

***SD Department of Environment & Natural Resources  
Watershed Protection Program  
Total Maximum Daily Load***

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***McCook Lake Watershed, Union County South Dakota  
February, 1999***

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This TMDL was developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by the US Environmental Protection Agency. The 1996 303(d) Waterbody List identified McCook Lake as impaired. A TMDL had not been completed for McCook Lake before the 1998 303(d) list was finalized; therefore, McCook Lake was "rolled over" into the 1998 list. During this time, the Section 319 Implementation Project was initiated and completed. This TMDL addresses the water quality impairment of accumulated sediment for McCook Lake prior to the implementation project.

***TMDL Summary for Accumulated Sediment***

<b>Waterbody Name</b>	<b>McCook Lake</b>
<b>Hydrologic Unit Code (HUC)</b>	10170101
<b>TMDL Pollutant</b>	<b>Accumulated Sediment</b>
<b>Water Quality Target</b>	Removal of 1,700,000 cubic yards of sediment
<b>TMDL Goal</b>	Increase average lake depth by 4.5 feet over 183 surface acres
<b>303(d) Status</b>	Roll over from 1996 303(d) Waterbody List into 1998 303(d) Waterbody List
<b>Impaired Beneficial Uses</b>	Warmwater permanent fish life propagation, immersion recreation, limited contact recreation.
<b>Reference Document</b>	Diagnostic/Feasibility Study Report McCook Lake Union County, South Dakota, 1990

***I. Executive Summary:***

***• Waterbody Description and Impairments***

McCook Lake is an oxbow lake located in extreme southeastern South Dakota, which was formed by an old cutoff of the Missouri River. The lake is located in Union County, Big Sioux Township, approximately one mile west-northwest of North Sioux City, South Dakota (Figure 1). The lake has a surface area of approximately 183 acres and a watershed of approximately 500 acres. Excess sediment resulting in loss of water depth and reduced recreational uses are the major concerns with McCook Lake. The average depth of the lake is 4 feet and ranges from 2 to 6 feet. Recreational uses that are impaired include fishing,

swimming, and boating. Sediment is the pollutant in this case. Sediment depth varies from approximately 2 feet to in excess of 10 feet.

- ***Stakeholder Description***

McCook Lake Association	SD Department of Environment and
McCook Lake Izaak Walton League	Natural Resources
North Sioux City, South Dakota	SD Department of Game, Fish and Parks
Union County, South Dakota	

- ***Intent to Submit as a Clean Water Act Section 303(d) TMDL***

In accordance with Section 303(d) of the Clean Water Act, the South Dakota Department of Environment and Natural Resources submits for EPA, Region VIII review and approval, the sediment total maximum daily load (TMDL) for McCook Lake as provided in this summary and attached documents. The TMDL was established to meet designated use classifications for McCook Lake with consideration of seasonal variation and a margin of safety. The designated use classifications that will be protected through implementation of the TMDL by removal of the lake sediment include: warmwater permanent fish life propagation, immersion recreation, limited contact recreation.

## ***II. Problem Characterization:***

- ***Maps***

A map of McCook Lake, its watershed, and location in South Dakota is included as Figure 1.

- ***Waters Covered by TMDL***

McCook Lake is the benefactor of this TMDL.

- ***Rationale for Geographic Coverage***

Soils surrounding the lake are alluvial bottomland soils of the Albanton-Haynie-Onawa association that are deep, poorly to well drained, level to nearly level, clayey and silty soils. Land-use on the outer shoreline of the oxbow lake is primarily residential with permanent year-round homes. All homes at McCook Lake are connected to a central sewer system. A portion of the inner oxbow land has been used as a disposal area to accommodate dredging activities as part of a lake restoration project. Additional land-use in the immediate area includes farmland and pastureland.

