STATEMENT OF BASIS

Applicant:	City of Custer
Permit Number:	SD0023281
Contact Person:	Robert Brown, Mayor 622 Crook Street Custer, SD 57730
Phone:	(605) 673-4824
Permit Type:	Minor Municipal - Renewal

This document is intended to explain the basis for the requirements contained in the draft Surface Water Discharge Permit. This document provides guidance to aid in complying with the permit requirements. This guidance is not a substitute for reading the draft permit and understanding its requirements.

SUMMARY OF DRAFT PERMIT CHANGES

- Pre-discharge sampling requirements have been removed.
- SSO sampling requirements have been removed.
- Effluent limits for ammonia for Outfall 004A are more stringent in some months. See permit **Section 3.9**
- Effluent limits for ammonia are being added to Outfall 001A. See permit **Section 3.8**
- Effluent limits for *Escherichia coli* (*E. coli*) are more stringent. See permit **Sections 3.8 and 3.9**.
- A compliance schedule has been added to have the facility address its effluent violations, and to allow interim ammonia limits to carry over from the current permit before the final ammonia limits become effective. See permit **Sections 3.7**, **3.8**, and **3.9**.
- An industrial waste survey must be submitted within 90 days of the effective date of this permit. See permit **Section 6.1**.
- Added Secondary Treatment Standards and percent removal to Outfall 002R.
- Removed Outfall 003 and Outfall 002N

DESCRIPTION

The city of Custer operates a wastewater treatment facility located in Sections 18 and 19 of Township 3 South, Range 5 East and Section 27 of Township 3 South, Range 4 East, all in Custer County, South Dakota (Latitude 43.773306°, Longitude -103.567528°, Satellite Map Estimation).

The facility began operation in 1972 and was upgraded in 1986, 1994, and 2022-2025. The latest upgrade consisted of adding treatment processes including a Submerged Attached Growth Reactor (SAGR), disc filtration, and UV disinfection. The upgrade also included piping and a new outfall location on French Creek. The draft permit includes monitoring and reporting requirements for both the current facility and the upgraded facility and both discharges to Flynn Creek and French Creek.

Current facility
Wastewater flows by gravity to the headworks building and aerated lagoons, which are located about 0.2 miles east of city in the Northwest ¼ of the Southeast ¼ of Section 19, Township 3 South, Range 5 East, in Custer County, South Dakota (Latitude 43.773306°, Longitude -103.567528°, Satellite Map Estimation). The wastewater treatment facility consists of a spiral influent screen, two aerated lagoons (1.4 million gallons each) which are operated in parallel.

From the aerated lagoons, wastewater is transferred to the facultative ponds by the aid of a lift station. The facultative ponds are located approximately ⅔ of a mile north of the aeration basins in the South ½ of Section 18 and North ½ of Section 19, all in Township 3 South, Range 5 East, in Custer County, South Dakota (Latitude 43.782611°, Longitude -103.569889°, Satellite Image Estimation). Flow to the ponds is split in parallel between Cell #1 (4.3 acres, 10-foot depth) and Cell #2 (4.6 acres, 5-foot depth). From these cells, flow is transferred in series to Cell #3 (11.7 acres, 21-foot depth) and then Cell #4 (5.6 acres, 25-foot depth). No discharge is permitted from the facultative Cell #4 via gravity flow to the unnamed tributary of French Creek upstream of Stockade Lake (Outfall 003N). Outfall 003N was the city's discharge location in a previous permit cycle. Discharge to this outfall was prohibited due to the proximity of Stockade Lake, which is located about 3 miles downstream. This outfall has been removed from this draft permit.

From facultative Cell #4, flow is transferred by gravity back to the primary treatment facility where the lift station pumps can transfer the treated wastewater to either the discharge outfall to Flynn Creek (Outfall 001A) or to the golf course land application holding pond (Outfall 002R). A valve in the forcemain controls where the flow is routed.

For wastewater discharged to Outfall 001A, effluent samples are collected at the primary treatment facility from a valve in the forcemain to Flynn Creek and are considered representative of the water discharged to the outfall. Discharge to Outfall 001A occurs year-round.

During the summer months, the final effluent is chlorinated, routed to a land application holding pond located at the city golf course, and land applied as needed. Land application of treated wastewater from Outfall 002R is not considered a discharge to waters of the state, and no discharge is permitted during land application (Outfall 002N). The holding pond (0.5 acres) is located at the Rocky Knolls Golf Course in southwest Custer in the Southwest ¼ of the Southeast ¼ of Section 27, Township 3 South, Range 4 East, in Custer County, South Dakota (Latitude 43.755417°, Longitude -103.623861°, Satellite Image Interpolation). When wastewater is diverted to the land application pond, a small portion is still discharged through the line to Outfall 001A to Flynn Creek.

The current facility has an average design flow rate of 0.483 million gallons per day (MGD) and a peak design flow of 0.553 MGD.

Upgraded facility
The city of Custer completed a major facility upgrade to repair existing treatment and also build in additional treatment to meet future surface water quality standards. The city completed these upgrades in 2025.

Wastewater flows by gravity to the headworks building and aerated lagoons, which are located about 0.2 miles east of town. The wastewater treatment facility consists of a spiral influent screen, two aerated lagoons (1.4 million gallons each) which are operated in parallel.
Wastewater is pumped from the primary treatment facility to the facultative ponds. The ponds have been renamed as part of the upgrade and a summary of the changes are as follows:

- Previous Cell #1 is now Cell #1A
- Previous Cell #2 is now Cell #1
- Previous Cell #3 is now Cell #2
- Previous Cell #4 is now Cell #3

The city's use of the facultative ponds' changes with the time of year due to treatment needs. In summer, the city will pump wastewater directly to Cell #3 for treatment and the wastewater would return by gravity back to the primary treatment facility.

In the winter, the city will pump wastewater to Cell #1. The wastewater will then flow by gravity through Cells #2 and #3 in series before being returned by gravity to the primary treatment facility.

Cells #1, #1A, and #2 will be used for flow equalization during high flow events during the summer months and the water will flow by gravity to Cell #3 once lower flows are experienced.

Cell #1A will be used for flow equalization during high flow events during the winter months and water will flow by gravity to Cell #2 once lower flows are experienced.

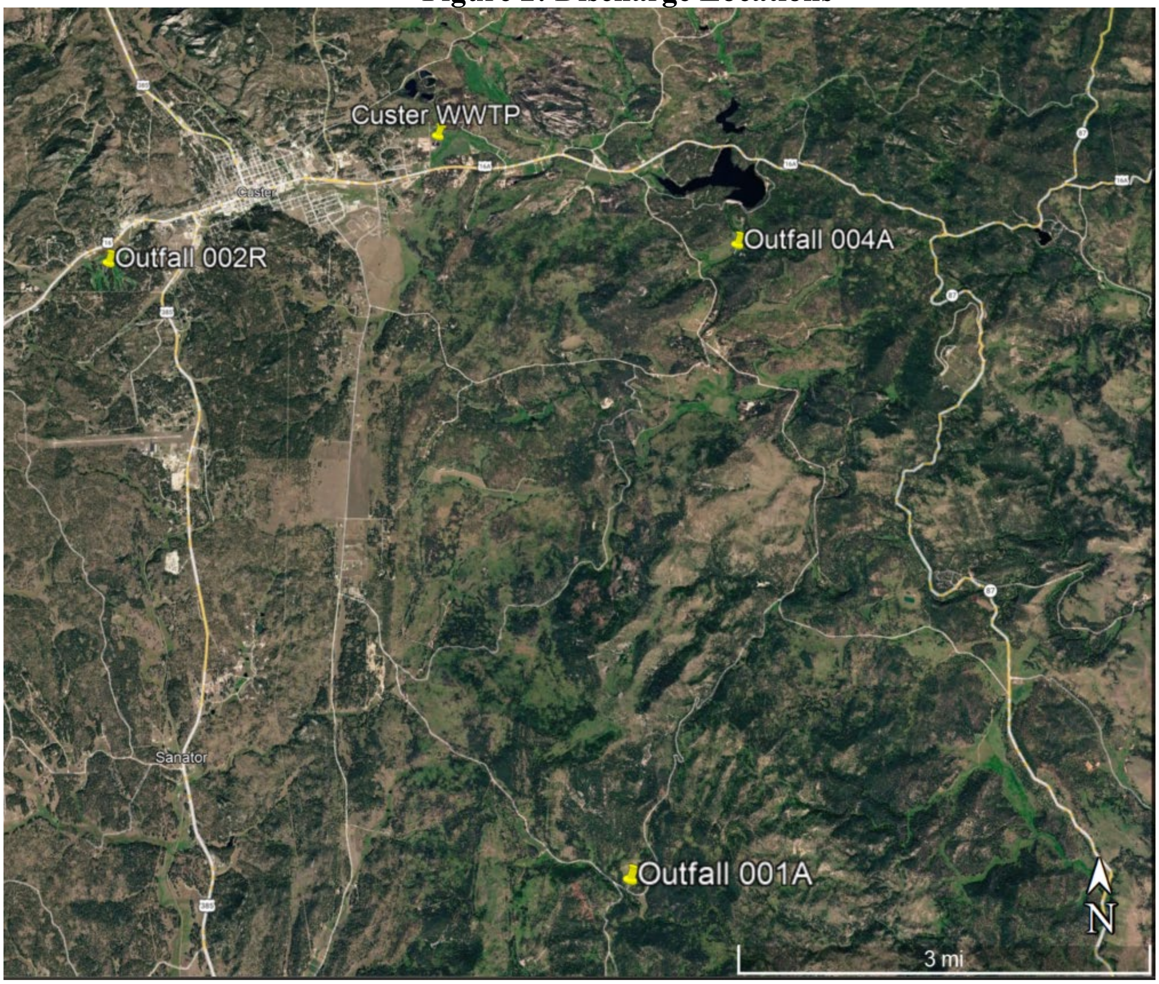
Wastewater flows by gravity from Cell #3 back to the primary treatment facility. The wastewater then enters a Submerged Attached Growth Reactor (SAGR) followed by disc filtration. Finally, the wastewater goes through Ultraviolet (UV) disinfection and the treated effluent is pumped to either Outfall 001A (Flynn Creek), Outfall 002R (Rocky Knolls Golf Course holding pond for land application), or Outfall 004A (French Creek).

The upgraded facility has an average design flow of 0.75 MGD and a peak design flow of 1.2 MGD. The facility average design organic treatment capacity is 592 pounds of BOD_5 per day.

This wastewater treatment facility serves a total population of approximately 2,200 persons from the city of Custer (1,919 persons - 2020 census) and East Custer Sanitary District (250 persons – application), with no known industrial users contributing flow to the system.

Figure 1: WWTP

Figure 2: Discharge Locations



RECEIVING WATERS

Current Facility – Outfall 001A

Any discharge from the current facility is pumped approximately 8 miles and will enter the Flynn Creek which is classified by the South Dakota Surface Water Quality Standards (SDSWQS), Administrative Rules of South Dakota (ARSD), Section 74:51:03:01 for the following beneficial uses:

(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

Approximately 5 miles downstream of the discharge location, Flynn Creek's classification changes and is classified by the SDSWQS, ARSD Section 74:51:03:01 and 74:51:03:15 for the following beneficial uses:

(3) Coldwater marginal fish life propagation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

Because the receiving waterbody has only the minimum fishery beneficial use classification of (9), the SDSWQS (ARSD 74:51:01:02:01) require that an analysis of the receiving stream be conducted to determine whether the waterbody deserves a higher beneficial use designation. The South Dakota Department of Agriculture and Natural Resources (SDDANR) has conducted an analysis for Flynn Creek near the discharge location. SDDANR personnel have determined that the creek in this area may need to be upgraded to a classified fishery. In accordance with ARSD Section 74:51:01:25:01, the effluent limits will include ammonia limits to protect this higher beneficial use. The effluent limits will be drafted to be protective of the beneficial use classifications of the coldwater marginal fish life propagation of Flynn Creek, in accordance with ARSD Section 74:51:01:04.

Land Application Site and System – Outfall 002R
Any runoff discharged from the golf course land application site or any discharge from the golf course holding pond will enter French Creek, which is classified by the SDSWQS, ARSD Sections 74:51:03:01 and 74:51:03:14, for the following beneficial uses:

(3) Coldwater marginal fish life propagation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

French Creek then flows approximately 0.25 miles to the Custer Municipal Pond, which is classified by the SDSWQS, ARSD Sections 74:51:02:01, 74:51:02:02, and 74:51:02:04, for the following uses:

(3) Coldwater marginal fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited Contact recreation waters; and
(9) Fish and wildlife propagation, recreation, and stock watering waters.

From the Custer Municipal Pond, any discharge would continue to French Creek, which is classified by the SDSWQS, ARSD Sections 74:51:03:01 and 74:51:03:14, for the following beneficial uses:

(3) Coldwater marginal fish life propagation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and

(10) Irrigation waters.

French Creek then flows approximately 6.5 miles to Stockade Lake, which is classified by the SDSWQS, ARSD Sections 74:51:02:01, 74:51:02:02, and 74:51:02:04, for the following uses:

(3) Coldwater marginal fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited Contact recreation waters; and
(9) Fish and wildlife propagation, recreation, and stock watering waters.

The SDSWQS (ARSD Section 74:51:01:04) allow application of criteria to protect downstream waterbodies which are impacted by discharges. Based on the proximity of the discharge location to the Custer Municipal Pond and Stockade Lake, the city of Custer's discharge is expected to impact the Custer Municipal Pond and Stockade Lake. Both the Custer Municipal Pond and Stockade Lake are considered classified lakes due to their coldwater marginal fish life propagation beneficial use. As established in the SDSWQS, ARSD Section 74:51:01:27, no discharge of pollutants is allowed to reach a lake classified for this beneficial use. Due to its proximity to these lakes, discharge from this outfall is prohibited. **No discharge shall occur from Outfall 002R. Land application of treated wastewater from Outfall 002R is not considered a discharge.**

Upgraded Facility – Outfall 004A

Any discharge from the upgraded facility is expected to be pumped approximately 3.5 miles to French Creek, which is 0.6 miles downstream of Stockade Lake, which is classified by the SDSWQS, ARSD Sections 74:51:03:01 and 74:51:03:14, for the following beneficial uses:

(3) Coldwater marginal fish life propagation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

The SDSWQS (ARSD Section 74:51:01:25.01) allow the application of criteria to protect higher existing beneficial uses than is currently designated for a water body. SDDANR has observed immersion recreation activities in French Creek. Therefore, the permit limits were developed to be protective of the immersion recreation waters beneficial use to protect the existing beneficial uses in French Creek, in accordance with ARSD Section 74:51:01:25.01. Daily maximum limits and 30-day average limits for *Escherichia coli (E. coli)* based off immersion recreation will be included in the draft permit.

TOTAL MAXIMUM DAILY LOAD

Section 303(d) of the federal Clean Water Act requires states to develop Total Maximum Daily Loads (TMDLs) for waters at levels necessary to achieve and maintain water quality standards. TMDLs are calculations of the amount of pollution a waterbody can receive and still maintain applicable water quality standards. According to the federal Clean Water Act, the state must develop TMDLs for all waters identified on their Section 303(d) list of impaired waters, according to their priority ranking on that list. Every two years, the state assesses its water quality and publishes the list of impaired water bodies as part of its Integrated Report.

TMDLs address specific waterbodies, segments of waterbodies, or even entire watersheds, and are pollutant specific. TMDLs must allow for seasonal variations and a margin of safety, which accounts for any lack of knowledge concerning the relationship between pollutant loads and water quality. A wasteload allocation is developed for any point sources that cause or contribute to the water quality impairment.

These receiving waterbodies, Flynn Creek and French Creek, have not been identified as being impaired; therefore, a TMDL is not needed.

SDDANR's 2024 Integrated Report for Surface Water Quality Assessment lists Stockade Lake as impaired for mercury in fish tissue (TMDL approved, August 2016), *Escherichia coli (E. coli)* and Chlorophyll-A. *E. Coli* and Chlorophyll-A impairment was first listed in 2024 and a TMDL is needed. However, no discharge is permitted to the city's outfall that is located upstream of Stockade Lake, therefore, no wasteload allocations are needed for the city of Custer.

ANTIDEGRADATION

SDDANR has fulfilled the antidegradation review requirements for this permit. In accordance with South Dakota's *Antidegradation Implementation Procedures* (SDDANR, October 1998) and the SDSWQS, it was determined that the discharge at the draft permit limits will cause an insignificant change in water quality. The results of SDDANR's review are included in Attachment 1 (Antidegradation Review). The antidegradation review and conclusions will be public noticed for public comment at the same time as the draft permit.

MONITORING DATA

The city of Custer has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, this facility failed to sample new parameters (nitrate, total nitrogen, and total phosphorus) that were added to the current permit for the first two months after its reissuance. These parameters do not have limits but the failures to sample are considered permit violations. The facility has had no effluent violations in the current permit cycle. No discharge was reported for the months not included in the table.

The facility did have a daily maximum pH violation and a Total Suspended Solids 30-day average effluent violation in 2020 but was under the previous permit. These are being included as they were not included in the previous permit's monitoring section.

Public access to facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/.

INSPECTIONS

Personnel from SDDANR conducted a Compliance Inspection of the city of Custer's wastewater treatment facility on March 24, 2021. No permit violations were identified during the compliance inspection.

EFFLUENT LIMITS

Current Facility

Outfall 001A – Any discharge from the wastewater treatment facility pumped 8 miles to Flynn Creek (Latitude 43.682725°, Longitude -103.538960°, Satellite Map Estimation).

During any discharge, the permittee shall comply with the effluent limits specified below which are based on the Secondary Treatment Standards (ARSD Section 74:52:06:03), the SDSWQS, permit writer's judgment, and the current permit limits.

1. The Five-Day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed 10 mg/L (30-day average) or 17.5 mg/L (daily maximum). These limits are based on the coldwater marginal fish life propagation waters classification of Flynn Creek, the SDSWQS (ARSD Section 74:51:01:32), and BPJ and are being included because SDDANR has determined there is a reasonable potential for BOD_5 to be present in the discharge at levels that may violate the SDSWQS. These limits are more restrictive than the Secondary Treatment Standards and will ensure compliance with ARSD Sections 74:51:03:15 and 74:52:06:03, therefore 7-day average limits will not be required for this discharge.

2. The Total Suspended Solids (TSS) concentration shall not exceed 10 mg/L (30-day average) or 17.5 mg/L (daily maximum). These limits are based on the coldwater marginal fish life propagation waters classification of Flynn Creek, the SDSWQS (ARSD Section 74:51:01:32), and BPJ and are being included because SDDANR has determined there is a reasonable potential for TSS to be present in the discharge at levels that may violate the SDSWQS. These limits are more restrictive than the Secondary Treatment Standards and will ensure compliance with ARSD Sections 74:51:03:15 and 74:52:06:03, therefore 7-day average limits will not be required for this discharge.

3. The pH shall not be less than 6.5 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the coldwater marginal fish life propagation waters classification of Flynn Creek and the Secondary Treatment Standards and are being included because SDDANR has determined there is a reasonable potential for the pH of the effluent to violate the SDSWQS. The minimum pH required under the Secondary Treatment Standards is 6.0 standard units; the minimum pH required by the beneficial uses assigned to Flynn Creek is 6.5 standard units. Therefore, the more stringent limit of 6.5 standard units shall be applied to this discharge to ensure compliance with both the Secondary Treatment Standards and the SDSWQS.

   Note: SDDANR specifies that pH analyses are to be conducted within 15 minutes of sample collection with a pH meter. Therefore, the permittee must have the ability to conduct onsite pH analyses. The pH meter used must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

4. The *Escherichia coli* (*E. coli*) organisms shall not exceed a concentration of 630 per 100 milliliters as a geometric mean based on a minimum of five samples obtained during separate 24-hour periods for any calendar month. *This limit is only applicable if five or more samples are taken and is only effective from May 1 to September 30.*

   In addition, the *E. coli* organisms shall not exceed 1,178 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the limited-contact recreation beneficial use classification of Flynn Creek and the SDSWQS (ARSD Section 74:51:01:51) and are being included because SDDANR has determined there is a reasonable potential for *E. coli* to be present in the discharge at levels that may violate the SDSWQS.

6. The ammonia-nitrogen (as N) concentration shall not exceed the limits specified in the table below. These limits are based on the coldwater marginal fish life propagation waters classification of Flynn Creek, the SDSWQS (ARSD Section 74:51:01:46), and permit writer's professional judgment and are being included because SDDANR has determined there is a reasonable potential for ammonia-nitrogen to be present in the discharge at levels that may violate the SDSWQS. See Attachment 7 for more details.

   Note: Because the ammonia-nitrogen (as N) limits developed for this permit are more stringent than the monitoring requirement of the previous permit, a compliance schedule has been added to the draft permit to allow interim limits carried over from the current permit before the final limits become effective on **July 1, 2029.**

INTERIM EFFLUENT LIMITS – *Effective through June 30, 2029*		
Season	**Ammonia-Nitrogen (as N) Limits**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January 1 – December 31	Report	Report

FINAL EFFLUENT LIMITS – *Effective starting July 1, 2029*		
Season	**Ammonia-Nitrogen (as N) Limits**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January 1 – March 31	1.1	3.2
April 1 – June 30	0.6	2.8
July 1 – September 30	0.9	4.7
October 1 – December 31	0.9	2.6

7. The dissolved oxygen (DO) concentration shall not be less than 5.0 mg/L at any time. SDDANR has determined there is a reasonable potential for the DO levels in the discharge to violate the SDSWQS. This limit is based on the coldwater marginal fish life propagation waters classification of Flynn Creek and the SDSWQS (ARSD Sections 74:51:01:46 and 74:51:03:15).

8. The water temperature shall not be greater than 75.2°F. This limit is based on the coldwater marginal fish life propagation waters classification of Flynn Creek in the Black Hills Trout Management Area and the SDSWQS (ARSD Sections 74:51:01:46.01)

9. No chemicals, such as chlorine, shall be used in the treatment process without prior written permission. This limit is based on permit writer's professional judgment.

SDDANR does not believe there is a reasonable potential for other pollutants to violate the SDSWQS. The limits and monitoring in the draft permit will be sufficient to ensure the protection of the water quality near the city of Custer's discharge.

Land Application Site and System

Outfall 002R – Any land application of treated wastewater from the golf course holding pond to the land application site (Latitude 43.755417°, Longitude -103.623861°, Satellite Map Estimation). **Land application of treated wastewater from Outfall 002R is not considered a discharge. No discharge shall occur from Outfall 002R.**

During land application of treated wastewater from Outfall 002R, the permittee shall comply with the land application limits and conditions specified below, which are based on SDDANR's *Recommended Design Criteria Manual, Wastewater Collection and Treatment Facilities* (Chapter 12, "Recommended Criteria for Disposal of Effluent by Irrigation," March 1991), the SDSWQS, permit writer's judgment, and the current permit limits.

1. The Five-Day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on the Secondary Treatment Standards and permit writer's professional judgment. These limits are being included based on the guidance specified in *South Dakota Recommended Design Criteria Manual for Wastewater Collection and Treatment Facilities* for the reuse and disposal of wastewater by land application.

2. The Total Suspended Solids (TSS) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on the Secondary Treatment Standards and permit writer's professional judgment. These limits are being included based on the guidance specified in *South Dakota Recommended Design Criteria Manual for Wastewater Collection and Treatment Facilities* for the reuse and disposal of wastewater by land application.

3. *Escherichia coli (E. coli)* shall not exceed a concentration of 126 per 100 milliliters in any one sample. This limit is based on current permit limits, permit writer's judgment and the immersion recreation 30-day geometric mean standard for *E. coli* and is being included because there is a potential for human contact with the land applied wastewater.

Upgraded Facility

Outfall 004A – Any discharge from the upgraded wastewater treatment facility that is pumped 3.5 miles to French Creek downstream of Stockade Lake (Latitude 43.758006°, Longitude -103.516167°, Satellite Map Estimation).

During any discharge, the permittee shall comply with the effluent limits specified below which are based on the Secondary Treatment Standards (ARSD Section 74:52:06:03), the SDSWQS, permit writer's judgment, and the current permit limits.

1. The Five-Day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed 10 mg/L (30-day average) or 17.5 mg/L (daily maximum). These limits are based on the coldwater marginal fish life propagation waters classification of French Creek, the SDSWQS (ARSD Section 74:51:01:32), and best professional judgement and are being included because SDDANR has determined there is a reasonable potential for BOD_5 to be present in the discharge at levels that may violate the SDSWQS. These limits are more restrictive than the Secondary Treatment Standards and will ensure compliance with ARSD Sections 74:52:03:14 and 74:52:06:03, therefore 7-day average limits will not be required for this discharge.

2. The Total Suspended Solids (TSS) concentration shall not exceed 10 mg/L (30-day average) or 17.5 mg/L (daily maximum). These limits are based on the coldwater marginal fish life propagation waters classification of French Creek, the SDSWQS (ARSD Section 74:51:01:32), and BPJ and are being included because SDDANR has determined there is a reasonable potential for TSS to be present in the discharge at levels that may violate the SDSWQS. These limits are more restrictive than the Secondary Treatment Standards and will ensure compliance with ARSD Sections 74:52:03:14 and 74:52:06:03, therefore 7-day average limits will not be required for this discharge.

3. The pH shall not be less than 6.5 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the coldwater marginal fish life propagation waters classification of French Creek and the Secondary Treatment Standards and are being included because SDDANR has determined there is a reasonable potential for the pH of the effluent to violate the SDSWQS. The minimum pH required under the Secondary Treatment Standards is 6.0 standard units; the minimum pH required by the beneficial uses assigned to French Creek is 6.5 standard units. Therefore, the more stringent limit of 6.5 standard units shall be applied to this discharge to ensure compliance with both the Secondary Treatment Standards and the SDSWQS.

