# STATEMENT OF BASIS

Devils Lake Outlet
ND-0026247

Issuance

The application is for a North Dakota Pollutant Discharge Elimination System (NDPDES) permit for a temporary discharge from West Bay of Devils Lake to the Sheyenne River. The purpose of this project is to remove water from Devils Lake, to reduce damages around the lake, to reduce the risk and possibly prevent a natural overflow, and to maintain North Dakota water quality standards. This is an intermittent discharge of surface water diverted from the West Bay of Devils Lake to the Sheyenne River, a Class IA stream. The discharge from the diversion system enters the Sheyenne in the SW ¼ of the SE ¼, Section 8, Township 151N, Range 68W.

## BACKGROUND

The Devils Lake Basin has received above normal precipitation since 1993. This has resulted in a 25-foot rise in lake elevation. To address the flooding concerns, federal, state, and local officials have implemented a three-pronged approach consisting of basin water management, infrastructure protection, and an outlet to the Sheyenne River.

Basin water management has been ongoing for several decades. This includes programs like Available Storage Acreage Program (ASAP), Extended Storage Acreage Program (ESAP), State Water Bank, and Wetland Reserve Programs that pay farmers to store water on their lands instead of allowing the water to reach Devils Lake.

Infrastructure protection has included property buyouts, as well as raising roads, dikes, and railroads. With nearly $400 million spent thus far on these activities, it is estimated that an additional $900 million will be needed if the level of Devils Lake rises to an elevation of 1459 feet above mean sea level (msl). While infrastructure protection is important within the Devils Lake Basin, it does not address reduced water levels in the lake.

In recent years numerous outlet projects and alternatives have been evaluated to relieve flooding on Devils Lake. Some of the prior alternatives are discussed in the State Water Commission's supplement to their NDPDES permit application for the project and in the Corps of Engineers, *Integrated Planning Report and Environmental Impact Statement for Devils Lake, North Dakota*. In addition to discussing the other alternatives, the Corps report includes background information on hydrology, natural resources and other evaluations that are relevant to the consideration of this discharge permit.

A primary consideration when evaluating any outlet option has been the potential to degrade water quality in the Sheyenne River, Lake Ashtabula and the Red River. To consider the numerous variables and contributing factors governing the quality of water bodies extending across a large area, computer based models become a necessary tool. The Corps has developed a modeling system to evaluate Devils Lake outlet options. The model considerations and techniques are described in appendix A of the *Integrated Planning Report and Environmental Impact Statement for Devils Lake, North Dakota*. The applicant, State Water Commission, provided the Corps model output specific to their outlet project as part of the permit application. The modeling results were considered by the Department in selecting parameters for limiting and monitoring in the permit.

The outlet project will operate during the open-water season (non-ice conditions), which includes the months of May through November. Actual outlet operation will be dependent on the water quality of the West Bay and the water quality and volume of the base flow in the Sheyenne River. In addition, a minimum operating level will be established where no discharge will occur if the water level of Devils Lake falls below the 1445-foot elevation msl.

The outlet will be operated to discharge at a maximum of 100 cubic feet per second (cfs), and not to exceed the Sheyenne River channel capacity, as provided by the applicant, of 600 cfs. There are flow restrictions included in the permit conditions to restrict the discharge rate to the maximum flow rates considered in developing this permit. Gaging stations measuring stream flow and specific conductance (conductivity) will be constructed upstream and downstream of the discharge to provide continuous monitoring of the river conditions. Specific conductance meters will be located at several other sites along the Sheyenne and Red Rivers to monitor river conditions.

Any discharge from this project will be managed not to exceed the 300 milligrams per liter (mg/l) sulfate after blending with the Sheyenne River. The permit includes a limitation of 300 mg/l for sulfate measured downstream of the discharge. The limit serves to verify that the discharge will be operated in a manner consistent with the operating plan for the project. Also, the Department's water quality evaluations for the project and selection of parameters to limit are premised on the 300 mg/l sulfate constraint. The sulfate limit also serves to provide a level of control for other mineral constituents and total dissolved solid (TDS) in the discharge. The models used to determine possible effects the discharge could have on TDS and sulfate levels in the Sheyenne and Red rivers were based on a 300 mg/l sulfate constraint.

