United States
Environmental Protection
Agency
Region V

Water Division
230 South Dearborn Street
Chicago, Illinois 60604

August, 1981

EPA

Environmental Impact Statement St. Croix, Wisconsin, and Taylors Falls, Minnesota, Wastewater Treatment Systems

Final

EPA-5-MN/WI-68-01-4612

FINAL ENVIRONMENTAL IMPACT STATEMENT

ST. CROIX FALLS, POLK COUNTY, WISCONSIN

AND

TAYLORS FALLS, CHISAGO COUNTY, MINNESOTA

WASTEWATER TREATMENT SYSTEMS

Prepared by the

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V, CHICAGO, ILLINOIS

AND

WAPORA, INCORPORATED

CHICAGO, ILLINOIS

Approved by:

Valdas V. Adamkus
Acting Regional Administrator

August 1981

For further information contact:

Marilyn Sabadaszka, Project Monitor
US Environmental Protection Agency, Region V
230 South Dearborn Street
Chicago, Illinois 60604
(312) 353-2157

ABSTRACT

An improved system to treat the wastewater generated by the residents of St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, is needed to comply with the Clean Water Act. The alternatives considered included upgrading/expanding the two existing facilities, combined treatment of the two communities' wastewater, and alternatives that would eliminate direct discharge of treated effluent to the St. Croix River. These alternatives consisted of various combinations of treatment processes, siting options, effluent disposal options, and sludge processing and disposal options. Implementation of any of the alternatives would produce short-term construction impacts to the local environment. Few long-term operational impacts are anticipated. Based on the technical feasibility, cost-effectiveness, and environmental and socioeconomic concerns addressed in this EIS, USEPA has concluded that the City of St. Croix Falls should upgrade and expand the existing wastewater treatment plant at St. Croix Falls and that the City of Taylors Falls should construct a new stabilization pond treatment system to replace the existing wastewater treatment facility at Taylors Falls.

SUMMARY

1. PURPOSE OF AND NEED FOR ACTION

To meet the requirements of the Clean Water Act (CWA), an improved system to treat wastewater at St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, (across the St. Croix River from each other) is needed. Presently, both communities discharge partially treated wastewater to the River from deteriorated, overloaded treatment facilities.

Because of their deteriorated condition, the existing wastewater treatment plants (WWTPs) at St. Croix Falls and Taylors Falls are not capable of meeting State effluent limitations, which have been established under the National Pollutant Discharge Elimination System (NPDES) program to protect the quality of the receiving water. The communities therefore are required either to upgrade the quality of, or eliminate entirely, the discharge of wastewater effluent to the River.

Wastewater Treatment Facilities Plans have been completed by the two communities that consider alternative solutions for meeting future wastewater treatment needs. These include upgrading/expanding the two existing facilities, a new stabilization pond system for Taylors Falls, combined treatment of the two communities' wastewater, and land disposal of treated effluent. The possible treatment alternatives have been evaluated on the bases of technical feasibility, reliability, costs, public desirability, environmental and socioeconomic effects, and the ability to meet the specified effluent discharge limitations.

2. ALTERNATIVES CONSIDERED

Initially, sixteen wastewater treatment alternatives were considered as potential solutions to improve the quality of effluent from the existing St. Croix Falls and Taylors Falls WWTPs. After completing the preliminary alternative screening process, ten potential wastewater treatment alternatives were developed and evaluated for technical feasiblity, cost-effectiveness, environmental, and socioeconomic concerns. The alternatives include no action, independent treatment systems for St. Croix Falls and Taylors Falls, and regional treatment systems that would serve both communities. A number of combinations of treatment processes, siting options, effluent disposal options, and sludge processing and disposal options were considered.

No-action Alternative

The "no-action" alternative would entail continued operation of the existing WWTPs with discharge to the St. Croix River, without any significant expansion, upgrading, or replacement during the design period (to the year 2000). The "no-action" alternative implies that USEPA would not provide funds to support new construction, upgrading, or expansion of existing WWTPs. The costs associated with the "no-action" alternative for both St. Croix Falls and Taylors Falls would be minimal, and would constitute the normal expenditures required for the continuing operation, maintenance, and repair of the existing equipment. This alternative is not feasible because the capacity of the existing plants would be inadequate for treatment of the projected wastewater flows and effluent limitations could not be met. The reliability and flexibility of the existing facilities also are limited, and the minor operational, equipment, and personnel improvements that could be made would not compensate for the age and deteriorated condition of the equipment.

Alternative 1 -- Upgrading and Expanding the Existing WWTP at St. Croix Falls

This alternative consists of upgrading and expanding the existing WWTP at St. Croix Falls to a 400,000 gallons per day (gpd) secondary treatment plant with direct discharge to the St. Croix River. This alternative would serve only the treatment needs of the St. Croix Falls service area. The estimated initial capital cost is $1,124,000 and the estimated annual operation and maintenance (O&M) cost is $31,000. The total present worth is estimated to be $1,414,000 (Section 3.4.2.).

Alternative 2 -- Land Disposal System for St. Croix Falls

This alternative consists of rehabilitation of the existing WWTP at St. Croix Falls, followed by land disposal of the effluent. This alternative only would serve the needs of St. Croix Falls. The existing WWTP would be modified, upgraded, and expanded to treat the average design flow of 400,000 gpd and to produce an effluent capable of meeting a BOD_5 effluent limitation of 50 milligrams per liter (mg/l). The effluent from the rehabilitated existing WWTP would be pumped through an 8-inch diameter force main approximately 2.0 miles to a land disposal site in the northeast quarter of Section 29 of St. Croix Falls Township. The effluent would be discharged into flooding basins and would percolate to the groundwater. During the three winter months, the effluent would be stored in a basin. The total land area required for the rapid infiltration system, including the storage basin and a buffer zone, is approximately 30 acres. An underdrain system or recovery wells may be required to control groundwater levels, depending on the hydrogeological conditions at the site. This alternative has an estimated initial capital cost of $1,181,000 and an estimated annual O&M cost of $40,000. The total present worth is estimated to be $1,466,000.

Alternative 3 -- Compact Activated Sludge System for Taylors Falls

This alternative for Taylors Falls proposes the demolition of the existing WWTP and construction of a new 140,000 gpd treatment plant at the same site utilizing a compact activated sludge (CAS) secondary treatment process. The treated wastewater would be discharged directly to the St. Croix River. To implement this alternative all existing wastewater treatment process units would have to be demolished. During the construction period, interim treatment facilities would be required. This alternative has an estimated initial capital cost of $988,000 and an estimated annual O&M cost of $36,000. The total present worth is estimated to be $1,348,000.

Alternative 4 -- Rotating Biological Contactor System for Taylors Falls

This treatment system alternative for Taylors Falls would involve demolition of the existing WWTP and construction of a new 140,000 gpd WWTP at the same site utilizing a rotating biological contactor (RBC) secondary treatment process. The treated wastewater would be discharged directly to the St. Croix River. Like Alternative 3, all the existing unit processes would have to be demolished and interim treatment facilities would be provided during construction. This alternative has an estimated initial capital cost of $985,000 and an estimated annual O&M cost of $27,000. The total present worth is estimated to be $1,233,000.

Alternative 5 -- Stabilization Pond System for Taylors Falls

This alternative for the Taylors Falls area involves the abandonment of the existing WWTP and the construction of a new stabilization pond treatment facility for secondary treatment at a site in the northwest quarter of Section 26 of Shafer Township. Implementation of this alternative would require approximately 30 acres to 40 acres of land. The treated wastewater would be discharged to the St. Croix River. However, the discharge to the River would be controlled and designed to discharge twice a year. The wastewater would be conveyed to the proposed site using four pumping stations and approximately 2.5 miles of new force main. This alternative has an estimated initial capital cost of $1,164,000 and an estimated annual O&M cost of $18,000. The total present worth is estimated to be $1,218,000. The cost for the demolition of existing facilities is not included in these figures.

Alternative 6 -- Land Disposal System for Taylors Falls

This alternative for Taylors Falls is similar to Alternative 5 except that the treated wastewater from the ponds would be discharged on land. The treatment facility and the land application site would be located in the northwest quarter of Section 26 of Shafer Township. Approximately 110 acres of land would be required for this alternative. To avoid the potential for raising the level of the groundwater, an underdrainage system would be provided. The renovated water, exceeding the secondary treatment standards, would be collected as drainage and pumped through a discharge force main to the St. Croix River. This alternative has an estimated initial capital cost of $1,584,000 and an estimated annual O&M cost of $21,000. The total present worth is estimated to be $1,569,000.

Alternative 7 -- Regional Conventional WWTP at St. Croix Falls

This alternative consists of upgrading and expanding the existing St. Croix Falls WWTP to treat wastewater from both the St. Croix Falls and Taylors Falls service areas. The existing Taylors Falls WWTP would be abandoned and an additional 0.25 acres of land would be needed at the St. Croix Falls WWTP site. A pumping station and interceptor line constructed from the Taylors Falls WWTP, attached to the US Highway 8 bridge, through the Wisconsin Interstate State Park, to the St. Croix Falls WWTP, would divert the wastewater from Taylors Falls to the regional WWTP on the St. Croix Falls side of the River. The plant would utilize a rotating biological contactor (RBC) secondary treatment process. The effluent from the WWTP would be discharged directly to the St. Croix River. This alternative has an estimated initial cost of $2,113,000 and an estimated annual O&M cost of $62,000. The total present worth is estimated to be $2,657,000.

Alternative 8 -- Regional Stabilization Pond System near Taylors Falls

This alternative consists of a new regional stabilization pond treatment facility to be constructed in a site in the northwest quarter of Section 26 of Shafer Township, to treat wastewater from both the St. Croix Falls and Taylors Falls service areas. Approximately 90 acres of land would be needed for this alternative. The wastewater treated to a secondary level would be discharged to the St. Croix River and, as described for Alternative 5, the discharge would be controlled. The facility would be designed to discharge twice a year.

The existing St. Croix Falls and Taylors Falls WWTPs would be abandoned. A pumping station would be constructed at the St. Croix Falls WWTP. A force main would extend from the existing St. Croix Falls WWTP site through the Wisconsin Interstate State Park, crossing the St. Croix River attached to the US Highway 8 bridge, to the existing Taylors Falls plant site. The combined system wastewater collected at the existing Taylors Falls WWTP site would be transported to the new stabilization pond system with the assistance of four pumping stations and approximately 2.5 miles of force main via the same route as discussed in Alternative 5. The effluent from the stabilization pond system would be pumped through 2.5 miles of force main and would discharge to the St. Croix River. This alternative has an estimated initial cost of $2,660,000 and an estimated annual O&M cost of $31,000. The total present worth is estimated to be $2,652,000.

Alternative 9 -- Regional Land Disposal System near Taylors Falls

This alternative is similar to Alternative 8 except that the effluent from the pond system would be discharged on land and not to the River. The regional treatment facility and the land application site would be located in Section 26 of Shafer Township. Approximately 280 acres of land would be needed for this alternative. The existing St. Croix Falls and Taylors Falls WWTPs would be abandoned and the wastewater would be diverted to the new regional plant by pumping stations and force mains as described for Alternative 8. To avoid the potential for raising the level of the ground-water, an underdrainage system would be provided. The renovated drainage water exceeding the secondary treatment standards, would be collected and pumped through a discharge force main to the St. Croix River. This alternative has an estimated initial cost of $3,651,000 and an estimated annual O&M cost of $23,000. The total present worth is estimated to be $3,375,000.

3. ENVIRONMENTAL IMPACTS

Construction Phase

Construction of any of the nine alternatives will produce primarily short-term impacts to the local environment. Construction of alternatives utilizing the existing WWTP sites (Alternatives 1, 3, and 4) would have the least potential for disruption and environmental impacts. The stabilization pond and land treatment alternatives (Alternatives 2, 5, 6, 8, and 9) would result in impacts along the force main and/or effluent discharge routes and the pond and/or land application sites. The regional alternatives (Alternatives 7, 8, and 9) would result in additional impacts along the force main route through the Wisconsin Interstate State Park and across the US Highway 8 bridge. Alternatives 8 and 9 also would involve the conversion of a significant amount of prime agricultural land (40 acres) from crop production.

Operation Phase

Implementation of independent treatment alternatives or a regional alternative by the communities would bring them into compliance with the effluent discharge standards of the respective States. Operation of any of the treatment alternatives would produce few significant long-term impacts. The operation of an expanded and rehabilitated St. Croix Falls WWTP (Alternative 1) with proper maintenance, alternate power supply, and duplicate unit processes would ensure a reliable treatment system that would improve water quality and create few long-term adverse environmental impacts. The rapid infiltration land application system for St. Croix Falls (Alternative 2) would have the potential for contaminating groundwater in the area and for raising the level of the groundwater. Because of the limited size of the site area for new secondary treatment facilities at Taylors Falls (Alternatives 3 and 4), it may be difficult to duplicate unit processes to provide for greater reliability in the treatment of wastewater. The stabilization pond treatment and spray irrigation disposal systems for Taylors Falls (Alternatives 5 and 6) offer greater flexibility for future expansion of the treatment system than the conventional treatment facilities (Alternatives 3 and 4), because they are not limited by the restrictive size of the site. The pumps at the pumping stations for Alternatives 5 and 6 will be properly maintained, and a backup power source will be provided in case a power failure should occur. The regional alternatives (Alternatives 7, 8, and 9) would present another potentially problematic system component with the force main supported over the St. Croix River by the US Highway 8 bridge. The force main would be subject to exposure and temperature extremes, and bridge flexure could cause leaks or joint failures resulting in a direct discharge of untreated sewage to the St. Croix River.

4. IMPLEMENTATION

The total costs to St. Croix Falls residents (annual user fees) would be higher for the construction and operation of a regional treatment system than for an independent treatment system; the costs to system users in Taylors Falls would be lower with a regional system. The ability to construct a regional treatment system may not be feasible, however, because of the difference in funding priorities for treatment facilities by the two States. Finally, the two communities have expressed no desire to form an interstate wastewater treatment district and to join in a regional system. The City of St. Croix Falls has gone on record preferring the expansion and rehabilitation of their existing treatment plant and the City of Taylors Falls has recommended the construction of a new stabilization pond wastewater treatment system.

5. RECOMMENDED ACTION

In consideration of these factors and others described in this Environmental Impact Statement (EIS), the US Environmental Protection Agency (USEPA) recommends that the City of St. Croix Falls upgrade and expand its existing WWTP (Alternative 1) and that the City of Taylors Falls construct a new stabilization pond treatment system (Alternative 5) to replace its existing WWTP. These two alternatives represent cost-effective, environmentally acceptable, and implementable solutions to meet these communities' wastewater treatment needs.

TABLE OF CONTENTS

Page

Page

LIST OF FIGURES

LIST OF FIGURES (concluded)

LIST OF TABLES

LIST OF TABLES (concluded)

LIST OF ABBREVIATIONS

AWT . . . . advanced wastewater treatment
BOD_5 . . . . 5-day biochemical oxygen demand
CAS. . . . . compact activated sludge
CBD . . . . central business district
CEQ . . . . Council on Environmental Quality
cfs . . . . cubic feet per second
CTH . . . . County Trunk Highway
CWA . . . . Clean Water Act
DEIS . . . . Draft Environmental Impact Statement
DO . . . . dissolved oxygen
EIS . . . . Environmental Impact Statement
gpcd . . . . gallons per capita per day
gpd . . . . gallons per day
gpm . . . . gallons per minute
I/I . . . . infiltration and inflow
kg/day . . . . kilograms/day
lb/ac/yr . . . . pounds per acre per year
lb/day . . . . pounds per day
MDNR . . . . Minnesota Department of Natural Resources
mg/l . . . . milligrams per liter
mgd . . . . million gallons per day
MN . . . . Minnesota
MPCA . . . . Minnesota Pollution Control Agency
MPN/100 ml . . . . . . most probable number per 100 milliliters
N . . . . nitrogen
NEPA . . . . National Environmental Policy Act
NPDES . . . . National Pollutant Discharge Elimination System
NPS . . . . National Park Service
NSP . . . . Northern States Power Company
NTU . . . . nephelometer turbidity units
O&M . . . . operation and maintenance
P . . . . phosphorus
RBC . . . . rotating biological contactor
SCS . . . . Soil Conservation Service

sq mi	square miles
SS	suspended solids
um	micrometers
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WCWRPC	West Central Wisconsin Regional Planning Commission
WDNR	Wisconsin Department of Natural Resources
WI	Wisconsin
WPDES	Wisconsin Pollutant Discharge Elimination System
WWTP	wastewater treatment plant

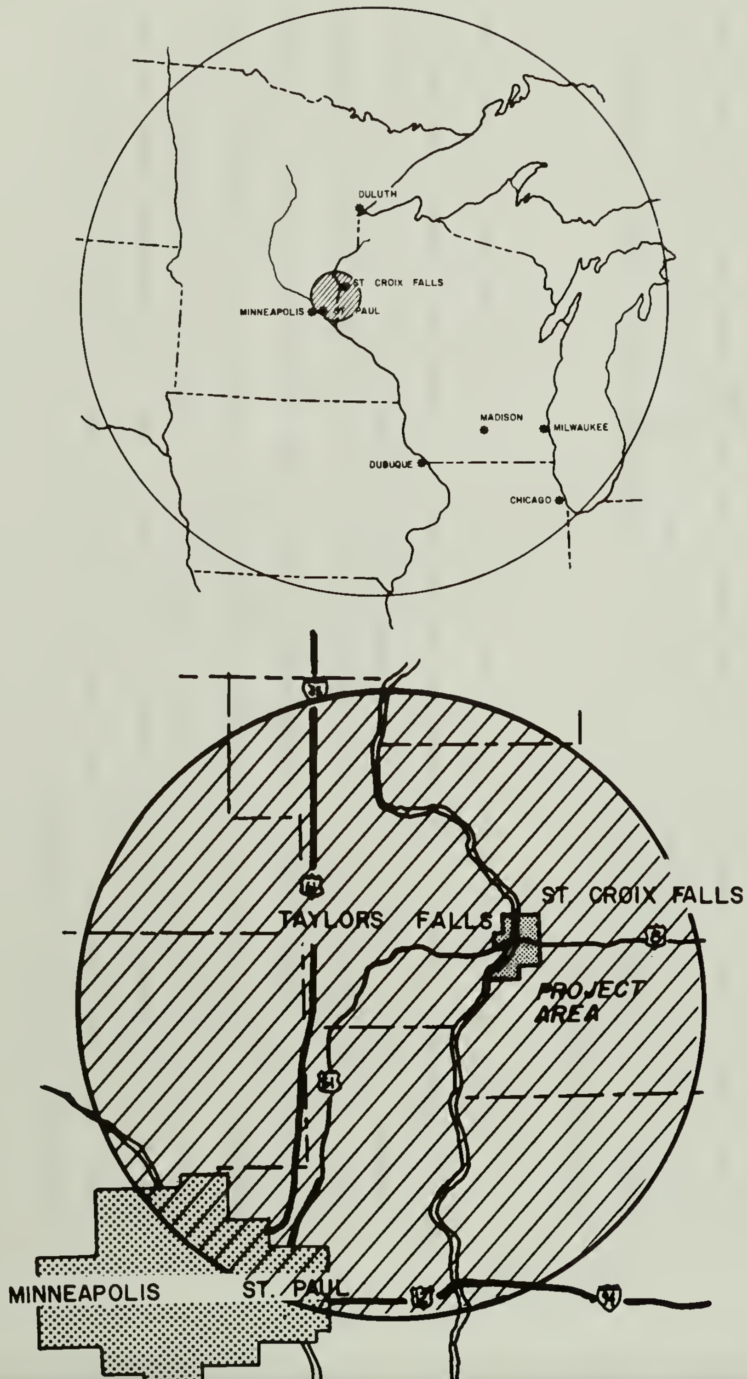
1.0. PURPOSE OF AND NEED FOR ACTION

1.1. Project Need and Legal Basis for Action

To meet the requirements of the Clean Water Act (CWA) an improved system to treat the wastewater at St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota (across the St. Croix River from each other; Figure 1-1), is needed. Presently both communities discharge partially treated wastewater to the River from deteriorated, overloaded treatment facilities.

The Clean Water Act (PL 92-500, as amended by PL 95-217) establishes a uniform, nationwide water pollution control program administered by the US Environmental Protection Agency (USEPA), within which all state water quality programs operate. The Wisconsin Department of Natural Resources (WDNR) and the Minnesota Pollution Control Agency (MPCA) have been delegated responsibilities for the National Pollutant Discharge Elimination System (NPDES) program by USEPA. The NPDES program was established by the CWA to regulate the quality of wastewater discharged to rivers and streams. USEPA retains approval and control over the NPDES program. Because of their deteriorated condition, the existing wastewater treatment plants (WWTPs) at St. Croix Falls and Taylors Falls are not capable of meeting State effluent limitations, which have been established under the NPDES program to protect the quality of the receiving water. These communities, therefore, are required either to upgrade the quality of, or to eliminate entirely, the discharge of wastewater effluent.

Facilities Plans have been completed by the two communities that include consideration of alternative solutions for meeting future wastewater treatment needs. These include upgrading/expanding the two existing facilities, a new stabilization pond system for Taylors Falls, combined treatment of the two communities' wastewater, and land disposal of the treated effluent. The possible treatment alternatives have been evaluated on the basis of the technical feasibility, reliability, costs, public desirability, and socioeconomic and environmental effects of the alternatives and on the basis of the ability of the improved facilities to meet the applicable effluent discharge standards.



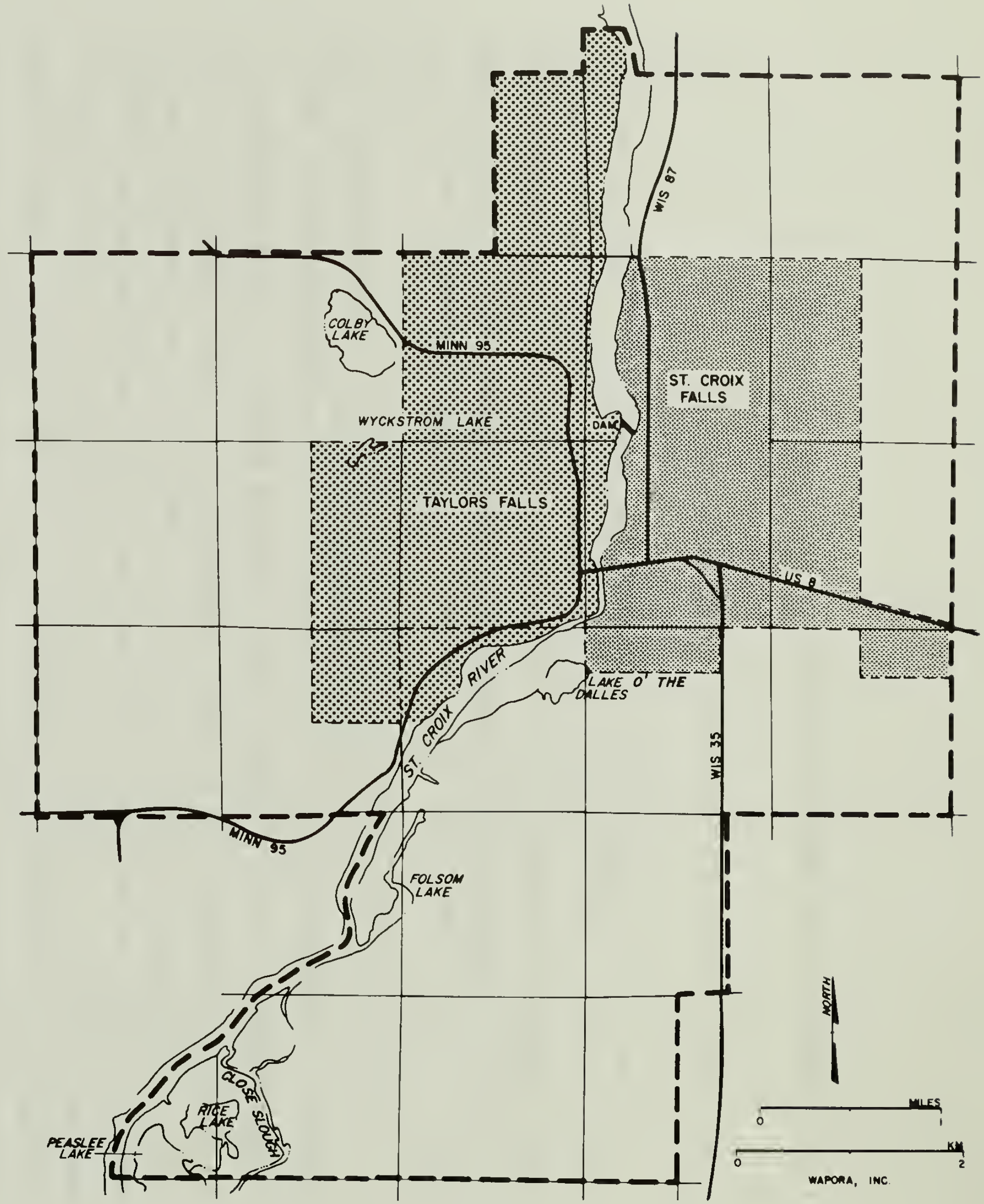


Figure 1-1. Location and boundaries of the St. Croix Falls, Wisconsin – Taylors Falls, Minnesota, project area.

Federal funding for wastewater treatment projects is provided under Section 201 of the CWA. The Act provides 75% Federal funding for eligible facilities planning, design, and construction costs. Portions of projects that are defined as innovative or alternative are eligible for 85% funding under the CWA.

The dispersal of Federal funds is made to local applicants via the Federal Construction Grants Program, which is administered by USEPA. The program consists of a three-step grant process: Step 1 includes wastewater facilities planning; Step 2 involves the development of detailed engineering plans and specifications; and Step 3 covers construction of the pollution control system. St. Croix Falls and Taylors Falls currently are completing Step 1, which involves planning for wastewater facilities that will be serviceable for at least 20 years, or until the year 2000.

The State of Wisconsin, through WDNR, and the State of Minnesota, through MPCA, administer the Federal Construction Grants Program at the State level. The State of Minnesota also provides an additional 15% of the costs for planning, design, and construction for Minnesota projects, except where the Federal share is larger than 75%. In such a case, the State's share is reduced. Because Federal grant regulations are, for the most part, the controlling factor in determining the selected (fundable) alternative, they significantly influence how the State grant funds are spent.

Communities may choose to construct wastewater treatment facilities without financial support from USEPA/State Grants Program. In such cases, the design must be considered by the State to be technically sound and the facility must be capable of meeting discharge standards. Without Federal assistance, construction costs would be borne by the States and local units of government. The funds available under the Wisconsin Fund (144.24 Wisconsin Statutes), may provide for 60% of eligible costs when Federal funds are unavailable.

If a community chooses to construct a wastewater treatment plant with USEPA grant assistance, the project must meet all requirements of the Federal Construction Grants Program. The CWA requires that the most cost-effective alternative be identified and selected. USEPA defines the cost-effective alternative as the one that will result in minimum total resource costs over the life of the project, while still meeting Federal, State, and local requirements. However, the cost-effective alternative is not necessarily the lowest cost proposal. The analysis for choosing the cost-effective alternative is based on both the capital (construction, engineering, and administrative) costs and the operation and maintenance (O&M) costs for a 20-year period, although only the capital costs are funded. Non-monetary costs, including social and environmental factors, also must be considered.

The National Environmental Policy Act of 1969 (NEPA) requires a Federal agency to prepare an Environmental Impact Statement (EIS) on "...major Federal actions significantly affecting the quality of the human environment ...." In addition, the Council on Environmental Quality (CEQ) published regulations (40 CFR Parts 1500-1508) to guide Federal agencies in determinations of whether Federal funds, or Federal approvals, such as the approval of the St. Croix Falls/Taylors Falls Facilities Plans would result in a project that would significantly affect the environment. USEPA developed its own regulations (40 CFR Part 6) for the implementation of the EIS process. Pursuant to these regulations, USEPA Region V determined on 27 July 1978 that an EIS was required for the proposed project at St. Croix Falls and Taylors Falls before the Facilities Plans could be approved. This decision was based on the potential for adverse impacts to the St. Croix National Scenic Riverway, the Wisconsin Interstate State Park, the Minnesota Interstate State Park, the Ice Age National Scientific Reserve, cultural sites, prime agricultural lands, wetlands, wildlife, recreational areas, and the socioeconomic environment.

1.2. Project History

During the past five years, wastewater treatment needs have been considered for a study area that included the municipalities of St. Croix Falls, Dresser, and Osceola, Wisconsin; the City of Taylors Falls, Minnesota; and adjacent areas. The St. Croix Falls-Dresser Metropolitan Sewerage District was formed in 1975 in response to the need to upgrade existing wastewater treatment facilities in the Wisconsin section of the project area. The

District initiated facilities planning for the construction of new treatment works that would serve the needs of both St. Croix Falls and Dresser and replace the existing, overloaded treatment plants.

A Facilities Plan for the St. Croix Falls-Dresser Metropolitan Sewerage District was completed by Banister, Short, Elliott, Hendrickson, and Associates, Inc., in March 1976 and revised in August 1976. The Facilities Plan recommended that a new regional WWTP be constructed at a location between St. Croix Falls and Dresser to serve the wastewater treatment needs of the two communities. The proposed facility would have discharged treated wastewater directly to the St. Croix River. Acceptance of the Facilities Plan by WDNR and USEPA was delayed because of questions regarding the potential impacts of the proposed new conveyance lines, the cost of the system, and the feasibility of alternative systems.

On 27 July 1978, USEPA published a Notice of Intent to prepare an EIS for a study area that included the St. Croix Falls-Dresser Metropolitan Sewerage District and the City of Taylors Falls planning area. During 1978, the F&A Dairy, which contributed a significant amount of wastewater to the Dresser WWTP, decided that it would discontinue its discharge to the City sewers and treat its own wastes. Because of the decision by F&A Dairy, Dresser determined that it could handle its own treatment system needs and withdrew from the District. This left St. Croix Falls to find its own solutions for wastewater improvement. After Dresser withdrew from the District, the EIS project area was revised to include only the cities of St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota. The City of St. Croix Falls amended the 1976 Facilities Plan for the St. Croix Falls-Dresser Metropolitan Sewerage District for its own use.

In 1978 the City of Taylors Falls received a Step I Grant from MPCA to begin preparation of a Facilities Plan. The City of Taylors Falls and MPCA determined that the planning area for the Facilities Plan would be the corporate limits of Taylors Falls. The Draft Facilities Plan for Taylors Falls was completed in March 1980 by Howard A. Kuusisto Consulting Engineers. This plan recommended the construction of a new stabilization pond treatment system to be located in Section 26 of Shafer Township, west of the

City. At about the same time, the St. Croix Falls Facilities Planner, Short-Elliott-Hendrickson, Inc., recommended that the expansion and upgrading of the existing St. Croix Falls WWTP would be the most environmentally sound and cost-effective alternative for St. Croix Falls.

On 28 April 1980, the St. Croix Falls City Council passed a resolution in favor of upgrading and expanding the existing wastewater treatment plant. On 14 May 1980, the City of Taylors Falls went on record in favor of the construction and operation of a stabilization pond system with a controlled discharge to the St. Croix River.

1.3. Study Process

The major efforts in the preparation of this Final EIS occurred during 1979 and 1980. During this period, WAPORA, Inc., USEPA's EIS consultant, submitted various interim reports to USEPA, including Existing Environmental Conditions in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, Wastewater Facilities Project Area.

Public meetings were sponsored by USEPA to facilitate public involvement during the preparation of the EIS:

Date	Location	Subject
24 May 1979	St. Croix Falls	Study process, EIS issues, and existing environmental conditions
10 December 1979	Taylors Falls	Wastewater treatment system alternatives and initial analyses of impacts
14 April 1980	Taylors Falls City Council	Initial cost analysis and environmental impacts of the wastewater treatment system alternatives
15 April 1980	St. Croix Falls City Council	Initial cost analysis and environmental impacts of the wastewater treatment system alternatives
30 March 1981	St. Croix Falls and Taylors Falls	Public hearings to receive comments on the Draft EIS

Several informational newsletters also were prepared during this time and mailed to persons who expressed interest in the project. The following participants in the wastewater planning process have coordinated their activities during the last two years: USEPA; WAPORA, Inc. (EIS consultant); Howard A. Kuusisto Consulting Engineers (Taylors Falls Facilities Planner); City of Taylors Falls; Short-Elliott-Hendrickson, Inc. (St. Croix Falls Facilities Planner); City of St. Croix Falls; MPCA; WDNR; Minnesota-Wisconsin Boundary Area Commission; National Park Service; and other Federal, State, local, and private agencies and organizations.

1.4. EIS Issues

Issues initially identified by USEPA in the 27 July 1978 Notice of Intent to Prepare an Environmental Impact Statement, and other issues subsequently determined through the EIS process, include:

- The quantity and quality of wastewater effluent that is produced by various wastewater treatment processes and the most cost-effective and implementable treatment methods and sites
- The impact of increased user charges to system users in St. Croix Falls and Taylors Falls
- The impact to local government finances from the indebtedness related to the local share of construction costs
- The potential for, and the possible impacts of, the release of pollutants to the St. Croix River or to groundwater from the various treatment methods and sites
- The conversion of prime agricultural land or wetlands to other uses through the construction of a new wastewater treatment facility and the potential for new residential growth from the expanded wastewater treatment capacity
- The impacts along the proposed interceptor/force main routes from the existing wastewater treatment plant sites to the stabilization pond and land application sites proposed in several of the alternatives
- The construction of a force main through the Wisconsin Interstate State Park, if a regional treatment system alternative is selected
- The potential contamination of soil and groundwater, and production of odors from the disposal of effluent on land
- The potential production of offensive odors from storing wastewater in storage ponds prior to release to the St. Croix River or land application

- The potential for leakage from the storage lagoons that would contaminate groundwater and thus preclude the use of groundwater for public water supply

- The effect on the value of property of areas adjacent to a wastewater land treatment or stabilization pond site

- The determination of the composition of sludge and residuals generated from various treatment processes and the best methods of treatment, transportation, disposal, and monitoring of sludges

- The possible danger to public health and welfare from aerosolization of pathogenic organisms and/or their accumulation on soil and plant surfaces, and from possible transmission into and through ground and surface waters for all treatment alternatives

- The commitment of resources, including but not limited to: construction materials, financial resources, and labor and energy resources

- The secondary impacts that would result from the implementation of all treatment alternatives

- The other environmental impacts that would result from the implementation of all treatment alternatives, including but not limited to: rare, endangered, or unique plant and animal species or associations; and cultural, archaeological, historical, and recreational resources.

2.0. RESPONSES TO COMMENTS ON THE DRAFT EIS

There were a number of comments on the Draft EIS (DEIS) received by mail or expressed at the public hearings held at St. Croix Falls and Taylors Falls. Responses to these comments are presented below. Copies of the letters received are included at the end of this section.

2.1. Correspondence from Federal Agencies

Advisory Council on Historic Preservation (11 March 1981)

Impacts on prehistoric and historic cultural properties located at the sites of the St. Croix Falls and Taylors Falls recommended alternatives:
Refer to Section 5.1.5. and the comment letters from the State Historical Society of Wisconsin and the Minnesota Historical Society at the end of Section 2.0.

Corps of Engineers, US Department of the Army (27 March 1981)

A permit will be required for any work performed below the ordinary high-water mark of the River or for the placement of fill material in wetlands adjacent to the River:
Refer to Section 5.1.2.

US Department of the Interior (15 April 1981)

1. No discussion of mineral resources at the site of the Taylors Falls recommended alternative in the DEIS:
   There are no commercially valuable minerals located in the Taylors Falls area (By telephone, Mr. G. B. Morey, Minnesota Geological Survey, to WAPORA, Inc., 14 May 1981).

2. Recommendation for additional study of on-land disposal:
   Comment noted. The designs and costs for the alternatives prepared by the Facilities Planners for each community were the bases for the selection of the recommended alternatives by USEPA. According to the Facilities Planners, the on-land disposal alternatives were not the most cost-effective for each community, based on total present worth.

3. Quality of the effluent discharged to the River should be equal to, but not lower than, the present river water quality :
   The State of Wisconsin's effluent limitations are not as stringent as the State of Minnesota's (Section 3.2.2.). The St. Croix Falls wastewater treatment plant must meet only the Wisconsin effluent limitations, which are stated in the WPDES permit.

4. Wisconsin Interstate State Park does not discharge to the Taylors Falls WWTP:
   Statement has been corrected; refer to Section 3.2.1.

5. Incorrect names of transportation routes:
   The errors have been corrected; refer to Section 4.2.4.5.

6. Incorrect headings on Table 4-22:
   The headings have been corrected; refer to Section 4.2.4.5.

7. Incorrect usage of Route 5 as descriptor:
   Route 5 has been changed to County Trunk Highway S; refer to Section 4.2.4.6.

8. Comparison of the slow-rate irrigation system site at Dickinson, North Dakota, with the proposed Taylors Falls site:
   Comment noted. Neither spray irrigation system alternative (Alternatives 6 and 9) was selected as a recommended alternative. Refer also to Section 5.2.3.2.

9. Recommendation to restrict definition of groundwater:
   Definition modified; refer to Section 8.0.

10. Recommendation to restrict definition of aquifer:
   Definition modified; refer to Section 8.0.

<u>US Department of Housing and Urban Development</u> (21 April 1981)

Possibility of future recreation-oriented residential development on the shores of the St. Croix River that may affect floodplains, wetlands, and prime farmland:

No residential development is planned on the shores of the River at St. Croix Falls WI or Taylors Falls MN, and no suitable land is available for development (By telephone, Ms. Bernice Peterson, City Clerk, City of Taylors Falls and Ms. Marion Edler, City Clerk, City of St. Croix Falls, to WAPORA, Inc., 14 May 1981). Thus no mitigation measures need be discussed in the EIS for control of such development.

<u>US Department of Transportation</u>, Federal Highway Administration, (23 April 1981)

1. Attachment of a force main to the US Highway 8 bridge for Regional Alternatives 7, 8, and 9:
   The regional alternatives were not selected as the recommended alternative because they are not the most cost-effective, environmentally acceptable, or implementable alternatives. Therefore, the intergovernmental coordination associated with the attachment of the force main to the US Highway 8 bridge was never addressed.

2. Planned repair of the deck on the US Highway 8 bridge by the Wisconsin Department of Transportation in 1983:
   If a regional alternative were selected, repairs to the bridge deck should be coordinated with the construction of the alternative to minimize traffic congestion. Refer to Section 5.5.1.

US Department of the Interior (28 April 1981)

Utilization of the Land and Water Conservation Fund by WDNR in the acquisition and development of the Wisconsin Interstate State Park, as it relates to the construction of a force main through the park for Regional Alternatives 7, 8, or 9:
Information included; refer to Section 5.1.

2.2. Correspondence from State of Minnesota Agencies

East Central Regional Development Commission (25 March 1981)

Concurrence with the selection at the recommended alternatives:
Comment noted.

Minnesota Pollution Control Agency (14 April 1981)

1. Sludge disposal at sanitary landfills in Minnesota:
   Refer to Section 3.3.5.2.

2. Wetland areas exist at the site of recommended Alternative 5. However, if a sufficient amount of high ground is available, MPCA does not see any problems associated with locating the stabilization ponds there:
   Comment noted.

3. Use of a plastic membrane or a clay liner for the stabilization ponds of Alternative 5. If a clay liner is used, the suitability of the borrow area should be determined to insure that no significant environmental damage occurs to the site:
   The Taylors Falls Facilities Planners performed preliminary soil borings at the proposed stabilization pond site and initially determined that the need for a soil seal is probable. The Facilities Planners intend to evaluate the site further during Step 2. However, for the purposes of the Facilities Plan, a higher seal cost was assumed through the use of a plastic membrane or clay liner (By telephone, Mr. Greg Pederson, Howard A. Kuusisto Consulting Engineers, to WAPORA, Inc., 18 May 1981). The potential borrow area for clay that would be a suitable liner has not been identified. The design engineer should specify how the borrow area would be reshaped and restored. This item normally is incorporated during the review of the design plans and specifications.

4. Error in forage crop uptake rate:
   Error has been corrected; refer to Section 5.2.3.2.

5. Clarification of Alternative 5 as most expensive alternative:
   Refer to Section 3.6.1.

6. Suitability of the proposed stabilization pond site of Alternative 5, especially in the event of high groundwater levels:
   The Taylors Falls Facilities Planner performed a site survey and found no problems associated with the site. Although some

wet spots were noted, there is enough high ground on which to locate the pond (By telephone, Mr. Greg Pederson, Howard A. Kuusisto Consulting Engineers, to WAPORA, Inc., 18 May 1981).

The preparation of the EIS was based on data and engineering judgements supplied by the Facilities Planners. The EIS is not intended to satisfy the requirements of a complete Facilities Plan. The task of preparing an approvable Facilities Plan is the responsibility of the Grantee.

Minnesota Historical Society (23 April 1981)

No archaeological or historic sites known to be located at the site of Alternative 5:
Comment noted; refer to Section 5.1.5.

2.3. Correspondence from State of Wisconsin Agencies

The State Historical Society of Wisconsin (26 February 1981)

No archaeological or historic sites known to be located at the site of Alternative 1:
Comment noted; refer to Section 5.1.5.

Minnesota-Wisconsin Boundary Area Commission (7 April 1981)

Recommendation for selection of Alternative 9 instead of Alternative 5:
Comment noted. The recommended alternatives for St. Croix Falls and Taylors Falls were selected primarily on the basis of the cost-effective analyses prepared by their respective Facilities Planners and the preferences of both communities concerning the recommended alternatives. The total present worth of Alternative 9 was significantly greater than that of the recommended alternatives.

Lower St. Croix Management Commission (10 April 1981)

1. Clarification of procedure used to determine unacceptability of land disposal system (Alternative 2):
Alternative 1 was selected as a recommended alternative based on the cost-effectiveness analysis provided by the Facilities Planners and on the desire of St. Croix Falls to implement that alternative. No conclusions were drawn that treatment by land application was "unacceptable."

2. Clarification of how the conclusion of non-degradation of the receiving stream was reached by USEPA:
The calculation of the effect of the WWTP discharges on the River was based on the dilution ratio of the discharge rate to the volume and rate of the river flow. No assimilative capacity calculations were completed because the two discharges are insignificant when compared with the flow in the River. The conclusion that the discharge of treated effluent from expanded/upgraded treatment facilities would not adversely affect river water quality was based primarily on the studies of the

effects of the current discharges. Due to better treatment, the expanded/upgraded treatment facilities would discharge less BOD_5 than presently is removed. Also refer to Section 5.2.1.2.

3. Clarification of amount of funding available for a regional facility built in Minnesota:
   No commitments for funding under various scenarios of Federal and State grant participation were obtained. The various agencies have declined to commit funds to these projects because higher-priority projects have expended available funds. The assumptions used in the calculation of the respective funding shares are given in Appendix E. The cost shares were calculated on the basis of the average daily summer flows from the respective communities.

State of Wisconsin, Department of Transportation (10 April 1981)

1. Unsuitability of the US Highway 8 bridge for attachment of sewage force main:
   Comment noted. Although none of the regional alternatives (Alternatives 7, 8, and 9) were selected as the recommended alternative, they have reasonable costs, particularly if Federal funds are unavailable. The pressures that would be experienced in the force main are expected to be very low because the discharge point at either existing WWTP site is at a lower elevation than the bridge, regardless of which direction the sewage is pumped. Suspension of the force main from the bridge appeared to be a reasonable assumption for initial costing purposes. If a regional alternative were to be selected, the Facilities Planners should engage in discussions with the bridge engineers as to whether the force main could be suspended from the bridge.

2. Incorrect use of Route 5:
   Correction made; refer to response #7 to US Department of the Interior comments of 15 April 1981 and to Section 4.2.4.6.

3. Wisconsin Department of Transportation permit is required for any sewer line that would cross or lie within the right-of-way of a State Trunk System highway:
   Refer to Section 5.1.

4. Scheduled repair of the US Highway 8 bridge deck in 1983:
   Refer to response #2 to US Department of Transportation comments.

State of Wisconsin, Department of Natural Resources (13 April 1981)

1. Error on cover page of Draft EIS:
   Error corrected.

2. Explanation of difference between the costs for Alternative 1 presented in the Facilities Plan and those presented in EIS:
   Refer to Section 3.4.2.

3. Level of treatment provided in Alternatives 5 through 9:
   Refer to Summary Section.

4. Percentage of eligible construction costs that may be provided by the Wisconsin Fund:
   Refer to Sections 1.1. and 5.3.

5. Possible revision of the WPDES permit to 0.4 mgd from the present design flow of 0.18 mgd to 0.4:
   Refer to Section 3.2.2.

6. Possible use of ultraviolet light as a disinfection technique:
   Refer to Section 3.3.3.4.

7. Availability of effluent discharge data for St. Croix Falls Fish Hatchery:
   Refer to Section 4.1.4.4.

8. Change in the status of the red-shouldered hawk from priority status in State of Wisconsin to threatened in State:
   Correction made; refer to Section 4.1.8.2., Table 4-9.

9. Population projections developed by the Facilities Planners should be mentioned in EIS:
   Comment noted.

10. Quality of wastewater treatment to be provided during the expansion of the existing WWTP:
    Comment noted. Maintenance of the necessary level of treatment during the construction phase should be addressed during the Step 2 phase of the project. The contractor has the responsibility to maintain treatment at a level equivalent to that provided prior to construction. The contractor must submit a plan to the consulting engineer for approval that outlines how treatment will be maintained, including sludge digestion and disposal (By telephone, Mr. Wilbur Liebenow, Short-Elliott-Hendrickson, Inc., to WAPORA, Inc., 15 May 1981).

11. Economic impacts on the residents of St. Croix Falls due to the cummulative effects of the costs of the wastewater treatment facilities and the construction of the new school:
    The present per capita debt in St. Croix Falls is $1,347, which includes the City's portion of the construction costs of the new school (Refer to DEIS, Section 3.2.3.1.) The per capita debt associated with the financing of the wastewater treatment facilities for both communities is presented in Table 5-6 and is discussed in Section 5.3.2. Although St. Croix Falls appears to be approaching its capacity for incurring additional debt, Alternatives 1 and 2 (which are similar in cost) would have the least impact on municipal finances.

12. Measures for mitigation of adverse impacts, including compliance with current regulations:
    Comment noted.

13. Mitigation of construction impacts through selection of best management practices appropriate to project requirements, available equipment, and weather conditions:
    Comment noted.

14. Location of odorous soils along the force main route:
    The sentence has been deleted; refer to Section 5.5.1.

15. Unsuitability of wetlands and other sensitive areas as spoil disposal sites:
    Refer to Section 3.3.4.3.

2.4. Correspondence from Individuals in St. Croix Falls

Warren White (10 March 1981)

1. Has the National Park system stated that a discharge of 30/30 effluent will always be permitted:
   WDNR has set effluent limits for the St. Croix River with input from the National Park Service. WDNR cannot guarantee that no change from the 30/30 discharge will occur during the next 20 years.

2. Is the existing wastewater treatment plant to be demolished and replaced with rotating biological contactors (RBCs), or could RBCs be added to the present facility:
   The trickling filter function will be replaced by the RBC function; the facilities planning documents did not include a site plan showing the location of the proposed units.

3. Adoption of the EIS and commencement of Step 2:
   St. Croix Falls may be able to get Step 2 funds from the State of Wisconsin, if so, plans to upgrade and expand the WWTP should continue.

   Reevaluation of Alternative 1 to only add treatment capacity:
   The existing building was not proposed for demolition, but in order to accomodate the 20-year projected flows, the Facilities Planner made engineering decisions based on his best judgement. In Step 2, changes in the selected plan may be made as long as the overall function of the facilities is not impaired and the respective State and Federal agencies concur with the proposed changes.

4. Necessity of storage basin for Alternative 2:
   Comment noted. Discharging effluent to infiltration beds can be accomplished year-round in cold climates. This is done at Grantsburg, Wisconsin, about 30 miles north of St. Croix Falls, as well as in a similar climate at Lake George and Bolton Landing, New York. The infiltration beds could be constructed

to provide temporary storage if it were needed during unusually severe weather conditions.

The storage basin cost was not estimated separately by the Facilities Planner. The construction cost for the total pond system, including three-month storage capacity, was estimated at $250,000. The portion of this total that would be associated with the storage basin and the portion required for the infiltration basin was not provided. Based on approximate costs from the USEPA technical report entitled <u>Cost of Land Treatment Systems</u>, approximately two-thirds of the cost may be attributable to the storage basin. If this is the case, the capital cost of the alternative may be as low as $972,000, or about $150,000 less than Alternative 1, the recommended alternative. Deletion of the storage basin may not reduce the O&M costs appreciably. The O&M costs of the rapid infiltration alternative were estimated by the Facilities Planner to be $40,000, or $9,000 greater than Alternative 1. The land application alternative then would be the least costly alternative for St. Croix Falls. However, the question of whether the soil characteristics at the rapid infiltration site are satisfactory for this alternative remains unanswered.

5. Justification of need for a storage lagoon liner for rapid infiltration site:

   One reason for a liner in a lagoon where wastewater is stored prior to rapid infiltration is that the lagoon may be located at a site independent from the infiltration site if conditions at the lagoon site are unacceptable for rapid infiltration. Another reason may be that the lagoon is used as a polishing pond for treatment plant effluent with a BOD_5 level considerably greater than 50 mg/l. It is difficult to conceive of other situations where a liner would be required in a storage basin. The sentence referring to a liner being required for a storage lagoon has been deleted.

6. Figures C-5 and C-6 are too general to serve as the basis for an adequate discussion of groundwater in Section 29:

   The acquisition of more detailed information on groundwater would require further field investigations. According to the costs developed by the Facilities Planners, Alternative 2 is not the most cost-effective alternative; therefore, additional field investigations are not feasible at the present time.

7. Extent of funding assistance available from EPA, FmHA, and Wisconsin:

   Currently, no grant funds are available from USEPA or the State of Minnesota. The Wisconsin Fund may have 60% grant monies available for St. Croix Falls. These realities do have an impact on what appears to be the least costly system for Taylors Falls, though not for St. Croix Falls. (Table E-1 in Appendix E was recalculated using the current funding probabilities and is presented in this section as Table 2-1.) For

Table 2-1, Estimated user charges for Alternatives 1 through 9, based on unavailability of Federal funds.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	Upgrade/Expand Existing WWTP at St. Croix Falls	Land Disposal System at St. Croix Falls	CAS System for Taylors Falls	RBC System for Taylors Falls	Pond System for Taylors Falls	Land Disposal System for Taylors Falls
I. Cost						
Capital Cost[a,b]	1,124,000	1,181,000	988,000	985,000	1,164,000	1,584,000
Annual O&M	31,000	40,000	36,000	27,000	18,000	21,000
Community's Share of Cost of Regional System	--	--	--	--	--	--
Capital Cost	--	--	--	--	--	--
Annual O&M	--	--	--	--	--	--
II. Capital Cost Distribution						
Federal	--	--	--	--	--	--
State	674,400 (60%)	708,600 (60%)	--	--	--	--
Local	449,600 (40%)	472,400 (40%)	988,000 (100%)	985,000 (100%)	1,164,000 (100%)	1,584,000 (100%)
III. Annual Cost[c]						
O&M--Residential	27,900	36,000	26,100	21,300	14,200	16,600
O&M--Interstate State Park	3,100	4,000	6,900	5,700	3,800	4,400
Debt service--Residential	38,600	40,500	74,400	74,200	87,600	119,300
Debt service--Interstate State Park	4,300	4,500	19,800	19,700	23,300	21,700
IV. Typical Monthly Residential User Charge[d]						
O&M--Residential	4.20	5.40	9.90	8.10	5.40	6.30
Debt service--Residential	5.80	6.10	28.20	28.10	33.20	45.20
Total Monthly Residential	10.00	11.50	38.10	36.20	38.60	51.50
V. Annual Residential User Charge	120.00	138.00	457.00	434.00	463.00	618.00

[a]The distribution of capital costs is determined as follows.
For Taylors Falls MN, Alternatives 3, 4, 5, 6, 7, 8, and 9, the capital cost distribution is:

100% x total cost = Local cost

For all projects in St. Croix Falls WI, Alternatives 1, 2, and 7, the capital cost distribution is:

60% x total cost = State cost
40% x total cost = Local cost.

[b]For the Regional Alternatives 7, 8, and 9, the cost allocated to each community was based on the community's waste flow. The cost allocation was determined as follows:

74% x total cost = St. Croix Falls' share
26% x total cost = Taylors Falls' share.

[c]The Interstate State Park contributes significantly to each community's waste flow and therefore is considered separately. For each community, commercial and industrial flows are included in the residential share. In Taylors Falls the residential share is 79%; the Interstate State Park share is 21%. In St. Croix Falls the residential share is 90%; the Interstate State Park share is 10%.

[d]Residential user charges are based on 1980 estimated populations and estimated number of persons per household. In Taylors Falls the 1980 population is estimated to be 655 with 2.98 persons per household. The number of households therefore is estimated to be 220. In St. Croix Falls, the 1980 population is estimated to be 1643 with 2.95 persons per household. The number of households therefore is estimated to be 557.

Table 2-1. Estimated user charges (concluded).

Alternative 7		Alternative 8		Alternative 9	
Regional Conventional WWTP at St. Croix Falls		Regional Stabilization Pond System Near Taylors Falls		Regional Land Disposal System Near Taylors Falls	
2,113,000		2,660,000		3,651,000	
62,000		31,000		23,000	
St. Croix Falls--74%	Taylors Falls--26%	St. Croix Falls--74%	Taylors Falls--26%	St. Croix Falls--74%	Taylors Falls--26%
1,563,600	549,400	1,968,400	691,600	2,701,700	949,300
45,900	16,100	22,900	8,100	17,000	6,000
--	--	--	--	--	--
938,200 (60%)	--	1,181,000 (60%)	--	1,621,000 (60%)	--
625,400 (40%)	549,400 (100%)	787,400 (40%)	691,600 (100%)	1,080,700 (40%)	949,300 (100%)
41,300	12,700	20,600	6,400	15,300	4,700
4,600	3,400	2,300	1,700	1,700	1,300
53,600	41,400	67,500	52,100	92,700	71,500
6,000	11,000	7,500	13,800	10,300	19,000
6.20	4.80	3.10	2.40	2.30	1.80
8.00	15.70	10.10	19.70	13.90	27.10
14.20	20.50	13.20	22.10	16.20	28.90
170.00	246.00	158.00	265.00	194.00	347.00

Taylors Falls, the alternative with the least cost impact on the local residents is the RBC system at the existing site. Viewed regionally, the regional RBC system at the St. Croix Falls WWTP site has the least total impact on local financing. The cost shares between Taylors Falls and St. Croix Falls were apportioned based on the proportional flow contributed by each municipality; other formulas for apportioning shares are possible.

Interest rate for user cost calculations:
The interest rate used for calculating the cost per hook-up was 7.125%. The interest rate in the current municipal bond market fluctuates around 11%. The 7.125% rate is specified by the Water Resources Council for cost-effectiveness analyses for federally funded projects; thus this rate was used consistently throughout the analysis. A higher interest rate would result in much higher local costs for the capital-intensive alternatives and proportionately lower costs for the O&M-intensive alternatives.

Cost estimate reliability:
The designs and cost estimates were developed by the Facilities Planners. Although some discrepancies may exist, the preparation of new designs and cost estimates independently through the EIS process was not thought to be justified. Such discrepancies, if any, are believed to be relatively minor.

8. Use of a 20 inch/week land application rate rather than a 10 inch/week rate:
The 10 inch/week application rate to the rapid infiltration basins is conservative; however, the persons responsible for reviewing the facility planning documents to date have not questioned the design and costing. With an application rate of 10 inches/week, an application area of 10.3 acres within the beds would be required; doubling the application rate would halve the application area. Since no site investigations were conducted, it is probable that the Facilities Planner decided that a conservative design was appropriate for use until the initial screening process was completed. If the rapid infiltration alternative had been identified as a cost-effective alternative, site testing would have been appropriate.

2.5. Comments at the St. Croix Falls Public Hearing

<u>Wisconsin Department of Natural Resources</u>

1. WDNR ownership of land at site of the existing treatment plant:
WDNR has made an informal agreement with the City of St. Croix Falls to grant the additional land required for the expansion of the WWTP (By letter, Mr. David A. Jacobson, WDNR, to Mr. James Erickson, City of St. Croix Falls, 8 May 1980). However, WDNR cannot make a legal commitment until a detailed proposal to expand the existing WWTP is presented to them.

2. Maintenance of the level of treatment during construction:
   Refer to response #10 to WDNR written comments.

3. State Administration Code NR110 requires a 500-foot minimum setback distance between a residence and a wastewater treatment plant:
   Refer to Section 5.5.1.

4. Severe limitations at the site and concern regarding the capability of the site to accommodate further growth:
   The expanded WWTP (Alternative 1) has been designed to handle wastewater needs for the next 20 years, based on population projections. Expandability was a factor in selection of the recommended alternative.

Warren White

Refer to responses to Warren White's written comments.

Regina Miller

Concern over the additional cost of the recommended alternative because of the new 5 million dollar school:

Comment noted.

2.6. Comments at the Taylors Falls Public Hearing

Howard A. Kuusisto Consulting Engineers, Greg Pederson

Belief that Kuusisto Consulting Engineers have formulated a viable wastewater treatment alternative to meet the needs of Taylors Falls; comments on projections for user charges and probable changes associated with Government cost figures:

Comments noted.

Howard DuFore

Concern over the availability of Federal funds and residents' share of the costs:

Comments noted. Refer to response #3 to Lower St. Croix Management Commission.

Howard A. Kuusisto Consulting Engineers, Howard A. Kuusisto

Project infeasibility without a grant structure:

Comments noted.

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

March 11, 1981

U.S. Environmental Protection Agency, Region V
230 South Dearborn Street
Chicago, IL 60604

Dear Sir:

The Council has reviewed your draft environmental impact statement for the St. Croix Falls, Wisconsin, and Taylor Falls, Minnesota, wastewater treatment systems circulated for comment pursuant to Section 102(2)(C) of the National Environmental Policy Act. We note that the undertaking will affect several known prehistoric and historic cultural properties that may be eligible for inclusion in the National Register of Historic Places. Circulation of a draft environmental impact statement, however, does not fulfill your responsibilities under Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320).

Prior to the approval of the expenditure of any Federal funds or prior to the granting of any license, permit, or other approval for an undertaking, Federal agencies must afford the Council an opportunity to comment on the effect of the undertaking on properties included in or eligible for inclusion in the National Register of Historic Places in accordance with the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800) (enclosed). Until these requirements are met, the Council considers the draft environmental statement incomplete in its treatment of historical, archeological, architectural, and cultural resources. You should obtain the Council's substantive comments through the process outlined in 36 CFR Sec. 800.9. These comments should then be incorporated into any subsequent documents prepared to meet requirements under the National Environmental Policy Act. Sharon Conway may be contacted at 202-254-3974 for further assistance.

Sincerely,

Jordan E. Tannenbaum

Jordan E. Tannenbaum
Chief, Eastern Division
of Project Review

Enclosure

DEPARTMENT OF THE ARMY
ST PAUL DISTRICT. CORPS OF ENGINEERS
1135 U. S. POST OFFICE & CUSTOM HOUSE
ST PAUL. MINNESOTA 55101

REPLY TO
ATTENTION OF:

NCSCO-RF (CC-0588-37)

27 MAR 1981

Ms. Marilyn Sabadaszka, Project Officer
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Ms. Sabadaszka:

Thank you for submitting for comments the draft environmental impact statement on the St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, Wastewater Treatment Systems.

We have no comments regarding the adequacy of the DEIS. However, any work performed below the ordinary high-water mark of the St. Croix River or fill material placed in wetlands adjacent to the river will reguire an individual Department of the Army permit.

Please contact us with specific plans when the proposed project enters the planning stage. We will then be able to comment more explicitly about permit requirements.

Sincerely,

Harold E. Taggatz

HAROLD E. TAGGATZ
Chief, Regulatory Functions Branch
Construction-Operations Division

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

ER 81/286

April 15, 1981

Mr. James A. Hanlon, Chief
Environmental Engineering Branch
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hanlon:

The Department of the Interior has reviewed the draft environmental impact statement for wastewater treatment systems, St. Croix Falls, Wisconsin, and Fergus Falls, Minnesota and offers the following comments, both general and specific.

We found no discussion of mineral resources in the document. Although available data indicates that no mining has occurred, known mineral resources of the project area include sand and gravel, limestone, traprock, and copper. Because the site selected for the Taylors Falls Stabilization Pond encompasses 40 acres, we recommend that a discussion of the mineral resources and an analysis of the project's effect upon such resources be made.

We recommend further study of on-land disposal. The adversity of this alternative appears to be based on economic rather than environmental reasons. In point of fact, it is suggested in the document itself that further study is warranted.

If alternative #1 is selected for St. Croix Falls, we believe that the quality of the effluent discharged into the river should be equal to, but no lower than, the present river water quality. Waters which are of quality better than the established standards should be maintained at high quality and not degraded to the standard. This is a part of the Minnesota W2 standards and should be applied to the whole of the St. Croix River.

Specific Comments

On page 2-11, first paragraph: It appears that the Wisconsin Interstate State Park discharges to Taylors Falls. It does not; this should be clarified.

On page 3-65, the last paragraph refers to "State Route 61 and 35 to State Route 8 . . . . " It should be "U.S. Route 61 and Interstate 35 to U.S. Route 8 . . . . " Also in this section (3.2.4.4 Transportation) there is no mention of Wisconsin Route 35 which carries traffic into the area from I-94 on the south and the Duluth-Superior area on the north.

On page 3-66, Table 3-23, the headings are incorrect. They should read "Minnesota State 95, U.S. Highway 8, U.S. Highway 61 and Interstate Highway 35".

On page 3-67, last paragraph, fourth line, "Route 5" should be "County Road S".

On page 4-33, reference is made to the use of a slow-rate irrigation system for effluent treatment at Dickinson, North Dakota; reportedly the system has operated successfully for 17 years. We suggest that the discussion of the example should include or compare significant factors at the Dickinson and Taylors Falls sites, especially soil characteristics, aquifer types, and depths of water.

On page 7-4, the definition of ground water is too broad to be significant, as it might include, for example, soil moisture and water in the vapor phase. We suggest that a more meaningful definition would restrict ground water to that in the zone of saturation.

On page 7-1, the definition of aquifer should be restricted to geologic strata or units that will yield useful or economically significant volumes of ground water. Most rock units contain some water; however, quantities yielded within a reasonable length of time may be insignificant.

Sincerely yours,

Sheila D. Minor

Sheila D. Minor
Regional Environmental Officer

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CHICAGO REGIONAL OFFICE
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

REGION V

IN REPLY REFER TO:
5C

21 APR 1981

Mr. Gene Wojcik
Chief, EIS Section
U.S. EPA
230 South Dearborn
Chicago, Illinois 60604

Dear Mr. Wojcik:

We have reviewed the draft Environmental Impact Statement for the St. Croix, Wisconsin and Taylor Falls, Minnesota Water Treatment Systems submitted under cover of letter from your Agency dated February 20, 1981 and have the following observations.

In general we find the report satisfactory and recommended alternatives acceptable. We are concerned, however, that improvements made in the Water Treatment Systems may result in recreation oriented residential development on both sides of the river adjacent flood plains and wetlands. Such development may (a) exacerbate the problem of development in floodplains, (b) degrade wetland areas and (c) consume additional prime agricultural land.

We recommend that the final EIS attempt to identify where future development is anticipated and determine local or state controls which may be taken to mitigate adverse effects. If you have any questions regarding this issue you may communicate directly with Robert Goulka, Milwaukee Area Office Environmental Clearance Officer at FTS 362-3356.

Sincerely,

Ron Gatton

Ron Gatton
Regional Administrator

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5
18209 DIXIE HIGHWAY
HOMEWOOD, ILLINOIS 60430

April 23, 1981

IN REPLY REFER TO: HEP-05

Mr. Gene Wojcik, Chief
EIS Section, Water Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Sir:

The draft EIS for the St. Croix, Wisconsin and Taylor Falls, Minnesota water treatment systems has been reviewed and we offer the following comments for your consideration in developing the final.

Based upon our review, we note that Alternates 7, 8 and 9 would involve attachment of a sewage force main to the existing US-8 bridge over the St. Croix River between Taylor Falls, Minnesota and St. Croix Falls, Wisconsin. We find no mention of the completion of the intergovernmental coordination that such a proposal would necessitate. We also find no mention of whether the proposal has been determined to be a viable alternative based on coordination with the maintaining agency. The environmental effects listed for such a proposal are serious, e.g., possible closure of portions of a heavily traveled bridge for extended periods. If such effects have been discussed with and approved by the maintaining agency, and the alternative has been determined to be viable, it should be so indicated.

We must also point out that the deck on the US-8 St. Croix River bridge is currently scheduled for replacement by WISDOT in their 1983 construction program. If the implementation of EPA Alternatives 7, 8 or 9 were coordinated with the scheduled bridge rehabilitation, the short term construction effects of the force main could be minimized.

Sincerely yours,

Martin J. Monahan

FOR James A. Walsh
Associate Regional Administrator
for Planning and Program Development

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

RECEIVED
'81 MAY 4 PM 12 33
WATER DIVISION

April 28, 1981

Mr. James A. Hanlon, Chief
Environmental Engineering Branch
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hanlon:

The Department of the Interior has reviewed the draft environmental impact statement for wastewater treatment systems, St. Croix Falls, Wisconsin and Fergus Fall, Minnesota. This is a follow-up to our letter dated April 15, 1981, and we request that the following concerns regarding recreational resources be included in our comments on the project.

The force main route for transfer of raw wastewater from Taylors Falls to the St.Croix Falls WWTP in Alternative 7, or from St. Croix Falls to Taylors Falls in Alternatives 8 and 9, would cross Wisconsin Interstate Park, including an area that contains a campground and picnic area. It should be noted that Land and Water Conservation Fund assistance has been utilized by the Wisconsin Department of Natural Resources in the acquisition and development of the park.

Section 6(f) of the Land and Water Conservation Fund Act stipulates that no property so assisted shall be converted to other than public outdoor recreation use without the approval of the Secretary of the Interior. If the force main right-of-way would not preclude the use of the land for outdoor recreation, the State Department of Natural Resources may issue a permit for the pipeline construction with prior approval by the U.S. Department of the Interior. The permit would include conditions for construction of the pipeline, operation and maintenance procedures, emergency procedures, and the like. However, should the development of the force main preclude public outdoor recreation activities on any of the right-of-way, it would be necessary for the conversion to be approved by the Secretary of the Interior. That Official may approve the conversion only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

Regional Director

It should also be noted that Land and Water Conservation Fund assistance has been provided to the Minnesota Department of Natural Resources for Minnesota Interstate Park. The above comments, therefore, also would apply to this park should any of its land be required for the wastewater treatment systems project.

Sincerely yours,

Sheila D. Minor
Regional Environmental Officer

East Central Regional Development Commission

Serving Local Governments in Chisago, Isanti, Kanabec, Mille Lacs and Pine Counties

March 25, 1981

Mr. Gene Wojcik, Chief EIS Section
US. EPA
230 Dearborn St.
Chicago, Illinois 60604

Dear Mr. Wojcik:

The East Central Regional Development Commission has reviewed the draft St. Croix Falls, Wisconsin and Taylors Falls, Minnesota Waste Treatment Systems EIS. The East Central Regional Development Commission concurs with the recommendation of the EIS for the construction of the alternatives #1 and #5 treatment facilities.

The EC RDC requests that this comment be made part of the public hearing record.

Sincerely,

Michael Sobota

Michael Sobota
Executive Director

MS:ak

119 South Lake Street Mora, Minnesota 55051 (612) 679-4065

Minnesota Pollution Control Agency

April 14, 1981

Gene Wojcik, Chief
EIS Section, Water Division
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

This is in reference to the draft EIS on the proposed waste water treatment alternatives at Taylors Falls, Minnesota, and St. Croix, Wisconsin.

Our staff has reviewed the draft EIS and has the following comments:

1. Page 2-33. Sludge Disposal

   The statement that "Sludge may be disposed at sanitary landfills and on agricultural or forest land" may be applicable in some states. The Minnesota Pollution Control Agency (MPCA), however, does not allow disposal of sludge in sanitary landfills.

2. Page 4-9. Floodplains and Wetlands

   According to the U.S.G.S. Quadrangle map, substantial wetland exists in the area of the proposed facility. The EIS points out that there is adequate area at the site to allow placement of the ponds on higher ground. If there is a sufficient amount of high ground available, we do not see any significant problems with locating the ponds at the proposed site.

Phone: (612) 296-7301
1935 West County Road B2, Roseville, Minnesota 55113
Regional Offices Duluth/Brainerd/Detroit Lakes/Marshall/Rochester
Equal Opportunity Employer

3. Page 4-15. Table 4-2, alternative 5(a) Groundwater

   This statement identifies that the ponds would be lined with a plastic membrane or clay to minimize seepage to the groundwater. If clay is to be used instead of a plastic membrane for the liner, care should be taken to insure that the borrow area is suitable for this purpose and that there will be no significant environmental damage to this site. Top soil should be replaced after the clay has been excavated so the land can revert back to agricultural purposes. Any significant effects on groundwater supplies should be known prior to construction of the ponds.

4. Page 4-33. Third paragraph

   The statement "A forage crop may be expected to uptake about 120 pounds per acre per hour, of nitrogen" appears to be in error. More likely "hour" is supposed to be "year."

5. Page 4-44. Top paragraph

   The statement that a stabilization pond system is the most expensive alternative for Taylors Falls should be clarified.

6. A point emphasized by MPCA Groundwater staff concerns construction of the proposed stabilization pond in the project area, especially in the event of high groundwater levels. The pond should be constructed above the seasonally high water table to insure the integrity of the seal and prevent the direct discharge of effluent to the groundwater. In conjunction with this concern, it should be pointed out that the EIS does not provide adequate information for determining the suitability of a particular site for land treatment or a stabilization pond. Information in the report is rather general in nature, and site specific information needed in locating a treatment facility is not presented. This information must be submitted and approved prior to the design of the proposed system in the Construction Grants program.

