

*ESCHERICHIA COLI* (*E. coli*) BACTERIA TOTAL MAXIMUM DAILY LOAD (TMDL) FOR  
HIDEWOOD CREEK SEGMENT 01, HAMLIN AND DEUEL COUNTIES, SOUTH DAKOTA



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Division of Resource Conservation and Forestry  
South Dakota Department of Agriculture and Natural Resources

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## INTRODUCTION

Hidewood Creek segment 01 (Big Sioux River to US Hwy 15) or **SD-BS-R-HIDEWOOD\_01** is identified as impaired for the limited contact recreation designated use due to *E. coli* in South Dakota's most recent 303(d) list documented in the 2026 Integrated Report (IR) and is considered high priority for total maximum daily load (TMDL) development (SD DANR, 2024). Hidewood Creek was first listed as impaired for *E. coli* in 2020. Data shown in Appendix B demonstrates exceedances of the limited contact recreation water quality criteria since 2019.

Hidewood Creek segment 01 is a 31.84-mile tributary that begins at the Highway 15 where it joins the Big Sioux River (SD-BS-R-BIG\_SIOUX\_04) about two miles northwest of the City of Estelline in northeast South Dakota. SD-BS-R-HIDEWOOD\_01 falls entirely within state jurisdiction (Figure 1 & Figure 2). The two HUC12 watersheds (101702020403, 101702020404) have an area of 64,899.75 acres.

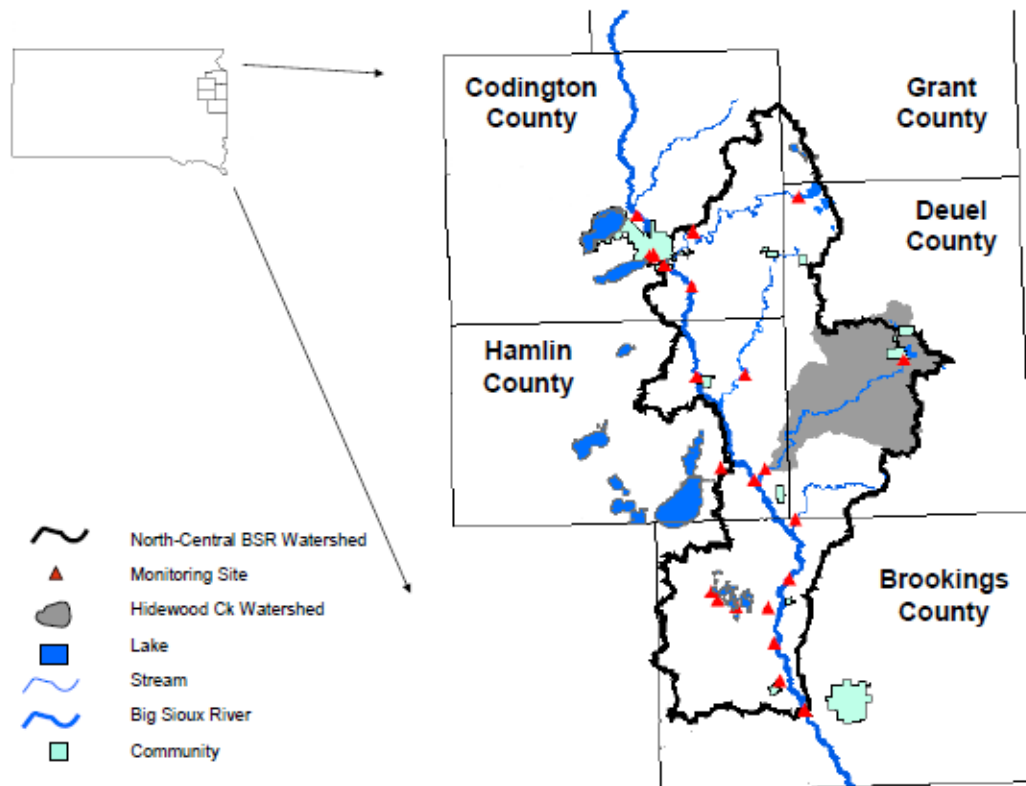


Figure 1. Location of Hidewood Creek and its watershed in South Dakota.

