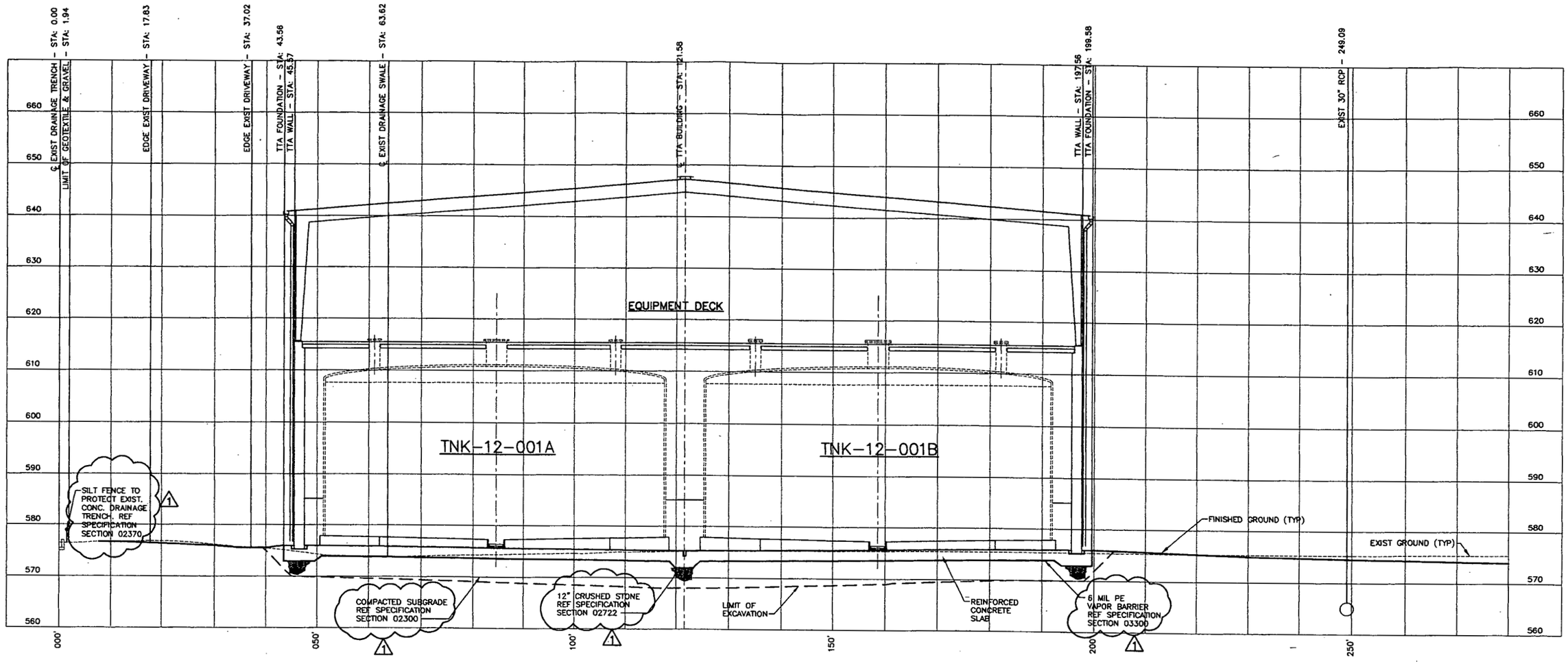
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM SITE LAYOUT PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	12FCD003	1

XREF DRAWINGS: 20-PROP 20-ENS

2918



SECTION

SCALE: 1"=10'

A

12FCD001
12FCD002
12FCD003

12FCD005

000073

LETTER OR NUMBER OF SECTION OR DETAIL

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					REVISED DIMENSIONS
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

PPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER

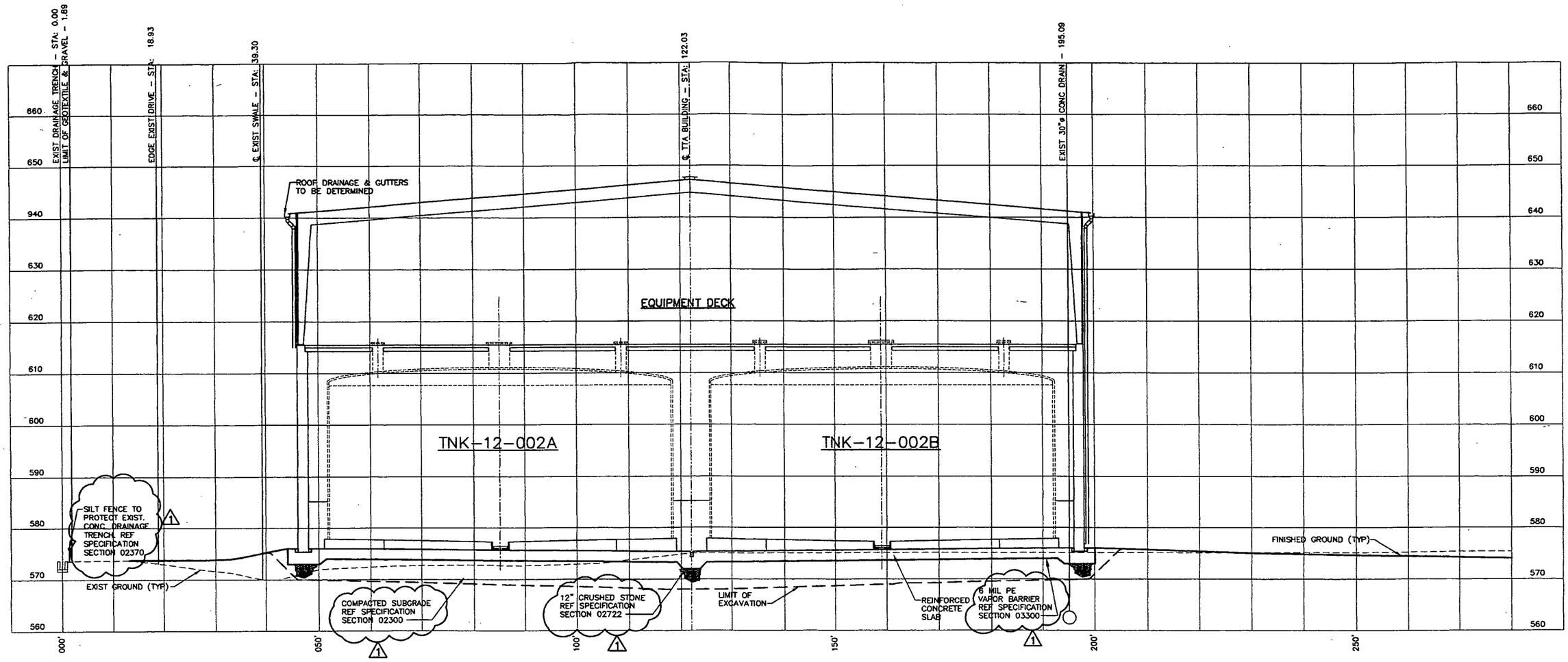
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE

TRANSFER TANK SYSTEM
CROSS SECTIONS
SHEET 1

SIZE	SCALE:	DWG. NO.	REV
D	1"=10'	12FCD005	1

2918



SECTION B

SCALE: 1"=10'

12FCD001
12FCD002
12FCD003
12FCD006

000074

LETTER OR NUMBER OF SECTION OR DETAIL

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					REVISED DIMENSIONS
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

		DATE
DRAWN BY	W. MARVIN	3/6/00
DESIGNED BY	M. HUGHES	3/6/00
CHECKED BY	V. BHATT	3/6/00
APPROVED BY	M. HUGHES	3/6/00
APPROVED BY	JOHN LAWSON	3/6/00

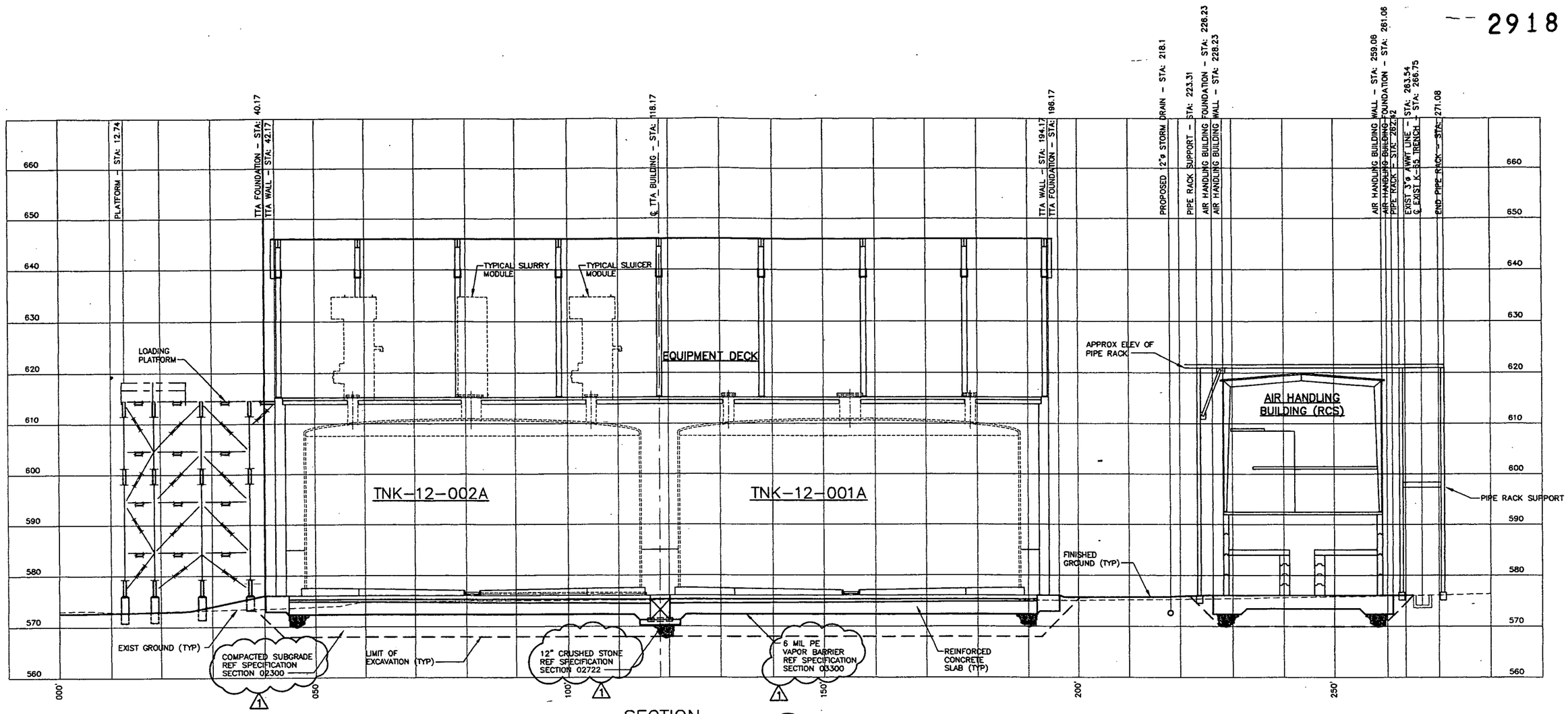
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
CROSS SECTIONS
SHEET 2

SIZE	SCALE:	DWG. NO.	REV
D	1"=10'	12FCD006	1

2918



SECTION

SCALE: 1"=10'

C

12FCD001
12FCD002
12FCD003

12FCD007

000075

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
CROSS SECTIONS
SHEET 3

1					REVISED DIMENSIONS
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION
REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

RPE

		DATE
DRAWN BY	W. MARVIN	3/6/00
DESIGNED BY	M. HUGHES	3/6/00
CHECKED BY	V. BHATT	3/6/00
APPROVED BY	M. HUGHES	3/6/00
APPROVED BY	JOHN LAWSON	3/6/00

SIZE	SCALE:	DWG. NO.	REV
D	1"=10'	12FCD007	1

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

GENERAL NOTES

CONCRETE

1. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
2. STRUCTURAL CONCRETE & FORM WORK SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 03300
3. FORM ALL EXPOSED EXTERNAL CORNERS OF CONCRETE WITH 3/4" x 45° CHAMFER.
4. CONCRETE COVER SHALL BE 2" UNLESS OTHERWISE NOTED
5. REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BARS CONFORMING TO ASTM A615 IN ACCORDANCE WITH SPECIFICATION SECTION 03200.
6. REINFORCING SPLICES SHALL BE CLASS 'B' TENSION LAP SPLICES. ALL EMBEDMENT LENGTHS TO BE TENSION DEVELOPMENT LENGTH. MINIMUN LENGTH OF FREE END OF BAR BENT TO ANY DEGREE SHALL BE TREATED AS A 90° HOOK OR 12" MIN.
7. PLACING DIMENSIONS ARE GIVEN TO CENTER OF BARS UNLESS OTHERWISE NOTED.
8. SHIFT OR BEND BARS TO CLEAR ANCHOR BOLTS, DRAINS, PIPE SLEEVES, ELECTRICAL AND EMBEDDED ITEMS PARTS.
9. ALL ANCHOR BOLTS, PIPES, PIPE SLEEVES AND ELECTRICAL CONDUITS SHALL BE IN POSITION BEFORE CONCRETE IS PLACED.
10. ANCHOR BOLTS EXCEPT AT TANK SHALL BE IN ACCORDANCE WITH ASTM A36 WITH HEAVY HEXAGONAL NUTS (ASTM A563), AND CIRCULAR WASHERS (NON-HARDENED-DIMENSIONS PER ASTM F-436), UNLESS OTHERWISE NOTED.
11. EQUIPMENT FOUNDATION DIMENSIONS, ANCHOR BOLT SIZE & LOCATION SHALL BE OBTAINED FROM CERTIFIED EQUIPMENT DRAWINGS. ALL MODIFICATIONS &/OR CHANGES WILL REQUIRE WRITTEN APPROVAL FROM CONSTRUCTION MANAGER.
12. EXPANSION ANCHORS AS SHOWN TO BE HILTI KWIK II. MANUFACTURED BY HILTI CORPORATION OR APPROVED EQUIVALENT.
13. ALL ELEVATIONS SHOWN ON DRAWING ARE HIGH POINTS, UNLESS OTHERWISE NOTED. ALL MAT THICKNESSES ARE WITH RESPECT TO HIGH POINT ELEVATION.
14. REFER TO VENDOR DRAWINGS FOR EMBEDDED ITEMS AND RECESSES NOT SHOWN ON THE STRUCTURAL DRAWING.
15. PREMOLDED JOINT FILLER SHALL CONFORM TO, TYPE A, ASTM D1751.
16. WATERSTOPS TO BE 6" WIDE PVC & SHALL HAVE A MINIMUM TENSILE STRENGTH OF 1750 PSI WITH A VARYING TEMPERATURE RANGE OF 50°F TO 175°F, MAXIMUM POSSIBLE LENGTHS, RIBBED PROFILE, PREFORMED CORNER SECTIONS & HEAT WELDED JOINTING.

STEEL

1. ALL BOLTS, NOT OTHERWISE NOTED ON DESIGN DRAWINGS, ARE TO BE 3/4" DIA. ASTM A325N, TYPE 1.
2. HOLES FOR BOLTS SHALL BE 1/16" LARGER THAN THE BOLT DIAMETER UNLESS NOTED OTHERWISE.
3. IF NOTED ON DRAWING, DESIGN SPLICE CONNECTIONS FOR COLUMNS, TOP AND BOTTOM CHORDS OF BRIDGE TRUSS TO BE FULLY EQUIVALENT TO THE UNCUT MEMBER IN BOTH MOMENT AND SHEAR CAPACITY.
4. ALL BOLTED CONNECTIONS SHALL HAVE A MINIMUM OF 2 BOLTS UNLESS NOTED OTHERWISE.
5. BEAM CONNECTIONS NOT OTHERWISE NOTED OR DEFINED ON DESIGN DRAWING SHALL BE DOUBLE CLIP ANGLE, SHOP WELDED AND FIELD BOLTED AISC, FRAMED BEAM CONNECTIONS PER TABLE II AND III SHOWN IN AISC MANUAL OF STEEL CONSTRUCTION ALLOWABLE STRESS DESIGN, 9TH. EDITION WITH 1/4" SHOP WELD AND 3/8" ANGLE THICKNESS . WHEN NOTED ON DESIGN DRAWINGS, BEAM CONNECTIONS SHALL BE FRAMED WITH SHEAR PLATE TYPE CONNECTIONS.
6. UNLESS INDICATED OTHERWISE ON DESIGN DRAWINGS, THE FOLLOWING NUMBER OF BOLT ROWS (FOR BOLTED SHEAR CONNECTIONS) SHALL BE USED FOR THE INDICATED BEAM SIZES.

BEAM SIZE	NO. BOLT ROWS	BEAM SIZE	NO. BOLT ROWS	BEAM SIZE	NO. BOLT ROWS
W6	1	W16	4	W27	7
W8, W10	2	W18	5	W30	8
W12	3	W21	6	W33	9
W14	3	W24	7	W36	10

7. ALL BOLTS SHALL BE FULLY-TENSIONED UNLESS INDICATED OTHERWISE ON THE DESIGN DRAWINGS. FULLY-TENSIONED BOLTS SHALL USE D.T.I. WASHERS INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. WHERE DESIGN DRAWING INDICATE THAT BOLTS NEED ONLY BE SNUG-TIGHT, D.T.I. WASHERS ARE NOT REQUIRED.
8. BRACING CONNECTIONS SHALL BE DESIGNED TO DEVELOP FULL TENSILE CAPACITY OF THE MEMBER CONNECTED UNLESS A SMALLER TENSILE DESIGN LOAD IS INDICATED ON THE DRAWING.
9. ALL GROOVE WELDS SHALL HAVE COMPLETE JOINT PENETRATION IN ACCORDANCE WITH THE STRUCTURAL WELDING CODE AWS D1.1 (UNLESS NOTED ON DESIGN DRAWINGS).
10. PLUS (+) OR MINUS (-) DIMENSIONS NOTED FOLLOWING MEMBER SIZES IN PLAN VIEW ARE FROM TOP OF STEEL ELEVATION NOTED FOR OVERALL PLAN.
11. DESIGN FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, NINTH EDITION, AND SPECIFICATION SECTIONS 05120
12. MATERIAL SHALL MEET THE REQUIREMENTS OF THE FOLLOWING SPECIFICATIONS: STRUCTURAL STEEL-A36 WELDING-AWS D1.1 CLASS E70XX (ELECTRODES)
13. HANDRAIL TO BE 1 1/4" DIA CARBON STL WITH TOE PLATE AND 1 1/4" DIA POSTS AT 8'-0" O.C. UNLESS OTHERWISE NOTED ON DRAWINGS.
14. UNLESS NOTED ON DRAWINGS, STEEL GRATING FOR PLATFORMS SHALL BE OF WELDED CONSTRUCTION WITH 1"X1/4" BEARING BARS SPACED AT 1 3/16" CENTERS AND CROSS BARS AT 4" CENTERS. AS MANUFACTURED BY IKG INDUSTRY OR APPROVED EQUAL
15. SHOP AND FIELD PAINTING AS PER THE SPECIFICATION SECTION 09900.
16. FABRICATOR SHALL PROVIDE ERECTION PLATES TO FACILITATE FIELD WELDING.
17. COLUMN BASE PLATES SHALL BE GROUTED AS SOON AS PRACTICAL AFTER ERECTION.
18. GROUT SHALL BE MASTER FLOW 928 AS MANUFACTURED BY MASTER BUILDERS OR APPROVED EQUAL.

ABBREVIATION INDEX

ANCH.	ANCHOR
A.B.	ANCHOR BOLT
APPROX.	APPROXIMATE
B.C.	BOLT CIRCLE
BM.	BEAM
BOT.	BOTTOM
B.O	BOTTOM OF
B.O.S.	BOTTOM. OF STEEL
CANT.	CANTILEVER
CHKD.	CHECKERED
CL	CENTERLINE
CLR.	CLEAR OR CLEARANCE
COL.	COLUMN
CONC.	CONCRETE
C.P.S.	CONCRETE PIPE SLEEPER
CONN.	CONNECTION
CONST.	CONSTRUCTION
CONT.	CONTINUOUS
CORR.	CORRUGATED
CTRD.	CENTERED
DET.	DETAIL
DIA. OR ø	DIAMETER
D.T.I.	DIRECT TENSION INDICATOR
DWG.	DRAWING
EA.	EACH
EL.	ELEVATION (HEIGHT)
ELEV.	ELEVATION (VIEW)
EQ.	EQUAL OR EQUALLY
EQUIP.	EQUIPMENT
EXIST.	EXISTING
FAB.	FABRICATE
FABR.	FABRICATOR
F.S.	FAR SIDE
FLG.	FLANGE
FDN.	FOUNDATION
F.T.	FULLY TENSIONED
GALV.	GALVANIZED
GEN.	GENERAL
GRTG.	GRATING
HORIZ.	HORIZONTAL
H.P.	HIGH POINT
HPFS	HIGH POINT FINISH SURFACE
H.R.	HANDRAIL
I.D.	INSIDE DIAMETER
INCL.	INCLUDING
INV.	INVERT
K.B.	KNEE BRACE
L.L.H.	LONG LEG HORIZONTAL
L.L.V.	LONG LEG VERTICAL
LOC.	LOCATION
L.P.	LOW POINT
MAX.	MAXIMUM
M.B.	MACHINE BOLT
M.E.S.	MISCELLANEOUS ELECTRICAL
MIN.	MINIMUM
MISC.	MISCELLANEOUS
M.P.S.	MISCELLANEOUS PIPE SUPPORT
N.S.	NEAR SIDE
NTD.	NOTED
N.T.S.	NOT TO SCALE
O.D.	OUTSIDE DIAMETER
OPNG.	OPENING
OPP.	OPPOSITE
P.S.	PIPE SUPPORT
PL OR ℞	PLATE
PLATF.	PLATFORM
P.	PROJECTION
P.O.	PURCHASE ORDER
RAD.	RADIUS
REF.	REFERENCE
REINF.	REINFORCING
REQD.	REQUIRED
R.	RISER
SCHED.	SCHEDULE
SECT.	SECTION
SIM.	SIMILAR
S.T.	SNUG TIGHT
SPA.	SPACE (S) OR SPACING
SPCD.	SPACED
SPEC.	SPECIFICATION
STD.	STANDARD
STIFF.	STIFFENER
STL.	STEEL
SUPT.	SUPPORT
SYMM.	SYMMETRICAL
THK.	THICK OR THICKNESS
THD.	THREAD
T.O.	TOP OF
T.O.C.	TOP OF CONCRETE
T.O.G.	TOP OF GROUT
T.O. PLATF.	TOP OF PLATFORM
T.O.S.	TOP OF STEEL
T.	TREAD
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VERT.	VERTICAL
W/	WITH
W/O	WITHOUT
W.P.	WORK POINT

REFERENCE SPECIFICATIONS

02-SITE CONSTRUCTION
- 02731 AGGREGATE SURFACE COURSE
- 02300 EARTHWORK
- 02722 AGGREGATE AND/ OR GRADED CRUSHED AGGREGATE BASE COURSE

03-CONCRETE
- 03200 CONCRETE REINFORCEMENT
- 03300 CAST-IN-PLACE CONCRETE
- 03410 PRECAST STRUCTURAL CONCRETE

05-METALS
- 05120 STRUCTURAL STEEL
- 05311 STEEL FLOOR DECK
- 05500 METAL FABRICATION

07-THERMAL AND MOISTURE PROTECTION
- 07900 JOINT SEALANTS

08-DOORS AND WINDOWS
- 08110 STEEL DOORS & FRAMES
- 08710 DOOR HARDWARE

09-FINISHES
- 09900 PAINTS AND COATINGS

13-SPECIAL CONSTRUCTION
- 13121 PRE-ENGINEERED METAL BUILDINGS

000076

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE: STATE OF OHIO, MING HSIEH, E-64589, REGISTERED PROFESSIONAL ENGINEER, 3/3/00

		DATE
DRAWN BY		3-3-00
DESIGNED BY		3/3/00
CHECKED BY		3/3/00
APPROVED BY		3/3/00
APPROVED BY		3/3/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

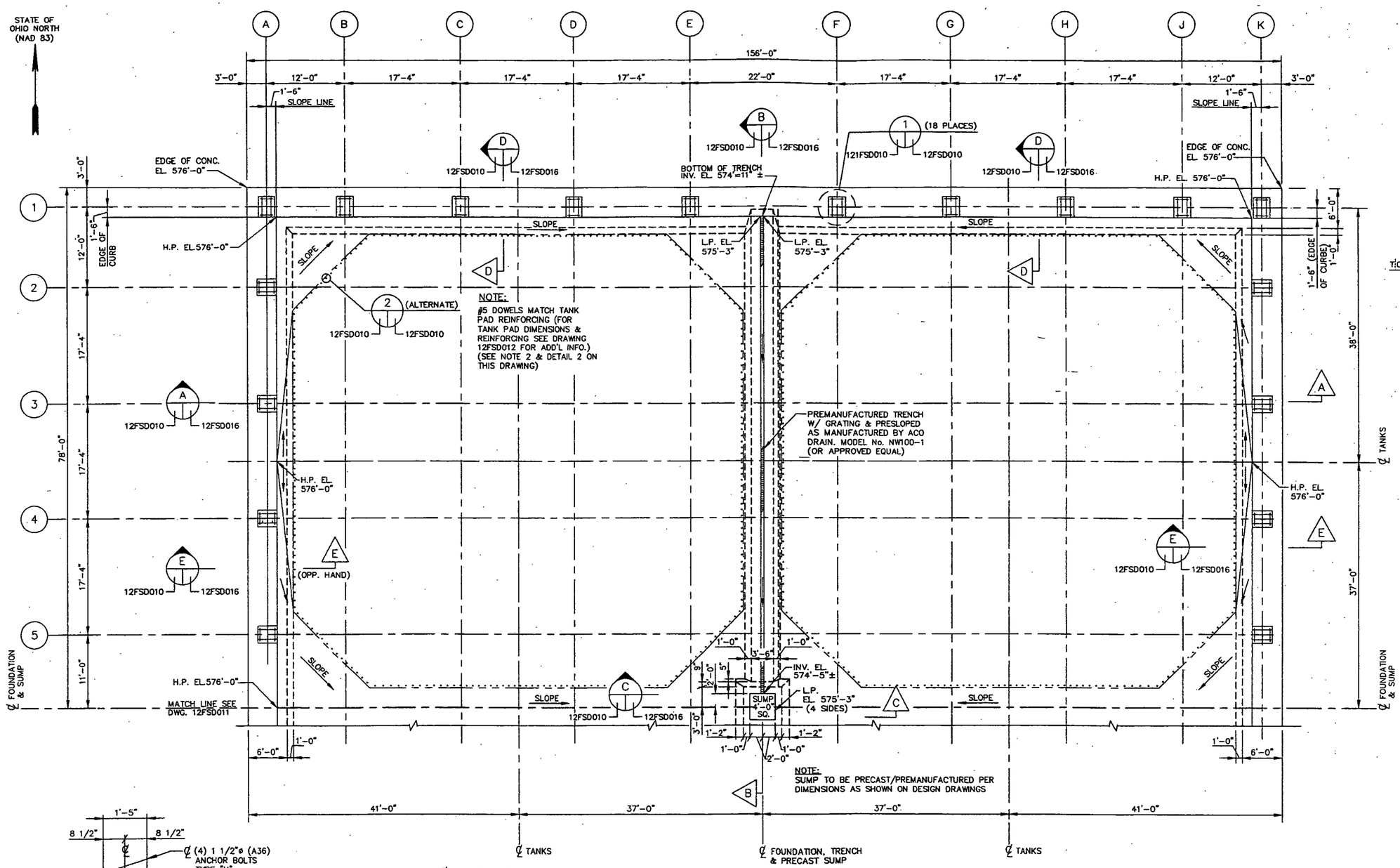
TITLE: TRANSFER TANK SYSTEM GENERAL NOTES & REFERENCE SPECS & ABBREVIATION INDEX

SIZE	SCALE:	DWG. NO.	REV
D	NONE	12FSD005	0

FILENAME: 12FSD005.DI

2918

STATE OF OHIO NORTH (NAD 83)



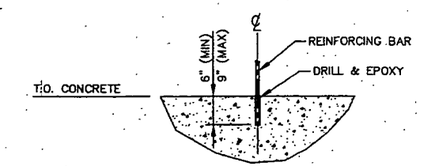
FOUNDATION PLAN
SCALE: 1/8" = 1'-0"

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. ONLY WHERE REQUIRED FOR CONSTRUCTION ACCESS, CONTRACTOR MAY CHOOSE TO INSTALL DOWELS AFTER CONCRETE IS IN PLACE USING ALTERNATE DOWEL PLACEMENT METHOD. (SEE DETAIL 2 ON THIS DRAWING.)
3. WORK THIS DRAWING WITH DWG. 12FSD012 FOR TANK PAD FOUNDATION DOWEL PLACEMENT.

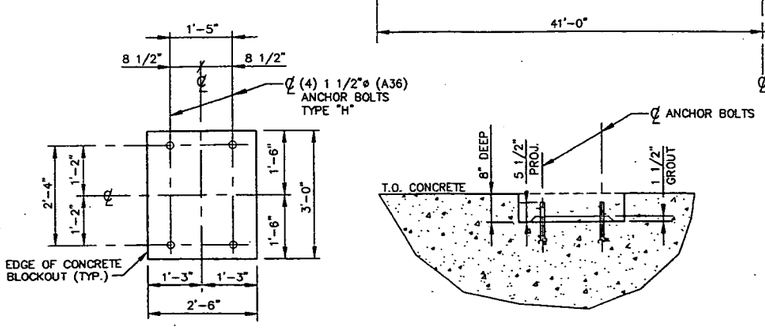
REFERENCE DRAWINGS:

12FSD011	TTA BUILDING FOUNDATION (SHEET 2)
12FSD012	TTA BUILDING TANK PAD FOUNDATIONS
12FSD015	ANCHOR BOLT DETAILS & SCHEDULE
12FSD016	TTA BUILDING FOUNDATION SECTIONS



ALTERNATIVE DOWEL PLACEMENT DETAIL

2 DETAIL (ALTERNATE)
SCALE: NONE
12FSD010 — 12FSD010



1 DETAIL (18 PLACES)
SCALE: NONE
12FSD010 — 12FSD010
(10 AS SHOWN/8 @ 90°)

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE — STATE OF OHIO — MING-JIN HSIEH — E-04599 — REGISTERED PROFESSIONAL ENGINEER

DRAWN BY		DATE 3/3/00
DESIGNED BY		DATE 3/3/00
CHECKED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00

000077

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BUILDING FOUNDATION
PLAN & DETAILS (SHEET 1 OF 2)

SIZE	SCALE:	DWG. NO.	REV
D	1/8" = 1'-0"	12FSD010	0

FILENAME: 12FSD010.D

2918

STATE OF OHIO NORTH (NAD 83)

156'-0"

3'-0" | 12'-0" | 17'-4" | 17'-4" | 17'-4" | 22'-0" | 17'-4" | 17'-4" | 17'-4" | 12'-0" | 3'-0"

6'-0" | 1'-0" | 1'-0" | 6'-0"

A B C D E F G H J K

6 7 8 9 10

11'-0" | 17'-4" | 17'-4" | 12'-0" | 3'-0" | 78'-0"

37'-0" | 38'-0" | 1'-6" | 1'-0" | 6'-0"

℄ TANKS

℄ FOUNDATION & SUMP

MATCH LINE SEE DWG. 12FSD010

H.P. EL. 576'-0"

SLOPE

B 12FSD011 12FSD016

SYMM. ABOUT ℄

NOTE:
FOR ADDITIONAL DIMENSIONS & INFORMATION FOR SUMP SEE DRAWING 12FSD010

INV. EL. 574'-5"±

L.P. EL. 575'-3" (4 SIDES)

C 12FSD011 12FSD016

1'-0" | 3'-6" | 1'-0"

2 (ALTERNATE) 12FSD011 12FSD011

NOTE:
#5 DOWELS MATCH TANK PAD REINFORCING (FOR TANK PAD DIMENSIONS & REINFORCING SEE DRAWING 12FSD012 FOR ADD'L INFO.) (SEE NOTE 2 & DETAIL 2 ON THIS DRAWING)

E (OPP. HAND)

E 12FSD011 12FSD016

PREMANUFACTURED TRENCH W/ GRATING & PRESLOPED AS MANUFACTURED BY ACO DRAIN. MODEL No. NW100-1 (OR APPROVED EQUAL)

A 12FSD010 12FSD016

D 12FSD011 12FSD016

L.P. EL. 575'-3"

T.O. CONC. EL. 576'-0"

BOTTOM OF TRENCH INV. EL. 574'-11"±

1 (18 PLACES) 121FSD011 12FSD011

D (OPP. HAND)

B

1'-6" SLOPE LINE

41'-0" | 37'-0" | 37'-0" | 41'-0"

℄ TANKS | ℄ FOUNDATION, TRENCH & SUMP | ℄ TANKS

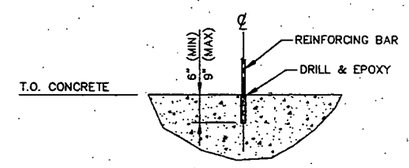
FOUNDATION PLAN
SCALE: 1/8" = 1'-0"

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005
2. ONLY WHERE REQUIRED FOR CONSTRUCTION ACCESS, CONTRACTOR MAY CHOOSE TO INSTALL DOWELS AFTER CONCRETE IS IN PLACE USING ALTERNATE DOWEL PLACEMENT METHOD. (SEE DETAIL 2 ON THIS DRAWING.)
3. WORK THIS DRAWING WITH DWG. 12FSD013 FOR TANK PAD FOUNDATION DOWEL PLACEMENT.

