Water regulatory permit application for the proposed Crandon Project mine site: scope ID 93C049. 1998

Foth and Van Dyke and Associates, Inc.
Green Bay, Wisconsin: Foth and Van Dyke, 1998

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Nicolet Minerals
COMPANY

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December 22, 1998

Mr. Bill Tans
Wisconsin Department of Natural Resources
Bureau of Integrated Science Services
101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Ms. Char Hauger
U.S. Army Corps of Engineers
St. Paul District
190 5th Street East
St. Paul, MN 55101

Dear Mr. Tans and Ms. Hauger:

Re: Crandon Project - Water Regulatory Permit Application for the Proposed Crandon Project Mine Site

Nicolet Minerals Company (NMC) is pleased to file the enclosed updated document titled *Water Regulatory Permit Application for the Proposed Crandon Project Mine Site*. This application encompasses the following permit and approval requests:

Mine Site Construction Activities

1. Site grading that would result in topsoil disturbances of more than 10,000 square feet to the banks of navigable waterways as covered by Sections 30.123 and 30.19, Wis. Stats.

2. General culvert installations in navigable waterways and intermittent streams as covered by Sections 30.123 and 30.20, Wis. Stats.

3. The construction of two bridges over Swamp Creek as covered by Sections 30.123, and 30.20, Wis. Stats.

4. Water discharge structure placement at the mitigation sites as covered by Section 30.20, Wis. Stats.

5. A Little Sand Lake outlet structure as covered by Section 30.20, Wis. Stats.

6. Other surface water monitoring structure placement as covered by Section 30.20, Wis. Stats.

This joint state/federal water regulatory permit application has been prepared on behalf of NMC by Foth & Van Dyke and Associates, Inc. As noted on the attached distribution list, NMC has distributed the document to appropriate state and federal agencies, to local officials, and to various interested parties. It is our understanding that the Wisconsin Department of Natural Resources and the U.S. Army Corps of Engineers will be responsible for distribution of the document to their appropriate staff members.

This application for Chapter 30, Wis. Stats., permits has been submitted as one document to facilitate a complete presentation of required information for water regulatory approvals for the mine site. If you or your staff have any questions regarding the permit application, please contact me at (715) 478-3393.

Sincerely,

Gordon Reid
Manager of Engineering
Nicolet Minerals Company

GR:cer1

Distribution

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Water Regulatory Permit Application for the Proposed Crandon Project Mine Site

Scope ID: 93C049

Prepared for
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Prepared by
Foth & Van Dyke and Associates Inc.

Originally Issued June 1996
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Nicolet Minerals Company
Water Regulatory Permit Application for the Proposed Crandon Project Mine Site

Executive Summary

Introduction

With this document Nicolet Minerals Company (NMC) has applied for the necessary permits from the Wisconsin Department of Natural Resources for activities associated with the construction of stream crossings, the installation of culverts and grading in or around navigable waterways for its proposed mine site. The document describes CMC's construction plans and the methods that will be used to keep environmental impacts to a minimum in these areas.

Construction Activities Near Navigable Water Resources

Construction activities in the area of navigable waterways requiring water regulatory permits include grading, bridge and culvert installation, discharge structure placement at mitigation sites, a lake outlet structure, and surface water flow monitoring structures.

Environmental Protection

The bridge and culvert stream crossings have been designed to allow the free flow of water so that upstream drainage problems will not occur even when waterways are under flood conditions.

During all construction near waterways, NMC will use appropriate practices designed to control dust and prevent runoff and erosion. Depending upon the area involved, these practices would include one or more of the following techniques:

- Diversion dikes, silt fencing, ditches and/or settling basins to collect runoff from disturbed areas.
- Riprap to protect slopes.
- Stockpiling of topsoil for use in reclaiming graded slopes.
- Mulching and replanting slopes as soon as possible after earth work; applying jute or paper matting to steep slopes where needed to enhance seed germination.
- Watering exposed soil as needed for dust control.

The above techniques are common construction practices that have been successfully applied for years to control erosion, restore construction areas and protect navigable waterways.

Nicolet Minerals Company
Water Regulatory Permit Application for the Proposed Crandon Project Mine Site

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Appendices

1 Introduction

Nicolet Minerals Company (NMC) is proposing to develop an underground zinc-copper mine in Forest County, Wisconsin. Pursuant to Chapter NR 132.05, Wis. Admin. Code, NMC submitted a Notice of Intent to Collect Data and Detailed Scope of Study (NOI/SOS) for the Crandon Project to the Wisconsin Department of Natural Resources (WDNR) on February 15, 1994. As part of further development of this project, numerous federal, state and local environmental, construction, building and safety permits and approvals need to be obtained. This submittal constitutes the Water Regulatory Permit Application (WRPA) for the proposed Crandon Project mine site.

The WRPA has been prepared in accordance with applicable portions of Chapter 30, Wis. Stats. The WRPA outlines the construction and operation of structures (such as bridges and culverts) and construction activities adjacent to navigable waters. The material presented in this report is indicative of the type and size of water regulatory facilities to be constructed and operated as part of the Crandon Project. During final design it is likely that some modification in the engineering and operational details of the facilities and systems will occur.

A number of parallel applications have been submitted to the WDNR and United States Army Corps of Engineers (USCOE) in support of the Crandon Project permitting process. The major documents and permit applications are listed below:

- Environmental Impact Report
- Air Pollution Control Permit Application
- Water Regulatory Permit Application for the Wetland Compensation Site
- Water Regulatory Permit under Section 404 of the Federal Clean Water Act
- Notice of Intent for Storm Water Discharges Associated with Construction Activities Under a General WPDES Permit
- Mine Permit Application
- Tailings Management Area Feasibility Report/Plan of Operations and Addenda
- Wisconsin Pollutant Discharge Elimination System (WPDES) Permit Application
- Preliminary Engineering Report for Wastewater Treatment Facilities
- High Capacity Well Permit Application
- Surface Water Mitigation Plan

An attempt has been made during the preparation of the above documents to avoid excessive duplication. The WRPA is intended to be self-contained; but, some cross-referencing to the other documents is necessary. Therefore, this permit application refers to information provided in the above documents whenever possible.

Erosion control features to be used during project construction are detailed in the project's Mine Permit Application (MPA) (Foth & Van Dyke, 1995/1998a). The MPA also presents surface water control structure design for the plant site and tailings management area (TMA). Additional detail regarding TMA design and construction can be found in the project's *Tailings Management*

Area Feasibility Report/Plan of Operation (Foth & Van Dyke, 1995) and Addenda (Foth & Van Dyke, 1996a, 1996b, 1997a, 1998a and 1998b). The WRPA is based on engineering and other environmental studies as they relate to the design, operation, closure and post-operational care and maintenance of the Crandon Project facilities. Additional information including that contained in the project's *Environmental Impact Report* (EIR) (Foth & Van Dyke, 1995/1998a), were also used as a basis for this permit application.

The WRPA is organized into four sections. The first section is this Introduction. Section 2 contains a brief description of the main elements of the Crandon Project. Section 3 contains detailed information concerning project features requiring water regulatory permits. Section 4 contains a list of references. Completed permit application forms are included in Appendix A. Supporting information, including calculations and details, are provided in the remaining Appendices B through G.

1.1 Background

The Crandon deposit was discovered in the mid-1970s using airborne geophysical techniques and exploratory drilling. The deposit is located approximately 5 miles south of Crandon, Wisconsin. Its size and quality of mineralization has been determined by core holes drilled from the surface.

In 1978, Exxon Minerals Company (EMC) submitted to the Wisconsin Department of Natural Resources (WDNR) a Notification of Intent (NOI) to collect data to support a mining permit application for its Crandon zinc and copper deposit. During the mid-1980s, EMC or its successor company submitted the following major documents or applications to the Wisconsin Department of Natural Resources: an Environmental Impact Report (EIR), a Mine Waste Disposal Facility Feasibility Report, a Mine Permit Application, an Air Permit Application, a Wisconsin Pollutant Discharge Elimination System Permit Application, a High Capacity Well Approval Application, a Mine Refuse Disposal Facility Feasibility Report, Chapter 30 and 31 permit applications, and supporting documents. Additional permit applications and plan approvals were submitted by EMC to the Wisconsin Department of Transportation (WisDOT) and local units of government, and to the Public Service Commission of Wisconsin (PSC) by Wisconsin Public Service Corporation (WPSC). In late 1986, the Wisconsin Department of Natural Resources issued a Final Environmental Impact Statement (FEIS) regarding the proposed project. Subsequently, EMC withdrew its permit applications due to depressed metal prices.

In the fall of 1993 the permitting process for the Crandon Project was reinitiated by Crandon Mining Company (CMC), a partnership comprising two subsidiaries of Exxon Corporation and two subsidiaries of Rio Algom Limited. Additional data were collected and all of the required documentation was again submitted to the WDNR and the USCOE. In 1998 the Exxon subsidiaries withdrew and the partnership changed its name to Nicolet Minerals Company (NMC). NMC continues the permitting and development of the Crandon Project.

As described in greater detail in Section 2 of this document, the deposit will be mined and reclaimed in a similar fashion to that proposed in the 1980s, with the primary difference being that the production rate will be reduced to 5,500 TPD. The current project has also been modified to meet or be better than current day environmental standards and to incorporate design changes to improve environmental protection.

In June 1996 CMC issued a WRPA for the planned Crandon Project mine site. On January 10, 1997, CMC received a review letter (WDNR, 1997a) from the WDNR on the application. On April 22, 1997, a response (Moe, 1997a) to the WDNR was issued. The pertinent portions of the April 22, 1997, response have been incorporated into applicable sections of this document. Given that NMC has selected a soil absorption system for discharge of treated project wastewaters, reference to Chapter 30 permit requirements for the previously proposed Wisconsin River discharge pipeline have been deleted from this updated WRPA.

2 General Project Description

The main elements of the Crandon Project consist of an underground mine; ore concentrating facilities; wastewater treatment facilities; a tailings management area; a soil absorption system; a surface water mitigation system; and ancillary facilities such as an access road, a railroad spur line, and other service and support facilities. An extensive description of the project is included in the *Mine Permit Application* (Foth & Van Dyke, 1995/1998a). Following is a brief overview describing the entire project. The overview discusses the location of the mining facilities, the geology of the ore body, the mining process, and the major project components which will be developed to operate and reclaim the proposed project in a manner which protects public health, safety, and the environment. The project location and features are shown on Figure 2-1.

The anticipated rate of production, project life, and projected employment requirements for the project are shown in Table 2-1. As with any industrial operation, the life of the facility could change based on economic conditions.

Table 2-1

Anticipated Production and Operation Data

Average Daily Ore Production	5,500 tons
Annual Ore Production	2,000,000 tons
Total Ore Production	55,000,000 tons
Total Estimated Project Life	35 years
Pre-production	3 years
Mining	28 years
Reclamation	4 years
Production Schedule	7 days/week
Employment (estimates)	
Construction (Peak)	750
Operations	402-526

Prepared by: PAE
Checked by: JWS

Within this section there are numerous references to the "project area", "mine site", "plant site", "soil absorption system", and the "tailings management area". These terms have specific meanings as follows:

- Project Area - The project area is defined by the boundaries delineated on Figure 2-2.

- Mine Site - The mine site is defined by the limits of disturbance of project facilities within the project area.

- Plant Site - The plant site is generally defined as the area within the mine site that includes all mining, concentrating, wastewater treatment, administrative offices, and storage facilities; portions of the railroad spur in the vicinity of the plant site; portions of the access road in the vicinity of the plant site; and the project's water supply well and its accompanying pipeline corridor. The plant site also includes all surface water runoff and storage basins constructed in its vicinity.

- Soil Absorption System (SAS) - The "SAS" is defined as the area within the "mine site" that includes the project's soil absorption cells and treated wastewater discharge pipeline.

- Tailings Management Area (TMA) - The "TMA" is defined as the area within the "mine site" that includes the project's three tailings cells, the reclaim pond, the tailings and reclaim water pipeline and access road corridors, and contiguous borrow and storage areas. The TMA also includes the surface water control facilities constructed in its vicinity.

In addition, the project's wetland compensation site is located outside of the project area in Shawano and Oconto Counties. Design information for the soil absorption system is included as part of the wastewater treatment system engineering report prepared pursuant to Wisconsin Administrative Codes. Design information relative to the wetland compensation site is included as part of the Federal Clean Water Act Section 404 permit application. For completeness, the description of the environmental aspects associated with these areas are included in the project's *Environmental Impact Report*.

The boundaries of the project area, plant site, TMA, and the SAS are shown on Figure 2-2. The estimated area of disturbance for the plant site, TMA, and SAS are 116, 282, and 90 acres, respectively. The total area of disturbance, including the access road, railroad spur, surface water mitigation system, and other facilities, is approximately 564 acres.

2.1 Site Location

The Crandon ore body is located in Forest County, Wisconsin. The civil land survey location is Section 25, Township 35 North, Range 12 East, Town of Nashville, and Section 30, Township 35 North, Range 13 East, Town of Lincoln. The project area is located 5 miles south of the City of Crandon, and approximately 2 miles east of both STH 55 and the Sokoagan Chippewa Indian Reservation. The plant site is approximately ¼ mile north of Little Sand Lake and 1 mile south of Swamp Creek. The plant site will be located north of the ore body. The proposed plant site layout is shown in Figure 2-3. Access to the plant site will be along a new access road from STH 55 northwest of the site. A railroad spur line serving the plant site will be connected northeasterly to the existing Wisconsin Central Limited Railroad. The project's TMA will be located approximately 1 mile southeast of the plant site. The project's SAS will be located approximately 2 miles to the northeast of the plant site on land immediately north of Keith Siding Road.

The project area shown in Figure 2-2 includes portions of property which Nicolet Minerals Company has purchased, leased, optioned for purchase, or obtained by easements for use in the development of the plant site, TMA, SAS, access roads, railroad spur line, and buffer areas. The project area excludes publicly-owned land and roads.

2.2 Geology

The Crandon deposit is composed of two distinct mineralization types, zinc ore and copper ore. The minerals were deposited during the Precambrian era, about 900 to 2,500 million years ago. The deposit was formed at and just below the ocean floor by mineral-bearing fluids of volcanic origin. Some of the materials deposited by this volcanic system were sulfide minerals which accumulated in low spots on the ocean floor. Continued accumulation of other volcanic materials and sediments occurred which buried the sulfide deposit. Deep burial, 33,000 to 50,000 feet, resulted in lithification and metamorphism which hardened and solidified both the host rock and the sulfide deposit over time. Later, a mountain building phase occurred in the region, tilting the volcanic layers and the deposit to a near vertical position. Thereafter, the deposit may have been covered by younger sediments; however, weathering and erosion have removed these later rocks. The more recent geological process which has affected the deposit is related to Pleistocene glaciation which left the bedrock buried under unconsolidated glacial overburden deposits.

The Crandon ore body is long and tabular with an average width of 100 feet, north-south, and a strike length of 4,900 feet, east-west. Based on the results of drilling, the ore body extends to an approximate depth of 2,200 feet. The interpreted geologic stratigraphy and ore body configuration are shown on Figures 2-4 and 2-5, respectively.

The bedrock in the hanging wall and in the footwall of the ore body consists of a series of fragmental volcanic rocks, fine tuffs (solidified volcanic ash), debris flow (ocean floor and volcanic-derived sediments), breccia (blocky, angular particles), lapilli tuffs (gravel sized volcanic material), and flows. Overlying the bedrock is a sequence of unconsolidated glacial sands, clays, and gravels. The rock in contact with the unconsolidated glacial overburden is weathered to varying degrees. The amount of weathering ranges from simple staining to extreme weathering near the surface which reduced the rock to a clay-like material called massive saprolite. The glacial overburden consists of interbedded and co-mingled glacial till, which is material deposited directly by the glacier, and glacial outwash deposited by streams emanating from the glacier. These glacial deposits are found in various thicknesses in the area ranging from 75 feet to over 250 feet thick.

2.3 Key Project Elements

2.3.1 Mine Development

Access to the mine will be through a main production/service shaft located north of the ore body. The first of two ventilation shafts will be located east of this main production shaft. Underground lateral development drifts will access the ore body at 200-foot vertical intervals. These level development drifts are designed to provide access to the ore body. The lateral extent of a mine level at a given point in time will depend upon the need for access to mining blocks, ore passes, and ventilation raises. A typical schematic longitudinal section showing typical mine level intervals and the initial stoping areas of the mine is shown on Figure 2-6.

An underground ramp will also connect some of the 200-foot spaced levels and the 400-foot spaced main shaft stations to allow for movement of mobile equipment, supplies, and personnel throughout the mine. This centrally-located ramp is also shown schematically on Figure 2-6.

Mine development will be divided into the following phases:

1. Site preparation and the sinking of the main production shaft and the east ventilation shaft, and construction of a grouting drift at the top of the ore body and installation of a grout blanket to reduce groundwater inflow to the mine. This phase is expected to take 19 months to complete.

2. The development of the underground ore handling and crushing system, lateral development into the ore horizons, and development of the initial mining blocks (stopes). An internal mobile equipment access ramp will connect the main production ore levels. This phase of mine development is expected to take about 18 months to complete.

As shown on Figure 2-6, mine development and production will begin in areas chosen to avoid weathered bedrock which are expected to be the primary conduits for water inflow into the mine workings.

2.3.1.1 Phase I Development

Phase I development primarily includes simultaneous construction of two vertical shafts in the hanging wall rocks. Each shaft will be concrete lined through the overburden and the weathered subcrop rock. Collar construction through the glacial overburden will include stabilization and hydraulic control by ground freezing or other suitable techniques, followed by the excavation and concrete lining of the shaft into bedrock. As required, inert grout will be pumped under pressure through holes in the collar into the rock to provide a watertight seal. When the collar section of the main shaft and east ventilation shaft are completed, a headframe structure will be erected over each shaft. Conventional shaft sinking by drilling and blasting techniques will then commence at the main shaft and the east shaft concurrently.

During shaft development, it is estimated that the drainage water from each shaft sinking will be controlled to less than 10 gallons per minute (gpm) by freezing and/or grouting. All shaft water will be pumped to the surface water storage ponds.

To control mine water inflow over the underground development and operating period, a grouting drift at the 260-foot mining level will be constructed below the crown pillar in the Crandon Formation parallel to the strike of the ore body. This drift will progress westerly from the East Ventilation Shaft. A 25-foot thick cement grout blanket will be constructed at and above the 250-foot mine level by fan drilling in a vertical and horizontal plane from the grouting drift. Primary grouting holes will be spaced at 20-foot intervals, while secondary and tertiary holes may be drilled between these primary grout holes.

2.3.1.2 Phase II Development

Because the east ventilation shaft is smaller than the main production shaft, it will be completed sooner. Upon its completion, horizontal level development, consisting of driving a horizontal opening in the hanging wall rock to connect the east shaft to the main shaft (Figure 2-6), will be initiated. After the two shafts are connected, level development can commence to access the ore body.

The underground ore handling facilities will be constructed near the main production shaft during this period. These facilities will consist of: (a) coarse ore and waste rock storage bins; (b) crusher facilities; (c) ore and waste handling systems; and (d) a loadout facility.

2.3.2 Mine Operations

Level development to the stoping areas will be driven at 200-foot vertical intervals. The primary mining method will be blasthole open stoping with delayed backfill. However, other mechanized mining methods, such as cut-and-fill, will also be used. Stopes (Figure 2-7) will average approximately 200 feet high by 75 feet along the strike, and will vary with the width of the ore body. Ore will be drilled in a stoping block, then blasted and removed. Top hammer or down-the-hole drills will be used to drill blastholes on approximately 10-foot by 12-foot center spacing for production stope blasting. Broken ore will be removed from the drawpoints at the bottom of each stope using mechanized mining equipment which will then transfer the ore to the crushing level below by means of ore pass raises. Primary crushed ore, at a top size of 8 inches, will be conveyed to a skip loading pocket and hoisted to the surface.

A typical stope will contain approximately 170,000 tons of ore. At a 2,000,000-ton annual production rate, approximately 12 stopes will be mined out each year, which exposes less than 5 percent of the footwall and hanging wall area of the ore body at any one time. Exact production parameters will be based on the grade of the ore in the mined stope; the mechanical characteristics of the rock in the stoping block, and the potential for inflow of water.

A permanent bridge, or crown pillar, of bedrock directly beneath the glacial overburden will be purposely excluded from mining activity. This bedrock barrier of a minimum of 100 feet thick, along with the routine backfilling of mined-out stopes, will maintain surface stability and prevent subsidence.

In the uppermost mine levels where the ore and host rock may have been moderately weakened by surficial weathering, mechanized cut-and-fill mining will be employed. This method is commonly used by the industry and involves removal of horizontal lifts of ore of variable thicknesses. The void created by each horizontal mining pass will be backfilled with cemented paste tailings prior to mining the next upper lift. Less than 10 percent of the ore body will require use of this mining method.

To provide support for the rock walls, a floor for subsequent mucking, and back support for pillar mining, the planned mining methods provide for backfilling all stopes with pyritic paste tailings following ore extraction. These practices, combined with the fact that 5 to 10 percent of the potentially minable ore will be left in place as pillars throughout the mine, will provide perpetual stability of the mine area bedrock and glacial overburden. Backfilling will also result in the reduction of pathways for water migration as mining progresses.

Major advances have been made in backfill technology in the past 10 years. These advances will allow the placement of whole tailings in the project's mined-out stopes as a cemented pyritic paste backfill. The whole tailings will consist of pyrite concentrate produced at the mill from a pyrite flotation process. The pyrite concentrate will be dewatered and the resulting paste will be mixed with cement. The pyritic paste backfill will then be transported underground at a density of about 84 percent solids for placement in mined-out stopes. Hydration of the cement, which will be added to the paste at a rate ranging from 1 to 5 percent by weight, will consume the water delivered with the fill, thereby reducing backfill drainage to negligible quantities (i.e., <1 percent). It is estimated that the mined-out stopes will accommodate 75 percent of the total tailings produced by the project.

The very low drainage water flow from the pyritic paste backfill will minimize stope preparation requirements. Timber and shotcrete bulkheads will be constructed as ventilation barriers after the depletion of a stope. Once bulkhead construction has been completed in a given stope, backfilling can commence.

Waste rock will be generated from mine development activities during the pre-production and operating phases of mining. Waste rock generated during pre-production, prior to construction of the first TMA cell, will be hoisted to the surface and temporarily stockpiled on a lined pad at the plant site. The stockpiled waste rock will be used later for construction inside of the TMA as riprap, as the grading layer beneath the final cover system, or placed in the TMA as general fill. Waste rock which is generated during the operating phase and after construction of the first TMA cell will be transported directly to the TMA.

2.3.3 Mine Dewatering and Groundwater Inflow Control

Groundwater inflow will vary during the different stages of mine construction and operation. The proposed mining plan for the Crandon Project avoids entry into weathered zones during the initial operations, therefore deferring maximum and steady state inflow rates. During the initial operations, groundwater inflow is expected to be minimal and localized, occurring through isolated bedrock fractures that have limited capacity to move water. During the pre-production and mining phases, a grouting drift (Figure 2-8) will be developed in the Crandon Formation below the crown pillar at the 260-foot mine level. As mine development progresses along the drift, conical drilling techniques will be used to advance a 25-foot thick horizontal grout blanket. The grout blanket will be keyed into the moderately weathered bedrock and will serve to control inflow of groundwater to the mine.

Groundwater seepage that is not controlled by grouting will infiltrate the mine workings and ultimately be recovered in the main sumps along with mine utility water and very small amounts of backfill drainage.

Normal mine drainage collection will begin on each mine level where groundwater seepage and utility water drainage will be ditched to small local sumps. Decant water from the local mine level sumps will be piped or drained through boreholes or ditched to the main mine sumps located adjacent to the production shaft.

The main mine sumps and pump station will generally be arranged as indicated on Figure 2-9. Sumps will consist of downgrade excavations in the wall rock adjacent to the pump station. These will function as pumping reservoirs with an outlet end bulkhead containing the pump suction pipes.

2.3.4 Ore Processing

Ore mined from the Crandon deposit will be physically concentrated at the plant site by adding water to the crushed ore and grinding it to the size of fine sand particles. After grinding, the ore slurry will be pumped to a series of flotation circuits where reagents will be added for separating metallic minerals from the ground-up ore. During this process, minerals will be selectively "floated" to the top of the flotation cells and removed. A pyrite separation circuit will also be included to produce pyritic tailings to be used for underground pyritic paste backfill purposes. The remaining depyritized material, which is called depyritized tailings, will be pumped to the TMA. Different flotation circuits require different reagents to concentrate specific individual minerals. A schematic of the ore processing circuits is shown on Figure 2-10. Separate concentrates of zinc, copper and lead minerals will be recovered by the flotation process. The concentrate from these processes will be thickened and filtered to an 8 percent moisture content.

The tailings will range in size from sand to very fine particles. The whole pyrite tailings from the separation circuits will be used to backfill the mined-out stopes. The depyritized fraction will be sent to the TMA.

In the TMA, the tailings will settle to the bottom of the lined basin. Excess water will then be pumped from the TMA basin to a reclaim pond for reuse in the ore processing facility. The ore concentration process, TMA, and reclaim pond are designed to operate as a closed circuit. The concentration process normally requires the continuous addition of "makeup" water. Water in this circuit will not require treatment because a discharge will not normally take place. The wastewater treatment system will be designed to treat tailings pond waters for discharge, if necessary.

2.4 Infrastructure

2.4.1 Wastewater Treatment

A wastewater treatment plant will be constructed as part of project facilities. It will treat mine water and, if needed, process water prior to discharge. Groundwater that enters the mine will be commingled with other mine drainage water, such as the water used for flushing while drilling the blast holes. All of these "contact waters" will be routed through the wastewater treatment plant.

The wastewater treatment plant will include primary and advanced treatment processes. The primary treatment process will include lime and sulfide precipitation with filtration and pH adjustment. Advanced treatment will be used as required to meet water quality discharge limits. A reverse osmosis (RO) system will provide advanced treatment of primary treatment system effluent. High quality effluent from the RO system will be pumped to the discharge holding ponds. Reject wastewater from the RO system will be further concentrated in an evaporator. High quality evaporator distillate water will be either pumped to the discharge holding ponds or to the mitigation storage tanks. Concentrated brine from the evaporator will be pumped to the pyritic paste backfill system for placement underground. Treatment solids from the primary treatment system will be placed along with the depyritized tailings in the TMA. Mine water will be treated and sampled to meet Wisconsin Department of Natural Resources Water Quality Standards before being discharged to groundwater by way of a soil absorption system.

Where required, wastewater treatment plant evaporator distillate will be used for mitigation of nearby lakes impacted by groundwater drawdown associated with mine dewatering activities. Groundwater provided from a small water well will be used for mitigating creeks. A detailed analysis of mitigation requirements is available in the *Crandon Project Surface Water Mitigation Plan* (Foth & Van Dyke, 1998c).

The treatment system is designed with two holding ponds to retain the treated water so it can be sampled prior to discharge. This will confirm that all water meets discharge standards prior to discharge.

Sanitary wastewater will also be generated at the facility. Sanitary wastewater will be handled separately through a package sanitary wastewater treatment plant. The treated wastewater from this plant will be pumped to the TMA.

2.4.2 Mining Waste Management

Crandon Project mining wastes will include waste rock, tailings, refuse, wastewater treatment plant solids, and laboratory wastes.

As discussed in Section 2.4.3 below, waste rock which is generated during pre-production will be hoisted to the surface and temporarily stockpiled. It will later be used for construction purposes within the TMA containment areas, or as general fill in that facility. Waste rock which is hoisted to the surface during operation will be transported directly to containment areas within the TMA to be used as riprap or as general fill. As discussed in Section 2.4.4 below, during the zinc mining phase, approximately 75 percent of the tailings generated by the project will be returned to the mine as backfill, with the remaining 25 percent placed in the TMA.

During mining operations, on-site laboratories will be used to conduct metallurgical testing for mining grade control and for production quality assurance testing related to milling operations. Wastes generated from the performance of these tests will be placed in the TMA. Approximately 900 cubic yards of general refuse such as office wastes will be generated at the facility each year during the 35 years of construction, operation, and reclamation. The reclaimable portion of this waste will be recycled in accordance with state law. The remaining waste materials will be disposed of by a contractor in an approved off-site landfill.

Solids will be generated from the primary treatment of project generated wastewaters. These solids will be placed in the TMA with the tailings. Brine generated from advanced treatment of project generated wastewaters will be placed underground with the pyritic paste backfill.

2.4.3 Pre-Production Ore/Waste Rock Storage Areas

As shown in Figure 2-3, a lined pre-production ore storage area will be located to the north of the main production shaft to stockpile pre-production ore and waste rock hoisted to the surface during development of the mine. Prior to the commencement of underground crushing and the start of mill operations, approximately 1.24 million tons of ore and waste rock of a maximum size of 24 inches will be hoisted and temporarily stockpiled on this lined area. An unlined construction storage area is to be located adjacent to and east of the ore/waste rock storage area (Figure 2-3). This area will be used for various construction staging activities. This unlined area may also be used to temporarily stockpile waste rock which is tested and shown to have very low potential to generate acidic runoff.

Within the land area, a ridge will divide the pre-production ore from the waste rock stockpile on a north-south line. Each side of the lined pad will slope away from the center. The pad will be bounded by berms with runoff collection ditches which will route water to a lined water storage basin. The base of the pre-production ore storage area will consist of a composite liner system having a geomembrane overlying a geosynthetic clay liner. A protective soil layer will be placed over the geomembrane. Once ore or waste rock is placed on the storage pad surface, water from the area will be drained to a wastewater storage basin. The wastewater storage basin and delivery system will be sized to hold the volume of water from a 100-year, 24-hour storm event. Water from this basin will be either pumped to the TMA for use in ore processing or to the project's wastewater treatment plant.

The base of the construction material storage area will consist of a compacted layer of existing on-site soil. The base will be sloped to drain toward a surface water runoff basin. Water from this basin will be discharged to natural site drainageways.

2.4.4 Tailings Management Area

Depyritized tailings, hoisted waste rock, wastewater treatment plant solids, and a small amount of laboratory wastes will be placed in the TMA. The TMA has been designed to provide long-term, environmentally-safe containment. Low sulfide tailings and treatment plant solids will be pumped to the TMA through a high density polyethylene (HDPE) pipeline. Waste rock will be transported to the TMA by truck.

As shown on Figures 2-11 and 2-12, the TMA will consist of three cells, each of which will consist of a composite liner at the base and along the sidewalls of the facility and will include a leachate collection system. The three cells, referred to as TMA 1, TMA 2, and TMA 3, will each be constructed and operated sequentially in two stages. An internal berm will be constructed to separate TMA 1A and TMA 1B. TMA 1 is designed to contain the depyritized tailings from processing the zinc ore. TMA 2 and TMA 3 will be used for the copper ore depyritized tailings. The approximate capacities and site lives for each cell are shown in Table 2-2.

Table 2-2

Approximate Tailings Management Area Capacity

TMA Cell	Capacity (in millions of cubic yards)	Approximate Site Life (years)
TMA 1	6	16
TMA 2	4	6
TMA 3	4	6
Total	14	28

Prepared by: SAD2
Checked by: JWS

TMA cell development and operation will first involve constructing and filling TMA 1A. As the tailings in TMA 1A approach the design elevation, TMA 1B will be built. As the tailings approach the design elevation of TMA 1B, the second stage of TMA 1 will be built. When approximately 1 to 2 years of capacity remain in the second stage of TMA 1, construction of the first stage of TMA 2 will begin. After consolidation, reclamation of TMA 1 will begin, while filling in the first stage of TMA 2 progresses. The same process will continue for the second stage of TMA 2 and for TMA 3.

The tailings slurry will be transported from the concentrator building to the TMA through an approximate 16-inch inside diameter HDPE aboveground pipeline. The location of the pipeline is shown on Figure 2-2. The pipeline will lie above ground in a lined ditch. A 22-foot wide access road will be located next to the pipeline for service and maintenance. Pumps used for pumping the tailings slurry in the pipe will be located in the concentrator building. The pipeline ditch will be sloped to lined sumps located at the plant site and approximately midway between the plant site and the TMA to collect tailings and water in the event of leakage or to provide storage if the pipe must be drained.

The tailings slurry will be deposited in the active TMA cell using spigots. The spigot discharge point(s) will be regularly moved around the inner perimeter of the active cell to facilitate even distribution of tailings and to keep the tailings saturated. The excess water that drains from the slurry after the tailings have settled will flow to an area in the center of the cell and will be pumped to the reclaim pond. Water in the reclaim pond will be retained for a short time and then pumped to the mill for reuse in the process circuit. The tailings operating system is designed to maximize tailings density.

The TMA cells have been designed to meet the standards contained in applicable State Statutes and administrative codes which are written to protect the public health and welfare. Key TMA design features include:

- An average 37-foot separation from the base of the TMA to groundwater.
- A minimum 1,250-foot separation from the nearest lake or stream.
- A composite liner consisting of a low-permeability soil member and a geomembrane liner.
- A leachate collection system over the bottom of each cell and extending up the interior sidewalls of each cell.
- A reclaimed final composite cover consisting of the following components from top to bottom.
    - topsoil
    - rooting layer
    - biotic layer
    - drainage layer
    - cushioning geotextile
    - geomembrane (60 mil HDPE) liner
    - geosynthetic clay liner (GCL)

- low permeability (P40) soil layer
- grading layer

- Surface water control structures designed to accommodate a 100-year, 24-hour storm event.

2.4.5 Access Roads

A site access road will be constructed from STH 55 to the plant site. A second access road will be constructed from the plant site to the TMA. The site access road will be approximately 3 miles long and consist of bituminous concrete with gravel shoulders. The TMA access road will be approximately 1 mile long and will be gravel-surfaced. Pipelines for tailings and reclaim water transport will be sited adjacent to the TMA access road in a lined ditch.

2.4.6 Railroad Spur

A 2.7-mile railroad spur line will be constructed from the plant site to the Wisconsin Central Limited Railroad located to the northeast. The spur line will consist of a single track along most of its corridor. A side track will be located near the point where the spur line connects with the main railroad line. The sidetrack will be used for switching and rail car staging. The spur line will be used to bring cement, lime and other materials to the plant, and to ship concentrates to market. Concentrate will be shipped in enclosed cars or containers.

2.4.7 Utilities

Electrical service to the project site will be provided by Wisconsin Public Service Corporation (WPSC) via an electric transmission line constructed between an existing substation near Monico, Wisconsin, and a new substation to be located at the plant site. The substation near Monico will be upgraded by WPSC as part of the extension of electrical power for the project.

The WPSC area distribution system, which will likely be located near the south end of Lake Metonga, will supply natural gas for the project via a pipeline installed to the plant site. The pipeline route will follow existing county roads, cross Swamp Creek north of the plant site, and then follow the main plant access road into the site.

2.4.8 Soil Absorption System

An in-ground soil absorption system will be constructed to provide for groundwater discharge of treated mine water from the advanced wastewater treatment system. The soil absorption system will be located approximately 2 miles to the northeast of the plant site. A multiple cell, pressure distribution system will be used. A treated water discharge pipeline will be constructed primarily within the railroad spur line corridor from the treated water discharge lagoons to the soil absorption system. The location of the pipeline and the soil absorption system is shown on Figure 2-13.

2.4.9 Other Facilities

In addition to the project elements discussed above, other site facilities as listed below will be constructed and used as part of the project:

- Administrative offices
- Changehouse facilities
- Explosive storage areas
- Gate house
- Core logging and storage
- Covered storage area
- Truck weigh scale
- Fencing
- On-site roads
- Area lighting
- Laboratory facilities
- Surface maintenance shops
- Potable water supply and distribution system
- Fire protection systems
- Lubricant storage
- Bulk fuel storage
- Lay-down areas
- Railroad weigh scale
- Mobile equipment fuel station
- Parking areas
- Material storage areas

2.4.10 Surface Water Controls

Precipitation falling within the limits of the plant site will be collected and directed to one of a number of water storage basins. Contact runoff will be directed to the wastewater treatment plant or to the TMA. Non-contact runoff will be directed to existing natural drainage features after passing through runoff basins. Precipitation falling within the TMA will co-mingle with process water and become part of the water used in the mill circuit. Some of the surface water drainage originating from outside the active mining area will be intercepted by a series of drainage swales and directed to existing natural drainage features.

2.4.11 Wetland Compensation

Although mine facilities have been designed to minimize impacts on wetlands, as part of project construction activities, approximately 26.7 acres of wetlands will be either excavated or filled. To compensate, NMC will develop replacement wetlands on a site located in Shawano and Oconto Counties. The selected site is in an area that was originally wetlands, but was converted to cropland. The establishment of the compensation site involves reconverting it from cropland back to wetlands.

2.4.12 Surface Water Mitigation

Potential impacts due to mining on nearby lakes and streams were assessed by a regional groundwater flow model. A mitigation framework was developed from an assessment of these potential impacts. The framework consists of a hierarchial system of classifying streams and lakes based on the degree of potential impact. A Level I water body will require the construction of a mitigation facility prior to commencement of mining, while a Level II water body will require that detailed engineering work be completed as part of project permitting, such that the mitigation system could be installed quickly if a need were to arise. Level III and IV water bodies would require proportionally less planning since the potential for impacts would be appreciably less.

2.4.13 Mine Reclamation

Topsoil will be salvaged from disturbed areas for use in reclamation activities. Reclamation of the mining site will occur on an ongoing basis during construction and operation, and at the final phase of the project. After mining, the area will be used for forestry and as open green space. During construction, disturbed soil areas will be revegetated on a continual basis such that wind and water erosion potential is significantly reduced. These areas will either be temporarily reclaimed or finally reclaimed depending upon their location relative to future construction activities.

Final reclamation of the plant site will begin after completion of mining. All open boreholes will be sealed in compliance with applicable regulations. Salvageable equipment from the mine will be brought to surface. Any equipment left underground will have potentially harmful fluids removed. The shafts to the mine will be sealed with reinforced concrete plugs. Surface facilities may be converted to other uses, if possible. If other uses are not feasible, these facilities will be removed. The site area will be regraded and revegetated. Settling basins and ponds will be drained and the area reclaimed. Containment structures will be removed. Disturbed areas will be regraded and revegetated. The TMA will be reclaimed in phases during its lifetime. Final closure of the last cell of the TMA will occur late in the sequence of project reclamation.

The wastewater treatment plant and associated pipelines will be removed after they are no longer required. Salvageable equipment will be transported off-site. Treatment solids will be placed in the TMA prior to closure of the final cell or disposed of in an approved landfill after the TMA has been closed. Buried segments of pipelines will be flushed, the ends capped, and the pipeline left in place. Above-grade pipelines will be removed. The wastewater treatment plant area and pipeline routes will be graded and revegetated.

The soil absorption system will be reclaimed after there is no further need to discharge treated wastewater. The ends of the piping to the soil absorption system will be capped and the pipeline will be left in place.

On-site roads, the plant site access road, and the railroad spur line will be among the last items to be reclaimed. Reclamation of these features would be dependent upon the final site use. If no future use is anticipated, the construction materials will be removed. Bituminous pavement will be salvaged for use elsewhere, if possible, or placed in an approved disposal facility. Rail will be salvaged. The areas will be regraded and revegetated.

Utilities that service other customers along the route to the plant site will be left in place. The portion of the utilities that extend onto the plant site will be removed if above ground, or remain in service depending upon the final use of the site. Below-ground piping will be flushed as required, capped and left in place, if no longer in service.

3 Chapter 30 Permit Structures and Activities

Project activities regulated by Chapter 30, Wis. Stats., are proposed for the Crandon Project mine site. This section presents the information necessary to support the required permit applications. Included are appropriate permit application forms and supporting data for each regulated activity.

3.1 Mine Site

Water regulatory permit application forms for the mine site are provided in Appendix A. In order to comply with Chapter 30, Wis. Stats., requirements, the following mine site activities will require permitting:

- Site grading that would result in topsoil disturbances of more than 10,000 square feet to the banks of navigable waterways as covered by Sections 30.123 and 30.19, Wis. Stats.;
- General culvert installations in navigable waterways and intermittent streams as covered by Sections 30.123 and 30.20, Wis. Stats.;
- The construction of two bridges over Swamp Creek as covered by Sections 30.123 and 30.20, Wis. Stats.;
- Water discharge structure placement at the mitigation sites as covered by Section 30.20, Wis. Stats.;
- A Little Sand Lake outlet structure as covered by Section 30.20, Wis. Stats.; and
- Other surface water monitoring structure placement as covered by Section 30.20, Wis. Stats.

The remainder of this section describes these proposed activities.

3.1.1 Site Grading

The project will include construction activities involving the disturbance of more than 10,000 square feet of topsoil on the banks of navigable waterways. In total, construction activities at the mine site will result in the disturbance of approximately 564 acres. The area that falls within the bank of any navigable water body, however, is substantially less than the total disturbance area and is generally localized to the stream crossings discussed in Sections 3.1.2 and 3.1.3. In accordance with a January 10, 1997, letter from Mr. Dale Lang (WDNR, 1997a), the WDNR will address the Chapter 30, Wis. Stats., grading requirements for stream crossings under both s. 30.123 and s. 30.19, Wis. Stats. Site grading activities will include:

- Plant Site Construction;
- TMA Construction;
- Access Road Construction;
- Railroad Spur Construction;
- TMA Access Road/Pipeline Corridor Construction;
- Soil Absorption System Construction;
- Mitigation Structure Installation (e.g., wells, pipeline discharge outfall structures, etc.); and
- Surface Water Monitoring Structure Installation.

Each activity is described below.

3.1.1.1 Plant Site Construction

Site grading in the area of the plant site will create a total of approximately 116.3 acres of surface disturbance including less than 0.01 acres of wetland disturbance. Procedures for erosion control and surface water management for plant site construction activities are described in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a).

3.1.1.2 TMA Construction

Site grading in the area of the TMA will create a total of approximately 282.2 acres of surface disturbance including approximately 19.9 acres of wetland disturbance. Procedures for erosion control and surface water management for the TMA construction activities are described within the MPA (Foth & Van Dyke, 1995/1998a) and the TMA and addenda (Foth & Van Dyke, 1995, 1996a, 1996b, 1997, 1998a and 1998b).

3.1.1.3 Access Road Construction

Construction of the project's access road will create approximately 38 acres of surface disturbance including five wetland and stream crossings which will disturb approximately 3.6 acres of wetlands at the locations indicated on Figure 3-1 where culvert or bridge installation will be necessary. The disturbance will consist of stripping topsoil and removing hydric soils. Structural fill material will be placed to design elevations. Culverts will be installed for flow equalization as described in Section 3.1.2, below. A crossing will be constructed over Swamp Creek as presented in Section 3.1.3, below. Wetlands adjacent to the site access road and stream banks will be protected during construction activities using the erosion control methods described in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a).

3.1.1.4 Railroad Spur Construction

Construction of the project's railroad spur will create a total of approximately 24.4 acres of surface disturbance, including approximately 2.7 acres of wetland disturbance at the locations indicated on Figure 3-2 where culvert or bridge installation will be necessary. The disturbance will consist of stripping topsoil and removing hydric soils. Structural fill material will be placed to design elevations. That portion of the discharge pipeline to the soil absorption system that crosses wetlands and Swamp Creek will be constructed within the embankment and limits of disturbance of the railroad spur. Culverts will be installed for flow equalization as described in Section 3.1.2, below. A crossing will be constructed over Swamp Creek as presented in Section 3.1.3, below. Wetlands adjacent to the railroad spur and stream banks will be protected during construction activities using the erosion control methods described in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a).

3.1.1.5 TMA Access Road/Pipeline Corridor Construction

Construction of the TMA access road will create a total of approximately 6.9 acres of surface disturbance including a wetlands crossing which will disturb approximately 0.5 acres of wetlands. The crossing location is depicted on Figure 3-3. The disturbance will consist of stripping topsoil and removing hydric soils. Structural fill material will be placed to design elevations. A culvert will be installed for flow equalization as discussed in Section 3.1.2, below. Wetlands adjacent to the TMA access road construction area will be protected during construction activities using the erosion control methods described in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a).

3.1.1.6 Soil Absorption System Construction

Construction of the soil absorption system will create a total of approximately 90 acres of surface disturbance. During construction, as shown on Figure 3-4, topsoil and fine-grained soils will be temporarily stockpiled west of each soil absorption cell and near the southeast corner of the site with no direct wetland disturbance. During operation the water table downgradient of the soil absorption system cells will rise slightly and discharge into the Z16 wetland complex, where it will then drain through the wetland system and adjoining culverts into Creek 17-13 and into Swamp Creek. The treated effluent from the wastewater treatment system will be pumped from the storage lagoon at the plant site to the soil absorption system via approximately 3.2 miles of 10-inch diameter pipeline. As noted in Section 3.1.1.4 above, the pipeline will be constructed primarily along the railroad spur route. Figure 2-2 shows the overall route of the pipeline. Figure 3-5 shows the location of the pipeline route in relation to the railroad spur line where both cross Swamp Creek and area wetlands.

3.1.1.7 Mitigation Structures Installation (e.g., Wells, Pipeline, and Discharge Outfall Structures)

The installation of the project's mitigation system for Level I and II surface water bodies will involve one stream crossing and the placement of water delivery structures on or within navigable waters. Hard and soft water pipeline routes for mitigation Levels I and II are shown on Figures 3-6 and 3-7, respectively. Level I surface water mitigation pipelines which will be installed at the onset of the project will create a total of approximately 3.1 acres of surface disturbance, with less than 0.2 acres of wetland disturbance. The construction of the pipeline discharge outfall structures will include installing a manhole and the directional boring of a pipeline to the bed of the receiving water body. Figure 3-8 shows the proposed mitigation water delivery system. Installation of these structures will cause only minimal surface disturbance which will not occur on the banks of navigable waterways.

3.1.1.8 Surface Water Monitoring Structure Installation

A fixed gaging station will be constructed at the outlet to Little Sand Lake in order to evaluate potential changes to the lake hydrology with the project's regional groundwater model. The control structure will consist of a 4-foot rectangular weir made of marine grade plywood and a shallow diversion wall constructed along the lowlands on both sides of the stream bank to direct overland flow. Figure 3-9 shows the configuration of the proposed weir.

3.1.2 Culvert Installations

Culverts which need to be placed to allow waterways to drain past the railroad spur and access road are addressed in this section.

3.1.2.1 Locations and Descriptions

Figures 3-1 and 3-3 depict culvert locations along the site access road and TMA access road/pipeline corridor, respectively. Figure 3-2 presents culvert locations along the proposed railroad spur. A total of four of the seven culverts shown on the three figures have been identified as requiring Chapter 30 permits for their construction. Appendix B contains plan and profile information for these five culvert locations. Table 3-1 summarizes size, length, types, and locations of the seven culverts and identifies which require Chapter 30 permits. The culvert lengths are approximate at this time. The actual lengths will be established during final project design.

3.1.2.2 Hydraulic Design Considerations

The mine site culverts have been sited and designed to minimize drainage effects along project construction features (e.g., access road, railroad spur, TMA access road/pipeline corridor, etc.) and to comply with Chapter 30, Wis. Stats., requirements. Culvert Nos. 3 and 7 will be installed for flow equalization in wetland crossings. Culvert Nos. 2 and 4 will be constructed at Swamp Creek tributary crossings along the plant site access road and railroad spur. Each of these latter culverts have been designed to pass the 25-year flow without backwater overtopping the constructed feature, reaching the level of the facility subgrade, or causing significant floodwater damage. As a navigable stream crossing for a tributary to Swamp Creek, culvert No. 5 has been designed to pass the 100-year flow without increasing the existing backwater depth under flood conditions. Culvert sizing calculations are contained in Appendix C.

Table 3-1

Proposed Culvert Locations Requiring Chapter 30 Permits

Culvert No.	Chapter 30 Permit Required[1]	Approximate Station	Approximate State Plane Coordinates		Description
			Northing	Easting	
1	No	1,100[2]	126,012	2,274,171	Approximate 92 ft, 24" RCP-Plant site access road, wetland crossing.
2	Yes	1,352[2]	126,043	2,275,043	Approximate 148 ft, 24" RCP-Plant site access road, intermittent stream and wetland crossing.
3	Yes	1,701[2]	125,699	2,276,128	Approximate 122 ft, 24" RCP-Plant site access road, intermittent stream and wetland crossing.
4	Yes	2,535[2]	123,151	2,276,459	Approximate 96 ft, 24" RCP-Plant site access road, intermittent stream and wetland crossing.
5	Yes	511+80[3]	125,493	2,283,372	Approximate 107 ft, 8-foot by 3-foot box culvert-railroad spur, navigable streams.
6	No	509+70[3]	125,555	2,284,075	Approximate 70 ft, 27" RCP-Railroad spur, wetland crossing.
7	No	18+00[3]	116,451	2,279,490	Approximate 112 ft, 24" RCP-TMA access road, wetland crossing.

[1]Based on WDNR onsite review conducted October 30, 1995 (WDNR, 1997a).
[2]Meters
[3]Feet
RCP = Reinforced Concrete Pipe

Prepared by: MRS
Checked by: PAE
Revised by: PAE
Checked by: JWS

3.1.2.3 Hydrology and Hydraulic Analyses

The Soil Conservation Service hydrologic computer program TR-20 was used to determine flood flows for all proposed culvert placements at stream crossings (i.e., culvert Nos. 2, 3, 4, and 5). The calculated flood flows from the TR-20 program were used as input to the Army Corps of Engineers HEC-2 computer model to size culvert No. 5. Culvert No. 5 was designed to pass the 100-year flow. An 8-foot by 3-foot box culvert will maintain the existing tributary flow depth of 2.80 feet caused by the 100-year flow of 38 cfs. Results from the computer analysis are provided in Appendix C.

The hydraulic analysis for the remaining three culverts included evaluation with Federal Highway Administration culvert nomographs (included in Appendix C). The proposed culverts are sized to pass the 25-year flow without backwater overtopping the facility drainage ditch divides, reaching the level of the facility subgrade, or causing significant flood water damage.

3.1.2.4 General Mine Site Construction Procedures

Construction will be performed in conformance with the requirements of Chapter 30, Wis. Stats., so that environmental impacts will be minimized. Initially, clearing and grubbing of the right-of-way will be conducted. Merchantable timber will be salvaged and hauled off site by a contractor. Stumps and brush will be chipped, mulched, and stockpiled for land reclamation. Salvageable topsoil will be stockpiled for revegetation of the graded slopes.

Erosion control measures as described in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a) will be used to minimize siltation of wetlands and tributaries. A system of diversion dikes, silt fencing, ditches, and/or settling basins will be constructed, as needed, during the clearing and grubbing operation to collect runoff from disturbed areas. Riprap will be used to protect slopes from erosion. Exposed slopes will be revegetated and mulched as soon as possible after grading. Temporary vegetation will be used to provide interim stability to slopes when weather conditions or construction delays preclude immediate establishment of permanent vegetation. Jute or other erosion matting will be used on steep slopes, where applicable, to enhance seed germination. Dust control will be provided by spraying open working areas with water on an as-needed basis. Most fill material required for drainage facilities will come from on-site excavation elsewhere in the project area. Construction will be accomplished using typical earth moving equipment.

3.1.2.5 Construction Procedures

The design of the culverts is in accordance with the State of Wisconsin, Department of Transportation Standard Specifications for Bridge and Highway Construction (WisDOT, 1990). Construction details concerning approaches to facilities, rights-of-way, cut and fill slope intercepts and sections are included in Appendix B.

Wetlands crossed will be excavated and organic peat material will be replaced with granular material sized with less than 15% passing number 200 mesh with the total portion passing a number 4 mesh. Material removed from the wetlands will be used as topsoil in upland areas. Hydrostatic relief vents constructed of riprap will be laid directly over the granular material on the downstream side of the fill. Culverts will provide hydraulic communication and flow equalization in wetlands crossed so water availability is not adversely affected. Erosion control procedures consistent with those outlined in Section 4 of the MPA (Foth & Van Dyke, 1995/1998a) will be used.

3.1.3 Swamp Creek Crossings

3.1.3.1 Locations

Two crossings over Swamp Creek will be constructed at the locations indicated on Figures 3-1 and 3-2. Crossing No. 1 is the access road bridge at approximate state plane coordinates 122,140 N and 2,276,450 E. Crossing No. 2 is the railroad spur bridge at approximate state plane coordinates 124,260 N and 2,282,525 E. NMC has selected a full-span bridge crossing design for both locations.

Crossing No. 1 will consist of a 126-foot full-span bridge constructed as shown in Appendix D. Crossing No. 2 will consist of a 63-foot full-span crossing constructed as shown in Appendix D.

3.1.3.2 Hydraulic Design Considerations

Both crossing locations have been designed to minimize effects to existing stream flows at the crossing locations and to comply with Chapter 30, Wis. Stats., requirements. The 100-year flood standard was used to size drainage structures for streams considered navigable by the State of Wisconsin. Swamp Creek is considered navigable at these locations under applicable federal and state law definitions.

Bridge hydraulic design criteria has been established to avoid increasing the backwater elevation resulting from a 100-year flood by 0.01 feet or more at the NMC property line. All crossings were sized so that the increase in backwater resulting from a 100-year flood was less than 0.01 feet. For the full span crossing No. 1 (access road bridge) the design criteria is satisfied and there will be no increase in backwater off the NMC property from the calculated 100-year flood flow of 1,010 cfs after the structure is in place. For the full span No. 2 (railroad spur bridge) the design criteria is also satisfied and there will be no increase in backwater from the calculated 100-year flow of 890 cfs after that structure is in place.

3.1.3.3 Hydrology and Hydraulic Analyses

The Soil Conservation Service hydrologic computer program TR-20 was used to determine flood flows. The calculated flood flows were used as input to the Army Corps of Engineers HEC-2 computer model to size the necessary drainage structures. The technical memorandum contained in Appendix E presents the hydrology and hydraulic analysis for the access road and railroad spur bridge structures. As shown in the technical memorandum, no backwater easements are required for the proposed bridge locations.

3.1.3.4 General Crossing Construction Procedures

The design of the two crossings are in accordance with the State of Wisconsin, Department of Transportation Standard Specifications for Bridge and Highway Construction (WisDOT, 1990). Construction details concerning approaches to facilities, rights of way, cut and fill slope intercepts and sections are included in Appendix D. Construction methods described in Section 3.1.2.4 will be used for both crossing locations.

Erosion control measures will be used to minimize siltation of Swamp Creek. A system of diversion dikes, silt fencing, ditches, and settling basins will be constructed during the clearing and grubbing operation to collect disturbed area runoff. Riprap will be used to protect slopes from erosion. Exposed slopes will be revegetated and mulched as soon as possible after grading.

3.2 Soil Absorption System

3.2.1 Location

NMC plans to discharge treated Crandon Project wastewaters to groundwater via a soil absorption system. After evaluation of several alternative locations in and around the project area, NMC has selected Area H as the preferred site for the soil absorption system, as shown on Figure 2-2. Area H, or the soil absorption system (SAS), as referred to on Figure 2-2, is located north of Swamp Creek, approximately 2 miles northeast of the plant site.

3.2.2 Hydraulic Design Considerations

The soil absorption system is designed for discharging treated wastewater to the groundwater. As shown on Figure 3-5, the system is laid out in six individual cells. Each cell is designed to apply treated wastewater evenly through the use of distribution laterals which are laid out at a uniform elevation over the entire cell. Each soil absorption cell can operate independently from the others. This will be accomplished by having a separate discharge system for each cell. Water from the wastewater treatment plant will be pumped to a central distribution chamber which will feed each dosing station proportionately to the capacity of each cell.

3.2.3 Hydrology and Hydraulic Analyses

The method used to determine the impact of additional water discharges near wetlands was based on Haestad Methods "TR-55" hydrologic software, Mannings formula hydraulics across the wetland valley (Haestad Methods "Flowmaster" software), and culvert nomographs where culverts control hydraulics (adding weir flow where appropriate). An existing or base condition flow was established from various storm events for the drainage areas tributary to each of the Z16 north, central, and south wetlands. A depth of flow associated with each storm event peak flow was calculated using the appropriate hydraulics. Then, the rates of peak discharge from the SAS were added to the existing base flows calculated for each wetland, and new depths of flow were determined. Any increase in depth caused by the SAS discharge could then be determined. To be conservative, it was assumed that all of the additional water from each SAS cell discharges to the respective wetland. Also, to assure conservativeness, discharge from cell D was added to the flow analysis for both the central and north wetlands, as it is not certain to which wetland the flow will pass.

Possible effects of the SAS discharge on the Swamp Creek floodplain were evaluated by calculating the 100-year flood flow of Swamp Creek in this area, and determining the associated depth of flow in Swamp Creek. The flood flow was found using the NRC5 TR20 hydrological program. The associated depth of flow was calculated from a Mannings analysis ("Flowmaster") across a section of the Swamp Creek floodplain. By calculating this depth of flow with the SAS discharge added to the 100-year flow, an increase caused by the SAS could be determined.

Figure 3-10 illustrates the location of the SAS cells and their estimated peak discharge rates, the location of the conveyance culverts, the location of the wetlands that were investigated, the location of the Swamp Creek cross-section used in the floodplain evaluation, and the location of the other valley sections used in the analysis.

As presented within the hydraulic analysis in Appendix F, the increases in backwater discharge from the 100-year flood while the soil absorption system is operating at its maximum capacity is less than a 0.01 foot increase. Therefore, no easements for backwater elevation increases for adjacent landowners are required.

3.2.4 Construction Procedures

Construction methods described in Section 3.1.2.4 will be followed during the construction of the soil absorption system. The erosion control methods described in Section 4 of the the *Mine Permit Application* (Foth & Van Dyke, 1995/1998a) will also be implemented during the construction, operation, and reclamation of the soil absorption system cells and soil borrow area. Figure 3-4 shows that temporary stockpiles of topsoil and loess/till will be located to the northwest of each soil absorption system cell. The borrow site for additional fill soils is located adjacent to Keith Siding Road away from the wetlands and Lake 17-16. The stockpile locations along with implementation of the erosion control methods described in the MPA will mitigate potential impacts to on-site wetlands and water bodies from soil absorption system construction activities.

The treated water discharge pipeline will be installed in an open-cut trench and backfilled with native material over most of the route. Figure 3-11 shows a typical pipe trench detail. Keith Siding Road and Swamp Creek will be crossed by boring or jacking a shell casing in place a minimum of 7 feet under the road and 3 feet under the streambed and installing the pipe through the casing. The annular space between the pipeline and the steel casing for both road and stream crossings will be grouted at both ends to provide a seal. Other streams and some wetlands will be crossed using directional boring. Figures 3-12 and 3-13 show a cross-section of a typical side road crossing and stream crossing, respectively. The stream crossings described above and areas along the pipeline route which consist of wetlands or other areas of high groundwater may require temporary construction dewatering.

3.3 Mitigation Structures

3.3.1 Locations/Description

Groundwater from a well will provide water for use in the mitigation of hard water bodies. Water for soft water body mitigation will be provided from treated mine water. Separate water sources, pumping facilities and conveyance systems will be provided for hard water body mitigation and soft water body mitigation.

As shown on Figure 3-6 , the water source for mitigation of the Level I and II hard water bodies will be from a groundwater well located within the proposed main access road corridor north of Swamp Creek. Water will be pumped from the well directly to the hard water conveyance system located in the right-of-way of the main access road.

The drawing also shows nominal pipe diameters for polyethylene (HDPE DR9) pipe material and pipe segment lengths for the system. The pipeline is sized to accommodate Level I and II mitigation water flow rates and, where appropriate, oversized to accommodate expansion for Level III mitigation flow rates, if they are needed in the future. The Level I pipeline route begins at the mitigation well site along the east side of the site access road at the curve in the road. From the well site the pipeline follows the proposed main access road along the east side to just south of the Swamp Creek crossing. At this point the pipeline turns east following an unpaved on-site access road through wetland P1and wetland O1 to Creek 19-14. Air release/vacuum relief valves will be installed in manholes at high points along the pipeline route, as needed, to vent entrapped air in the pipe.

The hard water conveyance system illustrated in Figure 3-6 also shows the route extension to Hoffman Creek/Hoffman Springs for Level II mitigation. The Level II hard water pipeline route begins at the Level I hard water pipeline along the west side of the proposed main access road at the point where the Level I hard water pipeline turns east toward Creek 19-14. From this location the pipeline follows the site access road to the plant site. From the plant site the pipeline turns west and extends to Sand Lake Road. The pipeline turns west along the north side of Sand Lake Road to a point where it turns north to the delivery system for Hoffman Creek/Hoffman Springs.

Figure 3-7 is a plan view and overall layout of the pipeline route locations for the soft water conveyance system. The drawing also shows nominal pipe diameters for polyethylene (HDPE DR9) pipe material and pipe segment lengths for the system. The Level I pipeline route begins at the project's wastewater treatment plant; follows the eastern edge of the plant site to an unpaved on-site access road at the southeast edge of the plant site; then follows the unpaved on-site access road to the northeast between wetlands 10 and F11 to a point along the road that is closest to Skunk Lake. From this point, the pipeline leaves the road to travel to the delivery system at Skunk Lake. The soft water conveyance system illustrated in Figure 3-7 also shows the route extensions to Little Sand Lake and Duck Lake for Level II mitigation. The drawing shows the nominal pipe diameters for polyethylene (HDPE DR9) pipe material and pipe segment lengths for this portion of the system. Air release/vacuum relief valves will be installed in manholes at high points along the pipeline route, as needed, to vent entrapped air in the pipe.

3.3.2 Mitigation Water Delivery Systems

The water conveyance pipeline will terminate at a control structure (manhole) which is part of the "mitigation water delivery system". The mitigation water delivery system consists of a manhole, a pipeline into the water body, and a diffuser within the water body as shown in Figure 3-8. Manholes will be located above the high water mark and outside wetland areas.

The control structure will be a below grade manhole that will house and provide access to a hydraulically operated rate of flow controller, a flow meter, and isolation valves between the conveyance pipeline and the pipeline to the water body. The rate of flow controller will maintain a constant preset flow rate regardless of changing line pressure. The rate of flow controller will provide a constant rate of flow even when another mitigation discharge flow rate is changed or added to the system.

From the control structure the pipeline will extend below grade into the water body terminating at the bottom of the slope into the water. At the pipeline termination a diffuser pipe with a combination diffuser and check valve will be installed to prevent debris from entering the system when not in use. The diffuser will be anchored and protected by placing articulated concrete block mats over the diffuser pipe.

3.3.3 Construction Procedures

The pipelines will be trenched to a minimum depth of 6.5 feet within the plant site and within roadways. Outside the road and the plant site, the pipeline will also be trenched to a minimum depth of 6.5 feet. Trenching equipment consisting of either a chain trencher or a rotary trencher will be used to trench, install, and backfill the pipe with native materials in one operation. The trench width will not exceed 18 inches. The pipe will be placed on native material with no additional bedding material. The equipment width will not exceed 12 feet, and will require clearing and leveling of uneven surfaces across the machine track to a minimum width of 15 feet. In the construction process soil will be cast back into the trench, rather than to the side of the trench, which reduces the required clear operational space. The trench will be located in the center of unpaved on-site access roads and along the side of town roads approximately 6 feet off the edge of the pavement or traveled area. Swamp Creek and the associated wetland W1 will be crossed by directional drilling of the pipe under the areas a minimum of 5 feet below wetlands and 3 feet below creek bottoms. Pipelines crossing wetland Z22 located near Lake 25-11 (Popple Pond) and wetland Z18 located near Hoffman Springs will also be installed using directional drilling. The pipeline will be constructed by trenching through other wetland crossings.

Level I mitigation pipelines will be installed during the preproduction construction period. After the pipelines are installed, the impacted area will be backfilled, graded, and stabilized. A breakdown of the estimated disturbance as a result of the pipeline construction is presented in Table 4.2.9-1 of the project's EIR (Foth & Van Dyke, 1995/1998b). The majority of the pipeline will be constructed down the center of on-site access roads and within the right-of-way of town roads adjacent to the site. There will be approximately 2.9 acres of impact to stands of northern hardwoods where access roads do not currently exist. All of the impacted northern hardwoods will be reclaimed. Impacts to wetlands as a result of trenching activities have been avoided, where possible. Large wetland complexes that need to be crossed by the pipeline will be completed by horizontal drilling under the wetlands. There will, however, be approximately 0.1 acres of impact to wetlands where it is not feasible to use the horizontal drilling method. There will be no access roads constructed within wetland areas. All stream crossings will be completed by horizontal drilling. Therefore, no impact to named streams is anticipated as a result of the proposed action. Level II pipelines would be constructed after mining begins in the event that monitoring data showed unacceptable impacts would occur to Level II water bodies.

A detailed description of erosion control techniques and reclamation procedures designed for the life of the Crandon Project are described in the project's MPA (Foth & Van Dyke, 1995/1998a). These techniques will be used as a guide when reclaiming the mitigation pipeline corridors. However, because of the relatively minor impact as a result of the pipeline construction, it is anticipated that the required reclamation activities will be minimal. The impacted areas will need to be stabilized to control erosion during construction and after construction is complete. It is anticipated that after construction, the corridors will begin to revert back to their original state and native vegetation will colonize the disturbance area.

3.4 Surface Water Monitoring Structures

3.4.1 Little Sand Lake Outlet Structure Description

Little Sand Lake, in southern Forest County, has been studied recently because of its proximity to the Nicolet Minerals Company's proposed mining operation. One area of interest is the stage/discharge relationship on the outlet of Little Sand Lake due to the diffuse nature of the outlet and downstream beaver activity. The WDNR believes that in order to monitor potential changes to the lake hydrology with the project's regional groundwater model, a more stable stage/discharge relationship is desirable. In a letter dated October 24, 1996 (WDNR, 1996), the WDNR requested that a fixed gaging station be constructed at the outlet to Little Sand Lake. By installing a control section (a weir or flume) in the outlet, a fixed stage/discharge relationship can be assumed for predicting future lake stage changes due to mining.

To address WDNR's request, on January 17, 1997, Addendum No. 1 to the June 1996 *Water Regulatory Permit Application for the Proposed Mine Site* was submitted to the WDNR (Moe, 1997b). The addendum contained a technical memorandum dated January 17, 1997, prepared by Foth & Van Dyke addressing the design and installation of a gaging station at the Little Sand Lake outlet (Foth & Van Dyke, 1997b). A Chapter 30, Wis. Stats., permit application for the proposed structure was also included with the addendum. The WDNR issued a letter on November 13, 1997 (WDNR, 1997b), providing comments on the addendum. Appendix G contains a revised technical memorandum pertaining to the Little Sand Lake outlet weir on Creek 12-19. The memorandum addresses the following:

- Monitoring site selection.
- Control structure selection.
- Permit considerations.
- Construction options for the weir and a recommended installation method that will minimize disturbance while maintaining a stable structure.
- Soil testing proposed for completion at the time of final design prior to construction.
- Information on planned beaver control.

The technical memorandum provides the information necessary for WDNR to complete its review of the Chapter 30, Wis. Stats., permit application for the Little Sand Lake outlet structure.

3.4.2 Other Flow Monitoring Locations

As part of the project's monitoring plan, flow monitoring will be conducted on selected water bodies in the mine site area. To properly develop and permit appropriate flow monitoring systems, onsite evaluation work will be performed in the spring of 1999. These activities will include:

- Field investigation to identify suitable monitoring locations;
- Stream cross-section surveying;
- Design of flow monitoring structures;
- Evaluation of flow monitoring structures, hydrology, and hydraulic conditions; and
- Selection of final flow monitoring locations and methodology.

Following the completion of these activities, an Addendum to the Crandon Project Water Regulatory Permit Application will be forwarded to the WDNR for review and approval.

4 References

Foth & Van Dyke, 1995. *Tailings Management Area Feasibility Report/Plan of Operation for the Crandon Project*. May 1995.

Foth & Van Dyke, 1995/1998a. *Mine Permit Application for the Crandon Project*. Originally Issued May 1995. Updated December 1998.

Foth & Van Dyke, 1995/1998b. *Environmental Impact Report for the Crandon Project*. Originally Issued May 1995. Updated December 1998.

Foth & Van Dyke, 1996a. *Addendum No. 1 to the May 1995 Crandon Project Tailings Management Area Feasibility Report/Plan of Operation*. February 1996.

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Foth & Van Dyke, 1997b. Memorandum from Michael D. Liebman, Foth & Van Dyke, to Jerry Sevick, Foth & Van Dyke, on Little Sand Lake Flow Monitoring Installation. January 17, 1997.

Foth & Van Dyke, 1998a. *Addendum No. 4 to the May 1995 Crandon Project Tailings Management Area Feasibility Report/Plan of Operation*. June 1998.

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Foth & Van Dyke, December, 1998c. *Crandon Project Surface Water Mitigation Plan*.

Moe, Don, 1997a. Letter to Mr. Dale Lang, WDNR, on the *Water Regulatory Permit Application*. April 22, 1997.

Moe, Don, 1997b. Letter to Mr. Bill Tans, WDNR, and Mr. David Ballman, USCOE, on Addendum No. 1 to the Water Regulatory Permit Application for the Proposed Mine Site and Treated Wastewater Discharge Pipeline. January 17, 1997.

Wisconsin Department of Transportation, April 1990. Standard Specifications for Road and Bridge Construction.

Wisconsin Department of Natural Resources, 1996. Letter from Mr. Christopher P. Carlson, WDNR, to Mr. Don Moe, CMC, on Monitoring Little Sand Lake Outflow/Creek 12-9 Flow and Predicting Outlet Flow. October 24, 1996.

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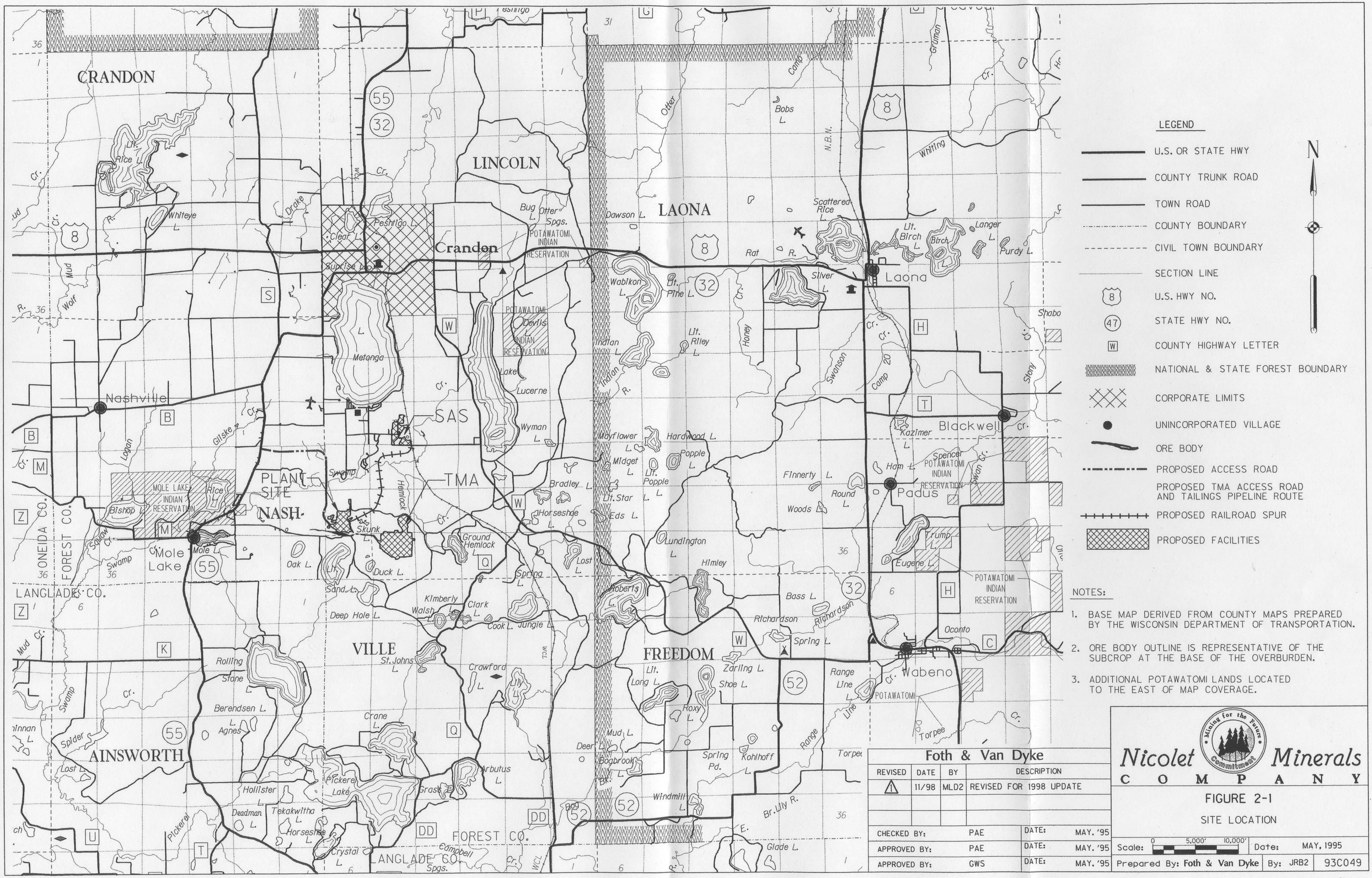
Wisconsin Department of Natural Resources, 1997b. Letter from Mr. Dale J. Lang, WDNR, to Mr. Don Moe, CMC, on *Crandon Project Water Regulatory Permit Application - Addendum No. 1* for the Little Sand Lake outlet weir on Creek 12-9. November 13, 1997.

FIGURES FOR WATER REGULATORY PERMIT APPLICATION



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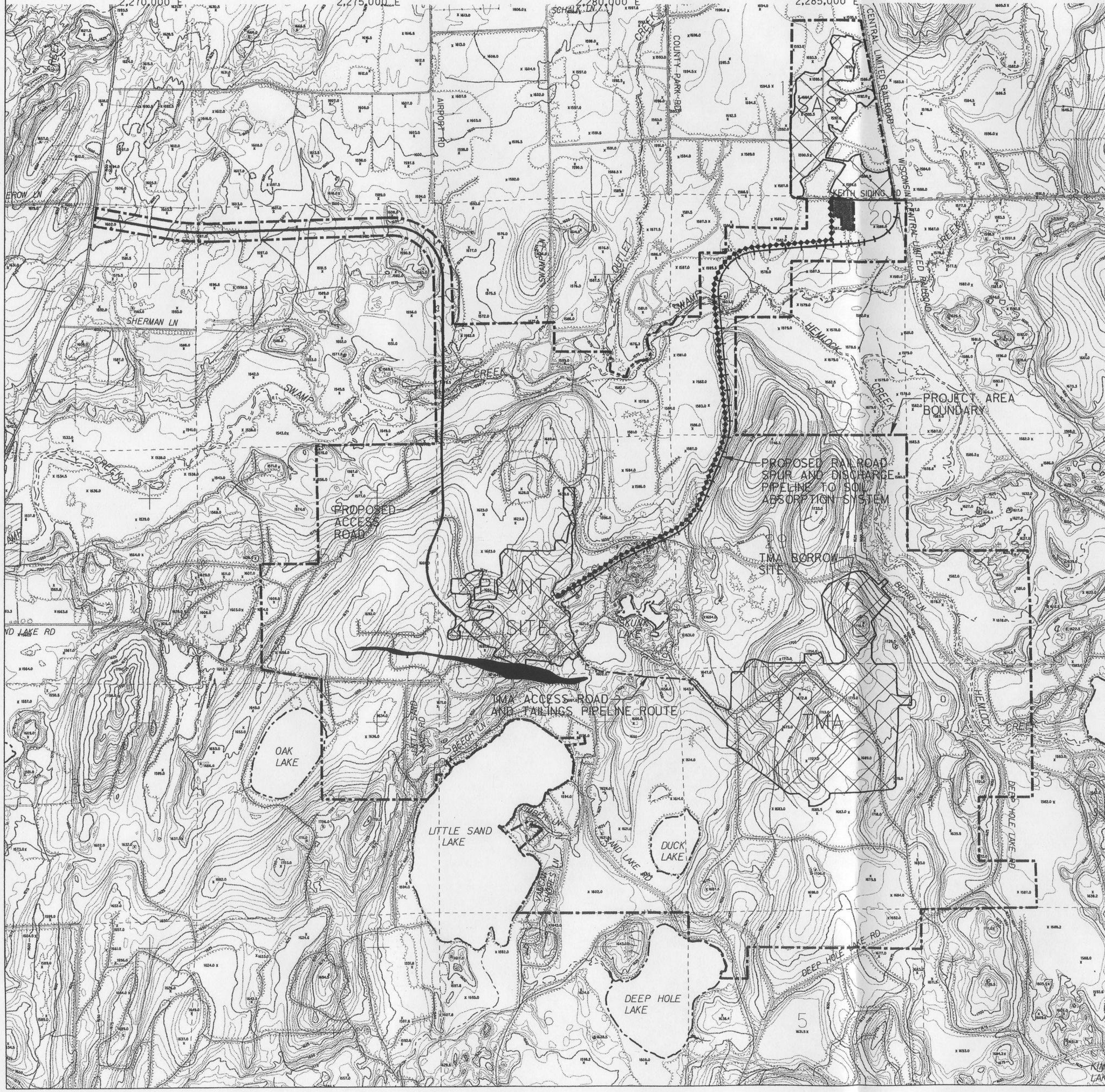

LEGEND

- LAKES
- STREAMS
- EXISTING ROAD
- 1675 EXISTING CONTOUR
- x 1692.0 EXISTING SPOT ELEVATION
- SECTION LINE
- ORE BODY
- PROPOSED ACCESS ROAD
- PROPOSED TMA ACCESS ROAD AND TAILINGS PIPELINE ROUTE
- PROPOSED RAILROAD SPUR
- PROPOSED FACILITIES
- PROJECT AREA BOUNDARY
- PROPOSED SOIL ABSORPTION SYSTEM PIPELINE
- PROPERTY NOT INCLUDED WITHIN PROJECT AREA

N

NOTES:

1. TOPOGRAPHIC BASE MAP DIGITIZED FROM 1" = 1000' SCALE, 5' CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
3. VERTICAL DATUM BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS 5 FEET.
4. SECTION LINES DIGITIZED FROM 7.5' SERIES USGS MAPS.
5. ORE BODY OUTLINE IS REPRESENTATIVE OF THE SUBCROP AT THE BASE OF THE OVERBURDEN.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION
⚠	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKS1	DATE:	MAY '95
APPROVED BY:	PAE	DATE:	MAY '95
APPROVED BY:	GWS	DATE:	MAY '95

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FIGURE 2-2

PROJECT AREA

Scale: 0 1200' 2400' | Date: MAY, 1995

Prepared By: Foth & Van Dyke | By: JRB2 | 93C049

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LEGEND

—1675—	EXISTING CONTOUR
x 1692.0	SPOT ELEVATION
----------	SECTION LINE
	ORE BODY
	PLANT SITE LIMITS OF DISTURBANCE

NOTES:

1. TOPOGRAPHIC BASE MAP DIGITIZED FROM 1''=1000' SCALE, 5' CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
3. VERTICAL DATUM BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS FIVE FEET.
4. COUNTY AND TOWNSHIP LINES DIGITIZED FROM 7.5' SERIES USGS MAPS.

SCALE
0 200' 400'

TYPICAL REPRESENTATION: REFINEMENTS MAY BE MADE PRIOR TO CONSTRUCTION.

