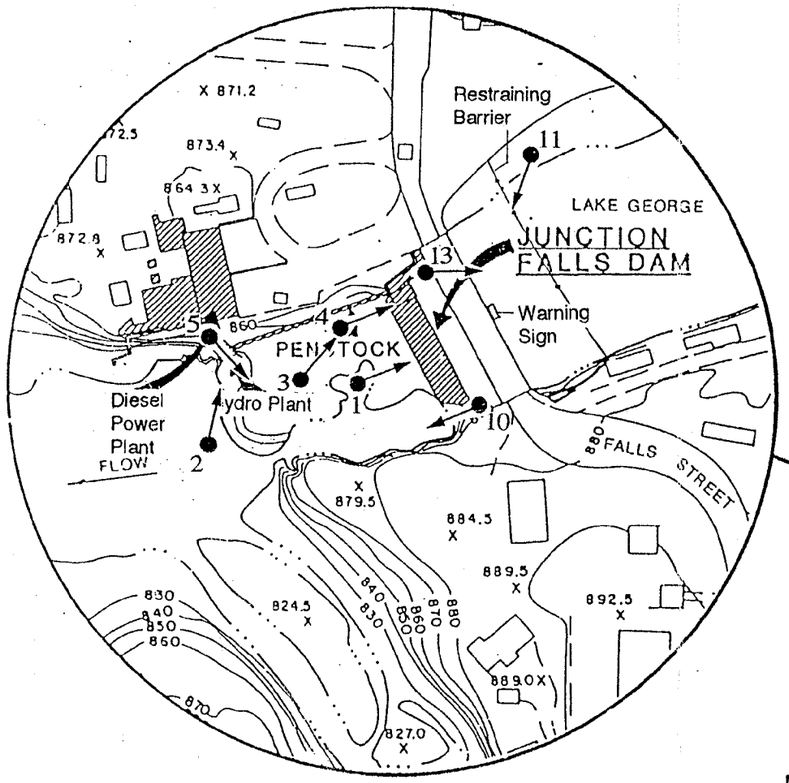
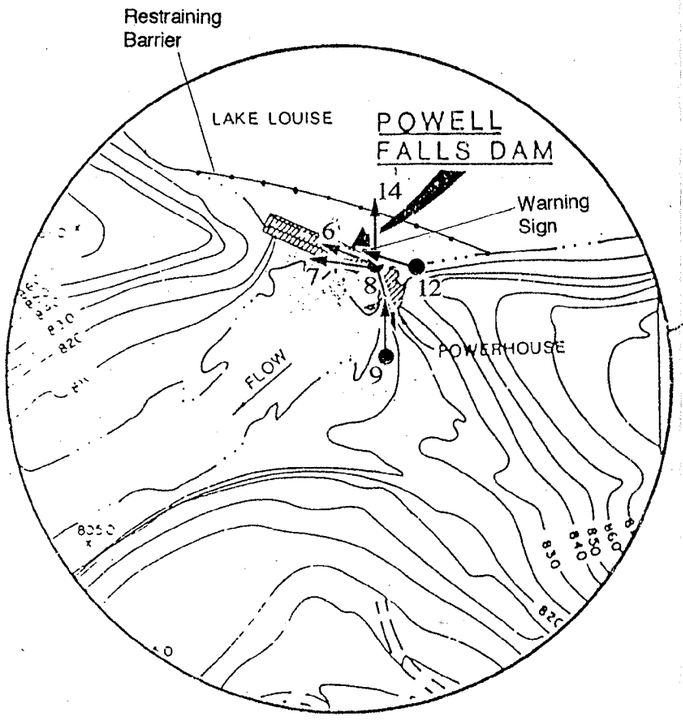
Appendix A

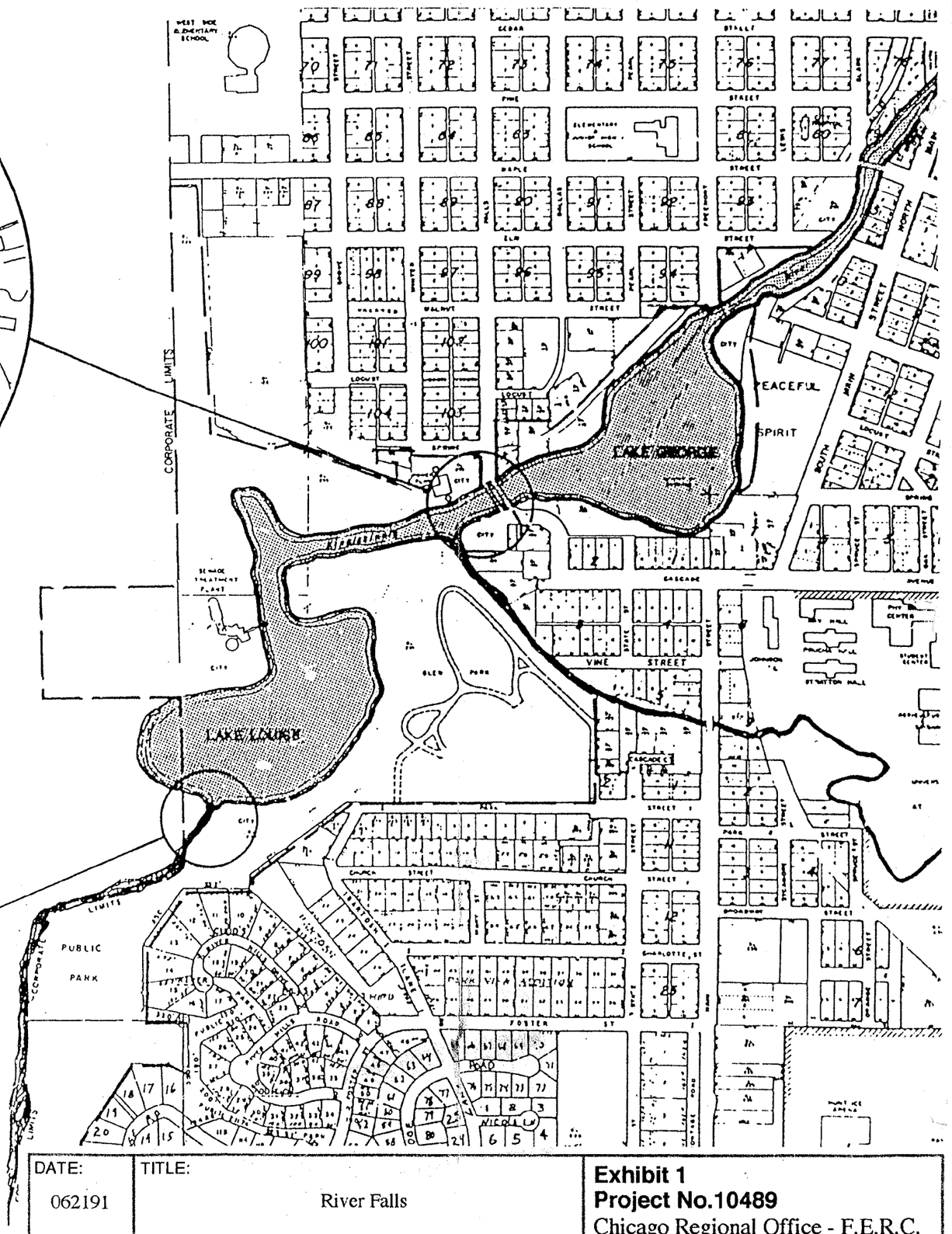
This page intentionally left blank.

River Falls Area Topography

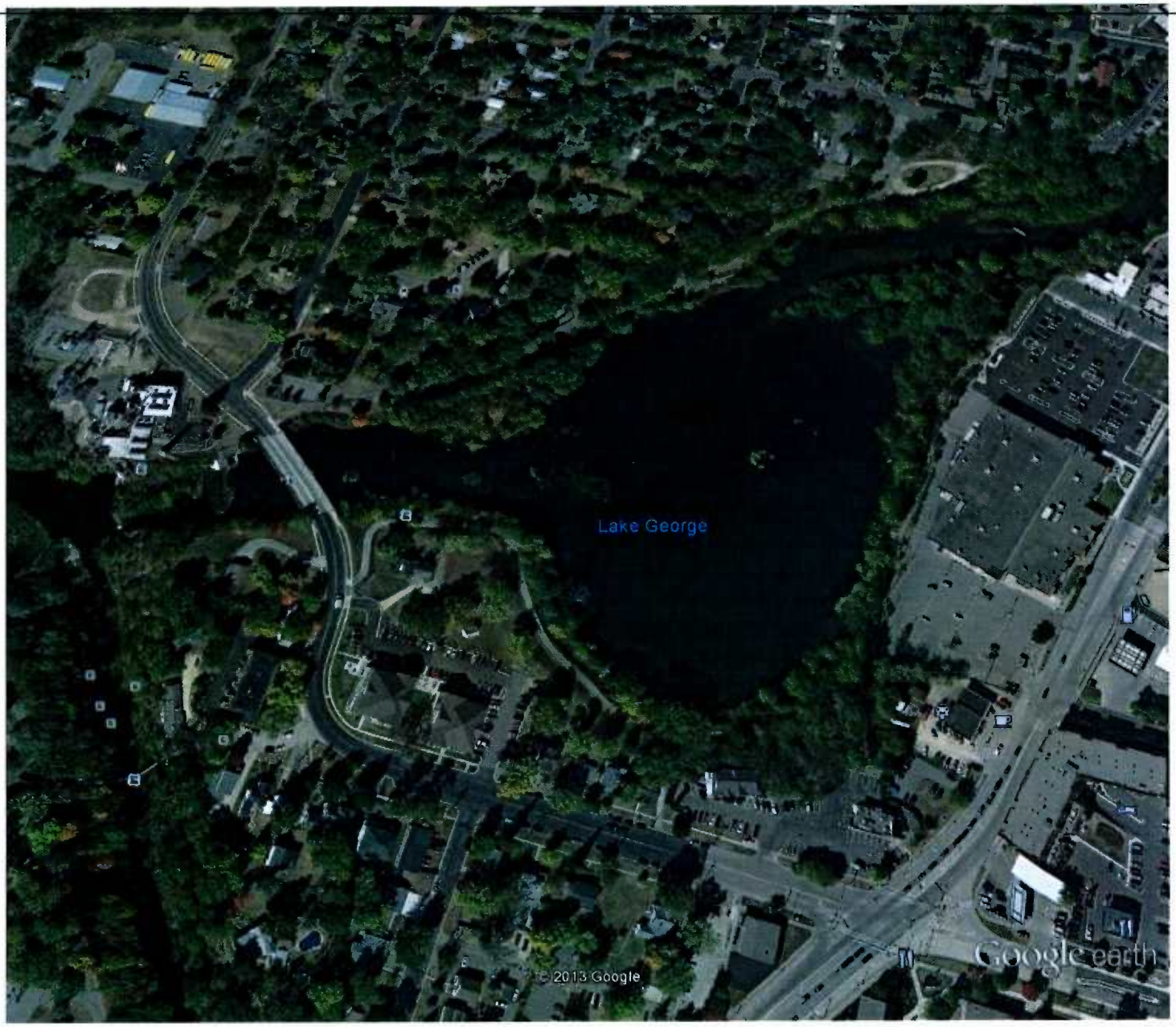


1 → Number and Direction of Photograph.



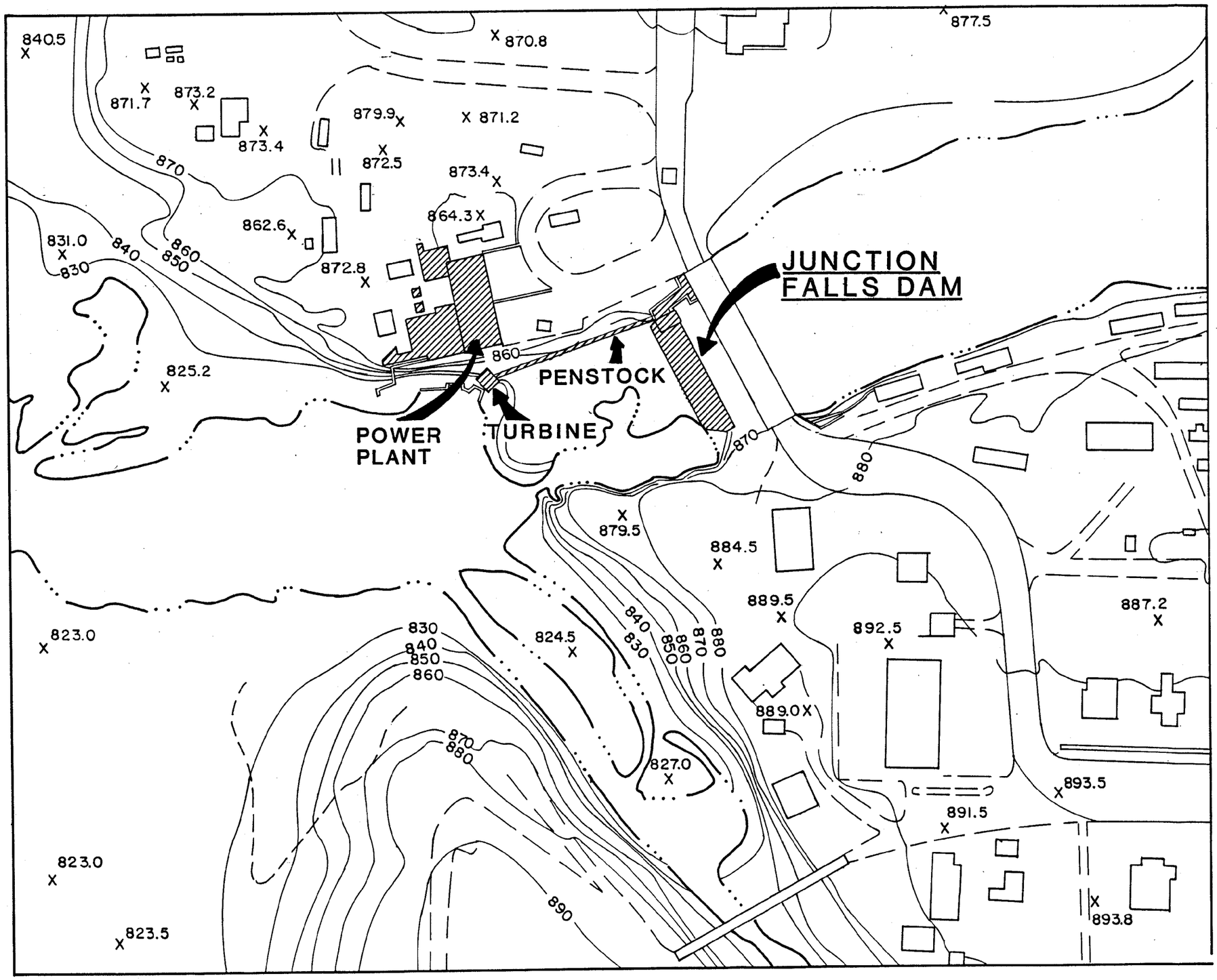


DATE:	TITLE:	
062191	River Falls	**Exhibit 1** **Project No.10489** Chicago Regional Office - F.E.R.C.



Google earth

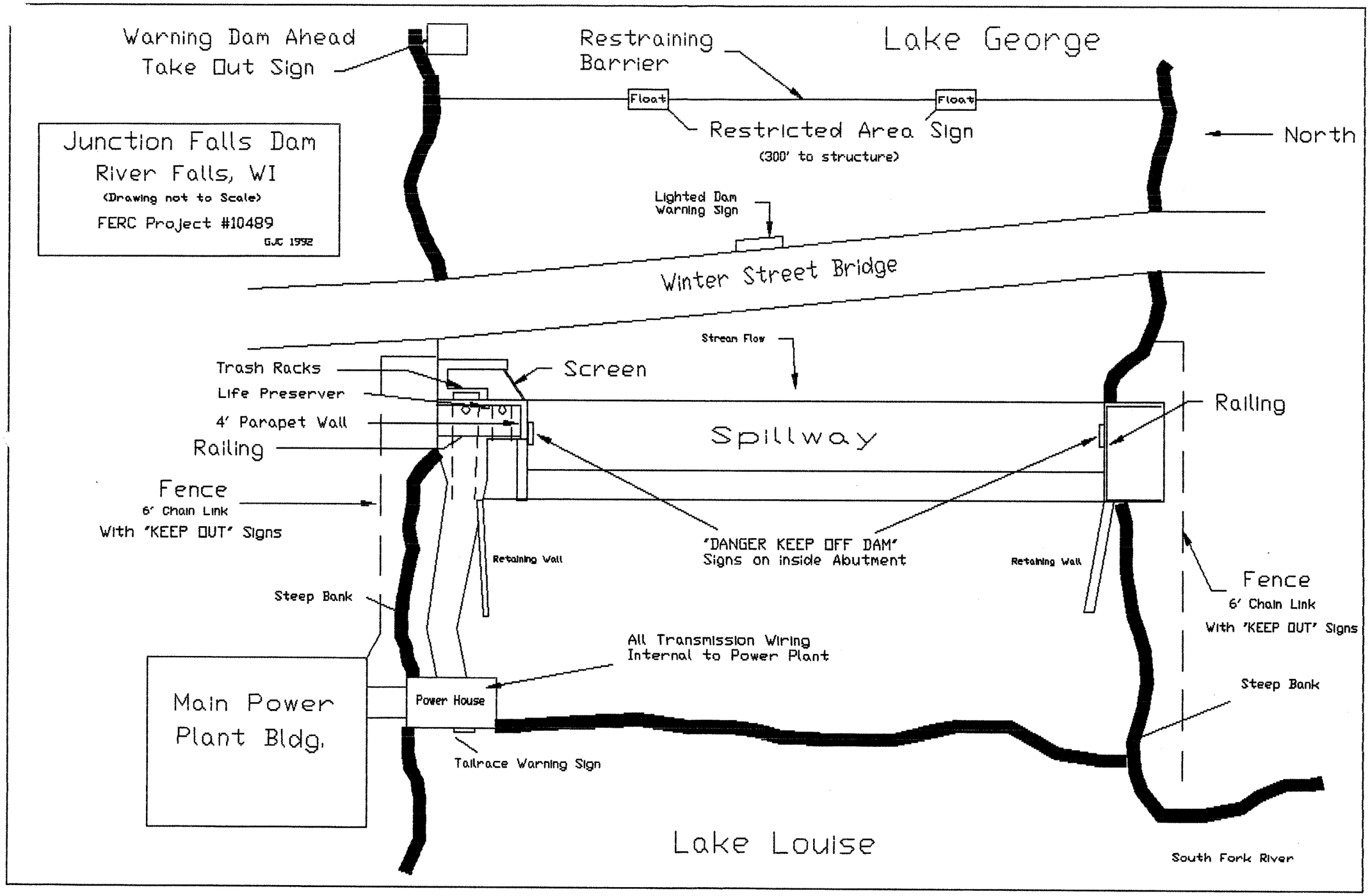
feet 800
meters 200



This drawing is a part of the application for license made by the undersigned this day of

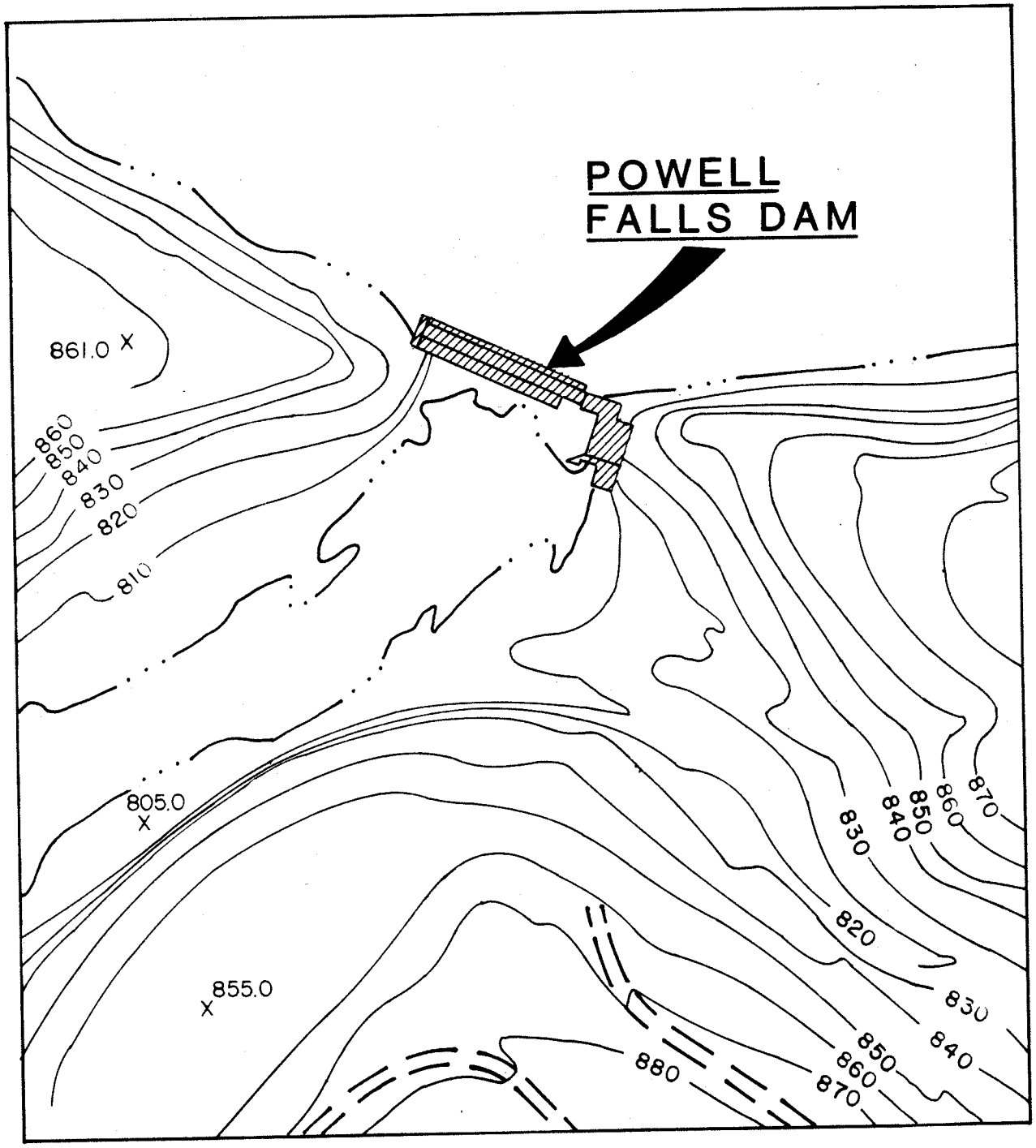
Facility Plan: Upper Dam

Figure A-1


Warning Dam Ahead
Take Out Sign
Restraining
Barrier
Lake George
Float
Float
Restricted Area Sign
(300' to structure)
North
Junction Falls Dam
River Falls, WI
(Drawing not to Scale)
FERC Project #10489
GJC 1992
Lighted Dam
Warning Sign
Winter Street Bridge
Stream Flow
Trash Racks
Screen
Life Preserver
4' Parapet Wall
Railing
Railing
Spillway
Fence
6' Chain Link
With "KEEP OUT" Signs
"DANGER KEEP OFF DAM"
Signs on inside Abutment
Retaining Wall
Retaining Wall
Steep Bank
Fence
6' Chain Link
With "KEEP OUT" Signs
All Transmission Wiring
Internal to Power Plant
Steep Bank
Main Power
Plant Bldg.
Power House
Tailrace Warning Sign
Lake Louise
South Fork River

Google earth

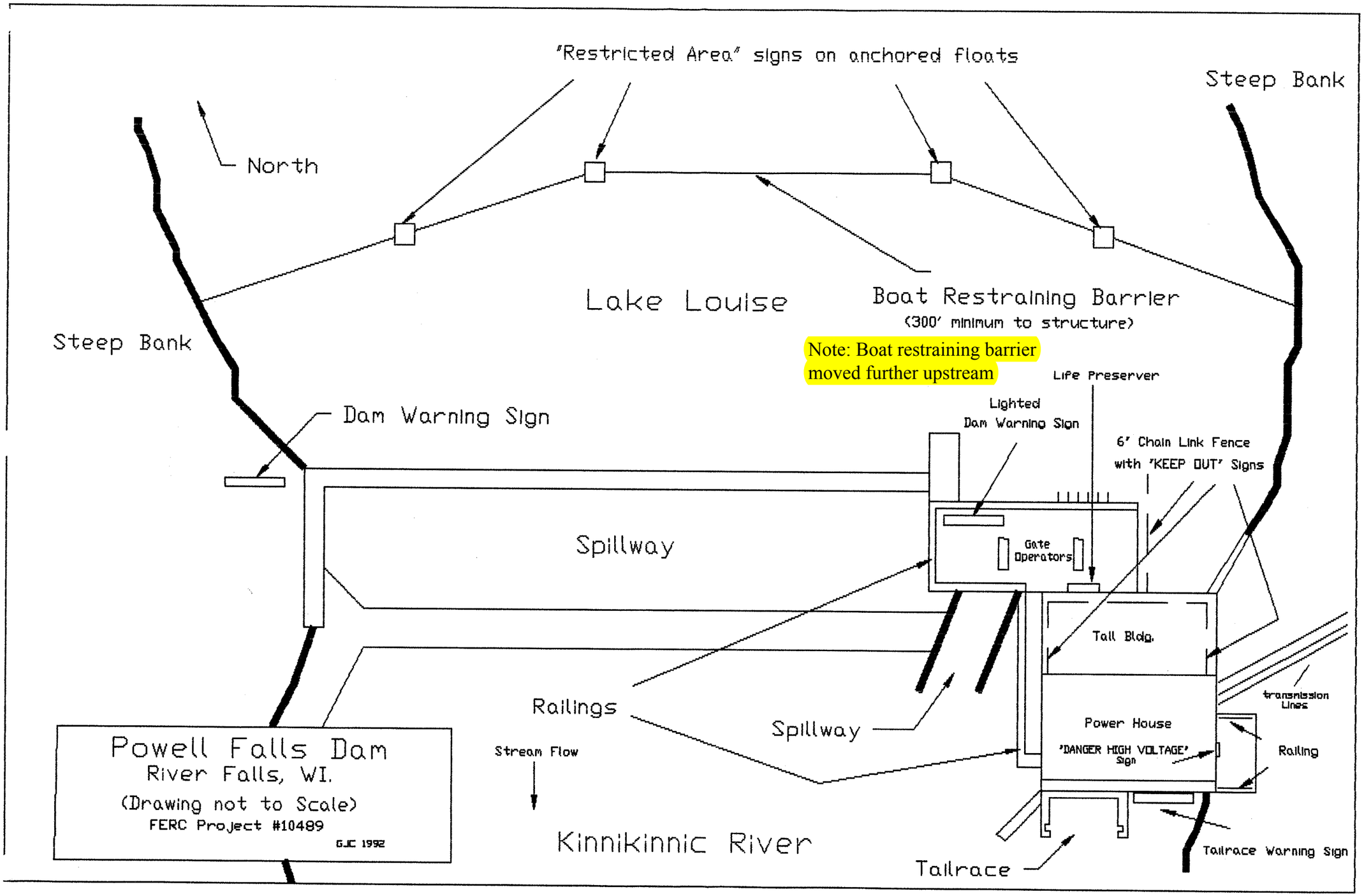
feet 800
meters 200



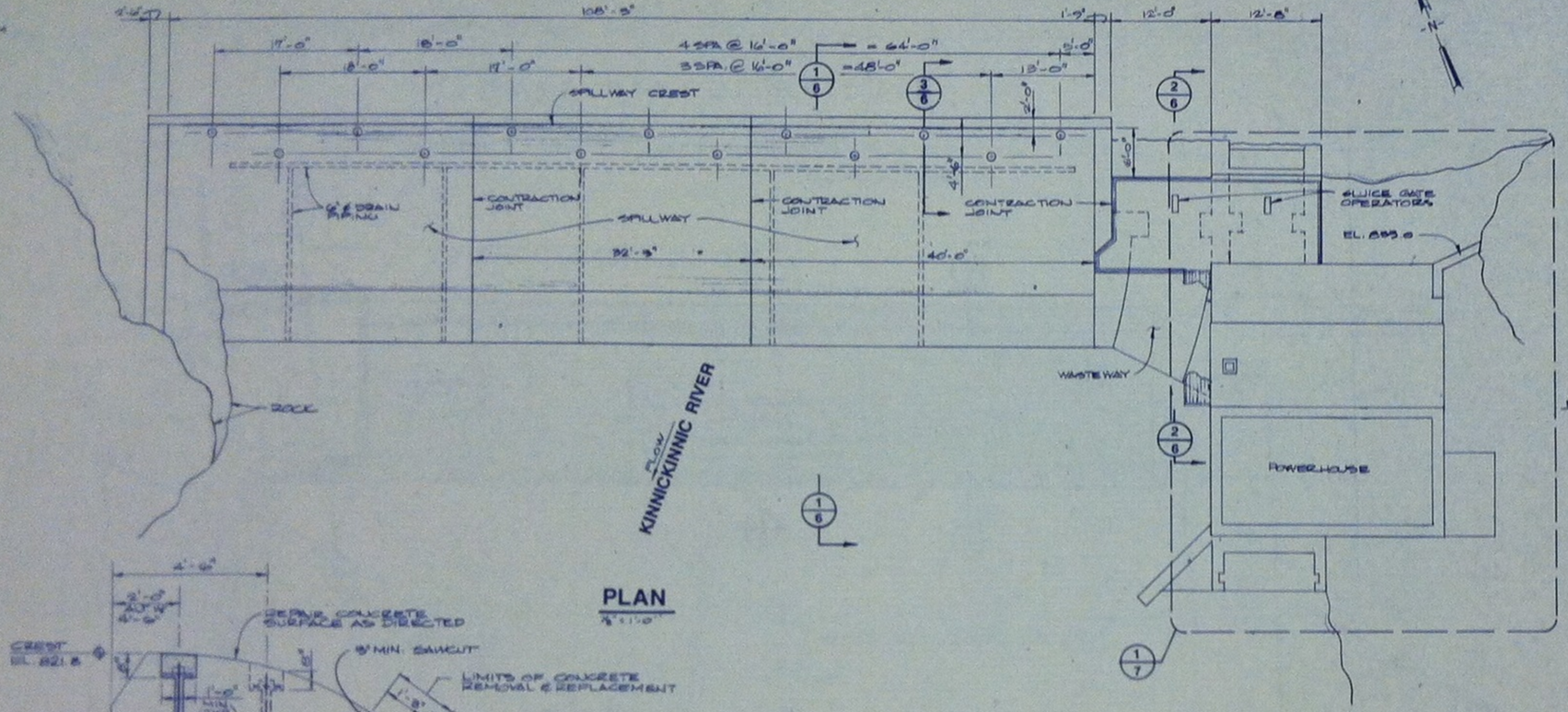
This drawing is a part of the application for license made by the undersigned this day of

Facility Plan: Lower Dam

Figure A-2

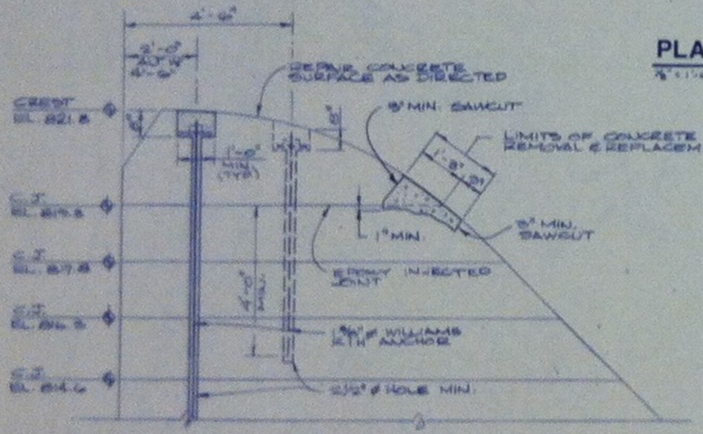

"Restricted Area" signs on anchored floats
Steep Bank
North
Lake Louise
Boat Restraining Barrier
(300' minimum to structure)
Note: Boat restraining barrier moved further upstream
Steep Bank
Life Preserver
Lighted
Dam Warning Sign
Dam Warning Sign
6' Chain Link Fence
with 'KEEP OUT' Signs
Spillway
Gate
Operators
Tail Bldg.
transmission
Lines
Railings
Spillway
Power House
'DANGER HIGH VOLTAGE'
Sign
Railing
Stream Flow
Powell Falls Dam
River Falls, WI.
(Drawing not to Scale)
FERC Project #10489
GJC 1992
Kinnikinnic River
Tailrace
Tailrace Warning Sign

Appendix B



PLAN

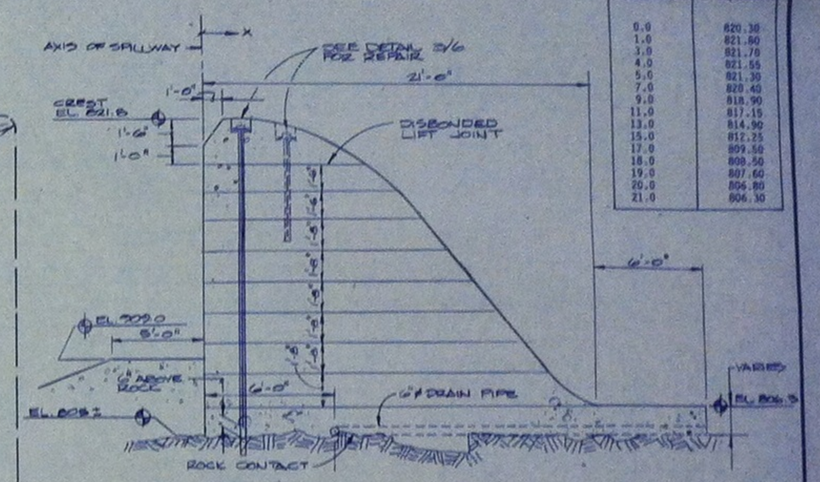
1/8" = 1'-0"



TOP LIFT REPAIR DETAIL

3/6

1/2" = 1'-0"



SECTION

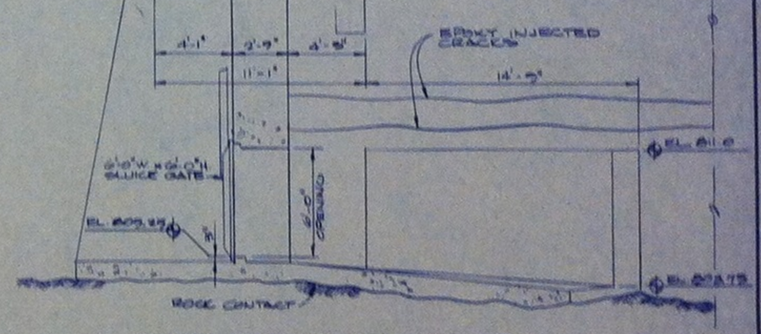
1/4" = 1'-0"

3/6

SPILLWAY CREST PROFILE	
(FT)	EL (FT)
0.0	820.38
1.0	821.60
3.0	821.78
4.0	821.55
5.0	821.30
7.0	820.48
9.0	818.90
11.0	817.15
13.0	814.90
15.0	812.25
17.0	809.50
18.0	808.50
19.0	807.60
20.0	806.80
21.0	806.30

DOWNSTREAM ELEVATION

1/8" = 1'-0"



WASTEWAY SECTION

1/4" = 1'-0"

2/6

RECORD DRAWING
OCTOBER 30, 1992

REVISED BY
CHECKED BY

NOTES:

1. ELEVATIONS REFER TO NATIONAL GEODETIC VERTICAL DATUM, 1929 ADJUSTMENT
2. DRAWING DEVELOPED FROM DRAWINGS "DAM REPLACEMENT" BY CARROL A. GRUBB DATED 9-10-65, & "LOWER HYDROELECTRIC PLANT IMPROVEMENTS" BY HERMAN T. HAGESTAD, DATED FEBRUARY & MARCH 1947 AND FIELD SURVEY ON MARCH 23, 1988 BY AYRES ASSOCIATES

This drawing is a part of the application for license made by the undersigned

this 12 day of April, 1988.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

EXHIBIT F-6 SHEET 6 OF 7

RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES

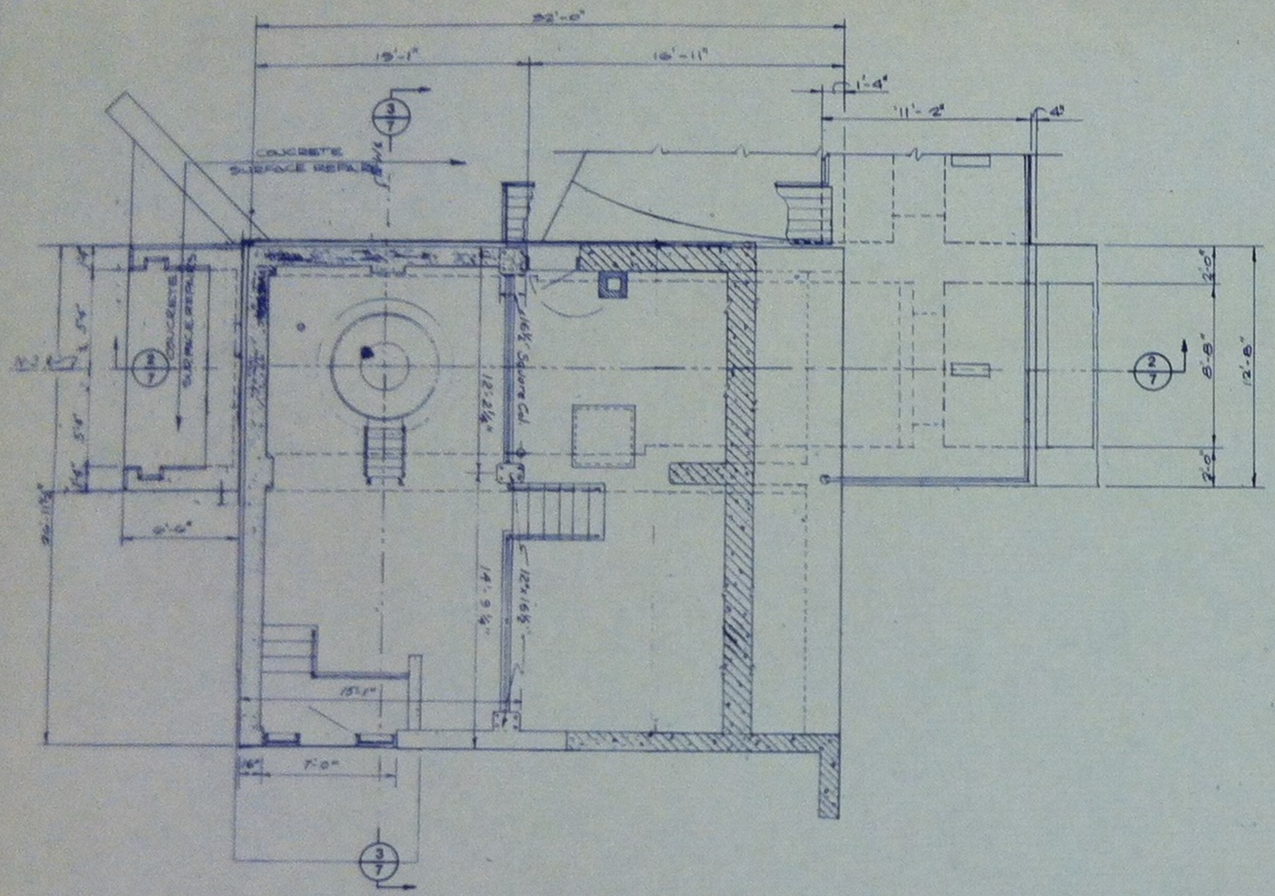
CITY OF RIVER FALLS, WISCONSIN

POWELL FALLS DAM

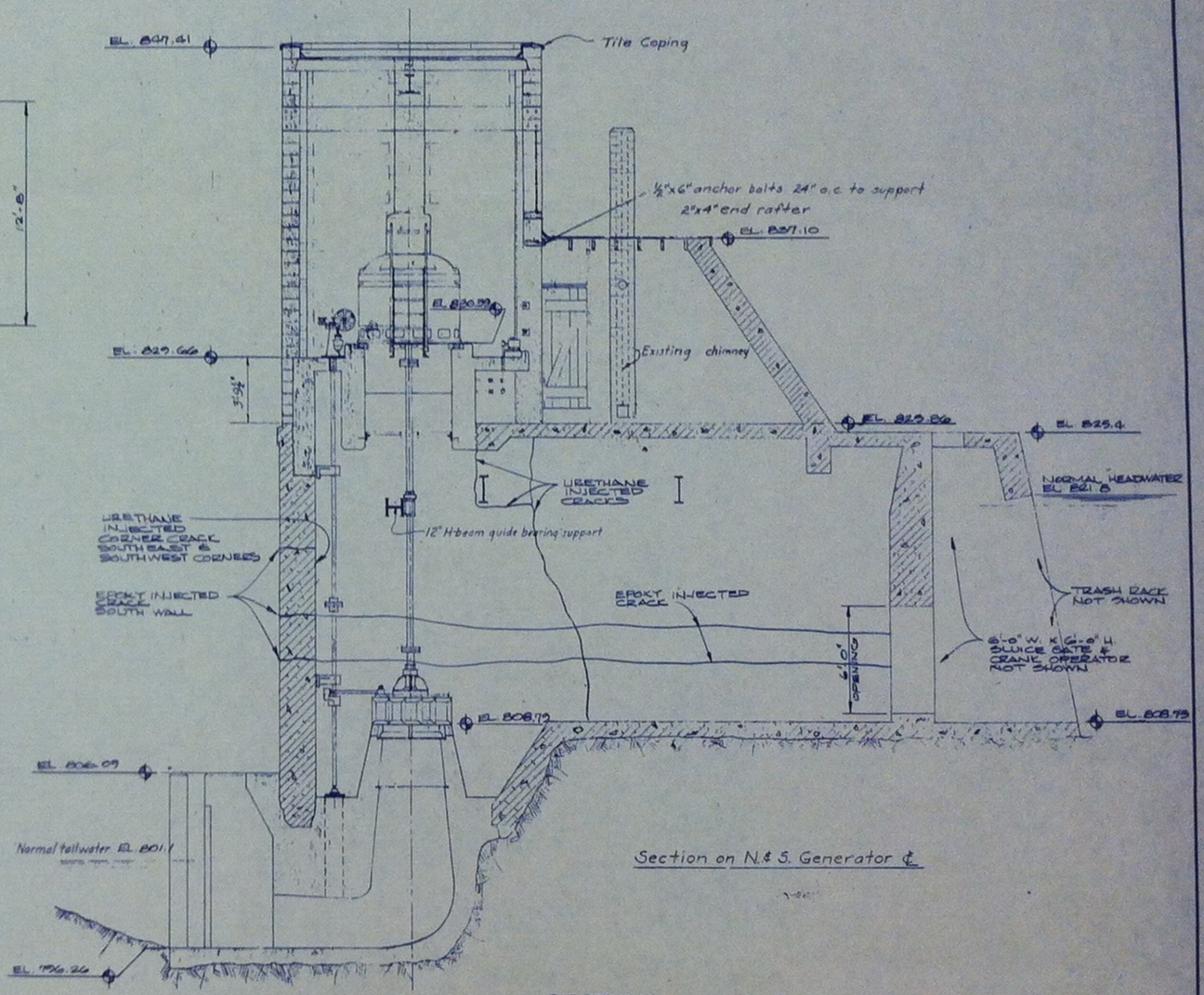
PLAN, ELEVATION & SECTIONS

4' 0 4'

SCALE: 1/4"=1'-0"

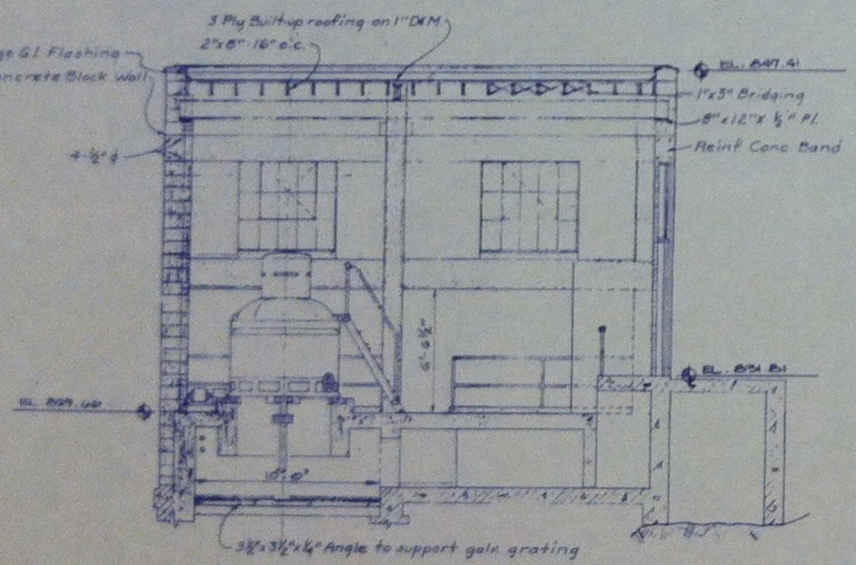


POWERHOUSE PLAN (1/7)
1/8" = 1'-0"



Section on N. & S. Generator ℄

SECTION (2/7)
1/4" = 1'-0"



Section on E & W Generator ℄

SECTION (3/7)
1/4" = 1'-0"

RECORD DRAWING
OCTOBER 30, 1992

REVISED BY RMD
CHECKED BY

NOTES:

1. ELEVATIONS REFER TO NATIONAL GEODETIC VERTICAL DATUM, 1929 ADJUSTMENT
2. DRAWING DEVELOPED FROM DRAWINGS "DAM REPLACEMENT" BY CARROL A. GRUBB DATED 9-10-65, & "LOWER HYDROELECTRIC PLANT IMPROVEMENTS" BY HERMAN T. HAGESTAD, DATED FEBRUARY & MARCH 1947 AND FIELD SURVEY ON MARCH 23, 1988 BY AYRES ASSOCIATES

This drawing is a part of the application for license made by the undersigned

this 12 day of April, 1988.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

EXHIBIT F-7 SHEET 7 OF 7

RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

POWELL FALLS DAM
POWERHOUSE PLAN & SECTIONS

4 0 4 8
SCALE: 1/4"=1'-0"

GENERAL NOTES

1. VERTICAL DATUM BASED ON USC&GS DISK (BM 611-A) MARKED "RAILROAD COMMISSION OF WIS." SET IN THE TOP OF THE HIGH POINT OF A ROCK LEDGE AT THE JUNCTION OF THE KINNICKINNIC AND SOUTH FORK ON THE LEFT BANK OF THE KINNICKINNIC AND THE RIGHT BANK OF THE SOUTH FORK. EL 847.174 FEET MSL.

