Summary: project description and environmental baseline data for the proposed Crandon Project, Crandon, Wisconsin: scope ID 93C049. 1995

Foth and Van Dyke and Associates, Inc.
Green Bay, Wisconsin: Foth and Van Dyke, 1995

Crandon Mining Company

7 N. BROWN ST., 3RD FLOOR
RHINELANDER, WI 54501-3161

Jerome D. Goodrich, Jr.
PRESIDENT

May 30, 1995

To the Residents of Forest County and the State of Wisconsin:

Crandon Mining Company is pleased to present this summary of the project documents filed in May with the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE).

This summary describes the nature of the mine project and conditions in the local environment and economy as they exist today. The information in the documents is the result of an extremely thorough scientific study—probably the most thorough study ever conducted for a development project in Wisconsin. Over the past 18 months, the study has involved some 100,000 hours of work by more than 100 engineers, scientists and other professionals. The goal of all this work is to enable us to build a mine that benefits everyone and is a source of local pride. More specifically, we are committed to building a mine that will:

- Meet or exceed all federal and state mining regulations, including environmental standards designed to protect lakes, streams, groundwater, air quality, wetlands, wildlife and more.
- Safeguard important resources like the Wolf River, Swamp Creek, Rice Lake, the Wisconsin River and a host of lakes and trout streams in the project area.
- Operate in harmony with the special values of Northwoods life: scenery, peace and quiet, relaxation, culture and traditions.
- Provide new tax revenue and hundreds of well-paying jobs to support a higher standard of living and help local communities build a strong, prosperous future.

Documents we have filed with regulatory agencies to-date are:

- The initial sections of the Mine Permit Application, which explain how we intend to build, operate and reclaim the mine in a way that protects natural resources and quality of life in the Northwoods. Additional sections, to be filed during the summer, will outline our monitoring plan, risk assessment, contingency plans and long-term care monitoring plan.
- A Tailings Management Area Feasibility Report and Plan of Operation, explaining our plans to manage mine tailings in a way that provides long-term environmental protection.
- Major sections of the Environmental Impact Report (EIR), presenting the results of our environmental, engineering and Socioeconomic studies. These sections do not yet include our assessments of how mining will affect groundwater, surface waters and other local resources. We will file these remaining sections of the Environmental Impact Report this summer. At that point, the WDNR and the USCOE will be able to complete the review process that will lead to publication of a Draft Environmental Impact Statement.

Telephone: (715) 365-1451

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The project documents completed so far are open to your review. Copies have been placed on file at the locations listed on Page 4 of this summary. We believe our plan is a good one, but if you have better ideas, or if you have concerns you feel we should address, by all means bring them forward. We look forward to working with you.

Sincerely,

Jerome D. Goodrich, Jr.
President
Crandon Mining Company

JDG:lxb

WISCONSIN
GERALD W.
SEVICK
E-15308
Green Bay,
Wis.
PROFESSIONAL ENGINEER

5/30/95

Summary:
Project Description
and Environmental Baseline Data
for the Proposed Crandon Project
Crandon, Wisconsin

Prepared for
Crandon Mining Company

Prepared by
Foth & Van Dyke and Associates Inc.

Scope ID: 93C049

May 1995

Foth & Van Dyke 1995
2737 S. Ridge Road, P.O. Box 19012, Green Bay, Wisconsin 54307-9012, 414/497-2500, FAX: 414/497-8516

Summary:

Project Description and Environmental Baseline Data

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A. Introduction

Environmental Impact Report and Baseline Summary

Under Wisconsin Law, no mine can receive permission to operate unless it meets six tests. Specifically, the mining company must prove that the proposed mine:

1. Complies with all federal and state environmental regulations.
2. Protects public health, safety and welfare.
3. Has a net positive socioeconomic impact.
4. Complies with local zoning laws.
5. Is located on a suitable site.
6. Includes suitable plans for reclamation.

Crandon Mining Company (CMC) is now completing major documents that will help decide whether the proposed zinc and copper mine in Forest County meets these six tests and so should be allowed to be developed. All the documents are being filed with the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE), which will conduct a thorough review under stringent state and federal laws and regulations. As part of the process, the two agencies will jointly prepare an Environmental Impact Statement (EIS).

To date, CMC has sent to the WDNR and USCOE its Mine Permit Application and its Feasibility Report and Plan of Operation for the Tailings Management Area (TMA). These documents describe in detail how mine facilities will be built and operated so that the environment is protected.

In addition, CMC has submitted portions of the project's Environmental Impact Report (EIR), which describe conditions in the local environment as they exist today. In summer, CMC will complete sections of the EIR that explain the likely effects of the mine and describe environmental monitoring plans, risk assessments, contingency plans and long-term care plans.

The EIR is based on an extremely thorough scientific study, probably the most thorough ever conducted for a development project in the state. Scientists, engineers and other experts hired by CMC have conducted extensive investigations of groundwater, surface water, air quality, geology, wildlife, historic and cultural resources, socioeconomic conditions and more, covering a wide area around the proposed mine site and within Forest, Langlade and Oneida counties. To date, more than 100 researchers have logged some 100,000 hours of work. All this work is in addition to similarly exhaustive studies conducted in the 1970s and 1980s, during the earlier permitting process.

These studies, in turn, will be analyzed and reviewed by state and federal regulators, by scientists and experts hired by interested parties, and by the general public under the state's open permitting process. The entire process is designed to ensure that the mine will open only when it is proven environmentally sound and economically beneficial.

It is not yet possible to draw conclusions about the environmental effects of the mine, because most EIR sections finished so far describe only existing conditions. The following overview lists findings and observations from the finished EIR sections that are likely to be of most interest to local residents. It also includes a brief description of the mine tailings management area (TMA).

Historical and Cultural Resources

Studies indicate that mining at Crandon is compatible with protection of archaeological and cultural resources in the area. Surveys covering more than 5,000 acres of land found a small number of archeological sites, all either outside the immediate area of the project or in places where impacts can be avoided or mitigated.

Air Quality

Air Quality in the area is typical of rural areas in Northern Wisconsin. The mine project area is classified as an air attainment area because it meets all ambient air quality standards set by the Clean Air Act.

Geology and Soils

Movement of groundwater downward into the mine will be restricted by two layers of low-permeability material just above the bedrock.

Surface Water

Studies suggest that lakes nearest the mine site—Oak, Little Sand, Skunk, Duck, and Deep Hole—receive very little of their water from groundwater sources. These lakes tend to contain soft water. Oak and Little Sand lakes have low to moderate nutrient content. Duck, Deep Hole, and Skunk lakes have moderate to high nutrient content sufficient to cause extensive weed growth.

Groundwater

The lakes near the mine have low-permeability bottom soils that tend to keep water from seeping out. Oak Lake is "perched" above the water table and is not connected to groundwater. All this suggests that if mining should cause any reduction in local groundwater levels, the lake levels would respond very slowly, allowing time for corrective measures. Groundwater in the area naturally contains relatively high levels of iron, manganese, arsenic, lead, aluminum, chromium, cadmium, nickel, nitrates, and antimony, and is high in alkalinity and total dissolved solids.

Aquatic and Terrestrial Biology

To-date, studies indicate that mining is consistent with protecting threatened and endangered species, and their habitats, found in the area. In studies covering 30 square miles, biologists found five threatened and five endangered species, all but one outside the area that would be disturbed by mining. Goblin fern, a state endangered species, was found on the mine site but also in eight locations away from the site, including three places in the Nicolet National Forest. The habitat of goblin fern is not uncommon, and the studies indicate the plant may be more widespread than previously thought. CMC will conduct follow-up studies on goblin fern in 1995.

Wetlands

CMC has adjusted the mine project to minimize the loss of wetlands. As now designed, the project would take 29.5 acres of wetlands, down from 65.4 acres that would have been lost under the original project design in the 1980s. All wetlands taken will be replaced by restoring wetlands in Shawano and Oconto counties that were converted to farmland years ago. The wetland replacement plan will be reviewed by from the U.S. Army Corps of Engineers.

Noise

CMC measured existing sound levels in the area and will use this information to assess how sound levels are likely to change during mine construction and operation. Existing sound levels are typical of rural areas in Northern Wisconsin.

Aesthetics

CMC evaluated visual effects of the mine headframe, the tailings pond embankments and the railroad spur. Forests in the area have matured since the 1980s and will conceal the facilities even more than they would have in the 1980s.

Socioeconomics

The mine is expected to create some 750 long-term mining and mine-related jobs while having a minor effect on population, housing, schools and government services in Forest, Langlade and Oneida counties. Construction employment will peak at 542 jobs, operations employment is estimated to range between 402 and 526 workers, and indirect employment in businesses serving the mine and its employees is projected to average between 320 and 420. The mine will make $43 million in local purchases during three years of construction and about $1.2 million per year in local purchases during 28 years of operation. Long-term, the mine will add about 750 more people (1.5 percent) to the tri-county area population than if no mine were built. The mine will add up to $110 million to the local tax base and generate an estimated $119 million in Net Proceeds Taxes.

Tailings Management

Mine tailings and waste rock contain substantial amounts of natural materials that neutralize acids. In six months of testing to simulate how tailings will react when exposed to the environment, tailings did not produce acidic leachate. These tests are continuing, and it may be several months before conclusions can be drawn.

Mine tailings will be contained in four engineered basins designed for long-term environmental protection. The basins will include systems designed to keep water and oxygen out so that the tailings remain in a harmless state. Among many protective features, the tailings basins will have:

- A multiple-layer bottom liner system that includes a plastic geomembrane and a layer of low-permeability soil.

- A multiple-layer top liner system (cap), also with a geomembrane and a layer of low-permeability soil.

- A drain system above the liner to collect seepage so that it can be removed and treated.

- Surface water controls designed to accommodate a 100-year, 24-hour storm.

- An average 43-foot separation between the basin bottom and the groundwater, and a minimum 1,250-foot distance from the nearest lake or stream.

For More Information

The remainder of this summary document provides more detailed information about the mine project and the EIR. Complete copies of the Environmental Impact Report and the other project documents are being placed on file at various public locations around the tri-county area and in major Wisconsin cities. The public is welcome to review the documents and take an active part in the permitting process for the Crandon mine.

Locations for Reviewing Crandon Project Documents

Complete copies of the mine permit applications and Environmental Impact Report sections have been placed on file at the following locations and are available for review during regular business hours. Supplemental documents to be filed with the WDNR later this summer will also be made available at these locations:

- Crandon Public Library, 104 South Lake Avenue, Crandon
- Antigo Public Library, 404 Superior Street, Antigo
- Rhinelander District Library, 106 North Stevens Street, Rhinelander
- Wisconsin DNR, 107 Sutliff Avenue, Rhinelander
- Wisconsin DNR, 101 South Webster Street, Madison
- Nicolet College, Highway G, Rhinelander
- Milwaukee Public Library, 814 West Wisconsin Avenue, Milwaukee
- Madison Public Library, 201 West Mifflin Street, Madison
- UW-Madison Engineering Library, 215 North Randall Avenue, Madison
- UW-Stevens Point Library, 900 Reserve Street, Stevens Point
- Marathon County Library, 300 First Street, Wausau
- Brown County Library, 515 Pine Street, Green Bay

Complete copies of the project documents also have been delivered to the entities listed below and may be available there for your review. Please contact the appropriate parties to make arrangements.

- City of Crandon
- City of Antigo
- City of Rhinelander

- Town of Lincoln
- Town of Nashville
- Town of Ainsworth
- Forest County
- Langlade County
- Oneida County
- Mole Lake Sokaogon Chippewa Community
- Forest County Potawatomi Community
- Menominee Indian Tribe of Wisconsin

B. General Project Description

The main elements of the Crandon Project consist of an underground mine; ore concentrating facilities; water treatment facilities; a tailings management area; a water discharge pipeline and ancillary facilities such as an access road, a railroad spur line, and service and support facilities. An extensive description of the project is included in the Mine Permit Application. The 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 relative location of the project is shown on Figure 2-1.

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

Anticipated Production and Operation Data

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
Preproduction	3 years
Mining	28 years
Reclamation	4 years
Production Schedule	7 days/week
Employment (estimates)	
Construction (Peak)	750
Operations	402-526

Within this section, there are numerous references to the "project area", "mine site", "plant site" 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.

FIGURE 2-1
SITE LOCATION

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93C049

- Plant Site - The plant site is generally defined as the area within the mine site that includes all mining, processing, concentrating, water treatment, administrative, 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; ventilation raises; 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.

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

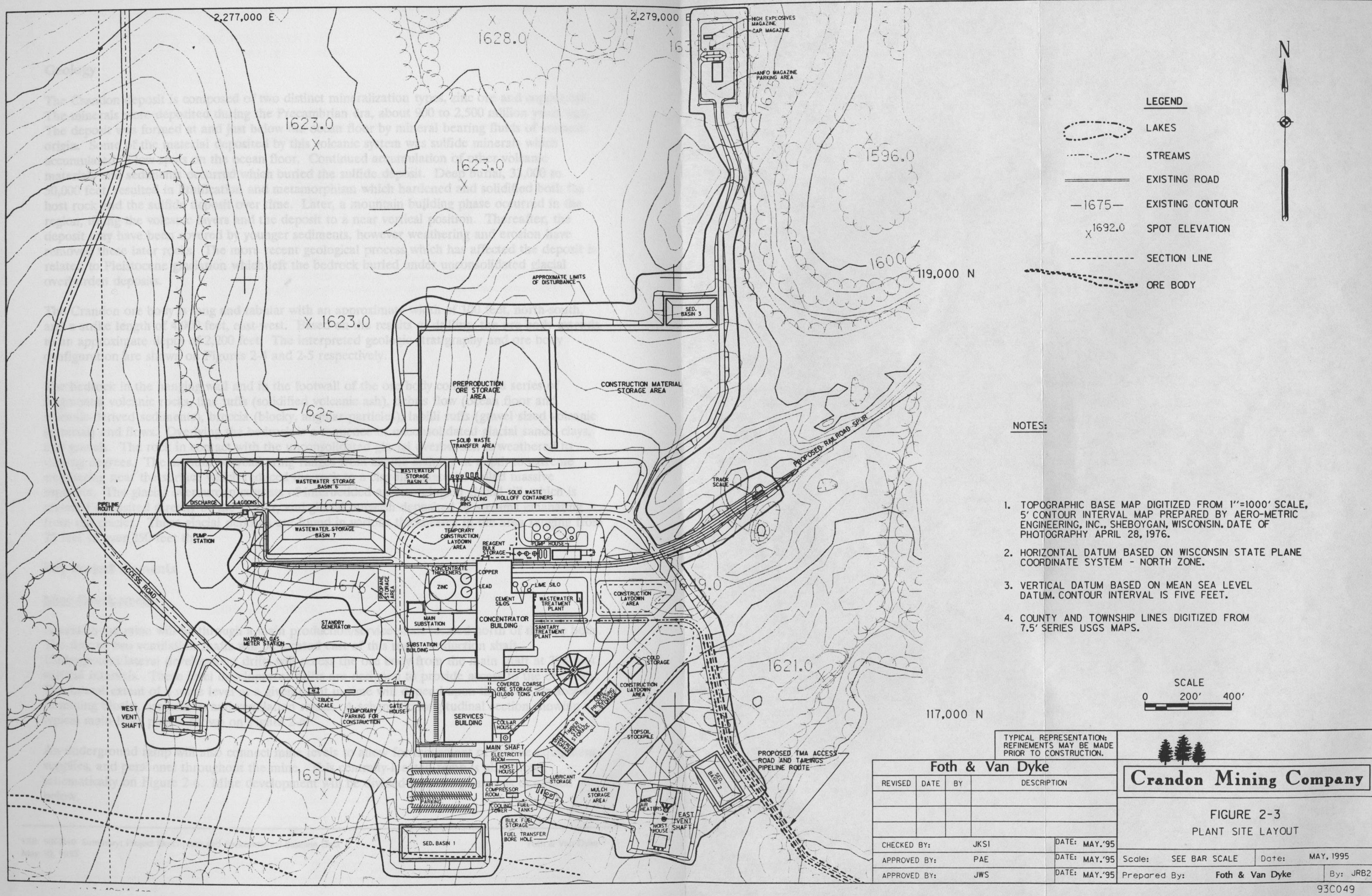
Two additional areas located outside of the project area include the narrow corridor along existing road right-of-ways from the intersection of the site access road and State Trunk Highway (STH) 55 to the Wisconsin River in which the project's treated water discharge line is to be located, and the project's wetland mitigation site located off-site in Shawano and Oconto Counties. Design information for the discharge pipeline to the Wisconsin River will be included as part of the water treatment system engineering report prepared pursuant to Wisconsin Administrative Codes. Design information relative to the wetland mitigation site will be 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 will be included in the project's EIR.

