Lake Kampeska Diversion Weir

A Plan to Measure the Effect of the Weir On Sediment Load and Transport to Downstream Areas

Flood Control Permit FC-29

January 26, 2001

Introduction

The Upper Big Sioux River watershed in extreme southern Roberts, western Grant, and east central Codington Counties has been faced with difficult sedimentation and other water quality problems. Lakes Pelican and Kampeska are direct reflections of their watershed and have also fallen victim to water quality impairments due to sediment accumulation and other water quality impacts.

As part of a comprehensive approach to improving conditions in the watershed, a diversion structure was constructed across the canal leading to Lake Pelican in 1998. The Lake Pelican Diversion Weir was constructed under the authority of Flood Control Permit FC-19 granted by the South Dakota Water Management Board on December 26, 1996. The purpose of the weir is to control the amount of sediment entering Lake Pelican from the Big Sioux River.

The Lake Kampeska Diversion Weir, a structure similar to the Lake Pelican Diversion Weir, will be constructed in the inlet/outlet channel of Lake Kampeska to reduce the amount of sediment entering the lake from the Big Sioux River. The South Dakota Water Management Board on June 15, 2000 granted Flood Control Permit FC-29 authorizing the construction of the Lake Kampeska Diversion Weir. This monitoring plan has been prepared to measure any effect of the weir on the sediment load entering Lake Pelican as required in the Water Management Board's Final Decision.

Plan Development

The Lake Kampeska Diversion Weir in the inlet/outlet of Lake Kampeska will include two manually operated slide gates as integral and necessary components of the structure. Subsequent to the Water Management Board's deliberations during the May 25, 2000 flood control application hearing, this plan has been developed to monitor the effect that operating the gates, and the subsequent releases from Lake Kampeska, may have on the sediment load entering Lake Pelican and on sediment transport to other downstream areas of the Big Sioux River. Additionally, although there were no philosophical concerns expressed during the hearing regarding the construction of the weir to divert sediment away from Lake Kampeska, the Water Management Board's deliberations suggested a need for background or baseline data as a means of indicating and understanding the sediment dynamics of the immediate lake and river system.

The Water Management Board's June 15 Final Decision on flood control permit application FC-29 directs that "...the City of Watertown shall formulate a plan to measure any effect of the proposed weir on the sediment load entering Lake Pelican." During the development of this

monitoring plan it became evident that this directive from the Water Management Board can be interpreted somewhat differently dependent upon point of view. It also became evident that more than one sampling site would be required to meet the water quality monitoring needs associated with the objectives of the various concerned parties in this matter of flood control permit FC-29 for the Lake Kampeska Diversion Weir.

This monitoring plan will provide for the explicit measurement of certain water quality parameters at the fish notch of the Lake Pelican Diversion Weir during times when the Big Sioux River is discharging into Lake Pelican and the gates of the Lake Kampeska Diversion weir are operated and in any open position.

This monitoring plan will also provide strong baseline data for certain water quality parameters through continuous monitoring of the Big Sioux River at an upstream location between Lake Kampeska and the urbanized areas of Watertown during the open water periods of the year. The effects of the gate operation will be effectively demonstrated through intensified sampling frequency at the time of operation.

Finally, this plan also addresses the Water Management Board's intent regarding notifications prior to operation of the gates, recordkeeping, and reporting.

Upstream Sampling Site Location (Sioux Conifer Road)

The upstream sampling site is located 1.5 miles (an estimated 15,000 feet measured along the channel) downstream of the Lake Kampeska Diversion Weir on the downstream side of the bridge over the Big Sioux River on Sioux Conifer Road in the northwest ¼ of section 13, township 117 north, range 53 west, Codington County, South Dakota (see attached map). This site is approximately 2 miles upstream of Watertown's urbanized areas. This is the same location of DENR's Clean Water Act Section 106 long-term water quality monitoring program site WQM55 and USGS' streamflow gauging station #06479500.

