~~1468~~

2053

Surface Water Management Plan for Remediation Area 1, Phase II

FDF Project No. 20710
Document No. 20710 PL-0001

May 1998
Revision 0B

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FDF Subcontract No. 2-21487
Project Order 175

INFORMATION ONLY

PARSONS

175 Tri-County Parkway
Cincinnati, Ohio 45246

000001

~~000178~~

~~1468~~

2053

Surface Water Management Plan for Remediation Area 1, Phase II

FDF Project No. 20710
Document No. 20710 PL-0001

May 1998
Revision 0B

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FDF Subcontract No. 2-21487
Project Order 175

PARSONS

175 Tri-County Parkway
Cincinnati, Ohio 45246

000002

~~000170~~

Surface Water Management Plan for Remediation Area 1, Phase II

CONTENTS

SECTION

Executive Summary **ES-1**

1.0 Introduction and Area 1, Phase II Description 1-1
- 1.1 Introduction 1-1
- 1.2 Purpose 1-3
- 1.3 Scope 1-3

2.0 Surface Water Management System 2-1
- 2.1 Overall Approach 2-1
- 2.2 Surface Water 2-1
- 2.3 Specific System Components 2-2

3.0 Stormwater Management 3-1

4.0 Erosion and Sediment Control Measures 4-1
- 4.1 Overall Concept 4-1
- 4.2 Specific Components 4-2
- 4.3 Design Criteria and Standards 4-3

5.0 Implementation 5-1
- 5.1 General Construction Practices 5-1
- 5.2 Construction Sequencing 5-2

6.0 Sediment Control Maintenance and Monitoring 6-1
- 6.1 Inspection 6-1
- 6.2 Maintenance 6-1

FIGURES

Figure 1-1 General Site Features

APPENDICES

A Calculations

B Drainage Area Map

LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A1PII	Area 1, Phase II
AWWT	Advanced Wastewater Treatment Facility
cfs	cubic feet per second
DOE	United States Department of Energy
FEMP	Fernald Environmental Management Project
FDF	Fluor Daniel Fernald, Inc.
fps	feet per second
FRL	Final Remediation Level
LCS	Leachate Conveyance System
NPDES	National Pollutant Discharge Elimination System
ODNR	Ohio Department of Natural Resources
OSDF	On-Site Disposal Facility
PLS	Permanent Lift Station
STP	Sewage Treatment Plant
SWMP	Surface Water Management Plan
SWPPP	Stormwater Pollution Prevention Plan

EXECUTIVE SUMMARY

This Surface Water Management Plan (SWMP) addresses surface water management of the Area 1, Phase II (A1PII) project area during site preparation and remediation activities. This SWMP addresses control/ management of erosion and sedimentation, stormwater runon and runoff, accumulations of perched water and stormwater in the Sewage Treatment Plant (STP) and STP influent/effluent pipeline excavations, and other surface water issues for A1PII.

The A1PII Project will consist of three major phases; Site Preparation, STP Excavation, and Trap Range Remediation. Site Preparation phase includes the sediment basin, spillway, and outfall channel plus the Conveyance Channel. It also includes the diversion ditches at the Trap Range and their outfall ditch to the Sediment Basin. The STP Excavation phase consists of demolition of below grade structures, removal of subsurface utility lines, and excavation at the STP; demolition of concrete pads, surface stripping around the STP excavation area (see Construction Drawings for location), and miscellaneous activities including removal of agricultural drain tiles. The Trap Range remediation phase is to stabilize the lead contamination in situ and then excavate and haul it to the On-Site Disposal Facility (OSDF). The remediation of A1PII involves removal of approximately 50,000 bank cubic yards of impacted material.

Three sediment basins will be used in the A1PII project to manage surface water and collect sediments during remediation. A1PII Sediment Basin 1 will be a new basin constructed to accommodate runoff from the STP and Trap Range excavation areas. A minimum of 27 cubic yards per acre watershed area of sediment storage will be provided in this basin. Stormwater collected in the basin will discharge through a principal spillway structure and outlet channel into an existing drainageway which conveys runoff from the southern portion of the Former Plant Area to Paddys Run. OSDF Sediment Basin is an existing basin presently used by the OSDF. This basin, along with associated drainage ditches, will be used for activities in the northeastern portion of the project area. The Sediment Basin is an existing basin which was used during Area 1 Phase I (A1PI) remediation activities and, along with associated drainage ditches, will be used for activities in the northwestern portion of the project area. There are small isolated activities including an existing gravel staging area where surface runoff cannot be directed to sediment basins. Perimeter silt fence will be used for sediment control for these areas.

The overall operation of the surface water management system was planned and designed to minimize erosion and provide means to collect and control runoff from remediation areas. Upon completion of remediation activities, the deep excavation area at the STP will be backfilled to the approximate original contour. Areas that receive surficial stripping will not be backfilled. Where further construction activities are planned, disturbed areas will be regraded to provide positive drainage, as necessary, and will be revegetated.

SECTION 1

INTRODUCTION AND AREA 1, PHASE II DESCRIPTION

1.1 Introduction

The Fernald Environmental Management Project (FEMP) is a 1,050-acre facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The mission of the facility was to provide high-purity uranium metal products to support United States defense programs. Production operations were discontinued in 1989. Subsequently, the United States Department of Energy (DOE) decided to decontaminate and dismantle the facility and began environmental remediation of the site.

To facilitate management of the environmental remediation activities, the site was divided into seven sitewide remediation areas. Several of these areas will be remediated in phases. Area 1 is subdivided into two major phases (Phase I and Phase II). Remediation of A1PI was completed in March 1997.

The A1PII project area encompasses approximately 153 acres and is located in the southeastern part of the FEMP. It is bordered on the east and south by the FEMP boundary; on the west by the South Access Road, an unnamed stream and former production area; and on the north by A1PI, and the OSDF. The terrain in the project area is rolling pasture. The STP is completely within and Phase I of the North Entrance Road is partially located in this area. A former trap shooting range is also located in the area. The remediation activities within the A1PII project will include: demolition of below grade structures, removal of subsurface utility lines, and excavation at the STP; demolition of concrete pads, and excavation of lead contaminated soils at the former Trap Range Area; surface stripping around the STP excavation area (see Figure 1-1, and Construction Drawings for locations); and miscellaneous activities including removal of agricultural drain tiles, and removal of sediments from existing sediment basins used during the A1PI remedial activities.

To facilitate remediation of A1PII, the project work is included in three packages including an initial Site Preparation Package, STP Excavation Package, and Trap Range Remediation Package. The initial package primarily covers stormwater and erosion control facilities and the second package primarily covers excavation of impacted materials. Lead stabilization surface water controls will focus on small sumps and erosion control. (Note that lead area remediation will be by separate contractor, but the preliminary stormwater controls will be done by the Site Preparation contractor.) There will also be separate smaller packages for development of a borrow area for backfill of the STP excavation area and a package for final reclamation of two sediment traps in A1PI. These packages are outside the scope of this SWMP.

This SWMP covers and applies to all project work including both the Site Preparation and STP Excavation Packages. It supplements the stormwater and erosion control facilities, measures, and related information presented in the project drawings and specifications.

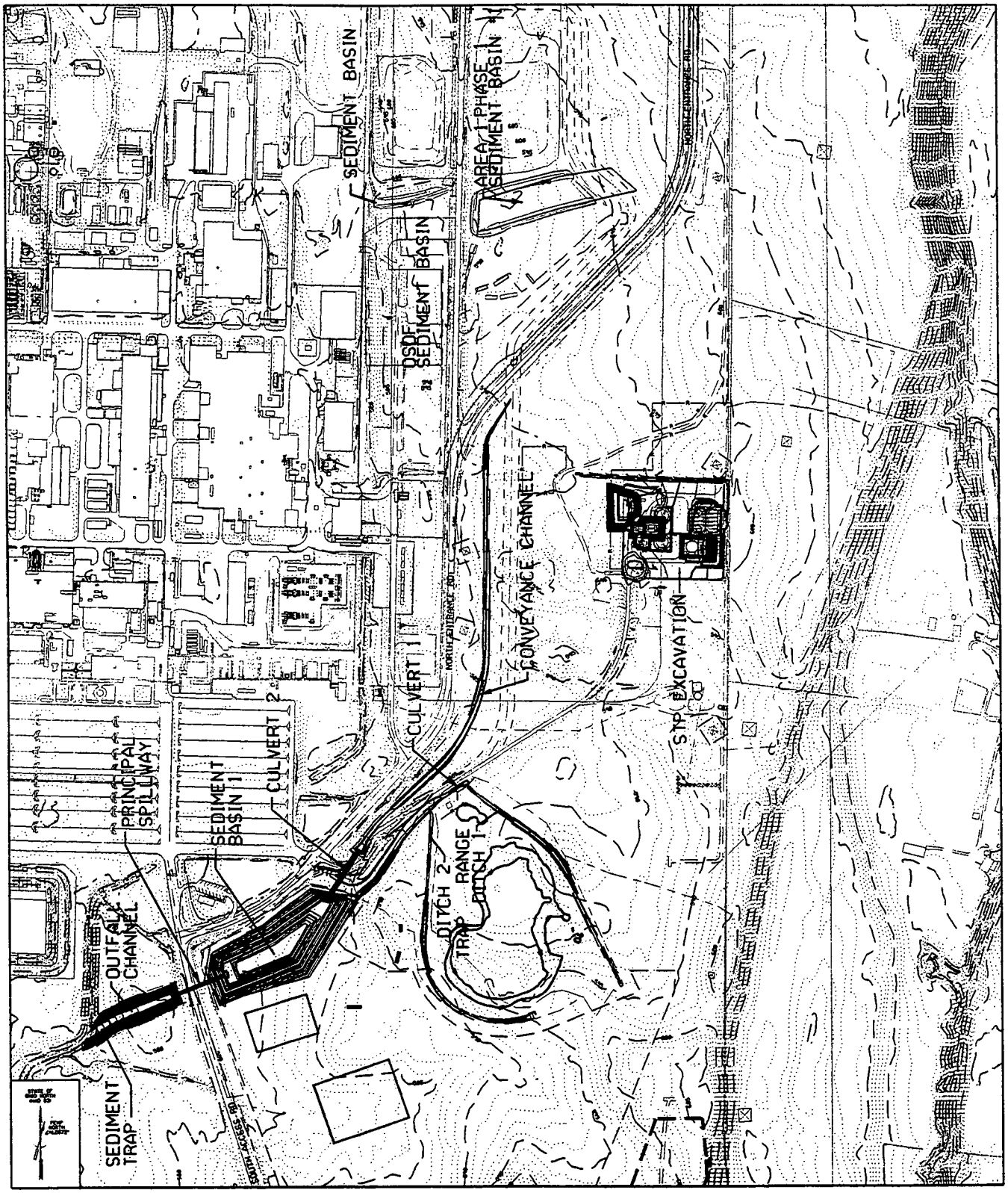


Figure 1-1 - General Site Features

1.2 Purpose

The FEMP is operating under a National Pollutant Discharge Elimination System (NPDES) Permit which requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP). This SWPPP became effective May 1, 1996. Section 6 of the SWPPP addresses discharges related to construction activities. The measures outlined in this SWMP and details shown on the construction drawings and specifications will be implemented to effectively manage stormwater and limit the amount of erosion and the release of sediment that will occur during the remediation of A1PII.

Stormwater and erosion and sediment control measures are also required to minimize release of radiological contaminants. This SWMP has been prepared as a guide to minimize construction-related impacts on water quality from erosion and sedimentation, and minimize the spread of contamination during remediation. During remediation, Fluor Daniel Fernald, Inc. (FDF) will perform required NPDES monitoring at the permitted stormwater outfalls and comply with all applicable Federal, State, DOE, and FEMP requirements.

1.3 Scope

This SWMP provides the following information:

- Background discussion of the scope of the A1PII project,
- Description of the A1PII proposed surface water management system.
- Description of proposed general and area-specific erosion and sediment control measures,
- Description of the type and frequency of maintenance activities required to support the control measures.

The SWMP addresses stormwater management, erosion prevention, sediment control, hydrologic and hydraulic evaluation, stormwater runon and runoff, physical site characteristics that impact the selection and implementation of control measures, and references to established design criteria. Supporting engineering data and calculations are attached as Appendix A.

SECTION 2

2053

SURFACE WATER MANAGEMENT SYSTEM

2.1 Overall Approach

The principal objectives of surface water management in the A1PII project area are to prevent or minimize stormwater runon to the work areas and to control water and runoff which has come into contact with contamination and/or impacted material. The project area covers approximately 153 acres. The topography is gentle to rolling pasture land. Existing drainage consists mainly of sheet flow that is uncontrolled before reaching existing conveyance channels. Drainage flows through the A1PII area in a south and westerly direction and eventually drains to Paddys Run via a storm sewer outfall ditch.

As a basic or fundamental approach to surface water management, runon from upgradient areas will be prevented, where possible, from flowing into the remediation area. This will minimize the possibility of erosion and limit the amount of potentially contaminated water.

Existing drainage patterns and facilities will be used for stormwater management, wherever possible, by implementing improvements to convey design flows. Incorporating erosion control measures and revegetation will limit erosion along drainage paths. Where necessary, new ditches or diversion berms will be constructed to redirect existing drainage paths away from the construction area. Sediment basins will be used to provide detention time for sediments to settle out. Where possible, existing and proposed vegetative buffer zones will be used to reduce sediment load in the stormwater runoff. Where runoff cannot be directed to a sediment basin, silt fence will be used to filter-out sediments.

Water collected in the STP excavation area may be contaminated. Therefore, all water collected within the STP excavation will be pumped to Advanced Wastewater Treatment Facility (AWWT) Phase II for treatment. Water from the Site Preparation activities will be routed through either a sediment trap, sediment basin, or silt fence prior to discharge to natural conveyance.

2.2 Surface Water

Precipitation not collected in excavation areas will be classified as surface water. Surface water which flows through the A1PII area will be collected and transported to sediment basins where practicable. Diversions (berms, ditches) will be used to divert surface water around the excavation where possible.

Surface water runoff from the STP and Trap Range excavation areas will be conveyed to a new sediment basin designated as Sediment Basin 1 (see Figure 1.1). Runoff from activities in the northern portion of the A1PII project area will utilize two existing sediment basins (designated as OSDF Sediment Basin and the Sediment Basin) to control sediment. OSDF Sediment Basin is approximately 2 acres in size, and is currently being used as the sediment basin for OSDF construction activities. The Sediment Basin is located just north of OSDF Sediment Basin and is approximately one-half acre in size. This basin was used previously during the A1PI remediation activities. There is an isolated area south of the OSDF Sediment Basin which will require soil stripping. Due to the relatively small size (approximately 1.5 acres) and flat topography, runoff from this area will be directed to perimeter silt fencing.

2.3 Specific System Components

Specific components of the surface water management system are described below. See the Construction Drawings and Technical Specifications for detailed design information concerning stormwater controls. See Appendix A for design calculations. A drainage area map for A1PII is presented in Appendix B.

2.3.1 Diversion Ditches and Related Devices

Runon from upgradient areas will be collected and diverted, where possible, around the remediation areas.

2.3.2 Excavation Sumps

The STP excavation area will be graded to drain to field located collection points within the excavation area to the extent practical. Sumps will be excavated at these collection points to temporarily hold the stormwater. One semi-permanent excavation sump pump will be used to transfer water to the OSDF leachate conveyance (transmission) system (LCS) for conveyance to the AWWT Phase II facility. Multiple sumps/pumps may be used for dewatering of the excavation area. The sump pumps will be provided and moved as necessary by the contractor as excavation progresses or as necessary to collect water from specific areas, based on the construction requirements. Water from the temporary sumps will be transferred by the contractor to the semi-permanent excavation sump pump. The excavation sump pump controls will be tied into the controls at the LCS Permanent Lift Station (PLS) such that during high flow conditions into the LCS PLS, the excavation sump pump will be turned off. This will give the flow from the OSDF cells priority.

2.3.3 Transfer Line

The effluent from the excavation sump pump will be routed mostly above ground in a transfer line to the LCS PLS. This transfer line will run under the OSDF Haul Road. Where the transfer line needs to cross paved roads, it will be run through existing culverts to avoid pavement cuts and disturbance to FEMP operation. The transfer line will discharge into the top of the LCS PLS at the access door. This will avoid any disturbance

to the tank and its secondary containment system. The effluent from the LCS PLS is pumped to the Biodentrification Surge Lagoon where it is then transferred to the AWWT Phase II facility.

2.3.4 Equipment Wash Facility

An Equipment Wash Facility will be constructed north of the STP excavation area. It will be used to remove mud and debris from the wheels and undercarriage of haul vehicles. Water from the collection sump at this facility will be pumped to the STP excavation and treated as STP excavation sump water. See Section 2.3.2

2.3.5 A1PII Sediment Basin 1

The proposed (during excavation conditions) watershed from A1PII is approximately 73 acres in size. Runoff will be collected and conveyed to the new sediment basin (see Construction Drawings and calculations) via Conveyance Channel 1. The sediment basin will be located adjacent to the South Access Road, and will cover approximately 2.0 acres of surface area.

The sediment basin will be designed in accordance with the Ohio Department of Natural Resources' (ODNR) *"Rainwater and Land Development"* as a minimum. The required storage capacity for the sediment basin and sediment trap are given as follows:

Sediment Basin

Watershed Area = 73.2 Acres
Total Storage Required = 3.0 Acre-Feet
Sediment Storage Required = 1.2 Acre-Feet

The OSDF originally planned a sediment basin in the same location to accommodate the development of the OSDF Borrow Area. A preliminary borrow area grading plan and sediment basin design have been submitted as part of the OSDF Drawings to the Ohio Environmental Protection Agency. Since the A1PII project is scheduled to be completed prior to beginning development of the OSDF Borrow Area, the goal is to prevent duplication in the construction of two sediment basins. The A1PII will provide a sediment basin which will accommodate the A1PII remediation activities, while providing OSDF with a sediment basin that with limits can be modified to accommodate future activities.

Since the OSDF borrow area grading plan and geometry of the sediment basin are interrelated, the OSDF sediment basin geometry will be used as much as possible. The OSDF Borrow Area Sediment Basin was designed according to OAC 3745-27-08(C)(6)(d). This basin is an excavated basin with twin pipe principal spillway structure.

Sediment basin requirements specified in the ODNR "*Rainwater and Land Development*" will be used for A1PII remediation activities. With the basin geometry defined, an outlet control structure will be designed for the A1PII remediation work which will meet total volume and sediment storage requirements. In anticipation of modifications that may be needed for future OSDF use, a second riser/pipe outlet structure will be installed during basin construction. An additional modification to OSDF Sediment Basin Plan was to raise the outlet control structure and pipe elevations to provide for an embankment height of less than 10 feet as defined by the Ohio Safe Dam Regulations. When A1PII activities are completed, the outlet control structures can be modified as needed by the OSDF project. The sediment storage volume will be in a sump below the elevation of the outlet control structure and is considered "dead storage" for any pond routing. The principal outlet control spillway discharges into an outlet channel, then to an unnamed channel.

2.3.6 Conveyance Channel

A conveyance channel will be constructed west of the STP excavation area to intercept and convey runoff from the A1PII project area south of the North Entrance Road to Sediment Basin 1 (see the Drainage Area Map, Exhibit B). The conveyance channel will be grassed-lined using an erosion control blanket and will be designed to accommodate a 10-year, 24 hour precipitation event from A1PII catchment with a maximum velocity in the channel of 3 feet per second. If the velocity is between 3 to 4 feet per second, stone check dams are required. Velocity greater than 4 feet per second requires stone channel protection. The conveyance channel will remain after A1PII remediation has been completed in anticipation of future modification and use by the OSDF. Diversion Ditch 1 will be constructed upgradient of the Trap Range area to minimize surface water run-on to the Trap Range and will discharge runoff to Sediment Basin 1. Diversion Ditch 2 will be constructed downgradient around the Trap Range area to collect and convey runoff to Sediment Basin 1.

2.3.7 Culverts

Culvert 1 is at the access point of the Trap Range (Lead Area). It discharges into the side ditch along the rerouted portion of the STP Access Road. This side ditch then discharges into Sediment Basin 1.

At the STP Access Road, Culvert 2 will consist of a series of pipes installed to carry flow from the conveyance channel to Sediment Basin 1. The culverts will pass over top an existing 24-inch diameter groundwater line (GW-24"). Culvert 2 is designed to include the peak discharge from A1PII catchment plus 16.1 acres from OSDF cell construction for the 25-year, 24-hour storm event.

There are several locations where temporary access is required, such as the Trap Range, outfall area access, and the Radiological Monitoring Trailer which will need small culverts to maintain positive drainage. In these cases, they are for short-term construction activities and would cause no significant problems if the capacity of the culvert is exceeded.

2.3.8 Sediment Trap

A Sediment Trap will be constructed prior to the start of the construction of the outfall channel for the Sediment Basin 1 Principal Spillway. The trap will be designed according to ODNR requirements. Once the outfall channel is constructed and stabilized, it is to be removed.

SECTION 3

STORMWATER MANAGEMENT

The goal of FEMP stormwater management on a sitewide basis is to prevent an increase in the peak runoff during remediation and restoration activities and after restoration. Stormwater management, as described in this SWMP, addresses the peak runoff that discharges from the site during construction/ remediation activities.

The A1PII project site is currently vegetated and consists of sheet flow and shallow concentrated flow in the upper watershed areas, leading to concentrated flows in the existing stormwater conveyance ditch, located east of the production area. All runoff from the A1PII project area presently flows into Paddys Run. Prior to the start of remediation, a surface water management system will be implemented to prevent runon to the site, where possible, and collect and convey runoff from the site for storm events up to the 10-year, 24-hour storm. The majority of runoff from the site will be diverted to sediment basins or traps during construction activities.

As part of the remediation, the STP excavation area will be restored to the approximate original topography. Areas where surficial stripping occurs will not be backfilled. Instead, surface stripped areas will be graded to provide positive drainage, as necessary. Initial land use after remediation will be undeveloped with a vegetated cover. Based on an undeveloped land use scenario, the total amount of runoff from the A1PII project site after remediation can be expected to be similar to the current conditions. Stormwater management for future land use of the A1PII project area is beyond the scope of this plan.

SECTION 4

EROSION AND SEDIMENT CONTROL MEASURES

4.1 Overall Concept

Soil conservation practices, combining vegetative and structural measures, have been incorporated in construction documents to mitigate soil erosion damage, off-site sediment migration, and water pollution from erosion. Many of these measures will be long-term in nature and will become part of the completed construction project (i.e., grading and seeding). Other measures will be temporary and will be removed by the Contractor at the completion of excavation and restoration. The selection of erosion and sediment control measures was based on several general principles including the following:

- minimization of water volumes requiring erosion and sediment control through diversion of runon water where possible
- minimization of erosion through project design,
- incorporation of temporary and permanent erosion control measures, and
- removal of sediment prior to discharge.

Erosion and sediment control measures incorporated into the A1PII project design use applicable State, Federal, DOE, and FEMP requirements. The FEMP standards for erosion and sediment control follow the ODNR and United States Soil Conservation Service standards for construction and materials. Vegetative stabilization, silt fencing, and ditch protection will be implemented in accordance with ODNR *"Rainwater and Land Development"*, Ohio Department of Transportation "*Construction and Material Specifications*", and the "*Location and Design Manual, Volume Two, Drainage*". A generalized description of proposed erosion and sediment control measures is presented in this section. Construction details for erosion and sediment control measures are included in the Construction Drawings and Specifications.

Runoff from the STP and Trap Range excavation areas will be directed to a new sediment basin (Sediment Basin 1) located adjacent to the South Access Road. See the Drainage Area Map in Appendix B. Runoff from activities in the northeast portion of the project area will be directed to the existing OSDF Sediment Basin and ditch system. Runoff from activities in the northwest portion of the project area will be directed to the existing Sediment Basin and ditch system. Sediment control for isolated stripping activities south of the OSDF Sediment Basin and for the sediment removal activities for the A1PI basins will consist of perimeter silt fence and vegetative buffer zones.

4.2 Specific Components

There are two types of erosion and sediment control components: temporary and long-term measures. Temporary measures include silt fencing, crusting agents, stabilization measures (vegetation, matting, dumped rock), and sediment storage capacity within the sediment basin. Long-term measures include design features such as grading, vegetation, and dumped rock. Both temporary and long-term measures are discussed below.

4.2.1 Silt Fencing

Silt fencing will be used to intercept sheet flow, retain sediments, and disperse flow prior to runoff reaching the collection ditches. Prior to clearing, grading, and excavation activities, silt fencing will be installed along downgradient perimeters to prevent migration of sediment eroded from exposed areas. Silt fencing will consist of a woven filter fabric attached to wooden posts. Silt fencing will be constructed so that the toe of the filter fabric is securely buried to prevent water from undercutting the fence. Silt fencing will be installed in accordance with details presented on the drawings and in accordance with manufacturer's recommendations. The locations presented on the Construction Drawings for the project areas are considered the minimum necessary during construction. Intermediate silt fencing may be used by the Contractor to control and slow down flows in active excavation areas. The Contractor will install breaks and overlaps in the silt fencing to allow vehicle access to the construction areas.

Inspection and maintenance of silt fence shall occur at regular intervals as outlined in Section 6.

4.2.2 Temporary Stabilization

As a result of phased construction, portions of the project areas may be left in intermediate/incomplete conditions. Intermediate areas may include rough graded areas awaiting final grading. Intermediate areas where activities will not resume for a period of 45 consecutive days or greater will be stabilized by applying a crusting agent within 7 days of last excavation. Temporary measures will help to stabilize exposed soil and limit erosion. As construction progresses, areas containing the crusting agent will be left in place, inspected and repaired regularly according to Section 6 until final seeding or until construction resumes.

4.2.3 Grading and Design Features

Grading design features incorporated into the Construction Drawings to control erosion include runon controls, limiting steep slopes, routing runoff to surface water collection ditches, limiting discharge and flow velocities in the collection ditches to the extent practical, and lining collection ditches with erosion control blankets or dumped rock as required to maintain non-erosive velocities.

4.2.4 Vegetation

Subsequent to final remediation of the project areas, a revegetation program will be implemented to establish a variety of vegetation. The vegetation layer will reduce erosion, enhance evapotranspiration of water, and improve the quality of water leaving the area. The project area will be seeded in stages as remediation is completed. In addition to seeding with a variety of grass seed, mulch and erosion control blankets will be placed to prevent erosion during establishment of vegetation. Mulch will be placed on graded slopes and erosion control blankets will also be used in all grass ditches. As an aid to establishment of vegetation, seeded areas will be fertilized with a starter fertilizer as described in the Technical Specifications.

4.2.5 Dumped Rock

The outlet channel from the Sediment Basin 1 will be lined with dumped rock to protect against erosion from excessive velocities. The slopes around the inlet and outlet of the culverts at the STP Access Road and the groundwater line will be lined with dumped rock. Additionally, a dumped rock apron will be installed at the inlet and outlet of these culverts to prevent scouring.

4.3 Design Criteria and Standards

The criteria used to design the various components of the SWMP are described below.

4.3.1 Sediment Basin 1

- Minimum total volume - determines invert elevation of principal riser and is based on 67 cubic yards per watershed acre in accordance with ODNR *"Rainwater and Land Development"*.

- Maximum sediment cleanout elevation - determines maximum cleanout elevation and is based on 27 cubic yards per watershed acre in accordance with ODNR *"Rainwater and Land Development"*.

- For a basin (such as Sediment Basin 1) designed to store less than 50 acre-feet at elevation where water would overflow embankment, the embankment height is to be less than 10 feet as defined by the Ohio Dam Safety regulations.

- Principal spillway structures - 2 riser/pipe structures each consisting of a 48-inch riser with a 48-inch pipe. The 10-year, 24-hour storm event is routed through outlet structures to evaluate performance under worst case conditions for A1PII. The spillway's controlling discharge was evaluated by determining the minimum flow for weir and orifice conditions on the riser and flow through the barrel, under various headwater elevations up to the elevation where water starts to overflow the basin and flow over the low point in the North Entrance Road. The tailwater condition was assumed to be

at the elevation equal to the invert of the pipe plus half its diameter. This is also approximately the same elevation as the depth of flow in the outlet channel using a 16-foot bottom width, 3H:1V side slopes, 0.8 percent channel slope, and a uniform flow depth of 1.9 feet (200 cfs).

(Note that the second principal spillway structure was added to provide additional capacity if OSDF elects to add to the drainage area beyond that for the A1PII watershed area (73 acres). No analysis was performed for any additional areas and will be the responsibility of others).

- A defined emergency spillway will not be constructed for Sediment Basin 1 due to the close proximity of the existing South Access Road and the North Entrance Road. Instead, emergency overflow (should an overflow situation ever arise), will flow in a northwest direction over the North Entrance Road, then the South Access Road.

4.3.2 Culverts

Culvert 1 is a pipe which conveys drainage from the Trap Range diversion ditch/berm underneath the gravel road leading from the STP Access Road.
Culvert 2 is a series of three pipes used to convey flow from Conveyance Channel 1 into Sediment Basin 1. In anticipation of future use by the OSDF, Culvert 2 is designed to carry 110 cfs which is the peak flow from the A1PII catchment plus 16.1 acres from the OSDF cell construction area, for the 25-year, 24-hour storm event. Culvert 2 is designed to have minimum clearance over the 24-inch diameter groundwater line. Culvert 2 will have 2.5 feet of gravel cover in the area of the STP Access Road crossing. In other locations, it will have a minimum of 1-foot of cover.

4.3.3 Conveyance Channel

The channel is designed to convey 10-year, 24 hour peak runoff from A1PII. Erosion control blanket without check dams will be used when the velocity is less than 3 fps. Between 3 and 4 fps, check dams will be added. Dumped rock channel protection will be used for velocities exceeding 4 fps.

4.3.4 Silt Fence

Silt fence criteria is as specified in ODNR "*Rainwater and Land Development*".

4.3.5 Sediment Trap

The Sediment trap criteria is as specified in ODNR "*Rainwater and Land Development*" and is sized based on 67 cubic yards per acre of total contributing drainage area.

SECTION 5

IMPLEMENTATION

Because of the large expanse of area that will be impacted by remediation, erosion control measures will be required to minimize erosion and maximize the capture of sediment. In conjunction with stormwater management measures, silt fencing will be installed along perimeter downslope areas and drainage ditches, where necessary, prior to the beginning of excavation activities. Erosion and sediment control will be a part of all construction packages for A1PII.

Once excavation of impacted material and contaminated soil begins, erosion and sediment control measures will be integrated with stormwater management measures. The Contractor will be required to periodically remove sediments from silt fences, drainage ditches, and sediment basins to maintain desired performance. Sediment removed from silt fences, drainage ditches, and sediment basins will be managed as impacted material and disposed of in the OSDF.

Any area left exposed for more than 45 consecutive days without any immediate plans for future work will be stabilized within 7 calendar days of last excavation using a crusting agent or seeding according to the Technical Specifications (also see Construction Drawings for proposed stormwater and sediment controls). All disturbed areas will be stabilized to the extent practical prior to winter shutdown.

5.1 General Construction Practices

In general, it is advantageous to disturb only as little an area as necessary to accommodate construction needs. Limiting the extent of grading and excavation will minimize disturbed areas subject to erosion at any given time. However, disturbed areas may be expanded to separate work areas and provide more room to work for safety reasons. The construction phasing ultimately incorporated into the work plan is dependent on several factors including the following:

- Contractor's management strategies,
- Construction conditions,
- Seasonal and weather conditions.

The following construction practices will be followed as a general rule.

- All erosion and sediment control measures are to be installed prior to or as the first step in excavation.

- Disturbed/exposed areas will be excavated as quickly as practical. Disturbed areas which will remain unworked for 45 consecutive days or greater will be stabilized with a crusting agent and/or temporary seeding within 7 days of last excavation.

- All erosion and sediment control measures shall be maintained and/or modified or supplemented as approved by FDF in accordance with the ODNR *"Rainwater and Land Development"* during construction to comply with this SWMP.

- Potential cross-contamination from vehicle traffic will be prevented by stabilization of entry/exit routes, management and control of road crossing, wheel washing, and monitoring vehicles exiting the work zone.

5.2 Construction Sequencing

The following sections discuss the general erosion control sequencing for the A1PII Construction Packages.

5.2.1 General Erosion Control Sequencing (Prior to Impacted Material Excavation)

Step 1. Establish site boundaries and access controls.

Step 2. Install sediment trap, silt fence, and diversion ditches in locations indicated on the Construction Drawings.

Step 3. Strip the top 6 inches of soil (if not certified below Final Remediation Levels (FRLs) by FDF) from areas designated for Sediment Basin 1 construction as noted on the construction drawings.

Step 4. Complete excavation of sediment basin to lines and grades shown on the plans. Stockpile soil in stockpiles as shown on the Construction Drawings.

