# TOTAL SUSPENDED SOLIDS TOTAL MAXIMUM DAILY LOAD EVALUATION FOR WOLF CREEK, HUTCHINSON COUNTY, SOUTH DAKOTA

South Dakota Department of
Environment and Natural Resources

*Protecting South Dakota's Tomorrow ... Today*

## SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

## APRIL 2011

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## *Wolf Creek Total Maximum Daily Load Summary Table*

| | |
|---|---|
| ***Entity ID:*** | SD-JA-R-WOLF-02 |
| ***Location:*** | HUC Code: 10160010 |
| ***Size of Watershed:*** | 255,600 acres total |
| ***Waterbody Type:*** | Stream |
| ***303(d) Listing Parameter:*** | Total Suspended Solids |
| ***Listing date:*** | 2010 IR |
| ***TMDL Priority Ranking:*** | 1 |
| ***Listed Stream Miles:*** | From the mouth to just above the Wolf Creek Colony |
| ***Designated Use of Concern:*** | Warmwater Marginal Fish Life Propagation |
| ***Analytical Approach:*** | Aquarius, Load Duration Curve Framework, RGAs |
| ***Target:*** | Meet all applicable water quality standards. |
| ***Indicators:*** | Total Suspended Solids Concentration |
| ***High Flow Zone LA:*** | 347 tons/day |
| ***High Flow Zone WLA:*** | 0 tons/day |
| ***High Flow Zone MOS:*** | 52 tons/day |
| ***High Flow Zone TMDL:*** | 400 tons/day |

# 1.0 Introduction:

The intent of this document is to clearly identify the components of the TMDL submittal to support adequate public participation and facilitate United States Environmental Protection Agency (EPA) review and approval. The TMDL was developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by EPA. This TMDL document addresses the total suspended solids (TSS) impairment of Wolf Creek from just above Wolf Creek Colony to the mouth, SD-JA-R-WOLF-02.

## *1.1 Watershed Characteristics*

Wolf Creek drains about 255,600 acres in southeast South Dakota (Figure 1) and discharges to the James River southwest of the community of Bridgewater (Figure 2). The stream receives runoff from agricultural operations. During the assessment, data was collected indicating the creek experiences periods of degraded water quality as a result of TSS loads. The land use in the watershed is predominately agricultural consisting of 59% row crops, 23% grass, 6% developed (including farmsteads, roads, and small communities), 4% herbaceous, 4% close seeded/small grain, and 3% water and wetlands.

There are four small communities within the watershed that have permitted wastewater treatment facilities. These include Canova, Spencer, Emery, and Bridgewater. None of these communities lie within the impaired reach of Wolf Creek.

The impaired reach of the Wolf Creek drainage lies within Hutchinson County. Common soil associations on the uplands in this section of the drainage include the Clarno-Tetonka-Prosper and the Hand-Clarno-Davison associations. Soil associations found in the floodplain of the stream include the Ethan-Betts-Chaska association. Most areas of this association are maintained as pasture land. Some bottomland is used for agricultural production (USDA, 1978).

Hutchinson County is considered humid continental and approaches semi-arid in some years. Temperatures range from over 100° to -30°. Most of the precipitation falls during the warm period, and rainfall is normally heaviest late in spring and early in summer. Average annual precipitation is 23 inches, of this, 18 inches usually falls in April through September. Snowfall accumulations typically total 36.6 inches annually (USDA, 1978).

Wolf Creek was assessed as an individual portion of the larger Lower James River Watershed Assessment, which looked at individual streams such as Wolf Creek as well as the entire drainage basin and the cumulative effects of the individual waterbodies. There are also two ambient water quality monitoring stations located on Wolf Creek.

Segment SD-JA-R-WOLF-02 was listed for TSS in the 2010 Integrated Report (SDDENR, 2010). This TMDL will address the TSS listing.