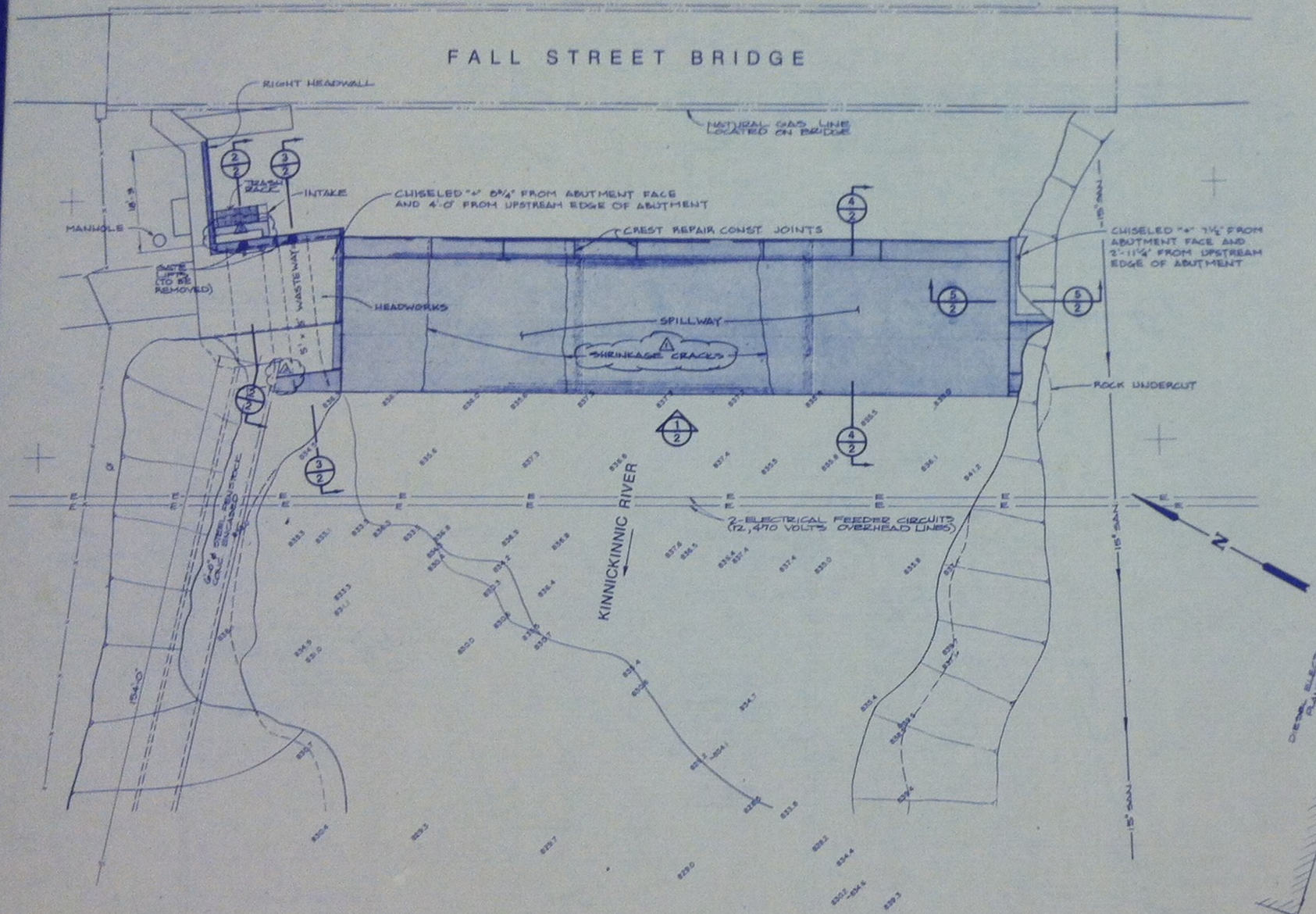
2. EXISTING STRUCTURE DIMENSIONING DEVELOPED FROM DRAWINGS ENTITLED "PLAN OF UPPER CITY DAM ACROSS KINNICKINNIC RIVER OF RIVER FALLS, WIS.", SHEET 1 THROUGH 4, J.P. WOLFF-CONSULTING ENGINEER, 323 W. SHEPARD, ASSOCIATE, MAY 1920, ST. PAUL, MINN. AND "UPPER HYDROELECTRIC PLANT IMPROVEMENTS, PLANS AND DETAILS," HERMAN T. HARRISON, CONSULTING ENGINEER, AUG 1948, 8 SHEETS. STRUCTURAL DIMENSIONS AND ELEVATIONS MAY DIFFER FROM THOSE DRAWINGS BASED ON FIELD MEASUREMENTS TAKEN.

3. THE CONTRACTOR MUST VERIFY WITH ENGINEER EXISTING FIELD CONDITIONS AND GEOMETRY OF THE CONCRETE REMOVAL LIMITS PRIOR TO INITIATING WORK.

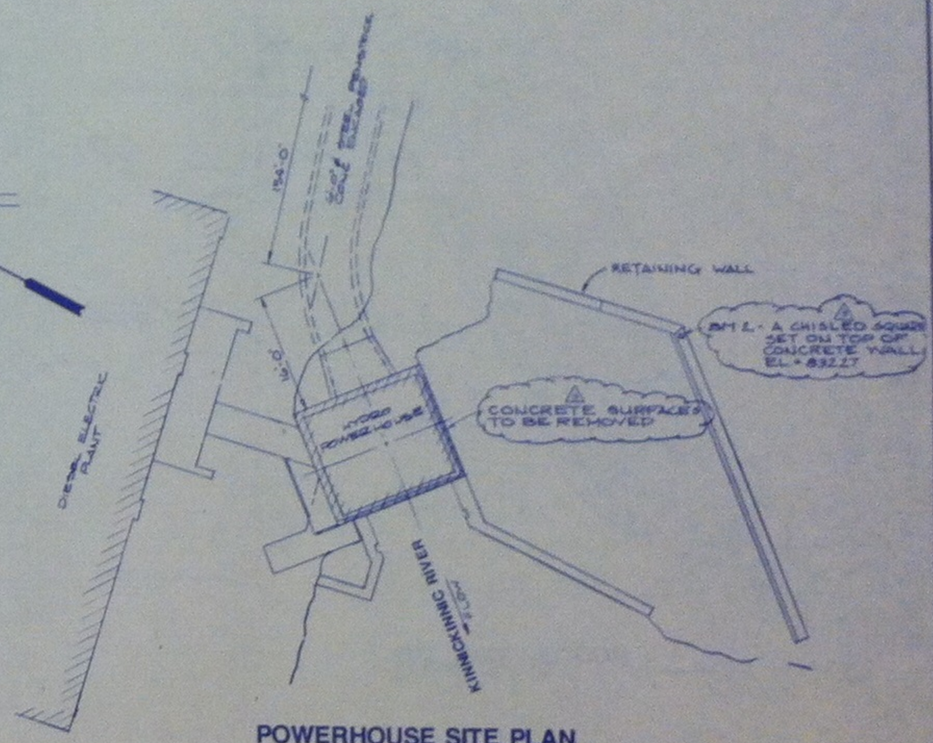
4. SHADED AREAS REPRESENT AREAS OF CONCRETE REMOVAL. EXISTING CONCRETE REQUIRING SURFACE REPAIRS ARE NOT SHOWN UNLESS CALLED OUT.

5. PROVIDE ADEQUATE SUPPORT AND SHORING FOR EXISTING STRUCTURES AND FEATURES DURING CONSTRUCTION; SPECIFICALLY THE PENSTOCK AND ABUTMENT FACES.

6. SECTION IDENTIFICATION — (1/2) — SECTION NUMBER / SHEET WHERE SECTION IS SHOWN.



PLAN
1"=10'



POWERHOUSE SITE PLAN
1"=10'

This drawing is a part of the application for license made by the undersigned

this 12 day of April, 1990.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

APR 11 1990

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors
Dean Ayres & Associates Inc.
Eau Claire, Wisconsin

EXHIBIT F-8 PROJECT NO. 10489 SHEET 1 OF 2

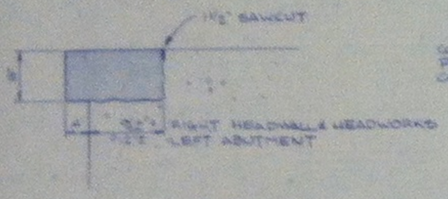
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

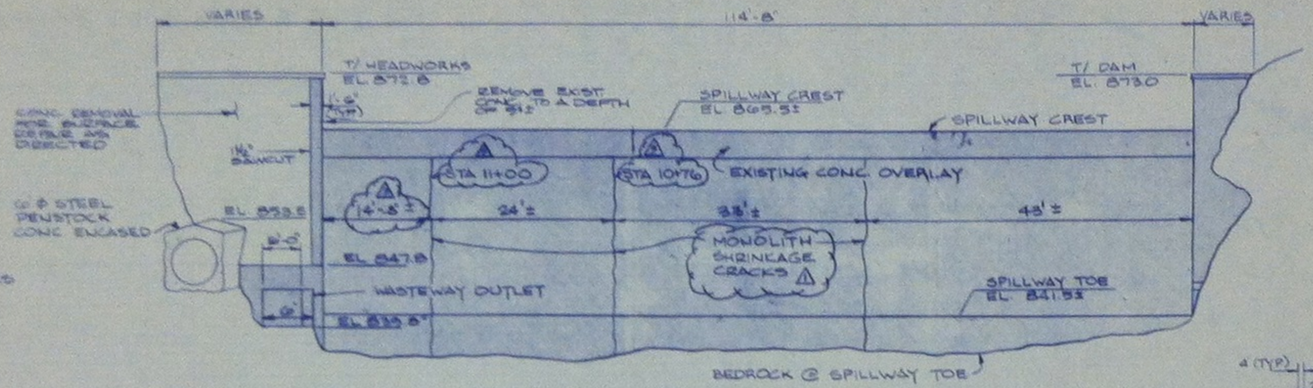
JUNCTION FALLS DAM

ORIGINAL STRUCTURES
DAM & POWERHOUSE PLAN

SCALE: AS SHOWN

⚠ REVISED 1/16/90 dla
⚠ REVISED 2/8/90 dla

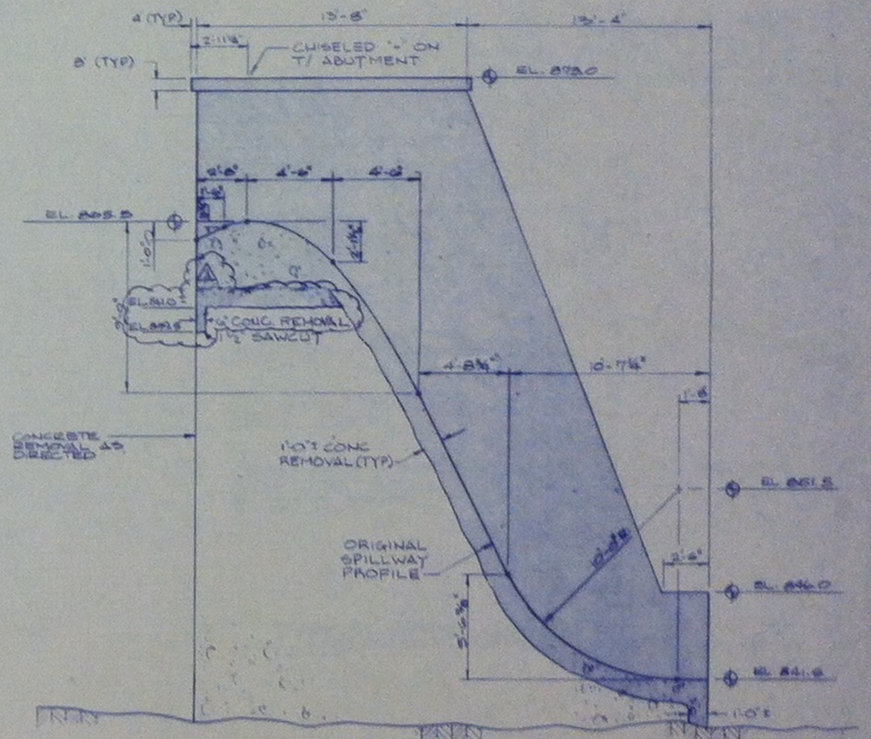




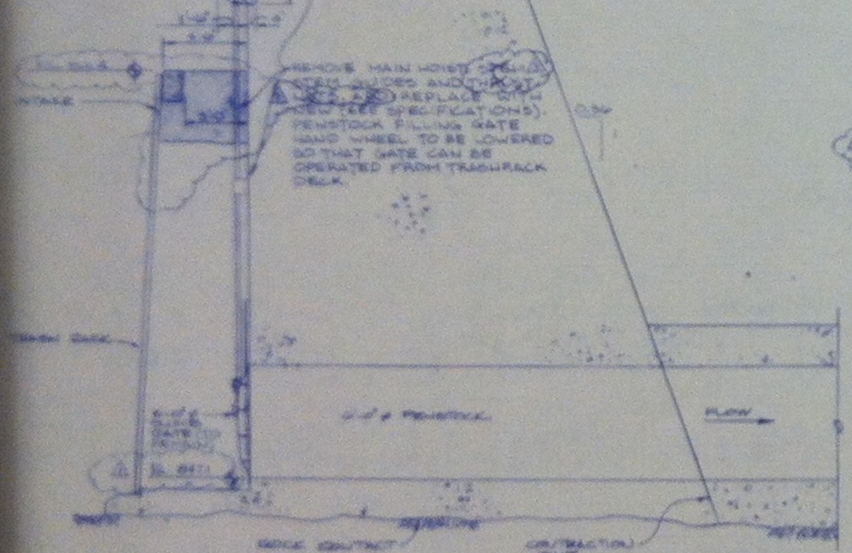
NOTES:
1. FOR GENERAL NOTES SEE SHT 1
2. EXIST. CONC. REMOVAL SHALL BE 1'-0"± UNLESS OTHERWISE SHOWN OR DIRECTED

DECK EDGE REMOVAL (TYP)
5/2

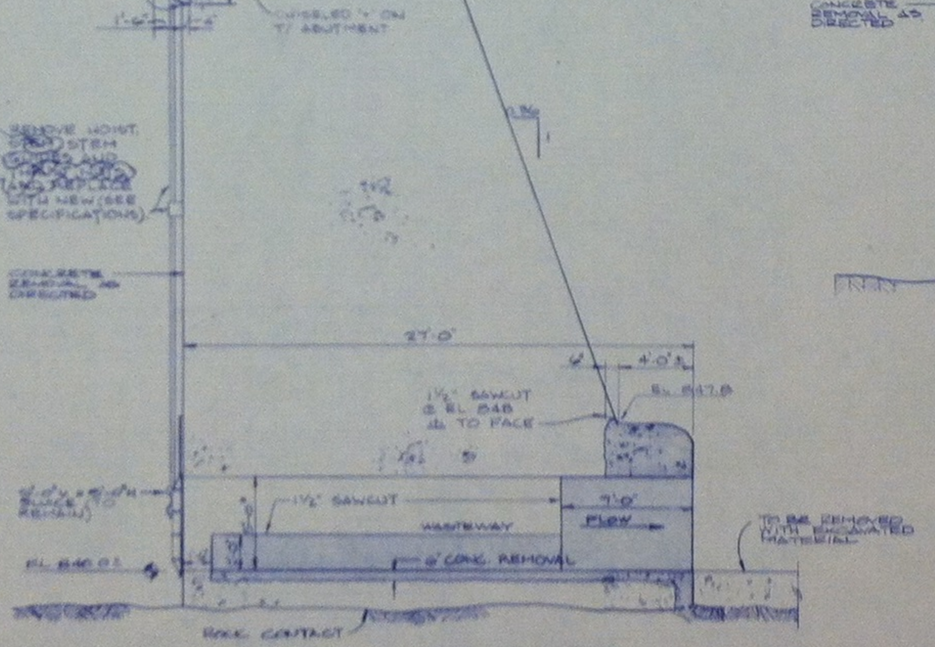
ELEVATION
(DEVELOPED ALONG DOWNSTREAM TOE) 1"=10'
1/2



SPILLWAY SECTION
1/4"=1'-0"
4/2



PENSTOCK INTAKE SECTION
3/4"=1'-0"
2/2



WASTEWAY SECTION
1/8"=1'-0"
3/2

This drawing is a part of the application for license made by the undersigned this 6 day of April, 1990.
By: Jerry E. Wilkens
Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors

EXHIBIT F-8 PROJECT NO. 10489 SHEET 2 OF 2

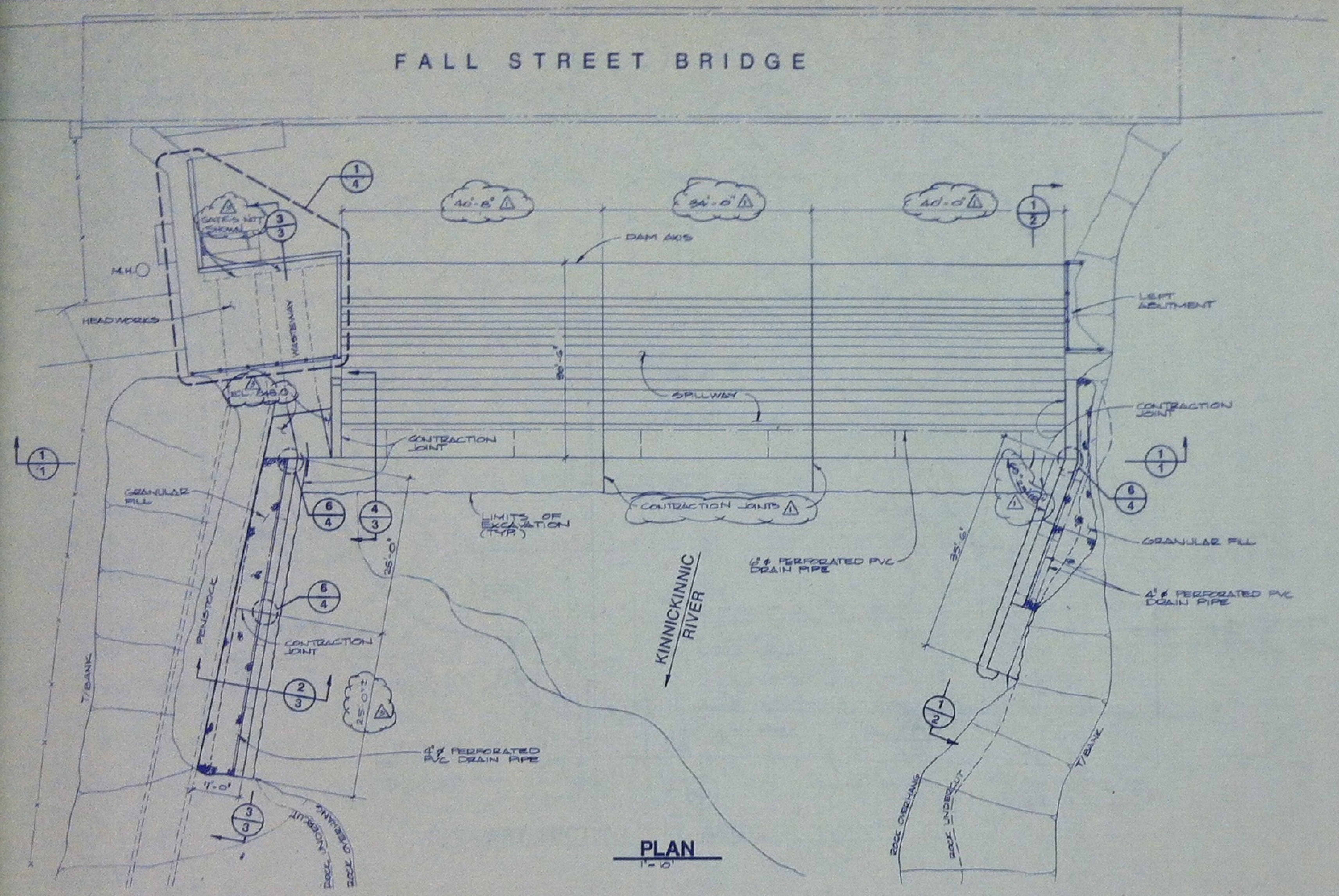
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

JUNCTION FALLS DAM

ORIGINAL STRUCTURES
DAM ELEVATION & SECTIONS
SCALE AS SHOWN

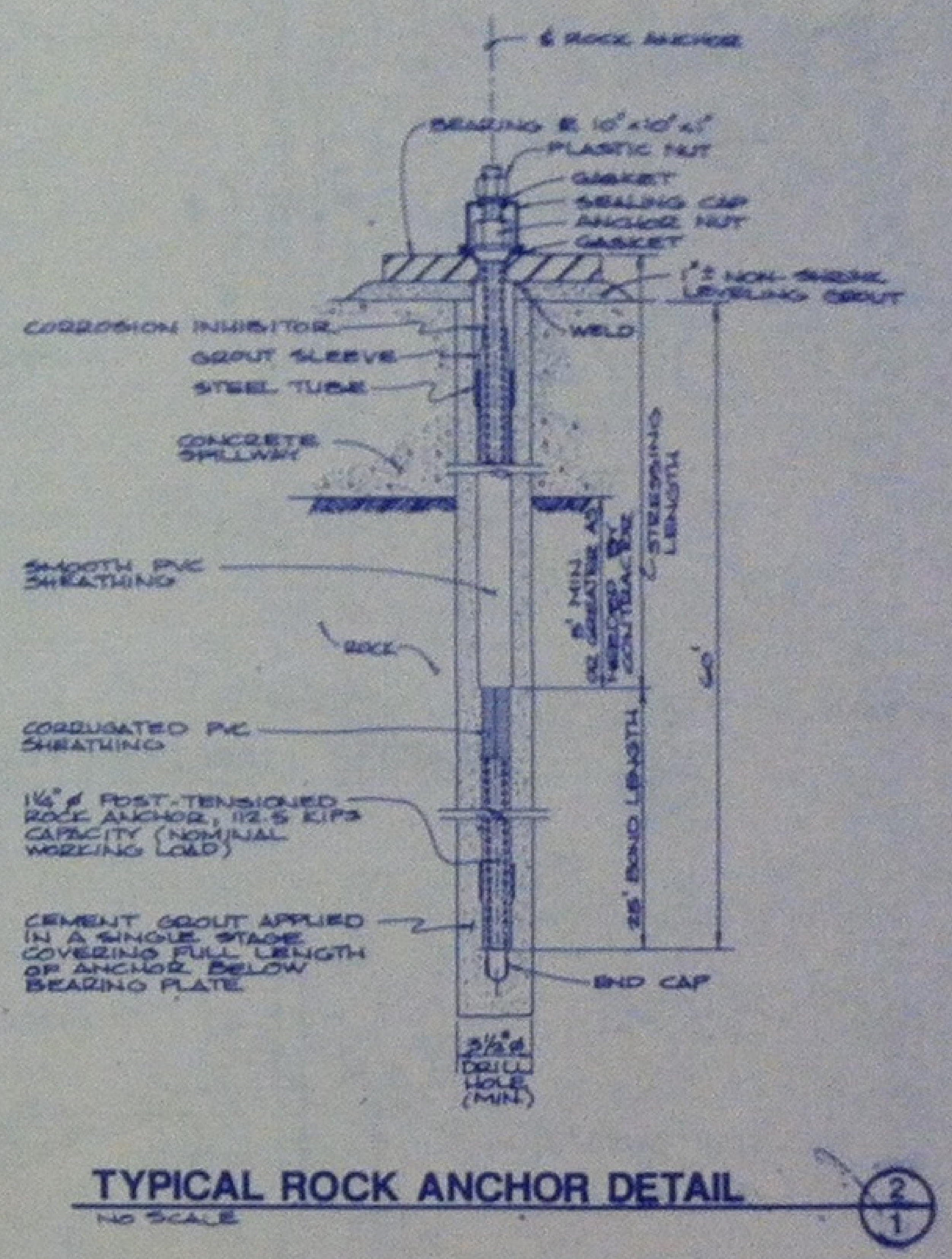
GENERAL NOTES

3. SECTION IDENTIFICATION — SECTION NUMBER — SHEET WHERE SECTION IS SHOWN.



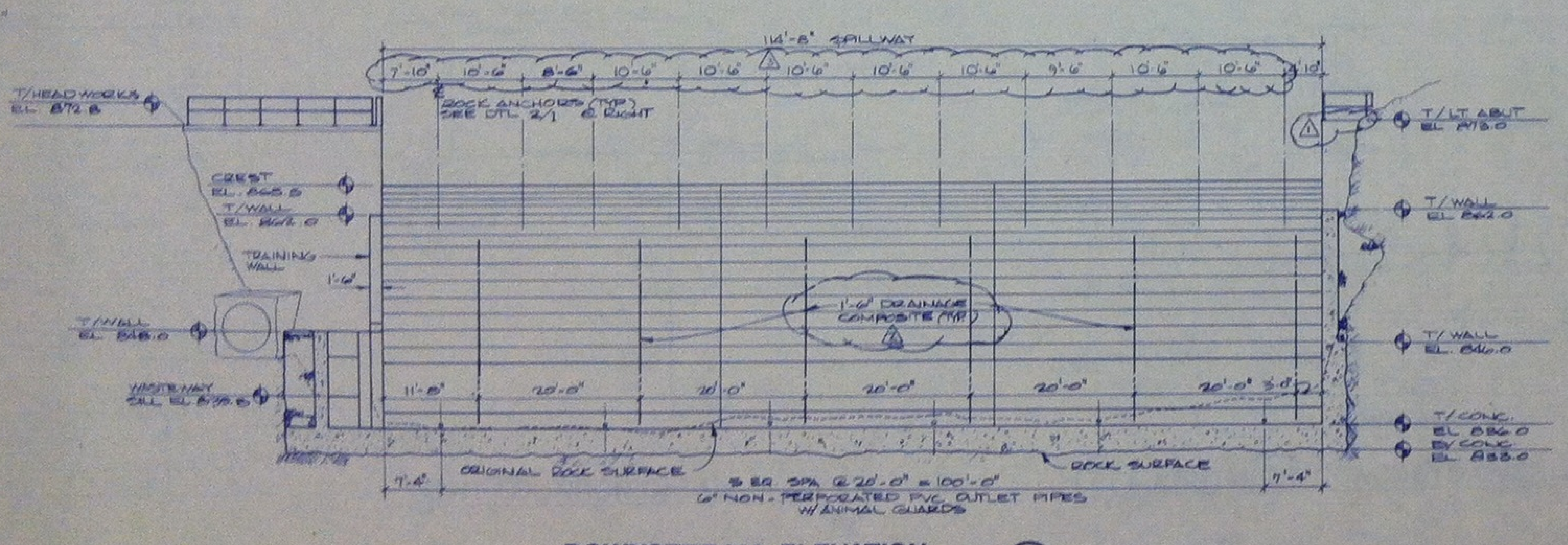
PLAN

1" = 10'



TYPICAL ROCK ANCHOR DETAIL

NO SCALE



DOWNSTREAM ELEVATION

1" = 10'

REVISED 1/16/90		
REVISED 9/14/89		
REVISED 8/8/89		

This drawing is a part of the application for license made by the undersigned

this 6 day of April, 1990.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor

City of River Falls, Wisconsin

AYRES ASSOCIATES — Engineers / Architects, Planners / Surveyors

EXHIBIT F-10 | PROJECT NO. 10489 | SHEET 1 OF 5

RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES

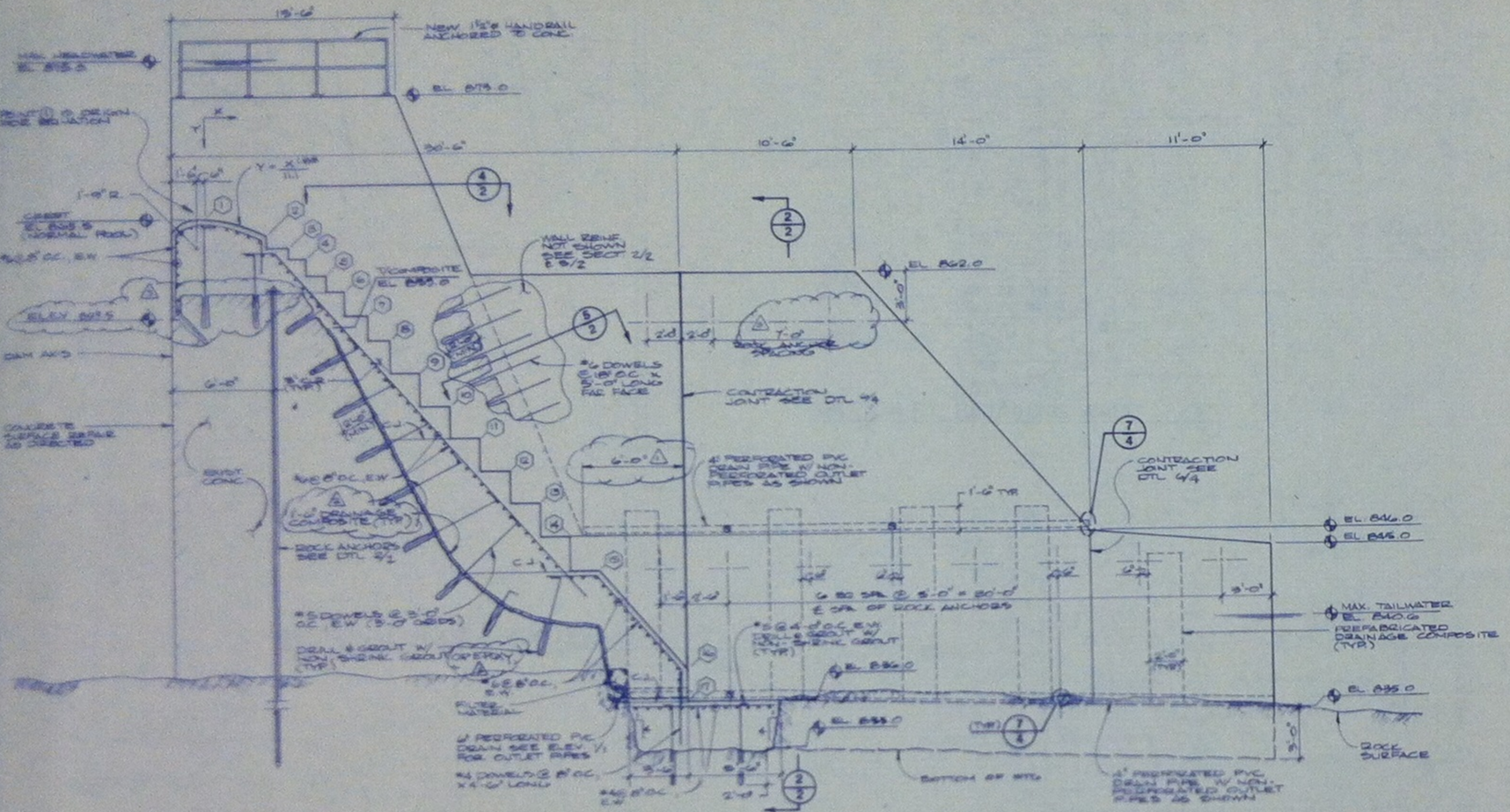
CITY OF RIVER FALLS, WISCONSIN

JUNCTION FALLS DAM

REHABILITATION

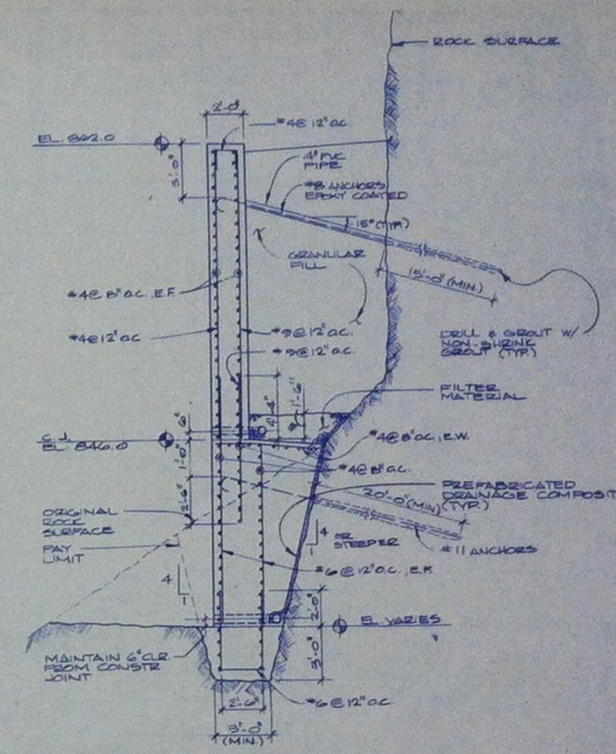
DAM PLAN & ELEVATION

SCALE: AS SHOWN



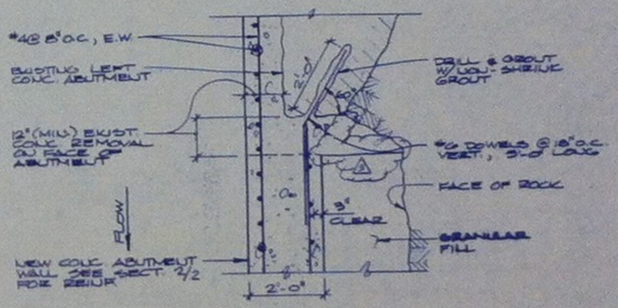
SPILLWAY SECTION @ LT. ABUT, 1/2

1/4" = 1'-0"



LT. RETAINING WALL SECTION 2/2

1/4" = 1'-0"

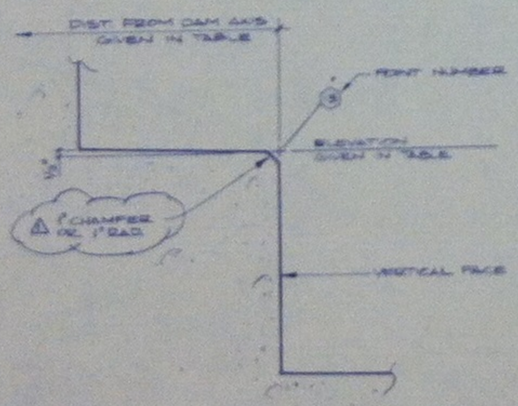


SECTIONAL PLAN

LEFT ABUTMENT WALL EXTENSION 5/2

1/2" = 1'-0"

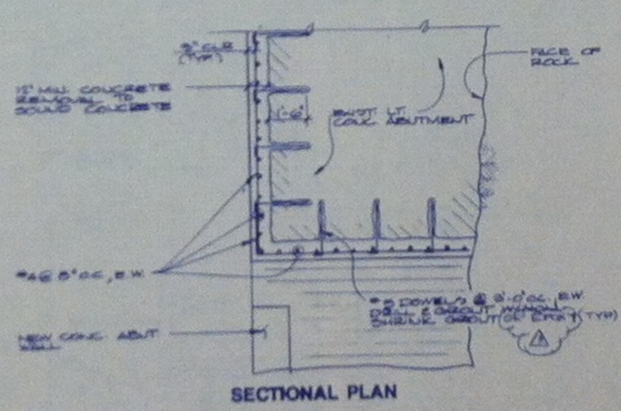
TABLE OF SURVEY OBJECT DIMENSIONS		
LOCATION	DISTANCE FROM DAM AXIS	ELEVATION
1	0'-0"	865.50
2	5'-8"	864.50
3	6'-11-1/2"	863.75
4	8'-8-1/2"	863.00
5	9'-2-3/4"	862.00
6	10'-3-1/2"	861.00
7	11'-8-1/4"	859.50
8	13'-0"	858.00
9	14'-9"	856.00
10	16'-8"	854.00
11	18'-2"	852.00
12	20'-6"	850.00
13	21'-9"	848.50
14	23'-6"	846.00
15	25'-3"	844.00
16	28'-6"	838.00
17	30'-6"	836.00



NOTE: FOR POINT LOCATIONS SEE DETAIL AT RIGHT

POINT LOCATION DETAIL 3/2

1½" = 1'-0"



SECTIONAL PLAN

LEFT ABUTMENT CONCRETE OVERLAY 4/2

1/2" = 1'-0"

This drawing is a part of the application for license made by the undersigned this 6 day of April, 1990.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors

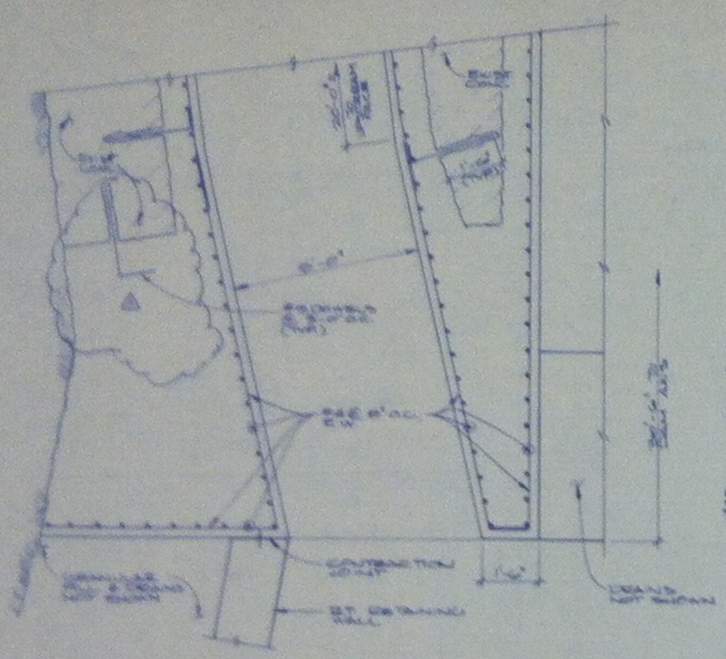
EXHIBIT F-11 PROJECT NO. 10489 SHEET 2 OF 5

RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

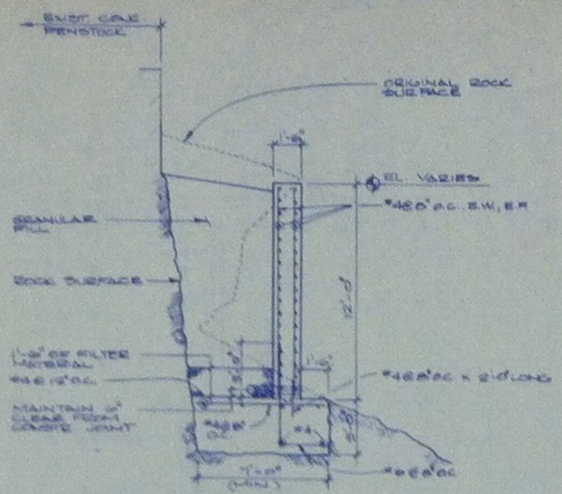
JUNCTION FALLS DAM
REHABILITATION

SPILLWAY & LEFT ABUTMENT

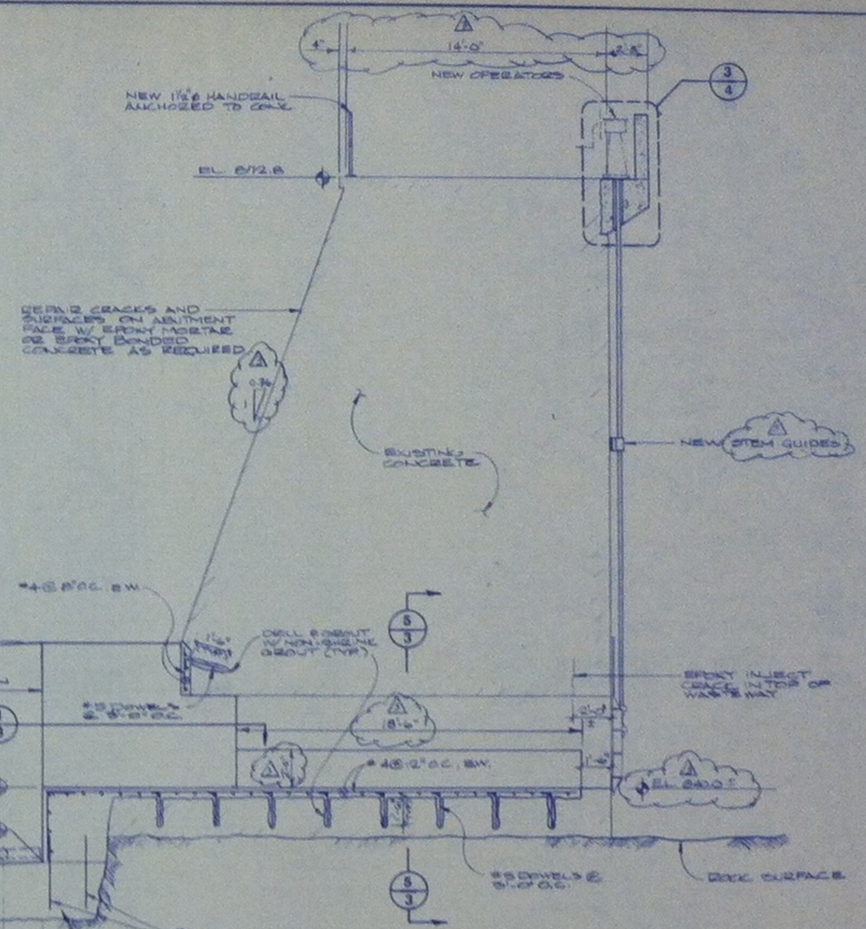
SCALE: AS SHOWN

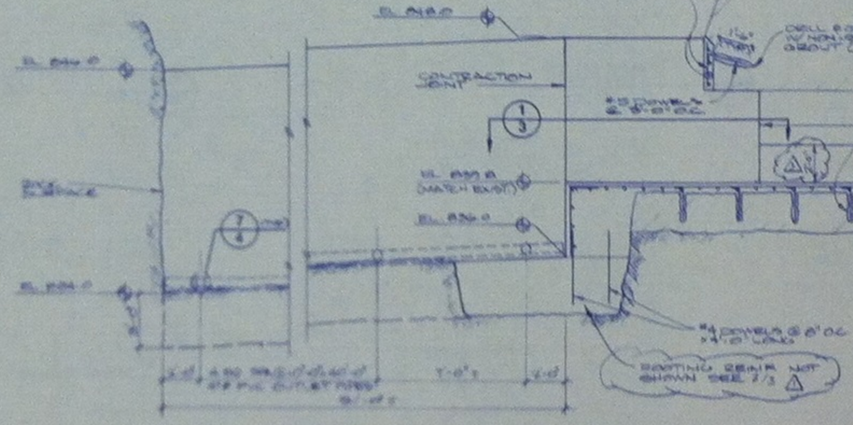


SECTIONAL PLAN @ WASTEWAY 1/3

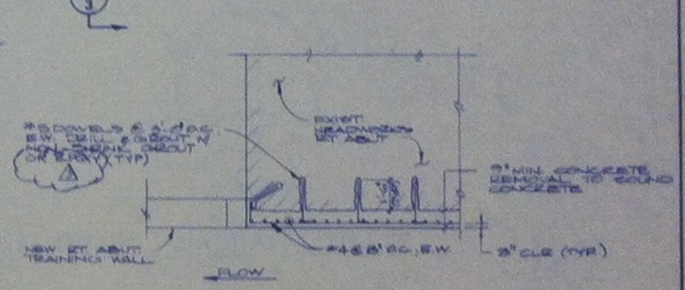


SECTION RT. RETAINING WALL 2/3

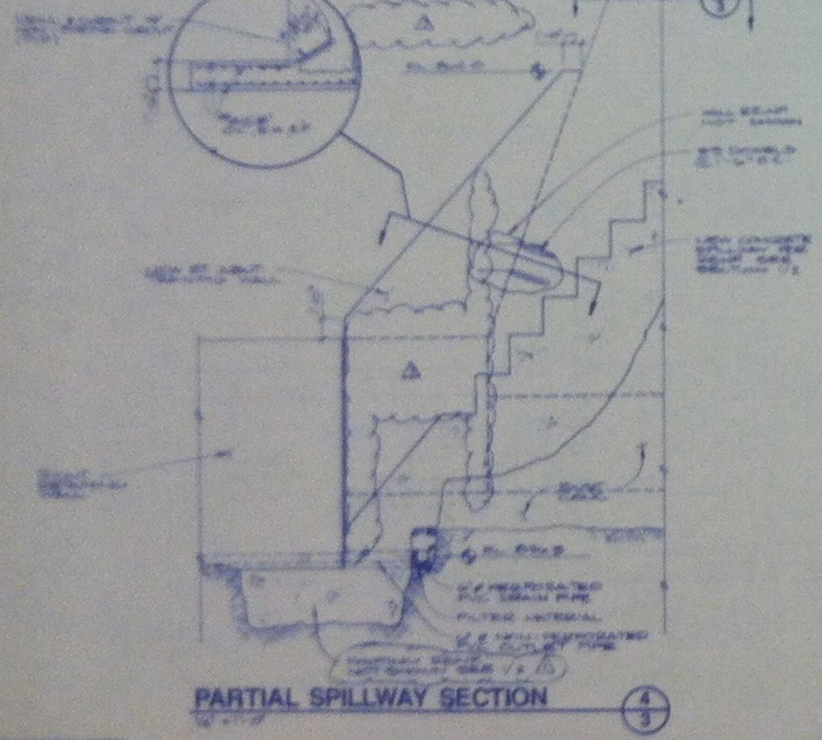




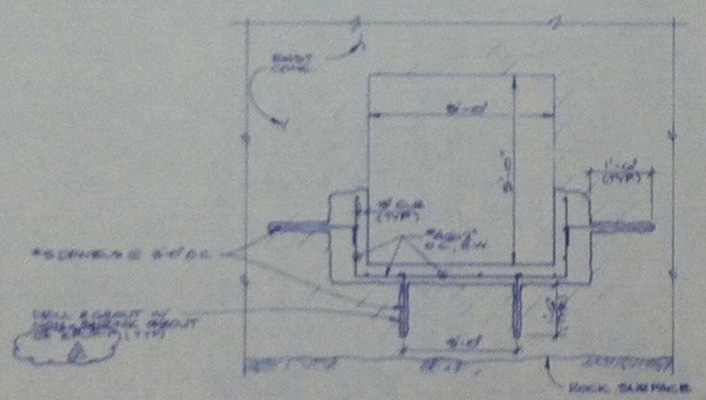
SECTION THRU WASTEWAY 3/3



SECTIONAL PLAN



PARTIAL SPILLWAY SECTION 4/3



CROSS - SECTION WASTEWAY 5/3

RIGHT ABUTMENT CONCRETE OVERLAY 6/3

This drawing is a part of the application for license made by the undersigned this 6 day of April, 1990.