   Note: SDDANR specifies that pH analyses are to be conducted within 15 minutes of sample collection with a pH meter. Therefore, the permittee must have the ability to conduct onsite pH analyses. The pH meter used must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

4. The *Escherichia coli* (*E. coli*) organisms shall not exceed a concentration of 126 per 100 milliliters as a geometric mean based on a minimum of five samples obtained during separate 24-hour periods for any calendar month. *This limit is only applicable if five or more samples are taken and is only effective from May 1 to September 30.*

   In addition, the *E. coli* organisms shall not exceed 235 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the immersion recreation beneficial use classification of French Creek and the SDSWQS (ARSD Section 74:51:01:50) and are being included because SDDANR has determined there is a reasonable potential for *E. coli* to be present in the discharge at levels that may violate the SDSWQS.

5. The ammonia-nitrogen (as N) concentration shall not exceed the limits specified in the table below. These limits are based on the coldwater marginal fish life propagation waters classification of French Creek, the SDSWQS (ARSD Section 74:51:01:46), the current permit limits, and permit writer's professional judgment and are being included because SDDANR has determined there is a reasonable potential for ammonia-nitrogen to be present in the discharge at levels that may violate the SDSWQS. See Attachment 3 for more detail.

   Note: Because the ammonia-nitrogen (as N) limits developed for this permit are more stringent for some/all months/seasons, a compliance schedule has been added to the draft permit to allow interim limits carried over from the current permit before the final limits become effective on **July 1, 2029.**

INTERIM EFFLUENT LIMITS – *Effective through June 30, 2029*		
Season	**Ammonia-Nitrogen (as N) Limits**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January 1 – February 29	2.2	4.9
March 1 – March 31	2.4	5.0
April 1 – April 30	2.9	6.0
May 1 – June 30	1.4	3.5
July 1 – August 31	1.0	3.1
September 1 – September 30	1.6	3.3
October 1 – October 31	2.0	4.1
November 1 – December 31	2.1	4.5

FINAL EFFLUENT LIMITS – *Effective starting July 1, 2029*		
Season	**Ammonia-Nitrogen (as N) Limits**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January 1 – February 29	1.8	4.9
March 1 – March 31	1.5	4.1
April 1 – April 30	2.6	6.0
May 1 – June 30	0.5	2.4
July 1 – August 31	0.6	2.7
September 1 – September 30	0.8	3.3
October 1 – October 31	1.6	4.1
November 1 – December 31	1.3	3.5

6. The dissolved oxygen (DO) concentration shall not be less than 5.0 mg/L at any time. SDDANR has determined there is a reasonable potential for the DO levels in the discharge to violate the SDSWQS. This limit is based on the coldwater marginal fish life propagation waters classification of French Creek, the SDSWQS (ARSD Sections 74:51:01:46 and 74:51:03:14).

7. The water temperature shall not be greater than 75.2°F. This limit is based on the coldwater marginal fish life propagation waters classification of French Creek in the Black Hills Trout Management Area and the SDSWQS (ARSD Sections 74:51:01:46.01)

8. No chemicals, such as chlorine, shall be used in the treatment process without prior written permission. This limit is based on permit writer's professional judgment.

SDDANR does not believe there is a reasonable potential for other pollutants to violate the SDSWQS. The limits and monitoring in the draft permit will be sufficient to ensure the protection of the water quality near the city of Custer's WWTF's discharge.

SELF MONITORING REQUIREMENTS

Current Facility – Outfall 001A

The draft permit requires the permittee to monitor all discharges from Outfall 001A for BOD_5 (mg/L), TSS (mg/L), ammonia-nitrogen (as N, mg/L), Dissolved oxygen (mg/L), effluent water temperature (°F), and pH (su). These monitoring requirements are based on the limits in the draft permit for these parameters. *E. coli* (#/100mL), ammonia-nitrogen (as N, mg/L), nitrate-nitrogen (as N, mg/L), total nitrogen (as N, mg/L), total phosphorus (as P, mg/L), and flow rate (MGD), shall be monitored, but will not have a limit. These monitoring requirements are based on the need to fully characterize the discharge.

Monitoring frequencies and sample types vary based on parameters. Please see **Section 3.8** of the permit for monitoring frequencies and sample types.

Land Application Site and System – Outfall 002R
The city of Custer shall have **no discharge** from the golf course holding pond, land application pump system, or land application site. **Land application of treated wastewater is not considered a discharge.**

The draft permit requires the permittee to monitor all land application wastewater for *E. coli* (#/100 mL), BOD_5 (mg/L), and TSS (mg/L). This monitoring requirement is based on the limits in the draft permit for these parameters. The flow rate of land application (MGD), duration of land application (days), total flow land applied (million gallons), pH (s.u.), water temperature (°F), Sodium Absorption Ratio (SAR, ratio), conductivity (µmhos/cm), total Kjeldahl nitrogen (TKN, mg/L), ammonia-nitrogen (as N, mg/L), total nitrates (as N, mg/L), total nitrites (as N, mg/L), total sulfates (mg/L), total chlorides (mg/L), total phosphorus (as P, mg/L), and total dissolved solids (TDS, mg/L) shall be monitored, but will not have limits. These monitoring requirements are based on the need to fully characterize the land application water.

Monitoring frequencies and sample types vary based on parameters. Please see **Section 3.11** of the permit for monitoring frequencies and sample types.

Upgraded facility – Outfall 004A
The draft permit requires the permittee to monitor all discharges from Outfall 004A for BOD_5 (mg/L), TSS (mg/L), *E. coli* (#/100 mL), ammonia-nitrogen (as N, mg/L), Dissolved oxygen (mg/L), effluent water temperature (°F), and pH (s.u.). These monitoring requirements are based on the limits in the draft permit for these parameters. Nitrate-nitrogen (as N, mg/L), total nitrogen (as N, mg/L), total phosphorus (as P, mg/L), and flow rate (MGD) shall be monitored, but will not have effluent limits. These monitoring requirements are based on the need to fully characterize the discharge.

Monitoring frequencies and sample types vary based on parameters. Please see **Section 3.8** of the permit for monitoring frequencies and sample types.

Effluent monitoring results from Outfalls 001A, 002R and 004A shall be summarized for each month and recorded on a DMR to be submitted via NetDMR to SDDANR on a **monthly** basis. If no discharge occurs during a month, it shall be stated as such on the DMR.

In accordance with 40 CFR Parts 122 and 127, all permit reports shall be submitted electronically starting no later than **December 21, 2025.** The SDDANR is rolling out programs to meet this requirement and will notify facilities as they become available.

Monitoring shall consist of **5 days per week** inspections of the mechanical processes and at least **monthly** inspections of the facultative ponds and the outfalls to verify that proper operation and maintenance procedures are being practiced and whether or not there is a discharge occurring from this facility's outfalls. When land applying, inspections are required **daily** of the land application system, and inspections are required **weekly** at the land application site.

Each lift station shall be inspected on at least a **weekly** basis, although **daily** inspections are recommended. The frequency of on-site inspection may be reduced at the Secretary's discretion with reasonable justification. During any sanitary overflow, the lift stations shall be inspected on a **daily** basis. Documentation of each of these visits shall be kept in a log in either paper or electronic format to be reviewed by SDDANR or EPA personnel when an inspection occurs.

WHOLE EFFLUENT TOXICITY

The SDDANR *Reasonable Potential Implementation Procedure for SWD Permits* was reviewed to determine if Whole Effluent Toxicity (WET) testing is applicable to the city of Custer. Following the guidance document, the city of Custer is not believed to have reasonable potential to cause or contribute to an exceedance of the SDSWQS for toxicity.

The draft permit will not include WET monitoring or limits. SDDANR has determined that due to the facility's minor discharge status and the lack of significant industrial contributions to the wastewater treatment facility, there is no reasonable potential for WET. SDDANR has the authority to reopen the permit to add WET effluent limits, compliance schedules, monitoring, or other appropriate requirements.

COMPLIANCE SCHEDULE TO MEET UPDATED AMMONIA-NITROGEN (AS N) EFFLUENT LIMITS

The ammonia-nitrogen (as N) effluent limits proposed in this draft permit were developed using updated ammonia criteria (USEPA, 2013), and are more stringent than those in the current permit for some seasons (Attachment 3 and 7, Ammonia Limits Development). Recent discharge monitoring data indicate that the facility may not be able to consistently meet these new effluent limits as it is currently operated (Attachment 2, Monitoring Data). Therefore, the ammonia-nitrogen (as N) limits in the current permit will be carried over as interim limits until completion of a compliance schedule for the facility to meet the final effluent limits.

The final effluent limits for ammonia-nitrogen (as N) shall become effective according to the following compliance schedule (**Section 3.8 and 3.9** of the draft permit), in accordance with the SDSWQS, ARSD Section 74:52:03:22:

1. Starting on the first effective day of the permit (**July 1, 2026)**, ammonia-nitrogen (as N) shall be monitored during a discharge according to **Section 3.8 and 3.9** of the draft permit. There shall be interim ammonia-nitrogen (as N) effluent limits carried over from the previous permit.

2. The permittee shall submit compliance progress reports on a **quarterly** basis. Quarterly reports shall be due on the first day of each calendar quarter. The first quarterly report shall be due by **October 1, 2026**. This report shall include details on the progress in meeting the compliance schedule, as well as any delays or setbacks in the process. Any expectation of delays of milestone achievements shall also be noted in the compliance progress report.

3. The permittee shall hire a professional engineer licensed in the state of South Dakota by **October 1, 2026**. The professional engineer shall evaluate the treatment system and

develop a preliminary engineering report which includes treatment and operational options for reducing ammonia-nitrogen (as N) levels in the discharge.

4. The permittee shall submit a preliminary engineering report developed by the professional engineer to the department by **September 1, 2027**.

5. If the facility upgrades are needed to achieve compliance with the final effluent limits, the permittee shall submit plans and specifications for the necessary upgrades by **April 1, 2028**.

6. The permittee shall start construction or other necessary adjustments to the wastewater treatment process and operations by **June 1, 2028**.

7. The permittee shall complete any necessary adjustments to the wastewater treatment processes and operations to comply with the final effluent limits for ammonia-nitrogen (as N) by **July 1, 2029**.

8. On **July 1, 2029**, the final effluent limits for ammonia-nitrogen (as N) in **Section 3.7 and 3.8** of the draft permit shall become effective.

The milestones must be completed by the date specified. The permittee shall submit to the SDDANR a written notice of compliance or noncompliance with each milestone by the date specified above. If the permittee is not in compliance with the milestone, the notice shall include the cause of any noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

PRETREATMENT

Publicly Owned Treatment Works (POTWs) with a 5 MGD or greater design flow which receive wastewater from a significant industrial user are required under 40 CFR 403.8 to develop a pretreatment program. The state may also require a POTW with a lower design flow to develop a program to prevent Pass Through or Interference with the POTW, including biosolids.

The city of Custer has a design flow of less than 5.0 MGD, and no industries who are likely to cause pass through or interference with the POTW. Therefore, the draft permit will not require the city of Custer to develop an industrial pretreatment program. Any categorical industrial user (CIU) or significant industrial user (SIU) that discharges to the POTW will be permitted by the state. However, the city must still meet the requirements for regulating nondomestic sources of wastewater entering its system in accordance with the requirements of Section 6.0 of the draft permit.

SLUDGE

Based on the city of Custer's permit application, SDDANR does not anticipate sludge will be removed or disposed of during the life of the permit. Therefore, the draft Surface Water Discharge permit shall not contain sludge disposal requirements. However, if sludge disposal is necessary, the city of Custer is required to submit to SDDANR a sludge disposal plan for review and approval **prior** to the removal and disposal of sludge.

DRAINAGE ISSUES

Custer County has the authority to regulate drainage. The city of Custer is responsible for getting any necessary drainage permits from the county **prior** to discharging.

ENDANGERED SPECIES

This is a renewal of an existing permit. No listed endangered species are expected to be impacted by activities related to this permit. However, the table below shows the species that may be present in the city of Custer's geographic area.

COUNTY	GROUP	SPECIES
CUSTER	MAMMAL	NORTHERN LONG-EARED BAT

This information was accessible at the following US Fish and Wildlife Service website as of December 3, 2025: https://ipac.ecosphere.fws.gov/.

PERMIT EXPIRATION

A five-year permit is recommended.

PERMIT CONTACT

This statement of basis and the draft permit were developed by Kyle Doerr, Engineer III for the Water Quality Program. Any questions pertaining to this statement of basis or the draft permit can be directed to the Water Quality Program, at (605) 773-3351.

January 29, 2026

ATTACHMENT 1

Antidegradation Review

Antidegredation Review: Current Facility – Outfall 001A

Permit Type:	**Minor Municipal - Renewal**	Applicant:	**City of Custer**
Date Received:	**09/18/2025**	Permit #:	**SD0023281**

County: **Custer** Legal Description: **Sec 18&19 of T3S, R5E, and Sec 27 of T3S, R4E**

Receiving Stream: **Flynn Creek** Classification: **9, 10**

If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: **Approximately 5 miles downstream, Flynn Creek is 3, 8, 9, 10.**

APPLICABILITY

1. Is the permit or the stream segment exempt from the antidegradation review process under ARSD 74:51:01? Yes ☐ No ☒ If no, go to question #2. If yes, check those reasons why the review is not required:

- ☐ Existing facility covered under a surface water discharge permit is operating at or below design flows and pollutant loadings;
- ☐ Existing effluent quality from a surface water discharge permitted facility is in compliance with all discharge permit limits;
- ☐ Existing surface water discharge permittee was discharging to the current stream segment prior to March 27, 1973, and the quality and quantity of the discharge has not degraded the water quality of that segment as it existed on March 27, 1973;
- ☐ The existing surface water discharge permittee, with DANR approval, has upgraded or built new wastewater treatment facilities between March 27, 1973, and July 1, 1988;
- ☐ The existing surface water discharge permittee discharges to a receiving water assigned only the beneficial uses of (9) and (10); the discharge is not expected to contain toxic pollutants in concentrations that may cause an impact to the receiving stream; and DANR has documented that the stream cannot attain a higher use classification. This exemption does not apply to discharges that may cause impacts to downstream segments that are of higher quality;
- ☐ Receiving water meets Tier 1 waters criteria. Any permitted discharge must meet water quality standards;
- ☐ The permitted discharge will be authorized by a Section 404 Corps of Engineers Permit, will undergo a similar review process in the issuance of that permit, and will be issued a 401 certification by the department, indicating compliance with the state's antidegradation provisions; or
- ☐ Other: ____________________

FORMAL REVIEW

2. Is the stream segment classified as an OSRW? Yes ☐ No ☒ If no, go to question #3. **If yes, no change in water quality allowed. No further review required.**

3. Will there be an insignificant change in water quality? Yes ☒ No ☐ If no, go to question #4. **If yes, no further review required. List reason why discharge is insignificant**

   - ☐ Only temporary change in water quality will result from the discharge;
   - ☐ Resulting change in water quality from the discharge will only affect a water quality parameter that is only regulated by a narrative standard and the discharge will not adversely impact the stream's beneficial uses;
   - ☐ Volume of the proposed discharge is small compared to the flow in the stream. The ratio of the average stream flow to discharge flow is greater than 50:1;
   - ☐ The increase in pollutant loading at critical low flow is expected to be less than 20% of the stream's assimilative capacity;
   - ☐ The resulting change in water quality from the discharge is less than one standard deviation of the mean concentration of the ambient water quality; or
   - ☒ Other: **This permit does not authorize an increase in effluent limits.**

   ____

   ____

4. Are existing, regulated point or nonpoint sources located in the area in compliance with required controls or has a compliance schedule been established for these sources? Yes ☐ No ☐ If no, establish an appropriate compliance schedule prior to approving, as proposed, the activity under review.

5. Based on available information, are there existing uses that are better than the currently designated uses? Yes ☐ No ☐ If yes, use protection of the higher existing use(s) as the basis for antidegradation decision-making and arrange to upgrade the currently designated use(s).

6. Will existing uses be fully maintained and protected? Yes ☐ No ☐ If no, recommend denial of the activity as proposed.

PERMIT APPLICATION

7. Has the applicant submitted all information listed in the antidegradation implementation Procedure? Yes ☐ No ☐ If no, why not? ______________________________

   ____

   ____

   ____

PUBLIC NOTICE AND OPPORTUNITY FOR HEARING

8. Has the application been properly public noticed? Yes ☐ No ☐ Date notice occurred In paper: ________________ Paper notice appeared in: ________________________

9. Has anyone petitioned the department for a public hearing on the application? Yes ☐ No ☐ **If no, no further review required. Proceed with writing permit based on outcome of antidegradation review. If yes, schedule time before the Water Management Board for public hearing on application**.
   Date and time of hearing: ____
   Location of hearing: ____

10. Did the Board of Water Management approve the application? Yes ☐ No ☐ Attach a copy of the board minutes to this worksheet.

ANTIDEGRADATION REVIEW SUMMARY

11. The outcome of the review is:
    - ☐ A formal antidegradation review was not required for reasons stated in this worksheet. Any permitted discharge must ensure water quality standards will not be violated.
    - ☐ The review has determined that degradation of water quality should not be allowed. Any permitted discharge would have to meet effluent limits or conditions that would not result in any degradation estimated through appropriate modeling techniques based on ambient water quality in the receiving stream, or pursue an alternative to discharging to the waterbody.
    - ☒ The review has determined that the discharge will cause an insignificant change in water quality in the receiving stream. The appropriate agency may proceed with permit issuance with the appropriate conditions to ensure water quality standards are met.
    - ☐ The review has determined, with public input, that the permitted discharge is allowed to discharge effluent at concentrations determined through a total maximum daily load (TMDL). The TMDL will determine the appropriate effluent limits based on the upstream ambient water quality and the water quality standard(s) of the receiving stream.
    - ☐ The review has determined that the discharge is allowed. However, the full assimilative capacity of the receiving stream cannot be used in developing the permit effluent limits or conditions. In this case, a TMDL must be completed based on the upstream ambient water quality and the assimilative capacity allowed by the antidegradation review.
    - ☐ Other: ____
      ____
      ____
      ____

12. Describe any other requirements to implement antidegradation or any special conditions That are required as a result of this antidegradation review: ______________________

Kyle Doerr
Permit Writer

01/29/2026
Date

Aaron Ward
Reviewer

10 March 2026
Date

Antidegredation Review: Upgraded Facility – Outfall 004A

Permit Type: **Minor Municipal - Renewal** Applicant: **City of Custer**
Date Received: **09/18/2025** Permit #: **SD0023281**
County: **Custer** Legal Description: **Sec 18&19 of T3S, R5E, and Sec 27 of T3S, R4E**
Receiving Stream: **French Creek** Classification: **3, 8, 9, 10**
If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: **N/A**

APPLICABILITY

2. Is the permit or the stream segment exempt from the antidegradation review process under ARSD 74:51:01? Yes ☐ No ☒ If no, go to question #2. If yes, check those reasons why the review is not required:

- ☐ Existing facility covered under a surface water discharge permit is operating at or below design flows and pollutant loadings;
- ☐ Existing effluent quality from a surface water discharge permitted facility is in compliance with all discharge permit limits;
- ☐ Existing surface water discharge permittee was discharging to the current stream segment prior to March 27, 1973, and the quality and quantity of the discharge has not degraded the water quality of that segment as it existed on March 27, 1973;
- ☐ The existing surface water discharge permittee, with DANR approval, has upgraded or built new wastewater treatment facilities between March 27, 1973, and July 1, 1988;
- ☐ The existing surface water discharge permittee discharges to a receiving water assigned only the beneficial uses of (9) and (10); the discharge is not expected to contain toxic pollutants in concentrations that may cause an impact to the receiving stream; and DANR has documented that the stream cannot attain a higher use classification. This exemption does not apply to discharges that may cause impacts to downstream segments that are of higher quality;
- ☐ Receiving water meets Tier 1 waters criteria. Any permitted discharge must meet water quality standards;
- ☐ The permitted discharge will be authorized by a Section 404 Corps of Engineers Permit, will undergo a similar review process in the issuance of that permit, and will be issued a 401 certification by the department, indicating compliance with the state's antidegradation provisions; or
- ☐ Other: ______________________________

FORMAL REVIEW

2. Is the stream segment classified as an OSRW? Yes ☐ No ☒ If no, go to question #3. **If yes, no change in water quality allowed. No further review required.**

3. Will there be an insignificant change in water quality? Yes ☒ No ☐ If no, go to question #4. **If yes, no further review required. List reason why discharge is insignificant**

   ☐ Only temporary change in water quality will result from the discharge;
   ☐ Resulting change in water quality from the discharge will only affect a water quality parameter that is only regulated by a narrative standard and the discharge will not adversely impact the stream's beneficial uses;
   ☐ Volume of the proposed discharge is small compared to the flow in the stream. The ratio of the average stream flow to discharge flow is greater than 50:1;
   ☐ The increase in pollutant loading at critical low flow is expected to be less than 20% of the stream's assimilative capacity;
   ☐ The resulting change in water quality from the discharge is less than one standard deviation of the mean concentration of the ambient water quality; or
   ☒ Other: **This permit does not authorize an increase in effluent limits.**

7. Are existing, regulated point or nonpoint sources located in the area in compliance with required controls or has a compliance schedule been established for these sources? Yes ☐ No ☐ If no, establish an appropriate compliance schedule prior to approving, as proposed, the activity under review.

8. Based on available information, are there existing uses that are better than the currently designated uses? Yes ☐ No ☐ If yes, use protection of the higher existing use(s) as the basis for antidegradation decision-making and arrange to upgrade the currently designated use(s).

9. Will existing uses be fully maintained and protected? Yes ☐ No ☐ If no, recommend denial of the activity as proposed.

PERMIT APPLICATION

7. Has the applicant submitted all information listed in the antidegradation implementation Procedure? Yes ☐ No ☐ If no, why not?

PUBLIC NOTICE AND OPPORTUNITY FOR HEARING

8. Has the application been properly public noticed? Yes ☐ No ☐ Date notice occurred In paper: ________________ Paper notice appeared in: ________________________

10. Has anyone petitioned the department for a public hearing on the application? Yes ☐ No ☐ **If no, no further review required. Proceed with writing permit based on outcome of antidegradation review. If yes, schedule time before the Water Management Board for public hearing on application**.
    Date and time of hearing: ____
    Location of hearing: ____

10. Did the Board of Water Management approve the application? Yes ☐ No ☐ Attach a copy of the board minutes to this worksheet.

ANTIDEGRADATION REVIEW SUMMARY

11. The outcome of the review is:
    - ☐ A formal antidegradation review was not required for reasons stated in this worksheet. Any permitted discharge must ensure water quality standards will not be violated.
    - ☐ The review has determined that degradation of water quality should not be allowed. Any permitted discharge would have to meet effluent limits or conditions that would not result in any degradation estimated through appropriate modeling techniques based on ambient water quality in the receiving stream, or pursue an alternative to discharging to the waterbody.
    - ☒ The review has determined that the discharge will cause an insignificant change in water quality in the receiving stream. The appropriate agency may proceed with permit issuance with the appropriate conditions to ensure water quality standards are met.
    - ☐ The review has determined, with public input, that the permitted discharge is allowed to discharge effluent at concentrations determined through a total maximum daily load (TMDL). The TMDL will determine the appropriate effluent limits based on the upstream ambient water quality and the water quality standard(s) of the receiving stream.
    - ☐ The review has determined that the discharge is allowed. However, the full assimilative capacity of the receiving stream cannot be used in developing the permit effluent limits or conditions. In this case, a TMDL must be completed based on the upstream ambient water quality and the assimilative capacity allowed by the antidegradation review.
    - ☐ Other: ____
      ____
      ____
      ____

12. Describe any other requirements to implement antidegradation or any special conditions That are required as a result of this antidegradation review: ____________________________

Kyle Doerr
Permit Writer

01/29/2026
Date

Aaron Ward
Reviewer

10 March 2026
Date

ATTACHMENT 2

Monitoring Data

MONITORING DATA
SD0023281, City of Custer

The monitoring data was obtained from the facility's DMRs and retrieved through the ICIS database, accessed December 1, 2025. The period of the data is from April 1, 2021, through September 30, 2025. Public access to the facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/

Outfall 001A						
Parameter& Limit / DMR	BOD_5		*E. coli*		Flow rate	
	30-Day Av	Max 7-Day Av	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	30 mg/L	45 mg/L	N/A #/100mL	N/A #/100mL	N/A MGD	N/A MGD
04/30/2021	15.53	20.1	Nul	Nul	0.56	1.19
05/31/2021	16.31	17.9	19.34	44.8	0.57	1.25
06/30/2021	8.14	11.9	14.81	40.2	0.53	1.03
07/31/2021	13.15	22	13.42	77.1	0.46	0.84
08/31/2021	7.87	9.33	4.23	9.8	0.39	1.05
09/30/2021	Nul	13.48	Nul	27.5	0.2	0.78
09/30/2021	8.4	Nul	14.46	Nul	Nul	Nul
11/30/2021	11.08	14.2	Nul	Nul	0.21	0.23
12/31/2021	11.08	12.5	Nul	Nul	0.2	0.25
01/31/2022	9.28	15.83	Nul	Nul	0.2	0.25
02/28/2022	6.93	8.08	Nul	Nul	0.2	0.48
03/31/2022	10.09	14.58	Nul	Nul	0.57	1.12
04/30/2022	19	21.75	Nul	Nul	0.34	0.64
05/31/2022	23.02	29.15	2.88	8.6	0.38	0.96
06/30/2022	15.49	21.38	9.05	21.6	0.49	0.6
07/31/2022	5.87	7.53	8.02	30.9	0.17	0.61
08/31/2022	6.19	7.28	23.43	71.2	0.22	0.58
09/30/2022	5.72	6.6	4.52	6.3	0.21	0.52
10/31/2022	10.3	13.93	Nul	Nul	0.2	1.54
11/30/2022	14.2	18.6	Nul	Nul	0.12	0.29
12/31/2022	13.62	15.93	Nul	Nul	0.16	0.36
01/31/2023	9.73	9.9	Nul	Nul	0.16	1.59
02/28/2023	14.17	14.45	Nul	Nul	0.05	0.8
03/31/2023	11.15	11.95	Nul	Nul	0.42	0.81
04/30/2023	20.68	22.43	Nul	Nul	0.5	1.41
05/31/2023	23.29	26.63	3.4	6.3	0.44	0.56
06/30/2023	15.82	20.7	46.12	179	0.61	1.5
07/31/2023	8.9	17.03	33.91	548	1.29	1.6
08/31/2023	9.42	11.43	32.97	83.3	1.4	1.7
09/30/2023	7.1	8	9.28	23.8	1.3	1.6