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CHECKED BY:	JKS1	DATE:	MAY '95
APPROVED BY:	PAE	DATE:	MAY '95
APPROVED BY:	JWS	DATE:	MAY '95

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FIGURE 2-3

PLANT SITE LAYOUT

Scale: AS SHOWN		Date: MAY, 1995	
Prepared By: Foth & Van Dyke		By: JRB2	93C049

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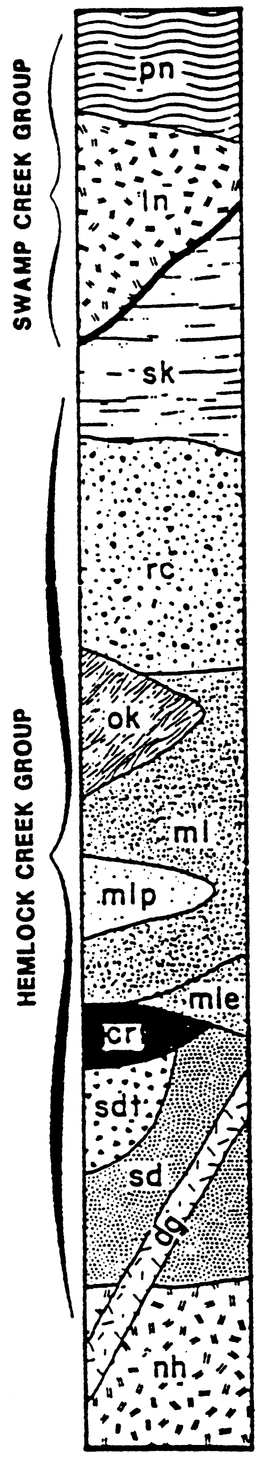

PINE FORMATION (pn)
Cherty tuff and argillite.

LINCOLN FORMATION (ln)
Quartz porphyritic rhyolite flows with minor interflow tuff, chert and argillite.

SKUNK LAKE FORMATION (sk)
Predominantly fine to coarse ash chert tuff, some cherty and very minor argillite.

RICE LAKE FORMATION (rc)
Volcanic debris flows (blocky chloritic and minor siliceous lapilli and breccia size debris) and eutaxitic ash flows, some chert.

OAK LAKE FORMATION (ok)
Sequence of cherty tuff and sericitic tuff.

MOLE LAKE FORMATION (ml)
Predominantly mafic ash tuff.

PROSPECT MEMBER (mlp)
Volcanic debris flow consisting of siliceous, lapilli size debris.

EAGLE MEMBER (mle)
Volcanic greywacke.

CRANDON FORMATION (cr)
Laminated, bedded & replacement sulfides (zinc ore) interbedded with pyritic argillite, pyritic felsic tuff and chert.

SAND LAKE FORMATION (sd)
Sequence of fine felsic tuffs and minor felsic debris & lava flows.

TOWNSHIP MEMBER (sdt)
Volcanic vent breccia affected by multiple stage hydrothermal alteration and sulfide enrichment.

NASHVILLE FORMATION (nh)
Feldspar porphyritic mafic flows.

DUCK LAKE GABBRO (dg)
Fresh, 2 pyroxene gabbro.
Cross cuts nh and sd.

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1	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY: JKSI	DATE: APR.'95
APPROVED BY: PAE	DATE: APR.'95
APPROVED BY: GWS	DATE: APR.'95

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FIGURE 2-4

STRATIGRAPHIC COLUMN

Scale: NOT TO SCALE		Date: MARCH, 1995	
Prepared By: Foth & Van Dyke		By: BSH	93C049

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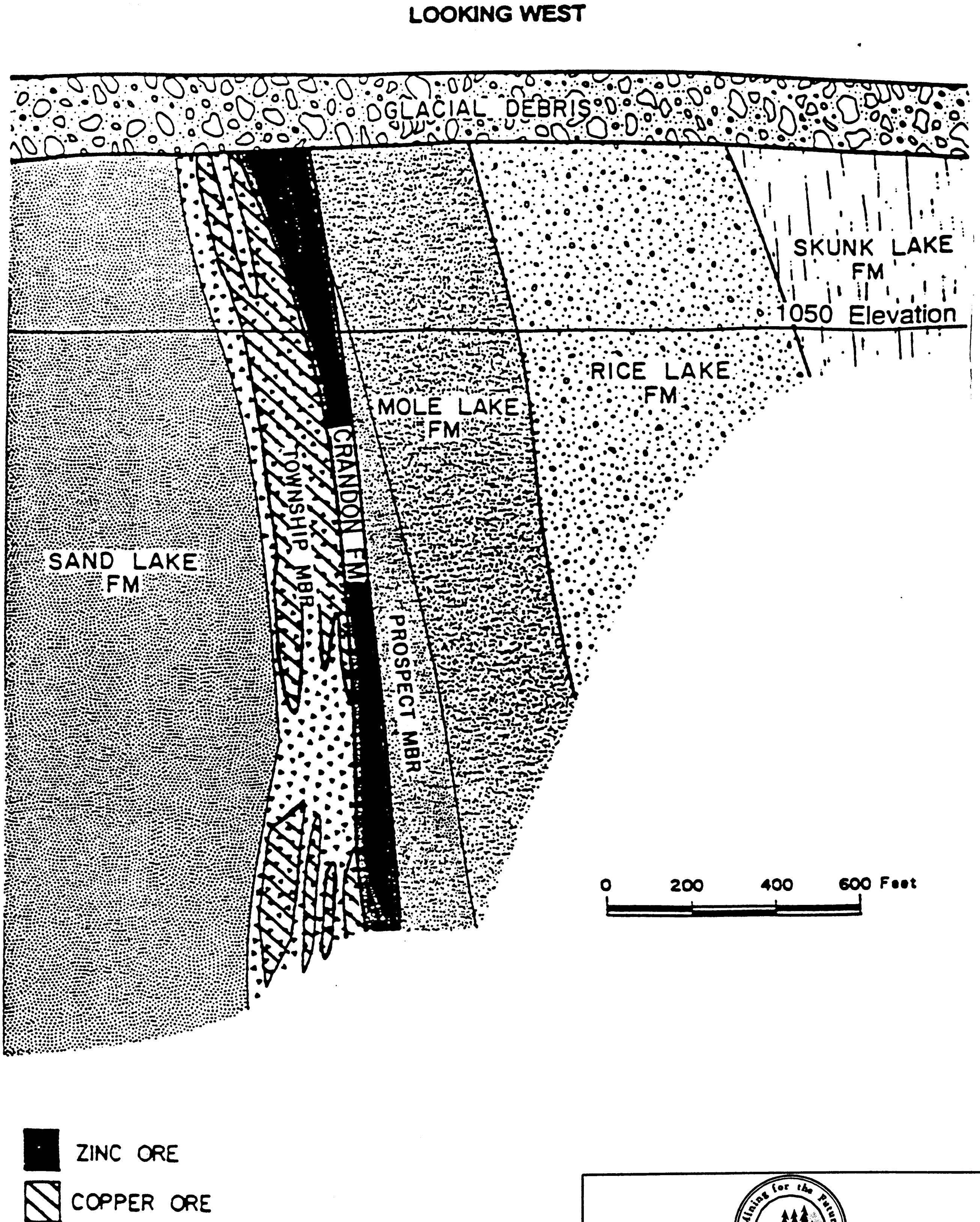

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REVISED	DATE	BY	DESCRIPTION
1	11/98	MLD2	REVISED FOR 1998 UPDATE

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APPROVED BY: PAE	DATE:	APR.'95
APPROVED BY: GWS	DATE:	APR.'95

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FIGURE 2-5

GENERALIZED GEOLOGIC CROSS SECTION C-C'

Scale: NOT TO SCALE		Date: MARCH, 1995	
Prepared By: Foth & Van Dyke		By: BSH	93C049

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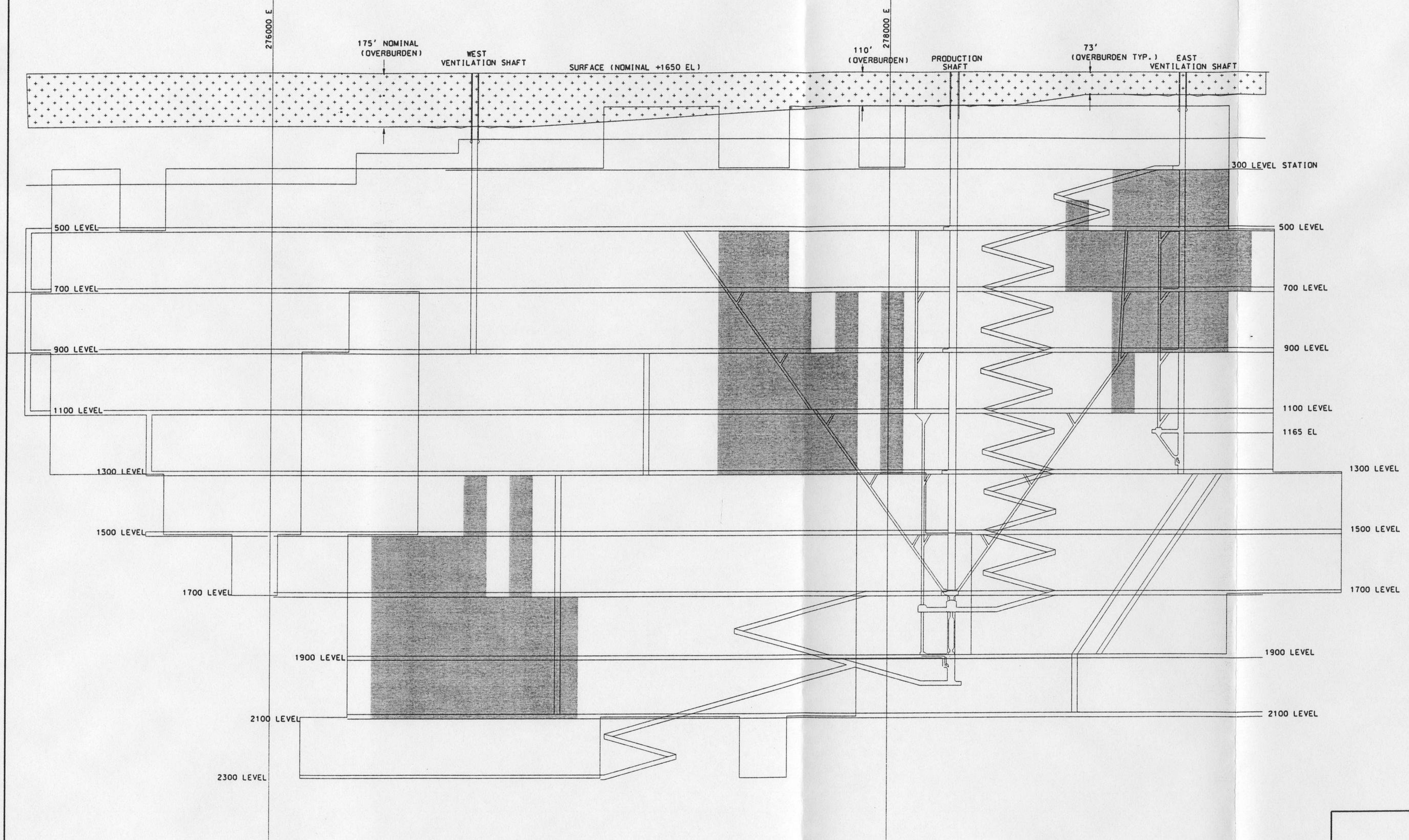

LEGEND

EARLY PRODUCTION AREAS

Foth & Van Dyke

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⚠	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	APR. '95
APPROVED BY:	PAE	DATE:	APR. '95
APPROVED BY:	GWS	DATE:	APR. '95

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FIGURE 2-6

SCHEMATIC LONGITUDINAL SECTION (LOOKING NORTH)

Scale: NOT TO SCALE		Date: APRIL, 1995	
Prepared By: Foth & Van Dyke	By: BSH	93C049	

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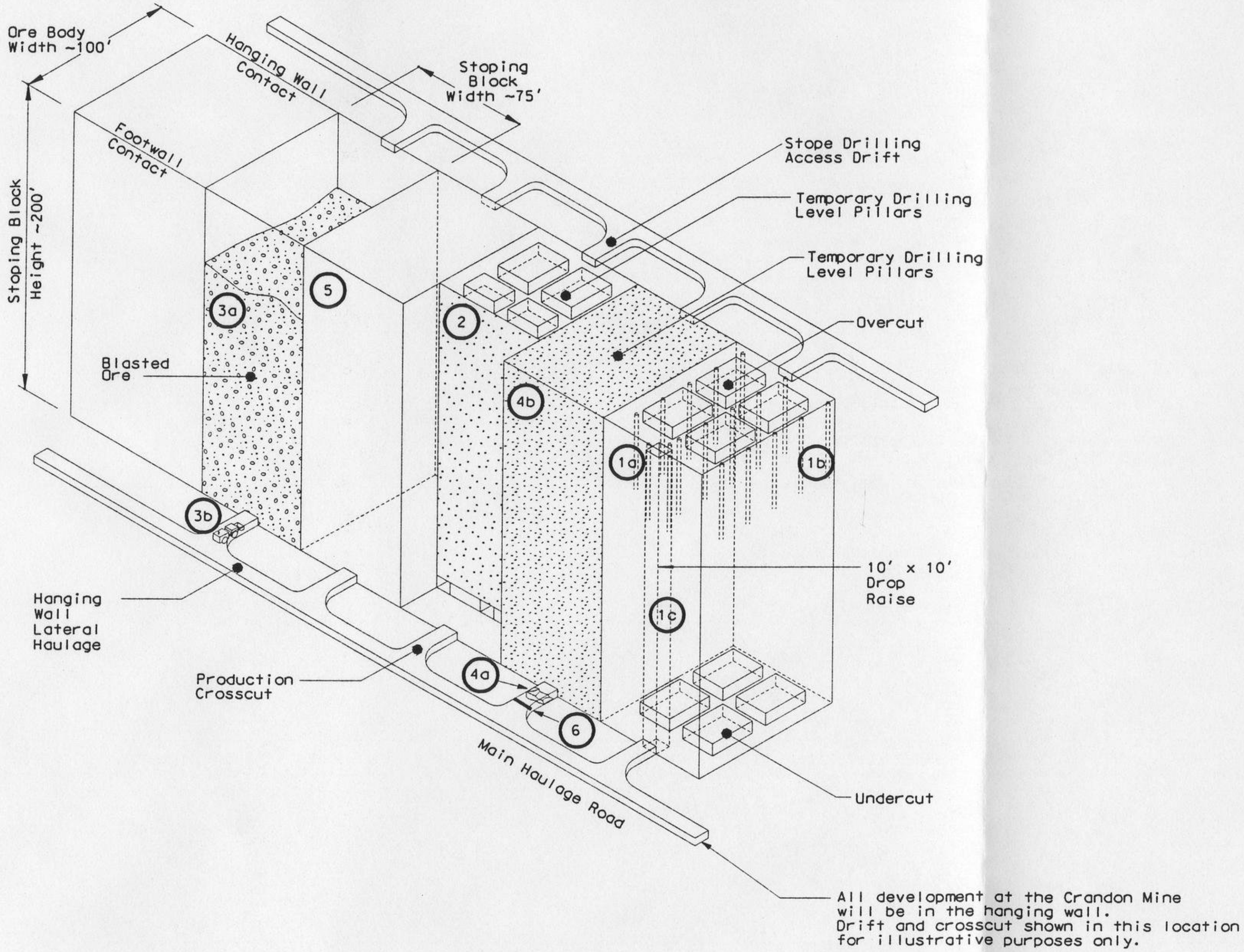

LEGEND

- (1a) Develop overcut and undercut.
- (1b) Drill off stope using all downholes from overcut.
- (1c) Open drop raise and muck out.
- (2) Open slot around drop raise until 30% to 50% void space has been achieved, muck out.
- (3a) Blast rest of stope in one blast.
- (3b) Muck out stope using remote control for final cleanup.
- (4a) Block access to undercut with waste rock.
- (4b) Backfill stope from overcut with paste backfill.
- (5) Alternate stoping block/pillar to be mined after backfilling adjacent stopes.
- (6) Establish ventilation stoppage top and bottom to inhibit oxygen transfer into stope.

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REVISED	DATE	BY	DESCRIPTION
△	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	APR. '95
APPROVED BY:	PAE	DATE:	APR. '95
APPROVED BY:	GWS	DATE:	APR. '95

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FIGURE 2-7

CONCEPTUAL STOPING SEQUENCE

Scale: NOT TO SCALE	Date: MARCH, 1995		
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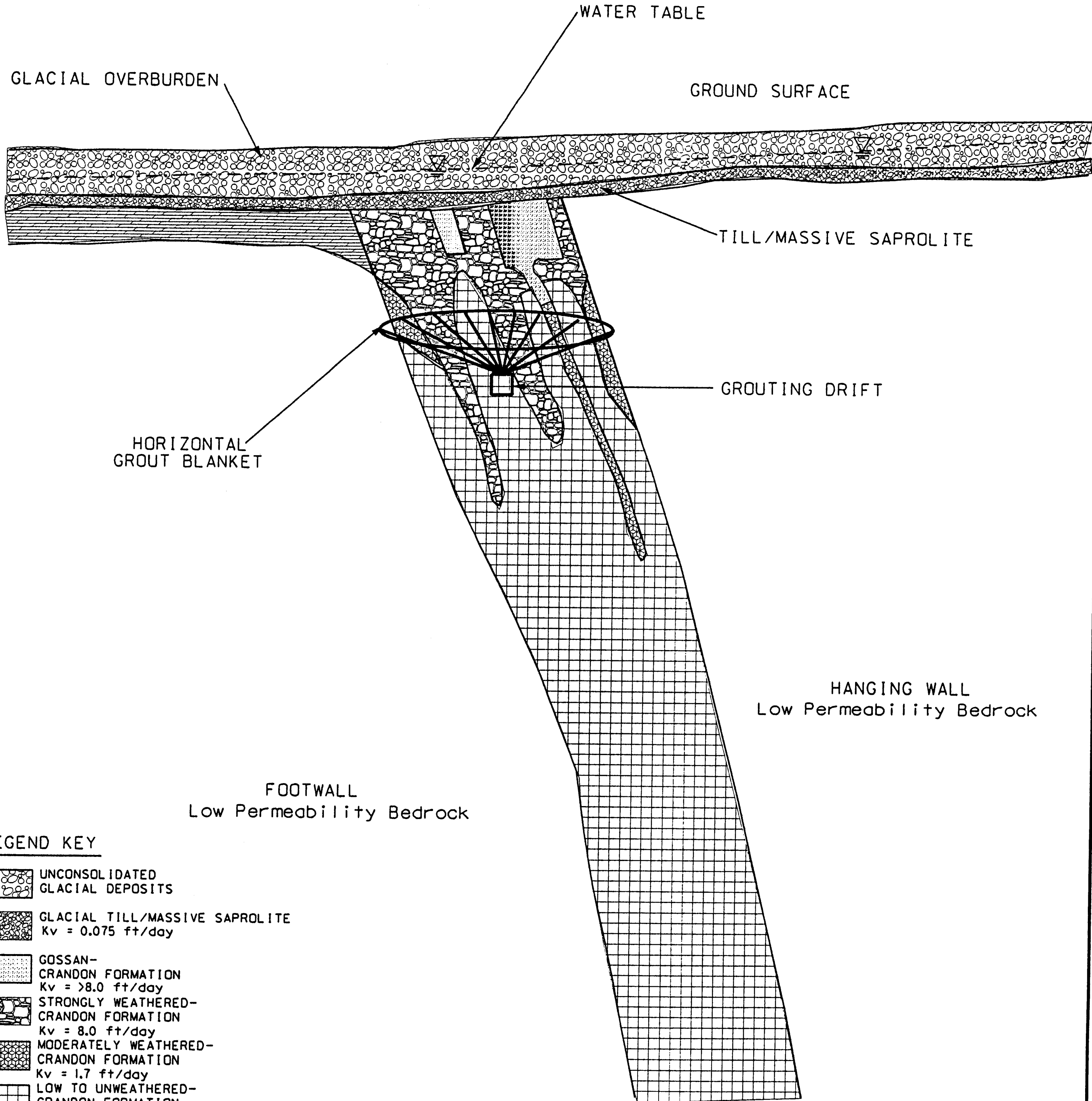

LEGEND KEY

- UNCONSOLIDATED GLACIAL DEPOSITS
- GLACIAL TILL/MASSIVE SAPROLITE Kv = 0.075 ft/day
- GOSSAN-CRANDON FORMATION Kv = >8.0 ft/day
- STRONGLY WEATHERED-CRANDON FORMATION Kv = 8.0 ft/day
- MODERATELY WEATHERED-CRANDON FORMATION Kv = 1.7 ft/day
- LOW TO UNWEATHERED-CRANDON FORMATION Kv = <0.012 ft/day
- STRONGLY WEATHERED-FOOTWALL Kv = 0.23 ft/day
- LOW PERMEABILITY-FOOTWALL AND HANGING WALL Kv = <0.048 ft/day

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	MLD2	DATE:	NOV. '98
APPROVED BY:	TWS	DATE:	NOV. '98
APPROVED BY:	GWS	DATE:	NOV. '98

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FIGURE 2-8

TYPICAL GROUT BLANKET FAN

Scale: NOT TO SCALE		Date: NOVEMBER, 1998	
Prepared By: Foth & Van Dyke	By: JRB2		93C049

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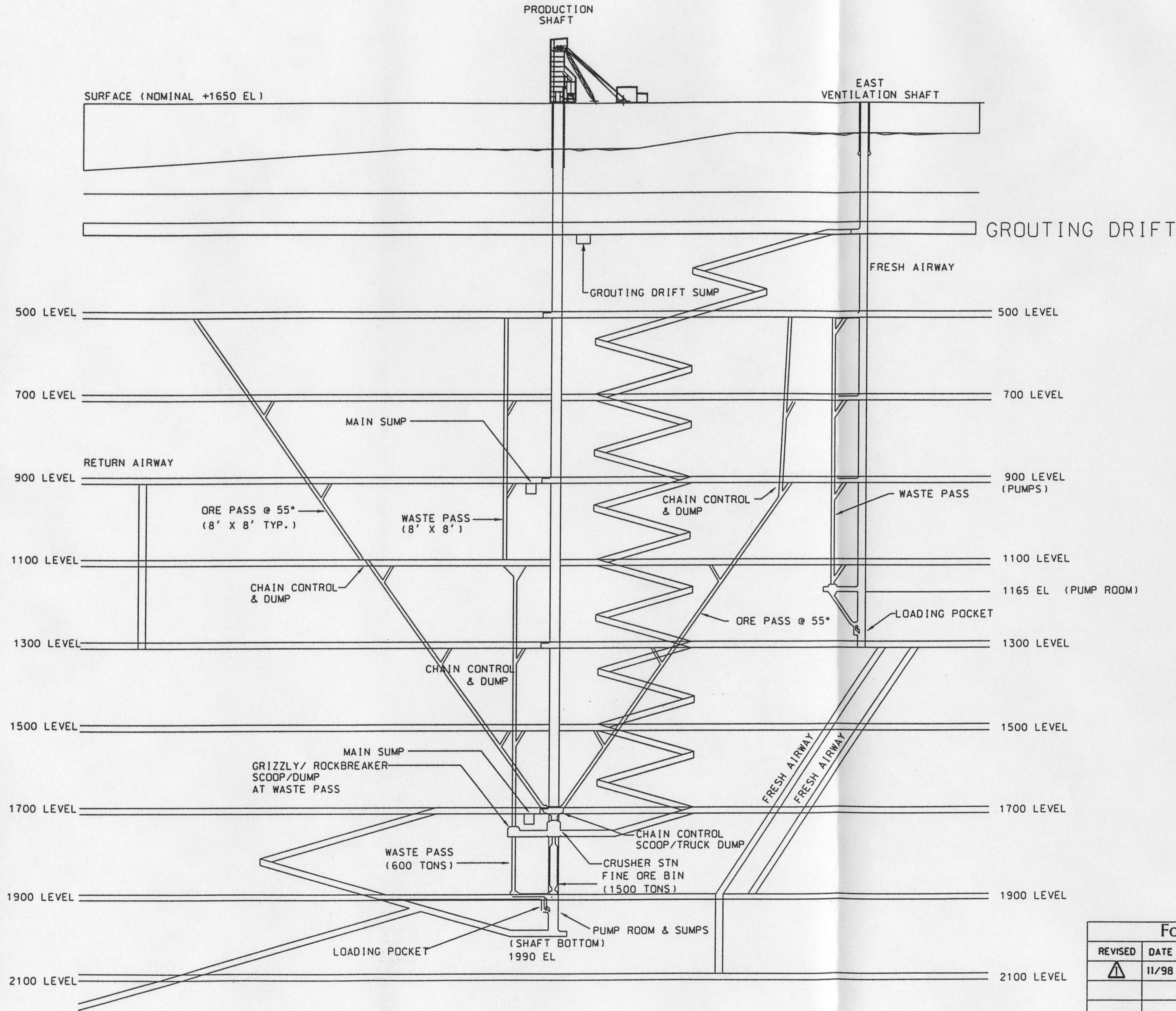

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION
⚠	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	APR. '95
APPROVED BY:	PAE	DATE:	APR. '95
APPROVED BY:	GWS	DATE:	APR. '95

Nicolet Minerals COMPANY

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FIGURE 2-9

MINE DRAINAGE SCHEMATIC

Scale:	NOT TO SCALE	Date:	APRIL, 1995		
Prepared By: Foth & Van Dyke		By:	BSH	93C049	

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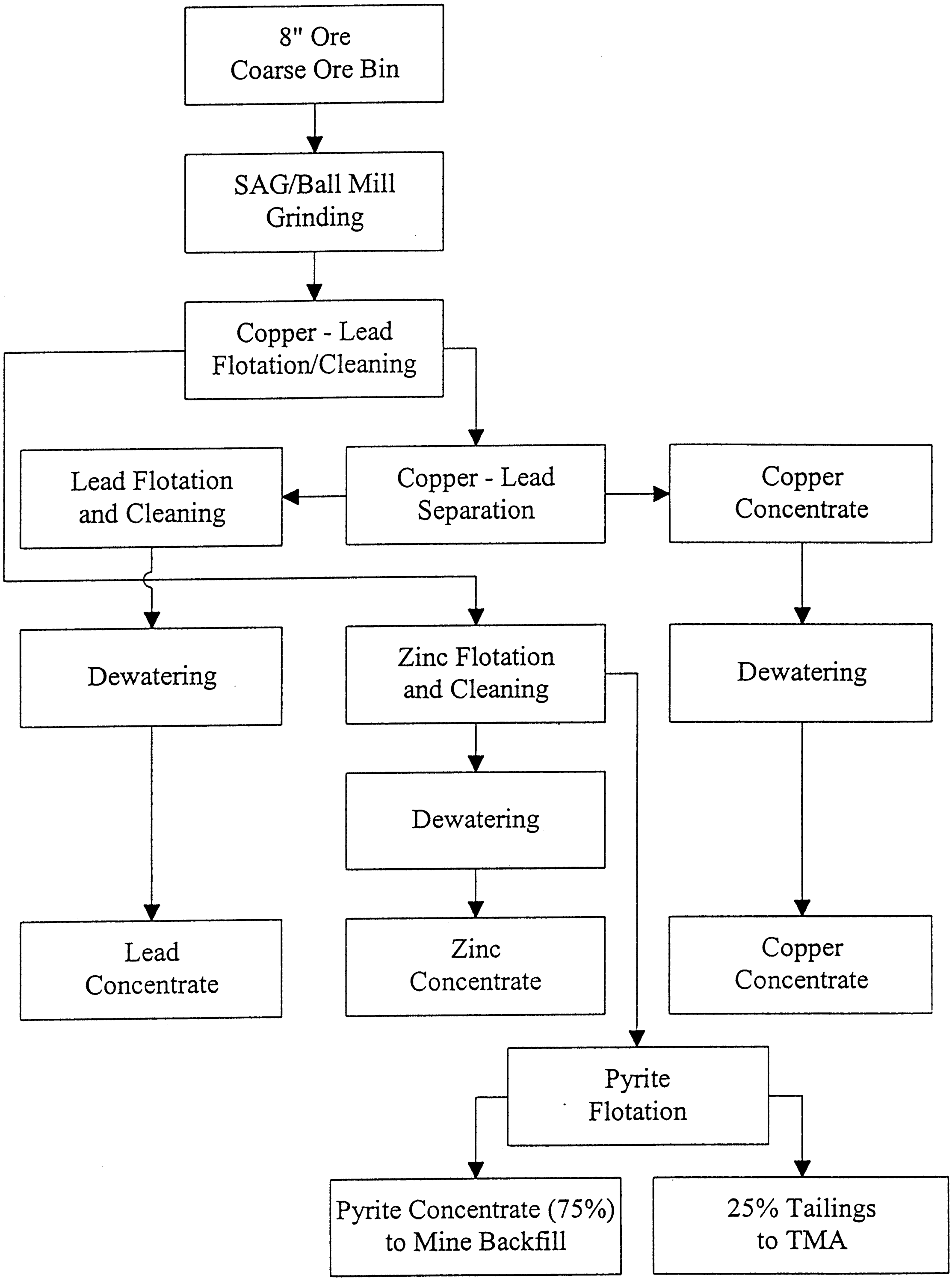

Foth & Van Dyke

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1	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKS1	DATE:	APR.'95
APPROVED BY:	PAE	DATE:	APR.'95
APPROVED BY:	GWS	DATE:	APR.'95

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FIGURE 2-10

CONCENTRATOR PROCESS FLOWSHEET

Scale: NOT TO SCALE		Date: MARCH, 1995	
Prepared By: Foth & Van Dyke		By: BSH	93C049

j:\scopes\93c049\fig210.flo

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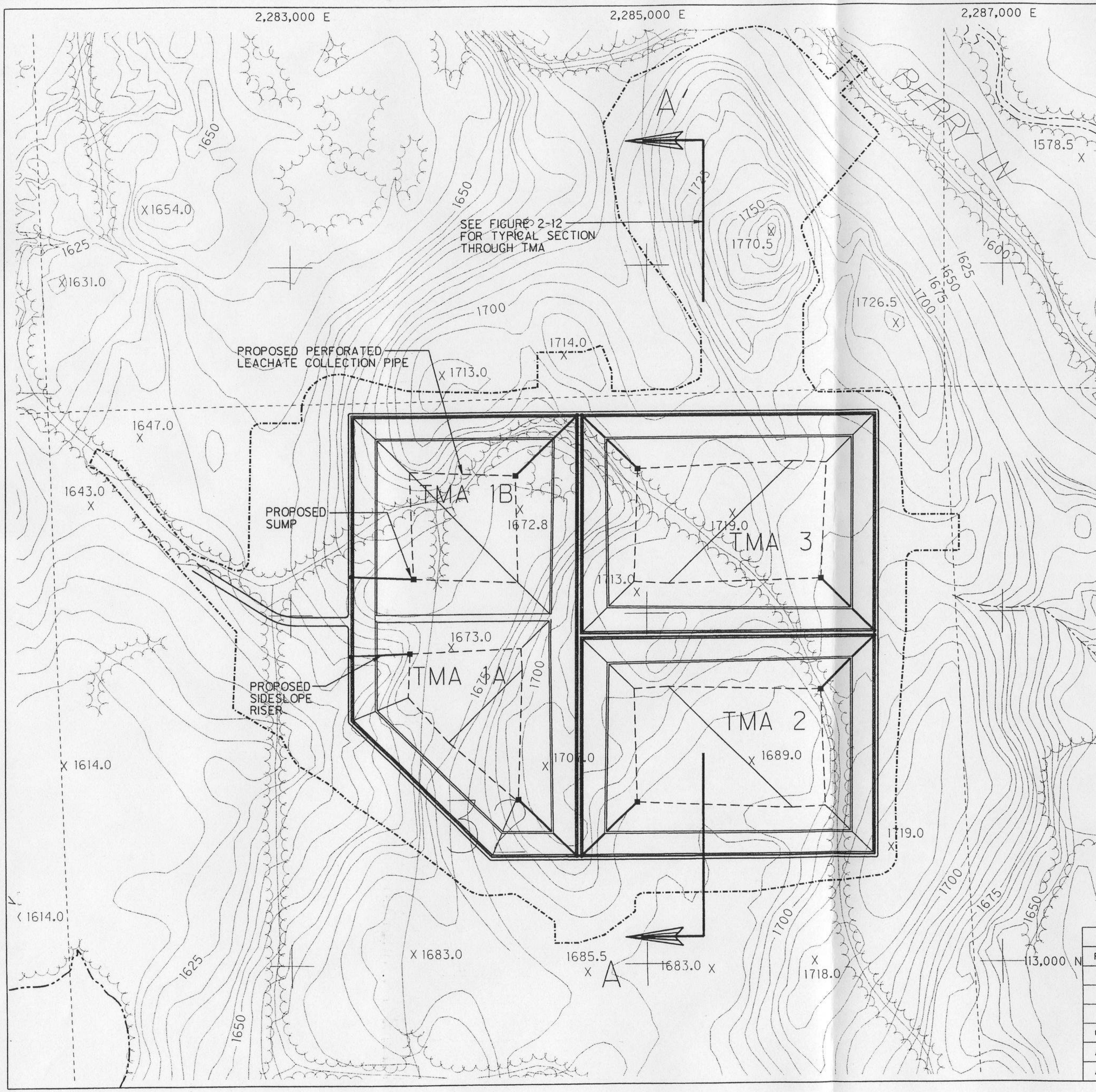

LEGEND

LAKES

STREAMS

EXISTING ROAD

—1675— EXISTING CONTOUR

X 1692.0 SPOT ELEVATION

SECTION LINE

APPROXIMATE LIMITS OF DISTURBANCE

N

NOTES:

1. TOPOGRAPHIC BASE MAP DIGITIZED FROM 1"=1000' SCALE, 5' CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
3. VERTICAL DATUM BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS FIVE FEET.
4. COUNTY AND TOWNSHIP LINES DIGITIZED FROM 7.5' SERIES USGS MAPS.

SCALE
0 300' 600'

TYPICAL REPRESENTATION: REFINEMENTS MAY BE MADE PRIOR TO CONSTRUCTION.

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CHECKED BY:	JKS1	DATE:	MAY, '95
APPROVED BY:	PAE	DATE:	MAY, '95
APPROVED BY:	GWS	DATE:	MAY, '95

Nicolet Minerals COMPANY

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FIGURE 2-11

PROPOSED TMA LAYOUT

Scale:	AS SHOWN	Date:	MAY, 1995
Prepared By: Foth & Van Dyke		By: MRS	93C049

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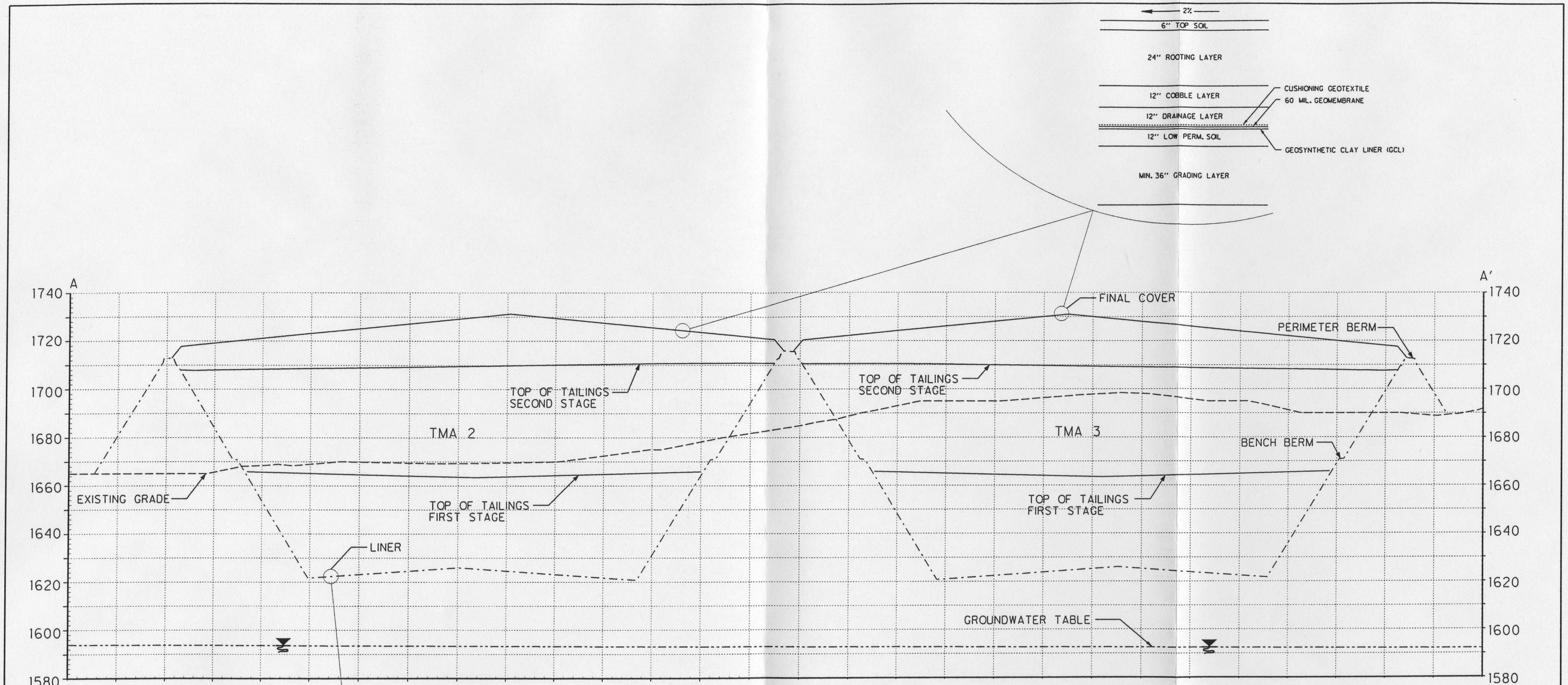
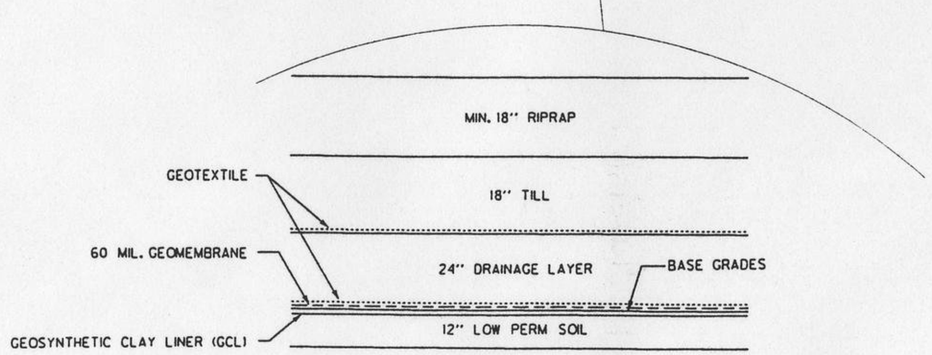
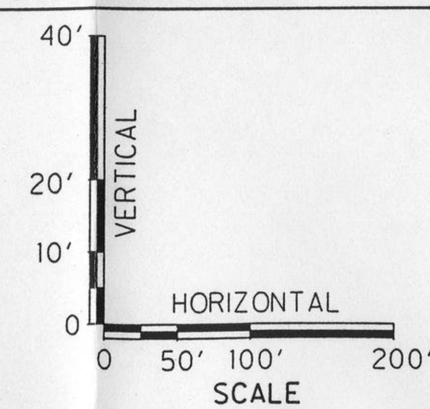


NOTE: VERTICAL SCALE IS EXAGGERATED



TYPICAL CROSS SECTION A-A' THROUGH TMA



TYPICAL REPRESENTATION: REFINEMENTS MAY BE MADE PRIOR TO CONSTRUCTION

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION
⚠	11/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	MAY '95
APPROVED BY:	PAE	DATE:	MAY '95
APPROVED BY:	GWS	DATE:	MAY '95

Nicolet Minerals COMPANY

FIGURE 2-12

TYPICAL CROSS SECTION THROUGH TMA

Scale:	AS SHOWN	Date:	MAY, 1995
Prepared By: Foth & Van Dyke		By: MRS	93C049

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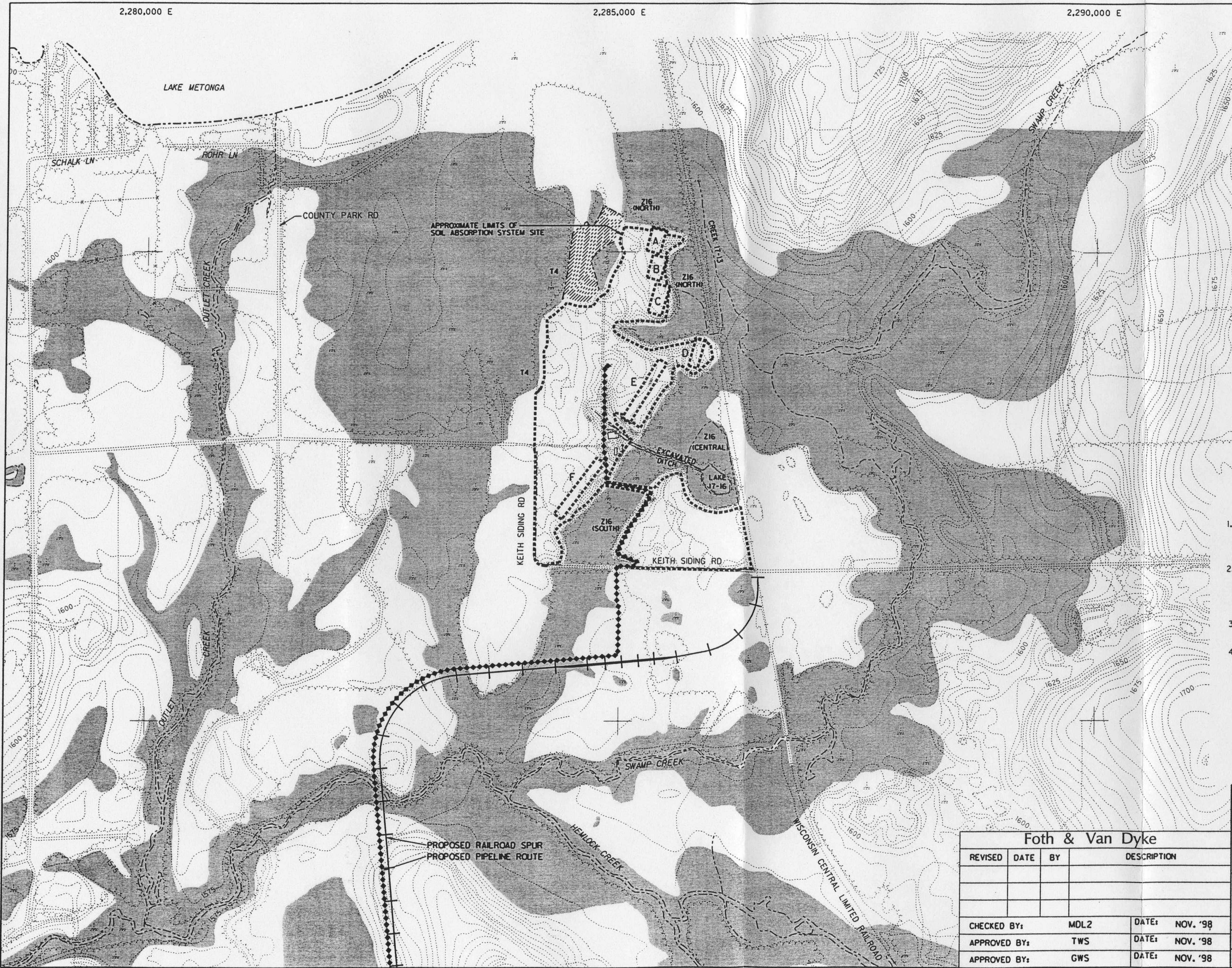

N

LEGEND

- LAKES
- STREAMS
- EXISTING ROAD
- 1675 EXISTING CONTOUR
- SWAMP/WETLAND
- TRAILS
- TREES
- RAILROAD
- WETLANDS
- A PROPOSED SOIL ABSORPTION SYSTEM LOCATION
- PROPOSED SAS PIPELINE ROUTE
- PROPOSED RAILROAD SPUR
- APPROXIMATE LIMITS OF SOIL ABSORPTION SYSTEM SITE
- Z16 WETLAND NAME
- DISTURBED WETLAND AREA NOT PREVIOUSLY DELINEATED AS A WETLAND

NOTES:

1. SAS TOPOGRAPHY AND WETLAND SPOT ELEVATIONS NORTH OF KEITH SIDING ROAD FROM SURVEY COMPLETED BY FOTH & VAN DYKE IN LATE SUMMER, 1998. CONTOUR INTERVAL IS ONE FOOT.
2. TOPOGRAPHY, WATER BODIES, WETLANDS, ETC. OUTSIDE SAS AREA BASED ON TOPOGRAPHIC BASE MAP DIGITIZED FROM THE 1" = 1000' SCALE 5 FOOT CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING INC., SHEBOYGAN, WI. DATE OF PHOTOGRAPHY APRIL 28, 1976.
3. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
4. VERTICAL DATUM BASED ON MEAN SEA LEVEL DATUM.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	MDL2	DATE:	NOV. '98
APPROVED BY:	TWS	DATE:	NOV. '98
APPROVED BY:	GWS	DATE:	NOV. '98

Nicolet Minerals COMPANY

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FIGURE 2-13

DISCHARGE PIPELINE AND SOIL ABSORPTION SYSTEM

Scale: 0 500' 1000' Date: NOVEMBER, 1998

Prepared By: Foth & Van Dyke By: JOW 93C049

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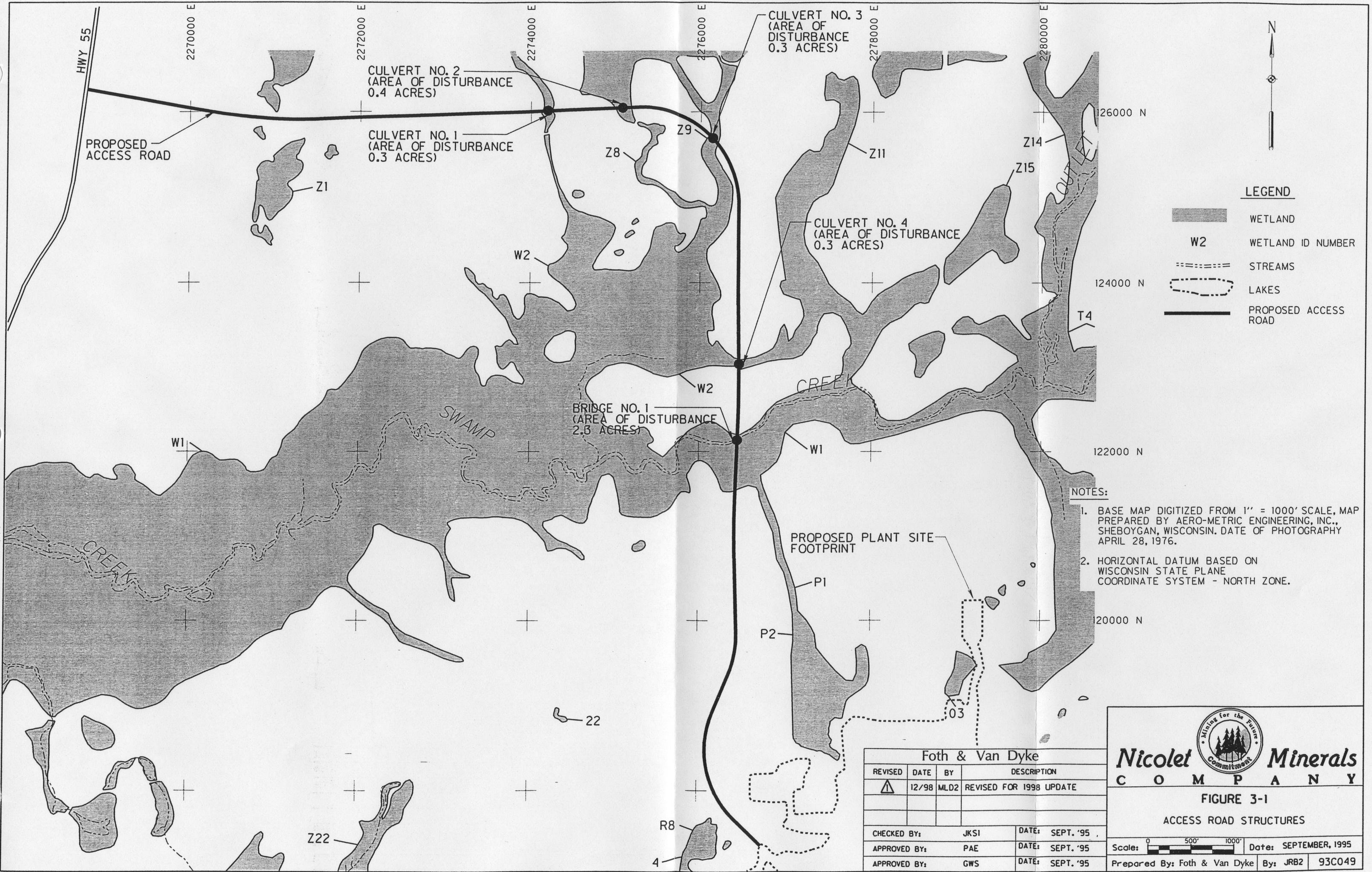

FIGURE 3-1

ACCESS ROAD STRUCTURES

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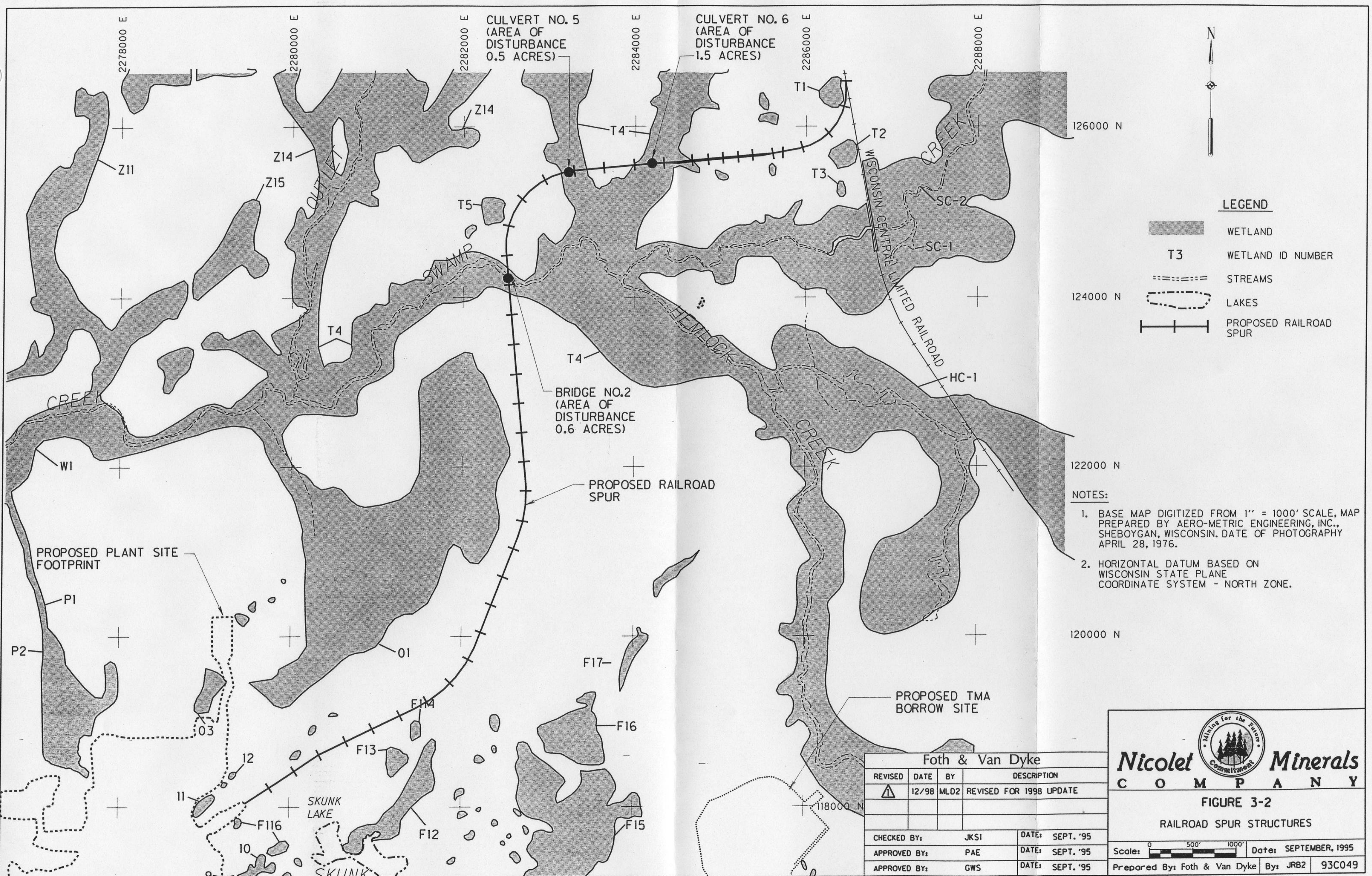
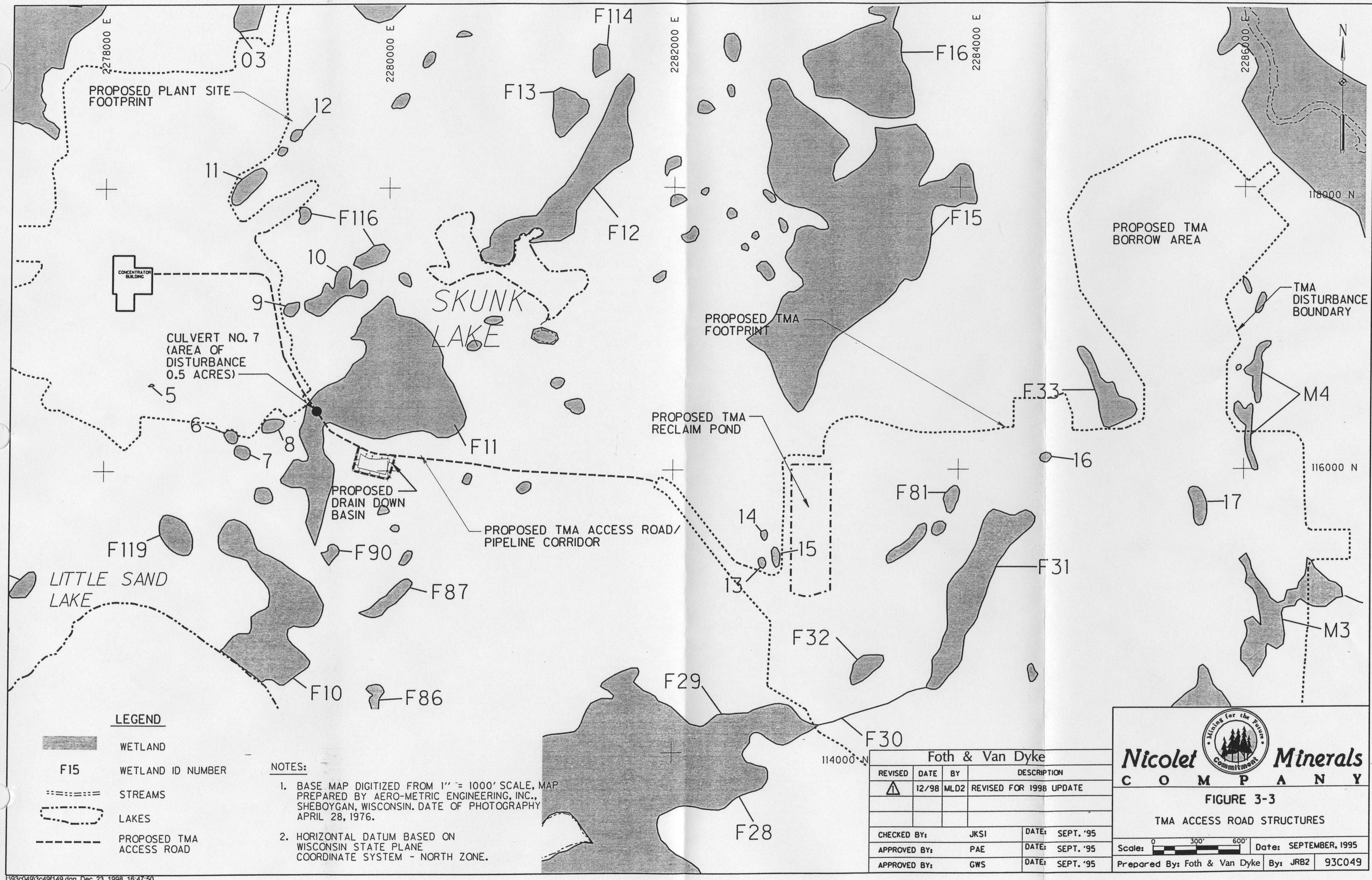


I:\93c049\3c49f147.dgn Dec. 21, 1998 07:08:52



2278000 E
2280000 E
2282000 E
2284000 E
2286000 E
118000 N
116000 N
114000 N
03
12
11
10
9
5
6
7
8
F114
F13
F12
F116
F16
F15
F11
F10
F119
F90
F87
F86
F81
F33
F31
F32
F29
F30
F28
M4
M3
14
15
13
16
17
PROPOSED PLANT SITE FOOTPRINT
CONCENTRATOR BUILDING
CULVERT NO. 7 (AREA OF DISTURBANCE 0.5 ACRES)
SKUNK LAKE
LITTLE SAND LAKE
PROPOSED DRAIN DOWN BASIN
PROPOSED TMA ACCESS ROAD/ PIPELINE CORRIDOR
PROPOSED TMA FOOTPRINT
PROPOSED TMA RECLAIM POND
PROPOSED TMA BORROW AREA
TMA DISTURBANCE BOUNDARY
N
LEGEND
WETLAND
F15 WETLAND ID NUMBER
STREAMS
LAKES
PROPOSED TMA ACCESS ROAD
NOTES:
1. BASE MAP DIGITIZED FROM 1" = 1000' SCALE, MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
Foth & Van Dyke
REVISED | DATE | BY | DESCRIPTION
⚠ | 12/98 | MLD2 | REVISED FOR 1998 UPDATE
CHECKED BY: JKSI DATE: SEPT. '95
APPROVED BY: PAE DATE: SEPT. '95
APPROVED BY: GWS DATE: SEPT. '95
Nicolet Minerals COMPANY
Mining for the Future
Commitment
FIGURE 3-3
TMA ACCESS ROAD STRUCTURES
Scale: 0 300' 600'
Date: SEPTEMBER, 1995
Prepared By: Foth & Van Dyke
By: JRB2
93C049
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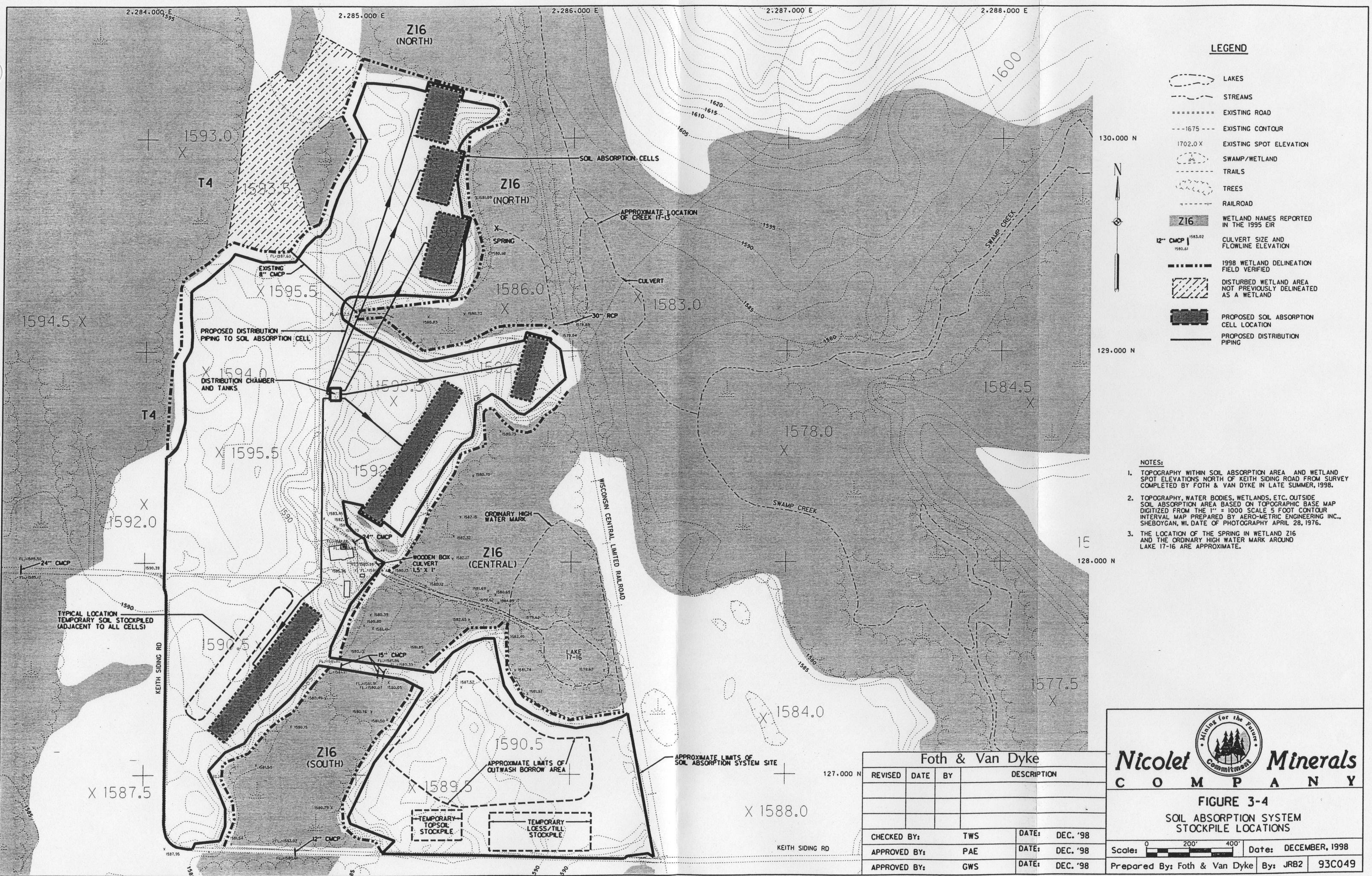

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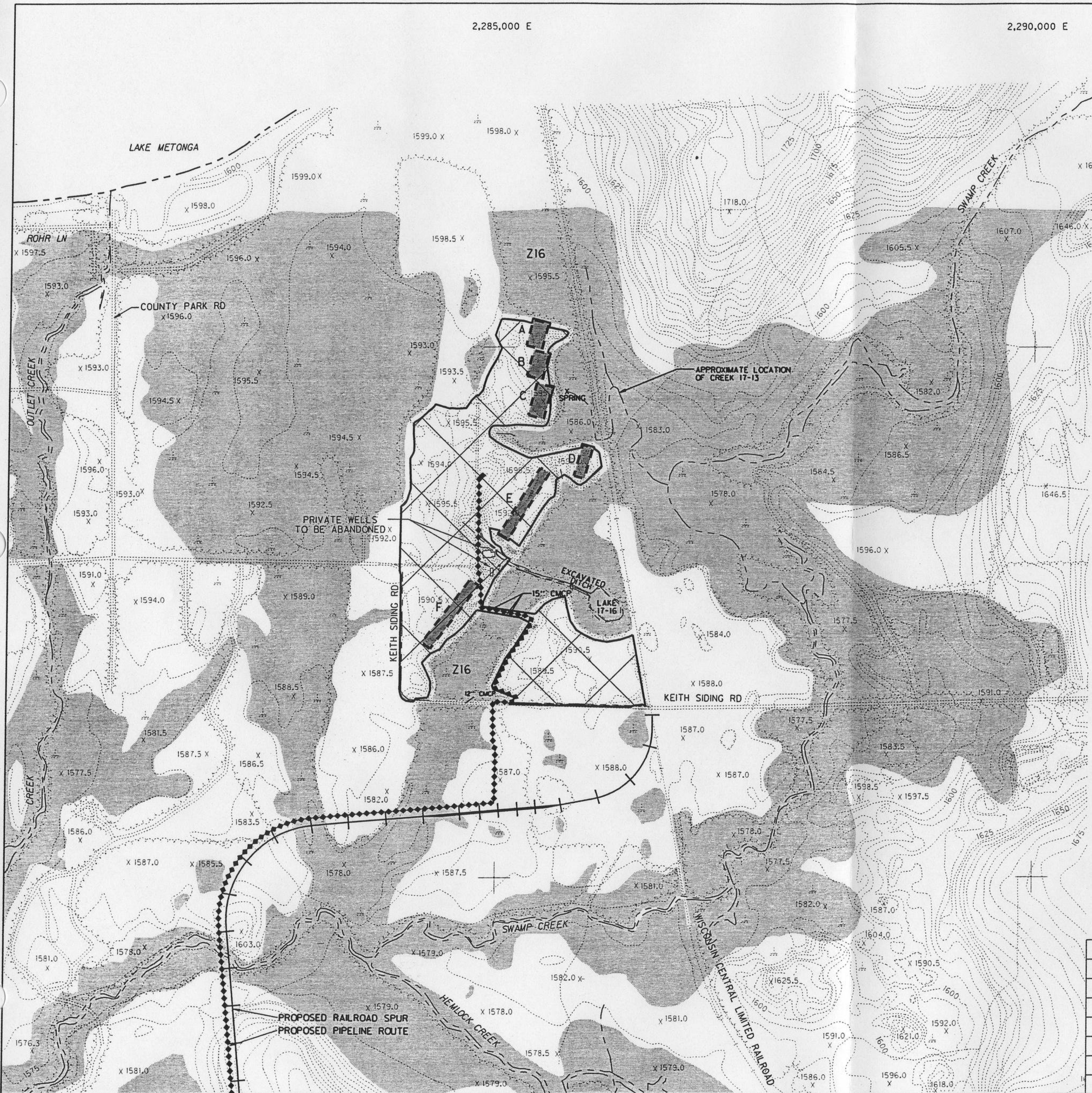

LEGEND

- LAKES
- STREAMS
- EXISTING ROAD
- 1675 — EXISTING CONTOUR
- 1702.0 X — EXISTING SPOT ELEVATION
- SWAMP/WETLAND
- TRAILS
- TREES
- RAILROAD
- PROPOSED FACILITIES
- Z16 — WETLANDS
- A — PROPOSED SOIL ABSORPTION SYSTEM LOCATION
- PROPOSED PIPELINE ROUTE
- PROPOSED RAILROAD SPUR

NOTES:

1. TOPOGRAPHY WITHIN SOIL ABSORPTION AREA AND WETLAND SPOT ELEVATIONS NORTH OF KEITH SIDING ROAD FROM SURVEY COMPLETED BY FOTH & VAN DYKE IN LATE SUMMER, 1998.
2. TOPOGRAPHY, WATER BODIES, WETLANDS, ETC. OUTSIDE SOIL ABSORPTION AREA BASED ON TOPOGRAPHIC BASE MAP DIGITIZED FROM THE 1" = 1000 SCALE 5 FOOT CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING INC., SHEBOYGAN, WI. DATE OF PHOTOGRAPHY APRIL 28, 1976.
3. THE LOCATION OF THE SPRING IN WETLAND Z16 AND THE ORDINARY HIGH WATER MARK AROUND LAKE 17-16 ARE APPROXIMATE.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	MLD2	DATE:	DEC. '98
APPROVED BY:	PAE	DATE:	DEC. '98
APPROVED BY:	GWS	DATE:	DEC. '98

Nicolet Minerals COMPANY

FIGURE 3-5

SOIL ABSORPTION SYSTEM LAYOUT

Scale: 0 500' 1000' | Date: DECEMBER, 1998

Prepared By: Foth & Van Dyke | By: JRB2 | 93C049

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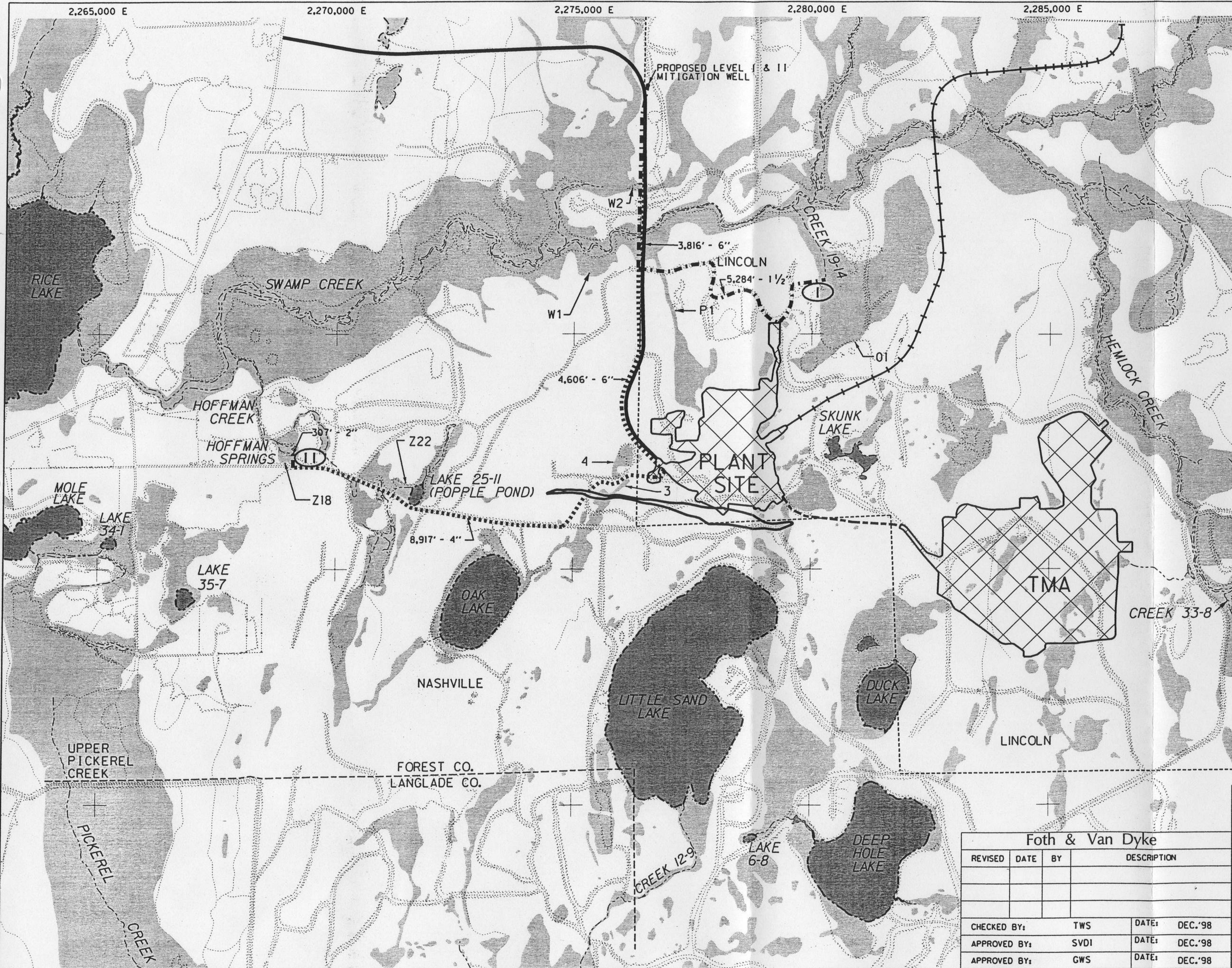

LEGEND

- TREES/BRUSH
- UNPAVED ROAD/TRAIL
- PAVED ROAD
- WETLAND
- CREEKS/RIVERS/LAKES
- TOWNSHIP LINE
- COUNTY LINE
- ORE BODY
- PROPOSED ACCESS ROAD
- PROPOSED TMA ACCESS ROAD AND TAILINGS PIPELINE ROUTE
- PROPOSED RAILROAD SPUR
- PROPOSED FACILITIES
- LEVEL I MITIGATION PIPELINE
- LEVEL II MITIGATION PIPELINE

NOTES:

1. BASE MAP DIGITIZED FROM 1" = 1000' SCALE, MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
3. COUNTY AND TOWNSHIP LINES DIGITIZED FROM 7.5' SERIES USGS MAPS.
4. ORE BODY OUTLINE IS REPRESENTATIVE OF THE SUBCROP AT THE BASE OF THE OVERBURDEN.