Sincerely,

Louis J. Breimhurst
Executive Director

MINNESOTA HISTORICAL SOCIETY
FOUNDED IN 1849
690 Cedar Street, St. Paul, Minnesota 55101 • (612) 296-6126

23 April 1981

Ms. Terri Ozaki Gedo
WAPORA, INC.
35 East Wacker Drive
Suite 490
Chicago, IL 60601

Dear Ms. Gedo:

RE: Review of the proposed stabilization pond site for Taylors Falls, Chisago County, NW¼ of Sec. 26, Shafer Twp.

MHS Referral File Number: M 436

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the National Advisory Council on Historic Preservation (36CFR800).

This review reveals that there are no recorded prehistoric or historic sites located in the above-referenced site location. In addition, archaeological survey work conducted in this vicinity as part of a stratified random sample did not result in the finding of any archaeological material. Consequently, it is our opinion that the potential for archaeological sites in this area is quite low and that additional survey work is not warranted.

Therefore, it is our opinion that there are no sites of historic, architectural, cultural, or archaeological significance listed on the National Register of Historic Places or eligible for inclusion on the National Register, which will be affected by your proposal.

Sincerely,

Russell W. Fridley
State Historic Preservation Officer

RWF/sl

THE STATE HISTORICAL SOCIETY OF WISCONSIN
1846

HISTORIC PRESERVATION DIVISION

February 26, 1981

Mr. Gene Wojcik
Chief, EIS Section
US Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

SHSW: 228-81
RE: Draft EIS-St. Croix-Taylor Falls Water treatment systems

Dear Mr. Wojcik:

We have reviewed the Draft Environmental Impact Statement prepared for the above referenced undertaking. As described, we do not believe that the preferred alternative would have any affect on any properties that are listed on, or eligible for inclusion on the National Register of Historic Places in Wisconsin. If this alternative is finally selected there will be no need to undertake any additional studies to document compliance with Section 106 of the National Historic Preservation Act, as amended and the Advisory Council's regulations (36 CFR 800).

If we can be of any further assistance, please contact me at (608) 262-2732.

Sincerely,

Richard W. Dexter

Richard W. Dexter
Compliance Coordinator

RWD:dk

THE STATE HISTORICAL SOCIETY OF WISCONSIN
816 STATE STREET · MADISON, WISCONSIN 53706 RICHARD A. ERNEY, DIRECTOR

MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION

619 SECOND STREET, HUDSON, WISCONSIN 54016

Serving Our Sponsor States on the St. Croix and Mississippi Rivers since 1965

Minnesota Telephone (612) 436-7131

Wisconsin Telephone (715) 386-9444

April 7, 1981

Gene Wojcik, Chief
EIS Section
USEPA
Region 5
230 S. Dearborn St.
Chicago, IL. 60604

Re: Draft Environmental Impact Statement
St. Croix Falls (Wis.)/Taylors Falls (Minn.) wastewater treatment systems

Dear Mr. Wojcik:

The Minnesota-Wisconsin Boundary Area Commission is an interstate agency charged with conducting studies and making recommendations concerning the wise use, development and protection of the natural resources of the St. Croix and Mississippi river valleys that form the border between Minnesota and Wisconsin. As part of that responsibility, the Commission has reviewed the draft Environmental Impact Statement for wastewater treatment system solutions for St. Croix Falls, Wis., and Taylors Falls, Minn.

The Commission on March 26 voted unanimously to submit comments to you on the draft EIS. The Commission offers no specific criticism of the document as a whole: it contains a fairly complete evaluation of the environmental impacts of the various alternatives. The Commission does, however, have a difference of opinion with USEPA concerning its recommended alternatives.

The Boundary Area Commission recommends rejection of the alternatives selected by USEPA and selection instead of Alternative #9, a regional land disposal system near Taylors Falls. Both communities currently discharge into the St. Croix River near the upstream end of the segment designated the Lower St. Croix National Scenic Riverway, a component (through P.L. 92-560) of the National Wild and Scenic Rivers System. Downstream from the two communities, the National Scenic Riverway is used for whole-body contact by more than 500,000 people each summer season, many of them in two state parks located within a mile downstream of the USEPA-proposed discharges. The Commission feels strongly that, considering the intensive use of the area and its national status, every effort should be made to keep all wastewater discharges out of the river.

Thank you for this opportunity to comment.

Very truly yours,

Steven P. Johnson, Associate Director

SPJ:rmb

April 10, 1981

BUREAU OF ENVIRONMENTAL
ANALYSIS AND REVIEW
4802 Sheboygan Avenue
P. O. Box 7916
Madison, WI 53707

Mr. Gene Wojcik, Chief, EIS Section
Water Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

RE: Draft Environmental Impact Statement (EIS)
Saint Croix Falls, Wisconsin and Taylors Falls,
Minnesota Waste Water Treatment Systems

We have reviewed the above noted document and offer the following comments.

1. We fully agree with the statements on pages 2-62 and 4-24 discussing problems in placing a force main on the U.S.H. 8 bridge. Our district office informs us that the "bridge is of a design which is not considered suitable for the attachment of a force main sewer. The pin connected spans provide for a considerable movement across the joints between space members. Opposing forces, caused by pumping in a force main at the gradient of this bridge, could be critical to the structure's integrity. Consequently a force main hung on the bridge should not be considered for any of the regional system alternatives".

   We believe that the Final EIS would be more valid if the regional system alternatives and their costs were based on a force main crossing the river on a separate structure designed and built specifically for that purpose.

2. Page 3-67 the eastern boundary of the Wisconsin Interstate Park is County Trunk Highway (CTH) "S" not Route 5.

3. Page 4-1 Item 4.1 Construction Impacts - This portion of the Final EIS should indicate that a permit from the Wisconsin Department of Transportation would be required if sewer lines cross or lie within the right of way of a highway on the State Trunk System.

4. Page 4-46 Item 4.5.1. Mitigation of Construction Impacts - Major deck repair to the U.S.H. 8 bridge is programmed for the 1983 construction season and will result in traffic congestion, delays, and minor detours during that period. To avoid adding to traffic problems in 1983 that

may result from the construction of the waste water treatment systems we suggest that you coordinate with : D.H. Jorgensen, Director
Transportation District #8
U. W. - Superior
Hawkes Hall
Superior, Wisconsin 54880
Phone (715) 394-0551

We thank you for the opportunity to comment on this Draft Environmental Impact Statement.

Sincerely,

R.W. Baker, Director

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

April 13, 1981

IN REPLY REFER TO: 1650-2

Mr. Gene Wojcik
Environmental Protection Agency
230 South Dearborn (5WEE)
Chicago, IL 60604

Dear Mr. Wojcik:

Re: DEIS on St. Croix Falls and Taylor Falls

We have reviewed EPA's Draft Environmenal Impact Statement (EIS) on wastewater facilities for St. Croix Falls, Wisconsin, and Taylor Falls, Minnesota. This review was conducted according to section NR 150.105, Wis. Adm. Code, regarding the review of EIS's prepared by other agencies. Our comments and this review do not represent any change in the Department's earlier finding that the project approvals sought by St. Croix Falls are not a major and significant action under the Wisconsin Environmental Policy Act (WEPA). The following comments refer to pages in the DEIS and follow page sequence.

Cover - The title should be: Environmental Impact Statement - St. Croix Falls, Wisconsin, and Taylor Falls, Minnesota, Wastewater Treatment Systems.

Page iv, 2-39, 2-59 - The referenced facilities plan for St. Croix Falls indicates a total capital cost of $1,071,000; operation and maintenance cost of $30,000; and a total present worth of $1,332,000. Explain why the EIS values differ.

Page v-vii - The alternative 5 through 9 discussions should, for consistency, identify the level of treatment provided.

Page 1-3, last paragraph - This paragraph suggests that state funding under the Wisconsin Fund is a certainty. This is not correct. While the Wisconsin Fund has successfully funded projects in the past, there is no guarantee of funding all applicants in the future. The Wisconsin Fund may provide up to 60% of the eligible construction costs.

Page 2-12, p. B-6 - The WPDES permit for St. Croix Fall may be revised to represent the 0.4 mgd design flow rather than the present 0.18 mgd flow.

Page 2-25 - Disinfection. Ultraviolet disinfection should also be addressed as a possible alternative.

Page 3-26 - St. Croix Falls Fish Hatchery. Flow and suspended solids data is available for this discharger through the NR 101 and WPDES self-monitoring programs. BOD, nutrients, sulfate and chloride are also reported.

Page 3-40 - Red-shouldered hawk. For Wisconsin, rather than P-priority species, it should be listed as T-threatened species.

Page 3-47 - Population Projections. This section should at least mention the population projections developed by the facilities planning consultants. For St. Croix Falls, the consultant estimated a population of 2,120 in the year 2000. This compares very favorably with WAPORA's 2,170 population.

Page 4-1 - Construction Impacts. This section should also address the quality of treatment provided during expansion of the existing plant when treatment units may be out of service.

Page 4-36 through 39, 42 - In evaluating the economic significance of any action alternative, cumulative impacts resulting from this wastewater project and other costly community projects should be considered. For St. Croix Falls, we understand that local school development costs may also place a substantial financial burden on households. If there is a special and substantial school assessment, then the cumulative effects of both additional school project costs and wastewater facility costs should be considered.

Page 4-45 - Mitigation of Adverse Impacts. This section on mitigation measures is rather confusing because several of the measures discussed are already under some regulatory control. For example: (a) weight restrictions are already placed on most roads and highways and (b) effluent monitoring and residual chlorine limits are already specified by the WPDES discharge permit program. These so-called "mitigation measures" could be summarized by simply stating the obvious, "obey the law." But then these wouldn't be "mitigation measures" since they are already required for the project. Listing regulated activities may be appropriate, but some justification for their listing is needed. The final EIS should identify the purpose and need in identifying regulated activities as mitigation measures.

Page 4-46, Mitigation of Construction Impacts. This section provides an extensive discussion of various mitigation measures that could be implemented to minimize various adverse impacts. It should be recognized, however, that many more construction related best management practices (BMP) are available to mitigate adverse impacts. Selection of the best mitigation techniques for a particular project depends to a great extent on the weather, equipment, ingenuity, concern and experience of the contractor. EPA should recognize this in their evaluation and provide for adequate flexibility in any decisions regarding mitigation requirements.

Page 4-47, Soil Odors - The discussion on soil odors is unclear. Is EPA suggesting that soil borings be done along the force main route to locate potentially odorous soils? What "significant impacts" does EPA expect from short-term, trench-and-cover construction in potentially odorous soils? Include these impacts then in section 4.1.1-Air Quality and Odors.

Page 4-47, Spoil Disposal. Wetlands and other sensitive areas should not be used for spoil disposal.

We hope these comments will be useful to you in the preparation of the final EIS. If you have any questions, please contact Mr. Roger Fritz at 608-266-6780.

Sincerely,
Bureau of Environmental Impact

Howard S. Druckenmiller
Howard S. Druckenmiller
Director

cc: L. Sridharan - WW/2
Northwest District - Spooner

LOWER ST. CROIX MANAGEMENT COMMISSION

MEMBER AGENCIES

NATIONAL PARK SERVICE - U.S. DEPARTMENT OF THE INTERIOR
DEPARTMENT OF NATURAL RESOURCES - STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES - STATE OF WISCONSIN
MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION (EX-OFFICIO)

Cooperation Between Responsible Management Agencies

LOWER ST. CROIX NATIONAL SCENIC RIVERWAY

April 10, 1981

Gene Wojcik, Chief
EIS Section
USEPA
Region 5
230 S. Dearborn St.
Chicago, IL. 60604

Re: Draft EIS: St. Croix Falls (Wis.)/Taylors Falls (Minn.) Wastewater Treatment Systems

Dear Mr. Wojcik:

The Lower St. Croix Management Commission is the coordination agency to assure proper management of the Lower St. Croix National Scenic Riverway, a component of the National Wild and Scenic Rivers System. The Management Commission's Technical Committee consists of the day-to-day field management personnel from each member agency, and its tasks include reviewing and commenting on all documents and project proposals that affect the Riverway. Since all proposed discharges from the St. Croix Falls and Taylors Falls systems (under all alternatives) would enter the National Scenic Riverway, the Technical Committee though it appropriate to comment on the Draft EIS. The committee's comments were prepared at its April 9 meeting in St. Croix Falls.

The committee feels the Final EIS should contain more information on how USEPA reached its conclusions concerning the unacceptability of land disposal east of St. Croix Falls. The DEIS' discussion of this aspect appears weak.

The committee feels the Final EIS should contain more information on how USEPA reached its apparent conclusions about non-degradation of the receiving stream. Some calculations must have been made about assimilation of the wastewater, and they should be explained in the final document.

The Draft EIS does not discuss the federal and state grant picture if a regional facility were built in Minnesota. Would Alternative 9 receive full 94 percent funding, for example, or would only Taylors Falls' share of that project be funded at 94 percent?

Thank you for this opportunity to comment.

Very truly yours,

Steven P. Johnson
Associate Director

COORDINATION OFFICE
Minnesota-Wisconsin Boundary Area Commission, 619 Second Street, Hudson, Wisconsin 54016
Minnesota Telephone (612)436-7131 Wisconsin Telephone (715)386-9444

P.O. Box 547
239 Day Road North
St. Croix Falls, WI 54024
March 10, 1981

Mr. Gene Wojcik
EIS Section
U.S. EPA Region V
230 South Dearborn Street
Chicago, IL 60604

Re: Draft EIS Wastewater Treatment
St. Croix Falls, Wisc./Taylors Falls, Minn.

Dear Mr. Wojcik:

In preparation for the March 30, 1981 public hearing on the referenced document, I would like to express the following concerns:

Is there a very clear cut, affirmative statement from the National Park system that the discharge of 30/30 to the river will always be permitted? If they have not given a 20 year guarantee that the discharge will be permitted, the land application (Alternative 2) shows far better salvage value than alternative 1.

Is the existing WWTP proposed to be demolished and replaced with RBC's? This is suggested by figure 2-2. It appears that the present facility could be utilized and merely added onto with RBC's to handle additional flow.

Does adoption of this EIS put St. Croix Falls in the mainstream to commence Step II of Alternative 1? Can Alternative 1 be re-evaluated to only add treatment capacity instead of spending 1.2 million dollars on a complete new plant?

In proper soils, a WWTP 30 miles north of St. Croix Falls, discharges to a "rapid infiltration basin" year round without apparent difficulty. Thus, the storage basin budgeted under Alternative 2 may not be necessary. This savings may readily show Alternative 2 to be most cost effective.

If a WWTP is going to pump 50 ppm BOD water to a storage cell, is there any sense to the storage lagoon liner required on page 3-10?

Figures C-5 and C-6 are far too general to adequately discuss groundwater in section 29 as required by Alternative 2. However, C-6 suggests that, in section 29 the groundwater is more than 50' below the ground surface.

Page 3-51 discusses that the St. Croix Falls debt load is very heavy and, by some indicators, at full capacity. Any savings possible are essential. To that end, I feel that the party presenting at the hearing should discuss:

1. What funding assistance will EPA provide?
2. What funding assistance will FmHA provide?
3. What funding assistance will Wisconsin provide?
4. How realistic is the interest rate used to develop the cost per hookup? At today's interest rates, what is the cost per hookup?
5. How real are the cost estimates?

It is surprising that a Federal EIS should determine that land application is not viable without conducting some on site testing of the land application site! To eliminate the concept on a cost basis without testing the accuracy of the 10"/week loading assumption is not realistic. If the lowest rate in Wisconsin is 7.8"/week and highest 52"/week, it seems that 10"/week is too conservative. If loading is instead 20"/week, the cost of land application would probably be less than that of the renovation.

As a St. Croix Falls resident, I would like to see the soils at the land application site tested before approval of the EIS. It appears to me that the decision to renovate the plant was made based on "gut feel" to protect groundwater and "desire" to build a new mechanical plant. The purpose of the EIS should be to make decisions based on engineering, facts, and cost effectiveness, rather than assumptions which reinforce a decision.

Please call us at 715/483-3010 if you wish to discuss this matter.

Sincerely,

Warren White

Warren White

3.0. DISCUSSION OF WASTEWATER TREATMENT ALTERNATIVES

3.1. Existing Wastewater Conveyance and Treatment Systems

3.1.1. Existing Service Areas

ST. CROIX FALLS

The St. Croix Falls wastewater collection system consists of approximately 8.6 miles of vitrified clay, gravity sewers (primarily 8-inch diameter pipe), five lift stations, and an undetermined length of force main (WCWRPC 1976). Two of the lift stations pump sewage from the Wisconsin Interstate State Park. The City is served by separate storm and sanitary sewer systems. There appears to be sufficient hydraulic capacity in the system. No sanitary sewer overflows or bypasses because of hydraulic overloading have been reported for the sewer system.

The service area includes approximately 347 residential, 82 commercial, 3 industrial, and 3 public customers (WCWRPC 1976). Industrial users presently discharge only domestic wastewater to the St. Croix Falls sewer system. There are no known major wastewater discharges in the St. Croix Falls service area. Approximately 30 residences within the City limits are served by septic tank-soil absorption systems (By telephone, Mr. Ron Mahaffey, City of St. Croix Falls, to WAPORA, Inc., 11 January 1979).

The wastewater service area also is served by a municipally-owned potable water supply system. The system serves approximately 356 residential, 85 commercial, 3 industrial, and 13 public customers.

TAYLORS FALLS

The Taylors Falls sanitary sewer system consists of approximately 25,800 feet of 6-inch and 8-inch, vitrified clay gravity sewer and 1,290 feet of 4-inch, ductile iron force main. Two lift stations and a 5,000-gallon Imhoff tank are included in the wastewater facilities for the Minnesota Interstate State Park that discharge to the City's sewer system.

The City is partially served by storm sewers. There are no combined sewers in the City, and no known instances of sanitary sewer overflows or bypasses of the sewer system.

Taylors Falls is served entirely by the sanitary sewer system except for three residences near the intersection of Hill Street and Basil Street. These residences have septic tank-soil absorption systems and are not connected to the sanitary sewer system because of the steep grade. The most significant individual major sources of wastewater in the Taylors Falls service area are the Minnesota Interstate State Park, the Cherry Hill Meat Processing Company, and the Taylors Falls Public School.

3.1.2. Existing Treatment Systems

ST. CROIX FALLS

The wastewater treatment facility for St. Croix Falls was designed in 1948 and constructed in 1951. The treatment plant is located on the bank of the St. Croix River on approximately 0.5 acres of land leased from WDNR.

The treatment processes include preliminary screening, primary treatment, biological filtration, final clarification, flow measurement, chlorination, sludge digestion, and sludge dewatering. The facility was designed to treat 120,000 gallons per day (gpd), with a 5-day biochemical oxygen demand (BOD_5) loading of grams per day 250 pounds per day (lb/day) and a total suspended solids loading of 240 lb/day. The 1975 yearly average wastewater flow was 211,400 gpd. The monthly peak flow was 299,400 gpd (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976). Based on the 1978 average raw sewage BOD_5 concentration of 159 milligrams per liter (mg/l) and the 1975 average flow, the current BOD_5 loading is 280 lb/day. This estimate assumes that there has been no significant increase in wastewater flow since 1975.

Raw sewage from the St. Croix Falls service area enters the treatment plant from sewers located along River Street. The old outfall sewer that was used before the construction of the treatment facility could be used as an emergency bypass from the River Street sewer. There are no reported instances of its use. A detailed discussion of the existing facilities at the St. Croix Falls WWTP is presented in Appendix A, Exhibit A-1.

TAYLORS FALLS

The existing sewage treatment facility for the City of Taylors Falls was constructed in 1941. The plant is located on the bank of the St. Croix River immediately north of the US Highway 8 bridge.

The treatment processes include preliminary screening, primary treatment, biological filtration, final clarification, chlorination, sludge digestion, and sludge dewatering. The existing facilities were designed for a flow rate of 75,600 gpd and a maximum raw sewage BOD_5 concentration of 250 mg/l (Howard A. Kuusisto Consulting Engineers 1979). A flow measurement and sampling survey conducted by SERCO (1978) during November 1978 showed that the treatment plant loading was 90,900 gpd and 105 lb/day. The peak flow rate observed during this period was 144,000 gpd. A detailed discussion of the existing facilities at the Taylors Falls WWTP is presented in Appendix A, Exhibit A-2.

3.1.3. Existing Effluent Quality

ST. CROIX FALLS

Raw sewage and final effluent are monitored three times per week at the St. Croix Falls WWTP, in accordance with the WPDES permit (Section 3.2.2.). The monthly averages of the BOD_5, suspended solids, and fecal coliform data are presented in Table 3-1. The 1978 mean concentrations for BOD_5 and suspended solids in the raw sewage were 159 mg/l and 162 mg/l, respectively. The 1978 mean concentrations for BOD_5, suspended solids and fecal coliform in the final effluent were 69 mg/l, 34 mg/l, and 390 counts/100 ml, respectively. On the basis of these data, the effluent appears to be within the concentration limits of the interim discharge permit (Section 3.2.2.). The load calculations (in kilograms per day; kg/day) cannot be determined accurately because the flow meter for the facility was not calibrated for accurate flow measurements during 1978 (Short-Elliot-Hendrickson, Inc. 1980). This deficiency was corrected early in 1979.

Table 3-1. Raw sewage and final effluent data for the St. Croix Falls, Wisconsin, wastewater treatment plant for 1978 (WDNR 1978).

	Raw Sewage		Final Effluent		
Month	BOD_5 (mg/l)	Suspended Solids (mg/l)	BOD_5 (mg/l)	Suspended Solids (mg/l)	Fecal Coliform (counts per 100 ml)
January	156	165	67	54	--
February	210	239	89	49	--
March	178	167	71	21	7,100
April	137	211	61	24	270
May	159	202	65	28	30
June	144	135	70	32	900
July	153	148	63	29	100
August	116	112	67	48	250
September	136	129	58	32	890
October	151	144	69	26	440
November	230	150	95	30	650
December	141	141	54	33	220
Mean	159	162	69	34	390

TAYLORS FALLS

Raw sewage and final effluent are monitored monthly for the Taylors Falls facility, as previously required by the expired NPDES Permit (Section 3.2.2.). The monthly averages of the BOD_5, suspended solids, and fecal coliform data are presented in Table 3-2. The 1978 mean concentrations of BOD_5 and suspended solids in the raw sewage were 482 mg/l and 429 mg/l, respectively. The 1978 mean concentrations of BOD_5, and suspended solids in the final effluent were 66 mg/l, and 33 mg/l respectively. The mean concentration of fecal coliform was not computed. These data indicate that the Taylors Falls WWTP effluent generally fails to comply with the interim effluent limitations (Section 3.2.2.).

Table 3-2. Raw sewage and final effluent data for the Taylors Falls, Minnesota, wastewater treatment plant for 1978 (MPCA 1978b).

	Raw Sewage		Final Effluent		
Month	BOD_5 (mg/l)	Suspended Solids (mg/l)	BOD_5 (mg/l)	Suspended Solids (mg/l)	Fecal Coliform (counts per 100 ml)
January	170	76	76	23	20
February	290	200	56	38	20
March	270	148	35	23	20
April	320	450	39	23	20
May	460	135	90	41	20
June	700	269	140	40	20
July	560	80	152	44	TNTC[1]
August	300	32	41	20	20
September	570	389	100	52	TNTC
October	1,480	2,100	43	28	TNTC
November	120	142	9	28	20
December	540	1,130	13	38	20
Mean	482	429	66	33	--

[1]TNTC = too numerous to count.

3.1.4. Wastewater Flows

ST. CROIX FALLS

The Facilities Plan for the St. Croix Falls-Dresser Metropolitan Sewerage District (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976) contains information on the base wastewater flow rates and infiltration and inflow (I/I) quantity for the City of St. Croix Falls. The report on the wastewater treatment plant at St. Croix Falls, Wisconsin (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1973) contains flow measurements for the City of St. Croix Falls that were made during several 24-hour periods.

The cost-effectiveness analysis in the Facilities Plan for the elimination of I/I for the St. Croix Falls-Dresser Metropolitan Sewerage District contains the conclusion that it would be cost-effective to eliminate 30,000 gpd of inflow at St. Croix Falls by sealing the manhole-wet well at the Virginia Street Pumping Station. This lift station subsequently was repaired. Therefore the remaining I/I quantity is 162,000 gpd minus 30,000 gpd, or 132,000 gpd.

According to the Facilities Plan (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976), the base flow of 137,400 gpd for the City of St. Croix Falls was determined to be equivalent to the potable water sold by the City during September 1975. The population of St. Croix Falls in 1974 was approximately 1,460, as indicated in the Facilities Plan. Assuming that the 1975 population was the same size as the 1974 population, a per capita base flow of 94 gpd was determined.

Wastewater flows from the Wisconsin Interstate State Park are collected in sanitary sewers tributary to the St. Croix Falls collection system. Metering devices are not installed on the sanitary sewage collection system within the Interstate State Park; thus the exact volumes of flow are not known. The wastewater flows from the Interstate State Park presumably are included in the base wastewater flow rate presented in the Facilities Plan.

TAYLORS FALLS

The I/I analysis report for the City of Taylors Falls (Howard A. Kuusisto Consulting Engineers 1979) contains information on water consumption, base wastewater flows, and I/I quantities. The Draft Facilities Plan for Taylors Falls, Minnesota (Howard A. Kuusisto Consulting Engineers 1980), indicates that the I/I report for the City of Taylors Falls has been reviewed and certified by both MPCA and USEPA. The I/I report concludes that I/I does exist in the Taylors Falls sanitary sewer system but is not excessive relative to the regulations and standards established by USEPA.

The analysis of water pumpage and water records indicated an average daily consumption rate of 65 gallons per capita per day (gpcd; Howard A.

Kuusisto Consulting Engineers 1979). This yields a base domestic and commercial wastewater flow of 41,000 gpd based on a Taylors Falls population of 625 persons in 1979.

Wastewater flow monitoring conducted during the I/I analysis revealed a peak month I/I rate of 102,000 gpd, a peak week I/I rate of 128,000 gpd, and a peak day I/I rate of 148,000 gpd. Total flow to the wastewater treatment plant during the 118 day monitoring period averaged 132,000 gpd (Howard A. Kuusisto Consulting Engineers 1979).

The Facilities Plan for Taylors Falls indicates that the I/I rates monitored during this period are the only data available and do not represent flows throughout the year. Furthermore, climatic and groundwater conditions are quite variable and may change the amount of I/I from year to year. Therefore, in an attempt to alleviate the data gaps of the flow monitoring, it was assumed that the I/I rate would average 50,770 gpd for the six dry months (September to February) and 102,000 gpd for the six wet months (March to August), for an average yearly I/I rate of 76,400 gpd (Howard A. Kuusisto Consulting Engineers 1980).

The Minnesota Interstate State Park, bordering the St. Croix River to the south of the City of Taylors Falls, contributes a wastewater flow that fluctuates with the seasonal tourist population. The Park is divided primarily into two separate areas. The northern section serves a day-oriented tourist traffic and has a low-flow toilet facility that is connected directly to the Taylors Falls municipal collection system. Park officials estimate that about 200,000 people, out of an average of 430,000 visitors per year, visit this section of the Park during June, July, and August. This is an average of approximately 2,000 visitors per day. Using an estimate of 2 gpd per visitor, a daily wastewater contribution of 4,000 gpd could be expected during an average summer day. The 2 gpd per visitor estimate is reasonable considering the low-flow toilet facilities and the fact that many visitors make short visits and would not use the facilities.

The southern section of the Park consists of campground facilities that include showers, flush toilets, and a wastewater dump for recreational vehicles. The campground wastewater is collected and passed through an Imhoff tank having a volume of approximately 5,000 gallons. The effluent from the Imhoff tank is pumped through force mains tributary to a gravity sewer and the municipal collection system. The wastewater is measured with a time clock on the two 100 gallons per minute (gpm) pumps in the upper pump stations. The clocks are read on a yearly basis.

The number of visitors to the campground is included in the total of 430,000 persons per year. The average number of campers during the 15 June to 15 August peak period was approximately 188 campers per day (based on 4 campers per site and 47 available camping sites). At other times during the season, the average number of campers per day was about 94. Based on an estimated 50 gpd per person, the daily average flow from the Park is estimated to be 9,400 gpd. Therefore, the total average daily flow from the Park is 13,400 gpd.

3.2. Design Factors

Three categories of factors must be considered in the design of a wastewater treatment system: the present and projected wastewater flows in the service area, the existing and proposed effluent standards established by Federal and State authorities, and economic cost criteria (duration of the planning period, interest rate, service factor, and service life of facilities and equipment). Each of these factors is discussed in the following sections.

3.2.1. Wastewater Load Factors

ST. CROIX FALLS

The major source of wastewater in St. Croix Falls is from residential and commercial development, with small contributions from the Wisconsin Interstate State Park and an 8-acre industrial park located in the southeast section of the City. These conditions are expected to continue in the future.

Wastewater load factors for the St. Croix Falls Service Area for the year 2000 were developed by WAPORA, Inc., on the basis of information presented in the Report on Wastewater Treatment Plant, St. Croix Falls (Banister, Short, Elliott, Hendrickson & Associates, Inc. 1973) and on a projected year 2000 design population of 2,170 as calculated by WAPORA (Section 3.2.2.2.). The design flows for wastewater from all sources (including the Wisconsin Interstate State Park, the industrial park, and I/I) were calculated to be:

- Average design flow: 397,700 gpd
- Peak design flow: 657,000 gpd.

The flow from the industrial park (presently under development) is projected to be approximately 10% of the design flow from all other sources (361,500 gpd average daily flow), or 36,200 gpd. The peak flow from the industrial park is estimated to be twice this amount, or 72,400 gpd.

The organic loads were projected on the basis of the accepted design values of 0.17 pounds (lb) of BOD_5 per capita per day and 0.20 lb of suspended solids (SS) per capita per day. These values were applied to the future projected increase in population of 769 for the year 2000 (Section 4.2.2.2.) plus existing and projected data provided by the St. Croix Falls Facilities Planners, Short-Elliott-Hendrickson, Inc. (1980), to obtain the following estimates:

- Design BOD_5: 460 lb/day
- Design SS: 500 lb/day.

The BOD_5 and SS concentrations were calculated on the basis of the average design flow of 397,700 gpd and were estimated to be 139 mg/l and 151 mg/l, respectively. The average per capita wastewater flow for the residential and commercial component of the flow is 94 gpd. The individual components of each total estimate for both wastewater flows and organic loads are given in Table 3-3.

Table 3-3. Wastewater load factors projected for St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, for the year 2000 (Howard A. Kuusisto Consulting Engineers 1980; Short-Elliott-Hendrickson, Inc. 1980).

Source	Average Daily Flow (gpd)	Peak Flow (gpd)	BOD_5 (lb/day)	SS (lb/day)
St. Croix Falls				
Residential and commercial	204,100	408,200	360	380
Wisconsin Interstate State Park	19,000	38,000	35	40
Projected industrial park	36,200	72,400	65	80
Existing infiltration/inflow	132,000	132,000	--	--
Future allowable infiltration (9 gpcd)	6,400	6,400	--	--
Total	397,700	657,000	460	500
Taylors Falls				
Residential and commercial (includes wastewater flow from Cherry Hill Meat Processing Co.)	50,000	100,000	155	230
Minnesota Interstate State Park	13,400	27,000	45	65
Cherry Hill Meat Processing Co.	--	--	10	10
Infiltration/inflow	76,400	148,000	--	--
Total	139,800	275,000	210	305
Regional Total (sum of totals for St. Croix Falls WI and Taylors Falls MN)	537,500	932,000	670	805

NOTE: All values have been rounded.

TAYLORS FALLS

The primary source of wastewater in Taylors Falls (as it is for St. Croix Falls) is from residential and commercial development. The Taylors Falls Public School also is included in this category. The Minnesota Interstate State Park contributes about 20% of the base flow of wastewater to the Taylors Falls treatment facility. The wastewater flow from the Cherry Hill Meat Processing Co., the only industry in the community, is insignificant.

Wastewater load factors for the Taylors Falls Service Area for the year 2000 were developed by WAPORA, Inc., on the basis of information presented in the Draft Facilities Plan for Taylors Falls (Howard A. Kuusisto Consulting Engineers 1980) and a projected year 2000 design population of 769, as estimated by WAPORA (Section 4.2.2.2.). The design flows for wastewater for all sources, including the Minnesota Interstate State Park, the Cherry Hill Meat Processing Co., and I/I were calculated to be:

- Average design flow: 139,800 gpd
- Peak design flow: 275,000 gpd.

The BOD_5 and SS loads were calculated by applying the design values mentioned previously (0.17 lb of BOD_5 and 0.20 lb of SS per capita per day) to the projected year 2000 population of 769 people. An additional BOD_5 load for 140 people was included to account for the contribution from public school students who reside outside the City but would contribute to the wastewater system during part of the day. The total BOD_5 and SS loads from all sources (including the Minnesota Interstate State Park and the Cherry Hill Meat Processing Co.) were estimated to be:

- Design BOD_5: 210 lb/day
- Design SS: 305 lb/day.

Based on the average design flow of 139,800 gpd, the concentrations of BOD_5 and SS were estimated to be 180 mg/l and 263 mg/l, respectively. The average per capita wastewater flow for the residential-commercial component of the total flow is 65 gpd. The individual components of each total estimate also are indicated in Table 3-3.

REGIONAL

The wastewater load factors for the St. Croix Falls WI and Taylors Falls MN region were obtained by addition of the totals from the two service areas for each factor. The following estimates were obtained:

- Average design flow: 537,500 gpd
- Peak flow: 932,000 gpd
- BOD_5: 670 lb/day
- SS: 805 lb/day.

On the basis of the average regional daily flow of 537,500 gpd, the BOD_5 and SS concentrations were calculated to be 150 mg/l and 180 mg/l, respectively. These factors have been used in the consideration of regional treatment alternatives.

3.2.2. Effluent Standards

ST. CROIX FALLS

The City of St. Croix Falls was reissued its original NPDES permit on 30 June 1978 to continue discharging effluent from the WWTP to the St. Croix River. This permit, Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0020796-2, will expire on 30 June 1982. The permit establishes interim effluent limitations that will be in effect until 30 June 1982, or until construction of upgraded wastewater treatment facilities is completed. Both the interim effluent limitations that are applicable during the duration of the participation by the City in the Construction Grants Program and the final effluent limitations applicable after completion of the upgrading process are presented in Table 3-4. These limitations were established by WDNR for discharge from the St. Croix Falls WWTP to the St. Croix River and were based on a design flow of 0.18 million gallons per day (mgd). Effluent limitations for fecal coliform bacteria are not stated in the existing permit. A copy of the WPDES permit is included in Appendix B, Exhibit B-1. The WPDES permit may be revised to reflect a design flow of 0.4 mgd (By letter, Mr. Howard S. Druckenmiller, WDNR, to Mr. Gene Wojcik, USEPA, 13 April 1981). However, the effluent limitations would not change for the increased discharge.

Table 3-4. Interim and final effluent limitations for the St. Croix Falls, Wisconsin, wastewater treatment plant (WPDES Permit No. WI-0020796-2; Appendix B).

Parameter	EFFLUENT LIMITATIONS Interim	Final
BOD_5		
(monthly average)	110 mg/l	30 mg/l
(weekly average)	165 mg/l	45 mg/l
Suspended solids		
(monthly average)	75 mg/l	30 mg/l
(weekly average)	110 mg/l	45 mg/l
pH		
(minimum)	6.0 units	6.0 units
(maximum)	9.0 units	9.0 units

TAYLORS FALLS

The City of Taylors Falls was reissued its original permit to discharge from the WWTP to the St. Croix River on 13 November 1979. This permit, NPDES Permit No. MN 0021768, will expire on 30 June 1984. The interim effluent limitations listed in the permit will be in effect until 30 June 1983. The City is required to comply with the final effluent limitations listed in the permit by 1 June 1983, and to meet those limitations for the final year of the permit period. If Federal funds are not available in time to meet the compliance date of 1 July 1983, the time extension stated in the permit for the interim limitations will be terminated. A copy of the NPDES permit is included in Appendix B, Exhibit B-2.

Both the interim and final effluent limitations for a discharge to the St. Croix River are presented in Table 3-5. These limitations also would apply to a discharge to Colby Lake, and a 1 mg/l phosphorus limitation also would be required for a discharge to Colby Lake or to Dry Creek. Effluent limitations for a discharge to Lawrence Creek or Dry Creek are shown in

Table 3-5. Interim and final effluent limitations for the Taylors Falls, Minnesota, wastewater treatment plant (NPDES Permit No. MN-0021768; Appendix B).

Parameter	EFFLUENT LIMITATIONS Interim	Final[a]
BOD_5[b]		
(monthly average)	50 mg/l	25 mg/l
(weekly average)	--	45 mg/l
Suspended solids[b]		
(monthly average)	30 mg/l	30 mg/l
(weekly average)	--	45 mg/l
Fecal coliform organisms[c]		
(monthly average)	200 MPN/100 ml	200 MPN/100 ml
(weekly average)	--	400 MPN/100 ml
Turbidity	--	25 NTU
pH[d]		
(minimum)	6.5 units	6.5 units
(maximum)	8.5 units	8.5 units
Floating solids or visible foam	Trace amounts only	Trace amounts only
Oil or other substances	No visible color film on surface of receiving water	No visible colc film on surfa of receiving water

[a]Both monthly and weekly average limitations are applicable during continuous discharge periods. The average concentrations during a period of controlled discharge must not exceed the monthly average limitations, and the weekly average limitations also must not be exceeded if the period of discharge is equal to or greater than one week.

[b]Arithmetic mean.

[c]Geometric mean.

[d]Not subject to averaging; must be met at all times.
MPN/100 ml = Most probable number per 100 milliliters.
NTU = Nephelometer turbidity unit.

Table 3-6. These limitations are more stringent, and include restrictions on the ammonia and chlorine levels for a discharge to Lawrence Creek because it has been designated as a Class A fisheries and recreation stream by the State of Minnesota.

REGIONAL SYSTEM

The effluent limitations for a regional treatment facility would be those applicable in the particular State in which the regional treatment facility would be sited. The discharge to the St. Croix River, to another body of water, or on land would be within the boundaries of either Wisconsin or Minnesota.

3.2.3. Economic Factors

The economic cost criteria used in the comparison of project alternatives include an amortization, or planning, period from the present to the year 2000, or approximately 20 years; an interest (discount) rate of 7.125%; a service factor of 25%; and service lives of 15 to 20 years for process and auxiliary equipment, 40 years for structures, and 50 years for piping and ponds. Salvage values were estimated using straight-line depreciation for items that could be used at the end of the 20-year planning period, and replacement costs were estimated for items with a service life shorter than the planning period.

Costs of land purchase were estimated for alternatives that include land treatment or disposal. An annual appreciation rate of 3% over the planning period was used to calculate the salvage value of the land. All costs used in this report were updated to third quarter 1979 dollar values. The total capital cost includes the initial construction cost plus 25% for engineering, legal, fiscal, and administrative costs. Operation and maintenance costs include labor, materials, and utility (power) costs associated with the treatment works, pumping stations, and solids handling and disposal processes and are based on prevailing rates. Annual revenue-producing benefits, such as irrigation of crops, are subtracted from O&M costs.

Table 3-6. Effluent limitations for a discharge to Lawrence Creek or Dry Creek (By letter, Mr. Lanny R. Peissig, MPCA, to Mr. Gregory Pederson, Howard A. Kuusisto Consulting Engineers, 16 May 1979).

Parameter	EFFLUENT LIMITATION Controlled Discharge	Continuous Discharge
BOD_5	25 mg/l	5 mg/l
Suspended solids	30 mg/l	5 mg/l
Fecal coliform organisms	200 MPN/100 ml 10 MPN/100 ml[a]	200 MPN/100 ml 10 MPN/100 ml[a]
Turbidity	25 NTU	25 NTU
pH		
(minimum)	6.5 units	6.5 units
(maximum)	8.5 units	8.5 units
Ammonia (as nitrogen)[a]	0.2 mg/l	0.2 mg/l
Chlorine[a]	0.002 mg/l	0.002 mg/l
Phosphorus[b]	1.0 mg/l	1.0 mg/l

[a]Applicable for a discharge to Lawrence Creek only.

[b]Applicable for a discharge to Dry Creek only.
MPN/100 = Most probable number per 100 milliliters.
NTU = Nephelometer turbidity unit.

3.3. System Component Options

Wastewater management alternatives were developed for the St. Croix Falls - Taylors Falls study area to meet the needs of the current and future populations of the service area and to conform with the requirements of Wisconsin, Minnesota, and Federal regulations. The principal objective was to reduce pollutant loads to surface waters. Other objectives were to explore the feasibility of various land application and disposal options. All alternatives must provide treatment to achieve the effluent requirements set by Federal and State permits or pretreatment requirements for land disposal (Section 3.3.4.2.).

The development of alternatives began with the identification of functional components within the wastewater collection and treatment system. The components considered were:

- Flow and waste reduction -- including I/I reduction and water conservation measures
- Collection systems -- including an interceptor sewer and pumping station from one community to a new regional WWTP or land application site
- Wastewater treatment processes -- including biological and/or physical unit processes for treating wastewater to the desired effluent quality
- Effluent disposal -- including available means for discharge, land application, or reuse of adequately treated wastewater
- Sludge treatment and disposal -- including processes for stabilization, conditioning, dewatering, volume reduction, and disposal of wastewater treatment residues.

The methods considered for fulfillment of the functions of each of these five system components can be termed "component options" or "options". The selection of options for any one component is, to some extent, dependent on the options considered for the other components, so that a compatible system can be produced.

In the following sections, component options for the independent treatment facilities at St. Croix Falls and Taylors Falls, a regional treatment facility to serve both communities, and various land treatment processes are identified and discussed to the extent necessary to justify or reject their inclusion in system-wide alternatives. Reasonable combinations of component options that comprise complete system alternatives are identified. For each alternative the level of technical detail is suitable for this planning stage. Detailed engineering plans and specifications will be developed by engineering consultants after the EIS process is completed, with Federal financial assistance through a "Step 2" grant (Section 1.0.).

3.3.1. Flow and Waste Reduction

3.3.1.1. Infiltration and Inflow Reduction

ST. CROIX FALLS

An I/I analysis of the St. Croix Falls wastewater collection system was performed by Banister, Short, Elliott, Hendrickson & Associates, Inc. (1976) to determine the presence, quantity, and type of I/I conditions that were present. Infiltration is the process through which water enters a sewer system from the ground through defective pipes, pipe joints, or manhole walls. Inflow is the water that is discharged into the collector system and service connections from roof, cellar, yard, area, and foundation drains; cooling water discharges; drains from springs and swampy areas; manhole covers; cross connections from storm sewers and combined sewers; catch basins; storm waters, surface runoff, street washwaters, and other sources. The sanitary sewage collection system in the City of St. Croix Falls is separate from the storm sewer system, and no known roof drains or surface runoff collection points currently are connected to the sanitary sewage collection system.

The maximum quantity of I/I entering the existing collection system in 1975 was estimated to be 162,000 gpd. Two sources of inflow to the sewer system were identifed during the I/I survey. As much as 12,500 gpd of inflow might occur through basement floor drains during periods of high groundwater conditions. However, waterproofing the approximately 25 basements involved could increase the external hydrostatic pressure and cause additional cracking of floors and walls. The second known source, contributing approximately 30,000 gpd of inflow, is the wet well of the pumping station located on Virginia Street. On the basis of a cost-benefit analysis prepared by Banister, Short, Elliott, Hendrickson, and Associates, Inc. (1976) it was determined and recommended that the manhole of the wet well could be sealed and 30,000 gpd of inflow eliminated; but the most-effective alternative for basement inflow (12,500 gpd) would be to transport and treat this volume of wastewater at an upgraded WWTP.

The net I/I of 132,000 gpd was included as a design factor in the Facilities Plan for the alternatives considered herein, and a limit of an additional 6,400 gpd was established for future allowable infiltration (Short-Elliott-Hendrickson, Inc. 1980). A check of the 1979 flow records at the St. Croix Falls WWTP confirms that there have been no changes in the flows that would affect the conclusions of the 1976 analysis (Short-Elliott-Hendrickson, Inc. 1980).

TAYLORS FALLS

An I/I analysis was conducted of the wastewater collection system in the City of Taylors Falls by Howard A. Kuusisto Consulting Engineers (1979). Wastewater flow monitoring conducted during the I/I analysis revealed a peak day I/I rate of 148,000 gpd and an average yearly rate of 76,400 gpd. Based on this analysis, it was concluded that the largest amount of extraneous flows are a result of infiltration. Many of the sources of this I/I flow appear to be on private property. It was determined that the amount of I/I within the sanitary sewer system is not excessive, according to USEPA program requirements, and that no additional steps need to be taken to control I/I exclusive of the improvement of the wastewater treatment facilities. This analysis was submitted to and subsequently certified by MPCA and USEPA (Howard A. Kuusisto Consulting Engineers 1980).

3.3.1.2. Water Conservation Measures

Water conservation as a means of significantly reducing wastewater flows is usually difficult to attain and often is only marginally effective. Traditional water conservation practices have proven to be socially undesirable except in areas where water shortages exist. Such measures usually succeed in limiting only luxury water usages such as lawn sprinkling, car washing, or swimming pool use, which do not impose loads on sanitary sewer systems.

One possible method for reduction of sewage flow is the adjustment of the price of water to control consumption. This method normally is used to reduce water demand in areas with water shortages. It probably would not be effective in reducing sanitary sewer flows because much of its impact is usually on luxury water usage, such as lawn sprinkling or car washing. None of the luxury uses impose a load on a separated sewerage system, such as the existing systems at St. Croix Falls and Taylors Falls. Therefore, the use of water price control probably would not be effective in significantly reducing wastewater flows.

Mandatory water conservation through the imposition of plumbing code restrictions could reduce domestic sewage flows. Two primary targets would be toilet tanks and shower heads. Typical plumbing code restrictions include a requirement that all new or replacement toilets have a 3.5-gallon capacity and that new or replacement shower heads deliver 3 gpm. Such measures would reduce water demand and sewage flow directly.

The projected amount of water consumed per capita by the year 2000 in the two service areas is 95 gpd in St. Croix Falls and 65 gpd in Taylors Falls. Visitors to the Interstate State Parks would contribute approximately 2 gpcd, and campers would contribute approximately 50 gpcd (Howard A. Kuusisto Consulting Engineers 1980). These per capita amounts are relatively small, and thus water conservation measures would be only marginally effective in reducing wastewater flows in the two communities.

3.3.1.3. Other Reduction Measures

Other conservation measures include educational campaigns, retrofitting of water-saving devices in toilets and showers, and the installation of pressure-reduction valves in areas where the water pressure is excessive (greater than 40 lb to 60 lb per square inch; lb/sq in). Educational campaigns usually take the form of spot television and radio commercials, and the distribution of leaflets with water bills or independently. Water-saving devices must continue to be used and maintained for flow reduction to be effective. Pressure reduction valves can be used where water pressure is higher than necessary, sometimes on a neighborhood basis. Where older pipes (especially iron pipes) are present, however, this excess pressure may be necessary to overcome higher head losses through the older pipes.

Because the efficacy of water conservation is complex and must be determined on a case-by-case basis, a comprehensive water conservation alternative is not proposed in this document. However, implementation of conservation measures in the future could reduce flows and could extend the de-sign capacity of the collection and treatment components for each community.

3.3.2. Collection Systems

The existing collection systems for both St. Croix Falls and Taylors Falls are discussed in Section 3.1.1. The sanitary sewer system in St. Croix Falls has been inspected periodically, and all required repairs and reconstruction have been completed since the last investigation in 1970 (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976). No repairs or reconstruction are required for this system or for the Taylors Falls sanitary sewer system.

No new interceptors or other collection facilities would be required for wastewater management alternatives that involve upgrading or replacement of either the St. Croix Falls WWTP or the Taylors Falls WWTP. The construction of a regional conventional treatment facility at St. Croix Falls or the implementation of a regional stabilization pond or land treatment alternative near either community would require the construction of a force main between the two communities that would connect the existing treatment plants. The line would pass through the Wisconsin Interstate State Park and be suspended within the bridge support system of the US Highway 8 bridge. A pumping station would be required in the community of origin and an additional pumping station would be required in the receiving community if the wastewater were to be treated at a site remote from the WWTP. A stabilization pond or land treatment alternative specific to either community would require the construction of a force main from the WWTP to the treatment site. New pumping stations also would be required for transportation of the wastewater to the site. The treated wastewater could be sprayed onto cropland or applied to land in flooding basins (rapid infiltration) with recovery of the treated water for irrigation or reuse. If the effluent will be discharged to the St. Croix River, an outfall sewer discharge line must be constructed from the treatment site to the point of discharge. It is expected that such a line would parallel the raw wastewater line to the site. The particular conveyance system required for each alternative considered is discussed in Section 3.4.

3.3.3. Wastewater Treatment Processes

A variety of treatment options were considered for both communities. In general, wastewater treatment options include conventional physical, biological, and chemical processes, and land treatment. The conventional options utilize preliminary treatment, primary sedimentation, secondary treatment, and tertiary treatment (including addition of chemicals) for phosphorus removal. These unit processes are followed by disinfection prior to effluent disposal. Land treatment processes include lagoons, slow-rate infiltration or irrigation, overland flow, and rapid infiltration.

The degree of treatment required is dependent on the effluent disposal option selected (Section 3.3.4.). Where disposal of treated wastewater is by effluent discharge to surface waters, effluent quality limitations determined by WDNR and MPCA (Section 3.2.2.) are used to establish the required level of treatment. Where effluent is disposed on land, groundwater protection standards must be met.

3.3.3.1. Preliminary Treatment and Primary Sedimentation

Conventional preliminary treatment and primary sedimentation processes serve to remove coarse solids, readily-settleable suspended solids, floating solids, and grease from the influent wastewater. The preliminary treatment generally consists of a bar screen (a screening device) or a combination of a coarse bar screen and a comminutor, followed by a grit chamber. Solids are ground in the comminutor and left in the waste, thereby eliminating the separate disposal of screenings. The grit chamber is used for the removal of inorganic solids such as sand. The next treatment unit is a primary sedimentation tank, in which heavy solid matter settles to the bottom and light solid matter floats to the top. The sludge (settled solids) and the scum (floating solids) are removed to the solids (sludge) handling facilities. The clarified liquid flows out of the primary sedimentation tank to the subsequent treatment units. It is assumed that these processes will remove approximately 30% of the BOD_5 and approximately 50% of the SS from the wastewater.

3.3.3.2. Secondary Treatment

Secondary treatment consists of biological processes in which soluble and colloidal-sized organic substances are removed from wastewater. The most frequently used processes provide a fluid media, such as the activated sludge process, or a fixed media, such as the trickling filter or the rotating biological contactor (RBC) process. Three processes were selected for cost-effective analysis: activated sludge systems, the RBC system, and the stabilization pond or aerated pond system. These systems were described in detail in the Facilities Plans. For comparative purposes, a brief discussion of these processes is presented here.

Activated sludge consists of an aerated suspension of microorganisms that utilize organic wastewater for respiration and reproduction. Aeration generally is provided by diffusion of air from the bottom of the tank or mechanical agitation. Separate settling facilities are used to remove viable organisms from the treated wastewater. There are a number of modifications to the basic activated sludge process, each specific to a different strength of waste. Efficiencies of BOD_5 removal by primary treatment and conventional diffused air and pure oxygen system options range from 85% to 95%.

The RBC system is a recent advance in fixed-media-type treatment systems (trickling filter process). This system is more compact and the cost of providing a cover over the units to eliminate freezing also is considerably less than the cost of providing a cover for the conventional rock trickling filter system. RBCs consist of a fixed medium (disks) on which biologial growth develops. The disks rotate partially through the wastewater. Separate settling facilities are used to remove slough (excess biomass) from the treated wastewater. The efficiency of the RBC process is comparable to that of an activated sludge system.

A stabilization pond (sometimes called a lagoon) is a shallow, man-made basin into which wastewater is discharged. The interaction of sunlight, algae, and oxygen provides treatment of the wastewater. An aerated pond is a variation of this system in which air is passed through the wastewater to increase the level of oxygen in the water and the circulation of the wastewater to increase the rate of the treatment process. Less land is required to treat the same volume of wastewater in an aerated pond because of the reduced requirement for surface area for the reaeration to occur. The effectiveness of the stabilization pond-aerated pond process may vary with weather conditions, but generally is close to that obtainable by other methods of secondary treatment. A preliminary cost comparison between these two variations was performed by the Facilities Planners. It was determined that the additional capital and O&M costs required for the aerated pond system were higher than the savings in land area and other costs over the stabilization pond system.

Compact activated sludge (CAS), RBC, and stabilization pond systems were selected for detailed costing and analysis as viable alternatives for secondary treatment processes for both St. Croix Falls and Taylors Falls by the communities' Facilities Planners.

3.3.3.3. Tertiary Treatment

Tertiary treatment or advanced wastewater treatment (AWT) involves treatment of wastewater beyond the primary and secondary processes. Tertiary treatment processes may include chemical treatment, biological nitrification, and land application. Tertiary treatment is not required by either State for a WWTP discharge to the St. Croix River. However, any discharge to Colby Lake and to Dry Creek would require advanced treatment for removal of phosphorus because of the 1.0 mg/l phosphorous limitation set by MPCA.

Chemical treatment consists of adding a chemical to promote the removal of suspended and/or colloidal matter or to precipitate dissolved pollutants such as phosphates. The chemical agents are added in a mixing tank; the water then is passed through a flocculation chamber and clarifier. Chemicals commonly used for phosphorus removal are lime, alum, and iron salts.

All three secondary treatment processes discussed in Section 3.3.3.2. are capable of providing nitrification. Basically, an increase in retention time during the process would produce the effects of nitrification (oxidation of ammonia to nitrate).

Land application consists of applying primary or secondary effluent to sites that have proper vegetation, soil, bedrock, and groundwater conditions. The application method may be either spray irrigation or rapid infiltration. The economics of this process depend on allowable application rates, site preparation costs, pretreatment and storage lagoon requirements, and the distance of the application site from the WWTP. These alternatives are described further in Section 3.3.4., where various methods of effluent disposal are discussed.

3.3.3.4. Disinfection

Disinfection processes are used to destroy disease-causing organisms. Four disinfection techniques are gas chlorination, sodium hypochlorite chlorination, ultraviolet, and ozonation. Chlorine is the least expensive of these chemicals to produce, to handle, and to provide the necessary disinfection to meet the present bacteriological standards. Residual chlorine, however, can reach toxic levels in receiving waters if chlorine is not applied properly or if the retention time is not sufficient. Sodium hypochlorite must be mixed in a dry state in water and fed to the wastewater. Ultraviolet light can be used for disinfection. An ultraviolet light is placed in the middle of a tube and the wastewater flows by the light source in the tube. For the light to be effective, its glass surface must be cleaned continually. Ozone generation requires large amounts of electric energy. Ozonation does not leave residual reaction products but is significantly more costly than chlorination. Therefore, chlorination is the disinfection process proposed in all system alternatives, assuming that chlorine will be carefully applied and that residual levels will be monitored and controlled.

3.3.4. Effluent Disposal

Three WWTP effluent disposal options are available: discharge to receiving waters, disposal on land or in wetlands, and reuse.

3.3.4.1. Surface Water Discharge

Presently, the most common method of the disposal of treatment plant effluent is to surface waters. Within the St. Croix Falls and Taylors Falls service areas, the only major waterway that could be utilized for effluent disposal is the St. Croix River. Of the ten wastewater facility alternatives considered, five propose direct discharge to the River, two propose discharge of effluent to the River only at two periods of the year, and two propose discharge of renovated water or underdrainage from the land treatment of the effluent. Only one alternative proposed the disposal of effluent at a land application site with no discharge to the St. Croix River.

3.3.4.2. Land Application

Land application or land treatment of wastewater utilizes natural physical, chemical, and biological processes in vegetation, soils, and underlying geological formations to renovate and dispose of domestic wastewater. Land application methods have been practiced in the US for over 100 years and presently are being used by hundreds of communities throughout the nation (Pound and Crites 1973).

Land disposal (including subsurface disposal and irrigation) involves the transport of effluent to a suitable site. The site must have suitable soil and geological conditions to prevent contamination of groundwater. In addition to wastewater renovation, the advantages of land application may include groundwater recharge, soil conditioning, and stimulation of plant growth. The applicability of this disposal option depends significantly on social acceptance, costs, and the amount of energy required to transport the effluent from the treatment facility to its disposal site.

The three principal processes utilized in the land disposal of treated wastewater are:

- Overland flow
- Slow-rate application or irrigation
- Rapid infiltration.

In the overland flow process, the wastewater is allowed to flow over a sloping surface and is collected at the bottom of the slope. This type of land application requires a stream for final disposal. Overland flow generally results in an effluent with an average phosphorus concentration of 4 mg/l. Phosphorus removals usually range from 30% of 60% on a concentration basis. At Ada, Oklahoma, using raw comminuted wastewater, total suspended solids concentrations were 6 mg/l to 8 mg/l in the runoff during the summer and 8 mg/l to 12 mg/l during the winter. BOD_5 concentrations during the same period were 7 mg/l to 11 mg/l in the summer and 8 mg/l to 12 mg/l in the winter. (USEPA and others 1977).

In the slow-rate method, treated wastewater is applied to the land to enhance the growth of crops or grasses. Wastewater is applied by spray, ridge and furrow, or flood methods, depending on the soil drainage characteristics and the type of vegetation. Application rates range from 0.5 inches to 4.0 inches per week. Renovation of wastewater occurs in the first 2 feet to 4 feet of soil, because organic matter, phosphorus, heavy metals, and bacteria are retained by adsorption and other mechanisms. Nitrogen is utilized by plants as they grow, and nitrogen removals at irrigation sites may be as high as 90%. Water is lost from the system through infiltration and evapotranspiration. The potential exists for affecting groundwater quality if the system is improperly designed or operated. A minimum depth to groundwater of 5 feet is required to allow for treatment of the wastewater before it mixes with the groundwater (USEPA and others 1977). Relatively large amounts of land are needed for the slow-rate process.

The rapid infiltration method involves high rates (4 inches to 120 inches per week) of application to highly permeable soils, such as sands and loamy sands. Although vegetative cover may be present, it is not an integral part of the system. Cleansing of wastewater occurs within the first few feet of soil by filtering, adsorption, chemical precipitation, and other geochemical reactions. In most cases, SS, BOD, and fecal coliform are removed almost completely. Phosphorus removal can range from 70% to 90%, depending on the physical and chemical properties of the soils. Nitrogen removal, however, generally is less significant, unless specific procedures are established to maximize denitrification (USEPA and others 1977).

In rapid infiltration systems, there is little or no consumptive use of wastewater by plants, and only minor evaporation occurs. Because most of the wastewater infiltrates the soil, groundwater quality may be affected. To minimize the potential for groundwater contamination at a rapid infiltration site, the minimum depth to the water table should be 10 feet. Due to extremely rapid rates of infiltration, the permeability of the underlying aquifer must be high to insure that the water table will not rise significantly and limit the usefulness of the site.

Recovery of renovated water from the soil material may be necessary for the successful operation of a rapid infiltration system. Recovery may be accomplished by pumped wells, draintile, or drainage ditches. Recovered water may have elevated nitrate levels during certain periods and total dissolved solids that may limit usage of the recovered water for some purposes.

LAND SUITABILITY

Several land areas in the vicinity of the St. Croix Falls and Taylors Falls WWTPs were considered through the facilities planning process for land application of effluent. Most of these areas were rejected because of unacceptable soil conditions; hydrogeological conditions; environmental, or aesthetic non-acceptance. Two sites that have potential for land application are located in Section 29 of St. Croix Falls Township, Wisconsin, and Section 26 of Shafer Township, Minnesota. However, detailed geotechnical investigations would have to be conducted and design parameters established to determine the suitability of these sites for land disposal. The Facilities Planners have determined, on the basis of available land area and existing data, that the site in Section 29 of St. Croix Falls Township is potentially suitable for rapid infiltration and the site in Section 26 of Shafer Township is suitable for spray irrigation. The site in Section 29 is located approximately 1.5 miles east of the existing St. Croix Falls WWTP. The site in Section 26 is located approximately 1.5 miles west of the existing Taylors Falls WWTP.

Treatment of Wastewater by Rapid Infiltration

Treatment by rapid infiltration of wastewater requires a relatively small area of highly permeable soil material (USEPA and others 1977). An application area of only 18 acres would be required to treat the projected year 2000 combined community design flow of 0.50 mgd (based on an estimated application rate of 10 inches per week during 9 months). Areas with slopes of up to 20% can be considered for use as application areas if site topography modification is incorporated into the system design. Both BOD_5 and SS in the wastewater can be removed to a high degree (up to 99%). However, nitrogen (N) and phosphorus (P) removal generally is poor (30% to 80%, and 50% to 90%, respectively, based on Sanks and Asano 1976).

Geotechnical investigations are required to determine suitability of a site for rapid infiltration of wastewater. Lenses of finely textured material can limit the vertical percolation of applied wastewater. This can result in mounding of the water table, sidehill seepage, and a reduction in the potential infiltration capacity. Recovery of the infiltrated water may be necessary in certain cases for monitoring the groundwater quality or to prevent mounding of the water table. Storage of wastewater during the winter should not be necessary considering climate conditions, but may be required to assure system reliability.

Treatment of Wastewater by Land Irrigation

Treatment of wastewater by the land irrigation process requires a considerable area of active cropland soils that have a moderately rapid permeability. Excellent removals of all (BOD_5 and SS, 99%; P, 95% to 99%; and N, 70% to 90%) except highly soluble salts can be expected. Based on an application rate of 2.5 inches per week, an annual application period of 26 weeks, and a flow of 0.50 mgd, an irrigation area of 110 acres would be required. If irrigation were to be limited to compensation for deficiencies of soil moisture, considerably more land area would be required.

The principal soil characteristic required for an acceptable application site is a permeability that will allow a reasonable drain tile spacing and still dewater the site. Under these conditions, farm equipment can be operated on the site within one day after the site has been irrigated, without traction or compaction problems. In addition, it is essential that the application site does not have a slope that will erode as a result of effluent applications. The acceptable slope varies according to the existing plant cover and the rate of infiltration. For example, cropland irrigation would be limited by slopes exceeding 6%, whereas forest irrigation would be feasible on slopes of up to 20% (Powers 1978).

Artificial drainage would be required on all sites except those where the water table is naturally low. Artificial drainage can be advantageous because it allows control of the applied effluent. The outlet point can be designed to minimize any excess seepage.

During the winter it would be necessary to store the effluent. The storage pond should be located on naturally fine-textured material to minimize seepage. The soil in the area west of Taylors Falls generally is loam till, with a moderate permeability and the area south of St. Croix Falls has similar soils. A pond constructed in this soil type would need to be artificially sealed.

The overland flow wastewater treatment alternative requires about half the land area needed for the irrigation alternative. Removals of BOD_5 (30%)

and N (60% to 90%) are excellent but P (60% to 80%) and SS (80%) removals are relatively poor. Additional treatment may be required to attain tertiary effluent limitations. Slopes should range from 2% to 4% to keep the travel distance to a minimum for a specified duration. Particle filtration accounts for the bulk of the treatment effect. Internal drainage of the soil should be minimal to minimize leaching of pollutants through the soil. The soils in the project area range from moderately permeable to very rapidly permeable; it is recommended that areas for overland flow have slowly permeable soils. It may be possible to find sufficient land area suitable for an irrigation-overland flow system within the project area. Storage for approximately 6 months would be required.

REGULATIONS

Wisconsin

The discharge limitations to the land disposal system are presented in the Wisconsin Administrative Code, Section NR 214.07. The applicable discharge limitations are summarized as follows:

- Wastewater must receive, at minimum, secondary treatment prior to disposal on land
- The BOD_5 concentration in the discharge to the land disposal system must not exceed 50 mg/l in more than 20% of the monitoring samples that are required during a calendar quarter
- The discharge must be distributed on an alternating basis to individual sections of the disposal system in a manner to allow sufficient resting periods to maintain the absorptive capacity of the soil
- The geometric mean of the fecal coliform bacteria counts for effluent samples taken during a calendar quarter, or such other period as may be specified in the permit for the discharge, shall not exceed 200 MPN per 100 ml.

Minnesota

The limitations to the disposal of wastewater on land are presented in MPCA's "Recommended Design Criteria for Disposal of Effluent by Land Application," including Addendum I--"Evaluating Land Application in Facilities

Planning" and Addendum II--"Design Considerations for Land Application Systems." The MPCA land application program is based on the "Process Design Manual for Land Treatment of Municipal Wastewater," prepared by USEPA, the US Army Corps of Engineers, and the US Department of Agriculture (1977).

Addendum II of the MPCA criteria does not state specific design parameters. Rather, it states that system design must be based on a particular set of circumstances unique to the project and that the facilities planners are responsible for interpreting field information and designing a land application system using the Design Manual and other available sources of information.

3.3.4.3. Wetlands Discharge

Wetlands, which constitute approximately 3% of the land area of the continental US (USEPA and others 1977), are hydrologically intermediate areas. Wetlands usually have too many plants and too little water to be called lakes, yet have enough water to prevent most agricultural or forestry uses. The use of wetlands to receive and satisfactorily treat wastewater effluents is a relatively new and experimental concept. In wetland application systems, wastewater is renovated by soil, plants, and microorganisms as it moves through and over the soil profile. Wetland systems are somewhat similar to overland flow systems in that most of the water flows over a relatively impermeable soil surface and the renovation action is more dependent on microbial and plant activity than on soil chemistry. The wetlands application option is not included in the alternatives considered herein because there are no suitable wetlands in the proximity of the existing or proposed WWTP sites. Creating a wetlands area to treat wastewater would require a large amount of land and could be environmentally unacceptable.

3.3.4.4. Reuse

Wastewater management techniques included under the category of treated effluent reuse may be identified as:

- Public water supply
- Groundwater recharge

- Industrial process uses or cooling tower makeup
- Energy production
- Recreation and turf irrigation
- Fish and wildlife enhancement.

Reuse of treatment plant effluent as a public water supply or for groundwater recharge could present potential public health concerns in the St. Croix Falls-Taylors Falls area. There are no major industries in the area that require cooling water. The availability of good-quality surface water and groundwater and the abundant rainfall, limit the demand for the use of treated wastewater for recreational and turf irrigation purposes. Organic contamination and heavy metal concentrations also are potential problems. Direct reuse would require very costly AWT, and a sufficient economic incentive is not available to justify the expense. Thus, the reuse of treated effluent currently is not a feasible management technique for the study area.

3.3.5. Sludge Treatment and Disposal

All of the wastewater treatment processes considered will generate sludge. The amount of sludge generated will vary considerably, depending on the treatment process. Sludge is largely water and organic matter; however, significant amounts of inert chemicals will be present if phosphorus removal has been performed. A typical sludge management program would involve interrelated processes for reducing the volume of the sludge and final disposal.

Volume reduction depends on the reduction of both the water and the organic content of the sludge. Organic material can be reduced through the use of digestion, incineration, or wet-oxidation processes. Moisture reduction is attainable through concentration, conditioning, dewatering, and/or drying processes. The mode of final disposal selected determines the processes that are required.

The disposal of sludge from the existing WWTPs at St. Croix Falls and Taylors Falls is by land application. The sludge produced at the St. Croix

Falls WWTP is anaerobically digested and hauled away by truck, either in liquid or dewatered form, and applied on agricultural land. The sludge produced at the Taylors Falls WWTP is anaerobically digested, dewatered on sand beds, and hauled away by truck for application on agricultural land. Because of the availability of adequate land in the proximity of the WWTP sites, the final disposal selected for the proposed WWTPs is land disposal of liquid sludge. The associated processes necessary for this selected mode of disposal are digestion and storage.

3.3.5.1. Sludge Digestion

During sludge digestion, organic solids are oxidized biologically to reduce and stabilize the sludge solids. The digestion processes considered are aerobic digestion and anaerobic digestion. In aerobic digestion, primary or biological sludges are oxidized by aeration in open tanks. This process has relatively low capital costs and entails little operational complexity, but it requires a high energy input. In anaerobic sludge digestion, organic matter in sludge is broken down by anaerobic microorganisms in a closed tank. Because the biological processes are complex, continuous control of the operation is required. Although the capital costs for this process are relatively high, the energy input is minimal, and the methane produced in the digester usually is used to further reduce operating costs.

3.3.5.2. Sludge Disposal

Sludge hauling and disposal is required for all treatment systems and is the last step in the sludge handling process. The type of vehicle used for sludge hauling will vary depending on whether the sludge is in a liquid or a solid form and whether land application is practiced. Sludge may be disposed of at sanitary landfills (except in Minnesota where it is not allowed), and on agricultural or forest land. When sludge is disposed in sanitary landfills, the sludge and other wastes are covered and the site is managed to prevent seepage or other environmental hazards. Although landfill disposal costs are relatively low, the nutrient value of the sludge is not utilized. Sludge can be used as a fertilizer and soil conditioner at agricultural land or forest disposal sites. Its utilization may be limited by the metals and pathogens in the sludge and by the soil conditions at the application site. Costs for utilization of sludge on farms or in forests are dependent on hauling distance, assuming that there are no costly limitations on the application of the sludge.

The disposal method recommended for both St. Croix Falls and Taylors Falls is direct hauling from the digester, land application of the sludge during non-frozen conditions, and storage of sludge during winter months.

3.4. System Alternatives

Initially, sixteen wastewater treatment alternatives were considered as potential solutions to improve the quality of effluent from the existing St. Croix Falls and Taylors Falls WWTPs, or to eliminate the direct discharge of treated effluent altogether. The alternatives include no action, independent treatment systems for St. Croix Falls and Taylors Falls, and regional treatment systems that would serve both communities. A number of combinations of treatment processes, siting options, effluent disposal options, and sludge processing and disposal options were considered. These alternatives initially included the following:

<u>Independent Treatment Systems for St. Croix Falls</u>

1. No action
2. Expanding and upgrading the existing WWTP (CAS)
3. Expanding and upgrading the existing WWTP (RBC)
4. Land disposal system (rapid infiltration)

<u>Independent Treatment Systems for Taylors Falls</u>

5. No action
6. Expanding and upgrading the existing WWTP (CAS)
7. Expanding and upgrading the existing WWTP (RBC)
8. Stabilization pond system with effluent discharge to River
9. Stabilization pond system with land disposal of effluent by spray irrigation
10. Land treatment of effluent by spray irrigation

Regional Treatment Systems

11. Conventional WWTP at St. Croix Falls
12. Conventional WWTP at Taylors Falls
13. Stabilization pond system near Taylors Falls with discharge of effluent to St. Croix River
14. Stabilization pond system with disposal of effluent on land by spray irrigation
15. Land disposal by rapid infiltration near St. Croix Falls
16. Land treatment by spray irrigation near Taylors Falls.

