

NPDES WASTE WATER DISCHARGE PERMIT EVALUATION

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PERMITTEE: Biggs Service District
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PROPOSED ACTION: Renewal of a National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit.

SOURCE CATEGORY: Minor Domestic

TREATMENT SYSTEM CLASS: Level II

COLLECTION SYSTEM CLASS: Level I

PERMIT APPLICATION DATE: August 3, 2007

PERMIT APPLICATION NUMBER: 973783

BACKGROUND

Introduction:

Biggs, Oregon is a small commercially-oriented community in Sherman County at the junction of US Interstate 84, US Highway 30, US Highway 97, and the Columbia River. Commercial businesses, including motels, restaurants, service stations, and mini-markets serve highway travelers and approximately 30 permanent residents.

In 1991, the Biggs Service District (District) was created to provide a legal entity to authorize the construction and operation of a new wastewater system for the unincorporated community. The District submitted a wastewater facility plan to the Department in August 1994. After consideration of several wastewater system options, the District proposed the construction of an activated sludge secondary treatment facility and gravity collection system.

The Biggs Service District treatment system utilizes extended aeration treatment technology with ultra-violet (UV) disinfection and has a build-out design average, dry weather flow (DADWF) of 0.079 million gallons per day (MGD). The District discharges its treated and disinfected wastewater through an off-shore outfall to the Columbia River at river mile 205.5027. The wastewater treatment facility was originally placed into operation in 1998.

Wastewater is treated and discharged to the Columbia River at river mile 205.5 in accordance with National Pollutant Discharge Elimination System (NPDES) Permit number 101347. The Permit for the facility was issued on February 20, 2003 and will expire on January 31, 2008. On August 3, 2007, the District submitted a renewal application to the Department for a National Pollutant Discharge Elimination System (NPDES) waste discharge permit. A renewal of this permit is necessary to allow continued discharge to state waters pursuant to provisions of Oregon Revised Statutes (ORS) 468B.050 and the Federal Clean Water Act. The Department proposes to renew the permit.

Facility Description:

The extended aeration treatment plant (provided by AeroMod, Inc.) is a dual-train process scheme with one selector tank, two surge control basins, two aeration basins, two clarifiers, and one aerobic digester. The plant is designed for a 20-year flow projection of 0.079 MGD.

Wastewater flows through a Parshall flume with an ultrasonic flow meter. A sample port is provided in the channel before influent is diverted to the extended aeration treatment plant. A refrigerated sampler is used for obtaining time- or flow-weighted composite samples. From the headworks, influent is diverted to the selector tank. The selector tank is aerated for mixing; it also receives return activated sludge (RAS) from the clarifiers and mixed liquor from the surge basins. Mixed liquor from the selector tank then flows to the aeration basins, equipped with coarse bubble diffusers. Retention time in the aeration basins is approximately 24 hours. Flows into the clarifiers from the aeration basins are regulated by surge control devices at the outlets. If a surge occurs in the system, mixed liquor from the aeration basins overflows weirs into surge tanks. Mixed liquor in the surge tanks is then pumped back into the selector tank, allowing for a reduction of the peak in the influent hydrograph. RAS from the clarifiers is diverted by air lifts to the selector tank. The clarifiers are also equipped with floating skimmers that work off a vacuum.

Mixed liquor from the aeration basins is pumped by air lifts to the aerobic digester. The air lifts are set on timed cycles so that a decant process occurs. Supernatant from the digesters flow back to the aeration basins by weirs. Solids from the digesters are then pumped to a Draimad™, bagging dewatering system. Sludge is dewatered to 12% solids by this equipment which utilizes a polymer, and then further dewatered to greater than 50% solids in slotted bags stored outside.

Disinfection of the treated effluent is through the use of ultra-violet (UV) disinfection equipment. Disinfected effluent is diverted to a Parshall flume with an ultrasonic flow meter prior to entering one of two tanks with dosing siphons. Effluent is then discharged through an outfall line to the Columbia River at river mile 205.5. The submerged outfall is 6-inches in diameter with a single 3-inch diffuser oriented perpendicular to river flow.

