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Final Environmental Impact Statement

Great Plains Gasification Project

Mercer County
North Dakota

U.S. Department of Energy

August 1980

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Volume 2 (of 3 Volumes)

Final Environmental Impact Statement

Great Plains Gasification Project

Mercer County North Dakota

Responsible Official

Ruth C. Clusen

Assistant Secretary for Environment

U.S. Department of Energy

August 1980

FOREWORD

The Federal Energy Regulatory Commission pursuant to the Natural Gas Act, is authorized to issue certificates of public convenience and necessity for the construction and operation of natural gas facilities subject to its jurisdiction, on the conditions that:

(a) certificate shall be issued to any qualified applicant therefor, authorizing the whole or any part of the operation, sale, service, construction, extension, or acquisition covered by the application, if it is found that the applicant is able and willing properly to do the acts and to perform the service proposed and to conform to the provisions of the Act and the requirements, rules, and regulations of the Commission thereunder, and that the proposed service, sale, operation, construction, extension, or acquisition, to the extent authorized by the certificate, is or will be required by the present or future public convenience and necessity; otherwise such application shall be denied.

15 U.S.C. 717

The Commission shall have the power to attach to the issuance of the certificate and to the exercise of the rights granted thereunder such reasonable terms and conditions as the public convenience and necessity may require.

Section 1.8 of the Commission's Rules of Practice and Procedure details the requirements which must be met in order to intervene in this proceeding.

FEDERAL POWER COMMISSION-ORDER 415-C
(Issued December 18, 1972)
STATEMENT OF GENERAL POLICY TO IMPLEMENT PROCEDURES FOR COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

§ 2.80 Detailed Environmental Statement.

(a) It shall be the general policy of the Federal Power Commission to adopt and to adhere to the objectives and aims of the National Environmental Policy Act of 1969 (Act) in its regulation under the Federal Power Act and the Natural Gas Act. The National Environmental Policy Act of 1969 requires, among other things, all Federal agencies to include a detailed environmental statement in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.

(b) Therefore, in compliance with the National Environmental Policy Act of 1969 the Commission staff shall make a detailed environmental statement when the regulatory action taken by us under the Federal Power Act and Natural Gas Act will have a significant environmental impact. A "detailed statement" prepared in compliance with the requirements of §§ 2.81 through 2.82 of this Part shall fully develop the five factors listed hereinafter in the context of such considerations as the proposed activity's direct and indirect effect on the air and water environment of the project or natural gas pipeline facility; on the land, air, and water biota; on established park and recreational areas; and on sites of natural, historic, and scenic values and resources of the area. The statement shall discuss the extent of the conformity of the proposed activity with all applicable environmental standards. The statement shall also fully deal with alternative courses of action to the proposal and, to the maximum extent practicable, the environmental effects of each alternative. Further, it shall specifically discuss plans for future development related to the application under consideration.

The above factors are listed to merely illustrate the kinds of values that must be considered in the statement. In no respect is this listing to be construed as covering all relevant factors.

The five factors which must be specifically discussed in the detailed statement are:

(1) the environmental impact of the proposed action,
(2) any adverse environmental effects which cannot be avoided should the proposal be implemented;
(3) alternatives to the proposed action,
(4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

(c) (i) To the maximum extent practicable no final administrative action is to be taken sooner than ninety days after a draft environmental statement has been circulated for comment or thirty days after the final text of an environmental statement has been made available to the Council on Environmental Quality and the public.

(c) (ii) Upon a finding that it is necessary and appropriate in the public interest, the Commission may dispense with any time period specified in §§ 2.80-2.82.

2.82 Compliance with the National Environmental Policy Act of 1969 Under the Natural Gas Act.

(d) In the case of each contested application, the applicant, staff, and all interveners taking a position on environmental matters shall offer evidence for the record in support of their environmental position. The applicant and all such interveners shall specify any differences with the staff's position, and shall include, among other relevant factors, a discussion of their position in the context of the factors enumerated in § 2.80.

(e) In the case of each contested application, the initial and reply briefs filed by the applicant, the staff, and all interveners taking a position on environmental matters must specifically analyze and evaluate the evidence in the light of the environmental criteria enumerated in § 2.80. Furthermore, the Initial Decision of the Presiding Administrative Law Judge in such cases, and the final order of the Commission dealing with the application on the merits in all cases, shall include an evaluation of the environmental factors enumerated in § 2.80 and the views and comments expressed in conjunction therewith by the applicant and all those making formal comment pursuant to the provisions of this section.

FEDERAL POWER COMMISSION
RULES OF PRACTICE AND PROCEDURE
18 CFR 1.8 Intervention

"(a) Initiation of intervention. Participation in a proceeding as an intervener may be initiated as follows:

(1) By the filing of a notice of intervention by a State Commission, including any regulatory body of the State or municipality having jurisdiction to regulate rates and charges for the sale of electric energy, or natural gas, as the case may be, to consumers within the intervening State or municipality.

(2) By order of the Commission upon petition to intervene.

(b) Who may petition. A petition to intervene may be filed by any person claiming a right to intervene or an interest of such nature that intervention is necessary or appropriate to the administration of the statute under which the proceeding is brought. Such right or interest may be:

(1) A right conferred by statute of the United States;

(2) An interest which may be directly affected and which is not adequately represented by existing parties and as to which petitioners may be bound by the Commission's action in the proceeding (the following may have such an interest; consumers served by the applicant, defendant, or respondent; holders of securities of the applicant, defendant, or respondent; and competitors of the applicant, defendant, or respondent).

(3) Any other interest of such nature that petitioner's participation may be in the public interest.

(c) Form and contents of petitions. Petitions to intervene shall set out clearly and concisely the facts from which the nature of the petitioner's alleged right or interest can be determined, the grounds of the proposed intervention, and the position of the petitioner in the proceeding, so as fully and completely to advise the parties and the Commission as to the specific issues of fact or law to be raised or controverted, by admitting, denying or otherwise answering specifically and in detail, each material allegation of fact or law asserted in the proceeding, and citing by appropriate reference the statutory provisions or other authority relied on: Provided, that where the purpose of the proposed intervention is to obtain an allocation of natural gas for sale and distribution by a person or municipality engaged or legally authorized to engage in the local distribution of natural or artificial gas to the public, the petition shall comply with the requirements of Part 156 of this chapter (i.e., Regulations Under the Natural Gas Act). Such petitions shall in other respects comply with the requirements of §§ 1.15 to 1.17, inclusive.

(d) Filing and service of petitions. Petitions to intervene and notices of intervention may be filed at any time following the filing of a notice of rate or tariff change, or of an application, petition, complaint, or other document seeking Commission action, but in no event later than the date fixed for the filing of petitions to intervene in any order or notice with respect to the proceedings issued by the Commission or its Secretary, unless, in extraordinary circumstances for good cause shown, the Commission authorizes a late filing. Service shall be made as provided in § 1.17. Where a person has been permitted to intervene notwithstanding his failure to file his petition within the time prescribed in this paragraph, the Commission or officer designated to preside may where the circumstances warrant, permit the waiver of the requirements of § 1.36(c)(5) with respect to copies of exhibits for such intervener.

(e) Answers to petitions. Any party to the proceeding or staff counsel may file an answer to a petition to intervene, and in default thereof, may be deemed to have waived any objection to the granting of such petition. If made, answers shall be filed within 10 days after the date of service of the petition, but not later than 5 days prior to the date set for the commencement of the hearing, if any, unless for cause the Commission with or without motion shall prescribe a different time. They shall in all other respects conform to the requirements of §§ 1.15 to 1.17, inclusive.

(f) Notice and action on petitions

(1) Notice and service. Petitions to intervene, when tendered to the Commission for filing, shall show service thereof upon all participants to the proceeding in conformity with § 1.17(b).

(2) Action on petitions. As soon as practicable after the expiration of the time for filing answers to such petitions or default thereof, as provided in paragraph (e) of this section, the Commission will grant or deny such petition in whole or in part or may, if found to be appropriate, authorize limited participation. No petitions to intervene may be filed or will be acted upon during a hearing unless permitted by the Commission after opportunity for all parties to object thereto. Only to avoid detriment to the public interest will any presiding officer tentatively permit participation in a hearing in advance of, and then only subject to, the granting by the Commission of a petition to intervene.

(g) Limitation in hearings. Where there are two or more interveners having substantially like interests and positions, the Commission or presiding officer may, in order to expedite the hearing, arrange appropriate limitations on the number of attorneys who will be permitted to cross-examine and make and argue motions and objections on behalf of such interveners."

FEDERAL ENERGY REGULATORY COMMISSION STAFF

SUPPLEMENT
TO THE
DEPARTMENT OF THE INTERIOR'S
FINAL ENVIRONMENTAL IMPACT STATEMENT
ANG COAL GASIFICATION COMPANY NORTH DAKOTA PROJECT

SUMMARY SHEET

Michigan Wisconsin Pipe Line Company, et al. Docket No. CP75-278, et al.

1. This Supplement to the Department of the Interior's Final Environmental Impact Statement (FEIS), prepared by the staff of the Federal Energy Regulatory Commission, is related to an administrative action.

2. The administrative action involved arises from applications filed jointly by Michigan Wisconsin Pipe Line Company (Michigan Wisconsin) and ANG Coal Gasification Company 1/ (Docket No. CP75-278), PGC Coal Gasification Company (PGC) and Natural Gas Pipeline Company of America (Docket No. CP77-556), and Great Lakes Gas Transmission Company (Docket No. CP75-283) which relate directly or indirectly to a proposal, pursuant to Section 7 of the Natural Gas Act, for the sale of ANG Coal Gasification Company and PGC to Michigan Wisconsin and Natural Gas Pipeline Company of America of synthetic natural gas (SNG) produced from coal commingled with natural gas, and for the construction and operation by Great Lakes Gas Transmission Company (Great Lakes) and Michigan Wisconsin of pipeline and compressor facilities to enable the receipt and transport of such gas. The Supplement evaluates the environmental impact resulting from construction and operation of these facilities. The facilities for which Great Lakes is seeking authorization include an interconnection between a proposed 20-inch diameter SNG pipeline and Great Lakes' existing 36-inch diameter pipeline system near the Thief River Falls Compressor Station in Minnesota; construction of 217.3 miles of new 36-inch diameter pipeline looping in eight sections across Minnesota, Wisconsin, and Michigan; utilization of 39.5 miles of existing 36-inch diameter pipeline looping in Minnesota; and modification of six

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1/ ANG Coal Gasification Company was replaced as coapplicant by ANR Gasification Properties Company on May 9, 1977.

compressor stations in Minnesota, Wisconsin, and Michigan. Facilities required by Michigan Wisconsin include 27.7 miles of new 30-inch diameter pipeline looping in two sections across Michigan and Wisconsin, addition of one 12,500-horsepower (hp) compressor unit at the existing Mountain Compressor Station in Oconto County, Wisconsin, and addition of one 3,500-hp compressor unit at the existing Kewaskum Compressor Station in Sheboygan County, Wisconsin.

3. Environmental impact would occur with respect to effects on man, wildlife, vegetation, soil, water quality, air quality, and noise quality.

4. Alternative locations for placement of the pipeline loop sections as well as alternative transportation arrangements (i.e., utilization of the proposed Northern Border pipeline) and the alternative of not constructing the proposed facilities are considered.

5. Copies of this Supplement are being made available to the public and all parties involved in the proceedings on or about April 17, 1978, and to the following agencies:

A. Federal:

Advisory Council on Historic Preservation
Attorney General Office
Department of Agriculture
Department of the Army
Department of Commerce
Department of Defense
Department of Energy
Department of Health, Education, and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Labor
Department of State
Department of Transportation
Energy Resources Council
Environmental Protection Agency
Federal Trade Commission
Federal Highway Administration
Interstate Commerce Commission
Nuclear Regulatory Commission

B. State and Regional:

Arrowhead Regional Development Commission
Fargo-Moorhead Metropolitan Council of Governments
Head of the Lakes Council of Governments
Headwaters Regional Development Commission

Michigan Area Council of Governments
Michigan State Clearinghouse
Michigan State Historic Preservation Officer
Minnesota Department of Natural Resources
Minnesota Historical Society
Minnesota State Clearinghouse
Minnesota-Wisconsin Boundary Area Commission
Missouri River Basin Commission
North Dakota State Clearinghouse
North Dakota State Historical Society
Northeastern Wisconsin Regional Planning and Development Commission
Northwest Regional Development Commission
Upper Great Lakes Regional Commission
Upper Mississippi River Basin Commission
Western Upper Peninsula Planning and Development Region
Wisconsin Department of Justice
Wisconsin Department of Natural Resources
Wisconsin Department of Transportation
Wisconsin Public Service Commission
Wisconsin State Clearinghouse
Wisconsin State Historical Society

C. National Citizens Groups

Environmental Defense Fund
Izaak Walton League of America
National Audobon Society
Nature Conservancy
Sierra Club
The Wildlife Society
Wildlife Management Institute

D. Local

Beulah City Library
Bismarck Public Library
Dickinson Public Library
Dunn County Board of County Commissioners
Lewis and Clark Environmental Association
Mercer County Board of County Commissioners
North Dakota State University
North Dakota Wildlife Federation
Oliver County Board of County Commissioners
United Plainsmen
University of North Dakota
University of Wisconsin
Honorable Governor Arthur A. Link
Honorable Governor Martin J. Schreiber

Honorable Governor William G. Milliken
Honorable Governor Rudy Perpich
Honorable Wendall R. Anderson
Honorable Quentin N. Burdick
Honorable Robert P. Griffin
Honorable Muriel Humphrey
Honorable Gaylord Nelson
Honorable William Proxmire
Honorable Donald W. Riegle, Jr.
Honorable Milton R. Young
U.S. Representative Mark Andrews
U.S. Representative Robert J. Cornell
U.S. Representative Lamar Gudger
U.S. Representative James L. Oberstar
U.S. Representative David R. Obey
U.S. Representative Phillip E. Ruppe
U.S. Representative Arlan Stangeland
U.S. Representative William A. Steiger

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A. DESCRIPTION OF THE PROPOSED ACTION [1/]

1. Introduction

On January 20, 1978, the Department of the Interior, Bureau of Reclamation (Interior) released its final environmental impact statement (FEIS) concerning the "ANG Coal Gasification Company (ANGCGC), North Dakota Project." The statement covered the impact of construction and operation of a proposed coal gasification complex in Mercer County, North Dakota, and its attendant facilities including the water intake structure and pipeline, railroad spur, coal mine, and synthetic natural gas (SNG) product pipeline. Because Interior's FEIS did not address the environmental impact of facilities and operations which would be required to receive the SNG and transport it as part of a commingled gas stream, the staff of the Federal Energy Regulatory Commission (FERC) has prepared the following supplemental environmental assessment.

2. Purpose, Facilities, and Locations

The purpose of the facilities proposed by Great Lakes and Michigan Wisconsin would be to increase their respective pipeline system capacities in order to transport the 275 million standard cubic feet per day (scfd) of SNG to be produced at the coal gasification complex in Mercer County, North Dakota. [2/]

1/ The following description is compiled from applications and other material submitted by Great Lakes Gas Transmission Company (Great Lakes) and Michigan Wisconsin Pipe Line Company (Michigan Wisconsin) in response to data requests.

2/ The total gasification complex is designed to produce 275 million scf per stream day of high Btu SNG. The plant is designed for a 91 percent on-stream factor, resulting in an average calendar day capacity of 250 million scf, or approximately 91 billion scf annually.

Facilities proposed to enable Great Lakes to receive and transport the Phase I volumes of gas (137.5 million scfd) include construction of an interconnection between the proposed 20-inch diameter SNG pipeline and Great Lakes' existing 36-inch diameter pipeline system near the Thief River Falls Compression Station in Minnesota; construction of 125 miles of 36-inch diameter pipeline looping 1/ in seven sections across Minnesota, Wisconsin, and Michigan; utilization of 35.8 miles of existing 36-inch diameter pipeline looping in Minnesota; and modification 2/ of six compressor stations in Minnesota, Wisconsin, and Michigan. Estimated Phase I project costs would be $55,680,700. 3/ The capability to transport Phase II gas volumes (137.5 million scfd) would require construction of an additional 92.3 miles of new 36-inch diameter pipeline looping in seven sections across Minnesota, Wisconsin, and Michigan, and utilization of 3.7 miles of existing 36-inch diameter pipeline looping in Minnesota. The new pipeline facilities would be constructed in conjunction with Phase II of the gasification complex, with costs to be estimated at a later date.