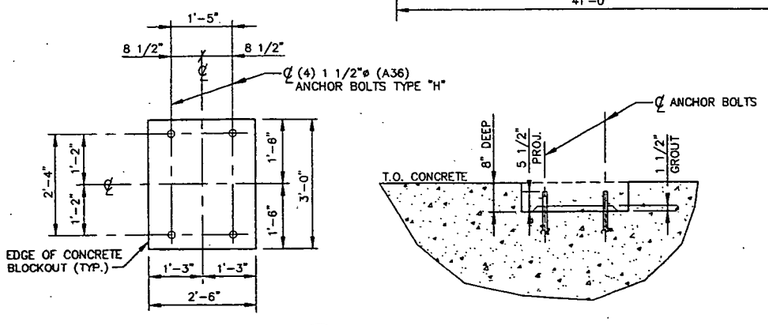
REFERENCE DRAWINGS:

12FSD010	TTA BUILDING FOUNDATION (SHEET 1)
12FSD013	TTA BUILDING TANK PAD FOUNDATIONS
12FSD015	ANCHOR BOLT DETAILS & SCHEDULE
12FSD016	TTA BUILDING FOUNDATION SECTIONS



ALTERNATIVE DOWEL PLACEMENT DETAIL

2 DETAIL (ALTERNATE)
SCALE: NONE
12FSD011 12FSD011



1 DETAIL (18 PLACES)
SCALE: NONE
12FSD011 12FSD011
(10 AS SHOWN/8 @ 90°)

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

000078

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00	[illegible]	[illegible]	[illegible]	CERTIFIED FOR CONSTRUCTION

RPE STATE OF OHIO MINS 3/3/00 HSEH E-64599 REGISTERED PROFESSIONAL ENGINEER

		DATE
DRAWN BY	[illegible]	3/3/00
DESIGNED BY	[illegible]	3/3/00
CHECKED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00

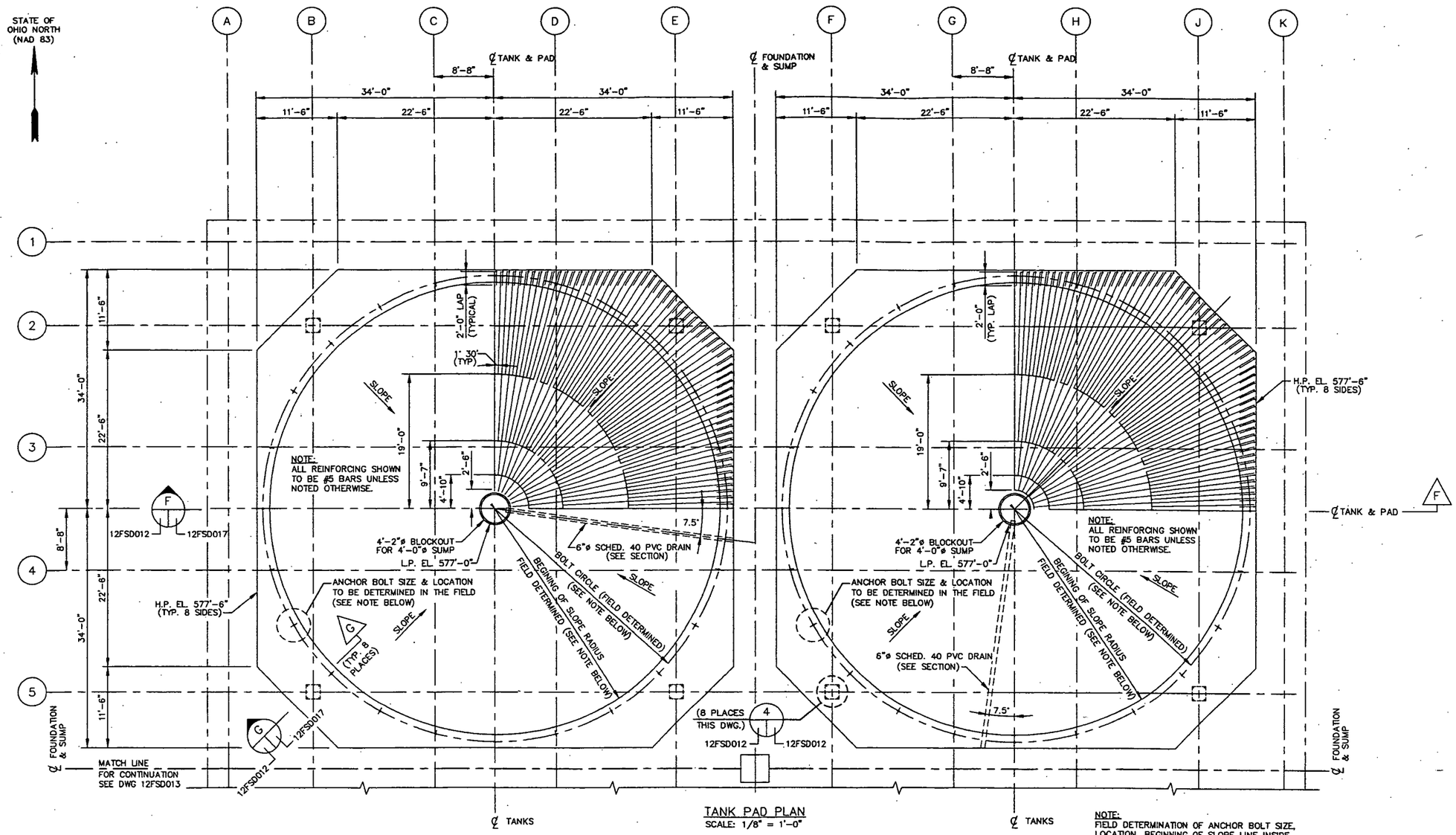
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BUILDING FOUNDATION
PLAN & DETAILS (SHEET 2 OF 2)

SIZE	SCALE:	DWG. NO.	REV
D	1/8" = 1'-0"	12FSD011	0

STATE OF OHIO NORTH (NAD 83)



TANK PAD PLAN
SCALE: 1/8" = 1'-0"

NOTES:

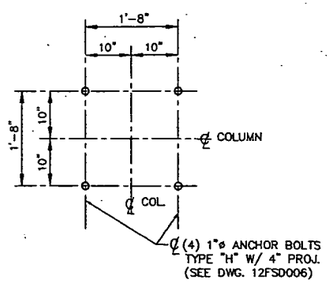
1. FOR GENERAL NOTES SEE DWG. 12FSD005.
2. FOR ADDITIONAL INFORMATION & DIMENSIONS FOR TTA BUILDING FOUNDATION SEE DRAWING 12FSD010.

2918

REFERENCE DRAWINGS:

12FSD011	TTA BUILDING FOUNDATION (SHT. 1)
12FSD016	TTA BUILDING FOUNDATION SECTIONS
12FSD017	TTA BUILDING TANK PAD FDN. SECTIONS

NOTE:
FIELD DETERMINATION OF ANCHOR BOLT SIZE, LOCATION, BEGINNING OF SLOPE LINE INSIDE BOLT CIRCLE SHALL BE BASED ON TANK MFR. CERTIFIED DRAWINGS OR ACTUAL DIMENSIONS TAKEN FROM THE TANKS.



4 DETAIL (16 REQUIRED)
SCALE: NONE
12FSD012
12FSD013
12FSD012

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

000079

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE: STATE OF OHIO, MIKQ 3/3/00, HSIEH, E-64599, REGISTERED PROFESSIONAL ENGINEER

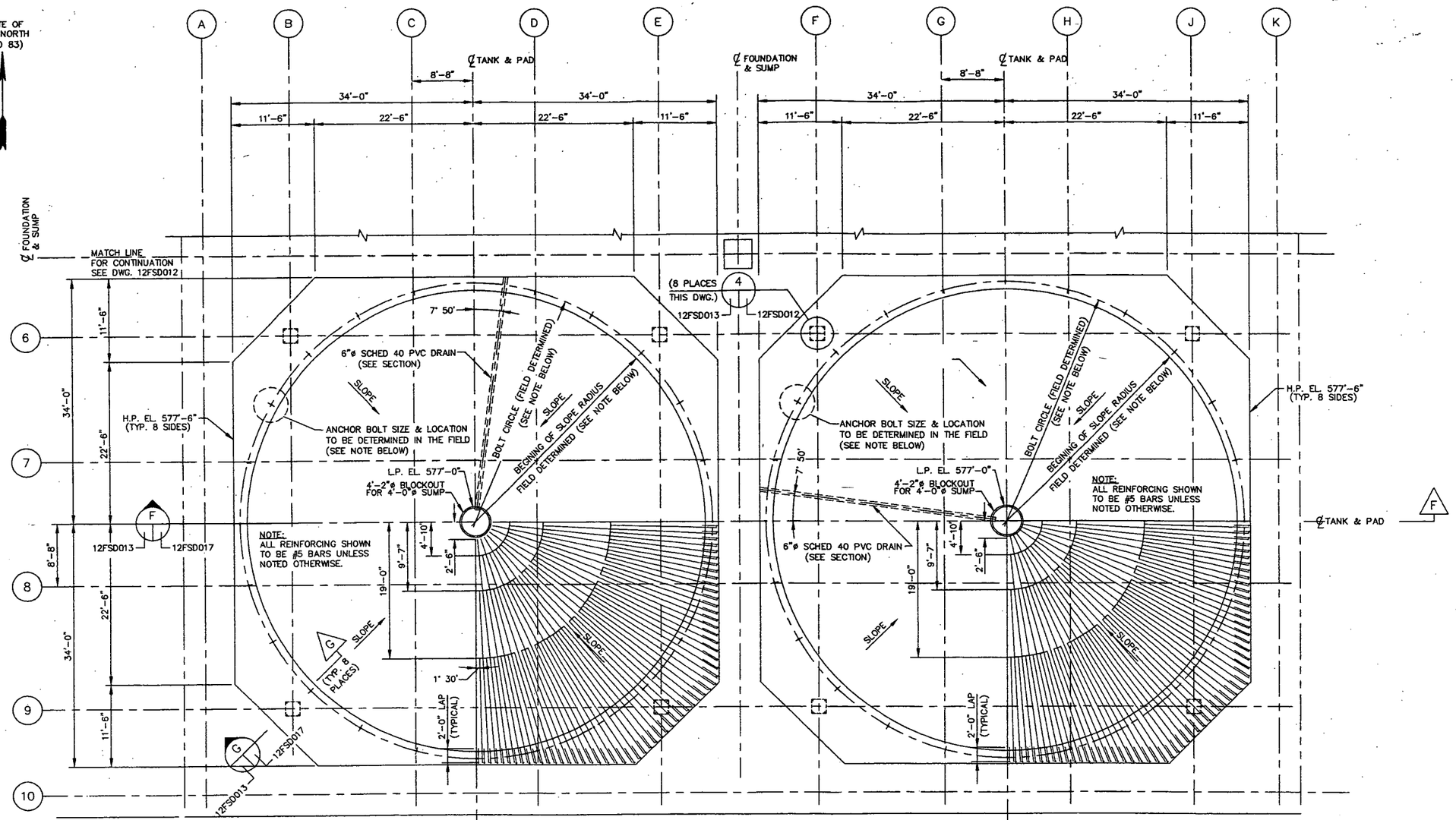
DRAWN BY — DATE 3/3/00
DESIGNED BY — DATE 3/1/00
CHECKED BY — DATE 3/3/00
APPROVED BY — DATE 3/3/00
APPROVED BY — DATE 3/3/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BLDG TANK PADS
PLAN & DETAILS (SHEET 1 OF 2)

SIZE	SCALE:	DWG. NO.	REV
D	1/8" = 1'-0"	12FSD012	0



TANK PAD PLAN
SCALE: 1/8" = 1'-0"

NOTE:
FIELD DETERMINATION OF ANCHOR BOLT SIZE, LOCATION, BEGINNING OF SLOPE LINE INSIDE BOLT CIRCLE SHALL BE BASED ON CERTIFIED DRAWINGS OR PHYSICAL DIMENSIONS TAKEN FROM THE TANKS.

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. FOR ADDITIONAL INFORMATION & DIMENSIONS FOR TTA BUILDING FOUNDATION SEE DRAWING 12FSD010.

2918

REFERENCE DRAWINGS:

12FSD011	TTA BUILDING FOUNDATION (SHT. 1)
12FSD016	TTA BUILDING FOUNDATION SECTIONS
12FSD017	TTA BUILDING TANK PAD FDN. SECTIONS

000080

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-64599
REGISTERED PROFESSIONAL ENGINEER
3-3-00

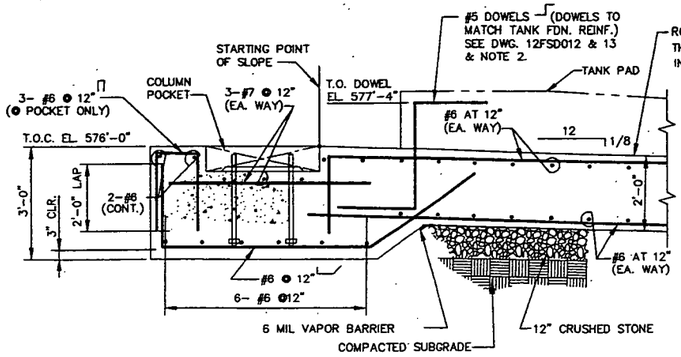
		DATE
DRAWN BY		3/3/00
DESIGNED BY		3/3/00
CHECKED BY		3/3/00
APPROVED BY		3/3/00
APPROVED BY		3/3/00

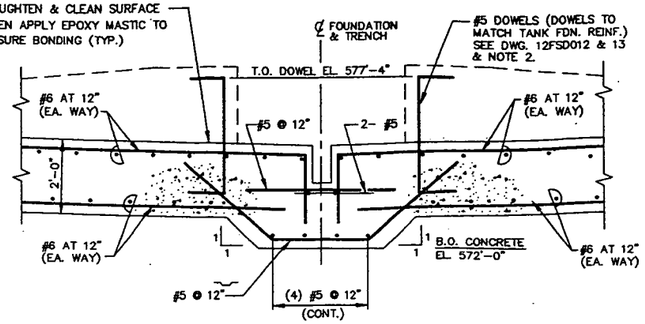
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

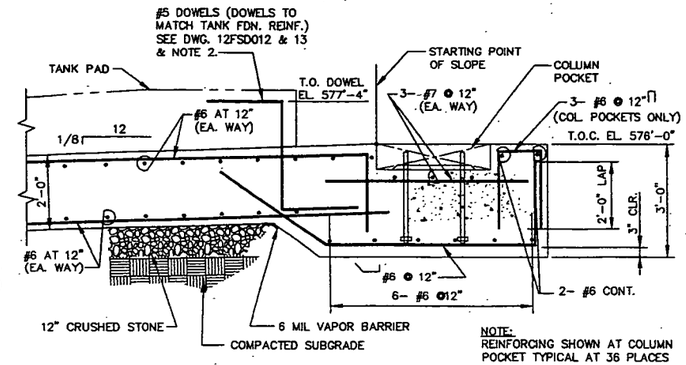
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BLDG TANK PADS
PLAN & DETAILS (SHEET 2 OF 2)

SIZE	SCALE:	DWG. NO.	REV
D	1/8" = 1'-0"	12FSD013	0







NOTE:
REINFORCING SHOWN AT COLUMN POCKET TYPICAL AT 36 PLACES

A SECTION
SCALE: 1/2"=1'-0"
12FSD010 12FSD011 — 12FSD016

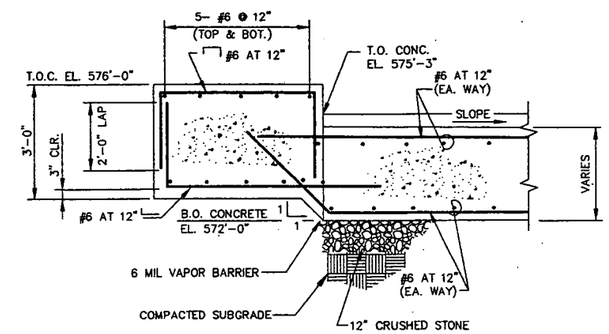
NOTES:

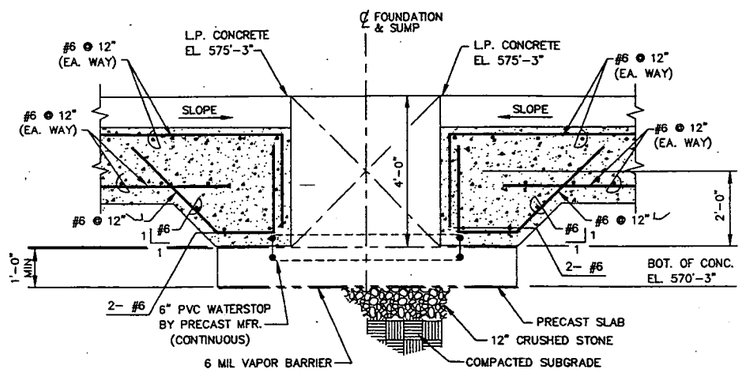
1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. PLACEMENT OF CRUSHED STONE SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02722.
3. SUB GRADE COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02300.
4. VAPOR BARRIER SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 03300.
5. DESIGN IS BASED ON MINIMUM BEARING PRESSURE OF 3200 PSF.
6. SLOPE FLATTER THAN 1:1 AT THE BOTTOM OF CONCRETE IS ACCEPTABLE WITH MINIMUM 3" COVER.

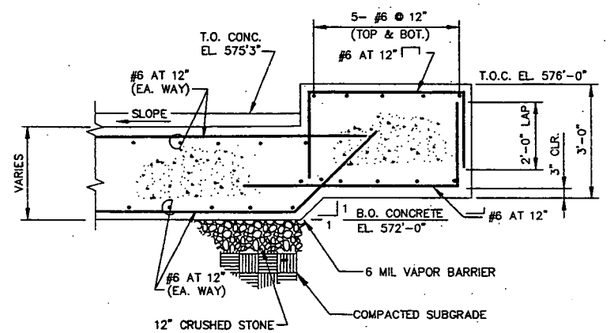
2918

REFERENCE DRAWINGS

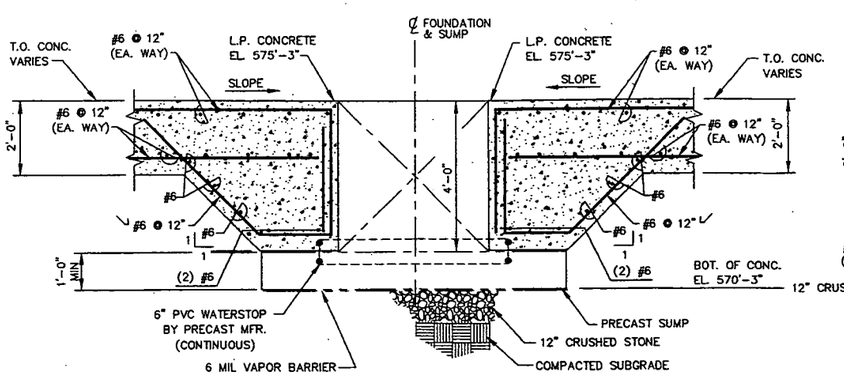
12FSD010	TTA FOUNDATION (SHEET 1)
12FSD011	TTA FOUNDATION (SHEET 2)
12FSD012	TTA TANK PAD FOUNDATION (SHEET 1)
12FSD013	TTA TANK PAD FOUNDATION (SHEET 2)



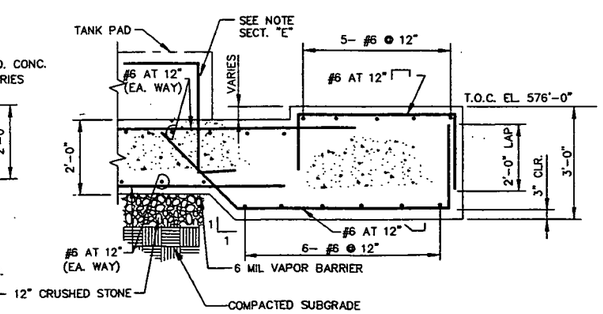




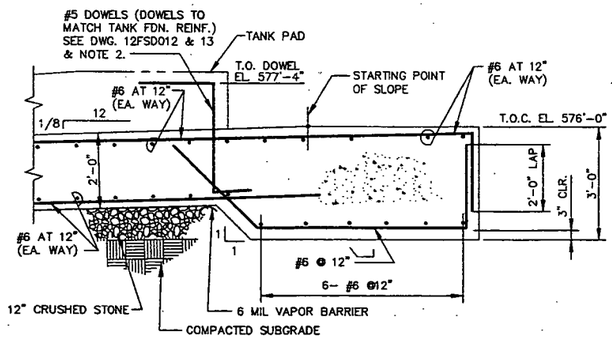
B SECTION
SCALE: 1/2"=1'-0"
12FSD010 12FSD011 — 12FSD016



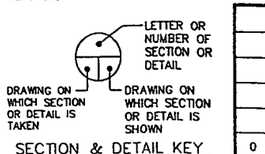
C SECTION
SCALE: 1/2"=1'-0"
12FSD010 12FSD011 — 12FSD016



D SECTION
SCALE: 1/2"=1'-0"
12FSD010 12FSD011 — 12FSD016



E SECTION
SCALE: 1/2"=1'-0"
12FSD010 12FSD011 — 12FSD016



SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE — STATE OF OHIO — MING HSIEH E-64599 — REGISTERED PROFESSIONAL ENGINEER — 3/3/00

		DATE
DRAWN BY		8/3/00
DESIGNED BY		3/3/00
CHECKED BY		3/3/00
APPROVED BY		3/3/00
APPROVED BY		3/3/00

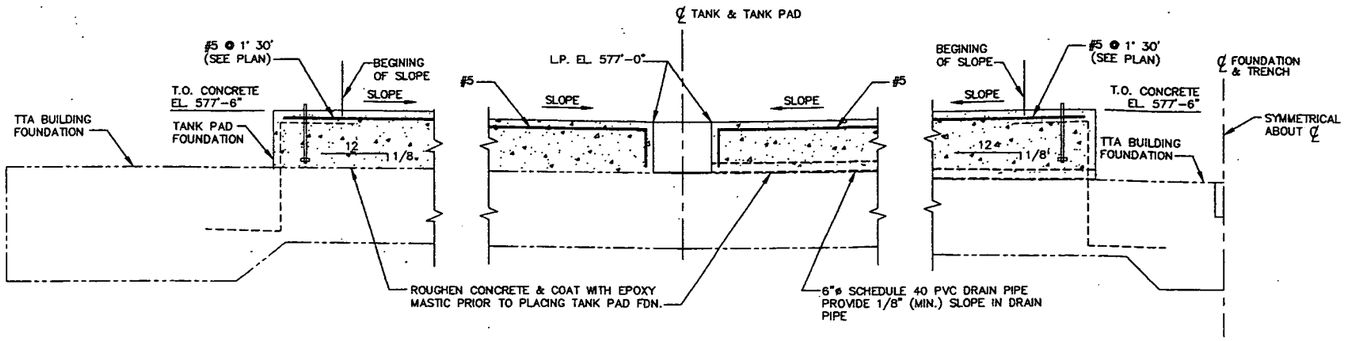
000081

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

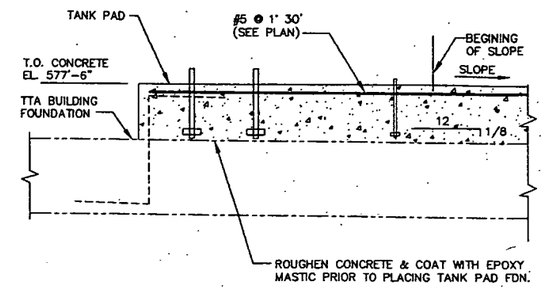
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BUILDING FOUNDATION
SECTIONS

SIZE	SCALE:	DWG. NO.	REV
D	1/2"=1'-0"	12FSD016	0



F SECTION
SCALE: 1/2"=1'-0"
12FSD012
12FSD013
12FSD017



G SECTION
SCALE: 1/2"=1'-0"
12FSD012
12FSD013
12FSD017

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.

REFERENCE DRAWINGS

12FSD012 TTA BLDG TANK PAD FDNS (SHEET 1)
12FSD013 TTA BLDG TANK PAD FDNS (SHEET 2)

2918

TOLERANCES:

1. TANK PAD ELEVATION SHALL MEET THE FOLLOWING TOLERANCES:
   ± 1/8" IN ANY 10'-0" OF CIRCUMFRENCE
   OR ± 1/2" IN TOTAL CIRCUMFRENCE.

000082

SECTION & DETAIL KEY

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00	[illegible]	[illegible]	[illegible]	CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-64599
REGISTERED PROFESSIONAL ENGINEER
3/3/00

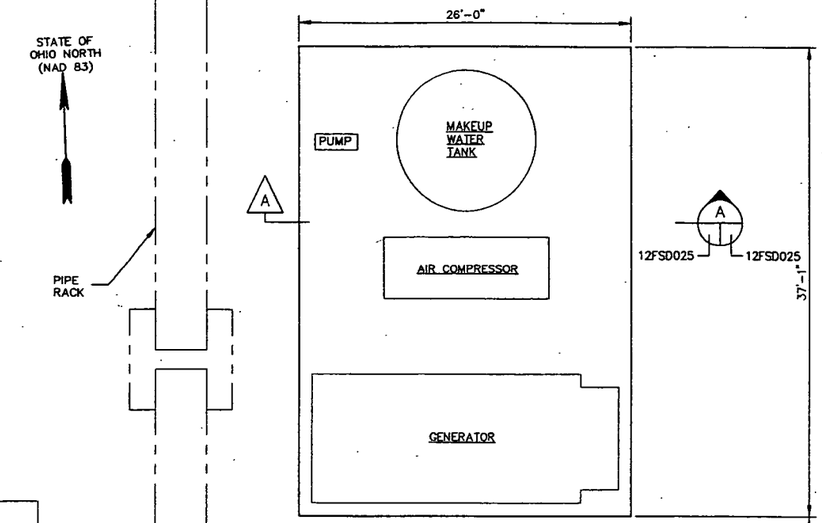
		DATE
DRAWN BY	[illegible]	3/3/00
DESIGNED BY	[illegible]	3/3/00
CHECKED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

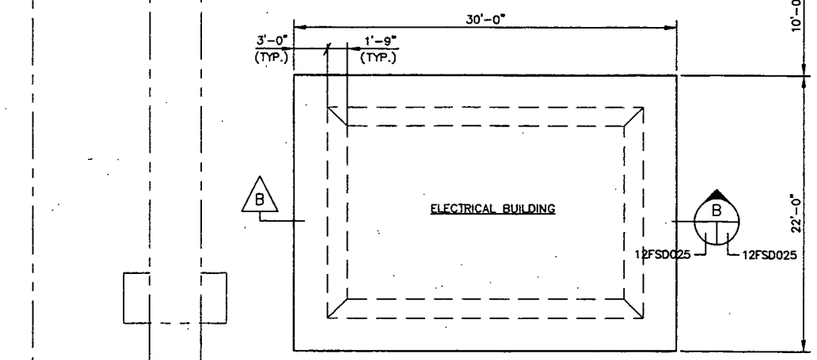
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANSFER TANK SYSTEM
TTA BLDG TANK PAD FDNS
SECTIONS

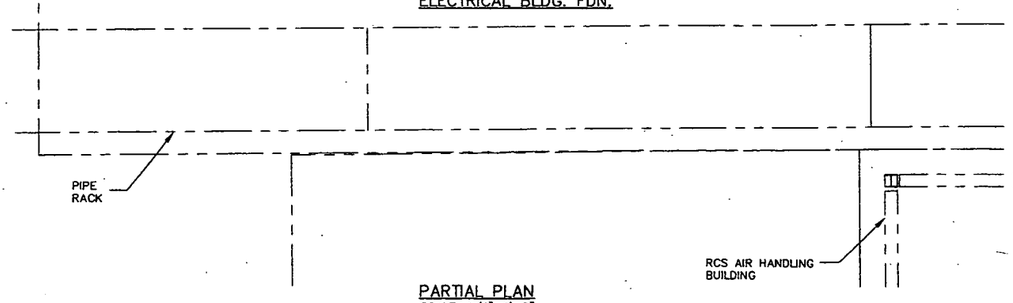
SIZE	SCALE:	DWG. NO.	REV
D	1/2"=1'-0"	12FSD017	0



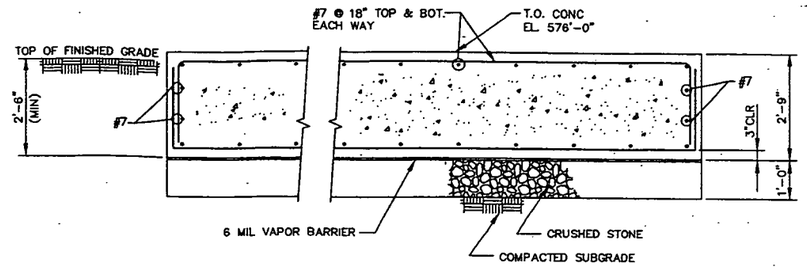
GENERATOR, COMPRESSOR, TANK, PUMP FDN



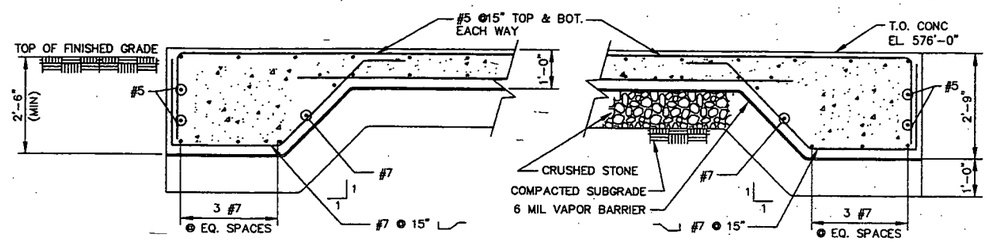
ELECTRICAL BLDG. FDN.



PARTIAL PLAN
SCALE: 1/4"=1'-0"



A SECTION
SCALE: 1/2"=1'-0"
12FSD025 12FSD025

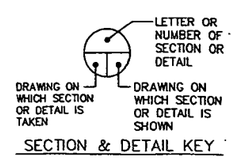


B SECTION
SCALE: 1/2"=1'-0"
12FSD025 12FSD025

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. PLACEMENT OF CRUSHED STONE SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02722.
3. SUB GRADE COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02300.
4. VAPOR BARRIER SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 03300.
5. DESIGN IS BASED ON MINIMUM BEARING PRESSURE OF 3200 PSF.
6. SLOPE FLATTER THAN 1:1 AT THE BOTTOM OF CONCRETE IS ACCEPTABLE WITH MINIMUM 3" COVER.
7. ANCHOR BOLT SIZE AND LOCATION SHALL BE FIELD DETERMINED BASED ON CERTIFIED VENDOR DRAWING.