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CHECKED BY:	TWS	DATE:	DEC.'98
APPROVED BY:	SVDI	DATE:	DEC.'98
APPROVED BY:	GWS	DATE:	DEC.'98

Nicolet Minerals COMPANY

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FIGURE 3-6

SURFACE WATER MITIGATION LEVEL I AND II - HARD WATER PIPELINE ROUTES

Scale: 0 1000' 2000' | Date: DECEMBER, 1998

Prepared By: Foth & Van Dyke | By: JRB2 | 93C049

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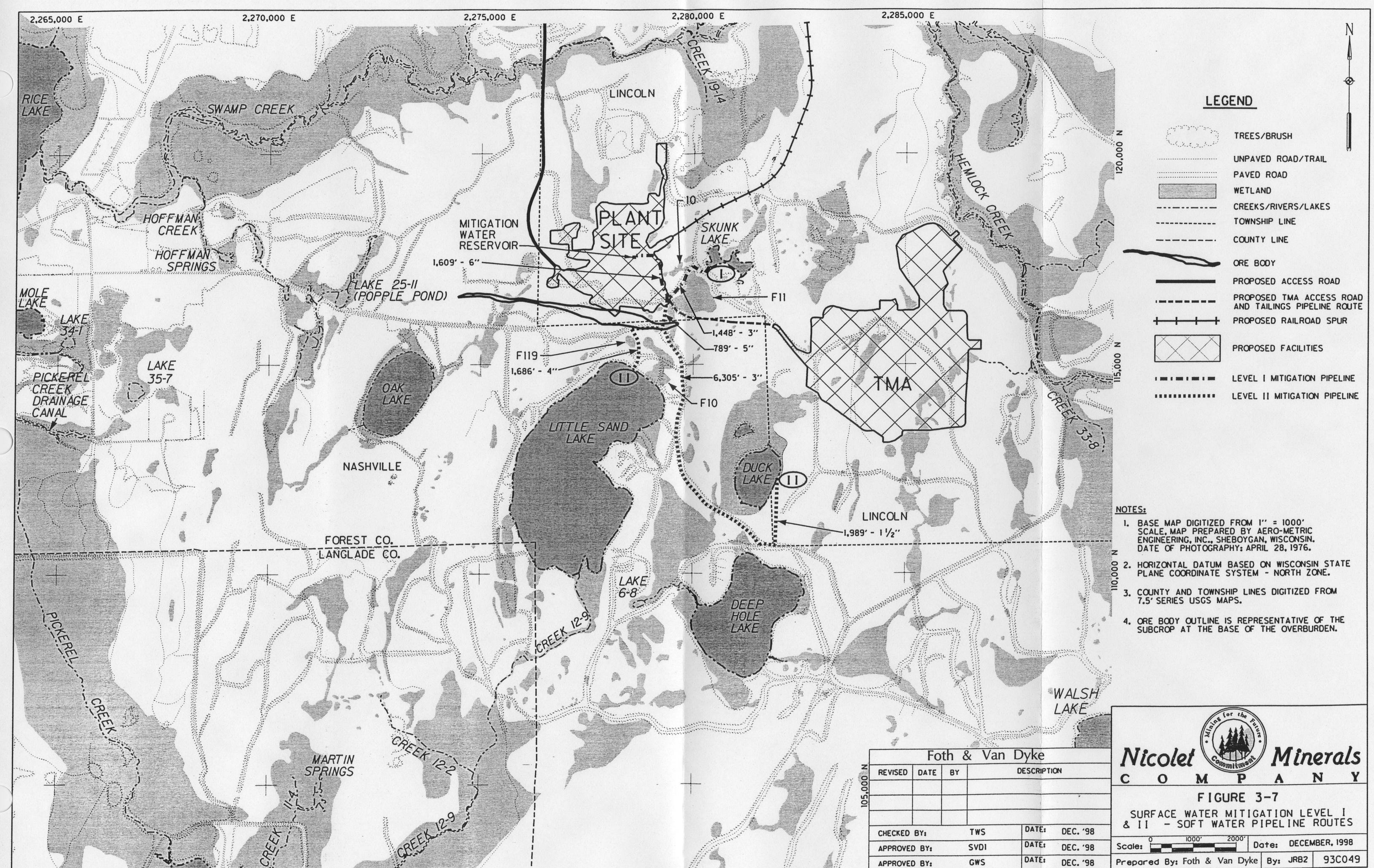

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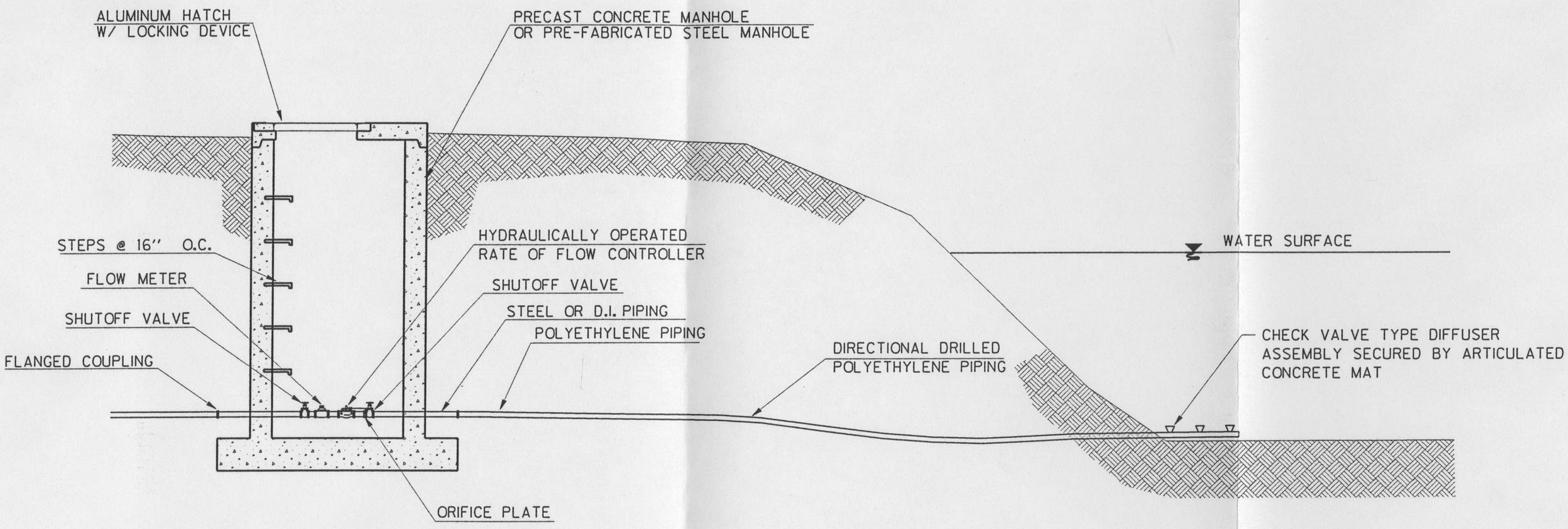

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	TWS	DATE:	DEC. '98
APPROVED BY:	GEV	DATE:	DEC. '98
APPROVED BY:	GWS	DATE:	DEC. '98

Nicolet Minerals COMPANY

Mining for the Future · Commitment

FIGURE 3-8

MITIGATION WATER DELIVERY SYSTEM

Scale: NOT TO SCALE | Date: DECEMBER, 1998

Prepared By: Foth & Van Dyke | By: JRB2 | 93C049

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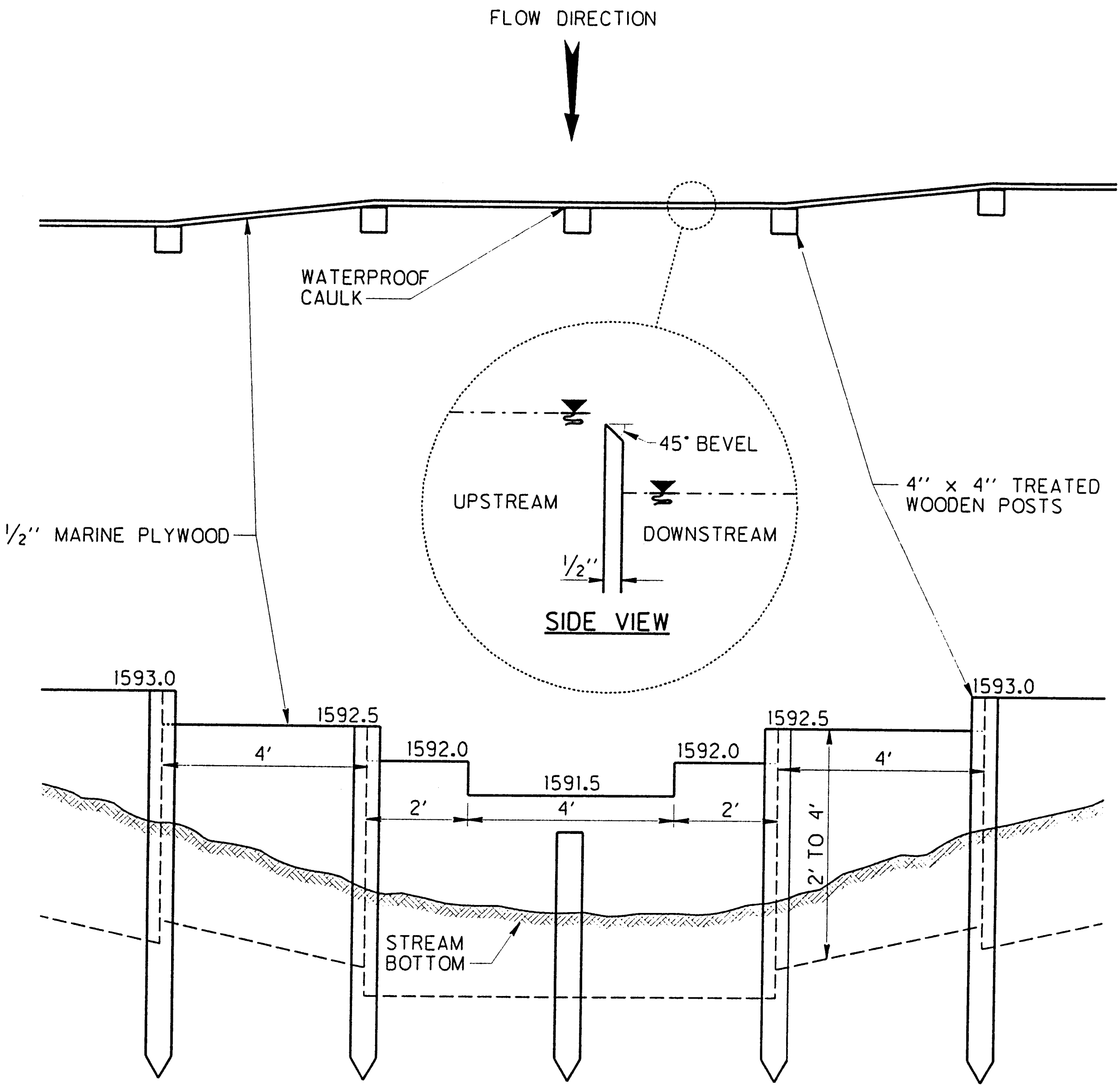

COMPOSITE RECTANGULAR WEIR

4' WEIR INSET INTO 8' WEIR INSET INTO 16' WEIR

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1	12/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	MDL	DATE:	MAR. '98
APPROVED BY:	SVDI	DATE:	MAR. '98
APPROVED BY:	GWS	DATE:	MAR. '98

Nicolet Minerals COMPANY

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FIGURE 3-9

PROPOSED MONITORING INSTALLATION

Scale: NOT TO SCALE		Date: MARCH, 1998	
Prepared By: Foth & Van Dyke		By: JRB2	93C049

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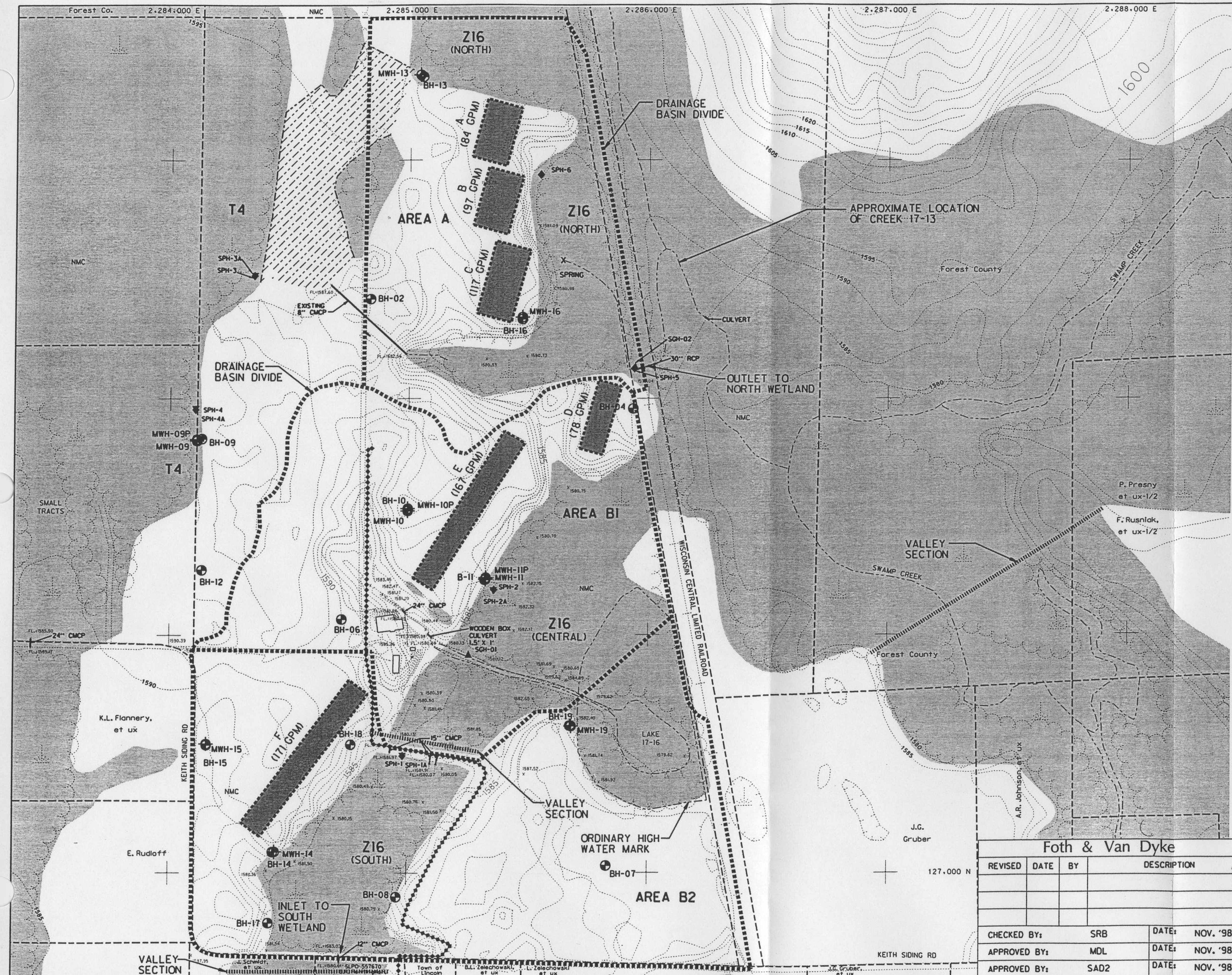

LEGEND

- LAKES
- STREAMS
- EXISTING ROAD
- 1675 EXISTING CONTOUR
- 1702.0 X EXISTING SPOT ELEVATION
- SWAMP/WETLAND
- TRAILS
- TREES
- RAILROAD
- NMC — APPROXIMATE PROPERTY BOUNDARY AND OWNER
- BH-09 — SOIL BORING NUMBER AND LOCATION
- MWH-09 — MONITORING WELL NUMBER AND LOCATION
- MWH-09P — PIEZOMETER NUMBER AND LOCATION
- SPH-1 — SAND POINT NUMBER AND LOCATION
- SGH-01 — STAFF GAUGE NUMBER AND LOCATION
- Z16 — WETLAND NAMES REPORTED IN THE 1995 EIR
- 12" CMCP — CULVERT SIZE AND FLOWLINE ELEVATION
- DISTURBED WETLAND AREA NOT PREVIOUSLY DELINEATED AS A WETLAND
- C 117 GPM — PROPOSED SOIL ABSORPTION CELL LOCATION AND DISCHARGE RATE (GPM)
- DRAINAGE BASIN DIVIDE
- PROPOSED PIPELINE ROUTE
- VALLEY SECTION

NOTE:

1. THE LOCATION OF THE SPRING IN WETLAND Z16 AND THE ORDINARY HIGH WATER MARK AROUND LAKE 17-16 ARE APPROXIMATE.

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CHECKED BY:	SRB	DATE:	NOV. '98
APPROVED BY:	MDL	DATE:	NOV. '98
APPROVED BY:	SAD2	DATE:	NOV. '98

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FIGURE 3-10

SOIL ABSORPTION SITE LOCATION WITH WETLAND DRAINAGE BASINS

Scale: 0 200' 400' — Date: NOVEMBER, 1998

Prepared By: Foth & Van Dyke — By: JRB2 — 93C049

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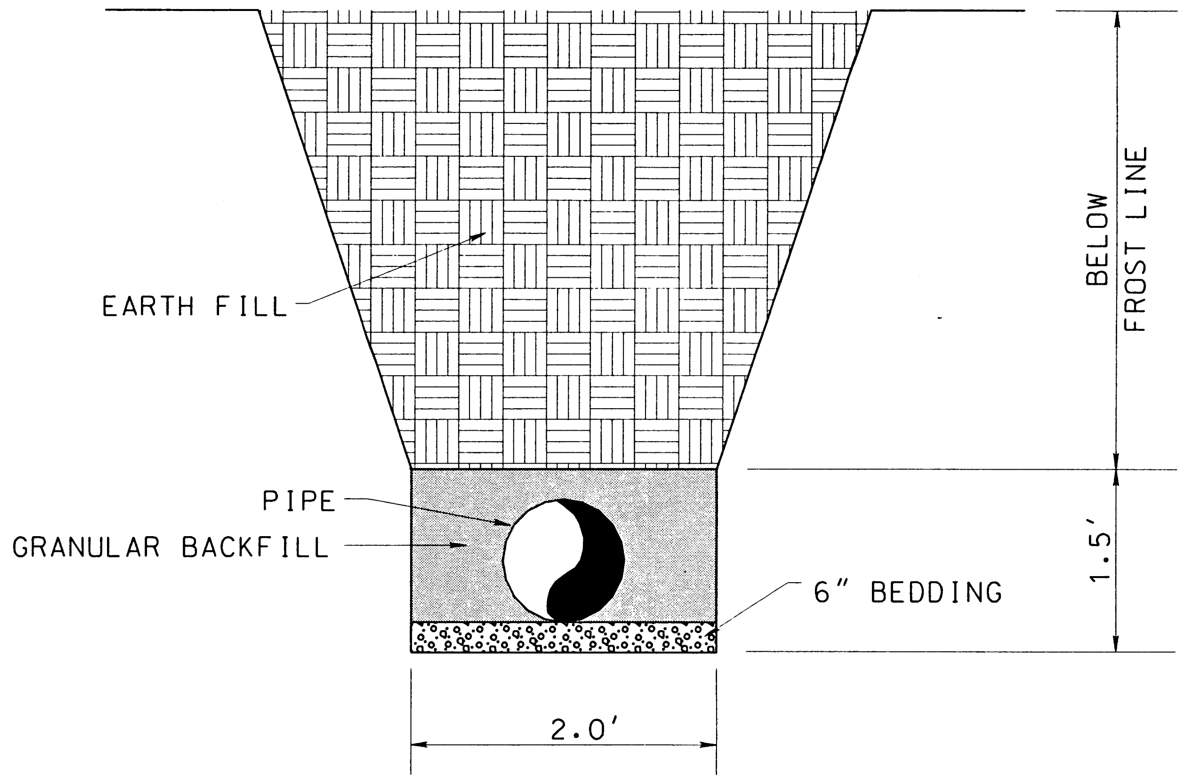

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	MLD2	DATE:	DEC. '98
APPROVED BY:	PAE	DATE:	DEC. '98
APPROVED BY:	GWS	DATE:	DEC. '98

Nicolet Minerals COMPANY

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FIGURE 3-11

PIPE TRENCH DETAIL

Scale: NOT TO SCALE		Date: DECEMBER, 1998	
Prepared By: Foth & Van Dyke	By: JRB2	93C049	

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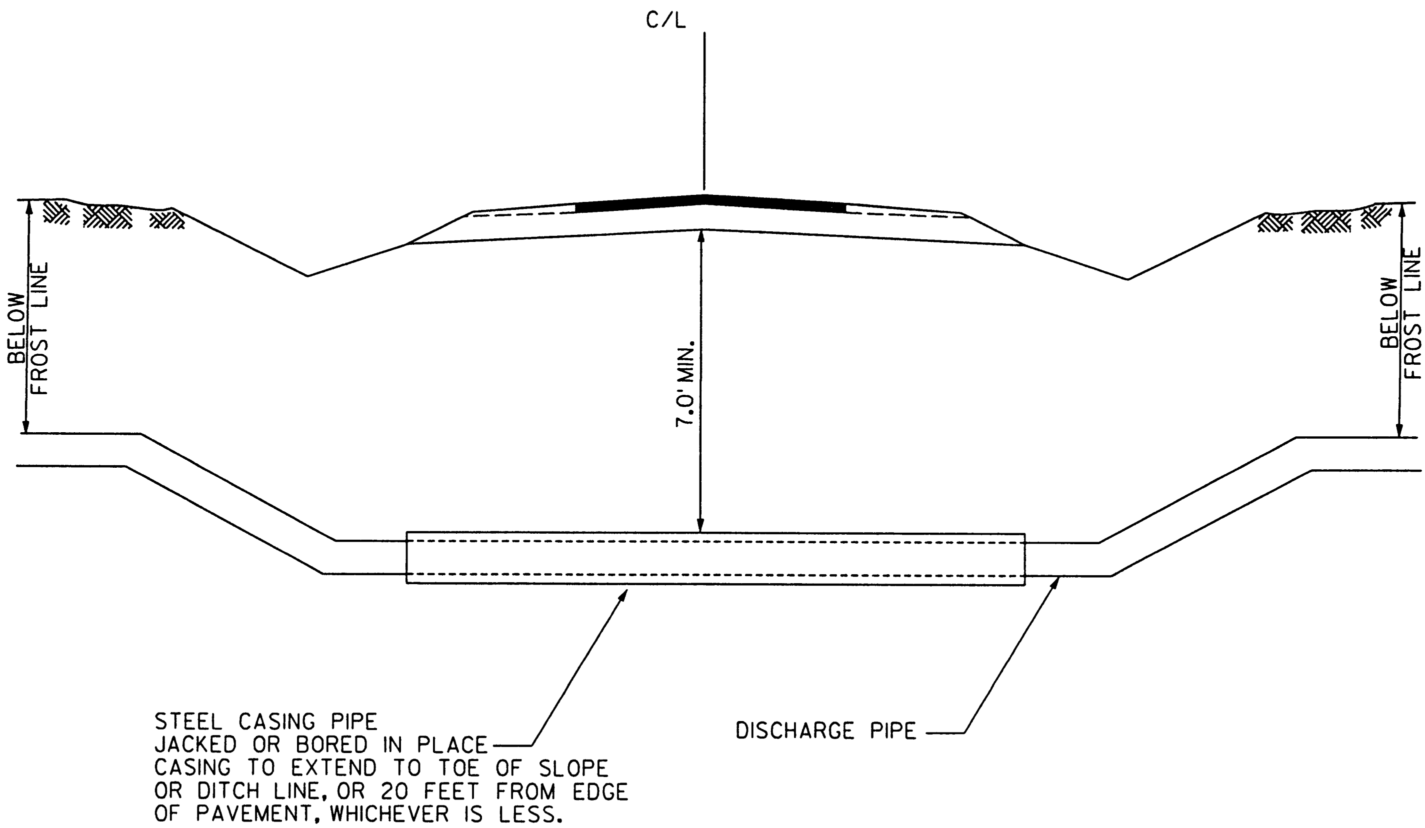

NOTE: THIS DETAIL PERTAINS TO STATE, COUNTY AND TOWN ROADS.

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APPROVED BY:	GEV	DATE:	NOV. '95
APPROVED BY:	GWS	DATE:	NOV. '95

Nicolet Minerals COMPANY

Mining for the Future · Commitment

FIGURE 3-12

TYPICAL SIDE ROAD BORING & JACK

Scale: NOT TO SCALE	Date: NOVEMBER, 1995
Prepared By: Foth & Van Dyke	By: SMMI 93C049

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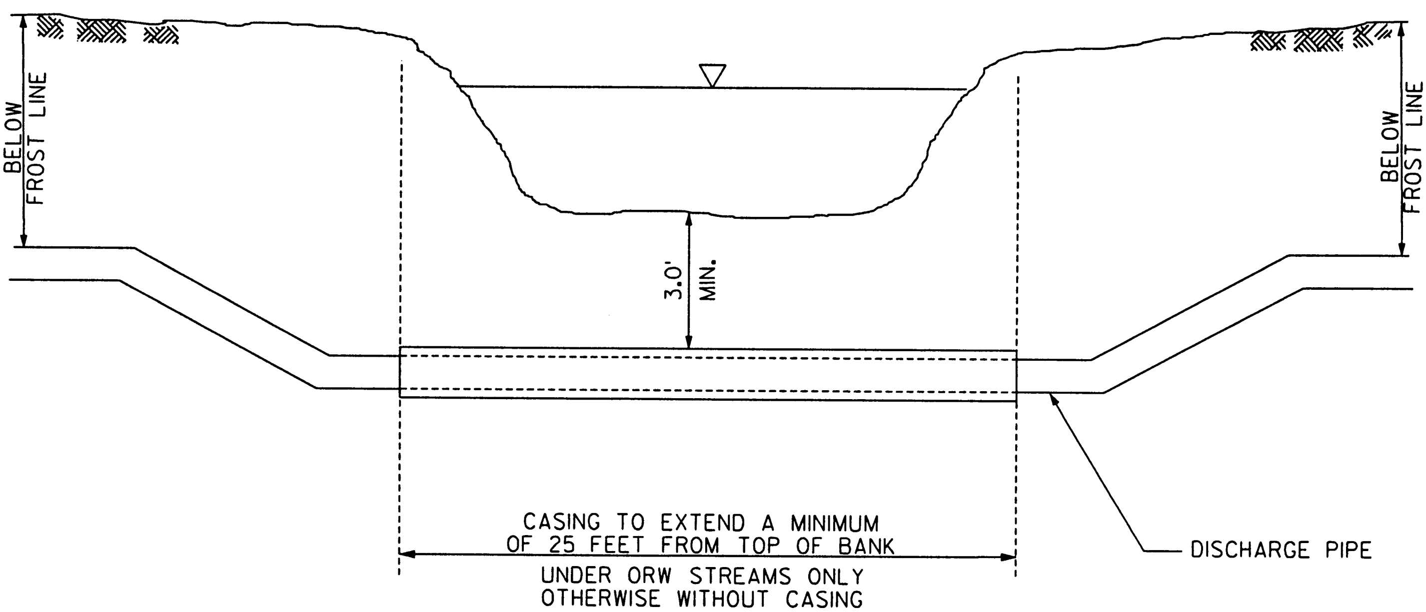

Foth & Van Dyke			
REVISED	DATE	BY	DESCRIPTION
⚠1	12/98	MLD2	REVISED FOR 1998 UPDATE

CHECKED BY:	PMP1	DATE:	NOV. '95
APPROVED BY:	GEV	DATE:	NOV. '95
APPROVED BY:	GWS	DATE:	NOV. '95

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FIGURE 3-13

TYPICAL RIVER/STREAM CROSSING

Scale: NOT TO SCALE		Date: NOVEMBER, 1995	
Prepared By: Foth & Van Dyke	By: SMMI		93C049

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Appendix A

Water Regulatory Permit Application Form 3500-53 and Form 3500-53A

Mine Site

State of Wisconsin
Department of Natural Resources
(Return to appropriate
DNR District/Area Office)

U.S. Army Corps of Engineer-St. Paul District
Regulatory Functions
190 Fifth Street East
St. Paul, MN 55101-1638

STATE/FEDERAL APPLICATION FOR WATER REGULATORY PERMITS AND APPROVALS
Form 3500-53 Rev. 9-95

PLEASE COMPLETE BOTH PAGES 1 & 2 OF THIS APPLICATION. PRINT OR TYPE. Use of this form is required by the Department for any application filed pursuant to Chapter 30, Wis. Stats. The Department will not consider your application unless you complete and submit this application form. Personally identifiable information on this form is not intended to be used for any other purpose.

1. Applicant (Individual or corporate name)
Nicolet Minerals Company
Address
7 North Brown Street, 3rd Floor
City, State, Zip Code
Rhinelander, Wisconsin 54501-3161
Telephone No. (Include area code)
(715) 365-1450

2. Agent/Contractor (firm name)
Foth & Van Dyke
Address
2737 S. Ridge Road
City, State, Zip Code
Green Bay, Wisconsin 54307-9012
Telephone No. (Include area code)
(414) 497-2500

3. If applicant is not owner of the property where the proposed activity will be conducted, provide name and address of owner and include letter of authorization from owner. Owner must be the applicant or coapplicant for structure, diversion and channel change activites. A purchaser under a land contract is not considered a riparian owner until property transfer has occurred.

Owner's Name	Address	City, State, Zip Code
Applicant is the Owner		

4. Is the applicant a business? [x] Yes [ ] No

If YES, is the permit or approval you are applying for necessary for you to conduct this business in the State of Wisconsin? [x] Yes [ ] No
If YES, please explain why (attach addition sheets if necessary):

See Section 2 - General Project Description

5. Project Location
Address 2 miles east of STH 55 , 5 miles S. of Crandon(see Section 2)
Village/City/Town Town of Lincoln (L) and Town of Nashville (N)
Waterway Swamp Creek and Pickeral Creek watersheds, various wetlands (see Section 3) **County** Forest
Govt. Lot ____ **OR** ____ **1/4,** ____ **1/4, of Section** 25(L)& 30(N)
Township 35 **North, Range** 12(L) & 13(N) **(East)(West)**

6. Adjoining Riparian (Neighboring Waterfront Property Owner) Information

Name of Riparian #1	Address	City, State, Zip Code
Not applicable as NMC controls land interests for adjoining properties (see Figure 2-2 of MPA)		
Name of Riparian #2	**Address**	**City, State, Zip Code**

7. Project Information (Attach additional sheets if necessary)
(a) Describe proposed activity (include how this project will be constructed)
Mine development (See Sections 2 and 3 of this submittal)
(b) Purpose, need and intended use of project
Drainage structures for mine facilities (see Section 2 & 3 of this submittal)
(c) I have applied for or received permits from the following agencies: (Check x)

[x] Municipal [x] County [x] Wis. DNR [x] Corps of Engineers

(d) Date activity will begin if permit is issued : 2001 **; be completed:** 2035
(e) Is any portion of the requested project now complete?

[ ] Yes [x] No **If yes, identify the completed portion on the enclosed drawings an indicated here the date activity was completed:**

I hereby certify that the information contained herein is true and accurate. I also certify that I am entitled to apply for a permit, or that I am the duly authorized representative or agent of an applicant who is entitled to apply for a permit. Any inaccurate information submitted may result in permit revocation, the imposition of a forfeiture(s) and requirement of restoration.

Signature of Applicant or Duly Authorized Agent [signature] **Date Signed** 12/22/98

LEAVE BLANK - FOR RECEIVING AGENCY USE ONLY

Corps of Engineers Process No.	Wisconsin DNR File No.	
Received By	**Date Received**	**Date Application Was Complete**

State of Wisconsin
Department of Natural Resources

FEE FOR DECISIONS ON APPLICATIONS TO ALTER LAKES, STREAMS OR WETLANDS
Form 3500-53A Rev. 04-98

*** PLEASE SEE OTHER SIDE OF THIS FORM FOR APPLICABLE FEE ***

State law requires that we charge a fee for processing your request to make changes to surface waters and wetlands. Each application or request requires the correct fee in order for review to begin. **If your project includes several regulated activities you must include payment only for the most costly activity.** If you have questions regarding the appropriate fee, please contact your local Water Management Specialist.

Expedited decision making guarantees a decision within 90 days for most activities, 150 days for activities requiring a public notice or environmental assessment (EA), or 210 days for activities requiring both public notice and EA (see other side). Please submit a letter with your application describing the timeframe that will meet your needs along with a check for $2000. Within twenty days we will respond in writing, specifying any additional information needed for a decision on your proposal and the time within which we can make a decision once the application is completed. Other applications are reviewed on a first in - first out basis. We will do our utmost to deliver a decision in the specified timeframe. Supplemental fees will be refunded if a decision is not made in less than the standard decision time.

Standard fees will be refunded only if the refund is requested before we determine that the application is complete.

Applications for permits or approvals submitted after work has been commenced or completed require twice the usual fee. Projects started or completed without obtaining the appropriate permits are subject to potential enforcement actions (e.g., monetary forfeitures, required abatement).

Personally identifiable information on this form is not intended to be used for any other purpose.

TO BE COMPLETED BY APPLICANT:

Navigable waters greater than 35 feet wide
Permit/Approval Applied for With Highest Fee
(see listing on other side)

Fee previously submitted
Amount Enclosed

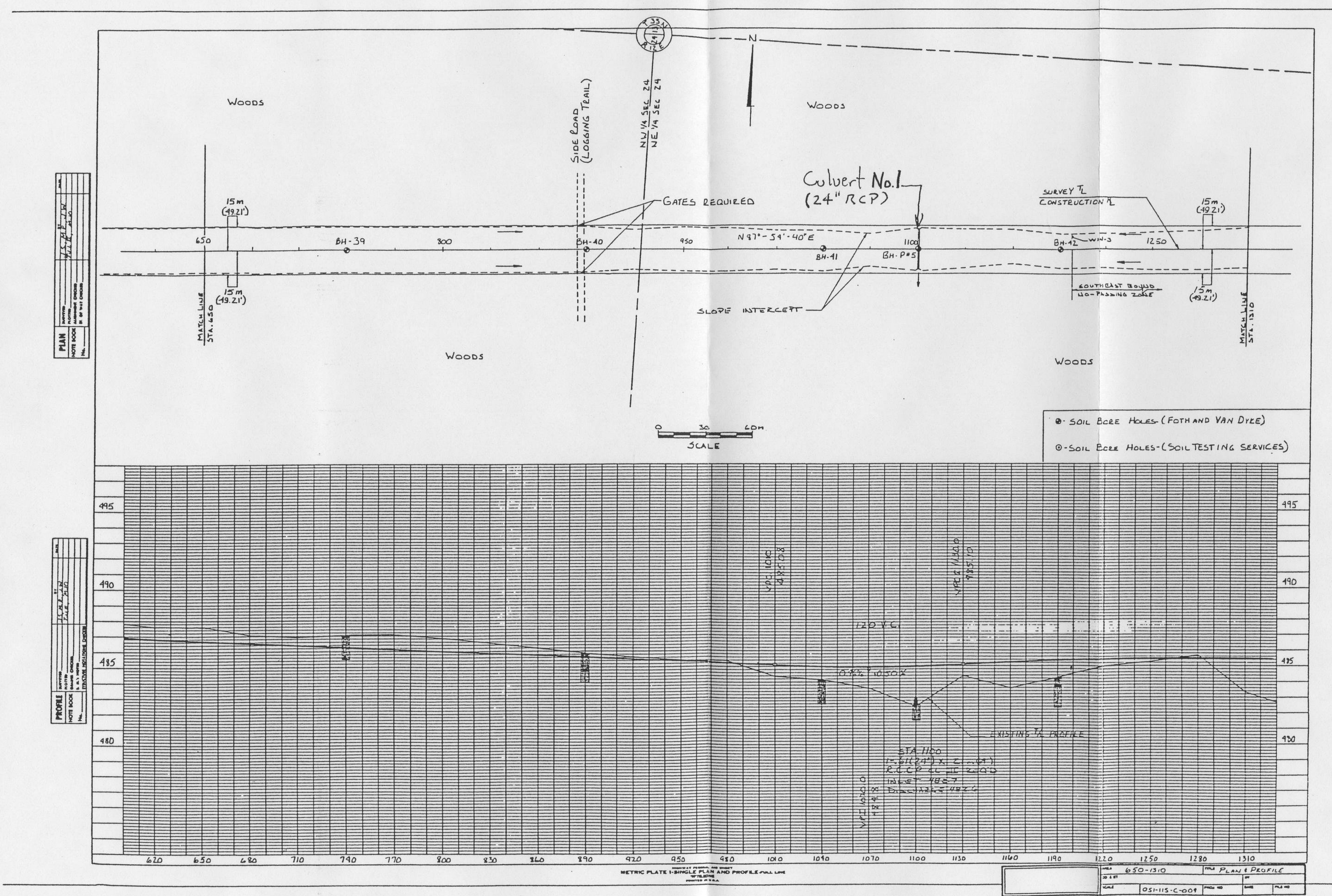
[signature]
Signature of Applicant

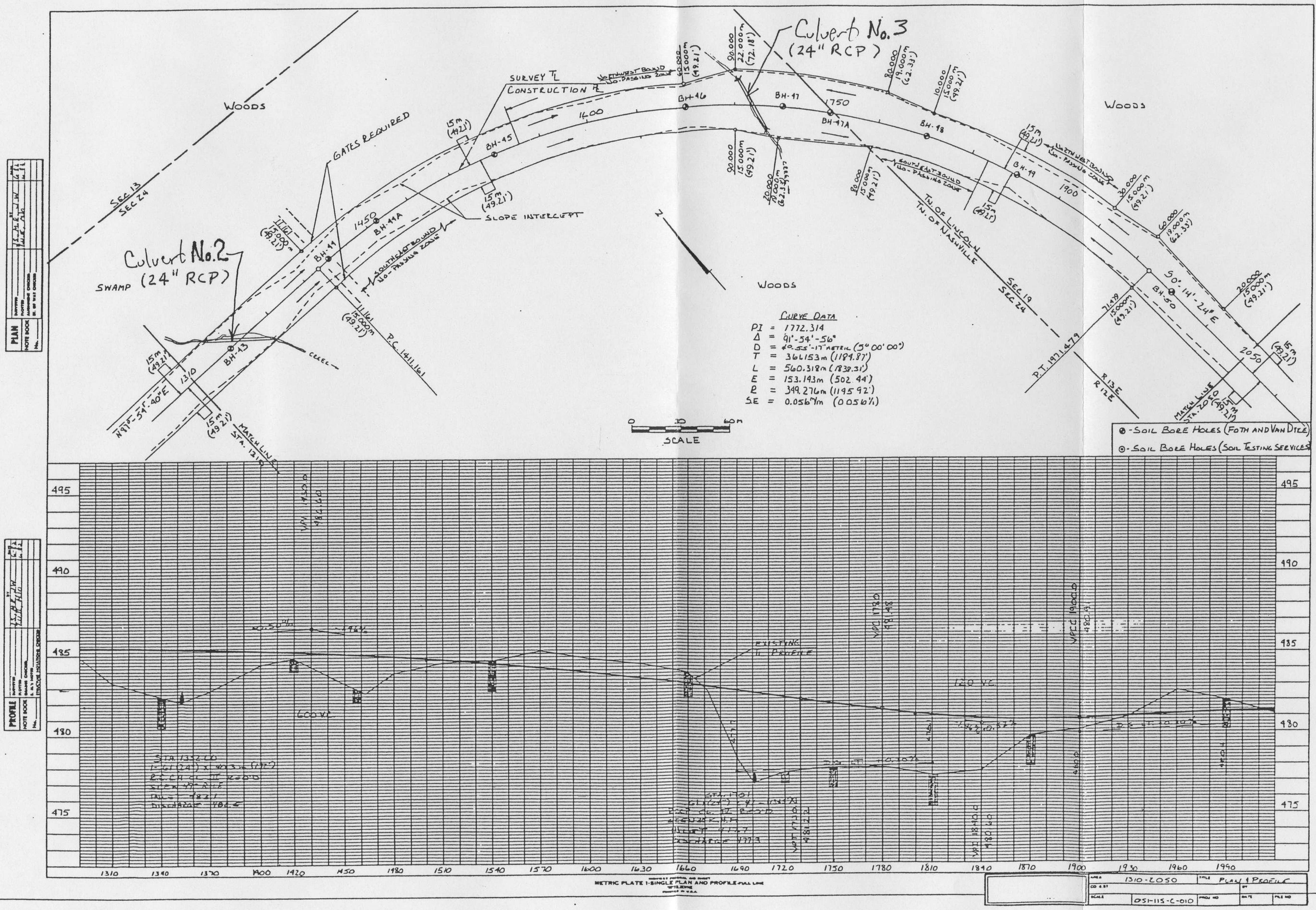
12/22/98
Date Signed

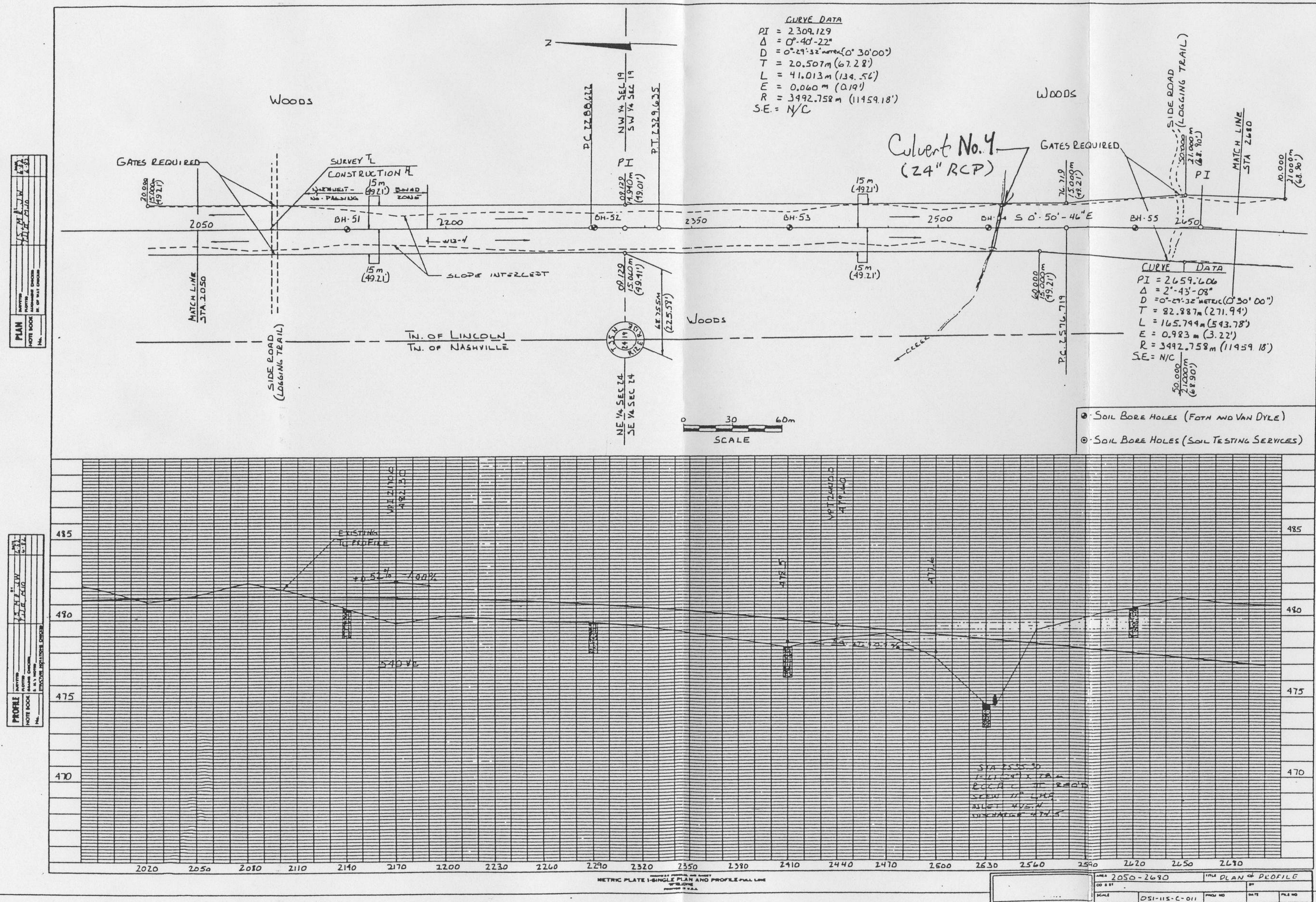
LEAVE BLANK - DEPARTMENT OF NATURAL RESOURCES USE ONLY		
Fee Received $________	Check ☐	Money Order ☐
Received by ________		

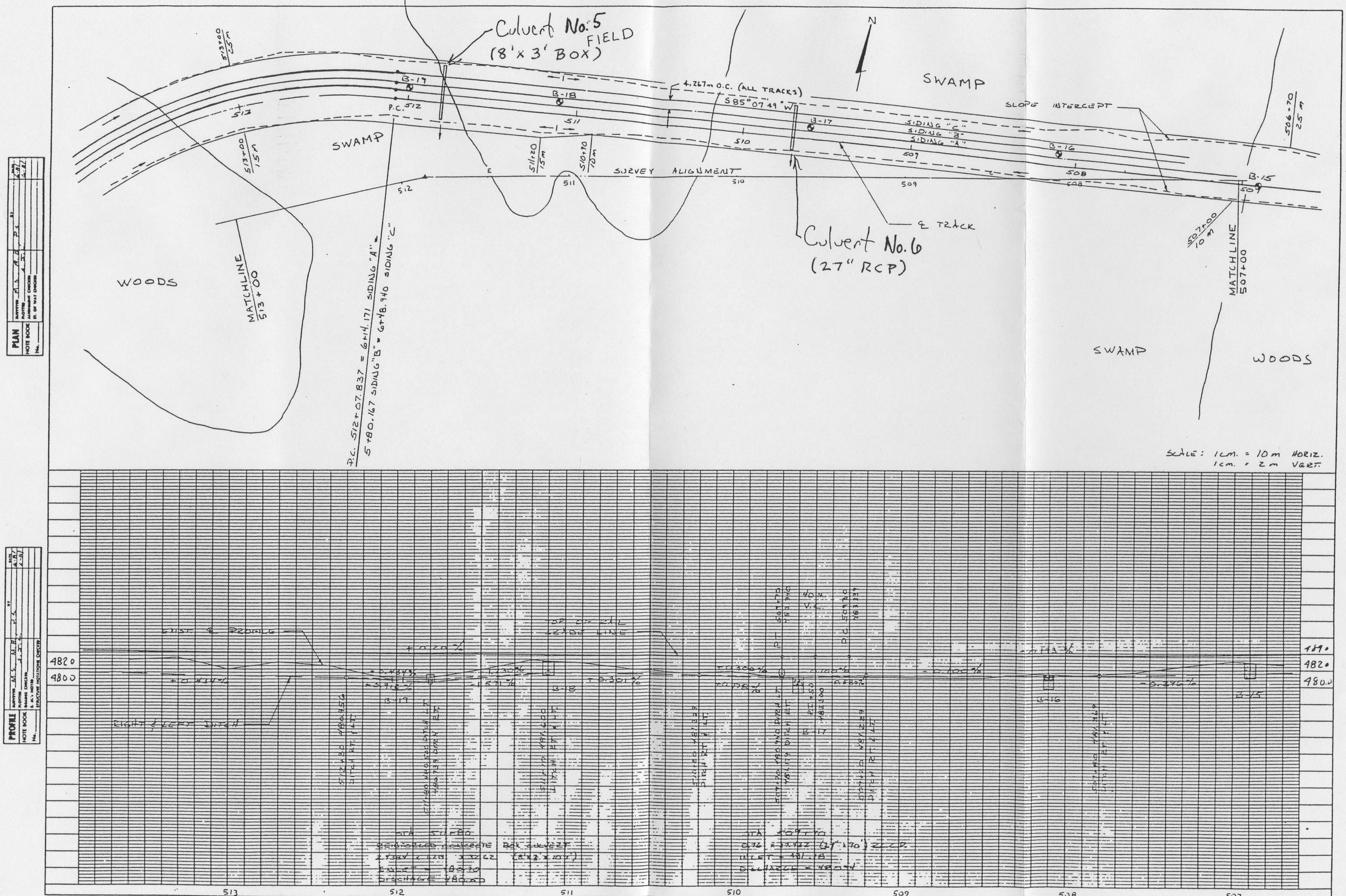
Appendix B

Culvert Locations - Plan & Profile


WOODS
WOODS
WOODS
WOODS
N
SIDE ROAD (LOGGING TRAIL)
NW 1/4 SEC 24
NE 1/4 SEC 24
Culvert No.1 (24" RCP)
GATES REQUIRED
SURVEY ℄
CONSTRUCTION ℄
15m (49.21')
15m (49.21')
15m (49.21')
15m (49.21')
650
BH-39
800
BH-40
950
N 87° - 54' - 40" E
BH-41
1100
BH-P#5
BH-42
1250
SOUTHEAST BOUND NO-PASSING ZONE
SLOPE INTERCEPT
MATCH LINE STA. 650
MATCH LINE STA. 1310
0 30 60m
SCALE
SOIL BORE HOLES-(FOTH AND VAN DYKE)
SOIL BORE HOLES-(SOIL TESTING SERVICES)
PLAN
PROFILE
495
490
485
480
120 V.C.
EXISTING ℄ PROFILE
STA 1100
620 650 680 710 740 770 800 830 860 890 920 950 980 1010 1040 1070 1100 1130 1160 1190 1220 1250 1280 1310
METRIC PLATE 1-SINGLE PLAN AND PROFILE-FULL LINE
650-1310
PLAN & PROFILE
051-115-C-009


Culvert No. 3
(24" RCP)
Culvert No. 2
(24" RCP)
SURVEY ℄
CONSTRUCTION ℄
NORTHWEST BOUND NO-PASSING ZONE
SOUTHEAST BOUND NO-PASSING ZONE
GATES REQUIRED
SLOPE INTERCEPT
WOODS
SWAMP
CREEK
SEC 13
SEC 24
SEC 19
SEC 24
TN. OF LINCOLN
TN. OF NASHVILLE
R13E
R12E
BH-43
BH-44
BH-44A
BH-45
BH-46
BH-47
BH-47A
BH-48
BH-49
BH-50
P.C. 1411.161
P.T. 1971.479
MATCH LINE STA. 1310
MATCH LINE STA. 2050
N 41°-54'-40" E
S 50°-14'-24" E
CURVE DATA
PI = 1772.314
Δ = 91°-54'-56"
D = 4°-55'-17" METRIC (5°00'00")
T = 361.153m (1184.87')
L = 560.318m (1838.31')
E = 153.193m (502.44')
R = 349.276m (1145.92')
SE = 0.056 m/m (0.056%)
SCALE
⊗ - SOIL BORE HOLES (FOTH AND VAN DYKE)
⊙ - SOIL BORE HOLES (SOIL TESTING SERVICES)
PLAN
PROFILE
EXISTING ℄ PROFILE
600 VC
120 VC
VPI 1780
VPCC 1902.0
495
490
485
480
475
1310 1340 1370 1400 1420 1450 1480 1510 1540 1570 1600 1630 1660 1690 1720 1750 1780 1810 1840 1870 1900 1930 1960 1990
METRIC PLATE 1-SINGLE PLAN AND PROFILE FULL LINE
1310-2050
PLAN & PROFILE
051-115-C-010

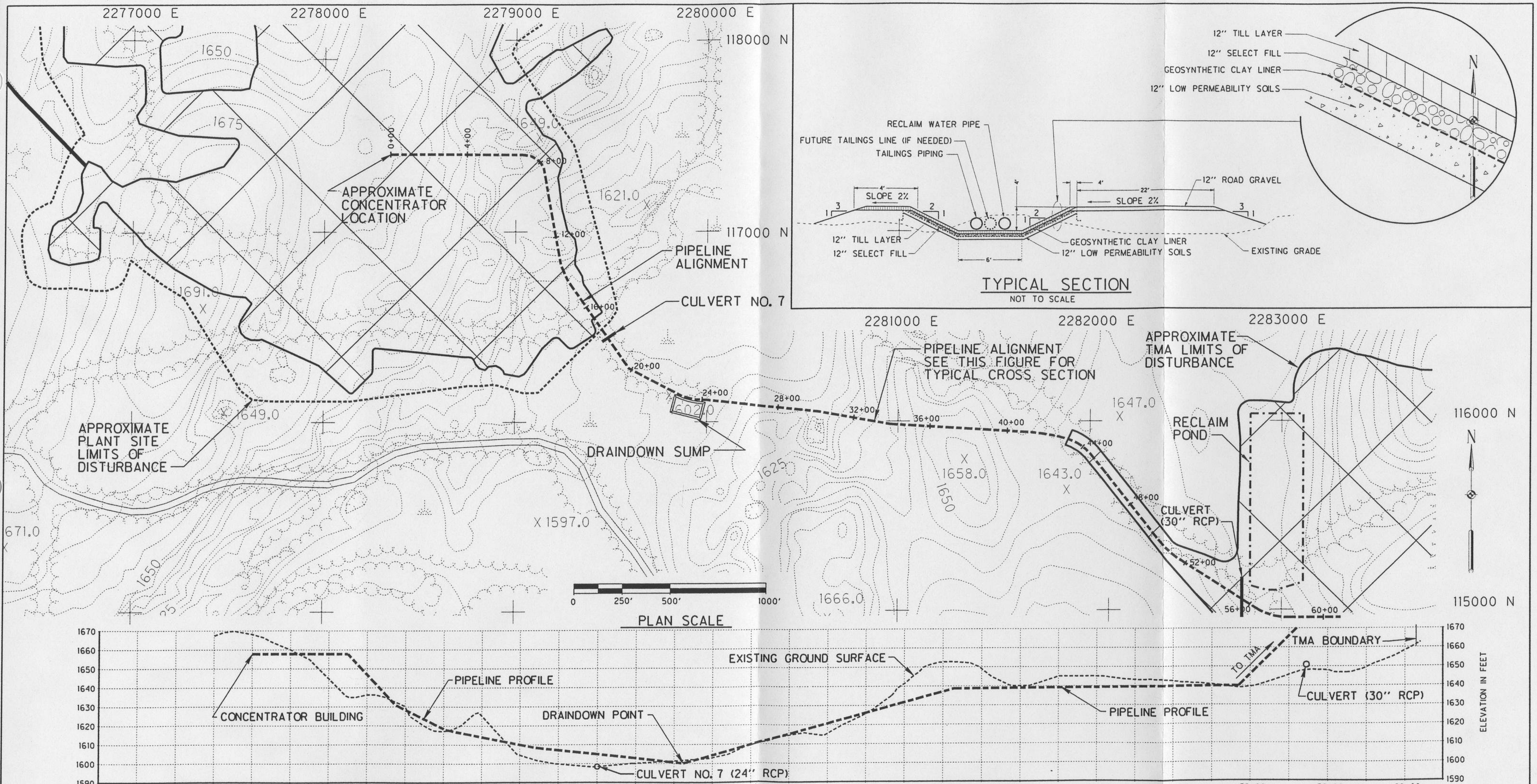

CURVE DATA
PI = 2309.129
Δ = 0°-40'-22"
D = 0°-29'-32" METRIC (0° 30'00")
T = 20.507m (67.28')
L = 41.013m (134.56')
E = 0.060 m (0.19')
R = 3992.758m (11959.18')
S.E. = N/C
WOODS
GATES REQUIRED
SURVEY ℄
CONSTRUCTION ℄
SLOPE INTERCEPT
MATCH LINE STA 2050
SIDE ROAD (LOGGING TRAIL)
TN. OF LINCOLN
TN. OF NASHVILLE
PI
P.C. 2288.622
P.T. 2329.635
NW 1/4 SEC 19
SW 1/4 SEC 19
NE 1/4 SEC 24
SE 1/4 SEC 24
BH-51
BH-52
BH-53
BH-55
Culvert No. 4
(24" RCP)
S 0°-50'-46" E
CREEK
P.C. 2576.719
MATCH LINE STA 2680
CURVE DATA
PI = 2659.606
Δ = 2°-43'-08"
D = 0°-29'-32" METRIC (0°30'00")
T = 82.887m (271.94')
L = 165.799m (543.78')
E = 0.983 m (3.22')
R = 3992.758m (11959.18')
S.E. = N/C
SOIL BORE HOLES (FOTH AND VAN DYKE)
SOIL BORE HOLES (SOIL TESTING SERVICES)
SCALE
0 30 60m
PLAN
PROFILE
EXISTING ℄ PROFILE
VPI 2170.0
482.30
VPI 2440.0
479.40
485
480
475
470
STA 2555.30
SKEW 11° LHS
2020 2050 2080 2110 2140 2170 2200 2230 2260 2290 2320 2350 2380 2410 2440 2470 2500 2530 2560 2590 2620 2650 2680
METRIC PLATE 1-SINGLE PLAN AND PROFILE
2050-2680
PLAN & PROFILE
DSI-115-C-011



METRIC PLATE 1-SINGLE PLAN AND PROFILE FULL LINE

B-4

0323



LEGEND

- 1675 — EXISTING GRADE
- x1582.5 — EXISTING SPOT ELEVATION
- PAVED ROAD
- UNPAVED ROAD/TRAIL
- TREES/BRUSH
- WETLAND

NOTES:

1. TOPOGRAPHIC BASE MAP DIGITIZED FROM 1" = 1000' SCALE, 5' CONTOUR INTERVAL MAP PREPARED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY APRIL 28, 1976.
2. HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM - NORTH ZONE.
3. VERTICAL DATUM BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS FIVE FEET.
4. COUNTY AND TOWNSHIP LINES DIGITIZED FROM 7.5' SERIES USGS MAPS.

PROFILE SCALE: VERTICAL 0 – 12.5' – 25'; HORIZONTAL 0 – 250' – 500' – 1000'

TYPICAL REPRESENTATION: REFINEMENTS MAY BE MADE PRIOR TO CONSTRUCTION

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION
1	12/98	SAD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	MAY '95
APPROVED BY:	JBH	DATE:	MAY '95
APPROVED BY:	PAE	DATE:	MAY '95

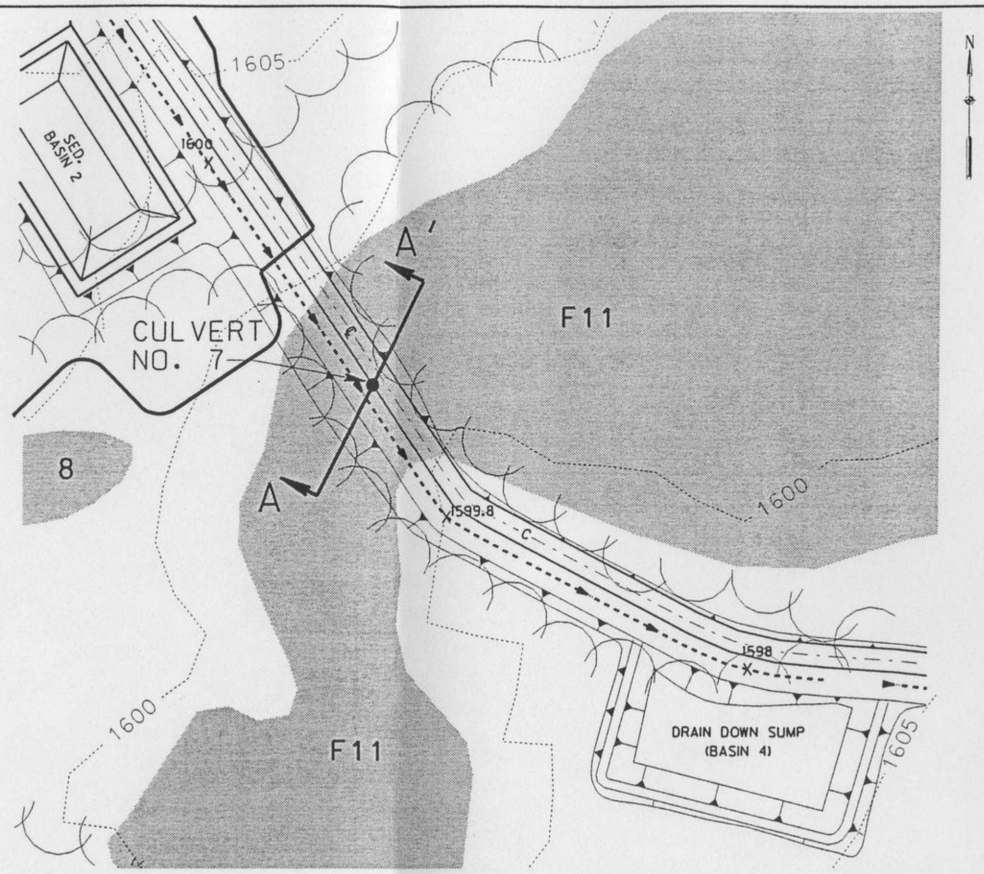
Nicolet Minerals Company

TMA ACCESS ROAD/PIPELINE CORRIDOR DETAIL

Scale: 0 250' 500' | Date: MAY, 1995

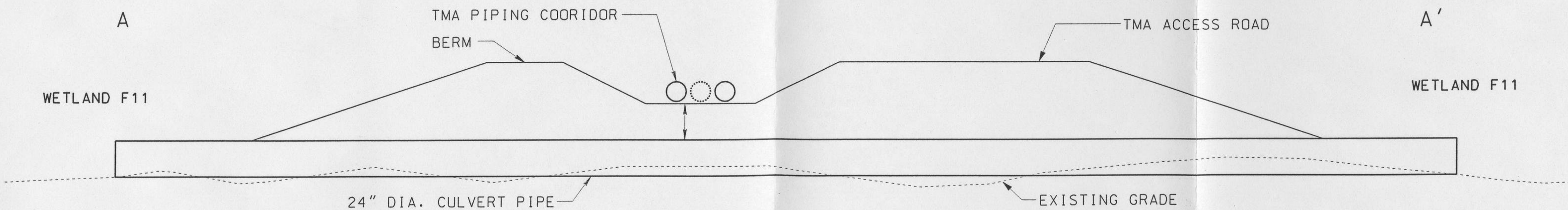
Prepared By: Foth & Van Dyke | By: GAM | 93C049

I:\93c049\94c056\4c56f5a.dgn Dec. 21, 1998 10:11:11



PLAN VIEW

SCALE: 1" = 200'



SECTION THROUGH CULVERT NO. 7

NOT TO SCALE

NOTES:

1. CULVERT FEATURES:
   - 24" REINFORCED CONCRETE PIPE.
   - APPROXIMATE LENGTH = 116 FEET.
   - APPROXIMATE INVERT ELEVATION = 1600 FEET (MSL)
2. ACTUAL LENGTH AND ELEVATION TO BE ESTABLISHED DURING FINAL DESIGN.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION
⚠	12/98	SAD2	REVISED FOR 1998 UPDATE

CHECKED BY:	JKSI	DATE:	MAY '97
APPROVED BY:	PAE	DATE:	MAY '97
APPROVED BY:	GWS	DATE:	MAY '97

Nicolet Minerals COMPANY

Mining for the Future · Commitment

SECTION THROUGH TMA ACCESS ROAD/ PIPELINE CORRIDOR AT WETLAND F11

Scale:	AS SHOWN	Date:	MAY, 1997
Prepared By: Foth & Van Dyke	By: JOW	93C049	

l:\93c049\3c49f203a.dgn Dec. 21, 1998 10:22:09

Appendix C

Culvert Sizing Computations and Computer Flood Analysis for Culvert No. 5

Foth & Van Dyke
Memorandum

September 7, 1995

TO: Jerry Sevick

FR: Mike Liebman MDL
Steve Birr SRB

RE: Crandon Project - Mine Site Proposed Culvert Sizing

Sizing for the seven proposed mine site culvert locations is based on the 25-year/24-hour flow. These flows were developed with the USGS SCS hydrologic forecasting model TR-20. The TR-20 forecasts are contained in an August 16, 1995 technical memorandum titled, "Crandon Project - Mine Site Access Road/Railroad Spur Hydrologic/Hydraulic Analyses". Culvert nomographs were used to size culverts No. 1 through No. 4 and No. 6. These nomographs are included with this memorandum. Culvert No. 5 was sized based on the 100-year flow as shown in this Appendix. Culvert No. 7 is sized to allow the equalization of water levels on both sides of the haul road. This area is a depression and there is no flow pattern. A 24-inch RCP will allow for adequate handling of hydrology in the area.

The following table lists culvert numbers with respective design features:

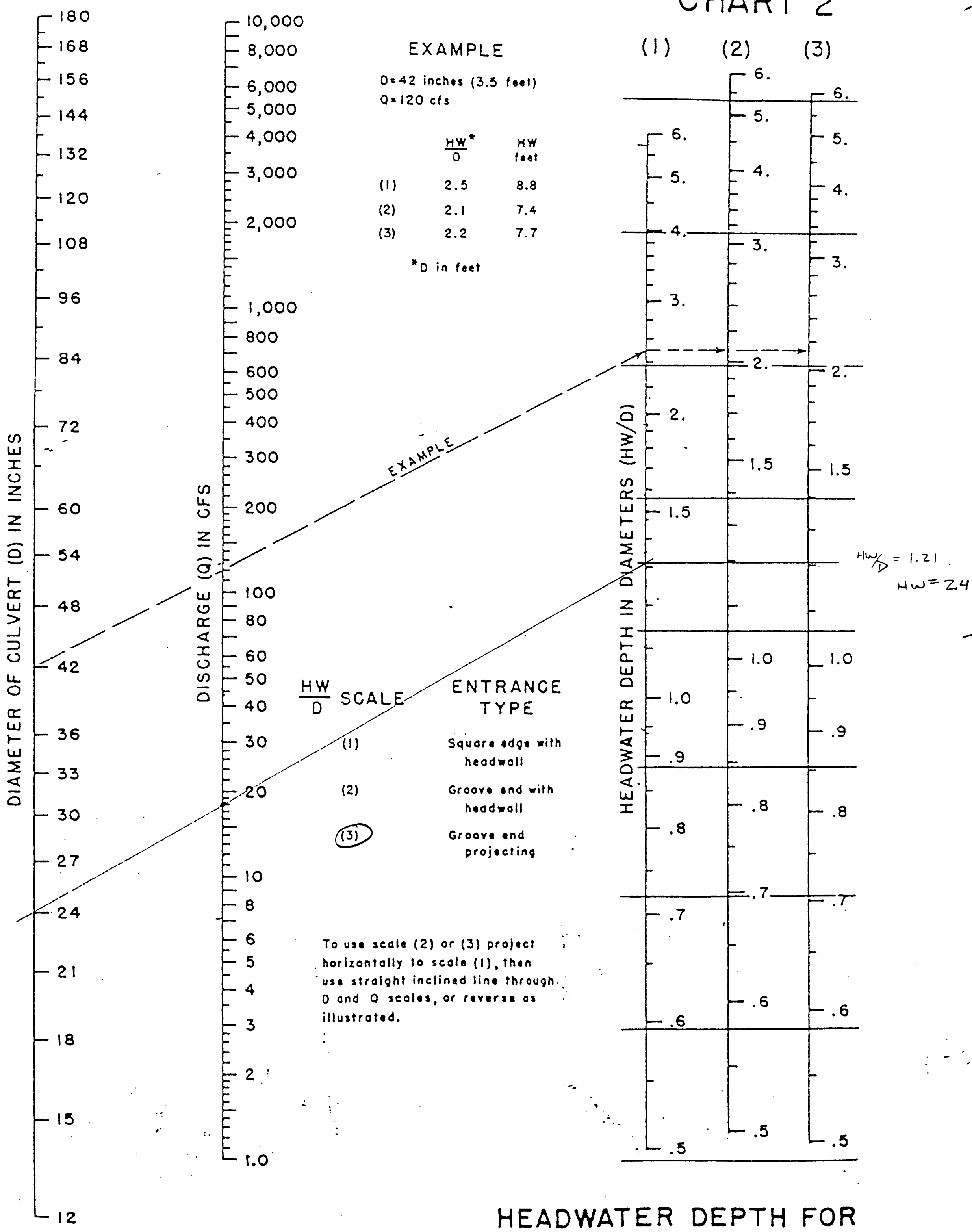
Culvert No.	Station	Q_{25} (cfs)	HW (ft)	Available HW (ft)	Culvert Size
1	1100	18	2.4	2.5	24" RCP
2	1352.6	17	2.3	3.3	24" RCP
3	1701	30	4.2	5.6	24" RCP
4	2535	17	2.3	4.0	24" RCP
6	509 + 70	19	2.3	3.1	27" RCP

SRB:lrm

Culvert No. 1

Q_{25} = 18 cfs

CHART 2



HEADWATER SCALES 2&3
REVISED MAY 1964

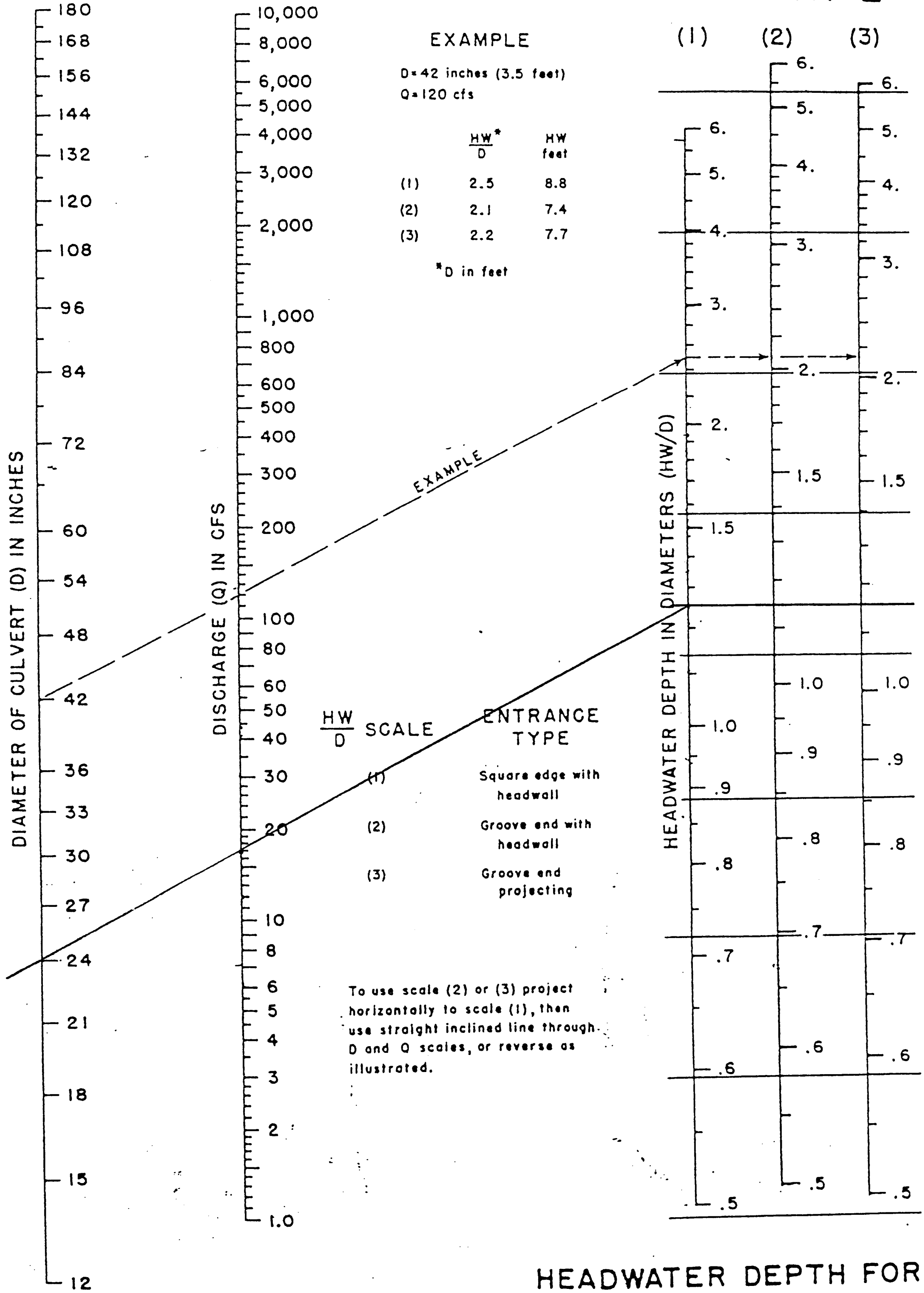
BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

Culvert No. 2

Q_{25} = 17 cfs

CHART 2



HW/D = 1.16
HW = 2.3'

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

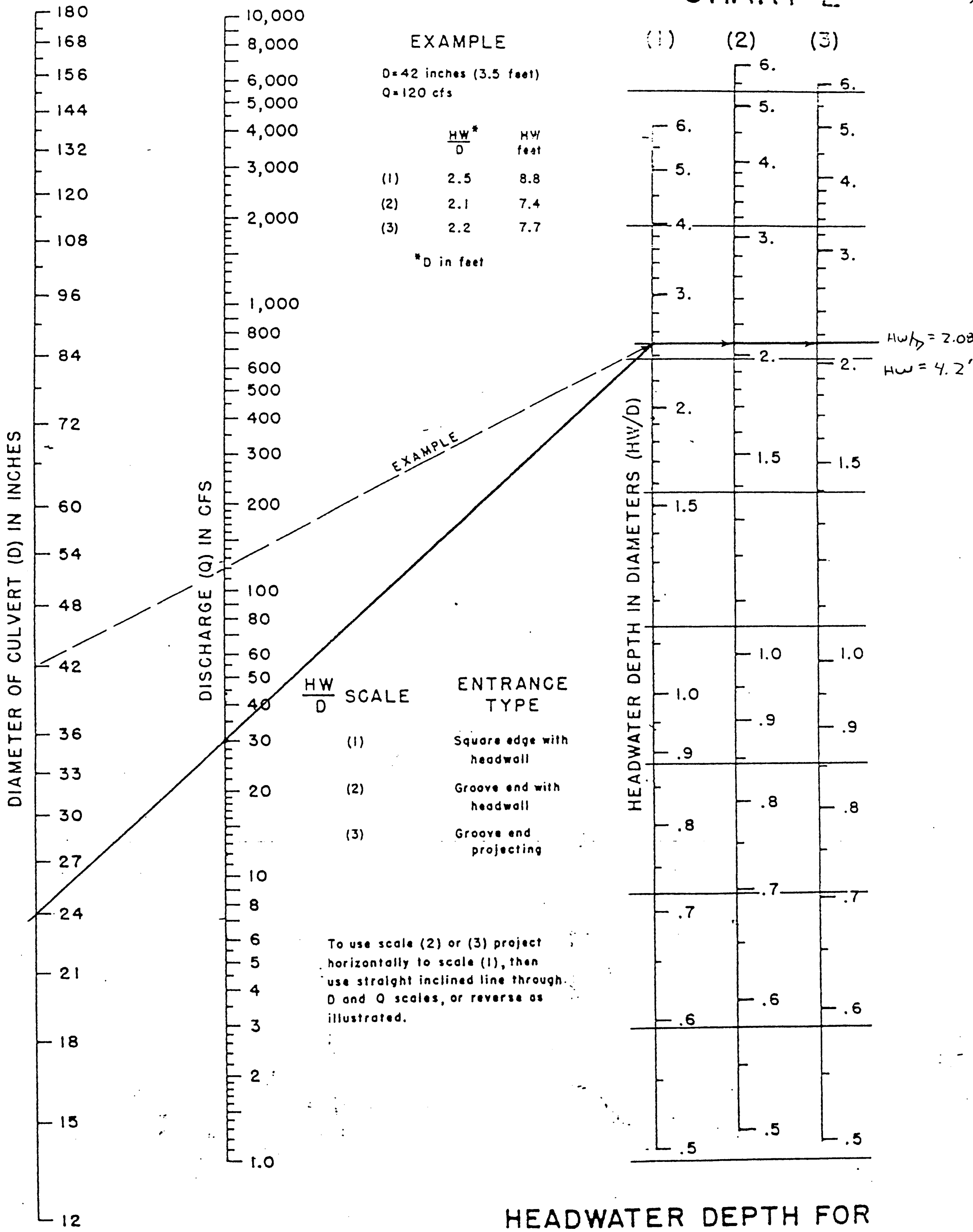
HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert No. 3

$Q_{25} = 30$ cfs

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

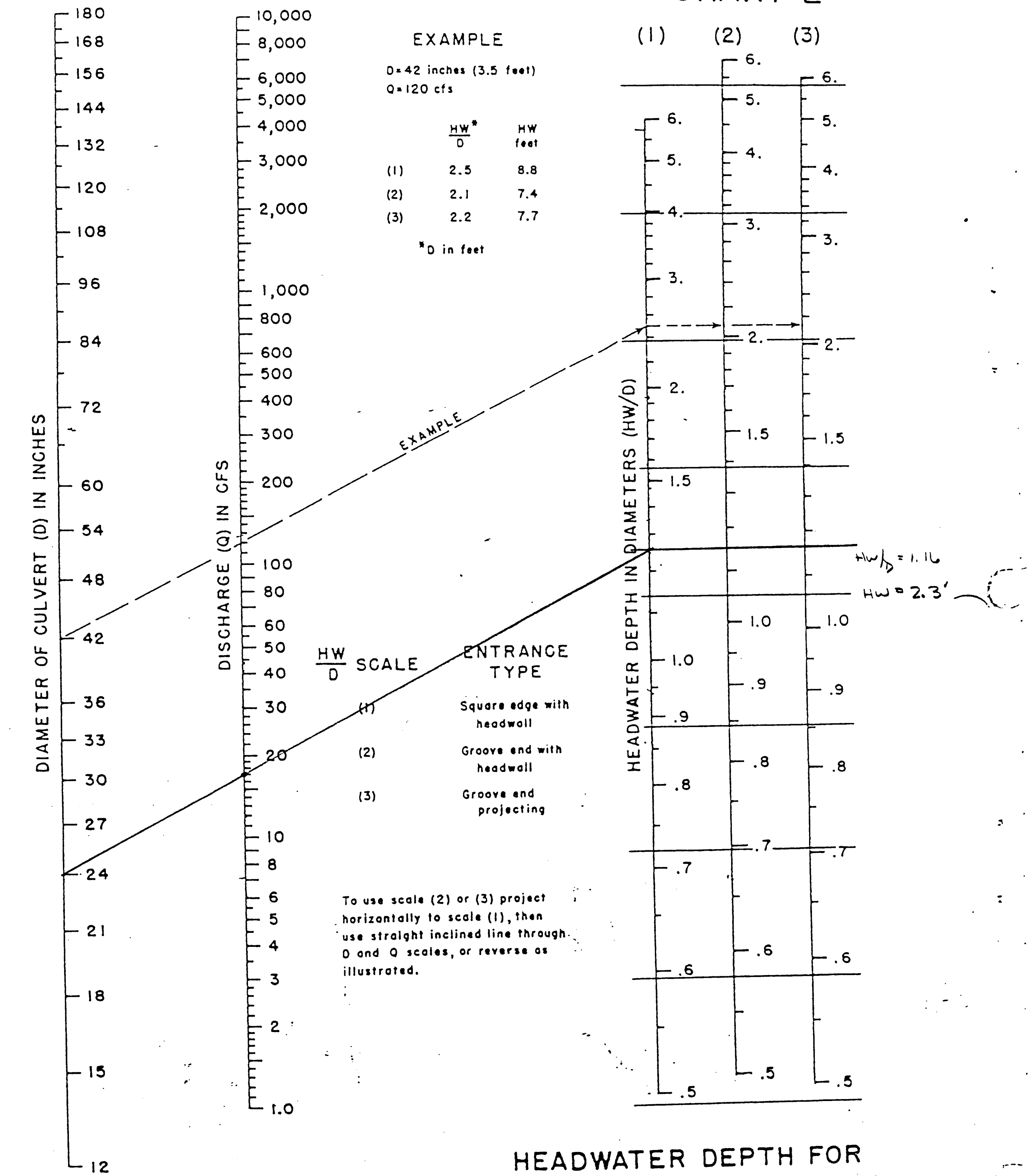
HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert No. 4

$Q_{25} = 17$ cfs

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

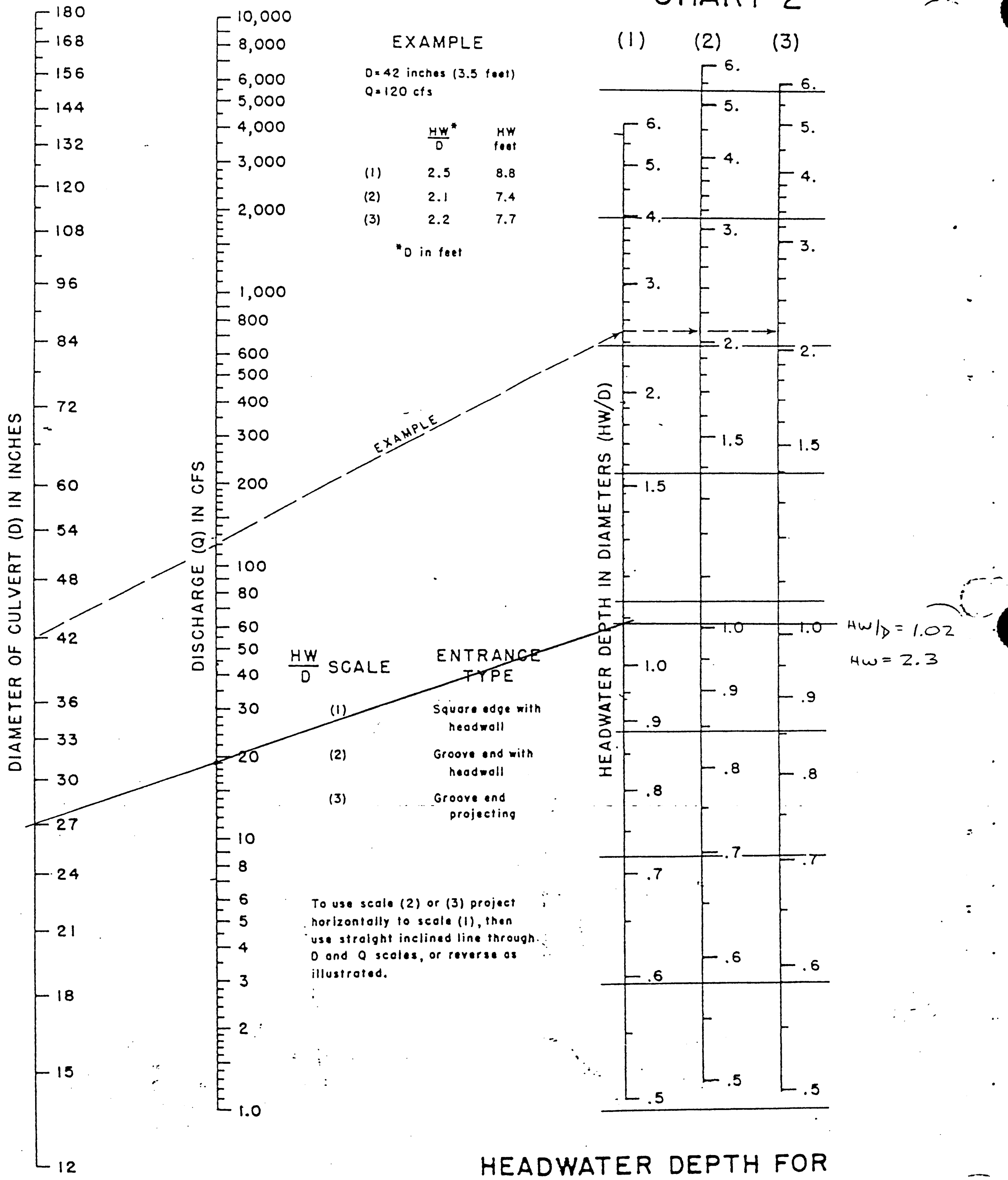
HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert No. 6

Q_{25} = 19 cfs

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

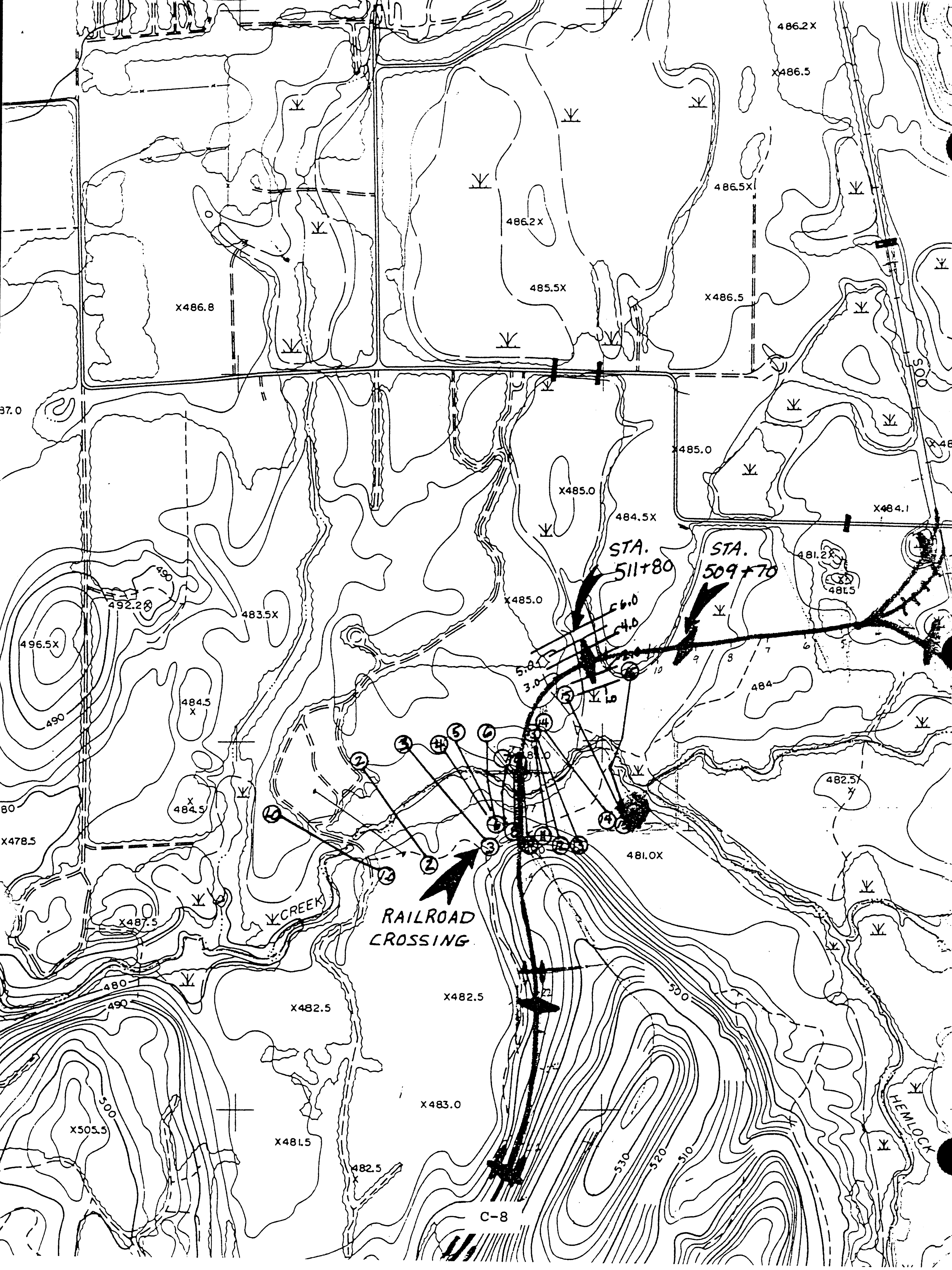
CRANDON MINING COMPANY

CULVERT NO. 5 TRIBUTARY CROSSING

FOTH AND VAN DYKE: 93C049.29

WATER SURFACE ELEVATIONS: 100 YEAR STORM EVENT

SECTION NO.	EXISTING	PROPOSED 8'X3' BOX	DIFFERENCE
1.00	481.07	481.07	0.00
2.00	481.08	481.08	0.00
3.00	481.10	481.11	0.01
4.00	481.13	481.16	0.03
5.00	481.23	481.24	0.01
6.00	481.39	481.39	0.00