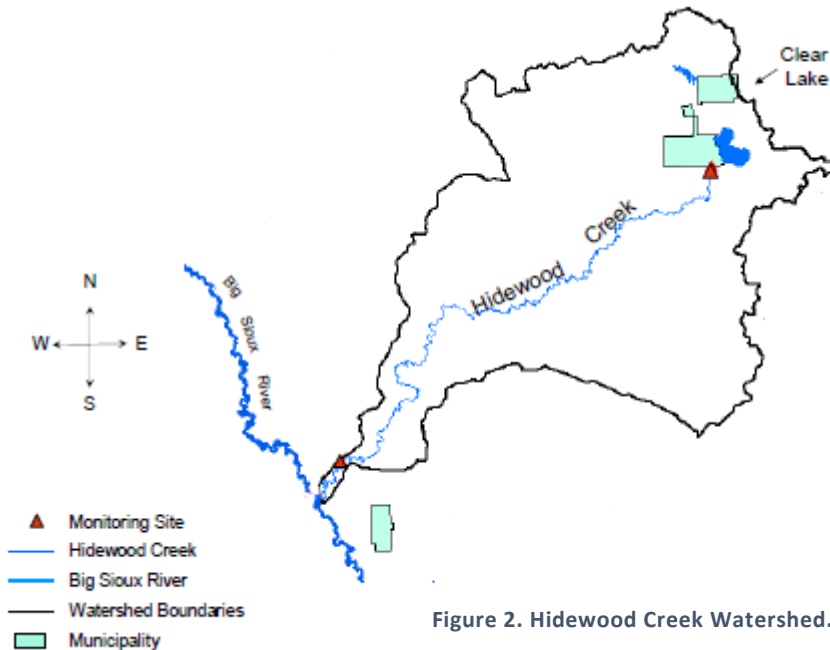


Figure 2. Hidewood Creek Watershed.

This TMDL builds on analyses conducted for the previous fecal coliform TMDL (FECAL COLIFORM BACTERIA TOTAL MAXIMUM DAILY LOAD EVALUATION FOR HIDEWOOD CREEK, HAMLIN AND DEUEL COUNTIES, SOUTH DAKOTA; SD DANR, 2005), TMDL Action ID: 34509. Ultimately translating the fecal coliform loading capacity to the *E. coli* standard before allocating the *E. coli* TMDL.

The South Dakota Department of Agriculture and Natural Resources (SDDANR) adopted a conversion process to translate existing fecal coliform TMDLs and allocations to *E. coli* to satisfy Clean Water Act section 303(d) requirements. The 2020 bacteria TMDL translation included *E. coli* TMDLs for four impaired waterbodies. The conversion process and resulting *E. coli* TMDLs were formally approved by the United States Environmental Protection Agency (EPA) November 8, 2020, and reissued following the correction of a minor clerical error on June 6, 2022 (SD DANR, 2022).

The intent of this document is to use the relationships identified in the 2020 bacteria TMDL translation to convert the existing fecal coliform TMDL for Hidewood Creek segment 01 to *E. coli*. However, rather than translating the allocations, this document is a standalone *E. coli* TMDL and presents new *E. coli* allocations to address several typographical errors identified in the fecal coliform TMDL.

## WATER QUALITY STANDARDS AND TMDL TARGETS

Hidewood Creek has been assigned beneficial uses by the state of South Dakota Surface Water Quality Standards regulations. Along with these assigned uses are narrative and numeric criteria that define the desired water quality of this stream. These criteria must be maintained for the stream to satisfy its assigned beneficial uses, which are listed below:

- Warmwater marginal fish life propagation
- Limited contact recreation
- Fish and wildlife propagation, recreation and stock watering
- Irrigation

Individual parameters determine the support of beneficial uses. Use support for limited contact recreation involved monitoring the levels of *E. coli* bacteria from May 1 through September 30, the recreation season. Limited contact waters must be maintained suitable for boating, fishing, and other water related recreation that does not involve immersion.

Administrative Rules of South Dakota Article 74:51 contains numeric and narrative standards to be applied to the surface waters (i.e. streams, rivers) of the state. To assess the status of the beneficial uses for this stream, water samples were obtained using SD DANR standard operating procedures and the results were compared to the applicable water quality criteria.

South Dakota *E. coli* criteria for immersion ([ARSD 74:51:01:50](#)) and limited contact recreation ([ARSD 74:51:01:51](#)) consist of a single sample maximum (SSM) and a monthly geometric mean (GM) both of which include distinct numeric limits. The SSM requires that no single daily sample exceed the associated numeric limit. The monthly GM also must not be exceeded and is calculated based on a minimum of 5 samples collected during separate 24-hr periods over a 30-day period. The limited contact recreation SSM and GM criteria for *E. coli* are presented in Table 1.

There are two numeric *E. coli* criteria for TMDL target consideration. Impaired waters require TMDL development based on the most protective criteria. Selecting the most protective numeric target for TMDL development ensures attainment with the water quality criteria. Appendix A of the 2020 bacteria TMDL translation outlines that the GM and SSM *E. coli* criteria are equally protective (SD DANR A, 2022). Because assessment data were insufficient to calculate a monthly GM, the SSM *E. coli* criterion of  $\leq 1,178$  was selected as the TMDL numeric target. In addition to the daily load, the geometric mean criteria must be attained on a longer (i.e., monthly) basis.

Table 1. Designated recreation uses and associated bacteria criteria designated to Hidewood Creek.

Impaired Stream Segment AUID	Designated Recreation Use	<i>E. coli</i> Geomean CFU/100 mL	<i>E. coli</i> SSM CFU/ 100mL
SD-BS-R-HIDEWOOD_01	Limited Contact Recreation	$\leq 630$	* $\leq 1,178$

\*Refers to numeric criteria used for TMDL development

This TMDL document is consistent with South Dakota antidegradation policies (ARSD 74:51:01:34) because it provides recommendations and establishes pollutant limits at water quality levels necessary to meet criteria and fully support existing beneficial uses.