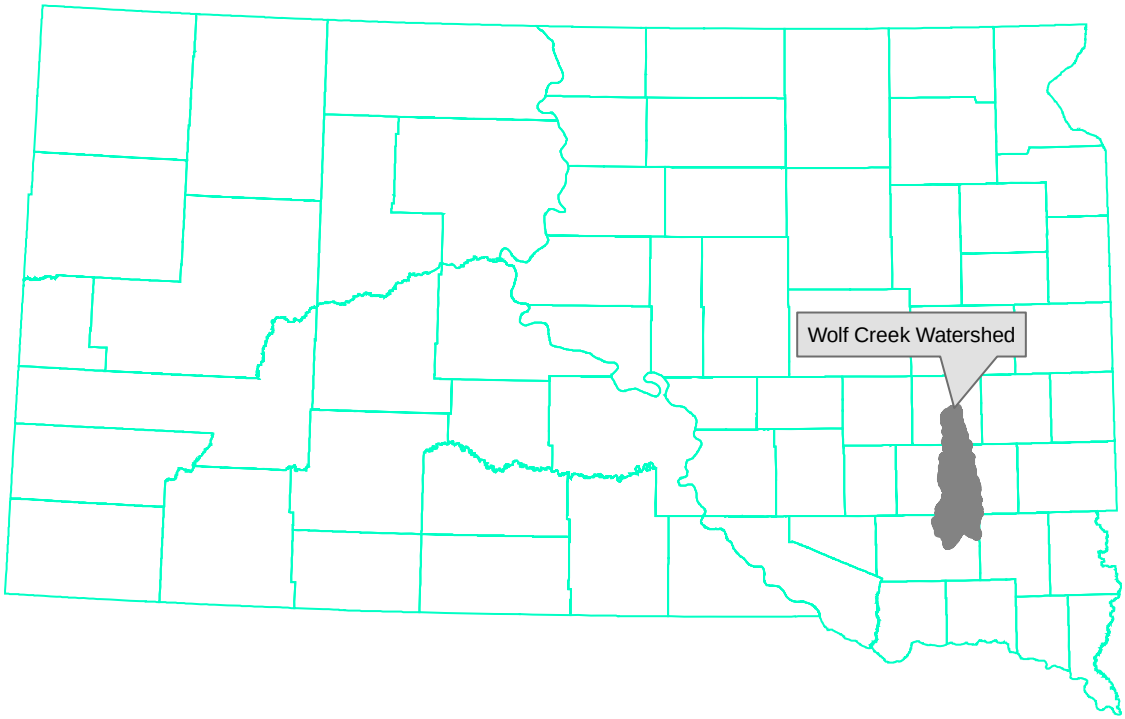


**Figure 1. Wolf Creek Watershed Location in South Dakota.**

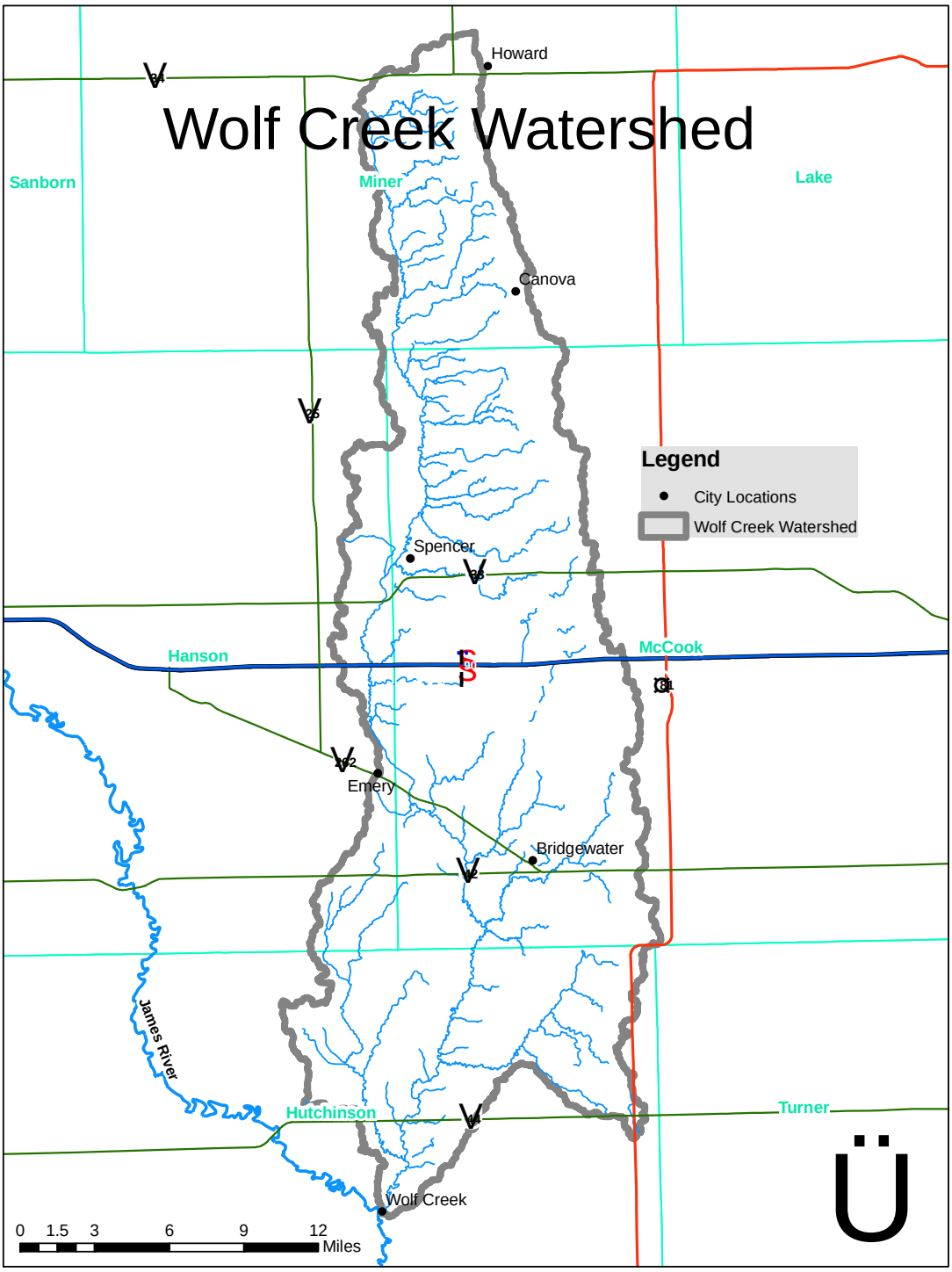


**Figure 2. Wolf Creek Watershed.**

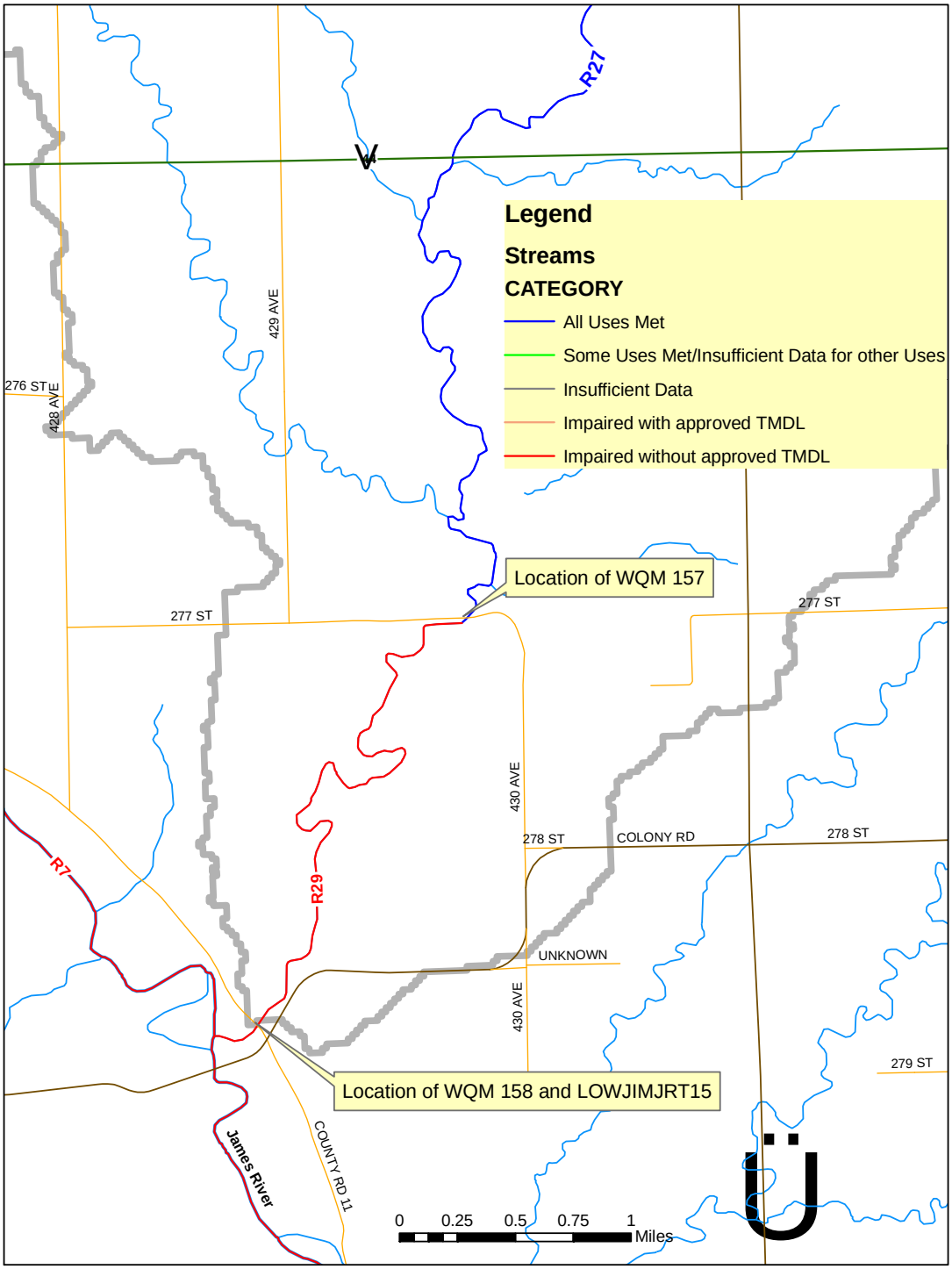


**Figure 3. Listed Segment of Wolf Creek.**

# 2.0 Water Quality Standards

Each waterbody within South Dakota is assigned beneficial uses. All waters (both lakes and streams) are designated the use of fish and wildlife propagation, recreation and stock watering. All streams are assigned the use of irrigation. Additional uses may be assigned by the state based on a beneficial use analysis of each waterbody. Water quality standards have been defined in South Dakota state statutes in support of these uses. These standards consist of suites of numeric criteria that provide physical and chemical benchmarks from which management decisions can be developed.

Chronic standards, including geometric means and 30-day averages, are applied to a calendar month. While not explicitly described within the states water quality standards, this is the method used in the states Integrated Water Quality Report (IR) as well as in permit development.

Additional "narrative" standards that may apply can be found in the "Administrative rules of South Dakota: Articles 74:51:01:05; 06; 08; 09; and 12". These contain language that generally prohibits the presence of materials causing pollutants to form, visible pollutants, and nuisance aquatic life.

Wolf Creek from just above Wolf Creek Colony to the mouth has been assigned the beneficial uses of: warmwater marginal fish life propagation; irrigation waters, limited contact recreation; and fish and wildlife propagation, recreation, and stock watering. Table 1 lists the criteria that must be met to support the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

South Dakota Water Quality Standards criteria do not apply when a low quality fishery (marginal and semipermanent warmwater fisheries) is below the 7 day average low flow that can be expected to occur once in five years (7Q5) or 1.0 cubic foot per second, whichever is greater. Wolf Creek is defined as a low quality fishery making this criterion applicable. A flow of 1 cfs will be used as the cutoff for the fishery standard because the 7Q5 for Wolf Creek is equal to approximately 0.1 cfs

The numeric TMDL target of 150 mg/L established for Wolf Creek took into consideration all current water quality standards. The TSS criteria for the warmwater marginal fish life propagation beneficial use requires that 1) no sample exceeds 263 mg/L and 2) during a 30-day period, the arithmetic mean of a minimum of 3 samples collected during separate 24-hour periods must not exceed 150 mg/L. These criteria are applicable throughout the year.

Individual parameters determine the support of beneficial uses and compliance with standards. The most restrictive of each of these standards that apply to Wolf Creek are listed in Table 1.

**Table 1. State Water Quality Standards for Wolf Creek.**

| Parameters | Criteria | Unit of Measure | Beneficial Use Requiring this Standard |
|---|---|---|---|
| Total ammonia nitrogen as N | Equal to or less than the result from Equation 3 in Appendix A of Surface Water Quality Standards | mg/L 30 average May 1 to October 31 | Warmwater Marginal Fish Propagation |
| | Equal to or less than the result from Equation 4 in Appendix A of Surface Water Quality Standards | mg/L 30 average November 1 to April 31 | |
| | Equal to or less than the result from Equation c in Appendix A of Surface Water Quality Standards | mg/L Daily Maximum | |
| Dissolved Oxygen | ≥4.0 | mg/L | Warmwater Marginal Fish Propagation |
| Total Suspended Solids | ≤150(mean) ≤263 (single sample) | mg/L | Warmwater Marginal Fish Propagation |
| Temperature | ≤32 | °C | Warmwater Marginal Fish Propagation |
| Fecal Coliform Bacteria (May 1- Sept 30) | ≤1000 (geometric mean) ≤2000 (single sample) | count/100 mL | Limited Contact Recreation |
| *Escherichia Coli* Bacteria (May 1- Sept 30) | ≤630 (geometric mean) ≤1178 (single sample) | count/100 mL | Limited Contact Recreation |
| Alkalinity ($CaCO_3$) | ≤750 (mean) ≤1,313 (single sample) | mg/L | Fish and Wildlife Propagation, Recreation and Stock Watering |
| Conductivity | ≤2,500 (mean) ≤4,375 (single sample) | µmhos/cm @ 25° C | Irrigation Waters |
| Nitrogen, nitrate as N | ≤50 (mean) ≤88 (single sample) | mg/L | Fish and Wildlife Propagation, Recreation and Stock Watering |
| pH (standard units) | ≥6.0 to ≤9.0 | units | Warmwater Marginal Fish Propagation |
| Solids, total dissolved | ≤2,500 (mean) ≤4,375 (single sample) | mg/L | Fish and Wildlife Propagation, Recreation and Stock Watering |
| Total Petroleum Hydrocarbon Oil and Grease | ≤10 ≤10 | mg/L | Fish and Wildlife Propagation, Recrwation and Stock Watering |
| Sodium Adsorption Ratio | <10 | ratio | Irrigation Waters |

# 3.0 Significant Sources

## *3.1 Point Sources*

There are four permitted facilities in the watershed, however all these are either zero discharge or many miles away from the impaired segment. The cities of Emery, Bridgewater, and Canova are allowed to discharge to Wolf Creek. Spencer wastewater treatment facility is operated as a no-discharge facility.

The city of Emery's facility reported discharging four times from 2001 to 2005. During the development of the NPDES/Surface Water Discharge permit for the facility, the potential impacts on the downstream segment were considered. SD DENR determined that Emery's discharge into Wolf Creek was a sufficient distance, around 25 stream miles, upstream of this listed segment of Wolf Creek and would not impact the designated beneficial uses.

The city of Canova's facility has discharged three times since 1999. The facility discharges into an unnamed wetland that drains into an unnamed tributary of Wolf Creek. Canova is located near the headwaters of Wolf Creek, over 50 stream miles north of the listed segment. The Canova facility should be a sufficient distance upstream to not impact the designated uses for the listed segment of Wolf Creek.

The city of Bridgewater's facility discharged once in May 2007 due to heavy rains. The facility discharges into an unnamed tributary of Wolf Creek about 20 stream miles upstream of the listed segment. The Bridgewater facility should be a sufficient distance upstream to not impact the designated uses for the listed segment of Wolf Creek.

The cities of Emery, Canova, Bridgewater, and Spencer are not causing water quality impacts in the listed segment of Wolf Creek and will not be given a WLA for this TMDL.

## *3.2 Non-point Sources*

Non-point sources of suspended solids in Wolf Creek come from agricultural uses, mainly grazing, in riparian areas and from channel degradations.

Figure 4 shows a comparison of data collected at the two water quality monitoring locations on Wolf Creek. This figure shows that there is no significant difference between WQM sites. The location of WQM 158 is within the listed segment while WQM 157 is within the non-listed segment of Wolf Creek.

Samples taken during the assessment of the Lower James River Watershed Assessment were taken at the location of WQM 158 and included the sampling of precipitation events. Rain events and snowmelt runoff are major contributors of suspended solids for the entire Wolf Creek watershed, not just the listed segment. On May 6$^{th}$, 2007 there was a major storm event that moved across the Wolf Creek watershed and contributed to

heavy runoff. Local coordinators sampled multiple locations (Figure 5) throughout the Wolf Creek watershed to find areas that contributed higher amounts of suspended solids during large rainstorm events.