Step 5. Install risers and pipes as shown on the Construction Drawings.

Step 6. Divert flow into Sediment Basin 1 by constructing the conveyance channel and diversion ditches.

Step 7. Construct equipment wash facility and associated devices as appropriate for package.

5.2.2 Impacted Material Excavation Sequencing

Step 1. Establish site boundaries and access controls.

Step 2. Confirm that surface water controls are in locations indicated on the Construction Drawings and as shown in the details. Confirm that all erosion and sediment controls are in place and all runoff from disturbed areas flows to the sediment basins or through silt fence.

Step 3. Clear remaining trees and vegetation. Stumps will be ground in place and excavated with surface soil removal.

Step 4. Excavate impacted material to the limits indicated on the Construction Drawings.

Step 5. When excavation is completed in a discrete area, certification samples will be collected (by FDF).

Step 6. Upon certification that soils remaining in the remediation area meet FRLs, perform restoration grading where required, install stabilization blankets and apply seed and mulch to all disturbed areas.

Step 7. Upon verification that the excavation meets FRLs and has an established stand of vegetation, remove accumulated sediments from the sediment basins and silt fences.

Step 8. Install temporary erosion and sedimentation controls for removal of sediments from sediment basins.

Step 9. Upon certifying that the upgradient areas and sediment basin meets FRLs, remove the riser and backfill, seed, and mulch when sediment control is no longer necessary.

Step 10. Remove temporary erosion and sedimentation controls following completion of final grading activities and after the excavation areas have an established stand of vegetation. Seed and mulch any areas disturbed by this activity.

5.2.3 Trap Range

In general, the Trap Range perimeter controls will be established with the Site Preparation Package. Additional sediment control measures, such as silt fence and a vegetative buffer upgradient of the silt fence shall be used prior to the start of remediation activities in the Trap Range.

SECTION 6

EROSION AND SEDIMENT CONTROLS/ INSPECTION AND MAINTENANCE

6.1 Inspection

The erosion and sediment controls identified in this SWMP will be monitored by a qualified representative of the Contractor and FDF every 7 calendar days or within 24 hours of a precipitation event of 0.5 inches or greater during the construction phase of the project. Inspections will include areas under excavation, stockpiles, stabilized and unstabilized exposed areas, erosion control measures, and locations where vehicles enter/exit the project area. Where portions of the project area have been completed and permanent erosion control measures have been implemented, inspection will be conducted at least once every month until the entire project area is completely stabilized. All inspections will be conducted and documented in accordance with the SWPPP.

Disturbed areas and areas used for storage of materials that are exposed to the elements will be inspected for evidence of, or for the potential of, pollutants entering local drainage systems. Locations where vehicles exit the project area will be inspected for evidence of off-site tracking of contaminated soil or impacted material.

If the inspections indicate that control measures are not adequate or effective, modifications to the control measure will be implemented immediately by the Contractor. A report summarizing the scope of the inspection, name of the inspector, inspection date, observations relating to the implementation of the SWMP, and corrective action measures (if any) will be made and retained in the FDF project files to demonstrate compliance. The reports will either identify any areas of noncompliance with the SWMP, or contain a certification that control measures are effective and in compliance with this plan.

6.2 Maintenance

Maintenance is according to the requirements of the Technical Specification and part of the warranty.

6.2.1 Silt Fence

The Contractor will remove the sediment that collects along the silt fences to maintain the desired removal performance and prevent structural failure of the fence in accordance with the Technical Specifications. Sediment removed during the STP Excavation Phase will be managed as impacted material and placed in the OSDF. The perimeter silt fencing will remain in place until excavation activities in the area are completed

and vegetative cover or other erosion control measures are adequately established. Damaged fence will be repaired or replaced as appropriate.

6.2.2 Conveyance Channel

The Contractor will be required to periodically remove sediment from the Conveyance Channel and other ditches to maintain flow. Unless sampling indicated sediment is below FRL, sediment removed during the STP Excavation Phase will be managed as impacted material and placed in the OSDF.

6.2.3 Sediment Basins

A Contractor will be required to periodically remove sediment from the sediment basins to maintain desired sediment storage capacity. Cleanout elevations are indicated on the Construction Drawings and are specified in the Technical Specifications. Unless sampling indicates sediment is below FRL, sediment removed during the STP Excavation phase will be managed as impacted material and placed in the OSDF.

6.2.4 Sediment Trap

The Contractor will be required to periodically remove sediment from the trap such that at least half of its design depth is maintained.

6.2.5 Equipment Wash Facility

The Contractor will remove the sediments from the collection sump as required. The sediments removed from the Equipment Wash Facility will be managed as impacted material and placed in the OSDF.

APPENDIX A

CALCULATIONS

~~1463~~

PARSONS

ENGINEERING CALCULATIONS TITLE AND SUMMARY SHEET

2053

Date 2/25/98

Sheet 1 of 9

Proj. Order No. PO175 Calculation No. 15-01

Project Title Area I, Phase II Remediation

Calculation Subject Stormwater Controls Date Verified/Checked 3-10-98

STATUS: PRELIMINARY _____ FINAL KB 5/4/98 SUPERSEDED _____ VOID _____

STATEMENT OF PROBLEM

Design drainage structures (i.e., sediment basin, conveyance channel, and associated drainage culverts) to accommodate Area I, Phase II (AIPII) remediation activities.

SUMMARY OF CONCLUSIONS	Originator's Signature and Date
Drainage structures are of adequate size to accommodate AIPII remediation activities.	Kenneth F. Gerard 3/6/98, 5/4/98
CHECKING METHOD	**Checker's Signature and Date**
1. Review _____	May 5, 1998
2. Alternate Calculation _____	Stuart M. Haw March 10, 1998
	Lead Discipline Engineer's Signature and Date

Rev. No.	Sheet No.	Description	Reviser's Signature/Date	Checker's Signature/Date	Approved by Signature/Date

05/93 ENG080

[redacted] 000026

PARSONS

ENGINEERING CALCULATIONS BASIS SHEET

Revision No. 0

Proj. Order No. PO175 Calculation No. 15-01

Project Title Area I, Phase II

Calculation Subject Stormwater Controls Date Verified/Checked 3-10-98

Prepared By: K. Gerard K.G. 5/4/98 Checked/Verified By: L.M. Hamr 3-19-98 5/5/98

Date 2/25/98

SUMMARY OF DATA SOURCES - CODES - ASSUMPTIONS

Data Sources:

1. Brater, E.F., & King, H.W., *"Handbook of Hydraulics"*, 6th ed,.1976, McGraw-Hill
2. FHWA, *Hydraulic Design of Highway Culverts*, HEC No. 5, 1985
3. Haestad Methods, 1989. Quick TR-55™ *Urban Hydrology for Small Watersheds*
4. Haestad Methods, 1989, Pond-2™ *Detention Pond Analysis*
5. Haestad Methods, 1995, Flow Master™ v 5.13
6. ODOT, *Location and Design Manual, Vol 2, Drainage Design*
7. PARSONS DWGs. (used to create drainage area maps)
8. Soil Conservation Service, August 1982. *Soil Survey of Hamilton County, Ohio*
9. Soil Conservation Service, July 1984. *Engineering Field Manual for Conservation Practices*
10. Soil Conservation Service, State of Ohio, June 1986. *Engineering Standard, Pond (No.) - 378*

CODES:

1. Applicable sections of the Ohio Department of Natural Resources *Rainwater and Land Development Manual* , 1996

ENGINEERING CALCULATIONS
BASIS SHEET
SUMMARY OF DATA SOURCES - CODES - ASSUMPTIONS (continued)

Sheet 3

GENERAL ASSUMPTIONS:

1. Runoff values will be calculated using SCS TR-55 (QTR-55 by Haestad Methods, Inc.)

   A. Hydrologic Soil Groups, HSG, for all soils are assumed to be "C ". This is the "worse case" based on the soil types found in the project area, per the SCS soils maps which are as follows:

FdA	Fincastle	C
XfA	Xenia	B
XfB2	Xenia	B

   B. CN Values used in the TR-55 calculations for discharge are based on the following assumptions for land use:

   Off-Site area is assumed to be in row crops with Contoured and Crop residue cover (C+CR) practices in good condition.

   "Construction"is equal to a bare soil condition, due to excavation, stockpiles, or traffic beating down and destruction of the vegetation. This includes the OSDF Cell construction when included within a design area.

   Open Space is used for existing grassed area that is assumed will be undisturbed during the construction time frame. Since the existing vegetation is well established, it is considered to be in good condition, >75% cover.

   "Revegetated Area" is considered to be an area disturbed and is in the process of establishing grass cover. Therefore it is considered to be the same as Open Space in fair condition, 50-75% cover.

   Riprap (OSDF Cell Construction Area) is in the 2,000-year ditch and is assumed to be the same as gravel.

2. Culvert analysis will use ODOT/BPR(FHWA) design charts unless otherwise noted. Only the final culvert calculation will be included in the calculation set.

3. HDPE pipe is corrugated exterior, smooth interior. Assume Mannings n = 0.012. Bituminous Coated Corrugated Metal Pipe, BCCMP, has a Mannings n = 0.024 based on ODOT and vendor literature. (Assumes annular corrugations. While helical has a lower Mannings n factor than annual, the assumption will provide for some conservatism if helical corrugated pipe is provided and will allow either type to be used.)

4. FlowMaster, by Haestad Methods, Inc., will be used for open channel flow and simplified pressure pipe calculations. Assume unifiorm channel flow.

5. Other assumptions are as noted within the calculations.

PARSONS

~~1463~~ 2053

COMPUTER CALCULATION SUMMARY SHEET

OU: 2 PO: 175 Job Number: 7663-0175-11115-150

Computer Code: QTR-55 Version: 5.46

Code Verification Status: REV 0, Nov 1992

Description of Program: Developes runoff hydrographs per SCS TR-55, Determines peak flows per Modified Rational Method

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: To develop runoff hydrographs for 10-yr, 24-hr. storm event. Sediment Basin 1, Ditch 1, Conveyance Channels 1A & 1B, and Culverts 1 & 2 will be sized for this storm. Ditch 2 will be designed for the 10-year frequency storm using the Modified Rational Method.

Run Performed By: K. Gerard

Date/Time of Run: 2/98

Computer Time of Run: n/a

Input Filename: See attached list

Output Filename: See attached list

Files Saved to Diskname: p:\engdata\c&sdata\po175\calc\swcalc2\ Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K. Gerard KG Date: 3/6/98

Checked By: S. Haw S. M. Haw Date: 3/19/98

Approved By: Date:

000030

PARSONS

COMPUTER CALCULATION SUMMARY SHEET

OU: 2 PO: 175 Job Number: 7663-0175-11115-150

Computer Code: Flow Master Version: 5.13

Code Verification Status: Rev 0, Feb. 1997

Description of Program: Computes solutions to uniform flow open channel hydraulic problems

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: Used to evaluate and select conveyance channel and diversion ditch geometry and acceptable lining material.

Run Performed By: K. Gerard

Date/Time of Run: 2/98 – 5/98

Computer Time of Run: n/a

Input Filename: See attached list

Output Filename: See attached list

Files Saved to Diskname\path: p:engdata\c&sdata\po175\calc\swcalc2\
Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K. Gerard KG Date: 3/6/98 5/4/98

Checked By: S. Haw S. M. Haw Date: 3/19/98 5/5/98

Approved By: Date:

~~1468~~

PARSONS

COMPUTER CALCULATION SUMMARY SHEET

2053

OU: 2 PO: 175 Job Number: 7663-0175-11115-151

Computer Code: POND -2 Version: 5.17

Code Verification Status: REV 0, NOV 1992

Description of Program: Computes solution for routing inflow hydrograph generated by QTR-55 and generates an outflow hydrograph using level-pool routing techniques

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: Used to confirm principal spillway and A1PII sediment basin configuration for passing the 10-year, 24-hour storm.

Run Performed By: K. Gerard

Date/Time of Run: 3/6/98

Computer Time of Run: n/a

Input Filename: OSDFSED1.RCN, *.TCT SB1.VOL

Output Filename: OSDFSED1.MOP, BA1-10.HYD, BA1.HYD, BA1.HYD

Files Saved to Diskname: p:\engdata\c&sdata\po175\swcalc21 Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K Gerard KG Date: 3/6/98

Checked By: S. Haw S. M. Haw Date: 3/19/98

Approved By: Date:

8

Print File List
5/4/98 8:51AM
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2

Total Files: 94
Total Bytes: 1,026,375

~
1501175.clc
a1p2-10.hyd
a1p2sed.mop
a1p2sed.rcn
a1p2sed.tcm
a1p2sed.tct
ba1-10.hyd
ba1-25.hyd
ba1.hyd
ba1.pnd
ba1.vol
c2-10.hyd
c2-25.hyd
ch1a-10.hyd
ch1b-10.hyd
chan1.mop
chan1.rcn
chan1.tct
chan1a.mop
chan1a.rcn
chan1a.tct
chan1b.mop
chan1b.rcn
chan1b.tct
chan2.bak
chan2.fm2
chan2.rcn
chan2.tct
convey.bak
convey.fm2
cul1-10.hyd
cul1.mop
cul1.rcn
cul1.tct
cul2.mop
cul2.rcn
cul2.tct
culv1-.tct
culv1.mop
culv1.rcn
culv2.mop
culv2.rcn
culv2.tct
d3-10.hyd
ditch1.hyd
ditch1.mop
ditch1.rcn

Print File List
5/4/98 8:51AM
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2

2053

ditch1.tct
ditch2.hyd
ditch2.mop
ditch2.rcn
ditch2.tct
ditch3.mop
ditch3.rcn
ditch3.tct
eng023
eng025
eng080
eng095
eng095.1
eng095.2
eng095.3
eng098
estimate.est
osdfsed1.mop
osdfsed1.rcn
osdfsed1.tcm
osdfsed1.tct
outlet.xls
outlet1.xls
project1.bak
project1.fm2
sb1-10.hyd
sb1-100.hyd
sb1-25.hyd
sb1.mop
sb1.msr
sb1.pnd
sb1.rcn
sb1.tcm
sb1.tct
sb1.vol
sb1a-10.hyd
sb1o-10.hyd
sb1o-100.hyd
sb1o-25.hyd
sdclcfly.0b
sdclcfly.wpd
sedbasin.xls
sedbout.bak
sedbout.fm2
trap.bak
trap.fm2

Attachment A - CONVEYANCE CHANNEL

DRAINAGE AREA:

- A1PII Catchment (Subareas 1 and 1A)

CRITERIA:

- 10-Year, 24-hour Storm
- Channel slope to be minimized, 0.40% (per FDF)
- 1-ft minimum freeboard
- Provide for a 6-inch layer above the normal flowline that can be removed if the channel becomes contaminated. Make this adjustment in the riprap area above Culvert 2.

SUMMARY:

DA 1A, 18.55 ac., is at the northern end of the channel

Q_{10} = 36 cfs
V_{10} = 2.5 fps
Width = 5-ft
Depth = 1.7-ft
z = 2:1

DA 1, 40.7 ac., is at the entire drainage area including 1A.

Q_{10} = 56 cfs
V_{10} = 2.8 fps
Width = 8-ft
Depth = 1.8-ft
z = 2:1

A2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:11:28 02-06-1998

CONVEYANCE CHANNEL 1A

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
SUBAREA 1A	18.55	83

A3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:11:28 02-06-1998

~~1462~~
2053

CONVEYANCE CHANNEL 1A

RUNOFF CURVE NUMBER DATA

::

Composite Area: SUBAREA 1A

SURFACE DESCRIPTION	AREA (acres)	CN	
C/ROW CROPS C+CR /GOOD	3.60	81	
C/GRAVEL	0.50	89	
PAVEMENT	0.40	98	
C/CONSTRUCTION (bare dirt)	7.58	91	
C/OPEN SPACE/GOOD	6.47	74	
COMPOSITE AREA --->	18.55	83.2	(83)

::

000037
~~000641~~

Quick TR-55 Ver.5.46 S/N:
Executed: 10:25:26 02-06-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CHAN1A.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CONVEYANCE CHANNEL 1A

Subarea descr.	Tc or Tt	Time (hrs)
SUBAREA 1A	Tc	0.53

Quick TR-55 Ver.5.46 S/N:
Executed: 10:25:26 02-06-1998
\engdata\c&sdata\po175\calc\swcalc2\CHAN1A.TCT

CONVEYANCE CHANNEL 1A

Tc COMPUTATIONS FOR: SUBAREA 1A

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		RANGE	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0233	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.34	= 0.34

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1214.0	
Watercourse slope, s	ft/ft	0.0186	
$Avg.V = Csf * (s)^{0.5}$	ft/s	2.2005	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.15	= 0.15

CHANNEL FLOW

Segment ID		3	
Cross Sectional Flow Area, a	sq.ft	15.27	
Wetted perimeter, Pw	ft	12.97	
Hydraulic radius, r = a/Pw	ft	1.177	
Channel slope, s	ft/ft	0.0040	
Manning's roughness coeff., n		0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.6268	
Flow length, L	ft	375	
T = L / (3600*V)	hrs	0.04	= 0.04

::

TOTAL TIME (hrs) 0.53

Tc Calc for SubArea 1A
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1A - Tc Calc
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	5.00	ft
Discharge	40.00	cfs

Results		
Depth	1.78	ft
Flow Area	15.27	ft^2
Wetted Perimeter	12.97	ft
Top Width	12.13	ft
Critical Depth	1.08	ft
Critical Slope	0.026633	ft/ft
Velocity	2.62	ft/s
Velocity Head	0.11	ft
Specific Energy	1.89	ft
Froude Number	0.41	
Flow is subcritical.		

Notes:

For Tc calc, assumed 40 cfs

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

~~1403~~

2053

Executed: 02-06-1998 10:25:58

Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP

Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea escription	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
UBAREA 1A	18.55	83.0	0.50	0.00	4.10	2.37	I.1 .10

Travel time from subarea outfall to composite watershed outfall point.
-- Subarea where user specified interpolation between Ia/p tables.

Total area = 18.55 acres or 0.02898 sq.mi
Peak discharge = 36 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea escription	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
BAREA 1A	0.53	0.00	0.50	0.00	No	Computed Ia/p < .1

Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
SUBAREA 1A	36	12.4
Composite Watershed	36	12.4

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

2053

Executed: 02-06-1998 10:25:58
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Composite Hydrograph Summary (cfs)

Subarea escription	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
BAREA 1A	1	2	2	4	6	12	21	32	36
tal (cfs)	1	2	2	4	6	12	21	32	36

Subarea escription	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
BAREA 1A	35	28	20	16	10	7	5	4	4
tal (cfs)	35	28	20	16	10	7	5	4	4

Subarea escription	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
BAREA 1A	3	3	2	2	2	2	2	1	1
tal (cfs)	3	3	2	2	2	2	2	1	1

Subarea escription	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
BAREA 1A	1	1	1	1	0
tal (cfs)	1	1	1	1	0

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	2
11.2	2	15.0	2
11.3	2	15.1	2
11.4	2	15.2	2
11.5	2	15.3	2
11.6	2	15.4	2
11.7	3	15.5	2
11.8	3	15.6	2
11.9	4	15.7	2
12.0	6	15.8	2
12.1	12	15.9	2
12.2	21	16.0	2
12.3	32	16.1	2
12.4	36	16.2	2
12.5	35	16.3	2
12.6	28	16.4	2
12.7	20	16.5	2
12.8	16	16.6	2
12.9	13	16.7	2
13.0	10	16.8	1
13.1	8	16.9	1
13.2	7	17.0	1
13.3	6	17.1	1
13.4	5	17.2	1
13.5	5	17.3	1
13.6	4	17.4	1
13.7	4	17.5	1
13.8	4	17.6	1
13.9	3	17.7	1
14.0	3	17.8	1
14.1	3	17.9	1
14.2	3	18.0	1
14.3	3	18.1	1

14.4	3	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

A-11

~~1403~~

2053

000045

~~000222~~

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	1
18.7	1	22.5	1
18.8	1	22.6	1
18.9	1	22.7	1
19.0	1	22.8	1
19.1	1	22.9	1
19.2	1	23.0	1
19.3	1	23.1	1
19.4	1	23.2	1
19.5	1	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	1
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0
22.1	1	25.9	0

A13

22.2	1
22.3	1

[redacted]

2053

[redacted]

Conveyance Channel - SubArea 1A
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1A - ECB Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	5.00	ft
Discharge	36.00	cfs

Results		
Depth	1.69	ft
Flow Area	14.15	ft^2
Wetted Perimeter	12.55	ft
Top Width	11.76	ft
Critical Depth	1.02	ft
Critical Slope	0.027034	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	1.79	ft
Froude Number	0.41	
Flow is subcritical.		

Notes:

Assume:
For SubArea 1A Q10
ECB n=0.04

[redacted]

000048

A15

~~1 108~~

Quick TR-55 Ver.5.46 S/N:
Executed: 10:21:17 02-06-1998

2053

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
SUBAREA 1	40.72	80

Quick TR-55 Ver.5.46 S/N:
Executed: 10:21:17 02-06-1998

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

RUNOFF CURVE NUMBER DATA

::

Composite Area: SUBAREA 1

SURFACE DESCRIPTION	AREA (acres)	CN	
C/ROW CROPS C+CR /GOOD	12.34	81	
C/GRAVEL	1.18	89	
PAVEMENT	0.49	98	
C/CONSTRUCTION (bare dirt)	7.58	91	
C/OPEN SPACE/GOOD	19.13	74	
COMPOSITE AREA --->	40.72	80.0	(80)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 11:13:43 02-06-1998
\engdata\c&sdata\po175\calc\swcalc2\CHAN1.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Subarea descr.	Tc or Tt	Time (hrs)
SUBAREA 1	Tc	0.65

```
Quick TR-55 Ver.5.46   S/N:
Executed: 11:13:43   02-06-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CHAN1.TCT

                         CONVEYANCE CHANNEL 1
                     (from Area 1A to Culvert 2)


                  Tc COMPUTATIONS FOR: SUBAREA 1

SHEET FLOW (Applicable to Tc only)
    Segment ID                                        1
    Surface description                         RANGE
    Manning's roughness coeff., n                   0.1300
    Flow length, L (total < or = 300)       ft      300.0
    Two-yr 24-hr rainfall, P2               in      3.000
    Land slope, s                        ft/ft      0.0233
                          0.8
          .007 * (n*L)
    T =  --------------                    hrs       0.34           =  0.34
              0.5    0.4
            P2   *   s

SHALLOW CONCENTRATED FLOW
    Segment ID                                       2
    Surface (paved or unpaved)?                    Unpaved
    Flow length, L                          ft      1214.0
    Watercourse slope, s                 ft/ft      0.0186

                            0.5
    Avg.V =  Csf *   (s)                  ft/s      2.2005
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                       hrs       0.15           =  0.15


CHANNEL FLOW
    Segment ID                                       3          4
    Cross Sectional Flow Area, a         sq.ft      15.27      20.00
    Wetted perimeter, Pw                    ft      12.97      15.79
    Hydraulic radius, r = a/Pw              ft      1.177      1.267
    Channel slope, s                     ft/ft     0.0040     0.0040
    Manning's roughness coeff., n                  0.0400     0.0400

                     2/3    1/2
         1.49  *  r    *  s
    V =  --------------------             ft/s     2.6268     2.7580
                    n

    Flow length, L                          ft        375       1125

    T = L / (3600*V)                       hrs       0.04   +   0.11   =  0.15
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                               TOTAL TIME (hrs)        0.65
```

A19

~~1462~~

2053

Tc Calc for SubArea 1
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1 - Tc Calc
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	8.00	ft
Discharge	55.00	cfs

Results		
Depth	1.74	ft
Flow Area	20.00	ft^2
Wetted Perimeter	15.79	ft
Top Width	14.97	ft
Critical Depth	1.04	ft
Critical Slope	0.025840	ft/ft
Velocity	2.75	ft/s
Velocity Head	0.12	ft
Specific Energy	1.86	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

For Tc calc, assume 55 cfs

A20

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/use
SUBAREA 1	40.72	80.0	0.75	0.00	4.10	2.12	I.12 .1

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 40.72 acres or 0.06363 sq.mi
Peak discharge = 56 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
SUBAREA 1	0.65	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

2053

Executed: 02-06-1998 11:14:15
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
SUBAREA 1	56	12.6
Composite Watershed	56	12.6

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
SUBAREA 1	2	2	3	4	6	8	14	25	38
Total (cfs)	2	2	3	4	6	8	14	25	38

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
SUBAREA 1	50	56	54	49	34	23	17	13	10
Total (cfs)	50	56	54	49	34	23	17	13	10

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
SUBAREA 1	8	7	6	5	4	4	3	3	3
Total (cfs)	8	7	6	5	4	4	3	3	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
SUBAREA 1	3	2	2	2	0
Total (cfs)	3	2	2	2	0

[redacted]

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

~~1462~~

2053

Executed: 02-06-1998 11:14:15
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	5
11.1	2	14.9	5
11.2	2	15.0	5
11.3	2	15.1	5
11.4	2	15.2	5
11.5	3	15.3	4
11.6	3	15.4	4
11.7	3	15.5	4
11.8	4	15.6	4
11.9	4	15.7	4
12.0	6	15.8	4
12.1	8	15.9	4
12.2	14	16.0	4
12.3	25	16.1	4
12.4	38	16.2	4
12.5	50	16.3	3
12.6	56	16.4	3
12.7	54	16.5	3
12.8	49	16.6	3
12.9	41	16.7	3
13.0	34	16.8	3
13.1	28	16.9	3
13.2	23	17.0	3
13.3	20	17.1	3
13.4	17	17.2	3
13.5	15	17.3	3
13.6	13	17.4	3
13.7	11	17.5	3
13.8	10	17.6	3
13.9	9	17.7	3
14.0	8	17.8	3
14.1	8	17.9	3
14.2	7	18.0	3
14.3	7	18.1	3

14.4	7	18.2	3
14.5	6	18.3	3
14.6	6	18.4	3
14.7	6	18.5	3

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

~~1463~~
2053

Executed: 02-06-1998 11:14:15
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	2	22.4	2
18.7	2	22.5	2
18.8	2	22.6	2
18.9	2	22.7	2
19.0	2	22.8	2
19.1	2	22.9	2
19.2	2	23.0	2
19.3	2	23.1	1
19.4	2	23.2	1
19.5	2	23.3	1
19.6	2	23.4	1
19.7	2	23.5	1
19.8	2	23.6	1
19.9	2	23.7	1
20.0	2	23.8	1
20.1	2	23.9	1
20.2	2	24.0	1
20.3	2	24.1	1
20.4	2	24.2	1
20.5	2	24.3	1
20.6	2	24.4	1
20.7	2	24.5	1
20.8	2	24.6	1
20.9	2	24.7	1
21.0	2	24.8	1
21.1	2	24.9	1
21.2	2	25.0	1
21.3	2	25.1	0
21.4	2	25.2	0
21.5	2	25.3	0
21.6	2	25.4	0
21.7	2	25.5	0
21.8	2	25.6	0
21.9	2	25.7	0
22.0	2	25.8	0
22.1	2	25.9	0

A26

22.2	2
22.3	2

[redacted]

A27

Conveyance Channel - SubArea 1
Worksheet for Trapezoidal Channel

[redacted]

2053

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1 - ECB Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	8.00	ft
Discharge	56.00	cfs

Results		
Depth	1.76	ft
Flow Area	20.25	ft^2
Wetted Perimeter	15.86	ft
Top Width	15.03	ft
Critical Depth	1.05	ft
Critical Slope	0.025768	ft/ft
Velocity	2.76	ft/s
Velocity Head	0.12	ft
Specific Energy	1.88	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

Assume:
For SubArea 1 Q10
ECB n=0.04

[redacted]

000061

Attachment B - CULVERT 2 (at GW-24" Line)

DRAINAGE AREA:

- Subarea 1 + OSDF Cell

CRITERIA:

- 25-Year, 24-hour Storm
- Culvert to go over GW-24" Line (per FDF). Assume a minimum of 4-inches between top of GW line to invert of culvert.
- Use same slope as Conveyance Channel (s = 0.004ft/ft)
- CN for OSDF area developed from land use data provided by OSDF and is incorporated into Subarea 1 for this calculation.
- Tc based on DA 1 (There is no design basis for getting the OSDF Cell construction runoff to the Conveyance Channel/Culvert 2. Hence, there is no basis for a Tc from the OSDF Cell area.)
- Pipes are assumed to be cut flush with the slope. There is no headwall or end sections. Use riprap to protect the slope.
- Minimum cover is 1 ft. (Top of pipe to bottom of flexible pavement). Use a minimum cover of 2.5 ft. of ODOT 304 at the STP Access Road during construction since there is no pavement. (This is similar to what is recommended for cmp.)

B2

Quick TR-55 Ver.5.46 S/N:
Executed: 08:55:04 02-09-1998

CULVERT 2
(at GW-24" Line)

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Sub 1 + OSDF	57.02	82

B3

Quick TR-55 Ver.5.46 S/N:
Executed: 08:55:04 02-09-1998

~~1463~~

2053

CULVERT 2
(at GW-24" Line)

RUNOFF CURVE NUMBER DATA

Composite Area: Sub 1 + OSDF

	SURFACE DESCRIPTION	AREA (acres)	CN	
SUB 1	C / ROW CROPS C+CR / GOOD	12.34	81	
	C / GRAVEL	1.18	89	
	PAVEMENT	0.49	98	
	C / CONSTRUCTION (bare soil)	7.58	91	
	C / OPEN SPACE / GOOD	19.13	74	
OSDF	C / CELL CONSTRUCTION	6.00	91	
	C / REVEGETATED AREA	6.30	79	
	C / GRAVEL SURFACE	2.00	89	
	C / RIPRAP	2.00	89	
	COMPOSITE AREA --->	57.02	81.7	(82)

000064

~~000241~~

```
  Quick TR-55 Ver.5.46    S/N:
  Executed: 08:58:24   02-09-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CUL2.TCT

                                     CULVERT 2
                                 (at GW-24" Line)


                         Tc COMPUTATIONS FOR: 1 + OSDF

   SHEET FLOW (Applicable to Tc only)
       Segment ID                                    1
       Surface description                       Range
       Manning's roughness coeff., n                  0.1300
       Flow length, L (total < or = 300)     ft       300.0
       Two-yr 24-hr rainfall, P2             in       3.000
       Land slope, s                       ft/ft      0.0233
                                 0.8
            .007 * (n*L)
       T =  --------------                   hrs        0.34                   =  0.34
                 0.5    0.4
              P2    *   s

   SHALLOW CONCENTRATED FLOW
       Segment ID                                    2
       Surface (paved or unpaved)?                Unpaved
       Flow length, L                        ft     1214.0
       Watercourse slope, s                ft/ft    0.0186

                                   0.5
       Avg.V =   Csf  *   (s)                ft/s     2.2005
       where:    Unpaved Csf  = 16.1345
                 Paved   Csf  = 20.3282

       T = L / (3600*V)                      hrs        0.15                   =  0.15


   CHANNEL FLOW
       Segment ID                                    3           4
       Cross Sectional Flow Area, a        sq.ft     15.27       20.00
       Wetted perimeter, Pw                  ft      12.97       15.79
       Hydraulic radius, r = a/Pw            ft      1.177       1.267
       Channel slope, s                    ft/ft    0.0040      0.0040
       Manning's roughness coeff., n                0.0400      0.0400

                             2/3     1/2
            1.49   *   r    *   s
       V =  --------------------             ft/s   2.6268      2.7580
                         n

       Flow length, L                        ft        375        1125

       T = L / (3600*V)                      hrs      0.04   +    0.11     =  0.15

   ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                TOTAL TIME (hrs)            0.65
```

Quick TR-55 Ver.5.46 S/N:
Executed: 08:58:24 02-09-1998
\engdata\c&sdata\po175\calc\swcalc2\CUL2.TCT

B5

~~1462~~

2053

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CULVERT 2
(at GW-24" Line)

Subarea descr.	Tc or Tt	Time (hrs)
1 + OSDF	Tc	0.65

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/use	
Sub 1 + OSDF	57.02	82.0	0.75	0.00	4.10	2.29	I.11	.11

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 57.02 acres or 0.08909 sq.mi
Peak discharge = 86 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Sub 1 + OSDF	0.65	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

~~1468~~

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 + OSDF	86	12.6
Composite Watershed	86	12.6

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Sub 1 + OSDF	3	3	5	7	9	13	23	38	59
Total (cfs)	3	3	5	7	9	13	23	38	59

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Sub 1 + OSDF	76	86	83	75	51	35	25	19	15
Total (cfs)	76	86	83	75	51	35	25	19	15

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Sub 1 + OSDF	13	10	9	7	6	6	5	5	4
Total (cfs)	13	10	9	7	6	6	5	5	4

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Sub 1 + OSDF	4	4	3	3	0
Total (cfs)	4	4	3	3	0

[redacted]

~~1403~~

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	3	14.8	8
11.1	3	14.9	7
11.2	3	15.0	7
11.3	3	15.1	7
11.4	4	15.2	7
11.5	4	15.3	6
11.6	5	15.4	6
11.7	6	15.5	6
11.8	6	15.6	6
11.9	7	15.7	6
12.0	9	15.8	6
12.1	13	15.9	6
12.2	23	16.0	6
12.3	38	16.1	6
12.4	59	16.2	6
12.5	76	16.3	5
12.6	86	16.4	5
12.7	83	16.5	5
12.8	75	16.6	5
12.9	63	16.7	5
13.0	51	16.8	5
13.1	43	16.9	5
13.2	35	17.0	5
13.3	30	17.1	5
13.4	25	17.2	5
13.5	22	17.3	4
13.6	19	17.4	4
13.7	17	17.5	4
13.8	15	17.6	4
13.9	14	17.7	4
14.0	13	17.8	4
14.1	12	17.9	4
14.2	11	18.0	4
14.3	10	18.1	~~[illegible]~~

000070

B10

14.4	10	18.2	4
14.5	9	18.3	4
14.6	9	18.4	4
14.7	8	18.5	4

[redacted]

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	4	22.4	3
18.7	4	22.5	3
18.8	4	22.6	3
18.9	4	22.7	2
19.0	4	22.8	2
19.1	4	22.9	2
19.2	4	23.0	2
19.3	4	23.1	2
19.4	4	23.2	2
19.5	4	23.3	2
19.6	3	23.4	2
19.7	3	23.5	2
19.8	3	23.6	2
19.9	3	23.7	2
20.0	3	23.8	2
20.1	3	23.9	2
20.2	3	24.0	2
20.3	3	24.1	1
20.4	3	24.2	1
20.5	3	24.3	1
20.6	3	24.4	1
20.7	3	24.5	1
20.8	3	24.6	1
20.9	3	24.7	1
21.0	3	24.8	1
21.1	3	24.9	1
21.2	3	25.0	1
21.3	3	25.1	1
21.4	3	25.2	1
21.5	3	25.3	1
21.6	3	25.4	0
21.7	3	25.5	0
21.8	3	25.6	0
21.9	3	25.7	0
22.0	3	25.8	0
22.1	3	25.9	0

22.2	3
22.3	3

B12

[redacted]

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

~~403~~

2053

Executed: 02-09-1998 09:00:36
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea escription	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
ub 1 + OSDF	57.02	82.0	0.75	0.00	4.80	2.90	I.09 .10

Travel time from subarea outfall to composite watershed outfall point.
-- Subarea where user specified interpolation between Ia/p tables.