486.2X
X486.5
486.5X
486.2X
485.5X
X486.8
X486.5
X485.0
X485.0
484.5X
X484.1
STA. 511+80
STA. 509+70
481.2X
481.5
X485.0
483.5X
492.2X
490
496.5X
484.5 X
484
482.5X
X 484.5
X478.5
481.0X
RAILROAD CROSSING
CREEK
X487.5
480
490
X482.5
X482.5
500
X483.0
X505.5
X481.5
482.5 X
530
520
510
HEMLOCK

```
*  HEC-2 WATER SURFACE PROFILES                  *                *  U.S. ARMY CORPS OF ENGINEERS          *
*                                                *                *  HYDROLOGIC ENGINEERING CENTER         *
*  Version   4.6.2;  May 1991                    *                *  609 SECOND STREET, SUITE D            *
*                                                *                *  DAVIS, CALIFORNIA 95616-4687          *
*  RUN DATE    23AUG95    TIME   09:13:38        *                *          (916) 756-1104                *
**************************************************                *****************************************
```

```
X     X  XXXXXXX   XXXXX             XXXXX
X     X  X         X     X          X     X
X     X  X         X                      X
XXXXXXX  XXXX      X         XXXXX   XXXXX
X     X  X         X                X
X     X  X         X     X          X
X     X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 23AUG95   09:13:38

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****************************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
****************************************
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T1     WATER SURFACE PROFILE:  100-YEAR FLOW          FILE: CMCTRIB
T2     RAILROAD DRAINAGE                              AUGUST,1981
T3     TRIBUTARY AT STATION 512 - EXISTING CONDITIONS F&VD: MDL
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.0	1.	.0	1.	481.07	0

NC	.15	.15	.14	.1	.3	0	0	0	0	0
X1	1.	7.	71.	73.7	0	0	0	0	0	0
GR	482.	0	480.265	70.	480.045	71.	479.845	72.35	480.235	73.7
GR	482.	130.	483.	180.	0	0	0	0	0	0
X1	2.	8.	90.	92.7	40.	40.	40.	0	0	0
GR	482.7	0	480.55	89.5	480.285	90.	480.085	91.4	480.475	92.7
GR	481.4	100.	482.	130.	484.	200.	0	0	0	0
X1	3.	10.	82.	85.5	30.	30.	30.	0	0	0
GR	484.	0	482.	48.	481.	65.	480.665	82.	480.265	82.5
GR	480.47	85.	480.685	85.5	481.	110.	482.	120.	484.	190.
X1	4.	12.	120.	124.5	30.	30.	30.	0	0	0

GR	480.86	120.	480.495	120.5	480.58	124.	480.9	124.5	481.145	140.
GR	482.	150.	484.	200.	0	0	0	0	0	0

X1	5.	12.	126.	128.2	30.	30.	30.	0	0	0
GR	484.3	0	484.	65.	481.985	100.	481.235	109.	480.94	126.
GR	480.75	126.2	480.625	128.	480.935	128.2	481.395	150.	481.475	193.
GR	483.01	210.	484.5	220.	0	0	0	0	0	0

X1	6.	10.	125.	127.2	30.	30.	30.	0	0	0
GR	484.3	0	482.	100.	481.4	110.	481.09	125.	480.92	125.3
GR	480.8	127.1	481.07	127.2	481.6	150.	482.	170.	484.	190.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1
0

CCHV= .100 CEHV= .300

*SECNO 1.000

1.000	1.23	481.07	.00	481.07	481.07	.00	.00	.00	480.05
1.0	.5	.2	.4	14.0	2.9	11.1	.0	.0	480.23
.00	.03	.06	.03	.150	.140	.150	.000	479.85	37.52
.000074	0.	0.	0.	0	0	0	.00	62.81	100.34

*SECNO 2.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .31

2.000	.99	481.08	.00	.00	481.08	.00	.01	.00	480.29
1.0	.5	.4	.1	6.0	2.3	1.4	.8	1.9	480.48
.09	.08	.18	.08	.150	.140	.150	.000	480.08	67.73
.000797	40.	40.	40.	0	0	0	.00	29.69	97.42

*SECNO 3.000

3.000	.83	481.10	.00	.00	481.10	.00	.02	.00	480.67
1.0	.3	.3	.4	4.4	2.4	6.1	1.1	3.0	480.68
.19	.07	.13	.06	.150	.140	.150	.000	480.27	63.48
.000617	30.	30.	30.	0	0	0	.00	47.42	110.90

*SECNO 4.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .52

4.000	.63	481.13	.00	.00	481.13	.00	.03	.00	480.86
1.0	.3	.6	.1	3.3	2.5	1.6	1.4	4.3	480.90
.24	.10	.22	.07	.150	.140	.150	.000	480.49	99.76
.002304	30.	30.	30.	1	0	0	.00	38.94	138.70

*SECNO 5.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =   .64

5.000	.61	481.23	.00	.00	481.23	.00	.10	.00	480.94
1.0	.3	.4	.3	2.4	1.1	2.1	1.6	5.4	480.93
.28	.14	.32	.14	.150	.140	.150	.000	480.63	109.22
.005645	30.	30.	30.	2	0	0	.00	33.01	142.23

1

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 6.000

6.000	.59	481.39	.00	.00	481.39	.00	.16	.00	481.09
1.0	.3	.3	.3	2.3	1.1	2.4	1.8	6.3	481.07
.32	.14	.30	.14	.150	.140	.150	.000	480.80	109.99
.005002	30.	30.	30.	1	0	0	.00	31.45	141.43

1

PROFILE FOR STREAM IBUTARY AT STATION 512 -

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

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ELEVATION   480.      480.      481.      481.      482.      482.      483.      483.      484.      484.
    SECNO   CUMDIS

     1.00     0.   I   L   R .         .    E    .         .  M      .         .         .         .         .         .
              5.   CI   L  R .         .    E    .         .    M    .         .         .         .         .         .
             10.   CI   L   R.         .    E    .         .      M  .         .         .         .         .         .
             15.   C I   L   R         .    E    .         .       M .         .         .         .         .         .
             20.   C I   L   R         .    E    .         .         M         .         .         .         .         .
             25.   C  I   L  .R        .    E    .         .         . M       .         .         .         .         .
             30.   C   I   L .R        .    E    .         .         .   M     .         .         .         .         .
             35.   C   I   L . R       .    E    .         .         .    M    .         .         .         .         .
     2.00    40.   C    I   L.  R      .    E    .         .         .      M  .         .         .         .         .
             45.   C    I    L  R      .    E    .         .         .         .M        .         .         .         .
             50.   C     I   .L  R     .    E    .         .         .         .     M   .         .         .         .
             55.   C      I  .  L R    .    E    .         .         .         .         M         .         .         .
             60.   C      I  .   LR    .    E    .         .         .         .         .   M     .         .         .
             65.   C       I .    LR   .    E    .         .         .         .         .        M.         .         .
     3.00    70.   C       I .      L  .    E    .         .         .         .         .         .  M      .         .
             75.   C        I.      L  .    E    .         .         .         .         .         .  M      .         .
             80.   C         I       L .    E    .         .         .         .         .         .  M      .         .
             85.   C         .I      LR.    E    .         .         .         .         .         .  M      .         .
             90.   C         .I       LR   WE    .         .         .         .         .         .  M      .         .
             95.   C         . I       L   WE    .         .         .         .         .         .  M      .         .
     4.00   100.   C         .  I      LR  WE    .         .         .         .         .         .  M      .         .
            105.   C         .  I      .L   E    .         .         .         .         .         .  M      .         .
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        115.  C         .  I     .L     E .          .          .          .          .          .    M   .          .
        120.  C         .   I    .L     E .          .          .          .          .          .     M  .          .
        125.  C         .   I    . L    E .          .          .          .          .          .      M .          .
  5.00  130.  C         .    I   . L     E .         .          .          .          .          .       M.          .
        135.  C         .    I   . L     E .         .          .          .          .          .      M .          .
        140.  C         .     I  .  L     E.         .          .          .          .          .     M  .          .
        145.  C         .     I  .  L     E.         .          .          .          .          .    M   .          .
        150.  C         .      I .   L     E         .          .          .          .          .   M    .          .
        155.  C         .       I.   L     EW        .          .          .          .          .  M     .          .
  6.00  160.  C         .       I.    L    .E        .          .          .          .          . M      .          .
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23AUG95 09:13:38 PAGE 4

THIS RUN EXECUTED 23AUG95 09:13:38

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HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

IBUTARY AT STATION 512 -

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	479.85	1.00	481.07	.00	481.07	.74	.06	28.02	1.16
*	2.000	40.00	.00	.00	480.08	1.00	481.08	.00	481.08	7.97	.18	9.71	.35
	3.000	30.00	.00	.00	480.27	1.00	481.10	.00	481.10	6.17	.13	12.90	.40
*	4.000	30.00	.00	.00	480.49	1.00	481.13	.00	481.13	23.04	.22	7.37	.21
*	5.000	30.00	.00	.00	480.63	1.00	481.23	.00	481.23	56.45	.32	5.67	.13
	6.000	30.00	.00	.00	480.80	1.00	481.39	.00	481.39	50.02	.30	5.83	.14

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IBUTARY AT STATION 512 -

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	1.00	481.07	.00	.00	.00	62.81	.00
*	2.000	1.00	481.08	.00	.01	.00	29.69	40.00
	3.000	1.00	481.10	.00	.02	.00	47.42	30.00

*	4.000	1.00	481.13	.00	.03	.00	38.94	30.00
*	5.000	1.00	481.23	.00	.10	.00	33.01	30.00
	6.000	1.00	481.39	.00	.16	.00	31.45	30.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 4.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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*********************************************                    ****************************************
*  HEC-2 WATER SURFACE PROFILES             *                    *  U.S. ARMY CORPS OF ENGINEERS        *
*                                           *                    *  HYDROLOGIC ENGINEERING CENTER       *
*  Version   4.6.2;  May 1991               *                    *  609 SECOND STREET, SUITE D          *
*                                           *                    *  DAVIS, CALIFORNIA 95616-4687        *
*  RUN DATE    23AUG95    TIME    12:14:06  *                    *          (916) 756-1104              *
*********************************************                    ****************************************
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```
X     X  XXXXXXX   XXXXX            XXXXX
X     X  X        X     X          X     X
X     X  X        X                      X
XXXXXXX  XXXX     X          XXXXX   XXXXX
X     X  X        X                 X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXXXXXX
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THIS RUN EXECUTED 23AUG95   12:14:06

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**************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
**************************************
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T1   WATER SURFACE PROFILE: 100-YEAR FLOW   FILE: CMCTRIBP
T2   RAILROAD DRAINAGE   AUGUST,1981
T3   TRIBUTARY AT STATION 512 - PROPOSED CONDITIONS   F&VD: MDL
(8'x3' Box)

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.0	1.	.0	1.	481.07	0

NC	.15	.15	.14	.1	.3	0	0	0	0	0
X1	1.	7.	71.	73.7	0	0	0	0	0	0
X3				50.0		83.0				
GR	482.	0	480.265	70.	480.045	71.	479.845	72.35	480.235	73.7
GR	482.	130.	483.	180.	0	0	0	0	0	0
X1	2.	8.	90.	92.7	40.	40.	40.	0	0	0
X3				83.0		94.0				
GR	482.7	0	480.55	89.5	480.285	90.	480.085	91.4	480.475	92.7
GR	481.4	100.	482.	130.	484.	200.	0	0	0	0
X1	3.0	11.	81.28	83.72	16.	16.	16.	0	0	0

X3	10.0	0	0	0	0	0	0.0	482.07	482.06	0
GR	484.	0	482.	48.	481.	65.	480.26	81.28	480.26	83.62
GR	480.26	83.72	480.47	85.0	480.69	85.5	481.	110.	482.	120.
GR	484.0	190.0								
NC	.013	.013	.013	.3	.5					
X1	3.4	6.0	81.28	83.72	2.0	2.0	2.0			
X3	10.0							482.07	482.06	
BT	6.0	0.0	482.50	482.50	81.28	482.07	480.26	81.29	482.07	481.17
BT	83.71	482.06	481.17	83.72	482.06	480.26	190.0	481.50	481.5	0.0
GR	482.5	0.0	480.26	81.28	480.26	81.29	480.26	83.71	480.26	83.72
GR	481.50	190.0								
X1	3.6				25.0	25.0	25.0			
X2							1.0			
X3	10.0							482.07	482.06	

NC	.15	.15	.14	.1	.3					
X1	3.8	11.0	81.28	83.72	2.0	2.0	2.0			
X3	10.0							482.07	482.06	
GR	484.0	0.0	482.0	48.0	481.0	65.0	480.26	81.28	480.26	83.62
GR	480.26	83.72	480.47	85.0	480.69	85.5	481.0	110.0	482.0	120.0
GR	484.0	190.0								
X1	4.	12.	120.	124.5	15.	15.	15.	0	0	0
X3				101.0		134.0				
GR	484.2	0	482.	60.	481.69	90.	480.995	102.	480.97	111.
GR	480.86	120.	480.495	120.5	480.58	124.	480.9	124.5	481.145	140.
GR	482.	150.	484.	200.	0	0	0	0	0	0
X1	5.	12.	126.	128.2	30.	30.	30.	0	0	0
GR	484.3	0	484.	65.	481.985	100.	481.235	109.	480.94	126.
GR	480.75	126.2	480.625	128.	480.935	128.2	481.395	150.	481.475	193.
GR	483.01	210.	484.5	220.	0	0	0	0	0	0
X1	6.	10.	125.	127.2	30.	30.	30.	0	0	0
GR	484.3	0	482.	100.	481.4	110.	481.09	125.	480.92	125.3
GR	480.8	127.1	481.07	127.2	481.6	150.	482.	170.	484.	190.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

```
*PROF 1
0

CCHV=     .100 CEHV=     .300
*SECNO 1.000

3470 ENCROACHMENT STATIONS=       50.0       83.0  TYPE=      1  TARGET=       33.000
     1.000      1.23    481.07       .00    481.07    481.07       .00       .00       .00    480.05
       1.0        .5        .2        .3      12.1       2.9       6.4        .0        .0    480.23
       .00       .04       .07       .05      .150      .140      .150      .000    479.85     50.00
   .000084        0.        0.        0.         0         0         0       .00     33.00     83.00


*SECNO 2.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .27


3470 ENCROACHMENT STATIONS=       83.0       94.0  TYPE=      1  TARGET=       11.000
     2.000       .99    481.08       .00       .00    481.08       .00       .01       .00    480.29
       1.0        .4        .5        .1       3.2       2.3        .7        .6        .9    480.48
       .06       .13       .22       .12      .150      .140      .150      .000    480.08     83.00
   .001192       40.       40.       40.         0         0         0       .00     11.00     94.00


*SECNO 3.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .45


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      482.07 ELREA=      482.06

     3.000       .85    481.11       .00       .00    481.12       .01       .04       .00    480.26
       1.0        .0       1.0        .0        .0       2.0        .0        .6       1.0    480.26
       .07       .00       .49       .00      .000      .140      .000      .000    480.26     81.28
   .005957       16.       16.       16.         1         0         0       .00      2.44     83.72


CCHV=     .300 CEHV=     .500
*SECNO 3.400

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO = 11.12

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   23AUG95      12:14:06                                                                     PAGE    4


     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3370 NORMAL BRIDGE, NRD=    6 MIN ELTRD=   481.50 MAX ELLC=   481.17


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      482.07 ELREA=      482.06
```

3.400	.85	481.11	.00	.00	481.12	.01	.00	.00	480.26
1.0	.0	1.0	.0	.0	2.1	.0	.6	1.0	480.26
.07	.00	.48	.00	.000	.013	.000	.000	480.26	81.28
.000048	2.	2.	2.	0	0	0	-31.22	2.44	83.72

*SECNO 3.600

3370 NORMAL BRIDGE, NRD= 6 MIN ELTRD= 481.50 MAX ELLC= 481.17

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 482.07 ELREA= 482.06

3.600	.85	481.11	.00	.00	481.12	.01	.00	.00	480.26
1.0	.0	1.0	.0	.0	2.1	.0	.7	1.1	480.26
.09	.00	.48	.00	.000	.013	.000	.000	480.26	81.28
.000049	25.	25.	25.	2	0	0	-30.83	2.44	83.72

CCHV= .100 CEHV= .300
*SECNO 3.800

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .09

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 482.07 ELREA= 482.06

3.800	.85	481.11	.00	.00	481.12	.01	.00	.00	480.26
1.0	.0	1.0	.0	.0	2.1	.0	.7	1.1	480.26
.09	.00	.48	.00	.000	.140	.000	.000	480.26	81.28
.005694	2.	2.	2.	0	0	0	.00	2.44	83.72

*SECNO 4.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.92

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3470 ENCROACHMENT STATIONS= 101.0 134.0 TYPE= 1 TARGET= 33.000

4.000	.67	481.16	.00	.00	481.16	.00	.04	.00	480.86
1.0	.4	.5	.1	3.9	2.6	1.7	.8	1.3	480.90
.12	.09	.19	.08	.150	.140	.150	.000	480.49	101.00
.001548	15.	15.	15.	1	0	0	.00	33.00	134.00

*SECNO 5.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .55

5.000	.61	481.24	.00	.00	481.24	.00	.08	.00	480.94
1.0	.3	.4	.3	2.5	1.2	2.2	1.0	2.3	480.93
.16	.14	.31	.14	.150	.140	.150	.000	480.63	108.97
.005169	30.	30.	30.	2	0	0	.00	33.55	142.53

*SECNO 6.000

6.000	.59	481.39	.00	.00	481.39	.00	.15	.00	481.09
1.0	.3	.3	.3	2.3	1.1	2.3	1.1	3.3	481.07
.20	.14	.31	.14	.150	.140	.150	.000	480.80	110.00
.005068	30.	30.	30.	1	0	0	.00	31.39	141.39

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PROFILE FOR STREAM IBUTARY AT STATION 512 -

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION   480.      480.      481.      481.      482.      482.      483.      483.      484.      484.
    SECNO   CUMDIS

      1.00     0.  I   L   R .         .    E    .         .         .         .  M      .         .         .         .
               2.  I   L   R .         .    E    .         .         .         .   M     .         .         .         .
               4.  CI   L   R .        .    E    .         .         .         .    M    .         .         .         .
               6.  CI   L   R .        .    E    .         .         .         .     M   .         .         .         .
               8.  CI   L    R.        .    E    .         .         .         .      M  .         .         .         .
              10.  CI   L    R.        .    E    .         .         .         .       M .         .         .         .
              12.  CI    L   R.        .    E    .         .         .         .        M.         .         .         .
              14.  C I   L   R.        .    E    .         .         .         .         M         .         .         .
              16.  C I   L    R        .    E    .         .         .         .         .M        .         .         .
              18.  C I   L    R        .    E    .         .         .         .         . M       .         .         .
             ,20.  C I   L    R        .    E    .         .         .         .         .  M      .         .         .
              22.  C  I   L   R        .    E    .         .         .         .         .   M     .         .         .
              24.  C  I   L  .R        .    E    .         .         .         .         .    M    .         .         .
              26.  C  I   L  .R        .    E    .         .         .         .         .     M   .         .         .
              28.  C  I   L  .R        .    E    .         .         .         .         .      M  .         .         .
              30.  C   I   L .R        .    E    .         .         .         .         .       M .         .         .
              32.  C   I   L . R       .    E    .         .         .         .         .        M.         .         .
              34.  C   I   L . R       .    E    .         .         .         .         .         M         .         .
              36.  C   I   L . R       .    E    .         .         .         .         .         .M        .         .
              38.  C   I    L. R       .    E    .         .         .         .         .         . M       .         .
      2.00    40.  C    I   L.  R      .    E    .         .         .         .         .         .  M      .         .
              42.  C    I   L. R       .    E    .         .         .         .         .         .  M      .         .
              44.  C     I  L. R       .    E    .         .         .         .         .         .  M      .         .
              46.  C     I  L.R        .    E    .         .         .         .         .         .  M      .         .
              48.  C     I  L.R        .    E    .         .         .         .         .         .  M      .         .
              50.  C      I LR         .    E    .         .         .         .         .         .  M      .         .
              52.  C      ILR.         .    E    .         .         .         .         .         .  M      .         .
              54.  C       IR.         .    E    .         .         .         .         .         .  M      .         .
      3.00    56.  C       I .         .    E    .         .         .         .         .         .  M      .         .
      3.40    58.  C       I .         .    E    .  M      .         .         .         .         .         .         .
              60.  C       I .         .    E    .  M      .         .         .         .         .         .         .
              62.  C       I .         .    E    .  M      .         .         .         .         .         .         .
              64.  C       I .         .    E    .  M      .         .         .         .         .         .         .
              66.  C       I .         .    E    .  M      .         .         .         .         .         .         .
              68.  C       I .         .    E    .  M      .         .         .         .         .         .         .
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         70.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         72.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         74.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         76.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         78.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         80.  C       I .         .    E    .  M      .         .         .         .         .         .         .
         82.  C       I .         .    E    .  M      .         .         .         .         .         .         .
3.60     84.  C       I .         .    E    .  M      .         .         .         .         .         .         .
3.80     86.  C       I .         .    E    .         .         .         .         .         .  M      .         .
         88.  C        IL         .    WE   .         .         .         .         .         .  M      .         .
         90.  C         I L       .     E   .         .         .         .         .         .  M      .         .
         92.  C         I  L      .     E   .         .         .         .         .         .  M      .         .
         94.  C         .I   L    .     E   .         .         .         .         .         .  M      .         .
         96.  C         .I    LR  .     E   .         .         .         .         .         .  M      .         .
         98.  C         . I     LR.     E   .         .         .         .         .         .  M      .         .
4.00    100.  C         .  I      LR    E   .         .         .         .         .         .  M      .         .
        102.  C         .  I      LR    E   .         .         .         .         .         .  M      .         .
        104.  C         .  I      .L     E  .         .         .         .         .         .   M     .         .
        106.  C         .  I      .L     E  .         .         .         .         .         .   M     .         .
        108.  C         .   I     .L     E  .         .         .         .         .         .    M    .         .
        110.  C         .   I     .L     E  .         .         .         .         .         .    M    .         .
        112.  C         .   I     .L     E  .         .         .         .         .         .    M    .         .
        114.  C         .   I     .L     E  .         .         .         .         .         .     M   .         .
        116.  C         .   I     .L     E  .         .         .         .         .         .     M   .         .
        118.  C         .    I    .L     E  .         .         .         .         .         .      M  .         .
        120.  C         .    I    .L     E  .         .         .         .         .         .      M  .         .
        122.  C         .    I    .LR    E  .         .         .         .         .         .      M  .         .
        124.  C         .    I    . L     E .         .         .         .         .         .       M .         .
        126.  C         .    I    . L     E .         .         .         .         .         .       M .         .
        128.  C         .     I   . L     E .         .         .         .         .         .        M.         .
5.00    130.  C         .     I   . L     E .         .         .         .         .         .        M.         .
        132.  C         .     I   . L     E .         .         .         .         .         .        M.         .
        134.  C         .     I   . L     E .         .         .         .         .         .       M .         .
        136.  C         .     I   . RL    EW.         .         .         .         .         .       M .         .
        138.  C         .      I  . RL     E.         .         .         .         .         .      M  .         .
        140.  C         .      I  .  L     E.         .         .         .         .         .      M  .         .
        142.  C         .      I  .  L     E.         .         .         .         .         .      M  .         .
        144.  C         .      I  .  L     E.         .         .         .         .         .     M   .         .
        146.  C         .       I .  L      E         .         .         .         .         .     M   .         .
        148.  C         .       I .  RL     E         .         .         .         .         .    M    .         .
        150.  C         .       I .   L     E         .         .         .         .         .    M    .         .
        152.  C         .       I .   L     E         .         .         .         .         .    M    .         .
        154.  C         .       I .   L     E         .         .         .         .         .   M     .         .
        156.  C         .        I.   L     .E        .         .         .         .         .   M     .         .
        158.  C         .        I.   RL    .E        .         .         .         .         .  M      .         .
6.00    160.  C         .        I.    L    .E        .         .         .         .         .  M      .         .
```

1

23AUG95 12:14:06 PAGE 6

THIS RUN EXECUTED 23AUG95 12:14:06

****

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

IBUTARY AT STATION 512 -

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	479.85	1.00	481.07	.00	481.07	.84	.07	21.38	1.09
*	2.000	40.00	.00	.00	480.08	1.00	481.08	.00	481.08	11.92	.22	6.17	.29
*	3.000	16.00	.00	.00	480.26	1.00	481.11	.00	481.12	59.57	.49	2.04	.13
*	3.400	2.00	481.50	481.17	480.26	1.00	481.11	.00	481.12	.48	.48	2.08	1.44
	3.600	25.00	481.50	481.17	480.26	1.00	481.11	.00	481.12	.49	.48	2.07	1.43
*	3.800	2.00	.00	.00	480.26	1.00	481.11	.00	481.12	56.94	.48	2.07	.13
*	4.000	15.00	.00	.00	480.49	1.00	481.16	.00	481.16	15.48	.19	8.23	.25
*	5.000	30.00	.00	.00	480.63	1.00	481.24	.00	481.24	51.69	.31	5.87	.14
	6.000	30.00	.00	.00	480.80	1.00	481.39	.00	481.39	50.68	.31	5.80	.14

IBUTARY AT STATION 512 -

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	1.00	481.07	.00	.00	.00	33.00	.00
*	2.000	1.00	481.08	.00	.01	.00	11.00	40.00
*	3.000	1.00	481.11	.00	.03	.00	2.44	16.00
*	3.400	1.00	481.11	.00	.00	.00	2.44	2.00
	3.600	1.00	481.11	.00	.00	.00	2.44	25.00
*	3.800	1.00	481.11	.00	.00	.00	2.44	2.00
*	4.000	1.00	481.16	.00	.05	.00	33.00	15.00
*	5.000	1.00	481.24	.00	.08	.00	33.55	30.00
	6.000	1.00	481.39	.00	.15	.00	31.39	30.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
WARNING SECNO=      2.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.400  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

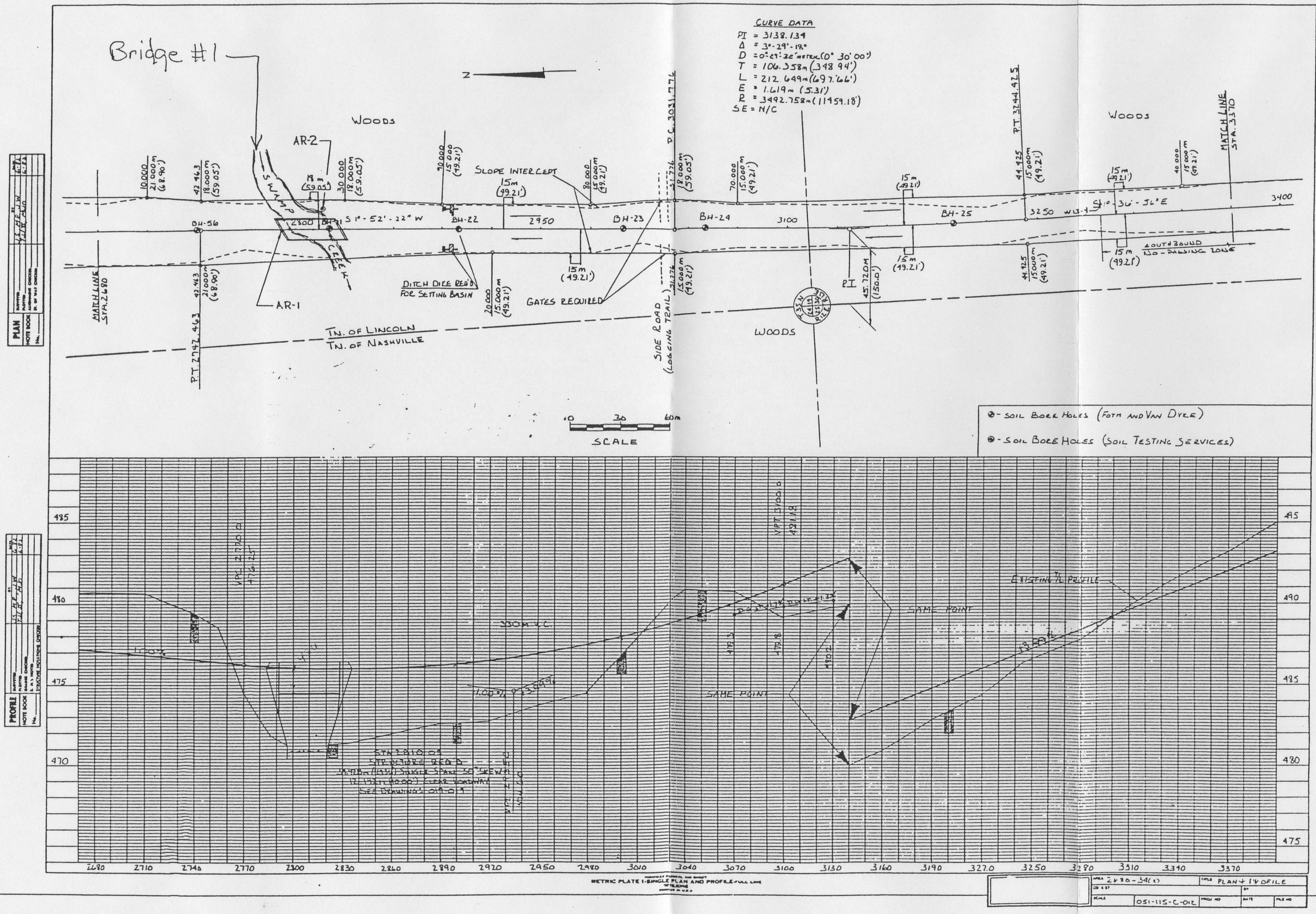
WARNING SECNO=      3.800  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

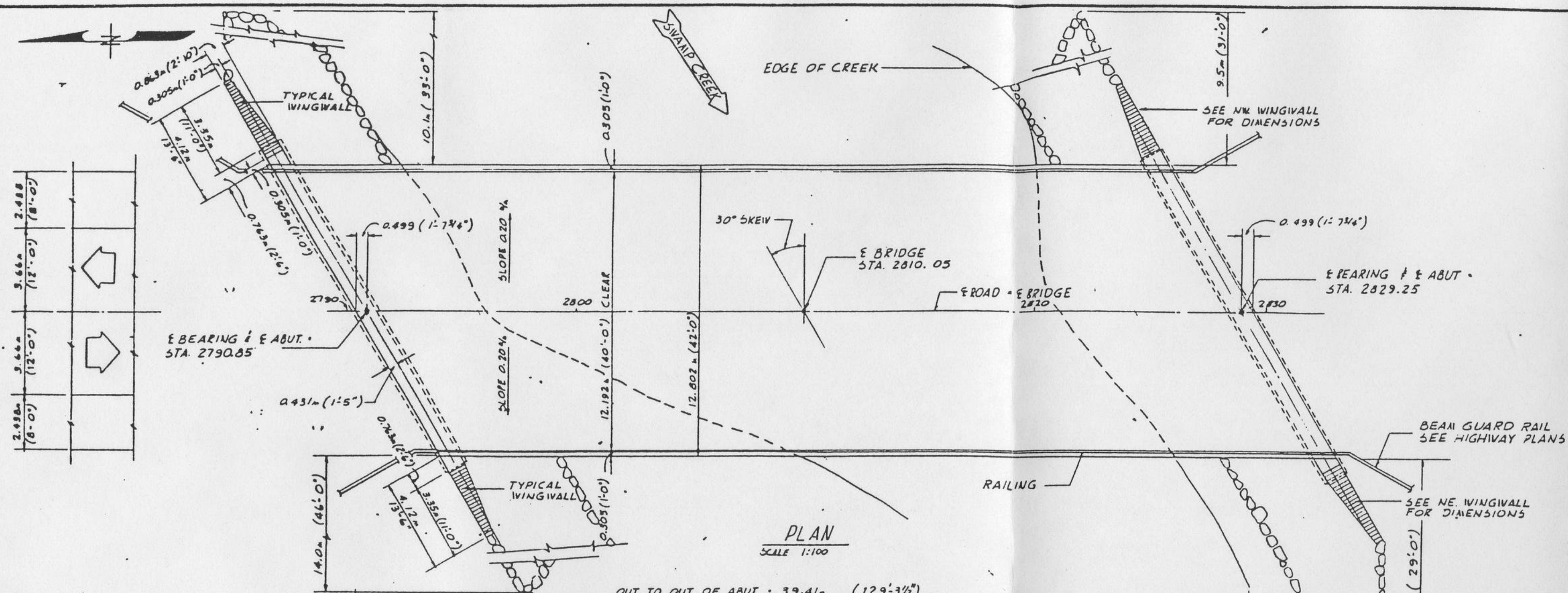
WARNING SECNO=      4.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

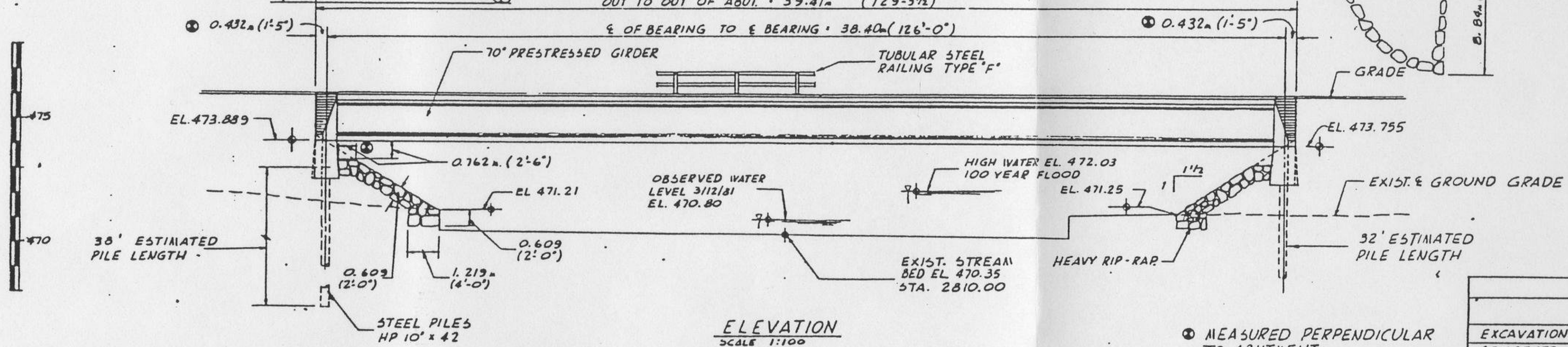
WARNING SECNO=      5.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

Appendix D

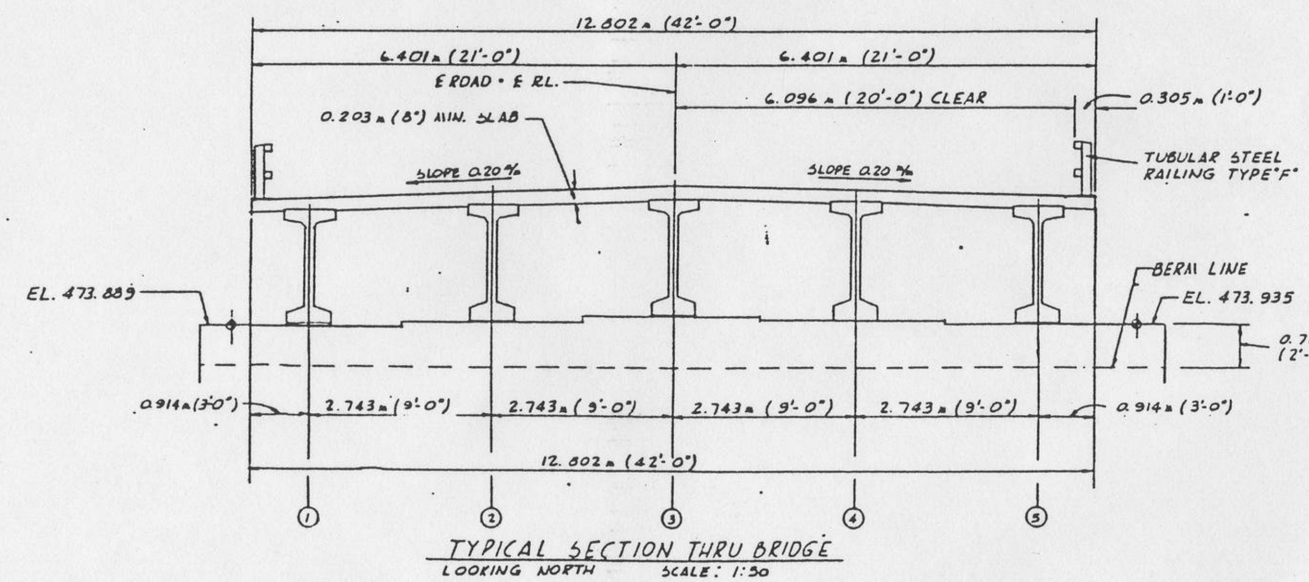
Bridge Construction Details

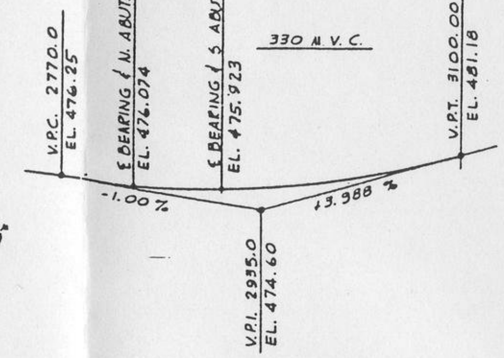

Bridge #1
CURVE DATA
PI = 3138.134
Δ = 3°-29'-19"
D = 0°-29'-32" METER (0° 30' 00')
T = 106.358m (348.94')
L = 212.649m (697.66')
E = 1.619m (5.31')
R = 3492.758m (11459.18')
SE = N/C
WOODS
AR-2
AR-1
SWAMP
CREEK
BH-56
BH-22
BH-23
BH-24
BH-25
S 1°-52'-22" W
SLOPE INTERCEPT
DITCH DIKE REQ'D FOR SETTING BASIN
GATES REQUIRED
SIDE ROAD (LOGGING TRAIL)
P.C. 3031.776
P.T. 3244.425
P.T. 2742.463
MATCH LINE STA. 2680
MATCH LINE STA. 3370
TN. OF LINCOLN
TN. OF NASHVILLE
SOUTHBOUND NO-PASSING ZONE
SCALE
0 30 60m
SOIL BORE HOLES (FOTH AND VAN DYKE)
SOIL BORE HOLES (SOIL TESTING SERVICES)
PLAN
PROFILE
EXISTING ℄ PROFILE
SAME POINT
330m V.C.
STA 2810.09
STRUCTURE REQ'D
SEE DRAWINGS
VPT 3100.0
METRIC PLATE 1-SINGLE PLAN AND PROFILE-FULL LINE
PLAN + PROFILE
051-115-C-012





② MEASURED PERPENDICULAR TO ABUTMENT





TOTAL ESTIMATED QUANTITIES					
BID ITEMS	UNIT	N. ABUT.	S ABUT.	SUPER	TOTAL
EXCAVATION FOR STRUCTURES	L.S				
CONCRETE MASONRY	C.M.(C.Y.)	42.8(56)	42.8(56)	161.5(211)	246.9(323)
PRESTRESSED CONC. GIRDER 70"	L.M.(L.F.)	—	—	1935(635)	1935(635)
HIGH STRENGTH BAR STEEL REINFG.	L.B.S.	(BY FINAL DESIGN)			
BEARING PADS	L.S.				
STEEL PILING DELIVERED AND DRIVEN HP 10" x 42 ; 32'	L.M.(L.F.)	115.8(380)	97.5(320)	—	213.3(700)
HEAVY RIP-RAP	C.M.(C.Y.)			—	206.4(270)
TYPE "F" STEEL RAILING	L.M.(L.F.)	—	—	78.6(258)	78.6(258)

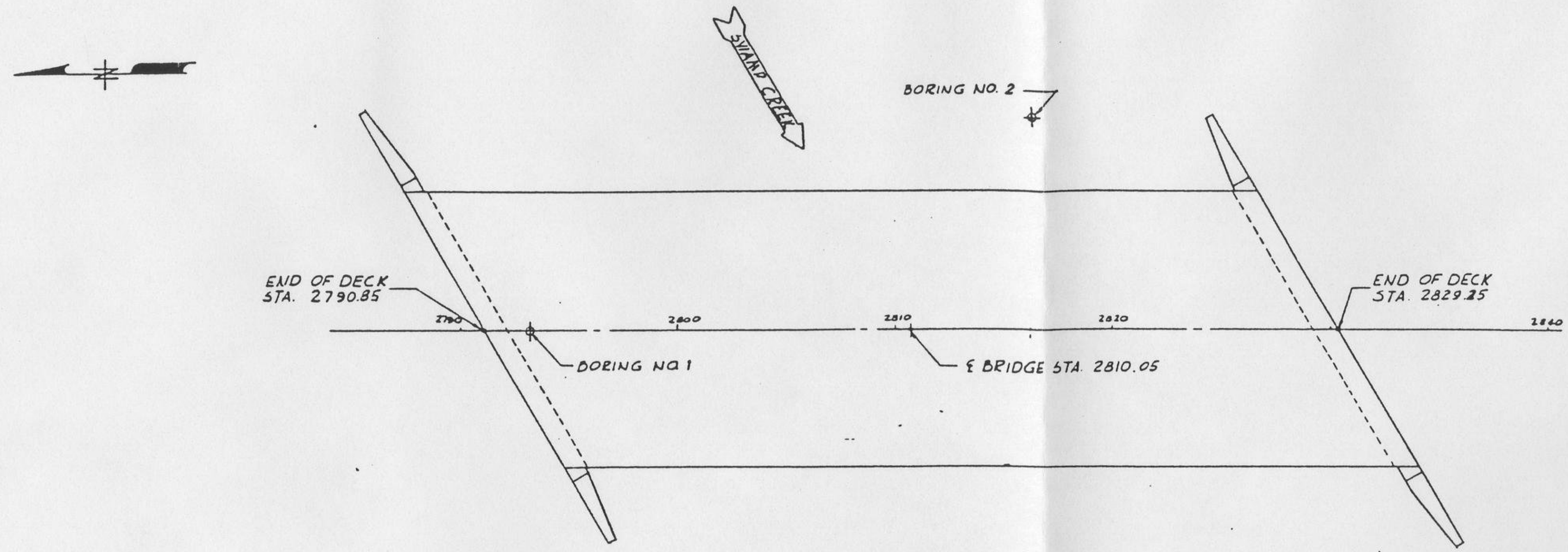
REVISED	DATE	BY	DESCRIPTION

EXXON PROPRIETARY

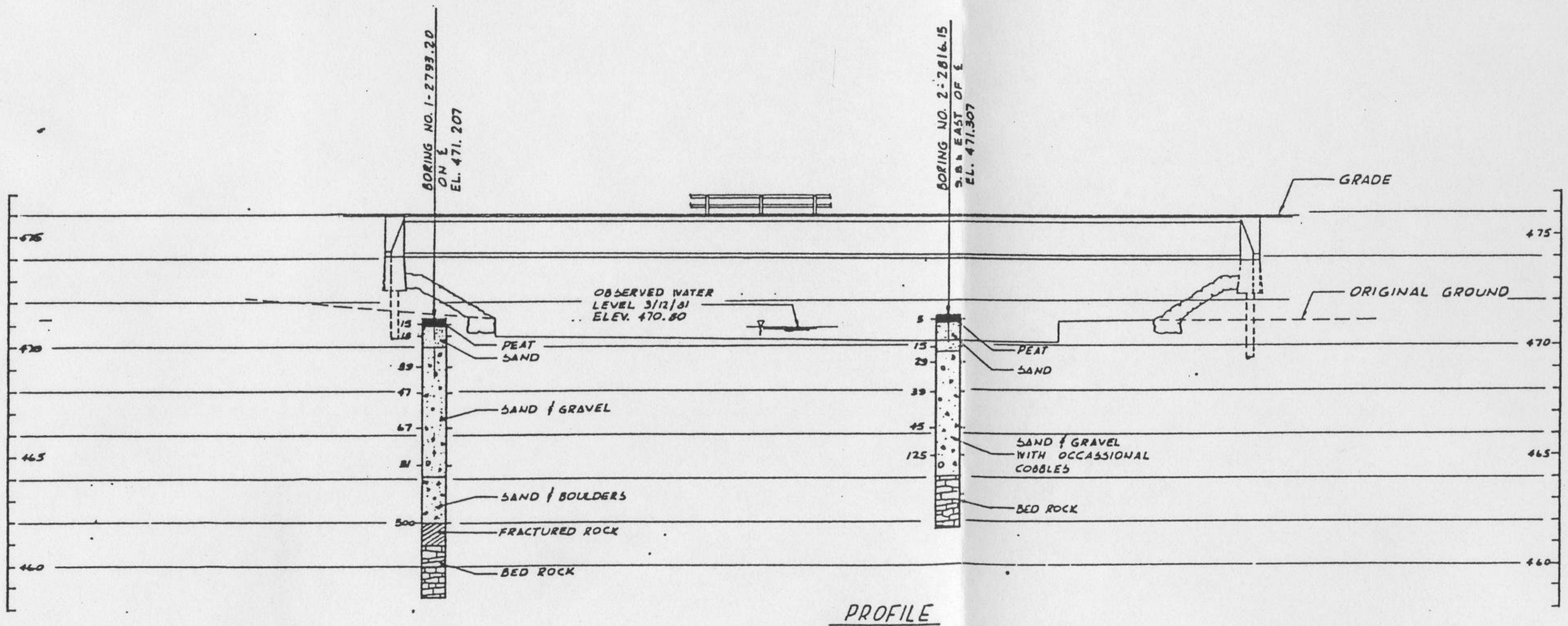
CRANDON PROJECT

TITLE: SWAMP CREEK BRIDGE #1 - GENERAL PLAN

SCALE: AS SHOWN	STATE: WISCONSIN	COUNTY: FOREST	
DRAWN BY: W.L.Y.	DATE: 7/82	CHECKED BY: J.G.L.	DATE: 8-6-82
APPROVED BY: P.R.W.	DATE: 8-6-82	APPROVED BY: K.A.E.	DATE: 8-6-82
APPROVED BY: T.J.J.	DATE: 8-6-82	EXXON	DATE
DRAWING NO: 051-115-C-017	SHEET __ OF __	REVISION NO	



PLAN
SCALE: 1:125

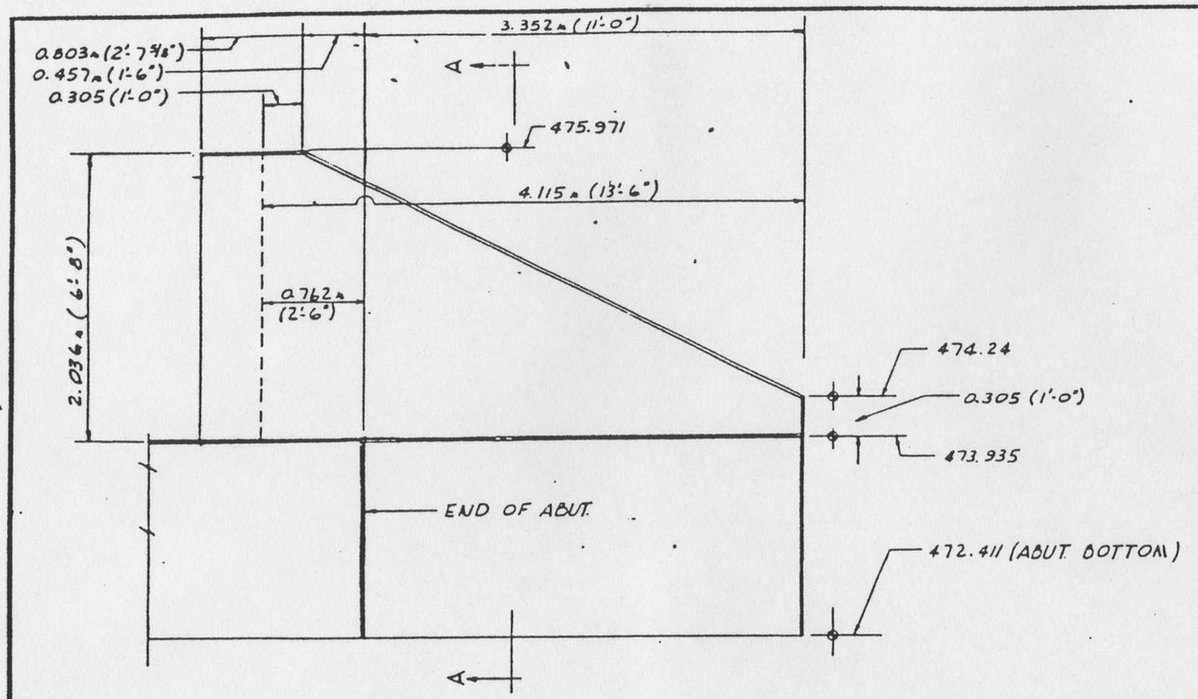


PROFILE
SCALE: 1:125

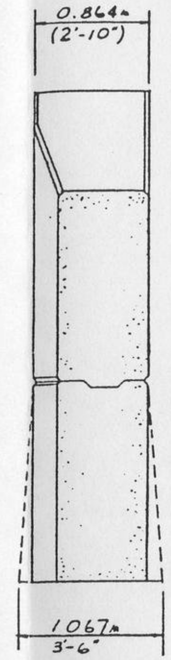
CRANDON PROJECT

TITLE: SWAMP CREEK BRIDGE #1 SURSURFACE EXPLORATION

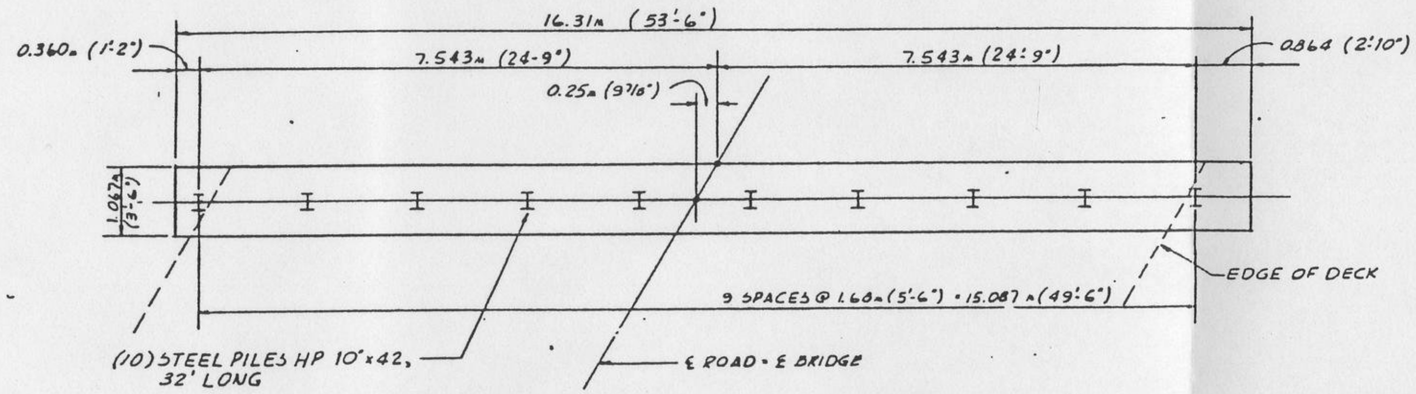
SCALE 1:125	STATE WISCONSIN	COUNTY FOREST --	
DRAWN BY W.L.Y.	DATE 7-82	CHECKED BY J.C.L.	8-2-82
APPROVED BY DRW	DATE 8-6-82	APPROVED BY K.A.E.	DATE 8-6-82
APPROVED BY T.J.J.	DATE 8-6-82		DATE
DRAWING NO. 051-115-C-018	SHEET		REVISION NO.



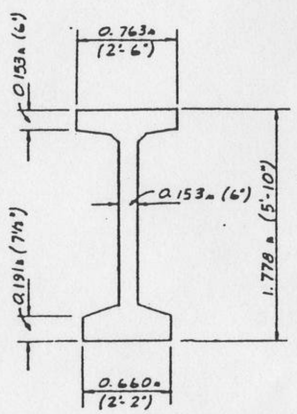
N-E WINGWALL ELEVATION (LOOKING NORTH)
SCALE 1:25



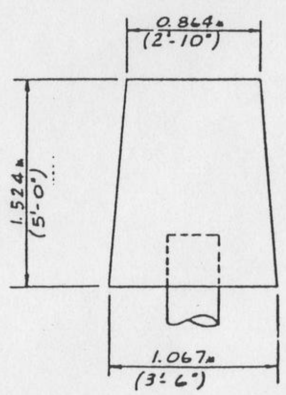
SECTION A-A
SCALE: 1:25



TYPICAL PILE PLAN (NORTH ABUT.-LOOKING NORTH)
SCALE 1:50



70" PRETENSIONED GIRDER DETAIL
SCALE: 1:25



ABUTMENT DETAIL
SCALE: 1:20

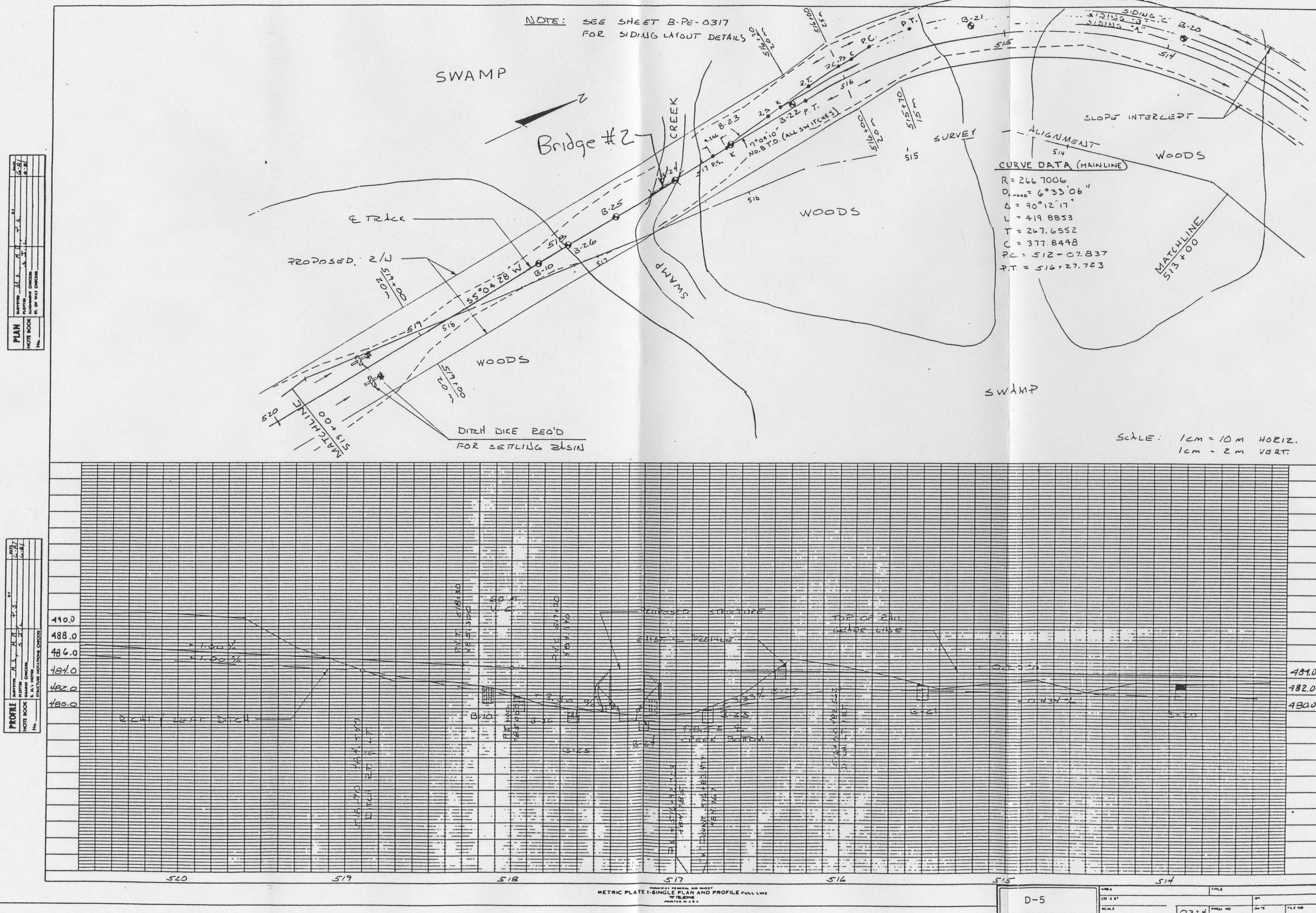
REVISED	DATE	BY	DESCRIPTION

EXXON PROPRIETARY

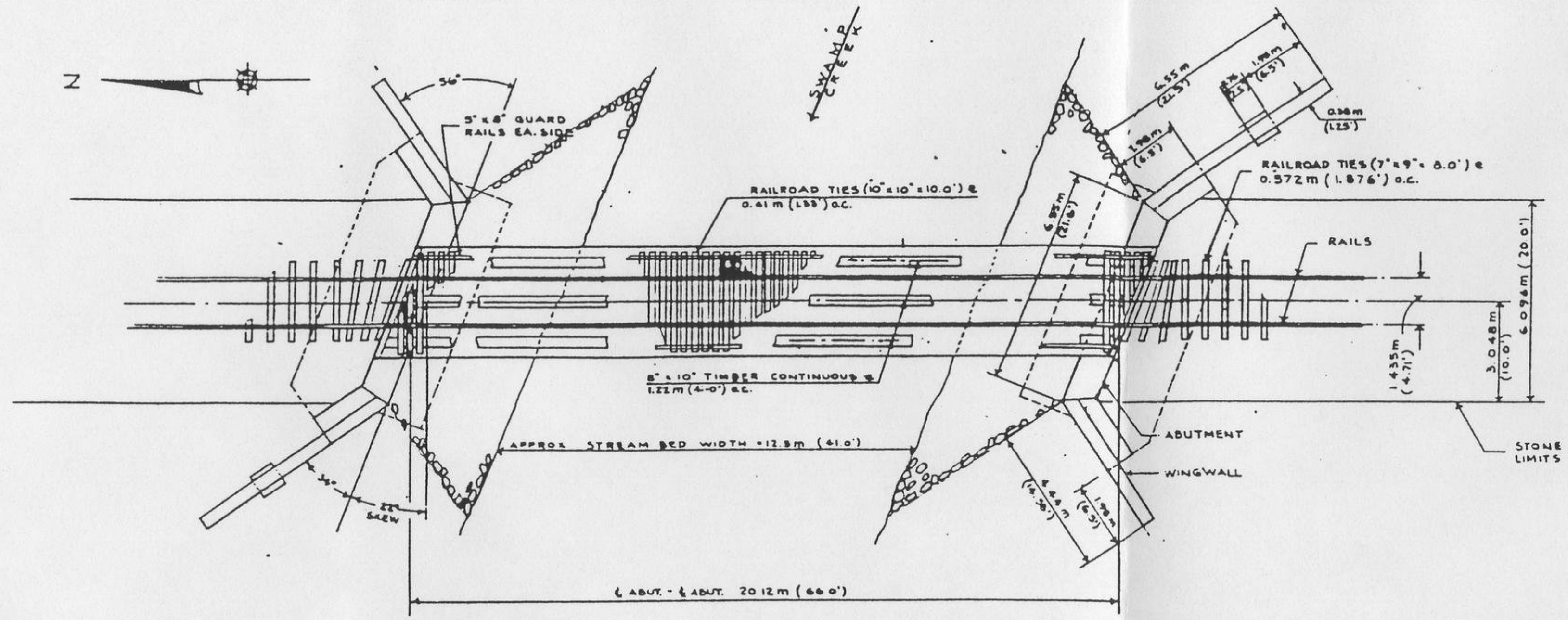
CRANDON PROJECT

TITLE SWAMP CREEK BRIDGE #1 DETAILS

SCALE AS SHOWN	STATE WISCONSIN	COUNTY FOREST	
DRAWN BY W.L.Y.	DATE 7-82	CHECKED BY J.G.L.	DATE 8-6-82
APPROVED BY P.R.W.	DATE 8-6-82	APPROVED BY K.A.C.	DATE 8-6-82
APPROVED BY T.J.J.	DATE 8-6-82	EXXON	DATE
DRAWING NO. 051-115-C-019	SHEET OF	REVISION NO.	



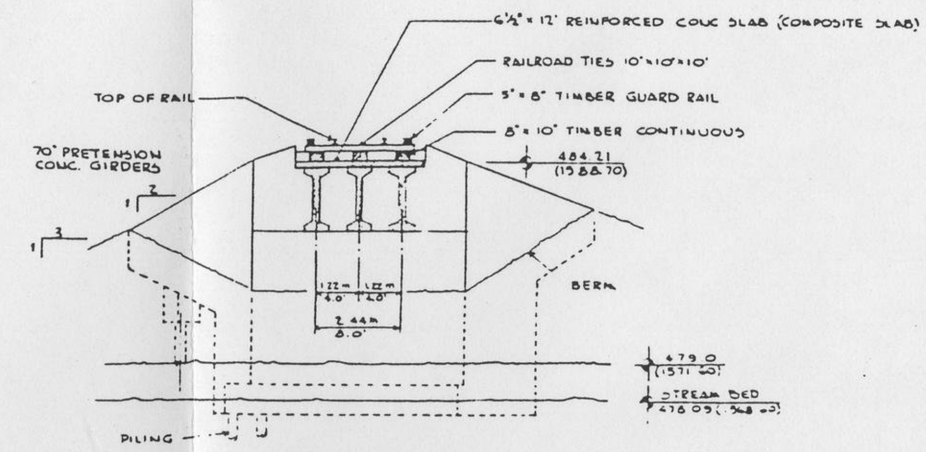
NOTE: SEE SHEET B-PE-0317 FOR SIDING LAYOUT DETAILS
SWAMP
Bridge #2
CREEK
SWAMP
WOODS
WOODS
WOODS
SWAMP
℄ TRACK
PROPOSED R/W
55°04'28" W
No. 8 T.O. (ALL SWITCHES)
SURVEY ALIGNMENT
SLOPE INTERCEPT
SIDING "C"
SIDING "B"
SIDING "A"
CURVE DATA (MAINLINE)
R = 266.7006
D CHORD = 6°33'06"
Δ = 90°12'17"
L = 419.8853
T = 267.6552
C = 377.8448
P.C. = 512+07.837
P.T. = 516+27.723
MATCHLINE 513+00
MATCHLINE 519+00
DITCH DIKE REQ'D FOR SETTLING BASIN
SCALE: 1cm = 10m HORIZ. 1cm - 2m VERT.
PROPOSED STRUCTURE
EXIST. ℄ PROFILE
TOP OF RAIL GRADE LINE
RIGHT & LEFT DITCH
CREEK BOTTOM
490.0
488.0
486.0
484.0
482.0
480.0
520
519
518
517
516
515
514
PLAN
PROFILE
METRIC PLATE 1-SINGLE PLAN AND PROFILE FULL LINE
D-5
0324



PLAN

1:100

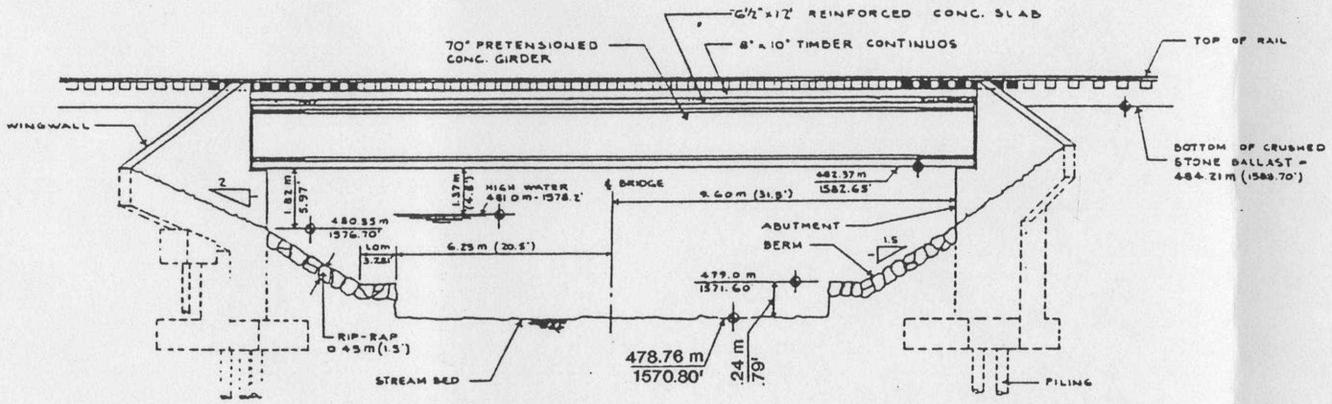
1 CM = 1 METER



TYPICAL SECTION

1:100

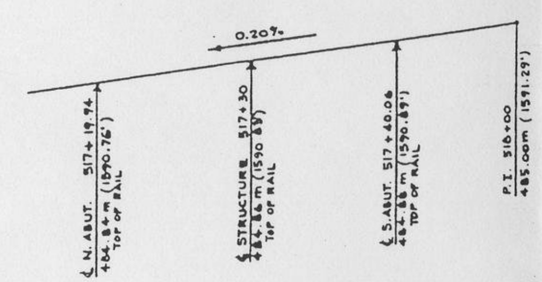
1 CM = 1 METER



ELEVATION

1:100

1 CM = 1 METER



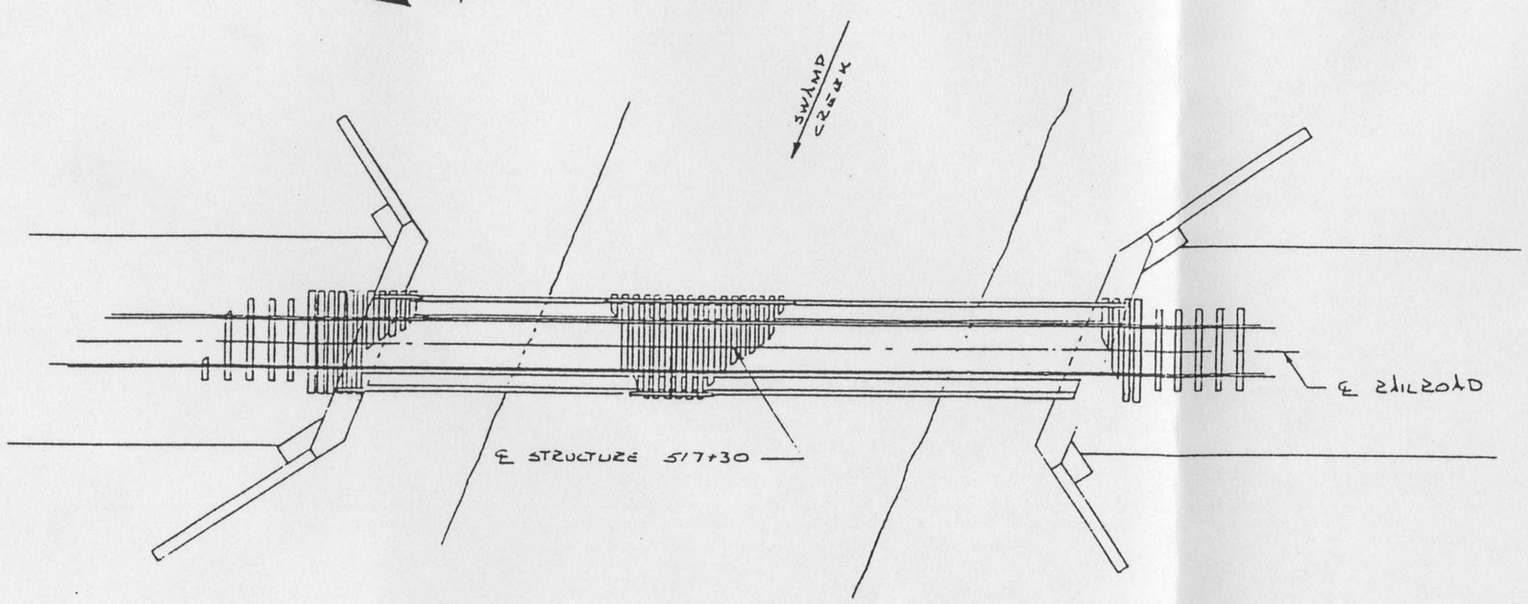
PROFILE GRADE LINE

REVISED	DATE	BY	DESCRIPTION

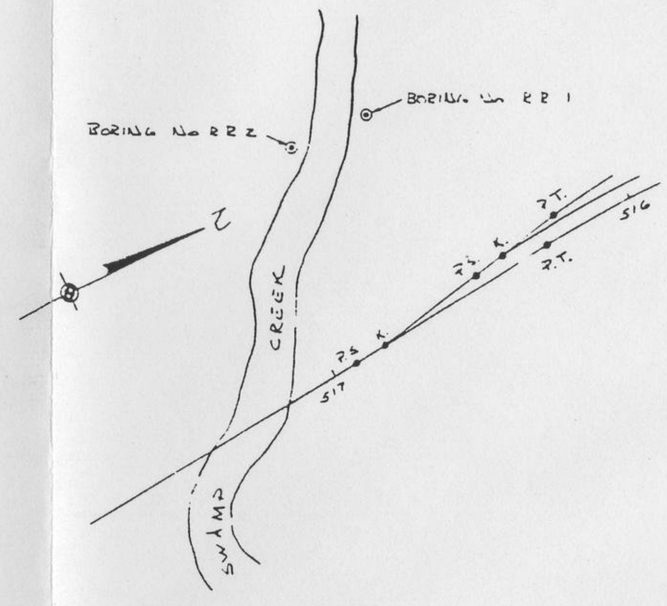
CRANDON PROJECT

TITLE GENERAL PLAN · SWAMP CREEK BRIDGE #2

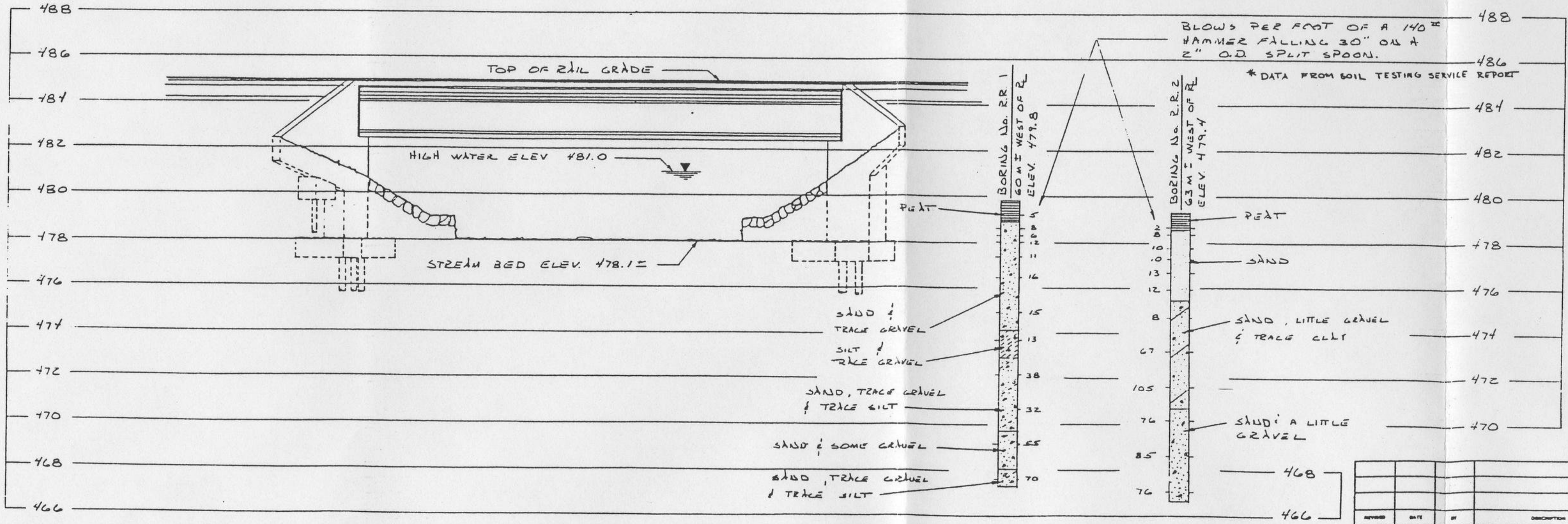
SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST		
DRAWN BY H.W	DATE 11-81	CHECKED BY W.L.F., E.L.G.		DATE 12-81	
APPROVED BY K.A.E.	DATE 12-81	APPROVED BY		DATE	
APPROVED BY	DATE	EXXON		DATE	
DRAWING NO. B-PE-0331		SHEET OF		REVISION NO.	



PLAN
1:100
1 CM = 1 METER

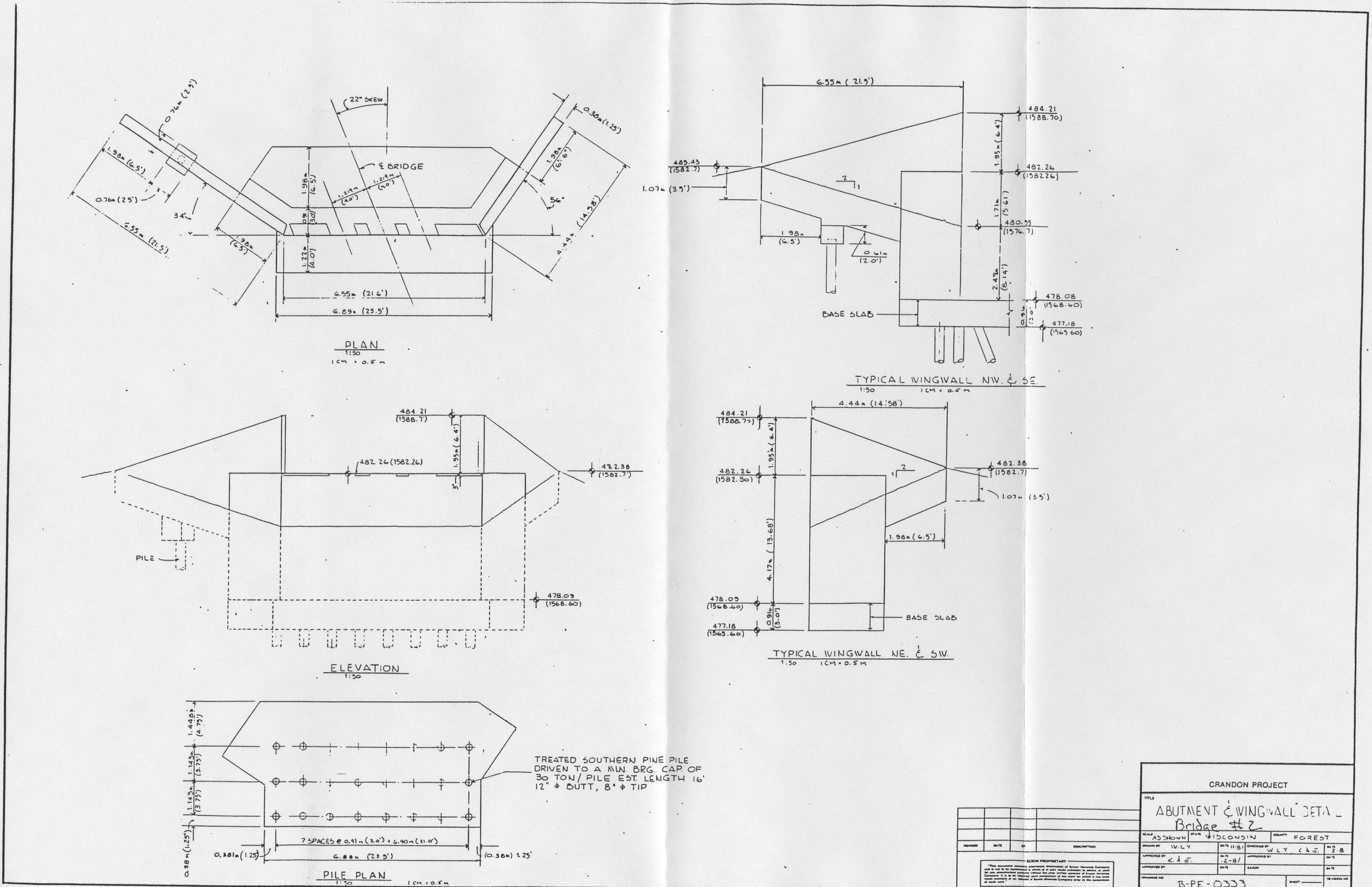


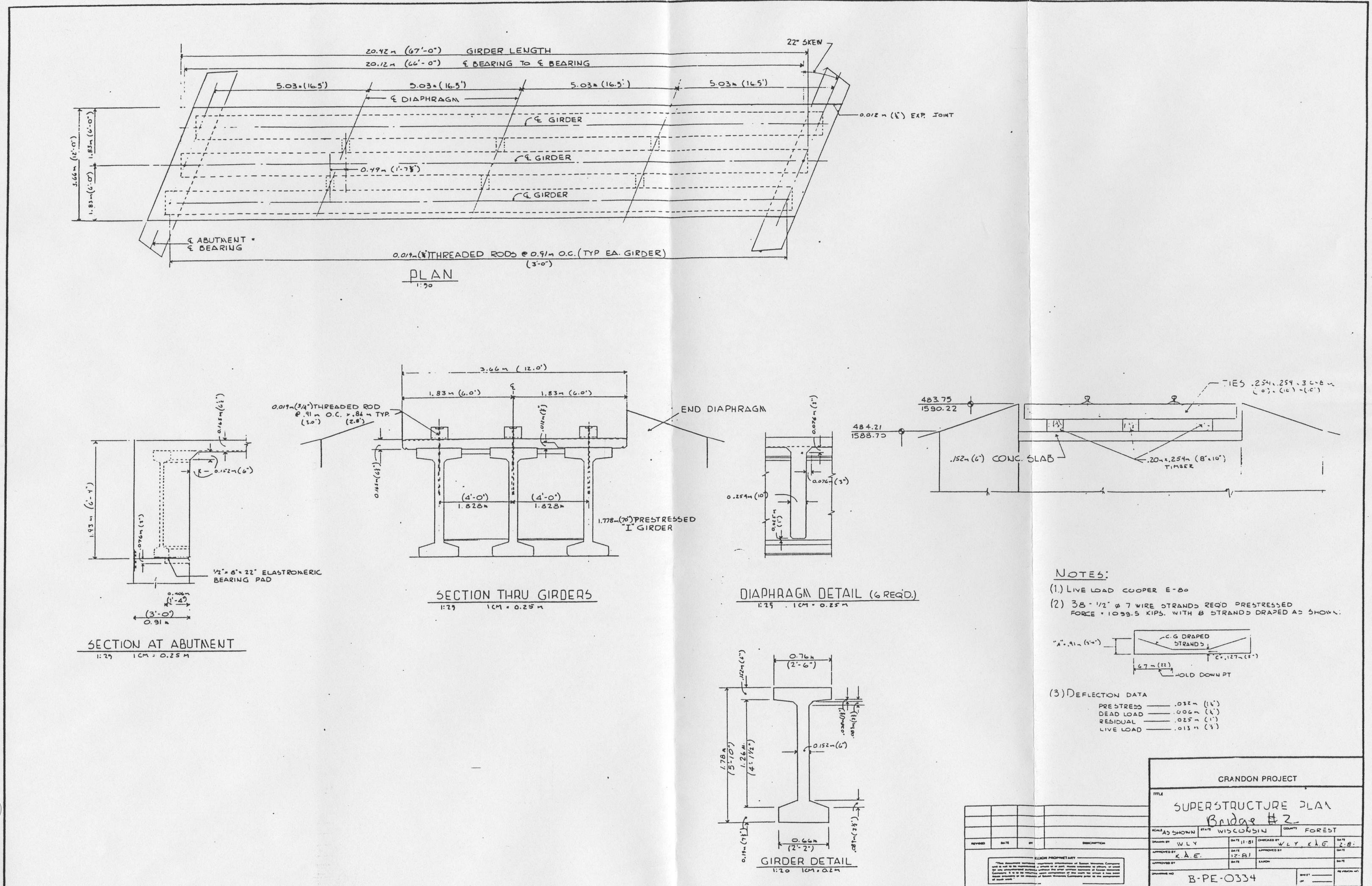
LOCATION MAP
1:1000
1 CM = 10 METER



PROFILE
1:100
1 CM = 1 METER

CRANDON PROJECT			
TITLE: SWAMP CREEK BRIDGE #2 SUBSURFACE EXPLORATION			
SCALE: AS SHOWN	STATE: WISCONSIN	COUNTY: FOREST	
DRAWN BY: M. J. O.	DATE: 1-81	CHECKED BY:	DATE:
APPROVED BY: K A G.	DATE: 2 81	APPROVED BY:	DATE:
APPROVED BY:	DATE:		DATE:
DRAWING NO: B-PE-0332	SHEET / OF		REVISION NO


PLAN
1:50
1CM = 0.5M
22° SKEW
℄ BRIDGE
6.55m (21.6')
6.89m (23.5')
TYPICAL WINGWALL NW. & SE.
1:50 1CM = 0.5M
BASE SLAB
484.21 (1588.70)
482.26 (1582.26)
480.35 (1576.7)
478.08 (1568.60)
477.18 (1565.60)
485.43 (1582.7)
ELEVATION
1:50
PILE
482.38 (1582.7)
478.05 (1568.60)
TYPICAL WINGWALL NE. & SW.
1:50 1CM = 0.5M
4.44m (14.58')
1.98m (6.5')
1.07m (3.5')
PILE PLAN
1:50 1CM = 0.5M
7 SPACES @ 0.91m (3.0') = 6.40m (21.0')
6.88m (23.5')
TREATED SOUTHERN PINE PILE DRIVEN TO A MIN. BRG. CAP. OF 30 TON/PILE EST. LENGTH 16' 12" ϕ BUTT, 8" ϕ TIP
CRANDON PROJECT
ABUTMENT & WINGWALL DETAIL
Bridge #2
AS SHOWN
WISCONSIN
FOREST
W.L.Y
11-81
K.A.E.
12-81
B-PE-0333



20.42 m (67'-0") GIRDER LENGTH
20.12 m (66'-0") ℄ BEARING TO ℄ BEARING
22° SKEW
5.03 m (16.5') 5.03 m (16.5') 5.03 m (16.5') 5.03 m (16.5')
℄ DIAPHRAGM
0.012 m (½") EXP. JOINT
℄ GIRDER
0.49 m (1'-7⅜")
3.66 m (12'-0")
1.83 m (6'-0")
℄ ABUTMENT = ℄ BEARING
0.019 m (¾") THREADED RODS @ 0.91 m O.C. (TYP EA. GIRDER) (3'-0")
PLAN
1:90
3.66 m (12.0')
1.83 m (6.0')
0.019 m (3/4") THREADED ROD @ .91 m O.C. = .84 m TYP. (3.0') (2.8')
END DIAPHRAGM
(4'-0") 1.828 m
1.778 m (70") PRESTRESSED "I" GIRDER
1.93 m (6'-4")
0.152 m (6")
½" × 8" × 22" ELASTROMERIC BEARING PAD
0.406 m (1'-4")
(3'-0") 0.91 m
SECTION AT ABUTMENT
1:25 1 CM = 0.25 M
SECTION THRU GIRDERS
1:25 1 CM = 0.25 M
0.076 m (3")
0.254 m (10")
DIAPHRAGM DETAIL (6 REQ'D.)
1:25 1 CM = 0.25 M
0.76 m (2'-6")
1.78 m (5'-10")
1.26 m (4'-1½")
0.152 m (6")
0.66 m (2'-2")
GIRDER DETAIL
1:20 1 CM = 0.2 M
TIES .254 × .254 × 3.0 m
483.75
1590.22
484.21
1588.75
.152 m (6") CONC. SLAB
.20 m × .254 m (8" × 10") TIMBER
NOTES:
(1.) LIVE LOAD COOPER E-80
(2) 38 - ½" ⌀ 7 WIRE STRANDS REQ'D PRESTRESSED FORCE = 1099.5 KIPS. WITH 8 STRANDS DRAPED AS SHOWN:
"A" = .91 m (3'-0")
C.G DRAPED STRANDS
"C" = .127 m (5")
6.7 m (22)
HOLD DOWN PT
(3) DEFLECTION DATA
PRESTRESS —— .032 m (1¼")
DEAD LOAD —— .006 m (¼")
RESIDUAL —— .025 m (1")
LIVE LOAD —— .013 m (½")
CRANDON PROJECT
TITLE
SUPERSTRUCTURE PLAN
Bridge #2
SCALE AS SHOWN
STATE WISCONSIN
COUNTY FOREST
DRAWN BY W L Y
DATE 11-81
CHECKED BY W L Y, K A E
APPROVED BY K. A. E.
DATE 12-81
EXXON
REVISED
DATE
BY
DESCRIPTION
EXXON PROPRIETARY
DRAWING NO
B-PE-0334
SHEET

Appendix E

Computer Flood Analysis - Bridge Construction

Foth & Van Dyke
Memorandum

August 16, 1995

TO: Jerry Sevick

CC: Don Moe, Crandon Mining Company
Master File

FR: Mike Liebman *MDL*
Steve Birr *SRB*

RE: Crandon Project - Mine Site Access Road/Railroad Spur Hydrologic/Hydraulic Analyses

Introduction

This memorandum contains hydrologic/hydraulic analyses pertaining to the Crandon Project access road and railroad spur crossings over Swamp Creek for sizing and construction of bridge structures. The effects of two different types of structures at each location, in terms of floodplain modifications and associated regulatory requirements are addressed.