- ***Pollutant(s) of Concern***

Accumulated sediment

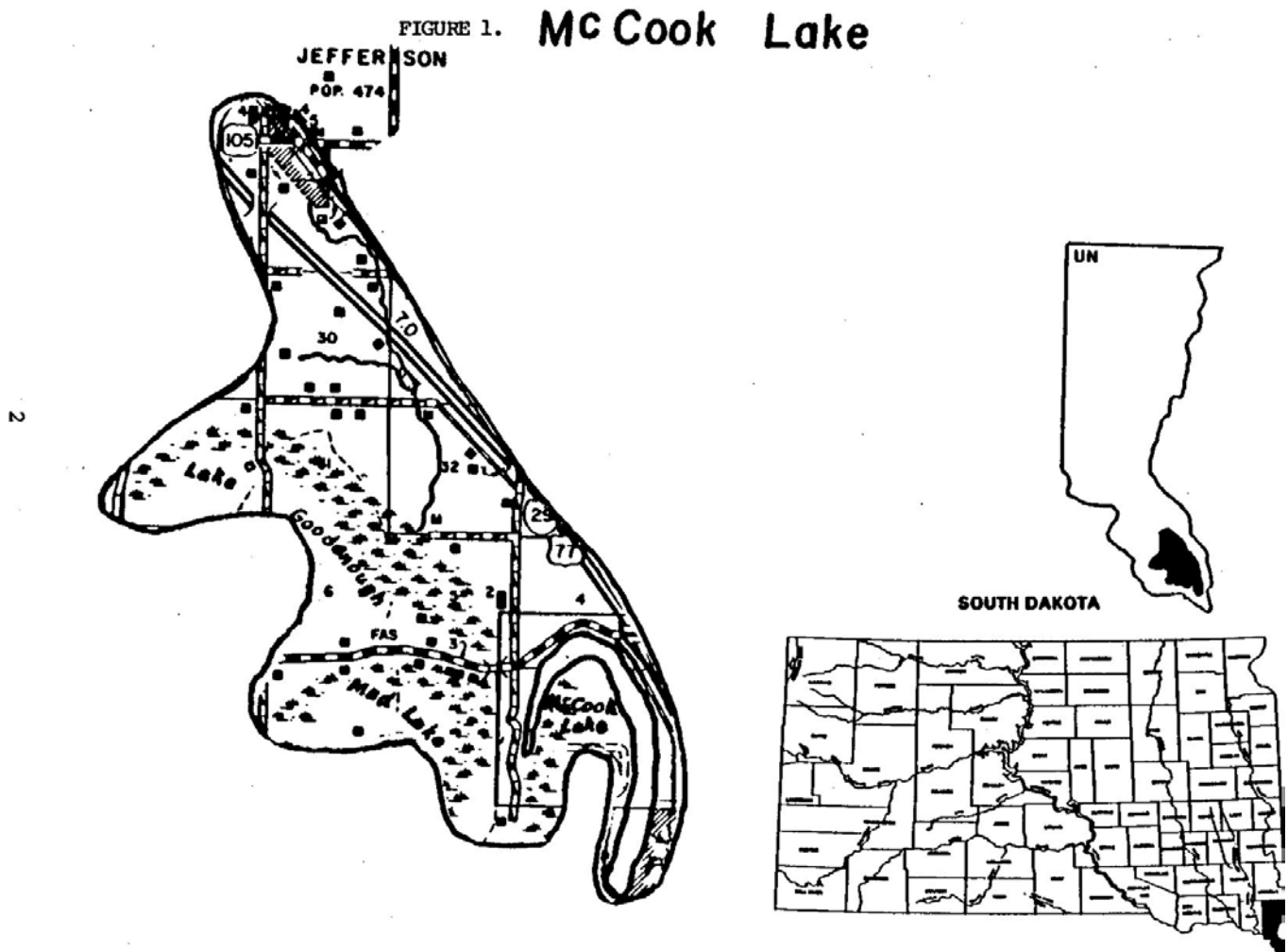


Figure 1. McCook Lake Watershed

- *Use Impairments or Threats*

The beneficial uses of warmwater fish life propagation, immersion recreation and limited contact recreation were impaired by the accumulated sediment due to shallow water depths and related water quality. Water depths ranged from 2 - 6 feet, with the greatest percentage of the lake between 2 - 4 feet deep. These depths, along with related increased temperatures and dense aquatic vegetation were not conducive to boating, swimming and sport fishing. The lake mimicked a prairie slough more than a lake.