The boundaries of the project area, plant site and TMA are shown on Figure 2-2. The plant site and the TMA are approximately 128 acres and 355 acres in size, respectively. The total area of disturbance, including the access road and railroad spur, is approximately 550 acres.

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 five miles south of the City of Crandon and two miles east of STH 55 and the Mole Lake Indian Reservation. The plant site is approximately one-quarter mile north of Little Sand Lake and one mile south of Swamp Creek. The primary mine surface facilities, e.g., 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 site will be connected northeasterly to the existing Wisconsin Central Limited Railroad. The project's TMA will be located approximately one mile southeast of the plant site.

The project area shown in Figure 2-2 includes those portions of property which CMC has purchased, leased, optioned for purchase or obtained by easements for use in the development of the plant site, TMA, access roads, railroad spur line and buffer areas.



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HIGH EXPLOSIVES MAGAZINE
CAP MAGAZINE
ANFO MAGAZINE PARKING AREA
APPROXIMATE LIMITS OF DISTURBANCE
SED. BASIN 3
PREPRODUCTION ORE STORAGE AREA
CONSTRUCTION MATERIAL STORAGE AREA
PROPOSED RAILROAD SPUR
TRACK SCALE
SOLID WASTE TRANSFER AREA
WASTEWATER STORAGE BASIN 6
WASTEWATER STORAGE BASIN 5
WASTEWATER STORAGE BASIN 7
DISCHARGE
LAGOONS
RECYCLING
SOLID WASTE ROLLOFF CONTAINERS
PIPELINE ROUTE
PUMP STATION
TEMPORARY CONSTRUCTION LAYDOWN AREA
REAGENT BULK STORAGE
PUMP HOUSE
ACCESS ROAD
CONCENTRATE THICKENERS
ZINC
COPPER
LEAD
PROPANE STORAGE AREA
LIME SILO
CEMENT SILOS
WASTEWATER TREATMENT PLANT
CONSTRUCTION LAYDOWN AREA
MAIN SUBSTATION
CONCENTRATOR BUILDING
SANITARY TREATMENT PLANT
STANDBY GENERATOR
NATURAL GAS METER STATION
SUBSTATION BUILDING
COLD STORAGE
GATE
COVERED COARSE ORE STORAGE (10,000 TONS LIVE)
CONSTRUCTION LAYDOWN AREA
TRUCK SCALE
GATE HOUSE
TEMPORARY PARKING FOR CONSTRUCTION
WEST VENT SHAFT
SERVICES BUILDING
COLLAR HOUSE
TOPSOIL STOCKPILE
MAIN SHAFT
ELECTRICITY ROOM
HOIST HOUSE
LUBRICANT STORAGE
PROPOSED TMA ACCESS ROAD AND TAILINGS PIPELINE ROUTE
SED. BASIN 2
AIR COMPRESSOR ROOM
MULCH STORAGE AREA
MINE AIR HEATERS
COOLING TOWER
FUEL TANKS
BULK FUEL STORAGE
FUEL TRANSFER BORE HOLE
HOIST HOUSE
EAST VENT SHAFT
SED. BASIN 1
N
LEGEND
LAKES
STREAMS
EXISTING ROAD
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x1692.0 SPOT ELEVATION
SECTION LINE
ORE BODY
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.
Foth & Van Dyke
REVISED DATE BY DESCRIPTION
Crandon Mining Company
FIGURE 2-3
PLANT SITE LAYOUT
CHECKED BY: JKSI DATE: MAY.'95
APPROVED BY: PAE DATE: MAY.'95
APPROVED BY: JWS DATE: MAY.'95
Scale: SEE BAR SCALE
Date: MAY, 1995
Prepared By: Foth & Van Dyke
By: JRB2
93C049

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 material deposited by this volcanic system was 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 approximate 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.

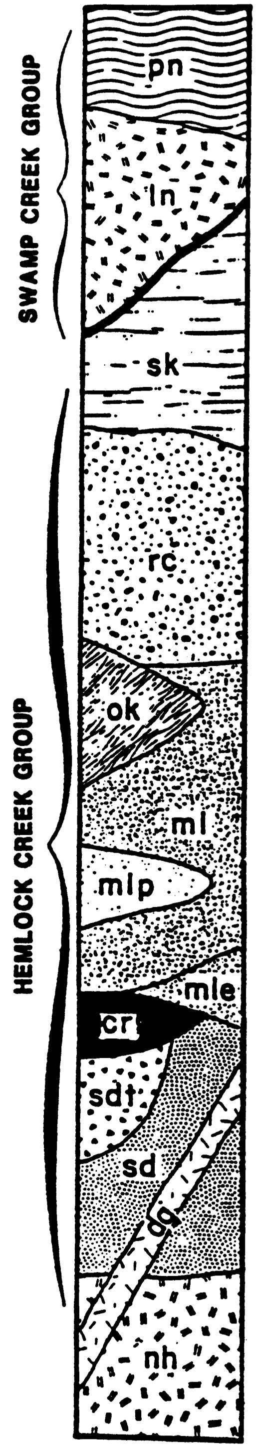
The bedrock in the hanging wall and in the footwall of the ore body consists of a series of fragmental volcanic rocks, fine tuffs (solidified volcanic ash), debris flow (ocean floor and volcanic-derived sediments), breccia (blocky, angular particles), lapilli tuffs (gravel sized volcanic material) and 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 at depth 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.

Key Project Elements

<u>Mine Development</u>

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 from the main shaft at 300 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 schematic longitudinal section showing a typical main level plan is shown on Figure 2-6.

An underground ramp will also connect mine levels 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 two phases as described below.



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.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

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

Crandon Mining Company

FIGURE 2-4
STRATIGRAPHIC COLUMN

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

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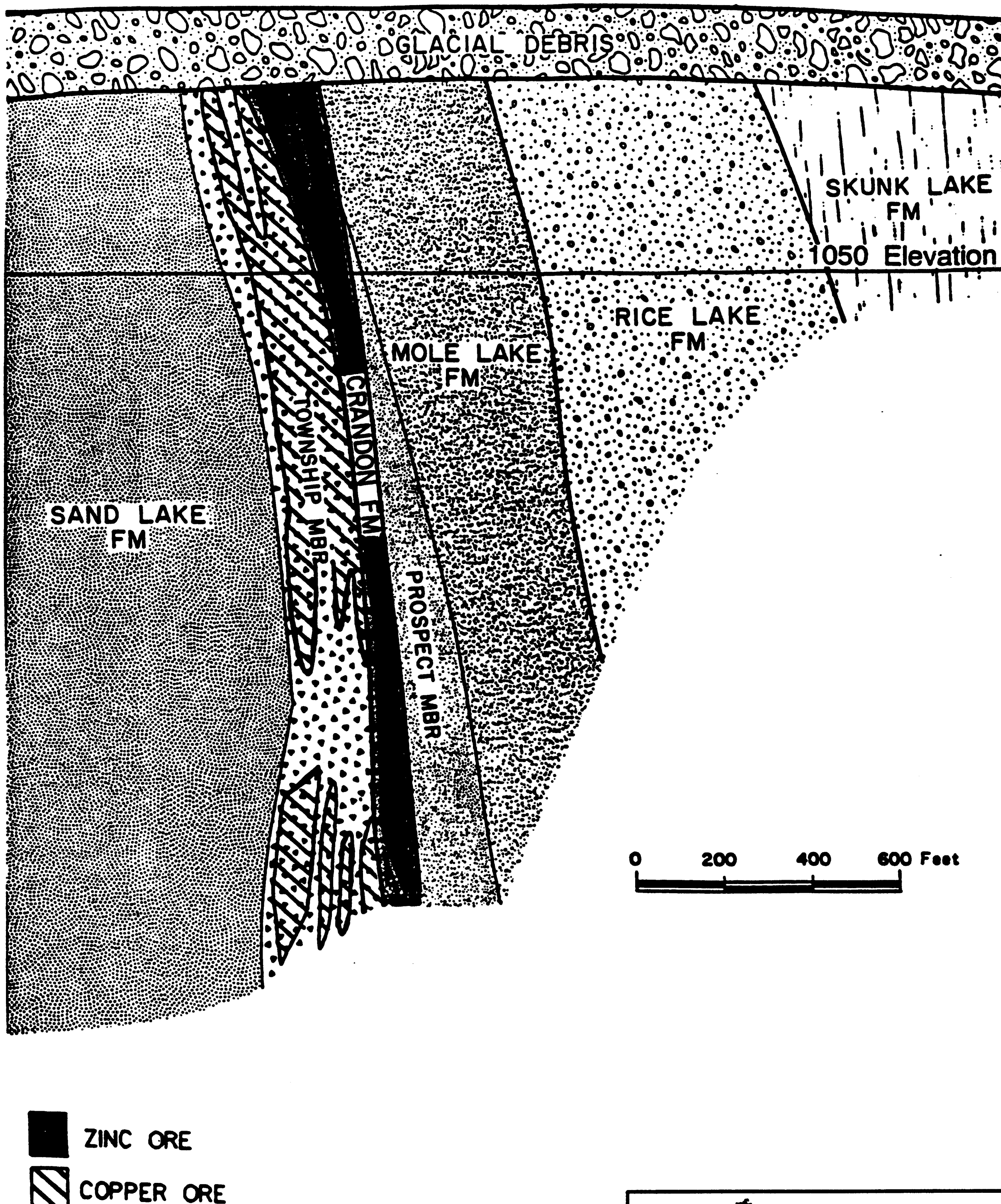
LOOKING WEST



Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

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

Crandon Mining Company

FIGURE 2-5
GENERALIZED GEOLOGIC CROSS SECTION C-C'

Scale: AS SHOWN	Date: MARCH, 1995
Prepared By: Foth & Van Dyke	By: BSH

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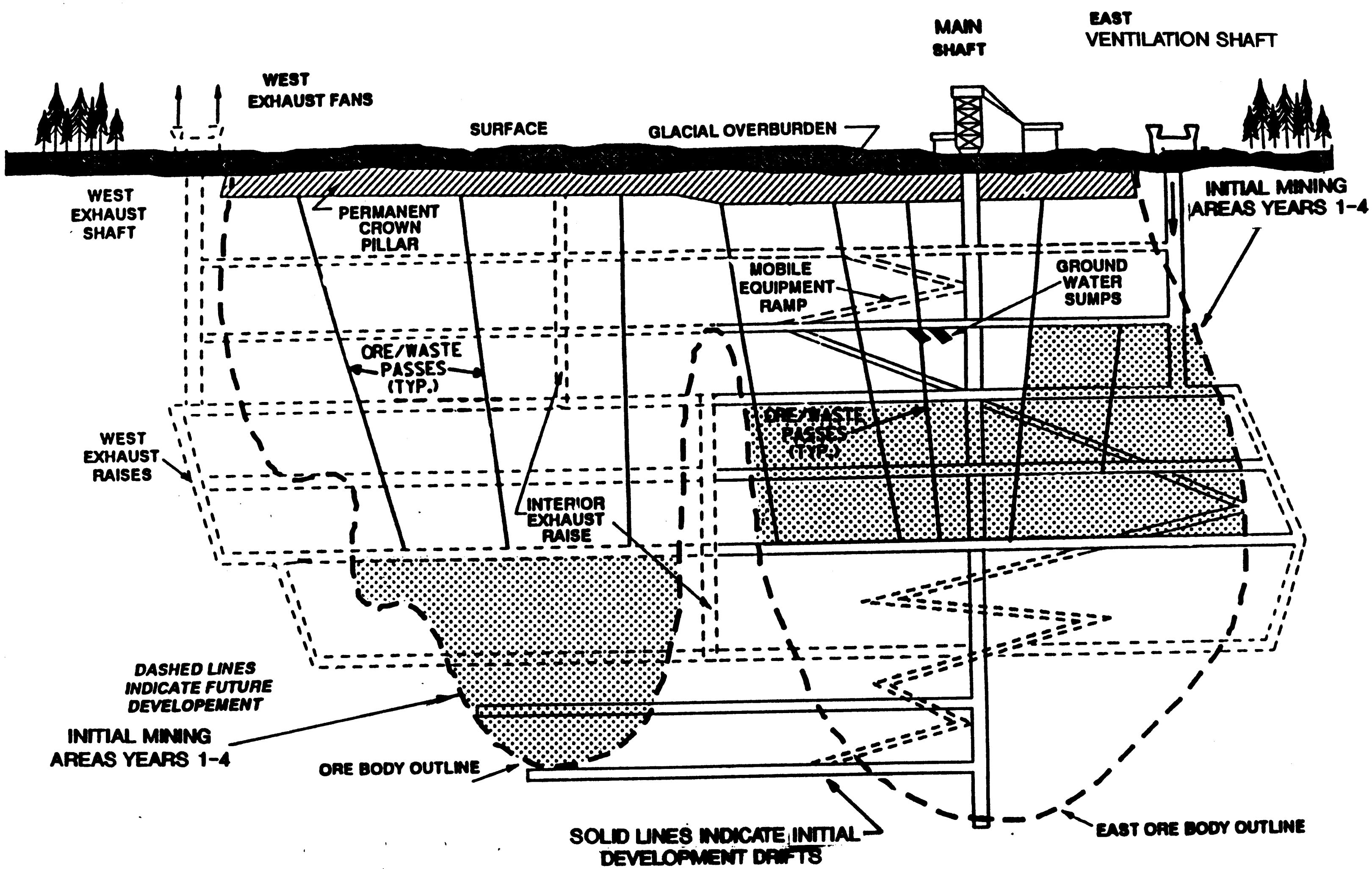


Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

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

Crandon Mining Company

FIGURE 2-6

SCHEMATIC LONGITUDINAL SECTON (LOOKING NORTH)

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

93C049 14

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 control of groundwater in flow by ground freezing or other suitable techniques, followed by the excavation and concrete lining of the shaft into bedrock. If required, inert grout will be pumped under pressure through holes in the collar into the rock and glacial formations 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 both shaft sinkings will be controlled to less than ten gallons per minute (gpm) by grouting. All shaft water will be pumped to the surface water storage ponds.