## SOURCE ASSESSMENT

This stream experiences bacteria loading from poor riparian areas, instream livestock, feedlot/manure runoff, NPDES systems, and/or overflowing sewer systems. Specific sources are described below.

## POINT SOURCES

Seven National Pollutant Discharge Elimination System (NPDES) permitted facilities are located in this watershed. All potential point sources of *E. coli* bacteria are documented here and summarized in Appendix A to provide a watershed scale account of each systems operational characteristics (discharge permits, etc.), potential impact, and Waste Load Allocation (WLA) consideration.

## Non-Stormwater Point Sources

This section identifies non-stormwater NPDES permits in the Hidewood Creek Segment 1 watershed.

### **The City of Clear Lake WWTF (NPDES Permit # [SD0020699](#))**

The wastewater treatment facility (WWTF) for the city of Clear Lake is authorized to discharge to an unnamed tributary of Hidewood Creek under NPDES permit SD0020699 (<https://danr.sd.gov/npdespdf/SD0020699/Clear%20Lake%20Permit.pdf>). This WWTF is located east of the city in Deuel County and consists of two stabilization ponds and a constructed wetland. Cell #1 is 10 acres, and Cell #2 is 4.0 acres, and the constructed wetland is 5.7 acres. Wastewater flows by gravity, aided by 3 area lift stations to a main lift station, which pumps wastewater into Cell #1. The main lift station has an overflow pipe that goes to the constructed wetland in case of emergency. This facility serves a population of 1,218 (2020 census). Discharge from the facility must comply with effluent limits established for various pollutants including *E. coli*. *E. coli* concentrations must not exceed the SSM and GM for limited contact recreation waters, which is consistent with the TMDL target. The *E. coli* TMDL would not add new requirements or implementation expectations to the permit. Per the Environmental Protection Agency's (EPA) Integrated Compliance Information System (ICIS), the last time the Clear Lake WWTF discharged was in May 2024. This was due to several days of heavy rain. A Waste Load Allocation (WLA) for the City of Clear Lake WWTF is provided for Hidewood Creek and is described below.

### **The City of Clear Lake (WTP) (NPDES Permit # [SDG860075](#))**

This facility is authorized under their general permit to discharge from the water treatment and/or distribution system activities described in the permittee's [Notice of Intent](#) (NOI) Form to a tributary of Hidewood Creek. This facility is a distribution system for water treated by Brookings-Deuel Rural Water Systems. Water is treated by aeration, coagulation, softening, disinfection, filtration, corrosion control, sedimentation, and fluoridation. Potassium permanganate, chlorine, and H<sub>2</sub>SiF<sub>6</sub> are added during treatment. This water treatment facility is not a source of bacteria and is therefore not assigned a WLA in this TMDL.

### **Gopher Sign Company (NPDES Permit # [SDPG00014](#))**

Gopher Sign Company is located at 103 Hwy 22 Easter in the city of Clear Lake, in Deuel County, South Dakota. Gopher Sign makes steel, aluminum, and plastic street signs, novelty signs, and license plates. Because this facility employs a phosphating (coating) system that contributes process wastewater flow to a Publicly Owned Treatment Works (POTW), and began discharging after August 31, 1982, they are a New Source Metal Finisher under the Code of Federal Regulations, Title 40, Part 433 (40 CFR 433). This facility is subject to pretreatment standards for new sources, monitoring and reporting requirements, and other conditions set forth in Administrative Rules of South Dakota (ARSD) Chapters 74:52:10 and 74:52:11, which adopts 40 CFR Part 403 Subchapter N by reference.

Both rinse waters (2nd and 4th stages) overflow directly to the sanitary sewer at outfall 001 as more fresh water is added. The phosphate wash water waste is evaporated and is not discharged to the city. The dip cleaning system will be evaporated as necessary instead of being discharged; it is used infrequently now. The clean rinse tank is treated with flocculants before discharge to remove any metals in the water. A floor drain in the loading area goes to the city without treatment and only receives runoff from trucks. No floor drains will be in the metalworking area that was being built during the

inspection in 2007. Wastewater streams that have been determined by the company to a high enough concentration to potentially cause violations are captured and evaporated. This facility is not a source of bacteria and is therefore not assigned a WLA in this TMDL.

### Concentrated Animal Feeding Operations (CAFOs)

A recent search found that there are three CAFO facilities located in Hidewood Creek Segment 01 watershed, as shown in Table 2.

