

STATEMENT OF BASIS

PERMITTEE: Spirit Lake Water Resource Management

FACILITY: Spirit Lake Rural Water System Water Treatment Plant

PERMIT NO.: ND-0031101

RESPONSIBLE OFFICIAL: Robert Thompson, Director
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Contact After Operational Status Achieved
Robert Thompson, Director, SLRWS

PERMIT TYPE: Minor Industrial Permit (New Permit)
Indian Country

FACILITY LOCATION: NW ¼ NE ¼ S29, T151N, R63W, Benson County, North Dakota
(latitude 47° 52' 18" N, longitude 98° 44' 42" W)

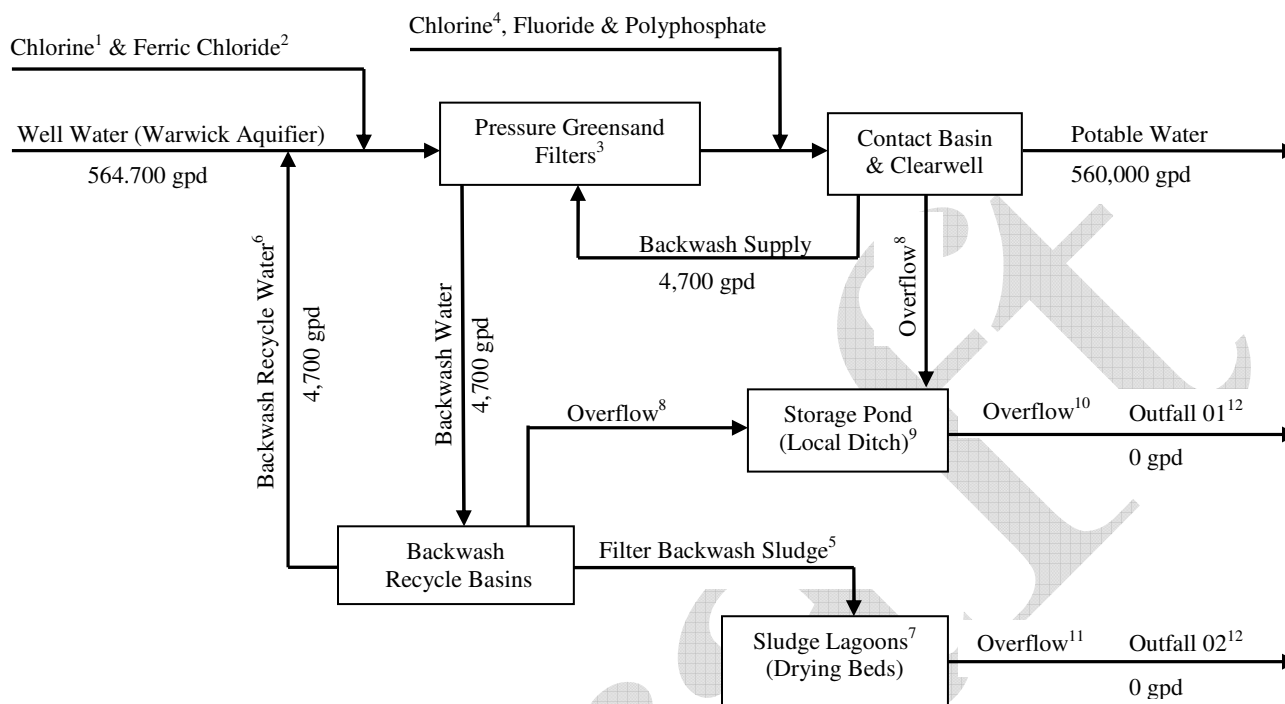
Background Information

This statement of basis is for a new permit for the Spirit Lake Rural Water System's water treatment plant (WTP) that is being constructed on the Spirit Lake Nation Reservation in Benson County, North Dakota. The Spirit Lake Rural Water System (SLRWS) is the potable water supply and distribution system for the residents and communities of the Spirit Lake Nation Reservation.