The restoration activity of dredging was begun in 1991 following local concerns of loss of depth and decrease of recreational opportunities. From 1991 through 1994, the restoration was funded with assistance of state and federal funds. From 1995 to the present, the restoration activity has been funded solely with local dollars. A testament to the concern about use impairment is the high level of local support to fund and manage the project for the last several years.

- **Probable Sources**

There are no tributaries flowing into or out of the lake basin; the level of the lake is controlled by groundwater and is directly connected to the Missouri River by the existing water table.

During the 1930's, locks were constructed at each end of the lake as a part of the WPA program. The locks were intended to allow Missouri River water to flow into the lake during periods of high flow to help stabilize the lake level. However, the Missouri River floods of the 1950's deposited large amounts of silt in McCook Lake. Since the construction of the main stem dams on the Missouri River, high flows on the river have been eliminated, and together with river bed degradation, has rendered the locks ineffective. Local residents have attempted to maintain the lake level by pumping from the Missouri River since 1970. A few years later, a well was added to supplement the water in the lake.

Prior to restoration, begun during 1991, the mean depth of the lake was 4 feet and the lake volume was approximately 732 acre-feet. The total soft sediment in the lake was estimated to be approximately 1,700,000 cubic yards. The soft sediment consisted of fine clay particles, with fine sand lying below the clay. A sediment survey conducted in 1989 revealed that the fine clay varied in thickness from 1.8 feet to over 10 feet with an average thickness of 4.5 feet. Nearly half the shoreline was covered with cattails and bulrush. *Potamogeton sp.* was a common floating and submerged aquatic plant.

Local project personnel were contacted concerning storm drains as sources of sediment. They confirmed that all storm drains filter through grassed waterways. In addition, all storm drains have debris baskets in place and are checked and cleaned periodically. According to local project personnel, little, if any, sediment reached the lake through storm drains. Bank erosion, road construction, and runoff from lawns and gardens were not significant sources of sediment according to local project personnel.

### **III. TMDL Endpoint:**

- **Description**

The TMDL for this waterbody was to restore beneficial uses by increasing average lake depth by an estimated 4.5 feet over an area of 183 surface acres.

This goal would be accomplished by the removal of 1,700,000 cubic yards of accumulated inlake sediment. The goal was based on the estimated total amount of accumulated sediment in the lake.

- *Endpoint Link to Surface Water Quality Standards*

Removal of lake sediment will have a dramatic effect on designated beneficial uses and should lead to better water quality. The dredging has deepened the lake. This alone will improve immersion and limited contact recreational uses. It is also expected that dissolved oxygen levels will increase and overall water temperatures will decrease, thereby enhancing the lake's fishery. Water clarity is also expected to increase as shallow vegetation will be eliminated and nutrient-bound sediment (primarily phosphorus) removed.

#### *IV. TMDL Analysis and Development:*

- *Data Sources*

Data sources include the 1990 Diagnostic/Feasibility Study Report for McCook Lake, additional reports found in Section IV of this document, and reports from the local project coordinator recording amounts of sediment removed.

- *Analysis Techniques or Models*

During the Diagnostic/Feasibility study, water quality samples were collected according to Quality Control/Quality Assurance EPA approved methods. Laboratory analyses were conducted by the South Dakota State Health Laboratory in Pierre, South Dakota. Water quality data was loaded onto computer files and analyzed for trends. A minimum, mean, and maximum were calculated for each of the parameters measured.