These conceptual alternatives were screened on a preliminary basis and seven (Alternatives 1, 2, 5, 10, 12, 15, and 16) were eliminated from further consideration because of technical infeasibility, low cost-effectiveness, and/or unacceptable environmental impacts.

After completing the preliminary screening process, nine other potential wastewater treatment alternatives were further developed and evaluated for technical feasibility, cost-effectiveness, and environmental concerns. These alternatives, including the no-action alternatives (required to be addressed in the EIS), are described in the following subsections.

The treatment plant construction cost and O&M costs for each alternative were estimated by the Facilities Planners. The alternatives and their costs are summarized in the following sections.

3.4.1. No-action Alternative

The "no-action" alternative would entail continued operation of the existing WWTPs with discharge to the St. Croix River, without any significant expansion, upgrading, or replacement during the current design period (to the year 2000). The "no-action" alternative implies that USEPA would not provide funds to support new construction, upgrading, or expansion of existing WWTPs.

The existing St. Croix Falls WWTP constructed in 1951 is incapable of achieving the reduction of BOD_5 and SS required by the WPDES discharge permit. Selection of this alternative would result in continued violation of State and Federal water pollution laws.

The existing Taylors Falls WWTP, constructed in 1941, is incapable of consistently achieving the reduction of BOD_5 and SS required by the NPDES discharge permit. The non-structural improvements might include improved scum and solids handling provisions, upgrading filter and digester equipment, and improved chlorination/disinfection measures. In addition, the operational improvements could be carried out by increased personnel, increased operational budget, and training of personnel. The above non-structural measures would result in improvement in effluent quality, but would not meet the proposed limitation consistently. Selection of this alternative would result in continued violation of State and Federal water pollution laws.

The costs associated with the "no-action" alternative for both St. Croix Falls and Taylors Falls would be minimal, and would constitute the normal expenditures required for the continuing operation, maintenance, and repair of the existing equipment. These costs have not been calculated for comparison with the costs of the other alternatives because the capacity of the existing WWTPs would be inadequate for treatment of the projected wastewater flows and effluent limitations could not be met. The reliability and flexibility of the existing facilities also are limited, and the minor operational, equipment, and personnel improvements that could be made would not compensate for the age and deteriorated conditon of the equipment. Thus the "no-action" alternative for the Taylors Falls and St. Croix Falls facilities is not feasible and will not be given further consideration.

3.4.2. Alternative 1 -- Upgrading and Expanding the Existing WWTP at St. Croix Falls

This alternative consists of upgrading and expanding the existing WWTP at St. Croix Falls (Figure 3-1) to a 400,000 gpd secondary treatment plant with direct discharge to the St. Croix River. This alternative would serve only the treatment needs of the St. Croix Falls service area. The treatment processes would include: raw wastewater pumping station; preliminary treatment consisting of screening and grit removal; primary clarification; secondary biological treatment using an RBC process; final clarification; chlorination; and anaerobic digestion of sludge. The digested sludge would be stored in a lagoon and/or hauled by tank truck for land spreading on

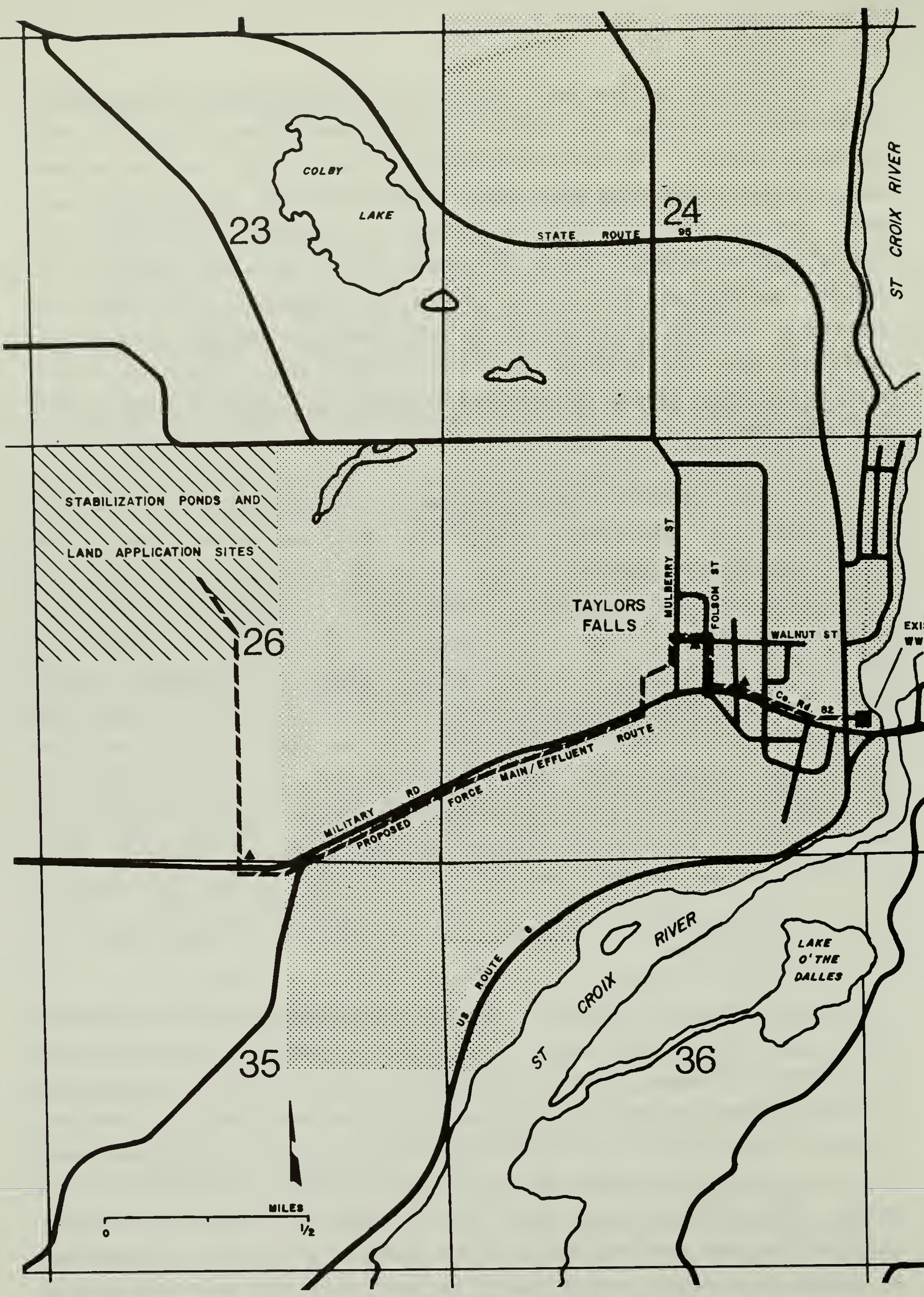
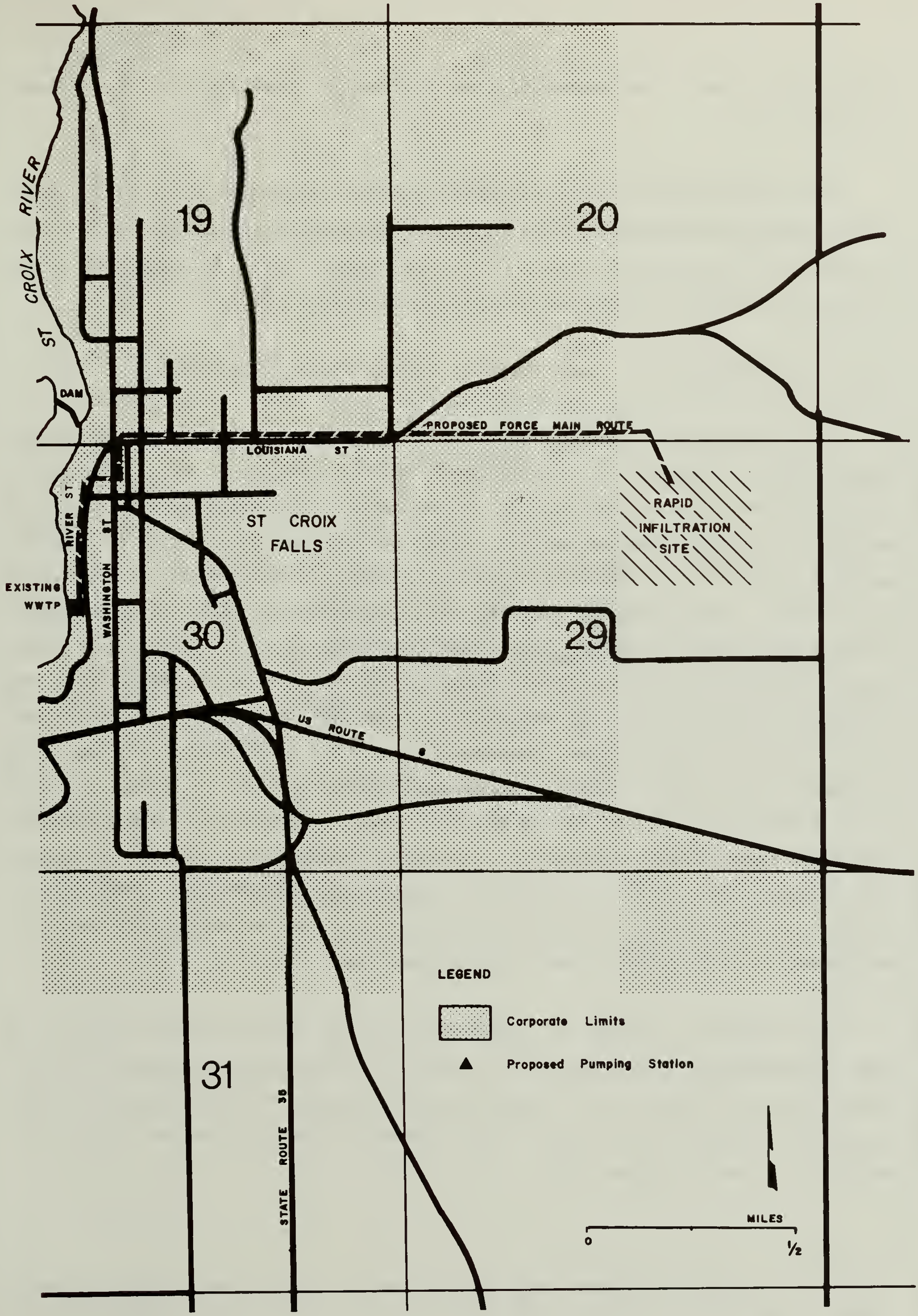


Figure 3-1. Existing and proposed site areas for the wastewater treatment facilities alternatives and force main routes.



ST CROIX RIVER
DAM
19
20
PROPOSED FORCE MAIN ROUTE
LOUISIANA ST
RIVER ST
WASHINGTON ST
ST CROIX FALLS
RAPID INFILTRATION SITE
EXISTING WWTP
30
29
US ROUTE 8
31
STATE ROUTE 35
LEGEND
Corporate Limits
Proposed Pumping Station
MILES
0
½

agricultural land. The schematic flow diagram for this alternative is shown in Figure 3-2.

This alternative has an estimated initial capital cost of $1,124,000. The estimated annual O&M cost is $31,000. The estimated salvage value after 20 years of use is $275,000. The total present worth is estimated to be $1,414,000 (Howard A. Kuusisto Consulting Engineers 1980).[1]

3.4.3. Alternative 2 -- Land Disposal System for St. Croix Falls

This alternative consists of rehabilitation of the existing WWTP at St. Croix Falls, followed by land disposal of the effluent. This alternative only would serve the needs of St. Croix Falls. The existing WWTP would be modified, upgraded, and expanded to treat the average design flow of 400,000 gpd and to produce an effluent capable of meeting a BOD_5 effluent limitation of 50 mg/l. The effluent from the modified existing WWTP would be pumped through an 8-inch diameter force main approximately 2.0 miles along River Road, through an area north of Kentucky Street, and along Washington and Louisiana Streeta to a land disposal site in the northeast quarter of Section 29 of St. Croix Falls Township (Figure 3-1). The effluent would be discharged into flooding basins at an application rate of 10 inches per week for a 9-month period, and stored for the 3 winter months in a storage basin. The total land area required for the rapid infiltration system, including the storage basin and a buffer zone, is approximately 30 acres. The modifications or additions that would be required to the existing WWTP were not addressed in the St. Croix Falls Facilities Plan.

An underdrain system or recovery wells may be required, depending on the hydrogeological conditions at the site. The digested sludge from the WWTP would be stored in a lagoon and/or hauled by tank truck for land spreading on agricultural land. The schematic flow diagram for this alternative is shown in Figure 3-3.

---

[1] Capital and O&M costs were supplied by the St. Croix Falls Step 1 Consultant. Costs were updated and broken down by the Taylors Falls Step 1 Consultant.

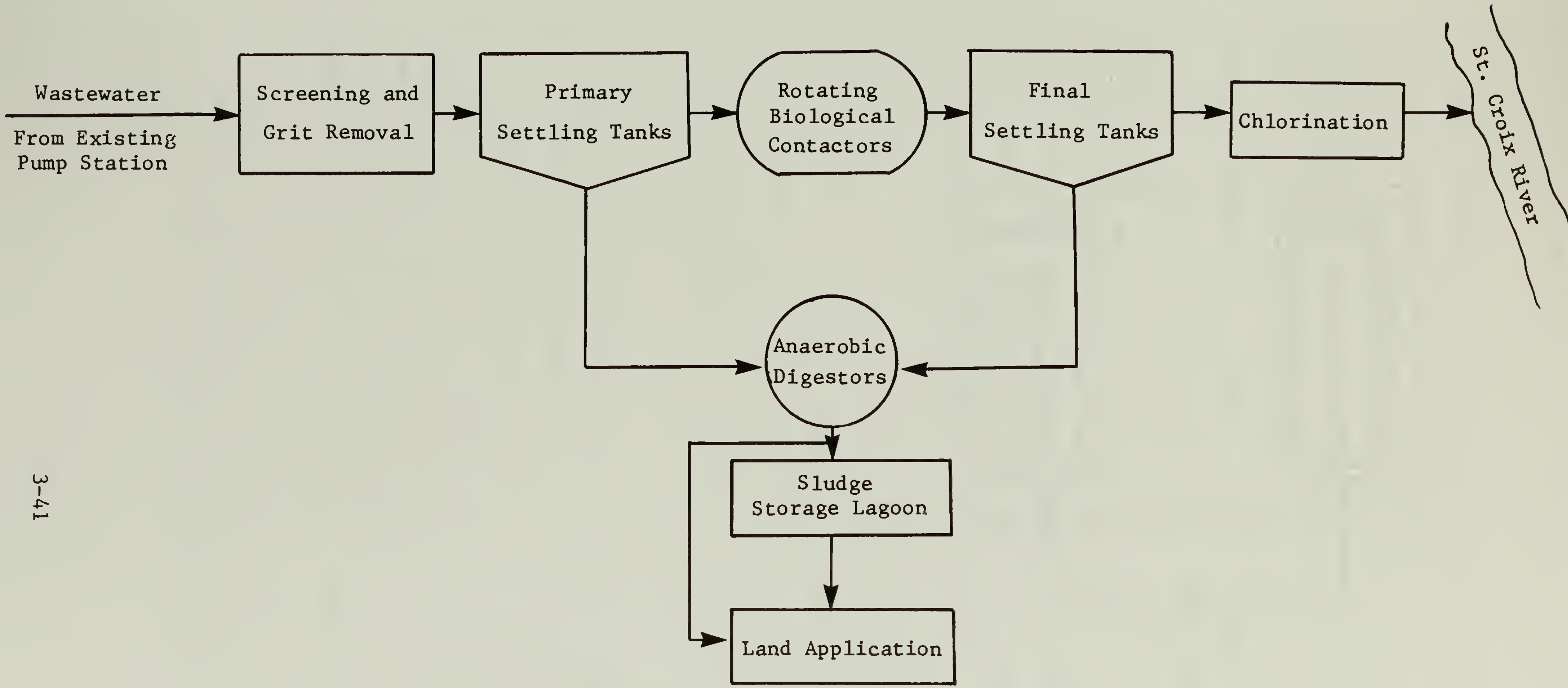


Figure 3-2. Schematic diagram of treatment processes proposed for Alternative 1.

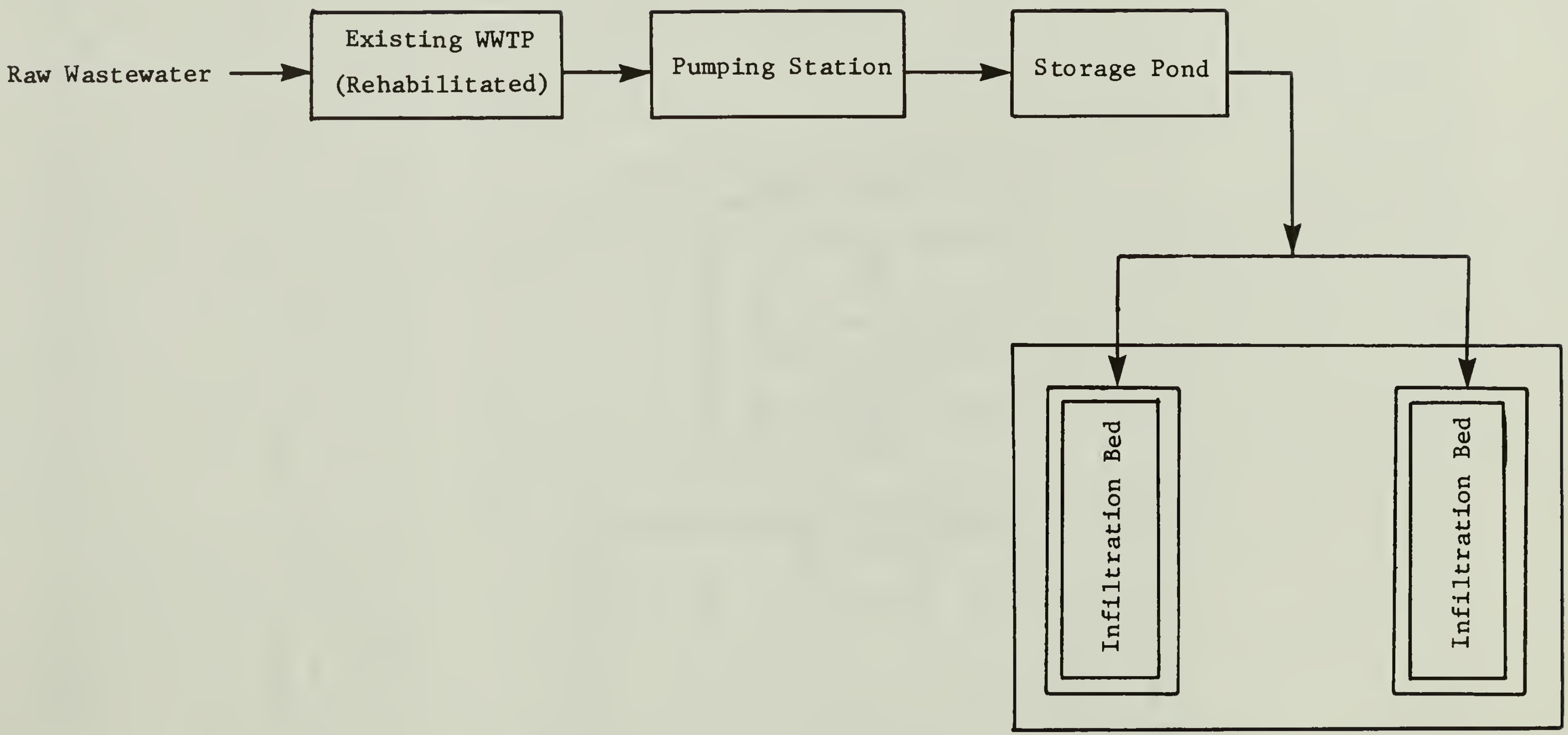


Figure 3-3. Schematic diagram of treatment processes proposed for Alternative 2.

This alternative has an estimated initial capital cost of $1,181,000 and an estimated annual O&M cost of $40,000. The estimated salvage value after 20 years of service is $540,000. The total present worth is estimated to be $1,466,000. The cost associated with underdrains and recovery wells were not included in the cost analysis for this alternative.

3.4.4. Alternative 3 -- Compact Activated Sludge System for Taylors Falls

This alternative for Taylors Falls proposes the demolition of the existing WWTP and construction of a new 140,000 gpd treatment plant at the same site utilizing a compact activated sludge secondary treatment process (Figure 3-1). The treated wastewater would be discharged directly to the St. Croix River. To implement this alternative all existing wastewater treatment process units would have to be demolished. During the construction period, interim treatment facilities would be required. The existing final tank would be utilized for primary settling and disinfection prior to discharge. The raw wastewater would be screened, and ferric chloride would be added prior to settling to enhance treatment efficiency. Settled solids would be pumped and disposed of off-site. Some temporary piping and manhole structures would be required to reroute wastewater directly to the final tank. A one-time cost is included in the cost estimates for interim treatment.

The treatment processes would include: preliminary treatment consisting of screening and grit removal; biological treatment using an extended aeration activated sludge process; final clarification; chlorination; and aerobic digestion of sludge. Because of the proximity of the WWTP site to the community area, most of the unit processes would be covered or enclosed for aesthetics and to avoid potential nuisance conditions. The digested sludge will be hauled by tank truck for spreading on agricultural land. The schematic flow diagram for this alternative is shown in Figure 3-4.

This alternative has an estimated initial capital cost of $988,000 and an estimated annual O&M cost of $36,000. The estimated salvage value after 20 years of use is $198,000. The total present worth is estimated to be $1,348,000.

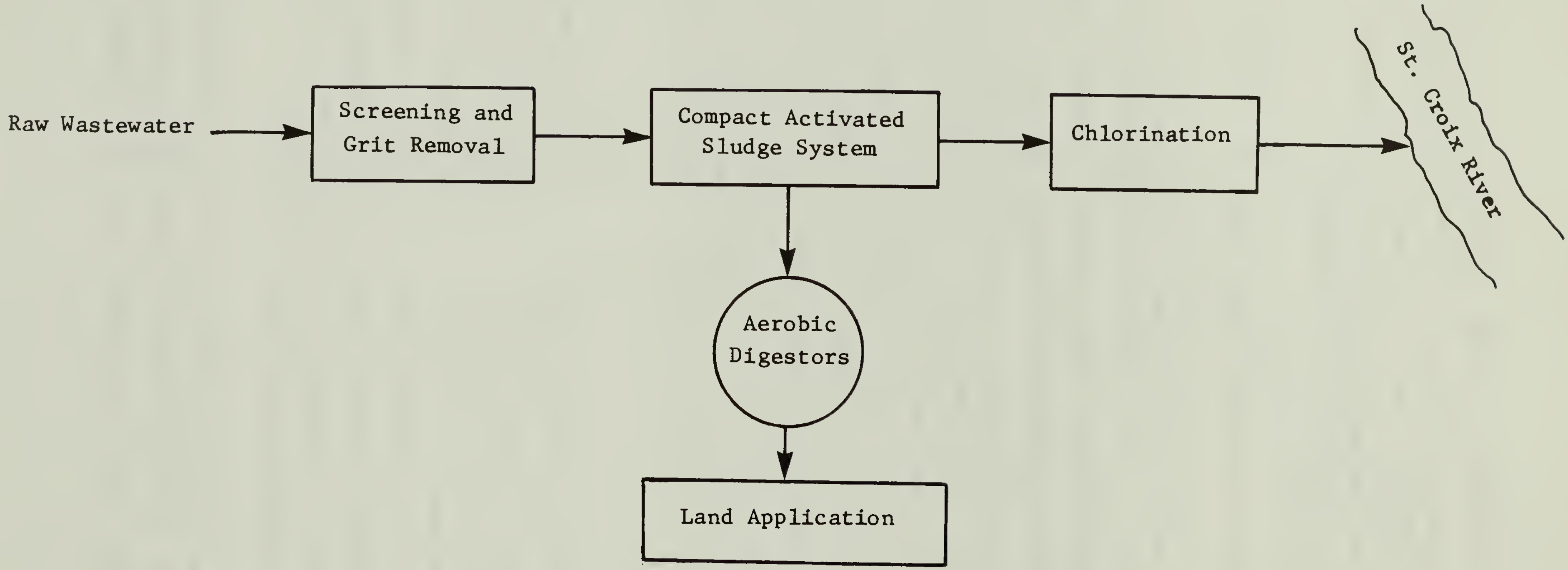


Figure 3-4. Schematic diagram of treatment processes proposed for Alternative 3.

3.4.5. Alternative 4 -- Rotating Biological Contactor System for Taylors Falls

This treatment system alternative for Taylors Falls would involve demolition of the existing WWTP and construction of a new 140,000 gpd plant at the same site utilizing an RBC secondary treatment process (Figure 3-1). The treated wastewater would be discharged directly to the St. Croix River. Like Alternative 3, all the existing unit processes would have to be demolished and interim treatment facilities would have to be provided during construction.

The treatment processes would include: preliminary treatment consisting of screening and grit removal; primary clarification; secondary biological treatment using an RBC process; final clarification; chlorination; and anaerobic digestion of sludge. Because of the proximity of the WWTP site to the downtown area, most of the unit processes would be enclosed for aesthetic purposes and to avoid the creation of potential nuisance conditions. The digested sludge would be hauled by tank truck for application on agricultural land. The schematic flow diagram for this alternative is shown in Figure 3-5.

This alternative has an estimated initial capital cost of $985,000 and an estimated annual O&M cost of $27,000. The estimated salvage values after 20 years of use is $264,000. The total present worth is estimated to be $1,233,000.

3.4.6. Alternative 5 -- Stabilization Pond System for Taylors Falls

This alternative for the Taylors Falls area consists of a new stabilization pond treatment facility at a site in the northwest quarter of Section 26 of Shafer Township (Figure 3-1). Implementation of this alternative would require approximately 30 acres to 40 acres of land. The treated wastewater would be discharged to the St. Croix River twice a year. This alternative offers a considerable degree of flexibility, but selecting the optimum time of the year for discharge by monitoring the receiving stream and the quality of the effluent is critical to the success of this method.

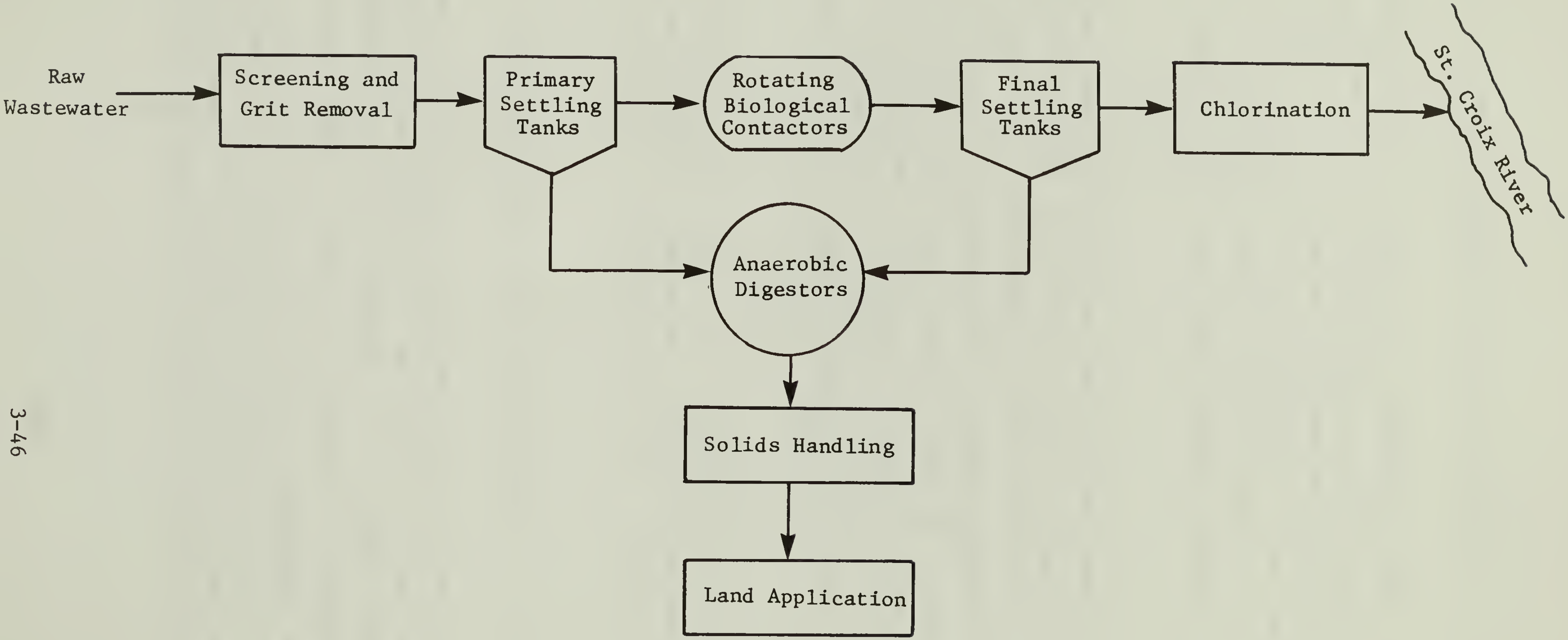


Figure 3-5. Schematic diagram of treatment processes proposed for Alternative 4.

The existing WWTP would be abandoned in this alternative. The wastewater would be conveyed to the proposed site using four pumping stations and approximately 2.5 miles of new force main located along County Road 82, Folson, Walnut, and Mulberry Streets, and Military Road (Figure 3-1). The effluent from the new treatment facility would be pumped through 2.5 miles of force main and would be discharged to the St. Croix River. The effluent line would be placed adjacent to the raw wastewater line between the St. Croix River and the treatment ponds. Use of the effluent line as a siphon should be given consideration during the Step 2 design phase of this project. This could reduce energy consumption and prolong the service life of the effluent pumping station. Provisions for disinfection would be included in conjunction with the design of the effluent line in case MPCA should require chlorination in the future. Chlorine could be metered into the final control structure, which would allow sufficient contact time within the line before discharge.

The treatment processes include: biological treatment using stabilization ponds and chlorination. The stabilization ponds would be sized for 180 days of wastewater detention time. This alternative does not require separate sludge processing facilities. The sludge would collect in the bottom of the pond and would undergo anaerobic digestion. Inert solids which would not decompose biologically would remain in the pond and would require cleanout and removal once every 10 to 20 years. The schematic flow diagram for this alternative is shown in Figure 3-6.

This alternative has an estimated initial capital cost of $1,164,000 and an estimated annual O&M cost of $18,000. The estimated salvage value after 20 years of use is $572,000. The total present worth is estimated to be $1,218,000. The cost for the demolition of existing facilities was not included in these figures by the Facilities Planners.

3.4.7. Alternative 6 -- Land Disposal System for Taylors Falls

This alternative for the Taylors Falls system is similar to Alternative 5 except that the treated wastewater from the ponds would be discharged on land. The treatment facility and the land application site would be located

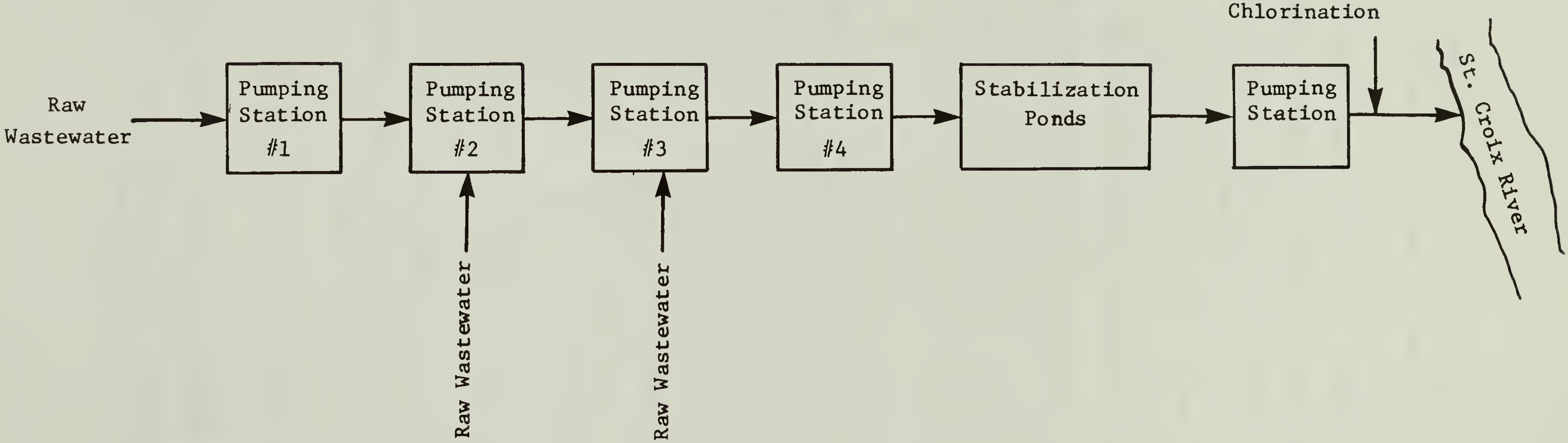


Figure 3-6. Schematic diagram of treatment processes proposed for Alternative 5.

in the northwest quarter of Section 26 of Shafer Township (Figure 3-1). Approximately 110 acres of land would be required for this alternative.

The treatment processes include: biological treatment, using stablization ponds; chlorination for disinfection; and irrigation. The stabilization pond system would be sized to provide for 210 days of both detention and storage of wastewater. The treated wastewater from the storage pond would be pumped and applied on land using spray irrigation equipment. To avoid the potential for raising the level of the groundwater, an underdrainage system would be provided. The renovated water would be collected as drainage and pumped through a discharge force main to the St. Croix River. The schematic flow diagram for this alternative is shown in Figure 3-7.

This alternative has an estimated initial capital cost of $1,584,000 and an estimated annual O&M cost of $21,000. The estimated salvage value after 20 years of use is $996,000. The total present worth is estimated to be $1,569,000.

3.4.8. Alternative 7 -- Regional Conventional WWTP at St. Croix Falls

This alternative consists of upgrading and expanding the existing St. Croix Falls WWTP to treat wastewater from both the St. Croix Falls and Taylors Falls service areas. The existing Taylors Falls WWTP would be abandoned and an additional 0.25 acres of land would be needed at the St. Croix Falls WWTP site. A pumping station and force main constructed from the Taylors Falls WWTP, attached to the US Highway 8 bridge, through the Wisconsin Interstate State Park, to the St. Croix Falls WWTP would divert the wastewater from Taylors Falls to the regional WWTP treatment facility on the St. Croix Falls side of the River (Figure 3-1).

The treatment processes for this regional WWTP would include: preliminary treatment consisting of screening and grit removal; primary clarification; secondary biological treatment using an RBC system; final clarification; chlorination; and anaerobic digestion of sludge. The digested sludge would be hauled by tank truck and spread on agricultural land. The effluent from the WWTP would be discharged directly to the St. Croix River. The schematic flow diagram for this alternative is shown in Figure 3-8.

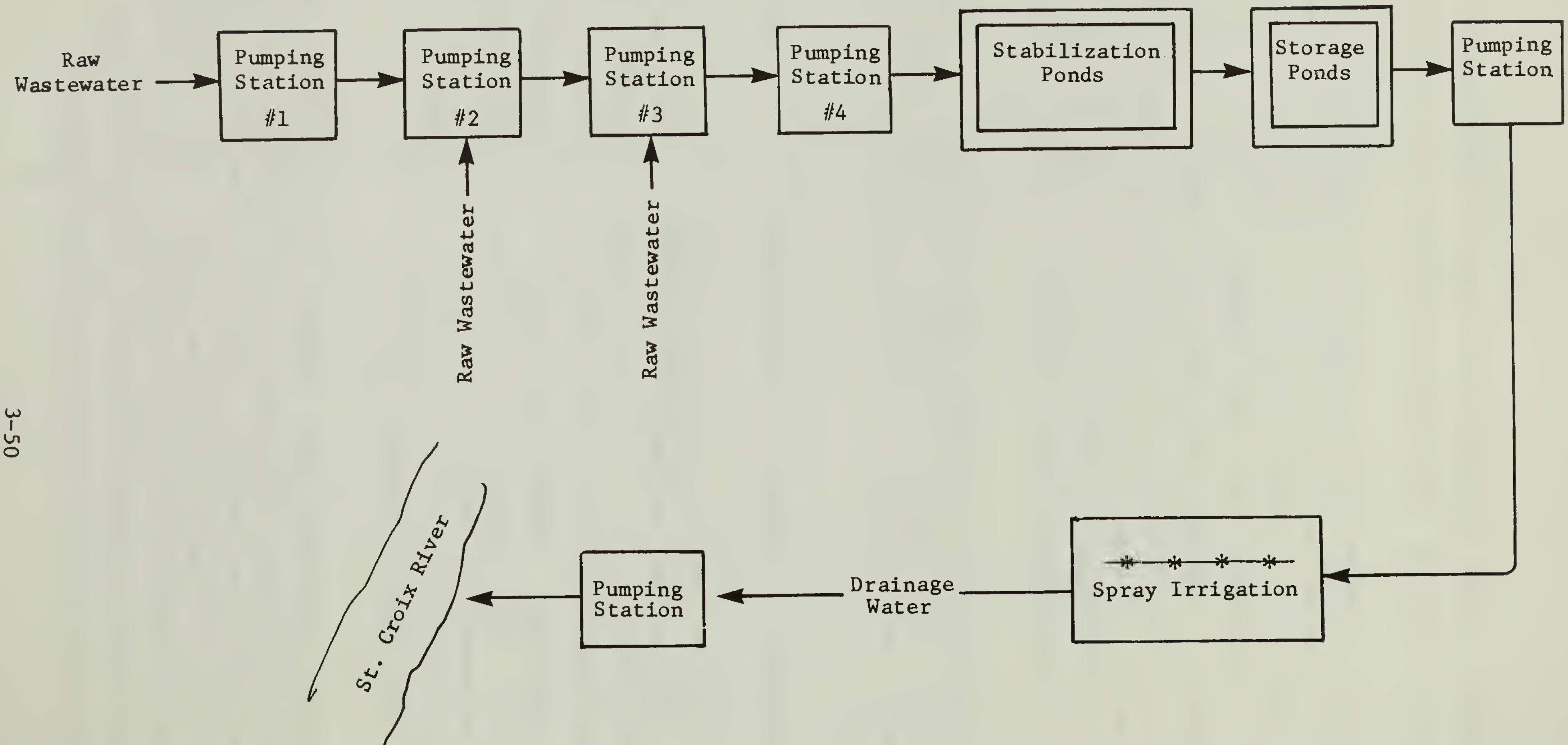


Figure 3-7. Schematic diagram of treatment processes proposed for Alternative 6.

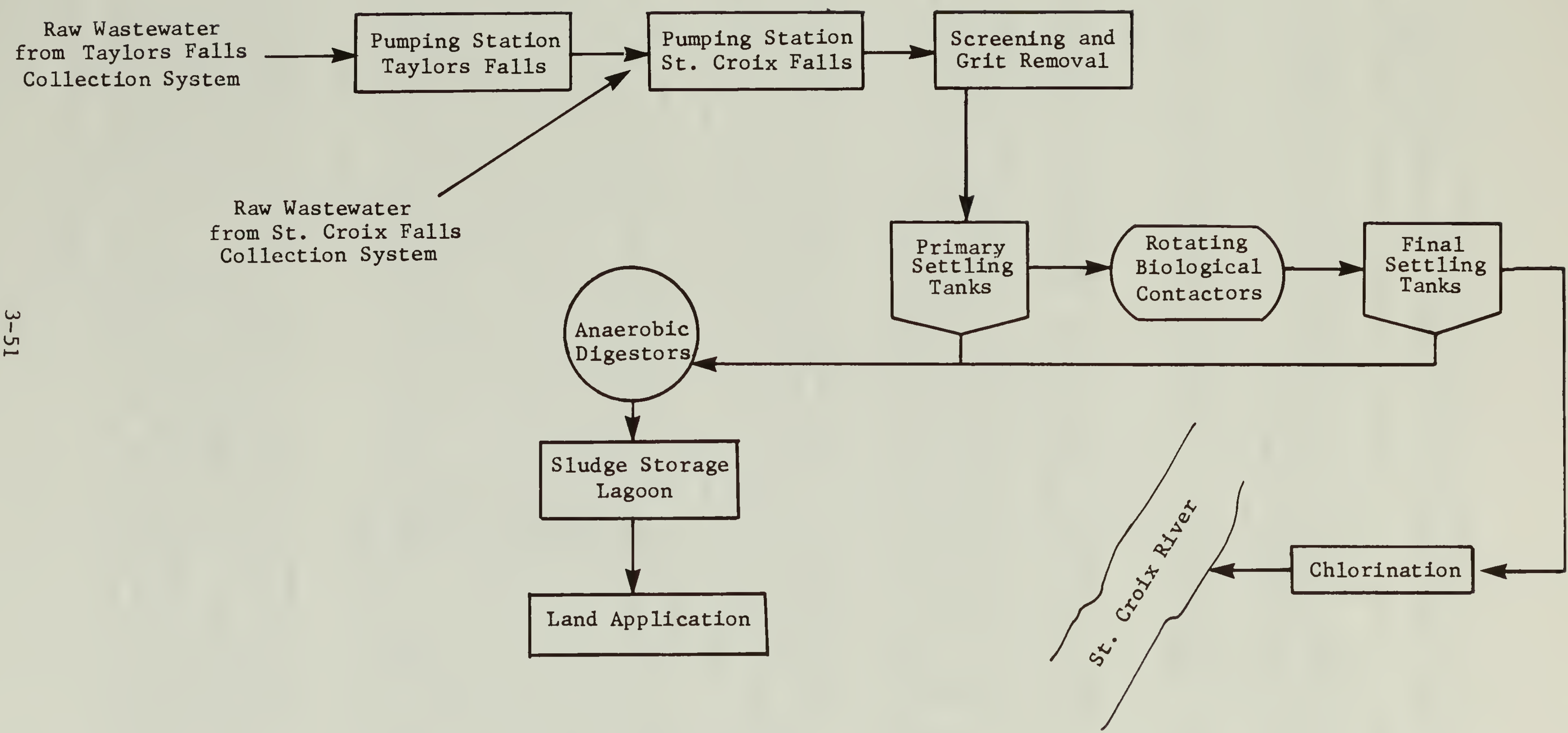


Figure 3-8. Schematic diagram of treatment processes proposed for Alternative 7.

This alternative has an estimated initial cost of $2,113,000, and an estimated annual O&M cost of $62,000. The estimated salvage value after 20 years of service is $636,000. The total present worth is estimated to be $2,657,000. The cost for the demolition of existing facilities at the Taylors Falls WWTP was not included in the cost analysis for this alternative by the Facilities Planners.

3.4.9. Alternative 8 -- Regional Stabilization Pond System near Taylors Falls

This alternative consists of a new regional stabilization pond treatment facility to be constructed at a site at the northwest quarter of Section 26 of Shafer Township (Figure 3-1), to treat wastewater from both the St. Croix Falls and Taylors Falls service areas. Approximately 90 acres of land would be needed for this alternative. The treated wastewater would be discharged to the St. Croix River twice a year.

The existing St. Croix Falls and Taylors Falls WWTPs would be abandoned. A pumping station would be constructed at the St. Croix Falls WWTP. A force main from the WWTP, south through the Wisconsin Interstate State Park to US Highway 8, crossing the St. Croix River attached to the highway bridge, extending to the existing Taylors Falls plant site would be constructed. This line would divert the wastewater from the St. Croix Falls service area to the regional plant. The combined system wastewater collected at the existing Taylors Falls plant site would be transported to the new stabilization pond system with the assistance of four pumping stations and approximately 2.5 miles of force main via the same route as discussed in Alternative 5 (Figure 3-1). The effluent from the stabilization pond system would be pumped through 2.5 miles of force main and would discharge to the St. Croix River.

The treatment processes include: biological treatment using stabilization ponds. The stabilization ponds would be sized for 180 days of wastewater detention. The sludge would collect in the bottom of the pond and would undergo anaerobic digestion. Inert solids that are not biologically decomposed would remain in the pond and may require cleanout and removal once every 10 to 20 years. The schematic flow diagram for this alternative is shown in Figure 3-9.

This alternative has an estimated initial cost of $2,660,000 and an estimated annual O&M cost of $31,000. The estimated salvage value after 20 years of use is $1,390,000. The total present worth is estimated to be $2,652,000. The costs for the demolition of the existing Taylors Falls and St. Croix Falls WWTPs have not been included in these estimates by the Facilities Planners.

3.4.10. Alternative 9 -- Regional Land Disposal System near Taylors Falls

This alternative is similar to Alternative 8 except that the treated wastewater would be discharged on land and not to the River. The regional treatment facility and the land application site would be located in Section 26 of Shafer Township (Figure 3-1). Approximately 280 acres of land would be needed for this alternative. The existing St. Croix Falls and Taylors Falls WWTPs would be abandoned and the wastewater would be diverted to the new regional plant by pumping stations and force mains as described for Alternative 8.

The treatment processes include biological treatment using stabilization ponds and chlorination. The stabilization pond system would be sized for 210 days to provide for both detention and storage of wastewater. The treated wastewater from the storage pond will be pumped and applied on land using spray irrigation equipment. To avoid the potential for raising the level of the groundwater, an underdrainage system would be provided. The renovated drainage water would be collected and pumped through a discharge force main to the St. Croix River. The schematic flow diagram for this alternative is shown in Figure 3-10.

This alternative has an estimated initial cost of $3,651,000, and an estimated annual O&M cost of $23,000. The estimated salvage value after 20 years of use is $2,175,000. The total present worth is estimated to be $3,375,000. The costs for the demolition of the existing Taylors Falls and St. Croix Falls WWTPs were not included in the cost analysis for this alternative by the Facilities planners.

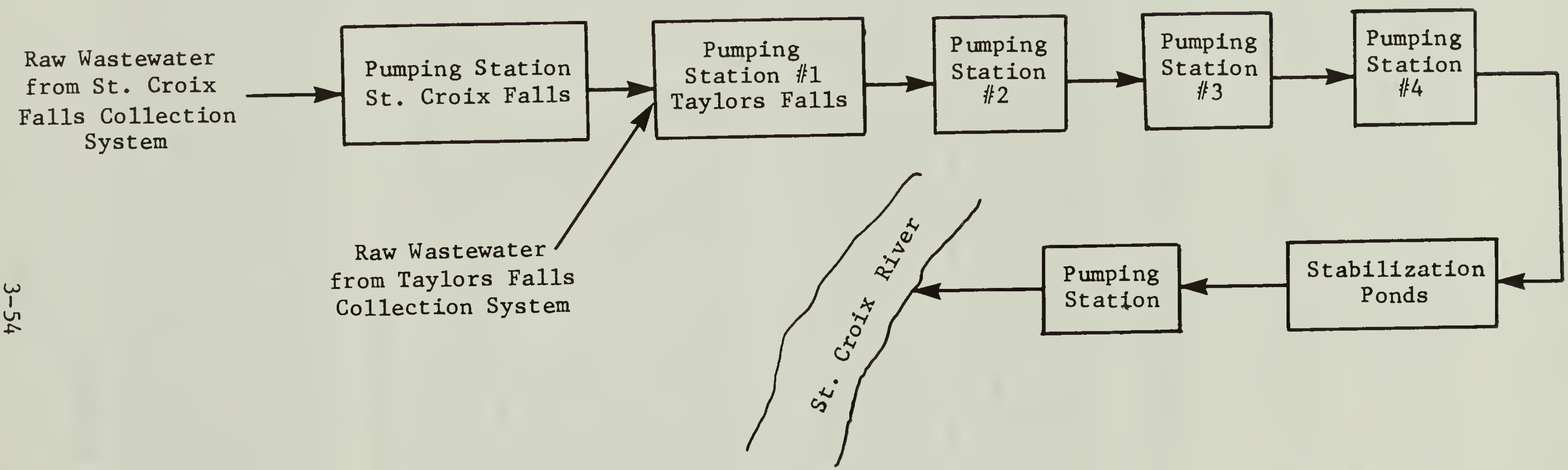


Figure 3-9. Schematic diagram of treatment processes proposed for Alternative 8.

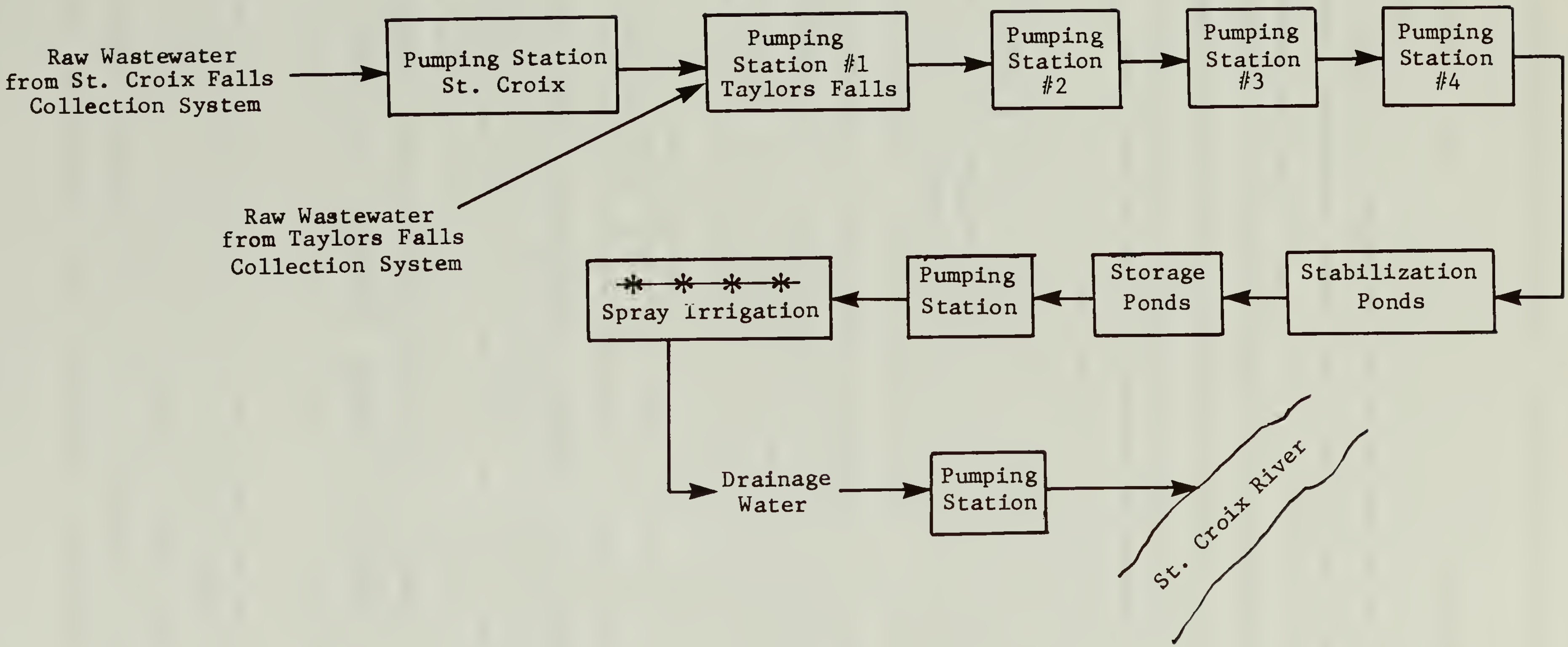


Figure 3-10. Schematic diagram of treatment processes proposed for Alternative 9.

3.5. Flexibility and Reliability of System Alternatives

3.5.1. Flexibility

Flexibility in wastewater treatment refers to the ease with which an existing system can be upgraded or modified to accommodate future growth and changing effluent limitations. The system alternatives considered for St. Croix Falls and Taylors Falls include the existing centralized collection sewer systems, new treatment facilities, and effluent disposal options. Because most of the components are common to a majority of the alternatives, the following evaluation is generally applicable to most of the alternatives unless stated otherwise in the discussion.

For gravity sewer systems, flexibility to handle future increases in flows greater than the original design flow generally is minimal. The interceptor sewers usually are designed to accommodate flows in excess of those expected during a 20-year planning period. Increasing the capacity of collector sewers is an expensive process. Also, the layout of the system depends on the location of the treatment facility. The expansion of a sewer system generally is easy through the addition of new sewers, but is expensive, especially when new large-diameter interceptor sewers are required.

The ability to expand a conventional WWTP depends largely on the processes being used, layout of the facilities, and availability of additional land for expansion. The expansion or upgrading of most of the treatment processes considered for the proposed systems would be relatively easy. With proper design of process components of the treatment plant, and proper planning of the facility layout, the cost and effort required for expansion may be relatively small. Most conventional treatment processes also have good operational flexibility because operators can, to some extent, vary treatment parameters.

Based on the above discussion, it can be concluded that the majority of the alternatives considered in this report generally have similar flexibility for future growth and/or planning. The primary exception is the site of the existing Taylors Falls WWTP, which is fairly steep-sloped and of minimal area, which significantly constrains future expansion of the facilities.

3.5.2. Reliability

Reliability refers to the ability of a system or system components to operate without failure at its designed level of efficiency. It is particularly important to have dependable operation in situations where adverse environmental or economic impacts may result from failure of the system.

A gravity sewer is highly reliable when designed properly. Such systems require little maintenance, consume no energy, and have no mechanical components to malfunction. Gravity sewer problems can include clogged pipes leading to sewer backups; I/I, increasing the volume of flow beyond the design level; and broken or misaligned pipes. Major contributors to these problems are improperly jointed pipes and damage to manholes, especially where they are not located in paved roads. Where large sewers are used to achieve lower pipe slopes, problems with solids deposition can mean that frequent flushing with large volumes of water will be necessary.

Pumping stations and force mains increase operation and maintenance requirements and decrease system reliability. Backup pumps must be installed to provide service in case one pump fails. A backup power source usually is provided, such as dual power lines or stationary or portable emergency generators. Force mains generally are reliable; excessive solids deposition and bursting pipes rarely occur.

Federal Guidelines for Design, Operation, and Maintenance of Wastewater Treatment Facilities (Federal Water Quality Administration 1970) require that:

> All water pollution control facilities should be planned and designed so as to provide for maximum reliability at all times. The facilities should be capable of operating satisfactorily during power failures, flooding, peak loads, equipment failure, and maintenance shutdowns.

The wastewater control system design for the study area will consider the following types of factors to insure system reliability:

- Duplicate sources of electric power
- Standby power for essential plant elements
- Multiple units and equipment to provide maximum flexibility in operation
- Replacement parts readily available
- Holding tanks or basins to provide for emergency storage of overflow and adequate pump-back facilities
- Flexibility of piping and pumping facilities to permit rerouting of flows under emergency conditions
- Provision for emergency storage or disposal of sludge
- Dual chlorination units
- Automatic controls to regulate and record chlorine residuals
- Automatic alarm systems to warn of high water, power failure, or equipment malfunction
- No treatment plant bypasses or upstream bypasses
- Design of interceptor sewers to permit emergency storage without causing backups
- Enforcement of pretreatment regulations to avoid industrial waste-induced treatment upsets
- Floodproofing of treatment plant
- Plant Operations and Maintenance Manual to have a section on emergency operation procedures
- Use of qualified plant operators.

Through the incorporation of these types of factors (and all appropriate standards set forth in the Wisconsin and Minnesota Administrative Codes) in the design and operation of the wastewater control system for the St. Croix Falls and Taylors Falls service areas, the system will be virtually "fail-safe." This is necessary to insure that effluent standards would be met during the entire design life of the system.

3.6. Comparison of Alternatives and Selection of the Recommended Action

The selection of the most cost-effective, environmentally acceptable, and implementable alternative(s) through the EIS process involved the consideration of technical feasibility, reliability, costs, environmental effects, public desirability, and the ability to comply with the applicable effluent discharge standards for the States of Wisconsin and Minnesota. The potential for forming an interstate sanitary district for the regional alternatives also was considered in the selection process.

3.6.1. Comparison of Alternatives

Project costs were categorized into capital expenses, operating and maintenance expenses, and salvage values for the equipment and structures for each alternative. A summary of the estimated costs of project alternatives are displayed in Table 3-7. The system alternatives are grouped into three categories -- independent treatment facilities for St. Croix Falls, independent treatment facilities for Taylors Falls, and regional treatment facilities for both communities.

Of Alternatives 1 and 2, which propose independent treatment systems for the St. Croix Falls service area, the lowest cost alternative of the two, in terms of total capital cost, total present worth, and annual cost, is Alternative 1. Of Alternatives 3 through 6, which propose new treatment systems for only the Taylors Falls service area, the total present worth cost for Alternatives 3 and 6 is higher than the total present worth cost for Alternatives 4 and 5. Alternatives 4 and 5 are within \$15,000, or less than 2%, of each other in terms of total present worth. Of Alternatives 7 through 9, which would serve both communities, Alternatives 7 and 8 are within \$5,000, or less than 1%, of each other in terms of total present worth. Alternative 9 is 27% more costly than the other two.

In summary, expanding and upgrading the existing WWTP at St. Croix Falls (Alternative 1) appears to be the most cost-effective individual system for the City of St. Croix Falls. Construction of a new RBC secondary WWTP at the site of the existing plant at Taylors Falls (Alternative 4) or treatment by stabilization ponds with return of the treated effluent on a periodic basis to the St. Croix River (Alternative 5) appear to be the most

Table 3-7. Summary of estimated costs for the St. Croix Falls, Wisconsin and Taylors Falls, Minnesota wastewater treatment alternatives (in thousands of dollars).

	Alternatives	Construction Cost	Land Cost	Replacement Cost	Salvage Cost	Annual O&M Cost	Present Worth[b] Capital[c]	Present Worth[b] Replacement	Present Worth[b] Salvage	Present Worth[b] O&M Cost	Present Worth[b] Total	Average Annual Equivalent Cost
1.	Upgrading/Expanding Existing WWTP at St. Croix Falls	899.0	--	95.0	275.0	31.0	1,124.0	34.0	(69.0)	325.0	1,414.0	134.7
2.	Land Disposal System for St. Criox Falls	890.0	68.0	--	540.0[d]	40.0	1,181.0	--	(143.0)	428.0	1,466.0	139.7
3.	Compact Activated Sludge System for Taylors Falls	790.0	--	90.0	198.0	36.0	988.0	32.0	(50.0)	378.0	1,348.0	128.5
4.	Rotating Biological Contactor System for Taylors Falls	788.0	--	90.0	264.0	27.0	985.0	32.0	(67.0)	283.0	1,233.0	117.5
5.	Stabilization Pond System for Taylors Falls	895.0	45.0	25.0	572.0[d]	18.0	1,164.0	9.0	(144.0)	189.0	1,218.0	116.1
6.	Land Disposal System for Taylors Falls	1,135.0	165.0	45.0	996.0[d]	21.0	1,584.0	16.0	(251.0)	220.0	1,569.0	149.5
7.	Regional Conventional Wastewater Treatment Plant at St. Croix Falls	1,690.0	--	150.0	636.0	62.0	2,113.0	53.0	(160.0)	651.0	2,657.0	253.2
8.	Regional Stabilization Pond near Taylors Falls	2,020.0	135.0	50.0	1,390.0[d]	31.0	2,660.0	18.0	(351.0)	325.0	2,652.0	252.7
9.	Regional Land Disposal System near Taylors Falls	2,585.0	420.0	90.0	2,175.0[d]	23.0	3,651.0	32.0	(549.0)	241.0	3,375.0	321.6

[a]All cost estimates are based on the Facilities Plans for Taylors Falls and St. Croix Falls (Howard A. Kuusisto Consulting Engineers 1980; Short-Elliot-Hendrickson, Inc. 1980).

[b]Present worth is computed for 20 years at a 7.125% interest rate.

[c]Includes construction cost plus 25% for engineering, administration, legal and contingencies.

[d]Includes land cost appreaciated at 3% annually over the 20-year planning period.

cost-effective individual system alternatives for Taylors Falls. Of the regionalization alternatives, expanding the St. Croix Falls WWTP to serve as a regional treatment plant at St. Croix Falls (Alternative 7) and the regional stabilization pond system west of Taylors Falls (Alternative 8) appear to be equally cost-effective. Alternative 8, having the apparent least present worth cost of the regional systems ($2,652,000) is only marginally more expensive, in terms of present worth, than the combined least cost of individual systems for St. Croix Falls and Taylors Falls (Alternatives 1 and 5 -- $1,414,000 + $1,218,000 = $2,632,000).

ENVIRONMENTAL IMPACTS

Construction of any of the nine alternatives will produce primarily short-term impacts to the local environment (Section 5.1.). Construction of alternatives utilizing only the existing WWTP sites (Alternatives 1, 3, and 4) would have the least potential for disruption and environmental impacts. The stabilization pond and land treatment alternatives (Alternatives 2, 5, 6, 8, and 9) would result in impacts along the force main and/or effluent discharge routes and the stablization pond and/or land disposal sites. The regional alternatives (Alternatives 7, 8, and 9) would result in additional impacts along the force main route through the Wisconsin Interstate State Park and across the US Highway 8 bridge. Alternatives 8 and 9 also would involve the conversion of a significant amount of prime agricultural land (more than 40 acres) from crop production.

Implementation of any of the independent treatment alternatives or regional alternatives by the communities would bring them into compliance with the effluent discharge standards of the respective States. Operation of any of the treatment alternatives would produce few significant long-term impacts (Section 5.2).

The operation of an expanded and rehabilitated St. Croix Falls WWTP (Alternative 1) with proper maintenance, alternate power supply, and duplicate unit processes would ensure a reliable treatment system that would improve water quality and create few long-term adverse environmental impacts. The rapid infiltration land disposal system for St. Croix Falls (Alternative 2) would have the potential for contaminating groundwater in the area and for raising the level of the groundwater. Because of the limited size of the site area for a new CAS or RBC secondary system for Taylors Falls (Alternatives 3 and 4) it may be difficult to construct duplicate unit processes to provide for greater reliability in the treatment of wastewater. The stabilization pond and effluent spray irrigation systems for Taylors Falls (Alternatives 5 and 6) offer greater flexibility for future expansion of the treatment system than the CAS or RBC treatment system (Alternatives 3 and 4), because they are not limited by the restrictive size of the site. The pumps at the pumping stations for Alternatives 5 and 6 will be properly maintained, and a backup power source will be provided in case a power failure should occur. The regional alternatives (Alternatives 7, 8, and 9) would present another potentially problematic system component with the force main supported over the St. Croix River by the US Highway 8 bridge. The force main would be subject to exposure, temperature extremes, and bridge flexure that could cause leaks or joint failures, resulting in a direct discharge of untreated sewage to the St. Croix River.

IMPLEMENTATION

One of the potential institutional frameworks necessary to implement a regional alternative is the formation of an interstate sanitary district. A review of Wisconsin and Minnesota State laws, undertaken to determine if provisions for such a district exist, indicated that existing statutes in both Wisconsin (Wisconsin Revised Statutes 66.30) and Minnesota (Minnesota Statutes 471.59) provide the legal authority to enable the formation of an interstate sanitary district by the Cities of St. Croix Falls and Taylors Falls (WAPORA, Inc. 1979). The district generally would be organized with an elected or appointed board that would be representative of the proposed service area. The sanitary district would have authority to issue bonds and to levy and collect appropriate user fees and service charges. Debt undertaken for capital improvements would be financed through bonds issued by the district or by the individual member communities. However, the ability to construct a regional treatment system with Federal funds seriously would be jeopardized because of the difference in funding priorities for treatment facilities for the two States.

Finally, the two communities have expressed no desire to join in a regional system. The City of St. Croix Falls has gone on record preferring the expansion and rehabilitation of their existing treatment plant and the City of Taylors Falls has recommended the construction of a new stabilization pond wastewater treatment system.

3.6.2. Recommended Action

In consideration of these factors and others described in this EIS, USEPA recommends that the City of St. Croix Falls upgrade and expand its existing WWTP (Alternative 1) and that the City of Taylors Falls construct a new stabilization pond treatment system (Alternative 5) to replace its existing WWTP. The site plan for the Taylors Falls recommended alternative is presented in Figure 3-11, and the site plan for the St. Croix Falls recommended alternative is presented in Figure 3-12. These two alternatives represent cost-effective, environmentally acceptable, and implementable solutions to meet the communities' wastewater treatment needs.

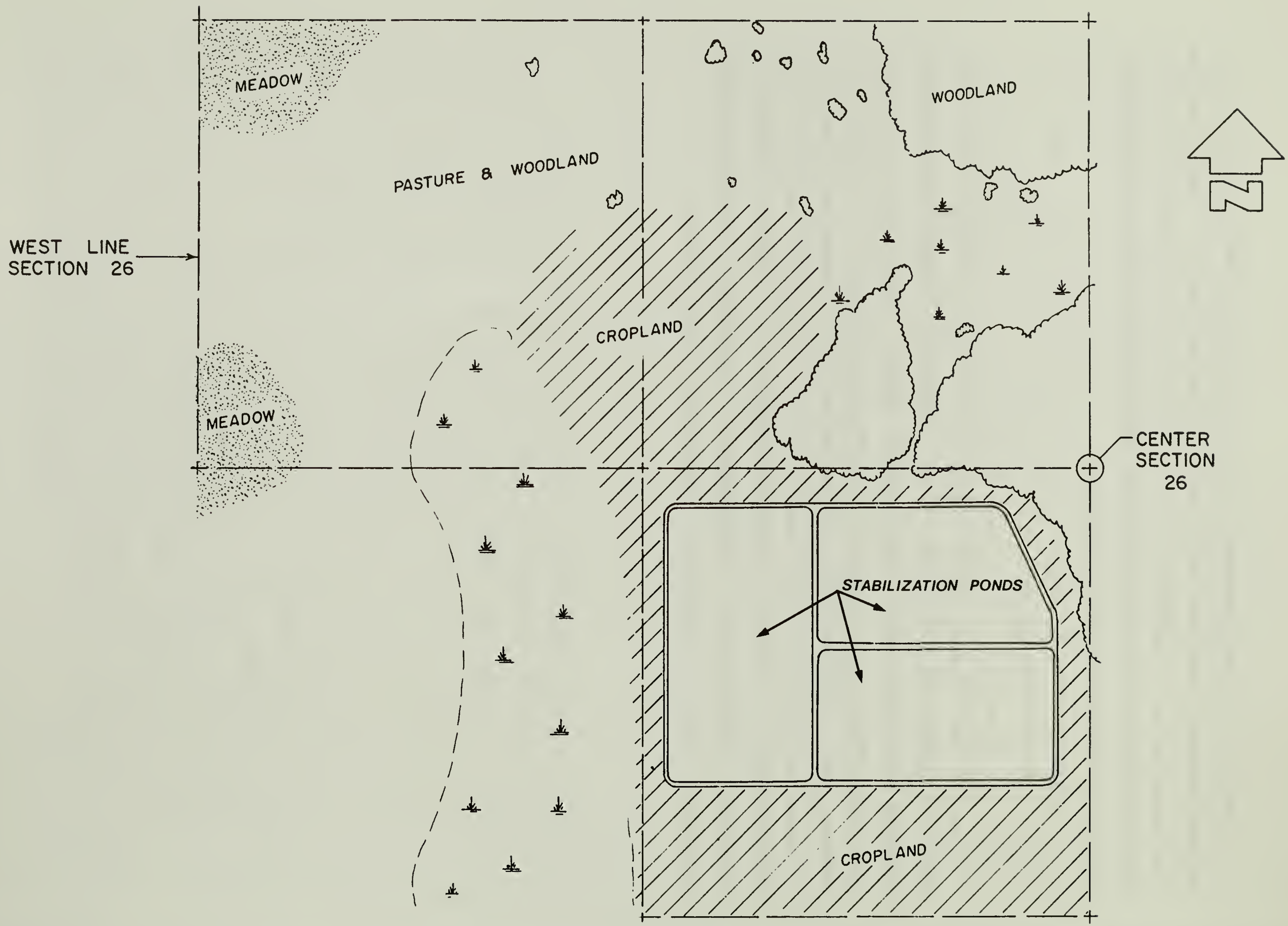


Figure 3-11. Site plan for Alternative 5, Taylors Falls, Minnesota.