The sulfate and total dissolved solids (TDS) levels in water from Devils Lake are regarded as having potential for violating water quality standards downstream of the discharge. Recent Department sampling data for Devils Lake was summarized in a report titled *Chemical, Physical, and Biological Characterization of Devils Lake 1995-2001.* The report notes that the trends in TDS and sulfate concentration in the lake were similar for the time period studied. The concentrations for sulfate and TDS for the

West Bay of Devils Lake for recent years are about 600 mg/l and 1375 mg/l respectively. North Dakota's water quality standard for sulfate is 450 mg/l in the Sheyenne River and 250 mg/l in the Red River. Minnesota's water quality standard for TDS in the Red River is 500 mg/l.

Based on the North Dakota's *2002 Section 303(d) List of Waters Needing Total Maximum Daily Loads* (enclosed) that has been submitted to the U.S. Environmental Protection Agency (EPA) Region VIII for review and approval, Lake Ashtabula and three reaches of the Sheyenne River are listed as water quality impaired. The Sheyenne River empties into Lake Ashtabula north of Valley City. Lake Ashtabula is not currently supporting the designated use of recreation because of eutrophication due to excessive nutrient loading. The Sheyenne River, from Lake Ashtabula downstream to State Highway 46 is designated as fully supporting but threatened for aquatic life use due to sedimentation and siltation. Further downstream, two other segments of the Sheyenne River are listed as threatened or not supporting recreational use due to total fecal coliform bacteria. These include an 11.4 mile reach near Lisbon, ND, and the Sheyenne River from the confluence with the Maple River downstream to the confluence with the Red River.

There presently are no federal effluent guidelines and standards for wastewater discharges from surface water bodies. However, limitations for this project are appropriate, based on the *Standards of Water Quality for the State of North Dakota* and the N.D. Department of Health's best professional judgment. The NDPDES permit and Process Control Monitoring Plan requirements will be used to address compliance issues, verify concentrations of water quality parameters, and confirm that the state water quality standards on the Sheyenne and Red Rivers are not exceeded.

## DISCHARGE POINTS

Description of Discharge Points
All discharges are to the Sheyenne River, a Class IA stream.

Discharge 001 - Devils Lake Outlet. This is an intermittent discharge consisting of surface water diverted from West Bay of Devils Lake to the Sheyenne. The discharge from the diversion system enters the river in the SW ¼ of the SE ¼, Section 8, Township 151 North, Range 68 West.

## EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Traditionally, limits in NDPDES permits are end-of-pipe limits specified for a discharge following all processes and treatment. In this case, the discharge does not result from a process but rather from another surface water body. The permit sets controls for the blending of water from Devils Lake with the Sheyenne River without violating water quality standards.

The effluent limitations proposed in the draft permit for the Devils Lake outlet are dependent on conditions in the Sheyenne River. The Sheyenne River must be monitored both upstream and downstream of the outlet's discharge ("insertion point") and at the outlet itself to determine compliance with the effluent limitations contained in this permit. The outlet discharge compliance monitoring shall be conducted at the canal terminal structure.

The general location of the stream monitoring stations will be as follows:

1. Upstream compliance monitoring shall be conducted at a point upstream of the outlet which is representative of river water quality prior to mixing with the effluent from the outlet system.

2. Downstream compliance monitoring shall be conducted at a point downstream of the outlet which is representative of river water quality after mixing with the effluent from the outlet system.

Managing the flow rate of this discharge will be critical for maintaining the desired downstream quality and for operating within the channel capacity of the river. The operator will have control over the flow rate and will be able to adjust the flow in response to changes in river and lake conditions. The permit identifies three flow limitations, of which the most limiting must be adhered to when managing the discharge.

The limitations and rationale are described below:

1. The flow from the outlet shall not exceed 100 cfs. This represents the capacity of the outlet described in the application and the highest outlet flow rate considered for this permit.

2. The flow from the outlet in cfs shall not exceed the value determined by:

   600cfs - Qi  Where: Qi = flow in cfs at the upstream location

   The N.D. State Water Commission (SWC) operating plan for the outlet provides that the discharge would be constrained so as not to exceed the Sheyenne River channel capacity of 600 cfs. The calculation determines the outlet flow rate based on the channel constraint.