Facilities proposed to enable Michigan Wisconsin to receive and transport Phase I gas volumes (137.5 million scfd less fuel and line losses) to its market area and to the existing point of delivery to Natural Gas Pipe Line Company of America (Natural) 4/ would be limited to construction of 22.3 miles of new 30-inch diameter pipeline looping in two sections across Michigan and Wisconsin. Estimated Phase I project costs would be $6,350,660. 3/ Gas volumes (an additional 137.5 million scfd less fuel and line losses) available in conjunction with

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1/ Pipeline looping consists of emplacing additional pipeline sections parallel to the existing mainline to increase the overall system capacity.

2/ Modifications would involve replacement of the compressor rotor assembly at the Shevlin, Cloquet, and Wakefield stations, and replacement of both the compressor rotor assembly and the compressor case at the Deer River, Iron River, and Crystal Falls stations.

3/ Mid-1976 constant dollars.

4/ Under an agreement between ANR Gasification Properties Company and PGC Coal Gasification Company for co-ownership of the gasification complex, Natural would receive quantities of gas thermally equivalent to one-half of the SNG produced by Phase I (68.75 million scfd), less fuel and line losses incurred during transportation, at an existing point of delivery between Michigan Wisconsin and Natural near Woodstock, Illinois.

Phase II of the gasification complex would require construction of 5.4 miles of new 30-inch diameter pipeline looping in Wisconsin, addition of one 12,000-horsepower (hp) compressor unit at the existing Mountain Compressor Station in Oconto County, Wisconsin, 1/ and addition of one 3,500-hp compressor unit at the existing Kewaskum Compressor Station in Sheboygan County, Wisconsin. Locations of the proposed facilities are illustrated in Figure 1 with significant project data summarized in Table 1.

The proposed 36- and 30-inch diameter pipeline loop sections would be designed for maximum allowable operating pressures of 974 and 975 psig, respectively.

While the facilities proposed by Great Lakes and Michigan Wisconsin to receive and transport the gas would be constructed in two phases in conjunction with construction of Phase I and Phase II of the gasification complex, this assessment will address the ultimate facilities proposed, i.e., those required to receive and transport the full 275 million scfd.

3. Construction Procedures

Pipeline construction procedures would be similar to those described in Section 1.5.6.1, Product Gas Pipeline, of Interior's FEIS. The existing rights-of-way would be surveyed and staked to identify the extent and locations of underground utilities to be crossed by the proposed loop sections. The expanded rights-of-way sections would be cleared and graded. Pipe sections would then be laid alongside the ditch line, and the ditch excavated. Trench dimensions typically range from 30 to 36 inches greater than the diameter of the pipeline in depth and from 4 to 5.5 feet in width. In areas where the trenching operation encounters rock, either a tractor-drawn ripper or explosives would be used during excavation. In extensive swamp or wetland areas, construction would either be scheduled during the winter when conventional techniques could be used, or at other times of the year when the "push" method of pipeline installation would be employed. After the trenching has been finished, the pipe sections would be lined up, welded together, cleaned, primed, coated and wrapped. After checking for faults in the coating and welds, the pipeline would be lowered into the trench and covered, followed by cleanup and restoration of

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1/ While Michigan Wisconsin originally requested authorization to increase compression capabilities at the Mountain station by 16,500 hp, a separate action involving Docket No. CP74-213 in April 1976 authorized an increase of 4,500 hp. Michigan Wisconsin has indicated that this increase is sufficient to compress the gas volumes anticipated during Phase I of the project.

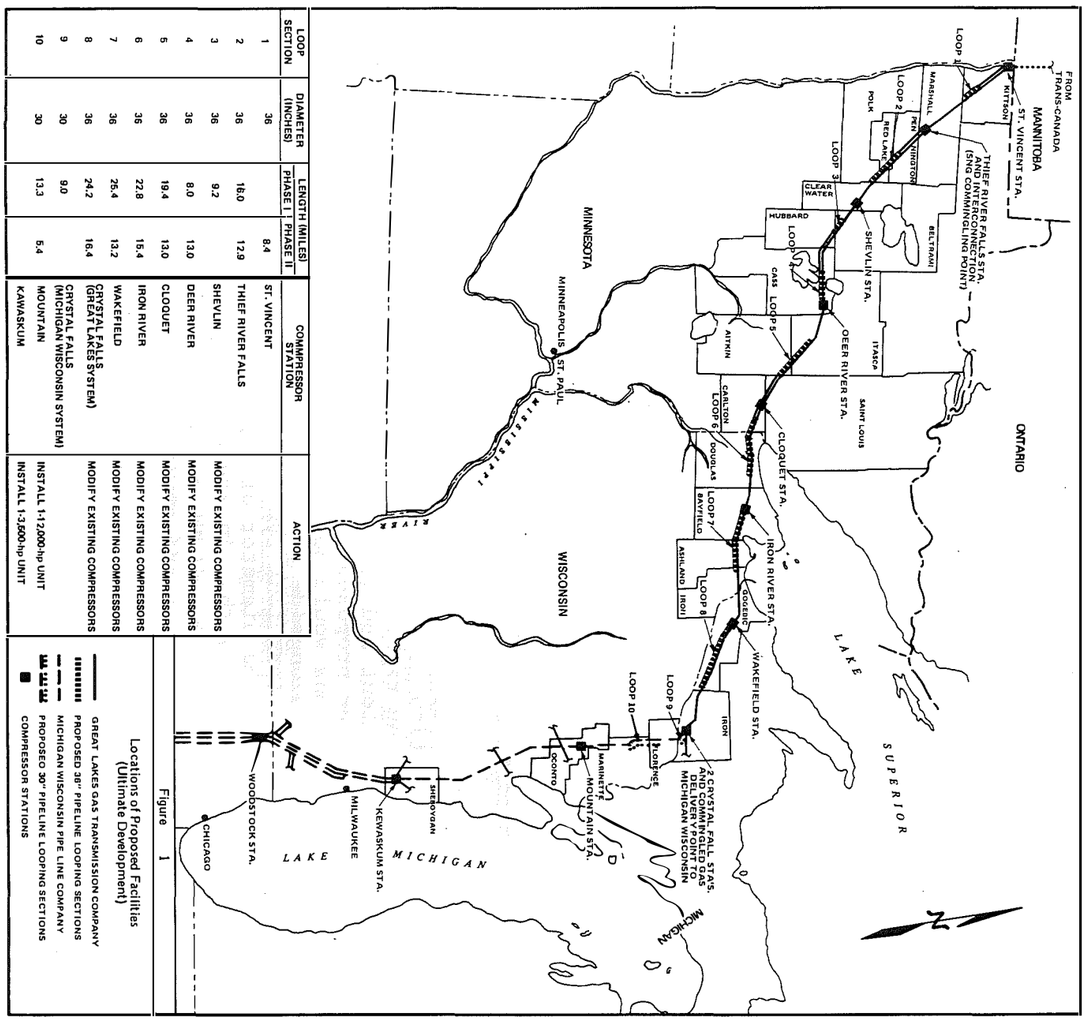

Figure 1

Locations of Proposed Facilities (Ultimate Development)

TABLE 1

GREAT LAKES-MICHIGAN WISCONSIN PIPELINE LOOPING PROJECT
LOOPING AREAS AND ENVIRONMENTAL DATA

LOOP SECTION	LOCATION	TOTAL LENGTH (MILES)	SIGNIFICANT WATER CROSSINGS 1/	UNIQUE AREAS CROSSED — FORESTS — STATE	FORESTS — NATIONAL	GAME REFUGES	INDIAN RESERVATIONS
1	Kittson, MN	8.4	1			1	
2	Pennington, Red Lake, Polk, and Clearwater, MN	28.9	2			1	
3	Beltrami and Hubbard, MN	9.2	0				
4	Cass and Itasca, MN	21.0	2	1	1		1
5	Itasca, Aitkin, and St. Louis, MN	32.4	1	2		1	
6	Carlton, MN and Douglas, WI	38.2	9	1			
7	Bayfield, Ashland, and Iron, WI	38.6	7		1		1
8	Gogebic, MI	40.6	5		1		
9	Iron, MI	9.0	5				
10	Florence and Marinette, WI	18.7	5				
	Total	245.0	37				

1/ Further information on these crossings is presented in Tables 2 and 3.

the rights-of-way. Restoration would be accomplished primarily by reseeding and fertilizing. In difficult areas, such as steep banks along creeks, sodding and mulching would be employed. The final step would be hydrostatic testing of the pipeline. Approximately 53 gallons of water would be required per foot of the 36-inch diameter pipeline, and 35 gallons per foot for the 30-inch diameter pipeline. The length of the test sections is not known at this time.

To accommodate placement of the 10 loop sections, the applicants propose to increase the width of their existing 75-foot rights-of-way by 25 feet. This increase would add about 3 acres per mile to the existing rights-of-way, or require a total of about 742 acres of new rights-of-way. The applicants do not anticipate that additional land would need to be cleared at stream crossings. However, Michigan Wisconsin indicates that if such a need arose, additional clearing would not exceed approximately 0.05 acre. While both companies intend to bore all railroad and major highway crossings, Great Lakes would not case such crossings, unless casing were required by authorities or construction conditions.

The additional compression facilities proposed by Michigan Wisconsin would be installed at existing compressor stations. Michigan Wisconsin proposes to construct one building at its Mountain Compressor Station to house one 12,000-hp gas compressor unit and accessories, and one building at its Kewaskum Compressor Station to house one 3,500-hp gas compressor unit and accessor Construction would entail placement of foundations, installation of the compressor units, and erection of the surrounding building. Piping and accessories would then be connected, and all components, controls, and safety devices tested.

4. Operation and Maintenance

Gas flow in the 10 pipeline loop sections and the two additional compressor units would be operated and controlled by the present systems which currently control the existing mainlines and compressor facilities. Maintenance of the proposed facilities would be performed by the applicants' respective maintenance personnel. Because the proposed facilities would be located adjacent to existing facilities, no special maintenance procedures are expected to be required beyond those presently being performed on the existing facilities. Procedures employed on both the Great Lakes and Michigan Wisconsin systems currently meet or exceed applicable requirements of the Department of Transportation, Office of Pipeline Safety Operations (49 CFR 192).

5. Future Plans

Except for the construction discussed above, the applicants have indicated that there are no plans for additional pipeline looping or other changes to their existing systems. However, in the event that additional volumes of SNG became available, it may be necessary to further increase or upgrade the existing facilities of both pipeline systems in order to provide adequate transportation capabilities.

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B. DESCRIPTION OF THE EXISTING ENVIRONMENT

1. Climate

A continental-type climate, typified by relatively large seasonal temperature variations and occasional great extremes of temperature, is characteristic of the western Great Lakes region. Average daily maximum temperatures in the general project area range from about 80°F in July to about 20°F in January. Average daily minimum temperatures range from about 55°F in July to about 0°F in January. Extreme minimum temperatures as low as -40°F have been recorded on several occasions; however, such extreme winter cold generally moderates within a few days. Lakes and rivers remain frozen from early December through March, with some local variation along the route. The average frost-free period in the cooler subregions of the project area extends from mid-May through mid-September giving a normal growing season of only 120 days. The growing season in the southern extremities of the project area normally may extend to 150 days.

Total precipitation across the western Great Lakes region generally increases from west to east within a normal range of about 20 to 36 inches per year. Approximately two-thirds of the total precipitation occurs as thundershowers during the growing season. Total snowfall averages about 36 inches annually but increases to over 100 inches in some areas near Lake Superior which receive heavy "lake effect" precipitation. Droughts of sufficient intensity to result in significant agricultural crop losses have occurred in recent years and have caused many farmers to install supplemental irrigation systems. Spring flooding due to showers and rapid snowmelt may present problems in floodplain areas.

Other types of severe weather in the project area are uncommon and are generally associated with spring and summer thunderstorm activity. The region lies at the northern edge of the area of maximum tornado frequency in the U.S., and may experience damaging high winds and hail. Average annual wind speeds in the project area range from 10 to 11 miles per hour, prevailing from the northwest during all but the summer months. Extreme wind velocities of 92 miles per hour have been recorded at Minneapolis-St. Paul.

2. Physiography, Topography, and Soils

The proposed pipeline loop sections would traverse the Superior Uplands physiographic province, a region where many

of the present-day landforms and soils can be directly attributed to past glacial processes and deposits.

In the area of the Minnesota-North Dakota border, and more extensively in the adjacent areas of Canada, lakebed sediments and strandlines provide evidence of an extinct glacial lake that was considerably larger than any of the Great Lakes today. Referred to as "Lake Agassiz" 1/, its total area of lakebed sediments covers a sprawling region about the size of Montana. Loop Sections 1 and 2 would traverse a portion of the Lake Agassiz Basin which is very flat topographically and is a fertile soil region. Elevations along these loop sections increase very gradually towards the southeast within a range of about 900 to 1,250 feet above sea level. Slightly elevated strandlines and outwash deposits 2/ at the former lake margins may be traversed and would present somewhat sandier soil conditions than the former lakebed itself. The lakebed soils are finer-textured silts and clays and in many areas have required the installation of tile drainage systems for agriculture.

Southeast of the Lake Agassiz Basin area, the major portion of Minnesota is mantled by a mixture of glacial debris, generally known as glacial till. The mixture contains soil and rock of all particle sizes and has relatively low permeability. Topographically, the region is flat to slightly undulating with elevations ranging from about 1,300 to 1,500 feet above sea level. Local relief along proposed Loop Sections 3, 4, and 5 is generally less than 50 feet. Drainage is poorly developed and lakes and marshlands are numerous. Organic soils generally associated with wetlands and wet forest conditions are dominant in the region and in some localities cover extensive areas. The largest organic soil area traversed by the proposed project is the Floodwood Swamp, which is located along approximately 20 miles of Loop Section 5. Local soil conditions in most areas are not suitable for agricultural development.

Pipeline Loop Sections 6 and 7 would lie in a transitional area between the poorly-drained Minnesota lake country and a region in Wisconsin and Michigan which is covered by relatively well-drained outwash-type deposits. Portions of both loop sections would traverse lakebed sediments deposited when water levels of Lake Superior were higher and covered areas adjacent to the present lake shoreline. These lakebed sediments include clay soils that are particularly noted for their high water tables and susceptibility to erosion and slumping in cut-and-fill situations. Sandy outwash deposits in the Minnesota-

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1/ After Louis Agassiz, who in 1840 became one of the earliest exponents of the glacial ice-age concept.

2/ Sands and gravels deposited by rapidly flowing glacial meltwater.

Wisconsin border area may also cause erosion problems unless careful measures are employed to reestablish disturbed vegetation. Outwash-type soils are excessively well-drained so that very little soil moisture is available to help reestablish normal vegetative cover. Topography in the border area is somewhat rougher than in any of the loop sections previously described. Elevations range from about 1,000 to 1,200 feet above sea level. Small stream channels across the area have steep, unstable banks. The eastern portion of Loop Section 6 and the entire length of Loop Section 7 lie in an area comprised almost entirely of sandy outwash soils. The topography is an undulating plain marked by many irregular depressions, shallow pits, and potholes. Only a few small lakes and wetlands exist within these loop areas. Bedrock ridges are exposed at the surface in the eastern extremities of Loop Section 7; however, these are avoided by the pipeline right-of-way.

Soil conditions along Loop Sections 8, 9, and 10 (including the Mountain Compressor Station) are similar in many respects to those found along Loop Section 7, i.e., comprised of glacial outwash deposits with associated hilly, pitted topography. However, wetlands are more in evidence, as is surface bedrock, particularly along Section 8. Generally, the potential for erosion is the same as previously discussed for other outwash-type deposits.

The area surrounding the Kewaskum Compressor Station, located on a glaciated plain west of Lake Michigan, contains a variety of drumlins, kames, eskers, and other interesting glacial landforms. Examples of many of these glacial features may be found in the National Park Service's "Ice Age National Scientific Preserve," located several miles northwest of the Kewaskum station itself. Soils in the general area are quite fertile and have been extensively developed for agriculture.

3. Geology

Most bedrock in the project area is Precambrian in age and consists of crystalline igneous and metamorphic rock types. A relatively minor outcrop area of Cambrian sandstone occurs near Loop Sections 7 and 8. The entire region has been subjected to glaciation and most areas are covered by glacial deposits. Thickness of the glacial deposits is variable but is known to reach depths of 550 feet near Superior, Wisconsin. Exposed bedrock at the surface occurs in the upland region northwest of Lake Superior and in extreme western Michigan.

The bedrock system supports extensive mineral resource development in the region. Of particular importance are the iron ore deposits in northeast Minnesota and northern Michigan. Other significant ore deposits contain zinc, lead, silver, and copper. The only mineral extraction activities close to the route are sand and gravel pits, and peat production operations, located in the Duluth-Superior area.

Low-level seismic activity does occur in the general project area but individual seismic events are not of sufficient magnitude to be of concern. There are no known, active geologic faults in the area. Minor seismic events which do occur may result from continuing crustal rebound (isostatic adjustment) following the recession of the massive glacial ice sheets.