Phase II Development

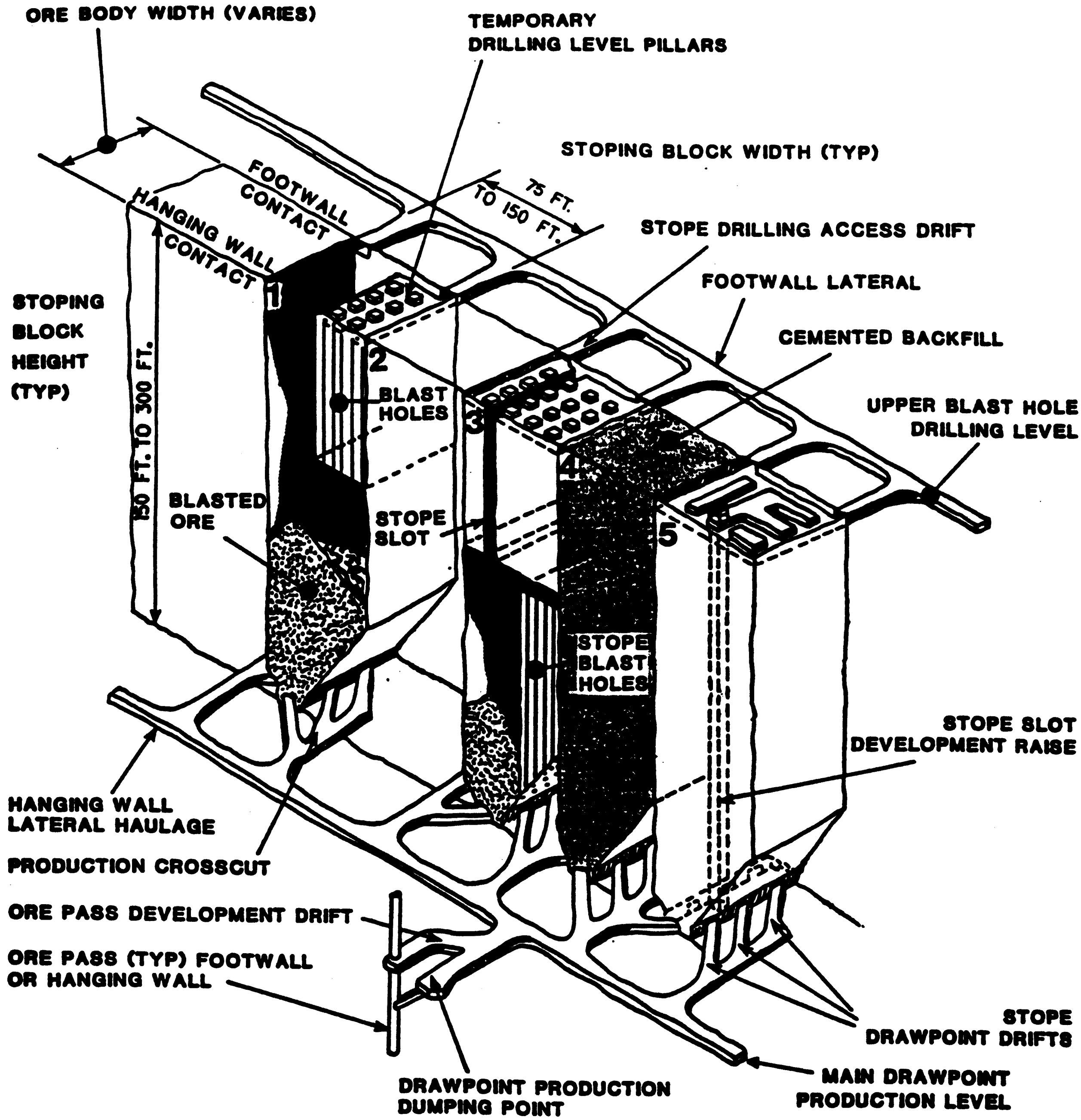
Because the east shaft is smaller than the main shaft, it will be completed at the end of Phase I. From this shaft, horizontal level development will consist of driving a horizontal opening in the hanging wall rock to connect the east shaft to the main shaft (Figure 2-6). After the two shafts are connected, 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 handling systems, and (d) a loadout facility.

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.

<u>Mine Operations</u>

Level development from the main production shaft to the stoping areas will be driven at 300-foot vertical intervals. The primary mining method will be blasthole open stoping with delayed backfill. However, other mechanized variations, such as sublevel mining or cut-and-fill stoping methods may also be used. Stopes (Figure 2-7) will average approximately 300 feet high by 75 feet long, 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 approximately four to six inch diameter blastholes on approximately 12-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 eight inches, will be conveyed to a skip loading pocket and hoisted to the surface.



STOPING BLOCK NO. 1-ACTIVE PRODUCTION-STOPE BLASTING NEARING COMPLETION

STOPING BLOCK NO. 2-ALTERNATE STOPING BLOCK/PILLAR-TO BE MINED AFTER BACKFILLING ADJACENT STOPES

STOPING BLOCK NO. 3-ACTIVE PRODUCTION-INITIAL STAGES OF STOPE BLASTING

STOPING BLOCK NO. 4-DEPLETED STOPE BLOCK-CEMENTED BACKFILL IN PLACE

STOPING BLOCK NO. 5-STOPE BLOCK PARTIALLY DEVELOPED

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

Crandon Mining Company

FIGURE 2-7

CONCEPTUAL STOPING SEQUENCE

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

A typical stope will contain approximately 250,000 tons of ore. At a 2,000,000 ton annual production rate, approximately eight stopes will be mined out each year, which exposes less than five 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, averaging approximately 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 may 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 is backfilled prior to mining the next upper lift. Less than 10 percent of the ore body may require use of this mining method.

The planned mining methods provide for backfilling all stopes following ore extraction. These practices, combined with the fact that five 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.

Mine backfilling will begin with the start of milling operations and after the first stope is depleted. The backfill will consist of mill tailings 10 to 15 micron or greater in size, supplemented with coarse waste rock retained underground. Uncemented tailings backfill will have a hydraulic conductivity on the order of 0.028 feet per day. The hydraulic conductivity of cemented tailings backfill will be lower. Backfill slurry containing approximately 60 to 70 percent solids will be pumped underground through boreholes fitted with distribution pipes. The backfilling operations will normally be conducted to coincide with the mining schedule.

Waste rock material from mine development will be used in the stope backfilling process and will be placed before or during the placement of hydraulic tailings fill. The hydraulically-placed fill will flow into and fill the voids between the rock fragments.

Cement will be added to the backfill when needed to provide stability so that the column of fill will stand unsupported and enable complete removal of the ore in the adjacent stope. Approximately one-third to one-half of the total backfill placed in the mine will contain cement.

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 this period, exploration holes will be advanced into the weathered bedrock areas to dewater them. The water removed in this fashion will primarily be stored water which will be withdrawn at rates that can be effectively managed at the project's water treatment plant. A more detailed description of this process follows.

As mine development progresses upward from the original mining areas (Figure 2-6), diamond drilling techniques will be used to identify active underground water courses prior to advancing the mine face. Diamond drill holes will be used throughout the mine to drain stored water. Flows encountered on the uppermost active mine level will be captured by interceptor drill holes and contained to avoid contamination by mining operations on levels below and to reduce pumping head. A conceptual cross-section of the groundwater interceptor system showing the collection methodology is presented in Figure 2-8. Standard rock grouting techniques, typically using neat cement, may also be used for local inflow control during the early mine years to limit total mine pumpage.

Typically, groundwater interception holes will form conical fans in the weathered rock above the development openings, thus increasing the radius of the drains. As is common practice in other mines, the drill hole collars will be fitted with valves to allow controlled water removal.

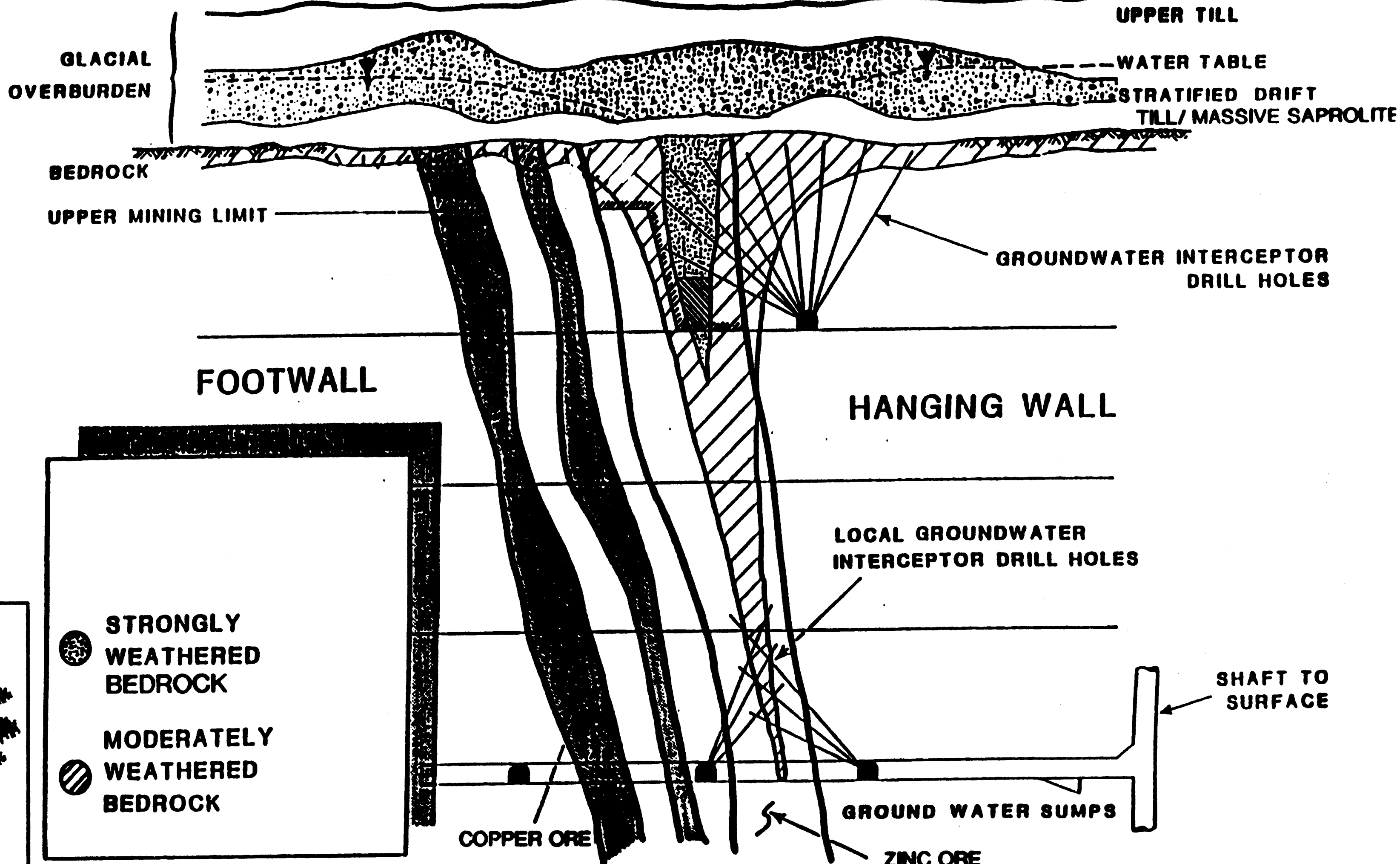
Groundwater collected from exploration drilling or other drill holes placed specifically for inflow interception will be routed directly to a clean water sump and pump station near the main shaft in the upper mine level. The collected groundwater will typically be pumped to the water treatment plant on the surface. However, a portion of the water may be retained underground for distribution as mine utility water.

Groundwater seepage that is not captured by the interceptor system will infiltrate the mine workings and ultimately be recovered in the main sumps along with the mine potable, utility and backfill drainage water. Normal mine drainage collection will begin on each mine level where groundwater seepage, utility water and backfill drainage will be ditched to small local sumps excavated in the drift wall. 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 at the lowest level.

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.

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 are 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. The remaining material, which is called tailings, will be either used as backfill in the mine or hydraulically transported 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 eight to 10 percent moisture content.



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Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

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

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FIGURE 2-8
GROUNDWATER INTERCEPTOR SYSTEM
(CONCEPTUAL CROSS SECTION)

Scale: AS SHOWN Date: MARCH, 1995
Prepared By: Foth & Van Dyke By: BSH

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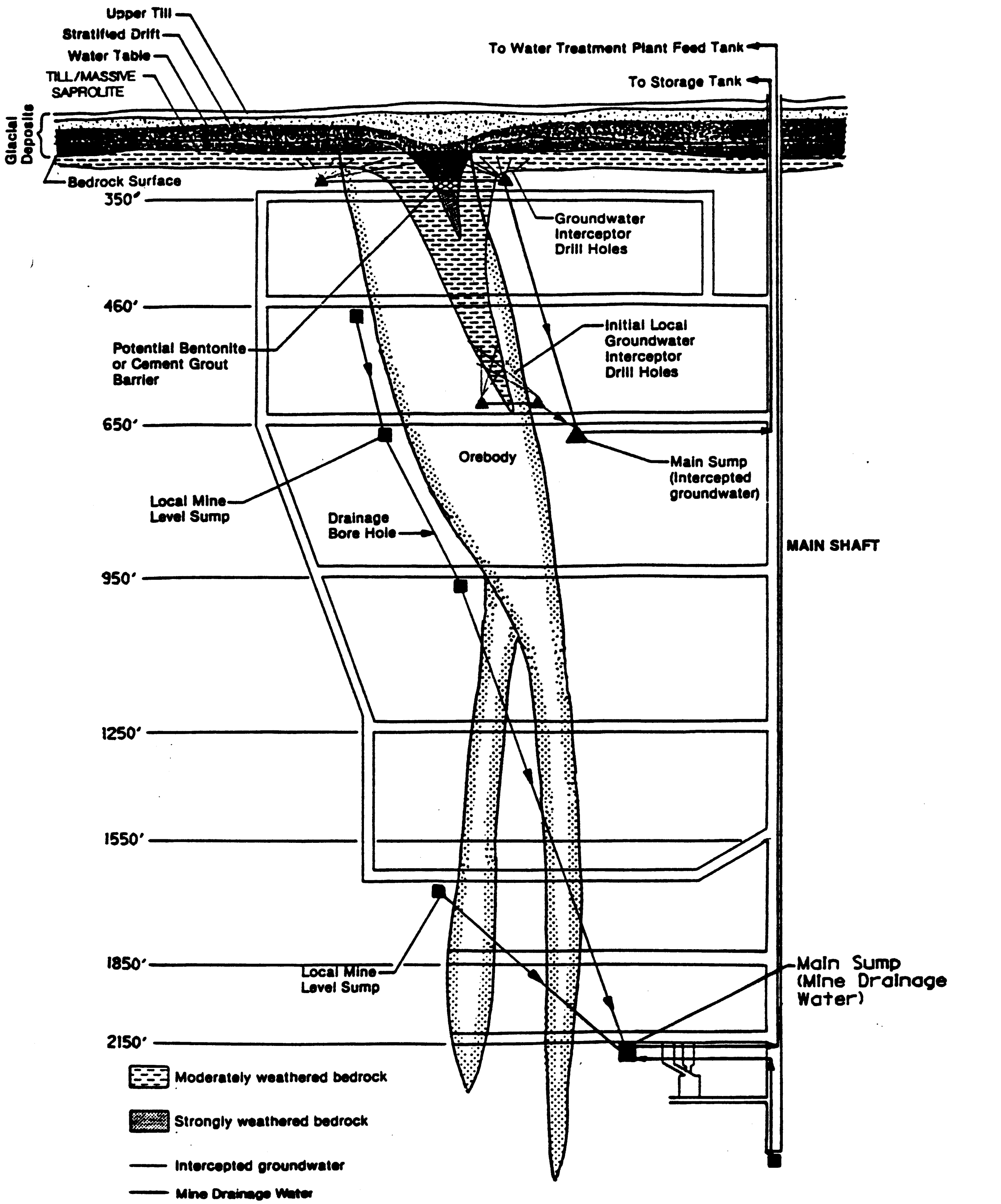