**Table 2. Concentrated Animal Feeding Operations in Hidewood Creek Watershed.**

<b>Name of Facility</b>	<b>Type of Operation</b>	<b>SD General Permit #</b>
Krause Swine Finishers	finisher swine (housed lot)	SDG-100389
Poinsett Hutterian Brethren, Inc.	multiple animals (housed lots)	SDG-0109199
Wild Rose Dairy, LLC	dairy cattle (housed lot)	SDG-100380

All CAFO's are required to maintain compliance with provisions of the Water Pollution Control Act (SDCL 34A-2). SDCL 34A-2-36.2 requires each concentrated animals feeding operations, as defined by Title 40 Codified Federal Regulations Part 122.23 Dated January 1, 2007, to operate under a general or individual water pollution control permit issued pursuant to 34A-2-36. The general permit ensures that all CAFO's in SD have permit coverage regardless of if they meet conditions for coverage a NPDES permit.

All facilities with a general permit number that starts with SDG-01\* are covered under the 2003 General Water Pollution Control Permit for Concentrated Animal Feeding Operations, which requires housed lots to have no discharge of solid or liquid manure to waters of the state, and allows open lots to only have a discharge of manure or process wastewaters from properly designed, constructed, operated and maintained manure management systems in the event of 25- years, 24-hour or 100-year, 24-hour storm event if they meet the permit conditions. The general permit was reissued and became effective on April 15, 2017. All CAFO's with coverage under the 2003 general permit have a deadline to apply for coverage under the 2017 general permit.

All facilities with a general permit number that starts with SDG-1\* are covered under the 2017 General Water Pollution Control Permit for Concentrated Animal Feeding Operations. The 2017 general permit allows no discharge of manure or process wastewater from operations with state permit coverage or NPDES permit coverage for new source swine, poultry, and veal operations, and other housed lots with covered manure containment systems. Operations also have the option to apply for a state issued NPDES permit. Operations covered by the 2017 general permit or NPDES permit for open or housed lots with uncovered manure containment systems can only discharge manure or process wastewater from properly designed, constructed, operated and maintained manure management systems in the event of 25-year, 24-hour storm event if they meet the permit conditions. Both the 2003 and 2017 general permits have nutrient management planning requirements based on EPA's regulations and the South Dakota Natural Resources Conservation Services 590 Nutrient Management Technical Standard to ensure the nutrients are applied at agronomic rates with management practices to minimize the runoff

of nutrients. Additionally, the general permits include design standards, operation, maintenance, inspection, record keeping, and reporting requirements.

(<https://danr.sd.gov/Agriculture/Livestock/FeedlotPermit/default.aspx>)

As long as CAFOs comply with the general permit requirements ensuring their discharges are unlikely and indirect loading events, the TMDL assumes their *E. coli* contribution is minimal, and unless found otherwise, no additional permit conditions are required by this TMDL. No WLA is included in this TMDL for CAFOs.

### Construction Storm Water Permits

Construction activities have the potential to produce pollutants that may contaminate stormwater runoff. Currently there are two construction permits that are ongoing in the watershed (Appendix A). Construction stormwater permits are denoted by the prefix SDR10xxxx. The status of these construction projects is considered to be active by DANR until the permitted party opts to close the permit. Stormwater construction activities must have coverage and comply with South Dakota's [General Permit Authorizing Stormwater Discharges Associated with Construction Activities](#) ensuring that discharges are minimal. The permits also stipulate that they do not contribute to violations of surface water quality criteria. A Stormwater Pollution Protection Plan (SWPPP) is required for all permitted construction and industrial stormwater sites. The SWPPP is a written document that outlines how contractors will ensure stormwater runoff leaving the site will not become contaminated with pollutants. A WLA is not assigned since these permits are not expected to be a source of bacteria pollution.

## NONPOINT SOURCES

Non-point source pollution, unlike pollution from municipalities and NPDES, comes from many diffuse sources. Potential non-point sources of fecal coliform bacteria include loadings from surface runoff, wildlife, livestock, and leaking septic tanks. The nonpoint source assessment for Hidewood Creek segment 01 is documented here. The Earth Resources Observation and Science (EROS) Center, National Land Cover Database (NLCD) was used for collecting land use data. A review of the 2021 NLCD layer shows very little change from the 2004 NLCD layer (Table 3). In the 2021 layer, cropland is 64.20%, range/grassland is 31.18%, building/farmstead is 4.06% and the remaining 0.57% is none or barren land (Table 3). Specific sources are discussed below.

Table 3. Land Use Data.

Landuse	2004 NLCD	2021 NLCD
Cropland	62.75%	64.20%
Range/Grassland	32.51%	31.18%
Building/Farmstead	3.98%	4.06%
None	0.76%	0.57%

## WILDLIFE

Wildlife deposit their feces onto land surfaces and in some cases directly into the water. The bacterial load from naturally occurring wildlife is assumed to be background. In addition, any strategy employed to control this source would likely have a negligible impact on attaining water quality standards.

## URBAN AREAS

*E. coli* bacteria in urban and suburban areas may be attributed to stormwater runoff, overflow of sewer systems, illicit discharge of sanitary waste, leaking septic systems and pets.