Raw water from the Warwick aquifer will be pumped to the WTP from 3 existing wells and 2 newly constructed wells. According to the permit application, an estimated 564,700 gallons per day will be pumped to the WTP, with an estimated 560,000 gallons per day going to the potable water distribution system after treatment. The water treatment process will include chlorine and ferric chloride primary treatment to provide oxidation of metals (including iron and arsenic) and coagulation of arsenic, respectively, pressure greensand filtration for precipitant separation, then the addition of chlorine for disinfection, fluoride for dental health purposes and polyphosphate for scale inhibition, prior to going to the potable water distribution system. The addition of ammonia or chloramines will not be utilized. Approximately 4,700 gallons per day of backwash water decant will be recycled to the head of the plant.

Refer to Attachment A for Proposed WTP Site Plan

Line Diagram of Water Treatment Process and Wastewater Treatment from the Permit Application



Flows based on estimated 2012 average daily demands.

- ¹ Chlorine will be added directly to raw well water to help provide adequate oxidation of metals (including iron and arsenic).
- ² Ferric chloride will be added directly to raw well water to aid in the coagulation of arsenic for more efficient removal by the filtration process.
- ³ Pressure greensand filters consisting of a layered media composed of 12 inches of anthracite, 18 inches greensand, 3 inches of torpedo sand, and 12 inches of supporting gravel.
- ⁴ Chlorine added following the treatment by the pressure filters will serve as residual chlorine for disinfection.
- ⁵ It is anticipated that the sludge backwash basins will be cleaned twice per year (once in the spring and once in the fall), as needed. Sludge from the basins will be conveyed to the sludge lagoons, with waste ultimately being disposed of utilizing appropriate methods and permitting requirements.
- ⁶ Backwash recycle water will involve recycling backwash water by combining it with raw well water at the head of the plant.
- ⁷ The sludge lagoons will accept sludge from the backwash recycle basins. These 2 lagoons operating in parallel will function as drying/evaporation beds and are designed as zero-discharge lagoons. Cleaning of the sludge lagoons is anticipated to occur approximately once every ten years or as necessary with waste being disposed of utilizing appropriate methods and permitting requirements.

- ⁸ Overflow from the clearwell (potable water) and/or backwash recycle basins (backwashed potable water) will be routed to the storage pond (local on-site ditch). Overflow may occur primarily during the startup testing and only infrequently thereafter. Quantities are unknown and anticipated to be negligible.
- ⁹ The storage pond will be in the form of a local on-site ditch. Upon closing of a canal gate installed on the downstream culvert, the upstream ditch from the closed culvert will be utilized to serve as a storage pond (maximum storage in excess of 40,000 ft³) to facilitate the infiltration and/or evaporation of overflow water.
- ¹⁰ Overflow from the storage pond (Outfall 001) will occur only in the unforeseen case where overflow from the clearwell, and/or backwash recycle basins or significant precipitation events is of greater volume than the maximum volume of the storage pond. Quantities are unknown and anticipated to be negligible.
- ¹¹ Overflow from the sludge lagoons (Outfall 002) will occur only under the unforeseen circumstance of major releases of water into the lagoons from the plant or due to significant precipitation events. Quantities are unknown and anticipated to be negligible.
- ¹² Any discharge from Outfalls 001 or 002 would travel by overland and unnamed intermittent stream/wetland flow approximately 8.3 miles to Devils Lake.

The facility will be a zero-discharge facility during the normal operation with the supernatant of the backwash water from the pressure media filters recycled to the head of the plant and any sludge collected in the backwash recovery basins pumped to on-site storage lagoons. The storage lagoons will serve as drying/evaporation beds for the collected sludge and will be cleaned periodically as warranted. Each of the two lagoons has a design capacity of approximately 523,200 gallons.