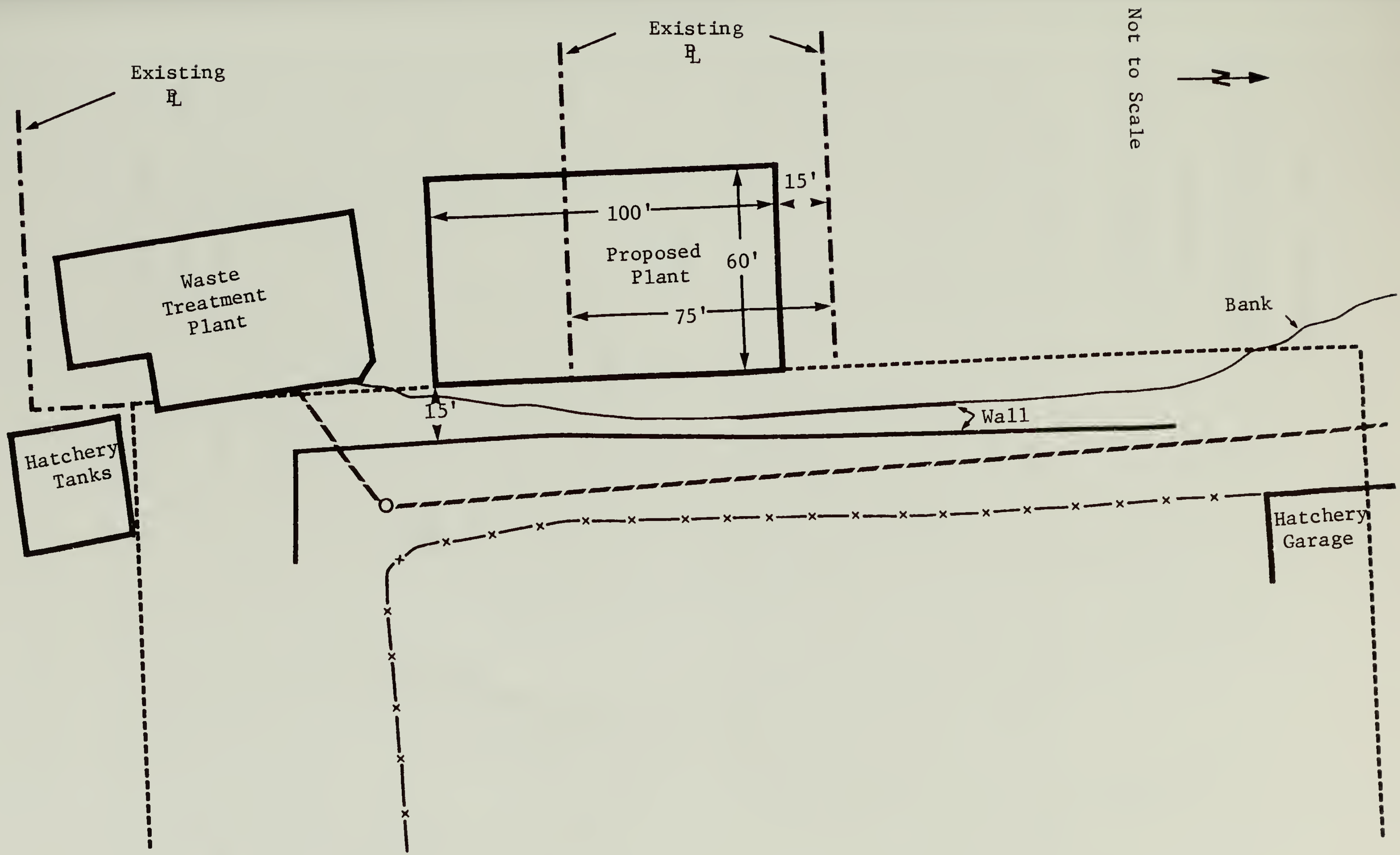


Figure 3-12. Site plan for Alternative 1, St. Croix Falls, Wisconsin.

4.0. AFFECTED ENVIRONMENT

4.1. Natural Environment

4.1.1. Atmosphere

4.1.1.1. Climate

The climate of the project area is classified as moist continental (Strahler and Strahler 1978). Seasonal weather variations include a cool, rainy spring; a warm, humid summer; a dry autumn; and a severely cold winter. Climatological conditions in the Minneapolis-St. Paul area are similar to those of the project area (WAPORA, Inc. 1979). Temperatures vary throughout the year, from an average temperature of 12.2°F in January to average temperatures of 71.9°F in July. Average monthly rainfall between May and September is approximately 3.36 inches. This 5-month period (totalling 17.0 inches) accounts for approximately 65% of the annual precipitation. Detailed meterological data are available in the DEIS, Section 3.1.1.1.

4.1.1.2. Air Quality

The St. Croix Falls-Taylors Falls project area is located in the West Central Wisconsin-Minnesota Interstate Air Quality Control Region (AQCR). The air quality of the project area is believed to be good (By telephone, Mr. Doug Evans, Wisconsin Department of Natural Resources and Mr. Greg Foley, Minnesota Pollution Control Agency, to WAPORA, Inc., 3 June 1980). Concentrations of pollutants and oxidants in the St. Croix Falls-Taylors Falls area are in attainment with the ambient air quality standards of their respective States (By telephone, Mr. Henry Onsgard, USEPA, to WAPORA, Inc., 23 September 1980). Applicable air quality standards and data from a nearby air monitoring station are presented in WAPORA, Inc. (1979). The project area presently is designated as a "Class II" Prevention of Significant Deterioration (PSD) area, as defined by the Clean Air Act (By telephone, Mr. Ronald Van Meersbergen, USEPA, to WAPORA, Inc., 24 September 1980). Therefore, normal development activities will not be restricted in the project area by existing State and Federal regulations to protect air quality.

4.1.1.3. Noise and Odor

NOISE

Excessive noise may disturb people who live near the source. There are no known major noise sources in the project area other than typical automobile and truck traffic. No data are available on ambient noise levels in the project area.

ODOR

There are no significant odor problems in the Taylors Falls area. There is an odor problem in the area immediately adjacent to the existing St. Croix Falls WWTP, caused by the improper operation of the plant's anaerobic digestor (DEIS, Section 3.1.1.3.).

4.1.2. Physiography, Topography, and Geology

4.1.2.1. Physiography and Topography

The project area is characterized by a terraced landscape, which resulted from glacial deposition over an irregular bedrock surface. The eastern part of the project area is characterized by rolling to hummocky morainal highlands (Figure 4-1). The region west of Taylors Falls generally consists of nearly level to level wetland. The topography of the area is discussed in the DEIS, Section 3.1.2.1.

The St. Croix River flows southward through the central part of the project area. Tributaries to the St. Croix River include Lawrence Creek, Close Slough, Dry Creek, and numerous minor and intermittent streams. Other bodies of surface water in the project area include Colby Lake, Folsom Lake, Wyckstrom Lake, Lake O' the Dalles, Rice Lake, and Peaslee Lake. These lakes are characteristic kettle lakes, and their water levels are maintained primarily through groundwater flow.

4.1.2.2. Geology

BEDROCK GEOLOGY

The bedrock geology of the project area is characterized by Cambrian rocks formed from sediments that were deposited in a near-shore environment

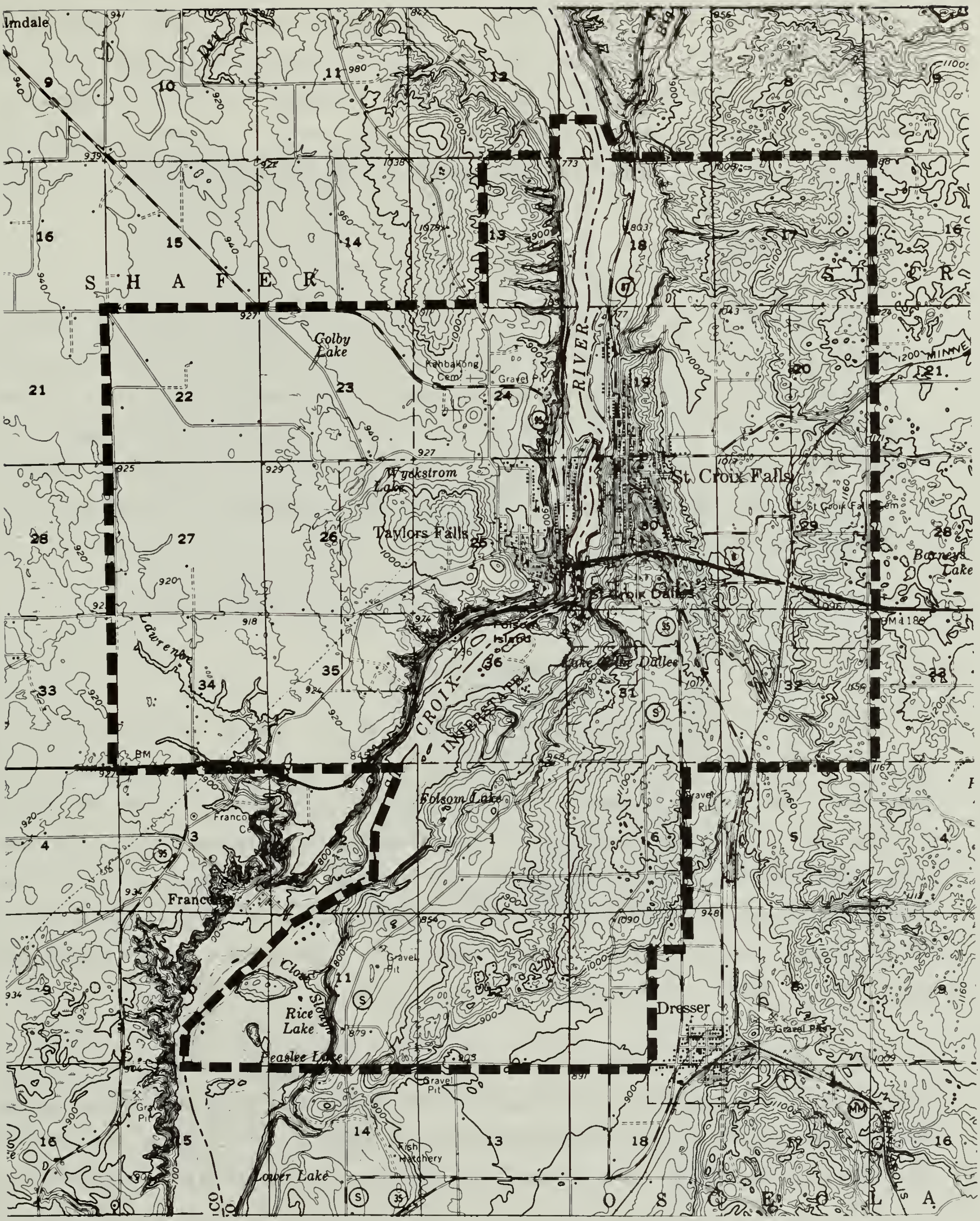


Figure 4-1. Topography of the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

over an uneven surface of Precambrian basalt (Liesch 1970). Because subsequent erosion has removed much of the sedimentary rocks, the occurrence of Cambrian rocks primarily is restricted to erosional depressions in the basalt. Well records for the project area indicate that the thickness of the Cambrian strata ranges from 0 feet to 230 feet. The character of the bedrock geology is illustrated in Appendix C, Figure C-1.

SURFICIAL GEOLOGY

The surficial geology of the project area is characterized by glacial deposits of the Wisconsin stage of glaciation. The glacial drift is absent in many places throughout the central part of the area, but attains thicknesses of over 100 feet in the western and eastern regions (Appendix C, Figure C-2). The character of the glacial deposits in the project area is depicted in Appendix C, Figure C-3. A brief description of the surficial geology is presented in the DEIS, Section 3.1.2.2.

4.1.3. Soils

4.1.3.1. Soils of the Project Area

The soils of the project area generally are coarse textured and well drained on the Wisconsin side, and medium textured and poorly drained on the Minnesota side. The predominant soil association present in the Wisconsin section of the project area is the Onamia-Cromwell-Menahga. The principal soil associations in the Minnesota section of the project area are the Hayden-Bluffton and Nessel-Bluffton. The general soil associations within the project area are presented in Figure 4-2. These soil associations are described in detail in Appendix C, Exhibit C-1.

The majority of land in the Minnesota portion of the project area is defined as prime agricultural land according to the classification system established by the Soil Conservation Service (SCS). Land within the project area defined as prime agricultural is presented in Appendix C, Figure C-4.

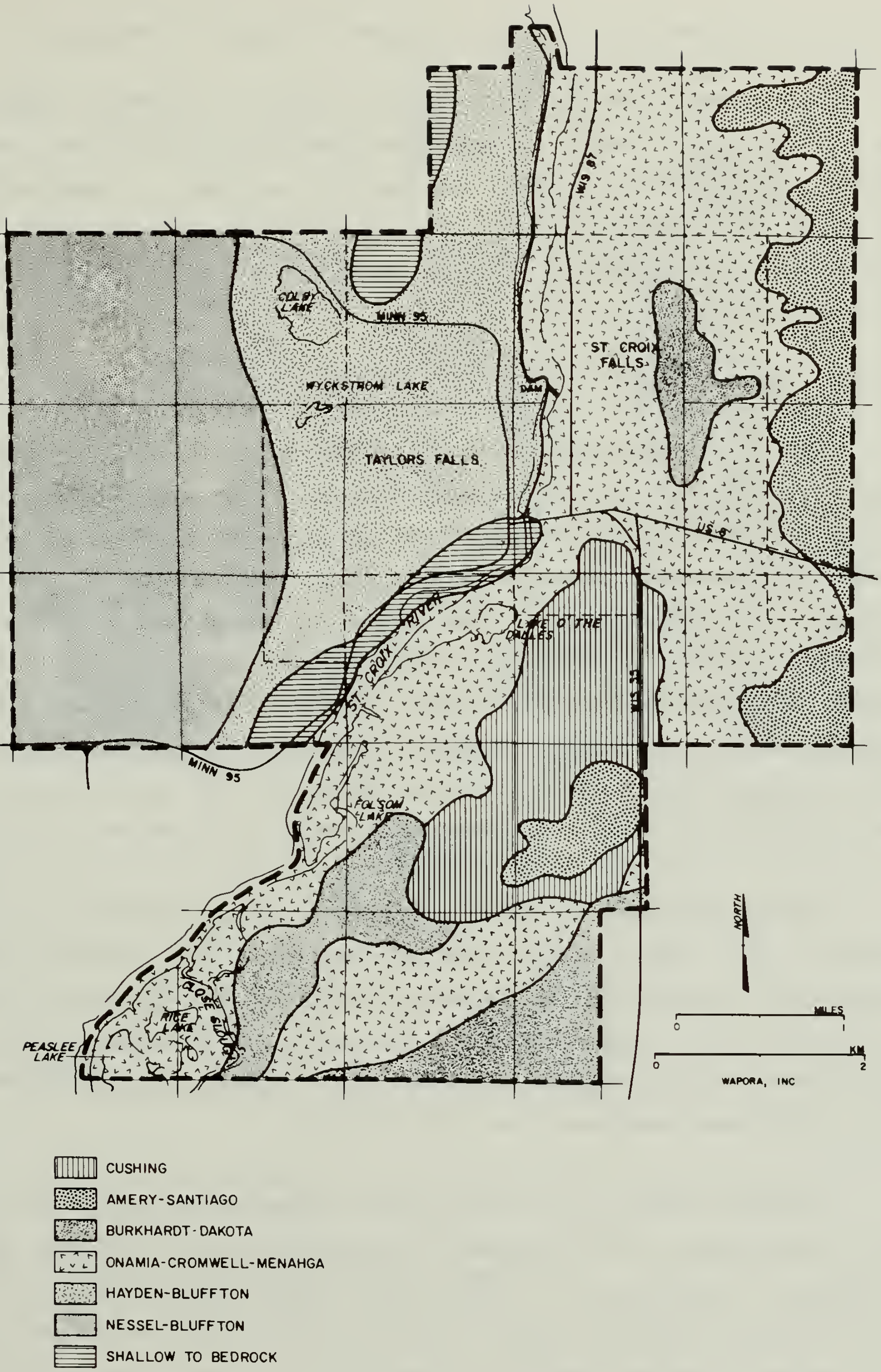


Figure 4-2. Soil Associations in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

4.1.3.2. Suitability of Soils for Land Treatment of Wastewater

Soil survey information, such as depth to bedrock, slope, depth to water, and water table contours provides useful data for assessing the suitability of soils for land treatment of wastewater. Examination of these data, as illustrated in Appendix C (Figures C-5, C-6, and C-7), in conjunction with an analysis of the soil maps reveals potentially suitable areas (Figure 4-3).

4.1.4. Surface Water

The St. Croix River is a major tributary of the Mississippi River. The River rises near Solon Springs, Wisconsin (elevation 1,016 feet msl), and continues 164 miles southwesterly and then southerly to join the Mississippi River at Prescott, Wisconsin (elevation 775 feet msl). The elevational change is 341 feet between the source of the River and the mouth, or an average gradient of 2.9 feet per mile. The upper 25-mile segment of the River is entirely within the State of Wisconsin, while the lower 139-mile segment forms the boundary between the States of Wisconsin and Minnesota. The drainage area for the St. Croix River is 7,650 square miles (sq mi), of which 4,828 sq mi are within Wisconsin and 2,822 sq mi are within Minnesota.

The locations of the lakes and streams in the project area are shown in Figure 4-1. Colby Lake, which is in Section 23, directly north of the wastewater treatment site, in Shafer Township on the Taylors Falls side of the River, has a surface area of 105 acres and a maximum depth of 4 feet. Colby Lake discharges intermittently to Dry Creek, which is tributary to the St. Croix River upstream from Taylors Falls.

Lawrence Creek is an intermittent stream which drains the area to the west and south of the wastewater treatment site in Section 26 of Shafer Township. According to a stream survey report by the Minnesota Division of Game and Fish (Haugstad 1968), the Creek has a total length of approximately 6.4 miles, a maximum depth of 4 feet, and a width of up to 300 feet where beaver dams create ponding. The report indicated that Lawrence Creek is an excellent trout stream.

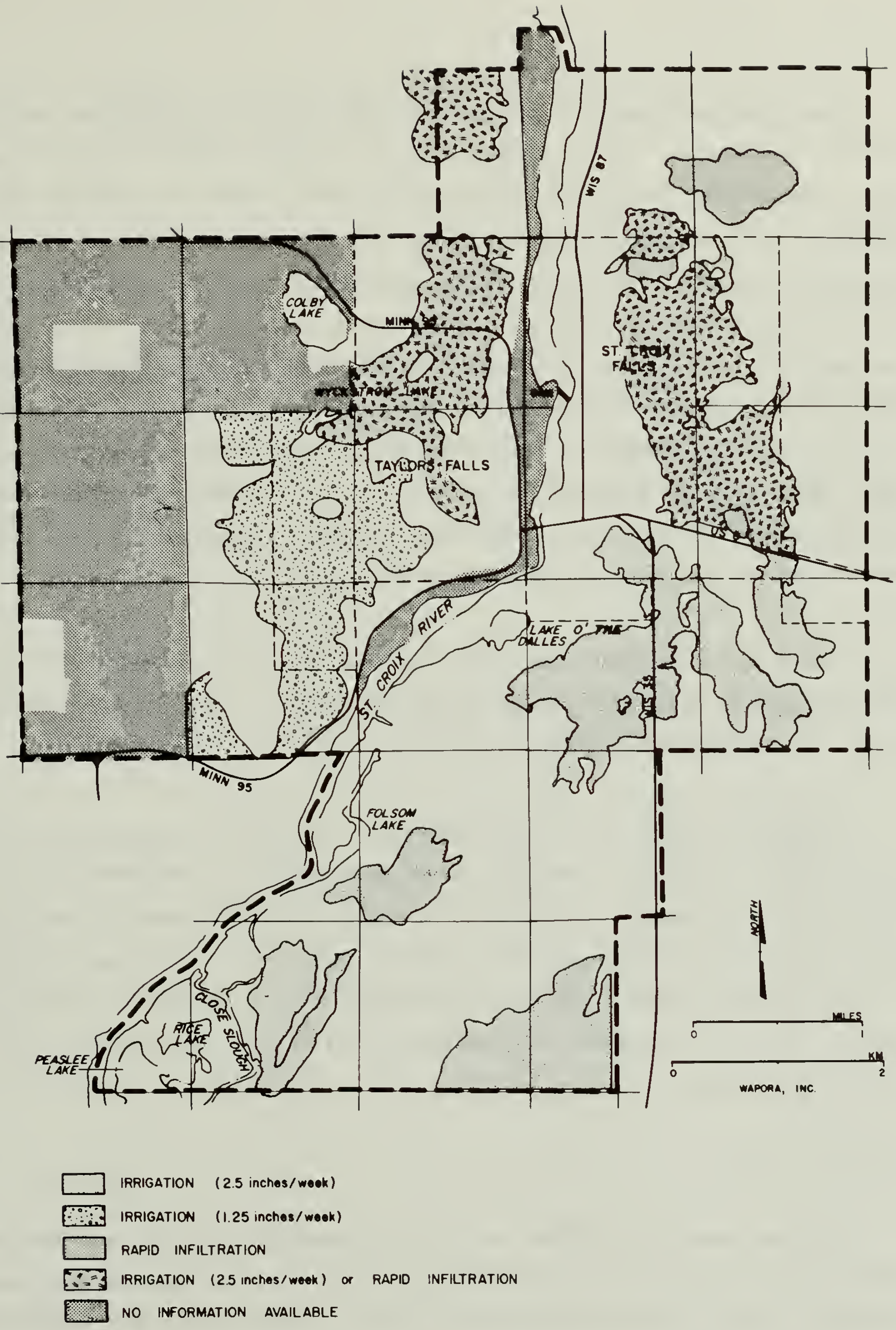


Figure 4-3. Areas potentially suitable for land application of treated wastewater in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

4.1.4.1. Hydrology

The flow of the St. Croix River is measured on a continuous basis by the US Geological Survey (USGS) at St. Croix Falls in Polk County, 1,800 feet downstream from the Northern States Power Co. (NSP) hydroelectric facility. Flows have been recorded since January 1902. The drainage area upstream from the St. Croix Falls gaging station is approximately 5,930 sq mi. Gage records are adequate for characterizing river flow variations in the project area. However, the operation of the NSP plant temporarily may affect the flow rate of the River downstream from the NSP Dam. A summary of flow records is presented in Table 4-1. A monthly summary of flow for the water year 1976 is present in Table 4-2. The monthly records illustrate the typical seasonal variations in flow, which correspond to low flows in late summer and autumn and to high flows during the spring.

The 7-day, 10-year low flow for the St. Croix River at St. Croix Falls is 1,100 cubic feet per second (cfs; USGS 1977). The 7-day, 2-year low flow at St. Croix Falls is 1,700 cfs.

Damaging floods occur infrequently in the St. Croix River Basin (Young and Hindall 1973). Flood magnitude generally is related directly to the size of the drainage area and is a result of rapid runoff from precipitation and snowmelt. Most floods in the basin occur either during the early spring or during the summer. The most damaging flood occurred during April 1965, near Stillwater, Minnesota. Backwater from the Mississippi River contributed significantly to the flooding (Young and Hindall 1973).

4.1.4.2. Uses

Recreational activities such as swimming, fishing, and boating are the primary uses of the St. Croix River, which is designated and managed as a National Scenic Riverway (Section 4.2.6.). Other uses include withdrawal of water for the irrigation of private farm lands and stock watering. A survey of use conducted in 1968 estimated that 3.1 mgd was used for irrigation of private farm lands and 0.8 mgd for stock watering (Young and Hindall 1973).

Table 4-1. Summary of flow data for the St. Croix River at St. Croix Falls, Wisconsin, for the period 1902-1977 (USGS 1978).

	Flow cfs	Date
Average discharge for period of record	4,172	1902-1977
Extremes for period of record		
Maximum discharge	54,900	8 May 1950
Minimum discharge	75	17 July 1910
Extremes for the water year 1976-1977		
Maximum discharge	15,600	26 Sept. 1977
Minimum discharge	896	13 Nov. 1976

Table 4-2. Monthly flow data for the gaging station at St. Croix Falls, Wisconsin, for water year 1976-1977 (USGS 1978).

Month	Mean cfs	Maximum cfs	Minimum cfs
October	1,624	2,390	1,310
November	1,569	2,220	896
December	1,492	1,800	1,160
January	1,488	1,710	1,210
February	1,456	1,810	1,150
March	3,252	5,500	1,260
April	3,803	5,240	2,540
May	2,600	3,210	1,760
June	2,686	4,910	1,560
July	2,585	5,560	1,520
August	2,049	5,730	1,230
September	7,784	15,400	3,270
Yearly average:	2,699		

The St. Croix River currently is not used for public water supply by either St. Croix Falls or Taylors Falls.

4.1.4.3. Quality

WATER QUALITY STANDARDS

St. Croix River

According to the Wisconsin Administrative Code, Rules of the Department of Natural Resources, under the section entitled Environmental Protection, the St. Croix River downstream of the northern boundary of Polk County is required to meet the standards for recreational use, fish and aquatic life, and public water supply. The most stringent of these standards are listed in Appendix D, Table D-1. Concentrations of other parameters are limited by the standards on the basis of information regarding their toxicities. References used in limiting other substances include Quality Criteria for Water (USEPA 1976b).

The Minnesota water quality regulations divide the St. Croix River into two reaches, one above and one below the NSP Dam located at Taylors Falls. Existing discharges from the St. Croix Falls and Taylors Falls WWTPs and from most of the project area are located downstream of the Dam. The most stringent water quality standards for the St. Croix River downstream from the Dam are summarized in Appendix D, Table D-2.

Lawrence Creek

Lawrence Creek is classified by the State of Minnesota as a Class A fisheries and recreation stream. This creek also is classified as Class B for domestic consumption and industrial consumption. The water quality standards for Lawrence Creek are somewhat more stringent than the Minnesota standards for the St. Croix River (Appendix D), with respect to the following parameters:

Parameter	Limit
Fecal coliform	10 MPN/100 ml
Turbidity	10 NTU
Dissolved oxygen	Not less than 7 mg/l from 10 October through 31 May and not less than 6 mg/l at other times
Temperature	No material increase
Ammonia as nitrogen	0.2 mg/l
Chlorides	5.0 mg/l
Chromium	0.02 mg/l

Dry Creek

Dry Creek is the outlet of Colby Lake and is tributary to the St. Croix River. It is classified as Class B for fisheries and recreation. The water quality standards for Dry Creek are listed in Appendix D, Table D-3.

Colby Lake

Colby Lake, located northwest of Taylors Falls, has not been specifically classified by the State of Minnesota. The most stringent water quality standards for this lake and other Minnesota waters not specifically classified (such as Wyckstrom Lake) are listed in Appendix D, Table D-4.

EXISTING WATER QUALITY

Water quality is monitored for the St. Croix River by USGS at St. Croix Falls and by MPCA at Taylors Falls. The closest station downstream from the project area for which recent data are available is the USGS station at Stillwater, Minnesota. Stillwater is located approximately 29 miles downstream from St. Croix Falls. Water quality data for Taylors Falls, St. Croix Falls, and Stillwater are presented in Tables 4-3, 4-4, and 4-5, respectively.

The physical and chemical water quality data for Stillwater, in general, appear to be similar to the data for St. Croix Falls and Taylors

Table 4-3. Water quality summary for the St. Croix River at Taylors Falls, Minnesota, for 1976 and 1977 (USEPA 1978a).[a]

Parameter	Number of Samples	Maximum	Minimum	Mean	Standard Deviation
Temperature[b]	20	28.0	0.0	11.2	9.5
pH[c]	21	8.4	7.2	7.9	0.3
Conductivity[d]	21	260.0	130.0	190.0	2.8
Dissolved oxygen	21	14.0	6.8	9.3	1.8
BOD_5	19	3.9	0.5	2.2	2.3
Turbidity[e]	21	14.0	1.2	5.5	3.4
Total phosphorus	21	0.082	0.016	0.05	0.02
Ammonia as nitrogen[f]	21	0.430	0.020	--	--
Nitrate + nitrite (as nitrogen)	13	0.60	0.01	0.2	0.2
Fecal coliform[g]	21	1700.0	2.0	13.3	2.0

[a] All values are given in milligrams per liter (mg/l) unless otherwise noted.

[b] Centigrade (°C).

[c] Standard units.

[d] Micromhos (umhos).

[e] Jackson turbidity units (JTU).

[f] 17 samples had values less than 0.200.

[g] Geometric mean in colonies/100 ml (3 samples had values less than 2).

Table 4-4. Water quality summary for the St. Croix River at St. Croix Falls, Wisconsin, for 1976 and 1977 (USGS 1977).[a]

Parameter	Number of Samples	Maximum	Minimum	Mean	Standard Deviation
Temperature[b]	24	26.5	0.0	11.3	9.6
pH[c]	20	8.3	7.0	7.6	0.4
Turbidity[d]	24	6.0	0.0	2.5	1.3
Dissolved oxygen	11	11.2	7.5	9.1	1.3
Fecal coliform[e]	24	160.0	1.0	2.4	1.12
Fecal streptococci[e]	23	2,000.0	10.0	39.9	1.5
Dissolved solids	24	133.0	55.0	104.4	17.0
Nitrate + nitrite (as nitrogen)	24	0.71	0.01	0.21	0.17
Kjeldahl nitrogen	24	1.2	0.18	0.53	0.23
Total nitrogen	24	1.5	0.25	0.74	0.28
Nitrate	24	6.8	1.1	3.3	1.3
Total phosphorus	24	0.07	0.02	0.045	0.01
Chlorophyll-A[f]	5	22.0	0.0	6.0	8.2
Carbon dioxide	20	15.0	0.8	5.2	4.3

[a] All values are given in milligrams per liter (mg/l) unless otherwise noted.

[b] Centigrade (°C).

[c] Standard units.

[d] Jackson turbidity units (JTU).

[e] Geometric mean in colonies/100 ml.

[f] Milligrams per square meter (mg/sq m).

Table 4-5. Water quality summary for the St. Croix River at Stillwater, Minnesota, for 1977 (USGS 1977).

Parameter	Number of Samples	Maximum	Minimum	Mean
Temperature[a]	7	24.0	0.0	8.9
pH[b]	7	8.3	7.6	7.9
Turbidity[c]	3	6.0	4.0	5.0
Dissolved oxygen	7	13.5	7.5	10.4
Fecal coliform[d]	1	--	--	16.0
Fecal streptococci[d]	1	--	--	4.0
Dissolved solids	3	146.0	124.0	138.0
Nitrate + nitrite (as nitrogen)	3	0.40	0.20	0.28
Kjeldahl nitrogen	3	0.30	0.13	0.23
Total nitrogen	3	0.55	0.47	0.52
Nitrate	3	2.4	2.1	2.3
Specific conductance[e]	7	410.0	170.0	242.0
Carbon dioxide	3	3.7	1.1	2.1

[a] Centigrade (°C).

[b] Standard units.

[c] Jackson turbidity units (JTU).

[d] Geometric mean in colonies/100 ml.

[e] Micromhos (umhos).

Falls. The Stillwater Station receives river water that includes pollutant loadings from the St. Croix Falls WWTP, the Taylors Falls WWTP, the Dresser WWTP, the Osceola WWTP, industrial cooling water, the Madsen gravel pit, and non-point source runoff. The similarity of water quality data for upstream (St. Croix Falls, Taylors Falls) and downstream (Stillwater) stations can be attributed to a combination of the dilution that occurs and the effects of assimilative and physical processes.

Fecal Coliform

Fecal coliform levels increased slightly from the project area to Stillwater, but this increase may not be statistically significant. Fecal coliform values have been in violation of the water quality standards. MPCA (1975b) has indicated that water from the River may not be suitable for drinking unless treatment beyond chlorination (such as sedimentation and coagulation) is provided, but that "it is expected that the designated uses of the St. Croix, such as swimming and maintenance of warm and cool water game fish, would generally be possible."

Heavy Metals

Concentrations of heavy metals in the St. Croix River were monitored at St. Croix Falls and at Stillwater by USGS. The values for heavy metals are recorded by location in Appendix D, Table D-5. The mean iron concentration at Stillwater was 0.2 mg/l higher than the concentration at St. Croix Falls. Apparent violations of water quality standards for iron and manganese were noted both at St. Croix Falls and at Stillwater. No major point sources of iron and/or manganese are known. Non-point sources include most soils and groundwater. No other significant variations in the heavy metal concentrations were observed.

Other Water Quality Parameters

The levels of other parameters, including dissolved oxygen (DO), nitrogen, dissolved solids, turbidity, and pH, do not indicate a significant difference between the water quality of the St. Croix River at St. Croix

Falls and Taylors Falls and the water quality of the River at Stillwater. No water quality violations for these parameters were recently recorded. No pesticides, herbicides, or other toxic substances were present in the River during 1976 sampling (USGS 1978; DEIS, Section 3.1.4.3.).

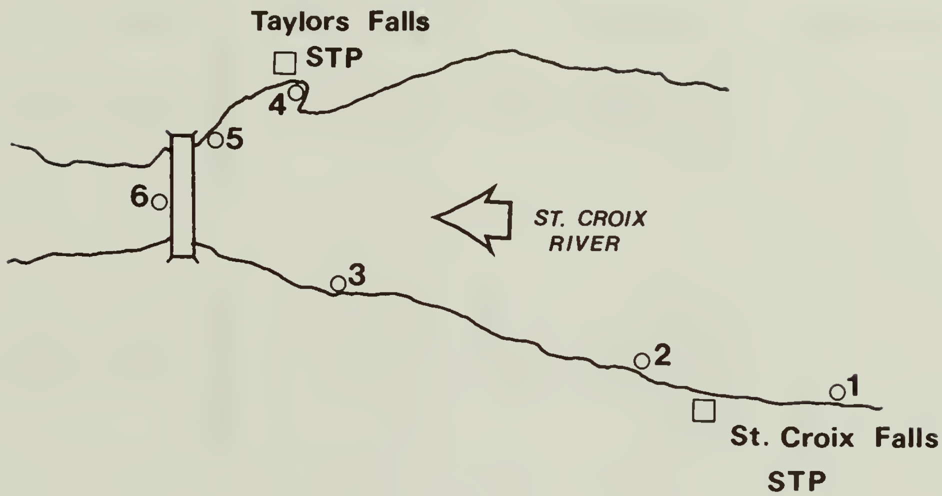
WATER QUALITY SURVEY

Two water quality surveys of the St. Croix River were conducted by WAPORA during May and August 1979, to evaluate the impact of discharges from the St. Croix Falls and Taylors Falls WWTPs. The effluent from the WWTPs at Taylors Falls and St. Croix Falls were sampled three times during each of the 2-day survey periods. The St. Croix River upstream and downstream from the outfalls also was sampled at the same frequency. All sampling stations are shown in Figure 4-4.

A summary of the survey data for the St. Croix Falls WWTP outfall and side of the River, monitored at four locations, is presented in Table 4-6. Similar data for the Taylors Falls outfall and side of the River, monitored at three locations, are presented in Table 4-7. The average flow of the River during the May 1979 survey was 9,175 cfs and was 2,485 cfs during the August 1979 survey (USGS 1980). The flow during the August survey was approximately twice the 7-day, 10-year low-flow condition and represented the response of the River during low flow.

The DO and SS concentrations upstream and downstream from the treatment plants were approximately the same. Increases in BOD_5, total Kjeldahl nitrogen, ammonia-nitrogen, and total P were recorded at the monitoring station immediately downstream of the discharge point of treatment plant effluents. However, the concentrations decrease rapidly to background levels at the subsequent monitoring station. A sharp rise in bacterial levels, fecal coliform, and fecal streptococci also occurred in the immediate vicinity of the WWTP discharges; however, the bacteria levels also rapidly decreased downstream. Profiles of the water quality constituents monitored during the surveys are presented in Appendix D, Figures D-1 through D-6. These profiles reflect that the discharges of WWTP effluent are not impacting the quality of the River significantly during either high- or low-flow conditions. The data also indicate that the concentrations of

May 1979 Water Quality Survey



August 1979 Water Quality Survey

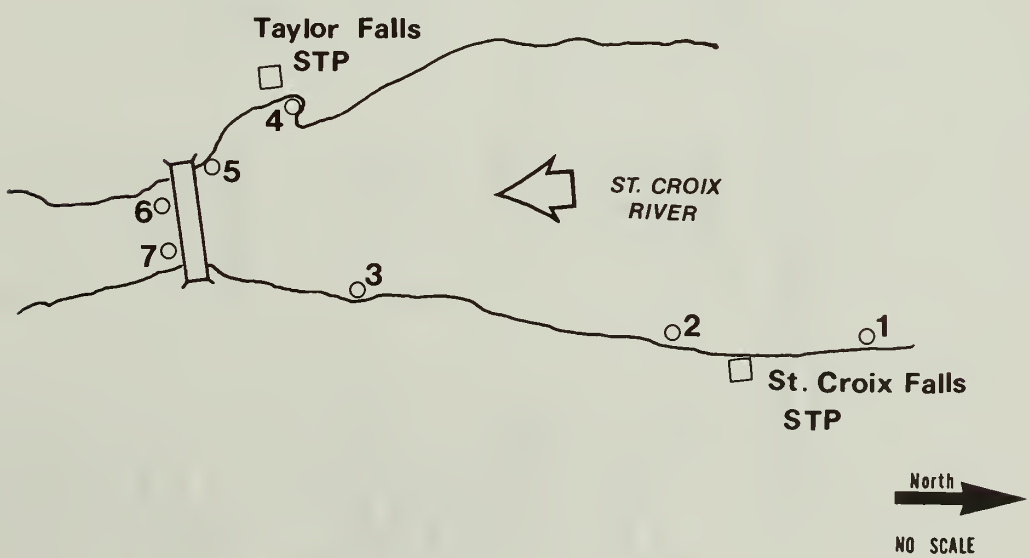


Figure 4-4. Water quality sampling sites.

Table 4-6. Water quality survey of the St. Croix River to assess the impact of the St. Croix Falls wastewater discharge (WAPORA, Inc. 1979).

May 1979	Station 1	St. Croix WWTP Outfall	Station 2	Station 3	Station 6
Temperature (°C)	12.3	10.5	12.2	12.3	11.9
Dissolved oxygen	9.9	9.3	10.2	10.1	10.5
BOD_5	2.7	95.7	2.3	2.0	2.7
Kjeldahl nitrogen	0.7	24.7	1.0	0.7	0.7
Ammonia as nitrogen	0.2	20.7	0.3	0.2	0.2
Nitrate + nitrite (as nitrogen)	0.08	0.9	0.08	0.08	0.04
Total phosphorus	0.09	4.5	0.11	0.08	0.07
Suspended solids	9.5	35.3	9.9	8.5	9.5
Fecal coliform ($x10^3$)	0.04	966.6	1.6	0.8	0.03
Fecal streptococci ($x10^3$)	0.02	82.7	0.7	0.02	0.01

August 1979	Station 1	St. Croix WWTP Outfall	Station 2	Station 3	Station 7
Temperature (°C)	17.6	15.3	17.4	17.0	17.4
Dissolved oxygen	9.8	8.0	10.1	10.2	10.1
BOD_5	1.2	170.0	4.4	1.4	1.6
Kjeldahl nitrogen	0.9	25.6	1.3	0.9	0.9
Ammonia as nitrogen	0.1	19.2	0.4	0.2	0.1
Nitrate + nitrite (as nitrogen)	0.1	1.0	0.3	0.3	0.2
Total phosphorus	0.04	4.0	0.16	0.6	0.05
Suspended solids	8.8	38.7	8.3	6.6	9.2
Fecal coliform ($x10^3$)	3.8	26.0	1.1	0.8	0.8
Fecal streptococci ($x10^3$)	12.7	35.0	1.1	0.9	0.8

NOTES
Station 1 approximately 300 meters upstream from St. Croix WWTP.
Station 2 approximately 30 meters downstream from St. Croix WWTP.
Station 3 approximately 500 meters downstream from St. Croix WWTP.
Station 6 at mid-section of US Highway 8 bridge.
Station 7 at east bank of US Highway 8 bridge.
All constituents are in mg/l except temperature (°C) and fecal coliform and streptococci (MPN/100ml).

Table 4-7. Water quality survey of the St. Croix River to assess the impact of the Taylors Falls, Minnesota wastewater discharge (WAPORA, Inc. 1979).

	Station 4	Taylors Falls WWTP Outfall	Station 5	Station 6
May 1979				
Temperature (°C)	12.5	8.0	12.1	11.9
Dissolved oxygen	11.0	8.3	11.0	10.5
BOD_5	2.4	78.0	3.0	2.7
Kjeldahl nitrogen	0.7	15.6	0.7	0.7
Ammonia as nitrogen	0.1	12.8	0.2	0.2
Nitrate + nitrite (as nitrogen)	0.05	0.8	0.05	0.04
Total phosphorus	0.06	2.95	0.07	0.07
Suspended solids	7.9	21.3	8.9	9.5
Fecal coliform ($x10^3$)	0.02	636.7	0.6	0.03
Fecal streptococci ($x10^3$)	0.01	180.0	0.2	0.01
August 1979				
Temperature (°C)	17.3	13.6	17.2	17.5
Dissolved oxygen	10.1	8.1	10.2	10.0
BOD_5	1.1	122.7	3.1	1.3
Kjeldahl nitrogen	0.9	19.9	1.1	1.0
Ammonia as nitrogen	0.05	16.8	0.3	0.1
Nitrate + nitrite (as nitrogen)	0.1	3.3	0.2	0.1
Total phosphorus	0.05	3.4	0.08	0.06
Suspended solids	6.2	37.3	10.0	7.1
Fecal coliform ($x10^3$)	0.2	204.0	1.4	0.5
Fecal streptococci ($x10^3$)	0.8	10.6	4.6	0.5

NOTES
Station 4 approximately 30 meters upstream from Taylors Falls WWTP.
Station 5 approximately 75 meters downstream from Taylors Falls WWTP.
Station 6 downstream from Taylors Falls WWTP at Dock.
Station 6 at mid-section of US Highway 8 bridge.
All constituents are in mg/l except temperature (°C) and fecal coliform and streptococci (MPN/100 ml).

SS and BOD_5 are much higher than expected from propertly operating WWTP plants with secondary treatment processes.

A dye-dispersion study was conducted by WAPORA during August 1979 to determine the transport of wastewater effluent in the River. Dye was added to the WWTP outfalls and the concentration of dye in the River was monitored at sampling stations downstream from the WWTP outfalls. It was observed that the dye released from the outfalls of both the Taylors Falls and St. Croix Falls WWTPs was dispersed rapidly downstream because of the highly turbulent condition of the River in the vicinity of the discharge points. The rapid dispersion of dye in the River indicates that the effluent discharged from the WWTPs at Taylors Falls and St. Croix Falls rapidly mix and are dissipated through transport downstream.

4.1.4.4. Existing Discharges

The significant existing surface water discharges located within the project area include those from the St. Croix Falls WWTP, the Taylors Falls WWTP, and non-point sources. The St. Croix Falls Fish Hatchery and Industrial Tool and Plastics, Inc., also discharge to the St. Croix River. Because of the small volume discharged and the low pollutant loadings, these discharges are not considered significant (WDNR 1972).

ST. CROIX FALLS WWTP

The effluent quality and flow from the St. Croix Falls WWTP are described in detail in Section 3.1. The 1978 mean effluent concentrations of BOD_5 and SS were 69 mg/l and 34 mg/l, respectively. The geometric mean concentration of fecal coliform recorded from March through December 1978 was 390 MPN per 100 ml. Based upon a mean wastewater flow rate of 211,490 gpd, measured from February through December 1975, the St. Croix Falls WWTP contributes an average of 122 pounds of BOD_5 and 60 pounds of SS per day to the St. Croix River. Long-term flow rates after 1975 are not available for the St. Croix Falls WWTP.

TAYLORS FALLS WWTP

The effluent quality and flow from the Taylors Falls WWTP are described in detail in Section 3.1. The 1978 mean effluent BOD_5 and SS concentrations were 66 mg/l and 33 mg/l, respectively. The fecal coliform concentrations were measured as less than 20 MPN per 100 ml for a 9-month period during 1978, and as "too numerous to count" for a 3-month period during the same year. The only recent wastewater flow data were recorded from 6 November through 25 November 1978 and averaged 90,170 gpd. Based upon this flow rate, the Taylors Falls WWTP contributed 50 pounds of BOD_5 and 25 pounds of SS per day to the St. Croix River.

ST CROIX FALLS FISH HATCHERY

The St. Croix Falls Fish Hatchery is located adjacent to the St. Croix Falls WWTP. The hatchery uses up to 3 mgd of spring water for the production of 40,000 pounds of trout annually (Anonymous 1978), and discharges directly to the St. Croix River. Three outfalls discharged to the St. Croix River during the first half of 1980 (discharge from outfall 003 ceased in May, and from 002 in June). Flows from the outfalls for their period of operation were as follows (WDNR 1981):

Outfall Number	Flow[a] (mgd) Maximum	Average
001	0.18	0.075
002	1.44	1.382
003	1.33	1.325

[a]Calculated from monthly estimates.

Based on the Hatchery's self-monitoring program conducted by WDNR personnel, the following concentrations were recorded in 1980. An average BOD_5 concentration of 4.9 mg/l; total suspended solids, 6.9 mg/l; nitrogen as nitrate and nitrite, 2.5 mg/l; Kjeldahl nitrogen, 0.8 mg/l; total phosphorus, 0.26 mg/l; sulfate, 13 mg/l; and chloride, 17 mg/l. Fecal coliform is no longer monitored at the Hatchery.

INDUSTRIAL TOOL AND PLASTICS, INC.

Industrial Tool and Plastics, Inc., discharges cooling water to the St. Croix River by means of a storm sewer. The cooling water flow during 1970 was 54,560 gpd and the discharge was sampled in 1971. The following concentrations were recorded: BOD_5, less than 1 mg/l; temperature, 12°C; pH, 7.7 units; and phenol, 0.008 mg/l. The discharge enters the St. Croix River approximately 0.4 miles downstream of the St. Croix Falls WWTP.

NON-POINT DISCHARGES

Non-point source discharges into surface waters may include surface runoff, groundwater discharge, and atmospheric contributions. Surface runoff loadings consist of sediment, wildlife wastes, feedlot wastes, plant residues, agricultural nutrients, herbicides and pesticides, and soil nutrients and organic matter. MPCA (1975a) has classified the Minnesota section of the project area as part of a region that exhibits an "average" non-point source pollution potential.

Groundwater discharge and atmospheric loadings on surface waters are dependent on local hydrology, groundwater quality, air quality, and the quantity of precipitation. Problems commonly associated with groundwater include high concentrations of sulfates, chlorides, nitrates, and sodium ions, and excessive hardness associated with high concentrations of calcium and magnesium ions (Todd 1967). Common pollutants from atmospheric sources include compounds of nitrogen, phosphorus, and sulfur (MPCA 1975a).

4.1.5. Groundwater

4.1.5.1. Resources

Groundwater within the project area occurs in sand and gravel deposits of glacial drift in Cambrian sandstone, and in fractures of Precambrian basalt. Domestic wells in the project area generally utilize sand and gravel aquifers in the glacial drift. However, high-capacity municipal wells derive water from Cambrian sandstone. The groundwater in Precambrian rocks is not used for water supply within the project area. Groundwater resources are discussed in the DEIS, Section 3.1.5.1. and Appendix C.

Groundwater is used for municipal and rural water supply, stock watering, irrigation, and industrial processes. The quantities of groundwater used within the St. Croix River basin for 1968 are listed in Table 4-8.

Table 4-8. Uses of groundwater withdrawn from the St. Croix River Basin (Young and Hindall 1973).

Use	Public Supply (mgd) Municipal	Other	Private Supply (mgd)
Domestic	1.6	0.1	5.3
Industrial and commercial	2.5	0.0	2.1
Irrigation	0.1	0.0	0.2
Stock	0.0	0.0	3.3
Other	1.4	0.1	0.0
Total	5.5	0.1	10.9

4.1.5.2. Quality

Groundwater in the project area typically has high concentrations of calcium and magnesium carbonate and a low concentration of total dissolved solids. One analysis of a well producing from a sand and gravel aquifer indicated that groundwater from glacial drift aquifers may be characterized by high levels of alkalinity, hardness, and total dissolved solids, and low pH relative to groundwater from the Cambrian sandstones. Groundwater from fractured basalt may be highly mineralized, possibly due to solution of minerals in joints and fractures over long periods of time. Water quality analyses for wells in or near the project area are presented in WAPORA, Inc. (1979).

Indicators of contamination from surface sources include concentrations of nitrates and fecal coliform counts. Bacterial contamination is not known to be a problem within the project area. Nitrate concentrations indicate that there is some contamination from surface sources (possibly agricultural operations and/or natural decomposition of organic material). However, all concentrations analyzed were well below recommended standards for drinking water (10 mg/l of nitrates as nitrogen, or approximately 44 mg/l of nitrate).

4.1.6. Terrestrial Biota

4.1.6.1. Vegetation and Landscape

A landcover map was prepared for the project area based on aerial photographs and field verification (Figure 4-5). Seventeen landscape types were identified, fourteen with vegetation and three (developed, cemetery, and water) with little or no vegetation. A brief review of the existing land use/cover of the project area and detailed descriptions of the proposed wastewater treatment sites and force main routes are presented in the DEIS, Section 3.1.6.1. A detailed description of each landscape type is presented in WAPORA, Inc. (1979).

4.1.6.2. Wildlife

The term "wildlife" includes all land-dwelling vertebrate animals, amphibians, reptiles, birds, and mammals. Many species of wildlife inhabit the project area because of the diversity of the habitats present. Many other species pass through the area using the migration corridor formed by the St. Croix River Valley. These wildlife habitats in the area range from the forested uplands and bottomlands and open water areas along the St. Croix River, to the open fields and wetlands west of Taylors Falls, and the St. Croix River. Species lists compiled from numerous sources (DEIS, Section 3.1.6.2.) are presented in WAPORA, Inc. (1979).

4.1.7. Aquatic Biota

Quantitative sampling of algae was conducted on the St. Croix River near St. Croix Falls from October 1976 through September 1977 (USGS 1977). Blue-green algae were predominant throughout much of the sampling period. Other abundant groups included green algae and diatoms. The algae were collected by whole water grab samples, identified to genus, and counted to determine the number of cells per milliliter of water. The results of the study indicated that the phytoplankton populations varied throughout the year. No studies of the macroinvertebrate fauna in the project area have been done according to the available literature.

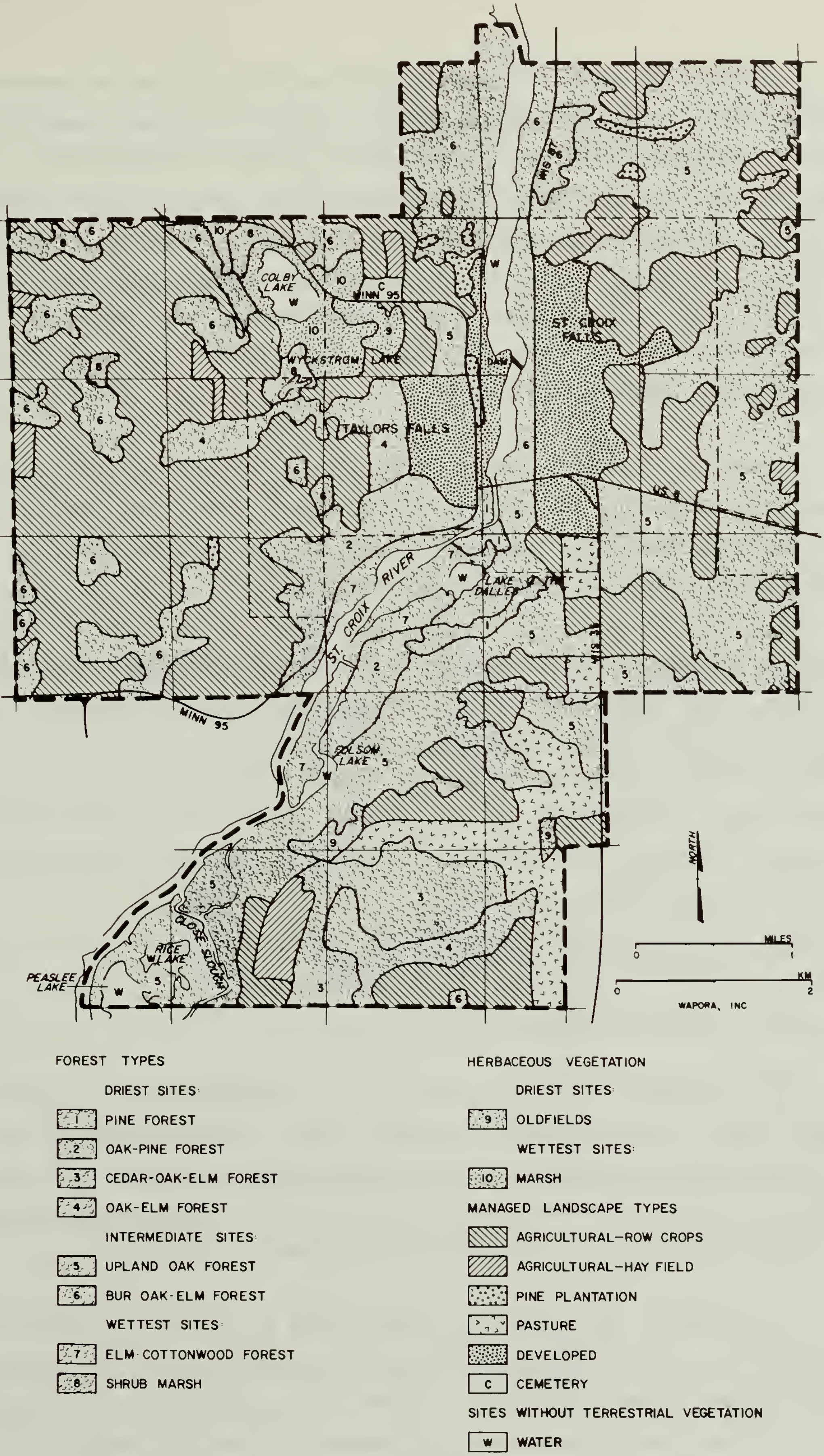


Figure 4-5. Land cover in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

A fisheries survey (Kuehn and others 1961) covered 105 miles of the St. Croix River and included information on the species composition of each river segment, the relative abundance of fish (except minnows), descriptions of habitats, and habitats associated with various fish species. Fifty species were captured during the survey. The predominant fish were redhorse (several species), suckers, yellow perch, walleye, and smallmouth bass. A limited amount of data also were presented on the spawning activities of some of the species, including the smallmouth bass, a common fish in the St. Croix River (WAPORA, Inc. 1979).

Lawrence Creek, a small tributary of the St. Croix River in Chisago County, Minnesota, is recognized as one of the outstanding brook trout streams in Minnesota. A more detailed discussion of fish in the project area is presented in the DEIS, Section 3.1.7.

Little information is available on the mussel populations of the St. Croix River. Two individuals of the Higgin's eye pearly mussel, including a gravid female, were collected. This species is listed as endangered by USFWS (1978). Although Hudson is 35 miles downstream from St. Croix Falls, the mussel populations in the project area could contain some of these species. However, no data are available that apply specifically to the project area (WAPORA, Inc. 1979).

4.1.8. Endangered and Threatened Species

4.1.8.1. Federal Designation

Two species on the Federal list of endangered and threatened species have ranges that include the project area. These species are the peregrine falcon (Falco peregrinus), listed as endangered throughout its range (50 CFR 17.11-17.13 and updates), and the bald eagle (Haliaeetus leucocephalus), listed as threatened in the States of Minnesota and Wisconsin.

At present, the peregrine falcon does not breed in either Minnesota or Wisconsin. Both the American and arctic subspecies of the peregrine falcon may migrate through the project area, but neither has been sited in recent years. There are recent breeding records for the bald eagle in both Chisago

County, Minnesota and Polk County, Wisconsin. The closest active nest for this species is located at Harris, Minnesota, approximately 18 miles northwest of Taylors Falls. Bald eagles have been observed during the winter in other state parks near the project area (By telephone, Mr. Floyd Knudson, Carlos Avery Game Farm, Forest Lake MN, to WAPORA, Inc., 11 December 1978). No federally endangered or threatened species of amphibians, reptiles, mammals, or plants are known to have ranges that include the project area.

4.1.8.2. State Designation

WISCONSIN

The most recent list of endangered and threatened species in the State of Wisconsin was issued in 1979 (WDNR 1979). Plants also are included in this list. Endangered or threatened species that may be present in the project area are listed in Table 4-9. An additional 15 species with watch status in the State of Wisconsin that may be in the project area are listed in Table 4-10. A more complete discussion is presented in the DEIS, Section 3.1.8.2.

MINNESOTA

There is no official list of endangered or threatened species for the State of Minnesota. The State follows the Federal list. The 12 species indicated as endangered or threatened (unofficial) that may be present in the project area are listed in Table 4-9. An additional two species with priority species designation in Minnesota that may be present in the project area are listed in Table 4-10 (Moyle 1980). Such species are considered to be uncommon or local in these states and to require particular management because of their unusual or unique features, public interest, or the vulnerability of their habitat. Minnesota also has a wildflower protec-tion law. The species of plants that are given protection under this law are listed in Table 4-11. It is not known if any of these species are present in the Minnesota section of the project area (DEIS, Section 3.1.8.2.).

Table 4-9. Endangered and threatened species that may be present in the St. Croix Falls, Wisconsin - Taylors Falls, Minnesota project area (Moyle 1980; WDNR 1979).[a]

Common Name	Scientific Name	Wisconsin	Minnesota
Pickerel frog	*Rana palustris*	T	--
Wood turtle	*Clemmys insculpta*	E	--
Blanding's turtle	*Endoidea blandingi*	T	P
Double-crested cormorant	*Phalacrocorax auritus*	E	--
Great egret	*Casmerodius albus*	T	--
Cooper's hawk	*Accipiter cooperii*	T	P
Red-shouldered hawk	*Buteo lineatus*	T	--
Bald eagle	*Haliaeetus leucocephalus*	FT, E	FT, T
Osprey	*Pandion haliaetus*	E	--
Peregrine falcon	*Falco peregrinus*	FE, E	FE, E, R
Common tern	*Sterna hirundo*	E	P
Mountain cranberry	*Vaccinium vitis-idaea*	E	--

KEY: E - Endangered in State
FE - Endangered in US
FT - Threatened in US
P - Priority species
T - Threatened in State

[a] The species listed have legal endangered or threatened status within Wisconsin; their comparable unofficial designation for these species in Minnesota also is shown.

Table 4-10. Species in the project area with watch status in Wisconsin and with priority species designation in Minnesota (Moyle 1980; WDNR 1979).

Common Name	Scientific Name	Wisconsin	Minnesota
Common loon	*Gavia immer*	W	--
Great blue heron	*Ardea herodias*	W	--
Black-crowned night heron	*Nycticorax nycticorax*	W	--
Common merganser	*Mergus merganser*	W	--
Red-breasted merganser	*Mergus serrator*	W	--
Marsh hawk	*Circus cyaneus*	W	P
Common flicker	*Colaptes auratus*	W	--
Eastern bluebird	*Sialia sialis*	W	P
Dickcissel	*Spiza americana*	W	--
Vesper sparrow	*Poocetes gramineus*	W	--
Field sparrow	*Spiza pucilla*	W	--
Short-tail shrew	*Blarina brevicauda*	W	--
Gray fox	*Urocyon cinereoargenteus*	W	--
Bobcat	*Lynx rufus*	W	--
White-tail jackrabbit	*Lepus townsendi*	W	--

KEY: W - Watch status.
P - Priority status.

Table 4-11. Species of plants that are protected under the Minnesota Wildflower Protection Act (Minnesota Statutes, Chapter 17, Section 17.23).

Gentians	All species of the genus Gentian
Lilies	All species of the genus Lilium
Lotus lily	Nelumbo lutea
Orchids	All members of the family Orchidaceae
Trailing arbutus	Epigaea repens
Trilliums	All species of the genus Trillium

4.2. Man-made Environment

4.2.1. Economics

4.2.1.1. Income

The 1980 estimated median family incomes for the two Counties in the project area are shown in Table 4-12, relative to the estimated median incomes for their respective States. The per capita personal incomes for the proposed service area are presented in Table 4-13. Data from the US Bureau of Economic Analysis (USBEA 1980a; 1980b), reveal an increasing trend in the per capita incomes of Wisconsin, Minnesota, Polk County, and Chisago County from 1973 to 1978. Census data (US Bureau of the Census 1979a; 1979b) for the Cities of St. Croix Falls and Taylors Falls, also indicate an increase in the per capita incomes of these areas from 1969 to 1975.

Table 4-12. Estimated 1980 median family income (By telephone, Mr. MacDonald, HUD, to WAPORA, Inc., 30 September 1980).

Area	Estimated Median Family Income
Wisconsin	$19,685
Polk County	$18,625
Minnesota	$19,847
Chisago County	$23,625

Table 4-13. Per capita personal income in thousands of dollars (USBEA 1980a, 1980b).

Area	Year 1969	1973	1974	1975	1976	1977	1978	Percentage Change 1969 to 1975	1973 to 1978
Wisconsin		4,754	5,183	5,616	6,087	6,776	7,532		37
Polk County		3,923	4,249	4,427	4,798	5,377	6,014		35
St. Croix Falls	3,041			4,920				38	
Minnesota		5,113	5,424	5,795	6,214	7,086	7,904		35
Chisago County		3,933	4,070	4,479	4,955	5,686	6,027		35
Taylors Falls	3,254			4,869				49	

4.2.1.2. Employment

Total employment in Chisago County, Minnesota, increased by 38.3% from 1971 to 1976, and by 13.1% in Polk County, Wisconsin, during the same period (Table 4-14). These County-level increases were significantly higher than the State-wide increases of 14.8% and 10.4% for Minnesota and Wisconsin, respectively (USBEA 1978). The service, wholesale trade, and retail trade sectors experienced the greatest growth in employment in Chisago County. In Polk County, the greatest increases in employment occurred in the wholesale trade, service, finance, and government sectors.

The growth of employment in Chisago and Polk Counties reflects the decentralization of commercial and industrial business from the Minneapolis-St. Paul area. The growth of local employment in Chisago County and Polk County is a factor for potential growth in the population of the proposed service area.

Table 4-14. Employment by category, 1971 and 1976 (USBEA 1978).

Category	Wisconsin Employment[a] 1971	Wisconsin Employment[a] 1976	Wisconsin Change[b] 1971 to 1976	Polk County Employment[a] 1971	Polk County Employment[a] 1976	Polk County Change[b] 1971 to 1976	Minnesota Employment[a] 1971	Minnesota Employment[a] 1976	Minnesota Change[b] 1971 to 1976	Chisago County Employment[a] 1971	Chisago County Employment[a] 1976	Chisago County Change[b] 1971 to 1976
TOTAL	1,883	2,079	10.4	10,752	12,158	13.1	1,620	1,860	14.8	5,082	7,030	38.2
Proprietors	235	234	-0.6	3,603	3,687	2.4	234	234	0.2	1,954	2,097	7.3
Farm	115	107	-6.8	2,454	2,366	-3.6	128	122	-4.3	1,241	1,221	-1.6
Non-farm	121	127	5.5	1,149	1,231	14.9	106	112	5.7	713	876	22.9
Total wage and salary	1,647	1,845	12.0	7,149	8,471	18.5	1,386	1,625	17.3	3,128	4,933	57.7
Farm	35	46	33.2	411	597	45.3	30	42	42.3	150	177	18.0
Non-farm	1,613	1,799	9.7	6,738	7,874	16.9	1,356	1,583	16.7	2,978	4,756	59.7
Private	1,303	1,464	12.4	4,743	5,777	21.8	1,078	1,272	18.0	1,773	3,210	81.0
Agriculture, fisheries, and forestry	3	5	46.1	D[c]	D[c]	--	4	5	45.1	1	D[c]	--
Mining	3	3	-1.1	D[c]	D[c]	--	14	15	7.5	0	D[c]	--
Construction	64	65	0.9	D[c]	D[c]	--	63	65	4.5	175	284	62.3
Manufacturing	481	522	8.6	1,463	1,510	3.2	299	321	7.4	599	878	46.4
Transportation	81	81	0.2	330	344	4.2	82	90	10.2	79	103	30.4
Wholesale trade	68	86	26.3	80	375	368.8	80	106	31.8	60	183	305.0
Retail trade	276	300	8.6	1,478	1,512	2.3	231	278	20.0	481	872	81.3
Finance, insurance and real estate	64	79	23.3	157	236	50.3	65	79	22.4	81	137	69.1
Services	262	322	23.1	877	1,439	64.1	241	312	29.7	297	729	145.5
Government	310	335	8.0	1,995	2,097	51.1	278	311	11.9	1,205	1,546	28.3

[a] Employment in thousands.

[b] Percent change for states calculated on the base of exact number of employees.

[c] Not reported to avoid disclosure.

4.2.2. Demographics

4.2.2.1. Historical Population Trends

Past population trends can be identified at the State, county, township, and local levels. The trends observed at each level are summarized in Table 4-15. They also are described in the DEIS, Section 3.2.2.1.

An analysis of historical population trends (DEIS, Section 3.2.2.1.) indicated that the populations of St. Croix Falls and Taylors Falls have grown at remarkably constant rates from 1950 to 1977. The average rate of increase for this period was 1.4% per year for St. Croix Falls and 0.7% per year for Taylors Falls. The rates of population growth for Polk County and Chisago County accelerated during the 1950 to 1977 period, with the result that St. Croix Falls and Taylors Falls have represented a generally declining share of their respective county populations during this period.

4.2.2.2. Population Projections

Previous projections for the year 2000 population (1980-2000 is the wastewater facilities planning period) have ranged from 1,681 to 3,217 for St. Croix Falls and from 626 to 1,623 for Taylors Falls. The wide range of values in these projections results from the use of different base years for data compilation and from different projection methodologies. Because of the wide range in these existing projections, a new series of population projections have been developed that are based on a thorough consideration of applicable methodologies, most recent population data, and available judgemental inputs. Section 3.2.2.2. of the DEIS presents a discussion of specific local factors and growth trends in the project area.

Based on consistent growth trends, the availability of land for additional growth, and the absence of major development plans within the proposed service areas, population projections for these areas were produced. The projections assume a continuation of the 1950 to 1977 historical growth rates. Projected populations for St. Croix Falls, Taylors Falls, and the combined service areas for 1980, 1985, 1990, 1995, and 2000 are presented

Table 4-15. Historic population trends in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

Area	Population							Percentage Change[g]					
	1920[a]	1930[a]	1940[b]	1950[b]	1960[c]	1970[c]	1977	1920 to 1930	1930 to 1940	1940 to 1950	1950 to 1960	1960 to 1970	1970 to 1977
Wisconsin	2,632,067	2,939,006	3,137,587	3,434,575	3,951,777	4,417,731	4,627,384[d]	11.7	6.8	9.5	15.1	11.8	4.7
Polk County	26,870	26,567	26,197	24,955	24,968	26,666	30,211[d]	-1.1	-1.4	-4.7	0.1	6.8	13.3
City of St. Croix Falls	825	952	1,007	1,065	1,249	1,425	1,576[d]	15.4	5.8	5.8	17.3	14.1	10.6
St. Croix Falls Township	915	852	817	670	677	783	824[d]	-6.9	-4.1	-18.0	-1.0	15.7	5.2
Osceola Township	1,211	765	736	678	716	769	988[d]	36.8	-3.8	-7.9	5.6	7.4	28.5
Minnesota	2,387,125	2,563,953	2,792,200	2,982,483	3,413,864	3,806,103	3,975,000[e]	7.4	8.9	6.8	14.5	11.5	4.4
Chisago County	14,445	13,189	13,124	12,664	13,419	17,492	23,033[e]	-8.7	-0.5	-3.5	6.0	30.4	31.7
City of Taylors Falls	570	527	552	520	546	587	640[f]	-7.5	4.7	-5.8	5.0	7.5	5.6
Shafer Township	927	758	698	633	583	636	766[e]	18.2	-7.9	-9.3	-7.9	9.1	20.4
Combined areas	1,395	1,479	1,559	1,585	1,795	2,012	2,216	6.0	5.4	1.7	13.2	12.6	9.1

[a]US Bureau of the Census 1932a, 1932b.

[b]US Bureau of the Census 1952a, 1952b.

[c]US Bureau of the Census 1972a, 1972b.

[d]Wisconsin Department of Administration 1977.

[e]Minnesota State Demographer 1978.

[f]Average of Taylors Falls Village clerk estimate (1979) and ECDRC estimate (1978), computed by WAPORA, Inc.

[g]As calculated by WAPORA, Inc.

in Table 4-16. The projections given in this table assume 1977 populations of 1,576 for St. Croix Falls and 640 for Taylors Falls (Section 4.2.2.1.). These projections also assume a continuation of the 1.4% per year growth rate for St. Croix Falls and the 0.7% per year growth rate for Taylors Falls that occurred during the 1950 to 1977 period.

Table 4-16. Population projections for St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota, 1980 to 2000 (WAPORA, Inc. 1979).

Year	St. Croix Falls	Taylors Falls	Service Areas
1980	1,643	655	2,298
1985	1,761	682	2,443
1990	1,888	710	2,598
1995	2,024	739	2,763
2000	2,170	769	2,939

The estimate for the population of St. Croix Falls in the year 2000 is 2,170. This is near the lower end of the range of 1,921 to 3,217 included in the "208" Small Area Projections in the Areawide Wastewater Management Plan. It also is within the anticipated population range for St. Croix Falls presented in the Master Plan for St. Croix Falls (Max Anderson and Associates 1971). The population projection of 769 for Taylors Falls in the year 2000 is within the range projected by the East Central Regional Development Commission (626 to 1,623) for that year, but is well below the projection of the Chisago County Zoning and Building Department (1,310) for the year 1990 (the year 2000 projection was not available for comparison). The estimate for the combined St. Croix Falls-Taylors Falls service area for the year 2000 is 2,939, a 33% increase over the 1977 population.

4.2.3. Public Finance

4.2.3.1. Revenues and Expenditures

In 1979, the City of St. Croix Falls collected revenues totaling $1,012,855 while its total expenditures were $986,034 (City of St. Croix

Falls 1980). The year-end fund balance was $296,414, which included the 1979 surplus and funds retained from 1978. The City obtains revenues from three basic sources:

- General operation
- Enterprises
- Capital projects.

In 1979, the City of Taylors Falls collected revenues totaling $214,287 and had expenditures of $240,346 (City of Taylors Falls 1980). City revenues and expenditures are categorized into seven basic fund types:

- General fund
- Utility fund
- Library fund
- Fireman's relief fund
- 1961 Waterworks Improvement Fund
- 1978 Sewer Survey Project
- 1977 Waterworks Improvement Fund.

Complete discussions of the revenues and expenditures for the City of St. Croix Falls and the City of Taylors Falls are presented in the DEIS, Sections 3.2.3.1. and 3.2.3.2., respectively.

4.2.3.2. Assessed Valuation and Property Tax Assessments

In 1979, St. Croix Falls property taxes were levied at a rate of $42.10 per $1,000 of assessed valuation. Equalized assessed value is the full or market value of a property. The total equalized assessed valuation in St. Croix Falls was $27,496,760 in 1979. The assessed value against which taxes are levied is 49.4% of the equalized value, or, in St. Croix Falls, $13,579,095. Taxes on a specific property cannot be estimated solely on the basis of assessed valuation and tax rates, however, because of the availability of various tax credits. In 1979, Taylors Falls property taxes were assessed at a rate of $125.00 per $1,000 of assessed valuation. Property taxes levied by Chisago County and Independent School District #140 on property owners in Taylors Falls are based on the same tax rate that is levied against non-City residents of the County and School District. The assessed valuation of Taylors Falls is $2,385,233, and taxes on specific properties are based on their assessed valuation.