By: Jerry E. Wilkens

Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors

EXHIBIT F-12 PROJECT NO. 10489 SHEET 3 OF 5

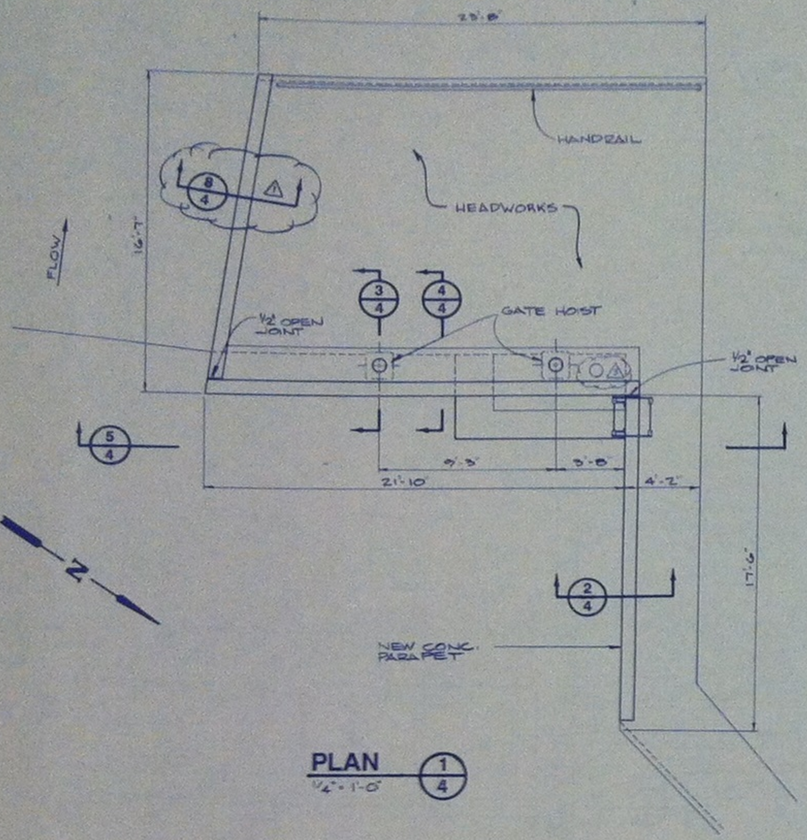
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

JUNCTION FALLS DAM

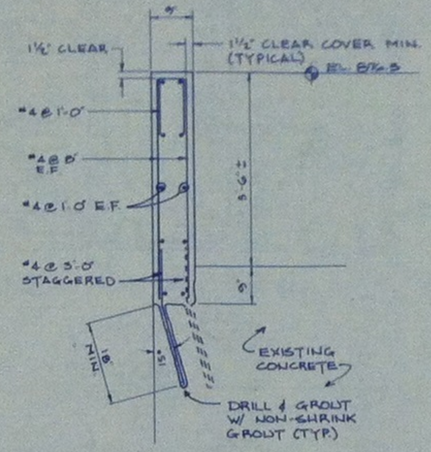
REHABILITATION

WASTEWAY & RIGHT ABUTMENT

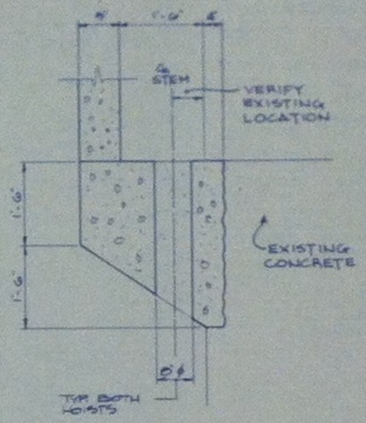
SCALE: AS SHOWN



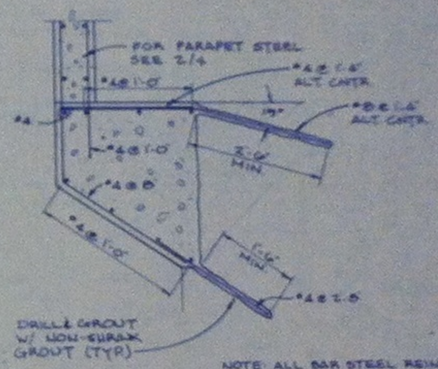
PLAN (1/4) 1/4" = 1'-0"



SECTION (2/4) 3/4" = 1'-0"

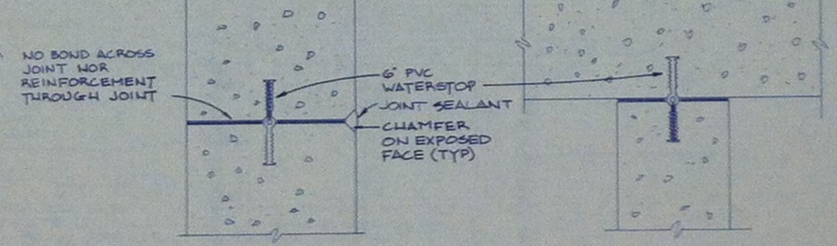


SECTION (3/4) 3/4" = 1'-0"

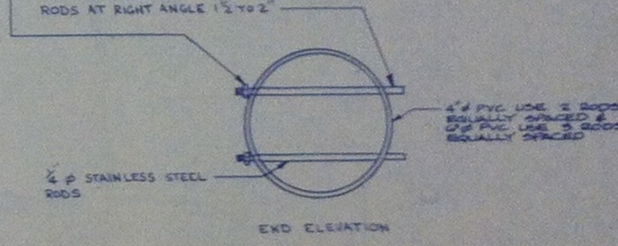


NOTE: ALL BAR STEEL REINF TO HAVE 1½" CLEAR COVER MIN.

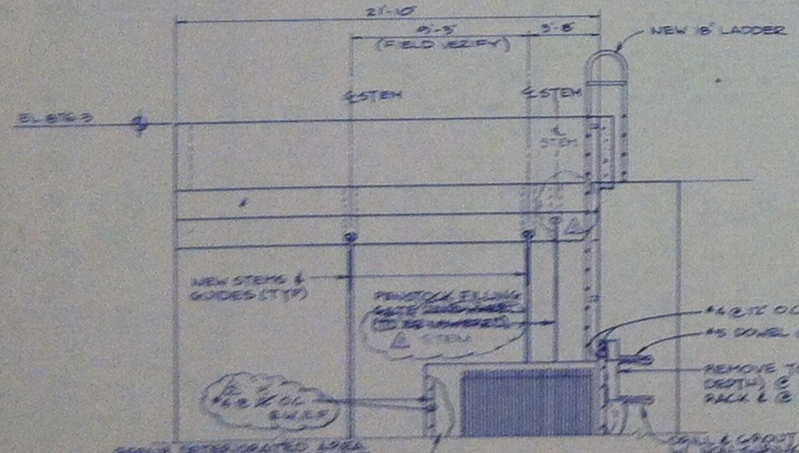
SECTION (4/4) 3/4" = 1'-0"



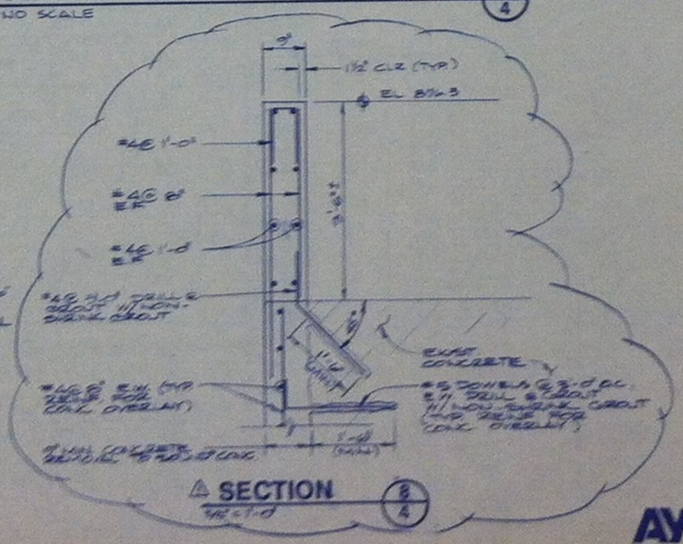
CONTRACTION JOINT DETAIL (6/4)
NO SCALE



ANIMAL GUARD FOR DRAIN OUTLETS (7/4)
NO SCALE



ELEVATION (5/4) 1/4" = 1'-0"



SECTION (8/4) 3/4" = 1'-0"

This drawing is a part of the application for license made by the undersigned this 6 day of April, 1990.
By: Jerry E. Williams
Jerry E. Williams, Mayor
City of River Falls, Wisconsin

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors

EXHIBIT F-13 PROJECT NO. 10489 SHEET 4 OF 5

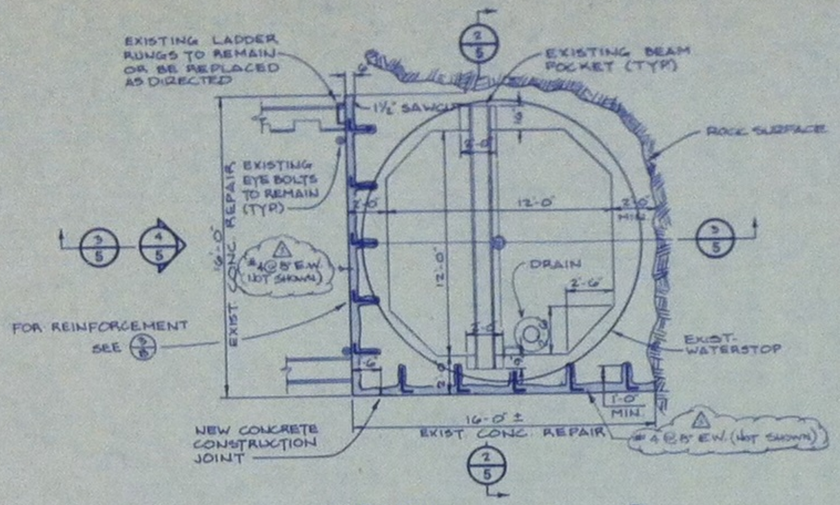
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

JUNCTION FALLS DAM

REHABILITATION

HEADWORKS & MISCELLANEOUS DETAILS

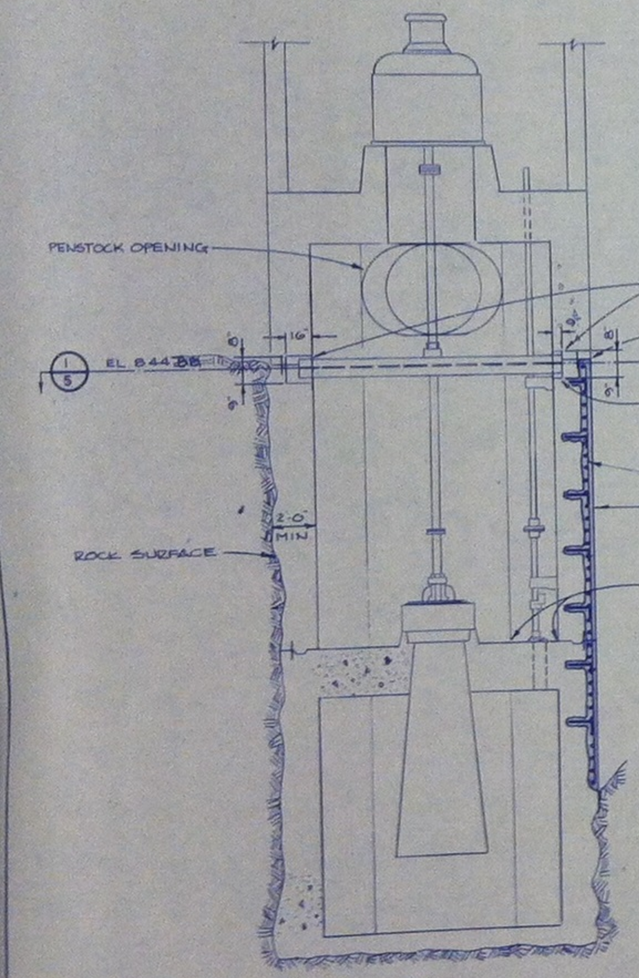
SCALE AS SHOWN



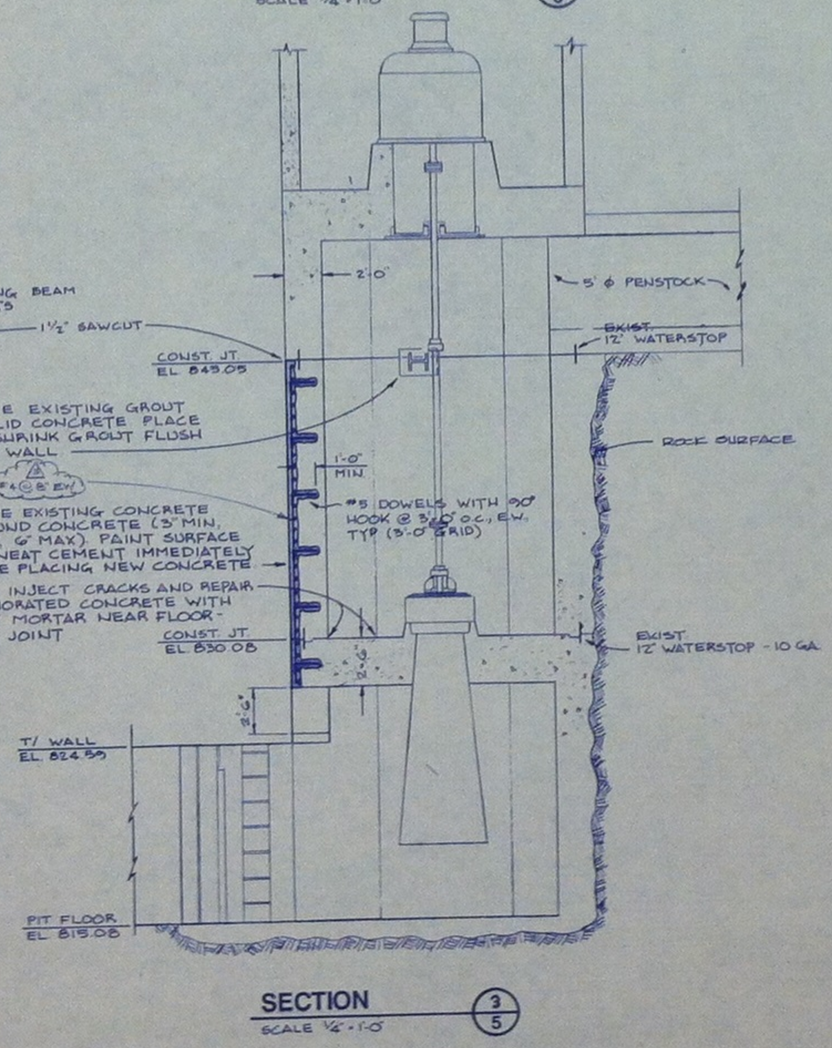
SECTION 1/5
SCALE 1/4" = 1'-0"

CONSTRUCTION NOTES:

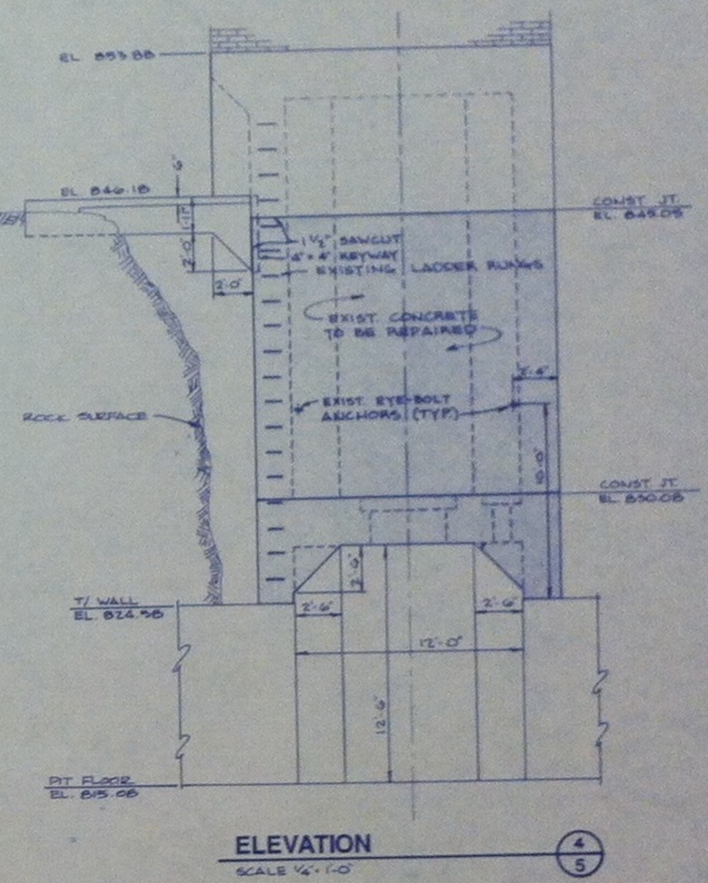
1) CONTRACTOR TO REPAIR ONE SIDE OF POWERHOUSE BEFORE PROCEEDING WITH THE OTHER SIDE.
2) EXISTING CONCRETE REMOVAL NOT TO EXCEED A DEPTH OF 6".
3) REINFORCEMENT SHALL HAVE 2" CLEAR COVER.
4) EXISTING REINFORCEMENT TO REMAIN OR BE REPLACED IN KIND USING SPLICES OR LAPS.
5) SHADED AREAS REPRESENT CONCRETE SURFACES TO BE REPAIRED.
6) EXISTING STRUCTURE DIMENSIONS DEVELOPED FROM DRAWINGS ENTITLED "UPPER HYDROELECTRIC IMPROVEMENTS, PLANS AND DETAILS," HERMAN T. NAGESTAD, CONSULTING ENGINEER, AUGUST 1946, 2 SHEETS. ADDITIONAL INFORMATION INCLUDING REINFORCEMENT DETAILS ARE SHOWN ON THESE DRAWINGS AND ARE AVAILABLE FOR THE CONTRACTORS USE. OWNER AND ENGINEER MAKE NO REPRESENTATION OR WARRANTY TO THE CONTRACTOR AS TO THE DRAWINGS ACCURACY OR THEIR USE BY THE CONTRACTOR.



SECTION 2/5
SCALE 1/4" = 1'-0"



SECTION 3/5
SCALE 1/4" = 1'-0"



ELEVATION 4/5
SCALE 1/4" = 1'-0"

EXHIBIT F-14 PROJECT NO. 10489 SHEET 5 OF 5

RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN

JUNCTION FALLS DAM

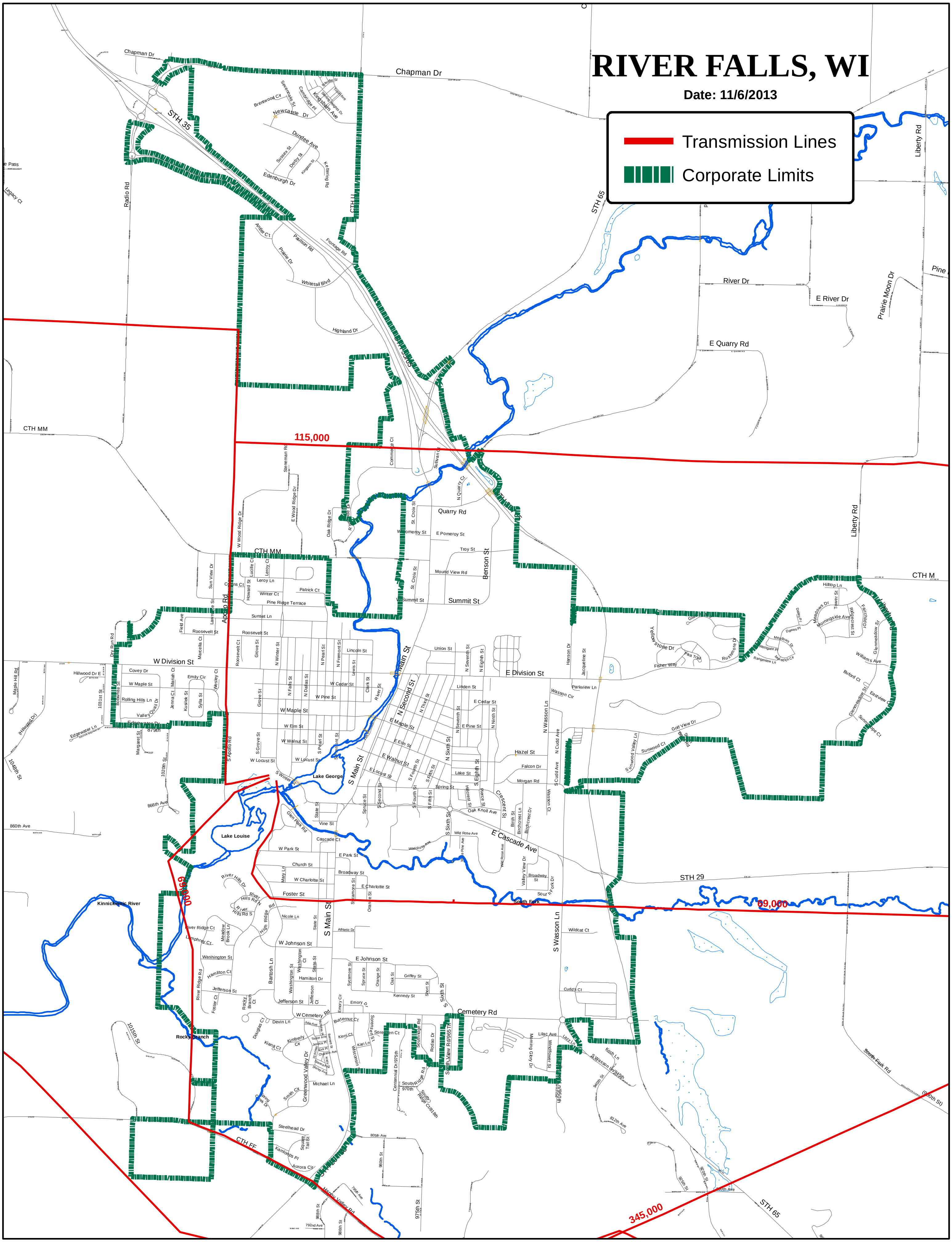
REHABILITATION
POWERHOUSE

This drawing is a part of the application for license made by the undersigned this 6 day of April, 1990.
By: Jerry E. Wilkens
Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors

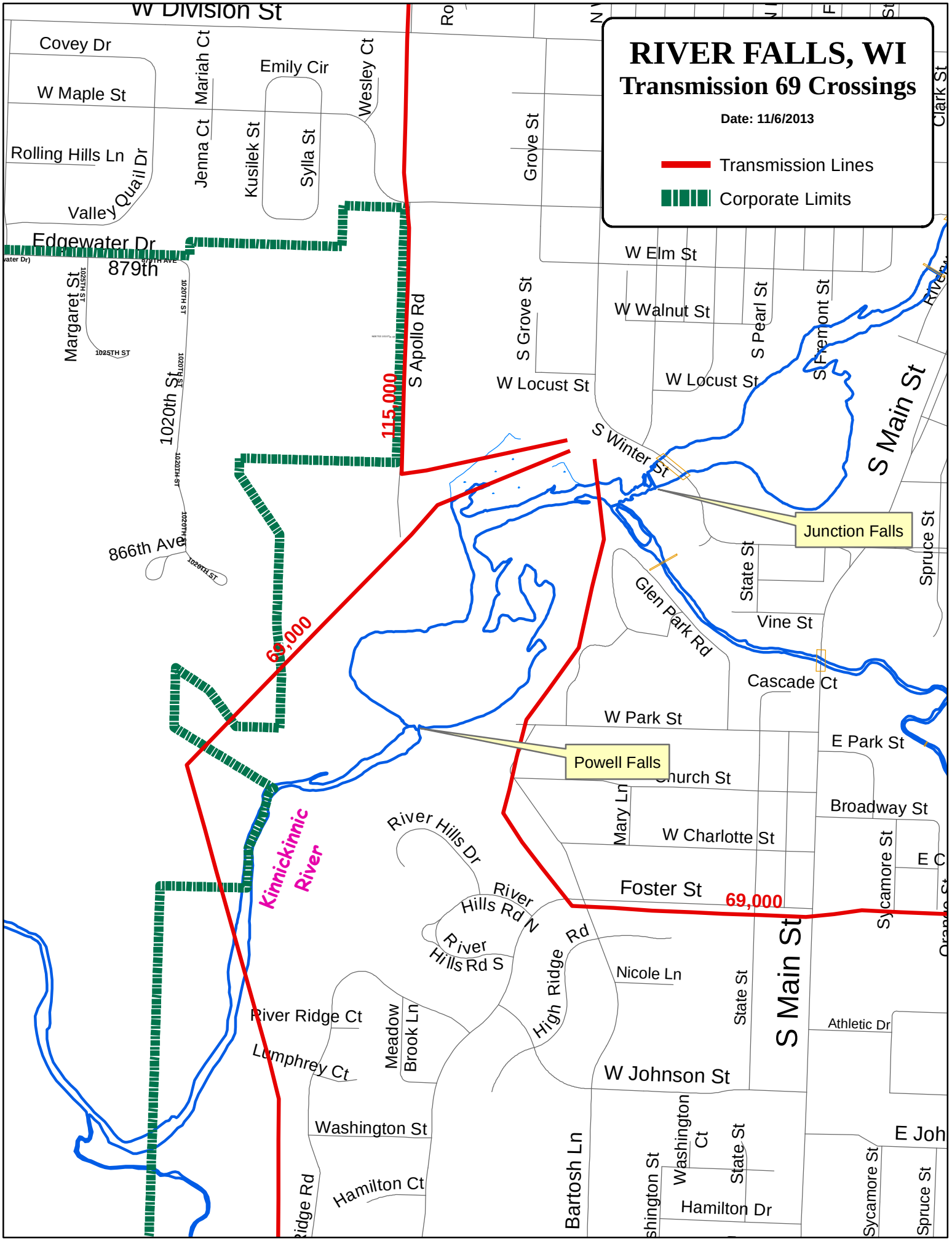
REVISED 1/16/90

Appendix C



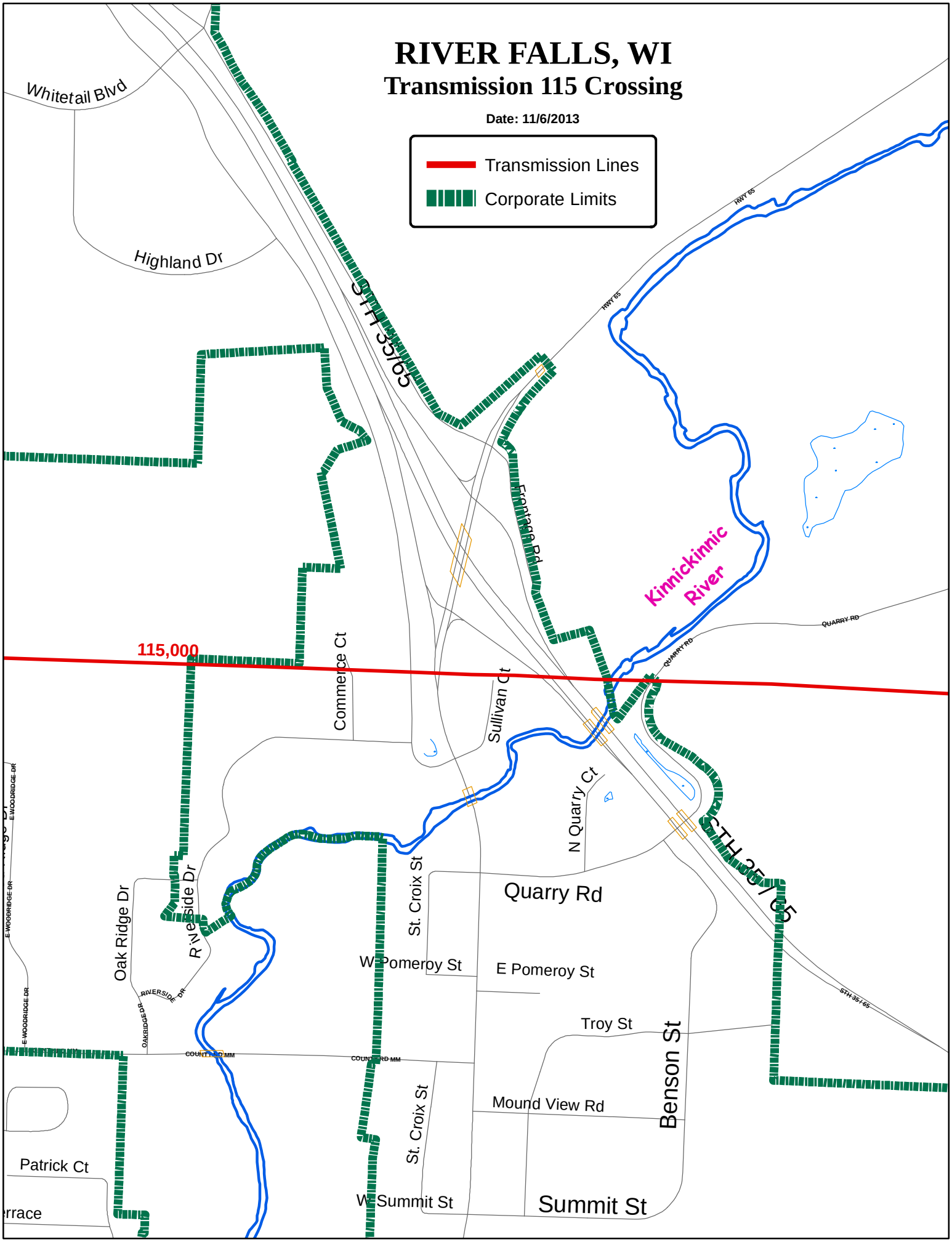
Document Path: C:\GIS_RFMU\Maps\ElectricMaps\Transimmision_FERC-License\Transimmision_For_FERC-License.mxd

Map Created by: T. Jaworski



Document Path: C:\GIS_RFMU\Maps\ElectricMaps\Transimmision_FERC-License\Transimmision_Crossings.mxd

Map Created by: T. Jaworski



Document Path: C:\GIS_RFMU\Maps\ElectricMaps\Transimmision_FERC-License\Transimmision_115-Crossing.mxd

Map Created by: T. Jaworski

Appendix D

License For FMS Sept., 1988

44 FERC ¶ 62,298

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

River Falls Municipal Utility — Project No. 10489-000
Wisconsin

ORDER ISSUING LICENSE
(Minor Project)
(Issued September 27, 1988)

River Falls Municipal Utility filed a license application under Part I of the Federal Power Act (Act) to operate and maintain the constructed River Falls Project located on the Kinnickinnic River, in Pierce County, Wisconsin. The project would affect the interests of interstate or foreign commerce.

Notice of the application has been published. No protests were filed in this proceeding, and no agency objected to issuance of this license. Comments received from interested agencies and individuals have been fully considered in determining whether to issue this license.

The State of Wisconsin Department of Natural Resources (DNR) filed a motion to intervene in this proceeding, requesting that certain conditions be included in any license issued. The DNR concerns have been addressed in the environmental assessment (EA) for the River Falls Project and provided for by license articles 401, 402 and 403.

Section 10(a)(2)-Comprehensive Plans

Section 10(a)(2) of the Act requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans (where they exist) for improving, developing, or conserving a waterway or waterways affected by the project. The Commission provided an interpretation of comprehensive plans under section 10(a)(2) 1/ that is revised by Order Granting Rehearing, issued April 27, 1988. 2/ In granting rehearing, the Commission instructed the Director, Office of Hydropower licensing, to request the state and federal agencies to file plans they believe meet the revised guidelines. Until the process is completed, the staff will consider all available plans pursuant to section 10(a)(2).

1/ Order No. 481, 52 FED. REG. 39,905 (October 26, 1987), III FERC STATS. & REGS. ¶ 30,773 (1987).

2/ Order No. 481-A, 43 FERC ¶ 61,120 (April 27, 1988).

The staff reviewed three plans that address various aspects of waterway management in relation to the proposed project. 3/ No conflicts were found.

Based upon a review of the agency and public comments filed in this proceeding, and on the staff's independent analysis, the River Falls Hydroelectric Project is best adapted to a comprehensive plan for the Kinnickinnic River.

Recommendations of Federal and State Fish and Wildlife Agencies

Section 10(j) of the Act requires the Commission to include license conditions, based on recommendations of federal and state fish and wildlife agencies, for the protection, mitigation, and enhancement of fish and wildlife. In the EA for the River Falls Project attached to and made part of this license, the staff addresses the concerns of the federal and state fish and wildlife agencies, and makes recommendations consistent with those of the agencies, except as indicated below.

The Department of the Interior, by letter dated April 5, 1988, recommends that the Commission require the licensee to survey two transmission lines that cross a wetland in the Powell Falls impoundment to determine if these lines are a hazard to water-fowl. Since these lines are not part of the project to be licensed, the Commission cannot require the licensee to conduct the survey to determine mitigative measures. Therefore, Interior's recommendation is outside the scope of Section 10(j). The staff discussed this with the U.S. Fish and Wildlife Service personnel and no further negotiations are necessary (personnal communication, Cathy Carnes, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Green Bay, Wisconsin, August 1, 1988).

Summary of Findings

An EA was issued for this project. Background information, analysis of impacts, support for related license articles, and the basis for a finding of no significant impact on the environment are contained in the EA attached to this order. Issuance of this license is not a major federal action significantly affecting the quality of the human environment.

3/ Wisconsin Water Quality, Report to Congress, 1986, Wisconsin Department of Natural Resources; Wisconsin Water Quality Program, St. Croix River Basin Areawide Water Quality Management Plan, October 1980, Wisconsin Department of Natural Resources; Wisconsin's 1986-91 Statewide Comprehensive Outdoor Recreation Plan, 1986, Wisconsin Department of Natural Resources.

C. EXISTING PROJECT AND ALTERNATIVES

1. Project Description:

The existing, unlicensed River Falls project consists of the Junction Falls and the Powell Falls developments (figure 1). The Junction Falls development consists of: (a) an existing 140-foot-long and 32-foot-high concrete dam; (b) an existing reservoir with a surface area of 15.5 acres and a storage capacity of 142.7 acre-feet at elevation 865.3 mean sea level (msl); (c) an existing 80-foot-long, 6-foot diameter penstock; (d) an existing powerhouse containing one generating unit rated at 250 kilowatts (kW); (e) the existing 50-foot-long transmission line; and (f) related facilities (figure 2). The Powell Falls development consists of: (a) an existing 110-foot-long and 16.5-foot-high concrete dam located approximately 0.5 mile downstream of the upper dam; (b) an existing reservoir with a surface area of 15.4 acres and a storage capacity of 37 acre-feet at elevation 820 feet msl; (c) an existing powerhouse containing one generating unit rated at 125 kW; (d) the existing 2500-foot-long transmission line; and (e) related facilities (figure 3). The estimated average annual energy output for the River Falls project is 2,000,000 kWh.

The Junction Falls dam was originally constructed in 1896 and was renovated in 1948 to generate electricity. The Powell Falls dam was originally built in 1903 and was renovated in 1948 and again in 1966. Each facility has been operating in a run-of-river mode since 1975. The project was previously operated in a peaking mode. The mode of operation was modified pursuant to a request from the Wisconsin Department of Natural Resources.

2. Applicant's proposed mitigative measures.

a. Construction. No new construction is anticipated therefore, no mitigative measures are proposed.

b. Operation. To reduce the impacts of operating the project, the applicant proposes to maintain the present run-of-river mode of operation and to enhance the recreational opportunities in the project area by providing canoe portage around the dams, and by installing signs at the Junction Falls take-out point. No other changes to the existing facilities are proposed.

3. Federal lands affected. There are no federal lands either in or adjacent to the project area and no such lands would be affected.

4. Alternatives to Licensing the Project

a. _X_ No reasonable action alternative has been found.
b. ___ Action alternative: Denial of the License.

Denying the license would result in removal of the project facilities and would preclude the city of River Falls from generating power at the site. To replace the power lost by removing the project facilities the city would need to consider developing other sources of energy, reducing the energy demand by employing conservation measures, or purchasing additional power from another utility. The city of River Falls has a fossil-fueled generating plant immediately adjacent to the Junction Falls development. If the license is denied and project facilities are removed, expanding the generating capacity of this plant may be an alternative for replacing the power lost by removing the River Falls Hydroelectric project.

D. CONSULTATION AND COMPLIANCE

1. Fish and wildlife agency consultation (Fish & Wildlife Coordination Act).

a. U.S. Fish & Wildlife Service (FWS): _X_ Yes. ___No.
b. Wisconsin Department of Natural Resources: _X_ Yes. ___No.
c. National Marine Fisheries Service (NMFS): _X_ Yes. ___No.

2. Section 7 consultation (Endangered Species Act).

a. Listed species: ___None. _X_ Present.

b. Consultation: _X_ Not required.
___ Required.

The project is within the general range of the peregrine falcon (endangered), the bald eagle (threatened), and the prairie bush-clover (threatened). The FWS states that because no new construction of facilities or access roads is proposed, the project would not affect the peregrine falcon, bald eagle, or prairie bush-clover (letter from Janet M. Smith, Field Supervisor, U.S. Fish and Wildlife Service, Green Bay, Wisconsin, March 22, 1988).

3. Section 401 certification (Clean Water Act).

Section 401 Water Quality Certification was granted by the Wisconsin Department of Natural Resources (WDNR) on September 9, 1986.

4. Cultural resource consultation (Historic Preservation Act).

a. State Historic Preservation Officer (SHPO): _X_ Yes. ___No.
b. National Park Service (NPS): _X_ Yes. ___No.
c. National Register status: _X_ None.
Eligible or listed.
d. Council: _X_ Not required. ___Completed: _____.
e. Further consultation: _X_ Not required. ___Required.

5. Recreational consultation (Federal Power Act).

a. U.S. Owners: ___Yes. _X_No.
b. NPS: _X_Yes. ___No.
c. State(s): _X_Yes. ___No.

6. Wild and scenic rivers (Wild and Scenic Rivers Act).

The St. Croix River, from it's headwaters to its confluence with the Mississippi River, is part of the National Wild and Scenic River System. The Kinnickinnic River is not part of, and is not being considered for inclusion in, the National Wild and Scenic River System.

7. Land and Water Conservation Fund lands and facilities (Land and Water Conservation Fund Act).

Status: _X_None. ___Designated.
___Determination completed: __/__/__.
Administering agency: _____.

E. COMMENTS

1. The following agencies and entities provided comments on the application or filed a motion to intervene in response to the public notice dated January 29, 1988. The applicant responded to the comments and interventions by a letter dated April 21, 1988.

Commenting agencies and other entities	Date of letter
Wisconsin Department of Natural Resources	February 23, 1988
Department of the Interior	April 5, 1988

Motion to intervene	Date of motion
Wisconsin Department of Natural Resources	March 28, 1988

F. AFFECTED ENVIRONMENT

1. General description of the St. Croix River Basin.

The St. Croix River forms the northern border between Minnesota and Wisconsin and is a major tributary of the upper Mississippi River. The drainage area of the St. Croix River Basin is 7,650 square miles. The river flows through rolling glacial terrain, including agricultural and forest lands typical of the upper midwest region. The St. Croix River Basin has an abundant supply of both ground- and surface water, and the hundreds of lakes scattered throughout the basin are the primary source of water for the river. The average annual flow of the

St. Croix River at it's confluence with the Mississippi is 4,200 cubic feet per second (cfs). Elevations in the basin range from 1,730 feet at the highest point to 675 feet at the confluence of the St. Croix and Mississippi Rivers. The entire mainstem St. Croix River is a Wild and Scenic River under the National Wild and Scenic Rivers System.