Biosolids Management and Utilization:

The management of biosolids generated by the District's facility is regulated by Oregon Administrative Rules (OAR), Chapter 340, Division 50. The permittee plans to meet these rules by achieving pathogen reduction of fecal coliform density to less than two million MPN per gram, and vector attraction reduction through 38% volatile solids reduction for land application.

The District originally planned to collect sludge in Draimad™ bags and store it for six months or longer on wooden pallets located on a concrete pad to obtain 50 to 75% solids content before land application. Solids disposal was to occur by trucking bags to Department-approved designated agricultural sites for beneficial use. However, the District currently creates a very small amount of biosolids; to date land application has proved unnecessary. Currently, the District's biosolids are sent to the local landfill for disposal. Prior to disposal, the biosolids are mixed with a polymer and dried in drying beds during the summer, and dried in Draimad™ bags during the winter. The current permit allows the District the option of land applying the solids at a later date.

A requirement has been added to Schedule B to report the amount of biosolids taken to the landfill each month. Biosolids monitoring and management requirements have been added to Schedule B, in the event that land application becomes necessary.

Pretreatment:

The permittee does not have a formal pretreatment program, nor is one required for this source. However, the District has developed a user ordinance to reduce and/or prevent grease from entering the system.

Pollutants Discharged:

The current permit allows the Biggs Service District to discharge treated effluent from the wastewater treatment plant year around. The current permit sets limits on the following pollutants: BOD₅, TSS, *E. coli* bacteria, and Temperature. The discharge is also regulated for pH and pollutant removal efficiency.

Outfalls:

Treated wastewater is discharged to the Columbia River (outfall 001) at mile 205.5. The submerged outfall is 6-inches in diameter and extends into the river about 45 feet. The pipe ends with a single 3-inch diffuser oriented perpendicular to river flow.

Receiving Streams/impact:

OAR 340-041-0101, Table 101A lists the beneficial uses for which water quality would be protected. Included in Table 101A are: public domestic water supply; private domestic water supply; industrial water supply; irrigation; livestock watering; salmon and steelhead migration corridors (OAR 340-041 Figure 160A); wildlife & hunting; fishing; boating; water contact recreation; aesthetic quality; hydro power; and commercial navigation & transportation. Applicable water quality standards for protection of these uses in the Columbia River are found in OAR 340-041-0101 through 0104.

Stormwater:

Stormwater is not addressed in this permit. General NPDES permits for stormwater are not required for facilities with a design flow of less than 1 MGD.

Permit History:

This facility was last inspected January 11, 2007, and was operating in compliance with the permit. The monitoring reports for this facility were reviewed for the period since the current permit was issued, including any actions taken relating to effluent violations. The permit compliance conditions were reviewed and all inspection reports for the same period were reviewed as well.

On September 25, 2006, the permittee was notified that it had been sampling for fecal coliform bacteria instead of *E. coli* as required by the permit. The permittee immediately began sampling for *E. coli*.

On March 2, 2006, the permittee received a Warning Letter for exceedance of pH limits on January 22, 2006. The permit requires the discharge to be within the range of 6.0 and 9.0. The pH of the effluent sample collected on January 22, 2006 was 5.89.

Permit Discussion:

Face Page:

The permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system. In accordance with OAR 340-049 all permitted wastewater collection and treatment facilities are to receive a classification based on the size and complexity of the system. The Department has evaluated the Service District's system based upon rule criteria and classifies the system as a Treatment System Class II and Collection System Class I.

Schedule A – Waste Discharge Limitations:

State regulations governing the implementation of minimum design criteria for waste treatment and control facilities are found in OAR 340-041-0057. Minimum treatment design criteria for the main stem Columbia River are described in OAR 340-041-0104.

BOD₅ and TSS Concentration and Mass Discharge Limitations:

BOD and TSS limits in the proposed permit remain unchanged. Based on OAR 340-041-0104, the minimum treatment resulting in a monthly average effluent concentration of 20 mg/l for both BOD₅ and TSS or equivalent control is required from May 1 through October 31 (summer) along the Columbia River. From November 1 to April 30 (winter), a minimum of 30 mg/l for both BOD₅ and TSS or equivalent control is required along the main stem Columbia River. The District's treatment process is required to meet the mainstem Columbia River effluent concentration limits.

