

Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed

Rehabilitation of Flood Water Retarding Structure M-4



Pembina and Cavalier Counties
North Dakota
August 2006

**Supplemental Watershed Plan No. 2
and Environmental Assessment
for the
Tongue River Watershed
Rehabilitation of Flood Water Retarding Structure M-4**

Prepared for:

Pembina County Water Resource District
Pembina County Soil Conservation District
Cavalier County Soil Conservation District

Prepared by:

United States Department of Agriculture,
Natural Resources Conservation Service

In Cooperation With:

North Dakota State Water Commission
North Dakota Department of Parks and Recreation

Proposed Action:

Rehabilitate and upgrade Watershed Structure No. M-4 (Renwick Dam) to meet State of North Dakota and National NRCS dam safety criteria. Project involves installing a roller compacted concrete (RCC) auxiliary spillway, modifications to embankment and access to Icelandic State Park, and raising the elevation of the permanent pool.

Project Location:

Pembina and Cavalier Counties, North Dakota

For More Information:

Mr. J.R. Flores
State Conservationist
USDA-Natural Resources Conservation Service
220 East Rosser Avenue
Bismarck, North Dakota, 58501-1458
701-530-2003

Plan Designation:

Final Plan

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Supplemental Watershed Agreement 2

between the

**Pembina County Water Resource District
Pembina County Soil Conservation District
Cavalier County Soil Conservation District
(Referred to herein as Sponsors)
State of North Dakota**

and the

**United States Department of Agriculture
Natural Resources Conservation Service
(Referred to herein as NRCS)**

WHEREAS, a Watershed Protection Program Agreement, which included Tongue River Watershed, Dam No. M-4 (referred herein as Renwick Dam) was executed between the Sponsors and the Soil Conservation Service (SCS) now the Natural Resources Conservation Service (NRCS) became effective in 1955; and

WHEREAS, application has heretofore been made to the Secretary of Agriculture by the Sponsor for assistance in preparing a plan for works of improvements for the Tongue River Watershed, State of North Dakota, under the authority of the Watershed Protection and Flood Prevention Act (PL-83-566) as amended by the Watershed Rehabilitation Amendments (PL-106-472), and

WHEREAS, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to NRCS; and

WHEREAS, there has been developed through the cooperative efforts of the Sponsor and NRCS a plan for works of improvement for the Tongue River Watershed - Dam No. M-4, State of North Dakota, hereinafter referred to as the watershed plan, which plan is annexed to and made a part of this agreement;

NOW, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the Sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The Sponsors agree to participate in and comply with applicable Federal floodplain management and flood insurance programs before construction starts.
2. The Sponsors will acquire all land rights, easements, or right-of-ways in connection with the planned works of improvement, to ensure installed works of improvement function as designed for evaluated life.
3. The Sponsors will obtain all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of planned works of improvement. The cost of such permitting is not eligible as part of the sponsor's cost-share requirement.
4. The Sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with a new Operation and Maintenance (O&M) Agreement to be entered into before issuing invitations to bid for construction

work. The terms of the new O&M Agreement will be for the life of the project (100 years).

5. The Sponsors will be responsible for the costs of water, mineral, and other resource rights and will acquire or provide assurance that landowner or resource users have acquired such right pursuant to State law as may be needed in the installation and operation of the works of improvement. The costs associated with the subject rights are not eligible as a part of the sponsor's cost-share requirement.
6. NRCS will assist the Sponsor with the installation of planned works of improvement. The percentages of total rehabilitation project costs to be paid by the Sponsors and NRCS are as follows:

Watershed Agreement

Works of Improvement	NRCS	Sponsors	Total
Cost Sharable Items			
Rehabilitation of Dam (Construction Costs)	\$3,117,900	\$1,336,100	\$4,454,000
Relocation, Replacement-In-Kind	\$0	\$0	\$0
Relocation, Required Decent, Safe, Sanitary	\$0	\$0	\$0
Sponsors Planning Costs	NA	\$81,000	\$81,000
Sponsors Engineering Costs	NA	\$0	\$0
Sponsors Project Administration	NA	\$5,000	\$5,000
Land Rights Acquisition Cost	NA	\$256,800	\$256,800
Subtotal: Cost-Share Costs	\$3,117,900	\$1,678,900	\$4,796,800
Cost-Share Percentages ^{a/}	65.0%	35.0%	100.0%
Non Cost-Sharable Items ^{b/}			
NRCS Engineering & Project Administration	\$700,900	NA	\$700,900
Natural Resource Rights	NA	\$0	\$0
Federal, State and Local Permits	NA	\$0	\$0
Relocation, Beyond Required Decent, Safe, Sanitary	NA	\$0	\$0
Subtotal: Non Cost-Share Costs	\$700,900	\$0	\$700,900

^{a/} Maximum NRCS cost-share is 65% of Cost-Sharable Items not to exceed 100% of Construction Costs (including Replacement-in-Kind; Required Decent, Safe, Sanitary; and flood proofing of downstream properties).

^{b/} If actual Non Cost-Sharable Item expenditures vary from these figures, the responsible party will bear the change.

7. The term of this agreement is 100 years, the service life expectancy of the project and does not commit the NRCS to assistance of any kind beyond that point unless agreed to by all parties.
8. The costs shown in this agreement and plan are preliminary estimates. Final costs to be borne by the parties here to, will be based on the actual costs incurred in the installation of works of improvement and the cost share percentages stated in this agreement.
9. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the watershed plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

10. A separate agreement will be entered into between NRCS and Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
11. An Emergency Action Plan (EAP) will be developed by the Sponsors in consultation with the Pembina County Emergency Management Office, State Water Commission, and NRCS prior to start of construction. The EAP will include duties, responsibilities, and actions that should happen in case of dam failure or flooding. The EAP will include park access road use during times of flood events.
12. This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the Sponsor has failed to comply with the conditions of this agreement. In this case, NRCS shall promptly notify the Sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the Sponsor or recoveries by NRCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the Sponsors having specific responsibilities for the measures involved.
13. No member or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.
14. Activities conducted under this agreements will be in compliance with nondiscrimination provisions as contained in Titles VI and VII of the Civil Rights Act of 1964, as amended, the Civil Rights Restoration Act of 1987 (Public law 100-259) and other nondiscrimination statues, namely, section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, The Age Discrimination Act of 1975, and in accordance with regulations of the Secretary of Agriculture (7 CFR. 15, Subparts A&B) which provide that no person in the United States shall, on the grounds of race, color, national origin, religion, sex, age, marital status or handicap, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity receiving Federal financial assistance from the Department of Agriculture or any agency thereof.
15. Certification Regarding Drug-Free Workplace Requirements (7 CFR 3017, Subpart F).

By signing this watershed agreement, the Sponsor is providing the certification set out below. If it is later determined that the Sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, the NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through (308.15);

Conviction means a finding of (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statues;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all direct charge employees; (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantees' payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification:

- A. The Sponsor certifies they will continue to provide a drug-free workplace by:
- (1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
 - (2) Establishing an ongoing drug-free awareness program to inform employees about:
 - (a) The danger of drug abuse in the workplace;
 - (b) The grantee's policy of maintaining a drug-free workplace;
 - (c) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
 - (3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1);
 - (4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee will:
 - (a) Abide by the terms of the statement; and
 - (b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;
 - (5) Notifying the NRCS in writing, within ten calendar days after receiving notice under paragraph (4) (b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

- (6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4)(b), with respect to any employee who is so convicted--
 - (a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
 - (b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and
 - (7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1), (2), (3), (4), (5), and (6).
 - B. The Sponsor may provide a list of the site(s) for the performance of work done in connection with a specific project or other agreement.
 - C. Agencies shall keep the original of all disclosure reports in the official files of the agency.
16. Certification Regarding Lobbying (7 CFR 3018) (applicable if this agreement exceeds \$100,000).
- A. The Sponsors certifies to the best of its knowledge and belief, that:
 - (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Sponsor, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
 - (3) The Sponsor shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.
 - B. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

17. Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions (7 CFR 3017).

- A. The Sponsor certifies to the best of their knowledge and belief, that they and their principals:
- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.
 - (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.
- B. Where the primary Sponsor is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this agreement.

18. Signatures

Pembina County Water Resource District

308 Courthouse Drive #5
Cavalier, ND 58220

By _____
Ronald Falk
Title Chairman
Date _____

The signing of this plan was authorized by a resolution of the governing body of the Pembina County Water Resource District adopted at a meeting held on _____.

Karen Kemp
Secretary
Date _____

308 Courthouse Drive #5
Cavalier, ND 58220

Pembina County Soil Conservation District

600 Division Ave S, Box 476
Cavalier, ND 58271-0476

By _____
Patricia Hinkle
Title Chair
Date _____

The signing of this plan was authorized by a resolution of the governing body of the Pembina County Soil Conservation District adopted at a meeting held on _____.

Charles Hart
District Manager
Date _____

600 Division Ave S, Box 476
Cavalier, ND 58271-0476

Cavalier County Soil Conservation District

800 9th Ave E, Suite B
Langdon, ND 58249

By _____
Karry Krahn
Title Chairman
Date _____

The signing of this plan was authorized by a resolution of the governing body of the Cavalier County Soil Conservation District adopted at a meeting held on _____.

Kathy Jordan
District Manager
Date _____

800 9th Ave E, Suite B
Langdon, ND 58249

**Natural Resources Conservation Service
United States Department of Agriculture**

Approved by

J.R. Flores
State Conservationist
Date: _____

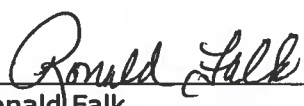
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18. Signatures

Pembina County Water Resource District

308 Courthouse Drive #5
Cavalier, ND 58220

By

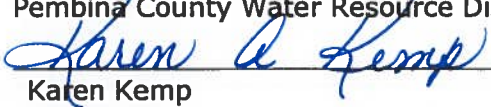

Ronald Falk

Title Chairman

Date

August 29, 2006

The signing of this plan was authorized by a resolution of the governing body of the
Pembina County Water Resource District adopted at a meeting held on August 29, 2006


Karen Kemp

Secretary

Date

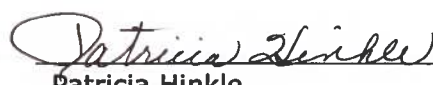
August 29, 2006

308 Courthouse Drive #5
Cavalier, ND 58220

Pembina County Soil Conservation District

600 Division Ave S, Box 476
Cavalier, ND 58271-0476

By

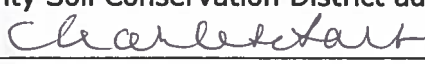

Patricia Hinkle

Title Chair

Date

August 29 - 2006

The signing of this plan was authorized by a resolution of the governing body of the
Pembina County Soil Conservation District adopted at a meeting held on March 15 - 2006


Charles Hart
District Manager

Date

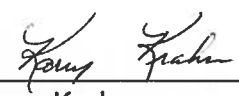
Aug. 26, 2006

600 Division Ave S, Box 476
Cavalier, ND 58271-0476

Cavalier County Soil Conservation District

800 9th Ave E, Suite B
Langdon, ND 58249

By

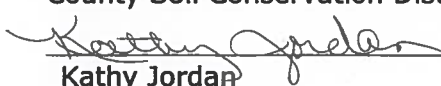

Karry Krahn

Title Chairman

Date

8-29-06

The signing of this plan was authorized by a resolution of the governing body of the Cavalier
County Soil Conservation District adopted at a meeting held on 8-29-06.


Kathy Jordan
District Manager

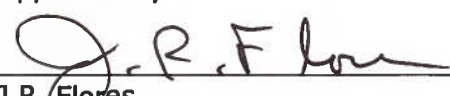
Date

8-29-06

800 9th Ave E, Suite B
Langdon, ND 58249

**Natural Resources Conservation Service
United States Department of Agriculture**

Approved by


J.R. Flores

State Conservationist

Date:

9-17-06

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Summary of Watershed Plan

Summary Watershed Plan – Environmental Assessment for

Tongue River Watershed Renwick Dam Rehabilitation Cavalier and Pembina Counties, North Dakota

Project Name Tongue River Watershed, Dam No. M-4

Counties Pembina and Cavalier

State North Dakota

Sponsors Pembina County Water Resource District
Pembina County Soil Conservation District
Cavalier County Soil Conservation District

Cooperating Agencies North Dakota Parks and Recreation Department
North Dakota State Water Commission

Description of Recommended Plan

The Recommended Plan consists of rehabilitating aging floodwater retarding structure to meet current NRCS dam design and safety criteria.

Resource Information

Tongue River Watershed, Dam No. M-4 Drainage Area – Land Cover

<u>Land Cover</u>	<u>Acres</u>
Cropland	67,200
Pastureland	300
Forest/Woods	21,600
Rangeland	500
Parks/Recreation	800
Transportation	2,300
Water	600
TOTAL	93,300

Land Ownership

Private (%)	96
Public (%)	4

Number of Farms and Ranches

Number of Farms	51
Average Farm Size (acres)	1,300
Prime, Statewide, and Local Important Farm Land (acres)	48,850
Number of Minority Producers	2
Number of Limited Resource Operators	4
Conservation Reserve Program (acres)	9,500
Wetlands (acres)	3,170

Project Beneficiaries

The watershed is primarily cropland and native forest land. The reservoir is used for flood control, recreation, water source for a golf course, and secondary water supply for the City of Cavalier. Failure of the dam would result in loss of a valuable recreation area, damages to downstream residences and roads, flood damage to thousands of acres of cropland, and loss of a water supply source. As such, agricultural producers, private homeowners, recreational enthusiasts, retail establishments, and local governments are the primary beneficiaries of this project.

The 2000 Census reported that Pembina County, North Dakota, had a population of 8,585 down from 10,728 in 1970. Median household income in the project area average \$36,430 compared to \$34,604 for the State and \$41,994 for the Nation (2000 US Census).

Threatened and Endangered Species

The US Fish and Wildlife Service (FWS) and the North Dakota Game and Fish Department participated in an on site inspection of the watershed. They expressed no concerns associated with the Endangered Species Act, and provided recommendations for protecting lake fisheries during construction activities. FWS provided a list of species that may occasionally be present in the watershed and includes the whooping crane, bald eagle, and gray wolf. The project will have no adverse impacts on these species.

Cultural Resources

The NRCS Cultural Resources Specialist visited the watershed in the fall 2002. He provided a methodology for considering culturally significant resources, which was followed in this planning process. An inventory of the watershed and the associated downstream impact area was completed. No culturally important or archaeological sites were noted within the proposed embankment and spillway work area. An area of cultural significance was identified in the upper reaches of the permanent pool. This area would only need further investigation if permanent pool elevations were significantly raised or sediment removal occurred. The one foot rise in the reservoir elevation is not considered to be significant.

It is anticipated additional borrow materials will be needed to complete the project. No borrow sites have been identified. A cultural resource inventory will be completed on proposed borrow site(s) and construction routes prior to work commencing.

Consultation has been initiated with the State Historic Preservation Office (SHPO) and Tribal Historic Preservation Office (THPO).

Water Quality

Early in the planning process sediment loading into the Renwick Dam and Senator Young Dam reservoirs was identified as a major resource concern. Specific to the Renwick Reservoir was the economic, social and environmental impacts of any accelerated erosion/sedimentation rates. The loss of flood storage and its associated decrease in recreational opportunities were key local issues from the Tongue River Watershed Water Management Council (WMC) and the watershed citizens.

Sediment removal was explored as an alternative to reduce the need of increasing the height of the dam and auxiliary spillway. The removal of sediment brought forth other environmental issues. The presence of agricultural pesticides, heavy metals, and elevated levels of nutrients were studied in detail to determine if sediment being removed could be safely disposed off on adjacent fields. Also studied was what impact the sediment disturbance would have on the reservoir fishery and other aquatic life.

The presence of the Icelandic Aquifer directly below the reservoir also was identified as a resource issue when considering sediment disposal over the aquifer.

Studies were completed by both private contractors and State and Federal agency personnel to evaluate the watershed water chemistry coming into and out of the Renwick and Senator Young Dams. Land cover surveys were completed to determine the need for additional land treatment practices in the watershed. A detailed study was completed to determine the existing depth of sediment load in the Renwick Reservoir.

Problem Identification

Tongue River Watershed Structure M-4 does not meet current dam design and safety requirements. The dam was originally constructed in 1962 as part of the pilot watershed program for the purpose of protecting downstream agricultural lands from flooding. As a result of the flood protection, development downstream from the dam has occurred. Many residents and businesses are now being protected. In response to this growth below the Renwick Dam watershed, the Corps of Engineers classified Tongue River Watershed Structure M-4 as a "high hazard". The high hazard classification is based on the potential loss of life due to numerous homes, businesses, public care facilities, roads, and bridges existing in the downstream dam break flood zone. See Appendix C-Dam Breach Map.

The corresponding NRCS hazard classification identifies this dam as a class C (high hazard) structure also. The North Dakota State Water Commission, a State agency whose responsibility includes dam safety, has likewise classified Renwick Dam as a high hazard dam.

Alternative Plans Considered

Four alternative plans of action to meet the Sponsor's objectives were considered:

1. No Action – Removal of the hazard by breaching the earthen embankment to National and State Water Commission standards. This alternative is similar to the decommission alternative, but the Sponsors would be responsible for 100 percent of the cost.
2. Decommission – Removal of the hazard by breaching the earthen embankment to National and State Water Commission standards.
3. Structural – Roller Compacted Concrete Auxiliary Spillway – (Park Entrance Road on Top of Dam) Installation of a 500 foot wide roller compacted concrete (RCC) auxiliary spillway through the middle of the earthen embankment with a two lane access road to Icelandic State Park located on top of dam. Top of dam elevated three feet. Principal spillway modified to add a one foot rise in permanent pool. A dike would be constructed to close the existing grass auxiliary spillway.
4. Structural – Roller Compacted Concrete Auxiliary Spillway– (Park Entrance Road on Face of Dam) Installation of a 500 foot wide roller compacted concrete auxiliary spillway through the middle of the earthen embankment with a two lane access road to Icelandic State Park located on up stream side of embankment. Principal spillway modified to add a one foot rise in permanent pool. A dike would be constructed to close the existing grass auxiliary spillway.

Project Purpose

This project complies with the purpose of Flood Prevention as outlined in the NRCS National Watershed Manual, Part 502-C, and Part 508. The objective of this project is to bring Tongue River Watershed Structure M-4 into compliance with current State and Federal dam design and safety criteria.

Principal Project Measures

Rehabilitate and upgrade Renwick Dam by installing a roller compacted concrete auxiliary spillway, raising the top of the dam, and modify principal spillway to allow a one foot rise to the permanent pool to provide for sediment storage for the extended life of the structure. A two lane access road connecting recreation facilities on the north side of the lake to Icelandic State Park Headquarters on the south side of the park will be constructed on the upstream side of the embankment.