Hydrology

Because of the size of the basin tributary to the Swamp Creek crossings and the number of discharge points for which flood flows were required, the USGS SCS hydrologic forecasting model TR-20 was selected as the primary hydrology tool. With stream gage data available, this program's calibration ability made this the most desirable method of most accurately determining flood flows. It should be noted that the TR-20 modeling (Attachment 1) was completed in English units.

Calibration of the TR-20 was performed through many procedures. Because of the peak flow reduction potential of the two major lakes in the area, Lake Metonga and Lake Lucerne, stage/discharge/storage relationships were analyzed. Each lake's controlling outlet was surveyed and evaluated to find the stage/discharge relationships. Stage/storage relationships were estimated by planimetering areas corresponding to incremental increases in depth and converting this data to volume in acre-feet. These relationships allowed TR-20 to route the incoming hydrographs through the lakes while allowing for the peak reducing and lagging effects of the lakes. Other calibrating procedures used were: analysis of stream gage data to identify large increases in flow related to large storm events; analysis of climatological data by obtaining hourly precipitation data and comparing with stream gage records; and comparing actual storm simulations with the stream gage records by modifying basin characteristics. Once the basin characteristics are so modified, the design storm may be modeled with confidence.

The 100-year event was then run to determine the flood flows at the two locations. As a final check, the Conger Method was used to determine regional flood flows at the Swamp Creek crossings. Comparison of the two methods was favorable with the Conger results being somewhat conservative. This can be expected because of the standard error of estimate which is added into the initial results.

TR-20 developed flow estimates based on a watershed area of approximately 47 square miles. For the access road crossing, flow was estimated at 25.32 cubic meters per second (890 cfs) for a 100-year storm event. For the railroad spur crossing, flow was estimated at 28.6 cubic meters per second (1010 cfs) for a 100-year storm event. Attachment 1 to this memo contains pertinent information relating to the TR-20 analysis.

Hydraulics

The hydraulics for the evaluation were conducted using the U.S. Army Corps of Engineers computer backwater program HEC-2. Detailed field survey data was used to develop cross sections for use in the HEC-2 programs which are included as Attachment 2 for the access road crossing and Attachment 3 for the railroad spur crossing. Cross section locations for both crossing locations are detailed on Figure 1.

At each crossing location, several bridge configurations were tried to determine the hydraulic capacity required to cause no increase in backwater through upstream surveyed cross sections. Existing conditions were finalized and used to gage the various structure results.

Referring to Table 1 of this memorandum, it was found that four (4) 10-foot by 8-foot box culverts or a 126-foot span bridge would adequately pass the 100-year flows at the access road crossing. A net backwater increase does occur at section 8.50, which would require backwater easements through this area if owned by a different riparian. As the adjacent lands along this reach are under CMC ownership, such minor backwater increases are acceptable.

Table 2 lists existing condition 100-year storm event water surface elevations for the railroad spur crossing. It was found that four (4) 16-foot by 8-foot box culverts or a 63-foot span railroad bridge would adequately pass the 100-year flows. For the box culverts, a net increase in flood backwater elevations occurred at cross sections 9.0, 12.0 and 15.0. For the span railroad bridge, a net increase in flood backwater elevations occurred at cross sections 12.0 and 15.0. These regional flood elevation increases would require backwater easements through this area if owned by a different riparian. Again, under CMC ownership, such minor backwater increases are acceptable.

Summary

As the HEC-2 results in Attachment 2 and Attachment 3 indicate, the proposed structures at the access road and railroad spur crossings cause only minor flood backwaters, which will dissipate before leaving CMC property.

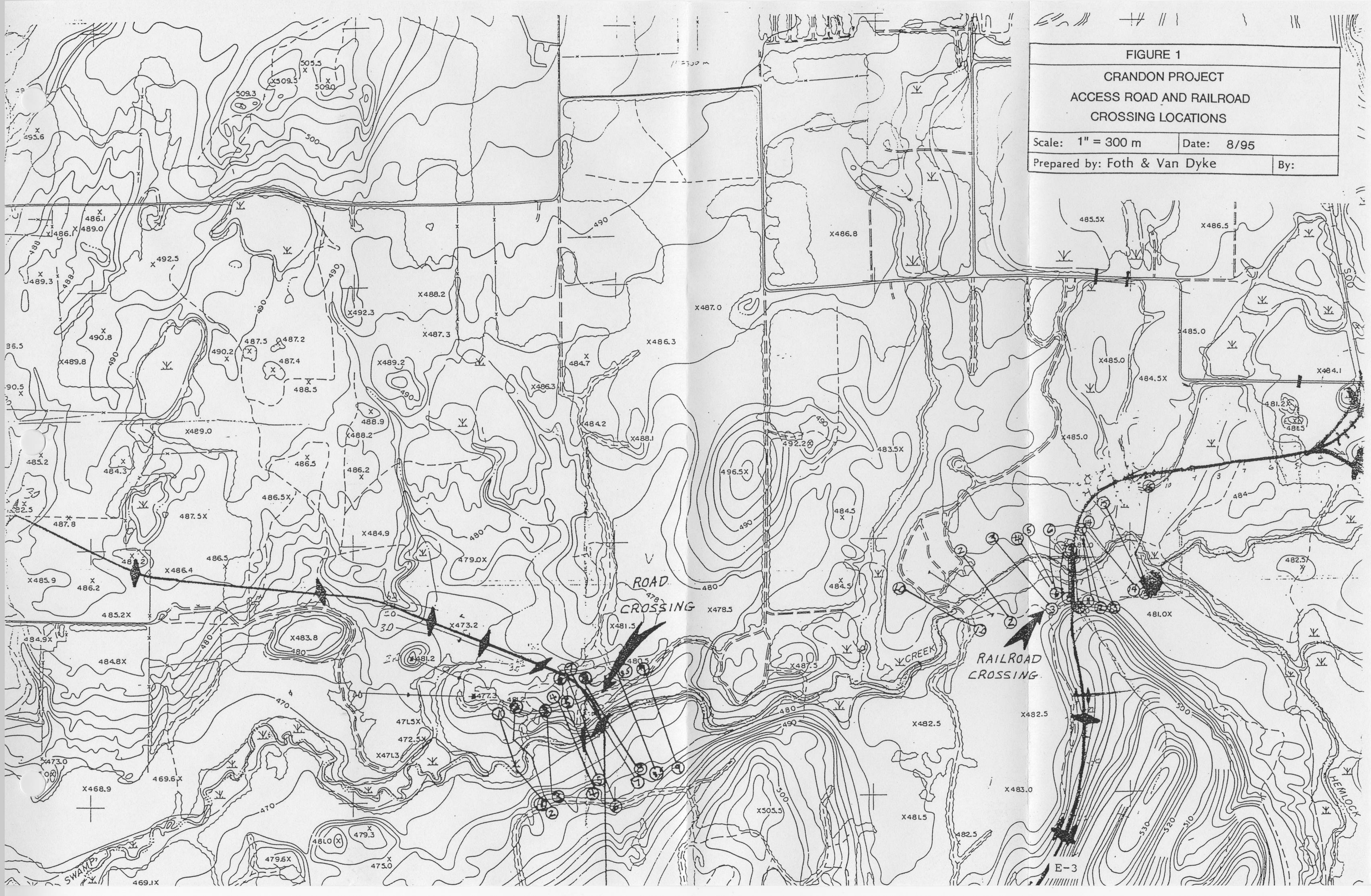


FIGURE 1
CRANDON PROJECT
ACCESS ROAD AND RAILROAD
CROSSING LOCATIONS
Scale: 1" = 300 m
Date: 8/95
Prepared by: Foth & Van Dyke
By:
ROAD CROSSING
RAILROAD CROSSING
CREEK
HEMLOCK
SWAMP
E-3

TABLE 1

CRANDON MINING COMPANY

ACCESS ROAD CROSSING WATER SURFACE ELEVATIONS

100-YEAR/24-HOUR STORM EVENT

FOTH AND VAN DYKE: 93C049.29

SECTION NO.	EXISTING	PROPOSED BOX CULVERTS (4: 10 FT. X 8 FT.)	PROPOSED SPAN BRIDGE (126 FT. SPAN)
1.00	470.85	470.85	470.85
2.00	471.16	471.16	471.16
3.00	471.43	471.43	471.43
4.00	471.71	471.71	471.71
5.00	471.88	471.86	471.88
5.50	471.96	471.95	471.95
6.00	472.09	472.03	472.01
7.00	472.32	472.31	472.30
8.00	472.43	472.42	472.41
8.50	472.98	472.99	472.99
9.00	473.57	473.57	473.57
Filenames:	"cmcroad"	"cmcrdp"	"cmcrdspn"

NOTE: ELEVATIONS AND DIMENSIONS IN METERS UNLESS SPECIFIED

TABLE 2

CRANDON MINING COMPANY

RAILROAD CROSSING WATER SURFACE ELEVATIONS

100-YEAR/24-HOUR STORM EVENT

FOTH AND VAN DYKE: 93C049.29

SECTION NO.	EXISTING	PROPOSED BOX CULVERTS (4: 16 FT. X 8 FT.)	PROPOSED SPAN BRIDGE (62 FT. SPAN)
1.00	480.99	480.99	480.99
1.50	481.02	481.02	481.02
1.60	481.02	481.02	481.02
1.70	481.02	481.02	481.02
1.80	481.02	481.02	481.02
1.90	481.01	481.01	481.01
2.00	481.11	481.11	481.11
3.00	481.13	481.13	481.13
4.00	481.14	481.14	481.14
5.00	481.15	481.15	481.15
6.00	481.16	481.16	481.16
7.00	481.16	481.16	481.16
8.00	481.18	481.18	481.18
9.00	481.18	481.19	481.18
9.30	481.19	481.19	481.19
10.00	481.20	481.19	481.19
11.00	481.22	481.22	481.22
12.00	481.22	481.23	481.23
13.00	481.23	481.23	481.23
14.00	481.24	481.24	481.24
15.00	481.24	481.25	481.25
16.00	481.25	481.25	481.25
Filename:	"cmcrre"	"cmcrrsc"	"cmcrrsp2"

NOTE: ELEVATIONS AND DIMENSIONS IN METERS UNLESS SPECIFIED

Attachment 1

TR-20 Hydrology

```
1.000 JOB      TR20          ,        NOPRINT
2.000                                 EXXON DRAINAGE... FOTH & VAN DYKE: MDL-MAR. 1981
3.000  5 RAINFL 1                0.5
3.050  8            0.0          .008       .017       .026       .035
3.100  8            .045         .055       .065       .076       .087
3.150  8            .099         .112       .125       .140       .156
3.200  8            .174         .194       .219       .254       .303
3.250  8            .515         .583       .624       .654       .682
3.300  8            .705         .727       .748       .767       .784
3.350  8            .800         .816       .830       .844       .857
3.400  8            .870         .882       .893       .905       .916
3.450  8            .926         .936       .946       .955       .965
3.500  8            .974         .983       .992       1.00       1.00
3.550  9 ENDTBL
3.600  5 RAINFL 2                0.02
3.650  8            0.0          .008       .0162      .0246      .0333
3.700  8            .0425        .0524      .0630      .0743      .0863
3.750  8            .0990        .1124      .1265      .142       .160
3.800  8            .18          .205       .255       .315       .437
3.850  8            .530         .603       .633       .660       .684
3.900  8            .705         .724       .742       .759       .775
3.950  8            .790         .8043      .8180      .8312      .8439
4.000  8            .8561        .8678      .8790      .8898      .9002
4.050  8            .9103        .9201      .9297      .9391      .9483
4.100  8            .9573        .966       .9747      .9832      .9916
4.150  8            1.0          1.0        1.0        1.0        1.0
4.200  9 ENDTBL
6.000  5 RAINFL 3                0.5
7.000  8            0.0          .10        .25        .45        .60
8.000  8            .70          .80        .80        .81        .95
9.000  8            1.06         1.14       1.20       1.25       1.30
10.000 9 ENDTBL
11.000 5 RAINFL 4                0.5
12.000 8            0.0          .04        .09        .13        .17
13.000 8            .20          .25        .29        .34        .34
14.000 8            .34          .34        .35        .35        .35
15.000 8            .35          .35        .35        .35        .35
16.000 8            .36          .36        .36        .36        .36
17.000 8            .36          .36        .38        .44        .45
18.000 8            .47          .52        .55        .57        .60
19.000 8            .64          .68        .68        .69        .73
20.000 8            .77          .79        .80        .80        .80
21.000 8            .85          .90        .93        .96        .98
22.000 8            1.00         1.04       1.08       1.11       1.14
23.000 8            1.18         1.23       1.26       1.30       1.31
24.000 9 ENDTBL
25.000 5 RAINFL 5                0.5
26.000 8            0.0          0.02       .05        .55        1.00
27.000 8            1.40         1.75       1.83       1.90       1.95
28.000 8            2.00         2.00       2.0        2.0        2.0
29.000 8            2.0          2.0        2.15       2.30       2.45
30.000 8            2.6          2.65       2.7        2.73       2.76
31.000 8            2.76         2.77       2.77       2.78       2.78
32.000 8            2.78         2.78       2.78       2.78       2.81
33.000 8            2.85         2.85       2.85       2.85       2.85
34.000 9 ENDTBL
35.000 5 RAINFL 6                0.5
36.000 8            0.0          .03        .07        .08        .09
37.000 8            .14          .22        .27        .34        .42
38.000 8            .51          .61        .73        .79        .86
```

"TRX"

II-7

```
90.000  6 RUNOFF 1 040         6   1.66         75.        5.6
91.000  6 ADDHYD 4 040    5 6 7                                        1
92.000  6 ADDHYD 4 040    4 7 5                                        1
93.000  6 REACH  3 050    5    6   7000.        0.41
94.000  6 RUNOFF 1 050         5   0.77         68.           3.0

39.000  8               .92    .   .98         1.01      1.04       1.13
42.000  9 ENDTBL
43.000  3 STRUCT        01
44.000  8                          1644.     0.0        0.0
44.500  8                          1644.1    1.0          2.
45.000  8                          1644.5    6.0        524.
46.000  8                          1645.0   10.        1060.
47.000  8                          1645.5   13.        1610.
48.000  8                          1646.0   15.        2170.
49.000  8                          1647.    19.        3320.
50.000  8                          1650.    50.        7000.
51.000  9 ENDTBL
52.000  3 STRUCT        02                                              METONGA
53.000  8                          1599.0    0.0        0.0
54.000  8                          1599.2    6.0        400.
55.000  8                          1599.5   23.4       1020.
56.000  8                          1599.8   47.3       1645.
57.000  8                          1600.    65.9       2060.
58.000  8                          1601.    185.       4200.
59.000  8                          1602.     3500.      6350.
60.000  8                          1605.    30000.     12800.
61.000  9 ENDTBL
62.000  6 RUNOFF 1 010         5   2.06         70.          12.5
63.000  6 RUNOFF 1 010         6   2.37         75.        11.6
64.000  6 ADDHYD 4 010    5 6 7
65.000  6 REACH  3   01 7 5    10.             .99
66.000  6 RUNOFF 1   01      7   7.92         82.        13.5
67.000  6 ADDHYD 4   01 5 7 6                                      1
68.000  6 RESVOR 2   01 6    7   1644.
69.000  6 REACH  3 030    7    5   21000.        .47
69.500  6 RUNOFF 1 030         6   3.19         74.          13.6
70.000  6 ADDHYD 4 030    5 6 4
71.000  6 RUNOFF 1 015         7   1.43         74.        8.5
72.000  6 REACH  3 025    7    5   4000.         0.22
73.000  6 RUNOFF 1 025         6   2.99         75.        21.7
74.000  6 ADDHYD 4 025    5 6 7
75.000  6 REACH  3 030    7    5  10000.        0.16
76.000  6 RUNOFF 1 030         7   4.75         73.        6.5
77.000  6 ADDHYD 4 030    5 7 6                                    1
78.000  6 ADDHYD 4 030    4 6 7                                    1
78.100  6 RUNOFF 1 030         5     0.44       75.       13.9     1         1
78.150  6 ADDHYD 4 030    5 7 6
78.200  6 RUNOFF 1 030         5      .26       77.       11.6     1         1
78.250  6 ADDHYD 4 030    5 6 4
78.300  6 RUNOFF 1 083         5      .04       74.       0.69     1         1
78.350  6 REACH  3 030    5    6     3500.      0.45
78.400  6 RUNOFF 1 030         7     0.10       74.       1.2      1         1
78.450  6 ADDHYD 4 030    7 6 5                                    1         1
78.500  6 ADDHYD 4 030    5 4 7                                    1         1
79.000  6 REACH  3 040    7    5   6000.        .16
80.000  6 RUNOFF 1 040         6   0.77         72.        4.9
81.000  6 ADDHYD 4 040    5 6 4                                    1
82.000  6 RUNOFF 1 034         5   5.77       85.        18.6
83.000  6 RUNOFF 1 034         6   1.18       87.        0.8
84.000  6 ADDHYD 4 034    5 6 7
85.000  6 REACH  3   02 7    5   10.          .99
86.000  6 RUNOFF 1   02      7   5.50         95.        5.6
87.000  6 ADDHYD 4   02 5 7 6                                      1
88.000  6 RESVOR 2   02 6    7   1599.                             1
89.000  6 REACH  3 040    7    5   9000.        0.47
```

```
 90.000  6 RUNOFF 1 040        6   1.66          75.         5.6
 91.000  6 ADDHYD 4 040    5 6 7                                          1
 92.000  6 ADDHYD 4 040    4 7 5                                          1
 93.000  6 REACH  3 050    5   6   7000.          0.41
 94.000  6 RUNOFF 1 050        5   0.77          69.           3.0
 95.000  6 ADDHYD 4 050    5 6 4                                          1         1
 96.000  6 RUNOFF 1 045        5   0.37          69.         7.4          1         1
 97.000  6 RUNOFF 1 045        6   0.61          76.         6.5          1         1
 98.000  6 ADDHYD 4 045    5 6 7
 99.000  6 RUNOFF 1 045        5   0.22          68.         4.4          1         1
  104.000  6 ADDHYD 4 050   7 4 6                                          1         1
  105.000  6 REACH  3 060   6   5   11000.          0.30                     1         1
  105.500  6 RUNOFF 1 055       6    0.54     57.          2.6                        1
  105.600  6 REACH  3 060   6   7    5000.          0.34
  105.800  6 ADDHYD 4 060   5 7 6
  106.000  6 RUNOFF 1 060       5   1.86           76.          3.0
  107.000  6 ADDHYD 4 060   5 6 7
  108.000  6 REACH  3 070   7   5   4200.            .16                     1
  109.000  6 RUNOFF 1 070       6   1.88           72.          21.0
  110.000  6 ADDHYD 4 070   5 6 7
  111.000  6 REACH  3 100   7   6   10.              1.00                    1
  112.000    ENDATA
  114.000  7 INCREM 6                 0.5
  115.000  7 COMPUT 7 010   100     0.0            5.0       1.0        1 2        1   Q100 - 24
  116.000    ENDCMP 1
  117.000  7 COMPUT 7 010   100     0.0            3.9       6.0        2 2        2   Q100 - 6
  118.000    ENDCMP 1
  119.000  7 COMPUT 7 010   100   0.0              3.6       1.0        1 2        3   Q10 - 24
  120.000    ENDCMP 1
  121.000  7 COMPUT 7 010   100     0.0            3.06      6.0        2 2        4   Q25 - 6  X
  122.000    ENDCMP 1
  123.000  7 COMPUT 7 010   100     0.0            4.4       12.0       2 2        5   Q100 - 12
  124.000    ENDCMP 1
  125.000  7 COMPUT 7 010   100     0.0            4.0       1.0        2'2        6   Q25 - 24
  126.000    ENDCMP 1
  127.000  7 COMPUT 7 010   100     0.0            4.4       1.0        1 2        7   Q50 - 24
  127.500    ENDCMP 1
  128.000    ENDJOB 2
 --EOF HIT AFTER 128.
 *END

 !SET F:5/TRX!IN

 !TR20:LM.
```


1 2 3 4 5 6 7 8

MAXIMUM CPU TIME (IN MINUTES) FOR THIS RUN

72

EXXON DRAINAGE... FOTH & VAN DYKE: MDL-MAR

TR-20 HYDROLOGY

PROGRAM DATE - FEB. 14, 1974 S/360

PASS= 1

```
EXECUTIVE CONTROL CARD        OPERATION  INCREM,    MAIN TIME INCREMENT=  .50
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  5.00     RAIN DURATION=  1.00    RAIN TABLE NO.= 1     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 1
```

ENDCMP

PASS= 2

```
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  3.90     RAIN DURATION=  6.00    RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 2
```

ENDCMP

PASS= 3

```
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  3.60     RAIN DURATION=  1.00    RAIN TABLE NO.= 1     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 3
```

ENDCMP

PASS= 4

```
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  4.40     RAIN DURATION= 12.00    RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 5
```

E-10

ENDCMP

PASS= 5

```
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  4.00     RAIN DURATION=  1.00    RAIN TABLE NO.= 1     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 6
```

ENDCMP

PASS= 6

```
EXECUTIVE CONTROL CARD        OPERATION  COMPUT,    FROM XSECTN/STRUCT  10/  0     TO XSECTN/STRUCT 100/  0
        STARTING TIME=   .00  RAIN DEPTH=  4.40     RAIN DURATION=  1.00    RAIN TABLE NO.= 1     SOIL CONDITION= 2
        ALTERNATE NO.= 0      STORM NO.= 7
```

ENDCMP

SUMMARY TABLE 1

	ALT	STORM	ID	DA SQ-MI.	RAIN TBLE	AMC	DELTA-T HRS.	TZERO HRS.	PRECIP IN.	PRECIP DURATION	PEAK-Q CFS	PEAK-TIME	PEAK-ELEV	RUNOFF IN.	CSM
X-80		1	30	.44	1	2	.50	.00	5.00	24.00	39.63	21.48	.00	2.44	90.08

X-81	1	30	.26	1	2	.50	.00	5.00	24.00	26.95	19.42	.00	2.62	103.65	Q100 24-HOUR
X-83	1	83	.04	1	2	.50	.00	5.00	24.00	16.85	10.40	.00	2.35	421.13	
X-82	1	30	.10	1	2	.50	.00	5.00	24.00	36.41	10.68	.00	2.37	364.08	
82+83	1	30	.14	1	2	.50	.00	5.00	24.00	48.06	10.73	.00	2.37	343.30	
RR	1	30	25.55	1	2	.50	.00	5.00	24.00	830.42	16.33	.00	1.32	32.50	
RD.	1	50	41.20	1	2	.50	.00	5.00	24.00	964.02	24.99	.00	1.32	23.40	
(STA. 2005) X-14	1	45	.37	1	2	.50	.00	5.00	24.00	35.94	16.29	.00	1.95	97.14	
(2236) X-15	1	45	.61	1	2	.50	.00	5.00	24.00	87.17	14.64	.00	2.53	142.90	
(2540) X-16	1	45	.22	1	2	.50	.00	5.00	24.00	29.50	13.56	.00	1.95	129.57	
14+15+16	1	45	1.20	1	2	.50	.00	5.00	24.00	146.58	14.65	.00	2.25	122.15	
14+15+16+17	1	50	1.49	1	2	.50	.00	5.00	24.00	186.28	14.62	.00	2.27	125.02	
BELOW RD.	1	50	42.69	1	2	.50	.00	5.00	24.00	1044.56	24.48	.00	1.35	24.47	
(310) X-18.5	1	55	.54	1	2	.50	.00	5.00	24.00	76.87	10.54	.00	1.10	142.35	
	2	30	.44	2	2	.50	.00	3.90	6.00	33.77	11.98	.00	1.59	76.74	Q100 6-HOUR
	2	30	.26	2	2	.50	.00	3.90	6.00	26.38	10.15	.00	1.73	101.47	
	2	83	.04	2	2	.50	.00	3.90	6.00	18.68	3.01	.00	1.51	466.99	
	2	30	.10	2	2	.50	.00	3.90	6.00	35.79	3.33	.00	1.51	357.94	
	2	30	.14	2	2	.50	.00	3.90	6.00	48.37	3.44	.00	1.51	345.52	
	2	30	25.55	2	2	.50	.00	3.90	6.00	853.71	8.07	.00	.87	33.41	
	2	50	41.20	2	2	.50	.00	3.90	6.00	702.11	13.69	.00	.88	17.04	
	2	45	.37	2	2	.50	.00	3.90	6.00	36.54	8.03	.00	1.20	98.75	
	2	45	.61	2	2	.50	.00	3.90	6.00	94.11	7.51	.00	1.66	154.29	
	2	45	.22	2	2	.50	.00	3.90	6.00	30.81	6.42	.00	1.20	140.06	
	2	45	1.20	2	2	.50	.00	3.90	6.00	157.68	7.37	.00	1.43	131.40	
	2	50	1.49	2	2	.50	.00	3.90	6.00	200.78	7.29	.00	1.45	134.75	
	2	50	42.69	2	2	.50	.00	3.90	6.00	776.17	9.42	.00	.90	18.18	
	2	55	.54	2	2	.50	.00	3.90	6.00	75.37	3.16	.00	.56	139.57	
	3	30	.44	1	2	.50	.00	3.60	24.00	21.92	21.62	.00	1.37	49.81	Q10 24-HOUR
	3	30	.26	1	2	.50	.00	3.60	24.00	15.29	19.85	.00	1.50	58.80	
	3	83	.04	1	2	.50	.00	3.60	24.00	8.65	10.46	.00	1.30	216.32	
	3	30	.10	1	2	.50	.00	3.60	24.00	18.19	10.73	.00	1.31	181.93	
	3	30	.14	1	2	.50	.00	3.60	24.00	23.28	10.83	.00	1.31	166.31	
	3	30	25.55	1	2	.50	.00	3.60	24.00	451.69	20.98	.00	.75	17.68	
	3	50	41.20	1	2	.50	.00	3.60	24.00	535.12	25.46	.00	.74	12.99	
	3	45	.37	1	2	.50	.00	3.60	24.00	17.62	16.54	.00	1.01	47.63	
	3	45	.61	1	2	.50	.00	3.60	24.00	46.77	15.30	.00	1.44	76.68	
	3	45	.22	1	2	.50	.00	3.60	24.00	13.29	13.86	.00	1.01	60.39	
	3	45	1.20	1	2	.50	.00	3.60	24.00	75.40	15.32	.00	1.23	62.84	
	3	50	1.49	1	2	.50	.00	3.60	24.00	95.98	15.06	.00	1.24	64.41	
	3	50	42.69	1	2	.50	.00	3.60	24.00	582.17	24.90	.00	.76	13.64	
	3	55	.54	1	2	.50	.00	3.60	24.00	17.61	10.76	.00	.45	32.61	
	5	30	.44	2	2	.50	.00	4.40	12.00	38.00	14.70	.00	1.97	86.35	Q100 12-HOUR
	5	30	.26	2	2	.50	.00	4.40	12.00	28.62	13.95	.00	2.13	110.09	
	5	83	.04	2	2	.50	.00	4.40	12.00	16.90	5.17	.00	1.88	422.61	
	5	30	.10	2	2	.50	.00	4.40	12.00	34.94	5.57	.00	1.89	349.36	
	5	30	.14	2	2	.50	.00	4.40	12.00	46.85	5.62	.00	1.89	334.63	
	5	30	25.55	2	2	.50	.00	4.40	12.00	874.60	11.48	.00	1.07	34.23	
	5	50	41.20	2	2	.50	.00	4.40	12.00	854.15	16.68	.00	1.08	20.73	
	5	45	.37	2	2	.50	.00	4.40	12.00	37.27	11.32	.00	1.53	100.72	
	5	45	.61	2	2	.50	.00	4.40	12.00	90.97	10.01	.00	2.04	149.13	
	5	45	.22	2	2	.50	.00	4.40	12.00	28.38	8.58	.00	1.53	129.01	
	5	45	1.20	2	2	.50	.00	4.40	12.00	152.15	10.01	.00	1.79	126.79	
	5	50	1.49	2	2	.50	.00	4.40	12.00	191.57	9.89	.00	1.81	128.57	
	5	50	42.69	2	2	.50	.00	4.40	12.00	940.57	14.91	.00	1.10	22.03	
	5	55	.54	2	2	.50	.00	4.40	12.00	66.56	5.44	.00	.79	123.27	
	6	30	.44	1	2	.50	.00	4.00	24.00	26.75	21.57	.00	1.66	60.79	
	6	30	.26	1	2	.50	.00	4.00	24.00	18.49	19.78	.00	1.81	71.12	
	6	83	.04	1	2	.50	.00	4.00	24.00	10.87	10.44	.00	1.59	271.70	
	6	30	.10	1	2	.50	.00	4.00	24.00	23.10	10.71	.00	1.60	231.00	
	6	30	.14	1	2	.50	.00	4.00	24.00	29.45	10.78	.00	1.60	210.33	
	6	30	25.55	1	2	.50	.00	4.00	24.00	550.71	18.67	.00	.90	21.55	Q25 24-HOUR
	6	50	41.20	1	2	.50	.00	4.00	24.00	651.85	25.30	.00	.90	15.82	
	6	45	.37	1	2	.50	.00	4.00	24.00	22.47	16.45	.00	1.26	60.74	
	6	45	.61	1	2	.50	.00	4.00	24.00	57.71	14.73	.00	1.74	94.61	
	6	45	.22	1	2	.50	.00	4.00	24.00	17.30	13.71	.00	1.26	78.64	
	6	45	1.20	1	2	.50	.00	4.00	24.00	93.94	15.06	.00	1.50	78.28	
	6	50	1.49	1	2	.50	.00	4.00	24.00	119.99	14.99	.00	1.52	80.53	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2	2	.50	.00	4.40	[illegible]	152.15	10.01	.00	1.79	126.79	
2	2	.50	.00	4.40	12.00	191.57	9.89	.00	1.81	128.57	
2	2	.50	.00	4.40	12.00	940.57	14.91	.00	1.10	22.03	
2	2	.50	.00	4.40	12.00	66.56	5.44	.00	.79	123.27	
1	2	.50	.00	4.00	24.00	26.75	21.57	.00	1.66	60.79	
1	2	.50	.00	4.00	24.00	18.49	19.78	.00	1.81	71.12	
1	2	.50	.00	4.00	24.00	10.87	10.44	.00	1.59	271.70	
1	2	.50	.00	4.00	24.00	23.10	10.71	.00	1.60	231.00	
1	2	.50	.00	4.00	24.00	29.45	10.78	.00	1.60	210.33	
1	2	.50	.00	4.00	24.00	550.71	18.67	.00	.90	21.55	
1	2	.50	.00	4.00	24.00	651.85	25.30	.00	.90	15.82	Q25 24-HOUR
1	2	.50	.00	4.00	24.00	22.47	16.45	.00	1.26	60.74	
1	2	.50	.00	4.00	24.00	57.71	14.73	.00	1.74	94.61	
1	2	.50	.00	4.00	24.00	17.30	13.71	.00	1.26	78.64	
1	2	.50	.00	4.00	24.00	93.94	15.06	.00	1.50	78.28	
1	2	.50	.00	4.00	24.00	119.99	14.89	.00	1.52	80.53	
1	2	.50	.00	4.00	24.00	708.16	24.77	.00	.92	16.59	
1	2	.50	.00	4.00	24.00	32.86	10.66	.00	.62	60.85	
1	2	.50	.00	4.40	24.00	31.78	21.53	.00	1.97	72.24	X-80
1	2	.50	.00	4.40	24.00	21.78	19.66	.00	2.13	83.76	X-81
1	2	.50	.00	4.40	24.00	13.19	10.42	.00	1.88	329.82	X-83
1	2	.50	.00	4.40	24.00	28.27	10.69	.00	1.90	282.67	X-82
1	2	.50	.00	4.40	24.00	37.29	10.75	.00	1.90	266.35	82+83 Q50 24-HOUR
1	2	.50	.00	4.40	24.00	656.60	18.53	.00	1.07	25.70	RR
1	2	.50	.00	4.40	24.00	773.71	25.16	.00	1.06	18.78	RD.
1	2	.50	.00	4.40	24.00	27.65	15.38	.00	1.53	74.74	X-14 (STA. 2005)
1	2	.50	.00	4.40	24.00	69.19	14.69	.00	2.05	113.43	X-15 (STA. 2236)
1	2	.50	.00	4.40	24.00	21.59	13.64	.00	1.53	98.13	X-16 (STA. 2540)
1	2	.50	.00	4.40	24.00	114.45	14.73	.00	1.79	95.38	14+15+16
1	2	.50	.00	4.40	24.00	145.66	14.74	.00	1.81	97.76	14+15+16+17
1	2	.50	.00	4.40	24.00	839.52	24.64	.00	1.09	19.67	BELOW RD.
1	2	.50	.00	4.40	24.00	48.96	10.61	.00	.80	90.67	X-18.5 (STA. 310)

DISCHARGE,CFS

Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

35.31 CFS = CMS

ID OF JOB.

FROM CALIBRATION ANALYSIS, A 45 CFS ± D/S AND 20 CFS ± U/S FACTOR SHOULD BE ADDED TO SWAMP CREEK TO ACCOUNT FOR BASE FLOW.

Attachment 2

HEC-2 Modeling for Access Road Crossing

```
*  HEC-2 WATER SURFACE PROFILES                *          *  U.S. ARMY CORPS OF ENGINEERS        *
*                                              *          *  HYDROLOGIC ENGINEERING CENTER       *
*  Version   4.6.2;  May 1991                  *          *  609 SECOND STREET, SUITE D          *
*                                              *          *  DAVIS, CALIFORNIA 95616-4687        *
*  RUN DATE    21AUG95    TIME    09:13:07     *          *           (916) 756-1104             *
************************************************          ****************************************
```

```
X     X  XXXXXXX   XXXXX             XXXXX
X     X  X         X     X          X     X
X     X  X         X                      X
XXXXXXX  XXXX      X          XXXXX   XXXXX
X     X  X         X                X
X     X  X         X     X          X
X     X  XXXXXXX   XXXXX            XXXXXXX
```


THIS RUN EXECUTED 21AUG95   09:13:07

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****************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
****************************************
```

T1   WATER SURFACE PROFILE: 100-YEAR FLOW   FILE: CMCROAD
T2   DRAINAGE   APRIL, 1981
T3   SWAMP CREEK-EXISTING CONDITIONS   F&VD: MDL

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.005	1.	0	29.	471.	0

NC	.105	.105	.05	0	0	0	0	0	0	0
X1	1.	13.	118.	130.3	0	0	0	0	0	0
GR	480.	0	474.	50.	472.	82.	470.35	118.	470.28	120.
GR	470.34	124.	470.04	124.3	469.3	127.9	469.53	130.	470.3	130.3
GR	470.5	210.	472.	250.	474.	350.	0	0	0	0
X1	2.	11.	193.	209.	60.	70.	120.	0	0	0
GR	480.	0	474.	38.	472.	84.	470.7	150.	470.5	192.
GR	470.	193.	469.92	208.	470.4	209.	472.	250.	474.	288.
GR	480.	350.	0	0	0	0	0	0	0	0
X1	3.	13.	200.	216.	90.	140.	120.	0	0	0
GR	480.	0	474.	38.	472.	110.	471.	185.	470.51	200.
GR	470.3	201.64	470.28	206.77	470.31	210.5	470.51	216.	471.	230.
GR	472.	262.	476.	280.	480.	320.	0	0	0	0

X1	4.	13.	180.	191.	120.	100.	100.	0	0	0
GR	480.	0	476.	30.	474.	80.	472.	168.	471.13	180.
GR	470.09	181.	470.15	186.	470.43	190.	471.2	191.	472.	210.
GR	474.	235.	476.	258.	480.	300.	0	0	0	0

X1	5.	12.	208.	229.	20.	20.	20.	0	0	0
GR	480.	0	476.	40.	474.	105.	472.	190.	471.5	208.
GR	471.73	209.	470.48	221.	470.36	228.	471.31	229.	471.92	238.
GR	472.	240.	480.	300.	0	0	0	0	0	0

ADD SECTION

1

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X1	5.5				20.0	20.0	20.0		.2	

X1	6.	10.	265.	281.	20.	20.	20.	0	0	0
GR	480.	0	476.	91.	474.	168.	472.	253.	471.13	265.
GR	470.8	267.	470.78	280.	471.34	281.	472.	291.	480.	334.

X1	7.	12.	239.	252.	80.	55.	70.	0	0	0
GR	480.	0	478.	18.	474.	140.	472.	226.	471.53	239.
GR	471.05	241.	470.97	246.	471.05	251.	471.54	252.	472.	253.
GR	474.	275.	480.	295.	0	0	0	0	0	0

X1	8.	11.	268.	280.	20.	20.	20.	0	0	0
GR	480.	0	474.	160.	472.	256.	471.58	268.	471.02	271.
GR	471.02	274.	471.58	279.	471.8	280.	472.	288.	474.	303.
GR	480.	317.	0	0	0	0	0	0	0	0

X1	8.5				100.	105.	102.		0.6	

X1	9.	13.	235.	246.	100.	105.	102.	0	0	0
GR	480.	0	478.	20.	476.	142.	474.	210.	472.89	235.
GR	472.25	236.	472.26	240.	472.2	245.	472.86	246.	474.	295.
GR	476.	313.	478.	350.	480.	363.	0	0	0	0

1

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

*SECNO 1.000

1.000	1.55	470.85	.00	471.00	470.89	.04	.00	.00	470.35

.00	.27	1.26	.39	.105	.050	.105	.000	469.30	107.12
.005016	0.	0.	0.	0	0	6	.00	112.17	219.29

*SECNO 2.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.54

2.000	1.24	471.16	.00	.00	471.19	.04	.30	.00	470.00
29.0	8.0	19.3	1.7	29.4	18.9	7.3	4.3	7.8	470.40
.04	.27	1.02	.23	.105	.050	.105	.000	469.92	126.98
.002108	60.	120.	70.	2	0	0	.00	101.33	228.31

*SECNO 3.000

3.000	1.15	471.43	.00	.00	471.47	.05	.28	.00	470.51
29.0	5.2	19.6	4.2	16.9	17.3	12.3	9.9	18.1	470.51
.07	.31	1.13	.34	.105	.050	.105	.000	470.28	152.96
.002876	90.	120.	140.	2	0	0	.00	90.71	243.67

*SECNO 4.000

4.000	1.62	471.71	.00	.00	471.86	.15	.39	.00	471.13
29.0	.7	27.5	.8	2.3	15.6	3.0	13.5	24.7	471.20
.09	.30	1.76	.28	.105	.050	.105	.000	470.09	172.07
.005331	120.	100.	100.	1	0	0	.00	30.91	202.99

*SECNO 5.000

5.000	1.52	471.88	.00	.00	471.96	.09	.10	.00	471.50
29.0	.5	27.8	.7	2.6	20.8	2.4	14.0	25.5	471.31
.09	.21	1.34	.28	.105	.050	.105	.000	470.36	194.42
.004677	20.	20.	20.	2	0	0	.00	42.94	237.37

*SECNO 5.500

5.500	1.40	471.96	.00	.00	472.08	.12	.11	.00	471.70
29.0	.3	28.3	.5	1.3	18.5	1.6	14.4	26.3	471.51
.10	.21	1.53	.30	.105	.050	.105	.000	470.56	198.29
.007097	20.	20.	20.	1	0	0	.00	37.49	235.78

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 6.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.53

6.000	1.31	472.09	.00	.00	472.17	.07	.09	.00	471.13
29.0	2.1	25.7	1.2	6.4	20.1	4.2	15.0	27.1	471.34
.10	.33	1.27	.29	.105	.050	.105	.000	470.78	249.33
.003036	20.	20.	20.	1	0	0	.00	42.13	291.46

7.000	1.35	472.32	.00	.00	472.43	.11	.26	.00	471.53
29.0	3.6	25.1	.3	9.4	16.2	1.1	17.0	30.2	471.54
.12	.38	1.55	.30	.105	.050	.105	.000	470.97	212.22
.004568	80.	70.	55.	2	0	0	.00	44.30	256.52

*SECNO 8.000

8.000	1.41	472.43	.00	.00	472.52	.10	.10	.00	471.58
29.0	4.9	22.1	2.0	12.0	14.0	4.9	17.6	31.2	471.80
.12	.41	1.58	.42	.105	.050	.105	.000	471.02	235.59
.005167	20.	20.	20.	2	0	0	.00	55.60	291.19

*SECNO 8.500

8.500	1.36	472.98	.00	.00	473.10	.11	.57	.00	472.18
29.0	4.6	22.5	1.9	10.6	13.4	4.4	20.6	36.7	472.40
.14	.43	1.68	.43	.105	.050	.105	.000	471.62	237.66
.006109	100.	102.	105.	2	0	0	.00	53.20	290.87

*SECNO 9.000

9.000	1.37	473.57	.00	.00	473.69	.12	.59	.00	472.89
29.0	1.7	23.6	3.7	5.0	13.9	10.5	23.6	42.3	472.86
.16	.34	1.70	.35	.105	.050	.105	.000	472.20	219.93
.005544	100.	102.	105.	0	0	0	.00	56.11	276.05

1
PROFILE FOR STREAM AMP CREEK-EXISTING CONDI

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION   469.      471.      473.      475.      477.      479.      481.      483.      485.      487.
    SECNO   CUMDIS

     1.00      0.  I    L  E .        .   M     .         .         .         .         .         .         .         .
              10.  I    L  E .        .     M   .         .         .         .         .         .         .         .
              20.  CI   L  E .        .        M.         .         .         .         .         .         .         .
              30.  CI   L  E .        .         .M        .         .         .         .         .         .         .
              40.  CI   L  E .        .         .   M     .         .         .         .         .         .         .
              50.  CI   L  WE.        .         .     M   .         .         .         .         .         .         .
              60.  C I LR   E.        .         .        M.         .         .         .         .         .         .
              70.  C I LR   E.        .         .         .M        .         .         .         .         .         .
              80.  C I LR   E.        .         .         .   M     .         .         .         .         .         .
              90.  C I LR   E.        .         .         .     M   .         .         .         .         .         .
             100.  C  ILR   E.        .         .         .        M.         .         .         .         .         .
             110.  C  ILR   E.        .         .         .         .M        .         .         .         .         .
     2.00    120.  C  IL R  E.        .         .         .         .   M     .         .         .         .         .
             130.  C  IL R  WE        .         .         .         .   M     .         .         .         .         .
             140.  C  IL R  WE        .         .         .         .   M     .         .         .         .         .
             150.  C   I R   E        .         .         .         .   M     .         .         .         .         .
             160.  C   I R   E        .         .         .         .   M     .         .         .         .         .
             170.  C   ILR   E        .         .         .         .   M     .         .         .         .         .
             180.  C   ILR   E        .         .         .         .   M     .         .         .         .         .
             190.  C   ILR   E        .         .         .         .   M     .         .         .         .         .
             200.  C   ILR   E        .         .         .         .   M     .         .         .         .         .
             210.  C   ILR  WE        .         .         .         .   M     .         .         .         .         .
             220.  C    IL  WE        .         .         .         .   M     .         .         .         .         .
```

```
  3.00   240.  C    IL   .E        .         .         .         .  M   .         .         .         .         .
         250.  C    IL   .E        .         .         .         .  M   .         .         .         .         .
         260.  C    I L  .E        .         .         .         .  M   .         .         .         .         .
         270.  C    I L  .E        .         .         .         .  M   .         .         .         .         .
         280.  C    I L  .WE       .         .         .         .  M   .         .         .         .         .
         290.  C   I   L .WE       .         .         .         .  M   .         .         .         .         .
         300.  C   I   L .WE       .         .         .         .  M   .         .         .         .         .
         310.  C   I   L . E       .         .         .         .  M   .         .         .         .         .
         320.  C   I    L. E       .         .         .         .  M   .         .         .         .         .
         330.  C   I    L. WE      .         .         .         .  M   .         .         .         .         .
  4.00   340.  C   I    LR WE      .         .         .         .  M   .         .         .         .         .
         350.  C    I    L WE      .         .         .         .  M   .         .         .         .         .
  5.00   360.  C    I    RL E      .         .         .         .  M   .         .         .         .         .
         370.  C     I   .RLWE     .         .         .         .  M   .         .         .         .         .
  5.50   380.  C     I   .RLWE     .         .         .         .   M  .         .         .         .         .
         390.  C      I  .L  E     .         .         .         .  M   .         .         .         .         .
  6.00   400.  C      I LR   E     .         .         .         .  M   .         .         .         .         .
         410.  C       ILR   WE    .         .         .         .  M   .         .         .         .         .
         420.  C       I L   WE    .         .         .         .  M   .         .         .         .         .
         430.  C       I LR  WE    .         .         .         .  M   .         .         .         .         .
         440.  C       I LR   E    .         .         .         .  M   .         .         .         .         .
         450.  C       I .L   E    .         .         .         .  M   .         .         .         .         .
         460.  C       I .L   E    .         .         .         .  M   .         .         .         .         .
  7.00   470.  C       I .L   WE   .         .         .         .  M   .         .         .         .         .
         480.  C       I .LR  WE   .         .         .         .  M   .         .         .         .         .
  8.00   490.  C        I.L R  E   .         .         .         .  M   .         .         .         .         .
         500.  C        I. LR  E   .         .         .         .  M   .         .         .         .         .
         510.  C        I. LR  WE  .         .         .         .  M   .         .         .         .         .
         520.  C        I. LR  WE  .         .         .         .  M   .         .         .         .         .
         530.  C         I  LR  E  .         .         .         .   M  .         .         .         .         .
         540.  C         I  LR  WE .         .         .         .   M  .         .         .         .         .
         550.  C         I  LR  WE .         .         .         .   M  .         .         .         .         .
         560.  C         .I L R  E .         .         .         .    M .         .         .         .         .
         570.  C         .I  LR  E .         .         .         .    M .         .         .         .         .
         580.  C         .I  LR  WE.         .         .         .    M .         .         .         .         .
         590.  C         . I LR  WE.         .         .         .    M .         .         .         .         .
  8.50   600.  C         . I L R WE.         .         .         .     M.         .         .         .         .
         610.  C         . I  LR  E.         .         .         .    M .         .         .         .         .
         620.  C         . I  LR  WE         .         .         .    M .         .         .         .         .
         630.  C         . I  LR  WE         .         .         .    M .         .         .         .         .
         640.  C         .  I  L   E         .         .         .   M  .         .         .         .         .
         650.  C         .  I  LR  E         .         .         .   M  .         .         .         .         .
         660.  C         .  I  LR  WE        .         .         .   M  .         .         .         .         .
         670.  C         .   I  L  WE        .         .         .  M   .         .         .         .         .
         680.  C         .   I  L  .E        .         .         .  M   .         .         .         .         .
         690.  C         .   I   L .WE       .         .         .  M   .         .         .         .         .
  9.00   700.  C         .    I  L .WE       .         .         .  M   .         .         .         .         .
```


THIS RUN EXECUTED 21AUG95 09:13:07

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK-EXISTING CONDI

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	469.30	29.00	470.85	.00	470.89	50.16	1.26	51.03	4.09
*	2.000	120.00	.00	.00	469.92	29.00	471.16	.00	471.19	21.08	1.02	55.54	6.32
	3.000	120.00	.00	.00	470.28	29.00	471.43	.00	471.47	28.76	1.13	46.58	5.41
	4.000	100.00	.00	.00	470.09	29.00	471.71	.00	471.86	53.31	1.76	20.87	3.97
	5.000	20.00	.00	.00	470.36	29.00	471.88	.00	471.96	46.77	1.34	25.70	4.24
	5.500	20.00	.00	.00	470.56	29.00	471.96	.00	472.08	70.97	1.53	21.38	3.44
*	6.000	20.00	.00	.00	470.78	29.00	472.09	.00	472.17	30.36	1.27	30.72	5.26
	7.000	70.00	.00	.00	470.97	29.00	472.32	.00	472.43	45.68	1.55	26.73	4.29
	8.000	20.00	.00	.00	471.02	29.00	472.43	.00	472.52	51.67	1.58	30.80	4.03
	8.500	102.00	.00	.00	471.62	29.00	472.98	.00	473.10	61.09	1.68	28.44	3.71
	9.000	102.00	.00	.00	472.20	29.00	473.57	.00	473.69	55.44	1.70	29.42	3.89

AMP CREEK-EXISTING CONDI

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	29.00	470.85	.00	.00	-.15	112.17	.00
*	2.000	29.00	471.16	.00	.31	.00	101.33	120.00
	3.000	29.00	471.43	.00	.27	.00	90.71	120.00
	4.000	29.00	471.71	.00	.29	.00	30.91	100.00
	5.000	29.00	471.88	.00	.16	.00	42.94	20.00
	5.500	29.00	471.96	.00	.09	.00	37.49	20.00
*	6.000	29.00	472.09	.00	.13	.00	42.13	20.00
	7.000	29.00	472.32	.00	.23	.00	44.30	70.00
	8.000	29.00	472.43	.00	.11	.00	55.60	20.00
	8.500	29.00	472.98	.00	.56	.00	53.20	102.00
	9.000	29.00	473.57	.00	.59	.00	56.11	102.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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*  HEC-2 WATER SURFACE PROFILES                 *        *  U.S. ARMY CORPS OF ENGINEERS          *
*                                               *        *  HYDROLOGIC ENGINEERING CENTER         *
*  Version   4.6.2;  May 1991                   *        *  609 SECOND STREET, SUITE D            *
*                                               *        *  DAVIS, CALIFORNIA 95616-4687          *
*  RUN DATE    21AUG95    TIME   09:16:07       *        *          (916) 756-1104                *
*************************************************        *****************************************
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X     X XXXXXXX  XXXXX          XXXXX
X     X X        X     X       X     X
X     X X        X                   X
XXXXXXX XXXX     X        XXXXX  XXXXX
X     X X        X              X
X     X X        X     X        X
X     X XXXXXXX  XXXXX          XXXXXXX
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21AUG95   09:16:07   PAGE   1

THIS RUN EXECUTED 21AUG95   09:16:07

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****************************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
****************************************
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T1   WATER SURFACE PROFILE: 100-YEAR FLOW   FILE: CMCROADP
T2   EXXON DRAINAGE   APRIL, 1981;8/95
T3   SWAMP CREEK-PROPOSED CONDITIONS (BOX CULVERTS) F&VD: MDL;SRB

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.005	1.	0	29.	471.	0

NC	.105	.105	.05	0	0	0	0	0	0	0
X1	1.	13.	118.	130.3	0	0	0	0	0	0
GR	480.	0	474.	50.	472.	82.	470.35	118.	470.28	120.
GR	470.34	124.	470.04	124.3	469.3	127.9	469.53	130.	470.3	130.3
GR	470.5	210.	472.	250.	474.	350.	0	0	0	0
X1	2.	11.	193.	209.	60.	70.	120.	0	0	0
GR	480.	0	474.	38.	472.	84.	470.7	150.	470.5	192.
GR	470.	193.	469.92	208.	470.4	209.	472.	250.	474.	288.
GR	480.	350.	0	0	0	0	0	0	0	0
X1	3.	13.	200.	216.	90.	140.	120.	0	0	0
GR	480.	0	474.	38.	472.	110.	471.	185.	470.51	200.
GR	470.3	201.64	470.28	206.77	470.31	210.5	470.51	216.	471.	230.
GR	472.	262.	476.	280.	480.	320.	0	0	0	0

X1	4.	13.	180.	191.	120.	100.	100.	0	0	0
GR	480.	0	476.	30.	474.	80.	472.	168.	471.13	180.
GR	470.09	181.	470.15	186.	470.43	190.	471.2	191.	472.	210.
GR	474.	235.	476.	258.	480.	300.	0	0	0	0

NC				.3	.5					

X1	5.	25.	216.	229.5	20.	20.	20.	0	0	0
X3				216.0	480.0	229.5	480.0			
GR	480.	0	476.	40.	474.	105.	472.	190.	471.5	208.
GR	471.70	216.	470.36	216.01	470.36	219.06	470.36	219.07	470.36	219.37
GR	470.36	219.38	470.36	222.43	470.36	222.44	470.36	222.74	470.36	222.75
GR	470.36	225.8	470.36	225.81	470.36	226.11	470.36	226.41	470.36	229.46
GR	470.36	229.47	471.3	229.5	471.9	238.0	472.0	240.0	480.0	300.0

4: 10 FT. X 8 FT. BOX CULVERTS

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SC	4.013	0.40	2.60	100	2.44	3.048	6.096	8.1	470.36	470.36
X1	5.5	0	0	0	20.	20.	20.	0	0	0
X2	0	0	2.0	472.8	475.92	0	0	0	0	0
X3	0	0	0	216.0	475.92	229.5	475.92	0	0	0

X1	6.	10.	265.	281.	20.	20.	20.	0	0	0
GR	480.	0	476.	91.	474.	168.	472.	253.	471.13	265.
GR	470.8	267.	470.78	280.	471.34	281.	472.	291.	480.	334.

NC				.1	.3					

X1	7.	12.	239.	252.	80.	55.	70.	0	0	0
GR	480.	0	478.	18.	474.	140.	472.	226.	471.53	239.
GR	471.05	241.	470.97	246.	471.05	251.	471.54	252.	472.	253.
GR	474.	275.	480.	295.	0	0	0	0	0	0

X1	8.	11.	268.	280.	20.	20.	20.	0	0	0
GR	480.	0	474.	160.	472.	256.	471.58	268.	471.02	271.
GR	471.02	274.	471.58	279.	471.8	280.	472.	288.	474.	303.
GR	480.	317.	0	0	0	0	0	0	0	0

X1	8.5				100.	105.	102.		0.6	

X1	9.	13.	235.	246.	100.	105.	102.	0	0	0
GR	480.	0	478.	20.	476.	142.	474.	210.	472.89	235.
GR	472.25	236.	472.26	240.	472.2	245.	472.86	246.	474.	295.
GR	476.	313.	478.	350.	480.	363.	0	0	0	0

1

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  Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
  TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
  SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


*PROF 1

*SECNO 1.000
     1.000      1.55     470.85       .00     471.00     470.89        .04        .00        .00     470.35
      29.0        .7       13.8      14.5        2.7       11.0       37.4         .0         .0     470.30
       .00       .27       1.26       .39       .105       .050       .105       .000     469.30     107.12
   .005016        0.         0.        0.          0          0          6        .00     112.17     219.29


*SECNO 2.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.54

     2.000      1.24     471.16       .00        .00     471.19        .04        .30        .00     470.00
      29.0       8.0       19.3       1.7       29.4       18.9        7.3        4.3        7.8     470.40
       .04       .27       1.02       .23       .105       .050       .105       .000     469.92     126.98
   .002108       60.       120.       70.          2          0          0        .00     101.33     228.31


*SECNO 3.000
     3.000      1.15     471.43       .00        .00     471.47        .05        .28        .00     470.51
      29.0       5.2       19.6       4.2       16.9       17.3       12.3        9.9       18.1     470.51
       .07       .31       1.13       .34       .105       .050       .105       .000     470.28     152.96
   .002876       90.       120.      140.          2          0          0        .00      90.71     243.67


*SECNO 4.000
     4.000      1.62     471.71       .00        .00     471.86        .15        .39        .00     471.13
      29.0        .7       27.5        .8        2.3       15.6        3.0       13.5       24.7     471.20
       .09       .30       1.76       .28       .105       .050       .105       .000     470.09     172.07
   .005331      120.       100.      100.          1          0          0        .00      30.91     202.99


CCHV=      .300 CEHV=      .500
*SECNO 5.000

3470 ENCROACHMENT STATIONS=      216.0      229.5  TYPE=        1  TARGET=        13.500
 ELENCL=     480.00  ELENCR=     480.00
     5.000      1.50     471.86       .00        .00     471.97        .10        .09        .01     471.70
      29.0        .0       29.0        .0         .0       20.3         .0       13.9       25.2     480.00
       .09       .00       1.43       .00       .000       .050       .000       .000     470.36     216.00
   .003867       20.        20.       20.          2          0          0        .00      13.50     229.50
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  SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
  Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
  TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
  SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST
```

SPECIAL CULVERT

4	.013	.40	2.60	100.00	2.44	3.05	6.10	8	1	470.36	470.36

CHART 8 - BOX CULVERT WITH FLARED WINGWALLS; NO INLET TOP EDGE BEVEL
SCALE 1 - WINGWALLS FLARED 30 TO 75 DEGREES

*SECNO 5.500

SPECIAL CULVERT OUTLET CONTROL
EGIC = 471.680 EGOC = 472.046 PCWSE= 471.864 ELTRD= 475.920

SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
471.68	472.05	.08	0.	29.	1.349	29.7	475.92	0.

3470 ENCROACHMENT STATIONS= 216.0 229.5 TYPE= 1 TARGET= 13.500
ELENCL= 475.92 ELENCR= 475.92

5.500	1.59	471.95	.00	.00	472.05	.09	.08	.00	471.70
29.0	.0	29.0	.0	.0	21.5	.0	14.3	25.4	475.92
.10	.00	1.35	.00	.000	.050	.000	.000	470.36	216.00
.003238	20.	20.	20.	2	0	0	.00	13.50	229.50

*SECNO 6.000

6.000	1.25	472.03	.00	.00	472.12	.09	.07	.00	471.13
29.0	1.9	26.1	1.0	5.5	19.1	3.5	14.8	26.0	471.34
.10	.34	1.36	.29	.105	.050	.105	.000	470.78	251.97
.003714	20.	20.	20.	0	0	0	.00	39.16	291.13

CCHV= .100 CEHV= .300
*SECNO 7.000

7.000	1.34	472.31	.00	.00	472.42	.11	.29	.01	471.53
29.0	3.5	25.2	.3	9.1	16.0	1.1	16.8	29.0	471.54
.12	.38	1.57	.30	.105	.050	.105	.000	470.97	212.69
.004736	80.	70.	55.	2	0	0	.00	43.71	256.40

*SECNO 8.000

8.000	1.40	472.42	.00	.00	472.52	.10	.10	.00	471.58
29.0	4.9	22.1	2.0	11.8	13.9	4.8	17.3	29.9	471.80
.12	.41	1.59	.42	.105	.050	.105	.000	471.02	235.83
.005267	20.	20.	20.	2	0	0	.00	55.32	291.15

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 8.500

8.500	1.37	472.99	.00	.00	473.10	.11	.58	.00	472.18
29.0	4.6	22.5	1.9	10.6	13.4	4.4	20.3	35.4	472.40
.14	.43	1.68	.43	.105	.050	.105	.000	471.62	237.68
.006119	100.	102.	105.	1	0	0	.00	53.18	290.86

```
*SECNO 9.000
    9.000       1.37    473.57       .00       .00    473.68       .12       .58       .00    472.89
     29.0        1.8      23.4       3.8       5.2      14.0      10.9      23.3      41.1    472.86
      .16        .34      1.67       .35      .105      .050      .105      .000    472.20    219.66
  .005310       100.      102.      105.         0         0         0       .00     56.90    276.56
```

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1
PROFILE FOR STREAM  AMP CREEK-PROPOSED CONDI



PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA



ELEVATION   469.      471.      473.      475.      477.      479.      481.      483.      485.      487.
    SECNO   CUMDIS

     1.00      0.  I    L  E .        .   M    .         .         .         .         .         .         .         .
              10.  I    L  E .        .     M  .         .         .         .         .         .         .         .
              20.  CI   L  E .        .        M.        .         .         .         .         .         .         .
              30.  CI   L  E .        .         .M       .         .         .         .         .         .         .
              40.  CI   L  E .        .         .   M    .         .         .         .         .         .         .
              50.  CI   L  WE.        .         .     M  .         .         .         .         .         .         .
              60.  C I LR   E.        .         .        M.        .         .         .         .         .         .
              70.  C I LR   E.        .         .         .M       .         .         .         .         .         .
              80.  C I LR   E.        .         .         .   M    .         .         .         .         .         .
              90.  C I LR   E.        .         .         .     M  .         .         .         .         .         .
             100.  C  ILR   E.        .         .         .        M.        .         .         .         .         .
             110.  C  ILR   E.        .         .         .         .M       .         .         .         .         .
     2.00    120.  C  IL R  E.        .         .         .         .   M    .         .         .         .         .
             130.  C  IL R  WE        .         .         .         .   M    .         .         .         .         .
             140.  C  IL R  WE        .         .         .         .   M    .         .         .         .         .
             150.  C   I R   E        .         .         .         .   M    .         .         .         .         .
             160.  C   I R   E        .         .         .         .   M    .         .         .         .         .
             170.  C   ILR   E        .         .         .         .   M    .         .         .         .         .
             180.  C   ILR   E        .         .         .         .   M    .         .         .         .         .
             190.  C   ILR   E        .         .         .         .   M    .         .         .         .         .
             200.  C   ILR   E        .         .         .         .   M    .         .         .         .         .
             210.  C   ILR   WE       .         .         .         .   M    .         .         .         .         .
             220.  C    IL   WE       .         .         .         .   M    .         .         .         .         .
             230.  C    IL   .E       .         .         .         .   M    .         .         .         .         .
     3.00    240.  C    IL   .E       .         .         .         .   M    .         .         .         .         .
             250.  C    IL   .E       .         .         .         .   M    .         .         .         .         .
             260.  C    I L  .E       .         .         .         .   M    .         .         .         .         .
             270.  C    I L  .E       .         .         .         .   M    .         .         .         .         .
             280.  C    I L  .WE      .         .         .         .   M    .         .         .         .         .
             290.  C   I   L .WE      .         .         .         .   M    .         .         .         .         .
             300.  C   I   L .WE      .         .         .         .   M    .         .         .         .         .
             310.  C   I   L . E      .         .         .         .   M    .         .         .         .         .
             320.  C   I    L. E      .         .         .         .   M    .         .         .         .         .
             330.  C   I    L. WE     .         .         .         .   M    .         .         .         .         .
     4.00    340.  C   I    LR WE     .         .         .         .   M    .         .         .         .         .
             350.  C    I    .LWE     .         . R       .         .   M    .         .         .         .         .
     5.00    360.  C    I    . LE     .         .         .         .   R    .         .         .         .         .
             370.  C    I    . LWE    .         .         . R       .   M    .         .         .         .         .
     5.50    380.  C    I    . LWE    .         .  R      .         .   M    .         .         .         .         .
             390.  C     I   .L WE    . R       .         .         .   M    .         .         .         .         .
     6.00    400.  C      I LR   E    .         .         .         .   M    .         .         .         .         .
             410.  C       ILR   E    .         .         .         .   M    .         .         .         .         .
```

```
        430.  C      I LR  WE  .        .        .        . M     .        .        .        .        .
        440.  C      I LR  WE  .        .        .        . M     .        .        .        .        .
        450.  C      I .L   E  .        .        .        . M     .        .        .        .        .
        460.  C      I .L   E  .        .        .        . M     .        .        .        .        .
  7.00  470.  C      I .L   WE .        .        .        . M     .        .        .        .        .
        480.  C      I .LR  WE .        .        .        . M     .        .        .        .        .
  8.00  490.  C       I.L R  E .        .        .        . M     .        .        .        .        .
        500.  C       I. LR  E .        .        .        . M     .        .        .        .        .
        510.  C       I. LR  WE .       .        .        . M     .        .        .        .        .
        520.  C       I. LR  WE .       .        .        . M     .        .        .        .        .
        530.  C        I  LR  E .       .        .        .  M    .        .        .        .        .
        540.  C        I  LR  WE .      .        .        .  M    .        .        .        .        .
        550.  C        I  LR  WE .      .        .        .  M    .        .        .        .        .
        560.  C        .I L R  E .      .        .        .   M   .        .        .        .        .
        570.  C        .I  LR  E .      .        .        .   M   .        .        .        .        .
        580.  C        .I  LR  WE.      .        .        .   M   .        .        .        .        .
        590.  C        . I LR  WE.      .        .        .   M   .        .        .        .        .
  8.50  600.  C        . I L R WE.      .        .        .    M  .        .        .        .        .
        610.  C        . I  LR  E.      .        .        .   M   .        .        .        .        .
        620.  C        . I  LR  WE      .        .        .   M   .        .        .        .        .
        630.  C        . I  LR  WE      .        .        .   M   .        .        .        .        .
        640.  C        .  I  L   E      .        .        .  M    .        .        .        .        .
        650.  C        .  I  LR  E      .        .        .  M    .        .        .        .        .
        660.  C        .  I  LR  WE     .        .        .  M    .        .        .        .        .
        670.  C        .   I  L  WE     .        .        . M     .        .        .        .        .
        680.  C        .   I  L  .E     .        .        . M     .        .        .        .        .
        690.  C        .   I   L .WE    .        .        . M     .        .        .        .        .
  9.00  700.  C        .    I  L .WE    .        .        . M     .        .        .        .        .
```

1

THIS RUN EXECUTED 21AUG95 09:16:08

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**************************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
**************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK-PROPOSED CONDI

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	469.30	29.00	470.85	.00	470.89	50.16	1.26	51.03	4.09
*	2.000	120.00	.00	.00	469.92	29.00	471.16	.00	471.19	21.08	1.02	55.54	6.32
	3.000	120.00	.00	.00	470.28	29.00	471.43	.00	471.47	28.76	1.13	46.58	5.41
	4.000	100.00	.00	.00	470.09	29.00	471.71	.00	471.86	53.31	1.76	20.87	3.97
	5.000	20.00	.00	.00	470.36	29.00	471.86	.00	471.97	38.67	1.43	20.29	4.66

6.000	20.00	.00	.00	470.78	29.00	472.03	.00	472.12	37.14	1.36	28.19	4.76
7.000	70.00	.00	.00	470.97	29.00	472.31	.00	472.42	47.36	1.57	26.25	4.21
8.000	20.00	.00	.00	471.02	29.00	472.42	.00	472.52	52.67	1.59	30.52	4.00
8.500	102.00	.00	.00	471.62	29.00	472.99	.00	473.10	61.19	1.68	28.42	3.71
9.000	102.00	.00	.00	472.20	29.00	473.57	.00	473.68	53.10	1.67	30.10	3.98

AMP CREEK-PROPOSED CONDI

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	29.00	470.85	.00	.00	-.15	112.17	.00
*	2.000	29.00	471.16	.00	.31	.00	101.33	120.00
	3.000	29.00	471.43	.00	.27	.00	90.71	120.00
	4.000	29.00	471.71	.00	.29	.00	30.91	100.00
	5.000	29.00	471.86	.00	.15	.00	13.50	20.00
	5.500	29.00	471.95	.00	.09	.00	13.50	20.00
	6.000	29.00	472.03	.00	.08	.00	39.16	20.00
	7.000	29.00	472.31	.00	.28	.00	43.71	70.00
	8.000	29.00	472.42	.00	.11	.00	55.32	20.00
	8.500	29.00	472.99	.00	.57	.00	53.18	102.00
	9.000	29.00	473.57	.00	.58	.00	56.90	102.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

```
X     X  XXXXXXX   XXXXX            XXXXX
X     X  X        X     X          X     X
X     X  X        X                      X
XXXXXXX  XXXX     X         XXXXX   XXXXX
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXXXXXX
```


THIS RUN EXECUTED 21AUG95 09:14:09

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

T1 WATER SURFACE PROFILE: 100-YEAR FLOW FILE: CMCRDSPN
T2 EXXON DRAINAGE APRIL, 1981;8/95
T3 SWAMP CREEK-PROPOSED CONDITIONS (SPAN BRIDGE) F&VD: MDL;SRB

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.005	1.	0	29.	471.	0

NC	.105	.105	.05	0	0	0	0	0	0	0
X1	1.	13.	118.	130.3	0	0	0	0	0	0
GR	480.	0	474.	50.	472.	82.	470.35	118.	470.28	120.
GR	470.34	124.	470.04	124.3	469.3	127.9	469.53	130.	470.3	130.3
GR	470.5	210.	472.	250.	474.	350.	0	0	0	0
X1	2.	11.	193.	209.	60.	70.	120.	0	0	0
GR	480.	0	474.	38.	472.	84.	470.7	150.	470.5	192.
GR	470.	193.	469.92	208.	470.4	209.	472.	250.	474.	288.
GR	480.	350.	0	0	0	0	0	0	0	0
X1	3.	13.	200.	216.	90.	140.	120.	0	0	0
GR	480.	0	474.	38.	472.	110.	471.	185.	470.51	200.
GR	470.3	201.64	470.28	206.77	470.31	210.5	470.51	216.	471.	230.
GR	472.	262.	476.	280.	480.	320.	0	0	0	0

```
X1      4.       13.      180.      191.      120.      100.      100.        0         0         0
GR    480.        0       476.       30.      474.       80.      472.      163.     471.13     180.
GR    470.09    181.      470.15    186.      470.43    190.      471.2     191.      472.      210.
GR    474.      235.      476.      258.      480.      300.        0         0         0         0

NC                                   .3        .5

X1      5.       23.      216.      229.5      20.       20.       20.        0         0         0
X3                                  203.54              241.94
GR    475.92      0       475.92     40.      474.      105.      472.      190.      471.5     203.53
GR    471.5     203.54    471.5     208       471.70    216       470.36    216.01    470.36    219.06
GR    470.36    219.37    470.36    222.43    470.36    222.74    470.36    222.8     470.36    226.11
GR    470.36    226.41    470.36    229.46    471.3     229.5     471.9     238.0     472.0     240.0
GR    472.4     241.94    472.4     241.95    480.0     300.0

1
  21AUG95       09:14:09                                                                  PAGE     2



X1      5.1                                      2.        2.        2.
X3                                  203.54              241.94
   1.25     1.60     2.70            38.4          84.7      470.36  470.36

X1      5.4       0         0         0        16.       16.       16.        0         0         0
        0        0       1.0      472.8  475.92        0         0        0        0        0
X3      0         0         0       203.54    475.92    241.94    475.92      0         0         0
BT     -9         0       475.92    475.92     40       475.92    475.92    105       475.92    474
BT              190       475.92    472       203.53    475.92    471.5     203.54    475.92    472.8
BT              241.94    475.92    472.8     241.95    475.92    472.4     300       480       480


X1      5.5                                      2.        2.        2.
X3                                    201                 244.5


X1      6.       10.      265.      281.       20.       20.       20.        0         0         0
GR    480.        0       476.       91.      474.      168.      472.      253.      471.13    265.
GR    470.8     267.      470.78    280.      471.34    281.      472.      291.      480.      334.


NC                                   .1        .3

X1      7.       12.      239.      252.       80.       55.       70.        0         0         0
GR    480.        0       478.       18.      474.      140.      472.      226.      471.53    239.
GR    471.05    241.      470.97    246.      471.05    251.      471.54    252.      472.      253.
GR    474.      275.      480.      295.        0         0         0         0         0         0


X1      8.       11.      268.      280.       20.       20.       20.        0         0         0
GR    480.        0       474.      160.      472.      256.      471.58    268.      471.02    271.
GR    471.02    274.      471.58    279.      471.8     280.      472.      288.      474.      303.
GR    480.      317.        0         0         0         0         0         0         0         0


X1      8.5                                    100.      105.      102.                 0.6


X1      9.       13.      235.      246.      100.      105.      102.        0         0         0
GR    480.        0       478.       20.      476.      142.      474.      210.      472.89    235.
GR    472.25    236.      472.26    240.      472.2     245.      472.86    246.      474.      295.
```

```
 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1

*SECNO 1.000
    1.000      1.55    470.85       .00    471.00    470.89       .04       .00       .00    470.35
     29.0        .7      13.8      14.5       2.7      11.0      37.4        .0        .0    470.30
      .00       .27      1.26       .39      .105      .050      .105      .000    469.30    107.12
  .005016        0.        0.        0.         0         0         6       .00    112.17    219.29


*SECNO 2.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.54

    2.000      1.24    471.16       .00       .00    471.19       .04       .30       .00    470.00
     29.0       8.0      19.3       1.7      29.4      18.9       7.3       4.3       7.8    470.40
      .04       .27      1.02       .23      .105      .050      .105      .000    469.92    126.98
  .002108       60.      120.       70.         2         0         0       .00    101.33    228.31


*SECNO 3.000
    3.000      1.15    471.43       .00       .00    471.47       .05       .28       .00    470.51
     29.0       5.2      19.6       4.2      16.9      17.3      12.3       9.9      18.1    470.51
      .07       .31      1.13       .34      .105      .050      .105      .000    470.28    152.96
  .002876       90.      120.      140.         2         0         0       .00     90.71    243.67


*SECNO 4.000
    4.000      1.62    471.71       .00       .00    471.86       .15       .39       .00    471.13
     29.0        .7      27.5        .8       2.3      15.6       3.0      13.5      24.7    471.20
      .09       .30      1.76       .28      .105      .050      .105      .000    470.09    172.07
  .005331      120.      100.      100.         1         0         0       .00     30.91    202.99


CCHV=      .300 CEHV=      .500
*SECNO 5.000

3470 ENCROACHMENT STATIONS=       203.5      241.9  TYPE=       1  TARGET=       38.400
    5.000      1.52    471.88       .00       .00    471.96       .09       .08       .02    471.70
     29.0       1.0      27.5        .6       3.9      20.5       2.4      14.0      25.4    471.30
      .09       .24      1.34       .23      .105      .050      .105      .000    470.36    203.54
  .003180       20.       20.       20.         2         0         0       .00     34.14    237.68
```



```
 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
```

```
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *SECNO 5.100

 3470 ENCROACHMENT STATIONS=       203.5       241.9  TYPE=        1  TARGET=        38.400
      5.100       1.52     471.88       .00        .00     471.97        .09        .01        .00     471.70
       29.0        1.0       27.4        .6        4.0       20.6        2.4       14.0       25.4     471.30
        .09        .25       1.33       .23       .105       .050       .105       .000     470.36     203.54
    .003116         2.         2.        2.          0          0          0        .00      34.25     237.79


 *SECNO 5.400

 3370 NORMAL BRIDGE, NRD=    9 MIN ELTRD=    475.92 MAX ELLC= ********


 3470 ENCROACHMENT STATIONS=       203.5       241.9  TYPE=        1  TARGET=        38.400
  ELENCL=      475.92  ELENCR=      475.92
      5.400       1.58     471.94       .00        .00     472.02        .08        .05        .00     471.70
       29.0        1.2       27.2        .7        4.6       21.2        2.9       14.5       26.0     471.30
        .10        .25       1.28       .24       .105       .050       .105       .000     470.36     203.54
    .002738        16.        16.       16.          0          0          0        .00      35.16     238.70


 *SECNO 5.500

 3470 ENCROACHMENT STATIONS=       201.0       244.5  TYPE=        1  TARGET=        43.500
      5.500       1.59     471.95       .00        .00     472.03        .07        .01        .00     471.70
       29.0        1.5       26.8        .7        5.8       21.4        3.0       14.5       26.1     471.30
        .10        .26       1.25       .24       .105       .050       .105       .000     470.36     201.00
    .002601         2.         2.        2.          0          0          0        .00      37.95     238.95


 *SECNO 6.000
      6.000       1.23     472.01       .00        .00     472.10        .09        .06        .01     471.13
       29.0        1.8       26.2       1.0        5.3       18.8        3.4       15.1       26.8     471.34
        .10        .35       1.39       .29       .105       .050       .105       .000     470.78     252.76
    .003952        20.        20.       20.          0          0          0        .00      38.27     291.03


 CCHV=       .100 CEHV=       .300
 *SECNO 7.000
      7.000       1.33     472.30       .00        .00     472.41        .11        .31        .01     471.53
       29.0        3.4       25.3        .3        8.9       15.9        1.0       17.0       29.8     471.54
        .12        .38       1.59       .30       .105       .050       .105       .000     470.97     213.06
    .004875        80.        70.       55.          2          0          0        .00      43.25     256.31


   21AUG95     09:14:09                                                                                PAGE     5


    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *SECNO 8.000
      8.000       1.39     472.41       .00        .00     472.52        .10        .10        .00     471.58
       29.0        4.8       22.2       2.0       11.6       13.8        4.8       17.6       30.8     471.80
```

