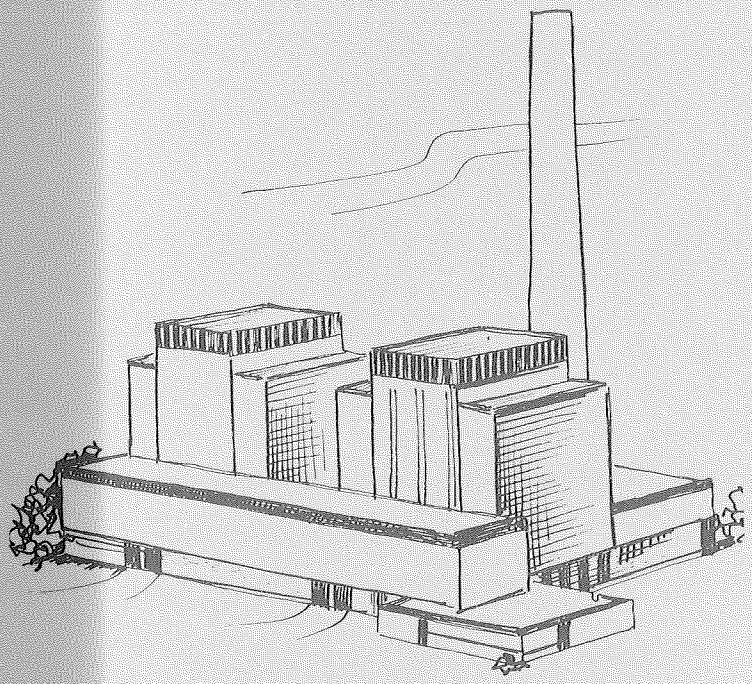
ENVIRONMENTAL REPORT

SITE APPLICATION
NORTHERN STATES POWER CO.
NSP-P-1



AUGUST 1975

ENVIRONMENTAL QUALITY COUNCIL
POWER PLANT SITING STAFF
100 Capital Square Building
550 Cedar Street
St. Paul, Minnesota 55101

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Prepared for:

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100 Capital Square Building
550 Cedar Street
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by

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I. INTRODUCTION

This environmental report has been prepared in response to an "Application For a Certificate of Site Compatibility For A Large Electric Power Generating Plant," submitted to the Minnesota Environmental Quality Council by Northern States Power Company, dated November 1, 1974. It is the purpose of this report to describe the preferred and alternate sites, and the impacts associated with locating an LEGPG at either, so that the Minnesota Environmental Quality Council may issue a certificate of site compatibility for the most environmentally sound site. In order to facilitate this action, the report is specifically directed toward presenting site differentiating characteristics. Characteristics which differ only slightly or not at all between the two sites are presented to assure the reader that they were examined, but do not receive the detailed analysis that is presented for site differentiating characteristics. Furthermore, the scope of the report is limited to the presentation of data which are existing, or available through short-term investigations or studies. Long-term, elaborate programs for data generation are beyond the scope of this report. For these reasons, it should be emphasized that this report is NOT an Environmental Impact Statement, nor is it in any way intended to substitute for, or replace, the Environmental Impact Statement. An Environmental Impact Statement will be prepared after a site has been designated. At that time NSP will be able to complete detailed engineering design for the plant, and thus will be able to provide much of the data which is unavailable to this report. Also, after site designation and detailed design, state and federal agencies responsible for the issuance of permits will conduct investigations and analyses in order to verify compliance with state and federal regulations. The purpose of this report is to aid in the determination of the most environmentally sound site for the location of an LEPGP, and the level of detail contained herein is intended to be sufficient to that purpose only.

Minn. Reg. MEQC 74 (c) Criteria For LEPGP Siting. The following criteria and standards shall be used by the Council in the preparation of an inventory of potential LEPGP sites and to guide the site suitability evaluation and selection process. These criteria are not grouped according to their application to nuclear plants, as opposed to fossil fuel and other types of plants. Not all site selection criteria are applicable to all plants to the same degree. Sites which are environmentally sound should not be excluded from the inventory due to costs or limited generating capacity.

(1) Exclusion Criteria

(aa) No LEPGP shall be sited in violation of any federal or state law or regulation. No area shall be considered in which a LEPGP is not licensable by all appropriate state and federal government agencies.

(bb) The following land areas shall be excluded: national parks; national historic sites and landmarks; national historic districts; national monuments; national wilderness areas; national wildlife refuges; national, wild, scenic, and recreational riverways; state wild, scenic, and recreational rivers and their land use districts; state parks; Nature Conservancy preserves; state scientific and natural areas; state wilderness areas; and any area designated a LEPGP exclusion area by the Council.

(cc) No area shall be considered which does not have reasonable access to a proven water supply sufficient for plant operation. No use of ground water shall be permitted where mining of ground water resources will result. "Mining" as used herein shall mean the removal of ground water that results in material adverse effects on ground water in and adjacent to the area, as determined in each case.

(dd) No water shall be transferred between the four major drainage basins within the

state: that is, the Missouri River drainage basin, the Mississippi River drainage basin, the Lake Superior drainage basin, and the Red-Rainy River drainage basin.

(ee) Water intake structures and water pipelines shall not necessarily be prohibited from land areas excluded for power plant sites.

(2) LEPGP Avoidance Areas.

(aa) In addition to exclusion areas, the following land use areas shall not be approved for LEPGP sites when feasible and prudent alternatives with lesser adverse human and environmental effect exist. Economic considerations alone shall not justify approval of avoidance areas. Any approval of such areas shall include all possible planning to minimize harm to these areas. LEPGP avoidance areas are: state registered historic sites; state historic districts; state wildlife management areas (except in cases where the plant cooling water is to be used for wildlife management purposes); county parks; metropolitan parks; designated state and federal recreational trails; designated trout streams; and the rivers identified in Minn. Stat. 85.32, subd. 1 (1971); and any other area designated a LEPGP avoidance area by the Council.

(bb) LEPGP avoidance areas also apply to new transportation access routes and storage facilities associated with the plant in addition to the plant itself. Water intake structures and water pipelines shall not necessarily be prohibited from LEPGP avoidance areas.

(cc) No transfer of water between sub-basins within each of the four major drainage basins shall be permitted except where it can be clearly demonstrated that the transfer will not have an adverse effect on water supplies or water quality in the areas involved.

(dd) The use of ground water for high consumption purposes, such as cooling, shall be avoided if feasible and prudent surface water alternatives less harmful to the environment exist. Ground water use to supplement available surface water shall be permitted if the cumulative impact minimizes environmental harm.

(3) Site Selection Criteria. The following criteria shall be applied in the selection of sites:

(aa) Preferred sites require the minimum population displacement and disruption of local communities and institutions.

(bb) Preferred sites minimize adverse health effects on human population.

(cc) Preferred sites do not require the destruction or major alteration of land forms, vegetative types, or wildlife habitat which are rare, unique, or of unusual importance to the surrounding area.

(dd) Preferred sites minimize the visual and audible impingement on waterways, parks, or other existing and proposed public recreation areas.

(ee) Preferred sites minimize the removal of valuable and productive land and water from other necessary uses and minimize conflicts among water users.

(ff) Preferred sites maximize reliability with respect to climate and geology.

(gg) Preferred sites permit significant conservation of energy or utilization of by-products.

(hh) Preferred sites are located near large load centers.

(ii) Preferred sites maximize the use of already existing operating sites and transportation systems.

(jj) Preferred sites allow for larger rather than smaller generating capacity.

Minn. Reg. MEQC 74 (j) Evaluation of Proposed Sites or Corridors. To facilitate the study, research, evaluation and designation of sites and corridors for LEPGP's and HVTL's and the approval of specific transmission line facilities and their routes, the Council shall be guided by, but not limited to, the following responsibilities, procedures, and considerations.

(1) Evaluation of research and investigations relating to the effects on land, water and air resources of LEPGP's and HVTL's and the effects of water and air discharges from such plants on public health and welfare, vegetation, animals, materials, and aesthetic values, including base line studies, predictive modeling, and monitoring of the water and air mass at proposed sites and sites of operating LEPGP's, evaluation of new and improved methods of minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment;

(2) Evaluation of the environmental effects of LEPGP sites and HVTL corridors and routes proposed for future development and expansion and their relationship to the land, water, air, and human resources of the State;

(3) Evaluation of the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects;

(4) Evaluation of the potential for beneficial uses of waste energy from proposed LEPGP's;

(5) Analysis of the direct and indirect economic impact of proposed LEPGP's and HVTL's;

(6) Evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site and transmission line corridor or route be accepted;

(7) Evaluation of alternatives to the proposed site and transmission line corridors and routes;

(8) Evaluation of irreversible and irretrievable committments of resources should the proposed site and transmission line corridor or route be approved; and

(9) Consideration of problems raised by other state and federal agencies and local entities, where appropriate;

A Draft Environmental Report was prepared in June, 1975, and made available to the public. We would like to thank the following individuals and agencies for their review of the report and their comments:

Mr. Robert S. Banks
Mr. Virgil E. Gilyard
Mr. Orville Heitkamp
Sister Nancy Hynes
Mr. Homer C. Luick
Mr. Anthony M. Selvo
Mr. Allie J. Weber
Mr. Melvin C. Wichelman
Minnesota Pollution Control Agency
Minnesota Department of Agriculture
U.S. Army Corps of Engineers
Northern States Power Company

II. PROJECT DESCRIPTION

Northern States Power Company proposes to construct two 800 megawatt coal fired generating units to go on line in 1982 and 1984. Northern States Power Company proposes to build these units at the existing SHERCO site in Sherburne County, Minnesota, in the town of Becker. Two units are already under construction at this site. NSP proposes the SIBCO site in Sibley County, Minnesota, near the town of Henderson, as an alternate siting choice. The locations of these sites are presented in Figure 1.

Detailed facility design has not yet been completed by NSP. Preliminary designs indicate that the following components will be included at SHERCO:

Steam-electric system;
Coal handling and storage facilities;
Water intake facilities;
Desulfurization equipment;
Wastewater recycle basin;
Wastewater holding basin;
Heat dissipation facilities;
Sludge and ash storage basins; and
Transmission facilities.

The steam-electric system includes the furnaces, steam generators, steam turbines, and electric generators. The furnaces will be designed for minimum NO_x production, and will be fired with pulverized coal. Each will consume 970,000 pounds of coal per hour at full load, for a total of 1,940,000 pounds of coal per hour for both units at full load. Each steam generator will produce approximately 6.1 million pounds of steam per hour. Steam conditions at the turbines will be 2,520 psig at 1,000°F with 1,000°F reheat. Each steam turbine will drive an electric generator to produce 800,000 kilowatts (800 megawatts) net. The electric energy will be transformed to 345,000 volts for delivery into the NSP interconnected transmission system.

The coal which will be used for SHERCO 3 and 4 will be Fort Union low sulfur coal. Although a final decision has not been made, it appears that the coal will probably come from the Sarpy Creek area of Montana. This coal will be transported by Unit train. Each unit train will consist of 105 cars with a capacity of 100 tons of coal per car (for a total of 10,500 tons of coal per train). An average of 1.6 unit trains per day will be required. Under normal conditions, coal from the trains will be unloaded either directly into the plant, or onto an active pile and then transferred to the plant as needed. Within the plant the coal will be crushed and pulverized, then fed to the furnaces.

A 90-day supply of coal will be stored on site. This coal will be used as an emergency supply in the event of a breakdown in the coal supply system. Under normal conditions, this pile will be inactive, or "dead", with none of this coal used for plant operation.

Water intake facilities at SHERCO will consist of the existing water intake structure, currently being built as part of the construction program for units 1 and 2. The structure has been designed to be large enough to supply units 3 and 4 also. No new intake structure is planned.

Desulfurization equipment will probably be necessary at SHERCO. A scrubber system is proposed.

SITE LOCATIONS

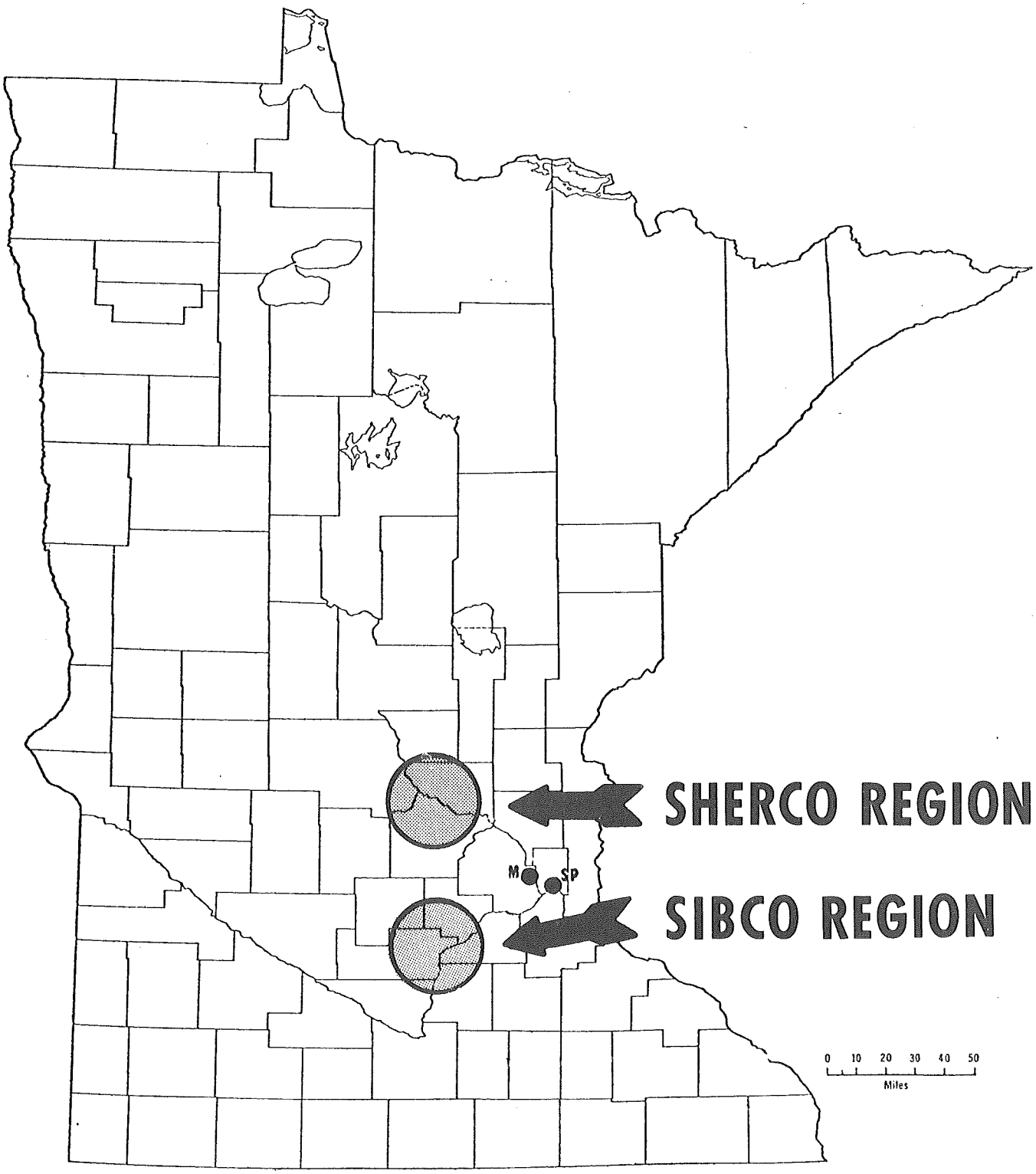


Figure 1

A recycle basin will be used to collect wastewater and water from plant drains. This water will be used for make up to the scrubber systems.

A holding basin will be used to cool water which is to be discharged to the Mississippi River. The water will be cooled to ambient temperature. Settling of suspended solids will be permitted in the holding basin if necessary to reduce turbidity. The pH will be adjusted as required to meet effluent standards. Discharged water will be continuously monitored.

Heat dissipation facilities at SHERCO will consist of mechanical draft wet type cooling towers and other associated components. The cooling towers and other components of the heat dissipation system will dissipate 3,800 million btu's of waste heat per unit per hour at full load, or a total of 7,600 million btu's per hour for Units 3 & 4 at full load.

The storage basin is divided into two sections: bottom ash storage; and scrubber sludge and fly ash storage. The basin which has already been constructed for Units 1 and 2 will provide for approximately ten years of operation of units 1, 2, 3 and 4. The basin will be incrementally enlarged as necessitated by plant requirements. The plant site as proposed includes sufficient area for the ultimate expansion of the basin.

Transmission facilities include the existing network for SHERCO 1 and 2, and Monticello, as well as four new lines. Two of the new lines will require two new rights-of-way, and will cross the Mississippi and Minnesota Rivers.

Units 3 and 4 combined will consume 970 tons per hour of coal at full load. Maximum water appropriation will be 47 cfs. Stack emissions will include 1,700 lb/hr of particulates, and 2.4 billion btu's/hr of waste heat, at full load. So_2 emissions will range from 15,875 lb/hr to 20,000 lb/hr at full load. The range is due to a variable sulfur content of the coal proposed for use at SHERCO. NO_x emissions are unspecified at this time. The heat dissipation systems (cooling towers, etc.) will dissipate 7.6 billion btu's of waste heat per hour, and the cooling towers will evaporate 3,900 tons/hr of water, at full load. The quantity of effluent to be discharged to the river, and the composition (i.e. quality) of the effluent are unknown at this time. Detailed engineering design will incorporate the best available technology and therefore will be performed for a specific site. Such detailed designs are not completed until after a site is determined. NSP has stated that it will comply with all applicable effluent, water quality, air quality, and noise standards. A diagrammatic summary of the proposed SHERCO project is presented in Figure 2.

Preliminary designs indicate that the following components will probably be included at SIBCO:

Steam-electric system;
Coal handling and storage facilities;
Water intake facilities;
Water storage reservoir;
Sidestream water treatment facilities;
Heat dissipation facilities;
Ash storage basins; and
Transmission facilities.

The steam-electric system includes the furnaces, steam generators, steam turbines, and electric generators. The furnaces will be designed for minimum NO_x production, and will be fired with pulverized coal. Each will consume 970,000 pounds of coal per hour at full load, for a total of 1,940,000 pounds of coal per hour for both units at full load. Each steam generator will produce approximately 6.1 million pounds of steam per hour. Steam conditions at the turbines will be 2,520 psig at 1,000°F with 1,000°F

reheat. Each steam turbine will drive an electric generator to produce 800,000 kilowatts (800 megawatts) net. The electric energy will be transformed to 345,000 volts for delivery into the NSP interconnected transmission system.

The coal which will be used at SIBCO has not yet been determined. NSP has been attempting to secure low sulfur Powder River coal from the Douglas area of Wyoming. Potential alternate sources include the Sarpy Creek area of Montana.

The coal will be transported by unit train. Each unit train will consist of 105 cars with a capacity of 100 tons of coal per car (for a total of 10,500 tons of coal per train). An average of 1.6 unit trains per day will be required. Under normal conditions coal from the trains will be unloaded either directly into the plant, or onto an active pile and then transferred to the plant as needed. Within the plant the coal will be crushed and pulverized, then fed to the furnaces.

A 90-day supply of coal will be stored on site. This coal will be used as an emergency supply in the event of breakdown in the coal supply system. Under normal conditions, this pile will be inactive, or "dead", with none of this coal used for plant operation.

A water intake structure will be constructed on the Minnesota River. Water will be pumped to a water reservoir located on the site. The water in the reservoir will be used to operate the plant during periods when the flows in the Minnesota River are too low to supply adequate water for plant needs. The reservoir will hold approximately 22,000 acre-feet of water, and will provide sufficient water for plant operation through an 18 month drought.

A sidestream water treatment facility will be used to treat water before it enters the cooling system. This is to prevent scaling or other interference with plant operation. Water which is to be discharged to the Minnesota River will be taken from this treated water. The temperature and pH will be adjusted as necessary before releasing the water to the river.

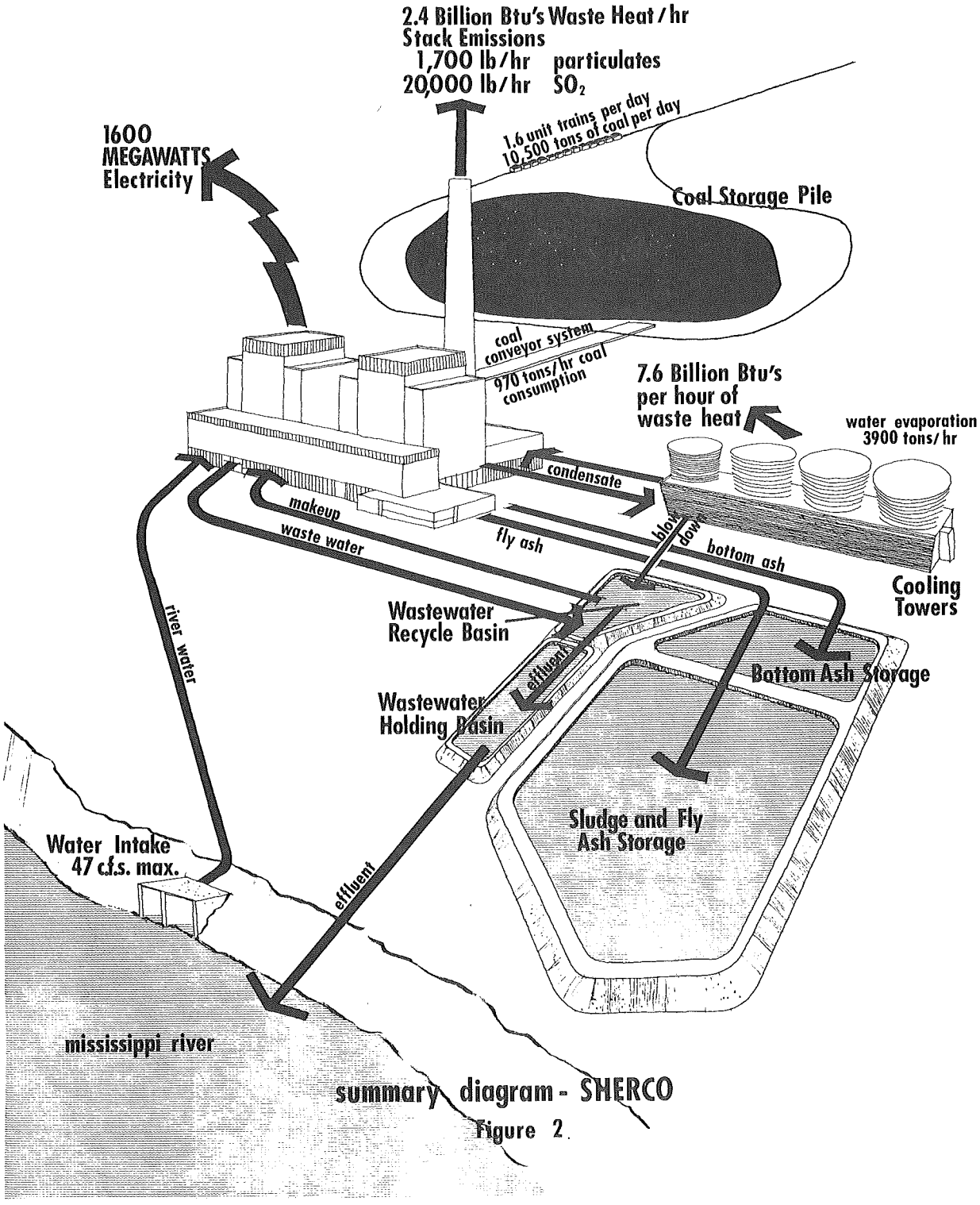
Heat dissipation facilities at SIBCO will consist of mechanical draft wet type cooling towers and other associated components. The cooling towers and other components of the heat dissipation system will dissipate 3,800 million btu's of waste heat per unit per hour at full load, or a total of 7,600 million but's per hour for operation at full load.

The bottom ash storage basin and the fly ash storage basin will be two separate facilities. Each will contain only the one kind of ash.

Transmission facilities will include five new lines, located in three new rights-or-way. The lines will cross the Minnesota River in two places.

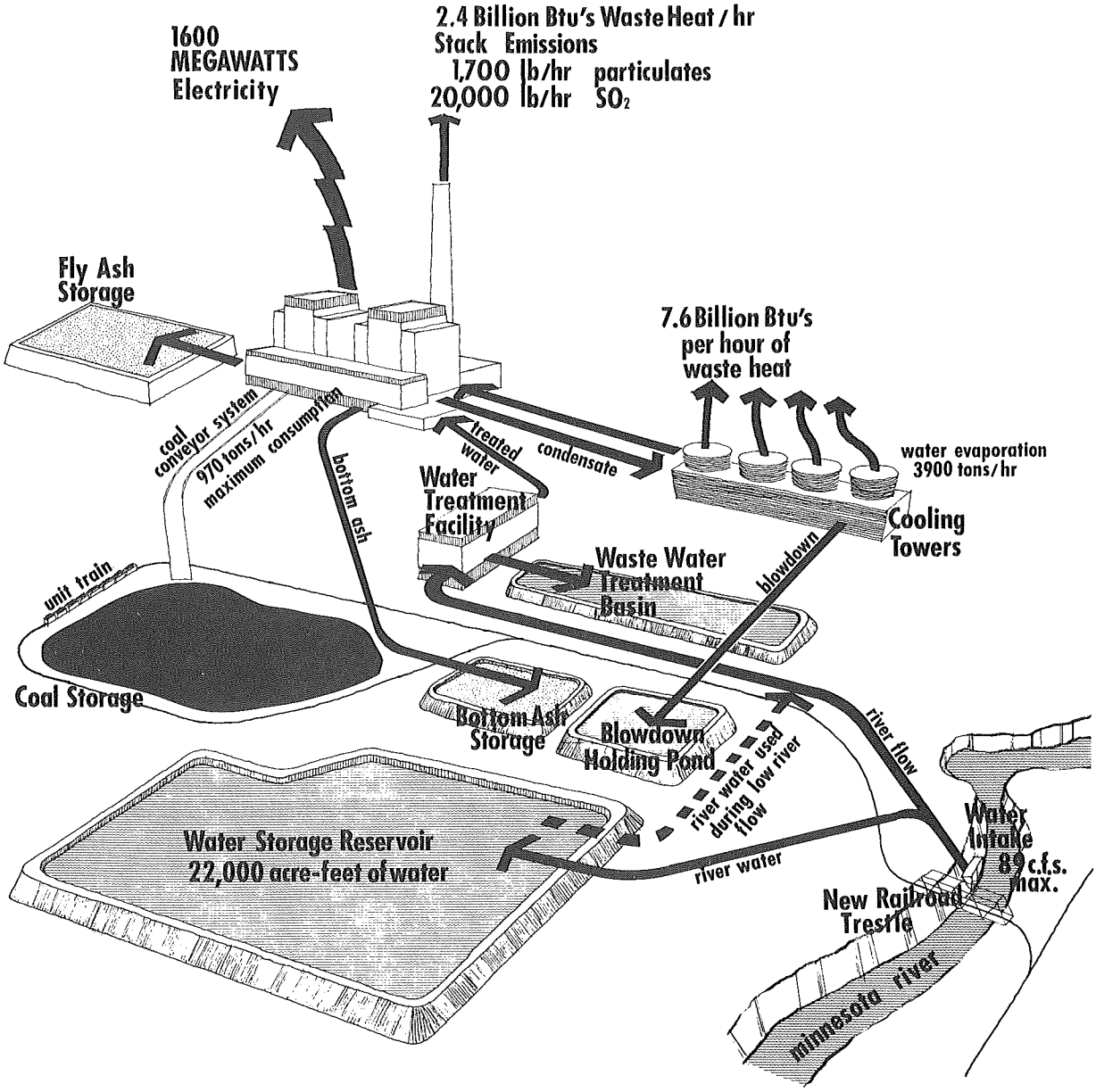
No desulfurization equipment is currently planned for the plant. NSP hopes to acquire low sulfur coal for this plant, with the result of meeting air quality standards without desulfurization equipment. However, a final decision on coal to be used at SIBCO has not been reached, and at a later date the site may be found to require desulfurization equipment.

Units 1 & 2 combined will consume 970 tons per hour of coal at full load. Maximum water appropriation will be 89 cfs, including water to fill the storage reservoir. Stack emissions will include



summary diagram - SHERCO

Figure 2.



summary diagram - SIBCO

Figure 3

1,700 lb/hr of particulates, 20,000 lbs/hr of SO_2, and 2.4 billion btu's/hr of waste heat, at full load. No_x emissions are unspecified at this time. The heat dissipation systems (cooling towers, etc.) will dissipate 7.6 billion btu's of waste heat per hour, and the cooling towers will evaporate 3,900 tons/hr of water, at full load. The quantity of effluent to be discharged to the river, and the composition (i.e. quality) of the effluent are unknown at this time. Detailed engineering design will incorporate the best available technology and therefore will be performed for a specific site. Such detailed designs are not completed until after a site is determined. NSP has stated that it will comply with all applicable effluent, water quality, air quality, and noise standards. A diagrammatic summary of the proposed SIBCO project is presented in Figure 3.

III. ENVIRONMENTAL SETTING — SHERCO

The purpose of the environmental setting is to describe the existing conditions at the site or in the region, so that the impacts of the proposed project upon the environment may be evaluated. A unique situation exists at SHERCO, in that between the present and the time that SHERCO units 3 and 4 become operational, SHERCO units 1 and 2, which are not operating now, will have become operational. This means that a description of the present environment may not be valid for evaluating the impacts of units 3 and 4. For this reason, the expected effects of units 1 and 2 are included as part of the setting, although these effects do not yet exist. These effects mainly concern the areas of air and water quality.

GENERAL

The Sherburne County Site is located in the City of Becker, Sherburne County, Minnesota. It is approximately 40 miles northwest of the Metropolitan Twin Cities Area, and 18 miles southeast of St. Cloud. The site abuts the Mississippi River, but the plant itself will be located one-hale mile from the river. The region is predominantly rural-agricultural, although there are also appreciable forested areas and several small urban centers within a 15 mile radius of the site.

NATURAL ENVIRONMENT

Within this report, the natural environment is examined on two levels: a regional level, and a site specific level. The SHERCO Region is defined as circle of 15 mile radius, centered on the plant site. The environmental setting of this region is presented so that impacts which may occur off of the plant site may be evaluated. A site description, which presents details that occur specifically within the site boundaries, is also included.

Regional Setting

Land Use - The major land use in the SHERCO Region is agricultural. Approximately 70-80% of the region is cultivated or open pasture. Major crops include potatoes, corn (generally irrigated), alfalfa, and soybeans. Approximately 10-15% of the land in the region is forested, while 4-5% of the region consists of lakes. A portion of the region is committed to electric power generation uses with the SHERCO 1 and 2 units, currently under construction, and the Monticello nuclear plant, currently in operation. Transmission line netwoks are associated with both plants.

Fourteen small non-industrialized urban areas lie within the 15 mile radius of the SHERCO region. St. Cloud, which is located just beyond the 15 mile SHERCO region perimeter is a large, fully industrialized urban center.

Recreational and public land management areas include the Sherburne National Wildlife Refuge and Sand Dunes State Forest, as well as several smaller wildlife management areas. The locations of these areas are presented on Figure 4. The Mississippi River is a designated canoe and boating river.

Vegetation - The area surrounding the SHERCO Site is generally situated within the southern deciduous forest biome. In this portion of Minnesota, hardwood forests are seldom continuous stands of trees; rather they are broken by numerous open areas and grasslands. A rather large intrusion of the prairie biome occurs on the flat, sandy plain surrounding the town of Becker, Minnesota.

Within the southern deciduous forest biome, three distinct associations can be identified in the

RECREATIONAL AREAS
SHERCO REGION

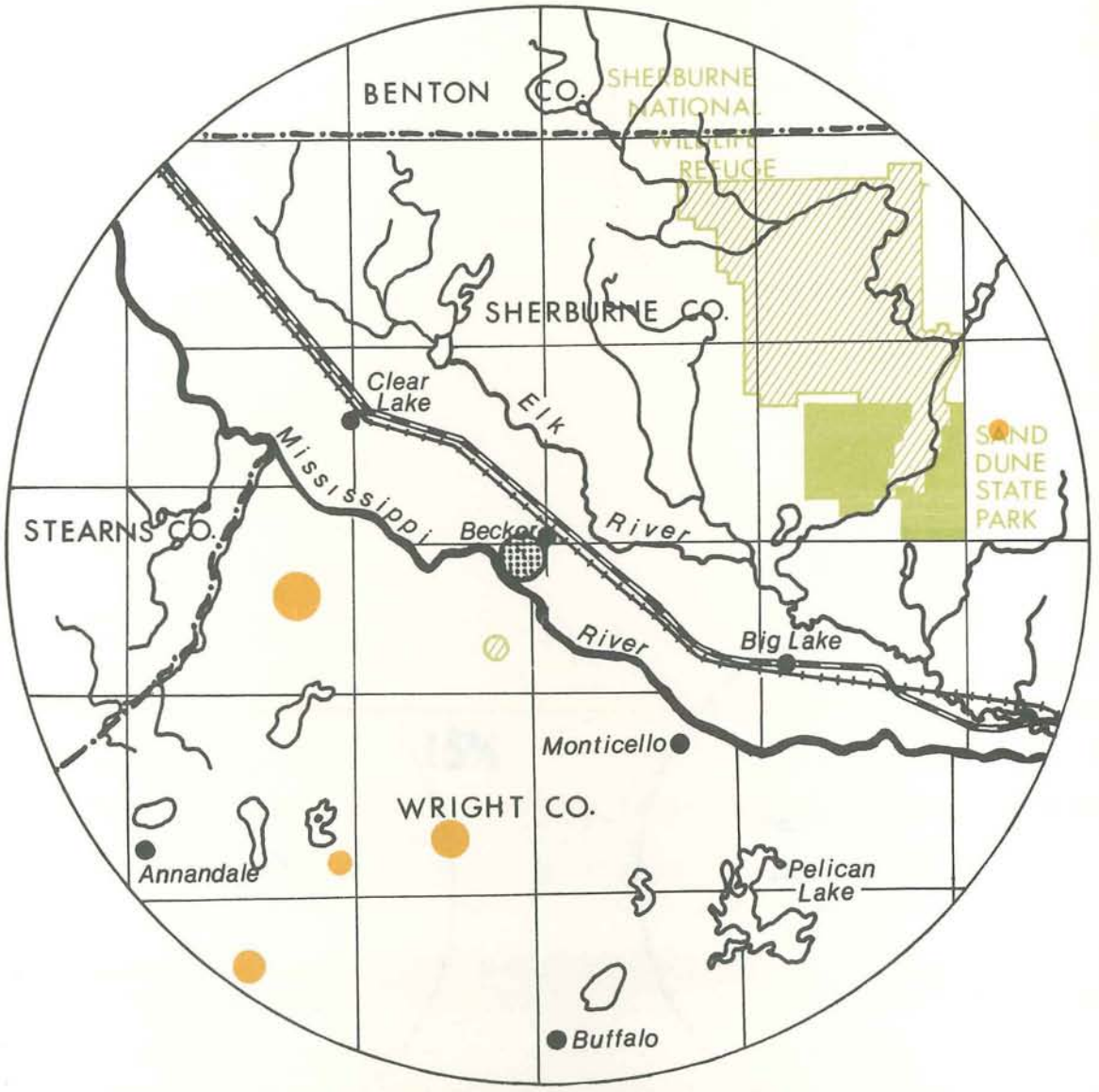
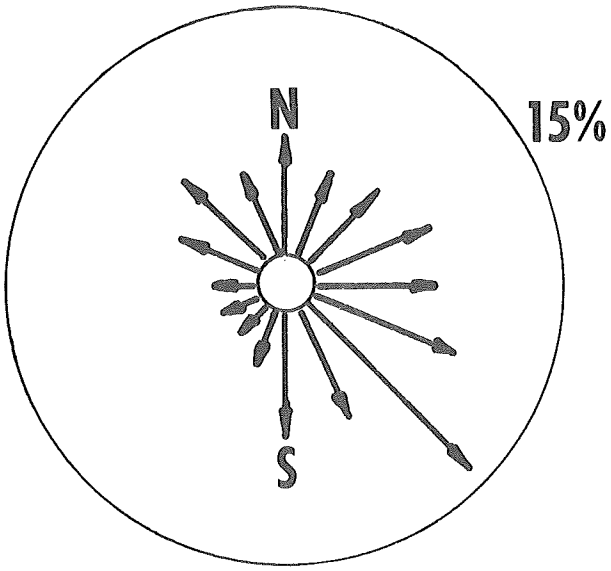


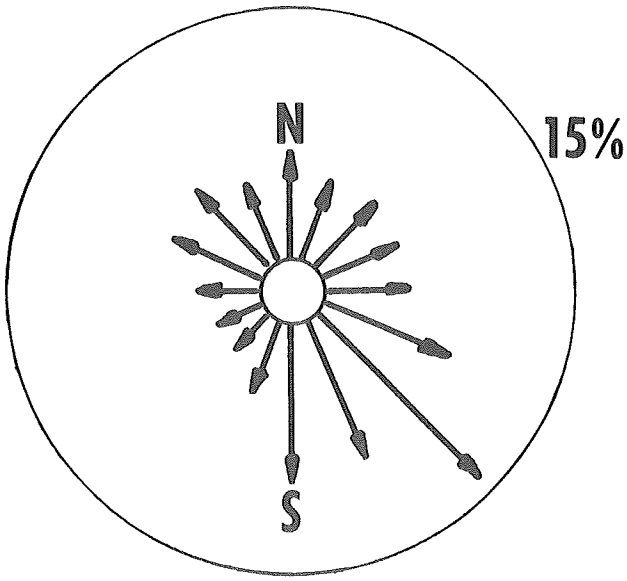
Figure 4

WIND ROSES; MINNEAPOLIS, MINNESOTA; 1958-72

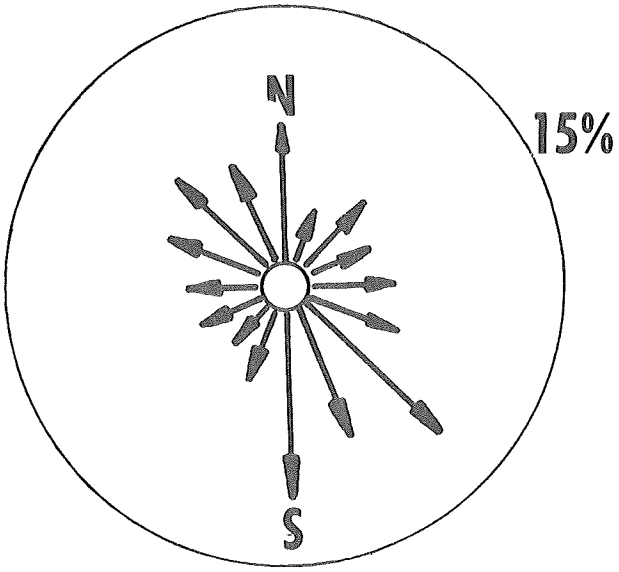
JANUARY



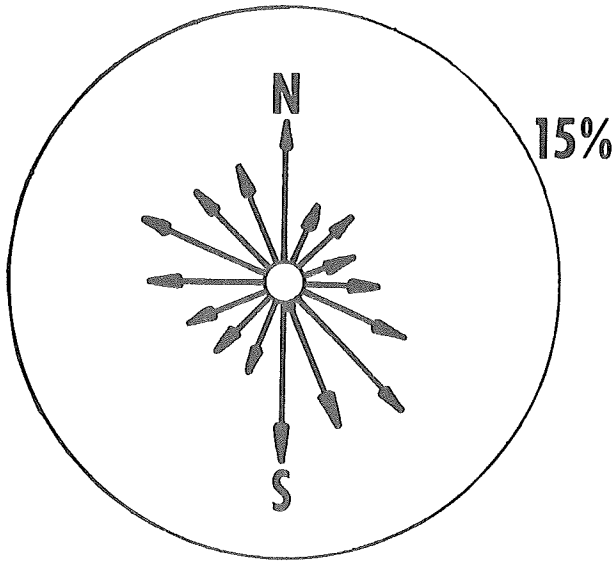
FEBRUARY



MARCH



APRIL

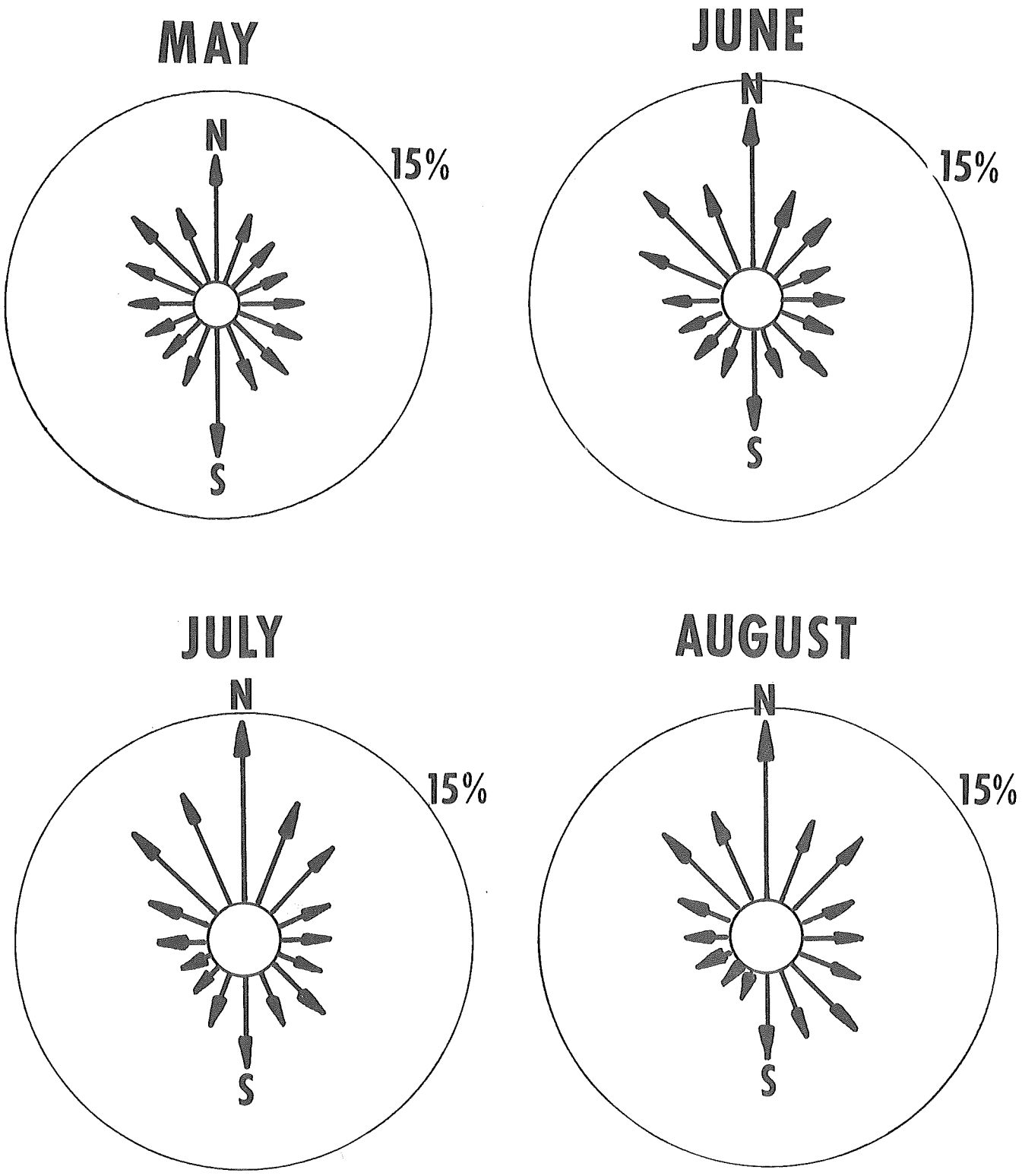


WINDS ARE TOWARD INDICATED DIRECTIONS. 7/16 INCH EQUALS 5%.