Data for septic tanks is discussed in the Assessment Report of the fecal coliform TMDL (p. 65 of SD DANR, 2005). Contributions from septic systems were estimated based on rural households because a direct accounting of the number of septic systems in use in the TMDL watershed was unavailable. The 25.6 percent contribution from septic systems was determined by assuming 20 percent of all rural septic systems in the North-Central Big Sioux River watershed area were failing. This percentage does not account for die-off or attenuation of fecal coliform bacteria between failing septic systems and the stream. In general, failing septic systems discharge over land for some distance, where a portion of the bacteria may be absorbed on the soil and surface vegetation before reaching the stream. It is assumed that failing septic systems constitute a diminutive amount of the overall contribution because not all of the failing systems would be reaching the receiving waters.

## AGRICULTURE

Agriculture animals are the source of several types of non-point sources. Agricultural activities, including runoff from pastureland and cattle in streams, can affect water quality. The table below shows the number of cattle located in the watershed based on data collected for the Agricultural Nonpoint Source Pollution Model (AGNPS) Feedlot Assessment (SD DANR, 2005). The AGNPS model is a GIS-integrated water quality model that predicts non-point source pollutant loadings within agricultural watersheds. Watersheds dominated by agricultural uses (i.e. pastured cattle in stream drainages, runoff from manure application, and runoff from concentrated animal feeding operations) can influence the amount of *E. coli* bacteria entering nearby surface waters. This assessment identifies feedlot locations in the watershed, ranked by their pollution potential using AGNPS and determines that agricultural loadings associated with feedlots are a source of bacteria in the watershed (see p. 9-10 of SD DANR [2005]).

Table 4. Livestock Distribution.

Livestock Distribution	Hidewood Creek (T40, T41)
Beef Cattle	6380
Dairy Cattle	325
Heifers	300

## LINKAGE ANALYSIS

A robust linkage analysis was conducted for the previous fecal coliform TMDL (SD DANR, 2005). Although performed for fecal coliform, this analysis also represents *E. coli* conditions in the watershed, as watershed characteristics including flow dynamics and pollutant source loading have not changed considerably over time. In addition, Appendix B contains *E. coli* data that have been sampled for Hidewood Creek segment 01 since 2006 (annually since 2019), showing the waterbody consistently demonstrates impairment for *E. coli* since 2019. Hidewood Creek segment 01 was first listed as impaired for *E. coli* in 2020.

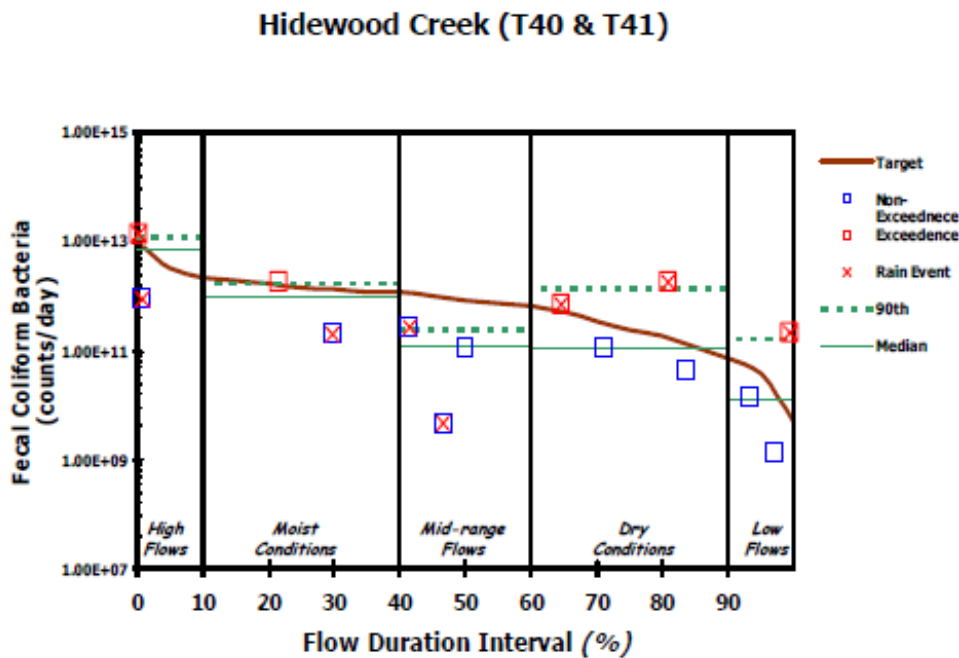
Water quality data was collected at two project monitoring sites (T40 and T41) on Hidewood Creek. Data were analyzed at the State Health Lab located in Pierre, South Dakota. Quality Assurance/Quality Control samples were collected on 10% of the samples according to South Dakota’s EPA approved Non-point Source Quality Assurance/Quality Control Plan.