.005376	20.	20.	20.	2	0	0	.00	55.03	291.11

*SECNO 8.500

8.500	1.37	472.99	.00	.00	473.10	.11	.58	.00	472.18
29.0	4.6	22.5	1.9	10.7	13.5	4.4	20.6	36.2	472.40
.14	.43	1.67	.43	.105	.050	.105	.000	471.62	237.59
.006075	100.	102.	105.	1	0	0	.00	53.28	290.88

*SECNO 9.000

9.000	1.37	473.57	.00	.00	473.68	.12	.58	.00	472.89
29.0	1.8	23.5	3.8	5.2	14.0	10.8	23.6	41.9	472.86
.16	.34	1.68	.35	.105	.050	.105	.000	472.20	219.72
.005359	100.	102.	105.	1	0	0	.00	56.73	276.45

1

PROFILE FOR STREAM AMP CREEK-PROPOSED CONDI

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION   469.      471.      473.      475.      477.      479.      481.      483.      485.      487.
    SECNO   CUMDIS

      1.00    0.  I     L  E .         .   M     .         .         .         .         .         .         .         .
             10.  I     L  E .         .     M   .         .         .         .         .         .         .         .
             20.  CI    L  E .         .        M.         .         .         .         .         .         .         .
             30.  CI    L  E .         .         .M        .         .         .         .         .         .         .
             40.  CI    L  E .         .         .   M     .         .         .         .         .         .         .
             50.  CI    L  WE.         .         .     M   .         .         .         .         .         .         .
             60.  C I LR    E.         .         .        M.         .         .         .         .         .         .
             70.  C I LR    E.         .         .         .M        .         .         .         .         .         .
             80.  C I LR    E.         .         .         .   M     .         .         .         .         .         .
             90.  C I LR    E.         .         .         .     M   .         .         .         .         .         .
            100.  C  ILR    E.         .         .         .        M.         .         .         .         .         .
            110.  C  ILR    E.         .         .         .         .M        .         .         .         .         .
      2.00  120.  C  IL R   E.         .         .         .         .   M     .         .         .         .         .
            130.  C  IL R   WE         .         .         .         .   M     .         .         .         .         .
            140.  C  IL R   WE         .         .         .         .   M     .         .         .         .         .
            150.  C   I R    E         .         .         .         .   M     .         .         .         .         .
            160.  C   I R    E         .         .         .         .   M     .         .         .         .         .
            170.  C   ILR    E         .         .         .         .   M     .         .         .         .         .
            180.  C   ILR    E         .         .         .         .   M     .         .         .         .         .
            190.  C   ILR    E         .         .         .         .   M     .         .         .         .         .
            200.  C   ILR    E         .         .         .         .   M     .         .         .         .         .
            210.  C   ILR   WE         .         .         .         .   M     .         .         .         .         .
            220.  C    IL   WE         .         .         .         .   M     .         .         .         .         .
            230.  C    IL    .E        .         .         .         .   M     .         .         .         .         .
      3.00  240.  C    IL    .E        .         .         .         .   M     .         .         .         .         .
            250.  C    IL    .E        .         .         .         .   M     .         .         .         .         .
            260.  C    I L   .E        .         .         .         .   M     .         .         .         .         .
            270.  C    I L   .E        .         .         .         .   M     .         .         .         .         .
            280.  C    I L   .WE       .         .         .         .   M     .         .         .         .         .
            290.  C   I    L .WE       .         .         .         .   M     .         .         .         .         .
            300.  C   I    L .WE       .         .         .         .   M     .         .         .         .         .
            310.  C   I    L . E       .         .         .         .   M     .         .         .         .         .
            320.  C   I     L. E       .         .         .         .   M     .         .         .         .         .
```

```
         4.00   340.  C   I    LR WE      .         .         .        .   M     .         .        .         .         .
                350.  C    I    RLWE      .         .         .        .   M     .         .        .         .         .
         5.00   360.  C    I    R LE      .         .         .        .   M     .         .        .         .         .
         5.10   370.  C    I    R LE      .         .         .        .   M     .         .        .         .         .
         5.40   380.  C    I    R LWE     .         .         .        .   M     .         .        .         .         .
         5.50   390.  C    I    R LWE     .         .         .        .   M     .         .        .         .         .
         6.00   400.  C      I LR   E     .         .         .        .   M     .         .        .         .         .
                410.  C       ILR   E     .         .         .        .   M     .         .        .         .         .
                420.  C       I L   E     .         .         .        .   M     .         .        .         .         .
                430.  C       I LR  WE    .         .         .        .   M     .         .        .         .         .
                440.  C       I LR  WE    .         .         .        .   M     .         .        .         .         .
                450.  C       I .L   E    .         .         .        .   M     .         .        .         .         .
                460.  C       I .L   E    .         .         .        .   M     .         .        .         .         .
         7.00   470.  C       I .L   WE   .         .         .        .   M     .         .        .         .         .
                480.  C       I .LR  WE   .         .         .        .   M     .         .        .         .         .
         8.00   490.  C        I.L R  E   .         .         .        .   M     .         .        .         .         .
                500.  C        I. LR  E   .         .         .        .   M     .         .        .         .         .
                510.  C        I. LR  WE  .         .         .        .   M     .         .        .         .         .
                520.  C        I. LR  WE  .         .         .        .   M     .         .        .         .         .
                530.  C         I  LR  E  .         .         .        .    M    .         .        .         .         .
                540.  C         I  LR  WE .         .         .        .    M    .         .        .         .         .
                550.  C         I  LR  WE .         .         .        .    M    .         .        .         .         .
                560.  C         .I L R  E .         .         .        .     M   .         .        .         .         .
                570.  C         .I  LR  E .         .         .        .     M   .         .        .         .         .
                580.  C         .I  LR  WE.         .         .        .     M   .         .        .         .         .
                590.  C         . I LR  WE.         .         .        .     M   .         .        .         .         .
         8.50   600.  C         . I L R WE.         .         .        .      M  .         .        .         .         .
                610.  C         . I  LR  E.         .         .        .     M   .         .        .         .         .
                620.  C         . I  LR  WE         .         .        .     M   .         .        .         .         .
                630.  C         . I  LR  WE         .         .        .     M   .         .        .         .         .
                640.  C         .  I  L   E         .         .        .    M    .         .        .         .         .
                650.  C         .  I  LR  E         .         .        .    M    .         .        .         .         .
                660.  C         .  I  LR WE         .         .        .    M    .         .        .         .         .
                670.  C         .   I  L WE         .         .        .   M     .         .        .         .         .
                680.  C         .   I  L .E         .         .        .   M     .         .        .         .         .
                690.  C         .   I  L .WE        .         .        .   M     .         .        .         .         .
         9.00   700.  C         .    I L .WE        .         .        .   M     .         .        .         .         .
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                                                                                    THIS RUN EXECUTED 21AUG95    09:14:09
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 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK-PROPOSED CONDI

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
1.000	.00	.00	.00	469.30	29.00	470.85	.00	470.89	50.16	1.26	51.03	4.09

*	2.000	120.00	.00	.00	469.92	29.00	471.16	.00	471.19	21.08	1.02	55.54	6.32
	3.000	120.00	.00	.00	470.28	29.00	471.43	.00	471.47	28.76	1.13	46.58	5.41
	4.000	100.00	.00	.00	470.09	29.00	471.71	.00	471.86	53.31	1.76	20.87	3.97
	5.000	20.00	.00	.00	470.36	29.00	471.88	.00	471.96	31.80	1.34	26.72	5.14
	5.100	2.00	.00	.00	470.36	29.00	471.88	.00	471.97	31.16	1.33	26.99	5.20
	5.400	16.00	475.92	-999999.00	470.36	29.00	471.94	.00	472.02	27.38	1.28	28.72	5.54
	5.500	2.00	.00	.00	470.36	29.00	471.95	.00	472.03	26.01	1.25	30.18	5.69
	6.000	20.00	.00	.00	470.78	29.00	472.01	.00	472.10	39.52	1.39	27.47	4.61
	7.000	70.00	.00	.00	470.97	29.00	472.30	.00	472.41	48.75	1.59	25.88	4.15
	8.000	20.00	.00	.00	471.02	29.00	472.41	.00	472.52	53.76	1.60	30.22	3.96
	8.500	102.00	.00	.00	471.62	29.00	472.99	.00	473.10	60.75	1.67	28.52	3.72
	9.000	102.00	.00	.00	472.20	29.00	473.57	.00	473.68	53.59	1.68	29.95	3.96

1

AMP CREEK-PROPOSED CONDI

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	29.00	470.85	.00	.00	-.15	112.17	.00
*	2.000	29.00	471.16	.00	.31	.00	101.33	120.00
	3.000	29.00	471.43	.00	.27	.00	90.71	120.00
	4.000	29.00	471.71	.00	.29	.00	30.91	100.00
	5.000	29.00	471.88	.00	.16	.00	34.14	20.00
	5.100	29.00	471.88	.00	.01	.00	34.25	2.00
	5.400	29.00	471.94	.00	.06	.00	35.16	16.00
	5.500	29.00	471.95	.00	.01	.00	37.95	2.00
	6.000	29.00	472.01	.00	.06	.00	38.27	20.00
	7.000	29.00	472.30	.00	.29	.00	43.25	70.00
	8.000	29.00	472.41	.00	.11	.00	55.03	20.00
	8.500	29.00	472.99	.00	.57	.00	53.28	102.00
	9.000	29.00	473.57	.00	.58	.00	56.73	102.00

1

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Attachment 3

HEC-2 Modeling for Railroad Spur Crossing

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 *  HEC-2 WATER SURFACE PROFILES                 *
 *                                               *
 *  Version   4.6.2;  May 1991                   *
 *                                               *
 *  RUN DATE    21AUG95     TIME    08:13:12     *
 *************************************************
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 *  U.S. ARMY CORPS OF ENGINEERS          *
 *  HYDROLOGIC ENGINEERING CENTER         *
 *  609 SECOND STREET, SUITE D            *
 *  DAVIS, CALIFORNIA 95616-4687          *
 *           (916) 756-1104               *
 ******************************************
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X     X  XXXXXXX   XXXXX             XXXXX
X     X  X        X     X           X     X
X     X  X        X                       X
XXXXXXX  XXXX     X          XXXXX   XXXXX
X     X  X        X                 X
X     X  X        X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 21AUG95   08:13:12

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****************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
****************************************
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T1    WATER SURFACE PROFILE:  100-YEAR FLOW     FILE: "CMCRRE"     **********
T2    RAILROAD DRAINAGE                         AUGUST, 1981:8/95  * METRIC *
T3    SWAMP CREEK - EXISTING CONDITIONS         F&VD: MDL/SRB      **********
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.001500	1.0	0	25.	480.69	0

NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.0	10.0	100.0	109.7	0	0	0	0	0	0
GR	482.2	0	482.	50.	481.	100.	478.58	101.	478.44	104.
GR	478.59	105.2	478.61	108.7	479.8	109.7	481.	160.	482.	200.
NC	.024	.024	.024	.3	.5	0	0	0	0	0
X1	1.5	20.	103.05	106.	20	20	20	0	0	0
X3	10.	0	0	0	0	0	0	479.5	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
X1	1.6	31.	103.05	106.	2.	2.	2.	0	0	0
BT	31.	0	482.24	482.24	50.	482.04	482.04	100.	481.04	481.04

BT	479.5	479.16	103.24	479.5	479.26	103.36	479.5	479.33	103.5	479.5
BT	479.3	103.64	479.5	479.33	103.76	479.5	479.26	103.86	479.5	479.16
BT	103.93	479.5	479.04	103.95	479.5	478.9	104.	479.5	479.2	105.2
BT	479.8	479.2	105.38	479.83	479.2	105.41	479.83	479.39	105.5	479.83
BT	479.6	105.64	479.82	479.7	105.81	479.82	479.79	106.	479.83	479.82
BT	106.19	479.8	479.79	106.36	479.79	479.7	106.5	479.79	479.56	106.59
BT	479.8	479.39	106.62	479.78	479.2	108.7	479.7	479.7	109.7	479.84
BT	479.84	200.	482.04	482.04	0	0	0	0	0	0
GR	482.24	0	482.04	50.	481.04	100.	479.5	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.5	103.64	478.54	103.76	478.64	103.86	478.76	103.93	478.9	103.95
GR	479.2	104.	479.2	105.2	479.2	105.38	479.01	105.41	478.84	105.5
GR	478.7	105.64	478.61	105.81	478.58	106.	478.61	106.19	478.7	106.36
GR	478.8	106.5	479.01	106.59	479.2	106.62	479.7	108.7	479.84	109.7
GR	482.04	200.	0	0	0	0	0	0	0	0

X1	1.7	0	0	0	10.	10.	10.	0	0	0
X2	0	0	0	0	0	0	1.	0	0	0
X1	1.8	20.	103.05	106.	2.	2.	2.	0	.04	0
X3	10.0	0	0	0	0	0	0	479.50	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.9	0	0	0	50.	50.	50.	0	.100	0
X1	2.	10.	137.	155.	70.	100.	95.	0	0	0
GR	482.2	0	482.	66.	479.15	130.	479.	137.	478.85	138.
GR	478.68	154.	479.	155.	479.3	165.	480.	210.	482.1	300.
X1	3.	10.	191.	209.	140.	140.	140.	0	0	0
GR	484.	0	482.	95.	479.36	180.	479.21	191.	479.07	191.5
GR	478.88	200.	478.875	208.5	479.215	209.	479.555	223.	482.	320.
X1	4.	12.	143.	157.	60.	70.	68.	0	0	0
GR	484.	0	482.	80.	480.	100.	479.32	130.	479.3	143.
GR	479.2	143.5	478.635	148.5	479.11	156.5	479.32	157.	479.31	169.
GR	480.	177.	482.	212.	0	0	0	0	0	0
X1	5.	11.	144.	146.6	22.	27.	22.	0	0	0
GR	484.	0	482.	90.	480.	120.	479.405	130.	479.405	144.
GR	478.69	144.3	478.69	146.3	479.385	146.6	479.385	155.	480.	170.
GR	482.	230.	0	0	0	0	0	0	0	0
NH	5.	.150	107.	.045	114.	.150	131.	.045	142.	.150
NH	210.	0	0	0	0	0	0	0	0	0
X1	6.	18.	107.	142.	40.	48.	45.	0	0	0

GR	478.84	109.5	479.22	113.5	479.38	114.	479.375	122.	479.35	131.
GR	479.05	131.5	478.75	136.5	478.97	141.5	479.375	142.	479.89	167.
GR	480.	173.	482.	179.	484.	210.	0	0	0	0
NC	.15	.15	.065	0	0	0	0	0	0	0
X1	7.	11.	102.	115.5	40.	55.	50.	0	0	0
GR	484.	0	482.	40.	479.96	78.	479.3	102.	479.04	102.5
GR	478.66	110.5	479.	115.	479.325	115.5	479.93	125.	482.	140.
GR	488.	165.	0	0	0	0	0	0	0	0

X1	8.	10.	71.00	80.00	40.	35.	38.	0	0	0
GR	484.	0	482.	30.	480.61	50.	479.37	71.00	478.95	71.50
GR	478.69	75.5	479.185	79.50	479.41	80.00	479.6	90.	482.	112.
X1	9.	10.	100.0	113.00	7.	7.	7.	0	0	0
GR	484.00	0	482.00	58.0	481.00	75.0	479.3	100.00	479.07	101.00
GR	478.76	107.00	478.805	112.00	479.395	113.	481.00	135.00	488.00	190.

ADD SECTION

X1	9.3				16	16	16		.03	
X1	10.	12.	102.	117.	7.	7.	7.	0	0	0
GR	484.	0	482.	52.	481.	65.	479.845	80.	479.305	102.
GR	478.99	102.50	478.81	110.5	479.215	116.50	479.37	117.	479.575	147.
GR	482.	155.	486.	170.	0	0	0	0	0	0
X1	11.	10.	127.	134.5	54.	50.	54.	0	0	0
GR	484.	0	482.	30.	479.59	100.	479.34	127.	479.15	127.5
GR	478.62	130.5	478.97	134.	480.18	134.5	481.	200.	482.	244.
NH	5.	.15	114.	.045	122.	.15	136.	.045	144.	.15
NH	250.	0	0	0	0	0	0	0	0	0
X1	12.	17.	114.	145.	15.	10.	12.	0	0	0
GR	484.	0	482.	22.	479.67	100.	479.345	114.	479.115	114.5
GR	479.05	119.	479.26	122.	479.445	122.5	479.36	130.	479.335	136.
GR	479.19	137.	478.935	140.	479.09	144.	479.29	145.	480.18	170.
GR	481.	195.	482.	250.	0	0	0	0	0	0
NC	.15	.15	.065	.1	.3	0	0	0	0	0
X1	13.	9.	170.	180.	32.	22.	25.	0	0	0
GR	482.	0	479.795	148.	479.52	170.	479.2	170.5	478.74	175.5
GR	479.25	179.5	479.46	180.	479.81	203.5	482.	300.	0	0
X1	14.	10.	166.	175.	63.	48.	50.	0	0	0
GR	480.8	0	479.84	140.	479.345	166.	479.05	166.5	478.65	170.5
GR	479.13	174.5	479.405	175.	479.645	201.	481.	255.	482.	310.
X1	15.	10.	206.	214.	75.	90.	90.	0	0	0

GR	479.25	213.5	479.525	214.	479.75	244.	482.	320.	483.	355.

X1	16.	10.	173.	188.	75.	135.	120.	0	0	0
GR	480.8	0	479.775	150.	479.505	173.	479.180	173.5	479.135	180.5
GR	479.16	187.5	479.4	188.	479.94	218.	482.	405.	484.	500.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= .100 CEHV= .300
*SECNO 1.000

1.000	2.55	480.99	.00	480.69	481.03	.03	.00	.00	481.00
25.0	.0	19.5	5.5	.0	21.8	29.9	.0	.0	479.80
.00	.00	.89	.18	.000	.065	.150	.000	478.44	100.00
.001505	0.	0.	0.	0	0	6	.00	59.79	159.79

CCHV= .300 CEHV= .500
*SECNO 1.500

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.45

1.500	2.57	481.02	.00	.00	481.04	.02	.01	.00	478.90
25.0	4.1	6.0	14.9	5.8	7.4	37.0	1.0	1.2	478.60
.01	.70	.82	.40	.024	.024	.024	.000	478.45	100.01
.000127	20.	20.	20.	0	0	0	.00	59.37	159.37

*SECNO 1.600

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

3370 NORMAL BRIDGE, NRD= 31 MIN ELTRD= 479.50 MAX ELLC= 479.82

1.600	2.57	481.02	.00	.00	481.04	.02	.00	.00	478.90
25.0	3.3	3.0	18.7	3.9	5.2	34.0	1.1	1.3	478.58
.01	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	2.	2.	2.	0	0	0	-2.36	58.22	158.23

*SECNO 1.700

3370 NORMAL BRIDGE, NRD= 31 MIN ELTRD= 479.50 MAX ELLC= 479.82

1.700	2.57	481.02	.00	.00	481.04	.02	.00	.00	478.90

.02	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	10.	10.	10.	0	0	0	-2.36	58.23	158.24

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.800

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.47

1.800	2.53	481.02	.00	.00	481.04	.02	.00	.00	478.94
25.0	4.2	6.2	14.7	5.7	7.2	34.9	1.6	2.0	478.64
.02	.73	.85	.42	.024	.024	.024	.000	478.49	100.02
.000141	2.	2.	2.	0	0	0	.00	57.63	157.65

CCHV= .100 CEHV= .300
*SECNO 1.900

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .18

1.900	2.42	481.01	.00	.00	481.08	.07	.02	.01	479.04
25.0	3.3	11.4	10.3	5.4	6.9	29.2	3.9	4.8	478.74
.03	.61	1.65	.35	.150	.065	.150	.000	478.59	100.07
.004157	50.	50.	50.	2	0	0	.00	52.76	152.83

*SECNO 2.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 6.34

2.000	2.43	481.11	.00	.00	481.11	.00	.03	.01	479.00
25.0	4.4	11.5	9.0	57.4	42.0	111.8	15.4	15.1	479.00
.18	.08	.27	.08	.150	.065	.150	.000	478.68	85.97
.000103	70.	95.	100.	2	0	0	.00	171.65	257.61

*SECNO 3.000

3.000	2.25	481.13	.00	.00	481.13	.00	.02	.00	479.21
25.0	6.3	12.5	6.3	70.6	39.5	73.5	43.1	38.5	479.21
.38	.09	.32	.09	.150	.065	.150	.000	478.88	123.09
.000149	140.	140.	140.	2	0	0	.00	162.30	285.39

*SECNO 4.000

4.000	2.50	481.14	.00	.00	481.14	.00	.01	.00	479.30
25.0	8.9	11.1	5.1	74.5	31.1	45.0	54.0	47.3	479.32
.46	.12	.36	.11	.150	.065	.150	.000	478.64	88.64
.000186	60.	68.	70.	0	0	0	.00	108.24	196.88

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 5.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .52

5.000	2.46	481.15	.00	.00	481.15	.00	.01	.00	479.40
25.0	10.5	3.6	10.9	48.5	6.2	56.1	57.1	49.9	479.39
.48	.22	.58	.19	.150	.065	.150	.000	478.69	102.86
.000681	22.	22.	27.	0	0	0	.00	101.41	204.27

1490 NH CARD USED
*SECNO 6.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.46

6.000	2.41	481.16	.00	.00	481.16	.00	.01	.00	479.32
25.0	1.9	18.8	4.3	25.4	70.1	47.6	62.8	54.3	479.38
.54	.07	.27	.09	.150	.062	.150	.000	478.75	78.93
.000113	40.	45.	48.	0	0	0	.00	97.57	176.49

*SECNO 7.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .59

7.000	2.50	481.16	.00	.00	481.17	.01	.01	.00	479.30
25.0	7.1	15.0	2.9	50.6	31.1	20.2	68.7	58.5	479.33
.58	.14	.48	.14	.150	.065	.150	.000	478.66	55.47
.000330	40.	50.	55.	1	0	0	.00	78.51	133.98

*SECNO 8.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .68

8.000	2.49	481.18	.00	.00	481.19	.01	.02	.00	479.37
25.0	5.1	14.0	5.9	27.1	20.3	28.0	72.1	61.2	479.41
.60	.19	.69	.21	.150	.065	.150	.000	478.69	41.93
.000711	40.	38.	35.	0	0	0	.00	62.47	104.40

*SECNO 9.000

9.000	2.42	481.18	.00	.00	481.19	.01	.00	.00	479.30
25.0	4.0	17.8	3.2	26.0	29.6	21.7	72.6	61.6	479.39
.61	.15	.60	.15	.150	.065	.150	.000	478.76	71.96
.000517	7.	7.	7.	0	0	0	.00	64.45	136.41

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 9.300

9.300	2.40	481.19	.00	.00	481.20	.01	.01	.00	479.33
25.0	3.9	17.9	3.2	25.5	29.4	21.3	73.8	62.6	479.42
.61	.15	.61	.15	.150	.065	.150	.000	478.79	72.27
.000537	16.	16.	16.	0	0	0	.00	63.99	136.26

*SECNO 10.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.65

10.000	2.39	481.20	.00	.00	481.21	.00	.00	.00	479.30
25.0	5.5	12.2	7.3	47.4	33.4	55.9	74.6	63.2	479.37
.62	.12	.37	.13	.150	.065	.150	.000	478.81	62.49
.000197	7.	7.	7.	0	0	0	.00	89.84	152.34

*SECNO 11.000

11.000	2.60	481.22	.00	.00	481.22	.00	.01	.00	479.34
25.0	13.0	8.2	3.9	86.1	17.3	42.4	82.0	69.6	480.18
.68	.15	.47	.09	.150	.065	.150	.000	478.62	52.61
.000358	54.	54.	50.	0	0	0	.00	157.14	209.75

1490 NH CARD USED
*SECNO 12.000
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

12.000	2.29	481.22	.00	.00	481.22	.00	.00	.00	479.35
25.0	6.3	13.2	5.5	64.1	61.9	54.1	84.1	71.6	479.29
.70	.10	.21	.10	.150	.103	.150	.000	478.93	48.15
.000192	15.	12.	10.	0	0	0	.00	158.90	207.04

CCHV= .100 CEHV= .300
*SECNO 13.000

13.000	2.49	481.23	.00	.00	481.23	.00	.01	.00	479.52
25.0	9.3	7.8	7.9	103.6	22.1	81.8	89.3	76.7	479.46
.75	.09	.35	.10	.150	.065	.150	.000	478.74	51.73
.000187	32.	25.	22.	0	0	0	.00	214.31	266.04

*SECNO 14.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 14.00 EXTENDED .44 METERS

14.000	2.59	481.24	.00	.00	481.24	.00	.01	.00	479.35
25.0	12.0	5.6	7.4	171.1	20.9	95.4	103.3	90.4	479.40
.88	.07	.27	.08	.150	.065	.150	.000	478.65	.00
.000100	63.	50.	48.	0	0	0	.00	268.01	268.01

*SECNO 15.000

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    15.000      2.70    481.24       .00       .00    481.24       .00       .01       .00    479.43
      25.0      14.7       4.3       5.9     224.3      18.2      86.2     128.1     112.9    479.52
      1.11       .07       .24       .07      .150      .065      .150      .000    478.55       .00
   .000083       75.       90.       90.         0         0         0       .00    294.58    294.58
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*SECNO 16.000
3280 CROSS SECTION     16.00 EXTENDED       .45 METERS

    16.000      2.12    481.25       .00       .00    481.25       .00       .01       .00    479.51
      25.0      11.1       6.8       7.1     182.0      31.4     125.8     160.6     144.0    479.40
      1.39       .06       .22       .06      .150      .065      .150      .000    479.14       .00
   .000075       75.      120.      135.         0         0         0       .00    337.21    337.21
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1
PROFILE FOR STREAM  AMP CREEK - EXISTING CON



PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA



ELEVATION   478.      479.      479.      480.      480.      481.      481.      482.      482.      483.
    SECNO   CUMDIS

     1.00     0.  I          .         .      R  .         .         .WE       .         .M        .         .         .
              5.  I          .         .R        .         .L        .WE       .         .M        .         .         .
             10.  I          .    R    .         L         .         .WE       .         . M       .         .         .
             15.  I         R.         L         .         .         . E       .         . M       .         .         .
     1.50    20.  I  R      L.         .         .         .         . E       .         . M       .         .         .
     1.60    25.  I  R      L.         .         .         .         . E       .         . M       .         .         .
             30.  I  R      L.         .         .         .         . E       .         . M       .         .         .
     1.70    35.  I  R      L.         .         .         .         . E       .         . M       .         .         .
     1.80    40.  CI  R      L         .         .         .         . E       .         .  M      .         .         .
             45.  CI  R      L         .         .         .         . E       .         .  M      .         .         .
             50.  CI  R      L         .         .         .         . E       .         .  M      .         .         .
             55.  C I  R     .L        .         .         .         . E       .         .  M      .         .         .
             60.  C I  R     .L        .         .         .         . E       .         .   M     .         .         .
             65.  C I  R     .L        .         .         .         .WE       .         .   M     .         .         .
             70.  C I  R     .L        .         .         .         .WE       .         .   M     .         .         .
             75.  C I  R     .L        .         .         .         .W E      .         .   M     .         .         .
             80.  C  I  R    . L       .         .         .         .W E      .         .   M     .         .         .
     1.90    85.  C  I  R    . L       .         .         .         .W E      .         .    M    .         .         .
             90.  C  I  R    . L       .         .         .         . WE      .         .    M    .         .         .
             95.  C  I   R   . L       .         .         .         . WE      .         .    M    .         .         .
            100.  C  I   R   . L       .         .         .         . WE      .         .    M    .         .         .
            105.  C  I   R   . L       .         .         .         . WE      .         .   M     .         .         .
            110.  C  I   R   . L       .         .         .         . WE      .         .   M     .         .         .
            115.  C   I    R . L       .         .         .         . WE      .         .   M     .         .         .
            120.  C   I    R . L       .         .         .         . WE      .         .   M     .         .         .
            125.  C   I    R . L       .         .         .         . WE      .         .   M     .         .         .
            130.  C   I    R . L       .         .         .         . WE      .         .   M     .         .         .
            135.  C   I     R. L       .         .         .         . WE      .         .   M     .         .         .
            140.  C   I     R. L       .         .         .         .  E      .         .   M     .         .         .
            145.  C   I     R.L        .         .         .         .  E      .         .   M     .         .         .
            150.  C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            155.  C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            160.  C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            165.  C    I     RL        .         .         .         .  E      .         .  M      .         .         .
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         175.  C    I    .L        .         .         .         .  E      .         .  M      .         .         .
  2.00   180.  C    I    .L        .         .         .         .  E      .         .  M      .         .         .
         185.  C    I    .L        .         .         .         .  E      .         .  M      .         .         .
         190.  C    I    .L        .         .         .         .  E      .         .  M      .         .         .
         195.  C    I    . L       .         .         .         .  E      .         .  M      .         .         .
         200.  C    I    . L       .         .         .         .  E      .         .  M      .         .         .
         205.  C     I   . L       .         .         .         .  E      .         .  M      .         .         .
         210.  C     I   . L       .         .         .         .  E      .         .  M      .         .         .
         215.  C     I   . L       .         .         .         .  E      .         .  M      .         .         .
         220.  C     I   . L       .         .         .         .   E     .         .  M      .         .         .
         225.  C     I   .  L      .         .         .         .   E     .         .  M      .         .         .
         230.  C     I   .  L      .         .         .         .   E     .         . M       .         .         .
         235.  C     I   .  L      .         .         .         .   E     .         . M       .         .         .
         240.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
         245.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
         250.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
         255.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
         260.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
         265.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
         270.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
         275.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
         280.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
         285.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
         290.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
         295.  C       I .    L    .         .         .         .   E     .         . M       .         .         .
         300.  C       I .    L    .         .         .         .   E     .         .M        .         .         .
         305.  C       I .    L    .         .         .         .   E     .         .M        .         .         .
         310.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
         315.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
  3.00   320.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
         325.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
         330.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
         335.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
         340.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
         345.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
         350.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
         355.  C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
         360.  C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
         365.  C     I   .      L  .         .         .         .   E     .         .M        .         .         .
         370.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
         375.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
         380.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
         385.  C   I     .      LR .         .         .         .   E     .         .M        .         .         .
  4.00   390.  C   I     .      LR .         .         .         .   E     .         .M        .         .         .
         395.  C   I     .       L .         .         .         .   E     .         .M        .         .         .
         400.  C   I     .       L .         .         .         .   E     .         .M        .         .         .
         405.  C    I    .        L.         .         .         .   E     .         .M        .         .         .
  5.00   410.  C    I    .        L.         .         .         .   E     .         .M        .         .         .
         415.  C    I    .        L.         .         .         .   E     .         .     M   .         .         .
         420.  C    I    .        L.         .         .         .   E     .         .         M         .         .
         425.  C    I    .        L.         .         .         .   E     .         .         .    M    .         .
         430.  C     I   .       LR.         .         .         .   E     .         .         .        M.         .
         435.  C     I   .       LR.         .         .         .   E     .         .         .         .  M      .
         440.  C     I   .       LR.         .         .         .   E     .         .         .         .       M .
         445.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
         450.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
  6.00   455.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
         460.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
         465.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
         470.  C     I   .      LR .         .         .         .   E     .         .         .         .         M
         475.  C    I    .      LR .         .         .         .   E     .         .         .         .         M
         480.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
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        490.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
        495.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
        500.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
 7.00   505.  C   I     .      LR .         .         .         .    E    .         .         .         .         M
        510.  C   I     .      LR .         .         .         .    E    .         .         .         .         M
        515.  C    I    .       L .         .         .         .    E    .         .         .         .         M
        520.  C    I    .       L .         .         .         .    E    .         .         .         .    M    .
        525.  C    I    .       LR.         .         .         .    E    .         .         .         M         .
        530.  C    I    .       LR.         .         .         .    E    .         .         .    M    .         .
        535.  C    I    .       LR.         .         .         .    E    .         .         M         .         .
        540.  C    I    .       LR.         .         .         .    E    .         .   M     .         .         .
 8.00   545.  C    I    .        L.         .         .         .    E    .         .M        .         .         .
 9.00   550.  C     I   .      L R.         .         .         .    E    .         .         .         .         M
        555.  C      I  .      L R.         .         .         .    E    .         .         .         .         M
        560.  C      I  .       LR.         .         .         .    E    .         .         .         .         M
 9.30   565.  C      I  .       L R         .         .         .    E    .         .         .         .         M
        570.  C      I  .      L R.         .         .         .    E    .         .         .         .         M
10.00   575.  C      I  .      L R.         .         .         .    E    .         .         .         .         M
        580.  C      I  .      L  R         .         .         .    E    .         .         .         .         M
        585.  C      I  .      L  . R       .         .         .    E    .         .         .         .         M
        590.  C     I   .      L  .  R      .         .         .    E    .         .         .         .         M
        595.  C     I   .      L  .    R    .         .         .    E    .         .         .         .     M   .
        600.  C     I   .       L .     R   .         .         .    E    .         .         .         .  M      .
        605.  C    I    .       L .       R .         .         .    WE   .         .         .        M.         .
        610.  C    I    .       L .        R.         .         .    WE   .         .         .    M    .         .
        615.  C    I    .       L .         .R        .         .    WE   .         .         . M       .         .
        620.  C   I     .       L .         . R       .         .    WE   .         .       M .         .         .
        625.  C   I     .       L .         .   R     .         .    E    .         .   M     .         .         .
11.00   630.  C   I     .       L .         .    R    .         .    E    .         .M        .         .         .
        635.  C     I   .       L .      R  .         .         .    E    .         .M        .         .         .
12.00   640.  C         I      RL .         .         .         .    E    .         .M        .         .         .
        645.  C        I.       RL.         .         .         .    E    .         .M        .         .         .
        650.  C       I .       R L         .         .         .    E    .         .M        .         .         .
        655.  C       I .        RL         .         .         .    E    .         .M        .         .         .
        660.  C      I  .         RL        .         .         .    E    .         .M        .         .         .
13.00   665.  C     I   .         R L       .         .         .    E    .         .M        .         .         .
        670.  C     I   .         RL        .         .         .    E    .        M.         .         .         .
        675.  C     I   .         RL        .         .         .    E    .     M   .         .         .         .
        680.  C    I    .         RL        .         .         .    E    .   M     .         .         .         .
        685.  C    I    .         L         .         .         .    E    . M       .         .         .         .
        690.  C    I    .         L         .         .         .    E   M.         .         .         .         .
        695.  C    I    .         L         .         .         .    EM   .         .         .         .         .
        700.  C    I    .        LR         .         .         .  M E    .         .         .         .         .
        705.  C    I    .        L.         .         .         . M  E    .         .         .         .         .
        710.  C   I     .        L.         .         .         M    E    .         .         .         .         .
14.00   715.  C   I     .       LR.         .         .      M  .    E    .         .         .         .         .
        720.  C   I     .       LR.         .         .      M  .    E    .         .         .         .         .
        725.  C   I     .       LR.         .         .      M  .    E    .         .         .         .         .
        730.  C   I     .       L R         .         .      M  .    E    .         .         .         .         .
        735.  C   I     .        LR         .         .      M  .    E    .         .         .         .         .
        740.  C   I     .        LR         .         .      M  .    E    .         .         .         .         .
        745.  C   I     .        LR         .         .      M  .    E    .         .         .         .         .
        750.  C  I      .        LR         .         .      M  .    E    .         .         .         .         .
        755.  C  I      .        LR         .         .      M  .    E    .         .         .         .         .
        760.  C  I      .        LR         .         .      M  .    E    .         .         .         .         .
        765.  C  I      .        L.R        .         .      M  .    E    .         .         .         .         .
        770.  C  I      .        L.R        .         .      M  .    E    .         .         .         .         .
        775.  C  I      .        L.R        .         .      M  .    E    .         .         .         .         .
        780.  C  I      .        L.R        .         .      M  .    E    .         .         .         .         .
        785.  C  I      .        L.R        .         .      M  .    E    .         .         .         .         .
        790.  C  I      .         LR        .         .      M  .    E    .         .         .         .         .
        795.  C I       .         LR        .         .      M  .    E    .         .         .         .         .
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 15.00  805.  C I        .          L R        .        .        M  .     E  .        .        .        .        .
        810.  C  I       .          LR         .        .        M  .     E  .        .        .        .        .
        815.  C  I       .          LR         .        .        M  .     E  .        .        .        .        .
        820.  C   I      .          LR         .        .        M  .     E  .        .        .        .        .
        825.  C   I      .          LR         .        .        M  .     E  .        .        .        .        .
        830.  C    I     .          LR         .        .        M  .     E  .        .        .        .        .
        835.  C    I     .          LR         .        .        M  .     E  .        .        .        .        .
        840.  C     I    .          LR         .        .        M  .     E  .        .        .        .        .
        845.  C     I    .          LR         .        .        M  .     E  .        .        .        .        .
        850.  C      I   .          LR         .        .        M  .     E  .        .        .        .        .
        855.  C      I   .          LR         .        .        M  .     E  .        .        .        .        .
        860.  C       I  .          RL         .        .        M  .     E  .        .        .        .        .
        865.  C       I  .          RL         .        .        M  .     E  .        .        .        .        .
        870.  C        I.           RL         .        .        M  .     E  .        .        .        .        .
        875.  C        I.           RL         .        .        M  .     E  .        .        .        .        .
        880.  C         I           RL         .        .        M  .     E  .        .        .        .        .
        885.  C         I           RL         .        .        M  .     E  .        .        .        .        .
        890.  C         .I          RL         .        .        M  .     E  .        .        .        .        .
        895.  C         .I          RL         .        .        M  .     E  .        .        .        .        .
        900.  C         . I         RL         .        .        M  .     E  .        .        .        .        .
        905.  C         . I         RL         .        .        M  .     E  .        .        .        .        .
        910.  C         .  I       R.L         .        .        M  .     E  .        .        .        .        .
        915.  C         .  I       R.L         .        .        M  .     E  .        .        .        .        .
        920.  C         .   I      R.L         .        .        M  .     E  .        .        .        .        .
 16.00  925.  C         .   I      R.L         .        .        M  .     E  .        .        .        .        .
1
   21AUG95      08:13:12                                                                                   PAGE   10
```

THIS RUN EXECUTED 21AUG95 08:13:14

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK - EXISTING CON

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	478.44	25.00	480.99	.00	481.03	15.05	.89	51.74	6.45
*	1.500	20.00	.00	.00	478.45	25.00	481.02	.00	481.04	1.27	.82	50.21	22.21
*	1.600	2.00	479.50	479.82	478.45	25.00	481.02	.00	481.04	3.04	.57	43.02	14.34
	1.700	10.00	479.50	479.82	478.45	25.00	481.02	.00	481.04	3.04	.57	43.04	14.35
*	1.800	2.00	.00	.00	478.49	25.00	481.02	.00	481.04	1.41	.85	47.81	21.03
*	1.900	50.00	.00	.00	478.59	25.00	481.01	.00	481.08	41.57	1.65	41.45	3.88
*	2.000	95.00	.00	.00	478.68	25.00	481.11	.00	481.11	1.03	.27	211.22	24.58

	3.000	140.00	.00	.00	478.88	25.00	481.13	.00	481.13	1.49	.32	183.47	20.45
	4.000	68.00	.00	.00	478.64	25.00	481.14	.00	481.14	1.86	.36	150.58	18.31
*	5.000	22.00	.00	.00	478.69	25.00	481.15	.00	481.15	6.81	.58	110.76	9.58
*	6.000	45.00	.00	.00	478.75	25.00	481.16	.00	481.16	1.13	.27	143.20	23.53
*	7.000	50.00	.00	.00	478.66	25.00	481.16	.00	481.17	3.30	.48	101.87	13.77
*	8.000	38.00	.00	.00	478.69	25.00	481.18	.00	481.19	7.11	.69	75.31	9.38
	9.000	7.00	.00	.00	478.76	25.00	481.18	.00	481.19	5.17	.60	77.35	10.99
	9.300	16.00	.00	.00	478.79	25.00	481.19	.00	481.20	5.37	.61	76.18	10.79
*	10.000	7.00	.00	.00	478.81	25.00	481.20	.00	481.21	1.97	.37	136.70	17.81
	11.000	54.00	.00	.00	478.62	25.00	481.22	.00	481.22	3.58	.47	145.84	13.21

1

21AUG95 08:13:12 PAGE 11

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
12.000	12.00	.00	.00	478.93	25.00	481.22	.00	481.22	1.92	.21	180.13	18.05
13.000	25.00	.00	.00	478.74	25.00	481.23	.00	481.23	1.87	.35	207.57	18.26
14.000	50.00	.00	.00	478.65	25.00	481.24	.00	481.24	1.00	.27	287.42	24.97
15.000	90.00	.00	.00	478.55	25.00	481.24	.00	481.24	.83	.24	328.62	27.42
16.000	120.00	.00	.00	479.14	25.00	481.25	.00	481.25	.75	.22	339.07	28.89

1

21AUG95 08:13:12 PAGE 12

AMP CREEK - EXISTING CON

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	25.00	480.99	.00	.00	.30	59.79	.00
*	1.500	25.00	481.02	.00	.03	.00	59.37	20.00
*	1.600	25.00	481.02	.00	.00	.00	58.22	2.00
	1.700	25.00	481.02	.00	.00	.00	58.23	10.00
*	1.800	25.00	481.02	.00	.00	.00	57.63	2.00
*	1.900	25.00	481.01	.00	-.01	.00	52.76	50.00
*	2.000	25.00	481.11	.00	.10	.00	171.65	95.00
	3.000	25.00	481.13	.00	.02	.00	162.30	140.00

	4.000	25.00	481.14	.00	.01	.00	108.24	68.00
*	5.000	25.00	481.15	.00	.01	.00	101.41	22.00
*	6.000	25.00	481.16	.00	.01	.00	97.57	45.00
*	7.000	25.00	481.16	.00	.01	.00	78.51	50.00
*	8.000	25.00	481.18	.00	.01	.00	62.47	38.00
	9.000	25.00	481.18	.00	.01	.00	64.45	7.00
	9.300	25.00	481.19	.00	.01	.00	63.99	16.00
*	10.000	25.00	481.20	.00	.01	.00	89.84	7.00
	11.000	25.00	481.22	.00	.01	.00	157.14	54.00
	12.000	25.00	481.22	.00	.01	.00	158.90	12.00
	13.000	25.00	481.23	.00	.00	.00	214.31	25.00
	14.000	25.00	481.24	.00	.01	.00	268.01	50.00
	15.000	25.00	481.24	.00	.01	.00	294.58	90.00
	16.000	25.00	481.25	.00	.01	.00	337.21	120.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 1.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.600 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.800 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.900 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 10.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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*  HEC-2 WATER SURFACE PROFILES                    *                         *  U.S. ARMY CORPS OF ENGINEERS            *
*                                                  *                         *  HYDROLOGIC ENGINEERING CENTER           *
*  Version    4.6.2;  May 1991                     *                         *  609 SECOND STREET, SUITE D              *
*                                                  *                         *  DAVIS, CALIFORNIA 95616-4687            *
*  RUN DATE    21AUG95     TIME    08:16:28        *                         *          (916) 756-1104                  *
****************************************************                         ********************************************
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X     X  XXXXXXX   XXXXX             XXXXX
X     X  X         X     X          X     X
X     X  X         X                      X
XXXXXXX  XXXX      X         XXXXX   XXXXX
X     X  X         X                X
X     X  X         X     X          X
X     X  XXXXXXX   XXXXX            XXXXXXX
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1

THIS RUN EXECUTED 21AUG95   08:16:28

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****************************************
HEC-2 WATER SURFACE PROFILES

Version    4.6.2;  May 1991
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T1    WATER SURFACE PROFILE:  100-YEAR FLOW        FILE: "CMCRRSC"  **********
T2    RAILROAD DRAINAGE                            AUGUST,1981;1995 * METRIC *
T3    SWAMP CREEK - PROPOSED CONDITIONS (CULVERTS) F&VD: MDL;SRB    **********
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.001500	1.0	0	25.	480.69	0

NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.0	10.0	100.0	109.7	0	0	0	0	0	0
GR	482.2	0	482.	50.	481.	100.	478.58	101.	478.44	104.
GR	478.59	105.2	478.61	108.7	479.8	109.7	481.	160.	482.	200.
NC	.024	.024	.024	.3	.5	0	0	0	0	0
X1	1.5	20.	103.05	106.	20	20	20	0	0	0
X3	10.	0	0	0	0	0	0	479.5	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
X1	1.6	31.	103.05	106.	2.	2.	2.	0	0	0
BT	31.	0	482.24	482.24	50.	482.04	482.04	100.	481.04	481.04

BT	479.5	479.16	103.24	479.5	479.26	103.36	479.5	479.33	103.5	479.5
BT	479.3	103.64	479.5	479.33	103.76	479.5	479.26	103.86	479.5	479.16
BT	103.93	479.5	479.04	103.95	479.5	478.9	104.	479.5	479.2	105.2
BT	479.8	479.2	105.38	479.83	479.2	105.41	479.83	479.39	105.5	479.83
BT	479.6	105.64	479.82	479.7	105.81	479.82	479.79	106.	479.83	479.82
BT	106.19	479.8	479.79	106.36	479.79	479.7	106.5	479.79	479.56	106.59
BT	479.8	479.39	106.62	479.78	479.2	108.7	479.7	479.7	109.7	479.84
BT	479.84	200.	482.04	482.04	0	0	0	0	0	0
GR	482.24	0	482.04	50.	481.04	100.	479.5	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.5	103.64	478.54	103.76	478.64	103.86	478.76	103.93	478.9	103.95
GR	479.2	104.	479.2	105.2	479.2	105.38	479.01	105.41	478.84	105.5
GR	478.7	105.64	478.61	105.81	478.58	106.	478.61	106.19	478.7	106.36
GR	478.8	106.5	479.01	106.59	479.2	106.62	479.7	108.7	479.84	109.7
GR	482.04	200.	0	0	0	0	0	0	0	0

X1	1.7	0	0	0	10.	10.	10.	0	0	0
X2	0	0	0	0	0	0	1.	0	0	0
X1	1.8	20.	103.05	106.	2.	2.	2.	0	.04	0
X3	10.	0	0	0	0	0	0	479.5	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.9	0	0	0	50.	50.	50.	0	.100	0
X1	2.	10.	137.	155.	70.	100.	95.	0	0	0
GR	482.2	0	482.	66.	479.15	130.	479.	137.	478.85	138.
GR	478.68	154.	479.	155.	479.3	165.	480.	210.	482.1	300.
X1	3.	10.	191.	209.	140.	140.	140.	0	0	0
GR	484.	0	482.	95.	479.36	180.	479.21	191.	479.07	191.5
GR	478.88	200.	478.875	208.5	479.215	209.	479.555	223.	482.	320.
X1	4.	12.	143.	157.	60.	70.	68.	0	0	0
GR	484.	0	482.	80.	480.	100.	479.32	130.	479.3	143.
GR	479.2	143.5	478.635	148.5	479.11	156.5	479.32	157.	479.31	169.
GR	480.	177.	482.	212.	0	0	0	0	0	0
X1	5.	11.	144.	146.6	22.	27.	22.	0	0	0
GR	484.	0	482.	90.	480.	120.	479.405	130.	479.405	144.
GR	478.69	144.3	478.69	146.3	479.385	146.6	479.385	155.	480.	170.
GR	482.	230.	0	0	0	0	0	0	0	0
NH	5.	.150	107.	.045	114.	.150	131.	.045	142.	.150
NH	210.	0	0	0	0	0	0	0	0	0
X1	6.	18.	107.	142.	40.	48.	45.	0	0	0

GR	478.84	109.5	479.22	113.5	479.38	114.	479.375	122.	479.35	131.
GR	479.05	131.5	478.75	136.5	478.97	141.5	479.375	142.	479.89	167.
GR	480.	173.	482.	179.	484.	210.	0	0	0	0
NC	.15	.15	.065	0	0	0	0	0	0	0
X1	7.	11.	102.	115.5	40.	55.	50.	0	0	0
X3				85		135				
GR	484.	0	482.	40.	479.96	78.	479.3	102.	479.04	102.5
GR	478.66	110.5	479.	115.	479.325	115.5	479.93	125.	482.	140.
GR	488.	165.	0	0	0	0	0	0	0	0

X1	8.	10.	71.	80.	40.	35.	38.	0	0	0
X3				60		90				
GR	484.	0	482.	30.	480.61	50.	479.37	71.	478.95	71.5
GR	478.69	75.5	479.185	79.5	479.41	80.	479.6	90.	482.	112.
NC	.012	.012	.012	.3	.5					
X1	9.	10.	100.27	120.74	7.	7.	7.	0	0	0
X3				100		121				
X4	1	478.76	120.74							
GR	484.	0	482.	58.	481.	75.	479.3	100.	478.76	100.27
GR	478.76	103.22	478.76	110.77	478.76	113.72	481.	135.	488.	190.

ADD SECTION
4: 8 FT. X 16 FT. BOX CULVERTS

SC	4.012	0.4	2.60	100	2.44	4.88	12.2	8.1	478.79	478.76
X1	9.30				16	16	16		.03	
X2			2.0	481.2	483.0					
X3				99		122				
NC	.15	.15	.065	.1	.3					
X1	10.	12.	102.	117.	7.	7.	7.	0	0	0
X3				91.0		129.0				
GR	484.	0	482.	52.	481.	65.	479.845	80.	479.305	102.
GR	478.99	102.5	478.81	110.5	479.215	116.5	479.37	117.	479.575	147.
GR	482.	155.	486.	170.	0	0	0	0	0	0
X1	11.	10.	127.	134.5	54.	50.	54.	0	0	0
GR	484.	0	482.	30.	479.59	100.	479.34	127.	479.15	127.5
GR	478.62	130.5	478.97	134.	480.18	134.5	481.	200.	482.	244.
NH	5.	.15	114.	.045	122.	.15	136.	.045	144.	.15
NH	250.	0	0	0	0	0	0	0	0	0
X1	12.	17.	114.	145.	15.	10.	12.	0	0	0
GR	484.	0	482.	22.	479.67	100.	479.345	114.	479.115	114.5
GR	479.05	119.	479.26	122.	479.445	122.5	479.36	130.	479.335	136.
GR	479.19	137.	478.935	140.	479.09	144.	479.29	145.	480.18	170.
GR	481.	195.	482.	250.	0	0	0	0	0	0
NC	.15	.15	.065	.1	.3	0	0	0	0	0

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GR    482.        0   479.795     148.    479.52     170.     479.2    170.5   478.74    175.5
GR  479.25    179.5    479.46     180.    479.81    203.5      482.     300.        0        0
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X1     14.      10.      166.     175.       63.      48.       50.        0        0        0
GR   480.8        0    479.84     140.   479.345     166.    479.05    166.5   478.65    170.5
GR  479.13    174.5   479.405     175.   479.645     201.      481.     255.     482.     310.

X1     15.      10.      206.     214.       75.      90.       90.        0        0        0
GR   480.8        0    479.69     180.   479.435     206.    479.31    206.5  478.545    210.5
GR  479.25    213.5   479.525     214.    479.75     244.      482.     320.     483.     355.

X1     16.      10.      173.     188.       75.     135.      120.        0        0        0
GR   480.8        0   479.775     150.   479.505     173.   479.180    173.5  479.135    180.5
GR  479.16    187.5     479.4     188.    479.94     218.      482.     405.     484.     500.
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=      .100 CEHV=      .300
*SECNO 1.000
     1.000      2.55    480.99       .00    480.69    481.03       .03       .00       .00    481.00
      25.0        .0      19.5       5.5        .0      21.8      29.9        .0        .0    479.80
       .00       .00       .89       .18      .000      .065      .150      .000    478.44    100.00
   .001505        0.        0.        0.         0         0         6       .00     59.79    159.79

CCHV=      .300 CEHV=      .500
*SECNO 1.500

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.45

     1.500      2.57    481.02       .00       .00    481.04       .02       .01       .00    478.90
      25.0       4.1       6.0      14.9       5.8       7.4      37.0       1.0       1.2    478.60
       .01       .70       .82       .40      .024      .024      .024      .000    478.45    100.01
   .000127       20.       20.       20.         0         0         0       .00     59.37    159.37

*SECNO 1.600

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

3370 NORMAL BRIDGE, NRD=  31 MIN ELTRD=   479.50 MAX ELLC=   479.82
```

25.0	3.3	3.0	18.7	3.9	5.2	34.0	1.1	1.3	478.58
.01	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	2.	2.	2.	0	0	0	-2.36	58.22	158.23

*SECNO 1.700

3370 NORMAL BRIDGE, NRD= 31 MIN ELTRD= 479.50 MAX ELLC= 479.82

1.700	2.57	481.02	.00	.00	481.04	.02	.00	.00	478.90
25.0	3.3	3.0	18.7	3.9	5.2	34.0	1.5	1.9	478.58
.02	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	10.	10.	10.	0	0	0	-2.36	58.23	158.24

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.800

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.47

1.800	2.53	481.02	.00	.00	481.04	.02	.00	.00	478.94
25.0	4.2	6.2	14.7	5.7	7.2	34.9	1.6	2.0	478.64
.02	.73	.85	.42	.024	.024	.024	.000	478.49	100.02
.000141	2.	2.	2.	0	0	0	.00	57.63	157.65

CCHV= .100 CEHV= .300
*SECNO 1.900

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .18

1.900	2.42	481.01	.00	.00	481.08	.07	.02	.01	479.04
25.0	3.3	11.4	10.3	5.4	6.9	29.2	3.9	4.8	478.74
.03	.61	1.65	.35	.150	.065	.150	.000	478.59	100.07
.004157	50.	50.	50.	2	0	0	.00	52.76	152.83

*SECNO 2.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 6.34

2.000	2.43	481.11	.00	.00	481.11	.00	.03	.01	479.00
25.0	4.4	11.5	9.0	57.4	42.0	111.8	15.4	15.1	479.00
.18	.08	.27	.08	.150	.065	.150	.000	478.68	85.97
.000103	70.	95.	100.	2	0	0	.00	171.65	257.61