REFERENCE:

ENVIRONMENTAL DATA SERVICE, SEASONAL AND ANNUAL WIND DISTRIBUTION BY PASQUILL STABILITY CLASSES-STAR PROGRAM-MINNEAPOLIS, 1958-1972. U.S. DEPARTMENT OF COMMERCE, ASHEVILLE, N. C.

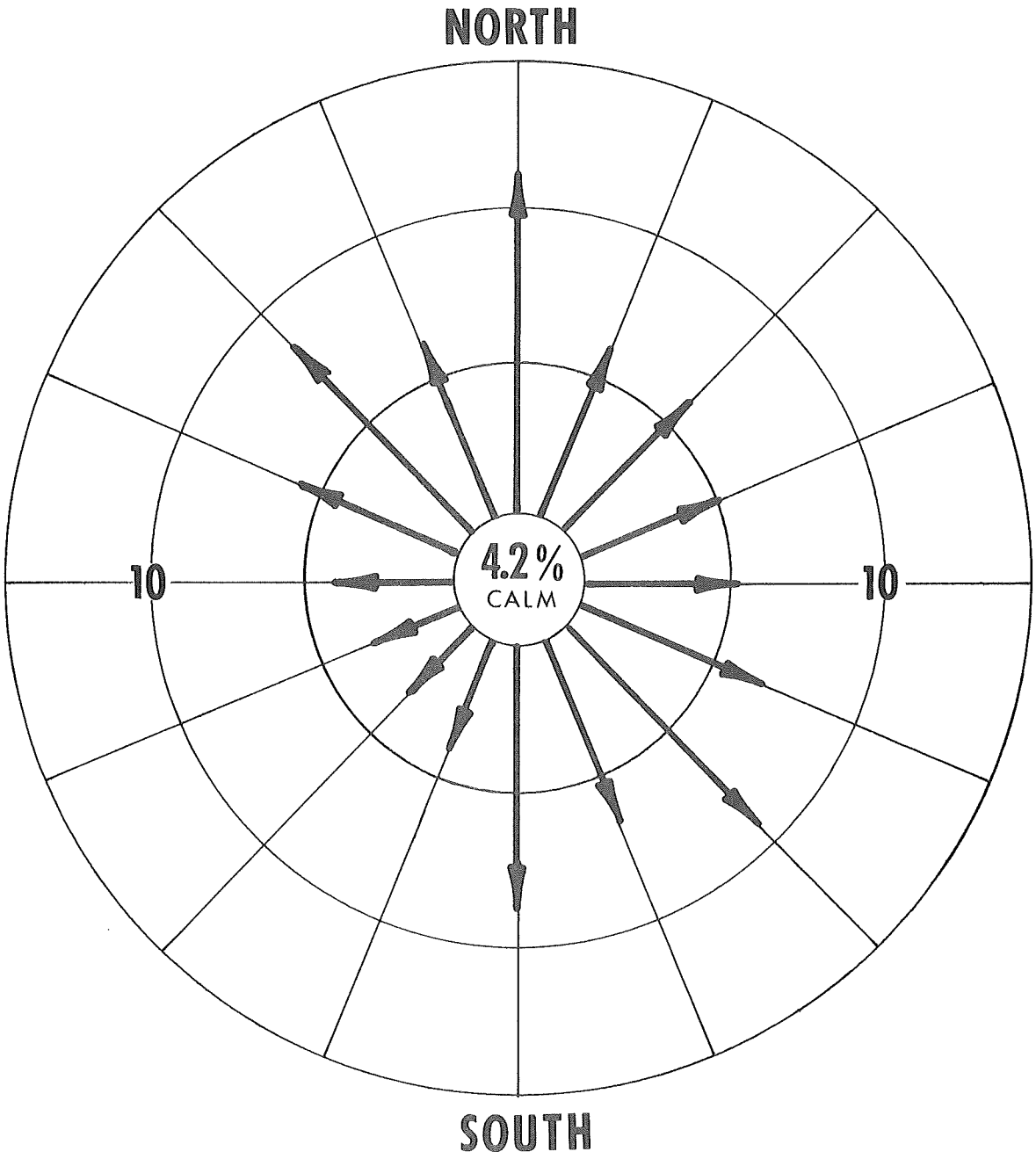
Figure 5A



WINDS ARE TOWARD INDICATED DIRECTIONS. 7/16 INCH EQUALS 5%.

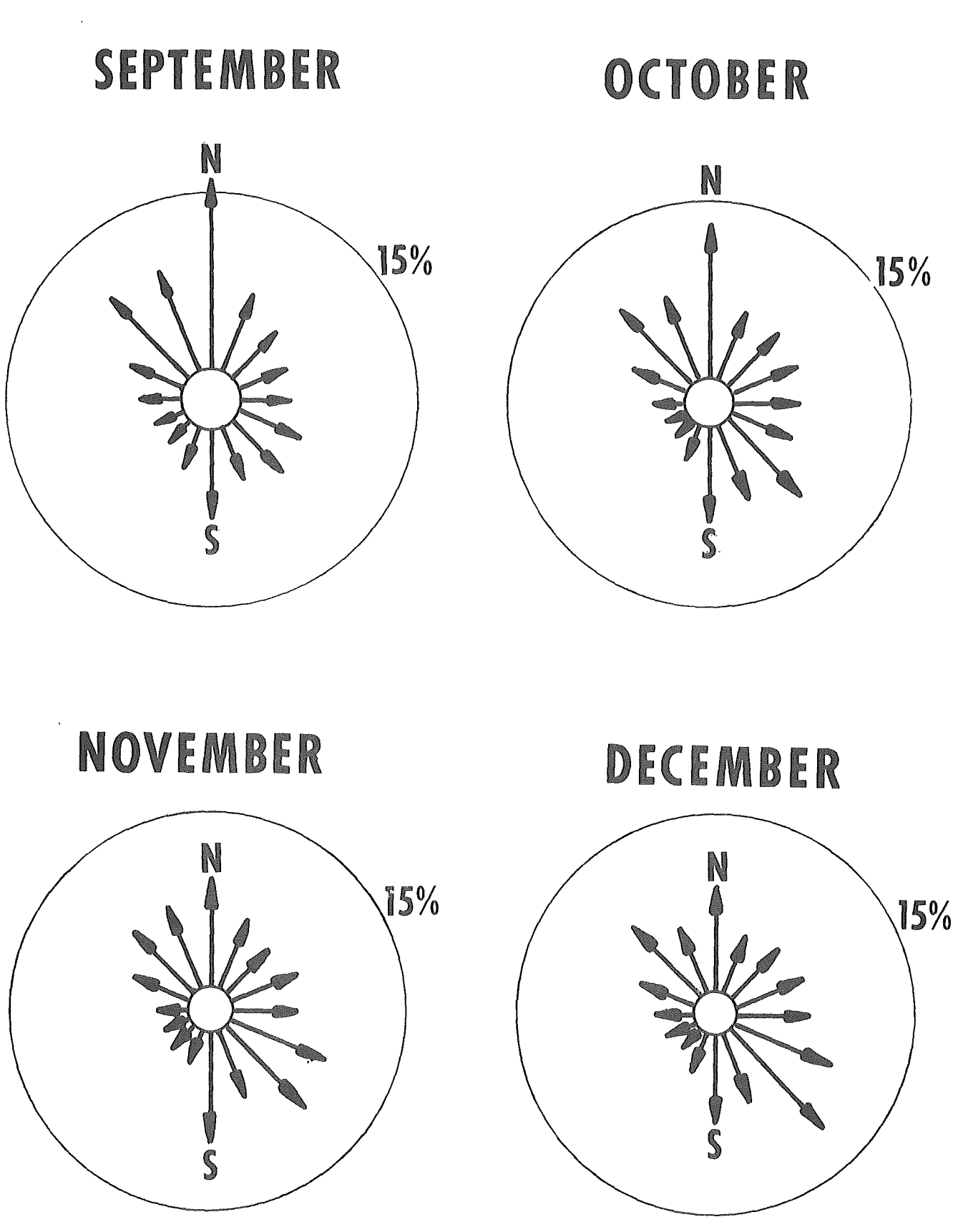
Figure 5B

ANNUAL WIND ROSE
MINNEAPOLIS, MINNESOTA
1958-1972



WINDS ARE TOWARD INDICATED DIRECTIONS. 7/8 INCH EQUALS 5%.

Figure 5D



WINDS ARE TOWARD INDICATED DIRECTIONS. 7/16 INCH EQUALS 5%.

Figure 5C

SHERCO region: the oak-hickory, the maple-basswood, and the oak-aspen. Forest associations are named according to the species with the greatest importance value.

Mesic (wet) and lowland prairies are found in the area around Becker. Sedges (genus Cyperaceae), grasses (genus Gramineae) and wildflowers are the major natural vegetation type of this area.

Today, with the exception of the forested areas along the Mississippi River, a great deal of the original forest has been cleared and harvested, and the original wetland prairie has been developed for agricultural use. The Soil Conservation Service has planted windbreaks in these cleared areas to prevent erosion of the sandy soils.

Wildlife - Wildlife habitat in the SHERCO Region is diverse and abundant. The brush deciduous forest communities found in this area provide good nesting habitat for birds, food and habitat for arboreal mammals, foliage and cover for deer, and habitat for mice, rabbits, fox, raccoon and others. The wet prairies are well suited to various burrowing mammals such as the Minnesota gopher, various mice and voles. The ruffed and sharp-tailed grouse are upland gamebirds that may be found in the area. Some additional wildlife species that occur in the SHERCO Region are identified in Appendix B.

Endangered species are those animals whose prospect of survival and/or reproduction is in jeopardy, as determined by the U.S. Department of the Interior. Though no endangered species were directly observed for this report, the bald eagle, American osprey and the Arctic peregrine falcon are endangered wildlife whose range and habitat requirements include the SHERCO Region.

Climate - The climate of the region may be characterized as continental, with warm to hot summers, cold winters and with well defined spring and fall transitional seasons. The average temperature range is from 72°F in the summer to 12°F in the winter. January is the coldest month with an average daily maximum temperature of 21°F, average daily mean of 12°F, and average daily minimum temperature of 3°F. July is the warmest month with an average daily maximum temperature of 83°F, average daily mean of 72°F, and an average daily minimum temperature of 61°F.

Annual precipitation averages 28 inches, of which 17-18 inches fall during May to September. Snow averages 42 inches annually. Record snowfalls are a 6 inch annual minimum and an 88 inch annual maximum.

Wind is predominantly from the northwest during the winter, and from the south-southeast during summer. Average windspeed is 13 mph in the spring, and 10 mph during the other seasons. Monthly and annual wind roses are presented in fig. 5.

Severe storms and tornadoes are a possibility in the region. NSP reports the probability of a tornado striking a given point as 5 x 10-4 per year or one tornado in 2,000 years.

Surface Water - The Mississippi River is the major occurence of surface water in the SHERCO Region. Average annual flow has been estimated at 4,600 cfs at Monticello (approximately 4 miles downstream of SHERCO) by A.J. Hopwood (1974). Hopwood also estimated minimum flow to be 240 cfs, and maximum flow to be 54,000 cfs, at Monticello. These estimates should also be valid at SHERCO.

Water quality in the Mississippi River has been monitored near the Monticello plant. Dissolved solids, pH, alkalinity, ortho phosphate, dissolved oxygen, and biochemical oxygen demand are presented for the period 1968-1972 in Table 1. Nitrate, chloride, turbidity, iron and sulfate contents for the period March, 1972 to February, 1973 are presented in Table 2.

TABLE 1

THE HIGH, LOW AND AVERAGE VALUES FOR DISSOLVED SOLIDS (mg/l), HYDROGEN ION CONCENTRATION (pH UNITS), TOTAL ALKALINITY (mg/l as $CaCO_3$), ORTHO PHOSPHATE (mg/l), DISSOLVED OXYGEN (mg/l) AND BIOCHEMICAL OXYGEN DEMAND (mg/l) FROM ½ MILE ABOVE (1), ½ MILES BELOW (2), AND 3½ MILES BELOW (3) THE NSP MONTICELLO GENERATING PLANT ON THE MISSISSIPPI RIVER DURING THE PERIOD 1968 THROUGH 1972. (FROM THE 1972 ANNUAL REPORT FOR THE MONTICELLO NUCLEAR GENERATING PLANT, NSP)

		DISSOLVED SOLIDS			pH			$CaCO_3$			ORTHO PHOSPHATE			D.O.			BOD		
		high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg
1968	Station 1	222.5	90	177.4	7.7	7.3	7.4	175	130	153.3	.37	.10	.17	12.8	7.3	9.6	2.9	1.37	1.95
	Station 2	222.5	90	177.4	7.7	7.3	7.4	180	128	154.0	.22	.12	.17	8.5	7.3	7.9	2.10	1.75	1.95
	Station 3	222.5	90	177.4	7.7	7.3	7.4	180	128	155.2	.29	.13	.18	14.0	7.3	10.1	3.25	1.37	2.0
1969	Station 1	243	130	180.2	7.4	7.1	7.2	180	100	153.3	.20	.02	.10	15.5	8.4	10.4	3.0	1.5	2.43
	Station 2	243	130	180.2	7.4	7.1	7.2	176	100	152.9	.14	.02	.08	14.0	8.3	10.8	3.5	1.25	2.20
	Station 3	243	130	180.2	7.4	7.1	7.2	180	95	147.3	.14	.01	.08	15.0	8.3	10.7	4.25	1.5	2.50
1970	Station 1	252	176.7	196.1	8.4	7.1	7.5	194.5	126.5	161.3	.20	.12	.15	12.5	7.6	10.3	4.6	0.4	2.6
	Station 2	252	180	196.4	8.4	7.1	7.5	190	127	162.5	.18	.09	.13	13.5	7.5	10.6	4.3	0.6	2.3
	Station 3	252	160	194.0	8.4	7.1	7.5	178.5	125	156.2	.09	.19	.14	13.3	7.8	10.7	4.4	1.8	2.9
1971	Station 1	200	135	168.5	8.4	7.3	7.9	180	120	155.8	.22	.12	.18	12.7	7.1	9.9	6.2	0.9	3.7
	Station 2	200	130	166.8	8.4	7.3	7.9	172.5	123.3	155.3	.21	.11	.17	12.6	7.6	9.7	4.5	1.9	3.2
	Station 3	100	130	167.6	8.4	7.1	7.8	175	122.5	154.5	.25	.09	.17	12.6	7.6	9.4	6.3	1.8	3.6
1972	Station 1	175	140	159.8	8.1	6.9	7.6	207.5	130	163.8	.22	.07	.13	14.1	7.7	10.0	4.6	1.5	2.9
	Station 2	177.5	137	160.8	8.0	7.0	7.6	207.5	130	164.0	.22	.08	.13	10.4	7.0	9.1	4.3	1.0	2.3
	Station 3	200	137	163.1	8.0	7.2	7.7	225	130	166.1	.20	.09	.12	12.9	7.2	9.8	3.6	1.6	2.8

TABLE 2

NITRATE (mg/l), CHLORIDE (mg/l), IRON (mg/l), SULFATE (mg/l) CONTENT AND TURBIDITY (JACKSON TURBIDITY UNITS) OF WATER SAMPLES FROM ½ MILE ABOVE (1), ½ MILE BELOW (2), AND 3½ MILES BELOW (3) THE NSP MONTICELLO GENERATING PLANT ON THE MISSISSIPPI RIVER DURING THE PERIOD MARCH 5, 1972 TO FEBRUARY 18, 1973. (FROM THE 1972 ANNUAL REPORT FOR THE MONTICELLO NUCLEAR GENERATING PLANT, NSP)

	NITRATE			CHLORIDE			TURBIDITY			IRON			SULFATE		
	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg
Station 1	30.0	.05	5.69	10.0	5.0	8.37	40	3	14.08	.19	.00	.067	13	3	9.38
Station 2	32.0	.50	4.47	12.0	5.0	8.37	45	1	13.69	.23	.00	.063	13	2	8.73
Station 3	28.0	.50	5.91	10.0	5.0	8.46	42	1	15.08	.18	.00	.067	13	2	8.84

The operation of SHERCO units 1 and 2 will produce an average of 1.3 cfs and a maximum of 4.6 cfs of wastewater to be discharged to the Mississippi River.

The permit issued by the MPCA for discharge from units 1 and 2 includes the following conditions:

pH value	6.5-8.5
Turbidity value (JTU)	25
5 day biochemical oxygen demand (or equivalent chemical oxygen demand)	25 mg/l
Total suspended solids	30 mg/l
Sulfates and Sulfites (as S)	1060 lb/hr
Total dissolved solids	4500 lb/hr

In addition, water quality standards must be met. The standards for this reach of the Mississippi River are specified in Minn. Reg. WPC 25 as:

1) Domestic Consumption: Class C
2) Fisheries and Recreation: Class B
3) Industrial Consumption: Class B

These standards are defined in Minn. Reg. WPC 15 (d). The standards are included below.[1]

WPC 15 (d) (1) Domestic Consumption

Class C. The quality of this class of the interstate waters of the state shall be such that with treatment consisting of coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes, the treated water will meet in all respects both the mandatory and recommended requirements of the Public Health Service Drinking Water Standards-1962 for drinking water as specified in Publication No. 956 published by the Public Health Service of the U.S. Department of Health, Education and Welfare, and any revisions, amendments or supplements thereto. This standard will ordinarily be restricted to surface waters, and ground waters in aquifiers not considered to afford adequate protection against contamination from surface or other sources of pollution. Such aquifers normally would include fractured and channeled limestone, unprotected impervious hard rock where interstate water is obtained from mechanical fractures, joints, etc., with surface connections, and coarse gravels subjected to surface water infiltration.

The basic requirements are given below:

Substance or Characteristic	**Limit or Range**
Fecal coliform organisms	200 most probable number per 100 milliliters
Turbidity value	25
Color value	15
Threshold odor number	3
Methylene blue active substance (MBAS)	0.5 milligram per liter
Arsenic (As)	0.01 milligrams per liter
Chlorides (Cl)	250 milligrams per liter
Copper (Cu)	1 milligram per liter

[1]Where the standards of another regulation are referenced within a given regulation, the standards of the referenced regulation are included for the convenience of the reader.

Carbon Chloroform extract	0.2 milligram per liter
Cyanides (CN)	0.01 milligram per liter
Fluorides (F)	1.5 milligrams per liter
Iron (Fe)	0.3 milligram per liter
Manganese (Mn)	0.05 milligram per liter
Nitrates (NO_3)	45 milligrams per liter
Phenol	0.001 milligram per liter
Sulfates (SO_4)	250 milligrams per liter
Total dissolved solids	500 milligrams per liter
Zinc (Zn)	5 milligrams per liter
Barium (Ba)	1 milligram per liter
Cadmium (Cd)	0.01 milligram per liter
Chromium (Hexavalent, Cr)	0.05 milligram per liter
Lead (Pb)	0.05 milligram per liter
Selenium (Se)	0.01 milligram per liter
Silver (Ag)	0.05 milligram per liter
Radioactive material	Not to exceed the lowest concentrations permitted to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

In addition to the above listed standards, no sewage, industrial waste or other wastes, treated or untreated, shall be discharged into or permitted by any person to gain access to any interstate waters classified for domestic consumption so as to cause any material undesirable increase in the taste, hardness, temperature, toxicity, corrosiveness or nutrient content, or in any other manner to impair the natural quality or value of the interstate waters for use as a source of drinking water.

WPC 15 (d) (2) Fisheries and Recreation

Class B. The quality of this class of the interstate waters of the state shall be such as to permit the propagation and maintenance of cool or warm water sport or commercial fishing and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. Limiting concentrations or ranges of substances or characteristics which should not be exceeded in the interstate waters are given below:

Substance or Characteristic	Limit or Range
Dissoved oxygen	Not less than 6 milligrams per liter from April 1 through May 31, and Not less than 5 milligrams per liter at other times.

Temperature*	5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature, except in no case shall it exceed the daily average temperature of 86°F.
Ammonia (N)	1 milligram per liter
Chromium (Cr)	0.05 milligram per liter
Copper (Cu)	0.01 milligram per liter or not greater than 1/10 the 96 hour TLM value.
Cyanides (CN)	0.02 milligram per liter
Oil	0.5 milligram per liter
pH value	6.5-9.0
Phenols	0.01 milligram per liter and none that could impart odor or taste to fish flesh or other fresh-water edible products such as crayfish, clams, prawns and like creatures. Where it seems probable that a discharge may result in tainting of edible aquatic products, bio-assays and taste panels will be required to determine whether tainting is likely or present.
Turbidity value	25
Fecal coliform organisms	200 most probable number per 100 milliliters as a monthly geometric mean based on not less than 5 samples per month, nor equal or exceed 2000 most probable number per 100 milliliters in more than 10% of all samples during any month.
Radioactive materials	Not to exceed the lowest concentration permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

*The following temperature criteria will be applicable for the Mississippi River from Lake Itasca to the outlet of the Metro Wastewater Treatment Works in St. Paul in addition to or superseding the above. The weekly average temperature shall not exceed the following temperatures during the specified months:

January	40°F	July	83°F
February	40°F	August	83°F
March	48°F	September	78°F
April	60°F	October	68°F
May	72°F	November	50°F
June	78°F	December	40°F

WPC 15 (d) (3) Industrial Consumption

Class B. The quality of this class of the interstate waters of the state shall be such as to permit their use for general industrial purposes, except for food processing, with only a moderate degree of treatment. The concentrations or ranges given below shall not be exceeded in the raw waters before treatment:

Substance or Characteristic	Limit or Range
Chlorides (Cl)	100 milligrams per liter
Hardness	250 milligrams per liter
pH value	6.0-9.0
Fecal coliform organisms	200 most probable number per 100 milliliters
Arsenic (As)	0.05 milligram per liter
Barium (Ba)	1 milligram per liter
Cadmium (Cd)	0.01 milligram per liter
Chromium (cr+6)	0.05 milligram per liter
Cyanide (CN)	0.2 milligram per liter
Fluoride (F)	1.5 milligrams per liter
Lead (Pb)	0.05 milligram per liter
Selenium (Se)	0.01 milligram per liter
Silver (Ag)	0.05 milligram per liter
Radioactive material	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

River water appropriators are listed in Table 3. Dischargers to the river are listed in Table 4.

Subsurface Water - There are two sources of subsurface water in the SHERCO Region. One is the unconsolidated sediments over the bedrock; the other is the bedrock itself. The bedrock yields significant water only in the southeastern portion of the region, where the rock consists mainly of sandstones; the rest of the region is underlain by granite which yields little or no water. The unconsolidated sediments, mostly terrace alluvium and possibly some glacial outwash, will yield considerable amounts of water. The upper limit of the yield has been estimated to be 300-500 gpm by the Minnesota Geological Survey. Wells

TABLE 3

MISSISSIPPI RIVER APPROPRIATORS
NSP SHERCO TO THE METROPOLITAN WASTEWATER TREATMENT PLANT

Owner	Use	Allotment (million gallons per year)
NSP SHERCO	Cooling	6,310.0
NSP Monticello	Cooling	155,666.7
Rural Coop Power Assn.	Cooling	53,766.7
Leonard DeChene	Irrigation	21.6
Richard A. Baldwin	Irrigation	20.0
Gerald Ewing	Irrigation	6.6
Lawrence Nadeau	Irrigation	13.6
D.R. Peterson	Irrigation	13.3
D.R. Peterson	Irrigation	11.0
Verle Ewing & Sons	Irrigation	41.6
Roy M. Iverson	Irrigation	3.3
Seeber L. Parker	Irrigation	15.0
W.R. Stephens	Irrigation	26.0
Elwyn C. Leathers	Irrigation	13.0
Rita Banks	Irrigation	0.1
Robert Haaf	Irrigation	26.7
Robert Haaf	Irrigation	6.7
I.R. Moldenhauer	Irrigation	7.3
Houlton Farm	Irrigation	26.1
Orville H. Throndsen	Irrigation	39.0
Barton Contracting Co.	Gravel Washing	24.3
Andrew L. Davis	Irrigation	28.7
Richard Lefbvre	Irrigation	6.0
Carl A. Swenson	Irrigation	7.2
City of St. Paul	Municipal Water Supply	20,000
City of Minneapolis	Municipal Water Supply	26,263.6*
Twin Parks Inc.	Private Water Works	22.0
B.F. Nelson Mfg. Co.	Cooling & Processing	7,260**
Ewald T. Peterson	Irrigation	1,500**
NSP Riverside	Cooling	N.A.***
NSP Riverside #8	Cooling	57,200.0
Minneapolis Park Board	Maintain City Lake Levels	1,500.0
NSP SE Steam Plant	N.A.	N.A.
NSP Lower Dam Hydro	Turbine	N.A.
NSP Hennepin Is. Hydro	Turbine	N.A.
NSP Island Plant	N.A.	90,000**
NSP High Bridge	Cooling	236,600**
Ford Motor Company	Cooling	N.A.
Vylactos Northern Inc.	Processing	246.5

*Total 1974 appropriation in million gallons
**DNR Permit specified rate only
***Not Available

Source: Minnesota Department of Natural Resources

TABLE 4

MAJOR DISCHARGERS TO THE MISSISSIPPI RIVER SHERCO TO HASTINGS

Municipal WWTP

- Monticello
- Elk River
- Anoka
- Metro Pig's Eye
- Newport
- St. Paul Park
- Rosemount
- Cottage Grove
- Hastings

Industrial

- NSP SHERCO
- NSP Monticello
- United Power Association
- NSP Riverside
- NSP High Bridge
- Vylactos Northern Inc.
- Swift & Co.
- Northwestern Refinery
- Sheely-Larson
- Koch Refining Co.
- St. Paul Ammonia
- 3M – Chemolite
- Numerous small cooling water discharges

Source: Minnesota Pollution Control Agency

currently in operation at the SHERCO Site have been constructed to yield 250 gpm.

Water quality for the unconsolidated sediment aquifer is appoximated in Table 5. Water quality for the bedrock aquifer (located in the southeast portion of the area) is approximated in Table 6. The granite bedrock yields no water.

Air Quality - NSP has had eight air quality monitoring stations in operation for a relatively short time. These stations provide a record of the ambient levels of SO_2 from August, 1974, through February, 1975, and of particulates from December, 1974, to March, 1975. The eight stations are located at: 1) City of Becker, 2) St. Cloud Airport, 3) Lake Maria State Park, 4) Monticello Nuclear Generating Plant, 5) City of Monticello, 6) City of Big Lake, 7) Sand Dunes State Park, and 8) SHERCO Plant Site. Sulfur dioxide was measured continuously at each station. Suspended particulate measurements were taken once every 6 days at each station.

Tables 7 and 8 summarize the data collected from these stations. Although the data are for a relatively short period of record, they suggest that background SO_2 levels are very low, approaching zero, and particulate concentrations are generally low, with episodes of moderate to high concentrations. Sampling for nitrogen oxides is currently being conducted by NSP.

SHERCO units 1 and 2 are anticipated to produce a maximum 3-hour average concentration of SO_2 of 320 ug/m^3 at 1 to 1.3 km from the plant, and a maximum 24-hour average concentration of 105 ug/m^3 at 4 to 6 km from the plant. At other locations the concentrations are expected to be lesser. Since the background levels of SO_2 are near zero, and the NSP figures are approximate, the NSP figures can be taken to represent maximum background levels of SO_2 after units 1 and 2 become operational. Since these are maximum figures, the levels at most locations, and during most of the time, will be lesser.

Background noise data are not available. Rough estimates and calculations suggest that an L_{50} of 60-65 dBA will occur at 1600 feet from units 1 and 2 (including cooling towers) and an L_{50} of 50 to 55 dBA will occur about one mile from the plant. Unit trains will periodically generate additional noise. "Small town" levels may range from 45 to 55 dBA for L_{50} values.

Soils and Geology - The southeastern portion of the region is underlain by Precambrian and Cambrian sandstone and shales, with some carbonate rocks. The rest of the region is underlain by granite or granitic rocks (Figure 6). The nearest known fault is the Douglas fault, about twenty miles southeast of Becker at its nearest point. There has been no movement along this fault in recorded history, and geologic evidence suggests that there has been no movement for over 500 million years.

The bulk of the soils in the SHERCO Region are of glacial origin (Figure 7). The Des Moines lobe of the Wisconsin glaciation covered the region with a clayey till, and then covered portions of the till with a sand and gravel outwash north of the Mississippi River. At a later time, meltwater from the retreating glacier added large quantities of both water and sediment to the Mississippi River. Much of this sediment has been deposited as a broad band of terrace alluvium along the north bank of the Mississippi River. There are also several more recent deposits of wind blown sand and silt.

The solum is of low fertility in sandy areas, and of meduim to low fertility in soils developed over glacial till. In both cases, the solum exhibits poor water holding capabilities.

TABLE 5

WATER QUALITY OF THE UNCONSOLIDATED SEDIMENTS AQUIFER
(EXTRAPOLATED FROM MADERAK, 1965)

CONSTITUENT	CONCENTRATION (ppm)
Ca	100-150
Mg	20-50
Na + K	10-20
HCO_3	300-500
SO_4	50-100
Hardness (as $CaCO_3$)	300-400

TABLE 6

WATER QUALITY OF THE SANDSTONE AQUIFER
(EXTRAPOLATED FROM MADERAK, 1965)

CONSTITUENT	CONCENTRATION (ppm)
Ca	60-80
Mg	20-40
Na + K	15-40
HCO_3	300-400
SO_4	5-30
Hardness (as $CaCO_3$)	200-300

TABLE 7

SUMMARY OF SULFUR DIOXIDE DATA FROM EIGHT STATIONS – SHERCO REGION

STATION	SAMPLING PERIOD	TOTAL POSSIBLE HOURS	OUT TIME HOURS	OUT TIME PERCENTAGE	MINIMUM SO_2 ($\mu g/m^3$)	MAXIMUM SO_2 ($\mu g/m^3$)	ARITHMATIC MEAN SO_2* ($\mu g/m^3$)
1	8/23/74–2/23/75	4416	138	3.1%	0.00	40	.077
2	8/28/74–2/23/75	4303	944**	21.9%	0.00	30	.098
3	9/30/74–2/24/75	3554	492	13.8%	0.00	30	.091
4	8/22/74–2/23/75	4420	7	0.2%	0.00	50	.48
5	8/22/74–2/3/75	3960	17	0.4%	0.00	60	.33
6	8/13/74–2/24/75	4687	2223	49.6%	0.00	40	.24
7	9/24/74–2/24/75	3694	987	26.7%	0.00	60	.37
8	8/21/74–2/24/75	4486	543**	12.1%	0.00	40	.16

*Standard is 60 $\mu g/m^3$ maximum annual arithmatic mean.

**Includes hours when charts were missing.

Source: Northern States Power Company

TABLE 8

DATA FROM HI VOLUME PARTICULATE SAMPLERS AT EIGHT STATIONS
SHERCO REGION

	STATION							
DATE	1	2	3	4	5	6	7	8
12- 2-74	30.95	7.98	20.01	21.67	23.21	89.88	7.26	494.95
12- 7-74	33.40	20.03	NO SAMPLE	25.93	38.76	26.45	90.36	78.26
12-14-74	26.54	183.29	14.71	9.11	18.11	11.54	13.18	14.51
12-20-74	108.18	93.11	106.75	97.79	122.93	101.02	93.42	117.95
12-27-74	14.05	17.41	16.30	10.04	18.24	18.01	14.05	12.58
1- 3-75	29.04	32.10	33.54	38.67	33.73	39.70	31.10	39.41
1- 9-75	27.16	33.26	32.24	25.34	NO SAMPLE	52.65	17.12	40.23
1-16-75	32.11	4.38	16.53	92.63	7.46	20.11	12.42	42.18
1-22-75	10.98	7.68	3.62	6.13	3.60	6.62	20.19	18.67
1-28-75	9.01	24.30	14.24	14.25	22.42	12.68	10.84	13.93
2- 3-75	35.39	34.65	21.62	19.42	32.34	30.59	34.02	49.63
2- 9-75	18.18	21.16	22.24	18.82	22.25	25.12	31.18	41.52
2-15-75	12.87	18.82	15.42	17.35	23.81	9.23	11.35	15.41
2-21-75	46.49	18.27	46.54	5.69	49.17	46.82	43.77	71.93
2-27-75	30.35	22.14	24.16	53.17	45.96	32.69	22.86	46.11
3- 5-75	26.42	16.15	38.91	13.39	26.22	17.02	14.71	18.82

Standard: 24-hr. Ave.: 150 $\mu g/m^3$

Source: Northern States Power Company

Site Description

Land Use - Much of the proposed site is already committed to electrical generation with the construction of Units 1 and 2. However, a significant portion of the site is forested, mostly located in the southern area of the site. Less than 50 acres of the northern area of the site as proposed have been leased to farmers and are under cultivation. The 320 acre parcel which will be added to the existing site on the east side is approximately half cultivated and half in soil bank. Typical crops yields are:

Corn	50-60 bu/acre
Rye	15-20 bu/acre
Soybeans	15-20 bu/acre

Vegetation - The SHERCO Site is surrounded to the north and east by flat agricultural land. Windbreaks, consisting of primarily jack pine and red pine, have been planted in rows 100 to 200 yards apart to prevent wind erosion of the highly erosible sand soils.

To the south and west of the SHERCO Plant, hardwood forests are found generally following the course of the Mississippi River. These hardwood forests are characteristic of oak openings and oak barren forest communities. Bur oak is the predominate tree species. The oak opening has an abundant second story development in the form of brushy thickets consisting of prickly ash, staghorn sumac, blackberry, hawthorns, green briar and dogwood. Red cedar and an occasional pine, white oak, silver maple, elm hickory and green ash were trees also noted in this relatively homogenous oak forest. The oak barrens are similar to the oak opens, but grasses (genus Graminae) and wildflowers are found in lieu of the brushy thickets. Aster, mullein, milkweed, cockleburs, and Verbena are among the herbacious plants noted in the oak barren community.

Wildlife - Fence rows and windbreaks, found north and east of the SHERCO Plant, provide food and habitat for song birds, game birds, fox and rabbits, In uncultivated open lands or pasture lands, various burrowing mammals are likely to be found.

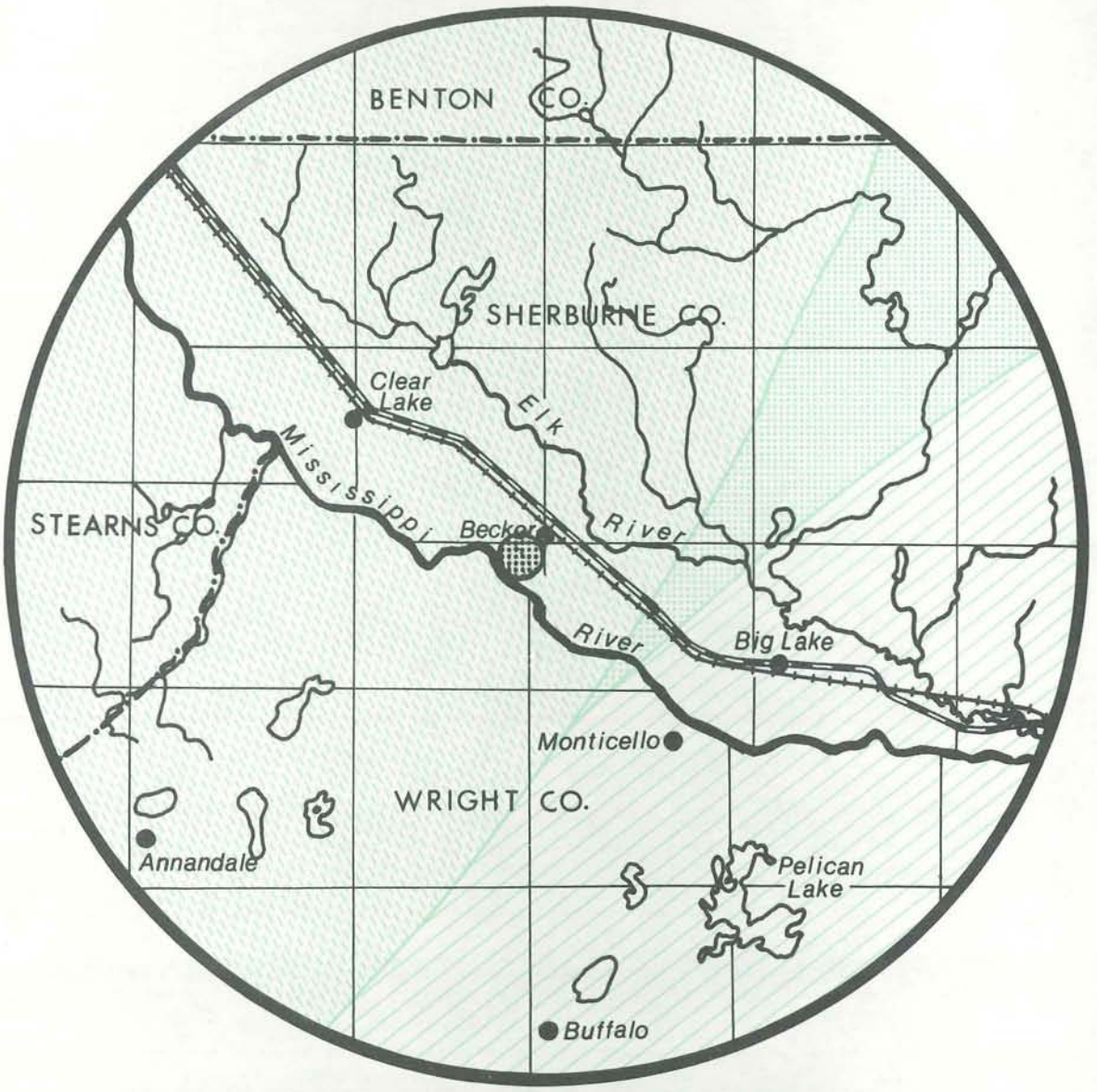
The hardwood forests found south and west of the SHERCO Plant are abundant in wildlife habitat because their broken (open) nature gives rise to an ecotone. An ecotone, or the edge effect, occurs where there are clearings in the forest. The resulting forest edge has full three story development (grasses, brush and trees) because of the optimum light and growing conditions. Evidence of deer, squirrels, woodchuck, mice and various birds were noted. Water fowl were seen on the Mississippi River near the water intake area. Other wildlife species that are likely to occur in or about the SHERCO Site are listed in Appendix B.

Endangered species, though not specifically encountered at the site, can be considered to be the same as those listed in the Regional Setting. The undeveloped portions of the site may provide habitat which is suitable for these species.

Aquatic Life - The only aquatic habitat present on the SHERCO Site is found in the Mississippi River. Data from the Monticello Annual Environmental Report 1973, has been used because it most closely approximates the river conditions found at the SHERCO Site 4 miles upstream. These data are presented in the Regional Setting.

Climate - The climate at the site is discussed under Climate of the Regional Setting. There are no site specific data to add to the regional description.