4. Hydrology

The proposed pipeline looping project would pass through four major drainage basins: the Red River of the North watershed, the Mississippi River Headwaters watershed, the Lake Superior Basin watershed, and the Lake Michigan Basin watershed. Surface water quality along the entire route can be generally described as good.

Loop Sections 1 and 2 lie in the Red River of the North watershed. Rivers in this watershed flow north and northwest emptying into the Red River of the North and eventually Hudson Bay. Characteristics of the streams proposed to be crossed in this drainage basin are provided in Table 2.

Within the Red River of the North watershed, the principal supply of groundwater comes from the various glacial deposits distributed throughout the area. Wells in this region generally yield 50 to 100 gallons per minute. The general quality of the water is good.

Proposed pipeline Loop Sections 3, 4, and most of 5 lie in the Mississippi River Headwaters watershed. The dominant hydrologic characteristic of the watershed is the presence of numerous lakes, pothole marshes, bogs, streams and rivers. The drainage of this area is predominately south via the Mississippi River.

The portion of Loop Section 4 proposed to cross the Chippewa National Forest would traverse a large marsh area and a portion of the upper Mississippi River proposed for inclusion under the Wild and Scenic River Act. Appropriate studies of this reach from the northwest corporate boundary of Anoka to the outlet of Lake Itasca, both in Minnesota, have been completed and a bill (H.R. 10425) was introduced in Congress on January 19, 1978,

TABLE 2

HYDROLOGIC CHARACTERISTICS OF SELECTED STREAMS
PROPOSED TO BE CROSSED BY THE PIPELINE LOOP SECTIONS

	Width at Crossing (ft)	Depth 1/ (ft)	Floodplain and Bank Characteristics	Stream Flow Characteristics
Loop Section 1				
South Branch, Two Rivers, Kittson County, Minnesota	10	1-3	The river flows through a shallow cut with a 1,250-foot floodplain.	Flow at Lake Bronson, Minnesota, ranges from 0.96 cfs in July to 4.0 cfs in September. The watershed consists of 444 square miles at this point.
Loop Section 2				
Clearwater River, Red Lake County, Minnesota	30	1-4	The river is channelized; both banks have been built up as levees.	Flow at Plummer, Minnesota, ranges from 7.7 cfs in July to 1,030 cfs in September. Average discharge for the period would be expected to range from 100-200 cfs. The watershed consists of 512 square miles.
Loop Section 3				
None				
Loop Section 4				
Mississippi River, Itasca County, Minnesota	100	3-10	The river flows through a low, broad floodplain; meander scars and oxbow lakes are frequent.	Flow at the Winnibigoshish Dam near Deer River, Minnesota, ranges from 1,260 cfs in April to 800 cfs in January. Average flow during construction would be expected to range between 400-500 cfs. The watershed drains 1,442 square miles at this point.
Loop Section 5				
Swan River, Itasca County, Minnesota	20	1-3	The banks are rather abrupt and tend to be marshy at the water's edge; there is a vaguely determined shallow floodplain.	Flow rates at the proposed pipeline loop crossing are estimated to range from 36 cfs in July to 186 cfs in August, averaging 75-90 cfs during construction. The watershed drains approximately 215 square miles at this point.
Loop Section 6				
Pokegama River, Douglas County, Wisconsin	Narrow (10-20 ft); channel would be crossed 3 times within 1,000 yards.	1-3	The river is incised several feet into the soil. The banks have been riprapped.	No records are available for the Pokegama River. Average flow rates, runoff coefficients, based on watershed size, runoff coefficients, and comparison with similar rivers, is 30 to 50 cfs. The watershed is estimated to be 50 square miles at the point of crossing.
Nemadi River, Douglas County, Wisconsin	20	2-5	The river flows through a floodplain about 1 mile wide.	No records are available. Flow at the point of crossing is estimated to be 200 cfs. The watershed is estimated to be 300 square miles at this point.
Amnicon River, Douglas County, Wisconsin	20	3-4	The river flows through a rocky gorge, cut through sandstone and gabbro.	No records are available. Flow at the point of construction is estimated to be 150 cfs during construction. The watershed is estimated to be 130 square miles at this point.
Middle River, Douglas County, Wisconsin	10	3-5	The river has a cut meandering gorge about 100 feet deep. Its banks are 10-15 feet deep through sandstone bedrock.	No records are available. Flow at the point of crossing is estimated to be 50-75 cfs during construction. The watershed drains approximately 75 square miles at this point.
Loop Section 7				
North Fish Creek, Bayfield County, Wisconsin	20	1-3	The river has low, marshy banks and meanders through a broad, low, poorly defined floodplain.	No records are available. Flow at the point of crossing is estimated to be 50-75 cfs during construction. The watershed drains approximately 75 square miles.
White River, Ashland County, Wisconsin	20	3-10	The river flows through a floodplain about 1,000 feet wide.	USGS records for the White River near Ashland, Wisconsin, show a range from 170 cfs in July to 4,100 cfs in August. Average flow during construction is estimated to be 300 cfs. The watershed drains 279 square miles.
Bad River, Ashland County, Wisconsin	40-50 (high flow)	3-10	The river flows through a broad, indeterminate floodplain.	The Bad River near Odonah, Wisconsin, discharges from 140 cfs in March to 3,720 cfs in April. Flow during construction is expected to be from 150 to 200 cfs. The watershed drains 611 square miles.

TABLE 2 (cont.)

	Width at Crossing (ft)	Depth 1/ (ft)	Floodplain and Bank Characteristics	Stream Flow Characteristics
Loop Section 8				
Big Presque Isle River, Gogebic County, Michigan	20	1-3	The river occupies a broad, deep V valley. Both banks are riprapped.	The Presque Isle River at Marinisco, Michigan, ranges from 86 cfs in July to 1,180 cfs in August. Average flow during construction is estimated to be 200 cfs. The watershed drains 171 square miles.
Cisco Branch of the Ontonagon River, Gogebic County, Michigan	20-25	2-5	The crossing is riprapped. Some bedrock along the crossing.	The Cisco Branch at the Cisco Lake Outlet, Michigan, ranges from 0.91 cfs in July to 180 cfs in September. The flow rate during construction is estimated to be 40-50 cfs. The watershed drains 50.7 square miles.
Middle Branch of the Ontonagon River, Gogebic County, Michigan	3-5	2-6	The river would be crossed in an area of bogs and marshes.	The Middle Branch ranges from 278 cfs in July to 1,350 cfs in September. Average flow during construction is estimated to be 300 to 400 cfs. The watershed drains 671 square miles.
Loop Section 9				
Connection Between Second and Third Lakes of Fortune Lake Chain, Iron County, Michigan	141	10	Unknown	Flow Rate: 0 cfs Estimated Drainage Area: 1.5 square miles
Fortune Lakes Creek, Iron County, Michigan	4	1	Unknown	Flow Rate: 0.9 cfs 2/ Estimated Drainage Area: 1.0 square mile
Mastodon Creek, Iron County, Michigan	10	2	Unknown	Flow Rate: 11.2 cfs Estimated Drainage Area: 7.0 square miles
Little McGregor Creek, Iron County, Michigan	6	1	Unknown	Flow Rate: 7.5 cfs Estimated Drainage Area: 0.5 square mile
McGovern's Creek, Iron County, Michigan	8	2	Unknown	Flow Rate: 10.8 cfs Estimated Drainage Area: 1.0 square mile
Loop Section 10				
Lund Creek, Florence County, Wisconsin	4	2	Unknown	Flow Rate: 11.6 cfs Estimated Drainage Area: 1.0 square mile
Lamon Tangue Creek, Florence County, Wisconsin	10	2	Unknown	Flow Rate: 22.4 cfs Estimated Drainage Area: 0.5 square mile
Gasler Creek, Marinette County, Wisconsin	24	3	Unknown	Flow Rate: 56.7 cfs Estimated Drainage Area: 1.0 square mile
Sidney Creek, Marinette County, Wisconsin	8	3	Unknown	Flow Rate: 1.5 cfs Estimated Drainage Area: 4.0 square miles
Avery Creek, Marinette County, Wisconsin	16	1.5	Unknown	Flow Rate: 28.3 cfs Estimated Drainage Area: 18.0 square miles

1/ Approximate average depth, subject to variation with season and precipitation.

2/ Intermittent flow.

Source: Field investigations conducted by the applicants and USGS topographical maps.

to amend the Wild and Scenic River Act by designating the studied reach of the river as a component of the National Wild and Scenic River System.

Proposed Loop Section 5 lies in the Floodwood Swamp area and would cross the Swan River. Characteristics of the streams proposed to be crossed in this drainage basin are provided in Table 2.

Proposed Loop Sections 6, 7, and a portion of 8 lie in the Lake Superior Basin watershed. Rivers and small streams are the dominant hydrologic features. Many local depressions and low-lying regions give rise to pothole marshes and bogs. The river pattern is generally dendritic with water flowing into Lake Superior.

The primary source of pumpable groundwater throughout this watershed is contained within the localized outwash glacial till deposits. The groundwater table, as observed in wells throughout the region, ranges from 6 to 78 feet below the ground surface.

Major water bodies proposed to be crossed by Loop Section 6 would include the Pokegama, Nemadji, Amnicon, and Middle Rivers. Major water bodies proposed to be crossed by Loop Section 7 would include the North Fish Creek and the White and Bad Rivers. Major water bodies proposed to be crossed by Loop Section 8 include the Big Presque Isle River and the Cisco and Middle Branches of the Ontonagon River. Characteristics of the streams proposed to be crossed in this drainage basin are provided in Table 2.

Proposed Loop Sections 9, 10, and a small portion of 8 lie in the Lake Michigan Basin watershed. The characteristics of this watershed are very similar to those of the Lake Superior Basin watershed. Lakes in the vicinity of the proposed construction are classified as first quality warm water. Streams and rivers are predominately classified as first and second quality trout water. Characteristics of the streams proposed to be crossed in this drainage basin are provided in Table 2.

5. Vegetation

Northwestern Minnesota, once covered by native prairie, is now mostly cultivated. Although scattered stands of prairie bunchgrasses may still be found, bottomland hardwoods along watercourses and fencerow plants constitute the bulk of the area's natural vegetation. Cottonwood, elm, willow, and box-elder are the dominant hardwood species. The area is also part of the eastern edge of the prairie pothole region and contains scattered "pothole" wetlands. Most of the surviving wetlands

are located in wildlife management areas. Proposed Loop Section 1 would be constructed within this vegetation region.

Along the beach ridges of former glacial Lake Agassiz, the topography is more rolling and there is less agriculture. This is an area of "border prairie," where grasslands begin to give way to eastern forest vegetation. Aspen stands are common here, and remnant stands of native prairie, wetlands, and maple-basswood forest are common vegetation types found interspersed among small farms. Most of proposed Loop Section 2 would be constructed through "border prairie" vegetation.

Lands along the pipeline route from Clearwater County, Minnesota, eastward are dominated by forest. In the region south of Lower Red Lake, where parts of Loop Sections 2 and 3 are proposed to be constructed, maple-basswood forests generally occur on well-drained hills, while pine forests occur on lower elevations. Red pine, Norway pine, and balsam fir are the dominant conifers and sugar maple, basswood, red oak, ash, and elm are the principal deciduous trees.

East of Leech Lake through northern Wisconsin, where Loop Sections 4, 5, 6, and 7 would be constructed, the Great Lakes mainline crosses a region of mixed spruce-fir and hardwood forests. Balsam fir, white spruce, white, red, and Norway pines, red oak, sugar maple, basswood, aspen, and white birch are the most important tree species. Large areas of bog forest and bog occur in poorly drained locations such as Floodwood Swamp. Black spruce and tamarack are the major bog forest trees. Heath shrubs and alder occur over a mat of sphagnum moss in bogs. The majority of proposed Loop Sections 4 and 5 would cross bog or bog forest vegetation. Aspen, birch, red maple, and red oak dominate extensive areas disturbed by logging or fire. Proposed Loop Section 7 would cross pine and aspen forests in the more elevated, sandy lands of the Chequamegon National Forest.

Through the Ottawa National Forest in northwest Michigan, proposed Loop Section 8 would traverse rugged glaciated terrain, covered with northern hardwood-fir forests, differing from the previous forest types chiefly in a greater proportion of hardwood, such as sugar maple and birch. This area is also spotted with bogs and bog forest where water has collected in the many basins and depressions formed in the till.

The 27.7 miles of pipeline Loop Sections 9 and 10, proposed to be constructed in northern Michigan and Wisconsin, would traverse a northern hardwood forest region dominated by sugar maple, white and yellow birch, and America beech. Much of this area supports aspen-birch forest on lands disturbed by fire or logging. No significant wetlands would be crossed by these sections.

After construction of the Great Lakes mainline in 1968, the right-of-way was seeded with a mixture of grasses and forbs. Although erosion problems were initially experienced in some areas, the applicant states that the existing right-of-way has fully revegetated. This vegetation generally consists of grasses, clovers, and other ground cover plants with a thin overstory of shrubs and saplings. Woody vegetation has not been cleared from the right-of-way since initial construction.

6. Wildlife

Loop Sections 1 and 2 are located where much of the natural wildlife habitat has been eliminated or altered by increasingly intensive agricultural devlopment. This change is especially evident along Loop Section 1. The original prairie has been eliminated and only those species tolerant of agricultural development have flourished.

Deer, coyote, raccoon, red fox, pheasant, sharp-tailed grouse, and cottontail rabbit are among the more common species found in the vicinity of the first two loop sections. Several species of waterfowl and other birds breed in the remaining wetlands and during migration the rivers, streams, and wetlands are used by large numbers of waterfowl.

The remaining sections of pipeline looping would be constructed where at least 70 percent of the land is covered by forest. Consequently, the wildlife in these areas differs considerably from that of the first two sections; species associated with forest become more prevalent. Typical species include whitetailed deer, bobcat, black bear, raccoon, gray and fox squirrel, red fox, snowshoe hare, and ruffed grouse plus a rich assortment of small mammals and birds. In the more remote and less disturbed portions of the route in Minnesota, timber wolves are found, though not in large numbers.

Lakes, ponds, rivers, streams, swamps and bogs are numerous throughout much of the forest. Furbearers such as river otter, mink, beaver, and muskrat are common along many of these waterways and wetlands. The same areas provide breeding habitat for mallards, black ducks, wood ducks, and hooded mergansers. Closely associated with the bog habitat are several shrews and the uncommon bog lemming.

Several species classified as either endangered or threatened by the U.S. Fish and Wildlife Service occur within the three states that would be crossed by the proposed pipeline loopings. These species are the bald eagle, peregrine falcon, eastern timber wolf, Higgin's eye pearly mussel, and the white cat's mussel. Of these five species, only the bald eagle,

TABLE 3

DESIGNATED TROUT WATERS TO BE CROSSED
BY THE PROPOSED PIPELINE LOOP SECTIONS

Location		
Loop Section	County	Stream
2	Polk, MN	Lost River
2	Clearwater, MN	Clearwater River
6	Carlton, MN	Otter Creek
6	Douglas, WI	Amnicon River
6	Douglas, WI	Miller Creek
6	Douglas, WI	Poplar River
6	Douglas, WI	Rocky River
6	Douglas, WI	Copper Creek
7	Bayfield, WI	Pine Creek
7	Bayfield, WI	North Fish Creek
7	Bayfield, WI	South Fish Creek
7	Ashland, WI	Beartrap Creek
7	Ashland, WI	Bad River
7	Ashland, WI	Laurence River
8	Gogebic, MI	Little Presque Isle River
8	Gogebic, MI	Big Presque Isle River
8	Gogebic, MI	Tenderfoot Creek
8	Gogebic, MI	Cisco Branch Ontonagon River
8	Gogebic, MI	Middle Branch Ontonagon River
10	Florence, WI	Lund Creek
10	Florence, WI	Lamon Tangue Creek
10	Marinette, WI	Sidney Creek
10	Marinette, WI	Avery Creek

peregrine falcon, and timber wolf occur in the vicinity of the looping project. The two mussels are found in the more southern portions of the states. The peregrine falcon occurs in the three states only as a rare migrant; no nesting takes place in the Great Lakes region. In addition to the federally classified species, Minnesota, Wisconsin, and Michigan maintain lists of species which are endangered, rare, or have declining populations. Several of these species are likely to occur in the vicinity of the proposed project.

The proposed pipeline loopings would cross 11 rivers and numerous smaller streams. Rivers and streams in the Great Lakes region usually support a mix of species including northern pike, walleye, smallmouth bass, yellow perch, rock bass and sunfish. Brook, brown, and rainbow trout are found in streams with low water temperatures and high water quality. At least 23 of the waterways crossed by the proposed loopings have been designated as trout waters by state resource agencies. These designated trout waters are listed in Table 3.