2918



SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-64599
REGISTERED PROFESSIONAL ENGINEER
3/3/00

		DATE
DRAWN BY		3-3-00
DESIGNED BY		3-3-00
CHECKED BY		3/3/00
APPROVED BY		3/3/00
APPROVED BY		3/3/00

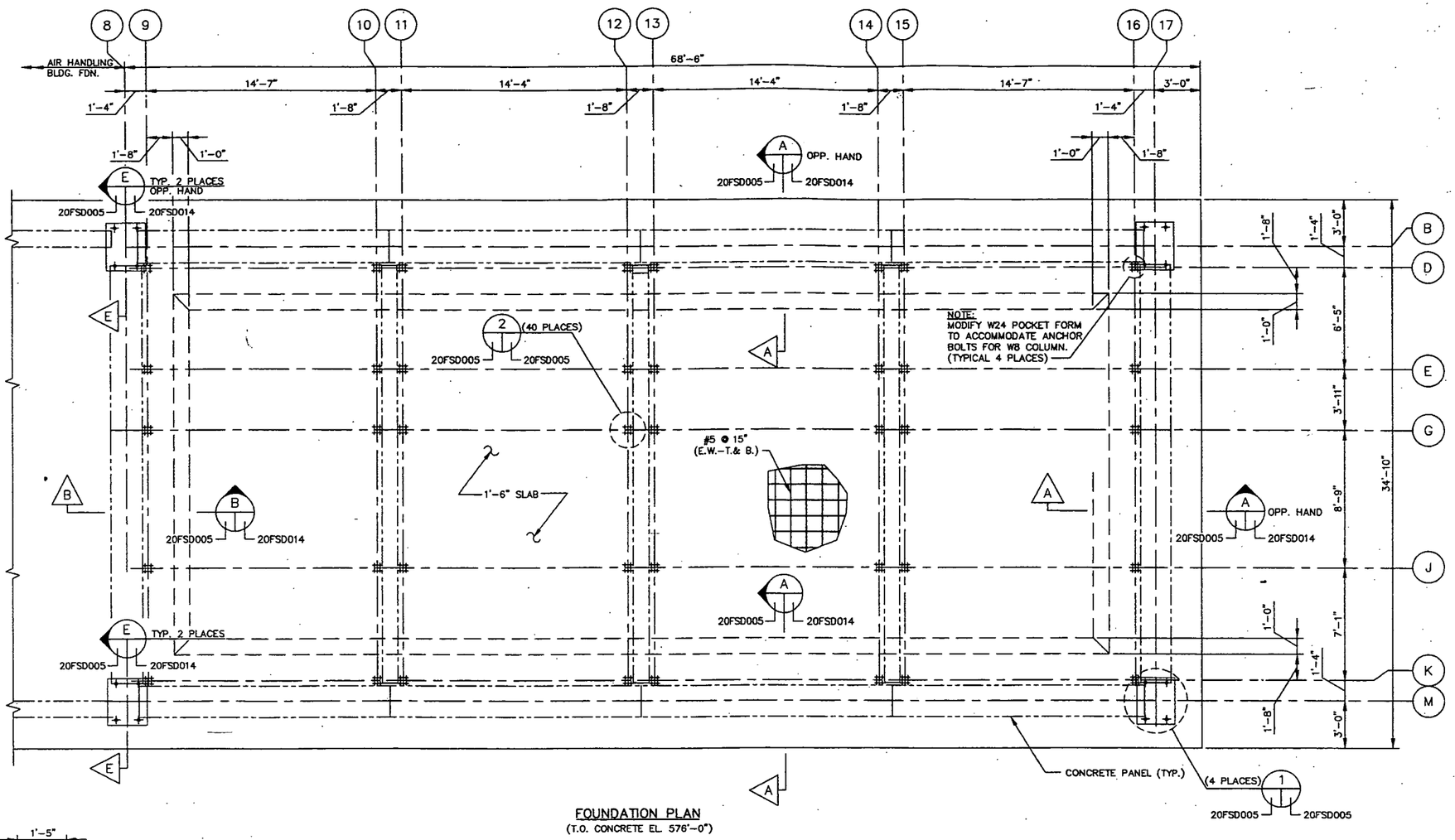
000083

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

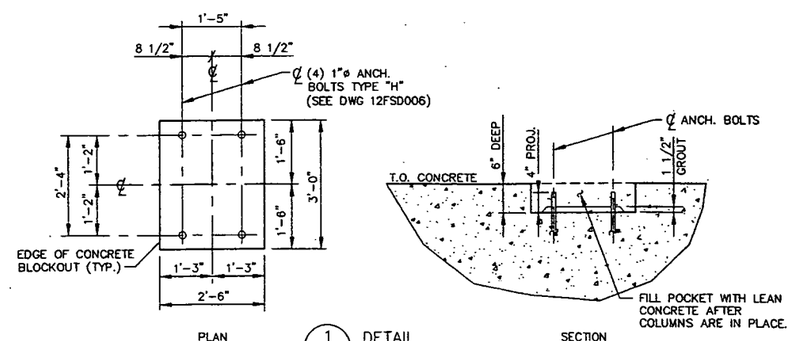
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
TRANFER TANK SYSTEM
SWRS
MISCELLANEOUS FOUNDATIONS

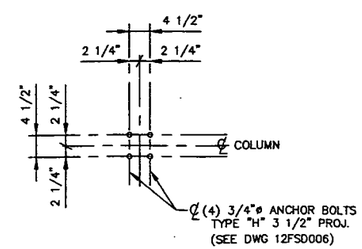
SIZE	SCALE:	DWG. NO.	REV
D	1/4"=1'-0"	12FSD025	0



FOUNDATION PLAN
(T.O. CONCRETE EL. 576'-0")



1 DETAIL
SCALE: NONE
20FSD005 — 20FSD005
(4 PLACES)



2 DETAIL
SCALE: 3/4"=1'-0"
20FSD005 — 20FSD005
(TYPICAL 40 PLACES)

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 12FSD005.
2. FOUNDATIONS FOR AIR HANDLING AND CARBON BED BUILDING SHALL BE PLACED AT THE SAME TIME.

REFERENCE DRAWINGS

12FSD005	GENERAL NOTES
12FSD006	ANCHOR BOLT STANDARDS & SCHEDULE
12FSD007	CONCRETE STANDARD DETAILS
20FSD015	BASE PLATE DETAILS
20FSD014	FOUNDATION SECTION VIEW

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-64509
REGISTERED PROFESSIONAL ENGINEER
3/3/00

		DATE
DRAWN BY		3-3-00
DESIGNED BY		3/3/00
CHECKED BY		3/3/00
APPROVED BY		3/3/00
APPROVED BY		3/3/00

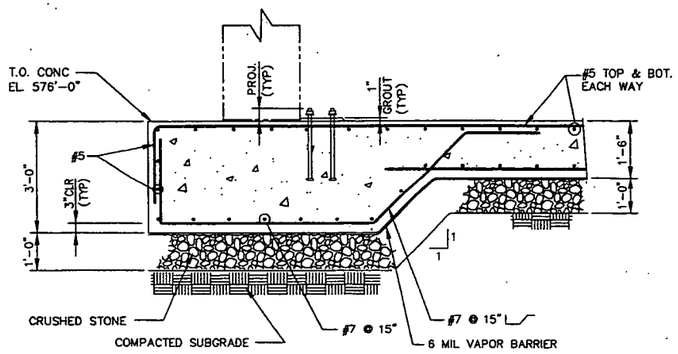
000084

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

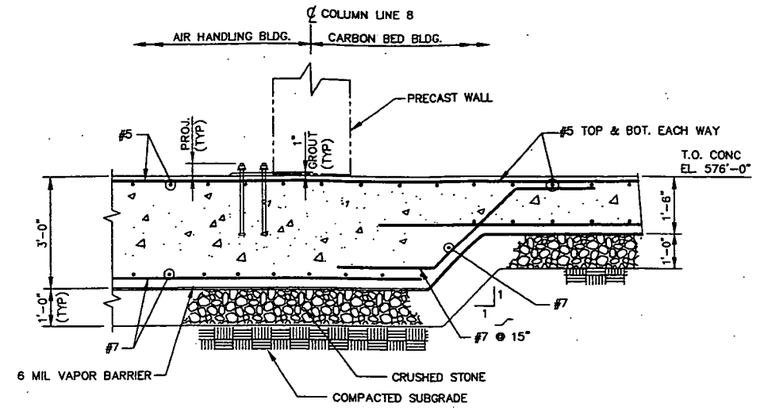
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
CARBON BED BUILDING
FOUNDATION PLAN

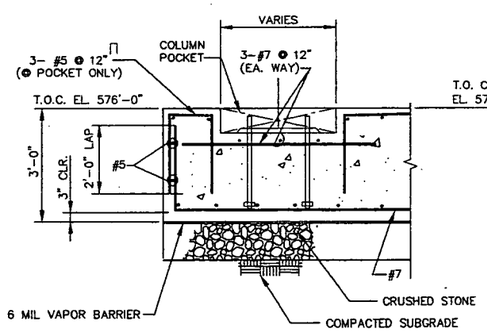
SIZE	SCALE:	DWG. NO.	REV
D	1/4"=1'-0"	20FSD005	0



A SECTION
SCALE: 1/2"=1'-0"
20FSD005 — 20FSD014



B SECTION
SCALE: 1/2"=1'-0"
20FSD005 — 20FSD014



E SECTION
SCALE: 1/2"=1'-0"
20FSD005
20FSD050 — 20FSD014

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. PLACEMENT OF CRUSHED STONE SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02722.
3. SUB GRADE COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02300.
4. VAPOR BARRIER SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 03300.
5. DESIGN IS BASED ON MINIMUM BEARING PRESSURE OF 3200 PSF.
6. SLOPE FLATTER THAN 1:1 AT THE BOTTOM OF CONCRETE IS ACCEPTABLE WITH MINIMUM 3" COVER.

2918

REFERENCE DRAWINGS

20FSD005 CARBON BED BUILDING FOUNDATION

000085

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-63989
REGISTERED PROFESSIONAL ENGINEER
3/3/00

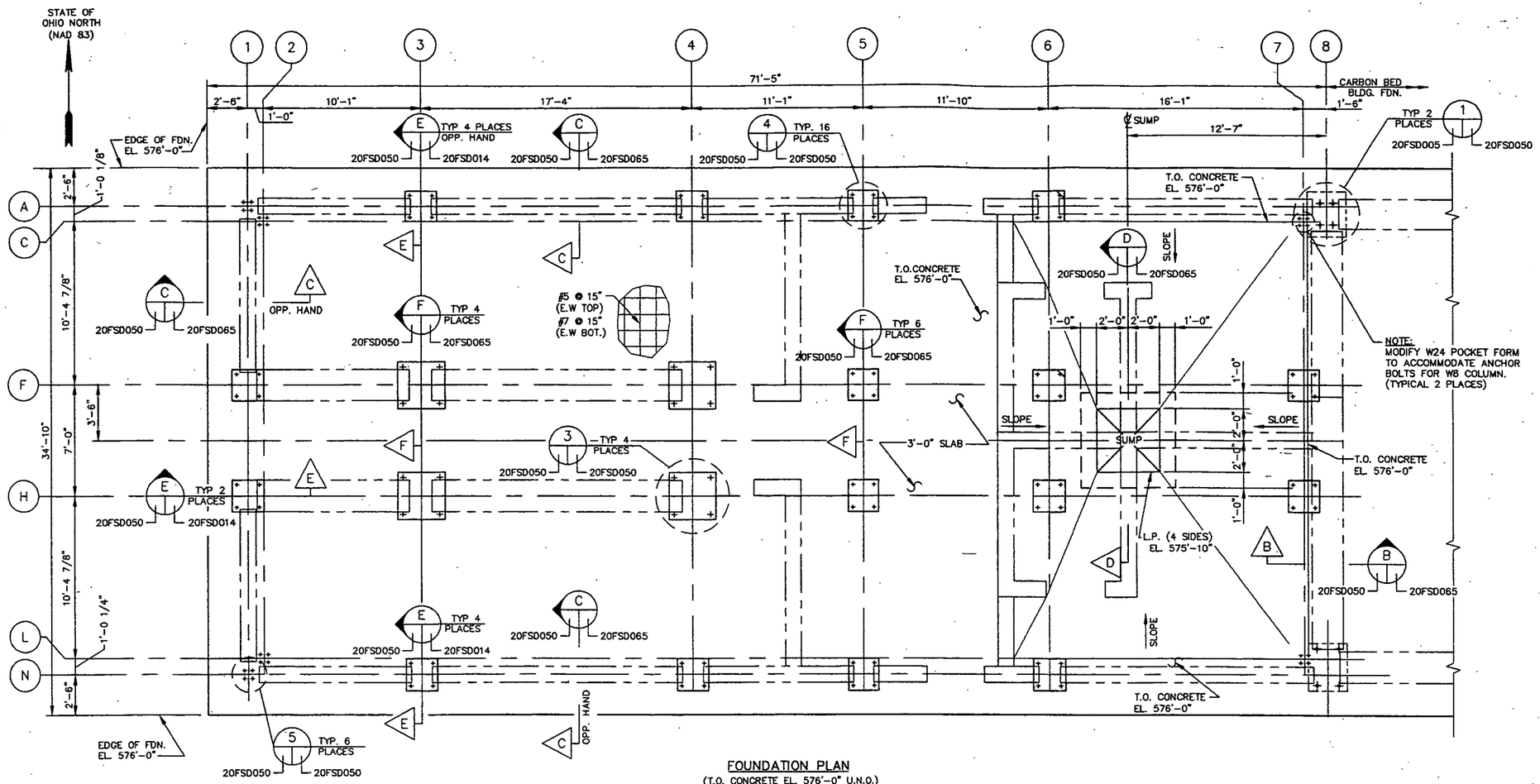
DRAWN BY		DATE 3-3-00
DESIGNED BY		DATE 3/3/00
CHECKED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

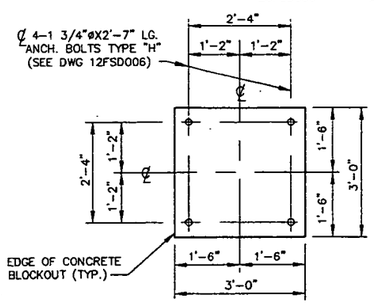
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
CARBON BED BUILDING
FOUNDATION SECTION VIEW

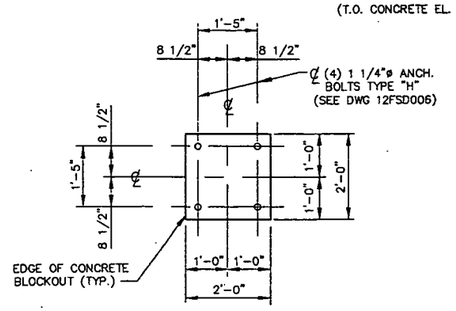
SIZE	SCALE:	DWG. NO.	REV
D	1/2"=1'-0"	20FSD014	0



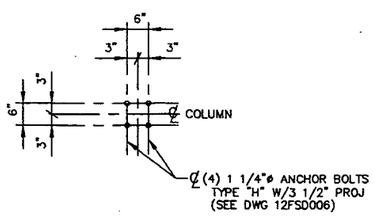
FOUNDATION PLAN
(T.O. CONCRETE EL. 576'-0" U.N.O.)



3 DETAIL
SCALE: NONE
20FSD050 — 20FSD050
(4 PLACES)



4 DETAIL
SCALE: NONE
20FSD050 — 20FSD050
(16 PLACES)



5 DETAIL
SCALE: NONE
20FSD050 — 20FSD050
(TYPICAL 6 PLACES)

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 12FSD005.
2. FOUNDATIONS FOR AIR HANDLING AND CARBON BED BUILDING SHALL BE PLACED AT THE SAME TIME.
3. SUMP BASE TO BE PRECAST/PREMANUFACTURED PER DIMENSIONS AS SHOWEN ON DESIGN DRAWINGS

2918

REFERENCE DRAWINGS

12FSD005	GENERAL NOTES
12FSD006	ANCHOR BOLT STANDARDS & SCHEDULE
12FSD007	CONCRETE STANDARD DETAILS
20FSD065	FOUNDATION SECTION VIEW

000086

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE: STATE OF OHIO, KONG HSIEH, E-64599, REGISTERED PROFESSIONAL ENGINEER

DRAWN BY		DATE 3-3-00
DESIGNED BY		DATE 3/3/00
CHECKED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00

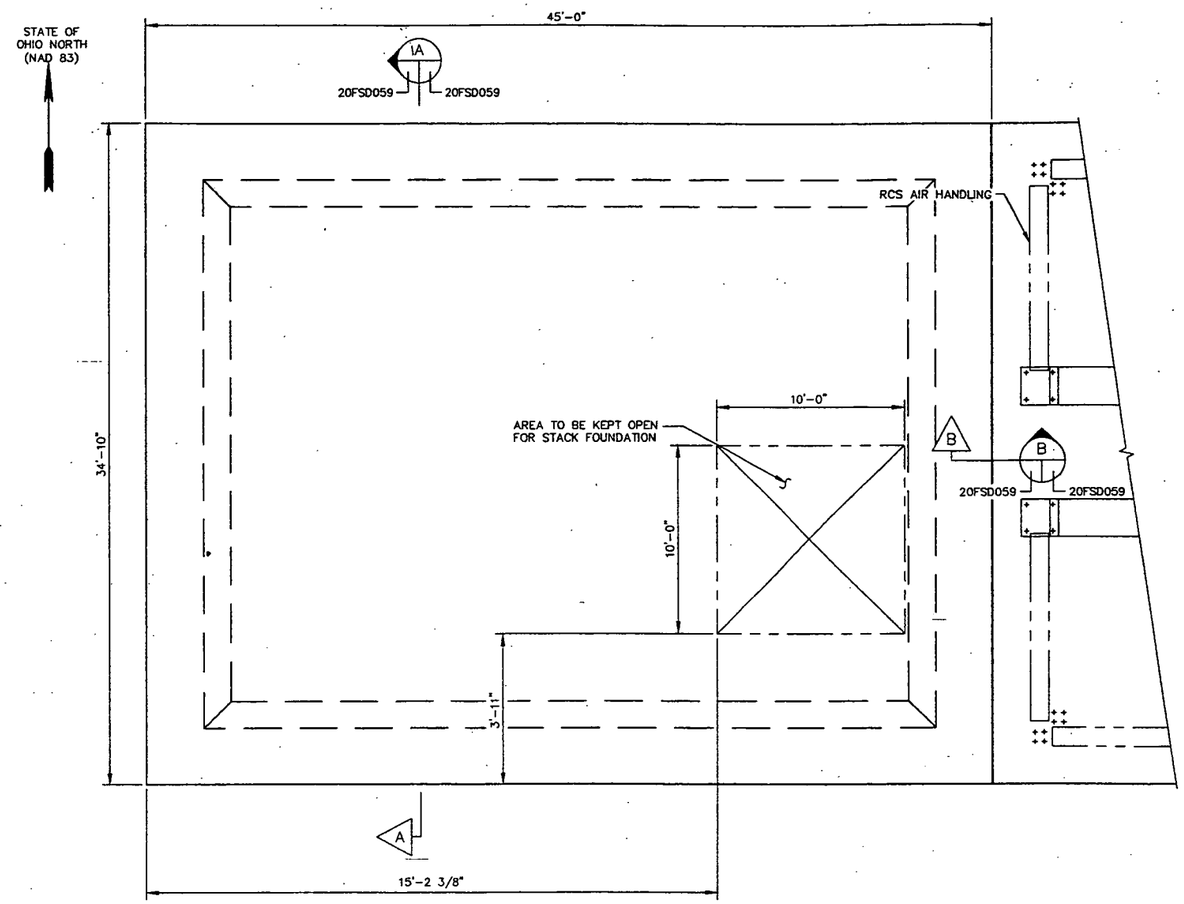
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

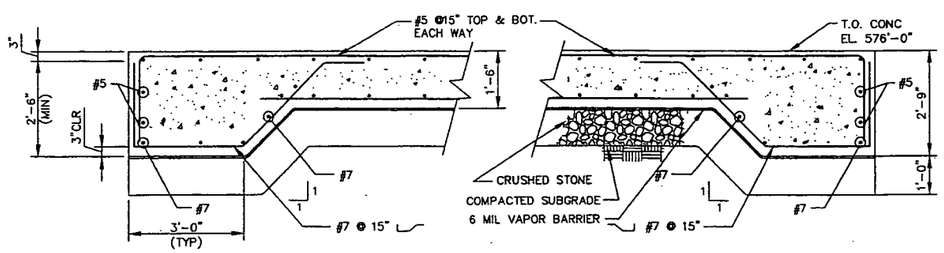
TITLE
RADON CONTROL SYSTEM
AIR HANDLING BUILDING
FOUNDATION PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1/4"=1'-0"	20FSD050	0

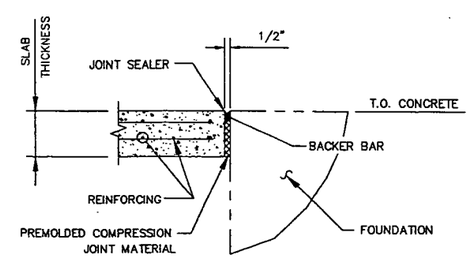
FILENAME: 20FSD050.D'



EQUIPMENT FOUNDATION PLAN



A SECTION
SCALE: 1/2"=1'-0"
20FSD059 20FSD059



B SECTION
SCALE: NONE
20FSD059 20FSD059

ISOLATION JOINT DETAIL

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. PLACEMENT OF CRUSHED STONE SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02722.
3. SUB GRADE COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02300.
4. VAPOR BARRIER SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 03300.
5. DESIGN IS BASED ON MINIMUM BEARING PRESSURE OF 3200 PSF.
6. SLOPE FLATTER THAN 1:1 AT THE BOTTOM OF CONCRETE IS ACCEPTABLE WITH MINIMUM 3" COVER.
7. ANCHOR BOLT SIZE AND LOCATION SHALL BE FIELD DETERMINED BASED ON CERTIFIED VENDOR DRAWING.

2918

000087

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00				CERTIFIED FOR CONSTRUCTION

RPE
STATE OF OHIO
MING HSIEH
E-64599
REGISTERED PROFESSIONAL ENGINEER
3/3/00

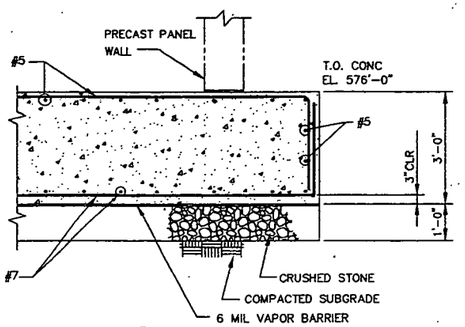
DRAWN BY		DATE 3-3-00
DESIGNED BY		DATE 3-3-00
CHECKED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00
APPROVED BY		DATE 3/3/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

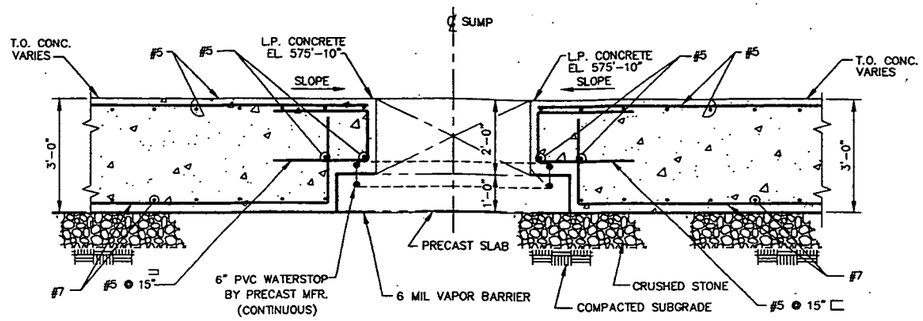
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
AIR HANDLING BUILDING
MISCELLANEOUS FOUNDATIONS

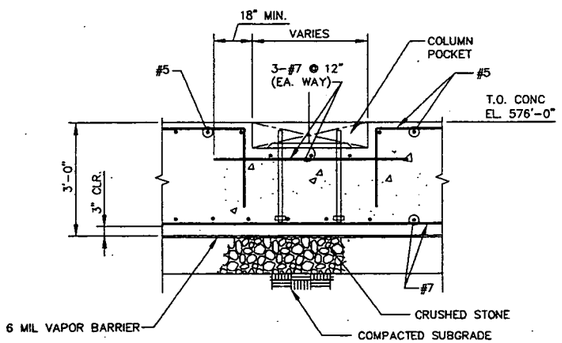
SIZE	SCALE:	DWG. NO.	REV
D	1/4"=1'-0"	20FSD059	0



C SECTION
SCALE: 1/2"=1'-0"
20FSD050 — 20FSD065



D SECTION
SCALE: 1/2"=1'-0"
20FSD050 — 20FSD065



F SECTION
SCALE: 1/2"=1'-0"
20FSD050 — 20FSD065

NOTES:

1. FOR GENERAL NOTES SEE DWG 12FSD005.
2. PLACEMENT OF CRUSHED STONE SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02722.
3. SUB GRADE COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 02300.
4. VAPOR BARRIER SHALL CONFORM TO THE REQUIREMENTS OF SPECIFICATION 03300.
5. DESIGN IS BASED ON MINIMUM BEARING PRESSURE OF 3200 PSF.
6. SLOPE FLATTER THAN 1:1 AT THE BOTTOM OF CONCRETE IS ACCEPTABLE WITH MINIMUM 3" COVER.

REFERENCE DRAWINGS

20FSD050 AIR HANDLING BUILDING FOUNDATION

2918

000088

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	3/3/00	[illegible]	[illegible]	[illegible]	CERTIFIED FOR CONSTRUCTION

RPE: STATE OF OHIO — MING HSIEH E-64599 — REGISTERED PROFESSIONAL ENGINEER — 3/3/00

		DATE
DRAWN BY	[illegible]	3-3-00
DESIGNED BY	[illegible]	3/3/00
CHECKED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00
APPROVED BY	[illegible]	3/3/00

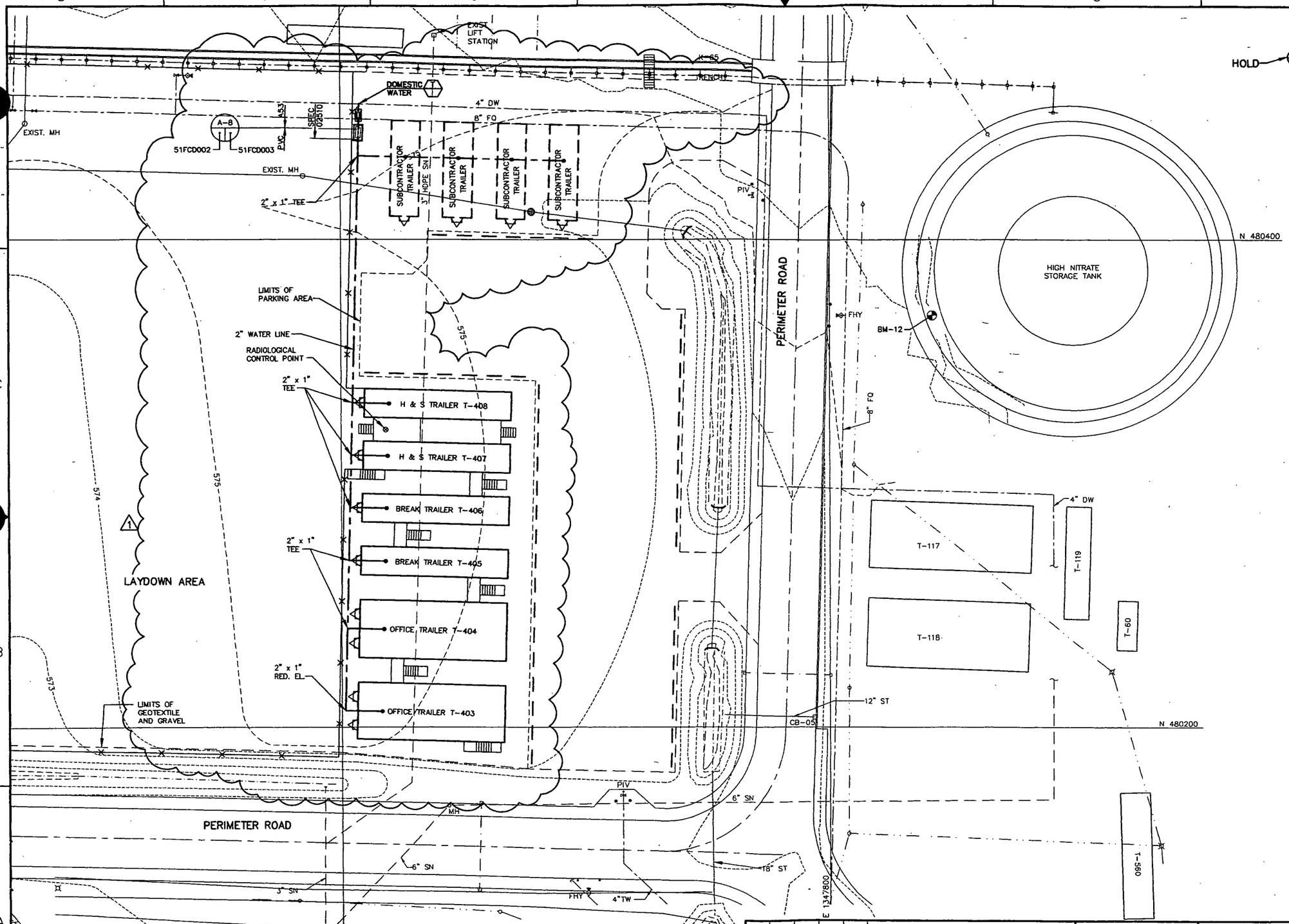
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
AIR HANDLING BUILDING
FOUNDATION SECTIONS

SIZE	SCALE:	DWG. NO.	REV
D	1/2"=1'-0"	20FSD065	0

FILENAME: 20FSD065.DWG



NOTES:

HOLD — SEE DRAWING 51FCD003 FOR EXISTING NOTE AND LEGEND

2. SEE DRAWING 51FCD003 FOR WATERLINE PROFILE.
3. CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES BEFORE BEGINNING EXCAVATION.
4. REFER TO SPECIFICATION SECTION 02510 FOR WATER DISTRIBUTION.
5. REFER TO SPECIFICATION SECTION 02302 FOR EXCAVATION, BACK FILLING, AND COMPACTING FOR UTILITIES.
6. EROSION CONTROL MEASURES WILL BE IN PLACE BEFORE BEGINNING BEGINNING EXCAVATION. SEE DRAWING NO. 66FCD003.