BEDROCK GEOLOGY
SHERCO REGION



CAMBRIAN ROCK, UNDIVIDED
Sandstones and shales with lesser carbonate rocks

HINCKLEY AND FOND DU LAC FORMATIONS
Predominantly sandstones

INTRUSIVE ROCKS, UNDIVIDED
Granite and granitic rocks

Figure 6

SURFICIAL GEOLOGY
SHERCO REGION

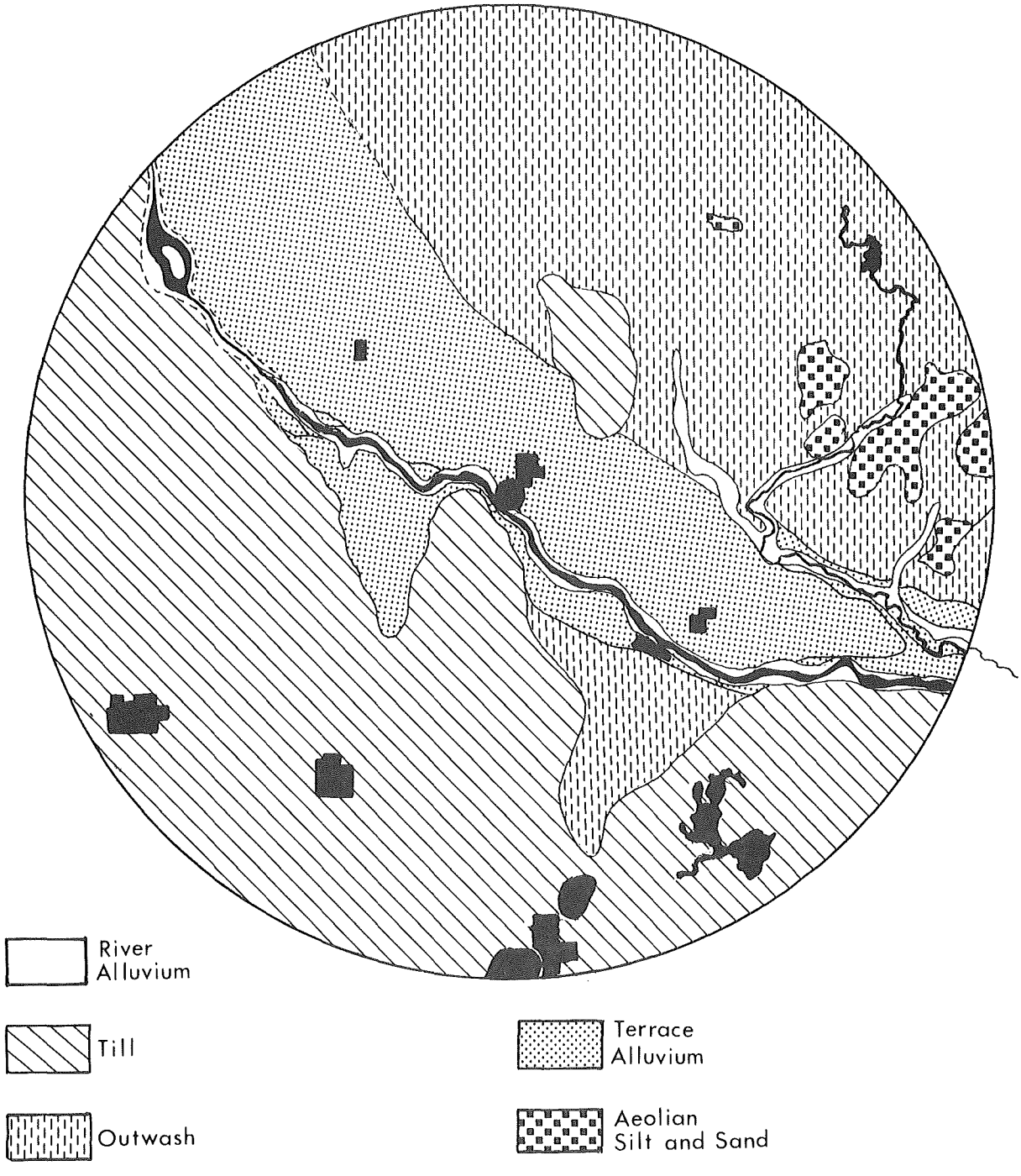


Figure 7

Surface Water - The major occurrence of surface water at the site is the Mississippi River. The elevation of the plant is approximately 40 feet above that of the river. Average flow of the Mississippi at SHERCO is estimated to be 4,600 cfs. A discussion of flow rates and water quality is included under **Surface Water** of the Regional Setting. There are no site specific data to add to the regional description.

Subsurface Water - Subsurface water is available only from the unconsolidated sediment aquifer. There is no sandstone aquifer at the site. The first bedrock encountered is granite, which yields no water.

The Minnesota Geological Survey has estimated that 300-500 gpm is an upper limit for the yield that may be possible from the unconsolidated sediments. Operational wells on the site have been constructed to yield 250 gpm. The water table ranges from 34 to 40 feet below ground surface. The water surface slopes toward the Mississippi River.

Quality of the subsurface water has been discussed under **Subsurface Water** of the Regional Setting. There are no specific data to add to the regional description.

Air Quality - Monitoring Station Number 8 is located at the site. SO_2 data suggests that there is little difference from the regional levels for this parameter. Particulate data suggest that in general there is little difference from the regional levels for this parameter, with the exception of a few incidents, probably due to local dust generation.

Soils and Geology - Bedrock at the site consists of granite. There is a weathered zone at the surface of the granite. Bedrock is encountered at 65 feet below ground surface at the plant site, and slopes to the southeast where it may be as deep as 160 feet below ground surface.

The site is blanketed by a 1½ to 2 foot layer of topsoil consisting of loose, dark brown, silty sand with grass roots extending 2 to 4 inches below the surface. The upper 5 to 15 feet is composed of loose, fine to medium sand. The soil from 12 to 30 feet below the surface grades medium dense to dense and contains some coarse sand and gravel. The material overlying the granite increases in density with depth down to the bedrock.

The solum is sandy and excessively drained. Fertility is low.

CULTURAL ENVIRONMENT

Introduction

Within this report, the scope of the "Cultural Environment" has been narrowed down to include only community infrastructure. Infrastructure has been defined to include the following topics:

Quantitative Population Statistics
Housing
Education and Schools
Employment and Income
Retail Services and Manufacturers
Community Tax Structure
Transportation
Medical Facilities
Waste Water Disposal Facilities

In addition to these topics, Historic Sites has been included as part of the cultural environment.

While the cultural environment is much more complex than is presented here, a more detailed investigation is beyond the scope of this report. This level of study, however, should identify many, if not all, of the major human impacts.

Methodology

In order to perform an assessment, an area must be defined which will include all of the major impacts of the project. At SHERCO this area, called the "Primary Impact Area" or "PIA", has been designated as a fifteen mile radius circle, centered on the plant site. This appears to be the limit of an area of enthusiastic housing development during the period of construction of SHERCO Units 1 and 2. This area also excludes the City of St. Cloud, and thus avoids the use of data which might skew statistics characterizing the impact area in favor of this relatively large city. The Primary Impact Area is defined as all of the communities and places within a 15 mile radius of the SHERCO Site. Within this PIA, there has been a designation of a Primary Urban Area, or PUA. The PUA includes only those places within the PIA which have been designated as communities by the U.S. Census Bureau. A third level of analysis has investigated urban communities located just outside of the PIA; that is, communities located just outside of a 15 mile radius from the SHERCO Site. These are designated the Secondary Urban Area, or SUA. Whenever data for entire counties are being presented, the counties are referred to as the"SHERCO Area." Table 9 summarizes the analytical areas defined for this report, and lists the communities included within them.

Population Characteristics

Impact has been considered in three aggregated geographical units. In 1970, the populations of these units were as follows: SHERCO PIA (15 mile radius from Becker) 23,251; SHERCO PUA (Monticello, Big Lake, Clear Lake, Becker 3,296; SHERCO SUA (Elk River, Buffalo, St. Michael/Albertville, St. Cloud) 50,455. Total population of counties represented in the SHERCO Area are presented in Table 10. Also included in Table 10 are projections for these counties and their urban/rural subsets. Available data do not allow for PIA population projections.

In 1970 the major portion of the county populations resided in rural areas, the smallest county farm population being in Sherburne County (Table 11). A total of 7,115 farms were under cultivation in the four county area in 1970 ranging from 150 to 259 acres in average size. Population density in the counties varied from 42.6 persons per square mile in Sherburne County to 71.1 persons per square mile in Stearns County.

Unfortunately an urban/rural breakdown for the SHERCO PIA is not readily available. It is possible to determine that nearly 3,300 persons lived in urban communities in 1970 or 14.2% of the SHERCO PIA population. Population density in 1970 was 32.9 persons per square mile within the fifteen mile radius of Becker. Rural density was slightly lower at 28.6 persons per square mile. A total of 1,753 area residents were employed in direct agricultural activities that year (7.5%).

German Catholics were a dominant force in the development of the region and continue to have a major influence on the area. The first Catholic church in Minnesota was dedicated at St. Joseph in Stearns County and the first Catholic school in the state was founded at the present site of St. John's University at nearby Collegeville.

SHERCO PIA

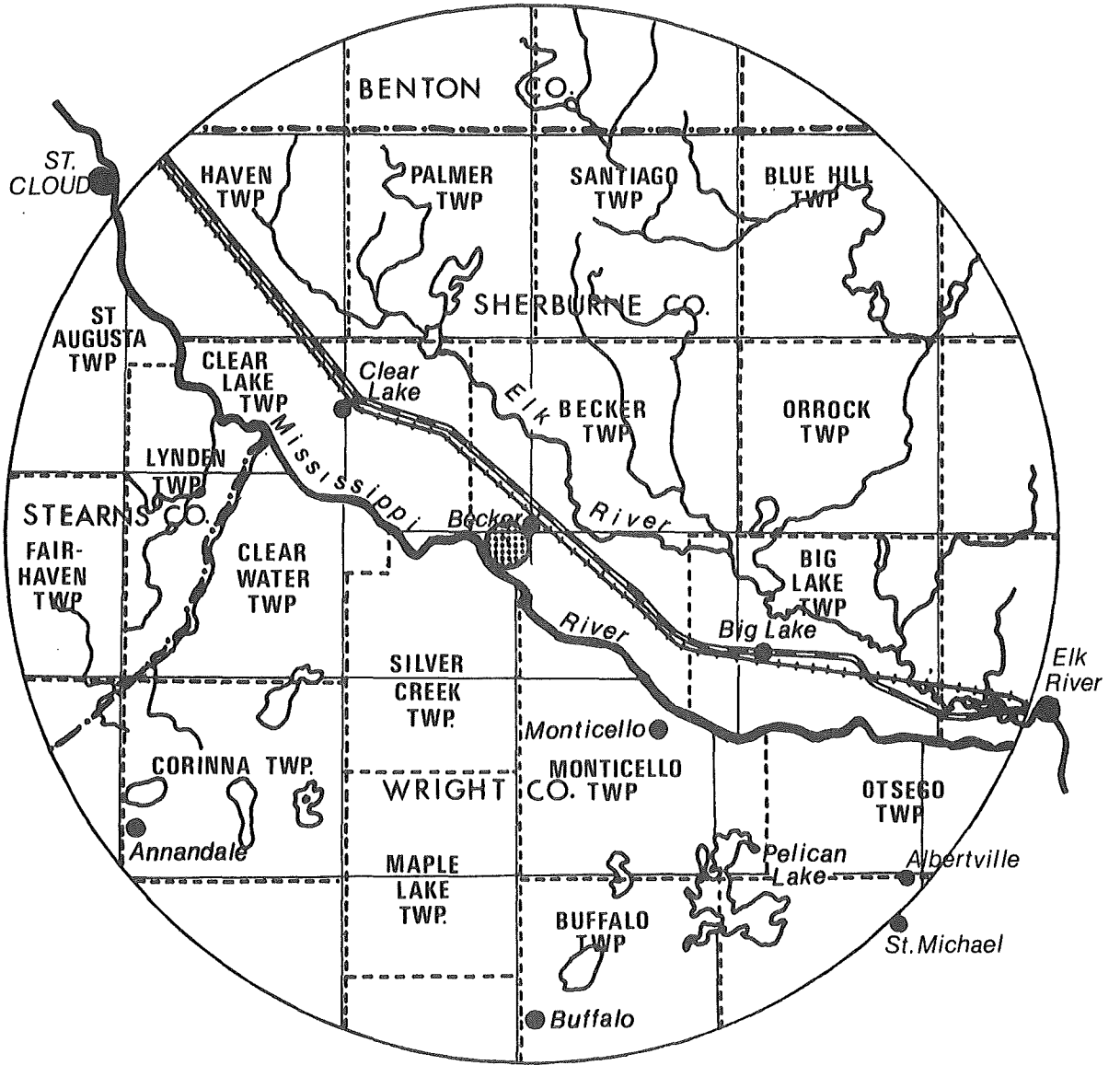


Figure 8

TABLE 9

SUMMARY OF ANALYTICAL AREAS – SHERCO

Analytical Area	Definition	Communities	Percentage of Area Included in Analytical Area
SHERCO Primary Impact Area (PIA)	15 mile radius from the site	Livonia TWP	.20
		Baldwin TWP	.03
		Elk River TWP	.20
		Ostego TWP	.40
		Frankfort TWP	25
		Buffalo TWP	70
		Chatham TWP	55
		Albion TWP	25
		Fairhaven TWP	80
		St. Augusta TWP	40
		South Side TWP	25
		Haven TWP	95
		Minden TWP	10
		St. George TWP	40
		Glendorado TWP	25
		Blue Hill TWP	75
		Santiago TWP	100
		Palmer TWP	100
		Orrock TWP	100
		Becker TWP	100
		Clear Lake TWP	100
		Clearwater TWP	100
		Silver Creek TWP	100
		Corinna TWP	98
		Lynden TWP	100
		Maple Lake TWP	100
		Monticello City	100
		Big Lake Village	100
		Clear Lake Village	100
		Becker Village	100
SHERCO Primary Urban Area (PUA)	Major communities within the PIA	Becker	100
		Clear Lake	100
		Monticello	100
		Big Lake	100
SHERCO Secondary Urban Area (SUA)	Major communities lying outside of, but near, the PIA	Buffalo	100
		St. Cloud, Stearns County	100
		St. Cloud, Wright County	100
		St. Cloud, Benton County	100
		Elk River	100
		Albertville	100
		St. Michael	100

TABLE 10

1970 POPULATION & PROJECTIONS – SHERCO AREA (ROUNDED TO NEAREST 100)

LOCATION	1960	1970	1960-1970 % CHANGE	1970	1975	1980	1985	1990	1995	2000
State	3,413,864	3,804,971	11.5							
Benton	17,287	20,841	20.6	20,800	22,000	23,400	25,200	27,000	28,600	29,700
Sherburne	12,861	18,344	42.6	18,300	22,700	25,500	29,600	34,000	39,400	45,300
Stearns	80,345	95,400	18.7	95,400	100,200	106,300	112,400	117,800	122,300	126,000
Wright	29,935	38,933	30.1	38,900	44,400	51,200	59,600	69,500	76,300	87,000
SHERCO PIA	N.A.	23,251	N.A.							
SHERCO PUA	N.A.	3,296	N.A.							
SHERCO SUA	N.A.	60,455	N.A.							

Source: 1) 1970 U.S. Census first count as developed by Minnesota Area Planning Systems, 1975.
2) State Demographer, Minnesota State Planning Agency, 1975.

TABLE 11

FARM POPULATION – SHERCO AREA

Location	1970 Area Sq. Mi.	Population Density (persons per square mile)	Urban Population	Rural Population	Farm Population as % of Total Population	Rural Non-farm Population as % of Total Population	Number of Farms	Average Farm Acreage
Sherburne	431	42.6	3,198	14,426	17.8	60.8	565	259
Wright	674	57.8	3,275	35,658	28.0	63.6	2,163	150
Benton	402	51.8	—	—	—	—	1,003	190
Stearns	1,342	71.1	38,167	57,233	20.2	39.8	3,384	208
SHERCO PIA◆	706	32.9	—	—	—	—	—	—

Employed in Agriculture*	1970
SHERCO PIA	1,176
SHERCO PUA	22
SHERCO SUA	555

◆ Note: Rural Density SHERCO PIA = 28.6 persons per square mile

* Includes farmers, farm managers and farm laborers.

Source: U.S. Census 1970 (as compiled by Minnesota Analysis and Planning Systems)

Between 80 and 87 percent of individual county population in 1970 were born in Minnesota. Of those born out of the country or of foreign-born parentage, the largest number were of German, Swedish, Canadian or Polish origin. Small pockets of Irish, Russian and British communities are singularly noticeable in Stearns County.

Larger proportions of the SHERCO PIA and SHERCO SUA populations were born in Minnesota than of the SHERCO PUA population (84% and 83% vs. 79%). Ethnic concentrations of foreign born or native born of mixed parentage were found in the SHERCO PIA and SUA communities as well. With the exception of five Czechoslovakians, the foreign population in the SHERCO PUA was exclusively of Western European heritage. Other groups appear to have located in rural or outlying urban areas.

Median age in the SHERCO PIA was 24.0, 25.0 in the SHERCO PUA and 22.0 in the SUA. The percentage of persons under 18 years of age was larger in the SHERCO PIA (42.1) than in any of the counties or urban impact areas. The largest concentration of persons over 65 was in the SHERCO PUA (14.5). (Table 12).

Nearly 40 percent of the 1970 SHERCO PIA population moved into their 1970 residences before 1965. Population growth in the area grew steadily between 1965 and 1970, with some 5,289 of a total 23,251 residents moving into their 1970 residences between 1969 and April 1970.

Almost fifty percent of the 1970 SHERCO PUA population (3,296) moved into their homes prior to 1965. The percentile in the SUA was 45.1.

Housing

General characteristics of 1970 housing in the SHERCO Area are presented in Table 13. Generally, it can be said that over three-fourths of the housing units in the four county area were owner-occupied in 1970 (slightly more than the average for the state-72%). There were, in 1970, very few one room housing units and 12 percent of all year round housing units were a seasonal or migratory nature, the largest concentration located in Sherburne and Wright Counties. Vacant housing was available in all counties. Median value of owner-occupied housing in the five county area was lower than the site average of $18,100 ranging from $14,300 in Benton to $16,600 in Sherburne County. Value of rural occupied housing was higher than the state median ($11,800) ranging from $12,500 in Benton to $16,200 in Sherburne County.

Similar variance from state averages were evident in median dollar contract rent. The range was between $111 in Sherburne County and $79 in Wright County. Rural rents were higher than the state median of $65 ranging from $75 in Wright County to $84 in Sherburne County.

Between 6 and 9 percent of all housing units lacked some or all plumbing in 1970. Residents of Sherburne and Wright County relied on private wells as a water source and septic tanks as a means of sewage disposal while other county residents used public or municipal water and sewage disposal systems.

A total of 9,989 housing units were situated within the SHERCO PIA in 1970 of which 54% were owner occupied. Nearly 3,100 of these units were seasonal (31%) and 530 (5.3%) were vacant. Median value of owner occupied housing units was $15,500 and median rent was $84 per month. Seven percent of

TABLE 12

1970 GENERAL POPULATION CHARACTERISTICS – SHERCO AREA

Location	Population 1970	% Born in State	Number of Households	Average Size	Median Age*	-18	65+	Median* Years of Education 1970 M	Median* Years of Education 1970 F	% High School Graduates 1970 M	% High School Graduates 1970 F
State	3,804,971		1,153,946	3.20	26.8	36.3	10.7				
Sherburne	18,344	79.5	4,953	3.46	24.1	37.7	10.3	12.1	12.3	51.9	59.7
Wright	38,933	86.1	10,926	3.52	25.6	40.8	11.6	10.4	12.2	43.2	56.0
Benton	20,841	86.4	5,652	4.16	23.4	41.1	9.4	11.2	12.1	46.8	53.9
Stearns	95,400	87.4	23,168	3.76	22.0	39.6	9.2	10.7	12.0	45.5	51.1
SHERCO PIA	23,251	84.1	6,369	3.70	24.0	42.1	10.1	10.0	12.0	44.6	56.4
SHERCO PUA	3,296	79.2	993	3.30	25.0	38.5	14.5	12.0	12.0	51.3	58.8
SHERCO SUA	50,455	82.5	12,823	3.40	22.0	33.6	10.2	12.0	12.0	56.9	59.9

*Estimated for Impact Areas

Source: U.S. Census First Count, 1970 (Compiled by Minnesota Analysis Planning Systems, 1975)

TABLE 13

GENERAL HOUSING CHARACTERISTICS FOR 1970 – SHERCO AREA

Location	Number of Units: Year Round	Number of Units: Seasonal and Migratory	% Year Round Owner Occupied	Permanent One Room Units: Number	Permanent One Room Units: % of Total Units	Vacant Year Round	Owner Median Total Units	Occupied $ Value-Rural	Median Total Units	Rent-Rural	Total Year Round Lacking Some/All Plumbing: Number	Total Year Round Lacking Some/All Plumbing: % of Total Units
Minnesota	1,219,591	56,491	72	26,973	2	65,645	18,100	11,800	102	65	92,770	8
Benton	5,823	195	78	14	0	171	14,300	12,500	98	81	528	9
Sherburne	5,305	1,143	73	73	1	352	16,600	16,200	111	84	303	6
Stearns	24,279	1,810	75	243	1	1,111	14,800	14,300	90	81	1,558	6
Wright	11,672	2,566	78	90	1	746	15,300	14,800	79	75	1,018	9
SHERCO PIA	9,989	3,090	54	63	.6	530	15,500	NA	84	NA	687	7
SHERCO PUA	1,056	19	72	7	.7	44	13,100	NA	80	NA	52	5
SHERCO SUA	13,321	114	68	175	1.3	384	16,600	NA	101	NA	411	3

Location	Rural Housing: Year Round Total	Rural Housing: % Owner Occupied	Rural Farm: Total	Rural Farm: % Owner Occupied	Total Year Round One Person Occupied
Minnesota	407,343	82	128,078	87	96,399
Benton	3,250	84	1,203	94	705
Sherburne	4,346	77	914	93	629
Stearns	14,290	80	3,833	94	3,214
Wright	10,636	78	2,723	93	1,515
SHERCO PIA		NOT AVAILABLE			731
SHERCO PUA		NOT AVAILABLE			185
SHERCO SUA		NOT AVAILABLE			2,069

Source: U.S. Census 1970 Fourth Count Data.

total housing units lacked some or all plumbing and 731 units were occupied by a single person. Sixty-three permanent, one room housing units were available in the PIA.

Generally, a larger percentage of SHERCO PUA housing units were owner-occupied. Median value and median rents were lower in this analytical area. Fewer homes lacked some or all plumbing (5%) and there were fewer one room housing units or dwellings occupied by a single person. Forty-four housing units were vacant.

In the Secondary Urban Area, there were 13,321 housing units of which 68% were owner-occupied, and 3% were vacant. Median value and rent were higher in this analytical area ($16,000 and $10,000). Three percent of total housing units lacked some/all plumbing. There were 175 (1.3%) permanent one-room housing units and 2,069 dwellings (15.5%) were occupied by one person.

Twleve residential housing permits were issued in the SHERCO PUA in 1970 and 14 in 1974. Most building activity took place in Monticello or Big Lake. The most recent development in Becker was completed in 1974 and included 6 homes built on rural lots north of the village along trunk Highway 25. Four of these homes were built by NSP employees.

Generally, housing construction has fallen off in the SHERCO Area in recent months (Table 14). During 1973, 879 residential permits were issued in Sherburne County. Between January and July, 1974, 375 permits were issued. Zoning administrators noted at that time that rental property was generally not available in the county though land was available for home building.

Education and School Facilities

As of 1970, 42.1% of the SHERCO PIA Population were under eighteen years of age. Comparable figures for the SHERCO Primary Urban and Secondary Urban Areas were 38.5 and 33.6 percent. The adult population (over 25) had completed an average of 10 to 12 years of formal schooling in 1970. Between 44.6 and 56.9 percent of the adult male populations were high school graduates. The range for females was 56.4 to 59.9 percent.

The SHERCO PIA comprises four school districts having a total public school enrollment of 3,950 (2,454 elementary and 1,496 high school students). Per pupil, annual costs ranged between $978.00 and $1,452.00 in 1973 (Table 15).

There are four school districts in the SHERCO Secondary Urban Area including Elk River, St. Cloud, St. Michael/Albertville and Buffalo. Total current enrollment in these public schools is 18,924 (9,248 elementary, 1,346 middle and 8,330 high school students). Average pupil costs ranged between $1,020 and $1,128 in 1973.

Schools located within the SHERCO PIA have a current total enrollment capacity of 4,754. Based on these figures, schools within the area are operating at 83.1 percent and could accommodate an additional 804 students (208 at the elementary level and 596 at the secondary level).

Total current capacity in SHERCO Secondary Urban Area communities is 20,546 at all levels. These schools are, as a unit, currently operating at 92 percent of maximum load. Broken down, this percentile is evident at educational levels as follows: Elementary (98.9%), middle (56.4%), high school (94.3%). The school system could accomodate a total of 1,622 additional students.

TABLE 14

RESIDENTIAL PERMITS ISSUED 1970-1974 – SHERCO AREA

Location	Total '70	Single Family '71	Single Family '72	Single Family '73	Apartments '71	Apartments '72	Apartments '73	Multiple Duplex '71	Multiple Duplex '72	Multiple Duplex '73	Total '74
SHERCO PUA											
Total	12	5	6	6	11	12	3	0	0	0	14
Becker	0	1	0	1	0	0	0		0		6
Big Lake	2	1	3	5	11	12					NA
Clear Lake					NOT AVAILABLE						
Monticello	10	3	3				3				8
SHERCO SUA											
Total	318	158	129	143	154	166	479	22	18	18	476
Albertville	5	5	3	6							
Buffalo	14	70	28	21		27		0	4	2	37
Elk River	12	3	20	35		50					12
St. Cloud	274	54	78	81	154	89	479	22	14	16	418
St. Michael	13	26									
Total Other SHERCO Communities	35	484	487	933		20	5	2			5
Zimmerman – Unincorporated	6	2	2	4							
Sherburne County		184	308	344							
Maple Lake – Unincorporated	2	4	9	8		8					5
Wright County		282	415	477		12					NA
Sauk Rapids Township	6	7	6	9							NA
Sauk Rapids Village	18	18	20	32			5	2			NA
Foley – Unincorporated	3	4	2	3							NA
Benton County		43	42	56							NA

Source: U.S. Census Bureau, C-40 Series Construction Report: Housing Authorized by Building Permit and Contract

TABLE 15

EDUCATION FACILITIES AND CAPACITIES – SHERCO AREA

Location	School District	Enrollment 1974 Elementary	Middle	High School	Pupil/Teacher Elementary	High School	Capacity Elementary	Middle	High School	$ Per Pupil Cost	Plans
SHERCO PIA											
Total	(4)	(2454)	––	(1496)	––	––	(2662)	––	(2092)		
Becker	726	373	––	282	15:1	15:1	423	––	382	978.00	In process of purchasing 80A for expansion adjacent to present site.
Big Lake	727	450	––	350	17:1	17:1	500	––	500	911.00	In process of relocating H.S. into new facilities (70A) to open fall 1975.
Monticello	Ind. 822	1074	––	864	26:1	22:1	1182	––	1210	1452.00	Planning building annex to house H.S. phy. ed. facilities and community education public rooms.
Clear Lake	St. Cloud 742	557	––	0	25-30:1	––	557	––	––	N.A.	Should expanded enrollment create facility crunch, student service area would be decreased and students would be bussed to inner city schools in St. Cloud.
SHERCO SUA											
Total	(4)	(9248)	(1346)	(8330)	––	––	(9348)	(2386)	(8830)	––	
Elk River	728	2166	1103	1871	20.5:1		2166	1103	871	––	Currently operating at full capacity and are in process of requesting school bond. Enrollment growing at all levels reflecting demand from Twin Cities.
St. Cloud	742	4964	––	6390	25:1	20:1	4864	––	6690	1040.00	One high school being remodeled to accommodate an extra 300 students. Elem. and high schools operating at near full capacity now.
St. Michael/ Albertville	885	400	400	400	N.A.		500	440	600	1128.00	Just completed new elementary school to meet demand of Twin Cities families.
Buffalo	887	1718	843	669	27:1		1718	843	669	1020.00	Enrollment 1972 was 2879 and is expected to reach 5100 by the year 2000. Bond issue passed in January, 1975 pegged for expansion of outlying elementary schools. Plan to request another bond issue in September to expand Buffalo City facilities.

EMPLOYMENT AND INCOME

The Becker plant is located in the middle of Economic Development Region 7W. This places the plant approximately 20 miles from the edge of Region 11, the Minneapolis-St. Paul Standard Metropolitan Statistical Area. The counties primarily affected by this plant will be Benton, Sherburne, Stearns, and Wright. With transportation coming primarily from U.S. Highway 10 and 52, and Interstate I-94, the Cities of St. Cloud and Anoka could easily derive secondary employment affects. Table 16 shows the populations of the four counties for 1960 and 1970 as well as estimates for 1980 and 1990.

TABLE 16

POPULATION BY COUNTY – SHERCO AREA

	1960	1970	1980	1990
Benton	17,827	20,841	24,300	27,000
Sherburne	12,861	18,344	25,500	34,000
Stearns	80,345	95,400	106,300	117,800
Wright	29,935	38,933	51,200	69,500
Total	140,428	173,518	207,300	248,300

Source: John Hoyt, et al.

The total rise in population growth of 63.2% for the SHERCO Area between 1960 and 1990 is spread almost evenly between Sherburne, Stearns and Wright Counties. Sherburne and Stearns include St. Cloud. Wright County's growth is conditioned by a set of medium sized growing towns such as Monticello, Buffalo and Annandale.

In order to provide a better picture of the working age population, a table of population of age 16 years and older (Table 17) has been included to indicate the availability of manpower during this period.

The sixteen plus population is projected to grow by 84.9 percent over the same 1960 to 1990 period. Hence, a larger portion of the population will be able to work. Again, the growth is most closely associated with Sherburne and Stearns Counties.

Work force data for the four county area is presented in Table 18. Data for Stearns, Benton and Sherburne Counties are combined as they are a Standard Metropolitan Statistical Area, and to this is added Wright County. This data is based on annual averages for 1973.

A total of 59,670 persons were employed for salary in the four counties in 1970. The unemployment rate varied that year between 3.8% (Benton) and 4.7% (Stearns). The average for the state was 4.2%.

TABLE 17

POPULATION OF AGE 16 YEARS AND OLDER BY COUNTY
SHERCO AREA

	1960	1970	1980	1990
Benton	10,513	13,196	16,236	18,226
Sherburne	8,389	12,138	17,722	23,813
Stearns	49,764	63,497	72,786	79,420
Wright	19,187	24,829	33,369	40,944
Total	87,853	113,660	140,113	162,403

Source: John Hoyt, et al.

TABLE 18

WORK FORCE DATA – SHERCO AREA

	Benton Sherburne Stearns	Wright	Total
Total Work Force	54,415	11,686	66,101
Employed	50,921	10,800	61,721
Unemployed	3,494	887	4,381
Unemployment Rate	6.4	7.6	6.6
Wage & Salary	40,943	7,652	48,595
Other Non-ag	4,149	1,100	5,249
Agricultural	5,829	2,048	7,877

Source: John Hoyt, et al.

Within the SHERCO PIA, 7,078 persons were salaried employees in 1970. Average family income was $8,750 and 10.1 percent of all families earned subsistence incomes (Table 19).

In the SHERCO PUA, 1,179 persons were employed, primarily in the wholesale/retail trade industry (30.3%). Just under 12 percent of the employed population were engaged in construction. Average family income in the PUA ($9,000) was slightly higher than for the SHERCO PIA as a whole, and slightly more families had below poverty incomes (10.4%).

Incomes and poverty levels were quite distinct in Secondary Urban Area communities. The highest average family incomes in the region were earned here ($9,650) and only 6.2 percent of families had below poverty incomes, well below averages for the state (8%) and region (8%-12%). The major industry (among selected categories) in this analytical area was wholesale/retail trade which employed 2,625 of 19,169 workers (13.7%). Just under 800 persons had occupations in the construction industry (4.2%). The number of males employed in selected occupations is presented in Table 20.

Unemployment figures and percentiles are not available for the SHERCO PIA. In 1970, however, unemployed persons with training in certain occupations lived in the SHERCO Area. This population is summarized in Table 21.

TABLE 19

EMPLOYMENT – SHERCO AREA

LOCATION	LABOR FORCE EMPLOYED 1970	PERCENT UNEMPLOYED 1970	MEDIAN FAMILY INCOME	% FAMILIES WITH BELOW POVERTY INCOME♦
Minnesota	1,464,273	4.2	$9,931	8.0
Sherburne	6,215	4.6	9,564	8.0
Stearns	32,205	4.7	8,437	12.0
Wright	13,840	4.5	8,936	11.0
Benton	7,410	3.8	8,461	11.0
SHERCO PIA	7,708	NA	8,750	10.1
SHERCO PUA	1,179	NA	9,000	10.4
SHERCO SUA	19,169	NA	9,650	6.2

♦ Poverty income in 1970 for a family of four was considered to be: Urban $3,743, Rural $3,195
The 1974 measure was: Urban $4,550, Rural $3,870

Source: U.S. Census 1970 Fourth Count Data.

TABLE 20

NUMBER OF MALES EMPLOYED AT
SELECTED OCCUPATIONS 1970* – SHERCO AREA

LOCATION	AGRICULTURE FORESTRY FISHERIES	CONSTRUCTION	WHOLESALE RETAIL TRADE	PERSONAL, RECREATION ENTERTAINMENT SERVICES
Sherburne	512	503	671	68
Benton	960	478	995	73
Wright	1,828	1,138	1,857	145
Stearns	3,477	1,821	4,273	470
SHERCO PIA	1,047	904	1,347	304
SHERCO PUA	24	136	357	78
SHERCO SUA	408	799	2,625	329

*Total employment for impact areas (over 14 years of age)
Source: U.S. Census 1970 Fourth Count Data.

TABLE 21

NUMBER OF UNEMPLOYED PERSONS WITH JOB EXPERIENCE
1970 – SHERCO AREA

LOCATION	1970 TOTAL	SALES	CRAFTS	OPERATIVES	NON-FARM LABORERS	SERVICE
Sherburne	276	6	61	62	57	36
Benton	256	0	31	71	14	19
Wright						
Stearns	1,390	81	254	366	144	196
SHERCO PIA	268	7	100	115	55	35
SHERCO PUA	77	0	11	16	13	19
SHERCO SUA	778	26	126	191	82	146

Source: U.S. Census 1970 Fourth Count and Special Compilations prepared from 1970 data by MN Analysis and Planning Systems.

A final table on employment (Table 22) will provide a basic understanding of the economic conditions of the four county area. Data is based on annual averages for 1973.

TABLE 22

EMPLOYMENT SUMMARY – SHERCO AREA

	BENTON	SHERBURNE	STEARNS	WRIGHT	TOTAL
Construction	187	197	1,587	533	2,504
Manufacturing	1,079	277	8,908	1,367	11,631
Transportation & Personal	196	379	1,367	354	2,296
Retail Trade	1,128	735	6,643	1,804	10,310
Wholesale Trade	232	98	710	269	1,309
F.I.R.E.	130	86	713	205	1,134
Services	618	371	4,348	973	6,310

Keeping in mind that the area is strongly influenced by two population centers, the Twin City Metropolitan Area, and the St. Cloud Area, the following statements can be made:

1) Total population will continue to grow and there will be a higher percentage of the population of working age. This growth will center around St. Cloud.
2) The unemployment rate in the area is substantial.
3) Agriculture, while a factor in the area, accounts for only 12% of total employment.
4) The area has a very good manufacturing base.
5) The trade sector is very strong.
6) Construction employment is about proportionate to size of area.
7) In #4-6 St. Cloud is the major factor for this strength.

Current data for family income are not available. The 1970 U.S. Census shows that median family income for each of the four counties is as follows; Benton $8,461, Sherburne $9,564, Stearns $8,437, Wright $8,936 while the State of Minnesota has a median family income of $9,931. It is significant to note that each of the counties has a lower median income than the state.

While the small towns along the U.S. Highway 10 and 52 will probably benefit somewhat from the expenditures of the construction and plant workers, Monticello, St. Cloud, Elk River and northern and western metropolitan suburbs will probably benefit more.

The source of the largest portion of the construction workers will be either the Twin City Metropolitan Region or the hometown of the general or subcontractors. It can be expected that a few (between 5 and 10 percent) of the construction force will be local. These will be either fill-in trade skills or general laborers. During phases of the construction period, shortages in skilled personnel will occur as time schedules must be met or certain parts of the plant must be completed. It is estimated that 1300 construction workers will be employed during the building of the second two generators.

Plant operation employment for Units 1 and 2 is approximately 200. Although economics of scale will affect operating manpower requirements, employment will increase significantly with the addition of Units 3 and 4.

Retail Services and Manufacturers

Table 23 reflects an attempt to categorize the communities within the Primary Impact Area on the basis of retail service availability. This categorization is based upon the methodology developed by John Bochert and Russell Adams and presented in *Trade Centers and Trade Areas in the Upper Midwest,* 1963, for the Twin Cities Metropolitan Planning Commission.

The Bochert-Adams document defines eight classifications of retail trade centers according to the volume of gross wholesale and retail trade and the breadth of variety in retail services available within the center.

The eight possibilities of retail trade centers are categorized as:

Metropolitan wholesale/retail center
Primary wholesale/retail center
Secondary wholesale/retail center
Complete shopping center
Partial shopping center
Full-convenience center
Minimum convenience center
Hamlet

Retail service centers are restricted to Monticello in the SHERCO PIA. With the exception of a very few services (i.e. hotel and motel accomodations and three or four speciality shops), Monticello provides consumers with a full line of competitive business providing both conveniences and speciality goods and services. Recent development of a retail shopping mall has stimulated shopping out of downtown. Annexation of property by Monticello in October 1974, expanded the city by three times it's size and suggests future expansion of retail centers and service area.

Retail services at Becker are limited to convenience outlets: a gas station, a liquor store, two restaurants, one small grocery, a self-service laundromat and an auto equipment store. One restaurant was opened in anticipation of plant stimulated demand. Both the liquor store and gas station have increased business in the last twenty-four months.

In the SHERCO Secondary Urban Area, limited retail services are available in all communities, primarily at Elk River and Buffalo. St. Cloud is a full retail shopping area. Big Lake, St. Michael, Albertville and Clear Lake offer limited services. Retail outlets at Clear Lake, for instance, are limited to one funeral home, one army surplus store, one small grocery and one 3.2 beer establishment.

Community Tax Structure

There are three property taxing bodies considered in this report: counties, communities, and school districts. With regard to large electric generating plants, all of these taxing bodies construct tax strategies which are defined as attempts to capture full tax benefits from a major industrial concern and thus lower the mill rate for the resident taxpayers.

TABLE 23

RETAIL SERVICES – SHERCO AREA

Check List of Full-Service Functions by Category

	CONVENIENCE																				SPECIALTY									
	Gas Station	Grocery	Hardware	Bank	Eat & Drink	Drugs	Gen. Merchandise	Variety	Fresh Produce	Auto, Farm Equip.	Furn., Appliance	Laund., Dry Clean	Jewelry	Mens/Boys Clothes	Ladies Clothes	Shoe Store	Lumber Yard	Funeral Serv.	Hotel/Motel	Garden Supply	Photo Studio	Sport Goods	Florist	Radio/TV	Tires, Auto. Access.	Paint, Glass, Wallpaper	Heating, Plumb.	Antique, 2nd Hnd.	Music	Camera	Women's Access.	Stationery	Children's Wear
SHERCO PUA																																
Becker	X	X	X	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Monticello	X	X	X	X	X	X	X	X	X	–	X	X	X	X	X	X	X	X	–	X	–	X	X	X	–	X	X	X	X	–	X	–	X
Clear Lake	X	X		–	X	–		–						–	–	–	–	X	–	Δ	–	–	–	–	–	–	–	–	–	–	–	–	–
Big Lake	X	1	X	X	X	–	–	–	X	X	X	X	–	–	–	–	–	–	X	Δ	–	–	–	X	X	X	X	–	–	–	–	–	–

Δ Feed Mill

Source: Telephone interviews conducted by NBI with local officials.

Generally there is a state-enforced levy increase limitation of 6% per capita per year with a number of exceptions to this rule. The most important exceptions that directly affect the establishment of a large electric generating plant are levies necessary to compensate for the increased cost of extending services to newly annexed areas and levies necessary for increased costs resulting from extending municipal services to a new private industrial and nonresidential commercial development. Levy limitations can be a more vexing problem for communities and school districts which do not share in the increased tax base, but who may share in the increased population of the area. Local communities and school districts where NSP proposes to become part of the tax base generally may disregard the levy limitation, especially in the short run. The other communities and school districts would likely be more sensitive to the penalties involved: these amount to a 33% penalty in state aid for local governments, and a 50% penalty for school districts.

This report will be concerned with identifying the various types of assessed property in different taxing districts. This will facilitate the pinpointing of any impacts which will result from lowering or raising mill rates according to different types of property and property owners.

The SHERCO tax setting is explained in Table 24. The values given are for taxes assessed in 1973 and payable in 1974. Much of the current construction activity is not included. This would include the construction of units 1 and 2 at Becker. These particular school districts were chosen because they are the ones in which projected population will most likely be seeking housing. Locations of taxing bodies are presented in Figure 9.