7. Land Use, Recreation, and Aesthetics

a) Land Use

The proposed natural gas pipeline looping would cross the following governmental units: Minnesota-- 12 counties, 1 Indian Reservation, 1 national forest, 3 state forests, and 1 state game refuge; Wisconsin-- 8 counties, 1 Indian Reservation, 1 national forest, and 1 state park; Michigan-- 2 counties and 1 national forest. A summary of the land uses to be traversed, by loop section, is given in Table 4.

The first loop section begins in Hazelton Township, Minnesota. The land use along the 110.5 miles of 36-inch diameter looping in Minnesota consists mainly of farmland, wetlands, and forests. Several significant natural and cultural areas would be corssed by the proposed looping. The major natural area is the Floodwood Swamp (Loop Section 5) which would be traversed by approximately 20 miles of looping. Of the cultural areas, a small section of Loop Section 4 would be constructed within the Leech Lake Indian Reservation. Approximately 6 miles of Loop Section 7 would cross the Bad River Indian Reservation.

Wisconsin would be crossed by a total of 66.2 miles of 36-inch and 18.7 miles of 30-inch diameter looping. The majority of this proposed looping would traverse forest lands, including a national forest. Several residential areas would be crossed by the proposed loopings including the towns of Moquah and Cedar (Loop Section 7). The outskirts of the John F. Kennedy Memorial Airport, serving Ashland, would also be crossed.

TABLE 4

EXISTING LAND USES TRAVERSED BY
PROPOSED PIPELINE LOOP SECTIONS (IN MILES)

Loop Section	Open/ Agricultural	Forest	Bog	Bog Forest	Total
1	7.5	0.9			8.4
2	11.7	6.5	10.3	4	28.9
3	3.3	3.1	0.2	2.6	9.2
4	0.5			20.5	21.0
5	3.3	4.6	16.8	7.7	32.4
6	18.4	19.8			38.2
7	8.6	28.7	2	1.1	38.6
8	0.3	11.6	20.1	8.6	40.6
9		7.5	1		8.5
10	4	11.5	3		18.5

Source: Great Lakes Gas Transmission Company and USGS Topographic Maps

The applicants also propose to expand two compressor stations in Oconto and Sheboygan Counties, Wisconsin. The expansion would be completed within the area already cleared for existing facilities. The Mountain Compressor Station in Oconto County is in an area of wetlands and forested bog, while the Kewaskum Compressor Station in Sheboygan County is in a forested area.

Michigan would be crossed by two loop sections - 40.6 miles of 36-inch and 9 miles of 30-inch diameter looping (Sections 8 and 9, respectively). The entire 36-inch diameter portion would be constructed in a national forest. The majority of the 30-inch loop would also cross forest land; however, none of it is state or national forest land.

b) Recreation

The western Great Lakes region traversed by the proposed project is a popular recreation area. Many high quality recreational resources, including extensive forests, a multitude of lakes and streams, topography which lends itself to winter sports, and an exceptionally attractive Lake Superior shoreline are all utilized to provide the estimated 13 million recreation days experienced in this region every year. The entire area is heavily dependent on tourism.

The proposed looping would cross eight established recreational areas in Minnesota. The entire length of proposed Loop Section 4 (21 miles) would be located in the Chippewa National Forest. Among the park facilities in the area of the proposed loop area are an historic site, a red pine seed production area, a residential area, and two boat-launching sites. Portions of this area are also designated as the Bowstring State Forest. Approximately 3 miles of proposed Loop Section 5 would traverse the Savannah State Forest. This section would also cross the Fond du Lac State Forest and the Floodwood Game Refuge. No developed recreational sites within these areas would be crossed. The remaining areas crossed in Minnesota would be the Hazelton State Game Refuge on proposed Loop Section 1 (0.4 mile), and two private game refuges, Polk-Clearwater and Clearbrook on proposed Loop Section 2.

In Wisconsin, proposed Loop Section 7 would traverse 8.6 miles of the Chequamegon National Forest, while proposed Loop Section 6 would traverse the Ammicon Falls State Park for 1.2 miles. No developed recreational sites would be affected in either of these areas.

The entire length of proposed Loop Section 8 (40.6 miles) would be located in Ottawa National Forest in Michigan. Among the park facilities which would be in the area of this section

are a tree seed orchard, a canoe route river (the Presque Isle), the Sylvania Visitor Center, a white spruce seed production area, the Imp Lake Forest Auto Tour route, and the Imp Lake camping facilities and forest trail. Proposed Loop Section 9 would cross an Iron County, Michigan Forest Preserve for one-half mile.

c) Aesthetics

The rich and varied land features of this region contribute to its overall high aesthetic value. Minnesota is known as the "Land of 10,000 Lakes." Many waterfalls cascade through the coastal area of the state. State and Federal parks throughout the region contain scenic lakes and wildernesses. The Upper Mississippi River, which would be crossed by Loop Section 4, has been proposed for inclusion in the Wild and Scenic Rivers System. Geographic sites also add to the variety, such as the Porcupine Mountains in Michigan. Reaching 1,985 feet at their highest point, these mountains represent the most dramatic topography in the Midwest.

In a long proposed pipeline project such as this one, it is difficult to select any specific areas of preeminent aesthetic value. In general, most parks and recreation areas are maintained in a natural state to enhance their aesthetic value. In addition, unique features such as those described above may occur along or be visible from the proposed right-of-way. These could not be determined without a right-of-way survey. However, no official state scenic areas would be crossed by this proposal.

8. Socioeconomic Considerations

Population and economic trends in the western Lake Superior region are representative of much of the Great Lakes Basin. Projections indicate a moderate increase in population of approximately 38 percent between 1970 and 2020. Agricultural employment will continue to decline from its current level of 2.2 percent to less than 1 percent of the total area employment by 2020. Mining employment will remain fairly constant but will decline in relative importance. Manufacturing employment will increase but at a slower rate than the growth rate of total employment. Urbanization can be expected to increase from the present 63 percent urban population as agricultural employment declines.

Tourism has a considerable impact on the economy of the Great Lakes region. A Bureau of Outdoor Recreation study 1/

1/ U.S. Department of the Interior, Bureau of Outdoor Recreation, "Water Oriented Recreation in the Lake Superior Basin," Ann Arbor, Michigan, October 1970.

of water-oriented recreation in the Lake Superior Basin indicated that an estimated 1.4 million tourists came to that area in 1964. The same report estimated tourist expenditures that year at $50 million. By 1977, it is estimated that these figures had nearly doubled. In the future, the importance of tourism is expected to increase in this region.

Because economic and demographic patterns vary widely along the proposed pipeline route, a brief sketch of the socio-economic characteristics of the areas along each proposed loop section follows.

Loop Section 1 - This rural area in Kittson County, Minnesota, is mainly agricultural, with 46 percent of the county land area in crops. The population is declining steadily, falling nearly 20 percent in the county from 1960 to 1970.

Loop Section 2 - The town of Thief River Falls (pop. 8,018) is the dominant economic factor along this section of pipeline. The snowmobile manufacturing plant here is the major employer; however, agriculture still runs a close second. The trend to larger farms will reduce the number of farm workers in the future and net out-migration is likely to continue for some time.

Loop Section 3 - This is the beginning of the heavy recreational area to be traversed by the pipeline route. This loop would pass within 2 miles of the city of Bemidji, the recreational, educational, and market center for north-central Minnesota. Bemidji had a 1970 population of 11,490, a 20 percent increase over 1960. Recreation-related employment is not categorized in census figures, but it is estimated to be high. Other occupational categories in this area are agriculture and forestry, wood products manufacturing, and wholesale trade.

Loop Section 4 - This loop would lie entirely within the Chippewa National Forest. The recreational dependence of this area is obvious. Small residential areas located on private land within the forest boundaries provide the only resident population in the area. These include the towns of Bena (pop. 169) and Ball Club. Since Chippewa is a multiple-use forest, residents may be engaged in recreation-related occupations, or in forestry or agriculture. This loop would also pass through a portion of the Leech Lake Indian Reservation.

Loop Section 5 - This loop would be located mainly in the Floodwood Swamp, where little development of any kind has occurred. The swampy lowlands are unsuitable for heavy

agricultural uses; however, some pasture land and hay crops are found. The surrounding area outside of the swamp has had to depend on industry, and so its economy revolves around the paper mills in the area. The area is experiencing a declining population.

Loop Section 6 - This loop would be influenced by its location near the Duluth-Superior standard metropolitan statistical area (SMSA). The combined 1970 population of this area was 265,350. This area serves as the shopping and manufacturing center for the region. Outside of the SMSA, manufacturing is still the predominant industry along with agriculture and forestry. Out-migration is still a problem in this region, however.

Loop Section 7 - With the exception of Ashland County, this section crosses mainly lightly populated rural areas. In Ashland County, the city of Ashland (pop. 9,615) is the predominant influence. Ashland is the service center for the region, but as an urban area it experienced 8.5 percent unemployment in 1970, a figure among the highest in the state. In the rural areas, forestry and agriculture, as well as their related processing industries, account for over 40 percent of the employment.

This loop section would also cross portions of the Bad River Indian Reservation. About 700 Chippewa Indians live on the reservation. Until recently, there had been an out-migration trend similar to the surrounding area; however, this has been reversed, as many Indians are returning to the reservation.

Loop Section 8 - This entire loop section would be located in the Ottawa National Forest. Recreation-related employment is therefore high. There are two small townships located on private land within this area-- Marenisco (pop. 635) and Watersmeet (pop. 711). Mining is also important to Gogebic County; however, the predominant occupations are and will continue to be recreation and forestry.

Loop Section 9 - This rural area in Iron County, Michigan, depends mainly on forestry. Population counts are decreasing and are expected to continue to decline, with limited economic development.

Loop Section 10 - The small residential areas along this proposed loop section are mainly dependent on recreation-related employment associated with the Nicolet National Forest. Some agricultural and forestry-related employment also takes place in

this area. Net out-migration still occurs in this area, although it has been slowed by the increasing recreational development.

9. Cultural Resources

The environmental staff has consulted the National Register of Historic Places and found that no National Register properties would be impacted by construction of the proposed pipeline loop sections. Great Lakes has consulted with the Minnesota Historical Society, the Wisconsin Historical Society, and Dr. Marla Buckmaster of Northern Michigan University to determine that no known cultural resources would be impacted. Several cultural properties are near Great Lakes' proposed pipeline looping areas. Two early settler cabins lie about 1 mile from the proposed route of Loop Section 3, and Indian mounds are known to lie within one-quarter mile. An historic village is located a mile away from Loop Section 4, and two mounds are within one-third mile of the proposed route. Floodwood and Scotts Corner are historic towns a mile or less away from the proposed right-of-way of Loop Sections 5. A military road lies within a mile of the proposed route of Loop Section 8. There are no known historic properties near Great Lakes' proposed Loop Sections 1, 2, 6, and 7.

Michigan Wisconsin has indicated that no cultural resources would be impacted by the proposed construction of Loop Sections 9 and 10.

10. Air and Noise Quality

The description of the existing air and noise quality for the project area is limited to the immediate environments of the two proposed compressor station additions. These units represent the only sources of air and noise emissions during the project's operational phase. While pipeline construction would result in the emissions of air pollutants and noise, the impact in any specific location would be only temporary. Therefore, a detailed description of the existing air and noise environments for all areas of pipeline construction is not necessary.

a) Air Quality

Both the Mountain Compressor Station in Oconto County and the Kewaskum Compressor Station in Sheboygan County are located

within the Lake Michigan Intrastate Air Quality Control Region of Wisconsin. With the exception of the Green Bay area, this region is characterized by relatively good air quality. Oconto and Sheboygan Counties are classified as attainment areas for all criteria pollutants, indicating that ambient concentrations are lower than the national ambient air quality standards.

Ambient nitrogen dioxide (NO2) data for this region was obtained at two monitoring stations in both Oshkosh, Wisconsin, about 35 miles northwest of the Kewaskum site, and in Door County, Wisconsin, about 60 miles east of the Mountain Compressor Station. 1/ The Door County station recorded a 24-hour high of 18 $\mu g/m^3$, while the Oshkosh station recorded 24-hour highs of 47 and 56 $\mu g/m^3$. A tentative annual arithmetic mean (based on only two or three valid sampling quarters) of 24 $\mu g/m^3$ was estimated for one of the Oshkosh stations. This level is significantly below the national ambient air quality standard of 100 $\mu g/m^3$. Data at the other stations was insufficient to calculate annual means.

The existing facilities at the Kewaskum Compressor Station consist of one 1,100-hp turbine-driven centrigugal compressor and four 660-hp reciprocating compressors. The maximum daily emissions for the total 3,740 hp are listed in Table 6. (See page .) All five units burn natural gas, a relatively clean burning fuel, and the emissions of all pollutants except nitrogen oxides (NO_x) are relatively low.

In their original application (Docket No. CP75-278, March 26, 1975), Michigan Wisconsin proposed to increase their existing 7,500-hp turbine-driven centrifugal compressor at the Mountain Compressor Station to 12,000 hp and to install an additional 12,000-hp compressor at this site. However, in a separate action involving Docket No. CP74-213, Michigan Wisconsin received FPC approval to increase the existing 7,500-hp unit to 12,000 hp on September 26, 1975. Maximum daily emissions for the existing 12,000-hp compressor at the Mountain Compressor Station are listed in Table 6. This unit would be sufficient to compress Phase I gas volumes, while the additional 12,000-hp unit would be required for Phase II. Again, NO_x is the primary pollutant emitted at this site.

b) Noise Quality

Existing noise levels at the Mountain Compressor Station range from 55 to 60 dBA at a distance of 400 feet from the compressor building. There are no residences within 1 mile of

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1/ Air Quality Data - 1975 Annual Statistics, U.S. Environmental Protection Agency 450/2-77-002, May 1977.

the site. At that distance, compressor noise levels are estimated to attenuate by more than 20 dBA and have a negligible impact on ambient noise levels.

The nearest residence to the Kewaskum Compressor Station is located 600 feet north of the compressor building. Existing noise levels of 55 to 60 dBA measured at 400 feet from the compressor building are estimated to attenuate to approximately 51 to 56 dBA at the nearest residence. A continuous noise level of 56 dBA corresponds to a Ldn of about 63 dBA 1/, a level characteristic of an urban residential area.

1/ EPA uses two descriptors, the Ldn and the Leq (24) to quantify ambient noise. The Leq (24) represents the A-weighted sound energy averaged over a 24-hour period while the Ldn represents the Leq (24) with a 10 dBA weighting applied to nighttime sound levels (10 p.m. to 7 a.m.). "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety," U.S. Environmental Protection Agency, 550/9-74-004, March 1974.

C. ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

1. Climate

The proposed project would have no identifiable impact on the climate of the western Great Lakes region.

2. Physiography, Topography, and Soils

Construction of the proposed pipeline loop sections and compressor facilities would cause increased soil erosion, some loss of agricultural soil productivity, and localized disturbance of soil-water conditions, especially in wetland areas. Minor topographic impact would result from the slight soil berm typically left over the pipeline trench to compensate for soil settlement and compaction. However, there would be no significant impact on the physiography of the region.

Soil erosion problems caused by the pipeline loop construction could be pronounced in some areas of moderate to strong topographic relief. The area of greatest concern is proposed Loop Section 6, where there is a combination of highly erodible lakebed sediments and sandy outwash deposits and sharp local topographic relief. Outwash deposit soils are difficult to revegetate because their coarse-textured substrates have little capacity for holding moisture. Stripping the surface vegetation from outwash deposit soils invites serious gully erosion unless mulching or other moisture-holding revegetation practices are implemented. Lakebed sediments, on the other hand, have a high clay content and are usually water-saturated at a relatively shallow depth. Primary limitations of these soils are their low shear-strength and high shrink-swell potential. Construction on these lakebed sediments may cause bank slumping, trench collapse, and gully erosion.

The proposed Loop Sections 1 through 5 would present only very minor erosion potentials because most of the terrain traversed would be relatively flat. Proposed Loop Sections 7 through 10 possess a more serious erosion potential due to the rolling topography and abundance of outwash-type deposits. However, problems should be of a localized nature, and should be responsive to control by mulching, seeding, and fertilizing.

Agricultural soil fertility losses can occur due to mixing of the fertile topsoil layer with less fertile subsoil from the pipeline trench. The problem can be reduced by "double-ditching" to segregate the topsoil from the subsoil materials. Another problem encountered in agricultural areas is the disruption to farm operations caused by the open pipeline trench and by the soil berm placed over the trench to compensate for future soil compaction and settlement. The trench area may be sufficiently uncompacted and soft to impede normal cultivation for several years following construction. In extreme situations, it may be necessary to cultivate a single field as two field units, one on either side of the backfilled trench, for several growing seasons. Levels of agricultural productivity would probably be reduced during this interval; however, the lost productivity should not be significant. Pipeline trenching can also damage agricultural drainage tile and otherwise affect shallow groundwater movement. Proposed Loop Sections 1 and 2 traverse most of the agricultural lands which would be affected by the proposed project.