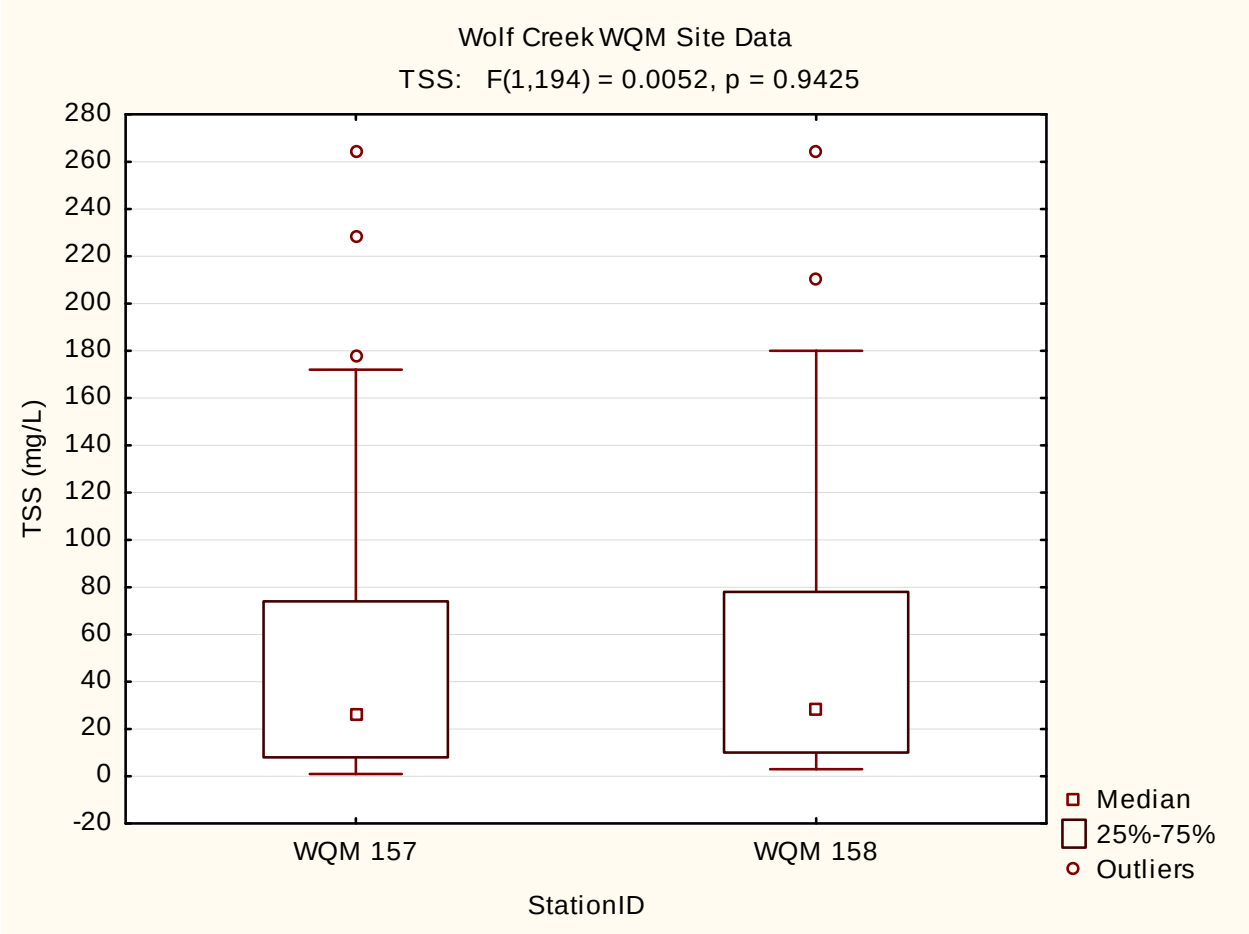


**Figure 4. Comparison of WQM sites on Wolf Creek.**

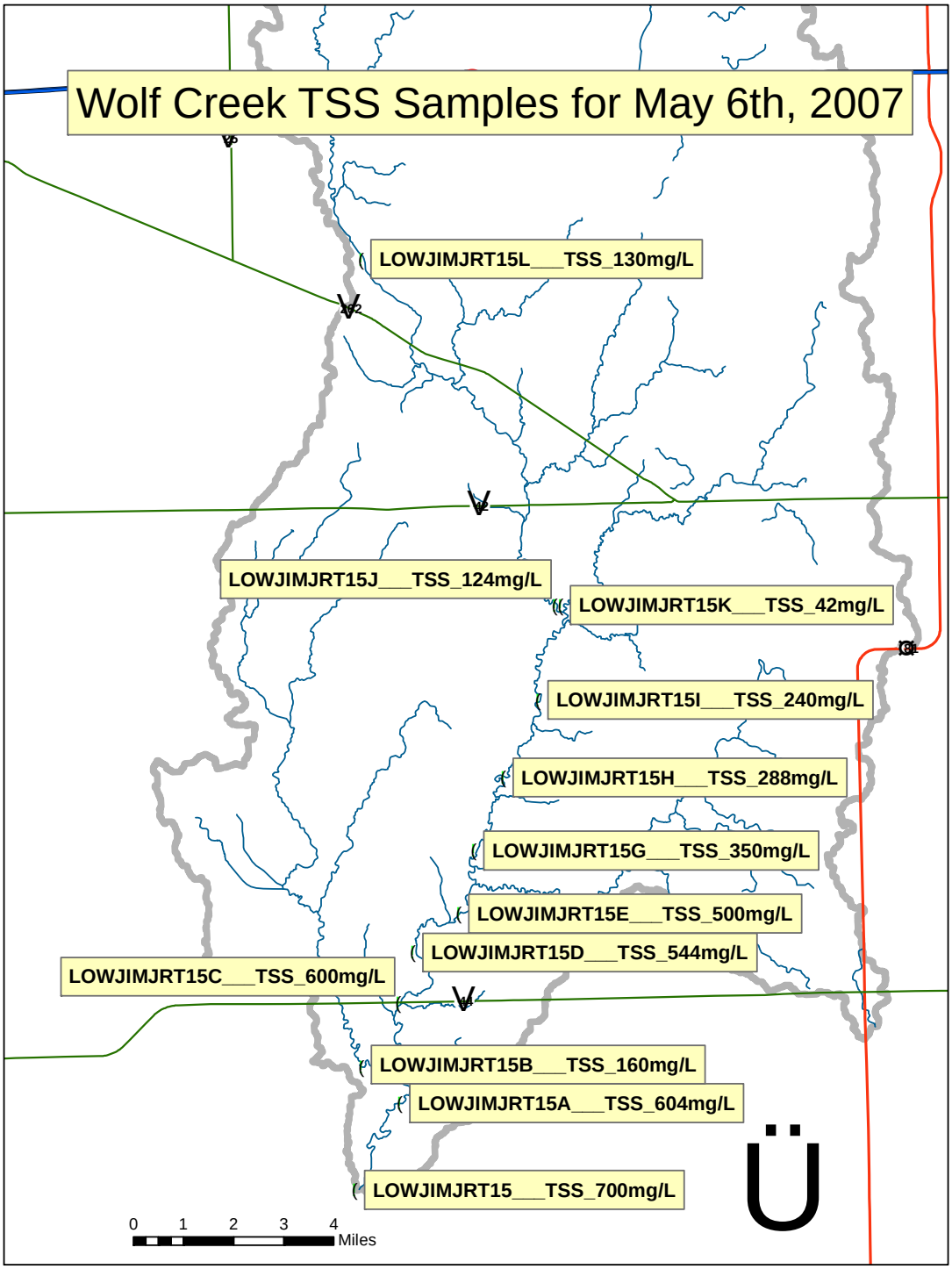


**Figure 5. Wolf Creek Sampling on May 6th, 2007.**

The Wolf Creek drainage contains approximately 215 animal feeding operations, some of which are in close enough proximity to the stream to have a potential for contributing

suspended solids. There are 133 feedlots located within a half mile of the stream or a tributary that runs into the stream.

There were 34 individual Rapid Geomorphic Assessments (RGAs) completed in the Wolf Creek drainage. Figure 6 depicts conditions of the stream corridor using RGAs as the basis for determining stable and unstable stream conditions.

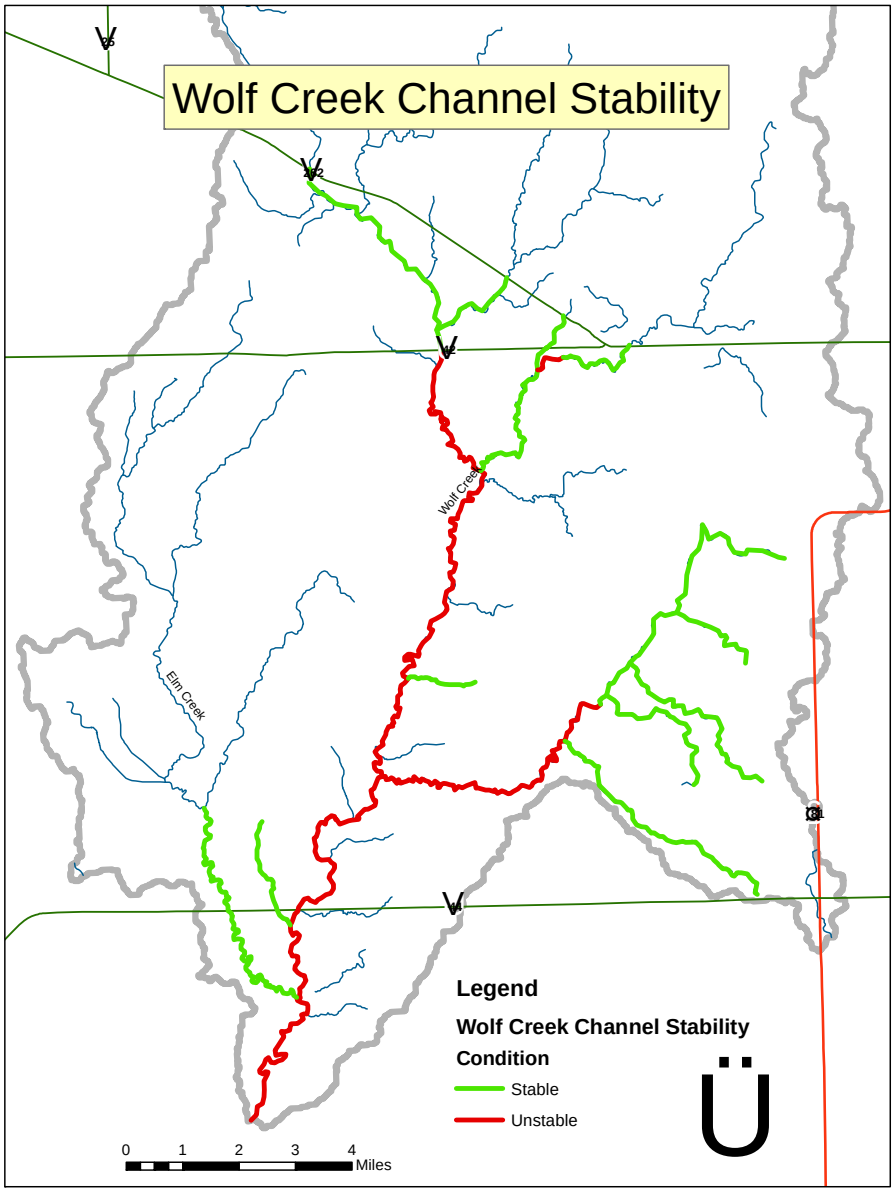


**Figure 6. Wolf Creek Channel Stability.**

It appears that the lower reaches from Highway 42 to the mouth of Wolf Creek are more unstable than the rest of the watershed. Also the first unnamed tributary on the east side of Wolf Creek contributed to the unstable conditions.

Agricultural pressures in and around the stream riparian area are the main causes of unstable portions of the stream. These factors in addition to natural channel erosion processes are the main contributing factors in the watershed.

Streams within ecoregion 46 (including Wolf Creek) that are stable may be expected to generate annual suspended sediment loads ranging from 0.158 T/y/km$^2$ to 0.579 T/y/km$^2$ with a median load of 0.351 T/y/km$^2$ (Klimentz *et al*. 2009). The maximum measured annual load in a stable stream for this ecoregion was measured at 4.33 T/y/km$^2$.

Substituting suspended solids data for the suspended-sediment data, the same methodology used by Klimentz and Simon was utilized for the Wolf Creek data. The mean of all sample loads were summed and equated to a calendar year, providing a mean annual load (T/y). To normalize data for watersheds of different size, sediment load was divided by drainage area, providing calculations of mean annual sediment yield (T/y/km$^2$).

A sediment load of 16.9 T/yr/km$^2$ was calculated for the stream. Depending on the reduction target selected (maximum vs. median of stable channels) reduction in sediment transport of 74% to 98% is necessary to reach the expected loading in a stable channel.

# 4.0 Technical Analysis

## *4.1 Data Collection Method*

Data on Wolf Creek was collected during the Lower James River Watershed Assessment from one sampling point located on Hutchinson County Road 11 near the mouth of the creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site WQM 158, which was co-located at site LOWJIMJRT15. Figure 3 represents the listed segment of the watershed as well as the drainage area of the watershed. There is also another ambient water quality monitoring site WQM 157 upstream.

The Aquarius hydrologic statistics function was used to evaluate stream flows. Sediment source evaluation was conducted through the use of RGAs and sample analysis. Analysis performed with these programs was completed according to the most recent version of the Water Quality Modeling in South Dakota document (SDDENR, 2009), except where noted.

## *4.2 Load Duration Curve*

The individual waste load allocation for each of facility was not included in the graphic due to their infrequent discharges and distance from the listed segment.

