



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10

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Seattle, Washington 98101

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Reply to  
Attn of: WD--139



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Publication # 93-10-208

MEMORANDUM

SUBJECT: Recommendation for TMDL Approvals

Wildcat Creek - mouth to headwaters - Waterbody Segment  
No. WA-22-4045.

TMDL Parameters: Ammonia-Nitrogen, Biochemical Oxygen Demand, Total Residual Chlorine, Fecal Coliform Bacteria.

FROM: Rob Pedersen, Environmental Engineer  
Environmental Characterization Program

TO: File

- TMDL submitted 9 March 1992
- TMDL package completed 1 February 1993
  - EPA Approval Checklist
  - Document 1: Transmittal letter
  - Document 2: TMDL document
  - Document 3: Musgrove, N. 1977. "Water quality Studies of Wildcat Creek near McCleary, Washington." Washington Department of Ecology, Olympia, WA.
  - Kendra, W. 1987. "Effect of McCleary Wastewater Treatment Plant Effluent on Water Quality and Macroinvertebrate Community Structure in Wildcat Creek, Washington." Washington Department of Ecology, Olympia, WA. 26pp.
  - Documents 4a, 4b, 4c: Implementation documentation, for the city of McCleary sewage treatment plant NPDES permit:

Document 4a: Public notice documentation for the city of McCleary (not in Ecology files, see Document 4c, Fact Sheet, December 1979.)

Document 4b: NPDES Permit No. WA-002404-0, city of McCleary, issued April 11, 1980, expired April 11, 1985. Reissuance not scheduled.

Document 4c: Fact Sheet for McCleary WWTP.

Transmittal letter - Complete (see Document 1)

- States that TMDLs have been established in accordance with Section 303(d)(1) of the Clean Water Act.
- Review note: meets requirements.

Problem Assessment - Complete (see Document 2, and 3)

- Wildcat Creek is a Class A stream. The creek drains about 21 square miles. The watershed is largely undeveloped; land use is primarily logging and associated mill activity, and limited pasturing. This 9.2 mile long stream is actually the east fork but is referred to as just "Wildcat Creek" for simplicity. The creek is 25 miles from Grays Harbor estuary by way of Cloquallum Creek and the Chehalis River. Average maximum discharge is 336 cfs and the 7Q10 is 1 cfs. Upstream of McCleary is a dam to store water for fire fighting.
- The primary pollutant source is effluent from the city of McCleary's (population about 1300) wastewater treatment plant (WWTP), and unpermitted cooling water discharge to storm drains at Simpson Timber Company (STC). STC storm sewers enter Sam's Canal. The city's discharge has been moved from Sam's Canal to Wildcat Creek immediately below the canal's mouth at RM 4.75.
- Prior to WWTP upgrade, receiving water studies (Document 3) during low flow conditions in 1977 showed substantial water quality degradation in Wildcat Creek. The receiving environment was found to be periodically toxic to salmonids and mussels, and significant changes in the macroinvertebrate community were observed below the discharge. Class A standards violations were documented for dissolved oxygen (DO), unionized ammonia-nitrogen, total residual chlorine (TRC), fecal coliform bacteria (FC), temperature and aesthetics (sewer odors and slime growth observed to RM 4:1). Concern over water quality degradation and possible

effects on salmon and steelhead runs led to WWTP upgrade in the winter of 1980-81. The upgrade included advanced secondary through installation of a biological tower (for nitrification), additional clarification, and dechlorination.

- Despite a 50 percent decrease in receiving water flow, a post-upgrade water quality survey (August 26-27, 1986; see Document 3) found none of the previous pollution problems except for elevated temperature.
- Review notes: Problem assessment accurately gives background information for both pre- and post- WWTP upgrade periods. For pre-upgrade conditions: identified exceedences of water quality standards for ammonia and TRC toxicity, and for FC counts; also highlighted are DO problems due to BOD<sub>5</sub> loading.

TMDL document -- Complete (see Document 2; and Kendra, 1987 under Document 3).

- After the 1986 WWTP inspection and receiving water survey (Document 3), worst case water quality modeling predicted general compliance with water quality standards. Modeling assumed WWTP design flow discharge of 0.4 cfs, and a dilution ratio of 2.5:1 with a 7Q10 of 1 cfs.