The Kinnickinnic River, a small tributary of the St. Croix River, is located in the lower portion of the basin about 30 miles southeast of St. Paul, Minnesota (figure 4). The river is approximately 40 miles long and has a drainage area of 174 square miles. The Kinnickinnic River flows through primarily agricultural land in its headwaters and through urban and suburban land near the confluence with the St. Croix River.

2. Existing Hydropower Projects

There are no pending applications for license in the St. Croix River Basin other than the River Falls Project. However, there are 11 other hydropower projects in the St. Croix River Basin. Only three of these projects are licensed.

The following is a list of the existing licensed and unlicensed hydropower projects and the pending license applications in the St. Croix River Basin, as of August 1, 1988.

Project Name	FERC Project No.	River
Powell Falls*	10489 (pending)	Kinnickinnic
Junction Falls*	10489 (pending)	Kinnickinnic
Apple River*		Apple
Riverdale*		Apple
Black Brook	2894	Apple
Balsam Lake*		Balsam
St. Croix Falls*		St. Croix
Clam Falls*		Clam
Danbury*		Yellow
Grodon*		Eau Claire
Nancy*		Totagatic
Trego	2711	Namekagon
Hayward	2417	Namekagon

* Unlicensed projects

The important natural resources within the St. Croix River Basin are related to the mainstem St. Croix River's designation as a Wild and Scenic River under the National Wild and Scenic Rivers System. Licensing the River Falls project, an operating, unlicensed hydropower development on the Kinnickinnic River, would not involve any new construction or changes in project operation. Therefore, continued operation of the project would not contribute to adverse cumulative impacts to the natural

resources of the St. Croix River and its designation as a Wild and Scenic River.

3. Descriptions of the resources in the project area. (Source: River Falls Municipal Utility, 1987, application, exhibit E, unless otherwise indicated).

a. Geology and soils: The project area is characterized by a glaciated surface consisting of a thin layer of silty loess over glacial till. Faulted Precambrian granites, diorites, and gneisses comprise the underlying bedrock. Cambrian sandstones, dolomite, and shale superpose the Precambrian igneous rocks. The soils in the area consist of prairie soils, including black silt loams and silty soils on plains of outwash sand and gravel. Upstream of the city of River Falls, the Kinnickinnic River flows through broad outwash plains bordered by steeply sloped valley walls. The Junction Falls dam is located in a steep narrow rock gorge on the North Branch of the Kinnickinnic River.

b. Streamflow:

low flow: 47 cfs. flow parameter: Flow exceeded 90% of the time.

high flow: 96 cfs. flow parameter: Flow exceeded 10% of the time.

median flow: 58 cfs. Flow exceeded 50% of the time.

These streamflow parameters were determined from the applicant's flow duration curve. The curve was derived from U.S. Geological Survey data taken from 1917 to 1921.

c. Water quality: The quality of the surface and groundwater in the Kinnickinnic River Basin is generally very good. The pollution that does exist in the river comes predominantly from agricultural runoff from the surrounding farmland. The river's sediment load is a concern because of the relatively high annual erosion rate of 5.0 tons of soil per year (Wisconsin Department of Natural Resources, 1980). The eroding top soil washed into the river contributes to seasonally high turbidity levels and decreased water quality. In addition, the city of River Falls' municipal wastewater treatment plant discharges into the Kinnickinnic River in the Powell Falls impoundment (figure 1). However, because of the tertiary water treatment at the plant, no water quality problems have occurred from the plant.

d. Fishery Resources: The Kinnickinnic River in the project area supports an excellent fishery for coolwater and coldwater fish. The fish species present in the project area are typical of those inhabiting the St. Croix River Basin. The species include walleye, sauger, yellow perch, smallmouth bass, channel catfish, bullheads, crappie, bluegill and brown, brook, and rainbow trout.

The Kinnickinnic River upstream and downstream of River Falls provides ideal conditions for the existence and reproduction of trout and other coldwater fish and is classified by the WDNR as Class 1 trout water. Class 1 means that the stream is a high quality trout stream and the trout populations are sustained entirely by natural reproduction. The Class 1 designation does not include the impounded portions of the river in the project area. The south fork of the Kinnickinnic River, which joins the mainstem Kinninickinnic River in the Powell Falls impoundment, is designated as Class II brook and brown trout water. This designation means that some stocking is required to maintain the trout population.

e,f. Vegetation and Wildlife:

Several sections of land along the lower Kinnickinnic River, near it's confluence with the St. Croix River, have been identified by the FWS as potential candidates for federal acquisition because of the area's unique mixture of wildlife habitat (e.g. bluff, prairie, floodplain, forest) and the high diversity of wildlife and plant species associated with the area.

Mammals inhabiting the lower Kinnickinnic Basin include white-tailed deer, raccoon, beaver, muskrat, gray squirrel, striped ground squirrel, red fox, striped skunk, and mink. Avian species include marsh hawk, broad-winged hawk, barn owl, ruffed grouse, ring-necked pheasant, great blue heron, green heron, common loon, Canada goose, wood duck, mallard, blue-winged teal, black tern, belted kingfisher, barn swallow, American gold finch, cerulean warbler, common yellow throat, eastern kingbird, and mourning dove. Canada geese and several species of ducks nest on the wetlands within the project impoundments and on several islands in the river downstream of the project.

The following is a partial list of the dominant plant species found in the project area.

Cover type	Dominant species
grassland	big bluestem, little bluestem, side-oats grama
upland mixed deciduous forest	sugar maple, red oak, basswood, paper birch
forested wetland (adjacent to the river)	willow, cottonwood
emergent wetland	burreed, cord grass, bulrush, reed canary grass, smartweed, cattail

g. Cultural: Properties listed or eligible for listing on the National Register of Historic Places have not been recorded in the project area.

h. Recreation: Recreational use in the area includes fishing, canoeing, hiking, hunting, and picnicking. The Kinnickinnic River has an excellent trout fishery and fishing pressure is heavy. The river below Powell Falls dam is frequently used by canoeists, however, natural river obstacles limit canoe use above Junction Falls impoundment. Recreational facilities in the project area include the Lake George Trails, which are located in the project vicinity, and Glen Park, which is adjacent to the river between Junction Falls and Powell Falls dams. Glen Park offers picnicking, softball, and other day-use facilities. The 1,034-acre Kinnickinnic State Park, located 25 miles below Powell Falls dam at the confluence of the Kinnickinnic and St. Croix Rivers, provides extensive water-based recreation opportunities including fishing, swimming, and boating, as well as areas for hiking, riding, cross-country skiing, and bird-watching.

i. Land use: The project is located in the city of River Falls. Land in the city is used for residential, commercial, and recreational purposes. In the immediate project vicinity, development is limited. Land is used for recreational and agricultural purposes, as well as for supporting a sewage treatment plant and the hydroelectric project.

G. ENVIRONMENTAL ISSUES AND PROPOSED RESOLUTIONS

There are three issues addressed below.

1. Mode of Operation and Stream Gauging: The current project operator proposes, and the FWS and the WDNR recommend, that the project be operated in a run-of-river mode.

The existing unlicensed project, including both the Junction Falls and Powell Falls developments, is currently operated in a run-of-river mode such that outflow from each development equals the inflow to each impoundment. By continuing to provide this present mode of operation, the project would continue to maintain the existing flow regime of the river and would minimize fluctuations in the elevation of the reservoirs and discharges downstream of the project. Minimizing the streamflow fluctuations would reduce instances when the streambed would be dewatered and would protect fish habitat and the fish population in the Kinnickinnic River. Therefore, the licensee should continue to operate the project in a run-of-river mode to protect aquatic resources in the river upstream and downstream from the project.

The WDNR, by letter dated February 23, 1988, and by their petition to intervene dated March 28, 1988, recommends that the applicant install three staff gauges to monitor compliance with the run-of-river mode of operation. The WDNR recommends the staff gauges be placed such that WDNR personnel are able to visually verify compliance with the mode of operation. The WDNR recommends that one flow gauge be installed above Junction Falls dam and that it be visible from the Falls Street Bridge; one flow gauge be installed above the Powell Falls dam and that it be visible from the Powell Falls powerhouse; and one flow gauge be installed in the tailwater below Powell Falls dam and that it be visible from the Powell Falls powerhouse.

Installing staff gauges would provide for monitoring of the inflow and outflow from the impoundments, and installing the gauges at the specific sites recommended by the WDNR would provide easy access to the gauges. These measures would facilitate compliance of the recommended mode of project operation. Therefore, the licensee should install the three staff gauges at the specific sites as recommended by the WDNR.

2. Recreational Resources:

The WDNR, by letter dated February 23, 1988, states that the project may adversely affect recreational opportunities currently available on the Kinnickinnic River including recreational navigation, fishing, hunting, and swimming. The WDNR also recommends that signs be installed at the take-out point above Junction Falls dam. These signs would indicate the presence of the dam for safety purposes and would identify the take-out point for canoes. The Interior by letter dated April 5, 1988, recommends the applicant allow public access to project lands and waters, except in those areas of the dams that are hazardous. The WDNR and Interior recommend the applicant provide and maintain canoe portage facilities around each dam. Deleted Aug 1990

The applicant agrees with Interior's and WDNR's recommendation to provide and to maintain canoe portage around the dams and to install the signs at the Junction Falls take-out point.

The existing recreational developments in the project vicinity provides for public recreation in the area. Canoeists frequently use the river below Powell Falls dam and there is occasional use of the pool above Junction Falls dam. Canoes cannot negotiate the dams, therefore, the dams disrupt the continuous canoe run between the upstream and downstream reaches of the river. In addition, Powell Falls dam is a safety hazard to canoeists approaching from the upstream side. Canoe portage facilities and warning signs would provide a safe and adequate means for canoeists to utilize the upstream and downstream reaches of the river in a single continuous canoeing experience.

Form L-12
(Revised October, 1975)

FEDERAL POWER COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR CONSTRUCTED MINOR PROJECT AFFECTING THE INTERESTS OF INTERSTATE OR FOREIGN COMMERCE

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project area and project works shall be in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Article 4. The project, including its operation and maintenance and any work incidental to additions or alterations authorized by the Commission, whether or not conducted upon lands of the United States, shall be subject to the inspection and supervision of the Regional Engineer, Federal Power Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him such information as he may require concerning the operation and maintenance of the project, and any such alterations thereto, and shall notify him of the date upon which work with respect to any alteration will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall submit to said representative a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of any such alterations to the project. Construction of said alterations or any feature thereof shall not be initiated until the program of inspection for the alterations or any feature thereof has been approved by said representative. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction, maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such

properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 7. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 8. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 9. The operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Commission may prescribe for the purposes hereinbefore mentioned.

Article 10. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and

the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 11. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 12. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 13. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of

such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 14. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 15. The Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. All clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 16. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining

within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 17. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 18. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

SAFETY AND DESIGN ASSESSMENT
RIVER FALLS PROJECT
FERC NO. 10489-000 - WISCONSIN

DAM SAFETY

On June 23, 1988, the Commission's Chicago Regional Director classified the existing Junction Falls dam and the existing Powell Falls dam as having a low hazard potential. The classification was based on a field inspection and other information available to the Regional Office staff. Powell Falls dam is located about one-half mile downstream of the Junction Falls dam. The dams were originally constructed in the mid-1800's.

The Junction Falls dam was reconstructed in 1920. The dam is a 32-foot-high concrete gravity structure with an uncontrolled ogee shaped spillway spanning 115 feet of the dam's 140-foot-length. The entire dam is founded on bedrock. The freeboard between the normal pool and the top of the dam is 7 feet. The gross storage capacity of the reservoir at normal pool elevation is 142.7 acre-feet. The field inspection showed that a sewage treatment plant along the right bank downstream would not be affected by the dam failure because of its higher elevation. A small park along the left bank is rarely used by the public, is not well maintained, and has been flooded occasionally. There is no overnight camping at the park.

The Powell Falls dam was replaced in 1966. It is a 16.5-foot-high and 110-foot-long concrete gravity structure with its entire length acting as a spillway. It impounds 37 acre-feet. The field observation revealed that because of steep slopes and limited access, there is lack of development downstream.

The probable maximum flood for the Junction Falls dam was estimated at 86,400 cubic feet per second (cfs) and for the Powell Falls dam at 91,800 cfs.

The dams are classified low hazard because any failure of the dams would not significantly increase the hazard downstream and thereby would not cause loss of life or result in extensive property damage.

The rehabilitation proposed at the project would involve rectifying the deteriorated concrete surface of the spillway and improving the stability of the Junction Falls dam. The spillway crest would be reshaped for better flow conditions. The applicant intends to improve the stability of the dam to withstand an inflow design flood, less than the probable maximum flood, in accordance with our standards of factors of safety for all credible loading

conditions. This would be accomplished by post-tensioning the dam into the foundation bedrock.

The rock anchors would be installed by drilling holes through the crest of the spillway into the underlying sandy dolomitic foundation. Rock anchors would be installed in these holes, grouted and then post-tensioned. Each rock anchor would be proof-tested. Solid threaded-bar anchors with the required design force at 60 percent of the ultimate strength would be spaced appropriately for each monolith. The required bond length, in conjunction with a free stressing length, would constitute the total length of each anchor.

The Powell Falls dam is in sound condition and, except for minor repairs, would not be rehabilitated by the applicant.

PROJECT DESIGN

The constructed project consists of two developments: the Junctions Falls Development and the Powell Falls Development. The latter development is located about one-half mile downstream.

The Junction Falls Development consists of a dam with headworks at the right end. One of the slide gates at the headworks controls flow via a 6-foot-diameter concrete-encased steel penstock to a powerplant located 200 feet downstream. The powerplant contains a single vertical Francis turbine-generator unit rated at 250 kilowatts (kW).

The Powell Falls Development consists of a dam with an integral powerhouse at the left end. The intake is controlled by gates. The powerplant contains a single vertical Francis turbine-generator unit rated at 125 kW.

WATER RESOURCES PLANNING

Both the developments operate run-of-river. The single-unit powerplant at Junction Falls operates at a design hydraulic capacity of 80 cfs and an average head of 44 feet. The single-unit powerplant at Powell Falls operates at a design hydraulic capacity of 82 cfs and an average head of 20 feet. The combined average annual generation of the powerplants is 2,000,000 kilowatthours (kWh).

The drainage area at the Junction Falls site is 100 square miles and at the downstream Powell Falls site it is 120 square miles. The drainage area for the Powell Falls site includes the additional area of the South Fork of the Kinnickinnic River. Both sites are located on the Kinnickinnic River. The flow data is based upon the 1916-1921 record from a USGS gaging station located about 5 miles downstream of the project site. This is the only flow data available in the vicinity of the project site and

was used to develop the flow-duration curve. A streamflow of 80 cfs, which is the hydraulic capacity of the powerplant at Junction Falls, is equalled or exceeded 7 percent of the time on the flow-duration curve. For Powell Falls, the streamflow of 82 cfs represents a 12 percent exceedence on the flow-duration curve. No minimum flows are required. The project site is adequately developed.

Based on a review of the agency and public comments filed in this proceeding and on the staff's independent analysis, the River Falls Project is best adapted to a comprehensive plan for the river.

CONSERVATION PLANNING

The applicant is engaged in a number of conservation and energy consumption efficiency programs.

The following programs include:

a) replacing all street lighting mercury vapor fixtures with high pressure sodium units, resulting in about 40 percent energy savings on street lighting.

b) working with the Wisconsin Public Service Commission to establish time-of-day rates to encourage use of cheaper energy during off-peak hours.

c) supporting their wholesale power supplier, Wisconsin Public Power, Inc., in working with the Wisconsin Public Service Commission in development of a customer rebate program for energy efficient appliances, which is expected to go into operation in 1989.

d) disseminating information to customers on energy conservation and assisting commercial customers for energy conservation loans and grants.

e) complying with various energy efficiency mandates promulgated from various state of Wisconsin agencies.

On the basis of these activities, the staff concludes that the applicant is making a good-faith effort to improve and maintain a reasonably high level of energy consumption efficiency.

EXHIBITS

The following portions of exhibit A and the following exhibit F drawings conform to the Commission's rules and regulations and they are included in the license.

EXHIBIT A: Table A-1 entitled "Technical Data."

Exhibit F Drawing	FERC No. 10489	Description
F-1	1	Junction Falls dam-existing conditions-site plans & downstream elevation
F-2	2	Junction Falls dam-existing conditions-dam sections & elevation
F-3	3	Junction Falls dam-existing conditions-powerhouse plan & sections
F-4	4	Junction Falls dam-proposed dam rehabilitation-plan, elevation & section
F-5	5	Junction Falls dam-proposed dam rehabilitation-sections
F-6	6	Powell Falls dam-plan, elevation & sections
F-7	7	Powell Falls dam-powerhouse plan & sections

51 FERC ¶ 62,104

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

River Falls Municipal Utility — Project No. 10489-002
Wisconsin

ORDER APPROVING AS-BUILT EXHIBITS

(Issued May 7, 1990)

On April 17, 1990, on behalf of the licensee, River Falls Municipal Utility, Owen Ayers & Associates, Inc. filed as-built revised exhibits A and F for the River Falls Project, FERC No. 10489, in compliance with article 202 of the license.

The revised exhibit F drawings show the project structures as-built. The revised exhibit A describes the rehabilitation work completed on the Junction Falls Dam. The changes made during construction are not considered substantive and do not affect the safety and adequacy of the project.

The Director orders:

(A) The following exhibits conform to the Commission's Rules and Regulations and are approved and made a part of the license superseding the existing exhibits:

Exhibit A - pages 1 through 8 entitled "Exhibit A - Project Description" filed on April 17, 1990.

Exhibit	FERC No.	Title	Superseding
F-8	10489-9	Junction Falls Dam Original Structure - Dam & Powerhouse Plan	10489-1
F-9	10489-10	Junction Falls Dam Original Structure - Dam Elevations & Sections	10489-2
F-10	10489-11	Junction Falls Dam Rehabilitation - Dam, Plan & Elevation	10489-3
F-11	10489-12	Junction Falls Dam Rehabilitation - Spillway & Left Abutment	10489-4
F-12	10489-13	Junction Falls Dam Rehabilitation - Wasteway & Right Abutment	10489-5
F-13	10489-14	Junction Falls Dam Rehabilitation - Headworks & Miscellaneous Details	10489-6
F-14	10489-15	Junction Falls Dam Rehabilitation - Powerhouse	10489-7

(B) The superseded exhibit F drawings are eliminated from the license.

(C) The exhibit A of the license filed on October 15, 1987, is superseded and eliminated from the license.

(D) Ordering paragraph (B)(2)(1) of the license is amended to read as follows:

(2) Project works consisting of: (1) Upper facilities; (a) a 147-foot-long and 37-foot-high concrete gravity dam; (b) a reservoir with a surface area of 16.5 acres and a storage capacity of 155 acre-feet at elevation 865.5 feet m.s.l.; (c) a 200-foot-long, 6-foot-diameter concrete and steel penstock; (d) a powerhouse containing a single 250-KW generating unit; (e) the 2,400-volt generator leads and the 50-foot-long, 2,400-volt transmission cable; and (f) appurtenant facilities.

(E) Within 90 days of the date of issuance of this order, the licensee shall file an original of the approved exhibit F drawings reproduced on silver or gelatin 35mm microfilm mounted on Type D (3 1/4" x 7 3/8") aperture cards for each drawing. In addition, the licensee shall file two Diazo-type duplicate sets of aperture cards. The original set and one duplicate set of aperture cards should be filed with the Secretary of the Commission. The remaining duplicate set of aperture cards should be filed with the Commission's Chicago Regional Office. The FERC drawing numbers (10489-9 through 10489-15) shall be shown in the margin below the title block of the microfilmed drawing and also in the upper right corner of each aperture card. The top lines of the aperture cards shall show the FERC Exhibit (i.e, F-1, G-1, L-1), Project Number, Drawing Title, and date of this order.

(F) This order is issued under authority delegated to the Director and is final unless appealed to the Commission under Rule 1902 within 30 days from the date of this order. Failure to file a petition appealing this order to the Commission shall constitute acceptance of this order.

J. Mark Robinson
Director, Division of Project
Compliance and Administration

Recd 5-11-90 MH

The design of this project is consistent with the engineering standards governing dam safety. The project will be safe if operated and maintained in accordance with the requirements of this license. Analysis of related issues is provided in the Safety and Design Assessment attached to this order.

The Director, Office of Hydropower Licensing, concludes that the project would not conflict with any planned or authorized development, and would be best adapted to comprehensive development of the waterway for beneficial public uses.

The Director orders:

(A) This license is issued to River Falls Municipal Utility (licensee), for a period of 30 years, effective the first day of the month in which this order is issued, to operate and maintain the River Falls Project. This license is subject to the terms and conditions of the Act, which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the Act.

(B) The project consists of:

(1) All lands, to the extent of the licensee's interests in those lands, shown by exhibit G:

Exhibit G-	FERC No.10489-	Showing
1	8	Project Location & Impoundment Map

(2) Project works consisting of: (1) Upper facilities; (a) a 140-foot-long and 32-foot-high concrete dam; (b) a reservoir with a surface area of 15.5 acres and a storage capacity of 142.7 acre-feet at elevation 865.3 m.s.l.; (c) an 80-foot-long by 6-foot-diameter penstock; (d) a powerhouse containing one generating unit rated at 250 kW; (e) the 2,400-volt generator leads and the 50-foot-long, 2,400-volt transmission cable; and (f) appurtenant facilities. (2) Lower facilities; (a) a 110-foot-long and 16.5-foot-high concrete dam located approximately 0.5 mile downstream of the upper dam; (b) a reservoir with a surface area of 15.4 acres and a storage capacity of 37 acre-feet at elevation 820 feet m.s.l.; (c) a powerhouse containing one generating unit rated at 125 kW; (d) the 2,400-volt generator leads and the 2500-foot-long, 2,400-volt transmission line; and (e) appurtenant facilities.

(3) All of the structures, fixtures, equipment or facilities used to operate or maintain the project, all portable property that may be employed in connection with the project and located within or outside the project boundary, and all riparian

or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) The exhibit G described above and those sections of exhibits A and F recommended for approval in the attached Safety and Design Assessment are approved and made part of the license.

(D) The following sections of the Act are waived and excluded from the license for this minor project:

> 4(b), except the second sentence; 4(e), insofar as it relates to approval of plans by the Chief of Engineers and the Secretary of the Army; 6, insofar as it relates to public notice and to the acceptance and expression in the license of terms and conditions of the Act that are waived here; 10(c), insofar as it relates to depreciation reserves; 10(d); 10(f); 14, except insofar as the power of condemnation is reserved; 15 4/; 16; 19; 20; and 22.

(E) This license is subject to the articles set forth in Form L-12, (October 1975), entitled "Terms and Conditions of License for Constructed Minor Project Affecting the Interests of Interstate or Foreign Commerce", and the following additional articles:

Article 201. The licensee shall pay the United States the following annual charge, effective the first day of the month in which this license is issued:

> For the purpose of reimbursing the United States for the cost of administration of Part I of the Act, a reasonable amount as determined in accordance with the provisions of the Commission's regulations in effect from time to time. The authorized installed capacity for that purpose is 500 horsepower.

Article 202. The licensee, within 90 days of completion of the proposed Junction Falls Dam rehabilitation, shall file for approval by the Commission, revised exhibits A and F to describe and show the Junction Falls Dam as-rehabilitated.

Article 401. The licensee shall operate the River Falls Project in an instantaneous run-of-river mode to protect the fish and wildlife resources in the Kinnickinnic River. The licensee,

---

4/ At the expiration of this license, any license application filed, including the licensee's, will be treated as an original license application. The municipal preference provisions of section 7(a) of the Act will apply.

in operating the project in an instantaneous run-of-river mode, shall minimize fluctuations of each reservoir surface elevation, i.e., maintain the discharge from each powerhouse that approximates the instantaneous sum of inflow to each reservoir. The instantaneous run-of-river operation may be temporarily modified if required by operating emergencies beyond the control of the licensee and for short periods upon mutual agreement between the licensee and the Wisconsin Department of Natural Resources.

Article 402. The licensee, after consulting with the Wisconsin Department of Natural Resources (WDNR), shall install three streamflow gauges in the project reservoirs and in the Kinnickinnic River to monitor compliance with the instantaneous run-of-river mode of operation, as stated in article 401. One flow gauge shall be installed at each of the following locations: (1) above Junction Falls dam to be visible from the Falls Street Bridge; (2) above the Powell Falls dam to be visible from the Powell Falls powerhouse; and (3) in the tailwater downstream of the Powell Falls dam to be visible from the Powell Falls powerhouse. The gauges shall be installed within one year from the date of issuance of this license.

Article 403. The licensee, after consulting with the Wisconsin Department of Natural Resources and the U.S. Fish and Wildlife Service, and within 1 year from the issuance date of this license, shall provide: (1) a sign upstream of the dams to warn upstream boaters of the presence of the dams; (2) a sign identifying the Junction Falls take-out point; and (3) a portage route around the dams for boaters. Within 3 months of completing these facilities, the licensee shall file as-built drawings with the Commission showing the type and location of these facilities. In addition, the licensee shall operate and maintain, or arrange for the operation and maintenance of the recreational facilities during the term of the license.

Article 404. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational,

or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, cancelling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and water for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; and (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of, project lands for: (1) replacement, expasion, realignment, or maintenance of bridges and roads for which all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one

million gallons per day from a project reservoir. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile from any other private or public marina; (6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from the edge of the project reservoir at normal maximum surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 45 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Hydropower Licensing, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked exhibit G or K map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved exhibit R or approved report on recreational resources of an exhibit E; or, if the project does not have an approved exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include covenants running with the land adequate to ensure that: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; and (ii) the grantee shall take all reasonable precautions to insure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised exhibit G or K drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised exhibit G or K drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

(F) The licensee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to that filing. Proof of service on these entities must accompany the filing with the Commission.

(G) This order is issued under authority delegated to the Director and is final unless appealed to the Commission by any party within 30 days from the issuance date of this order. Filing an appeal does not stay the effective date of this order or any date specified in this order. The licensee's failure to appeal this order shall constitute acceptance of the license.

Fred E. Springer
Director, Office of
Hydropower Licensing

ENVIRONMENTAL ASSESSMENT 1/
FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF HYDROPOWER LICENSING,
DIVISION OF PROJECT REVIEW

August 30, 1988

River Falls Municipal Hydroelectric Project

FERC Project No. 10489-000

A. APPLICATION

1. Application type: minor license, existing dam.

2. Date filed with the Commission: October 15, 1987.

3. Applicant: River Falls Municipal Utility.

4. Water body: Kinnickinnic River River basin: St. Croix

5. Nearest city: River Falls, Wisconsin

6. Location: The Kinnickinnic River in Pierce County, Wisconsin

B. PURPOSE AND NEED FOR ACTION

1. Purpose:

The purpose of the River Falls Municipal Hydroelectric project is to assist in meeting the customer power requirements of the municipal utility of the city of River Falls, Wisconsin.

2. Need for power:

The power from this existing project will continue to be useful in meeting a small part of the current and projected future need for power for the Mid-American Interpool Network Reliability Council region. In 1987, the project supplied 2.26 gigawatthours of hydroelectric energy, or about 3 percent of the applicant's total energy requirement, thereby reducing the amount of fossil-fueled electric power generation that would be purchased from investor-owned utilities in the area. Hence, the project contributes to the conservation of nonrenewable fossil fuels and to the reduction in emission of noxious byproducts caused by the combustion of fossil fuels. On this basis, the staff concludes that a need for the project power exists.

1/ Figures and attachments referenced in the text are omitted from this document due to reproduction requirements.

Therefore, the licensee, after consulting with the WDNR and the FWS, should provide and maintain canoe portage around the dams and install signs at the Junction Falls take-out point.

Public access to rivers is decreasing rapidly as residential and commercial development spreads, especially in urban areas. This decline in recreational river access supply comes at a time when participation in river-oriented activities, including fishing and canoeing, is increasing (President's Commission on Americans Outdoors, 1987). The impacts from the loss of public river access is even more severely felt near population centers. Since people are choosing to recreate closer to home, the demand for recreational access is much greater near populated areas. By providing continued free, public access to project lands and waters, the opportunity for participation in river-oriented activities within a short distance of the approximately 10,000 residents of River Falls, Wisconsin and nearby towns is assured. Therefore, the licensee should allow free public access to project lands. An article included in any license issued would require the licensee to allow free public access, to a reasonable extent, to project lands and waters for recreational purposes within safety limitations.

The recommended run-of-river mode of operation, the maintenance of existing flows, the maintenance of public access to project lands, and the addition of the canoe portage facility would preserve and enhance the existing recreational opportunities on the Kinnickinnic River in the project area.

3. Waterfowl collisions with the transmission lines: Two existing distribution transmission lines cross an emergent backwater wetland north of the Powell Falls impoundment. The wetland contains numerous wood duck nest boxes and is used extensively by waterfowl. The FWS states that there is some potential for waterfowl collisions with the transmission lines although the transmission lines are relatively high and waterfowl would most likely fly along the river and under the lines to land in the wetland. The FWS recommends that the applicant monitor the transmission lines to determine the extent of bird collisions and to determine if mitigative measures, such as marking the lines, are necessary to reduce the number of bird collisions (letter from Janet M. Smith, Field Supervisor, U.S. Fish and Wildlife Service, Green Bay, Wisconsin, March 22, 1988).

The applicant states that they have been conducting periodic bird strike inspections and will consult with the FWS and the WDNR to determine if protective measures are needed. The applicant adds that these lines have been in place since 1900 and no bird strike problems are known.

One of the two transmission lines in the vicinity of the project is owned by the city of River Falls and the other is

owned by Northern States Power Company. Although both transmission lines are shown in the application, neither of these lines are in fact, part of the project. Both transmission lines originate from the electrical generating station located immediately downstream of the Junction Falls dam (figure 1) and distribute power throughout the city of River Falls. Since the transmission lines originate from the city's power station, and not from the hydropower project, they are not primary transmission lines and therefore cannot be considered as part of the project [Section 3(11) of the Act]. Although the applicant agrees to voluntarily conduct the studies of the transmission lines, the Commission does not have the authority to require the licensee to conduct studies or to impose mitigative measures to reduce bird strikes.

H. ENVIRONMENTAL IMPACTS

1. An assessment of impacts expected from the applicant's proposed project (P), with the proposed mitigation and any terms and conditions set by the fish and wildlife agencies; the proposed project with any additional mitigation recommended by the staff (Ps); and any action alternative considered (A). Assessment symbols indicate the following impact levels:

   0 = None; 1 = Minor; 2 = Moderate; 3 = Major;
   A = Adverse; B = Beneficial; L = Long-term; S = Short-term.

Resource	Impact P	Ps	A	Resource	Impact P	Ps	A
a. Geology-Soils	0			f. Wildlife	0		
b. Streamflow	0			g. Cultural: Archeological	0		
c. Water quality: Temperature	0			Historical	0		
Dissolved oxygen	0			h. Visual quality	0		
Turbidity and sedimentation	0			i. Recreation	1BL		
d. Fisheries: Anadromous	0			j. Land use	0		
Resident	0			k. Socioeconomics	0		
e. Vegetation	0						

Remarks:

i. Installing portage facilities and take-out signs would enhance the recreational opportunities in the project area.

2. Impacts of the No-Action Alternative.

Under the No-Action Alternative, the project would continue to operate without a license and without any needed requirements for operating the project.

3. Recommended alternative (including proposed, required, and recommended mitigative measures):

_X_ Proposed project. ___ Alternative. ___ No action.

4. Reason for selecting the preferred alternative.

The proposed project would generate electricity using a renewable resource without significantly affecting the existing environmental conditions of the area.

I. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS OF THE RECOMMENDED ALTERNATIVE

No unavoidable adverse environmental impacts are expected to occur.

J. CONCLUSION

_X_ **Finding of No Significant Impact.** Approval of the recommended alternative [H(3)] would not constitute a major federal action significantly affecting the quality of the human environment; therefore, an environmental impact statement (EIS) will not be prepared.

___ **Intent to Prepare an EIS.** Approval of the recommended alternative [H(3)] would constitute a major federal action significantly affecting the quality of the human environment; therefore, an EIS will be prepared.

K. LITERATURE CITED

President's Commission on Americans Outdoors. 1987. Americans Outdoors, the Legacy, the Challenge. Island Press, Washington, D.C.

River Falls Municipal Utility. 1987. Application for license for a minor hydroelectric power project, River Falls Municipal Hydroelectric Facilities (FERC Project No.10489), Wisconsin. October 15, 1987.

Wisconsin Department of Natural Resources. 1980. The St. Croix River Basin Areawide Water Quality Management Plan. Madison, Wisconsin.

L. LIST OF PREPARERS

Name	Position title
Mark Bagdovitz	Fishery Biologist (Coordinator)
John Staples	Ecologist
Ann E. Mates	Environmental Protection Specialist
Mary C. Nowak	Writer - Editor

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

River Falls Municipal Utilities — Project No. 10489-003
Wisconsin

ORDER AMENDING LICENSE

(Issued August 16, 1990)

On July 2, 1990, River Falls Municipal Utilities (licensee) filed a request for deletion of the canoe portage requirement from article 403 of the project license.

The request for deletion of the canoe portage is supported by a letter from the Wisconsin Department of Natural Resources (WDNR) dated June 19, 1990. The WDNR cites no traditional canoeing use of the Kinnickinnic River and the WDNR's wish to preserve a class I Brown Trout fishery as its reasons for now opposing installation of the canoe portage. The U.S. Fish and Wildlife Service expressed no opposition to removing the portage requirement.

The installation of the canoe portage will likely result in user conflicts between fishermen and boaters. The predominate recreational use of the area is fishing; introducing a conflicting use, boating, will diminish the current recreational use of the area. The project license should be amended to delete the requirement for a canoe portage. If, however, based on additional information provided to the Commission, or changes in recreational use of the project, the need for such a facility becomes apparent, the Commission should reserve the right to require installation of the facilities.

The Director orders:

(A) The request for amendment of license article 403, filed July 2, 1990, is approved.

(B) The Commission reserves the right to require installation of the facilities at a later date should a need for the facilities become apparent.

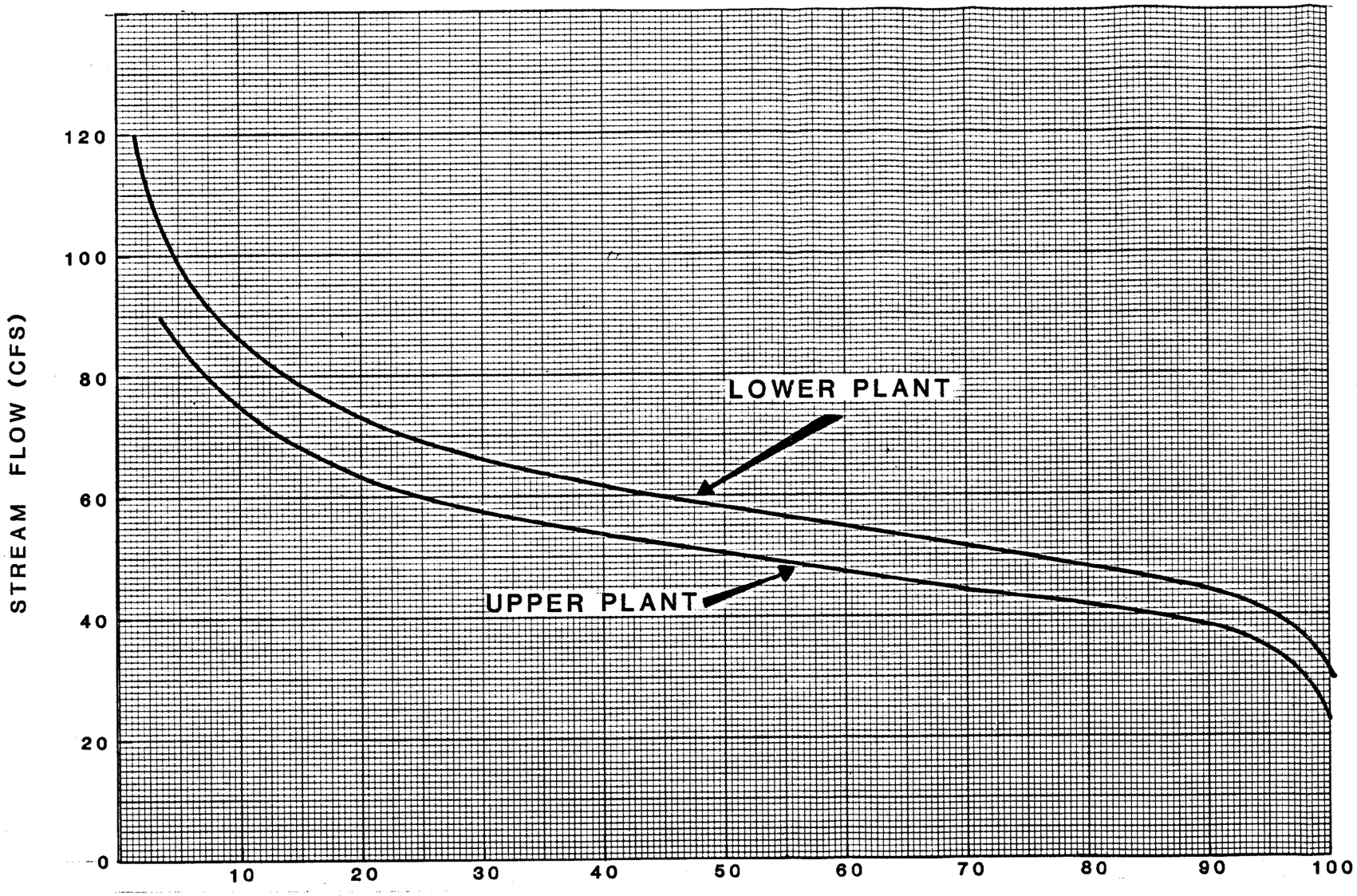
(C) This order is issued under authority delegated to the Director pursuant to section 375.314 of the Commission's regulations. Section 385.1902 of the Commission's regulations

provides 30 days from the date of this order for an appeal to the Commission of this action. Filing an appeal does not stay the effective date of this order or any date specified herein.

Joseph D. Morgan

J. Mark Robinson
Director, Division of Project
Compliance and Administration

Appendix E



PERCENT OF TIME EQUALLED OR EXCEEDED

(Adjusted to normal flow and drainage area)

SOURCE: U.S. Geologic Survey. 1950

This drawing is a part of the application for license made by the undersigned this day of

Flow Duration Curve for the Kinnickinnic River at River Falls, Wisconsin: Years 1917 - 1921

Figure A-3

05342000 KINNICKINNIC RIVER NEAR RIVER FALLS, WI

St. Croix Basin
Lower St. Croix Subbasin

LOCATION.--Lat 44°49′51″, long 92°43′59″ referenced to North American Datum of 1983, in NE ¼ NW ¼ sec.18, T.27 N., R.19 W., Pierce County, WI, Hydrologic Unit 07030005, on right bank, 325 ft upstream from County Trunk Highway F, 1.9 mi upstream from mouth, 4.8 mi downstream from Lake Louise Dam, and 5.5 mi west of River Falls.

DRAINAGE AREA.--165 mi², from recent U.S.G.S. topographic maps.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1916 to September 1921 (monthly discharge for some periods published in WSP 1308), October 1998 to September 1999, July 2002 to current year. Monthly average data were published outside the period of daily data collection.

REVISED RECORDS.--WSP 1308. WDR WI-99-1: Drainage area. WDR WI-02-1: Statistics table.

GAGE.--Water-stage recorder and crest-stage gages. Elevation of gage is 690 ft above NAVD of 1988, from topographic map. Prior to Oct. 1, 1921, recording gage near present site at different datum. Prior to Apr. 09, 2012, recording gage 275 ft downstream at present datum.

REMARKS.--Records good, except for estimated daily discharges, which are poor. Flow is partially regulated by two hydro-electric plants located 7 miles upstream in the town of River Falls. Gage-height telemeter at station.