*SECNO 3.000

3.000	2.25	481.13	.00	.00	481.13	.00	.02	.00	479.21
25.0	6.3	12.5	6.3	70.6	39.5	73.5	43.1	38.5	479.21
.38	.09	.32	.09	.150	.065	.150	.000	478.88	123.09
.000149	140.	140.	140.	2	0	0	.00	162.30	285.39

```
*SECNO 4.000
     4.000      2.50    481.14       .00       .00    481.14       .00       .01       .00    479.30
      25.0       8.9      11.1       5.1      74.5      31.1      45.0      54.0      47.3    479.32
       .46       .12       .36       .11      .150      .065      .150      .000    478.64     88.64
   .000186       60.       68.       70.         0         0         0       .00    108.24    196.88
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS  L-BANK ELEV
       Q      QLOB       QCH      QROB      ALOB       ACH      AROB       VOL       TWA  R-BANK ELEV
    TIME      VLOB       VCH      VROB       XNL      XNCH       XNR       WTN     ELMIN     SSTA
   SLOPE     XLOBL      XLCH     XLOBR    ITRIAL       IDC     ICONT     CORAR    TOPWID    ENDST


*SECNO 5.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .52

     5.000      2.46    481.15       .00       .00    481.15       .00       .01       .00    479.40
      25.0      10.5       3.6      10.9      48.5       6.2      56.1      57.1      49.9    479.39
       .48       .22       .58       .19      .150      .065      .150      .000    478.69    102.86
   .000681       22.       22.       27.         0         0         0       .00    101.41    204.27


1490 NH CARD USED
*SECNO 6.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.46

     6.000      2.41    481.16       .00       .00    481.16       .00       .01       .00    479.32
      25.0       1.9      18.8       4.3      25.4      70.1      47.6      62.8      54.3    479.38
       .54       .07       .27       .09      .150      .062      .150      .000    478.75     78.93
   .000113       40.       45.       48.         0         0         0       .00     97.57    176.49


*SECNO 7.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .52


3470 ENCROACHMENT STATIONS=      85.0      135.0  TYPE=      1  TARGET=       50.000
     7.000      2.50    481.16       .00       .00    481.17       .01       .01       .00    479.30
      25.0       5.0      16.8       3.2      27.8      31.1      20.2      68.2      57.9    479.33
       .57       .18       .54       .16      .150      .065      .150      .000    478.66     85.00
   .000415       40.       50.       55.         1         0         0       .00     48.98    133.98


*SECNO 8.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=      60.0       90.0  TYPE=      1  TARGET=       30.000
     8.000      2.49    481.18       .00       .00    481.20       .02       .02       .00    479.37
      25.0       4.1      16.5       4.4      16.2      20.3      16.7      70.7      59.4    479.41
       .59       .25       .81       .27      .150      .065      .150      .000    478.69     60.00
   .000977       40.       38.       35.         0         0         0       .00     30.00     90.00
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .300 CEHV= .500
*SECNO 9.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 9.35

3470 ENCROACHMENT STATIONS= 100.0 121.0 TYPE= 1 TARGET= 21.000

9.000	2.43	481.19	.00	.00	481.20	.01	.00	.00	478.76
25.0	.1	24.9	.1	.6	49.5	.6	71.1	59.6	478.76
.59	.11	.50	.11	.012	.012	.012	.000	478.76	100.00
.000011	7.	7.	7.	0	0	0	.00	21.00	121.00

SPECIAL CULVERT

SC	CUNO	CUNV	ENTLC	COFQ	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
	4	.012	.40	2.60	100.00	2.44	4.88	12.20	8	1	478.79	478.76

CHART 8 - BOX CULVERT WITH FLARED WINGWALLS; NO INLET TOP EDGE BEVEL
SCALE 1 - WINGWALLS FLARED 30 TO 75 DEGREES

*SECNO 9.300

SPECIAL CULVERT OUTLET CONTROL
EGIC = 479.652 EGOC = 480.333 PCWSE= 481.189 ELTRD= 483.000

5150, EG OF 480.33 LESS THAN XEG OF 481.20
SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
479.65	480.33	.00	0.	25.	.484	47.6	483.00	0.

3470 ENCROACHMENT STATIONS= 99.0 122.0 TYPE= 1 TARGET= 23.000

9.300	2.40	481.19	.00	.00	481.20	.01	.00	.00	478.79
25.0	.5	23.8	.7	2.4	49.2	2.9	71.9	59.9	478.79
.60	.22	.48	.24	.012	.012	.012	.000	478.79	99.00
.000010	16.	16.	16.	4	0	0	.00	23.00	122.00

CCHV= .100 CEHV= .300
*SECNO 10.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .16

1

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV

SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3470 ENCROACHMENT STATIONS= 91.0 129.0 TYPE= 1 TARGET= 38.000

10.000	2.38	481.19	.00	.00	481.20	.01	.00	.00	479.30
25.0	3.5	17.7	3.9	19.3	33.4	21.4	72.4	60.1	479.37
.61	.18	.53	.18	.150	.065	.150	.000	478.81	91.00
.000413	7.	7.	7.	0	0	0	.00	38.00	129.00

*SECNO 11.000

11.000	2.60	481.22	.00	.00	481.22	.00	.02	.00	479.34
25.0	13.0	8.2	3.8	85.3	17.2	41.7	78.2	65.2	480.18
.67	.15	.48	.09	.150	.065	.150	.000	478.62	52.91
.000368	54.	54.	50.	1	0	0	.00	156.39	209.30

1490 NH CARD USED

*SECNO 12.000

1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

12.000	2.29	481.23	.00	.00	481.23	.00	.00	.00	479.35
25.0	6.3	13.1	5.6	64.5	62.0	54.5	80.2	67.2	479.29
.69	.10	.21	.10	.150	.103	.150	.000	478.93	47.97
.000190	15.	12.	10.	0	0	0	.00	159.36	207.33

CCHV= .100 CEHV= .300

*SECNO 13.000

13.000	2.49	481.23	.00	.00	481.23	.00	.00	.00	479.52
25.0	9.3	7.8	7.9	104.1	22.1	82.2	85.5	72.3	479.46
.73	.09	.35	.10	.150	.065	.150	.000	478.74	51.46
.000186	32.	25.	22.	0	0	0	.00	214.76	266.22

*SECNO 14.000

3280 CROSS SECTION 14.00 EXTENDED .44 METERS

14.000	2.59	481.24	.00	.00	481.24	.00	.01	.00	479.35
25.0	12.1	5.6	7.4	171.7	21.0	95.8	99.5	86.0	479.40
.86	.07	.27	.08	.150	.065	.150	.000	478.65	.00
.000099	63.	50.	48.	0	0	0	.00	268.22	268.22

*SECNO 15.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 15.00 EXTENDED .45 METERS

15.000	2.70	481.25	.00	.00	481.25	.00	.01	.00	479.43
25.0	14.8	4.3	5.9	225.0	18.2	86.5	124.4	108.5	479.52
1.10	.07	.24	.07	.150	.065	.150	.000	478.55	.00
.000082	75.	90.	90.	0	0	0	.00	294.71	294.71

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*SECNO 16.000
3280 CROSS SECTION     16.00 EXTENDED       .46 METERS

    16.000       2.12    481.25       .00       .00    481.26       .00       .01       .00    479.51
      25.0       11.1       6.8       7.1     182.6      31.4     126.3     157.0     139.7    479.40
      1.38        .06       .22       .06      .150      .065      .150      .000    479.14       .00
   .000074        75.      120.      135.         0         0         0       .00    337.53    337.53
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1

PROFILE FOR STREAM AMP CREEK - PROPOSED CON

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

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ELEVATION  478.      479.      479.      480.      480.      481.      481.      482.      482.      483.
    SECNO  CUMDIS

     1.00      0. I          .         .      R  .         .         .WE       .         .M        .         .         .
              5. I          .         .R        .         .L        .WE       .         .M        .         .         .
             10. I          .    R    .         L         .         .WE       .         . M       .         .         .
             15. I         R.        L         .         .         . E       .         . M       .         .         .
     1.50     20. I  R      L.        .         .         .         . E       .         . M       .         .         .
     1.60     25. I  R      L.        .         .         .         . E       .         . M       .         .         .
             30. I  R      L.        .         .         .         . E       .         . M       .         .         .
     1.70     35. I  R      L.        .         .         .         . E       .         . M       .         .         .
     1.80     40. CI  R      L         .         .         .         . E       .         .  M      .         .         .
             45. CI  R      L         .         .         .         . E       .         .  M      .         .         .
             50. CI  R      L         .         .         .         . E       .         .  M      .         .         .
             55. C I  R     .L        .         .         .         . E       .         .  M      .         .         .
             60. C I  R     .L        .         .         .         . E       .         .   M     .         .         .
             65. C I  R     .L        .         .         .         .WE       .         .   M     .         .         .
             70. C I  R     .L        .         .         .         .WE       .         .   M     .         .         .
             75. C I  R     .L        .         .         .         .W E      .         .   M     .         .         .
             80. C  I  R    . L       .         .         .         .W E      .         .   M     .         .         .
     1.90     85. C  I  R    . L       .         .         .         .W E      .         .    M    .         .         .
             90. C  I  R    . L       .         .         .         . WE      .         .    M    .         .         .
             95. C  I   R   . L       .         .         .         . WE      .         .    M    .         .         .
            100. C  I   R   . L       .         .         .         . WE      .         .    M    .         .         .
            105. C  I   R   . L       .         .         .         . WE      .         .   M     .         .         .
            110. C  I   R   . L       .         .         .         . WE      .         .   M     .         .         .
            115. C   I   R  . L       .         .         .         . WE      .         .   M     .         .         .
            120. C   I   R  . L       .         .         .         . WE      .         .   M     .         .         .
            125. C   I   R  . L       .         .         .         . WE      .         .   M     .         .         .
            130. C   I   R  . L       .         .         .         . WE      .         .   M     .         .         .
            135. C   I     R. L       .         .         .         . WE      .         .   M     .         .         .
            140. C   I     R. L       .         .         .         .  E      .         .   M     .         .         .
            145. C   I     R.L        .         .         .         .  E      .         .   M     .         .         .
            150. C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            155. C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            160. C   I      RL        .         .         .         .  E      .         .   M     .         .         .
            165. C    I     RL        .         .         .         .  E      .         . M       .         .         .
            170. C    I     .L        .         .         .         .  E      .         . M       .         .         .
            175. C    I     .L        .         .         .         .  E      .         . M       .         .         .
     2.00    180. C    I     .L        .         .         .         .  E      .         . M       .         .         .
            185. C    I     .L        .         .         .         .  E      .         . M       .         .         .
            190. C    I     .L        .         .         .         .  E      .         . M       .         .         .
            195. C    I     . L       .         .         .         .  E      .         . M       .         .         .
            200. C    I     . L       .         .         .         .  E      .         . M       .         .         .
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       210.  C     I   . L       .         .         .         .  E      .         .  M      .         .         .
       215.  C     I   . L       .         .         .         .  E      .         .  M      .         .         .
       220.  C     I   . L       .         .         .         .   E     .         .  M      .         .         .
       225.  C     I   .  L      .         .         .         .   E     .         .  M      .         .         .
       230.  C     I   .  L      .         .         .         .   E     .         . M       .         .         .
       235.  C     I   .  L      .         .         .         .   E     .         . M       .         .         .
       240.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       245.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       250.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       255.  C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       260.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       265.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       270.  C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       275.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
       280.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
       285.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
       290.  C       I .   L     .         .         .         .   E     .         . M       .         .         .
       295.  C       I .    L    .         .         .         .   E     .         . M       .         .         .
       300.  C       I .    L    .         .         .         .   E     .         .M        .         .         .
       305.  C       I .    L    .         .         .         .   E     .         .M        .         .         .
       310.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
       315.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
3.00   320.  C        I.    L    .         .         .         .   E     .         .M        .         .         .
       325.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
       330.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
       335.  C       I .     L   .         .         .         .   E     .         .M        .         .         .
       340.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       345.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       350.  C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       355.  C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
       360.  C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
       365.  C     I   .      L  .         .         .         .   E     .         .M        .         .         .
       370.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       375.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       380.  C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       385.  C   I     .      LR .         .         .         .   E     .         .M        .         .         .
4.00   390.  C   I     .      LR .         .         .         .   E     .         .M        .         .         .
       395.  C   I     .       L .         .         .         .   E     .         .M        .         .         .
       400.  C   I     .       L .         .         .         .   E     .         .M        .         .         .
       405.  C    I    .        L.         .         .         .   E     .         .M        .         .         .
5.00   410.  C    I    .        L.         .         .         .   E     .         .M        .         .         .
       415.  C    I    .        L.         .         .         .   E     .         .     M   .         .         .
       420.  C    I    .        L.         .         .         .   E     .         .         M         .         .
       425.  C    I    .        L.         .         .         .   E     .         .         .    M    .         .
       430.  C     I   .       LR.         .         .         .   E     .         .         .        M.         .
       435.  C     I   .       LR.         .         .         .   E     .         .         .         .  M      .
       440.  C     I   .       LR.         .         .         .   E     .         .         .         .       M .
       445.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
       450.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
6.00   455.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
       460.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
       465.  C     I   .       LR.         .         .         .   E     .         .         .         .         M
       470.  C     I   .      LR .         .         .         .   E     .         .         .         .         M
       475.  C    I    .      LR .         .         .         .   E     .         .         .         .         M
       480.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
       485.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
       490.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
       495.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
       500.  C    I    .      LR .         .         .         .    E    .         .         .         .         M
7.00   505.  C   I     .      LR .         .         .         .    E    .         .         .         .         M
       510.  C   I     .      LR .         .         .         .    E    .         .         .         .         M
       515.  C    I    .       L .         .         .         .    E    .         .         .         .         M
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       525.  C     I    .       LR.         .         .         .   E     .         .         .         .         M
       530.  C     I    .       LR.         .         .         .   E     .         .         .         .         M
       535.  C     I    .       LR.         .         .         .   E     .         .         .    M    .
       540.  C     I    .       LR.         .         .         .   E     .         .         .M        .         .
8.00   545.  C     I    .        L.         .         .         .   E     .         .M        .         .         .
9.00   550.  C      I   .         .         .         .         .   E     .         .         .         .         M
       555.  C       I  .         .         .         .         .   E     .         .         .         .         M
       560.  C       I  .         .         .         .         .   E     .         .         .         .         M
9.30   565.  C       I  .         .         .         .         .   E     .         .         .         .         M
       570.  C       I  .  LR     .         .         .         .   E     .         .         .         .         M
10.00  575.  C       I  .      L R.         .         .         .   E     .         .         .         .         M
       580.  C       I  .      L  R         .         .         .   E     .         .         .         .         M
       585.  C       I  .      L  . R       .         .         .   E     .         .         .         .         M
       590.  C      I   .      L  .  R      .         .         .   E     .         .         .         .         M
       595.  C      I   .      L  .    R    .         .         .   E     .         .         .         .         M
       600.  C      I   .       L .     R   .         .         .   E     .         .         .         .         M
       605.  C     I    .       L .       R .         .         .   E     .         .         .         .         M
       610.  C     I    .       L .        R.         .         .   E     .         .         .         .        M.
       615.  C     I    .       L .         .R        .         .   E     .         .         .         . M       .
       620.  C    I     .       L .         . R       .         .  WE     .         .         .    M    .         .
       625.  C    I     .       L .         .   R     .         .  WE     .         .      M  .         .         .
11.00  630.  C    I     .       L .         .    R    .         .  WE     .         .M        .         .         .
       635.  C      I   .       L .      R  .         .         .  WE     .         .M        .         .         .
12.00  640.  C          I      RL .         .         .         .    E    .         .M        .         .         .
       645.  C         I.       RL.         .         .         .    E    .         .M        .         .         .
       650.  C        I .       R L         .         .         .    E    .         .M        .         .         .
       655.  C        I .        RL         .         .         .    E    .         .M        .         .         .
       660.  C       I  .         RL        .         .         .    E    .         .M        .         .         .
13.00  665.  C      I   .         R L       .         .         .    E    .         .M        .         .         .
       670.  C      I   .         RL        .         .         .    E    .        M.         .         .         .
       675.  C      I   .         RL        .         .         .    E    .     M   .         .         .         .
       680.  C     I    .         RL        .         .         .    E    .   M     .         .         .         .
       685.  C     I    .         L         .         .         .    E    . M       .         .         .         .
       690.  C     I    .         L         .         .         .    E   M.         .         .         .         .
       695.  C     I    .         L         .         .         .    EM   .         .         .         .         .
       700.  C     I    .        LR         .         .         .  M E    .         .         .         .         .
       705.  C     I    .        L.         .         .         . M  E    .         .         .         .         .
       710.  C    I     .        L.         .         .         M    E    .         .         .         .         .
14.00  715.  C    I     .       LR.         .         .      M  .    E    .         .         .         .         .
       720.  C    I     .       LR.         .         .      M  .    E    .         .         .         .         .
       725.  C    I     .       LR.         .         .      M  .    E    .         .         .         .         .
       730.  C    I     .       L R         .         .      M  .    E    .         .         .         .         .
       735.  C    I     .        LR         .         .      M  .    E    .         .         .         .         .
       740.  C    I     .        LR         .         .      M  .    E    .         .         .         .         .
       745.  C    I     .        LR         .         .      M  .    E    .         .         .         .         .
       750.  C   I      .        LR         .         .      M  .    E    .         .         .         .         .
       755.  C   I      .        LR         .         .      M  .    E    .         .         .         .         .
       760.  C   I      .        LR         .         .      M  .    E    .         .         .         .         .
       765.  C   I      .        L.R        .         .      M  .    E    .         .         .         .         .
       770.  C   I      .        L.R        .         .      M  .    E    .         .         .         .         .
       775.  C   I      .        L.R        .         .      M  .    E    .         .         .         .         .
       780.  C   I      .        L.R        .         .      M  .    E    .         .         .         .         .
       785.  C   I      .        L.R        .         .      M  .    E    .         .         .         .         .
       790.  C   I      .         LR        .         .      M  .    E    .         .         .         .         .
       795.  C I        .         LR        .         .      M  .    E    .         .         .         .         .
       800.  C I        .         LR        .         .      M  .    E    .         .         .         .         .
15.00  805.  C I        .         L R       .         .      M  .    E    .         .         .         .         .
       810.  C   I      .         LR        .         .      M  .    E    .         .         .         .         .
       815.  C   I      .         LR        .         .      M  .    E    .         .         .         .         .
       820.  C    I     .         LR        .         .      M  .    E    .         .         .         .         .
       825.  C    I     .         LR        .         .      M  .    E    .         .         .         .         .
       830.  C     I    .         LR        .         .      M  .    E    .         .         .         .         .
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          840.  C    I   .      LR        .        .      M  .    E  .        .        .        .        .
          845.  C    I   .      LR        .        .      M  .    E  .        .        .        .        .
          850.  C     I  .      LR        .        .      M  .    E  .        .        .        .        .
          855.  C     I  .      LR        .        .      M  .    E  .        .        .        .        .
          860.  C      I .      RL        .        .      M  .    E  .        .        .        .        .
          865.  C      I .      RL        .        .      M  .    E  .        .        .        .        .
          870.  C       I.      RL        .        .      M  .    E  .        .        .        .        .
          875.  C       I.      RL        .        .      M  .    E  .        .        .        .        .
          880.  C        I      RL        .        .      M  .    E  .        .        .        .        .
          885.  C        I      RL        .        .      M  .    E  .        .        .        .        .
          890.  C        .I     RL        .        .      M  .    E  .        .        .        .        .
          895.  C        .I     RL        .        .      M  .    E  .        .        .        .        .
          900.  C        . I    RL        .        .      M  .    E  .        .        .        .        .
          905.  C        . I    RL        .        .      M  .    E  .        .        .        .        .
          910.  C        .  I   R.L       .        .      M  .    E  .        .        .        .        .
          915.  C        .  I   R.L       .        .      M  .    E  .        .        .        .        .
          920.  C        .   I  R.L       .        .      M  .    E  .        .        .        .        .
   16.00  925.  C        .   I  R.L       .        .      M  .    E  .        .        .        .        .
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THIS RUN EXECUTED 21AUG95 08:16:30

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HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK - PROPOSED CON

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	478.44	25.00	480.99	.00	481.03	15.05	.89	51.74	6.45
*	1.500	20.00	.00	.00	478.45	25.00	481.02	.00	481.04	1.27	.82	50.21	22.21
*	1.600	2.00	479.50	479.82	478.45	25.00	481.02	.00	481.04	3.04	.57	43.02	14.34
	1.700	10.00	479.50	479.82	478.45	25.00	481.02	.00	481.04	3.04	.57	43.04	14.35
*	1.800	2.00	.00	.00	478.49	25.00	481.02	.00	481.04	1.41	.85	47.81	21.03
*	1.900	50.00	.00	.00	478.59	25.00	481.01	.00	481.08	41.57	1.65	41.45	3.88
*	2.000	95.00	.00	.00	478.68	25.00	481.11	.00	481.11	1.03	.27	211.22	24.58
	3.000	140.00	.00	.00	478.88	25.00	481.13	.00	481.13	1.49	.32	183.47	20.45
	4.000	68.00	.00	.00	478.64	25.00	481.14	.00	481.14	1.86	.36	150.58	18.31
*	5.000	22.00	.00	.00	478.69	25.00	481.15	.00	481.15	6.81	.58	110.76	9.58

*	7.000	50.00	.00	.00	478.66	25.00	481.16	.00	481.17	4.15	.54	79.07	12.27
*	8.000	38.00	.00	.00	478.69	25.00	481.18	.00	481.20	9.77	.81	53.18	8.00
*	9.000	7.00	.00	.00	478.76	25.00	481.19	.00	481.20	.11	.50	50.75	74.81
	9.300	16.00	483.00	481.20	478.79	25.00	481.19	.00	481.20	.10	.48	54.46	77.22
*	10.000	7.00	.00	.00	478.81	25.00	481.19	.00	481.20	4.13	.53	73.98	12.31
	11.000	54.00	.00	.00	478.62	25.00	481.22	.00	481.22	3.68	.48	144.24	13.04

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
12.000	12.00	.00	.00	478.93	25.00	481.23	.00	481.23	1.90	.21	180.96	18.15
13.000	25.00	.00	.00	478.74	25.00	481.23	.00	481.23	1.86	.35	208.44	18.36
14.000	50.00	.00	.00	478.65	25.00	481.24	.00	481.24	.99	.27	288.44	25.09
15.000	90.00	.00	.00	478.55	25.00	481.25	.00	481.25	.82	.24	329.71	27.55
16.000	120.00	.00	.00	479.14	25.00	481.25	.00	481.26	.74	.22	340.29	29.03

AMP CREEK - PROPOSED CON

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	25.00	480.99	.00	.00	.30	59.79	.00
*	1.500	25.00	481.02	.00	.03	.00	59.37	20.00
*	1.600	25.00	481.02	.00	.00	.00	58.22	2.00
	1.700	25.00	481.02	.00	.00	.00	58.23	10.00
*	1.800	25.00	481.02	.00	.00	.00	57.63	2.00
*	1.900	25.00	481.01	.00	-.01	.00	52.76	50.00
*	2.000	25.00	481.11	.00	.10	.00	171.65	95.00
	3.000	25.00	481.13	.00	.02	.00	162.30	140.00
	4.000	25.00	481.14	.00	.01	.00	108.24	68.00
*	5.000	25.00	481.15	.00	.01	.00	101.41	22.00
*	6.000	25.00	481.16	.00	.01	.00	97.57	45.00

*	8.000	25.00	481.18	.00	.01	.00	30.00	38.00
*	9.000	25.00	481.19	.00	.01	.00	21.00	7.00
	9.300	25.00	481.19	.00	.00	.00	23.00	16.00
*	10.000	25.00	481.19	.00	.00	.00	38.00	7.00
	11.000	25.00	481.22	.00	.03	.00	156.39	54.00
	12.000	25.00	481.23	.00	.01	.00	159.36	12.00
	13.000	25.00	481.23	.00	.00	.00	214.76	25.00
	14.000	25.00	481.24	.00	.01	.00	268.22	50.00
	15.000	25.00	481.25	.00	.01	.00	294.71	90.00
	16.000	25.00	481.25	.00	.01	.00	337.53	120.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 1.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.600 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.800 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.900 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 10.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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*  HEC-2 WATER SURFACE PROFILES                   *          *  U.S. ARMY CORPS OF ENGINEERS        *
*                                                 *          *  HYDROLOGIC ENGINEERING CENTER       *
*  Version   4.6.2;  May 1991                     *          *  609 SECOND STREET, SUITE D          *
*                                                 *          *  DAVIS, CALIFORNIA 95616-4687        *
*  RUN DATE    21AUG95    TIME   08:19:24         *          *        (916) 756-1104                *
***************************************************          ****************************************
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X     X  XXXXXXX   XXXXX             XXXXX
X     X  X        X     X           X     X
X     X  X        X                       X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X        X                 X
X     X  X        X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 21AUG95   08:19:24

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 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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T1    WATER SURFACE PROFILE:  100-YEAR FLOW    FILE: "CMCRRSP2" **********
T2    RAILROAD DRAINAGE                        AUGUST, 1995     * METRIC *
T3    SWAMP CREEK - PROPOSED CONDITIONS (SPAN) F&VD: SRB/MDL    **********
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J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	0	.001500	1.0	0	25.	480.69	0

NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.0	10.0	100.0	109.7	0	0	0	0	0	0
GR	482.2	0	482.	50.	481.	100.	478.58	101.	478.44	104.
GR	478.59	105.2	478.61	108.7	479.8	109.7	481.	160.	482.	200.
NC	.024	.024	.024	.3	.5	0	0	0	0	0
X1	1.5	20.	103.05	106.	20	20	20	0	0	0
X3	10.	0	0	0	0	0	0	479.5	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
X1	1.6	31.	103.05	106.	2.	2.	2.	0	0	0
BT	31.	0	482.24	482.24	50.	482.04	482.04	100.	481.04	481.04

BT	479.5	479.16	103.24	479.5	479.26	103.36	479.5	479.33	103.5	479.5
BT	479.3	103.64	479.5	479.33	103.76	479.5	479.26	103.86	479.5	479.16
BT	103.93	479.5	479.04	103.95	479.5	478.9	104.	479.5	479.2	105.2
BT	479.8	479.2	105.38	479.83	479.2	105.41	479.83	479.39	105.5	479.83
BT	479.6	105.64	479.82	479.7	105.81	479.82	479.79	106.	479.83	479.82
BT	106.19	479.8	479.79	106.36	479.79	479.7	106.5	479.79	479.56	106.59
BT	479.8	479.39	106.62	479.78	479.2	108.7	479.7	479.7	109.7	479.84
BT	479.84	200.	482.04	482.04	0	0	0	0	0	0
GR	482.24	0	482.04	50.	481.04	100.	479.5	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.5	103.64	478.54	103.76	478.64	103.86	478.76	103.93	478.9	103.95
GR	479.2	104.	479.2	105.2	479.2	105.38	479.01	105.41	478.84	105.5
GR	478.7	105.64	478.61	105.81	478.58	106.	478.61	106.19	478.7	106.36
GR	478.8	106.5	479.01	106.59	479.2	106.62	479.7	108.7	479.84	109.7
GR	482.04	200.	0	0	0	0	0	0	0	0

X1	1.7	0	0	0	10.	10.	10.	0	0	0
X2	0	0	0	0	0	0	1.	0	0	0
X1	1.8	20.	103.05	106.	2.	2.	2.	0	.04	0
X3	10.	0	0	0	0	0	0	479.5	479.78	0
GR	482.2	0	482.04	50.	481.04	100.	478.62	101.	478.9	103.05
GR	478.8	103.07	478.64	103.14	478.54	103.24	478.47	103.36	478.45	103.5
GR	478.6	106.	478.61	106.19	478.7	106.36	478.84	106.5	479.01	106.59
GR	479.2	106.62	478.65	108.7	479.84	109.7	481.04	160.	482.04	200.
NC	.150	.150	.065	.100	.300	0	0	0	0	0
X1	1.9	0	0	0	50.	50.	50.	0	.100	0
X1	2.	10.	137.	155.	70.	100.	95.	0	0	0
GR	482.2	0	482.	66.	479.15	130.	479.	137.	478.85	138.
GR	478.68	154.	479.	155.	479.3	165.	480.	210.	482.1	300.
X1	3.	10.	191.	209.	140.	140.	140.	0	0	0
GR	484.	0	482.	95.	479.36	180.	479.21	191.	479.07	191.5
GR	478.88	200.	478.875	208.5	479.215	209.	479.555	223.	482.	320.
X1	4.	12.	143.	157.	60.	70.	68.	0	0	0
GR	484.	0	482.	80.	480.	100.	479.32	130.	479.3	143.
GR	479.2	143.5	478.635	148.5	479.11	156.5	479.32	157.	479.31	169.
GR	480.	177.	482.	212.	0	0	0	0	0	0
X1	5.	11.	144.	146.6	22.	27.	22.	0	0	0
GR	484.	0	482.	90.	480.	120.	479.405	130.	479.405	144.
GR	478.69	144.3	478.69	146.3	479.385	146.6	479.385	155.	480.	170.
GR	482.	230.	0	0	0	0	0	0	0	0
NH	5.	.150	107.	.045	114.	.150	131.	.045	142.	.150
NH	210.	0	0	0	0	0	0	0	0	0
X1	6.	18.	107.	142.	40.	48.	45.	0	0	0

GR	484.	0	482.	65.	480.8	85.	479.32	107.	479.12	107.5
GR	478.84	109.5	479.22	113.5	479.38	114.	479.375	122.	479.35	131.
GR	479.05	131.5	478.75	136.5	478.97	141.5	479.375	142.	479.89	167.
GR	480.	173.	482.	179.	484.	210.	0	0	0	0
NC	.15	.15	.065	0	0	0	0	0	0	0

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21AUG95 08:19:24 PAGE 3

X1	7.	11.	102.	115.5	40.	55.	50.	0	0	0
X3				90.0		129.0				
GR	484.	0	482.	40.	479.96	78.	479.3	102.	479.04	102.5
GR	478.66	110.5	479.	115.	479.325	115.5	479.93	125.	482.	140.
GR	488.	165.	0	0	0	0	0	0	0	0
X1	8.	10.	69.15	81.85	40.	35.	38.	0	0	0
X3				63.0		86.0				
GR	484.	0	482.	30.	480.61	50.	479.00	69.15	478.69	69.25
GR	478.69	75.5	478.69	81.75	479.00	81.85	479.6	90.	482.	112.
NC	.024	.024	.024	.3	.5					
X1	9.	10.	97.70	117.10	7.	7.	7.	0	0	0
X3				97		118				
GR	484.83	0	480.35	97.7	480.35	97.8	479.0	100.11	478.76	101.11
GR	478.76	113.61	479.00	114.61	480.35	117.00	480.35	117.1	484.83	190.0
X1	9.1				2.0	2.0	2.0			
X3				97.8		117				
X1	9.2				12	12	12		.03	
X3				97.8		117				
BT	-10.0	0.0	484.83	484.83	97.7	484.83	480.35	97.8	484.83	482.37
BT		100.11	484.83	482.37	101.11	484.83	482.37	113.61	484.83	482.37
BT		114.61	484.83	482.37	117.0	484.83	482.37	117.1	484.83	480.35
BT		190	484.83	484.83						
X1	9.3	12.0	97.60	117.10	2.	2.	2.			
X3				98		118				
GR	484.0	0.0	482.0	58.0	481.0	75.0	479.30	97.6	479.07	101.0
GR	478.76	101.41	478.76	111.47	478.76	111.57	478.76	112.0	479.00	117.1
GR	481.0	135.0	488.0	190.0						
NC	.15	.15	.065	.1	.3					
X1	10.	12.	102.	117.	7.	7.	7.	0	0	0
X3				92		128				
X4	2	478.81	104.25	479.00	116.85					
GR	484.	0	482.	52.	481.	65.	479.845	80.	479.305	102.
GR	479.00	104.15	478.81	110.5	478.81	116.75	479.37	117.	479.575	147.
GR	482.	155.	486.	170.	0	0	0	0	0	0
X1	11.	10.	127.	134.5	54.	50.	54.	0	0	0
X3				61		198				
GR	484.	0	482.	30.	479.59	100.	479.34	127.	479.15	127.5
GR	478.62	130.5	478.97	134.	480.18	134.5	481.	200.	482.	244.

NH	5.	.15	114.	.045	122.	.15	136.	.045	144.	.15
NH	250.	0	0	0	0	0	0	0	0	0
X1	12.	17.	114.	145.	15.	10.	12.	0	0	0
GR	484.	0	482.	22.	479.67	100.	479.345	114.	479.115	114.5
GR	479.05	119.	479.26	122.	479.445	122.5	479.36	130.	479.335	136.
GR	479.19	137.	478.935	140.	479.09	144.	479.29	145.	480.18	170.
GR	481.	195.	482.	250.	0	0	0	0	0	0
NC	.15	.15	.065	.1	.3	0	0	0	0	0
X1	13.	9.	170.	180.	32.	22.	25.	0	0	0
GR	482.	0	479.795	148.	479.52	170.	479.2	170.5	478.74	175.5
GR	479.25	179.5	479.46	180.	479.81	203.5	482.	300.	0	0
X1	14.	10.	166.	175.	63.	48.	50.	0	0	0
GR	480.8	0	479.84	140.	479.345	166.	479.05	166.5	478.65	170.5
GR	479.13	174.5	479.405	175.	479.645	201.	481.	255.	482.	310.
X1	15.	10.	206.	214.	75.	90.	90.	0	0	0
GR	480.8	0	479.69	180.	479.435	206.	479.31	206.5	478.545	210.5
GR	479.25	213.5	479.525	214.	479.75	244.	482.	320.	483.	355.
X1	16.	10.	173.	188.	75.	135.	120.	0	0	0
GR	480.8	0	479.775	150.	479.505	173.	479.180	173.5	479.135	180.5
GR	479.16	187.5	479.4	188.	479.94	218.	482.	405.	484.	500.

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= .100 CEHV= .300

*SECNO 1.000

1.000	2.55	480.99	.00	480.69	481.03	.03	.00	.00	481.00
25.0	.0	19.5	5.5	.0	21.8	29.9	.0	.0	479.80
.00	.00	.89	.18	.000	.065	.150	.000	478.44	100.00
.001505	0.	0.	0.	0	0	6	.00	59.79	159.79

CCHV= .300 CEHV= .500

*SECNO 1.500

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.45

1.500	2.57	481.02	.00	.00	481.04	.02	.01	.00	478.90

.01	.70	.82	.40	.024	.024	.024	.000	478.45	100.01
.000127	20.	20.	20.	0	0	0	.00	59.37	159.37

*SECNO 1.600

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

3370 NORMAL BRIDGE, NRD= 31 MIN ELTRD= 479.50 MAX ELLC= 479.82

1.600	2.57	481.02	.00	.00	481.04	.02	.00	.00	478.90
25.0	3.3	3.0	18.7	3.9	5.2	34.0	1.1	1.3	478.58
.01	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	2.	2.	2.	0	0	0	-2.36	58.22	158.23

*SECNO 1.700

3370 NORMAL BRIDGE, NRD= 31 MIN ELTRD= 479.50 MAX ELLC= 479.82

1.700	2.57	481.02	.00	.00	481.04	.02	.00	.00	478.90
25.0	3.3	3.0	18.7	3.9	5.2	34.0	1.5	1.9	478.58
.02	.85	.57	.55	.024	.024	.024	.000	478.45	100.01
.000304	10.	10.	10.	0	0	0	-2.36	58.23	158.24

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.800

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.47

1.800	2.53	481.02	.00	.00	481.04	.02	.00	.00	478.94
25.0	4.2	6.2	14.7	5.7	7.2	34.9	1.6	2.0	478.64
.02	.73	.85	.42	.024	.024	.024	.000	478.49	100.02
.000141	2.	2.	2.	0	0	0	.00	57.63	157.65

CCHV= .100 CEHV= .300
*SECNO 1.900

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .18

1.900	2.42	481.01	.00	.00	481.08	.07	.02	.01	479.04
25.0	3.3	11.4	10.3	5.4	6.9	29.2	3.9	4.8	478.74
.03	.61	1.65	.35	.150	.065	.150	.000	478.59	100.07
.004157	50.	50.	50.	2	0	0	.00	52.76	152.83

*SECNO 2.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 6.34

25.0	4.4	11.5	9.0	57.4	42.0	111.8	15.4	15.1	479.00
.18	.08	.27	.08	.150	.065	.150	.000	478.68	85.97
.000103	70.	95.	100.	2	0	0	.00	171.65	257.61

*SECNO 3.000

3.000	2.25	481.13	.00	.00	481.13	.00	.02	.00	479.21
25.0	6.3	12.5	6.3	70.6	39.5	73.5	43.1	38.5	479.21
.38	.09	.32	.09	.150	.065	.150	.000	478.88	123.09
.000149	140.	140.	140.	2	0	0	.00	162.30	285.39

*SECNO 4.000

4.000	2.50	481.14	.00	.00	481.14	.00	.01	.00	479.30
25.0	8.9	11.1	5.1	74.5	31.1	45.0	54.0	47.3	479.32
.46	.12	.36	.11	.150	.065	.150	.000	478.64	88.64
.000186	60.	68.	70.	0	0	0	.00	108.24	196.88

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 5.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .52

5.000	2.46	481.15	.00	.00	481.15	.00	.01	.00	479.40
25.0	10.5	3.6	10.9	48.5	6.2	56.1	57.1	49.9	479.39
.48	.22	.58	.19	.150	.065	.150	.000	478.69	102.86
.000681	22.	22.	27.	0	0	0	.00	101.41	204.27

1490 NH CARD USED
*SECNO 6.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.20

3470 ENCROACHMENT STATIONS= 105.0 165.0 TYPE= 1 TARGET= 60.000

6.000	2.41	481.16	.00	.00	481.16	.00	.01	.00	479.32
25.0	.3	21.1	3.7	3.6	70.1	35.7	62.0	53.5	479.38
.53	.08	.30	.10	.150	.062	.150	.000	478.75	105.00
.000141	40.	45.	48.	0	0	0	.00	60.00	165.00

*SECNO 7.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .55

3470 ENCROACHMENT STATIONS= 90.0 129.0 TYPE= 1 TARGET= 39.000

7.000	2.50	481.16	.00	.00	481.18	.01	.01	.00	479.30
25.0	3.9	17.8	3.3	20.5	31.1	18.5	66.6	56.0	479.33
.56	.19	.57	.18	.150	.065	.150	.000	478.66	90.00
.000465	40.	50.	55.	1	0	0	.00	39.00	129.00

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*SECNO 8.000

3470 ENCROACHMENT STATIONS=       63.0      86.0  TYPE=      1  TARGET=       23.000
      8.000      2.49    481.18       .00       .00    481.20       .02       .02       .00    479.00
       25.0       2.5      20.9       1.7      11.8      31.5       8.4      68.9      57.2    479.00
        .58       .21       .66       .20      .150      .065      .150      .000    478.69     63.00
    .000576       40.       38.       35.         0         0         0       .00     23.00     86.00


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      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


CCHV=      .300 CEHV=      .500
*SECNO 9.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.78


3470 ENCROACHMENT STATIONS=       97.0     118.0  TYPE=      1  TARGET=       21.000
      9.000      2.42    481.18       .00       .00    481.20       .02       .00       .00    480.35
       25.0        .1      24.7        .1        .6      42.1        .7      69.2      57.3    480.35
        .58       .19       .59       .21      .024      .024      .024      .000    478.76     97.00
    .000074        7.        7.        7.         0         0         0       .00     21.00    118.00


*SECNO 9.100

3470 ENCROACHMENT STATIONS=       97.8     117.0  TYPE=      1  TARGET=       19.200
      9.100      2.42    481.18       .00       .00    481.20       .02       .00       .00 100000.00
       25.0        .0      25.0        .0        .0      42.0        .0      69.3      57.4 100000.00
        .58       .00       .60       .00      .000      .024      .000      .000    478.76     97.80
    .000085        2.        2.        2.         0         0         0       .00     19.20    117.00


*SECNO 9.200

3370 NORMAL BRIDGE, NRD=  10 MIN ELTRD=   484.83 MAX ELLC=   482.37


3470 ENCROACHMENT STATIONS=       97.8     117.0  TYPE=      1  TARGET=       19.200
      9.200      2.39    481.18       .00       .00    481.20       .02       .00       .00 100000.00
       25.0        .0      25.0        .0        .0      41.4        .0      69.8      57.6 100000.00
        .59       .00       .60       .00      .000      .024      .000      .000    478.79     97.80
    .000088       12.       12.       12.         0         0         0       .00     19.20    117.00


*SECNO 9.300

3470 ENCROACHMENT STATIONS=       98.0     118.0  TYPE=      1  TARGET=       20.000
      9.300      2.43    481.19       .00       .00    481.20       .02       .00       .00 100000.00
       25.0        .0      24.5        .5        .0      44.4       1.9      69.9      57.7    479.00
        .59       .00       .55       .25      .000      .024      .024      .000    478.76     98.00
    .000065        2.        2.        2.         0         0         0       .00     20.00    118.00
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .100 CEHV= .300
*SECNO 10.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .40

3470 ENCROACHMENT STATIONS= 92.0 128.0 TYPE= 1 TARGET= 36.000

10.000	2.38	481.19	.00	.00	481.20	.01	.00	.00	479.30
25.0	3.1	18.4	3.5	17.6	34.8	19.6	70.3	57.8	479.37
.59	.18	.53	.18	.150	.065	.150	.000	478.81	92.00
.000401	7.	7.	7.	0	0	0	.00	36.00	128.00

*SECNO 11.000

3470 ENCROACHMENT STATIONS= 61.0 198.0 TYPE= 1 TARGET= 137.000

11.000	2.60	481.22	.00	.00	481.22	.00	.02	.00	479.34
25.0	13.1	8.1	3.7	84.3	17.2	40.3	75.9	62.4	480.18
.65	.16	.47	.09	.150	.065	.150	.000	478.62	61.00
.000359	54.	54.	50.	1	0	0	.00	137.00	198.00

1490 NH CARD USED
*SECNO 12.000
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

12.000	2.29	481.23	.00	.00	481.23	.00	.00	.00	479.35
25.0	6.3	13.1	5.6	64.5	62.0	54.5	78.0	64.2	479.29
.68	.10	.21	.10	.150	.103	.150	.000	478.93	47.96
.000190	15.	12.	10.	0	0	0	.00	159.38	207.35

CCHV= .100 CEHV= .300
*SECNO 13.000

13.000	2.49	481.23	.00	.00	481.23	.00	.00	.00	479.52
25.0	9.3	7.8	7.9	104.1	22.1	82.2	83.2	69.3	479.46
.72	.09	.35	.10	.150	.065	.150	.000	478.74	51.45
.000185	32.	25.	22.	0	0	0	.00	214.77	266.22

*SECNO 14.000
3280 CROSS SECTION 14.00 EXTENDED .44 METERS

14.000	2.59	481.24	.00	.00	481.24	.00	.01	.00	479.35
25.0	12.1	5.6	7.4	171.7	21.0	95.8	97.3	83.1	479.40
.85	.07	.27	.08	.150	.065	.150	.000	478.65	.00
.000099	63.	50.	48.	0	0	0	.00	268.24	268.24

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Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 15.000
3280 CROSS SECTION     15.00 EXTENDED       .45 METERS

    15.000      2.70    481.25       .00       .00    481.25       .00       .01       .00    479.43
      25.0      14.8       4.3       5.9     225.0      18.2      86.5     122.1     105.6    479.52
      1.09       .07       .24       .07      .150      .065      .150      .000    478.55       .00
   .000082       75.       90.       90.         0         0         0       .00    294.71    294.71


*SECNO 16.000
3280 CROSS SECTION     16.00 EXTENDED       .46 METERS

    16.000      2.12    481.25       .00       .00    481.26       .00       .01       .00    479.51
      25.0      11.1       6.8       7.1     182.6      31.4     126.3     154.8     136.7    479.40
      1.36       .06       .22       .06      .150      .065      .150      .000    479.14       .00
   .000074       75.      120.      135.         0         0         0       .00    337.55    337.55
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PROFILE FOR STREAM AMP CREEK - PROPOSED CON

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION   478.      479.      479.      480.      480.      481.      481.      482.      482.      483.
    SECNO   CUMDIS

     1.00      0.  I         .         .      R  .         .        .WE        .        .M         .         .         .
               5.  I         .         .R        .         .L       .WE        .        .M         .         .         .
              10.  I         .    R    .         L         .        .WE        .        . M        .         .         .
              15.  I        R.         L         .         .        . E        .        . M        .         .         .
     1.50     20.  I  R     L.         .         .         .        . E        .        . M        .         .         .
     1.60     25.  I  R     L.         .         .         .        . E        .        . M        .         .         .
              30.  I  R     L.         .         .         .        . E        .        . M        .         .         .
     1.70     35.  I  R     L.         .         .         .        . E        .        . M        .         .         .
     1.80     40. CI   R     L         .         .         .        . E        .        .   M      .         .         .
              45. CI   R     L         .         .         .        . E        .        .   M      .         .         .
              50. CI   R     L         .         .         .        . E        .        .   M      .         .         .
              55.  C I  R    .L        .         .         .        . E        .        .   M      .         .         .
              60.  C I  R    .L        .         .         .        . E        .        .    M     .         .         .
              65.  C I  R    .L        .         .         .        .WE        .        .    M     .         .         .
              70.  C I  R    .L        .         .         .        .WE        .        .    M     .         .         .
              75.  C I  R    .L        .         .         .        .W E       .        .    M     .         .         .
              80.  C  I  R   . L       .         .         .        .W E       .        .    M     .         .         .
     1.90     85.  C  I  R   . L       .         .         .        .W E       .        .     M    .         .         .
              90.  C  I  R   . L       .         .         .        . WE       .        .     M    .         .         .
              95.  C  I   R  . L       .         .         .        . WE       .        .     M    .         .         .
             100.  C  I   R  . L       .         .         .        . WE       .        .     M    .         .         .
             105.  C  I   R  . L       .         .         .        . WE       .        .    M     .         .         .
             110.  C  I   R  . L       .         .         .        . WE       .        .    M     .         .         .
             115.  C   I   R . L       .         .         .        . WE       .        .    M     .         .         .
             120.  C   I   R . L       .         .         .        . WE       .        .    M     .         .         .
             125.  C   I   R . L       .         .         .        . WE       .        .    M     .         .         .
             130.  C   I   R . L       .         .         .        . WE       .        .    M     .         .         .
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       140.    C   I    R. L       .         .         .         .  E      .         .   M     .         .         .
       145.    C   I    R.L        .         .         .         .  E      .         .   M     .         .         .
       150.    C   I     RL        .         .         .         .  E      .         .   M     .         .         .
       155.    C   I     RL        .         .         .         .  E      .         .   M     .         .         .
       160.    C   I     RL        .         .         .         .  E      .         .   M     .         .         .
       165.    C    I    RL        .         .         .         .  E      .         .  M      .         .         .
       170.    C    I    .L        .         .         .         .  E      .         .  M      .         .         .
       175.    C    I    .L        .         .         .         .  E      .         .  M      .         .         .
2.00   180.    C    I    .L        .         .         .         .  E      .         .  M      .         .         .
       185.    C    I    .L        .         .         .         .  E      .         .  M      .         .         .
       190.    C    I    .L        .         .         .         .  E      .         .  M      .         .         .
       195.    C    I    . L       .         .         .         .  E      .         .  M      .         .         .
       200.    C    I    . L       .         .         .         .  E      .         .  M      .         .         .
       205.    C     I   . L       .         .         .         .  E      .         .  M      .         .         .
       210.    C     I   . L       .         .         .         .  E      .         .  M      .         .         .
       215.    C     I   . L       .         .         .         .  E      .         .  M      .         .         .
       220.    C     I   . L       .         .         .         .   E     .         .  M      .         .         .
       225.    C     I   .  L      .         .         .         .   E     .         .  M      .         .         .
       230.    C     I   .  L      .         .         .         .   E     .         . M       .         .         .
       235.    C     I   .  L      .         .         .         .   E     .         . M       .         .         .
       240.    C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       245.    C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       250.    C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       255.    C      I  .  L      .         .         .         .   E     .         . M       .         .         .
       260.    C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       265.    C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       270.    C      I  .   L     .         .         .         .   E     .         . M       .         .         .
       275.    C       I .   L     .         .         .         .   E     .         . M       .         .         .
       280.    C       I .   L     .         .         .         .   E     .         . M       .         .         .
       285.    C       I .   L     .         .         .         .   E     .         . M       .         .         .
       290.    C       I .   L     .         .         .         .   E     .         . M       .         .         .
       295.    C       I .    L    .         .         .         .   E     .         . M       .         .         .
       300.    C       I .    L    .         .         .         .   E     .         .M        .         .         .
       305.    C       I .    L    .         .         .         .   E     .         .M        .         .         .
       310.    C        I.    L    .         .         .         .   E     .         .M        .         .         .
       315.    C        I.    L    .         .         .         .   E     .         .M        .         .         .
3.00   320.    C        I.    L    .         .         .         .   E     .         .M        .         .         .
       325.    C       I .     L   .         .         .         .   E     .         .M        .         .         .
       330.    C       I .     L   .         .         .         .   E     .         .M        .         .         .
       335.    C       I .     L   .         .         .         .   E     .         .M        .         .         .
       340.    C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       345.    C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       350.    C      I  .     L   .         .         .         .   E     .         .M        .         .         .
       355.    C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
       360.    C     I   .     LR  .         .         .         .   E     .         .M        .         .         .
       365.    C     I   .      L  .         .         .         .   E     .         .M        .         .         .
       370.    C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       375.    C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       380.    C    I    .      L  .         .         .         .   E     .         .M        .         .         .
       385.    C   I     .      LR .         .         .         .   E     .         .M        .         .         .
4.00   390.    C   I     .      LR .         .         .         .   E     .         .M        .         .         .
       395.    C   I     .       L .         .         .         .   E     .         .M        .         .         .
       400.    C   I     .       L .         .         .         .   E     .         .M        .         .         .
       405.    C    I    .        L.         .         .         .   E     .         .M        .         .         .
5.00   410.    C    I    .        L.         .         .         .   E     .         .M        .         .         .
       415.    C    I    .        L.         .         .         .   E     .         .     M   .         .         .
       420.    C    I    .        L.         .         .         .   E     .         .         M         .         .
       425.    C    I    .        L.         .         .         .   E     .         .         .    M    .         .
       430.    C     I   .       LR.         .         .         .   E     .         .         .        M.         .
       435.    C     I   .       LR.         .         .         .   E     .         .         .         .  M      .
       440.    C     I   .       LR.         .         .         .   E     .         .         .         .       M .
       445.    C     I   .       LR.         .         .         .   E     .         .         .         .         M
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6.00   455.   C     I   .       LR.         .         .         .   E     .         .         .         .         M
       460.   C     I   .       LR.         .         .         .   E     .         .         .         .         M
       465.   C     I   .       LR.         .         .         .   E     .         .         .         .         M
       470.   C     I   .      LR .         .         .         .  WE     .         .         .         .         M
       475.   C    I    .      LR .         .         .         .  WE     .         .         .         .         M
       480.   C    I    .      LR .         .         .         .   E     .         .         .         .         M
       485.   C    I    .      LR .         .         .         .   E     .         .         .         .         M
       490.   C    I    .      LR .         .         .         .   E     .         .         .         .         M
       495.   C    I    .      LR .         .         .         .   E     .         .         .         .         M
       500.   C    I    .      LR .         .         .         .   E     .         .         .         .         M
7.00   505.   C   I     .      LR .         .         .         .   E     .         .         .         .         M
       510.   C   I     .     LR  .         .         .         .   E     .         .         .         .         M
       515.   C    I    .     L   .         .         .         .   E     .         .         .         .         M
       520.   C    I    .    L    .         .         .         .   E     .         .         .         .         M
       525.   C    I    .   L     .         .         .         .   E     .         .         .         .         M
       530.   C    I    .  L      .         .         .         .   E     .         .         .         .         M
       535.   C    I    . LR      .         .         .         .   E     .         .         .         .     M   .
       540.   C    I    . L       .         .         .         .   E     .         .         .M        .         .
8.00   545.   C    I    .L        .         .         .         .   E     .         .M        .         .         .
9.00   550.   C     I   .         .         .       L .         .   E     .         .         .         .         M
9.10   555.   C     I   .         .         .         .         .   E     .         .         .         .         L
       560.   C      I  .         .         .         .         .   E     .         .         .         .         L
9.20   565.   C      I  .         .         .         .         .   E     .         .         .         .         L
9.30   570.   C     I   .R        .         .         .         .   E     .         .         .         .         L
10.00  575.   C      I  .      L R.         .         .         .   E     .         .         .         .         M
       580.   C      I  .      L  R         .         .         .   E     .         .         .         .         M
       585.   C      I  .      L  . R       .         .         .   E     .         .         .         .         M
       590.   C     I   .      L  .  R      .         .         .   E     .         .         .         .         M
       595.   C     I   .      L  .    R    .         .         .   E     .         .         .         .         M
       600.   C     I   .       L .     R   .         .         .   E     .         .         .         .         M
       605.   C    I    .       L .      R  .         .         .   E     .         .         .         .         M
       610.   C    I    .       L .        R.         .         .   E     .         .         .         .        M.
       615.   C    I    .       L .         .R        .         .   E     .         .         .         . M       .
       620.   C   I     .       L .         . R       .         .  WE     .         .         .   M     .         .
       625.   C   I     .       L .         .  R      .         .  WE     .         .     M   .         .         .
11.00  630.   C   I     .       L .         .   R     .         .  WE     .         .M        .         .         .
       635.   C     I   .       L .     R   .         .         .  WE     .         .M        .         .         .
12.00  640.   C         I     RL  .         .         .         .    E    .         .M        .         .         .
       645.   C        I.       RL.         .         .         .    E    .         .M        .         .         .
       650.   C       I .       R L         .         .         .    E    .         .M        .         .         .
       655.   C       I .        RL         .         .         .    E    .         .M        .         .         .
       660.   C      I  .         RL        .         .         .    E    .         .M        .         .         .
13.00  665.   C     I   .         R L       .         .         .    E    .         .M        .         .         .
       670.   C     I   .         RL        .         .         .    E    .        M.         .         .         .
       675.   C     I   .         RL        .         .         .    E    .    M    .         .         .         .
       680.   C    I    .         RL        .         .         .    E    .  M      .         .         .         .
       685.   C    I    .         L         .         .         .    E    . M       .         .         .         .
       690.   C    I    .         L         .         .         .    E   M.         .         .         .         .
       695.   C    I    .         L         .         .         .    EM   .         .         .         .         .
       700.   C    I    .        LR         .         .         .  M E    .         .         .         .         .
       705.   C    I    .        L.         .         .         . M  E    .         .         .         .         .
       710.   C   I     .        L.         .         .        M     E    .         .         .         .         .
14.00  715.   C   I     .       LR.         .         .     M   .    E    .         .         .         .         .
       720.   C   I     .       LR.         .         .     M   .    E    .         .         .         .         .
       725.   C   I     .       LR.         .         .     M   .    E    .         .         .         .         .
       730.   C   I     .       L R         .         .     M   .    E    .         .         .         .         .
       735.   C   I     .        LR         .         .     M   .    E    .         .         .         .         .
       740.   C   I     .        LR         .         .     M   .    E    .         .         .         .         .
       745.   C   I     .        LR         .         .     M   .    E    .         .         .         .         .
       750.   C  I      .        LR         .         .     M   .    E    .         .         .         .         .
       755.   C  I      .        LR         .         .     M   .    E    .         .         .         .         .
       760.   C  I      .        LR         .         .     M   .    E    .         .         .         .         .
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          770.  C  I      .      L.R         .         .     M  .     E  .         .         .         .         .
          775.  C  I      .      L.R         .         .     M  .     E  .         .         .         .         .
          780.  C  I      .      L.R         .         .     M  .     E  .         .         .         .         .
          785.  C  I      .      L.R         .         .     M  .     E  .         .         .         .         .
          790.  C  I      .       LR         .         .     M  .     E  .         .         .         .         .
          795.  C I       .       LR         .         .     M  .     E  .         .         .         .         .
          800.  C I       .       LR         .         .     M  .     E  .         .         .         .         .
  15.00   805.  C I       .       L R        .         .     M  .     E  .         .         .         .         .
          810.  C  I      .       LR         .         .     M  .     E  .         .         .         .         .
          815.  C  I      .       LR         .         .     M  .     E  .         .         .         .         .
          820.  C   I     .       LR         .         .     M  .     E  .         .         .         .         .
          825.  C   I     .       LR         .         .     M  .     E  .         .         .         .         .
          830.  C    I    .       LR         .         .     M  .     E  .         .         .         .         .
          835.  C    I    .       LR         .         .     M  .     E  .         .         .         .         .
          840.  C     I   .       LR         .         .     M  .     E  .         .         .         .         .
          845.  C     I   .       LR         .         .     M  .     E  .         .         .         .         .
          850.  C      I  .       LR         .         .     M  .     E  .         .         .         .         .
          855.  C      I  .       LR         .         .     M  .     E  .         .         .         .         .
          860.  C       I .       RL         .         .     M  .     E  .         .         .         .         .
          865.  C       I .       RL         .         .     M  .     E  .         .         .         .         .
          870.  C        I.       RL         .         .     M  .     E  .         .         .         .         .
          875.  C        I.       RL         .         .     M  .     E  .         .         .         .         .
          880.  C         I       RL         .         .     M  .     E  .         .         .         .         .
          885.  C         I       RL         .         .     M  .     E  .         .         .         .         .
          890.  C         .I      RL         .         .     M  .     E  .         .         .         .         .
          895.  C         .I      RL         .         .     M  .     E  .         .         .         .         .
          900.  C         . I     RL         .         .     M  .     E  .         .         .         .         .
          905.  C         . I     RL         .         .     M  .     E  .         .         .         .         .
          910.  C         .  I   R.L         .         .     M  .     E  .         .         .         .         .
          915.  C         .  I   R.L         .         .     M  .     E  .         .         .         .         .
          920.  C         .   I  R.L         .         .     M  .     E  .         .         .         .         .
  16.00   925.  C         .   I  R.L         .         .     M  .     E  .         .         .         .         .
1
 21AUG95      08:19:24                                                                                   PAGE    11
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THIS RUN EXECUTED 21AUG95 08:19:25

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HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

AMP CREEK - PROPOSED CON

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	478.44	25.00	480.99	.00	481.03	15.05	.89	51.74	6.45
*	1.500	20.00	.00	.00	478.45	25.00	481.02	.00	481.04	1.27	.82	50.21	22.21
*	1.600	2.00	479.50	479.82	478.45	25.00	481.02	.00	481.04	3.04	.57	43.02	14.34

*	1.800	2.00	.00	.00	478.49	25.00	481.02	.00	481.04	1.41	.85	47.81	21.03
*	1.900	50.00	.00	.00	478.59	25.00	481.01	.00	481.08	41.57	1.65	41.45	3.88
*	2.000	95.00	.00	.00	478.68	25.00	481.11	.00	481.11	1.03	.27	211.22	24.58
	3.000	140.00	.00	.00	478.88	25.00	481.13	.00	481.13	1.49	.32	183.47	20.45
	4.000	68.00	.00	.00	478.64	25.00	481.14	.00	481.14	1.86	.36	150.58	18.31
*	5.000	22.00	.00	.00	478.69	25.00	481.15	.00	481.15	6.81	.58	110.76	9.58
*	6.000	45.00	.00	.00	478.75	25.00	481.16	.00	481.16	1.41	.30	109.41	21.04
*	7.000	50.00	.00	.00	478.66	25.00	481.16	.00	481.18	4.65	.57	70.08	11.60
	8.000	38.00	.00	.00	478.69	25.00	481.18	.00	481.20	5.76	.66	51.70	10.42
*	9.000	7.00	.00	.00	478.76	25.00	481.18	.00	481.20	.74	.59	43.42	28.97
	9.100	2.00	.00	.00	478.76	25.00	481.18	.00	481.20	.85	.60	41.96	27.19
	9.200	12.00	484.83	482.37	478.79	25.00	481.18	.00	481.20	.88	.60	41.39	26.62
	9.300	2.00	.00	.00	478.76	25.00	481.19	.00	481.20	.65	.55	46.27	30.90

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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	10.000	7.00	.00	.00	478.81	25.00	481.19	.00	481.20	4.01	.53	72.01	12.48
	11.000	54.00	.00	.00	478.62	25.00	481.22	.00	481.22	3.59	.47	141.81	13.20
	12.000	12.00	.00	.00	478.93	25.00	481.23	.00	481.23	1.90	.21	181.00	18.16
	13.000	25.00	.00	.00	478.74	25.00	481.23	.00	481.23	1.85	.35	208.46	18.36
	14.000	50.00	.00	.00	478.65	25.00	481.24	.00	481.24	.99	.27	288.50	25.10
	15.000	90.00	.00	.00	478.55	25.00	481.25	.00	481.25	.82	.24	329.76	27.55
	16.000	120.00	.00	.00	479.14	25.00	481.25	.00	481.26	.74	.22	340.35	29.04

1
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AMP CREEK - PROPOSED CON

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	25.00	480.99	.00	.00	.30	59.79	.00
*	1.500	25.00	481.02	.00	.03	.00	59.37	20.00

	1.700	25.00	481.02	.00	.00	.00	58.23	10.00
*	1.800	25.00	481.02	.00	.00	.00	57.63	2.00
*	1.900	25.00	481.01	.00	-.01	.00	52.76	50.00
*	2.000	25.00	481.11	.00	.10	.00	171.65	95.00
	3.000	25.00	481.13	.00	.02	.00	162.30	140.00
	4.000	25.00	481.14	.00	.01	.00	108.24	68.00
*	5.000	25.00	481.15	.00	.01	.00	101.41	22.00
*	6.000	25.00	481.16	.00	.01	.00	60.00	45.00
*	7.000	25.00	481.16	.00	.01	.00	39.00	50.00
	8.000	25.00	481.18	.00	.02	.00	23.00	38.00
*	9.000	25.00	481.18	.00	.00	.00	21.00	7.00
	9.100	25.00	481.18	.00	.00	.00	19.20	2.00
	9.200	25.00	481.18	.00	.00	.00	19.20	12.00
	9.300	25.00	481.19	.00	.00	.00	20.00	2.00
*	10.000	25.00	481.19	.00	.01	.00	36.00	7.00
	11.000	25.00	481.22	.00	.03	.00	137.00	54.00
	12.000	25.00	481.23	.00	.01	.00	159.38	12.00
	13.000	25.00	481.23	.00	.00	.00	214.77	25.00
	14.000	25.00	481.24	.00	.01	.00	268.24	50.00
	15.000	25.00	481.25	.00	.01	.00	294.71	90.00
	16.000	25.00	481.25	.00	.01	.00	337.55	120.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 1.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.600 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.800 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 1.900 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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WARNING SECNO=      6.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      7.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      9.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     10.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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Appendix F

Soil Absorption System Hydraulic Analysis

Foth & Van Dyke
Memorandum

November 23, 1998

TO: Steve Dischler, Foth & Van Dyke

CC: Steve Donohue, Foth & Van Dyke
Jerry Sevick, Foth & Van Dyke
Gordon Reid, Nicolet Minerals Company
Master File

FR: Michael D. Liebman, P.E., Senior Water Resource Consultant MDL
Steve R. Birr, Water Resource Engineer SRB

RE: Crandon Project - Soil Absorption System Wetland Surface Water Flow Impacts

Introduction

With the discharge from the soil absorption system (SAS) ultimately entering nearby down-gradient wetlands (i.e., Z16 north, central, and south), the impact of the SAS on the hydrology and surface water flow of these wetlands was investigated. Also investigated was the potential impact of the SAS discharge on the floodplain of Swamp Creek.

This memorandum summarizes the results of the surface water flow evaluation. For these analyses, it was assumed that positive surface water drainage is maintained across the dredged canal and snowmobile trail which bisect the wetland body.

Methods of Analyses

The method used to determine the impact of additional water discharges near wetlands was based on Haestad Methods "TR-55" hydrologic software, Mannings formula hydraulics across the wetland valley (Haestad Methods "Flowmaster" software), and culvert nomographs where culverts control hydraulics (adding weir flow where appropriate). An existing or base condition flow was established from various storm events for the drainage areas tributary to each of the Z16 north, central, and south wetlands. A depth of flow associated with each storm event peak flow was calculated using the appropriate hydraulics. Then, the rates of peak discharge from the SAS were added to the existing base flows calculated for each wetland, and new depths of flow were determined. Any increase in depth caused by the SAS discharge could then be determined. To be conservative, it was assumed that all of the additional water from each SAS cell discharges to the respective wetland. Also, to assure conservativeness, discharge from cell D was added to the flow analysis for both the central and north wetlands, as it is not certain to which wetland the flow will pass.

Possible effects of the SAS discharge on the Swamp Creek floodplain were evaluated by calculating the 100-year flood flow of Swamp Creek in this area, and determining the associated depth of flow in Swamp Creek. The flood flow was found using the NRC5 TR20 hydrological program. The associated depth of flow was calculated from a Mannings analysis ("Flowmaster") across a section of the Swamp Creek floodplain. By calculating this depth of flow with the SAS discharge added to the 100-year flow, an increase caused by the SAS could be determined.

Figure 1 illustrates the location of the SAS cells and their peak discharge rates, the location of the conveyance culverts, the location of the wetlands that were investigated, the location of the Swamp Creek cross-section used in the floodplain evaluation, and the location of the other valley sections used in the analysis.

Results

Table 1 illustrates the results of the hydraulic analysis. The north wetland (Area A) has a drainage area of 42.7 acres. To be conservative in terms of base flow comparison, adding SAS flow to a lower base flow would show a greater impact. The approximate 9-acre wetland area that may intermittently drain through the 8 inch agricultural drain tile was excluded from the area which drains to the Z16 north wetland. Using this assumption, Area A contributes from approximately 2 cfs to approximately 24 cfs of runoff for the 2 through 100-year recurrence interval storm events under existing conditions. Surface water flow for this wetland is controlled by the railroad culvert east of the north wetland. A base flow of 0.5 cfs was estimated from field observation of depth and velocity at this culvert. This brings total existing flow to a range from 0.5 cfs (no storm event) to 24.5 cfs (100-year storm event). The proposed peak discharge from the northern SAS cells (A, B, C, and D) is a combined 376 gal/min (0.84 cfs) of discharge, which would give a total flow rate of 3.34 cfs to 25.34 cfs of flow at the wetland for the 2 through 100-year storm events, respectively. Depth of increase of the wetland water surface upgradient from this culvert varied from 0.05 to 0.07 ft for these storm events if the SAS were operating, and showed 0.10 ft increase with SAS flow only.

Similarly, the central wetland (Area B1) has a drainage area of 50 acres. The range of flows for the 2-100 year storm events was found to be approximately 2 cfs to approximately 28 cfs. With the 245 gal/min (0.55 cfs) discharge from the SAS cells D and E, the depth increase based on the wetland valley hydraulics if the SAS were operating was from 0 to 0.01 ft during the storm events, and 0.03 ft with no storm flow.

The south wetland (south of Keith Siding Road - Area B2) has a drainage area of 105 acres, which includes the 50-acre central area (Area B1). This drainage area includes a dredge canal and pond, and contributes from approximately 4 cfs to approximately 53 cfs of runoff for the 2 through 100-year storm events under existing conditions. The proposed peak discharge from the southern SAS cell (F) is 171 gal/min (0.38 cfs) of flow which, when combined with the central area flows (245 gal/min or 0.55 cfs), gives a total flow rate of 4.93 cfs to 53.93 cfs of flow in the wetland when the SAS is operating. For the south wetland, both valley section and culvert crossing hydraulics were evaluated. Depth increase of the wetland water surface at these locations varied from 0.00 ft to 0.01 ft if the SAS were operating during storm events, and 0.6 ft

with only SAS flow. The capacity of the 12-inch CMCP that conveys runoff across Keith Siding Road is only 4 cfs. Therefore, weir flow overtopping of the road is predicted for larger storm events under base flow conditions without the SAS in operation. The weir length was estimated to be 680 ft, which is the width of the wetland at the road (refer to Figure 1). Attachment 1 documents modeling data used in obtaining results illustrated in Table 1.
For Swamp Creek, floodplain impacts were found to be non-existent because the increase in flow caused by the SAS discharge changed the 100-year flow from 277.5 cfs to 278.34 cfs, which makes no detectable difference to the hydraulics of the floodplain.

Conclusion

The wetland surface water elevation increase as a direct result of the SAS discharge was shown to be minimal. Under predicted base flow conditions during operation of the SAS (i.e., with no surface water component and 100% discharge from the SAS), 0.10 ft is predicted to occur in the upstream vicinity of the culvert in the north wetland. At the south wetland, the post-SAS operation base flow predicts an increase in elevation of 0.6 ft in the upgradient vicinity of the culvert which crosses Keith Siding Road.

Referring to the valley section modeling, the biggest increase to onsite flow depths during storm events is 0.01 ft. Any increase at the northern wetland will occur only at the upstream side of the railroad culvert due to the presence of the railroad berm. Similarly, increases at the south area culvert will only extend upstream on NMC property due to the road grade of Keith Siding Road.

No changes to the Swamp Creek floodplain elevation occur as a result of operation of the SAS. As such, floodplain issues are not relevant.

Based upon the information contained on Table 1 and the documentation in Attachment 1, it has been shown that the amount of flow that will be discharged from the SAS is very small in comparison to the existing drainage basin runoff to each wetland and, as a result, surface water hydrology in the Z16 wetland and Swamp Creek will not be significantly affected by SAS operation.

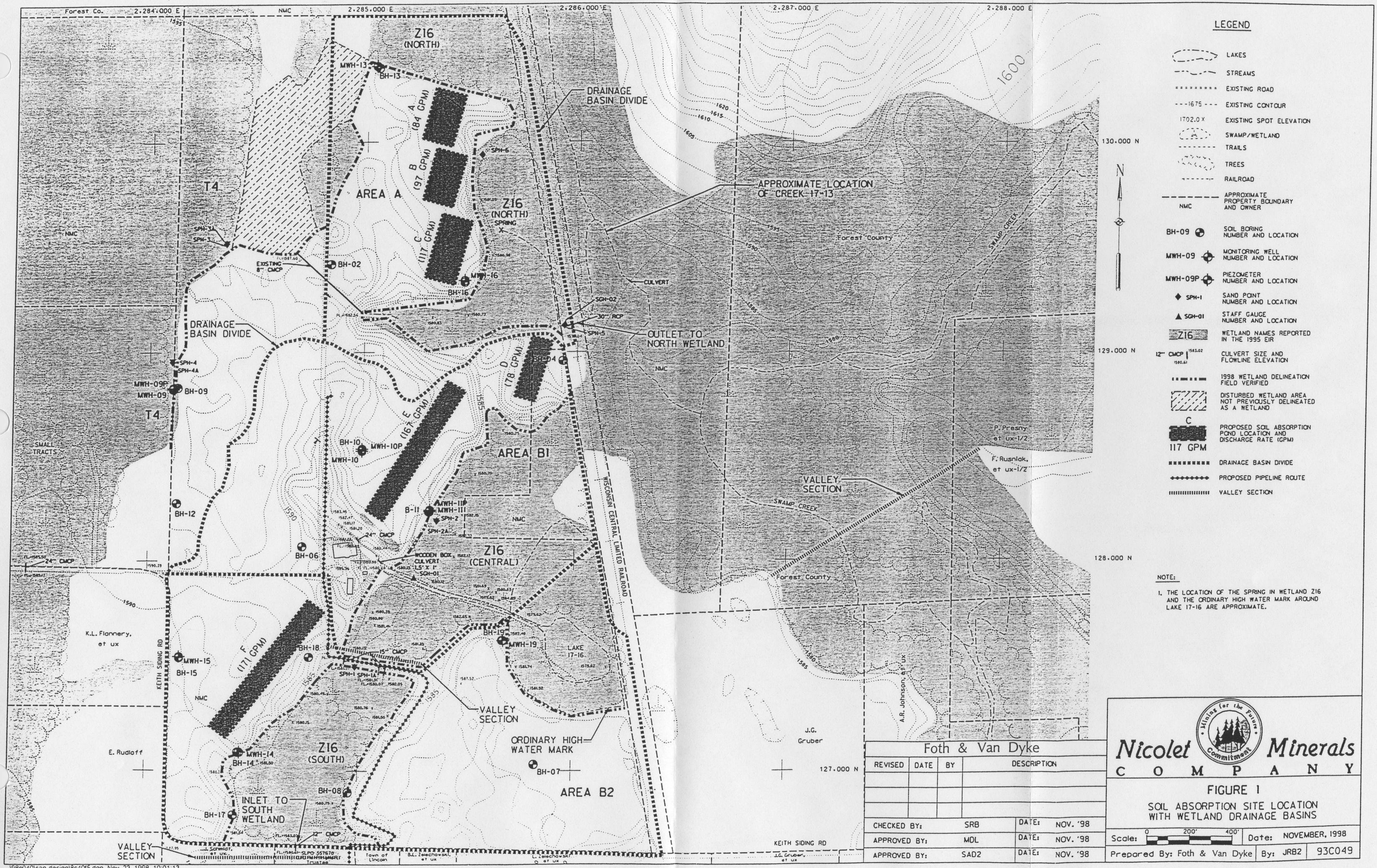
Table 1

Crandon Project - Soil Absorption Sites Surface Flow Analyses

		Storm Events					
North Area (42.7 Acres)		0 Year (Base)	2 Year (2.4")	5 Year (3.1")	10 Year (3.6")	25 Year (4.2")	100 Year (5.0")
Railroad Crossing	Existing Flow	0.5 cfs	2.5 cfs	4.5 cfs	11.5 cfs	16.5 cfs	24.5 cfs
	Existing Depth	1.15 ft	1.30 ft	1.40 ft	1.75 ft	2.10 ft	2.71 ft
	Existing + SAS Flow	1.34 cfs	3.34 cfs	5.34 cfs	12.34 cfs	17.34 cfs	25.34 cfs
	Existing + SAS Depth	1.25 ft	1.35 ft	1.45 ft	1.80 ft	2.17 ft	2.78 ft
Central Area (50 Acres)							
Valley Section[1]	Existing Flow	0 cfs	2 cfs	5 cfs	13 cfs	19 cfs	28 cfs
	Existing Depth	0 ft	0.06 ft	0.10 ft	0.18 ft	0.23 ft	0.29 ft
	Existing + SAS Flow	0.55 cfs	2.55 cfs	5.55 cfs	13.55 cfs	19.55 cfs	28.55 cfs
	Existing + SAS Depth	0.03 ft	0.07 ft	0.11 ft	0.19 ft	0.23 ft	0.29 ft
South Area (105 Acres)							
Valley Section[1]	Existing Flow	0 cfs	4 cfs	9 cfs	24 cfs	36 cfs	53 cfs
	Existing Depth	0 ft	0.06 ft	0.10 ft	0.18 ft	0.24 ft	0.30 ft
	Existing + SAS Flow	0.93 cfs	4.93 cfs	9.93 cfs	24.93 cfs	36.93 ft	53.93 cfs
	Existing + SAS Depth	0.03 ft	0.07 ft	0.11 ft	0.19 ft	0.24 ft	0.30 ft
Keith Siding Road	Existing Flow	0 cfs	4 cfs	9 cfs	24 cfs	36 cfs	53 cfs
	Existing Depth	0 ft	1.70 ft	1.72 ft	1.75 ft	1.77 ft	1.79 ft
	Existing + SAS Flow	0.93 cfs	4.93 cfs	9.93 cfs	24.93 cfs	36.93 cfs	53.93 cfs
	Existing + SAS Depth	0.6 ft	1.71 ft	1.72 ft	1.75 ft	1.77 ft	1.79 ft
Swamp Creek (15 Sq Mi)							
Floodplain Section	Existing Flow	3.5 cfs	66.5 cfs	114.5 cfs	153.5 cfs	204.5 cfs	277.5 cfs
	Existing Depth	0.05 ft	0.31 ft	0.43 ft	0.51 ft	0.61 ft	0.73 ft
	Existing + SAS Flow	4.34 cfs	67.34 cfs	115.34 cfs	154.34 cfs	205.34 cfs	278.34 cfs
	Existing + SAS Depth	0.06 ft	0.31 ft	0.43 ft	0.51 ft	0.61 ft	0.73 ft

[1] Section locations are shown on attached Figure 1.

Prepared by: SRB
Checked by: MDL



LEGEND
LAKES
STREAMS
EXISTING ROAD
EXISTING CONTOUR
EXISTING SPOT ELEVATION
SWAMP/WETLAND
TRAILS
TREES
RAILROAD
APPROXIMATE PROPERTY BOUNDARY AND OWNER
NMC
BH-09 SOIL BORING NUMBER AND LOCATION
MWH-09 MONITORING WELL NUMBER AND LOCATION
MWH-09P PIEZOMETER NUMBER AND LOCATION
SPH-1 SAND POINT NUMBER AND LOCATION
SGH-01 STAFF GAUGE NUMBER AND LOCATION
Z16 WETLAND NAMES REPORTED IN THE 1995 EIR
12" CMCP CULVERT SIZE AND FLOWLINE ELEVATION
1998 WETLAND DELINEATION FIELD VERIFIED
DISTURBED WETLAND AREA NOT PREVIOUSLY DELINEATED AS A WETLAND
C 117 GPM PROPOSED SOIL ABSORPTION POND LOCATION AND DISCHARGE RATE (GPM)
DRAINAGE BASIN DIVIDE
PROPOSED PIPELINE ROUTE
VALLEY SECTION
NOTE:
1. THE LOCATION OF THE SPRING IN WETLAND Z16 AND THE ORDINARY HIGH WATER MARK AROUND LAKE 17-16 ARE APPROXIMATE.
Z16 (NORTH)
A (84 GPM)
B (97 GPM)
C (117 GPM)
D (78 GPM)
E (167 GPM)
F (171 GPM)
AREA A
AREA B1
AREA B2
Z16 (CENTRAL)
Z16 (SOUTH)
T4
DRAINAGE BASIN DIVIDE
APPROXIMATE LOCATION OF CREEK 17-13
OUTLET TO NORTH WETLAND
INLET TO SOUTH WETLAND
VALLEY SECTION
ORDINARY HIGH WATER MARK
LAKE 17-16
SWAMP CREEK
WISCONSIN CENTRAL LIMITED RAILROAD
KEITH SIDING RD
Forest County
K.L. Flannery, et ux
E. Rudloff
J.G. Gruber
A.R. Johnson, et ux
P. Presny et ux-1/2
F. Rusniak, et ux-1/2
SMALL TRACTS
Foth & Van Dyke
REVISED | DATE | BY | DESCRIPTION
CHECKED BY: SRB DATE: NOV. '98
APPROVED BY: MDL DATE: NOV. '98
APPROVED BY: SAD2 DATE: NOV. '98
Nicolet Minerals COMPANY
Mining for the Future Commitment
FIGURE 1
SOIL ABSORPTION SITE LOCATION WITH WETLAND DRAINAGE BASINS
Scale: 0 200' 400'
Date: NOVEMBER, 1998
Prepared By: Foth & Van Dyke
By: JRB2
93C049
...\98c040\sap-design\8c40f5.dgn Nov. 23, 1998 10:01:13

Attachment 1

Hydrologic & Hydraulic Modeling Documentation

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 16:38:52 10-06-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	42.70	62

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 16:38:52 10-06-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
A1	25.50	50	
A2	17.20	80	
COMPOSITE AREA --->	42.70	62.1	(62)

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 16:38:17 10-06-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	105.00	62

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 16:38:17 10-06-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
B1	43.90	50	
B2	36.10	80	
B3	25.00	55	
COMPOSITE AREA --->	105.00	61.5	(62)

:::

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 17:42:18 10-22-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	50.00	62

FOR CENTRAL BASIN
B1
(VALLEY SECTION)

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 17:42:18 10-22-1998

NICOLET MINING COMPANY
SOIL ABSORPTION SITE
RUNOFF CURVE NUMBERS FOR WETLANDS
FOTH AND VAN DYKE: 93C049 10/98

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
B1	30.00	50	
B2	20.00	80	
COMPOSITE AREA --->	50.00	62.0	(62)

::

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 17:32:48 10-22-1998 NMCSOIL.TCT

NICOLET MINING COMPANY
TIME OF CONCENTRATION (Tc) ESTIMATES
FOR SOIL ABSORPTION SITE: WETLAND ISSUES
FOTH & VAN DYKE: 93C049 10/98

Tc COMPUTATIONS FOR: A

SHEET FLOW (Applicable to Tc only)

Segment ID		A	
Surface description		MEADOW	
Manning's roughness coeff., n		0.2500	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	2.400	
Land slope, s	ft/ft	0.0067	
$T = \dfrac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	1.06	= 1.06

SHALLOW CONCENTRATED FLOW

Segment ID		B	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1150.0	
Watercourse slope, s	ft/ft	0.0057	
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.2181	
where: Unpaved Csf = 16.1345; Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.26	= 0.26

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
$V = \dfrac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::
TOTAL TIME (hrs) 1.32

```
Quick TR-55 Ver.5.46   S/N:1315430197
Executed: 17:32:48    10-22-1998    NMCSOIL.TCT

                         NICOLET MINING COMPANY
                  TIME OF CONCENTRATION (Tc) ESTIMATES
                 FOR SOIL ABSORPTION SITE: WETLAND ISSUES
              FOTH & VAN DYKE: 93C049                         10/98

                     Tc COMPUTATIONS FOR: B

SHEET FLOW (Applicable to Tc only)
    Segment ID                                     A
    Surface description                        MEADOW
    Manning's roughness coeff., n                   0.2400
    Flow length, L (total < or = 300)      ft      300.0
    Two-yr 24-hr rainfall, P2              in      2.400
    Land slope, s                        ft/ft     0.0220
                        0.8
         .007 * (n*L)
    T =  --------------                   hrs       0.64            =  0.64
              0.5    0.4
           P2    *   s

SHALLOW CONCENTRATED FLOW
    Segment ID                                     B
    Surface (paved or unpaved)?                    Unpaved
    Flow length, L                         ft      2120.0
    Watercourse slope, s                 ft/ft     0.0015

                         0.5
    Avg.V =   Csf *  (s)                  ft/s     0.6249
    where:    Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

    T = L / (3600*V)                      hrs       0.94            =  0.94


CHANNEL FLOW
    Segment ID
    Cross Sectional Flow Area, a        sq.ft      0.00
    Wetted perimeter, Pw                   ft      0.00
    Hydraulic radius, r = a/Pw             ft      0.000
    Channel slope, s                     ft/ft     0.0000
    Manning's roughness coeff., n                  0.0000

                    2/3     1/2
         1.49  *  r   *   s
    V =  --------------------             ft/s     0.0000
                    n

    Flow length, L                         ft         0

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

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                        TOTAL TIME (hrs)        1.58
```

```
Quick TR-55 Ver.5.46   S/N:1315430197
Executed: 17:32:48   10-22-1998     NMCSOIL.TCT

                         NICOLET MINING COMPANY
                  TIME OF CONCENTRATION (Tc) ESTIMATES
                FOR SOIL ABSORPTION SITE: WETLAND ISSUES
            FOTH & VAN DYKE: 93C049                       10/98

                  Tc COMPUTATIONS FOR: AREA B1 (CENTL)

SHEET FLOW (Applicable to Tc only)
    Segment ID                                 A
    Surface description                     MEADOW
    Manning's roughness coeff., n              0.2400
    Flow length, L (total < or = 300)   ft     300.0
    Two-yr 24-hr rainfall, P2           in     2.400
    Land slope, s                       ft/ft  0.0220
                     0.8
         .007 * (n*L)
    T =  --------------                 hrs     0.64          =  0.64
            0.5    0.4
          P2   *  s

SHALLOW CONCENTRATED FLOW
    Segment ID                                 B
    Surface (paved or unpaved)?                Unpaved
    Flow length, L                      ft     1300.0
    Watercourse slope, s                ft/ft  0.0020

                       0.5
    Avg.V =  Csf *  (s)                 ft/s   0.7216
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                    hrs     0.50          =  0.50


CHANNEL FLOW
    Segment ID
    Cross Sectional Flow Area, a        sq.ft   0.00
    Wetted perimeter, Pw                ft      0.00
    Hydraulic radius, r = a/Pw          ft      0.000
    Channel slope, s                    ft/ft   0.0000
    Manning's roughness coeff., n               0.0000

                   2/3    1/2
         1.49  *  r   *  s
    V =  --------------------           ft/s    0.0000
                  n

    Flow length, L                      ft        0

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

  ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                           TOTAL TIME (hrs)      1.14
```

Quick TR-55 Ver.5.46 S/N:1315430197
Executed: 17:32:48 10-22-1998 NMCSOIL.TCT

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

NICOLET MINING COMPANY
TIME OF CONCENTRATION (Tc) ESTIMATES
FOR SOIL ABSORPTION SITE: WETLAND ISSUES
FOTH & VAN DYKE: 93C049 10/98

Subarea descr.	Tc or Tt	Time (hrs)
A	Tc	1.32
B	Tc	1.58
AREA B1 (CENTL)	Tc	1.14

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

2-YEAR

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
AREA A	42.70	62.0	1.25	0.00	2.40	0.19	.51	.50
AREA B	105.00	62.0	1.50	0.00	2.40	0.19	.51	.50
AREA B1	50.00	62.0	1.25	0.00	2.40	0.19	.51	.50

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 197.70 acres or 0.3089 sq.mi
Peak discharge = 8 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
AREA A	1.32	0.00	1.25	0.00	No	Computed Ia/p > .5
AREA B	1.58	0.00	1.50	0.00	No	Computed Ia/p > .5
AREA B1	1.14	0.00	1.25	0.00	No	Computed Ia/p > .5

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

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

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
AREA A	2	13.0
AREA B	4	13.2
AREA B1	2	13.0
Composite Watershed	8	13.2

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

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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
AREA A	0	0	0	0	0	0	0	0	0
AREA B	0	0	0	0	0	0	0	0	0
AREA B1	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

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
AREA A	0	1	1	1	2	2	2	2	1
AREA B	0	1	1	2	3	4	4	4	4
AREA B1	0	1	1	1	2	2	2	2	2
Total (cfs)	0	3	3	4	7	8	8	8	7

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

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Composite Hydrograph Summary (cfs)

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
AREA A	1	1	1	1	1	1	1	1	1
AREA B	3	3	3	2	2	2	2	2	1
AREA B1	2	1	1	1	1	1	1	1	1
Total (cfs)	6	5	5	4	4	4	4	4	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
AREA A	1	0	0	0	0
AREA B	1	1	1	1	0
AREA B1	1	1	1	0	0
Total (cfs)	3	2	2	1	0

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

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	4
11.1	0	14.9	4
11.2	0	15.0	4
11.3	0	15.1	4
11.4	0	15.2	4
11.5	0	15.3	4
11.6	0	15.4	4
11.7	0	15.5	4
11.8	0	15.6	4
11.9	0	15.7	4
12.0	0	15.8	4
12.1	0	15.9	4
12.2	0	16.0	4
12.3	0	16.1	4
12.4	0	16.2	4
12.5	0	16.3	4
12.6	3	16.4	4
12.7	3	16.5	4
12.8	4	16.6	4
12.9	6	16.7	4
13.0	7	16.8	4
13.1	8	16.9	4
13.2	8	17.0	4
13.3	8	17.1	4
13.4	8	17.2	4
13.5	8	17.3	3
13.6	8	17.4	3
13.7	8	17.5	3
13.8	7	17.6	3
13.9	6	17.7	3
14.0	6	17.8	3
14.1	6	17.9	3
14.2	5	18.0	3
14.3	5	18.1	3
14.4	5	18.2	3
14.5	5	18.3	3
14.6	5	18.4	3
14.7	5	18.5	2

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

Executed: 10-22-1998 17:44:00
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	2	22.4	1
18.7	2	22.5	1
18.8	2	22.6	1
18.9	2	22.7	1
19.0	2	22.8	1
19.1	2	22.9	1
19.2	2	23.0	1
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	0
20.3	2	24.1	0
20.4	2	24.2	0
20.5	2	24.3	0
20.6	2	24.4	0
20.7	2	24.5	0
20.8	2	24.6	0
20.9	2	24.7	0
21.0	2	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
22.2	1		
22.3	1		

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution 5-YEAR
(24 hr. Duration Storm)

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
AREA A	42.70	62.0	1.25	0.00	3.10	0.44	.4	.50
AREA B	105.00	62.0	1.50	0.00	3.10	0.44	.4	.50
AREA B1	50.00	62.0	1.25	0.00	3.10	0.44	.4	.50

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 197.70 acres or 0.3089 sq.mi
Peak discharge = 18 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
AREA A	1.32	0.00	1.25	0.00	No	--
AREA B	1.58	0.00	1.50	0.00	No	--
AREA B1	1.14	0.00	1.25	0.00	No	--

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

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

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
AREA A	4	13.0
AREA B	9	13.4
AREA B1	5	13.2
Composite Watershed	18	13.4

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

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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
AREA A	0	0	0	0	0	0	0	0	0
AREA B	0	0	0	0	0	0	0	0	1
AREA B1	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	1

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
AREA A	1	1	2	3	4	4	4	4	3
AREA B	1	2	3	4	7	8	9	9	9
AREA B1	1	2	2	3	4	5	5	4	4
Total (cfs)	3	5	7	10	15	17	18	17	16

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

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Composite Hydrograph Summary (cfs)

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
AREA A	3	3	2	2	2	2	2	1	1
AREA B	8	7	6	6	5	4	4	4	3
AREA B1	4	3	3	2	2	2	2	2	2
Total (cfs)	15	13	11	10	9	8	8	7	6

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
AREA A	1	1	1	1	0
AREA B	3	3	3	2	0
AREA B1	1	1	1	1	0
Total (cfs)	5	5	5	4	0

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

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	10
11.1	0	14.9	10
11.2	0	15.0	10
11.3	0	15.1	10
11.4	0	15.2	10
11.5	0	15.3	9
11.6	0	15.4	9
11.7	0	15.5	9
11.8	0	15.6	9
11.9	0	15.7	9
12.0	0	15.8	8
12.1	0	15.9	8
12.2	0	16.0	8
12.3	0	16.1	8
12.4	1	16.2	8
12.5	3	16.3	8
12.6	5	16.4	8
12.7	7	16.5	8
12.8	10	16.6	8
12.9	12	16.7	8
13.0	15	16.8	7
13.1	16	16.9	7
13.2	17	17.0	7
13.3	18	17.1	7
13.4	18	17.2	7
13.5	18	17.3	6
13.6	17	17.4	6
13.7	16	17.5	6
13.8	16	17.6	6
13.9	16	17.7	6
14.0	15	17.8	5
14.1	14	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	11	18.5	5

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

Executed: 10-22-1998 17:44:37
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	5	22.4	4
18.7	5	22.5	4
18.8	5	22.6	3
18.9	5	22.7	3
19.0	5	22.8	3
19.1	5	22.9	3
19.2	5	23.0	3
19.3	5	23.1	3
19.4	5	23.2	3
19.5	5	23.3	3
19.6	5	23.4	3
19.7	5	23.5	2
19.8	5	23.6	2
19.9	5	23.7	2
20.0	5	23.8	2
20.1	5	23.9	2
20.2	5	24.0	2
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	1
20.9	5	24.7	1
21.0	4	24.8	1
21.1	4	24.9	1
21.2	4	25.0	1
21.3	4	25.1	1
21.4	4	25.2	1
21.5	4	25.3	1
21.6	4	25.4	1
21.7	4	25.5	0
21.8	4	25.6	0
21.9	4	25.7	0
22.0	4	25.8	0
22.1	4	25.9	0
22.2	4		
22.3	4		

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution 10-YEAR
(24 hr. Duration Storm)

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
AREA A	42.70	62.0	1.25	0.00	3.60	0.66	.34 .30
AREA B	105.00	62.0	1.50	0.00	3.60	0.66	.34 .30
AREA B1	50.00	62.0	1.25	0.00	3.60	0.66	.34 .30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 197.70 acres or 0.3089 sq.mi
Peak discharge = 46 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
AREA A	1.32	0.00	1.25	0.00	No	--
AREA B	1.58	0.00	1.50	0.00	No	--
AREA B1	1.14	0.00	1.25	0.00	No	--

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

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

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
AREA A	11	13.0
AREA B	24	13.2
AREA B1	13	13.0
Composite Watershed	46	13.2

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

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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
AREA A	0	0	0	0	0	0	0	1	2
AREA B	0	0	0	0	0	0	1	2	3
AREA B1	0	0	0	0	0	0	0	1	3
Total (cfs)	0	0	0	0	0	0	1	4	8

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
AREA A	4	6	8	9	11	10	9	7	6
AREA B	6	9	12	16	21	24	23	20	17
AREA B1	4	7	9	11	13	12	10	8	7
Total (cfs)	14	22	29	36	45	46	42	35	30

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

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Composite Hydrograph Summary (cfs)

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
AREA A	5	4	3	3	2	2	2	2	1
AREA B	15	12	10	8	6	5	5	4	4
AREA B1	6	5	4	3	3	2	2	2	2
Total (cfs)	26	21	17	14	11	9	9	8	7

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
AREA A	1	1	1	1	0
AREA B	3	3	3	2	0
AREA B1	2	1	1	1	0
Total (cfs)	6	5	5	4	0

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

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	16
11.1	0	14.9	15
11.2	0	15.0	14
11.3	0	15.1	13
11.4	0	15.2	13
11.5	0	15.3	12
11.6	0	15.4	12
11.7	0	15.5	11
11.8	0	15.6	11
11.9	0	15.7	10
12.0	0	15.8	10
12.1	0	15.9	9
12.2	1	16.0	9
12.3	4	16.1	9
12.4	8	16.2	9
12.5	14	16.3	9
12.6	22	16.4	9
12.7	29	16.5	9
12.8	36	16.6	9
12.9	40	16.7	9
13.0	45	16.8	8
13.1	46	16.9	8
13.2	46	17.0	8
13.3	44	17.1	8
13.4	42	17.2	8
13.5	39	17.3	7
13.6	35	17.4	7
13.7	32	17.5	7
13.8	30	17.6	7
13.9	28	17.7	7
14.0	26	17.8	6
14.1	24	17.9	6
14.2	23	18.0	6
14.3	21	18.1	6
14.4	20	18.2	6
14.5	18	18.3	6
14.6	17	18.4	6
14.7	16	18.5	6

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

Executed: 10-22-1998 17:45:20
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	5	22.4	4
18.7	5	22.5	4
18.8	5	22.6	3
18.9	5	22.7	3
19.0	5	22.8	3
19.1	5	22.9	3
19.2	5	23.0	3
19.3	5	23.1	3
19.4	5	23.2	3
19.5	5	23.3	3
19.6	5	23.4	3
19.7	5	23.5	2
19.8	5	23.6	2
19.9	5	23.7	2
20.0	5	23.8	2
20.1	5	23.9	2
20.2	5	24.0	2
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	1
20.9	5	24.7	1
21.0	4	24.8	1
21.1	4	24.9	1
21.2	4	25.0	1
21.3	4	25.1	1
21.4	4	25.2	1
21.5	4	25.3	1
21.6	4	25.4	1
21.7	4	25.5	0
21.8	4	25.6	0
21.9	4	25.7	0
22.0	4	25.8	0
22.1	4	25.9	0
22.2	4		
22.3	4		

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

25-YEAR

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
AREA A	42.70	62.0	1.25	0.00	4.20	0.97	.29 .30
AREA B	105.00	62.0	1.50	0.00	4.20	0.97	.29 .30
AREA B1	50.00	62.0	1.25	0.00	4.20	0.97	.29 .30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 197.70 acres or 0.3089 sq.mi
Peak discharge = 69 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
AREA A	1.32	0.00	1.25	0.00	No	--
AREA B	1.58	0.00	1.50	0.00	No	--
AREA B1	1.14	0.00	1.25	0.00	No	--

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

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

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
AREA A	16	13.0
AREA B	36	13.2
AREA B1	19	13.0
Composite Watershed	69	13.2

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

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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
AREA A	0	0	0	0	0	0	1	2	3
AREA B	0	0	0	0	0	0	1	2	5
AREA B1	0	0	0	0	0	0	1	2	4
Total (cfs)	0	0	0	0	0	0	3	6	12

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
AREA A	6	8	11	13	16	15	13	11	9
AREA B	8	13	18	23	31	36	33	30	25
AREA B1	7	10	13	16	19	18	15	12	10
Total (cfs)	21	31	42	52	66	69	61	53	44

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

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Composite Hydrograph Summary (cfs)

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
AREA A	7	6	5	4	3	3	3	2	2
AREA B	21	17	14	11	9	8	7	6	5
AREA B1	9	7	6	5	4	3	3	3	2
Total (cfs)	37	30	25	20	16	14	13	11	9

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
AREA A	2	2	2	1	0
AREA B	5	4	4	3	0
AREA B1	2	2	2	1	0
Total (cfs)	9	8	8	5	0

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

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	22
11.1	0	14.9	21
11.2	0	15.0	20
11.3	0	15.1	19
11.4	0	15.2	18
11.5	0	15.3	18
11.6	0	15.4	17
11.7	0	15.5	16
11.8	0	15.6	16
11.9	0	15.7	15
12.0	0	15.8	15
12.1	0	15.9	14
12.2	3	16.0	14
12.3	6	16.1	14
12.4	12	16.2	14
12.5	21	16.3	13
12.6	31	16.4	13
12.7	42	16.5	13
12.8	52	16.6	13
12.9	59	16.7	12
13.0	66	16.8	12
13.1	68	16.9	11
13.2	69	17.0	11
13.3	65	17.1	11
13.4	61	17.2	10
13.5	57	17.3	10
13.6	53	17.4	9
13.7	48	17.5	9
13.8	44	17.6	9
13.9	40	17.7	9
14.0	37	17.8	9
14.1	35	17.9	9
14.2	32	18.0	9
14.3	30	18.1	9
14.4	28	18.2	9
14.5	27	18.3	9
14.6	25	18.4	9
14.7	24	18.5	8

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

Executed: 10-22-1998 17:46:32
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	8	22.4	4
18.7	8	22.5	4
18.8	8	22.6	4
18.9	8	22.7	4
19.0	8	22.8	4
19.1	8	22.9	4
19.2	8	23.0	4
19.3	8	23.1	4
19.4	8	23.2	4
19.5	8	23.3	3
19.6	8	23.4	3
19.7	8	23.5	3
19.8	8	23.6	3
19.9	8	23.7	3
20.0	8	23.8	3
20.1	8	23.9	3
20.2	8	24.0	2
20.3	8	24.1	2
20.4	7	24.2	2
20.5	7	24.3	2
20.6	7	24.4	2
20.7	7	24.5	2
20.8	7	24.6	2
20.9	7	24.7	2
21.0	6	24.8	2
21.1	6	24.9	1
21.2	6	25.0	1
21.3	6	25.1	1
21.4	6	25.2	1
21.5	6	25.3	1
21.6	6	25.4	1
21.7	5	25.5	1
21.8	5	25.6	0
21.9	5	25.7	0
22.0	5	25.8	0
22.1	5	25.9	0
22.2	5		
22.3	5		

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution 100-YEAR
(24 hr. Duration Storm)

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
AREA A	42.70	62.0	1.25	0.00	5.00	1.44	.25 .30
AREA B	105.00	62.0	1.50	0.00	5.00	1.44	.25 .30
AREA B1	50.00	62.0	1.25	0.00	5.00	1.44	.25 .30

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 197.70 acres or 0.3089 sq.mi
Peak discharge = 102 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
AREA A	1.32	0.00	1.25	0.00	No	--
AREA B	1.58	0.00	1.50	0.00	No	--
AREA B1	1.14	0.00	1.25	0.00	No	--

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

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

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
AREA A	24	13.0
AREA B	53	13.2
AREA B1	28	13.0
Composite Watershed	102	13.2

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

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

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
AREA A	0	0	0	0	0	0	1	2	5
AREA B	0	0	0	0	0	0	1	4	7
AREA B1	0	0	0	0	0	0	1	3	6
Total (cfs)	0	0	0	0	0	0	3	9	18

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
AREA A	8	12	17	20	24	23	19	16	13
AREA B	13	19	26	34	46	53	49	44	37
AREA B1	10	15	20	23	28	26	23	18	15
Total (cfs)	31	46	63	77	98	102	91	78	65

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

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Composite Hydrograph Summary (cfs)

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
AREA A	11	9	7	6	5	4	4	3	3
AREA B	32	26	21	17	13	11	10	9	8
AREA B1	13	10	9	7	6	5	4	4	4
Total (cfs)	56	45	37	30	24	20	18	16	15

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
AREA A	3	3	2	2	0
AREA B	7	7	6	5	0
AREA B1	3	3	3	2	0
Total (cfs)	13	13	11	9	0

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

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

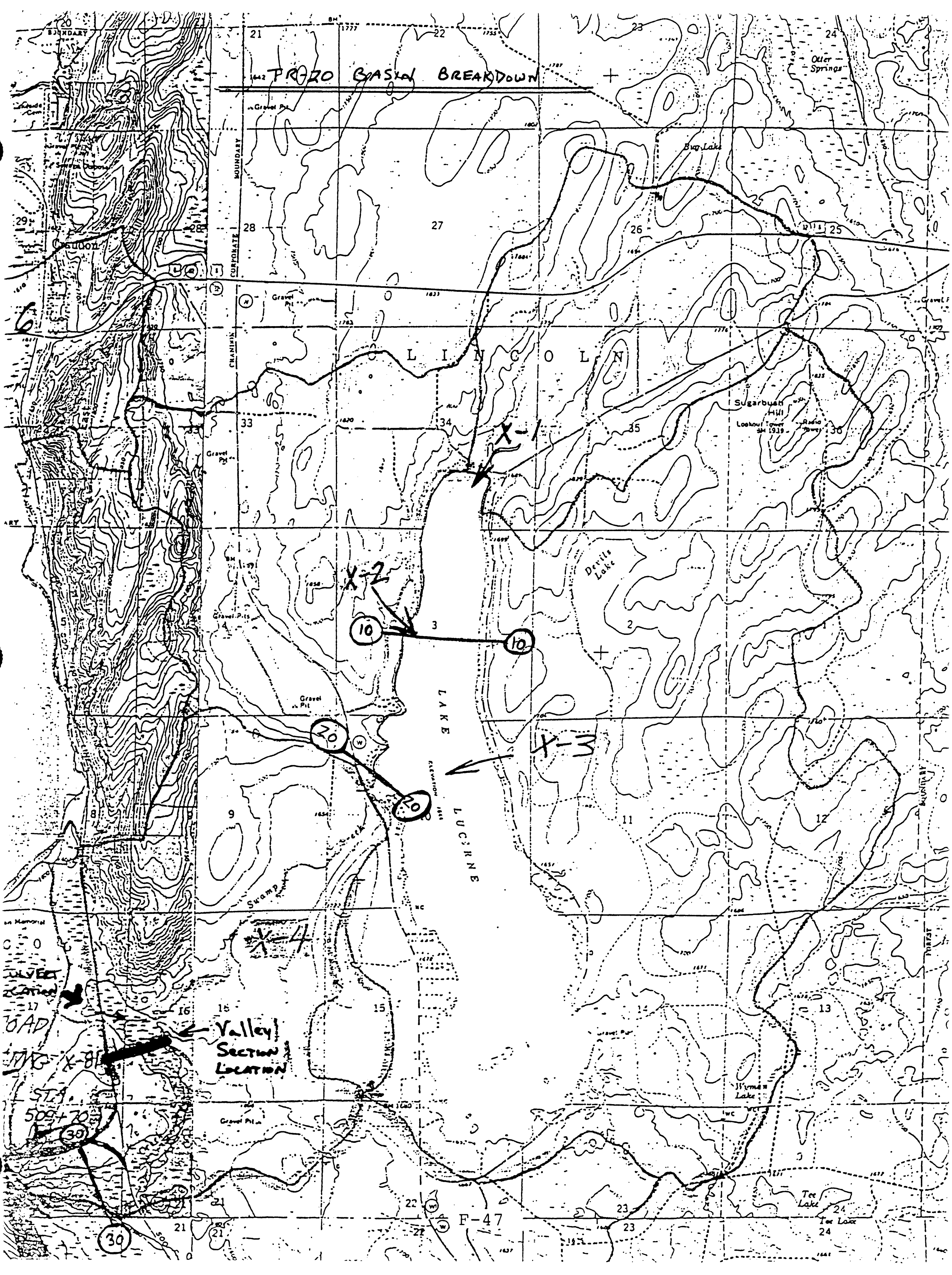
Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	34
11.1	0	14.9	32
11.2	0	15.0	30
11.3	0	15.1	29
11.4	0	15.2	28
11.5	0	15.3	26
11.6	0	15.4	25
11.7	0	15.5	24
11.8	0	15.6	23
11.9	0	15.7	22
12.0	0	15.8	22
12.1	0	15.9	21
12.2	3	16.0	20
12.3	9	16.1	20
12.4	18	16.2	19
12.5	31	16.3	19
12.6	46	16.4	18
12.7	63	16.5	18
12.8	77	16.6	18
12.9	88	16.7	17
13.0	98	16.8	17
13.1	100	16.9	16
13.2	102	17.0	16
13.3	96	17.1	16
13.4	91	17.2	16
13.5	85	17.3	15
13.6	78	17.4	15
13.7	71	17.5	15
13.8	65	17.6	15
13.9	60	17.7	14
14.0	56	17.8	14
14.1	52	17.9	13
14.2	49	18.0	13
14.3	45	18.1	13
14.4	42	18.2	13
14.5	40	18.3	13
14.6	37	18.4	13
14.7	35	18.5	13

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

Executed: 10-22-1998 17:47:26
Watershed file: --> NMCSOIL .WSD
Hydrograph file: --> NMCSOIL .HYD

NICOLET MINING COMPANY
FOTH AND VAN DYKE 93C049
SOIL ABSORPTION SITE AREA A
LOCAL WETLAND IMPACTS 10/98

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	13	22.4	8
18.7	13	22.5	8
18.8	13	22.6	8
18.9	13	22.7	7
19.0	13	22.8	7
19.1	13	22.9	7
19.2	13	23.0	7
19.3	12	23.1	7
19.4	12	23.2	6
19.5	12	23.3	6
19.6	12	23.4	6
19.7	12	23.5	6
19.8	11	23.6	5
19.9	11	23.7	5
20.0	11	23.8	5
20.1	11	23.9	5
20.2	11	24.0	4
20.3	11	24.1	4
20.4	11	24.2	4
20.5	10	24.3	4
20.6	10	24.4	4
20.7	10	24.5	3
20.8	10	24.6	3
20.9	10	24.7	3
21.0	10	24.8	3
21.1	10	24.9	2
21.2	10	25.0	2
21.3	10	25.1	2
21.4	10	25.2	2
21.5	10	25.3	2
21.6	9	25.4	1
21.7	9	25.5	1
21.8	9	25.6	1
21.9	9	25.7	1
22.0	9	25.8	0
22.1	9	25.9	0
22.2	9		
22.3	8		


TR-20 BASIN BREAKDOWN
X-1
X-2
X-3
X-4
10
20
30
LINCOLN
LAKE LUCERNE
Devils Lake
Sugarbush Hill
Lookout Tower
Radio Tower
Bug Lake
Otter Springs
Crandon
Wyman Lake
Tee Lake
Swamp
Gravel Pit
CULVERT LOCATION
Valley Section Location
STA. 509+70
ELEVATION

```
********************************************************************************
*                                        * TR 20 S/N    :                          *
*                                        * HMVersion    :  3.40                  *
*            TR 20                       * Date         : 10/30/98               *
*                                        * Time         : 15:48:44               *
*    Project Formulation Hydrology       * Input file   : NMCSOIL.T20            *
*                                        * Output file  : NMCSOIL.OUT            *
*                                        *                                       *
*                                        *                                       *
********************************************************************************
```

```
XXXXXXX  XXXXXX    XXXXX    XXXXX
   X     X     X  X     X  X    XX
   X     X     X        X  X   X X
   X     XXXXXX       X    X  X  X
   X     X   X      X      X X   X
   X     X    X   X        XX    X
   X     X     X  XXXXXXX   XXXXX
```

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                 by                  :::
:::         Haestad Methods, Inc.       :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                                PASS=  1           NOPLOTS
TITLE   1 HYDROLOGY FOR SWAMP CREEK AT SAS-NICOLET MINING CO.   10/30/98
TITLE     EXISTING             FILE:NMCSOIL.T20   FOTH & VAN DYKE 93C049
 3 STRUCT       01
 8                        1644.00        0.00        0.00
 8                        1644.10        1.0         2.00
 8                        1644.50        6.0       524.00
 8                        1645.00       10.0      1060.00
 8                        1645.50       13.0      1610.00
 8                        1646.00       15.0      2170.00
 8                        1647.00       19.0      3320.00
 8                        1650.00       50.0      7000.00
 9 ENDTBL
 3 STRUCT       02                                                  METONGA
 8                        1599.00        0.00        0.00
 8                        1599.20        6.0       400.0
 8                        1599.50       23.4      1020.0
 8                        1599.80       47.3      1645.0
 8                        1600.00       65.9      2060.0
 8                        1601.00      185.0      4200.0
 8                        1602.00     3500.0      6350.0
 8                        1605.00    30000.0     12800.0
 9 ENDTBL
 6 RUNOFF 1   10       5     2.06       70        12.51       1       X1
 6 RUNOFF 1   10       6     2.37       75        11.61       1       X2
 6 ADDHYD 4   10   5 6 7                              1       1
 6 REACH  3   20   7   5       10        0.2        1.31       1
 6 RUNOFF 1   20       7     7.92       82        13.51       1       X3
 6 ADDHYD 4   20   5 7 6                              1       1
 6 RESVOR 2     1 6    7     1644                     1       1  LUCERNE
 6 REACH  3   30   7   5    21000        1.5        1.251      1
 6 RUNOFF 1   30       6     3.05       74        13.61       1       X4
 6 ADDHYD 4   30   5 6 4                              1       1
 6 RUNOFF 1   40       7     1.43       74         8.51       1       X9
 6 REACH  3   45   7   5     4000        1.2        1.21       1
 6 RUNOFF 1   45       6     2.99       75        21.71       1       X10
 6 ADDHYD 4   45   5 6 7                              1       1
 6 REACH  3   50   7   5    10000        1.2        1.21       1
 6 RUNOFF 1   50       7     4.75       73         6.51       1       X11
 6 ADDHYD 4   50   5 7 6                              1       1
 6 ADDHYD 4   50   4 6 7                              1       1
   ENDATA
 7 INCREM 6           0.1333333333
 7 COMPUT 7   10    50          0        2.4        1.01 2     1       2YR
   ENDCMP 1
 7 COMPUT 7   10    50          0        3.1        1.01 2     2       5YR
```

```
***********************80-80 LIST OF INPUT DATA (CONTINUED)**********************

  ENDCMP 1
7 COMPUT 7  10    50                 0           3.6         1.01 2      3      10YR
  ENDCMP 1
7 COMPUT 7  10    50                 0           4.2         1.01 2      4      25YR
  ENDCMP 1
7 COMPUT 7  10    50                 0           5.0         1.01 2      5     100YR
  ENDCMP 1
  ENDJOB 2

********************************END OF 80-80 LIST*********************************
```

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .13 HOURS RECORD ID

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 10 TO XSECTION 50 RECORD ID 2YR
STARTING TIME = .00 RAIN DEPTH = 2.40 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 0 STORM NO.= 1 MAIN TIME INCREMENT = .13 HOURS

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
23.50	31.27	(RUNOFF)

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.36	54.53	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.00	84.77	(NULL)

*** WARNING REACH 20 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING - REACH 20 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 9.27 CFS, 10.94 % OF PEAK.