Total area = 57.02 acres or 0.08909 sq.mi
Peak discharge = 110 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea escription	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
b 1 + OSDF	0.65	0.00	0.75	0.00	No	Computed Ia/p < .1

Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 + OSDF	110	12.6
Composite Watershed	110	12.6

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

~~1463~~

Executed: 02-09-1998 09:00:36

2053

Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Composite Hydrograph Summary (cfs)

Subarea escription	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
b 1 + OSDF	3	5	6	9	12	18	30	50	76
tal (cfs)	3	5	6	9	12	18	30	50	76

Subarea escription	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
b 1 + OSDF	98	110	106	95	65	44	32	24	19
tal (cfs)	98	110	106	95	65	44	32	24	19

Subarea escription	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
b 1 + OSDF	16	13	11	9	8	7	6	6	5
tal (cfs)	16	13	11	9	8	7	6	6	5

Subarea escription	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
b 1 + OSDF	5	4	4	3	0
tal (cfs)	5	4	4	3	0

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	3	14.8	10
11.1	4	14.9	9
11.2	4	15.0	9
11.3	5	15.1	9
11.4	5	15.2	9
11.5	6	15.3	8
11.6	6	15.4	8
11.7	7	15.5	8
11.8	8	15.6	8
11.9	9	15.7	8
12.0	12	15.8	7
12.1	18	15.9	7
12.2	30	16.0	7
12.3	50	16.1	7
12.4	76	16.2	7
12.5	98	16.3	6
12.6	110	16.4	6
12.7	106	16.5	6
12.8	95	16.6	6
12.9	80	16.7	6
13.0	65	16.8	6
13.1	54	16.9	6
13.2	44	17.0	6
13.3	38	17.1	6
13.4	32	17.2	6
13.5	28	17.3	5
13.6	24	17.4	5
13.7	21	17.5	5
13.8	19	17.6	5
13.9	17	17.7	5
14.0	16	17.8	5
14.1	15	17.9	5
14.2	14	18.0	5
14.3	13	18.1	5

14.4	12	18.2	5
14.5	12	18.3	5
14.6	11	18.4	5
14.7	10	18.5	5

B17

~~1 403~~

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	4	22.4	3
18.7	4	22.5	3
18.8	4	22.6	3
18.9	4	22.7	2
19.0	4	22.8	2
19.1	4	22.9	2
19.2	4	23.0	2
19.3	4	23.1	2
19.4	4	23.2	2
19.5	4	23.3	2
19.6	4	23.4	2
19.7	4	23.5	2
19.8	4	23.6	2
19.9	4	23.7	2
20.0	4	23.8	2
20.1	4	23.9	2
20.2	4	24.0	2
20.3	4	24.1	1
20.4	4	24.2	1
20.5	4	24.3	1
20.6	4	24.4	1
20.7	4	24.5	1
20.8	4	24.6	1
20.9	4	24.7	1
21.0	4	24.8	1
21.1	3	24.9	1
21.2	3	25.0	1
21.3	3	25.1	1
21.4	3	25.2	1
21.5	3	25.3	1
21.6	3	25.4	0
21.7	3	25.5	0
21.8	3	25.6	0
21.9	3	25.7	0
22.0	3	25.8	0
22.1	3	25.9	0

22.2	3
22.3	3

B19

~~1463~~

2053

000080

~~000257~~

SHEET ____ OF ____

CULVERT ANALYSIS

DATE- 2/9/98

DESIGNED BY- KG
CHECKED BY- A. M. Haw 5/5/98

CONTRACT- A1 P II SCS
TITLE- CULVERT 2 - 36"ØHDPE OPTION

HYDROLOGIC INFORMATION

SCS METHOD

AREA - ____ AC.= ____ SM.

RCN.= ____

t_c = ____ MIN.= ____ HRS.

RATIONAL METHOD

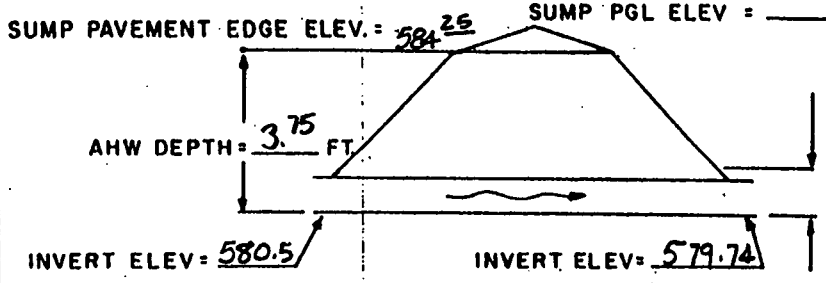
AREA - ____ AC.

C_w = ____

t_c = ____ MIN.
i_2 = ____ "/HR.
i_{10} = ____ "/HR.
i_{100} = ____ "/HR.

CULVERT DIMENSION(S)- ____ IN.= ____ FT.

CULVERT STATION 2
SUMP STATION ____
SUMP PGL ELEV = ____



S_o = 0.4 %
L = 191 FT.

CULVERT TYPE & ENTRANCE TYPE	Q CFS	HEADWATER COMPUTATION: INLET CONTROL HW/D	INLET CONTROL HW	OUTLET CONTROL Ke	Dc	(Dc+D)/2	TW	h_o	S_fL	V_f	$V_f^2/2g$	H	LSo	HW	CONTROLLING HW DEPTH	CONTROLLING HW SURF. ELEV.	COMMENTS
TRY 5-36"Ø	17.2	0.64	1.92														Q_{10} = 86 cfs
TRY 3-36"Ø	28.7	0.88	2.64														
TRY 5-36"Ø	22	0.74	2.22														Q_{25} = 110 cfs
TRY 3-36"Ø	36.7	1.06	3.18	0.7*	1.90	2.45	2.04	2.45	~	~	~	1.2	0.76	2.89	3.18	583.68	

FORMULAE:

OUTLET CONTROL:

$HW = h_o + H - LSo$

$H = S_fL + (1 + K_e)\left(\frac{V_f^2}{2g}\right)$

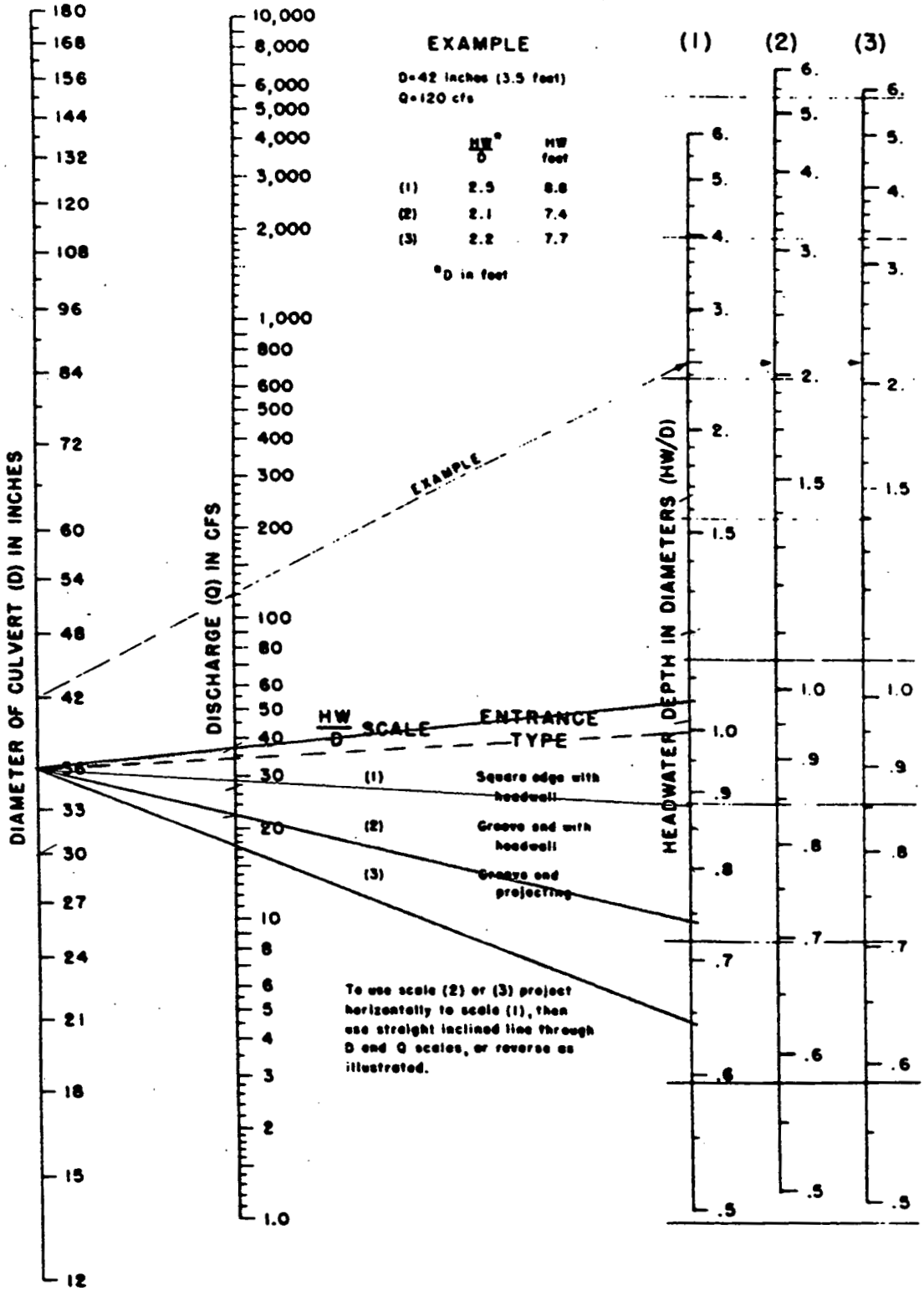
REMARKS:
PIPE IS HDPE. USE n = 0.012
*Ke = 0.7 but use 0.5 for calc.
TW = PIPE FLOW DEPTH

000081

320

B21
~~1463~~

Fig. 1100-246 2053



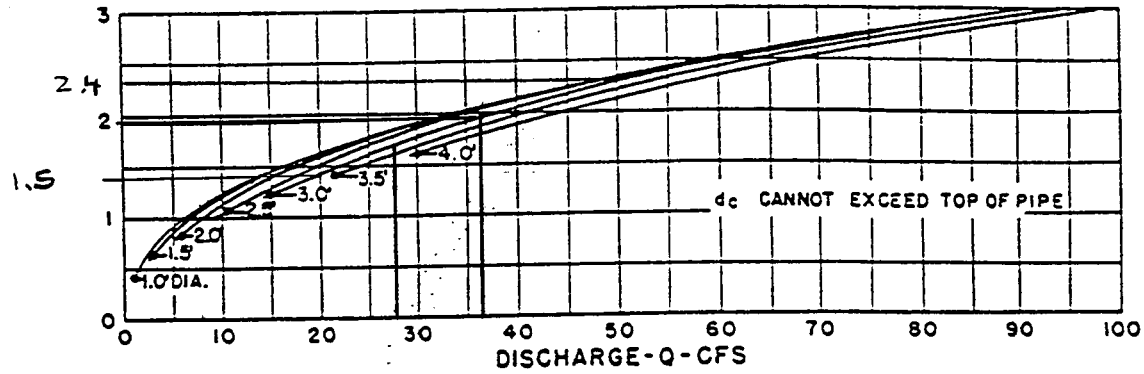
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

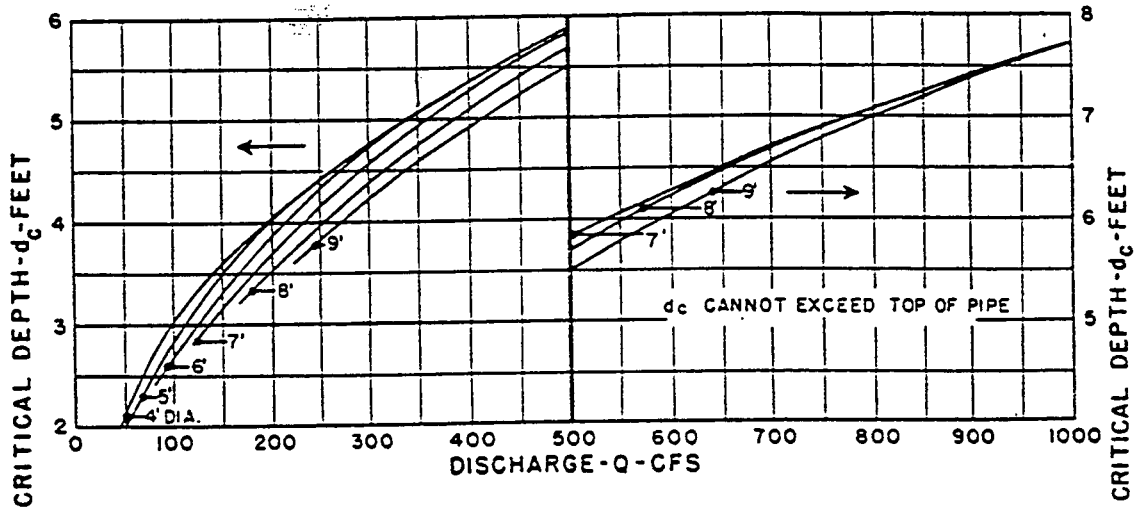
000082

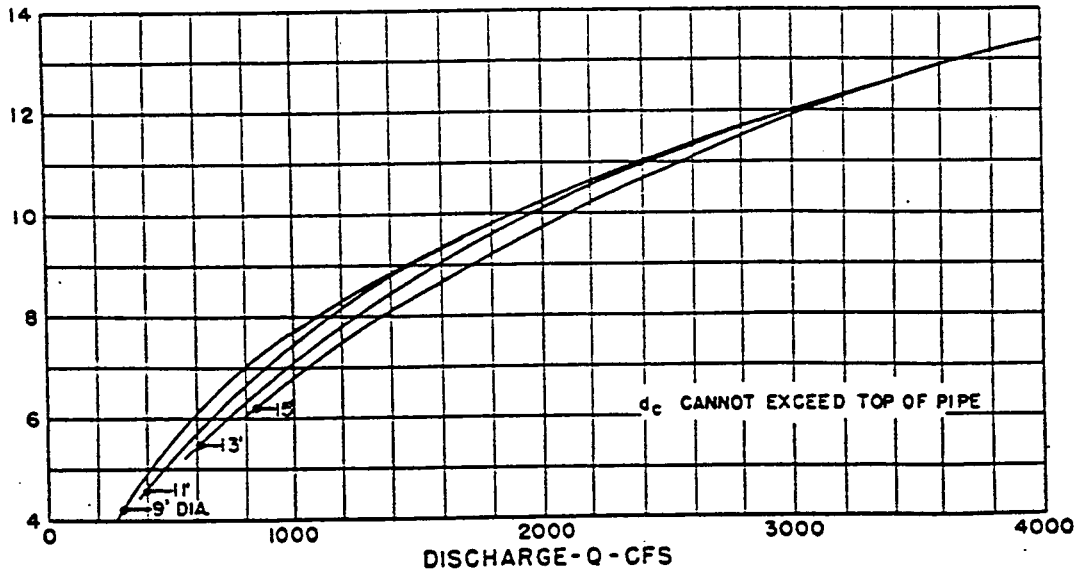
~~000215~~

SHT B22

CHART 4







BUREAU OF PUBLIC ROADS

JAN. 1964

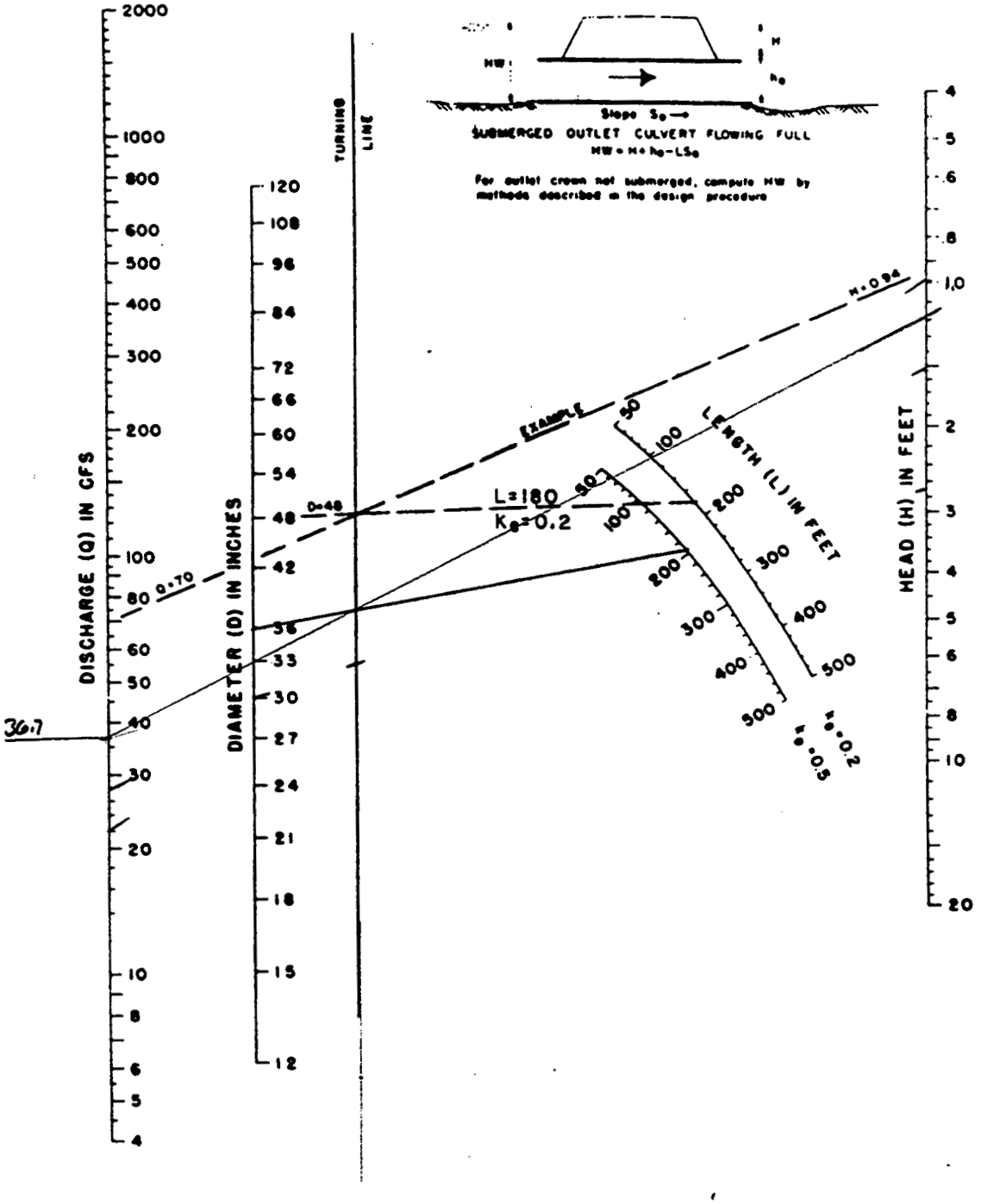
CRITICAL DEPTH
CIRCULAR PIPE

[redacted]

000083

B23
2053
~~1463~~

Fig.1100-249



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

Pipe calc for flow depth, HW calc
Worksheet for Circular Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	CUVLERT 2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.012	
Channel Slope	0.004000	ft/ft
Diameter	36.00	in
Discharge	36.70	cfs

Results		
Depth	2.04	ft
Flow Area	5.11	ft^2
Wetted Perimeter	5.81	ft
Top Width	2.80	ft
Critical Depth	1.97	ft
Percent Full	67.85	
Critical Slope	0.004378	ft/ft
Velocity	7.19	ft/s
Velocity Head	0.80	ft
Specific Energy	2.84	ft
Froude Number	0.94	
Maximum Discharge	49.16	cfs
Full Flow Capacity	45.70	cfs
Full Flow Slope	0.002580	ft/ft
Flow is subcritical.		

Notes:

Assume Q25=110cfs total
3 pipes = 36.7cfs each

n=0.012 for HDPE

[redacted] 000085

TABLE 12 - ENTRANCE LOSS COEFFICIENTS

Outlet Control, Full or Partly Full Entrance head loss

$$H_e = k_e \left(\frac{V^2}{2g}\right)$$

Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2

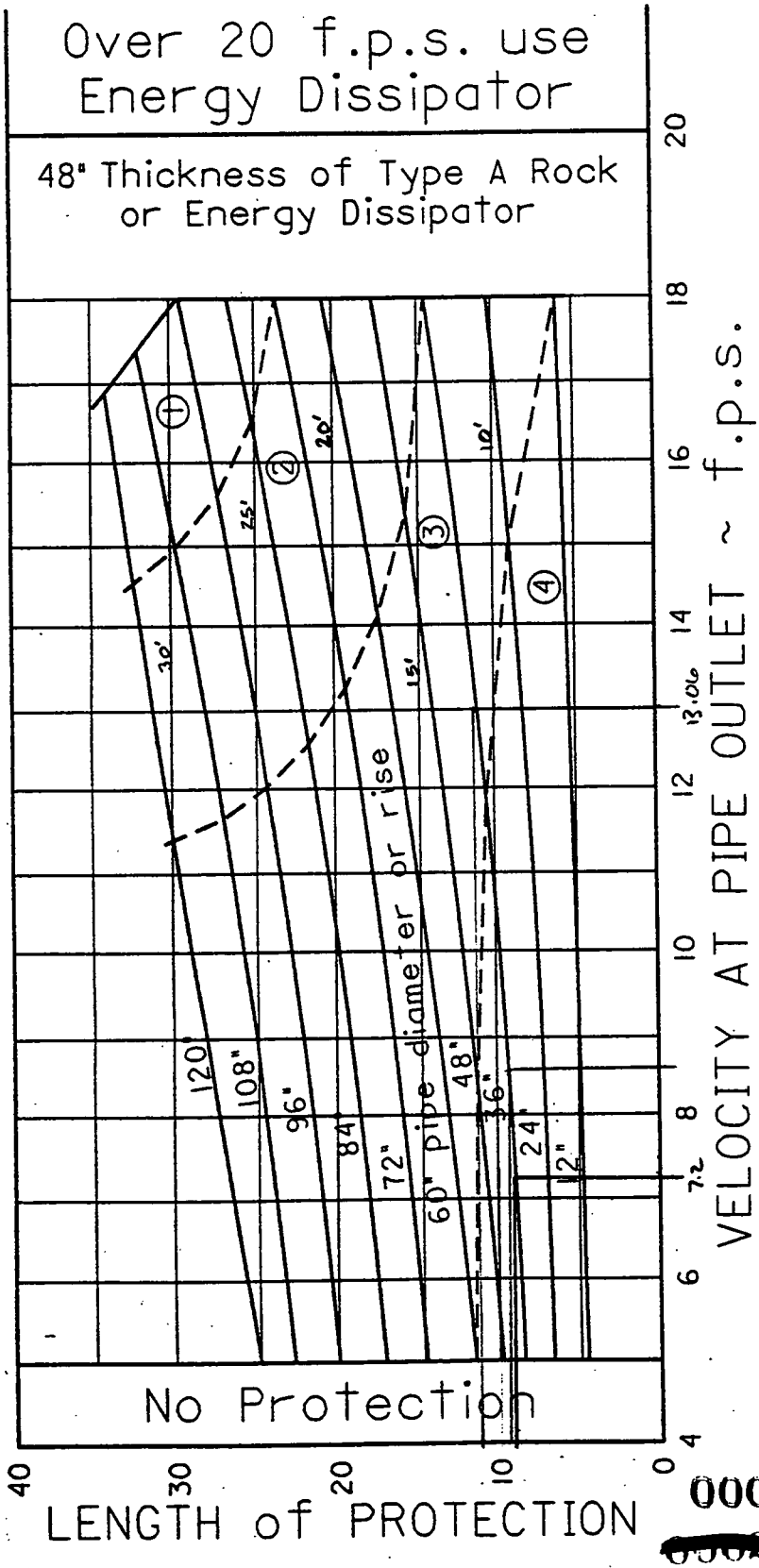
*Note: "End Section conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be

CULVERT 2

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION
1107.2



ROCK TYPE

LEGEND
① 48" of 18" rock A
② 36" of 18" rock A
③ 30" of 12" rock B
④ 18" of 6" rock C

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

B27

~~1162~~

2053

Sediment Basin 1 Sump
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	Culvert 2 Outfall
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0833	ft/ft
Left Side Slope	6.00	H : V
Right Side Slope	6.00	H : V
Bottom Width	12.00	ft
Discharge	110.0	cfs

Results		
Depth	0.76	ft
Flow Area	12.68	ft^2
Wetted Perimeter	21.30	ft
Top Width	21.18	ft
Critical Depth	1.13	ft
Critical Slope	0.019169	ft/ft
Velocity	8.67	ft/s
Velocity Head	1.17	ft
Specific Energy	1.93	ft
Froude Number	1.98	
Flow is supercritical.		

Notes:

Calculation for Outlet stabilization within the basin assumed to be similar to channel flow.

Assume dumped rock n = 0.035

Q25 = 110 cfs

000088

~~000285~~

Sediment Basin 1
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	Culvert 2 Outfall
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0167	ft/ft
Left Side Slope	6.00	H : V
Right Side Slope	6.00	H : V
Bottom Width	31.00	ft
Discharge	110.0	cfs

Results		
Depth	0.75	ft
Flow Area	26.45	ft^2
Wetted Perimeter	40.07	ft
Top Width	39.95	ft
Critical Depth	0.70	ft
Critical Slope	0.020974	ft/ft
Velocity	4.16	ft/s
Velocity Head	0.27	ft
Specific Energy	1.01	ft
Froude Number	0.90	
Flow is subcritical.		

Notes:

Calculation for Outlet stabilization within the basin assumed to be similar to channel flow.

Assume dumped rock n = 0.035

Q25 = 110 cfs

Attachment C - DITCH 1

DRAINAGE AREA:

- Part of Subarea 2A = 6.37 ac.

CRITERIA:

- 10-Year, 24-hour Storm

SUMMARY:

Q_{10} = 10 cfs
V_{10} = 2.5 fps

COMMENTS:

The purpose of Ditch 1 is to control stormwater run on into the Trap Range. The CN is based on the assumption that the area remains mostly vegetated and undisturbed from its present condition, open space in good condition.

C2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:10:52 04-18-1998

Ditch 1
Trap Range Area

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Ditch 1	6.37	75

C3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:10:52 04-18-1998

~~1468~~

2053

Ditch 1
Trap Range Area

RUNOFF CURVE NUMBER DATA

::

Composite Area: Ditch 1

SURFACE DESCRIPTION	AREA (acres)	CN	
CONSTRUCTION (bare soil)	0.21	91	
C/OPEN SPACE/GOOD	6.16	74	
COMPOSITE AREA --->	6.37	74.6	(75)

::

000092

Quick TR-55 Ver.5.46 S/N:
Executed: 10:15:59 04-18-1998
p:\engdata\c&sdata\po175\calc\swcalc2\DITCH1.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

DITCH 1
TRAP RANGE AREA

Subarea descr.	Tc or Tt	Time (hrs)
DITCH1	Tc	0.44

C5

Quick TR-55 Ver.5.46 S/N:
Executed: 10:15:59 04-18-1998
\engdata\c&sdata\po175\calc\swcalc2\DITCH1.TCT

2053

DITCH 1
TRAP RANGE AREA

Tc COMPUTATIONS FOR: DITCH1

SHEET FLOW (Applicable to Tc only)

Segment ID		2-1	
Surface description		range	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0392	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.28	= 0.28

SHALLOW CONCENTRATED FLOW

Segment ID		2-2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	487.0	
Watercourse slope, s	ft/ft	0.0068	
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.3305	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.10	= 0.10

CHANNEL FLOW

Segment ID		2-3	
Cross Sectional Flow Area, a	sq.ft	7.26	
Wetted perimeter, Pw	ft	11.37	
Hydraulic radius, r = a/Pw	ft	0.639	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.7621	
Flow length, L	ft	570	
T = L / (3600*V)	hrs	0.06	= 0.06

::

TOTAL TIME (hrs) 0.44

000094

C6

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/use
Ditch 1	6.37	75.0	0.40	0.00	4.10	1.74	I.16 .16

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 6.37 acres or 0.00995 sq.mi
Peak discharge = 10 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Ditch 1	0.44	0.00	0.40	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

[redacted]

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Ditch 1	10	12.3
Composite Watershed	10	12.3

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Ditch 1	0	0	0	1	2	4	7	10	10
Total (cfs)	0	0	0	1	2	4	7	10	10

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Ditch 1	7	5	4	3	2	1	1	1	1
Total (cfs)	7	5	4	3	2	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Ditch 1	1	1	1	1	1	0	0	0	0
Total (cfs)	1	1	1	1	1	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Ditch 1	0	0	0	0	0
Total (cfs)	0	0	0	0	0

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

~~1462~~

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56

Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP

Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	1	15.6	1
11.9	1	15.7	1
12.0	2	15.8	0
12.1	4	15.9	0
12.2	7	16.0	0
12.3	10	16.1	0
12.4	10	16.2	0
12.5	7	16.3	0
12.6	5	16.4	0
12.7	4	16.5	0
12.8	3	16.6	0
12.9	2	16.7	0
13.0	2	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0

C10

14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

Return Frequency: 10 years

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0

C 12

22.2	0
22.3	0

Table
Rating Table for Trapezoidal Channel

2003

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	DITCH 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data		
Mannings Coefficient	0.040	
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft

(ASSUME FOR ECM)

Input Data				
	Minimum	Maximum	Increment	
Channel Slope	0.005000	0.020000	0.001000	ft/ft
Discharge	6.00	10.00	1.00	cfs

Rating Table

Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
6.00	0.005000	0.81	1.67
6.00	0.006000	0.78	1.78
6.00	0.007000	0.75	1.88
6.00	0.008000	0.73	1.98
6.00	0.009000	0.71	2.07
6.00	0.010000	0.69	2.15
6.00	0.011000	0.67	2.23
6.00	0.012000	0.66	2.30
6.00	0.013000	0.64	2.37
6.00	0.014000	0.63	2.43
6.00	0.015000	0.62	2.49
6.00	0.016000	0.61	2.55
6.00	0.017000	0.60	2.61
6.00	0.018000	0.60	2.66
6.00	0.019000	0.59	2.72
6.00	0.020000	0.58	2.77
7.00	0.005000	0.87	1.73
7.00	0.006000	0.84	1.85
7.00	0.007000	0.81	1.96
7.00	0.008000	0.78	2.06
7.00	0.009000	0.76	2.15
7.00	0.010000	0.74	2.24

CK

Table
Rating Table for Trapezoidal Channel

Rating Table			
Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
7.00	0.011000	0.72	2.32
7.00	0.012000	0.71	2.39
7.00	0.013000	0.70	2.46
7.00	0.014000	0.68	2.53
7.00	0.015000	0.67	2.60
7.00	0.016000	0.66	2.66
7.00	0.017000	0.65	2.72
7.00	0.018000	0.64	2.78
7.00	0.019000	0.63	2.83
7.00	0.020000	0.63	2.89
8.00	0.005000	0.93	1.80
8.00	0.006000	0.89	1.92
8.00	0.007000	0.86	2.03
8.00	0.008000	0.83	2.14
8.00	0.009000	0.81	2.23
8.00	0.010000	0.79	2.32
8.00	0.011000	0.77	2.40
8.00	0.012000	0.76	2.48
8.00	0.013000	0.74	2.55
8.00	0.014000	0.73	2.62
8.00	0.015000	0.72	2.69
8.00	0.016000	0.71	2.76
8.00	0.017000	0.69	2.82
8.00	0.018000	0.69	2.88
8.00	0.019000	0.68	2.94
8.00	0.020000	0.67	2.99
9.00	0.005000	0.98	1.85
9.00	0.006000	0.94	1.98
9.00	0.007000	0.91	2.10
9.00	0.008000	0.88	2.20
9.00	0.009000	0.86	2.30
9.00	0.010000	0.84	2.39
9.00	0.011000	0.82	2.48
9.00	0.012000	0.80	2.56
9.00	0.013000	0.78	2.63
9.00	0.014000	0.77	2.71
9.00	0.015000	0.76	2.78
9.00	0.016000	0.75	2.84
9.00	0.017000	0.74	2.91
9.00	0.018000	0.73	2.97
9.00	0.019000	0.72	3.03
9.00	0.020000	0.71	3.09
Q_{10} = 10.00	0.005000	1.03	1.90 ←
10.00	0.006000	0.99	2.04
10.00	0.007000	0.95	2.16

[redacted]

000103

C 15

~~1403~~

2053

Table
Rating Table for Trapezoidal Channel

Rating Table

Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)	
10.00	0.008000	0.92	2.26	
10.00	0.009000	0.90	2.37	
10.00	0.010000	0.88	2.46	
10.00	0.011000	0.86	2.55	
10.00	0.012000	0.84	2.63	
10.00	0.013000	0.82	2.71	
10.00	0.014000	0.81	2.78	
10.00	0.015000	0.80	2.86	
10.00	0.016000	0.79	2.92	
10.00	0.017000	0.77	2.99	
10.00	0.018000	0.76	3.05	← OK w/ELM
10.00	0.019000	0.75	3.12	
10.00	0.020000	0.74	3.17	

~~000081~~

000104

Attachment D - Ditch 2

DRAINAGE AREA:

- Part of Subarea 2, = 1.85 acres

CRITERIA:

- 10-Year, 24-hour Storm

SUMMARY:

Q_{10} = 6 cfs
V_{10} = 1.67 fps

COMMENTS:

The purpose of Ditch 2 is to control stormwater run off from the Trap Range. The CN is based on the assumption that the area remains mostly disturbed due to construction but has some vegetated and undisturbed areas from its present condition, open space in good condition.