Sediment surveys were conducted using the rebar technique of sediment probing. Elutriate samples of the sediment were collected and analyzed by the U.S. Army Corps of Engineers Laboratory in Omaha, Nebraska.

Amounts of sediment removed by dredging were calculated by readings of the nuclear density meter on board the dredge during operation.

- *Seasonality*

Seasonality is not a factor as there are no seasonally-related loadings to the lake and the sediment removal goal has been met.

- *Margin of Safety*

The total amount of sediment in McCook Lake was larger than previously estimated. The amount of sediment actually removed from McCook Lake from 1991 to the present (1998) totals 2,248,000 cubic yards. This amount represents nearly 132 percent of the TMDL goal to remove 1,700,000 cubic yards.

Additional sediment removal is expected to continue through the year 2000. With insignificant or zero future sediment deposition anticipated from the Missouri River or the McCook Lake watershed, it is expected that the implementation activity will result in permanent removal of the inflake sediment that was causing beneficial use impairment in McCook Lake.

## ***V. Allocation of TMDL Loads or Responsibilities:***

- ***Wasteload Allocation***

There are no point sources of pollutants of concern in the watershed. Therefore, the "wasteload allocation" component of this TMDL is considered a zero value. The TMDL is considered wholly included within the "load allocation" component.

- ***Load Allocation***

The load allocation for accumulated sediment in McCook Lake is 100 percent historic deposition by the Missouri River prior to the construction of the Missouri River reservoir system. No significant sources of sediment exist now that the potential for high flows received from the Missouri River has been eliminated.

- ***Allocation of Responsibility***

In 1990, the Department of Environment and Natural Resources produced a report of a Diagnostic/Feasibility study of McCook Lake conducted from June 1988, through September 1989. Based upon information available at that time, a recommendation was made to restore McCook Lake using a two-step approach beginning with selective dredging in areas with maximum sediment accumulation and establishment of boating restrictions. The second phase recommended was continued dredging, as funding permitted, in areas with less accumulated sediment.

The McCook Lake Izaak Walton League was able to purchase a large dredge from the state of South Dakota and elected to conduct whole lake dredging as a restoration alternative. State funding assisted the project from 1991 through 1994. Private funds contributed by the McCook Lake Izaak Walton League were used to fund the project from 1995 to the present and will be used to fund the project through the year 2000. Information supplied by the local sponsors indicates the yearly totals in cubic yards of sediment removed from McCook Lake as follows:

<b>Year</b>	<b>Dredged Material (cubic yards)</b>
1991	38,000
1992	250,000
1993	240,000
1994	330,000

1995	340,000
1996	375,000
1997	325,000
1998	350,000
<b>TOTAL</b>	<b>2,248,000</b>

According to local project sponsors, dredging will continue for approximately two more years, through the autumn of 2000, as there is more sediment in the lake than was previously identified.

Average depth of the lake has increased from 4.5 feet to 11.0 feet with some areas reaching deeps up to 15 feet (Al Parvu, project manager, pers. comm.).

### ***VI. Schedule of Implementation:***

The TMDL has been implemented, therefore, a schedule is not included.

### ***VII. Post-Implementation Monitoring:***

After the year 2000, it is recommended that the McCook Lake Izaak Walton League participate in the South Dakota Citizen's Monitoring Program to monitor the effectiveness of the TMDL. It is also proposed that the department continue to monitor McCook Lake every two to four years as part of the Statewide Lakes Assessment Program.

### ***VIII. Public Participation:***

- ***Summary of Public Review***

The Diagnostic/Feasibility study was conducted from June 1988 through September, 1989 and involved the following entities: South Dakota Department of Environment and Natural Resources, town of North Sioux City, local residents, and the McCook Lake chapter of the Izaak Walton League. Initial implementation funding was secured through a section 314 EPA Clean Lakes grant and supplemented with funds awarded by the Board of Water and Natural Resources of the South Dakota Department of Environment and Natural Resources.