The tax base in the SHERCO Area is generally nonagricultural. The only exception in 1973 was Becker which has agricultural evaluations in excess of $2,000,000 while it had nonagricultural evaluations of about $1,300,000. Nonagricultural evaluations were in homesteads, which generally amounted to 50% or better of the total nonagricultural assessed values. Levy limitations for 1977, the anticipated date of construction, are presented in the last column of Table 24. This levy limit would apply only if no exceptions to the rules of levy limitations were exercised by any of the communities that are listed, but rather if the community expanded its levy by the maximum allowable amount each year until 1977.

There is a wide variance in mill rates between similar situations in different districts, as shown in column 3 of Table 24. These are products of historical patterns of expenditures. The intent of the levy limitations law is to freeze the proportion of levies as they currently exist, while allowing the mill rate to increase or decrease with the increase and decrease of assessed values of property.

Transportation

The northernmost side of the plant facility and property parallel the Burlington Northern Railway tracks just east of U.S. Highway 10 and 52. The most westerly property line of the current facility is flanked by County Road 52 which runs north and west and provides an access road into the plant property. The southern boundary of the plant is formed by the Mississippi River.

The SHERCO PIA includes a major portion of Sherburne County, a large portion of Wright County and a small portion of both Benton and Stearns Counties. A review of Figure 10 will show that the SHERCO facility is located within a zone of heavy traffic volume. This zone encompasses all of the Primary Impact Area, but is especially predominant in the center portion of the PIA forming a band which originates on the eastern border of the PIA and proceeds north through the city of St. Cloud and onward into northern Minnesota.

TABLE 24

TAX SUMMARY, 1974 – SHERCO AREA

School District	1975 Agricultural Mill Rates	Agricultural Valuations ($1000)	1975 Non-Agricultural Mill Rates	Homestead ($1000)	Non-Homestead ($1000)	Vacant and Commercial ($1000)	Public Utility ($1000)	Industrial ($1000)	Total Non-Agricultural ($1000)	Personal ($1000)	Total ($1000)	Total Taxes Levied ($1000)	Levy Limit 1977
Becker													
School District #726	62	2060	71	493	68	166	561		1288	27	3375	222	269
Becker City			58								329	19	23
Sherburne County											42167	1244	1480
Big Lake													
School District #727	66	1900	75	2177	443	485	3	34	3143	1521	5195	372	443
Big Lake City		360	5								2628	13	15
Sherburne County			34								42167	1244	1480
Elk River													
School District #728	59	7115	67	12488	1449	3198	3621	552	21242	568	28924	1879	2236
Elk River City		37	14								4993	70	83
Sherburne County			34								42167	1244	1480
Monticello													
School District #882	31	4049	39	4251	724	1077	35692	103	41847	312	46209	1785	2124
Monticello City		10	31										
Wright County			43								126642	2920	3475
St. Cloud													
School District #742	52	7880	60	57861	13047	25191	2320	8897	107627	4007	119513	7150	8509
Clear Lake City		34	19								342	7	8
Sherburne County			34								42167	1244	1480

TAXING AUTHORITIES
SHERCO P I A

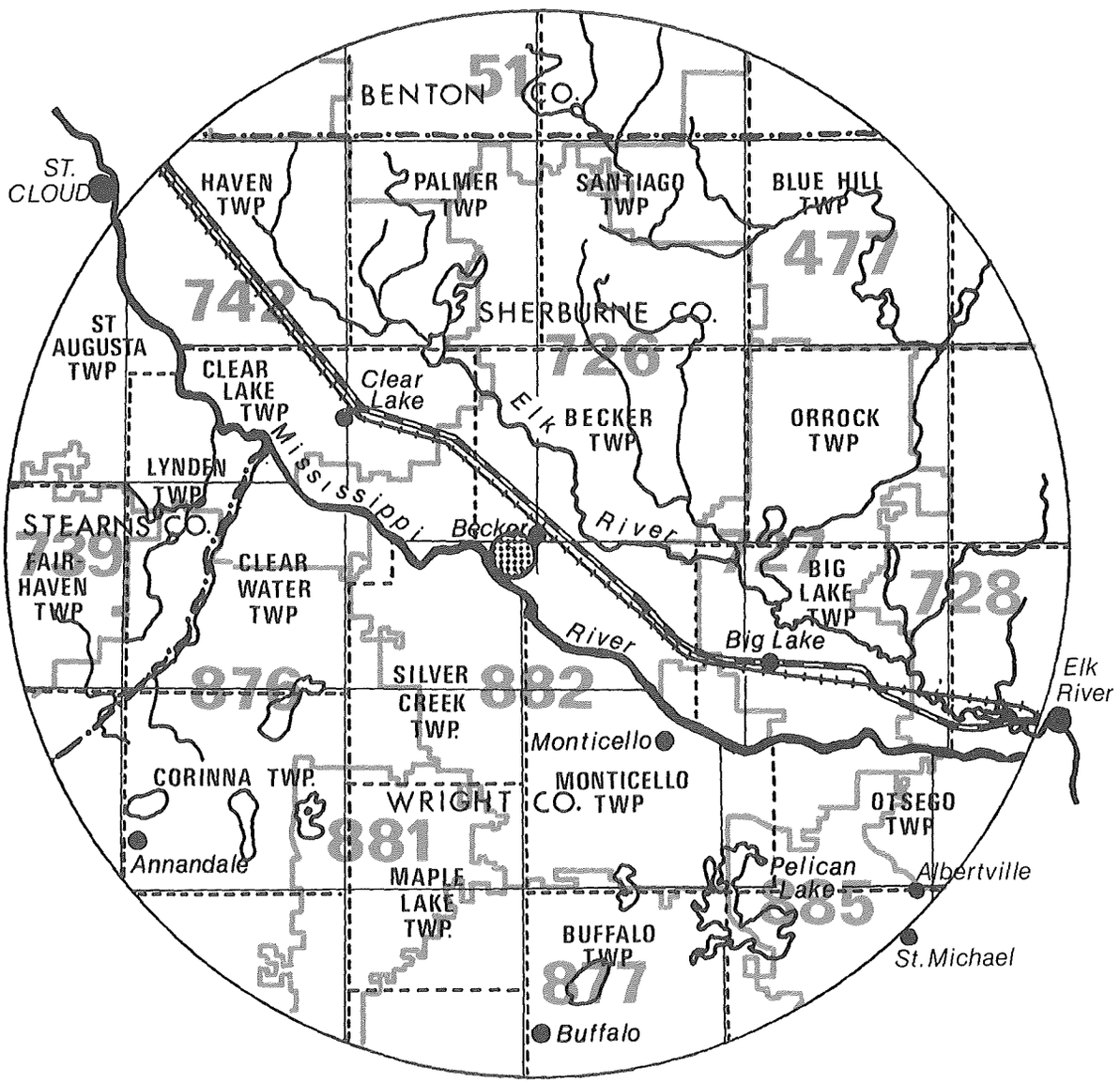


Figure 9

KEY TO SCHOOL DISTRICTS ON FIGURE 9

Benton County

47	Sauk Rapids
51	Foley

Sherburne County

726	Becker
727	Big Lake
728	Elk River

Stearns County

739	Kimball
742	St. Cloud

Wright County

876	Annandale
877	Buffalo
881	Maple Lake
882	Monticello

The major roadways in this belt are U.S. Highway 10 and 52, which enter the PIA just west of the community of Elk River and proceeds northwest to St. Cloud. Running parallel to and southwest of this road system is State Trunk Highway 152 and Interstate Highway 94. State Trunk Highway 152 enters the PIA just beyond Albertville and proceeds through it to St. Cloud via Clearwater.

Major north-south roadways which occur in the PIA are State Trunk Highways 25 and 24. State Trunk Highway 25 runs north from State Highway 12 (east-west from Minneapolis to western portions of Minnesota), through the community of Buffalo where it forms a junction with State Trunk Highway 55 and proceeds through the PIA to the community of Big Lake. State Trunk Highway 24 enters the Primary Impact Area east of the community of Annandale and terminates at Clear Lake where it forms a junction with U.S. Highway 10 and 52. It should be noted that State Trunk Highway 25 and State Trunk Highway 24 provide the only major river crossings north and south of the community of Becker.

Secondary systems of high volume traffic flank the Primary Impact Area of the proposed SHERCO plant on the south, north, and east. The major roadway system running north and south to the east of the PIA is U.S. Highway 169 which connects portions of U.S. Highway 52, State Trunk Highway 101, and U.S. Highway 10 with State Trunk Highway 95. State Trunk Highway 95 runs east and west, north of the zone between St. Cloud and eastern Minnesota. U.S. Highway 169 is tangential to the Primary Impact Area at the community of Zimmerman, northeast of the community of Becker. State Trunk Highway 95, U.S. Highway 169, and State Trunk Highway 23 provide individual high volume traffic zones to the north of the Primary Impact Area northeast of St. Cloud.

State Trunk Highways 15 and 23 are major traffic belts to the west of the PIA. State Trunk Highway 15 connects U.S. Trunk Highway 12, which runs east and west between the Twin Cities and other portions of western Minnesota, with the community of St. Cloud to the north. At this point it forms a junction with State Trunk Highway 23 and proceeds northeasterly to Duluth. Another major roadway south of the PIA is State Trunk Highway 55, which enters the PIA just north of Buffalo and proceeds briefly through the PIA to Maple Lake. It proceeds northwesterly at this point to Annandale, South Haven, and a junction with State Trunk Highway 15. State Trunk Highway 15 proceeds north at this point to St. Cloud. (Figure 10).

The proposed power plant at Becker is situated within a zone of very highly traveled roadways within the State of Minnesota. It should not be suggested that all of the roadways mentioned above and included in Figure 10 will be of particular interest in terms of potential impacts as a result of the placement of this plant at Becker. It could be suggested that traffic and highway concerns which will be of particular interest in terms of potential power plant impact will be located in an area within immediate proximity of the proposed expanded plant site.

Secondary roadways within the Primary Impact Area which provide a direct access with the community of Becker include County State Aid Highway 4 which links communities and residents living east and north of Becker with the town of Becker and that portion of County State Aid Highway 11 which runs north of County State Aid Highway 4 towards Benton County. Traffic originating north of Becker in the northern portion of Sherburne and the southern portions of Benton Counties have access with the community of Becker and the NSP power plant via State Trunk Highway 25, which provides a feeder for roadways east of St. Cloud, County State Aid Highway 3 running east and west within the PIA, and County State Aid Road 6 which runs north and south from the Lake Julia area to the southern portion of Benton County.

HIGHWAY NETWORK
SHERCO PIA

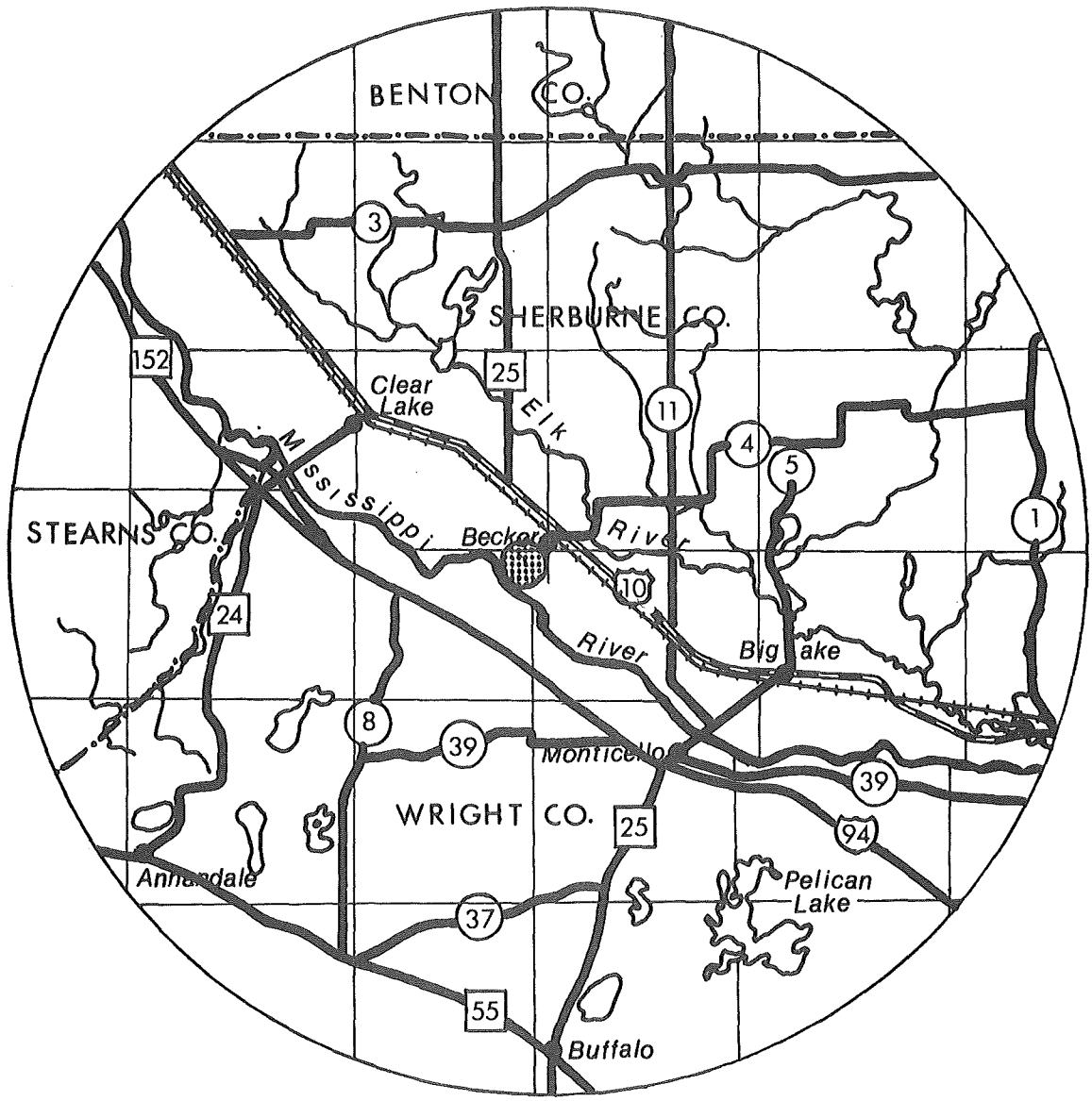


Figure 10

State Trunk Highway 25 runs north and south in the central portion of the PIA parallel to County State Aid Highway 11. Traffic flow data compiled by the Minnesota Highway Department for the period 1969 to 1973 are included in Table 25. It should be noted that in 1970 County Road 52 which provides a major access into the plant site was a gravel road. Major attention is also directed to the traffic volume on State Trunk Highways 25 and 24 which provide the primary river crossing links between Sherburne and Wright County north and south of the Becker plant.

Medical Facilities

Table 26 presents the status of medical facilities in the SHERCO Primary Impact Area, Primary Urban Area, Secondary Urban Area, and the counties within which the PIA is located, for the fiscal year 1973. Figures were compiled from reports published by the Minnesota Department of Health.

It should be noted that there are no general hospital facilities at either Benton or Sherburne Counties. The nearest hospital to the proposed expanded site having emergency and general care is located approximately seven miles away at Monticello. As of 1973, 19 of 39 general hospital beds were occupied at this facility (Table 27). More specialized services are available at St. Cloud, some 21 miles from the NSP plant. Both cities are easily accessible via U.S. Highway 10 and 52, and County State Aid Highway 11. Of the 7 hospitals located in the subject counties, only one is situated within the fifteen mile radius of the SHERCO PIA which is located at Monticello (39 beds). Facilities at Buffalo (69 beds) and St. Cloud (360) are situated within the Secondary Urban Area.

Approximately 92 active physicians service Sherburne, Benton, Wright and Stearns Counties. There is an average of one doctor to every 1,000 population. Eighty-five physicians service hospitals located within the PUA and SUA.

A Public Health Nurse and staff serve approximately 20,000 from headquarters in Elk River. An estimated 1,000 of this total are residents of Becker Village and Becker Township. A wide variety of specialized programs are available through this service. Four doctors practice at the Elk River Clinic with referral service to Mercy Hospital at Anoka and North Memorial Hospital in the Twin Cities.

Historic Sites

Historic sites designated by the Minnesota Historical Society within the SHERCO PIA are listed according to county location on Table 28.

A total of 48 sites of architectural, social and prehistoric significance are situated within fifteen miles of the proposed site of power plant expansion at Becker. None of these sites are situated so near the site as to be disturbed of affected by construction of operation activities at the site.

The state archeologist has conducted a survey of the site and has stated that no archeological sites occur on the NSP SHERCO plant site, as defined for SHERCO units 1 and 2. Since the additional 320 acres to be added to the site for Units 3 and 4 have been cultivated, it is highly unlikely that any archeological sites presently exist on that parcel of land. Letters from the state archeologist have been included in Appendix C.

Wastewater Treatment Facilities

Wastewater treatment facilities in the SHERCO PIA are summarized in Table 29.

TABLE 25

TRAFFIC FLOW DATA – SHERCO AREA

ROADWAY	Annual Average Daily Traffic Flow 1970	1972	1974
County State Aid Highway 3 at County Road 52	133		1373
County Road 52 at jct. with County State Aid Highway 8	42		1373
State Trunk Highway 25 at U.S. Highway 10/52	630		
U.S. Highway 10 & 52 at jct. with State Trunk Highway 25 and State Trunk Highway 8	9350		
U.S. Highway 10 & 52 at jct. with County State Aid Highway 11	9600		
County State Aid Highway 23 at jct. with County State Aid Highway 4	232		
County State Aid Highway 4 at County State Aid Highway 23	295		
County State Aid Highway 4 at County State Aid Highway 11	184		
County State Aid Highway 11 at U.S. Highway 10 & 52 (North) Sherburne	420		
County State Aid Highway 11 at U.S. Highway 10 & 52 (South of jct.) Sherburne	1940		
County Road 67 North from County State Aid Highway 4 East of Becker	41		2500
County State Aid Highway 5 at U.S. Highway 10 & 52	763		
U.S. Highway 10 & 52 at Elk River	9800		
County State Aid Highway 1 at Elk River	660		
County State Aid Highway 39 at Elk River			1516
Interstate 94 at jct. with County State Aid Highway 39 near Monticello			
State Trunk Highway 25 East of I-94 near Monticello (Wright)		2600	
State Trunk Highway 25 at river crossing (Wright)	4700	6600	5500
State Trunk Highway 152 at jct. with State Trunk Highway 25 (Wright)		3150	
State Trunk Highway 152 at jct. with County State Aid Highway 8 (Wright)		2820	
County State Aid Highway 8 at jct. with State Trunk Highway 152 (Wright)		770	
State Trunk Highway 152 at jct. with State Trunk Highway 24 (Wright)		2750	
State Trunk Highway 24 at jct. with State Trunk Highway 152 (Wright)		725	
State Trunk Highway 24 at river crossing (Wright)	600	900	2300
Jct. of County State Aid Highway 8 and State Trunk Highway 24 (Sherburne) (South of 24)	106		
Jct. County State Aid Highway 8 and County Road 65 (Sherburne)	560		
U.S. Highway 10 & 52 at jct. with County State Aid Highway 24 (Sherburne)	9600		

TABLE 26

SUMMARY OF MEDICAL FACILITIES – SHERCO AREA

Location	Number of Hospitals	Number of Nursing Homes	Beds			General Hospital Beds Per 1000 Population
			Hospitals	Boarding Care Homes	Nursing Homes	
Sherburne County	0	4	0	58	242	0
SHERCO PIA	1	2	39		112	
SHERCO SUA	2	11	429	187	430	

	Nursing Home Beds Per 1000 Population Age 65 and Over	Doctors Per 1000 Population	Active Physicians	Boarding Care Home Beds Per 1000 Population Age 65 and Over
Sherburne County	131.7	.21	4	31.6

Source: Minnesota Department of Health, Health Centers and Other Related Facilities, 1973

TABLE 27

GENERAL HOSPITAL OCCUPANCY RATE – SHERCO AREA

County	Location	Name	Owner	Capacity	Approx. Miles From Site	% Occupied 10/71-9/72
Sherburne	——	——	——	——	——	——
Benton	——	——	——	——	——	——
Stearns						
	Albany	Albany Community	City	26	40	81
	Melrose	Melrose & Pine Villa Hosp.	City	34	50	60
	Paynesville	Paynesville Community	City	55	43	47
	**St. Cloud	St. Cloud Hospital	NPA	360	21	77
	Sauk Center	St. Michael's	City	45	60	69
Wright						
	**Buffalo	Buffalo Memorial	City	69	15	45
	*Monticello	Monticello-Big Lake Com.	Dist.	39	7	50
Total		7		628	Avg. 28	45–81%

*Sherco PIA (Total 1; 39 beds)

**Sherco SUA (2,429 beds)

Source: Minnesota Department of Health, Minnesota Plan for Hospitals, Health Centers and Other Related Facilities, 1973.

TABLE 28

HISTORIC SITES – SHERCO AREA

COUNTY	LOCATION	SITE
Sherburne	Big Lake TWP	Bacley Station
	Haven TWP (Hwy 10 & 52)	First Granite Quarry
	Blue Hill TWP (SH–15)	Aboriginal Americans – Hanker
	Palmer TWP (SH–2)	Aboriginal Americans – Moorhouse
	Blue Hill TWP	Aboriginal Americans – Refuge Site
	Elk River	County Courthouse
	St. Cloud	State Reformatory
	Big Lake (SH–3)	Aboriginal Americans
	Big Lake TWP (SH–4, 5, 6, 7, 8)	Aboriginal Americans
	Orrock TWP (SH–9, 10, 11)	Aboriginal Americans
	Clear Lake TWP (SH–12)	Aboriginal Americans
	Baldwin TWP (SH–13, 14)	Aboriginal Americans
	Blue Hill TWP (SH–16)	Aboriginal Americans
	Palmer TWP (SH–17)	Aboriginal Americans
Stearns	St. Cloud	German Town Building Cluster
	St. Cloud	High Banks Historic District
	West St. Cloud	Town and Urban Planning
	St. Cloud	Seventh Day Adventist Church
	Fairhaven TWP (SN–1)	Aboriginal Americans
Wright	Albertville	Albertville Roller Mill
	Clearwater	Clearwater Historic District
	Howard Lake	Co-operative Electric Plant
	Monticello	Hannaford, Roscoe Farm
	Howard Lake	Howard Lake Nursery
	Buffalo TWP	Immigrant Log House
	Monticello	Lowry, Thomas Mansion
	Monticello	Mealey, Tobias G. House
	Buffalo	Olson's Point Lodge Nelsonian
	Monticello	Rand Mansion
	Clearwater Lake	St. Mark's Episcopal Church
	Monticello	Sherwin, Howard H. House
	Silver Creek TWP (WR–41)	Silver Lake, Aboriginal Americans
	Monticello	Tarbot Residence
	Buffalo	Wright County Poor Farm
	Ostego TWP (WR–25)	Aboriginal Americans
	Buffalo TWP (WR–28, 29)	Aboriginal Americans
	Corinna TWP (WR–32, 33, 34)	Aboriginal Americans
	Clearwater TWP (WR–40)	Aboriginal Americans

Source: Minnesota Historical Society

TABLE 29

WASTEWATER TREATMENT FACILITIES
SHERCO PUA AND SUA

Municipality	Design Capacity (million gallons per day)
Albertville	0.052
Becker	0.045
Big Lake	0.38
Buffalo	0.404
Clear Lake	0.14
Elk River	0.4
Monticello	0.45
St. Cloud	3.6
St. Michael	0.08

Source: Minnesota Pollution Control Agency

IV. ENVIRONMENTAL SETTING — SIBCO

GENERAL

The environmental setting for SIBCO is presented with the same format as that for SHERCO, so that direct comparisons may be made by the reader.

The Sibley County site is located approximately 6 miles north-northwest of the city of Henderson, Sibley County, Minnesota. It is approximately 40 miles southwest of the Metropolitan Twin Cities area (Figure 1). The plant is approximately 3 miles west of the Minnesota River, but the site includes a corridor to the Minnesota River to provide for river water appropriation and a railroad spur. The area is rural-agricultural, with several small urban areas within a 15-mile radius of the site.

NATURAL ENVIRONMENT

Within this report, the natural environment is examined on two levels: a regional level, and a site specific level. The SIBCO Region is defined as circle of 15 mile radius, centered on the plant site. The environmental setting of this region is presented so that impacts which may occur off of the plant site may be evaluated. A site description, which presents details that occur specifically within the site boundaries, is also included.

Regional Setting

Land Use - Land use in the SIBCO region is predominately agricultural. The principal crops include corn, oats, soybeans, alfalfa, sweet corn and canning peas. It is estimated that 75% of the region is cropland, while 5-10% is forested. Approximately 2-3% of the SIBCO Region is occupied by lakes. There are 6 urban centers located within a 15 mile radius of the site, and 13 smaller communities. Recreational and public lands include several wildlife management areas. Locations of these are presented in Figure 11. The Minnesota River is a canoe and boating river.

Vegetation - The SIBCO region is found in a transitional prairie-deciduous forest biome. Plant associations of both biomes can be identified in this area.

The predominant forest association is the "bigwoods" maple-basswood forest association consisting of sugar maple, basswood, elm, hackberry, box elder, oak, black walnut and aspen. Oak-aspen forests are found in scattered stands which generally consist of a dense growth of aspen, intermingled with oaks, elms and basswoods. The bottomland forest occurs in the wet floodplains of the Minnesota River and along the banks of the small tributary streams. These forests consist of cottonwood, box elder, willow, elm, soft maple and basswood.

Prairies found in the SIBCO region are of two types: wetland prairies and upland prairies. Wetland prairies occur in poorly drained lowlands and in the low banks that surround the small marshy lakes of the area. Upland prairies are predominately composed of grasses (genus Graminae) and an assortment of wildflowers, forbs, shrubs and an occasional tree (less than 1 tree per acre). Wetland prairies are dominated by sedges (genus Cyperaceae).

Most of the SIBCO region is cropland. Native woodlands are found in scattered upland forests, along water courses and in the Minnesota River Valley. Little, if any, virgin prairie exists in the SIBCO region. Plants found in the SIBCO region are listed in Appendix B.

Wildlife - Wildlife habitat in the SIBCO region has been greatly reduced by extensive agricultural use. Shelterbelts, fence rows, the remaining remnant forests and the Minnesota River Valley are the principle wildlife habitats. Wildlife found in the upland woods is primarily songbirds and arboreal mammals. Upland game birds such as pheasant and sharp-tailed grouse are common in fence rows and along the edges of woods. Pasturelands and soil banks are likely to support populations of burrowing mammals, i.e. the Minnesota gopher. The Minnesota River Valley provides habitat for a number of animals including deer, fox, rabbit, raccoon, waterfowl, songbirds, arboreal mammals and various reptiles. The wildlife likely to be found in the SIBCO region is listed in Appendix B.

The bald eagle, an endangered species, may occur in the Minnesota River Valley. Several sightings have been reported, but have not been confirmed. The area also lies within the migratory range of several other endangered birds. These have not been sighted, but potentially include the Arctic peregrine falcon, the osprey, and the whooping crane.

Climate - The climate of the region may be characterized as continental, with warm to hot summers and cold winter, and with well defined spring and fall transitional seasons. The average temperature range is from 74°F in the summer to 14°F in the winter.

Annual average precipitation is approximately 28 inches. Most of this precipitation occurs during the period May to September. Mean annual snowfall is estimated to be 48 inches. Maximum snowfall of record is 88 inches.

During the late fall, winter, and early spring, winds are predominantly from the northwest. During summer and early fall, winds are from the south-southeast. Monthly and annual wind roses are presented in Figure 5.

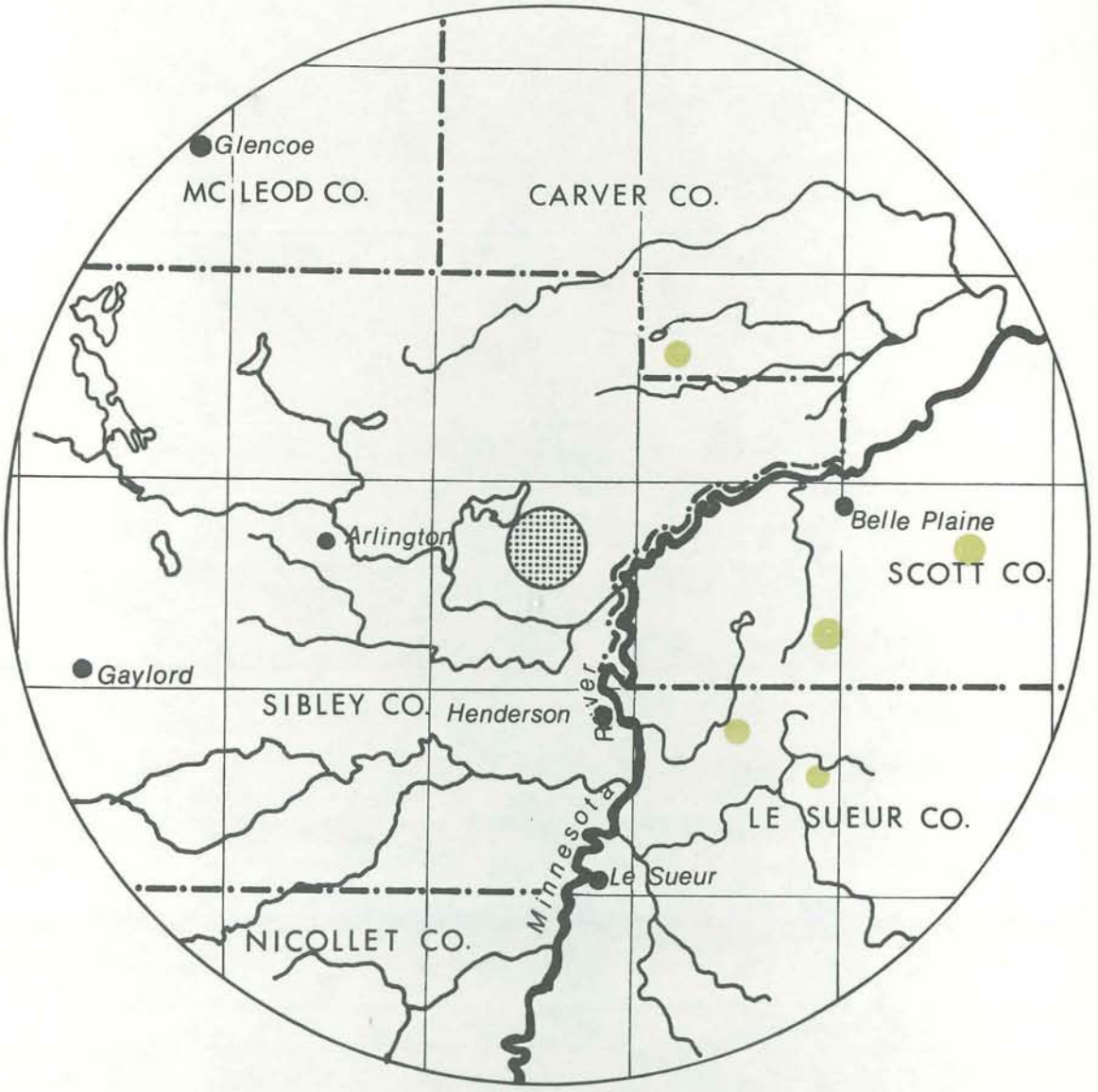
Surface Water - The major occurrence of surface water in the SIBCO region is the Minnesota River. U.S.G.S. records show an average flow for the Minnesota River at Mankato to be 2690 cfs, and at Jordan to be 3425 cfs. From these figures it can be estimated that average flow in the SIBCO region is on the order of 3000 cfs.

The record maximum flow at Mankato is 94,000 cfs, and at Jordan 117,000 cfs. Record minimum flow at Mankato is 26 cfs, and at Jordan 79 cfs. From these data it may be estimated that record maximum flow at SIBCO is on the order of 105,000 cfs and record minimum flow is on the order of 53 cfs. These figures are rough estimates, accurate data are not available.

Other occurrences of surface water are Silver Lake and High Island Creek. No data are available on these waters.

Table 30 is a presentation of data collected at the Henderson monitoring station by the MPCA. This is the closest station to the proposed plant site and the data indicates the quality of the river to be expected in the vicinity of the proposed intake and discharge. The data in Table 30 indicate high colimform and solids concentrations.

RECREATIONAL AREAS
SIBCO REGION



WILDLIFE MANAGEMENT AREA

Figure 11

TABLE 30

MINNESOTA RIVER WATER QUALITY AT HENDERSON, MINNESOTA
ANNUAL SUMMARIES 1967–1974

YEAR	NO. OF SAMPLES		5–DAY BOD mg/l	TOTAL SUSPENDED SOLIDS mg/l	FECAL COLIFORM MPN/100ml	TURBIDITY JTU	pH
		MAX	5.3	240	700	250	8.0
1967	3	MIN	4.0	28	50	28	7.4
		AVE	5.2	123	317	103	7.7
		MAX	5.8	380	17000	310	8.1
1968	10	MIN	1.5	14	80	5	7.7
		AVE	3.9	172	4527	125	7.9
		MAX	9.8	350	2300	74.0	8.4
1969	11	MIN	2.8	2	130	3.2	7.4
		AVE	5.0	92	804	28.6	7.9
		MAX	8.6	140	3300	42.0	8.3
1970	11	MIN	2.6	4	50	2.7	7.4
		AVE	4.9	67	968	20.5	7.9
		MAX	10.0	330	13000	79.0	8.3
1971	11	MIN	2.9	2	20	2.3	7.0
		AVE	5.9	100	703	30.6	7.7
		MAX	5.7	230	2300	54.0	8.0
1972	8	MIN	2.8	4	80	3.3	7.6
		AVE	4.0	107	834	33.4	7.9
		MAX	6.8	110	790	43.0	8.3
1973	10	MIN	2.7	4	110	2.5	7.4
		AVE	4.7	61	351	24.1	8.0
1974	1		4.8	46	2200	3.7	7.7

Source: Draft E.I.S. on the Proposed NSP Generating Facility in Sibley County, Minnesota

Minnesota Regulation WPC 25 designates this reach of the Minnesota River as:

2) Fisheries and Recreation: Class B
3) Industrial Consumption: Class B

The water quality standards for these classes are defined in Minnesota Regulation WPC 15 (d). These standards are included below.[2]

WPC 15 (d) (2) Fisheries and Recreation

Class B. The quality of this class of the interstate waters of the state shall be such as to permit the propagation and maintenance of cool or warm water sport or commercial fishing and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. Limiting concentrations or ranges of substances or characteristics which should not be exceeded in the interstate waters are given below:

Substance or Characteristic	Limit or Range
Dissolved oxygen	Not less than 6 milligrams per liter from April 1 through May 31, and Not less than 5 milligrams per liter at other times.
Temperature*	5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature, except in no case shall it exceed the daily average temperature of 86°F.
Ammonia (N)	1 milligram per liter
Chromium (Cr)	0.05 milligram per liter
Copper (Cu)	0.01 milligram per liter or not greater than 1/10 the 96 hour TLM value.
Cyanides (CN)	0.02 milligram per liter
Oil	0.5 milligram per liter
pH value	6.5-9.0

[2]Where the standards of another regulation are referenced within a given regulation, the standards of the referenced regulation are included for the convenience of the reader.

Phenols	0.01 milligram per liter and none that could impart odor or taste to fish flesh or other fresh-water edible products such as crayfish, clams, prawns and like creatures. Where it seems probable that a discharge may result in tainting of edible aquatic products, bioassays and taste panels will be required to determine whether tainting is likely or present.
Turbidity value	25
Fecal coliform organisms	200 most probable number per 100 milliliters as a monthly geometric mean based on not less than 5 samples per month, nor equal or exceed 2000 most probable number per 100 milliliters in more than 10% of all samples during any month.
Radioactive materials	Not to exceed the lowest concentration permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

*The following temperature criteria will be applicable for the Mississippi River from Lake Itasca to the outlet of the Metro Wastewater Treatment Works in St. Paul in addition to or superseding the above. The weekly average temperature shall not exceed the following temperatures during the specified months:

January	40°F	July	83°F
February	40°F	August	83°F
March	48°F	September	78°F
April	60°F	October	68°F
May	72°F	November	50°F
June	78°F	December	40°F

WPC 15 (d) (3) Industrial Consumption

Class B. The quality of this class of the interstate waters of the state shall be such as to permit their use for general industrial purposes, except for food processing, with only a moderate degree of treatment. The concentrations or ranges given below shall not be exceeded in the raw waters before treatment:

Substances or Characteristic	Limit or Range
Chlorides (Cl)	100 milligrams per liter
Hardness	250 milligrams per liter
pH value	6.0-9.0
Fecal coliform organisms	200 most probable number per 100 milliliters
Arsenic (As)	0.05 milligram per liter
Barium (Ba)	1 milligram per liter
Cadium (Cd)	0.01 milligram per liter
Chromium (Cr+6)	0.05 milligram per liter
Cyanide (CN)	0.2 milligram per liter
Fluoride (F)	1.5 milligrams per liter
Lead (Pb)	0.05 milligram per liter
Selenium (Se)	0.01 milligram per liter
Silver (Ag)	0.05 milligram per liter
Radioactive material	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

DNR records indicate that there are no river water appropriators along the Minnesota River between Henderson and Fort Snelling. A list of dischargers to the river is presented in Table 31.

No data are available on the water quality of High Island Creek or Silver Lake.

Subsurface Water - Subsurface Water is available in very limited quantities from the glacial drift. Less than 50 gpm yield is expected. The bedrock yields considerable water. NSP's site compatibility application reports a yield of 280 gpm from the St. Lawrence Formation.

No ground water quality data is available for the surficial aquifers. In recent years, samples have been analyzed form the Henderson municipal well. The data for 1968 and 1971 is shown in Table 32.

Air Quality - There are no air quality monitoring stations in the SIBCO region. However, since there are no major sources of SO_2 located in the region, background levels of SO_2 may be anticipated to be low. With the exception of occasional episodes of high dust generation, concentrations of particulates may be anticipated to be moderate to low. These are assumptions, without verification.

TABLE 31

MAJOR DISCHARGERS TO THE MINNESOTA RIVER HENDERSON TO FORT SNELLING

Municipal WWTP
- Belle Plaine
- Chaska
- Blue Lake
- Savage
- Seneca

Industry (Cooling Water)
- American Crystal Sugar
- Shielly Company
- Rahr Malting
- Midland Glass
- Cargill, Inc.
- Metro Airport Commission

Industry (Other)
- Bunge Corp
- Pearson Sand and Gravel
- Bryan Rock Products
- Northern Culvert
- Minnesota Valley Milk

Source: Minnesota Pollution Control Agency

Background noise levels at the site were monitored in June, 1974, by the MPCA. The results of that program indicated that the 24-hour L_{10} was 44 dBA, and the 24-hour L_{50} was 37 dBA.

TABLE 32

CHEMICAL ANALYSIS* – HENDERSON MUNICIPAL WELL

	1968	1971
Total Hardness ($CaCO_3$)	370	390
Alkalinity ($CaCO_3$)	350	340
Calcium ($CaCO_3$)	220	130
pH	7.2	7.1
Iron	1.1	0.93
Manganese	0.02	0.08
Chlorides	20	21
Sulfates	110	91
Fluorides	0.29	0.3
Nitrate Nitrogen	1	1
Sodium	---	54
Potassium	---	14
Total Solids	---	510

*All results in milligrams per liter except pH.

Source: Draft E.I.S. on the Proposed NSP Generating Facility in Sibley County, Minnesota

Soils and Geology - The bedrock surface under the SIBCO region consists mostly of Cambrian and Ordovician sedimentary rocks (Figure 11). The Cambrian rocks are sandstones and shales with lesser carbonate rocks (limestones and dolomites). The Ordovician rocks are dolomites with lesser sandstones and shales. Some Precambrian sandstone has been reported north of Belle Plaine.