Section 106 water quality monitoring has been conducted on a monthly basis at this site since December 1972. The USGS streamflow gauging station ("Big Sioux River at Watertown") was previously in operation from 1946 through 1972, and portions of 1997 during a significant spring flood event. This streamflow gauging station has been reactivated as a full-time streamflow gauging station in Watertown's enhanced flood-forecasting system, and will provide the flow data necessary for load computations.

The attached map also indicates the location of numerous precipitation gauges and streamflow gauges that make up Watertown's flood forecasting system. Data acquired by the gauges is transmitted via satellite and downloaded to USGS' Internet site. The USGS home page can be found at the following Internet address: *http://sd.water.usgs.gov*. Real-time streamflow and rainfall data is available at *http://sv04dsdhrn.cr.usgs.gov/rt-cgi/gen_tbl_pg*. Data from this network may help explain unanticipated monitoring results by providing a window of information describing watershed events that may affect water quality in the Lake Kampeska, Watertown, and Lake Pelican vicinity.

Sample collection and frequency of sampling – Upstream Sampling Site (Sioux Conifer Road)

Water samples will be collected continuously at the sampling site throughout the open water season. It is anticipated that monitoring will occur most generally from March 1 through October 31, but the annual monitoring period will be adjusted dependent upon the weather, water surface elevation of Lake Kampeska, and streamflow conditions of the Big Sioux River.

A stationary automated sampler equipped to cool and heat the composite water sample to 4 degrees Celsius will be provided by the City of Watertown for collection and storage of the sample. The suction line and strainer will be installed so that the strainer is located near the bottom of the streambed either in the thalweg or the center of the channel at the direction of the South Dakota Department of Environment and Natural Resources at the time the sampling equipment is installed. It is Watertown's intent that automated sampling equipment will remain in place and in service at this sampling location at least until such time that the Water Management Board authorizes its removal.

For general continuous sampling, the sample will consist of individual sample portions collected in a single composite container a minimum of 5 times during each 24-hour day of a 7-day sampling period. At the time the criteria for operating the gates are met, the length of the sampling period will be reduced to 1 day. One day prior to, and 3 days following, the opening of the gates a 5-sample (minimum) 24-hour daily composite sample will be collected for analysis. Thereafter, the sampling frequency will return to the weekly schedule.

Sample pickup and transport - Upstream Sampling Site (Sioux Conifer Road)

Personnel of Watertown's Wastewater Department will pick up the sample at the end of each sampling period and transport the sample to Watertown's wastewater treatment facility laboratory. Chain of custody procedures will be employed to trace the possession of the sample from the time it is collected and picked up until the lab analysis has been completed. This procedure will demonstrate that the samples have not been tampered with during collection, pickup, transport, storage, and analysis.

At the time the sample is picked up, Watertown Wastewater Department personnel will record stage-discharge-rainfall information available from Watertown's flood forecasting system. This information is available by accessing the Internet at the USGS home page *(http://www.sd.water.usgs.gov)*. The real-time streamflow and rainfall data can be found most specifically at *http://sv04dsdhrn.cr.usgs.gov/rt-cgi/gen_tbl_pg*.

Observations regarding precipitation, wind, cloud cover, water odor, septic conditions, presence of dead fish, noticeable films or sheens, turbidity, color, and the presence of wildlife or domestic animals near the sampling site will be recorded at the time the sample is picked up. Additionally, portable hand-held meters will be used to measure and record field measurements for dissolved oxygen, pH, conductivity, and water temperature.

Sample analysis - Upstream Sampling Site (Sioux Conifer Road)

Watertown's wastewater treatment facility laboratory staff will analyze the water sample for Total Suspended Solids and Volatile Suspended Solids. The total suspended solids analysis will be conducted according to approved EPA method 160.2 and the Wastewater Department's standard operating procedure. This is the same methodology and procedure used by the Wastewater Department to determine, document, and report compliance with the City's National Pollutant Discharge Elimination System permit issued by the United States Environmental Protection Agency.