OPERATION REACH CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.00	84.77	(NULL)

OPERATION RUNOFF CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.22	271.79	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.18	356.53	(NULL)

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 5.60 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	5.60	1644.47

*** WARNING - REACH 30 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 5.60 CFS, 100.00 % OF PEAK.

OPERATION REACH CROSS SECTION 30

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 5.27 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	5.27	(NULL)

OPERATION RUNOFF CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
23.53	60.91	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
23.71	62.80	(NULL)

OPERATION RUNOFF CROSS SECTION 40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.32	34.73	(RUNOFF)

OPERATION REACH CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.84	34.54	(NULL)

OPERATION RUNOFF CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
30.01	49.88	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
26.65	71.28	(NULL)

*** WARNING - REACH 50 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 29.41 CFS, 41.26 % OF PEAK.

OPERATION REACH CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
27.59	70.82	(NULL)

OPERATION RUNOFF CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
16.35	118.06	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.24	154.69	(NULL)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.42	212.06	(NULL)

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1 RECORD ID

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 10 TO XSECTION 50 RECORD ID 5YR
STARTING TIME = .00 RAIN DEPTH = 3.10 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 0 STORM NO.= 2 MAIN TIME INCREMENT = .13 HOURS

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.25	59.63	(RUNOFF)

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.70	96.65	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.25	155.00	(NULL)

*** WARNING REACH 20 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION REACH CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.25	155.00	(NULL)

OPERATION RUNOFF CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.68	433.60	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.52	588.29	(NULL)

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 7.97 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	7.97	1644.75

*** WARNING - REACH 30 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 7.97 CFS, 100.00 % OF PEAK.

OPERATION REACH CROSS SECTION 30

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 7.62 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	7.62	(NULL)

OPERATION RUNOFF CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.77	108.32	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.95	110.78	(NULL)

OPERATION RUNOFF CROSS SECTION 40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.77	64.11	(RUNOFF)

OPERATION REACH CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.23	63.83	(NULL)

OPERATION RUNOFF CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
29.38	86.13	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
26.14	122.31	(NULL)

*** WARNING - REACH 50 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 48.26 CFS, 39.46 % OF PEAK.

OPERATION REACH CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
27.05	121.72	(NULL)

OPERATION RUNOFF CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.87	227.66	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
16.59	286.55	(NULL)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.98	373.07	(NULL)

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 2 RECORD ID

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 10 TO XSECTION 50 RECORD ID 10YR
STARTING TIME = .00 RAIN DEPTH = 3.60 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 0 STORM NO.= 3 MAIN TIME INCREMENT = .13 HOURS

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.84	83.69	(RUNOFF)

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.43	130.89	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.90	213.07	(NULL)

*** WARNING REACH 20 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION REACH CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.90	213.07	(NULL)

OPERATION RUNOFF CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.42	558.32	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.25	770.86	(NULL)

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 9.75 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	9.75	1644.97

*** WARNING - REACH 30 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 9.75 CFS, 100.00 % OF PEAK.

OPERATION REACH CROSS SECTION 30

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 9.35 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	9.35	(NULL)

OPERATION RUNOFF CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.44	147.04	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.56	149.98	(NULL)

OPERATION RUNOFF CROSS SECTION 40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.53	88.43	(RUNOFF)

OPERATION REACH CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.95	88.10	(NULL)

OPERATION RUNOFF CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
29.01	115.14	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
25.89	162.90	(NULL)

*** WARNING - REACH 50 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 62.82 CFS, 38.56 % OF PEAK.

OPERATION REACH CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
26.75	162.21	(NULL)

OPERATION RUNOFF CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.65	320.10	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
16.31	401.58	(NULL)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.30	507.24	(NULL)

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 3 RECORD ID

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 10 TO XSECTION 50 RECORD ID 25YR
STARTING TIME = .00 RAIN DEPTH = 4.20 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 0 STORM NO.= 4 MAIN TIME INCREMENT = .13 HOURS

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.47	115.82	(RUNOFF)

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.14	175.34	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.60	289.44	(NULL)

*** WARNING REACH 20 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION REACH CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.60	289.44	(NULL)

OPERATION RUNOFF CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.19	714.87	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.97	1003.36	(NULL)

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 11.47 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	11.47	1645.24

*** WARNING - REACH 30 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 11.47 CFS, 100.00 % OF PEAK.

OPERATION REACH CROSS SECTION 30

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 11.10 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	11.10	(NULL)

OPERATION RUNOFF CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.14	197.40	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.28	200.90	(NULL)

OPERATION RUNOFF CROSS SECTION 40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.28	120.37	(RUNOFF)

OPERATION REACH CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.71	119.97	(NULL)

OPERATION RUNOFF CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
28.69	152.50	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
25.70	214.92	(NULL)

*** WARNING - REACH 50 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 81.12 CFS, 37.74 % OF PEAK.

OPERATION REACH CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
26.60	214.15	(NULL)

OPERATION RUNOFF CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.46	442.68	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
16.14	550.56	(NULL)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.73	681.98	(NULL)

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 4 RECORD ID

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 10 TO XSECTION 50 RECORD ID 100YR
STARTING TIME = .00 RAIN DEPTH = 5.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 0 STORM NO.= 5 MAIN TIME INCREMENT = .13 HOURS

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.15	162.88	(RUNOFF)

OPERATION RUNOFF CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.83	239.01	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 10

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.33	399.79	(NULL)

*** WARNING REACH 20 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION REACH CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.33	399.79	(NULL)

OPERATION RUNOFF CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.92	931.95	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.68	1330.49	(NULL)

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 13.51 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	13.51	1645.63

*** WARNING - REACH 30 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 13.51 CFS, 100.00 % OF PEAK.

OPERATION REACH CROSS SECTION 30

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = 13.21 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
39.87	13.21	(NULL)

OPERATION RUNOFF CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.76	269.66	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 30

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
21.93	273.97	(NULL)

OPERATION RUNOFF CROSS SECTION 40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.05	166.49	(RUNOFF)

OPERATION REACH CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.46	165.99	(NULL)

OPERATION RUNOFF CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
28.40	205.52	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 45

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
25.53	288.41	(NULL)

*** WARNING - REACH 50 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 106.49 CFS, 36.92 % OF PEAK.

OPERATION REACH CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
26.30	287.60	(NULL)

OPERATION RUNOFF CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.26	621.19	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.97	771.59	(NULL)

OPERATION ADDHYD CROSS SECTION 50

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.52	939.65	(NULL)

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 5 RECORD ID

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID		STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE * ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 0 STORM 1			2-YEAR											
XSECTION	10	RUNOFF	2.06	1	2	.13	.0	2.40	24.00	.39	---	23.50	31.27	15.2
XSECTION	10	RUNOFF	2.37	1	2	.13	.0	2.40	24.00	.58	---	21.36	54.53	23.0
XSECTION	10	ADDHYD	4.43	1	2	.13	.0	2.40	24.00	.49	---	22.00	84.77	19.1
XSECTION	20	REACH	4.43	1	2	.13	.0	2.40	24.00	.49	---	22.00	84.77	19.1
XSECTION	20	RUNOFF	7.92	1	2	.13	.0	2.40	24.00	.89	---	22.22	271.79	34.3
XSECTION	20	ADDHYD	12.35	1	2	.13	.0	2.40	24.00	.74	---	22.18	356.53	28.9
STRUCTURE	1	RESVOR	12.35	1	2	.13	.0	2.40	24.00	.01	1644.47	39.87?	5.60?	.5
XSECTION	30	REACH	12.35	1	2	.13	.0	2.40	24.00	.01	---	39.87?	5.27?	.4
XSECTION	30	RUNOFF	3.05	1	2	.13	.0	2.40	24.00	.52	---	23.53	60.91	20.0
XSECTION	30	ADDHYD	15.40	1	2	.13	.0	2.40	24.00	.11	---	23.71	62.80	4.1
XSECTION	40	RUNOFF	1.43	1	2	.13	.0	2.40	24.00	.55	---	18.32	34.73	24.3
XSECTION	45	REACH	1.43	1	2	.13	.0	2.40	24.00	.55	---	18.84	34.54	24.2
XSECTION	45	RUNOFF	2.99	1	2	.13	.0	2.40	24.00	.46	---	30.01	49.88	16.7
XSECTION	45	ADDHYD	4.42	1	2	.13	.0	2.40	24.00	.49	---	26.65	71.28	16.1
XSECTION	50	REACH	4.42	1	2	.13	.0	2.40	24.00	.48	---	27.59	70.82	16.0
XSECTION	50	RUNOFF	4.75	1	2	.13	.0	2.40	24.00	.51	---	16.35	118.06	24.9
XSECTION	50	ADDHYD	9.17	1	2	.13	.0	2.40	24.00	.50	---	19.24	154.69	16.9
XSECTION	50	ADDHYD	24.57	1	2	.13	.0	2.40	24.00	.25	---	22.42	212.06	8.6
ALTERNATE 0 STORM 2			5-YEAR											
XSECTION	10	RUNOFF	2.06	1	2	.13	.0	3.10	24.00	.74	---	22.25	59.63	28.9
XSECTION	10	RUNOFF	2.37	1	2	.13	.0	3.10	24.00	1.00	---	20.70	96.65	40.8
XSECTION	10	ADDHYD	4.43	1	2	.13	.0	3.10	24.00	.88	---	21.25	155.00	35.0
XSECTION	20	REACH	4.43	1	2	.13	.0	3.10	24.00	.88	---	21.25	155.00	35.0
XSECTION	20	RUNOFF	7.92	1	2	.13	.0	3.10	24.00	1.40	---	21.68	433.60	54.7
XSECTION	20	ADDHYD	12.35	1	2	.13	.0	3.10	24.00	1.21	---	21.52	588.29	47.6
STRUCTURE	1	RESVOR	12.35	1	2	.13	.0	3.10	24.00	.02	1644.75	39.87?	7.97?	.6
XSECTION	30	REACH	12.35	1	2	.13	.0	3.10	24.00	.01	---	39.87?	7.62?	.6
XSECTION	30	RUNOFF	3.05	1	2	.13	.0	3.10	24.00	.93	---	22.77	108.32	35.5
XSECTION	30	ADDHYD	15.40	1	2	.13	.0	3.10	24.00	.19	---	22.95	110.78	7.2
XSECTION	40	RUNOFF	1.43	1	2	.13	.0	3.10	24.00	.97	---	17.77	64.11	44.8
XSECTION	45	REACH	1.43	1	2	.13	.0	3.10	24.00	.97	---	18.23	63.83	44.6
XSECTION	45	RUNOFF	2.99	1	2	.13	.0	3.10	24.00	.81	---	29.38	86.13	28.8

* MUST ADD BASE FLOW OF 3.5 CFS TO GET TOTAL PEAK FLOW

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 0 STORM 2													
XSECTION 45	ADDHYD	4.42	1	2	.13	.0	3.10	24.00	.86	---	26.14	122.31	27.7
XSECTION 50	REACH	4.42	1	2	.13	.0	3.10	24.00	.84	---	27.05	121.72	27.5
XSECTION 50	RUNOFF	4.75	1	2	.13	.0	3.10	24.00	.92	---	15.87	227.66	47.9
XSECTION 50	ADDHYD	9.17	1	2	.13	.0	3.10	24.00	.88	---	16.59	286.55	31.2
XSECTION 50	ADDHYD	24.57	1	2	.13	.0	3.10	24.00	.45	---	19.98	373.07	15.2
ALTERNATE 0 STORM 3 10-YEAR													
XSECTION 10	RUNOFF	2.06	1	2	.13	.0	3.60	24.00	1.03	---	21.84	83.69	40.6
XSECTION 10	RUNOFF	2.37	1	2	.13	.0	3.60	24.00	1.34	---	20.43	130.89	55.2
XSECTION 10	ADDHYD	4.43	1	2	.13	.0	3.60	24.00	1.20	---	20.90	213.07	48.1
XSECTION 20	REACH	4.43	1	2	.13	.0	3.60	24.00	1.20	---	20.90	213.07	48.1
XSECTION 20	RUNOFF	7.92	1	2	.13	.0	3.60	24.00	1.79	---	21.42	558.32	70.5
XSECTION 20	ADDHYD	12.35	1	2	.13	.0	3.60	24.00	1.58	---	21.25	770.86	62.4
STRUCTURE 1	RESVOR	12.35	1	2	.13	.0	3.60	24.00	.02	1644.97	39.87?	9.75?	.8
XSECTION 30	REACH	12.35	1	2	.13	.0	3.60	24.00	.02	---	39.87?	9.35?	.8
XSECTION 30	RUNOFF	3.05	1	2	.13	.0	3.60	24.00	1.25	---	22.44	147.04	48.2
XSECTION 30	ADDHYD	15.40	1	2	.13	.0	3.60	24.00	.26	---	22.56	149.98	9.7
XSECTION 40	RUNOFF	1.43	1	2	.13	.0	3.60	24.00	1.30	---	17.53	88.43	61.8
XSECTION 45	REACH	1.43	1	2	.13	.0	3.60	24.00	1.30	---	17.95	88.10	61.6
XSECTION 45	RUNOFF	2.99	1	2	.13	.0	3.60	24.00	1.09	---	29.01	115.14	38.5
XSECTION 45	ADDHYD	4.42	1	2	.13	.0	3.60	24.00	1.16	---	25.89	162.90	36.9
XSECTION 50	REACH	4.42	1	2	.13	.0	3.60	24.00	1.14	---	26.75	162.21	36.7
XSECTION 50	RUNOFF	4.75	1	2	.13	.0	3.60	24.00	1.25	---	15.65	320.10	67.4
XSECTION 50	ADDHYD	9.17	1	2	.13	.0	3.60	24.00	1.19	---	16.31	401.58	43.8
XSECTION 50	ADDHYD	24.57	1	2	.13	.0	3.60	24.00	.61	---	19.30	507.24	20.6
ALTERNATE 0 STORM 4 25-YEAR													
XSECTION 10	RUNOFF	2.06	1	2	.13	.0	4.20	24.00	1.42	---	21.47	115.82	56.2
XSECTION 10	RUNOFF	2.37	1	2	.13	.0	4.20	24.00	1.78	---	20.14	175.34	74.0
XSECTION 10	ADDHYD	4.43	1	2	.13	.0	4.20	24.00	1.61	---	20.60	289.44	65.3
XSECTION 20	REACH	4.43	1	2	.13	.0	4.20	24.00	1.61	---	20.60	289.44	65.3
XSECTION 20	RUNOFF	7.92	1	2	.13	.0	4.20	24.00	2.29	---	21.19	714.87	90.3
XSECTION 20	ADDHYD	12.35	1	2	.13	.0	4.20	24.00	2.04	---	20.97	1003.36	81.2
STRUCTURE 1	RESVOR	12.35	1	2	.13	.0	4.20	24.00	.03	1645.24	39.87?	11.47?	.9
XSECTION 30	REACH	12.35	1	2	.13	.0	4.20	24.00	.02	---	39.87?	11.10?	.9
XSECTION 30	RUNOFF	3.05	1	2	.13	.0	4.20	24.00	1.67	---	22.14	197.40	64.7
XSECTION 30	ADDHYD	15.40	1	2	.13	.0	4.20	24.00	.35	---	22.28	200.90	13.0
XSECTION 40	RUNOFF	1.43	1	2	.13	.0	4.20	24.00	1.74	---	17.28	120.37	84.2

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID		STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 0 STORM 4														
XSECTION	45	REACH	1.43	1	2	.13	.0	4.20	24.00	1.74	---	17.71	119.97	83.9
XSECTION	45	RUNOFF	2.99	1	2	.13	.0	4.20	24.00	1.45	---	28.69	152.50	51.0
XSECTION	45	ADDHYD	4.42	1	2	.13	.0	4.20	24.00	1.54	---	25.70	214.92	48.6
XSECTION	50	REACH	4.42	1	2	.13	.0	4.20	24.00	1.51	---	26.60	214.15	48.4
XSECTION	50	RUNOFF	4.75	1	2	.13	.0	4.20	24.00	1.67	---	15.46	442.68	93.2
XSECTION	50	ADDHYD	9.17	1	2	.13	.0	4.20	24.00	1.59	---	16.14	550.56	60.0
XSECTION	50	ADDHYD	24.57	1	2	.13	.0	4.20	24.00	.81	---	18.73	681.98	27.8
ALTERNATE 0 STORM 5		100-YEAR												
XSECTION	10	RUNOFF	2.06	1	2	.13	.0	5.00	24.00	1.97	---	21.15	162.88	79.1
XSECTION	10	RUNOFF	2.37	1	2	.13	.0	5.00	24.00	2.40	---	19.83	239.01	100.8
XSECTION	10	ADDHYD	4.43	1	2	.13	.0	5.00	24.00	2.20	---	20.33	399.79	90.2
XSECTION	20	REACH	4.43	1	2	.13	.0	5.00	24.00	2.20	---	20.33	399.79	90.2
XSECTION	20	RUNOFF	7.92	1	2	.13	.0	5.00	24.00	2.97	---	20.92	931.95	117.7
XSECTION	20	ADDHYD	12.35	1	2	.13	.0	5.00	24.00	2.69	---	20.68	1330.49	107.7
STRUCTURE	1	RESVOR	12.35	1	2	.13	.0	5.00	24.00	.03	1645.63	39.87?	13.51?	1.1
XSECTION	30	REACH	12.35	1	2	.13	.0	5.00	24.00	.02	---	39.87?	13.21?	1.1
XSECTION	30	RUNOFF	3.05	1	2	.13	.0	5.00	24.00	2.27	---	21.76	269.66	88.4
XSECTION	30	ADDHYD	15.40	1	2	.13	.0	5.00	24.00	.47	---	21.93	273.97	17.8
XSECTION	40	RUNOFF	1.43	1	2	.13	.0	5.00	24.00	2.36	---	17.05	166.49	116.4
XSECTION	45	REACH	1.43	1	2	.13	.0	5.00	24.00	2.35	---	17.46	165.99	116.1
XSECTION	45	RUNOFF	2.99	1	2	.13	.0	5.00	24.00	1.97	---	28.40	205.52	68.7
XSECTION	45	ADDHYD	4.42	1	2	.13	.0	5.00	24.00	2.09	---	25.53	288.41	65.3
XSECTION	50	REACH	4.42	1	2	.13	.0	5.00	24.00	2.05	---	26.30	287.60	65.1
XSECTION	50	RUNOFF	4.75	1	2	.13	.0	5.00	24.00	2.28	---	15.26	621.19	130.8
XSECTION	50	ADDHYD	9.17	1	2	.13	.0	5.00	24.00	2.17	---	15.97	771.59	84.1
XSECTION	50	ADDHYD	24.57	1	2	.13	.0	5.00	24.00	1.10	---	17.52	939.65	38.2

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA			VOLUME	MAIN	ITER-	Q AND A EQUATION			PEAK	S/Q	ATT-	TRAVEL TIME	
XSEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	ABOVE BASE (IN)	TIME INCR (HR)	ATION #	COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	RATIO O/I (Q*)	@PEAK (K) (SEC)	KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE	0	STORM	1																
20	10	85	22.0	85	22.0	357	22.1	0	.49*	.13	0	.200	1.30	.000	1.000	10	1.00?	.00	.00
30	21000	6	39.9	5	39.9	63	23.7	0	.01*	.13	1	1.50	1.25	.109	.941	8606	.05	.00	2.40
45	4000	35	18.3	35	18.8	71	26.7	0	.55	.13	1	1.20	1.20	.019	.995	1585	.26	.53	.44
50	10000	71	26.7	71	27.6	155	19.2	0	.49*	.13	1	1.20	1.20	.034	.993	3516	.13	.93	.98
ALTERNATE	0	STORM	2																
20	10	155	21.2	155	21.2	588	21.5	0	.88	.13	0	.200	1.30	.000	1.000	8	1.00?	.00	.00
30	21000	8	39.9	8	39.9	111	22.9	0	.02*	.13	1	1.50	1.25	.098	.956	8019	.06	.00	2.23
45	4000	64	17.7	64	18.3	122	26.1	0	.97	.13	1	1.20	1.20	.017	.996	1431	.29	.53	.40
50	10000	122	26.1	122	27.1	287	16.5	0	.86*	.13	1	1.20	1.20	.030	.995	3213	.14	.93	.89
ALTERNATE	0	STORM	3																
20	10	213	20.9	213	20.9	771	21.2	0	1.20	.13	0	.200	1.30	.000	1.000	8	1.00?	.00	.00
30	21000	10	39.9	9	39.9	150	22.5	0	.02*	.13	1	1.50	1.25	.094	.958	7702	.06	.00	2.14
45	4000	88	17.5	88	18.0	163	25.9	0	1.30	.13	1	1.20	1.20	.017	.996	1357	.30	.53	.38
50	10000	163	25.9	162	26.8	402	16.3	0	1.16*	.13	1	1.20	1.20	.028	.996	3063	.15	.93	.85
ALTERNATE	0	STORM	4																
20	10	289	20.7	289	20.7	1003	20.9	0	1.61	.13	0	.200	1.30	.000	1.000	7	1.00?	.00	.00
30	21000	11	39.9	11	39.9	201	22.3	0	.03*	.13	1	1.50	1.25	.087	.968	7457	.06	.00	2.07
45	4000	120	17.3	120	17.7	215	25.7	0	1.74	.13	1	1.20	1.20	.016	.997	1289	.31	.40	.36
50	10000	215	25.7	214	26.5	551	16.1	0	1.54*	.13	1	1.20	1.20	.026	.996	2925	.15	.67	.81
ALTERNATE	0	STORM	5																
20	10	400	20.3	400	20.3	1330	20.7	0	2.20	.13	0	.200	1.30	.000	1.000	7	1.00?	.00	.00
30	21000	14	39.9	13	39.9	274	21.9	0	.03*	.13	1	1.50	1.25	.081	.978	7216	.06	.00	2.01
45	4000	166	17.1	166	17.5	288	25.5	0	2.36	.13	1	1.20	1.20	.016	.997	1221	.33	.40	.34
50	10000	288	25.5	288	26.3	772	16.0	0	2.09*	.13	1	1.20	1.20	.024	.997	2785	.16	.67	.77

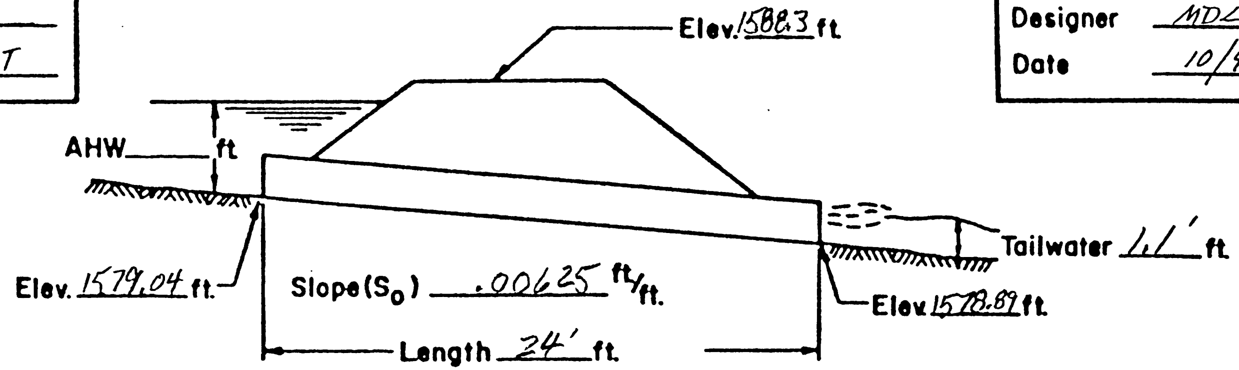
SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS.......... 1	2	3	4	5
STRUCTURE 1	12.35					
ALTERNATE 0		5.60	7.97	9.75	11.47	13.51
XSECTION 10	4.43					
ALTERNATE 0		84.77	155.00	213.07	289.44	399.79
XSECTION 20	12.35					
ALTERNATE 0		356.53	588.29	770.86	1003.36	1330.49
XSECTION 30	15.40					
ALTERNATE 0		62.80	110.78	149.98	200.90	273.97
XSECTION 40	1.43					
ALTERNATE 0		34.73	64.11	88.43	120.37	166.49
XSECTION 45	4.42					
ALTERNATE 0		71.28	122.31	162.90	214.92	288.41
XSECTION 50	24.57					
ALTERNATE 0		212.06	373.07	507.24	681.98	939.65

HYDROLOGIC AND CHANNEL INFORMATION

Project: NORTH AREA
Culvert Sta.: RAILROAD CULVERT

Designer: MDL
Date: 10/98



Hydrology:

(____ freq.) Q = ________ cfs.

(____ freq.) Q = ________ cfs.

$$\frac{L}{100 S_o} = \frac{24}{\ } = 38.4$$

Location comments:

F-71

Culvert			Q	Capacity Charts HW	Inlet Cont.		Outlet Control							Controling HW	Outlet Velocity	Comments
Entrance	Material	Size			HW/D	HW	K_e	d_c	$\frac{d_c+D}{2}$	h_o*	H	LS_o	**HW			
BASE FLOW	RCP	30"	.5 / 1.34				.9	.2 / .2	1.35 / 1.5	1.35 / 1.35	<.1	.15	1.15 / 1.25			0.10 INCREASE
2 - YR.			2.5 / 3.34				.9	.4 / .4	1.4 / 1.5	1.45 / 1.45	<.1	.15	1.3 / 1.35			0.05 INCREASE
5 - YR			4.5 / 5.34		0.4 /	1.0 /	.9	.6 / .7	1.55 / 1.6	1.55 / 1.6	<.1	.15	1.4 / 1.45			0.05 INCREASE
10 - YR			11.5 / 12.34				.9	1.1 / 1.2	1.8 / 1.85	1.8 / 1.85	.1 / .2	.15	1.75 / 1.80			0.05 INCREASE
25 - YR			16.5 / 17.34				.9	1.3 / 1.4	1.9 / 1.95	1.9 / 1.95	.35 / .37	.15	2.1 / 2.17			0.07 INCREASE
100 - YR.			24.5 / 25.34		1.0 /	2.5 /	.9	1.7 / 1.8	2.1 / 2.15	2.1 / 2.15	.76 / .78	.15	2.7 / 2.78			0.07 INCREASE

* h_o = The greater of $\frac{d_c+D}{2}$ or TW

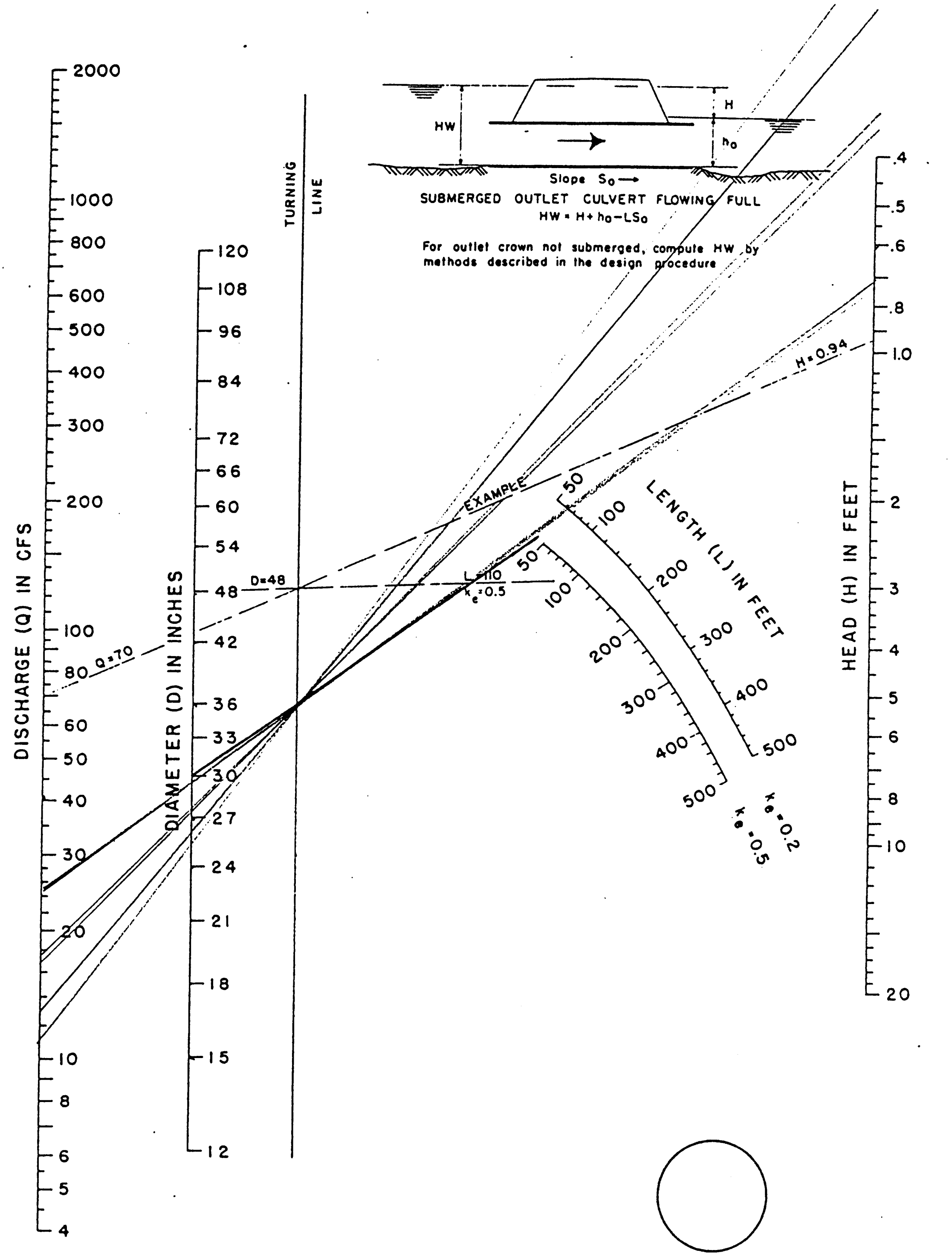
** $HW = H + h_o - LS_o$

Summary & Recommendations:

DRAINAGE

NORTH AREA
RAILROAD CULVERT

CHART 9



INCREASE 0.84 CFS

HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - BASE CONDITION

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	0.55 cfs

Computed Results:

Depth............	0.03 ft
Velocity.........	0.05 fps
Flow Area........	10.35 sf
Flow Top Width...	380.44 ft
Wetted Perimeter.	380.44 ft
Critical Depth...	0.00 ft
Critical Slope...	0.5869 ft/ft
Froude Number....	0.06 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCCENT

Comment: CENTRAL VALLEY- EXISTING 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	2.00 cfs

Computed Results:

Depth............	0.06 ft
Velocity.........	0.09 fps
Flow Area........	22.47 sf
Flow Top Width...	380.94 ft
Wetted Perimeter.	380.95 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4405 ft/ft
Froude Number....	0.06 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - PROPOSED 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	2.55 cfs

Computed Results:

Depth............	0.07 ft
Velocity.........	0.10 fps
Flow Area........	26.00 sf
Flow Top Width...	381.09 ft
Wetted Perimeter.	381.10 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4174 ft/ft
Froude Number....	0.07 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCCENT

Comment: CENTRAL VALLEY- EXISTING 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	5.00 cfs

Computed Results:

Depth............	0.10 ft
Velocity.........	0.13 fps
Flow Area........	38.97 sf
Flow Top Width...	381.64 ft
Wetted Perimeter.	381.65 ft
Critical Depth...	0.02 ft
Critical Slope...	0.3594 ft/ft
Froude Number....	0.07 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - PROPOSED 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	5.55 cfs

Computed Results:

Depth............	0.11 ft
Velocity.........	0.13 fps
Flow Area........	41.49 sf
Flow Top Width...	381.74 ft
Wetted Perimeter.	381.76 ft
Critical Depth...	0.02 ft
Critical Slope...	0.3512 ft/ft
Froude Number....	0.07 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCCENT

Comment: CENTRAL VALLEY- EXISTING 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	13.00 cfs

Computed Results:

Depth............	0.18 ft
Velocity.........	0.19 fps
Flow Area........	69.22 sf
Flow Top Width...	382.90 ft
Wetted Perimeter.	382.93 ft
Critical Depth...	0.03 ft
Critical Slope...	0.2907 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - PROPOSED 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	13.55 cfs

Computed Results:

Depth............	0.19 ft
Velocity.........	0.19 fps
Flow Area........	70.97 sf
Flow Top Width...	382.98 ft
Wetted Perimeter.	383.00 ft
Critical Depth...	0.03 ft
Critical Slope...	0.2880 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCCENT

Comment: CENTRAL VALLEY- EXISTING 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	19.00 cfs

Computed Results:

Depth............	0.23 ft
Velocity.........	0.22 fps
Flow Area........	86.99 sf
Flow Top Width...	383.65 ft
Wetted Perimeter.	383.67 ft
Critical Depth...	0.04 ft
Critical Slope...	0.2672 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - PROPOSED 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	19.55 cfs

Computed Results:

Depth............	0.23 ft
Velocity.........	0.22 fps
Flow Area........	88.50 sf
Flow Top Width...	383.71 ft
Wetted Perimeter.	383.74 ft
Critical Depth...	0.04 ft
Critical Slope...	0.2655 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCCENT

Comment: CENTRAL VALLEY- EXISITNG 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	28.00 cfs

Computed Results:

Depth............	0.29 ft
Velocity.........	0.25 fps
Flow Area........	109.89 sf
Flow Top Width...	384.60 ft
Wetted Perimeter.	384.63 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2452 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCFLOOD

Comment: CENTRAL VALLEY - PROPOSED 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	380.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	28.55 cfs

Computed Results:

Depth............	0.29 ft
Velocity.........	0.26 fps
Flow Area........	111.19 sf
Flow Top Width...	384.65 ft
Wetted Perimeter.	384.69 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2441 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-BASE CONDITION WITH SAS

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	0.93 cfs

Computed Results:

Depth............	0.03 ft
Velocity.........	0.05 fps
Flow Area........	17.90 sf
Flow Top Width...	680.42 ft
Wetted Perimeter.	680.42 ft
Critical Depth...	0.00 ft
Critical Slope...	0.5943 ft/ft
Froude Number....	0.06 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-EXISTING 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	4.00 cfs

Computed Results:

Depth............	0.06 ft
Velocity.........	0.09 fps
Flow Area........	42.97 sf
Flow Top Width...	681.01 ft
Wetted Perimeter.	681.02 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4298 ft/ft
Froude Number....	0.07 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-PROPOSED 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	4.93 cfs

Computed Results:

Depth............	0.07 ft
Velocity.........	0.10 fps
Flow Area........	48.71 sf
Flow Top Width...	681.15 ft
Wetted Perimeter.	681.15 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4102 ft/ft
Froude Number....	0.07 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-EXISTING 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	9.00 cfs

Computed Results:

Depth............	0.10 ft
Velocity.........	0.13 fps
Flow Area........	69.92 sf
Flow Top Width...	681.64 ft
Wetted Perimeter.	681.66 ft
Critical Depth...	0.02 ft
Critical Slope...	0.3589 ft/ft
Froude Number....	0.07 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-PROPOSED 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	9.93 cfs

Computed Results:

Depth............	0.11 ft
Velocity.........	0.13 fps
Flow Area........	74.18 sf
Flow Top Width...	681.74 ft
Wetted Perimeter.	681.76 ft
Critical Depth...	0.02 ft
Critical Slope...	0.3511 ft/ft
Froude Number....	0.07 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-EXISTING 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	24.00 cfs

Computed Results:

Depth............	0.18 ft
Velocity.........	0.19 fps
Flow Area........	126.05 sf
Flow Top Width...	682.96 ft
Wetted Perimeter.	682.98 ft
Critical Depth...	0.03 ft
Critical Slope...	0.2886 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-PROPOSED 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	24.93 cfs

Computed Results:

Depth............	0.19 ft
Velocity.........	0.19 fps
Flow Area........	128.96 sf
Flow Top Width...	683.03 ft
Wetted Perimeter.	683.05 ft
Critical Depth...	0.03 ft
Critical Slope...	0.2862 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-EXISTING 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	36.00 cfs

Computed Results:

Depth............	0.24 ft
Velocity.........	0.22 fps
Flow Area........	160.84 sf
Flow Top Width...	683.77 ft
Wetted Perimeter.	683.80 ft
Critical Depth...	0.04 ft
Critical Slope...	0.2638 ft/ft
Froude Number....	0.08 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-PROPOSED 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	36.93 cfs

Computed Results:

Depth............	0.24 ft
Velocity.........	0.23 fps
Flow Area........	163.33 sf
Flow Top Width...	683.83 ft
Wetted Perimeter.	683.86 ft
Critical Depth...	0.05 ft
Critical Slope...	0.2623 ft/ft
Froude Number....	0.08 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-EXISTING 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	53.00 cfs

Computed Results:

Depth............	0.30 ft
Velocity.........	0.26 fps
Flow Area........	202.97 sf
Flow Top Width...	684.76 ft
Wetted Perimeter.	684.80 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2421 ft/ft
Froude Number....	0.08 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSOUT

Comment: SOUTH AREA-PROPOSED 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	680.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	53.93 cfs

Computed Results:

Depth............	0.30 ft
Velocity.........	0.26 fps
Flow Area........	205.11 sf
Flow Top Width...	684.81 ft
Wetted Perimeter.	684.85 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2411 ft/ft
Froude Number....	0.08 (flow is Subcritical)

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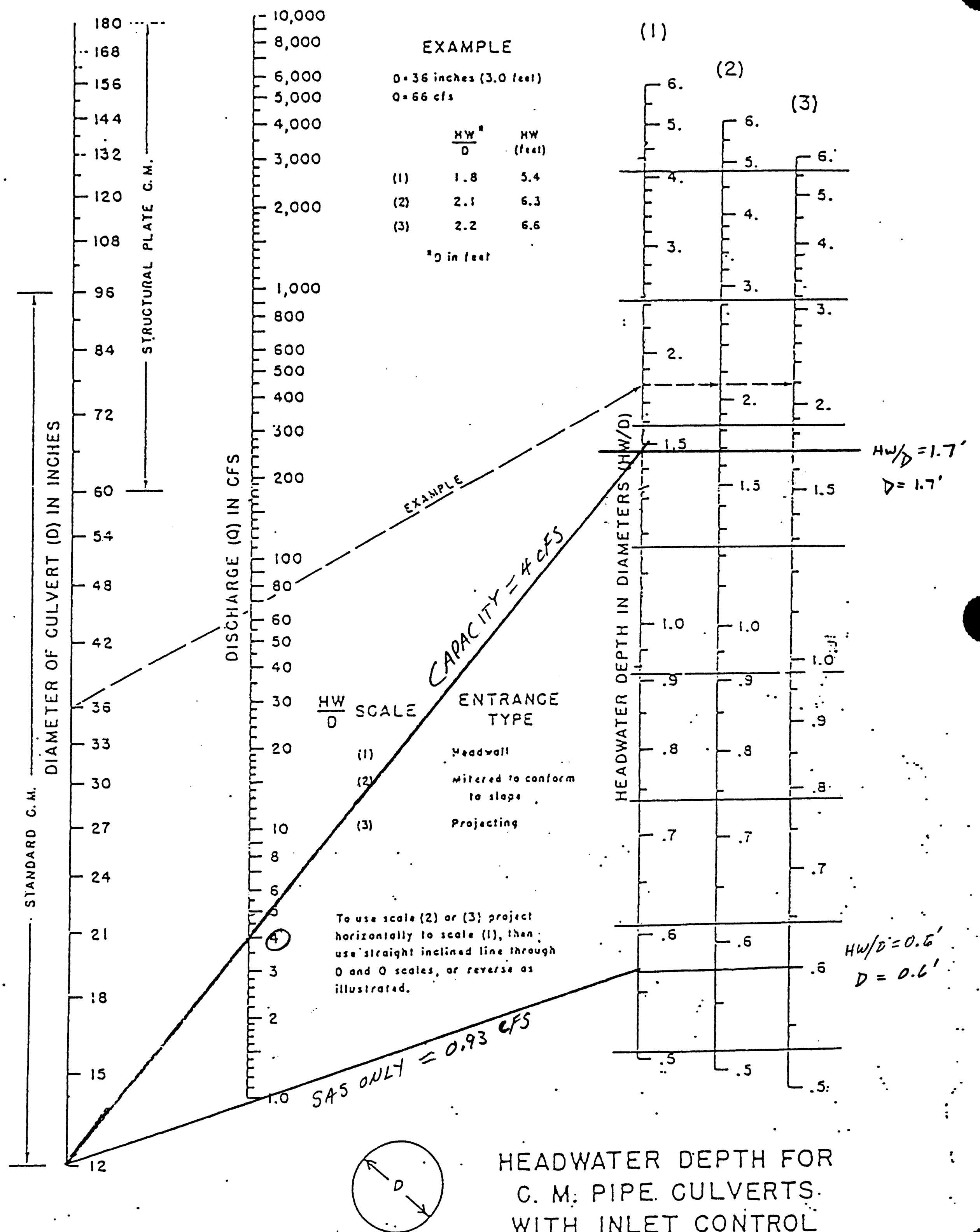
South Area 12" CMCP

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Foth & Van Dyke	Client: NMC	Scope I.D.: 93C049
	Project: SOIL ABSORPTION SITE	Page: 1
	Prepared by: SRB	Date: 10/7/98
	Checked by: MDL	Date: 11/12/98

CULVERT + WEIR FLOW

$$Q_{weir} = 3LH^{1.5}$$

$$H = \left(\frac{Q}{3L}\right)^{2/3}$$

NORTH AREA

24" CMCP: FL = 1578.9
T/o/RAIL = 1588.3
AVAILABLE HW = 9.4

Capacity of 24" Before Overtop (Based on Inlet Control Nomograph) = 40 CFS

Based on Haestad Methods "TR-55" Hydrologic Model, flows for this area, 2-100 year are less than 40 cfs. Therefore, there will be no weir flow. Therefore, refer to Haestad Methods "FLOWMASTER" software along with culvert nomographs for depth of water calculations.

SOUTH AREA

12" CMCP: FL = 1583.0
T/o/ROAD = 1584.7
AVAILABLE HW = 1.7

Capacity of 12" Before Overtop (Based on Inlet Control Nomograph) = 4 CFS

Depth comparison over road based on increase of flow over 4 CFS and 680 foot wide weir (WIDTH of wetland at road).

* $Q = 3LH^{1.5}$, solve for H (DEPTH).

YEAR	EXISTING (Q)	PROPOSED (Q)	EXISTING (H)	PROPOSED (H)
2	4 CFS	4.98 CFS	1.70	1.71
5	10 CFS	10.98 CFS	1.72	1.72
10	27 CFS	27.98 CFS	1.75	1.75
25	40 CFS	40.98 CFS	1.77	1.77
100	60 CFS	60.98 CFS	1.79	1.79

Ex①: $H = 1.70 + \left(\frac{0.98}{3(680)}\right)^{2/3} = 1.71$ Ex②: $H = 1.70 + \left(\frac{6.98}{3(680)}\right)^{2/3} = 1.72$

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXISTING BASE CONDITION

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	3.50 cfs

Computed Results:

Depth............	0.05 ft
Velocity.........	0.08 fps
Flow Area........	42.32 sf
Flow Top Width...	800.85 ft
Wetted Perimeter.	800.85 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4590 ft/ft
Froude Number....	0.06 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED BASE CONDITION

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	4.34 cfs

Computed Results:

Depth............	0.06 ft
Velocity.........	0.09 fps
Flow Area........	48.15 sf
Flow Top Width...	800.96 ft
Wetted Perimeter.	800.97 ft
Critical Depth...	0.01 ft
Critical Slope...	0.4375 ft/ft
Froude Number....	0.06 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXSITNG 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	66.50 cfs

Computed Results:

Depth............	0.31 ft
Velocity.........	0.27 fps
Flow Area........	248.11 sf
Flow Top Width...	804.95 ft
Wetted Perimeter.	804.99 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2386 ft/ft
Froude Number....	0.09 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED 2-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	67.34 cfs

Computed Results:

Depth............	0.31 ft
Velocity.........	0.27 fps
Flow Area........	249.99 sf
Flow Top Width...	804.98 ft
Wetted Perimeter.	805.02 ft
Critical Depth...	0.06 ft
Critical Slope...	0.2380 ft/ft
Froude Number....	0.09 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXISTING 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	114.50 cfs

Computed Results:

Depth............	0.43 ft
Velocity.........	0.33 fps
Flow Area........	344.08 sf
Flow Top Width...	806.85 ft
Wetted Perimeter.	806.91 ft
Critical Depth...	0.09 ft
Critical Slope...	0.2115 ft/ft
Froude Number....	0.09 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED 5-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	115.34 cfs

Computed Results:

Depth............	0.43 ft
Velocity.........	0.33 fps
Flow Area........	345.59 sf
Flow Top Width...	806.88 ft
Wetted Perimeter.	806.94 ft
Critical Depth...	0.09 ft
Critical Slope...	0.2112 ft/ft
Froude Number....	0.09 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXISTING 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	153.50 cfs

Computed Results:

Depth............	0.51 ft
Velocity.........	0.37 fps
Flow Area........	410.51 sf
Flow Top Width...	808.17 ft
Wetted Perimeter.	808.23 ft
Critical Depth...	0.10 ft
Critical Slope...	0.1982 ft/ft
Froude Number....	0.09 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED 10-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	154.34 cfs

Computed Results:

Depth............	0.51 ft
Velocity.........	0.37 fps
Flow Area........	411.86 sf
Flow Top Width...	808.20 ft
Wetted Perimeter.	808.26 ft
Critical Depth...	0.10 ft
Critical Slope...	0.1979 ft/ft
Froude Number....	0.09 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXISTING 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	204.50 cfs

Computed Results:

Depth............	0.61 ft
Velocity.........	0.42 fps
Flow Area........	487.98 sf
Flow Top Width...	809.70 ft
Wetted Perimeter.	809.78 ft
Critical Depth...	0.13 ft
Critical Slope...	0.1860 ft/ft
Froude Number....	0.10 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED 25-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	205.34 cfs

Computed Results:

Depth............	0.61 ft
Velocity.........	0.42 fps
Flow Area........	489.19 sf
Flow Top Width...	809.72 ft
Wetted Perimeter.	809.80 ft
Critical Depth...	0.13 ft
Critical Slope...	0.1858 ft/ft
Froude Number....	0.10 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -EXISTING 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	277.50 cfs

Computed Results:

Depth............	0.73 ft
Velocity.........	0.47 fps
Flow Area........	586.63 sf
Flow Top Width...	811.65 ft
Wetted Perimeter.	811.74 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1738 ft/ft
Froude Number....	0.10 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: NMCSWMP

Comment: SWAMP CREEK -PROPOSED 100-YR

Solve For Depth

Given Input Data:

Bottom Width.....	800.00 ft
Left Side Slope..	8.00:1 (H:V)
Right Side Slope.	8.00:1 (H:V)
Manning's n......	0.080
Channel Slope....	0.0010 ft/ft
Discharge........	278.34 cfs

Computed Results:

Depth............	0.73 ft
Velocity.........	0.47 fps
Flow Area........	587.70 sf
Flow Top Width...	811.67 ft
Wetted Perimeter.	811.76 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1737 ft/ft
Froude Number....	0.10 (flow is Subcritical)

Appendix G

April 2, 1998, Updated Technical Memorandum Pertaining to the Little Sand Lake Outlet Weir on Creek 12-9

Foth & Van Dyke
Memorandum

April 2, 1998

TO: Jerry Sevick

CC: Don Moe, Nicolet Minerals Company
Master File

FR: Michael Liebman, Foth & Van Dyke MDL
Steve Donohue, Foth & Van Dyke SVD

RE: Crandon Project - Little Sand Lake Flow Monitoring Installation

Background

Little Sand Lake, in southern Forest County, has been studied recently because of its proximity to the Nicolet Minerals Company's proposed mining operation. One area of interest is the stage/discharge relationship on the outlet of Little Sand Lake due to the diffuse nature of the outlet and downstream beaver activity. The Wisconsin Department of Natural Resources (WDNR) believes that in order to evaluate potential changes to the lake hydrology with the project's regional groundwater model, a more stable stage/discharge relationship is desirable. In a letter dated October 24, 1996, the WDNR requested that a fixed gaging station be constructed at the outlet to Little Sand Lake. By installing a control section (a weir or flume) in the outlet, a fixed stage/discharge relationship can be assumed for predicting future lake stage changes due to mining.

To address WDNR's request, on January 17, 1997, Nicolet Minerals Company (NMC) submitted to WDNR Addendum No. 1 to its June 1996 *Water Regulatory Permit Application for the Proposed Mine Site and Treated Wastewater Discharge Pipeline*. The addendum contained a technical memorandum dated January 17, 1997, prepared by Foth & Van Dyke addressing the design and installation of a gaging station at the Little Sand Lake outlet. The WDNR issued a letter on November 13, 1997, providing comments on the addendum. This technical memorandum is an update to the original memorandum dated January 17, 1997, and supersedes that document. This memorandum includes revisions made to address WDNR's November 13, 1997, comments on Addendum No. 1.

Monitoring Site Selection

Little Sand Lake outlets into a small stream known as Creek 12-9. The stream immediately adjacent to the lake is wide and very marshy, making it difficult to provide a suitable site for a flow monitoring installation. Within 100 yards downstream, however, the stream narrows and a suitable site for a flow monitoring installation is available. A field meeting on November 4, 1996 with WDNR and U.S. Army Corps of Engineers staff confirmed the potential suitability of this site for placement of a flow monitoring facility. Figure 1 shows the location of the proposed flow monitoring installation.

Control Structure Selection

In order to create a fixed stage/discharge relationship and monitor the flows discharging from Little Sand Lake, a control structure is required, with the majority of surface water flow leaving Little Sand Lake directed to it. For low flow conditions, most of the waters leaving the lake are contained within the banks of the outlet stream and a control structure across the stream will adequately measure flow. For high flow or flooding conditions, however, some waters may flow over the lowlands adjacent to the stream proper and could move downstream without measurement. To capture such flows, a small diversion structure is needed across the lowlands adjacent to the stream at the monitoring point. A shallow diversion wall can be constructed along the lowlands on both sides of the stream bank to divert the majority of overland flow into the flow monitoring control section in the stream.

The type of control structures available for an application such as creating a fixed stage/discharge relationship and monitoring discharge from Little Sand Lake include a flume or a weir. For this site, flumes were discounted because of the need to install them in a more permanent dam-like setting. With the natural conditions at this site, such an installation would be difficult and environmentally undesirable. So, although the flume has the advantage of working well in a low head condition as found in this case, installation difficulties make the use of a flume for a stage/discharge monitoring structure less acceptable.

With easier installation and more accurate overall measurement capabilities, a weir is recommended for the proposed monitoring installation. Various weir configurations were examined to determine the weir type and shape best fitted to create a fixed stage/discharge relationship and monitor the flows expected from Little Sand Lake. Because of the flatness of the stream slope and the associated lack of elevation change, or head, an important weir characteristic must be minimizing the depth of overflow. The hydraulic characteristics of the V-notch weir would not allow high flow measurement without excessive overflow head. As such, a V-notch weir would not be an acceptable flow monitoring device.

Trapezoidal and rectangular weirs (with and without end contractions) were also evaluated in terms of best meeting the needs for creating a stable stage/discharge relationship and flow monitoring application. In order to minimize the overflow head caused by the weir, a rectangular weir with end contractions is recommended. To best meet the existing lake level fluctuations and flow relationships, a compound weir consisting of a 4-ft wide rectangular weir inset into an 8-ft wide weir inset into a 16-ft wide weir is proposed for the monitoring structure. The 8-ft wide weir would be activated after head on the 4-ft wide weir exceeds ½-ft. The 16-ft wide weir would be activated after the head on the 8-ft weir exceeds ½-ft. This configuration allows the weir to accurately measure a wide range of flows. The inset 4-ft weir would measure flows ranging from low flows to nearly 5 cfs, while the 8-ft weir would measure total flow to over 17 cfs with 1 ft of total overflow head. With overflow heads as high as 1.5 ft, flows as high as 45 cfs could be measured. Attachment 1 summarizes the weir facility discharge rating equation based on basic weir equations. Figure 2 shows the configuration of the weir.

Any flow discharges larger than about 45 cfs would overtop the monitoring structure along its length making flow measurements difficult to achieve. Based on available monitoring records, the frequency of such large flows discharging from Little Sand Lake should be non-existent to very rare. These rare, infrequent flow events may produce large flows, but they are short-term and have little effect on the overall lake stage. As such, loss of precise measurement of the rare, extremely high flow discharge would be generally insignificant relative to the long-term stage/discharge relationship for Little Sand Lake. Figure 3 shows the flow and water elevation data for the Little Sand Lake outlet which falls well within the operating range of the 4-ft and 8-ft composite weir structure.

Although the 4-ft rectangular weir will provide a stable stage/discharge relationship and solid measurements for the normal ranges of flow expected from the lake, during periods of very high flow, the overflow head may become greater than 1.3 ft. In order to achieve maximum performance and accuracy from this weir structure, the height of the weir crest above the channel bottom should be at least two times the overflow height, or in this case 2.6 ft. For those high overflow head conditions, the approach velocities will become less uniform because the total depth in the stream at the site is only about 1.5 ft. Again, it is unlikely that the rare occurrence of such high flow events and the somewhat less accurate measurements derived from them, will have any significant affect on the overall stage/discharge analysis for the lake.

Permit Considerations

Over the past 10 to 15 years the lake stage has typically ranged from about 1,592 ft msl to about 1,593 ft msl. As requested by the WDNR, the public rights stages are closer to 1591 and 1591.5 ft msl. The elevation of the weir crest needs to be set at an elevation that does not significantly alter the historical levels or public rights stages. The crest elevation of the weir also needs to consider the ordinary high water mark (OHWM) as determined by the WDNR. The WDNR has determined that the OHWM for Little Sand Lake is 1591.96 ft msl. Given the above permit considerations and the need to meet design criteria to have a functioning flow monitoring structure, 1,591.5 ft msl was selected as the crest elevation of the weir.

The proposed structure is essentially a stream bank modification to achieve a more stable stage/discharge relationship and provide an accurate flow monitoring station. The proposed structure should not alter the overall hydrology of the lake. As such, the structure is believed to be governed under Chapter 30 permit requirements for installation of a gaging station.

Physical Installation

The location and general layout of the weir outlet monitoring installation is shown on Figure 2. Although the specific configuration of the composite weir must be adhered to for hydraulic purposes, the construction details for the installation may vary significantly. The construction variations relate to the general relationship where the more solid, sturdy and maintenance free the installation, the more impact the construction of the installation will have on the natural environment at the site. Conversely, the more sensitive the construction is to the local environment, the less durable the installation will be. For this reason, three construction alternatives are discussed for the proposed monitoring installation. NMC is proposing that final selection of the desired alternative be made at the time final design is completed, which is proposed to occur after the project is permitted. More detailed soils data are also proposed to be collected and provided at that time as well.

Option 1: Low Impact, Low Durability - This option would cause little impact to the environment at the site. For this installation, a wooden diversion and overflow structure is proposed. Marine grade plywood would be affixed to posts driven into the ground or stream bed. The posts could be wood, steel, or concrete. The structure must be set at least 1 ft below the ground surface to minimize seepage under the structure. Clay soils can be packed along the plywood/soil interface to further reduce seepage potential. Periodic bracing may be desirable to add needed stability to the structure. Figure 2 shows the proposed weir structure along with proposed crest elevations and other details pertinent to the design of the monitoring station.

Option 2: Moderate Impact, Moderate Durability - The second option would have the configuration of Option 1, but would be constructed more solidly. A thicker facing of plywood or metal sheeting would be used. A mechanical trencher or small backhoe would be utilized to create a narrow trench to more securely embed the face sheeting into the ground. Soil (material from trenching, sand bags and/or concrete block) would be placed along the bottom of the facing at the ground surface to solidify the base of the installation. Additional bracing and cable can further secure the weir.

Option 3: High Impact, High Durability - The third option would require even more disruption to the area than Option 2. Besides the movement of heavy equipment to this remote site as with Option 2, this alternative calls for construction of a driven sheet piling structure to which the weir proper would be firmly attached. The weir component would be bolted to the sheet piling, providing exact weir settings. The piling would be more difficult to remove after completion of the monitoring. Like Option 2, the overall configuration would mirror that of Option 1 in dimensions and elevations, as shown in Figure 2.

Additional features considered that will be added to the compound weir flow monitoring structure include the following:

- A permanent staff gauge affixed to a solid post approximately 3 ft upstream from the weir structure from which to read the overflow head overtopping the weir crest.

- A solid benchmark near the site whereby the staff gauge and weir crest elevation may be checked periodically and from which they may be reset if needed.

- Reduction in the water level below the weir structure will be critical so that the overflow has a non-submerged drop into the stream below. This will require lowering the downstream beaver dam spillway a minimum of 1 ft, with 2 ft being a preferred amount. By lowering the downstream beaver dam and setting the weir crest at the proper elevation, the fluctuations in Little Sand Lake will be similar to historical trends while maintaining the needed non-submerged flow regime at the structure.

- If desired, a continuous monitoring set-up can be included in the design. A bubble-tube can be permanently affixed to the staff gage post and run to a meter located in a locked vault on the adjacent overbank. The meter will require maintenance due to the necessity for battery powered operation.

The expected life of the of structure will be entirely dependent on maintenance. Spring ice-out, determined vandalism, or freeze/thaw cycles could cause some damage to the facility (particularly with Option 1). As such, regular monitoring of the installation should be maintained to detect problems before they become critical. Such monitoring should be made on a weekly basis with maintenance activities performed as needed. Expected maintenance may include resetting posts and panel segments, bracing panel segments against ice pressures, removing excessive ice build-ups, flushing or removing sediment accumulations, and maintaining proper levels in the downstream beaver dam. Less maintenance will be needed with Option 3.

Based on the available options for construction, NMC believes that, pending the results of soil testing to be completed at the time of final design, Option 2 is a feasible approach for providing a stable structure requiring moderate maintenance while minimizing construction disturbance. It is also anticipated that the structure will be installed in the winter when frozen conditions will facilitate access by trenching equipment.

Beaver Control

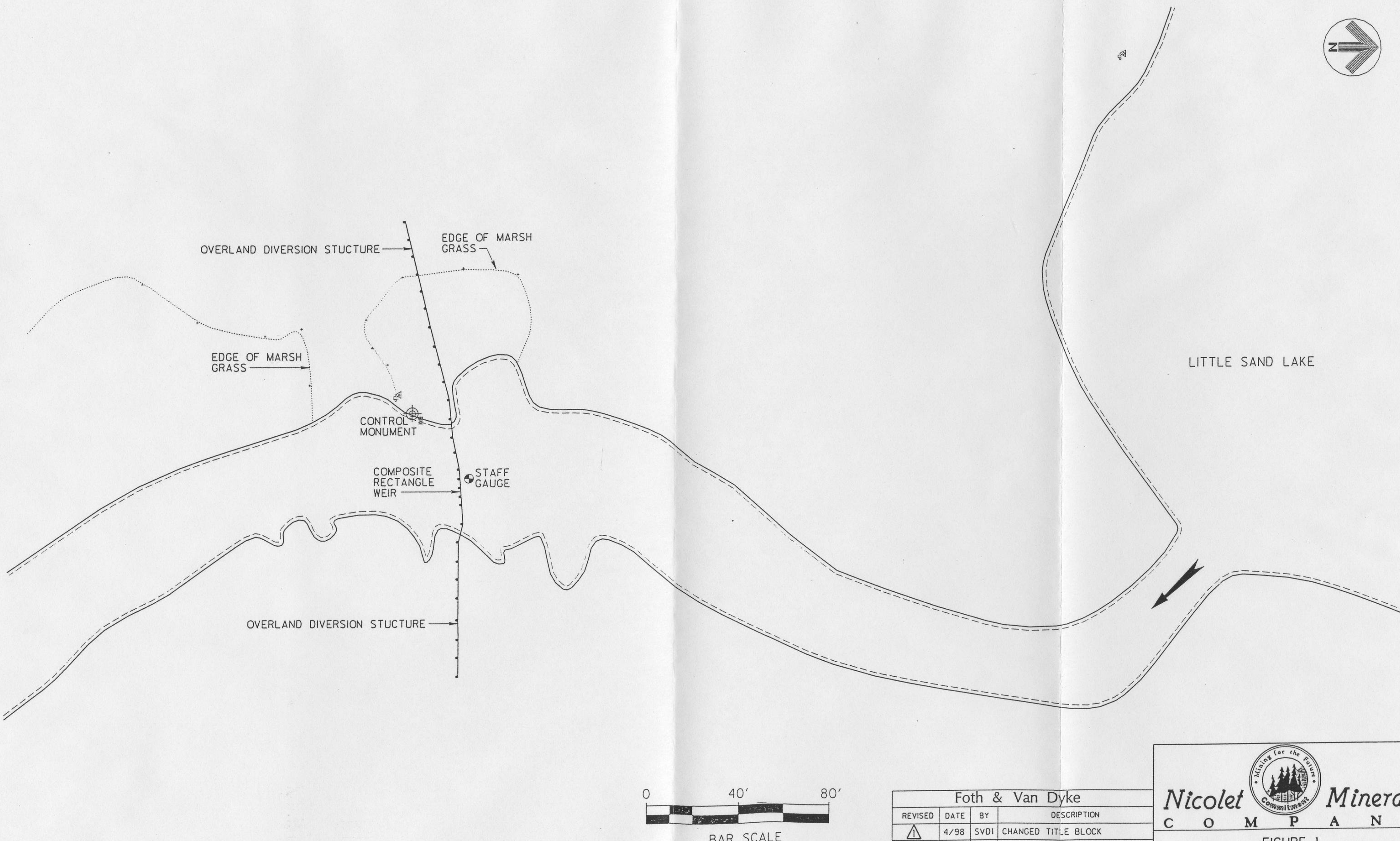
In order for the weir structure to properly function, downstream beaver dams need to be removed. Nicolet Minerals Company will work with the U.S. Department of Agriculture Animal Control Office in Rhinelander, Wisconsin, to implement a program to remove the dams and control the beaver population to keep Upper Creek 12-9 unobstructed.

Summary

With proper setting of the weir crest, a 4-ft by 8-ft by 16-ft composite rectangular weir structure will provide the full range of measuring capabilities required while causing minimal change in water surface fluctuations throughout the full range of flows expected from Little Sand Lake.

With this type of facility, a means of setting a stable stage/discharge relationship and collection of flow data on the Little Sand Lake discharge can be provided while minimizing environmental impact to the area at the outlet of the lake. While requiring more maintenance than other structures (cleaning the weir, checking crest elevation stability, etc.) the structure is capable of meeting the needs for creating a stable stage/discharge relationship and monitoring the surface water flow of the discharge from Little Sand Lake.

MDL:smh:mld2



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Foth & Van Dyke			
REVISED	DATE	BY	DESCRIPTION
⚠	4/98	SVD1	CHANGED TITLE BLOCK

CHECKED BY:	JKS1	DATE: JAN. '97
APPROVED BY:	MDL	DATE: JAN. '97
APPROVED BY:	JWS	DATE: JAN. '97

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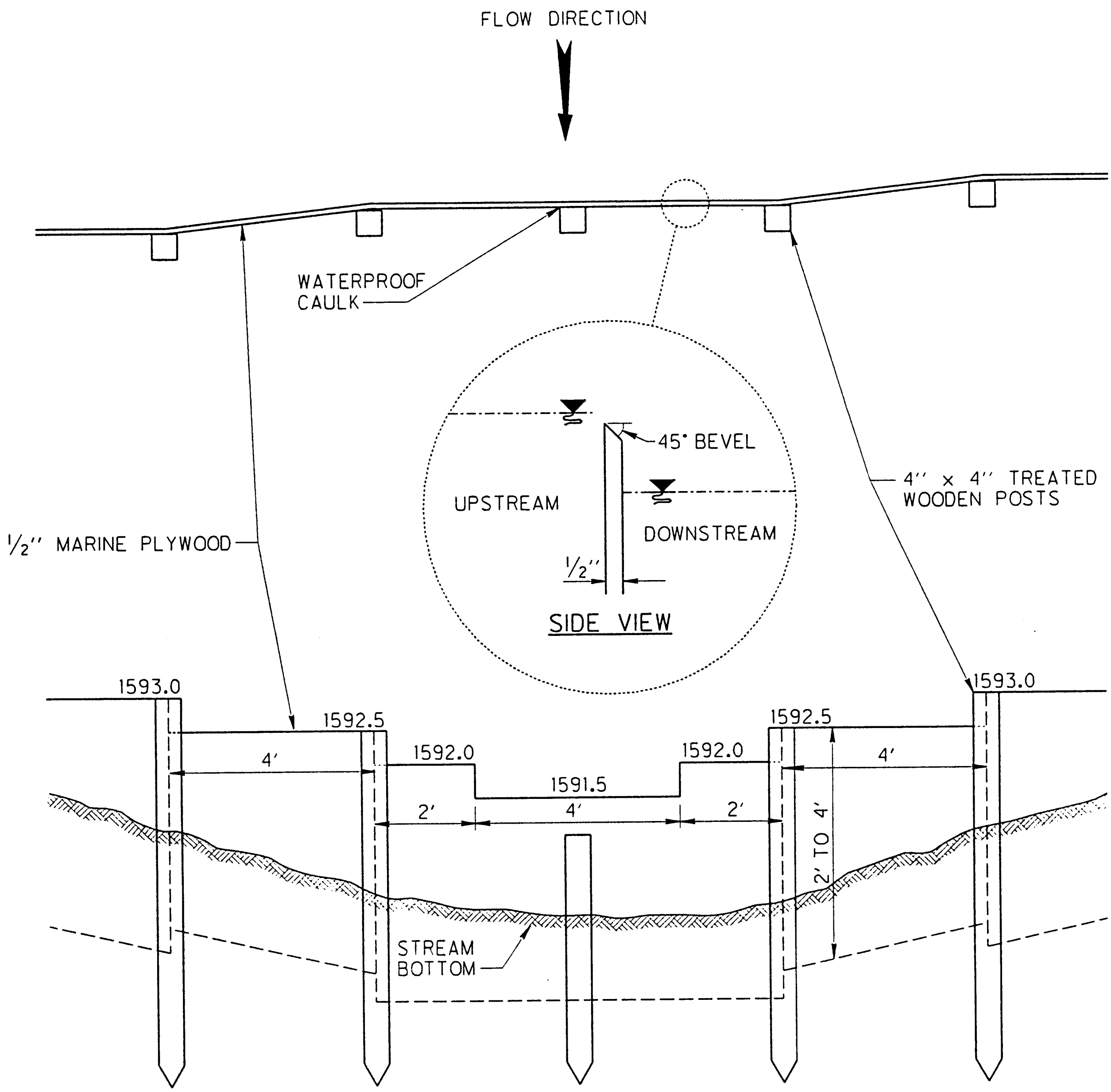
FIGURE 1
LITTLE SAND LAKE
WEIR OUTLET LOCATION DIAGRAM

Scale: SEE BAR SCALE | Date: 01/06/97
Prepared By: Foth & Van Dyke | By: MDL | 93C049



COMPOSITE RECTANGULAR WEIR

4' WEIR INSET INTO 8' WEIR INSET INTO 16' WEIR

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	MDL	DATE: MAR. '98
APPROVED BY:	SVD1	DATE: MAR. '98
APPROVED BY:	GWS	DATE: MAR. '98

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FIGURE 2

PROPOSED MONITORING INSTALLATION

Scale: NOT TO SCALE		Date: MARCH, 1998	
Prepared By: Foth & Van Dyke	By: JRB2	93C049	

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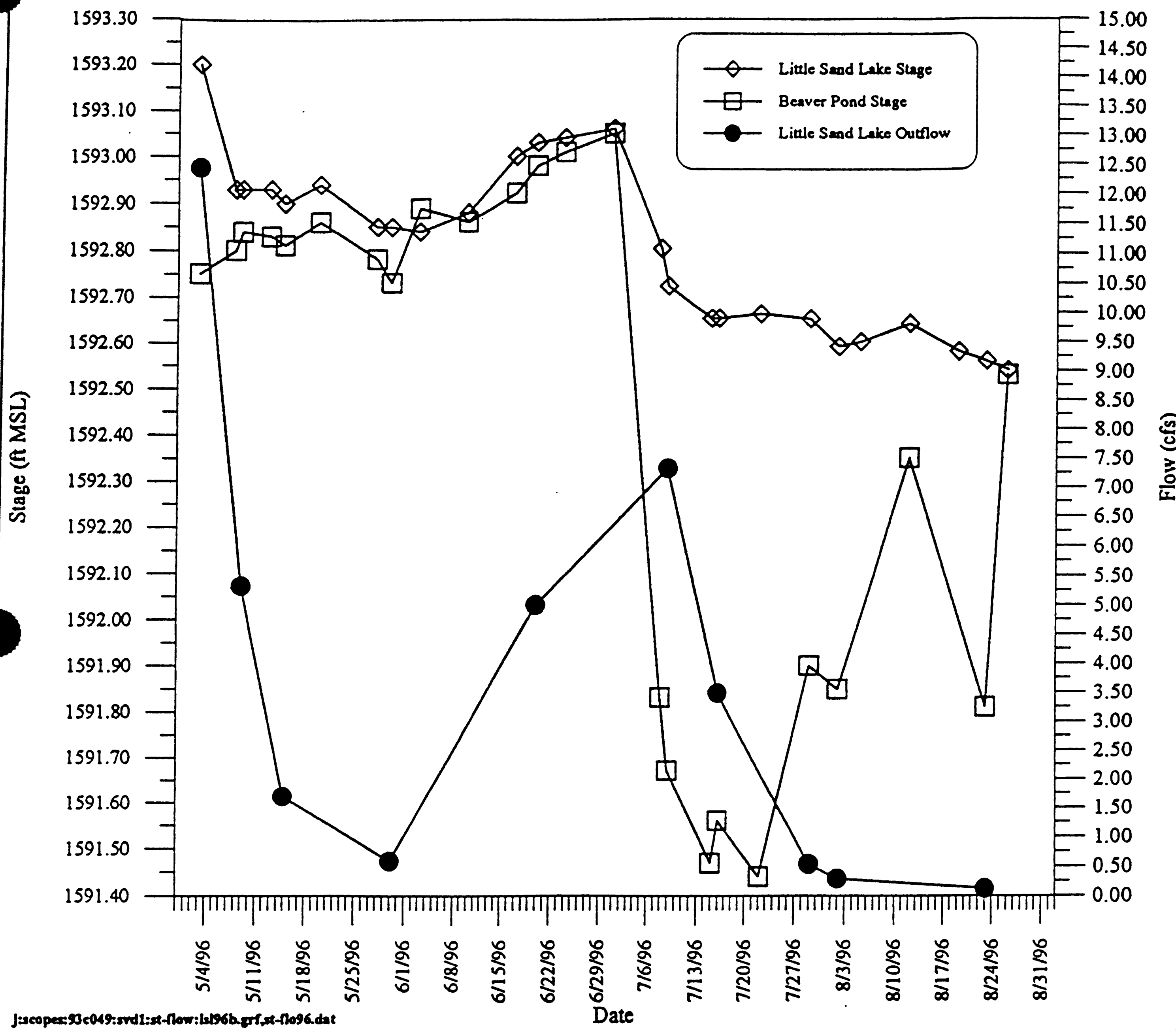

Foth & Van Dyke			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JKS1	DATE: SEPT.'96
APPROVED BY:	SVD1	DATE: SEPT.'96
APPROVED BY:	GWS	DATE: SEPT.'96

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FIGURE 3

1996 FLOW, LAKE STAGE AND BEAVER POND DATA FOR DUCK LAKE

Scale: NTS		Date: SEPTEMBER, 1996	
Prepared By: Foth & Van Dyke		By:	93C049

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Attachment 1

Outlet Rating Equation for Proposed Monitoring Installation for Little Sand Lake Outlet

Outlet Rating Equation for Proposed Monitoring Installation for Little Sand Lake Outlet (see Figure 3)

Using weir equation[1,3]

$$Q = CLH^{1.5}$$

where:
- Q = flow discharge in cfs
- C = weir coefficient[2,3]
  - = 3.25 (chosen within published ranges of coefficients to best match this condition)
- L = weir length, in feet
- H = head above crest, in feet

For the first stage: L=4 ft; crest elev.=1591.5, so H =lake stage-1591.5
=LS-1591.5

$$Q_1 = 3.25(4)H^{1.5} = 13(LS\text{-}1591.5)^{1.5}$$

For the second stage: L=4 ft; crest elev.=1592.0, H=LS-1592

$$Q_2 = 3.25(4)H^{1.5} = 13(LS\text{-}1592)^{1.5}$$

For the third stage: L=8 ft; crest elev.=1592.5, H=LS-1592.5

$$Q_3 = 3.25(8)H^{1.5} = 26(LS\text{-}1592.5)^{1.5}$$

Total flow in cubic feet per second (cfs), then, is:

$$Q = 13(LS\text{-}1591.5)^{1.5} + 13(LS\text{-}1592)^{1.5} + 26(LS\text{-}1592.5)^{1.5}$$

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[1]Chow, V.T. Open Channel Hydraulics, p. 362.

[2]Chow, V.T. Open Channel Hydraulics, p. 53, 362.

[3]Grant and Dawson. ISCO Open Channel Flow Measurement Handbook - Fourth Edition. p. 40.