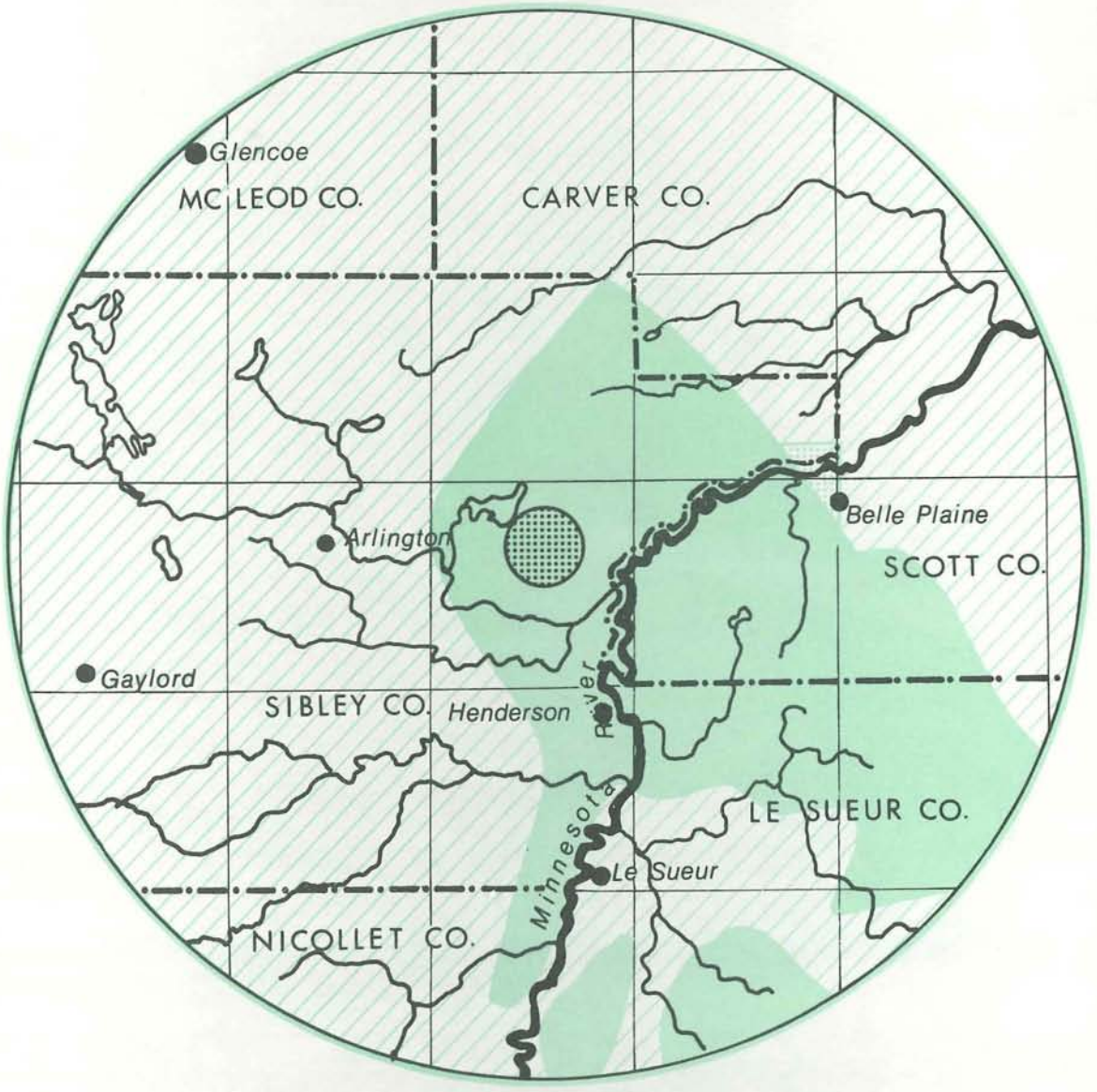
Moderate to large amounts of ground water are available from the Ordovician rocks, and the Cambrian Sandstones. The Jordan and Mt. Simon sandstones, both Cambrian in age, are the major aquifers in the area.

A northwesterly trending fault occurs near Belle Plaine and extends almost to Hamburg. Geologic evidence indicates that there has been no movement along this fault for over 400 million years.

Soils in the region consist mainly of till of the Des Moines Lobe (Figure 12). The till is a silty, sandy clay with gravel and boulders. Some sand and gravel lenses may occur within the till. The Minnesota River Valley contains floodplain alluvium (mostly silt and clay) and terrace alluvium (mostly sand and gravel).

The solum over most of the area is rich and fertile. It consists mainly of the Lester-Le Sueur-Glencoe Soil Association.

BEDROCK GEOLOGY
SIBCO REGION



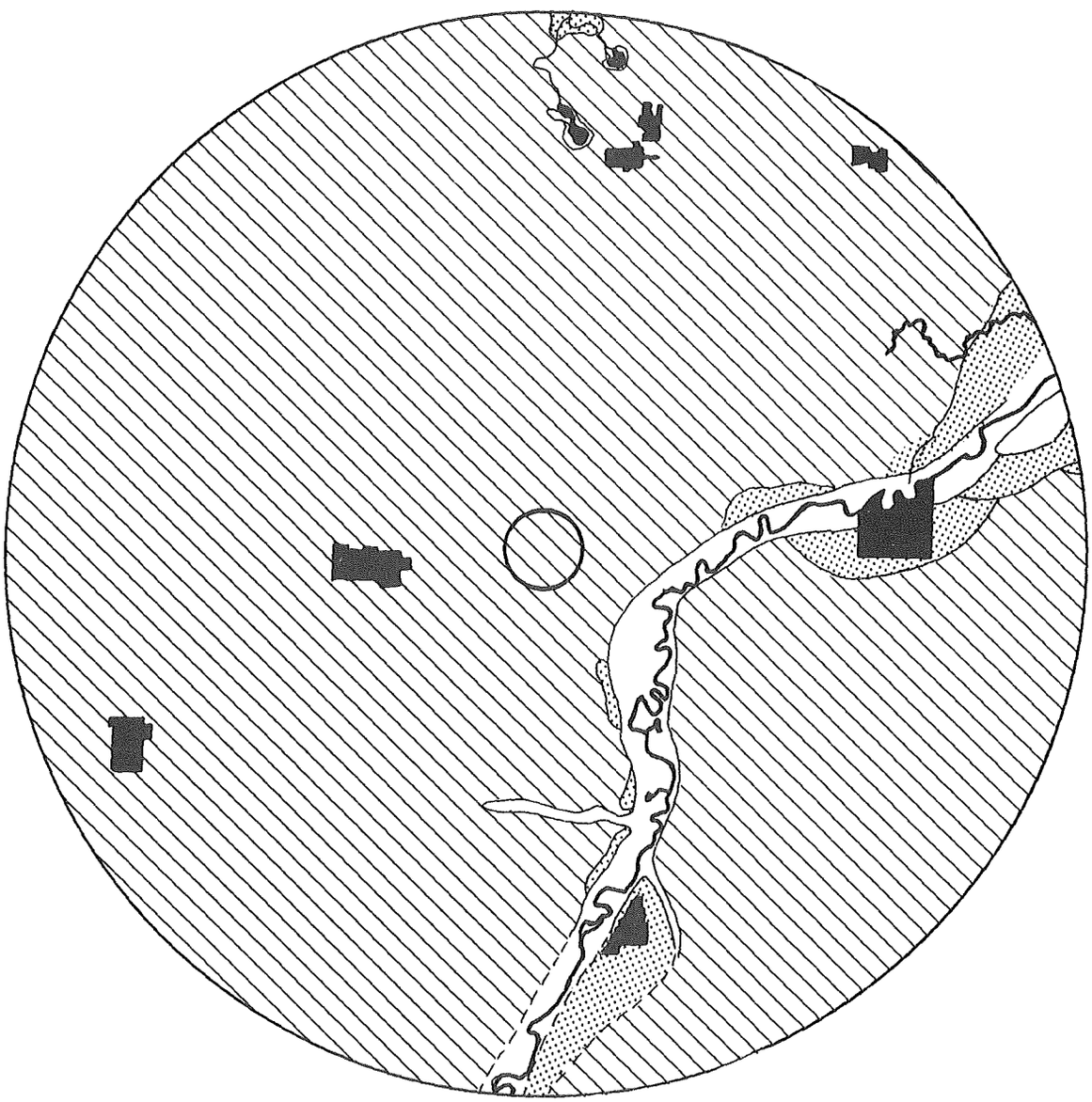
ORDOVICIAN ROCKS, UNDIVIDED
Carbonate rocks with lesser sandstones and shales

CAMBRIAN ROCKS, UNDIVIDED
Sandstones and shales with lesser carbonate rocks

HINCKLEY AND FOND DU LAC FORMATIONS
Predominant sandstones

Figure 12

SURFICIAL GEOLOGY
SIBCO REGION



Till

Terrace Alluvium

River Alluvium

Figure 13

Site Description

Land Use - With the exception of the remaining native woodlands, and the Minnesota River floodplain forests, the entire SIBCO site is agricultural land. Corn, small grains, soybeans, and livestock are the primary agricultural endeavors.

Typical yields are:

Corn	105 bu/acre
Soybeans	33 bu/acre
Hay	5 tons/acre
Small Grain	69 bu/acre

The Minnesota River is moderately used by canoeists and fishermen.

Vegetation - Two distinct areas characterize the SIBCO plant site: The upland on the bluffs overlooking the Minnesota River Valley, and the Minnesota River Valley.

The upland is predominantly cropland with remnant stands of the native maple-basswood forest scattered throughout the plant site. These forests consist of sugar maple, basswood, elm, red and white oaks, silver maple, black walnut, aspen, and an under-story of shade tolerant saplings and shrubs where a break in the forest canopy occurs. These forests are also found on the hills of the Minnesota River Valley. In the woodlots where cattle have grazed, the under-story has been destroyed and a grassy parkland savanna consisting of oaks, elm, box elder and basswood is found. The remaining woodlots occur as shelterbelts around farms. Shrubs, small trees and grasses are commonly found in fence rows. Bottomland forests occur in the ravines along water courses with such species as cottonwood, box elder, silver maple and basswood occurring. A cattail marsh consisting of emergent vegetation and various sedge grasses is found around Silver Lake. In the lower lying areas that tend to collect surface runoff, wetland prairie consisting of sedges, willow brush and an occasional cottonwood is found.

Wildlife - An estimated 75% of the SIBCO plant site is agricultural land, greatly reducing wildlife habitats. The wildlife found in these areas is generally limited to birds (especially game birds, i.e. pheasant) and other motile animals. Burrowing mammals such as the Minnesota gopher and mice find habitat along fence rows, windbreaks and in pastureland. A raptor, possibly a falcon or hawk was noted along one fence row.

The marshlands that surround Silver Lake show evidence of nesting birds, i.e. red wing blackbird and possible yellow-headed blackbird and shore birds (killdeer, heron and tern). Muskrat is also a common inhabitant of such lakes.

The most abundant wildlife habitat found on the SIBCO site occurs in the Minnesota River Valley. A diverse wildlife population is expected with deer, cotton-tail rabbit, fox, gray squirrel, mice, raccoons, and various birds likely to occur. Appendix B further identifies the wildlife expected to occur on the SIBCO plant site.

The site lies within the migratory range of several endangered species listed in **Wildlife** of the Regional Setting, but none of these have been seen at the plant site.

Aquatic Life - Fishing is reported in Silver Lake despite frequent winter kills. Carp (Cyprinus carpio), fat-head minnows (Pimphalus promelus), black bullheads (Ameiurus melus) and brook stickleback (Euzolia inconstans) were reported in a 1947 survey.

Climate - The climate at the site is discussed under **Climate** of the Regional Setting. There are no site specific data to add to the regional description.

Surface Water - The major occurrence of surface water at the site is the Minnesota River. Average flow of the Minnesota at SIBCO is estimated to be 3000 cfs. A discussion of flow and water quality is included under **Surface Water** of the Regional Setting. There are no site specific data to add to the regional discussion.

Subsurface Water - Subsurface water is available from the glacial drift in very small quantities, but from the bedrock in moderate to large quantities. A discussion of subsurface water quantity and quality is found under **Subsurface Water** of the Regional Setting. There are no site specific data to add to the regional description.

Air Quality - Air quality has been discussed under **Air Quality** of the Regional Setting. There are no site specific data to add to the regional description.

Soils and Geology - Bedrock at the site has been reported to be the St. Lawrence Formation, consisting of sandstones, shales, and some dolomites. This formation is underlain by other sandstones, shales and dolomites to a considerable depth. The sandstones yield moderate to large amounts of water.

The soil at the site is a grayish-blue, calcareous boulder till with a high percentage of the clay mineral montmorillonite. It weathers to yellowish brown in color. The till is approximately 400 feet thick at the site.

The solum is rich and fertile, though poorly drained. It consists mainly of the Lester-Le Sueur-Glencoe Soil Association.

CULTURAL ENVIRONMENT

Introduction

Within this report, the "Cultural Environment" has been narrowed down to include only community infrastructure. Infrastructure has been defined to include the following topics:

Quantitative Population Statistics
Housing
Education and Schools
Employment and Income
Retail Services and Manufacturers
Community Tax Structure
Transportation
Medical Facilities
Waste Water Disposal Facilities

In addition to these topics, Historic Sites has been included as part of the cultural environment.

While the cultural environment is much more complex than is presented here, a more detailed investigation is beyond the scope of this report. This level of study, however, should identify many, if not all, of the major human impacts.

Methodology

In order to perform an assessment, an area must be defined which will include all of the major impacts of the project. At SIBCO this area, called the "Primary Impact Area" or "PIA", has been designated as a circle of ten mile radius, centered on the plant site. It is assumed that the social and political characteristics of the population living within the defined PIA are quite distinct from those to the north and south of the PIA, where Mankato or the Twin Cities would be heavy influences. The Primary Impact Area is defined as all of the communities and places within a 15 mile radius of the SIBCO Site. Within this PIA, there has been a designation of a Primary Urban Area, or PUA. The PUA includes only those places within the PIA which have been designated as communities by the U.S. Census Bureau. A third level of analysis has investigated urban communities located just outside of the PIA; that is, communities located just outside of a 15 mile radius from the SIBCO site. These are designated the Secondary Urban Area, or SUA. Whenever data for entire counties are being presented, the counties are referred to as the "SIBCO Area." Table 33 summarizes the analytical areas defined for this report, and lists the communities included within them. Figure 14 presents the locations of the communities within the PIA.

Population Characteristics

Total population in the counties of the SIBCO Area increased between 48% (Scott) and 7.2% (Le Sueur) in the years 1960-1970. Sibley County was the only exception where a population loss of 2.4% was experienced during the decade. Population increases are projected between 1970 and 2000 of 66% (Carver), 18% (Le Sueur), 53% (Mc Leod), 75% (Scott), and 3% (Sibley). (Table 34).

Population of the SIBCO PIA was 30,154 in 1970. The SIBCO PUA had a population of 13,012 and the SUA, 10,234. Over 60% of the PIA population resided in the area before 1965.

Land use in the SIBCO region is predominately agricultural, all of Sibley County being designated as rural by the Census Bureau in 1970. Within the five SIBCO Area counties, there were 6,939 farms in 1970 averaging between 140 and 200 acres in size. Population density in subject counties ranged between 27.2 persons per square mile in Sibley County to 91.8 persons per square mile in Scott County. Density within the SIBCO PIA was 102.0 persons per square mile in 1970, with rural density approximately 63 persons per square mile. 2,407 persons in the SIBCO PIA population were employed in direct agricultural occupations when the census was taken (Table 35).

Twenty-two percent of the five county population was of foreign stock in 1906 with German, Swedish, Polish, Russian, Czech, Canadian and Irish populations dominant in all counties. The oldest Irish Community in Minnesota was founded at Henderson in 1852. Scotts settled the area around Glencoe in 1837 and Czechs established communities in New Prague, and Montgomery in 1857. (Burnquist 1924 Vol. II p. 525).

In 1970, 13.2 percent of the five county population were of foreign stock with roughly the same configuration of dominant nationalities present. Foreign stock accounted for 15 percent of the SIBCO PIA population, 16.8 percent of the SIBCO PUA population and 15.8 percent of the SIBCO SUA population in 1970. Sixty-five percent of the foreign stock in the SIBCO PIA population were of German origin.

TABLE 33

SUMMARY OF ANALYTICAL AREAS – SIBCO

Analytical Areas	Definition	Communities	Percentage of Communities Included in Analytical Area
SIBCO Primary Impact Area (PIA)	10 mile radius from the site	San Francisco TWP	.045
		Dryden TWP	.05
		New Auburn TWP	.045
		Helen TWP	.14
		Young America TWP	.45
		Hancock TWP	.90
		Faxon TWP	100
		Washington TWP	100
		Green Isle TWP	90
		Arlington TWP	100
		Jessenland TWP	100
		Blakely TWP	100
		Belle Plaine TWP	.25
		Tyrone TWP	.40
		Henderson TWP	.90
		Kelso TWP	.40
SIBCO Primary Urban Area (PUA)	Major communities within the PIA	Henderson	100
		Arlington	100
		Le Sueur	100
		Belle Plaine	100
		Green Isle	100
		Hamburg	100
SIBCO Secondary Urban Area (SUA)	Major communities outside of, but near, the PIA	Glencoe	100
		Jordan	100
		New Auburn	100
		Norwood	100
		Young America	100
		Gaylord	100
		Cologne	100

SIBCO P I A

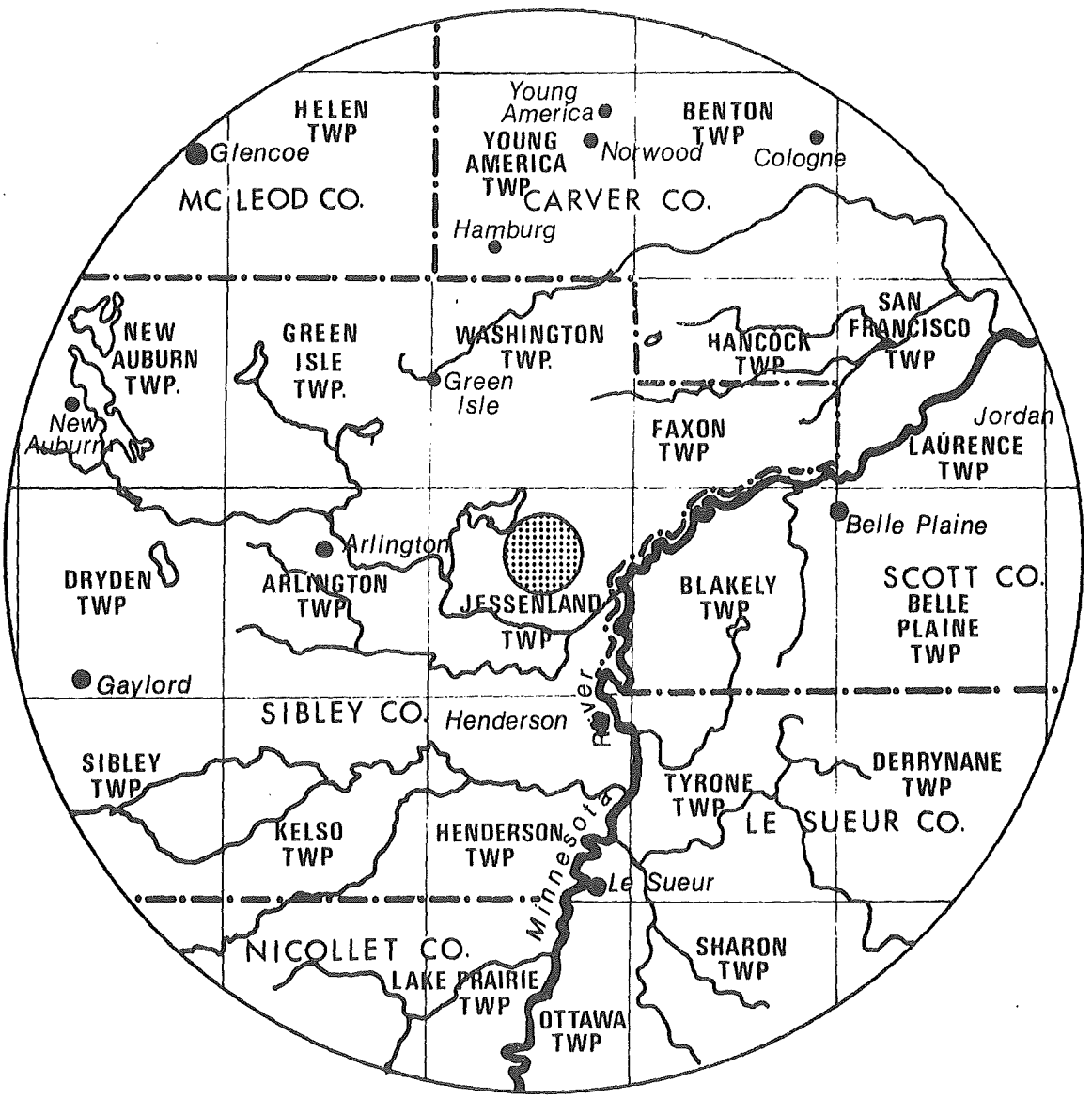


Figure 14

TABLE 34

1970 POPULATION & PROJECTIONS – SIBCO AREA
(ROUNDED TO NEAREST 100)

LOCATION	1960	1970	1960-1970 % CHANGE	1970	1975	1980	1985	1990	1995	2000
State	3,413,864	3,804,971	11.5							
Carver	21,358	28,310	32.5	28,300	31,600	34,400	36,500	40,300	43,800	46,900
LeSueur	19,906	21,332	7.2	21,300	22,400	22,900	23,800	24,400	24,900	25,100
McLeod	24,401	27,662	13.4	27,700	29,100	31,400	34,100	36,800	39,500	42,300
Scott	21,909	32,423	48.0	32,400	35,500	39,100	43,000	47,800	52,500	56,800
Sibley	16,228	15,845	-2.4	15,800	16,100	16,100	16,300	16,400	16,500	16,300
SIBCO PIA	N.A.	30,154	N.A.							
SIBCO PUA	N.A.	13,012	N.A.							
SIBCO SUA	N.A.	10,234	N.A.							

Source: 1) 1970 U.S. Census First Count as Developed by Minn. Area Planning Systems, 1975.
2) State Demographer, Minn. State Planning Agency, 1975.

TABLE 35

FARM POPULATION – SIBCO AREA

Location	1970 Area Sq. Mi.	Population Per Square Mile Density	Urban Population	Rural Population	% Farm Population	% Rural Non-farm	Number of Farms	Average Farm Acreage
Sibley	583	27.2		15,845	45.1	54.9	1,645	207
Scott	358	91.8	12,218	20,205	21.5	41.3	989	167
LeSueur	440	48.5	4,694	16,638	32.2	46.1	1,290	192
McLeod	488	56.7	12,248	15,414	27.4	29.1	1,682	169
Carver	359	78.9	9,191	19,111	23.4	44.2	1,333	139
SIBCO PIA △	314	102.0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Employed in Agriculture*	1970
SIBCO PIA	2,407
SIBCO PUA	158
SIBCO SUA	104

△ Note: Rural Density SIBCO PIA = 63.0 PSM

* Includes farmers, farm managers and farm laborers.

Source: U.S. Census 1970 (as compiled by Minnesota Analysis and Planning Systems)

According to Census data of 1970 as presented, German was by far the dominant language spoken by residents in the PIA other than English. Although no definitive number of persons with Irish ancestory is suggested in census data, one could presume that the presence of this ethnic group is couched in the figures represented by English language in census data.

As might be expected, a higher concentration of persons speaking a language other than English in their homes is found in rural townships rather than in more developed towns. This is especially true of German-language speakers. Historically, the numbers of German descendants relative to total population in the state has weakened the pressure in favor of assimilation of this group's language preferences.

Concentrations of Germans, though wide-spread throughout the area, tend to be localized in easily identified sections of larger communities. German speaking persons account for over 60% of the population of Green Isle, while in nearby Saxon Township, this language group accounts for less than ten percent of that population.

The ratio of English to German speaking persons in 1970 was two to one. Of a total population within the PIA of 25,965, 8,509 (31%) were German speaking and 16,147 (62%) were English speaking. The French and Swedish speaking population numbered 341 (1.3%) of the area residents. "All other" language groups accounted for the remaining 1,418 (5.6%) with Polish, Hungarian, and Russian most commonly represented.

Ninety percent of the 1970 SIBCO PIA population were born in the state of Minnesota. This percentage was slightly lower in the SIBCO PUA (88.3%) and SUA (86.9%). Ninety-two percent of the Sibley County population were born in Minnesota (Table 36).

Average household size within the SIBCO PIA was slightly less than the average for the state in urban areas at 3.00 and 3.23 for the PIA as a whole (Table 36). Between 34.3 and 36.0 percent of the population in the PIA were under 18 in 1970 and between 15.5 and 17.6 percent were over 65. The averages for the state in these categories were 36.3 and 10.7.

Housing Characteristics

There was a total of 37,359 year-round housing units in 1970 in the SIBCO Area. Between 75 (Carver) and 79 (Le Sueur) percent were owner-occupied. Three percent of all units (1,111) were seasonal or migratory; 2.9% (1,067) were vacant. The greatest number of seasonal and vacant homes was located in Le Sueur County (922 and 243 respectively). Nearly 2,900 housing units lacked some or all plumbing facilities (7.7%), primarily located in Sibley and Le Sueur counties (Table 37).

Median 1970 value of owner-occupied housing units in these counties was generally lower than that for the state ($18,100) with the exception of Scott and Carver ($20,700 and $19,200). The highest median rent paid was in Scott County ($114.00). Other rents ranged from $65 in Sibley County to $98 in Carver County. Very few one-room dwellings are available in the counties (185 or 0.5%) although 5,170 (13.8%) housing units were occupied by only one person.

There were 10,239 year-round housing units within the SIBCO PIA in 1970. Seventy-eight percent were owner-occupied and 2.7% were vacant (278 units). The median value of owner-occupied units was $13,700 and median rent was $65 per month. The value of housing units within the SIBCO PIA varies from less than $7,500 to $50,000+ (in Le Sueur). One hundred thirty-three homes occupied in Henderson in

TABLE 36

1970 GENERAL POPULATION CHARACTERISTICS – SIBCO AREA

Location	Population 1970	% Born in State	# Households	Average Size	Median Age*	-18	65+	Median * Yrs. Ed. 1970 M	Median * Yrs. Ed. 1970 F	% H.S. Grads 1970 M	% H.S. Grads 1970 F
State	3,804,971		1,153,946	3.20	26.8	36.3	10.7				
Sibley	15,845	92.1	4,820	3.25	31.8	36.1	13.7	8.8	9.1	33.1	39.5
Scott	32,423	83.0	8,498	3.75	22.9	43.4	7.8	11.3	12.2	46.9	57.2
Le Sueur	21,332	87.8	6,507	3.25	28.6	37.8	14.2	9.6	12.1	40.2	52.7
McLeod	27,662	87.5	8,530	3.20	29.2	35.3	12.8	9.9	11.9	41.3	49.8
Carver	28,310		7,937	3.53	25.7	40.0	10.1	11.5	12.1	48.0	54.3
SIBCO PIA	32,154	90.6	9,960	3.23	30.0	36.0	15.1	8.0	10.0	37.6	45.8
SIBCO PUA	13,012	88.3	4,296	3.00	31.0	34.3	17.6	9.0	11.0	41.9	47.8
SIBCO SUA	10,234	86.9	3,308	3.00	30.0	34.7	15.9	10.0	10.0	43.6	46.0

*Estimated for Impact Areas

Source: U.S. Census First Count, 1970 (Compiled by Minnesota Analysis Planning Systems, 1975)

TABLE 37

GENERAL HOUSING CHARACTERISTICS 1970 — SIBCO AREA

Location	Number of Units: Year Round	Number of Units: Seasonal and Migratory	% Year Round Owner Occupied	Permanent One Room Units: Number	Permanent One Room Units: % of Total Units	Vacant Year Round	Owner Median Total Units	Occupied $ Value Rural	$ Median Total Units	Rent-Rural	Total Year Round Lacking Some or All Plumbing: Number	Total Year Round Lacking Some or All Plumbing: % of Total Units
Minnesota	1,219,591	56,491	72	26,973	2	65,645	18,100	11,800	102	65	97,770	8
Carver	8,167	97	75	56	1	230	19,200	16,088	98	79	547	7
LeSueur	6,750	922	79	25	0	243	12,700	11,400	68	64	674	10
McLeod	8,735	31	78	46	1	206	16,100	13,800	78	63	691	8
Scott	8,726	50	78	42	0	228	20,700	20,300	114	96	495	6
Sibley	4,980	11	78	16	0	160	11,700	11,700	65	65	475	10
SIBCO PIA	10,239	5	78	39	.4	278	13,900	NA	66	NA	807	8
SIBCO PUA	4,423	1	76	17	.4	126	13,700	NA	65	NA	267	6
SIBCO SUA	3,392	1	78	26	.8	83	15,100	NA	70	NA	229	7

Location	Rural Housing: Year Round Total	Rural Housing: % Owner Occupied	Rural Farm: Total	Rural Farm: % Owner Occupied	Total Year Round One Person Occupied
Minnesota	407,343	83	128,078	87	96,399
Carver	5,427	78	1,561	84	981
LeSueur	5,142	81	1,766	86	1,172
McLeod	4,607	81	2,110	86	1,276
Scott	5,360	81	1,548	89	990
Sibley	4,980	78	1,948	83	751
SIBCO PIA	NA	NA	NA	NA	1,790
SIBCO PUA			NOT AVAILABLE		951
SIBCO SUA			NOT AVAILABLE		630

Source: U.S. Census First & Fourth Count Data.

1970 were valued at less than $7,500. Eleven homes in Le Sueur were worth more than $50,000 that year. Tyrone Township has had one major development of homes within the $25,000-$50,000 bracket. In the communities, the median home values ranged from $7,719 in Henderson to $18,462 in Le Sueur.

Permits issued between 1970 and 1974 in selected communities indicate housing values ranging higher than the averages for the period recorded in census figures. In Gaylord, for instance, the average home value was $19,600 (1970-1974) as opposed to $15,800 in 1970. In Arlington, 1971-72 values averaged $18,100 while the 1970 mean value was $13,250.

Eight percent of total housing units in the SIBCO PIA lacked some/all plumbing facilities (807 units). Nearly 1,800 dwellings were occupied by one person (17.8%).

A total of 24 housing permits were issued in the six communities in the SIBCO PUA in 1970. Construction peaked in 1973 with the issuance of 109 permits. As of 1973, only 18 permits were issued in communities for which data is available (Table 38).

Construction activity in the SIBCO SUA has been most active in Gaylord, Glencoe and Norwood/Young America. 50 residential permits were issued in the area in 1970. Adequate figures are not available for 1974. Sixty-one percent of the year-round housing units currently occupied within the SIBCO PIA were constructed before 1940. This is especially true of over 80% of the housing within townships. Housing units constructed since 1940 are located primarily in the communities of Glencoe, Le Sueur, Hamburg, Belle Plaine, Arlington and Gaylord. Very little growth in the housing industry can be reported for the communities of Henderson, Green Isle and Jordan. In recent years, a substantial increase in numbers of rental units have appeared only in Le Sueur and Glencoe. One hundred fifteen rental units were added to the housing profile in Le Sueur between 1950-1970 and 83 in Glencoe. The largest markets in rental housing occur in Le Sueur (315 units), Glencoe (268), Jordan (157), Belle Plaine (144), Arlington (127) and Gaylord (116). Thus, 1,127 of 5,092 (22%) housing units were renter-occupied in 1970 for these communities; a ratio compatible with that of the entire area.

There appears to be a current trend being fostered towards construction of multiple unit and low income rental housing. A sixty-four unit apartment complex (42 units are low income) is scheduled to open soon in Le Sueur along with a bungalow complex. Gaylord is in the process of constructing two eight-plexes and a 16 unit apartment building. Proposals for apartment construction are being discussed in Arlington as means of meeting currently perceived local demand.

As of 1970, 208 housing units were vacant in the SIBCO PIA. This figure translates as a vacancy ratio of 2.6% — an indicator of a tight housing market in the area. Given the low vacancy rate in housing in 1970 for this area, it would appear that isolated housing permit figures reported by town officials and the Federal Reserve Bank and presented here, indicate a slow development in the housing industry in the PIA.

It is remarkable to note that for the towns of Glencoe, Young America, Arlington and Gaylord there have been 142 residential permits issued while in Jordan alone 143 mobile home units have been added since 1970. A total of 225 mobile homes were reported for the PIA in 1970.

The recent development of multiple-unit and federally funded housing may reflect the fact that 63.4% of homes occupied by a single person were those of persons over 65 years of age and presumably on fixed incomes. It has been suggested by local town officials that a majority of this population live in large homes and would welcome the opportunity to relocate in smaller appartments for personal and financial reasons.

TABLE 38

RESIDENTIAL PERMITS ISSUED 1970-1974 – SIBCO AREA

Location	Total '70	Single Family '71	'72	'73	'74	Apartments '71	'72	'73	'74	Duplex '71	'72	'73	'74	Total '74
SIBCO PUA	24	33	45	45	12			64	6	6				NA
Henderson	1	0	1	0	0									0
Arlington	NA	6	4	8	3									NA
Le Sueur	7	8	28	20	9			64						NA
Belle Plaine	11	18	8	13	0					6				NA
Greene Isle	3	0	0	0	0									NA
Hamburg	2	1	4	4	0				6					2
SIBCO SUA	50	35	40	42	9	4	27	0	0	2				
Gaylord	10	7	8	4	9									NA
Glencoe	23	6	22	19			8							NA
New Auburn	0	0	0	1										NA
Norwood/ Young America	7/5	8/8	4	15			6/9			/2				0/31
Jordan	5	6	6	3		4	4							4
Cologne	NA				NOT AVAILABLE									NA

Source: U.S. Bureau of Commerce: C40 Series Construction Report: Housing Authorized by Building Permit and Contracts, Table IV.

TABLE 39

EDUCATIONAL FACILITIES AND CAPACITIES – SIBCO AREA

Location	School District	Enrollment 1974 Elementary	Middle	High School	Pupil/Teacher Elementary	High School	Capacity Elementary	Middle	High School	$ Per Pupil Cost*	Plans
Total SIBCO PIA	(5)	(1913)	––	(2032)			(2173)	––	(2227)	––	
Henderson	934	200	––	225	N.A.		360	––	400	N.A.	New elementary school to open fall 1974.
Arlington	731	482	––	522	20:0	18:1	482	––	522	787.44	None. Grades 7-8 overtaxed now. Grades 1-2 housed in temporary buildings.
LeSueur	393	700	––	730	22:1	18:1	800	––	750	788.00	No planned expansion.
Belle Plaine*	716	531	––	555	18:1		N.A.	––	N.A.		
Green Isle	K-8	Included in Arlington enrollment					(531)	––	(555)	801.83	N.A.
Hamburg											
Total SIBCO SUA	(4)	(2058)	(540)	(1948)	––	––	(1840)	––	(2925)		
Gaylord	732	503	––	43	––	––	N.A.	––	635	735.00	No plans. Could accommodate 10% (180-200) increase in total enrollment.
Glencoe	422	535	540	610	15:1			Present + 170		841.16	H. S. was built in 1970. No current expansion plans.
New Auburn*	422	Included in Glencoe enrollment									
Norwood/ Young America	108	420	––	580	19:1		420	––	580	N.A.	School Bond September, 1974 to increase enrollment capacity 50%.
Jordan	717	600	––	715	N.A.		800		1015	911.00	New elementary school will open in fall, 1975. Plan to build senior H. S. by 1990 with capacity for 2000 students.
Cologne	108	Included in Norwood/Young America									

Source: 1) Interviews conducted by NBI with District School officials, 1975.
2) Draft EIS on the Proposed NSP Generating Facility in Sibley County, Minnesota.

*1973 Data

Education and School Facilities

When the Census was taken in 1970, 36% of the SIBCO PIA population were under eighteen years of age. Comparable figures for the SIBCO PUA and SIBCO SUA were 34.3 and 34.7 percent. Adult males in the three areas had completed between 8 and 10 years of formal schooling. Females had completed between 10 and 11 years. Between 38 and 44 percent of the area's male population were high school graduates. Comparable figures for women were 46 and 48 percent.

There are five school districts in the SIBCO PIA having a total enrollment of 3,945 students (1,913 elementary, 2,032 secondary level students) in the summer of 1974. Larger schools are located at Le Sueur and Arlington. Per pupil costs reported vary between $787.44 and $801.83. (Table 39). A new elementary school opened at Henderson in the fall of 1974. No other school in the SIBCO PIA had built recently or had planned expansions as of 1974. Arlington school is an exception. An annex was opened recently housing an olympic pool and other physical education facilities. The annex was designed to house needed classroom space but was deemed inadequate to this purpose subsequent to opening. Total capacity of SIBCO PIA schools in 1974 was 4,400 (2,173 elementary and 2,227 high school spaces). SIBCO PIA schools were operating a 89.7% of capacity in 1974. 455 spaces are available based on enrollment for that year (260 elementary and 195 high school).

The SIBCO SUA includes seven communities and four school districts. Total enrollment in 1974 was 4,546. Total capacity that year was 4,765—a difference of 219 students. Schools in this analytical area were operating, as a unit, at 95.4% capacity last year. A school bond issue was proposed in the Norwood/Young America district for Fall 1974. A new elementary school is scheduled to open September 1975 at Jordan/Cologne. There were, as of 1974, no plans for expansion at either Gaylord or Glencoe.

Employment and Income

The proposed SIBCO generating plant would be located on the northwest border of Economic Development Region 9, only a short distance from Development Region 11 which is the Minneapolis-St. Paul Standard Metropolitan Statistical Area. The counties primarily affected would be four; Carver, Le Sueur, Scott and Sibley. Because of the ease of transportation, the City of St. Peter in Nicollet County may also be affected. Table 40 shows the population for each of the four counties, plus totals for the decennials from 1960-1990.

TABLE 40

POPULATION BY COUNTY – SIBCO AREA

	1960	1970	1980	1990
Carver	21,358	28,310	34,400	40,300
LeSueur	19,906	21,332	22,900	24,400
Sibley	16,228	15,845	16,100	16,400
Scott	21,909	32,423	39,100	47,800
Total	79,401	97,910	112,500	128,900

Source: John Hoyt, et al.

While the total for the four counties rises significantly (61.3%), Carver and Scott counties, part of the Metropolitan area, account for all of this growth.

Table 41 shows the population of persons 16 years and older for the decennial periods 1960-1990, indicating the availability of working age people. This total rises 86% over the period which means that a larger percentage of people are coming of working age. Again the growth is primarily in Carver and Scott counties.

The work force in the four county area is shown in Table 42 for the year 1973. These data are based on annual averages.

TABLE 41

POPULATION OF AGE 16 AND OLDER BY COUNTY – SIBCO AREA

	1960	1970	1980	1990
Carver	13,696	18,278	24,586	30,181
Le Sueur	13,199	14,209	15,089	14,935
Sibley	10,819	10,856	10,692	9,393
Scott	13,388	19,793	30,114	40,520
Total	51,102	63,136	80,481	95,029

TABLE 42

WORK FORCE – SIBCO AREA

	Carver	LeSueur	Scott	Sibley	Total
Total Work Force	9,852	9,168	12,156	5,538	36,714
Employed	9,390	8,621	11,565	5,216	34,792
Unemployed	462	547	591	322	1,922
Unemployment Rate	4.7	6.0	4.9	5.8	5.2
Wage & Salary	6,901	6,266	9,533	2,865	25,565
Other Non-ag	891	1,082	892	422	3,287
Agriculture	1,597	1,273	1,140	1,929	5,939

Source: John Hoyt et al.

Table 43 shows employment by major industry.

TABLE 43

EMPLOYMENT BY MAJOR INDUSTRY – SIBCO AREA

	CARVER	LE SUEUR	SCOTT	SIBLEY	TOTAL
Construction	409	259	611	181	1,460
Manufacturing	1,402	2,395	2,889	617	7,803
Transportation	226	150	539	39	954
Retail Trade	1,603	1,127	1,761	550	5,041
Wholesale Trade	98	135	316	185	734
F.I.R.E.	273	134	209	100	716
Service	876	727	1,125	318	3,046

Keeping in mind that Scott County data includes the City of Shakopee and Le Sueur County includes the City of Le Sueur, one can make the following statements about the SIBCO Area.

1) Population and working age population will continue to provide workers.
2) The area has no great unemployment problem.
3) Agriculture is a strong factor in area (roughly 17% of total employment).
4) The area has good manufacturing base.
5) The number of construction workers in the area is proportionate to other industries.
6) The area has adequate trade and service sectors.

While current data for income are not available, 1970 Census figures show that median family income for each of the four counties is as follows; Carver $10,427, Le Sueur $8,411, Sibley $7,636 and Scott $10,570. These compare favorably with the median income of the state which is $9,931 (Table 44).

The Cities of Le Sueur and Gaylord will benefit first from expenditures of construction and/or plant workers, while Shakopee, St. Peter, Mankato and smaller towns along U.S. route 169 will derive secondary effects.

Normally the source of the largest portion of the construction workers will be either the Twin City Metropolitan area or the hometown of the general or sub-contracting firm. It can be expected that few construction workers other than fill-in and general labor will be local. At the same time, it would be safe to say that at points during the construction phase, personnel shortages will occur in skill areas such as pipefitters or electricians. It is estimated that 1,300 construction workers will be employed at the site.

A total of 12,037 were employed in the SIBCO PIA population in 1970. Average family income there was $8,350 and 7.4% of all families had below poverty income. Incomes were slightly higher in the SIBCO PUA ($8,620) where 4,959 people were employed and 5 percent of the families had subsitence incomes.

Of the employed SIBCO PIA population, 16.7% were engaged in agriculture, forestry or fishery industries and 7.3% worked in the construction industry. In 1970, 487 experienced unemployed persons lived in the SIBCO PIA of whom 376 were experienced craftsmen, operatives or general laborers.

TABLE 44

EMPLOYMENT 1970 – SIBCO AREA

Location	Labor Force Employed 1970	Percent Unemployed 1970	Median $ Family Income	% Families With Below Poverty Income△
Minnesota	1,464,273	4.2	9,931	8
Sibley	5,907	3.9	7,636	14
Carver	11,138	2.9	10,427	7
Scott	11,981		10,570	8
McLeod	11,007	2.8	8,794	9
LeSueur	7,397	5.3	8,411	10
SIBCO PIA	12,037	NA	8,350	7.4
SIBCO PUA	4,959	NA	8,620	5.0
SIBCO SUA	4,060	NA	9,230	7.7

Source: U.S. Census 1970 Fourth Count Data

△Poverty income for a family of four in 1970 was considered as follows:

Urban	$3,743
Rural	$3,195

1974 figures were:

Urban	$4,550
Rural	$3,870

In 1970, Jessenland Township had a population of 471, of which 156 were employed and 125 were under sixteen years of age and 44 were over 65. The total labor force was 182 with a 9.3 percent unemployment rate.