The City's National Pollutant Discharge Elimination System permit does not require monitoring and reporting of volatile suspended solids concentrations. However, Watertown's Wastewater Department conducts volatile suspended solids analyses for in-house process control using approved EPA method 160.4 and the Wastewater Department's standard operating procedure.

Duplicate sample analyses will be conducted for every 5th sample to demonstrate laboratory quality assurance and quality control. Duplicate samples for QA/QC analyses will be representative sample portions obtained after splitting the sufficiently mixed, homogeneous composite sample delivered to the laboratory for analysis. The results of duplicate sample analyses will be reported in the same manner as normal samples.

Lake Pelican Diversion Weir Sampling Site Location

A water quality sampling and monitoring site will also be established and located at the fish notch of the Lake Pelican Diversion Weir. The Lake Pelican Diversion Weir was constructed across the man-made canal leading from the Big Sioux River to Lake Pelican in 1998. It is located approximately 265 to 340 feet south of the centerline of United States highway 212 in the northwest ¼ of section 6, township 116 north, range 52 west, Codington County, South Dakota (see attached map). The monitoring equipment will be installed prior to the commencement of construction activities for the Lake Kampeska Diversion Weir.

Sample collection and frequency of sampling – Lake Pelican Diversion Weir Sampling Site

Water sampling and analysis will be conducted at this Lake Pelican Diversion Weir site when flows from the Big Sioux River are entering Lake Pelican and the Lake Kampeska Diversion Weir gates are operated and in any open position. Sample collection, pick-up, and analysis will be conducted on a composite daily basis 1day before the gates of the Lake Kampeska Diversion Weir are opened and for the 3 days immediately after the gates opened. Following the third day after the gates were opened, sample collection, pick-up, and analysis during the extended periods during which the gates remain open will coincide with the weekly frequency and schedule associated with the monitoring effort at the upstream sampling location between Lake Kampeska and the urbanized areas of Watertown (Sioux Conifer Road). Sample collection, pick-up, and analysis will continue at the Lake Pelican Diversion Weir site for 1 day following the closure of the Lake Kampeska Diversion Weir gates.

The City of Watertown will furnish, install, operate and maintain a stationary automated sampler of a type mutually agreeable to the City of Watertown and the Lake Pelican Water Project District. The automated sampler will be equipped to cool and heat the composite water sample to 4 degrees Celsius, and will be capable of flow-paced and time-based sample collection. The suction line and strainer will be installed so that the strainer is located on the lakeside of the weir as close to the bottom of the fish notch as possible. Watertown will furnish, install, operate and maintain at the Lake Pelican Diversion Weir site additional equipment capable of sensing water stage, flow velocity, and flow direction.

All equipment furnished at this Lake Pelican Diversion Weir site for use in implementing this monitoring plan will be removed or relocated only upon mutual agreement by the City of Watertown and the Lake Pelican Water Project District.

The primary purpose of the equipment installed under this monitoring plan at the Lake Pelican Diversion Weir is to monitor the quality of Big Sioux River flows that enter Lake Pelican during those times when the Lake Kampeska Diversion Weir gates are operated and in an open position. When not in use for this primary purpose, Lake Pelican Water Project District may use the equipment for sample collection at the District's expense which may include without limitation the costs associated with activities such as picking up the sample, shipping, laboratory analysis, and other related water quality sampling activities.

All sampling at this Lake Pelican Diversion Weir site will be flow-paced with sample portions of equal volume delivered into a compositing bottle in the automatic sampler base. Pacing will be adjusted to match expected hydrograph conditions and sample holding times associated with the standard methods of analysis for total suspended solids, volatile suspended solids, and total phosphorus. Equipment programming to facilitate the flow-paced sampling will be coordinated with the District's technical advisor for water quality sampling and monitoring.