Mass balance calculations were performed for temperature, ammonia and FC. The only predicted violation was temperature. The TMDL for ammonia was developed from various estimating procedures for an ammonia criterion (see page 5, Additional Information). The permit limit of 2 mg/l total ammonia was assumed for instream estimating procedures.

- To maintain water quality standards under the above conditions, the following instream loading capacities (LC), nonpoint load allocations (LA) and point source waste load allocations (WLA) were developed:

	<u>LC</u>	<u>LA</u>	<u>WLA</u>
TRC	0.083	0	0.0043
NH <sub>3</sub> -N	9.07	4.75*	4.32
BOD <sub>5</sub>	ND	ND	31
FC	39,649	16,993*	22,656

FC in colony forming units/sec all other units in lbs/day . ND = not determined; \* LA: not provided by Ecology back calculated; ammonia for 21 degrees C pH 7.4

- Review note: Clearly identifies the wasteload

allocations for the TMDLs for ammonia-N, residual chlorine, FC and BOD<sub>5</sub>. References the supporting ambient monitoring data. Effluent monitoring for all of the parameters in question is required; instream monitoring for DO is also required. Approximately, 9 lbs/day of ammonia was removed from Wildcat Creek due to the WWTP upgrade.

Supporting Studies - Complete (see Document 3)

- The 1977 intensive surveys revealed the water quality problems discussed previously. The dilution ratio was 6:1. A variety of fish populations were observed. Fish bioassays utilizing creek water from below Sam's Canal showed 100 percent mortality within 24 hours due to chlorine toxicity. Without effluent chlorination, FC counts were in the 10s of thousands. Fish avoided the creek area near the mouth of the canal; salmonid numbers recovered somewhat downstream. Benthic macroinvertebrates also showed an impact from Sam's Canal carrying the WWTP discharge. Although nutrient levels were (and still are) high, analysis of Selenastrum bioassay data indicated other factors were limiting algal growth. (Musgrove, 1977.)

- The post-upgrade survey in 1986 found none of the previous water quality problems except temperature, probably due to illegal discharge by STC to Sam's Canal. Dilution was 4:1. The WWTP diffuser provided good initial dilution. Benthic invertebrate community structure was improved and showed no impact from the WWTP. Fishery surveys were not performed. Instream ammonia has, essentially been eliminated. Nutrient levels remained high yet excessive periphyton growth was not observed; streambank vegetation was heavy.

Water quality surveys were used in conjunction with water quality modeling to develop the TMDLs discussed above. (Kendra, 1987.)

- Review notes: Documentation gives a thorough analysis of observed and modeled instream effects due to ammonia, TRC, FC and oxygen demanding materials. The TMDLs will maintain water quality standards.

Public participation - Complete (see Documents 4a, 4b, 4c).

- Public notice for city of McCleary NPDES permit.
- Review notes: The public notice for permit issuance (December 1979) was before water pollution control

plans were publicized as TMDLs.

Enforceability - Complete (see Document 4b)

- NPDES Permit NO. WA-002404-0, city of McCleary WWTP.
- Review notes: Valid permit and supporting documentation.

TMDL effectiveness plan - Complete (see Documents 2 and 3)

- The TMDLs and permit require effluent monitoring of all parameters of concern to determine compliance. Receiving water monitoring for DO is required adjacent to the discharge point.
- Review notes: Monitoring and to assess compliance with the TMDLs. No stream survey work is scheduled. Recommend periodic monitoring during low flow, last survey was 1986.

Additional Information

- Water quality modeling, the resultant TMDLs and the permit conditions represent stringent requirements. Maintenance and enhancement of Wildcat Creek's biological integrity is assured with these TMDLs.
- TMDL for BOD: Computer simulations were used to model DO sag. Six scenarios employed various BOD loads, with and without nitrification, and different flow regimes. One scenario predicted a slight DO sag (below 8 mg/l) for about a half mile near RM 4.6. This sag was possibly attributable to the illegal warm water source from STC. EPA determined the predicted sag was not grounds for disapproving the DO TMDL given the stringent conditions utilized in these analyses.
- Ammonia-nitrogen TMDL: A mass balance approach was utilized. The 21 degree C and 7.4 pH basis were also arrived at by mass balance analysis and other estimating techniques that may be less than rigorous for predicting ammonia concentrations with precision. EPA determined the accuracy was adequate. Unionized ammonia toxicity increases as the temperature decreases from 21 to 15 degrees C. However, the unionized ammonia criteria at much lower temperatures than 21 (and pH 7.4), would not be exceeded by any expected/predicted instream ammonia concentrations in Wildcat Creek.