According to the permittee, the overflow from the clear well was not connected to the piping for the wastewater going to the sludge lagoons because of the potential for cross-contamination should the discharge piping to the sludge lagoons become backed up for any reason.

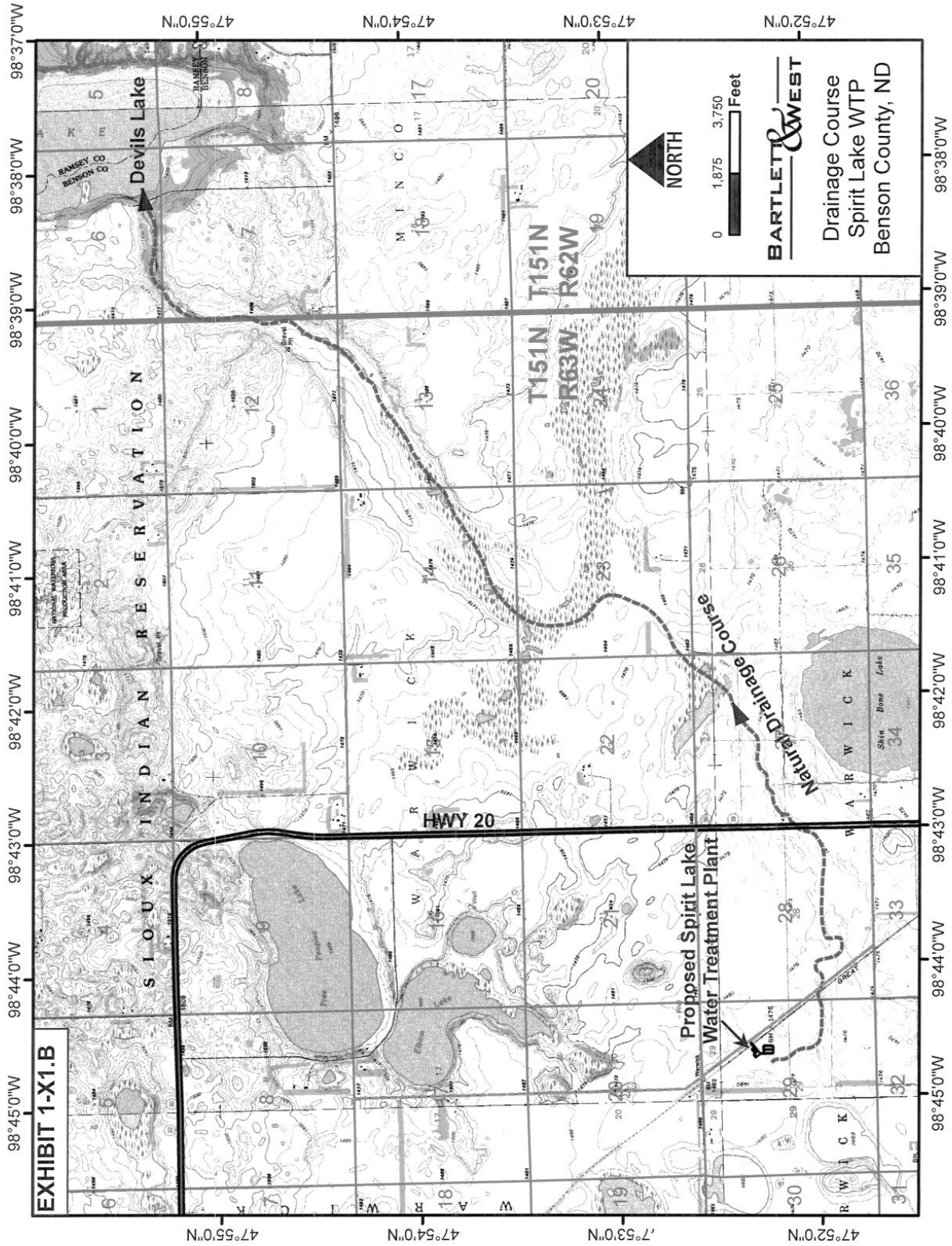
Discharges from the facility will be the result of overflow (i.e., will not be controlled) and are likely to be intermittent in nature. Under these emergency discharge situations, off-site discharge would consist of treated water and/or backwash water.