Suggested citation: U.S. Geological Survey, 2013, Water-resources data for the United States, Water Year 2012: U.S. Geological Survey Water-Data Report WDR-US-2012, site 05342000, accessed at http://wdr.water.usgs.gov/wy2012/pdfs/05342000.2012.pdf

05342000 KINNICKINNIC RIVER NEAR RIVER FALLS, WI—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2011 TO SEPTEMBER 2012
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	116	115	113	108	105	349	106	107	98	98	90	83
2	116	114	111	104	104	256	105	152	97	98	89	84
3	116	113	113	e104	104	170	113	133	97	101	88	87
4	118	113	113	105	104	128	106	124	138	99	110	86
5	118	114	112	e107	104	118	104	146	97	97	95	85
6	114	114	112	e108	104	139	103	374	96	96	91	85
7	115	115	112	107	104	355	103	197	95	101	91	86
8	116	114	112	106	103	247	103	138	94	96	90	86
9	116	114	e109	106	104	138	103	128	93	95	91	86
10	115	114	e107	107	103	121	104	120	92	94	90	88
11	119	115	108	108	e103	124	104	117	91	94	88	85
12	129	114	110	107	103	143	105	115	91	94	89	85
13	122	114	110	105	102	139	106	112	90	99	87	89
14	116	113	122	e105	101	124	109	111	121	113	92	87
15	116	112	127	105	103	121	136	108	117	97	96	87
16	115	111	115	106	101	117	133	106	99	95	91	86
17	115	110	111	105	102	118	119	105	100	92	89	91
18	118	111	108	e100	101	119	124	104	126	91	88	89
19	117	113	108	e96	101	119	118	102	134	94	92	87
20	116	112	107	e97	102	128	115	102	247	92	89	90
21	119	111	107	e97	105	119	111	102	310	118	88	86
22	113	112	106	e99	103	118	110	101	137	100	87	89
23	113	113	106	e102	103	118	108	100	117	94	87	89
24	114	113	105	105	103	112	107	125	113	104	87	90
25	111	114	105	105	103	110	109	123	108	96	87	92
26	115	121	105	104	104	108	107	119	99	94	88	90
27	115	116	107	108	103	108	104	118	108	94	87	90
28	115	115	106	106	108	107	106	113	105	94	81	91
29	114	113	107	104	439	105	106	104	101	100	86	90
30	115	112	106	105	---	111	111	101	100	95	90	90
31	115	---	106	105	---	108	---	99	---	91	84	---
Total	3,602	3,405	3,406	3,236	3,329	4,497	3,298	3,906	3,511	3,016	2,778	2,629
Mean	116	114	110	104	115	145	110	126	117	97.3	89.6	87.6
Max	129	121	127	108	439	355	136	374	310	118	110	92
Min	111	110	105	96	101	105	103	99	90	91	81	83
Cfsm	0.70	0.69	0.67	0.63	0.70	0.88	0.67	0.76	0.71	0.59	0.54	0.53
In.	0.81	0.77	0.77	0.73	0.75	1.01	0.74	0.88	0.79	0.68	0.63	0.59

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1917 - 2012, BY WATER YEAR (WY)

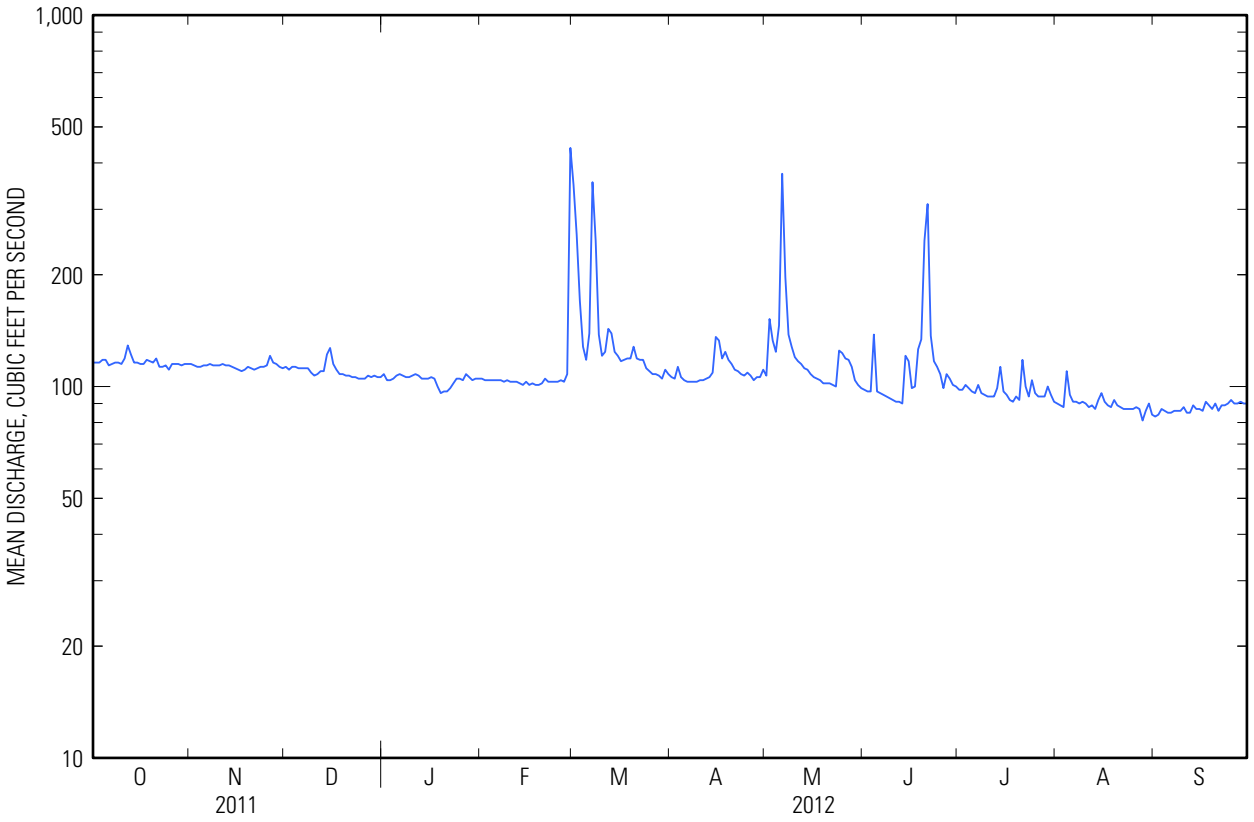
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	101	99.1	91.9	85.2	88.7	182	107	102	110	90.8	99.8	93.9
Max	165	131	119	108	115	469	144	166	167	133	174	143
(WY)	(2003)	(1999)	(2003)	(2003)	(1999)	(1919)	(2006)	(2003)	(1920)	(2003)	(2010)	(2010)
Min	65.2	62.5	72.9	60.0	55.0	87.9	78.8	69.1	74.3	43.5	27.4	41.9
(WY)	(1918)	(1917)	(1917)	(1918)	(1918)	(1921)	(1918)	(1917)	(1921)	(1920)	(1920)	(1920)

05342000 KINNICKINNIC RIVER NEAR RIVER FALLS, WI—Continued

SUMMARY STATISTICS

	Calendar Year 2011		Water Year 2012		Water Years 1917 - 2012	
Annual total	45,032		40,613			
Annual mean	123		111		104	
Highest annual mean					133	2003
Lowest annual mean					74.3	1921
Highest daily mean	409	Mar 23	439	Feb 29	2,870	Mar 15, 1920
Lowest daily mean	96	Feb 2	81	Aug 28	13	Aug 30, 1920
Annual seven-day minimum	[a]98	Feb 7	85	Aug 31	19	Aug 5, 1920
Maximum peak flow			718	Jun 20	[b]4,760	Mar 15, 1920
Maximum peak stage			12.23	Jun 20	[c]7.98	Mar 15, 1920
Instantaneous low flow			[d]48	Aug 28	11	Aug 30, 1920
Annual runoff (cfsm)	0.748		0.673		0.630	
Annual runoff (inches)	10.15		9.16		8.56	
10 percent exceeds	143		122		125	
50 percent exceeds	117		106		93	
90 percent exceeds	105		89		70	

[a] Ice affected.
[b] From rating curve extended above 1,000 ft³/s, based on contracted-opening measurement of peak flow.
[c] Datum then in use.
[d] Result of regulation.



This page intentionally left blank.

Appendix F

Kinnickinnic River Priority Watershed
Surface Water Resource Appraisal Report

December 1998

Prepared by

Ken Schreiber
Wisconsin Department of Natural Resources
West Central Region

Kinnickinnic River Priority Watershed

Surface Water Resource Appraisal Report

Water Resource Appraisal Team

Tim Popple - St. Croix County LCD
Mark Lobermeier - City of River Falls
Kent Johnson - Trout Unlimited
Marty Engel - DNR (Baldwin)
Ruth Stern - Pierce County LCD
Rick McMonagle - Kinnickinnic River Land Trust
Sam Hoffman - UW River Falls
Mark Hazuga - DNR (Eau Claire)
Ken Schreiber - DNR (Eau Claire)
Steve Greb - DNR (Madison)

Contents

Introduction

The Kinnickinnic River watershed was selected in 1995 as a large-scale Priority Watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program. Surface water resource appraisal monitoring was initiated in October 1995 and completed in October 1997. The purpose of this appraisal report is to summarize the condition of surface water resources in the Kinnickinnic River Priority Watershed and provide water resource goals for each important waterbody. The water resource goals identified here will be incorporated into the watershed management plan and used to help determine eligibility for cost-sharing of Best Management Practices (BMPs) in the watershed project.

The Kinnickinnic River is a high quality, Class I trout fishery that originates in agricultural lands in St. Croix County, flows through the City of River Falls and eventually drains to the St. Croix River (Fig.1). In rural areas of the watershed, the river is primarily impacted by cropland runoff, flashy streamflow and sedimentation. As the stream flows through River Falls, it is also thermally impacted by urban stormwater runoff and two shallow impoundments (known locally as Lake George and Lake Louise).

The City of River Falls is undergoing rapid urban development in large part due to its proximity to the Twin Cities metropolitan area. In response to local concerns, a stormwater management plan was developed and adopted by the City in 1993. The plan identified thermal pollution as a concern, but did not quantify or model the impacts of stormwater runoff on the river. The plan recommended that future studies include monitoring and modelling of stream and stormwater temperatures. The surface water resource appraisal and watershed management plan will address these, and other important water resource issues.

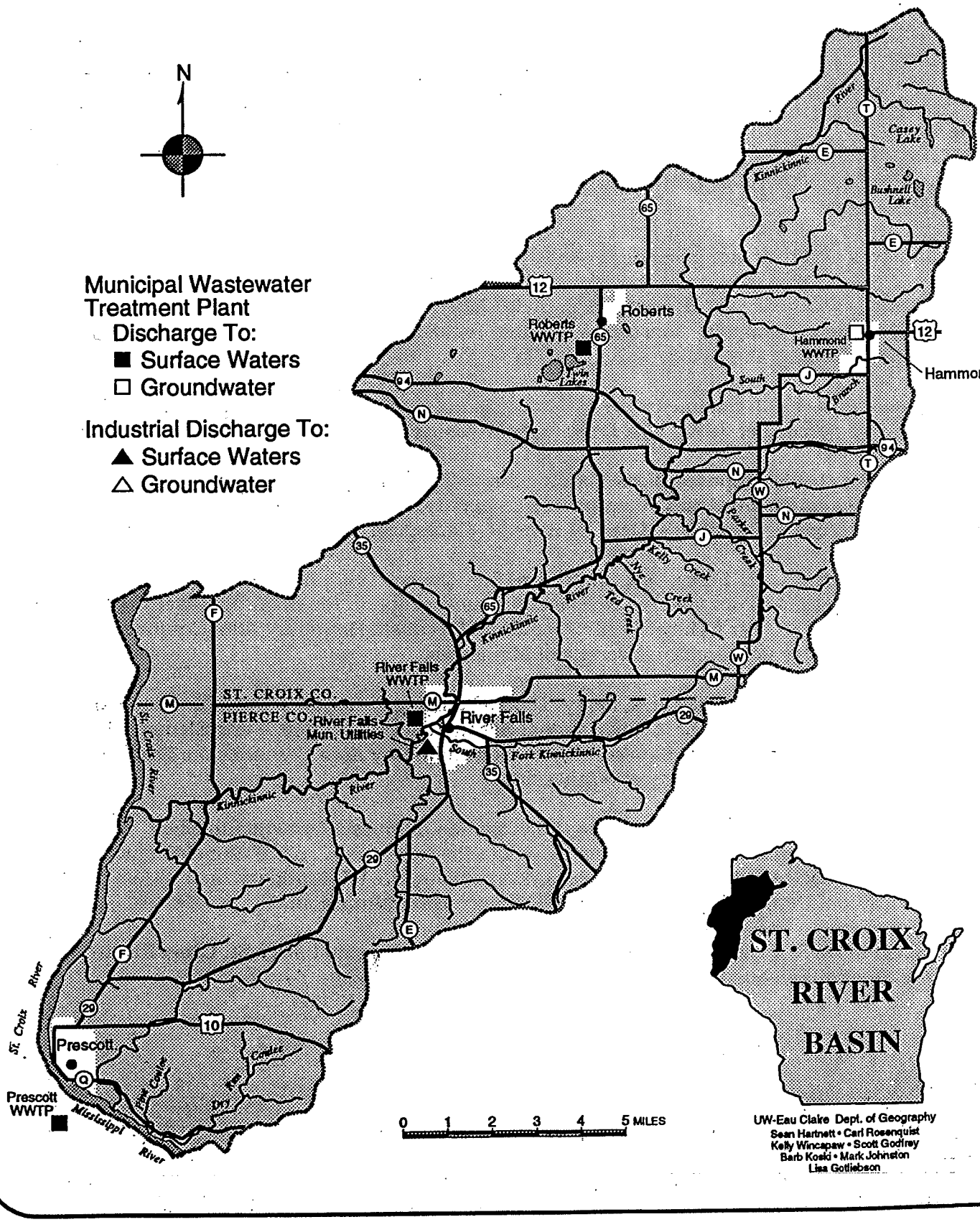
Appraisal monitoring activities included fish surveys, macroinvertebrate sampling, water quality monitoring, habitat assessment and continuous streamflow and temperature monitoring. Upon completion of these monitoring activities, streamflow and temperature data will be used to help develop and calibrate an urban runoff and river thermal model. The model will be used to simulate the thermal impacts of various stormwater runoff events and potential future urban growth scenarios.

Summary of Water Resource Conditions

The Kinnickinnic River Priority Watershed is 174 square miles in area, with about 30% located in Pierce County and 70% in St. Croix County. The watershed is primarily agricultural and features the Kinnickinnic and St. Croix rivers, South Fork Kinnickinnic River (South Fork) and numerous small tributary trout streams. Several lakes and impoundments are also located within the watershed boundaries, including Twin Lakes, Bushnell and Casey lakes and the Upper and Lower Kinnickinnic ponds in the City of River Falls. Approximately 4% of the watershed is urban, including the communities of River Falls, Hammond, Prescott and Roberts.

Numerous perennial streams in the watershed support coldwater fish communities. The Kinnickinnic River watershed has 6 Class I and 18 Class II trout streams and one stream reach that supports a warmwater sport fishery. Fish surveys conducted at 46 sites in the watershed in 1996 found brook and brown trout, smallmouth bass and 22 minnow and forage fish species. Brook and brown trout

Figure 1. Kinnickinnic River Priority Watershed



dominate the coldwater fishery in this watershed. White sucker, brook stickleback, longnose dace, mottled sculpin and Johnny darter were the most common forage species.

Water resource problems identified in the watershed include streambank erosion, sedimentation of riffle and pool areas, organic and nutrient loading from animal waste, and elevated stream temperatures. The primary causes of streambank erosion appear to be a combination of cattle grazing of streambanks and occasional flooding. A frequent consequence of streambank erosion is sedimentation of pools, filling-in of spawning substrate in riffle areas and elimination of bank cover. Filling-in of spawning substrate in riffle areas (measured as embeddedness) impairs reproductive success of trout by reducing inter-gravel flow which is necessary to maintain suitable temperature and oxygen conditions for eggs and larval fish. Sedimentation of riffle areas also destroys habitat for macroinvertebrates and other fish food organisms. Filling-in of pools reduces the amount of available cover for juvenile and adult fish.

Other water resource problems in the watershed include flashy stream flows, ditching, and stream warming caused by beaver dams. Land use activities that reduce infiltration result in flashy high peak flows during runoff events and loss of groundwater discharge during low flow conditions.

Organic loading (in the form of animal waste) affects water quality by reducing stream dissolved oxygen conditions which stresses fish and other aquatic life. Based on appraisal findings, oxygen conditions are generally good in the watershed streams, however, some streams show evidence of organic pollution. The primary source of this organic loading is likely livestock waste from barnyards, feedlots and field spread manure. Animal waste may also be a source of un-ionized ammonia which is toxic to aquatic organisms. Nutrient (phosphorus and nitrogen) loading contributes to eutrophication of surface waters and contamination of groundwater.

Several of the watershed streams have summer water temperatures that are above optimal for some coldwater aquatic species, especially trout. Elevated water temperatures may be caused by a number of factors including lack of stream shading, reduced infiltration and groundwater recharge, and a relatively shallow, wide stream morphometry. The elimination of streambank vegetation reduces shading and increases solar radiation which may increase stream temperatures. Streambank erosion and resulting sedimentation of the bottom may result in wider, shallower streams which allows increased solar radiation and contributes to elevated water temperatures. Impoundments (built by humans or beaver) on streams or spring areas may also increase water temperatures. The cumulative effect of these impacts may decrease the suitability of a stream to support coldwater aquatic life.

Kinnickinnic River

Historically, the Kinnickinnic River has undergone a dramatic transformation from a pristine coldwater prairie trout stream to a degraded, marginal trout stream, and back again to one of the premier trout fisheries in western Wisconsin. Prior to the 1850s, the Kinnickinnic, South Fork and their tributaries were excellent prairie brook trout streams. However, during the late 1800s through the early 1900s, the stream was severely degraded by agricultural activities, wastewater effluent, deforestation and construction of milling and power dams. More recently, since the mid 1930s, the stream was greatly rehabilitated by conservation activities including soil erosion control programs, wastewater treatment and fish habitat restoration projects. The stream now supports a Class I brook and brown trout fishery. The river above and below River Falls is classified as an outstanding resource water in NR 102.10 (Wis. Admin. Code).

The most recent threat to the stream and watershed is rapid urbanization resulting from its close proximity to the Twin Cities metropolitan area. The primary water resource concerns from this urban development include increased imperviousness of the drainage area (resulting in increased runoff and reduced infiltration of stormwater), increased summer water temperatures (due to heated stormwater runoff) and water pollution in the form of phosphorus, chlorides, suspended solids and heavy metals from stormwater runoff. Decreased infiltration of stormwater results in a reduction in groundwater recharge and stream baseflow (summer low flow) conditions. Reduced infiltration also results in higher peak flows during storm events, which may result in increased downstream bank erosion, scouring of the stream bottom and disruption of aquatic life.

Project Implementation

Installation of Best Management Practices (BMPs) during implementation of the watershed project would have a number of positive effects on water resources. Stabilizing streambanks through installation of rip-rap and/or restricting cattle access would increase available cover for adult trout and reduce sedimentation of riffles and pools. Eliminating excessive streambank grazing would increase bank stability, stream cover and shading by allowing growth of shrubs and grasses along the stream corridor. Increased cover and overall habitat improvement improves carryover and survival of adult fish. Reduced sedimentation of riffle areas may increase trout reproduction and fry survival, provided other factors such as oxygen and temperature conditions are suitable. Reduced sedimentation of riffle areas also improves habitat for macroinvertebrates and other fish food organisms. Control of sedimentation and bank erosion generally results in narrower, deeper streams, providing cooler temperatures and improved cover for adult fish.

Reducing the impacts of urban stormwater runoff, through stormwater detention and BMPs that increase infiltration in the drainage area would reduce peak streamflows, increase baseflow and reduce thermal impacts to surface water resources.

Successful installation of BMPs in the watershed will likely increase trout reproduction where limited reproduction is already occurring and improve survival and growth of adult fish in streams where limited trout populations already exist.

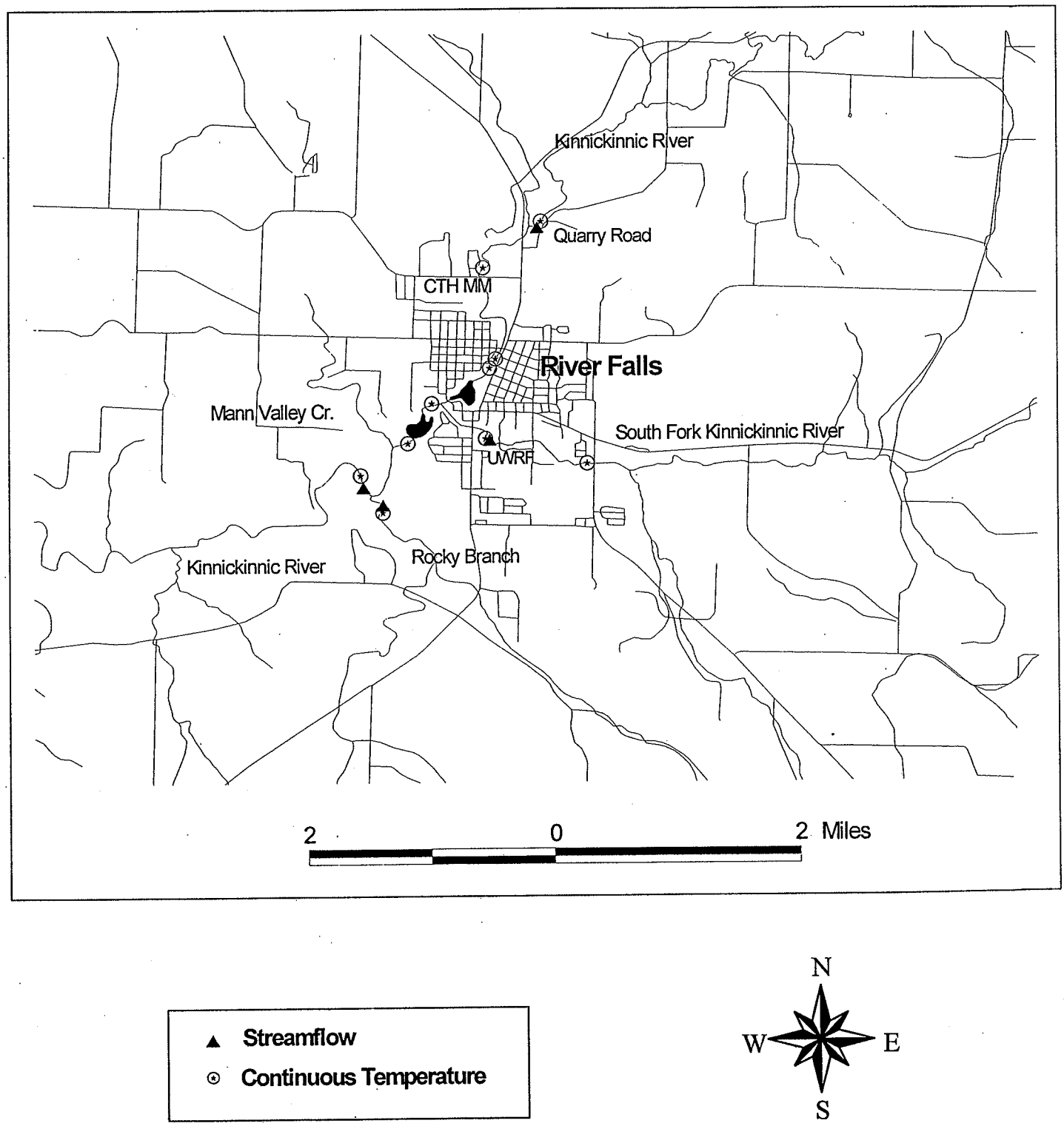
Methods

Monitoring activities for the water resource appraisal were initiated in October 1995 and completed in October 1997. A significant portion of the appraisal monitoring efforts in River Falls and the Kinnickinnic River were designed to accommodate the data needs of developing thermal models to simulate stormwater runoff and in-stream temperature conditions. The modelling effort required continuous streamflow and temperature monitoring at several locations through the City of River Falls during 1996 and 1997. Following is a summary of methods used to collect information for the appraisal.

Streamflow

Two continuous streamflow monitoring stations were installed and operated by USGS (U.S. Geological Survey) staff during May-September 1996 and 1997 in the Kinnickinnic River, above and below River Falls (Figure 2). A third continuous flow station was installed and operated in 1997 on the South

Figure 2. Continuous temperature and streamflow monitoring sites in the vicinity of River Falls, Wis.



Fork Kinnickinnic River (South Fork), a major tributary of the Kinnickinnic River in the City of River Falls. In addition, staff gauges were monitored on the South Fork and Rocky Branch during summer 1996, and Rocky Branch only during summer 1997. Staff gauges were calibrated by USGS staff and read daily, or more frequently, by a local observer.

USGS staff conducted a longitudinal flow survey during baseflow conditions in 1997 to estimate groundwater recharge to the river through the City of River Falls. The survey included flow and conductivity measurements at 8 stations in the Kinnickinnic River mainstem and 3 stations in the South Fork. The flow survey data will be used to help estimate groundwater recharge and calibrate the river thermal model.

Water Chemistry

The water quality monitoring effort was primarily focused on potential impacts associated with urban runoff in the City of River Falls. The 1996 monitoring protocol included sufficient sampling to estimate May through September suspended solids and total phosphorus loads. The 1997 monitoring program only attempted to characterize loading during several summer runoff events.

Water samples were collected by a UWRF intern and DNR staff at the flow monitoring stations during base flow and stormwater runoff event conditions. Baseflow grab samples were collected monthly at the four monitoring sites during non-event periods. Grab water samples were collected more frequently (2-3 per day) at the staff gauge sites during storm events. Automated ISCO water samplers were used at the continuous flow monitoring sites to collect multiple water samples during runoff events.

Stormwater event samples were preserved and sent on ice to the State Laboratory of Hygiene (SLOH) and analyzed for suspended solids and total phosphorus. Baseflow samples were analyzed for ammonia-N, nitrite+nitrate-N, total Kjeldahl-N, suspended solids and total and dissolved phosphorus.

Stream Temperature

RYAN TempMentor recording thermometers were deployed at 7 sites on 3 streams in 1996, and 11 sites on 3 streams in 1997. The recording thermometers measured and recorded stream temperatures using a 10-minute recording interval. Considerable additional continuous temperature data was collected from 1992 to 1997 on the Kinnickinnic River mainstem by Kent Johnson, a member of the Kiap-TU-Wish Chapter of Trout Unlimited. A summary of continuous temperature monitoring locations and deployment periods are presented in Appendix 1. In addition, maximum/minimum thermometers were placed in streams at each of 46 fish survey sites to measure temperature extremes during August 23-29, 1996 (Fig.3).

The vertical and horizontal distribution of water temperatures in the impoundments were measured during summer baseflow periods in 1996 and 1997 using a YSI 57 D.O./temperature probe at 6-8 locations along transects spaced about 100 meters apart. Results from this information will be used to help calibrate the river thermal model.

Storm Sewer Monitoring

Six storm sewers in the City of River Falls were monitored during summer 1996 using RYAN

TempMentors deployed at a 5-minute recording interval. Storm sewer monitoring locations and deployment periods are presented in Appendix 2. During summer 1997, one storm sewer outfall to the Kinnickinnic River was fitted with a weir, level sensor, thermistor and data logger to continuously measure flow and temperature. The storm sewer monitoring data will be used to help calibrate the urban stormwater runoff model to be developed for the watershed project.

Fish Surveys

Electrofishing surveys were conducted during summer 1996 at 46 sites on 20 streams in the watershed (Fig. 3). Surveys were conducted at approximately one site per mile of permanent stream (approximately 20% of the total stream miles). Electrofishing surveys were conducted to inventory the sport fishery using 900 ft. stations in streams less than 10 meters wide, and 1,800 ft. stations where stream width was greater than 10 meters.

Fish were collected using one or two Whitney DC (250v., 3 amp) generator-type stream shockers or AbP-3 DC backpack shockers, depending on stream size. All trout captured were identified, measured, weighed, clipped and released. Catch per unit effort (CPUE) was calculated for each station. A second run was conducted and population estimated using the Bailey's modification of the Peterson Estimate where 50 or more trout 4 inches or greater were captured during the first run.

Fish assemblage segments (including all fish species) were 300 ft. in length for streams less than 10 meters wide, and 600 ft. long for sites greater than 10 meters. All fish captured were identified and counted in the assemblage segment of the fish survey station. A coldwater version of the stream Index of Biotic Integrity (IBI) (Lyons, et. al. 1994) was used to evaluate the streams' ability to support and maintain a balanced and healthy fish community. The coldwater IBI rating scale ranges from 0 (very poor) to 100 (excellent).

Habitat Assessment

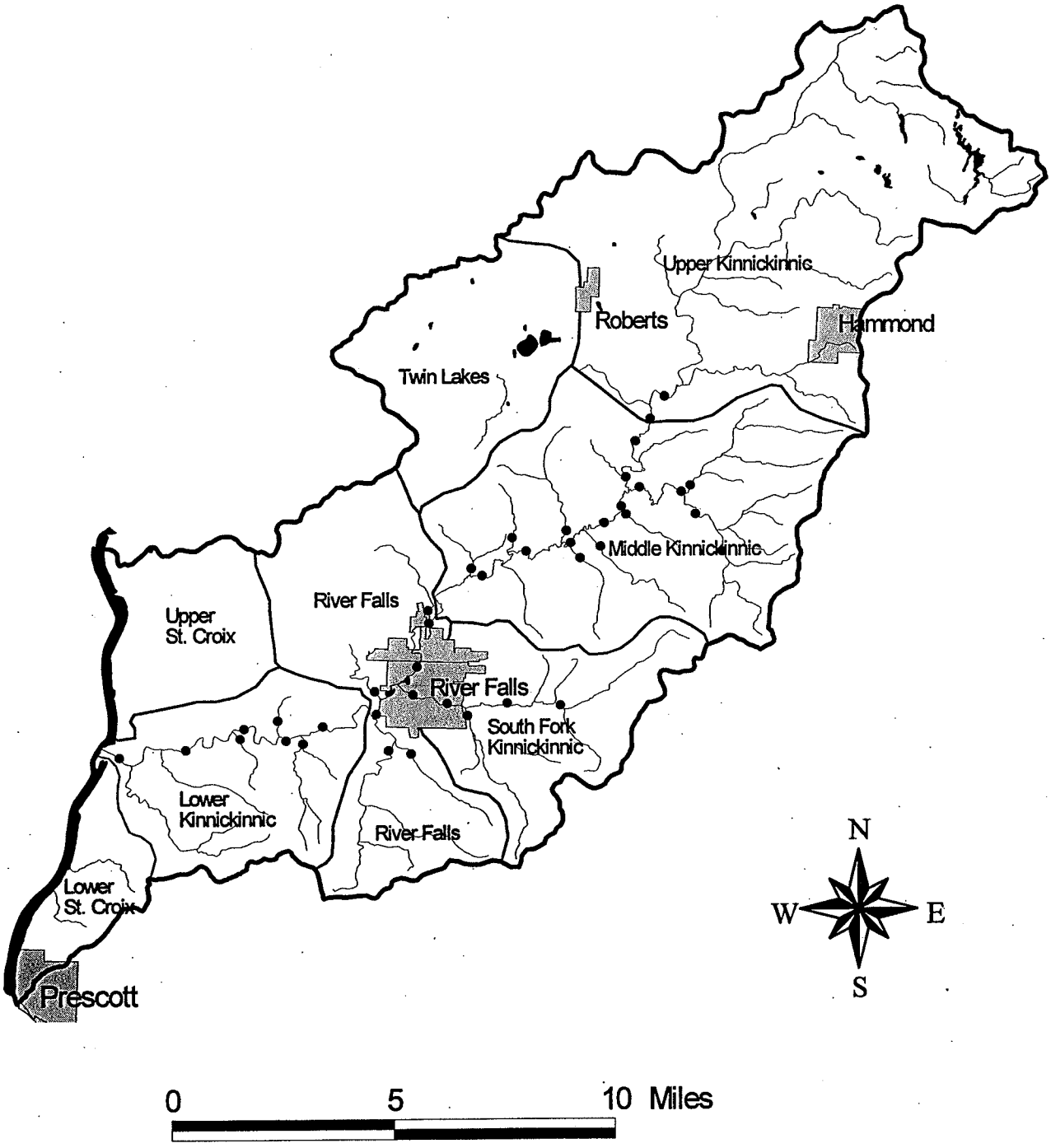
Habitat assessments were conducted at each fish survey site using stream segments that were 35 times the MSW (Mean Stream Width) according to methods outlined in Simonson et al. (1994). The assessments included qualitative and quantitative measurements of streamflow, width, depth, cover, substrate composition and streambank characteristics. A fish habitat rating was calculated for each site according to Simonson, et al. (1994).

Macroinvertebrates

Aquatic macroinvertebrates were collected at 11 sites in the watershed, generally near stream mouths, during Fall 1995. Additional samples were collected at three sites located in the Kinnickinnic River through downtown River Falls in Spring 1997. All samples were collected using the kick method with a D-frame net according to methods outlined in Hilsenhoff (1977 and 1982). Samples were preserved in 70% ethanol and sent to UW-Stevens Point for sorting and identification.

Macroinvertebrate sample results were analyzed using several biometrics including the HBI (Hilsenhoff Biotic Index), EPT (Ephemeroptera-Plecoptera-Trichoptera) index and Margalefs' diversity index. The HBI values are based on species tolerance and provides a relative measure of organic loading to streams. The HBI rating system ranges from 0 (excellent) to 10 (very poor).

Figure 3. Fish survey and habitat assessment sites in the Kinnickinnic River Priority Watershed .



The EPT index used measures the percent genera within the insect orders Ephemeroptera, Plecoptera and Trichoptera. Genera from these orders are typically considered sensitive to organic pollution. The EPT index values generally increase as water quality improves (EPA 1989).

Margalef's diversity index is used as an estimate of community diversity. The diversity index not only measures species richness but considers equitability (or evenness) of the community (Szcztyko 1988). Species diversity values generally increase as water quality improves.

Lake Surveys

Water quality monitoring was conducted on East Twin and West Twin lakes (near Roberts) monthly during summer 1996. Water samples were collected mid-lake from the surface and bottom, sent on ice to the SLOH, and analyzed for chlorophyll a, ammonia-N, nitrite+nitrate-N, total Kjeldahl-N and total and dissolved P.

Water samples were also collected from the Roberts WWTP outfall (which discharges to Twin Lakes) monthly during summer 1996. The samples were sent on ice to the SLOH for analysis of ammonia-N, nitrite+nitrate-N, total Kjeldahl-N and total P. Temperature and pH were measured in the field by the WWTP operator.

Sediment cores were collected mid-lake from West Twin by DNR staff and delivered to the U.S. Corps of Engineers - Eau Galle Aquatic Ecology Lab in Spring Green for sediment P release measurements. Sediment P release rates were measured under both aerobic and anaerobic conditions according to methods outlined in James and Barko (1991). The sediment P release rates were used with lake D.O. profile information to estimate annual internal P loading in each lake.

A macrophyte (rooted aquatic plants) survey was conducted on Lake George during peak biomass in August 1996, using the Jenssen and Lound (1962) line-intercept rake sampling method.

Results and Discussion

KINNICKINNIC RIVER

Streamflow

Streamflow conditions in the Kinnickinnic River are greatly influenced by geology and prevailing land use in the watershed. A significant portion of the headwaters area is comprised of intermittent dry runs which flow only during runoff events. As a result, flow in the upper reaches of the perennial stream is erratic except under baseflow conditions. Numerous large springs are located in the headwaters area and are the source of permanent flow in the river, beginning about 1.5 miles above the I-94 bridge. Streamflow becomes more stable in the middle reach, where considerable groundwater recharge occurs.

Streamflow conditions at the continuous monitoring sites in the vicinity of River Falls are summarized in Table 1. As the river flows through the City of River Falls, streamflow conditions are dramatically impacted by stormwater runoff, the South Fork Kinnickinnic River and flow manipulation by two

hydropower operations. The downstream Kinnickinnic River station actually recorded lower minimum flows than the upper site due to hydropower manipulations.

During a baseflow survey conducted by USGS in 1997, streamflow at the upstream station (above River Falls) was about 68 cfs, and 94 cfs at the downstream site (below River Falls). Since the South Fork contributed about 11 cfs, and two small tributaries (Rocky Branch and Mann Valley Creek) contribute about 5 cfs, the Kinnickinnic River received approximately 10 cfs (or about 9%) of its baseflow from groundwater recharge through the city during the survey.

During storm events, the South Fork occasionally contributed as much as 90% of peak flow measured at the downstream Kinnickinnic River site, suggesting disproportionately higher stormwater runoff rates and reduced infiltration rates in the South Fork subwatershed. The impact of a single summer

Table 1. Summary of streamflow conditions at USGS continuous flow monitoring stations in the Kinnickinnic River in River Falls. All values in cubic-feet per second (cfs).

1996 Streamflow	**Upstream (STH 35)**	**Downstream (below Rocky Br.)**	**South Fork Kinni.**
Maximum	153.0	467.0	NA
Minimum	49.3	44.4	NA
Mean	66.0	87.3	NA
Median	66.2	83.6	NA

1997 Streamflow	**Upstream (STH 35)**	**Downstream (below Rocky Br.)**	**South Fork Kinni.**
Maximum	327.5	713.3	657.8
Minimum	49.3	45.9	7.8
Mean	62.0	103.7	24.2
Median	52.8	88.2	9.5

storm event on streamflow in the Kinnickinnic River is illustrated in Figure 4. At the upstream (STH 35) site, the stream hydrograph showed a gradual rise over the course of the storm, typical of a fairly well protected watershed. The South Fork hydrograph shows a more rapid rise and higher peak in streamflow than the upstream Kinnickinnic River station, suggesting a more degraded watershed with an increased level of imperviousness. The downstream Kinnickinnic River hydrograph also shows the impact of urban stormwater runoff (and the South Fork discharge) and the moderating effect of the

Figure 4. Streamflow above and below River Falls in the Kinnickinnic River and South Fork Kinnickinnic River during a July 27-28, 1997 storm event.

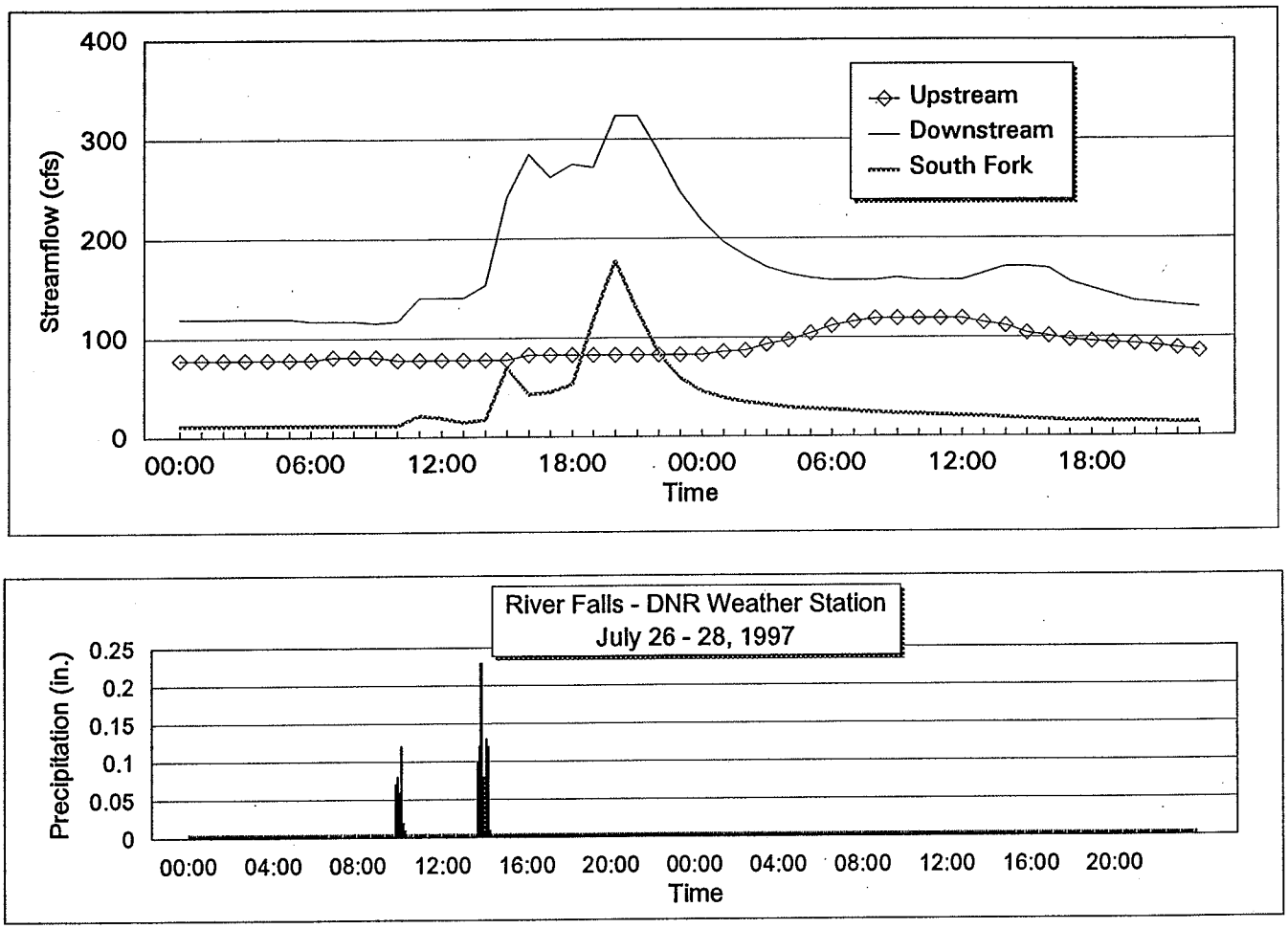
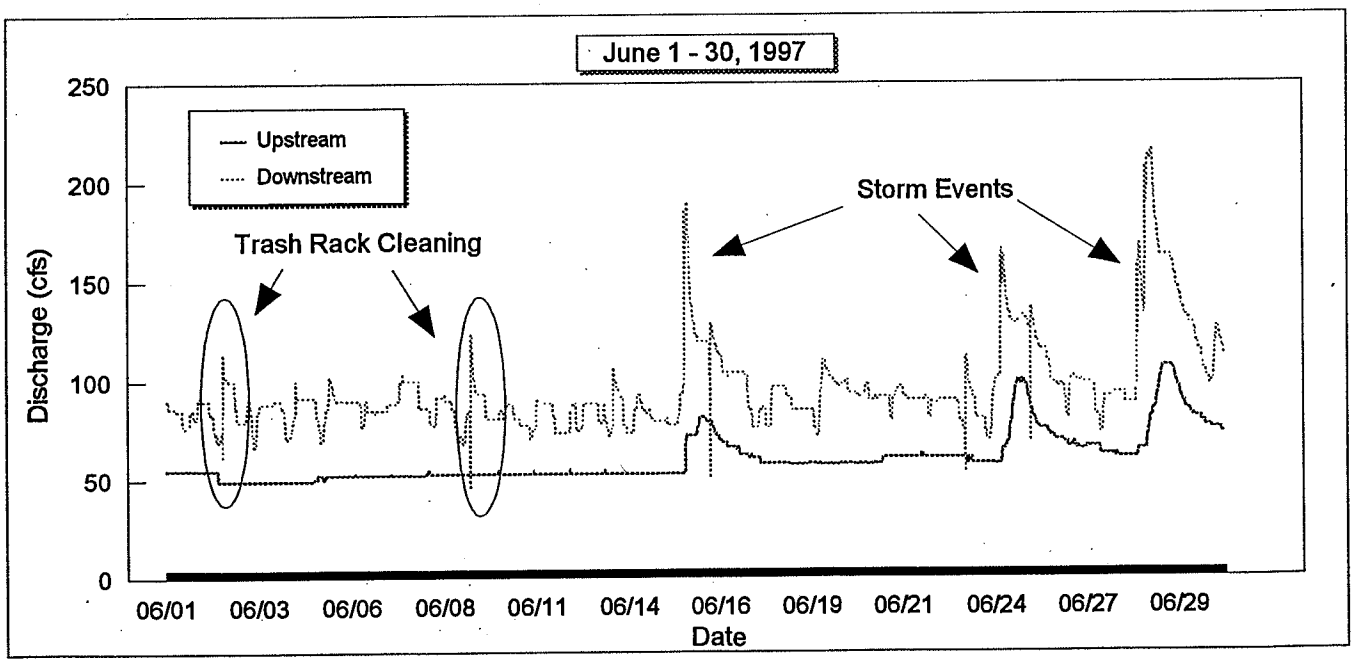


Figure 5. Streamflow in the Kinnickinnic River during storm runoff events and hydropower trash rack cleanings.



kinni\report\figure4.wk4

impoundments on peak streamflow.

Hydropower Impacts

The two hydropower facilities in the City of River Falls primarily impact downstream flow during non-event periods. During storm events, flow through the turbines is readily exceeded and excess water flows over the dam spillways. However, under normal or baseflow conditions hydropower operations have a measurable impact on downstream flows. Hydropower manipulations cause daily (and sometimes hourly) flow changes as the operators attempt to maintain constant water levels in the impoundments. These daily manipulations typically result an approximate 5-10% fluctuation from normal flow at the downstream station.

More significant downstream flow fluctuations occur as a result of trash rack cleaning above the dams. This operation requires a temporary reduction in flow through the turbines, resulting in decreased flow in the river until water levels rise in the impoundment. As water levels rise, additional water is discharged over the spillway, resulting in elevated flows downstream (Fig. 5). Following cleaning of the trash racks, the turbine gates are opened and additional water is passed through the dam. The combined effect of water flowing over the spillway and through the turbines causes a temporary increase in downstream flow.

Cleaning of turbine trash racks typically results in a 15-20% decrease (below mean) in flow, followed by a 15-20% increase (above mean) in downstream flow after the turbines are returned to full capacity. The summer streamflow record indicates that minimum flow at the downstream site was occasionally lower than at the upstream site, due to hydropower manipulations (Table 1). It should be noted that peak flows during trash rack cleaning are generally much lower than during storm runoff events.

The actual biological impact of temporary flow fluctuations caused by hydropower manipulations on the downstream aquatic community has not been documented in the Kinnickinnic River. However, decreased water levels in riffle areas in some streams have been shown to cause dehydration of the substrate, desiccation of eggs and stress to aquatic insects and other organisms. Also, fluctuating flows may require fish to expend energy that could be directed to growth, to seek out suitable habitat during rapid changes in water levels and velocities. The Department is currently working with the City of River Falls Utility Department to develop operating procedures to minimize flow extremes caused by turbine trash rack cleaning.

Sediment and P Loads

A summary of suspended solids and total phosphorus monitoring results from the water quality and flow monitoring sites during 1996 and 1997 is presented in Table 2. During baseflow conditions, total P concentrations ranged from 22 to 27 ug/l and suspended solids ranged from 3 to 4.8 mg/l at all sites. The highest total P concentrations (up to 1000 ug/l) occurred during storm events in the Kinnickinnic River below River Falls and the South Fork. The highest suspended solids concentrations (up to 725 mg/l) occurred in the South Fork during storm events during both 1996 and 1997.

Numerous equipment malfunctions during the 1996 monitoring season resulted in fewer than optimal number of water samples from the continuous flow monitoring sites. Consequently, the estimated

Table 2. Summary of suspended solids and total P sampling results from water quality monitoring sites in the vicinity of River Falls during 1996 and 1997.