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APPROVED BY:	PAE	DATE:	APR.'95
APPROVED BY:	GWS	DATE:	APR.'95

Crandon Mining Company

FIGURE 2-9

MINE DRAINAGE SCHEMATIC

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

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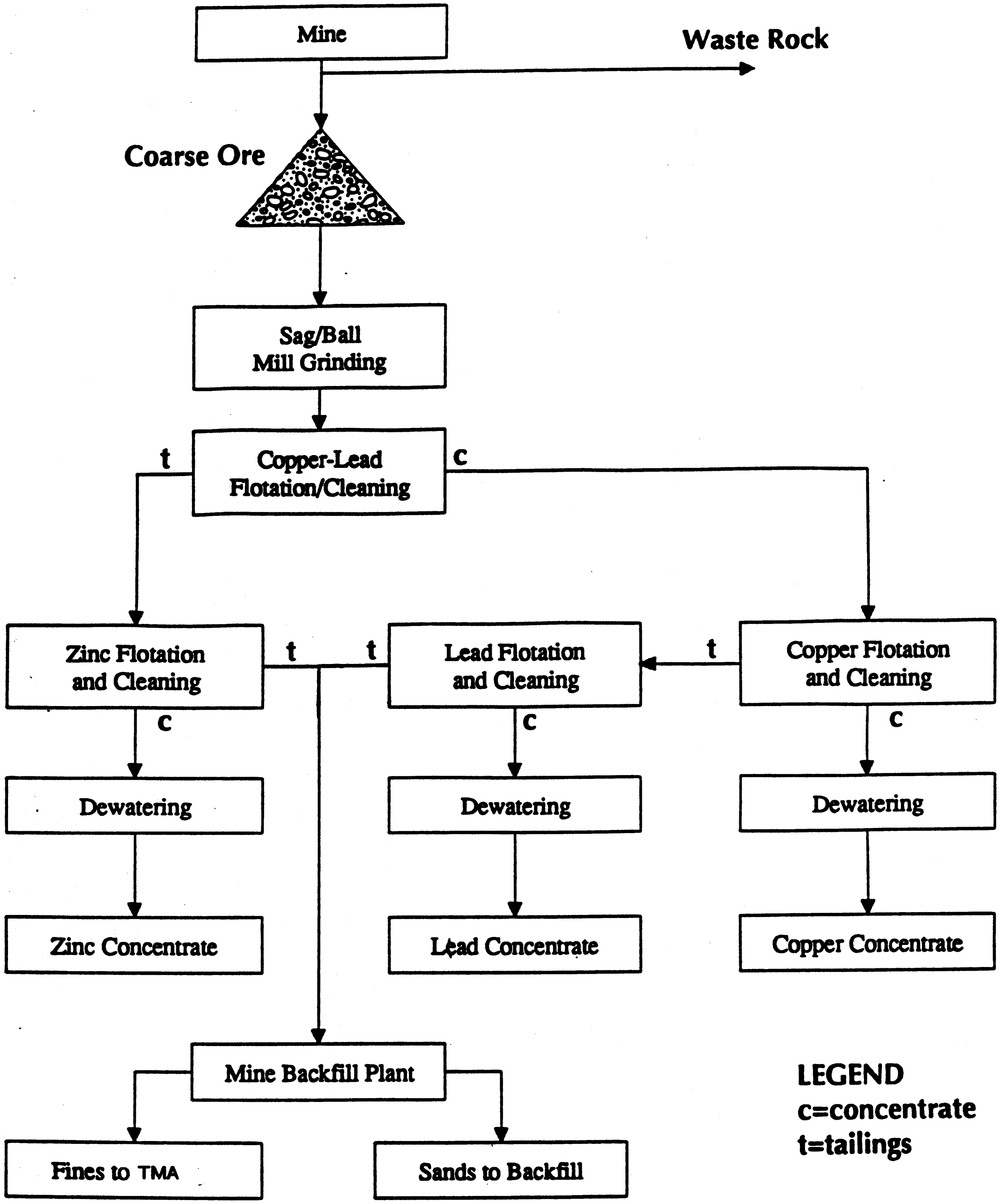

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APPROVED BY:	PAE	DATE:	APR.'95
APPROVED BY:	GWS	DATE:	APR.'95

Crandon Mining Company

FIGURE 2-10
CONCENTRATOR PROCESS FLOWSHEET

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

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The tailings will range in size from sand to very fine particles. The coarser tailings from the mineral separation circuits will be used to backfill the mined-out stopes. The finer 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 water treatment system will be designed to treat tailings pond waters for discharge, if necessary.

Infrastructure

Infrastructure features to support the mine and milling operations include a water treatment plant, ore and waste rock storage facilities, mining waste management facilities, access road, railroad spur line, electric power transmission lines, a natural gas pipeline, a treated water discharge pipeline, and ancillary buildings and storage facilities. A discussion of each follows.

Water Treatment

A water treatment plant will be constructed as part of the project facilities. It will treat mine water and, if needed, process water prior to discharge. Intercepted groundwater is expected to be representative of natural groundwater quality. If the monitoring of this groundwater indicates that the water quality is not suitable for direct discharge, it will be routed through the water treatment plant. Groundwater that bypasses the interceptor system and comes in contact with mining activities will be commingled with other mine drainage water, such as the water used to cool the drill bits while drilling the blast holes. All of these "contact waters" will be routed through the water treatment plant.

The water treatment plant will include a lime and sulfide precipitation system with filtration and pH adjustment. Treatment solids from this facility will be placed along with the ore processing tailings in the TMA. Mine water will be treated to meet WDNR Water Quality Standards before being discharged to the Wisconsin River via a discharge pipeline installed primarily along the U.S. Route 8 corridor (Figure 2-11).

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

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

Mining Waste Management

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

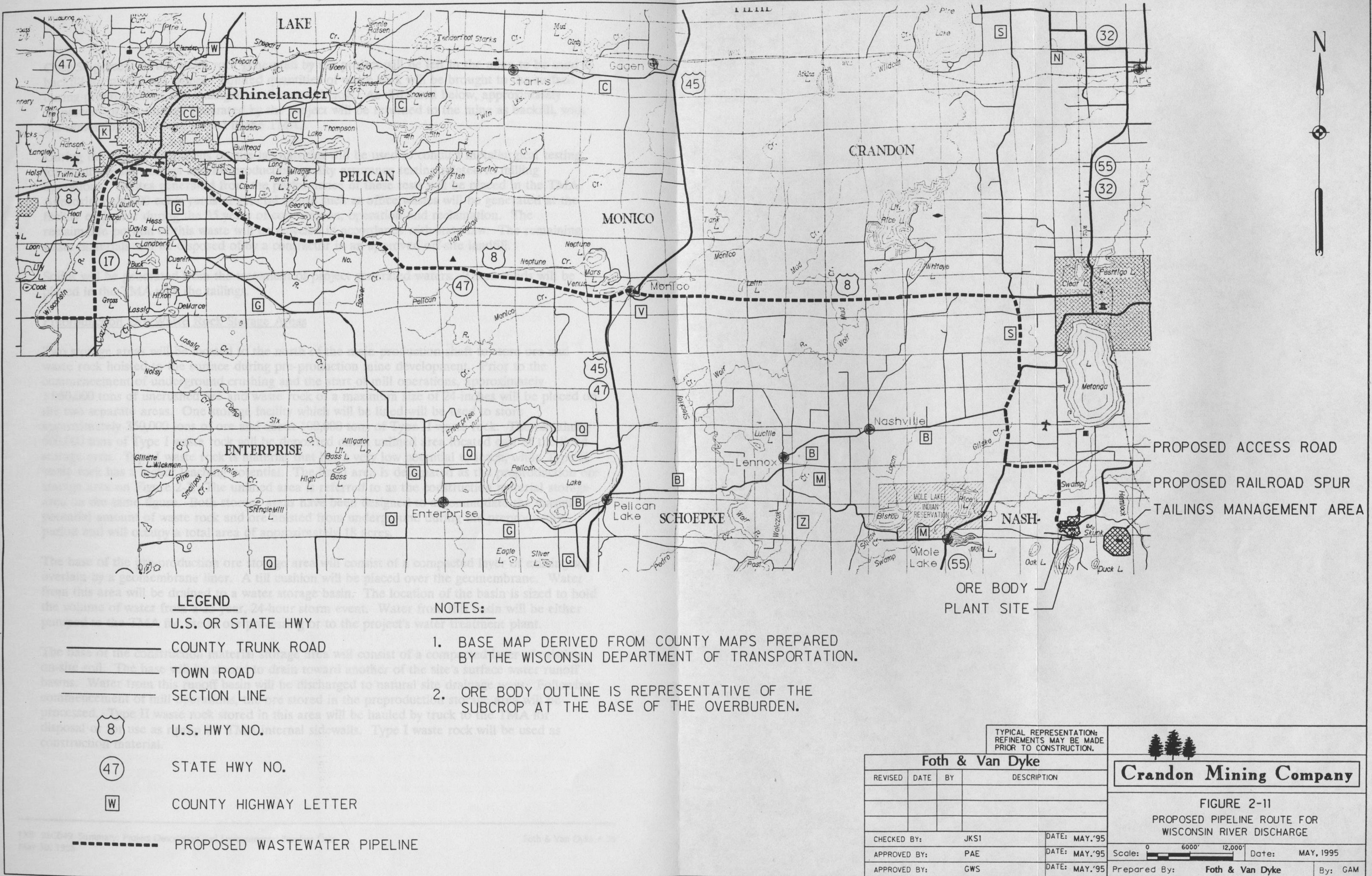


FIGURE 2-11
PROPOSED PIPELINE ROUTE FOR WISCONSIN RIVER DISCHARGE

Over 50 percent of the waste rock generated by the project will be left in the mine to be used as backfill for mined out stopes. Limited quantities of waste rock will be brought to the surface during preproduction and managed as discussed below. As discussed below, approximately 50 percent of the tailings generated by the project will be returned to the mine as backfill, with the remaining 50 percent placed in the TMA.

During the 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 treatment of project generated waters. These solids will be placed in the TMA with the tailings.

Preproduction Ore/Waste Rock Storage Areas

Two storage areas will be located to the north of the main production shaft to store ore and waste rock hoisted to the surface during pre-production mine development. Prior to the commencement of underground crushing and the start of mill operations, approximately 1,050,000 tons of uncrushed ore and waste rock of a maximum size of 24-inches will be placed on the two separate areas. One storage facility which will be lined will be used to store approximately 350,000 tons of ore and about 100,000 tons of Type II waste rock. The remaining 600,000 tons of Type I waste rock will be deposited on an unlined area located east of the lined storage area. Type I waste rock is material that has a very low potential to leach, while Type II waste rock has a higher leaching potential. The lined area is designated as the preproduction ore storage area on Figure 2-3. The unlined area is referred to as the construction material storage area on the same figure. Both storage areas have been designed to accommodate the maximum potential amount of waste rock and ore hoisted from underground during the preproduction period and will occupy a total area of approximately 18 acres.

The base of the pre-production ore storage area will consist of a compacted layer of existing soil overlain by a geomembrane liner. A till cushion will be placed over the geomembrane. Water from this area will be drained to a water storage basin. The location of the basin is sized to hold the volume of water from a 25-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 water 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 another of the site's surface water runoff basins. Water from this runoff basin will be discharged to natural site drainage ways. Following commencement of mill operations, the ore stored in the preproduction storage area will be processed. Type II waste rock stored in this area will be hauled by truck to the TMA for disposal or for use as riprap for TMA internal sidewalls. Type I waste rock will be used as construction material.

Tailings Management Area

All tailings produced by ore processing that are not used for mine backfill, hoisted Type II waste rock, water treatment plant solids and the small amount of laboratory wastes will be placed in the TMA. The TMA has been designed to provide long-term, environmentally-safe containment. 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 2-12 and 2-13 the TMA will consist of four cells, each of which will be lined and include a leachate collection system. The four cells, referred to as TMA1 through TMA4 will each be constructed and operated in two stages. TMA1 and TMA2 are designed to contain the tailings from processing the zinc ore. TMA3 and TMA4 will be used for the copper ore tailings. The approximate capacities and site lives for each cell are shown below.

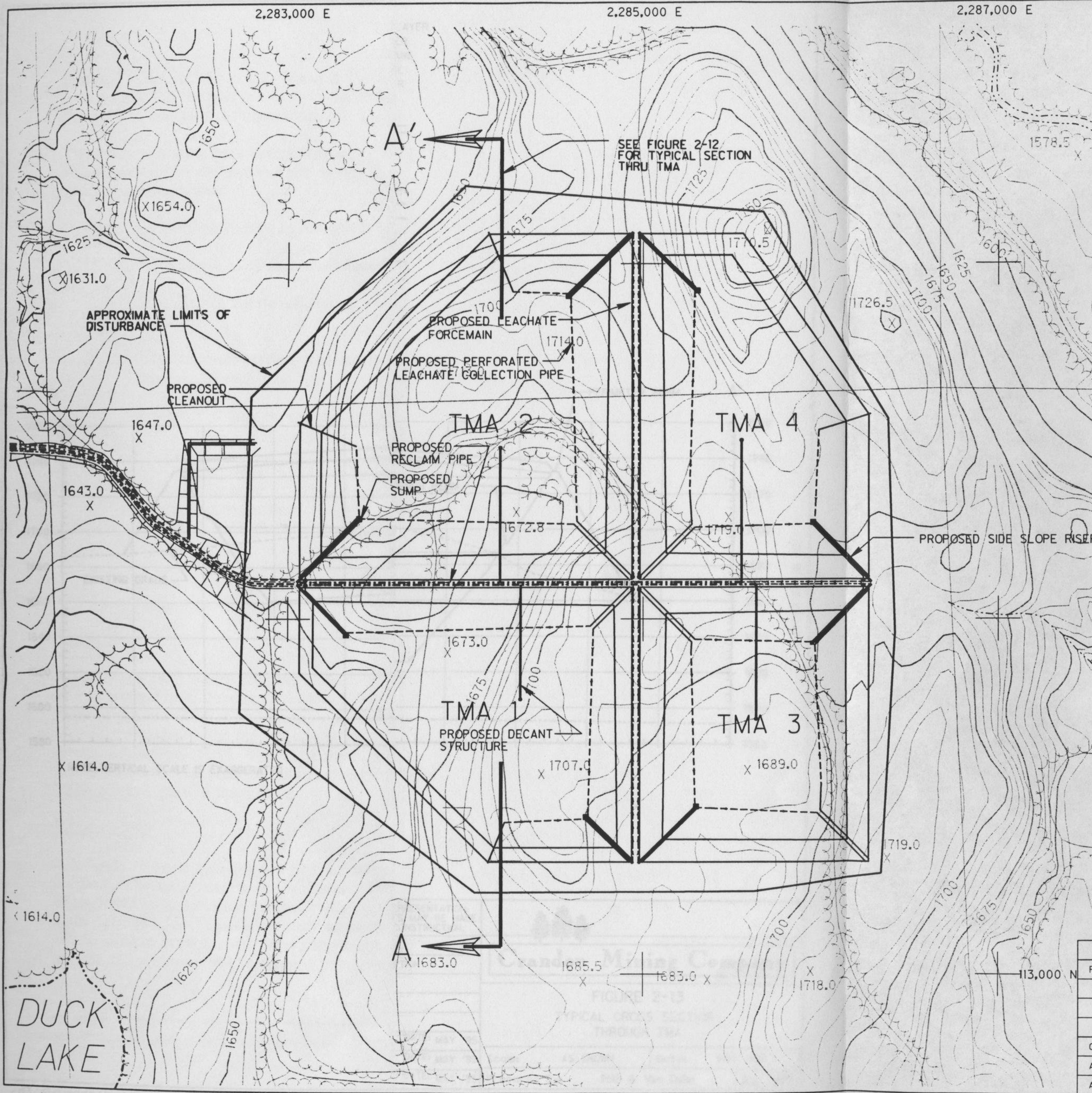
Approximate Tailings Management Area Capacity

TMA Cell	Capacity (in millions of cubic yards)	Approximate Site Life (years)
TMA 1	4.0	6
TMA 2	7.8	10
TMA 3	3.9	6
TMA 4	4.8	6
Total	20.5	28

TMA cell construction and operation will first involve constructing and filling Stage 1 of TMA1. As the tailings in Stage 1 approach the design elevation, Stage 2 of TMA1 will be built. When approximately one to two years of capacity remain in TMA1, construction of Stage 1 for TMA2 will begin. When TMA1 is full, tailings placement in TMA2 will start. After consolidation, reclamation of TMA1 will begin, while filling in TMA2 progresses. The same process will continue for TMA3 and TMA4.