While the velocity is well below the need for check dams, several will be used to limit the release of sediment from the area. A grass strip will be maintained between Ditch 2 and the work area in an effort to capture sediment .

D 2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:12:23 04-18-1998

Ditch 2
Trap Range Area

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Ditch 2	1.85	88

[redacted]

D-3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:12:23 04-18-1998

~~1463~~

2053

Ditch 2
Trap Range Area

RUNOFF CURVE NUMBER DATA

Composite Area: Ditch 2

SURFACE DESCRIPTION	AREA (acres)	CN	
CONSTRUCTION (bare soil)	1.50	91	
C/OPEN SPACE/GOOD	0.35	74	
COMPOSITE AREA --->	1.85	87.8	(88)

D4

Quick TR-55 Ver.5.46 S/N:
Executed: 10:18:57 04-18-1998
p:\engdata\c&sdata\po175\calc\swcalc2\DITCH2.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

DITCH 2
TRAP RANGE AREA

Subarea descr.	Tc or Tt	Time (hrs)
DITCH2	Tc	0.33

[redacted]

```
Quick TR-55 Ver.5.46   S/N:
Executed: 10:18:57   04-18-1998
:\engdata\c&sdata\po175\calc\swcalc2\DITCH2.TCT

                              DITCH 2
                          TRAP RANGE AREA


                   Tc COMPUTATIONS FOR: DITCH2

 SHEET FLOW (Applicable to Tc only)
     Segment ID                                    2-21
     Surface description                      range
     Manning's roughness coeff., n                  0.1300
     Flow length, L (total < or = 300)          ft    185.0
     Two-yr 24-hr rainfall, P2                  in    3.000
     Land slope, s                           ft/ft    0.0392
                           0.8
          .007 * (n*L)
     T =  --------------                       hrs      0.19          =  0.19
             0.5    0.4
           P2    *  s

 SHALLOW CONCENTRATED FLOW
     Segment ID
     Surface (paved or unpaved)?
     Flow length, L                             ft      0.0
     Watercourse slope, s                    ft/ft    0.0000

                               0.5
     Avg.V =  Csf *  (s)                      ft/s    0.0000
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                          hrs      0.00          =  0.00


 CHANNEL FLOW
     Segment ID                                    2-22
     Cross Sectional Flow Area, a            sq.ft      5.06
     Wetted perimeter, Pw                       ft      8.32
     Hydraulic radius, r = a/Pw                 ft     0.608
     Channel slope, s                        ft/ft    0.0050
     Manning's roughness coeff., n                    0.0400

                      2/3    1/2
          1.49   *  r    *  s
     V =  --------------------                ft/s    1.8907
                    n

     Flow length, L                             ft       985

     T = L / (3600*V)                          hrs      0.14          =  0.14
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                   TOTAL TIME (hrs)      0.33
```

D6

Ditch 2 Tc Calc
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	Ditch 2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.005000	ft/ft
Depth	1.00	ft
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft

Results		
Discharge	9.35	cfs
Flow Area	5.00	ft^2
Wetted Perimeter	8.32	ft
Top Width	8.00	ft
Critical Depth	0.64	ft
Critical Slope	0.032363	ft/ft
Velocity	1.87	ft/s
Velocity Head	0.05	ft
Specific Energy	1.05	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

For Tc calc only

Assume n = 0.04 for grass & ECM

[redacted] 000110

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

2053

Executed: 04-18-1998 10:23:22
Watershed file: -->
:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Ditch 2	1.85	88.0	0.30	0.00	4.10	2.82	I.07	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 1.85 acres or 0.00289 sq.mi
Peak discharge = 6 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
itch 2	0.33	0.00	0.30	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Ditch 2	6	12.2
Composite Watershed	6	12.2

[redacted]

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
itch 2	0	0	0	1	2	4	6	6	4
otal (cfs)	0	0	0	1	2	4	6	6	4

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
itch 2	2	2	1	1	1	1	0	0	0
otal (cfs)	2	2	1	1	1	1	0	0	0

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
itch 2	0	0	0	0	0	0	0	0	0
otal (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
itch 2	0	0	0	0	0
otal (cfs)	0	0	0	0	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	2	15.8	0
12.1	4	15.9	0
12.2	6	16.0	0
12.3	6	16.1	0
12.4	4	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0

14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

D11 -

~~1463~~

2053

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0

22.2	0
22.3	0

D13

~~1463~~

2053

D 14

Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	Ditch 2 at Trap Range
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data		
Mannings Coefficient	0.040	
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft
Discharge	6.00	cfs

Q10

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.020000	0.001000 ft/ft

Rating Table		
Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
0.005000	0.81	1.67
0.006000	0.78	1.78
0.007000	0.75	1.88
0.008000	0.73	1.98
0.009000	0.71	2.07
0.010000	0.69	2.15
0.011000	0.67	2.23
0.012000	0.66	2.30
0.013000	0.64	2.37
0.014000	0.63	2.43
0.015000	0.62	2.49
0.016000	0.61	2.55
0.017000	0.60	2.61
0.018000	0.60	2.66
0.019000	0.59	2.72
0.020000	0.58	2.77

[redacted]

Attachment E - SEDIMENT BASIN 1

DRAINAGE AREA:

- For A1PII construction activities, the following drainage Subareas drain to Sediment Basin 1:

Subarea 1	40.72 acres
Subarea 2	26.11
Subarea 3B	6.36
Total	73.19 acres

The addition of other draiange areas into the basin will require additional storage which will be the responsibility of others. This would include the possible addition of flow from the OSDF Cell construction or OSDF Borrow Area construction.

CRITERIA:

The required volume of storage is based on the requirements of the ODNR *Rainwater and Land Development* manual. The requirements are as follows:

- Minimum volume of sediment basin equals 67 cubic yard per arcre of drainage area
- Maximum sediment storage before cleanout is equal to 27 cubic yard per acre of drainage area

Other criteria from ODNR is that the total stoarge volume before overtopping the embankment is less than 15 acre-feet. Ohio Dam Safety Laws may come into effect if the embankment is greater than 10 feet.

SUMMARY:

The required volume of storage and cleanout for A1PII are as follows:

• Minimum volume of sediment basin	4,904 cy 132,401 cf 3.04 ac-ft
• Maximum sediment storage (Cleanout volume)	1,976 cy 53,356 cf 1.22 ac-ft

Storage

Sediment Basin 1 has a sump below the base of the outlet riser and the 8" perforated cmp riser pipe. This sump is the maximum sediment storage volume (sediment clean out elevation) and is considered "dead storage" (ie. Not usable) for routing calculations. The 8" perforated cmp riser is assumed to be not operational as far as allowing water into the outlet structure during the storm but it is assumed to allow water to seep in after the storm. What this means is that no credit is taken for inflow through the 8" perforated riser during the storm, but it will dewater the basin over time so that the starting condition for the routing is based on the sediment clean out elevation. Maximum storage is considered to be at the elevation at which water starts to overtop the North Entrance Road (elevation 578.34 per field run survey). The area attributed to this elevation is an extrapolation of the previous readings and is likely low.

Summary

- Peak Inflow, $Q_{10\text{-}yr}$ = 158 cfs
- Peak Outflow = 136 cfs
- Peak Elevation, $Q_{10\text{-}yr}$ = 576.8'

E 3

SEDIMENT BASIN 1
STORAGE VOLUME

2053 ~~1403~~

A1PII Sediment Basin

Elev	Area ft^2	Ave. Area	Ht. ft	Volume ft^3	Cum. Vol. ft^3	Cum. Vol. Above CO ft^3	ac.ft
567	12,728						
		14,835.5	1.0	14,836	14,836		
568	16,943						
		19,202.5	1.0	19,203	34,038		
569	21,462						
		23,334.0	0.8	18,201	52,239		
569.78	25,206					CO	
		24,945.5	0.22	5,488	57,727	5,488	0.1260
570	28,429						
		31,207.0	1.0	31,207	88,934	36,695	0.8424
571	33,985						
		37,729.5	1.0	37,730	126,663	74,425	1.7086
572	41,474						
		44,611.0	1.0	44,611	171,274	119,036	2.7327
573	47,748						
		50,986.0	1.0	50,986	222,260	170,022	3.9032
574	54,224						
		57,570.5	1.0	57,571	279,831	227,592	5.2248
575	60,917						
		61,883.5	0.3	17,327	297,158	244,919	5.6226
575.28	62,850						
		64,366.5	1.0	64,367	344,197	291,959	6.7024
576	67,816						
		71,368.0	1.0	71,368	415,565	363,327	8.3408
577	74,920						
		78,756.5	1	78,757	494,322	442083.01	10.1488
578	82,593						
		84,051.5	0.34	28,578	522,899	470660.52	10.8049
578.34	85,510						

NOTE:

1 Contours set for 48" riser at elev. 569.78.

2 Minimum storage volume is 132,401 cf

572	126,663	cf	
min storage elev	132,401	cf @ 67cy/ac	
573	171,274		
	5,738		0.13
	44,611		

min storage elev = 572.13

min storage elev - inv. = 2.35 ft.

3 CO is the cleanout volume @ 27 cy/ac

~~000288~~

000121

SEDIMENT BASIN 1
OUTLET CONTROL

AIPII Sediment Basin					
WEIR		ORIFICE		PIPE	
D_R (in.) =	48	D_R (in.) =	48	D (in.) =	48
INVERT	575.28	INVERT	575.28	NVERT IN	569.80
C =	9.739	C=	3.78	INV. OUT=	569.00
				LENGTH=	200
				AREA(sf)=	12.56
				H_O =	571.00
				g =	32.20
				KM =	1.00
				KP =	0.0168
				n =	0.024

WSE	H	Q_W	H	Q_O	H	Q_P	Q_{MIN}	2 X Q_{MIN}
	ft	cfs	ft	cfs	ft	cfs	cfs	cfs
569.00	N/A	0	N/A	0	N/A	0	0	0
570.00	N/A	0	N/A	0	N/A	0	0	0
571.00	N/A	0	N/A	0	N/A	0	0	0
572.00	N/A	0	N/A	0	N/A	0	0	0
573.00	N/A	0	N/A	0	N/A	0	0	0
574.00	N/A	0	N/A	0	N/A	0	0	0
575.00	N/A	0	N/A	0	N/A	0	0	0
576.00	0.72	24	0.72	51	5.00	97	24	48
577.00	1.72	88	1.72	79	6.00	107	79	159
578.00	2.72	175	2.72	100	7.00	115	100	200
578.34	3.06	209	3.06	106	7.34	118	106	212

$Q_w = 9.739*(D_R/12)*H^{3/2}$

$Q_o = 3.782*(D_R/12)^2*H^{1/2}$

Weir and orifice flow equations from ODNR *Rainwater and Land Development*, pg. 103.

$Q_P = a*(2gH/1+K_M+K_P*L)^{1/2}$

Pipe flow equation from SCS, *Engineering Field Manual fo Conservation Practices*, Chapter 3. (eq 3-12)

where

Q_P = discharge, cfs

g = acceleration of gravity, ft/sec^2

H = elevation of head differental, ft [ie. WSE-(INV_O + 1/2 dia)]

K_M = coefficient of minor losses (use 1.0 for bend and entrance)

K_P = pipe friction coefficient = $(5087*n^2)/d_i^{4/3}$ (eq 3-9)

L = pipe length, ft

PARSONS ERA PROJECT

CALCULATION SHEET

REV	BY	DATE	CK	DATE
0A	KG	2/20/98	MH	3/19/98
0B	KG	5/2/98	MH	5/5/98

TITLE A1 PII SP Pkg.

PRINCIPAL SPILLWAY

AUTHOR K.G 2/20/98 SHEET E5 OF

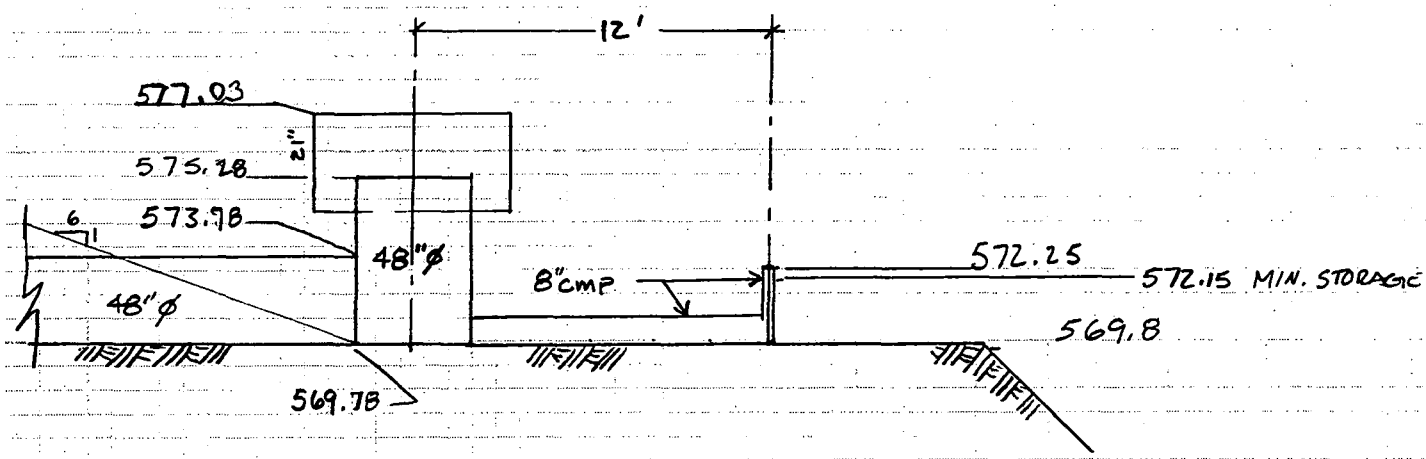
Project SEEP

PO No. 175

ASSUME:
TWIN 48" BCCMP, $n = 0.024$
$S = 0.40\%$
$L = 200'$

ODOT VOL II 1104.45
CONTECH, CSP-101

8" CMP / RISER NOT OPERATING



$Q_w = 9.739 * (D_R/12) * H^{3/2}$ (from ODNR)

$Q_o = 3.782 * (D_R/12)^2 * H^{1/2}$

E 6

TW calc using outlet channel, Q25=200 cf
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Principal Spillway Outfall Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data			
Mannings Coefficient	0.035		
Channel Slope	0.008000	ft/ft	
Left Side Slope	3.000000	H : V	
Right Side Slope	3.000000	H : V	
Bottom Width	16.00	ft	
Discharge	200	cfs	(ASSUMED)

Results		
Depth	1.89	ft
Flow Area	40.87	ft^2
Wetted Perimeter	27.93	ft
Top Width	27.32	ft
Critical Depth	1.53	ft
Critical Slope	0.017001	ft/ft
Velocity	4.89	ft/s
Velocity Head	0.37	ft
Specific Energy	2.26	ft
Froude Number	0.71	
Flow is subcritical.		

Notes:

For TW elev only

Assume: riprap n=0.035
Q25=200 cfs

[redacted] 000124

E 7

2053

Outlet Channel at Principal Spillway
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Outlet Channel - 16' Flat Bottom
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0080	ft/ft
Depth	2.00	ft
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	16.0	ft

Results		
Discharge	222	cfs
Flow Area	44.00	ft^2
Wetted Perimeter	28.65	ft
Top Width	28.00	ft
Critical Depth	1.63	ft
Critical Slope	0.016711	ft/ft
Velocity	5.05	ft/s
Velocity Head	0.40	ft
Specific Energy	2.40	ft
Froude Number	0.71	
Flow is subcritical.		

Notes:

Discharge for proposed channel at 2.0 ft height of flow = height of proposed riprap.

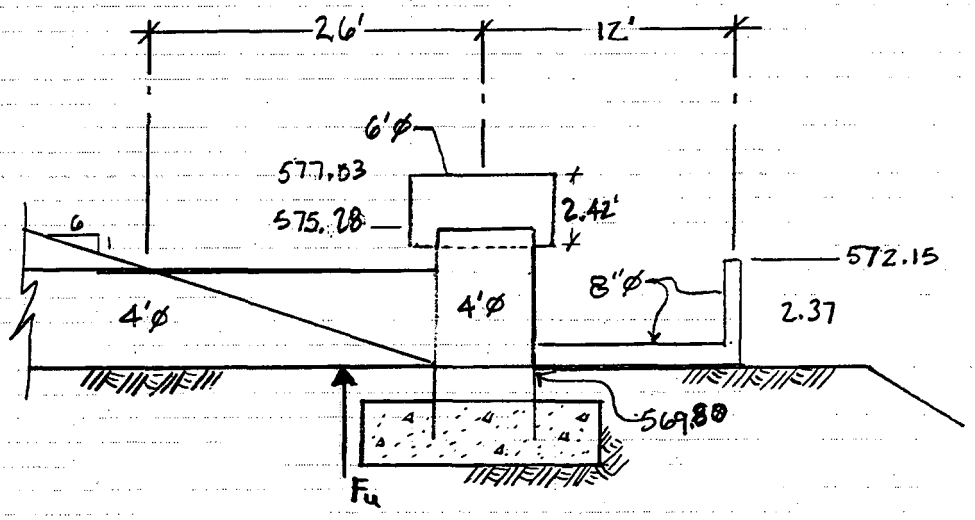
Assume riprap n = 0.035

000125

PARSONS ERA PROJECT

CALCULATION SHEET

REV	BY	DATE	CK	DATE	TITLE A1PII STORMWATER CONTROL ANTI-FLOTATION @ SED BASIN 1	Project SCEP
0A	KG	2/25/98	MH	3/19/98		
0B	KG	5/4/98	MH	5/5/98		PO No. 175
					AUTHOR K. GERARD 2/25 SHEET E 8 OF	



1. DETERMINE BUOYANT FORCE, F_u

$F_u = Vol \times W_w$ WHERE $W_w = 62.4\ lb/ft^3$

$Vol = (10' + 2.37') \times \pi \frac{(0.67)^2}{4} + (573.30' - 569.80') \times \pi (4)^2/4 + 24' \times \pi (4)^2/4 +$

$2.42' \times \pi (6)^2/4$

$= 4.36 ft^3 + 69.12 ft^3 + 301.59 ft^3 + 68.33 ft^3$

$Vol = 443.4\ ft^3$

$F_u = 443.4\ ft^3 \times 62.4\ lb/ft^3$

$F_u = 27{,}668\ lbs$

2. DETERMINE VOLUME OF CONCRETE REQUIRED TO COUNTER F_u

IGNORE WEIGHT OF PIPE & GRAVEL. USE $S_{F_{min}} = 1.1$

$Vol_c = 1.1 \times \frac{F_u}{(W_c - W_w)}$ WHERE W_c = WT OF CONC. = $150\ lb/ft^3$

$W_c - W_w$ ASSUMES GROUND UNDER RISER IS SATURATED.

$= 1.1 \times \frac{27{,}668\ lbs}{(150\ lb/ft^3 - 62.4\ lb/ft^3)}$

$Vol_c = 347.4 ft^3$

TRY $11' \times 11' \times 3'\text{-}0'' = 363\ ft^3$ ∴ OK

PARSONS ERA PROJECT

CALCULATION SHEET

REV	BY	DATE	CK	DATE
0A	KG	2/25/98	AMH.	3/19/98
0B	KG	5/2/98	AMH	5/5/98

TITLE A1PII STORMWATER CONTROL
ANTI SEEP COLLARS @ 48" PIPE
OR BENTONITE - SOIL PLUG

AUTHOR K. GERARD 2/25 SHEET E9 OF

Project SCEP

PO No. 175

1. DETERMINE NUMBER & SIZE OF ANTI SEEP COLLARS REQ'D.[1,2,4]

$N = 0.075\ L/V$ WHERE N = NUMBER OF COLLARS
L = LENGTH OF PIPE IN SATURATION ZONE
V = COLLAR PROJECTION

2. ASSUME $L = 140'$ SEE SKETCH

3 TRY $V = 3'-0''$ w/ 4 COLLARS.

$n = 0.075\ (140')/3'$ $4 = 0.075(140')/V$
$V = 2.625'$

$n = 3.5$

USE A MIN. OF 4 COLLARS WITH A MIN. PROJECTION OF 2'-8"

FOR 3 COLLARS, FIND V REQ.

$3 = 0.075\ (140/V)$
$V = 3.5'$

SPACING GUIDANCE[3]

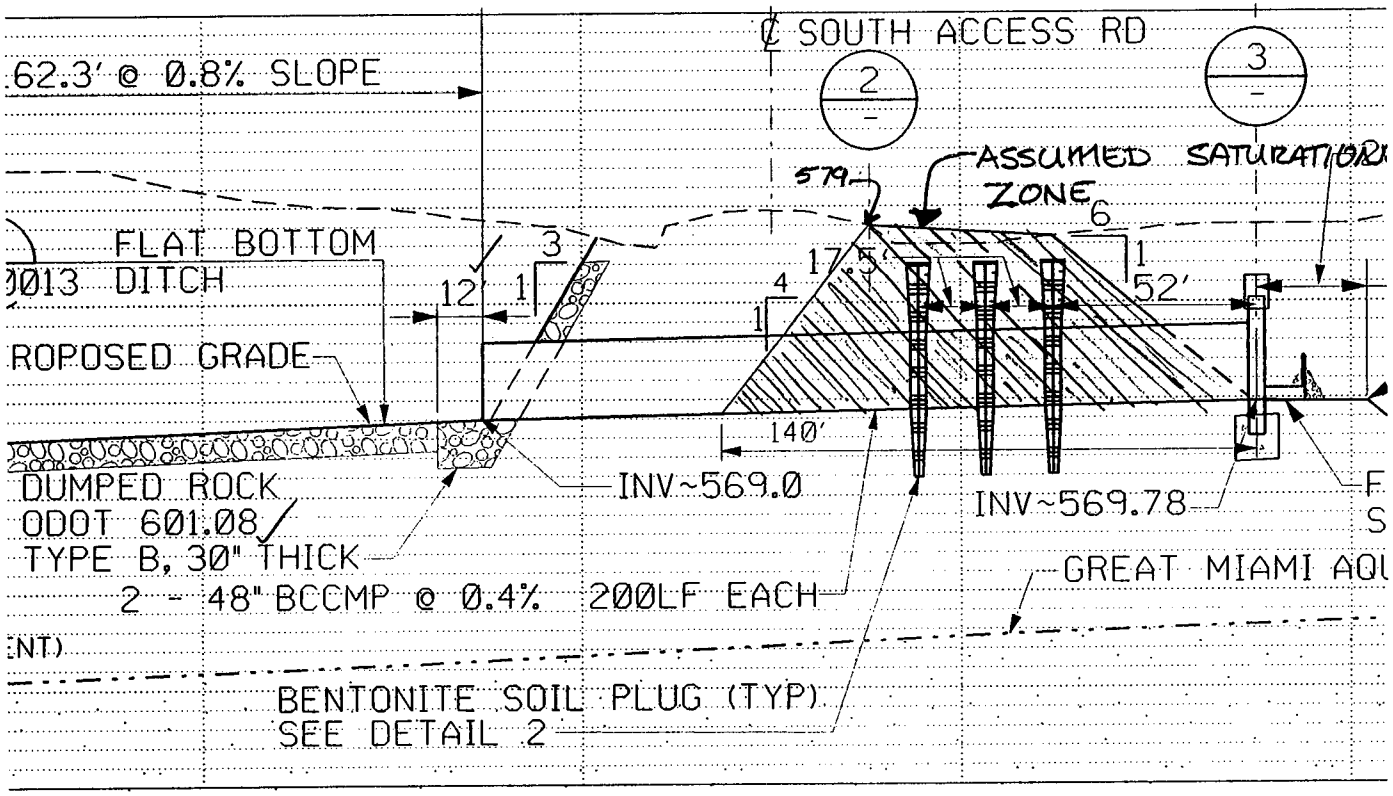
MINIMUM IS 5 x MIN PROJECTION @ 3.5', 3.5'x5 = 17.5' SPACING
MAXIMUM IS 14 x MIN. PROJECTION 3.5'x14 = 49' SPACING
BUT SHALL NOT EXCEED 25 FT.[2]

[1] ODNR "RAINWATER AND LAND DEVELOPMENT"

[2] SCS-OH POND 378

[3] SCS-MD POND 378

[4] CALCULATIONS BASED ON METAL ANTI-SEEP COLLARS. BENTONITE-SOIL PLUGS TO BE USED SHALL HAVE SAME NUMBER AND REQUIRED PROJECTIONS.



SKETCH FOR ANTI SEEP COLLAR / BENTONITE-SOIL PLUG DESIGN

1" = 50' H
1" = 5' V

R92g00461.m po175@ws110. Sat May 2 22:00:13 CDT 19

48" BCCMP Outlet Protection
Worksheet for Pressure Pipe

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Outlet Protection for 48"BCCMP
Flow Element	Pressure Pipe
Method	Hazen-Williams Formula
Solve For	Pressure at 2

Input Data		
Pressure at 1	9.34	feet H20
Elevation at 1	569.80	ft
Elevation at 2	569.00	ft
Length	200.00	ft
C Coefficient	120.0	
Diameter	48.00	in
Discharge	118	cfs

Results		
Pressure at 2	9.07	feet H20
Headloss	1.07	ft
Energy Grade at 1	580.51	ft
Energy Grade at 2	579.44	ft
Hydraulic Grade at 1	579.14	ft
Hydraulic Grade at 2	578.07	ft
Flow Area	12.57	ft^2
Wetted Perimeter	12.57	ft
Velocity	9.39	ft/s
Velocity Head	1.37	ft
Friction Slope	0.005356	ft/ft

Notes:

Rough calculation to establish a velocity for outlet protection. No entrance loss.

Assume P1 at max before topping road
Assume C=120 for BCCMP

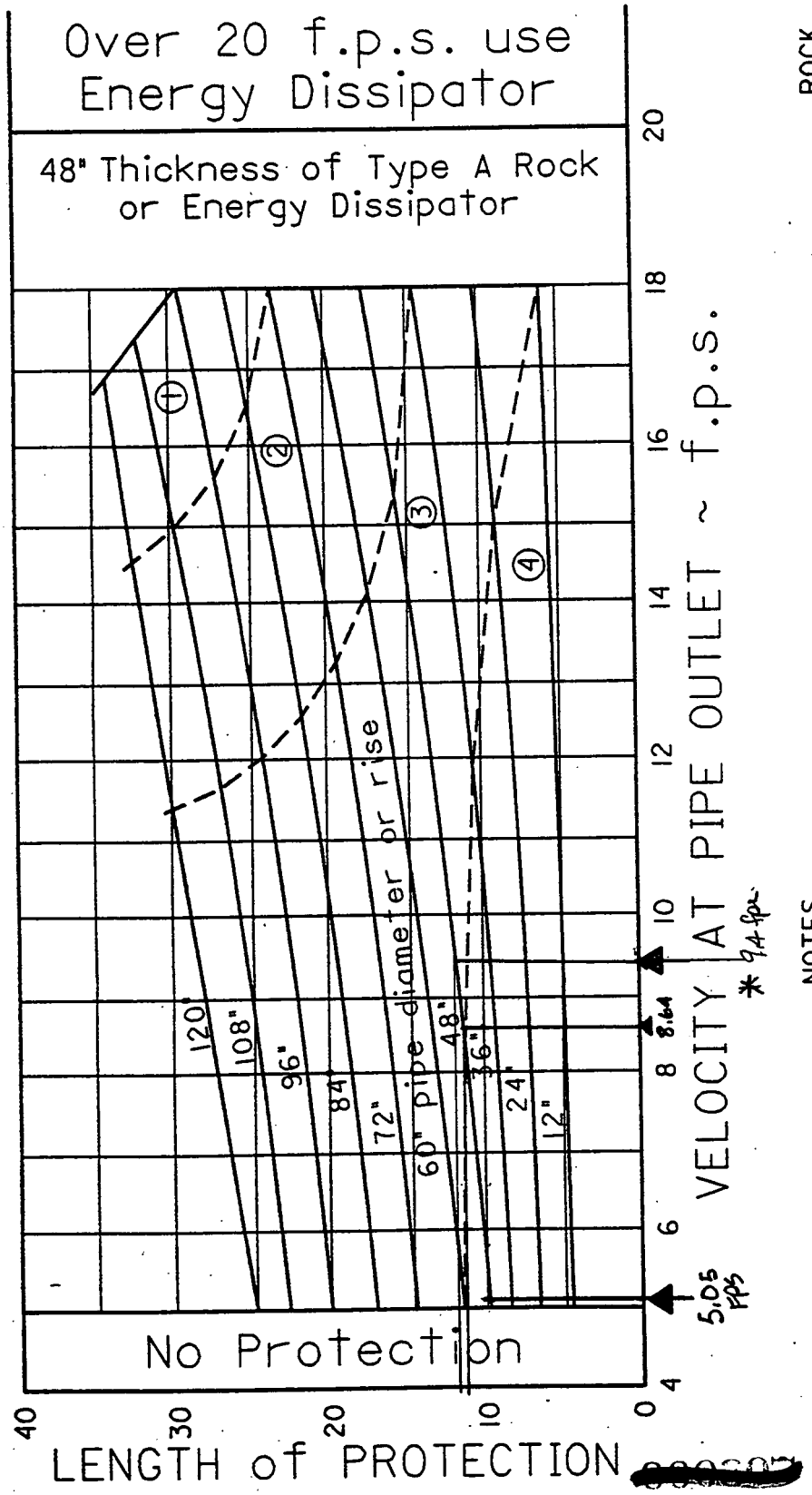
E12

TWIN- 48" BCCMP

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION
1107.2



ROCK TYPE
A
A
B
C

LEGEND
① 48' of 18" rock
② 36' of 18" rock
③ 30' of 12" rock
④ 18' of 6" rock

USE * 12' of 12" Rock, 30" THICK

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

POND ROUTING:

Purpose

The purpose of the pond routing is to determine how the design of the principal spillway and A1PII sediment basin configuration will function with the 10-year, 24-hour storm. This design was chosen based on it being the same as for the A1PII Conveyance Channel. Routing the storm through the sediment basin as if it were a pond will take into account the storage capacity of the sediment basin when the amount of runoff coming into the basin is greater than the amount that can leave. (Routing other storms may be necessary to confirm compliance with other design criteria not required by A1PII. Those calculations are beyond the scope of A1PII calculation.)