In accordance with OAR 340-041-00061(10)(a)(A) and (B), mass load limits are calculated based on the treatment facility capabilities and the highest and best practicable treatment to minimize the discharge of pollutants. Summer and winter monthly average mass load limits for both BOD₅ and TSS are based upon achievable year-round monthly average effluent concentrations of 20 mg/l and a daily average dry weather flow (DADWF) of 0.079 MGD. Weekly average and daily maximum load limits are calculated using standard multipliers (1.5 and 2.0, respectively) of the calculated monthly average mass load limits. The charts below indicate the seasonal effluent limitations along with mass load calculations.

Summer BOD₅ and TSS Effluent Limitations

Parameter	Monthly Average		Weekly Average		Daily Maximum	
	mg/l	lb/day	mg/l	lb/day	mg/l	lb/day
BOD ₅	20	13	30	20	--	26
TSS	20	13	30	20	--	26

Winter BOD₅ and TSS Effluent Limitations

Parameter	Monthly Average		Weekly Average		Daily Maximum	
	mg/l	lb/day	mg/l	lb/day	mg/l	lb/day
BOD ₅	30	13	45	20	--	26
TSS	30	13	45	20	--	26

Summer and Winter Load (lb/day) Calculations:

- (a) 20 mg/l achievable monthly average x 8.34 lb/gal x 0.079 MGD = 13 lb/day monthly average.
- (b) 13 lb/day monthly average x 1.5 = 20 lb/day weekly average.
- (c) 13 lb/day monthly average x 2.0 = 26 lb/day daily average.

Bacteria:

The proposed permit limits are based on the *E. coli* standard contained in OAR 340-041-0009(5). The proposed limits are a monthly geometric mean of 126 *E. coli* per 100 mL, with no single sample exceeding 406 *E. coli* per 100 mL. If a single sample exceeds 406 *E. coli* per 100 mL, then the permittee may take five consecutive re-samples. If the log mean of the five re-samples is less than or equal to 126, a violation is not triggered. The re-sampling must be taken at four hour intervals beginning within 28 hours after the original sample was taken.

The proposed limits are taken directly from the Oregon bacteria rule which is found in OAR 340-041-0009. This rule establishes numeric in-stream water quality standards (OAR 340-041-0009(1)), establishes a prohibition against discharging raw sewage, establishes effluent limitations and the methodology for establishing a violation (OAR 340-041-0009(5)). Regarding the general condition 6 found in Section B of Schedule F in this permit which prohibits overflows from wastewater conveyance systems, the Environmental Quality Commission (EQC) recognizes that it is impossible to design and construct a conveyance system that will prevent overflows under all storm conditions. The applicant is not seeking permit coverage for overflows and the permit does not authorize such discharges. The State of Oregon has determined that all wastewater conveyance systems should be designed to transport storm events up to a specific size to the treatment facility. Therefore, in exercising its enforcement discretion regarding Sanitary Sewer Overflows, the Department will consider the following:

- (1) Whether the permittee has conveyance and treatment facilities adequate to prevent overflows except during a storm event greater than the one-in-five-year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten-year, 24-hour duration storm from May 22 through October 31. In addition, DEQ will also consider using enforcement discretion for overflows that occur during a storm event less than the one-in-five-year, 24-hour duration storm from November 1 through May 21 if the permittee had separate sanitary and storm sewers on January 10, 1996, had experienced sanitary sewer overflows due to inflow and infiltration problems, and has submitted an acceptable plan to the Department to address these sanitary sewer overflows by January 1, 2010;
- (2) Whether the permittee has provided the highest and best practicable treatment and/or control of wastes, activities, and flows and has properly operated the conveyance and treatment facilities;
- (3) Whether the permittee has minimized the potential environmental and public health impacts from the overflow; and
- (4) Whether the permittee has properly maintained the capacity of the conveyance system.