Outfall 001A						
Parameter& Limit / DMR	BOD$_5$		*E. coli*		Flow rate	
	30-Day Av	Max 7-Day Av	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	30 mg/L	45 mg/L	N/A #/100mL	N/A #/100mL	N/A MGD	N/A MGD
10/31/2023	9.28	11.55	Nul	Nul	1.2	1.55
11/30/2023	14.02	18.83	Nul	Nul	1.2	1.55
12/31/2023	13.26	17.23	Nul	Nul	1.41	1.61
01/31/2024	15.98	21.2	Nul	Nul	0.2	1.59
02/29/2024	18.52	22.88	Nul	Nul	0.31	1.5
03/31/2024	20.98	26.7	Nul	Nul	0.34	1.5
04/30/2024	27.45	37	Nul	Nul	0.81	1.5
05/31/2024	23.19	30.85	11.87	11.87	0.5	0.56
06/30/2024	9	12.38	7.37	21.8	0.84	1
07/31/2024	7.12	11.15	21.57	179	0.39	0.91
08/31/2024	13.04	16.2	104.97	921	0.39	1
09/30/2024	13.04	16.2	104.97	921	0.39	1
10/31/2024	18.69	19.38	Nul	Nul	0.2	0.5
11/30/2024	15.75	20.83	Nul	Nul	0.15	0.38
12/31/2024	15.02	17.2	Nul	Nul	0.25	0.3
01/31/2025	10.5	15.08	Nul	Nul	0.25	0.39
02/28/2025	13.26	17.3	Nul	Nul	0.26	0.45
03/31/2025	13.12	15.98	Nul	Nul	0.26	0.41
04/30/2025	20.86	29.5	Nul	Nul	0.23	0.38
05/31/2025	23.02	32.15	2.5	7.5	0.77	1.5
06/30/2025	15.26	19.4	61.36	488	0.4	1.4
07/31/2025	10.5	16.98	41.57	93.3	0.38	1.2
08/31/2025	13.98	15.48	16.62	138	0.41	0.73
09/30/2025	12.14	15.73	4.98	18.3	0.38	0.7

Outfall 001A							
Parameter & Limit / DMR…….	Ammonia		Nitrate		Total Nitrogen		DO
	30-Day Av	Daily Max	30-Day Av	Daily Max	30-Day Av	Daily Max	Daily Min
	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L
04/30/2021	11.98	13.3	NS	NS	NS	NS	6.71
05/31/2021	8.72	10.7	NS	NS	NS	NS	6.58
06/30/2021	7.13	8.1	0.14	0.14	8.15	8.15	6.68
07/31/2021	5	7	0.05	0.05	0.8	8	7.13
08/31/2021	2.24	2.71	0.11	0.11	4.71	4.71	7.37
09/30/2021	4.57	6.27	0.27	0.27	4.55	4.55	7.28
11/30/2021	10.63	11	0.4	0.4	13.6	13.6	7.48
12/31/2021	10.7	11.1	0.06	0.06	13.4	13.4	7.25

Outfall 001A							
Parameter & Limit / DMR…….	Ammonia		Nitrate		Total Nitrogen		DO
	30-Day Av	Daily Max	30-Day Av	Daily Max	30-Day Av	Daily Max	Daily Min
	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L
01/31/2022	11.1	11.3	1.92	1.92	14.9	14.9	7.05
02/28/2022	10.43	10.8	2.74	2.74	15.4	15.4	7.07
03/31/2022	10.95	11.5	2.22	2.22	15	15	7.01
04/30/2022	10.58	11.1	1.3	1.3	14.8	14.8	7.13
05/31/2022	11.7	12.5	0.62	0.62	16	16	6.82
06/30/2022	9.43	11.7	0.31	0.31	11.1	11.1	6.71
07/31/2022	5.22	8.33	0.05	0.05	9.65	9.65	6.6
08/31/2022	1.54	2.05	0.82	0.82	3.92	3.92	6.97
09/30/2022	1.58	2.17	0.27	0.27	3.4	3.4	6.91
10/31/2022	7.04	8.84	0.14	0.14	7.28	7.28	6.81
11/30/2022	5.95	6.33	1.2	1.2	10.7	10.7	6.7
12/31/2022	5.5	5.62	10.7	10.7	10.7	10.7	8.07
01/31/2023	5.6	6.2	2.6	2.6	10.6	10.6	7.41
02/28/2023	9.37	9.38	1.73	1.73	12.9	12.9	7.24
03/31/2023	11.29	13.1	1.33	1.33	12.8	12.8	6.85
04/30/2023	16.5	21.2	0.25	0.25	24.6	24.6	7
05/31/2023	5.88	8.71	0.72	0.72	7.65	7.65	7.05
06/30/2023	4.65	5.12	0.51	0	6.23	0	6.56
07/31/2023	33.91	548	1.67	1.67	7.4	7.5	6.91
08/31/2023	1.25	1.79	1.06	1.06	4.71	4.71	7.01
09/30/2023	2.44	3.83	0.52	0.52	4.83	4.83	6.88
10/31/2023	5.09	6.27	0.65	0.65	7.81	4.81	6.96
11/30/2023	6.22	6.41	0.7	0.7	2.5	2.5	6.94
12/31/2023	7.97	8.55	0.68	0.68	11.7	11.7	6.8
01/31/2024	9.7	11.4	0.05	0.05	12.1	12.1	6.58
02/29/2024	12.35	13.9	0.05	0.05	14.6	14.6	6.68
03/31/2024	11.2	13	0.1	0.1	16.7	16.7	6.75
04/30/2024	7.7	8.4	1.22	1.22	13.3	13.3	7.12
05/31/2024	6.9	7.36	0.32	0.32	12.5	12.5	6.67
06/30/2024	5.49	6.98	1.2	1.2	9.18	9.18	6.52
07/31/2024	2.07	3.65	0.05	0.05	3.7	3.7	6.78
08/31/2024	2.69	7.17	1.13	1.13	4.32	4.32	6.6
09/30/2024	2.69	7.17	1.13	1.13	4.32	4.32	6.6
10/31/2024	7.68	9.02	0.05	0.05	9.55	9.55	6.65
11/30/2024	17.12	48.2	0.05	0.05	12.3	12.3	6.38
12/31/2024	9.49	9.72	0.41	0.41	9.68	9.68	6.42
01/31/2025	10.18	10.5	0.26	0.26	13.2	13.2	6.8
02/28/2025	11.48	12.5	0.05	0.05	13.2	13.2	6.57
03/31/2025	11.56	12	0.05	0.05	13.8	13.8	6.34
04/30/2025	5.32	7.98	0.3	0.3	11.5	11.5	7.66
05/31/2025	3.21	4.67	0.66	0.66	7.51	7.51	6.4
06/30/2025	6.57	7.74	0.7	0.7	10.3	10.3	6.52
07/31/2025	5.68	7.17	0.56	0.56	8.95	8.95	6.76
08/31/2025	3.15	4.59	1.14	1.14	6.75	6.75	7.14

Parameter & Limit / DMR	Ammonia		Nitrate		Total Nitrogen		DO
	Outfall 001A						
	30-Day Av	Daily Max	30-Day Av	Daily Max	30-Day Av	Daily Max	Daily Min
	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L
09/30/2025	4.68	5.18	0.68	0.68	8.3	8.3	7.01

Parameter& Limit / DMR	pH		Total Phosphorus		TSS		Water Temperature	
	Outfall 001A							
	Daily Min	Daily Max	30-Day Av	Daily Max	30-Day Av	Max 7-Day Av	30-Day Av	Daily Max
	6 SU	9 SU	N/A mg/L	N/A mg/L	30 mg/L	45 mg/L	N/A deg C	N/A deg C
04/30/2021	7.4	7.74	NS	NS	13.75	22	10.3	12.8
05/31/2021	7.62	8.69	NS	NS	13.8	23	13.3	17.9
06/30/2021	7.55	7.77	2.14	2.14	6.75	11	19	20.9
07/31/2021	7.47	8.23	2.57	2.57	8.6	11	20.5	21.3
08/31/2021	8.53	8.71	3.86	3.86	10.5	20	18.5	20.9
09/30/2021	7.64	8.7	2.27	2.27	9.4	15	17.9	19.1
11/30/2021	7.83	7.95	2.76	2.76	12	18	9	9.3
12/31/2021	7.11	8.06	4.95	4.95	13.5	17	7.55	10.4
01/31/2022	7.18	7.43	5.04	5.04	8	11	6.06	6.5
02/28/2022	7.25	7.6	5.23	5.23	6.25	9	10.65	20.5
03/31/2022	6.65	7.41	5.66	5.66	12.75	16	11.05	11.9
04/30/2022	7.38	7.63	5.05	5.05	14.8	19	11.96	13
05/31/2022	7.58	7.73	4.2	4.2	10.5	22	13.95	15.1
06/30/2022	7.45	7.84	3.69	3.69	9.5	26	17.25	20.1
07/31/2022	7.19	8.81	4.09	4.09	3	5	21.44	22.4
08/31/2022	8.29	8.95	1.66	1.66	3	5	20.68	21.2
09/30/2022	8.58	8.87	1.43	1.43	1.75	3	18.93	20
10/31/2022	7.3	7.82	4.54	4.54	10	27	14.1	16.9
11/30/2022	7.08	7.93	5.36	5.36	14.75	20	12.08	17.1
12/31/2022	6.87	8.07	5.36	5.36	12	19	9.6	10.3
01/31/2023	6.84	7.78	5.55	5.55	4	6	9.43	9.5
02/28/2023	6.71	6.78	5.43	5.43	6	6	9.5	9.5
03/31/2023	6.69	7.16	5.18	5.18	6.25	8	8.48	9.7
04/30/2023	6.88	8.06	5.73	5.73	11	20	8.8	11.3
05/31/2023	8.44	8.88	2.06	2.06	10.25	22	15.25	17.9
06/30/2023	7.36	7.63	1.29	0	5.25	8	20.63	21.7
07/31/2023	7.4	7.47	1.3	1.3	4.2	8	20.44	21.5
08/31/2023	7.36	7.8	2.98	2.98	2.5	3	20.63	22.5
09/30/2023	7.37	7.5	0.33	0.33	4.2	6	17.42	19.4
10/31/2023	7.32	7.85	0.3	0.3	4.75	10	13.85	15.6
11/30/2023	6.73	7.49	5.58	5.58	6.25	8	12.35	15.1
12/31/2023	7.12	7.47	5.97	5.97	9.2	14	8.42	10.1
01/31/2024	7.05	7.32	5.72	5.72	8.4	13	9.04	9.7
02/29/2024	7.17	7.42	5.03	5.03	9.75	19	10.88	17.4
03/31/2024	7.33	7.82	3.95	3.95	18.2	32	10.98	18.4
04/30/2024	7.63	8.62	3.85	3.85	20.8	38.18	11.75	14.6

Outfall 001A								
Parameter& Limit / DMR ……	pH		Total Phosphorus		TSS		Water Temperature	
	Daily Min	Daily Max	30-Day Av	Daily Max	30-Day Av	Max 7-Day Av	30-Day Av	Daily Max
	6 SU	9 SU	N/A mg/L	N/A mg/L	30 mg/L	45 mg/L	N/A deg C	N/A deg C
05/31/2024	6.66	7.45	4.39	4.39	7.5	11	14.18	16.1
06/30/2024	6.6	7.31	3.29	3.29	5.4	7	19.2	21.8
07/31/2024	6.52	7.19	2.59	2.59	3	5	18.88	19.4
08/31/2024	6.76	7.17	2.75	2.75	6.4	8	19.02	19.6
09/30/2024	6.76	7.17	2.75	2.75	6.4	8	19.02	19.6
10/31/2024	6.71	6.91	4.24	4.24	12	19	14.65	15.3
11/30/2024	6.75	7.69	5.03	5.03	13.16	27.78	10.18	12.2
12/31/2024	7.03	7.64	4.77	4.77	7	12	9.88	10.7
01/31/2025	6.54	7.35	4.99	4.99	6.25	11	9.83	10.7
02/28/2025	6.7	7.36	5.3	5.3	5.5	11	8.4	10.1
03/31/2025	7.6	7.78	6.12	6.12	8.4	15	8.56	9.6
04/30/2025	8.47	8.86	3.76	3.76	25.5	30	10.95	11.9
05/31/2025	8.54	8.96	1.58	1.58	12.75	26	13.85	14.8
06/30/2025	7.89	8.29	2.45	2.45	9.2	15	17.18	19.6
07/31/2025	7.53	8.59	2.89	2.89	11.75	20	21.73	22.6
08/31/2025	8.07	8.77	3.01	3.01	11.46	15	20.96	21.8
09/30/2025	7.84	8.25	4.38	4.38	9.5	12	17.78	19.6

Outfall 002R							
Parameter& Limit / DMR………..	BOD_5	Chloride	Conductivity	Duration of Land Application	E. coli	Flow rate	Total Flow
	VALUE	VALUE	VALUE	MO TOTAL	DAILY MX	VALUE	VALUE
	N/A mg/L	N/A mg/L	N/A umho/cm	N/A d	126 #/100mL	N/A MGD	N/A Mgal
05/31/2021	0.23	199	1,120	3	NS	0.25	0.76
06/30/2021	3.4	209	1,240	16	1	0.2	3.25
07/31/2021	1.23	212	1,220	14	1	0.18	2.57
08/31/2021	1.2	202	1,170	13	1	0.2	2.55
09/30/2021	3.43	196	1,190	18	2	0.19	3.4
05/31/2022	0.5	242	1,460	11	1	0.17	1.81
06/30/2022	2.58	257	1,480	12	1	0.22	2.6
07/31/2022	0.45	246	1,460	13	1	0.27	3.45
08/31/2022	1.48	244	1,340	14	1	0.28	3.92
09/30/2022	7.53	258	1,320	13	1	0.24	3.16
10/31/2022	0.93	221	1,410	7	1	0.19	1.3
05/31/2023	0.02	0.02	984	5	8	0.39	0.39
06/30/2023	0.37	210	1,170	13	1	2.82	2.82
07/31/2023	4	198	1,110	13	6.3	1.3	16.85
08/31/2023	9.13	211	1,170	16	1	1.3	20.7

Outfall 002R							
Parameter& Limit / DMR………..	BOD_5	Chloride	Conductivity	Duration of Land Application	E. coli	Flow rate	Total Flow
	VALUE	VALUE	VALUE	MO TOTAL	DAILY MX	VALUE	VALUE
	N/A mg/L	N/A mg/L	N/A umho/cm	N/A d	126 #/100mL	N/A MGD	N/A Mgal
06/30/2024	5.38	210	1,280	12	3.1	1.3	15.6
07/31/2024	11.5	209	1,290	16	52.9	1.3	20.7
08/31/2024	10.53	212	1,260	15	49.6	1.3	19
09/30/2024	10.53	212	1,260	15	49.6	1.3	19
10/31/2024	19	208	1,370	9	75.4	1.3	11.7
05/31/2025	5.35	215	1,260	6	1	1.3	7.8
06/30/2025	4.55	235	1,390	10	1	1.3	13
07/31/2025	1.63	221	1,300	10	37.9	1.2	11.8
08/31/2025	4.65	222	1,260	12	124	1.3	13
09/30/2025	7.24	227	1,340	19	3	1.47	4.07

	Outfall 002R						
Parameter& Limit / DMR	Ammonia	TKN	Nitrate	Nitrite	Total Nitrogen	pH	
	VALUE	VALUE	VALUE	VALUE	VALUE	DAILY MN	DAILY MX
	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A SU	N/A SU
05/31/2021	5.6	8.78	0.15	0.29	9.22	8.55	8.55
06/30/2021	7.78	7.1	0.05	0.05	7.2	7.28	7.28
07/31/2021	7.56	8.18	0.05	0.05	8.18	7.45	7.45
08/31/2021	1.95	4.51	0.47	0.22	5.14	8.54	8.54
09/30/2021	2.77	4.15	0.05	0.05	4.15	8.54	8.54
05/31/2022	11.6	13.9	0.19	0.05	14.1	7.54	7.54
06/30/2022	12.2	14	0.14	0.05	14.39	7.61	7.61
07/31/2022	8.53	9.29	0.05	0.05	9.29	7.75	7.75
08/31/2022	2.11	3.95	0.38	0.08	4.41	8.44	8.44
09/30/2022	1.79	3.28	0.39	0.05	3.72	8.79	8.79
10/31/2022	5.62	7.48	0.22	0.05	7.7	7.82	7.82
05/31/2023	4.46	15.4	1.7	0.79	6.95	8.78	8.78
06/30/2023	4.7	6.56	0.59	0.22	7.37	7.38	7.38
07/31/2023	0.8	2.22	0.67	0.13	3.02	7.77	7.77
08/31/2023	1.93	3.34	1.25	0.14	4.73	7.36	7.36
06/30/2024	4.25	6.29	1.23	0.61	8.13	6.81	6.81
07/31/2024	4.31	5.42	0.86	0.42	6.7	7.05	7.05
08/31/2024	1.78	3.88	0.05	0.05	3.88	6.96	6.96
09/30/2024	1.78	3.88	0.05	0.05	3.88	6.96	6.96
10/31/2024	7.4	9.2	0.05	0.05	9.2	7.01	7.01
05/31/2025	3.15	6.75	0.44	0.32	7.5	6.95	6.95
06/30/2025	7.93	9.59	0.05	0.16	9.75	7.94	7.94

	Outfall 002R						
Parameter& Limit / DMR	Ammonia	TKN	Nitrate	Nitrite	Total Nitrogen	pH	
	VALUE	VALUE	VALUE	VALUE	VALUE	DAILY MN	DAILY MX
	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A mg/L	N/A SU	N/A SU
07/31/2025	5.38	8.06	0.68	0.63	9.36	8.27	8.27
08/31/2025	1.85	8.09	0.72	0.49	9.3	8.04	8.04
09/30/2025	4.86	6.46	0.63	0.18	7.27	8.27	8.27

Outfall 002R						
Parameter& Limit / DMR	Phosphorus	SAR	TDS	TSS	Sulfate	Water Temperature
	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE
	N/A mg/L	N/A Ratio	N/A mg/L	N/A mg/L	N/A mg/L	N/A deg C
05/31/2021	1.78	3.21	618	6.8	55.6	12.9
06/30/2021	2.13	3.15	668	5	57.5	16.8
07/31/2021	2.71	3.11	665	665	59.9	20.1
08/31/2021	2.34	3.03	608	8	60.2	20.2
09/30/2021	0.36	3.24	627	14	59.5	17.8
05/31/2022	4.05	4.14	765	1	57.7	12.4
06/30/2022	4.3	3.91	725	6	57.3	14.7
07/31/2022	4.34	4.07	750	2	57.2	22
08/31/2022	1.7	4.25	705	2	52.6	20.4
09/30/2022	2.85	4	707	2.13	60.7	19.4
10/31/2022	4.24	3.65	726	7	59	15.9
05/31/2023	2.37	984	0.79	8	8.78	15.4
06/30/2023	2.76	3.68	561	8	49.1	19.8
07/31/2023	3.19	3.21	567	1	43	20.9
08/31/2023	3.11	3.05	651	2	49.7	19.9
06/30/2024	2.88	3.12	692	3	56.1	21
07/31/2024	3.3	3.06	690	1	55.4	16.4
08/31/2024	3.11	2.97	669	1	58	18.8
09/30/2024	3.11	2.97	669	1	58	18.8
10/31/2024	4.26	2.93	736	6	49.3	15
05/31/2025	1.76	4.17	669	6.96	50	14.1
06/30/2025	3.66	3.5	753	3	56.1	14
07/31/2025	3.4	3.74	706	4	53.7	21.3
08/31/2025	3.02	3.22	689	13	53.6	19.3
09/30/2025	3.84	3.39	722	3	56.6	17.9

NS is No Sample. No sample is available for these parameters.
Violations are bolded, shaded, and larger font.

ATTACHMENT 3

Ammonia Limits Development
for the
city of Custer Treatment Facility

in French Creek
near
Custer, South Dakota

Prepared by

South Dakota Department of Agriculture and Natural Resources

December 2025

INTRODUCTION

Under Section 303(c) of the federal Clean Water Act, states have been required to develop water quality standards to protect public health and enhance water quality. In accordance with the Clean Water Act, the state of South Dakota has assigned beneficial uses to all waters of the state and developed water quality criteria to protect those uses. South Dakota's surface water quality standards and assigned beneficial uses are found in the Administrative Rules of South Dakota (ARSD) Article 74:51.

To ensure the protection of the state's surface water quality standards, the Clean Water Act authorized a permitting program for point source discharges of pollutants. The U.S. Environmental Protection Agency delegated this permitting program to the South Dakota Department of Agriculture and Natural Resources on December 30, 1993.

The department issues Surface Water Discharge permits containing, at a minimum, technology-based effluent limits. However, these limits are not always adequate to protect South Dakota's water quality. In those cases, the Department of Agriculture and Natural Resources develops water quality-based effluent limits. In accordance with the procedures and requirements outlined below, water quality-based effluent limits for ammonia will be developed for the city of Custer's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for French Creek near Custer are maintained and protected.

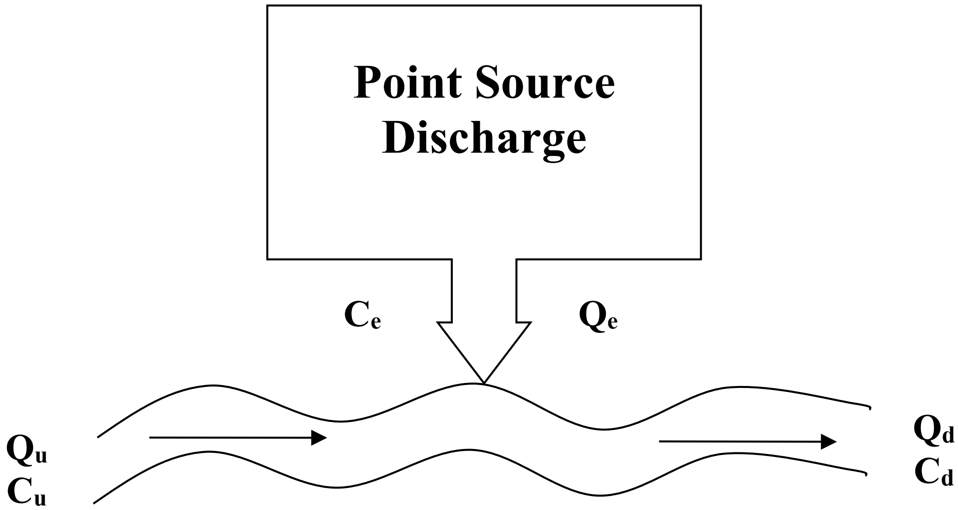
Developing the ammonia limits for the city of Custer is a matter of determining the maximum level of ammonia that can be present in French Creek without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

The effluent limits for ammonia are developed for critical conditions to be conservative, thereby assuring water quality standards are maintained under less critical conditions. Critical conditions are those at which the surface water quality standards are most likely to be violated. Critical conditions can be defined by several factors, including, but not limited to the following:

- stream flow (e.g., high, low);
- storm event occurrence and intensity;
- ambient water quality conditions (e.g., pH, temperature, etc.);
- diurnal variations in water column conditions;
- temporal occurrence of pollutant loadings from natural and human-induced activities; and
- the presence or absence of salmonids.

The following mass balance equation will be used to determine the ammonia limits for the city of Custer:

Figure 1: Mass Balance of Receiving Stream



$$Q_u C_u + Q_e C_e = Q_d C_d$$

Where:

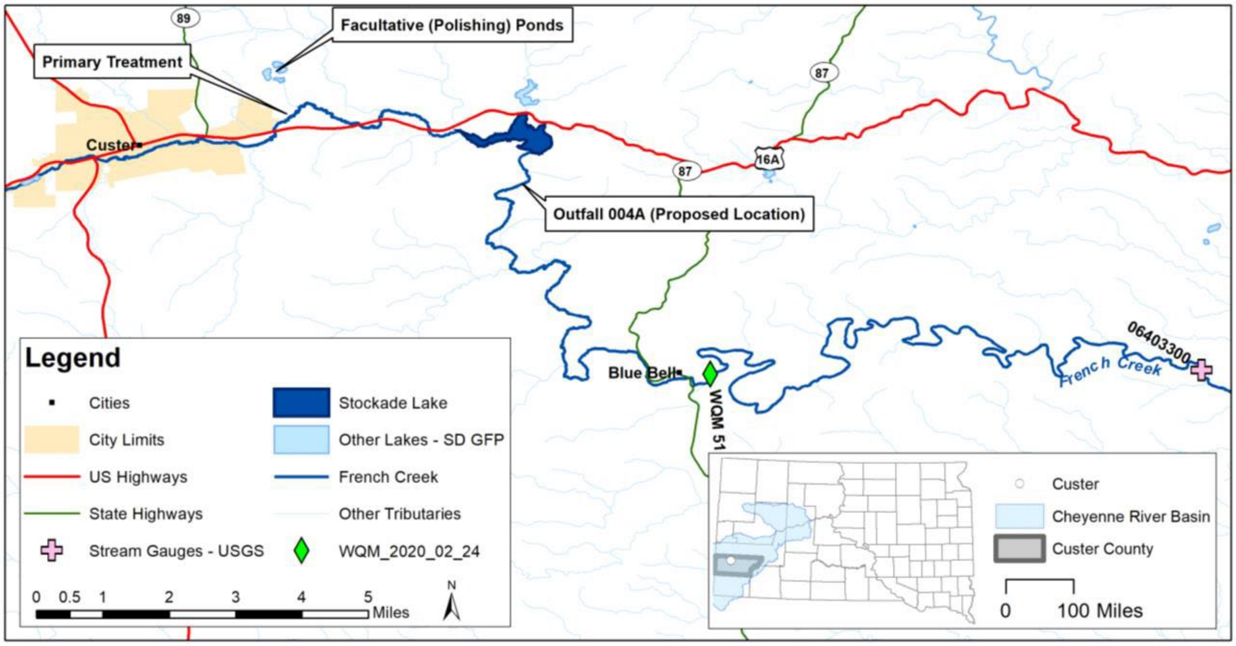
- Q_u = Receiving stream flow, in cubic feet per second (cfs);
- C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
- Q_e = Effluent discharge flow rate, in cfs;
- C_e = Water quality based effluent limit for ammonia in mg/L;
- Q_d = Downstream flow (equal to $Q_u + Q_e$), in cfs; and
- C_d = Allowable instream ammonia concentration (based on the SD Surface Water Quality Standards), in mg/L.