<u>Project Costs</u>	<u>PL-472 Funds</u>	<u>Other Funds</u>	<u>Total</u>
	\$3,809,000	\$1,604,500	\$5,413,500

Refer to Table 2 (see Appendix A) for estimated cost distribution

Monetary Benefits (Average Annual):

Flood damage reduction benefits	
Agricultural lands	\$143,100
Residential and Commercial Property	\$312,700
Roads and Transportation	<u>\$1,300</u>
Total flood damage reduction benefits	\$457,100
Recreation	<u>\$775,800</u>
Total Monetary Benefits	\$1,232,900
(Price base – 2005)	

Non-Monetary Benefits

- Meet dam design and safety criteria
- Protect property (private and State)
- Protect aesthetics
- Protect and enhance fish and wildlife habitats
- Remove the potential for loss of life
- Protect fen wetlands
- Protect and enhance recreational opportunities

Summary of Affected Environmental Values

Resource	Impact
Land Use Changes	No Impact
Flood Plains	The current flood plain will be maintained, protected, or enhanced.
Landscape Resources (aesthetics)	Concrete auxiliary spillway will replace grass cover spillway.
Fisheries	Fish habitats will be maintained and protected.
Wildlife Habitat	Loss of two acres of hardwood trees removed during construction.
Wetlands	The make-up and composition of wetlands will be maintained and protected. Watershed fen wetlands would be maintained.
Water Quality	Continued land treatment practices in the watershed will reduce the rate of sedimentation. One foot rise in permanent pool will improve water quality.
Cultural Resources (No. and Type)	No Impact
Important Farmlands (Ac)	No Impact
Compensatory Mitigation	Four acres of woodlands created to replace lost woodland.

Need for the Supplement

The Sponsors and NRCS have determined that Tongue River Watershed Structure M-4 (Renwick Dam) is a high hazard structure based on previous studies. Renwick Dam will pass greater than the 24-hour, 100-year rainfall event through the principal before discharging through the auxiliary spillway. However, the design storm for a high hazard structure, the Probable Maximum Precipitation (PMP), would cause the dam to overtop. Soil borings have determined the auxiliary spillway was constructed on sandy materials that would cause a dam failure if the spillway ever experienced flows. There are human health and safety concerns about the performance of this dam.

Purpose

To achieve the objective of the project Sponsors, which are to continue to provide flood protection and to reduce the risk of loss of human life.

Need

To address the structural integrity concerns of Tongue River Watershed Structure M-4 (Renwick Dam) and to meet applicable safety and performance standards.

The need for this watershed plan arises from the fact that Tongue River Watershed Structure M-4 (Renwick Dam) does not currently meet dam design and safety criteria. Figure 1 shows the deficient auxiliary spillway. As a result – lives, structures (homes and businesses), and infrastructures (roads and telecommunications) are at risk. This watershed plan documents the planning process by which the USDA-Natural Resources Conservation Service (NRCS) provided technical assistance to local project Sponsors, the Watershed Management Council, and the public in addressing resource issues and concerns within the Tongue River Watershed, Pembina County. The primary objective for Tongue River Watershed Site M-4 is ***to meet applicable National NRCS and State of North Dakota standards for public health and safety***, which will provide continued flood protection and reduce the risk of loss of human life and retain the quality of life the community has experienced since the dam was constructed.

Figure 1. Outlet of Auxiliary Spillway



Soil borings completed by NRCS determined sandy soils to depths of 30 feet were present in the auxiliary spillway.

Project Setting

Original Project

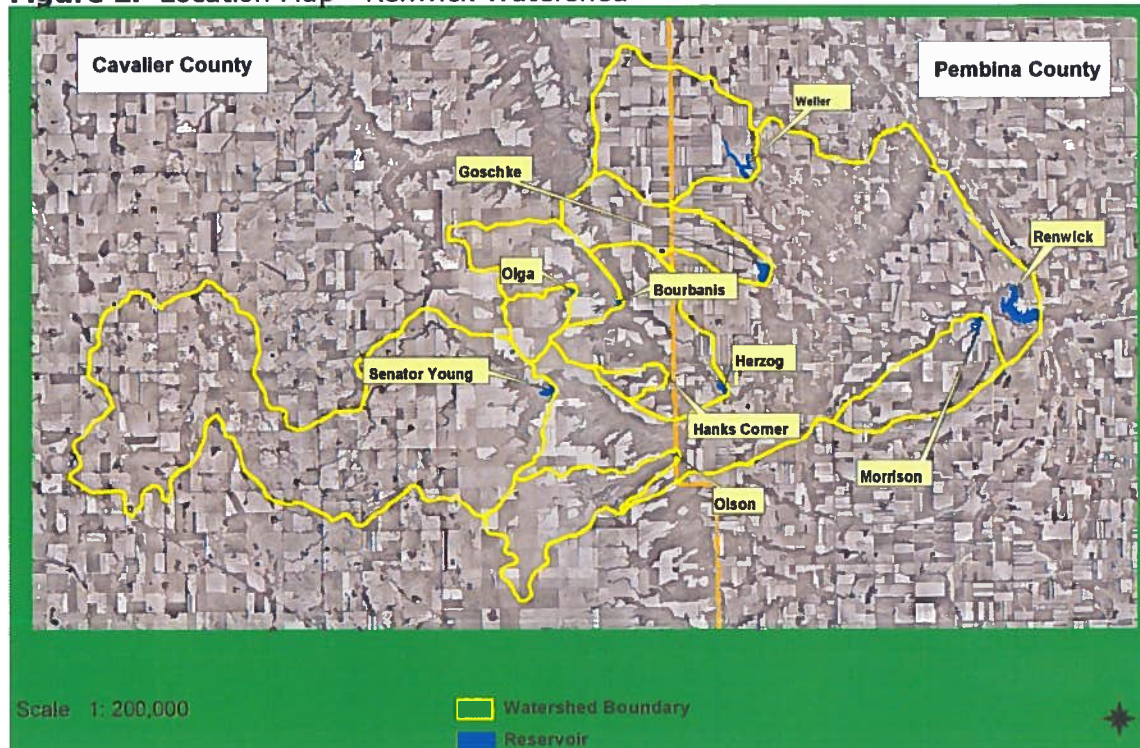
Construction of Tongue River Watershed Structure M-4 (Renwick Dam) was based on a plan for the PL-566 Watershed Pilot Program in Cavalier and Pembina Counties in North Dakota. Watershed planning was initiated as a result of local interest due to the severe flooding events in 1948, 1949, and 1950 on agricultural lands. Flood prevention measures included twelve PL-566 floodwater retarding structures (FWRS), 45 miles of stream channel improvement, 31.5 miles of floodways, and numerous land treatment practices. Ten FWRSs were built including Tongue River Watershed Structure M-4 (Renwick Dam), which was completed in 1962. Five miles of floodway, known as the Tongue River Cutoff, several miles of stream channel improvement (clearing and snagging), and land treatment practices were also installed.

Physical Features

1. Project Location

The Renwick Dam Project (see Figure 2) is in Pembina County, North Dakota, which is located in northeast North Dakota. It is in the Red River Valley Land Resource Area (MLRA 56) and Northern Black Glaciated Plains (MLRA 55A). The Project area includes hydrologic sub-watershed 09020313-100; which is located in the Pembina River Basin. The original Tongue River Watershed project area was 295,575 acres. The watershed area of the Renwick Dam Project area is 93,300 acres.

Figure 2. Location Map - Renwick Watershed



2. Topography

The Renwick Dam Watershed drainage area is approximately 24 miles in length with elevations ranging from 970 feet mean sea level (MSL) at the normal pool elevation to approximately 1,650 feet MSL in the upper watershed.

3. Climate

The climate of the watershed is a cool, temperate, subhumid, continental climate. Summers are pleasantly warm, and although winters are long and cold, there are usually a few mild periods when temperatures move above freezing. About 85 percent of the precipitation falls during the warm-season period, April through October. Mean seasonal snowfall is about 37 inches. The average length of the freeze-free period is about 120 days. Average annual precipitation is 19 inches.

4. Land Cover

The two major land uses in the watershed are cropland (72%) and forest/woodland (23%). The majority of the forest/woodlands are located on the Pembina Escarpment and Pembina River and tributaries. Fourteen percent (9,500 acres) of the cropland is currently enrolled in the Conservation Reserve Program (CRP). Nearly all the CRP is located on the sandy soils of the Pembina Delta.

5. Soils

All soils in the watershed formed from parent material of glacial origin. This material consists of glacial till that was deposited by glacial ice, of glacial lake sediment that has accumulated in still water, and of glacial outwash that was deposited by moving water. Other soils were formed in alluvium deposited by streams or in alluvium of local origin. There are three major land areas in the watershed. These are the Pembina Escarpment, Pembina Delta, and the area of sand deposits and gravel beaches.

Approximately 52 percent of the watershed is comprised of soils which are classified as Prime, Statewide Importance, and Local Importance Soils (see Appendix C for map).

6. Geology

The watershed is comprised of beach ridges and the Pembina delta. The Pembina escarpment, a rugged strip of ground separating the glacial uplands from the Red River Valley plain, consists of a deep layer of cretaceous shale's overlain by glacial till. The shale, which forms the bedrock, is exposed on many of the steeper slopes through the escarpment.

The Pembina Escarpment, rising 300 to 400 feet above the Red River Valley in northeastern-most North Dakota and southern Manitoba, forms one of North Dakota's most dramatic landscapes. The hilly country, with cool ravines full of aspen and birch, stands in stark contrast to the flat lowlands to the east.

The area west of the escarpment is drift prairie. In this portion of the watershed, glacial till mantles the shale to depths ranging from four or five feet to about 60 feet.

7. Hydrology

The Tongue River is a right bank tributary of the Pembina River located in extreme northeast Pembina County, North Dakota. The Tongue is a third-order stream in the Red River of the North Basin. The Tongue River Watershed flows west to east from Cavalier County into Pembina County. The Tongue River flows northeast into the Pembina River, which then enters the Red River of the North. The watershed is located in the Hudson Bay drainage.

The Renwick Reservoir sediment pool is estimated to be 50-60 percent full. A water quality/sediment survey conducted by Specialty Devices Incorporated in September 2003 indicated between 115 and 150 acre feet of sediment in the pool.

8. Threatened and Endangered Species

The US Fish and Wildlife Service provided a listing of species that may occur in the watershed. The bald eagle, whooping crane, and the gray wolf are occasionally seen in the area. The bald eagle is the only species that may be a local resident as the other two species are considered migratory or transient individuals when found. There are no recorded nesting sites for bald eagles located in the watershed in recent years although with increasing populations, they may eventually use the areas around the dams for nesting. Important habitat for any of these three species should be maintained under any alternatives evaluated.

9. Cultural Resources, Natural and Scenic Areas, and Visual Resources

A file search at the North Dakota State Historic Preservation Office resulted in the identification of 29 sites within the watershed. None of the 29 identified sites are recorded on the National Register of Historic Places. No known sites will be affected by the proposed project.

10. Fish and Wildlife Habitats

White-tailed deer are abundant in the watershed. Moose and elk also inhabit the area with moderate populations. Sharp-tailed grouse, Hungarian partridge, and ruffed-grouse provide upland bird hunting. Diverse habitat provides favorable conditions for large numbers of passerine bird species both as breeding grounds and rest areas during migration. Riparian forest including dense aspen stands, old growth hardwoods, and marshland shrubs maintain numerous bird species relying on these forest components. Large areas undisturbed by farming provides quality habitat to several herp species. Two reservoirs and the Tongue River itself provide fishing opportunities, including walleye, northern pike, and perch.

11. Wetlands

Nearly 3,200 acres are identified as wetlands on the US Fish and Wildlife Service's National Wetlands Inventory. This figure is nearly 3.5 percent of the watershed. Many wetlands have been drained for farming, including Rosa Lake, a 960 acre broad flat wetland in the upper part of the watershed. Prairie pothole wetlands from temporary to permanent are scattered throughout the watershed. Slope, intermittent stream, and riverine wetlands line the escarpment. Rare fen wetlands occur primarily along the lower end of the escarpment near the Tongue River. Deep organic layers and water chemistry set these unique wetlands apart from others and provide habitat to several plant species not commonly found in the area. Figure 3 shows the landscape of one of the fens.

Figure 3. Fen Plant Identification Site



This fen wetland is located on the north side of the reservoir. Fen wetlands are located in three different areas around the reservoir and below the embankment.

Social and Economic Conditions

1. Recreation

Renwick Dam provides an important recreation opportunity for the region. Recreation was not an original purpose for Renwick Dam, but the State of North Dakota began acquiring land in the early 1960's for what is now Icelandic State Park. Renwick Dam is located within the boundaries of Icelandic State Park. Lake based recreation consists of fishing, swimming, paddling, and boating. Icelandic State Park includes picnic areas, playground, sleeping cabins, and over 150 camp sites. A paved road across the top of the earthen embankment and grass auxiliary spillway provides access to the boat dock, camping, and recreation facilities on the north side of the lake. The State Park estimates 118,900 recreational user days are directly related to Renwick Dam annually. Canadian visitors account for 35 to 40 percent of the campers. Located within the State Park downstream from the dam is the Gunlogson State Nature Preserve (see Appendix C for map) which offers nature hiking trails and cross country skiing. Adjacent to the south shore of the reservoir is the Cavalier Golf Course.

2. Real Estate

There are no residential properties around the reservoir, but there are many residential and commercial structures downstream from the dam. The City of Cavalier located about five miles downstream accounts for the majority of these structures. The original work plan did not evaluate flood damages to these structures. For this current study, the potential flood damages to these structures were evaluated.

3. Social and Economic Data

The majority of the Tongue River Renwick Dam Watershed is located within Pembina County with the rest of the watershed in Cavalier County. Total population for Pembina County in 2000 was 8,585. Of this total, 1,527 live in the city of Cavalier. The county population is 95.5 percent white with American Indian and Alaska Native and two or more other races making up approximately 1.4 percent each. Cavalier County had a 2000 total population of 4,831 of which 98.1 percent were white. See the following table for additional social and economic data. The source for the population data was the U.S. Census Bureau – 2000 Census while the unemployment rates were from the U.S. Department of Labor – Bureau of Labor Statistics.

Table A. Social and Economic Data.

Population Characteristic	Units	Cavalier County	Pembina County	City of Cavalier	North Dakota	United States
Population	Number	4,831	8,585	1,527	642,200	281.4 million
65 years and older	Percent	22.9	19.5	24.8	14.7	12.4
Unemployment (August 2005)	Percent	2.9	6.7	N/A	3.1	4.9
Median Household Income	Dollars	31,868	36,430	35,667	34,604	41,994
Per Capita Income	Dollars	15,817	18,692	19,586	17,769	21,587
High School Graduates	Percent	78.8	79.8	82.9	83.9	80.4
Bachelor's Degree or Higher	Percent	13.1	16.4	22.8	24.4	24.4
Disability Status	Percent	14.4	16.8	15.9	16.7	19.3
Median Home Value	Dollars	46,100	55,100	71,800	74,400	119,600

Description of Existing Dam

Hazard Classification

Renwick Dam was designed and constructed under the Pilot Watershed Program with no specific hazard classification identified. Under current conditions, the potential hazard to life and property downstream should Renwick Dam suddenly breach or fail requires a class "C" (high hazard) designation.

The North Dakota State Water Commission, dam safety regulatory agency for North Dakota has classified Renwick Dam as a high hazard structure. The NRCS State Conservation Engineer concurs with this classification.

Structural Data

Table B. Existing Structural Data for Tongue River Watershed Structure M-4.

Dam Name	Renwick Dam
Stream	Tongue River
Year Completed	1961
Cost	\$357,761
Purpose	Flood Prevention
Drainage Area	93,300 Acres
Dam Height	49 Feet
Dam Type	Earthen
Dam Volume	361,900 cu.yds.
Dam Crest Length	1,360 Feet
Storage Capacity	
Sediment	303 Acre-Feet
Flood	4,065 Acre-Feet
Surcharge	3,010 Acre-Feet
Total	8,300 Acre-Feet
Principal Spillway	
Type	Concrete
Riser Height	25.3 Feet
Conduit Size	6' X 6' Box
Stages	2
Capacity	1,200 cu.ft./second
Energy Dissipater	SAF
Auxiliary Spillway	
Type	Earthen
Width	400 Feet
Capacity	15,000 cu.ft./second
Normal Pool Surface Area	204 Acres
Normal Pool Elevation	970.0 ft-mean sea level
Second Stage Principal Spillway Elevation	978.3 ft-mean sea level
Flood Pool Elevation	982.8 ft-mean sea level
Top of Dam Elevation	989.0 ft-mean sea level

Dam Status

In 1957 and again in 1961, the North Dakota Legislature passed dam safety legislation, Century Codes NDCC 57-51.1-07 and NDCC 61-02-14.

Pembina County Water Resource District serves as the dam's owner/operator and the project sponsor responsible for operation and maintenance (O&M) on the structure. NRCS

staff have participated in all annual inspections conducted by the sponsor and have assisted in monitoring and inspection activities during major runoff events. The Sponsors have kept O&M of Renwick Dam current. As a result, all structural components (see Figure 4 for principal spillway) of the dam continue to be in good condition and serviceable for another 100-years. However, as the structure continues to age future O&M will become increasingly complex and expensive.

The State dam safety agency (North Dakota State Water Commission) has performed detailed follow-up inspections to the Phase I Inspection Report conducted by the U.S. Army Corps of Engineers in August 1978. Renwick Dam was reinspected in 1995 and 1999 with no major concerns noted in the inspection reports.

Figure 4. Principal Spillway - Renwick Dam



Breach Analysis

Tongue River Watershed Structure M-4 is located in Pembina County, near Cavalier, North Dakota and has a drainage area of 93,300 acres. The site is located on the Tongue River which flows 29 miles downstream to its confluence with the Pembina River. There are 75 to 80 homes and businesses within the breach zone. The breach would also overtop five roads. The breach analysis used TR-60/TR-66 procedures to determine peak discharge and hydrograph shape using the water level at the top of dam (994.4 feet MSL). The breach hydrograph was routed downstream with the HEC-RAS unsteady flow computer model utilizing cross sections surveyed by the North Dakota State Water Commission survey crew to represent the floodplain of the Tongue River. A large amount of the breach hydrograph is lost from the Tongue River due to breakout flows starting at River Station 195. The results of the breach analysis are shown in the following table. A map showing the breach inundation can be found in Appendix C - Breach Inundation Map.

Table C. Results of a Dam Breach Routing for Tongue River M-4.

River Station	River Mile	Wat. Surf. Elev. (ft) (msl)	Max. Discharge (cfs)	River Station	River Mile	Wat. Surf. Elev. (ft) (msl)	Max. Discharge (cfs)
325	0.0	970.8	44300	185	7.9	907.8	3121
316	0.2	959.8	42732	180	8.7	903.6	2838
313	0.3	960.4	47584	175	9.0	901.9	2783
311	0.5	959.3	42661	170	10.0	896.7	2777
310	0.5	959.3	42660	165	10.3	894.2	2583
305	0.6	958.6	42650	155	10.3	891.6	2582
295	0.6	958.3	42607	150	11.5	889.9	1699
290	0.8	958.1	42595	145	12.5	884.8	1693
285	1.0	955.4	42536	141	12.5	884.5	1693
280	1.4	951.0	42318	140	12.5	884.2	1693
270	1.4	950.3	42318	138	12.6	883.8	1692
265	1.7	948.9	42218	137	12.6	883.8	1692
260	2.1	947.6	42174	136	12.6	883.5	1692
255	2.3	946.1	42151	134	12.7	883.1	1692
250	2.6	943.3	42135	132	12.9	881.0	1692
245	3.3	937.2	42013	128	12.9	880.7	1692
235	3.3	936.7	41990	125	13.1	879.7	1692
230	3.9	932.5	41884	113	13.1	879.3	1692
225	5.0	927.5	41763	111	13.7	877.4	1692
220	5.7	923.4	41518	109	13.7	877.3	1692
210	5.8	922.7	41517	105	13.8	876.9	1692
205	6.8	915.6	25740	103	14.7	872.7	1692
200	7.2	911.4	23483	101	14.7	872.4	1692
195	7.9	908.3	3037	100	15.2	868.9	1692

A dam breach would result in a potential loss of life by impacting approximately 75 to 80 homes, several private and public businesses, and five roads existing in the downstream dam break flood zone.