Receiving Waters

Discharge from Outfalls 001 or 002 would be conveyed by overland and unnamed intermittent stream/wetland flow approximately 8.3 miles to Devils Lake, which is tributary to the Sheyenne River. The drainageway from the WTP to Devils Lake is entirely within the boundary of the Spirit Lake Sioux Reservation.



**Spirit Lake WTP
Vicinity Map**



Spirit Lake WTP
Discharge Drainageway

Water Quality Considerations

The Spirit Lake Sioux Tribe does not have program authorization (treatment as state (TAS)) for water quality standards (WQS) that can be approved by the EPA. Furthermore, the Tribe has not developed WQS for the Spirit Lake Indian Reservation. In the absence of water quality standards on the reservation, the EPA needs to consider protecting beneficial uses of the receiving waters. Section 101(a)(2) of the Clean Water Act states “it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water to be achieved by July 1, 1983”. The EPA regulations on water quality standards specify at 40 CFR § 131.10(j) “A State must conduct a use attainability analysis as described in 40 CFR §131.3(g) whenever: (1) The State designates or has designates or has designated uses that do not include the uses specified in section 101(a)(2) of the Act, or (2) The State wishes to remove a designated use that is specified in section 101(a)(2) of the Act or to adopt subcategories of uses specified in section 101(a)(2) of the Act which require less stringent criteria.” To this writer’s knowledge, a use attainability analysis has not been done on these stream segments. Therefore, the beneficial uses of the receiving waters will be considered to include aquatic life and recreation.

The State of North Dakota has classified Devils Lake as Class 2 (cool water fishery) with Class 1 stream characteristics including immersion recreation, irrigation, stock watering, wildlife and municipal or domestic use. It is unlikely the pollutants from the two discharges would be conveyed to Devils Lake in concentrations great enough to have a measurable effect on water quality within the lake, however, since Devils Lake is designated for municipal or domestic use (water supply), the State of North Dakota Human Health criteria with respect with arsenic only will be considered in this permit.

Numeric Water Quality Criteria

The criteria used in evaluation of reasonable potential and setting permit effluent limitations are listed in Table 1.

Table 1 – Applicable Water Quality Criteria - expressed as µg/L

Pollutant	EPA Water Quality Criteria		ND Water Quality Criteria		
	Aquatic Life		Aquatic Life		Human Health
	Acute	Chronic	Acute	Chronic	
Aluminum, Total	750	87	750	87	--
Arsenic, Total	340	150	340	150	10
Cadmium, Total	4.24 ⁽¹⁾	0.42 ⁽¹⁾	4.64 ⁽¹⁾	0.48 ⁽¹⁾	5
Chlorides	860,000	230,000	--	100,000	--
Chromium (III)	1,066.5 ⁽¹⁾	138.7 ⁽¹⁾	3,375 ⁽¹⁾	161 ⁽¹⁾	100
Chromium (VI), Hexavalent	16	11	16	11	100
Copper, Total	27.6 ⁽¹⁾	17.2 ⁽¹⁾	28.8 ⁽¹⁾	17.9 ⁽¹⁾	1,000
Fluoride	--	--	--	--	4,000
Iron, Total	--	1,000	--	--	--
Lead, Total	147.0 ⁽¹⁾	5.7 ⁽¹⁾	216.3 ⁽¹⁾	8.4 ⁽¹⁾	15
Mercury, Total	1.4	0.77	1.7	0.012	0.05
Nickel, Total	895 ⁽¹⁾	99 ⁽¹⁾	896.6 ⁽¹⁾	99.7 ⁽¹⁾	100
Oil and Grease	Narrative, 10 mg/L		Narrative, 10 mg/L		--
Selenium, Total	--	4.6	20	5	50
Silver, Total	12.0 ⁽¹⁾	--	14.1 ⁽¹⁾	--	--
Zinc, Total	224 ⁽¹⁾	226 ⁽¹⁾	229.2 ⁽¹⁾	229.2 ⁽¹⁾	7,400
Residual Chlorine, Total	19	11	19	11	--

⁽¹⁾ Criterion is hardness dependent. Table values adjusted for hardness using the permit application data hardness value of 215 mg/L.