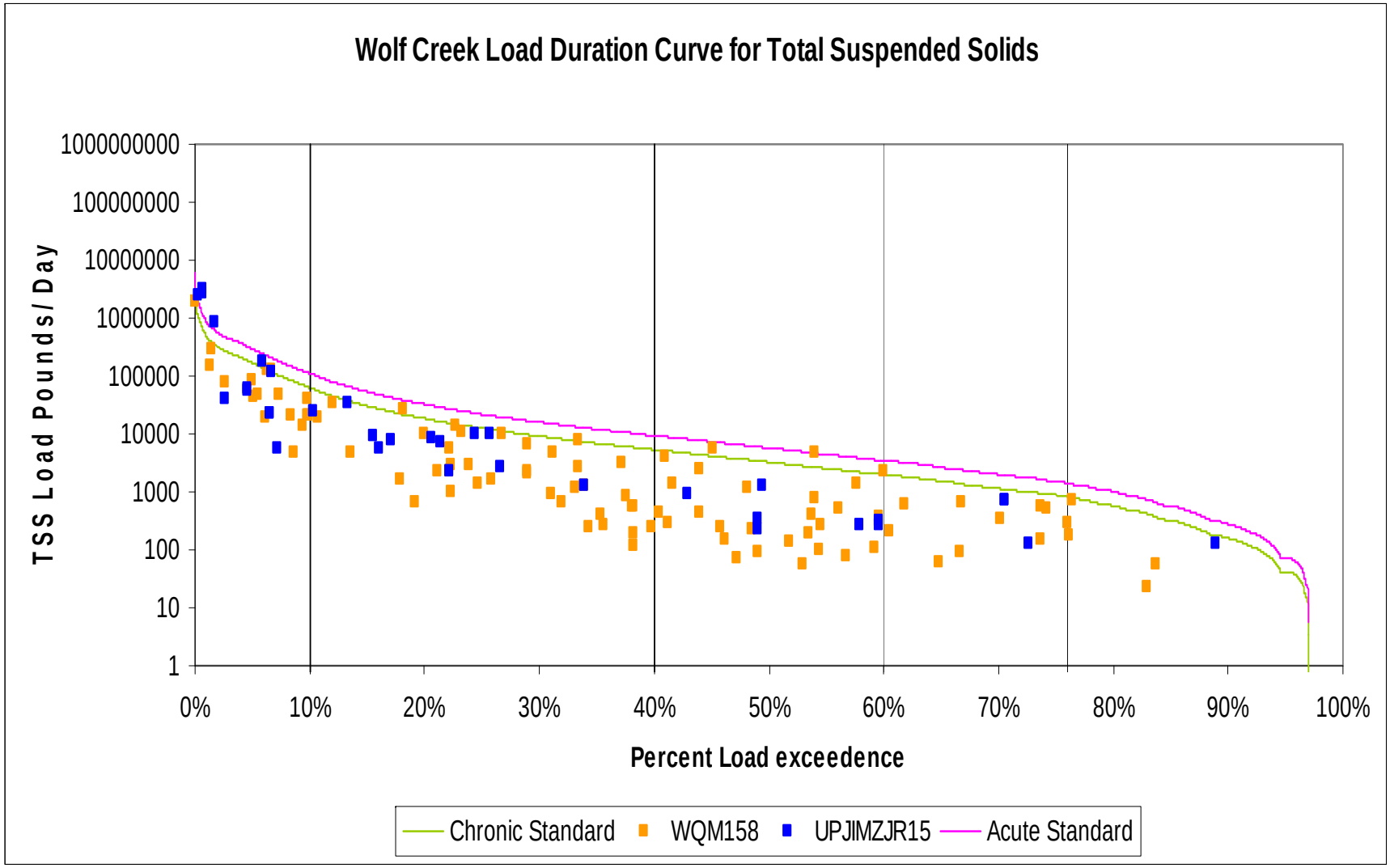


**Figure 7. Wolf Creek Load Duration Curve for Total Suspended Solids**

## *4.3 Flow Analysis*

Water quantity data were collected during the project and supplemented with USGS data from station 06478390 located on Wolf Creek near Clayton, South Dakota. This USGS station is located a few miles upstream of the water quality monitoring station. The difference between the drainage areas for the two gauges is less than 2% with no significant tributaries entering the creek between the sites. Daily flows from over 10 years of data were used to generate the flow frequency. This relatively robust dataset provided the basis for a load duration curve that accurately represents the Wolf Creek flow frequencies. Water quality data from the Lower James River Watershed Assessment as well as SDDENR ambient water quality monitoring were utilized in the development of this TMDL. Sites LOWJIMJRT15 and WQM 158 are both located at the same point on the creek.

### 4.3.1 Zone 1 – High Flow (0% to 10% exceedance)

The high flow zone is composed of the highest 10% of flows that occurred in Wolf Creek. The 10$^{th}$ percentile equates to a flow of 78 cfs and is the division between flow zones 1 and 2 as defined in the EPA load duration curve guidance. This flow is slightly less than the $Q_{1.5,}$ which is approximately 135 cfs. This is still very close to the channel forming flow making the 90% flow exceedence a good division for flow zone 1. The chronic water quality standard was exceeded in seven of the 29 samples collected from this zone, see Table 2. Of those seven, four also exceeded the acute standard of 263 mg/L.

**Table 2. Data Collected from the High Flow Zone in Wolf Creek.**

| Station ID | Sample Date | TSS (mg/L) | Flow (CFS) | Flow Zone |
|---|---|---|---|---|
| WQM 158 | 06/15/2010 | 114 | 3029.8 | 1 |
| **LOWJIMJRT15** | **05/07/2007** | **354** | **1282.4** | **1** |
| **LOWJIMJRT15** | **05/06/2007** | **700** | **805.4** | **1** |
| **LOWJIMJRT15** | **03/12/2007** | **630** | **774.5** | **1** |
| WQM 158 | 08/10/2010 | 55 | 495.1 | 1 |
| WQM 158 | 06/14/2005 | 114 | 488.0 | 1 |
| **LOWJIMJRT15** | **04/02/2007** | **344** | **439.4** | **1** |
| LOWJIMJRT15 | 03/26/2007 | 22 | 338.9 | 1 |
| WQM 158 | 07/13/2010 | 42 | 337.0 | 1 |
| LOWJIMJRT15 | 04/09/2007 | 48 | 229.8 | 1 |
| LOWJIMJRT15 | 04/09/2007 | 47 | 229.8 | 1 |
| WQM 158 | 06/17/2008 | 78 | 208.0 | 1 |
| WQM 158 | 07/21/2009 | 41 | 204.9 | 1 |
| WQM 158 | 04/12/2007 | 48 | 188.9 | 1 |
| LOWJIMJRT15 | 04/23/2007 | 196 | 171.5 | 1 |
| WQM 158 | 05/15/2007 | 23 | 161.0 | 1 |
| WQM 158 | 06/14/2004 | 150 | 158.1 | 1 |
| LOWJIMJRT15 | 04/17/2007 | 28 | 150.6 | 1 |
| LOWJIMJRT15 | 04/17/2007 | 28 | 150.6 | 1 |
| WQM 158 | 04/11/2006 | 168 | 145.5 | 1 |
| LOWJIMJRT15 | 04/11/2006 | 146 | 145.5 | 1 |
| LOWJIMJRT15 | 05/31/2007 | 8 | 132.3 | 1 |

| | | | | |
|---|---|---|---|---|
| WQM 158 | 03/20/2007 | 70 | 124.6 | 1 |
| WQM 158 | 04/15/2008 | 37 | 104.1 | 1 |
| WQM 158 | 06/05/2007 | 9 | 98.8 | 1 |
| WQM 158 | 04/13/2010 | 30 | 85.8 | 1 |
| WQM 158 | 06/23/2009 | 48 | 81.7 | 1 |
| WQM 158 | 07/10/2007 | 96 | 81.2 | 1 |
| WQM 158 | 08/11/2009 | 50 | 79.3 | 1 |

Table 3 depicts an example of a TMDL for a flow of 987 cfs, the 95$^{th}$ percentile flow within flow zone 1. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

The concentration of 263 mg/L represents the acute standard and may make an appropriate goal for this flow zone because flows in excess of 78 cfs typically only last for short periods of time (peak runoff events). However, the chronic threshold of 150 mg/L will be utilized for the TMDL instead of the acute criteria. This provides assurance that both the acute and chronic criteria are fully supported.

The resulting reduction of 71% agrees with the sediment reduction suggested in section 3.2.2 (74% to 98%).

**Table 3. High Flow Zone for Wolf Creek.**

| | **Flow Zone (expressed as tons/day)** | |
|---|---|---|
| | **High Flows** | |
| | **>78 cfs** | |
| **LA** | **347** | *Remaining load after deducting WLA and MOS from TMDL* |
| **WLA** | | *No Waste Load Allocation* |
| | | |
| **MOS** | **52** | |
| **TMDL @ 150 mg/L** | **400** | *Standard multiplied by 95th % flow for zone* |
| | | |
| **Current Load**** | **1385** | *95th Percentile of observed suspended sediment load for each zone* |
| **Load Reduction** | **71%** | *Reduction required to reduce the current load to the load at the standard* |

### 4.3.2 Zone 2 – Moist Conditions (10% to 40% exceedance)

Zone 2 flows are characterized by above average moisture conditions in the watershed. Flows in this regime are generated by precipitation and snowmelt events. The upper bound of this flow regime is approximately the annual return event.

Two of the 50 samples collected within this flow zone were above the chronic threshold of 150 mg/L and none of those exceeded the acute standard of 263 mg/L. Flows within this zone may be expected to persist for several weeks on a regular basis. By utilizing

150 mg/L as the reduction target for a single sample maximum, it ensures that both the chronic and acute standards are fully supported. There is no reduction needed in this flow zone.

**Table 4. Data Collected from the Moist Conditions Zone in Wolf Creek.**

| Station ID | Sample Date | TSS (mg/L) | Flow (CFS) | Flow Zone |
|---|---|---|---|---|
| LOWJIMJRT15 | 03/21/2007 | 59 | 74.7 | 2 |
| WQM 158 | 03/25/2010 | 52 | 68.2 | 2 |
| WQM 158 | 05/19/2004 | 113 | 55.4 | 2 |
| LOWJIMJRT15 | 07/25/2007 | 132 | 46.8 | 2 |
| WQM 158 | 11/17/2009 | 19 | 45.4 | 2 |
| LOWJIMJRT15 | 04/26/2006 | 48 | 35.4 | 2 |
| LOWJIMJRT15 | 05/01/2007 | 30 | 33.4 | 2 |
| LOWJIMJRT15 | 06/25/2007 | 48 | 30.3 | 2 |
| WQM 158 | 05/20/2008 | 11 | 27.6 | 2 |
| WQM 158 | 02/11/2009 | 180 | 26.8 | 2 |
| WQM 158 | 11/18/2008 | 5 | 24.4 | 2 |
| WQM 158 | 03/18/2003 | 79 | 23.0 | 2 |
| LOWJIMJRT15 | 05/02/2006 | 73 | 21.7 | 2 |
| WQM 158 | 05/19/2010 | 21 | 20.8 | 2 |
| LOWJIMJRT15 | 08/22/2007 | 68 | 20.4 | 2 |
| WQM 158 | 03/25/2008 | 54 | 19.0 | 2 |
| WQM 158 | 09/26/2006 | 23 | 18.9 | 2 |
| LOWJIMJRT15 | 09/26/2006 | 23 | 18.9 | 2 |
| WQM 158 | 05/05/2009 | 10 | 18.8 | 2 |
| WQM 158 | 04/14/2009 | 28 | 18.8 | 2 |
| WQM 158 | 08/21/2007 | 136 | 18.3 | 2 |
| WQM 158 | 04/12/2005 | 113 | 17.6 | 2 |
| WQM 158 | 04/08/2002 | 31 | 16.9 | 2 |
| LOWJIMJRT15 | 08/20/2007 | 118 | 16.2 | 2 |
| WQM 158 | 02/15/2005 | 16 | 15.9 | 2 |
| LOWJIMJRT15 | 04/17/2006 | 126 | 14.8 | 2 |
| WQM 158 | 12/18/2001 | 21 | 14.6 | 2 |
| LOWJIMJRT15 | 05/10/2006 | 36 | 13.9 | 2 |
| WQM 158 | 05/17/2005 | 138 | 13.7 | 2 |
| WQM 158 | 07/16/2008 | 100 | 12.0 | 2 |
| WQM 158 | 05/14/2003 | 32 | 12.0 | 2 |
| WQM 158 | 05/09/2006 | 35 | 11.9 | 2 |
| WQM 158 | 10/15/2008 | 16 | 10.6 | 2 |
| WQM 158 | 09/15/2003 | 82 | 10.5 | 2 |
| WQM 158 | 03/30/2004 | 12 | 10.0 | 2 |
| WQM 158 | 03/26/2002 | 24 | 9.4 | 2 |
| WQM 158 | 08/10/2004 | 158 | 9.3 | 2 |
| WQM 158 | 10/20/2009 | 53 | 9.3 | 2 |
| WQM 158 | 08/15/2006 | 27 | 9.0 | 2 |
| LOWJIMJRT15 | 08/15/2006 | 27 | 9.0 | 2 |
| WQM 158 | 12/02/2003 | 5 | 8.8 | 2 |
| WQM 158 | 12/18/2008 | 9 | 8.3 | 2 |
| WQM 158 | 12/08/2004 | 6 | 8.2 | 2 |
| WQM 158 | 08/12/2008 | 78 | 7.6 | 2 |
| WQM 158 | 04/15/2003 | 21 | 7.5 | 2 |
| WQM 158 | 10/11/2006 | 14 | 7.3 | 2 |
| WQM 158 | 01/15/2002 | 5 | 7.2 | 2 |
| WQM 158 | 12/10/2002 | 3 | 7.2 | 2 |
| WQM 158 | 01/07/2003 | 15 | 7.2 | 2 |
| WQM 158 | 12/04/2007 | 7 | 6.7 | 2 |

Table 5 depicts an example of a TMDL for a flow of 60 cfs, the 95th percentile flow, within the moist condition regime. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

Elevated levels of suspended solids in this zone may be linked to bed and bank failures. Banks that are aggravated during high flow events are most likely to fail while water levels are dropping in this flow zone. Also moderate storm events may fall in this zone creating increased sheet and rill erosion.

**Table 5. Moist Conditions Flow Zone for Wolf Creek.**

| | **Flow Zone (expressed as tons/day)** | |
|---|---|---|
| | **Moist Conditions** | |
| | **78-6.6 cfs** | |
| **LA** | **21** | *Remaining load after deducting WLA and MOS from TMDL* |
| **WLA** | | *No Waste Load Allocation* |
| | | |
| **MOS** | **3.5** | |
| **TMDL @ 150 mg/L** | **24.5** | *Standard multiplied by 95th % flow for zone* |
| | | |
| **Current Load**** | **22** | *95th Percentile of observed suspended sediment load for each zone* |
| **Load Reduction** | **0%** | *Reduction required to reduce the current load to the load at the standard* |

### 4.3.3 Zone 3 – Mid-range Flow (40% to 60% exceedance)

The mid-range flows extend from approximately 6.6 cfs down to 2.5 cfs. Of the 34 samples collected from this flow regime, three exceeded the chronic standard. One sample exceeded both the acute and chronic standard. A load reduction of 17% will be needed to fully support designated beneficial uses to the chronic water quality standard.