Drainage Area

Refer to the Drainage Area Map. The pond routing used the hydrograph generated for the following drainage areas:

Subarea 1 + OSDF Cell Construction
Subarea 2 + 3B
Subarea 3A (Phase I OSDF Borrow Area)

Calculations

Use Pond-2 ™ by Haestad Methods to calculate the pond routing based on the inflow hydrograph from QTR-55™ for the drainage areas indicated. The theory used is based on level-pool reservoir routing which is based on the equation:

$$S/t = I-O$$

Where:

t = Hydrograph time increment
I = Inflow into reservoir during increment t
O = Outflow from reservoir during increment t
S = Change in storage during increment t

The input information includes data from earlier Sediment Basin 1 Outlet Control table for Elevation Vs. Discharge relationships and the Storage Volume table for Elevation Vs. Storage Volume relationships.

E 14

Quick TR-55 Ver.5.46 S/N:
Executed: 10:46:15 02-13-1998

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE 1
BORROW AREA

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Sub 1 & Cell	57.02	82
Sub 2 & 3A+3B	40.66	85

Quick TR-55 Ver.5.46 S/N:
Executed: 10:46:15 02-13-1998

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE 1
BORROW AREA

RUNOFF CURVE NUMBER DATA

::

Composite Area: Sub 1 & Cell

SURFACE DESCRIPTION	AREA (acres)	CN	
C / ROW CROPS C+CR / GOOD	12.34	81	
C / GRAVEL	1.18	89	
PAVEMENT	0.49	98	
C / CONSTRUCTION (bare soil)	7.58	91	
C / OPEN SPACE / GOOD	19.13	74	
C / CELL CONSTRUCTION	6.00	91	
C / REVEGETATED AREA	6.30	79	
C / GRAVEL SURFACE	2.00	89	
C / RIPRAP	2.00	89	
COMPOSITE AREA --->	57.02	81.7	(82)

::

Composite Area: Sub 2 & 3A+3B

SURFACE DESCRIPTION	AREA (acres)	CN	
C / GRAVEL	0.50	89	
C / CONSTRUCTION	11.20	91	
C / OPEN SPACE / GOOD	14.41	74	
C / OPEN SPACE / FAIR	1.23	79	
C / CONSTRUCTION (sed. basin)	12.97	91	
PAVEMENT	0.35	98	
COMPOSITE AREA --->	40.66	84.6	(85)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 10:48:54 02-13-1998
p:\engdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

E16

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Tc COMPUTATIONS FOR: Sub 1 & Cell

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		Range	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0233	
$T = \dfrac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.34	= 0.34

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1214.0	
Watercourse slope, s	ft/ft	0.0186	
$Avg.V = Csf * (s)^{0.5}$	ft/s	2.2005	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.15	= 0.15

CHANNEL FLOW

Segment ID		3		4	
Cross Sectional Flow Area, a	sq.ft	15.27		20.00	
Wetted perimeter, Pw	ft	12.97		15.79	
Hydraulic radius, r = a/Pw	ft	1.177		1.267	
Channel slope, s	ft/ft	0.0040		0.0040	
Manning's roughness coeff., n		0.0400		0.0400	
$V = \dfrac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.6268		2.7580	
Flow length, L	ft	375		1125	
T = L / (3600*V)	hrs	0.04	+	0.11	= 0.15

:::

TOTAL TIME (hrs) 0.65

[redacted] 000134

Quick TR-55 Ver.5.46 S/N:
Executed: 10:48:54 02-13-1998
\engdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Tc COMPUTATIONS FOR: Sub 2 & 3A+3B

SHEET FLOW (Applicable to Tc only)

Segment ID		2-1	
Surface description		Range	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0392	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.28	= 0.28

SHALLOW CONCENTRATED FLOW

Segment ID		2-2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	487.0	
Watercourse slope, s	ft/ft	0.0068	
Avg.V = $Csf * (s)^{0.5}$	ft/s	1.3305	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.10	= 0.10

CHANNEL FLOW

Segment ID		2-3	2-4	
Cross Sectional Flow Area, a	sq.ft	7.26	11.65	
Wetted perimeter, Pw	ft	11.37	13.77	
Hydraulic radius, r = a/Pw	ft	0.639	0.846	
Channel slope, s	ft/ft	0.0100	0.0075	
Manning's roughness coeff., n		0.0400	0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.7621	2.8857	
Flow length, L	ft	570	575	
T = L / (3600*V)	hrs	0.06 +	0.06	= 0.11

::

TOTAL TIME (hrs) 0.49

Quick TR-55 Ver.5.46 S/N:
Executed: 10:48:54 02-13-1998
p:\engdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

E18

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Subarea descr.	Tc or Tt	Time (hrs)
Sub 1 & Cell	Tc	0.65
Sub 2 & 3A+3B	Tc	0.49

Quick TR-55 Ver.5.46 S/N:
Executed: 10:49:58 02-13-1998

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using Length/Velocity)

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Subarea descr.	Tc or Tt	Time (hrs)
	Tt	0.05

Quick TR-55 Ver.5.46 S/N:
Executed: 10:49:58 02-13-1998

E20

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Tc or Tt DATA
::

Subarea: DESCRIPTION	LENGTH (feet)	VELOCITY (ft/sec)	TIME minutes		hours
Culvert 2	190	7.50	0.4	=	0.01
Sediment basin	430	3.00	2.4	=	0.04
			minutes		hours
		TOTAL Tt --->	2.8	=	0.05

::::::::::::::::::::::::::::::::::::

[redacted]

Return Frequency: 10 years

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea escription	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
b 1 & Cell	57.02	82.0	0.75	0.00	4.10	2.29	I.11	.11
b 2 & 3A+3B	40.66	85.0	0.50	0.00	4.10	2.55	I.09	.10

Travel time from subarea outfall to composite watershed outfall point.
-- Subarea where user specified interpolation between Ia/p tables.

Total area = 97.68 acres or 0.15262 sq.mi
Peak discharge = 158 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea escription	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
1 & Cell	0.65	0.05	0.75	0.00	Yes	--
2 & 3A+3B	0.49	0.00	0.50	0.00	No	Computed Ia/p < .1

Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 & Cell	86	12.6
Sub 2 & 3A+3B	86	12.4
Composite Watershed	158	12.5

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Composite Hydrograph Summary (cfs)

Subarea escription	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
b 1 & Cell	3	3	5	7	9	13	23	38	59
b 2 & 3A+3B	3	4	5	9	15	28	50	76	86
tal (cfs)	6	7	10	16	24	41	73	114	145

Subarea escription	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
b 1 & Cell	76	86	83	75	51	35	25	19	15
b 2 & 3A+3B	82	65	48	37	23	16	12	10	9
tal (cfs)	158	151	131	112	74	51	37	29	24

Subarea escription	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
b 1 & Cell	13	10	9	7	6	6	5	5	4
b 2 & 3A+3B	8	7	6	5	5	4	4	3	3
tal (cfs)	21	17	15	12	11	10	9	8	7

Subarea escription	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
b 1 & Cell	4	4	3	3	0

Sub 2 & 3A+3B	3	3	2	2	0
Total (cfs)	7	7	5	5	0

E2A

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

2053

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	6	14.8	13
11.1	6	14.9	13
11.2	7	15.0	12
11.3	7	15.1	12
11.4	8	15.2	12
11.5	9	15.3	11
11.6	10	15.4	11
11.7	12	15.5	11
11.8	14	15.6	11
11.9	16	15.7	11
12.0	24	15.8	10
12.1	41	15.9	10
12.2	73	16.0	10
12.3	114	16.1	10
12.4	145	16.2	10
12.5	158	16.3	9
12.6	151	16.4	9
12.7	131	16.5	9
12.8	112	16.6	9
12.9	93	16.7	9
13.0	74	16.8	8
13.1	62	16.9	8
13.2	51	17.0	8
13.3	44	17.1	8
13.4	37	17.2	8
13.5	33	17.3	7
13.6	29	17.4	7
13.7	26	17.5	7
13.8	24	17.6	7
13.9	22	17.7	7
14.0	21	17.8	7
14.1	20	17.9	7
14.2	18	18.0	7
14.3	17	18.1	7

14.4	16	18.2	7
14.5	16	18.3	7
14.6	15	18.4	7
14.7	14	18.5	7

E26

[redacted]

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	7	22.4	5
18.7	7	22.5	4
18.8	7	22.6	4
18.9	7	22.7	4
19.0	7	22.8	4
19.1	7	22.9	4
19.2	7	23.0	4
19.3	6	23.1	4
19.4	6	23.2	4
19.5	6	23.3	3
19.6	6	23.4	3
19.7	6	23.5	3
19.8	5	23.6	3
19.9	5	23.7	3
20.0	5	23.8	3
20.1	5	23.9	3
20.2	5	24.0	3
20.3	5	24.1	2
20.4	5	24.2	2
20.5	5	24.3	2
20.6	5	24.4	2
20.7	5	24.5	2
20.8	5	24.6	2
20.9	5	24.7	2
21.0	5	24.8	2
21.1	5	24.9	1
21.2	5	25.0	1
21.3	5	25.1	1
21.4	5	25.2	1
21.5	5	25.3	1
21.6	5	25.4	1
21.7	5	25.5	1
21.8	5	25.6	1
21.9	5	25.7	0
22.0	5	25.8	0
22.1	5	25.9	0

E 28

22.2	5
22.3	5

[redacted]

POND-2 Version: 5.17
S/N:

E29

2053

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell, A1PII, & OSDF PH I
Borrow Area

CALCULATED 03-06-1998 11:32:46
DISK FILE: p:\engdata\c&sdata\po175\calc\swcalc2\SB1 .VOL

Planimeter scale: 1 inch = 10 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
569.78	252.06	0.58	0.00	0.00	0.00
570.00	284.29	0.65	1.85	0.14	0.14
571.00	339.85	0.78	2.15	0.72	0.85
572.00	414.74	0.95	2.59	0.86	1.72
573.00	477.48	1.10	3.07	1.02	2.74
574.00	542.24	1.24	3.51	1.17	3.91
575.00	609.17	1.40	3.96	1.32	5.23
575.28	628.50	1.44	4.26	0.40	5.63
576.00	678.16	1.56	4.50	1.08	6.71
577.00	749.20	1.72	4.91	1.64	8.34
578.00	825.93	1.90	5.42	1.81	10.15
578.34	855.10	1.96	5.79	0.66	10.81

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

POND-2 Version: 5.17
S/N:

E 30

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell, A1PII, & OSDF PH I
Borrow Area

CALCULATED 03-06-1998 17:03:41
DISK FILE: c:\po175\BA1 .VOL

Planimeter scale: 1 inch = 10 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
569.78	252.06	0.58	0.00	0.00	0.00
570.00	284.29	0.65	1.85	0.14	0.14
571.00	339.85	0.78	2.15	0.72	0.85
572.00	414.74	0.95	2.59	0.86	1.72
573.00	477.48	1.10	3.07	1.02	2.74
574.00	542.24	1.24	3.51	1.17	3.91
575.00	609.17	1.40	3.96	1.32	5.23
575.28	628.50	1.44	4.26	0.40	5.63
576.00	678.16	1.56	4.50	1.08	6.71
577.00	749.20	1.72	4.91	1.64	8.34
578.00	825.93	1.90	5.42	1.81	10.15
578.34	855.10	1.96	5.79	0.66	10.81

IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

[redacted]

2053

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

```
*****************************************
*                                       *
*            SEDIMENT BASIN 1           *
*              OSDF PHASE I             *
*  Includes OSDF Cell, A1PII, & OSDF PH I *
*              Borrow Area              *
*                                       *
*****************************************
```

Inflow Hydrograph: c:\po175\BA1-10 .HYD
Rating Table file: c:\po175\BA1 .PND

10-YEAR

----INITIAL CONDITIONS----
Elevation = 575.28 ft
Outflow = 0.00 cfs
Storage = 5.63 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
569.78	0.0	0.000
570.00	0.0	0.140
571.00	0.0	0.850
572.00	0.0	1.720
573.00	0.0	2.740
574.00	0.0	3.910
575.00	0.0	5.230
575.28	0.0	5.630
576.00	48.0	6.710
577.00	159.0	8.340
578.00	200.0	10.150
578.34	212.0	10.810

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
33.9	33.9
205.7	205.7
416.2	416.2
663.1	663.1
946.2	946.2
1265.7	1265.7
1362.5	1362.5
1623.8	1671.8
2018.3	2177.3
2456.3	2656.3
2616.0	2828.0

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	6.00	-----	1362.5	1362.5	0.00	575.28
11.100	6.00	12.0	1370.7	1374.5	1.86	575.31
11.200	7.00	13.0	1377.1	1383.7	3.30	575.33
11.300	7.00	14.0	1382.2	1391.1	4.45	575.35
11.400	8.00	15.0	1386.4	1397.2	5.40	575.36
11.500	9.00	17.0	1390.7	1403.4	6.36	575.38
11.600	10.00	19.0	1395.1	1409.7	7.33	575.39
11.700	12.00	22.0	1400.1	1417.1	8.47	575.41
11.800	14.00	26.0	1406.4	1426.1	9.88	575.43
11.900	16.00	30.0	1413.4	1436.4	11.47	575.45
12.000	24.00	40.0	1425.2	1453.4	14.11	575.49
12.100	41.00	65.0	1450.6	1490.2	19.82	575.58
12.200	73.00	114.0	1501.8	1564.6	31.36	575.75
12.300	114.00	187.0	1585.4	1688.8	51.74	576.03
12.400	145.00	259.0	1672.6	1844.4	85.89	576.34
12.500	158.00	303.0	1746.2	1975.6	114.71	576.60
12.600	151.00	309.0	1790.8	2055.2	132.18	576.76
12.700	131.00	282.0	1800.7	2072.8	136.06	576.79
12.800	112.00	243.0	1784.4	2043.7	129.66	576.74
12.900	93.00	205.0	1753.9	1989.4	117.73	576.63
13.000	74.00	167.0	1715.5	1920.9	102.70	576.49
13.100	62.00	136.0	1676.6	1851.5	87.46	576.36
13.200	51.00	113.0	1641.9	1789.6	73.86	576.23
13.300	44.00	95.0	1612.3	1736.9	62.28	576.13
13.400	37.00	81.0	1587.9	1693.3	52.72	576.04
13.500	33.00	70.0	1566.2	1657.9	45.83	575.97
13.600	29.00	62.0	1545.7	1628.2	41.23	575.90
13.700	26.00	55.0	1526.8	1600.7	36.97	575.83
13.800	24.00	50.0	1510.3	1576.8	33.26	575.78
13.900	22.00	46.0	1496.1	1556.3	30.07	575.73
14.000	21.00	43.0	1484.3	1539.1	27.41	575.69
14.100	20.00	41.0	1474.8	1525.3	25.27	575.66
14.200	18.00	38.0	1466.1	1512.8	23.32	575.63
14.300	17.00	35.0	1458.1	1501.1	21.52	575.60
14.400	16.00	33.0	1451.2	1491.1	19.96	575.58
14.500	16.00	32.0	1445.7	1483.2	18.73	575.56
14.600	15.00	31.0	1441.3	1476.7	17.73	575.55
14.700	14.00	29.0	1436.8	1470.3	16.73	575.53
14.800	14.00	28.0	1433.0	1464.8	15.88	575.52
14.900	13.00	27.0	1429.8	1460.0	15.14	575.51
15.000	12.00	25.0	1426.1	1454.8	14.32	575.49
15.100	12.00	24.0	1422.9	1450.1	13.60	575.48
15.200	12.00	24.0	1420.7	1446.9	13.10	575.48
15.300	11.00	23.0	1418.5	1443.7	12.61	575.47
15.400	11.00	22.0	1416.3	1440.5	12.11	575.46

2053

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	11.00	22.0	1414.8	1438.3	11.76	575.46
15.600	11.00	22.0	1413.7	1436.8	11.53	575.45
15.700	11.00	22.0	1413.0	1435.7	11.36	575.45
15.800	10.00	21.0	1411.8	1434.0	11.10	575.45
15.900	10.00	20.0	1410.3	1431.8	10.76	575.44
16.000	10.00	20.0	1409.2	1430.3	10.52	575.44
16.100	10.00	20.0	1408.5	1429.2	10.36	575.44
16.200	10.00	20.0	1408.0	1428.5	10.25	575.43
16.300	9.00	19.0	1407.0	1427.0	10.02	575.43
16.400	9.00	18.0	1405.6	1425.0	9.70	575.43
16.500	9.00	18.0	1404.6	1423.6	9.48	575.42
16.600	9.00	18.0	1403.9	1422.6	9.33	575.42
16.700	9.00	18.0	1403.5	1421.9	9.23	575.42
16.800	8.00	17.0	1402.5	1420.5	9.00	575.42
16.900	8.00	16.0	1401.1	1418.5	8.69	575.41
17.000	8.00	16.0	1400.1	1417.1	8.48	575.41
17.100	8.00	16.0	1399.5	1416.1	8.33	575.40
17.200	8.00	16.0	1399.0	1415.5	8.23	575.40
17.300	7.00	15.0	1398.0	1414.0	8.00	575.40
17.400	7.00	14.0	1396.6	1412.0	7.69	575.40
17.500	7.00	14.0	1395.7	1410.6	7.48	575.39
17.600	7.00	14.0	1395.0	1409.7	7.33	575.39
17.700	7.00	14.0	1394.6	1409.0	7.23	575.39
17.800	7.00	14.0	1394.3	1408.6	7.16	575.39
17.900	7.00	14.0	1394.1	1408.3	7.11	575.39
18.000	7.00	14.0	1393.9	1408.1	7.07	575.39
18.100	7.00	14.0	1393.8	1407.9	7.05	575.39
18.200	7.00	14.0	1393.7	1407.8	7.04	575.39
18.300	7.00	14.0	1393.7	1407.7	7.02	575.39
18.400	7.00	14.0	1393.6	1407.7	7.02	575.39
18.500	7.00	14.0	1393.6	1407.6	7.01	575.39
18.600	7.00	14.0	1393.6	1407.6	7.01	575.39
18.700	7.00	14.0	1393.6	1407.6	7.01	575.39
18.800	7.00	14.0	1393.6	1407.6	7.00	575.39
18.900	7.00	14.0	1393.6	1407.6	7.00	575.39
19.000	7.00	14.0	1393.6	1407.6	7.00	575.39
19.100	7.00	14.0	1393.6	1407.6	7.00	575.39
19.200	7.00	14.0	1393.6	1407.6	7.00	575.39
19.300	6.00	13.0	1392.9	1406.6	6.85	575.38
19.400	6.00	12.0	1391.7	1404.9	6.58	575.38
19.500	6.00	12.0	1390.9	1403.7	6.40	575.38
19.600	6.00	12.0	1390.4	1402.9	6.28	575.37
19.700	6.00	12.0	1390.0	1402.4	6.19	575.37
19.800	5.00	11.0	1389.0	1401.0	5.98	575.37
19.900	5.00	10.0	1387.7	1399.0	5.67	575.37
20.000	5.00	10.0	1386.8	1397.7	5.46	575.36

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	5.00	10.0	1386.1	1396.8	5.32	575.36
20.200	5.00	10.0	1385.7	1396.1	5.22	575.36
20.300	5.00	10.0	1385.4	1395.7	5.15	575.36
20.400	5.00	10.0	1385.2	1395.4	5.11	575.36
20.500	5.00	10.0	1385.0	1395.2	5.07	575.36
20.600	5.00	10.0	1384.9	1395.0	5.05	575.36
20.700	5.00	10.0	1384.8	1394.9	5.03	575.36
20.800	5.00	10.0	1384.8	1394.8	5.02	575.36
20.900	5.00	10.0	1384.8	1394.8	5.02	575.36
21.000	5.00	10.0	1384.7	1394.8	5.01	575.36
21.100	5.00	10.0	1384.7	1394.7	5.01	575.36
21.200	5.00	10.0	1384.7	1394.7	5.01	575.36
21.300	5.00	10.0	1384.7	1394.7	5.00	575.36
21.400	5.00	10.0	1384.7	1394.7	5.00	575.36
21.500	5.00	10.0	1384.7	1394.7	5.00	575.36
21.600	5.00	10.0	1384.7	1394.7	5.00	575.36
21.700	5.00	10.0	1384.7	1394.7	5.00	575.36
21.800	5.00	10.0	1384.7	1394.7	5.00	575.36
21.900	5.00	10.0	1384.7	1394.7	5.00	575.36
22.000	5.00	10.0	1384.7	1394.7	5.00	575.36
22.100	5.00	10.0	1384.7	1394.7	5.00	575.36
22.200	5.00	10.0	1384.7	1394.7	5.00	575.36
22.300	5.00	10.0	1384.7	1394.7	5.00	575.36
22.400	4.00	9.0	1384.0	1393.7	4.84	575.35
22.500	4.00	8.0	1382.8	1392.0	4.58	575.35
22.600	4.00	8.0	1382.0	1390.8	4.40	575.35
22.700	4.00	8.0	1381.5	1390.0	4.28	575.34
22.800	4.00	8.0	1381.1	1389.5	4.19	575.34
22.900	4.00	8.0	1380.8	1389.1	4.13	575.34
23.000	4.00	8.0	1380.6	1388.8	4.09	575.34
23.100	4.00	8.0	1380.5	1388.6	4.06	575.34
23.200	4.00	8.0	1380.4	1388.5	4.04	575.34
23.300	3.00	7.0	1379.7	1387.4	3.87	575.34
23.400	3.00	6.0	1378.5	1385.7	3.60	575.33
23.500	3.00	6.0	1377.6	1384.5	3.42	575.33
23.600	3.00	6.0	1377.1	1383.6	3.29	575.33
23.700	3.00	6.0	1376.7	1383.1	3.20	575.33
23.800	3.00	6.0	1376.4	1382.7	3.14	575.33
23.900	3.00	6.0	1376.2	1382.4	3.09	575.33
24.000	2.00	5.0	1375.4	1381.2	2.91	575.32
24.100	2.00	4.0	1374.1	1379.4	2.63	575.32
24.200	2.00	4.0	1373.3	1378.1	2.43	575.32
24.300	2.00	4.0	1372.7	1377.3	2.30	575.31
24.400	2.00	4.0	1372.3	1376.7	2.21	575.31
24.500	2.00	4.0	1372.0	1376.3	2.14	575.31
24.600	2.00	4.0	1371.8	1376.0	2.10	575.31

OND-2 Version: 5.17 S/N:
XECUTED: 03-06-1998 17:11:33

ond File: c:\po175\BA1 .PND
nflow Hydrograph: c:\po175\BA1-10 .HYD
utflow Hydrograph: c:\po175\BA1 .HYD

NFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	2.00	4.0	1371.7	1375.8	2.07	575.31
24.800	2.00	4.0	1371.6	1375.7	2.05	575.31
24.900	1.00	3.0	1370.8	1374.6	1.88	575.31
25.000	1.00	2.0	1369.6	1372.8	1.60	575.30
25.100	1.00	2.0	1368.8	1371.6	1.42	575.30
25.200	1.00	2.0	1368.2	1370.8	1.29	575.30
25.300	1.00	2.0	1367.8	1370.2	1.20	575.30
25.400	1.00	2.0	1367.5	1369.8	1.14	575.30
25.500	1.00	2.0	1367.3	1369.5	1.09	575.30
25.600	0.00	1.0	1366.5	1368.3	0.91	575.29
25.700	0.00	0.0	1365.2	1366.5	0.63	575.29
25.800	0.00	0.0	1364.4	1365.2	0.43	575.29
25.900	0.00	0.0	1363.8	1364.4	0.30	575.28

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

Starting Pond W.S. Elevation = 575.28 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 158.00 cfs
Peak Outflow = 136.06 cfs
Peak Elevation = 576.79 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 5.63 ac-ft
Peak Storage From Storm = 2.37 ac-ft

Total Storage in Pond = 8.00 ac-ft

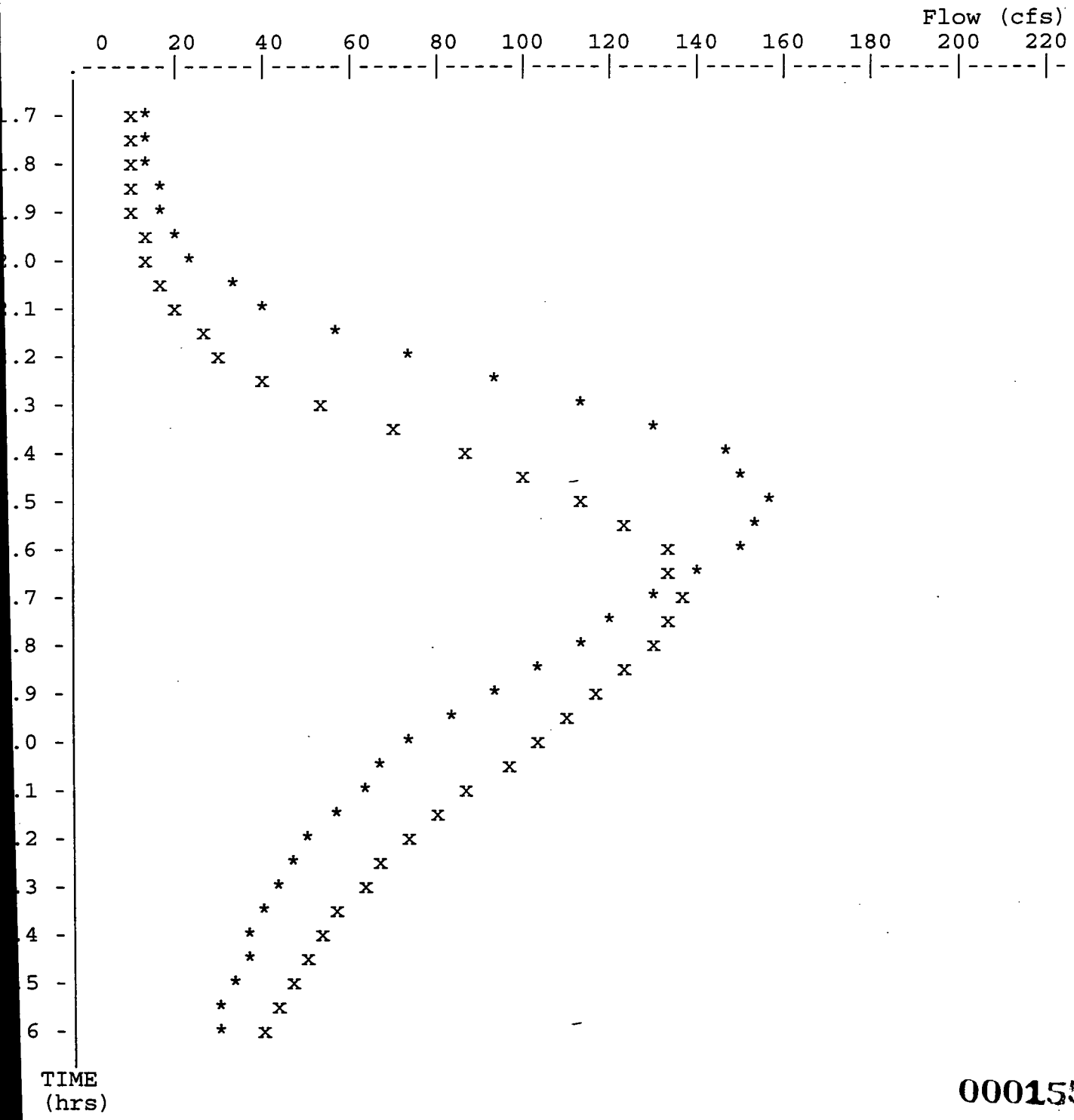
Warning: Inflow hydrograph truncated on left side.

POND-2 Version: 5.17 S/N:

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

EXECUTED: 03-06-1998
17:11:33

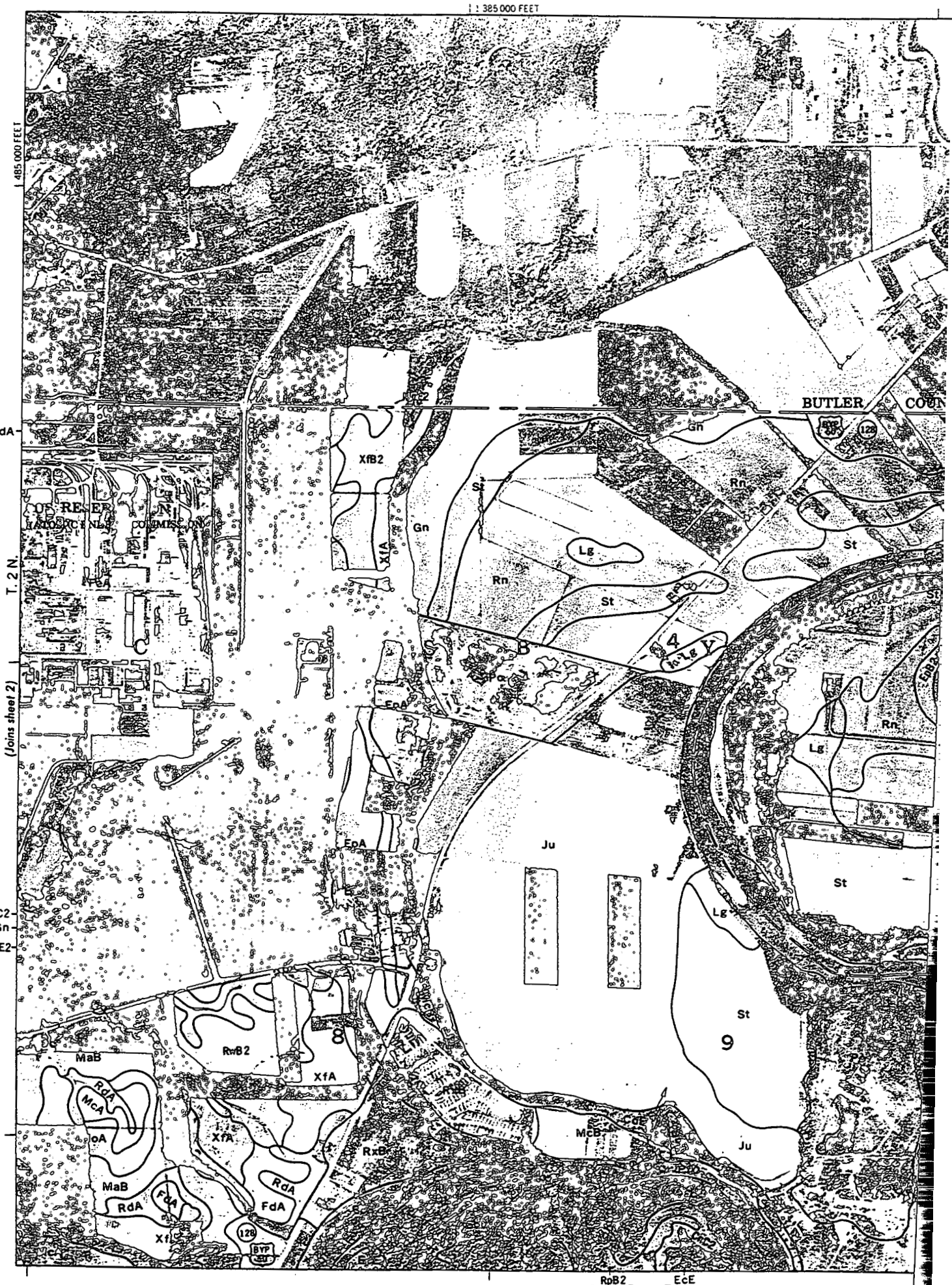
Peak Inflow = 158.00 cfs
Peak Outflow = 136.06 cfs
Peak Elevation = 576.79 ft



File: c:\po175\BA1-10 .HYD Qmax = 158.0 cfs
File: c:\po175\BA1 .HYD Qmax = 136.1 cfs

SOILS MAP

HAMILTON COUNTY, OHI



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ArA, ArB2, ArC2---Ava	C	None--------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
AsB*, AsC*:												
Ava----------	C	None--------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
Urban land.												
AvA---------- Avonburg	D	None--------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
AwA*:												
Avonburg---------	D	None--------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Urban land.												
BoD, BoE, BoF----- Bonnell	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
CcC2, CdD, CdE, CdF---------- Casco	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
CnB2, CnC2-------- Cincinnati	C	None--------	---	---	>4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
DaB---------- Dana	B	None--------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	Moderate.
EcB2, EcC2, EcD, EcE, EdF--------- Eden	C	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
EeB*, EeC*, EeD*:												
Eden----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
Urban land.												
EpA, EpB2, EpC2--- Eldean	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
ErA*, ErB*:												
Eldean----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Urban land.												
FdA---------- Fincastle	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

See footnotes at end of table.