Evaluation of Potential Failure Modes

Sedimentation – Most FWRS are designed to store sediment. When the sediment pool has filled to the elevation of the principal spillway inlet, the pool no longer has permanent water storage, but still has some level of flood control. As the detention pool loses storage due to sediment deposition, the emergency spillway operates, or has flowage more often and is, therefore, subject to erosion. A potential mode of failure exists as the auxiliary spillway continues to degrade and depth of flow increases. The dam will ultimately breach.

There is no record of the auxiliary spillway on Renwick Dam ever carrying flood flows. The structure was designed with a sediment storage capacity of 303 acre-feet at elevation 962.3 feet MSL. At the current permanent pool elevation 970.0 feet MSL, approximately 1,225 acre-feet of storage exists, and approximately 1,440 acre-feet of storage exists at the planned permanent pool elevation of 971.0 feet MSL. As a part of this planning effort, a reservoir sediment survey was conducted in September 2003. The survey revealed that between 115 and 150 acre-feet of sediment has been deposited in the reservoir since its completion in 1961. This equates to a sediment deposition rate of between 2.7 and 3.6 acre-feet per year.

Estimating future sediment accumulation in Renwick Dam is based on assumptions regarding future land use in the drainage area. Based on this re-evaluation and reallocated land use, the sediment storage life of Renwick Dam is well in excess of 100 years. The project evaluation period is 100 years; therefore, sedimentation presents no potential for dam failure during the evaluation period of this project.

Hydrologic Capacity – Failure of a dam can occur by breaching the auxiliary spillway, or overtopping the dam. The integrity and stability of the auxiliary spillway is dependent upon the depth, velocity, and duration of flow, the vegetative cover, and the spillway's resistance to erosion. Integrity of the embankment during overtopping is dependent on depth, velocity, and duration of flow, vegetative cover, and the embankment's resistance to erosion.

Under the current configuration, Renwick Dam will pass greater than the 24-hour, 100-year rainfall event through the principal before discharging through the auxiliary spillway. However, the design storm for a high hazard structure, the Probable Maximum Precipitation (PMP), would cause the dam to overtop. That is assuming the current auxiliary spillway, with soils comprised mainly of poorly graded sand, would not erode and breach first. Therefore, the current configuration of Renwick Dam represents a risk for failure based on its hydrologic capacity.

Seepage – Embankment and foundation seepage can contribute to failure of an embankment by removing (piping) soil material through the embankment or foundation. As the soil material is removed, the voids created allows even more water flow through the embankment or foundation until the dam collapses due to internal erosion. Seepage that increases with increases in pool elevation is an indication of potential problems, as is stained or muddy water or "sand boils". Foundation and embankment drainage systems can alleviate the seepage problem by removing the water without allowing soil particle to be transported away from the dam. Renwick Dam does not exhibit obvious signs of excessive seepage; therefore, seepage provides a low risk of dam failure.

Seismic – The integrity and stability of an earthen embankment are dependent upon the presence of a stable foundation. Foundation movement through consolidations, compression, or lateral movement can cause the creation of void within the embankment, separation of the principal spillway conduit joint, or in extreme cases, complete collapse of the embankment. The Tongue River Watershed is located in an area of low seismic risk with no historical events identified that would have compromised its structural integrity; therefore, seismic activity reflects a low risk of dam failure.

Material Deterioration – Material used in the principal spillway system, the foundation and embankment drains, and the pool drainage systems are subject to weathering and chemical reaction due to natural elements within the soil, water, and atmosphere. Concrete risers and conduits can deteriorate and crack, metal components will rust and corrode, and leaks can develop. Embankment failure can occur from internal erosion caused by such leaks.

Renwick Dam has a concrete riser and conduit, along with metal foundation and embankment drains. All material components are in excellent shape as a result of O&M activities by the dam's operator. NRCS inspected the riser and conduit in 2002 and found the conduit joints to be water tight and the concrete in the conduit and riser to be sound. The foundation and toe drains are also functioning properly as designed. Material deterioration represents a low risk of dam failure.

Consequences of Dam Failure

Given the evaluation of dam failure modes previously discussed, it does not seem plausible at this point to discuss the consequences of a dam failure. At this point in time Renwick Dam is considered an unsafe structure, not because of imminent danger or threat of failure, but because of its high hazard dam classification and the results of a dam failure would likely be catastrophic.

In analyzing the failure of Renwick Dam, a worst case scenario is conceived. Specifically, a sunny day breach, with no advanced warning is assumed. Dam failure is assumed to occur when water begins to overtop the structure resulting from the unresolved blockage of the principal and auxiliary spillway. It is assumed that structural collapse would occur quickly and result in 11,000 acre-feet of water and sediment being released, beginning with a wall that is approximately 40 feet in height. Resource inventories during the planning process indicate a failure of Renwick Dam would jeopardize approximately 75 to 80 homes, several private and public businesses, and five roads putting residents and commuters at risk.

Status of Operations and Maintenance

The Pembina County Water Resource Board is responsible for the O&M of all structures in Tongue River Watershed, including Renwick Dam. Inspections have been completed timely and as scheduled. Deficiencies noted have been addressed immediately.

Watershed Purpose and Need

Watershed Problems

The North Dakota State Water Commission has classified Renwick Dam as a high hazard dam. Renwick Dam does not currently meet design and safety criteria associated with a high hazard dam. This classification is based on the fact approximately 75 to 80 homes, several private and public businesses, and five roads and bridges are located downstream of the dam in the "breach zone". A breach zone is the area below an impoundment of water that is likely to be inundated upon the sudden release of stored water should the impoundment breach. The North Dakota State Water Commission, through a contract with NRCS, identified the breach zone for Renwick Dam.

The Sponsors have identified flooding in the floodplain downstream as a primary concern. Pembina County participates in the National Flood Insurance Program and realizes the value Renwick Dam provides in flood protection benefits. As such, they have expressed concerns about returning to pre-project flood exposure. Specifically, they have indicated that removing Renwick Dam would have negative impacts associated with flood frequency and intensity downstream, including decreased property values, increased flood insurance premiums, disruptions to transportation and utilities, and loss of agricultural production.

The potential for removing Renwick Dam has also sparked a number of concerns among local residents. Specifically, they have identified the potential for loss of one of the states prime recreation areas as a primary concern.

Associated water quality concerns due to sediment loading and potential removal of sediment from the reservoir were identified as areas of concern. The environmental impacts as well as the cost of sediment removal were identified and required additional study. Sediment accumulation, under any alternative is an issue of concern for local residents. Long-term operation and maintenance of Renwick Reservoir is limited by the watershed protection provided above the reservoir.

Watershed Opportunities

The following is a general list of opportunities that will be gained through the implementation of this watershed plan:

- Compliance with Dam Design and Safety Criteria
- Protect Public Safety
- Prevent Increased Flooding in the Floodplain
- Protect Real Estate Values
- Protect Fish and Wildlife Habitats
- Protect Unique Fen Wetlands
- Protect Recreation Opportunities
- Protect North Dakota Listed Rare and Unique Plants and Animals
- Maintain Access to Park Lands

Quantification of these opportunities is provided in other sections as appropriate.

Scope of the Environmental Assessment

An interagency interdisciplinary scoping process was conducted on June 18-19, 2002 to identify issues of economic, environmental, cultural, and social concerns in the watershed. Watershed concerns of Sponsors, Watershed Management Council, and local citizens were expressed at additional planning and public meetings. Factors that would affect soil, water, air, plant, animal, and human resources were identified by multidisciplinary teams composed of engineers, biologists, economist, soil scientist, water quality specialist, agronomist, Geographic Information Specialist, and others. Concerns and their degree of significance to the decision making process were identified. Table D shows the degree of concern and degree of importance in decision making.

Table D. Magnitude of Identified Concerns

Economic, Environmental, Cultural and Social Concerns	Degree of Concern 1/	Degree of Importance 1/	Comments
Soil			
Important Ag. Land	High	High	No anticipated impacts.
Sedimentation	High	Moderate	Concerned with reservoir storage and its effect on life of recreation facility.
Soil Erosion	Medium	Low	Impact due to Food Security Act.
Streambank Erosion	Moderate	Low	Adds to sedimentation in reservoir.
Shoreline Erosion	Moderate	Low	Bank adjacent to golf course may erode due to rise in pool elevation.
Water			
Flood Plain Management	High	High	Protection of Cavalier and downstream residents. Future downstream development.
Ground Water	Moderate	Low	
Irrigation	Moderate	Low	Concern with irrigators requesting permits from existing upstream reservoirs.
MR&I Water	Moderate	Low	Emergency backup for North Valley Water supply.
Streams	Moderate	Low	Increasing permanent pool will back upstream and possible increased flows downstream.
Water Quality	Moderate	Moderate	Impacts recreational uses later in season.
Water Quantity	Moderate	Moderate	Prior water permits may affect reservoir uses. Increased size of permanent pool.
Wetlands	High	High	Bog (and fen) areas.
Special Aquatic Sites	High	High	Bog (and fen) areas.
Plant			
Threatened and Endangered Species	High	Low	Consult with US Fish and Wildlife Service.
Woodlands(Upland)	Low	Low	
Woodlands(Adjacent to Stream)	Low	Low	
Woodlands(Adjacent to Reservoir)	Moderate	Low	
Bog/Fen Areas	High	High	NDPR Department considers important.
State Rare Plants	Moderate	Moderate	Fifteen species identified by NDPR.
Invasive Species	Low	Low	

Economic, Environmental, Cultural and Social Concerns	Degree of Concern 1/	Degree of Importance 1/	Comments
Air			
Air Quality	Low	Low	Short-term during construction period.
Animal			
Threatened and Endangered Species	High	Low	Consult with US Fish and Wildlife Service.
Wildlife	Moderate	Low	Moose and elk are unique to the area.
State Rare Animals	Moderate	Moderate	Six species identified by ND Parks and Recreation Department.
Sport Fishery and Fish Habitat	Moderate	Low	Effected only during construction, may be beneficial post construction.
Human Considerations			
Cultural Resources	High	Moderate	Icelandic State Park very important to the history of the area.
Economics	High	High	Icelandic State Park important to area economy, impact to flood insurance rates, local costs for project, length of construction period.
Recreation	High	High	Icelandic State Park very important to the community of Cavalier and region. Impacts to golf course.
Social-Human Health and Safety	High	High	Dam safety (during and after construction). Reducing downstream flooding. Length of construction period.
Transportation	High	High	Park visitor and emergency services access to park. Access over the top of dam.
Landscape Resources	Moderate	Moderate	Important to park appearance and golf course.
Land Use Changes	Moderate	Low	CRP impacts to water quality and land use around reservoir.
Environmental Justice	High	Low	No known impacts.
Limited Resource Farmer	High	Low	No known impacts.
Stream Channel Modification	High	Low	None expected.

- 1/ High - must be considered in the analysis of alternatives
 Moderate - may be affected by some alternative solutions
 Low - consider, but not very significant
 None - Need not be considered in analysis

Formulation and Comparison of Alternatives

The Tongue River Watershed project is formulated *to bring Tongue River Watershed Structure M-4 into compliance with current dam safety criteria*. The consensus of Federal, State, and local planners in the planning process is that installation of planned actions will satisfy this objective. Preliminary investigations for achieving the projects purpose included:

1. Bringing Tongue River Watershed Site M-4 into compliance with current public safety criteria,
2. maintaining the current level of flood protection provided by Tongue River Watershed Structure M-4, and
3. addressing major resource concerns of local residents within the scope of the Small Watershed Dam Rehabilitation Program and this planning process.

Two additional objectives identified by the Sponsors and the Watershed Management Council were:

4. Raise the permanent pool one foot, or more and
5. remove sediment from the permanent pool area.

Formulation Process

Formulation of alternative plans for Renwick Dam followed procedures outlined in the NRCS-National Watershed Manual, Part 508. Other guidance incorporated into the formulation process included the NRCS-National Planning Procedures Handbook, National Environmental Compliance Handbook, Economic and Environmental Principles and Guidelines for Water and Related Land Resource Problems, and other NRCS watershed planning policy.

The process began with formal discussions between the Sponsors and NRCS. At a Special Meeting held on March 6, 2001, NRCS conveyed State law and policy associated with high hazard dams. It was stated that National Dam Safety Inspection Reports of 1978, 1983, 1987, and 1991 listed Renwick Dam in the High Hazard category for potential loss of life in the event of failure. NRCS also explained agency policy associated with Public Law 106-472, "The Small Watershed Rehabilitation Amendments of 2000", and related alternative plans of action.

As a result of these discussions, the Sponsors submitted an application on March 14, 2001, to Wes Wiedenmeyer, NRCS State Conservation Engineer, requesting assistance for rehabilitation of Renwick Dam under the provisions of Public Law 106-472.

On April 16, 2002, a Public Meeting was held in Cavalier to review preliminary rehabilitation plans and to hear public comments pertaining to the proposed rehabilitation project. Fifteen items of concern were identified at the meeting. These concerns have been incorporated into this document.

A meeting and field tour with the North Dakota Interagency Advisory Committee was held on June 18-19, 2002, to assess proposed measures and their potential impact on resources of concern. A review of National Environmental Policy Act (NEPA) concerns was initiated at this meeting. NEPA concerns were reviewed and documented.

The NRCS planning staff requested National Water Management Center (NWMC) assistance for planning guidance on this rehabilitation project. Three main areas of concern of the NRCS planning staff were:

1. Format of the Rehabilitation Plan
2. Study Area and Level of Study Intensity (Scoping)
3. Environmental Documents

National Water Management Center (NWMC) Staff and Planning Staff completed a site visit to the watershed on October 7, 8, and 9 of 2002. At this same time, an engineering review team was also on site. This presented an opportunity for a wide exchange of ideas in both the planning process and design opportunities.

The Sponsors early in the planning process recognized the complexity of the proposed project and its potential impacts on the City of Cavalier and the surrounding area. As a result they initiated and adopted a Watershed Management Council (WMC)-on May 22, 2003. The WMC membership was made up of one representative from each local organization, and city and county political authorities within the surrounding Cavalier and Pembina watershed area. The WMC advisory role was critical in the formulation and evaluation of alternatives.

Early on in the planning process the Sponsors and WMC wanted the additional objectives of raising the permanent pool one foot or more (971.0 or 972.0 feet MSL), along with removal of sediment from the permanent pool area.

Upon detailed analysis and consultation with NRCS technical specialists and State natural resource agencies, the NRCS and Sponsors agreed that an increase of the permanent pool by one foot to 971.0 feet MSL would be necessary to maintain the same volume in the beneficial use (wildlife) pool. The beneficial use (wildlife) pool was described in the original plan as that area above the sediment pool. Removal of sediment was determined to be an unreasonable component of any proposed action due to a lack of safe disposal sites, high risk of not meeting Clean Water Act laws, and unpredictable costs per unit volume of sediment removed. It was also determined the volumes of sediment proposed to be removed would have little to no benefit towards flood storage and reducing the amount of rehabilitation work required to bring the structure into compliance with the Federal Dam Safety Program.

Alternatives Considered

The following eleven alternatives were considered during the planning process. All structural alternatives were considered with at least 50 percent of the contributing watershed area being adequately protected from excessive erosion and sediment delivery. The watershed currently does exceed the 50 percent protection level. All alternatives were analyzed with the permanent pool elevation of 971.0 feet MSL, a one foot raise from the current elevation, and with no sediment removal from the permanent pool.

- No Action.
- Decommission Dam.
- Leave Dam 'As Is' Relocate Downstream Structures.
- Armor Entire Dam and Dike Existing Auxiliary Spillway.
- Armor Existing Auxiliary Spillway.
- Structural Spillway with Bridge.
- Co-Alignment of Principal Spillway and Auxiliary Spillway.
- Structural 300 Foot Compacted Concrete Spillway. Road over top of dam. Downstream zoning and relocation required due to 50 percent PMF(Probable Maximum Flood) design.
- Structural 300 Foot Roller Compacted Concrete Spillway. Road on upstream side of dam. Downstream zoning and relocation required due to 50 percent PMF design.
- Structural - Roller Compacted Concrete Auxiliary Spillway - (Park Entrance Road on upstream face of dam). Full PMF design of 500 foot Spillway width.
- Structural - Roller Compacted Concrete Auxiliary Spillway - (Park Entrance Road on top of dam). Full PMF design of 500 foot Spillway width.

Alternatives Considered but Not Studied in Detail

Leave Dam As Is – Relocate Downstream Structures

Removing downstream hazards would allow the existing structure to remain unchanged. This would require all structures (houses, businesses, etc.) be removed from the dam breach zone and relocated elsewhere. Bridges and culverts downstream would also have to be upgraded.

- A minimum of 75 to 80 houses would have to be relocated.

This alternative was not acceptable to the Sponsors and local public because of the number of homes and businesses that would have to be moved. Also this alternative would be more expensive than the recommended alternative. It was estimated to cost \$100,000 to relocate a house which would have cost at a minimum \$7.5 million. In addition to the houses, a nursing home would have to be relocated which would cost considerably more than \$100,000. This alternative was excluded from further consideration early in the planning process.

Armor Entire Dam and Dike Existing Auxiliary Spillway

The entire dam would be armored with interlocking concrete blocks, paving, or some other similar type material. Permanent pool would be raised one foot. Existing auxiliary spillway would be closed off with an earthen dike. Dam would be allowed to overtop during a design freeboard hydrograph event.

- Would require variance from National Headquarters.
- Potential impact to fen located downstream of embankment.

Although this option is conceptually simple, the factors listed above and the estimated cost impose severe limitations on its implementation. Through consultation and public meetings, the Sponsors have indicated this alternative is not physically or socially acceptable. This alternative was excluded from further consideration.

Armor Existing Auxiliary Spillway

The existing auxiliary spillway would be armored with interlocking blocks or other similar type material in order to prevent erosion. This would have a negative impact on the fen wetland located at the outlet end of the spillway, and would present construction problems due to the trees and wet soils along the spillway alignment. The top of the dam would need to be raised to contain the design freeboard hydrograph event without overtopping. The estimated construction cost would also be much larger than other alternatives. This alternative was excluded from further consideration.

Structural Spillway (RCC) with Bridge

Initial cost estimates on construction of bridge made this alternative cost prohibitive. There was also a question as to if the bridge cost would be a cost-shared item. Maintenance and liability costs of bridge were beyond scope of Sponsors.