The McCook Lake Izaak Walton League held several scoping meetings prior to and during the assessment and implementation phases of the project.

Pubic participation in the McCook Lake project are also documented in the following activities:



North Sioux City South Dakota Common Council. McCook Lake Restoration Project. 1980. Document contained a diagnostic/feasibility study and in in-depth study of groundwater in the McCook Lake area.

Buell, Winter, Mousel and Associates, Sioux City, Iowa. Preliminary engineering report of proposed dredging work at McCook Lake. 1980. Document listed plans for dredging the lake.

South Dakota Department of Environment and Natural Resources. Ordinary High Water Mark Investigations for McCook Lake. 1981. OHWM set at 1090.7 feet msl and OHWL at 1090.3 feet msl.

South Dakota Department of Environment and Natural Resources. South Dakota Lakes Survey. 1981. Document presented geographical, physio-chemical, biotic, edaphic, and other descriptive information on McCook Lake.

Union Conservation District. Soil and Water Conservation Plan. United States Department of Agriculture, Soil Conservation Service, 1982. Document included soil loss estimated for selected plots near McCook Lake.

U. S. Army Corps of Engineers. Feasibility Study for Water Level Maintenance at McCook Lake. Omaha District, South Dakota. 1983. Proposed that dredging of the lake to the sand bottom will result in more rapid equilibration of the lake and ground water levels.

<i>Electronic media</i>	<i>Mailings</i>	<i>Public Comments Received</i>
<b>December, 1998</b> Project Summary added to department website <b>March, 1999</b> TMDL Summary advertised on department website	<b>Interested Parties</b> March 10, 1999 <b>Stakeholders</b> March 10, 1999 <b>Daily Newspaper</b> March 8, 1999	Comments received during project meetings and review of the draft report and findings were considered

***IX. Supporting Development Document(s) (attached):***

Diagnostic/Feasibility Study Report McCook Lake Union County, South Dakota. March, 1990. South Dakota Clean Lakes Program, Division of Water Resources Management, South Dakota Department of Water and Natural Resources. 25pp.





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8  
999 18<sup>TH</sup> STREET - SUITE 500  
DENVER, CO 80202-2466

APR 13 1999



Ref: Ref: 8EPR-EP

Nettie Myers, Secretary  
Department of Environment and Natural Resources  
Joe Foss Building  
523 East Capitol  
Pierre, South Dakota 57501-3181

Re: TMDL Approvals  
*Lake Bryon*  
*Elm Lake*  
*Lake Faulkton*  
*Lake Hendricks*  
*Lake Hiddenwood*  
*Lake Madison/Brant*  
*McCook Lake*  
*Ravine Lake*  
*Redfield Lake*  
*Swan Lake*

Dear Ms. Myers:

We have completed our review of the total maximum daily loads (TMDLs) as submitted by your office for the subject waterbodies. In accordance with the Clean Water Act (33 U.S.C. 1251 et. seq.), we approve all aspects of the TMDLs as developed for these water quality limited waterbodies as described in Section 303(d)(1). We acknowledge that these particular TMDLs for the various lakes are based primarily on a voluntary and incentive-based approach to implementation.

Based on our review, we feel the separate TMDL elements listed in the enclosed checklists adequately address the pollutants of concern, taking into consideration seasonal variation and a margin of safety.

For years, the State has sponsored an extensive clean lakes program. Through the lakes assessment and monitoring efforts associated with this program, priority waterbodies have been identified for clean up. It is reasonable that these same priority waters have been a focus of the Section 319 nonpoint source projects as well as one of the priorities under the State's Section 303(d) TMDL efforts.

In the course of developing TMDLs for impaired waters, EPA has recognized that not all impairments are linked to water chemistry alone. Rather, EPA recognizes that "*Section 303(d) requires the States to identify all impaired waters regardless of whether the impairment is due to toxic pollutants, other chemical, heat, habitat, or other problems.*" (see 57 Fed. Reg.