2053
000157

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
XfA, XfB2--------- Xenia	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.
** The plus sign preceding the range in depth to the water table means that the range in this soil is from .5 foot above the surface to 2.0 feet below.

000158

SEDIMENT BASIN 1
OUTLET CONTROL

AIPII Sedime

WEIR		ORIFICE		PIPE	
D_R (in.) =	48	D_R (in.) =	48	D (in.) =	48
INVERT=	575.28	INVERT=	575.28	INVERT IN=	569.8
C =	9.739	C=	3.782	INV. OUT=	569
				LENGTH=	200
				AREA(sf)=	=(3.14*(G3/12)^2)/4
				H_o =	=G5+(G3/2)/12
				g =	32.2
				KM =	1
				KP =	=(5087*G12^2)/G3^(4/3)
				n =	0.024

WSE	H	Q_W	H	Q_O	H	Q_P	Q_{MIN}	2 X Q_{MIN}
	ft	cfs	ft	cfs	ft	cfs	cfs	cfs
569	N/A	0	=B16	0	=D16	0	=MIN(C16,E16,G16)	=(H16*2)
570	N/A	0	=B18	0	=D18	0	=MIN(C18,E18,G18)	=(H18*2)
571	N/A	0	=B20	0	=D20	0	=MIN(C20,E20,G20)	=(H20*2)
572	N/A	0	=B22	0	=D22	0	=MIN(C22,E22,G22)	=(H22*2)
573	N/A	0	=B24	0	=D24	0	=MIN(C24,E24,G24)	=(H24*2)
574	N/A	0	=B26	0	N/A	0	=MIN(C26,E26,G26)	=(H26*2)
575	N/A	0	=B28	0	N/A	0	=MIN(C28,E28,G28)	=(H28*2)
576	=A30-$C$4	=($C$5)*($C$3/12)*B30^1.5	=$A30-$E$4	=($E$5)*(($E$3/12)^2)*D30^0.5	=A30-$G$8	=($G$7)*((2*$G$9*F30)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C30,E30,G30)	=(H30*2)
577	=A32-$C$4	=($C$5)*($C$3/12)*B32^1.5	=$A32-$E$4	=($E$5)*(($E$3/12)^2)*D32^0.5	=(A32-G8)	=($G$7)*((2*$G$9*F32)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C32,E32,G32)	=(H32*2)
578	=A34-$C$4	=($C$5)*($C$3/12)*B34^1.5	=$A34-$E$4	=($E$5)*(($E$3/12)^2)*D34^0.5	=(A34-G8)	=($G$7)*((2*$G$9*F34)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C34,E34,G34)	=(H34*2)
578.34	=A36-$C$4	=($C$5)*($C$3/12)*B36^1.5	=$A36-$E$4	=($E$5)*(($E$3/12)^2)*D36^0.5	=(A36-G8)	=($G$7)*((2*$G$9*F36)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C36,E36,G36)	=(H36*2)

000159

2053

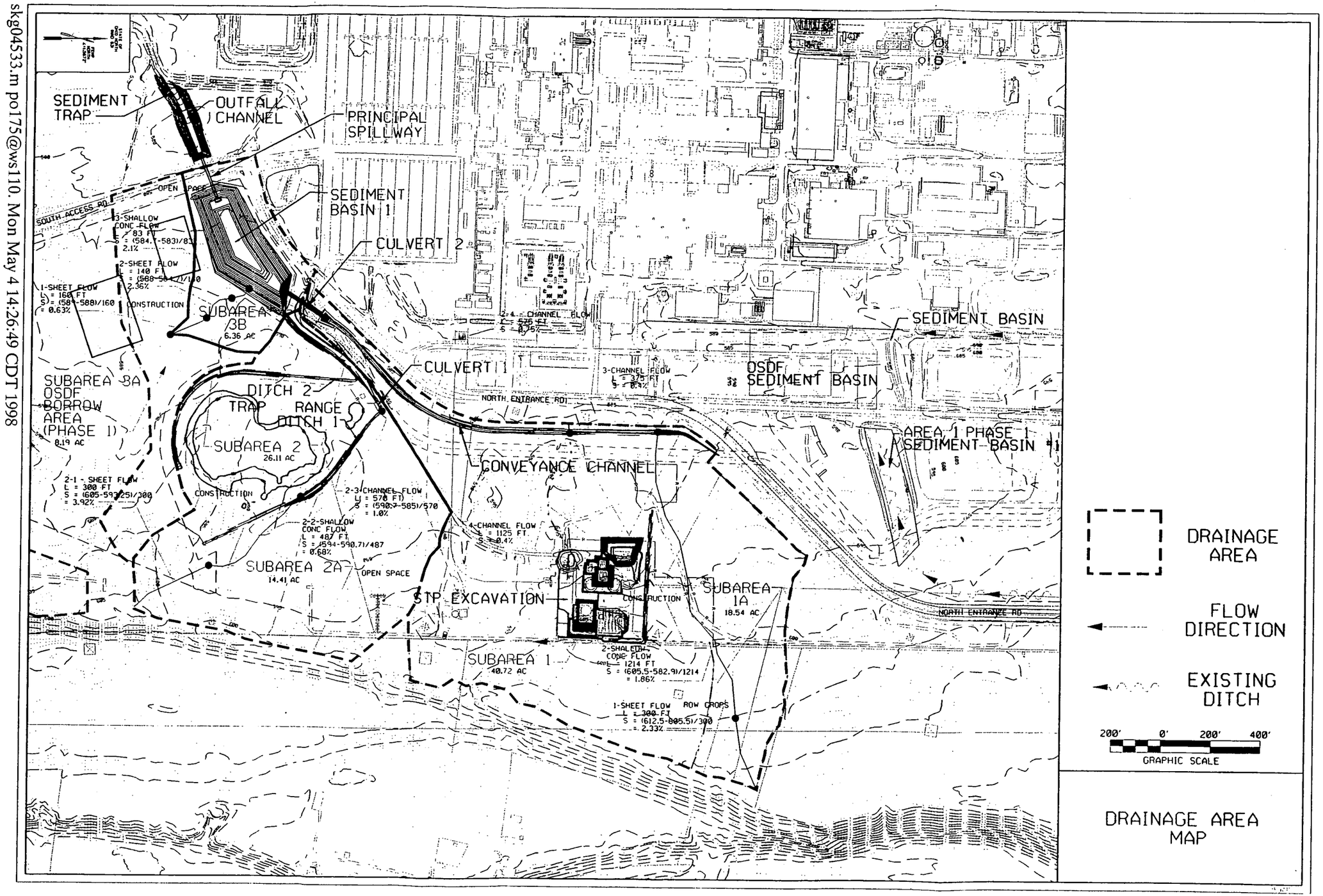
SEDIMENT BASIN 1
STORAGE VOLUME

	A	B	C	D	E	F	G	H
1	A1PII Sediment Basi							
2	Elev	Area	Ave.	Ht.	Volume	Cum. Vol.	Cum. Vol. Above CO	
3		ft^2	Area	ft	ft^3	ft^3	ft^3	ac.ft
4	567	12728						
5			=(B4+B6)/2	=A6-A4	=C5*D5	=E5		
6	568	16943						
7			=(B6+B8)/2	=A8-A6	=C7*D7	=E7+F5		
8	569	21462						
9			=(B8+B10)/2	=A10-A8	=C9*D9	=E9+F7		
10	569.78	25206					CO	
11			=(B8+B12)/2	=A12-A10	=C11*D11	=E11+F9	=E11	=G11/43560
12	570	28429						
13			=(B12+B14)/2	=A14-A12	=C13*D13	=E13+F11	=G11+E13	=G13/43560
14	571	33985						
15			=(B14+B16)/2	=A16-A14	=C15*D15	=E15+F13	=G13+E15	=G15/43560
16	572	41474						
17			=(B16+B18)/2	=A18-A16	=C17*D17	=E17+F15	=G15+E17	=G17/43560
18	573	47748						
19			=(B18+B20)/2	=A20-A18	=C19*D19	=E19+F17	=G17+E19	=G19/43560
20	574	54224						
21			=(B20+B22)/2	=A22-A20	=C21*D21	=E21+F19	=G19+E21	=G21/43560
22	575	60917						
23			=(B22+B24)/2	=A24-A22	=C23*D23	=E23+F21	=G21+E23	=G23/43560
24	575.28	62850						
25			=(B22+B26)/2	=A26-A22	=C25*D25	=E25+F21	=G21+E25	=G25/43560
26	576	67816						
27			=(B26+B28)/2	=A28-A26	=C27*D27	=E27+F25	=G25+E27	=G27/43560
28	577	74920						
29			=(B28+B30)/2	=A30-A28	=C29*D29	=E29+F27	=G27+E29	=G29/43560
30	578	82593						
31			=(B30+B32)/2	=A32-A30	=C31*D31	=E31+F29	=G29+E31	=G31/43560
32	578.34	85510						
33								
34	NOTE:							
35	1	Contours set for 48" ri						
36								
37	2	Minimum storage vol		='[SEDBASIN.XLS]A	cf			
38								
39			572	=F15	cf			
40			min storage elev	=D37	cf @ 67cy/ac			
41			573	=F17				
42				=D40-D39	=D42/D43			
43				=D41-D39				
44								
45			min storage elev =	=C39+E42				
46								
47		min storage elev - inv		=D45-569.78	ft.			
48								

APPENDIX B

DRAINAGE AREA MAP

skg04533.m po175@ws110. Mon May 4 14:26:49 CDT 1998

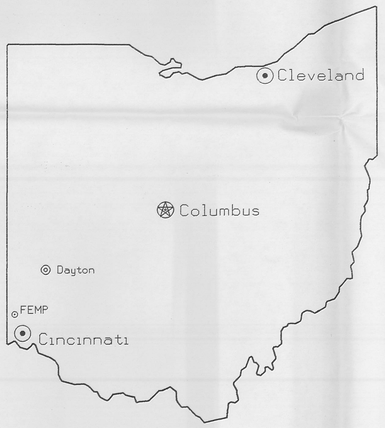


UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

REMEDIATION AREA 1, PHASE II SITE PREPARATION PACKAGE
CONTRACT NO. FSC622
FDF PROJECT NO. 20711

STATE OF OHIO NORTH (NAD 83)

FEMP NORTH ∠=1.5672°



600′ 0′ 600′ 1200′
GRAPHIC SCALE: 1"=600′

PARSONS

The Ralph M. Parsons Company * Parsons Main, Inc. * Engineering-Science, Inc.

ARCHITECTS - ENGINEERS
CINCINNATI, OHIO

NOTES

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 3/6/98	CS 3/6/98	KG 3/6/98
		INITIALS AND DATE		

2053

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
PROJECT TITLE SHEET

000163

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/21/97	K. GERARD	11/19/97	K. GERARD	11/18/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=600′	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 6/20/97	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-X-00415	X0001	0B

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	92X-5900-X-00415	X0001	0B	PROJECT TITLE SHEET	
	92X-5900-X-00418	X0002	0B	DRAWING INDEX	
	92X-5900-X-00420	X0003	0B	LEGEND AND GENERAL NOTES	
	92X-5900-G-00421	G0001	0B	CIVIL - EXISTING CONDITIONS PLAN	
		G0002		SHEET NOT USED	DRAWING NOT USED FOR CFC ISSUE
	92X-5900-G-00428	G0003	0B	CIVIL - MASTER KEY PLAN	
	92X-5900-G-00436	G0004	0B	CIVIL - SITE/GRADING/UTILITY PLAN - TRAP RANGE	
	92X-5900-G-00432	G0005	0B	CIVIL - SITE/GRADING/UTILTIY PLAN - SEDIMENT BASIN	
	92X-5900-G-00461	G0006	0B	CIVIL - SEDIMENT BASIN - SECTIONS AND DETAILS	
	92X-5900-G-00466	G0007	0B	CIVIL - SITE/GRADING/UTILITY PLAN - CONVEYANCE CHANNEL	
	92X-5900-G-00459	G0008	0B	CIVIL - TRAFFIC PLAN	
	92X-5900-G-00468	G0009	0B	CIVIL - MATERIAL TRACKING PLAN	
	92X-5900-G-00477	G0010	0B	CIVIL - ACCESS CONTROL - SECTOR 1	
		G0011		SHEET NOT USED	DRAWING NOT USED FOR CFC ISSUE
	92X-5900-G-00467	G0012	0B	CIVIL - EROSION AND SEDIMENT CONTROL - NOTES AND DETAILS	
	92X-5900-G-00469	G0013	0B	CIVIL - DETAIL SHEET	

NOTES

1. DRAWING INDEX CODE NUMBERS ARE FOR FDF FILE REFERENCE. DRAWINGS ARE ORDERED BY SHEET NUMBER IN THIS DRAWING SET.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00415	PROJECT TITLE SHEET	X0001
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
DRAWING INDEX

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
R.M. LINDGREN	04/21/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

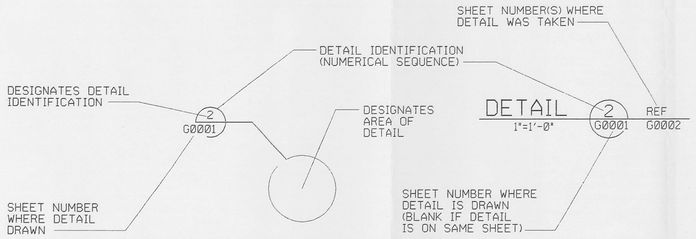
SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 6/20/97	DATE	DATE 11/19/97

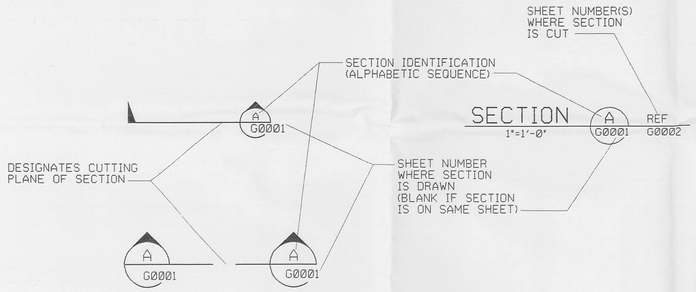
PO NUMBER	FDF PROJECT NO. WBS 1.1.1.1.5.3.2	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	00-90701	92X-5900-X-00418	X0002	0B

000164

2053

GENERAL LEGEND





UTILITY SYMBOLS

EXISTING		PROPOSED
----- ST -----	STORM SEWER	
-----FG -----	FUEL GAS	
-----DW -----	DRINKING WATER	
----- FT -----	WASTEWATER EFFLUENT	
----- E -----	UNDERGROUND ELECTRICAL	
----- OE -----	OVERHEAD ELECTRICAL	
----- G -----	ELECTRIC GROUND	
----- GW -----	GROUND WATER	
----- WW -----	WASTE WATER	
----- SN -----	SANITARY SEWER	
----- SD -----	SUBDRAIN (TILES)	

GRADING SYMBOLS

EXISTING		PROPOSED
X 584.9	SPOT ELEVATION	X 589.4
584	CONTOUR - MINOR	584
585	CONTOUR - MAJOR	585
(TOE)	SLOPE INDICATOR	(TOE)

SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	
OR	CATCH BASIN (CB)	
	POWER OR LIGHT POLE	
	ELECTRICAL MANHOLE	
	GATE VALVE	
1313	SOIL BORING	
11503	MONITORING WELL	
11503	MONITORING WELL (TO BE ABANDONED BY OTHERS)	
E	EXTRACTION WELL	
	SURFACE DRAINAGE FLOW	
	GRAVEL SURFACE	
	ASPHALTIC CONCRETE PAVING	
	CONCRETE PAD	
	BUILDING/TRAILER	
	TREE LINE	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	CENTERLINE DRAINAGE DITCH	
	RIVER/CREEK	
	TO BE REMOVED	
	SILT FENCE	S S
	ELECTRICAL TRANSFORMER	
	TRANSMISSION TOWER	
	HEADWALL	
	BENCH MARK	
x x	CHAIN LINK/CATTLE FENCE	
XXX XXX	CERTIFICATION ROPE FENCE	
XX XX	CONSTRUCTION/WIND BARRIER FENCE	XX XX
R R	ROPE FENCE	
	SIGN	
	BOLLARD/GUARD POST	
PB	ELECTRICAL PULL BOX	
	REDUCER	
	DOUBLE GATE	
	SINGLE GATE	
	APPROXIMATE ELEVATION OF GROUNDWATER	
	SECTOR BOUNDARY	
	100 YR FLOOD PLAIN	
	FEMP PROPERTY LINE	
	EASEMENT	
	TRAP RANGE BOUNDARY	
	DUST CONTROL/WORK LIMIT	
	AREA 1, PHASE II BORROW AREA	
	DUMPED ROCK	

ABBREVIATIONS

A1PI	AREA 1, PHASE I	N/A	NOT APPLICABLE
A1PII	AREA 1, PHASE II	NTS	NOT TO SCALE
A2PI	AREA 2, PHASE I	O.C.	ON CENTER
AWWT	ADVANCED WASTEWATER TREATMENT	ODNR	OHIO DEPARTMENT OF NATURAL RESOURCES
BCCMP	BITUMINOUS COATED CORRUGATED METAL PIPE	ODOT	OHIO DEPARTMENT OF TRANSPORTATION
BCY	BANKED CUBIC YARDS	OEPA	OHIO ENVIRONMENTAL PROTECTION AGENCY
BSL	BIODENITRIFICATION SURGE LAGOON	OSDF	ON-SITE DISPOSAL FACILITY
C/C	CENTER TO CENTER	OU-2	OPERABLE UNIT 2
CG&E CO	CINCINNATI GAS & ELECTRIC COMPANY	PHII	PHASE II
CM	CONSTRUCTION MANAGER	PPM	PARTS PER MILLION
CMP	CORRUGATED METAL PIPE	PVC	POINT OF VERTICAL CURVE
CU	CERTIFICATION UNIT	PVI	POINT OF VERTICAL INTERSECTION
CY	CUBIC YARDS	PVT	POINT OF VERTICAL TANGENCY
DECON	DECONTAMINATION	RAD II	RADIOLOGICAL WORKER II
DO	DISSOLVED OXYGEN	RI	REMEDIAL INVESTIGATION
E.W.	EACH WAY	SHT	SHEET
EXIST	EXISTING	STP	SEWAGE TREATMENT PLANT
FDF	FLUOR DANIEL FERNALD	SWM	STORMWATER MANAGEMENT
FEMP	FERNALD ENVIRONMENTAL MANAGEMENT PROJECT	SWRB	STORMWATER RETENTION BASIN
FRL	FINAL REMEDIATION LEVEL	SWU	SOUTHERN WASTE UNIT
FS	FEASIBILITY STUDY	TYP	TYPICAL
HDPE	HIGH DENSITY POLYETHYLENE	VC	VERTICAL CURVE
LCS	LEACHATE CONVEYANCE SYSTEM	WAC	WASTE ACCEPTANCE CRITERIA
LF	LINEAR FEET		
MAX	MAXIMUM		
MIN	MINIMUM		
MH	MANHOLE		
MTL	MATERIAL TRACKING LOCATION		

NOTES

GENERAL NOTES

1. EXISTING TOPOGRAPHY PREPARED BY PARSONS FROM DIGITAL MAPPING BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY PROVIDED BY WOOLPERT CONSULTANTS FLOWN ON APRIL, 1997. OTHER SOURCES OF EXISTING INFORMATION SHOWN ON DRAWINGS WERE PROVIDED BY FDF; THESE SOURCES INCLUDE:

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS

2. HORIZONTAL CONTROL SHOWN ON THE DRAWINGS IS BASED UPON NORTH AMERICAN DATUM 1983 (NAD 83). SEE SHEET G0001 FOR PROJECT SURVEY CONTROL.

3. VERTICAL CONTROL SHOWN ON THE DRAWINGS IS BASED UPON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 29). SEE SHEET G0001 FOR PROJECT SURVEY CONTROL.

4. REFERENCES TO SECTIONS (E.G. SEE SECTION 02206) ARE TO THE CONTRACT TECHNICAL SPECIFICATION SECTIONS.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00415	PROJECT TITLE SHEET	X0001
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-G-00421	EXISTING CONDITIONS PLAN	G0001

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
		INFORMATION ONLY		
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1 - PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
LEGEND AND GENERAL NOTES

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/22/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 6/20/97	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO. WBS 1.1.1.1.5.3.2	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	00-90701	92X-5900-X-00420	X0003	0B

NOTES

1. ON SITE DISPOSAL FACILITY (OSDF) IMPROVEMENTS SHOWN ARE EITHER PROPOSED, UNDER CONSTRUCTION OR COMPLETED.
2. OVERHEAD POWER AND COMMUNICATION LINES ARE PROPOSED AND ARE TO BE INSTALLED BY OTHERS.
3. FOR UTILITIES SEE SHEETS G0004, G0005, AND G0007.
4. CONTOURS SHOWN ALONG THE PHASE I RE-ROUTED NORTH ENTRANCE ROAD RELOCATION WERE DEVELOPED FROM CFC DRAWINGS. AS-BUILT CONDITIONS MAY BE DIFFERENT. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND NOTIFY THE CONSTRUCTION MANAGER IN WRITING OF ANY DEVIATIONS PRIOR TO INITIATING ANY WORK IN THIS AREA.
5. EXISTING CONTOURS SHOWN ON THIS SHEET ARE AT 5' INTERVALS. EXISTING CONTOURS ARE SHOWN AT 1' INTERVALS ON THE VARIOUS SITE/GRADING/UTILITY PLANS. CONTOURS SHOWN IN THE STOCKPILE AREA ARE FROM TOPOGRAPHY PRIOR TO PLACING MATERIAL.
6. BORINGS AND WELLS SHOWN ARE TAKEN FROM FDF FILES. ADDITIONAL WELLS AND BORINGS OUTSIDE THE WORK LIMITS (SEE SHT G0003) NOT SHOWN.
7. THERE SHALL BE NO WORK PERFORMED OR EQUIPMENT TO ENTER THE MID-VALLEY OIL EASEMENT WITHOUT WRITTEN AUTHORIZATION FROM MID-VALLEY OIL AND THE CONSTRUCTION MANAGER.

LEGEND

△ EXISTING BENCHMARK

1970 ⊕ MONITORING WELL

11669 ● SOIL BORING

BENCHMARK INFORMATION

BENCHMARK	NORTHING	EASTING	ELEVATION	REMARKS
N-1	476876.20	1351301.43	607.88	EXISTING
N-3	480007.25	1349883.72	579.44	EXISTING
N-5	478758.71	1350146.60	580.37	EXISTING
N-6	476928.55	1348369.68	551.99	EXISTING
IRON PIN (IP)	478205.58	1351472.81	603.32	EXISTING
DOE-WMCO-1A	479157.59	1350835.05	585.57	EXISTING
W-2428	480850.13	1351732.75	600.79	EXISTING
OSDF-2	482199.94	1351779.16	615.82	EXISTING
OSDF-3	478850.42	1351749.33	595.61	EXISTING

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00428	MASTER KEY PLAN	G0003
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00466	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0007

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

2053

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

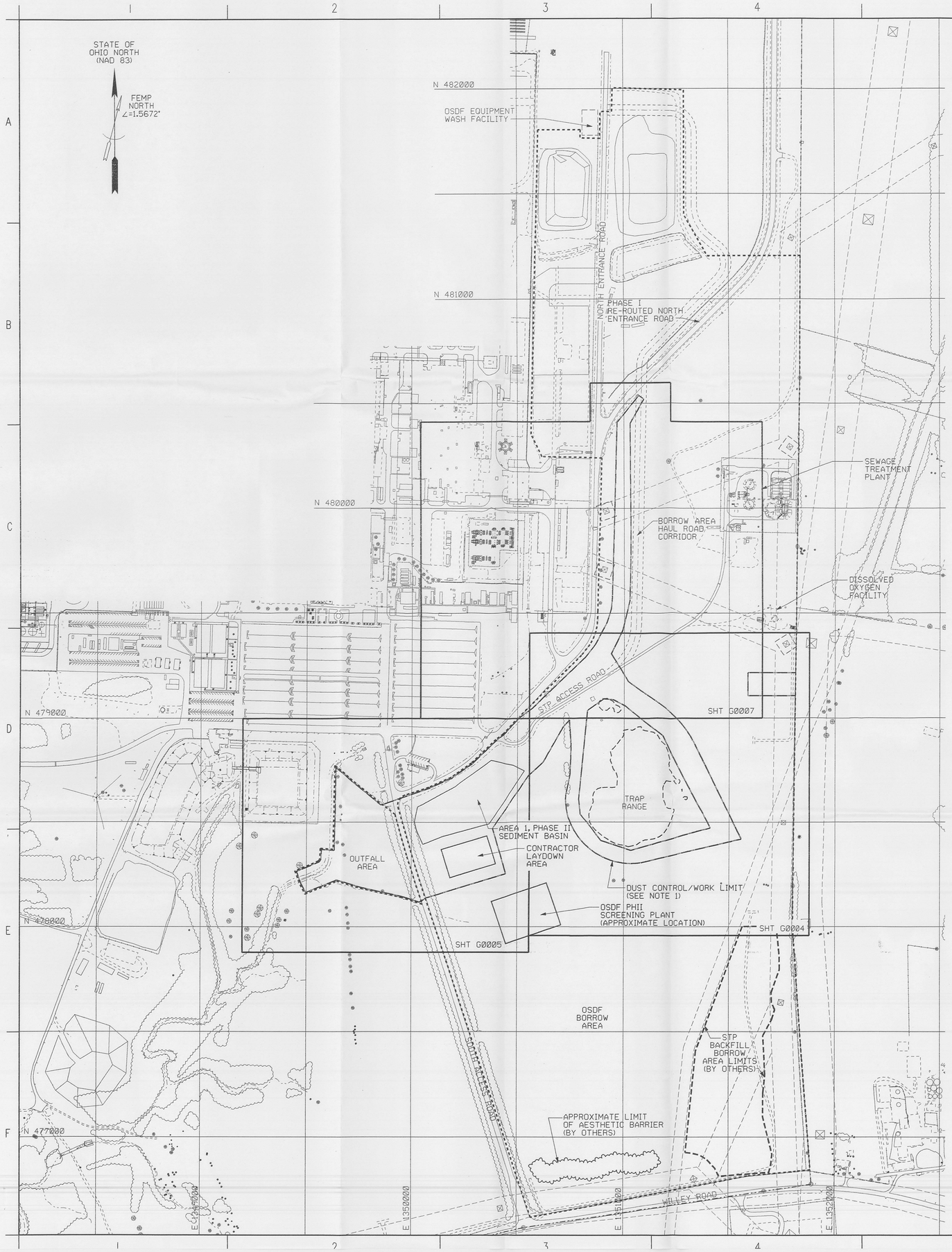
DRAWING TITLE
CIVIL
EXISTING CONDITIONS PLAN 000166

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/22/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 6/20/97	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00421	G0001	0B



NOTES

1. PERFORM DUST CONTROL WITHIN THE DUST CONTROL/WORK LIMITS, MATERIAL STOCKPILES, ACCESS ROADS, AND OTHER AREAS OF WORK AS SPECIFIED IN PART 6 - STATEMENT OF WORK AND TECHNICAL SPECIFICATIONS OF THE CONTRACT DOCUMENTS.
2. FOR EXISTING CONDITIONS PLAN SEE SHT G0001. FOR EXISTING UTILITIES SEE SHEETS G0004, G0005 AND G0007.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00415	PROJECT TITLE SHEET	X0001
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00421	EXISTING CONDITIONS PLAN	G0001
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00466	SITE/GRADING/UTILITY PLAN CONVEYANCE CHANNEL	G0007

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION -DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

2053

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
MASTER KEY PLAN

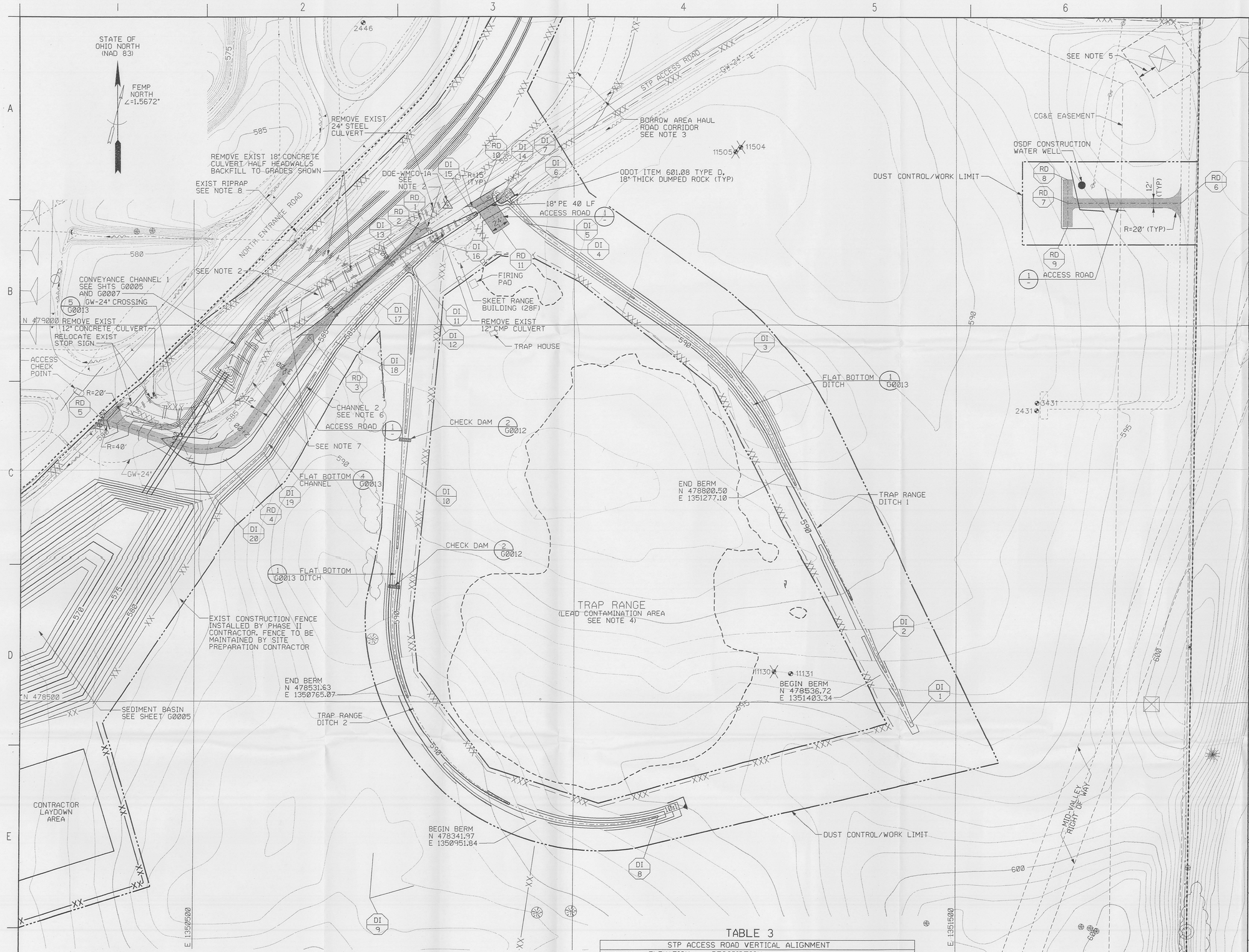
000167

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/22/97	K. GERARD	11/19/97	K. GERARD	11/19/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 5/20/97	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00428	G0003	0B



NOTES

1. ACCESS TO TRAP RANGE WORK AREA SHOWN IS APPROXIMATE AND MAY BE FIELD LOCATED BY CONTRACTOR SUBJECT TO CONSTRUCTION MANAGER APPROVAL AND SHALL BE SIMILAR TO DETAIL 1 THIS SHEET. THE CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE TO EXISTING AND PROPOSED DITCHES/CHANNELS.
2. CONTRACTOR SHALL SAW CUT AND REMOVE EXISTING PAVEMENT (2"-4" BITUMINOUS CONCRETE) AND REMOVE CULVERTS FROM THE EXISTING STP ACCESS ROAD FROM THE NORTH ENTRANCE ROAD TO POINT RD-1. BACKFILL WITH COMPACTED FILL TO THE PROPOSED GRADES SHOWN AND SEED.
3. BORROW AREA HAUL ROAD, TO BE LOCATED WITHIN THE BORROW AREA HAUL ROAD CORRIDOR, SHALL BE CONSTUCTED BY OTHERS.
4. LEAD CONTAMINATION AREA, STABILIZATION AND REMEDIATION WORK BY OTHERS. AREA SHALL NOT BE DISTURBED BY SITE PREPARATION ACTIVITIES.
5. NO WORK SHALL BE PERFORMED WITHIN 25' OF BASE OF CG&E TOWER.
6. OSDF CONSTRUCTION OF THE HAUL ROAD, TO INCLUDE DRAINAGE, WILL PRECEED AIPII CONSTRUCTION. AIPII CONTRACTOR SHALL RELOCATE APPROXIMATELY 60 LF OF 12" PIPE IN ORDER TO INSTALL THE STP ACCESS ROAD/TRAP RANGE DITCH (CHANNEL 2) AS SHOWN ON THE CONSTRUCTION DRAWINGS. CONTRACTOR SHALL RECONSTRUCT THE BORROW AREA HAUL ROAD TO ORIGINAL CONFIGURATION. COORDINATE WORK THROUGH THE CONSTRUCTION MANAGER.
7. EXISTING CERTIFICATION ROPE FENCE SHALL BE RELOCATED, SEE SHT G0010.
8. RESHAPE EXISTING STONE AT PIPE OUTFALL TO MATCH EXISTING DITCH GRADES.