Co-Alignment of Principal Spillway and Auxiliary Spillway

This alternative was discussed briefly. The plan was basically to build the auxiliary spillway over the existing principal spillway. It would require excavating into native material adjacent to and within the existing auxiliary, most of which is beach sand. This alternative would impact the fen wetland.

Note: The next two alternatives are based on a 50 percent PMF. NRCS National Engineering Team agreed with the proposal to waive existing design criteria and utilize the inflow design flood approach as described in FEMA94 provided land use controls are established to avoid nullifying the analysis in the future. This would be accomplished through zoning to prohibit future installation of homes with first floor or low opening (including basement floor) below the elevation of the breach water surface profile. Zoning would be done by elevation. Existing homes within the breach zone would have to be flood-proofed or relocated. This would impact an existing eight to twelve homes and a nursing home.

Structural 300 Foot Roller Compacted Concrete Spillway. Road on upstream side of dam. Downstream zoning and relocation required due to 50 percent PMF design

Alternative would include a 300 foot wide vertical wall RCC spillway over center portion of dam and would route the access road to the upstream side of the dam. The top of the dam would be at 991.3 feet MSL, which is approximately 2.3 feet higher than current top of dam elevation. Estimated construction cost is \$3.4 million.

Structural 300 Foot Roller Compacted Concrete Spillway. Road over top of dam. Downstream zoning and relocation required due to 50 percent PMF design

This alternative is similar to the prior, except the access road would be over the top of the dam and across auxiliary spillway. Access road would be sloped to allow traffic to transition from top of dam through auxiliary spillway. Estimated construction cost \$3.7 million.

The WMC recommended to not consider the 50 percent PMF design alternatives because of the need for a variance and zoning to prohibit future construction of homes. These two alternatives become more costly than the full PMF alternatives when the cost of zoning and relocating the existing homes and nursing home are added to the construction cost and thereby not evaluated further.

Description of Alternative Plans

The following four alternatives were reviewed by the WMC at the September 26, 2005, meeting. Meeting participants identified no additional alternatives, or proposed plans of action that met the projects purpose and need.

No Action

Under this alternative, no additional Federal funds would be expended and no additional benefits would accrue beyond those associated with the original project. Original project Sponsors would continue to operate and maintain Renwick Dam as originally constructed. At some point in time, the North Dakota State Water Commission (SWC) would mandate the removal of the dam for the purpose of removing the hazard in the interest of public safety. It is unknown at this time what the schedule would be for such a mandated removal. The Sponsors do not have the resources to upgrade this structure without Federal assistance.

Dam removal would consist of removing the flood retarding capacity of the reservoir while maintaining enough storage to prevent existing sediment from being carried downstream. A notch would likely be cut into the embankment with some type of drop structure installed to ensure safe passage of flood flows through the notch down to the Tongue River.

Previous flood protection provided by Renwick Dam would no longer exist. The City of Cavalier, rural homes, businesses, as well as roads, bridges, and railroads would be at an increased risk of damages due to flooding. The 100-year flood plain would be required to be re-established with the proposed action. The no action alternative is similar to the decommission dam alternative except the Sponsors would be responsible for 100 percent of the costs.

Estimated Costs - \$2.3 million

Decommission Dam

Decommissioning Renwick Dam would involve removing the floodwater retarding capacity by cutting a 400 foot wide section of the embankment down an elevation of 960.0 feet MSL. This notch would act as a weir and would have armoring to safely pass flows down to the Tongue River below the dam. The remaining portion of the embankment would slope at 4:1 to the existing top of the dam. Approximately 127,000 cubic yards of fill would be removed and disposed from the earthen embankment. None of the accumulated sediment would be removed. Flood flows would pass through the notch unhindered.

Downstream water quality would need to be addressed when the dam is decommissioned. A weir on the old dam structure or a sediment basin would need to be installed to minimize sediment and nutrient loads from eroding and translocating downstream. Previous flood protection provided by Renwick Dam would no longer exist. The City of Cavalier, rural homes, businesses, as well as roads, bridges, and railroads would be at an increased risk of damages due to flooding. The 100-year flood plain would be required to be re-established with the proposed action.

No impacts would occur to the fen wetlands around the reservoir or on the existing emergency spillway. The trees located immediately downstream from the dam would not be impacted with this alternative.

Estimated Costs - \$2.3 million

Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on Top of Dam)

This alternative consists of raising the top of dam from 989.0 feet MSL to 994.4 feet MSL, modifying the principal spillway by raising it one foot and consequently the permanent pool from 970.0 feet MSL to 971.0 feet MSL, constructing a 500 foot wide roller compacted concrete (RCC) spillway over the center portion of the dam, and diking off the existing auxiliary spillway to prevent flow from passing through it. Access road to the Icelandic State Park will be 28 foot wide concrete or bituminous road over the top of the dam and across the auxiliary spillway.

The trees located directly downstream of the dam would be removed during construction and will be mitigated. A riparian planting at a 2:1 ratio along the reservoir shoreline or along the river immediately downstream of the principle spillway will be installed.

Estimated Costs - \$5.4 Million

Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on Face of Dam) (NED Plan)

This alternative consists of raising the top of dam from 989.0 feet MSL to 994.4 feet MSL, modifying the principal spillway by raising it one foot and consequently the permanent pool from 970.0 feet MSL to 971.0 feet MSL, constructing a 500 foot wide roller compacted concrete spillway over the center portion of the dam, and diking off the existing auxiliary spillway to prevent flow from passing through it. Access road to the Icelandic State Park will be a 28 foot wide concrete or bituminous road on the upstream face of the existing dam structure.

The trees located directly downstream of the dam would be removed during construction and will be mitigated. A riparian planting at a 2:1 ratio along the reservoir shoreline or along the river immediately downstream of the principle spillway will be installed.

Estimated Costs - \$5.6 Million

Effects of Alternative Plans

Alternative plans of action can result in a multitude of effects on resources upstream and downstream of Renwick Dam. This section describes anticipated effects on resource concerns identified by the project Sponsors and by the public during public meetings. Effects of alternative plans of action on resource concerns of National importance are also included. In the following discussion both the **Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on Top of Dam)** and the **Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on Face of Dam) (NED Plan)** have the same effect and are labeled as *Rehabilitation of Renwick Dam* since the only difference is the location of the road on the dam.

Public Safety

Existing Conditions – Renwick Dam construction was finished in 1961. It was designed under the Pilot Watershed Program with no specific hazard classification or criteria in place. Under its current configuration, Renwick Dam will pass greater than the 24-hour, 100-year rainfall event through the principal spillway before discharging through the auxiliary spillway. However, the design storm for a high hazard structure, the Probable Maximum Precipitation (PMP), would cause the dam to overtop. That is assuming the current auxiliary spillway, with soils comprised mainly of poorly graded sand, would not erode and breach first. To date, no flows have been recorded over the auxiliary spillway.

Renwick Dam was not designed to provide the level of safety required for protecting downstream homes, businesses, utility, and transportation systems. There are 75 to 80 homes and businesses along with five roads and bridges downstream creating the potential for loss of life.

No Action (Future without Project) – There would be a slightly increased risk to public safety through increased flood frequencies exposing individuals to floodwaters. Roads, bridges, and utility infrastructure would also be exposed to increase maintenance concerns that could pose a threat to public safety. The risk of catastrophic dam failure would be eliminated.

Decommissioning – There would be a slightly increased risk to public safety through increased flood frequencies exposing individuals to floodwaters. Roads, bridges, and utility infrastructure would also be exposed to increase maintenance concerns that could pose a threat to public safety. The risk of catastrophic dam failure would be eliminated.

Rehabilitation of Renwick Dam – The risk of dam failure from overtopping or a breaching of the auxiliary spillway would be reduced as a result of the construction of the proposed dam safety modifications. Potential risk to human life and structures would be mitigated for a minimum of 100 years. Flood protection benefits, and their associated maintenance concerns, to five roads and bridges and utility infrastructure would be maintained.

Flooding in the Floodplain

Existing Conditions – Renwick Dam was built to protect cropland and other agricultural lands from flooding. Because flood storage is a primary function of this structure, the 100-year floodplain downstream was narrowed significantly when Renwick Dam was originally constructed. This narrower floodplain has allowed development to occur in areas that were not suitable prior to pre-structure conditions. With Renwick Dam in place, there is one house located in the 100-year floodplain.

No Action (Future without Project) – Flooding similar to that of pre-structure conditions would occur. Homes, business, and infrastructure would all experience increased flood

frequencies. Under this scenario, there would be four homes and businesses in the 100-year floodplain.

Decommissioning – Flooding commensurate with that of pre-structure conditions would occur. Homes, businesses, and infrastructure would all experience increased flood frequencies. Under this scenario, there would be four homes and businesses in the 100-year floodplain.

Rehabilitation of Renwick Dam – Flood protection benefits realized downstream would be ensured for another 100 years. With Renwick Dam rehabilitated, there would be one house located in the 100-year floodplain.

Property Values

Existing Conditions – The Renwick Dam project area, especially downstream of the dam, has experienced growth over the past 20 years. Housing development has taken place downstream of Renwick Dam. Maintaining and protecting property values is a primary concern of local residents.

No Action (Future without Project) – Property values for homes downstream would decrease due to increased flooding. Future appreciation values would be below that of upland houses.

Decommissioning – Property values for homes downstream would decrease due to increased flooding. Future appreciation values would be below that of upland homes.

Rehabilitation of Renwick Dam – Property values would be maintained upstream and downstream of Renwick Dam.

Fish and Wildlife Habitats

Existing Conditions – Recreation and fishing has become a valued activity on Renwick Dam. While conducting the reservoir sedimentation survey, huge quantities of fish and fish habitats were observed.

No Action (Future without Project) – Approximately 204 acres of deep water fish habitats would be reduced to shallow stream and the value associated with fishing on Renwick Dam would be lost. Fish habitats would be converted to that of small, free-flowing streams in rural North Dakota. However, there would be an increase in approximately 170 acres of wildlife habitat, primarily for small non-game species (i.e., raccoon, squirrel, rabbit, etc.).

Decommissioning – Approximately 204 acres of deep water fish habitats would be reduced to shallow stream and the value associated with fishing on Renwick Dam would be lost. Fish habitats would be converted to that of small, free-flowing streams in rural North Dakota. However, there would be an increase in approximately 200 acres of wildlife habitat, primarily for small non-game species (i.e., raccoon, squirrel, rabbit, etc.).

Rehabilitation of Renwick Dam – Approximately 180 acres of established fish habitat will be protected. Approximately two acres of trees will be impacted by construction activities on the downstream side of embankment. Primarily species are oak and ash. Lost habitat will be replaced at a 2:1 ratio as riparian plantings on public lands either upstream or downstream of Renwick Dam.

Sedimentation

Existing Conditions – Renwick Dam was built in 1961 with 303 acre-feet of sediment storage capacity. A sediment survey was performed in August 1990, by NRCS personnel. The reported amount of sediment at that time was 96.5 acre-feet. The average amount of sediment per year was calculated at 3.45 acre-feet.

According to the as-built plans, the sediment pool elevation is 962.3 feet MSL, with a storage amount listed as 303 acre-feet. The permanent pool was at 970.0 feet MSL, with a storage amount of 1,225 acre-feet. Therefore in 1990, the sediment pool had filled 32 percent with 56 percent (50-year design life) of the design life passed. Sediment had taken up approximately eight percent of the permanent pool.

No Action (Future without Project) – Sediment currently deposited in the reservoir could become exposed and available for transport further downstream. Turbidity levels could increase markedly downstream, potentially impacting property values. Sediment would have to be stabilized by some method (removal, structurally, vegetative, etc.). There would be increased concerns and challenges associated with disposing of sediment that are potentially contaminated with hazardous materials. The US-EPA, Corps of Engineers, US-Fish and Wildlife Service, and North Dakota Wildlife Resources Division also expressed concerns associated with sediment removal.

Decommissioning – Sediment deposition could move from the bottom of reservoir to stream channels downstream reducing the biological integrity for fish and wildlife habitat. Contaminants associated with deposited sediments could also be reintroduced into stream processes, potentially degrading water quality downstream in the short-term.

Rehabilitation of Renwick Dam – The remaining sediment storage life of Renwick Dam is well in excess of 100 years.

Recreational Opportunities

Existing Conditions – While recreation was not an original purpose of Renwick Dam, the reservoir is providing a number of upstream recreational opportunities that include, but are not limited to, camping, fishing, boating, and swimming. During the reservoir sedimentation survey, camping, fishing, boating, and swimming by individuals and groups of all ages was observed. Downstream, Cavalier's City Park which includes picnic area, playground equipment, and swimming pool are being protected from floodwaters due to Renwick Dam's flood retention capacity.

No Action (Future without Project) – There would be a loss of fishing, boating, and swimming opportunities on Renwick Dam reservoir. Cavalier's City Park would be exposed to increased flood frequencies, thus, increasing maintenance costs. The average annual negative impacts associated with lost recreational opportunities on the lake alone are estimated to be \$775,800. These benefits were calculated using the ND Parks and Recreation estimate of 118,800 users and an estimated value of \$6.52 per user day.

Decommissioning – There would be a loss of fishing, boating, and swimming opportunities on Renwick Dam reservoir. Cavalier's City Park would be exposed to increase flood frequencies, thus, increasing maintenance costs. The average annual negative impacts associated with lost recreational opportunities on the lake alone are estimated to be \$775,800.

Rehabilitation of Renwick Dam – Camping, fishing, boating, and swimming would be maintained. Recreational activities downstream, such as the Cavalier City Park, would be maintained.

Water Quality

Existing Conditions – Water quality in the reservoir as a whole appears to be in an adequate and static condition. Water quality monitoring of the lake was conducted during this planning process. The North Dakota Department of Health, Water Quality Division in cooperation with U.S. Geological Survey (USG) and the Red River Regional Council collected water quality samples for chemical and physical analysis in 2003 and 2004. Study findings

are not finalized at this time, thus no information from the study will be incorporated into this assessment. The study was part of the overall Pembina Basin Watershed Restoration Action Strategy (WRAS).

Specialty Devices, Incorporated was contracted by NRCS to conduct a sediment survey and chemical composition for Renwick Reservoir. Their survey identified 115 acre-feet of sediment. There were no significant concentrations of heavy metal or hydroflorocarbons or organochlorine pesticides found in the reservoir.

Periods of turbidity associated with normal lake turnover in the spring have been observed during various site visits to the dam. Also, extreme turbidity was observed in the upper limits of northwest reach during the reservoir sedimentation survey. Functionally, the reservoir serves as a sediment trap, which also traps pollutants attached to sediment particles, improving water quality downstream.

No Action (Future without Project) – Water quality conditions downstream would degrade as deposited sediment, and any attached pollutants, would be reintroduced into the aquatic environment. Sediment deposition would move from the bottom of Renwick Dam to stream channels downstream, reducing the biological integrity for fish and wildlife habitat. Contaminants associated with deposited sediments would also be reintroduced into stream processes, potentially degrading water quality downstream.

Decommissioning – Water quality conditions downstream would degrade as deposited sediment, and any attached pollutants, would be reintroduced into the aquatic environment. Sediment deposition would move from the bottom of Renwick Dam to stream channels downstream, reducing the biological integrity for fish and wildlife habitat. Contaminants associated with deposited sediments would also be reintroduced into stream processes, potentially degrading water quality downstream.

Rehabilitation of Renwick Dam – Water quality would continue to be protected by the sediment trapping aspects of Renwick Dam. The integrity of downstream aquatic environments would be maintained. Riparian health of the stream will not be impacted with the proposed action alternative.

Wetlands

Existing Conditions – Transitional floodplain wetlands are located in the upper reaches of the reservoir. Approximately ten acres of surface area of the lake has been lost due to sedimentation, which now functions as a wetland. Hydrophytic vegetation has become established and is helping to filter out additional sediment and associated pollutants prior to deposition in the lake.

No Action (Future without Project) – Removal of the embankment will facilitate a transition in the wetland habitats and types from lacustrine to riverine. Under this alternative the transition would be very gradual, as exposed sediment will require a long period of time to re-establish vegetative cover. Eventually 180 acres of lacustrine wetlands would be transformed into an estimated 30 acres of upland habitat, 140 acres of palustrine, and 10 acres of riverine wetlands.

Decommissioning – Removal of the embankment will facilitate a transition in the wetland habitats and types from lacustrine to riverine. Under this alternative the transition would be quick relative to the No Action alternative. Removing exposed sediment will hasten the natural regeneration of landforms, drainage patterns, and vegetation. Eventually 180 acres of lacustrine wetlands would be transformed into an estimated 30 acres of upland habitat, 140 acres of palustrine, and 10 acres of riverine wetlands.

No impacts would occur to the fen wetlands around the reservoir or on the existing emergency spillway. The trees located immediately downstream from the dam would not be impacted with this alternative.

Rehabilitation of Renwick Dam – The wetland composition that has evolved over the past 43 years will continue. Established vegetation will continue to provide beneficial function associated with wetlands in North Dakota (i.e., water quality enhancement, wildlife habitat, etc.).

Due to the estimated 10-15 years of the Sponsors and the park operating the reservoir pool level at elevation 971 MSL, via using splash boards, the impacts to the fen wetlands are negligible and immeasurable. The hydrophytic vegetation unique to the fen areas has been replaced with other macrophytes or water. The hydrology of the fen wetlands area has been dramatically altered prior to planning this rehabilitation project.

The trees located directly downstream of the dam would be removed during construction and will be mitigated. A riparian planting at a 2:1 ratio along the reservoir shoreline or along the river immediately downstream of the principle spillway will be installed.

Transportation

Existing Conditions – Renwick Dam was built in 1961 as a medium hazard class “B” dam. It was not designed to provide the level of safety required for protecting downstream homes, business, and utility and transportation systems. There are houses; roads and bridges; and commercial, elderly health care, and public buildings downstream creating the potential for loss of life.

No Action (Future without Project) – Removal of Renwick Dam will lead to increased flooding downstream on five roads and bridges. This increased flooding will require additional maintenance activities from Pembina County to ensure public safety is maintained.

Decommissioning – Removal of Renwick Dam will lead to increased flooding downstream on five roads and bridges. This increased flooding will require additional maintenance activities from Pembina County to ensure public safety is maintained.

Rehabilitation of Renwick Dam – Roads, bridges, and utility networks will continue to be protected. Expenses from normal operation and maintenance activities will continue.

Threatened and Endangered Species

Existing Conditions – Preliminary investigations revealed no breeding populations of threatened or endangered species within the project area. The US Fish and Wildlife Service and the North Dakota Parks and Recreation Department further confirmed this during interagency meetings and site visits to the watershed.

No Action (Future without Project) – There will be no effect on this resource concern under this alternative.

Decommissioning – There will be no effect on this resource concern under this alternative.

Rehabilitation of Renwick Dam – There will be no effect on this resource concern under this alternative.

Cultural and Historic Properties

Existing Conditions – Preliminary investigations within the project area revealed no cultural or historic properties within the project area. Land disturbance has occurred through development of the area around the structure, i.e., the recreation area on the north side of reservoir and during the actual construction of the structure in the early 1960s.

No Action (Future without Project) - There will be no effect on this resource concern under this alternative.

Decommissioning - There will be no effect on this resource concern under this alternative.