The linkage analysis presented in the fecal coliform TMDL is based on Flow Duration Interval method, which calculates bacteria loading, (concentration) × (flow), using zones based on hydrologic conditions (SD DANR, 2005). Reductions are calculated using the median of the bacteria samples in each zone. This method shows that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. In order to assess the impact bacteria for this stream, the flow duration interval curve was divided into “flow zones”. The purpose of the zones is to differentiate hydrologic conditions, between peak and low flows, as ranges. For this stream, the ranges or flow zones are High (0-10), Moist (10-40), Mid-Range (40-60), Dry (60-90), and Low (90-100). Load duration curves were calculated using the following equation:

$$(\text{flow}) \times (\text{conversion factor}) \times (\text{state criteria}) = \text{quantity/day or daily load}$$

This curve represents the threshold of the allowable load. As seen in Figure 3 any sample occurring above this line is an exceedance of the water quality standard and represented by a red box. Table 5 depicts the allowable fecal coliform bacteria load during the study for peak flow, low flow, and then each 5th percentile increment in flow (SD DANR, 2005). The mid-points for each of the flow zones represent the fecal coliform TMDL, which was then converted into an *E. coli* allowable loading using the approach documented in the 2020 bacteria TMDL translation (SD DANR, 2022).

Figure 3. Flow Duration Interval for Hidewood Creek.



Flow Rank (percent)	Allowable Loads		2000 cfu/100mL
	cfs	fecal Coliform (counts/day)	Flow Conditions
0.019	243.93	1.19E+13	Peak
0.1	206.81	1.01E+13	
0.274	192.57	9.42E+12	
1	163.93	8.02E+12	
5	66.59	3.26E+12	
10	42.88	2.10E+12	
15	38.67	1.89E+12	
20	33.75	1.65E+12	
25	29.41	1.44E+12	
30	26.70	1.31E+12	
35	24.56	1.20E+12	
40	24.26	1.19E+12	
45	20.25	9.91E+11	
50	17.36	8.50E+11	
55	15.28	7.48E+11	
60	13.34	6.53E+11	
65	10.62	5.20E+11	
70	6.99	3.42E+11	
75	4.93	2.41E+11	
80	3.82	1.87E+11	
85	2.34	1.15E+11	
90	1.43	7.02E+10	
95	0.77	3.78E+10	
100	0.10	5.05E+09	Low

Table 5. Fecal Coliform Target Loads for Flow.

## TMDL AND ALLOCATIONS

As noted above, a load duration curve method was used to develop the bacteria loading capacity using the equation below for different hydrologic zones calculated based on discharge data recorded in the Hidewood Creek segment. The allowable fecal coliform load at the midpoint of each hydrologic zone from Figure 1 and Table 5 from FC TMDL represent the TMDL for fecal coliform (shown in the second column of Table 6).

$$(\text{flow}) \times (\text{conversion factor}) \times (\text{state water quality criteria}) = \text{loading capacity or allowable daily load}$$

The *E. coli* loading capacity for each hydrologic zone was calculated by multiplying the fecal coliform values by the ratio 0.589 (EC:FC) for the SSM (Table 7), documented in the translation TMDL (SD DANR, 2022). In addition, the fecal coliform existing load from the Hidewood Creek 01 fecal coliform TMDL, calculated as the median flow multiplied by the median concentration and a conversion factor, was converted to *E. coli* using the ratio (EC:FC) for the SSM. The percent reduction was then calculated as the converted *E. coli* current load minus the *E. coli* converted TMDL divided by the converted *E. coli* current load (Table 7).

Table 6. Bacteria loading capacity for Hidewood Creek segment 01 for limited contact recreation.

Flow Zone	Fecal Coliform TMDL (CFU/day)*	Existing Fecal Coliform Load (CFU/day)*	<i>E. coli</i> TMDL (CFU/day)	Existing <i>E. coli</i> Load (CFU/day)	% Reduction
High	3.26E+12	7.21E+12	1.92E+12	4.25E+12	54.79%
Moist	1.44E+12	1.02E+12	8.48E+11	6.01E+11	0%
Mid-Range	8.50E+11	1.15E+11	5.01E+11	6.77E+10	0%
Dry	2.41E+11	1.10E+11	1.42E+11	6.48E+10	0%
Low	3.78E+10	1.30E+10	2.23E+10	7.66E+09	0%

\*See Table 8 of SD DANR (2005)

Table 7. Applicable bacteria criteria and ratio for the limited contact recreation use.

Fecal coliform criteria	<i>E. coli</i> criteria	EC:FC ratio
GM 1000	GM 630	0.63
SSM 2000	SSM 1178	0.589

The *E. coli* loading capacity was allocated among the point and nonpoint sources as described in the sections below, while also including a margin of safety (MOS) (Table 8).

Table 8. *E. coli* TMDL and allocations for Hidewood Creek segment 01.

Flow Zone	<i>E. coli</i> TMDL (CFU/day)	WLA (CFU/day)	LA (CFU/day)	MOS (CFU/day)
High	1.92E+12	2.06E+10	1.71E+12	1.92E+11
Moist	8.48E+11	2.06E+10	7.43E+11	8.48E+10
Mid-Range	5.01E+11	2.06E+10	4.30E+11	5.01E+10
Dry	1.42E+11	2.06E+10	1.07E+11	1.42E+10
Low	2.23E+10	7.32E+09	1.49E+10	Implicit*

\*Implicit MOS explained below.