TABLE 1

CENTERLINE DITCH/CHANNEL COORDINATES (DI)

POINT	NORTHING	EASTING	DESCRIPTION	DITCH EL
1	478472.50	1351442.37	BEGIN DITCH 1	592.5
2	478562.99	1351399.07	SLOPE BREAK POINT	590.7
3	478934.51	1351221.29	PI 400' CURVE	N/A
4	479135.43	1350937.42	PI 300' CURVE	N/A
5	479133.09	1350944.81	SLOPE BREAK POINT	586.0
6	479160.50	1350918.43	SLOPE BREAK POINT	585.0
7	479170.61	1350910.23	MEET CHANNEL 2	584.6
8	478347.33	1351111.93	BEGIN DITCH 2	591.0
9	478238.70	1350733.91	PI 275' CURVE	N/A
10	478802.34	1350773.82	SLOPE BREAK POINT	587.5
11	479064.83	1350792.40	PI 30' CURVE	N/A
12	479065.80	1350788.89	SLOPE BREAK POINT	585.0
13	479110.01	1350760.72	MEET CHANNEL 2	583.8
14	479166.10	1350903.21	END OF PIPE, INV EL 584.3	584.3
15	479144.45	1350869.57	END OF PIPE, INV EL 584.2	584.2
16	479109.96	1350815.91	PI 78' CURVE	N/A
17	479033.59	1350737.53	ANGLE POINT	583.5
18	478977.27	1350686.88	PI 300' CURVE	N/A
19	478829.80	1350591.60	ANGLE POINT	582.5
20	478770.49	1350527.39	ANGLE POINT	582.2

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00461	SEDIMENT BASIN SECTIONS AND DETAILS	G0006
92X-5900-G-00466	SITE/GRADING/UTILITY PLAN CONVEYANCE CHANNEL	G0007
92X-5900-G-00459	TRAFFIC PLAN	G0008
92X-5900-G-00477	ACCESS CONTROL SECTOR 1	G0010
92X-5900-G-00467	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS	G0012
92X-5900-G-00469	DETAIL SHEET	G0013

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1 - PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
SITE/GRADING/UTILITY PLAN
TRAP RANGE

000168

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/23/97	K. GERARD	11/19/97	K. GERARD	11/12/97
PLANT/BLDG. NO.		FLOOR		SCALE 1"=50'	CLASS
SUBMITTED FOR 30% ISSUE		SUBMITTED FOR 60% ISSUE		SUBMITTED FOR 90% ISSUE	
TECH LEAD K. GERARD		TECH LEAD N/A		TECH LEAD K. GERARD	
DATE 6/20/97		DATE		DATE 11/19/97	

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00436	G0004	0B

TABLE 2

REROUTED STP ACCESS ROAD COORDINATES (RD)

POINT	NORTHING	EASTING	DESCRIPTION
1	479130.3	1350806.9	MATCH EXIST ROAD/PC OF CURVE
2	479125.2	1350799.0	PI 100' RADIUS
3	478984.3	1350650.9	PI 400' RADIUS
4	478819.0	1350541.8	PI 75' RADIUS
5	478874.2	1350378.1	MATCH EXIST ROAD (STA 0+00)
6	479162.2	1351794.7	MATCH EXIST GRAVEL
7	479162.2	1351647.3	INTERSECTION OF ROAD
8	479193.2	1351647.3	END OF ROAD
9	479131.2	1351647.3	END OF ROAD
10	479168.5	1350877.6	MATCH EXIST ROAD
11	479126.9	1350905.4	END OF ROAD

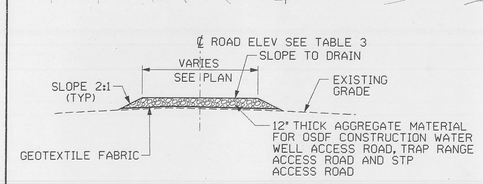
TABLE 3

STP ACCESS ROAD VERTICAL ALIGNMENT

STATION	ELEVATION	DESCRIPTION
0+00	EXIST	PVC MATCH EXISTING EDGE OF PAVEMENT (POINT 5)
0+30	581.20	PVI 60' VC
0+60	583.60	PVT = PVC (SEE NOTE BELOW)
0+80	585.20	PVI 40' VC
1+00	585.40	PVT
2+00	586.40	STATION POINT
2+50	586.90	PVC
3+00	587.40	PVI 100' VC
3+50	586.20	PVT = PVC (SEE NOTE BELOW)
4+00	585.00	PVI 100' VC
4+50	585.00	PVT
5+67	585.50±	END OF RELOCATED STP ACCESS ROAD (POINT 1)

FROM 4+50 TO 5+67 ADJUST SLOPE TO MATCH EXIST PAVEMENT FOR COORDINATE ON PT

ADJACENT REVERSE VERTICAL CURVES, END POINT FOR LEADING CURVE (PVT) IS THE BEGINNING OF THE FOLLOWING CURVE (PVC).



ACCESS ROAD (1 / -) NTS — REF G0004 G0005

STATE OF OHIO NORTH (NAD 83)

FEMP NORTH ∠=1.5672°

TABLE 2

A1PII SEDIMENT BASIN COORDINATES (SB)			
POINT	NORTHING	EASTING	ELEVATION
1	478512.56	1350020.79	577.0
2	478569.76	1350029.22	577.0
3	478670.19	1350212.10	579.0
4	478794.40	1350368.52	581.0
5	478759.94	1350492.66	579.0
6	478498.57	1350361.23	582.0
7	478403.90	1350057.40	578.0

TABLE 3

EXIST GW-24" COORDINATES (GW)			
POINT	NORTHING	EASTING	ELEVATION
1	478816.85	1350406.96	578.90
2	478837.50	1350461.70	578.67
3	478848.98	1350488.77	579.37
4	478947.86	1350623.93	582.48

TABLE 4

DUMPED ROCK COORDINATES (DR)			
POINT	NORTHING	EASTING	ELEVATION
1	478677.39	1350306.05	571.0
2	478638.45	1350367.11	571.0
3	478701.99	1350439.43	576.0
4	478738.74	1350461.10	576.0
5	478759.02	1350528.01	584.0
6	478766.04	1350532.07	584.0
7	478779.47	1350546.09	584.0
8	478789.87	1350536.80	584.0
9	478776.68	1350521.72	584.0
10	478768.62	1350495.14	582.0
11	478790.08	1350400.99	582.0
12	478773.80	1350391.40	576.0
13	478752.28	1350360.68	576.0

TABLE 5

CONSTRUCTION FENCE BAFFLE COORDINATES (CF)			
POINT	NORTHING	EASTING	ELEVATION
1	478577.74	1350215.34	567.0
2	478488.46	1350254.36	577.0
3	478532.29	1350171.58	567.0
4	478619.45	1350133.50	577.0

NOTES

1. EXISTING TOPOGRAPHY SHOWN ON THESE DRAWINGS FOR THE AREA WEST OF THE SOUTH ACCESS ROAD HAS BEEN MODIFIED BY CONSTRUCTION ACTIVITIES. THE AREA OVER THE GW-10" AND GW-20" LINES WERE NOT BACKFILLED TO THE ORIGINAL GRADE. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF THE GROUNDWATER LINES PRIOR TO OUTFALL CHANNEL CONSTRUCTION. SEE SPECIFICATION 02050.
2. DUMPED ROCK SHALL BE WIDE ENOUGH TO GO UP THE SIDE SLOPES TO 4' VERTICAL HEIGHT, UNLESS OTHERWISE SHOWN. SEE PROFILE B ON SHT G0006 FOR TYPES OF DUMPED ROCK.
3. FOR ALL WORK RELATED TO THE STP ACCESS ROAD SEE SHT G0004.
4. COORDINATE LIMITS AND ACCESS WITH CONSTRUCTION MANAGER. CONTRACTOR TO COORDINATE ROAD CLOSURE AND PIPE CONSTRUCTION WITH CONSTRUCTION MANAGER.
5. THE SEDIMENT BASIN WILL HAVE BEEN EXCAVATED BY OTHERS TO APPROXIMATELY ONE FOOT ABOVE THE PROPOSED ELEVATIONS SHOWN. CONTRACTOR SHALL FINISH GRADE THE SEDIMENT BASIN TO THE LINES AND GRADES SHOWN ON THIS SHEET AND AS SPECIFIED IN THE SPECIFICATION 02050.

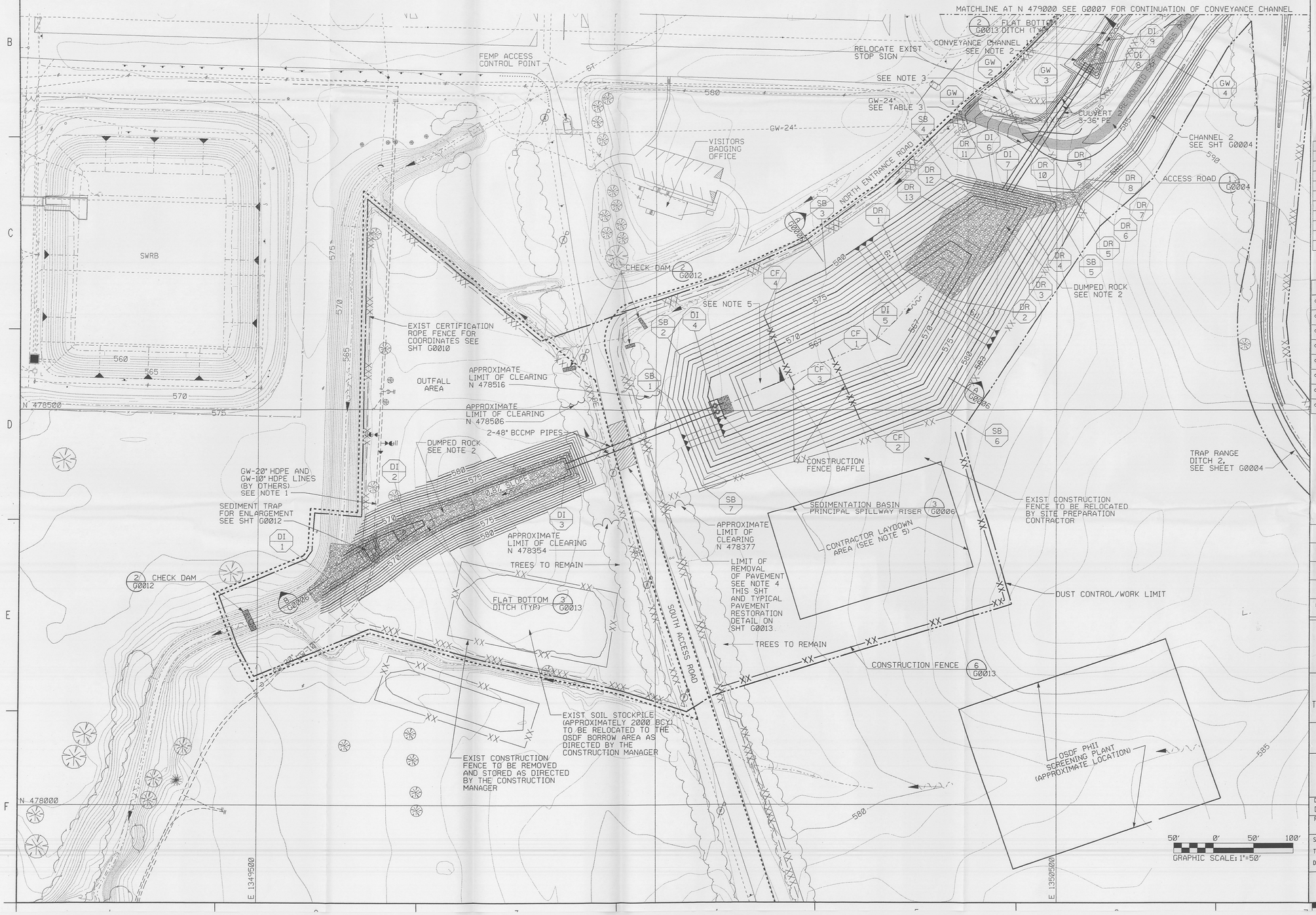


TABLE 1

CENTERLINE DITCH/CHANNEL COORDINATES (DI)			
POINT	NORTHING	EASTING	DESCRIPTION
1	478285.65	1349589.35	INTERSECT DITCHES
2	478348.82	1349687.76	PI 400' RADIUS
3	478427.67	1349886.62	℄ OF CHANNEL AT END OF 48" PIPES
4	478502.12	1350074.40	℄ OF BASIN AT 48" RISERS
5	478589.30	1350273.91	ANGLE POINT IN BASIN
6	478753.81	1350425.13	℄ OF BASIN AT BOTTOM OF SLOPE
7	478774.59	1350437.81	℄ AT END OF CENTER 36" PIPE
8	478936.48	1350541.13	INLET OF CENTER 36" PIPE
9	478967.28	1350560.79	END 8' WIDE DITCH

(SEE SHT G0007 FOR ELEVATIONS ALONG DITCH/CHANNEL PROFILE)

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00461	SEDIMENT BASIN SECTIONS AND DETAILS	G0006
92X-5900-G-00466	SITE/GRADING/UTILITY PLAN CONVEYANCE CHANNEL	G0007
92X-5900-G-00477	ACCESS CONTROL SECTOR 1	G0010
92X-5900-G-00467	EROSION AND SEDIMANT CONTROL NOTES AND DETAILS	G0012
92X-5900-G-00469	DETAIL SHEET	G0013

PRELIMINARY

NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE

CIVIL
SITE/GRADING/UTILITY PLAN
SEDIMENT BASIN

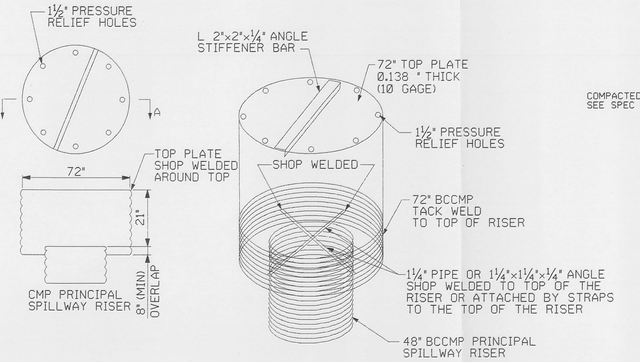
000169

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	04/23/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=50'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD K. GERARD	TECH LEAD N/A	TECH LEAD K. GERARD
DATE 6/20/97	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO. WBS 1.1.1.1.5.3.2	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	00-90701	92X-5900-G-00432	G0005	0B

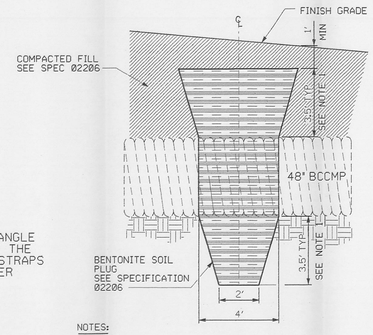


SECTION A-A

ISOMETRIC VIEW

CONCENTRIC TRASH RACK AND PRINCIPLE SPILLWAY RISER DEVICE DETAIL (1/-)

NTS

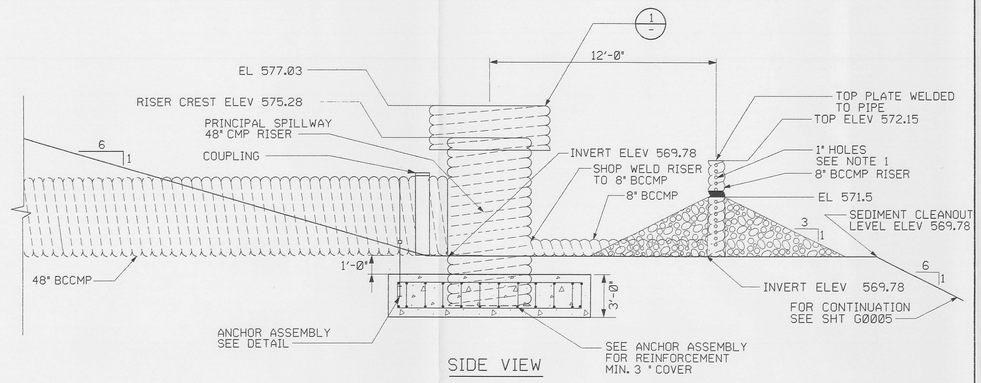


NOTES:

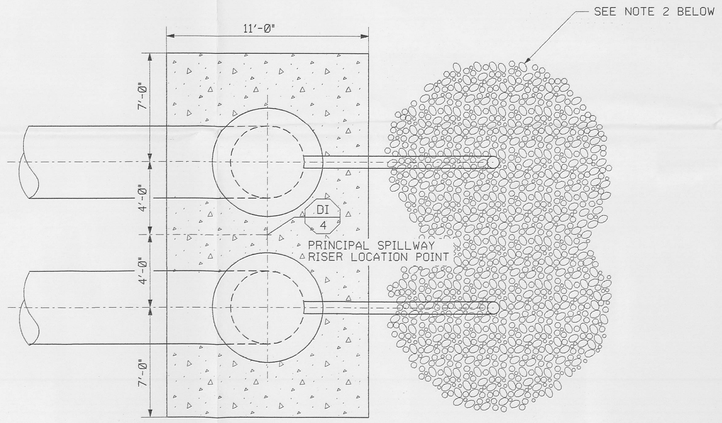
1. BENTONITE SOIL PLUG SHALL BE USED AS AN ANTI-SEEP COLLAR. 3.5' MINIMUM PROJECTION.
2. 3 BENTONITE SOIL PLUGS PER PIPE ARE REQUIRED.
3. MAKE PLUG CONTINUOUS BETWEEN 48" BCCMP'S.
4. PLUG TO BE A MINIMUM OF 2' FROM PIPE COUPLING.

BENTONITE SOIL PLUG DETAIL (2/-)

NTS



SIDE VIEW



TOP VIEW

W/O TOP PLATE

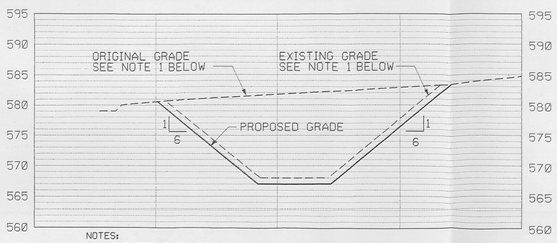
SEDIMENTATION BASIN PRINCIPAL SPILLWAY RISER DETAIL (3/G0006)

REF G0005

NTS

NOTES:

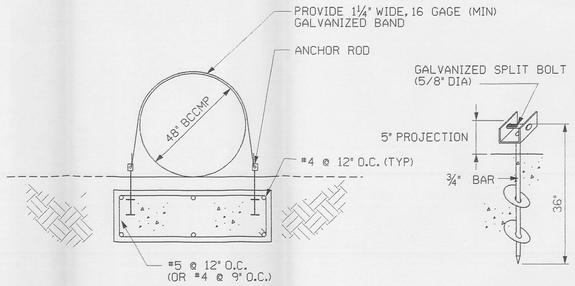
1. 4 ROWS OF 1" DIAMETER HOLES, 4" O.C., EQUALLY SPACED AROUND RISER.
2. PLACE AGGREGATE STONE UP TO ELEVATION SHOWN. STONE SHALL BE NO.1 STONE WITH THE FRACTION SMALLER THAN 2" REMOVED. MATERIAL SHALL CONFORM TO ODOT ITEMS 601, 703.01 AND 703.04.



NOTES:

1. THE SEDIMENT BASIN WILL HAVE BEEN EXCAVATED BY OTHERS TO APPROXIMATELY ONE FOOT ABOVE THE PROPOSED ELEVATIONS SHOWN. CONTRACTOR SHALL FINISH GRADING THE SEDIMENT BASIN TO THE LINES AND GRADES SHOWN ON THIS SHEET AND AS SPECIFIED IN THE SPECIFICATIONS.

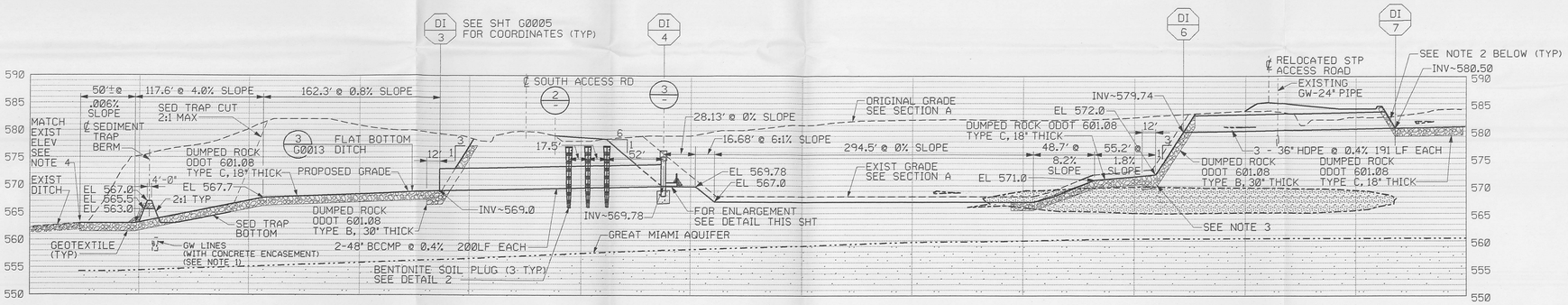
SECTION (A/G0006) REF G0005



ANCHOR ASSEMBLY DETAIL (4/-)

NTS

ANCHOR ASSEMBLY SHALL BE SIMILAR TO MINUTE MAN ANCHOR MODEL 4436 WITH MIN SYSTEM STRENGTH OF 6000 LBS.



PROFILE (B/G0006) REF G0005

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF THE EXISTING GROUNDWATER LINES, CONCRETE ENCASEMENT, AND GROUND SURFACE PRIOR TO OUTFALL CHANNEL CONSTRUCTION. PROVIDE 3' MINIMUM COVER.
2. CUT PIPE ENDS FLUSH WITH SLOPE.
3. UNDERCUT COARSE GRAIN MATERIAL SO THAT THERE IS A MINIMUM OF 2' OF CL MATERIAL COVER. SEE SPECIFICATION 02206.
4. GRADE THE OUTFALL CHANNEL SO AS TO PROVIDE POSITIVE DRAINAGE TO THE EXISTING DITCH. REUSE AND BLEND EXISTING ROCK.
5. DUMPED ROCK SHALL BE PLACED ON GEOTEXTILE, ODOT 712.09 TYPE B.
6. SEE SHT G0012 FOR ADDITIONAL INFORMATION ON SEDIMENT TRAP AND CONSTRUCTION IN THE AREA DOWNSTREAM OF THE TRAP.

LEGEND

- GROUND SURFACE (1992 FLYOVER)
- SEDIMENT BASIN/OUTFALL
- MODELED COARSE GRAINED MATERIAL (ESTIMATED LOCATION)
- TOP OF GREAT MIAMI AQUIFER
- COARSE GRAINED MATERIAL (MODELED LOCATION)
- GREAT MIAMI AQUIFER

10' 0' 10' 20'
GRAPHIC SCALE: 1"=10' VERTICAL

50' 0' 50' 100'
GRAPHIC SCALE: 1"=50' HORIZONTAL

NOTES

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00467	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS	G0012
92X-5900-G-00469	DETAIL SHEET	G0013

PRELIMINARY

NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
		INFORMATION ONLY		
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	5/6/98	5/6/98	5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE

CIVIL
SEDIMENT BASIN
SECTIONS AND DETAILS

000170

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/09/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00461	G0006	0B

NOTES

1. POINT DI-12 IS THE BEGINNING OF THE CHANNEL WHICH IS AT THE LOCATION THE CHANNEL BOTTOM TRANSITIONS FROM CUT TO FILL.
2. POINT DI-13 IS THE END OF THE CHANNEL EXTENSION IF THE LOW AREA IS FILLED. IT IS LOCATED WHERE THE CHANNEL TRANSITIONS FROM FILL TO CUT. CHANNEL EXTENSION SHALL ONLY BE CONSTRUCTED IF THE CONSTRUCTION MANAGER PROVIDES WRITTEN DIRECTION.
3. CONSTRUCT BERM TO THE LOCATION SHOWN, REGARDLESS OF BEGINNING LOCATION OF THE CHANNEL. CONTRACTOR SHALL CONSTRUCT THE BERM THAT IS OUTSIDE THE CU BOUNDARY FROM A SOURCE OF CERTIFIED SOIL MATERIAL.
4. BORROW AREA HAUL ROAD, TO BE LOCATED WITHIN THE BORROW AREA HAUL ROAD CORRIDOR, SHALL BE CONSTRUCTED BY OTHERS.

CENTERLINE CHANNEL COORDINATES (DI)

POINT	NORTHING	EASTING	DESCRIPTION	ELEV
8	479019.01	1350593.78	PI 400' RADIUS	N/A
9	479380.00	1350983.76	PI 800' RADIUS	N/A
10	479885.90	1350991.19	TRANSITION 8' TO 5' CHANNEL	585.4
11	479925.89	1350991.78	BEGIN 5' WIDE CHANNEL	585.6
12	480279.12	1350996.98	BEGIN DITCH - SEE NOTE 1	587.0
13	480373.86	1351001.11	END EXTENSION - SEE NOTE 2	587.4

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN 1	G0005
92X-5900-G-00467	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS	G0012
92X-5900-G-00469	DETAIL SHEET	G0013

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY 2053
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
SITE/GRADING/UTILITY PLAN
CONVEYANCE CHANNEL

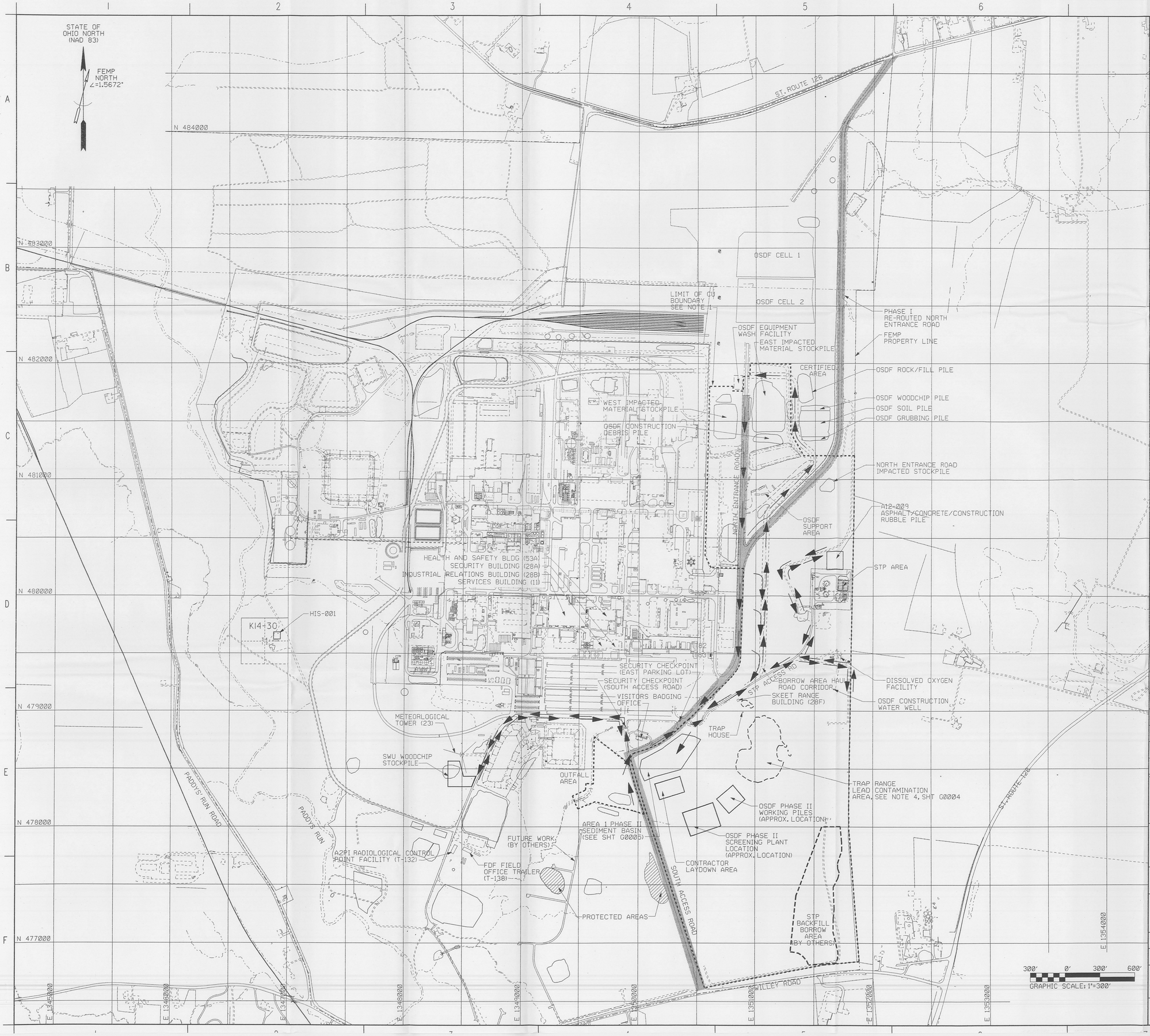
000171

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/30/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=50'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO. WBS 1.1.1.1.5.3.2	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	00-90701	92X-5900-G-00466	G0007	0B



NOTES

1. VEHICLES AND PERSONNEL SHALL NOT CROSS OVER THE CERTIFICATION LIMITS AS INDICATED BY THE CERTIFICATION ROPE EXCEPT WHERE SHOWN. SEE SHT G0010 FOR CERTIFICATION ROPE FENCE LOCATIONS AND PART 6 FOR CERTIFICATION AREA ACCESS REQUIREMENTS.
2. CONSTRUCTION VEHICLES SHALL USE SITE ACCESS ROUTES SHOWN FOR INGRESS AND EGRESS. INTERNAL ROUTES AND TRAFFIC PATTERNS WITHIN PROJECT AREA TO BE DETERMINED BY CONTRACTOR AND TO BE SHOWN ON THE CONTRACTORS TRAFFIC PLAN SUBMITTAL.
3. CONTRACTOR SHALL SUBMIT A TRAFFIC PLAN, TO INCLUDE TRAFFIC CONTROL MEASURES AND DEVICES, TO THE CONTRACTOR MANAGER FOR APPROVAL.
4. STP ACCESS ROAD AND SOUTH ACCESS ROAD ARE TO BE CLOSED DURING PIPE INSTALLATION. SOUTH ACCESS ROAD SHALL BE SCHEDULED TO BE CLOSED OVER THE WEEKEND. CONTRACTOR SHALL PLAN WORK TO MINIMIZE THE TIME THE ROADS ARE CLOSED AND THE IMPACT TO FEMP TRAFFIC/OPERATIONS. ROAD CLOSURE SHALL BE ADDRESSED IN THE TRAFFIC CONTROL PLAN AND SHALL BE COORDINATED THROUGH THE CONSTRUCTION MANAGER AS SPECIFIED IN PART 6.