Rehabilitation of Renwick Dam - A summary of the project, accompanied by maps and aerial photographs, was provided to the North Dakota State Historic Preservation Office (SHPO) on August 31, 2001, with a request for concurrence. As a result, passive concurrence from the North Dakota SHPO has been received. The probability of discovering a new site is low but if cultural resources are encountered during the construction activities associated with rehabilitation of the structure, procedures outlined in NRCS General Manual (GM) 420, Part 401 and NRCS Cultural Resources Handbook (GM 420, Part 601) will be followed.

Air Quality

Existing Conditions - Air quality in the Renwick Dam area is generally regarded as good.

No Action (Future without Project) - There will be no long-term effect on this resource concern under this alternative; however, there would be some short-term negative effects associated with the construction process itself (i.e., increased dust, exhaust, use of fossil fuels, etc.).

Decommissioning - There will be no long-term effect on this resource concern under this alternative; however, there would be some short-term negative effects associated with the construction process itself (i.e., increased dust, exhaust, use of fossil fuels, etc.).

Rehabilitation of Renwick Dam - There will be no long-term effect on this resource concern under this alternative; however, there would be some short-term negative effects associated with the construction process itself (i.e., increased dust, exhaust, use of fossil fuels, etc.).

Landscape Resources (Aesthetics)

Existing Conditions - The landscape resource will remain the same.

No Action (Future without Project) - The area will lose most of the reservoir, but over time the dewatered part would re-vegetate and provide a green area with the Tongue River winding its way through the old reservoir bed. The structure holding the current sediment in place would not be aesthetically pleasing.

Decommissioning - The area will lose most of the reservoir, but over time the dewatered part would re-vegetate and provide a green area with the Tongue River winding its way through the old reservoir bed. The structure holding the current sediment in place would not be aesthetically pleasing.

Rehabilitation of Renwick Dam - A new concrete auxiliary spillway will replace the grass covered auxiliary spillway. There will be a loss of native woodland below the embankment. The new structure will look more like an urban and built-up area than the existing spillway.

Prime Farmland

Existing Conditions - Renwick Dam currently protects thousands of acres of prime farmlands in the downstream floodplain below the structure.

No Action (Future without Project) - Flooding would occur on thousands of acres of downstream prime farmlands.

Decommissioning - Flooding would occur on thousands of acres of downstream prime farmlands.

Rehabilitation of Renwick Dam – Flood protection for prime farmland below the structure would continue for a minimum of 100 years. No prime farmland will be inundated with the raising of the permanent pool elevation by one foot.

Comparison Table

The following table summarizes and compares the features of the four alternatives.

Table E. Summary and Comparison of Candidate Plans

Effects	No Action	Decommission	Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on Face of Dam) (NED)	Structural – Roller Compacted Concrete Spillway – (Park Entrance Road on top of Dam)
Measures	Renwick Dam deteriorates; SWC mandates removal at WRD expense	Controlled breach of Renwick Dam	Upgrade Renwick Dam to meet dam safety criteria	Upgrade Renwick Dam to meet dam safety criteria
Project Investment	\$2,300,000	\$2,300,000	\$5,646,700	\$5,416,700
National Economic Development Account				
Beneficial Annual	\$0	\$0	\$910,800	\$910,800
Adverse Annual (includes O&M)	\$130,200	\$130,200	\$319,600	\$306,600
Net Beneficial	\$(130,200)	(\$130,200)	\$591,200	\$604,200
Environmental Quality Account				
Fish and Wildlife Habitats	Loss of 204 acres of aquatic habitat	Loss of 204 acres of aquatic habitat	Maintain current habitat for 100 years	Maintain current habitat for 100 years
Sedimentation	Return to pre-dam erosion/sediment delivered to streams	Return to pre-dam erosion/sediment delivered to streams	Allow for additional 100 years of sediment trapping.	Allow for additional 100 years of sediment trapping.
Water Supply	Loss of 204 acre lake. Loss of emergency water supply for City of Cavalier	Loss of 204 acre lake. Loss of emergency water supply for City of Cavalier	Increase reservoir size. Maintain emergency water supply for City of Cavalier	Increase reservoir size. Maintain emergency water supply for City of Cavalier
Water Quality	Decreased due to more sediment in streams	Decreased due to more sediment in streams	Protected due to sediment trapping in reservoir	Protected due to sediment trapping in reservoir
Wetlands	Transition to Riverine	Transition to Riverine	Maintain current wetlands	Maintain current wetlands
T&E Species	No Effect	No Effect	No Effect	No Effect
Other Social Effects Account				
Public Safety	Slight increased risk due to increased flooding	Slight increased risk due to increased flooding	Risks are decreased due to less chance of dam failure	Risks are decreased due to less chance of dam failure
Property Values	Value could decrease	Value could decrease	Values protected	Values protected
Recreation	Loss of approximately 118,900 annual user days for Icelandic State Park	Loss of approximately 118,900 annual user days for Icelandic State Park	Approximately 118,900 annual user days for Icelandic State Park protected	Approximately 118,900 annual user days for Icelandic State Park protected
Transportation	Increased maintenance on roads and bridges	Increased maintenance on roads and bridges	Maintenance on downstream roads and bridges maintained at existing levels	Maintenance on downstream roads and bridges maintained at existing levels
Regional Economic Development Account (Positive Effects/Negative Effects Annualized)				
Region	\$91,900 / \$130,200	\$91,900 / \$45,000	\$1,262,600 / \$114,300	\$1,253,400 / \$109,500
Rest of North Dakota	\$12,200 / \$0	\$12,200 / \$0	\$183,000 / \$0	\$181,800 / \$0
Rest of Nation	\$0 / \$ 104,000	\$0 / \$ 189,300	\$0 / \$ 740,100	\$0 / \$ 721,400

Risk and Uncertainty

Assessments, considerations, and calculations in this plan are based on a 100-year evaluation period. Assessments and evaluations of sediment storage capacity and material components have concluded the service life of Renwick Dam will continue beyond 2102, which is well beyond the original service life of 2012.

Impacts of each evaluated alternative were identified based on the occurrence of storm events equal to or less than the 100-year storm event. Assessed property values and county averages were used to identify the value of potential damages. Actual damages occurring from the 100 year storm event could realistically be much higher depending on rainfall duration, topography, future development, and other factors.

Population increases within Pembina County over the next 50 years could cause transportation and utility facilities to reach their maximum handling capacity. Based on recent trends, it is likely that future upgrades and additional infrastructure will be built within or near the watershed. However, because the location is uncertain for any future development, the potential damages to roads, bridges and utilities that were evaluated were based on current conditions within the watershed and downstream of Renwick Dam.

Recreation values were estimated by identifying general recreation activities and the ND Parks and Recreation average of 118,900 user days for Icelandic State Park.

The objective of this project is to meet applicable NRCS and State of North Dakota public health and safety standards associated with watershed dams. By meeting all NRCS standards and criteria for watershed dams, all of the State of North Dakota standards will be met as well.

From a financing and administration stand point, Pembina County has committed to NRCS they will be able to fund 35 percent of the sponsor cost share amount to complete installation of the selected alternative and also perform the required maintenance on the upgraded structure for the next 100 years.

Rationale for Recommended Plan

The Structural – Roller Compacted Concrete Auxiliary Spillway – (Park Entrance Road on Face of Dam) (NED Plan) Alternative was developed to comply with dam safety criteria and to accommodate the maximum number of resource concerns identified during the initial scoping process of the first public meeting. When compared against the No Action, Decommission, and the other Structural – Roller Compacted Concrete Auxiliary Spillway – (Park Entrance Road on Top of Dam) structural alternative, the Recommended Alternative NED plan was identified to be the more acceptable alternative to the public and Water Management Council and was subsequently recommended to the Project Sponsors. The Structural – Roller Compacted Concrete Auxiliary Spillway – (Park Entrance Road on Face of Dam) (NED Plan) Alternative meets the Sponsor's objectives of bringing Renwick Dam into compliance with current dam safety criteria, maintaining the current 100-year floodplain, and addressing the resource concerns identified by the public.

Consultation and Public Participation

Project Sponsors

Original sponsoring organizations include the Pembina County Water Resource District, Pembina County Soil Conservation District, and the Cavalier County Soil Conservation District. At the initiation of the planning process, meetings were held with representatives of the original sponsoring organizations to ascertain their interests and concerns regarding the Tongue River Watershed. The Pembina County Water Resource District agreed to serve as lead sponsor, being responsible for leading the planning process with assistance from NRCS. As lead sponsor they also agreed to provide non-federal cost-share, property rights, operation and maintenance, and conduct public participation during the planning process. Meetings with the project Sponsors were held throughout the planning process. Project Sponsors provided representation at planning team, technical advisory and public meetings. See Appendix E for a list of public and Water Management Council meeting dates.

Interdisciplinary Planning Team

An Interdisciplinary Planning Team provided the "technical" administration of this project. Technical administration includes tasks pursuant to the NRCS nine-step planning process, and planning procedures outlined in the NRCS-National Planning Procedures Handbook. Examples of tasks completed by the Planning Team include, but are not limited to, Preliminary Investigations, Hydrologic Analysis, Reservoir Sedimentation Surveys, Economic Analysis, Land Resource Surveys, Riparian Surveys, Formulating and Evaluating Alternatives, and Writing the Watershed Plan - Environmental Assessment. Data collected from partner agencies, databases, landowners, and others throughout the entire planning process were evaluated at Watershed Management Council meetings. Informal discussions amongst the planning team, partner agencies, and landowners were conducted throughout the entire planning period.

Watershed Management Council

A Watershed Management Council (WMC) was developed to aid the Sponsors and Planning Team with the planning process. Fifteen meetings were held in the time period of May 22, 2003, through September 26, 2005.

A WMC and Sponsor tour (see Figure 5) was conducted on June 27, 2005. Participants had the opportunity to view fen wetlands adjacent to the permanent pool, review the watershed area above Renwick Dam, and also to see a flood control structure during the construction phase in a nearby watershed project.

The following agencies and organizations were involved in the development of this plan and provided representation on the Watershed Management Council:

- Cavalier Area Chamber of Commerce
- Cavalier County Township Officers Association
- Cavalier County Water Resource District
- Cavalier Country Club
- City of Cavalier
- Irrigation Caucus
- Landowners Association of North Dakota (LAND)
- Rendezvous Region
- North Valley Water District
- Northeastern North Dakota Heritage Association
- Pembina County and Area Sportsman's Club
- Pembina County Commissioners
- Pembina County Farm Bureau
- Pembina County Township Officers Association
- North Dakota Parks and Recreation Department

Figure 5. Watershed Tour Group - WMC Members and NRCS Personnel

Public Participation

A public meeting was held on April 16, 2002, to explain the Aging Dams Program and to scope resource problems, issues, and concerns of local residents associated with the Renwick Dam rehabilitation project. Potential alternative solutions to bring Renwick Dam into compliance with current dam safety criteria were also presented by NRCS. Through a nominal group process, meeting participants provided input on issues and concerns to be considered in the planning process, and identified the most socially acceptable alternative solution. See Appendix E-Public Meeting Priority Concerns.

A second public meeting was held on April 15, 2003, in Langdon to summarize planning accomplishments, convey results of the reservoir sedimentation survey, and present various structural alternatives.

Plan Development and Review

A Technical Review Draft of the Watershed Plan, Environmental Assessment (EA), was submitted to the NRCS-National Water Management Center, Project Sponsors, Interdisciplinary Planning Team, Interagency Watershed Committee, and Water Management Council.

A Final Draft was distributed for interagency and public review to appropriate local, State, and Federal agencies and other interested groups. The availability of the Final Draft was publicized in the Pembina and Cavalier official newspapers. After a 45-day review period, comments were incorporated into the Final Supplemental Watershed Plan, EA. The notice of availability of the Finding of No Significant Impact (FONSI) was published in the Federal Register.

Recommended Plan

Purpose

The purpose of this Watershed Plan is *to meet applicable NRCS and State of North Dakota standards for public health and safety at Tongue River Watershed Site M-4*. In doing this, the downstream risk to human life and flooding is reduced. The recommended plan will accomplish this objective by meeting all applicable dam safety and flood insurance criteria.

Measures to be Installed

This recommended plan consists of constructing a roller compacted concrete (RCC) spillway through the existing dam, similar to the one shown in Figure 6. The RCC spillway's purpose is to convey the design flood runoff safely through the reservoir without overtopping the earthen embankment. A roller compacted concrete spillway is similar to conventional concrete, yet its material properties allow it to be worked and hauled by traditional earth moving equipment. As designed in this watershed plan, Renwick Dam will meet all current NRCS and State of North Dakota dam safety and performance standards.

Figure 6. Example of RCC Spillway with Access Road on Upstream Side of Embankment



The embankment will be partially excavated to design grades for construction of a 500-foot-wide auxiliary RCC spillway. The RCC spillway will be constructed as a broad-crested weir at an elevation of 983.3 feet MSL. Material excavated from the embankment to construct the spillway will be used as earth-fill to construct a dike in the existing auxiliary spillway and to raise the top of the embankment. Additional borrow materials will be needed to meet construction needs. Borrow area(s) will be away from the project site. Sites will be identified during the design phase of the project. A cultural resources inventory will be completed on the borrow site(s) and their respective ingress/egress routes.

The earthen embankment will be raised to an elevation of 994.4 feet MSL. A 28 foot wide, two lane access road to camp and recreation facilities on the north side of Icelandic State Park will be constructed on the upstream side of the embankment. The access road will be located between the permanent pool and RCC spillway. The elevation of the access road will be approximately 11 feet above the permanent pool.

The low stage orifice of the principal spillway will be raised one foot to elevation 971.0 feet MSL. This is the same elevation the dam was operated at for a number of years in the past. Due to the lake being operated at this level in the past, no mitigation would be necessary for impacted land up to elevation 971.0 feet MSL.

The following table compares the original structure as built to the planned structure after rehabilitation.

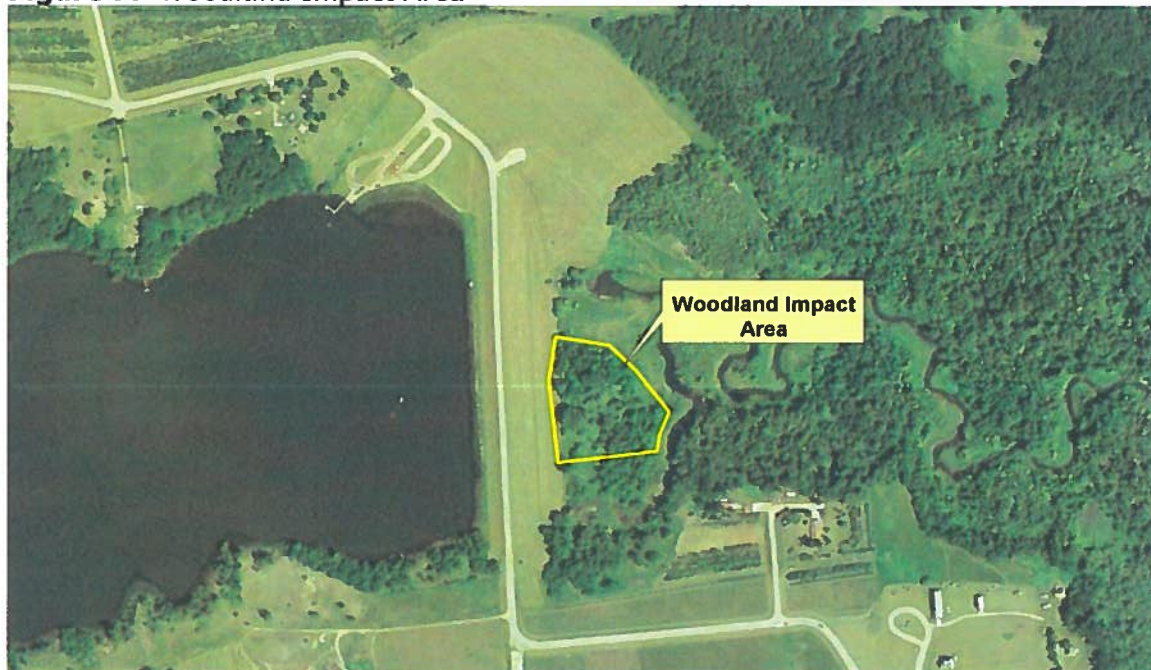
Table F. Comparison of Structural Physical Data

<u>Tongue River M-4</u>	<u>Unit</u>	<u>As Built</u>	<u>Planned</u>
Surface Area	Acres	204	220
Elevation, Top of Dam	MSL	989.0	994.4
Elevation, Principal Spillway (Low Stage)	MSL	970.0	971.0
Elevation, Auxiliary Spillway	MSL	982.8	983.3
Principal Spillway	Type	Concrete	Concrete
Auxiliary Spillway	Type	Vegetated	Concrete
Auxiliary Spillway Width	Feet	400	500
Sediment Storage	Acre-Feet	303	508

Mitigation

The loss of an estimated two acres of native woodland (area shown in Figure 7) will be mitigated at a 2:1 ratio. The native woodland will be removed and either burned on an acceptable site or used as materials for shoreline or streambank stabilization efforts. The estimated 4.0 acres mitigation tree and shrub planting will use native plants. The planting(s) will be established as riparian plantings on public lands along the reservoir shoreline or along the Tongue River immediately downstream of the spillway.

Figure 7. Woodland Impact Area



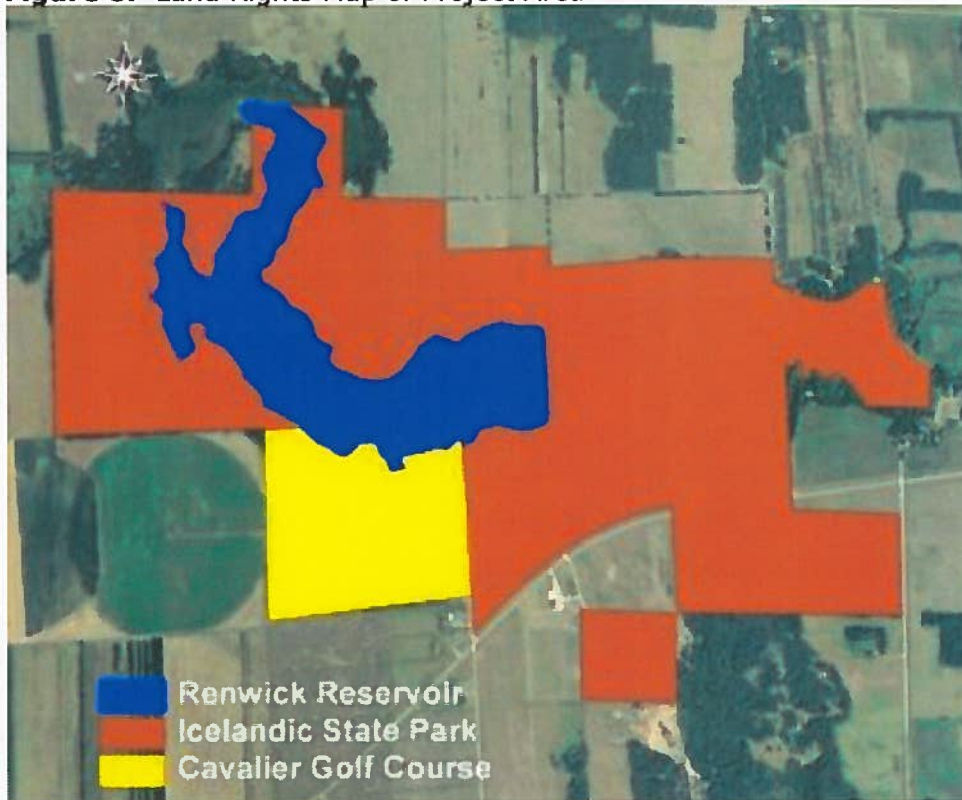
Permits and Compliance

Installation of the recommended plan will bring Renwick Dam into compliance with current dam safety criteria. Additional flood easements will not be necessary. Current flood pool easements are for an elevation at 982.8 feet MSL. New flood pool crest elevation will be 983.3 feet MSL. There will be no relocation of houses or buildings involved with installation of the project measures.