Effluent Monitoring Data

A raw well water sample was taken from one of the existing wells currently providing water to SLRWS. This sample, in addition to water being drawn from two other existing wells currently supplying water to the SLRWS, as well as the two newly constructed wells, are from the same aquifer, and therefore, is considered being representative of the water to be supplied to this proposed WTP. The North Dakota Department of Health analyzed the sample with the results outlined in Table 2 below.

Table 2 –Well Water Analysis Data – Application - Supplementary Exhibit C

Parameter	Units	Data	Reporting Limit
Conductivity	µmhos/cm	529	-
TDS	mg/L	305	-
Hardness, CaCO ₃	mg/L	215	10
Alkalinity, Total (CaCO ₃)	mg/L	225	-
pH	s.u.	7.71	-
Oil & Grease	mg/L	6.20	-
Aluminum	µg/L	ND	50
Ammonia (N)	mg/L	0.667	-
Antimony	µg/L	ND	5
Arsenic	µg/L	7.87	1
Barium	µg/L	131	-
Beryllium	µg/L	ND	5
Boron	µg/L	ND	50
Cadmium	µg/L	ND	5
Calcium	mg/L	59.7	10
Chloride	mg/L	5.99	5
Chromium	µg/L	5.12	5
Copper	µg/L	ND	5
Cyanide	mg/L	ND	0.005
Fluoride	mg/L	0.16	1
Iron	µg/L	157	50
Lead	µg/L	ND	5
Manganese	µg/L	741	2
Magnesium	mg/L	16.0	30 µg/L
Mercury	µg/L	ND	0.2
Nickel	µg/L	ND	5
Nitrate + Nitrate (N)	mg/L	ND	0.03
Phenols	µg/L	ND	5
Phosphorus	mg/L	0.093	-
Potassium	mg/L	4.4	-
Selenium	µg/L	ND	5
Silica	mg/L	29.3	-
Silver	µg/L	ND	5
Sodium	mg/L	33.4	-
Sulfate as (SO ₄)	mg/L	48	-
Thallium	µg/L	ND	5
Zinc	µg/L	ND	5

The pollutants in the discharges from Outfalls 001 and 002 should not cause water quality problems in terms of recreational and stock watering uses of the receiving waters. In terms of fresh water aquatic life, the only pollutant of potential concern is total residual chlorine (TRC). Due to the intermittent

nature of the discharges at either outfall, only the acute criteria will be considered. The acute criterion for TRC is 0.019 mg/L. Given the potential detention period within the storage pond and sludge lagoon systems, the chlorine within the overflows is likely to decay sufficiently to meet the criteria at Outfalls 001 and 002.

As described in the application documentation, the process of removing arsenic from the raw water will involve utilizing ferric chloride to form a precipitate which in turn is removed from the raw water by sand filtration. This removal process may have the added benefit of removing other undesirable compounds along with arsenic such as phosphate, fluoride, nitrate, iron and manganese. Precipitants processed through the backwash recycle basins and ultimately to the sludge lagoons will accumulate within the normally non-discharging lagoons. It is not known if these pollutants will be present in any overflow discharges from Outfall 002 in sufficient concentrations to have reasonable potential to exceed the aquatic criterion.

The permittee has acknowledged in the application documents that dramatic changes in the pH levels can lead to a change in the reduction state of ions and can result in precipitated arsenic re-solubilizing and re-entering solution at times of overflow. As part of the operation and maintenance of the facility, the pH shall be closely monitored and actions taken, if necessary, within the lagoons to maintain the precipitous state.