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



LEGEND

- LAKES
- STREAMS
- EXISTING ROAD
- —1675— EXISTING CONTOUR
- x 1692.0 SPOT ELEVATION
- SECTION LINE
- (TMA) 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.

Foth & Van Dyke

REVISED	DATE	BY	DESCRIPTION

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

Crandon Mining Company

FIGURE 2-12

PROPOSED TMA LAYOUT

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

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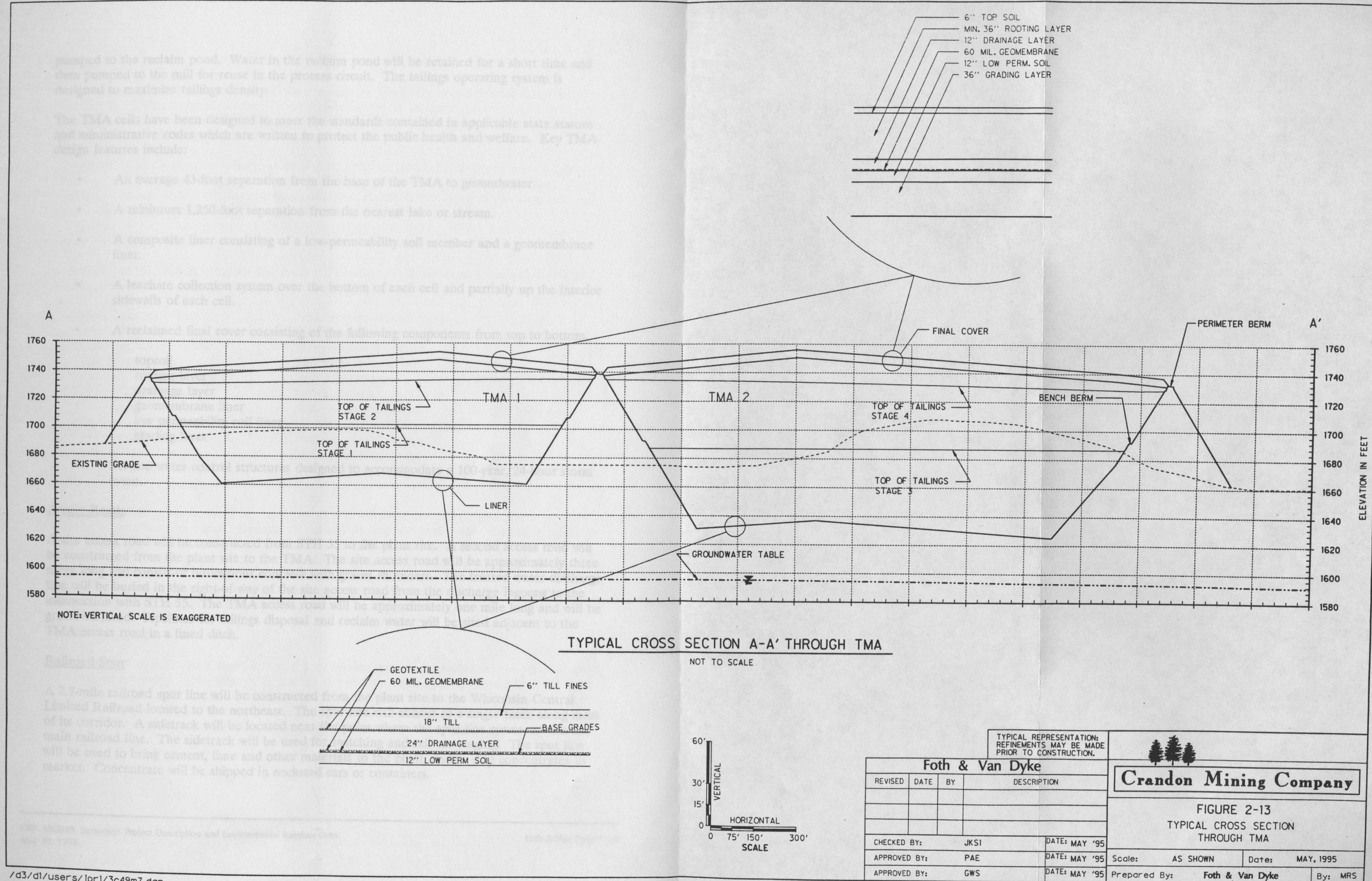

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pumped to the reclaim pond. Water in the reclaim pond will be retained for a short time and then pumped to the mill for reuse in the process circuit. The tailings operating system is designed to maximize tailings density.

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

- An average 43-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 partially up the interior sidewalls of each cell.
- A reclaimed final cover consisting of the following components from top to bottom.
    - topsoil
    - rooting layer
    - drainage layer
    - geomembrane liner
    - low permeability soil liner
    - grading layer
- Surface water control structures designed to accommodate a 100-year, 24-hour storm event.

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 three miles long and consist of bituminous concrete with gravel shoulders. The treated water discharge line will be buried in the right-of-way of the site access road from the discharge lagoons to the intersection with STH 55. The TMA access road will be approximately one mile long and will be gravel-surfaced. Pipelines for tailings disposal and reclaim water will be sited adjacent to the TMA access road in a lined ditch.

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 sidetrack 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.

Utilities

Electrical service to the project site will be provided by Wisconsin Public Service Corporation (WPSC) by 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.

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

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 water 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 area will be intercepted by a series of drainage swales and directed to existing natural drainage features.

Wetland Mitigation

Although mine facilities have been designed to minimize impacts on wetlands, as part of project construction activities, approximately 29.5 acres of wetlands will be either excavated or filled. To compensate, CMC 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.

Mine Reclamation

Topsoil will be salvaged and stored from all disturbed areas for use in reclamation activities. Reclamation of the mining site will occur on an ongoing basis during construction and operation, and as 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, those 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 water treatment plant and associated pipelines will be removed after they are no longer required. Salvageable equipment will be transported off-site. Scrap and treatment solids will be placed in the TMA prior to closure of the final cell. Buried segments of pipelines will be purged and left in place. Above-grade pipelines will be removed. The water treatment plant area and pipeline routes will be graded and revegetated.

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 the TMA. 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.

C. Description of Environmental Setting

Historical, Archaeological and Cultural Resources

Purpose

This study is designed to identify features near the mine site that may have historical, archaeological or cultural importance to the state or to local residents, including Native Americans. State law requires that appropriate steps be taken to protect such features if they might be affected by a mining project.

Procedure

The studies conducted by CMC in 1994-95 built on extensive work completed in the late 1970s and early 1980s. All told, the studies looked at more than 5,300 acres of land on and around the mine property and closely investigated lands proposed for the plant site, tailings management area, railroad spur, access road, Wisconsin River water discharge pipeline corridor, and natural gas pipeline corridor. The new studies also looked at lands in Shawano and Oconto counties where farmland may be converted back to wetlands to replace wetland acres lost to mine construction.

The new study also included a traditional cultural properties inventory. Traditional cultural properties are places associated with cultural practices or beliefs of living communities that are rooted in the community's history and are important to maintaining the community's cultural identity. Separate surveys were conducted to identify such properties that may have importance to Euro-American ethnic groups and Native American tribes

Observations

- To-date, all the studies indicate mining at Crandon is compatible with the protection of all archaeological and cultural resources in the area.

- One historic site, the former settlement of Keith's Siding southeast of Crandon, lies near the route of the mine's railroad spur. The settlement, believed to have included a school and several homes, burned to the ground about 1920. Research indicates it is likely to be eligible for listing on the National Register of Historic Places and, if listed, would be either protected or recovered by CMC using techniques approved by state and federal governments. Recovery may be advantageous because the site otherwise will be lost through natural decay.

- No Euro-American traditional cultural properties were found.

- Native American traditional cultural properties probably exist in the area, but none closer than 1.5 miles from the ore body. CMC is working with the Menominee Indian Tribe of Wisconsin through an independent ethnographer to identify traditional cultural properties valued by the tribe. To date, neither the Mole Lake Sokaogon Chippewa Community or the Forest County Potawatomi Community have expressed an interest in participating in the study.

Next Steps

CMC will complete the Native American traditional cultural properties inventory, using field data collected with help from the Menominee Indian Tribe of Wisconsin and published literature relating to the Mole Lake Sokaogon Chippewa Community and the Forest County Potawatomi Community. In summer of 1995, CMC will file sections of the Environmental Impact Report that describe any effects mining may have on historic, archaeological and cultural resources. The mine construction plan will include any specific steps that may be required to make sure historic sites are monitored and protected.

Transportation and Utilities

Purpose

This study assesses the effects of the mine project on traffic, highways and other transportation facilities, as well as the effects of extending utilities to serve the mine facilities.

Procedure

A transportation analysis was conducted to define the volume and direction of traffic in the local area. An extensive Wisconsin Department of Transportation database was used as part of the study. CMC also conducted traffic counts at six intersections and analyzed existing conditions of local roadways. In addition, a survey was conducted of electric, gas, telephone, water and sewer services in the area.

Observations

- The study area has a well-developed system of federal, state and county highways, as well as a small utility airfield south of Crandon and nearby rail service.

- Traffic counts showed that at present 1,900 vehicles per day move north and south on Highway 55 past the point where the mine access road would intersect.

- Electricity is the only utility service now supplied to the Crandon mine site. New electric facilities will be required if the mine is permitted. Gas service also would need to be extended to the site. Electrical and natural gas distribution service in the area is provided by Wisconsin Public Service Corporation.

- The immediate area surrounding the mine is now served by individual, private water-supply wells and on-site sanitation systems. The City of Crandon maintains a public water supply and municipal wastewater treatment facility.

- Telephone service is supplied by Crandon Telephone Company in Crandon. Although no telephone service is now supplied to the proposed plant site, overhead lines exist along Little Sand Lake Road.

Next Steps

In sections of the Environmental Impact Report to be filed this summer, CMC will describe how the mine will affect local traffic patterns, and how the extension of utility services will affect the environment and the availability of utility services in the area.

Climatology, Meteorology and Air Quality

Purpose

This study assesses air quality in the area. The monitoring program is measuring amounts of particulate matter (dust) and trace elements in the air. Also being measured are local weather conditions such as wind speed, wind direction, temperature, relative humidity and precipitation. This will help define existing conditions and allow CMC to forecast whether the mine is likely to affect local air quality.

Procedure

Sampling is being conducted at three sites strategically selected around the project area. Air samples are collected over a continuous 24-hour period every third day. Meteorological testing is conducted continuously. Figure 3-1 shows the locations of air monitoring stations.

Observations

- Air quality in the study area is typical of rural areas in Northern Wisconsin.
- Research to date indicates that air emissions from the proposed Crandon project will be far below regulatory limits and will not have a significant effect on air quality.
- Based on previous studies, the mine appears likely to be classified as a minor source of air pollutants under the Clean Air Act.
- The mine project area is classified as an air quality attainment area because it meets all ambient air quality standards set by the federal Clean Air Act.
- The area's climate is continental, modified slightly by Lake Michigan 80 miles east and Lake Superior 93 miles north.

Next Steps

A final projection of the mine's effects on air quality will be completed in summer of 1995, at the time the remaining sections of the Environmental Impact Report are filed with the regulatory agencies.

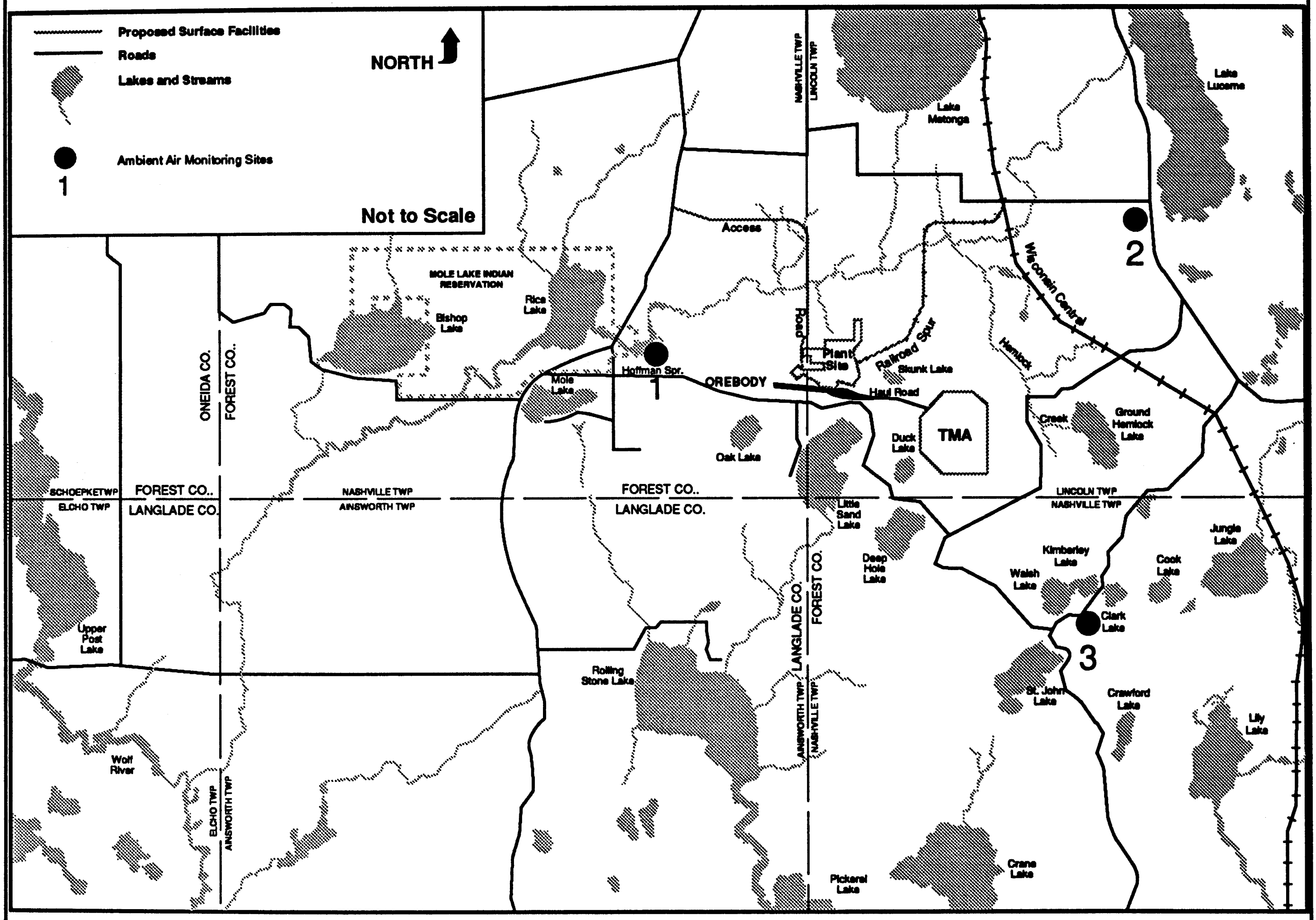

Figure 3-1

Location Of Ambient Air Monitoring Sites

Geology and Soils

Purpose

The purpose of this study is to define bedrock, soil and geological conditions around the mine site, in large part to help determine how groundwater moves within the soils and bedrock, and to predict how much groundwater is likely enter the mine while it is being built and operated.