Unemployment in Jessenland Township in 1970 among experienced persons consisted of: 13 craftsmen, foremen and kindred workers and 4 farm laborers.

Three townships bordering on Jessenland Township were at full employment in 1970: Kelso, Washington-Lake, and Blakeley. Arlington Township reported nine unemployed farm workers (3%), and Henderson Township reported five professional/technical/managerial persons unemployed (2%). Three experienced professional people were unemployed in Green Isle (1.6%). The seemingly high unemployment rate in Jessenland Township is created by the presence of an unusually large number of craftsmen, foremen, and kindred workers residing in the area. Nineteen percent of the total labor force include persons in these occupational categories. Ten of these workers received earnings from this type of work of less than $4,000 in 1970 which suggests a degree of part-time work.

The bulk of experienced unemployed persons within the primary impact area is represented by "operatives including transportation," (228). There were very few unemployed sales personnel (9) in 1970. Unemployed operatives were distributed widely through the area with substantial pockets in Hamburg, Glencoe, and Belle Plaine: Unemployed professional/technical and managerial workers were located almost exclusively in the Cities of Gaylord, Jordan, Green Isle, and Henderson. (Table 45). Besides Jessenland Township, the cities of Jordan, Hamburg, and Glencoe had a number of unemployed former craftsmen and kindred workers. Unemployed laborers resided in towns and unemployed laborers were found primarily in rural townships.

Retail Services and Manufacturers

Table 46 reflects an attempt to categorize the communities within the Primary Impact Area on the basis of retail service availability. This categorization is based upon the methodology developed by John Bochert and Russell Adams and presented in *Trade Centers and Trade Areas in the Upper Midwest*, 1963, for the Twin Cities Metropolitan Planning Commission.

The Bochert-Adams document defines eight classifications of retail trade centers according to the volume of gross wholesale and retail trade and the breadth of variety in retail services available within the center.

The eight possibilities of retail trade centers are categorized as:

Metropolitan wholesale/retail center
Primary wholesale/retail center
Secondary wholesale/retail center
Complete shopping center
Partial shopping center
Full-convenience center
Minimum convenience center
Hamlet

We are concerned here with the last five categories. Wholesale functions for the area are currently served by Mankato and the Twin Cities.

TABLE 45

EXPERIENCED UNEMPLOYED 1970 – SIBCO AREA

Location	1970 Total	Sales	Crafts	Operatives Including Transportation	Laborers	Service
Carver	333	0	90	142	34	17
LeSueur	408	8	96	166	41	5
McLeod	301	20	37	137	37	25
Scott	394	5	124	117	46	54
Sibley	220	0	42	52	44	15
SIBCO PIA	487	9	65	228	83	33
SIBCO PUA	226	0	26	113	34	18
SIBCO SUA	179	9	50	77	17	6

Source: U.S. Census 1970 Fourth Count and Special Compilations prepared from 1970 data by MN Analysis & Planning Systems.

TABLE 46

RETAIL SERVICES – SIBCO AREA

Check List of Full-Service Functions by Category

	1967 Annual Retail Sales ($million)	CONVENIENCE																										SPECIALTY																		Status	Comments
		Gas Station	Grocery	Hardware	Bank	Eat & Drink	Drugs	Gen. Merchandise	Variety	Fresh Produce	Auto, Farm Equip.	Furn., Appliance	Laund. Dry Clean	Jewelry	Mens/Boys Clothes	Ladies Clothes	Shoe Store	Lumber Yard	Funeral Serv.	Hotel/Motel	Garden Supply	Photo Studio	Sport Goods	Florist	Radio/TV	Tires, Auto. Access.	Paint, Glass, Wallpaper	Heating, Plumb.	Antique, 2nd Hnd.	Music	Camera	Women's Access.	Stationery	Children's Wear		
Glencoe	14.0	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x			x	x	x	+	x	x	x		x	+		Complt. shopping ctr.	Continued Status
LeSueur	7.8	x	x	x	x	x	x		x		x	x	x	x		x	+	x	x	x		x	x	x	x	x	x	x				+			Partl. shopping ctr.	New mall is an attempt to achv. complete shopping ctr.
Belle Plaine		x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			x	x	x	x	x	x	x			x			Partl. shopping ctr.	Too close to Twin Cities
Gaylord		x	x	x	x	x	x	x	x	x	x	x	x					x	x	x	x	x		x	x	x	x	x	x						Partl. shopping ctr.	Too close to Glencoe
Arlington		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x		x	x			x							Partl. shopping ctr.	Too close to Gaylord & Glencoe
Jordan		x	x	x	x	x	x	x	x	x	x	x		x					x	x	x			x	x		x								Full convenience	If it becomes a full-fledged suburb w/increase
Norwood/ Young America		x	x		x	x	x	x		x		x	x				x	x		x	x		x			x	x		x						Full convenience	May well become a partial shopping center
Henderson		x	x	x	x	x	x		x	x			x						x		x			x					x				x		Min. convenience	May not increase if LeSueur works
Hamburg		x	x	x	x	x		x		x																										Hamlet	If growth continues may become minimum convenience center
Green Isle		x	x	x	x	x		x			x																x									Hamlet	If pop. increases could become minimum convenience center

Source: Phone interviews with local officials conducted by NBI, 1974

+ = anticipated services included

The data in Table 46 reflect conversations with members of the business communities and local town officials within the area. As of July, 1974, Glencoe was the only complete shopping center within the Primary Impact Area. The retail trade status of Glencoe is dependent chiefly upon the fact that its annual gross retail sales average more than $11,000,000. Conversations with local residents support this classification, indicating Glencoe is a preferred regional shopping area for specialized consumer goods.

Current re-development activities in Le Sueur, which include construction of a central shopping mall as well as new multiple dwelling housing, suggest that a complete shopping center status may be achieved here shortly. Le Sueur's identification with Green Giant Co. may assist in its ability to attract both retail businesses and clientele. Geographically, Le Sueur is situated between service centers of New Prague to the east, Glencoe to the west, St. Peter and Mankato to the south, and the Twin Cities to the north. Thus, it is extremely unlikely that this city would develop into any type of wholesale/retail trade center.

Belle Plaine is currently a partial shopping center. It appears to be situated too close to the Metro Area to become a complete shopping center. One notes the lack of stores devoted to durable goods such as furniture and major appliances as evidence of this suggestion. While Le Sueur may attempt to maximize its geographical location, development and expansion of retail services will be dependent upon major population growth within its market area.

Further development of Gaylord is restricted by its proximity to Glencoe. It is currently a partial shopping center as is Arlington, which is in a similar development situation geographically.

None of the other communities appear likely to change greatly as retail trade centers. Jordan may experience a population growth as might Norwood and Young America due to their proximity to the Twin Cities. Henderson, Hamburg and Green Isle may, with increased population, become minimum convenience centers. Henderson, close to Le Sueur, may suffer from retail expansion in the latter city.

Manufacturing history varies between the communities. The most recent firm to begin operations in Le Sueur is Gopher State Silica in 1953 (as reported in the Minnesota Directory of Manufacturers, 1973). Non-agricultural industrial development began in Glencoe during the post-war period. The most recent newcomers to this community are divisions of state and national firms. The available information suggests that Belle Plaine has been the subject of more recent and more diversified manufacturing. Although agriculture remains the largest single industry in the area, it does not overwhelm other industries in importance, especially as regards female employment.

Tax Structure

Table 47 identifies most elements of property classes which distinguish between assessments and school tax levies. Figure 15 shows the locations of taxing authorities. Valuations in the SIBCO regions are predominantly agricultural, with the exception of Le Sueur, which has slightly more non-agricultural valuation than most area communities. The bulk of the non-agricultural assessments are in homestead, with assessments rising to as much as two-thirds of the total amount of agricultural assessments. Simply stated, increases or decreases in expenditures in the region are likely to affect farmers and homeowners.

TAXING AUTHORITIES
SIBCO P I A

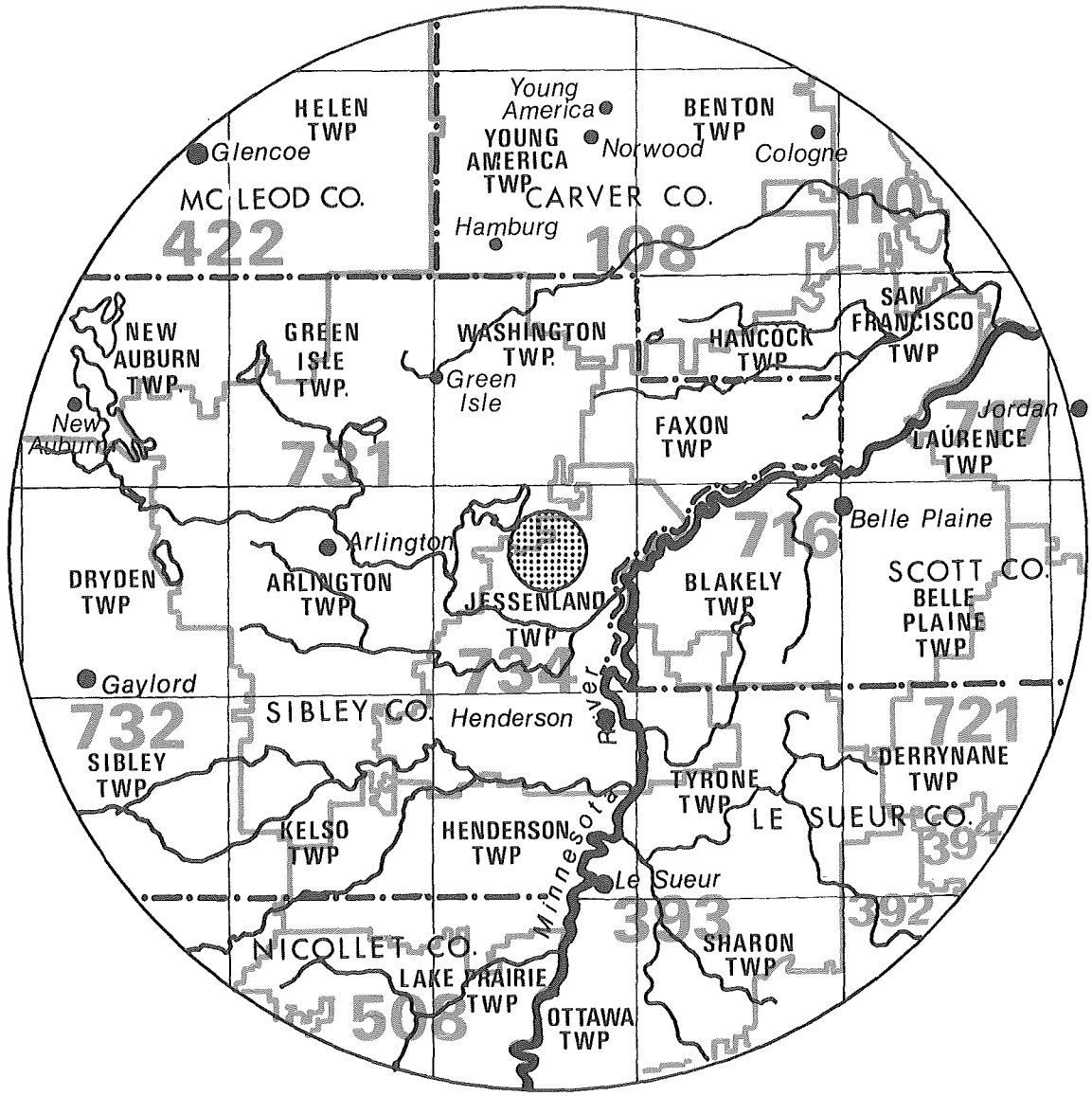


Figure 15

KEY TO SCHOOL DISTRICTS ON FIGURE 15

Carver County	
108	Norwood-Young America
112	Chaska
Le Sueur County	
391	Cleveland
392	Le Center
393	Le Sueur
394	Montgomery
Mc Leod County	
422	Glencoe
Nicollet County	
507	Nicollet
508	St. Peter
Scott County	
716	Belle Plaine
717	Jordan
Sibley County	
731	Arlington
732	Gaylord
734	Henderson

TABLE 47

TAX SUMMARY, 1974 – SIBCO AREA

	Valuations ($1,000)	1975 Non-Agricultural Mill Rates	Homestead ($1,000)	Non-Homestead ($1,000)	Vacant and Commercial ($1,000)	Public Utility ($1,000)	Industrial ($1,000)	Total Non-Agricultural ($1,000)	Personal ($1,000)	Total	Total Tax Levied	Levy Limit 1977
Arlington												
School District #731	$7,317		$2,171	$236	$ 575	$ 72	$ 193	$3,247	$119	$10,683	$ 495	$ 589
Arlington City	7	$24						2,487	73	2,567	62	74
Sibley County		22								46,769	1,019	1,213
Gaylord												
School District #732	7,887		2,191	223	674	36	170	3,295	244	11,426	456	543
Gaylord City	11	27						3,017	208	3,237	87	104
Sibley County		22								46,769	1,019	1,213
Henderson												
School District #734	2,265		434	92	112	--	6	644	47	2,956	151	180
Henderson City	11	31						580	40	631	20	24
Sibley County		22								46,769	1,019	1,213
Winthrop												
School District #735	7,731		1,396	114	378	82	454	2,424	108	10,263	401	477
Winthrop City	4	13						2,174	95	2,273	30	36
Sibley County		22								46,769	1,019	1,213
Norwood/Young America												
School District #108	7,543		3,827	319	1,283	184	--	5,617	576	13,736	646	769
Norwood City												
Young America City	24	35						1,262	99	1,386	48	57
Carver County		31								79,937	2,447	2,912
Belle Plaine												
School District #716	5,892		3,067	311	633	25	220	4,256	239	10,387	490	583
Belle Plaine City	122	35						4,018	213	4,354	153	182
Scott County		31								92,748	3,185	3,790
Le Sueur												
School District #392	6,395		4,463	497	621	27	1,204	6,812	155	13,362	691	822
Le Sueur City	61							6,297	137	6,494		
Le Sueur County		29								51,035	1,499	1,784

Transportation

Most county and township roads in Sibley, Mc Leod, Scott, and Le Sueur Counties evolved and have been upgraded along township lines. As a result, most county and township roads are oriented either north-south or east-west in a grid fashion. Their function has remained essentially the same as when they were originally plotted out, to serve small local trading centers. With the advent of state and federal highway systems, the function of which was to serve major regional centers, roads were constructed so as to take relatively direct routes between towns along their route. More often than not, such state and federal roads run at angles to the more formal county and township road patterns. Sibley County presently has seven major federal and state highways. These are shown on Figure 16.

U.S. Highway 169, is a four lane divided major intra and inter-state arterial connecting the Twin Cities with southern Minnesota. This highway parallels the Minnesota River through Scott, Le Sueur, Sibley and Nicollet Counties as far as Mankato. Although regionally important, with only 2.58 miles of 169 in the southeastern corner of the county, it does not directly serve any Sibley County community, nor does it provide a major link with communities within the county.

State Trunk Highway 5 combines with State Trunk Highway 19 to provide the major northeast-west route within and through the county. State Trunk Highway 19 provides a major east-west route across the state and through the county, and connects the four largest communities within the county. State Trunk Highway 22 provides a major north-south route through the state and through the county, and connects major regional centers outside of and within the county. State Trunk Highway 25 is contained entirely within the northeastern corner of the county and provides major east-west collector service. State Trunk Highway 93 is a short connector between State Trunk Highway 19 and U.S. Highway 169 in the southeastern corner of the state. It parallels the Minnesota River and is considered a scenic route.

The proposed site area is presently served by a number of hard surface and gravel roads. The proposed SIBCO power plant would be located in the southeast quarter of Section 9 of Jessenland Township. The site may be conveniently reached from the four closest towns as follows: From Green Isle, bituminous County State Aid Highways 11 and 12 south and east, and gravel County Road 19 east, about 7 miles (11km). From Arlington, bituminous County State Aid Highway 12 east, and gravel County Road 19 east, about 6 miles (9.6 km). From Henderson, bituminous County State Aid Highways 6 and 12 north and west, and gravel County Roads 64 and 19 north and west, about 6 miles (9.6 km). From Belle Plaine, bituminous County State Aid Highways 25 and 6 west and southwest, and gravel County Road 19 west, about 10 miles (16 km). Both Green Isle and Arlington can be most conveniently reached from the Twin Cities via State Trunk Highway 5. Travel time from the Twin Cities to the plant site, via any of the above routes, its from one to one-and-one half hours.

The Chicago and Northwestern Railroad presently operates two mainline tracks in the general vicinity of the proposed power plant. The closest track to the proposed plant parallels the east side of the Minnesota River about 3 1/2 miles (5.6 km) from the proposed power plant. This line passes through the communitites of Worthington, St. James, Mankato, Le Sueur and Shakopee on its way to the Twin Cities. This is the primary proposed route of coal unit trains from Wyoming to the SIBCO site. Traffic on the line, in the area of the proposed power plant, presently consists of four scheduled freight trains per day, as well as occasional unscheduled trains.

The second mainline track lies from St. James to Gaylord. This route would require substantial renovation of nearly all of its trackage. It would also require a 7.5 mile spur to the site. Bridges would be required over the Minnesota River, Rush River, Buffalo Creek, High Island Creek, and other small streams, depending upon the choice of a route through Mankato or Hanska to New Ulm, and ultimately Gaylord. Present traffic on the portion of the track through Gaylord and Green Isle is one freight train per day, plus occasional unscheduled services.

Medical Facilities

As of 1973, there were four general hospitals located in PUA and SUA communities of the SIBCO area. Combined general hospital bed space is 147. There are also 587 boarding care and nursing home beds in eight nursing homes in the area (Table 48). Seventeen doctors are home-based in Glencoe, Le Sueur, Arlington, Gaylord and Belle Plain. Fourteen dentists have practices in these communities. Two doctors and one medical assistant are located in Arlington and one at Gaylord. The Gaylord staff is expected to increase to three by June 1975. It is estimated that the service area of Arlington is 3,000 persons.

Historical Sites

Two aspects of the environmental setting which includes the site of a proposed power plant in Jessenland Township are of historical significance to that area as well as to the region. Firstly are those occupational, social, and cultural traditions which were determined by settlement patterns and have survived the pressures of recent growth or change. Moreover, these are traditions which receive more than cursory or sentimental attention from current generations. Secondly, and more commonly recognized, is the contemporary social conscience which actively pursues a desire to maintain those physical sites commonly agreed upon as memorials to present and past traditions.

The Primary Impact Area was settled in two phases - before and after 1860. Roughly speaking, Henderson, Jessenland, Blakeley, Faxon, and Hancock Townships were settled during the first phase, along with the City of Henderson and a settlement south of the present town of Blakeley called Walker's Landing.

Prior to the migration of white settlers into the area, the hardwood forests of the Minnesota River Valley (Maple-Basswood and Elm) were sparsely populated by Dakota Sioux Indians. There are currently five designated Indian burial mounds in Faxon Township and thirteen in Blakeley Township and one noted at High Island in Jessenland Township.

The first white settlements were of largely Irish and German Catholic descent. The City of Henderson is reputed by local residents to have been the first Irish settlement in Minnesota. During the period before the railroad was built through Arlington, when Henderson was a shipping center for upland grain farmers and the County Seat, it has been suggested that there was a distinct rivalry between the two ethnic groups. One elderly gentleman recalls that during the First World War, it was a standing joke that a German farmer could not drive a load of hay through Green Isle without encouraging an Irishman to put a match to it. These distinctions have become considerably less noticeable in the years since World War II.

Early settlements are vividly recalled in Henderson both by local residents and by the presence of eight historical buildings within the city limits. The architecture is pre-1860 and includes three homes, two commercial establishments and three public buildings. St. Thomas Church in Jessenland Township

HIGHWAY NETWORK
SIBCO P I A

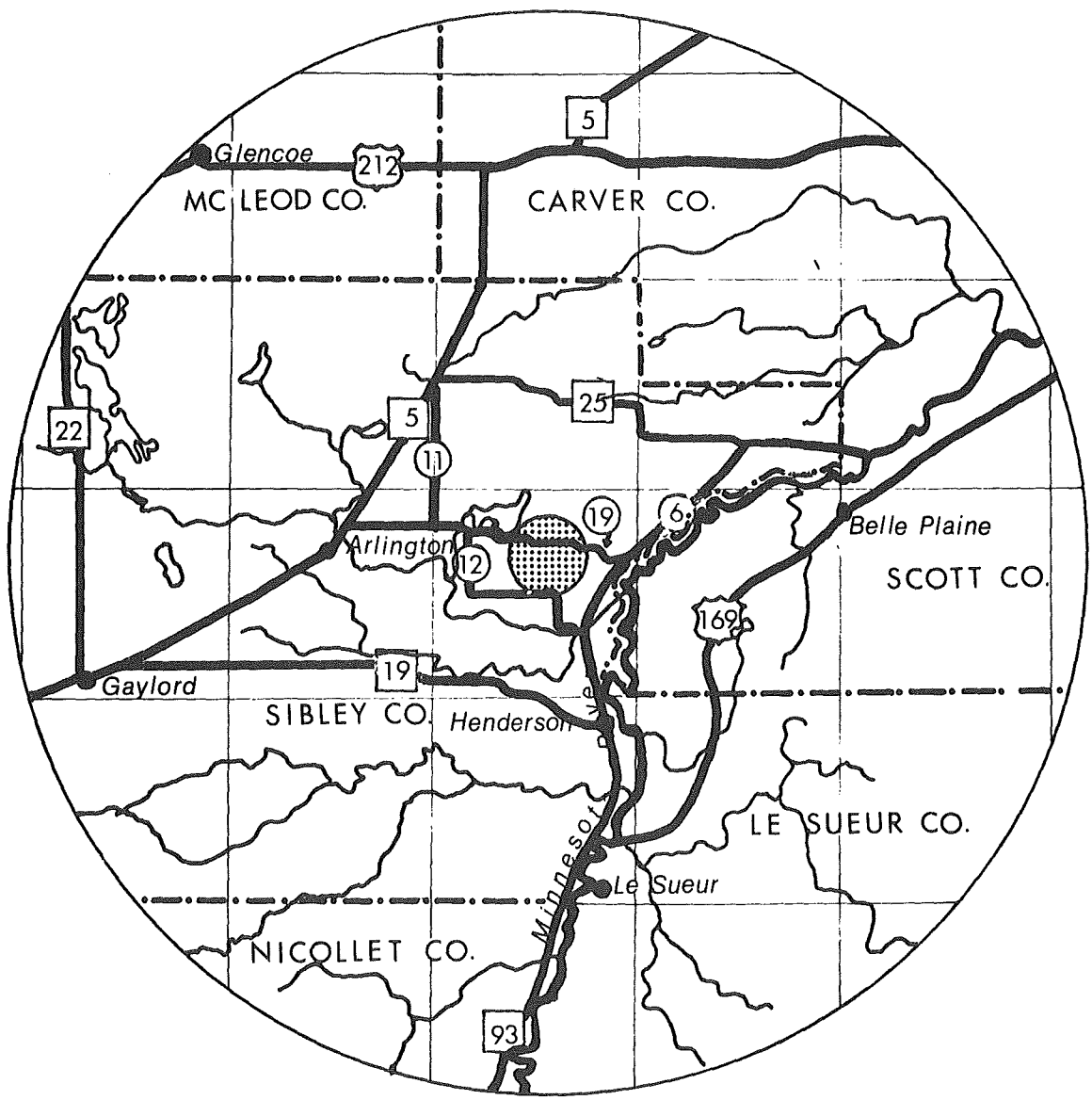


Figure 16

TABLE 48

SUMMARY OF MEDICAL FACILITIES

Location	Number of Hospitals	Number of Nursing Homes	Beds		
			Hospitals	Boarding Care Homes	Nursing Homes
Sibley County	2	4	64	14	112
SIBCO PIA	2	4	61	15	273
SIBCO SUA	2	4	86	94	177

	General Hospital Beds Per 1000 Population	Nursing Home Beds Per 1000 Population Age 65 and Over	Doctors Per 1000 Population
Sibley County	4.0	51.4	.38
SIBCO PIA			
SIBCO SUA			

	Active Physicians	Boarding Care Beds Per 1000 Population Age 65 and Over
Sibley County		
SIBCO PIA	6	6.9
SIBCO SUA		

Source: Minnesota Department of Health, Health Centers and Other Related Facilities, 1973

has also been designated as a historic site along with Zion Kirche in Green Isle Township. Of the historic sites mentioned, the proximity of St. Thomas Church is of greatest concern, as it is situated on a main access route to the proposed power plant (Rt. 19) and is approximately 1/2 mile from the SIBCO Site.

The community of Walker's Landing, mentioned earlier, is currently marked by a single brick building which was originally a tavern and way station frequented by Minnesota River passengers and carriers. According to Henry Harren of the Minnesota Historical Society, no state or grant funds have been devoted to restoration of local historical buildings. The Walker's Landing site and two buildings are reported to be in disrepair in Henderson.

It has been noted in another section of this report that a high percentage of residents in the impact area sited German as their mother tongue in 1970. On this score, Dr. Lowry Nelson has noted that in Minnesota, it is often third generation residents who claim mother tongues other than English. The implication is that foreign languages have survived in this state despite long associations with English as the Dominant language. (Nelson, *The Minnesota Community,* 1963, P. 42). In addition, one must remember that the percentage of persons sited as predominantly English-speaking in census statistics may conceal Irish populations in the area.

Table 49 lists the recognized historic sites in the SIBCO Region.

Dr. Guy E. Gibbon, of the University of Minnesota, has conducted a survey of the site for archeological sites in 1971. Three sites were located along Silver Lake. These are located in a buffer zone which NSP proposes to maintain around Silver Lake. Dr. Gibbon's report on the survey is included in Appendix C.

Waste Water Treatment Facilities

A list of waste water treatment facilities is included in Table 50.

TABLE 49

HISTORIC SITES – SIBCO AREA

1. Henderson Historic District
    a. Old Sibley County Courthouse
    b. A.O. Poehler House
    c. Camnick House
    d. J.R. Brown House
    e. Fire Hall
    f. Water Works
    g. Stucke Building
2. St. Thomas Church
3. Zion Kirche
4. High Island excavated Indian Mounds
5. Walkers Landing
6. Several Indian Mounds

TABLE 50

WASTEWATER TREATMENT FACILITIES
SIBCO PUA AND SUA

Municipality	Design Capacity (million gallons per day)
Arlington	0.1
Belle Plaine	0.2
Cologne	0.08
Gaylard	0.228
Glencoe	0.9
Green Isle	0.055
Henderson	0.1
Jordan	0.275
LeSueur	0.62
New Auburn	0.0498
Norwood	0.244
Young America	0.1587

Source: Minnesota Pollution Control Agency

V. ENVIRONMENTAL IMPACTS

GENERAL

Within this report the purpose of the environmental impacts analysis is to provide enough information to evaluate the proposed site with respect to the MEQC site selection criteria. For this reason the non-occurrence of some impacts (such as impacts upon the geology) are also included in the discussion.

The impacts have been categorized by source into two groups: impacts from plant construction; and impacts from plant operation. The impacts from each of these categories are evaluated for each of the topics presented in the Environmental Setting.

NATURAL ENVIRONMENT

Construction

Land Use - SHERCO - The construction of units 3 and 4 at SHERCO will convert 320 acres of agricultural land of low fertility to heavy industrial uses. Most of the site (approximately 1,700 acres) was converted to heavy industrial uses by the construction of units 1 and 2, and so is unaffected by units 3 and 4 in terms of land use. Some of the site will be kept in a forested state to provide a buffer zone between the plant and the Mississippi River. In this respect, the use of this forested land will not change. No rare, unique, or unusually important land forms are found at the site.

Land Use - SIBCO - The construction of units 1 and 2 at SIBCO will convert 3,480 acres of very good agricultural land to heavy industrial uses. Approximately 2,800 acres of the site is under cultivation, with approximately 520 acres devoted to woodlands and 160 acres to pasture. Some wooded and open areas will be left unchanged to provide a buffer zone along Silver Lake, and between the plant and the Minnesota River. A small portion of the west bank of the Minnesota River Valley will be devoted to transportation uses with the construction of an earthen embankment for a rail line to the site. The east side of the valley is already committed to railroad uses. No rare, unique, or unusually important land forms are found at the site.

Vegetation - SHERCO - The construction of units 3 and 4 at the SHERCO Site will have a minimal impact on the existing vegetation because most of the land on or around the proposed plant site has been cleared or graded during the construction of units 1 and 2. Vegetation on the periphery of the construction area is likely to be impacted by any fugitive dust resulting from construction. These impacts will be short-term; ceasing to exist once reseeding of the exposed soils is complete.

Vegetation - SIBCO - The grading and construction of the generating units, coal storage area, cooling towers, ash ponds, substation and rail facilities will result in the total disruption of the existing vegetation throughout most of the SIBCO Site. Fugitive dust from construction activity will impact, to a lesser degree, vegetation in the vicinity of the plant site.

Wildlife - SHERCO - Little or no existing wildlife will be displaced by the proposed construction of units 3 and 4. Wildlife habitat in the area of construction was destroyed by clearing and grading for units 1 and 2. Fugitive dust, noise, and construction activity are likely to diminish wildlife populations around the construction area, but when construction is completed, animal populations in these areas will return to their normal levels.

Wildlife - SIBCO - Existing wildlife habitat in the immediate area of plant construction will be destroyed. Fugitive dust, noise and construction activity will reduce wildlife populations around the construction site, but once construction is completed, wildlife populations in these areas should return to their normal level.

Aquatic Life - SHERCO - A minimal impact on aquatic environment is expected to result from construction of units 3 and 4. Since no new intake facilities will be constructed on the Mississippi, the only conceivable construction impact would be increased sediment load of construction site runoff or possible accidents (i.e. oil and gas spills). Neither of these is expected to occur.

Aquatic Life - SIBCO - Construction of the water intake structure and railroad trestle will increase the sediment load on the Minnesota River. This has the potential to harm those organisms for which the existing sediment load of the river is at the maximum level tolerable by those organisms. Actual tolerance levels have not been determined.

Climate - SHERCO - Construction at the SHERCO Site will not affect the climate of the region.

Climate - SIBCO - Construction at the SIBCO Site will not affect the climate of the region.

Surface Water - SHERCO - Since the SHERCO units 3 and 4 will use the existing water intake, no additional water intake construction will be necessary, and therefore, there will be no impacts connected with that operation. Grease and oil leaked to the ground from construction equipment may find its way to the river, but in such small quantities that it should not present a serious problem. Since soil drainage is extreme at the site, erosion, turbidity, and siltation by runoff water is not expected to be a problem.

Surface Water - SIBCO - Construction of the river water intake will result in increased turbidity near the construction. This will be due to the installation of sheet piling, and possible from the excavation for the intake structure behind the piling. Turbidity will also be increased by the construction of the foundation for the railroad trestle required for this site. An oil slick may develop to some degree surrounding any barged equipment used in the construction of the railroad trestle. Soil drainage at the site is very poor, so almost all runoff water is discharged to the Minnesota River or to Silver Lake. Once the area is graded, a significant rise in the turbidity of the runoff water can be expected.

Subsurface Water - SHERCO - There will be no effects upon ground water during construction procedures. Significant amounts of ground water are not expected to be used. The only possible effect upon ground water may be caused by excessive discharges of oil and grease, or toxic materials to the sandy soil of the site. In this case, some of the materials may be carried through the soil to the water table, but this occurrence is highly unlikely.

Subsurface Water - SIBCO - There will be no effects upon ground water during construction procedures. The first significant occurrence of ground water is in the bedrock, 400 feet below the surface. The bedrock is covered by 400 feet of impervious material, which will prevent any contamination of the ground water. Any uses of ground water from the bedrock are expected to be insignificant compared to the ground water potential.

Air Quality - SHERCO - Major considerations for impacts on air quality during construction are dust, noise, and exhaust emissions. Dust may be entrained by wind when the soil is dry. Construction equipment and activities will generate noise, but the increase in the noise level should not be large

beyond the boundaries of the site. Construction equipment will contribute exhaust emissions, but well maintained and tuned equipment will minimize these. They should not be a major impact.

With the possible exception of the stack, the construction should not be visible from the river. Since units 3 and 4 will use the same intake as units 1 and 2, there should be no additional construction along the river. Construction is visible for several miles on the plain above the river.

Air Quality - SIBCO - Dust may be entrained by wind when the soil is dry. Noise and exhaust emissions will be similar to those at SHERCO.

The construction of the plant itself is removed from the river bluff, and with the exception of the stack, should not be visible from the Minnesota River. It will be visible from much of the surrounding area on the bluff. The river water intake and the railroad bridge, however, will contribute major visual aesthetic impacts to the Minnesota River during construction.

Soils and Geology - SHERCO - Grading the site will remove the topsoil from that portion of the site that is graded. Since soil fertility is low, and the area is zoned heavy industrial, this does not represent a major impact. Construction equipment and activities may compact the loose sand near the surface. This may reduce the permeability of the sand, but the resultant permeability will still be more than adequate to insure proper drainage of the site. Compaction of the sand may also result in more favorable foundation conditions.

The geology will be completely unaffected by the construction of the plant.

Soils and Geology - SIBCO - Grading the site will remove the topsoil. Since this area has a highly fertile soil, and is currently committed to agricultural land uses, this is viewed as a major impact. Since the soil is a clay, with a high percentage of montmorillonite, compaction by construction activities is not a major impact. The degree of compaction will be determined by the water content of the soil, and the soil is subject to a considerable shrink-swell range due to the montmorillonite.

The geology will be completely unaffected by the construction of the plant.

Operation

Land Use - SHERCO - Operation of the plant at SHERCO will not result in impacts to land use other than those described under construction.

Land Use - SIBCO - Operation of the plant at SIBCO will not result in impacts to land use other than those described under construction.

Vegetation - SHERCO - Because the emissions of particulates, sulfur dioxide, and nitrogen oxides will meet MPCA standards, the operational impact on vegetation should be negligible.

Vegetation - SIBCO - Because the emission of particulates, sulfur dioxide, and nitrogen oxides will meet MPCA standards, the operational impact on vegetation should be negligible.

Wildlife - SHERCO - Because the emission of particulates, sulfur dioxide, and nitrogen oxides will meet MPCA standards, the operational impact on wildlife should be negligible.

Wildlife - SIBCO - Because the emission of particulates, sulfur dioxide, and nitrogen oxides will meet MPCA standards, the operational impact on wildlife should be negligible.

Aquatic Life - SHERCO - There may be some impact to aquatic life in the zone of mixing of the discharge, but this zone will be small compared to the river in the vicinity of the discharge. Some organisms may be impinged or entrained on the intake structure. These impacts should be minor.

Aquatic Life - SIBCO - There may be some impact to aquatic life in the zone of mixing of the discharge, but this zone will be small compared to the river in the vicinity of the discharge. Some organisms may be impinged or entrained on the intake structure. These impacts should be minor.

Climate - SHERCO - Detectable, though not necessarily harmful, climate changes may be experienced as far as 30 miles from the plant under special meteorological conditions. Oxides of nitrogen have great significance in the production of photo-chemical smog. Sulfur dioxide enhances the formation of visibility-reducing aerosols. Sulfur dioxide can also increase the acidity of rain. Both of these compounds will be products of plant operation. Systems are planned which will reduce the amounts of these compounds to below the levels permitted by air quality standards, but there will still be an increase in the ambient levels of concentration of these compounds.

Large quantities of water vapor injected into the air by cooling towers may contribute to the cloud formation process and form fog at ground level. The cooling towers at SHERCO are being designed to minimize this effect. However, because of the proximity of major transportation corridors, induced fog which reaches these major transportation corridors (especially highways) is considered to be an impact.

Air temperature will not be significantly affected by plant operation. Heat will be released to the atmosphere by the cooling towers, but this amount of heat will be insignificant compared to the large heat capacities of the atmospheric air masses involved.

Climate - SIBCO - Climatic effects at SIBCO will be much the same as at SHERCO. Sulfur dioxide and nitrogen oxides will contribute to photo-chemical smog, visibility-reducing aerosols, and acid rain.

Since the SIBCO plant site is fairly distant from major transportation corridors, cooling tower induced fog is not expected to be a major impact.

Surface Water - SHERCO - Impacts upon surface water (primarily the Mississippi River) due to plant operations will be associated with water discharges. No details are available on the composition of plant wastewater, or on the treated effluent, but in order to be licensable the effluent must meet the standards established by WPC 15. Although this effluent must meet the standards, it will almost undoubtedly result in some degradation of the current Mississippi River quality.

Mississippi River water appropriation is expected to be less than 15% of the 7-day low flow with a ten year recurrence, and less than 2% of the average flow, at maximum appropriation rates, for Units 1, 2, 3 and 4 combined. Units 3 and 4 alone will appropriate 8% of the 7-day low flow with a ten year recurrence, and approximately 1% of the average flow.

Surface Water - SIBCO - Impacts upon surface water (primarily the Minnesota River) due to plant operation will be associated with water discharges. No details are available on the composition of plant wastewater, or on the treated effluent, but in order to be licensable the effluent must meet the standards established by WPC 15.

At 89 cfs, the plant will appropriate 3 1/2% of the median flow of the Minnesota River. This number includes water to fill the storage reservoir, and is a maximum figure. At the seven day low flow of 152 cfs,

NSP proposes to operate entirely on water from the reservoir, and will appropriate 0% of the flow of the river. At 241 cfs, which is 89 cfs above the seven day low flow, an appropriation of 89 cfs will be 37% of the river flow. Again, this is a maximum figure, including water to fill the storage reservoir. Actual operation will probably require less water.

Water quality will be degraded by increases in the concentrations of sodium, sulfate, chloride, and nitrate.

Since no water will be discharged to Silver Lake or any other occurrences of surface water in the area, no effects due to plant operation are expected upon these waters.

Subsurface Water - SHERCO - Although some ground water will be used at the site, the quantity will be so small that there should not be any effects on the ground water due to pumping.

There is the possibility that an inadequate seal of the holding ponds could release plant wastewater to the ground water, degrading the quality. Proper design of these facilities should eliminate this possibility.

Subsurface Water - SIBCO - Ground water at SIBCO will be drawn from the bedrock aquifer. The amounts required for plant uses should not affect the aquifer.

The bedrock aquifers are covered by approximately 400 feet of impervious clayey till. There is little chance of any pollutant from the plant reaching the ground water.

Air Quality - SHERCO - Stack emissions consist primarily of SO_2, NO_x, and particulates. Of these, only SO_2 concentrations have been modelled. The model indicates that the maximum 3-hour average concentration from SHERCO 1, 2, 3 and 4 will be 650 $\mu g/m^3$ at 1 to 1.3 km from the plant, and the maximum 24 hour average will be 210 $\mu g/m^3$ at 4 to 6 km from the plant. The peak annual average concentration is expected to be 2.26 $\mu g/m^3$ at 18 km southeast and 25 km north of the plant.

Noise generated by plant operation will probably be perceptible in some areas beyond the site boundaries. Rough estimates suggest an L_{50} of 60-65 dBA at 1600 feet from the plant, and an L_{50} of 50-55 dBA at approximately one mile from the plant. Noise generated by unit trains will raise these values periodically.

Air Quality - SIBCO - The maximum 24 hour average for SO_2 concentrations from the SIBCO plant is expected to be 135 $\mu g/m^3$ at 4 to 6 km. from the plant. The 3-hour average is expected to be 420 $\mu g/m^3$ at 1 to 1.3 km from the plant. The peak annual SO_2 concentration at SIBCO, including that contributed by SHERCO units 1 and 2, is expected to be 1.99 $\mu g/m^3$ at 18 km southeast and 25 km north of the plant.

Soils and Geology - SHERCO - Vibrations from heavy industrial complexes have been known to cause differential compaction of soils underlying the structure, resulting in structural damage. Proper foundation analysis and design will eliminate the possibility of the occurrence of this problem.

Plant operation will have no effect on the geology of the area.

Soils and Geology - SIBCO - Vibrations from heavy industrial complexes have been known to cause differential compaction of soils underlying the structure, resulting in structural damage. Proper foundation analysis and design will eliminate the possibility of the occurrence of this problem.

Plant operation will have no effect on the geology of the area.

CULTURAL ENVIRONMENT

Population Characteristics

SHERCO - According to population projections, total population in the SHERCO Area counties is expected to increase between 1970 and 2000 by a range of 42% (Benton) to 147% (Sherburne). This increase is predicted in both rural and urban sectors. A determination of the precise effect a development of an expanded NSP facility at Becker would have on this trend is not possible. It could be assumed that such action would generally contribute to area population growth.

Very minimal contact with area personnel and residents suggests that there has been no significant impact upon the social fabric of the SHERCO PIA relative to current NSP operations at Becker. It has been suggested that NSP officials have provided area residents with adequate advance information regarding corporate planning, have assisted local communities (Becker) in municipal planning and have generally attempted to integrate NSP into the Becker community. The settlement pattern of NSP employees in the area has been considered to be gradual and dispersed and thus could not, at this time, be assessed as an intrusion or a disruptive factor in area life. Area residents also suggest that the goals of NSP are compatible with long-range economic goals of surrounding communities, at least within Sherburne County.

Some observations, based on secondary data analysis and results of minimal primary research in the SIBCO PIA as presented in a Draft Environmental Impact Statement prepared for the Minnesota Pollution Control Agency, 1974 can be made. The major portion of the SIBCO PIA is located in Sibley County which by U.S. Commerce Department definition is entirely rural. Most recent population projections indicate a 3% increase in population in Sibley County between 1970 and 2000. Development of a power plant at SIBCO may increase this slight growth by encouraging the development of other industry in the county.