Using the mass balance equation and the following information, the water quality-based effluent limits for ammonia can be determined for the city of Custer's discharge into French Creek.

GEOGRAPHICAL EXTENT

French Creek is located in the Cheyenne River Basin in the southwestern portion of the state. The Cheyenne River Basin drains approximately 9,732 square miles of land, which is comprised of the Black Hills, Badlands, rangeland, irrigated cropland, and mining areas. Figure 2 shows French Creek near Custer.

Figure 2: The city of Custer in the Cheyenne River Basin



Past experience has shown that, due to the decay and transformation of organic pollutants such as ammonia, most adverse effects are generally exhibited within 10 miles of pollutant loading. While this rule of thumb can certainly vary depending on the source of the pollutant, fate and transport characteristics, hydrologic conditions, and other factors, it has generally held true in past instances. Therefore, the development of the ammonia limits for the city of Custer's discharge into French Creek will be relatively narrow in spatial extent.

ALLOWABLE INSTREAM AMMONIA CONCENTRATION (C_d)

South Dakota Surface Water Quality Standards

The SDSWQS specify the beneficial uses assigned to specific water bodies. The SDSWQS also contain specific narrative and numeric criteria that must be met to ensure the protection of each beneficial use. French Creek is classified for the following beneficial uses:

- (3) Coldwater marginal fish life propagation waters;
- (8) Limited-contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

SDDANR has observed immersion recreation activities in French Creek. Therefore, the permit limits were developed to be protective of the immersion recreation waters beneficial use to protect the existing beneficial uses in French Creek, in accordance with ARSD Section 74:51:01:25.01.

Waterbodies designated in the SDSWQS with the beneficial use classification of either coldwater permanent or coldwater marginal fish life propagation are suitable for supporting salmonids. Waterbodies with the beneficial use classifications of warmwater permanent, warmwater semipermanent, or warmwater marginal fish life propagation will likely not have salmonids. Salmonids are expected to be present in French Creek.

Allowable Instream Ammonia Levels

New ammonia-nitrogen (as N) criteria have been adopted as part of SDDANR's 2021 triennial review of the SDSWQS. Previous ammonia-nitrogen (as N) permit effluent limits were calculated based on the U.S. Environmental Protection Agency's (US EPA) 1999 criteria. The updated criteria, which are to be utilized for permits with an effective date on or after July 1, 2021, are based on EPA's 2013 criteria. For more information about the development of these ammonia-nitrogen (as N) criteria, see *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013* (US EPA, April 2013).

Based on the beneficial uses of French Creek, the following equations can be used to determine the total allowable ammonia concentration in the receiving stream (SDSWQS, ARSD Chapter 74:51:01, Appendix A):

Equation 1: Daily Maximum (Salmonids present)

$$\mathrm{Cd} = \mathrm{MIN}\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39.0}{1+10^{pH-7.204}}\right),\ \left(0.7249 \text{ x } \left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right) \text{ x } \left(23.12 \text{ x } 10^{0.036 \text{ x } (20-T)}\right)\right)\right)$$

Equation 2: Daily Maximum (Salmonids NOT present)

$$\mathrm{Cd} = 0.7249 \text{ x } \left(\frac{0.0114}{1+\ 10^{7.204-pH}}+\frac{1.6181}{1+\ 10^{pH-7.204}}\right) \text{ x MIN } (51.93, 23.12 \text{ x } 10^{0.036 \text{ x } (20-T)})$$

Equation 3: 30-day Average

$$\mathrm{Cd} = 0.8876 \text{ x } \left(\frac{0.0278}{1+\ 10^{7.688-pH}}+\frac{1.1994}{1+\ 10^{pH-7.688}}\right) \text{ x } (2.126 \text{ x } 10^{0.028\, x\, (20-MAX\,(T,7))})$$

Where:

pH	=	the pH of the water quality sample in standard units
T	=	the water temperature of the sample in degrees Centigrade
MIN	=	use either 51.93 or the value of 23.12 x $10^{0.036 \text{ x } (20\text{-T})}$, whichever is the smaller value
MAX	=	use either the water temperature (T) for the sample or 7, whichever is the greater value

To develop the ammonia limits for the city of Custer, equations 1 and 3 will be used to determine the instream ammonia concentration, C_d, allowed in French Creek. C_d will be expressed as both 30-day average and daily maximum concentrations. The eight seasons have been determined based on the availability of instream water quality monitoring data and the current permit seasons.

Instream Water Quality Monitoring
The department maintains a statewide network of fixed monitoring stations to gain a historic record of water quality for various streams around the state. This water quality monitoring (WQM) network consists of 153 monitoring stations, which are sampled at monthly, quarterly, or seasonal intervals. The goal of this sampling is to collect reliable water quality data that reflects actual stream conditions; to collect data to determine the effectiveness of controls on point and nonpoint sources of pollution; and to collect data to evaluate the appropriateness of current beneficial use designations.

Water quality samples are collected at a WQM station on French Creek. A description of the station is listed below. Figure 2 denotes the location of WQM 51.

WQM 51	French Creek near Bluebell Lodge, located approximately 7.4 miles downstream of the city of Custer's proposed Outfall 004A (Latitude 43.716390°, Longitude -103.47516°)

Ambient water temperature, pH, and ammonia data at WQM 51 were obtained to represent instream conditions. The water quality information obtained from WQM 51 is presented in Attachment 4. The pH and temperature data are summarized in Table 1 below.

Calculation of Allowable Instream Ammonia Concentration (C_d)
The SDSWQS specify the total ammonia concentration that is allowed at a given pH and temperature. The 80th percentile of the pH and temperature at WQM 51 was determined to ensure the ammonia standards are maintained during critical conditions. During the months of July and August, the 50th percentile of pH and temperature was used to account for summer ammonia nitrification. This information was used to calculate the allowable instream ammonia concentrations for each season. Table 1 summarizes the allowable instream ammonia (C_d) for French Creek.

Table 1: Allowable Instream Total Ammonia Concentrations for French Creek

Season	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January 1 – February 29	0.56	8.12	1.51	4.48
March 1 – March 31	1.80	8.40	0.95	2.59
April 1 – April 30	8.00	8.36	0.95	2.80
May 1 – June 30	20.00	8.51	0.34	1.45
July 1 – August 31	20.00	8.31	0.48	2.15
September 1 – September 30	15.00	8.41	0.56	2.56
October 1 – October 31	8.00	8.33	1.01	2.99
November 1 – December 31	0.00	8.42	0.92	2.49

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 51 was reviewed to determine the ambient water quality in French Creek. The 80th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 51 is presented in Attachment 4. Table 2 below summarizes the 80th percentile ammonia data for each season. This data represents the ambient ammonia concentration for French Creek (C_u).

Table 2: Ambient Ammonia Data for French Creek

Season	Ammonia (mg/L)
January 1 – February 29	0.07
March 1 – March 31	0.05
April 1 – April 30	0.05
May 1 – June 30	0.05
July 1 – August 31	0.05
September 1 – September 30	0.05
October 1 – October 31	0.05
November 1 – December 31	0.05

EFFLUENT DISCHARGE FLOW RATE (Q_e)

The effluent discharge flow rate, Q_e, can be determined in several different ways. If effluent data is available for the discharger, the 50th or 80th percentile of the daily flow can be used. The effluent design flow rate of the wastewater treatment facility may be used as the expected effluent flow rate in the absence of actual discharge data. Alternatively, for stabilization pond systems, it may be appropriate to develop an effluent flow rate based on expected performance.

For the purposes of developing ammonia limits for the city of Custer Outfall 004A, 0.81 cfs was used for Q_e based on the 80th percentile of 30-day average effluent flow of Outfall 001A from July 2014 through September 2025. See Attachment 5 for more details.

Table 3 summarizes the effluent flow rate used in these calculations.

RECEIVING STREAM FLOW (Q_u)

The United States Geological Survey (USGS) maintains hundreds of flow monitoring sites in South Dakota. The receiving stream flow rate, Q_u, is determined from an analysis of stream flow data available, incorporating the flow considerations required by *South Dakota's Mixing Zone and Dilution Implementation Procedures*.

Critical conditions for ammonia presumably occur when stream flows are relatively low. Therefore, the ammonia limits will be developed for low stream flow conditions. Should it be determined that water quality standards are violated at other flow conditions, the permit would be reopened and new limits would be developed.

ARSD Section 74:51:01:29 specifies that surface water quality standards apply to high quality fishery waters when flows meet or exceed the minimum 7-day average low flow that can be expected to occur once every 25 years (7Q25). The 7Q25 is therefore the minimum, or critical, flow for which the SDSWQS must be maintained, although all Surface Water Discharge permit limits remain in force below this minimum flow.

The seasonal 7Q25 flows were determined using data retrieved from the USGS gauging station 06403300 and a Log Pearson type III statistical analysis. The seven-day averages are calculated for the entire data set. After the averages are calculated, the data is split into the selected seasons. Analysis is then done in accordance with the EPA guidance document *Technical Guidance Manual for Performing Wasteload Allocation* to determine the seasonal 7Q25 flow. A description of the station is listed below. Figure 2 denotes the location of the USGS gauging station.

USGS 06403300 — French Creek above Fairburn, SD, located approximately 13 miles downstream of the city of Custer's WWTF's Outfall 004A (Latitude 43.717222°, Longitude -103.367500°).

South Dakota's water quality standards allow a zone of mixing for discharges. In accordance with the SDSWQS, chronic and acute ammonia water quality criteria must be met at the end of the mixing zone. The mixing zone is therefore a limited portion of a water body where mixing of the effluent and receiving stream is in progress, but not complete. In some cases, the discharge will not completely mix with the entire receiving stream. There are many factors that influence the rate of mixing in a stream. A few of these factors are the flow and velocity of the receiving stream, the flow and velocity of the effluent, the slope of the stream, and other stream characteristics.

The *South Dakota Mixing Zone and Dilution Implementation Procedures* outlines an approach for modeling the mixing zone. Using these procedures, the 7Q25 is adjusted to account for the allowable ratio of flow available in the receiving stream. This adjusted flow represents the receiving stream flow rate (Q_u).

Table 3 and Attachment 6summarize the flow data and the determination of Q_u for French Creek.

Table 3: Critical Low Flow Values for French Creek

Season	7Q25 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q25	Allowable Ratio of 7Q25	Critical Low Flow Q_u (cfs)
January 1 – February 29	0.16	0.81	5.23	1.00	0.16
March 1 – March 31	0.49	0.81	1.64	1.00	0.49
April 1 – April 30	1.45	0.81	0.56	1.00	1.45
May 1 – June 30	0.56	0.81	1.44	1.00	0.56
July 1 – August 31	0.20	0.81	4.10	1.00	0.20
September 1 – September 30	0.35	0.81	2.31	1.00	0.35

Season	7Q25 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q25	Allowable Ratio of 7Q25	Critical Low Flow Q_u (cfs)
October 1 – October 31	0.48	0.81	1.68	1.00	0.48
November 1 – December 31	0.34	0.81	2.35	1.00	0.34

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is simply the sum of the upstream flow rate (Q_u) and the effluent flow rate (Q_e). The downstream flow rate used for the calculation of the ammonia limits for the city of Custer's discharge into French Creek is summarized in Table 4 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Table 4. Using the mass balance equation, the ammonia limits for the city of Custer's discharge into French Creek can be calculated as follows:

Equation 4: Mass Balance Equation

$$Ce = \frac{(Qd * Cd) - (Qu * Cu)}{Qe}$$

The water quality-based effluent limits for ammonia for the city of Custer's discharge into French Creek are presented in Table 4.

Table 4: Variables Calculated for Mass Balance Equation

Season	C_u, mg/L	C_d, mg/L		Q_e, cfs	Q_d, cfs	C_e, mg/L	
		30-day Average	Daily Maximum			30-Day Average	Daily Maximum
January 1 – February 29	0.07	1.51	4.48	0.81	0.97	**1.8**	**5.3**
March 1 – March 31	0.05	0.95	2.59	0.81	1.30	**1.5**	**4.1**
April 1 – April 30	0.05	0.95	2.80	0.81	2.26	**2.6**	**7.7**
May 1 – June 30	0.05	0.34	1.45	0.81	1.37	**0.5**	**2.4**
July 1 – August 31	0.05	0.48	2.15	0.81	1.01	**0.6**	**2.7**
September 1 – September 30	0.05	0.56	2.56	0.81	1.16	**0.8**	**3.7**
October 1 – October 31	0.05	1.01	2.99	0.81	1.29	**1.6**	**4.8**
November 1 – December 31	0.05	0.92	2.49	0.81	1.16	**1.3**	**3.5**

The city of Custer's current permit contains ammonia limits. The current effluent limits were compared to the limits calculated using the information presented above. A comparison of the two limits is presented in Table 5 below.

During the month of January – February, April, and September – October the city of Custer's current daily maximum limit is adequate to protect the beneficial use and the water quality criteria for French Creek. These limits will be continued in the draft permit, to prevent backsliding. During the remaining months, it was necessary to establish more stringent limits. For the chronic 30-day average, all months the calculated limits were more stringent. The shaded values in Table 5 indicate the limits that will be included for the city of Custer.

Table 5: Comparison of Current and Draft Effluent Limits

Month	**Current Effluent Limits**		**Calculated Effluent Limits**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**	**30-Day Average (mg/L)**	**Daily Maximum (mg/L)**
January 1 – February 29	2.2	**4.9**	**1.8**	5.3
March 1 – March 31	2.4	5.0	**1.5**	**4.1**
April 1 – April 30	2.9	**6.0**	**2.6**	7.7
May 1 – June 30	1.4	3.5	**0.5**	**2.4**
July 1 – August 31	1.0	3.1	**0.6**	**2.7**
September 1 – September 30	1.6	**3.3**	**0.8**	3.7
October 1 – October 31	2.0	**4.1**	**1.6**	4.8
November 1 – December 31	2.1	4.5	**1.3**	**3.5**

Based on recent facility performance (Attachment 2, Monitoring Data), the 30-day average limits are expected to be applicable for a typical discharge from this facility, and the facility is not expected to be able to meet the ammonia-nitrogen (as N) effluent limits proposed in the draft permit. A compliance schedule is recommended to carry over the current permit's limits temporarily (interim limits) allow the facility additional time to make operational adjustments to meet these proposed effluent limits (final limits).

ATTACHMENT 4

French Creek Water Quality Data

WATER QUALITY DATA
WQM 51

WQM data was obtained from the water quality monitoring station WQM 51. The period of the data is from January 1, 1990 through December 31, 2024. This data can be obtained at https://www.waterqualitydata.us/portal/

SDDANR considers ammonia-nitrogen (as N) to have a reporting limit of 0.05 mg/L. For ammonia nitrogen values reported as “Below Detection,” “Present Below Quantification Limit,” or less than 0.05 mg/L, 0.05 mg/L was used calculations.

WQM 51 Data

Temperature								
	Season 1	Season 2	Season 3	Season 4	Season 5	Season 6	Season 7	Season 8
Average	0.270526	1.058824	6.813158	17.15385	20.0824	13.55	6.69	0.066667
50th Percentile	0	0	7.78	16.05	20	13.3	6	0
80th Percentile	0.56	1.8	8	20	22.44	15	8	0

pH								
	Season 1	Season 2	Season 3	Season 4	Season 5	Season 6	Season 7	Season 8
Average	7.993333	8.206667	8.206111	8.381667	8.3	8.335556	8.231111	8.171538
50th Percentile	8	8.2	8.215	8.4	8.31	8.4	8.2	8.2
80th Percentile	8.126	8.4	8.36	8.512	8.5	8.406	8.326	8.42

Ammonia								
	Season 1	Season 2	Season 3	Season 4	Season 5	Season 6	Season 7	Season 8
Average	0.058947	0.055	0.054421	0.05	0.050909	0.05	0.050526	0.053333
50th Percentile	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
80th Percentile	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.05

January/ February				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
01/08/1990	0.05	0.05	1.11	7.7
01/08/1991	0.08	0.08	0.56	7.74
01/13/1992	0.07	0.07	0.56	7.76
01/19/1993	0.08	0.08	1.11	8.18
01/04/1994	0.06	0.06	0	8.12
01/11/1995	0.07	0.07	0	7.87
01/08/1996	0.11	0.11	0	7.88
01/14/1997	ND	0.05	0.4	7.88
01/07/1998	ND	0.05	0	8.07
01/05/1999	ND	0.05	0.1	7.88
01/13/2000	ND	0.05	0.8	8.13
01/16/2001	ND	0.05	0	--
01/10/2002	ND	0.05	0.5	8.27
01/08/2003	ND	0.05	0	8
01/21/2004	ND	0.05	0	8
01/10/2005	ND	0.05	0	7.9
01/10/2006	ND	0.05	0	8
01/10/2007	ND	0.05	0	8.4
01/14/2008	ND	0.05	0	8.1

March				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
03/16/2009	ND	0.05	1	8.1
03/17/2010	0.1	0.1	0	8.1
03/16/2011	ND	0.05	0	8
03/14/2012	ND	0.05	0	8.2
03/07/2013	ND	0.05	1	--
03/05/2014	ND	0.05	0	--
03/09/2015	ND	0.05	0	8.1
03/09/2016	ND	0.05	4	8.5
03/08/2017	ND	0.05	0	8.3
03/15/2018	ND	0.05	7	8
03/19/2019	0.084	0.084	0	7.9
03/09/2020	0.051	0.051	2	8.2
03/19/2021	ND	0.05	0	8.4
03/14/2022	ND	0.05	0	8.2
03/24/2023	ND	0.05	0	8.4
03/12/2024	ND	0.05	3	8.4
03/03/2025	ND	0.05	0	8.3

April				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
04/09/1990	0.084	0.084	5.56	7.45
04/10/1991	ND	0.05	5	8.16
04/14/1992	0.05	0.05	7.78	8.55
04/13/1993	ND	0.05	2.22	8.24
04/25/1994	ND	0.05	11.67	8.26
04/24/1995	ND	0.05	4.44	8.79
04/24/1996	ND	0.05	7.78	8.14
04/21/1997	ND	0.05	7.8	8.23
04/14/1998	ND	0.05	4.4	8.06
04/21/1999	ND	0.05	7.8	8.24
04/11/2000	ND	0.05	6.3	8
04/09/2001	ND	0.05	4	--
04/10/2002	0.1	0.1	5.7	8.09
04/09/2003	ND	0.05	7	8
04/14/2004	ND	0.05	8	8.4
04/14/2005	ND	0.05	9	8.3
04/12/2006	ND	0.05	8	8.2
04/17/2007	ND	0.05	8	8.4
04/29/2008	ND	0.05	9	8.2

May/ June				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
05/10/2022	ND	0.05	11.7	7.77
05/08/2023	ND	0.05	15.4	8.49
05/15/2024	--	--	11.8	8.41
05/13/2025	--	--	18.5	8.53
05/26/2025	--	--	10.5	8.35
06/30/2009	ND	0.05	19	8.4
06/09/2010	ND	0.05	16	8.3
06/21/2011	ND	0.05	16	8.5
06/13/2012	ND	0.05	16	8.4
06/18/2013	ND	0.05	18	--
06/19/2014	ND	0.05	16	--
06/10/2015	ND	0.05	18	8.1
06/07/2016	ND	0.05	16	8.5
06/15/2017	ND	0.05	17	8.4
06/07/2018	ND	0.05	22	8.4
06/17/2019	ND	0.05	16	8.2

May/ June				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
06/18/2020	ND	0.05	19	8.4
06/16/2021	ND	0.05	23	8.6
06/09/2022	ND	0.05	15.1	8.53
06/13/2022	ND	0.05	21	8.33
06/14/2023	ND	0.05	20	8.6
06/21/2023	ND	0.05	21	8.49
06/06/2024	ND	0.05	16	8.5
06/17/2024	--	--	14.9	8.2
06/12/2025	ND	0.05	22	8.8
06/25/2025	--	--	16.1	7.96

July/ August				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
07/16/1990	ND	0.05	15.6	8.05
07/10/1991	0.05	0.05	18.9	8.45
07/22/1992	ND	0.05	14.4	8.39
07/27/1993	ND	0.05	15.2	8.1
07/12/1994	0.06	0.06	18.89	8.13
07/11/1995	ND	0.05	18.89	8.13
07/22/1996	0.06	0.06	18.33	7.92
07/23/1997	ND	0.05	19.6	8.02
07/13/1998	ND	0.05	20.9	8.31
07/15/1999	ND	0.05	20.2	8.32
07/19/2000	ND	0.05	18.8	8.37
07/16/2001	ND	0.05	23.2	8.47
07/23/2002	ND	0.05	19.5	8.34
07/16/2003	ND	0.05	22	8
07/06/2004	ND	0.05	15	8.3
07/18/2005	ND	0.05	20	8.2
07/12/2006	ND	0.05	21	8.2
07/10/2007	ND	0.05	22	8
07/07/2008	ND	0.05	22	8.5
07/14/2022	ND	0.05	27.1	8.52
07/13/2023	ND	0.05	22.3	8.87
07/01/2024	--	--	23	8.64
07/16/2025	--	--	17.05	8.12
08/03/2022	ND	0.05	23.6	8.65
08/06/2024	--	--	24.6	8.5

September				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
09/14/2009	ND	0.05	14	8.2
09/22/2010	ND	0.05	14	8.3
09/21/2011	ND	0.05	10	8.5
09/20/2012	ND	0.05	12	8.3
09/26/2013	ND	0.05	13	--
09/17/2014	ND	0.05	13	--
09/29/2015	ND	0.05	13	8.4
09/08/2016	ND	0.05	15	8.4
09/07/2017	ND	0.05	13	8.1
09/26/2018	ND	0.05	9	8.4
09/12/2019	ND	0.05	14	8.4
09/16/2020	ND	0.05	13	8.4
09/21/2021	ND	0.05	11	8.6
09/20/2022	ND	0.05	15.5	8.29
09/27/2022	ND	0.05	13	8.4
09/12/2023	ND	0.05	15	8.5
09/21/2023	ND	0.05	13.6	8.24
09/03/2024	--	--	19.9	8.41
09/10/2024	ND	0.05	15	8.1
09/03/2025	ND	0.05	15	8.1

October				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
10/15/1990	ND	0.05	5.56	8.33
10/15/1991	0.06	0.06	10	8.2
10/14/1992	ND	0.05	5	8
10/26/1993	ND	0.05	3.89	8.11
10/05/1994	ND	0.05	10	8.12
10/18/1995	ND	0.05	6.67	8.2
10/24/1996	ND	0.05	3.89	8.1
10/22/1997	ND	0.05	5.2	8.13
10/22/1998	ND	0.05	5.7	8.32
10/01/1999	ND	0.05	7.8	--
10/10/2000	ND	0.05	4.1	8.18
10/11/2001	ND	0.05	5.3	8.58
10/09/2002	ND	0.05	13	8.29
10/20/2003	ND	0.05	8	8.1
10/21/2004	ND	0.05	8	8.2
10/19/2005	ND	0.05	8	8.4

October				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
10/25/2006	ND	0.05	4	8.1
10/17/2007	ND	0.05	6	8.3
10/20/2008	ND	0.05	7	8.5

November/ December				
Date	Ammonia(mg/l)		Temperature (C)	pH (su)
	Result	Value		
12/17/2009	0.1	0.1	0	7.93
12/08/2010	ND	0.05	0	7.8
12/14/2011	ND	0.05	0	8
12/12/2012	ND	0.05	0	8
12/02/2013	ND	0.05	0	--
12/02/2014	ND	0.05	0	--
12/03/2015	ND	0.05	0	8.3
12/19/2017	ND	0.05	0	8.2
12/05/2018	ND	0.05	0	8.2
12/05/2019	ND	0.05	1	8.5
12/04/2020	ND	0.05	0	8.3
12/14/2021	ND	0.05	0	8.3
12/06/2022	ND	0.05	0	7.7
12/06/2023	ND	0.05	0	8.5
12/03/2024	ND	0.05	0	8.5

ATTACHMENT 5

Point Source Dischargers Flow Rate

EFFLUENT FLOW RATE
SD0023281, city of Custer

Outfall 001A		
Date	Flow rate	
	30-Day Ave	Daily Max
	MGD	MGD
07/31/2014	0.34	0.89
08/31/2014	0.44	0.8
09/30/2014	0.35	0.83
10/31/2014	0.8	5.15
11/30/2014	0.27	1.39
12/31/2014	0.26	0.73
01/31/2015	0.22	0.64
02/28/2015	0.32	0.61
03/31/2015	0.33	1.58
04/30/2015	0.14	0.61
05/31/2015	0.54	1.66
06/30/2015	0.54	1.96
07/31/2015	0.38	0.56
08/31/2015	0.71	1.03
09/30/2015	0.37	0.7
10/31/2015	0.38	0.67
11/30/2015	0.31	1.6
12/31/2015	0.28	0.32
01/31/2016	0.24	0.33
02/29/2016	0.25	0.34
03/31/2016	0.21	0.22
04/30/2016	0.32	0.67
05/31/2016	0.25	0.55
06/30/2016	0.26	0.41
07/31/2016	0.35	0.64
08/31/2016	0.31	0.6
09/30/2016	0.24	0.37
10/31/2016	0.66	1.55
11/30/2016	0.29	1.09
12/31/2016	0.19	1.52
01/31/2017	0.17	0.31
02/28/2017	0.25	0.39
03/31/2017	0.31	0.53
04/30/2017	0.31	0.48
05/31/2017	0.23	0.39
06/30/2017	0.28	0.58
07/31/2017	0.23	0.51
08/31/2017	0.25	0.37
09/30/2017	0.22	0.53
10/31/2017	0.26	0.48
11/30/2017	0.19	0.46
12/31/2017	0.27	0.44
01/31/2018	0.41	0.66