### **Wasteload Allocations (WLAs)**

NPDES facilities are permitted to discharge effluent in compliance with their permitted limits. When operating properly, they are not expected to cause or contribute to water quality violations. Their contributions are relatively small in comparison to the total loading of the stream. A WLA is assigned to the City of Clear Lake WWTF. The point source waste load allocation to the stream was calculated as 2.06E+10 *E. coli* counts if the facility discharged their 30-day average flow. This amount is unlikely since most dischargers operate well within their permit limits and discharge smaller loads than allowed. The WLA was calculated by multiplying the SSM *E. coli* concentration included in the permit (1,178

CFU/100mL) by the 30-day average flow (0.46 MGD) and a conversion factor, resulting in 2.06E+10 CFU/day.

The WLA is applied to the High, Moist, Mid-range, and Dry flow conditions; however, a different approach was applied for the low flow zone because the creek is not solely effluent driven during the lowest flows. The facility discharged 33 times in the recreational period over the course of 25 years. To evaluate conditions during the low flow zone, the average discharge of the Clear Lake WWTF from the years 2000-2025 during the months of August and September were obtained. During the recreational period these two months generally exhibit the lowest flows. The average daily discharge from the facility for August and September were 1.52 cfs and 0.46 cfs, respectively. The average daily flow for these months observed at Hidewood Creek (Site T40) were 4.79 cfs and 1.23 cfs, respectively. Using the average from these two months from the WWTF and Site T40, the resulting percent of flow that was effluent driven constituted 33% of the total flow for the low flow zone. This percentage was applied to the low flow zone loading capacity, resulting in a WLA allocation for the low flow zone of 7.32E+09 CFU/day.

### **Load Allocations (LAs)**

Load allocations account for the portion of the TMDL assigned to non-point sources. Natural background constitutes two percent of the total. The remainder of the LA is assigned to the land used likely to contribute to *E. coli* bacteria loads at rates above natural backgrounds. This includes cropland, pastureland, and residential areas. The LA was calculated using the following equation: (TMDL)-(MOS)-(WLA)= LA.

### **Margin of Safety (MOS)**

The margin of safety (MOS) is a portion of the loading capacity that is set aside to prevent exceedance of a water quality standard as a means to account for the uncertainty involved in developing a TMDL. A margin of safety provided by (1) using implicit assumptions in the calculation of the loading capacity of the waterbody and/or (2) by establishing explicit allocations. An explicit approach was used within the load duration curve framework to establish a MOS for all flow zones in this TMDL with the exception of the low flow zone. This explicit MOS was calculated as 10 percent of the loading capacity to account for uncertainties associated with flow estimates and nonpoint sources. The following conservative assumptions were incorporated as an implicit MOS for the low flow zone: 1) ARSD stream segment starts downstream approximately 2.7 miles from the WWTF Outfall; 2) The TMDL loading does not account for bacteria die off or the attenuation rate; and 3) the WWTF discharges infrequently.

## **SEASONAL VARIATION**

Different seasons of the year can yield differences in water quality due to changes in precipitation and agricultural practices. When rainfall occurs, *E. coli* bacteria that have built up on the land surface under dry conditions are washed off and deposited into lakes, rivers and wetlands. To determine seasonal differences, runoff events were noted when samples were collected in the fecal coliform TMDL (see Figure 3). In addition, the load duration curve process itself demonstrates variability in seasonal conditions by presenting water quality data associated with their associated flow conditions, which vary seasonally. Figure 3 illustrates some exceedances during each flow regime, particularly associated with rainfall events.

## CRITICAL CONDITIONS

The critical conditions for *E. coli* loadings in any watershed depend on the characteristics of point sources and land use within that watershed. In the case of Hidewood creek, three out of the five exceedances happened during a storm event that occurred within the dry flow zone (Figure 3). During rain fall events, *E. coli* bacteria that have built up on the land surface can wash into the stream, causing wet weather exceedances.

## FOLLOW-UP MONITORING

Monitoring and evaluation efforts will be targeted toward the effectiveness of implemented best management practices (BMPs). Sample sites will be based on BMP site selection and include the parameter of *E. coli* bacteria. Once the implementation project is complete, post-implementation monitoring will be necessary to assure that the TMDL has been reached and improvement to the beneficial uses occurs. This will be achieved by recurrent water quality sampling at the original monitoring sites.

## IMPLEMENTATION PLAN

The TMDL analysis was performed using the best data available to specify the *E. coli* reductions necessary to achieve water quality criteria. The intent of meeting the criteria is to support the designated use classification of this stream, and to follow the most stringent downstream use as well. A detailed implementation plan is not included in this TMDL, but implementation is expected through existing programs involving local entities and landowners to help minimize *E. coli* bacteria loading.

The South Dakota DANR partners with Day County Conservation District, implementing the Prairie Couteau Project with the use of CWA Section 319 funds to help landowners implement BMPs within the Big Sioux River Watershed. Hidewood Creek Segment 01 is in this watershed, and the project is working to reduce *E. coli* loading to the stream.