Ammonia was detected in the raw water sample and therefore may be present in any discharges from Outfalls 001 or 002. The acute criterion for ammonia nitrogen is dependent on pH, but not on temperature. The chronic criterion is dependent on both pH and temperature. Since the facility is not yet operational, there are no data on the temperature, pH and ammonia nitrogen concentrations for the discharges from Outfalls 001 and 002. Hence, it is not reasonable to determine possible effluent limitations on ammonia nitrogen at this time.

Again, since the facility is not operational at the time of this permit preparation, there is no effluent data from either Outfall 001 or 002 to determine reasonable potential of any pollutant concentration, except TRC, to exceed the aquatic life criterion. Monitoring of specific pollutants detected in the raw water sample or added in the treatment process, will be included in this permit to provide data to evaluate this reasonable potential and subsequently determine if limits are required at a future time.

Effluent Limitations

Outfall 001

The discharge from Outfall 001 will occur when there is an exceedance of the storage pond's capacity as a result of an emergency overflow from the clear well and/or backwash recycle basins into the storage pond. Overflow from the clear well is expected to occur mainly during the initial startup of the WTP and be very infrequent after stable operating conditions of the WTP are achieved. No additional treatment has been provided for the water being discharged from Outfall 001.

The pollutant of potential concern for aquatic life includes Total Residual Chlorine (TRC) and for human health (municipal or domestic uses) includes arsenic. The permit application gave the expected concentration of arsenic at 10-15 µg/L (max. daily) and 2 µg/L (avg. daily). This expected concentration

range for arsenic is well within the aquatic criteria and within the 30 day average human health criteria (Table 1), but only a concern due to its bioaccumulation.

The permit will require that the following conditions be met for Outfall 001:

There shall be no discharge from Outfall 001 except as the result of the emergency overflow of the clear well and/or backwash recycle basins, and storage pond. Any discharge from Outfall 001 shall be terminated as soon as reasonable and practicable after the permittee becomes aware of the discharge.

There shall be no discharge containing wastewater from the cleaning of the clear well.

Effluent Characteristic	Effluent Limitation		Basis <u>b/</u>
	30-Day Average <u>a/</u>	Daily Maximum <u>a/</u>	
Total Residual Chlorine, mg/L	N/A	0.019	WQS
Total Recoverable Arsenic, µg/L	10	N/A	WQS
The pH of the discharge shall not be less than 6.5 or greater than 9.0 at any time.			WQS

a/ See Definitions, Part 1.1, for definitions.

b/ BPJ = Technology based limit based on best professional judgement; WQS = Limitation based on protecting water quality.

With the exception of the limitation on TRC, this writer anticipates that there will be no problem in meeting the above numerical effluent limitations. It is up to the permittee to determine how best to meet the effluent limitation on TRC. It is very unlikely that there will be measurable amounts of oil and grease in the clear well and therefore, no effluent limitation on oil and grease will be included in the permit. There will be no effluent limitation on ammonia unless future monitoring for ammonia, temperature, and pH show that there is a need for a limitation. There will not be an effluent limitation on total suspended solids (TSS) because the concentration of TSS in the water in the clear well should be very low and the permit prohibits the discharge of wastewater from the cleaning of the clear well. Monitoring for TSS will, however, be included in the permit.

Outfall 002

The discharge from Outfall 002 is the emergency overflow from the sludge lagoons in exceedance of the lagoons’ storage capacities. Overflow from the lagoons is expected to be very infrequent. No additional treatment has been provided for the water being discharged from Outfall 002.

The permit will require that the following conditions be met for Outfall 002:

There shall be no discharge from Outfall 002 except as the result of the overflow of the sludge lagoons. Any discharge from Outfall 002 shall be terminated as soon as reasonable and practicable after the permittee becomes aware of the discharge.