The Pembina County Water Resource Board will adopt, administer, and enforce management regulations for the purpose of prohibiting future development in the flood pool of Renwick Dam.

The one foot rise in permanent pool elevation will impact acres not currently owned by Pembina County Water Resource Board. It is anticipated approximately 20 additional acres will need to be purchased in fee title for lands inundated by the permanent pool. The following figure shows the approximate land ownership adjacent to the reservoir. An area in the northwest portion of the reservoir is currently in private ownership.

Figure 8. Land Rights Map of Project Area



The Sponsors will obtain Federal and State permits for construction and the Clean Water Act prior to construction.

The following table shows the effect of the preferred alternative on resources of principal national recognition.

Table G. Effects of the Preferred Alternative on Resources of Principal National Recognition.

Types of Resources	Principal Sources of National Recognition	Measurement of effects Resource Gain or Loss
Air quality	Clean Air Act, as amended (42 U.S.C.1857b. et seq.).	No Effect long-term effect. Short term resource impact during construction.
Areas of particular concern within the coastal zone	Coastal Zone management act of 1973, as amended (16 U.S.C. 1451 et seq.).	Not Applicable.
Endangered and Threatened species critical habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).	No Effect.
Fish and Wildlife habitat	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.).	Maintain. Protection of existing habitats. Approximately 20 acres of upland will be converted to lacustrine wetlands.
Floodplains	Executive Order 11988, Flood Plain Management	Maintain. Sponsors will develop emergency evacuation plan. Floodplain will remain in same condition prior to project implementation.
Historic and cultural properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. Sec 470 et seq.).	No Effect. SHPO and THPO have been consulted.
Prime and unique farmland	CEQ Memorandum of August 1,1980; Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act	No Effect.
Water quality	Clean Water Act of 1977 (33U.S.C. 1251 et seq.).	Maintain. Reservoir will continue to accumulate and trap sediment and nutrients.
Wetlands	Executive Order 11990, Protection of Wetlands Clean Water Act of 1977(42 U.S.C 1857h-7, et seq.).	Effectuated. Wetland areas upstream of reservoir will be protected. The stream below the dam may be impacted temporarily during construction. No draining or filling of wetlands will occur. An additional 20 acres of lacustrine wetlands will be created.
Wild and scenic rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271 et seq.).	Not Applicable.

Costs

Estimated costs for installing the project are shown in Tables 1 and 2 (Appendix A). Total average annual costs are shown in Table 4 (Appendix A). The watershed agreement shows the actual cost sharing between Public Law 106-472 funds and other funds.

Installation and Financing

The RCC spillway will be installed in year one of the project agreement period. During installation, equipment will only be operated on special circumstances during the weekends from Memorial Day through Labor Day. Vegetation will be established immediately following construction on all land disturbed by construction activities. Appropriate plants for erosion control and wildlife habitat will be selected based upon the installation season, soils, surrounding vegetation, and Sponsor preference.

The mitigation tree and shrub planting will use native plants. The four acre planting(s) will be established as riparian plantings on public lands along the reservoir shoreline or downstream of the embankment along the Tongue River.

NRCS will be responsible for the following:

- Providing contract administration technical assistance.
- Providing construction management technical assistance (Inspector, Contracting Officer Technical Representative).
- Providing financial assistance equal to 65 percent of project costs, not to exceed 100 percent of actual construction costs.
- Certifying completion of all installed measures.
- Executing a Project Agreement with project Sponsors to obligate funds for cost-share payments.

Pembina County Water Resource Board will be responsible for the following:

- Installation of all planned structural measures.
- Providing financial assistance at a rate equal to, or greater than, 35 percent of project costs.
- Securing all needed permits, easements, and rights for installation, operation, and maintenance.
- Providing local administrative services necessary for installation of the project.
- Executing a Memorandum of Understanding with NRCS to provide a framework where cost-share funds are accredited,
- Executing an Operation and Maintenance (O&M) Agreement for Renwick Dam with NRCS.
- Executing a Project Agreement with NRCS to obligate funds for cost-share payments.
- Administering and enforcing adopted floodplain management regulations.
- Securing needed easements and land rights for installation, operation, and maintenance.
- Develop an Emergency Action Plan.

Cavalier County Soil Conservation District and Pembina County Soil Conservation District will be responsible for the following:

- Installation of land treatment measures to insure 50% or more of the watershed is adequately treated.
- Executing a Memorandum of Understanding with NRCS to provide a framework within which cost-share funds are accredited.

Other Organizations

- No other organizations other than Sponsors and NRCS have any responsibilities in carrying out this plan.

Operation, Maintenance, and Replacement

Measures installed in this plan, and previously installed measures, will be operated and maintained by the Sponsors with technical assistance from Federal, State, and local agencies in accordance with their delegated authority. A new O&M agreement will be developed for Renwick Dam utilizing the NRCS-National Operation and Maintenance Manual, and will be executed prior to signing project agreements. The O&M agreement will specify responsibilities of the Sponsors and include detailed provisions for retention, use, and disposal of property acquired or improved with PL 106-472 cost sharing. Provisions will be made for free access to district, State, and Federal representatives to inspect all structural measures and their appurtenances at any time. The term of the agreement(s) will be 100 years, the service life expectancy of the project.

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Appendix A – Tables 1-6

Table 1 - Estimated Installation Cost

Renwick Dam – M-4
 Tongue River Watershed, North Dakota
 (Dollars) ^{1/}

Installation Cost Item	Unit	Number	Estimated cost (dollars) ^{1/}		
			Federal Funds	Other Funds	Total ^{2/}
Rehabilitation of Structure M-4	No	1	\$3,818,800	\$1,597,900	\$5,416,700
Total Project			\$3,818,800	\$1,597,900	\$5,416,700

^{1/} 2005 Prices.

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^{2/} Federal funds include NRCS engineering services cost (\$470,400) and project administration cost (\$230,500) which are not included when calculating eligible Federal cost-share; therefore, Federal cost-share is based on estimated rehabilitation cost of \$4,796,800.

Table 2 - Estimated Cost Distribution – Structural and Non-Structural Measures

Renwick Dam – M-4
Tongue River Watershed, North Dakota
(Dollars) ^{1/}

Item	Installation Costs – Federal Funds ^{1/}					Installation Costs - Other Funds ^{1/}							Total Installation Cost		
	Construction ^{2/}	Engineering ^{3/}	Real Property Rights	Relocation Payments	Project Administration ^{4/}	Total Federal Cost	Construction ^{2/}	Engineering	Real Property Rights ^{4/}	Natural Resource Rights	Relocation Payments	Required Permits		Project Administration ^{2/}	Total Non-Federal Cost
Rehabilitation of Structure M-4	\$3,117,900	\$470,400	\$0	\$0	\$230,500	\$3,818,800	\$1,336,100	\$0	\$256,800	\$0	\$0	\$0	\$5,000	\$1,597,900	\$5,416,700

March 2006

^{1/} Price Base 2005^{2/} Includes \$0 for relocation assistance advisory service.^{3/} Includes \$0 of Federal funds and \$0 of non-federal funds for cultural resource protection and mitigation measures.^{4/} Includes \$0 for real property costs for mitigation, \$6,800 for land rights, and \$250,000 for construction of road.^{5/} Federal engineering services cost (\$470,400) and project administration cost (\$230,500) are not included when calculating eligible Federal cost-share; therefore, federal cost-share is based on the estimated rehabilitation cost of \$4,796,800.

Table 3 - Structural Data – Dam with Planned Storage Capacity

Renwick Dam – M-4
Tongue River Watershed, North Dakota

Item	Unit	Amount
Class of Structure		C
Seismic Zone		1
Uncontrolled Drainage Area	Sq. Mi.	53.6
Controlled Drainage Area	Sq. Mi.	91.4
Total Drainage Area	Sq. Mi.	145.0
Condition II Curve Number		72
Time of Concentration (Tc)	Hours	43
Elevation, Top of Dam	Feet (MSL)	994.4
Elevation, Auxiliary Spillway Crest	Feet (MSL)	983.3
Elevation, Principal Spillway Low Stage	Feet (MSL)	971.0
Elevation, Principal Spillway High Stage	Feet (MSL)	978.3
Auxiliary Spillway Type		RCC ¹
Auxiliary Spillway Bottom Width	Feet	500
Auxiliary Spillway Exit Slope	%	25
Maximum Height of Dam	Feet	53
Volume of Fill	Cu. Yd.	385,000 ²
Total Capacity ³	Ac. Ft.	12,000
Total Capacity ⁴	Ac. Ft.	5,500
Sediment, Submerged	Ac. Ft.	508
Sediment, Aerated	Ac. Ft.	0
Beneficial Use (Wildlife)	Ac. Ft.	922
Floodwater Retarding	Ac. Ft.	4,070
Surface Area		
Sediment Pool	Acres	85
Permanent Pool	Acres	225
Floodwater Retarding Pool	Acres	430
Principal Spillway Design		
Rainfall Volume, (1day)	Inches	4.54
Rainfall Volume, (10 day)	Inches	8.5
Runoff Volume, (10 day)	Inches	4.7
Capacity (low-stage max)	CFS	387
Capacity (high-stage max)	CFS	1,200
Dimension	Feet	6' x 6' Box
Conduit Type		Reinforced Concrete
Frequency of Operation, Auxiliary Spillway	%	1
Auxiliary Spillway Hydrograph		
Rainfall Volume	Inches	N/A
Runoff Volume	Inches	N/A
Storm Duration	Hours	N/A
Velocity of Flow (Ve)	Ft./Sec.	N/A
Maximum Surface Elevation	Feet (MSL)	N/A
Freeboard Hydrograph		
Rainfall Volume	Inches	20.0-26.5 ⁵
Runoff Volume	Inches	19.0
Storm Duration	Hours	72
Maximum Elevation	Feet	994.4
Bulk Length	Feet	N/A (Concrete)
Capacity		
Sediment	Inches	0.18
Beneficial Use (Wildlife)	Inches	0.32
Floodwater Retarding	Inches	1.42

March 2006

¹ Roller Compacted Concrete² Includes existing embankment plus raise to 994.4 plus dike across existing auxiliary spillway³ Top of Dam⁴ Crest of Auxiliary Spillway⁵ HMR 52 Isolines

Table 4 - Estimated Average Annual NED Costs

Renwick Dam – M-4
Tongue River Watershed, North Dakota
(Dollars) ^{1/}

Evaluation Unit	Project Outlays		Total
	Installation Costs (Amortized)	Operation, Maintenance, and Replacement	
Rehabilitation of Structure M-4	\$279,500	\$27,100	\$306,600
TOTAL	\$279,500	\$27,100	\$306,600

March 2006

^{1/} Interest rate is 5.125 percent with a 100-year period of analysis and 2005 price base.

Table 5 - Estimated Average Annual Flood Damage Reduction Benefits

Renwick Dam – M-4
Tongue River Watershed, North Dakota
(Dollars) ^{1/}

Item	Average Annual Damages Without Project	Average Annual Damages With Project	Average Annual Benefits
Agricultural			
Crop Loss	\$367,300	\$230,800	\$136,500
Other Agriculture	\$17,700	\$11,100	\$6,600
Road and Bridge	\$5,900	\$4,600	\$1,300
Residential and Commercial Property	\$492,700	\$180,500	\$312,200
Other	\$2,400	\$1,900	\$500
Total	\$886,000	\$428,900	\$457,100

March 2006

1/ Price Base, 2005

Table 6 - Comparison of NED Benefits and Costs

Renwick Dam – M-4
Tongue River Watershed, North Dakota
(Dollars) ^{1/}

Evaluation Unit	Average Annual Benefits			Average Annual Cost	Benefit Cost Ratio
	Damage Reduction (Agricultural)	Recreation ^{2/}	Total		
Rehabilitation of Structure M-4	\$457,100	\$453,700	\$910,800	\$306,600	3.0:1.0
Total	\$457,100	\$453,700	\$910,800	\$306,600	3.0:1.0

1/ Price Base, 2005

March 2006

2/ Recreation is not a purpose of the plan, but is a secondary benefit. A table showing the Comparison of NED Benefits and Costs with recreation excluded can be found in the Economics Section of Appendix D.

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Appendix B – Comments and Responses

Comment Letter from North Dakota Department of Commerce

North Dakota
Department of Commerce

Community Services

Economic
Development & Finance

Tourism

Workforce Development



Century Center

1600 E. Century Ave

Suite 2

PO Box 2057

Bismarck, ND 58502-2057

Phone 701-328-5300

Fax 701-328-5320

www.ndcommerce.com



April 18, 2006

J.R. Flores
Natural Resources Conservation Service
PO Box 1458
Bismarck, ND 58502-1458

"Letter of Clearance" In Conformance with the North Dakota Federal Program
Review System - State Application Identifier No.: ND060418-0153

Dear Mr. Flores:

SUBJECT: Draft Supplemental Watershed Plan No. 2 and Environmental Assessment
for the Tongue River Watershed in Cavalier and Pembina Counties, ND

The above referenced draft has been reviewed through the North Dakota Federal
Program Review Process. As a result of the review, clearance is given to the project
only with respect to this consultation process.

If the proposed project changes in duration, scope, description, budget, location or
area of impact, from the project description submitted for review, then it is necessary
to submit a copy of the completed application to this office for further review.

We also request the opportunity for complete review of applications for renewal or
continuation grants within one year after the date of this letter.

Please use the above SAI number for reference to the above project with this office.
Your continued cooperation in the review process is much appreciated.

Sincerely,

James R. Boyd
Manager of Governmental Services
Division of Community Services

cmw

Response Letter to North Dakota Department of Commerce

United States Department of Agriculture



Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

August 15, 2006

James R. Boyd
North Dakota Department of Commerce
Division of Community Services
1600 E. Century Avenue
PO Box 2057
Bismarck, ND 58502-2057

Dear Mr. Boyd:

Thank you for reviewing and commenting on the Interagency Review Draft, Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed. Your agency's support for the project is appreciated.

Any changes in duration, scope, description, budget, location or area of impact, from the project description submitted for review will be forwarded to your agency.

The Natural Resources Conservation Service (NRCS) looks forward to your continued cooperation in the implementation of this project. If you have additional questions regarding the project, please contact James Schmidt, Assistant State Conservationist for Water Resources at (701) 530-2074.

Sincerely,

A handwritten signature in black ink that reads "James Schmidt".

ACTING J.R. FLORES
State Conservationist

cc:

James Schmidt, ASTC (WR), NRCS, Bismarck, ND

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Comment Letter from State Historical Society of North Dakota

STATE
HISTORICAL
SOCIETY
OF NORTH DAKOTA

John Hoeven
Governor of North Dakota

North Dakota
State Historical Board

Marvin L. Kaiser
Williston - President

Albert I. Berger
Grand Forks - Vice President

Chester E. Nelson, Jr.
Bismarck - Secretary

Gerold Gernholz
Valley City

A. Ruric Todd III
Jamestown

Diane K. Larson
Bismarck

John E. Von Rueden
Bismarck

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Douglass Prchal
Director
Parks and Recreation
Department

David A. Sprynczynatyk
Director
Department of
Transportation

Merlan E. Paaverud, Jr.
Director

Accredited by the
American Association
of Museums

April 26, 2006

Mr. J. R. Flores
State Conservationist
Natural Resources Conservation Office
P.O. Box 1458
Bismarck, ND 58502-1458

ND SHPO REF.:06-0511 NRCS Supplemental Watershed Plan No. 2 and
Environmental Assessment for the Tongue River Watershed

Dear Mr. Flores:

Thanks you for your cover letter and a copy of "Supplemental Watershed Plan
No. 2 and Environmental Assessment for the Tongue River Watershed."

We thank you for the opportunity to review the project at this preliminary stage,
and we look forward to further consultation on cumulative and specific effects
with regard to the proposed Tongue River Watershed project. If you have
questions please contact Susan Quinnell at 701-328-3576, squinnell@state.nd.us
or Paul Picha at 328-3574.

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota)

Response Letter to State Historical Society of North Dakota

United States Department of Agriculture



Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

August 16, 2006

Merlan E. Paaverud, Jr.
State Historic Preservation Officer
North Dakota Heritage Center
612 East Blvd. Ave.
Bismarck, ND 58505

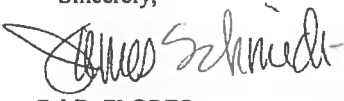
Dear Mr. Paaverud, Jr.:

Thank you for reviewing and commenting on the Interagency Review Draft, Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed, dated April 2006.

Your agency will be consulted on any and all actions having an impact on cultural resources, as indicated on pages 2, 30, 37, 49, and 64 in the above named document.

The Natural Resources Conservation Service (NRCS) looks forward to your continued cooperation in the implementation of this project. If you have additional questions regarding the project, please contact James Schmidt, Assistant State Conservationist for Water Resources at (701) 530-2074.

Sincerely,


ACTING J.R. FLORES
State Conservationist

cc:
James Schmidt, ASTC (WR), NRCS, Bismarck, ND

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Conserve, maintain, and improve our natural resources.

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Comment Letter from North Dakota Department of Health

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov



May 4, 2006

Mr. J. R. Flores
State Conservationist
Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

Re: Supplemental Watershed Plan No. 2 for Tongue River Watershed
Pembina and Cavalier Counties

Dear Mr. Flores:

This department has reviewed the information concerning the above-referenced project submitted under date of April 10, 2006, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.
2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.
3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

Environmental Health
Section Chief's Office
701.328.5150

Division of
Air Quality
701.328.5188

Division of
Municipal Facilities
701.328.5211

Division of
Waste Management
701.328.5166

Division of
Water Quality
701.328.5210

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Comment Letter from North Dakota Department of Health (cont.)

Mr. J. R. Flores

2.

May 4, 2006

4. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

These comments are based on the information provided about the project in the above-referenced submittal. The U.S. Army Corps of Engineers may require a water quality certification from this department for the project if the project is subject to their Section 404 permitting process. Any additional information which may be required by the U.S. Army Corps of Engineers under the process will be considered by this department in our determination regarding the issuance of such a certification.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,



L. David Glat, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

Comment Letter from North Dakota Department of Health (cont.)