The study also will determine the make-up of mine water so that an effective, reliable treatment process can be designed.

Finally, the study will measure the characteristics of solid wastes the mine will generate so that steps can be taken to provide effective environmental protection.
The mine will generate three main types of solid waste material:

- Mine tailings: ground rock remaining after minerals are removed from the ore.
- Waste rock: bedrock removed during development of the mine.
- Water treatment solids.

Procedure

The study builds on extensive research conducted in the 1970s and 1980s. In all, thousands of ore, rock and soil samples have been collected and analyzed. This includes extensive studies of soils in lakebeds and wetlands to determine how water levels relate to the soils beneath them.

Laboratory tests are being conducted to determine how tailings and waste rock will actually behave in the environment over time.

Groundwater is being exposed to ore and bedrock to produce water that can be used for testing the water treatment process.

Observations

- Mine tailings and waste rock contain substantial amounts of natural materials that neutralize acids. In six months of testing to simulate how tailings will react when exposed to the environment, tailings did not produce acidic leachate. These tests are continuing, and it may be several months before conclusions can be drawn.

- Most waste rock from the mine is not susceptible to leaching and is suitable for use as construction material. Remaining waste rock will be used to backfill the mine, or placed in the tailings ponds.

- The movement of groundwater downward into the mine will be restricted by two layers of material lying above the bedrock. One layer consists of low-permeability weathered rock called massive saprolite, and the other consists of fine-grained, low-permeability glacial till.

- The bedrock in the project area is covered by 75 to 250 feet of glacial material. Figure 3-2 presents a geological profile of the area above the ore body.

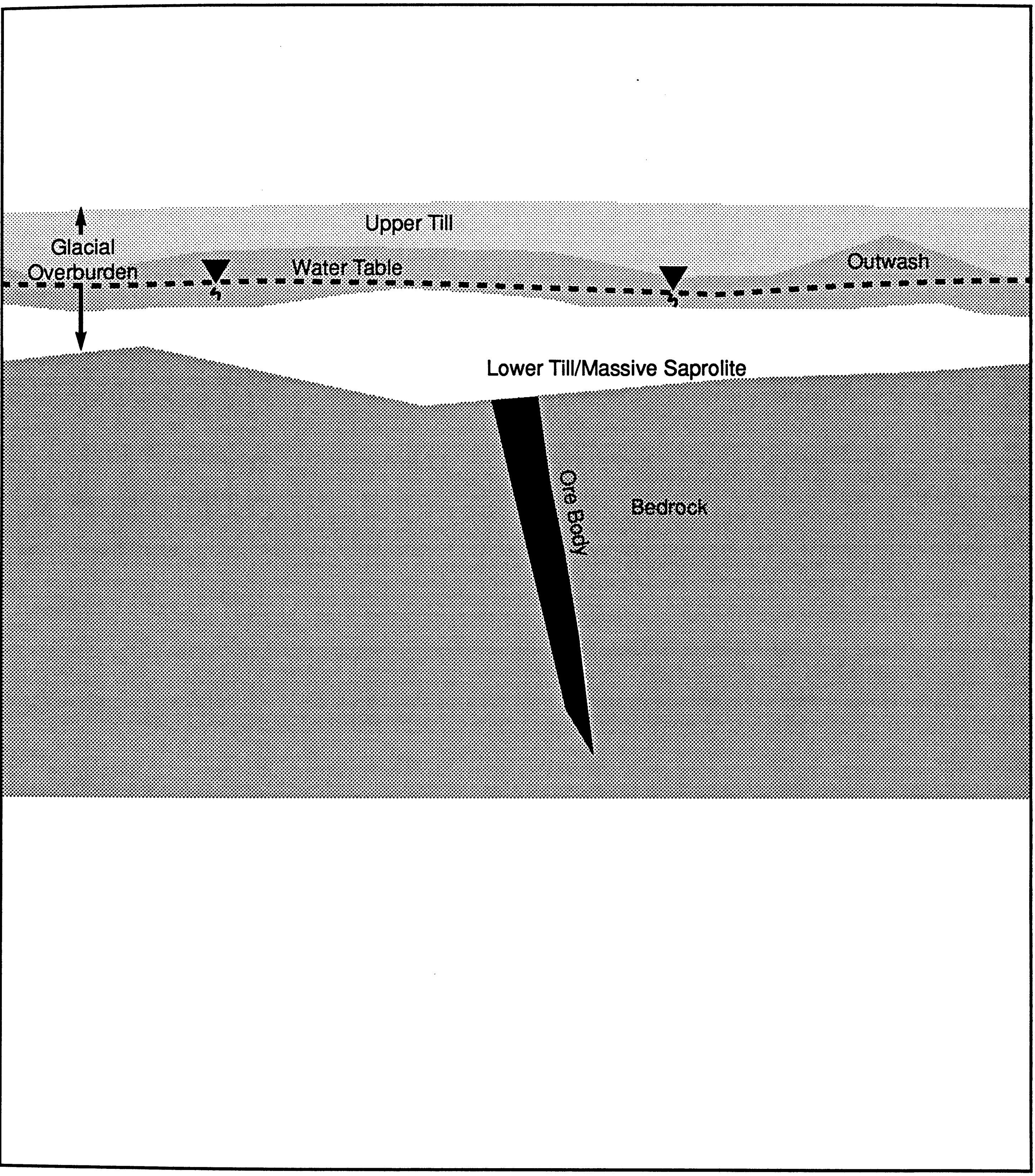

Figure 3-2
Soil and Bedrock Profile

- An earthquake large enough to affect mine facilities is highly unlikely. Earthquakes are extremely rare across Northern Wisconsin and Upper Michigan.

- Radioactivity is not a concern in the mine project. The ore contains less radioactive material than the surrounding rock.

- No asbestos-like materials were found in the ore body or the bedrock.

Next Steps

Information from studies of geology and soils will be used in completing modeling programs that will project the mine's effects on groundwater levels, groundwater quality, and lake levels and stream flows.

Waste characterization tests will continue throughout the mine permitting process. The results will be used to refine the mine's environmental controls to provide the most effective protection for local resources.

Further information about geology, soils and waste characterization studies will be included with remaining sections of the Environmental Impact Report, to be filed with the regulatory agencies in summer of 1995.

Groundwater

Purpose

The purpose of this study is to gather information about groundwater conditions in the study area, and to predict how mining will affect groundwater levels, lake levels, stream flows, and groundwater quality. This will help CMC take necessary steps to protect groundwater resources. The study also included an inventory of private wells in the immediate area of the mine.

Procedure

The work conducted by CMC in 1994 and 1995 builds on extensive studies already conducted in the 1970s and 1980s. The new studies included investigations of groundwater levels, groundwater flow patterns and groundwater quality. Groundwater was tested for 29 water-quality parameters.

The study also analyzed relationships between groundwater and local lakes, streams and wetlands, looking in detail at the five lakes in the immediate area of the mine: Little Sand Lake, Skunk Lake, Duck Lake, Deep Hole Lake and Oak Lake. In 1994, researchers conducted a major geophysical study of the bottom sediments in area lakes.

In addition, a pump test was conducted to help measure how groundwater levels in the area will actually respond to the inflow of water into the mine.

Observations

- On Little Sand, Skunk, Duck and Deep Hole lakes, any effects of mining on water levels would occur very slowly. Although these lakes are connected to the groundwater (recharge lakes), geophysical studies, lakebed soil borings and other testing showed that all have low-permeability bottom sediments that restrict the movement of water down toward the groundwater table. An indication of how this helps sustain water levels was found during a severe drought of the late 1980s. At that time, groundwater levels near the lakes declined by four to five feet, yet water levels in the lakes showed little change.

- Mining would not affect the water level in Oak Lake because it is a perched lake, lying above the water table and not connected to the groundwater. Figure 3-3 illustrates the relationship of recharge and perched lakes to the groundwater table.

- Groundwater flow in the region is mainly from east to west. The main groundwater aquifer is a stratified layer of glacial outwash consisting of sands and gravels.

- Groundwater in the area of the mine site naturally contains high levels of iron, manganese, arsenic, lead, aluminum, chromium, cadmium, nickel, nitrates, and antimony, and is high in alkalinity and total dissolved solids.

Next Steps

The results of all the groundwater studies will be used extensively in the ongoing modeling program that will project how mining is likely to affect groundwater levels and groundwater quality. The modeling work will be completed by the summer of 1995, at which time the remaining sections of the EIR will be filed with the regulatory agencies.

Surface Water

Purpose

This study gathered information about the quality and quantity of surface waters in the area as they exist today, and about relationships between groundwater and local lakes and streams. The results will help determine whether mining will affect surface water quality, lake levels and stream flows, and suggest what steps may be necessary to safeguard water resources.

Procedure

A great deal of data has been collected over the past 15 years on surface waters and lake and stream sediments in the study area. CMC conducted new studies to collect information required because of changes in environmental regulations.

Streams sampled in the current and previous studies were the Wolf River, Swamp Creek, Hemlock Creek, Outlet Creek, Hoffman Creek, Pickerel Creek and 11-4, 12-4 and 12-9 Creeks. Lakes sampled in the current and previous studies were Oak, Ground Hemlock, Rice, Rolling Stone, Little Sand, Duck, Deep Hole, Skunk, Mole, Walsh and St. John's. Also monitored were Hoffman Springs, Hoffman Pond, and five unnamed ponds.

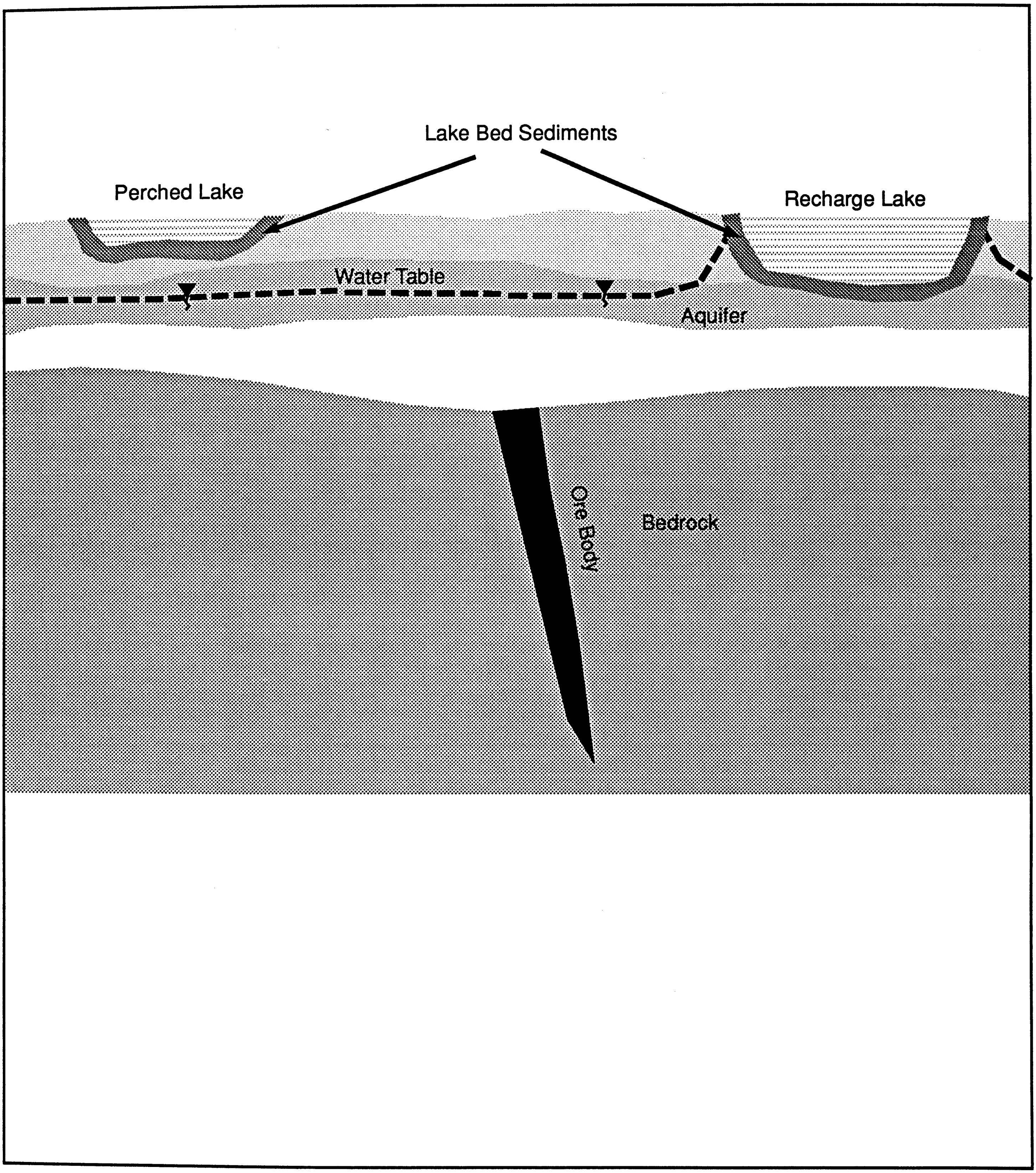

Figure 3-3
Relationship of Area Lakes to Groundwater

Water and sediment samples were analyzed for the presence of metals and other parameters. Some of the testing used new methods able to measure metals at the parts per trillion level and lower. One part per trillion is equivalent to one inch in 16 million miles. Figure 3-4 shows the locations of water and sediment sampling.

Surface water sampling was performed at different intervals (i.e. monthly or quarterly) depending on the location. Two sites on the Wolf River and two on Swamp Creek were monitored two additional times during peak flows to find out if major runoff events affect water quality.

Observations

- Studies suggest that lakes nearest the mine site—Oak, Little Sand, Skunk, Duck, and Deep Hole—either receive none or very little of their water from groundwater sources (see table). These lakes tend to contain soft water and to be acidic.

- Oak and Little Sand lakes have low to moderate nutrient content. Duck, Deep Hole, and Skunk lakes have moderate to high nutrient content sufficient to cause extensive weed growth.

- The relationship between groundwater and surface water in the study area is mixed. In some cases, groundwater feeds into the surface waters (discharge areas) and in other cases surface waters feed the groundwater system (recharge areas).

- When groundwater contributes significantly to a lake or stream, the water chemistry of the lake or stream reflects the chemistry of the groundwater.

- The groundwater in the study area is classified as moderately hard to very hard. Surface waters fed directly by groundwater or by groundwater-fed streams tend to have similar hardness.

- Surface waters fed primarily by precipitation and surface runoff are usually soft. These bodies of water discharge water to the groundwater system.

- In general, the stream water in the study area is moderately hard to hard, suggesting that the groundwater component of these streams ranges from moderate to high. By contrast, the Wolf River is softer, suggesting that groundwater is a smaller component of the Wolf River's water.

Next Steps

A complete assessment of whether mining will affect surface water levels and quality is still being prepared. It will be completed in the summer of 1995 and filed with remaining sections of the Environmental Impact Report.