## PUBLIC COMMENT

This TMDL was made available for public comment in accordance with section 303(d) requirements. A public notice letter was published in ----- to announce the availability for public comment. The TMDL document and comment process was made available on the South Dakota Department of Agriculture and Natural Resources webpage at <https://danr.sd.gov/public/default.aspx>. The public comment period began xx/xx/xxxx and ended xx/xx/xxxx. No comments were received during the public comment period.

## LITERATURE CITED

Earth Resources Observation and Science (EROS) Center, 2023. National Land Cover Database (NLCD) 2021: Conterminous U.S. Land Cover. <https://www.usgs.gov/media/images/national-land-cover-database-nlcd-2021-conterminous-us-land-cover>

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SD DANR, 2022. *Escherichia coli* Total Maximum Daily Loads (TMDLs) Conversion with Existing Fecal Coliform TMDLs for Impaired Streams Designated Recreation Uses in South Dakota, Pierre, SD. [https://danr.sd.gov/Conservation/WatershedProtection/TMDL/docs/TableDocs/tmdl\\_statewidetranslation\\_ecoli.pdf](https://danr.sd.gov/Conservation/WatershedProtection/TMDL/docs/TableDocs/tmdl_statewidetranslation_ecoli.pdf)

SD DANR, 2026. The 2026 South Dakota Integrated Report for Surface Water Quality Assessment. South Dakota Department of Agriculture and Natural Resources, Pierre, SD. <https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/waterqualitystandards/integratedreports.aspx/1000>

## APPENDIX A: PERMITS

#	CWPName	Permit Type	SourceID	RegistryID	DFR URL
1	CLEAR LAKE, CITY OF	NPDES Individual Permit	SD0020699	110009792037	<a href="https://echo.epa.gov/detailed-facility-report?fid=SD0020699&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SD0020699&amp;sys=ICP</a>
2	CLEAR LAKE, CITY OF (WTP)	General Permit Covered Facility	SDG860075	110055240289	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDG860075&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDG860075&amp;sys=ICP</a>
3	GOPHER SIGN COMPANY	General Permit Covered Facility	SDPG00014	110009792554	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDPG00014&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDPG00014&amp;sys=ICP</a>
4	HENDRICKSON DAIRY BARN AND AWMS CONSTRUCTION	General Permit Covered Facility	SDR10H658	110071323281	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDR10H658&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDR10H658&amp;sys=ICP</a>
5	PCN 04HL	General Permit Covered Facility	SDR10P52P	110071656445	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDR10P52P&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDR10P52P&amp;sys=ICP</a>
6	STEVE KNUTSON AWMS	General Permit Covered Facility	SDR10P5BS	110071824329	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDR10P5BS&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDR10P5BS&amp;sys=ICP</a>
7	WILD ROSE DAIRY EXPANSION	General Permit Covered Facility	SDR10P5B8	110071849558	<a href="https://echo.epa.gov/detailed-facility-report?fid=SDR10P5B8&amp;sys=ICP">https://echo.epa.gov/detailed-facility-report?fid=SDR10P5B8&amp;sys=ICP</a>

## APPENDIX B: *E. COLI* DATA

Sample Date	<i>E.coli</i> (CFU/100mL)	Sample Date	<i>E.coli</i> (CFU/100mL)
04/06/2006	22.80	06/08/2020	<1
05/02/2006	>2420	06/22/2020	1990
06/07/2006	517.00	07/06/2020	479
07/12/2006	365.00	07/20/2020	544
09/12/2006	1120.00	08/03/2020	75.7
10/10/2006	150.00	08/17/2020	60.1
04/16/2007	22.60	09/08/2020	579
04/23/2007	>2420	09/21/2020	1200
06/05/2012	292.00	10/19/2020	35.4
06/05/2012	481.00	04/19/2021	13.5
06/05/2012	74.00	05/03/2021	1
05/19/2015	548.00	05/25/2021	57.3
05/19/2015	411.00	06/07/2021	921
05/19/2015	921.00	06/23/2021	1550
06/20/2016	122.00	05/23/2022	71.2
06/20/2016	3870.00	06/13/2022	1300
06/20/2016	62.00	07/11/2022	435
08/01/2017	52.00	08/15/2022	88.4
08/01/2017	41.00	09/19/2022	1410
05/21/2019	393.00	05/22/2023	32.3
06/03/2019	54.60	06/26/2023	260
06/17/2019	548.00	07/17/2023	36.3
07/01/2019	4880.00	05/20/2024	23.8
07/15/2019	8660.00	06/13/2024	649
08/21/2019	197.00	07/15/2024	188
09/16/2019	1570.00	07/15/2024	204
09/23/2019	744.00	07/15/2024	<1
10/07/2019	2420.00	08/12/2024	112
06/08/2020	77.60	09/16/2024	388
06/08/2020	68.90	10/28/2024	238

## APPENDIX C: PUBLIC COMMENTS

## APPENDIX D: EPA FINAL APPROVAL