4.2.3.3. Local Indebtedness

Both the City of St. Croix Falls and the City of Taylors Falls appear to be financially sound. Table 4-17 summarizes the common municipal debt measures for these two cities. Indicators suggest that the City of St. Croix Falls is approaching its recommended capacity for incurring debt. The City of Taylors Falls apparently has the ability to incur additional debt. A more complete discussion of municipal indebtedness is presented in the DEIS, Section 3.2.3.

4.2.3.4. User Fees

Residents of St. Croix Falls and Taylors Falls are assessed user fees for wastewater collection and treatment. Rates are established by their respective City Councils and are revised periodically. Present user fees are presented in Appendix E, Exhibit E-1, and are discussed in Section 3.2.3. of the DEIS.

4.2.4. Land Use

4.2.4.1. Existing Land Use

The project area is largely rural in character with over 90% of the total land area undeveloped (Table 4-18). Approximately 34% of the project area is devoted to agriculture (Figure 4-6). Natural areas are found in over 28% of the project area. Recreation areas and parklands account for another 9% of the land in the project area. The remaining 28% of the project area is located within the corporate limits of St. Croix Falls and Taylors Falls. However, nearly 24% of this land is classified as vacant with no identifiable use. Thus, only 352 acres (4.6% of the project area) have been developed for residential, commercial, industrial, or public use.

Table 4-17. Common municipal debt measures (adapted from Moak and Hillhouse 1975).

Debt Ratio	Standard Upper Limits	St. Croix Falls[a]	Taylors Falls[b]
Debt per capita			
Low income	$ 500		
Middle income	$1,000	$1,347	$473
High income	$5,000		
Debt to market value of property	10% of current market value	8.0%	13.0%[c]
Debt service to revenue[d] (or budget)	25% of the local government's total budget	9.0%	11.7%

[a] Includes St. Croix Falls residents share of County and School District debt; debt in general obligation bonds, except for debt supporting the County Nursing Home.

[b] Does not include County or School District debt; all existing debt is in revenue bonds that are repaid through water service charges.

[c] Is ratio to assessed valuation which is between 30% and 43% of market value depending on available credits; thus, the upper limit is not exceeded.

[d] Calculations based on municipal data; County and School District figures are not included.

Table 4-18. Existing land use in the St. Croix Falls, Wisconsin - Taylors Falls, Minnesota project area.

Land Use	Area Acres	% of Project Area
Agriculture	2,558	33.9
Natural	2,145	28.4
Recreation and parkland	702	9.3
Incorporated lands		
Vacant	1,798	23.8
Developed	352	4.6
	7,555	100.0

In the developed portions of both communities, residential areas comprise the largest percentage of urbanized land (Table 4-19). Residential areas are located in the northern and western portions of Taylors Falls and in the northern and eastern portions of St. Croix Falls (Figures 4-7 and 4-8). Commercial land use, concentrated along the main streets of Taylors Falls and St. Croix Falls in the central business district (CBD), account for approximately 10% of the total area in both communities.

Table 4-19. Existing developed land uses in Taylors Falls, Minnesota, and St. Croix Falls, Wisconsin.

Developed Land Use	Taylors Falls Acres	Taylors Falls % Developed Land	St. Croix Falls Acres	St. Croix Falls % Developed Land
Residential				
Single-family	84	77.8	146	60.0
Multifamily	1	0.9	6	2.4
Commercial	11	10.2	22	9.0
Industrial	3	2.8	26	10.6
Public and institutional	9	8.3	44	18.0
	108	100.0	244	100.0

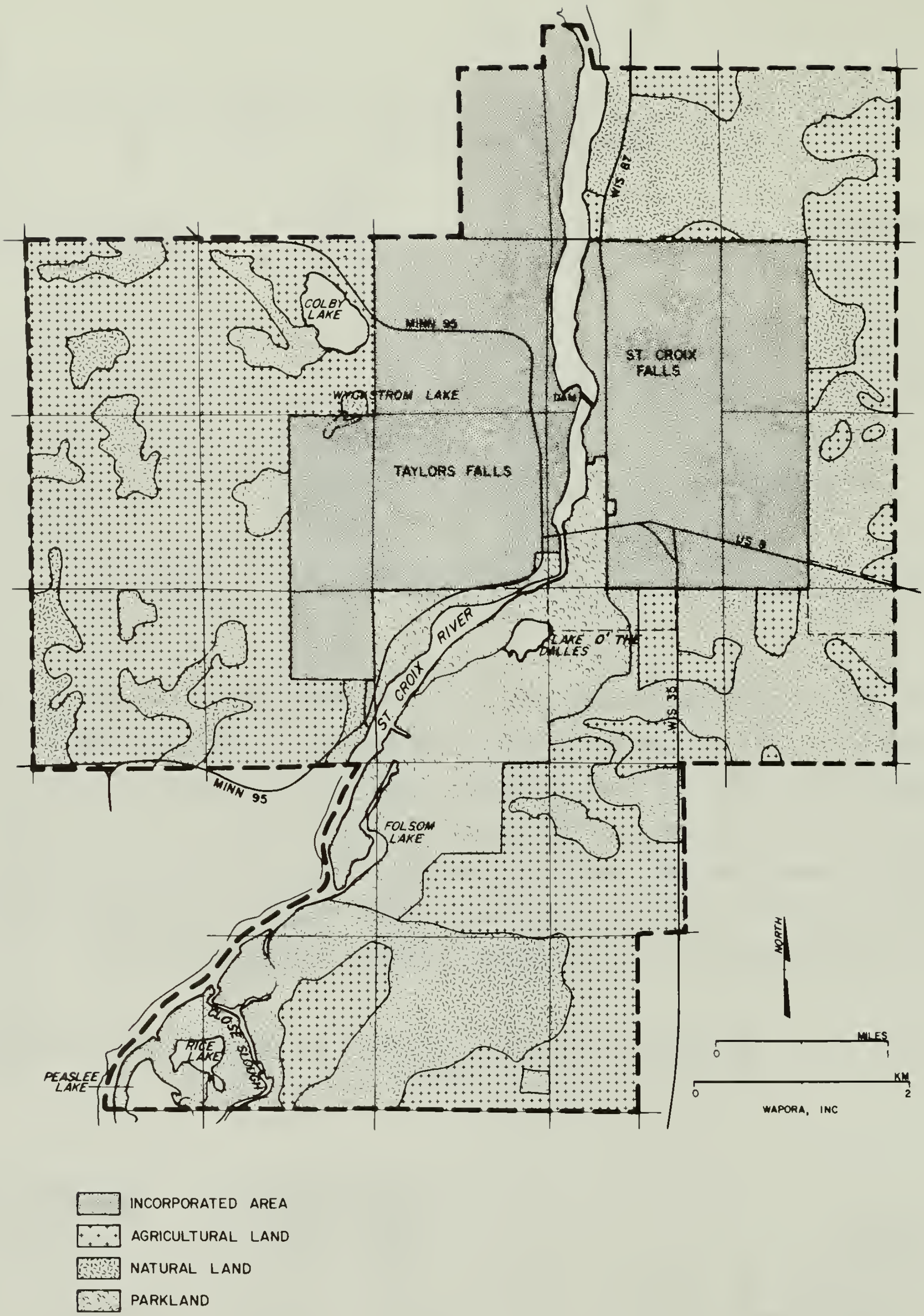


Figure 4-6. Existing land uses in the St. Croix Falls, Wisconsin-Taylors Falls Minnesota, project area, 1979.

Figure 4-7. Existing land uses in Taylors Falls, Minnesota, 1979.

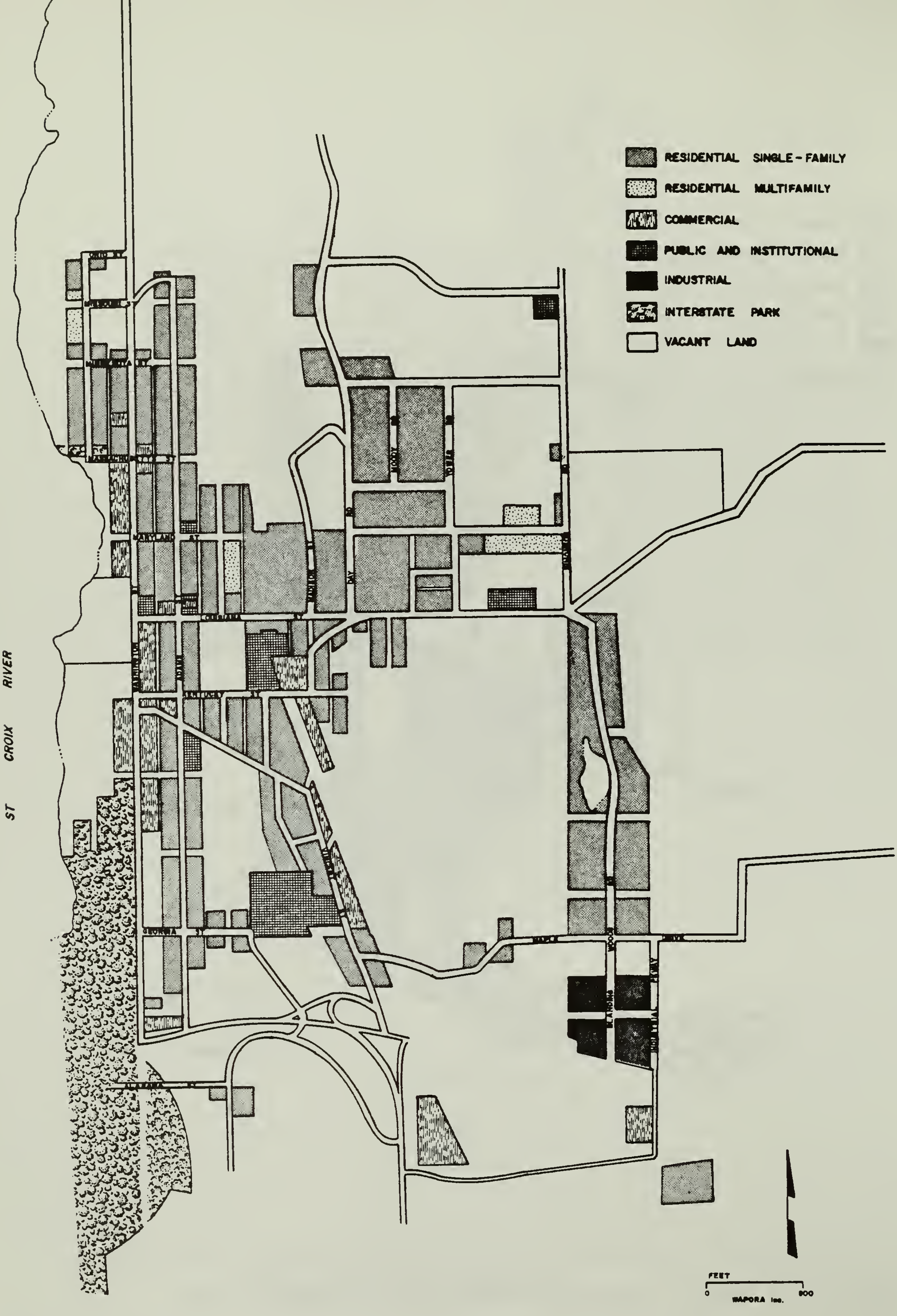


Figure 4-8. Existing land uses in St. Croix Falls, Wisconsin, 1979.

Approximately 3% of the developed land in Taylors Falls is used for industrial purposes. All industrial land is located at the northern edge of town near the St. Croix River. St. Croix Falls has developed an industrial park at the southeastern edge of the City. The industrial park currently includes 26 acres (10.6% of the developed land), 18 of which were recently added to the original 8 acres to allow sufficient room for expansion (By telephone, Mr. Ron Mahaffey, St. Croix Falls Public Works Director, to WAPORA, Inc., 10 June 1980).

Public and institutional uses occupy 18% of the developed land in St. Croix Falls and approximately 8% of the developed land in Taylors Falls. The land is used to house a variety of public facilities including schools, a hospital, a public power company, and water supply facilities.

4.2.4.2. Future Land Use

Population growth will be a major factor governing the future growth of the proposed service area and, thus, the future land use patterns. Development controls and transportation networks (DEIS, Section 3.2.4.4.) also will have an impact on regional land use.

Much of the future development will be in the residential sector. Single-family housing will continue to comprise the largest percentage of urbanized land in the proposed service area. Between 1977 and 2000, Taylors Falls will need 39 additional single-family units and 5 multifamily homes to accommodate the expected 20% population growth (Table 4-20). The 21 acres of land required for this new housing will increase the total area devoted to residential uses by 23%.

Projections for St. Croix Falls indicate that the community's population will increase 38% between 1977 and 2000. As a result, there will be a need for approximately 181 single-family units and 18 multifamily units (Table 4-21). Approximately 97 acres of land will be needed for these new housing units. Thus, land used by the residential sector will increase by approximately 63% over existing residential areas. However, the projected levels of growth for both communities will occur only if the problems area

Table 4-20. Projected residential acreage in Taylors Falls, Minnesota, 1977 to 2000.

Year	Population[a]	Total Additional Units[b]		Total Additional Acreage		Cumulative Housing Acres
		Single-family	Multi-family	Single-family[c]	Multi-family[d]	
1977	640	--	--	--	--	85.0
1980	655	4.0	1.0	2.0	0.3	87.3
1985	682	8.0	1.0	4.0	0.3	91.6
1990	710	9.0	1.0	4.5	0.3	96.4
1995	739	9.0	1.0	4.5	0.3	101.2
2000	769	9.0	1.0	4.5	0.3	106.0
Totals		39.0	5.0	19.5	1.5	

[a]See Section 4.2.2.

[b]Total additional units calculated by dividing the population change by 2.98 persons per household. It was assumed that 90% of additional units would be single-family and 10% would be low-density, multifamily housing (Real Estate Research Corporation 1974). Estimates are rounded to the nearest whole number.

[c]Based on 2 units per gross acre including streets and sidewalks (Real Estate Research Corporation 1974).

[d]Based on 3.3 units per gross acre (Real Estate Research Corporation 1974).

Table 4-21. Projected residential acreage in St. Croix Falls, Wisconsin, 1977 to 2000.

Year	Population[a]	Total Additional Units[b]		Total Additional Acreage		Cumulative Housing Acres
		Single-family	Multi-family	Single-family[c]	Multi-family[d]	
1977	1,576	--	--	--	--	152.0
1980	1,643	20.0	2.0	10.0	0.6	162.6
1985	1,761	36.0	4.0	18.0	1.2	181.8
1990	1,888	39.0	4.0	19.5	1.2	202.5
1995	2,024	41.0	5.0	20.5	1.5	224.5
2000	2,170	45.0	5.0	22.5	1.5	248.5
Totals		181.0	18.0	90.5	6.0	

[a]See Section 4.2.1.

[b]Total additional units calculated by dividing the population change by 2.95 persons per household. It was assumed that 90% of additional units would be single-family and 10% would be low-density, multifamily housing (Real Estate Research Corporation 1974). Estimates are rounded to the nearest whole number.

[c]Based on 2 units per gross acre including streets and sidewalks (Real Estate Research Corporation 1974).

[d]Based on 3.3 units per gross acre (Real Estate Research Corporation 1974).

which limited new housing construction during the 1970s are resolved (DEIS, Section 3.2.4.3.).

Currently, there are no plans for major industrial or commercial expansion in the proposed service area. If this trend continues, the commercial and industrial sectors will remain small and will not require large amounts of land. Public and institutional lands are not expected to increase significantly during the planning period.

4.2.4.3. Development Controls

Development control of the study area is under the jurisdiction of Chisago County, Taylors Falls, Polk County, and St. Croix Falls. Chisago County, Minnesota, has a comprehensive development plan, a zoning ordinance, a floodplain zoning ordinance, and building codes. The comprehensive development plan includes land use policies, land use trends, and environmentally sensitive areas.

Polk County, Wisconsin, has a comprehensive land use ordinance, a shoreland protection zoning ordinance, a floodplain zoning ordinance, and building codes. In Wisconsin, zoning regulations must be adopted by the individual townships and incorporated areas; townships are not under the jurisdiction of the County without adoption of the County regulations. Presently none of the project area in Wisconsin is under County jurisdiction for zoning.

Both St. Croix Falls and Taylors Falls have development codes. St. Croix Falls has zoning, housing, building, plumbing, electrical, and fire prevention codes. Taylors Falls has building codes; codes for mobile homes and parks; camping, picnic, recreational, transient parking facility, and subdivision regulations; and on-lot sewage disposal system regulations.

4.2.4.4. Housing Characteristics

Dwellings in the project area may be characterized by size, age, structural condition, and value. Dwelling sizes in the proposed project service generally are very similar to County and State averages. One exception is the high proportion of large houses (seven or more rooms) in Taylors Falls (WAPORA, Inc. 1979). A detailed discussion of housing characteristics in the project area is presented in the DEIS, Section 3.2.4.3.

4.2.4.5. Transportation

From the Minneapolis-St. Paul region, highway access to the study area includes US Highway 61 and Interstate 35 to US Highway 8 and State Highway 95 to US Highway 8. Traffic loads on State Highway 95 and US Highway 61 have increased substantially at the Washington County-Chisago County line (Table 4-22). Both State Highway 95 and US Highway 61 have relatively low traffic volumes relative to US Highway 8 and Interstate 35.

Table 4-22. Traffic volumes between Chisago County and Washington County, Minnesota (Minnesota Department of Transportation 1977).

Year	Minnesota State Route 95[a]	US Highway 8[a]	US Highway 61[a]	Interstate Highway 35[a]
1972	1,260	6,300	1,900	10,860
1974	1,360	6,685	2,450	10,965
1977	1,565	6,750	2,950	12,430
Percent increase 1972 to 1977	24%	7%	55%	14%

[a]Number of cars passing stationary points.

4.2.4.6. Recreation

All recreation activity centers around the St. Croix River and the two State Parks adjacent to it. The River provides a variety of water-related activities, while each park offers camping and day-use areas.

Attendance at the Minnesota Interstate State Park averages about 99% of capacity from 1 May through 25 October. The family campground normally has about 17,665 visitors each season while the group campground has 2,924 visitors each season. The annual number of recreational visitors has remained stable over the past 10 years because of the limited space of only 46 campsites. However, the campground has been modernized to provide facilities for recreational vehicles and campers (By interview, Mr. Duane Ellertson, Minnesota Interstate State Park, with WAPORA, Inc., 8 March 1979).

The State of Minnesota recently purchased 42 acres and plans to acquire an additional 58 acres. Plans include the construction of a new entrance on the eastern side of the park and additional hiking trails. The campgrounds will not be expanded however (By interview, Mr. Duane Ellertson, Minnesota Interstate State Park, with WAPORA, Inc., 8 March 1979).

Over 414,000 people visited the Wisconsin Interstate State Park in 1978 (Table 4-23). The park has approximately 90 camping units and approximately 30 acres of day-use area. Plans have been proposed to vacate the part of County Trunk Highway (CTH) S that is on the eastern boundary of the Park and to establish a new entryway with a visitor center on the northeastern edge of the Park (By interview, Manager, Wisconsin Interstate State Park, with WAPORA, Inc.,

Table 4-23. Recreational visitation in the Wisconsin Interstate State Park (By letter, Mr. B. McGaver, Park Superintendent, to WAPORA Inc., 11 January 1979).

	1976	1977	1978
Recreational visitors	364,155	358,050	414,650 (16%)
Family camper days	30,616	25,688	30,327
Outdoor group camper days	3,115	3,140	2,501

8 March 1979). No further acquisition of land is anticipated. The St. Croix River is a designated National Wild and Scenic Riverway upstream of the project area and a designated National Scenic and Recreational River downstream of the project area (Section 4.2.6.).

4.2.5. Archaeological, Historical, and Cultural Resources

4.2.5.1. Archaeological Sites

An inventory of known prehistoric and historic cultural resources within the project area was conducted by WAPORA. A search of the Wisconsin Archaeological Codification Files of the State Historical Society of Wisconsin, Historic Preservation Division, indicated a total of five known archaeological sites in the Wisconsin portion of the project area. These sites include an extensive mound complex, a prehistoric bison kill, two Chippewa campsites, and a Chippewa-Sioux and Fox battle site. The battle site has potential for inclusion in the National Register of Historic Places (By letter, Mr. Albert P. Seidenkranz, US National Park Service, St. Croix National Scenic Riverway, to WAPORA, Inc., 18 January 1979).

Existing information on cultural resources is not sufficient to describe existing conditions in the Wisconsin portion of the project area. There is a need for detailed cultural resource inventories in the Wisconsin section of the project area, concentrating on archaeological surveys (By interview, Mr. Richard Dexter, State Historical Society of Wisconsin, with WAPORA, Inc., 14 December 1978; by letter Mr. Richard Dexter, State Historical Society of Wisconsin, with WAPORA, Inc., 23 October 1979). No known sites of archaeological significance are located within the Minnesota section of the project area (By letter, Mr. Russel W. Fridley, SHPO, to Mr. Gene Wojcik, USEPA, 6 September 1978; Ms. Susan Queripel, Minnesota Historical Society, to WAPORA, Inc., 30 January 1979; and Mr. Russel W. Fridley, SHPO, to WAPORA, Inc., 26 October 1979).

The Minnesota Interstate State Park and the Wisconsin Interstate State Park are potential sources of undocumented prehistoric and historic archaeological sites. According to Pond (1937):

> Interstate Park and the shores of the St. Croix were important Indian country before the coming of the White man. The river was a recognized thoroughfare for travel between the Great Lakes and the Mississippi but the steep rapids (Falls) made a portage necessary at what is now St. Croix Falls and Taylors Falls. This region seems to have been about the boundary between the territories of the Sioux and Chippewa tribes and the scene of important battles between these tribes in historic times.

The prehistoric and historic archaeological resources of the project area are discussed in detail in WAPORA, Inc. (1979).

4.2.5.2. Historical Sites and Cultural Resources

The Angel's Hill Historic District, the Taylors Falls Public Library, and the Munch-Roos House all are listed on the National Register of Historic Places. The Angel's Hill Historic District consists of 34 structures, primarily houses, and are predominantly a New England variation of Greek Revival. A 1979 survey in Chisago County for standing structures of historical significance did not identify any other significant structures in the vicinity of the project area.

The Wisconsin Inventory of Historic Places lists seven sites in the Wisconsin portion of the project area, all located in St. Croix Falls. Information from the Polk County Historical Society concerning other historical or architectural sites in the Wisconsin section of the project area indicated 18 additional sites of local significance in the St. Croix Falls area (By letter, Mr. Frank J. Werner, Polk County Historical Society, to WAPORA, Inc., 23 April 1979). The historic, cultural, and architectural resources of the project area are discussed in detail in WAPORA, Inc. (1979).

4.2.6. National Scenic Riverway

The St. Croix River has been designated a National Wild and Scenic Riverway in the reaches upstream of the study area and a National Scenic and Recreational Riverway downstream of the study area.

The National Park Service (NPS 1975) has described the St. Croix River from north of St. Croix Falls, Wisconsin, to the mouth as follows:

> Below the former (Nevers) dam site, the wild character reappears for a few miles, but shortly the river slows and widens into the St. Croix Falls Flowage. This 10-mile long lake partially fills a half-mile-wide valley. The lake is impounded by a 60-foot hydroelectric dam at St. Croix Falls, Wisconsin/Taylors Falls, Minnesota.

> At Taylors Falls the river flows through a narrow, metamorphic rock gorge, the Dalles, which has been protected by inclusion in the Interstate parks of Minnesota and Wisconsin. From below the Dalles to the Soo Railroad swing bridge a mile below the Chisago County line, the river flows through a heavily wooded, steep-sided valley with occasional sandstone and limestone bluffs... Islands, sloughs and backwater areas make the river scene ideal for the river user to explore.
>
> [Once past the study area]... the character of the Lower St. Croix Rvier begins to change. The river becomes wider and gradually begins to lose its intimate island and slough environment. From Stillwater [Minnesota], the largest city on the river, to its mouth at Prescott [Wisconsin], the river is relatively deep and wide....

Approximately 185,000 people use the recreational and surface water facilities on the Lower St. Croix Riverway each year.

Easements and property bordering the River in the reach from Taylors Falls downstream to Stillwater was recently acquired by NPS (By telephone, Mr. Jack Pattie, NPS, Land Acquisitions Officer, to WAPORA, Inc., 10 June 1980). NPS also is planning a visitors center and canoe take-out along the River, although the exact location is still undecided. NPS headquarters for the St. Croix National Scenic Riverway is located at St. Croix Falls, just north of the dam site. There are no plans to acquire land in the project area upstream of Taylors Falls and St. Croix Falls. Most of this land currently is owned by the Northern States Power Company.

5.0. ENVIRONMENTAL CONSEQUENCES

The potential environmental consequences of the implementation of any of the nine proposed wastewater treatment system alternatives are described in the following sections. The "no-action" alternative (Section 3.4.1.) is not considered because it is not a viable solution to the need to improve the quality of the wastewater discharges at St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota.

The effects of various aspects of the construction (Section 5.1.) and operation (Section 5.2.) of the facilities proposed by the alternatives may be beneficial or adverse, and may vary in duration and degree of significance. Environmental effects are classified either as primary or secondary impacts. Primary impacts are those effects that would be related directly to construction and operation activities (i.e., the noise produced by construction equipment). Secondary impacts (Section 5.4.) are indirect or induced effects (i.e., stimulation of population growth because of the availability of excess wastewater collection and treatment capacity). Many of the potentially adverse effects may be reduced or eliminated by various techniques (Section 5.5.).

5.1. Construction Impacts

The rehabilitation and/or construction of new independent wastewater treatment facilities for St. Croix Falls and Taylors Falls, or the construction of a regional wastewater treatment facility to serve both communities, primarily will produce short-term environmental impacts. These impacts would be localized in the area affected by construction, which depends on the wastewater treatment alternative that is selected. The potential physical, biological, and socioeconomic impacts from the construction of each of the nine alternatives are presented in comparative fashion in Table 5-1. The effects are quantified where possible.

Clearing, grading, and construction activities at the proposed treatment plant sites, excavation and backfilling of trenches for force main

Table 5-1. Potential major primary impacts from the construction of new waste-water treatment facilities at St. Croix Falls WI and Taylors Falls MN.

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality and Odors	a) Nuisance fugitive dust would be generated from rehabilitation and expansion of existing WWTP and may be objectionable to local residents and commercial establishments in St. Croix Falls, recreationists in the WI Interstate State Park, and the adjacent Fish Hatchery.	a) Same as Alt. 1a, plus fugitive dust would be generated: • by 2 miles of force main trenching and backfilling from the WWTP site, along River, Washington, and Louisiana Streets to the proposed land application site (see Fig. 2-1) • from clearing, grading, and excavating 30 acres in NE ¼ of Sec. 29, St. Croix Falls Twp., for land application site.	a) Nuisance fugitive dust would be generated from demolition of existing WWTP and construction of new WWTP and may be objectionable to local residents and commerical establishments in Taylors Falls and to recreationists in the MN Interstate State Park.	a) Same as Alt. 3a.
	b) Emissions of hydrocarbons and fumes from construction equipment may be objectionable to local residents and commercial establishments in St. Croix Falls, recreationists in the WI Interstate State Park, and to the adjacent Fish Hatchery.	b) Same as Alt. 1b, plus effects to commercial establishments and residents along the 2 mile force main route on River, Washington, and Louisiana Streets (see Fig. 2-1).	b) Emissions of hydrocarbons and fumes from construction equipment may be objectionable to local residents and to commercial establishments in Taylors Falls and to recreationists in the MN Interstate State Park.	b) Same as Alt. 3b.
Noise	a) Noise generated by construction activities at the existing WWTP may be objectionable to persons in the downtown St. Croix Falls area, Fish Hatchery, and WI Interstate State Park.	a) Same as Alt. 1a, plus effects to residents near the 2 mile force main route from the WWTP and along River, Washington and Louisiana Streets to land application site.	a) Noise generated by demolition and construction activities at the existing WWTP site may be objectionable to persons in the downtown Taylors Falls area and the MN Interstate State Park.	a) Same as Alt. 3a.
Topography, Geology, and Soils	a) No significant impacts expected.	a) Extensive grading of portions of the 30-acre land application site in NE ¼ of Sec. 29, St. Croix Falls Twp., for construction of basins in steep sloping terrain would alter existing topography and soil regime.	a) Fill material may be required to increase the land area for the new WWTP.	a) Same as Alt. 3a.
Surface Water	a) If not properly mitigated, surface runoff from disturbed areas during construction could contribute to increased turbidity and sedimentation in the adjacent St. Croix River, causing some short-term degradation in water quality.	a) Same as Alt. 1a, plus surface runoff from the disturbed area on the 30-acre land application site and turbid waters pumped from excavations and 2-miles of force main trenching could contribute to increased turbidity and sedimentation in drainage-ways.	a) Same as Alt. 1a.	a) Same as Alt. 3a.
Groundwater	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Floodplains and wetlands	a) No impact expected.	a) Same as Alt. 1a.	a) Flooding of the St. Croix River during construction phase could result in inundation of settling tanks being used for interim treatment. This could cause short-term degradation of water quality from partially treated waste being released in the river.	a) Same as Alt. 3a.
Terrestrial Biota	a) Temporary disturbance of vegetation and wildlife area adjacent to existing WWTP during expansion of facility.	a) Same as Alt. 1a.	a) Temporary disturbance of vegetation and wildlife in area adjacent to existing WWTP during demolition and construction activities.	a) Same as Alt. 3a.
		b) Short-term disruption of vegetation and wildlife along 2 miles of force main route.		
		c) Loss of approximately 30 acres of oldfield vegetation for construction of infiltration site, access road, and force main in the NE ¼ of Sec. 29, St. Croix Falls Twp.		

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Nuisance fugitive dust would be generated: • from demolition of existing WWTP • by 2.5 miles of force main/discharge line trenching and backfilling at WWTP site and along County Road 82, Folsom, Walnut, and Mulberry Streets, and Military Road (aee Fig. 2-1) • by construction of 4 pumping stations located along interceptor route (see Fig. 2-1) • from clearing, grading, and excavating 40 acrea in NW ¼ of Sec. 26, Shafer Twp., for stabilization ponds.	a) Same as 5a, except nuisance fugitive duat would be generated from clearing, grading, and excavating 100 acres in NW ¼ of Sec. 26, Shafer Twp., for stabilization ponds and land application site.	a) Same as Alt. 1a, plus nuisance fugitive dust would be generated from: • demolition of existing Taylors Falls WWTP • trenching and backfilling along approximately 0.5 mile force main route from Taylors Falls pumping station to St. Croix Falls WWTP, through the WI Interstate State Park.	a) Same as Alt. 6a, except nuisance fugitive duat would be generated from: • clearing, grading and excavating 90 acres in NW ¼ of Sec. 26, Shafer Twp., for stabilization ponds • trenching and backfilling force main/and/or discharge line from St. Croix Falls pumping station to Taylors Falls pumping station through the WI Interstate State Park.	a) Same as Alt. 6a, except nuisance fugitive dust would be generated from: • clearing, grading, and excavating 280 acres in Sec. 26, Shafer Twp., for stabilization ponds and and land application site • trenching and backfilling force main/and/or discharge line from St. Croix Falls pumping station to Taylors Falls pumping station through the WI Interstate State Park.
b) Same as Alt. 3b, plus effects to residents along 2.5 miles of force main/discharge line from existing WWTP site and along County Road 82, Folsom, Walnut, and Mulberry Streets and Military Road (see Fig. 2-1).	b) Same as Alt. 5b.	h) Same as Alt. 1b and Alt. 3b.	b) Same as Alt. 1b and Alt. 5b.	b) Same as Alb. 1b and Alt. 5b.
a) Same as Alt. 3a, plus effects to residents near the 2.5 miles of force main/discharge line and 4 pumping station locations and along County Road 82, Folsom, Walnut, and Mulberry Streets, and Military Road.	a) Same as Alt. 5a.	a) Same as Alt. 1a and Alt. 3a, plus effects from noise generated by construction of a force main route from the Taylors Falls pumping station through the WI Interstate State Park.	a) Same as Alt. 1a and Alt. 5a.	a) Same as Alt. 1a and Alt. 5a.
a) Excavating and grading 40-acre stabilization pond site in NW ¼ of Sec. 26, Shafer Twp., would alter existing topography and soil regime. Dikes around the pond would be 6 to 8 ft. above ground surface.	a) Same as Alt. 5a.	a) No significant impacts expected.	a) Same as Alt. 5a, except the stabilization pond site would be 90-acres.	a) Same as Alt. 8a.
a) Same as Alt. 3a, plus surface runoff from the disturbed area on the 40-acre pond stabilization site and turbid waters pumped from excavations and 2.5 miles of force main trenching could contribute to increased turbidity and sedimentation in drainageways.	a) Same as Alt. 5a.	a) Same as Alt. 1a and Alt. 3a, plus surface runoff and turbid waters pumped from WWTP excavations and force main trench through the WI Interstate State Park could contribute to increased turbidity and sedimentation in the St. Croix River, causing some short-term degradation in water quality.	a) Same as Alt. 5a and Alt. 7a.	a) Same as Alt. 6a and Alt. 7a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) No significant impacts expected.	a) Same as Alt. 5a.	a) Same as Alt. 1a.	a) Same as Alt. 5a.	a) Same as Alt. 5a.
a) Temporary diaturbance of agricultural and forest vegetation and wildlife along approximately 2.5 miles of force main and at 4 pumping stations.	a) Same aa Alt. 5a.	a) Same as Alt. 1a, plus permanent loss of 0.25 acrea of forest vegetation and wildlife habitat at site of new facility.	a) Same as Alt. 5a and Alt. 7b	a) Same as Alt. 5a and Alt. 7b.
b) Loss of approximately 40 acres of forest vegetation or agricultural crops at stabilization pond aite or NW ¼ of Sec. 26, Shafer Twp.	b) Same as Alt. 5b, plus additional vegetation loss on land required for spray irrigation equipment. However, crops can be cultivated on most of additional 70 acres required for this alternative.	b) Short-term disruption of vegetation and wildlife along approximately 0.5 mile of force main route from Taylors Falls WWTP site to St. Croix Falls WWTP through WI Interstate State Park.	b) Loss of 90 acres of forest vegetation or agricultural crops at stabilization pond site in NW ¼ of Sec. 26, Shafer Twp.	b) Same as Alt. 8b, plus additional vegetation loss on land required for spray irrigation equipment and access road(s). However, crops can be cultivated on most of additional 190 acres required for this alternative.
c) Permanent displacement of wildlife from stabilization pond aite. Reduction in number of individuals of forest speciea and increase in number of individuals of "edge" species.	c) Same as Alt. 5c.		c) Same as Alt. 5c.	

Table 5-1. (Continued)

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Aquatic Biota	a) Short-term degradation in water quality near WWTP site as a result of erosion and sedimentation during expansion of facility would result in short-term changes in macroinvertebrate and plankton communities. Fish would temporarily avoid the area.	a) Same as Alt. 1a.	a) Short-term degradation in water quality near WWTP site as a result of erosion and sedimentation during construction and/or demolition activities would result in short-term changes in macroinvertebrate and plankton communities. Fish would temporarily avoid the area.	a) Same as Alt. 3a.
Endangered and Threatened Species	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Economics and Demographics	a) An estimated 15 man-years of construction labor would be needed during the period of construction. The amount of local employment will depend on the hiring practices of contractors.	a) Same as Alt. 1a.	a) Same as Alt. 1a, except 13 man-years of labor needed.	a) Same as Alt. 1a, except 14 man-years of labor needed.
	b) Little, if any, additional (secondary) short-term employment in other economic sectors would be generated in the St. Croix Falls-Taylors Falls area.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.
	c) No residents would be displaced by construction activities.	c) Same as Alt. 1c.	c) Same as Alt. 1c.	c) Same as Alt. 1c.
Public Finance	a) State government and the City of St. Croix Falls would share construction cost (Federal construction grants in WI are not available): • \$624,000 from WI Grant • \$449,600 from City. (See Section 4.3) This represents a significant social cost in terms of alternative public services obtainable through use of public funds.	a) Same as Alt. 1a, except share would be: • \$708,600 from State • \$472,400 from City.	a) Federal and State governments, and the City of Taylors Falls would share construction cost: • \$741,000 from USEPA Grant • \$148,200 from MN Grant • \$ 98,800 from City.	a) Same as Alt. 3a, except shares would be: • \$738,800 from USEPA • \$147,800 from State • \$ 98,500 from City.
Land Use	a) The existing WWTP site would be utilized; no change in existing land use would occur.	a) 30 acres of agricultural and wooded land in NE ¼ of Sec. 29, St. Croix Falls Twp., would be converted to a land application site.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
		b) Force main route from existing WWTP site, along River, Washington, and Louisiana Streets, to the land application site would be a public utility right-of-way.		

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Same as Alt. 3a.	a) Same as Alt. 3a.	a) Same as Alt. 1a and Alt. 3a, and because of erosion and sedimentation along approximately 0.5 mile force main route between St. Croix Falls WWTP site and Taylors Falls WWTP site through the WI Interstate State Park.	a) Same as Alt. 3a. and Alt. 7a.	a) Same as Alt. 3a and Alt. 7a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Same as Alt. 1a.	a) Same as Alt. 1a, except 19 man-years of labor needed.	a) Same as Alt. 1a, except 28 man-years of labor needed.	a) Same as Alt. 1a, except 34 man-years of labor needed.	a) Same as Alt. 1a, except 43 man-years of labor needed.
b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.
c) Same as Alt. 1c.	c) Same as Alt. 1c.	c) Same as Alt. 1c.	c) Same as Alt. 1c.	c) Same as Alt. 1c.
a) Same as Alt. 3a, except shares would be: • $873,000 from USEPA • $174,600 from State • $116,400 from City.	a) Same as Alt. 3a, except shares would be: • $1,346.000 from USEPA • $ 142,000 from State • $ 95,000 from City.	a) For regional alternatives, the cost split between communities would be based on contribution to total flow. For St. Croix Falls, share would be: • $938,200 from WI • $625,400 from City. For Taylors Falls, share would be: • $421,100 from USEPA • $ 82,400 from MN • $ 54,900 from City.	a) Same as Alt. 7a, except for St. Croix Falls, share would be: • $1,181,000 from WI • $ 787,400 from City For Taylors Falls, share would be: • $518,700 from USEPA • $103,700 from MN • $ 69,200 from City.	a) Same as Alt. 7a, except for St. Croix Falls, share would be: • $1,621,000 from WI • $1,080,700 from City. For Taylors Falls, share would be: • $806,900 from USEPA • $ 85,400 from MN • $ 57,000 from City.
a) 40 acres of agricultural and wooded land in the NW ¼ of Sec. 26, Shafer Twp., would be converted to a stabilization pond site.	a) 110 acres of agricultural and wooded land in the NW ¼ of Sec. 26, Shafer Twp., would be converted to a stabilization pond and land application site.	a) The existing St. Croix Falls WWTP site plus an additional 0.25 acres of Fish Hatchery land would be converted for the expansion of the existing WWTP.	a) 110 acres of agricultural and wooded land in the NW ¼ of Sec. 26, Shafer Twp., would be converted to a stabilization pond site.	a) 280 acres of agricultural and wooded land in Sec. 26 of Shafer Twp. would be converted to a stabilization pond and land application site.
b) Force main from existing WWTP site and along County Road 82, Folsom, Walnut, and Mulberry Streets, and Military Road to stabilization pond site would be a public utility right-of-way (See Fig. 2-1).	b) Same as Alt. 5b.	b) The existing Taylors Falls WWTP site would be used for a pumping station.	b) Same as Alt. 5b.	b) Same as Alt. 5b.
c) Land at existing WWTP site would remain in public use as a pumping station site.	c) Same as Alt. 5c.	c) Right-of-way through the WI Interstate State Park would be needed for a force main route from the Taylors Falls pumping station to the St. Croix Falls WWTP.	c) Right-of-way through the WI Interstate State Park would be needed for a force main route from the St. Croix Falls pumping station to the Taylors Falls pumping station.	c) Same as Alt. 8c.
d) Land for 3 additional pumping stations along force main would be converted to public use (exact location to be determined during detailed engineering design, approximate location in Fig. 2-1).	d) Same as Alt. 5d.		d) Same as Alt. 5c.	d) Same as Alt. 5c.
			e) Same at Alt. 5d.	e) Same as Alt. 5d.

Table 5-1. (Concluded)

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Transportation	a) Vehicular traffic occasionally may be disrupted or inconvenienced by construction equipment and delivery trucks in St. Croix Falls near WWTP site.	a) Same as Alt. 1a.	a) Vehicular traffic occasionally may be disrupted or inconvenienced by construction equipment and delivery trucks near WWTP site and Rt. 8 bridge.	Same as Alt. 3a.
	b) Some construction equipment and delivery trucks may need to travel through the WI Interstate State Park to the existing WWTP. Inconvenience or nuisance to recreationists in the Park would be short-term.	b) Vehicular traffic would be disrupted by trenching of the force main route along River, Washington, and Louisiana Streets.		
Recreation	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Archaeological, Historical, and Cultural Resources	a) Because the existing WWTP site already is developed, no significant impacts are expected.	a) No archaeological, historical, or cultural sites are known to exist along the River, Washington, and Louisiana Street force main route or at the land application site in the NE ¼ of Sec. 29, St. Croix Falls Twp; however no field survey has been completed. It is possible that significant archaeological sites could be damaged or uncovered along the 2 mile force main route or at the 30-acre land application site.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Resource Use	a) $1,124,000 of public capital would be committed irretrievably.	a) $1,181,000 of public capital would be committed irretrievably.	a) $988,000 of public capital would be committed irretrievably.	a) $985,000 of public capital would be committed irretrievably.
	b) An unquantifiable amount of engineering, administrative, legal, construction, and related labor has been/will be committed to the project.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.
	c) Materials, fuel, and other energy resources would be committed irretrievably for the expansion and rehabilitation of the existing WWTP.	c) Same as Alt. 1c, plus for the construction of a land application site and 2 mile force main route.	c) Materials, fuel, and other energy resources would be committed irretrievably for the demolition of the existing WWTP and the construction of a new conventional treatment plant.	c) Same as Alt. 3c.
	d) The existing WWTP site would be committed at least for the useful life of the facilities (50 years).	d) The existing WWTP site, 2 miles of force main right-of-way, and 30 acres of land for a land application site would be committed at least for the useful life of the facilities (50 years).	d) The existing WWTP site would be committed at least for the useful life of the facilities (50 years).	d) Same as Alt. 3d.

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Same as Alt. 3a, plus vehicular traffic would be disrupted by trenching of the force main along County Road 82, Folsom, Walnut, and Mulberry Streets, and Military Road (See Fig. 2-1).	a) Same as Alt. 5a.	a) Vehicular traffic would be disrupted and inconvenienced by construction equipment and delivery trucks: • traveling through the WI Interstate State Park • trenching the force main through the WI Interstate State Park • entering and exiting the Taylors Falls WWTP site near the Rt. 8 bridge • on the Rt. 8 bridge (possibly closing one lane of traffic for several weeks between the hours of 8 am to 5 pm) during construction of the force main across the bridge.	a) Same as Alt. 7a, plus traffic disruption by trenching of the force main along County Road 82 Folsom, Walnut, and Mulberry Streets and Military Road (See Fig. 2-1).	a) Same as Alt. 8a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Recreationists would be inconvenienced and distracted by the construction of a force main through the WI Interstate State Park.	a) Same as Alt. 7a.	a) Same as Alt. 7a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Because the existing St. Croix Falls and Taylors Falls WWTP sitea already have been developed, no significant impacts are expected at these locations.	a) Same as Alt. 7a.	a) Same as Alt. 7a.
b) No archaeological, historical, or cultural sites are known to exist along the County Road 82, Folsom, Walnut, and Mulberry Streets, and Military Road force main route or at the stabilization pond site in the NW ¼ of Sec. 26, Shafer Twp.; however no field survey has been completed. It is possible that significant archaeological sites could be damaged or uncovered along the 2.5 mile force main route or at the 40-acre stabilization pond site.	b) Same as Alt. 5b, except significant archaeological and historical sites could be damaged or uncovered in the 110-acre stabilization pond and land application site in the NW ¼ of Sec. 26, Shafer Twp.	b) No known archaeological, historical, or cultural sites are known to exist along the proposed force main route from the Taylors Falls WWTP site to the St. Croix Falls WWTP site through the WI Interstate State Park; however no field survey has been completed. It is possible that significant archaeological sites could be damaged or uncovered along the force main route through the Park.	b) Same as Alt. 5b, except siginificant archaeological sites could be damaged or uncovered in the 90-acre stabilization pond site located in the NW ¼ of Sec. 26, Shafer Twp. c) Same as Alt. 7b.	b) Same as Alt. 5b, except significant archaeological sites could be damaged or uncovered in the 280-acre stabilization pond and land application site located in Sec. 26 of Shafer Twp.
a) $1,164,000 of public capital would be committed irretrievably.	a) $1,584,000 of public capital would be committed irretrievably.	a) $2,113,000 of public capital would be committed irretrievably.	a) $2,660,000 of public capital would be committed irretrievably.	a) $3,651,000 of public capital would be committed irretrievably.
b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.	b) Same as Alt. 1b.
c) Materials, fuel, and other energy, resources would be committed irretrievably for the demolition of the existing WWTP and construction of 4 pumping stations, 2.5 miles of force main, and a stabilization pond treatment system.	c) Same as Alt. 5c, including a land application site.	c) Same as Alt. 1c, including that committed for the demolition of the WWTP and construction of the pumping station at Taylors Falls, and for construction of force main from the Taylors Falls pumping station to the St. Croix Falls WWTP.	c) Materials, fuel, and other energy resources would be committed irretrievably for the demolition of the existing WWTP at Taylors Falls and the construction of pumping stations at Taylors Falls and St. Croix Falls; the force main between the 2 pumping stations; 2.5 miles of force main; and a stabilization pond treatment system.	c) Same as Alt. 8c, including a land application system.
d) Same as Alt. 3d, plus 2.5-mile force main right-of-way and 40 acres of land for a stabilization pond treatment system would be committed at least for the useful life of the project (50 years).	d) Same as Alt. 3c, plus 2.5-mile force main right-of-way and 110 acres of land for a stabilization pond and land treatment system would be committed at least for the useful life of the project (50 years).	d) The existing WWTPs at St. Croix Falls and Taylors Falls and force main right-of-way between the 2 WWTPs would be committed for at least the useful life of the project (50 years).	d) Same as Alt. 7d, plus 2.5 miles of force main right-of-way and 90 acres of land for a stabilization pond treatment system.	d) Same as Alt. 7d, plus 2.5 miles of force main right-of-way and 280 acres of land for a stabilization pond and land application treatment system.

emplacement, and construction activities at pumping stations would create a variety of effects:

- Fugitive dust and emissions of hydrocarbons and fumes from construction equipment
- Noise from excavating and other construction equipment
- Destruction of vegetation
- Disturbance of wildlife
- Erosion that potentially would increase sediment loads in the St. Croix River
- Disrupt local traffic flows
- Impair aesthetics
- Potentially destroy or uncover important archaeological or historical sites.

The rehabilitation and/or construction of new treatment facilities would irretrievably commit various quantities of public capital, energy resources, land, labor, and materials. A number of short-term construction jobs would be created.

Land and Water Conservation Fund assistance was utilized by WDNR in the acquisition and development of the Wisconsin Interstate State Park. Therefore, construction of the force main through the Park for Regional Alternatives 7, 8, and 9 will require a permit issued by WDNR with prior approval from the US Department of the Interior. However, if the development of the force main will remove any portion of the right-of-way from public outdoor recreational use, the Secretary of the Interior must approve the conversion of use (By letter, Ms. Sheila D. Minor, US Department of the Interior, to Mr. James A. Hanlon, USEPA, 28 April 1981). The Wisconsin Department of Transportation also must issue a permit if any of the new sewer lines will cross or be placed within the right-of-way of a highway in the State Trunk System.

Impacts of significant public concern, as evidenced by specific Executive Orders concerning their consideration and/or those impacts that require additional explanation, are described further in the following sections.

The impacts of system construction and operation on local government finance are described in Section 5.3.

5.1.1. Air Quality and Odors

The air quality of the project area would not be affected significantly by any of the proposed alternatives. Short-term, adverse impacts could result from the generation of fugitive dust during the demolition of existing facilities and the construction of new facilities. Fugitive dusts include respirable particulates less than 30 micrometers (um; 0.0012 in) in diameter, which might remain in suspension and be transported by wind more than 10 miles from their source. Particles larger than 30 um tend to settle out within 20 feet to 30 feet of their source (USEPA 1976a). The very small particles can be inhaled by people and wildlife, and be deposited deep in the most sensitive areas of the pulmonary region. Thus increased fugitive dusts from construction activities can contribute to acute and chronic respiratory problems.

In addition to particle size, the chemical composition of the dust particles and the prevailing wind speeds determine how fugitive dust emissions will affect air quality (Cowherd, Bohn, and Cuscino 1979). Wind speeds must be significant to carry the dust away from its source. Other factors affecting fugitive dust emissions include source activity, moisture content of the disturbed surface material, humidity, temperature, and time of day.

5.1.2. Floodplains and Wetlands

Although no significant impacts to floodplains or wetlands are expected during construction of any of the nine alternatives, the US Army Corps of Engineers must issue a permit if any work will be performed below the ordinary high-water mark of the St. Croix River or if fill material is to be placed in wetland areas adjacent to the River. An MDNR statute also requires a Chapter 105 permit that applies to all grading, filling, or dredging to be performed in a public waterway. The southeast area of the stabilization pond site in Section 26 of Shafer Township (Alternatives 5, 6, 8, and 9) is wet during most of the year. There is adequate area at the site, however, so that the stabilization ponds can be located on higher ground to the west of this area. Provisions to prevent runoff or leakage of wastewater or drainage water to this wetland area also would be required.

Construction of a new conventional WWTP for Taylors Falls (Alternatives 3 and 4) at the site of the existing WWTP would be above the 100-year floodplain elevation of the St. Croix River. However, during construction of a new plant under either of these alternatives, interim wastewater treatment for Taylors Falls would include the use of the existing settling tanks, which are located within the River's floodplain. Any significant flooding during the construction phase would result in the inundation of the settling tanks. This could cause short-term degradation of river water quality; however, because of the extremely high flow associated with flood conditions, the partially treated wastewater would be diluted. Bacterial contamination would be the only significant concern in such case.

5.1.3. Prime Agricultural Land

The majority of the land in Section 26 of Shafer Township, including the proposed wastewater treatment site, is defined as prime agricultural land according to the classification system established by SCS. Only a small portion of the land in Section 29 of St. Croix Falls Township, virtually none within the proposed wastewater treatment site, is defined as prime agricultural land. The irreversible loss of agricultural lands to other land uses is a growing national concern. The Council on Environmental Quality (CEQ) issued a memorandum (1976) to all Federal agencies requesting that efforts should be made to insure that prime and unique farmlands (as designated by SCS) are not irreversibly converted to other uses unless other national interests override the importance or benefits from their protection.

USEPA has a policy of not allowing the construction of a treatment plant or the placement of interceptor sewers funded through the Construction Grants Program in prime agricultural lands unless it is necessary to eliminate existing point discharges and accommodate flows from existing habitation that violate the requirements of the Clean Water Act (USEPA 1979a). The policy of USEPA is to protect prime agricultural land from being adversely affected by primary and secondary impacts. It is considered to be a significant impact if 40 or more acres of prime agricultural land are diverted from production.

Alternatives 5 and 6 may adversely impact as much as 40 acres of prime agricultural land. Regional Alternatives 8 and 9 would each impact up to 90 acres of agricultural land. These lands would be taken out of crop production for use as stabilization and holding ponds, control facilities, buffer zones, and access roads. The actual amount of acres of prime agricultural land taken out of crop production for these treatment alternatives is dependent on the actual location and placement of the treatment sites and interceptor route within Section 26 of Shafer Township.

5.1.4. Endangered and Threatened Species

No significant impacts to species designated as endangered or threatened are expected during construction of any of the alternatives. The majority of the species designated as endangered or threatened by the State of Wisconsin, or given priority status by the State of Minnesota, are typically present in extensive tracts of forests or wetland habitats. Therefore, these species are not likely to be present in the primarily agricultural and oldfield lands proposed for use in the stabilization pond and land application alternatives, or in the developed areas where the existing treatment plants are located. No species classified as endangered or threatened were noted in the vicinity of the sites involved in the various wastewater system alternatives by an ecologist during a site visit in October 1979 (WAPORA, Inc. 1979). Sufficient habitat is available in the vicinity of the project area for relocation of any endangered or threatened animals in the remote case that any may be present and displaced by implementation of any of the alternatives.

5.1.5. Cultural Resources

Construction of the facilities proposed for the various alternatives in the Taylors Falls portion of the project area (Alternatives 3, 4, 5, 6, 8, and 9) will not impact any identified archaeological sites. An archaeological survey of the project area and its environs indicated that no archaeological sites were located in the vicinity. Therefore, no further archaeological investigations are necessary in the Taylors Falls portion of the project area (By letter, Mr. Russell W. Fridley, Office of the Minnesota State Historic Preservation Officer, to WAPORA, Inc., 26 October 1979). In addition, a review of the site of Alternative 5 revealed "that there are no sites of historic, architectural, cultural, or archaeological significance listed on the National Register of Historic Places or eligible for inclusion on the National Register," that will be impacted by the recommended alternative (By letter, Mr. Russel W. Fridley, Minnesota Historical Society, to WAPORA, Inc., 23 April 1981).

The proposed force main/discharge route for Alternatives 5, 6, 8, and 9 would be located near the northern border of the Angel's Hill Historic District in Taylors Falls. If one of these alternatives is selected, care should be taken that the proposed route is outside the boundaries of the historic district to minimize impacts to both the architectural components of the district and to any associated archaeological remains within the district.

The St. Croix Falls portion of the project area contains several archaeological sites and a number of documented historic structures. A review of the site of Alternative 1 conducted by the State Historical Society of Wisconsin revealed that construction of the recommended alternative would not have an impact on any properties on or eligible for inclusion on the National Register of Historic Places in Wisconsin (By letter, Mr. Richard W. Dexter, State Historical Society of WI, to Mr. Gene Wojcik, USEPA, 26 February 1981). However, no systematic archaeological or architectural survey work has been conducted in those portions of the project area that might be directly affected by construction of Alternatives 2, 7, 8, and 9. The presence of known archaeological and architectural sites in the vicinity indicates that the potential for finding unidentified sites in and near the proposed construction areas is high. Because there is the potential that unidentified archaeological and architectural resources may be impacted by the proposed construction activities, a thorough archaeological and architectural investigation should be completed during the "Step 2" design phase, prior to the construction of any of these alternatives.

5.2. Operation Impacts

The operation of rehabilitated and/or new independent wastewater treatment facilities for St. Croix Falls and Taylors Falls, or the operation of a regional wastewater treatment facility to serve both communities, will affect the local environment. The long-term significance of such effects, however, is expected to be minimal.

The potential physical, biological, and socioeconomic impacts from the operation of each of the nine alternatives are presented in comparative fashion in Table 5-2 (pages 5-14 through 5-19). The effects are quantified where possible. Impacts of significant public concern and/or those impacts that require a more detailed explanation are addressed in the following sections. To avoid the redundancy involved in addressing similar alternatives, the nine alternatives have been grouped for discussion purposes. Alternatives 1, 3, 4, and 7 involve conventional treatment plants and are discussed in Section 5.2.1. Alternatives 5 and 8 involve stabilization pond treatment systems and are discussed in Section 5.2.2. Alternative 2, 6, and 9 propose land disposal of the treated effluent and are discussed in Section 5.2.3. The impacts of the alternatives on local government finance and the users of the system are described in Section 5.3.

5.2.1. Conventional Treatment Plant Alternatives

The operation of expanded and upgraded conventional secondary treatment facilities, utilizing an RBC secondary treatment process at St. Croix Falls and a CAS or RBC secondary treatment process at Taylors Falls (as proposed in Alternatives 1, 3, and 4), each would create similar operational impacts. The regional conventional treatment plant alternatives (Alternative 7) also

Table 5-2. Potential major primary impacts from the operation of new wastewater treatment facilities at St. Croix Falls WI and Taylors Falls MN.

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality and Odors	a) Operation of rehabilitated WWTP would release low-level malodorus gases and vapors because most of the treatment processes would be covered. Sludge pumping and hauling would produce some odors.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
	b) Odors generated by the release of methane gas from the existing WWTP would be eliminated.	b) Same as Alt. 1b.		
		c) Odors from the storage pond would be noticeable when the pond ice thaws in the spring. Also, if the storage pond is completely dewatered, some odors would emanate from the organic materials accumulated at the bottom of the pond.		
Noise	a) Noise levels would remain the same; no significant impacts expected.	a) Noise levels would remain the same at the existing WWTP; no significant impacts expected.	a) Noise levels would remain the same; no significant impacts expected.	a) Same as Alt. 3a.
		b) Noise levels at the rapid infiltration site would be minimal and would create little change from the natural background conditions.		
Topography, Geology, and Soils	a) 55 tons of digested sludge from the treatment process would require disposal on land each year. Continued use of existing sites is anticipated. No significant impacts are expected.	a) The surface of the infiltration basins may, in the future, need to be removed to restore the infiltration rate. Disposal of this material should not cause significant impacts because toxic substances are not expected to accumulate.	a) Same as Alt. 1a, except 35 tons of sludge per year.	a) Same as Alt. 1a, except 24 tons of sludge per year.
Surface Water	a) BOD and SS discharged to St. Croix River would not have any impact on DO, turbidity, or aquatic biota. The discharge would increase background BOD concentration by 0.017 mg/l and SS by 0.017 mg/l. The effluent would be disinfected prior to discharging to River to eliminate potential bacterial health hazard.	a) There would be no surface water discharge during normal operation. Discharge of partially treated water to the River may occur during a power failure or major malfunction.	a) BOD and SS discharged to St. Croix River would not have any impact on DO, turbidity, or aquatic biota. The discharge would increase background BOD concentration by 0.005 mg/l and SS by 0.006 mg/l. The effluent will be disinfected prior to discharging to River to eliminate potential bacterial health hazard.	a) Same as Alt. 3a.
Groundwater	a) No impact expected.	a) The groundwater flow would be increased in the area to the west of the proposed infiltration basins. Springs and wetness may result in areas previously dry. Nitrate, iron, fecal coliform, and other groundwater mineral constituents would be increased downgradient from the infiltration basins. No potable water standards would be violated if the system were operated to maximize nutrient removals.	a) No impact expected.	a) No impact expected.

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Ponds likely would experience a spring "turnover" resulting in anaerobic conditions and septic sewage odors that may persist as long as a month.	a) Same as Alt. 5a.	a) Operation of the Regional WWTP would release only low-level malodorous gases and vapors because most of the treatment processes would be covered. Sludge pumping and hauling would produce some odors.	a) Same as Alt. 5a.	a) Same as Alt. 5a.
b) Odors at pumping stations normally would be intermittent, except during periods of low flow when they could be more problematic.	b) Same as Alt. 5b.	b) Odors generated by the release of methane gas from the existing St. Croix Falls WWTP would be eliminated.	b) Same as Alt. 5b.	b) Same as Alt. 5b.
a) Noise levels would remain essentially the same at the existing WWTP site.	a) Same as Alt. 5a.	a) Noise levels would remain essentially the same at the Taylors Falls and St. Croix Falls WWTP sites; no significant impacts expected.	a) Same as Alt. 7a.	a) Same as Alt. 7a.
b) Noise levels would increase at the 3 pumping stations located along the force main route, near the intersections of County Road 82 and West St; Walnut and Chestnut St.; and Military Road and the center line of Sec. 26 of Shafer Twp. (See Fig. 2-1).	b) Same as Alt. 5b.		b) Same as Alt. 5b.	b) Same as Alt. 5b.
c) Noise levels at the pond site would be minimal and would create little change from the natural background conditions.	c) Noise levels at the pond and land application site would create little change from the natural background conditions.		c) Same as Alt. 5c.	c) Same as Alt. 6c.
a) No significant impacts are expected.	a) Build-up of organic matter, phosphorous, and other wastewater constituents would occur. No significant harmful impacts are expected.	a) Same as Alt. 1a, except 80 tons of sludge per year.	a) No significant impacts are expected.	a) Same as Alt. 6a.
a) Effluent would be discharged to River semiannually. Monitoring of effluent prior to discharge and monitoring receiving water flow and quality would minimize impacts on St. Croix River. Growth of algae in pond and release of algae-laden pond effluent could be a potential problem, but can be mitigated. The effluent would be disinfected before discharge, if necessary, to reduce potential bacterial health hazard.	a) Underdrainage collected at land treatment site would be relatively free of contaminants. Discharge to River would occur on a continuous basis.	a) BOD and SS discharged to St. Croix River would not have any impact on DO, turbidity, or aquatic biota. The discharge would increase background BOD concentration by 0.022 mg/l and SS by 0.023 mg/l. The effluent would be disinfected prior to discharging to the River to eliminate the potential for bacterial health hazard.	a) Same as Alt. 5a, except 3 times more flow.	a) Same as Alt. 6a, except 3 times more flow.
b) Short-term raw sewage discharges to roadside ditches and River may occur during a power failure or major pumping station malfunction.	b) Same as Alt. 5b.			
a) The wastewater stabilization ponds would be lined with a plastic membrane or clay to minimize seepage to the groundwater. Monitoring wells would be used to detect lining failures and isolation distances would provide a measure of safety for potable water wells.	a) Same as Alt. 5a.	a) No impact expected.	a) Same as Alt. 5a, except area of ponds is approximately 3 times larger, so effect would be larger.	a) Same as Alt. 6a, except additional pond and irrigated areas are approximately 3 times larger, so effect would be larger.
	b) Groundwater below irrigated area would have slightly elevated nitrate, iron, and other groundwater mineral concentrations, though no violations of potable water standards are expected.			

Table 5-2. (Continued)

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Floodplains and Wetlands	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Terrestrial Biota	a) No impacts expected.	a) No significant impacts expected during normal operating conditions.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Aquatic Biota	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Endangered and Threatened Species	a) No impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Economics and Demographics	a) Although more treatment capacity would be made available, it is unlikely that the wastewater treatment capacity would induce population growth or economic development above the levels projected (See Sec. 3.2).	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
User Costs and Municipal Indebtedness	a) St. Croix Falls residents would pay the annual treatment O&M costs, debt service, and collection system maintenance costs. A typical household of 3 would pay $165/yr, 28% increase over existing charges. This represents 1.1% of median family income and thus does not exceed the USEPA guideline of 2% that is used to determine significant financial impact.	a) Same as Alt. 1a, except annual costs for a family of 3 would be $183, a 42% increase over current costs. 1.2% of median family income would be spent on user costs, which does not exceed USEPA guidelines.	a) Taylors Falls residents would pay the annual treatment O&M costs, debt service, and collection system maintenance costs. A typical household of 3 would pay $184/yr, a 33% increase over current costs. This represents 1.0% of median family income and thus does not exceed USEPA guideline of 2% used to indicate significant financial impact.	a) Same as Alt. 3a, except annual costs for a household of 3 would be $163, a 106% increase over current costs. 0.9% of median family income would be spent on user costs, which does not exceed USEPA guidelines.
	b) The level of indebtedness required to capitalize the City's share of contruction costs may limit its ability to finance additional major capital projects.	b) Same as Alt. 1b.	b) Compared to recommended guidelines, the level of indebtedness required to capitalize the City's share of construction costs would not significantly limit the City's ability to finance additional major capital projects.	b) Same as Alt. 3b.
Land Use	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Transportation	a) No significant impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
Recreation	a) Failure of any of the system components of the WWTP could cause untreated or partially treated waste to be discharged to the St. Croix River, resulting in short-term water quality degradation and adversely impacting water recreation activities downstream of the discharge.	a) No impacts expected.	a) Same as Alt. 1a.	a) Same as Alt. 1a.

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Same as Alt. 5a.	a) No significant impacts expected during normal operating conditions; however, periodic monitoring should be performed to determine if potentially harmful concentrations of heavy metals, other toxic substances, or micronutrients are present in soil, vegetation, or crops.	a) Same as Alt. 1a.	a) No significant impacts expected during normal operating conditions.	a) Same as Alt. 6a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Same as Alt. 3a, except annual costs for a household of 3 would be $136, a 72% increase over current costs. 0.7% of median family income would be spent on user costs, which does not exceed USEPA guidelines.	a) Same as Alt. 3a, except annual costs for a household of 3 would be $140, a 77% increase over current costs. 0.7% of median family income would be spent on user costs, which does not exceed USEPA guidelines.	a) For regional alternatives, the cost split between communities would be: • St. Croix Falls 74% • Taylors Falls 26%. A typical household of 3 in St. Croix Falls would pay $215/yr, a 67% increase over current costs. This represents 1.5% of median family income, which does not exceed USEPA guidelines. For Taylors Falls, a typical household of 3 would pay $109/yr, a 38% increase over current costs. This represents 0.6% of median family income, which does not exceed USEPA guidelines.	a) Same as Alt. 7a, except for St. Croix Falls, a household of 3 would pay $203/yr, a 57% increase over current costs. This represents 1.4% of median family income, which does not exceed USEPA guidelines. For Taylors Falls, a household of 3 would pay $85/yr, an 8% increase over current costs. This represents 0.4% of median family income, which does not exceed USEPA guidelines.	a) Same as Alt. 7a, except for St. Croix Falls, a household of 3 would pay $239/yr, an 85% increase over current costs. This represents 1.7% of median family income, which does not exceed USEPA guidelines. For Taylors Falls, a household of 3 would pay $73/yr, which is a slight reduction in current costs. This represents 0.4% of median family income, which does not exceed USEPA guidelines.
b) Same as Alt. 3b.	b) Same as Alt. 3b.	b) For St. Croix Falls, same as Alt. 1b. For Taylors Falls, same as Alt. 3b.	b) Same as Alt. 7b.	b) Same as Alt. 7b.
a) Depending on final design and location of the pond facility, access road, and force main, the treatment system may remove 40 acres of prime agricultural land from crop production.	a) Depending on final design and location of the ponds/land application facility, access road, and force main, the treatment system may remove 40 acres of prime agricultural land from crop production.	a) Same as Alt. 1a.	a) Same as Alt. 5a, except 90 acres of prime agricultural land could be removed from crop production.	a) Same as Alt. 6a, except 90 acres of prime agricultural land could be removed from crop production.
a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.	a) Same as Alt. 1a.
a) Failure of the pumping station located at the existing WWTP site could cause untreated waste to be discharged to the St. Croix River, resulting in short-term water quality degradation and adversely impacting water recreation activities downstream of the discharge.	a) Same as Alt. 5a.	a) Same as Alt. 1a.	a) Same as Alt. 5a.	a) Same as Alt. 5a.
		b) Rupture of the force main across the Route 8 bridge would result in untreated waste being discharged to the St. Croix River, causing short-term water quality degradation and adversely impacting water recreation activities downstream of the discharge.	b) Same as Alt. 7b.	b) Same as Alt. 7h.

Table 5-2. (Concluded)

Environmental Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Resource Use	a) Operation of the 0.40 mgd WWTP (at design flow) would consume: • 178,000 kwh/yr of electricity • 12,100 lbs/yr of chlorine • other resources, including labor, 500 gal. of fuel, materials, and an estimated $31,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.40 mgd WWTP (at design flow) would consume: • 267,000 kwh/yr of electricity • other resources, including labor, other fuels, materials, and an estimated $40,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.14 mgd WWTP (at design flow) would consume: • 180,000 kwh/yr of electricity • 3,500 lbs/yr of chlorine • other resources, including labor, 400 gal. of fuel, materials, and an estimated $36,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.14 mgd WWTP (at design flow) would consume: • 55,000 kwh/yr of electricity • 4,400 lbs/yr of chlorine • other resources, including labor, 500 gal. of fuel, materials, and an estimated $27,000 in O&M costs per year (1980 dollars).
Public Health	a) Potential failure of disinfection process at the rehabilitated WWTP could create short-term health hazard in the St. Croix River downstream from the outfall.	a) No significant quantities of aerosols that may harbor bacteria or virus are expected to be generated by the operation of the rapid infiltration basins.	a) Same as Alt. la.	a) Same as Alt. la.

Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9
a) Operation of the 0.14 mgd stabilization pond system (at design flow) would consume: • 155,000 kwh/yr of electricity • other resources, including labor, fuels, materials, and an estimated $18,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.14 mgd spray irrigation system (at design flow) would consume: • 240,000 kwh/yr of electricity • other resources, including labor, fuels, materials, and an estimated $21,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.54 mgd WWTP (at design flow) would consume: • 240,000 kwh/yr of electricity • 16,400 lbs/yr of chlorine • other resources, including labor, fuels, materials, and an estimated $62,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.54 mgd stabilization pond system (at design flow) would consume: • 300,000 kwh/yr of electricity • other resources, including labor, fuels, materials, and an estimated $31,000 in O&M costs per year (1980 dollars).	a) Operation of the 0.54 mgd spray irrigation system (at design flow) would consume: • 360,000 kwh/yr of electricity • other resources, including labor, 700 gals. of fuel, materials, and an estimated $23,000 in O&M costs per year (1980 dollars).
a) Aerosol from surface area of stabilization ponds containing non-disinfected wastewater would not present significant health problems to operation staff or area residents. It would be attractive to waterfowl; however, little is known about potential disease transmission from ponds to waterfowl; the potential health problem is expected to be insignificant.	a) Same as Alt. 5a. b) Aerosol from spray application process may create a potential for health hazard.	a) Same as Alt. 1a.	a) Same as Alt. 5a.	a) Same as Alt. 5a. b) Same as Alt. 6b.

would generate operational impacts similar to those associated with Alternatives 1, 3, and 4, though of greater magnitude. Additional impacts would be associated with the conveyance system needed to transport raw wastewater from Taylors Falls to the regional treatment facility located on the St. Croix Falls side of the River proposed in Alternative 7. The operational impacts associated with these treatment facilities, discharge of treated wastewater, sludge disposal, and wastewater conveyance system are described in the following subsections.

5.2.1.1. Wastewater Treatment Facilities

AIR QUALITY AND ODORS

The potential emissions from the operation of conventional secondary wastewater treatment plants include aerosols, hazardous gases, and odors. If not properly controlled, the emissions could pose a public health risk or be a nuisance.