DEQ will review the permittee's determination of the one-in-five-year, 24-hour duration winter storm and the one-in-ten year, 24-hour duration summer storm as described above in the permit holder's facilities plan. In the event that a permit holder reports an overflow event associated with a storm event and DEQ does not have information from the permit holder sufficient to determine whether or not the storm event exceeds storm events as specified in OAR 340-041-0009(6) & (7), DEQ will perform the determination using the information contained in Figure 26 of the 1973 NOAA Atlas 2 entitled "Precipitation-Frequency Atlas of the Western United States, Volume X – Oregon". This figure is entitled "Isopluvials of 5-yr 24-hr precipitation in tenths of an inch". The Atlas can be obtained on line at http://hdsc.nws.noaa.gov/hdsc/pfds/other/or_pfds.html, however the file is very large. A scanned version of Figure 26 is available at: <http://www.wrcc.dri.edu/pcpnfreq/or5y24.gif>. DEQ will compare the information in this figure with rainfall data available from the National Weather Service, or other source as necessary.

pH:

Limits for pH are unchanged in the proposed permit. In accordance with the Code of Federal Regulations (CFR) minimum secondary treatment standards (40 CFR, Part 133), the effluent values for pH shall be maintained within the limits of 6.0 to 9.0. State water quality standards allow an instream pH range for the main stem Columbia River of 7.0 to 8.5. Within the permittee's mixing zone, the water quality standard for pH does not have to be met. The Department evaluated pH using a spreadsheet that derives the pH at the mixing zone boundary (**See pH Worksheet**). Mixing with ambient water within the mixing zone will ensure that the pH at the edge of the mixing zone meets the ambient criteria. Therefore, the Department considers the proposed permit limits to be protective of the water quality standard.

BOD₅ and TSS Percent Removal Efficiency:

A minimum level of percent removal for BOD₅ and TSS for municipal dischargers is required by the Federal secondary treatment standards (40 CFR, Part 133). An 85 percent removal efficiency limit is included in the proposed permit to comply with federal requirements. An examination of the DMR data indicates the permittee will have little difficulty meeting the limit with their current facilities.

Chlorine Residual:

The treatment facility uses ultra-violet light to disinfect the treated wastewater. No chlorine or chlorine compounds may be used for disinfection purposes and no chlorine residual will be allowed in the effluent due to chlorine used for maintenance purposes.

Temperature, Mixing Zone and Zone of Immediate Dilution:

Mixing Zone

A thorough mixing zone analysis was conducted using CORMIX when the permit was first issued. The 2003 permit documents a mixing zone that extends 50 feet downstream from the diffuser for all effluent limitations except temperature. For temperature, the allowable mixing zone is that portion of the Columbia River 80 feet downstream from the diffuser. The dilution factor is 120 at a point 80 feet from the diffuser. The Zone of Immediate Dilution (ZID) for temperature only is defined as that portion of the allowable mixing zone that is within 6 inches of the point of discharge.

Temperature

Since the last permit was issued, the Department has adopted a new temperature standard. For the Columbia River, however, the temperature criterion remains at 68°F (20°C). This segment of the Columbia River serves as a migration corridor for anadromous fish, but does not support spawning or rearing (OAR 340-041, Tables 160A and 160B, respectively). In addition, for streams that are listed on Oregon's 303(d) list, prior to the completion of a temperature TMDL or other cumulative effects analysis, the rule states that no single NPDES point source that discharges into a waterbody that is water quality limited for temperature may cause the temperature of that water-body to increase more than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after mixing with either twenty five (25) percent of the stream flow, or the temperature mixing zone, whichever is more restrictive (340-041-0028(12)(b)). The USEPA is developing a TMDL for temperature in the Columbia River, but this work is not expected to be finished in the near future. The District's design effluent flow is 0.079 MGD or 0.122 CFS; the Columbia River 7Q10 flow is 80,637 CFS. The ratio of the District's effluent to 25% of the river flow is: 164,927 to 1. Dilution at the edge of the mixing zone is 120 to 1. Clearly, dilution at the mixing zone will be the more restrictive.

In addition to this rule, however, there are two additional requirements in the new temperature rules that apply to this source: cold water protection (OAR 340-041-0028(11)) and thermal mixing zones (340-041-0053).