3. The flow from the outlet in cfs shall not exceed the value determined by:

   $\frac{Qi(300 - Ci)}{(Cd - 300)}$  Where: Qi = flow in cfs at the upstream location
   Ci = sulfate (mg/l) at upstream location
   Cd= sulfate (mg/l) at outlet

The calculation determines the maximum discharge flow rate from the outlet that could occur without causing the sulfate concentration to exceed 300 mg/l at the downstream location. The calculated limit will require that the discharge be adjusted in response to changing conditions in the Sheyenne River and changes in sulfate levels in Devils Lake.

The permit includes a 300 mg/l limit for sulfate applicable to the Sheyenne River downstream of the discharge. The limit serves to verify that accuracy of the blending ratio.

The water quality standard for pH in the Sheyenne River is within the range of 7.0 to 9.0. Based on water quality records for the lake and river, the pH standard should be met. However, natural processes may cause the pH to drift outside the stated range. In the event the measured downstream pH is outside of the range, the discharge would be suspended if it were determined that the pH excursion is a result of the outlet discharge.

The permit includes a 100 mg/l limitation for total suspended solids (TSS) applicable to the discharge from the outlet. The limitation has been included to ensure that the system is designed, operated and maintained to prevent excessive sediment contributions to the Sheyenne River. This TSS limit is the same as that required by the Department in permits for construction and miscellaneous dewatering activities.

Continuous monitoring for specific conductance (conductivity) provides an immediate indication of the TDS (salt) content of water at all times. The conductivity measurements are made with direct reading instruments which can provide realtime information for operating the outlet. The relationship between specific conductance and sulfate, as a component of dissolved solids, will need to be developed over time through the comparison of conductance and measured sulfate.

The minimum compliance monitoring requirements for the outlet, upstream, and downstream stations during outlet operation are specified below:

| | Monitoring Requirements | |
|---|---|---|
| | Measurement | Sample |
| Parameter | Frequency | Type |
| Flow | Continuous | Recorder |
| Specific Conductance | Continuous | Recorder |
| Sulfate | Weekly 1/ | Grab |
| pH | Weekly | Grab |
| Total Suspended Solids | Weekly | Grab |

1/ The initial sampling period for sulfate shall be daily (5 times per week). After the outlet has operated for a period of one year, the sampling frequency shall be reevaluated and could be adjusted upon notification by the Department.

In addition to the compliance monitoring requirements listed above, the permittee must conduct (or otherwise secure) a downstream monitoring program at a network of sites on the Sheyenne and Red Rivers. The monitoring program is outlined under Process Control Monitoring (also included in Appendix 2 of the permit). The Process Control Monitoring will provide information needed to verify and refine model predictions used in designing an operating plan for the outlet. The information may also be used to adjust discharge limitations to maintain the desired water quality in the Sheyenne and Red Rivers.

River flow and water quality information collected by other agencies may be used to satisfy the compliance monitoring requirements. The collection and transportation of all samples must conform with EPA preservation techniques, holding times, and test procedures. The permittee is responsible for obtaining the data in a timely manner and including it in the discharge monitoring reports (DMRs). Should an agency providing compliance data discontinue monitoring at a location, it is the permittee's responsibility to make arrangements to continue the required monitoring.

The Department of Health may make certain adjustments to the effluent limitations and monitoring requirements described in this part without providing a public notice and comment period. Increased or additional monitoring may be required if deemed necessary to further evaluate the impact of the discharge. The department may specify additional discharge conditions or restrictions (including temporarily limitations) to ensure established water quality standards are maintained and/or to prevent the discharge from interfering with downstream uses.

The department must be notified, in advance, of any facility expansions, additions, or modifications to increase outlet capacity. The increase in any effluent limitation, including the instream limit for sulfate, is considered a major permit modification. Major modifications require the issuance of a public notice inviting public comment.

The actual dates of discharge, frequency of analyses, total volume discharged, discharge flow rates, and number of exceedances shall also be included on the DMRs. A separate attachment shall be included with the DMRs, providing the sample dates and test results for sulfate, TDS, and daily flow rates (upstream, downstream, and discharge).

**ANTIDEGRADATION**

The applicants submitted extensive documentation on alternatives and economic impacts. The Department of Health's antidegradation review concluded that the permitted activity is consistent with state antidegradation policy. A copy of the antidegradation review worksheet, a summary of the supplemental water quality monitoring required for process control, and a statement verifying that beneficial uses of the water will be met can be found in Appendix 2 of the permit.