The technology based effluent limitations of likely concern for the discharges from Outfall 002 are Total Suspended Solids (TSS), pH and possibly oil and grease. The TSS could come from the sediment discharged into the settling pond system. A commonly used effluent limitation in permits for TSS for discharges from WTPs in Region 8 is 30 mg/L as a 30-day average and 60 mg/L as a daily maximum. This limitation is based on best professional judgement (BPJ) since there presently are no effluent limitation guidelines for discharges from WTPs.

Due to the extended detention period within the sludge lagoons, TRC should dissipate and not be a discharge concern, therefore, a limit for TRC will not be included in the permit for Outfall 002. Monitoring only for TRC will be included.

The water quality criterion for pH for most aquatic life is 6.5 - 9.0. This limitation will be used in the permit.

Although unlikely, oil and grease possibly could be present in the sludge lagoon system due to oil leakage from pumps, etc. possible spillage within the WTP and/or activities around the lagoon system.

Because of the detention time in the lagoon system, it is anticipated that all the effluent limitations for Outfall 002 can be met effectively immediately. The effluent limitations are shown in the table below.

Effluent limitations for Outfall 002

Effluent Characteristic	Effluent Limitation		Basis <u>b/</u>
	30-Day Average <u>a/</u>	Daily Maximum <u>a/</u>	
Total Suspended Solids (TSS), mg/L	30	60	BPJ
Total Recoverable Arsenic, µg/L	10	N/A	WQS
The concentration of oil and grease in any single sample shall not exceed 10 mg/L nor shall there be any visible sheen in the receiving water or adjoining shoreline.			BPJ & WQS
The pH of the discharge shall not be less than 6.5 or greater than 9.0 at any time.			WQS

a/ See Definitions, Part 1.1, for definitions.

b/ BPJ = Technology based limit based on best professional judgement; WQS = Limitation based on protecting water quality

Self-Monitoring Requirements

Sampling and test procedures for pollutants listed in this part shall be in accordance with guidelines promulgated by the Administrator in 40 CFR Part 136, as required in 40 CFR § 122.41(j). At a minimum, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

Effluent Characteristic	Frequency <u>b/</u>	Sample/Monitoring Type <u>a/</u>
Total Flow, gpd <u>c/</u>	Weekly During Each Discharge	Instantaneous
Total Suspended Solids, mg/L	Weekly During Each Discharge	Grab
pH, std units	Weekly During Each Discharge	Instantaneous or Grab
Temperature, °C	Weekly During Each Discharge	Instantaneous
Oil and grease, <u>d/</u>	Weekly During Each Discharge	Visual/Grab <u>d/</u>
Total Residual Chlorine, mg/L <u>e/</u>	Weekly During Each Discharge	Grab
Total Recoverable Arsenic, µg/L	Weekly During Each Discharge	Grab
Total Recoverable Iron, µg/L	Weekly During Each Discharge	Grab
Total Recoverable Manganese, µg/L	Weekly During Each Discharge	Grab
Fluoride, mg/L	Weekly During Each Discharge	Grab
Ammonia, (as N), mg/L <u>f/</u>	Weekly During Each Discharge	Grab

a/ See Definitions, Part 1.1, for definition of terms.

b/ The permit requires that because the discharge is intermittent, the first sample shall be collected as soon after the discharge begins as is reasonable and practicable, but within the first day after the discharge begins.

c/ The total volume of wastewater discharged during a reporting period resulting from an overflow of the sludge lagoon(s) or clearwater storage pond shall be estimated. For flow, the permit requires reporting the total number of discharges that occurred, the approximate accumulative duration of all discharges, in hours, and the estimated total volume of water discharged, in gallons. The intent is to obtain an idea of the total amount of time a discharge was occurring and an estimate of the total volume of water discharged.

d/ Any discharge shall be visually observed for the presence of a visible sheen and/or floating oil. If a visible sheen is detected, a grab sample shall be taken immediately and analyzed in accordance with the requirements of 40 CFR Part 136. The concentration of oil and grease shall not exceed 10 mg/L in any sample.