Many rural residents in the Jessenland Township area own and operate farms which have been held by their families for three generations. For many, land is an investment in heritage as well as agricultural product. An urban/rural, industrial/agricultural split appears to exist in attitudes towards significant change in the area. Development of a power plant facility on agricultural land would most probably have a significant impact on that split as well as on neighborhood cohesion currently manifested among residents of Jessenland Township.

Housing

SHERCO - According to the Sherburne County zoning administration, the sudden spurt in area construction between 1972 and 1974 was not specifically conditioned by the siting of a power plant at Becker. This spurt has declined as evidenced by the number of residential permits issued in 1974. One hundred sixty-three permits were issued in Big Lake Township in 1972, for instance, versus 32 in 1974.

Two homes were built in Becker Township in 1971, seventy-four in 1972 (including 8 apartments) and ten in 1974.

Officials do not anticipate much plant-related housing development as a result of proposed site expansion. It is estimated that a number of permanent NSP employees have purchased or built homes in the area in the last 24 months. Settlement has been dispersed among the communities of Monticello, Big Lake, East St. Cloud and rural Sherburne and Wright Counties. Some development has taken place north of Becker Village (6 homes). It is suggested that this area is preferred to an undeveloped tract of approximately seven miles just east of the village because it is more wooded.

In the long-run, it is anticipated that housing developments will be forthcoming in the Becker area as a response to the current tax structure. Officials note that a home valued at $30,000 in Big Lake provides $1,100 in annual taxes. A home of the same value in Becker is currently taxed at $30 per year.

Since there are no rental units available in Becker Village, it is suggested that employees not wishing to build homes would locate at Monticello, Big Lake or Eastern St. Cloud. The impact on housing in this area is expected to be minimal and dispersed.

Transient housing available in the area include several thousand seasonal homes in the SHERCO PIA. There are 6 motels in the area at Elk River and St. Cloud and several boarding houses.

SIBCO - There has been relatively little housing construction in the SIBCO PUA in recent years with little planned as of 1974. More activity appears apparent in the SUA especially in Norwood/Young America. As of 1974, capacity in the SIBCO PUA was not sufficient to meet housing demand in those communities. The general vacancy rate there in 1970 was 2.7%.

As of 1974, there were two homes for sale in Arlington and three for sale in Henderson. Average home value in Henderson was $7,000. There were also 3 apartments available for rent in Henderson. Monthly rentals averaged $100. Mobile home courts are located at Belle Plaine and Jordan.

It is noted that some 80 construction workers rented rooms in private homes in Henderson a few years ago during construction of a highway project near that city. Officials at Arlington suggest that several families there would rent rooms to transient construction workers. A home in that city was converted into an 11 room boarding house in 1974.

Transient housing may be available elsewhere in the area given a new interest in apartment dwelling. There are a large number of single person occupied units (100 in Arlington City) and an increasing number of vacant farm homes due to agricultural land consolidation.

There are few hotel/motel accommodations in the area and they are well patronized.

Arlington	8 motel rooms
Belle Plaine	6 hotel/11 motel rooms
Green Isle	No commercial transient rooms
Gaylord	40 hotel/motel rooms
Glencoe	36 hotel/motel rooms
Le Sueur	One motel with 13 rooms

New multiple housing units have recently been built in Le Sueur where the transfer of personnel to Green Giant headquarters at Jonathan has left some vacant homes.

It is not expected that construction and operation of a plant at Jessenland Township would have a major impact on the SIBCO PIA housing market as the site is situated within easy commuting distance from the Twin Cities and Mankato metropolitan areas.

Any settlement in the area would probably be dispersed in communities within ten miles of the proposed alternate plant site. As there are few homes for rent or sale in these communities, new housing developments would be likely to occur, probably in river townships in eastern Sibley County. Such development could alter current agricultural land use in those areas.

Educational and School Facilities

SHERCO - It has been determined that an approximate total of 2,426 students could be accomodated in 8 public schools throughout the SHERCO PIA and SUA barring unforeseen expansion of current plans.

A reference to Table 15 will show that each of the schools concerned is either in the process of completing expansion or requesting funds for same. The one exception is Clearview School at Clear Lake.

Any impact upon public school facilities induced by an increase in area population relative to plant expansion and operation at Becker will be felt within the SHERCO PIA and possibly eastern St. Cloud. The Monticello school system will likely receive the brunt of this impact.

Of the 1,104 spaces currently available in this area (including St. Cloud), 454 (41%) are located at Monticello primarily at the high school level. This does not preclude the possibility of meeting additional demand at the elementary school level should it exceed demand for high school space.

School officials at Monticello note that inquiries have been made by residents now living in suburban areas of the Twin Cities relative to securing space for their children in the near future. These residents have identified themselves as NSP employees anticipating relocation in the Becker area. Increased enrollments in the last 18 months have reflected the movement of NSP employees into the district.

Space is available at the Becker School (345 places), but officials note that construction activities at the current NSP facility there have not been reflected in increased enrollments.

School officials at Elk River, Buffalo, and St. Michael/Albertville claim that increases in enrollments there reflect a widening of service areas to include portions of the Twin Cities and not portions of the SHERCO PIA.

In general, school officials anticipate no significant NSP-related increases in enrollment which would affect area schools in the next three to four years.

A possible long-range exception might be Becker School. Should the current area-wide tax structure remain constant, zoning officials are anticipating a housing boom in the Becker School district within the next five years which may require additional expansion of the Becker School.

SIBCO - Current public school facilities in the SIBCO PIA and SUA communities are operating at nearly full capacity as of 1974 (95.4%) with no major plans for expansion.

Excess capacity is available at schools in Henderson and Jordan. Elementary school facilities at Arlington are overtaxed presently and will continue to operate in this fashion for the immediate future.

A major increase in student-age population in the SIBCO PIA would create a burden for area schools. In the short-run, a minor or gradual increase in this population could be accommodated especially at Henderson, Gaylord and Jordan.

Employment and Income

SHERCO - Expansion of a power plant at Becker, Minnesota will not directly affect employment in the SHERCO PIA in the short-run.

Currently, there are approximately 1,300 persons working at the site in construction related activities. It is anticipated that replacement of current construction crew personnel would be minimal as the lag time between completion of units one and two and initiation of work on proposed units three and four would be a matter of only a few months.

The construction 'boom' phenomena of traveling construction crews is not applicable in the case of NSP power plant construction. The majority of current construction employees are permanent residents of the region surrounding the work site and many would be available for work on proposed units three and four at Becker.

While employment may rise some in the area, most likely the total will not be more than 75-150 workers. Most of the workers will commute from the Twin Cities or live in rented housing during their work week and go home for rest periods. Any out-of-state workers will live in rented housing of which there is currently little in the PIA.

Approximately 200 permanent plant employees are scheduled to operate completed units three and four. The majority of these operators are currently participating in training programs relative to these positions. It is not anticipated that the balance of personnel will be recruited from within the SHERCO PIA.

Adequate figures are not currently available regarding experienced unemployed specialized technical construction personnel in the SHERCO PIA. It is suggested that NSP construction crews are currently lacking personnel in certain specialized skills (e.g. pipe fitters, electricians). The impact of this need upon the current unemployed labor supply is not known at this time.

If the Becker experience in recent months can be accepted as a realistic indication of the effects of power plant construction on local employment, there should be no major impacts on this area as a result of plant expansion.

Although it is not known how many current NSP employees at Becker were former area residents, it is known that no direct increase in commercial activities and concomitant hiring in Becker evolved out of plant stimulated demand.

The income of the area will increase somewhat due to spending on rent, food and recreation. However, this will probably be less than 25-30% of total take-home pay. In 1974 dollars and wage scales, each worker will receive an average of $9.00 per hour. This is a monthly total of $1,560. Over the period of construction the number of workers will average about 700. Those who commute from the Twin Cities will take virtually all their pay home. The local construction workers (an average between 50 and 75 people), will spend their money within the region. Those from out-of-state will spend their money on rent, food and recreation and send the rest home. There are no county income estimates available to determine

what effect this income will have in proportion to total four county area income. No long-term increase in employment due to construction can be predicted.

The permanent staff of the expanded plant is expected to be drawn, for the most part, from outside of the PIA. In 1974 dollars and wage scales these people will each earn an average of $1,040 per month. Virtually all this income is kept in the area but little incremental income can be envisioned due to the addition.

Little can be said about the purchasing of raw materials for plant construction. Because of this little can be said of the effects of this on the area economy.

The tax revenue from the plant will have the net effect of raising personal income by lowering the local tax rate.

SIBCO - While construction employment of local workers may rise somewhat in the area the total will be no more than 100-200 people. Many of these will commute as much as fifty miles one way per day. The largest portion of workers will come with general or subcontractors with the large gaps being filled by unions in the Twin City area.

Between one-third and one-half of plant employment will be local with the more professional and trained staff coming from other NSP plants. These 100 maximum jobs will be obtained through normal growth in the area work force.

While the income of the area will grow somewhat due to construction workers spending, this will probably amount to less than 25-30 percent take-home pay. This money will be spent for rent in temporary housing in the area, food and other trade and recreation. Figuring in 1974 dollars and yearly wages, each worker averages $9.00 per hour. On that basis, total monthly pay would be $1,560.00. Those in the area who obtain jobs at the plant for short periods of time will spend their income in the local area. Those who commute from the Twin Cities will take it home with them, those from out-of-state will spend a portion of their income on rent and recreation and send the balance home. The overall impact will be an increased income in the area but no long-term employment increases due to this income.

The permanent staff will average $6.00 per hour in 1974 dollars and wage scales or $1,040 per month. Virtually all of this income will be kept in the four county area but will have only small marginal growth effects on the local economy.

Little is known about the purchasing of raw materials for the plant construction. Because of this little can be said about the effect of the money in the area.

The tax revenue from the plant will have the net effect of raising the personal income in the area by lowering the tax rate.

It has been suggested that the presence of a facility at SIBCO would be reflected in the reduction of the local tax mill rate, and thus in the rise in real income of Sibley County residents. This is not to say that the poverty experienced by many persons in the area will be significantly reduced. The presence of a sophisticated plant facility and a relatively well paid work force may in fact induce a cultural phenomenon of poverty which presently is not seen as an important aspect of social relationships in the area. If that inducement is thus forthcoming, one might expect to see an increase in the demand for social services in the area.

Taxes - SHERCO

The introduction of a major facility (e.g. power plant) into an area will put demands on the area's various units of government in the following ways:

1. Municipal services demanded by the major facility itself.
2. Municipal services demanded by any new commercial or industrial growth in the area in response to or supported by the major facility.
3. Municipal and educational services (schools) demanded by employees of the major facility and their families.

Conversely, the major facility will lend support to the various units of government through:

1. Property tax paid on the facility itself.
2. Property tax paid by related commercial and industrial growth.
3. Property tax, fees and fines paid by the facility's employees and their families.
4. Increased state aids to the localities, as induced by the increased school enrollments resulting from the facility's employee families.

Until the actual assessed value of the NSP plant is known, it is impossible to attach dollar estimates to a cost/revenue analysis of its fiscal impact. Generally speaking, however, the municipality or school district within which the plant will reside can anticipate a net revenue as a result of the plant's presence. The statement has been made in this report that the development of the plant may entail some infrastructural outlays on the part of area units of government. Tax revenues generated by the plant can be expected to cover those expenses in the municipality or school district in which it will reside. The impact on neighboring units of government will depend upon settlement patterns of NSP employee families and upon the location of any horizontally or vertically related commercial or industrial development spun-off by the new facility.

The Becker area has experienced dispersed and gradual settlement patterns by NSP employees. Very little commercial/industrial spin-off is evident. Infrastructural facilities in the area have, for the most part, been assessed as capable of accomodating mild growth. Generally speaking, therefore, the projected tax impact on units of government within both areas will range from negligible to favorable.

Taxes - SIBCO

The introduction of a major facility (e.g. power plant) into an area will put demands on the area's various units of government in the following ways:

1. Municipal services demanded by the major facility itself.
2. Municipal services demanded by any new commercial or industrial growth in the area in response to or supported by the major facility.
3. Municipal and educational services (schools) demanded by employees of the major facility and their families.

Conversely, the major facility will lend support to the various units of government through:

1. Property tax paid on the facility itself.
2. Property tax paid by related commercial and industrial growth.
3. Property tax, fees and fines paid by the facility's employees and their families.
4. Increased state aids to the localities, as induced by the increased school enrollments resulting from the facility's employee families.

Until the actual assessed value of the NSP plant is known, it is impossible to attach dollar estimates to a cost/revenue analysis of its fiscal impact. Generally speaking, however, the municipality or school district within which the plant will reside can anticipate a net revenue as a result of the plant's presence. The statement has been made in this report that the development of the plant may entail some infrastructural outlays on the part of area units of government. Tax revenues generated by the plant can be expected to cover those expenses in the municipality or school district in which it will reside. The impact on neighboring units of government will depend upon settlement patterns of NSP employee families and upon the location of any horizontally or vertically related commercial or industrial development spun-off by the new facility.

If the settlement pattern at Becker, noted above, occurs at SIBCO tax impacts are expected to range from negligible to favorable on the various units of local government in the impact area.

Transportation

SHERCO - Current highway systems are adequate to meet the needs of current and proposed plant operations. U.S. Highway 10 and 52 which spans the SHERCO PIA is a major roadway in the Minnesota highway system north of the Twin City Metropolitan Area and need not be altered to serve future plant needs. Access roads (County Road 52 and County State Aid Highway 8) have been upgraded to meet needs of heavy construction related traffic. County State Aid Highways 23 and 4 south and east of the Village of Becker provide adequate diversions of construction traffic away from village streets. Some congestion does occur at the junction of U.S. 10 and 52 and County State Aid Highway 8 at peak traffic hours. Neither the County Sheriff's office nor the Minnesota Highway Department consider this congestion merits special patrolling or alterations of roadways or delineation techniques now in service. Primary traffic-related negative impacts created by current construction activities at the NSP facility in recent months have been related to noise and traffic diversion on U.S. Highway 10 and 52 and community complaints regarding speeding violations on County State Aid Highway 8.

Rail service to the plant will be via Burlington Northern. A BN spokesman has described the trackage serving the area as excellent. There is local concern in St. Cloud that the increased rail traffic through the city will create congestion at street crossings. Also of concern is the blockage of crossings at Becker when unit trains stop to throw a manual switch to enter the plant. BN has indicated that if there is a problem at Becker, it might be possible to utilize an underpass, overpass, or automatic switch to reduce or eliminate the time that the crossing is blocked. The problem of increased congestion in St. Cloud has not been directly addressed at this time.

SIBCO - Approximately 5.75 miles of county and township roads will be eliminated as a result of this project. This elimination will probably be conducted in the early phases of the project as land clearing and surface grading and reorganization is accomplished in order to provide for various facilities such as the coal pile, ash pits, water storage, etc., required by the project. The elimination of these roads during the construction phase of the project will result in the alteration of local north-south and east-west travel routes through the project area. The elimination of north-south County Road 19 will result in several miles of detours for those persons wishing to, or normally using those particular highways.

From a long-term point of view, the removal and realignment of certain roads as outlined in the project description within the proposed plant site will probably not have an extreme adverse effect on the population in the area for several reasons. First, the resident population which presently lives within the proposed plant site will be no longer there; therefore, the internal road system which presently serves that population will, for all practical purposes, not be necessary without that population. Second, the population which presently lives in the outer surrounding area of the plant site will continue to have a serviceable highway and road pattern which, although in some cases placing somewhat longer travel times in their path, will adequately allow residents to still get from one side of the plant site to the other without undue inconvenience.

In addition to the road system within the plant site, County Roads 5, 6 and 12 will have to undergo upgrading from their present 5-ton to approximately a 10-ton capacity. The Sibley County Highway officials have received assurances from NSP that upgrading as a result of the proposed Sibley Power Plant will be reimbursable by Northern States Power. It is expected that any highway work which would be conducted relative to the proposed Sibley County Power Plant would probably be instituted early in the construction process in order to allow construction related transportation to use the roads without resulting in damage to them. This upgrading will result in detrimental short-term impacts upon local residents and travelers as road machinery and various types of equipment are used in the upgrading process. From the long-term point of view and highway upgrading within the county could be expected to have a beneficial long-term impact for all county residents.

NSP proposes to construct approximately 4 miles of spur and loop track at SIBCO. This spur will cross the Minnesota River by means of a trestle and earthen embankment. The Minnesota River is a canoe and boating river, and thus an avoidance area for power plant and related transportation systems siting. Thus, it must be demonstrated that this route is the most environmentally sound alternative.

The alternative to the proposed route is a route from St. James to Gaylord on the west side of the Minnesota River. Within this alternative are two possible routes: St. James-Hanska-New Ulm-Gaylord, or St. James-Mankato-Cambria-New Ulm-Gaylord. Either of these routes will require substantial renovation of nearly all of this trackage and a new spur of approximately 7.5 miles from south of Arlington to the plant site. The routes would require new single track construction of various lengths, and bridges over the Minnesota River, Rush River, Buffalo Creek, High Island Creek, and other small streams depending on the route. Thus, it appears at this time that the shorter spur, lesser renovation, and only one bridge required by the proposed rail route will generate the lesser impact.

Medical Facilities

SHERCO - There appears to be ample general hospital bed capacity within the Primary and Secondary Urban Areas of the NSP site to adequately accomodate current and projected (plant stimulated) demand. As of 1973, no hospital in the area was operating at more than 80 percent occupancy for the year. Intensive and emergency care facilities are located within seven miles of the proposed site expansion.

It is not anticipated that an influx in temporary or full-time NSP employees and their families will over-tax current medical personnel efficiency. It is anticipated that the number of Monticello-Big Lake physicians will number four by July 1975. Each doctor is assisted by two paramedics. The Monticello-Big

Lake service area includes approximately 16,000 persons. Three county nurses are adequate to serve the demands of Wright County.

The Public Health Nurse maintains that public health staff and programs are well atuned to current demand and anticipated growth needs.

SIBCO - The four hospitals situated within fifteen miles of the proposed site were operating at roughly 58% total capacity in 1973. It is not anticipated that an increase in temporary or permanent employee population would effect a strain on area facilities.

General health care needs can be adequately served by current medical personnel, although the general impact region has suffered from a lack of physicians in recent years.

Specialized medical personnel (paramedics, physical therapists, technicians, etc.) are not available. Premature nursery and out patient care are limited. Emergency care is available. There are no doctors at Henderson.

VI. MEASURES TO ENHANCE THE ENVIRONMENT OR TO AVOID OR MITIGATE ADVERSE ENVIRONMENTAL EFFECTS

The impacts of discharges to the air can be mitigated by various combinations of scrubbers, precipitators, low sulfur coal, tall stacks, boiler design and appropriate combustion techniques. Either site will employ a number of these measures to ensure that the emissions meet all state and federal air quality regulations.

Dust from coal handling and storage may be reduced by the use of high-efficiency bag houses in areas of high dust generation, and by enclosing the coal conveyor system.

Wastewater which is discharged to the river should be treated to reduce the concentrations of pollutants to MPCA standards.

Impacts upon aesthetics may be mitigated by landscaping the site. Trees may be used to prevent road and river users from seeing much of the site. Only major structures, such as the stack, or the railroad bridge at SIBCO, need be obvious.

The railroad bridge at SIBCO may be designed so as to be an aesthetically pleasing piece of architecture. However, aesthetics are a matter of personal tastes and predjudices, and opinions about the subject will vary with the individual.

NSP has stated that the coal proposed for use at SHERCO has a variable sulfur content. If worst case meteorological conditions, full load operation, and consumption of coal from the high end of the sulfur content range coincide, the possibility exists that air quality standards will be violated. Segregation of coal from the low end of the sulfur content range for use during worst case periods may lessen or prevent these possible violations.

In the event that conflicts arise with downstream water users, the use of a water storage reservoir at SHERCO will help reduce the conflict. However, at this time the DNR has indicated that programs can be initiated to reduce water appropriations by downstream NSP facilities, and thus conflicts will be minimized without the use of a reservoir.

VII. ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

There are several adverse environmental impacts which cannot be avoided, although they may be reduced in severity. Each impact is presented for both SHERCO and SIBCO, so that the reader may make comparisons.

RIVER DEGRADATION

SHERCO - Although wastewater discharged to the Mississippi River from a plant at SHERCO can be treated to meet MPCA standards, the quality of the effluent will still be poorer than that of the river. This will result in a degradation of river quality in the area of discharge.

SIBCO - For most constituents, wastewater can be treated to a higher quality than the Minnesota River. Sodium, sulfate, chlorine, and nitrate, however, will be present in the effluent in higher concentrations than in the river.

AIR DEGRADATION

SHERCO - Although the stack emissions may meet MPCA air quality standards, they will still result in an increase of the ambient concentrations of particulates, SO_2, NO_x, and other constituents of the flue gas.

SIBCO - Although the stack emissions may meet MPCA air quality standards, they will still result in an increase of the ambient concentrations of particulates, SO_2, NO_x, and other constituents of the flue gas.

COAL DUST

SHERCO - Since a coal storage pile will already be in operation for units 1 and 2 at the time that units 3 and 4 become operational, any additional coal dust due to the increased amount of coal required for all four units will be an incremental impact. Since a greater number of unit trains will be required for four units as for two, any dust generated by the trains would increase, and also provide an incremental impact.

SIBCO - Dust generated by coal storage and handling at SIBCO will produce an impact. Dust generated by the unit trains will also produce an impact.

TRAIN NOISE

SHERCO - The 1.6 unit trains per day required by units 3 and 4 will produce a noise impact along the train route.

SIBCO - The 1.6 unit trains per day required by units 1 and 2 will produce a noise impact along the train route.

POPULATION DISRUPTION

SHERCO - No significant population disruption is expected at SHERCO.

SIBCO - 61 persons (13%) of the current population of Jessenland Township would be relocated.

In the short-term, such action will create inconvenience to these residents as well as effectively destroy the population base of a longstanding Minnesota community. In the particular case of Jessenland Township, population disruption will be more than a quantitative change. The community of Jessenland Township is somewhat distinct from that of other, even contiguous communities in that is appreciates itself and is appreciated by area residents as a distinct social group within the region. Social relationships within the township demonstrate a cohesiveness which cannot be explained as merely a phenomenon of isolated, rural communities. This cohesion is based on ethnic heritage and stable historical roots.

TRANSPORTATION

SHERCO - Short-term unavoidable impacts at the SHERCO Site may include inconvenience to area residents and travelers created by transportation of construction materials.

SIBCO - Short-term unavoidable impacts at the SIBCO Site may include inconvenience to area residents and travelers created by transportation of construction materials. Additional short-term impacts will result from the construction of access roads and county road diversions. Noise, dust and detours resulting from these operations will create unavoidable temporary adverse impacts.

Construction of a proposed bridge spanning the Minnesota River will create an aesthetic impact.

VIII. SITE SELECTION CRITERIA

The purpose of this section is to address the charges of Minn. Reg. of MEQC 74 (c), "Criteria for LEPGP Siting". The basis for this evaluation is the data and conclusions of the preceeding sections.

Minn. Reg. MEQC 74 (c) is divided into three parts: Exclusion Criteria; LEPGP Avoidance Areas; and Site Selection Criteria. Each of these is further divided into several subparts. Each of these will be addressed below.

EXCLUSION CRITERIA

> *(aa) No LEPGP shall be sited in violation of any federal or state law or regulation. No area shall be considered in which a LEPGP is not licensable by all appropriate state and federal government agencies.*

SHERCO - The Minnesota Pollution Control Agency has stated that the site appears to be licensable, but that more detailed descriptions of the effluent from the plant are required before a final, definitive decision can be reached. These details will be presented during the permitting process.

The Minnesota Department of Natural Resources has stated that the site appears licensable if a program can be put into effect to reduce water appropriations at NSP plants along the Mississippi between SHERCO and Pigs Eye during periods of low flow. The water "saved" by this program would be available for appropriation by SHERCO. This program is one example of a possible solution to the water appropriation problem. Many other alternatives will have to be evaluated during the permitting process.

SIBCO - The Minnesota Pollution Control Agency has stated that the site appears to be licensable, but that more detailed descriptions of the effluent from the plant are required before a final, definitive decision can be reached. These details will be presented during the permitting process.

The Minnesota Department of Natural Resources has stated that the site appears licensable if a program can be put into effect to reduce water appropriations at NSP plants along the Mississippi between SHERCO and Pigs Eye during periods of low flow. The water "saved" by this program would be available for appropriation by SIBCO.

This program is one example of a possible solution to the water appropriation problem. Many other alternatives will have to be evaluated during the permitting process.

> *(bb) The following land areas shall be excluded: national parks; national historic sites and landmarks; national historic districts; national monuments; national wilderness areas; national wildlife refuges; nation, wild, scenic, and recreational riverways; state wild, scenic, and recreational rivers and their land use districts; state parks; Nature Donservancy preserves; state scientific and natural areas; state wilderness areas; and any area designated a LEPGP exclusion area by the Council.*

SHERCO - The plant site is not located in any prohibited areas.

SIBCO - The plant site is not located in any prohibited areas.

(cc) No area shall be considered which does not have resonable access to a proven water supply sufficient for plant operation. No use of ground water shall be permitted where mining of ground water resources will result. "Mining" as used herein shall mean the removal of ground water that results in material adverse effects on ground water in and adjacent to the area, as determined in each case.

SHERCO - The Mississippi River serves as the major water supply for the SHERCO Site. Maximum plant appropriation for all four units will be less than 15% of the seven day low flow with a ten year recurrence, and less than 2% of the average flow. More than adequate ground water is available for domestic uses.

SIBCO - The Minnesota River serves as the major water source for the SIBCO Site. A water storage pond is planned to provide adequate water during those periods when the Minnesota River flow is very low. A capacity of approximately 22,000 acre-feet will provide for plant operation through an 18-month drought. When river flow is high, the storage pond will be refilled with river water. More than adequate ground water is available from the bedrock for domestic uses.

(dd) No water shall be transferred between the four major drainage basins within the state: that is, the Missouri River drainage basin, the Mississippi River drainage basin, the Lake Superior drainage basin, and the Red-Rainy River drainage basin.

SHERCO - No water is transferred between any major drainage basins.

SIBCO - No water is transferred between any major drainage basins.

(ee) Water intake structures and water pipelines shall not necessarily be prohibited from land areas excluded for power plant sites.

SHERCO - No additional water intake structures are required.

SIBCO - Water intake structures and pipelines are not located in any exclusion areas.

LEPGP AVOIDANCE AREAS

(aa) In addition to exclusion areas, the following land use areas shall not be approved to LEPGP sites when feasible and prudent alternatives with lesser adverse human and environmental effects exist. Economical consideration alone shall not justify approval of avoidance areas. Any approval of usch areas shall include all possible planning to minimize harm to these areas. LEPGP avoidance areas are: state registered historic sites; state historic districts; state wildlife management areas (escept in cases where the plant cooling water is to be used for wildlife management purposes); county parks; metropolitan parks; designated state and federal recreation trails; designated trout streams; and rivers identified in Minn. Stat. §85.32, subs. 1 (1971); and any other area designated a LEPGP avoidance area by the Council.

SHERCO - The site does not lie in any of the above areas.

SIBCO - The site does not lie in any of the above areas.

(bb) LEPGP avoidance areas also apply to new transportation access routes and storage facilities associated with the plant in addition to the plant itself. Water intake structures and water pipelines shall not necessarily be prohibited from LEPGP avoidance areas.

SHERCO - No additional water intake structures or new transportation access routes are required.

SIBCO - The storage facilities do not lie in any avoidance areas. The proposed trestle over the Minnesota River, however, does lie in an avoidance area. At this time the proposed rail route appears to involve lesser environmental impact than the alternative route west of the Minnesota River, but a detailed study should be performed to document this conclusion. A water intake structure is required on the Minnesota River.

> (*cc*) *No transfer of water between sub-basins within each of the four drainage basins shall be permitted except where it can be clearly demonstrated that the transfer will not have an adverse effect on water supplies or water quality in the areas involved.*

SHERCO - No water will be transferred between any sub-basins.

SIBCO - No water will be transferred between any sub-basins.

> (*dd*) *The use of ground water for high consumption purposes, such as cooling, shall be avoided if feasible and prudent surface water alternatives less harmful to the environment exist. Ground water used to supplement available surface water shall be permitted if the cumulative impact minimizes environmental harm.*

SHERCO - The DNR has indicated that with the initiation of programs to reduce appropriations at downstream NSP facilities, adequate surface water will be available from the Mississippi River. Ground water usage will be minimal.

SIBCO - The DNR has indicated that with the initiation of programs to reduce appropriations at downstream NSP facilities, the combination of the Minnesota River and the proposed storage reservoir will provide an adequate supply of surface water. Ground water uses will be minimal.

SITE SELECTION CRITERIA

> (*aa*) *Preferred sites require minimum population displacement and disruption of local communities and institutions.*

SHERCO - In as much as location of the facility on the SHERCO site would take the form of an expansion of an existing plant, as opposed to the development of a new operation, a number of initial social and cultural problems would not be attendent (these initial problems having been confronted and dealt with at the time of primary development of the site). Expansion of the facility would result in no further population displacements. In fact, informal contacts will area residents and officials have suggested that expansion is compatible with the long-range economic goals of the area. Infrastructure, medical and educational facilities all appear to be sufficient to handle projected increased demands as a result of expansion.

Although an influx of a number of people would occur in response to permanent operation of the facility (employees plus their families), the settlement pattern of NSP employees to date in the area has been considered gradual and dispersed, and thus could not be assessed as a disruptive factor in area life.

SIBCO - Medical, educational and infrastructural facilities in the SIBCO impact area all appear capable of supporting projected increased demands as a result of power plant construction and operation. The Sibley County Commissioners have gone on record favoring development of the facility in their area.

A total of 61 persons or 13% of the Jessenland Township population would be displaced by the proposed power plant. In an NBI attitudinal survey of the impact area, 25 people said that they would leave the area if displaced. Most local farmers responding to the survey stated that, if displaced, they would buy another farm in the area and continue farming. As the local county agent pointed out, however, the farmers requiring land would greatly exceed the amount of land available to them in the local area. As a result, they would be forced either to leave the area to farm, or retire from farming. In either case, a disruption would occur in the area's long tenure, family farm system.

An influx of a number of people would occur in response to permanent operation of the facility (employees plus their families). Although the majority of these people will likely settle in surrounding urban areas. (LeSueur, Twin Cities) a percent can be expected to prefer a residence in the primary impact area. If housing patterns were to evolve in a manner similar to those experienced in the Becker area, the three river townships in eastern Sibley County would be greatly altered in character.

The cumulative effect of this projected out-migration of traditional area residents, coupled with an in-migration of NSP employees and their families could be a disequilibrum in social relationships in the area. These relationships are currently the strongest characteristic in township culture. Included herein is the tradition of the speaking of German in the area. With the dispersion of the elderly farmers and the demise of the long tenure, family owned farm, this tradition will in all likelihood die.

(*bb*) *Preferred sites minimize adverse health effects on human population.*

Concentrations of SO_2, particulates, and NO_x at which adverse health effects are first observed are presented in Table 51. This table also shows the air quality standards, and the maximum concentrations of the pollutants from SHERCO and SIBCO. It should be noted that the air quality standards are established to be protective for health, and that in each case there is a substantial margin between the concentrations which are the standards and the concentrations at which adverse health effects are first observed.

SHERCO - Maximum concentrations of SO_2, as calculated by NSP's model (which the MPCA currently accepts as valid) do not exceed any of the standards, although the maximum 3-hour average approaches the standard (within 5 $\mu g/m^3$). The maximum annual average concentration is less than 4% of the standard. The facts that SHERCO will not violate the standards, and that the concentrations at which adverse health effects are noticed are substantially higher than the standards, indicates that there will be no adverse health affects caused by SO_2 due to SHERCO. This indication is further strengthened by the fact that the figures for SHERCO are maximum concentrations, calculated for plant operation at 100% capacity. Over the life of the plant, it is anticipated to operate at an average of about 70% capacity. This means that much of the time emissions will be lower than the concentrations presented in Table 51.

Figures for the concentrations of particulates and NO_x have not been presented by NSP. However, it is generally accepted that SO_2 standards are the most stringent, and that the ability to meet the SO_2

TABLE 51

CONCENTRATIONS OF STACK EMISSIONS
AT WHICH ADVERSE HEALTH EFFECTS ARE OBSERVED

Pollutant	Adverse Health Effects Observed At These Concentrations	Air Quality Standard, Protective for Health	Maximum Concentrations Due to SHERCO	Maximum Concentrations Due to SIBCO
Sulfur Dioxide	115 $\mu g/m^3$, annual mean 300 $\mu g/m^3$, 24 hr. Ave. for 3-4 days	60 $\mu g/m^3$ annual Ave. 260 $\mu g/m^3$ 24-hr. Ave. 655 $\mu g/m^3$ 3-hr. Ave.	2.6 $\mu g/m^3$, annual Ave. (SHERCO 1, 2, 3 & 4) 210 $\mu g/m^3$, 24-hr. Ave. (SHERCO 1, 2, 3 & 4) 650 $\mu g/m^3$, 3-hr. Ave. (SHERCO 1, 2, 3 & 4)	1.99 $\mu g/m^3$, annual Ave. (SIBCO 1 & 2, SHERCO 1 & 2) 135 $\mu g/m^3$, 24-hr. Ave. (SIBCO 1 & 2 only) 420 $\mu g/m^3$, 3-hr. Ave. (SIBCO 1 & 2 only)
Particulates	80 $\mu g/m^3$, annual mean	60 $\mu g/m^3$ annual Ave. 150 $\mu g/m^3$, 24-hr. Ave.	Unknown (see text)	Unknown (see text)
NO_x	118-156 $\mu g/m^3$, 24 hr. mea mean over 6 months, associated with a 24-hr. maximum of 284 $\mu g/m^3$ 117-205 $\mu g/m^3$, 24-hr. mean over 6 months with mean suspended nitrate level of 3.8 $\mu g/m^3$ or more	100 $\mu g/m^3$ annual Ave.	Unknown (see text)	Unknown (see text)

Source: Chanlett, 1973.

standards indicates an ability to meet particulate and NO_x standards. What is not known is how far below the standards the emissions will actually be for particulates and NO_x. This is dependent upon boiler design and the particular pollution control devices which are installed. Since the standards must be met to receive a permit and to remain in operation, there appears to be no adverse health effects from particulates or NO_x anticipated due to SHERCO.

SIBCO - Maximum concentrations of SO_2, as calculated by NSP's model, do not exceed any of the standards, and in fact do not even approach any of the standards. The figures are slightly misleading, in that the 24-hour and 3-hour averages are for SIBCO 1 & 2 only, without calculating a contribution from SHERCO 1 & 2 as included in the SHERCO figures. However, because the two sites are so far apart, the inclusion of a contribution due to SHERCO 1 & 2 will not raise the SIBCO concentrations sufficiently to approach the levels of the SHERCO concentrations. This is supported by the annual average calculation for SIBCO, which does include a contribution from SHERCO 1 & 2, and which is significantly lower than the annual average for SHERCO 1, 2, 3 and 4.

The fact that SIBCO will not violate the standards indicates that there will be no adverse health effects from SO_2 due to SIBCO. This is further strengthened by the fact that over the life of the plant, SIBCO is anticipated to operate at 70% capacity, resulting in lower emissions than presented in Table 51 for much of the time.

Figures for the concentrations of particulates and NO_x have not been presented by NSP. However, it is generally accepted that SO_2 standards are the most stringent, and that the ability to meet the SO_2 standards indicates an ability to meet the particulate and NO_x standards. What is not known is how far below the standards the emissions will actually be for particulates and NO_x. This is dependent upon boiler design and the particular pollution control devices which are installed. Since the standards must be met to obtain a permit, and to remain in operation, there appears to be no adverse health effects from particulates or NO_x anticipated due to SIBCO.

> (*cc*) *Preferred sites do not require the destruction or major alteration of landforms, vegetative types, or wildlife habitat which are rare, unique or of unusual importance to the surrounding area.*

The wording "rare, unique, or of unusual importance" may need some clarification or definition. It is our interpretation that "rare" means relatively few, occurring randomly, "unique" means occurring at a limited number of localities, and "unusual importance" includes items which may be rare, unique, or common, but from which the locality derives some special benefit. As an example, the chimney-like pinnacles known as buttes which are scattered over the western portion of the U.S. may be "rare", while the weirdly sculpted shapes of the rocks found in Monument Valley, Utah, may be considered "unique". On the other hand a portion river's bluff, which is not significantly different from another portion of a river's bluff, is not "rare, unique, or of unusual importance".

SHERCO - No rare, unique, or unusually important landforms, vegetative types, or wildlife habitat will be destroyed or altered. All of the items affected are common throughout the area.

SIBCO - No rare, unique, or unusually important landforms, vegetative types, or wildlife habitat will be destroyed or altered. All of the items affected are common throughout the area.

> (*dd*) *Preferred sites minimize the visual and audible impingement on waterways, parks, or other existing or proposed public recreation areas.*

SHERCO - Visually, there will be an impact due to the stack, which is visible from the Mississippi River. However, since the plant will use an existing intake structure, there will be no visual impact on the river due to the intake, since the intake will be there whether units 3 and 4 are constructed or not. Transmission lines for SHERCO will cross both the Mississippi and Minnesota Rivers, each once, resulting in a visual impact.

There will also be an audible impact upon the Mississippi River. At its nearest point, the river is approximately 1700 feet from the proposed cooling towers. Assuming 96 dBA to be the noise level at 25 feet from the towers (EPA estimate for forced draft fans), the noise level at the river will be approximately 60 dBA. This is the noise level of normal conversation, or that is perceived at twenty feet from an air conditioner. When unit trains enter the plant site, the noise levels at the river may increase to 70 dBA. This is twice as loud as 60 dBA, and is the noise level near a vacuum cleaner in operation, or at 100 feet from street traffic. Table 52 presents noise levels in dBA of common sounds.

SIBCO - At SIBCO the plant itself is so far removed from the Minnesota River and trail system, that it cannot be seen. However, a portion of the stack is visible.

Assuming a noise level of 100 dBA at 25 feet from the plant (treating the entire plant as a point source), the noise will attenuate to approximately 45-50 dBA at the river. This will be further attenuated by the forested bluffs of the river valley. Thus, noise from the plant should be very slight, if at all noticeable, on the river and trail system. However, noise levels from unit trains crossing the trestle and embankment will be very high (approximately 96 dBA at 100 feet from the train). This will occur 2 to 4 times a day as unit trains enter and leave the plant, for a duration of approximately 2 to 3 minutes.

The railroad trestle, the embankment, and the water intake structure will be visible from the river and trail system. A portion of the stack will be visible from certain points on the river. Transmission lines will cross the river at two locations.

(ee) Preferred sites minimize the removal of valuable and productive land and water from other necessary uses and minimize conflicts among water users.

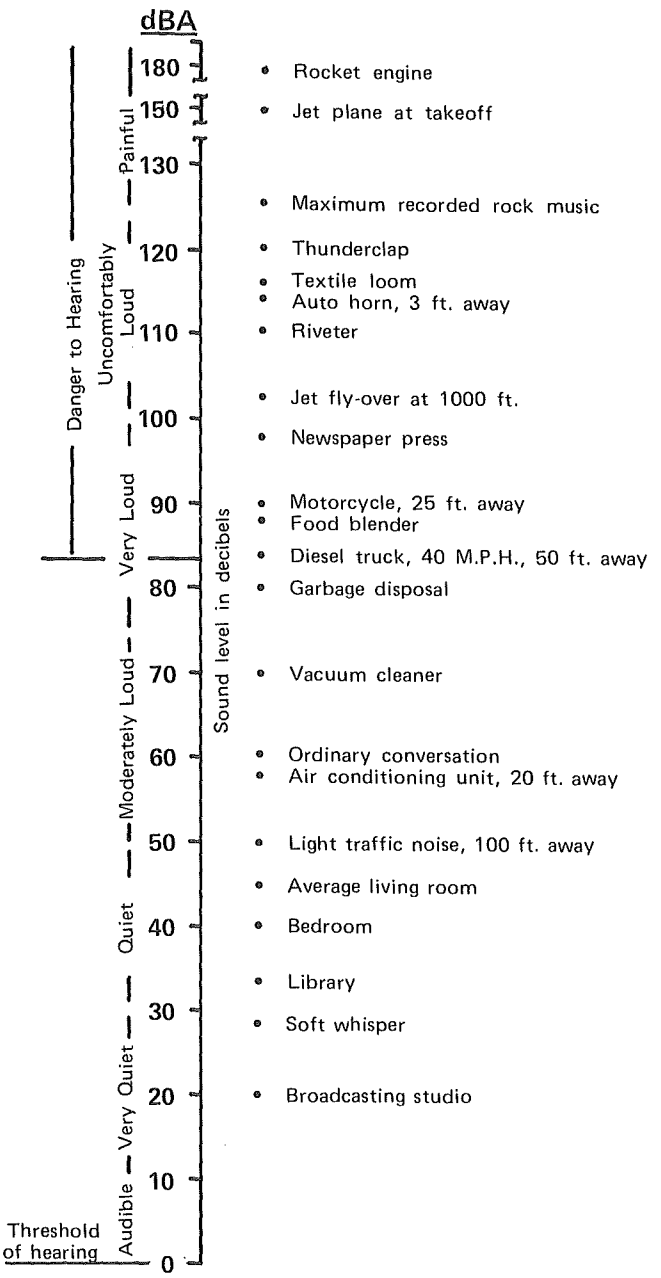
SHERCO - SHERCO requires an additional 320 acres over the already existing site. The soil on both the site and the addition is very sandy. This makes the soil droughty, or of poor water holding capabilities. The soil is also somewhat deficient in nutrients, although the actual extent of the deficiency is unknown. The combination of these two properties reduces the productivity of the soil, so the soil requires irrigation and fertilization.