Sample pickup and transport - Lake Pelican Diversion Weir Sampling Site

Personnel of Watertown's Wastewater Department will pick up the sample at the end of each sampling period and transport the sample to Watertown's wastewater treatment facility laboratory. Chain of custody procedures will be employed to trace the possession of the sample from the time it is collected and picked up until the lab analysis has been completed. This procedure will demonstrate that the samples have not been tampered with during collection, pickup, transport, storage, and analysis.

At the time the sample is picked up, Watertown Wastewater Department personnel will record stage-discharge-rainfall information available from Watertown's flood forecasting system. This information is available by accessing the Internet at the USGS home page *(http://www.sd.water.usgs.gov)*. The real-time streamflow and rainfall data can be found most specifically at *http://sv04dsdhrn.cr.usgs.gov/rt-cgi/gen_tbl_pg*.

Observations regarding precipitation, wind, cloud cover, water odor, septic conditions, presence of dead fish, noticeable films or sheens, turbidity, color, and the presence of wildlife or domestic animals near the sampling site will be recorded at the time the sample is picked up.

Additionally, portable hand-held meters will be used to measure and record field measurements for dissolved oxygen, pH, conductivity, and water temperature.

Sample analysis - Lake Pelican Diversion Weir Sampling Site

Watertown Wastewater Department staff will ship adequately-sized, representative sample portions to a contract commercial laboratory for analysis. The contract laboratory will be mutually agreed upon by Watertown and Lake Pelican Water Project District. Composite samples collected at the Lake Pelican Diversion Weir site will be analyzed for total suspended solids, volatile suspended solids, and total phosphorus at Watertown's expense.

Duplicate sample analyses will be conducted for every 10^{th} sample to demonstrate laboratory quality assurance and quality control. Duplicate samples for QA/QC analyses will be representative sample portions obtained after splitting the sufficiently mixed, homogeneous composite sample delivered to the laboratory for analysis. The results of duplicate sample analyses will be reported in the same manner as normal samples.