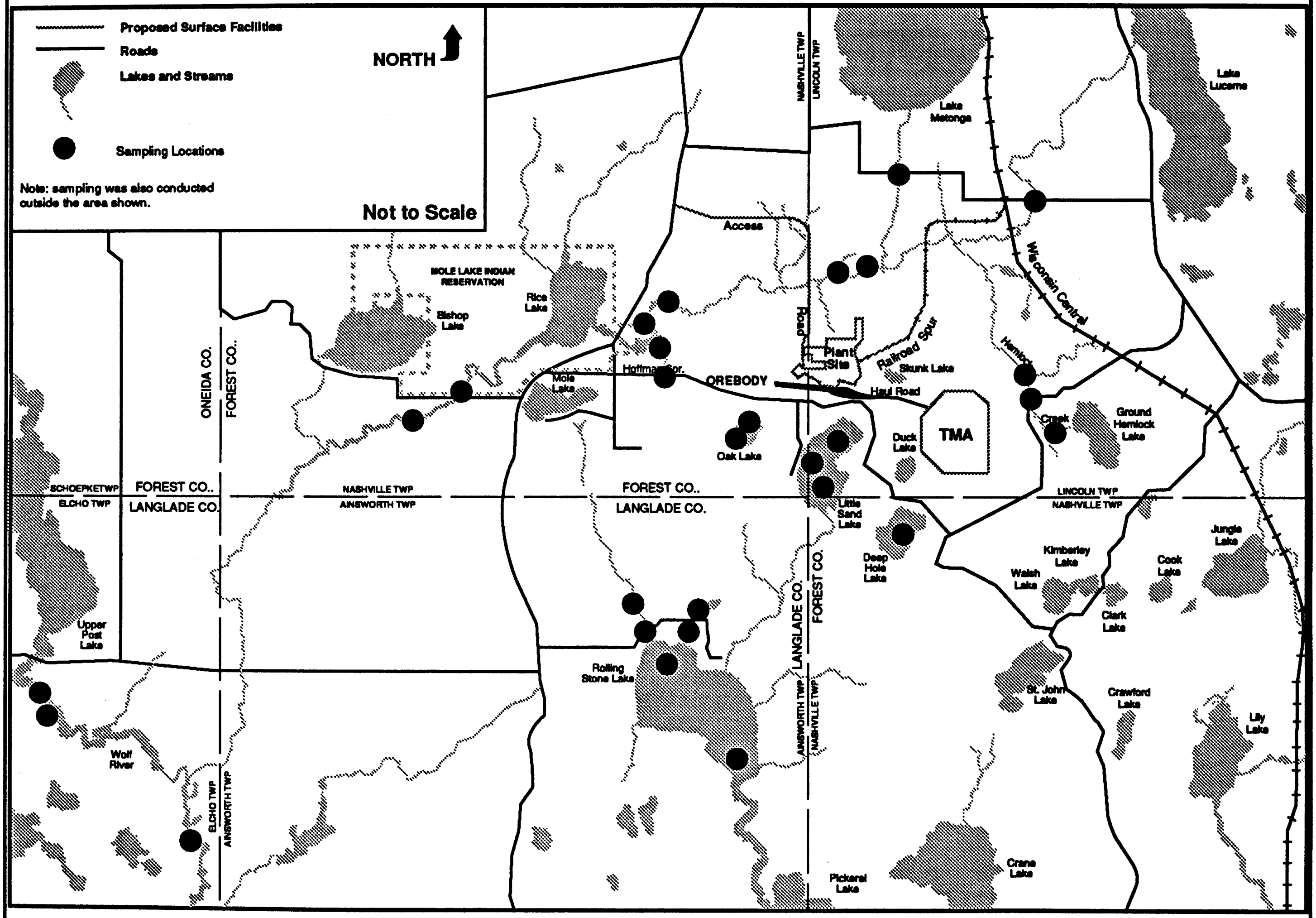

Figure 3-4

Surface Water and Sediment Sampling Locations

Water Hardness in Area Lakes
(mg/L as $CaCO_3$)
April 1994 to September 1994

	Lakes						
	Rolling Stone	Ground Hemlock[1]	Skunk	Oak	Deep Hole	Duck	Little Sand
Average Hardness	75	97	5	6	5	4	3
Maximum Hardness	82	100	11	10	10	8	8
Minimum Hardness	68	87	ND	ND	ND	ND	ND

[1]Data listed is from Hemlock Creek, which is fed by Ground Hemlock Lake.

Note: A higher hardness readings indicate lakes that receive a major share of their water from groundwater sources. Lower hardness readings indicate lakes that receive most of their water from precipitation and runoff.

Average hardness of Groundwater = 151 mg/L as $CaCO_3$

ND = Not Detected

Aquatic and Terrestrial Biology

Purpose

These studies surveyed a 30-square-mile area around the mine site for species of plants and animals considered unique in the region and classified by federal and state agencies as requiring protection. The results will help determine how the mine may affect rare species, so that necessary steps can be taken to make sure no species are placed at risk.

Rare Species and the Law

Wisconsin law states that a mine must not destroy or permanently damage land needed for the survival of species listed as threatened or endangered. The law allows some disturbance of individual members of a species if healthy populations are found in other places, or if the species can be firmly re-established elsewhere.

The federal government has two categories of protected species: endangered and threatened. The state has these same two categories, plus a special concern category. All species in these categories are included on the Wisconsin Heritage Inventory List, which contains more than 400 species of plants and animals.

Species are listed for a variety of reasons. For example, some federal endangered species may be at risk of extinction; state endangered species may be rare in Wisconsin but abundant elsewhere. Some species are listed because they are new scientific discoveries or have recently been found for the first time in the state. Others are listed simply because scientists know very little about them.

Procedure

The biological studies for the Crandon mine are among the most intensive ever conducted in Wisconsin. Figure 3-5 shows the study area. The studies were performed by a team of 25 biologists, including many of the most respected researchers in the state. The studies have involved:

- More than 30 square miles of land, including 2,145 acres of wetlands.
- More than 8,000 hours of field investigation.
- Surveys of nine lakes and ponds and more than 20 miles of rivers and streams.

Studies conducted in the 1980s provided a complete profile of the major plant and animal communities in the area. Studies done by CMC during 1993 and 1994 focused on species on the Wisconsin Heritage Inventory List. Biologists searched for the listed species most likely to live in the various habitats, including:

- Plants
- Fish
- Mammals
- Birds
- Butterflies
- Reptiles and amphibians
- Dragonflies and damselflies
- Bottom-dwelling aquatic creatures such as midges and clams
- Zooplankton, phytoplankton and algae

Observations

To date, the studies indicate that mining is consistent with protecting all threatened, endangered and special concern species.

Out of more than 400 species on the Wisconsin Heritage Inventory List, researchers found five endangered and five threatened species (see table). Only one of these, the state-endangered goblin fern, was found on land that would be directly affected by mining. Goblin fern, a tiny plant, growing only three or four inches tall, was found in 14 places: six on the project site, five others within the study area, and three more outside the study area in the Nicolet National Forest. The plant was officially listed as a newly discovered species in 1981. The state listed it as endangered in 1985. Before the CMC studies, goblin fern had been found in places in Wisconsin and in several places in Minnesota and Michigan. Figure 3-6 shows counties where goblin fern has been found. The new discoveries indicate the plant may be much more widespread than previously thought. Its habitat within second growth maple and basswood forests is not uncommon in Northeastern Wisconsin.

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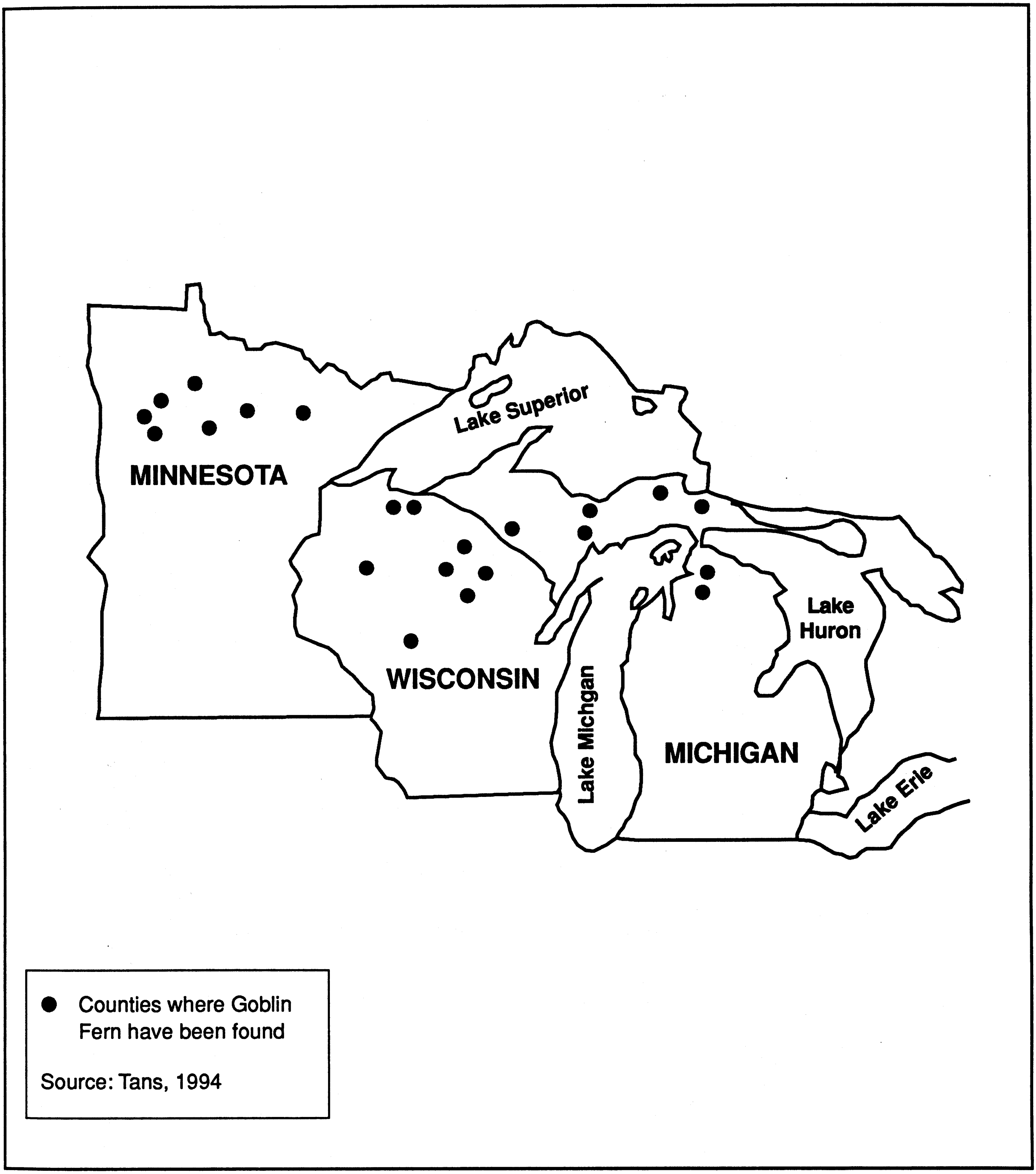

Figure 3-6
Goblin Fern: Known Distribution

The studies led to these additional observations and conclusions:

- The kinds of forest, wetland, lake and stream habitats in the area are generally common across the northern one-third of Wisconsin.

- No unique or rare habitats were found on the mine property.

- The number of listed species found reflects more on the thoroughness of the studies than on the characteristics of the area. An equally extensive search conducted by trained biologists in similar habitats most likely would have similar results.

- The CMC studies have greatly expanded scientific knowledge of animal and plant life in the area and in similar habitats.

Next Steps

Follow-up studies to determine the actual range and abundance of goblin fern will be conducted in 1995. A final assessment of the total impacts the mine will have on threatened or endangered species will be completed in the summer of 1995 when the remaining sections of the Environmental Impact Report are filed with the regulatory agencies.

Wisconsin Heritage Inventory List
Species Found in 30-Square-Mile Crandon Project Study Area

State Endangered Species	Where Found
Goblin Fern	On and Off-Site
Mountain Cranberry	Off-Site
Small Yellow Water Crowfoot	Off-Site
Dwarf Bilberry	Off-Site
Northern Blue Butterfly	Off-Site
State Threatened Species	
Bald Eagle	Off-Site
Osprey	Off-Site
Red-Shouldered Hawk	Off-Site
Algal-Leaved Pondweed	Off-Site
Calypso Orchid	Off-Site
State Special-Concern Species	
Northern Ringneck Snake	Off-Site
Arctic Shrew	On and Off-Site
Pygmy Shrew	On and Off-Site
Bobcat (tracks only)	Off-Site
8 species of Plants	On and Off-Site
4 species of Butterflies	On and Off-Site
3 species of Mussels	Off-Site
11 species of dragonflies	On and Off-Site
One species of Caddisfly	Off-Site
One species of Stonefly	Off-Site

Wetlands

Purpose

This study provides information on wetlands surrounding the mine site to determine whether mining is likely to affect them. This will enable CMC to take necessary steps to minimize wetland impacts, as required by law.

Procedure

Wetlands in the area have been studied extensively since the original effort to permit the mine in the 1980s. CMC has updated and verified those studies. The WDNR and the U.S. Army Corps of Engineers conducted independent reviews of the work done in the 1980s and have been closely involved in the new studies. CMC also studied plants, reptiles, amphibians, birds and mammals within the six major wetland types found in the area.

Observations

All told, new and previous studies have mapped 2,145 acres of wetlands in 256 locations within 18.3 square miles around the proposed mine facilities. Of these, 174 wetlands near the proposed facilities have been assessed for functional value based on their importance for:

- Habitat for plants, fish, birds and wildlife
- Water supply for lakes and streams
- Groundwater recharge
- Storm water and floodwater storage
- Shoreline protection
- Water quality protection
- Culture and economics
- Recreation
- Aesthetics
- Education

Next Steps

Already, CMC has used the wetland study to adjust the facility layout to preserve wetlands to the greatest extent possible. As designed in the 1980s, the project within the mine site area would have taken up to 65.4 acres of wetlands. As now designed, within the mine site, 29.5 acres will be taken. All wetlands taken will be replaced under a mitigation plan to be reviewed by the USCOE. Under that plan, CMC proposes to restore wetland parcels in Oconto and Shawano counties that were previously converted to farmland years ago.

The complete assessment of effects on the wetlands around the mine property is still in progress. It will be completed in summer of 1995, when the remaining sections of the Environmental Impact Report are filed with the regulatory agencies.

Noise

Purpose

This study measured sound levels that already exist in the project area, so that CMC can assess how mine construction and operation will affect those sound levels. The results will help CMC decide what steps may be necessary to minimize noise.

Procedure

CMC studied sound levels that already exist because of traffic, business and commercial operations, and other activity. To do this, CMC examined data previously collected in 1977 and 1983, and also collected more noise data from ten locations around the area during 1994 and 1995. This included short-term and long-term sound measurements. Figure 3-7 shows the sound measurement locations.

Observations

Sound levels measured were typical of rural areas in Northern Wisconsin. Background sound in the area is controlled mainly by birds, animals and nearby and distant traffic on roads.

Figure 3-8 illustrates sound levels associated with some everyday noise sources. The figure also shows the range of sound levels found during CMC's recent monitoring study.

Next Steps

A projection of how sound levels will change because of mining will be completed in the summer of 1995 and will be filed with remaining sections of the Environmental Impact Report.

Land Use

Purpose

This study assesses how the project is likely to affect existing and future land use in the immediate area of the mine.

Procedure

The land use study was conducted mainly by using available information from local and county governments and regional planning agencies. The area studied includes 100 square miles (64,000 acres) surrounding the proposed mine and encompasses parts of the Towns of Nashville and Lincoln in Forest County and the Town of Ainsworth in Langlade County.

Major Findings

- Land use in the study area consists of about 85 percent forested lands and wetlands, 5 percent residential lands, and 5 percent agricultural lands. Less than 1 percent of the land is in commercial use; no land is used for manufacturing.