**Table 6. Data Collected from the Mid-range Flow Zone in Wolf Creek.**

| Station ID | Sample Date | TSS (mg/L) | Flow (CFS) | Flow Zone |
|---|---|---|---|---|
| WQM 158 | 03/22/2005 | 13 | 6.5 | 3 |
| WQM 158 | 07/26/2005 | 120 | 6.3 | 3 |
| WQM 158 | 02/13/2002 | 9 | 6.2 | 3 |
| WQM 158 | 11/17/2004 | 41 | 6.1 | 3 |
| LOWJIMJRT15 | 05/16/2006 | 30 | 5.7 | 3 |
| WQM 158 | 04/13/2004 | 15 | 5.4 | 3 |
| WQM 158 | 09/10/2002 | 84 | 5.4 | 3 |
| WQM 158 | 07/13/2004 | 210 | 5.1 | 3 |
| WQM 158 | 11/06/2002 | 9 | 5.0 | 3 |

| | | | | |
|---|---|---|---|---|
| WQM 158 | 02/14/2006 | 6 | 4.8 | 3 |
| WQM 158 | 11/19/2003 | 3 | 4.6 | 3 |
| WQM 158 | 10/12/2004 | 49 | 4.4 | 3 |
| WQM 158 | 11/22/2005 | 10 | 4.4 | 3 |
| LOWJIMJRT15 | 10/25/2006 | 15 | 4.3 | 3 |
| LOWJIMJRT15 | 10/25/2006 | 10 | 4.3 | 3 |
| WQM 158 | 02/12/2003 | 4 | 4.2 | 3 |
| LOWJIMJRT15 | 05/31/2006 | 59 | 4.1 | 3 |
| WQM 158 | 01/06/2004 | 7 | 3.7 | 3 |
| WQM 158 | 01/12/2005 | 3 | 3.5 | 3 |
| WQM 158 | 10/22/2002 | 11 | 3.4 | 3 |
| WQM 158 | 09/07/2004 | 23 | 3.3 | 3 |
| WQM 158 | 09/18/2007 | 43 | 3.3 | 3 |
| **WQM 158** | **02/21/2007** | **264** | **3.3** | **3** |
| WQM 158 | 01/09/2007 | 6 | 3.2 | 3 |
| WQM 158 | 02/10/2004 | 15 | 3.2 | 3 |
| WQM 158 | 03/29/2006 | 32 | 3.0 | 3 |
| WQM 158 | 12/14/2006 | 5 | 2.9 | 3 |
| WQM 158 | 06/10/2003 | 94 | 2.7 | 3 |
| LOWJIMJRT15 | 11/01/2005 | 18 | 2.7 | 3 |
| WQM 158 | 01/10/2006 | 8 | 2.5 | 3 |
| LOWJIMJRT15 | 08/30/2006 | 24 | 2.5 | 3 |
| LOWJIMJRT15 | 08/30/2006 | 20 | 2.5 | 3 |
| WQM 158 | 10/06/2003 | 28 | 2.5 | 3 |
| WQM 158 | 08/19/2003 | 166 | 2.5 | 3 |

Table 7 depicts an example of a TMDL for a flow of 6.3 cfs, the 95$^{th}$ percentile flow, within the mid-range flow regime. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

**Table 7. Mid-Range Flow Zone for Wolf Creek.**

| | **Flow Zone (expressed as tons/day)** | |
|---|---|---|
| | **Mid-Range Flows** | |
| | **6.6-2.5 cfs** | |
| **LA** | **2** | *Remaining load after deducting WLA and MOS from TMDL* |
| **WLA** | | *No Waste Load Allocation* |
| | | |
| **MOS** | **0.6** | |
| **TMDL @ 150 mg/L** | **2.6** | *Standard multiplied by 95th % flow for zone* |
| | | |
| **Current Load**** | **3.1** | *95th Percentile of observed suspended sediment load for each zone* |
| **Load Reduction** | **17%** | *Reduction required to reduce the current load to the load at the standard* |

### 4.3.4 Zone 4 – Dry Conditions (60% to 76% exceedance)

The dry conditions zone extends from approximately 2.5 cfs down to 1.00 cfs. All fifteen samples in this zone were below both the acute and chronic standards. A load reduction is not needed because the designated beneficial uses are fully supported.

**Table 8. Data Collected from the Dry Conditions Zone in Wolf Creek.**

| Station ID | Sample Date | TSS (mg/L) | Flow (CFS) | Flow Zone |
|---|---|---|---|---|
| WQM 158 | 10/12/2005 | 16 | 2.4 | 4 |
| WQM 158 | 02/20/2008 | 51 | 2.2 | 4 |
| WQM 158 | 11/07/2007 | 6 | 1.9 | 4 |
| WQM 158 | 05/07/2002 | 10 | 1.7 | 4 |
| WQM 158 | 06/18/2002 | 72 | 1.7 | 4 |
| WQM 158 | 08/30/2005 | 44 | 1.4 | 4 |
| LOWJIMJRT15 | 06/06/2006 | 98 | 1.4 | 4 |
| LOWJIMJRT15 | 06/06/2006 | 95 | 1.4 | 4 |
| LOWJIMJRT15 | 05/23/2006 | 19 | 1.2 | 4 |
| WQM 158 | 06/13/2006 | 86 | 1.2 | 4 |
| WQM 158 | 09/20/2005 | 25 | 1.2 | 4 |
| WQM 158 | 07/18/2006 | 90 | 1.1 | 4 |
| WQM 158 | 09/23/2008 | 52 | 1.0 | 4 |
| WQM 158 | 09/14/2009 | 32 | 1.0 | 4 |
| WQM 158 | 07/16/2002 | 140 | 1.0 | 4 |

Table 9 depicts an example of a TMDL for a flow of 2.3 cfs, the 95$^{th}$ percentile flow, within the dry conditions regime. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

**Table 9. Dry Conditions Zone for Wolf Creek.**

| | **Flow Zone (expressed as tons/day)** | |
|---|---|---|
| | **Dry Conditions** | |
| | **2.5-1.0 cfs** | |
| **LA** | **0.7** | *Remaining load after deducting WLA and MOS from TMDL* |
| **WLA** | | *No Waste Load Allocation* |
| | | |
| **MOS** | **0.2** | |
| **TMDL @ 150 mg/L** | **0.9** | *Standard multiplied by 95th % flow for zone* |
| | | |
| **Current Load**** | **0.7** | *95th Percentile of observed suspended sediment load for each zone* |
| **Load Reduction** | **0%** | *Reduction required to reduce the current load to the load at the standard* |

### 4.3.5 Zone 5 – Low Flow (76% to 100% exceedance)

The low flow zone represents flows below 1 cfs. No TMDL was developed for zone 5, because the total suspended solids water quality standard does not apply to flows that are below the 1 cfs cutoff for a low quality fishery.

**Table 10. Data Collected from the Low Flow Zone in Wolf Creek.**

| Station ID | Sample Date | TSS (mg/L) | Flow (CFS) | Flow Zone |
|---|---|---|---|---|
| WQM 158 | 01/22/2009 | 8 | 0.5 | 5 |
| WQM 158 | 10/10/2007 | 24 | 0.5 | 5 |
| LOWJIMJRT15 | 07/26/2006 | 108 | 0.2 | 5 |
| WQM 158 | 12/16/2009 | 8 | 0.0 | 5 |
| WQM 158 | 01/13/2010 | 21 | 0.0 | 5 |
| WQM 158 | 02/17/2010 | 5 | 0.0 | 5 |

All samples that were collected below 2.5 cfs were in full support of the total suspended solids water quality standard.

# 5.0 TMDL and Allocations

## *5.1 Load Allocations (LAs)*

A 71% reduction in solids is required in the high flow regime to fully attain the current water quality standards. Load reductions are possible in this flow regime, but a 71% reduction may be difficult or impossible to achieve**.**

A 17% reduction in solids is required in the mid-range flow regime to fully attain the current water quality standards. Load reductions used for the high flow regime should be sufficient with the implementation to address the mid-range flow regime.

## *5.2 Wasteload Allocations (WLAs)*

There are four permitted facilities in this watershed. All of the facilities were either no-discharge permits or far upstream of the listed segment. None of which were included in the calculation of the TMDL.

# 6.0 Margin of Safety (MOS) and Seasonality

## *6.1 Margin of Safety*

An explicit MOS identified using a duration curve framework is basically unallocated assimilative capacity intended to account for uncertainty (e.g., loads from tributary streams, effectiveness of controls, etc). An explicit MOS was calculated as the standard error between the loading capacity at the mid-point of each of the flow zones and the loading capacity at the minimum flow in each zone. A substantial MOS is provided using this method, because the loading capacity is typically much less at the minimum flow of a zone as compared to the mid-point. Because the allocations are a direct function of flow, accounting for potential flow variability is an appropriate way to address the MOS.

## *6.2 Seasonality*

Different seasons of the year can yield differences in water quality due to changes in precipitation and agricultural practices. Some seasonal variation in the suspended solids load would be expected. The data indicates that violations are directly linked to high flow conditions, which most often occur during the spring months.

# 7.0 Public Participation

STATE AGENCIES
South Dakota Department of Environment and Natural Resources (SD DENR) was the primary state agency involved in completion of this assessment. SD DENR provided technical support and equipment throughout the course of the project.

FEDERAL AGENCIES
Environmental Protection Agency (EPA) provided the primary source of funds for the completion of the Lower James River Assessment project.

LOCAL GOVERNMENT, INDUSTRY, ENVIRONMENTAL, AND OTHER GROUPS, AND PUBLIC AT LARGE
The primary local sponsor for this project was the James River Water Development District. The district held bi-monthly board meetings in which, short updates on the progress of the assessment project were presented. The updates were followed by a question and answer session for board members and public attendees. TMDL activities in the district were presented and discussed at nearly every meeting since project planning began in 2005.

During the summer sampling seasons, project personnel frequently met with landowners in the field. These meetings were most often initiated by landowners stopping to ask questions while coordinators were engaged in data collection. Although informal in nature, these meetings provide an important medium for obtaining local landowner views and opinions.

This TMDL was placed on public notice during April 2011 in the Mitchell Daily Republic as well as the Bridgewater Tribune. The document was made available on the DENR website and advertised on its home page during the same time period.

# 8.0 Monitoring Strategy

The Department may adjust the load and/or wasteload allocations in this TMDL to account for new information or circumstances that are developed or come to light during the implementation of the TMDL and a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment of the load and waste load allocation will only be made following an opportunity for public participation. New information generated during TMDL implementation may include, among other things, monitoring data, BMP effectiveness information and land use information. The Department will propose adjustments only in the event that any adjusted LA or WLA will not result in a change to the loading capacity; the adjusted TMDL, including its WLAs and LAs, will be set at a level necessary to implement the applicable water quality standards; and any adjusted WLA will be supported by a demonstration that load allocations are practicable. The Department will notify EPA of any adjustments to this TMDL within 30 days of their adoption.

Monitoring will continue throughout the Lower James River watershed. Wolf Creek sites WQM 157 and WQM 158 will be monitored monthly as part of the ambient water quality monitoring program. The results from this monitoring can be used to supplement the modeling to judge project effectiveness or TMDL adjustments.

# 9.0 Implementation Plan

There have been 5 contracts, totaling about 340 acres, signed into the Conservation Reserve Enhancement Program (CREP) in the Wolf Creek watershed.

Five feeding areas were assessed and prioritized based on water quality data and a simple matrix involving the AFO's distance from the stream and the number of livestock in the AFO (Figure 8). AFOs located in areas where TSS was increasing were targeted and then assessed using the matrix. A 1-10 rating score was given for each criteria (distance from stream and number of livestock) and the five AFOs were ranked.