There are several mechanisms by which pipeline construction can result in disturbance to near-surface groundwater flows in wetland soil areas. Construction activities may compact soils in the trench vicinity, effectively damming normal groundwater movement to the downhill side of the pipeline. In some areas, subsoil clay layers (fragipans) cause perched water table conditions which in turn support surface wetlands. Such wetlands can be permanently damaged if the subsurface clay layer is perforated by the trenching operation. Drainage of wetland areas sometimes results from water movement along the pipeline trench, even when backfilled. In such situations, trench plugs may be needed to prevent water drainage at the wetland periphery. Other problems of a similar nature can usually be alleviated by giving attention to local conditions during the project planning and as construction proceeds.

While all proposed loop sections would cross wetland areas, the major wetlands traversed would occur within Loop Sections 4, 5, and 8. The proposed 20-mile crossing of the Floodwood Swamp within Section 5 may require extensive use of ballast and anchor devices to prevent pipeline flotation. Additional discussion of construction impact in wetlands can be found in Sections C.4 and C.5 which address hydrology and vegetation.

3. Geology

The proposed project would have an insignificant impact on regional geology and mineral resources extraction activities. Many areas along the pipeline route are deeply mantled with glacial drift deposits and have little potential for hard rock or other mineral resource development. Even if economically attractive mineral deposits were identified in the immediate area of the project rights-of-way, relocation of the pipelines would be possible, if necessary.

Pipeline emplacement may require some blasting of the bedrock, especially in the more rugged terrain encountered in the Michigan-Wisconsin border area. Exact blasting locations would be established after a complete review of the existing mainlines' installation records are corroborated by field investigations. It is not anticipated that blasting of a new trench would result in any damage to the existing mainlines.

4. Hydrology

Potentially, the most significant surface water quality impact associated with the proposed loop constructions would be erosion. Stream crossing operations and runoff from adjacent denuded areas would create increases in concentrations of suspended sediments.

Alteration of chemical concentrations through disruption of the stream bottom and runoff would also occur. Biochemical oxygen demand, dissolved oxygen levels, and nutrient levels would be affected by the proposed construction. Toxins or compounds that could be released by runoff or disturbance of riverbed sediments could cause shifts in pH, changing the biological productivity of the affected area. The release of additional nutrients would be beneficial as food for stream organisms, provided the total oxygen demand did not exceed reoxygenation capabilities. Factors that would determine the amount of material which would be introduced to or resuspended in the water column would include stream velocity and turbulence, riverbank and substrate composition and slope, soil erosion potentials, and the time necessary to stabilize the backfilled trench and banks. All such changes would be temporary, and conditions would tend to return to normal shortly after completion of construction.

Any construction-associated spills or leaks of petroleum products into exposed groundwater tables or surface watercourses would adversely affect water quality. Fertilizers applied to the rights-of-way could also affect water quality adversely if washed or blown into streams. Trenching, pipelaying, and backfilling at stream crossings would temporarily disrupt stream channels and floodplains.

Groundwater would be affected by proposed construction activities in areas where the trench would encounter a water table at or near the surface. In such areas, trench dewatering would be required, resulting in a localized lowering of the water table and a temporary alteration of local groundwater flow. Careless dewatering discharges could result in increased erosion and the introduction of suspended sediments and other pollutants into existing watercourses.

The most significant impact previously associated with the crossing of lowland swamps by rights-of-way in the project area has been drainage disruptions. Slow swamp flows have been obstructed by the effective damming action of the rights-of-way. This has resulted in raising the water level on the upstream side of the rights-of-way, thus killing the timber growing there. This has been mitigated by the use of suitably spaced cross ditches which maintain the natural flow and existing water levels in areas adjacent to the rights-of-way. If cross ditches were not used or became obstructed, this type of impact could recur.

Table 5 presents a compilation of available data on the sources of water proposed for use for hydrostatic testing. To prevent any adverse effects on the source when test water was withdrawn, only the larger sources would be used. Fish screens would be used to prevent entrainment of fish in the test water. To prevent erosion and siltation when hydrostatic test water was discharged, the discharge rate would be controlled. Water would be filtered or discharged to a settling pond if suspended solids were present. It is not anticipated that any significant environmental impact on hydrology and water quality would result from the proposed hydrostatic testing.

The Wild and Scenic Rivers Act, Section 10(a), states that "Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system, without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values."

TABLE 5

POTENTIAL SOURCES OF HYDROSTATIC TEST WATER
AND QUANTITIES AVAILABLE

Loop Section	Water Source	Quantity Available (Thousands of gal/hr)	Quantity to be Utilized (Thousands of gallons)
1	South Branch Two Rivers	54	2,344
		2,693 to 5,386	8,063
2	Clearwater River		anticipated to have a source other than local river water, such
3	None (Pipeline Loop 3 is anticipated to have a source other than local river water, such as trucked water from other sources. These sources have not yet been determined.)		
		10,771 to 13,464	5,859
		2,020 to 2,424	9,040
		808 to 1,346	3,906
4	Mississippi River	5,386	3,348
5	Swan River	4,039	2,232
6	Pokegama River	1,346 to 2,020	1,172
	Namadji River	11,559 to 12,791	10,658
	Ammicon River	1,346 to 2,020	3,236
	Middle River	8,080	4,185
Section 6 Totals		4,039 to 5,386	3,348
		13,464 to 15,660	10,770
7	North Fish Creek	5,386	6,026
	White River	8,080 to 10,771	3,348
	Bad River	14,810 to 17,503	11,328
Section 7 Totals		157,000 2/	1,746
8	Presque Isle River	1,527	3,628
	Cisco Branch Ontonagon River		
Section 8 Totals			
9	Connection Between Second and Third Lakes 1/		
10	Gasler Creek 1/		

1/ Michigan Wisconsin indicates that these sources are examples of the several available sources.

2/ Michigan Wisconsin estimates this quantity would be available from the nearby lakes.

The Mississippi River is proposed to be crossed at a location where it meanders extensively and where it would be necessary to traverse nearly a mile of associated wetlands. Although it is not anticipated that significant long-term environmental impact would occur because of the proposed crossing, the river's scenic, aesthetic, and scientific features would be disturbed for at least the duration of the proposed construction and restoration period, and the potential for long-term impact would exist. Because a continuous pipeline loop is not required in the area between the Shevlin and Deer River Compressor Stations, construction of proposed Loop Section 4 could be stopped short of the proposed Mississippi River crossing with the remainder of the necessary loop mileage constructed within a less environmentally sensitive area. (See Chapter H, "Alternatives to the Proposed Action.")

Winter construction through the bogs of proposed Loop Section 5 should mitigate most significant hydrologic impact. However, overestimating the amount of subsidence that would occur with the ice-rich backfill could result in the formation of a berm and subsequent bog drainage disruption.

No significant impact on surface or groundwater quality is anticipated from the normal operation and maintenance of the proposed facilities. Gas escaping from severe leaks or rupture of the pipeline has a low solubility in water and would be quickly dissipated. However, repairs or maintenance work at stream crossings or in wetlands could cause impacts similar to those incurred during construction. Repair or maintenance impact would be greater than construction impact if summer repair or maintenance work were necessary in the wetland areas proposed to be crossed in the winter.

5. Vegetation

Construction of the proposed pipeline looping would require the clearing of approximately 742 acres of vegetation for new right-of-way (3 acres per mile) and approximately 1,485 acres of existing right-of-way vegetation, assuming that about 50 feet of the existing right-of-way would have to be cleared.

Construction of Loop Sections 1 and 2 through northwestern Minnesota's prairie region would have relatively little adverse impact on natural vegetation, since most of the land is cultivated. Some clearing of bottomland hardwood forests might occur in the vicinity of streams such as the South Fork Twin River, Lost River, and Clearwater River, which could have local adverse effects on soil stability, hindering revegetation efforts. Construction through prairie wetlands would exert temporary adverse impact on this vegetation, but these areas would recover readily if the existing water regime were preserved.

Pipeline construction through forested areas would require removal of trees, resulting in relatively long-term impact. The northern continental climate results in a lengthy recovery time for cut-over areas, as exemplified by the low density and small size of trees on the 10-year old existing right-of-way. The construction right-of-way would attain a stabilizing cover of herbaceous vegetation fairly rapidly, however, and the unmaintained right-of-way border would eventually become reforested. Such impact would occur along Loop Sections 3 through 10.

Construction through wetlands could potentially exert significant adverse impact on these communities if waterflow patterns were altered. The interruption of normal waterflow in wetlands of the Great Lakes states by roads, railroads, and pipelines has reportedly damaged thousands of acres of timber by flooding tree root zones in the drainage above obstructions and drying lands below the obstructions. Pipeline construction could cause this effect by leaving a raised berm across a wetland or by compacting the porous surface layers of bog soil, where much of the waterflow occurs. Following construction of the existing Great Lakes mainline, a berm 1-foot high remained over the backfilled trench across a 20-mile stretch of bog forest where proposed Loop Section 4 would be built. This berm still persists. Bog forests would be slow to recover from clearing because tree growth is very slow in these communities, although shrubby plants such as alders may recover fairly rapidly. Although wetlands occur along all of the proposed loop sections, Sections 4, 5, and 8 would traverse particularly extensive wetland areas--primarily bog and bog forest.

In areas of lakebed clay soils and other erodible substrates on steep slopes, vegetation recovery could be inhibited by erosion unless preventative measures were carried out. Loop Sections 6 and 7 would traverse limited areas where erosion hazards have been noted.

6. Wildlife

Destruction of wildlife habitat during construction would be confined to the existing rights-of-way and the 25-foot extension. Grading and vegetation clearing in upland areas would remove food sources of browsing and foraging species which feed on the shrubs, herbs, and grasses within and adjacent to the existing rights-of-way. This reduction would be minor and temporary if the rights-of-way are quickly revegetated. Trees cleared from the rights-of-way would represent a minor loss of feeding and nesting sites for woodland birds such as warblers, chickadees, and woodpeckers.

Construction activities could destroy slow-moving animals such as reptiles, amphibians, and small mammals. Since construction would occur in late summer or winter when the reproductive season of most species would be over, destruction of young animals in nests and dens would be avoided. This construction schedule would also reduce any disturbance of noise-sensitive species during their breeding seasons.

The permanent rights-of-way would be maintained to prevent the establishment of large trees and shrubs. This increase in open acreage within upland forest might have beneficial effects on some animal species, but it is unlikely that there would be any significant changes in local wildlife populations. Where the routes cross cropland or pasture, there would be little impact on wildlife since the lands would return to their previous condition following construction. Any detrimental effects on wildlife would be limited to the short construction periods.

Construction in the bog forests and swamps should not have any impact on wildlife other than that previously described. Obstruction of waterflow by the pipeline could cause a reduction in tree growth and in some cases, the death of trees in areas adjacent to the rights-of-way. This would cause an additional loss of habitat for some species of forest wildlife; however, other species might benefit. Most problems of obstructed waterflow can be minimized or eliminated by proper construction methods during pipeline installation.

None of the federally protected endangered or threatened species or their habitats would be significantly impacted by the proposed project. Since the peregrine falcon occurs only as a rare migrant, it would not be affected by habitat loss or disruption of nesting. The proposed looping within Minnesota, with the exception of Loop Section 1, are located at the periphery of the timber wolves' range in Minnesota. The density of wolves in this part of its range is very low compared to the northeastern part of the state. The proposed broadening of the existing rights-of-way would not have any appreciable impact on wolves in the vicinity of the project.

The proposed pipeline looping would be located within the range of bald eagles which nest in the Great Lakes region. Construction of the looping is scheduled for late summer and winter and would avoid the periods of nest selection, nesting, and rearing of young when the birds are most sensitive to human disturbance. Since the looping would be located adjacent to existing rights-of-way, there would be no increase in human disturbance of remote areas which are usually favored for nest sites. Inspection of the rights-of-way by airplane overflight could cause disturbance of eagle nesting, but this impact could be avoided by proper scheduling and location of overflights.

Loop Section 4 would cross part of the Chippewa National Forest which is a major breeding area for bald eagles. About 100 pairs are known to nest in the forest's 1,650,000 acres of land and water. In this major breeding area, the pipeline would be constructed within a transmission corridor which avoids eagle nesting sites. The proposed pipeline would therefore be expected to have no effect on eagle nesting in the forest.

Although several species listed by Minnesota, Wisconsin, and Michigan as rare, endangered, or having declining populations are likely to occur in the vicinity of the proposed project, construction and operation of the proposed facilities would not be expected to significantly affect their populations.

Construction of the proposed pipeline looping would require crossing numerous rivers and streams. Many of these waterways (see Table 2) are of exceptionally high quality and support important trout fisheries. Since high water quality must be maintained in these trout waters, the pipeline crossings of these rivers and streams present a potential for significant local environmental damage.

Removal of streamside vegetation, grading by heavy construction equipment, and pipeline trenching result in increased erosion, turbidity, and siltation. Severe turbidity and siltation can cause the destruction of eggs, fry, benthic organisms, and vegetation, decrease light penetration and dissolved oxygen, and cause an overall reduction in the diversity and "health" of the aquatic environment. Sediment carried by runoff from the exposed rights-of-way can contribute to siltation problems. Clearing of streamside vegetation not only contributes to siltation but also reduces shade which helps keep down water temperatures.

Trenching operations in the stream and river beds would cause destruction of benthic organisms which are an important food source for many species. This direct impact would be restricted to a small area which could quickly be repopulated if a suitable substrate is provided and water quality remains high.

The degree to which any of the stream and river environments are affected by pipeline construction varies among the streams, but in general the impacts are temporary, though during construction they may be moderately severe near the crossing. However, if proper erosion control measures such as bank stabilization, revegetation, and continued inspection and maintenance of the rights-of-way are not implemented, there is a potential for long-lasting local impact on water quality and aquatic life. Some incidences of inadequate bank stabilization and resulting erosion have been noted at river crossings associated with the existing Great Lakes pipeline. Use of the rights-of-way by off-road vehicles has further induced and aggravated erosion problems at some sites along the Great Lakes right-of-way.

7. Land Use, Recreation and Aesthetics

a) Land Use

Construction of the proposed 245 miles of looping would require the commitment of an additional 742 acres of land as established rights-of-way for the life of the project. This acreage is minimal, because it represents the addition of only 25 feet to the existing 75-foot wide rights-of-way. The effect of this expansion will vary with the land traversed.

Approximately 41 percent of the proposed looping would cross bogs and bog forests. The impact on these resources is more fully discussed in Sections C.4 and C.5. Approximately 35 percent of the proposed looping would be constructed in forest lands.

Trees within the broadened rights-of-way would be cleared and the corridors maintained in an early successional state, eliminating forest resources for the life of the project. The cumulative effect of this expansion would not be serious; however, individual property owners might suffer some adverse impacts. These include a possible loss of timber income and increased encroachment of the cleared rights-of-way into private properties.

Approximately 24 percent of the proposed looping would be constructed on agricultural or pasture lands. No long-term impact would be expected on these lands; however, crop or pasture within the expanded rights-of-way would be lost for an average of one to two growing seasons. These lands would be allowed to return to their original use after construction.

The proposed route does not appear to conflict with any official local land use plan examined by the staff to date. There might be some temporary disruptions when the construction passed through or near residential areas, but this is expected to be minimal.

b) Recreation

The major impact on recreation would come during the construction of the loop sections through national and state recreation areas. Visitors to the parks and forests crossed would be exposed to noise from the heavy machinery and dust from clearing and excavation. Often these activities would be adjacent to or within sight of campsites. Although construction in each area would be short, the danger is that visitors might associate the entire recreation area with the construction, thus reducing use. After construction was completed, the impact would be minimal.

c) Aesthetics

The aesthetic impact of this project is difficult to quantify. Although the cleared rights-of-way are seen as an artificial landform in forested areas, the effect of broadening

these artificial forms may not be as damaging as the establishment of new corridors. In most cases, the broadened rights-of-way would probably not be perceived as anything more than an incremental addition to the intrusion resulting from the existing corridors and therefore would have minimal impact.

A specific instance where broadening the existing rights-of-way could have a potentially significant impact would occur at the proposed upper Mississippi River crossing within Loop Section 4. This portion of the river has been proposed for inclusion in the National Wild and Scenic River System. The looping would parallel and widen an existing right-of-way at this point, thus increasing the aesthetic impact of the crossing.