Stream	Site Location	Monitoring Period	No. Samples	Total P Range (ug/l)	Suspended Solids Range (mg/l)
Kinnickinnic River	STH 35 (above River Falls)	5/15/96 - 9/24/96 5/6/97 - 7/6/97	39 37	23 - 128 31 - 674	3 - 33 ND* - 273
	Below Rocky Branch	5/15/96 - 9/24/96 5/6/97 - 7/6/97	58 39	23 - 261 139 - 1000	4.8 - 97 5 - 564
South Fork Kinnickinnic	UWRF Campus	5/15/96 - 9/24/96 5/6/97 - 7/4/97	14 21	27 - 923 35 - 846	4.8 - 650 ND - 725
Rocky Branch	Above confluence w/ Kinnickinnic River	5/15/96 - 9/24/96 5/6/97 - 7/2/97	10 10	22 - 77 31 - 323	4.8 - 35 4 - 36

* ND - No detection (below detection limit).

phosphorus and sediment loads were approximated with the available data. The May -September 1996 suspended sediment load was estimated at 280.8 tons from the upstream (STH 35) site, and 323.5 tons from the downstream (below Rocky Branch) site. The River Falls urban area and South Fork watershed contributed about 42.7 tons (or about 13%) of the total sediment load to the downstream site.

The May-September 1996 total phosphorus load was estimated at 3,578 pounds at the upstream site, and 7,914 pounds at the downstream site. The River Falls urban area and South Fork watershed contributed about 4,336 pounds (or about 55%) of the total P load at the downstream station.

Additional sediment and phosphorus monitoring was conducted in 1997 to characterize loading during several summer storm events. A July 1-3, 1997 storm event that produced 2.76 inches of rain, generated approximately 182 tons of suspended solids and 946 pounds of total phosphorus from the South Fork and City of River Falls. These quantities represent about 69% and 57% of the total suspended solids and phosphorus load, respectively, measured at the downstream station.

Stream Temperatures

The upstream (Quarry Road) monitoring station was identified as a suitable temperature reference site for other locations in the river, since the upstream watershed is relatively well protected and the stream has a high density of brown trout at this location. Temperature data from the Interstate 94 (I-94) site provides a good reference point for a brook trout fishery.

Table 3 indicates maximum, minimum and mean stream temperatures at continuous monitoring sites

located in the Kinnickinnic River during the summers of 1996 and 1997. Water temperatures in the Kinnickinnic River were fairly similar at the Quarry Road and Division Street sites but increase at the Powell Dam and Glen Park (below Rocky Branch) sites. Elevated mean and maximum water temperatures moving through the City are a result of the combined effects of urban stormwater runoff and the constant warming effect of the impoundments. A summary of all summer continuous temperature monitoring data for the 1993-1997 period can be found in Appendix 3.

Stream water temperatures are influenced by a variety of factors including shading, groundwater recharge, stream morphometry, gradient and climactic conditions. Coldwater biological communities have relatively narrow temperature requirements. Table 4 lists general temperature requirements of adult brook and brown trout. A more complete summary of temperature requirements for various life stages of brown trout can be found in Appendix 4.

Table 3. Summary of 1996-1997 summer temperature conditions in the Kinnickinnic River. Based on continuous,10-minute interval temperature monitoring from June 1 through August 31, unless otherwise indicated. All temperatures reported in degrees Centigrade.

Location	Year	Maximum	Minimum	Mean
Above I-94 Bridge*	1997	13.7	9.1	11.27
Quarry Rd. (above River Falls)	1996 1997	20.9 19.4	10.9 10.9	14.84 14.50
CTH MM (River Falls)	1997	20.2	10.9	14.70
Division St. (downtown River Falls)	1996 1997	21.2 20.0	9.6 11.0	14.79 15.28
Footbridge (downtown River Falls)	1997	20.0	10.9	14.73
Below Junction Falls Dam	1997	20.6	12.0	15.60
Below Powell Dam (below River Falls)	1996 1997	23.1 21.9	11.1 12.3	16.92 16.27
Below Rocky Branch (below River Falls)	1996 1997	22.6 21.2	11.1 11.7	16.66 16.51

**30-minute temperature recording interval.*

During summer storm events the river receives heated runoff from streets, roofs and parking lots, resulting in elevated stream temperatures. Numerous factors affect the extent of stream warming from runoff waters including the initial stream water temperature and flow, air temperature, ambient land surface temperatures, and length, timing and duration of the storm. Storms that occur during hot

Table 4. Upper limiting (near lethal) and optimal temperatures for adult brook and brown trout (Raleigh 1982, 1986).

Brown Trout	Temperature Range
Upper limiting (near lethal) temperature	81° F. (27.2° C.)
Optimal for growth and survival	53.6 - 66.2° F. (12-18° C.)
Brook Trout	
Upper limiting (near lethal) temperature	74.8° F. (23.8° C.)
Optimal for growth and survival	51.8 - 60.8° F. (11-16° C.)

summer days under low streamflow conditions have the greatest impact on stream temperatures. The quantity of runoff is influenced by a variety of factors including the amount and intensity of precipitation, degree of imperviousness of the drainage area and antecedent soil moisture conditions.

Many of the storms during the summers of 1996 and 1997 occurred during early evening, or at night, and had minimal thermal impacts on the river. Also, recent summers (1993-1997) have been relatively wet and cool, which tend to decrease the significance of runoff events on the thermal regime of the river (Fig. 6). However, several storms occurred during the 1996-1997 monitoring period that illustrate the warming effect of urban runoff on the river.

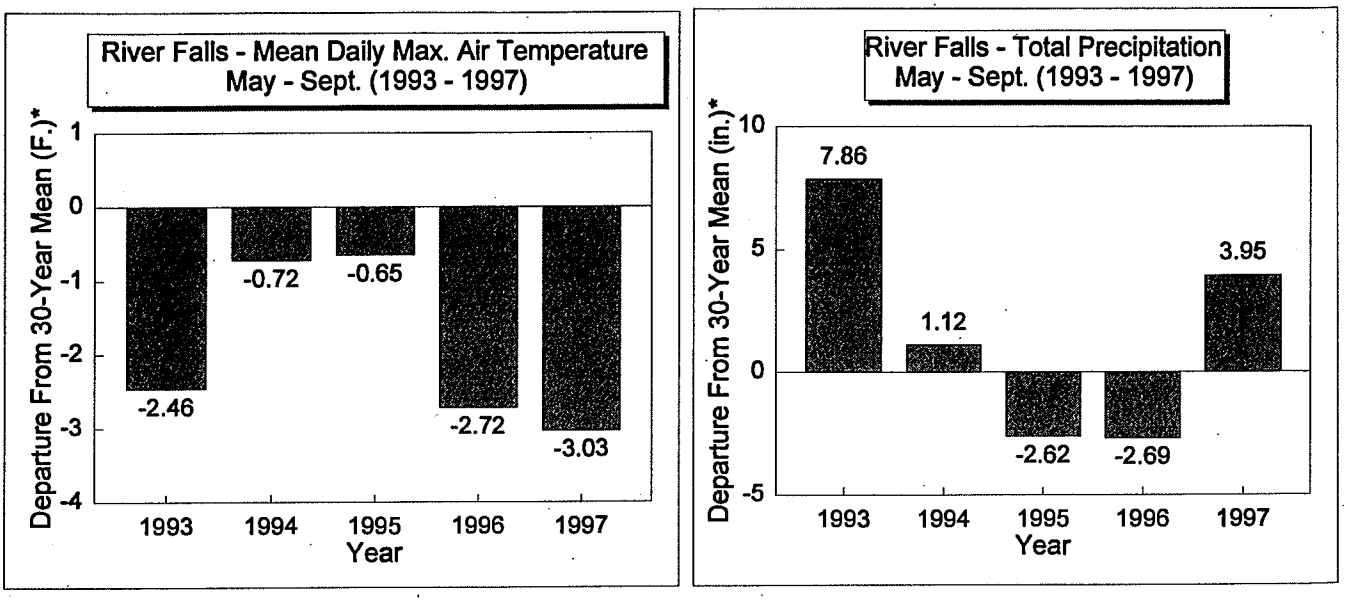
Figure 7 illustrates the thermal impact of a summer storm that occurred on July 27-28, 1996. The storm began during early evening on July 27 and ended early morning July 28, producing a total of 3.13 inches of precipitation. The stormwater runoff from this event caused a 3° C. (5° F.) increase in stream temperatures at the Division Street site which is located in downtown River Falls directly below several storm sewers. The storm had no appreciable impact on water temperatures at the upstream (Quarry Road) site and minimal impacts on the downstream site. The upstream station represents a relatively undisturbed watershed, and the lower station is situated below two impoundments which tend to buffer the thermal impacts of storms, but still cause overall elevated downstream water temperatures.

The impact of the impoundments on downstream temperatures during summer baseflow is evident in Figure 7, during the period prior to, the July 27 storm. The impoundments had an overall constant warming effect of about 3° C. (5° F.) on downstream water temperatures during base flow.

Temperature Frequency Analysis

Although the maximum and mean temperature of streams provide useful information about overall thermal conditions, the proportion of time the stream exceeds optimal temperatures for growth and survival of a particular species may have the greatest relevance to the biological community. Figure 8 shows the relative proportion of time stream sites were at a particular temperature during the summers

Figure 6. Departures from 30-year mean daily maximum air temperatures and total precipitation for May - September (1993 - 1997) at River Falls, Wisconsin. Source: Midwest Climate Center.



* Based on 1961-1990 climatological data from River Falls weather station.

Figure 7. Kinnickinnic River stream temperatures during a July 27-28, 1996 storm event. Based on 10-minute interval continuous temperature recordings.

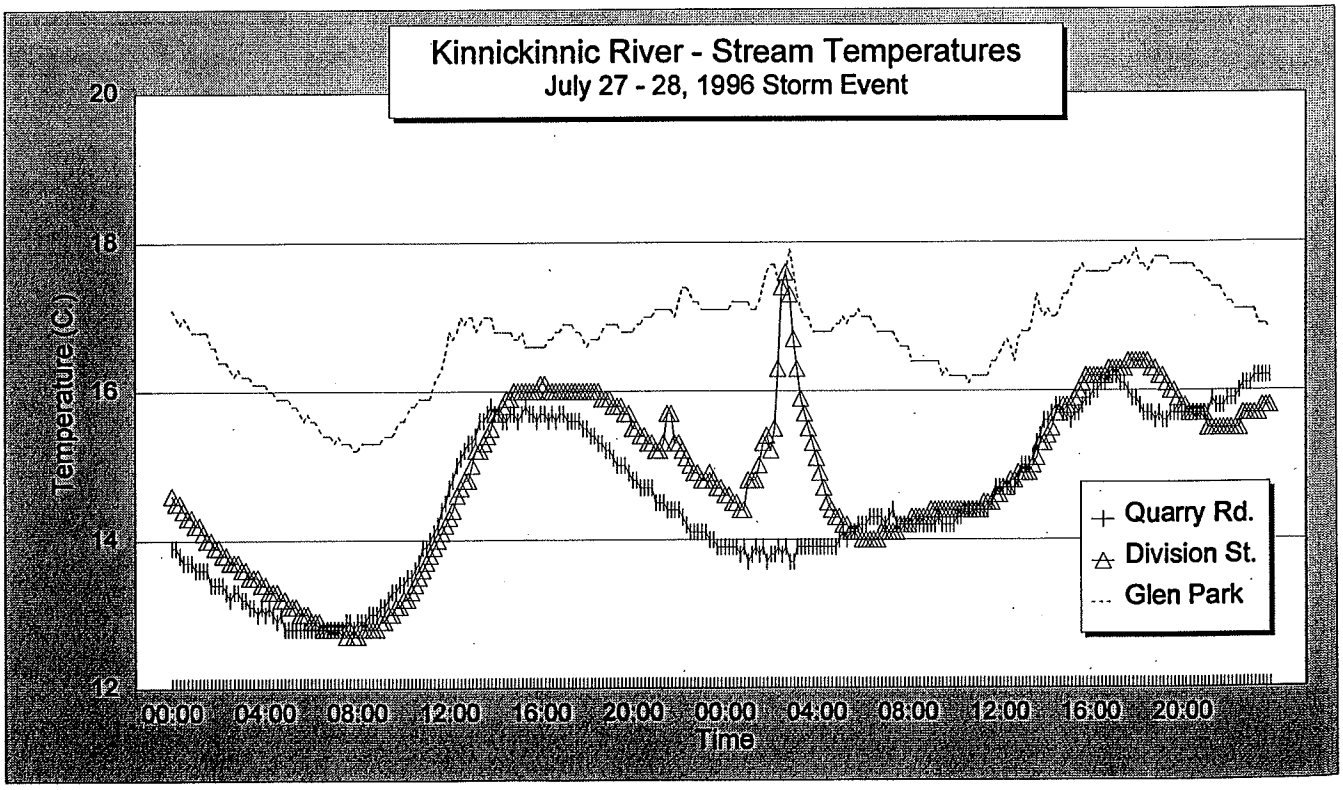
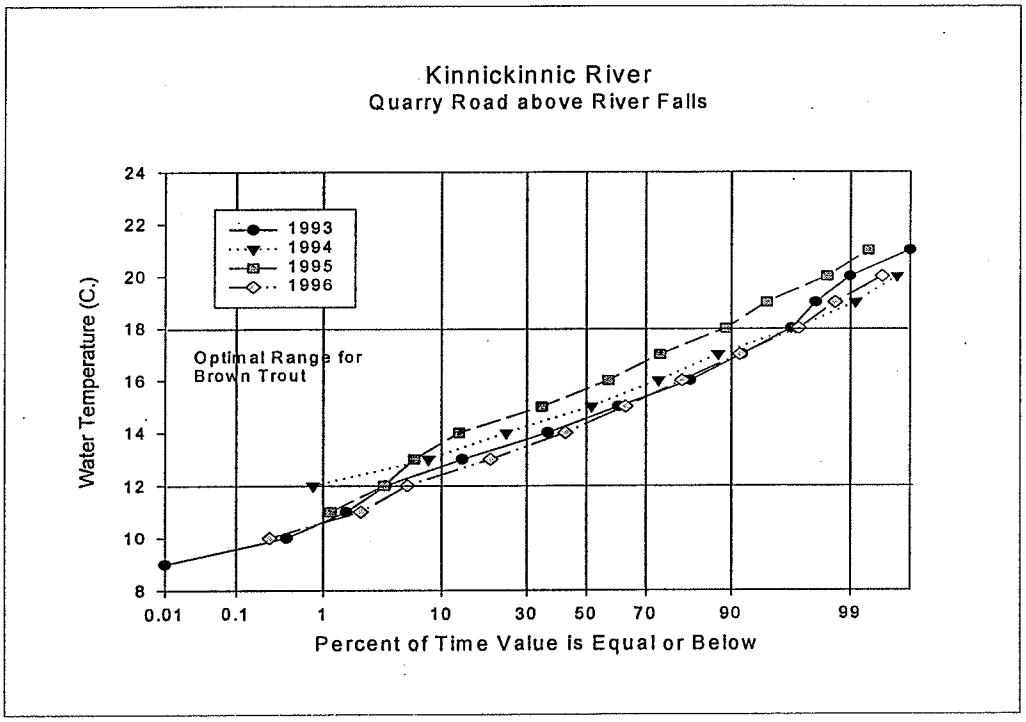
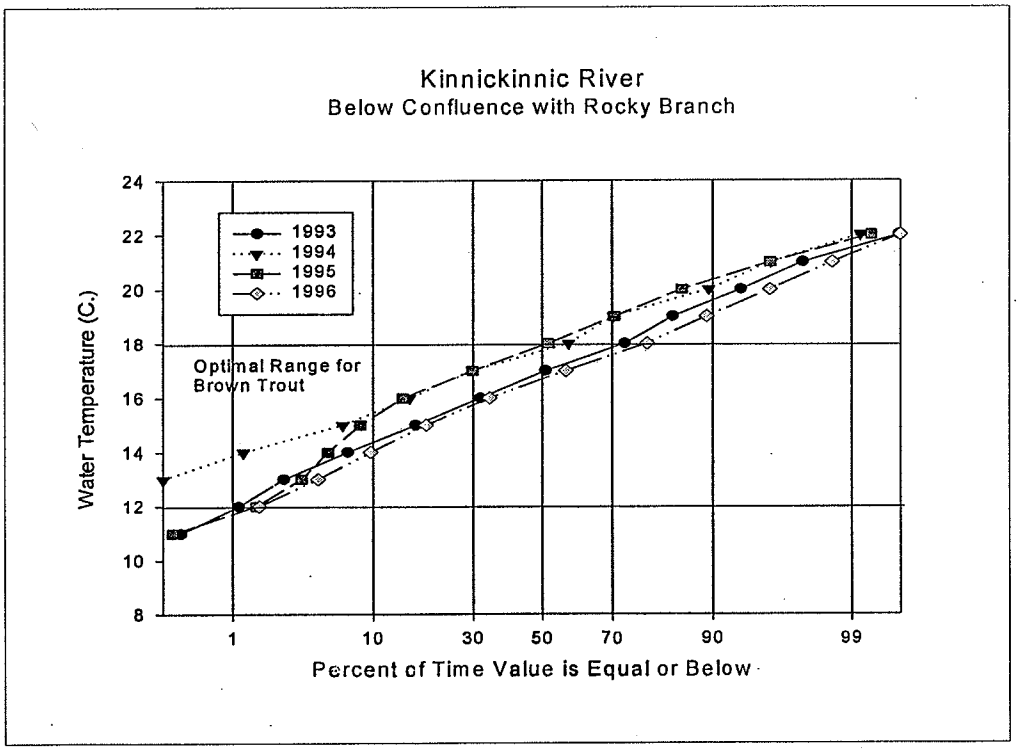


Figure 8. Frequency analysis of water temperatures in the Kinnickinnic River at Quarry Road (above River Falls) and below Rocky Branch (below River Falls) for the period of June 1 - August 31, 1993 - 1996.





of 1993-1996. The upstream (Quarry Road) site exceeded the maximum optimal temperature for brown trout (as identified in Table 4) 3-10% of the time, whereas, temperatures at the downstream site exceeded the optimal range 21-48% of the time during the monitored summers. This analysis suggests that overall upstream temperature conditions are better suited for brown trout than downstream temperatures. The fish survey findings substantiate this conclusion. The analysis also shows that overall summer temperature conditions in the river did not vary considerably between years.

Fisheries

As mentioned previously, the Kinnickinnic River has a Class I trout fishery with some of the highest trout densities in western Wisconsin. Brown trout densities range from about 1,300 to over 7,000 fish per mile, with no stocking conducted in the watershed. Brown trout biomass ranged from 90 to 420 pounds per acre (Fig. 9). Table 5 lists general guidelines for interpreting trout population and biomass estimates for western Wisconsin streams. A complete summary of trout population estimates and habitat ratings for watershed streams is available in Appendix 5.

Significant brook trout populations were present at only two stations in the Kinnickinnic River located in the headwaters area. The lower 0.3 mile (Station 1) had no trout and was dominated by warmwater fish species.

Trout densities are generally higher above River Falls than below, likely due to cooler water temperatures and more stable flow conditions. The highest brown trout densities (7,363 fish/mile) occurred at Station 8, directly upstream of River Falls. The highest brown trout biomass was found at station 16 located above the I-94 bridge. The fishery below River Falls is impacted by elevated water temperatures, fluctuating streamflows and urban runoff.

Since the coldwater fish IBI methodology identifies brown trout as an exotic species, IBI values in the Kinnickinnic River range from fair to good. Excellent IBI ratings only occurred where native brook trout and mottled sculpin were present. Station 1 (located near the river mouth) and influenced by the presence of warmwater fish species, received a "poor" coldwater IBI rating.

Habitat

Fish habitat ratings ranged from "poor" to "excellent" in the Kinnickinnic River (Fig.9 and Table 6). Station 1 had a "poor" rating due to lack of cover, poor substrate and shallow, wide stream morphometry. Habitat ratings were fair to good upstream to Station 16 (near the headwaters) where habitat was excellent. The most common habitat problems in the river were lack of cover and shortage of deep pool area.

Figure 9. Brown trout biomass estimates and coldwater fish habitat ratings for the Kinnickinnic River during summer 1996. Fish and habitat station locations are identified in Appendix 5.

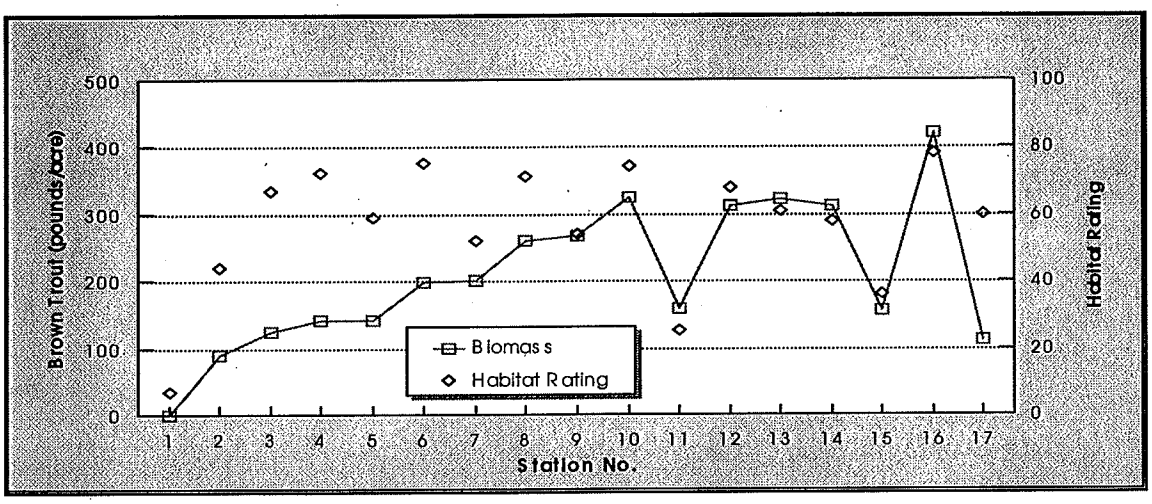


Table 5. General guidelines for interpreting trout abundance values for summer fish survey results from western Wisconsin streams. (Engel, 1996).

Abundance Level	CPUE* No. / Mile (all sizes)	Pop. Est.** No./ Mile (>4.0 in.)	Biomass** Pounds/ Mile (>4.0 in.)
Low	< 250	<500	<35
Moderate	250 - 1500	500 - 1500	40 - 90
High	1500 - 2500	1500 - 3500	100 - 175
Very High	>2500	>3500	> 175

** CPUE - Catch Per Unit Effort includes all trout captured, including young of year using one pass with standard electrofishing gear.*
*** Population estimates and pounds per acre only include age one trout and older, or approximately 4 inches and larger.*

Table 6. Interpretation of fish habitat rating values (Simonson, et al. 1994).

Fish Habitat Rating	Qualitative Rating
<25	Poor
25-49	Fair
50-74	Good
>75	Excellent

A comparison of brown trout biomass and habitat ratings suggest the lower river (below River Falls) could support higher trout densities. The reduced densities are likely a result of factors other than those measured in the habitat surveys, such as increased summer water temperatures (or decreased winter temperatures), reduced spawning success, fishing pressure and/or fluctuating water levels.

Macroinvertebrates

Macroinvertebrate sampling in the Kinnickinnic River found HBI values in the "very good" to "excellent" water quality range, suggesting minimal impacts from organic loading (Table 7). During Fall 1995, one site at CTH F below River Falls received an "excellent" HBI value, and all other sites in the river had "very good" HBI values. Follow-up sampling conducted during Spring 1997 in the vicinity of River Falls, found excellent HBI values at 3 sites and a very good rating at a downtown site. The macroinvertebrate sample results indicate very minimal organic loading from the River Falls area.

Although the results are somewhat inconsistent, interpretation of the macroinvertebrate data using other biometrics generally indicates a healthy aquatic community. The highest (best) EPT values were found at CTH F (below River Falls) and the lowest values occurred at CTH JJ (above River Falls), even though both sites had "excellent" HBI values. Diversity index values also suggest the sites with the greatest diversity (sites 2 and 3) do not correspond to the best HBI or EPT values.

Table 7. Summary of macroinvertebrate sample results from the Kinnickinnic River.

Date	Site No.	Location	HBI Value	HBI Rating	EPT (%)	Diversity Index
10/10/95	1	CTH F	3.37	Excellent	71	3.05
10/10/95	2	Below Rocky Br.	3.76	V. Good	62	3.53
10/10/95	3	Division St.	4.44	V. Good	36	3.85
10/10/95	4	STH 35	4.47	V. Good	56	3.52
10/10/95	5	CTH JJ*	3.65	V. Good	31	3.13
5/21/97	7	Above Rocky Br.	2.97	Excellent	63	2.77
5/21/97	6	Cedar St.	3.62	V. Good	44	3.35
5/21/97	4	STH 35	3.16	Excellent	53	3.34
3/27/97	5	CTH JJ*	3.50	Excellent	23	2.79

** Regional macroinvertebrate reference site (mean of three replicates).*

Limiting Factors and Watershed Goals

Water resource limiting factors, pollutant sources and project goals are identified for all perennial streams in the watershed in Table 8. Limiting factors are physical, chemical and biological conditions that prevent the full biological use from being attained in a specific waterbody. Pollutant reduction goals (for sediment and nutrient control) are indicated in relative terms as high or medium depending on the level of control needed to achieve the identified water resource goals. Final numerical values for the loading reduction goals will be identified during the watershed planning process.

Table 8. Summary of surface water resource uses, problems and goals for lakes and streams in the Kinnickinnic River Priority Watershed.

Subwatershed	Waterbody	WBIC*	Waterbody Size (MI./ Ac.)	Biological Use** (MI./ Ac.)	Limiting Factors***	Observed or Potential Sources****	Water Resource Goals*****
Upper Kinnickinnic	Casey Lake Bushnell Lake	2606700 2606300	28 ac. 17 ac.	WWFF WWFF	EUT, DO, SED, TURB EUT, DO, SED, TURB	CR	Reduce sediment loading - High Reduce nutrient loading - High Improve macrophyte community
	Kinnickinnic River (above I-94)	2601800	1.5	Cold I (1.5)	SED, WET, FLOW SPR, TURB	CR, SB, PSB, GUL BDAM, BY	Reduce sediment loading - High Reduce nutrient loading - High Reduce gully erosion Reduce streambank erosion Improve stream hydrology Protect or restore spring areas Maintain brook trout conditions Restore wetlands
Twin Lakes	West Twin Lake East Twin Lake	2598900 2462300	80 ac. 43 ac.	WWFF WWFF	EUT, DO, SED, TURB WET	CR , URB, PS , DCH	Reduce sediment loading - High Reduce nutrient loading - High Reduce urban runoff pollution Improve macrophyte community
Middle Kinnickinnic	Kinnickinnic R. (Steeple Rd. to I-94)	2601800	2.7	Cold I (2.7)	SED, WET, FLOW SPR, TURB	CR, SB, PSB, GUL, BY	Reduce nutrient loading - Med. Reduce sediment loading - High Protect or restore spring areas Reduce gully erosion Reduce streambank erosion Improve stream hydrology Maintain brook trout conditions Restore wetlands
	Kinnickinnic R. (STH 35 to Steeple Rd.)	2601800	8.5	Cold I (8.5)	SED, WET, TURB	CR, SB, PSB, BY, GUL	Reduce sediment loading - High Reduce nutrient loading - Med. Reduce gully erosion Reduce streambank erosion Improve stream hydrology

Table 8 (cont.)

Subwatershed	Waterbody	WBIC	Waterbody Size (Mi./ Ac.)	Biological Use (Mi./ Ac.)	Limiting Factors	Observed or Potential Sources	Water Resource Goals
Middle Kinnickinnic (cont.)	Kinnickinnic R. (STH 35 to Steeple Rd.) (cont.)	2601800					Protect or restore spring areas Maintain brown trout conditions Restore wetlands
	Parker Creek Cr. 13-2	2604700 2604800	6 3	Cold I (6) Cold I (3)	WET, TEMP, SED SPR, HAB, FLOW TURB	CR, SB, PSB, BY DCH, BDAM, FL	Reduce sediment loading - High Reduce nutrient loading - Med. Reduce gully erosion Reduce streambank erosion Improve stream hydrology Protect or restore spring areas Maintain brook trout conditions Restore wetlands Improve macroinvert. habitat
	Kelly Creek	2604600	1	Cold II (1)	SED, HAB, SPR	CR	Reduce sediment loading - High Reduce nutrient loading - Med. Reduce streambank erosion Maintain brook trout conditions Improve macroinvert. habitat
	Nye Creek	2604500	2	Cold II (2)	SED, HAB, WET	CR, PSB	Reduce sediment loading - High Reduce nutrient loading - Med. Reduce streambank erosion Maintain brook trout conditions Restore wetlands Improve macroinvert. habitat
	Ted Creek	2604400	2	Cold II (2)	SED, WET, HAB	GUL, PSB, CR	Reduce sediment loading - High Reduce gully erosion Reduce streambank erosion Restore wetlands Improve brook trout conditions

Table 8 (cont.)

Subwatershed	Waterbody	WBIC	Waterbody Size (Mi./ Ac.)	Biological Use (Mi./ Ac.)	Limiting Factors	Observed or Potential Sources	Water Resource Goals
Middle Kinnickinnic (cont.)	Cr. 21-4	2604300	3	Cold I (3)	WET, SED, HAB	PSB, CR, DCH	Reduce sediment loading - High Reduce nutrient loading - Med. Reduce streambank erosion Improve brook trout conditions Restore wetlands Improve macroinvert. habitat
	Cr. 30-1	2604000	1	Cold 2 (1)	WET, TEMP, SPR	CR, DCH	Reduce sediment loading - High
	Cr. 30-10	na	1	Cold II (1)	HAB, SED		Reduce nutrient loading - Med. Protect or restore spring areas Improve temp. conditions Improve brook trout conditions Restore wetlands
South Fork	South Fork Kinnickinnic R.	2603100	9	Cold II (9)	TEMP, WET, SED	SB, PSB, URB	Reduce sediment loading - High
	Cr. 7-1	2603200	5	Cold II (5)	FLOW, HAB	BDAM, DCH, FL	Reduce nutrient loading - Med.
	Cr. 5-15	na	2	Cold II (2)			Reduce streambank erosion Improve stream hydrology Improve temp. conditions Reduce gully erosion Reduce urban runoff pollutants Improve brook trout conditions Restore wetlands Improve macroinvert. habitat
River Falls	Kinnickinnic R. (above Lake George to STH 35)	2601800	2	Cold I (2)	FLOW, HAB, SED TEMP	URB, GUL	Reduce sediment loading - High Reduce nutrient loading - High Improve stream hydrology Improve temp. conditions Protect or restore spring areas Improve macroinvert. habitat Maintain brown trout conditions

Table 8 (cont.)

Subwatershed	Waterbody	WBIC	Waterbody Size (Mi./ Ac.)	Biological Use (Mi./ Ac.)	Limiting Factors	Observed or Potential Sources	Water Resource Goals
River Falls (cont.)	Kinnickinnic R. (above Lake George) (cont.)	2601800					Reduce streambank erosion Reduce urban runoff pollutants
	Lake George (Upper Kinni. Pond)	2603700	18 ac.	Cold I/ WWSF	EUT, SED, TURB	URB, PS	Reduce sediment loading - High
	Lake Louise (Lower Kinni. Pond)	2603000	15 ac.	Cold I/ WWSF	HAB, SED, FLOW		Reduce urban runoff pollutants Reduce nutrient loading - High
	Kinnickinnic R. (between Jct. Falls dam and Lake Louise)	2601800	0.2	Cold I (0.2)	TEMP, FLOW, TURB, SED	URB, HYDRO	Reduce sediment loading - High Reduce nutrient loading - High Reduce streambank erosion Improve stream hydrology Improve temp. conditions Reduce urban runoff pollutants Maintain brown trout conditions
	Kinnickinnic R. (below Powell Dam to Rocky Branch)	2601800	1	Cold I (1)	TEMP, FLOW, TURB, SED	URB, HYDRO, SB	Reduce sediment loading - High Reduce nutrient loading - High Improve stream hydrology Improve temp. conditions Reduce streambank erosion Reduce urban runoff pollutants Improve macroinvert. habitat Maintain brown trout conditions
	Cr. 36-1	2603900	3	Cold II (3)	FLOW, SED, HAB SPR	DCH, URB	Reduce sediment loading - High Reduce nutrient loading - High Improve stream hydrology Maintain brook trout conditions Reduce streambank erosion Reduce urban runoff pollutants

Table 8 (cont.)

Subwatershed	Waterbody	WBIC	Waterbody Size (Mi./ Ac.)	Biological Use (Mi./ Ac.)	Limiting Factors	Observed or Potential Sources	Water Resource Goals
River Falls (cont.)	Cr. 36-15	na	1	Cold II (1)	SPR, SED, FLOW HAB	URB, SB	Reduce sediment loading - High Reduce nutrient loading - High Reduce streambank erosion Improve stream hydrology Protect or restore spring areas Reduce urban runoff pollutants Improve brook trout conditions
	Mann Valley Creek (Cr. 2-16)	2602800	2	Cold II (2)	SED, SPR	CR, URB	Reduce sediment loading - High Reduce nutrient loading - High Improve stream hydrology Protect or restore spring areas Reduce streambank erosion Reduce urban runoff pollutants Maintain brook trout conditions
	Rocky Branch Cr. 12-11	2602400 2602500	6 3	Cold I (6) Cold II (3)	SED, FLOW, HAB	URB, GUL, SB, FL	Reduce sediment loading - High Reduce nutrient loading - High Improve stream hydrology Reduce gully erosion Reduce streambank erosion Reduce urban runoff pollutants Improve macroinvert. habitat Maintain brook trout conditions
Lower Kinnickinnic	Kinnickinnic R. (below Rocky Branch to CTH F)	2601800	6.8	Cold I (6.8)	TEMP, FLOW, SED	CR, SB, FL, GUL HYDRO	Reduce sediment loading - Med. Reduce nutrient loading - Med. Improve stream hydrology Reduce gully erosion Maintain brown trout conditions Reduce streambank erosion Reduce urban runoff pollutants

Table 8 (cont.)

Subwatershed	Waterbody	WBIC	Waterbody Size (Mi./ Ac.)	Biological Use (Mi./ Ac.)	Limiting Factors	Observed or Potential Sources	Water Resource Goals
Lower Kinnickinnic (cont.)	Kinnickinnic R. (CTH F to mouth)	2601800	2.3	Cold I (2) WWSF (0.3)	TEMP, FLOW, SED HAB	CR, SB, HYDRO, GUL FL	Reduce sediment loading - Med. Reduce nutrient loading - Med. Improve stream hydrology Reduce streambank erosion Reduce gully erosion Maintain brown trout conditions
	Cr. 9-11a	na	1	Cold II (1)	SED	CR, GUL	Reduce sediment loading - Med.
	Cr. 9-11b	2602140	1	Cold II (1)			Reduce nutrient loading - Med.
	Cr. 10-11	2602200	3	Cold II (3)			Reduce gully erosion
	Cr. 8-13	2602120	0.5	Cold II (0.5)			Maintain brook trout conditions
	Cr. 8.11	2602040	1	Cold II (1)			
	Cr. 17-6	2602020	1	Cold II (1)			
Upper St. Croix	St. Croix River	2601400	5	WWSF (5)	EUT, SED	CR, GUL	Reduce sediment loading - Med. Reduce gully erosion Reduce nutrient loading - Med.
Lower St. Croix	St. Croix River	2601400	6.7	WWSF (6.7)	EUT, SED	CR, GUL	Reduce sediment loading - Med. Reduce gully erosion Reduce nutrient loading - Med.
	Barkley Coulee	2601700	2	UNK (2)	SED	CR, GUL	Reduce sediment loading - Med. Reduce gully erosion Reduce nutrient loading - Med.

Table 8 (cont.)

*WBIC - Waterbody Identification Code

**Biological Use (Abbreviations):

WWSF - Warmwater Sport Fishery
WWFF - Warmwater Forage Fishery
Cold - Coldwater Fishery

Trout stream classifications (DNR, 1980):
Class I - sufficient natural reproduction to sustain populations of wild trout
Class II - some natural reproduction of trout, good survival and carryover of adult trout
Class III - no natural reproduction of trout, marginal trout habitat

***Limiting Factors (abbreviations):

HAB - Habitat (loss of cover, etc.)
SED - Sedimentation
TEMP - Temperature (elevated)
DO - Dissolved Oxygen (depletion)
SPR - Springhead alterations
EUT - Eutrophication
FLOW - altered streamflow hydrology
TURB - Turbidity
WET - Wetland alteration

**** Observed or Potential Impacts (Abbreviations):

BDAM - Beaver Dams
DCH - Ditching
BY - Barnyard Runoff
CR - Cropland Runoff
GUL - Gully erosion
HYDRO - Hydropower flow impacts
PSB - Streambank Pasturing
FL - Flooding (Flashy flows)
SB - Streambank erosion
URB - Urban Stormwater Runoff
PS - Point Source Discharge

*****Water Resource Goals (Definitions):

Reduce sediment loading - High or Medium level of control (actual quantity to be determined by advisory committee)
Reduce nutrient loading - High or Medium level of control (actual quantity to be determined by advisory committee)
Reduce urban runoff pollutants - reduce urban runoff by using detention basins, street sweeping, increasing infiltration, etc.
Reduce gully erosion - reduce or eliminate downcutting of gullies through check dams, grassed waterways, etc.
Reduce streambank erosion - reduce or eliminate streambank erosion through rip-rap, stabilization, etc.
Improve macroinvert. habitat - improve stream bottom substrate composition for aquatic insects and other aquatic life
Improve temp. conditons - improve water temperature conditions for the coldwater aquatic community
Maintain trout conditions - prevent degadation of temperature, habitat or water quality conditions affecting the brook or brown trout fishery
Improve trout conditions - improve habitat and water quality conditions sufficiently to increase trout populations
Protect or restore spring areas - protect existing spring areas or prevent further degradation through fencing, rehabilitation, etc.
Restore wetlands - rehabilitate impacted wetlands through fencing, plugging ditches or tile drains, etc.
Improve stream hydrology - reduce streamflow "flashiness" by increasing infiltration of runoff waters

A variety of project management goals were identified by the water resource appraisal work group for the Kinnickinnic River watershed, including short-term and long-term goals. Short term goals are considered achievable during the course of the Priority Watershed Project (10 years). Long term goals may take considerably longer and require actions independent and beyond the scope of the priority watershed project.

Short term water resource goals are identified in Table 8 and should be accomplished during the course of the watershed project. The recommended long term goal for the Kinnickinnic River is as follows:

Improve water temperature conditions in the lower Kinnickinnic River (from STH 35 to CTH F) to the optimal range for brown trout and other coldwater aquatic life. Temperature conditions at the Quarry Road monitoring site should be used as a benchmark for optimal future river temperatures.

In order to achieve this long-term goal it would likely be necessary to alter, modify or remove the Kinnickinnic River impoundments in River Falls and take aggressive management actions to reduce urban runoff impacts to levels below that which is presently occurring.

All permanent streams in the Kinnickinnic River watershed are currently classified as Class I or Class II trout fisheries. In many cases, the water resource goal is to maintain or protect the current biological condition. However, installation of best management practices are recommended in order to prevent further degradation and to enhance the existing condition. Several streams (or reaches) have a goal to improve the biological condition. These streams will require a more aggressive management approach that would reduce pollutant loading sufficiently to result in a measurable improvement in the overall biological condition. A relatively higher level of pollutant control should be directed to these streams.

Following is a discussion of surface water appraisal results for the Kinnickinnic River and all permanent surface waters in the watershed. The descriptions are arranged by subwatershed and provide a summary of available information on each named, perennial waterbody including a discussion of water resource conditions, problems affecting the resource and recommended management goals.

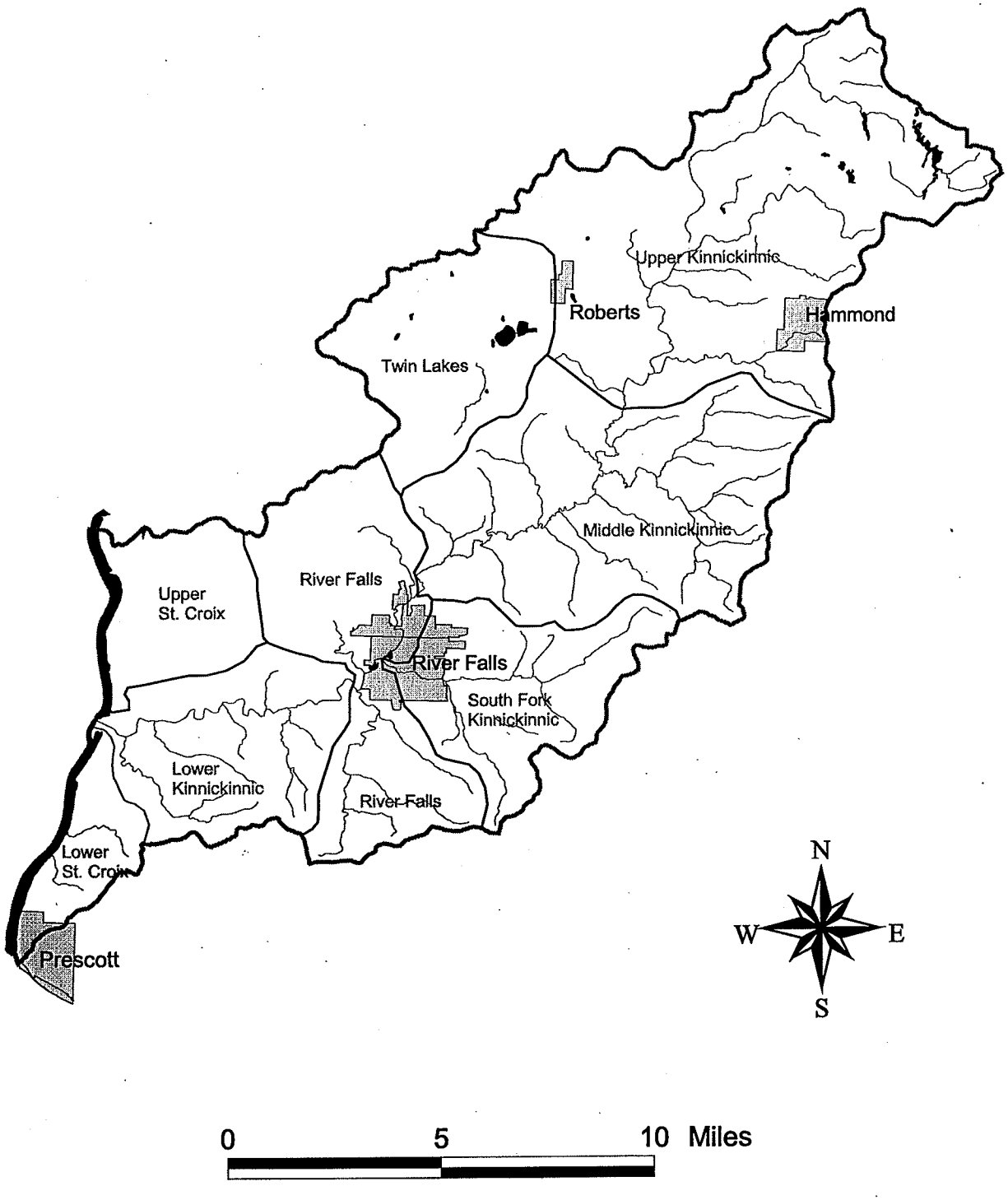
Subwatershed Descriptions

Streams in the Kinnickinnic River watershed are generally in good condition and support a viable, naturally-reproducing trout fishery. However, many of the streams would benefit from nonpoint source management, and could be improved to support a higher quality coldwater aquatic community. The following subwatershed narratives provide a brief description of water resource appraisal findings and recommended project management goals for each major perennial waterbody. The project subwatershed boundaries are shown in Figure 10.

UPPER KINNICKINNIC

The Upper Kinnickinnic subwatershed is 46 square miles and includes Casey and Bushnell Lakes and the headwaters of the Kinnickinnic River.

Figure 10. Subwatershed boundaries in the Kinnickinnic River Priority Watershed .



Permanent flow in the Kinnickinnic River begins about 1.5 miles upstream of the I-94 bridge. The watershed above this location primarily consists of intermittent, grassed dry runs. The permanent portion of the stream is managed as a Class I brook and brown trout fishery. The fish habitat rating and Index of Biotic Integrity (IBI) for this reach were good to excellent. The stream has high brown trout densities and relatively low brook trout densities in this reach.

Strong baseflow from several large springs in this reach resulted in the lowest summer maximum water temperatures found throughout the Kinnickinnic River during the 1996 fish surveys. However, the stream experiences occasional high peak flows due to agricultural and urban stormwater runoff in the watershed. The stream is also impacted by excessive sediment loading from upland runoff and streambank erosion.