Aerosols are defined as solid or liquid particles, ranging in size from 0.01 to 50 um that are suspended in the air. These particles are produced at wastewater treatment facilities during various treatment processes. Some of the constituents of aerosols could be pathogenic and could cause respiratory and gastrointestinal infections. Concentrations of bacteria or viruses in aerosols, however, are generally insignificant (Hickey and Reist 1975). The vast majority of the microorganisms in aerosols are destroyed by solar radiation, dessication, and other environmental phenomena. There are no records of disease outbreaks resulting from pathogens present in aerosols. Therefore, no adverse impacts are expected from aerosol emissions for any of the alternatives.

Discharges of hazardous gases could have adverse affects on public health and the environment. Explosive, toxic, noxious, lachrymose (causing tears), and asphyxiating gases can be produced at wastewater treatment facilities. These gases include chlorine, methane, ammonia, hydrogen sulfide, carbon monoxide, nitrogen oxides, sulfur, and phosphorus. The knowledge of the possibility that such gases can escape from the facilities or into work areas in dangerous or nuisance concentrations might affect the operation of the plant and the adjacent land uses. Gaseous emissions, however, can be controlled by proper design, operation, and maintenance procedures.

Odor is a property of a substance that affects the sense of smell. Organic material that contains sulfur or nitrogen may be partially oxidized anaerobically and result in the emission of byproducts that may be malodorous. Common emissions, such as hydrogen sulfide and ammonia, are often referred to as sewer gases and have odors of rotten eggs and concentrated urine, respectively. Some organic acids, aldehydes, mercaptans, skatoles, indoles, and amines also may be odorous, either individually or in combination with other compounds. Sources of wastewater treatment related odors include:

- Fresh, septic, or incompletely treated wastewater
- Screenings, grit, and skimmings containing septic or putrescible matter
- Oil, grease, fats, and soaps from industry, homes, and surface runoff
- Gaseous emissions from treatment processes, manholes, wet wells, pumping stations, leaking containers, turbulent flow areas, and outfall areas
- Chlorinated water containing phenols
- Raw or incompletely stabilized sludge.

No odor problems associated with any of the alternatives are expected to occur if the wastewater treatment facilities and collection systems are designed, operated, and maintained properly.

NOISE

Noise during the operation of the wastewater treatment facilities would be generated predominantly by pumps and aeration equipment. The alternatives proposing the use of a CAS system would generate more noise than other alternatives, such as the RBC system.

POWER FAILURE AND EQUIPMENT MALFUNCTIONS

As discussed in Section 3.6., the proposed wastewater treatment systems would be equipped with either an alternate power source or auxiliary power generator. Therefore, no adverse environmental consequences should occur because of an extended electrical power failure. Impacts related to the malfunction of some or any of the treatment units would be minimal if the facilities are designed (i.e., duplicate units), operated, and maintained properly.

5.2.1.2. Discharge of Treated Wastewater

The effluent from the St. Croix Falls, Taylors Falls, and regional conventional treatment plant alternatives (Alternatives 1, 3, 4, and 7) would be discharged on a continuous basis to the St. Croix River through the existing outfall sewers. The treatment systems proposed by these alternatives would provide secondary treatment and reduce the loadings of BOD_5, SS, and other pollutants to the St. Croix River.

BOD_5 AND SUSPENDED SOLID LOADS

Expanding and upgrading the existing WWTP at St. Croix Falls (Alternative 1) to a design flow of 400,000 gpd would contribute an average of 100 pounds of BOD_5 per day and 100 pounds of SS per day to the St. Croix River when operating at design flow. A new WWTP at Taylors Falls (Alternatives 3 and 4) operating at the design flow of 140,000 gpd would contribute 30 pounds of BOD_5 and 35 pounds of SS per day. These loadings represent a reduction of 18% and 42%, respectively, relative to the BOD_5 loads discharged to the River by the existing St. Croix Falls and Taylors Falls plants. These reductions would be obtained through upgraded treatment processes, even considering that at design flow, significantly more BOD_5 will be entering the treatment plant than at present. The suspended solids loads at design flow would increase by 40% and 66%, respectively, from the expanded/upgraded facilities at Taylors Falls and St. Croix Falls, because of the increase in wastewater flows relative to the present condition and the proposed effluent limitation for SS.

The combined total BOD_5 load of 130 pounds per day from expanded/upgraded facilities at both communities (Alternatives 1 and 3 or 4) or from one regional facility at St. Croix Falls (Alternative 7), would increase the BOD_5 concentration of the St. Croix River by approximately 0.022 mg/l at the 7-day, 10-year low-flow condition 1,100 cfs -- a "worst case" condition). The insignificant increase in BOD_5 concentration in the River would not have any discernible impact on the DO levels in the St. Croix River. The combined community design flow SS load of 135 pounds per day also would create an insignificant effect, increasing the SS concentration of the St. Croix River by about 0.023 mg/l at the 7-day, 10-year low-flow condition.

The treatment facilities proposed in Alternatives 1, 3, 4, and 7 all would provide for disinfection of the treated wastewater prior to discharge to the River. The use of a reliable disinfection system and controls would eliminate the potential bacterial health hazard associated with wastewater discharge. The discharge of treated effluent from expanded/upgraded treatment facilities directly to the St. Croix National Scenic Riverway therefore would not adversely affect recreational opportunities downstream.

5.2.1.3. Sludge Disposal

The conventional WWTPs proposed in Alternatives 1, 3, 4, and 7 each would generate sludge--the product of the removal of solids from the wastewater. The sludge is proposed to be digested in aerobic or anaerobic sludge digesters. The digested liquid sludge would be pumped directly from the digester into a tank truck and hauled to disposal sites.

At present, sludge from the existing St. Croix Falls WWTP is hauled by tank truck and spread on land at two 80-acres fields located north and northeast of St. Croix Falls in Section 19 and Section 16 of St. Croix Falls Township. The fields, owned by Mr. Duane Chinander and Mr. Art Bishop, are used on an alternating basis throughout the year, depending on weather conditions and cropping. Grass and grain crops are grown at these sites, which are used for cattle feed. No adverse environmental impacts from this practice have been reported. It is proposed that this sludge disposal practice will continue in the future at these two sites.

At present, dewatered sludge from the existing Taylors Falls treatment plant is hauled to the Blood Farm, located north of Taylors Falls in Section 14 of Shafer Township, for ultimate disposal. Alternatives 3 and 4 propose to continue this practice; i.e., digested liquid sludge would be pumped directly into a tank truck and hauled to the Blood Farm for final disposal.

Truck traffic to and from the proposed WWTPs would be associated with liquid sludge hauling to the sludge sites for diposal. Other infrequent truck traffic to the treatment facilities can be expected for delivery of supplies and chemicals such as chlorine. Automobile traffic also can be expected, but is not considered to have as great an impact as the potential truck traffic.

The primary traffic will arise from trucking sludge from the proposed treatment facilities to the sludge disposal sites. The sludge hauling trucks would probably be small, single-axle, gasoline- or diesel-powered trucks. Sludge would not necessarily be hauled weekly; the sludge digesters at the treatment facilities would be designed for several weeks of storage.

Sludge hauling would have minimal impacts on traffic and residential areas. Aside from noise, emissions, and hazards associated with any trucking operation, occasional ephemeral odors from the truck may be noticeable. Good "housekeeping" at the sludge transfer location would prevent sludge deposits on the outside of the truck tank and should minimize potential odor problems.

5.2.1.4. Conveyance System

The regional, conventional WWTP proposed in Alternative 7 includes a pumping station located at the existing Taylors Falls WWTP site and a force main to convey the raw wastewater from Taylors Falls to the regional plant at St. Croix Falls. A force main generally is trouble-free and requires little maintenance. The pipe rarely leaks because the fluid pressure is low. Because force mains are buried at a depth just below the frost line, the main is subject to breakage from unrelated excavations.

To convey the raw wastewater across the St. Croix River, the force main would be attached to the US Highway 8 bridge. Exposure to temperature extremes and bridge flexure would subject the force main to stresses that could cause leaks or joint failures. A direct discharge of untreated sewage to the St. Croix River would result in short-term degradation of water quality in the River.

The most significant environmental impacts associated with the conveyance line involve the proposed pumping station, to be located at the existing Taylors Falls WWTP site. During normal operation, the pumping station, would emit noises and odors. When the pumps are operating a low "hum" would be heard nearby. The noise would be produced on an intermittent basis. Certain measures are available for reducing or masking the odors and should be included as part of the routine operation of the system. During normal operation of the pumping station, the bar screen must be inspected and cleaned regularly. Large solids must be removed and disposed of in an environmentally acceptable manner.

The environmental consequences of a power outage or a pumping station malfunction would be a raw sewage spill to the St. Croix River, resulting in short-term degradation of water quality. Provisions should be included for providing alternate power by either obtaining backup service from another independent distribution system or by installing an auxiliary gasoline- or diesel-powered emergency generator.

5.2.2. Stabilization Pond Treatment System Alternatives

The operation of the conveyance facilities, the treatment and storage ponds, and the outfall facilities proposed in Alternatives 5 and 8 would create environmental effects different from the conventional treatment plant alternatives. These effects are described in the following subsections.

5.2.2.1. Treatment and Storage Ponds

The location of the treatment and storage ponds proposed in Alternatives 5 and 8 is presented in Section 3.4. The stabilization pond system would be operated so that the water would be discharged semiannually, during high river flows, in April and November.

AIR QUALITY AND ODORS

The proposed ponds would have a potential to create odor problems, particularly in the spring. The ponds would likely experience a "turnover" in the spring because of the water temperature differential, which would result in resuspension of solids. The increase in organic loading due to resuspension would result in anaerobic conditions and septic sewage odors that may persist for as long as a month.

POWER FAILURE AND EQUIPMENT MALFUNCTIONS

The treatment and storage ponds operate by natural biochemical processes without any power inputs; thus, the treatment system is immune to power outages. Also, the treatment system easily can accommodate "slugs" of unusual wastes without affecting the quality of the discharge. The only noise associated with the pond system would be from the use of maintenance equipment.

GROUNDWATER

The proposed stabilization ponds are not expected to impact the quality of groundwater. The ponds must be lined with either clay or a plastic membrane in a manner that meets MPCA design criteria (1975b) for controlling leakage. Monitoring wells would be installed to monitor for pond leakage.

5.2.2.2. Discharge of Treated Wastewater

The effluent from the stabilization ponds would be discharged to the St. Croix River on a semiannual basis. The quality of the pond water would be tested prior to discharge and approval for discharge would be obtained from MPCA. The success of this method depends on the selection of the optimum time for release of the pond effluent, considering the flow in the St. Croix River and the pond water quality. Most often, disinfection of stabilization pond effluent is not required, but may become necessary if sampling of pond effluents indicates high levels of fecal coliform bacteria.

Because of the potential for seepage to groundwater, odors, and aerosols, MPCA guidelines state that a pond should be at least 0.25 miles from the nearest dwelling or 0.5 miles from a city or cluster of residences. There are no residences within this distance from the proposed pond location.

5.2.2.3. Conveyance System

The conveyance systems for the wastewater stabilization pond alternatives are described in Section 3.4.6. for the Taylors Falls stabilization pond system (Alternative 5), and in Section 3.4.9. for the regional stabilization pond system (Alternative 8). In both alternatives, four pumping stations along the force main route in Taylors Falls are proposed to convey the wastewater the 2.5-mile distance. The four stations are needed to overcome the 150 feet increase in elevation from the pumping station located on the existing Taylors Falls WWTP site to the proposed stabilization pond located in Section 26 of Shafer Township.

The force mains generally are trouble-free and require little maintenance. Leakage is rare because the fluid pressure is low. Because the force main would be buried at a depth just below the frost line, it may be subject to accidental breakage from unrelated excavations.

NOISE

The four pumping stations during normal operation would emit low-levels of noise. When the pumps are operating a low "hum" would be heard nearby and may be considered a nuisance.

AIR QUALITY AND ODORS

Odors at each pumping station normally would be intermittent except during periods of low flow when odor might be more problematic. Because the variation in flow between the wet weather and dry weather condition is so large, the residence time of the sewage in the force main may exceed eight hours and a considerable amount of hydrogen sulfide may be generated. The odor would be released as the sewage is discharged into the wet well of the next pumping station. Certain measures are available for reducing or masking odor problems, and provisions should be included in the operation plan for the system.

During normal operation of the pumping stations, the bar screens must be inspected and cleaned regularly. Large solids must be removed and disposed of in an environmentally acceptable manner.

POWER FAILURE AND EQUIPMENT MALFUNCTIONS

The environmental consequences of a power outage or a pumping station malfunction would be a raw sewage overflow from the pumping station at the present treatment plant site or at another pumping station along the force main route. The sewage would be discharged directly into the St. Croix River or into a roadside ditch. Such a spill would cause either short-term water quality degradation of the St. Croix River or odor, aesthetic, and potential health hazard impacts in the residential area surrounding the pumping station where the spill occurred. Spills from pumping station malfunctions would be difficult to prevent. To guard against system failure from a power outage, either another major electric distribution system tie or an auxiliary generator would be necessary.

The regional stabilization pond alternative (Alternative 8) would present an additional potential hazard. Attaching the force main from St. Croix Falls to the US Highway 8 bridge over the St. Croix River could be problematic. Exposure to temperature extremes and bridge flexure would subject the force main to stresses that could cause leaks or joint failures. A direct discharge of untreated sewage to the St. Croix River from a rupture of the pipe would result in short-term degradation of water quality to the River.

5.2.3. Land Application Wastewater Treatment Alternatives

The operation of the conveyance facilities, the treatment and/or storage ponds, and the application systems proposed in Alternatives 2, 6, and 9 would create environmental effects somewhat different from the other alternatives. These effects are described in the following subsections. First, the alternative proposing rapid infiltration east of St. Croix Falls (Alternative 2) will be discussed; followed by the land application alternatives which incorporate slow-rate, spray irrigation at a site west of Taylors Falls.

5.2.3.1. Rapid Infiltration Land Application System for St. Croix Falls

As proposed in Alternative 2, the existing St. Croix Falls treatment plant would be rehabilitated to produce an effluent with a BOD_5 concentration of 50 mg/l. The effluent conveyance system would consist of a pumping station at the treatment plant and a force main to the application site. A pond capable of storing 3-months of flow and the flooding basins would be located at the effluent disposal site (the northwest 40 acres of the northeast quarter section of Section 29 in St. Croix Falls Township). No recovery of the renovated water (the effluent that has percolated through the soil) was considered necessary by the Facilities Planners in the preliminary design of the system. The environmental impacts of the operation of each of the major components are presented in the following subsections.

WASTEWATER TREATMENT FACILITIES

The operational impacts of a rehabilitated wastewater treatment plant for St. Croix Falls are discussed in Section 5.2.1. The upgraded treatment plant under this alternative would meet the BOD_5 treatment requirement of 50 mg/l, which is not as stringent as the 30 mg/l standard required for a direct river discharge. Thus, new or rehabilitated treatment units would be designed with less detention time and possibly fewer components.

CONVEYANCE SYSTEM

A pumping station would be located at the rehabilitated WWTP for conveying the partially treated effluent to the rapid infiltration site. The pumping station would not handle raw sewage; thus, the environmental impact of its operation would be minimal. A power failure or malfunction would mean that the effluent would be discharged to the River for as long as repairs would require. The quality of this discharge would be better than the effluent currently discharged from the existing WWTP.

The force main would be approximately 2 miles long and would lift the effluent to the top of the bluffs, an increase in elevation of about 350 feet. The operational impact of the force main would be minimal. Because the internal pressure in the pipe near the treatment plant would be great, some potential for pipe bursts would exist.

STORAGE AND INFILTRATION BASINS

A storage basin would be used to retain the effluent for 3 months during the winter when frozen ground and operational difficulties would preclude use of the infiltration basins. The storage basin would be lined to limit movement of the partially treated effluent to the groundwater. When the pond ice thaws in the spring, some odors from the storage pond would be noticeable. Also, if the storage pond is completely dewatered, some odors may be generated from the organic material accumulated at the bottom of the pond.

The infiltration basins should not produce odors during normal operation. No significant quantities of aerosols that may harbor bacteria or viruses are expected to be generated by operation of the basins. The surface of the infiltration basins may, at some time in the future, need to be removed and replaced by new material to restore the infiltration capability of the basin. Disposal of this material would not create an environmental problem, because toxic substances would not be expected to accumulate in the material.

Evaluation of the level of treatment provided by long-term operation of infiltration sites reveals that total organic carbon is almost completely removed (USEPA 1980). Phosphorus also is almost completely removed, although the phosphorus concentration in the groundwater may be higher than background concentrations. The USEPA report (1980) also indicates that some potential for movement of fecal coliforms into the groundwater exists at such sites, though bacterial counts were not found to be significantly elevated.

Nitrate potentially can reach excessive concentrations relative to water quality standards for groundwater. With proper loading and resting cycles, good nitrate removals consistently have been obtained (USEPA 1980). Because the chemical balance of the soils is altered by effluent application, the potential for leaching of different elements from the soils exists. For example, elevated levels of iron have been found in the groundwater below rapid infiltration sites. Elevated levels of iron in domestic water supplies results in the staining of plumbing fixtures and unpleasant tastes. Iron removal is costly for individual water supplies.

The disposition of the infiltrated effluent is difficult to predict. The lack of site specific information concerning the geology of the area makes difficult the evaluation of the underground flow away from the site. In general, the flow path would be toward the west, down gradient toward the St. Croix River. While springs and high water tables are not evident at the present time, except in the terrace immediately above the River, the increased flow could cause an undesirable rise in the local water table and the potential for springs in the area to the west of the site.

More information concerning this area must be gathered before a reasonable prediction of effects can be made. A possible impact may be that inadequate treatment would occur because the depth of unsaturated material under the site would be too thin due to shallow bedrock.

5.2.3.2. Spray Irrigation Land Application System

The components that constitute the wastewater stabilization pond alternatives also are included in the spray irrigation alternatives (Alternatives

6 and 9). The conveyance system would be identical; the treatment and storage ponds would be similar; and the outfall discharge line also would be similar. These major components either are discussed in the following subsections or reference is made to the sections where the specific impacts are discussed.

CONVEYANCE SYSTEM

The environmental impacts of the conveyance system are discussed in Section 5.2.2.1. The most significant impacts are odors emanating from the pumping stations during normal operation and the potential for raw sewage spills to occur during a power outage or pumping station malfunction.

TREATMENT AND STORAGE PONDS

The treatment portions of the land treatment alternatives would be similar to other alternatives. The wastewater stabilization ponds would be similar for both the intermittent discharge alternatives and the land application alternatives (Alternatives 5, 6, 8, and 9). The operational impacts of these treatment systems are discussed in Section 5.2.2.2.

The storage component of the land treatment alternatives is similar to the wastewater stabilization pond alternatives in terms of storage volume, but would have slightly different operating procedures. The capacity of the storage systems would be sized for six months of flow. For the land treatment alternatives, the effluent would begin to be irrigated in the late spring and would continue to be irrigated throughout the summer, until late autumn. No significant difference is expected between the environmental effects of storage for the intermittent discharge (Alternatives 5 and 8) relative to the land treatment alternatives.

SPRAY IRRIGATION SYSTEM

The long-term effects of irrigated wastewater on vegetation, soils, and groundwater are not expected to result in adverse impacts. Generally, the vegetation grown with effluent irrigation has tended to outproduce adjacent cropland, because nutrients and water are in ample supply. The vegetation usually contains a greater percentage of inorganic elements due to luxury uptake, though the crop rarely is harmful to animals that ingest it. Wastewater that derives from industrial sources can have elevated contents of metals which can be toxic to animals when certain crops are grown. Neither Taylors Falls nor St. Croix Falls have industrial sources of metals that are considered harmful. The soils irrigated with wastewater generally experience a noticeable build-up of organic matter, phosphorus, and other wastewater constituents (USEPA 1979b).

Organic constituents in the irrigated wastewater would be oxidized by natural biological processes within the top few inches of the soil, much like crop residues decompose (USEPA and others 1977). At the Muskegon, Michigan, spray irrigation site the BOD_5 of renovated water from the underdrainage system ranged from 1.2 mg/l to 2.2 mg/l (Demirjian 1975). SS in the applied water also are removed by the soil through filtration.

Phosphorus would be present in the storage pond effluent in an inorganic form, in addition to that contained in the organic life. Dissolved inorganic phosphorus applied to soils would be absorbed by soil material and/or precipitated through reactions with soluble iron, aluminum, or calcium. The extent to which these processes remove phosphorus from the percolating water depends on its concentration, soil pH, temperature, time, total loading, and the concentration of other wastewater constituents that react directly with orthophosphate, or that affect soil pH and oxidation-reduction reactions (USEPA and others 1977). Soils generally can accept and hold large quantities of phosphorus before it begins to leach to the underdrainage water or groundwater. A slow-rate irrigation site has been operating at Dickinson, North Dakota, for 17 years. At the present rate of accumulation of phosphorus in the soil, the soils have sufficient capacity for another 100 years of irrigation (USEPA 1979b). The soils at the Dickinson site are deep sandy alluvium overlying sand and gravel. The typical soil material in the top 51 inches is layered dark grayish brown fine sandy loam and loamy fine sand. The soils at Taylors Falls at the proposed irrigation site are loam and sandy loams which could be expected to have similar phosphorus removal capabilities. At the proposed rate of irrigation at

Taylors Falls, phosphorus levels in the underdrainage water are expected to be elevated only slightly above natural, background levels.

Of greater concern than the phosphorus is the potential for pollution of the groundwater by nitrate. Nitrate is highly soluble and readily leaches to the groundwater if not utilized by the vegetation or denitrified. The nitrate level deemed safe for human consumption is 10 mg N/l. Total nitrogen levels in wastewater stabilization pond effluents usually are within the 10 mg/l to 15 mg/l range. A forage crop may be expected to uptake about 120 lb/ac/yr of nitrogen, which would be all the nitrogen from about 36 inches of effluent. For this reason, excessive levels of nitrates in the groundwater would not be expected.

The irrigation site is proposed to be underdrained to remove the excess irrigated water. This collected drainage water is proposed to be conveyed to the St. Croix River by the same route that is proposed for the effluent line for the wastewater stabilization pond alternatives. This drainage water is expected to be rather clean and clear. It would contain almost no organics and very little phosphorus. The quality of the drain tile water at the Muskegon, Michigan, land treatment site serves as a good example of the water quality potentially achievable (Table 5-3).

The depth to the existing water table would probably be lowered on part of the proposed irrigation sites by the installation of underdrains. The soil mapping sheets for the site indicate the presence of soils with a water table of less than 60 inches below the surface. Lowering the water table with underdrains in these soils would facilitate vehicle movement and improve soil temperatures during the spring. Areas where the water table depth is more than the proposed drain depth would experience a water table rise with irrigation, though the rise is expected to be minimal.

5.3. Public Finance Impacts

5.3.1. User Costs

The cost for construction of any of the nine wastewater treatment system alternatives will be shared among the Federal, State, and City gov-

Table 5-3. Quality of drain tile water at Muskegon, Michigan, land treatment site (Demirjian 1975).

Parameter	Unit	Drain Tiles
BOD	mg/l	2.2
DO	mg/l	2-9
Temp	^oC	--
pH	s.u.	7
Sp. Cond.	umhos	600
TS	mg/l	--
TVS	mg/l	--
SS	mg/l	--
COD	mg/l	--
TOC	mg/l	5
NH_4^+	mg/l	0.40
NO_3/NO_2	mg/l	2.8
PO_4^{3-}	mg/l	0.05
SO_4^{2-}	mg/l	140
Cl^-	mg/l	50
Na	mg/l	40
Ca	mg/l	70
Mg	mg/l	25
K	mg/l	2.8
Fe	mg/l	4.0
Zn	mg/l	0.06
Mn	mg/l	0.15
Color	s.u.	20-150
Turbidity	Jackson units	0.1-50
Total Coli	(#/100 ml)	10-1,000
Fecal Coli	(#/100 ml)	0-440
Fecal Strep	(#/100 ml)	2-700

ernments. The local construction costs and the entire cost of system operation and maintenance will be born entirely by the system users. As discussed in Section 1.1., Federal funding through the National Municipal Wastewater Treatment Works Construction Grants Program will provide funds to cover 75% of the eligible planning, design, and construction costs of conventional wastewater treatment facilities. "Innovative/alternative" components of the proposed treatment systems, such as land treatment/disposal, are eligible for 85% Federal funding. The State of Minnesota provides an additional 15% of the funds for conventional systems, or an additional 9% when the Federal share is 85%, through a State grant program. Thus, in the case where the Federal and State shares totaled 90% of the cost, Taylors Falls would be obligated to contribute only 10% of the eligible planning, design, and construction costs (or 6% where the Federal and State shares total 94%), and 100% of the ineligible costs, such as interest on borrowed capital during the construction period (prior to when the State and Federal grant funds would be received).

Wisconsin does not have a program to provide supplemental funds for communities receiving a Federal grant. Therefore, St. Croix Falls would be obligated to contribute either 25% of the eligible planning, design, and construction funds for a conventional wastewater treatment system, or 15% of the eligible construction costs for an innovative/alternative system, in addition to 100% of any ineligible costs.

As discussed in Section 1.1., the State of Wisconsin does have a grants program that can provide 60% of the costs of design and construction of wastewater facilities for municipalities that are not funded by the Federal program. Under the Federal Construction Grants Program, the States develop priority lists for the allocation of the limited funds. Presently, St. Croix Falls holds priority number 93 for Federal grant funds. According to WDNR (By telephone, Ms. Anna Rasmussen, Bureau of Water Grants, to WAPORA, Inc., 7 November 1980), the anticipated amount of Federal funds available to Wisconsin will only accommodate projects with a priority number of 20 or less. Therefore, St. Croix Falls will have to rely on a 60% State grant and finance the remaining 40% with local funds.

Taylors Falls holds priority 250 on the Minnesota Priority List. According to MPCA (By telephone, Mr. Duane Anderson, Construction Grants Section, to WAPORA, Inc., 7 November 1980), the City likely will have a wait of several years before Federal funds will be available for construction of new wastewater facilities at Taylors Falls. Because there is no independent State fund in Minnesota as in Wisconsin, Taylors Falls either must wait until Federal grant monies become available or fund the entire construction cost locally.

ST. CROIX FALLS

The annual user costs for wastewater service for families in St. Croix Falls have been estimated for each of the proposed alternatives (Table 5-4). Assuming that 40% of the construction cost will have to be derived locally, the estimated annual user charge for a typical family of three would be $120 for the expansion and upgrading of the existing facility (Alternative 1), and $138 for the rapid infiltration land treatment system (Alternative 2). These costs cover the operation and maintenance of the treatment facility and the debt service on the bonds used to finance the local share of construction. A description of how the user charges were calculated is included in Appendix E, Table E-1. To estimate the total user costs, the existing costs for operation and maintenance of the collection system also must be added. Current costs for wastewater collection for families of three are approximately $45 per year (Table 5-4). The total user costs, therefore, would be $165 for Alternative 1 and $183 for Alternative 2.

Compared to current user costs, this represents increases of 28% and 42% for Alternatives 1 and 2, respectively. Thus, regardless of which non-regional alternative is considered, the construction of a new wastewater facility at St. Croix Falls will significantly increase the local costs of wastewater service.

If regional alternatives are considered, assuming 40% local financing, user costs for St. Croix Falls residents would range from $158 for stabilization ponds near Taylors Falls (Alternative 8) to $194 for a regional land treatment system near Taylors Falls (Alternative 9; Table 5-4). Adding the

Table 5-4. Estimated annual user costs for typical families of three for wastewater treatment and collection for Alternatives 1 through 9.

Alternative	WWTP O&M and Debt Service St. Croix Falls[b]	WWTP O&M and Debt Service Taylors Falls	Collection System Operation and Maintenance[a] St. Croix Falls	Collection System Operation and Maintenance[a] Taylors Falls	Total Costs for Treatment and Collection St. Croix Falls	Total Costs for Treatment and Collection Taylors Falls
1	120.00	--	45.00	--	165.00	--
2	138.00	--	45.00	--	183.00	--
3	--	152.00	--	32.00	--	184.00
4	--	131.00	--	32.00	--	163.00
5	--	104.00	--	32.00	--	136.00
6	--	108.00	--	32.00	--	140.00
7	170.00	77.00	45.00	32.00	215.00	109.00
8	158.00	53.00	45.00	32.00	203.00	85.00
9	194.00	41.00	45.00	32.00	239.00	73.00

[a]Assumes that 35% and 40% of current charge is for operation and maintenance of the collection system in St. Croix Falls, and Taylors Falls, respectively.

[b]For alternatives for St. Croix Falls, 40% local funding is assumed.

current costs of wastewater collection ($45), this represents increases in user costs from 57% for Alternative 8 to 85% for Alternative 9. Thus, for residents of St. Croix Falls, regional alternatives are more expensive than non-regional alternatives.

The economic significance of the impact of the proposed wastewater alternatives on users of the new system in St. Croix Falls can be evaluated by relating estimated user charges to various established guidelines. Two such guidelines for determining economic hardship are if (USEPA 1978b):

- More than 2% of median family income will be spent on user fees
- More than 1% of median family income will be spent on debt service for the new system.

Because the user fee concept includes the annual O&M, the debt service, and collection system maintenance costs, it is the better indicator of the two.

Current USEPA guidance concerning funding of wastewater treatment projects that require treatment more stringent than secondary (PRM #79-7; USEPA 1979a) indicates that:

A project shall be considered high-cost when the total average annual cost (debt service, operation and maintenance, and collection costs) to a domestic user exceeds the following percentage of median household incomes:

- 1.5% when the median income is under $6,000
- 2.0% when the median income is $6,000 to $10,000
- 2.5% when the median income is over $10,000.

System users in Polk County (St. Croix Falls) have a median family income of $18,625 (Section 4.2.1.1.). As indicated in Table 5-5, a typical family of four is projected to spend between 1.1% and 1.7% of median family income on wastewater user fees, depending on which alternative is implemented (for this analysis, user fees for a typical family of four have been

Table 5-5. Comparison of user charges and debt service as a percentage of median family income.

Parameter[a]	Total user charges as percentage of median family income	Total debt service as percentage of median family income
Recommended Upper Limit	2% - 2.5%	1.0%
Alternative 1	1.1%	0.5%
Alternative 2	1.2%	0.5%
Alternative 3	1.0%	0.2%
Alternative 4	0.9%	0.2%
Alternative 5	0.7%	0.2%
Alternative 6	0.7%	0.2%
Alternative 7		
St. Croix Falls	1.5%	0.7%
Taylors Falls	0.6%	0.1%
Alternative 8		
St. Croix Falls	1.4%	0.9%
Taylors Falls	0.4%	0.1%
Alternative 9		
St. Croix Falls	1.7%	1.2%
Taylors Falls	0.4%	0.1%

[a]Based on USEPA (1978c) and USEPA (1979a).

calculated; these are presented in Appendix E; Table E-2). None of the alternatives surpasses either suggested upper limit for user fees as a percentage of median family income, indicating that none of the alternatives would be a "high cost" system that would pose a significant financial burden on system users. Debt service costs for each alternative, except Alternative 9, the regional land treatment system near Taylors Falls, are well below the suggested 1% guideline comparing debt service to median family income (Table 5-5). Thus, this parameter also indicates that none of the proposed alternatives for St. Croix Falls would pose financial burdens on residents of St. Croix Falls.

TAYLORS FALLS

The annual user costs for wastewater service for families in Taylors Falls are presented in Table 5-4. The user costs for alternatives for Taylors Falls range from $41/year for Alternative 9, the regional land treatment system near Taylors Falls, to $152/year for Alternative 3, the independent, conventional CAS WWTP for Taylors Falls. These costs include the O&M costs and the debt service costs for the new treatment facility. When current estimated collection costs are added to obtain total user costs, the estimated annual costs range from $73 for Alternative 9 to $184 for Alternative 3.

Compared to current annual user costs of $79, these represent changes in costs that range from a slight decrease to an increase of approximately 133%. Thus, the costs to Taylors Falls residents will vary significantly, depending on which alternative is implemented. It should be noted that the lowest costs for Taylors Falls residents would result from implementation of a regional system. For example, implementation of Alternative 7, the regional, conventional WWTP at St. Croix Falls (the most expensive regional alternative), would increase current costs to Taylors Falls residents by only 38%. By comparison, implementation of Alternative 5, stabilization ponds near Taylors Falls (the least cost non-regional alternative), would increase costs to Taylors Falls residents by 72%. Thus, the regional alternatives appear to be the most economical options for Taylors Falls residents.

Compared to the USEPA guidelines presented in Table 5-5, it appears that none of the alternatives would pose an economic hardship to the residents of Taylors Falls. Families in Chisago County have a median income of $23,625 (Section 4.2.1.1.). This is relatively high. Compared to costs for St. Croix Falls, the costs for wastewater treatment are low. Thus, regardless of which alternative is implemented, residents of Taylors Falls should not be unduly burdened by increased wastewater treatment user fees.

5.3.2. Municipal Indebtedness

ST. CROIX FALLS

A new wastewater treatment facility will increase the amount of indebtedness supported by residents of St. Croix Falls from $449,600 (20%) to $1,080,700 (49%), depending on which alternative is implemented. Compared to the criteria suggested by Moak and Hillhouse (1975; Section 4.2.3.), implementation of any of the alternatives would exceed the recommended upper limit for debt per capita for middle income families, but would remain within the recommended upper limit for the ratio of debt service to revenues (Table 5-6). Neither of the non-regional alternatives would exceed the recommended upper limit for the ratio of debt to total valuation, although implementation of any of the regional alternatives would exceed this guideline.

It thus appears that St. Croix Falls is approaching its capacity for incurring additional debt. Because other capital projects probably will be required before the debt for the wastewater treatment plant is retired, it is important to minimize the new burden on the finances of the City. This will help the City to retain bonding capacity for additional projects.

Alternatives 1 and 2, which are similar in cost, would have the least impact on municipal finances and are therefore most desirable from an economic viewpoint. The regional alternatives are significantly more expensive and would pose a much greater burden on municipal finances.

Table 5-6. Per capita debt levels associated with financing new wastewater treatment facilities at St. Croix Falls, Wisconsin and Taylors Falls, Minnesota.

Parameter[a]	Standard Upper Limit	Current Level of Debt[b,c]	Alternatives 1	2	3	4	5	6	7	8	9
Debt/Capita	Low income - $5,000										
St. Croix Falls	Mid income - $1,000	$1,347	$1,621	$1,635	--	--	--	--	$1,728	$1,826	$2,005
Taylors Falls	High income - $5,000	$ 473	--	--	$624	$623	$651	$618	$ 557	$ 579	$ 560
Debt/Total Valuation	10% of current market value										
St. Croix Falls		8.0%	9.7%	9.8%	--	--	--	--	11.5%	12.3%	13.9%
Taylors Falls[d]		NA[e]	--	--	NA	NA	NA	NA	NA	NA	NA
Debt Service/Revenues	25% of total revenues										
St. Croix Falls		9.3%	13.1%	13.3%	--	--	--	--	14.6%	16.0%	18.4%
Taylors Falls		11.7%	--	--	15.1%	15.1%	15.8%	15.0%	13.6%	14.1%	13.7%

[a]In general, these criteria are used to analyze the full faith and credit limits of the City in relation to general obligation bonds retired through tax revenues. The bonds issued for the wastewater treatment plant probably would be revenue bonds retired with revenues collected from users of the system. Nonetheless, these same quantitative criteria will be used to assess the impacts of revenue bonds because they both depend on the general economic health and resources of the community.

[b]See Sections 4.3.1. and 4.3.2. for explanations of how these values were computed.

[c]For St. Croix Falls, assumes local share of capital costs will be 40% of total costs.

[d]Information required to compute this ratio is not available.

[e]NA = not available.

TAYLORS FALLS

A new wastewater treatment facility will increase the amount of indebtedness supported by residents of Taylors Falls from $54,900 (18%) to $116,400 (38%), depending on which alternative is implemented. Despite this increase, however, none of the guidelines suggested by Moak and Hillhouse (1975) for evaluating the ability of a community to incur debt would be exceeded (Table 5-6). It also appears that Taylors Falls has the ability to incur a significant amount of debt in addition to a new wastewater treatment plant. For example, if Alternative 5, a stabilization pond system for Taylors Falls (Section 3.6.1.), was implemented the City still could incur an additional $349 of debt per capita before exceeding the suggested guidelines for middle income families.

For Taylors Falls, the regional alternatives cost significantly less than the non-regional alternatives. However, because the City appears capable of financing the non-regional alternatives, and because the regional alternatives would impose a significant burden on St. Croix Falls, it appears that Alternatives 5 and 6 are most desirable for Taylors Falls.

5.4. Secondary Impacts

Secondary impacts include the indirect or induced effects that result in land use, demographic, and other socioeconomic changes. These changes may be manifested by higher population density and increased development made possible by the availability of wastewater treatment capacity in excess of presently needed capacity, or lower rates of growth in St. Croix Falls and Taylors Falls versus the surrounding area because of high user charges for wastewater services. As these changes would occur, associated impacts may be created. These include: air and water pollution; changes in the tax base; increased consumption of energy and other resources; increased noise levels; demand for expanded public infrastructure; conversion of agricultural lands, wetlands, and environmentally sensitive areas to other uses; decreased wildlife habitat; increased employment and business activity; change in property values; and changes in the cost of public services.

Because each of the nine alternatives under consideration will provide only moderately expanded wastewater treatment capacity for the St. Croix Falls and Taylors Falls area, no significant secondary impacts are anticipated. The portion of the 2.5-mile force main to be placed along Military Road in Alternatives 5, 6, 8, and 9, may allow for additional residential growth along the sewer line that could not be supported by individual wastewater disposal systems. New local collection sewers serving such areas could discharge to the force main system at the pumping stations. Such developments could affect prime agricultural land. The owners of frontage land along the segment of Military Road, where the force main would be placed, may experience economic pressures to sell frontage road property for residential lots. Unless the local property taxes are structured to assess farmland at its farmland value, the increased taxes that would result from the property being assessed as developable land would induce the sale of the land. The extent of such growth would be limited by the maximum carrying capacity of the force main system. If local population growth by the year 2000 is greater than the projected growth for the project area, the wastewater treatment system(s) would need to be expanded.

A possible concern of local residents related to the secondary effects of stabilization lagoons or land treatment of wastewater at the St. Croix Falls or Taylors Falls sites is whether land values of surrounding property would be affected by the presence of the system. The perceived psychological effect related to the concept of odors generated by the storage lagoons and irrigation of wastewater, and applying domestic wastewater on land would make selling adjacent property, especially for residential use, extremely difficult. The literature has not dealt with this subject and little case study information is readily available. No evidence of differential property values is evident in the area of Muskegon County, Michigan, where a 7,000 acre) wastewater spray irrigation system has been operational for several years. A new land treatment system in the project area likely would have to prove itself a "good neighbor" to ensure that neighboring property values were not affected adversely.

5.5. Mitigation of Adverse Impacts

As previously discussed, adverse impacts would be associated with each of the alternatives. Many of these adverse impacts could be reduced significantly by the application of mitigative measures. These mitigative measures consist of a variety of legal requirements, planning measures, and design practices. The extent to which these measures are applied will determine the ultimate impact of the selected action. The following sections discuss potential measures for alleviating construction, operation, and secondary effects presented in Sections 5.1. through 5.3.

5.5.1. Mitigation of Construction Impacts

The construction oriented impacts presented in Section 5.1. primarily are short-term effects resulting from construction activities at the WWTP site or along the route of the proposed raw wastewater or effluent force mains. Proper design should minimize the potential impacts and the plans and specifications should incorporate mitigative measures consistent with the following discussion.

Fugitive dust from the excavation and backfilling operations for the force mains and treatment plants could be minimized by various techniques. Frequent street sweeping of dirt from construction activities would reduce the major source of dust. Prompt repaving of roads disturbed by construction also could reduce dust effectively. Construction sites, spoil piles, and unpaved access roads should be wetted periodically to minimize dust. Soil stockpiles and backfilled trenches should be seeded with a temporary or permanent seeding or covered with mulch to reduce susceptibility to wind erosion.

Street cleaning at sites where trucks and equipment gain access to construction sites and of roads along which a force main would be constructed would reduce loose dirt that otherwise would generate dust, create unsafe driving conditions, or be washed into roadside ditches or storm drains. Trucks transporting spoil material to disposal sites should cover their loads to eliminate the escape of dust while in transit.

Exhaust emissions and noise from construction equipment could be minimized by proper equipment maintenance. The resident engineer should have, and should exercise the authority, to ban from the site all poorly maintained equipment.

Spoil disposal sites should be identified during the project design stage ("Step 2") to ensure that adequate sites are available and that disposal site impacts are minimized. The Step 2 consultant and the Step 3 (construction) resident engineer should assume the responsibility for approval of spoil disposal sites, both location and final disposition, so that wetlands and other sensitive area are not filled. Landscaping and restoration of vegetation should be conducted immediately after disposal is completed to prevent impacts from dust generation and unsightly conditions.

Lands disturbed by trenching for force main construction should be regraded and compacted as necessary to prevent future subsidence. However, too much compaction will result in conditions unsuitable for vegetation.

Areas disturbed by trenching and grading at the plant site should be revegetated as soon as possible to prevent erosion and dust generation. Native plants and grasses should be used. This also will facilitate the reestablishment of wildlife habit. If fill material is necessary at the existing Taylors Falls WWTP site, a US Army Corps of Engineers 404 permit may be required.

Construction-related disruption in the community can be minimized through considerate contractor scheduling and appropriate public announcements. The State and County highway departments have regulations concerning roadway disruptions, which should be rigorously applied. Special care should be taken to minimize disruption of access to frequently visited establishments. Announcements should be published in local newspapers and broadcast from local radio stations to alert drivers of temporary traffic disruptions on primary routes. Street closings should be announced by fliers delivered to each affected household. If a regional treatment facility is constructed, special care should be taken to minimize traffic disruption on the US Highway 8 bridge. The bridge is scheduled for major deck repair in 1983. The resulting traffic congestion associated with this construction may be compounded by the construction of any of the regional alternatives if construction schedules coincide. To alleviate the traffic problems, construction of the wastewater alternatives should be coordinated with the Director of Transportation District #8 of the Wisconsin Department of Transportation.

Planning of routes for heavy construction equipment and materials should ensure that surface load restrictions are considered. In this way, damage to streets and roadways would be avoided. Trucks hauling excavation spoil to disposal sites or fill material to the WWTP sites should be routed along primary arteries to minimize the threat to public safety and to reduce disturbance in residential environments.

Erosion and sedimentation must be minimized at all construction sites. USEPA's Program Requirements Memorandum 78-1 establishes requirements for control of erosion and runoff from construction activities. Adherence to these requirements would serve to mitigate potential problems:

- Construction site selection should consider potential occurrence of erosion and sediment losses
- The project plan and layout should be designed to fit the local topography and soil conditions
- When appropriate, land grading and excavating should be kept at a minimum to reduce the possibility of creating runoff and erosion problems which require extensive control measures
- Whenever possible, topsoil should be removed and stockpiled before grading begins
- Land exposure should be minimized in terms of area and time
- Exposed areas subject to erosion should be covered as quickly as possible by means of mulching or vegetation
- Natural vegetation should be retained whenever feasible
- Appropriate structural or agronomic practices to control runoff and sedimentation should be provided during and after construction
- Early completion of stabilized drainage system (temporary and permanent systems) will substantially reduce erosion potential

- Access roadways should be paved or otherwise stabilized as soon as feasible

- Clearing and grading should not be started until a firm construction schedule is known and can be effectively co-ordinated with the grading and clearing activity.

The National Historic Preservation Act of 1966, Executive Order 11593 (1971), The Archaeological and Historic Preservation Act of 1974, and the 1973 Procedures of the Advisory Council on Historic Preservation require that care must be taken early in the planning process to identify cultural resources and minimize adverse effects on them. USEPA's final regulations for the preparation of EISs (40 CFR 1500) also specify that compliance with these regulations is required when a Federally funded, licensed, or permitted project is undertaken. The State Historic Preservation Officer must have an opportunity to determine that the requirements have been satisfied.

Once an alternative is selected and design work begins, a thorough pedestrian archaeological survey may be required for those areas affected by the proposed facility. In addition to the information already collected through a literature review (WAPORA, Inc. 1979) and consultation with the State Historic Preservation Officer and other knowledgeable informants, a controlled surface collection of discovered sites and minor subsurface testing should be conducted. A similar survey would be required of historic structures, sites, properties, and objects in and adjacent to the construction areas, if they might be affected by the construction or operation of the project.

In consultation with the State Historic Preservation Officer, it would be determined if any of the resources identified by the surveys appear to be eligible for the National Register of Historic Places. Subsequently, an evaluation would be made of the probable effects of the project on these resources and what mitigation procedures may be required. Prior to initiation of the proposed Federally funded project, the Advisory Council on Historic Preservation in Washington DC should be notified of the intended undertaking and be provided an opportunity to comment on the proposed project.

The State of Wisconsin's Administrative Code NR110, requires a minimum setback distance of 500 feet between a wastewater treatment plant and a residence. This setback distance applies to the construction of a new WWTP and/or to the expansion of an existing facility. Because the proposed expansion of the existing WWTP will violate this code, a variance will be required before construction can begin.

5.5.2. Mitigation of Operation Impacts

The majority of potentially adverse operational aspects of the conventional treatment alternatives relate to the discharge of effluent to surface waters. For the land treatment alternatives, the most significant potential adverse effects are impacts on groundwater, high cost, and possible health risks. Measures to minimize these and other operation phase impacts from all the alternatives are discussed below.

Adverse impacts related to the operation of the proposed force mains and treatment facilities would be minimal if the facilities are designed, operated, and maintained properly. Aerosols, gaseous emissions, odors, and noise from the various treatment processes could be controlled to a large extent. Above-ground pumps would be enclosed and installed to minimize sound impacts. Concentrations of the effluent constituents discharged from either the St. Croix Falls and Taylors Falls WWTPs or a regional WWTP would be regulated by the conditions of the NPDES permits. The effluent quality is specified for both Minnesota and Wisconsin and must be monitored. Proper and regular maintenance of facilities also would maximize the efficiency of system operation.

Special care to control chlorination and effluent concentrations of chlorine residuals should be taken to minimize adverse impacts to the aquatic biota of the St. Croix River. Tsai (1973) documented that numbers of fish and macroinvertebrates were reduced downstream from outfalls that discharge chlorinated effluents. No fish were present in water with chlorine residuals greater than 0.37 mg/l, and the species diversity index reached zero at 0.25 mg/l. A 50% reduction in the species diversity index occurred at 0.10 mg/l. Arthur and others (1975) reported that concentrations of chlorine residuals lethal to various species of warm water fish range from 0.09 mg/l to 0.30 mg/l. Many wastewater treatment plants have effluents with chlorine residual concentrations of 0.5 mg/l to 2.0 mg/l. Furthermore, chlorination of wastewater can result in the formation of halogenated organic compounds that are potentially carcinogenic (USEPA 1976b). Rapid mixing of chlorine and design of contact chambers to provide long contact times, however, can achieve the desired disinfection and the minimum chlorine residual discharge (USEPA and others 1977). Chlorination will require especially careful application and routine monitoring to insure that chlorine residual concentrations are kept to a minimum. The design engineers for the Cities of St. Croix Falls and Taylors Falls should consider the measures listed in Section 3.5.2. to insure system reliability.

5.5.3. Mitigation of Secondary Impacts

As discussed in Section 5.4., few secondary impacts are expected to occur during the operation of any of the nine alternatives. Adequate zoning regulations and property tax structure could help deter the conversion of prime farmland to residential use within the project area. Local growth management planning would assist in the regulation of general location, density, and type of growth that might occur.

5.6. Unavoidable Adverse Impacts

Some impacts associated with the implementation of each of the alternatives cannot be avoided. These include the following:

- Some short-term construction dust, noise, and traffic nuisance
- Alteration of vegetation and wildlife habitat at the WWTP site and along the force main route
- Some erosion and siltation during construction
- Discharge of BOD_5, SS, phosphorus, and ammonia at levels that would not significantly affect overall water quality of the St. Croix River
- Minimal impacts from the operation of the WWTP, such as possible odors and noises
- Minimal induced growth and some resultant loss of agricultural land

- Increased user fees for wastewater treatment services for residents of St. Croix Falls and Taylors Falls.

5.7. Irretrievable and Irreversible Resource Commitments

The major types and amounts of resources that would be committed through the implementation of any of the nine alternatives are presented in Sections 5.1. and 5.2. The resource commitments would include:

- Fossil fuel, electrical energy, and human labor for facilities construction and operation
- Chemicals, especially chlorine, for WWTP operation
- Tax dollars for construction and operation
- Some unsalvageable construction materials.

For each alternative, there is a significant consumption of these resources with no feasible means of recovery. Thus, non-recoverable resources would be foregone for the provision of the proposed wastewater control system.

Accidents which could occur from system construction and operation could cause irreversible bodily damage or death, and damage or destroy equipment and other resources. Unmitigated treatment plant failure potentially could kill aquatic life in the immediate mixing zone.

The potential accidental destruction of undiscovered archaeological sites through excavation activities is not reversible. This would represent permanent loss of the site.

6.0. CONSULTATION, COORDINATION, AND LIST OF PREPARERS

The Final Environmental Statement (FES) for this project was prepared by the Chicago Regional Office of WAPORA, Inc., under contract to USEPA Region V. USEPA reviewed and approved the FES and hereby publishes it as a Final EIS. Consultation and coordination among WAPORA, USEPA, and the various Federal, State, local, and private agencies and organizations listed in the following facilitated the exchange of information and data for inclusion and analysis in the DES:

- National Park Service
- Minnesota-Wisconsin Boundary Area Commission
- Wisconsin Department of Natural Resources
- Minnesota Pollution Control Agency
- Short-Elliott-Hendrickson, Inc. (St. Croix Falls Facilities Planners)
- Howard A. Kuusisto Consulting Engineers (Taylors Falls Facilities Planners)
- City of St. Croix Falls
- City of Taylors Falls.

Meetings during the preparation of the DEIS and Final EIS include:

Date	Attending Organizations	Purpose
Week of 27 November 1978	USEPA; WAPORA: MN-WN Boundary Area Commission; National Park Service; City of St. Croix Falls; City of Taylors Falls; Polk Co. WI; Chisago Co. MN	Start-up meetings, Phase I Plan of Study, initial data collection
7 March 1979	USEPA; WAPORA; MPCA; WDNR; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.; MN-WI Boundary Area Commission	Status of facility planning, water quality and discharge standards proposed by MPCA
16 April 1979	USEPA; WAPORA; MPCA; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.	Population and flow projections, wastewater treatment alternatives

Date	Attending Organizations	Purpose
22 May 1979	USEPA; MPCA; National Park Service; Facilities Planners; MN-WI Boundary Area Commission; private citizens	Effluent discharge standards
24 May 1979	Public information meeting	EIS process, existing environmental conditions, population projections
17 August 1979	USEPA; WAPORA; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.	Wastewater treatment alternatives, need for additional information concerning effluent discharge criteria
24 October 1979	USEPA; WAPORA; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.; MPCA	Development of system alternatives, preliminary engineering costs
10 December 1979	USEPA; WAPORA; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.	Discussion of environmental and cost assessment
10 December 1979	Second public information meeting	Status of Facilities Plans and EIS, potential wastewater treatment solutions, potential environmental impacts
14 April 1980	USEPA; WAPORA; Howard A. Kuusisto Consulting Engineers; Short-Elliot-Hendrickson, Inc.	Cost data for alternatives, environmental consequences, recommended wastewater treatment
14 April 1980	USEPA; WAPORA; Howard A. Kuusisto Consulting Engineers; Taylors Falls City Council	Preliminary summary of cost analysis, proposed wastewater treatment system components, potential environmental consequences
15 April 1980	USEPA; WAPORA; Short-Elliot-Hendrickson, Inc.; St. Croix Falls City Council	Preliminary summary of cost analysis, proposed wastewater treatment system components, potential environmental consequences
30 March 1981	USEPA; WAPORA; MPCA; WDNR Howard A. Kuusisto Consulting Engineers; private citizens	Public hearing on Draft EIS conducted at St. Croix Falls and Taylors Falls

The USEPA Project Officer and the WAPORA staff involved in the preparation of the FES/FEIS during the past three years include:

Name	Highest Degree	Project Assignment	Years of Experience
USEPA			
Marilyn Sabadaszka	B.A.	Project Officer	2
Jack Braun	M.S.	Project Officer (former)	5
WAPORA, Inc.			
Gerard M. Kelly	M.S.P.H.	Project Administrator FES/FEIS	6
Terri-lynn Ozaki Gedo	M.A.	Project Manager FES/FEIS	2
Dan Sweeney	M.S.	Project Administrator DES/DEIS	6
Ron Sundell	M.U.P.	Project Manager DES/DEIS	3
Jim Mikolaitis	M.S.	Environmental Engineer	5
Kathleen Brennan	M.S.	Ecologist	8
Mirza Meghji	Ph.D.	Senior Water Quality Scientist	10
J.P. Singh	M.S.	Project Engineer	8
Gerry Lenssen	B.S.	Agricultural Engineer	9
Phillip Phillips	Ph.D.	Socioeconomist	8
Sherman Smith	M.S.	Air Specialist	6
Carol Qualkinbush	M.L.A.	Land Use	4
Greg Lindsey	B.A.	Public Finance Specialist	3
Valerie Krejcie	M.A.	Cartographer	3
Jan Saper	M.A.	Land Use	2
Ellen Renzas	B.S.	Socioeconomist	2
Kimberly Smith	M.E.M.	Environmental Scientist	1
Tara Kidd	B.S.	Biologist	1
Ron Wilson	--	Production Specialist	6
Peter Woods	B.L.A.	Graphics Specialist	1
Richard McKean	B.S.	Biologist	4
George Bartnik	M.A.	Cultural Historian	7
Kent Peterson	M.S.	Geologist, Hydrologist	4
Stuart Townsend	M.A.	Economist	8
William C. McClain	B.S.	Botanist	10
Phil Pekron	M.P.H.	Environmental Scientist	2
Lauren Rader	M.A.	Cultural Historian	2

Name	Highest Degree	Project Assignment	Years of Experience
Robert M. Cutler	M.S.	Air Analyst	10
William Bale	--	Graphics Specialist	19
Jerome Gold	--	Graphics Specialist	14
Anita Locke	B.S.	Botanist	3
Winston Lung	Ph.D.	Environmental Engineer	9

Persons and organizations that were sent a copy of the Draft EIS include:

Federal

Senator Robert Kasten
Senator William Proxmire
Senator Rudolph E. Boschwitz
Senator David Durenberger
Representative Arlan Stangeland
Representative Steve Gunderson
Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Health and Human Services
Department of Housing and Urban Development
Department of the Interior
Fish & Wildlife Service
Geological Survey
Bureau of Indian Affairs
Heritage Conservation & Recreation Service
National Park Service
Advisory Council on Historic Preservation
Department of Labor
Department of Transportation
Army Corps of Engineers
Soil Conservation Service

State of Minnesota

Governor Albert Quie

Senator Randolph Peterson

Representative John Clawson

Minnesota Pollution Control Agency

Minnesota Water Resources Board

Department of Natural Resources

Department of Health

State Historical Society

State Planning Agency

Environmental Quality Board

Department of Transportation

Energy Agency

Department of Agriculture

Interstate State Park

State of Wisconsin

Governor Lee Sherman Dreyfus

Senator James Harstorf

Representative Robert Harer

Department of Agriculture

Department of Natural Resources

Department of Transportation

Bureau of Envionmental Health

Bureau of Planning and Budget

Bureau of State Planning

Public Service Commission

State Historical Society

Interstate State Park

Regional

Upper Mississippi River Basin Commission

Minnesota-Wisconsin Boundary Area Commission

West Central Wisconsin Regional Planning Commission

East Central Regional Development Commission, Minnesota

Local

Mayor, City of St. Croix Falls, Wisconsin

Mayor, City of Taylors Falls, Minnesota

City Council, City of St. Croix Falls, Wisconsin

City Council, City of Taylors Falls, Minnesota

Chairman, Polk County Board of Commissioners, Wisconsin

Chairman, Chisago County Board of Commissioners, Minnesota

Library, St. Croix Falls, Wisconsin

Citizens and Groups

This list is available upon request from USEPA

7.0. LITERATURE CITED

Anonymous. 1978. DNR asks renewal for hatchery discharge permit. The [St. Croix Falls] Standard Press (7 December 1978; Section 2), page 1.

Arthur, J. W. and others 1975. Comparative toxicity of sewage-effluent disinfection to freshwater aquatic life. Water Pollution Control Research Service, US Environmental Protection Agency, Washington DC.

Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1973. Report on wastewater treatment plant--St. Croix Falls, Wisconsin. St. Paul MN, 69 p. plus attachments.

Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976. Facilities plan for St. Croix Falls-Dresser Metropolitan Sewerage District. St. Paul MN, variously paged, 155 p. plus appendixes.

City of Taylors Falls. 1980. City Financial Report. Taylors Falls MN, 15 p.

Cowherd, Chatten, Jr., Russel Bohn, and Thomas Cuscino, Jr. 1979. Iron and steel plant open source fugitive emission evaluation. Prepared for USEPA, Washington DC, by Midwest Research Institute, Kansas City MO. 130 p.

Demirjian, Y. A. 1975. Design seminar for land treatment of municipal wastewater effluents. Prepared for US Environmental Protection Agency Technology Transfer Program. Muskegon MI, 91 p.

East Central Regional Development Commission. 1978. ECRDC population projections. Unpublished, 5 p.

Federal Water Quality Administration. 1970. Federal guidelines for design, operation, and maintenance of wastewater treatment facilities. US Department of the Interior, Washington DC, 29 pp.

Great Lakes-Upper Mississippi River Board of State Sanitary Engineers. 1978. Recommended standards for sewage works. Health Education Service, Inc., Albany NY, 112 p.

Haugstad, M.C. 1968. Lawrence Creek, Chisago County. MDNR, St. Paul MN, 12 p.

Hickey, J.S., and P.C. Reist. 1975. Health significance of airborne microorganisms from wastewater treatment processes. Journal of the Water Pollution Control Federation 47: 2,741-2,773.

Howard A. Kuusisto Consulting Engineers. 1979. Report--Taylors Falls, Minnesota, infiltration/inflow analysis. St. Paul MN, 87 p.

Howard A. Kuusisto Consulting Engineers. 1980. Taylors Falls, Minnesota, Draft Facility Plan. St. Paul MN, variously paged, plus appendixes.

Kuehn, J. H., W. Niemuth, and A. R. Peterson. 1961. A biological reconnaissance of the Upper St. Croix River. Minnesota Conservation Department and Wisconsin Conservation Department, 25 p. plus appendixes and tables.

Liesch, B. A. 1970. Groundwater investigation for St. Croix Falls, Wisconsin--an independent hydrologic report prepared for the Village of St. Croix Falls. 15 p.

Max Anderson and Associates. 1971. Master plan for St. Croix Falls, Wisconsin. Madison WI, 45 p.

Metcalf & Eddy, Inc. 1972. Wastewater engineering. McGraw-Hill Book Co., New York NY, 782 p.

Minnesota Department of Transportation. 1977. Traffic volumes. St. Paul MN, 1 p.

Minnesota Pollution Control Agency. 1975a. 1975 Minnesota water quality inventory. Report to Congress, Section 305(b). 194 pp. plus appendix.

Minnesota Pollution Control Agency. 1975b. Recommended design criteria for sewage stabilization ponds. Roseville MN, 17 p.

Minnesota Pollution Control Agency. 1976. Report on compliance monitoring survey at City of Taylors Falls wastewater treatment facility--Taylors Falls, Minnesota--August 5, 1976. Brainerd MN, 12 p.

Minnesota Pollution Control Agency. 1977. Report on compliance monitoring survey at City of Taylors Falls, Minnesota--November 26, 1977. Brainerd MN, 17 p.

Minnesota Pollution Control Agency. 1978a. Minnesota code of agency rules. Office of the State Register-Department of Administration, St. Paul MN, variously paged.

Minnesota Pollution Control Agency. 1978b. Unpublished documents in MPCA files. 4 December 1978.

Minnesota State Demographer. 1978. Population estimates for Minnesota counties, 1977. Office of the State Demographer, St. Paul MN, 14 p.

Moak, L. L. and A. M. Hillhouse. 1975. Concepts and practices in local government finance. Municipal Finance Officers Association of the US and Canada, Chicago IL, 454 p.

Moyle, J. B. 1980. The uncommon ones - animals and plants in need of special consideration in Minnesota. Minnesota--DNR, 32 p.

National Park Service, Midwest regional office. 1975. Final environmental statement, master plan, Lower St. Croix National Scenic Riverway, Minnesota--Wisconsin. US Government Printing Office, Washington DC, 119 p. plus appendixes.

Pond, A. W. 1937. Interstate Park and the Dalles of the St. Croix. St. Croix Standard Press, St. Croix Falls WI.

Pound, C.E. and R.W. Crites. 1973. Wastewater treatment and reuse by land application, Volume 1, Summary. USEPA, Office of Research and Development, Washington DC, 80 p.

Powers, J.A. 1978. Feasibility study and preliminary site identification for land treatment in middle Tennessee. In State of knowledge in land treatment of wastewater, Proceedings of an international symposium, US Army Corps of Engineers CRREL, August 1978, Volume II, Hanover NH, 423 p.

Real Estate Research Corporation. 1974. The costs of sprawl-detailed cost analysis. US Government Printing Office, Washington DC, 278 p.

Sanks, R.L., and T. Asano. 1976. Land treatment and disposal of municipal and industrial wastewater. Ann Arbor Science Publishers Inc., Ann Arbor MI, 310 p.

SERCO. 1978. Report of wastewater survey--City of Taylors Falls, Taylors Falls, MN, November-December, 1978. Roseville MN, 25 p.

Short-Elliott-Hendrickson, Inc. 1980. Facilities Plan Wastewater Treatment St. Croix Falls, Wisconsin, Our File No. 79002. St. Paul MN, 10 p.

Soil Conservation Service. 1962. Soil survey manual. Agricultural Handbook No. 18. US Department of Agriculture, Washington DC, 503 p.

Strahler, A.N., and A.H. Strahler. 1978. Modern physical geography. John Wiley & Sons, Inc., New York NY, 502 p.

Todd, D.K. 1967. Groundwater hydrology. John Wiley & Sons, Inc., New York NY, 336 p.

Tsai, C. 1973. Water quality and fish life below sewage outfalls. Transactions of the American Fisheries Society 102 (281).

US Bureau of the Census. 1932a. Fifteenth census of the US: 1930. Population, Volume III, Part I, Alabama--Missouri. Department of Commerce, Washington DC, 1,389 p.

US Bureau of the Census. 1932b. Fifteenth census of the US: 1930. Population, Volume III, Part II, Montana--Wyoming. Department of Commerce, Washington DC, 1,389 p.

US Bureau of the Census. 1952a. US census of population: 1950. Volume II, characteristics of the population, Part 23, Minnesota. Department of Commerce, Washington DC, 20 p.

US Bureau of the Census. 1952b. US census of population: 1950. Volume II, characteristics of the population, Part 49, Minnesota. Department of Commerce, Washington DC, 230 p.

US Bureau of the Census. 1972a. General social and economic characteristics, Minnesota. US Government Printing Office, Department of Commerce, Washington DC, 495 p. plus appendixes.

US Bureau of the Census. 1972b. General social and economic characteristics, Wisconsin. US Government Printing Office, Department of Commerce, Washington DC, 492 p. plus appendixes.

US Bureau of the Census. 1979a. 1976 population estimates and 1975 and revised 1974 per capita income estimates for counties, incorporated places, and selected minor civil divisions--Minnesota. Department of Commerce, Washington DC, 44 p.

US Bureau of the Census. 1979b. 1976 population estimates and 1975 and revised 1974 per capita income estimates for counties, incorporated places, and selected minor civil divisions--Wisconsin. Department of Commerce, Washington DC, 34 p.

US Bureau of Economic Analysis. 1978. Employment by type and broad industrial sectors, 1971-76. Regional Economic Information System. Washington DC, computer printout.

US Bureau of Economic Analysis. 1980a. Local area personal income 1973-1978. Volume 4, great lakes region. US Department of Commerce, Washington DC, 142 p.

US Bureau of Economic Analysis. 1980b. Local area personal income 1973-1978. Volume 5, plains region. US Department of Commerce, Washington DC, 184 p.

US Environmental Protection Agency. 1976a. Compilation of air pollutant emission factors, 2nd edition. Office of Air and Waste Management, Office of Air Quality Planning and Standards, Research Triangle Park NC. Variously paged.

US Environmental Protection Agency. 1976b. Quality criteria for water. EPA-440/9-76-003. Washington DC, 501 p.

US Environmental Protection Agency. 1977. Erosion and sediment control in the Construction Grants Program. Program Requirements Memorandum PRM#78-1. From John T. Rheff, Deputy Assistant Administrator for Water Program Operations, to Regional Administrators, Regions I-X, 29 December 1977. Washington DC, 3 p and attachments.

US Environmental Protection Agency. 1978a. Printout of STORET data-23 October 1978. variously paged.

US Environmental Protection Agency. 1978b. Proceedings from national conferences on shopping for sewage treatment: How to get the best bargain for your community or home (draft), April 23-30, and June 4-6. Office of Water Program Operations, Washington DC, 119 p. (p. 53).

US Environmental Protection Agency. 1979a. Grant funding of projects requiring treatment more stringent than secondary. Construction grants program requirements memorandum PRM#79-7. From Thomas C. Jorling, Assistant Administrator for Water and Waste Management, to Water Division Directors, Regions I-X, 9 May 1979. Washington DC.

US Environmental Protection Agency. 1979b. Long-term effects of land application of domestic wastewater: Dickinson, North Dakota, slow rate irrigation site. Robert S. Kerr Environmental Research Lab, Ada OK. EPA 600/2-79-144, 162 p.

US Environmental Protection Agency. 1980. Summary of long-term rapid infiltration system studies. Robert S. Kerr Environmental Research Lab, Ada OK. EPA 600/2-80-165, 51 p.

US Environmental Protection Agency, US Army Corps of Engineers, and US Department of Agriculture. 1977. Process design manual for land treatment of municipal wastewater. EPA 625/1-77-008, 575 p.

US Fish and Wildlife Service. 1978. Endangered and threatened wildlife and plants. Department of the Interior, Office of Endangered Species, Washington DC, 9 p.

US Geological Survey. 1977. Water resources data for Wisconsin, water year 1976. Department of the Interior, Madison WI, 596 p.

US Geological Survey. 1978. Water resources data for Wisconsin, water year 1977. Department of the Interior, Madison WI, 626 p.

US Geological Survey. 1980. Water resources data for Wisconsin, water year 1979. Department of the Interior, Madison WI, 514 p.

WAPORA, Inc. 1979. Existing environmental conditions in the St. Croix Falls, Wisconsin - Taylors Falls, Minnesota, Wastewater Facilities Project Area. Prepared for USEPA Region V. Chicago IL, 175 p.

Water Pollution Control Federation. 1976. Manual of practice No. 11-operation of wastewater treatment plants. Lancaster Press, Lancaster PA, 536 p.

West Central Wisconsin Regional Planning Commission. 1976. An economic analysis of the west central Wisconsin region. Eau Claire WI, 114 p.

Wisconsin Department of Administration. 1977. Official population estimates for 1977, final estimates for all Wisconsin towns, incorporated villages and cities as of January 1, 1977. Demographic Services Center, Madison WI, 47 p.

Wisconsin Department of Natural Resources. 1972. St. Croix pollution investigation survey. Division of Environmental Protection, Madison WI, 37 p.

Wisconsin Department of Natural Resources. 1978. Water quality operations handbook 3205.1. Bureau of Water Quality, Madison WI, 34 p.

Wisconsin Department of Natural Resources. 1979. List of endangered and threatened species. Office of Endangered and Nongame Species, Madison WI, 1 p.

Wisconsin Department of Natural Resources. 1981. St. Croix Falls fish hatchery effluent data (unpublished). Madison WI, 3 p.

Young, H. L., and S. M. Hindall. 1973. Water resources of Wisconsin: St. Croix River Basin. US Geological Survey Hydrologic Investigations Atlas HA-451. Washington DC, 4 sheets.

8.0. GLOSSARY OF TECHNICAL TERMS

Activated sludge process. A method of secondary wastewater treatment in which a suspended microbiological culture is maintained inside an aerated treatment basin. The microbial organisms oxidize the complex organic matter in the wastewater to carbon dioxide, water, and energy.

Advanced secondary treatment. Wastewater treatment more stringent than secondary treatment but not to advanced waste treatment levels.

Advanced waste treatment. Wastewater treatment to treatment levels that provide for maximum monthly average BOD_5 and SS concentrations less than 10 mg/l and/or total nitrogen removal of greater than 50% (total nitrogen removal = TKN + nitrite and nitrate).

Aeration. To circulate oxygen through a substance, as in wastewater treatment, where it aids in purification.

Aerobic. Refers to life or processes that occur only in the presence of oxygen.

Aerosol. A suspension of liquid or solid particles in a gas.

Algae. Simple rootless plants that grow in bodies of water in relative proportion to the amounts of nutrients available. Algal blooms, or sudden growth spurts, can affect water quality adversely.

Algal bloom. A proliferation of algae on the surface of lakes, streams or ponds. Algal blooms are stimulated by phosphate enrichment.

Alluvial. Pertaining to material that has been carried by a stream.

Ambient air. Any unconfined portion of the atmosphere: open air.

Ammonia-nitrogen. Nitrogen in the form of ammonia (NH_3) that is produced in nature when nitrogen-containing organic material is biologically decomposed.

Anaerobic. Refers to life or processes that occur in the absence of oxygen.

Aquifer. A geologic stratum that is capable of yielding useful amounts of water to wells and springs. The geologic stratum may be sand and gravel or fissured or permeable bedrock.

Artesian (adj.). Refers to ground water that is under sufficient pressure to flow to the surface without being pumped.

Artesian well. A well that normally gives a continuous flow because of hydrostatic pressure, created when the outlet of the well is below the level of the water source.

Bar screen. In wastewater treatment, a screen that removes large floating and suspended solids.

Base flow. The rate of movement of water in a stream channel that occurs typically during rainless periods, when stream flow is maintained largely or entirely by discharges of groundwater.