2918

STATE OF OHIO NORTH (NAD 83)

20 0 20 40

SCALE IN FEET

000089

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					EXPANDED GRAVEL AREA, REVISED WATERLINE
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

D

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

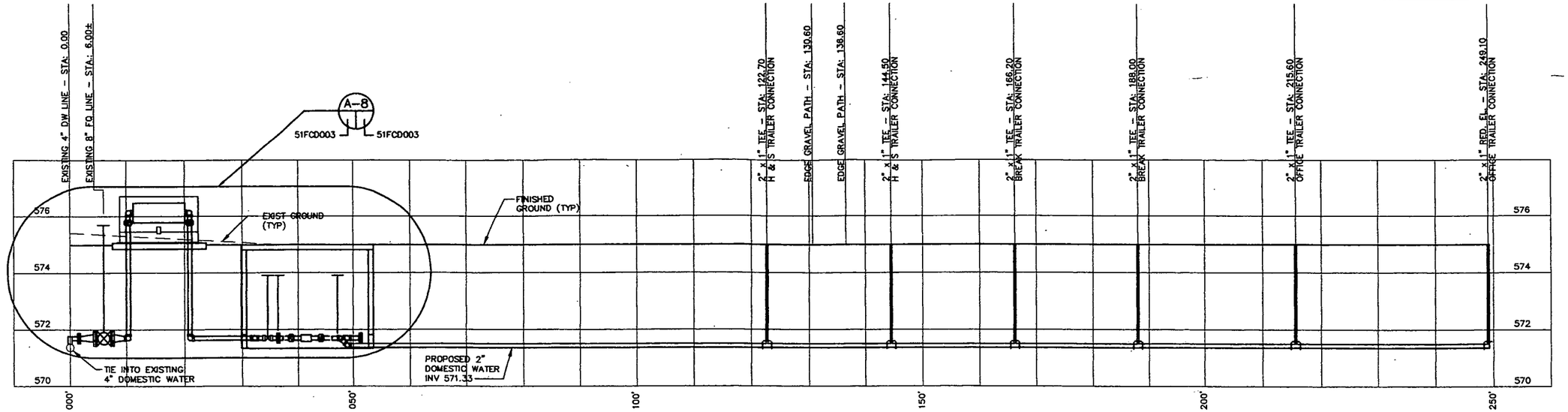
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
DOMESTIC WATER SYSTEM UNDERGROUND LAYOUT PLAN SHEET 2

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	51FCD002	1

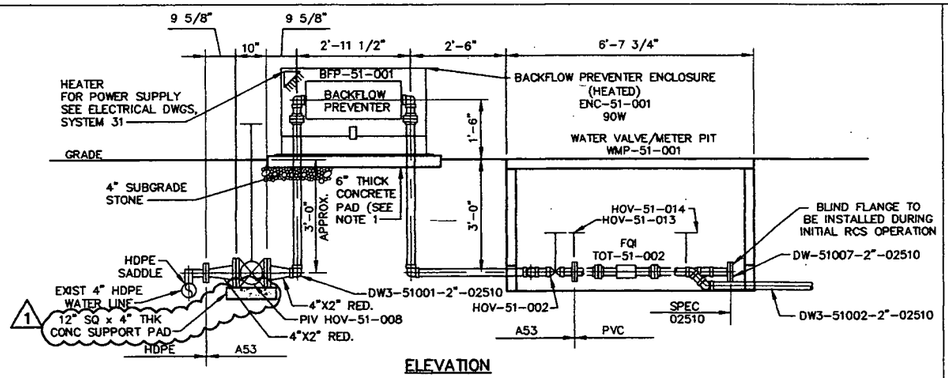
2918



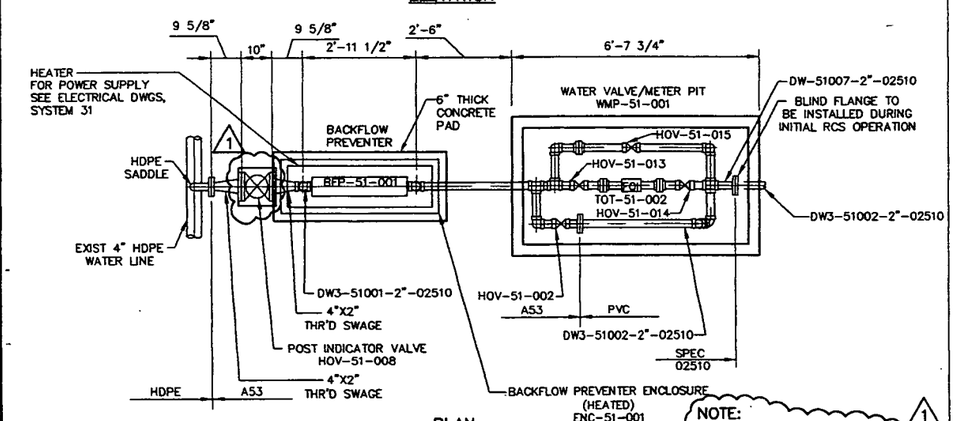
DOMESTIC WATER TO TRAILERS PROFILE

HOR. SCALE: 1"=10'
VER. SCALE: 1"=2'

A — 51FCD002 — 51FCD003



ELEVATION



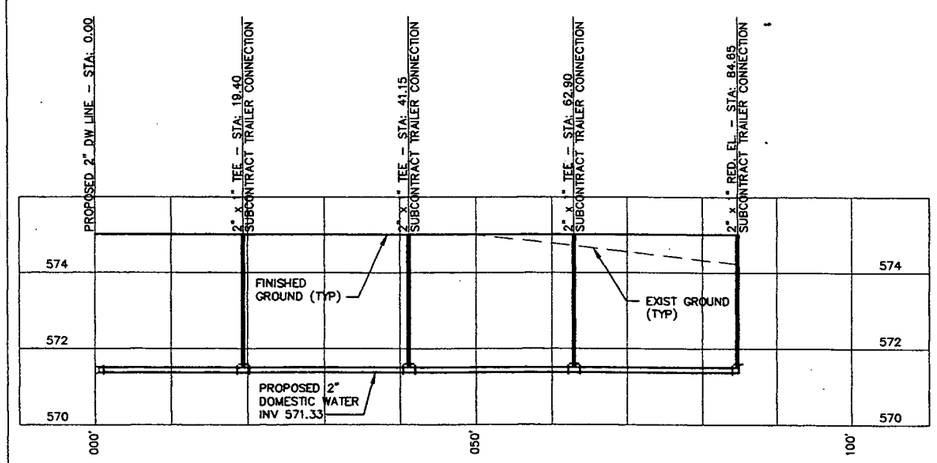
PLAN

NOTE:
1. PAD FOR PRZ ENCLOSURE TO BE NON-STRUCTURAL CONCRETE (BY FIELD), NO CONCRETE TESTING REQUIRED.

DOMESTIC WATER TIE DETAIL

NOT TO SCALE

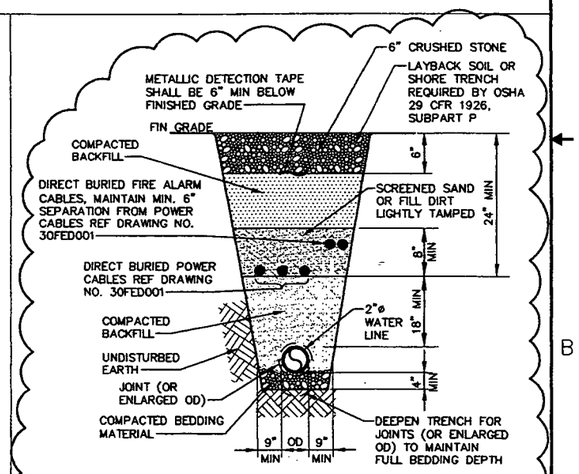
A-8 — 51FCD002 — 51FCD003



DOMESTIC WATER TO SUBCONTRACTOR TRAILERS PROFILE

HOR. SCALE: 1"=10'
VER. SCALE: 1"=2'

B — 51FCD002 — 51FCD003



NOTES:
1. METALLIC DETECTION TAPE SHALL CONSIST OF AN ALUMINUM CORE FOIL TYPE, A COATED IMPRINT, 3" UTILITY MARKING TAPE. PROVIDE SEATON OR EQUAL VENDOR.
2. REFERENCE DRAWING NO. 30FED001

PIPE BEDDING DETAIL

NOT TO SCALE

A-2 — 51FCD002 — 51FCD003

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					REVISED BEDDING DETAIL
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

		DATE
DRAWN BY	W. MARVIN	3/6/00
DESIGNED BY	M. HUGHES	3/6/00
CHECKED BY	V. BHATT	3/6/00
APPROVED BY	M. HUGHES	3/6/00
APPROVED BY	JOHN LAWSON	3/6/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
DOMESTIC WATER SYSTEM UNDERGROUND PIPING DETAILS

SIZE	SCALE:	DWG. NO.	REV
D	AS SHOWN	51FCD003	1

NOTES:

HOLD — SEE DRAWING REVISION NO. 1 GENERAL NOTES AND LEGEND

2. SEE SPECIFICATION SECTION 02530 FOR TECHNICAL REQUIREMENTS.
3. SEE SPECIFICATION SECTION 02300 FOR EARTHWORK.
4. SEE DRAWING NO. 61FCD002 FOR SANITARY SEWER DETAILS.
5. SEE DRAWING NO. 61FCD002 FOR SANITARY SEWER PROFILES.
6. REFER TO SPECIFICATION SECTION 02302 AND 02530.
7. EROSION CONTROL MEASURES ARE TO BE IN PLACE BEFORE BEGINNING EXCAVATION.

2918

EXIST LIFT STATION
TRENCH
4" DW
8" FO
EXIST. MH
SUBCONTRACTOR TRAILER
3" HDPE SN
CO
MH
PROP MANHOLE
TOP 574.10
INV IN 570.28
INV IN 570.28
INV OUT 570.18
CLEANOUT (TYP)
CONCRETE WHEELSTOP (TYP)
LIMITS OF PARKING AREA
CLEANOUT
61FCD001
61FCD002
RADIOLOGICAL CONTROL POINT
H & S TRAILER T-408
H & S TRAILER T-407
BREAK TRAILER T-406
BREAK TRAILER T-405
OFFICE TRAILER T-404
OFFICE TRAILER T-403
4"ø PVC (TYP)
LAYDOWN AREA
LIMITS OF GEOTEXTILE AND GRAVEL
PROP MANHOLE
TOP 574.07
INV IN 569.09
INV OUT 568.99
PERIMETER ROAD
EXIST MANHOLE
INV IN 567.50
INV OUT 566.43
6" SN
3" SN
4"TW
4" SN
EXIST LIFT STATION
E 1347800
N 480400
N 480200
PIV
FHY
PERIMETER ROAD
HIGH NITRATE STORAGE TANK
BM-12
8" FO
4" DW
T-117
T-118
T-119
T-60
T-560
12" ST
CB-05
18" ST
574
575
573
570

STATE OF OHIO NORTH (NAD 83)

000091

20 0 20 40
SCALE IN FEET

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					EXPANDED GRAVEL AREA, NEW SANITARY SEWER
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

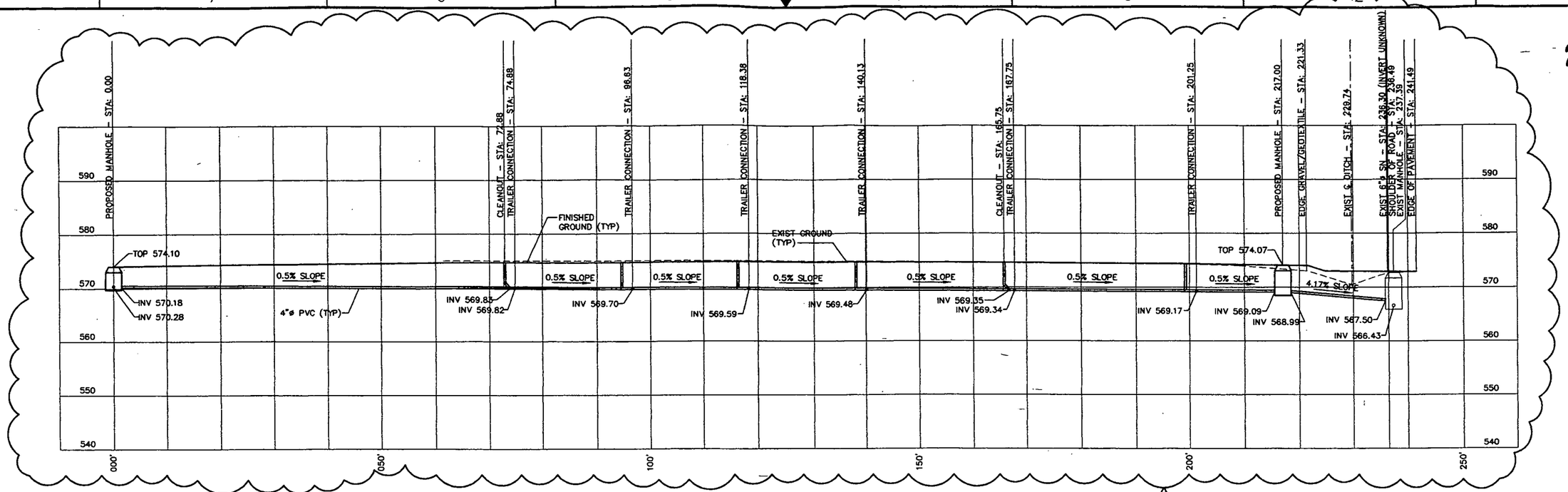
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
SANITARY SEWER SYSTEM LAYOUT PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=20'	61FCD001	1

FILENAME: 61FCD001

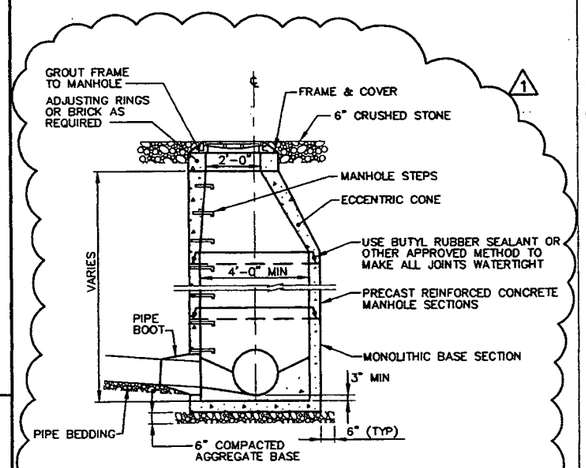
2918



PROFILE (A)

SCALE: 1"=10'

61FCD001 — 61FCD002



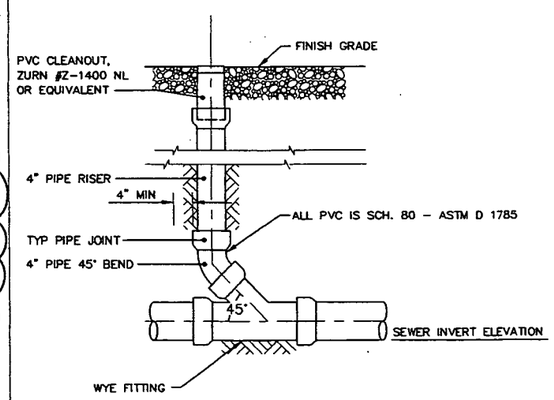
NOTES

1. ALL PRECAST RISERS, CONES, BASES, TOPS, AND STEPS SHALL CONFORM TO ASTM C 478.
2. FLOWLINE OF MANHOLE MAY BE FORMED IN CONCRETE; BUILT UP WITH MORTAR; OR BY LAYING A PIPE THROUGH MANHOLE, THE TOP BEING BROKEN OUT LATER.
3. GROUT ANNULAR SPACE BETWEEN WALL AND PIPES WITH NON-SHRINK MORTAR TO ENSURE A WATERTIGHT SEAL OR USE NEOPRENE BOOT WITH COMPRESSION RING; CLAMP BOOT TO PIPE WITH STAINLESS STEEL CLAMP.

PRECAST CONCRETE MANHOLE DETAIL (1)

NOT TO SCALE

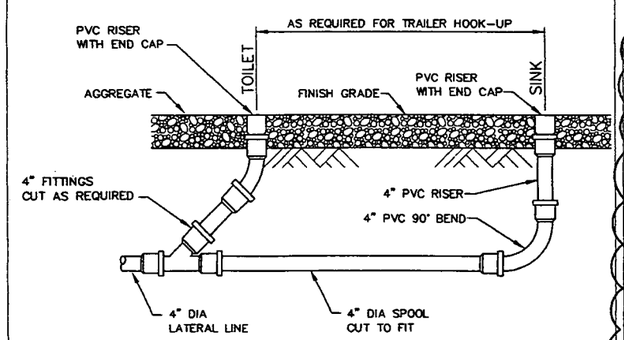
61FCD001 — 61FCD002



SEWER CLEANOUT DETAIL (2)

NOT TO SCALE

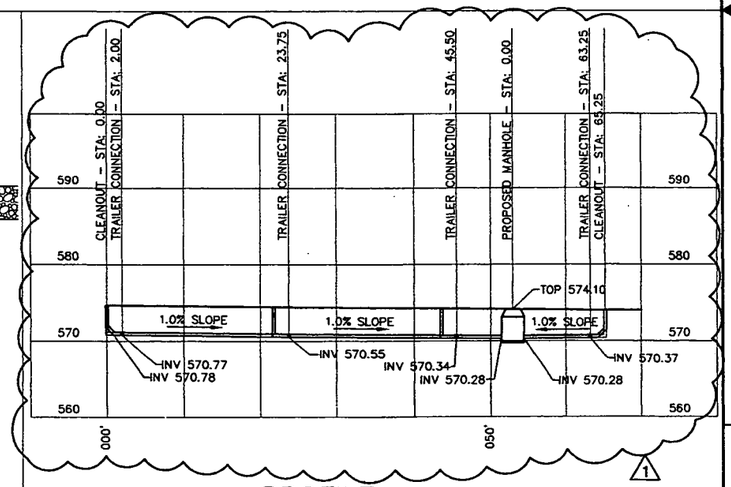
61FCD001 — 61FCD002



TRAILER CONNECTION DETAIL (3)

NOT TO SCALE

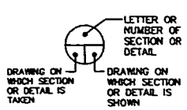
61FCD001 — 61FCD002



PROFILE (B)

SCALE: 1"=10'

61FCD001 — 61FCD002



SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					ADDED MANHOLE DETAIL, REVISED PROFILES
0	3/6/00	WVD	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

000092

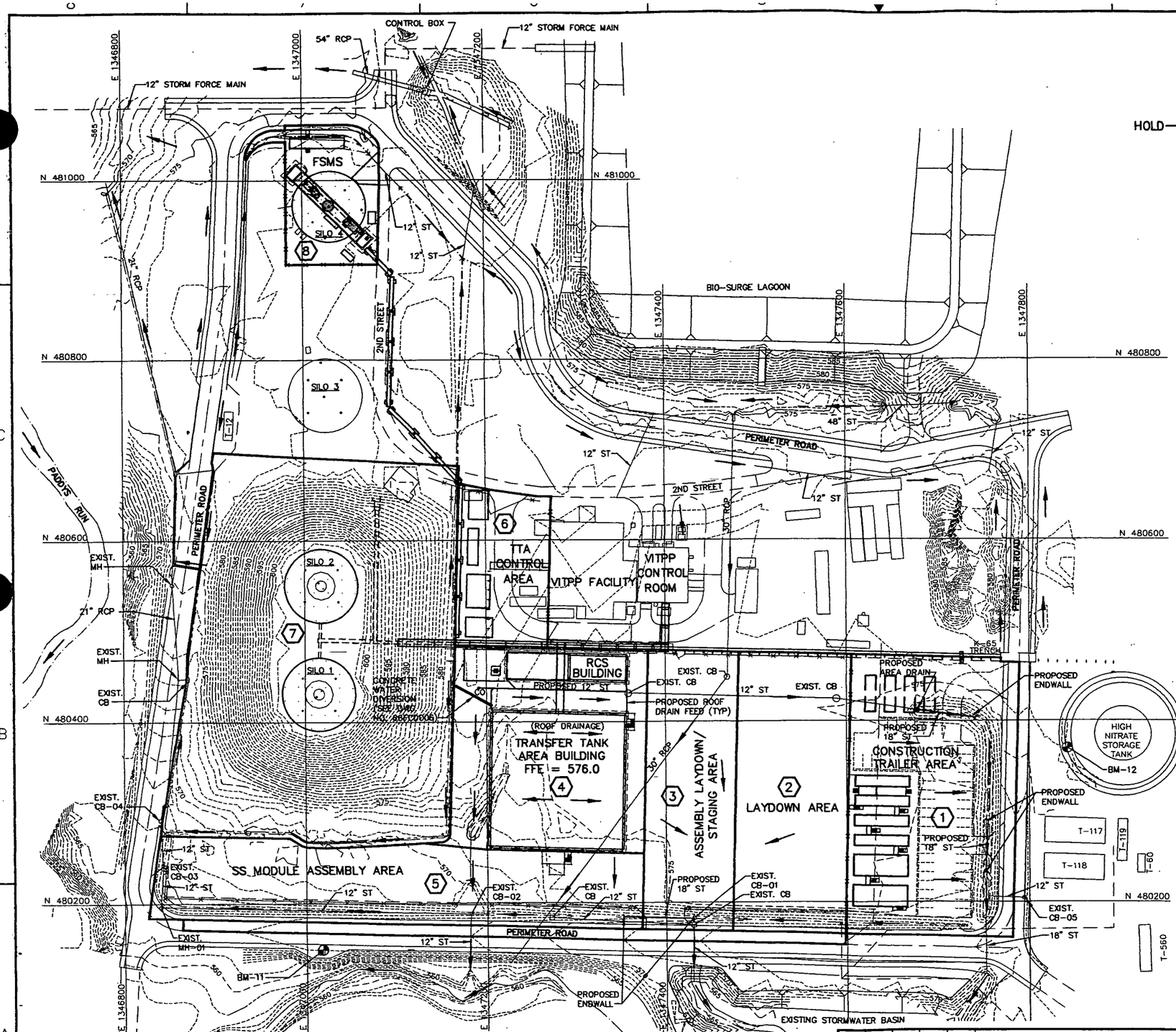
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
SANITARY SEWER SYSTEM DETAILS

SIZE	SCALE:	DWG. NO.	REV
D	AS SHOWN	61FCD002	1

2918



NOTES:

HOLD — 1. SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND.

2. DRAINAGE AREAS AT THE SILO'S AND NORTH AND WEST OF THE PERIMETER ROAD DRAIN TO THE WEST TO AN EXISTING CONCRETE SUMP. THE CONCRETE SUMP CONTAINS A 12" DIA FORCE MAIN TO THE BIO-SURGE LAGOON.

3.

DRAINAGE AREA	DESCRIPTION OF DRAINAGE AREA	OUTLET
1	GRAVEL LOT	EXISTING STORMWATER BASIN AT 18"ø OUTLET
2	GRAVEL LOT	EXISTING STORMWATER BASIN AT CB-01
3	LAYDOWN AREA	EXISTING STORMWATER BASIN AT CB-01
4	TTA AND RCS BUILDINGS – GUTTERS	PROPOSED ROOF DRAINAGE TO 18"ø OUTLET EAST OF AREA 1
5	SOUTH OF SILO 1	12 IN. OUTLET FROM CB-02
6	TTA CONTROL AREA	EXISTING STORMWATER BASIN NORTH OF K-65 TRENCH
7	SILOS 1 AND 2 – PERIMETER TRENCH	CONCRETE SUMP TO BIO-SURGE LAGOON
8	SILO 4 – PERIMETER TRENCH	CONCRETE SUMP TO BIO-SURGE LAGOON
9	ALL OTHER AREAS OUTSIDE PROJECT	EXISTING STORMWATER BASINS

4. DRAINAGE AREAS 7 & 8 RUNOFFS HAVE BEEN CALCULATED USING A 25 YEAR, 24 HOUR STORM.

5. ALL OTHER DRAINAGE AREA RUNOFFS HAVE BEEN CALCULATED USING A 10 YEAR, 24 HOUR STORM.

6. STORM WATER CONTROLS FOR ALL AREAS WILL BE BASED ON OHIO DEPT. OF NATURAL RESOURCES (ODNR) RAINWATER AND LAND DEV. PLAN.

7. THE AWR STORMWATER DRAINAGE PLAN ACCOUNTS FOR ANY CHANGES FROM PHASED CONSTRUCTION WITHIN THE INDIVIDUAL DRAINAGE AREAS AS FOLLOWS:

ZONE	ZONE AREA (Sf)	RUNOFF COEFFICIENT OF DRAINAGE	ZONE MAXIMUM FLOW OF STORMWATER IN CFS	STORMWATER CONVEYANCE SYSTEM CAPACITY
1	56,535	0.58	7.25	14.0 CFS
2	37,978	0.40	2.35	11.0 CFS
3	31,405	0.50	1.94	11.0 CFS
4	47,539	0.78	1.42	11.0 CFS
5	48,287	0.50	3.00	11.0 CFS
6	17,616	0.57	N/A	N/A
7	123,437	0.69	13.05	53.2
8	16,287	0.56	N/A	53.2
ROAD	4,260	0.90	0.48	11.0

8. REFERENCE CALCULATION NO. CA-FSC624-FC-001.

STORMWATER LEGEND:

- (1) DRAINAGE AREA
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- CO PROPOSED CLEANOUT
- PROPOSED AREA DRAIN
- PROPOSED ENDWALL

STATE OF OHIO NORTH (NAD 83)

000093

0 60 120
SCALE IN FEET

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0					CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY DATE
DESIGNED BY DATE
CHECKED BY DATE
APPROVED BY DATE
APPROVED BY DATE

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

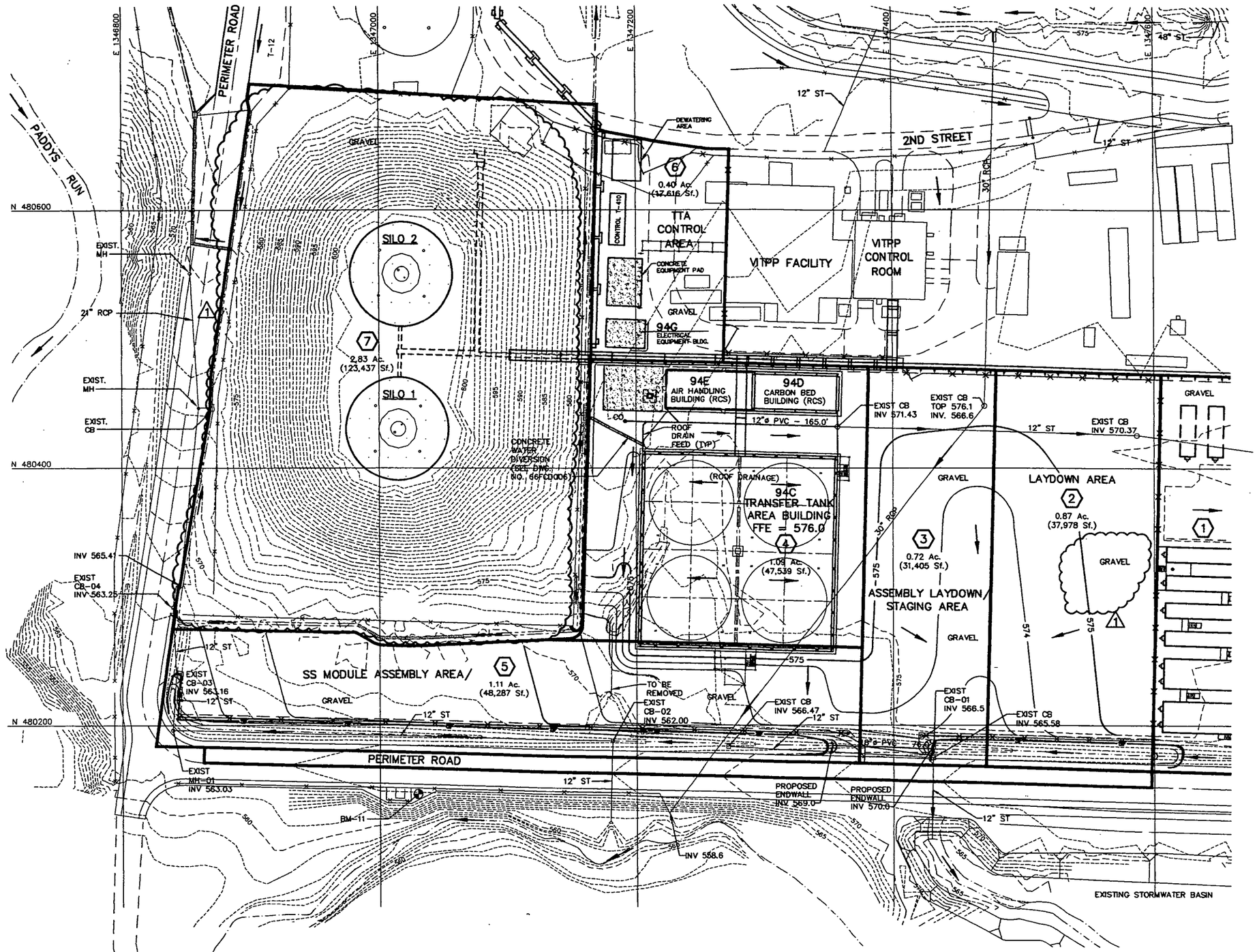
TITLE
STORM WATER SYSTEM
OVERALL DRAINAGE PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=60'	66FCD001	0

FILENAME: 66FCD001.D

XREF DRAWINGS: 60-E 60-E

2918



NOTES:

HOLD — SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND.

2. SILT FENCE TO BE INSTALLED AT THE BOTTOM OF ALL DISTURBED SLOPES, AND FOLLOW CONTOUR.
3. CULVERT ENTRANCES AND EXITS TO BE PROTECTED BY RIP-RAP AND GEO FABRIC, REFER TO SPEC SECTION 02370. (1)
4. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED WITHIN 7 DAYS.
5. OVERSEEDING AND RESEEDING ARE TO BE PERFORMED AS NECESSARY UNTIL VEGETATION IS ESTABLISHED.
6. SILT IS TO BE REMOVED FROM DIVERSION DITCHES AND SILT FENCE INSTALLED AS REQUIRED BY THE SPECIFICATIONS AND AT THE END OF CONSTRUCTION.
7. EROSION CONTROL MEASURES ARE TO BE INSPECTED WEEKLY AND WITHIN 24 HOURS OF A 0.5 INCH RAINFALL.
8. REMEDIATION OF PROBLEMS IDENTIFIED IN THE INSPECTION ARE TO BE COMPLETED IWITHIN 24 HOURS. (1)
9. AWR PROJECT ACTIVITIES DO NOT SIGNIFICANTLY ALTER EXISTING DRAINAGE PATTERNS.
10. THE TTA BUILDING AREA ROOF DRAINAGE WILL BE DIRECTED TO THE EXISTING 12" STORM DRAIN SYSTEM AT THE NORTHEAST SECTION OF THE BUILDING. (1)
11. EROSION AND SILTATION INTO THE CONCRETE CHANNEL IS TO BE PREVENTED.

STORMWATER LEGEND:

- (1) DRAINAGE AREA
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- CO PROPOSED CLEANOUT
- PROPOSED SILT FENCE

STATE OF OHIO NORTH (NAD 83)

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

40 0 40 80
SCALE IN FEET

000094

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					AREA 2 GRAVELED, AREA 7 EXC & FNDN REMOVED
0	3/6/00	WVM	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

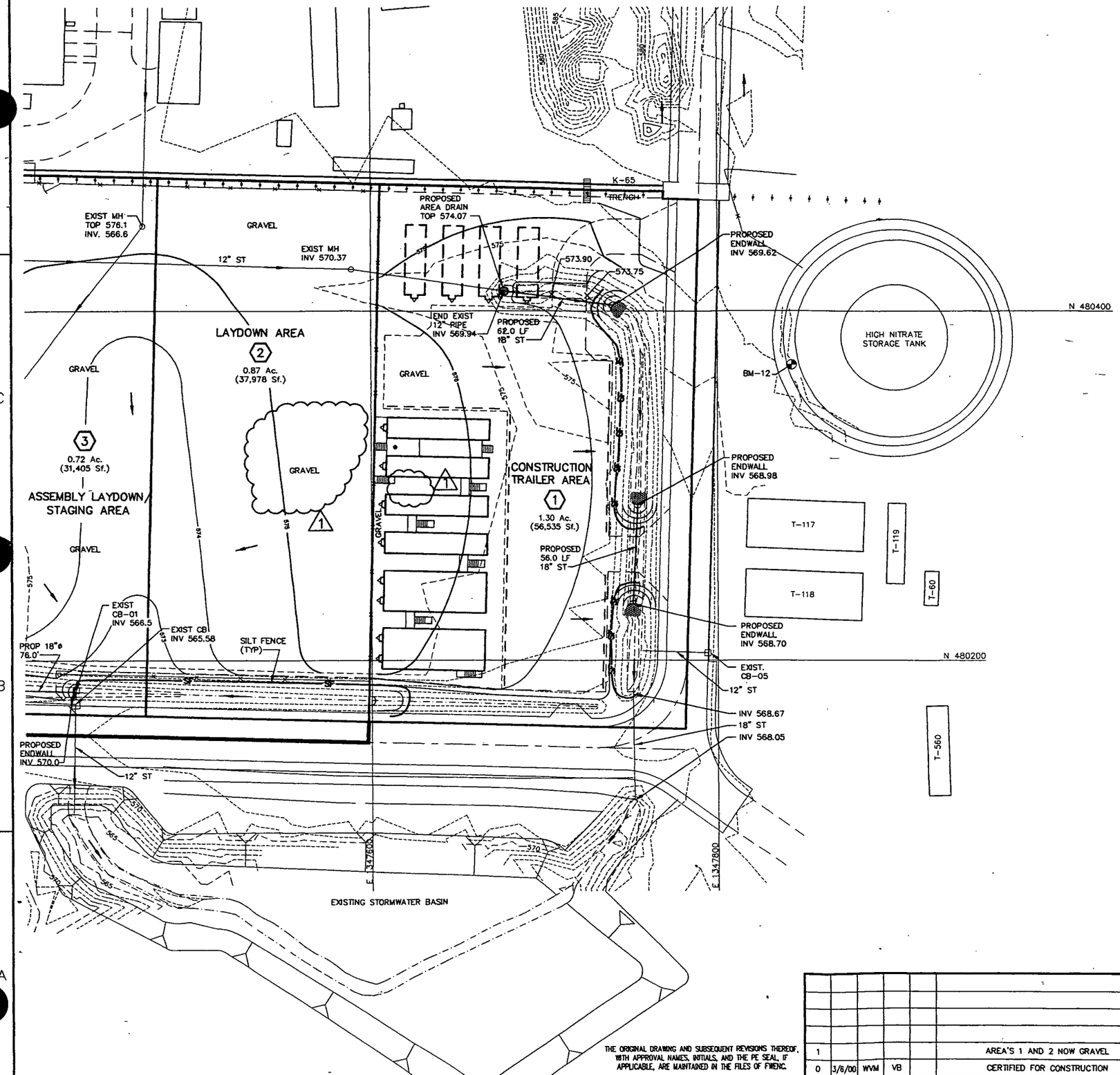
TITLE
STORM WATER SYSTEM
SWRS – DRAINAGE PLAN
PHASE 1

SIZE	SCALE:	DWG. NO.	REV
D	1"=30'	66FCD002	1

FILENAME: 66FCD002.I

XREF DRAWINGS: 40-
40-

2918



NOTES:

HOLD — SEE DRAWING 66FCD001 FOR GENERAL NOTES AND LEGEND

2. SILT FENCE TO BE INSTALLED AT THE BOTTOM OF ALL DISTURBED SLOPES, AND FOLLOW CONTOUR.
3. CULVERT ENTRANCES AND EXITS TO BE PROTECTED BY RIP-RAP AND GEO FABRIC, REFER TO SPEC SECTION 02370.
4. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED WITHIN 7 DAYS, REFER TO SPEC SECTION 02924.
5. OVERSEEDING AND RESEEDING ARE TO BE PERFORMED AS NECESSARY UNTIL VEGETATION IS ESTABLISHED.
6. SILT IS TO BE REMOVED FROM DIVERSION DITCHES AND SILT FENCE INSTALLED AS REQUIRED BY THE SPECIFICATIONS AND AT THE END OF CONSTRUCTION.
7. EROSION CONTROL MEASURES ARE TO BE INSPECTED WEEKLY AND WITHIN 24 HOURS OF A 0.5 INCH RAINFALL.
8. REMEDIATION OF PROBLEMS IDENTIFIED IN THE INSPECTION ARE TO BE COMPLETED WITHIN 24 HOURS.
9. AWR PROJECT ACTIVITIES DO NOT SIGNIFICANTLY ALTER EXISTING DRAINAGE PATTERNS.
10. SEE 66FCD007 FOR STORM DRAIN PROFILES.