## PROCESS CONTROL MONITORING

The discharge will be constrained so as not to exceed 100 cfs, a combined maximum flow of 600 cfs, and a sulfate concentration of 300 mg/l after blending with the Sheyenne River. The project can operate from May through November each year limited by the flow maintenance of water quality standards in the Sheyenne River. In addition, a minimum operating level will be established where no discharge will occur if the water level of Devils Lake falls below the 1445-foot elevation msl.

Three water quality monitoring sites will be established to ensure the discharge is in compliance with permit conditions. Monitoring is required at the outlet, upstream of the outlet on the Sheyenne River, and downstream of the outlet on the Sheyenne following mixing. Flow and conductivity will be measured continuously at all three sites.

The permittee must adjust the discharge rate, based on calculations estimating the blended sulfate concentrations from upstream flow and conductivity measurements. The downstream site will be used to validate calculations and enforce permit requirements. Conductivity can be used to estimate TDS concentrations, and sulfate concentrations can be estimated as a percent of TDS. Therefore, estimates of sulfate concentrations can be determined almost instantaneously. Daily sulfate sampling and analysis is required to calibrate the calculations.

An extensive monitoring network exists along the Sheyenne and Red Rivers. Monitoring sites are operated by the Department of Health and the U.S. Geological Survey.

The state of North Dakota established a Devils Lake Outlet Management Committee. The committee's purpose is to develop an annual plan for the operation of the project. The committee is comprised of: (1) three governor-appointed members representing downstream interests impacted by a Devils Lake outlet, (2) one member appointed by the Red River Joint Water Resource Board, (3) one member appointed by the Devils Lake Joint Water Resource Board, (4) one county commissioner from Ramsey County, (5) one county commissioner from Benson County, (6) one representative of the Spirit Lake Nation, and (7) the State Engineer or designee.

<u>Parameters and Locations</u>

The purpose of this monitoring is to regulate and/or adjust the discharge rate to ensure that the desire to manage Devils Lake levels is balanced by the protection of water quality and the beneficial uses of the Sheyenne and Red Rivers. Monitoring will also be used to refine the HEC-5Q Model and to interpret significant changes in biological and physical characteristics.

The Department may consider requests for less frequent monitoring. Less frequent monitoring may be granted when the accumulated test data for the parameter is

consistent and at a level which would not result in a violation of an established water quality standard. A reduction in monitoring frequency for a parameter may also be considered if a satisfactory relationship between the parameter and an alternate test can be demonstrated

1. Devils Lake Outlet
   The sampling location will be at the canal terminal structure.

| Parameters | Sampling Frequency |
|---|---|
| Temperature | Continuous |
| Specific Conductance | Continuous |
| pH | Daily |
| TDS & Major Ions * | Weekly |
| Ammonia | 2 Weeks |
| Nitrate/Nitrite | 2 Weeks |
| Total Kjeldahl Nitrogen | 2 Weeks |
| Total Phosphorus | 2 Weeks |
| Dissolved Phosphorus | 2 Weeks |
| Suspended Solids | 2 Weeks |
| Trace Metals ** | Monthly |

2. Sheyenne River Upstream of the Devils Lake Discharge
   This site shall be located as near as is practicably feasible upstream of the outlet. Exact location will be identified after a field survey is completed. Parameters and sampling frequency are the same as for No. 1 (above).

3. Sheyenne River Downstream of Discharge
   This site will be located immediately downstream of the outlet after mixing with the Sheyenne River. The exact location for complying with the mixed waters is subject to review and approval by the department. Field surveys will be required to determine this location and its suitability for access. Parameters and sampling frequency are the same as for No.1.

4. Sheyenne River Near Cooperstown, ND

| Parameters | Sampling Frequency |
|---|---|
| Stream Flow | Continuous |
| Specific Conductance | Continuous |
| TDS & Major Ions * | Weekly |
| Ammonia | 2 Weeks |
| Nitrate/Nitrite | 2 Weeks |
| Total Kjeldahl Nitrogen | 2 Weeks |
| Total Phosphorus | 2 Weeks |
| Dissolved Phosphorus | 2 Weeks |
| Suspended Solids | 2 Weeks |
| Trace Metals ** | Monthly |

5. Sheyenne River Near Valley City, ND
Parameters and sampling frequency are the same as for No. 4.

6. Sheyenne River Above Diversion Near Horace, ND
Parameters and sampling frequency are the same as for No. 4.

7. Red River Above the Confluence of the Sheyenne River Near Harwood, ND

| Parameters | Sampling Frequency |
|---|---|
| Flow | Continuous |
| Specific Conductance | Continuous |
| TDS & Major Ions * | Weekly |