Outfall 001A		
Date	Flow rate	
	30-Day Ave	Daily Max
	MGD	MGD
02/28/2018	0.23	0.33
03/31/2018	0.39	0.42
04/30/2018	0.46	0.67
05/31/2018	0.35	1.04
06/30/2018	0.43	1.02
07/31/2018	0.4	0.75
08/31/2018	0.68	1.1
09/30/2018	0.5	1.47
10/31/2018	0.34	0.47
11/30/2018	0.34	0.49
12/31/2018	0.47	0.58
01/31/2019	0.37	0.62
02/28/2019	0.31	0.42
03/31/2019	0.31	0.42
04/30/2019	0.52	0.73
05/31/2019	0.58	1.2
06/30/2019	1.09	1.28
07/31/2019	0.78	1.15
08/31/2019	0.95	1.38
09/30/2019	0.71	0.99
10/31/2019	0.71	1.24
11/30/2019	0.51	0.6
12/31/2019	0.42	0.6
01/31/2020	0.37	0.75
02/29/2020	0.35	0.62
03/31/2020	0.52	0.95
04/30/2020	0.52	0.8
05/31/2020	0.52	0.75
06/30/2020	0.43	1.01
07/31/2020	0.77	1.29
08/31/2020	0.47	0.87
09/30/2020	0.3	0.9
10/31/2020	0.28	0.63
11/30/2020	0.41	1.25
12/31/2020	0.24	0.69
01/31/2021	0.34	0.74
02/28/2021	0.32	0.76
03/31/2021	0.36	1.17
04/30/2021	0.56	1.19
05/31/2021	0.57	1.25
06/30/2021	0.53	1.03
07/31/2021	0.46	0.84
08/31/2021	0.39	1.05
09/30/2021	0.2	0.78
11/30/2021	0.21	0.23
12/31/2021	0.2	0.25

Outfall 001A		
Date	Flow rate	
	30-Day Ave	Daily Max
	MGD	MGD
01/31/2022	0.2	0.25
02/28/2022	0.2	0.48
03/31/2022	0.57	1.12
04/30/2022	0.34	0.64
05/31/2022	0.38	0.96
06/30/2022	0.49	0.6
07/31/2022	0.17	0.61
08/31/2022	0.22	0.58
09/30/2022	0.21	0.52
10/31/2022	0.2	1.54
11/30/2022	0.12	0.29
12/31/2022	0.16	0.36
01/31/2023	0.16	1.59
02/28/2023	0.05	0.8
03/31/2023	0.42	0.81
04/30/2023	0.5	1.41
05/31/2023	0.44	0.56
06/30/2023	0.61	1.5
07/31/2023	1.29	1.6
08/31/2023	1.4	1.7
09/30/2023	1.3	1.6
10/31/2023	1.2	1.55
11/30/2023	1.2	1.55
12/31/2023	1.41	1.61
01/31/2024	0.2	1.59
02/29/2024	0.31	1.5
03/31/2024	0.34	1.5
04/30/2024	0.81	1.5
05/31/2024	0.5	0.56
06/30/2024	0.84	1
07/31/2024	0.39	0.91
08/31/2024	0.39	1
09/30/2024	0.39	1
10/31/2024	0.2	0.5
11/30/2024	0.15	0.38
12/31/2024	0.25	0.3
01/31/2025	0.25	0.39
02/28/2025	0.26	0.45
03/31/2025	0.26	0.41
04/30/2025	0.23	0.38
05/31/2025	0.77	1.5
06/30/2025	0.4	1.4
07/31/2025	0.38	1.2
08/31/2025	0.41	0.73
09/30/2025	0.38	0.7

Effluent Flow Data Statistics

	30-Day Ave	Daily Max	30-Day Ave	Daily Max
	MGD	MGD	CFS	CFS
Average	0.42	0.88	0.65	1.36
50th Percentile	0.35	0.735	0.54	1.14
80th Percentile	0.524	1.284	0.81	1.99

ATTACHMENT 6

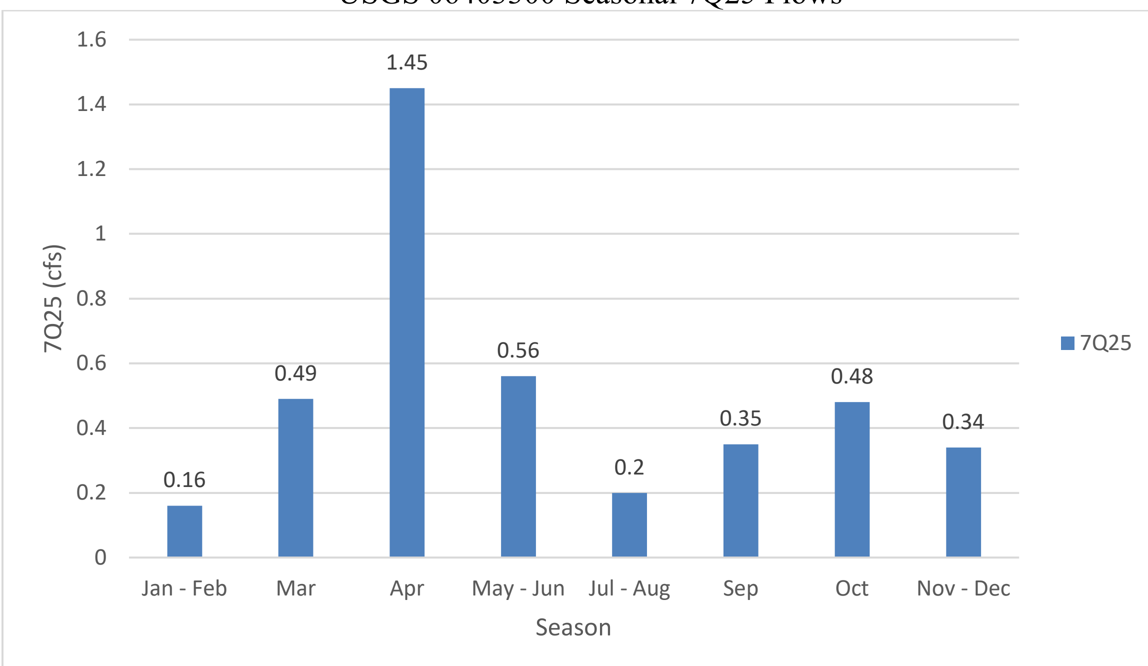
French Creek Flow Data

RECEIVING STREAMFLOW DATA
USGS 06403300 Gaging Station

The data to develop the seasonal 7Q25 low flows was obtained from the U.S. Geological Survey (USGS) gaging station USGS 06403300 for French Creek below the city of Custer's wastewater treatment facility's proposed Outfall 004A. The period of the data is from January 1, 1983 through December 31, 2024. This data can be obtained at http://waterdata.usgs.gov/sd/nwis/sw.

06403300 French Creek above Fairburn, SD, located approximately 13 miles downstream of the city of Custer's WWTF's Outfall 004A (Latitude 43.717222°, Longitude -103.367500°)

USGS 06403300 Seasonal 7Q25 Flows



USGS 06403300 Frequency Statistics

Log Pearson Type III Frequency Curve Parameters (based on logs of the non-zero values)							
Season	**Mean**	**Variance**	**Standard Deviation**	**Skewness**	**Standard Error of Skewness**	**Serial Correlation Coefficient**	**Coefficient of Variation**
January 1 – February 29	0.19	0.238	0.488	-1.028	0.365	0.641	2.566
March 1 – March 31	0.505	0.163	0.404	-0.86	0.37	0.323	0.8
April 1 – April 30	0.819	0.12	0.346	-0.476	0.365	0.52	0.423
May 1 – June 30	0.719	0.264	0.514	-0.422	0.365	0.414	0.714
July 1 – August 31	0.352	0.36	0.6	-0.028	0.37	0.424	1.705
September 1 – September 30	0.337	0.219	0.468	0.176	0.37	0.391	1.391
October 1 – October 31	0.464	0.203	0.45	0.056	0.37	0.433	0.97
November 1 – December 31	0.286	0.182	0.427	-0.008	0.37	0.617	1.493

USGS 06403300 Seasonal Annual Low Flow Rankings

January 1 - February 29			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1989	02/08/1989	0.03
2	2008	01/23/2008	0.22714
3	1988	02/08/1988	0.26429
4	1991	01/07/1991	0.3
5	1990	02/19/1990	0.44286
6	2007	02/15/2007	0.57143
7	1995	01/07/1995	0.60714
8	1993	02/22/1993	0.65571
9	1986	02/14/1986	0.66429
10	2013	01/18/2013	0.81
11	1987	01/23/1987	0.85714
12	1985	02/06/1985	0.91429
13	1984	01/21/1984	1.0286
14	2004	02/01/2004	1.0286
15	2005	01/14/2005	1.1571
16	1992	01/20/1992	1.2429
17	1994	01/19/1994	1.3
18	2006	02/21/2006	1.3143
19	1983	02/04/1983	1.3857
20	2003	02/28/2003	1.3857
21	2023	01/08/2023	1.5671

January 1 - February 29			
Rank	Year	Date	Annual Minimum Flow (cfs)
22	2009	01/27/2009	1.7714
23	2021	02/18/2021	1.96
24	2010	01/11/2010	2.0429
25	2018	01/17/2018	2.22
26	2002	01/30/2002	2.2429
27	2014	02/10/2014	2.5
28	2022	02/25/2022	2.7486
29	2001	02/17/2001	2.7571
30	2017	01/25/2017	2.8257
31	2019	02/19/2019	3.4486
32	1996	02/04/1996	3.4714
33	2012	02/13/2012	3.7143
34	2011	01/15/2011	3.7857
35	2016	01/12/2016	4.31
36	2024	01/09/2024	4.3671
37	2015	01/12/2015	5.15
38	2000	02/01/2000	5.4
39	2020	02/23/2020	5.5257
40	1998	02/06/1998	5.9429
41	1997	02/17/1997	7.2857
42	1999	02/03/1999	13.429

March 1 - March 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1989	03/07/1989	0.21429
2	2007	03/07/2007	0.42857
3	1988	03/07/1988	0.57286
4	1993	03/07/1993	0.88857
5	2002	03/26/2002	0.93857
6	2013	03/07/2013	1.1
7	2008	03/08/2008	1.2571
8	2003	03/07/2003	1.3
9	1990	03/09/1990	1.6143
10	2005	03/07/2005	1.7943
11	2006	03/19/2006	1.9
12	1991	03/07/1991	2.4286
13	1995	03/08/1995	2.5571
14	1985	03/07/1985	2.7143
15	2023	03/12/2023	2.74
16	2021	03/07/2021	2.8157

March 1 - March 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
17	2009	03/07/2009	2.8857
18	2018	03/07/2018	3.05
19	2019	03/07/2019	3.5843
20	2010	03/07/2010	3.7071
21	2012	03/07/2012	4.0029
22	2017	03/09/2017	4.1129
23	1986	03/31/1986	4.5771
24	2004	03/07/2004	4.6429
25	1996	03/07/1996	4.6571
26	2001	03/07/2001	5.0571
27	2022	03/07/2022	5.1971
28	2015	03/31/2015	5.5114
29	2014	03/07/2014	5.5857
30	2024	03/10/2024	5.64
31	2011	03/08/2011	5.9143
32	1997	03/07/1997	6.1571
33	2020	03/07/2020	6.8729
34	1992	03/31/1992	7.3857
35	1994	03/31/1994	8.6
36	2016	03/23/2016	8.7657
37	1998	03/09/1998	8.8286
38	1987	03/28/1987	10.353
39	2000	03/23/2000	13.714
40	1999	03/14/1999	15.286

April 1 - April 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1989	04/28/1989	1.2
2	1990	04/19/1990	1.3714
3	2007	04/18/2007	1.4829
4	2005	04/20/2005	1.6586
5	2013	04/07/2013	1.7129
6	1988	04/23/1988	1.8571
7	2004	04/20/2004	2.93
8	2006	04/24/2006	3.41
9	2008	04/30/2008	3.81
10	2022	04/20/2022	3.8986
11	1992	04/30/1992	4.1571
12	2015	04/09/2015	4.85
13	1986	04/07/1986	4.9271

April 1 - April 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
14	2023	04/07/2023	5.2486
15	2012	04/26/2012	5.2814
16	1995	04/07/1995	5.3571
17	1985	04/07/1985	5.87
18	1984	04/24/1984	6.7371
19	1991	04/07/1991	6.9
20	2009	04/07/2009	7.3414
21	2003	04/07/2003	7.6629
22	2016	04/15/2016	8.1429
23	2002	04/26/2002	8.1714
24	1993	04/30/1993	8.6
25	1997	04/13/1997	8.8429
26	1996	04/07/1996	8.8857
27	1994	04/19/1994	9.0143
28	1987	04/30/1987	9.0286
29	2001	04/21/2001	9.4571
30	2017	04/21/2017	9.5929
31	2018	04/08/2018	11.317
32	2000	04/10/2000	11.571
33	2010	04/07/2010	12.114
34	2014	04/27/2014	13.557
35	2021	04/18/2021	14.5
36	2011	04/18/2011	15.843
37	2024	04/25/2024	16.629
38	1998	04/30/1998	20
39	1999	04/07/1999	22.143
40	2020	04/07/2020	24
41	2019	04/17/2019	26.671

May 1 - June 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1989	06/21/1989	0.38429
2	1988	06/21/1988	0.47429
3	2007	06/30/2007	0.53857
4	1985	06/29/1985	0.60571
5	2005	05/09/2005	1.4771
6	2006	06/30/2006	1.5014
7	2016	06/28/2016	1.6343
8	2004	06/09/2004	1.66
9	2013	06/30/2013	1.7386

May 1 - June 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
10	1992	05/09/1992	2.4
11	1986	06/06/1986	2.4843
12	2002	06/27/2002	2.58
13	2012	06/30/2012	2.5814
14	2017	06/29/2017	2.7814
15	1987	06/30/1987	3.2486
16	1994	06/30/1994	3.8286
17	2022	06/30/2022	4.1329
18	1990	06/30/1990	4.7571
19	2023	05/10/2023	4.9786
20	2008	05/22/2008	5.4671
21	2021	06/24/2021	5.4686
22	2024	06/30/2024	6.7186
23	2000	06/19/2000	6.8571
24	2003	06/01/2003	7.4914
25	2009	06/30/2009	8.1957
26	1991	05/07/1991	8.4571
27	2018	05/12/2018	9.3814
28	1993	06/02/1993	11.057
29	2001	05/17/2001	11.286
30	2011	05/12/2011	11.814
31	2020	06/21/2020	11.971
32	2015	05/07/2015	12.004
33	1984	05/24/1984	14.071
34	2014	05/24/2014	14.957
35	1996	05/08/1996	15
36	1998	05/07/1998	18.571
37	2010	05/09/2010	21.557
38	1997	05/22/1997	24.714
39	1995	05/07/1995	29.286
40	2019	05/18/2019	33.857
41	1999	06/02/1999	45.143

July 1 - August 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1989	07/12/1989	0.14714
2	2007	07/17/2007	0.18857
3	2006	08/05/2006	0.24714
4	1985	07/14/1985	0.29857
5	2012	08/26/2012	0.36

July 1 - August 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
6	1987	08/22/1987	0.45286
7	2004	08/26/2004	0.45714
8	2005	07/24/2005	0.70429
9	2002	08/21/2002	0.87143
10	1988	08/19/1988	0.89714
11	2022	08/15/2022	0.97
12	2013	07/07/2013	0.99286
13	1986	08/29/1986	1.0443
14	2003	08/31/2003	1.1329
15	1994	08/31/1994	1.1414
16	1990	08/31/1990	1.2714
17	2016	07/20/2016	1.5886
18	2017	07/27/2017	1.6057
19	2021	08/29/2021	1.6757
20	2000	08/26/2000	2.0857
21	1992	08/23/1992	2.3
22	2008	08/31/2008	2.5229
23	2009	08/31/2009	2.6443
24	1991	08/31/1991	3.0143
25	2020	08/31/2020	3.6286
26	2023	08/31/2023	4.5057
27	2010	08/31/2010	5.0814
28	1984	08/19/1984	5.3814
29	2001	08/25/2001	6.2
30	1996	07/26/1996	6.5286
31	2011	08/29/2011	6.8829
32	2014	08/26/2014	7.1286
33	1993	08/31/1993	8.9857
34	2015	08/17/2015	13.543
35	1998	08/31/1998	14
36	1995	08/22/1995	14.429
37	1999	08/28/1999	16.714
38	1997	07/19/1997	17.286
39	2018	08/31/2018	17.971
40	2019	08/02/2019	31.657

September 1 - September 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	2006	09/18/2006	0.21714
2	1985	09/07/1985	0.36143

September 1 - September 30			
Rank	Year	Date	Annual Minimum Flow (cfs)
3	2012	09/07/2012	0.42429
4	1987	09/30/1987	0.51571
5	2004	09/20/2004	0.68
6	1989	09/08/1989	0.78571
7	2005	09/17/2005	0.81429
8	1990	09/30/1990	0.83714
9	1988	09/18/1988	0.91286
10	2003	09/09/2003	0.94571
11	2017	09/12/2017	0.97857
12	2002	09/08/2002	0.99857
13	2022	09/26/2022	1.0943
14	2007	09/23/2007	1.28
15	1994	09/13/1994	1.3429
16	1992	09/20/1992	1.4
17	2013	09/28/2013	1.4257
18	2009	09/10/2009	1.8286
19	2000	09/18/2000	1.8857
20	2008	09/30/2008	1.9743
21	2016	09/16/2016	2.0457
22	2021	09/30/2021	2.0929
23	1986	09/18/1986	2.36
24	1991	09/09/1991	2.4286
25	2001	09/10/2001	2.5571
26	1984	09/13/1984	2.7614
27	2020	09/07/2020	2.7943
28	2023	09/08/2023	3.2586
29	2014	09/28/2014	4.4529
30	2010	09/09/2010	4.4686
31	2011	09/14/2011	5.6714
32	2015	09/23/2015	6.0029
33	1993	09/18/1993	6.0143
34	1996	09/17/1996	7.5571
35	1998	09/13/1998	8.3857
36	2018	09/20/2018	9.9357
37	1997	09/22/1997	11.143
38	1995	09/18/1995	12.429
39	1999	09/28/1999	15
40	2019	09/20/2019	21.843

October 1 - October 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
1	1987	10/07/1987	0.50857
2	1988	10/11/1988	0.51143
3	2006	10/07/2006	0.53714
4	2012	10/07/2012	0.62714
5	1990	10/07/1990	0.70286
6	2004	10/07/2004	0.84143
7	1985	10/07/1985	0.98714
8	1989	10/15/1989	1.1143
9	2007	10/11/2007	1.1543
10	2005	10/07/2005	1.19
11	2003	10/07/2003	1.3514
12	1992	10/19/1992	1.3857
13	2022	10/07/2022	1.51
14	2002	10/31/2002	1.7857
15	2008	10/07/2008	1.97
16	2017	10/31/2017	2.0943
17	2021	10/07/2021	2.1543
18	2016	10/18/2016	2.2371
19	2000	10/17/2000	2.5
20	1994	10/15/1994	2.6571
21	1991	10/07/1991	3.1
22	2001	10/07/2001	3.2143
23	2009	10/07/2009	3.4543
24	2020	10/07/2020	3.7543
25	2010	10/08/2010	4.7114
26	2023	10/11/2023	4.9314
27	1993	10/31/1993	4.9429
28	1984	10/22/1984	5.4429
29	2013	10/07/2013	5.9714
30	1986	10/31/1986	6.2129
31	2011	10/22/2011	6.2814
32	1996	10/16/1996	7.7
33	2015	10/20/2015	8.7229
34	1995	10/21/1995	9.9
35	1997	10/26/1997	11
36	2018	10/31/2018	11.086
37	1999	10/29/1999	13
38	1998	10/16/1998	14.429
39	2014	10/31/2014	17.371
40	2019	10/31/2019	20.343

November 1 - December 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
12	1983	12/28/1983	1.0857
17	1984	12/31/1984	1.6857
5	1985	12/03/1985	0.55714
23	1986	12/15/1986	2
9	1987	12/31/1987	0.68571
3	1988	12/29/1988	0.43571
1	1989	12/24/1989	0.32857
2	1990	12/31/1990	0.33
14	1991	12/31/1991	1.2714
8	1992	12/09/1992	0.64571
21	1993	12/24/1993	1.9571
24	1994	12/21/1994	2.2143
34	1995	12/24/1995	5.3714
38	1996	12/22/1996	7.3143
36	1997	12/28/1997	5.7857
41	1998	12/25/1998	16
40	1999	12/26/1999	8.8857
27	2000	11/15/2000	3
7	2001	12/06/2001	0.62143
22	2002	11/07/2002	1.9971
16	2003	11/08/2003	1.6286
13	2004	12/24/2004	1.2286
4	2005	12/09/2005	0.47429
6	2006	12/23/2006	0.57857
11	2007	12/31/2007	0.82714
20	2008	12/20/2008	1.9429
25	2009	12/28/2009	2.3714
31	2010	12/20/2010	4.0486
33	2011	12/31/2011	4.7086
10	2012	12/29/2012	0.72143
26	2013	12/11/2013	2.5429
35	2014	12/31/2014	5.7114
37	2015	12/31/2015	6.7857
15	2016	12/10/2016	1.4557
19	2017	12/07/2017	1.7229
32	2018	12/31/2018	4.3429
39	2019	12/29/2019	8.0671
28	2020	12/07/2020	3.0757
30	2021	11/22/2021	3.8471

November 1 - December 31			
Rank	Year	Date	Annual Minimum Flow (cfs)
18	2022	12/24/2022	1.6871
29	2023	12/15/2023	3.8286

ATTACHMENT 7

Ammonia Limits Development
for the
city of Custer Treatment Facility

in Flynn Creek
near
Custer, South Dakota

Prepared by

South Dakota Department of Agriculture and Natural Resources

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INTRODUCTION

Under Section 303(c) of the federal Clean Water Act, states have been required to develop water quality standards to protect public health and enhance water quality. In accordance with the Clean Water Act, the state of South Dakota has assigned beneficial uses to all waters of the state and developed water quality criteria to protect those uses. South Dakota's surface water quality standards and assigned beneficial uses are found in the Administrative Rules of South Dakota (ARSD) Article 74:51.

To ensure the protection of the state's surface water quality standards, the Clean Water Act authorized a permitting program for point source discharges of pollutants. The U.S. Environmental Protection Agency delegated this permitting program to the South Dakota Department of Agriculture and Natural Resources on December 30, 1993.

The department issues Surface Water Discharge permits containing, at a minimum, technology-based effluent limits. However, these limits are not always adequate to protect South Dakota's water quality. In those cases, the Department of Agriculture and Natural Resources develops water quality-based effluent limits. In accordance with the procedures and requirements outlined below, water quality-based effluent limits for ammonia will be developed for the city of Custer's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for Flynn Creek near the city of Custer are maintained and protected.

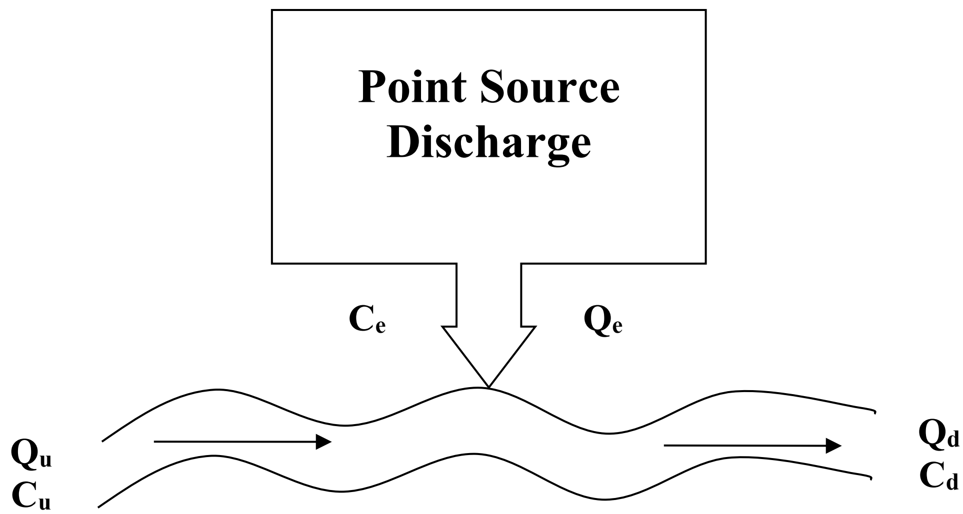
Developing the ammonia limits for the city of Custer is a matter of determining the maximum level of ammonia that can be present in Flynn Creek without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

The effluent limits for ammonia are developed for critical conditions to be conservative, thereby assuring water quality standards are maintained under less critical conditions. Critical conditions are those at which the surface water quality standards are most likely to be violated. Critical conditions can be defined by several factors, including, but not limited to the following:

- stream flow (e.g., high, low);
- storm event occurrence and intensity;
- ambient water quality conditions (e.g., pH, temperature, etc.);
- diurnal variations in water column conditions;
- temporal occurrence of pollutant loadings from natural and human-induced activities; and
- the presence or absence of salmonids.