STORMWATER LEGEND:

- DRAINAGE AREA
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- PROPOSED AREA DRAIN
- PROPOSED ENDWALL
- SILT FENCE

STATE OF OHIO NORTH (NAD 83)

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

000095

30 0 30 60

SCALE IN FEET

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					AREA'S 1 AND 2 NOW GRAVEL
0	3/6/00	WVM	VB		CERTIFIED FOR CONSTRUCTION

PE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

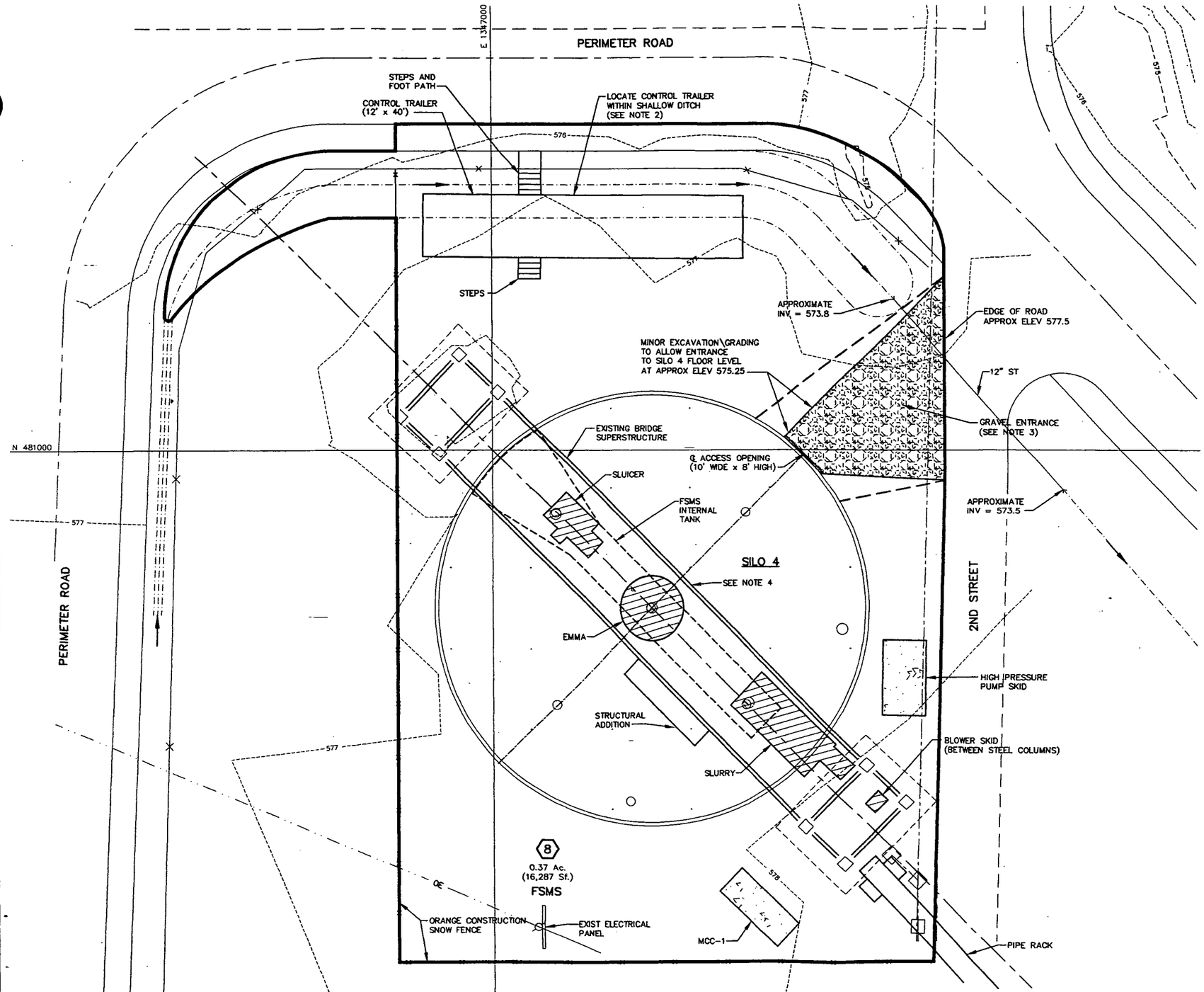
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
STORM WATER SYSTEM
TRAILER AREA – DRAINAGE PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=30'	66FCD003	1

FILENAME: 66FCD003.D

XREF DRAWINGS: 30A-30A



* THIS DRAWING IS PART OF ATTACHMENT A, SHEET A18 OF A19, OF CALCULATION NO. CA-FSC624-FC-001

2918

NOTES:

HOLD — 1. SEE DRAWING 10FSD001 FOR GENERAL NOTES AND LEGEND.

2. CONTROL TRAILER WILL BE INSTALLED AFTER MODIFICATIONS TO SILO 4 SUPERSTRUCTURE HAVE BEEN MADE AND THE EMMA UNIT HAS BEEN INSTALLED.

3. GRAVEL ENTRANCE WILL BE INSTALLED AFTER MODIFICATIONS TO SILO 4 SUPERSTRUCTURE HAVE BEEN MADE AND THE EMMA UNIT HAS BEEN INSTALLED.

4. SEE DRAWINGS 10FSD001 THROUGH 10FSD005 FOR SUPERSTRUCTURE DEMOLITION AND MODIFICATIONS.

5. SILT FENCE TO BE INSTALLED AT THE BOTTOM OF ALL DISTURBED SLOPES, AND FOLLOW CONTOUR.

6. CULVERT ENTRANCES AND EXITS TO BE PROTECTED BY RIP-RAP AND GEO FABRIC.

7. AREAS DISTURBED BY EXCAVATION ACTIVITIES ARE TO BE SEEDED AND MULCHED WITHIN 7 DAYS.

8. OVERSEEDING AND RESEEDING ARE TO BE PERFORMED AS NECESSARY UNTIL VEGETATION IS ESTABLISHED.

9. SILT IS TO BE REMOVED FROM DIVERSION DITCHES AND SILT FENCE INSTALLED AS REQUIRED BY THE SPECIFICATIONS AND AT THE END OF CONSTRUCTION.

10. EROSION CONTROL MEASURES ARE TO BE INSPECTED WEEKLY AND WITHIN 24 HOURS OF A 0.5 INCH RAINFALL.

11. REMEDIATION OF PROBLEMS IDENTIFIED IN THE INSPECTION ARE TO BE COMPLETED WITHIN 24 HOURS.

12. AWR PROJECT ACTIVITIES DO NOT SIGNIFICANTLY ALTER EXISTING DRAINAGE PATTERNS.

14. THE TTA BUILDING AREA ROOF DRAINAGE WILL BE DIRECTED TO THE EXISTING 12" STORM DRAIN SYSTEM AT THE NORTHEAST SECTION OF THE BUILDING.

15. EROSION AND SILTATION INTO THE CONCRETE CHANNEL IS TO BE PREVENTED.

STORMWATER LEGEND:

(1) DRAINAGE AREA BOUNDARY

DRAINAGE DIVIDE

FLOW DIRECTION

STATE OF OHIO NORTH (NAD 83)

000096

10 0 10 20

SCALE IN FEET

LETTER OR NUMBER OF SECTION OR DETAIL

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION & DETAIL KEY

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0					CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY DATE
DESIGNED BY DATE
CHECKED BY DATE
APPROVED BY DATE
APPROVED BY DATE

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

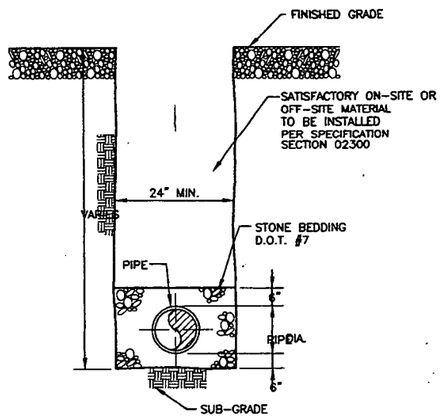
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
STORM WATER SYSTEM
FSMS – DRAINAGE PLAN

SIZE	SCALE:	DWG. NO.	REV
D	1"=10'	66FCD004	0

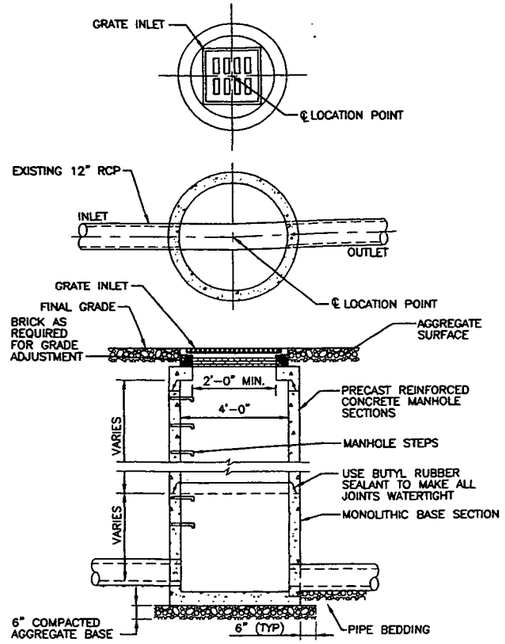
FILENAME: 66FCD004.D

2918



STORM PIPE BEDDING DETAIL

NOT TO SCALE



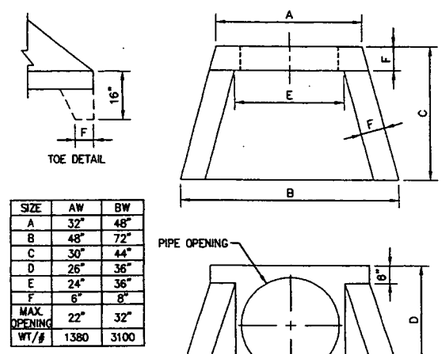
NOTE:
GROUT ANNULAR SPACE BETWEEN WALL AND PIPE WITH NON-SHRINK MORTAR TO ENSURE A WATERTIGHT SEAL OR USE NEOPRENE BOOT WITH COMPRESSION RING; CLAMP BOOT TO PIPE WITH STAINLESS STEEL CLAMP.

PRECAST CONCRETE AREA DRAIN DETAIL

NOT TO SCALE

NOTES:

1. ALL EROSION CONTROLS ARE TO BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION.
2. ALL SITE WORK MUST CONFORM TO APPLICABLE CFC DRAWINGS AND CONSTRUCTION SPECS, WHICH INCORPORATE ODNR RAINWATER AND LAND DEVELOPMENT STANDARDS.
3. FWENC WILL CONDUCT WEEKLY SITE INSPECTIONS DURING CONSTRUCTION ACTIVITIES OF ALL EROSION CONTROLS, GENERAL HOUSEKEEPING PRACTICES, AND STORM WATER CHANNELS AS SET FORTH IN THE ENVIRONMENTAL CONTROL PLAN, DOCUMENT NO. 624-P621-10. 1
4. AT CULVERT INLETS AND OUTLETS, EROSION CONTROL BLANKETS (MATTING) AND SEEDING MAY BE SUBSTITUTED FOR RIP-RAP. REFER TO SPECIFICATION SECTION 02370, SLOPE PROTECTION AND EROSION CONTROL, AND SECTION 02924, SEEDING. 1



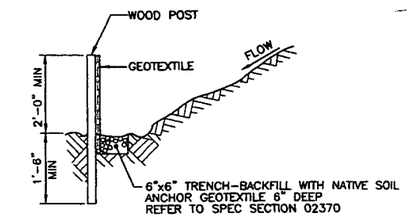
SIZE	AW	BW
A	32"	48"
B	48"	72"
C	30"	44"
D	26"	36"
E	24"	36"
F	6"	8"
MAX. OPENING	22"	32"
Wt/#	1380	3100

NOTE:
1. MINIMUM REINFORCING WIRE REINFORCEMENT 4x4 W7xW7.
2. fc = 4,500psi.
3. fy = 60 Ksi.
* 0" ON AW HEADWALL

PRECAST HEADWALL DETAIL BY SHERMAN DIXIE OR EQUIVALENT

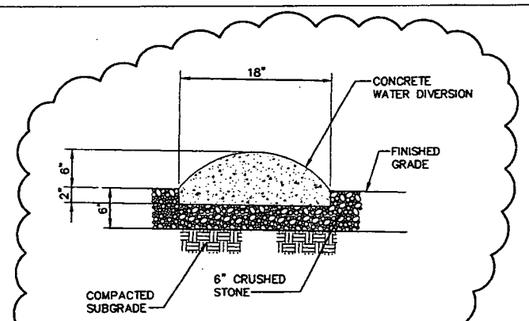
ENDWALL DETAIL

NOT TO SCALE



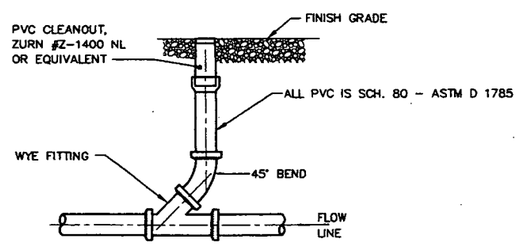
SILT FENCE DETAIL

NOT TO SCALE



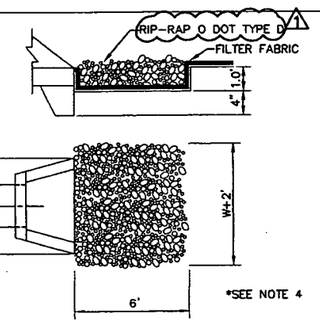
WATER DIVERSION DETAIL

NOT TO SCALE 1



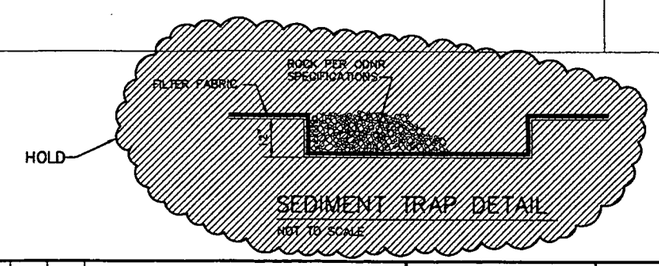
STORM DRAINAGE CLEANOUT DETAIL

NOT TO SCALE



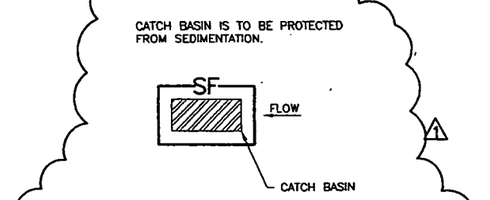
CULVERT INLET & OUTLET PROTECTION DETAIL

NOT TO SCALE



SEDIMENT TRAP DETAIL

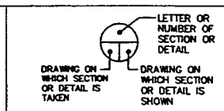
NOT TO SCALE



CATCH BASIN PROTECTION DETAIL

NOT TO SCALE 1

000097



SECTION & DETAIL KEY

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					ADDED DIVERSION DETAIL, MINOR DETAIL EDIT
0	3/6/00	WVM	VB		CERTIFIED FOR CONSTRUCTION

RPE

DRAWN BY W. MARVIN	DATE 3/6/00	
DESIGNED BY M. HUGHES	DATE 3/6/00	
CHECKED BY V. BHATT	DATE 3/6/00	
APPROVED BY M. HUGHES	DATE 3/6/00	
APPROVED BY JOHN LAWSON	DATE 3/6/00	

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

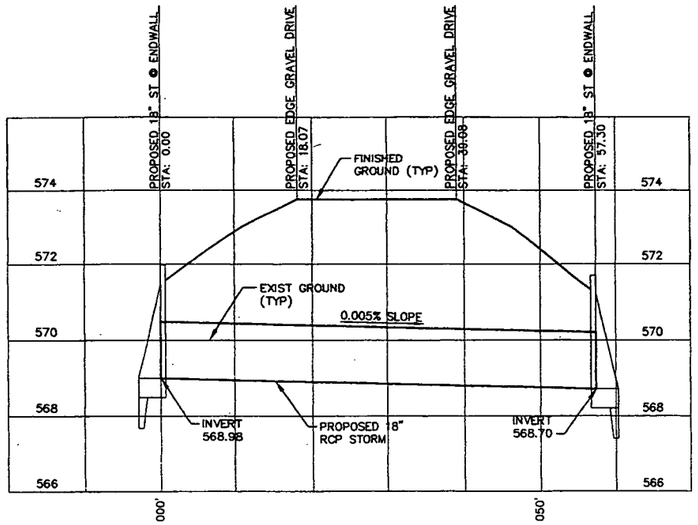
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
STORM WATER SYSTEM
MISC DETAILS
SHEET 1

SIZE	SCALE:	DWG. NO.	REV
D	AS SHOWN	66FCD006	1

FILENAME: 66FCD006.I

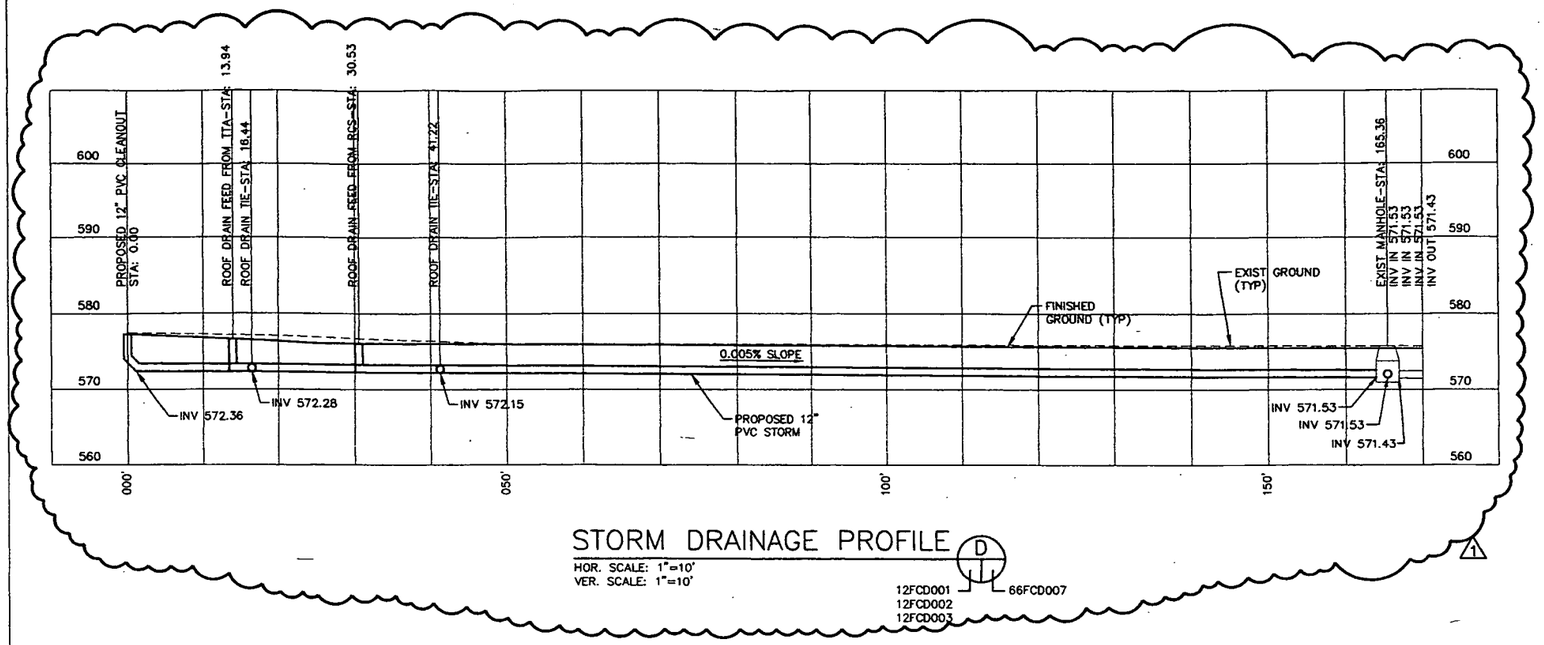
2918



STORM DRAINAGE PROFILE (A)

HOR. SCALE: 1"=10'
VER. SCALE: 1"=2'

12FCD001
12FCD002
12FCD003
66FCD007

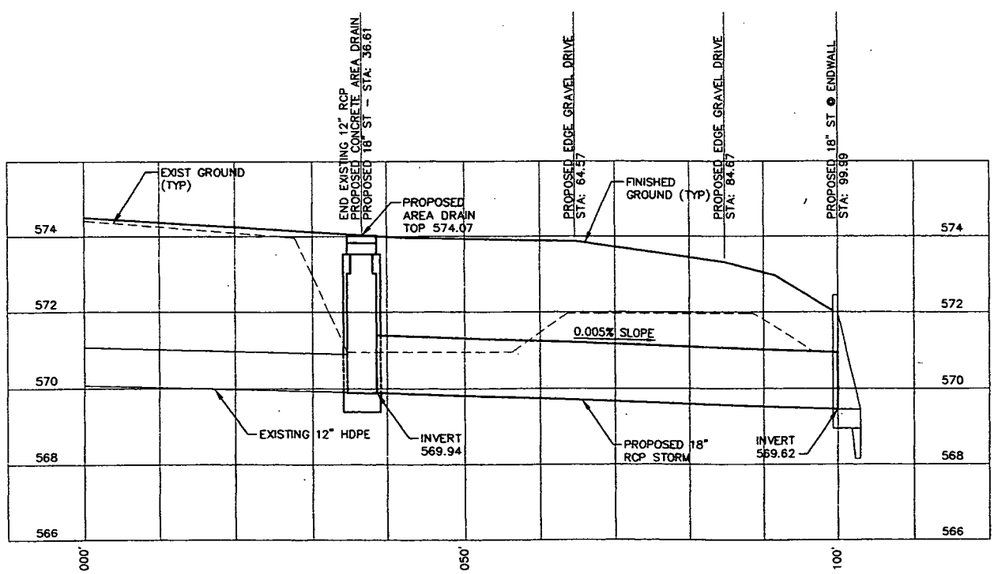


STORM DRAINAGE PROFILE (D)

HOR. SCALE: 1"=10'
VER. SCALE: 1"=10'

12FCD001
12FCD002
12FCD003
66FCD007

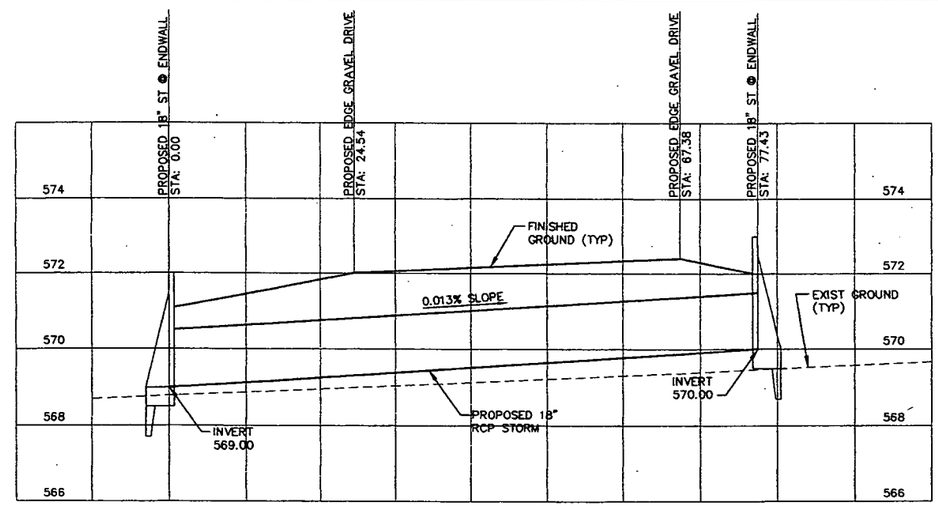
1



STORM DRAINAGE PROFILE (B)

HOR. SCALE: 1"=10'
VER. SCALE: 1"=2'

12FCD001
12FCD002
12FCD003
66FCD007



STORM DRAINAGE PROFILE (C)

HOR. SCALE: 1"=10'
VER. SCALE: 1"=2'

12FCD001
12FCD002
12FCD003
66FCD007

000098

LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION AND DETAIL KEY:

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1					ADDED PROFILE "D"
0	3/6/00	WVM	VB		CERTIFIED FOR CONSTRUCTION

RPE

		DATE
DRAWN BY	W. MARVIN	3/6/00
DESIGNED BY	M. HUGHES	3/6/00
CHECKED BY	V. BHATT	3/6/00
APPROVED BY	M. HUGHES	3/6/00
APPROVED BY	JOHN LAWSON	3/6/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
STORM WATER SYSTEM PROFILES

SIZE	SCALE:	DWG. NO.	REV
D	AS SHOWN	66FCD007	1

FILENAME: 66FCD007.

2918

Attachment C
Construction
Specifications

FOSTER WHEELER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CONSTRUCTION SPECIFICATION
DIVISION 02

DOCUMENT P622-55B, Rev. 0

FOR THE

SILOS 1 AND 2
ACCELERATED WASTE RETRIEVAL PROJECT

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SUBMITTED TO:

FLUOR FERNALD, INC.

CONTRACT FSC624

March 6, 2000

DIVISION 02
SITE CONSTRUCTION

Section	Title	Revision
02060	Aggregate	Deleted
02220	Site Demolition	0
02225	Site Demolition	Deleted
02300	Earthwork	0
02302	Excavation, Backfill, and Compaction for Utilities	0
02325	Flowable Fill	Deleted
02370	Slope Protection and Erosion Control	0
02371	Riprap	Deleted
02373	Separation/Filtration Geotextiles	0
02510	Water Distribution	0
02513	Protective Coating for Underground Water Line	Deleted
02530	Sanitary Sewer	0
02581	Underground Ducts	Deleted
02630	Storm Drainage	0
02722	Aggregate and/or Graded-Crushed Aggregate Base Course	0
02731	Aggregate Surface Course	0
02924	Seeding	0
Attachment A — Inspection Summary		Later
Attachment B — Test Summary		Later
Attachment C — Submittal Summary		Later

CONSTRUCTION SPECIFICATIONS
DIVISION 02 – SITE CONSTRUCTION

SILOS 1 AND 2
ACCELERATED WASTE RETRIEVAL (AWR)
Contract FSC 624

"This document is the property of Fluor Fernald, Inc., prepared by Foster Wheeler Environmental Corporation, and is provided upon the condition that it will neither be reproduced, copied, issued to a third party, will be used solely for the intended purpose and solely for the execution review of the engineering and construction of the subject project."

Prepared under the supervision of Michael Stanley Hughes
Foster Wheeler Environmental Corporation
111 Union Valley Road, Oak Ridge TN 37930

Ohio PE Number E-64652

STATE OF OHIO
MICHAEL STANLEY HUGHES
E-64652
REGISTERED
PROFESSIONAL ENGINEER

Revision	Prepared by	Reviewed by	Approved by	Date	Pages Affected
0	Michael S. Hughes	Vinay Bhatt	John Lawson	3/06/2K	All

SECTION 02220

SITE DEMOLITION

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

1.2 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6	(1990) Demolition Operations

1.3 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from Foster Wheeler Environmental Corporation (FWENC). Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. Store materials that cannot be removed daily in areas specified by FWENC.

1.4 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-07 Certificates

Demolition plan

Notifications

Notification of Demolition and Renovation forms

Submit proposed salvage, demolition and removal procedures to FWENC for approval before work is started.

SD-11 Closeout Submittals

Receipts

1.5 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.6 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris to occupied portions of the site and avoid the creation of a hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.7 PROTECTION

1.7.1 Existing Work

Protect existing work which is to remain in place, be reused, or remain the property of the owner. Repair items which are to remain and which are damaged during performance of the work to their original condition, or replace with new. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have FWENC approval.

1.7.2 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

1.8 BURNING

Burning will not be permitted.

1.9 REQUIRED DATA

Demolition plan shall include procedures for coordination with other work in progress, a detailed description of methods and equipment to be used for each operation and of the sequence of operations.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Utilities and Related Equipment

Perform Fluor Fernald~~, Inc.,~~, Inc., lockout and tagout procedure. Remove existing utilities as indicated on the plans. If utility lines are encountered that are not shown on drawings, contact FWENC for further instructions.

3.1.2 Guardrail

Remove existing guardrail as directed by FWENC.

3.2 FILLING

Fill holes, trenches, and other hazardous openings as indicated on the plans.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Subcontractor and shall be removed from the property. FWENC will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.4 CLEANUP

3.4.1 Debris and Rubbish

Remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up spillage from streets and adjacent areas.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

02302 Excavation, Backfill, and Compaction for Utilities

02530 Storm Drainage Systems

02924 Seeding

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 698	(1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft).
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, CL, ML, or CH. Satisfactory materials for grading shall be comprised of stones less than 4 inches.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. FWENC shall be notified of any contaminated materials.

1.3.3 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698 abbreviated as a percent of laboratory maximum density.

1.3.4 Topsoil

~~Material suitable for topsoils is defined as natural, friable, fertile, fine sandy loam reasonably free from noxious weeds, stones larger than 1 in. diameter.~~ See Section 02924, "Seeding."

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittal Procedures."

SD-08 Statements

Earthwork;

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material.

SD-09 Reports

Testing;

Within 24 hours of conclusion of physical tests, 2 copies of test results.

SD-13 Certificates

Testing;

Qualifications of the commercial testing laboratory.

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SD-18 Records

Earthwork;

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

1.5 CLASSIFICATION OF EXCAVATION

~~Excavation specified shall be done on a classified basis, in accordance with the following designations and classifications.~~

~~1.5.1 Rock Excavation~~

~~Rock excavation shall include excavating, grading, and disposing of material classified as rock and shall include the satisfactory removal and disposal of boulders 1/2 cubic yard in volume. The removal of any concrete or masonry structures, except pavements, exceeding 1/2 cubic yard in volume that may be encountered in the work shall be included in this classification. If at any time during excavation, including excavation from borrow areas, the Subcontractor encounters material that may be classified as rock excavation, such material shall be uncovered and FWENC shall be notified by the Subcontractor. The Subcontractor shall not proceed with the excavation of this material until FWENC has classified the materials as common excavation or rock excavation and has taken cross sections as required.~~

~~1.5.2 Common Excavation~~

~~Common excavation shall include the satisfactory removal and disposal of all materials not classified as rock excavation.~~All excavation shall be unclassified.

1.6 BLASTING

Blasting shall not be permitted.

1.7 USE OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in ~~designated~~ accordance with FWENC direction~~waste disposal or spoil areas~~. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding as backfill, and for similar purposes. ~~Satisfactory material authorized to be wasted~~ Excess material shall be transported to ~~disposed of in~~ designated areas approved for surplus material storage or designated waste areas as directed. Coarse rock from excavations shall be ~~stockpiled and used as directed by FWENC~~transported to a designated location. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

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PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

~~Where indicated or directed, topsoil shall be stripped as necessary. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be stockpiled in locations indicated by FWENC.~~Stripping of topsoil shall be as specified in Section 02924, "Seeding."