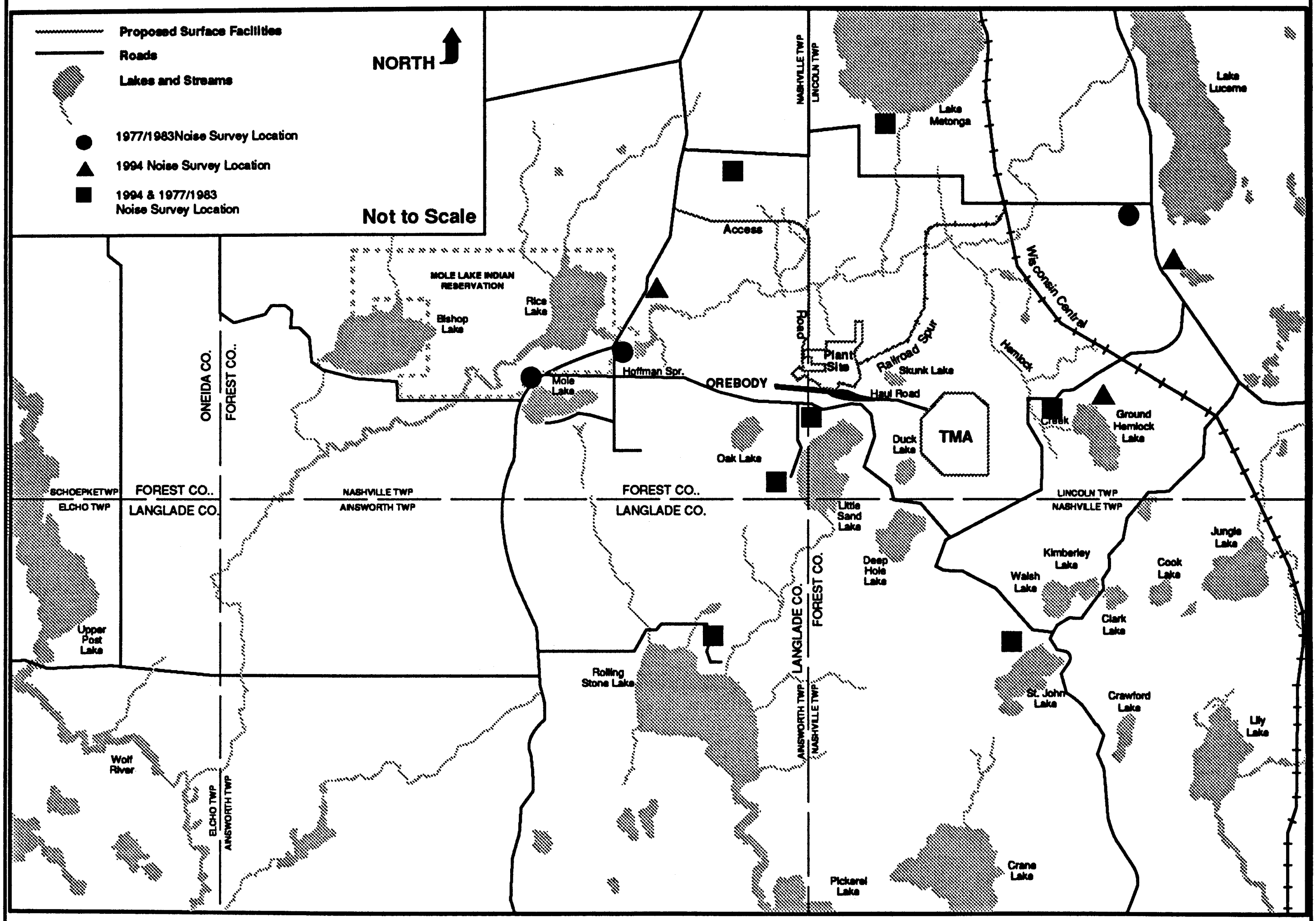

Figure 3-7
Noise Monitoring Sites

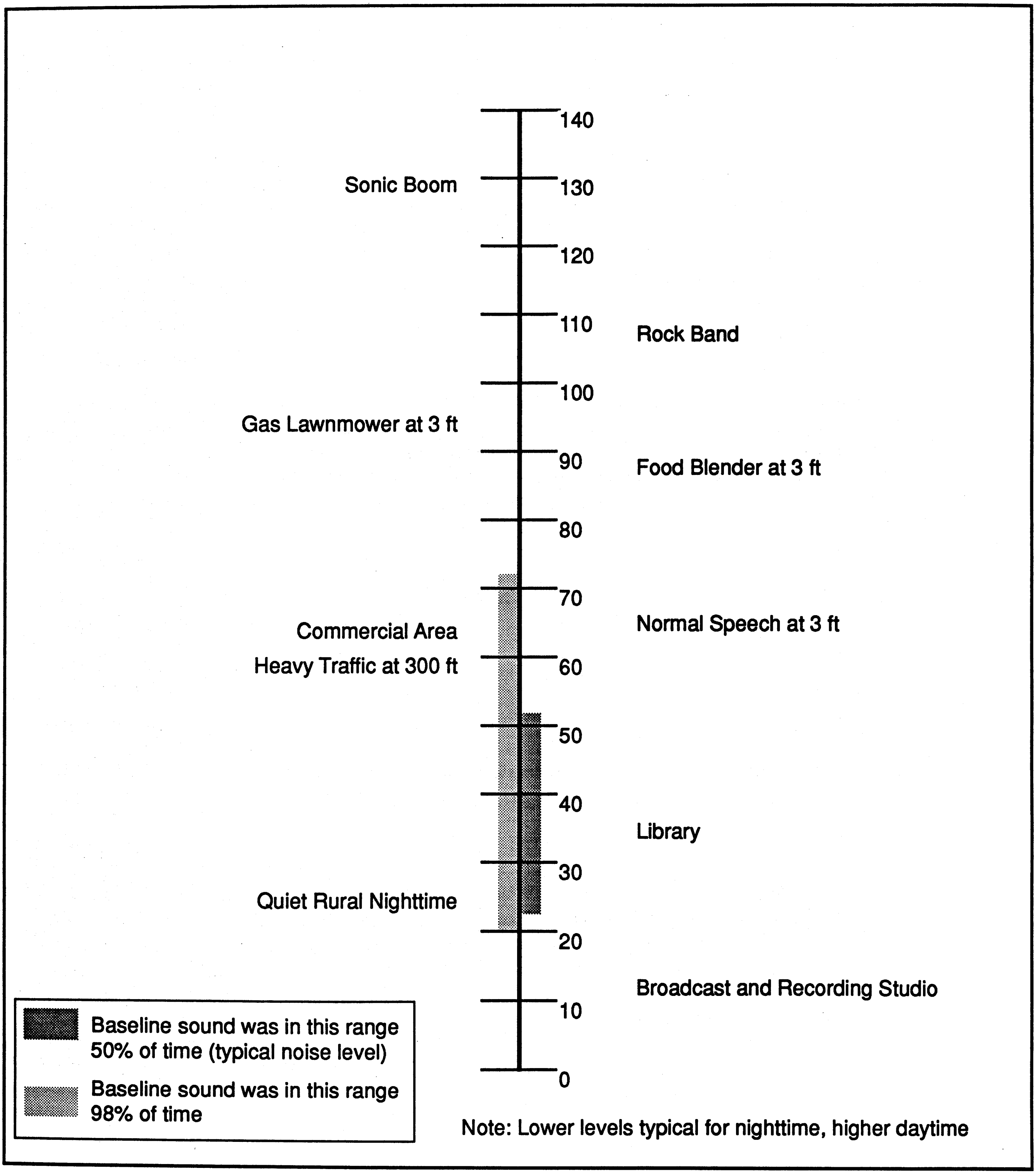

Figure 3-8
Typical Sound Levels from Common Sources

- About 77 percent of the study area is forest land. Forty-seven percent of the forest lands are privately owned, 35 percent are owned by private companies, and 18 percent are publicly owned by the state or by Langlade or Forest counties. Northern hardwoods and aspen comprise most of the forests in the area. The proposed mine site is forested.

- Residential development is concentrated around the larger lakes and generally consists of one- or two-bedroom seasonal cottages. Most of the permanent homes in the study area are located in Mole Lake, along Lakes Metonga and Lucerne, and along Highway 55, County Highway B and Airport Road.

- Agriculture in the area is limited by poor soil and a short growing season. Farmland use in the study area includes about 15 farms that total about 3,200 acres. Agricultural activity consists mainly of dairying, livestock production, and crops of oats, barley, wheat, alfalfa, hay or potatoes.

- The forest lands, lakes and streams in the region create abundant opportunities for outdoor recreation. The study area has about 9,000 acres of public lands available for hunting, fishing, picnicking and camping. Three campgrounds (two public and one private) offer 110 campsites. Public boat access is available at four lakes. Trails for snowmobiling and all-terrain vehicles are also provided.

<u>Next Steps</u>

A section of the EIR to be filed in the summer of 1995 will address how land use in the area is likely to change after mining begins.

Aesthetics

<u>Purpose</u>

This study looks at how the mine will affect scenery and natural beauty in the local area so that, if necessary, steps can be taken to protect scenic resources.

<u>Procedure</u>

An original assessment of aesthetic effects, conducted in the 1980s, evaluated visual effects from 35 viewpoints around the mine site. That study concentrated on the three structures likely to be the most visible: the mine headframe, the embankments around the tailings ponds, and the rail spur to be used for shipment of concentrates.

A new assessment conducted in 1995, using 36 viewpoints, was designed to verify the previous work and to identify any changes in land use, such as new buildings or forest cuttings, that might make the mine project more or less visible.

Observations

In many cases, the forests around the proposed mine site have matured and will conceal the facilities even more than they would have in the 1980s. There have been no substantial changes in the surrounding landscape since the previous study.

Next Steps

The new projection of the mine's visual effects is still in progress. It will be completed in summer of 1995 when the remaining sections of the Environmental Impact Report are filed with the regulatory agencies.

Socioeconomics

Purpose

This study examines how mining is likely to affect local economies and the people who live in the area of the project. The study examined effects on population, employment, housing, government structure and public finance, public facilities and services, and Native American communities.

Procedure

The socioeconomic study looked at all areas and communities likely to be directly or indirectly affected by the project. The area encompasses most of Forest, Oneida and Langlade counties and covers forty towns, one village and three cities. The study has three main parts:

- A baseline study describing socioeconomic conditions as they exist today.
- A Without Project forecast describing how local socioeconomic conditions most likely would change over the next 40 years if no mine were built.
- A With Project forecast, describing how socioeconomic conditions would change with construction, operation and closure of the mine.

The study looked at a 39-year period covering four phases from mine construction through the first four years of an expected 40-year post-closure period. Beyond four years after closure, the socioeconomic effects of the mine are expected to be insignificant. The mine project phases are:

Construction	3 years
Operation	28 years
Closure	4 years
Post-Closure	40 years

Observations

Forecasts of Mine Project Impact

Employment - Project employment is expected to peak during the third year of construction with 542 construction jobs and 208 operations jobs. Long-term mine operations employment is estimated to range from 402 to 526 workers. Indirect employment in businesses that serve the mine and its employees is projected to range between 320 to 420 jobs. About 70 percent of operations workers and about 20 percent of construction workers are expected to be hired from the three-county area. Overall, mining and related businesses are expected to account for six percent of the study area's employment during the peak year of construction and four percent during operations.

Mine Purchases - Total construction spending for the mine is estimated at $287 million. In addition, mine operations costs will vary between $50 million and $78 million per year during operations. Total mine purchases in Wisconsin are projected at $740 million.

Population - Without the mine, the area population would increase slightly during the next two decades, then decline slowly for the rest of the 40-year forecast period. During the peak year of construction, the project is expected to add 1,174 more people (2.2 percent) to the tri-county area population than if no mine were built. This includes population related to employment in mine-related businesses. During the 28-year operations phase, the project would add 750 people (1.5 percent) to the area population.

Housing - While most long-term mine employees would be drawn from the tri-county area, a limited number would move to the area with their families (an average of three people per household) and would either build new homes or buy existing homes. Construction workers generally would live in the area for six months or less and would not need long-term or high-quality housing. Construction workers will create demand for hotel and motel units, as well as mobile home units and room and board facilities.

Property Taxes - The mine will contribute $110 million to the local tax base during its peak year. The largest benefit will be in the Town of Lincoln, where the tax base will more than double. Forest County, the Crandon School District and the Town of Nashville also will benefit. The increased tax base will likely enable local officials to reduce property tax rates or improve public facilities and services.

Net Proceeds Taxes - At base metal prices (defined as five-year average historical prices), the project is expected to generate $119 million in Net Proceeds Taxes during it 28-year life. The Net Proceeds Tax is paid only by mines and is in addition to regular corporate income taxes and property taxes. Net Proceeds Tax revenue will be distributed by the state to the Towns of Lincoln and Nashville, Forest County, the Mole Lake Sokaogon Chippewa Community and the Forest County Potawatomi Community, based on pre-determined formulas. Some $42 million of the Net Proceeds Tax revenue will be available for discretionary grants to help local communities offset mining impacts. In addition, 40 percent of the Net Proceeds Tax collections are also used to partially fund the Badger Fund, a major environmental protection and management fund administered by state government.

Public Facilities - The mine will not create a need for any major new public facilities. Local school districts will have enough space to accommodate the children of newly arriving families, and no new schools will have to be built because of the mine.

Native American Communities - Two Native American tribes are located in the vicinity of the project. The Mole Lake Sokaogon Chippewa Community is located two miles west of the mine site, and the Forest County Potawatomi community is located northeast of the mine site. The Menominee Indian Tribe of Wisconsin is located 27 miles south of the site on the Wolf River. CMC has made numerous attempts to involve the Sokaogon Chippewa Community and the Forest County Potawatomi Community in the study of potential socioeconomic effects on Native American tribes. These efforts have been unsuccessful. The Menominee Indian Tribe of Wisconsin indicated last year that it would provide socioeconomic information, but CMC has not yet received it. Therefore, potential socioeconomic effects on Native American communities are being evaluated using available sources of existing information. The assessment of such potential impacts is intertwined with tribal concerns about environmental effects on or near the reservations, and with potential effects on traditional cultural properties. Therefore, the assessment of socioeconomic effects on the tribes is being completed as the assessment of other project-related impacts is developed. It will be filed in summer of 1995 with the remaining sections of the EIR.

Baseline Conditions (see table)

Population - Between 1970 and 1990 the study area population increased by 13 percent, while Wisconsin's population grew by 11 percent. In general, the population is relatively stable or growing slowly, except in townships around Rhinelander, which have experienced significant growth in recent years.

Employment - Unemployment rates in the study area historically have been higher, while the historic labor force participation rate in the study area has been lower than in Wisconsin as a whole. This suggests that there is proportionally a greater pool of available labor in the study area than exists in other areas of Wisconsin. In recent years, the area has seen increased economic activity, and unemployment rates have declined. Tourism continues to be an important employment sector in the area, along with forestry, retail trade, manufacturing and government.

Housing - The area housing stock includes more units held for seasonal, recreational, or occasional use than is typical in Wisconsin communities. Housing can be generally classified as older with a high percentage of owner-occupied units.

Schools - There are eight school districts in the study area with thirty-two facilities serving about 10,000 students.

Native American Communities - Native American employment, population, housing, and other socioeconomic data are included in the study and counted in figures listed for the study area as a whole.

<u>Next Steps</u>

Except for information on Native American communities, this study is complete. It will be evaluated along with the rest of the Environmental Impact Report during the permitting process.

Summary of Selected Baseline Socioeconomic Data
Crandon Project Study Area

	Forest Co.	Oneida Co.	Langlade Co.	Total
Population (Estimated Entire County, 1993)	8,942	32,662	20,026	61,630
Unemployment (Average Annual Rate, 1992)	5.8%	4.7%	5.9%	N/A
Per Capita Personal Income (1991)	$11,283	$16,436	$13648	N/A
Total Retail Sales (Millions of Dollars, 1992)	$34.4	$296.0	$140.7	$471.1
Housing Supply (Total Units in Study Area Only, 1990)	6,502	16,596	10,541	33,639

Figures in the above chart are taken from the most recently-completed and publicly-available data supplied by appropriate government agencies.