The following mass balance equation will be used to determine the ammonia limits for the city of Custer:

Figure 1: Mass Balance of Receiving Stream



$$Q_uC_u + Q_eC_e = Q_dC_d$$

Where:

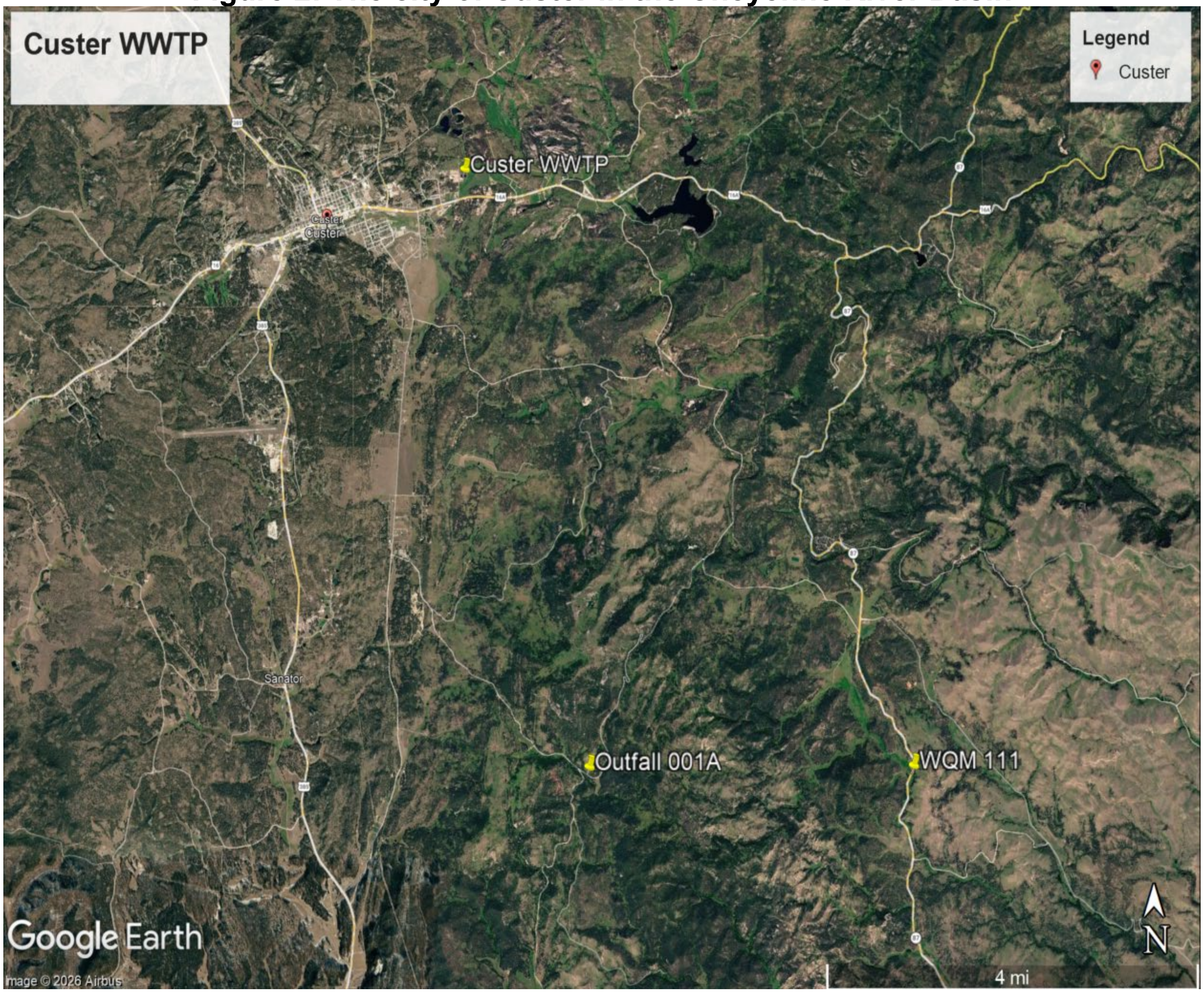
Q_u = Receiving stream flow, in cubic feet per second (cfs);
C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
Q_e = Effluent discharge flow rate, in cfs;
C_e = Water quality based effluent limit for ammonia in mg/L;
Q_d = Downstream flow (equal to $Q_u + Q_e$), in cfs; and
C_d = Allowable instream ammonia concentration (based on the SD Surface Water Quality Standards), in mg/L.

Using the mass balance equation and the following information, the water quality-based effluent limits for ammonia can be determined for the city of Custer's discharge into Flynn Creek.

GEOGRAPHICAL EXTENT

Flynn Creek is located in the Cheyenne River Basin in the southwestern portion of the state. The Cheyenne River Basin drains approximately 9,732 square miles of land, which is comprised of the Black Hills, Badlands, rangeland, irrigated cropland, and mining areas. Figure 2 shows French Creek near Custer.

Figure 2: The city of Custer in the Cheyenne River Basin



Attachment 7: Flynn Creek Ammonia Limit Development

Past experience has shown that, due to the decay and transformation of organic pollutants such as ammonia, most adverse effects are generally exhibited within 10 miles of pollutant loading. While this rule of thumb can certainly vary depending on the source of the pollutant, fate and transport characteristics, hydrologic conditions, and other factors, it has generally held true in past instances. Therefore, the development of the ammonia limits for the city of Custer's discharge into Flynn Creek will be relatively narrow in spatial extent.

ALLOWABLE INSTREAM AMMONIA CONCENTRATION (C_d)

South Dakota Surface Water Quality Standards

The SDSWQS specify the beneficial uses assigned to specific water bodies. The SDSWQS also contain specific narrative and numeric criteria that must be met to ensure the protection of each beneficial use. Flynn Creek is classified for the following beneficial uses five miles downstream of the discharge point:

- (3) Coldwater marginal fish life propagation waters;
- (8) Limited-contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Waterbodies designated in the SDSWQS with the beneficial use classification of either coldwater permanent or coldwater marginal fish life propagation are suitable for supporting salmonids. Waterbodies with the beneficial use classifications of warmwater permanent, warmwater semipermanent, or warmwater marginal fish life propagation will likely not have salmonids. Salmonids are expected to be present in Flynn Creek.

Allowable Instream Ammonia Levels

New ammonia-nitrogen (as N) criteria have been adopted as part of SDDANR's 2021 triennial review of the SDSWQS. Previous ammonia-nitrogen (as N) permit effluent limits were calculated based on the U.S. Environmental Protection Agency's (US EPA) 1999 criteria. The updated criteria, which are to be utilized for permits with an effective date on or after July 1, 2021, are based on EPA's 2013 criteria. For more information about the development of these ammonia-nitrogen (as N) criteria, see *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013* (US EPA, April 2013).

Based on the beneficial uses of Flynn Creek, the following equations can be used to determine the total allowable ammonia concentration in the receiving stream (SDSWQS, ARSD Chapter 74:51:01, Appendix A):

Equation 1: Daily Maximum (Salmonids present)

$$Cd = MIN\left(\left(\frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}\right), \left(0.7249 \text{ x } \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \text{x } \left(23.12 \text{ x } 10^{0.036 \text{ x } (20-T)}\right)\right)\right)$$

Equation 2: Daily Maximum (Salmonids NOT present)

$$Cd = 0.7249 \text{ x } \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \text{x MIN } (51.93, 23.12 \text{ x } 10^{0.036 \text{ x } (20-T)})$$

Equation 3: 30-day Average

$$Cd = 0.8876 \text{ x } \left(\frac{0.0278}{1 + 10^{7.688-pH}} + \frac{1.1994}{1 + 10^{pH-7.688}}\right) \text{x } (2.126 \text{ x } 10^{0.028 \, x \, (20-MAX\,(T,7))})$$

Where:

pH = the pH of the water quality sample in standard units
T = the water temperature of the sample in degrees Centigrade
MIN = use either 51.93 or the value of 23.12 x $10^{0.036 \text{ x } (20\text{-T})}$, whichever is the smaller value
MAX = use either the water temperature (T) for the sample or 7, whichever is the greater value

To develop the ammonia limits for the city of Custer, equations 1 and 3 will be used to determine the instream ammonia concentration, C_d, allowed in Flynn Creek. C_d will be expressed as both 30-day average and daily maximum concentrations. The seasons have been determined based on the availability of instream water quality monitoring data which is quarterly.

Instream Water Quality Monitoring

The department maintains a statewide network of fixed monitoring stations to gain a historic record of water quality for various streams around the state. This water quality monitoring (WQM) network consists of 153 monitoring stations, which are sampled at monthly, quarterly, or seasonal intervals. The goal of this sampling is to collect reliable water quality data that reflects actual stream conditions; to collect data to determine the effectiveness of controls on point and nonpoint sources of pollution; and to collect data to evaluate the appropriateness of current beneficial use designations.

Water quality samples are collected at a WQM station on Flynn Creek. A description of the station is listed below. Figure 2 denotes the location of WQM 111.

WQM 111 — Approximately 3 miles south of Blue Bell Lodge on SD Hwy 87, which is the northernmost crossing of Flynn Creek.

Ambient water temperature, pH, and ammonia data at WQM 111 were obtained to represent instream conditions. The water quality information obtained from WQM 111 is presented in Attachment 8. The pH and temperature data are summarized in Table 1 below.

Calculation of Allowable Instream Ammonia Concentration (C_d)

The SDSWQS specify the total ammonia concentration that is allowed at a given pH and temperature. The 80th percentile of the pH and temperature at WQM 111 was determined to ensure the ammonia standards are maintained during critical conditions. During the months of July through September, the 50th percentile of pH and temperature was used to account for summer ammonia nitrification. This information was used to calculate the allowable instream ammonia concentrations for each quarter. Table 1 summarizes the allowable instream ammonia (C_d) for the Flynn Creek.

Table 1: Allowable Instream Total Ammonia Concentrations for Flynn Creek

Season	**Temperature (°C)**	**pH (s.u.)**	**C_d, Allowable Total Ammonia (mg/L)**	
			30-Day Average	**Daily Maximum**
January 1 – March 31	4.00	8.30	1.13	3.15
April 1 – June 30	17.00	8.30	0.59	2.81
July 1 – September 30	15.60	8.10	0.89	4.64
October 1 – December 31	7.50	8.40	0.92	2.59

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 111 was reviewed to determine the ambient water quality in Flynn Creek. The 80th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 111 is presented in Attachment 8. Table 2 below summarizes the 80th percentile ammonia data for each season. This data represents the ambient ammonia concentration for Flynn Creek (C_u).

Table 2: Ambient Ammonia Data for Flynn Creek

Season	**Ammonia (mg/L)**
January 1 – March 31	0.07
April 1 – June 30	0.05
July 1 – September 30	0.05
October 1 – December 31	0.05

EFFLUENT DISCHARGE FLOW RATE (Q_e)

The effluent discharge flow rate, Q_e, can be determined in several different ways. If effluent data is available for the discharger, the 50th or 80th percentile of the daily flow can be used. The effluent design flow rate of the wastewater treatment facility may be used as the expected effluent flow rate in the absence of actual discharge data. Alternatively, for stabilization pond systems, it may be appropriate to develop an effluent flow rate based on expected performance.

For the purposes of developing ammonia limits for the city of Custer Outfall 001A, 0.81 cfs was used for Q_e based on the 80th percentile of 30-day average effluent flow of Outfall 001A from July 2014 through September 2025. See Attachment 5 for more details.

Table 3 summarizes the effluent flow rate used in these calculations.

RECEIVING STREAM FLOW (Q_u)

The United States Geological Survey (USGS) maintains hundreds of flow monitoring sites in South Dakota. The receiving stream flow rate, Q_u, is determined from an analysis of stream flow data available, incorporating the flow considerations required by *South Dakota's Mixing Zone and Dilution Implementation Procedures*.

Critical conditions for ammonia presumably occur when stream flows are relatively low. Therefore, the ammonia limits will be developed for low stream flow conditions. Should it be determined that water quality standards are violated at other flow conditions, the permit would be reopened and new limits would be developed.

ARSD Section 74:51:01:29 specifies that surface water quality standards apply to high quality fishery waters when flows meet or exceed the minimum 7-day average low flow that can be expected to occur once every 25 years (7Q25). The 7Q25 is therefore the minimum, or critical, flow for which the SDSWQS must be maintained, although all Surface Water Discharge permit limits remain in force below this minimum flow.

The seasonal 7Q25 flows for Flynn Creek were determined using data retrieved from the regional USGS gauging stations and a Log Pearson type III statistical analysis. This average was done as there is not a USGS gauging station on Flynn Creek. The seven-day averages are calculated for the entire data set. After the averages are calculated, the data is split into the selected seasons. Analysis is then done in accordance with the EPA guidance document *Technical Guidance Manual for Performing Wasteload Allocation* to determine the seasonal 7Q25 flow. A description of the stations used are listed below.

USGS 06425100	Elk Creek Near Rapid City, SD
USGS 06404998	Grace Coolidge Creek Near Game Lodge, SD
USGS 06422500	Boxelder Creek Near Nemo, SD
USGS 06410500	Rapid Creek Above Pactola Reservoir, SD
USGS 06412500	Rapid Creek Above Canyon Lake, SD

USGS 06407500	Spring Creek Near Keystone, SD
USGS 06404000	Battle Creek Near Keystone, SD
USGS 06403300	French Creek Above Fairburn, SD

South Dakota's water quality standards allow a zone of mixing for discharges. In accordance with the SDSWQS, chronic and acute ammonia water quality criteria must be met at the end of the mixing zone. The mixing zone is therefore a limited portion of a water body where mixing of the effluent and receiving stream is in progress, but not complete. In some cases, the discharge will not completely mix with the entire receiving stream. There are many factors that influence the rate of mixing in a stream. A few of these factors are the flow and velocity of the receiving stream, the flow and velocity of the effluent, the slope of the stream, and other stream characteristics.

The *South Dakota Mixing Zone and Dilution Implementation Procedures* outlines an approach for modeling the mixing zone. Using these procedures, the 7Q25 is adjusted to account for the allowable ratio of flow available in the receiving stream. This adjusted flow represents the receiving stream flow rate (Q_u).

Table 3 and Attachment 9 summarize the flow data and the determination of Q_u for Flynn Creek.

Table 3: Critical Low Flow Values for Flynn Creek

Season	7Q25 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q25	Allowable Ratio of 7Q25	Critical Low Flow Q_u (cfs)
January 1 – March 31	0.01	0.81	162	1	0.01
April 1 – June 30	0.01	0.81	162	1	0.01
July 1 – September 30	0.01	0.81	162	1	0.01
October 1 – December 31	0.01	0.81	162	1	0.01

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is simply the sum of the upstream flow rate (Q_u) and the effluent flow rate (Q_e). The downstream flow rate used for the calculation of the ammonia limits for the city of Custer's discharge into Flynn Creek is summarized in Table 4 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Table 4. Using the mass balance equation, the ammonia limits for the city of Custer's discharge into Flynn Creek can be calculated as follows:

Equation 4: Mass Balance Equation

$$Ce = \frac{(Qd * Cd) - (Qu * Cu)}{Qe}$$

The water quality-based effluent limits for ammonia for the city of Custer's discharge into Flynn Creek are presented in Table 4.

Table 4: Variables Calculated for Mass Balance Equation

Season	C_u, mg/L	C_d, mg/L		Q_e, cfs	Q_d, cfs	C_e, mg/L	
		30-day Average	Daily Maximum			30-Day Average	Daily Maximum
January 1 – March 31	0.07	1.13	3.15	0.81	0.82	1.1	3.2
April 1 – June 30	0.05	0.59	2.81	0.81	0.82	0.6	2.8
July 1 – September 30	0.05	0.89	4.64	0.81	0.82	0.9	4.7
October 1 – December 31	0.05	0.92	2.59	0.81	0.82	0.9	2.6

Based on recent facility performance (Attachment 2, Monitoring Data), the 30-day average limits are expected to be applicable for a typical discharge from this facility, and the facility is not expected to be able to meet the ammonia-nitrogen (as N) effluent limits proposed in the draft permit. A compliance schedule is recommended to carry over the current permit's limits temporarily (interim limits) allow the facility additional time to make operational adjustments to meet these proposed effluent limits (final limits).

ATTACHMENT 8

Flynn Creek Water Quality Data

WATER QUALITY DATA
WQM 111

WQM data was obtained from the water quality monitoring station WQM 111. The period of the data is from November 1, 1984 through September 30, 2025. This data can be obtained at https://www.waterqualitydata.us/portal/

SDDANR considers ammonia-nitrogen (as N) to have a reporting limit of 0.05 mg/L. For ammonia nitrogen values reported as “Below Detection,” “Present Below Quantification Limit,” or less than 0.05 mg/L, 0.05 mg/L was used calculations.

WQM 51 Data

Temperature				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Average	1.93	12.53	15.96	3.90
50th Percentile	1.11	12.22	15.60	4.00
80th Percentile	4.00	17.00	19.68	7.50

pH				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Average	8.03	8.06	8.06	8.14
50th Percentile	8.19	8.10	8.10	8.20
80th Percentile	8.30	8.30	8.30	8.40

Ammonia				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Average	0.10	0.06	0.06	0.07
50th Percentile	0.05	0.05	0.05	0.05
80th Percentile	0.07	0.05	0.05	0.05

1st Quarter				
Datetime	**Ammonia(mg/l)**		**Temperature(C)**	**pH**
01/08/1985	0.05	0.05	1.67	7.7

1st Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
01/08/1986	0.05	0.05	0	7.85
01/08/1987	0.05	0.05	0.56	8.2
01/09/1989	0.07	0.07	0.56	7.5
01/08/1990	0.05	0.05	1.11	7.2
01/13/1992	0.05	0.05	0.56	7.79
01/04/1994	0.13	0.13	0	8.18
01/11/1995	0.02	0.05	0.56	7.95
01/08/1996	0.07	0.07	1.11	8.1
01/14/1997	0.02	0.05	0.3	7.95
01/07/1998	0.3	0.3	0.1	8.28
01/05/1999	0.1	0.05	1	8.15
01/13/2000	0.5	0.5	0.8	8.27
01/16/2001	0.1	0.05	0.2	
01/10/2002	0.1	0.05	0.5	8.14
01/08/2003	0.1	0.05	1	8.26
01/21/2004	0.1	0.05	0	8.2
01/10/2005	0.1	0.05	0	8.2
01/10/2006	0.1	0.05	0	8.1
01/10/2007	0.1	0.05	0	8.2
01/14/2008	0.1	0.05	0	8.2
02/06/1985	0.05	0.05	1.11	7
02/11/1986	0.05	0.05	0	8.2
02/03/1987	0.05	0.05	0	8.3
02/18/1988	0.05	0.05	1.11	7
02/20/1990	0.05	0.05	2.22	7.2
03/13/1985	0.05	0.05	2.22	7
03/25/1986	0.05	0.05	10	7.9
03/04/1987	0.04	0.05	1.11	7.75
03/09/1988	0.05	0.05	1.11	8.45
03/21/1989	0.05	0.05	0.56	8.1
03/13/1990	0.05	0.05	1.11	7.2
03/16/2009	0.1	0.05	7	8.4
03/17/2010	0.1	0.05	5	8.2
03/16/2011	0.3	0.3	5	8.1
03/14/2012	0.1	0.05	4	8.4
03/07/2013	0.1	0.05	0	
03/05/2014	0.1	0.05		
03/09/2015	0.128	0.128	4	8.3
03/09/2016	0.05	0.05	6	8.7
03/08/2017	0.065	0.065	4	8.4

1st Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
03/15/2018	0.207	0.207	6	8.2
03/19/2019	0.77	0.77	0	7.8
03/09/2020	0.272	0.272	3	8.1
03/19/2021	0.05	0.05	2	8.3
03/14/2022	0.054	0.054	3	8.2
03/24/2023	0.05	0.05	4	8.3
03/12/2024	0.05	0.05	5	8.9
03/03/2025	0.05	0.05	4	8.4

2nd Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
04/03/1985	0.05	0.05	7.78	7.1
04/08/1986	0.05	0.05	16.67	7.5
04/07/1987	0.03	0.03	5.56	7.85
04/20/1988	0.05	0.05	7.78	8.25
04/04/1989	0.05	0.05	3.33	7.35
04/09/1990	0.053	0.053	5.56	7.45
04/10/1991	0.05	0.05	3.33	8.13
04/14/1992	0.05	0.05	8.41	8.41
04/13/1993	0.05	0.05	0.56	8.18
04/25/1994	0.06	0.06	8.89	8.19
04/24/1995	0.02	0.05	5	9.07
04/24/1996	0.02	0.05	8.89	7.98
04/21/1997	0.1	0.05	8.4	8.08
04/14/1998	0.1	0.05	3.9	8.14
04/21/1999	0.4	0.4	7.8	8.15
04/11/2000	0.1	0.05	5.4	8.19
04/10/2002	0.1	0.1	8.8	8.31
04/09/2003	0.1	0.05	10.8	8.6
04/14/2004	0.1	0.05	11.9	8.6
04/14/2005	0.1	0.05	12.7	8.8
04/12/2006	0.1	0.05	10	8.2
04/17/2007	0.1	0.05	11	8.3
04/29/2008	0.1	0.05	14	8.3
05/07/1985	0.05	0.05	11.11	8
05/05/1986	0.05	0.05	11.11	7.55
05/11/1987	0.11	0.11	16.67	8.15
05/23/1988	0.05	0.05	12.22	7.95
05/15/1989	0.1	0.1	14.44	7.65

2nd Quarter				
Datetime	**Ammonia(mg/l)**		**Temperature(C)**	**pH**
05/03/1990	0.05	0.05	8.33	7.35
05/10/2022	0.05	0.05	13.5	7.79
05/08/2023	0.05	0.05	18.7	9.13
05/15/2024			10.5	8.5
05/13/2025			20.4	8.43
05/26/2025			9.6	8.01
06/12/1985	0.05	0.05	10	7.65
06/08/1986	0.05	0.05	12.22	7.95
06/09/1987	0.038	0.038	12.22	7
06/09/1988	0.06	0.06	23.33	7.96
06/13/1989	0.03	0.03	13.33	7.25
06/04/1990	0.05	0.05	18.9	7.25
06/30/2009	0.1	0.05	17	8.1
06/09/2010	0.1	0.05	14	8.1
06/21/2011	0.1	0.05	14	8.3
06/06/2012	0.1	0.05	18	8.3
06/18/2013	0.1	0.05	17	
06/19/2014	0.1	0.05	12	
06/10/2015	0.05	0.05	14	7.9
06/07/2016	0.05	0.05	17	8.4
06/15/2017	0.05	0.05	15	8.2
06/07/2018	0.05	0.05	20	8
06/17/2019	0.05	0.05	13	8.1
06/18/2020	0.05	0.05	16	8.2
06/16/2021	0.05	0.05	20	8.3
06/09/2022	0.144	0.144	11.9	8.26
06/13/2022	0.05	0.05	19.5	8.02
06/14/2023	0.05	0.05	21	8.6
06/21/2023	0.05	0.05	17.8	8.07
06/06/2024	0.05	0.05	15	8.1
06/17/2024			12	7.92
06/12/2025	0.05	0.05	22	8.2
06/25/2025			14.9	7.95

3rd Quarter				
Datetime	**Ammonia(mg/l)**		**Temperature(C)**	**pH**
07/16/1985	0.05	0.05	22.22	7.3
07/08/1986	0.09	0.09	17.78	7.5
07/15/1987	0.07	0.07	24.44	7.9

3rd Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
07/12/1988	0.05	0.05	21.67	7.79
07/11/1989	0.04	0.05	21.11	7.65
07/16/1990	0.05	0.05	14.4	8.07
07/10/1991	0.05	0.05	16.1	8.02
07/22/1992	0.07	0.07	12.2	8.29
07/27/1993	0.05	0.05	13.1	7.99
07/12/1994	0.05	0.05	16.67	8.21
07/11/1995	0.29	0.29	17.22	7.92
07/22/1996	0.02	0.05	16.67	8
07/23/1997	0.1	0.05	15.4	7.93
07/13/1998	0.1	0.05	15.6	8.1
07/15/1999	0.1	0.05	15.8	8.09
07/19/2000	0.1	0.05	16.6	8.55
07/16/2001	0.1	0.05	19.8	8.18
07/23/2002	0.1	0.05	17.2	8.33
07/16/2003	0.1	0.05	18.6	8.1
07/06/2004	0.1	0.05	15.3	8.4
07/18/2005	0.1	0.05	14.3	8.2
07/12/2006	0.1	0.05	17	8
07/10/2007	0.1	0.05	16	8.1
07/07/2008	0.1	0.05	20	8.2
07/14/2022	0.057	0.057	25	7.41
07/13/2023	0.05	0.05	19.8	8.15
07/01/2024			21.4	7.8
07/16/2025			13.94	7.83
08/21/1985	0.05	0.05	15.56	7.95
08/12/1986	0.05	0.05	16.67	7.5
08/11/1987	0.05	0.05	20	7.5
08/24/1988	0.07	0.07	15.56	7.48
08/07/1989	0.05	0.05	14.44	7.35
08/06/1990	0.05	0.05	16.1	8.04
08/03/2022	0.05	0.05	23.4	7.83
08/06/2024			23.3	7.78
09/04/1985	0.04	0.05	16.11	7.75
09/22/1986	0.05	0.05	10.56	8.1
09/02/1987	0.05	0.05	14.44	8.3
09/14/1988	0.07	0.07	12.78	8.44
09/19/1989	0.14	0.14	14.44	7.9
09/11/1990	0.05	0.05	15.6	8.04
09/14/2009	0.1	0.05	15	8.3

3rd Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
09/22/2010	0.05	0.05	15	8.2
09/21/2011	0.1	0.05	9	8.4
09/20/2012	0.1	0.05	12	8.4
09/26/2013	0.1	0.05	12	
09/17/2014	0.1	0.05	12	
09/29/2015	0.05	0.05	11	8.2
09/08/2016	0.05	0.05	17	8.4
09/07/2017	0.05	0.05	13	7.9
09/26/2018	0.05	0.05	8	8.2
09/12/2019	0.05	0.05	11	8.16
09/16/2020	0.05	0.05	12	8.4
09/21/2021	0.05	0.05	11	8.6
09/20/2022	0.05	0.05	19.2	8.72
09/27/2022	0.05	0.05	16	8.8
09/12/2023	0.05	0.05	14	8.3
09/21/2023	0.05	0.05	13.9	8.01
09/03/2024			20.1	8.21
09/10/2024	0.05	0.05	13	8.1
09/03/2025	0.05	0.05	11	8.2

4th Quarter				
Datetime	Ammonia(mg/l)		Temperature(C)	pH
10/15/1985			6.11	7.75
10/20/1986	0.03		8.89	9.9
10/06/1987	0.13		7.78	7.7
10/20/1988	0.05	0.05	6.11	7.92
10/17/1989	0.05	0.05	3.33	7.2
10/15/1990	0.05	0.05	5.56	8.14
10/15/1991	0.09	0.09	12.2	7.95
10/14/1992	0.06	0.06	4.44	8.22
10/26/1993	0.05	0.05	4.44	8.09
10/05/1994	0.05	0.05	11.11	8.4
10/18/1995	0.02	0.05	7.78	8.19
10/24/1996	0.09	0.09	3.89	8
10/22/1997	0.1	0.05	4.9	7.9
10/22/1998	0.1	0.05	5.5	8.28
10/21/1999	0.1	0.05	8.1	8.16
10/10/2000	0.1	0.05	5.1	8.31
10/11/2001	0.1	0.05	5.2	8.79

4th Quarter				
Datetime	**Ammonia(mg/l)**		**Temperature(C)**	**pH**
10/09/2002	0.1	0.05	7.5	8.58
10/20/2003	0.1	0.05	8.8	8.4
10/21/2004	0.1	0.05	8	8.4
10/19/2005	0.1	0.05	6	8.6
10/25/2006	0.1	0.05	4	8.2
10/17/2007	0.1	0.05	6	8.3
10/20/2008	0.1	0.05	8	8.5
11/15/1984	0.05	0.05	0	7.6
11/04/1985	0.05	0.05	7.78	8
11/04/1986	0.05	0.05	5.56	8
11/05/1987	0.03	0.05	5.56	8.4
11/08/1988	0.03	0.05	2.22	7.1
11/07/1989	0.04	0.05	3.33	7.6
12/04/1984	0.05	0.05	0	7
12/11/1985	0.05	0.05	0	7.9
12/04/1986	0.05	0.05	0	8.25
12/02/1987	0.04	0.05	1.11	8.6
12/18/1989	0.095	0.095	0.56	7.25
12/17/2009	0.1	0.05	1	8.02
12/08/2010	0.1	0.05	0	8.2
12/14/2011	0.1	0.1	1	8.2
12/12/2012	0.1	0.05	0	8
12/02/2013	0.1	0.05	4	
12/02/2014	0.1	0.05	0	
12/03/2015	0.05	0.05	1	8.4
12/20/2016	0.05	0.05	1	8.1
12/19/2017	0.05	0.05	0	8.3
12/05/2018	0.927	0.927	0	8.1
12/05/2019	0.05	0.05	2	8.3
12/04/2020	0.175	0.175	0	8.4
12/14/2021	0.05	0.05	1	8.3
12/06/2022	0.05	0.05	0	8.1
12/06/2023	0.05	0.05	3	8.5
12/03/2024	0.05	0.05	0	8.6

ATTACHMENT 9

Flynn Creek Flow Data

Regional Low-Flow Statistics (7Q5 & 7Q25) Eastern Black Hills, South Dakota

Prepared by SD DANR Water Quality Program January, 2026

Executive Summary

This report documents the development and application of monthly regional regression curves for low-flow statistics—specifically 7Q5 (flow exceeded 80% of the time; 1-in-5-year low flow) and 7Q25 (flow exceeded 96% of the time; 1-in-25-year low flow)—for streams in the Eastern Black Hills. The curves relate predicted low flow (Q, in cfs) to drainage area (A, in square miles) using power-law regressions of the form Q = c × A^b, fit separately for each month. The approach follows USGS low-flow practice and relies on multi-decadal daily streamflow records processed via rolling 7-day means.