3.2 GENERAL EXCAVATION

The Subcontractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in Paragraph 3.~~10~~9, "Subgrade Preparation~~Finishing~~." Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade, transported to a designated location, and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be ~~disposed of in areas approved for surplus material storage or designated waste areas~~transported to a designated location. Unsatisfactory excavated material shall be ~~disposed of in designated waste or spoil areas~~transported to a designated location. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by FWENC as specified.

3.2.1 Ditches~~, Gutters,~~ and Channel Changes

Excavation of ditches~~, gutters,~~ and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. ~~Ditches and gutters shall not be excavated below grades shown.~~ Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Subcontractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed.

~~**3.3 SELECTION OF BORROW MATERIAL**~~

~~Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from within the limits of construction shown or from other approved sources.~~

3.4~~3~~ OPENING AND DRAINAGE OF EXCAVATION

The Subcontractor shall notify FWENC 48 hours in advance of the opening of any excavation. Except as otherwise permitted, excavation areas shall be excavated providing adequate drainage. ~~Overburden and other spoil material~~Excess material shall be transported to designated ~~spoil~~storage areas or otherwise disposed of as directed. The Subcontractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

Excavations shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is completed. The subcontractor shall be responsible for all damage incurred to the drainage facilities as a result of dewatering operations. All pipe or conduits shall be left clean and free of sediment.

Excavation shall be sloped to sumps and/or graded to drain. Excavations are to be kept free of standing water.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practical.

3.~~5~~4 GRADING AREAS

Where indicated, ~~work will be divided into grading areas within which~~ satisfactory excavated material from on-site shall be ~~plac~~incorporated~~ed~~ in embankments, fills, and required backfills.

3.~~6~~5 STRUCTURAL BACKFILL

Backfill placed ~~with~~ within 5 ft. to any and all types of structures shall be placed and compacted to at least 95 percent laboratory maximum density ~~for cohesive materials or 95 percent laboratory maximum density for cohesionless materials~~ to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in ~~paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS.~~Paragraph 3.6, "Preparation of Ground Surface for

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Embankments." Compaction requirements for backfill materials shall also conform to the applicable portions of Paragraph 3.~~7~~6, "Preparation of Ground Surface for Embankments," Paragraph 3.~~8~~7, "Embankments," Paragraph 3.~~9~~ 8 "Subgrade Preparation," Section 02530, "~~Storm Drainage System~~Sanitary Sewer;" and Section 02302, "Excavation, Backfill, and Compaction for Utilities." Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.~~7~~6 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.~~7~~6.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up, pulverized; moistened or aerated as necessary; thoroughly mixed; proof rolled steel wheel roller. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to ensure adequate bond between embankment material and the prepared ground surface.

3.~~7~~6.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, that is acceptable to FWENC and replaced with new material. FWENC may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.~~8~~7 EMBANKMENTS

3.~~8~~7.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 98 percent laboratory maximum density under buildings and structures ~~for cohesive materials~~and ~~or~~ 95 percent laboratory maximum density ~~for cohesionless materials~~in graveled drive areas. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in Paragraph 3.9, "Subgrade Preparation." Compaction

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shall be performed using sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment.

3.~~9~~8 SUBGRADE PREPARATION

3.~~9~~8.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finish subgrade shall not vary more than 0.10 foot from the established grade and cross section.

3.~~9~~8.2 Compaction

Compaction shall be performed using sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment. Except for ~~paved areas and~~ building foundations, each layer of the embankment shall be compacted to at least 95 percent of laboratory maximum density. ~~Paved areas and b~~Building foundations shall be compacted to 98 percent of laboratory maximum density. Non structural areas shall be proof rolled 5 passes using a steel wheel roller~~. Compact fill and backfill under grass yards and grounds to a minimum of 90% of maximum density at 4% of optimum moisture dry~~.

3.~~10~~9 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. ~~The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in Paragraph 3.9, "Subgrade Preparation."~~ Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.~~11~~10 PLACING TOPSOIL

On areas to receive topsoil, the soil shall be prepared per Section 02924, "Seeding."

3.~~12~~11 DENSITY TESTING

Soils testing shall be performed by FWENC's site testing Subcontractor. Field in-place density shall be determined in accordance with ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also

be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by FWENC. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by FWENC, that compaction is not as specified, the material shall be reworked~~ed~~ to meet specification requirements. FWENC shall administer two density test per compaction area to support the earthwork Subcontractor. However, the third and subsequent tests shall be at the expense of the earthwork Subcontractor. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the supervision of FWENC and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.~~12~~11.1 Fill and Backfill Material Gradation (By Site Testing Subcontractor)

One test per 5000 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136.

3.~~12~~11.2 In-Place Densities (By Site Testing Subcontractor)

a. One test per 5000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 1000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

3.~~12~~11.3 Check Tests on In-Place Densities (By Site Testing Subcontractor)

When ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

a. One check test per lift for each 15,000 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.

b. One check test per lift for each 3000 square feet, of fill or backfill areas compacted by hand-operated machines.

3.~~12~~11.4 Moisture Contents (By Earthwork Subcontractor in process of working the area)

In the stockpile, excavation, or borrow areas, the Subcontractor will perform a minimum of two tests per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved by FWENC.

3.~~12~~11.5 Optimum Moisture and Laboratory Maximum Density (By Site Testing Subcontractor in conjunction with densities)

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values.

One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.~~12~~11.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in ~~paragraph SUBGRADE PREPARATION~~Paragraph 3.9, "Subgrade Preparation" shall be made during construction of the subgrades.

3.~~13~~12 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Subcontractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

END OF SECTION

SECTION 02302

EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

~~01575 Temporary Environmental Controls~~

02730 Slope Protection and Erosion Controls

~~02373 Separation/Filtration Geotextile~~

02924 Seeding

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	Standard Specification for Concrete Aggregates
ASTM C 76	(1997) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m))
ASTM D 1556	(1990;R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2774	(1994) Standard Practice for Underground Installation of Thermoplastic Pressure Piping

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

29 CFR 1926	Occupational Safety and Health Administration (OSHA Subpart P – Excavations

OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT 304 (1997) Construction and Material Specifications, Aggregate Base

~~AMERICAN WATER WORKS ASSOCIATION (AWWA)~~

~~AWWA C600 (1993) Installation of Ductile-Iron Water Mains and Their Appurtenances~~

1.3 DEFINITIONS

1.3.1 Backfill

Material used in refilling a cut, trench or other excavation.

1.3.2 Cohesive Materials

Soils classified by ASTM D 2487 as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when fines have a plasticity index greater than zero.

1.3.3 Cohesionless Materials

Soils classified by ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.3.4 Compaction

The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 698 for general soil types.

1.3.5 Granular Pipe Bedding

A dense, well-graded aggregate mixture of sand, gravel, or crushed stone (mixed individually, in combination with each other, or with suitable binder soil) placed on a subgrade to provide a suitable foundation for pipe. Granular bedding material may also consist of poorly graded sands or gravels where fast draining soil characteristics are desired.

1.3.6 In-Situ Soil

Existing in place soil.

1.3.7 Lift

A layer (or course) of soil placed on top of subgrade or a previously prepared or placed soil in a fill or backfill.

1.3.8 Porous Fill

A granular soil material having a large void ratio when placed and compacted, allowing a free flow of fluid to or from the surrounding soil, with no more than 10 percent of the material passing the 1/2 inch.

1.3.9 Refill

Material placed in excavation to correct overcut in depth.

1.3.10 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume.

1.3.11 Topsoil

In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well-decomposed organic matter, often containing traces of the parent rock material. Topsoil shall conform to specifications in Section 02924, "Seeding."

1.3.12 Unyielding Material

Rock rib, ridge, rock protrusion, or soil with cobbles in the trench bottom requiring a covering of finer grain material or special bedding to avoid bridging in the pipe or conduit.

1.3.13 Unsatisfactory Material

In-Situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in the trench without excessive consolidation or loss of stability. Also backfill material which contains refuse, frozen material, large rocks, debris, soluble particles, and other material which could damage the pipe or cause the backfill not to compact. Materials classified as PT, OH, or OL by ASTM D 2487 are unsatisfactory.

1.3.14 Unstable Material

Material in the trench bottom which lacks firmness to maintain alignment and prevent joints from separating in the pipe, conduit, or appurtenance structure during backfilling. This may be material otherwise identified as satisfactory which has been disturbed or saturated.

1.4 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-06 Test Reports

Underdrainage backfill material tests

Concrete tests

Trench backfill material tests

Pipe bedding material tests

Topsoil tests

Test for moisture-density relation

Density and moisture tests

SD-07 Certificates

Shoring and sheeting plan

Dewatering plan

SD-11 Closeout Submittals

As-built drawings

1.5 REGULATORY REQUIREMENTS

Materials and workmanship specified shall be in accordance with the referenced articles, sections, and paragraphs of the standard except that contractual and payment provisions do not apply.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage. Store synthetic fiber filter fabric to prevent exposure to direct sunlight.

1.7 PROTECTION

1.7.1 Dewatering Plan

Base on site surface and subsurface conditions, available soil and hydrological data.

1.7.2 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Subcontractor's risk. For work immediately adjacent to or for

excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by FWENC. Report damage to utility lines or subsurface construction immediately to FWENC.

1.8 QUALITY ASSURANCE

~~1.8.1 Shoring and Sheeting Plan~~

~~Describe materials of shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer registered in any jurisdiction. Indicate sequence and method of installation and removal.~~

1.8.~~2~~1 Dewatering Plan

Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area.

1.8.~~3~~2 Test for moisture-density relation

Submit 7 days prior to commencing utility excavation.

1.8.~~4~~3 Topsoil tests

Submit topsoil tests per Section 02924, "Seeding," verifying conformance to required parameters prior to commencing seeding operations.

1.8.~~5~~4 Density and moisture tests

Submit field test data not listed above sufficiently in advance of construction so as not to delay work. Submit within 14 days of test date.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

Provide soil materials as specified below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, ice, or other deleterious and objectionable materials.

2.1.1 Backfill

Bring trenches to grade indicated on the drawings using material excavated on the site of this project. This material will be considered unclassified and no testing other than for compaction will be required before use as backfill.

2.1.2 Sand

Clean, coarse-grained sand classified as SW or SP by ASTM D 2487 for bedding and backfill.

2.1.3 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof having a classification ~~of GW~~ in accordance with ODOT ~~ASTM D 2487~~304 for bedding and backfill.

2.1.4 Backfill for Underdrainage Systems

Clean sand, crushed rock, or gravel meeting the following requirements:

a. Perforated or Slotted-Wall Pipe: Backfill meeting requirements of Type I material as specified in Table 1.

b. Any Type Drain Used With Filter Fabric: Clean gravel or crushed stone or gravel conforming to ASTM C 33 coarse aggregate grading size 57, 67, or 7.

TABLE 1

ASTM D 422 Sieve Size	Type I Gradation E 11 ASTM C 33 Percent Passing
~~1.5~~2 inches	–100
1 inch	–70 – 100
3/~~8~~4 inch	~~100~~50 – 90
No. 4	~~95 – 100~~30 – 60
No. ~~50~~30	~~10~~ 9 – ~~30~~33
N0. ~~100~~200	0 – ~~10~~13

2.1.5 Pipe Bedding

TABLE 02302-1 UTILITY EARTHWORK REFERENCES

	PIPE MATERIALS	SOIL MATERIALS REFERENCE	INSTALLATION REF.
a.	Concrete Culvert Pipe	ASTM C 76 (Reinforced)	ACPA 01-103
b.	Polyvinyl Chloride (PVC)	ASTM D 2774, except bedding shall be SW or SP and all material surrounding pipe shall have maximum particle size of ½ inch	ASTM D 2774

Provide material for pipe bedding as indicated.

2.2 FILTER FABRIC

Provide a pervious sheet of polyester, nylon, or polypropylene filaments woven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. ~~Fabric shall have manufacturer certified minimum average roll properties as outlined in Specification Section 02373 "Separation/Filtration Geotextile."~~

2.3 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Red:	Buried Electric Line Below
Orange:	Buried Telephone or Other Voice/Data Communications Line Below
Blue:	Buried Water Line Below
Green:	Buried Sewer Line Below

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring and sheeting where indicated.

3.1.2. Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

3.1.3 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the

excavation reaches the water level in order to maintain the integrity of the in situ material.

Excavations shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is completed. The subcontractor shall be responsible for all damage incurred to the drainage facilities as a result of dewatering operations. All pipe or conduits shall be left clean and free of sediment.

Excavation shall be sloped to sumps and/or graded to drain. Excavations are to be kept free of standing water.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practical. Any water accumulating in excavated areas shall be pumped to the nearest ditch or channel discharging to the sediment basin or sediment trap.

Operate the dewatering system continuously until construction work below existing water levels is complete. ~~Measure and record the performance of the dewatering system at the same time each day with observation wells and piezometers installed in conjunction with the dewatering system.~~

3.1.4 Underground Utilities

Location of the existing utilities indicated is approximate. The Subcontractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. At the completion of construction, all drawings shall be red-lined "as-built" and forwarded to FWENC for approval.

3.1.5 Structures and Surfaces

Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Protect existing streams, ditches, and storm drain inlets from water-borne soil by means of filter fabric and rip-rap protection as indicated on the contract drawings. Perform work in accordance with requirements specified in Section 02370, "Slope Protection and Erosion Control."

3.1.5.1 Disposal of Excavated Material

Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.

3.1.6 Channels and Ditches

Construct (rip-rap) rock protection in areas indicated to the lines and thicknesses specified. Place rip-rap on a layer of filter fabric.

3.2 SURFACE PREPARATION

3.2.1 Stockpiling ~~Topsoil~~

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

Stockpiles that are to be inactive for a period of 45 days or more shall be stabilized with a crusting agent within 7 calendar days of last activity. Slopes on stockpiles may not exceed 2:1 in steepness and shall be less than 15 feet in height. The pile shall be shaped with a drainage pitch of at least 2% on all areas. The perimeter of the pile shall have proper sediment controls (e.g. silt fence)

Differing materials shall be separated with dividers, or stockpiled separately to prevent mixing. Surface water shall be directed away from stockpile areas to prevent deterioration of materials.

The ground surface at stockpile locations shall be cleared and grubbed. Suitable and unsuitable materials shall be separately stockpiled. Stock [piles of suitable materials shall be protected from contamination.

3.3 GENERAL EXCAVATION AND TRENCHING

Keep excavations free from water while construction is in progress. Notify FWENC immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated~~. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe.~~ . Excavate ledge rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe unless otherwise indicated or specified. Blasting will not be permitted. Use bedding material placed in 6 inch maximum layers to refill overdepths to the proper grade. At the Subcontractor's option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as indicated.

3.3.1 *Shoring and Sheeting*

~~Shore and sheet excavations as described in the plan submitted with various member sizes arranged to prevent injury to persons and damage to structures. Arrange shoring and sheeting to preclude injurious caving during removal. Obtain approval from FWENC before removing shoring, sheeting, or bracing in excavations adjacent to on-grade slabs,~~

~~foundations, or other structural elements.~~Excavation protection shall be in accordance with OSHA 29 CFR 1926, Subpart P – Excavations.

3.4 BEDDING

Of materials and depths as indicated for utility lines and utility line structures. Place bedding in 6 inch maximum loose lifts. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.

3.5 BURIED WARNING AND IDENTIFICATION TAPE

Install tape in accordance with FWENC design drawings except as modified herein. Bury tape at the depth indicated on FWENC design drawings.

3.6 BACKFILLING

Construct backfill in two operations (initial and final) as indicated and specified in this section. Place initial backfill in 12-inch maximum loose lifts to one foot above pipe unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe structure. Ensure that no damage is done to the utility or its protective coating. Place the remainder of the backfill (final backfill) in 12-inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "General Compaction" before placing the next lift. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized by FWENC. Provide a minimum cover from final grade as shown on FWENC design drawings for water piping and for sewer lines. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of utilities.

3.7 COMPACTION

Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

3.7.1 Compaction of Material in Subcuts or Overexcavations

In rock, compact to 95 percent of ASTM D 698 maximum density. In stable soils, compact to 95 percent of ASTM D 698 maximum density.

3.7.2 Compaction of Pipe and Conduit Bedding

In rock, compact to 95 percent and in soil, compact to 95 percent of ASTM D 698 maximum density.

3.7.3 Compaction of Backfill

Compact initial backfill material surrounding pipes, cables, conduits, or ducts, to 95 percent of ASTM D 698 maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same material, compact initial backfill to the density of the bedding. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 92 percent of ASTM D 698 maximum density.

3.8 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in the areas indicated.

3.8.1 Preparation

Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.8.2 Bedding Placement

Spread filter fabric on prepared subgrade as indicated.

3.8.3 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.9 FINISH OPERATIONS

3.9.1 Grading

Finish to grades indicated within one-tenth of a foot. Provide sod or topsoil in areas to be seeded or sodded as indicated. Grade areas to drain water away from structures. Grade existing grades that are to remain but have been disturbed by the Subcontractor's operations.

3.9.2 Spreading Topsoil

Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade as specified in Section 07924, "Seeding." Do not place topsoil when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading.

3.9.3 Disposition of Surplus Material

Surplus or other soil material not required or suitable for filling, backfilling, or grading shall be disposed of per FWENC directions.

3.9.4 Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.10 FIELD QUALITY CONTROL

Test bedding and backfill for conformance to specified requirements. Test bedding and backfill for moisture-density relations in accordance with ASTM D 698 as specified herein. Provide additional tests as specified above for each change of source. Perform density and moisture tests in randomly selected locations and in accordance with ASTM D 1556 as follows:

a. Bedding and backfill in trenches: One test per 50 linear feet in each lift.

b. Appurtenance structures: One test per 100 square feet or fraction thereof in each lift.

END OF SECTION

SECTION 02370

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. This section includes temporary control measures for slope protection and controls to reduce erosion and sedimentation through the use of erosion control devices.

B. Related Sections:

01330	Submittal Procedures
02300	Earthwork
02924	Seeding

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M 288 Geotextile Specification for Highway Applications.

B. Ohio Department of Transportation (ODOT)

ODOT Item 688 Construction and Material Specification (1997).

C. Ohio Department of Natural Resources (ODNR)

Rainwater and Land Development, Ohio's Standard for Stormwater Management (1996)

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittal Procedure."

SD-01 Data

Manufacturer's data on silt fence.

Manufacturer's data on erosion control matting.

SD-06 Instructions

Manufacturer's installation and maintenance instructions.

1.4 PROJECT CONDITIONS

A. Provide temporary pollution control features to ensure that effective and continuous erosion control is maintained throughout the construction period.

~~1.4~~1.5 Quality Assurance

Subcontractor shall inspect and evaluate the effectiveness of, need for, maintenance of, the control measures. Repairs shall be made within 24 hours of problem discovery. Inspections shall occur weekly and within 24 hours of a 0.5-inch rainfall.

PART 2 PRODUCTS

2.1 MATERIALS

A. Silt Fence

1. Geotextile Filter Fabric: Shall be made of pervious sheets of strong rot-proof plastic fabric meeting the requirements of AASHTO M 288 for Sediment Control Fabrics.

2. Reinforcement Backing: Shall either be minimum 14-gauge steel wire and maximum mesh spacing of 6 inches or synthetic netting of equal strength. Use reinforcement backing as recommended by manufacturer of geotextile filter fabric. Reinforcement backing can be eliminated if post spacing is a maximum of 6 feet and the geotextile tensile strength is at least 200 pounds.

3. Posts: Shall be either wood or steel with minimum length of 4 feet. Wood posts shall be at least 2 inches by 2 inches of oak or similar hardwood. Steel posts shall be round or shaped as a "U", "T", or "C". Steel posts shall have a minimum weight of 1.33 pounds per linear foot and shall have projections for fastening reinforcement to silt fence.

4. Wire Staples: Shall be at least ~~9 gauge~~9-gauge thickness with a minimum length of 1 inch.

5. A preassembled silt fence meeting the material requirements may be used instead of a field constructed silt fence.

B. ~~Excelsior Matting: In accordance with ODOT Item 668.~~Erosion Control Blankets (Matting): The matting shall be made from 100% commercial-grade Coir yard (spun from coconut fibers) containing approximately 45% Lignin, 55% cellulose. The erosion control blanket shall be 100% biodegradable within a maximum service life expectancy of 10 years for use on slopes of 1:1 or greater and where shown on the drawings. The blanket shall have the following physical properties.

1. Material Content

   a. Coir Yarn: 100 percent; containing 45% Lignin, 55% Cellulose (approximately).

2. Physical Specifications (Roll)

   a. Weight: 83.6 lbs; 22.7 oz/sq. yd (approximately)

   b. Average Mesh: 0.4" × 0.5"

   c. Open Area: 38% (approximately)

2.2 EQUIPMENT

The choice of equipment to perform erosion control operations shall be the responsibility of the Subcontractor. However, any equipment that results in waste, damage of material, or inaccurate work shall be promptly replaced.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate use of erosion control measures with requirements of Section 02300, "Earthwork." Silt fences and rock check dams shall be installed as a first step in clearing and earthwork and maintained throughout the construction period.

B. Temporary measures may be removed at the beginning of the workday but must be replaced at the end of the workday. Erosion and sediment control measures shall be inspected at the end of each workday.

C. Prepare subgrade at locations to receive erosion and sediment control measures. Compact surface by use of hand or mechanical tamps. Replace pockets of soft soil as necessary. Do not install on frozen or spongy subgrades.

3.2 GENERAL REQUIREMENTS

A. Existing vegetative ground cover shall not be destroyed, removed, or disturbed more than 14 calendar days before grading operations.

B. Comply with local, state, and federal quality regulations for stormwater discharge. All pumped water shall be discharged through a siltation control device that removes all visible sediment. Pumped water shall not discolor the receiving stream.

C. All points of construction ingress and egress shall be protected to prevent tracking of mud or soil onto paved roads. Tracked mud or soil shall be removed by the Subcontractor at the end of each workday using shovels and brooms.

D. Seed and mulch in accordance with Section 02924, "Seeding."

3.3 SILT FENCE

A. Install silt fence on the downhill side of all work limits, along contours, and along natural drainage areas to reduce the quantity of sediment and flow velocities to downstream areas. Terminate silt fences on the uphill portion of work limits at a distance that prevents short-circuiting around the ends of silt fence. Silt fence shall be constructed before upland grading begins. Install in accordance with ODNR and manufacturer's recommendations.

B. Posts shall have a maximum spacing of 6 feet for silt fences constructed without reinforcement backing, or a maximum spacing of 10 feet for silt fences constructed with reinforcement backing. Install posts at least 1½ ~~2~~ feet into ground. Seams between sections of fencing shall be overlapped with the end stakes wrapped together before driving into the ground.

C. Excavate trench approximately 6 inches wide and 6 inches deep upslope from the posts. Securely fasten wire reinforcement (if used) to upslope side of posts using wire staples, tie wires, or hog rings. Attach geotextile filter cloth directly to posts and wire reinforcement backing using wire, staples, or other means recommended by the silt fence manufacturer. Install filter fabric so that the fabric height above grade is at least 2 feet and the fabric length below grade is at least 12 inches. Do not use fabric with defects, rips, holes, deterioration or other types of damage. Backfill trench and compact soil.

3.4 ~~EXCELSIOR~~ EROSION CONTROL BLANKETS (MATTING)

A. Install ~~excelsior~~ matting with anchoring devices on all disturbed slopes of 10% or greater, and on all disturbed waterways and channels not designated to receive riprap. Install in accordance with manufacturer's recommended written instructions for slopes and for drainage channels.

B. Shape waterway, channel, and slope areas to required shape and grade. Prepare seedbed in accordance with Section 02924, "Seeding."

C. Erosion Control Blankets (Matting)

1. Install in accordance with ODNR and manufacturer's recommendations. All blankets shall be properly anchored with wire staples and wood stakes in patterns and sizes recommended by manufacturer. Bury edges in 6-inch deep trench, rake area smooth, and seed.

2. Erosion control blanket shall be used on all slopes steeper than 4H:1V and at all ditch inverts to a ditch depth of 1 foot.

3.5 ADJUSTING

A. Remove accumulated sediment, debris, and obstructions as necessary from ditches and the channels as directed by the Construction Manager. In no case shall sediment reduce the available depth in the ditches and channels to less than one-third the depth shown on the Construction Drawings.

B. Remove accumulated sediment from the sediment trap before available depth is reduced to one-half its design depth.

C. Removal of Temporary Control Facilities

1. Erosion control facilities shall be removed after the disturbed areas are stabilized and established with grass or other measures approved by FWENC.

~~3.5~~3.6 MAINTENANCE

A. The Subcontractor shall maintain an erosion control checklist and an erosion control inspection log. Inspection records shall be maintained in proper order at the project site until after the construction is completed and accepted. Inspection records shall be given to FWENC.

B. Inspect erosion control devices immediately after each rainfall, at least daily during prolonged rainfall and weekly during dry periods. Remove sediment deposits after each storm event. Repair or replace damaged devices as necessary.

C. Silt is to be removed from diversion ditches and silt fence as needed and at the end of construction.

END OF SECTION

SECTION 02373

SEPARATION/FILTRATION GEOTEXTILE

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

02300 Earthwork

~~0270~~0273~~122~~ ~~Aggregate and/or Graded-Crushed Aggregate Base Course~~Aggregate Surface Course

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4354	(1996) Sampling of Geosynthetics for Testing
ASTM D 4759	(1988; R 1996) Determining the Specification Conformance of Geosynthetics

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittal Procedure."

SD-06 Instructions

Manufacturer's installation instructions

SD-13 Certificates

Manufacturer's Certificate of Compliance for geotextile material

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

FWENC will be present during delivery and unloading of the geotextile. Rolls shall be packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed by FWENC. Each roll

shall be labeled with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.4.2 Storage

Geotextile rolls shall be protected from becoming saturated. Rolls shall be either elevated off the ground or placed on a sacrificial sheet of plastic. The geotextile rolls shall also be protected from the following: construction equipment, ultraviolet radiation, chemicals, sparks and flames, temperatures in excess of 160 °F, and any other environmental condition that may damage the physical properties of the geotextile.

1.4.3 Handling

Geotextile rolls shall be handled and unloaded with carrying straps by a fork lift with a stringer bar or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 GEOTEXTILE

Geotextile materials shall conform to quality acceptance requirements of ASTM D 4759

2.2 THREAD

Sewn seams shall be constructed with high-strength polyester, nylon, or other approved thread type. Thread shall have ultraviolet light stability equivalent to the geotextile and the color shall contrast with the geotextile.

PART 3 EXECUTION

3.1 QUALITY ASSURANCE

The Subcontractor shall obtain a manufacturer's certificate of compliance confirming that the geotextile material provided has been tested according to ASTM D 4354, Procedure A, and quality accepted according to ASTM D 4759. This certificate of compliance shall be submitted to FWENC.

3.2 INSTALLATION

3.2.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions that could damage the geotextile. Subgrade materials requirements shall be in accordance with Section 02300, "Earthwork."

3.2.2 Placement

The Subcontractor shall request the presence of FWENC during handling and installation. Geotextile rolls that are damaged or contain imperfections shall be repaired

or replaced as directed by FWENC. The Subcontractor shall lay and secure geotextile materials according to manufacturer's installation instructions.

3.3 PENETRATIONS

Penetrations of the geotextile shall be performed by methods recommended by the geotextile manufacturer.

3.4 PROTECTION

The geotextiles shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed by FWENC. Adequate ballast (e.g., sand bags) shall be used to prevent uplift by wind. The geotextile shall not be left uncovered for more than 7 days during installation.

3.5 REPAIRS

Repairs shall be performed in accordance with manufacturer's instructions.

3.6 COVERING

Geotextile shall not be covered before approval by FWENC. The Subcontractor shall request the presence of FWENC during covering of the geotextile. Cover requirements are described in Section ~~0272~~02731, "~~Aggregate and/or Graded Crushed Aggregate Base Course~~Aggregate Surface Course." Compaction and testing requirements for cover soil are described in Section 02300, "Earthwork."

3.7 FIELD QUALITY CONTROL

FWENC will provide quality control oversight of Subcontractor's inspection activities.

The Subcontractor shall inspect (1) the Certificate of Compliance and confirm that the geotextile material meets the quality acceptance requirements of ASTM D 4759 and (2) the geotextile installation for conformance with manufacturer's installation instructions.

The manufacturer's Certificate of Compliance for the geotextile material and the Subcontractor's documentation for installation of the geotextile material constitute a portion of the Subcontractor's objective evidence for compliance with the specified requirements

END OF SECTION

SECTION 02510

WATER DISTRIBUTION

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

02302 Excavation, Backfill and Compaction for Utilities

1.2 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ANSI B16.3	(1998) Malleable Iron Threaded Fittings Classes 150 and 300
ANSI B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1999) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
ASTM A 126	(1993) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 197	(1992) Standard Specification for Cupola Malleable Iron
ASTM A 307	(1997) Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 563	(1997) Standard Specification for Carbon and Alloy Steel Nuts
ASTM D 1785	(1994) Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2000	(1995) Classification System for Rubber Products in Automotive Applications
ASTM D 2466	(1994; Rev. A) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3261	(1997) Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3350	(1998) Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
ASTM F 402	(1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 714	(1997) Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C509	(1994) Resilient-Seated Gate Valves for Water and Sewerage Systems
AWWA C511	(1997) Reduced-Pressure Principle Backflow Prevention Assembly
AWWA C901	(1996) Polyethylene (PE) Pressure Pipe and Tubing, ½ in. Through 3 in. for Water Service
AWWA M23	(1980) PVC Pipe - Design and Installation

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY, INC. (MSS)

MSS SP-6	(1996) Standard Finishes for Contact Faces of Pipe Flanges and Connecting Valves and Fittings
MSS SP-80	(1987) Bronze Gate, Globe, Angle and Check Valves

SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL (SBCCI)

SBCCI	(1997) Standard Plumbing Code, Water Supply and Distribution, Chapter 6

UNDERWRITERS LABORATORIES INC. (UL)

UL 262	(1994) Gate Valves for Fire-Protection Service
UL 789	(1993; R 1994) Indicator Posts for Fire-Protection Service

1.3 DESIGN REQUIREMENTS

1.3.1 Water Lines

Provide water service lines indicated from water distribution main to building service at the points indicated. Provide water service line appurtenances as specified and where indicated.

1.4 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Piping and Fitting Materials

Joints

Valves

Flow Meters

~~Back-Flow~~Backflow Preventers

~~Back-Flow~~Backflow Preventer Enclosure

Indicator posts

Valve boxes

Submit manufacturer's standard drawings or catalog cuts. Include information concerning gaskets with submittal for joints and couplings.

SD-07 Certificates

Piping and Fittings Materials

Valves

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Flow Meters

~~Back-Flow~~Backflow Preventers

~~Indicator posts~~

~~Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.~~

~~Subcontractor shall provide manufacturer's Certificates of Compliance that the items or components were manufactured and tested in accordance with the governing codes and/or standards.~~

SD-08 Manufacturer's Instructions

Installation procedures for ~~Flow Meters.~~flow meters.

Installation procedures for ~~Back-Flow Preventer.~~backflow preventer.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping and jointing materials shaded out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings and valves free of dirt and debris.

1.5.2 Handling

Handle pipe, fittings, valves, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry, do not drag pipe to the trench.

PART 2 PRODUCTS

2.1 WATER LINE MATERIALS

2.1.1 Piping Materials

2.1.1.1 Steel Piping

a. Pipe (to 4 in.): Steel, furnace welded, Schedule 40, ASTM A 53, galvanized.

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b. Fittings (to 2 in.): MI, 150 lb, screwed ends, ASTM A 197, ANSI B16.3, galvanized.

c. Fittings (2 1/2 to 4 in.): CI, 125 lb, flanged ends, ASTM A 126, ANSI B16.1, galvanized.

d. Flanges: CI, 125-lb, screwed, ASTM A 126, ANSI B16.1, galvanized, with smooth or serrated faces conforming to MSS SP-6.

e. Swage Nipples (4 × 2 in.): Steel, Schedule 40, ASTM A106, galvanized.

f. Unions (to 2 in.): MI, 150-lb, screwed ends, brass-to-iron seats, ASTM A 197, galvanized, ANSI B16.39.

g. Dope: Tyte Unyte, J.C. Whitlam Mfg. Co., or MIL-STD Teflon tape, Sepco Corp., or Rector Seal-5, Rector Seal Co., or approved equal.

h. Gaskets: Red rubber sheet, 1/16 in. thick, full face, ASTM D 2000, No. 2AAA705A13L14; Sepco Corp. No. 20.

i. Valve Stem Packing (for repacking only): Garlock 8921 or John Crane K-1730.

j. Fasteners: Bolts: Steel, heavy hex head, ASTM A 307, Grade B; Nuts: Heavy hex, ASTM A 563, Grade B.