8. Socioeconomic Considerations

The socioeconomic impact of the proposed pipeline looping project includes many of the same elements of any other pipeline construction project. Communities near the pipeline routes would experience the temporary benefits of increased purchases of goods and services by transient construction crews. Most of the region has an excess service system capacity, so no burden on local facilities from this short-term demand would be expected. Division of the construction into two phases would further limit this impact. In agricultural areas, short-term minor economic losses might be incurred because of the disruption to crops and cultivation and harvesting schedules. Grazing animals might have to be temporarily relocated, which could involve economic costs. Landowners would be compensated for losses by the applicants, and all agricultural land would be restored to its original use after construction.

There might be some minor socioeconomic impact from construction on the two Indian reservations. Short-term disruptions of hunting and fishing areas might occur. If properly arranged with tribal representatives prior to construction, such impact is expected to be minimal.

Installation of the additional compressor units at the Mountain and Kewaskum stations would have a negligible socio-economic impact on the region.

The major economic impact of pipeline operation would be the addition of the proposed facilities to the tax base. Tax assessment procedures vary considerably in different jurisdictions, and therefore the total tax benefits of this project cannot be

readily estimated. Michigan-Wisconsin, however, has estimated that its portion of the project, proposed Loop Sections 9 and 10 and the expansion of the two compressor stations, would provide approximately $35,000 per year to counties in Michigan and $84,000 per year to counties in Wisconsin. Similar figures are not available for the Great Lakes portion of the project.

9. Cultural Resources

Impact on cultural resources due to construction of the proposed pipeline looping sections cannot be determined until site identification studies are performed. A lack of known sites in an area is a better indication that surveys have not been made rather than an indication that there are no cultural properties. The Minnesota State Historic Preservation Officer cites a recent survey nearby in which only 2 of the 30 sites discovered (i.e., less than 7 percent) had been previously recorded. The rights-of-way along which the proposed looping sections would be constructed cross many streams and near a great number of lakes and marshes. Prehistoric sites would be expected in these areas because aboriginal peoples tended to settle near water, often within a thousand feet of streams or lakes.

Direct and indirect adverse impact to intact portions of cultural properties on or near the proposed rights-of-way could occur as a result of any terrain modifications, such as land clearing, grading, quarrying for fill material, trenching, backfilling, and heavy equipment movement. Construction of the mainlines which the proposed looping would parallel may have disturbed cultural resources over or near which it passed. However, the degree of disturbance would vary so that there still may be intact portions of sites on the rights-of-way.

10. Air and Noise Quality

a) Air Quality

During the construction of the proposed pipeline looping, the main sources of air pollutants would be the exhausts from the gasoline- and diesel-powered construction equipment and fugitive dust from general construction activities. Under

unfavorable meteorological conditions, exhaust emissions could cause a localized increase in ambient pollutant concentrations. Since pipeline construction in undeveloped areas typically proceeds at the rate of about 1 mile per day, the impact at any specific location would be short-term. The entire 125 miles of Phase I pipeline looping proposed by Great Lakes would be constructed over a 3-month period.

Fugitive dust from vehicular traffic on unpaved roads, materials stockpiling, and grading, trenching, and backfilling operations would be an additional source of particulate matter (PM) emissions. The extent of dust generation would depend on the level of construction activity and soil composition and dryness. Because of their relatively large diameter, dust particles tend to settle in the vicinity of the construction site. However, dry and windy weather could create a nuisance for any nearby residences, if proper dust suppression techniques were not implemented.

Land clearing wastes from the rights-of-way might be disposed of by open burning in some locations, after the appropriate burning permits had been obtained. The smoke from open burning could cause a temporary nuisance for nearby residences.

During the operational phase, the primary sources of emissions directly related to the proposed project would be the two compressor station additions required to transport Phase II gas volumes. The existing compressor facilities would be adequate to transport the gas volumes proposed for Phase I of this project. Minor emissions would also result from occasional pipeline maintenance and repair activities.

The maximum daily emissions for the proposed 3,500-hp compressor addition to the Kewaskum Compressor Station are listed in Table 6. On an annual basis, this unit would emit approximately 80 tons of NO_x and much lower quantities of the remaining pollutants. At this time, no Federal emission standards apply to this unit. However, on October 3, 1977, EPA proposed new source performance standards (NSPS) for gas-turbines larger than 1,000 hp. Emissions of NO_x and sulfur dioxide (SO_2) would be limited to 75 and 150 ppm, respectively. When finally promulgated, the NSPS would immediately apply to new, modified, and reconstructed gas-turbines greater than 10,000 hp, while smaller units would be exempted for 5 years from the date of the proposal. Although the actual schedule for implementing Phase II is uncertain at this time, it is likely that the NSPS would apply to the 3,500-hp compressor addition. Under current regulations, the unit would not qualify as a "major source" as defined by EPA, since the emissions of any pollutant are less than 100 tons per year, and a detailed ambient air quality analysis is not required.

TABLE 6

MAXIMUM COMPRESSOR EMISSIONS
(lb/Day)

LOCATION	NO_x	HC	CO	PM	SO_2
Mountain Compressor Station 1/					
1) Existing 12,000-hp unit	1647	71	172	Trace	0.07
2) Proposed 12,000-hp addition	82	64	325	Trace	0.03
Kewaskum Compressor Station 2/					
1) Existing 3,740-hp unit	3717.2	81.9	165.5	Trace	0.06
2) Proposed 3,500-hp addition	564	NIL	47	Trace	0.08

1/ Source: Michigan Wisconsin Pipe Line Company, March 1978 letter to Joel Zipp, Staff Counsel, FERC.

2/ Source: Docket No. CP75-278, Michigan Wisconsin Pipe Line Company and ANG Coal Gasification Company, Volume II, filed March 26, 1975.

Note : Normal operating conditions are 80 percent of full load.

Table 6 lists the maximum daily emissions for the proposed 12,000-hp compressor addition at the Mountain Compressor Station. These emissions estimates reflect the reduction in NO_x emissions required by the NSPS.

Stack data estimates are not available for the proposed 12,000-hp compressor addition, due to the possible engine modifications required to comply with the NSPS. Therefore, the combined impacts on ambient air quality from both existing and proposed compressors at the Mountain Compressor Station were estimated based on the stack data available for the uprated 12,000-hp compressor. 1/ Maximum short period concentrations for various combinations of windspeed and atmospheric stability class were estimated using EPA's PTMAX program. The analysis found a maximum 1-hour level of 28 $\mu g/m^3$ for NO_2 and 8 $\mu g/m^3$ for CO. Short period concentrations of the remaining pollutants would be negligible. The contribution to the annual average NO_2 level would be 1 to 2 $\mu g/m^3$ and would have little impact on the national ambient air quality standard of 100 $\mu g/m^3$. The impact on the other standards would be negligible.

New sources of air pollution having a heat input greater than 30 million Btu per hour are reviewed by the Wisconsin Department of Natural Resources. The department issues an approval after it determines that the source would comply with the appropriate emission standards and would not violate any ambient air quality standards (the Wisconsin and national ambient standards are identical). Both of the proposed compressor station additions would require review by the state.

The only state emission standard applicable to the compressor additions would limit PM emissions to 0.15 pound per million Btu heat input. The use of natural gas would permit compliance with this standard. No state SO_2 or NO_x emission standards apply to either unit.

b) Noise Quality

Pipeline construction would have only a minor impact on the noise environment in most locations since the major portion of construction would occur in remote areas having few permanent residences. In those areas where residences are located near the pipeline route, construction activities would temporarily

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1/ Stack height = 30 ft., stack diameter = 5.5 ft., stack temperature = 670°F, stack velocity = 105 ft./sec.

increase daytime noise levels. Nighttime noise levels would not be affected, since construction would be limited to daytime hours. Construction noise levels at the nearest residence, located approximately 100 feet from the pipeline, are estimated to range from 75 to 85 dBA. Exposure to such noise levels has been identified as causing outdoor activity interference and annoyance.

Operational noise levels would be limited to the two compressor additions. Since the noise environments in the vicinity of each station are controlled by the existing compressors, the noise from the additional compressors would have only a minor impact. Assuming that the compressor additions would double the magnitude of the noise emissions at each station, property line noise levels would increase by 3 dBA. At the nearest residence to the Kewaskum Compressor Station, the impact would be a slightly noticeable increase in perceived sound. The nearest residence to the Mountain Compressor Station, over a mile away, would not experience an increase in the ambient noise environment. No Federal or state noise regulation would apply to this type of facility.

D. MEASURES TO AVOID OR MITIGATE ADVERSE ENVIRONMENTAL EFFECTS

The most significant circumstance serving to mitigate the environmental impact of this project is that all of the pipeline loop sections would be constructed on or adjacent to existing rights-of-way, and only areas previously impacted by pipeline construction would be involved. Experience obtained during construction of the existing mainline and right-of-way restoration would allow the applicants to anticipate areas particularly sensitive to impact and apply preventative or remedial measures.

The applicants have indicated that adverse environmental impact would be mitigated or avoided through use of the following procedures:

--On cultivated lands with fertile topsoil, the "double-ditching" method of construction would be used. This method preserves topsoil for placement on top of the backfilled trench after construction. Growers would be reimbursed for crop losses suffered as a result of construction across cultivated land.

--Any drain tile cut during trenching would be replaced, with particular attention given to reestablishing the original tile line gradient and alignment. The pipeline would be placed far enough below tile repairs to insure that it would not interfere with normal drain tile operation. All repairs would be made so as to satisfy the landowner or tenant.

--Backfill would be compacted where the pipeline looping would cross ditches, terraces, banks or levees. Rock or sandbag riprapping and runoff diversion channels or terraces would be provided where necessary, especially on slopes.

--Explosives would be used only in accordance with required permits and authorization, under supervision of a licensed blasting expert. Mats would be used to contain explosion debris.

--The backfilled rights-of-way would be graded and restored to their original contours and stabilized by seeding, fertilizing, and mulching or by sodding and mulching. Native sod pegged in place would be preferred to seeding on steep banks. A mixture of red fescue, sheep fescue, bluegrass, redtop, ryegrass, clover, and/or other appropriate species might be used on mineral soils. Redtop, timothy, clover, and reed canarygrass may be used for wet, organic soils.

--The restored rights-of-way would be periodically patrolled to detect washouts, and immediate remedial action would be taken if any were found.

--As many existing trees on streambanks would be preserved as possible. Streambanks would be restored to their former grade and stabilized by a revetment of earth and cement-filled bags or rocks or by use of a retaining wall and supplemental riprapping and by revegetation of the banks.

--Full waterflow would be maintained during construction at stream crossings and turbidity controlled by the use of turbidity depressants such as silt screens. Crossings would be timed to avoid fish spawning periods.

--Only the larger streams would be used as sources of hydrostatic test water, and fish screens would be used during test water intake. Hydrostatic test water would be cascaded between test sections when possible, thereby reducing the volume of test water needed and the frequency of discharges. Discharge rates would be controlled and only approved discharge locations used. Discharges would be controlled by prohibiting open-end draining of the pipe, and through flow control reservoirs or settling ponds where appropriate.

--Existing waterflow and circulation patterns would be preserved in wetlands by restoring the original land contour and providing cross-drainage ditches across the backfilled trench where appropriate. Drainage along the pipe would be prevented. Impervious plugs would be used to seal swamp and marsh edges, preventing drainage downslope.

--Floodwood Swamp would be crossed during the winter while frozen, as would the Mississippi and Bad Rivers, thereby allowing conventional construction techniques to be used.

--Construction would be timed to avoid nesting seasons and periods of high migratory bird density when crossing streams and wetlands. Specifically, construction during late summer or winter would avoid any impact on migrating waterfowl at the proposed crossings of the South Branch Two Rivers, the Clearwater River, and the Lost River in western Minnesota. Right-of-way revegetation would restore potential wildlife habitat.

--A ranger from each state and national forest crossed would review plans and be detailed to the construction crew.

--The Indian tribal councils of the Leech Lake and Bad River Indian Reservations would be asked to name a representative to review plans for crossing these reservations.

--Should cultural resources be discovered during construction, prompt action would be taken to facilitate the removal and preservation of disturbed articles. The State Archaeologist would be notified to determine the discovery's significance and to initiate follow-up procedures.

Permit conditions established by local and regional authorities in granting permission to cross public lands would be instrumental in mitigating adverse impact. These conditions are often based on intimate local knowledge of the areas to be crossed and may serve to mitigate impact on specific sensitive areas. Private lands are usually not afforded this type of protection.

The staff believes that the applicants could further mitigate or avoid potential adverse impact through the use of procedures recommended in Chapter I,"Conclusions and Recommendations."

E. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACT

Regardless of the planning involved and precautions taken to prevent damage to the environment, construction activities will always result in some adverse environmental impact. The impact may be minor, to the extent that it goes unnoticed, may be cumulative and appear only in later stages, or may readily be seen and measured.

The removal of forests and other vegetation for the rights-of-way would result in lower primary productivity, the loss of some crops, the increased vulnerability of soils to erosion, and an adverse visual-aesthetic impact. The magnitude of the impact would depend on the local environment because some areas would involve more vegetation removal than others. For example, use of the existing rights-of-way entails less clearing, and the majority of the visual, aesthetic, and environmental changes would have already occurred. The impact of the vegetation removed in a farm field would depend on the season of construction. If construction took place before crops were to be harvested, the economic loss would be greatest.

The construction process of trench excavation would leave land scars that would be visible for several years. The fertile topsoils cannot always be replaced in their original postion, and altered structure or nutrient losses may lower soil fertility.

Some sediment-related damage to the aquatic ecosystems would occur where the pipeline crossed a waterway. The impact would vary, but there would be greater impact in the watercourses which flow faster, have more fine material in their beds and floodplain, or are fish resource streams. A stream with a combination of all these factors would have the greatest level of damage from sedimentation resulting from pipeline construction.

Sediment-related damage could affect the aquatic life of a waterway through direct mechanical damage, such as abrasion, and indirect damage from loss of habitat or food supply organisms. In some cases, an increase in the biochemical oxygen demand of the water would occur because nutrient-rich sediments would be released into suspension.

Pipeline construction through wetlands would entail a significant risk of disturbance to existing water circulation patterns and possible damage to wetlands beyond the immediate pipeline rights-of-way areas.

No structures would be permitted on the pipeline rights-of-way, thus restricting residential and commercial development in their paths. This could cause an adverse economic impact.

Associated with the pipeline construction would be the adverse impact of increased noise levels, vehicle exhaust emissions

and particulates released to the air, and disruption of traffic on roadways where the bore and casement method is not used. Construction at the compressor stations would also result in increased noise levels. The operation of the compressor engines would result in the emission of carbon dioxide, water vapor, unburned natural gas, sulfur dioxide, nitrogen oxides, and particulates to the atmosphere.

F. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The construction and operation of the proposed facilities would involve short-term uses of the environment during the life of the pipeline systems involved and would affect some aspects of the environment's long-term productivity.

Additional land occupied by the proposed facilities would be preempted from other productive use on a short-term basis; soil, air quality, water, and visual resources committed to the project would also experience short-term impact. Timber and mineral production, residential development, and certain types of recreational activity would be curtailed on the pipeline rights-of-way for the life of the project. Wildlife would avoid the rights-of-way areas during construction, and some species might be eliminated from the rights-of-way for the life of the pipeline facilities.

Balanced against these short-term uses of the environment would be a short-term gain from the use of a relatively clean-burning fuel in the applicants' general market area.

After termination of pipeline operations, the lands and environmental resources could return to their former use or function with little or no permanent reduction in their productive capacity. Biological resources damaged during construction and operation of the facilities would most probably regain their former productivity.

Among the possible long-term consequences of the facilities would be the intangibles of decreased wilderness area and negative aesthetic effects which would constitute a loss of environmental productivity to area residents, recreationalists, natural scientists, and others who value wilderness lands and scenic areas. However, because this project would result in only an expansion of existing pipeline rights-of-way, long-term losses of this type would be minimal.

G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Quantities of energy, materials, labor, and financial resources would be committed to the construction and operation of the proposed pipeline facilities.

Because of the nature of the pipeline looping project, additional fuel requirements would be limited to that consumed by the 15,500 hp of compression facilities proposed to be installed on the Michigan Wisconsin system during Phase II of the project. Since this operating fuel would be expended to make available significant new quantities of gas to a large distribution system, it is a minor use of fuel resources. The commingled synthetic and natural gas transported through the proposed facilities would be ultimately consumed and, therefore, irretrievably lost.

Any loss of soil through erosion, injury to endangered biota, or destruction of archaeologic resources would be irreversible and irretrievable. However, preventative measures are expected to significantly reduce losses of this type.

No resources other than those connected with energy and material expenditures would be irretrievably lost.