The resulting models show stronger scaling and higher explanatory power (R^2) in late spring and summer, consistent with sustained baseflow and snowmelt, while winter fits are weaker, influenced by ice conditions and localized variability. Across months, median $R^2 \approx 0.75$ for 7Q5 and ≈ 0.65 for 7Q25.

Data & Methods

Daily mean discharge was obtained from USGS Water Data for the Nation (NWIS) and reported in Appendix A. The station set includes eight Eastern Black Hills gages, spanning ≈26.8 to 374 mi² in drainage area; associated metadata (drainage area, datum, period of record) were compiled from NWIS inventory pages.

For each station, daily flows were converted to 7-day rolling means. Monthly minima of these 7-day means were extracted for each year. Across years, empirical quantiles were computed for each month: 20th percentile for 7Q5 and 4th percentile for 7Q25.

Monthly regional curves were fit using power-law regression: Q = c * A^b, where A is drainage area (sq mi) (Appendix B). Regression was performed in $\log^{10}$ space using ordinary least squares. Goodness-of-fit was assessed using R^2.

Table 1. Monthly 7Q5 Flows

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
USGS 06425100 ELK CREEK NR RAPI (6425100)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
USGS 06404998 GRACE COOLIDGE CR (6404998)	0.6	0.6	0.7	1.0	1.0	1.0	0.8	0.6	0.5	0.6	0.8	0.7
USGS 06422500 BOXELDER CREEK NE (6422500)	2.1	2.2	3.2	6.3	8.1	5.9	3.8	2.6	3.0	3.4	3.3	2.6
USGS 06410500 RAPID CREEK ABOVE (6410500)	9.3	10.0	13.9	27.0	33.6	29.5	23.9	22.2	19.1	17.2	12.8	10.4
USGS 06412500 RAPID CREEK ABV C (6412500)	3.7	4.4	6.2	6.6	13.6	24.7	29.9	24.9	15.6	6.1	4.7	3.7
USGS 06407500 SPRING CREEK NEAR (6407500)	1.1	1.2	2.4	4.4	6.5	5.4	1.9	0.7	0.2	0.4	0.7	1.5
USGS 06404000 BATTLE CREEK NEAR (6404000)	0.2	0.4	0.7	1.9	2.2	1.8	0.3	0.1	0.0	0.0	0.5	0.3
USGS 06403300 FRENCH CREEK ABOV (6403300)	0.8	0.9	1.6	3.4	2.7	2.2	1.1	0.9	0.9	1.1	1.3	0.7

Table 2. Monthly 7Q25 Flows

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
USGS 06425100 ELK CREEK NR RAPI (6425100)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
USGS 06404998 GRACE COOLIDGE CR (6404998)	0.3	0.1	0.4	0.7	0.5	0.2	0.1	0.2	0.2	0.4	0.4	0.2
USGS 06422500 BOXELDER CREEK NE (6422500)	1.3	1.2	1.9	3.8	4.2	3.1	2.1	1.2	1.1	1.6	2.0	1.4
USGS 06410500 RAPID CREEK ABOVE (6410500)	7.3	6.9	8.5	15.6	20.6	20.1	16.6	16.1	14.6	13.0	9.1	7.4

USGS 06412500 RAPID CREEK ABV C (6412500)	0.3	1.0	0.8	0.5	6.9	13.8	15.6	12.9	7.6	2.8	1.8	1.5
USGS 06407500 SPRING CREEK NEAR (6407500)	0.0	0.0	0.0	2.1	3.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0
USGS 06404000 BATTLE CREEK NEAR (6404000)	0.0	0.0	0.1	1.1	0.7	0.2	0.0	0.0	0.0	0.0	0.1	0.0
USGS 06403300 FRENCH CREEK ABOV (6403300)	0.3	0.4	0.4	1.5	1.6	0.5	0.2	0.3	0.4	0.5	0.8	0.4

Results

The tables below present monthly coefficients (c, b) and R^2 for 7Q5 and 7Q25. These are ready to use for drainage areas within (or close to) the observed range (≈27–374 mi^2), with caution for extrapolation.

Overall performance: Median $R^2 \approx 0.75$ (7Q5); ≈ 0.65 (7Q25). Performance peaks in late spring/early summer (May–June) and is notably weaker in winter, reflecting ice effects and localized variability.

Monthly Regression Coefficients for 7Q5

Month	c	b	R^2	N
January	0.007	1.096	0.579	7
February	0.01	1.056	0.677	7
March	0.014	1.086	0.803	7
April	0.741	0.177	0.003	8
May	0.019	1.19	0.82	7
June	0.009	1.338	0.884	7
July	0.001	1.622	0.71	7
August	0.0	1.836	0.591	7
September	0.004	1.287	0.453	6
October	0.001	1.418	0.402	7
November	0.028	0.886	0.48	7
December	0.015	0.984	0.581	7

Monthly Regression Coefficients for 7Q25

Month	c	b	R^2	N
January	0.077	0.375	0.043	6
February	0.003	1.174	0.647	5
March	0.013	0.881	0.355	6
April	0.224	0.444	0.122	7
May	0.006	1.277	0.806	7
June	0.0	1.847	0.794	7
July	0.0	1.574	0.185	6
August	0.0	1.764	0.822	5
September	0.001	1.64	0.84	5
October	0.008	1.092	0.648	5
November	0.01	0.807	0.094	7
December	0.001	1.245	0.147	7

Example Predictions for Selected Drainage Areas (7Q5)

Area (sq mi)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
10	0.09	0.12	0.17	1.11	0.30	0.19	0.05	0.02	0.08	0.04	0.21	0.14
20	0.19	0.24	0.36	1.26	0.67	0.49	0.16	0.07	0.20	0.10	0.39	0.28
50	0.51	0.63	0.97	1.48	2.00	1.66	0.70	0.35	0.64	0.36	0.89	0.68
100	1.10	1.32	2.07	1.67	4.57	4.20	2.16	1.24	1.55	0.96	1.64	1.35
150	1.71	2.02	3.21	1.80	7.40	7.22	4.16	2.61	2.61	1.71	2.35	2.02
200	2.35	2.74	4.38	1.89	10.42	10.61	6.63	4.43	3.79	2.57	3.04	2.68
250	3.00	3.47	5.58	1.96	13.59	14.30	9.52	6.67	5.04	3.52	3.70	3.33
300	3.66	4.20	6.81	2.03	16.88	18.25	12.80	9.32	6.38	4.56	4.35	3.99
350	4.34	4.95	8.04	2.09	20.28	22.43	16.43	12.37	7.78	5.68	4.98	4.64
400	5.02	5.69	9.30	2.13	23.77	26.82	20.41	15.80	9.24	6.86	5.61	5.29

Example Predictions for Selected Drainage Areas (7Q25)

Area (sq mi)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
10	0.18	0.04	0.10	0.62	0.12	0.02	0.01	0.02	0.03	0.10	0.07	0.01
20	0.24	0.10	0.18	0.85	0.29	0.06	0.03	0.07	0.08	0.22	0.11	0.02
50	0.33	0.28	0.40	1.27	0.94	0.32	0.13	0.35	0.35	0.60	0.24	0.07
100	0.43	0.63	0.74	1.73	2.27	1.16	0.37	1.19	1.08	1.28	0.42	0.18
150	0.51	1.02	1.05	2.07	3.81	2.45	0.71	2.43	2.09	2.00	0.58	0.29
200	0.56	1.42	1.36	2.35	5.50	4.17	1.11	4.04	3.35	2.74	0.73	0.42
250	0.61	1.85	1.65	2.59	7.31	6.30	1.58	5.99	4.83	3.49	0.88	0.55
300	0.66	2.29	1.94	2.81	9.23	8.82	2.11	8.26	6.52	4.26	1.01	0.69
350	0.69	2.75	2.22	3.01	11.23	11.73	2.69	10.84	8.39	5.04	1.15	0.84
400	0.73	3.21	2.50	3.19	13.32	15.01	3.32	13.71	10.44	5.83	1.28	0.99

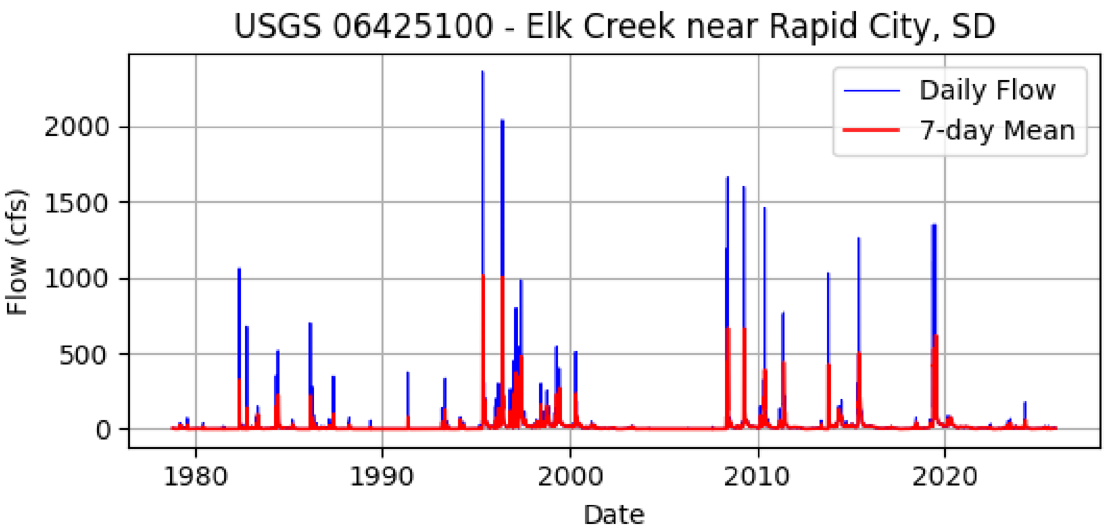
References

- Riggs, H.C., 1982, Techniques of Water-Resources Investigations, Book 4, Chapter B3
- USGS StreamStats and NSS documentation
- EPA Low Flow Statistics Handbook (2018, 2023)
- USGS Scientific Investigations Reports on low-flow frequency analysis

Appendix: Station Notes and Flow Plots

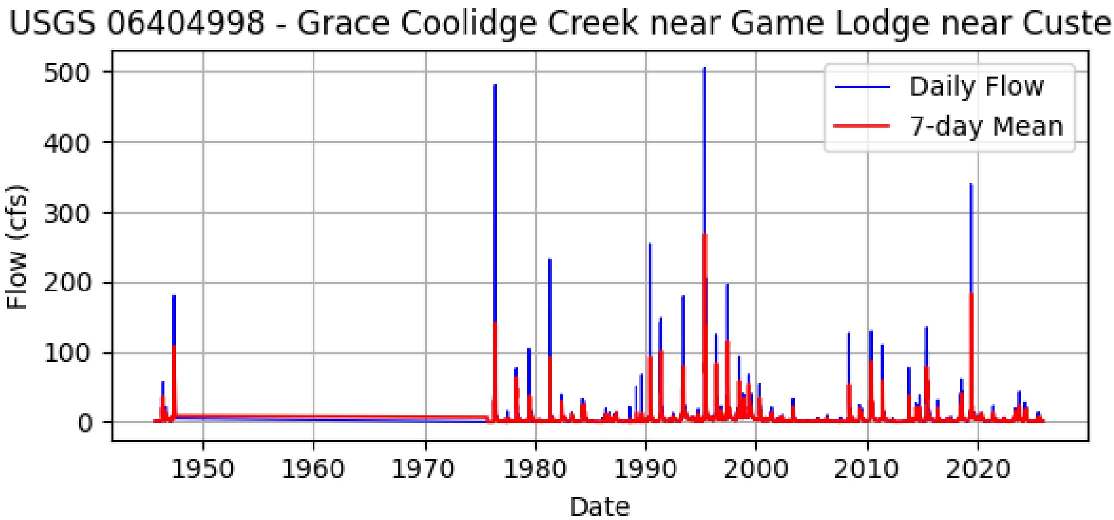
USGS 06425100 - ELK CREEK NEAR RAPID CITY, SD

Location: Meade County
Coordinates: 44.2403, -103.1513
Drainage Area: 211 sq mi
Period of Record: 1978-11-01 to present



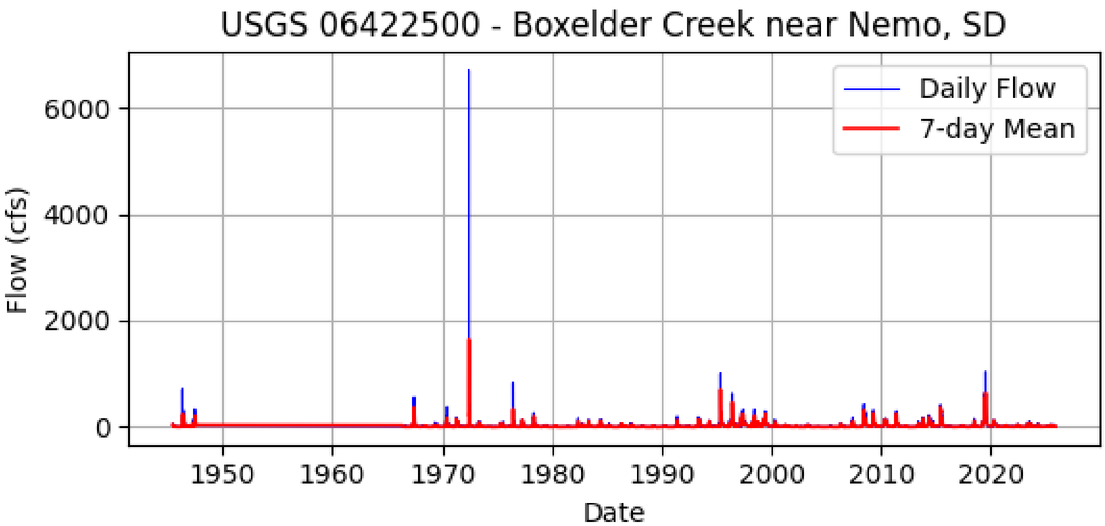
USGS 06404998 - GRACE COOLIDGE CREEK NEAR GAME LODGE NEAR CUSTER, SD

Location: Custer County
Coordinates: 43.7611, -103.3641
Drainage Area: 26.8 sq mi
Period of Record: 1945-10-01 to present


USGS 06404998 - Grace Coolidge Creek near Game Lodge near Custer
Daily Flow
7-day Mean
Flow (cfs)
Date
0
100
200
300
400
500
1950
1960
1970
1980
1990
2000
2010
2020

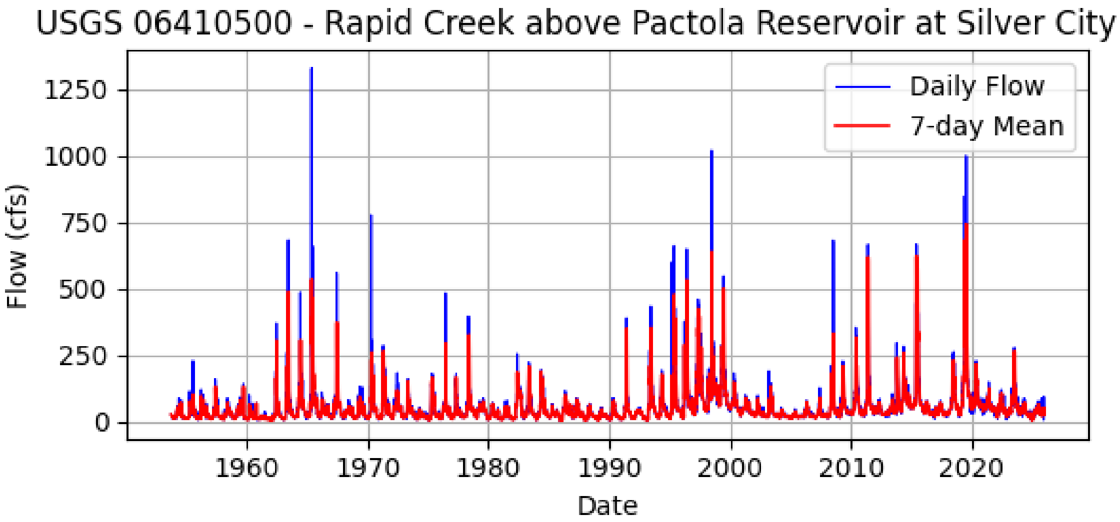
USGS 06422500 - BOXELDER CREEK NEAR NEMO, SD

Location: Lawrence County
Coordinates: 44.1443, -103.4545
Drainage Area: 94.2 sq mi
Period of Record: 1945-06-17 to present



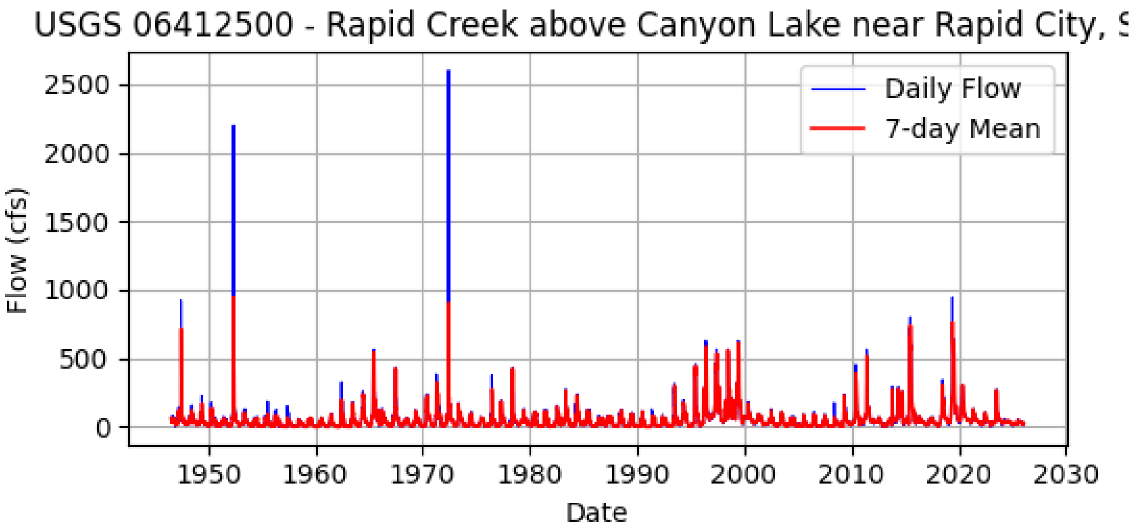
USGS 06410500 - RAPID CREEK ABOVE PACTOLA RESERVOIR AT SILVER CITY, SD

Location: Pennington County
Coordinates: 44.0847, -103.5805
Drainage Area: 293 sq mi
Period of Record: 1953-10-01 to present


USGS 06410500 - Rapid Creek above Pactola Reservoir at Silver City
Daily Flow
7-day Mean
Flow (cfs)
0
250
500
750
1000
1250
1960
1970
1980
1990
2000
2010
2020
Date

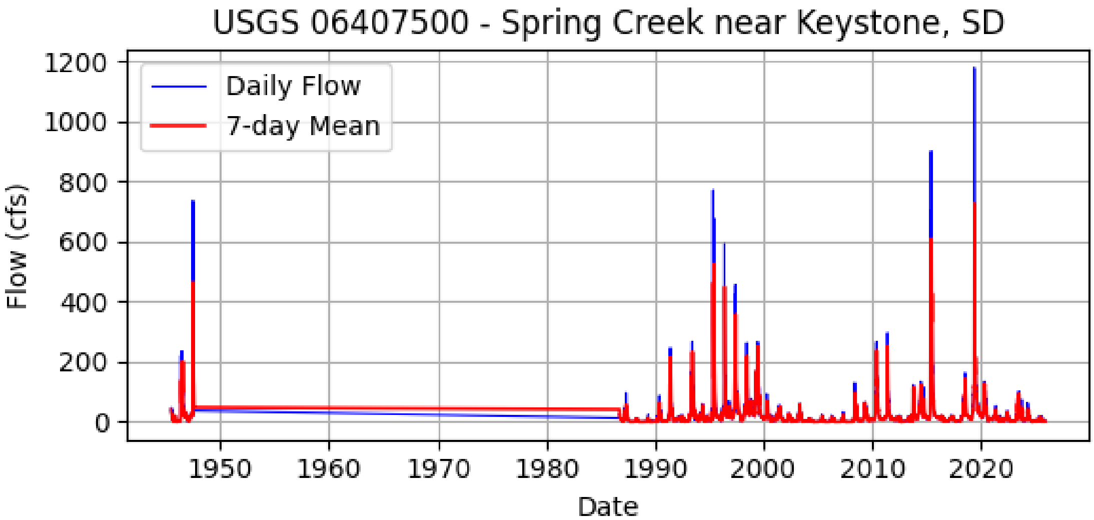
USGS 06412500 - RAPID CREEK ABOVE CANYON LAKE NEAR RAPID CITY, SD

Location: Pennington County
Coordinates: 44.0528, -103.3119
Drainage Area: 374 sq mi
Period of Record: 1946-08-01 to present



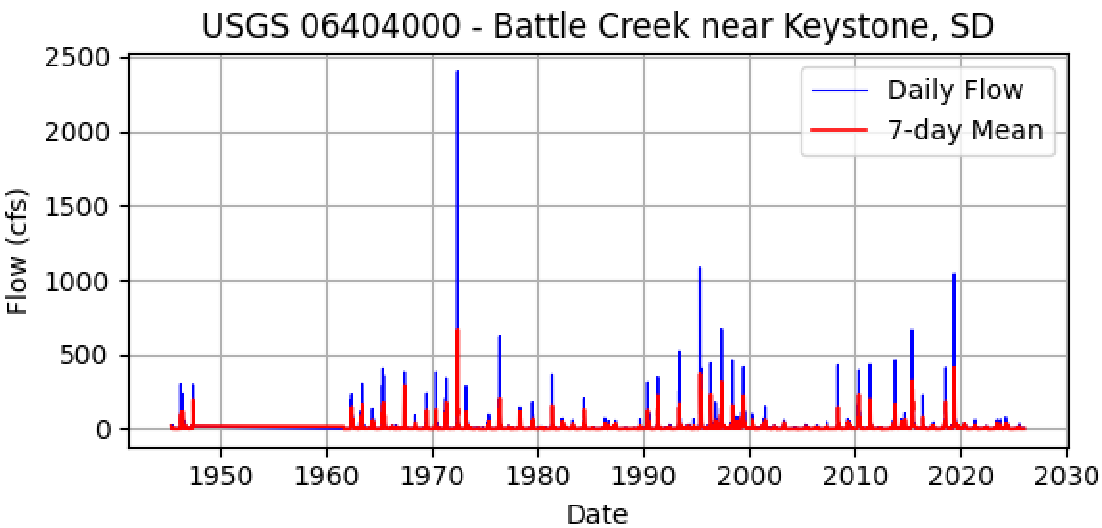
USGS 06407500 - SPRING CREEK NEAR KEYSTONE, SD