2.1.1.2 Plastic Piping

Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.

a. Polyvinyl Chloride (PVC) Plastic Piping: ASTM D 1785, Schedule 40. Fittings: ASTM D 2466. Solvent cement for jointing: ASTM D 2564.

2.1.1.3 HDPE Piping

a. Pipe: PE 3408 Polyethylene per ASTM D 3350, Manufactured in accordance with ASTM F 714, Pressure Class 160, Plexco Bluestripe SDR-11, or approved equal.

b. Fittings: PE 3408 Polyethylene per ASTM D 3350, Molded in accordance with ASTM D 3261.

2.1.1.4 Insulating Joints

Joints between pipe of dissimilar metals shall have a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact between adjacent sections of piping.

2.1.2 Water Service Line Appurtenances

2.1.2.1 Gate Valves

Gate valves 3-inch size and larger AWWA C509 or UL 262. Valves, AWWA C509, non-rising stem type. Valves, UL 262, inside-screw type with operating nut and designed for a hydraulic working pressure of 200 psi. Materials for UL 262 valves conforming to the reference standards specified in AWWA C509. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have 0-ring stem seals and shall be bolted and constructed so as to permit easy removal of parts for repair.

2.1.2.2 Gate Valves

Gate valves smaller than 3-inch size, MSS SP-80, Class 125, solid wedge, rising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators.

~~2.1.2.3 Back-Flow~~2.1.2.3 Backflow Preventer and Insulated Enclosure

Provide a Reduced Pressure Zone (RPZ) type back-flow preventer, full port, size as indicated on design drawing, in accordance with AWWA C511. Service Pressure to 175 psi, and Service Temperature to 140 °F. Bronze body. Bronze strainer on inlet ball valve. Watts, Series 909QT-S or approved equal.

Provide an insulated and heated enclosure for freeze protection of the back-flow preventer. Enclosure shall be of fiberglass construction with a hinged lid for testing/calibration, suitable for mounting on a concrete pad. Hasps to be stainless steel to accept lock. It shall contain a thermostatically controlled 120 Volt, 60 Hz electric heater to provide freeze protection to –30 °F. The enclosure shall have a minimum R-value of 8. It shall contain drain openings sized to accommodate the maximum discharge of the RPZ, and protected against the intrusion of wind, debris, or animals. WATTSBOX Insulated Enclosure, Model No. WB-2S, or approved equal.

2.1.2.4 Indicator Posts

Provide a Post Indicator in accordance with UL 789 for gate valves where indicated. Paint Post Indicator Orange with Green top.

2.1.2.5 Turbine Flow Meter

Provide a turbine type flow meter with local digital display for rate and total indication. Size: 2" FNPT threads. Housing: 316 SS. Journal Bearings: Ceramic (96% Alumina). Shaft: Tungsten Carbide. Rotors and Supports: PVDF. Other Materials: Manufacturers standard. Service Pressure: 200 psi. Service Temperature: 14 °F to 140 °F. Accuracy ± 1.0%. Repeatability ± 0.1%. Display: 6-Digdit LCD, flow rate, batch, cumulative total, and automatic "off" for conserving batteries. Battery: Quantity two (2), 4000 hours of actual use. Omega model FTB795 or approved equal.

2.1.2.6 Valve Box

Provide a valve box as shown on drawings. Valve box to be STRONGWELL Model LG3672BB21, Quantity two (2) stacked with one (1) two-piece cover, STRONGWELL Model LG3672CA00. Logo on cover to state "WATER".

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs. Joints in Steel pipe shall be Screwed. Joints in PVC pipe shall be glued. Joints in HDPE pipe shall be Butt-Fused on Flanged.

3.1.1.1 Location of Water Lines

Terminate the work covered by this section at a point approximately 5 feet from the building. Where the location of the water line is not clearly defined by dimensions on the drawings, do not lay water line closer horizontally than 10 feet from any sewer line. Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.

3.1.1.2 Earthwork

Perform excavation, backfilling and compacting operations in accordance with Section 02302, "Excavation, Backfill, and Compaction for Utilties."

3.1.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding. Excavate recesses to accommodate joints and couplings. Provide anchors and supports where necessary for fastening work into place. Keep trenches free of water until joints have been properly made. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall be as shown on drawings.

3.1.1.4 Connections to Existing Water Lines

Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped. For connection to existing 4" diameter HDPE water line, use a Tapping Tee with 2" diameter Butt-Joint outlet as manufactured by PLEXCO, or approved equal. HDPE pipe and fitting shall be manufactured by the same manufacturer.

3.1.2 Special Requirements for Installation of HDPE Water Pipe

Unless otherwise specified, install pipe and fittings in accordance with AWWA C901.

3.1.3 Special Requirements for Installation of Steel Water Pipe

Unless otherwise specified, install pipe and fittings in accordance with the SBCCI Standard Plumbing Code.

3.1.4 Special Requirements for Installation of PVC Plastic Water Pipe

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines"; with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation." Also with the applicable requirements of ASTM D 2855, unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with ASTM F 402.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Foster Wheeler Environmental Corporation (FWENC) will conduct field surveillance and witness field inspections and tests specified in this section. The Subcontractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Subcontractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Testing Procedure

Test water lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements."

3.2.3 Special Testing Requirements

For hydro test, use a hydrostatic test pressure of 100 psi. Hold this pressure for not less than 2 hours. FWENC shall be provided with a 24 hour advance notice of the Subcontractor's testing activity.

END OF SECTION

SECTION 02530

SANITARY SEWER

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

02302 Excavation, Backfilling, and Compaction for ~~Utility Trenches~~Utilities

03200 Concrete Reinforcement

~~03300 Cast-In-Place Concrete~~

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 443	(1998) Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 923	(1996) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 969	(1994) Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C 972	(1995) Standard Test Method for Compression-Recovery of Tape Sealant
ASTM C 990	(1996) Standard Specification for Joints for Concrete Pipe, Manholes,and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D 412	(1998) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 624	(1998) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

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ASTM D 1785	(1996; Rev. B) Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 80
ASTM D 2412	(1996; Rev. A) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
~~ASTM D 3034~~	~~(1997) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings~~
ASTM D 3212	(1996; Rev. A) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM F 477	(1996; Rev. A) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.27	Fixed Ladders

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-60005	(1988) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

~~UBPPA UNI-B-3~~	~~(1988) Installation of Polyvinyl Chloride (PVC) Pressure Pipe~~
UBPPA UNI-B-6	(1990) Low-Pressure Air Testing of Installed Sewer Pipe

1.3 SYSTEM DESCRIPTION

1.3.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals 4 inch lines of polyvinyl chloride (PVC) plastic pipe. Provide building connections 4 inch lines of polyvinyl chloride (PVC) plastic pipe.

The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein.

1.4 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

~~Precast concrete cistern holding tank~~

Metal items

000143

Frames, covers, and gratings

SD-03 Product Data

Pipeline materials including joints, fittings, and couplings

Submit manufacturer's standard drawings or catalog cuts.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

1.5.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.1.2 Cement, Aggregate, and Reinforcement

As specified in Section 03300, "Cast-In-Place Concrete" and 03200, "Concrete Reinforcement."

1.5.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

2.1.1 ~~2.1.1~~ PVC Plastic Gravity Sewer Piping

ASTM D 1785, Poly (Vinyl Chloride) (PVC) plastic pipe shall be Schedule 80.

~~2.1.1.1 PVC Plastic Gravity Pipe and Fittings~~

~~ASTM D 3034, Standard Dimension Ratio (SDR) 35, with ends suitable for elastomeric gasket joints.~~

2.1.1.~~2~~1 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 CONCRETE MATERIALS

Concrete materials shall be as specified in Section 03300, "Cast-In-Place Concrete."

2.3 MISCELLANEOUS MATERIALS

2.3.1 Precast Concrete and Associated Materials

2.3.1.1 Precast Concrete Manhole Sections

Precast concrete manhole risers, base sections, and tops shall conform to ASTM C 478. Base and first riser shall be monolithic.

2.3.1.2 Gaskets and Connectors

Gaskets for joints between manhole sections shall conform to ASTM C 443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C 923 or ASTM C 990.

2.3.1.3 External Preformed Rubber Joint Seals

An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Proplene Di Monomer (EPDM) rubber with a minimum thickness of 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings. Properties and valves are listed in the following tables:

Properties, Test Methods and Minimum Values for Rubber used in Preformed Joint Seals

Physical Properties	Test Methods	EPDM	Neoprene	Butyl mastic
Tensile, psi	ASTM D 412	1849	2195	–
Elogation percent	ASTM D 412	553	295	350
Tear Resistance, ppi	ASTM D 624 (Die B)	280	160	–
Rebound, percent				
5 minutes	ASTM C 972	–	–	11
2 hours	ASTM C 972	–	–	12

2.3.2 Metal Items

2.3.2.1 Frames, Covers, and Gratings for Manholes

CID A-A-60005, cast iron; figure numbers shall be [as follows] ~~[as indicated]~~:

a. Non-traffic manhole:

000145

Frame: Figure 4, Size 22
Cover: Figure 12, Size 22
Steps: Figure 19

2.3.2.2 Manhole Steps

Zinc-coated steel conforming to 29 CFR 1910.27. Steps are not required in manholes less than 4 feet deep.

~~2.3.2.3 Septic Tank Piping~~

~~Cast iron soil pipe and fittings.~~

~~2.3.2.4 Siphon for Septic Tank~~

~~Welded steel or close-grained cast iron free from flaws, of an approved standard design, and prompt and positive in action.~~

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

Apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

The work covered by this section shall include all system installations. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

3.1.1.2 Earthwork

Perform excavation, backfilling and compacting operations in accordance with Section 02302, "Excavation, Backfilling, and Compaction for Utilities."

3.1.1.3 Connections to Existing Lines

~~There will be no connections to existing lines.~~Obtain approval from FWENC before making connections to existing lines or manholes. Conduct work so that there is minimum interruption of service.

3.1.2 Concrete Work

Cast-in-place concrete is included in Section 03300, "Cast-In-Place Concrete."

3.1.3 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

FWENC will conduct field inspections and witness field tests specified in this section. The Subcontractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969.

b. Low-pressure air tests: Perform tests as follows:

(1) PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

~~3.2.2.2 Deflection Testing~~

~~Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D 2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.~~

~~a. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:~~

~~(1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.~~

~~(2) Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.~~

~~(3) Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.~~

~~(4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.~~

~~b. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.~~

~~c. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails~~

~~to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.~~

~~d. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.~~

3.2.3 Field Tests for Concrete

Field testing requirements are covered in Section 03200, "Concrete Reinforcement."

END OF SECTION

000149

SECTION 02630

STORM DRAINAGE

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

03200 Concrete Reinforcement

03300 Cast in Place Concrete

1.2 REFERENCES

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

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

ACPA 01-102	(1988) Concrete Pipe Handbook
ACPA 01-103	(1990) Concrete Pipe Installation Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 32	(1993) Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 62	(1997) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 76	(1995; Rev. A) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	(1997) Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 270	(1997) Mortar for Unit Masonry
ASTM C 443	(1994) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 476	(1995) Grout for Masonry
ASTM C 478	(1996) Precast Reinforced Concrete Manhole Sections

ASTM C 923	(1998) Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM D 1785	(1996; Rev. B) Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 3212	(1996; Rev. A) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM F 477	(1996; Rev. A) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.27	Fixed Ladders

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-60005	(1998) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Precast concrete structures

Metal items

SD-03 Product Data

Concrete piping including fittings and jointing materials

Subsurface drainage piping including fittings and jointing materials

SD-07 Certificates

Pipeline and fittings, including factory-applied linings and joint materials

Cast-iron frames, covers, and gratings

000151

Precast concrete structures

Submit certificates attesting that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the frequency or intervals specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

1.4.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store plastic piping, jointing materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.4.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.4.1.3 Cement, Aggregates, and Reinforcement

Store as specified in Section 03200, "Concrete Reinforcement."

1.4.2 Handling

Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Carry, do not drag pipe to trench.

PART 2 PRODUCTS

2.1 PIPELINE AND CULVERT MATERIALS

2.1.1 Concrete Piping

2.1.1.1 Concrete Pipe and Fittings

Storm drainage pipe shall be reinforced concrete pipe conforming to ASTM C 76, Class III.

2.1.1.2 Jointing Materials for Concrete Piping

Gaskets and pipe ends for rubber gasket joint shall conform to ASTM C 443. Gaskets shall be suitable for use with sewage.

2.1.2 PVC Pipe

2.1.2.1 Storm drainage pipe carrying building roof drainage shall be 12-inch PVC Schedule 40, conforming to ASTM D 1785.

2.1.2.2 PVC plastic gravity joints and jointing materials joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 CONCRETE MATERIALS

Provide as specified in Section 03200, "Concrete Reinforcement."

2.3 MISCELLANEOUS MATERIALS

2.3.1 Drainage Structures

Precast structures shall be provided in lieu of cast-in-place concrete. Pipe-to-wall connections shall be mortared to produce smooth transitions and watertight joints or provided with ASTM C 923 resilient connectors. Bases shall have smooth inverts accurately shaped to a semicircular bottom conforming to the inside contour of the adjacent sewer sections. Changes in direction of the sewer and entering branches into the manhole shall have a circular curve in the manhole invert of as large a radius as the size of the manhole will permit.

2.3.1.1 Precast Concrete Structures

ASTM C 478, except as specified herein. ~~Provide a 4 inch layer of clean gravel bedding with a maximum size of 2 inches.~~

2.3.2 Masonry Materials

Shall conform to the following specifications and other requirements specified hereunder.

2.3.2.1 Brick

ASTM C 32, Grade MS, or ASTM C 62, Grade SW, except that the absorption test will be waived.

2.3.2.2 Concrete Masonry Units

ASTM C 139.

2.3.2.3 Mortar

ASTM C 270, Type M.

2.3.2.4 Water

Water for masonry mortar shall be fresh, clean, potable.

2.3.2.5 Grout

ASTM C 476.

2.3.3 Metal Items

2.3.3.1 Frames, Covers, and Gratings

Shall be cast iron conforming to CID A-A-60005, figure numbers as indicated. Fabricate frames, covers, and gratings of standard commercial grade steel or ductile iron, welded by qualified welders in accordance with AWS D1.1. Covers shall be of rolled steel floor plate or ductile iron having an approved anti-slip surface. Steel gratings shall be of commercial grade steel or ductile iron and be of welded construction.

a. Non-traffic manhole:

Frame: Figure 4, Size 22
Cover: Figure 12, Size 22
Steps: Figure 19

2.3.3.2 Drainage Structure Steps

Zinc-coated steel conforming to 29 CFR 1910.27. Steps are not required in manholes or catch basins less than 4 feet deep.

2.4 FLARED ENDS

Flared end sections shall be same material as pipe material except that only reinforced concrete flared ends shall be provided for concrete pipe

2.5 EROSION CONTROL RIPRAP

Provide sound and durable limestone rock conforming to O.D.O. T. Type D. Provide a dense mass with a minimum thickness of 8 inches.

~~Rip-Rap~~Riprap shall be installed at ~~all~~ existing and proposed endwalls, catchbasins and area drains unless otherwise directed.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to pipeline installation except where specific exception is made under paragraph entitled "Special Requirements."

3.1.1.1 Location

The work covered by this section shall include all storm drainage construction as shown on the plans.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02300.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; remove those found defective from site and replace with new. Provide proper facilities for lowering sections of pipe into trenches. Lay pipe with the bell ends in the upgrade direction. Adjust spigots in bells to produce a uniform space. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions any pipe or fitting that does not allow sufficient space for proper calking or installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

3.1.1.4 Connections to Existing Lines

Notify FWENC in writing at least 10 days prior to date that connections are to be made. Obtain approval of FWENC before interrupting service. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of Concrete Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the provisions for rubber gasket jointing and jointing procedures of ACPA 01-103 or of ACPA 01-102, Chapter 9. Make joints with the gaskets previously specified for joints with this piping. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe. Protect gaskets from sun, blowing dust, and other deleterious agents at all times. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets. Align each pipe section with the previously installed pipe section, and pull the joint together. If, while pulling the joint, the gasket becomes loose and can be seen through the exterior joint recess when the pipe is pulled up to within one inch of closure, remove the pipe and remake the joint.

3.1.2.2 Installation of PVC Piping

Installation of PVC storm drainage pipe will be in accordance with ASTM D 2477.

3.1.3 Concrete Work

Perform cast-in-place concrete work in accordance with Section 03200.

000155

3.1.4 Manhole and Catch Basin Construction

Use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent drainage sections. For changes in direction of drains and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. For precast concrete construction, make joints between sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Give a smooth finish to inside joints of precast concrete manholes and catch basins. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the ~~paragraph entitled,~~Paragraph 3.1.3, "Concrete Work." Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose or mortared to produce a watertight joint; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as required to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding beyond into the manhole.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

FWENC will monitor Subcontractor's quality activities (e.g., surveillance of inspection and testing activities and special processes performance) and provide required oversight for verification of activity performance in accordance with assigned witness/hold points designated in the inspection and test documentation.

The Subcontractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.

3.2.2 Pipeline Testing

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line.

3.2.3 Field Tests for Concrete

Field testing requirements are covered in Section 03300, "Cast-In-Place Concrete."

END OF SECTION

SECTION 02722

AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 RELATED SECTIONS

01330	Submittal Procedures
01400	Quality Assurance
02300	Earthwork
~~02721~~	~~Subbase Courses~~

1.2 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(1993) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

~~ASTM C 29/C 29M~~	~~(1997) Bulk Density ("Unit Weight") and Voids in Aggregate~~
ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
~~ASTM D 1556~~	~~(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method~~
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
~~ASTM D 2167~~	~~(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method~~
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
~~ASTM D 2922~~	~~(1996) Density of Soil and Soil-Aggregate in Place by~~ Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire Cloth Sieves for Testing Purposes

1.3 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.3.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.3.2 Graded-crushed Aggregate Base Course

Graded-crushed aggregate (GCA) base course is well graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction. GCA is similar to ABC, but it has more stringent requirements and it produces a base course with higher strength and stability.

1.3.3 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittal Procedures."

SD-01 Data

Plant, Equipment, and Tools

List of proposed equipment to be used in performance of construction work, including descriptive data.

SD-09 Reports

Sampling and Testing; Field Density Tests;

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

SD-18 Records

Waybills and Delivery Tickets

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Subcontractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Subcontractor. Sampling and testing shall be performed by a testing laboratory approved in accordance with Section 01400, "Quality Assurance." Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. Foster Wheeler Environmental Corporation (FWENC) may specify the time and location of the tests. Copies of test results shall be furnished to FWENC within 24 hours of completion of the tests.

1.5.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by FWENC.

1.5.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.5.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C ~~117 and~~117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ~~[ASTM D 1557] [AASHTO T 180, Method D].~~ASTM D 1557.

1.5.2.4 Field Density Tests

Density shall be field measured in accordance with ASTM D 2922. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed.~~]~~

1.5.2.5 Wear Test

Wear tests shall be made on ABC and GCA course material in conformance with ASTM C 131.

1.5.2.6 Soundness

Soundness tests shall be made on GCA in accordance with ASTM C 88.

1.5.3 Testing Frequency

1.5.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

a. Sieve Analysis

b. Liquid limit and plasticity index moisture-density relationship.

c. Moisture-density relationship.

d. Wear.

e. Soundness.

1.5.3.2 In Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted ABC and GCA. Samples shall be taken and tested at the rates indicated.

a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards or portion thereof, of completed area.

b. Sieve Analysis shall be performed for every 500 tons, or portion thereof, of material placed.

c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.5.4 Approval of Material

The source of the material shall be selected 14 days before the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC and GCA.

1.6 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

Equipment that is subject to calibration shall be controlled, issued, and maintained under a Measurement & Test Equipment Program approved by FWENC.

PART 2 PRODUCTS

2.1 AGGREGATES

The ABC and GCA shall consist of clean, sound, durable particles of crushed stone, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. GCA shall be free of silt and clay as defined by ASTM D 2487, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregate

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. Crushed Recycled Concrete: Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

2.1.1.1 Aggregate Base Course

ABC coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in Table 1.

2.1.1.2 Graded-Crushed Aggregate Base Course

GCA coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. GCA coarse aggregate shall not exhibit a loss greater than 50 percent weighted average, at five cycles, when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The amount of flat and elongated particles shall not exceed 20 percent for the fraction retained on the 1/2 inch sieve nor 20 percent for the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregate shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum size sieve listed in Table 1.

2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

2.1.2.1 Aggregate Base Course

ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.2.2 Graded-Crushed Aggregate Base Course

GCA fine aggregate shall consist of angular particles produced by crushing stone, slag, recycled concrete, or gravel that meets the requirements for wear and soundness specified for GCA coarse aggregate.

2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1 inch and shall be continuously well graded within the limits specified in Table 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3	No. 4
2 inch	100	---------	---------	100
1-1/2 inch	100	100	---------	---------
1 inch	90-100	95-100	---------	70-100
¾ inch	20-55	--------	100	50-90
1/2 inch	0-10	25-60	90-100	---------
3/8 inch	0-5	---------	40-70	---------
No. 4	---------	0-10	0-15	30-60
No. 8	---------	0-5	0-5	---------
No. 40	30	---------	---------	--------- 9-33
No. 200	---------	---------	--------	0-13

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the

specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by FWENC.

2.1.4 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC or GCA is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 STOCKPILING MATERIAL

Before stockpiling of material, storage sites shall be cleared and leveled by the Subcontractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by FWENC to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.3 PREPARATION OF UNDERLYING COURSE

Prior to constructing the ABC and GCA, the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction of the ABC and GCA, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300, "Earthwork." Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the ABC and GCA. Stabilization shall be accomplished by mixing ABC or GCA into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Subcontractor in a satisfactory condition until the ABC and GCA is placed.

3.4 INSTALLATION

~~3.4.1 Mixing the Materials~~

~~The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Subcontractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory ABC and GCA meeting all requirements of this specification.~~

3.4.~~2~~1 Placing

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness ~~with~~ in an approved ~~spreader~~manner. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. ~~The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC and GCA is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable ABC and GCA.~~

3.4.~~3~~2 Grade Control

The finished and completed ABC and GCA shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required ABC and GCA thickness so that the finished ABC and GCA with the subsequent surface course will meet the designated grades.

3.4.~~4~~3 Compaction

Each layer of the ABC and GCA shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 3 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least ~~100~~ 98 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC and GCA. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.4.~~5~~4 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 8 inches nor be less than 3 inches in compacted thickness. ~~The total compacted thickness course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the ABC and GCA course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.~~

3.4.~~6~~5 Proof Rolling

Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of ~~30~~ 3 coverages with a ~~heavy pneumatic-tired roller having four or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum of 150 psi~~steel wheel roller. In areas designated, proof rolling shall be applied to the top of the underlying material on which ABC and GCA is laid and to each layer of ABC and GCA. Water content of the underlying material shall be maintained at optimum or at the percentage directed from start of compaction to completion of proof rolling of that layer. Water content of each layer of the ABC and GCA shall be maintained at the optimum percentage directed from start of compaction to completion of proof rolling. Any ABC and GCA materials or any underlying materials that produce unsatisfactory results by proof rolling shall be removed and replaced with satisfactory materials, recompacted and proof rolled to meet these specifications.

~~**3.4.7 Finishing**~~

~~**The surface of the top layer of ABC and GCA shall be finished after final compaction and proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC and GCA is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in, compacted and proof rolled to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.**~~

~~**3.4.8 Smoothness**~~

~~**The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 10-foot straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50-foot intervals. Deviations exceeding this amount**~~

~~shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.~~

~~3.5 TRAFFIC~~

~~Traffic shall not be allowed on the completed ABC and GCA course. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.~~

3.~~6~~5 MAINTENANCE

The ABC and GCA shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any ABC and GCA that is not paved over before the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of ABC and GCA that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.~~7~~6 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as directed. No additional payments will be made for materials that must be replaced.

END OF SECTION

SECTION 02731

AGGREGATE SURFACE COURSE

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

02300 Earthwork

02373 Separation/Filtration Geotextiles

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
~~ASTM D 3740~~	~~(1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction~~

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ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.3 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated herein as present laboratory maximum density.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittal ~~Procedures":~~Procedures."

SD-01 Data

Equipment;

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; Density Test;

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Test results from samples, not less than 30 days before material is required for the work. Results of laboratory tests for quality control purposes, for approval, prior to using the material.

1.5 EQUIPMENT

All plant, equipment, and tools used in the performance of the work covered by this section will be subject to approval by FWENC before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, and meeting the grade controls, thickness controls, and smoothness requirements set forth herein.

1.6 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Subcontractor. Sampling and testing shall be performed by an approved commercial testing laboratory.

1.6.1 Sampling

Sampling for material gradation, liquid limit, and plastic limit tests shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by FWENC.

1.6.2 Testing

1.6.2.1 Gradation

Aggregate gradation shall be made in conformance with ASTM C 117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM E 11.

1.6.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.6.3 Approval of Materials

The source of the material to be used for producing aggregates shall be selected 14 days prior to the time the material will be required in the work. Approval of sources not already approved by FWENC may be based on an inspection and/or approval by FWENC. Tentative approval of materials will be based on appropriate test results on the aggregate source. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

1.7 WEATHER LIMITATIONS

Aggregate surface courses shall not be constructed when the ambient temperatures is below 35 degrees F and on subgrades that are frozen or contain frost. It shall be the responsibility of the Subcontractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by FWENC. Surfaces damaged by freeze, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Subcontractor.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Subcontractor shall be responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction and proof rolling operations have been completed.

2.1.1 Coarse Aggregates

The material retained on the No. 4 sieve shall be known as coarse aggregate. Coarse aggregates shall be reasonably uniform in density and quality. The coarse aggregate shall have a percentage of wear not to exceed 50 percent after 500 revolutions as determined by ASTM C 131. The amount of flat and/or elongated particles shall not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein.

2.1.2 Fine Aggregates

The material passing the No. 4 sieve shall be known as fine aggregate. Fine aggregate shall consist of screenings, sand, soil, or other finely divided mineral matter that is processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

Gradation requirements specified in TABLE I shall apply to the completed aggregate surface. It shall be the responsibility of the Subcontractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. TABLE I shows permissible gradings for granular material used in aggregate surface roads and airfields. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION FOR AGGREGATE SURFACE COURSES

Sieve Designation	No. 1	No. 2	No. 3	No. 4
1 in.	100	100	100	100
3/8 in.	50-85	60-100	–	–
No. 4	35-65	50-85	55-100	70-100
No. 10	25-50	40-70	40-100	55-100
No. 40	15-30	24-45	20-50	30-70
No. 200	8-15	8-15	8-15	8-15

2.2 LIQUID LIMIT AND PLASTICITY INDEX REQUIREMENTS

The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

PART 3 EXECUTION

3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating shall be the responsibility of the Subcontractor. The aggregate sources shall be operated to produce the quantity and quality of materials meeting these specification requirements in the specified time limit. Upon completion of the work, the aggregate sources on the FEMP site shall be conditioned to drain readily and be left in a satisfactory condition.

3.2 STOCKPILING MATERIALS

All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled in such a manner that will prevent segregation. Aggregates and binders obtained from different sources shall be stockpiled separately.

3.3 PREPARATION OF UNDERLYING COURSE SUBGRADE

The subgrade, including shoulders, shall be cleaned of all foreign substances. At the time of surface course construction, the subgrade shall contain no frozen material. Ruts or soft yielding spots in the subgrade areas having inadequate compaction and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade and recompacting to density requirements specified in Section 02300, "Earthwork." The completed subgrade shall not be disturbed by traffic or other operations and shall be maintained by the Subcontractor in a satisfactory condition until the surface course is placed.

3.4 GRADE CONTROL

During construction, the lines and grades including crown and cross slope indicated for the aggregate surface course shall be maintained by means of line and grade stakes placed by the Subcontractor.

3.5 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the material and a uniform optimum water content for compaction. The Subcontractor shall make adjustments in mixing, placing procedures, or in equipment to obtain the true grades, to minimize segregation and degradation, to obtain the desired water content, and to ensure a satisfactory surface course.

3.6 LAYER THICKNESS

The aggregate material shall be placed on a separation fabric as specified in Section 02373, "Separation/Filtration Geotextiles," in layers of uniform thickness. When a compacted layer of 6 inches or less is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall exceed 6 inches nor be less than 3 inches when compacted.

3.7 COMPACTION

Each layer of the aggregate surface course shall be compacted with approved compaction equipment. The water content during the compaction procedure shall be maintained at optimum or at the percentage specified by FWENC. In locations not accessible to the rollers, the mixture shall be compacted with mechanical tampers. Compaction shall continue until each layer through the full depth is compacted to at least 100 percent of laboratory maximum density. Any materials that are found to be

unsatisfactory shall be removed and replaced with satisfactory material or reworked to produce a satisfactory material.

3.8 SMOOTHNESS TEST

The surface of each layer shall not show any deviations in excess of 3/8 inch when tested with a 10 foot straightedge applied both parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by the Subcontractor by removing material, replacing with new material, or reworking existing material and compacting, as directed.

3.9 THICKNESS CONTROL

The completed thickness of the aggregate surface course shall be within 1/2 inch, plus or minus, of the thickness indicated on plans. The thickness of the aggregate surface course shall be measured at intervals in such manner that there will be a thickness measurement for at least each 500 square yards of the aggregate surface course. The thickness measurement shall be made by test holes at least 3 inches in diameter through the aggregate surface course. When the measured thickness of the aggregate surface course is more than 1/2 inch deficient in thickness, the Subcontractor, at no additional expense to FWENC, shall correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting, as directed. Where the measured thickness of the aggregate surface course is more than 1/2 inch thicker than that indicated, it shall be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements determined as specified above, but shall be within 1/4 inch of the thickness indicated. When the average job thickness fails to meet this criterion, the Subcontractor shall, at no additional expense to FWENC, make corrections by scarifying, adding or removing mixture of proper gradation, and reblading and recompacting, as directed.

3.10 DENSITY TESTS

Density shall be measured in the field in accordance ASTM D 2922. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals, as directed.

3.11 WEAR TEST

Wear tests shall be made in conformance with ASTM C 131.

3.12 MAINTENANCE

The aggregate surface course shall be maintained in a condition that will meet all specification requirements until accepted.

END OF SECTION

SECTION 02924

SEEDING

PART 1 GENERAL

1.1 RELATED SECTIONS

01330 Submittal Procedures

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4427	(1992; R 1996) Peat Samples by Laboratory Testing

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909	Fertilizer

DEPARTMENT OF AGRICULTURE (DOA)

DOA FSA	(January 1985) Federal Seed Act Rules and Regulations of the Secretary of Agriculture
DOA SSIR	(April 1984) Soil Survey Investigation Report No. 1, Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Conservation Service

STATE OF OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR)

	(1996) Rainwater and Land Development, Ohio's Standard for Storm Water Management, Land Development, and Urban Stream Protection

1.3 DEFINITIONS

1.3.1 Stand of Turf

95 percent ground cover of the established species.

1.4 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Wood cellulose fiber mulch

Fertilizer

Include physical characteristics, and recommendations.

Lime

Peat

SD-06 Test Reports

Topsoil composition tests as specified in DOA SSIR

SD-07 Certificates

State Approval for seed

Submit the following within thirty (30) calendar days from Notice to Proceed :

1. Proposed seed mixes and application rates for seed, mulch, mulch binder, and fertilizers.
2. Manufacturer's product data and recommended methods of application for seed, mulches, mulch binder, and fertilizer. Product data for fertilizer shall also include chemical analysis including uranium analysis to assure that there is no resultant or derived uranium from fertilizer use.
3. Material Safety Data Sheets (MSDS) for fertilizer and mulch binder.

A plan shall be provided showing seeding type by area (interim or permanent), a written statement of proposed changes to the seed mix, application rate and/or associated materials a minimum of ten (10) days before seeding.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Seed Protection

Protect from contamination during delivery, on-site storage, and handling.

1.5.1.2 Fertilizer and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer and lime may be furnished in bulk for hydro-seeding with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Seed, Fertilizer and Lime Storage

Store in cool, dry locations away from contaminants.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.6.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.7 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.7.1 Seed

All disturbed areas must be seeded within seven days of knowing that the area will be idle for 45 days or more.

Seeding shall be from March 1 through October 31.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Provide FWENC- and/or Fluor Fernald, Inc.-approved seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weed seed content, and inert material and date of expiration. Label in conformance with DOA FSA and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected.

Each variety of seed shall: have a purity of not less than 90 percent, have a percentage of germination not less than 80 percent, have a weed to seed content of not more than 0.75 percent and contain no noxious weeds. These percentages are by weight.