- Review notes: The TMDLs will protect for water quality standards in Wildcat Creek.

Recommendation, approve TMDLs.

ERP, 02/02/93

FACT SHEET - STATEMENT OF BASIS  
December 1979

1. Applicant: Town of McCleary  
P.O. Box 360  
McCleary, WA 98557  
  
Application No.: WA-002404-0  
  
Location: West End of Maple Street  
  
Receiving Water: The East Fork of Wildcat Creek  
(Designated a Class A Waterway)
  
2. Background - Present Facility: The existing secondary type sewage treatment facility consists of an influent wet well/pump station, primary clarifier, biological trickling filter, secondary clarifier and a chlorine contact chamber. The sludge is pumped to an anaerobic digester for digestion prior to disposal. This facility is hydraulically overloaded during wet weather and the discharge of effluent is to a small stream.  
  
During dry weather this facility may meet secondary effluent limits. Fecal coliform organisms in the effluent are very high at times, in order to disinfect effectively we could cause fish kills in the receiving water.
  
3. Evaluation: The McCleary facility plan has been completed; grant funds will be awarded and the upgraded sewage treatment facility should be completed by January 1981. The sewer system rehabilitation project should be completed by September 1981. We expect this facility to be meeting secondary treatment by October 30, 1981.
  
4. Design Information: From McCleary Facilities Plan and Plans and Specs submitted by Byrne, Stevens and Associates.  
  
Design Year - 2,000  
Design Population - 2,056  
Design Average Flow - 178,840 gpd Present = 139,209 gpd  
Max. Mo. Average - 237,320 gpd, 0.25 mgd
  
5. Proposed Interim Effluent Limitations: The interim effluent limitations, below, were arrived at using the available operation data submitted by the McCleary wastewater plant operator.

The present secondary treatment design flow is 0.140 mgd.

<u>Parameter</u>	<u>Monthly Average</u>	<u>Weekly Average</u>
BOD <sub>5</sub>	65 mg/l, 281 lb/day	65 mg/l, 281 lb/day
Suspended Solids	56 mg/l, 242 lb/day	56 mg/l, 242 lb/day
Fecal Coliform Bacteria*	NA	NA
pH	Shall not be outside the range of 6.0 - 9.0	
Total available (residual) chlorine	Maximum of 0.5 mg/l in the effluent	

\*The disinfection process is not presently adequate to provide good disinfection at all times.

The monthly and weekly averages for BOD and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for fecal coliform are based on the geometric mean of the samples taken.

6. Proposed Final Effluent Limitations: The limitations, below, are based on the design information submitted by the McCleary consultant. The stringent limitations are necessary to protect the water quality of Wildcat Creek and meet the states water quality standards.

Treatment design maximum monthly flow is 0.250 mgd.

BOD<sub>5</sub> Monthly Average = 15 mg/l, 31 lb/day  
 BOD<sub>5</sub> Weekly Average = 23 mg/l, 47 lb/day  
 Suspended Solids Monthly Average = 15 mg/l, 31 lb/day  
 Suspended Solids Weekly Average = 23 mg/l, 47 lb/day

[BOD<sub>5</sub> and SS lb/day, on the previous page, was computed as follows:  
 lb/day = Flow (0.25 mgd) x Concentration (15 mg/l) x 8.34 (a constant).]

The weekly average concentration and lb/day was computed by multiplying the monthly average by 150 percent.

Fecal Coliform Bacteria Monthly Average = 200 organisms/100 ml  
 Fecal Coliform Bacteria Weekly Average = 400 organisms/100 ml

Dissolved Oxygen - Dissolved oxygen shall exceed 8.0 mg/l in the receiving water adjacent to the discharge point at all times.

Ammonia (NH<sub>3</sub>-N) - Shall not exceed 2 ppm. (2 ppm limit was established based on assumed worst condition of 20°C and pH 7.4.)

Total Available (Residual) Chlorine - Less than 0.002 - no measurable chlorine residual is allowed in the effluent.

pH - Shall not be outside the range of 6.0 - 9.0.

The monthly and weekly averages for BOD and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for fecal coliform are based on the geometric mean of the samples taken.