**Table 11. Matrix for Wolf Creek AFOS.Matrix for Wolf Creek AFOs**

| AFO | Distance from water | # of Animals | Total |
|---|---|---|---|
| 1 | 10 | 8 | 18 |
| 2 | 10 | 4 | 14 |
| 3 | 5 | 4 | 9 |
| 4 | 4 | 1 | 5 |
| 5 | 1 | 3 | 4 |

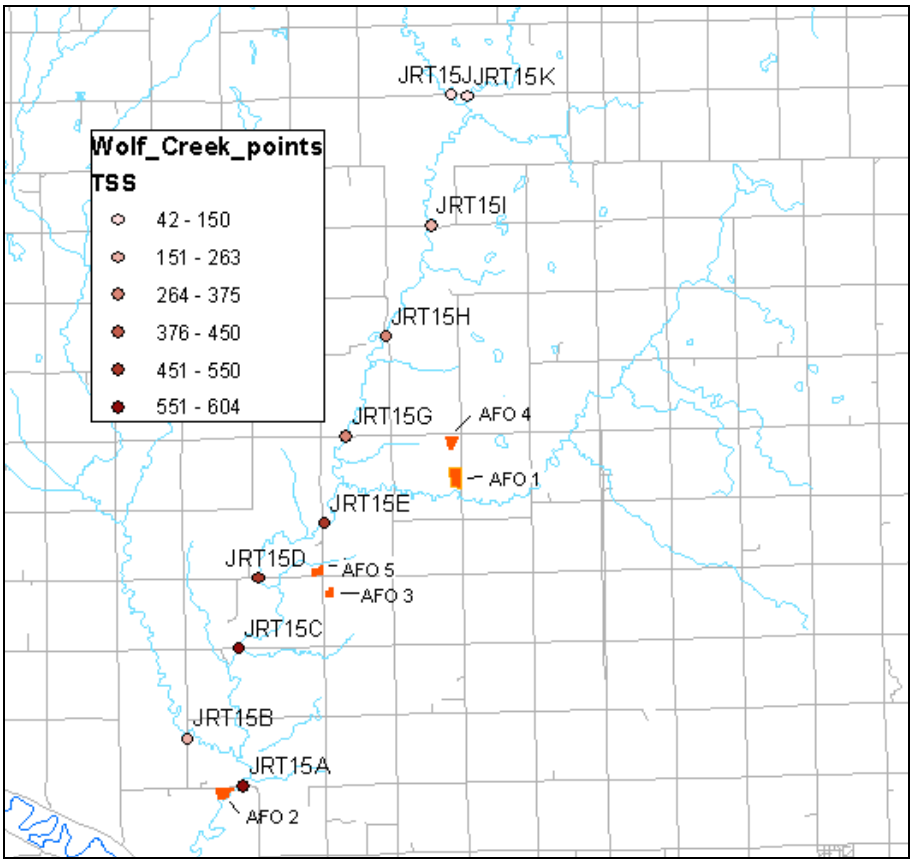


**Figure 8. Wolf Creek feeding areas. AFOs are numbered according to implementation prioritization.**

# 10.0 Literature Cited

Klimentz, L., Simon, A., Schwartz, J., 2009. Characterization of Suspended-Sediment Transport Conditions for Stable, ”Reference” Streams in Selected Ecoregions of EPA Region 8.

SDDENR (South Dakota Department of Environment and Natural Resources). 2009. Water Quality Modeling in South Dakota, May, 2009 Revision; Pierre, SD.

SDDENR (South Dakota Department of Environment and Natural Resources). 2010. The 2008 South Dakota Integrated Report for Surface Water Quality Assessment Pierre, SD.

USDA (United States Department of Agriculture) 1978, Soil Survey of Hanson and Hutchinson Counties, South Dakota.

USEPA (United States Environmental Protection Agency) 2007, An Approach for using Load Duration Curves in the Development of TMDLs.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 8**
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DENVER, CO 80202-1129
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RECEIVED
AUG 12 2011
DEPT. OF ENVIRONMENT AND NATURAL RESOURCES, SECRETARY'S OFFICE

Ref: 8EPR-EP

AUG 8 2011

Steven M. Pirner
Secretary
South Dakota Department of Environment & Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Re: TMDL Approvals
*Wolf Creek, Segment 2; Total Suspended Solids;*
*SD-JA-R-WOLF_02*

Dear Mr. Pirner:

We have completed our review of the total maximum daily loads (TMDLs) as submitted by your office for the waterbodies listed in the enclosure to this letter. In accordance with the Clean Water Act (33 U.S.C. 1251 *et. seq.*), we approve all aspects of the TMDL(s) referenced above as developed for the water quality limited waterbodies as described in Section 303(d)(1). Based on our review, we feel the separate elements of the TMDL(s) listed in the enclosed table adequately address the pollutants of concern as given in the table, taking into consideration seasonal variation and a margin of safety.

Thank you for submitting these TMDLs for our review and approval. If you have any questions, the most knowledgeable person on my staff is Vern Berry and he may be reached at 303-312-6234.

Sincerely,

Carol L. Campbell

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Enclosures

Printed on Recycled Paper

ENCLOSURE 1: APPROVED TMDLs

# Total Suspended Solids Total Maximum Daily Load Evaluation for Wolf Creek, Hutchinson County, South Dakota (SD DENR, April 2011)

**Submitted:** 6/3/2011

| | |
|---|---|
| 1 | Pollutant TMDLs completed. |
| 1 | Causes addressed from the 2010 303(d) list. |
| 0 | Determinations that no pollutant TMDL needed. |

**Segment:** Wolf Creek from just above Wolf Creek Colony to the mouth

**303(d) ID:** SD-JA-R-WOLF 02

**Parameter/Pollutant (303(d) list cause):** TOTAL SUSPENDED SOLIDS - 518

**Water Quality Targets:** <= 150 mg/L

| Allocation* | Value | Units | Permits |
|---|---|---|---|
| WLA | 0 | TONS/DAY | |
| LA | 347 | TONS/DAY | |
| TMDL | 400 | TONS/DAY | |
| MOS | 52 | TONS/DAY | |

**Notes:** The loads shown represent the loads during the high flow regime as defined by the load duration curve for Wolf Creek, Segment 2 (see Figure 7 of the TMDL). The high flows are when the largest differences occur between the existing load and the target load, therefore the greatest load reduction is needed to meet the water quality standards.

* LA = Load Allocation, WLA = Wasteload Allocation, MOS = Margin of Safety, TMDL = sum(WLAs) + sum(LAs) + MOS

ENCLOSURE 2

# EPA REGION VIII TMDL REVIEW

TMDL Document Info:

| | |
|---|---|
| **Document Name:** | **Total Suspended Solids Total Maximum Daily Load Evaluation for Wolf Creek, Hutchinson County, South Dakota** |
| **Submitted by:** | **Cheryl Saunders, SD DENR** |
| **Date Received:** | **June 3, 2011** |
| **Review Date:** | **July 28, 2011** |
| **Reviewer:** | **Vern Berry, EPA** |
| **Rough Draft / Public Notice / Final?** | **Final** |
| **Notes:** | |

Reviewers Final Recommendation(s) to EPA Administrator (used for final review only):

- ☒ Approve
- ☐ Partial Approval
- ☐ Disapprove
- ☐ Insufficient Information

**Approval Notes to Administrator:**

This document provides a standard format for EPA Region 8 to provide comments to state TMDL programs on TMDL documents submitted to EPA for either formal or informal review. All TMDL documents are evaluated against the minimum submission requirements and TMDL elements identified in the following 8 sections:

1. Problem Description
   1.1. .TMDL Document Submittal Letter
   1.2. Identification of the Waterbody, Impairments, and Study Boundaries
   1.3. Water Quality Standards
2. Water Quality Target
3. Pollutant Source Analysis
4. TMDL Technical Analysis
   4.1. Data Set Description
   4.2. Waste Load Allocations (WLA)
   4.3. Load Allocations (LA)
   4.4. Margin of Safety (MOS)
   4.5. Seasonality and variations in assimilative capacity
5. Public Participation
6. Monitoring Strategy
7. Restoration Strategy
8. Daily Loading Expression

Under Section 303(d) of the Clean Water Act, waterbodies that are not attaining one or more water quality standard (WQS) are considered "impaired." When the cause of the impairment is determined to

be a pollutant, a TMDL analysis is required to assess the appropriate maximum allowable pollutant loading rate. A TMDL document consists of a technical analysis conducted to: (1) assess the maximum pollutant loading rate that a waterbody is able to assimilate while maintaining water quality standards; and (2) allocate that assimilative capacity among the known sources of that pollutant. A well written TMDL document will describe a path forward that may be used by those who implement the TMDL recommendations to attain and maintain WQS.

Each of the following eight sections describes the factors that EPA Region 8 staff considers when reviewing TMDL documents. Also included in each section is a list of EPA's minimum submission requirements relative to that section, a brief summary of the EPA reviewer's findings, and the reviewer's comments and/or suggestions. Use of the verb "must" in the minimum submission requirements denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable.

This review template is intended to ensure compliance with the Clean Water Act and that the reviewed documents are technically sound and the conclusions are technically defensible.

# 1. Problem Description

A TMDL document needs to provide a clear explanation of the problem it is intended to address. Included in that description should be a definitive portrayal of the physical boundaries to which the TMDL applies, as well as a clear description of the impairments that the TMDL intends to address and the associated pollutant(s) causing those impairments. While the existence of one or more impairment and stressor may be known, it is important that a comprehensive evaluation of the water quality be conducted prior to development of the TMDL to ensure that all water quality problems and associated stressors are identified. Typically, this step is conducted prior to the 303(d) listing of a waterbody through the monitoring and assessment program. The designated uses and water quality criteria for the waterbody should be examined against available data to provide an evaluation of the water quality relative to all applicable water quality standards. If, as part of this exercise, additional WQS problems are discovered and additional stressor pollutants are identified, consideration should be given to concurrently evaluating TMDLs for those additional pollutants. If it is determined that insufficient data is available to make such an evaluation, this should be noted in the TMDL document.

## 1.1 TMDL Document Submittal Letter

When a TMDL document is submitted to EPA requesting formal comments or a final review and approval, the submittal package should include a letter identifying the document being submitted and the purpose of the submission.

Minimum Submission Requirements.

☒ A TMDL submittal letter should be included with each TMDL document submitted to EPA requesting a formal review.

☒ The submittal letter should specify whether the TMDL document is being submitted for initial review and comments, public review and comments, or final review and approval.

☒ Each TMDL document submitted to EPA for final review and approval should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter should contain such identifying information as the

name and location of the waterbody and the pollutant(s) of concern, which matches similar identifying information in the TMDL document for which a review is being requested.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The final Wolf Creek, Segment 2 total suspended solids (TSS) TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on June 3, 2011. The email included the final TMDL document and a letter requesting approval of the TMDL.

**COMMENTS:** None.

## 1.2 Identification of the Waterbody, Impairments, and Study Boundaries

The TMDL document should provide an unambiguous description of the waterbody to which the TMDL is intended to apply and the impairments the TMDL is intended to address. The document should also clearly delineate the physical boundaries of the waterbody and the geographical extent of the watershed area studied. Any additional information needed to tie the TMDL document back to a current 303(d) listing should also be included.

Minimum Submission Requirements:

☒ The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).

☒ One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map

☐ If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity_ID information or reach code (RCH_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Wolf Creek is located in south eastern South Dakota and is part of the larger James River basin in the Lower James sub-basin (HUC 10160010). Wolf Creek has a total drainage area of approximately 255,600 acres. This TMDL document covers one segment of Wolf Creek from just above Wolf Creek Colony to the mouth at its confluence with the James River (6.3 miles, SD-JA-R-WOLF_02). The segment is listed as high priority for TMDL development.

The designated uses for Wolf Creek, Segment 2 includes warmwater marginal fish life propagation waters, limited contact recreation waters, irrigation, fish and wildlife propagation, recreation, and stock watering. This segment was listed in 2010 for total suspended solids (TSS) which is impairing the warmwater marginal fish life propagation use.

**COMMENTS:** None.

## 1.3 Water Quality Standards

TMDL documents should provide a complete description of the water quality standards for the waterbodies addressed, including a listing of the designated uses and an indication of whether the uses are being met, not being met, or not assessed. If a designated use was not assessed as part of the TMDL analysis (or not otherwise recently assessed), the documents should provide a reason for the lack of assessment (e.g., sufficient data was not available at this time to assess whether or not this designated use was being met).

Water quality criteria (WQC) are established as a component of water quality standard at levels considered necessary to protect the designated uses assigned to that waterbody. WQC identify quantifiable targets and/or qualitative water quality goals which, if attained and maintained, are intended to ensure that the designated uses for the waterbody are protected. TMDLs result in maintaining and attaining water quality standards by determining the appropriate maximum pollutant loading rate to meet water quality criteria, either directly, or through a surrogate measurable target. The TMDL document should include a description of all applicable water quality criteria for the impaired designated uses and address whether or not the criteria are being attained, not attained, or not evaluated as part of the analysis. If the criteria were not evaluated as part of the analysis, a reason should be cited ( e.g. insufficient data were available to determine if this water quality criterion is being attained).