Notification

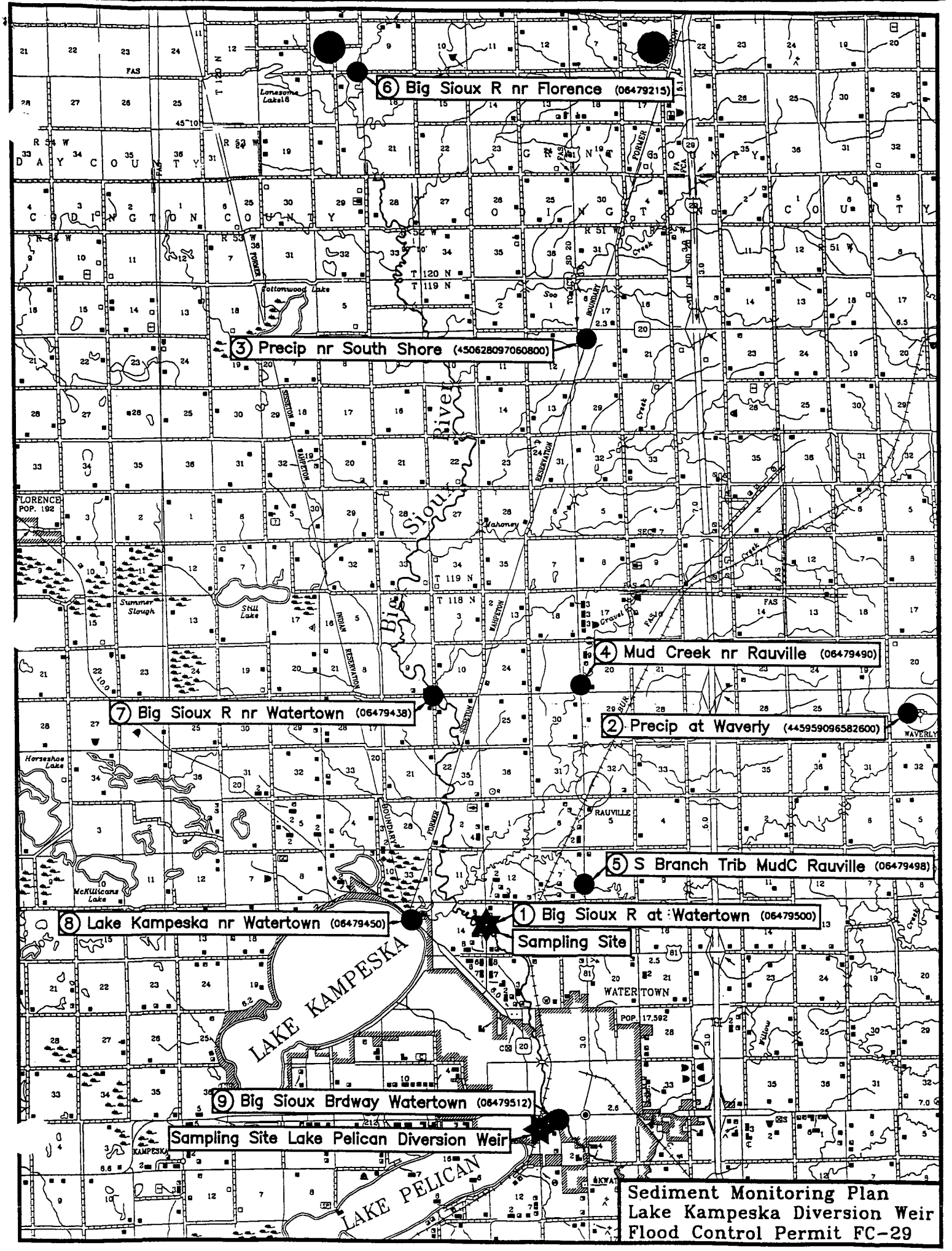
Prior to operating the gates of the Lake Kampeska Diversion Weir, the City of Watertown will contact the chairperson of Lake Pelican Water Project District by telephone. This verbal communication will be followed up with a notification/confirmation letter. A form letter may be developed and used to facilitate this notification process. The notification/confirmation letter will be delivered via certified mail, return receipt requested.

Report Monitoring Results

Watertown will provide one (1) copy of a summary reporting form for each sample analyzed to Chief Engineer, Water Rights Program, South Dakota Department of Environment and Natural Resources and one (1) copy to Lake Pelican Water Project District. The summary reporting form will contain the results of laboratory analyses (total suspended solids, volatile suspended solids, total phosphorus as applicable), field water quality measurements, visual observations, watershed streamflow and rainfall conditions summary, Lake Pelican Diversion Weir site flow data as applicable, chain of custody record, and pertinent information regarding the operational status of the Lake Kampeska Diversion Weir gates.

Maintain Monitoring Records

Watertown will maintain a file and electronic database containing the results of laboratory analyses, field water quality measurements, visual observations, watershed streamflow and rainfall conditions summary, Lake Pelican Diversion Weir site flow data, chain of custody record, and pertinent information regarding the operational status of the Lake Kampeska Diversion Weir gates.


6 Big Sioux R nr Florence (06479215)
3 Precip nr South Shore (450628097060800)
4 Mud Creek nr Rauville (06479490)
7 Big Sioux R nr Watertown (06479438)
2 Precip at Waverly (445959096582600)
5 S Branch Trib MudC Rauville (06479498)
8 Lake Kampeska nr Watertown (06479450)
1 Big Sioux R at Watertown (06479500)
Sampling Site
9 Big Sioux Brdway Watertown (06479512)
Sampling Site Lake Pelican Diversion Weir
LAKE KAMPESKA
LAKE PELICAN
Big Sioux River
WATERTOWN
POP. 17,592
FLORENCE
POP. 192
RAUVILLE
WAVERLY
Sediment Monitoring Plan
Lake Kampeska Diversion Weir
Flood Control Permit FC-29