The Department uses the following equations to determine compliance with the biologically based criteria and cold water protection temperature standards (Refer to the attached Excel worksheet):

Equation used to calculate the change in temperature (ΔT_{mz}) at edge of the Mixing Zone:

$$\Delta T_{mz} = \frac{T_e + (S - 1)T_a}{S} - T_a$$

Where:

ΔT_{mz} = The Change in Temperature at the edge of the mixing zone

S = Dilution

T_e = Effluent temperature (°C)

T_a = Ambient stream temperature criterion (°C)

The discharge from the wastewater treatment facility does not cause the temperature of the Columbia River to be increased greater than 0.3°C above the applicable criteria at the edge of the mixing zone, at 25% of the stream flow, or at 100% of the stream flow. Based on the above analysis, there appears to be no reasonable potential that this facility will cause or contribute to the temperature in the Columbia River.

Although these results show compliance with the biological criteria and cold water sections of the temperature standard, the thermal plume requirements also apply to the discharge.

Thermal Plume Criteria

Recent revisions to the Department's water quality standards include temperature thermal plume limitations in OAR 340-041-0053(2)(d). This section of the rules contains criteria to prevent potential adverse impacts that may result from thermal plumes. Note that the temperature thermal plume limitations that the Department has adopted are similar to the recommendations in the April 2003 EPA Region X Temperature guidance.

The criteria as they apply to Biggs STP are discussed below:

- *OAR 340-041-0053(d)(A)*: Impairment of an active salmonid spawning area where spawning redds are located or likely to be located.
Biggs discharge: There is no salmonid spawning in this segment of the Columbia River. This segment of the Columbia River serves as a migration corridor for salmonids (OAR 340-041 Table 160A).
- *OAR 340-041-0053(d)(B)*: Acute impairment or instantaneous lethality is prevented or minimized by limiting potential fish exposure to temperatures of 32°C or more to less than 2 seconds.
Biggs discharge: Based on temperature data submitted on the DMR's, the maximum effluent temperature at outfall 001 is 26°C. Thus, the discharge is not expected to cause an acute impairment or instantaneous lethality.
- *OAR 340-041-0053(d)(C)*: Thermal shock caused by a sudden increase in water temperature is prevented or minimized by limiting potential fish exposure to temperatures of 25°C or more to less than 5% of the cross-section of 100% of the 7Q10 flow of the waterbody.
Biggs discharge: The mixing zone is less than 5% of the cross section of 100% of the 7Q10 flow for the waterbody.
- *OAR 340-041-0053(d)(D)*: Unless ambient temperature is 21°C or greater, migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21°C or more to less than 25% of the cross-section of 100% of the 7Q10 flow of the waterbody.
Biggs discharge: The mixing zone is less than 25% of the cross section of 100% of the 7Q10 flow for the waterbody, thus the discharge will not be a cause for migration blockage.

Thus, the analysis indicates that the discharge from Biggs STP meets the temperature thermal plume limitations in OAR 340-041-0053(2)(d).

Based on comments received during the public comment period, the Department proposes to maintain the existing temperature limit in the permit. Discharge may not exceed 79°F.

Turbidity

The previous NPDES permit did not require monitoring for turbidity. Therefore, the Department does not have sufficient data to run an RPA or set possible permit limits. Turbidity monitoring has been included in the proposed permit. Turbidity monitoring must be conducted in both the effluent and in the Columbia River upstream of the outfall and recorded on the monthly Discharge Monitoring Reports (DMR). This data will be used to run an RPA during the next permit cycle.

Groundwater:

The proposed renewal permit requires all wastewater and process related residuals to be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040). No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater.

Schedule B - Minimum Monitoring and Reporting Requirements:

In 1988, the Department developed a monitoring matrix for commonly monitored parameters. Proposed monitoring frequencies for all parameters are based on this matrix and, in some cases, may have changed from the current permit. The proposed monitoring frequencies for all parameters correspond to those of facilities of similar size and complexity in the state.