The Department of Natural Resources has indicated that sufficient water will be available from the Mississippi River for the operation of the SHERCO plant. During periods of low flow, NSP installations downstreams of SHERCO may reduce their water appropriations, with the intent of permitting SHERCO to appropriate that water. This will aid in reducing conflicts with downstream users. However, during sufficiently low flows, conflicts may be expected to occur. Major dischargers and appropriators are presented in Tables 3 and 4.

Most of the water which will be appropriated will be used in consumptive processes, removing that water from other uses.

TABLE 52

NOISE LEVELS OF COMMON SOUNDS



dBA	
0	Threshold of hearing
10	
20	Studio for sound pictures
30	Studio for speech broadcasting
40	Very quiet room
50	Residence
60	Conventional speech
70	Street traffic at 100 ft.
74	Passing automobile at 20 ft.
80	Light trucks at 20 ft.
90	Subway at 20 ft.
100	Looms in textile mill
110	Loud motorcycle at 20 ft.
120	Peak level from rock and roll bank
140	Jet plane on the ground at 20 ft.

Source: Chanlett, 1973.
Turk, Turk, W. Hes and W. Hes, 1974.

Associated with the plant will be 4 transmission lines located in 2 new transmission corridors, and an existing corridor. Although only the area under the base of each transmission tower is removed from other uses, the positioning of the tower may interfere with other uses. Of particular concern is cropland irrigation. The most common system used in this area requires the equipment to travel in a complete circle. The radius of this circle is on the order of 2600 feet. Location of a transmission tower within this circle is incompatible with the operation of the irrigation equipment. The locations, size, and number of towers to be used is part of the detailed design, and will not be determined until after designation of a site.

SIBCO - The SIBCO site consists of about 3480 acres of agricultural land, of which 2800 acres is currently under cultivation. The soil is fertile and productive. Crops include soybeans, corn and alfalfa.

The Department of Natural Resources has indicated that sufficient water will be available from the Minnesota River (with the use of the storage basin as proposed by NSP) for the operation of the SIBCO plant. During periods of low flow, NSP installations on the Mississippi River upstream of the Metropolitan Wastewater Treatment Plant may reduce their water appropriations, with the intent of permitting SIBCO to appropriate that water. Since the Metropolitan plant is downstream of the confluence of the Mississippi and Minnesota, it makes no difference to plant operation whether a given quantity of water is appropriated upstream of the plant on the Mississippi, or if it is appropriated on the Minnesota. The object is to minimize conflicts with downstream users. However, during sufficiently low flows, conflicts will occur. Major dischargers on the Minnesota River are presented in Table 31. There are no major appropriators along this portion of the Minnesota River.

Most of the water which will be appropriated will be used in consumptive processes, removing that water from other uses.

Associated with the plant will be 5 transmission lines located in 3 transmission corridors. Although only the area under the base of each transmission tower is removed from other uses, the positioning of the tower may interfere with other uses. The locations, size, and number of towers to be used is part of the detailed design, and will not be determined until after designation of a site.

(ff) Preferred sites maximize reliability with respect to climate and geology.

SHERCO - The site is significantly higher than the level of the record flood at this locality. NSP has calculated the probability of a tornado striking the plant as once in 2,000 years. There is zero probability of damage due to earth tremors. The topography and soil types at the site are not susceptible to landslides.

SIBCO - The site is considerably higher than the level of the record flood at this locality. NSP has calculated the probability of a tornado striking the plant as once in 2,300 years. There is zero probability of damage due to earth tremors. The topography and soil types at the site are not susceptible to landslides.

(gg) Preferred sites permit significant conservation of energy or utilization of by-products.

SHERCO - The difference between plant elevation and river elevation is approximately 40-50 feet. This results in a relatively low expenditure of energy to pump water to the plant (as compared to SIBCO). The distance over which coal will be transported to SHERCO is shorter than that for SIBCO. This will result in a saving in transportation energy.

The desulfurization equipment to be used at SHERCO will consume energy. Mixing fly ash with scrubber sludge will preclude the possible sale of fly ash. There is currently no known use for scrubber sludge.

SIBCO - If very low sulfur coal is used at SIBCO, as has been the intention of NSP, desulfurization equipment will probably not be necessary, and there will be a corresponding savings in energy over SHERCO. If scrubbers are not used, and therefore no sludge produced, fly ash may remain a saleable by-product of plant operation.

The difference in elevation between the river and the plant site is approximately 270 feet. This results in a relatively high expenditure of energy to pump water to the plant (as compared to SHERCO). The distance over which coal will be transported is greater than that for SHERCO. This will result in an additional expenditure of transportation energy at SIBCO.

(*hh*) *Preferred sites are located near large load centers.*

SHERCO - The site is located approximately 40 miles northwest of the Twin Cities Metropolitan area.

SIBCO - The site is located approximately 40 miles southwest of the Twin Cities Metropolitan area.

(*ii*) *Preferred sites maximize the use of already existing operating sites and transportation systems.*

SHERCO - The proposed SHERCO site already contains two units which are under construction, and should be operating before or shortly after construction of units 3 and 4 begins. Transportation systems are adequate. The area is serviced by Highway 10-52 and Interstate 94. The Burlington Northern trackage serving the area has been described as excellent by a BN spokesman. A spur already exists to the site.

The transmission line network which already serves the SHERCO site will require the addition of four more lines, two in an existing right-of-way and one each in two new rights-of-way.

SIBCO - There is no existing operating site. The land at the proposed site is currently agricultural. A rail spur and trestle will be required to serve the site. The railroad will probably require improvement over portions of the track, in order to handle increased traffic and higher speeds. Several county roads will require upgrading to provide adequate service to the plant site.

A transmission line network does not exist at this site. Five transmission lines, located in three rights-of-way, will be required.

(*jj*) *Preferred sites allow for larger rather than smaller generating capacity.*

SHERCO - The site probably cannot accept a fifth fossil fuel 800 mw unit without violating air quality standards for SO_2, with current technology. An increase in SO_2 emissions comparable to those for each of the new units over SHERCO 1 and 2 would be in excess of the standards (by 155 $\mu g/m^3$ for the 3-hour average, and 2.5 $\mu g/m^3$ for the 24-hour average, as estimates).

Low flows in the Mississippi River may not be sufficient to provide the water needs of a fifth unit.

SIBCO - The site probably can accept a third fossil fuel 800 mw unit without violating air quality standards for SO_2. A rough estimate based on emissions reported for SIBCO 1 and 2 would be 25 $\mu g/m^3$

under the 3-hour average, and 55-60 $\mu g/m^3$ under the 24-hour average for three units. The site probably cannot accept a fourth unit.

Low flows in the Minnesota River may not be sufficient to provide the water needs of a third unit, requiring a larger storage reservoir than currently planned.

IX. ALTERNATIVES

The Minnesota Environmental Quality Council has not designated any alternative sites to those proposed in the site compatibility application. The two proposed sites were recommended by the Governor's Environmental Quality Council in 1972. At that time, the GEQC created a Special Plant Siting Task Force. The Task Force evaluated 10 potential sites and held public hearings in the vicinities of these sites. In December, 1972, the Task Force made the following recommendations to the GEQC:

1. Highest priority was given to the Sherburne County site in Becker, Minnesota, northwest of the Twin City Metropolitan area. (This site is presently being developed by NSP with construction of a 1360 megawatt coal fired generating plant.)
2. Second priority was given to a new site near Henderson, Minnesota, in Sibley County, southwest of the Twin Cities.

For this reason, it is unlikely that a site which would be competitive in compatibility, and in the availability of data upon which to base an evaluation, can be found.

X. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES TO THE PROJECT

The manpower used in the design, construction, and operation of the plant may be considered irreversibly committed to the project. Construction materials, such as sand, gravel, cement, lumber, etc., may be considered irreversibly committed. Since the topsoil is being destroyed, the land use of agriculture may be considered irretrievable. Coal and limestone consumed during plant operation may be considered an irreversible commitment.

XI. REQUIRED PERMITS

The following is a list of permits that are required for construction and operation of the proposed plant.

AGENCY	DESCRIPTION OF PERMIT	SHERCO	SIBCO	APPLICABLE REGULATION
Minnesota Pollution Control Agency	1. Liquid Waste Disposal Permit (plant blowdown and basin drainage including holdup pond and coal storage basins)	X	X	WPC 20, 15
	2. Certificate of Compliance (assurance of meeting water quality standards)	X	X	WPC 15
	3. Gaseous Waste Disposal Permits (gaseous waste installation permit and gaseous waste operating permit	X	X	APC 1, 3, 4
	4. Burning Permit (construction and operating waste incineration)	X	X	APC 7, 8
	5. Solid Waste Disposal Permit (ash storage)	X	X	SW 6
	6. Solid Waste Disposal Permit (construction wastes – landfill)	X	X	SW 6
	7. Liquid Storage Permit (oil and chemical storage)	X	X	WPC 4
	8. NPDES Discharge Permit	X	X	40 CFR Part 425 40 CFR Part 423, Effluent 40 CFR Part 402, Cooling Water
Minnesota Department of Natural Resources	1. Surface Water Appropriation (river water for plant operation)	X	X	
	2. Ground Water Appropriation (dewatering wells)	X	X	
	3. Ground Water Appropriation (batch plant well)	X		
	4. Ground Water Appropriation (domestic, service water, and plant makeup wells)	X	X	
	5. Work in Beds of Public Waters (intake and discharge structures including dredging)		X	
	6. Railroad Bridge Crossing		X	
Minnesota Department of Health	1. Approval of Sewage Disposal Plans (temporary sanitary sewage disposal system)	X	X	
	2. Approval of Sewage Disposal Plans (plant sanitary sewage disposal system)	X	X	
	3. Approval of Plumbing Plans (tempory building plumbing)	X	X	
	4. Approval of Plumbing Plans (permanent plant plumbing)	X	X	
	5. Approval of Potable Water Plans (wells and water supply plumbing)	X	X	

AGENCY	DESCRIPTION OF PERMIT	SHERCO	SIBCO	APPLICABLE REGULATION
Minnesota Department of Labor and Industry	1. Certification of National Board Acceptance (auxiliary boiler)	X	X	
	2. Approval of Plans (access to chimney lighting balconies)	X	X	
Minnesota Public Commission	1. Railroad Spur Track		X	
State Fire Marshall	1. Approval of Plans 1 (flammable liquid storage)	X	X	
U.S. Army Corps of Engineers	1. Dredging (intake and discharge structures)		X	33 CFR 209, 120
	2. Bridge Crossing		X	33 CFR 209, 120 Appendix A
U.S. Coast Guard	1. Bridge Permit		X	33 CFR, Part 11t
Environmental Protection Agency	1. Plant Discharges (NPDES)	X	X	(Taken over by MPCA as of 6-30-74)
	2. Operation Notification (boiler operation)	X	X	40 CFR 60.8
Federal Aviation	1. Notice of Proposed Construction or Alteration (chimney and powerhouse elevation authorization lighting and marking requirements)	X	X	14 CFR, Part 77
Sherburne County	1. Approval of Plans (flammable liquid storage)	X		
Becker, Minnesota	1. Burning Permit (site preparation clearing)	X		
Sibley County	1. Possible Road Vacations		X	
	2. Approval of Railroad Spur Track Grade Crossing		X	
	3. Burning Permit		X	
Jessenland Township	1. Road Vacations		X	
	2. Approval of Railroad Spur Track Grade Crossings		X	

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APPENDIX A

GLOSSARY

GLOSSARY

alkalinity – the property of having excess hydroxide ions in solution

ambient – surrounding

aquifer – a subsurface zone that yields economically important amounts of water to wells

bedrock – solid rock that has not been transported from the location of its formation (i.e. non-boulder)

biochemical oxygen demand (BOD) – the amount of dissolved oxygen required to meet the metabolic needs of anaerobic organisms in water

blow down – water which is withdrawn from the cooling system when dissolved solids concentrations exceed permissible limits

bottom ash – residue from the combustion of coal which is collected from the bottom of the furnace

Btu (British thermal unit) – a unit of heat energy equal to the heat needed to raise the temperature of one pound of air-free water from 60° to 61°F at a constant pressure of one standard atmosphere

cfs (cubic feet per second) – a unit of volume flow rate equal to a uniform flow of one cubic foot in one second

cooling tower – a mechanism in which atmospheric air circulates and cools warm water, generally by direct contact (evaporation)

dBA – a unit of acoustic energy used to measure sound, and weighted to reflect the ability of the human ear to detect certain sounds

dissolved oxygen – the amount of oxygen in solution in water

fly ash – a fine particulate, essentially noncombustible refuse, carried in a gas stream from a furnace to the stack

glacial outwash – sand and gravel transported away from a glacier by streams of meltwater and deposited as a floodplain

glacial till – a heterogeneous mixture of clay, silt, sand and gravel deposited by a glacier

gpm – gallons per minute

L_{10} – the A-weighted sound level equaled or exceeded 10% of the time

L_{50} – the A-weighted sound level equaled or exceeded 50% of the time

LEPGP – Large Electric Power Generating Plant

makeup – water which is added to a system to replace water losses due to evaporation or blow down

median – an item so located in a series of items that there is an equal number of items both above and below the median

Montmorillonite – a clay mineral which is capable of absorbing large quantities of water, resulting in a large expansion of the crystal structure of the mineral

NO_x – nitrogen oxides

Noise – unwanted sound

Ortho phosphate – the PO_4 which is available for use by the biological community

particulate – fine solid particles which remain individually dispersed in gases and stack emissions

permeability – the capacity of a porous rock, soil, or sediment to transmit a fluid

pH – a term used to describe the hydrogen ion activity of a system; it is equal to $-\log_{10}$ (concentration of H^+); values of 0 to 6.9 are acid, 7.0 is neutral, 7.1 to 14 are basic

precipitator – a device which removes dust or other finely divided particles from a gas by charging the particles inductively with an electric field, then attracting them to highly charged collector plates

SHERCO Area – Benton, Sherburne, Stearns and Wright Counties

SHERCO PIA – a circle of 15 mile radius, centered on the plant site

SHERCO PUA – major communities within the SHERCO PIA

SHERCO Region – a circle of 15 mile radius, centered on the plant site (coincides with SHERCO PIA)

SHERCO SUA – major communities outside of, but near, the SHERCO PIA

SIBCO Area – Carver, LeSeuer, McLeod, Scott and Sibley Counties

SIBCO PIA – a circle of ten mile radius, centered on the plant site

SIBCO PUA – major communities located within the SIBCO PIA

SIBCO Region – a circle of 15 mile radius, centered on the plant

SIBCO SUA – major communities located outside of, but near, the SIBCO PIA

soil – unconsolidated sediment

solum – the upper part of a soil profile, including the A and B horizons

SO_2 – sulfur dioxide

terrace alluvium – sand and gravel deposited as a floodplain in a river valley, at a time when the river level was higher than at present

turbidity – cloudy appearance of water due to a suspension of colloidal solids; measured in arbitrary units called Jackson Turbidity Units (JTU)

APPENDIX B

SPECIES LISTS

MAMMALS: SHERCO AND SIBCO

	Common Name	Scientific Name	Preferred Habitat
SH	Common Mole	*Scalopus aquaticus*	prairie, prefers sand and light loam soils
SH	Cinerous Shrew	*Sorex cinereus*	moist areas
SB	Opposum	*Didelphis virginiana*	hollow trees, brush piles, old buildings
	White Tail S. Rabbit	*Lepus townshedii*	grasslands
	Cottontail	*Sylvilagus floridonus*	brush and broken decidum
	Woodchuck	*Marmota monax*	edges of clearings
	Minnesota Gopher	*Citellus tridecemlineatus*	open pastures, edges of clearings
SH	Eastern Chipmunk	*Tamias striatus*	deciduous brush
SH	Red Squirrel	*Tamiasciurus hudsonicus*	coniferous forests
	Fox Squirrel	*Sciurus niger*	mature hardwood forest
	Gray Squirrel	*Sciurus carolinensis*	mature hardwood forest
SH	Mississippi Valley Pocket Gopher	*Geomys bursarius*	loose soils
SH	Pocket Mouse	*Peroghathus flavesceus*	sandy soils, open areas
SH	Beaver	*Castor canadesis*	aspen-willow forests, small streams or lakes
	White-footed Mouse	*Peromyscus maniculatus*	grassland
SH	Bog Lemming	*Synaptomys cooperi*	bog and fen meadows
	Red Back Vole	*Clethrionomys gapperi*	damp deciduous forests
	Meadow Mouse	*Microtus pennsylvanicus*	lowland prairie
	Prairie Vole	*Microtus ochrogaster*	grasslands
	Muskrat	*Ondatra zibethica*	cattail marshes, streams, lakes
	Meadow Jumping Mouse	*Zapus hundsonicus*	lowland prairie
	Raccoon	*Procyonlotor*	oak forests & farmland
	Long-tailed Weasel	*Mustela frenta*	brushy areas & along water courses
	Mink	*Mustela vison*	along water courses & lakes
SH	Otter	*Lutra canadensis*	streams, rivers, lakes, ponds
	Striped Skunk	*Mephitis mephitis*	brush, forest, prairies
SH	Badger	*Taxidea taxus*	brush, forest, prairie
	Red Fox	*Vulpes fulva*	grasslands, forest
SH	Bobcat	*Lynx rufus*	wooded riverbottom
	White-tailed Deer	*Odocoileus virginiauus*	grasslands, brush forest

SH – More common in Sherco Region

SB – More common in Sibco Region

BIRDS: SHERCO AND SIBCO

	Common Name	Scientific Name
	Falcons and Hawks	
	Goshawk	*Acupter gentilis*
	Rough-legged Hawk	*Buteo lagopus*
*	Bald Eagle	*Haliaeetus leucocephalus*
*	Osprey	*Pandion haliaetus*
*	Peregrine Falcon	*Falco peregrinus*
	Sparrow Hawk	*Falco sparverius*
	Gallinaceaous Birds	
SH	Ruffed Grouse	*Bonasa umbellus*
SB	Sharp-tailed Grouse	*Pedioecetes phasianellus*
SB	Ring-necked Pheasant	*Phasianus colchieus*
SB	Partridge	*Perdix perdix*
	Cranes	
	Blue Heron	*Ardeu herodias*
	Green Heron	*Butorides virescens*
	American Coot	*Fulica americana*
	Shorebirds and Gulls	
	Killdeer	*Charadrius vociferus*
	Common Snipe	*Capella gallinago*
	Pigeons and Doves	
	Domestic Pigeon	*Columba livia*
	Mourning Dove	*Zenadiura macroura*
	Owls	
	Screech Owl	*Otus asio*
	Great Horned Owl	*Bubo virginianus*
	Barred Owl	*Strix varia*

Woodpeckers

Yellow-shafted Flicker	*Colaptes auratus*
Downy Woodpecker	*Dendrocopos pubescens*
Red-headed Woodpecker	*Malanerpes erythrocephalus*

Perching Birds

Blue Jay	*Eyanocitta cristata*
Crow	*Corvus brachyrhynchas*
White-breasted Nuthatch	*Sitta carolinensis*
Robin	*Turdus migratorius*
Cedar Waxwings	*Bombycilla cedrorum*
Western Meadowlark	*Sturnella neylecta*
Red-wing Blackbird	*Agelaius phoeniceus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Baltimore Oriole	*Icterus galbula*
Common Grackle	*Quiscolus quiscula*
Cowbird	*Molthrus ater*
Cardinal	*Richmondena cardinalis*
Goldfinch	*Spinus tristis*
Sparrows	genus *Spizella*
Sparrows	genus *Passenculus*
Sparrows	genus *Melospiza*

Waterfowl

Canada Goose	*Branta caradensis*
Mallard	*Anas platyrhynchos*
Pintail	*Anas acutca*
Blue-wing Teal	*Anas discors*
Wood Duck	*Aix Sponsa*

* Rare or endangered species

SH More common in SHERCO Region

SB More common in SIBCO Region

FISH PRESENT IN THE MISSISSIPPI RIVER NEAR SHERCO

Common Name	Scientific Name
Spotfin Shiner	*Notropis spilopterus*
Bigmouth Shiner	*Notropis dorsalis*
Sand Shiner	*Notropis stramineus*
Bluntnose Minnow	*Pimephales notatus*
White Sucker	*Catostomus commersoni*
Common Shiner	*Notropis cornutus*
Johnny Darter	*Etheostoma nigrum*
Hornyhead Chub	*Nacomis biguttatus*
Smallmouth Bass	*Micropterus dolomieui*
Fathead Minnow	*Pimephales promelas*
Spottail Shiner	*Notropis hudsonius*
Longnose Dace	*Rhinichthys cataractae*
Redhorse Sucker	*Maxostoma carinatum*
Trout-perch	*Percopsis omiscomaycus*
Blacknose Dace	*Rhinichthys atratulus*
Brassy Minnow	*Hybognathus hankinsoni*
Logperch	*Percina caprodes*
Largemouth Bass	*Micropterus salmoides*
Creek Chub	*Semotilus atromaculatus*
N. Redbelly Dace	*Chrosomus eos*

FISH PRESENT IN THE MINNESOTA RIVER NEAR SIBCO

Common Name	Scientific Name
Shortnose Gar	*Lepisosteus platostomus*
Gizzard Shad	*Dorosoma cepedianum*
Bigmouth Buffalofish	*Ictiobus cyprinellus*
Smallmouth Buffalofish	*Ictiobus bubalus*
Quillback	*Carpiodes cyprinus*
River Carpsucker	*Carpiodes carpio*
Highfin Carpsucker	*Carpiodes velifer*
Common White Sucker	*Catostomus commersoni*
Northern Hog Sucker	*Hypenuelium nigricans*
Silver Redhorse	*Moxostoma anisurum*
Northern Redhorse	*Moxostoma aureolum*
Carp	*Cyprinus carpio*
Silver Chub	*Hyboosis storeriana*
Emeral Shiner	*Notropis atherinoides*
Spotfin Shiner	*Notropis spilopterus*
Central Bigmouth Shiner	*Notropis dorsalis*
Sand Shiner	*Notropis deliciosus*
Brassy Minnow	*Hybognathus hankinsoni*
Fathead Minnow	*Pimephales promelas*
Bluntnose Minnow	*Pimophales notatus*
Channel Catfish	*Ictelurus punctatus*
Black Bullhead	*Ictalurus melas*
Shovelhead Catfish	*Pylodictis olivaris*
Northern Pike	*Esox lucius*
White Bass	*Roccus chrysops*
Aauger	*Stizostedion canadense*
Walleye	*Stizostedion vitreum*
Slenderhead Darter	*Percina phoxocephala*
Smallmouth Bass	*Micropterus dolomieui*
Green Sunfish	*Lepomis cyanellus*
Orangespotted Sunfish	*Lepomis humilis*
Bluegill	*Lepomis macrochirus*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis nigromaculatus*
Sheepshead	*Aplodinotus grunniens*

TERRESTRIAL VEGETATION: SHERCO AND SIBCO

	Common Name	Scientific Name
	Trees	
SH	Bur Oak	*Querecus macrocorpa*
	White Oak	*Quercus alba*
	Red Oak	*Quercus rubra*
SH	Bitternut Hickory	*Carya cordiformis*
SB	Box Elder	*Acer negundo*
	Sugar Maple	*Acer saccharum*
	Red Maple	*Acer rubrum*
	Silver Maple	*Acer saccharinum*
SB	Black Walnut	*Juglans nigra*
	Butternut	*Juglans cinerea*
SB	Cottonwood	*Populus deltoides*
	Balsam Poplar	*Populus basamifera*
	Common Juniper	*Juniperus communis*
SH	Eastern Red Cedar	*Juniperus virginiana*
	Willows	genus *Salix*
	Quaking Aspen	*Populus tremuloides*
	Hophornbeam (Ironwood)	*Ostraya virginiana*
	Hornbeam (Blue Beech)	*Carpinus caroliniana*
SH	Jack Pine	*Pinus banksiana*
SH	Red Pine	*Pinus resinosa*
SH	White Pine	*Pinus strobus*
	American Elm	*Ulmus americana*
	Slippery Elm	*Ulmus rubra*
	Hackberry	*Celtis accidentalis*
	Green Ash	*Fraxinus pennsylvania*
SB	Basswood	*Tilia americana*

SH – More common in Sherco

SB – More common in Sibco

TERRESTRIAL VEGETATION: SHERCO AND SIBCO (Cont.)

Common Name	Scientific Name
Shrubs	
Greenbriers	g. *Smilax*
Gooseberries	g. *Grossularia*
Currents	g. *Ribes*
Hawthorns	g. *Crataegus*
Juneberry	g. *Amelanchia*
Blackberries	g. *Rubis*
Sumac	g. *Rhus*
Dogwoods	g. *Cornus*
Prickly-ash	g. *Zanthoxylum*
Herbaceous Plants	
Big Bluesteur	*Andropogon gerardi*
Indian-grass	*Sarghastrum nutaus*
Panic-grass	genus *Panicum*
Bunch-grass	*Stipa viridula*
Ragweed	genus *Ambrosia*
Mullier	*Verbascum thapsus*
Verbena	*Verbena hastata*
Milkweed	*Asclepias syriaca*
Aster	genus *Aster*
Goldenrod	genus *Solidago*
Blackeyed Susan	*Rudbeckia serotina*
Yarrow	*Achillea millefodium*
Old Man's Beard	*Clematis virginiana*
Dutchman's Breeches	*Dicentra cucullaria*
Dandelion	*Taraxacum officinale*

AQUATIC PLANTS PRESENT IN SILVER LAKE – SIBCO REGION

Common Name	Scientific Name
Emergent	
Reed Canary Grass	*Phalaris arundinacea*
River Bulrush	*Scirpus Fluviatilis*
Giant Burreed	*Sparganium eurycarpum*
Manna Grass	*Glyceria grandis*
Arrowhead	*Sagittaria latifolia*
Softstem Bulruch	*Scirpus validus*
Sweet Flag	*Acorus calamus*
Wide-leaf Sedge	*Cares* spp.
Narrow-leaf Sedge	*Cares* spp.
Smartweed	*Polygonum* spp.
Great Waterdock	*Rumex orbiculatus*
Duck millet	*Echinochloa* sp.
Rice Cutgrass	*Leersia oryzoides*
Redtop Grass	*Agrostis alba*
Common Cattail	*Typha latifolia*
Blue Flag	*Iris versicolor*
Wild Barley	*Hordeum Jubatum*
Cane	*Phragmites communis*
Bulb-bearing Water Hemlock	*Cicuta bulbifera*
Wool Grass	*Scirpus atrocinctus*
Beggattick	*Bidens* spp.
Submerged	
Sago Pondweed	*Potamogeton pectinatus*
Pondweed	*Potamogeton* sp.
Lesser Duckweed	*Lemna minor*
Greater Duckweed	*Spirodela polyrhiza*
White Waterlily	*Mymphaea tuberosa*

APPENDIX C

ARCHEOLOGICAL SURVEYS

UNIVERSITY OF MINNESOTA
TWIN CITIES

Department of Anthropology
215 Ford Hall
Minneapolis, Minnesota 55455

May 14, 1974

Mr. R. S. McGinnis
Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota

Dear Mr. McGinnis:

This letter is to certify that I did examine the records and did conduct a surface survey of the Sherburne County generating plant lands and found them to be devoid of prehistoric archaeological sites. I am enclosing a copy of a memo dated 5 February 1971, reporting my meeting with you, Arthur Dienhart and others, and where I indicated that the record search had been negative.

I visited the site area in the spring of 1971 and conducted the surface survey and reported verbally to your engineering department that no sites were found.

Sincerely,

Elden Johnson
State Archaeologist

EJ:ml
Enc.

UNIVERSITY OF MINNESOTA
TWIN CITIES

Department of Anthropology
215 Ford Hall
Minneapolis, Minnesota 55455

July 14, 1975

Mr. Ed Hibbard
Environmental Division
Northern State Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

Dear Mr. Hibbard:

This letter certifies that the lands owned by Northern States Power in Sherburne County, Minnesota, to be occupied by a steam generating plant have been surveyed for archaeological sites with negative results. There are, therefore, no objections on any archaeological basis for construction of the plant.

The areas surveyed included the SW 1/4, Sec. 6 and the NW 1/4 Sec. 7, Twp 33N, R. 28W. The entire area lies on the level Anoka sand plain and is now cultivated agricultural land, planted to row crops. This is a very unlikely place to find archaeological evidence, and the survey confirmed this.

I appreciate your help and hope to see you again.

Sincerely,

Elden Johnson
State Archaeologist

EJ:ml
CC: Russell Fridley, Minnesota Historical Society

ARCHAEOLOGICAL SURVEY OF THE SIBLEY COUNTY GENERATING PLANT SITE

Guy E. Gibbon

Department of Anthropology
Archaeology Laboratory
University of Minnesota
Minneapolis, Minnesota

May 31, 1974

CONTENTS

ARCHAEOLOGICAL SURVEY OF SIBLEY COUNTY NSP PLANT SITE

I. Purpose

To examine the area within the proposed Sibley County Generating Plant site as depicted in Map 1 to determine the presence and value of archaeological sites which might be destroyed by construction and maintenance activities connected with the project.

II. Survey Strategy and Methods

The archaeological survey of the Sibley County Generating Plant site was conducted in three phases:

1) All reports and letters on file at the University of Minnesota Archaeology Laboratory and all other relevant publications were reviewed in a search for recorded archaeological sites in the survey area. This included examining the records of the early Minnesota surveyor (Winchell), as well as checking the site files of the Minnesota state archaeologist which record all reported archaeological sites in the state. The Minnesota State Historical Society, Mankato State College, local collectors, and the County Historical Society were also contacted for information concerning known archaeological sites in this and immediately adjacent areas. No archaeological sites of any kind were discovered in the survey area during this initial "review" phase of our research, although several were located in immediately adjacent areas.

2) During the initial phase of the field survey, approximately 90% of the land owners within the survey area were personally contacted and questioned about the presence of archaeological sites on their property and within the broader survey area. Permission to walk over the survey area was also obtained at this time. Again no archaeological sites of any kind (with the exception of farms abandoned within the last 100 years) were discovered, although several additional sites immediately outside the survey area were mentioned and several false clues were obtained.

3) The third and longest phase of the survey involved the actual physical search for archaeological sites. Approximately 200 student hours were spent – along with the field director – in this phase of the survey. Because the Sibley County Generating Plant site is a very large area for several archaeologists to thoroughly survey within the time period allotted, a survey strategy was developed to most effeciently accomplish this phase. The plant site was subdivided into three zones on the basis of the degree of probability of intensive prehistoric occupation. The first zone included those areas having the highest probability of expected prehistoric occupation – the Minnesota River Valley, the bordering bluff tops, a fifty yard wide strip of land immediately adjacent to the shores of Silver Lake. Zone Two included all of the ravines cutting back into the Minnesota River Valley bluffs, a strip of land extending back about 100 yards from the initial zone around Silver Lake, and all high points within the remaining survey area. The third zone and the zone with the lowest probability of prehistoric occupation was composed of most of the central core of the survey area. A grid of 100 equal size units was superimposed over this core zone and a random numbers table was used to determine the order in which the units would be surveyed. This method was employed because of the low probability of occupation. In our opinion the 20% sample of zone three actually surveyed was more than adequate to permit a generalization to the broader core zone. The first two zones and the 20% sample of the third zone were intensively surveyed over a period of approximately one and one-half months.

Two burial mounds and a campsite were found during phase three survey in zone one around Silver Lake. These archaeological sites are briefly described below and in Map 2.

III. Summary Statement and Recommendations

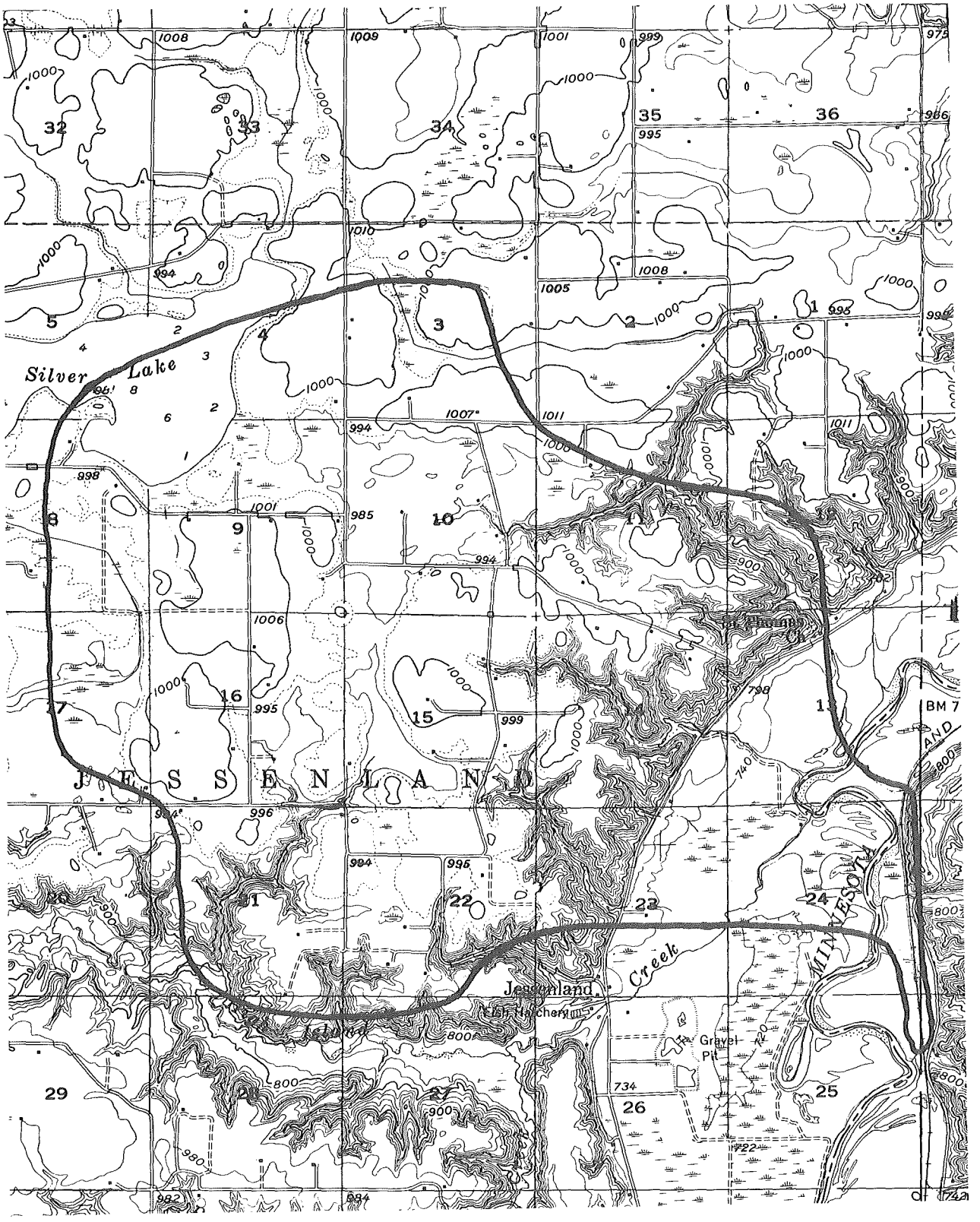
The proposed Sibley County Generating Plant site is remarkable for its dearth of archaeological remains. Only three prehistoric sites – all immediately adjacent to the shores of Silver Lake – were found that should be preserved and eventually excavated if threatened by destruction. These consist of the two burial mound clusters and the campsite mentioned above. A cluster of 10 to 12 burial mounds is situated in a pasture between Allie Weber's farm buildings and Silver Lake in the approximate center of the NE ¼ of the SE ¼ of Sec. 9 (SB 11 in Map 2). A second cluster of 10 to 12 mounds is situated in the NW ¼ of the SE ¼ of Sec. 4 on land owned by Victor Zeiher and Aloysius Weber (SB 12 in Map 2); this cluster does not extend more than about 40 yards back from the shores of Silver Lake. The mounds in both groups are 20 to 30 feet in diameter and about 2 feet in height. The third site, a Late Woodland campsite, is situated in a field on a peninsula that juts out into Silver Lake in the lower south-central ¼ of the SE ¼ of Sec. 5 (SB 10 in Map 2). It was later discovered that a Twin Cities collector, Arlo Hasse, has an extensive artifact sample from this site. Scattered flint chips were also found in other areas around the edge of the lake, but it is our opinion that these do not indicate the presence of additional sites warranting excavation. Despite our intensive survey, no other archaeological sites were found within the proposed plant boundaries.

The following recommendations are made:

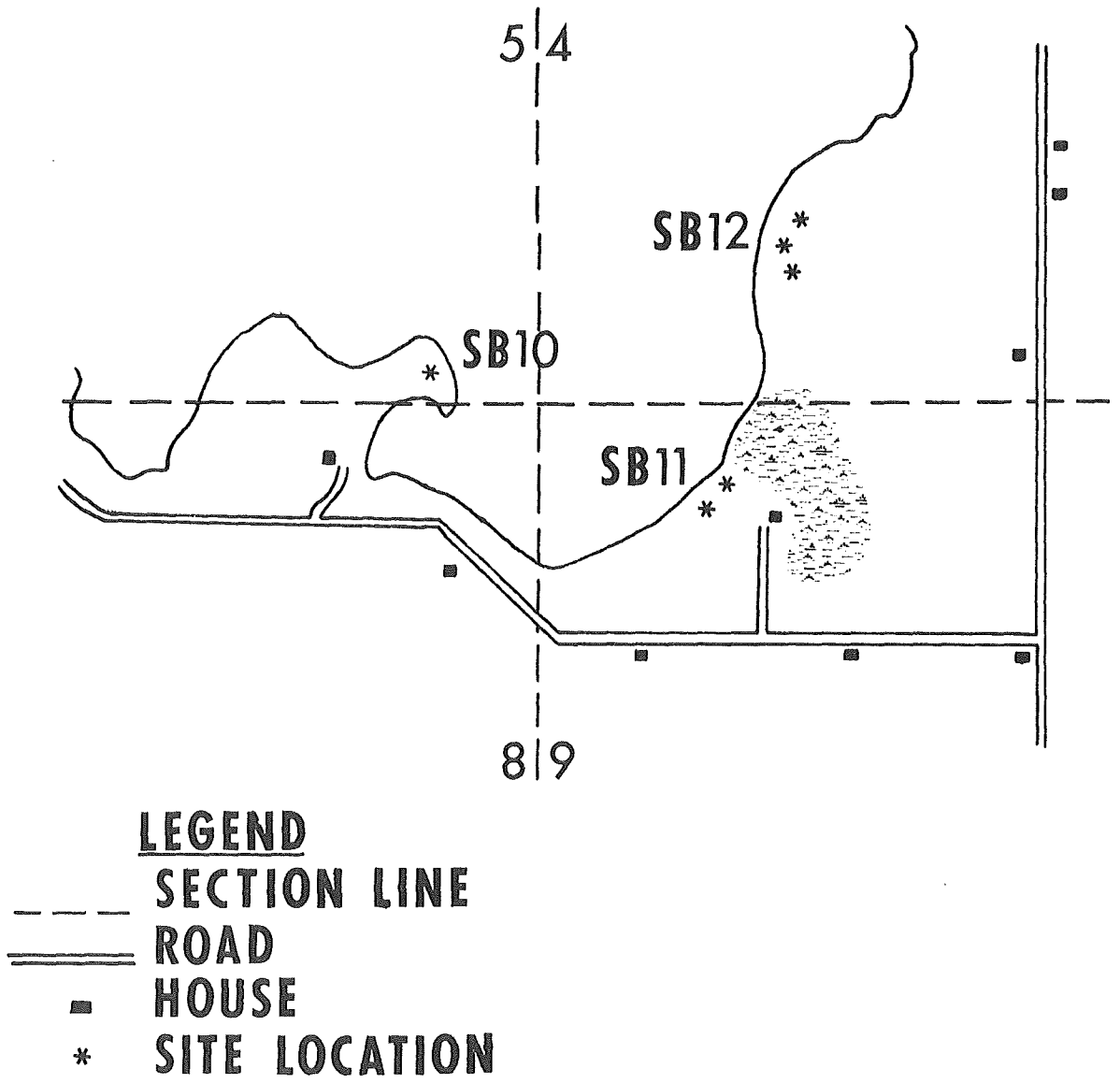
1) The two burial mound clusters and the campsite immediately adjacent to the shores of Silver Lake should be preserved and eventually excavated if threatened by destruction.

2) Construction engineers should be informed of the possible presence of archaeological sites within the Minnesota River floodplain that are presently buried by alluvium. Active soil movement and redeposition within the floodplain may explain in part the complete absence of observable archaeological sites in a zone where the probability of their presence is high.

3) We would recommend that this office be kept informed of any future work which might be planned for adjacent areas of the Generating Plant site. Archaeological sites are present, for example, at the intersection of High Island and Buffalo creeks and on the fluff tops along the east side of the Minnesota River. We would recommend in addition that any buried sites uncovered during the construction of the plant and its support facilities also be reported to this office.



Map 1. Sibley County Generating Plant Site (original map provided by Black and Veatch, Consulting Engineers)



Map 2. Location of Silver Lake Archeological Sites.