e/ The analysis for total residual chlorine shall be done with an approved procedure that has a method detection level of no greater than 0.10 mg/L (100 ug/L). **The analysis for total residual chlorine shall be done within 15 minutes after the sample is collected.** In the calculation of average TRC concentrations, those analytical results that are less than 0.10 mg/L shall be considered to be zero for calculation purposes. If all individual analytical results that would be used in the calculations are less than 0.10 mg/L, then “less than 0.10 mg/L” shall be reported on the discharge monitoring report form. Otherwise, report the maximum value and the calculated average value.

f/ When collecting samples for a given outfall, the samples or measurements for total ammonia, temperature, and pH shall be collected at essentially the same time. The time of day of each sampling shall also be recorded and reported.

Special Monitoring Requirements

In order to obtain the data to determine if the discharges of ammonia from Outfalls 001 and 002 are a potential water quality concern, the permit requires monitoring of both outfalls for ammonia, pH, and temperature at the time of each infrequent discharge. The pH and temperature data are necessary because the acute toxicity criterion for ammonia is pH dependent and chronic toxicity criterion is pH and temperature dependent. It is anticipated that ammonia toxicity will not be a problem, but data are needed to determine if it is or is not a concern.

Reporting Requirements

Effluent monitoring results obtained during the previous three (3) months shall be summarized and reported on **one** Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28 day of the month following the reporting period. If no discharge occurs during the reporting period, “no discharge” shall be reported.

Inspection Requirements

Part 1.3.3 of the permit has inspection requirements for the sludge lagoon system and the clearwater overflow storage pond. The basic intent of the inspection requirements is to ensure that the permittee is maintaining the integrity and operating capabilities of the storage systems. If problems are observed, the permittee is expected to take the appropriate corrective measures. A log is to be maintained of inspections, observations, and corrective actions taken and must be available to inspectors upon request.

Endangered Species Act (ESA) Requirements

Section 7(a) of the Endangered Species Act requires federal agencies to insure that any actions authorized, funded, or carried out by an Agency are not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or adversely modify or destroy critical habitat of such species. Federally listed threatened, endangered and candidate species found in Benson County, North Dakota include:

<u>Group</u>	<u>Species</u>	<u>Status</u>
Bird	Whooping Crane (<i>Grus americana</i>)	E
Bird	Piping Plover (<i>Charadrius melodus</i>)	T
Bird	Sprague’s Pipit (<i>Anthus spragueii</i>)	C

E = Endangered, T = Threatened, C = Candidate, CH = Critical Habitat

The EPA finds that this permit is Not Likely to Adversely Affect any of the species listed by the US Fish and Wildlife Service under the Endangered Species Act. This facility discharges overland and into unnamed intermittent stream/wetlands approximately 8.3 miles to Devils Lake, which is tributary to the Sheyenne River. The permit limitations are protective of water quality and flows are expected to not be excessive.

National Historic Preservation Act (NHPA) Requirements

Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f) requires that federal agencies consider the effects of federal undertakings on historic properties. The EPA has evaluated its planned issuance of the NPDES permit for the Spirit Lake Rural Water System Wastewater Treatment Plant to assess this action's potential effects on any listed or eligible historic properties or cultural resources. The EPA does not anticipate any impacts on listed/eligible historic properties or cultural resources.

Miscellaneous

The permit will be issued for a period of approximately 5 years, but not to exceed 5 years, with the permit effective date and expiration date determined at the time of permit issuance.

Permit drafted by Craig Jorgenson, SEE, 8P-W-WW, EPA Region 8.

Permit reviewed by Robert Shankland, SEE, 8P-W-WW, EPA Region 8.

Permit reviewed by Bruce Kent, 8P-W-WW, EPA Region 8.

ATTACHEMENT A
 Spirit Lake Water Treatment Facility Site Plan