Biochemical oxygen demand (BOD). A bioassay-type procedure in which the weight of oxygen utilized by microorganisms to oxidize and assimilate the organic matter present per liter of water is determined. It is common to note the number of days during which a test was conducted as a subscript to the abbreviated name. For example, BOD_5 indicates that the results are based on a five-day long (120-hour) test. The BOD value is a relative measure of the amount (load) of living and dead oxidizable organic matter in water. A high demand may deplete the supply of oxygen in the water, temporarily or for a prolonged time, to the degree that many or all kinds of aquatic organisms are killed. Determinations of BOD are useful in the evaluation of the impact of wastewater on receiving waters.

Bio-disc. See rotating biological contactor.

Bio-surf. See rotating biological contactor.

Chlorination. The application of chlorine to drinking water, sewage or industrial waste for disinfection or oxidation of undesirable compounds.

Clarifier. A settling tank where solids are mechanically removed from waste water.

Coliform bacteria. Members of a large group of bacteria that flourish in the feces and/or intestines of warm-blooded animals, including man. Fecal coliform bacteria, particularly Escherichia coli (E. coli), enter water mostly in fecal matter, such as sewage or feedlot runnoff. Coliforms apparently do not cause serious human diseases, but these organisms are abundant in polluted waters and they are fairly easy to detect. The abundance of coliforms in water, therefore, is used as an index to the probability of the occurrence of such disease-producing organisms (pathogens) as Salmonella, Shigella, and enteric viruses. The pathogens are relatively difficult to detect.

Comminutor. A machine that breaks up wastewater solids.

Community. The plants and animals in a particular area that are closely related through food chains and other interactions.

Compact activated sludge. Compact activated sludge plants are small activated sludge plants commonly known as "package plants". These plants are sold as prefabricated plants or in easily assembled standard components. The most common preassembled units employ some type of activated sludge process. These plants, since they were first used in the latter part of the 1940's, have been called "aerobic digestion" plants, "total oxidation" plants, and "extended aeration" plants. Extended aeration has been accepted as properly descriptive of most of these plants. Based on the average flow, the detention time in the aeration compartment is usually between 18 and 30 hr, if domestic wastewater is treated. Contact-stabilization type activated sludge package plants are also commonly used. Also see activated sludge process.

Cultural resources. Fragile and nonrenewable sites, districts, buildings, structures, or objects representative of our heritage. Cultural re-sources are divided into three categories: historical, architectural, or archaeological. Cultural resources of especial significance may be eligible for listing on the National Register of Historic Places.

Decibel (dB). A unit of measurement used to express the relative intensity of sound. For environmental assessment, it is common to use a frequency-rated scale (A scale) on which the units (dBA) are correlated with responses of the human ear. On the A scale, 0 dBA represents the average least perceptible sound (rustling leaves, gentle breathing), and 140 dBA represents the intensity at which the eardrum may rupture (jet engine at open throttle). Intermediate values generally are: 20 dBA, faint (whisper at 5 feet, classroom, private office); 60 dBA, loud (average restaurant or living room, playground); 80 DBA, very loud (impossible to use a telephone, noise made by food blender or portable standing machine; hearing impairment may result from prolonged exposure); 100 dBA, deafening noise (thunder, car horn at 3 feet, loud motorcycle, loud power lawn mower).

Detention time. Average time required to flow through a basin. Also called retention time.

Digestion. In wastewater treatment a closed tank, sometimes heated to 95°F where sludge is subjected to intensified bacterial action.

Disinfection. Effective killing by chemical or physical processes of all organisms capable of causing infectious disease. Chlorination is the disinfection method commonly employed in sewage treatment processes.

Dissolved oxygen (DO). Oxygen gas (O_2) in water. It is utilized in respiration by fish and other aquatic organisms, and those organisms may be injured or killed when the concentration is low. Because much oxygen diffuses into water from the air, the concentration of DO is greater, other conditions being equal, at sea level than at high elevations, during periods of high atmospheric pressure than during periods of low pressure, and when the water is turbulent (during rainfall, in rapids, and waterfalls) rather than when it is placid. Because cool water can absorb more oxygen than warm water, the concentration tends to be greater at low temperatures than at high temperatures. Dissolved oxygen is depleted by the oxidation of organic matter and of various inorganic chemicals. Should depletion be extreme, the water may become anaerobic and could stagnate and stink.

Drift. Rock material picked up and transported by a glacier and deposited elsewhere.

Effluent. Wastewater or other liquid, partially or completely treated, or in its natural state, flowing out of a reservoir, basin, treatment plant, or industrial treatment plant, or part thereof.

Endangered species. Any species of animal or plant that is in known danger of extinction throughout all or a significant part of its range.

Eutrophication. The process of enrichment of a water body with nutrients.

Fauna. The total animal life of a particular geographic area or habitat.

Fecal coliform bacteria. See coliform bacteria.

Floodway. The portion of the floodplain which carries moving water during a flood event.

Flood fringe. The part of the floodplain which serves as a storage area during a flood event.

Flora. The total plant life of a particular geographic area or habitat.

Flowmeter. A guage that indicates the amount of flow of wastewater moving through a treatment plant.

Force main. A pipe designed to carry wastewater under pressure.

Gravity system. A system of conduits (open or closed) in which no liquid pumping is required.

Gravity sewer. A sewer in which wastewater flows naturally down-gradient by the force of gravity.

Groundwater. All subsurface fresh water, especially that part in the zone of saturation.

Infiltration. The water entering a sewer system and service connections from the ground through such means as, but not limited to, defective pipes, pipe joints, improper connections, or manhole walls. Infiltration does not include, and is distinguished from, inflow.

Inflow. The water discharged into a wastewater collection system and service connections from such sources as, but not limited to, roof leaders, cellars, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross-connections from storm sewers and combined sewers, catch basins, storm waters, surface runoff, street wash waters or drainage. Inflow does not include, and is distinguished from, infiltration.

Influent. Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment facility, or any unit thereof.

Interceptor sewer. A sewer designed and installed to collect sewage from a series of trunk sewers and to convey it to a sewage treatment plant.

Lift station. A facility in a collector sewer system, consisting of a receiving chamber, pumping equipment, and associated drive and control devices, that collects wastewater from a low-lying district at some convenient point, from which it is lifted to another portion of the collector system.

Loam. Soil mixture of sand, silt, and clay.

Macroinvertebrates. Invertebrates that are visible to the unaided eye (those retained by a standard No. 30 sieve, which has 28 meshes per inch or 0.595 mm openings); generally connotes bottom-dwelling aquatic animals (benthos).

Macrophytes. A macroscopic plant, especially one in an aquatic habitat.

Milligram per liter (mg/l). A concentration of 1/1000 gram of a substance in 1 liter of water. Because 1 liter of pure water weighs 1,000 grams, the concentration also can be stated as 1 ppm (part per million, by weight). Used to measure and report the concentrations of most substances that commonly occur in natural and polluted waters.

Moraine. A mound, ridge, or other distinctive accumulation of sediment deposited by a glacier.

National Register of Historic Places. Official listing of the cultural resources of the Nation that are worthy of preservation. Listing on the National Register makes property owners eligible to be considered for Federal grants-in-aid for historic preservation through state programs. Listing also provides protection through comment by the Advisory Council on Historic Preservation on the effect of Federally financed, assisted, or licensed undertakings on historic properties.

Nitrate-nitrogen. Nitrogen in the form of nitrate (NO_3). It is the most oxidized phase in the nitrogen cycle in nature and occurs in high concentrations in the final stages of biological oxidation. It can serve as a nutrient for the growth of algae and other aquatic plants.

Nitrite-nitrogen. Nitrogen in the form of nitrite (NO_2). It is an intermediate stage in the nitrogen cycle in nature. Nitrite normally is found in low concentrations and represents a transient stage in the biological oxidation of organic materials.

Nonpoint source. Any area, in contrast to a pipe or other structure, from which pollutants flow into a body of water. Common pollutants from nonpoint sources are sediments from construction sites and fertilizers and sediments from agricultural soils.

Nutrients. Elements or compounds essential as raw materials for the growth and development of an organism; e.g., carbon, oxygen, nitrogen, and phosphorus.

Outwash. Sand and gravel transported away from a glacier by streams of meltwater and either deposited as a floodplain along a preexisting valley bottom or broadcast over a preexisting plain in a form similar to an alluvial fan.

Oxidation lagoon (pond). A holding area where organic wastes are broken down by aerobic bacteria.

Percolation. The downward movement of water through pore spaces or larger voids in soil or rock.

pH. A measure of the acidity or alkalinity of a material, liquid or solid. pH is represented on a scale of 0 to 14 with 7 being a neutral state; 0, most acid; and 14, most alkaline.

Phosphorus. An essential food element that can contribute to the eutrophication of water bodies.

Photochemical oxidants. Secondary pollutants formed by the action of sunlight on nitric oxides and hydrocarbons in the air; they are the primary components of photochemical smog.

Piezometric level. An imaginary point that represents the static head of groundwater and is defined by the level to which water will rise.

Plankton. Minute plants (phytoplankton) and animals (zooplankton) that float or swim weakly in rivers, ponds, lakes, estuaries, or seas.

Point source. In regard to water, any pipe, ditch, channel, conduit, tunnel, well, discrete operation, vessel or other floating craft, or other confined and discrete conveyance from which a substance considered to be a pollutant is, or may be, discharged into a body of water.

Polychlorinated biphenyls (PCBs). A group of organic compounds used especially in the manufacture of plastics. In the environment, PCBs exhibit many of the same characteristics as DDT and may, therefore, be confused with that pesticide. PCBs are highly toxic to aquatic organisms, they persist in the environment for long periods of time, and they are biologically magnified.

Primary treatment. The first stage in wastewater treatment, in which substantially all floating or settleable solids are mechanically removed by screening and sedimentation.

Prime farmland. Agricultural lands, designated Class I or Class II, having little or no limitations to profitable crop production.

Pumping station. A facility within a sewer system that pumps sewage/effluent against the force of gravity.

Rotating biological contactor. This secondary treatment process (also sometimes referred to as biodiscs or rotating biological surfaces) consists of a series of closely spaced discs (10 to 12 feet in diameter) mounted on a horizontal shaft within a tank of wastewater. During operation, the discs are covered with a layer of biological slime and are rotated with about one-half of their surface area immersed in wastewater. As the discs rotate, they carry a film of wastewater into the air, where it trickles over the slime surface and the microbes oxidize the organic material in the wastewater. As the discs complete their rotation, this film mixes with the wastewater in the tank, adding to the oxygen in the tank, and excess biological growth is sheared from the discs. The attached growths are similar in concept to a trickling filter, except that the media with the microbes attached is passed through the wastewater rather than the wastewater passed over the microbes.

Runoff. Water from rain, snow melt, or irrigation that flows over the ground surface and returns to streams. It can collect pollutants from air or land and carry them to the receiving waters.

Sanitary sewer. Underground pipes that carry only domestic or commercial wastewater, not stormwater.

Screening. Use of racks of screens to remove coarse floating and suspended solids from sewage.

Secondary treatment. The second stage in the treatment of wastewater in which bacteria are utilized to decompose the organic matter in sewage. This step is accomplished by introducing the sewage into a trickling filter or an activated sludge process. Effective secondary treatment processes remove virtually all floating solids and settleable solids, as well as 90% of the BOD and suspended solids. USEPA regulations define secondary treatment as 30 mg/1 BOD, 30 mg/1 SS, or 85% removal of these substances.

Seepage. Water that flows through the soil.

Settling tank. A holding area for wastewater, where heavier particles sink to the bottom and can be siphoned off.

7-day, 10-day low flow. The lowest average flow that occurs for a consecutive 7-day period at a recurrence interval of 10 years.

Sludge. The accumulated solids that have been separated from liquids such as wastewater.

Storm sewer. A system that collects and carries rain and snow runoff to a point where it can soak back into the groundwater or flow into surface waters.

Surface water. All bodies of water on the surface of the Earth.

Suspended solids (SS). Small solid particles that contribute to turbidity. The examination of suspended solids and the BOD test constitute the two main determinations for water quality that are performed at wastewater treatment facilities.

Tertiary treatment. Advanced treatment of wastewater that goes beyond the secondary or biological stage. It removes nutrients such as phosphorus and nitrogen and most suspended solids.

Threatened species. Any species of animal or plant that is likely to become endangered within the foreseeable future throughout all or a significant part of its range.

Till. Unsorted and unstratified drift, consisting of a heterogeneous mixture of clay, sand, gravel, and boulders, that is deposited by and underneath a glacier.

Trickling filter process. A method of secondary wastewater treatment in which the biological growth is attached to a fixed medium, over which wastewater is sprayed. The filter organisms biochemically oxidize the complex organic matter in the wastewater to carbon dioxide, water, and energy.

Unique farmland. Land, which is unsuitable for crop production in its natural state, that has been made productive by drainage, irrigation, or fertilization practices.

Wastewater. Water carrying dissolved or suspended solids from homes, farms, businesses, and industries.

Water quality. The relative condition of a body of water, as judged by a comparison between contemporary values and certain more or less objective standard values for biological, chemical, and/or physical parameters. The standard values usually are based on a specific series of intended uses, and may vary as the intended uses vary.

Water table. The upper level of groundwater that is not confined by an upper impermeable layer and is under atmospheric pressure. The upper surface of the substrate that is wholly saturated with groundwater.

Wetlands. Swamps or marshes.

9.0. INDEX

APPENDIX A

Existing Wastewater Treatment Systems

EXHIBIT A-1

St. Croix Falls Wastewater Treatment System

The wastewater treatment facility for St. Croix Falls was designed in 1948 and constructed in 1951. The treatment plant is located on the bank of the St. Croix River on approximately 0.5 acres of land leased from WDNR.

The treatment processes include preliminary screening, primary treatment, biological filtration, final clarification, flow measurement, chlorination, sludge digestion, and sludge dewatering. The facility was designed to treat 120,000 gpd, with a BOD_5 loading of 250 lb/day and a total suspended solids loading of 240 lb/day (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976). The 1975 yearly average wastewater flow was 211,400 gpd (Banister, Short, Elliott, Hendrickson, and Associates, Inc. 1976). The monthly peak flow was 299,400 gpd. Based on the 1978 average raw sewage BOD_5 concentration of 159 mg/l and the 1975 average flow, the current BOD_5 loading is 280 lb/day. This estimate assumes that there has been no significant increase in wastewater flow since 1975.

Raw sewage from the St. Croix Falls service area enters the treatment plant from sewers located along River Street. The old outfall sewer that was used before the construction of the treatment facility could be used as an emergency bypass from the River Street sewer. There are no reported instances of its use.

Preliminary Treatment

Raw sewage flows by gravity to the treatment plant and passes through a 4-foot bar screen. One manually-cleaned bar screen with 1.5-inch bar spacing is provided. Flow from the bar screen is combined with a recirculation flow from the final clarifier effluent. Screened materials are collected and hauled to the City landfill.

Primary Treatment

A rotating fine-mesh screen is utilized for removal of settleable solids. One screen, approximately 38 inches in diameter by 4 feet in length, is provided. The screen is comprised of a 14x14 bronze wire mesh. Final clarifier effluent is used as spray washwater. Solids removed by the screen are discharged to the anaerobic sludge digester. The unit appears to be in good working condition.

Biological Filtration

A high-rate, single-stage trickling filter with prefabricated tile media is provided as part of the secondary treatment. The filter is octagonal in shape, with a surface area of approximately 500 square feet and a depth of 6 feet. The design hydraulic loading is 3.5 million gallons per acre per day (mgad) and the current hydraulic loading is 6.1 mgad. This filter has design and current organic loadings of 3,600 pounds and 4,100 pounds of BOD_5 per acre per foot per day, respectively, or (83 pounds and 93 pounds of BOD_5 per thousand cubic feet) of media, respectively. The organic loadings are higher than the design criteria indicated in the WDNR regulations.

Two 100-gpm pumps are provided for a one-to-one recirculation. Recirculation presently is utilized for about 14 to 16 hours per day, during the nighttime low-flow periods, in order to provide continuous application of wastewater.

The turntable of the rotary distributor formerly had a mercury-type seal. The seal was broken, and no new seal has been provided. This condition results in substantial leakage. There is an unmetered trickling filter bypass from the fine screen to the final clarifier.

The coarse nozzles used, the leakage from the distributor, and the apparent inefficiency of the fine screen have allowed sewage debris to accumulate on the surface of the media. According to the Director of Public Works of the City of St. Croix Falls, the filter has not been susceptible to flooding problems. Apart from the turntable, the trickling filter appears to be in satisfactory condition. Although the degree of hydraulic and organic overloading is unknown, some loss of efficiency in this unit is suspected. In addition, bypassing of the filter during severe hydraulic loading periods substantially reduces the overall pollutant removals.

Final Clarification

The trickling filter underdrainage flow and bypass flow are discharged by gravity to the final clarifier. The clarifier is 36 feet by 12 feet, with a 10-foot operating depth. At the design loading and current loading, this clarifier provides surface settling rates of 280 and 490 gallons per square foot per day (gpsfd), respectively; detention times of 6.5 and 3.7 hours, respectively; and weir overflow rates of 5,000 and 8,800 gallons per foot per day (gpfd), respectively.

These loading rates are within the Wisconsin design criteria. Sludge and scum are removed with an axially-rotated chain and scraper flight system. The scum and sludge are pumped to the anaerobic sludge digester. The hydraulic overloading has caused a noticeable deterioration in the performance of the final clarifier. The inlet baffles have been submerged due to high inlet wastewater velocities. Heavy scum layers have arisen due to the inadequate operation of the flight system. The effluent troughs occasionally are submerged, and high concentrations of effluent suspended solids are discharged due to the hydraulic overloading. Replacement of the sludge and scum removal equipment and structural modifications to ensure a uniform flow distribution, a dissipation of inlet velocities, and a minimum of large-scale turbulence appear to be required to ensure a prolonged period of proper operation.

Flow Measurement

The discharge from the final clarifier flows by gravity to the recirculation wet well containing the flow measurement device. Two 100-gpm pumps lift the final clarifier effluent to a 450-gallon tank for use as the fine screen spray and also to recirculate flow to the trickling filter. A 12-inch rectangular weir with a Stevens Type F, Model 63 recorder is provided. The most recent known calibration was performed during February 1979. Erroneous flow readings may have been obtained prior to February

1979 due to a lack of calibration. The flow meter is not easily accessible, but appears to be properly maintained.

Chlorination

The chlorine contact tank is located immediately downstream from the flow measurement weir. The contact tank has a volume of 3,440 gallons and provides detention times of 40 minutes and 23 minutes at the design flow and current average flow, respectively. At the current peak flow of 299,400 gpd, the detention time is 11 minutes. These detention times are significantly less than the Wisconsin design average rate and peak rate of 60 minutes and 30 minutes, respectively. A Wallace and Tiernan gas chlorinator is provided. Approximately 10 pounds of chlorine is applied to the effluent daily. The condition of the chlorination facilities is unknown because of their inaccessibility.

Sludge Digestion

Sludge from the fine screen and final clarifier is digested in a single-stage, 5,000-cubic-foot anaerobic digester. The digester has a fixed cover and is heated. The only mixing occurs when sludge recirculates through the heat exchanger, which is operated on fuel oil. Gas produced in the digester is vented off without being flared. At present, only pH analyses are run on the digester. The information is not sufficient to determine the adequacy of performance of the unit.

Sludge Dewatering and Disposal

Six sludge-drying beds occasionally are used for dewatering. The beds have a total area of 1,100 square feet. Dewatered sludge is removed from the beds manually. More frequently, digested liquid sludge is pumped directly from the digester into a tank truck and hauled to disposal sites on the Bishop Farm and the Chinander Farm, both located north of St. Croix Falls. These sludge disposal sites were not inspected.

Other Facilities

The treatment facility is enclosed in a three-story, concrete structure located on the bank of the St. Croix River. Wastewater flows through the treatment plant entirely by gravity, except for recirculation, fine-screen spray water, and sludge flows. Although the structure is almost 30 years old, it appears to be in sound condition. Ancillary facilities, including ventilation equipment, doors, windows, handrails, and electrical facilities, generally are in need of replacement or repair. Other mechanical equipment, such as the heat exchanger and pumps, may need replacement if an extended service life is required.

At present, only chlorine residual and pH tests are run at the plant site. Other analyses are conducted by Commercial Testing Laboratory, Inc. Additional laboratory and administrative facilities appear to be required for proper operation and control of the treatment plant.

A 15-kilowatt (kw) portable generator is owned by the City of St. Croix Falls for power outage emergencies. Because the major treatment-related units that would be affected by a power loss are the sludge removal equipment, the recirculation pumps, and the fine-screen motor, the emergency power facilities appear to be sufficient.

There are no domestic water protection facilites, such as a water break tank, at the treatment plant. This omission should be corrected.

The existing plant is located on approximately 0.5 acres of land leased from WDNR. The adjacent land also is owned by WDNR. Any expansion of the existing facilities would require an arrangement for the use of additional land.

EXHIBIT A-2

Taylors Falls Wastewater Treatment System

The existing sewage treatment facility for the City of Taylors Falls was constructed in 1941. The plant is located on the bank of the St. Croix River immediately north of the US Highway 8 and State Route 95 Bridge.

The treatment processes include preliminary screening, primary treatment, biological filtration, final clarification, chlorination, sludge digestion and sludge dewatering. The existing facilities were designed for a flow rate of 75,600 gpd and a maximum raw sewage BOD_5 concentration of 250 mg/l (MPCA 1976). A flow measurement and sampling survey conducted by SERCO (1978) during November 1978 showed that the treatment plant loading was 90,900 gpd and 105 pounds of BOD_5 per day. The peak flow rate observed during this period was 144,000 gpd.

Preliminary Treatment

Sewage entering the treatment facility is screened by a bar rack, which is cleaned manually. The bar rack structure contains a bypass line tributary to the plant outfall (Howard A. Kuusisto Consulting Engineers 1979). The bypass is used infrequently (MPCA 1976, 1977). No permanent flow measurement device is provided.

Primary Treatment

Both the sewage flow from the bar rack and a recirculation flow from the final clarifier enter the primary clarifier. The enclosed clarifier is 21 feet by 8.3 feet, with an operating depth of 7 feet. The detention time and surface settling rate at the design flow of 75,600 gpd are 2.8 hours and 450 gpsfd, respectively. At the current loading of 90,900 gpd, the detention time is 2.4 hours and the surface settling rate is 520 gpsfd. These rates generally are within the recommended design criteria (Great Lakes-Upper Mississippi River Board of State Sanitary Engineers 1978; Metcalf and Eddy, Inc. 1972). The clarifier structure and the sludge removal equipment appear to be in satisfactory condition. However, some scum removal deficiencies were observed.

Biological Filtration

A standard-rate, single-stage trickling filter with a coarse rock media is provided for biological oxidation after primary clarification. The trickling filter was converted to a high-rate filter with the addition of a pump to recirculate the flow from the final clarifier. The recirculation pump is rated at 150 gpm. The circular filter is enclosed separately from the other treatment units and is 42.5 feet in diameter by 6.0 feet in depth. The current organic loading is 540 pounds of BOD_5 per acre-foot per day. The design and current hydraulic loadings are 1.5 mgad and 1.6 mgad, respectively. These loadings are well below the recommended criteria for high-rate filters and are within the standard-rate classification (Water Pollution Control Federation 1976). The rotary distribution system was leaking at the turntable, and several diffusers were clogged. This caused an irregular spray of sewage on the surface of the media. Some deterioration of the filter housing also was observed, indicating that major rehabilitation would be required for continued service.

Final Clarification

The trickling filter underdrainage flows by gravity to the final clarifier. The uncovered, rectangular clarifier is 28.2 feet long and 8 feet wide. The operating water depth is unknown. The design and current surface settling rates are 335 gpsfd 403 gpsfd, respectively. The current peak surface settling rate is 638 gpsfd, based on a maximum hourly flow of 100 gpm. The design and current weir overflow rates are 4,725 gpfd and 5,680 gpfd, respectively. These rates are below the recommended criteria (Great Lakes-Upper Mississippi River Board of State Sanitary Engineers 1978). The final clarifier has a chain and scraper sludge conveyor system similar to the other clarifier system previously discussed. Sludge is pumped continuously to the primary settling tank. Electrical problems occasionally have shut down the sludge pump and the conveyor system. There is no provision for scum removal in the final clarifier. The final clarifier is subject to flooding during periods when the water level in the River is high.

Chlorination

One section of the final clarifier is walled off and utilized as a chlorine contact basin. The basin is 5.5 feet by 8 feet, with an approximate depth of 5.5 feet. The detention time is 18 minutes at the current peak hydraulic loading, slightly better than the 15-minute criterion recommended by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (1978).

A new gas chlorinator currently is utilized. Normal chlorine usage is approximately 2 lb/day. Although the contact tank is baffled, MPCA has recommended a different point of chlorination in order to promote additional dispersion and lengthen the contact time. Final effluent from the chlorine contact tank flows into the outfall pipe tributary to the St. Croix River.

Sludge Digestion

Sludge from the primary clarifier is pumped to the single-stage, anaerobic sludge digester. The digester is 15 feet in diameter, with a depth of 16 feet. Heating and mixing facilities are not provided. The existing operating data are not sufficient to evaluate the performance of this unit or the loading on the unit. The lack of heating and mixing equipment, however, generally precludes its ability to digest sludge properly, especially during the winter months. An odor from sludge being dewatered during April 1979 also indicated insufficient digestion.

Sludge Dewatering and Disposal

One sand drying bed, divided into four compartments, is provided for dewatering of digested sludge. The drying bed is 30 feet by 28 feet According to the Public Works Director of the City of Taylors Falls, approximately four beds of sludge are drawn per year. This usage does not appear to be excessive. No provisions are made for pumping liquid digested sludge for disposal. Dewatered sludge is hauled to the Blood Farm, located north of Taylors Falls, for ultimate disposal. This disposal site was not inspected.

Other Facilities

The structures enclosing the control room and the primary clarifier, the trickling filters, and the anaerobic digester are approximately 40 years old and generally in need of repair. The sludge pump, part of the original equipment, should be replaced.

The treatment plant has very little laboratory or control room space. Additional facilities should be provided if continued operation at this site is required. At present, most laboratory analyses are conducted by Feed-Rite Controls, Inc.

Alternative power facilities are not provided for the treatment plant. The sludge conveyor systems, the sludge pump, and the recirculation pump would be affected by a power loss.

The existing plant site has limited space for additional facilities The plant is bordered by a ravine on the north; by a ridge and a commercial district on the west; by the US State Highway 8 and State Route 95 Bridge on the south; and by the St. Croix River on the east. A large-scale plant expansion at this site may not be feasible.

APPENDIX B

Pollutant Discharge Elimination System Permits

EXHIBIT B-1

Permit to Discharge under the
Wisconsin Pollutant Discharge Elimination System
for the City of St. Croix Falls, Wisconsin

Permit No. WI- 0020796-2

PERMIT TO DISCHARGE UNDER THE
WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Chapter 147, Wisconsin Statutes,

CITY OF ST. CROIX FALLS

is permitted to discharge from a wastewater treatment facility located at

RIVER STREET
ST. CROIX FALLS, WISCONSIN

to THE ST. CROIX RIVER, IN POLK COUNTY

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

This permit shall become effective on the date of signature.

This permit to discharge shall expire at midnight, June 30, 1982.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit in accordance with the requirements of Chapter NR 200, Wisconsin Administrative Code, at least 180 days prior to this expiration date.

State of Wisconsin Department of Natural Resources
For the Secretary

By Thomas A. Kroehn
THOMAS A. KROEHN
ADMINISTRATOR
DIVISION OF ENVIRONMENTAL STANDARDS

Dated this 30 day of June, 1978.

TABLE OF CONTENTS

Part I. MONITORING REQUIREMENTS

1. Reporting

a. Monitoring results obtained during the previous month shall be summarized and reported on a WPDES Self-Monitoring Report Form, #3200-28, postmarked no later than the 15th day of the month following the completed reporting period. The first report for the month of June, 1978 is due on or before July 15, 1978. The white and green copies of 3200-28 shall be submitted to:

Wisconsin Department of Natural Resources
Environmental Protection Section-Permits
Northwest District
Hwy. 70, Box 309
Spooner, Wisconsin 54801

The pink report copy is to be retained by the permittee.

b. Monitoring reports shall be signed by a principal executive officer, a ranking elected official, or other duly authorized representative.

c. If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on form #3200-28.

d. Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219 of the Wisconsin Administrative Code.

A. INFLUENT MONITORING REQUIREMENTS

During the period beginning on the effective date of the permit and lasting until June 30, 1982 the permittee is required to perform the following monitoring.

Samples taken in compliance with the monitoring requirements specified below shall be taken at representative locations.

PARAMETER	UNITS	MONITORING REQUIREMENTS Sample Frequency	MONITORING REQUIREMENTS Sample Type
BOD_5-day	mg/l	3xweekly	3-hr. composite [1]
Suspended Solids	mg/l	3xweekly	3-hr. composite

1. A 3-hour composite sample consists of 3 grab samples of equal volume collected 1 hour apart and composited. Recommended sampling times are 11:00 A.M., 12:00 Noon and 1:00 P.M.

Upon completion of the upgraded facility, 24-hr. composite flow proportional sampling will be required.

INTERIM

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and lasting until June 30, 1982 the permittee is authorized to discharge from outfall serial number 001

Samples taken in compliance with the monitoring requirements specified below shall be taken at Representative Locations

There shall be no discharge of visible or floating solids in other than trace amounts.

	EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day (lbs/day)		Other Limitations (Specify Units)				
EFFLUENT PARAMETERS	Average[2]	Maximum	Minimum	Average	Maximum	Sample Frequency	Sample Type
Flow	--	--	--	--	--	Continuous	
BOD_5 (Monthly)	74.8 (165)	--	--	110 mg/l	--	3x Weekly	3 hr. composite
BOD_5 (Weekly)	112 (248)	--	--	165 mg/l	--	3x Weekly	3 hr. composite
Suspended Solids (Monthly)	51 (112.6)	--	--	75 mg/l	--	3x Weekly	3 hr. composite
Suspended Solids (Weekly)	74.8 (165)	--	--	110 mg/l	--	3x Weekly	3 hr. composite
pH	--	--	6.0	--	9.0	Daily	Grab
Total Residual CL_2 (Daily)[2]	--	--	--	--	- mg/l	Daily	Grab
Fecal Coliform (Monthly)[2]	--	--	--	#/100 ml	--	1x Weekly	Grab

[1]Based on a design flow of .18 MGD.

[2]At such time as effluent limitations for fecal coliforms and chlorine residual are finally promulgated in the Wisconsin Administrative Code, this permit may be modified to incorporate either the final limitations or interim limitations and a compliance schedule to achieve the final limitations.

FINAL

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on **completion of the upgraded sewage treatment facility** the permittee is authorized to discharge from outfall serial number 001.

Samples taken in compliance with the monitoring requirements specified below shall be taken at representative locations.

	EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day (lbs/day)		Other Limitations (Specify units)				
EFFLUENT PARAMETERS	Average 1	Maximum	Minimum	Average	Maximum	Sample Frequency	Sample Type
Flow	-	-	-	-	-	Continuous	
BOD_5 (monthly)	20.4(45)	-	-	30 mg/l	-	3xweekly	24-hr. composite 2
BOD_5 (weekly)	30.6(67.6)	-	-	45 mg/l	-	3xweekly	24-hr. composite
Suspended Solids (monthly)	20.4(45)	-	-	30 mg/l	-	3xweekly	24-hr. composite
Suspended Solids (weekly)	30.6(67.6)	-	-	45 mg/l	-	3xweekly	24-hr. composite
pH	-	-	6.0	-	9.0	Daily	Grab
Total Residual Cl_2 (DAILY)	-	-	-	-	mg/l	Daily	Grab
Fecal Coliform	-	-	-	#/100 ml	-	1xweekly	Grab

1 Based on a design flow of .18 MGD.

2 Indicates flow proportional sampling.

PART II. SPECIAL REPORTS

All reports required in this section shall be signed by a principal executive officer, a ranking elected official, or other duly authorized representative. These signed reports shall be submitted to:

Wisconsin Department of Natural Resources
WPDES Permits - Municipal Wastewater Section
P. O. Box 7921
Madison, Wisconsin 53707

SLUDGE MANAGEMENT PLAN

1. A sludge management plan shall be developed for the disposal of solids, sludges or other materials resulting from treatment of wastewater. The permittee shall submit the initial sludge management plan by OCT 31 1978 . If the Department determines that the plan is acceptable it will issue a letter of approval to the permittee.

   If the plan as submitted is determined by the Department to be unacceptable, it shall be returned to the permittee for revision and resubmittal.

   The permittee shall be responsible for the implementation of the approved sludge management activities. The permittee may at any time amend the sludge management plan, subject to the approval of the Department. The amended plan may not be put into effect until it has received approval from the Department.

   The Department shall evaluate the management plans on the basis of recommendations in Wisconsin Department of Natural Resources (DNR) Technical Bulletin #88 and any other pertinent information deemed appropriate to the review of sludge management plans.

   The sludge management plan shall be submitted on reporting forms to be provided by this Department. Following review of the management plan, the Department shall issue a letter of approval with any necessary conditions. The letter of approval will establish a means by which the permittee will periodically report to the Department on the sludge disposal practices in the time period between reports. It will also indicate the frequency of sludge analysis required and the parameters to be analyzed in the next reporting period. In general municipalities over 1 MGD will be required to report on a quarterly basis, while municipalities under 1 MGD will be required to report annually. This may be modified depending on the type of waste treated at the municipal facility.

2. The management plan shall be a comprehensive report which incorporates the following items in sufficient detail to allow evaluation:

   a. Storage facilities, when normal disposal sites are unavailable or inaccessible, including:

      1) Type of facility

      2) Location of facility

      3) Capacity of facility

      4) Property interest or contractual agreement allowing use of facility, and

      5) Any other planned use of the storage facility

b. A description of sludge characteristics, including:

1) Type of wastewater treatment provided that results in sludge generation

2) Type of sludge treatment prior to disposal

3) The quantity of sludge generated for disposal on a daily, monthly and annual basis

4) Physical and chemical characteristics of the sludge including:

Parameter	Abbreviation
*Percent Total Solids	
Total Nitrogen	N
Ammonium Nitrogen	NH_4^+-N
*pH	- -
Total Phosphorous	P
Total Potassium	K
Arsenic	As
Cadmium	Cd
Copper	Cu
Chromium	Cr
Lead	Pb
Mercury	Hg
Nickel	Ni
Zinc	Zn

*All parameters other than Percent Solids and pH shall be calculated on a dry weight basis.

c. The mode of sludge transportation, including:

1) The hauler's name and mailing address (license number if a certified hauler).

2) The method of transportation, such as pipe line, barge, truck, train and others.

3) If hauled by a vehicle the following information is needed:

a) Type of vehicle

b) Capacity of vehicle

c) The gross weight of vehicle

d. Information about the ultimate disposal site.

1) If sludge will be disposed of at one or more licensed landfill sites, the following information shall be provided:

a) The amount of sludge to be disposed of at each site

b) The site names and license numbers

c) Contractual agreements

d) An indication of approval from the Solid Waste Management Section of this Department

2) If sludge will be disposed of on land areas (other than at licensed landfill sites), the following information shall be provided for each disposal site.

a) A soil test shall be completed for each disposal site for each year that sludge is to be applied.

b) The location of the site shall be indicated on a soils map. Either a plat map or U.S.G.S. topographic map shall also be provided.

c) A description of the crops to be grown or the dominant vegetation on the disposal site.

d) A discussion of adjacent land use, drainage and land features associated with the disposal site.

e) The ownership of the site

f) A description of the land use agreement

g) A description of methods to be used to spread and incorporate the sludge into the soil.

h) The applicator of the sludge, such as the farmer, land owner, municipality, contractor or others.

i) An estimate of the total acreage to which sludge will be applied.

j) The maximum rate of application (tons/acre/year based on nitrogen or cadmium, whichever is lower) and the loading limit (tons/acre based on metal equivalents or cadmium whichever is lower). If recommended application rates or loading limits are exceeded, comprehensive monitoring may be required.

k) The anticipated use of the site for the 12 months immediately following sludge application.

3) The frequency of sludge disposal and the months in which it will occur.

3. Beginning with submission of the plan, records shall be maintained for each site, (other than at a licensed landfill site), including:

   a. The amount of sludge applied (tons/acre).

   b. The amount of nitrogen applied per year (lbs./acre).

   c. The amount of cadmium applied per year (lbs./acre).

   d. The total amount of metal equivalents applied (lbs./acre).

   e. The total amount of cadmium applied (lbs./acre).

   f. The location of the site on a plat map and the number of acres to which the sludge was applied.

   g. The site monitoring results.

   h. A description of any adverse environmental, health or social effects that occurred due to sludge disposal.

   i. A report of any action not in conformance with the approved plan.

PART III. SCHEDULE OF COMPLIANCE

Due

a. Submit Facilities Plan - July 1, 1979
b. Submit Plans and Specifications - July 1, 1980
c. Award Construction Contracts - February 1, 1981
d. Construction Progress Report - August 31, 1981
e. Complete Construction of an Upgraded Wastewater Treatment Facility - June 30, 1982

The above reports shall be submitted to:

Wisconsin Department of Natural Resources
WPDES Permits - Municipal
P.O. Box 7921
Madison, Wisconsin 53707

PART IV. SPECIAL CONDITIONS

1. Noncompliance Notification

If for any reason the permittee does not comply with or will be unable to comply with any condition specified in this permit or should any unusual or extraordinary discharge of wastes occur from the facilities permitted herein, the permittee shall within five days of noncompliance occurrence notify the Department of Natural Resources, Compliance Section, Box 7921, Madison, Wisconsin 53707, providing the following information:

a. Cause for noncompliance.

b. Expected duration of noncompliance period.

c. Steps taken by permittee to regain compliance with permit conditions.

d. Steps taken to prevent recurrence of the condition of noncompliance.

2. Change in Discharge

The permittee shall notify this Department in advance of:

a. Any facility modification, addition and/or expansion that increases the plant capacity.

b. Any anticipated change in the facility discharge, including any new or changed significant industrial discharges or any significant changes in the quantity or quality of existing industrial discharges as required under Section 147.14, Wisconsin Statutes.

c. Any maintenance of the treatment facility which could result in degradation of effluent quality.

Where necessary, the permit will be modified or reissued to reflect changes in discharge, including any necessary effluent limitations for any pollutants not identified or limited herein. In no case are any new connections, operational changes, increased flows, or significant changes in influent quality permitted that will cause violation of the effluent limits specified herein.

3. Change of Owner

In the event of transfer of control of operation of a wastewater treatment facility, the prospective owner must file a Statement of Acceptance with this Department. This "Statement" shall indicate that the new owner accepts the terms, conditions and liabilities of the present permit and desires that the existing permit be transferred. At this time the new owner shall also state whether there will be any changes in operation due to transfer of ownership which will cause a change in the discharge.

4. <u>Permit Modification</u>

After notice and opportunity for a hearing as provided in Section 147.03, Wisconsin Statutes, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

PART V. GENERAL CONDITIONS

1. Facility Operation and Quality Control

All waste collection, control, treatment and disposal facilities shall be operated in a manner consistent with the following:

a. The municipal wastewater treatment facility must be under the supervision of a state certified operator as required by Chapter 114 of the Wisconsin Administrative Code.

b. At all times, all facilities shall be operated as efficiently as possible and in a manner which will minimize upsets and discharges of excessive pollutants.

2. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact on waters of the state resulting from noncompliance with any effluent limitations specified in this permit, including such special or additional monitoring as may be required by the Department or may be necessary to determine the nature and impact of the noncomplying discharge.

3. Right of Entry

The permittee shall allow authorized representatives of the Department of Natural Resources, and the Administrator of the United States Environmental Protection Agency or his authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any wastewaters.

4. Records Retention

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Department of Natural Resources.

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;
b. The dates the analyses were performed;
c. The person(s) who performed the analyses;
d. The analytical techniques or methods used; and
e. The results of all required analyses.

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (General Condition 17 & 18) and "Power Failures" (General Conditions 16), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties or liabilities under Section 147.21, Wisconsin Statutes, Section 311 of the Federal Water Pollution Control Act (33 U.S.C. Section 1321) or any other applicable state law or regulation.

7. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

8. Severability

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

9. Construction of Onshore or Offshore Structures

This permit does not authorize or approve the construction of any onshore or offshore physical structure of facilities or the undertaking of any work in any navigable waters.

10. Confidential Information

Except for data determined to be confidential under Section 147.08(2)(c), Wisconsin Statutes, all monitoring reports required by this permit shall be available for public inspection at the headquarters of U.S. EPA Region V and the Department of Natural Resources.

11. False Statements and Data

Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, may result in the imposition of criminal penalties in accordance with the provisions of Section 147.21, Wisconsin Statutes.

12. Prohibited Wastes

Under no circumstances shall the introduction of wastes prohibited by NR 211.10, Wisconsin Administrative Code, be allowed into the waste treatment system. Prohibited wastes include those:

a. Which create a fire or explosion hazard in the treatment works,

b. Which will cause corrosive structural damage to the treatment works,

c. Solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment works,

d. Wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency, or

e. Changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

13. Pretreatment

The permittee shall require any industrial user of the permitted facility to meet pretreatment standards established pursuant to Section 147.07(2), Wisconsin Statutes, and to provide records, reports, and/or information related to compliance with such pretreatment standards.

14. Effluent Limit Modification

Pollutants attributable to Significant Industrial Dischargers may be present in the permittee's discharge. At such time as sufficient information becomes available to establish limitations for such pollutants, and after notice and opportunity for public hearings as provided in Chapter NR 3, Wisconsin Administrative Code, this permit may be revised to specify effluent limitations for any or all of such other pollutants.

15. Toxic Pollutants

Nothing in this permit shall be construed to authorize the discharge of any toxic pollutant or combination of pollutants in amounts or concentrations which exceed any applicable toxic effluent standard or prohibition promulgated under Section 147.07(1). If the promulgated toxic effluent standard or prohibition under Section 147.07(1) for a pollutant present in the discharge is more stringent than any pollutant limitation in this permit, this permit shall be modified or revised in accordance with the toxic effluent standard or prohibition.

16. Power Failures

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failure either by means of alternate power sources, standby generators or retention of inadequately treated effluent.

17. Unscheduled Bypassing

The unscheduled diversion or unscheduled bypass of any wastewater at the treatment works or collection system is prohibited except (i) an inadvertent bypass resulting from equipment damage or temporary power interruption, or (ii) an unavoidable bypass necessary to prevent loss of life or severe property damage, or (iii) a bypass of excessive storm drainage or runoff which would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. In the event of an unscheduled bypass, the permittee shall immediately notify the Department District Office by telephone of such occurrence. In addition, the permittee shall notify the Department of Natural Resources, WPDES Permit Section in writing of each such unscheduled diversion or unscheduled bypass by letter within 72 hours.

18. Scheduled Bypassing

Bypassing of wastewater in order to accomplish maintenance or construction activities is prohibited unless specifically authorized in writing by the Department. Under certain conditions, it may be necessary to bypass wastewater in order to accomplish such maintenance or construction activities. When such conditions exist, the permittee shall request permission not less than 60 days prior to the proposed date of scheduled bypassing. The request shall include justification for the bypassing and an evaluation of alternatives for minimizing the volume of the bypass. Based upon the information presented, the Department may deny the request, approve it, or approve it with conditions. If the Department determines that the proposal is of significant public interest, the Department may circulate the request for public comment.

EXHIBIT B-2

Permit to Discharge under the
National Pollutant Discharge Elimination System
for the City of
Taylors Falls, Minnesota

AUTHORIZATION TO DISCHARGE AND CONSTRUCT WASTEWATER TREATMENT FACILITIES

UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

AND STATE DISPOSAL SYSTEM PERMIT PROGRAM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq; hereinafter the "Act"), Minnesota Statutes Chapters 115 and 116 as amended and Minnesota Pollution Control Agency Regulation WPC 36 (hereinafter Agency Regulation WPC 36)

CITY OF TAYLORS FALLS

is authorized by the Minnesota Pollution Control Agency, to construct wastewater treatment facilities and/or to discharge from the municipal wastewater treatment facility located in the NW ¼ of the SW ¼ of Section 30, T 34 N, St. Croix Falls Township, R 18 W, Chisago County, and from the bypass point listed herein

to receiving water named the St. Croix River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit is a reissuance of an existing permit which has an expiration date of midnight, June 30, 1977. This reissued permit shall become effective on the date of issuance by the Director and will supersede the existing permit upon issuance.

This permit and the authorization to discharge shall expire at midnight, June 30, 1984. The Permittee is not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Permittee shall submit such information and forms as are required by the Agency no later than 180 days prior to the above date of expiration pursuant to Agency Regulation WPC 36.

Barry C. Schade

Date: NOV 13 1979

Barry C. Schade
Acting Director
Division of Water Quality

For Terry Hoffman
Executive Director
Minnesota Pollution Control Agency

P-R(Rev. 10/78) 325 768

PART I

A. TREATMENT FACILITY DESCRIPTION

The application and plans indicate that the project or existing treatment system consists of:

A grit chamber, primary sedimentation tank, pumping station, dosing siphon trickling filter, resettling tank, chlorination chamber, sludge digester, and sludge drying bed.

The facility has a continuous discharge (Discharge 001) to the St. Croix River and is designed to treat an average flow of up to 75,000 gallons per day with a strength as measured by the 5-day biochemical oxygen demand of 250 milligrams per liter.

The facilities are further described in plans and specifications on file with the Minnesota Pollution Control Agency (X-3545 dated December 8, 1939) and in an engineering report by the firm of Bannister Engineering Company.

Treatment facility bypass Discharge Serial No. 001-A has infrequent untreated discharges to the outfall sewer.

B.1. INTERIM EFFLUENT LIMITATIONS

During the period beginning on the effective date of this Permit and lasting until attainment of final effluent limitations according to the Schedule of Compliance shown in PART I, F., the Permittee is authorized to discharge from outfall(s) serial number (s) 001.

Such discharge shall be limited by the Permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS	
	Continuous Discharge	
	Thirty Consecutive Day Average	Notes
5-Day Biochemical Oxygen Demand (BOD_5)	50 mg/l	(1)
Total Suspended Solids (TSS)	30 mg/l	(1)
Fecal Coliform Bacteria	200 MPN/100 ml	(2)

The pH shall not be less than 6.5 nor greater than 8.5. These upper and lower limitations are not subject to averaging and shall be met at all times.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

The discharge shall not contain oil or other substances in amounts sufficient to create a visible color film on the surface of the receiving waters.

Notes: (1) - Arithmetic Mean (2) - Geometric Mean

draft

140482

B.2. FINAL EFFLUENT LIMITATIONS

The effluent limitations as described in PART I, B.1. shall be construed as interim requirements for a limited duration. Upon termination or expiration of these interim effluent limitations and upon completion of necessary modifications, alterations and/or construction, and lasting until June 30, 1984 the Permittee is authorized to discharge from outfall(s) serial number(s) 001. Such discharge shall be limited by the Permittee as specified below:

This permit is subject to amendment to require compliance with the effluent limitations stated below where changed circumstances or other good cause warrants such action.

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS			
	Continuous Discharge		Controlled Discharge	
	Seven Consecutive Day Average	Thirty Consecutive Day Average	*Average During Discharge Period	Notes
5-Day Biochemical Oxygen Demand (BOD_5)	45 mg/l	25 mg/l	25 mg/l	(1)(3)(4)
Total Suspended Solids (TSS)	45 mg/l	30 mg/l	30 mg/l	(1)(3)(4)
Fecal Coliform Bacteria	400 MPN/100 ml	200 MPN/100 ml	200 MPN/100 ml	(2)
Turbidity	NA	25 NTU	25 NTU	(1)

The pH shall not be less than 6.5 nor greater than 8.5. These upper and lower limitations are not subject averaging and shall be met at all times.
There shall be no discharge of floating solids or visible foam in other than trace amounts.
The discharge shall not contain oil or other substances in amounts sufficient to create a visible color on the surface of the receiving waters.

*In addition, the seven consecutive day average shall not exceed 45 mg/l BOD_5, 45 mg/l TSS, and 400 MPN/100 ml Fecal Coliform Bacteria.

Notes: (1) - Arithmetic Mean; (2) - Geometric Mean; (3) - For the thirty consecutive day average, the effluent BOD_5 and TSS concentrations for a continuous discharge, and the effluent BOD_5 concentration for a controlled discharge, shall not exceed the stated values or 15% of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (most restrictive values). (4) - Weight limitations shall be determined following approval of the Facilities Plan.

draft

B.3. BYPASS/OVERFLOW AUTHORIZATION

In accordance with PART II, A.1.b. and A.2., of this permit, the Permittee is authorized to discharge from bypass/overflow points, outfall(s) serial number(s) 001-A.
The Permittee shall, in accordance with PART II, A.1., of this permit, report in the remarks section of the Discharge Monitoring Report Form, each bypass or overflow event, its duration and estimated volume.

In accordance with the schedule as contained in the Schedule of Compliance shown in PART I, F. of this permit, the Permittee may be required to eliminate or further control the bypass/overflow(s).

C. SPECIAL REQUIREMENTS

1. Section 301 (i)(1) Time Extension

In accordance with Section 301 (i)(1) of the Act, it has been demonstrated that an extension to achieve compliance with limitations under section 301 (b)(1)(B) or 301 (b)(1)(C) should be granted. Therefore, the Agency hereby extends the Schedule for achieving compliance with final effluent limitations.

2. State Certification

The Agency certifies that Federal funding allotted to the State will be made available for obligation under Section 201 of the Act in a timely manner to ensure compliance by the Permittee by July 1, 1983. This certification is dependent on the allocation of sufficient Federal funds to the State. If it is subsequently determined that Federal funding will not be available in time to ensure compliance by the Permittee by July 1, 1983, the time extension shall be terminated in accordance with Minnesota Regulation WPC 36(s).

3. Construction Grant Applications

With regard to all future construction grant applications, the Permittee shall comply with the requirements of Section 201 (b) through (g) of the Act.

4. Funding Progress Report

By December 31 of each year, the Permittee shall submit to the Director (Attn: Compliance and Enforcement Section) a report as to its progress in obtaining Federal funding.

D. MONITORING AND REPORTING

1. Monitoring

a. Representative Sampling
Samples shall be taken at a point representative of the discharge. Any monitoring measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

b. Quality Assurance
In order to insure the validity of analytical data, the Permittee shall submit an outline of the quality assurance program employed by the laboratory performing the analyses. Such outline shall be contained in the monitoring plan required by PART I, D.2.

c. Test Procedures
Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304 (g) of the Act, and Minnesota Statutes, Section 115.03, Subd. 1 (e) (7) as amended.

The Permittee shall periodically calibrate and perform maintenance on all monitoring and analytical instrumentation used to monitor pollutants discharged under this permit, at intervals to insure accuracy of measurements. The Permittee shall maintain written records of all such calibrations and maintenance.

d. Recording of Results
For each measurement taken or sample collected pursuant to the requirements of this permit, the Permittee shall record the following information, except for data in items 1) and 4) below which is identified in the monitoring plan required by PART I, D.2.

1) the exact place, date, and time of sampling;
2) the dates the analyses were performed;
3) the person who performed the analyses;
4) the analytical techniques, procedures or methods used; and
5) the results of such analyses.

e. Additional Monitoring by Permittee
If the Permittee monitors any pollutant designated herein more frequently than required by this permit, or as otherwise directed by the Agency or Director, the results of such monitoring shall be included in the calculation and reporting of values submitted on the Discharge Monitoring Report Form. Any increased monitoring frequency shall also be indicated on such designated form.

f. <u>Recording and Records Retention</u>
All sampling and analytical records required by this permit shall be retained by the Permittee for a minimum of three (3) years. The Permittee shall also retain all original recordings from any continuous monitoring instrumentation, and any calibration and maintenance records, for a minimum of three (3) years. These retention periods shall be automatically extended during the course of any legal or administrative ; oceedings or when so requested by the Regional Administrator, the Agency, or the Director.

2. <u>Monitoring Plan</u>

The Permittee shall submit a monitoring plan or monitoring plan amendments to the Director for approval within forty-five (45) days after the date of issuance of this permit, unless a previously submitted monitoring plan has not been rejected by the MPCA and is being followed. New monitoring plans or amendments to previous monitoring plans shall be submitted if changes are to be made or if additional or different monitoring is required by this permit. The monitoring plan shall include the items described in Agency Regulation WPC 36 (n)(2).

3. <u>Reporting</u>

a. The Permittee shall effectively monitor the operation and efficiency of all treatment facilities and the quantity and quality of the treated discharge. The Permittee shall enter on the Agency Monthly Operation Report of Wastewater Treatment Facility (MPCA Form 703) the determinations as listed in PART I, D.4.

b. The reporting form shall be submitted to the Director on a monthly basis, or as specified in PART I, C., at the following address and shall be postmarked no later than the 21st day following the month during which the monitoring was completed:

Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113
Attn: Compliance and Enforcement Section

c. The Permittee shall report the results of the monitoring in the units specified in this permit. The reports or written statements shall be submitted even if no discharge occurred during the reporting period. The report shall include (a) a description of any modifications in the wastewater collection, treatment, and disposal facilities;

(b) any substantial changes in operational procedures; (c) any other significant activities which alter the nature or frequency of the discharge; (d) any other material factors affecting compliance with the conditions of this permit and such information as the Agency or Director may reasonably require of the Permittee pursuant to Agency Regulation, WPC 36 (n) and Minnesota Statutes, Chapters 115 and 116 as amended.

d. Except for data determined to be confidential under Section 308 of the Act, and Minnesota Statutes, Section 116.075, Subd. 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Agency. Procedures for submitting such confidential material shall be pursuant to Minnesota Regulation WPC 36 (j) (2). As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report, confidential or otherwise, is subject to the imposition of criminal penalties as provided for in Section 309 of the Act and Minnesota Statutes, Section 115.071 Subd. 2 (b).

4. Monitoring Requirements for Class C Mechanical Wastewater Treatment Facilities Serving Population Areas of up through 700

Determination	Frequency	Sample Type	Notes
Precipitation	Daily		
Influent flow	Daily	Continuous	
Effluent fecal coliform	Monthly	Grab	
Effluent dissolved oxygen	Monthly	Grab	(1)
Chlorine residual	Daily	Grab	(1)(2)
Chlorine used	Daily		
Influent settleable solids	Daily	Grab	(1)(2)
Effluent settleable solids	Daily	Grab	(1)(2)
Effluent pH	Monthly	Grab	(3)
Influent BOD_5	Monthly	4 hour composite	(4)
Effluent BOD_5	Monthly	4 hour composite	(4)
% BOD_5 removal	Monthly		
Influent total suspended solids	Monthly	4 hour composite	(4)
Effluent total suspended solids	Monthly	4 hour composite	(4)
% Total suspended solids removal	Monthly		

Notes:

(1) Analysis shall be performed at the time of sampling.

(2) Excluding weekends and holidays.

(3) It is recommended that the analysis be performed at the time of sampling; however, if this is not possible, a holding time of up to six (6) hours is permissible between the time of sampling and the time of analysis.

(4) The four (4) hour composite shall be collected during the time period which will provide the most representative sample. Unless a more representative time interval can be established, this composite shall be collected between 10:00 A.M. and 2:00 P.M.

DEFINITIONS

1. The "Agency" means the Minnesota Pollution Control Agency, as constituted pursuant to Minnesota Statutes, Section 116.02, Subd. 1.

2. The "Director" means the Executive Director of the Minnesota Pollution Control Agency as described in Minnesota Statutes, Section 116.03 as amended.

3. The "Regional Administrator" means the Environmental Protection Agency (EPA) Regional Administrator for the region in which Minnesota is located (now Region V).

4. The "Act" means the Federal Water Pollution Control Act, as amended 33 U.S.C. 1251, et seq.

5. A "Composite" sample, for monitoring requirements, is defined as (1) a series of grab samples collected at least once per hour at equally spaced time intervals and proportioned according to flow, or (2) grab samples of equal volume collected at equally spaced intervals of wastewater volume and collected not less than once per hour.

6. The thirty (30) consecutive day average, other than for fecal coliform bacteria, is defined as the arithmetic mean of the samples collected in a period of thirty (30) consecutive days. The thirty (30) consecutive day average for fecal coliform bacteria is defined as the geometric mean of samples collected in a period of thirty (30) consecutive days.

7. The seven (7) consecutive day average, other than for fecal coliform bacteria, is defined as the arithmetic mean of the samples collected in a period of seven (7) consecutive days. The seven (7) consecutive day average for fecal coliform bacteria is defined as the geometric mean of samples collected in a period of seven (7) consecutive days.

8. The "Grant Agreement" means the formal EPA grant offer, as executed by the Permittee, accepting an EPA construction grant, or the grant agreement between the Permittee and the Agency in the case of the Independent State Grant Program.

F. SCHEDULE OF COMPLIANCE

1. The Permittee shall achieve compliance with the future final effluent limitations and eliminate or control any bypass/overflow points that may exist by proceeding in accordance with the following schedule:

   a) Submit facilities plan (Step 1 Grant) not later than April 30, 1980.

   b) The Permittee shall submit a completed grant application for a step 2 grant as soon as possible and not later than 150 days of being notified by the Agency of the availability of funds, or within any other reasonable time period specified by the Agency.

   c) Upon completion and approval of the Facilities Plan, this permit will be modified in accordance with Minnesota Regulation WPC 36(s) to incorporate fixed date schedules for the Step 2 and Step 3 grants.

   d) The Permittee shall submit a report to the Director of the MPCA (Attn: Compliance and Enforcement Section) within fourteen days following each date in the schedule. The report shall indicate compliance or noncompliance with the schedule, and in the case of noncompliance, include the cause of noncompliance, any remedial actions taken, and the probability of meeting the remaining scheduled requirements.

2. The Permittee shall submit a report of progress on June 30 and December 31, of each year, in addition to other reports required by the above schedule.

3. The Permittee shall submit the necessary reports, plans and specifications for the construction required by the compliance schedule in this permit or contained in subsequent modifications to this permit to the Director (Attn: Compliance and Enforcement Section) for review and written approval in accordance with PART II, A.9.

4. No construction shall begin until the Permittee has submitted reports, plans, and specifications for the construction to the Director (Attn: Compliance and Enforcement Section) and has received written approval of the reports, plans, and specifications in accordance with PART II, A.9. of this permit.

PART II

A. MANAGEMENT REQUIREMENTS

1. Non-Compliance and Bypass Notification

If, for any reason, the Permittee exceeds any effluent limitation specified in the permit, bypasses, or causes a diversion of wastewater or unauthorized discharge in violation of this permit, the Permittee shall notify the Director as follows:

a. Telephone Communication
Report Immediately to the Compliance and Enforcement Section (612)296-7373 any bypass which may cause a nuisance or health hazard and all unauthorized discharges, accidental or otherwise of oil, toxic pollutants, or other hazardous waste. The Permittee shall immediately recover as rapidly and thoroughly as possible such discharged substance(s) and take such other action as may be reasonable to minimize or abate pollution of the waters of the State. This must be followed by a written explanation on the discharge monitoring report.

b. Prior Approval
Bypassing which would result in the discharge of raw or inadequately treated effluent is prohibited during routine maintenance procedures. If, for any reason, a major treatment unit must be bypassed for routine maintenance, and this bypass will result in a degradation of the effluent, the Director (Attn: Operations Unit, (612)296-7207) must be notified and grant approval prior to removing this unit from service. In the case of emergency maintenance, the Director shall be informed of the circumstances surrounding the need for emergency maintenance and the action taken.

c. Written Report
Report on the Discharge Monitoring Report, any violation of daily minimum, maximum, seven (7) day average, or thirty (30) day average effluent limitation and any bypass that did not present a nuisance or health hazard.

d. Written notification required above shall contain the following information:

(1) A description of the discharge, approximate volume, and cause of non-compliance or bypass.

(2) The period of non-compliance or bypass including exact dates and times; or if not corrected, the anticipated time the non-compliance is expected to continue; and steps taken to correct, reduce, eliminate and prevent recurrence of the non-complying discharge.

2. Bypassing

The diversion or bypass of any discharge from the collection system or treatment facility by the Permittee is prohibited, except: (1) where unavoidable to prevent loss of life or severe property damage; or (2) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the terms and conditions of this permit; or (3) where emergency maintenance must be performed; or (4) where routine maintenance must be performed on a major treatment unit and prior approval has been received from the Director. Provision (3) does not authorize discharges caused by a failure to perform routine or preventive maintenance or by a failure to maintain system reliability in accordance with PART II, A.8.

3. Adverse Impact

The Permittee shall take all reasonable steps to minimize any adverse impact to waters of the State resulting from:

a. All unauthorized discharges accidental or otherwise, of oil, toxic pollutants or other hazardous substances;
b. Effluent limitation violations or;
c. A bypass.

4. Change in Discharge

a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil or criminal penalties as provided for in Section 309 of the Act and Minnesota Statutes Section 115.071.

b. Facility modifications, additions, and/or expansions that increase the plant capacity shall be reported to the Director, (Attn: Compliance and Enforcement Section) and this permit then modified or reissued to reflect such changes.

c. Any anticipated change in the facility discharge, including any new significant industrial discharge or significant change in the quality of existing industrial discharges to the treatment system that may result in a new or increased discharge of pollutants shall be reported to the Director, (Attn: Compliance and Enforcement Section). Modification to the permit may then be made to reflect any necessary change in permit conditions, including any necessary effluent limitations for any pollutant not identified and limited herein.

d. In no case are any new connections, increased flows, or significant changes in influent quality permitted that will cause violation of the effluent limitations specified herein.

5. Sewer Extensions

In accordance with Minnesota Statutes Section 115.07 Subd. 3, application must be made, plans and specifications submitted, and a permit obtained for any addition to or extension of a sanitary sewer prior to the commencement of construction.

6. Facilities Operation and Quality Control

All waste collection, control, treatment, and disposal facilities shall be operated in a manner consistent with the following:

a. Maintenance of the treatment facility that results in degradation of effluent quality shall be scheduled as much as possible during non-critical water quality periods and shall be carried out in a manner approved by the Director.

b. The Director may require the Permittee to submit a maintenance plan to eliminate degradation of the effluent. The Permittee shall operate the disposal system in accordance with this plan as approved by the Director.

c. The Permittee shall provide an adequate operating staff which is duly qualified under Minnesota Regulations WWOB 1, if applicable (as determined by the Director pursuant to Agency Regulation WPC 36 (1) (6) (ee), to carry out the operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

d. The Permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used to achieve compliance with the terms and conditions of this permit.

e. Necessary in-plant control tests shall be conducted at a frequency adequate to ensure continuous efficient operation of the treatment facility.

7. Removed Substances

The Permittee shall dispose of solids, sludges, or other pollutants removed from or resulting from treatment or control of wastewaters in a manner acceptable to the Agency. When requested by the Director, the Permittee shall submit for approval an acceptable plan for such disposal and shall be responsible for obtaining Agency approval and/or permit of such disposal plans.

8. System Reliability

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes at all times. The Permittee is responsible for insuring system reliability by means of alternate power sources, back up systems, storage of inadequately treated effluent, or other appropriate methods of maintaining system reliability.

9. Construction

This permit only authorizes the construction of treatment works to attain compliance with the limitations and conditions of this permit, after plans and specifications for treatment facilities have been submitted and approved in writing by the Director prior to the start of any construction.

B. RESPONSIBILITIES

1. Prohibited Wastes

Under no circumstances shall the Permittee allow the introduction of wastes prohibited by regulations promulgated pursuant to Section 307 of the Act or regulations adopted by the Agency (Rules and Regulations WPC 36) into the sewer collection system including, but not limited to the following:

a. Those which create a fire or explosion hazard in the disposal system,

b. Which will cause corrosive structural damage to the disposal system,

c. Solids or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment works,

d. Wastewaters at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so as to cause a loss of treatment efficiency.

e. New wastes or increased volumes or quantities of wastes from contributing industries in such volumes or quantities as to overload the treatment facility or cause a loss of treatment efficiency.

2. Cooling Water

a. Recirculation of non-contact cooling water by contributors to the collection system shall be encouraged in order to conserve surface and ground water supplies and to reduce the hydraulic load on the collection and treatment system of municipal wastewater treatment facilities receiving these discharges.

b. Consistent with federal construction grant regulations and the intent of the Act, existing discharges of non-contact cooling waters to municipal sanitary sewer systems shall be eliminated, where such elimination is cost effective, where such discharges adversely impact the municipal treatment facilities, or where an infiltration/inflow analysis and sewer system evaluation survey indicates the need for such removal, provided such discharges are in compliance with all applicable Agency effluent quality standards, or which, through reasonable measures, can be brought into such compliance.

c. New discharges of non-contact cooling waters to municipal sanitary sewer systems are prohibited, unless there are no cost-effective alternatives, provided such discharges do not cause the discharge from the facility to violate the effluent limitations contained in this permit.

3. Transfer of Ownership or Control

No permit may be assigned or transferred by the holder without the approval of the Agency. In the event of any changes in control or ownership of the facilities, a Request for Permit Transfer, signed by both parties shall be sent to the Agency, Attn: Compliance and Enforcement Section. Any succeeding owner or controller shall also comply with the terms and conditions of this permit.

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;
b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
d. Agency Regulation WPC 36 (s) (1).

5. Toxic Pollutants

Notwithstanding PART II,B.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307 (a) of the Act or Minnesota Statutes, Chapters 115 and 116 as amended, for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and in accordance with applicable laws and regulation.

6. Right of Entry

The Permittee shall, pursuant to Section 308 of the Act and Minnesota Statutes 115.04, allow the Director of the Agency, the Regional Administrator, and their authorized representatives, upon presentation of credentials:

a. to enter upon the Permittee's premises where a disposal system or other point source or portion thereof is located for the purpose of obtaining information, examination of records, conducting surveys, or investigations;
b. to examine and copy any books, papers, records, or memoranda pertaining to the installation, maintenance, or operation of the discharge, including but not limited to, monitoring data of the disposal system or point source or records required to be kept under the terms and conditions of this permit;

c. to inspect any monitoring equipment or monitoring procedures required in this permit; and

d. to sample any discharge of pollutants.

7. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the Permittee from civil or criminal penalties for non-compliance with the terms and conditions provided herein.

8. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties to which the Permittee is or may be subject to under Section 311 of the Act and Minnesota Statutes, Chapters 115 and 116 as amended.

9. Minnesota Laws

Nothing in this permit shall be construed to preclude the institution of any legal or administrative proceedings or relieve the Permittee from any responsibilities, liabilities, or penalties for violation of effluent and water quality limitations not included in this permit.

10. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or Local laws or regulations.

11. Severability

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

EFFLUENT LIMITATIONS ON INDUSTRIAL POLLUTANTS

Requirements for Effluent Limitations on Pollutants Attributable to Industrial Users.

By regulations promulgated pursuant to Section 307(b) of the Act, or regulations adopted by the Agency pursuant to Minnesota Statutes, 115.03, Subd. 1 (e) (6) the Permittee shall, with respect to all major contributing industries impose such pre-treatment requirements on such industrial users as may be necessary to assure compliance by the Permittee with all applicable effluent limitations set forth in this Permit, with more restrictive pretreatment requirements as promulgated by the U.S. Environmental Protection Agency pursuant to Section 307 (b) of the Act, or as otherwise required by the Director. A major contributing industry is one that: (a) has a flow of 50,000 gallons or more per average work day; (b) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (c) has in its waste a toxic pollutant, in toxic amounts, as defined in standards issued under Section 307(a) of the Act; or (d) has significant impact, either individually or in combination with other contributing industries, on the treatment works or the quality of its effluent.

Immediately following the issuance of this Permit, the Permittee shall establish and implement a procedure to obtain from all major industrial contributors, specific information on the quality and quantity of effluents introduced by such industrial contributors and their impact on the overall municipal discharge. This information shall be reported to the Director (Attn: Compliance and Enforcement Section) on a quarterly basis, with reports for the previous three months, postmarked no later than the 21st day of January, April, July, and October.

This permit may be modified in accordance with WPC 36(s) to incorporate a compliance schedule for the Permittee to develop a Pretreatment Program in accordance with Title 40 of the Code of Federal Regulations, Part 403 (40 CFR 403). In addition, prior to allowing a significant industrial contributor to tie into the municipal sewer system, the Permittee shall develop an approved Pretreatment Program in accordance with 40 CFR 403.