2.1.2 Seed Mixture Composition

~~Creeping Red Fescue – 20 pounds/acre~~
~~Annual Ryegrass – 10 pounds/acre~~
~~Kentucky Bluegrass – 15 pounds/acre~~
~~Aliske Clover – 5 pounds/acre~~
~~Flatpea – 5 pounds/acre~~

For interim Seeding, the seed mixture shall be Perennial Rye, 60 pounds pls/acre

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For permanent seeding, the seed mixture shall be at least (all measures are in pounds pls/acre):

	April 15-May 31	October 1-April 14
1. Canada Wild Rye	2	3
2. Little Bluestem	2	3
3. Big Bluestem	3	4
4. Indian Grass	2	3
5. Switch Grass	½	1
6. Side Oats Gramma	½	1
7. Live Oats	20	25

For summer (June-September) seeding, the seed mixture shall be Buckwheat, 60 pounds pls/acre. The planting of buckwheat during the summer season will be followed by either interim or permanent seeding during the next seeding window.

Seed mixtures should be prepared by a seed vender for the above mixture compositions. Field mixes will be acceptable when field mix is performed on site in the presence of FWENC.

2.2 FERTILIZER:

1. Use fertilizer that is dry or liquid commercial grade fertilizer. Uniform in composition that meets the requirements of all state and federal regulations and standards of the Association of Agricultural Chemists.
2. Fertilizer for interim seeding shall be VCOTE 34-4-14 as manufactured by George W. Hill or equal.

2.3 MULCH:

Furnish mulch meeting the following requirements:

1. Mulch shall be straw or wood cellulose fiber, free of clay, stone, foreign substances, and reasonable free of weeds.
2. Furnish straw that does not contain sticks larger than ¼ inch in diameter or other materials that may prevent matting down during application. Use straw that is free from mold and other objectionable material and in an air-dry condition suitable for placing with mulch blower equipment or other equipment as approved by the Contractor. Straw shall be generally 6 inches or more in length.
3. Mulch applied by hydrospraying shall be a wood cellulose processed into a uniform fibrous physical state. Use wood cellulose fiber containing a green dye that will provide for easy visual inspection for uniformity of slurry spread. The wood cellulose fiber, including dye, shall contain no growth or germination inhibiting properties. The fiber shall be manufactured in a manner that, after addition and agitation in slurry tanks with water, the fibers become uniformly suspended to form a homogenous material. When sprayed on the ground, the material shall allow absorption and percolation of moisture. The wood cellulose fiber

shall have a maximum particle length of 0.375 inches and a maximum particle thickness of o.o47 inches.

2.4 MULCH BINDER

Mulch Binder agent shall be as approved by the Contractor and shall meet the following requirements:

1. The binder shall be a pine sap emulsion comprised of a 100% organic emulsion produced from naturally occurring resins and be nontoxic to plants. The mulch binder shall be compatible with application via a hydroseeder, and must not require intense cleaning of equipment.
2. The mulch binder shall not have hazardous characteristics of as defined in 40 CFR 261 Subpart C either in its pre-applied or cured states.

~~Seed mixtures should be prepared by a seed vender for the above mixture compositions. Field mixes will be acceptable when field mix is performed on site in the presence of FWENC.~~

2.5~~2~~ TOPSOIL

2.5~~2~~.1 Existing Soil

Modify existing soil to conform to the requirements specified in paragraph entitled "Composition."

2.5~~2~~.2 On-Site Topsoil

Reusable surface soil stripped and stockpiled on site if requirements specified for topsoil in paragraph entitled "Composition" are met.

2.5~~2~~.3 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by FWENC or obtained from topsoil borrow areas identified by FWENC.

2.5~~2~~.4 Composition

Containing from 5 to 20 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. Other components shall be within the following percentages:

Silt	25-50
Clay	10-30
Sand	20-35
PH	5 to 7.6
Soluble Salts	600 PPM maximum

2.63 PH ADJUSTERS

2.63.1 Lime

Commercial grade limestone containing not less than 50 percent of total oxides, gradation, as follows: Minimum 75 percent passing 100 mesh sieve and 100 percent passing 20 mesh sieve.

2.63.2 Aluminum Sulfate

Commercial grade.

2.74 SOIL CONDITIONERS

Provide singly or in combination as required to meet specified requirements for topsoil. Soil conditioners shall be nontoxic to plants.

2.74.1 Peat

Peat humus derived from a freshwater site and conforming to ASTM D 4427 as modified herein. Shred and granulate peat to pass ½-inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.74.2 Sand

Clean and free of materials harmful to plants.

2.74.3 Perlite

Horticultural grade.

2.74.4 Vermiculite

Horticultural grade.

2.74.5 Rotted Manure

Composted, horse or cattle manure containing maximum 25 percent by volume of straw, or other bedding materials. Manure shall be free of stones, sticks, and soil, viable weed seed, and other materials harmful to plants.

2.74.6 Composted Wood Derivatives

Ground bark, nitrolized sawdust, humus, or other wood green waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.74.6.1 Particle Size

Minimum percent by weight passing:

No. 4 mesh screen	95

No. 8 mesh screen	80

2.74.6.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.74.7 Calcined Clay

Granular particles produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F to the following gradation: minimum 90 percent passing 8 mesh screen, 99 percent retained on 60 mesh screen and, maximum 2 percent passing 100 mesh screen. Bulk density: 40 pounds maximum per cubic foot.

~~2.5 FERTILIZER~~

~~2.5.1 Commercial Grade Fertilizer~~

~~CID A-A-1909, free flowing, uniform in composition with nitrogen-phosphorous-potassium ratio of 12-12-12, composed of pills coated with plastic resin to provide continuous release of fertilizer for at least 6 months.~~

~~2.6 SURFACE TOPDRESSING (MULCH)~~

~~Free from noxious weeds, mold, and other deleterious materials.~~

~~2.6.1 Humus~~

~~95 percent decomposed vegetable matter and wood fiber with a particle size of 1/4 to 1/2 inch.~~

~~2.6.2 Straw~~

~~Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment.~~

~~2.6.3 Hay~~

~~Air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Provide only marsh hay for lawn areas.~~

~~2.6.4 Wood Cellulose Fiber Mulch~~

~~Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 3.5 to 5.0. Use with hydraulic application of grass seed and fertilizer.~~

2.8~~7~~ WATER

Suitable quality for irrigation.

2.9~~8~~ EROSION CONTROL MATERIALS

2.9~~8~~.1 Net

Heavy twisted jute mesh, plastic net, biodegradable paper fabric with knitted yarns, or standard weave burlap.

2.9~~8~~.2 Blanket

Fiber

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Soil Preparation

Remove existing topsoil to a minimum depth of 2 inches and stockpile. After areas have been brought to finish subgrade elevation, thoroughly till to minimum depth of 6 inches by scarifying, disking, harrowing, or other methods approved by FWENC until a smooth seedbed is provided. A smooth seedbed shall be defined as soils containing no clods greater than 1.5 inches in diameter within 1.5 inches of the surface of the soil The Contractor shall conduct periodic inspections of finished seedbed preparation. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage.

3.1.2 Topsoiling

Spread stockpiled topsoil evenly to provide positive drainage. Provide off-site topsoil to meet indicated finish grade if required. Do not spread topsoil when frozen or excessively wet or dry. Thoroughly mix subgrade and topsoil and off-site topsoil to a depth of 6 inches by disking, harrowing, tilling or other method approved by FWENC. Correct irregularities in finished surfaces to eliminate depressions. Protect finished prepared soil areas from damage by vehicular or pedestrian traffic.

3.1.3 Fertilizer, Lime, pH Adjuster, and Soil Conditioners

Apply at rates as determined by laboratory soil analysis of the soils at the job site or at the standardization rates of:

Agriculture Lime at two tons per acre and Fertilizer (12-12-12) at 500 pounds per acre.

3.2 SEEDING

3.2.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade and thoroughly moisten soil to a depth of 6 inches. Do not seed when ground is muddy frozen, snow covered or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to FWENC stating the special conditions and proposed variance. Apply seed within twenty-four hours after seedbed preparation. Sow seed by approved sowing equipment.

3.2.2 Seed Application Method

Do not seed in excess of what can be mulched within 24 hours. Apply mulch within 24 hours of seeding

3.2.2.1 Broadcast and Drop Seeding

Use broadcast or drop seeders. Cover seed uniformly to a maximum depth of 1/2 inch by means of spike-tooth harrow, cultipacker, raking or other approved devices.

3.2.2.2 Hydroseeding

First, mix water and fiber. Fiber shall be added at 1,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce homogeneous slurry. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

3.2.3 Top Dressing (Mulch)

Spread straw, hay, humus in a uniformly thick layer over seed bed area to an even depth of 1/2 inch at a rate of 2 air-dried tons per acre. Take precautionary measures to prevent topdressing materials from spilling onto pavements or utilities structures. During June through September, increase straw or mulch application to 3 air-dried tons per acre.

Apply sprayed wood cellulose fiber at a net dry rate of 2000 pounds per acre. Mix the wood cellulose fiber with water at a ratio of 50 pounds of wood cellulose fiber per 100 gallons of water.

Maintain mulching material in place with a pine sap emulsion binder. Apply binder according to manufacturer's directions at a rate of 2500 gallons of diluted emulsion per acre.

3.2.4 Rolling

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width. If seeding is performed with cultipacker-type seeder or by hydroseeding, rolling may be eliminated.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

3.4 MAINTENANCE

3.4.1 Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 2 inches without runoff. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.4.2 Mow turfed area to an average height of 1-½ inches when average height of grass becomes greater than 4 inches.

3.4.3 Maintain the seeded areas in satisfactory condition until acceptance of the seeding by the Contractor. Maintenance of seeded areas includes repairing eroded areas revegetating when necessary, watering, and mowing (if applicable). A satisfactory condition of the vegetated area is defined as follows:

1. An area shall have a predominant stand of the seeded vegetation.
2. Within 3 weeks, germination must occur over 95 percent of the area with no single bare area greater than 3 square feet.
3. Within 3 months, 95 percent of the area must be covered with mature vegetation.

Areas failing to meet these requirements shall be repaired or reseeded ad necessary to produce an acceptable stand of vegetation as specified in this Section. Areas that become bare during June through September shall be reseeded with the summer seeding mix.

Seeded areas shall be maintained with applied crusting agent to ensure proper erosion control.

3.5 WARRANTY

Seeded areas shall be subject to a warranty period of not less than 12 months from initial establishment of vegetation over 100 percent of the seeded areas.

At the end of the warranty period, the Contractor shall perform an inspection upon written request of the Subcontractor. Seeded areas not demonstrating satisfactory condition of vegetation as specified herein shall be repaired, reseeded, and maintained to meet all requirements as specified herein at the Subcontractor's expense.

The seeded areas shall be accepted at the end of the warranty period if a satisfactory condition exists as defined in this Section. After all disturbed areas are stabilized and all necessary corrective work has been completed, the Contractor shall certify in writing the final acceptance of seeded areas.

3.5 FIELD QUALITY CONTROL

3.5.1 Final Inspection and Acceptance

Final acceptance will be based upon a satisfactory stand of turf.

Within 3 weeks, germination must occur over 95 percent of the area with no single bare area greater than 3 square feet.

Within 3 months, 95 percent of the area must be covered with mature perennial grass. Replant within specified planting dates areas which do not have a satisfactory stand or turf.

END OF SECTION

Attachment D
Response to
Comments

Response to Ohio EPA Verbal Comments
Received March 14, 2000

GENERAL COMMENTS		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #: NA	Line #: NA
Original General Comment #: 1		
Comment: The Lay down area shown on Drawing 05FCD014 needs to be better defined. The area is not to be enlarged beyond the currently developed boundaries and is not to affect wetlands, etc.		
Comment Response: Agreed, the current drawing of the lay down area outside of the W52 Gate is misleading. The drawing has been revised to better depict the current condition of this area. Also a note has been added to the drawing indicating this area will not be modified.		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #: NA	Line #: NA
Original General Comment #: 2		
Comment: How will verification of compliance with OSDF WAC be accomplished around the silos with the high radiation levels involved in that area.		
Comment Response: The soil management for site preparation will monitor the excavated soil in accordance with the current site procedures. However when the berm material is being excavated the current site procedures will not be adequate. Fluor Fernald is currently exploring other means of monitoring the silo berm material during excavation. This issue will be addressed in the berm excavation information, which will be submitted in the Remedial Design package.		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #: NA	Line #: NA
Original General Comment #: 3		
Comment: Concern was expressed relative to the current planned use of stone in the sediment traps and silt fencing.		
Comment Response: The sediment trap and silt fencing information on the drawing and specification will be updated to meet the standard that Ohio EPA expects and has approved for the WPRAP and Silos Infrastructure projects.		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #:	Line #: NA
Original General Comment #: 4		
Comment: Concern was expressed about the use of underground holding tanks for sanitary waste, this is not a preferred method for handling these wastes.		
Comment Response: The use of underground holding tanks for sanitary waste is being eliminated. Fluor and Foster Wheeler are currently working on the details. The details for the sanitary sewer system will be provide to the agencies when they are finalized.		

Response to Ohio EPA Verbal Comments
Received March 14, 2000

Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #:	Line #: NA
Original General Comment #: 5		
Comment: How is sampling done for radium in waste water?		
Comment Response: This comment will be addressed in the Remedial Design submittal in early May.		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #:	Line #: NA
Original General Comment #: 6		
Comment: Need to explain to the Ohio EPA the storm water drainage patterns for the K-65 trench.		
Comment Response: Currently the K-65 Trench is covered so the majority of stormwater follows the adjacent area stormwater patterns. However if stormwater reaches the K-65 trench the water is sent to the waste pit area runoff control sump via the ditch around the K-65 silos.		
Commenting Organization: OHIO EPA Verbal Comments		
Section #:	Page #:	Line #:
Original General Comment #: 7		
Comment: Explain why mass balance indicates more water flowing into the silos than is transferred out of silos.		
Comment Response: This comment will be addressed in the Remedial Design submittal in early May.		

Response to Ohio EPA Written Comments
Received March 14, 2000

GENERAL COMMENTS		
Commenting Organization: OHIO EPA		
Section #: Drawings	Page #: NA	Line #: NA
Original General Comment #: 1		
Comment: Placement of silt fence is not consistent between drawings		
Comment Response: The AWR Site Preparation package has been corrected to address these inconsistencies.		
Commenting Organization: OHIO EPA		
Section #: Drawings	Page #: NA	Line #: NA
Original General Comment #: 2		
Comment: Drawings not consistent between Feb. 4, 2000 document and full scale drawings (eg dam in swale on drawing (06FCD0001) not in full-scale drawings, silt fence location, etc.).		
Comment Response: The AWR Site Preparation drawings have been finalized and the inconsistencies have been corrected.		
Commenting Organization: OHIO EPA		
Section #: General	Page #: NA	Line #: NA
Original General Comment #: 3		
Comment: There are no "ground level" provisions for containment in the event of a catastrophic failure of the overhead piping or silo. Because of the close proximity of the project to Paddy's Run. For example, the existing storm water retention basin in the southeast corner of the project could be modified so that discharge could be reduced or eliminated (additional controls to the outlet), removal of the berm around the silos could be completed such that the silos were always in a "bowl" with elevated grade between the silo contents and drainage away from the silos, a low berm could be built on the outside of the concrete trench leading to the K65 sump, etc.		
Comment Response: The potential impact of releases resulting from catastrophic failure of the AWR systems, such as the silos and the transfer line from the TTA, was considered during the development of the drainage plan. A valve will be installed on the outlet of the southeast stormwater basin. Additional details on containment of the potential releases have been added to section 2.2.2 of the Pre-Operational Environmental Control Plan.		
Commenting Organization: OHIO EPA		
Section #: 2.4 Environmental Control Plan	Page #: 5-6	Line #: NA
Original General Comment #: 4		
Comment: More detail is needed: how the erosion mats and silt fence will be used, how is erosion and siltation in the concrete channel to be prevented, where will french drains be installed in the TTA area and to where will they drain, etc.		
Comment Response: The AWR Site Preparation Package has been revised to include the detail relative to erosion mats and silts fencing on the drawing notes and in the construction specifications.		

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Commenting Organization: OHIO EPA		
Section #: 2.4 Environmental Control Plan	Page #: 6	Line #: NA
Original General Comment #: 5		
Comment: What provisions are being made for controlling storm water runoff from sources such as trucks hauling contaminated soils from the berm, the roads these trucks travel on, the soil piles created from this activity, etc.		
Comment Response: During Berm excavation, trucks will be loaded within the area draining to the waste pit area runoff control sump. Additional details regarding contamination control during excavation is provided in section 2.4 and appendices C and D of the Pre-Operational Environmental Control Plan.		
Commenting Organization: OHIO EPA		
Section #: 2.4, 2.5	Page #: 7	Line #: NA
Original General Comment #: 6		
Comment: Reference is made to "repaired as soon as possible" and installed as early as possible. More specific information should be included such as "silt fence will be installed before any soil disturbance occurs in the drainage area."		
Corrective Action: The recommended wording has been added to the Pre-Operational Environmental Control Plan and construction specification #02370.		
Commenting Organization: OHIO EPA		
Section #: 2.5	Page #: 8	Line #: bullets 2,3,4,8
Original General Comment #: 7		
Comment: More detail is needed in this section. Silt fences must be installed on the contour with ends turned up to be effective (i.e. act as a dam to allow time for fines to settle out). They should be set as far back from the toe of a slope as practical to maximize the size of the pool upgradient of them. It is preferred that culvert entrances/exits be protected with natural vegetation and coir matting rather than riprap. Minimizing the use of riprap is desirable. Seeding and mulching (soil stabilization) should be done no more than seven days after work is completed. Any problems identified should be corrected immediately (within 24 hours.)		
Comment Response: Agreed additional details including those recommended in this comment, have been added to section 2.3 of the Pre-Operational Environmental Control Plan, specification #02370 and drawing #66-FCD-006		

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Commenting Organization: OHIO EPA		
Section #: Exhibit 3-1	Page #: 10	Line #: Radon 222
Original General Comment #: 8		
Comment: How is radon carried by wastewater addressed? That should be included in this section.		
Comment Response: This issue will be addressed in the AWR Remedial Design Package.		
Commenting Organization: OHIO EPA		
Section #: Exhibit 3-2	Pg. #: 13	Line #: ESP
Original General Comment #: 9		
Comment: The Sloan's Crayfish has been captured in the Paddy's Run corridor on site. This states that no sightings have occurred. Sloan's Crayfish also occurs in areas potentially impacted by this project. What is the significance of posting pictures in the change trailer? What measures are going to be taken to protect the habitat of these animals (e.g. no trees removed in Paddy's Run corridor, berms and basins to contain any spills from reaching Paddy's Run, etc.)?		
Comment Response: Details addressing the preservation of the natural resources in the Paddy's Run corridor have been added to Section 2.2.2 of the Pre-Operational Environmental Control Plan.		
Commenting Organization: OHIO EPA		
Section #: Exhibit 3-3	Pg. #: 14	Line #: Stormwater
Original General Comment #: 10		
Comment: The project must also comply with the site wide storm water pollution prevention plan.		
Comment Response: Agreed compliance with the Stormwater Pollution Prevention Plan is specified in Section 2.3 of the Pre-Operational Environmental Control Plan.		
Commenting Organization: OHIO EPA		
Section #: Site Prep and Storm Water Drainage	Pg. #:	Line #:
Original General Comment #: 11		
Comment: Drawings do not agree. Please submit one drawing with the detail of system components that you intend to use (see comment 2).		
Comment Response: Agreed the AWR Site Preparation package has been finalized and any inconsistencies noted during preliminary reviews were addressed.		

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Commenting Organization: OHIO EPA		
Section #: Storm water drainage plan	Pg. #:	Line #:
Original General Comment #: 12		
Comment: Pages 3 and 5 are missing from all packages. Cannot comment without these. Noted in the conclusions: stated that "proper soil and erosion control...should prevent contaminated storm water form leaving the site" but no detail to describe exactly how this will be accomplished. More detail is needed.		
Comment Response: The revised Pre-Operational Environmental Control Plan has incorporated additional details on soil management and stormwater control. The appropriate specifications have been revised to include details and lessons learned from previous projects (WPRAP, Silos Infrastructure).		
Commenting Organization: OHIO EPA		
Section #: Drawing 66FCD001		
Original General Comment #: 13		
Comment: There is an existing catch basin in the 30" line that extends from northeast to southwest under the southeast corner of the TTA building. This line drains to the pilot plant drainage ditch and then to Paddy's Run. Should any contaminated material be lost from the overhead piping this is a conduit to the aquifer. Provisions for surface level containment of any material should be made and this is a serious problem in trying to contain any material at surface level.		
Comment Response: The potential impact of releases resulting from a catastrophic failure of the overhead piping to the 30" line was considered during the development of the drainage plan. Conservatively the quantity of slurry released during a catastrophic failure of the transfer line is approximately 200-300 gallons. The area under the piperack is gravel surface and drain to the southeast stormwater retention basin. The 30" line is located approximately 10 feet underground and is a 30" concrete pipe. The stormwater drainage patterns and the depth of the 30" line provide adequate protection from contamination of the 30" line with slurry material. Additional details on containment of the potential releases have been added to section 2.2.2 of the Pre-Operational Environmental Control Plan.		

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Commenting Organization: OHIO EPA		
Section #: Storm water drainage plan	Pg. #. Drawings	
Original General Comment #: 14		
Comment: More detail is needed to show surface water flow, for example, where will surface water flow from drainage area 7 during excavation of the berms. The current drawing only shows a couple of arrows along the concrete trench. There should be drawings showing how flow will change with excavation of the berm (in detail).		
Comment Response: Agreed, the AWR stormwater drainage plan drawings were enhanced to show directional arrows of where the area 7 stormwater will drain. The Northeast quadrant of area 7 flow north through a concrete perimeter ditch to the Waste Pit Area Runoff Control Sump. The southeast, southwest and northwest quadrants of area 7 stormwater drains to the Waste Pit Area Runoff Control Sump through the concrete perimeter ditch and 21" culvert pipe.		

Commenting Organization: OHIO EPA		
Section #: Berm Plan	Pg. #: 2	Line #: Section 1.4
Original General Comment #: 15		
Comment: How will contaminated soils be contained, that is what controls will be in place to keep these soils from washing away from the excavation in the event of a storm. What provisions are being made for capturing soils from hauling vehicles to prevent them from getting into the pilot plant drainage ditch?		
Comment Response: The Berm Plan will be revised to clearly address concerns. The Berm Plan will be reissued with the final RDWP submittal since berm excavation activities are not part of the AWR Site Preparation. During Berm excavation, trucks will be loaded within the area draining to the waste pit area runoff control sump. Additional details regarding contamination control during excavation is provided in section 2.4 and appendices C and D of the Pre-Operational Environmental Control Plan.		

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Received March 14, 2000

Commenting Organization: OHIO EPA		
Section #: Berm Plan	Pg. #:6	
Original General Comment #: 16		
Comment: This states that a ditch is graded to divert runoff to the east and west. What contingency is there for containment of contaminated material in the event of a catastrophic failure? What provisions are there to keep sediment from being washed out through these diversion ditches? Where are the detailed drawings of these ditches and there associated storm water and erosion controls?		
Answer: The Berm Plan will be revised to clearly address concerns. The Berm Plan will be reissued with the final RDWP submittal since it does not involve the site preparation portion of the project. The potential impact of releases resulting from catastrophic failure of the AWR systems, such as the silos and the transfer line from the TTA, was considered during the development of the drainage plan. The following provisions were added to prevent the contamination of Paddy's Run in the case of a catastrophic failure of the transfer line 1) A valve will be installed on the outlet of the southeast stormwater basin. 2) The waste retrieval will have controls which automatically shutoff waste retrieval in the case of the transfer pipe failure. The following provisions are being implemented to prevent the contamination of Paddy's Run in the case of the catastrophic failure of the silos 1) Berm will be maintained at a level higher than the waste in silos 2) Stormwater from the silos area will be conveyed to the waste pit area runoff control sump. The waste pit area runoff sump is sent to Bio-surge lagoon and to AWWT prior to release off site. Additional details on containment of the potential releases have been added to section 2.2.2 of the Pre-Operational Environmental Control Plan. Notes have been added to the drawings and the construction specifications to perform inspection on the conditions of the ditches to ensure the ditches do not get plugged with dirt and sediment. The detail drawings and construction specification associated with stormwater are included in the AWR Site Preparation package.		
Commenting Organization: OHIO EPA		
Section #: Berm Plan	Pg. #: Drawing 11FCD009	
Original General Comment #: 17		
Comment: This drawing appears to show silt fence going up and down slopes. Silt fence should be installed along a contour and turn upslope on the ends. There is little else that indicated any erosion control on this drawing, what about covering exposed slopes, hauling contaminated soils, any other controls (see other comments about berm plan erosion controls).		
Answer: The Berm Plan will be revised to clearly address concerns. The Berm Plan will be reissued with the final RDWP submittal since it does not involve the site preparation portion of the project. See response to comment #15 and #16 for more details.		
Commenting Organization: OHIO EPA		
Section #: Storm water Drainage Plan	Pg. #: Drawing 66FCD001	
Original General Comment #: 18		
Comment: Does the runoff coefficient for drainage area 7 include the coverage of disturbed soils by Geotextile?		
Comment Response: Yes, see stormwater drainage plan calculations for further details.		

Response to US EPA Written Comments
Received on February 7, 2000

GENERAL COMMENTS		
Commenting Organization: U.S. EPA		
Section #: Not applicable (NA)	Page #: NA	Line #: NA
Original General Comment #: 1		
Comment: The following drawings listed on the first page titled "Site Preparation" are missing and should be submitted for review: - Drawing No. 05FCDD013, Miscellaneous Facility Tie-In Locations - Drawings No. 20FSD014 and 20FSD025, Radon Control System Carbon Bed Building Foundation Section View		
Comment Response: Drawings 05FCD013 and 20FSD014 have been finalized and are included in the revised site preparation package. Drawing 20FSD025 was not needed in the Site Preparation Package and will be included in the Final Design Report.		
Commenting Organization: U.S. EPA		
Section #: Not applicable (NA)	Page #: NA	Line #: NA
Original General Comment #: 2		
Comment: The site preparation drawings appear to be incomplete, as many details are missing. Elevations of culverts and other piping are not shown, and areas that require grading lack topographic information to indicate a "finished grade." In addition, the drawing scale is too small to allow a proper review. Moreover, a number of drawings, silo Drawing No. 05FCD011 for its general notes and legend; however, this drawing is not included in the submittal. The silo preparation drawings should be revised so (1) include all missing details, (2) increase their scale, and (3) include Drawing No. 05FCD011.		
Comment Response: Site preparation drawings have been completed and resubmitted including the level of detail required for review and for execution of the work. A full size set of prints has also been provided for reference along with the reduced size prints in the package.		

Commenting Organization: U.S. EPA		
Section #: Not applicable (NA)	Page #: NA	Line #: NA
Original General Comment #: 3		
Comment: The drawings in the site preparation section are difficult to follow because the work pertinent to site preparation is not clearly shown. The drawings in this section should be reviewed to see if the work associated with site preparation needs to be more clearly defined.		
Comment Response: Agreed, a revised site preparation package will be submitted to the EPA's. A full size set of prints has also been provided for reference along with the reduced size prints in the package.		
Commenting Organization: U.S. EPA		
Section #: 2.2	Page #: 4	Line #: NA
Original General Comment #: 1		
Comment: The text states that "personnel should be on-call during non-working periods seven days per week, including holidays, to respond to the generation of visible dust during off-hours." It is not clear how "generation of visible dust" will be detected during non-working periods or how the "on-call" personnel will be notified of visible dust during these periods. If someone will be on site at all times to detect any visible dust, there should be no need for "on-call" personnel. The text should be revised to clarify these matters.		
Comment Response: During backshifts and off periods, the FEMP Fugitive Dust Control Procedure assigns the onsite Utility Engineer the responsibility to monitor appropriate areas for fugitive dust and initiate appropriate action to mitigate such as required including if necessary calling in additional personnel to handle the situation. The text will be modified to clarify this.		
Commenting Organization: U.S. EPA		
Section #: 2.4.1	Page #: 6	Line #: NA
Original General Comment #: 2		
Comment: The text states that employees are to be trained to comply with appropriate Occupational Safety and Health Administration (OSHA) standards with regard to fall protection and trench safety. Because the work will involve use of heavy construction equipment, the training should also include OSHA safety requirements for work with and around heavy construction equipment. The text should be revised accordingly.		
Comment Response: While there is not any specific training course for employees relative to working around heavy equipment, the potential hazards will be discussed during employee daily safety briefings, in safe work plans and the project specific Safety and Health Plan. Other related protective measures include; use of orange vests, equipment utilizing back-up alarms, horns, lights, etc. Text of document will be modified to include these aspects of safety.		

Commenting Organization: U.S. EPA		
Section #: 2.4.2	Page #: 6	Line #: NA
Original General Comment #: 3		
Comment: The text states that "appropriate precautions are to be taken to minimize discharge of fuel, oil, lubricants, grease and other hydrocarbons." The text should be revised to include engine coolant and hydraulic fluids.		
Comment Response: Agreed, engine coolant and hydraulic fluids will be added to the text.		
Commenting Organization: U.S. EPA		
Section #: 2.4.4	Page #: 7	Line #: NA
Original General Comment #: 4		
Comment: The text lists a number of bulleted items to be inspected weekly. Erosion control mats should be included in the list. Furthermore, the third and fourth bullets should be revised to read as follows: - Fuel storage tanks for leaks - Other storage tanks and equipment for leaks		
Comment Response: Agreed, erosion control mats will be added to the list of items to be inspected weekly and the third and fourth bullets will be revised as suggested.		
Commenting Organization: U.S. EPA		
Section #: 2.5	Page #: 7	Line #: NA
Original General Comment #: 5		
Comment: The text states that erosion controls are put in place during the construction phase in order to minimize soil movement "from excavated areas." Because erosion also affects disturbed areas, the test should be revised to read "from excavated or disturbed areas."		
Comment Response: Agreed, text will be changed as suggested.		
SITE PREPARATION AND STORMWATER DRAINAGE PLAN DRAWINGS		
Commenting Organization: U.S. EPA		
Drawing #: 06FCD001 (also marked as Drawing A8 and A9)		
Original General Comment #: 6		
Comment: The drawing shows "proposed swales," culverts, and other features. However, surface elevations and the sizes of the swales are not shown. This drawing should be revised to clearly show all details of the required work.		
Comment Response: The referenced drawing 06FCD001 has been completed and is provided in the package but drawings 66FCD003 and 66FCD007 show these features better and are also provided in the package.		

Commenting Organization: U.S. EPA
Drawing #: 11FCD009
Original General Comment #: 7
Comment: This drawing is intended to show proposed "new work" around Silos 1 and 2. However, it is not clear which portions of the topography shown reflect the proposed "new work" and which portions reflect existing conditions. The drawing should be revised to clearly indicate the "new work" that will be part of the site preparation activities.
Comment Response: Drawing 11FCD009 was submitted with the AWR Site Preparation package in error. This drawing is not required to define the site preparation work scope and thus will not be provided in the revised Site Preparation package.
Commenting Organization: U.S. EPA
Drawing #: 61FCD001 and 61FCD002
Original General Comment #: 8
Comment: The sanitary sewer system layout plan is not fully consistent with the details provided. Specifically, the plan shows a sanitary sewer system manhole near the health and safety trailer, but the details do not show this manhole. This discrepancy should be corrected. Also, it is not clear whether the system is to be vented. Because a large holding tank is to be used, the tank should be properly vented to prevent sewer gas from backing up into the trailers. The plan should be revised to address this issue, and details of the holding tank should be included.
Comment Response: In accordance with Ohio EPA concerns regarding the use of holding tanks. The sanitary sewer system is being revised to eliminate the use of the holding tanks. Therefore the concerns regarding venting of the tanks is being eliminated. Revised sanitary sewer system will be provided with the revised Site Preparation package.
Commenting Organization: U.S. EPA
Drawing #: 51FCD002
Original General Comment #: 9
Comment: This drawing shows no water connections to two break trailers. However, Drawing No. 61FCD001 clearly shows sewer connections to these two trailers. If the two trailers are to be connected to the sewer system, they would presumably be connected to the water system as well. This drawing should be revised to clarify this matter.
Comment Response: Water supply to all the trailers is now shown on drawing 51FCD002. Sewer connections to handle the sanitary waste generated are shown on drawing 61FCD001.
Commenting Organization: U.S. EPA
Drawing #: 66FCD006
Original General Comment #: 10
Comment: This drawing shows a detail of the precast concrete catch basin. Typically, a catch basin has a sump below the outlet sewer for collection of debris, sediment, soil, and other solids. The detail of the catch basin lacks such a sump. This detail should be revised to include a sump.
Comment Response: Drawing 66 FCD006 has been revised to show the catch basin design in accordance with ODNR requirements.