The coldwater community would benefit from wetland and spring area protection, gully and streambank erosion control, and BMPs that would increase infiltration in the watershed. The Village of Hammond should develop and adopt a stormwater control plan and a construction site erosion control ordinance to reduce the impacts from urban runoff.

The water resource goal for the upper Kinnickinnic River is to maintain brook trout habitat conditions by reducing gully, upland and streambank erosion, improving stream hydrology, restoring wetlands and protecting spring areas.

Casey Lake is a shallow 28 acre seepage lake with a limited warmwater fishery. Bushnell Lake is a shallow 17 acre seepage lake with a marginal warmwater fishery. Both lakes are highly eutrophic with summer algae blooms and frequent winterkills. These lakes would benefit from sediment and nutrient reductions from the watershed.

The water resource goal of these lakes is to provide a high level of nutrient and sediment control in order to improve water clarity and increase macrophyte growth.

TWIN LAKES

The Twin Lakes subwatershed is 20.7 square miles and includes East Twin and West Twin lakes. Twin Lakes are shallow, highly eutrophic waterbodies (about 168 acres in size) located approximately one mile southwest of the Village of Roberts in St. Croix County, Wisconsin. In 1976, Twin Lakes were classified as wetlands by the Department, for purposes of establishing wastewater treatment effluent limits. Twin Lakes are not listed in the surface water resources inventory of St. Croix County (WDNR, 1961), but are identified as lakes in the Wisconsin Lakes publication (WDNR, 1995).

Water levels in Twin Lakes fluctuate considerably, depending on prevailing climatic conditions. Maximum depth of the larger western portion (referred to as West Twin) reportedly ranges from about 9-12 feet. The smaller eastern portion (East Twin), which is hydraulically connected to West Twin by a culvert, has a maximum depth ranging from about 3-6 feet. Historically, Twin Lakes and other comparable waterbodies in the region have fluctuated from a wetland condition with little open water during dry periods, to open-water lakes capable of supporting a limited forage fishery during wet periods. The lakes are heavily used by migratory waterfowl.

Both waterbodies suffer from severe summer algae blooms and winterkill due to dissolved oxygen

depletion. During July 1991, the Department received reports of an intense algae bloom in Twin Lakes and water samples confirmed the presence of blue-green algal toxins. An ice-cover survey conducted in February 1993 found dissolved oxygen levels throughout the water column below 1.0 mg/l in both portions of Twin Lakes, indicating probable fish winterkill conditions.

Phosphorus Loading

The Roberts wastewater treatment plant (WWTP) has discharged directly to East Twin Lake since 1984. A recent DNR study determined that approximately 35 percent of the annual phosphorus load originates from nonpoint sources, 15 percent from the WWTP discharge and the remainder from internal loading (Schreiber, 1995). However, the nonpoint source and internal load estimates were approximations based on limited available data. The current priority watershed planning process and appraisal included collection of additional lake data and a detailed land use inventory of the Twin Lakes watershed. Revised watershed P loading estimates will be included in the priority watershed management plan.

The water resource goal for this subwatershed is to provide a high level of nutrient and sediment control in order to improve water clarity and increase macrophyte growth in Twin Lakes.

MIDDLE KINNICKINNIC

The Middle Kinnickinnic subwatershed is 39.2 square miles and includes the Kinnickinnic River, Parker, Kelly, Nye and Ted creeks, and several small unnamed streams.

The Kinnickinnic River in this reach is 11.2 miles and supports a Class I brook and brown trout fishery. The upper 2.7 miles support brook and brown trout, and the lower 8.5 miles support brown trout only. Brown trout densities were high to very high in this reach, with a significant brook trout population at the furthest upstream site (CTH N). The macroinvertebrate HBI was very good indicating minimal organic loading. The fish habitat ratings and coldwater IBI values were fair to good.

Water resource problems in this reach include sedimentation, barnyard runoff (from one barnyard), streambank erosion, wetland grazing and gully erosion in the dry runs. The stream is also impacted by flashy stream flows during runoff events.

The stream fishery goals are to maintain brook trout habitat conditions above Steeple Road, and maintain brown trout conditions below Steeple Road. Other water resource goals include reducing sediment and nutrient loading, reduce streambank and gully erosion and improve stream hydrology.

Parker Creek is 4.5 miles in length and supports a Class I brook and brown trout fishery. Brown trout densities were low in the headwaters area and very high near the mouth. The stream supports relatively low brook trout densities but acts as an important rearing area for the Kinnickinnic River. The stream HBI was very good indicating minimal organic loading, and the fish habitat rating was fair to good. The coldwater IBI was poor at the two upstream stations and good at the lower stations.

The stream is impacted by sedimentation, elevated water temperatures, turbidity and excessive macrophyte growth. Other water resource problems include ditched wetlands and bank erosion due to

cattle pasturing.

Note: A severe fish kill occurred in Parker Creek in May 1998 that was caused by runoff from a field spread with liquid manure. The runoff event resulted in a near total kill of brook and brown trout in Parker Creek. The event also caused a 40% kill of brown trout in a 1.5 mile portion of the Kinnickinnic River downstream of Parker Creek.

The water resource goal is to maintain brook trout and macroinvertebrate habitat conditions by restoring wetlands and reducing gully, upland and streambank erosion.

Kelly Creek (Kelly Spring) is very small (less than 1 mile in length) and supports a low density, Class II brook and brown trout fishery. The coldwater IBI was good and fish habitat rating was fair. The stream is limited by its small size, sedimentation and dense tag alder growth in the riparian area. The watershed is also being impacted by conversion from agricultural land use to residential development.

The water resource goal is to maintain brook trout and macroinvertebrate habitat conditions by reducing streambank and upland erosion.

Nye Creek is 2 miles in length and supports a moderate density Class II brook trout fishery. The stream HBI was very good indicating minimal organic loading. The fish habitat rating was good and the coldwater IBI was excellent. The stream is impacted by sedimentation and streambank and gully erosion. The stream is also impacted by wetland alterations and cattle pasturing in the headwaters area.

The water resource goal for this stream is to improve brook trout and macroinvertebrate habitat conditions by restoring wetlands and reducing upland and streambank erosion.

Ted Creek is 2 miles in length and supports a low density Class II brook trout fishery. The stream HBI was excellent indicating little or no organic loading. The fish habitat rating was fair and coldwater IBI was excellent. The stream is impacted by sedimentation, streambank and gully erosion and wetland grazing.

The water resource goal is to improve brook trout habitat conditions by restoring wetlands and reducing gully and streambank erosion.

SOUTH FORK

The South Fork subwatershed is 19.3 square miles and includes the South Fork Kinnickinnic River and two unnamed tributaries to the South Fork.

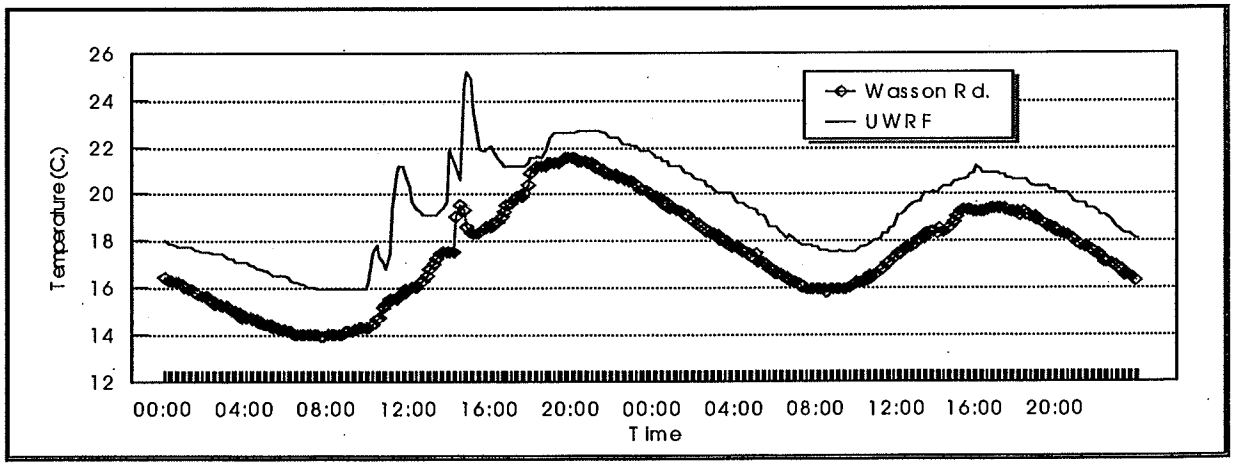
The South Fork Kinnickinnic River flows 9 miles west to the Kinnickinnic River between Lake George and Lake Louise in River Falls. The stream supports a low to moderate density Class II brook trout fishery. Stream habitat conditions range from poor in the headwaters area, to good in the lower reaches. The coldwater IBI was fair to excellent and the HBI was good to very good, indicating minimal organic loading.

The upper portion of the stream is impacted by sedimentation, bank and upland erosion, wetland grazing and beaver dams on the tributaries. The lower portion, which flows through River Falls, is impacted by flashy streamflow, sedimentation, elevated temperatures and lack of suitable fish habitat. The South Fork is significantly impacted by excessive peak streamflow and elevated water temperatures during summer storm events. Figure 4 illustrates streamflow conditions at the three continuous flow monitoring sites during a July 27-28, 1997 storm event. Although the South Fork only comprises about 16% of the direct drainage area above the downstream gauging station, peak flow in the South Fork was approximately 50% of the total peak flow in the Kinnickinnic during the storm event. Several large storm sewers draining the east side of River Falls enter the South Fork above the gauging station.

The South Fork is also impacted by elevated water temperatures from stormwater runoff. Figure 11 shows water temperatures at two stations in the South Fork during the July 27 storm event. The Wasson Road site represents conditions above River Falls, and the UW-River Falls site is located below several city storm sewer outfalls. Temperature data from the UWRF site indicates an approximate 4° C. (7° F.) increase in stream temperatures due to the storm event. More importantly, the maximum stream temperature during the event was 25.2° C., which is 1.4° C. above what is considered the upper limiting (near lethal) temperature for brook trout (see Table 4).

The water resource goals for the South Fork and its tributaries are to improve brook trout and macroinvertebrate habitat conditions by reducing streambank and upland erosion, reducing urban runoff pollutants, restoring wetlands, and improving water temperatures and overall stream hydrology.

Figure 11. Stream temperatures in the South Fork Kinnickinnic River during a July 27-28, 1997 storm event. Based on 10-minute interval continuous temperature recordings.



RIVER FALLS

The River Falls subwatershed is 16.2 square miles and includes the Kinnickinnic River, Mann Valley Creek, Rocky Branch and several small unnamed streams. This reach of the Kinnickinnic River also

includes two impoundments known locally as Lake George and Lake Louise.

The Kinnickinnic River in this subwatershed includes three separate reaches; 1) a 2 mile upper reach from above Lake George to STH 35, 2) a 0.2 mile reach from below Junction Falls to upper Lake Louise, and 3) a 1.0 mile lower reach from below Powell Dam to the confluence with Rocky Branch. Each of these reaches currently support a Class I brown trout fishery, however, the middle reach was not inventoried during the 1996 fish surveys. The 1996 surveys found very high brown trout densities in the upper and lower reaches.

The coldwater IBI and habitat rating was fair in the upstream (downtown River Falls) reach. The stream HBI was very good indicating minimal organic loading. The upstream reach is impacted by urban runoff pollution (including thermal), flashy flows and lack of adequate fish habitat.

The middle reach (between the two impoundments) is deep, slow moving and has marginal trout habitat conditions. The South Fork enters this reach and provides a source of relatively cool water to the Kinnickinnic River.

The downstream reach (below Powell Dam) had a fair coldwater IBI and a good habitat rating. This reach had an excellent HBI indicating minimal organic loading. The stream in this reach is impacted by flashy stream flows caused by urban runoff and hydropower manipulations. The stream also has elevated water temperatures and occasional turbidity caused by the two upstream impoundments and stormwater runoff.

The water resource goals for the river in this subwatershed are to maintain brown trout temperature conditions and improve macroinvertebrate habitat by reducing urban stormwater runoff pollutants, improving stream hydrology, protecting spring areas and reducing sediment loading.

Lake George is a shallow, eutrophic 18-acre impoundment of the Kinnickinnic River formed by the Junction Falls dam. The lake has a limited warmwater and coldwater sport fishery consisting of largemouth bass, panfish and brown trout. The lake is nearly filled with sediment and experiences summer algae blooms and turbidity. Water temperatures in the original stream channel are generally cool enough to support brown trout. However, warming in the shallow areas tends to cause a general increase in downstream water temperatures.

A macrophyte (rooted aquatic plant) survey conducted on Lake George during August 1996 found a macrophyte community characterized by a moderate level of species diversity and plant densities (Konkel 1996). The plant community was dominated by *Potamogeton zosteriformis* and *Elodea canadensis*, both species that are tolerant of high turbidity levels.

Lake Louise is a shallow, eutrophic 15-acre impoundment of the Kinnickinnic River formed by Powell Dam. Similar to Lake George, the lake has a limited warmwater and coldwater sport fishery consisting of largemouth bass, panfish and brown trout. The lake also supports a significant carp population. The lake is nearly filled with sediment and experiences summer algae blooms and turbidity. The impoundment contributes to elevated downstream water temperatures.

Mann Valley Creek is 2 miles in length and supports a low density, Class II brook and brown trout fishery. The fish habitat rating was good and the coldwater IBI was excellent. This small stream receives urban runoff from the City of River Falls and experiences flashy flows, streambank erosion

and sedimentation.

The water resource goal is to maintain brook trout conditions by improving stream hydrology, reducing gully and bank erosion and controlling urban runoff pollutants.

Rocky Branch is 6 miles in length and supports a moderate density, Class I brown trout fishery. The headwaters area had minimal flow and supported no trout. The stream had a good habitat rating and a very good HBI, suggesting minimal organic loading. The coldwater IBI was good at the lower station and fair at the upper station. The stream is impacted by severe streambank and gully erosion, flashy streamflows, sedimentation and lack of suitable habitat.

Rocky Branch provides a source of cold water to the Kinnickinnic River. The mean summer water temperature of Rocky Branch is about 4° C. (7° F.) cooler than the Kinnickinnic River at the confluence of the two streams (Appendix 3).

The water resource goal for this stream is to maintain current temperature conditions and improve macroinvertebrate habitat by reducing streambank and gully erosion, sedimentation and urban runoff pollutant loading.

LOWER KINNICKINNIC

The Lower Kinnickinnic subwatershed is 19.9 square miles and includes the Kinnickinnic River and six unnamed tributaries.

The Kinnickinnic River in this subwatershed flows 9.1 miles through what is locally known as "The Canyon" to the St. Croix River. The stream supports a moderate to high density Class I brown trout fishery in the upper 8.8 miles, and a limited warmwater sport fishery in the lower 0.3 miles (above mouth). Fish habitat ratings ranged from fair to good, with a poor rating at the furthest downstream site. Coldwater IBI values ranged from fair to good, with poor values at the three furthest downstream sites. The poor IBI values were a result of the lack of brook trout and presence of some warmwater species.

The river in this reach is impacted by urban runoff pollution, elevated water temperatures, flashy flows (due to urban stormwater runoff and hydropower manipulations) and sediment from upland and gully erosion. All of the unnamed tributaries to the Kinnickinnic River in this subwatershed have low density, Class II brown trout fisheries. These streams are also impacted by gully erosion, sedimentation and cropland runoff.

The water resource goal of this subwatershed is to maintain brown trout habitat conditions by reducing gully and streambank erosion, improving stream hydrology and temperature conditions, and reducing urban runoff pollutants.

UPPER ST. CROIX

The Upper St. Croix subwatershed is 8.8 square miles and includes a 5 mile reach of the St. Croix River. The St. Croix River supports a warmwater sport fishery and is impacted by sediment loading

from gully and cropland erosion, and nutrient loading from croplands. *The water resource goal for this subwatershed is to reduce sediment and nutrient loading to the St. Croix River.*

LOWER ST. CROIX

The Lower St. Croix subwatershed is 16.5 square miles and includes a 6.7 mile reach of the St. Croix River and Barkley Coulee Creek. The St. Croix River supports a warmwater sport fishery and is impacted by sediment loading from gully and cropland erosion, and nutrient loading from croplands. *The water resource goal for this subwatershed is to reduce sediment and nutrient loading to the St. Croix River.*

Barkley Coulee Creek is a 2 mile tributary of the St. Croix River. The status of the fishery is unknown since no inventories have been conducted on this stream. The stream is limited by its small size and sedimentation from gully and upland erosion.

Literature Cited

Konkel, D. 1996. The aquatic plant community of Lake George in River Falls, Wisconsin. WDNR, Eau Claire, Wis. 17pp.

Engel, M. 1996. Personal communication. WDNR, Baldwin, Wis.

Hilsenhoff, W. L. 1977. Use of arthropods to evaluate water quality of streams. WDNR Tech. Bull. 100. Madison, Wis. 16pp.

Hilsenhoff, W. L. 1987. An improved biotic index of organic stream pollution. Great Lakes Entomologist 20(1): 31-39.

Lyons, J., Wang, L. and T.D. Simonson. 1996. Development and validation of an index of biotic integrity (IBI) for coldwater streams in Wisconsin. N. Amer. Jour. Fish. Mgmt. 16:241-256.

Raleigh, R.F. 1982. Habitat suitability index models: brook trout. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.24. 42 pp.

Schreiber, K. 1995. Twin Lakes/ Roberts WWTP water quality assessment. WDNR. Eau Claire, Wis. 22pp.

Szczytyko S.W. Dr., 1988. Investigation of new interpretative techniques for assessing biomonitoring data and stream water quality in Wisconsin streams. Univ. Wis. Stevens Point. Stevens Point, Wis.

U.S. Environmental Protection Agency. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers. EPA/444/4-89/001. Washington, D.C.

Wisconsin Department of Natural Resources. 1961. Surface water resources of St. Croix County. Wis. Dept. Nat. Res. Madison, Wis.

Wisconsin Department of Natural Resources. 1995. Wisconsin lakes. Wis. Dept. Nat. Res. Madison, Wis. 181pp.

Appendix 1. Summary of continuous temperature monitoring deployments at stream sites in the vicinity of River Falls. All monitoring was conducted using a 10-minute recording interval.

Stream	Location	Deployment Period
Kinnickinnic River	Above I-94 bridge	5/97 - ongoing
	Quarry Road (above R. Falls)	6/92 - 9/92
		5/93 - ongoing
	CTH MM (River Falls)	5/97 - 9/97
	Division St. (River Falls)	5/93 - 10/93
		4/94 - 10/94
		5/95 - 10/95
		4/96 - 9/96
	Footbridge (River Falls)	5/97 - 9/97
	Below Junction Falls (River Falls)	5/97 - 9/97
	Below Powell Dam (below R. Falls)	6/92 - ongoing
	Glen Park (below River Falls)	5/93-10/93
		5/94 - 10/94
		4/95 - 10/95
		4/96 - 6/96
South Fork Kinni. R.	900th St. (above River Falls)	7/96 - 9/96
	Old STH 35 bridge (River Falls)	5/97 - 9/97
	UWRF Campus	6/96 - 9/96

Appendix 2. Summary of continuous temperature monitoring deployments in storm sewers in River Falls, Wisconsin. All monitoring was conducted using a 5-minute recording interval.

Location	Deployment Period
Clark & Maple St. (manhole)	5/30/96 - 7/30/96
	8/20/96 - 9/11/96
Maple & Third St. (manhole)	6/17/96 - 7/31/96
	8/13/96 - 9/24/96
Pine & Lewis St. (storm drain)	8/9/96 - 8/31/96
Rural Development Institute parking lot (manhole)	8/26/96 - 9/17/96
Riverside Square - SW corner of parking lot (manhole)	5/30/96 - 6/4/96
Riverside Square - north side of parking lot (storm drain)	6/13/96 - 9/17/96
Maple St. - behind Ben Franklin (manhole)	6/14/96 - 6/23/96
	6/23/96 - 6/26/96
	7/2/96 - 7/3/96
	8/19/96 - 8/20/96

Appendix 3. Summary of continuous temperature monitoring conducted in Kinnickinnic River Watershed streams during June-Augustt (1993

10-minute recording interval (unless otherwise noted)

Temperature (C.)

Stream	Location		1993	1994	1995	1996	1997	Comments
Kinnickinnic River	Above I-94 Bridge (30- min. interval)	Max.					13.7	
		Min.					9.1	
		Mean					11.27	
	Quarry Rd. - Above River Falls	Max.	21.2	21.0	22.0	20.9	19.4	
		Min.	8.9	11.2	10.1	10.9	10.9	
		Mean	14.70	15.13	15.83	14.84	14.50	
	CTH MM (River Falls)	Max.					20.2	
		Min.					10.9	
		Mean					14.7	
	Cedar St. (River Falls)	Max.	20.6	22.1				
		Min.	8.7	11.0				
		Mean	14.4	15.2				
	Division St. (River Falls)	Max.			21.6	21.2	20.0*	* Only includes
		Min.			9.4	9.6	11.0*	6/7/97 - 8/3/97
		Mean			15.58	14.79	15.28*	
	Footbridge (River Falls)	Max.					20.0	
		Min.					10.9	
		Mean					14.73	
	Below Junction Falls Dam	Max.					20.6	
		Min.					12.0	
		Mean					15.60	
	Below Powell Dam	Max.		22.6	24.2	23.1	21.9	
		Min.		12.5	11.3	11.1	12.3	
		Mean		17.06	18.42	16.92	16.27	
	Below Rocky Branch	Max.	22.6	23	23	22.6	21.2	
		Min.	10.1	12.4	10.6	11.1	11.7	
		Mean	16.97	17.87	17.88	16.66	16.51	
South Fork Kinnickinnic River	900th St. (Above River Falls)	Max.				21.1		
		Min.				8.5		
		Mean				13.14		
	S. Wasson Lane (River Falls)	Max.					21.5	
		Min.					10.3	
		Mean					14.9	
	UWRF Campus	Max.				21.8*	25.2	*Missing
		Min.				12.0*	11.6	7/2/96 - 8/8/96
		Mean				15.66*	16.5	
Rocky Branch	50 m. above confl. with Kinnickinnic River	Max.				20.7*	22.5	* Only includes
		Min.				9.0*	8.5	6/27/96 - 8/31/96
		Mean				12.66*	12.33	

Appendix 4. Literature review of temperature requirements of various life stages of brown trout.

Reproductive impairment:

Source	Temp. Range (C.)	Comments
Kaya (1977b)	28.0 - 28.8 for 5 consecutive days	Poor reproductive success
Elliot (1981)	>13.0	Lethal temp. (eggs)

Growth impacts:

Source	Temp. Range (C.)	Comments
Pentelow (1939)	10.0 - 15.6	Maximal growth rate
Swift (1961)	12.0	Maximal growth rate
Jensen (1990)	14.9	Maximal growth rate
Jobling (1981)	10.0 - 15.5	Maximal growth rate
Hunt (DNR)	16 - 18	Optimal range
Frost & Brown (1967)	12 - 19	Optimal for growth & survival
	7 - 19	Maximum growth
Brynildson et. al. (1963)	18.3 - 23.9 (65 - 75 F.)	Optimal range for growth
Elliot (1981)	11.7 - 18.5	Preferred temp. (YOY)
Brungs & Jones (1977)	19.0	Optimal growth (max. weekly ave.)
	24.0	Max. temp. for short survival (24hr)

Tolerance limits:

Source	Temp. Range (C.)	Comments
Embody (1921)	>25	Fingerlings survived for 10 days
	>26.7	Fingerlings survived for 3 days
Frost & Brown (1967)	22.5 - 25.3	Upper tolerance limits
Alabaster & Lloyd (1982)	18 - 24	Upper tolerance level
Needham (1969)	27.2	Upper limiting, near lethal
Spaas (1960)	25.9	Ultimate upper incipient lethal temp. (ULT)
Elliot (1981)	22.5	Lethal temp. (fry)
	23.0	Lethal temp. (YOY)
	25.0 - 26.0	Lethal temp. (adult)

Appendix 5. Summary of fish surveys and habitat ratings for streams in the Kinnickinnic River Watershed, Pierce & St. Croix counties, Wisconsin during July - August, 1996.

Waterbody	Station	Location	Fish Habitat Rating (>10 meters)	Coldwater Bi Rating	Trout CPUE (no./mi) Brook	Trout CPUE (no./mi) Brown	Pop. Est. >= 4 (no./mi) Brook	Pop. Est. >= 4 (no./mi) Brown
KINNICKINNIC RIVER	1	KINNI. R. (MOUTH)	POOR*	POOR	0	0	0	0
	2	CTH F	FAIR*	FAIR	0	1,044.3	0	1,380.4
	3	CHAMBERS PROP.	GOOD*	POOR	0	1,490.1	0	1,902.3
	4	ERICKSON PROP.	GOOD*	FAIR	0	1,912.5	0	2,193.5
	5	PETERSON PROP.	FAIR*	GOOD	2.9	3,056.5	--	3,070.0
	6	CONF. W/ ROCKY BR.	GOOD*	FAIR	0	5,464.8	0	3,870.8
	7	RIVER FALLS	FAIR*	FAIR	0	4,071.5	0	5,850.4
	8	STH 35	GOOD*	GOOD	29.3	6,811.2	--	7,363.6
	9	QUARRY RD.	FAIR*	FAIR	5.9	5,133.3	--	5,820.9
	10	LIBERTY RD.	GOOD*	FAIR	0	4,083.2	0	6,369.5
	11	RIVER RD. (120TH ST.)	FAIR*	FAIR	5.9	1,551.7	--	2,573.2
	12	CTH JJ	GOOD*	GOOD	2.9	3,886.7	--	4,882.7
	13	CTH J	GOOD	GOOD	5.9	4,241.6	--	4,346.9
	14	STEEPLE RD.	GOOD	GOOD	158.4	4,411.7	--	4,362.4
	15	CTH N	FAIR	EXCELLENT	469.3	3,977.6	442.8	2,177.8
	16	I-94	EXCELLENT	EXCELLENT	551.5	3,942.4	258.1	4,561.0
	17	140 TH ST.	GOOD	GOOD	586.7	5,274.1	--	1,477.0
KELLY SPRING	1	PRIVATE DR.	FAIR	GOOD*	17.6	246.4	--	--
NYE CREEK	1	OAK RD.	GOOD	EXCELLENT	1,877.3	0	546.1	0
TED'S CREEK	1	MADSEN PROP.	FAIR	EXCELLENT*	211.2	0	--	0
UNAMED STREAM 21-4	1		GOOD	GOOD	0	1,193.1	0	1,181.1
UNAMED STREAM 30-1	1		FAIR	FAIR*	0	5.9	0	--
UNAMED STREAM 30-10	1		FAIR	GOOD*	28.2	204.2	--	--
UNAMED STREAM 36-1	1		GOOD	GOOD	374.1	120.7	--	--
UNAMED STREAM 36-15	1		FAIR	EXCELLENT*	17.6	0	--	0
ROCKY BR.	1	ABOVE MOUTH	GOOD	GOOD	0	6,001.6	0	1,234.0
	2	CTH FF	GOOD	FAIR*	0	0	0	0
UNAMED STREAM 12-11	12-11		GOOD	FAIR*	0	5.9	0	--
UNAMED STREAM 2-16	2-16		GOOD	EXCELLENT	152.5	29.3	--	--
UNAMED STREAM 8-11	8-11		GOOD	GOOD*	0	46.9	0	--
UNAMED STREAM 8-13	8-13		GOOD	FAIR*	0	49.7	0	--
UNAMED STREAM 9-11A	9-11a		FAIR	GOOD*	0	38.2	0	--
UNAMED STREAM 9-11B	9-11b		GOOD	GOOD*	0	18.7	0	--
UNAMED STREAM 10-11	10-11		GOOD	GOOD*	0	133.9	0	--
UNAMED STREAM 17-6	17-6		GOOD	FAIR*	0	58.7	0	--
PARKER CREEK	1	MORROW PROP.	GOOD	GOOD	240.5	7,609.1	--	1,634.6
	2	PLEASANT AVE.	FAIR	FAIR	193.6	1,320.0	108.3	361.3
	3	CTH J	FAIR	POOR	134.9	269.9	--	--
	4	CTH W	FAIR	POOR	134.9	152.5	173.1	196.5
UNNAMED STREAM 13-2	1		GOOD	GOOD	105.6	199.5	--	--
SOUTH FORK	1	STH 29	GOOD	FAIR	70.4	0	--	0
	2	STH 35	GOOD	FAIR	434.1	0	576.1	0
	3	SOUTH FORK RD.	FAIR	EXCELLENT	680.5	0	628.5	0
	4	SADDLE CLUB RD.	POOR	FAIR*	0	0	--	0
UNAMED STREAM 5-15	1		FAIR	GOOD*	18.3	0	--	0
UNAMED STREAM 7-1	2		FAIR	POOR	23.5	0	--	0

* Fish habitat rating score (stream width >10 meters).

** Rating may not be representative when total number of individuals caught was less than 25 individuals. A rating of "very poor" may apply.

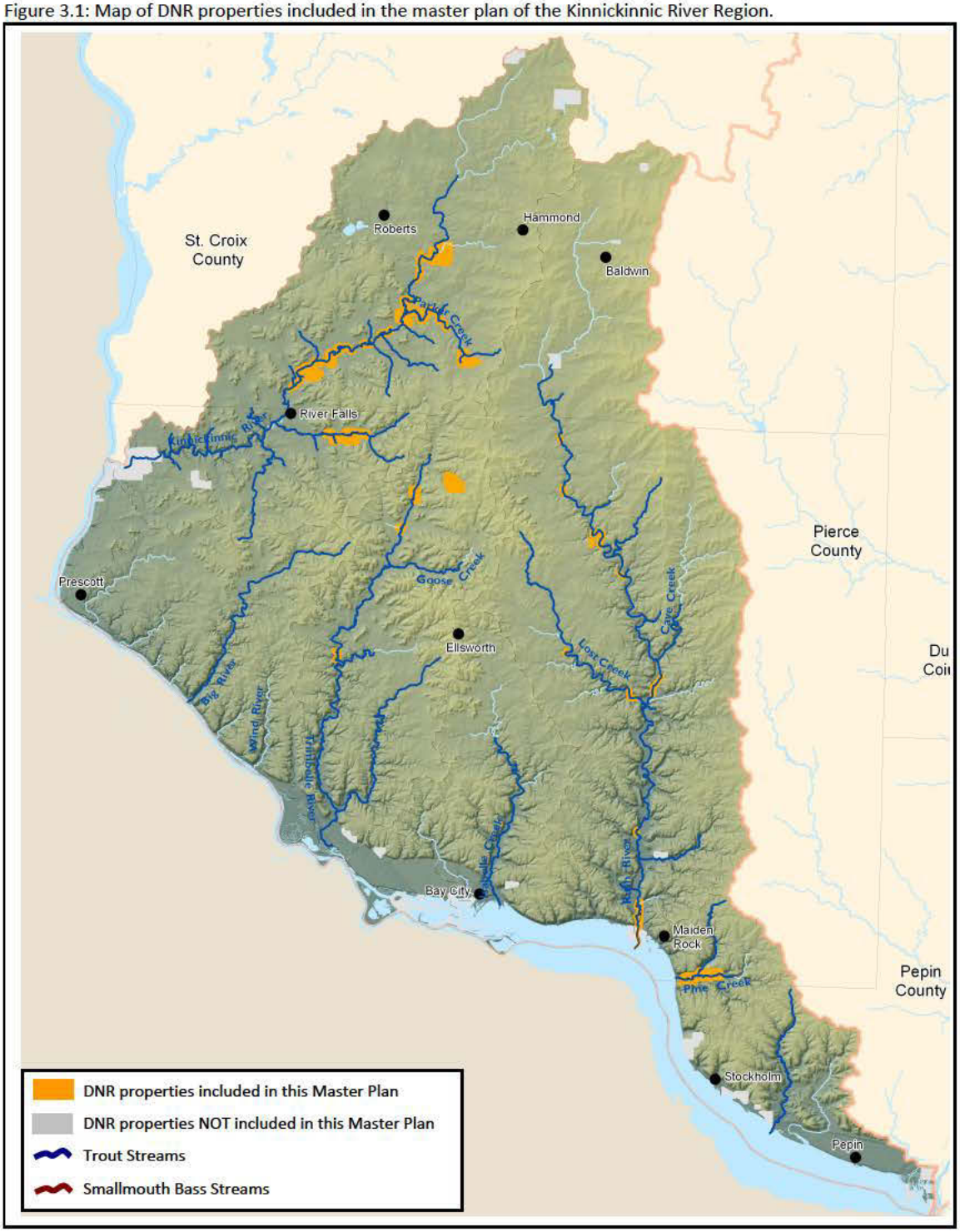
*** Max./Min. water temperatures for all stations were for the period of August 23-29, 1996. Max/min. air temperature was 89/43 F.

**** Angler counts were conducted May 3, 1997 between the hours of 7:00 and 9:00 AM. (- - indicates site was not visited)

Appendix G

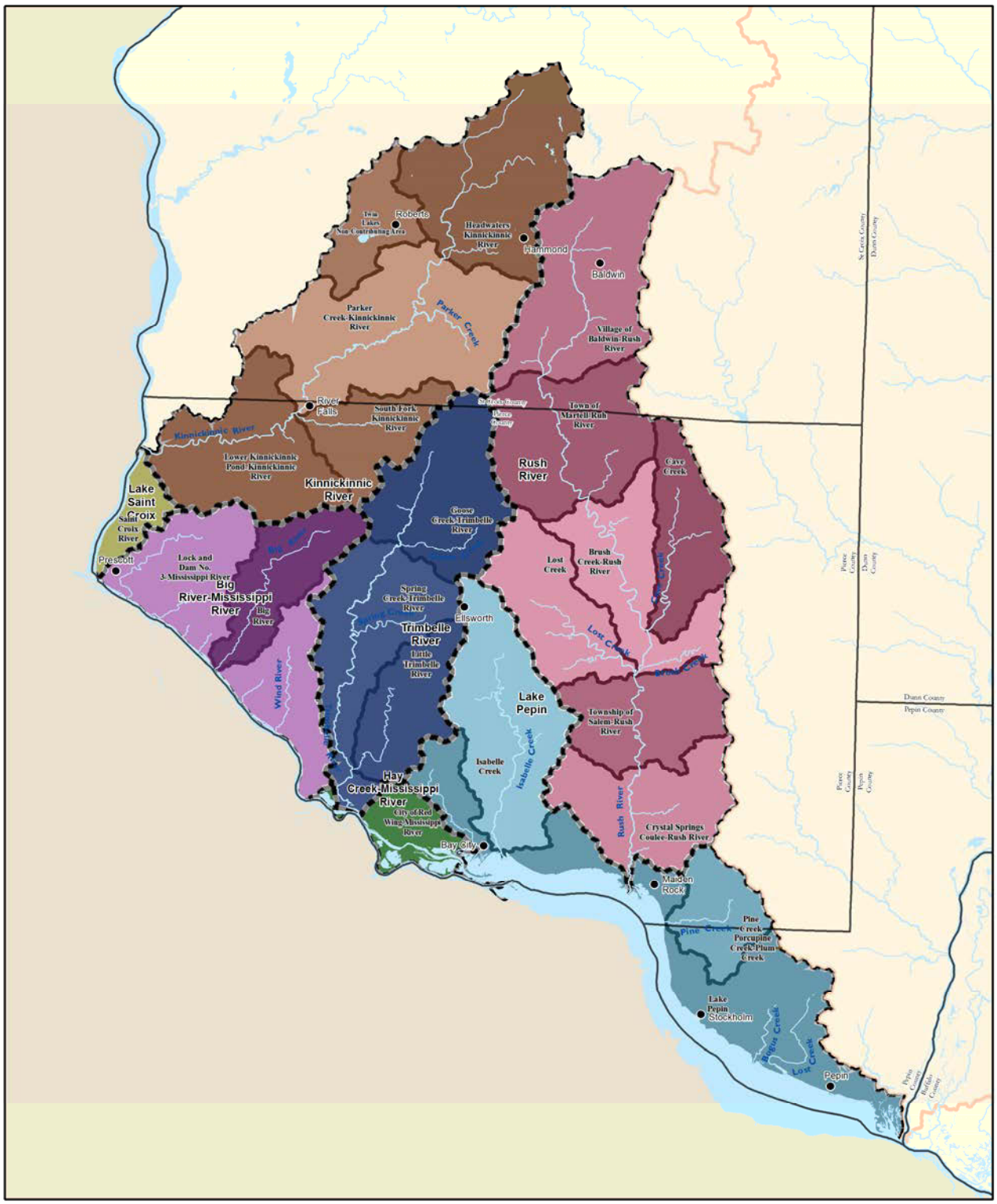
CHAPTER 3: KINNICKINNIC RIVER REGION

Figure 3.1: Map of DNR properties included in the master plan of the Kinnickinnic River Region.



Note: Most of the properties included in this master planning process are narrow strips along trout and smallmouth bass waters and cannot be seen at the scale of this map. To enable readers to see the properties, their boundaries have been significantly exaggerated.

Figure 3.2: Watersheds and Sub-Watersheds of the Kinnickinnic River Region.



1. OVERVIEW

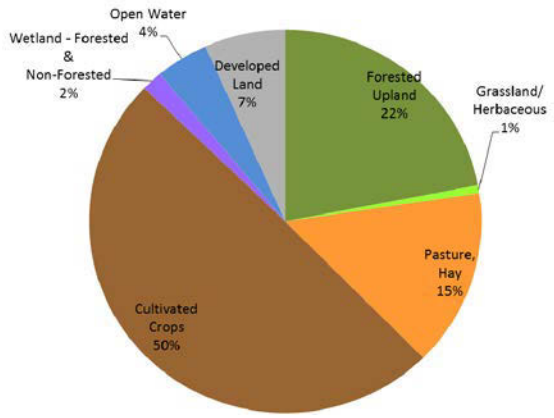
a) Physical Environment

Sitting at the northwestern edge of the Driftless Area, the "Kinni" Region exhibits both glaciated and unglaciated characteristics. The broad rolling plains of the northern portion (a function of previous glacial periods as well as the Wisconsin Glaciation) are cut by incised valleys carved by streams flowing to the St. Croix and Mississippi Rivers. Soils are predominantly formed in loamy till glacial deposits, while some are in outwash. A loess cap of wind-deposited silt is 6 to 48 inches thick over the surface. River bottoms are moderately well drained to poorly drained silty soils with a silt loam surface over calcareous and non-calcareous silty alluvium or loess.

b) Land Cover and Use

This Planning Region is primarily dominated by agriculture with the majority in row crops (Figure 3.3). Many of the streams in the southern portion of the region flow through partially or fully forested coulees. With the increasing price of corn and soybeans over the last decade, many pastures, hayfields, and lands that were enrolled in the Conservation Reserve Program (CRP) are being converted to row crops. This large conversion out of permanent vegetation to agricultural uses that expose open soil is also likely to have an adverse effect on water quality of streams in the region. In addition, over the last decade, residential development has increased dramatically in the western part of the Ecological Landscape along and near the St. Croix River. Many new residents commute to the Twin Cities for work.

Figure 3.3: Land cover of the Kinnickinnic River Region.



The major forest types are maple-basswood and oak-hickory, with lesser amounts of lowland hardwoods. Native coniferous forests are rare, and are limited to a few tamarack swamps and small scattered stands of pine on steep rocky slopes.

c) Terrestrial Habitats

Grassland management at multiple scales is a major opportunity in the Western Prairie and will only benefit water quality in the watershed. Small, scattered remnants of native prairie exist here along with substantial areas of "surrogate grassland" that now provide increasingly critical habitat for many grassland species, especially birds. The largest grassland management project in this region is the Western Prairie Habitat Restoration Area in St. Croix and Polk counties. By managing at multiple scales, large blocks of surrogate grassland, unplowed prairie pastures, small native prairie remnants on bluffs or within rights-of-way and working agricultural lands can all play key roles in the conservation and restoration of the grassland ecosystem that historically covered most of this ecological landscape. Ponds and lakes border or are embedded within some of the areas with high grassland management potential; these add great value for species that nest near or over water and for migrants that use open wetlands and water.

Additional natural community types found in this region include southern dry, dry-mesic, and mesic forests, floodplain forest, emergent marsh, and dry cliff. Less common to rare natural communities include moist cliff, southern sedge meadow, dry prairie and oak opening. In addition to the dry prairie and surrogate grassland opportunities mentioned above, the region is also noteworthy for its' southern mesic forests and moist cliffs. High

quality natural communities of Driftless Area study stream properties can be found in Appendix C of the "Rapid Ecological Assessment for Driftless Area Streams" (Appendix 2).

d) Aquatic habitats

Despite the intensive nature of row crop agriculture, cold water fish communities throughout the watershed have shown steady improvement during the last two decades. Many streams in the past were dependent on stocking of trout to sustain sport fisheries. However, since records were first kept in the 1950s, self-sustaining brook and brown trout populations have expanded both in distribution and abundance. Today, this watershed boosts some of the highest densities of self-sustaining brook and brown trout streams in Wisconsin. In addition, many streams have shifted from warm/cool water fish assemblages to cool/cold water fish assemblages. Much of this is due to improvements in agricultural practices on the landscape, major decreases in grazing along streams, precipitation changes and DNR land acquisition and trout stream habitat improvement.

Currently, the Kinnickinnic River is listed as an Outstanding Resource Water under the Clean Water Act. The St. Croix, Big, and Trimbelle rivers, along with Rocky Run, are listed as Exceptional Resource Waters. The Lower St. Croix River is designated as a National Scenic Riverway and supports an exceptionally high diversity of aquatic organisms, including fish, mussels and other invertebrates. Many rare species have been documented there, and several of the mussels are globally rare. The river's floodplain contains good examples of emergent marsh, wet prairie and floodplain forest.

Note: Detailed descriptions of the sport fishery can be found in the next section. A more complete discussion of the aquatic features and water management goals can be found in the watershed basin reports developed by the DNR.[1]

e) Endangered, Threatened, and Special Concern Species

As mentioned, the region's prairies and grasslands harbor important grassland bird populations, many of which are rare or declining. Maintaining these lands in permanent grass cover will benefit bird, insect, and other rare upland species. By reducing run-off, large grasslands will also help maintain high quality water flows and associated aquatic species.

To date, there are 26 known rare species that occur within the study stream properties of this region. Included within this list are 4 birds, 12 fish, 8 invertebrates, and 2 plants. Of these, 6 are state Endangered, 7 are state Threatened, and 13 are special concern. For a complete list of these species by property see in Appendix C of the "Rapid Ecological Assessment for Driftless Area Streams" (Appendix 2). For an explanation of the state and global ranks, as well as state status, see Appendix A of the "Rapid Ecological Assessment for Driftless Area Streams."

f) Invasive Species and Other Species of Management Concern

Currently, reed canary grass, buckthorn and box elder dominate many previously grazed stream corridors within the region. Such invasions have limited stream accessibility and degraded stream banks. Control of these invasive plants will continue to present challenges to managing riparian habitat along trout streams well in into the future.

Although there is direct access from the St. Croix and Mississippi Rivers, there is limited concern over Asian Carp or other exotic species migrating up the smaller, cold water Kinnickinnic River Region watersheds.

[1] Watershed Basin Reports are posted on the DNR's web (dnr.wi.gov); search for "basins."

g) Social and Recreation Issues

This Planning Region is easily accessible to residents of the Twin Cities and surrounding communities, and as a result the streams in the Kinni River Region with public access tend to receive heavy fishing pressure. In particular, the Kinnickinnic and Rush river systems receive exceptionally heavy fishing pressure.

h) Cultural Resources

Archaeological sites representing all of the recognized prehistoric culture periods are found throughout the region, from Paleo-Indian (10,000-8,000 BC), through Archaic (8,000-500 BC), Woodland (500 BC-1000 AD), and Oneota (1000-1650 AD). Associated sites include Native American camps, villages, burial mounds, rock art, shell middens, and more. Although present, the area evidences relatively few animal-shaped effigy mounds. Large Mississippian-era sites, some of the northernmost recorded, are found in Pierce County and surrounding areas.

Historic period archaeological sites (ca. 1650-present) include farmsteads, iron mines, dams, sawmills, cemeteries, and others. The area's river towns, villages, and rural roads are dotted with many historic homes, businesses, bridges, and other early structures, many used continuously to this day.