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

**Construction and Environmental Disturbance Requirements**

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

Environmental Health
Section Chief's Office
701.328.5150

Division of
Air Quality
701.328.5188

Division of
Municipal Facilities
701.328.5211

Division of
Waste Management
701.328.5166

Division of
Water Quality
701.328.5210

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Response Letter to North Dakota Department of Health

United States Department of Agriculture



Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

August 16, 2006

L. David Glatt
North Dakota Department of Health
Environmental Health Section
Gold Seal Center
918 Divide Ave.
Bismarck, ND 58501-1947

Dear Mr. Glatt:

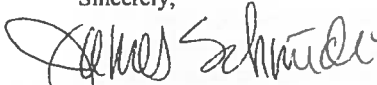
Thank you for reviewing and commenting on the Interagency Review Draft, Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed, dated April 2006.

Your concerns about air quality (fugitive dust emissions), water quality (disturbance of stream beds and banks and replacement and revegetation of any disturbed areas), and noise pollution issues will be addressed as part of the project design packet. Contract specialists and construction engineers will inform contractors about these concerns prior to and during construction.

Project sponsors will obtain all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of planned works of improvement. All disturbed areas will be re-established to vegetative species as per design specifications.

The Natural Resources Conservation Service (NRCS) looks forward to your continued cooperation in the implementation of this project. If you have additional questions regarding the project, please contact James Schmidt, Assistant State Conservationist for Water Resources at (701) 530-2074.

Sincerely,


ACTING J.R. FLORES
State Conservationist

cc:

James E. Schmidt, ASTC (WR), NRCS, Bismarck, ND

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Conserve, maintain, and improve our natural resources.

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Comment Letter from North Dakota Game and Fish Department

May 19, 2006

J.R. Flores
Natural Resources Conservation Service
220 East Rosser Avenue
Bismarck, North Dakota 58501-1458

Dear Mr. Flores:

Re: Renwick Dam Rehabilitation Review

The North Dakota Game and Fish Department has received and reviewed the Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed, Rehabilitation of Flood Water Retarding Structure M-4.

As stated in our December 22, 2005 comments, Renwick Dam is an extremely important fishery for the sportsman of North Dakota being the only public managed fishery in Pembina County. The lake is also an important component to Icelandic State Park providing water-based recreation to its constituents. Given the fact that Renwick Dam is the last of a series of ten dams on the Tongue River, a watershed management plan is an integral document to assure the watershed is managed in an environmentally friendly manner.

Although the Department believes this project will have minimal environmental impacts due in part to the past operation of the spillway, we encourage the Natural Resources Conservation Service (NRCS) to concentrate efforts to reduce sedimentation into the reservoir. Unless sedimentation is addressed in the watershed, any water quality improvements documented in the report will be rapidly offset. Therefore, we suggest mitigating the 4-acre native woodland tract upstream of the reservoir instead of downstream as suggested in the report. Upstream mitigation offers greater potential to positively influence water quality by reducing sedimentation through the implementation of buffer strips, riparian plantings or other Best Management Practices (BMP's).

The Department also recommends the NRCS implements a monitoring plan to assure the fen habitat is not negatively impacted by the rise in pool elevation. The report does not specifically state the duration Renwick Dam was operated at a higher elevation in the past, therefore any change in the fen habitat due to the rise in pool should be documented. If these special aquatic sites are impacted by the project, a mitigation plan will need to be developed.

**Comment Letter from North Dakota Game and Fish Department
(cont.)**

Finally, we believe it would be prudent for the NRCS to develop downstream development easements restricting building in the breach zone or the 100 year flood plain. These areas are subject to potential sudden and hazardous inundation due to dam failure.

Sincerely,



Michael G. McKenna

Chief

Conservation & Communication Division

blk

Response Letter to North Dakota Game and Fish Department

United States Department of Agriculture



Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

August 24, 2006

Michael G. McKenna
North Dakota Game and Fish Department
100 North Bismarck Expressway
Bismarck, ND 58501-5095

Dear Mr. McKenna:

Thank you for reviewing and commenting on the Interagency Review Draft, Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed, dated April 2006.

The Natural Resources Conservation Service (NRCS) in cooperation with the Sponsors will consider your comments as we proceed in the design of the project.

If you have additional questions regarding the project, please contact James Schmidt, Assistant State Conservationist for Water Resources at (701) 530-2074.

Sincerely,

A handwritten signature in black ink, appearing to read "J.R. Flores".

ACTING J.R. FLORES
State Conservationist

cc:
James Schmidt, ASTC (WR), NRCS, Bismarck, ND

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Comment Letter from U.S. Fish and Wildlife Service**United States Department of the Interior****FISH AND WILDLIFE SERVICE**

Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501



MAY 25 2006

Mr. J.R. Flores
State Conservationist
Natural Resources Conservation Service
P.O. Box 1458
Bismarck, North Dakota 58502-1458

Dear Mr. Flores:

The U. S. Fish and Wildlife Service (Service) has reviewed the April 2006 Supplemental Watershed Plan No. 2 and Environmental Assessment (EA) for the rehabilitation of Renwick Dam on the Tongue River in Pembina County, North Dakota. Renwick Dam was constructed in 1962 as part of the PL-566 Watershed Pilot Program in Cavalier and Pembina Counties. The objective of this project is to bring Renwick Dam into compliance with current State and Federal dam design and safety criteria. The Service provides the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) and the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.).

The project as proposed, with implementation of the mitigation measures outlined in the EA, should have minimal impact to fish and wildlife resources in the project area. The Service concurs with the Natural Resources Conservation Service's determination of "no affect" to federally listed threatened or endangered species. Under requirements of Section 7 of the Endangered Species Act, further consultation is not necessary. Should project plans change, a reassessment of impacts to threatened or endangered species is necessary.

Thank you for the opportunity to provide comments on this project. If you require further information, please contact Terry Ellsworth of my staff at (701) 250-4481, or at the letterhead address above.

Sincerely,

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Comment Letter from U.S. Fish and Wildlife Service (cont.)

2

cc: Director, ND Game & Fish Department, Bismarck
(Attn: M.. McKenna)

Response Letter to U.S. Fish and Wildlife Service

United States Department of Agriculture



Natural Resources Conservation Service
P.O. Box 1458
Bismarck, ND 58502-1458

August 16, 2006

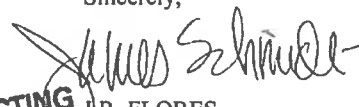
Jeffrey K. Towner
Field Supervisor
U. S. Fish and Wildlife Service
3425 Miriam Avenue
Bismarck, ND 58501

Dear Mr. Towner:

Thank you for reviewing and commenting on the Interagency Review Draft, Supplemental Watershed Plan No. 2 and Environmental Assessment for the Tongue River Watershed, dated April 2006.

The Natural Resources Conservation Service (NRCS) looks forward to your continued cooperation in the implementation of this project. If you have additional questions regarding the project, please contact James Schmidt, Assistant State Conservationist for Water Resources at (701) 530-2074.

Sincerely,


ACTING J.R. FLORES
State Conservationist

cc:
James Schmidt, ASTC (WR), NRCS, Bismarck, ND

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Conserve, maintain, and improve our natural resources.

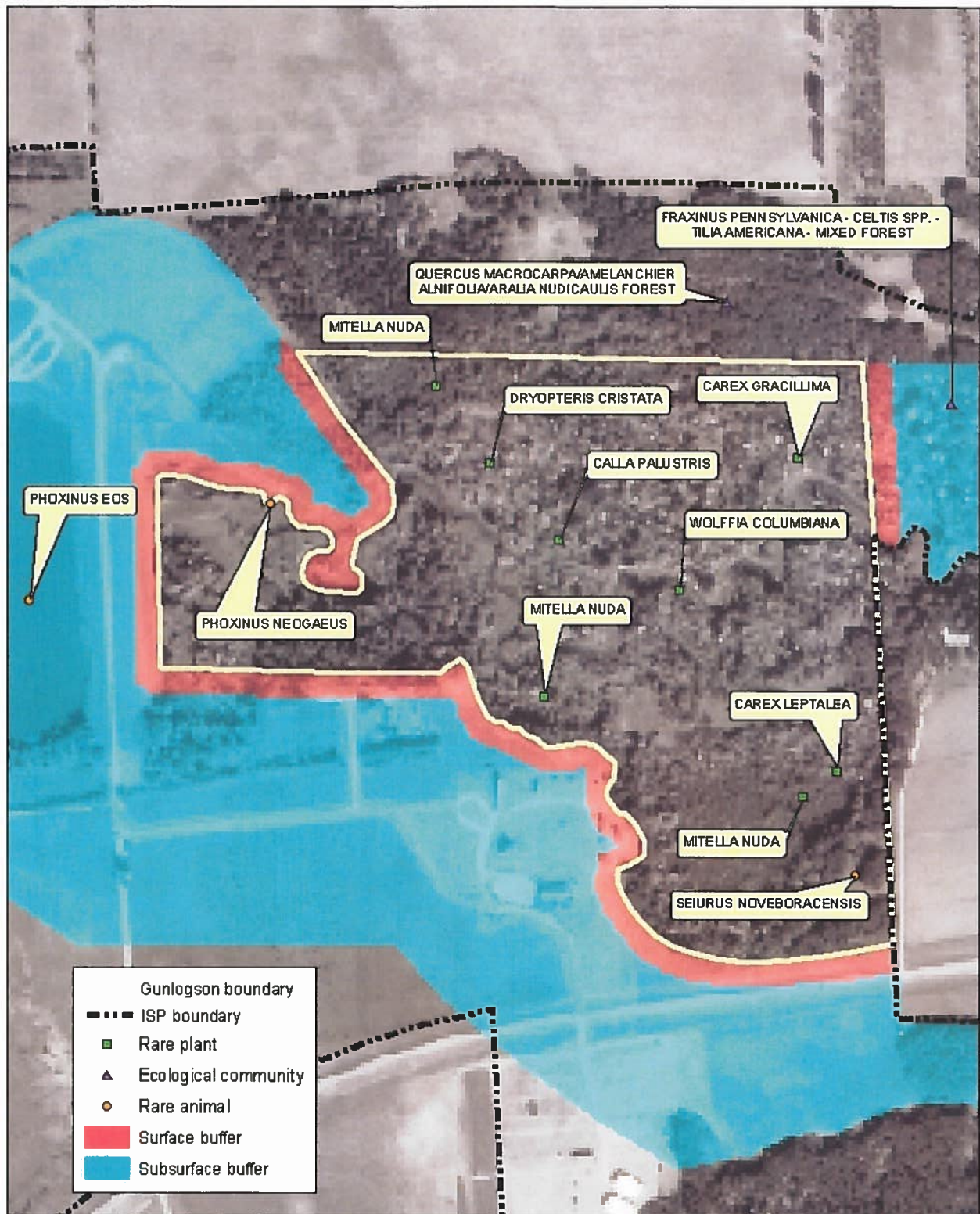
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Appendix C – Support Maps

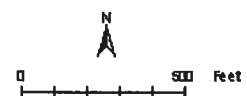
Gunlogson Nature Preserve

Renwick Dam Breach Analysis Map

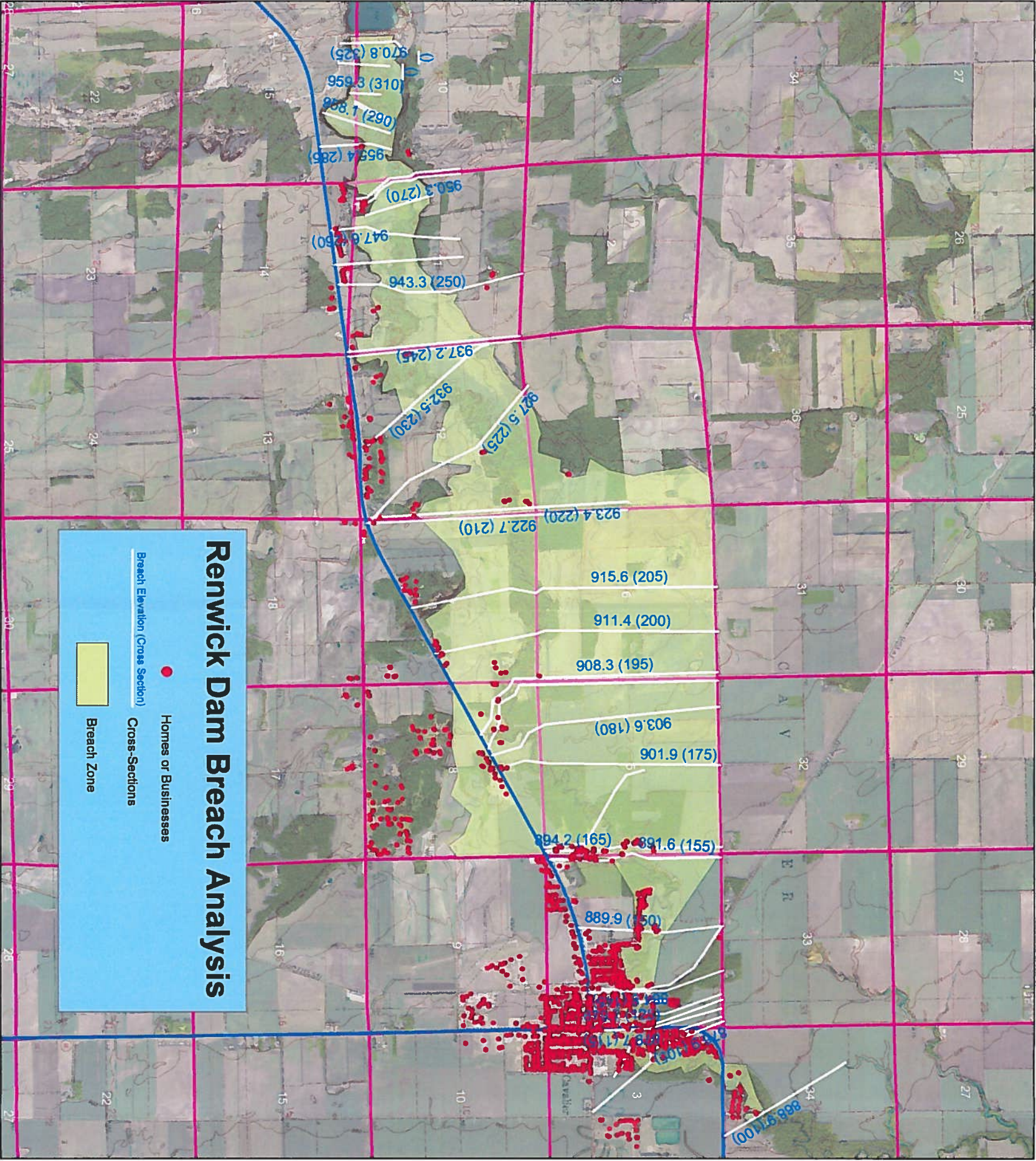
Prime, Statewide Importance, and Local Importance Soils

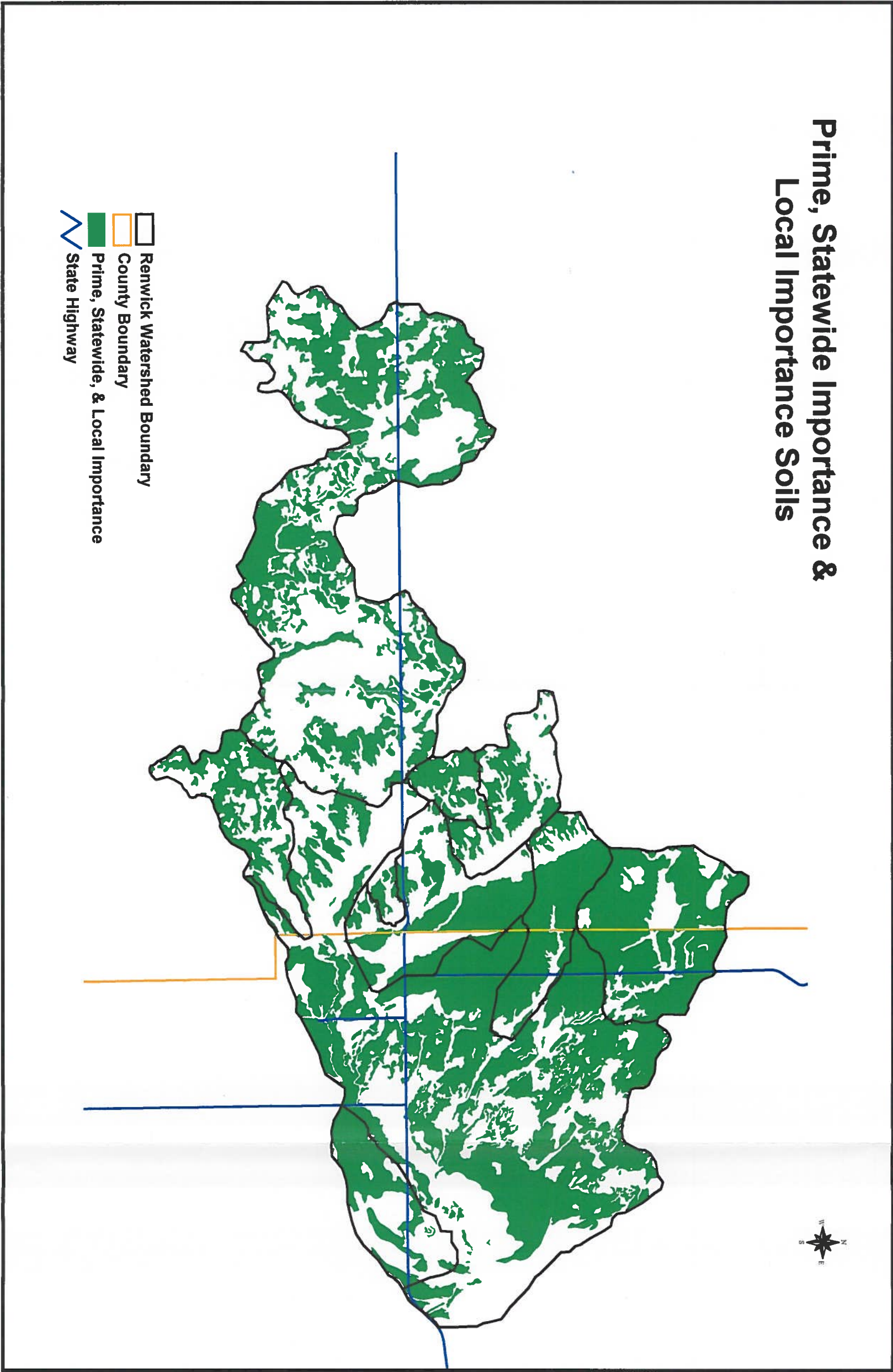


Gunlogson Nature Preserve
Icelandic State Park



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Appendix D – Investigations and Analysis Report

11/17

Cultural Resources

A review of the relevant cultural resource files located at the State Historical Society offices in Bismarck was conducted. This review established the area of the dam, the area surrounding it, and the campground located to the west, on the north side of the reservoir, have been surveyed for cultural resources. In addition, some subsurface testing has been done. These analyses reveal there are no known historic properties in the area of potential effect as far defined at this time. One cart trail is known to exist at the west end of the reservoir; the physical integrity of the trail has been considered to be low by previous workers. The consensus of the State Historical Society of North Dakota and the author of the information recording the trail is the trail is not eligible for listing on the National Register of Historic Places.