H. ALTERNATIVES TO THE PROPOSED ACTION

The alternatives to implementing the proposed project include:

1) Utilization of the proposed Northern Border pipeline

2) Alternative placement of pipeline loop sections

3) The alternative of no action

These alternatives are discussed in the following pages. Alternatives related to the coal gasification complex, such as energy sources, plant and process design, siting, resource utilization, and SNG product pipeline routes, except for the Northern Border alternative, have been adequately discussed in Chapter 8 of Interior's FEIS.

1. Utilization of the Proposed Northern Border Pipeline

The most attractive alternative to the proposed pipeline looping project would utilize the 42-inch diameter pipeline proposed by Northern Border Pipeline Company (Northern Border) in Docket No. CP78-124 (formerly CP74-290) to transport the proposed SNG from Mercer County, North Dakota, to the designated recipient gas companies, Michigan Wisconsin and Natural, in the upper Midwest. This transportation alternative would not only substitute for the 245 miles of looping proposed along the Great Lakes and Michigan Wisconsin systems, but would also avoid construction of all but approximately 25 miles of the proposed 365-mile long SNG product pipeline, thus eliminating approximately 585 miles of pipeline construction. 1/ The Northern Border pipeline (part of the Alcan Pipeline Project), proposed as the eastern leg of the Alaska Natural Gas Transportation System, would extend for 1,117 miles from Monchy, Canada, to Dwight, Illinois, passing through Mercer County, North Dakota, just south of the proposed gasification complex. The Northern Border project has been approved by the President of the United States and the Congress under the Alaska Natural Gas Transportation Act and was conditonally certificated by the FERC on December 16, 1977.

The Northern Border alternative, illustrated in Figure 2, would involve construction of approximately 25 miles of non-jurisdictional SNG product pipeline 2/ from the proposed

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1/ The proposed Northern Border pipeline is expected to pass within 25 miles of the gasification complex.

2/ Only those facilities required to receive the SNG, i.e., the interconnection, and to transport the commingled gas are presently under the jurisdiction of the FERC.

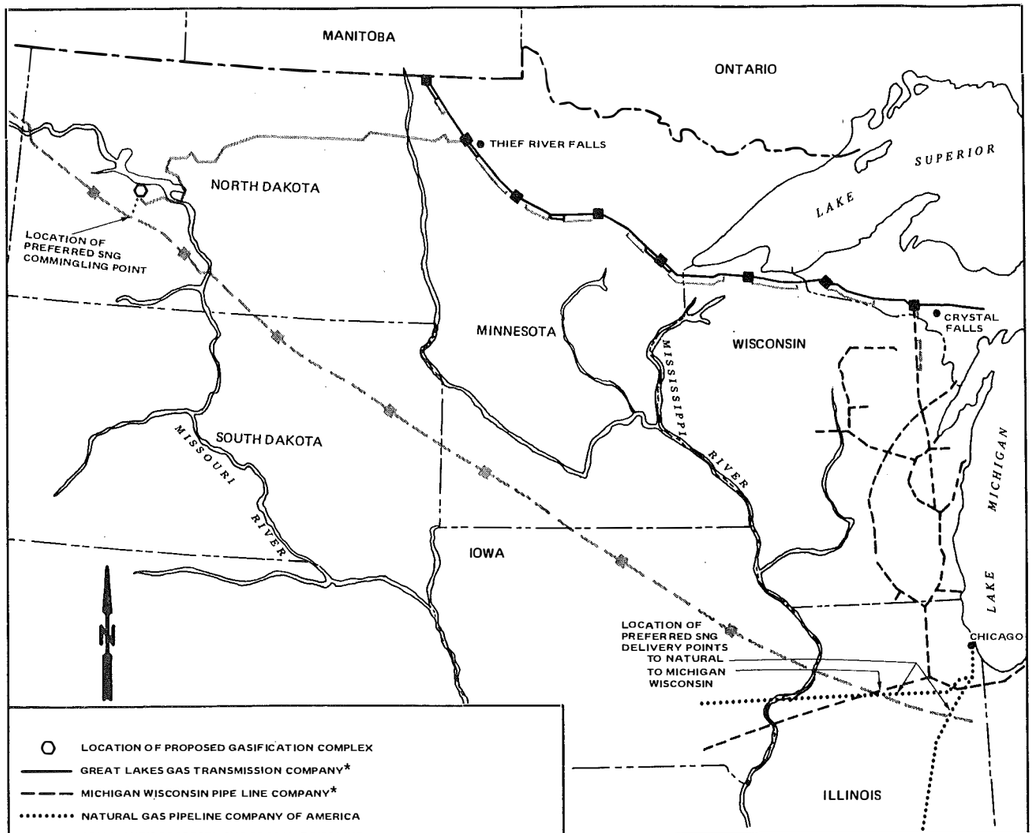

Figure 2

Applicants' Proposed SNG Transportation Arrangement
And The Northern Border Alternative

gasification complex, and an interconnection between the SNG pipeline and the proposed Northern Border pipeline. The proposed SNG would be delivered to Northern Border at a point approximately 10 miles south of Beulah, North Dakota, where it would be commingled with Alaskan and/or Canadian natural gas. Northern Border would then transport and deliver the commingled gas to Michigan Wisconsin at a proposed interconnection in Bureau County, Illinois, and to Natural at one or both of two proposed interconnections in LaSalle and Grundy Counties, Illinois. The Northern Border system would require either additional compression at seven stations between the receiving point in North Dakota and the delivery points in Illinois, or larger diameter pipe, or a higher operating pressure to handle the ultimate 275 million scfd of SNG. These modifications are both technically and economically feasible. Both Michigan Wisconsin and Natural appear to have sufficient capacity in their respective pipeline systems to receive and transport the scheduled Alaskan volumes plus the proposed volumes of commingled gas; no additional facility requirements are therefore anticipated. 1/

The alternative SNG product pipeline route would traverse predominately grassland prairie and agricultural lands similar to those surrounding the proposed gasification complex site as described in Chapter 2 of Interior's FEIS. Among the rights-of-way potentially available for the SNG pipeline, a proposed 345/500 kilovolt transmission line right-of-way which would proceed southward from the proposed Antelope Valley power plant 2/ would provide the most direct route. While this routing would encounter several small watercourses, i.e. Spring Creek, the Knife River, and possibly Coyote Creek, it is not expected that surface water impact beyond that described in Section 3.1.2.d of Interior's FEIS would be sustained. Other environmental impact resulting from construction of the alternative SNG pipeline would be similar to that described in Chapter 3 of Interior's FEIS for the proposed SNG pipeline route, but would be much less extensive, affecting only about 25 miles of right-of-way corridor rather than the 345-mile long route proposed.

1/ Based on information filed in Docket Nos. CP76-43 and CP76-44.

2/ The Antelope Valley Station, proposed by the Basin Electric Power Cooperative, would be an 880-megawatt lignite-fired steam electric generating plant to be located adjacent to the proposed gasification complex.

In comparison to the proposed SNG transportation system, the Northern Border alternative is clearly environmentally superior. Its impact would be minimal considering that only about 25 miles of new pipeline construction would be involved compared to the 365 miles of new SNG pipeline and a total of 245 miles of pipeline looping required in the applicants' proposal. Furthermore, because all looping requirements on the Great Lakes and Michigan Wisconsin pipeline systems would be eliminated, pipeline construction would be avoided in the numerous federally owned and other wetlands in Minnesota, Wisconsin, and Michigan. 1/

The applicants currently intend to form a consortium of pipeline companies to finance and own the gasification complex and presumably its SNG output. Should such an arrangement come about, the Northern Border alternative could offer an additional advantage in that wider distribution of the SNG among several participants may be possible with a minimum of new facilities.

Use of the Northern Border alternative has been estimated to save approximately $125 million 2/ over the construction cost of the proposed SNG transportation system.3/ Unit cost-of-service for transporting the SNG by way of Northern Border has been estimated at 37.70 cents/Mcf compared to 65.05 cents/Mcf with the proposed system. 4/

A potential problem facing use of this alternative concerns the timing of the coal gasification and Northern Border projects. As currently proposed, the gasification complex would begin SNG production in 1982,while the Northern Border pipeline would not be completed until 1983. There is a distinct possibility, however, that the Northern Border pipeline may be constructed sooner than 1983 to receive increased natural gas imports from Canada. It is also possible that the gasification complex could be delayed by a number of factors including financing or construction difficulties or a prolonged start-up period.

1/ Approximately 97.9 miles of the proposed looping would be constructed on land classified as bog or bog forest.

2/ 1976 dollars.

3/ G. Patrick Sanders, Federal Energy Regulatory Commission staff, hearing testimony in the matter of Michigan Wisconsin Pipeline Company, Docket No. CP75-278, et al., March 6, 1978.

4/ Ibid.

The President's Decision and Report to Congress on the Alaska Natural Gas Transportation System discusses the possibility of predelivery of Canadian natural gas under existing licenses in place of Alaskan gas as a means of making effective delivery of Alaskan gas possible prior to actual completion of the entire Alcan pipeline system. Under this proposal, the southern portions of the Alcan pipeline system (including the Northern Border pipeline) would be constructed first. Deliveries of excess natural gas from Alberta could reach 1.1 billion scfd by the winter of 1979-1980. Recent indications from the Canadian government that increased exports may indeed be authorized have increased the likelihood of early construction of the Northern Border pipeline. Contracts have recently been signed between Pan-Alberta Gas Ltd. and Northwest Alaskan Pipeline Company (formerly Alcan Pipeline Company) for the sale of 1.04 billion scfd of Alberta gas, much of which would be transported through the proposed Northern Border pipeline.

2. Alternative Placement of Pipeline Loop Sections

The FERC staff has investigated alternative locations for the proposed pipeline loop sections to determine whether environmental impact of the project could be reduced by avoiding construction in sensitive areas. During review of the proposed loop sections, the staff found that areas potentially sensitive to significant adverse impact would be crossed by Loop Sections 4, 5, 6, 7, and 8. Alternative locations were sought for constructing these sections in an attempt to reduce the number of environmentally sensitive areas which would be affected.

The arrangement of new looping sections along an existing mainline is flexible within certain technical and economic limits.

Avoiding the need for additional compression requires a relatively even distribution of loop sections along the system. The loop lengths proposed by the applicants represent the length of pipe required between compressor stations to transport the additional gas volumes without increasing system compression and fuel use. Therefore, repositioning the same length of pipe between two compressor stations along the mainline segment proposed to be looped was considered a reasonable means of avoiding sensitive areas. Reducing loop lengths or shifting entire loop sections to other parts of the pipeline system, while feasible, were not pursued because additional compression facilities would be required and long-term fuel penalities sustained.

Proposed Loop Section 4 (MP 180.2 to MP 201.2) would cross 19 miles of wetland habitat, mostly forested, within the Chippewa National Forest, Bowstring State Forest, and Leech Lake Indian Reservation. It would also cross the Ball Club River and the Mississippi River at a site which is part of a segment proposed for inclusion in the Wild and Scenic River System. The wetlands bordering both sides of the Mississippi River would make this crossing almost a mile wide.

Phase I construction of Loop Section 4 would result in 8 miles of looping through wetlands of the two public forests. The remaining 13 miles of Section 4 would be constructed during Phase II between MP 188.2 and MP 201.2, where it would cross the Ball Club and Mississippi Rivers, and 11 additional miles of public forest or Indian reservation lands, approximately 10 miles of which are wetlands. By locating the 13 miles of Phase II loop adjacent to the Shevline Compressor Station between MP 131.4 and MP 144.4, as illustrated in Figure 3, these latter sensitive areas could be avoided. 1/ In this alternative location, the looping would cross approximately 1.1 miles of wetland and about 3 miles of the Mississippi Headwaters State Forest, resulting in net reduction of about 9 miles of wetlands and public forest crossed. The proposed Mississippi River crossing would be also be avoided.

The alternate Phase II portion of Loop Section 4 would cross more cultivated lands and other private holdings, possibly increasing the cost of right-of-way acquisition. However, savings in construction, restoration, and maintenance costs would probably be realized by eliminating wetlands construction

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1/ Relocation of both phases of Section 4 adjacent to the Shevlin Compressor Station (between MP 131.4 and MP 150.2) would further limit the potential environmental impact of construction. However, this would necessitate crossing another reach of the Mississippi River (also proposed for inclusion in the Wild and Scenic River System) and reduce the total loop length by 2.2 miles, thus reducing pipeline capacity.

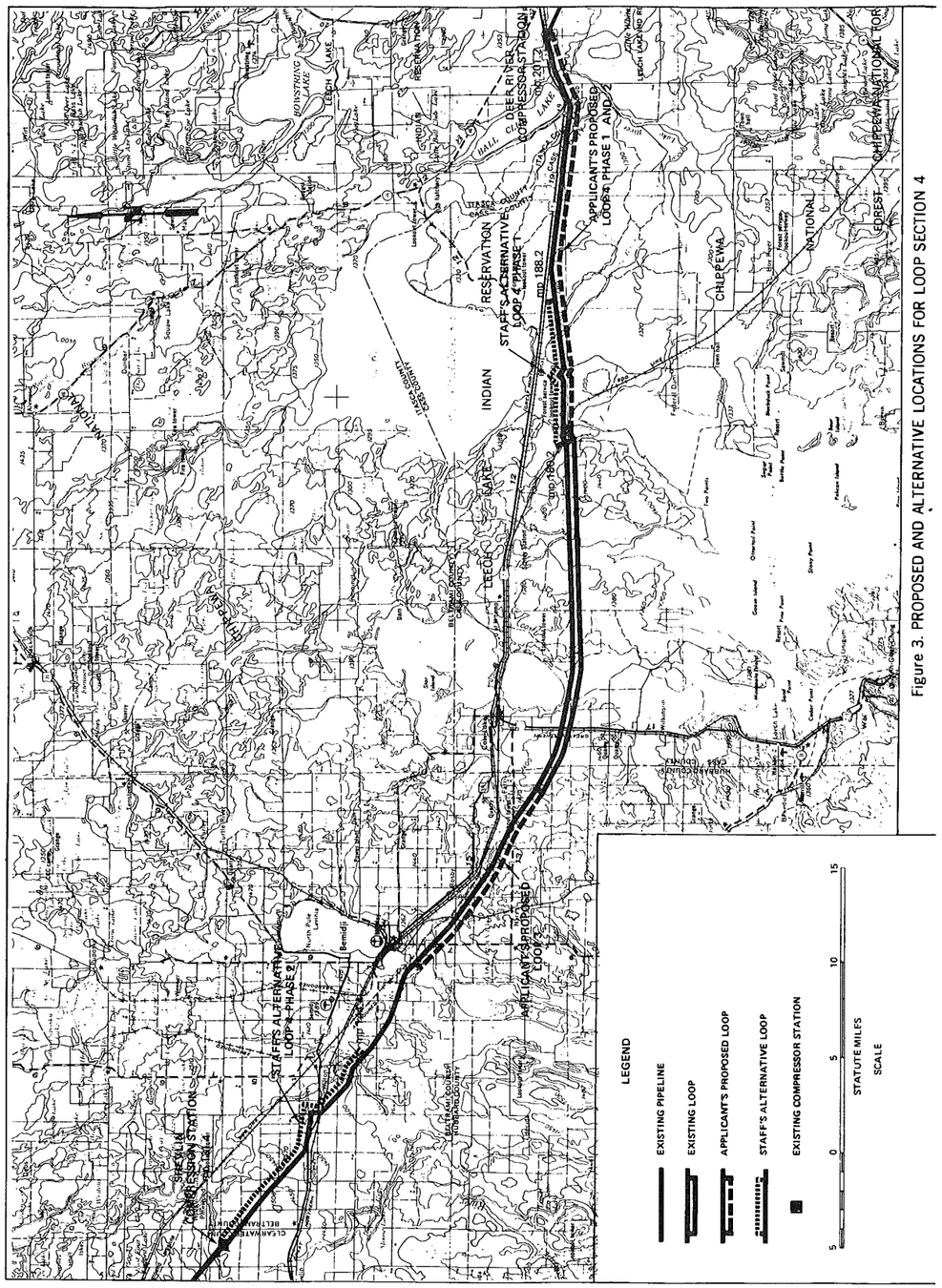

Figure 3. PROPOSED AND ALTERNATIVE LOCATIONS FOR LOOP SECTION 4

and a major river crossing, thereby reducing the cost differential. This alternative would cross about one-quarter mile of terrain having slopes over 20 percent near Grant Lake and Grant Creek in Beltrami County. Standard measures to prevent right-of-way erosion and sedimentation of the water bodies would minimize the potential for these adverse impacts.

Although the proposed location of Loop Section 4 would be within a utility corridor designated by national forest staff and would parallel U.S. Route 2 within 1,500 yards, there is always the potential that pipeline construction would adversely affect the bog and bog forest ecosystems which would be crossed. This has been amply demonstrated historically in the Great Lakes region. Existence of a 1-foot berm over the applicant's existing mainline through the Chippewa National Forest confirms this possibility, and it would be desirable to avoid even those wetland areas where impact would potentially be mitigated by adjacent development.