Whether populated by ancient Indian peoples or more recent arrivals, the area's numerous archaeological sites and historic structures reflect a lengthy record of settlement, as well as intensive utilization of the diverse water, mineral, plant, animal, and other resources characteristic of the region.

The 1992 data followed previous DNR monitoring efforts. Table 11 illustrates 1991 monitoring data at 10 locations. The resulting profile is Figure 9 on page 64.

Table 11
1991 Thermal Monitoring Results[1]

		Date									
		8/30/91		8/31/91		9/1/91		9/2/91		9/3/91	
Location	No.	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Air Temp.		87	65	75	58	73	51	83	56	73	57
STH 35	1	66	60	67	62	63	55	60	56	63	59
Cedar Str.	3	68	60	67	63	64	55	62	56	64	59
L. George	4	82	72	81	70	74	61	68	61	70	62
Above Jct. F	5	69	61	70	60	66	57	65	57	66	60
Below Jct. F	6	70	66	70	62	66	59	65	59	66	58
S. Fk (mouth)	7F	70	67	72	62	66	58	67	55	68	58
S. Fk (UWRF)	7D	71	64	72	60	67	57	66	56	73	57
Above Powell	8	80	66	78	64	72	62	73	65	74	62
Below Powell	9	76	62	78	60	76	57	76	58	74	56
Below Ret. B11	10	75	65	73	63	74	60	75	59	70	54

1. Source: Marty Engel, WNDR, 1992.

Table 8.1 Plants of Concern in Pierce and St. Croix Counties, Wisconsin.

Scientific Name	Common Name	State Status	Federal Status	Habitat
Adoxa moschatellina	Musk-root	Threatened	–	Shaded, damp cliffs
Anemone caroliniana	Carolina Anemone	Endangered	–	Dry prairies, sand prairies, bluff prairies
Astragalus crassicarpus	Ground Plum	Endangered	–	Bluffs and dry prairies
Besseya bullii	Kitten Tails	Threatened	–	Prairies, barrens, open woods
Calylophus serrulatus	Yellow Evening Primrose	Special Concern	–	Prairies, river valleys
Catabrosa aquatica	Brook Grass	Endangered	–	Cold springs
Cirsium hillii	Hill's Thistle	Threatened	–	Dry prairies
Dalea villosa	Silky Prairie-clover	Special Concern	–	Sand prairies
Drosera linearis	Slenderleaf Sundew	Threatened	Threatened	Bogs
Glycyrrhiza lepidota	Wild Licorice	Special Concern	–	Wet meadows and prairies
Lespedeza leptostachya	Prairie Bush Clover	Endangered	Threatened	Dry sandy prairies
Lesquerella ludoviciana	Silver Bladderpod	Threatened	–	Dry prairies
Liatris punctata (var. *nebraskana*)	Dotted Blazing Star	Endangered	–	Sand prairies, roadsides
Nothocalais cuspidata	Prairie False-dandelion	Special Concern	–	Dry prairies
Onosmodium molle	Marbleseed	Special Concern	–	Dry open woods
Orbanche ludoviciana	Louisiana Broomrape	Endangered	–	Dry prairies and sand dunes
Prenanthes apsera	Rough Rattlesnake-root	Endangered	–	Dry prairies
Psoralea esculenta	Pomme-de-Prairie	Special Concern	–	Dry prairies
Scutellaria parvula (var. *parvula*)	Small Skullcap	Endangered	–	Dry prairies and bluffs
Senecio plattensis	Prairie Ragwort	Special Concern	–	Dry prairies, open woodlands
Talinum rugospermum	Prairie Fame-flower	Special Concern	–	Sand barrens
Trillium nivale	Snow Trillium	Threatened	–	Calcareous woods

Table 8.2 Animals of Concern in Pierce and St. Croix Counties, Wisconsin.

Scientific Name	Common Name	State Status	Federal Status	Habitat
Alosa chrysochloris	Skipjack Herring	Endangered	–	St. Croix River system
Ammocrypta asprella	Crystal Darter Fish	Endangered	–	St. Croix River system
Buteo lineatus	Red-shouldered Hawk	Threatened	–	Bottomland hardwoods, mixed forests
Casmerodius albus	Great Egret	Threatened	–	Lakes, streams, marshes
Clemmys insculpta	Wood Turtle	Threatened	–	Hardwoods, wet meadows
Crotalus horridus	Timber Rattlesnake	Special Concern	–	Woodlands, prairies, bluffs
Cumberlandia monodonta	Spectacle Case Mussel	Endangered	–	St. Croix River system
Cyclonaias tuberculata	Purple Wartyback Mussel	Endangered	–	St. Croix River system
Ellipsaria lineaolata	Butterfly Mussel	Endangered	–	St. Croix River system
Elliptio crassidens	Elephant Ear Mussel	Endangered	–	St. Croix River system
Epioblasma triquetra	Snuffbox Mussel	Endangered	–	St. Croix River system
Falco peregrinus	Peregrine Falcon	Endangered	Endangered	Bluffs
Fusconaia ebena	Ebony Shell Mussel	Endangered	–	St. Croix River system
Gastrocopta procera	Wing Snaggletooth Snail	Threatened	–	St. Croix River system
Hiodon alosoides	Goldeye Fish	Endangered	–	St. Croix River system
Ictiobus niger	Black Buffalo Fish	Threatened	–	St. Croix River system
Lampsilis higginsi	Higgins' Eye Mussel	Endangered	Endangered	St. Croix River system
Lanius ludovicianus	Loggerhead Shrike	Endangered	–	Prairie and bushland
Macrhybopsis aestivalis	Speckled Chub Fish	Threatened	–	St. Croix River system
Moxostoma carinatum	River Redhorse Fish	Threatened	–	St. Croix River system
Moxostoma valenciennesi	Greater Redhorse Fish	Threatened	–	St. Croix River system
Notropis amnis	Pallid Shiner Fish	Endangered	–	St. Croix River system
Ophiogomp hus anomalus	Extra-striped Snaketail Dragonfly	Endangered	–	Warm water streams in forested watersheds
Ophiogomphus howei	Pygmy Snaketail Dragonfly	Threatened	–	Streams in forested watersheds
Ophiogomphus susbehcha	Saint Croix Snaketail Dragonfly	Endangered	–	Large streams in forested watersheds
Percina evides	Gilt Darter Fish	Threatened	–	St. Croix River system
Plethobasus cyphyus	Bullhead Mussel	Endangered	–	St. Croix River system
Podiceps grisegena	Red-necked Grebe	Endangered	–	Bluff prairies, sandy prairies
Polydon spathula	Paddlefish	Threatened	–	St. Croix River system
Quadrula fragosa	Winged Mapleleaf Mussel	Endangered	Endangered	St. Croix River system
Quadrula metanevra	Monkeyface Mussel	Threatened	–	St. Croix River system
Simpsonaias ambigua	Salamander Mussel	Threatened	–	St. Croix River system
Speyeria idelia	Regal Fritillary	Endangered		Prairies and pastures
Tritogonia verrucosa	Buckthorn Mussel	Threatened	–	St. Croix River system

Group	Name	Population	Status	Lead Office	Recovery Plan Name	Recovery Plan Stage
Clams	Higgins eye (pearlymussel)	Entire	Endangered	Twin Cities Ecological Services	Higgins Eye Pearlymussel	Final Revision 1
Clams	Spectaclecase (mussel)		Endangered	Twin Cities Ecological Services		
Clams	Snuffbox mussel (Epioblasma		Endangered	Columbus Ecological Services		
Flowering Plants	Prairie bush-clover (Lespedeza		Threatened	Twin Cities Ecological Services	Prairie Bush-clover	Final
Mammals	Northern Long-Eared Bat		Proposed Endangered	Green Bay Ecological Services		

Appendix H

This page intentionally left blank.

River Falls

Park Inventory 2009

P P

Table of Contents

P Park Inventory P

Introduction:

The Park Inventory was developed as part of a citywide strategy to tailor the activities and inventories to the goals expressed in the Comprehensive Plan. The Comprehensive Plan, adopted in 2005, calls for a complete park inventory to define each park and public space into a functional class with an individual description.

Prior to this Inventory, the majority of the parks were zoned and legally considered to be Conservancy. Park and conservancy areas are different in their purpose and require a different type of management and definition. The Park Inventory, in conjunction with the creation of a Park District in the zoning code, will serve to define each park and conservancy area based on the zoning code and the features of each park.

The intent of the Park Inventory is to aid the residents and prospective residents in locating individual parks that offer recreational opportunities best suited to their needs. The Inventory provides information about individual parks in addition to providing an overview of the public spaces provided throughout the City, which will be used to guide park development, encourage use and improve accessibility while fostering a sense of community.

Organization:

The Park Inventory is divided into three sections based on the use of the space. The first and most extensive is the **Park** section that describes all of the areas that are traditionally considered to be parkland. **Conservancy** is the second section and refers to areas that exist to protect the natural resources of the area. **Quasi-Public** spaces are addressed last and address the areas that function as a park but are operated and managed by owners other than the City of River Falls.

Parks:

The Park section is divided into several categories based on the function, size and general scope of influence. The **Community Park** classification is used to describe the largest and most elaborate spaces that offer the widest array of activities to serve the entire population. **Neighborhood Parks** are designed to serve the nearby neighborhood with recreational opportunities located within walking distance. **Special Use Parks** are

oriented toward a single use that is typically recreational, cultural, or historic by its design and use. **Linear Parks** act as a connection between centers of activity for pedestrians or as a scenic path along a stream or other feature. Parks in this section are owned and maintained by the City of River Falls and are accessible by the general public.

Conservancy:

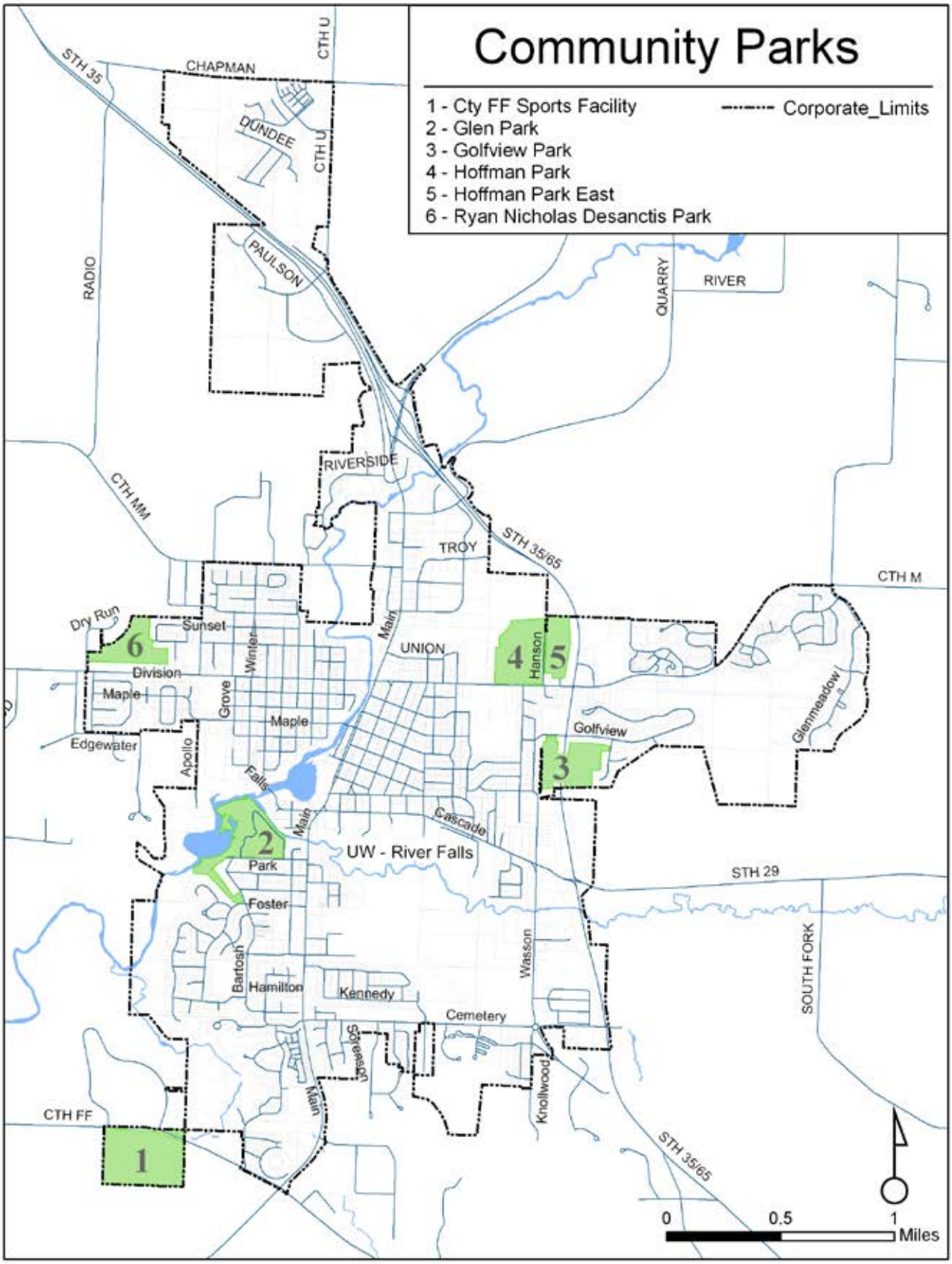
Conservancy areas describe properties that serve the primary function of natural resource protection. These areas may allow for passive recreational activities such as hiking or bicycling, which can be conducted without supportive infrastructure such as paved trails. Conservancy areas can describe anything from a large natural area designed to protect major natural features or small outlots designed for small-scale storm water management. All areas with a primary function of natural resource protection are classified into the Conservancy section.

Quasi-Public:

The **Quasi-Public** classification is used to describe the private or public recreational sites and facilities such as private play structures, the UW-River Falls Campus and the River Falls School District. These sites and facilities are maintained and managed by their owners and not the City, which therefore limits the use of these sites as public parks.

Content:

The following Inventory dedicates one page to each park. Each area is classified and organized as a Park, a Conservancy area, or as a Quasi-Public space. Each page details the name, address, date of establishment, and size of the park. The description features an inventory of existing conditions for each park that documents the features and activities supported by park infrastructure. The inventories describe features such as sport fields and courts, play structures, miscellaneous amenities and activities. In addition, the page describes the improvements that are planned or recommended and a general summary of the location, use, condition, and atmosphere. On the reverse of each page, a map explains the context of the park by describing the location, major recreational features, boundaries, easements, land cover percentages and the conditions of the site to aid the reader in visually understanding the narrative page. The following Inventory describes the public spaces throughout the City of River Falls.


Community Parks
1 - Cty FF Sports Facility
2 - Glen Park
3 - Golfview Park
4 - Hoffman Park
5 - Hoffman Park East
6 - Ryan Nicholas Desanctis Park
Corporate_Limits
STH 35
CHAPMAN
CTH U
DUNDEE
PAULSON
RADIO
QUARRY
RIVER
RIVERSIDE
CTH MM
TROY
STH 35/65
CTH M
Dry Run
Sunset
Winter
Main
UNION
Hanson
Division
Maple
Grove
Maple
Edgewater
Apollo
Golfview
Glenmeadow
Falls
Cascade
UW - River Falls
Park
STH 29
Foster
Bartosh
Hamilton
Kennedy
Cemetery
Wasson
SOUTH FORK
Knollwood
CTH FF
STH 35/65
0
0.5
1
Miles

P GLEN PARK

355 Park Street

Community Park

Park Date: 1898 **Park Size:** 40.58 acres

Existing Park Inventory:

Field Sports

- ¢ Soccer
- ¢ Softball
- ¢ Baseball

Court Sports

- ¢ Sand Volleyball
- ¢ Basketball
- ¢ Tennis
- ¢ Horseshoes

Play Equipment

- ¢ Play Structure
- ¢ Safety Surface
- ¢ Swings

Misc. Activities

- ¢ Pool
- ¢ Trails
- ¢ Fishing Area

Misc. Amenities

- ¢ Open Space
- ¢ Biking/Walking Trails
- ¢ Bike Rack
- ¢ Enclosed Shelter
- ¢ Restrooms
- ¢ Drinking Water
- ¢ Picnic Shelter
- ¢ Historic Swinging Bridge
- ¢ Picnic Tables
- ¢ Benches
- ¢ Grill
- ¢ Off-Street Parking
- ¢ Lights
- ¢ Garbage Cans
- ¢ Bleachers

Future Park Improvements:

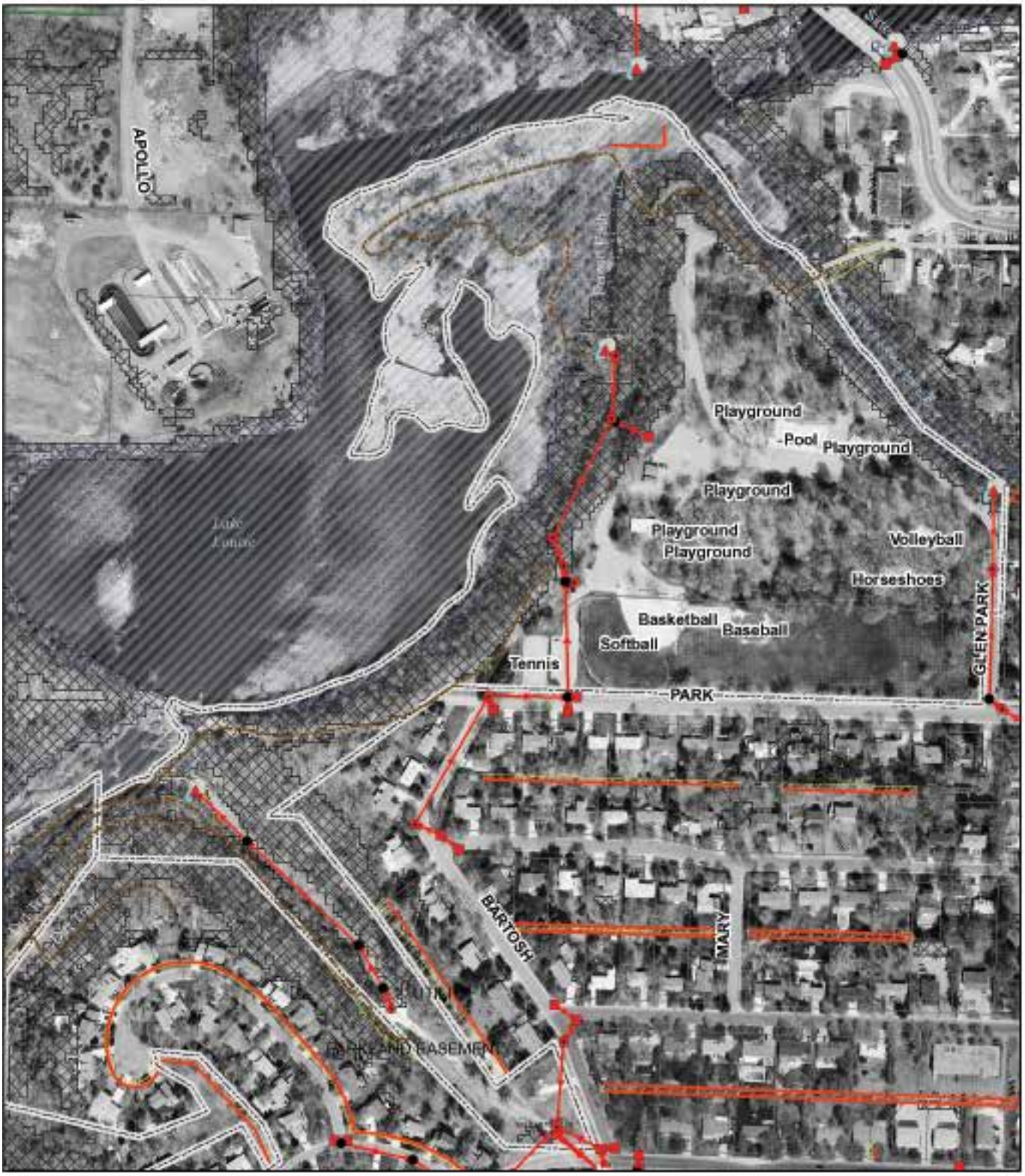
- ¢ Upgrade Pool Area
- ¢ Upgrade Bathhouses
- ¢ Update Playground Equipment

Summary:

Glen Park is an active/passive mixed use Community Park located southwest of the downtown district. It is the City's oldest park and even had a zoo at one point. Some highlights of the Park include the trails connecting to the White Pathway to the north, River Hills Park to the south and the Kinnickinnic River, a public swimming pool, many large trees, grass and several types of recreational activities. Pedestrian access can be found at the Swinging Bridge to the northeast from Cascade Avenue, along Glen Park Road and Park Street. There are several off-street parking lots.

Glen Park

355 Park Street
Community Park



Legend

- City Park
- Easements_fromUtility
- Flood_Way
- Easements
- 20%slope

Sidewalks and Paths

- Dirt Trail
- Paved Path
- Sidewalk

Storm System

- Inlet, Apron, City
- Inlet, Catch Basin, City
- Inlet, Manhole, City
- Inlet, Manhole, Private
- Manhole, Manhole, City
- Outlet, Apron, City
- Outlet, Weir (Overflow), Private
- Outfalls
- City Pipes

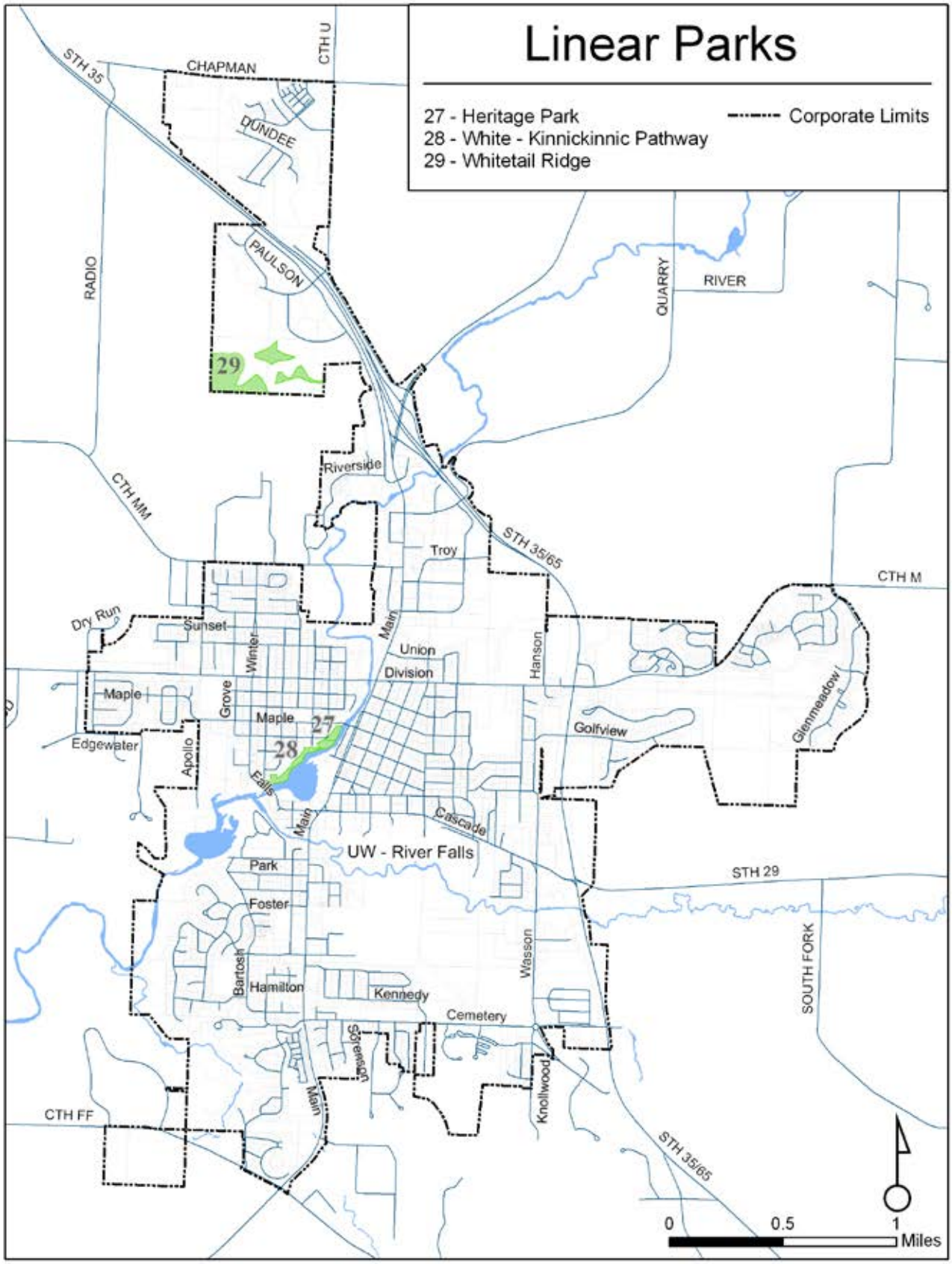
Park Size = 40.58 ac

Developed Area= 18 ac
Tree Coverage = 55%
Grass Coverage = 14 acres
Sidewalks = 820 ft
Total Paved = 2.5 acres

Undeveloped Area = 22 acres
Tree Coverage = 62%
Paved Trails = 0.2 mi
Dirt Trails = 1 mi

0 125 250 500 Feet

City of River Falls, Engineering Department
123 Elm St, River Falls, WI, 54022
January 19, 2008
Aerial Photos by St. Croix County 2004


Linear Parks
27 - Heritage Park
28 - White - Kinnickinnic Pathway
29 - Whitetail Ridge
Corporate Limits
STH 35
CHAPMAN
CTH U
DUNDEE
PAULSON
RADIO
QUARRY
RIVER
29
Riverside
CTH MM
STH 35/65
Troy
CTH M
Dry Run
Sunset
Winter
Main
Union
Division
Hanson
Maple
Grove
Maple
27
28
Edgewater
Apollo
Golfview
Glenmeadow
Falls
Main
Cascade
UW - River Falls
Park
STH 29
Foster
Wasson
SOUTH FORK
Bartosh
Hamilton
Kennedy
Cemetery
Sorenson
Main
Knollwood
CTH FF
STH 35/65
0
0.5
1
Miles

HERITAGE PARK

232 West Maple Street

Linear Park

Park Date: 1976 **Park Size:** 1.39 acres

Existing Park Inventory:

Misc. Amenities

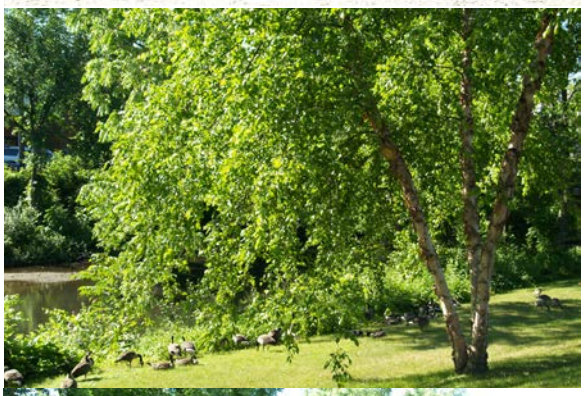
- Biking/Walking Trails
- Bike Rack
- Benches
- Off-Street Parking
- Lights
- Garbage Cans

Future Park Improvements

- Upkeep of the Parking Lot
- Additional Benches
- Additional Picnic Tables
- Increase Park Area

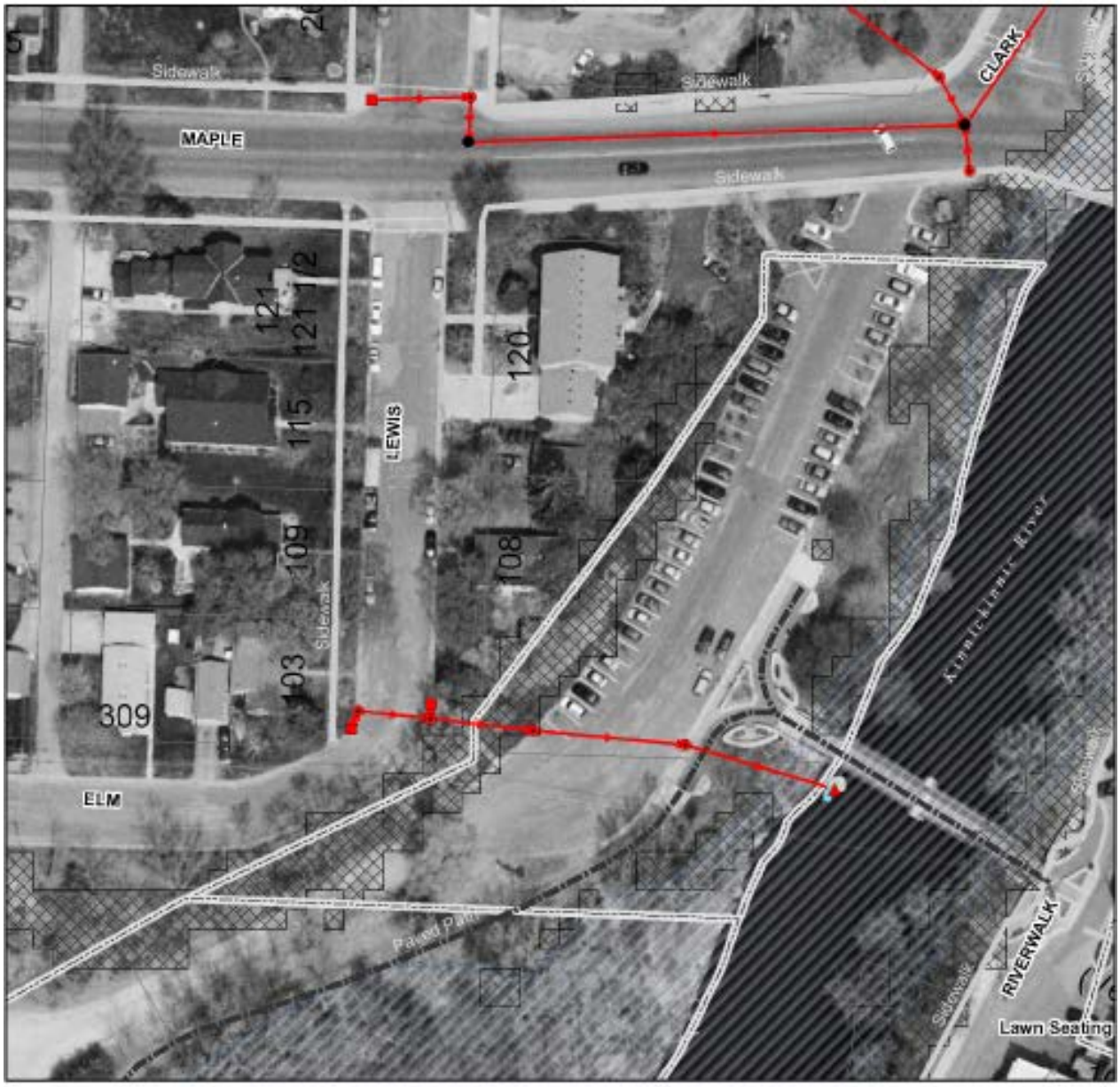
Summary:

Heritage Park is a passive special use park located just west of the downtown district and Veterans Park. The Park is also directly south of City Hall. At the entrance of the Park is a bell that was used in the old firehouse. The sign beneath the bell reads, “The land from the 1974 Maple Street Bridge South to Elm Street, plus Hospital Hill-Ingram Center, was developed into this Park by the Garden Club. It worked with the Bicentennial Commission and other organizations, making it a community-wide project. The goal was to use the Kinnickinnic River as a park.” Pedestrian access to the park can be found from Veterans’ Park by way of the pedestrian bridge, White Kinnickinnic Pathway Park, and off of Maple Street. A parking lot is available on Maple Street with a capacity of approximately 20 cars. This Park is a part of the Downtown Plan to improve the look and feel of this special area along the Kinnickinnic River.



Heritage Park

232 W. Maple St.



Legend

- City Park
- 20%slope
- Flood_Plain 100 year
- Flood_Way

Sidewalks and Paths

- Paved Path
- Sidewalk

Storm System

- City Pipes
- Inlet, Catch Basin, City
- Inlet, Manhole, City
- Manhole, Manhole, City
- Outfalls
- Outlet, Apron, City

Feet
0 25 50 100

Park Size = 1.39 ac
Impervious Surfaces = 0.68 ac
Parking / Road = 0.57 ac
Wooded Area = 0.39 ac
Grass Coverage = 0.32 ac

City of River Falls, Engineering Department
123 Elm St, River Falls, WI, 54022
January 23, 2008
Aerial Photos by St. Croix County, 2004

WHITE KINNICKINNIC PATHWAY

374 South Winter Street

Linear Park

Park Date: 1980 **Park Size:** 5.54 acres

Existing Park Inventory:

Misc. Activities

- Biking
- Walking/Jogging
- Fishing (Class 1 Trout Stream)

Misc. Amenities

- Biking/Walking Trails
- Bike Rack
- Picnic Tables
- Benches
- Boat Launch
- Off-Street Parking
- Lights
- Garbage Cans
- Observation Deck

Future Park Improvements:

- Trail Upgrade
- Repaving as Needed

Summary:

White Kinnickinnic Pathway Park is an active/passive linear park located to the west of the downtown district. This Park runs along the west bank of the Kinnickinnic River from the Winter Street Bridge to Maple Street. Street pedestrian access and vehicle parking can be found at either Winter or Maple Street. To the northern end of the Park near Maple Street is Heritage Park and across the Kinnickinnic River to the east is Veterans' Park. Some of the main attractions of the Park include a lookout deck onto Lake George, picnic tables, paved trails, lighting and natural landscaping of mostly trees and some grassy areas. The north end of the Park is connected to Heritage Park, Veterans Park, the Riverwalk and the downtown district which make this park complex an asset to the entire community.

White-Kinnickinnic Pathway

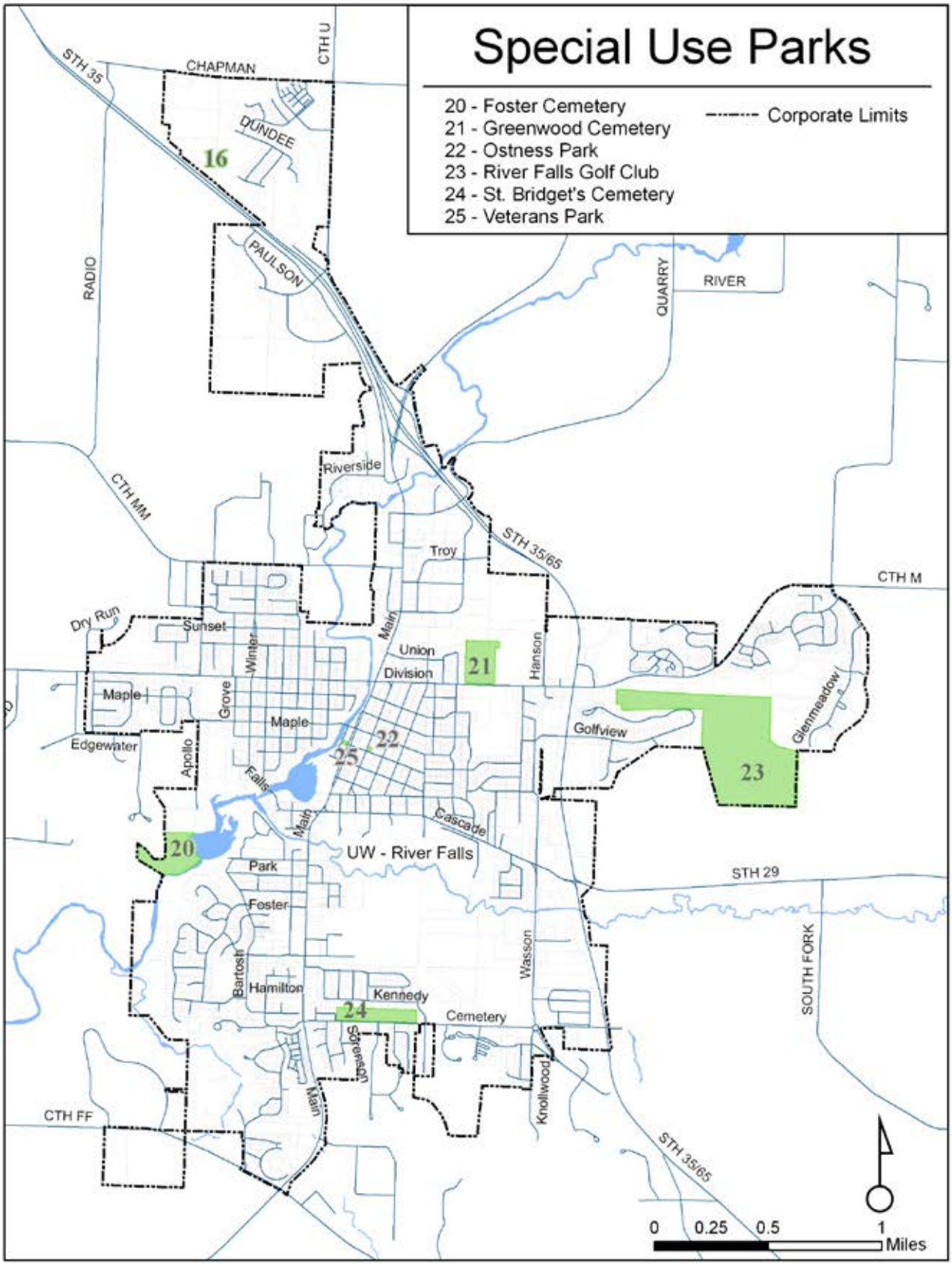
347 S. Winter St.

Legend

- City Park
- 100 year Flood Plain
- Flood Way
- Easements
- Easements_fromUtility
- Paved Path
- Sidewalk
- City Storm Pipes
- Private Storm Pipes
- Outfalls

Park Size = 5.54 acres
Total Paved Paths = 2930 ft
Path Area = 0.5 acres
Maintained Grass ~ 1.5 ac

City of River Falls, Engineering Department
123 Elm St, River Falls, WI, 54022
January 23, 2008
Aerial Photos by St. Croix County 2004


Special Use Parks
20 - Foster Cemetery
21 - Greenwood Cemetery
22 - Ostness Park
23 - River Falls Golf Club
24 - St. Bridget's Cemetery
25 - Veterans Park
Corporate Limits
STH 35
CHAPMAN
CTH U
DUNDEE
16
PAULSON
RADIO
QUARRY
RIVER
Riverside
CTH MM
STH 35/65
Troy
CTH M
Dry Run
Sunset
Winter
Main
Union
Division
21
Hanson
Maple
Grove
Maple
Edgewater
Apollo
Falls
25
22
Golfview
Glenmeadow
23
Main
Cascade
20
UW - River Falls
Park
STH 29
Foster
Bartosh
Hamilton
Kennedy
24
Cemetery
Wasson
SOUTH FORK
Stevenson
Main
Knollwood
CTH FF
STH 35/65
0
0.25
0.5
1
Miles

FOSTER CEMETERY

Southwest Side of Lake Louise *Conservancy*

Park Date: 1852-56 **Park Size:** 3.92 acres

Existing Park Inventory:

Misc. Amenities

- Open Space

Future Park Improvements:

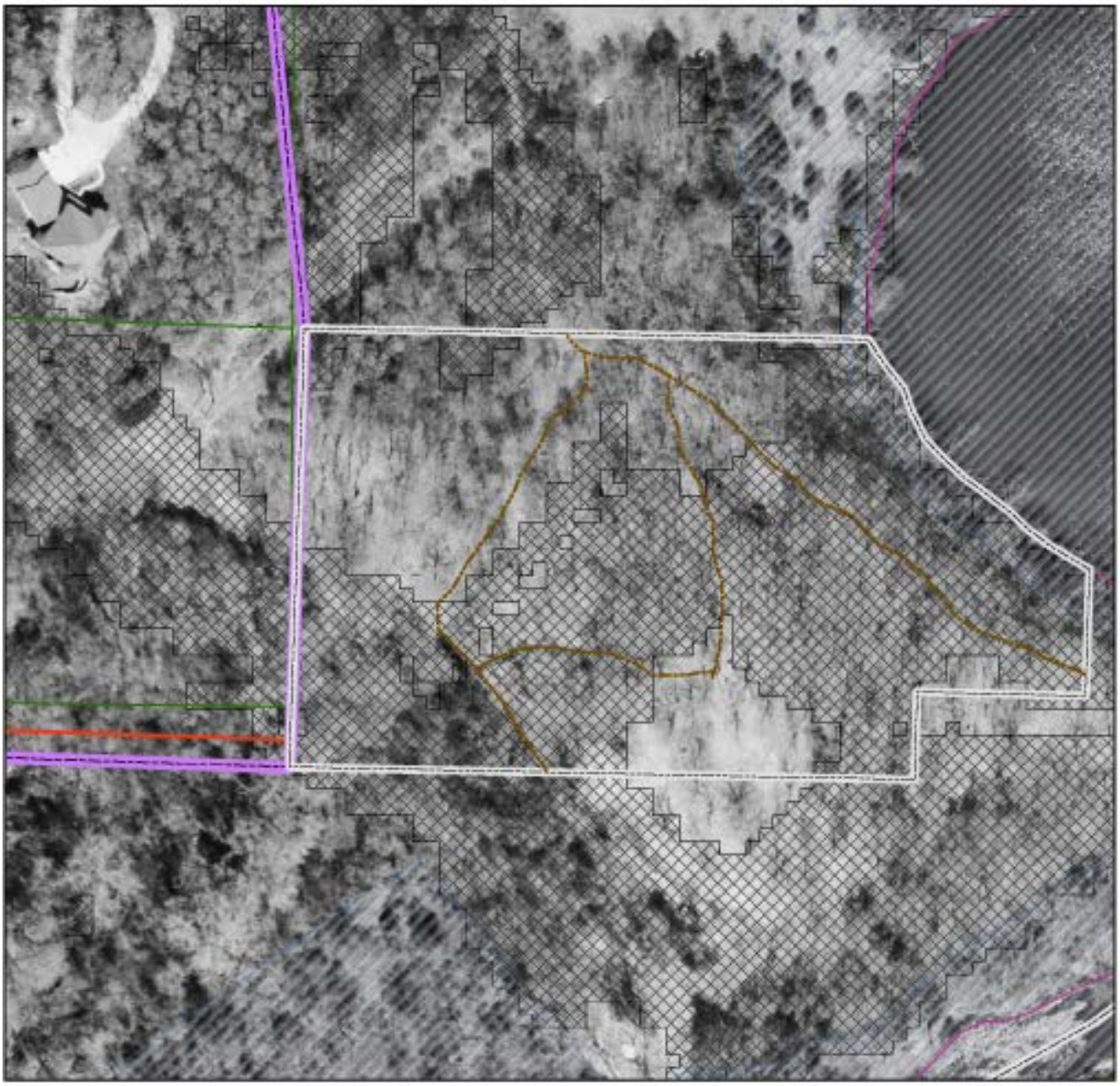
- Continued Preservation
- Improve Access

Summary:

Foster Cemetery is located on the southwest side of Lake Louise near the Wastewater Treatment Facility. In order to get there, park near the Treatment Facility and find the path on the Westside with a sign stating “Authorized Vehicles Only.” Follow the path as it winds around the Facility and up a hill to the Cemetery, which is covered in vegetation, much like the path that leads there. The Cemetery was established in the early 1850’s by Eli Foster and donated to Trinity Episcopal Church upon his death in 1856. Headstones from this Cemetery date from the mid 1800’s to 1918. In 2000, the Trustees of the Episcopal Church in the diocese of Eau Claire gave the City the deed to the Cemetery. It is now zoned Conservancy where most of the land is left in its natural state which is native prairie.

Foster Cemetery

Cemetery & Conservancy



0 250 500 1,000 Feet

0 50 100 200 Feet

Legend

- City Park
- Flood Way
- 100 year Flood Plain
- 20%slope
- Corporate Limits
- Dirt Trail
- Easements from Utility

Total Size = 3.92 acres
Cemetery = --
Trails = 1283 ft

City of River Falls, Engineering Department
123 Elm St. River Falls, WI. 54022
February 21, 2008
Aerial Photos by St. Croix County, 2004