In conformance with the monitoring matrix, twice monthly monitoring for ammonia-nitrogen has been added to the permit. Monthly monitoring for turbidity has also been added to the permit.

The proposed permit includes effluent monitoring for temperature from May 1 through October 31. If continuous monitors are installed for the effluent monitoring, then the devices must be audited (field checked for accuracy of temperature readings) in June and September, and visually checked each month to ensure that the devices are still in place, and are still submerged. An annual report summarizing the weekly averages of the maximum daily temperature readings is required.

Discharge monitoring reports must be submitted to the Department monthly by the 15th day of the following month. The monitoring reports need to identify the principal operators designated by the District to supervise the treatment and collection systems. The reports must also include records concerning application of biosolids and all applicable equipment breakdowns.

Schedule B of the permit includes the requirement for the submittal of annual reports. The conditions are standard language requirements concerning; Annual report on temperature data, and Annual report on transporting biosolids.

Schedule C - Compliance Conditions and Schedules:

The renewed permit does not contain any compliance conditions or schedules to be met.

Schedule D - Special Conditions:

The permittee must have the facilities supervised by personnel certified by the Department in the operation of treatment and/or collection systems.

Schedule D includes a condition requiring the District to manage grease. Grease has the potential to accumulate in sewers, causing backups and overflows. Excessive grease can also adversely affect the treatment efficiency of the sewage treatment plant. The District must actively enforce their ordinance requiring restaurants and other establishments to reduce grease from entering the system.

Schedule F - General Conditions:

The permittee must comply with all General Conditions including, but not limited to, conditions relating to operation and maintenance of pollution controls, monitoring and record keeping, and reporting requirements.

The General Conditions were revised in 2008. A summary of the changes is as follows:

- There are additional citations to the federal Clean Water Act and CFR, including references to standards for sewage sludge use or disposal.
- There is additional language regarding federal penalties.
- Bypass language has been made consistent with the Code of Federal Regulations.
- Overflow language has been modified. Formerly the language stated that overflows in response to the five or ten year event would not violate the permit. Now it states that overflows are prohibited. DEQ will continue to exercise enforcement discretion with respect to overflows consistent with the provisions of the Bacteria Rule (OAR 340-041-0009).
- Reporting requirements regarding overflows have been made more explicit.
- Requirements regarding emergency response and public notification plans have been made more explicit.
- Language pertaining to duty to provide information has been made more explicit.
- Confidentiality of information is addressed.



Calculation of pH of a mixture of two flows.

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT	RPA for pH	
	Lower pH Criteria	Upper pH Criteria
1. DILUTION FACTOR AT MZ BOUNDARY - $(Q_e+Q_r)/Q_e$	120	120
2. UPSTREAM/BACKGROUND CHARACTERISTICS		
Temperature (deg C):	21.6	21.6
pH:	7.8	8.0
Alkalinity (mg CaCO ₃ /L):	61.0	61.0
3. EFFLUENT CHARACTERISTICS		
Temperature (deg C):	23.2	23.2
pH:	6.0	9.0
Alkalinity (mg CaCO ₃ /L):	75.0	75.0
4. APPLICABLE PH CRITERIA	6.5	8.5
OUTPUT		
1. IONIZATION CONSTANTS		
Upstream/Background pKa:	6.37	6.37
Effluent pKa:	6.36	6.36
2. IONIZATION FRACTIONS		
Upstream/Background Ionization Fraction:	0.96	0.98
Effluent Ionization Fraction:	0.30	1.00
3. TOTAL INORGANIC CARBON		
Upstream/Background Total Inorganic Carbon (mg CaCO ₃ /L)	63.27	62.43
Effluent Total Inorganic Carbon (mg CaCO ₃ /L):	247.14	75.17
4. CONDITIONS AT MIXING ZONE BOUNDARY		
Temperature (deg C):	21.61	21.61
Alkalinity (mg CaCO ₃ /L):	61.12	61.12
Total Inorganic Carbon (mg CaCO ₃ /L):	64.80	62.54
pKa:	6.37	6.37
pH at Mixing Zone Boundary:	7.6	8.0
Is there Reasonable Potential?	No	No