33040 for July 24, 1992). Further, EPA states that "*...in some situations water quality standards -- particularly designated uses and biocriteria -- can only be attained if nonchemical factors such as hydrology, channel morphology, and habitat are also addressed. EPA recognizes that it is appropriate to use the TMDL process to establish control measures for quantifiable non-chemical parameters that are preventing the attainment of water quality standards.*" (see Guidance for Water Quality-based Decisions: The TMDL Process; USEPA; EPA 440/4-91-001, April 1991; pg.4). We feel the State has developed TMDLs that are consistent with this guidance, taking a comprehensive view of the sources and causes of water quality impairment within each of the watersheds. For example, in several of the TMDLs, the State considered nonchemical factors such as lake depth and its relationship to the impaired uses. Further, we feel it is reasonable to use factors such as lake depth as surrogates to express the final endpoint of the TMDL.

Thank you for your submittal. If you have any questions concerning this approval, feel free to contact Bruce Zander of my staff at 303/312-6846.

Sincerely,



Max H. Dodson  
Assistant Regional Administrator  
Office of Ecosystems Protection and  
Remediation

Enclosures

APPROVED TMDLS

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Lake Bryon*	phosphorus	TSI < 70	50% reduction in phosphorus loads	§303(d)(1)	Lake Assessment Project Report, (Lake Byron excerpt) (SD DENR, August 1996) Lake Assessment Project Report, Lake Byron, Beadle County, SD (SD DENR, December 1992) Section 319 Nonpoint Source Control Program Watershed Project Final Report, Lake Byron Watershed Project (Beadle CD, December 31, 1997) Lake Byron Watershed Project Section 319 Project Implementation Plan (SD DENR, July 1993)
	sediment	Decrease annual inlake sediment accumulation by 1200 tons/year	50% reduction in sediment loads	§303(d)(1)	
Elm Lake*	phosphorus	N:TDP ratio > 7.5 averaged over growing season	60% reduction in phosphorus loads	§303(d)(1)	Phase I Watershed Assessment Final Report, Elm Lake, Brown County, South Dakota (SDDENR, September 1998)
Lake Faulkton*	phosphorus	TSI < 90	35% reduction in phosphorus loads	§303(d)(1)	Lake Assessment Project, Lake Faulkton, Faulk County, South Dakota (SD DENR, 1996)
	sediment	Increased average lake depth by 6 feet over 15.5 acres	Remove 150,000 cubic yards of lake sediment	§303(d)(1)	
Lake Hendricks*	phosphorus	TSI < 65	50% reduction in phosphorus loads	§303(d)(1)	Diagnostic/Feasibility Study Report, Lake Hendricks/Deer Creek Watershed, Brookings County, South Dakota; Lincoln County, Minnesota (SD DENR, February 1993)
	sediment	Increased average lake depth by 6 feet over 100 acres	Remove 1 million cubic yards of lake sediment	§303(d)(1)	