Minimum Submission Requirements:

☒ The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).

☒ The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, <u>all TMDL documents must be written to meet the existing water quality standards</u> for that waterbody (CWA §303(d)(1)(C)).

*Note: In some circumstances, the load reductions determined to be necessary by the TMDL analysis may prove to be infeasible and may possibly indicate that the existing water quality standards and/or assessment methodologies may be erroneous. However, the TMDL must still be determined based on existing water quality standards. Adjustments to water quality standards and/or assessment methodologies may be evaluated separately, from the TMDL.*

☒ The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.

☒ If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wolf Creek segment addressed by this TMDL is impaired based on the total suspended solids (TSS) concentrations for warmwater marginal fish life propagation. South Dakota has applicable numeric standards for TSS that are applicable to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of TSS of 263 mg/L in any one sample, or an arithmetic mean of 150 mg/L over a 30 day period. Discussion of additional applicable water quality standards for Wolf Creek, Segment 2, can be found on pages 9 - 10 of the TMDL document.

**COMMENTS:** None.

# 2. Water Quality Targets

TMDL analyses establish numeric targets that are used to determine whether water quality standards are being achieved. Quantified water quality targets or endpoints should be provided to evaluate each listed pollutant/water body combination addressed by the TMDL, and should represent achievement of applicable water quality standards and support of associated beneficial uses. For pollutants with numeric water quality standards, the numeric criteria are generally used as the water quality target. For pollutants with narrative standards, the narrative standard should be translated into a measurable value. At a minimum, one target is required for each pollutant/water body combination. It is generally desirable, however, to include several targets that represent achievement of the standard and support of beneficial uses (e.g., for a sediment impairment issue it may be appropriate to include a variety of targets representing water column sediment such as TSS, embeddeness, stream morphology, up-slope conditions and a measure of biota).

Minimum Submission Requirements:

☒ The TMDL should identify a numeric water quality target(s) for each waterbody pollutant combination. The TMDL target is a quantitative value used to measure whether or not the applicable water quality standard is attained.

*Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. Occasionally, the pollutant of concern is different from the parameter that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as a numerical dissolved oxygen criterion). In such cases, the TMDL should explain the linkage between the pollutant(s) of concern, and express the quantitative relationship between the TMDL target and pollutant of concern. In all cases, TMDL targets must represent the attainment of current water quality standards.*

☐ When a numeric TMDL target is established to ensure the attainment of a narrative water quality criterion, the numeric target, the methodology used to determine the numeric target, and the link between the pollutant of concern and the narrative water quality criterion should all be described in the TMDL document. Any additional information supporting the numeric target and linkage should also be included in the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The numeric TMDL target established for Wolf Creek, Segment 2, is based on the 30-day average water quality standard for TSS for the warmwater marginal fish life propagation beneficial use. The TMDL target is the TSS 30-day average value of $\leq$ 150 mg/L. While the standard is intended to be

expressed as the 30-day average, the target was used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the target will be protective of both the acute (single sample value) and chronic (average of 3 samples) standard.

**COMMENTS:** None.

# 3. Pollutant Source Analysis

A TMDL analysis is conducted when a pollutant load is known or suspected to be exceeding the loading capacity of the waterbody. Logically then, a TMDL analysis should consider all sources of the pollutant of concern in some manner. The detail provided in the source assessment step drives the rigor of the pollutant load allocation. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source (or source category) when the relative load contribution from each source has been estimated. Therefore, the pollutant load from each significant source (or source category) should be identified and quantified to the maximum practical extent. This may be accomplished using site-specific monitoring data, modeling, or application of other assessment techniques. If insufficient time or resources are available to accomplish this step, a phased/adaptive management approach may be appropriate. The approach should be clearly defined in the document.

Minimum Submission Requirements:

☒ The TMDL should include an identification of all potentially significant point and nonpoint sources of the pollutant of concern, including the geographical location of the source(s) and the quantity of the loading, e.g., lbs/per day. This information is necessary for EPA to evaluate the WLA, LA and MOS components of the TMDL.

☒ The level of detail provided in the source assessment should be commensurate with the nature of the watershed and the nature of the pollutant being studied. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of both the natural background loads and the nonpoint source loads.

☒ Natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g. measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified, characterized, and properly quantified.

☒ The sampling data relied upon to discover, characterize, and quantify the pollutant sources should be included in the document (e.g. a data appendix) along with a description of how the data were analyzed to characterize and quantify the pollutant sources. A discussion of the known deficiencies and/or gaps in the data set and their potential implications should also be included.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL document identifies the land use in the watershed as predominately agricultural consisting of cropland/small grain (63%), grassland (23%), herbaceous (4%) and water/wetlands, developed or forest land (9%).

There are four permitted point source facilities in the watershed. However they are all either zero discharge or their discharge is many miles away from the impaired segment. The cities of Emery, Canova, Bridgewater, and Spencer are not causing water quality impacts in the listed segment of Wolf Creek and were not given a WLA for this TMDL.

Non-point sources of suspended solids in Wolf Creek come from agricultural uses, mainly grazing, in riparian areas and from channel degradations. Rain events and snowmelt runoff seem to be major contributors of suspended solids for the entire Wolf Creek watershed, not just the listed segment. The Wolf Creek drainage contains approximately 215 animal feeding operations, some of which are in close enough proximity to the stream to have a potential for contributing suspended solids. There are 133 feedlots located within a half mile of the stream or a tributary that runs into the stream.

There were 34 individual Rapid Geomorphic Assessments (RGAs) completed in the Wolf Creek drainage. The RGAs were used to assess the current channel stability along the river and to determine the stage of channel evolution. Results from the RGAs show that most of the mainstem sites within the impaired segment are unstable indicating, bank erosion, and channel widening from collapse of bank sections. Agricultural pressures in and around the stream riparian area are the main causes of unstable portions of the stream. These factors in addition to natural channel erosion processes are the main contributing factors in the watershed.

**COMMENTS:** None.

# 4. TMDL Technical Analysis

TMDL determinations should be supported by a robust data set and an appropriate level of technical analysis. This applies to **all** of the components of a TMDL document. It is vitally important that the technical basis for **all** conclusions be articulated in a manner that is easily understandable and readily apparent to the reader.

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor → response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

The pollutant loading allocation is at the heart of the TMDL analysis. TMDLs apportion responsibility for taking actions by allocating the available assimilative capacity among the various point, nonpoint, and natural pollutant sources. Allocations may be expressed in a variety of ways, such as by individual discharger, by tributary watershed, by source or land use category, by land parcel, or other appropriate scale or division of responsibility.

The pollutant loading allocation that will result in achievement of the water quality target is expressed in the form of the standard TMDL equation:

$$TMDL = \sum LAs + \sum WLAs + MOS$$

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

MOS = The portion of the Load Capacity allocated to the Margin of safety.

Minimum Submission Requirements:

☒ A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

☒ The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.

☒ The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

☒ It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:

(1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;
(2) the distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) a presentation of relevant information affecting the characterization of the pollutant of concern and its allocation to sources such as population characteristics, wildlife resources, industrial activities etc…;
(4) present and future growth trends, if taken into consideration in determining the TMDL and preparing the TMDL document (e.g., the TMDL could include the design capacity of an existing or planned wastewater treatment facility);
(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

☒ The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.

☒ TMDLs must take critical conditions (e.g., steam flow, loading, and water quality parameters, seasonality, etc…) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1) ). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

☐ Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Wolf Creek, Segment 2

TMDL describes how the TSS loads were derived in order to meet the applicable water quality standards for the impaired stream segment.

Data on Wolf Creek was collected during the Lower James River Watershed Assessment from a sampling point located on Hutchinson County Road 11 near the mouth of the creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site WQM 158. A sediment source evaluation was conducted by using the data from the RGAs and the sediment water quality data.

Flow data was collected during the project and supplemented with USGS data from station 06478390 located on Wolf Creek near Clayton, South Dakota. Daily flows from over 10 years of data were used to generate the flow frequency. This relatively robust dataset provided the basis for a load duration curve that accurately represents the Wolf Creek flow frequencies.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach that results in a flow-variable target that considers the entire flow regime. The LDC is a dynamic expression of the allowable load for any given day. To aid in the interpretation of the TMDL, the LDC flow intervals were grouped into five flow zones. Once the loading capacity was derived for each flow zone then the load allocations were calculated by subtracting the WLA and MOS. The five distinct flow regimes are as follows – high flow ($\geq$ 78 cfs), moist flow (between 78 cfs and 6.6 cfs), midrange flow (between 6.6 cfs and 2.5 cfs), dry flow (between 2.5 cfs and 1.0 cfs) and low flow (< 1.0 cfs). The result is a flow-variable TMDL target across the flow regimes shown in Figure 7 of the TMDL document. The LDC is a dynamic expression of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 95$^{th}$ percentile of the observed total suspended solids load for each flow regime: high flow = 400 tons/day; moist flow = 24.5 tons/day; midrange flow = 2.6 tons/day; and dry flow = 0.9 tons/day. No TMDL was developed for low flow because the total suspended solids water quality standard does not apply to flows that are below the 1 cfs cutoff for a low quality fishery.

When the instantaneous loads are plotted on the LDC, characteristics of the water quality impairment are shown for the segment. Instantaneous loads that plot above the curve are exceeding the TMDL, while those below the curve are in compliance. As the LDC plot shows, TSS samples collected from Segment 2 of Wolf Creek exceed the daily maximum criterion mostly during the high flow conditions where flow frequencies rank between 0 – 10 percent (see Figure 7 of the TMDL).

**COMMENTS:** None.

## 4.1 Data Set Description

TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis. An inventory of the data used for the TMDL analysis should be provided to document, for the record, the data used in decision making. This also provides the reader with the opportunity to independently review the data. The TMDL analysis should make use of all readily available data for the waterbody under analysis unless the TMDL writer determines that the data are not relevant or appropriate. For relevant data that were known but rejected, an explanation of why the data were not utilized should be provided (e.g., samples exceeded holding times, data collected prior to a specific date were not considered timely, etc…).

Minimum Submission Requirements:

☒ TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis such that the water quality impairments are clearly defined and linked to the impaired beneficial uses and appropriate water quality criteria.

☒ The TMDL document submitted should be accompanied by the data set utilized during the TMDL analysis. If possible, it is preferred that the data set be provided in an electronic format and referenced in the document. If electronic submission of the data is not possible, the data set may be included as an appendix to the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wolf Creek, Segment 2 TMDL data description and summary are included mainly in the Data Collection Method section of the document and are plotted on the load duration curve for. The full data set is included in Section 4.3 of the TMDL document. Sampling was conducted on a temporal basis from 2007 to 2010.

Data on Wolf Creek was collected during the Lower James River Watershed Assessment from one sampling point located on Hutchinson County Road 11 near the mouth of the creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site WQM 158, which was co-located at site LOWJIMJRT15. There is also another ambient water quality monitoring site WQM 157 upstream.

Flow data was collected during the project and supplemented with USGS data from station 06478390 located on Wolf Creek near Clayton, South Dakota. This USGS station is located a few miles upstream of the water quality monitoring station. The difference between the drainage areas for the two gauges is less than 2% with no significant tributaries entering the creek between the sites. Daily flows from over 10 years of data were used to generate the flow frequency.

**COMMENTS:** None.

## 4.2 Waste Load Allocations (WLA):

Waste Load Allocations represent point source pollutant loads to the waterbody. Point source loads are typically better understood and more easily monitored and quantified than nonpoint source loads. Whenever practical, each point source should be given a separate waste load allocation. All NPDES permitted dischargers that discharge the pollutant under analysis directly to the waterbody should be identified and given separate waste load allocations. The finalized WLAs are required to be incorporated into future NPDES permit renewals.

Minimum Submission Requirements:

☒ EPA regulations require that a TMDL include WLAs for all significant and/or NPDES permitted point sources of the pollutant. TMDLs must identify the portion of the loading capacity allocated to individual existing and/or future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit. If no allocations are to be made to point sources, then the TMDL should include a value of zero for the WLA.