LEGEND:

SITE ACCESS

HAUL ROUTE

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00477	ACCESS CONTROL SECTOR 1	G0010

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS 2053
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

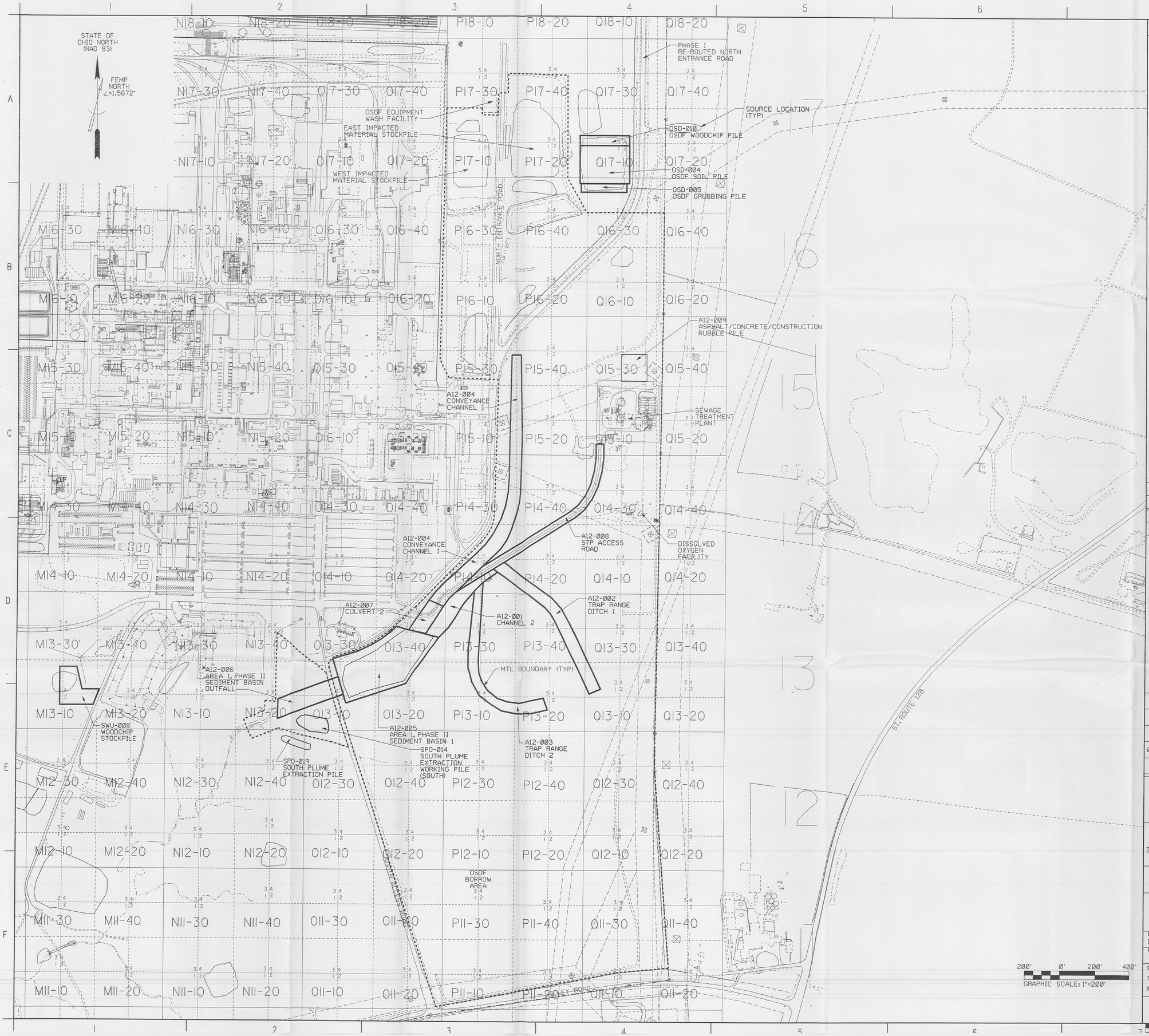
DRAWING TITLE
CIVIL
TRAFFIC PLAN 000172

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/08/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=300'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO. WBS 1.1.1.1.5.3.2	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	00-90701	92X-5900-G-00459	G0008	0B



NOTES

1. THE CONTRACTOR SHALL PROVIDE IN WRITING THE CONSTRUCTION MANAGER WITH THE QUANTITY, MATERIAL TYPE, SOURCE LOCATION (MTL), AND DESTINATION LOCATION (MTL) OF ALL MATERIALS MOVED BETWEEN MTL'S DAILY. SOIL MOVED WITHIN A MTL DOES NOT NEED TO BE TRACKED.
2. THE MATERIAL TYPES WILL BE TOPSOIL, SOIL, DEBRIS (CONCRETE, GRAVEL, WOOD, METAL, ASPHALT, REMOVED STRUCTURES), WOODCHIPS CLEARING AND GRUBBING MATERIAL.
3. THE SOURCE LOCATIONS ARE SHOWN ON THIS DRAWING.
4. THE QUANTITIES SHALL BE RECORDED TO THE NEAREST 3 CUBIC YARDS.
5. THE QUANTITIES SHALL BE RECORDED BY MATERIAL TYPE PER LOCATION PER DAY.
6. Q16-20 - TYPICAL FDF MATERIAL TRACKING DESIGNATION.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00415	PROJECT TITLE SHEET	X0001
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY 2053
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

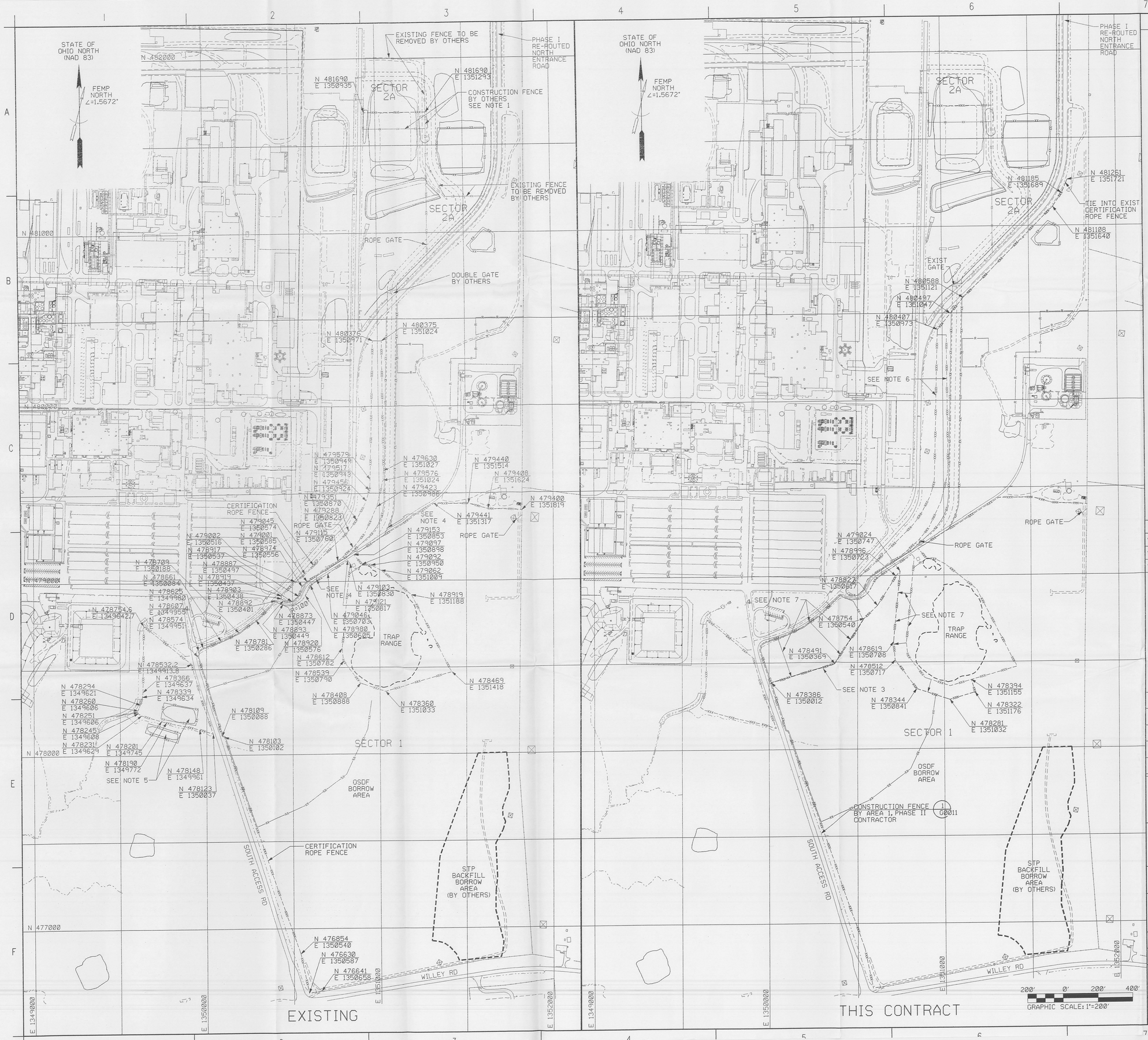
DRAWING TITLE
CIVIL
MATERIAL TRACKING PLAN 000173

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/11/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00468	G0009	0B



NOTES

1. FENCE IN SECTOR 2A TO BE YELLOW ROPE.
2. INSTALL CONSTRUCTION FENCE AND GATES AT TRAP RANGE PRIOR TO THE START OF STABILIZED LEAD CONTAMINATED SOIL EXCAVATION. GATE TO BE FIELD LOCATED BY CONSTRUCTION MANAGER AT OSDF BORROW AREA HAUL ROAD (BY OTHERS).
3. RELOCATE CERTIFIED AREA SIGNS, POSTS, AND CERTIFICATION ROPE FENCE AS DIRECTED BY THE CONSTRUCTION MANAGER.
4. OSDF PHASE II CONSTRUCTION FENCE AND ACCESS GATES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY AND INFORM CONSTRUCTION MANAGER OF ANY DEVIATIONS.
5. STOCKPILES AWAITING SAMPLE RESULTS TO DETERMINE CERTIFICATION. RELOCATE UPON AUTHORIZATION BY THE CONSTRUCTION MANAGER.
6. CONTRACTOR TO REMOVE CERTIFICATION SIGNS AT END OF CONTRACT AND TURN OVER SIGNS TO CONSTRUCTION MANAGER. POSTS AND ROPE FENCE TO REMAIN.
7. CONTRACTOR TO RELOCATE CERTIFICATION SIGNS, AND ROPE FENCE AT END OF CONTRACT AS DIRECTED BY THE CONSTRUCTION MANAGER.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00480	ACCESS CONTROL DETAIL SHEET	G0011

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	KG 5/6/98	CS 5/6/98	KG 5/6/98

INITIALS AND DATE

2053

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
ACCESS CONTROL
SECTOR 1

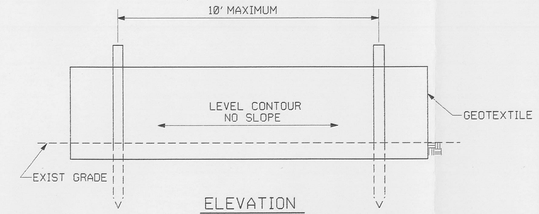
000174

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	10/29/97	K. GERARD	11/19/97	K. GERARD	11/12/97

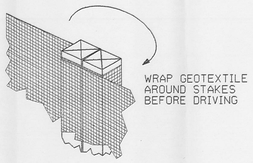
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

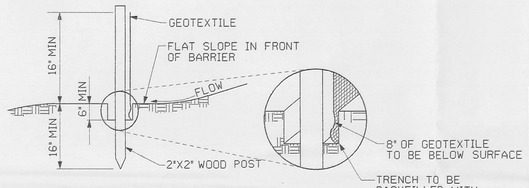
PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00477	G0010	0B



ELEVATION



JOINING SILT FENCE SECTIONS

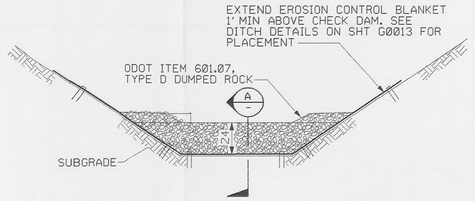


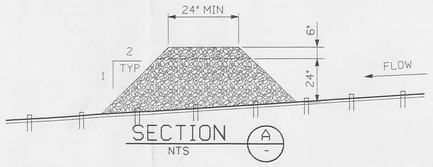
SECTION

GEOTEXTILE FOR SILT FENCE SHALL BE COMPOSED OF STRONG ROT-PROOF POLYMERIC FABRIC WHICH MEETS THE FOLLOWING REQUIREMENTS:

GEOTEXTILE PROPERTIES	VALUES	TEST
GRAB TENSILE STRENGTH	90 LB MIN	ASTM D 1682
MULLEN BURST STRENGTH	190 PSI MIN	ASTM D 3786
SLURRY FLOW RATE	0.3 GAL/MIN PER SF MAX	
EQUIVALENT OPENING SIZE	40 - 80	US STD SIEVE CW-02215
UV RADIATION STABILITY	70% MIN	ASTM D 4355

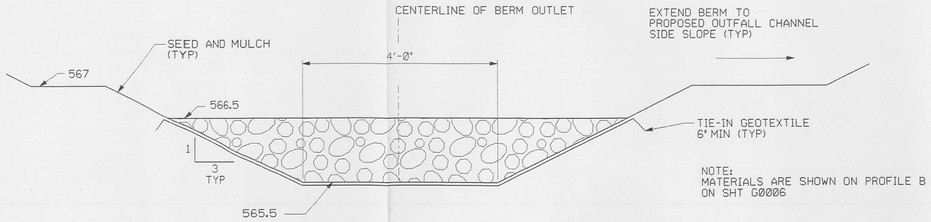
SILT FENCE DETAIL (1) G0012 REF G0005
NTS





SECTION (A) -
NTS

CHECK DAM DETAIL (2) G0012 REF G0005
NTS

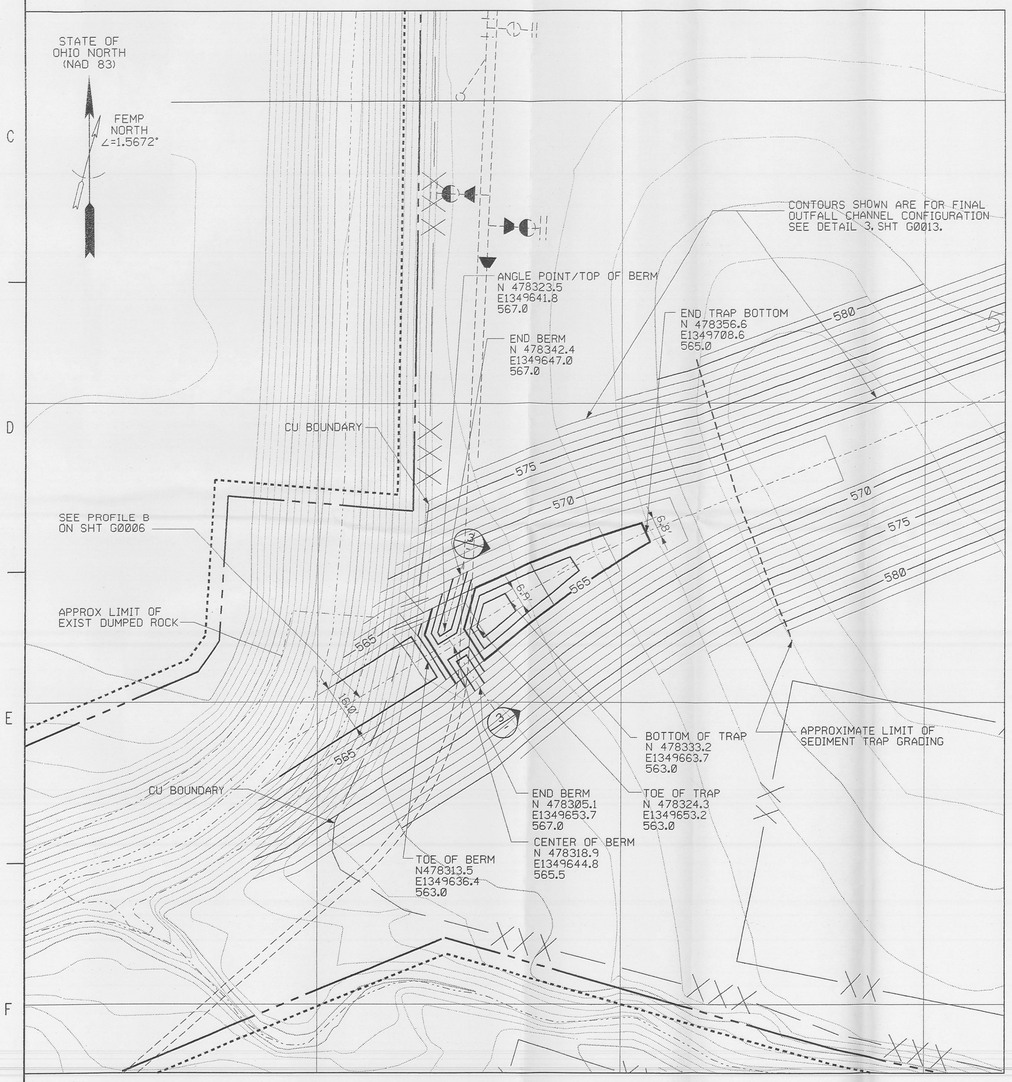


TOP OF BERM PROFILE (3)
NTS

SEDIMENT TRAP CONSTRUCTION NOTES

1. SEDIMENT TRAP SHALL BE CONSTRUCTED AND OPERATIONAL BEFORE UPSLOPE LAND DISTURBANCE BEGINS.
2. THE AREA UNDER THE EMBANKMENT MUST BE CLEARED, GRUBBED, AND STRIPPED OF ANY VEGETATION AND ROOTMAT. THE POOL AREA SHALL BE CLEARED AS NEEDED TO FACILITATE SEDIEMENT CLEANOUT AND FUTURE CONSTRUCTION OF THE DUMPED ROCK FILL.
3. COMPACTED FILL MATERIAL NEEDED FOR THE EMBANKMENT SHALL BE FROM CERTIFIED AREAS AND FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVERSIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONAL MATERIAL. ANY EMBANKMENT FILL SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
4. TEMPORARY SEEDING SHALL BE ESTABLISHED ON NON-SUBMERGED AREAS OF THE SEDIMENT TRAP.
5. GEOTEXTILE SHALL BE PLACED OVER THE BOTTOM AND SLOPES OF THE OUTLET SPILLWAY. GEOTEXTILE SHALL CONTINUE DOWNSTREAM OF THE EMBANKMENT TO FORM AN APRON ON THE SURROUNDING GROUND. TO PREVENT RUNOFF FROM FLOWING UNDER THE GEOTEXTILE, THE SECTIONS PLACED NEAREST THE FRONT SHALL OVERLAP FOLLOWING SECTIONS. SECTIONS OF GEOTEXTILE SHALL OVERLAP AT LEAST 2'.
6. ROCK PLACED ON THE GEOTEXTILE SHALL BE PLACED 1' THICK ON THE GEOTEXTILE. REUSE AND RESHAPE THE EXISTING ROCK IN THE CHANNEL.
7. THE SOIL EXCAVATED OUTSIDE THE CERTIFICATION UNIT, AS DEFINED BY THE CERTIFICATION ROPE FENCE, SHALL BE SPOILED IN OTHER ADJACENT UNCERTIFIED AREAS AND SEEDED. SPOIL AREAS SHALL BE APPROVED BY THE CONSTRUCTION MANAGER PRIOR TO PLACEMENT OF THE MATERIAL. SPOIL MATERIAL SHALL BE GRADED TO BLEND IN WITH THE ADJACENT AREAS.
8. THE SEDIMENT TRAP SHALL BE OPERATIONAL UNTIL THE SEDIMENT BASIN AND PRINCIPAL SPILLWAY OUTFALL CHANNEL IS OPERATIONAL. ONCE THEY ARE OPERATIONAL, THE SEDIMENT TRAP AND THE SEDIMENT SHALL BE REMOVED. COMPLETE CONSTRUCTION OF THE OUTFALL CHANNEL.
9. FIELD VERIFY THE EXISTING TOPOGRAPHY IN THE AREA OF THE SEDIMENT TRAP AND GROUNDWATER LINES PRIOR TO STARTING CONSTRUCTION AS SPECIFIED IN SECTION 02050.

AREA (ACRE)	STORAGE VOLUME (CUBIC FEET) REQUIRED	PROVIDED
0.67	1212	1380



ENLARGEMENT - SEDIMENT TRAP

20' 0' 20' 40'
GRAPHIC SCALE: 1"=20'

NOTES

1. UNLESS OTHERWISE NOTED, MATERIALS SHALL CONFORM TO ODOT CONSTRUCTION AND MATERIAL SPECIFICATIONS, DATED JANUARY 1997.
2. ADDITIONAL GUIDANCE AND REQUIREMENTS FOR EROSION CONTROL MEASURES SHALL BE AS INDICATED IN ODNR 'RAINWATER AND LAND DEVELOPMENT.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00432	SITE/GRADING/UTILITY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00461	SEDIMENT BASIN SECTIONS AND DETAILS	G0006
92X-5900-G-00469	DETAIL SHEET	G0013

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	5/6/98	5/6/98	5/6/98

INITIALS AND DATE

2053

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
EROSION AND SEDIMENT CONTROL
NOTES AND DETAILS

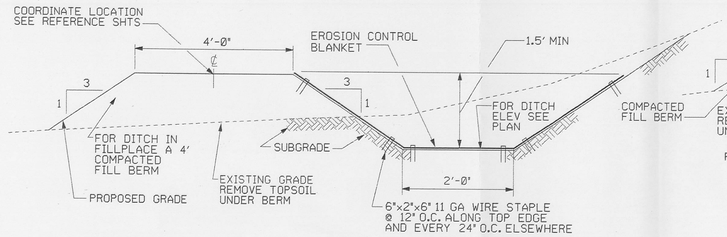
000175

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/09/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

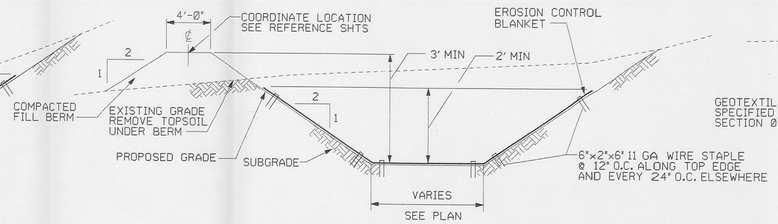
SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00467	G0012	0B



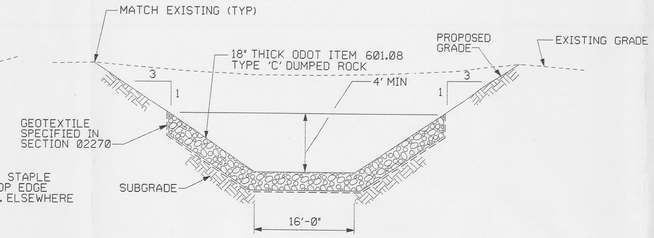
TYPICAL FLAT BOTTOM DITCH (FB) DETAIL

NTS — 1 G0013 — REF G0004



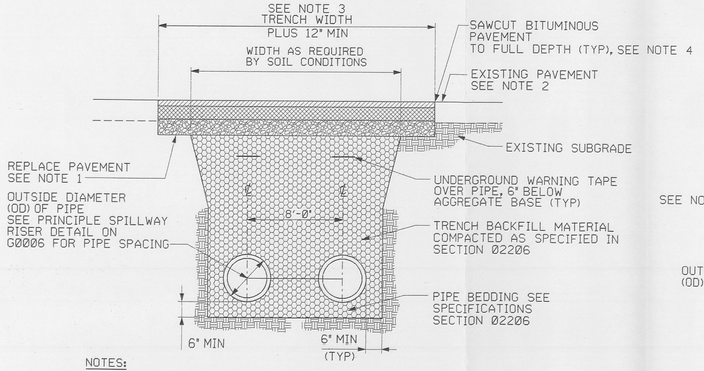
TYPICAL FLAT BOTTOM DITCH (FB) DETAIL

NTS — 2 G0013 — REF G0005, G0007



TYPICAL FLAT BOTTOM DITCH (FB) DETAIL

NTS — 3 G0013 — REF G0005, G0006

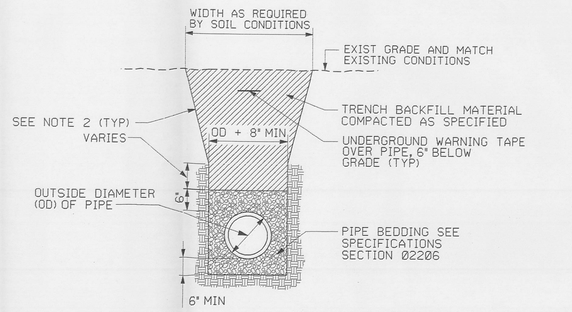


NOTES:

1. REPLACE PAVEMENT WITH THE FOLLOWING PAVEMENT SECTION:
   2" ASPHALT CONCRETE SURFACE, ODOT 404 (AC 20)
   8" MIN BITUMINOUS AGGREGATE BASE, ODOT 301 (3 LIFTS)
   6" AGGREGATE BASE, ODOT 304
2. EXISTING PAVEMENT IS A 2"± BITUMINOUS CONCRETE OVERLAY ON A 12"± REINFORCED CONCRETE BASE.
3. REMOVE CONCRETE ROADWAY EITHER AT CONSTRUCTION JOINT OR SAWCUT CONCRETE.
4. ASPHALT, CONCRETE AND AGGREGATE BASE SHALL BE REMOVED STOCKPILED AS SPECIFICIED IN SECTION 02100.
5. SOIL BELOW EXISTING AGGREGATE BASE SHALL BE CONSIDERED TO BE CERTIFIED.

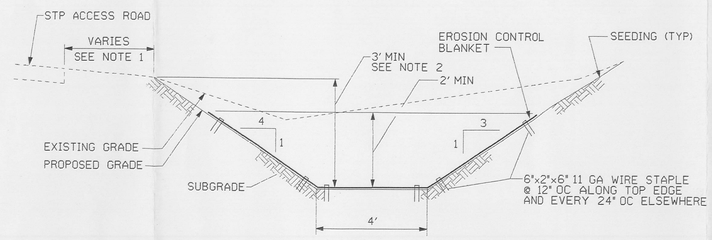
TYPICAL PAVEMENT RESTORATION DETAIL

NTS



TYPICAL PIPE BEDDING DETAIL

NTS

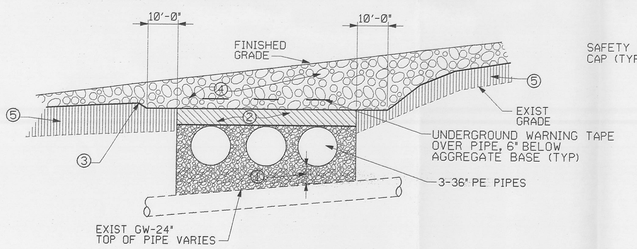


NOTES:

1. DISTANCE FROM STP ACCESS ROAD SHALL VARY. MAINTAIN A 2 TO 4% SLOPE FROM THE ROAD TO DITCH. SLOPE OF DITCH IS 0.40% UNLESS OTHERWISE NOTED BY SPOT ELEVATIONS.
2. DEPTH OF DITCH VARIES. MAINTAIN DITCH SLOPE TO THE HEAD OF THE SEDIMENT BASIN. FOR DITCH ELEV SEE SHT G0004.
3. CENTER TRAP RANGE CULVERT IN DITCH. PLACE 10 LF OF ODOT 601.08 TYPE D DUMPED ROCK, 18" THICK, AND 2' UP THE SIDE SLOPES AT EACH END OF THE CULVERT.

TYPICAL FLAT BOTTOM DITCH (FB) DETAIL

NTS — 4 G0013 — REF G0005, G0006



GW-24" CROSSING

NTS — 5 G0013 — REF G0005

① MINIMUM OF 4" FROM TOP OF GW-24" TO BOTTOM OF 36" PIPES. CLEARANCE WILL BE DIFFERENT FOR EACH PIPE TO MAINTAIN GRADES AS SHOWN ON PROFILE B, SHEET G0006.

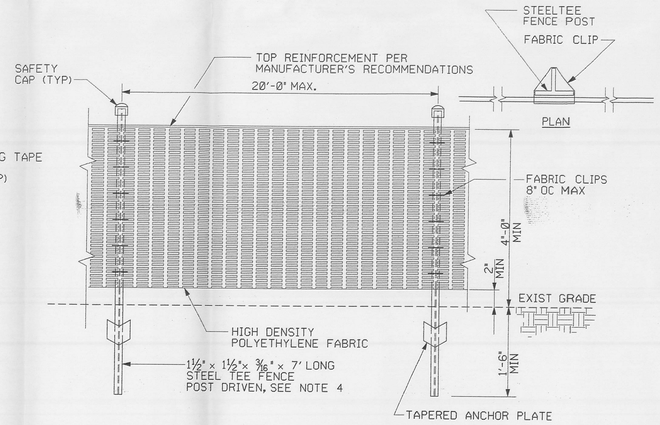
② 6" OF EMBEDMENT FILL, ODOT 703.11 OVER TOP OF 36" PIPES.

③ GEOTEXTILE ACCORDING TO SPECIFICATION 02506.

④ MINIMUM OF 12" AGGREGATE SURFACE, (ODOT 304) EXCEPT 18" MINIMUM WHEN WITHIN 10' OF 36" HDPE PIPES. FOLLOW STP ACCESS ROAD VERTICAL ALIGNMENT.

⑤ COMPACTED FILL MATERIAL, SEE SPECIFICATION 02206. PLACE COMPACTED FILL ON TOP OF EMBEDMENT FILL SUCH THAT NO MORE THAN 18" OF AGGREGATE SURFACE IS REQUIRED TO MATCH STP ACCESS ROAD ALIGNMENT.

⑥ SOIL BELOW EXISTING AGGREGATE BASE SHALL BE CONSIDERED TO BE CERTIFIED.



CONSTRUCTION FENCE DETAIL

NTS — 6 G0013 — REF G0010

NOTES

1. ALL DISTURBED AREAS, TO INCLUDE DITCHES AND BERMS, SHALL BE SEEDED IN ACCORDANCE WITH SPECIFICATION 02900.
2. TRENCH EXCAVATION SHALL CONFORM TO SPECIFICATION 02206.
3. SUBJECT TO THE APPROVAL OF THE CONSTRUCTION MANAGER, MINOR FIELD ADJUSTMENTS TO BERM WIDTH AND/OR SLOPES TO MAINTAIN CONSTRUCTION WITHIN THE CERTIFIED ROPE FENCES.

RELATED DWG NO.	DRAWING TITLE	SHEET NO.
92X-5900-X-00418	DRAWING INDEX	X0002
92X-5900-X-00420	LEGEND AND GENERAL NOTES	X0003
92X-5900-G-00436	SITE/GRADING/UTILITY PLAN TRAP RANGE	G0004
92X-5900-G-00432	SITE/GRADING/UTILTIY PLAN SEDIMENT BASIN	G0005
92X-5900-G-00461	SEDIMENT BASIN SECTIONS AND DETAILS	G0006
92X-5900-G-00466	SITE/GRADING/UTILITY PLAN CONVEYANCE CHANNEL	G0007
92X-5900-G-00477	ACCESS CONTROL SECTOR 1	G0010

PRELIMINARY
NOT FOR CONSTRUCTION

INFORMATION ONLY

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	TL	PM	REVD BY
0B	CERTIFIED FOR CONSTRUCTION - DRAFT	RG 5/6/98	CS 5/6/98	RG 5/6/98

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY 2053
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
REMEDIATION AREA 1, PHASE II
SITE PREPARATION PACKAGE

DRAWING TITLE
CIVIL
DETAIL SHEET

000176

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D.R. FOX	09/09/97	K. GERARD	11/19/97	K. GERARD	11/12/97

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR 30% ISSUE	SUBMITTED FOR 60% ISSUE	SUBMITTED FOR 90% ISSUE
TECH LEAD N/A	TECH LEAD N/A	TECH LEAD K. GERARD
DATE	DATE	DATE 11/19/97

PO NUMBER	FDF PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
P0175	WBS 1.1.1.1.5.3.2 00-90701	92X-5900-G-00469	G0013	0B