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Lake Hiddenwood*	phosphorus	Decreased winter fish kills and increased visitor days	Maintenance of increased depth regime plus 2% decrease in phosphorus loads	§303(d)(1)	Lake Hiddenwood Restoration and Protection Project Preproposal (North Central RC&D; August 1993) Lake Hiddenwood Restoration and Protection Project Implementation Plan for FY 94 (1994) Preliminary Report; Hiddenwood Recreation Damsite and Reservoir, North Central RC&D (RC-050-WA), Walworth County, SD (USDA, SCS; August 1978)
	sediment	Increased depth corresponding to increasing volume by 53 acre-feet	Maintenance of increased depth regime plus 5% decrease in sediment loads	§303(d)(1)	
Lake Madison*	phosphorus	TSI < 50	50% reduction in phosphorus loads	§303(d)(1)	Phase I Watershed Assessment Final Report - Madison Lake/Brant Lake, Lake County South Dakota (SD DENR, October 1998)
Lake Brant*	phosphorus	TSI < 50	50% reduction in phosphorus loads	§303(d)(1)	
McCook Lake*	sediment	Increased average lake depth by 4.5 feet over 183 acres	Remove 1.7 million cubic yards of lake sediment	§303(d)(1)	Diagnostic/Feasibility Study Report McCook Lake, Union County, South Dakota (SD DENR, March 1990)
Ravine Lake*	phosphorus	TSI of < 84	70% reduction in phosphorus loads	§303(d)(1)	Diagnostic/Feasibility Study Report, Ravine Lake, Beadle County, SD (SD DENR, July 1990) AGNPS Modeling of the Ravine Lake Watershed, Huron, SD (SD DENR, July 1988)
	fecal coliform	< 400/100 mL fecal coliform counts	< 400/100 mL fecal coliform counts	§303(d)(1)	
Redfield Lake*	phosphorus	TSI < 90	45% reduction in total phosphorus load	§303(d)(1)	Lake Assessment Project Report, Lake Redfield, Spink County, SD (SD DENR, May 1993)
	sediment	Increased average lake depth by 5 feet over 31 acres	Remove 250,000 cubic yards of lake sediment	§303(d)(1)	

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Swan Lake*	phosphorus	TSI < 65	60% reduction in phosphorus loads	§303(d)(1)	Diagnostic/Feasibility Study Swan Lake; Turner County, South Dakota (SD DENR, January 1993)
	sediment	TSI (secchi depth) < 65	50% increase in secchi depth	§303(d)(1)	

\* An asterisk indicates the waterbody has been included on the State's Section 303(d) list of waterbodies in need of TMDLs.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <b>South Dakota</b>		
Waterbody Name: <b>Lake Bryon</b>		
Point Source-control TMDL:	Nonpoint Source-control TMDL: <b>X</b> (check one or both)	
Date Received: <b>March 30, 1999</b>	Date Review completed: <b>April 9, 1999</b>	
		BAZ
Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and sediment loading rate. These are reasonable indicators to use in expressing the TMDL targets since they are quantifiable and relate to the use impairments.
■ TMDL	X	The TMDLs are expressed in terms of annual phosphorus and sediment load reductions. This is a reasonable way to express the TMDL for lakes since it takes lakes a period of time to respond to pollutant reductions.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by a high level of detailed monitoring and assessment, by further educational efforts throughout the watershed, by conservative assumptions regarding no-till or minimum till acreage, application of additional nutrient BMPs, and stabilization of more shoreline than recommended through the assessment Study. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas, shoreline areas, and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Elm Lake Point Source-control TMDL: _____ Nonpoint Source-control TMDL: <input checked="" type="checkbox"/> (check one or both) Date Received: March 30, 1999 Date Review completed: April 9, 1999 <span style="float: right;">BAZ</span>		
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are drinking water and recreation.
■ Water Quality Standards Target	X	Targets were established based on nitrogen:phosphorus ratios. This is a reasonable approach since it relates to the trophic status of the waterbody which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction. This is a reasonable way to express the TMDL for lakes since it takes lakes a period of time to respond to pollutant reductions.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas, shoreline areas, and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Since part of the Elm Lake watershed is in North Dakota, the state of North Dakota as well as local entities in that State have participated in the development of the TMDL and will be participating in the future through implementation of BMPs within the watershed. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.



## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Lake Faulkton Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X</span> (check one or both) Date Received: March 30, 1999 <span style="float: right;">Date Review completed: April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Lake Hendricks Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X (check one or both)</span> Date Received: March 30, 1999 <span style="float: right;">Date Review completed: April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by augmenting the watershed land use controls with in-lake dredging. The in-lake dredging will further reduce the amount of available nutrients into the lake because of increased depth as well as provide further aquatic life habitat. Additional margin of safety could be provided through addressing the failing wastewater on-site systems near the lake. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance. This TMDL involved cooperation between South Dakota and Minnesota since the watershed is in both states. Lincoln County, Minnesota participated in the process as a stakeholder.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Lake Hiddenwood Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X (check one or both)</span> Date Received: March 30, 1999 <span style="float: right;">Date Review completed: April 9, 1999</span>		
	BAZ	
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on lake depth, fish kill frequency, and visitor-days. These are reasonable targets for the TMDL since they relate to the impaired uses of concern.
■ TMDL	X	The TMDL are expressed in terms of annual phosphorus load reduction and removal of lake sediment. Also, the TMDL relates to the depth and volume of the Lake. Lake depth has a particularly important factor related to both the recreational use and fisheries use of the Lake. The emphasis at this point in time is to protect the improvements already made in the Lake as well as adding more controls on pollutant sources as a margin of safety.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Additional BMPs include entrapment dams, construction of four agricultural waste systems, and cropland BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands as well as to the bottom lake sediment.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: <span style="float: right;">Lake Madison/Lake Brant</span> Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X</span> (check one or both) Date Received: <span style="float: right;">March 30, 1999</span> Date Review completed: <span style="float: right;">April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status. This is a reasonable approach since trophic status of the waterbody relates to the uses of concern.
■ TMDL	X	The TMDLs for each lake are expressed in terms of annual phosphorus load reduction. This is a reasonable way to express the TMDL for this lake since it takes a long period of time for a lake to respond to water quality controls, rather than on a daily basis.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by increasing the target phosphorus reduction from 40% to 50%, and possibly by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: <span style="float: right;">McCook Lake</span> Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X</span> (check one or both) Date Received: <span style="float: right;">March 30, 1999</span> <span style="float: right;">Date Review completed: April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	There are no contemporary sources of sediment (the pollutant of concern). Rather, the current lake sediment that has been deposited over the years is the primary cause of impairment within the lake.
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying acceptable levels of sediment removal from the Lake. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by removal of more sediment than calculated to support inlake uses. Seasonality was adequately considered by evaluating the changes in lake conditions over the year, but seasonality has proven to be of very little concern related to the development of the TMDL and application of appropriate water quality controls.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to lake bottom sediments.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

BPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Ravine Lake Point Source-control TMDL: _____ Nonpoint Source-control TMDL: <input checked="" type="checkbox"/> (check one or both) Date Received: March 30, 1999 Date Review completed: April 9, 1999 <span style="float: right;">BAZ</span>		
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and fecal coliform concentration. This is a reasonable approach since these factors relate to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and fecal coliform concentration. This is a reasonable way to express the TMDLs for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs and reflects the long response time of lakes of this type to pollutant controls within the watershed.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs including the stabilization of more shoreline than calculated and removal of more lake sediments than calculated. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Redfield Lake Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X</span> (check one or both) Date Received: March 30, 1999 <span style="float: right;">Date Review completed: April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by application of additional nonpoint source BMPs, and by dredging more lake sediments than calculated. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and bottom sediments.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.



## ■ TMDL Checklist ■

EPA Region VIII

State/Tribe: <span style="float: right;">South Dakota</span> Waterbody Name: Swan Lake Point Source-control TMDL: <span style="float: right;">Nonpoint Source-control TMDL: X</span> (check one or both) Date Received: March 30, 1999 <span style="float: right;">Date Review completed: April 9, 1999</span>		
		BAZ
Review Criteria <small>(All criteria must be met for approval.)</small>	Approved <small>(check if yes)</small>	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and secchi depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which is, in turn, related to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and increase in clarity (e.g., secchi depth). This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs including selective dredging, bank stabilization, and elimination of inflow from Turkey Ridge Creek. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as land uses in the Turkey Ridge Creek sub-watershed and in-lake sediments.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.