Unknowns include the location and extent of borrow areas. Additional information needs to include possible cultural resources survey in these areas, including haul routes to the construction area, as soon as these are defined. Until this is done, compliance activities related to the National Historic Preservation Act Sections 106 and 110(k) are as complete as can be accomplished. As soon as more specific information is available, it will be taken into consideration.

Geology

Preliminary geologic investigations were conducted at Renwick and Senator Young Dams on August 18-19, 2003. Work at Renwick Dam consisted of a preliminary investigation of the embankment foundation at the downstream toe of the dam. Five test holes were bored to depths of about 50 feet to characterize the materials and identify areas to be sampled in a future investigation of the dam. In addition, five test holes were bored in the existing auxiliary spillway to characterize the materials for the NRCS erosion model. In general, materials in the auxiliary spillway consist of easily eroded, fine sands, to the depth of the downstream floodplain.

Land Resources

Land resource data was collected by visual observation and by use of the ArcView GIS 3.3 computer program.

A Land Cover Survey grid route for the watershed was developed by the NRCS planning staff. The field office completed the survey on three separate occasions. The survey was conducted to determine percent of cropland residue ground cover before and after seeding and after fall tillage.

Resource information (land cover type and acres, soil type and acres, and wetland acres) was derived from data sources utilizing ArcView GIS 3.3. Figures 2, 7, 8, Appendix C – Support Maps, and Appendix F – Project Map were generated from ArcView GIS 3.3 layouts.

Economics

Many of the estimated economic values were computed based on values found in the original plan adjusted to today's dollars using appropriate economic indices. Flood damage reduction benefits were indexed for agriculture, road and bridge, and other non-agriculture damages. Neither urban flood damage reduction nor recreation was considered part of the original plan.

The residential and commercial property damage reduction benefits were analyzed using the HEC-FDA Program. These properties are downstream of Renwick Dam and include the City of Cavalier. Damages relating to downstream flooding were based on eight, 24-hour storm

flood frequencies (2-year, 5-year, 10-year, 25-year, 50-year, 100-year, 250-year, and 500-year). Assessments, considerations, and calculations in this plan are based on a 100-year evaluation period and a discount rate of 5.125 percent.

Recreation is not a purpose of the original plan, but is considered to be a very important benefit to the surrounding area. Recreation benefits are secondary benefits and were calculated using the Unit Day Value Method as described in Economic and Environmental Principles and Guidelines. Values were established for the activities provided by the park and data from North Dakota Parks and Recreation Department for user days. The following table shows what Table 6 – Comparison of NED Benefits and Costs would be without recreation used to determine the benefit-cost ratio. The benefit-cost ratio is 1.5:1.0 without recreation.

Comparison of NED Benefits and Costs (without Recreation Benefits)

Renwick Dam – M-4
Tongue River Watershed, North Dakota
(Dollars) ^{1/}

Evaluation Unit	Average Annual Benefits				Average Annual Cost	Benefit – Cost Ratio
	Damage Reduction		Recreation	Total		
	Agricultural	Non-Agricultural				
Rehabilitation of Structure M-4	\$143,100	\$314,000	\$0	\$457,100	\$306,600	1.5:1.0
Total	\$143,100	\$314,000	\$0	\$457,100	\$306,600	1.5:1.0

1/ Price Base, 2005.

2/ Recreation is not a purpose of the plan, but a secondary benefit. This table shows the Comparison of NED Benefits and Costs with recreation excluded. See Appendix 1 – Table 6 for the comparison which includes recreation.

Construction of a road entering the campground from the north was considered. The Sponsors and ND Parks and Recreation favored the road to be constructed over the dam. Costs for an entrance road from the north were calculated to be approximately three times the cost of the road over the dam (\$830,000 for north entrance versus \$250,000 for over the dam).

Engineering

Engineering planning efforts were completed to meet the following project objectives:

- Upgrade the dam to comply with minimum Federal and State dam safety requirements.
- Maintain flood control benefits.
- Maintain access to Icelandic State Park campground area.

Designed dam safety modifications include raising the dam four feet, constructing a new 500-foot-wide roller-compacted concrete (RCC) auxiliary spillway, and diking off the existing 400-foot auxiliary spillway to prevent flow passing over it in the future.

Engineering work items completed as part of the development of this planning study include:

- Gathering and reviewing existing site data.
- Identifying problems, opportunities, and concerns.
- Conducting planning studies, including:
 - Analyzing existing data.
 - Conducting an environmental evaluation.
 - Conducting field investigations to evaluate the condition of existing structures and obtain additional data (e.g., survey and geotechnical data).
 - Conducting underwater surveys for sediment yield analyses.
 - Conducting engineering, environmental, geologic, hydrologic, hydraulic, social, and economic analyses in accordance with the requirements of NRCS design criteria (e.g., National Engineering Handbook, technical releases, technical notes, design notes, SITES software, and HEC-HMS software).
- Developing design layouts and cost estimates for evaluation of design alternatives including:
 - No Action Alternative.
 - Decommission Alternative.
 - Rehabilitation Alternatives including various auxiliary spillway configurations:
 - RCC spillway.
 - Armoring existing auxiliary spillway.
- Developing inundation maps for impact comparisons associated with the proposed design modifications.
- Providing public involvement support services, including coordinating with local NRCS offices, site landowners, Sponsors, and the public; preparing presentations to the public; and attending public meetings.

Hydrology

Development and the City of Cavalier downstream of Renwick Dam necessitated that the North Dakota State Water Commission re-classify it as a high hazard dam (Class C). Dam break modeling performed for this project demonstrated that some loss of life could occur because of dam failure, confirming that status. This raised classification requires the dam meet the following basic criteria:

- The 100-year Principal Spillway Hydrograph (PSH) storm event must be contained below the top the auxiliary spillway (if earthen or vegetative); and
- The Probable Maximum Flood (PMF) must not overtop the dam.

In a cooperative study with the North Dakota State Water Commission, a hydrologic model was developed for the Tongue River Watershed. Curve numbers and times of concentration were calibrated to a June 2002 rainfall event. Aerial video, rainfall gage records, and the

stream gage on the Tongue River just downstream of Renwick Dam were used to assist in the calibration of the peak discharge and timing.

The SITES computer program was used to set 10-day drawdown elevations for the freeboard hydrograph (FBH) as well as to run the PSH event to set the elevation of the auxiliary spillway.

A HMR-52 method for developing the Probable Maximum Precipitation (PMP) event was completed for the entire Tongue River Watershed. From that PMP event, a PMF hydrograph was developed using HEC-HMS. This model was used in sizing the revised structure (setting the dam crest and spillway dimensions) and in defining impacts and benefits associated with project alternatives.

An Incremental Design Flood (IDF) process was investigated to determine if it was feasible to select a smaller design event without significantly increasing the risk to downstream homes, businesses, and infrastructure. As part of the analysis, zoning for the downstream area would be required to prevent further development downstream that would have increased the risk of damage to homes, businesses, and infrastructure. In addition to the Sponsors lack of interest in zoning, the additional costs to zone and relocate eight to twelve homes and a nursing home cause this alternative's construction costs to be more costly than the full PMF alternatives, so it was eliminated as a possibility.

In general, the tasks performed for the hydrologic study included:

- Assembly of existing relevant geographic information system (GIS) data into a project database.
- Delineation of the Tongue River Watershed.
- Estimation of rainfall depths for the 24-hour duration storm.
- Estimation of the PMP rainfall depths as per HMR-52.
- Estimation and calibration of watershed curve numbers and lag times.
- Estimation of flow rates using the computer model HEC-HMS.

Wetlands and Wildlife

Wetlands were identified adjacent to present day Renwick Dam Reservoir using criteria established in the US Army Corps of Engineers' 1987 Wetlands Delineation Manual. Fen wetlands have discharge hydrology and 8 inches or greater of organic material at the surface. Areas meeting wetland criteria were delineated using a Global Positioning System (GPS) backpack unit along the exterior boundary. Interior boundaries were estimated due to inundation of the reservoir. Separate delineations were made for wetland areas and fen areas. Fen areas on the northwest side of the reservoir are estimated at 18 acres.

An interdisciplinary team consisting of two biologists, a soil scientist, and an engineer reviewed the wetlands adjacent to the reservoir and also those at the base of the auxiliary spillway. Wetland and fen vegetation adjacent to the reservoir were impacted by an increased inundation elevation. Splashboards were installed in the principal spillway by the North Dakota State Parks Department staff beginning in approximately 1980, raising the water level by 12 inches in an effort to improve the water quality in the permanent pool for recreational purposes. With the approval of the Pembina County Water Resource District the splashboards were installed each spring after the snowmelt runoff had occurred and remained in-place during the summer months. This action was neither condoned nor opposed by NRCS for a period of approximately 15 years. In 1995, NRCS requested the splashboard installation be discontinued due to the reduction in flood storage capacity and

increased potential for emergency spillway flows. The Sponsors fully complied with the request and the splashboards are no longer used.

Based on field observations during the wetland and fen delineations, inundation impacts to fen and wetland vegetation were realized during this time period. These impacts were primarily increases in hybrid cattail, and drown-out of bog birch. As these impacts preceded dam rehabilitation evaluations, they are considered baselines for additional impacts. No additional impacts to wetland or fen vegetation or hydrology are anticipated if the present spillway elevation is increased by 12 inches as a part of rehabilitation to provide sediment storage, provided the outlet capacity removes waters above the normal pool elevation at a rate consistent with the original dam design.

Potential impacts to fen wetlands on the downstream side of the dam limit potential for increasing the “footprint” of the dam to the east. These unique wetlands take several thousand years to develop deep layers of organic material, therefore, avoidance is necessary.

Wildlife habitat impacts in the area immediately adjacent to the dam during construction will be short term and minimal, as this area exhibits low wildlife habitat quality. Protection measures similar to geotextile dams should be used to reduce erosion of the dam structure until perennial vegetation is re-established. No long-term impacts to wildlife habitat in this area are anticipated.

Borrow areas and haul roads are expected to be outside of quality wildlife habitat areas. Topsoil should be stripped from borrow areas and replaced after construction. This will ensure potential re-establishment of quality habitat, if desired, in the future. Potential erosion of material into open water, wetlands, or fens will be limited by geotextile dams or similar measures to maintain quality. Wildlife habitat impacts to these sites will be short term and minimal.

Water Quality

Water quality was assessed using chemical, physical, and biological methods.

Specialty Devices, Inc. from Plano, Texas, was contracted by NRCS to complete a detailed analysis of sediments in the reservoir. The purpose for conducting the study was due to the uncertainty of potential nutrients and heavy metals which might occur in the Renwick Dam Reservoir. This information was used in evaluation of alternatives involving sediment removal.

Field data collection operations were conducted during September 2003. The field data collection was intended to determine the extent of the sedimentation and any contaminants that may prevent the local deposition of dredge soil materials. The survey was conducted from the water and was limited to those areas that were accessible from the water. Sediment samples were collected using an SDI VibeCore D vibrating coring device.

Core samples were taken and analyzed for the reservoir. Sample analysis included testing for organochlorine pesticides and a metal screen. Analyses were also performed for phosphorus, nitrates, moisture, and ash content.

All tests for organochlorine pesticides showed levels below detection levels of 50 ppb. phosphorus and nitrate levels were low. The moisture and ash analysis tracked well with the expected dropping moisture content, sediment depth, and compaction. Heavy metal analysis showed no elevated levels. All trace metal samples showed less than 20 mg/kg.

A sediment volume was completed by Specialty Devices, Inc. for Renwick Dam Reservoir. Acoustic surveys were performed using an SDI BSS+ sediment survey system. Sediment in

the non-surveyed areas and corrections to acoustic calculation methods resulted in an estimate of the total sediment volume to be between 115 and 150 acre-feet.

The upstream reservoirs and specifically Renwick Dam Reservoir was evaluated for water chemistry through a Memorandum of Agreement (MOA) with the Red River Regional Council (RRRC), United States Geological Survey (USGS), and North Dakota Department of Health (NDDH), Division of Water Quality. Water samples were pulled on a recurring basis over parts of two years and sent to the NDDH State laboratory for analysis. USGS used permanent and temporary gauging stations to collect inflow and outflow data from the Senator Young Dam and Renwick Dam Reservoirs. Details of the analysis were published in a report titled "Tongue River Watershed Rehabilitation Assessment Project".

NRCS National Water and Climate Center, Technical Note 99-1 "Stream Visual Assessment Protocol" (SVAP), was utilized on reaches of the Tongue River above Renwick Dam by the NRCS planning staff and local field office staff. The assessment was completed on October 1-3, 2002. Five sites were evaluated. The SVAP provides an assessment based primarily on physical conditions within the assessment area. The assessment area is 12 times the active channel width. Physical conditions evaluated include:

- Channel condition
- Hydrologic alteration
- Riparian zone
- Bank stability
- Water appearance
- Nutrient enrichment
- Barriers to fish movement
- Instream fish cover
- Pools
- Invertebrate habitat
- Canopy cover
- Manure presence
- Salinity
- Riffle embeddedness
- Macroinvertebrates

At the same, the assessment team also completed a stream functional rating utilizing U.S. Department of the Interior, Bureau of Land Management, TR 1737-9 "Process for Assessing Proper Functioning Condition (PFC)". Eight stream areas above Renwick Reservoir were assessed by the team. The functional rating looks at three areas: vegetation, soils, and hydrology.

Conclusions: All the sites evaluated using the either the SVAP or PFC assessment method were found to be in fair to good condition. The assessments also revealed the Tongue River between Senator Young Dam and Renwick Dam has stabilized over 40 years of modified hydrology. The river has formed a new floodplain within the deeply incised original flood plain. Sinuosity and sediment transport appear to be in harmony with one another. The presence of wide riparian zones and species diverse vegetation, along with beaver dam activity, has allowed the river system to achieve a relatively stable state.

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Appendix E – Supporting Information

Below is listing of meetings held in development of this plan.**Sponsors Meeting with NRCS Outlining Dam Rehabilitation Program**

- March 6, 2001, Pembina County Court House, Cavalier, North Dakota

Public Meetings:

- Apr 16, 2002, Cavalier American Legion Hall, Cavalier, North Dakota
- Apr 15, 2003, Cavalier County Courthouse, Langdon, North Dakota
- Nov 1, 2005, Cavalier American Legion Hall, Cavalier, North Dakota

Water Management Council Meetings Held:

- May 22, 2003, Law Enforcement Center, Cavalier, North Dakota
- Jun 30, 2003, Law Enforcement Center, Cavalier, North Dakota
- Jul 28, 2003, Law Enforcement Center, Cavalier, North Dakota
- Aug 25, 2003, Law Enforcement Center, Cavalier, North Dakota
- Sep 29, 2003, Law Enforcement Center, Cavalier, North Dakota
- Nov 24, 2003, Law Enforcement Center, Cavalier, North Dakota
- Feb 23, 2004, Law Enforcement Center, Cavalier, North Dakota
- Mar 29, 2004, Law Enforcement Center, Cavalier, North Dakota
- Jun 3, 2004, Heritage Center, Icelandic State Park, Cavalier, North Dakota
- Aug 30, 2004, Law Enforcement Center, Cavalier, North Dakota
- Sep 28, 2004, Heritage Center, Icelandic State Park, Cavalier, North Dakota
- Dec 13, 2004, Heritage Center, Icelandic State Park, Cavalier, North Dakota
- Feb 21, 2005, Law Enforcement Center, Cavalier, North Dakota
- Jun 28, 2005, Law Enforcement Center, Cavalier, North Dakota
- Aug 29, 2005, Heritage Center, Icelandic State Park, Cavalier, North Dakota
- Sep 26, 2005, Heritage Center, Icelandic State Park, Cavalier, North Dakota

Public Meeting Priority Concerns – April 16, 2002

Economic, Social, Environmental, and Cultural Concerns	Degree of Concern ¹	Degree of Significance to the Decision Making ^{1/2}	Remarks
<u>Soil</u>			
Important Ag. Land	High	Low	No anticipated impacts.
Sedimentation	High	Medium	Concerned with reservoir storage and its effect on life of recreation facility.
Soil Erosion	Medium	Low	Impacts due to Food Security Act.
Streambank Erosion	Medium	Low	Adds to sedimentation in reservoir.
Shoreline Erosion	Medium	Low	Effects of rise in pool - bank adjacent to golf course.
<u>Water</u>			
Flood Plain Management	High	High	Protection of Cavalier and downstream residents. Future downstream development.
Ground Water	Medium	Low	
Irrigation	Medium	Low	Concern with irrigators requesting permits from existing upstream reservoirs.
MR&I Water	Medium	Low	Emergency water supply for North Valley Water system.
Streams	Medium	Low	Increasing permanent pool will back upstream with possible increased flows downstream.
Water Quality	Medium	Medium	Impacts recreational uses later in season.
Water Quantity	Medium	Low	Prior water permits may affect reservoir uses. Increased size of permanent pool.
Wetlands	High	High	Bog (and fen) areas, riverine & lacustrine wetlands.
Special Aquatic Sites	High	High	Bog (and fen) areas.
<u>Air</u>			
Air Quality	Low	Low	Short-term during construction period.
<u>Plant</u>			
Threatened and Endangered Species	High	Low	Consult with U.S. Fish and Wildlife Service.
Woodlands (Upland)	Low	Low	
Woodlands (Riverine)	Low	Low	
Woodlands (Lacustrine)	Medium	Low	Little effect from 1 foot rise - unknown for 2 foot rise.
Bog / Fen Areas	High	High	NDPR Dept. considers important.
State Rare Plants	Medium	Medium	Fifteen species identified by ND Parks & Rec.

Economic, Social, Environmental, and Cultural Concerns	Degree of Concern ¹	Degree of Significance to the Decision Making ¹	Remarks
			Dept.
Invasive Species	Low	Low	
<u>Animal</u>			
Threatened and Endangered Species	High	Low	Consult with U.S. Fish and Wildlife Service.
Wildlife	Medium	Low	Moose and elk are unique to the area.
State Rare Animals	Medium	Medium	Six species identified by ND Parks & Rec. Dept.
Sport Fishery and Fish Habitat	Medium	Low	Effected only during construction, may be beneficial post construction.
<u>Human Considerations</u>			
Cultural Resources	High	Medium	Icelandic State Park very important to the community.
Economics	High	High	State Park important to the area economy; impacts to flood insurance rates, local costs for project, length of construction period.
Recreation	High	High	Icelandic State Park very important to the community of Cavalier and region. Impacts to golf course.
Social-Human Health and Safety	High	High	Dam safety during and after construction. Reducing downstream flooding. Length of construction period.
Transportation	High	High	Park visitor and emergency services access to park. Access over the top of dam.
Landscape Resources	Medium	Medium	Important to park appearance and golf course.
Land Use Changes	Medium	Low	CRP impacts to water quality and land use around reservoir.
Environmental Justice	High	Low	No know impacts.
Limited Resource Farmers	High	Low	No know impacts.
Stream Channel Modification	High	Low	None expected.

- ¹ High - Must be considered in the analysis of alternatives
Medium- May be affected by some alternative solutions
Low - Consider, but not too significant
None - Need not be considered in analysis

Appendix F – Project Map

The following page is a map of the project area defining the Tongue River Watershed for this plan. Renwick Dam is the downstream subwatershed.

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