Avoiding the long, marshy Mississippi River crossing with its attendant aesthetic impact is also highly desirable, particularly in light of the river's wild and scenic status.

In view of these facts, the staff's alternative location for the 13 miles of Phase II Loop Section 4 construction appears to be environmentally preferable to the applicant's proposed location.

Proposed Loop Section 5 (MP 221.4 to MP 253.8) would cross nearly 25 miles of wetlands (bog and bog forest), including nearly 20 miles of Floodwood Swamp. It would also cross 2.8 miles of the Savannah State Forest and the Swan River, which has extensive wetlands along its banks.

Between the Deer River (MP 201.2) and Cloquet (MP 269.3) Compressor Stations, 52.6 miles of unlooped mainline extend between MP 201.2 and MP 253.8. Analysis indicated that Loop Section 5 could be located between MP 201.2 and MP 233.6, as illustrated in Figure 4, instead of the proposed location. While this alternative would cross 13 miles of wetland along the Mississippi River drainage, about 1.5 miles of the Savannah State Forest, and skirt the city of Grand Rapids, it would avoid construction across Floodwood Swamp, the Swan River, and reduce state forest looping mileage by about 50 percent.

This arrangement would almost halve the distance of wetlands to be crossed and eliminate a marshy river crossing. This alternative might also slightly improve fuel efficiency at the Deer River Compressor Station by virtue of placing the proposed looping on the high pressure end of the mainline

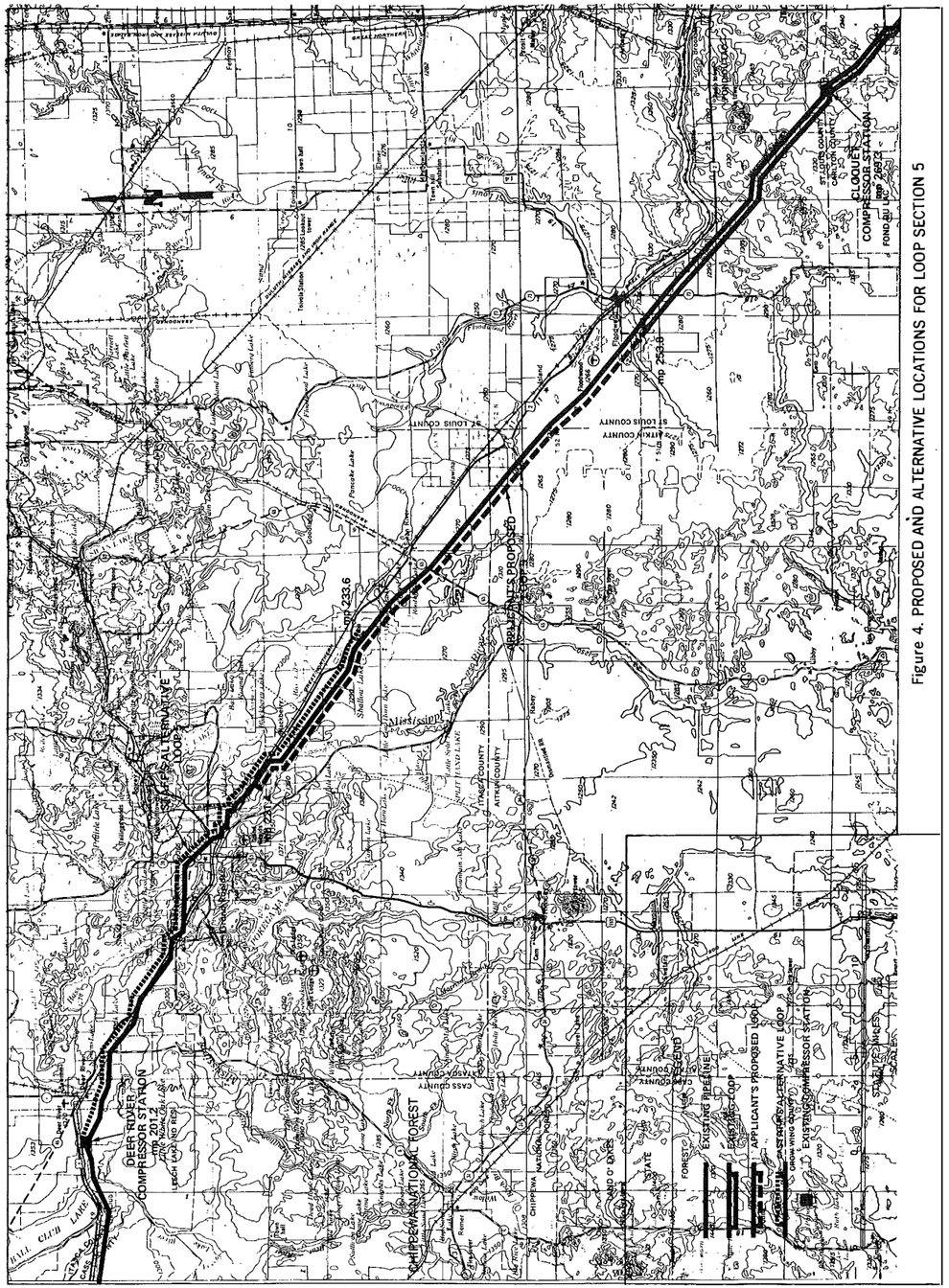

Figure 4. PROPOSED AND ALTERNATIVE LOCATIONS FOR LOOP SECTION 5

segment to be looped. Alternative Loop Section 5 would require more road crossings, especially in the vicinity of Grand Rapids, and cross more private holdings. Three streams would also be crossed by the alternative. Although substantial amounts of wetland would still be affected, winter construction, as proposed by Great Lakes for the Floodwood Swamp crossing, would minimize impact during construction in these areas and across the three streams. 1/

In consideration of the potential for adverse impact in wetlands from pipeline construction and maintenance, the avoidance of a major river crossing, and reduction of clearing through forests, the staff believes that the alternative location for Loop Section 5 would be environmentally superior to the applicant's proposed location.

Proposed Loop Section 6 (MP 283.5 to MP 321.7) would cross eight significant water bodies (five major rivers and three designated trout streams), the most of any proposed loop section. It would also cross 1.2 miles of Amnicon Falls State Park and certain areas of noted soil instability near the Minnesota-Wisconsin border. Available unlooped mainline lies between MP 283.5 in Minnesota and the Iron River Compressor Station at MP 344.4.

Relocation of Loop Section 6 to the area between MP 306.2 and MP 344.4 would eliminate approximately 3.5 miles of wetland crossings along the Pokegama River and the Nemadji River crossing. However, it would result in two other major river crossings, the Iron and Brule Rivers, and would pass along the shores of two lakes within the Chequamegon National Forest. Erosion problems stemming from construction of the existing mainline near the lakeshores have been noted. 2/

This relocation would offer no significant environmental advantage over the applicant's proposed location. Moreover, the applicant's proposed location for Loop Section 6 would maintain continuity with existing looping along this stretch of the mainline and would therefore be somewhat more efficient. As such, the applicant's proposed location for Loop Section 6 appears superior to the alternative.

1/ While winter construction would be expected to minimize impact during construction operations, drainage alterations following the spring thaw and impact from maintenance operations may still occur. The best means to minimize wetlands impact is to avoid or reduce the amount of area affected.

2/ Kenneth D. Shalda, Chequamegon National Forest, Park Falls, Wisconsin, letter to Federal Energy Regulatory Commission staff, dated February 27, 1978.

Proposed Loop Section 7 (MP 344.4 to MP 383.0) would traverse 8.6 miles of Chequamegon National Forest across rolling topography where erosion problems were noted following construction of the existing mainline. These areas have since been reworked, reseeded, and become stabilized, but the potential for further disturbance remains. Proposed Loop Section 7 would also traverse 12.8 miles of the Bad River Indian Reservation, a heavily forested area where approximztely 700 Chippewa Indians reside. Within the reservations, the White and Bad Rivers would be crossed. These two rivers have wide basins and the length of active floodplain crossed would total about 2.5 miles, part of which is wetland. The reservation would be the most environmentally sensitive area to be crossed.

Alternatively, 38.6 miles of looping could be placed on the low-pressure end of the mainline segment to be looped, between MP 377.6 and the Wakefield Compressor Station at MP 416.2. By locating Loop Section 7 in this area, all but 1.2 miles of the reservation would be avoided, neither the White nor Bad Rivers would be crossed, and less forest would be crossed. However, the Black River, Montreal River, West Fork Montreal River, and several large creeks would be crossed by the alternative, as well as nearly 6 miles of the Ottawa National Forest and about 1.5 miles of wetlands along the Fourche Creek area. The additional stream crossings would double the total number of designated trout streams crossed by Loop Section 7. Moreover, steep, erodible slopes in the Iron Hills area could be affected. Because relocation of Loop Section 7 would simply exchange one set of sensitive areas for another, the staff concludes that no environmental advantage would be gained through this alternative.

Proposed Loop Section 8 (MP 416.2 to MP 456.8) would be constructed entirely within the Ottawa National Forest. The route is heavily forested and would traverse approximately 26 miles of wetlands. 1/

The staff investigated the possibility of locating Loop Section 8 on the low-pressure end of the mainline segment to be looped (between MP 447.1 and the Crystal Falls Compressor Station at MP 487.7) and found that this alternative would impact approximately the same amount of forested areas, wetlands, and number of river crossings. Although it would cross about 10 fewer miles of national forest, the alternative would have similar environmental impact to that resulting from the applicant's proposal.

1/ Applicant's estimate.

The staff therefore concludes that no significant environmental advantage would result from relocating Loop Section 8.

In summation, the staff finds that proposed Loop Sections 4 and 5 could be relocated to areas where their potential impact on the environment would be significantly less than at the proposed locations. These relocations would not appear to require significantly greater construction or operating costs.

3. No Action or Postpone Action

The actions that are available are to grant the various certificates that are sought, to deny them, or to postpone action pending further study. Postponement of a decision approving transportation and sale of the proposed gas volumes could allegedly impede the coal gasification project to the extent that it may be abandoned. However, if the sale of the commingled gas were approved and assurances given that some transportation system would be ultimately approved, alternative transportation arrangements could be more fully studied in the interim without delaying the gasification project.

Denial of the proposed transportation project could potentially result in abandonment of the coal gasification project and the loss of 275 million scfd to the Michigan Wisconsin and Natural market areas or action which would result in the development of an alternate transportation arrangement.

I. CONCLUSIONS AND RECOMMENDATIONS

Information provided by Great Lakes and Michigan Wisconsin and further developed by the staff from literature research, state, and other Federal agencies indicates that the environmental impact associated with implementing the proposed transportation project, as discussed in Chapter C of this supplement, would not result in a significant long-term impact on the human environment.

The staff's analysis of alternative transportation arrangements indicates that utilization of the proposed Northern Border pipeline, should appropriate sections of it be constructed prior to operational status of the gasification plant, would provide a vastly superior alternative to the transportation arrangement proposed by the applicants. Recent developments suggest that the availability of the proposed Northern Border pipeline is a distinct possibility.

The staff recommends that the applicants consult with Northern Border to assure the earliest possible consideration of the proposed SNG volumes in the design of the Northern Border pipeline.

Should the applicants' proposed transportation arrangement be certificated, it is recommended that the Commission require Great Lakes to comply with the following conditions in order to minimize the potential adverse environmental impact of its portion of the proposed pipeline looping project.

1. Great Lakes shall utilize the staff's preferred locations for placement of Loop Sections 4 and 5 as identified in Chapter H, "Alternatives to the Proposed Action, 2. Alternative Placement of Pipeline Loop Sections":

   (a) Construction of the proposed 21-mile long Loop Section 4 shall be accomplished between MP 131.4 (the Shevlin Compressor Station) and MP 144.4, and between MP 180.2 (where an existing loop section terminates) and MP 188.2.

   (b) Construction of the proposed 32.4-mile long Loop Section 5 shall be accomplished between MP 201.2 (the Deer River Compressor Station) and MP 233.6. The portion of this proposed loop section which crosses extensive wetlands shall be constructed during the winter.

Although the staff has identified in Chapter D numerous measures which the applicants would institute to limit the environmental impact of their proposals, to further mitigate the potential impact of the proposed project it is recommended that the following additional conditions be attached to any Commission certificate.

1. In consultation with officials of the respective state departments of natural resources, the applicants shall determine the location(s) of potentially sensitive streams which would be crossed and the means to mitigate the impact of any such stream crossings. 1/

2. Through further consultation with the respective state natural resource departments, the applicants shall determine the location(s) of any endangered plant or animal species along the proposed construction routes and the means to avoid adverse effects on any such organisms. 1/

3. The applicants shall consult with the U.S. Soil Conservation Service to determine the best methods to assure adequate erosion control in all disturbed areas. These methods shall be implemented except where other agencies having jurisdiction or individual landowners specify otherwise. 1/

4. The portions of proposed Loop Section 8 which would cross extensive wetlands shall be constructed during the winter when such wetlands are frozen.

5. The applicants are required to assure the maintenance of adequate flow and drainage patterns in all marsh, bog, swamp, or other wetland areas proposed to be crossed. Should periodic inspection of the rights-of-way in such areas reveal that drainage patterns have been altered by the development of a trough or berm over the pipeline, remedial measures shall be taken to return flow and drainage to preconstruction patterns.

6. Wherever the proposed pipeline loop sections would cross state or federally owned lands, the applicants, in conjunction with the desires of officials administering the respective lands, shall take measures to control access to the rights-of-way, thereby preventing their use by off-road vehicles.

7. In consultation with the respective State Historic Preservation Officers, State Archaeologists, and other appropriate agencies such as Interior's Interagency Archaeological Service, the applicants shall undertake cultural resources management programs along the proposed construction rights-of-way consistent with those measures outlined in Appendix A. 1/

1/ It should be noted that the staff recommends similar measures and programs be implemented along the proposed 365-mile SNG product pipeline route between the proposed coal gasification complex and the proposed Thief River Falls interconnection.

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APPENDIX A

CULTURAL RESOURCES MANAGEMENT PROGRAM

To supplement the applicants' mitigation measures, the environmental staff of the Federal Energy Regulatory Commission proposes a phased program for identifying historic and prehistoric properties and for mitigating impact. The applicants should be required to fund and to allow sufficient time to carry out this program, preferably under the direction of a single entity or institution to ensure comparable results. All phases should be conducted in consultation with the respective State Historic Preservation Officers, State Archaeologists, and other appropriate agencies and institutions, who should receive copies of reports on all phases for an evaluation of adequacy. The program would apply to all areas of terrain modification.

Phase 1, a survey of the literature on known prehistoric and historic sites, should identify any cultural properties near all proposed facilities and analyze local settlement patterns to plan for the field survey. Phase 2 would be a field survey to locate and determine the boundaries of all cultural properties potentially impacted. This effort should investigate alternatives to avoid impact to any cultural resources identified or located in Phases 1 and 2. A report should be prepared on this work which details the survey methodology, describes which portions of affected land were omitted from the survey, justifies their omission, and summarizes the discoveries made. Subsurface sampling to identify sites may be necessary in some circumstances.

Small scale excavations in Phase 3 would evaluate the significance of sites potentially eligible for inclusion in the National Register and provide input for recommendations to mitigate impact. The report for this phase should include the data needed to request a determination of eligibility to the National Register. (See Vol. 42, No. 183 of the Federal Register, September 21, 1977.) Requests for a determination should be made for all potentially eligible properties, and eligible properties should be nominated to the National Register. The report should include a research design which would govern excavation of each site which could not be avoided. This research design would address each property's points of significance. Salvage excavation in Phase 4 should conform to the standards for data recovery in proposed Title 36 CFR Part 66 (Federal Register, Vol. 42, No. 19, January 28, 1977). An excavation report in Phase 5 should also conform to proposed 36 CFR 66.

Sue

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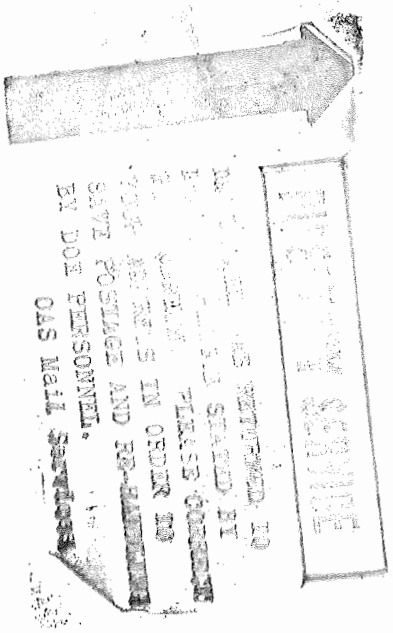

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