8. Red River at Halstad, MN
Parameters and sampling frequency are the same as for No. 7.

9. Red River at Pembina, ND
Parameters and sampling frequency are the same as for No. 7.

* TDS and Major Ions consists of the following parameters:

| | | |
|---|---|---|
| Bicarbonate | Calcium | Carbonate |
| Chloride | Conductivity | Fluoride |
| Iron | Magnesium | Manganese |
| Nitrate | Percent sodium | pH |
| Potassium | Sodium | Sodium absorption ratio |
| Sulfate | Total alkalinity | Total Hardness |
| Total dissolved solids | Turbidity | |

** Trace Metals consist of the following parameters:

| | | |
|---|---|---|
| Aluminum | Antimony | Arsenic |
| Barium | Beryllium | Boron |
| Cadmium | Chromium | Copper |
| Lead | Nickel | Selenium |
| Silver | Thallium | Zinc |

**BIOMONITORING REQUIREMENTS**

Whole Effluent Testing is a requirement of all major and significant minor dischargers. The Devils Lake outlet is an intermittent discharge of surface water to the Sheyenne River and considered a significant minor discharger. At a minimum, acute toxicity testing will be required for this discharge. In the permit, the permittee shall be required to conduct acute, static replacement toxicity tests on the effluent from Discharge 001 on a quarterly basis. Once four tests have been completed with no toxicity detections, the permittee may request reduced toxicity testing. The static replacement toxicity test shall be conducted in general accordance with the procedures established in the latest revision of the *Methods for Measuring the Acute Toxicity of Effluents to Fresh Water and Marine Organisms* (EPA/600/4-90/027F Revised August 1993) and the *Region VIII EPA NPDES Acute Test Conditions Static Renewal Whole Effluent Toxicity Tests*. In the case of conflict, the Region VIII document will prevail. The permittee shall conduct an acute 48-hour static toxicity test using *Ceriodaphnia sp.* and an acute 96-hour static replacement toxicity test using fathead minnows.

The permit shall require that no acute toxicity be present in the discharge effective immediately. Acute toxicity occurs when 50 or more percent mortality is observed for either species at any effluent concentration. If acute toxicity occurs in a routine sample, an additional test shall be conducted within four weeks of the date of the sampling. Should acute toxicity occur in the second sample, testing shall be conducted monthly until further notification by the Department of Health.

If toxicity is detected, the permittee may be required to perform a toxicity reduction evaluation. The purpose of this evaluation will be to establish the cause, locate the source, and control and treat the toxicity.

If the results of a minimum of four consecutive samples taken over at least a 12-month period indicate no acute toxicity, the permittee may request the department to reduce testing to only one species per quarter. When conducting one-species testing, the

permittee must alternate species for each consecutive test, provided they continue to pass the test. The request to reduce testing will be approved or denied based on biomonitoring results and other available information. If the request is approved, test procedures are to be the same as specified above for test species.

Test results shall be submitted with the DMR for that month. The format for the report shall be consistent with the latest revision of the *Region VIII Guidance for Acute Whole Effluent Reporting* and shall include all chemical and physical data as specified for the tests.

**MONITORING REPORTS AND EXPIRATION DATE**

DMRs shall be submitted on a monthly basis and shall include the actual dates of any discharges and any additional monitoring. The recommended expiration date for this permit is June 30, 2008.

GB/RK/MS (03/26/03)

References

U.S. Army Corps of Engineers, St. Paul District. April 2003. Integrated Planning Report and Environmental Impact Statement for Devils Lake, North Dakota.

North Dakota Department of Health. January 2002. Chemical, Physical, and Biological Characterization of Devils Lake 1995-2001.

North Dakota Department of Health. November 2002. North Dakota's 2002 Section 303(d) List of Waters Needing Total Maximum Daily Loads. (Submitted to EPA for Final Approval)

North Dakota State Water Commission. December 2002. Water Quality Report for The State of North Dakota's Devils Lake Outlet Project. (Supplement to permit application for anti- degradation review)

U.S. Geological Survey. 2001. National Water Information System (NWISWeb) data available on the World Wide Web. Accessed during 2002 to 2003, at URL http://waterdata.usgs.gov/nwis/qwdata/.