APPENDIX C

Geology and Soils

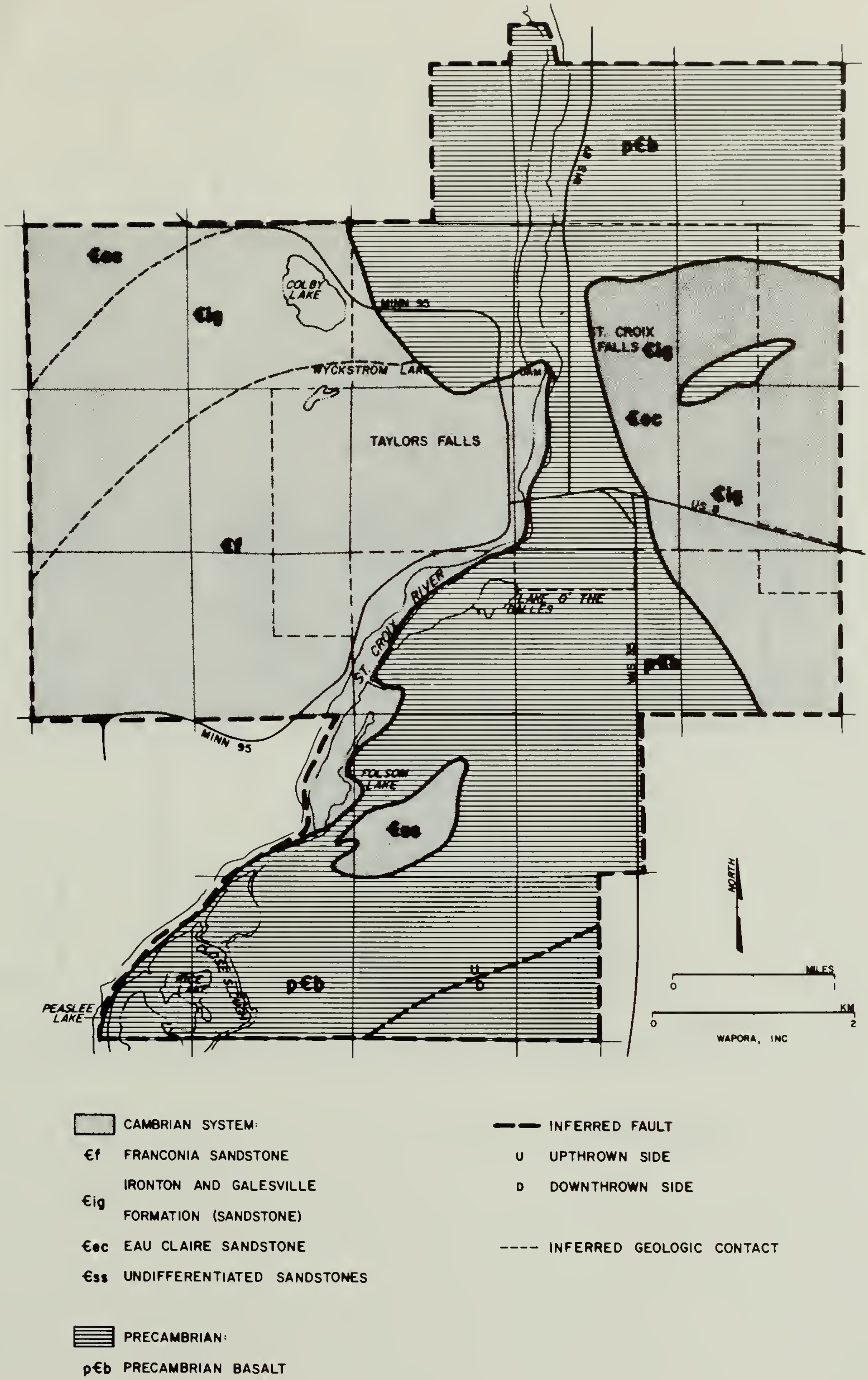


Figure C-1. Character of the bedrock surface in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

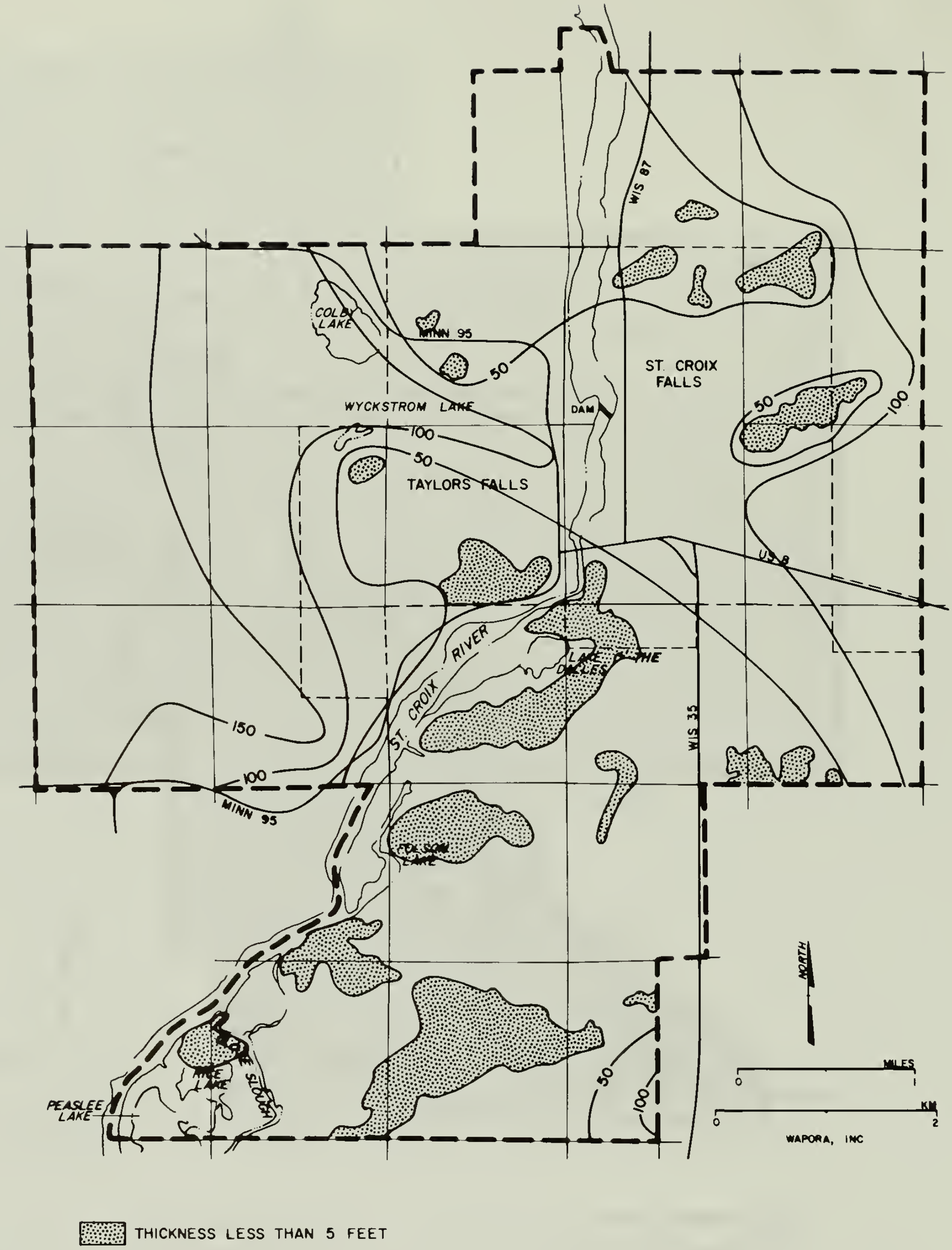


Figure C-2. Thickness of glacial deposits in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

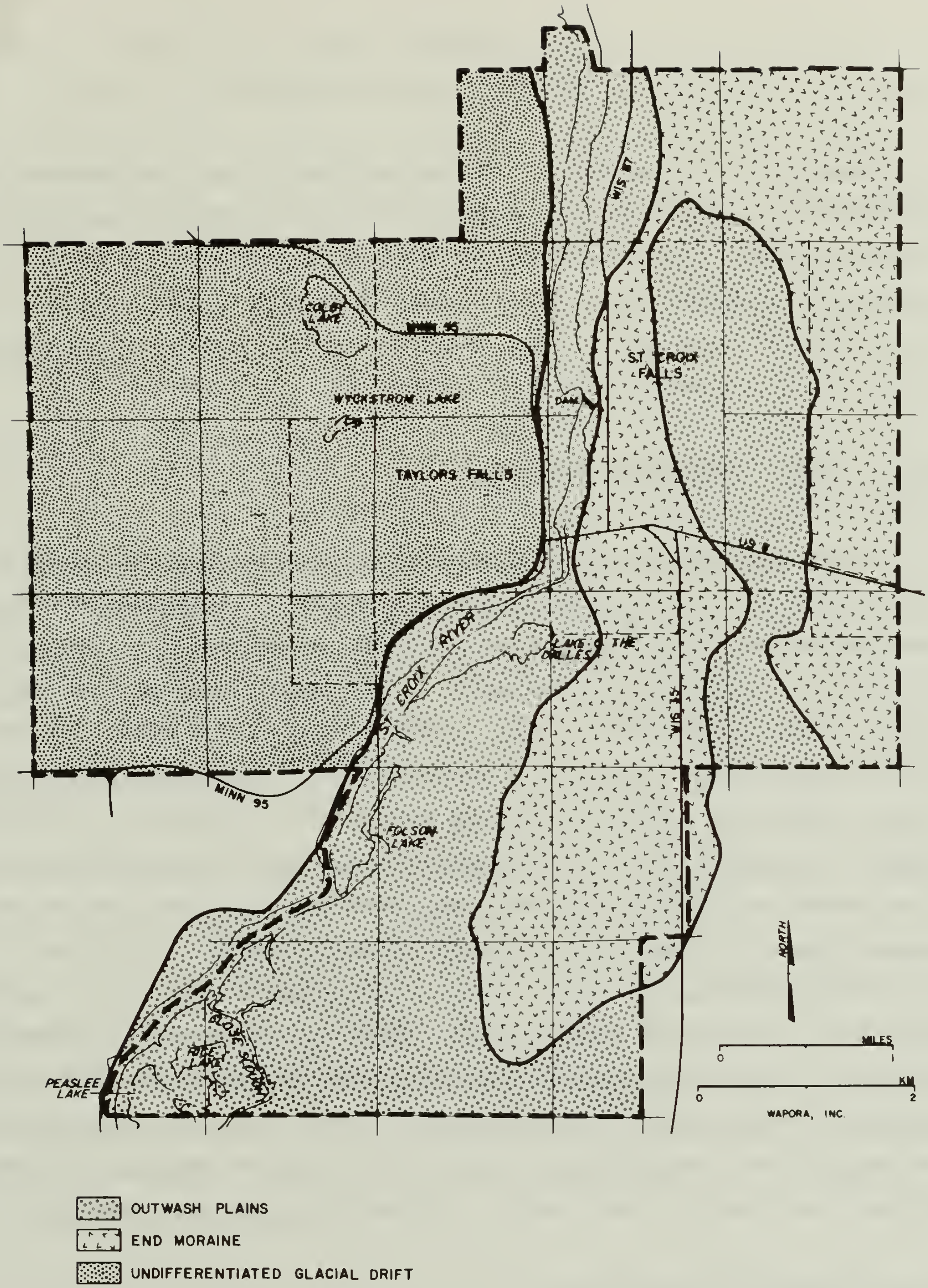


Figure C-3. Character of glacial deposits in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

EXHIBIT C-1

Soils of the Project Area

The soils of the project area generally are coarse textured and well-drained on the Wisconsin side and medium textured and poorly-drained on the Minnesota side. The general soils associations within the project area are presented in Figure 4-2. These associations may consist of soils that are very different from each other but that occur together. They may include only half of the soils indicated in the name of the association.

Onamia-Cromwell-Menahga Association

The predominant soil associations present in the Wisconsin section of the project area is the Onamia-Cromwell-Menahga. It is described as nearly level to steep, well-drained to excessively-drained, loamy and sandy soils over glacial outwash sand and gravel. It occurs on terraces and terraced slopes in the project area. The Onamia series is the most prominent series in the association, and is a well-drained, nearly level to moderately steep, loamy soil underlain by sand and gravel at depths of 20 inches to 40 inches. Permeability in the surface soil (upper 30 inches) is moderate (0.6 inches to 2.0 inches per hour) and in the substratum is very rapid (greater than 20 inches per hour). The Cromwell series is a somewhat excessively-drained, nearly level to moderately steep soil underlain by sand and gravel at a depth of 15 inches to 30 inches. Permeability is moderately rapid (0.2 inches to 6.0 inches per hour) in the surface soil (upper 15 inches depth) and rapid (6.0 inches to 20.0 inches per hour) in the substratum. The Menahga series consists of excessively-drained, gently sloping to steep, sandy soils. Permeability of the profile is rapid.

Burkhardt-Dakota Association

The next most extensive association present in the Wisconsin section of the project area is the Burkhardt-Dakota. It is characterized as nearly level to sloping, well-drained and somewhat excessively-drained, loamy soil over glacial outwash sand and gravel. This association occurs southwest of Dresser, along CTH S south of the Wisconsin Interstate State Park, and at the northeast corner of the St. Croix Falls corporate boundary. The Burkhardt series consists of well-drained, nearly level, sandy soils underlain by gravel at depths of 10 inches to 20 inches. The permeability of the surface soil and the substratum is rapid. The Dakota complex is composed of well-drained, nearly level to gently sloping loamy soils underlain by glacial outwash sand and gravel at depths of 24 inches to 40 inches. The surface soil permeability is moderate, while the substratum permeability is rapid.

Cushing Association

The Cushing association occurs to the south of St. Croix Falls. It consists of gently sloping to steep, well-drained loamy soil over loam glacial till. The Cushing series soils are well-drained, gently sloping to steep loamy soils underlain by loam glacial till at depths of 24 inches to 50 inches. The permeability of the surface material (upper 40 inches) is moderate and the permeability of the underlying material is moderately slow (0.2 inches to 0.6 inches per hour).

Amery-Santiago Association

The Amery-Santiago association occurs on the top of the hill south of St. Croix Falls (Section 6) and along the east boundary of the project area. The soils are gently sloping to steep, well-drained, loamy-textured soils over sandy loam glacial till. The Amery series consists of deep (upper 30 inches to 50 inches), well-drained, gently sloping to steep loamy soils. These soils overlie glacial till that consists of fine sandy loam, sandy loam, or loamy sand. The permeability of the surface material is moderate to moderately rapid, and the permeability of the underlying material is moderately rapid.

The Santiago series consists of well-drained, gently sloping to moderately steep, loamy soils underlain by sandy loam glacial till. The permeability throughout the profile is moderate.

Hayden-Bluffton Association

The principal soil association in the eastern part of the Minnesota section of the project area is the Hayden-Bluffton. This association is characterized by nearly level to very steep, very poorly to well-drained, loamy soils formed in loam glacial till. The Hayden series consists of well-drained, gently sloping to steeply sloping, loamy soils underlain by loam glacial till. Permeability is moderate throughout the profile. The Bluffton series consists of poorly and very poorly-drained, nearly level loamy soils. They are underlain by loam to sandy clay loam glacial till. The permeability of the surface material (upper 22 inches) is moderately slow to moderately rapid, and the underlying glacial till is moderately slow.

Nessel-Bluffton Association

The Nessel-Bluffton association extant in the western, Minnesota section of the project area are nearly level to gently sloping, very poorly to moderately well-drained, loamy soils formed in loam glacial till. The Nessel series consists of moderately well-drained, nearly level to gently sloping, loamy soils underlain by loam glacial till on ground moraines. Permeability of these soils is moderate throughout the entire profile. The Bluffton series was described in the discussion of the Hayden-Bluffton association.

Special Limitations

Two areas within the project area are mapped as "shallow to bedrock" (Figure 4-2). These areas include the bluff along the St. Croix River south of Taylors Falls, (Sections 25, 35 and 36) and the hill on the northern boundary of the project area (Section 24). These areas are characterized by numerous bedrock exposures and shallow bedrock depths. Slopes are nearly level to very steep. The texture of the soil material is highly variable.

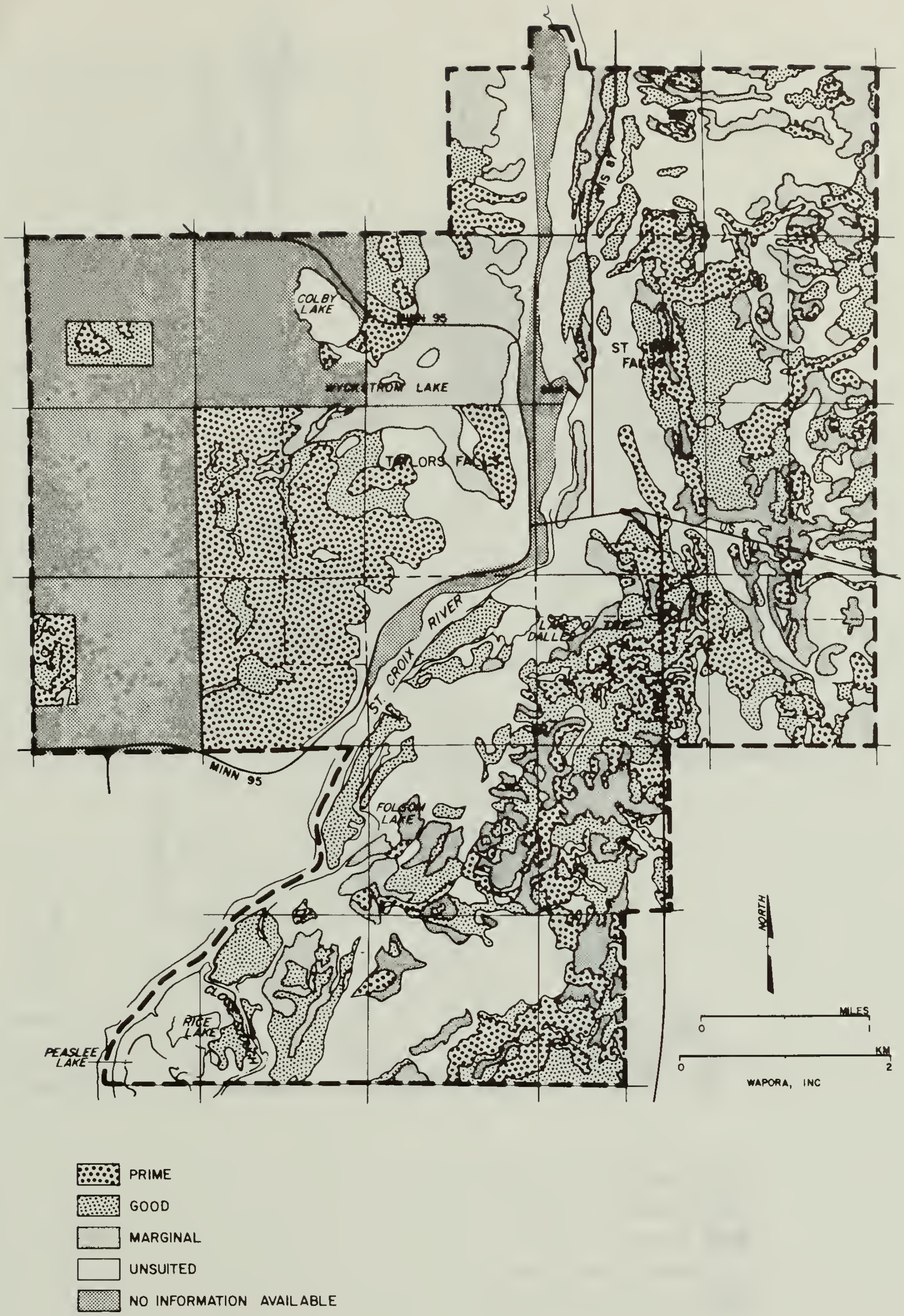


Figure C-4. Agricultural land classes in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

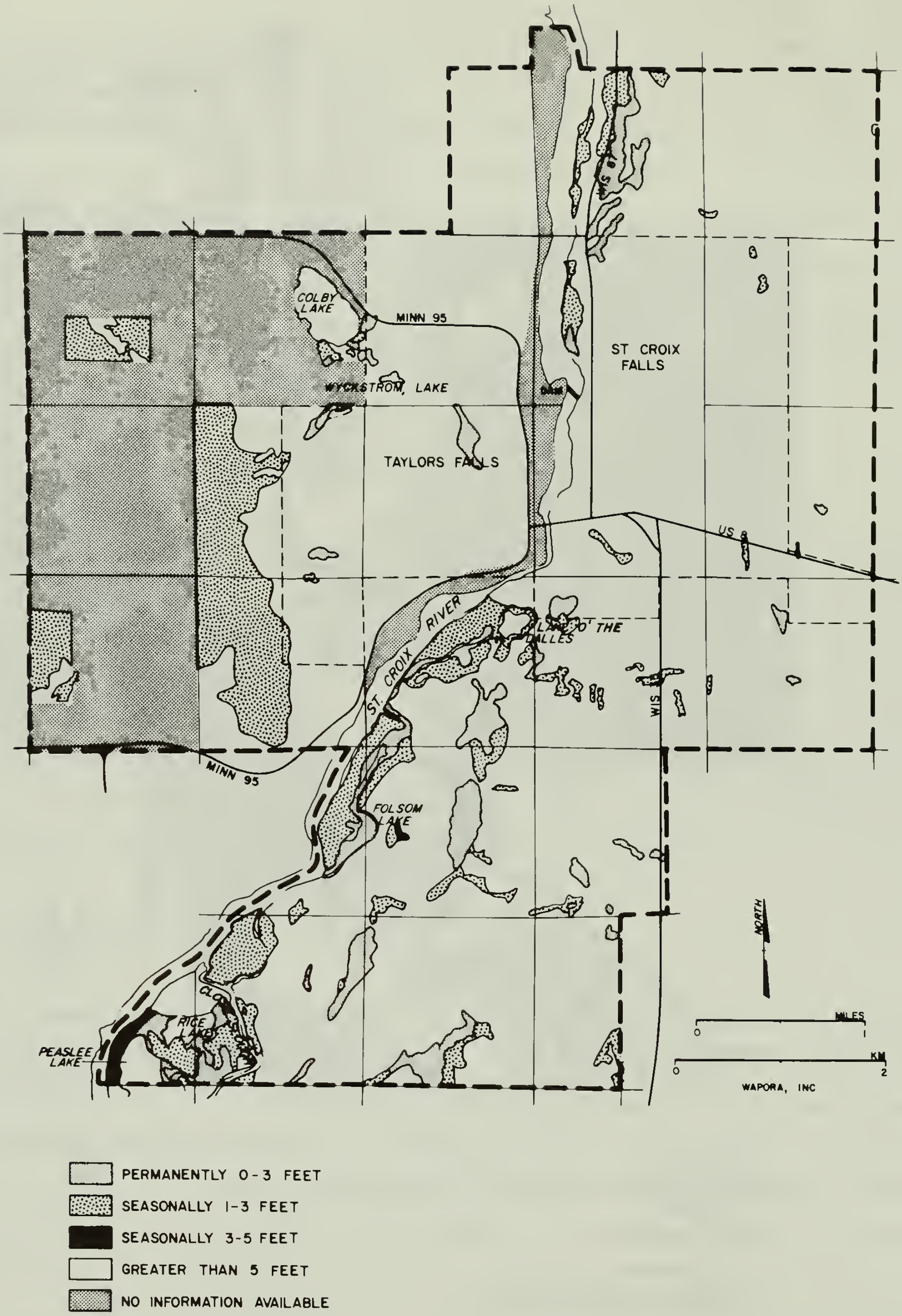


Figure C-5. Depth to water table in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

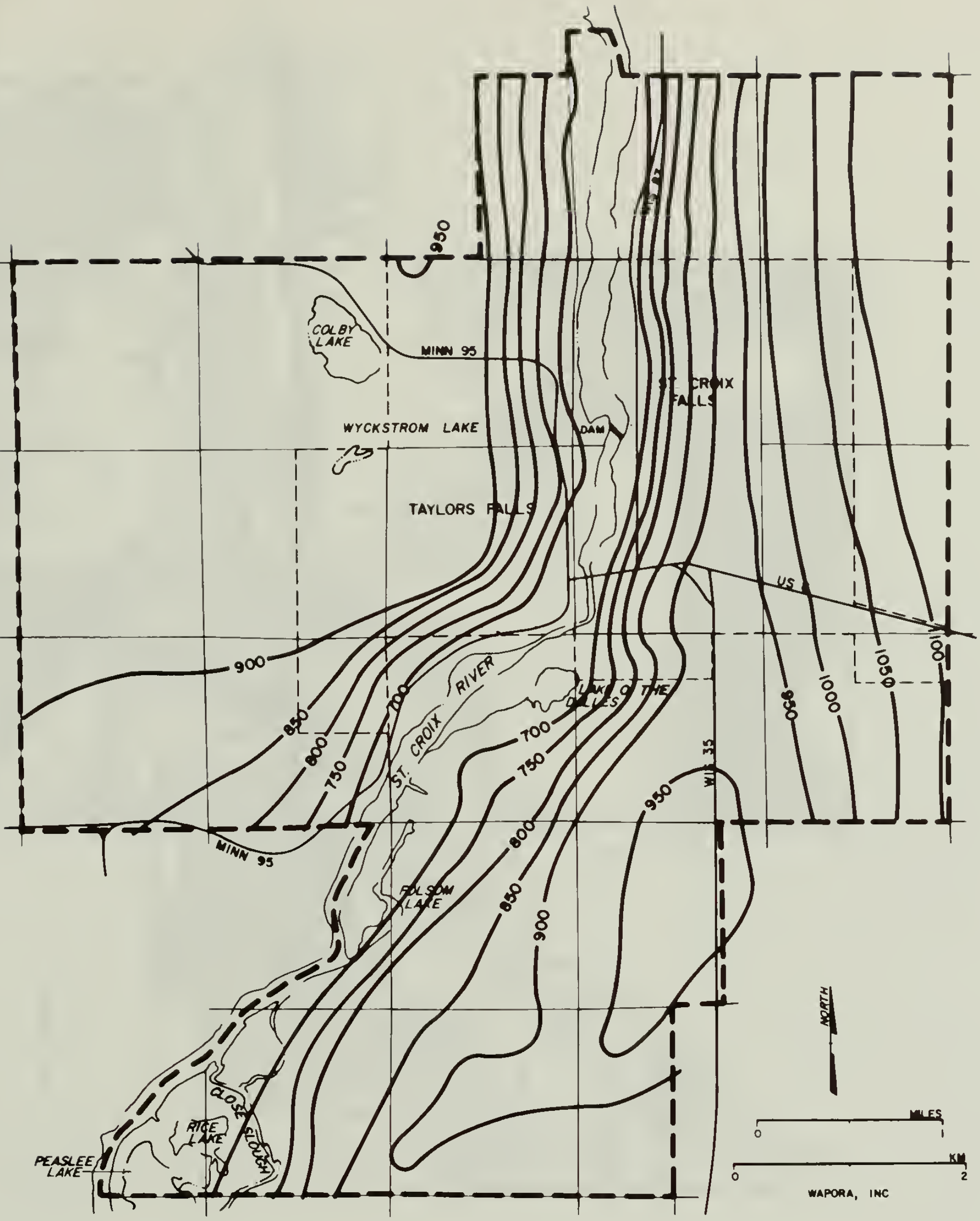


Figure C-6. Generalized water table map for the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

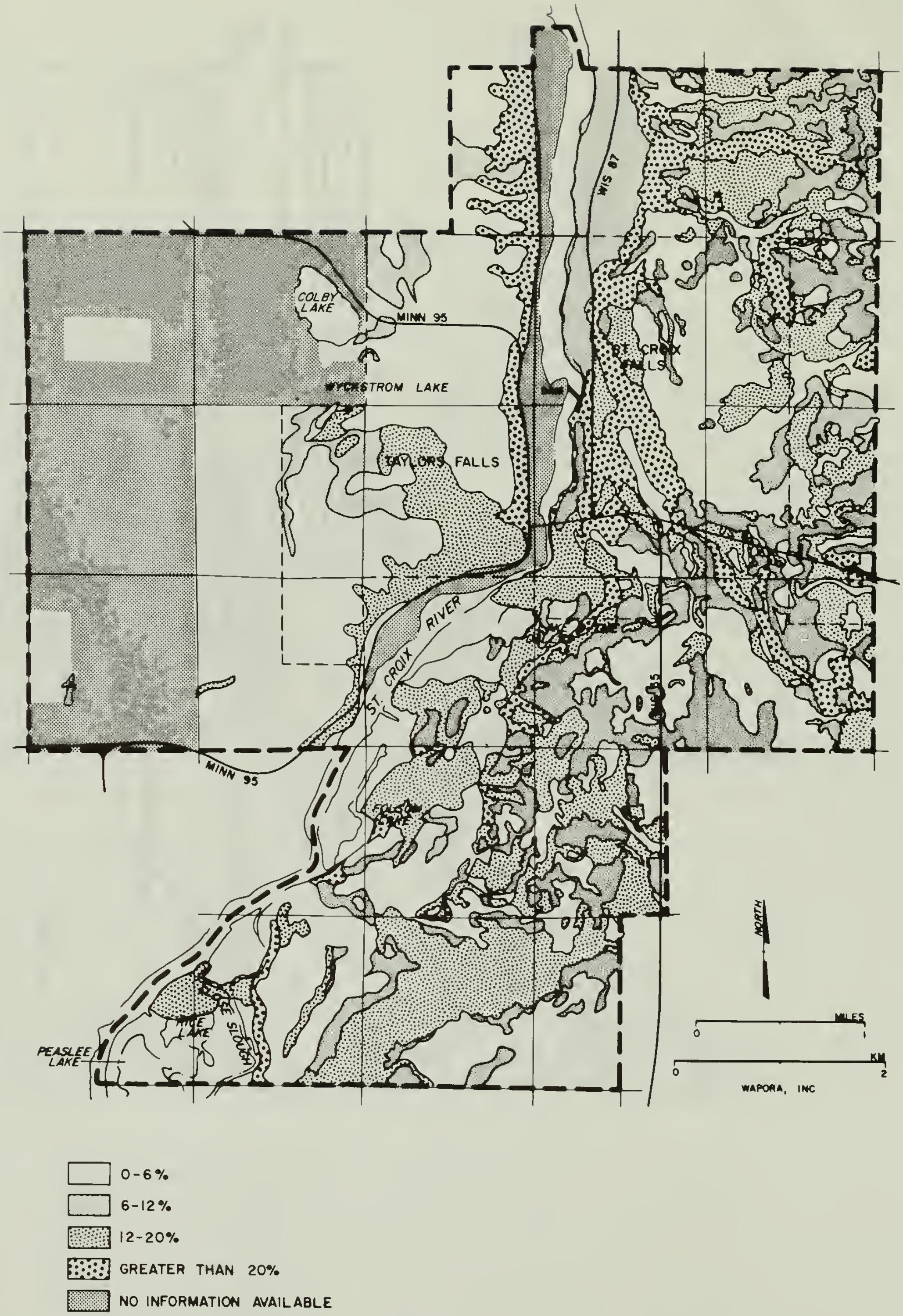


Figure C-7. Slope gradients in the St. Croix Falls, Wisconsin-Taylors Falls, Minnesota, project area.

APPENDIX D

Water Quality

Table D-1. Wisconsin water quality standards for the St. Croix River downstream from the northern boundary of Polk County.

Parameter	Limit
Dissolved oxygen	5 mg/l
Temperature	1) There shall not be any changes which adversely affect aquatic life 2) Natural daily and seasonal fluctuations shall be maintained 3) Maximum rise at the edge of the mixing zone above the existing natural temperature shall not exceed -12.7°C (5°F). 4) Shall not exceed 71° (89°F) for warmwater fish
pH	Shall be within the range 6.0 to 9.0 with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum
Fecal coliform	The membrane filter count shall not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month
Dissolved solids	Not to exceed 500 mg/l as a monthly average value, nor exceed 750 mg/l at any time at sites where water is withdrawn for treatment and distribution as a potable water

Table D-2. Minnesota water quality standards for the St. Croix River downstream from the dam located in Taylors Falls (MPCA 1978a).

Parameter	Limit
Fecal coliform	200 MPN/100 ml
Turbidity	25 NTU
Dissolved oxygen	Not less than 6 mg/l from 1 April through 31 May, and not less than 5 mg/l at other times
Temperature	Shall not exceed a rise of -12.7°C (5°F) above natural levels, based on monthly average of the maximum daily temperature or in any case the daily average temperature shall not exceed 68°C (86°F)
Ammonia as nitrogen	1 mg/l
Chromium	0.05 mg/l
Copper	0.01 mg/l or not greater than 0.10 the 96-hour mean tolerance limit (TLM) value
Cyanides	0.01 mg/l
Oil	0.5 mg/l
pH	Within the range of 6.5 to 8.5 units
Phenols	0.001 mg/l and none that could impart odor or taste to freshwater edible products such as crayfish, clams, prawns and like creatures
Color value	15 units
Threshold odor number	3 units
Methylene blue active substance	0.5 mg/l
Arsenic	0.01 mg/l
Chlorides	100 mg/l
Carbon chloroform extract	0.2 mg/l

Table D-2. Minnesota water quality standards (continued).

Parameter	Limit
Fluorides	1.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Nitrates	45 mg/l
Sulfates	250 mg/l or 10 mg/l applicable to waters used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels
Total dissolved solids	500 mg/l
Zinc	5 mg/l
Barium	1 mg/l
Cadmium	0.01 mg/l
Chromium (hexavalent)	0.05 mg/l
Lead	0.05 mg/l
Selenium	0.01 mg/l
Silver	0.05 mg/l
Radioactive material	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
Hardness	250 mg/l
Bicarbonates	5 meq/l
Boron	0.5 mg/l
Specific conductance	1,000 umhos/cm
Total dissolved salts	700 mg/l

Table D-2. Minnesota water quality standards (concluded).

Parameters	Limit
Sodium	60% of total cations as meq/l
Total salinity	1,000 mg/l
Hydrogen sulfide	0.02 mg/l
Unspecified toxic substances	None at levels harmful either directly or indirectly

Table D-3. Water quality standards for Dry Creek (MPCA 1978a).

Parameter	Limit
Dissolved oxygen	Not less than 6 mg/1 from 1 April through 31 May, and not less than 5 mg/1 at other times
Temperature	-12.7°C (5°F) above natural based on monthly average of the maximum daily temperature except in no case shall it exceed the daily average temperature of 68°C (86°F)
Ammonia as nitrogen	1 mg/1
Chromium	0.05 mg/1
Copper	0.01 mg/1 or not greater than 0.1 of the 96-hour mean tolerance limit (TLM) value
Cyanides	0.02 mg/1
Oil	0.05 mg/1
pH	Within the range of 6.5 to 8.5 units
Phenols	0.01 mg/1 and none that could impart odor or taste to fish flesh or other freshwater 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	25 NTU
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
Biocarbonates	5 meq/1
Boron	0.5 mg/1
Specific conductance	1,000 umhos/cm
Total dissolved salts	700 mg/1

Table D-3. Water quality standards for Dry Creek (concluded).

Parameter	Limit
Sodium	60% of total cations as meq/l
Fecal coliform organisms	200 MPN per 100 ml
Sulfates	10 mg/l applicable to waters used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels
Total salinity	1,000 mg/l
Unspecified toxic substances	None at levels harmful either directly or indirectly
Chlorides	250 mg/l
Hardness	500 mg/l
Hydrogen sulfide	0.02 mg/l

Table D-4. Water quality standards for Colby Lake and other Minnesota intrastate waters not specifically classified (MPCA 1978a).

Parameter	Limit
Dissolved oxygen	Not less than 6 mg/l from 1 April through 31 May and not less than 5 mg/l at other times
Temperature	-12.7°C (5°F) above natural in streams and -14.7°C (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 68°C (86°F)
Ammonia as nitrogen	1 mg/l
Chromium	0.05 mg/l
Copper	0.01 mg/l or not greater than 0.1 the 96-hour TLM value
Cyanides	0.02 mg/l
Oil	0.5 mg/l
Phenols	0.01 mg/l and none that could impart odor or taste to fish flesh or other freshwater 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	25 NTU
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
Chlorides	100 mg/l
Hardness	250 mg/l
Biocarbonates	5 mg/l
Boron	0.5 mg/l

Table D-4. Water quality standards for Colby Lake (concluded).

Parameter	Limit
pH	Within the range of 6.0 to 8.5 units
Specific conductance	1,000 umhos/cm
Total dissolved salts	700 mg/l
Sodium	60% of total cations as meq/l
Fecal coliform organisms	200 MPN/100 ml
Sulfates	10 mg/l applicable to waters used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels
Total salinity	1,000 mg/l
Unspecified toxic substances	None at levels harmful either directly or indirectly
Hydrogen sulfide	0.02 mg/l

Table D-5. Concentrations of heavy metals in the St. Croix River at St. Croix Falls, Wisconsin, for water years 1976 and 1977 (USGS 1977, 1978). Values represent total metal concentrations and are expressed in micrograms per liter (μg/l).

Date	Arsenic	Cadmium	Chromium	Cobalt	Copper
14 October 1975	1	0	<10	0	24
14 January 1976	1	0	10	0	10
14 April 1976	0	0	<10	1	0
6 July 1976	0	1	<10	0	0
7 October 1976	1	0	<10	1	0
11 January 1977	2	1	<10	0	0
19 March 1977	1	2	<10	0	10
8 July 1977	3	0	<10	0	2
Mean	1	1	<10	0	6

Date	Iron	Zinc	Lead	Manganese	Mercury	Selenium
14 October 1975	320	50	7	50	<0.5	0
14 January 1976	590	10	2	20	<0.5	0
14 April 1976	630	10	3	50	<0.5	0
6 July 1976	300	10	3	92	<0.5	0
7 October 1976	200	0	5	50	<0.5	0
11 January 1977	240	10	7	40	<0.5	0
19 March 1977	510	0	8	60	<0.5	1
8 July 1977	500	0	6	100	<0.5	0
Mean	410	10	5	60	<0.5	0

Table D-6. Concentrations of heavy metals in the St. Croix River at Stillwater, Wisconsin, for water year 1977 (USGS 1977). Values represent total metal concentrations and are expressed in micrograms per liter (µg/l).

Date	Arsenic	Barium	Boron	Cadmium	Chromium	Cobalt	Copper
1 February 1977	0	0	40	<10	0	<50	<10
6 April 1977	0	0	40	<10	0	<50	<10
6 June 1977	1	100	50	<10	0	<50	<10
4 August 1977	1	300	70	<10	<60	<50	<10
Mean	1	100	50	<10	0	<50	<10

Date	Iron	Zinc	Lead	Manganese	Mercury	Selenium
1 February 1977	500	10	<100	50	<0.5	0
6 April 1977	580	10	<100	60	<0.5	0
6 June 1977	900	10	<100	10	<0.5	0
4 August 1977	470	30	<100	130	<0.5	0
Mean	610	20	<100	60	<0.5	0

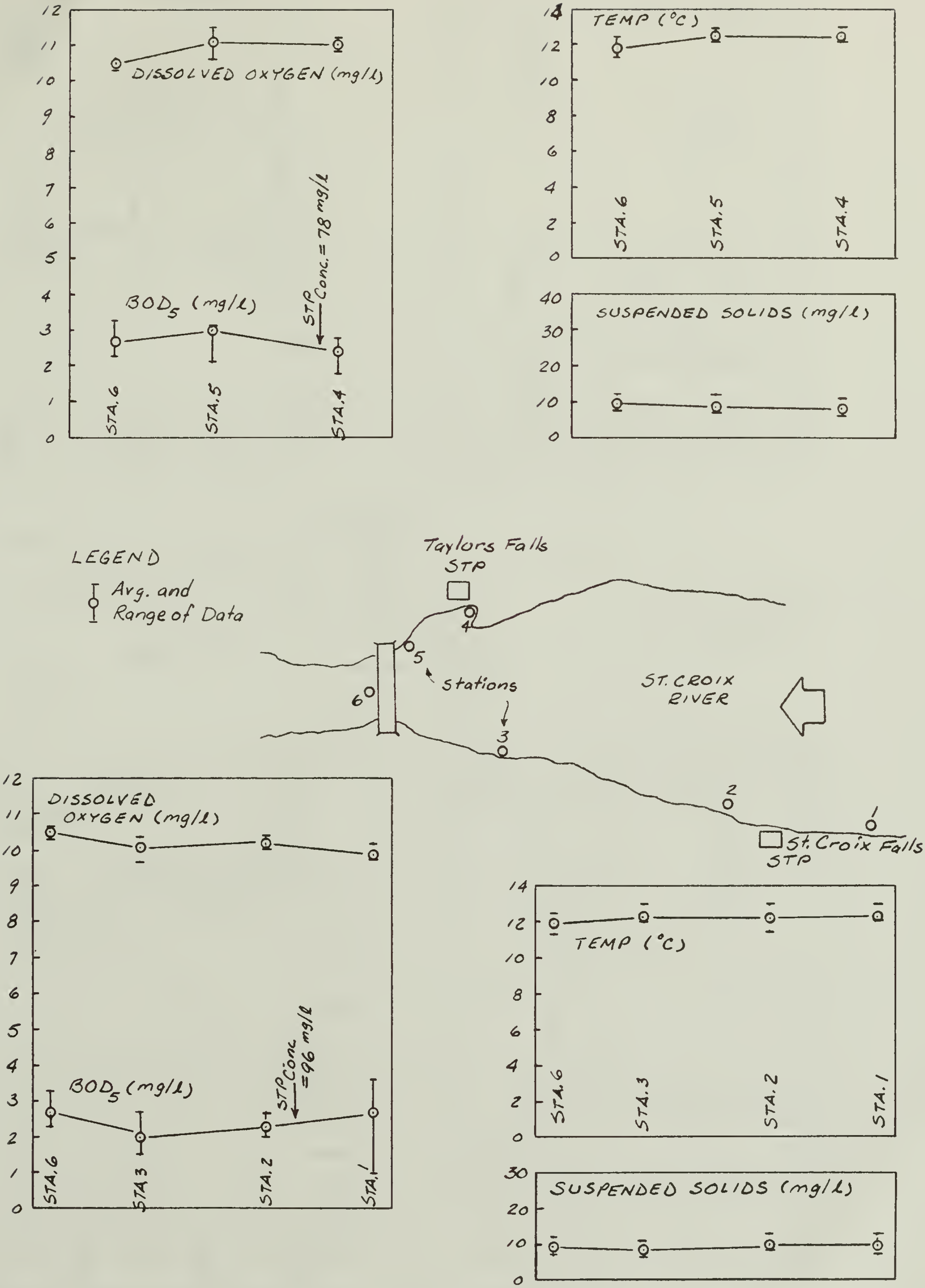


Figure D-1. DO, BOD_5, temperature, and suspended solids concentrations observed in May 1979.

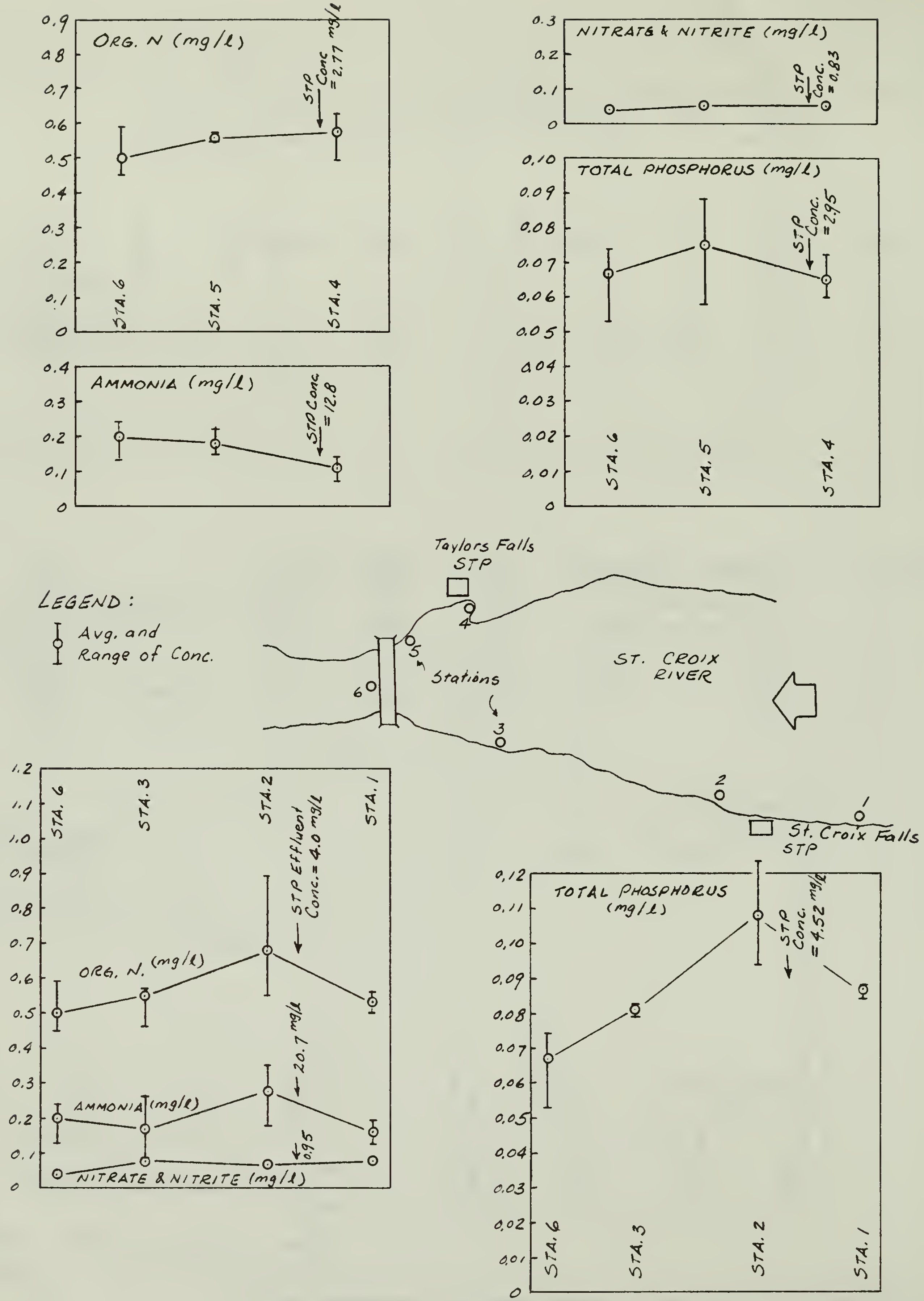


Figure D-2. Nutrient concentrations observed in May 1979.

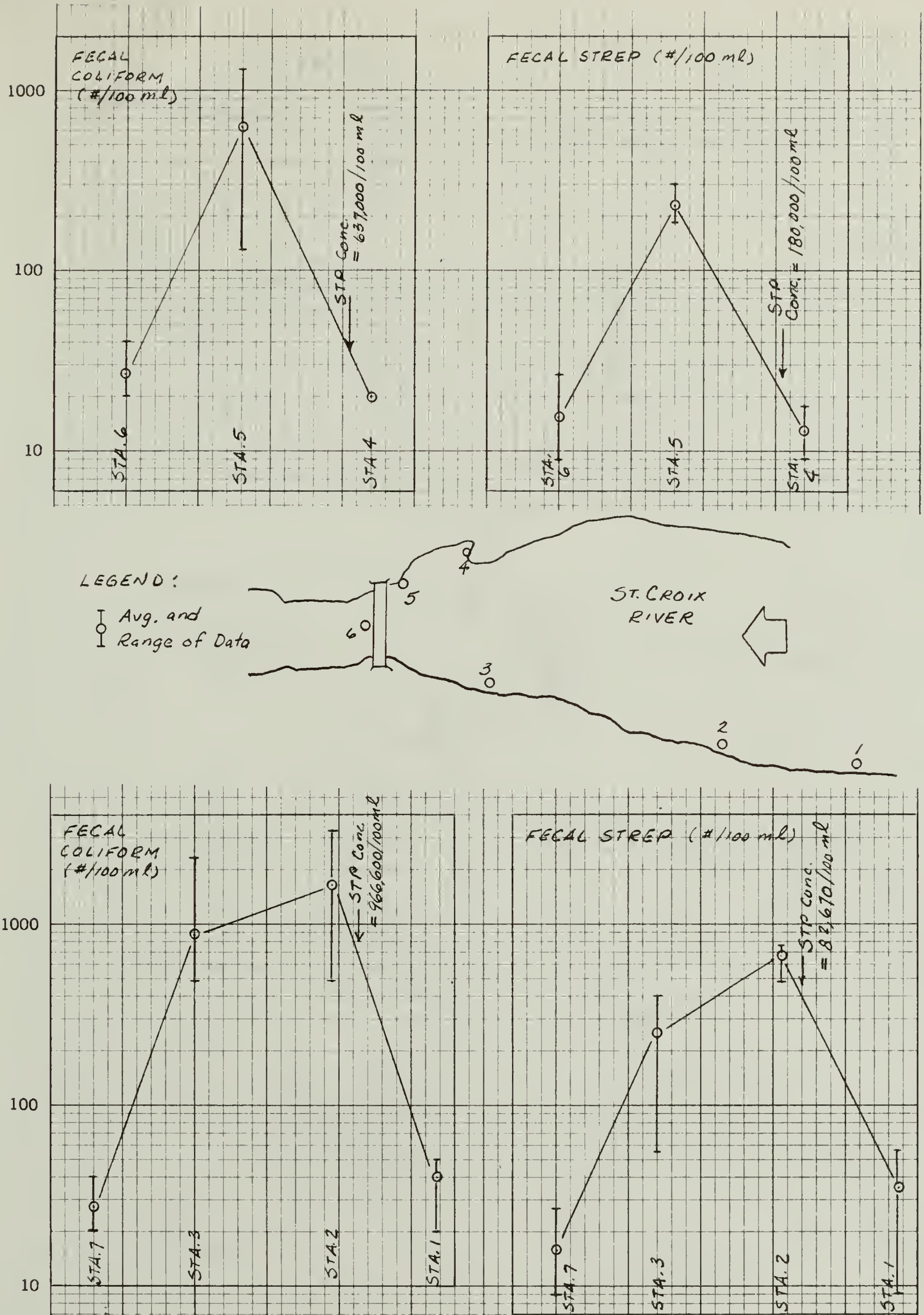


Figure D-3. Fecal coliform and fecal strep concentrations observed in May 1979.

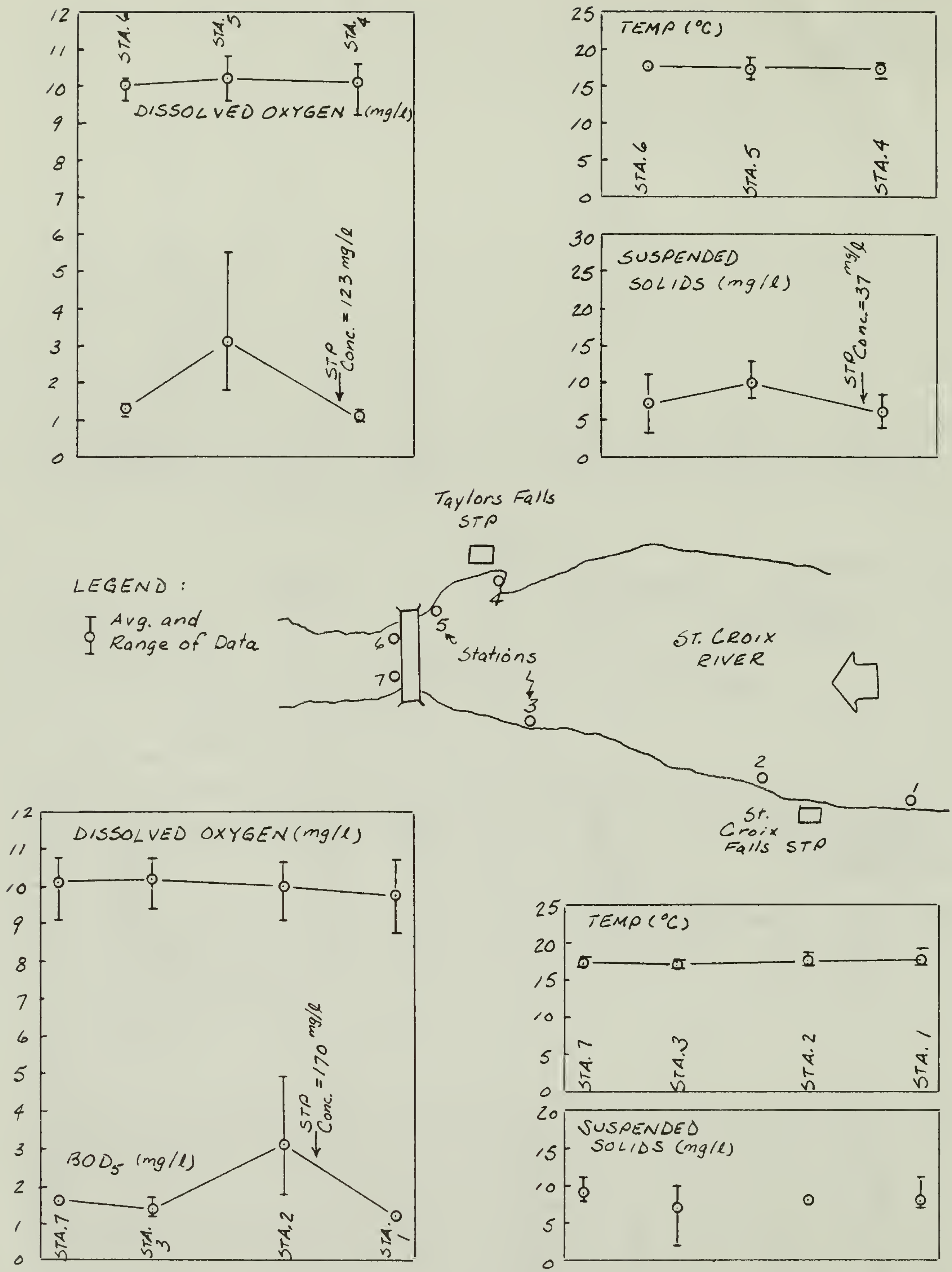


Figure D-4. DO, BOD_5, temperature, and suspended solids concentrations observed in August 1979.

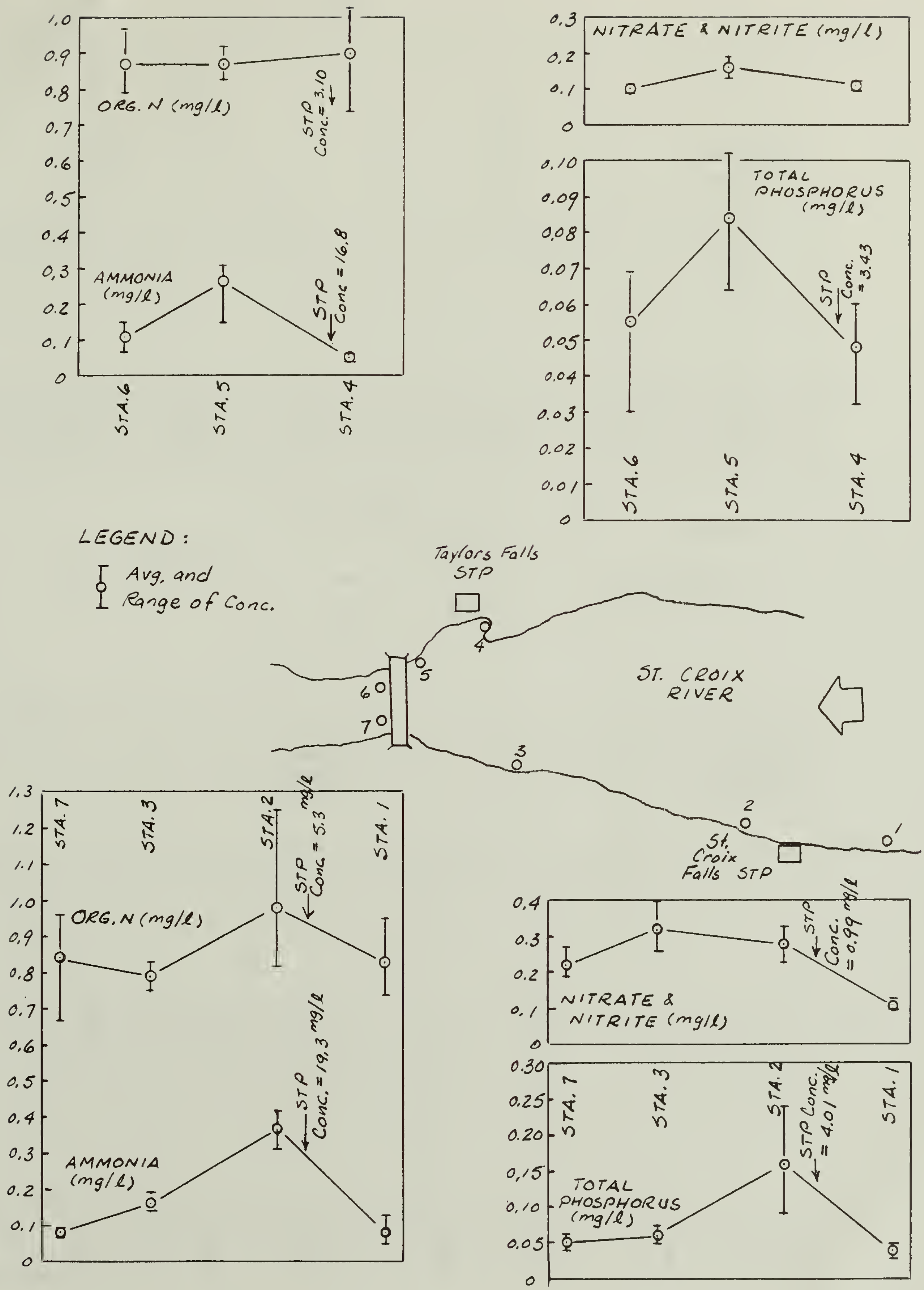


Figure D-5. Nutrient concentrations observed in August 1979.

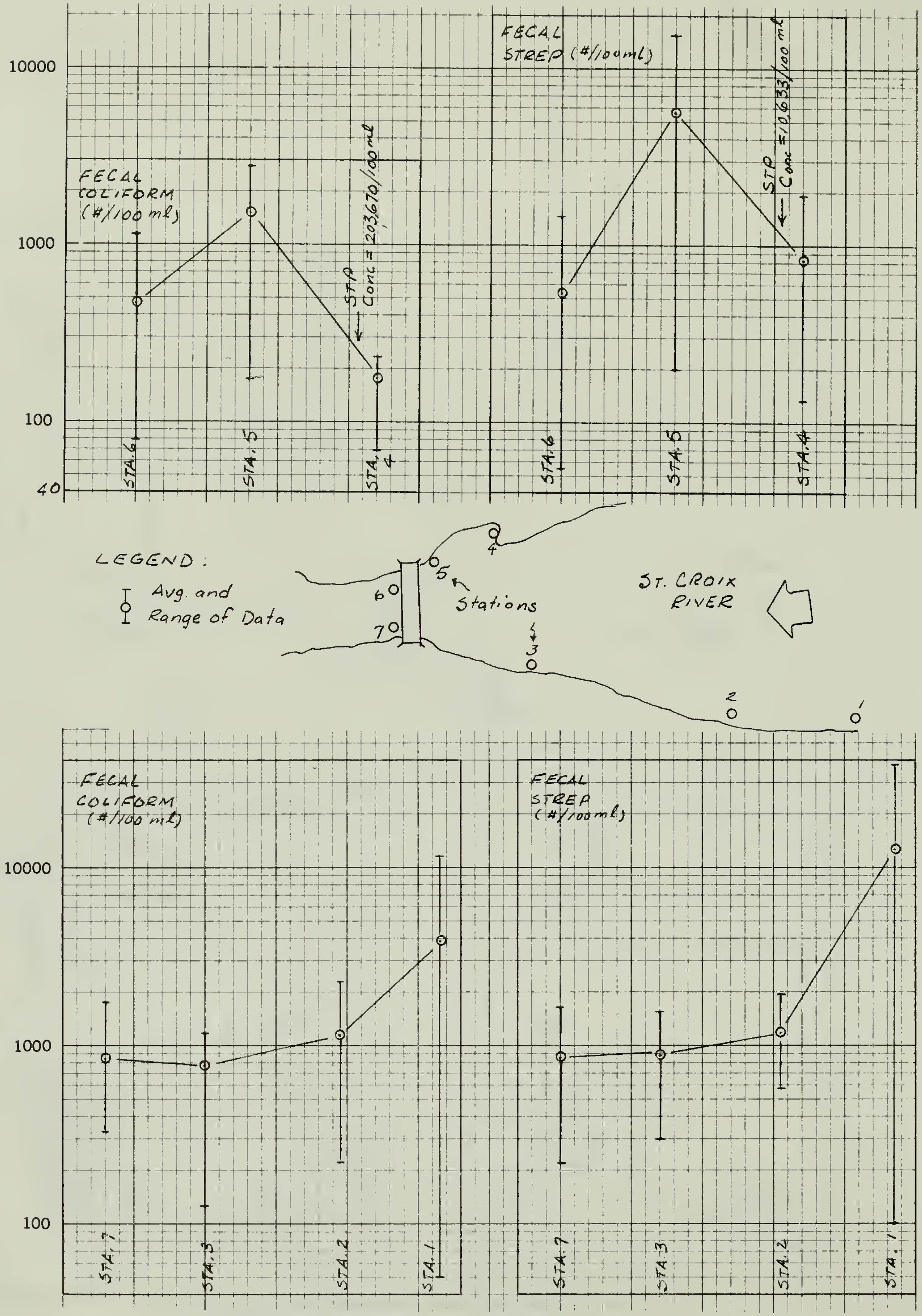


Figure D-6. Fecal coliform and fecal strep concentrations observed in August 1979.

APPENDIX E

Public Finance and User Fees

EXHIBIT E-1

Water and Sewer Rate Schedule for St. Croix Falls, Wisconsin

MINIMUM QUARTERLY CHARGE

5/8 and 3/4 Inch Meter . . .	\$ 6.00	3 Inch Meter . . .	\$ 76.00
1 Inch Meter	13.50	4 Inch Meter . . .	126.00
1½ Inch Meter	26.00	6 Inch Meter . . .	250.00
2 Inch Meter	40.00		

For each ADDITIONAL unit of Service* on one meter, add $1.50 to the appropriate minimum charge for the meter size.

First	600 cu. ft. used ea. qtr.	- apply minimum charge
Next	8,400 cu. ft. used ea. qtr.	- 55¢ per 100 cu. ft.
Next	26,000 cu. ft. used ea. qtr.	- 37¢ per 100 cu. ft.
Next	65,000 cu. ft. used ea. qtr.	- 18¢ per 100 cu. ft.
Over	100,000 cu. ft. used ea. qtr.	- 13¢ per 100 cu. ft.

SEWER SERVICE RATE

Under Ordinance A-4, dated 1 October 1978, sewer service shall be based upon the water rates and for metered owners or occupants, shall, in each fourth quarter be based upon the water rates in said fourth quarter in the succeeding three quarters. The sewer service rates shall be 150% of the water rate schedule presently in effect.

EXHIBIT E-2

Current wastewater treatment user costs for a typical family of three in St. Croix Falls, Wisconsin.

These calculations are based on Table E-1. It is assumed that the per capita generation of sewage is 74 gallons per day, that there are 90 days per quarter, and three persons per family.

1) The amount of sewage generated per family per quarter first must be calculated:

   12.6 cu. ft. (94 gal)/capita/day x 90 days/quarter x 3 persons/family = 3,402 cu. ft./quarter.

2) Based on Table E-1, a typical quarterly residential rate can be computed:

   $1.5 \times (\$6.00 + (\$0.55 \times \frac{2,802}{100})) = 1.5 \times (\$6.00 + \$15.44) =$ $32.16/quarter.

3) The annual charge is four times the quarterly charge: 4 x $32.16 = $129/year.

EXHIBIT E-3

Water and Sewer Rate Schedule for Taylors Falls, Minnesota (By letter, City of Taylors Falls, to WAPORA, Inc., 17 October 1980).

All water sold shall be measured by meters, but where necessary a flat rate of not less than the minimum charge may be established by the Council. The rates for sewage service and the same.

Effective January 1, 1976, the following charges for water and sewer used per quarter are hereby established.

a. For the use of 3,000 gallons or less the charge shall be $6.00.

b. For the next 7,000 gallons the charge shall be $1.10 per each additional 1,000 gallons of water used.

c. For the next 10,000 gallons the charge shall be 80 cents per each additional 1,000 gallons of water used.

d. For the next 80,000 gallons the charge shall be 70 cents per each additional 1,000 gallons of water used.

e. For the amount of water in excess of 100,000 gallons, the charge shall be 60 cents per each additional 1,000 gallons of water used.

f. Where there is more than one unit served through a meter, in that case the minimum charge, at least, shall apply to each dwelling or business unit served through that meter.

g. There shall be a surcharge of 100% of the bill calculated pursuant to the rates set forth herein that shall be added to the bill of any person purchasing water from the City whose property serviced by the City water is not within the corporate limits of the City.

A service charge of $5.00 shall be made for each request of turning water off or on.

EXHIBIT E-4

Current Wastewater Treatment User Costs for a Typical Family of Three in Taylors Falls, Minnesota.

These calculations are based on Table E-3. It is assumed that the per capita generation of sewage is 65 gallons per day, that there are 90 days per quarter, and three persons per family.

1) The amount of sewage generated per family per quarter first must be calculated:

   65 gal/capita/day x 90 days/quarter x 3 persons per family = 17,550 gallons/quarter.

2) Based on Table E-3, a typical quarterly residential rate can be computed:

   $$\$6.00 + \left(\frac{7,000}{1,000} \times \$1.10\right) + \left(\frac{7,550}{1,000} \times \$0.80\right) = \$6.00 + \$7.70 + \$6.04 =$$
   $19.74/quarter.

3) The annual user charge is four times the quarterly charge: 4 x $19.74 = $79.00/year.

Table E-1. Estimated user charges for Alternatives 1 through 9.

	Alternative 1		Alternative 2		Alternative 3	Alternative 4	Alternative 5	Alternative 6
	Upgrade/Expand Existing WWTP at St. Croix Falls		Land Disposal System at St. Croix Falls		CAS System for Taylors Falls	RBC System for Taylors Falls	Pond System for Taylors Falls	Land Disposal System for Taylors Falls
	Without Federal Funding	With Federal Funding	Without Federal Funding	With Federal Funding				
I. Cost								
Capital Cost[a,b]	1,124,000	1,124,000	1,181,000	1,181,000	988,000	985,000	1,164,000	1,584,000
Annual O&M	31,000	31,000	40,000	40,000	36,000	27,000	18,000	21,000
Community's Share of Cost of Regional System								
Capital Cost	--	--	--	--	--	--	--	--
Annual O&M	--	--	--	--	--	--	--	--
II. Capital Cost Distribution								
Federal	--	843,000(75%)	--	885,800(75%)	741,000(75%)	738,800(75%)	873,000(75%)	1,346,400(85%)
State	674,400(60%)	--	708,600(60%)	--	148,200(15%)	147,800(15%)	174,600(15%)	142,600(9%)
Local	449,600(40%)	281,000(25%)	472,400(40%)	295,300(25%)	98,800(10%)	98,500(10%)	116,400(10%)	95,000(6%)
III. Annual Cost[c]								
O&M--Residential	27,900	27,900	36,000	36,000	26,100	21,300	14,200	16,600
O&M--Interstate State Park	3,100	3,100	4,000	4,000	6,900	5,700	3,800	4,400
Debt service--Residential	38,600	24,100	40,500	25,300	7,400	7,400	8,800	7,200
Debt service--Interstate State Park	4,300	1,100	4,500	1,100	2,000	2,000	2,300	1,900
IV. Typical Monthly Residential User Charge[d]								
O&M--Residential	4.20	4.20	5.40	5.40	9.90	8.10	5.40	6.30
Debt service--Residential	5.80	3.60	6.10	3.80	2.80	2.80	3.30	2.70
Total Monthly Residential	10.00	7.80	11.50	9.20	12.70	10.90	8.70	9.00
V. Annual Residential User Charge	120.00	94.00	138.00	110.00	152.00	131.00	104.00	108.00

[a] The distribution of capital costs is determined as follows.
For Taylors Falls MN, Alternatives 3, 4, 5, 7, and 8, the capital cost distribution is:

75% x total cost = Federal cost
25% x total cost = State cost
10% x total cost = Local cost

For Taylors Falls MN, Alternatives 6 and 9, the land application alternatives, the capital cost distribution is:

85% x total cost = Federal cost
9% x total cost = State cost
6% x total cost = Local cost

For all projects in St. Croix Falls WI, Alternatives 1, 2, and 7, the capital cost distribution is:

60% x total cost = State cost
40% x total cost = Local cost.

[b] For the Regional Alternatives 7, 8, and 9, the cost allocated to each community was based on the community's waste flow. The cost allocation was determined as follows:

74% x total cost = St. Croix Falls share
26% x total cost = Taylors Falls share.

[c] The Interstate State Park contributes significantly to each community's waste flow and therefore is considered separately. For each community, commercial and industrial flows are included in the residential share. In Taylors Falls the residential share is 79%; the Interstate State Park share is 21%. In St. Croix Falls the residential share is 90%; the Interstate State Park share is 10%.

[d] Residential user charges are based on 1980 estimated populations and estimated number of persons per household. In Taylors Falls the 1980 population is estimated to be 655 with 2.98 persons per household. The number of households therefore is estimated to be 220. In St. Croix Falls, the 1980 population is estimated to be 1643 with 2.95 persons per household. The number of households therefore is estimated to be 557.

Alternative 7			Alternative 8			Alternative 9		
Regional Conventional WWTP at St. Croix Falls			Regional Stabilization Pond System Near Taylors Falls			Regional Land Disposal System Near Taylors Falls		
Without Federal Funding	With Federal Funding		Without Federal Funding	With Federal Funding		Without Federal Funding	With Federal Funding	
2,113,000	2,113,000		2,660,000	2,660,000		3,651,000	3,651,000	
62,000	62,000		31,000	31,000		23,000	23,000	
St. Croix Falls(74%)		Taylors Falls(26%)	St. Croix Falls(74%)		Taylors Falls(26%)	St. Croix Falls(74%)		Taylors Falls(26%)
1,563,600	1,563,600	549,400	1,968,400	1,968,400	691,600	2,701,700	2,701,700	949,300
45,900	45,900	16,100	22,900	22,900	8,100	17,000	17,000	6,000
--	1,172,300(75%)	412,100(75%)	--	1,489,800(75%)	518,700(75%)	--	2,296,400(85%)	806,900(85%)
938,200(60%)	--	82,400(15%)	1,181,000(60%)	--	103,700(15%)	1,621,000(60%)	--	85,400(9%)
625,400(40%)	390,900(25%)	54,900(10%)	787,400(40%)	492,100(25%)	69,200(10%)	1,080,700(40%)	405,300(15%)	57,000(6%)
41,300	41,300	12,700	20,600	20,600	6,400	15,300	15,300	4,700
4,600	4,600	3,400	2,300	2,300	1,700	1,700	1,700	1,300
53,600	33,500	4,100	67,500	42,200	5,200	92,700	34,800	4,300
6,000	1,500	1,100	7,500	1,900	700	10,300	1,500	1,100
6.20	6.20	4.80	3.10	3.10	2.40	2.30	2.30	1.80
8.00	5.00	1.60	10.10	6.30	2.00	13.90	5.20	1.60
14.20	11.20	6.40	13.20	9.40	4.40	16.20	7.50	3.40
170.00	134.00	77.00	158.00	113.00	53.00	194.00	90.00	41.00

Table E-2. Annual user fees for a family of four for the nine alternatives for St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota.

	St. Croix Falls	Taylors Falls
Alternative 1	$208	--
Alternative 2	$232	--
Alternative 3	--	$236
Alternative 4	--	$207
Alternative 5	--	$173
Alternative 6	--	$177
Alternative 7	$275	--
Alternative 8	$259	$103
Alternative 9	$308	$ 87

✰ U.S. GOVERNMENT PRINTING OFFICE: 1981 752-098

United States
Environmental Protection
Agency
Region V

Water Division
230 South Dearborn Street
Chicago, Illinois 60604