Location: Pennington County
Coordinates: 43.9789, -103.346
Drainage Area: 163 sq mi
Period of Record: 1945-06-15 to present


USGS 06407500 - Spring Creek near Keystone, SD
Daily Flow
7-day Mean
Flow (cfs)
1200
1000
800
600
400
200
0
1950
1960
1970
1980
1990
2000
2010
2020
Date

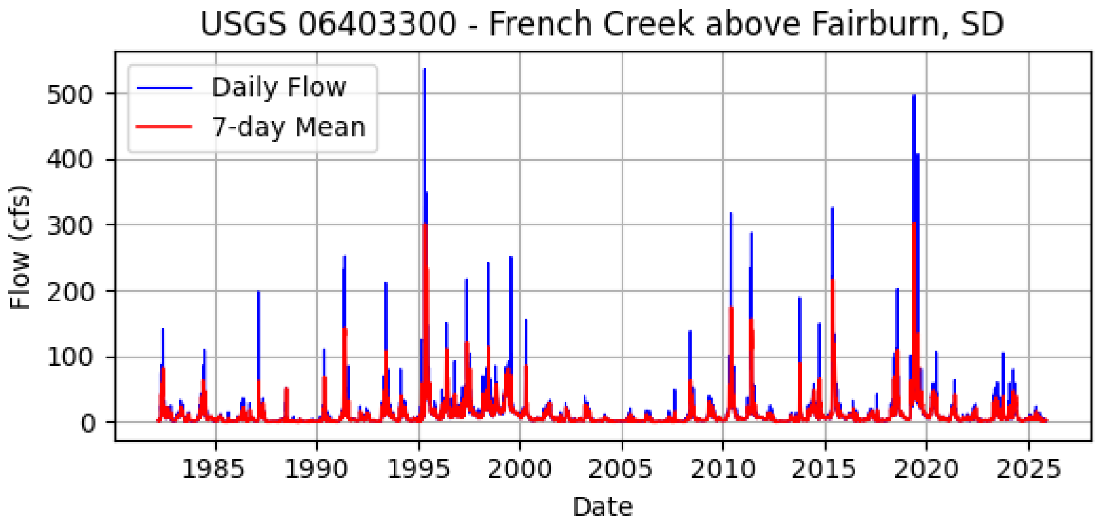
USGS 06404000 - BATTLE CREEK NEAR KEYSTONE, SD

Location: Pennington County
Coordinates: 43.8716, -103.3363
Drainage Area: 58.5 sq mi
Period of Record: 1945-06-20 to present



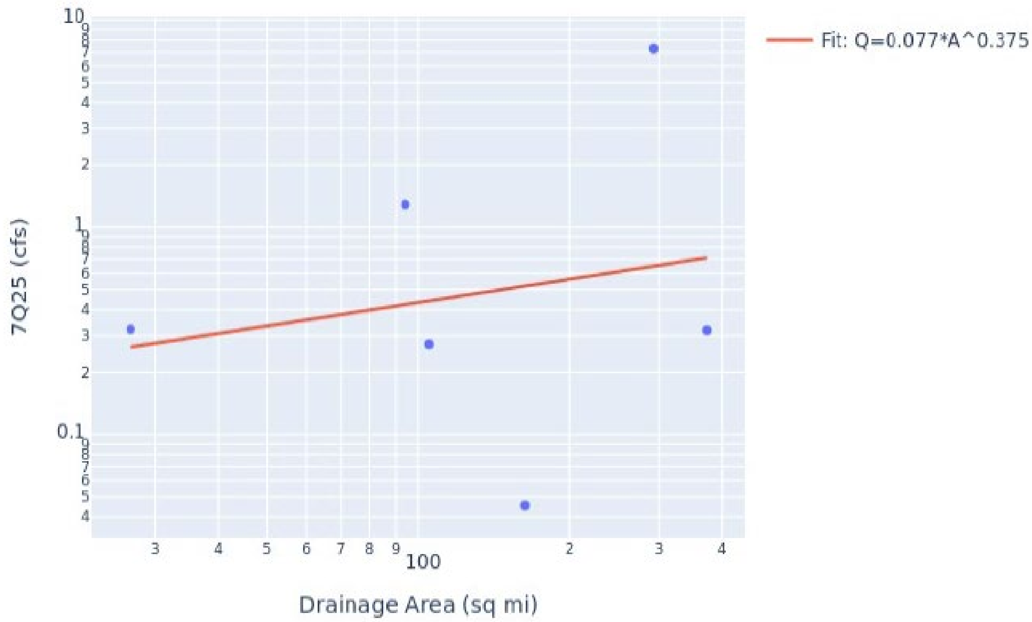
USGS 06403300 - FRENCH CREEK ABOVE FAIRBURN, SD

Location: Custer County
Coordinates: 43.7172, -103.368
Drainage Area: 105 sq mi
Period of Record: 1982-04-01 to present

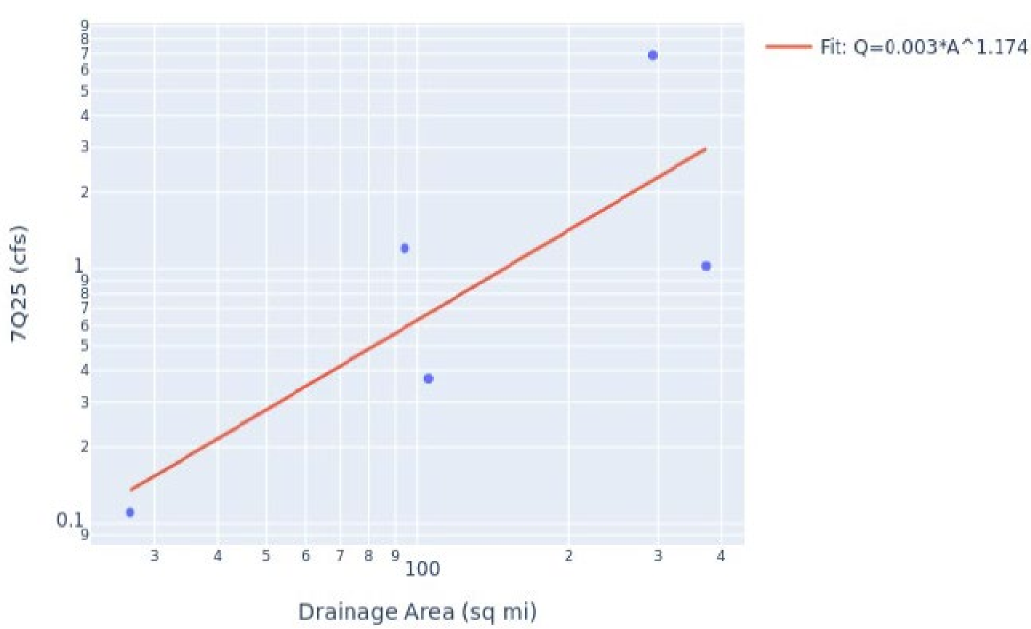

USGS 06403300 - French Creek above Fairburn, SD
Daily Flow
7-day Mean
Flow (cfs)
0
100
200
300
400
500
1985
1990
1995
2000
2005
2010
2015
2020
2025
Date

Appendix B: Station Notes and Flow Plots

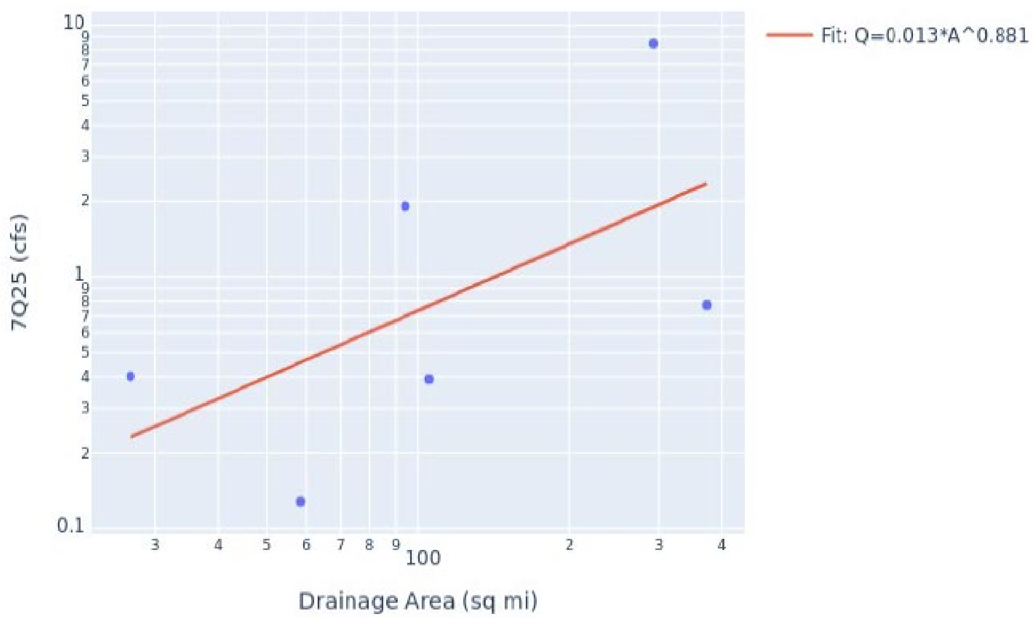
Regional Curve 7Q25 - January



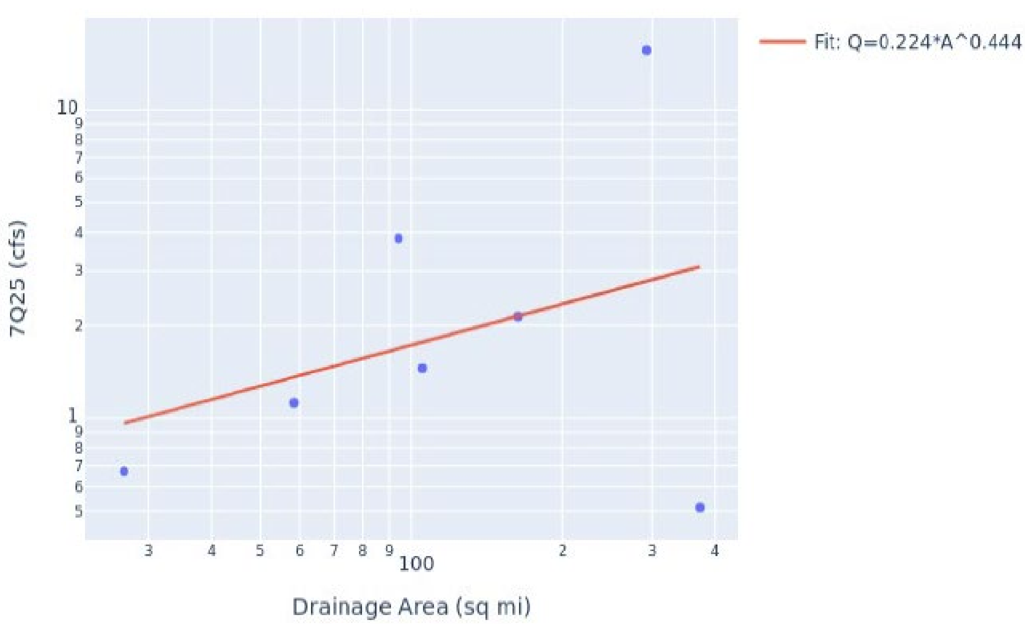
Regional Curve 7Q25 - February



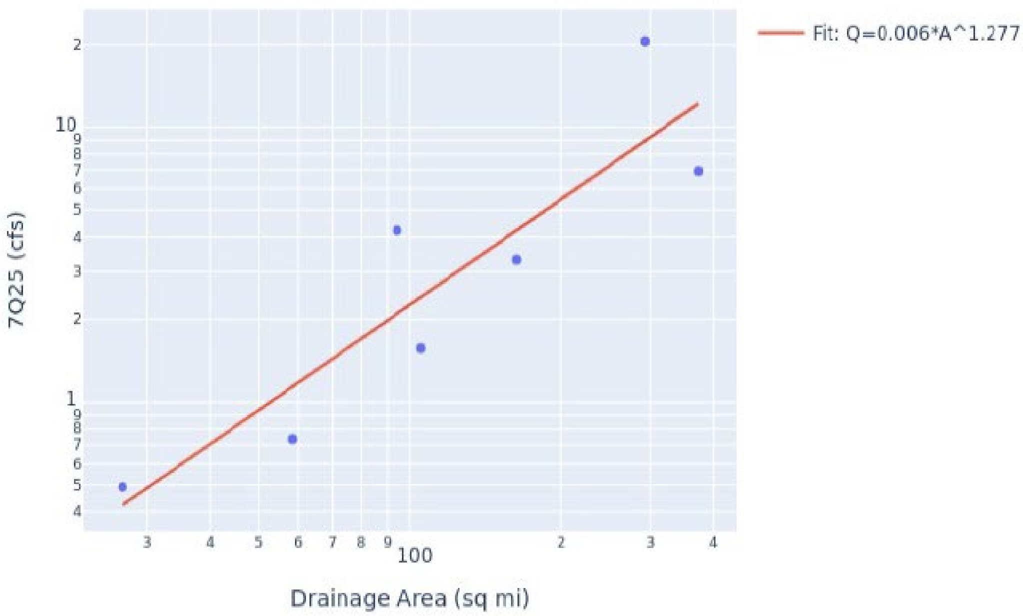
Regional Curve 7Q25 - March



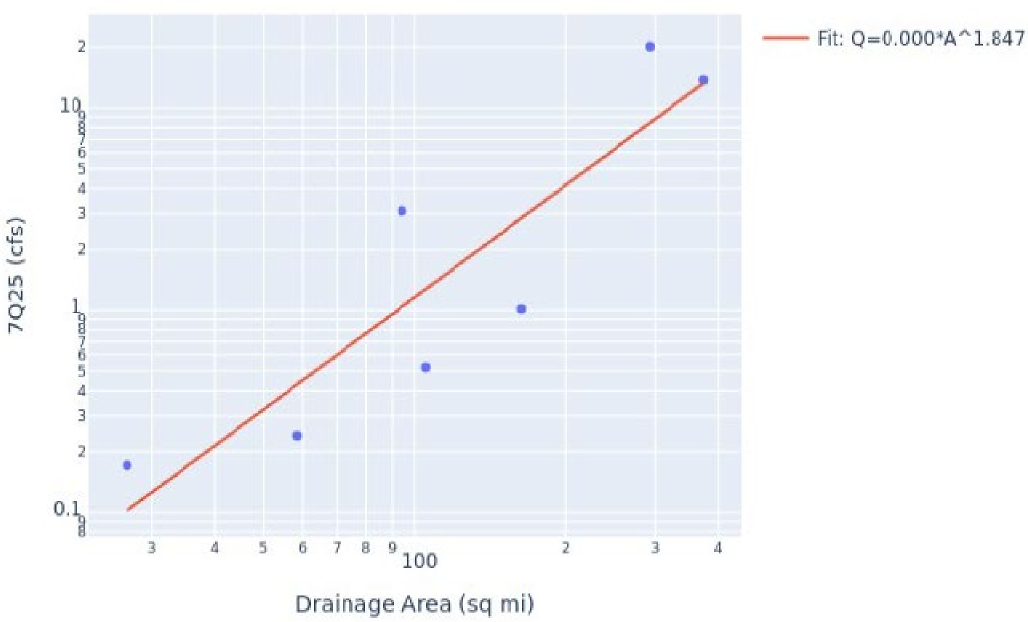
Regional Curve 7Q25 - April



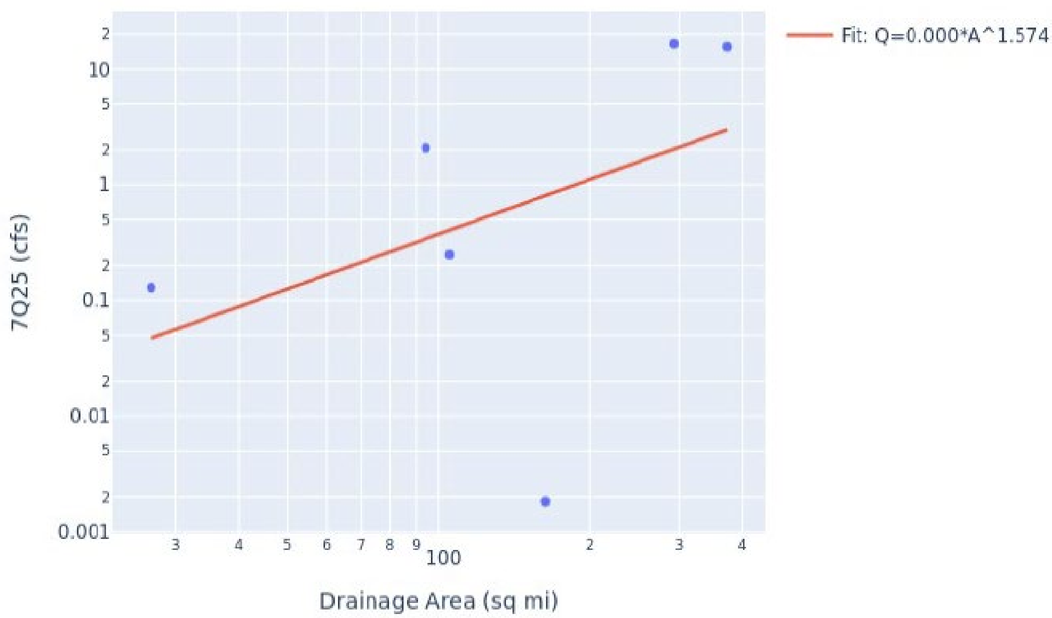
Regional Curve 7Q25 - May



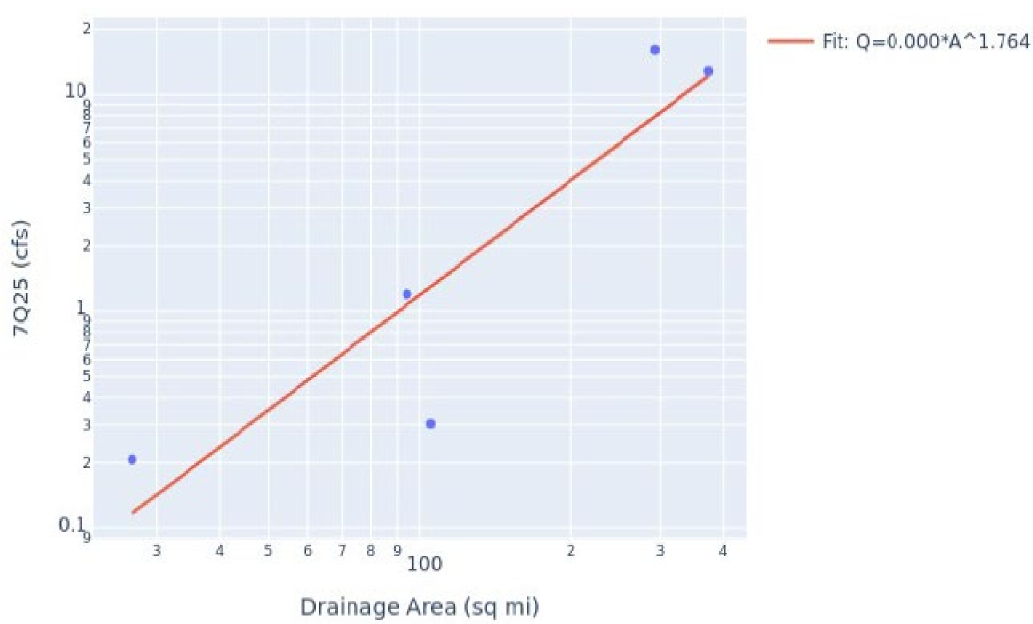
Regional Curve 7Q25 - June



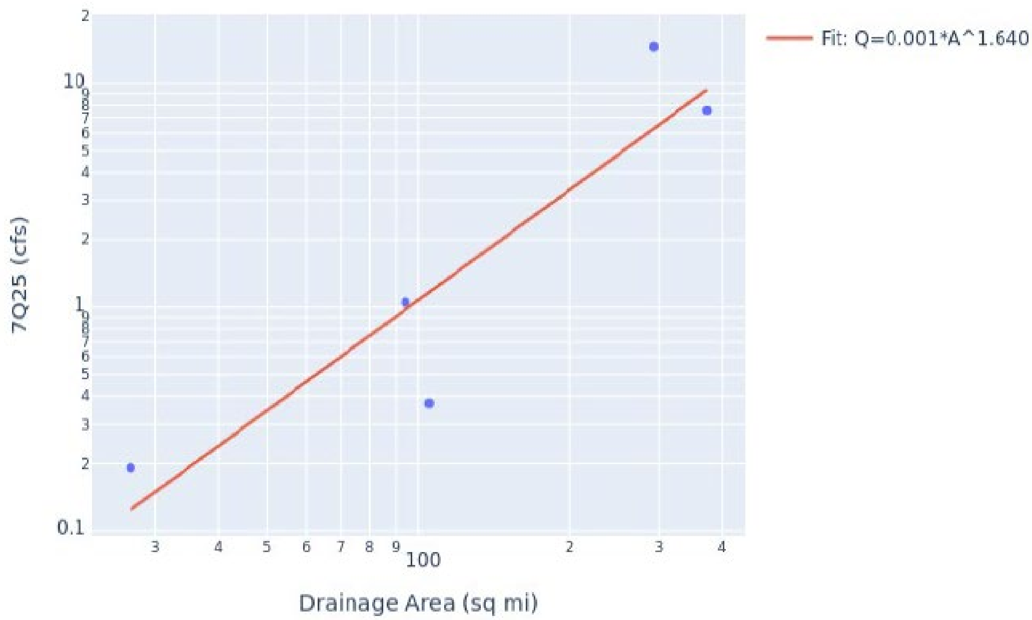
Regional Curve 7Q25 - July



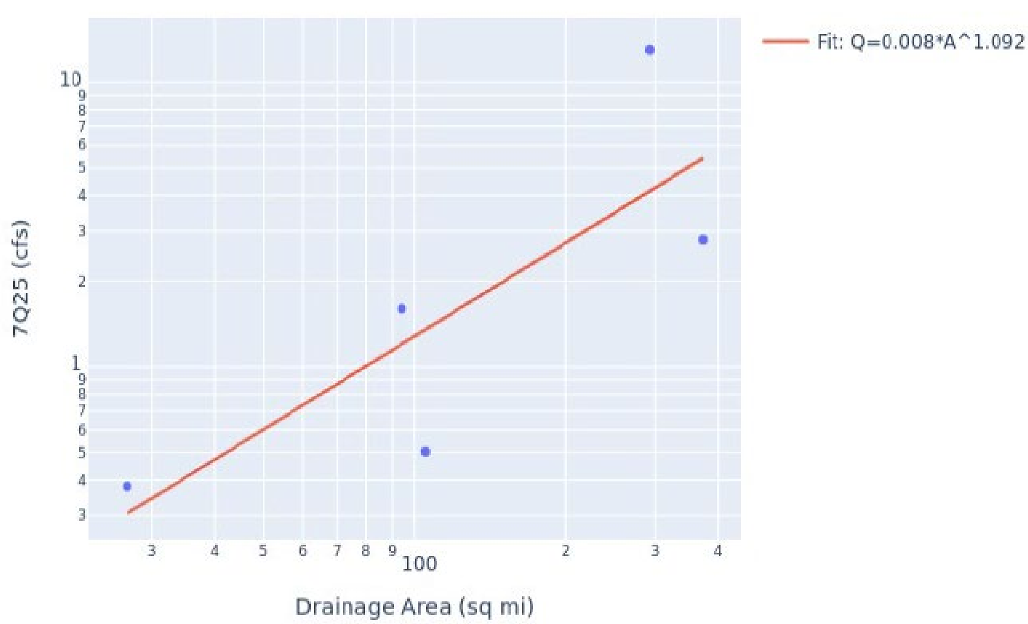
Regional Curve 7Q25 - August



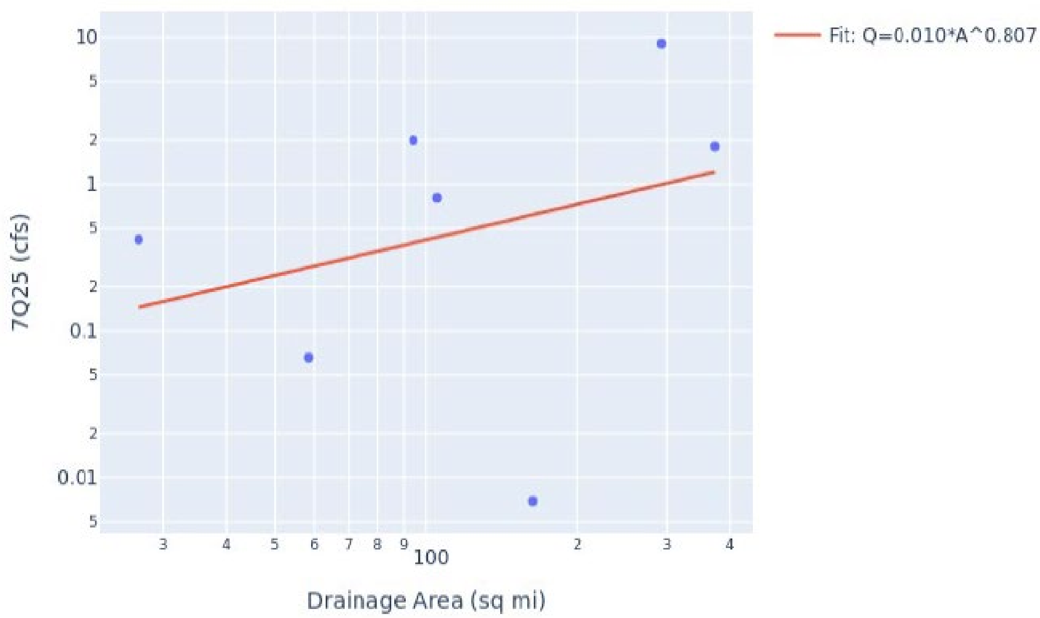
Regional Curve 7Q25 - September



Regional Curve 7Q25 - October



Regional Curve 7Q25 - November



Regional Curve 7Q25 - December