☒ All NPDES permitted dischargers given WLA as part of the TMDL should be identified in the TMDL, including the specific NPDES permit numbers, their geographical locations, and their associated waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** There are four permitted point source facilities in the watershed. However they are all either zero discharge or their discharge is many miles away from the impaired segment. The city of Spencer's wastewater treatment facility is operated as a no-discharge facility. The cities of Emery, Bridgewater, and Canova are allowed to discharge wastewater to Wolf Creek or its tributaries. The city of Emery's facility reported discharging four times from 2001 to 2005. During the development of the NPDES/Surface Water Discharge permit for the facility, the potential impacts on the downstream segment were considered. SD DENR determined that Emery's discharge into Wolf Creek was a sufficient distance, around 25 stream miles, upstream of this listed segment of Wolf Creek and would not impact the designated beneficial uses. The city of Canova's facility has discharged three times since 1999. The facility discharges into an unnamed wetland that drains into an unnamed tributary of Wolf Creek. Canova is located near the headwaters of Wolf Creek, over 50 stream miles north of the listed segment. The Canova facility should be a sufficient distance upstream to not impact the designated uses for the listed segment of Wolf Creek. The city of Bridgewater's facility discharged once in May 2007 due to heavy rains. The facility discharges into an unnamed tributary of Wolf Creek about 20 stream miles upstream of the listed segment. The Bridgewater facility should be a sufficient distance upstream to not impact the designated uses for the listed segment of Wolf Creek.

Therefore, cities of Emery, Canova, Bridgewater, and Spencer are not causing water quality impacts in the listed segment of Wolf Creek and were not given a WLA for this TMDL.

**COMMENTS:** None.

## 4.3 Load Allocations (LA):

Load allocations include the nonpoint source, natural, and background loads. These types of loads are typically more difficult to quantify than point source loads, and may include a significant degree of uncertainty. Often it is necessary to group these loads into larger categories and estimate the loading rates based on limited monitoring data and/or modeling results. The background load represents a composite of all upstream pollutant loads into the waterbody. In addition to the upstream nonpoint and upstream natural load, the background load often includes upstream point source loads that are not given specific waste load allocations in this particular TMDL analysis. In instances where nonpoint source loading rates are particularly difficult to quantify, a performance-based allocation approach, in which a detailed monitoring plan and adaptive management strategy are employed for the application of BMPs, may be appropriate.

Minimum Submission Requirements:

☒ EPA regulations require that TMDL expressions include LAs which identify the portion of the loading capacity attributed to nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Load allocations may be included for both existing and future nonpoint source loads. Where possible, load allocations should be described separately for natural background and nonpoint sources.

☒ Load allocations assigned to natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g., measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified and given proper load or waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Watershed Characteristics section of the TMDL explains that the landuse in the watershed as predominately agricultural consisting of cropland/small grain (63%), grassland (23%), herbaceous (4%) and water/wetlands, developed or forest land (9%). Non-point sources of suspended solids in Wolf Creek come from agricultural uses, mainly grazing, in riparian areas and from channel degradations. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Tables 3, 5, 7 and 9 include the load allocations at for each flow regimes – 347 tons/day at high flows; 21 tons/day during moist flows; 2 tons/day at midrange flows; and 0.7 tons/day during dry conditions.

The 30-day average criterion (150 mg/L) was used for the calculation of the LC, rather than the daily maximum criterion (263 mg/L) because the chronic criterion is considered more protective. The 30-day average TSS criteria applies at all times but compliance can only be determined when a minimum of three samples are obtained during separate weeks for any 30-day period. In many instances, only one or two samples were collected during any 30-day period, so the average criterion was applied to each flow zone. Although the daily maximum criteria are exceeded, to be conservative it was decided to use the average criterion to develop the loading capacity of the stream in order to ensure that the most stringent water quality standards are met. Additional data are needed to accurately assess compliance with the 30-day average criterion. The loading capacities and reductions derived from the available data are estimates (i.e., the calculated loading capacities and reductions may be higher or lower if/when a more extensive data set is collected to fully assess compliance with the chronic standard).

**Comments:** None.

## 4.4 Margin of Safety (MOS):

Natural systems are inherently complex. Any mathematical relationship used to quantify the stressor → response relationship between pollutant loading rates and the resultant water quality impacts, no matter how rigorous, will include some level of uncertainty and error. To compensate for this uncertainty and ensure water quality standards will be attained, a margin of safety is required as a component of each TMDL. The MOS may take the form of a explicit load allocation (e.g., 10 lbs/day), or may be implicitly built into the TMDL analysis through the use of conservative assumptions and values for the various factors that determine the TMDL pollutant load → water quality effect relationship. Whether explicit or implicit, the MOS should be supported by an appropriate level of discussion that addresses the level of uncertainty in the various components of the TMDL technical analysis, the assumptions used in that analysis, and the relative effect of those assumptions on the final TMDL. The discussion should demonstrate that the MOS used is sufficient to ensure that the water quality standards would be attained if the TMDL pollutant loading rates are met. In cases where there is substantial uncertainty regarding the linkage between the proposed allocations and achievement of water quality standards, it may be necessary to employ a phased or adaptive management approach (e.g., establish a monitoring plan to determine if the proposed allocations are, in fact, leading to the desired water quality improvements).

Minimum Submission Requirements:

☒ TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ). EPA's 1991 TMDL Guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).

☐ If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS should be identified and described. The document should discuss why the assumptions are considered conservative and the effect of the assumption on the final TMDL value determined.

☒ If the MOS is explicit, the loading set aside for the MOS should be identified. The document should discuss how the explicit MOS chosen is related to the uncertainty and/or potential error in the linkage analysis between the WQS, the TMDL target, and the TMDL loading rate.

☐ If, rather than an explicit or implicit MOS, the TMDL relies upon a phased approach to deal with large and/or unquantifiable uncertainties in the linkage analysis, the document should include a description of the planned phases for the TMDL as well as a monitoring plan and adaptive management strategy.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wolf Creek, Segment 2 TSS TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the four flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Tables 3, 5, 7 and 9 of the TMDL document.

**COMMENTS:** None.

## 4.5 Seasonality and variations in assimilative capacity:

The TMDL relationship is a factor of both the loading rate of the pollutant to the waterbody and the amount of pollutant the waterbody can assimilate and still attain water quality standards. Water quality standards often vary based on seasonal considerations. Therefore, it is appropriate that the TMDL analysis consider seasonal variations, such as critical flow periods (high flow, low flow), when establishing TMDLs, targets, and allocations.

Minimum Submission Requirements:

☒ The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variability as a factor. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ).

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** By using the load duration curve approach to develop the TMDL allocations seasonal variability in TSS loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months. Critical conditions occur within the basin during the spring and summer storm events. Typically, during severe thunderstorms the largest concentrations are highest in the basin during the summer months. Combined with the peak in tillage for agricultural crops, high-intensity rainstorm events, which are common during the spring and summer, produce significant amounts of sheet and rill erosion. Implementation targeted to the critical conditions should reduce the sediment loading in the river.

**COMMENTS:** None.

# 5. Public Participation

EPA regulations require that the establishment of TMDLs be conducted in a process open to the public, and that the public be afforded an opportunity to participate. To meaningfully participate in the TMDL process it is necessary that stakeholders, including members of the general public, be able to understand the problem and the proposed solution. TMDL documents should include language that explains the issues to the general public in understandable terms, as well as provides additional detailed technical information for the scientific community. Notifications or solicitations for comments regarding the TMDL should be made available to the general public, widely circulated, and clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review. When the final TMDL is submitted to EPA for approval, a copy of the comments received by the state and the state responses to those comments should be included with the document.

Minimum Submission Requirements:

☒ The TMDL must include a description of the public participation process used during the development of the TMDL (40 C.F.R. §130.7(c)(1)(ii) ).

☒ TMDLs submitted to EPA for review and approval should include a summary of significant comments and the State's/Tribe's responses to those comments.

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The State's submittal includes a summary of the public participation process that has occurred which describes the ways the public has been given an opportunity to be involved in the TMDL development process to date. In particular, the State has encouraged participation through public meetings in the watershed, and a website was developed and maintained throughout the project. The TMDL was available for a 30-day public notice period prior to finalization.

**COMMENTS:** None.

# 6. Monitoring Strategy

TMDLs may have significant uncertainty associated with the selection of appropriate numeric targets and estimates of source loadings and assimilative capacity. In these cases, a phased TMDL approach may be necessary. For Phased TMDLs, it is EPA's expectation that a monitoring plan will be included as a component of the TMDL document to articulate the means by which the TMDL will be evaluated in the field, and to provide for future supplemental data that will address any uncertainties that may exist when the document is prepared.

Minimum Submission Requirements:

☒ When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.

☒ Under certain circumstances, a phased TMDL approach may be utilized when limited existing data are relied upon to develop a TMDL, and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. EPA recommends that a phased TMDL document or its implementation plan include a

monitoring plan and a scheduled timeframe for revision of the TMDL. These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may be necessary to support a rationale for approving the TMDL. http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.pdf

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wolf Creek should continue to be monitored as part of DENR's ambient water quality monitoring. Post-implementation monitoring will be necessary to assure the TMDL has been reached and maintenance of the beneficial use occurs.

Monitoring will continue throughout the Lower James River watershed. Wolf Creek sites WQM 157 and WQM 158 will be monitored monthly as part of the ambient water quality monitoring program. The results from this monitoring can be used to supplement the modeling to judge project effectiveness or TMDL adjustments.

**COMMENTS:** None.

# 7. Restoration Strategy

The overall purpose of the TMDL analysis is to determine what actions are necessary to ensure that the pollutant load in a waterbody does not result in water quality impairment. Adding additional detail regarding the proposed approach for the restoration of water quality is not currently a regulatory requirement, but is considered a value added component of a TMDL document. During the TMDL analytical process, information is often gained that may serve to point restoration efforts in the right direction and help ensure that resources are spent in the most efficient manner possible. For example, watershed models used to analyze the linkage between the pollutant loading rates and resultant water quality impacts might also be used to conduct "what if" scenarios to help direct BMP installations to locations that provide the greatest pollutant reductions. Once a TMDL has been written and approved, it is often the responsibility of other water quality programs to see that it is implemented. The level of quality and detail provided in the restoration strategy will greatly influence the future success in achieving the needed pollutant load reductions.

Minimum Submission Requirements:

☒ EPA is not required to and does not approve TMDL implementation plans. However, in cases where a WLA is dependent upon the achievement of a LA, "reasonable assurance" is required to demonstrate the necessary LA called for in the document is practicable). A discussion of the BMPs (or other load reduction measures) that are to be relied upon to achieve the LA(s), and programs and funding sources that will be relied upon to implement the load reductions called for in the document, may be included in the implementation/restoration section of the TMDL document to support a demonstration of "reasonable assurance".

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Implementation section of the TMDL document says that some implementation planning has already been completed to address five priority animal feeding areas that have a high potential for contributing sediment to Segment 2 of Wolf Creek. Also, there have been 5 contracts, totaling about 340 acres, signed into the Conservation Reserve Enhancement Program in the Wolf Creek watershed.

**COMMENTS:** None.

# 8. Daily Loading Expression

The goal of a TMDL analysis is to determine what actions are necessary to attain and maintain WQS. The appropriate averaging period that corresponds to this goal will vary depending on the pollutant and the nature of the waterbody under analysis. When selecting an appropriate averaging period for a TMDL analysis, primary concern should be given to the nature of the pollutant in question and the achievement of the underlying WQS. However, recent federal appeals court decisions have pointed out that the title TMDL implies a "daily" loading rate. While the most appropriate averaging period to be used for developing a TMDL analysis may vary according to the pollutant, a daily loading rate can provide a more practical indication of whether or not the overall needed load reductions are being achieved. When limited monitoring resources are available, a daily loading target that takes into account the natural variability of the system can serve as a useful indicator for whether or not the overall load reductions are likely to be met. Therefore, a daily expression of the required pollutant loading rate is a required element in all TMDLs, in addition to any other load averaging periods that may have been used to conduct the TMDL analysis. The level of effort spent to develop the daily load indicator should be based on the overall utility it can provide as an indicator for the total load reductions needed.

Minimum Submission Requirements:

☒ The document should include an expression of the TMDL in terms of a daily load. However, the TMDL may also be expressed in temporal terms other than daily (e.g., an annual or monthly load). If the document expresses the TMDL in additional "non-daily" terms the document should explain why it is appropriate or advantageous to express the TMDL in the additional unit of measurement chosen.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wolf Creek TSS TMDL includes daily loads expressed as tons per day. The daily TMDL loads are included in the Technical Analysis section of the TMDL document.

**COMMENTS:** None.