Addendum #1

Modification to the City of Jefferson WWTP Waste Load Allocation

for the

Willamette Basin Total Maximum Daily Load (TMDL) (September 2006)

Overview

In 2006 the Oregon Department of Environmental Quality issued the Willamette Basin Total Maximum Daily Load (TMDL). The TMDL addressed water quality impairments primarily for temperature, bacteria, and mercury. The purpose of this addendum is to modify the temperature waste load allocation (WLA) for the City of Jefferson's waste water treatment plant (WWTP) located at 701 North Second Street, Jefferson OR, 97352.

The 2006 Willamette Basin TMDL allocated a thermal load limit to the Jefferson WWTP to minimize excessive warming in the Santiam River. The Santiam River is listed as impaired for temperature on Oregon's 303(d) list from the mouth to river mile 12 during the summer rearing and spawning use periods. The City of Jefferson WWTP discharges treated waste water into the Santiam River at approximately river mile 9.3.

The modification is to correct a spreadsheet unit error that resulted in the incorrect calculation of the Jefferson WWTP WLA during the rearing and migration use period and the dry weather portion of the salmon and steelhead spawning use period. The original TMDL spreadsheet used a facility effluent design flow expressed in million gallons per day (MGD) when it should have been expressed in cubic feet per second (CFS). This addendum corrects this mistake and will replace the Jefferson WWTP WLA in the original TMDL. The error does not impact the river modeling analysis, the calculation of the Santiam River's loading capacity, or other allocations.

Summary of Waste Load Allocation Methodology

The methodology used to calculate the revised waste load allocations will be the same as in the Willamette Basin Temperature TMDL shown below and also in the original 2006 Willamette TMDL document - Appendix 4.5 page 4-132.

The portion of the human use allowance allocated to each facility is determined by Equation 5. The thermal waste load allocation is calculated using Equation 6.

A. The waste load allocation expressed as a change in temperature. This is a point source's portion of the human use allowance. ($^{\circ}$C)

$$HUA = \left(\frac{d \cdot Q_{PS}}{\left(d \cdot Q_{PS} \right) + Q_R} \right) \cdot \left(T_{PS} - T_{RC} \right) \quad \textbf{(Eq. 5)}$$

B. The waste load allocation expressed as an excess thermal load. (million kilocalories per day). This equation is used to develop permit limits and determine compliance.

$$WLA = d \cdot Q_{PS} \cdot k \cdot \left(T_{PS} - T_{RC} \right) \quad \textbf{(Eq. 6)}$$

where,

$d =$	Scaling factor between maximum observed effluent flow and the effluent flow at the river's loading capacity (see Scaling Factor Equation 7)
$T_{PS} =$	The effluent temperature ($^{\circ}$C) that is defined as the maximum observed effluent discharge. This value is a constant.
$T_{RC} =$	The fish use designation period numeric biological temperature criteria ($^{\circ}$C).
$Q_R =$	The rolling seven-day average ambient river flow (cfs).
$Q_{PS} =$	The effluent flow (cfs) that is defined as the maximum observed effluent discharge. This value is a constant.
$k =$	Million kilocalories conversion factor: (2.447 million kcals/day $^{\circ}$C) $\dfrac{1\,\text{ft}^3}{1\,\text{sec}} \cdot \dfrac{1\,\text{m}^3}{35.31\,\text{ft}^3} \cdot \dfrac{1000\,\text{kg}}{1\,\text{m}^3} \cdot \dfrac{86400\,\text{seconds}}{1\,\text{day}} \cdot \dfrac{1\,\text{kcal}}{1\,\text{kg} \cdot 1\ ^{\circ}\text{C}} \cdot \dfrac{1\,\text{Million kcals}}{1000000\,\text{kcals}} = 2.447$

The modeling analysis described in the TMDL document found the Santiam River's loading capacity was sufficient to assimilate the Jefferson WWTP current facility design thermal loading while not exceeding the allocated human use allowance or contribute to exceedances of the temperature standard downstream (see Willamette Basin TMDL Figure 4.146 on page 4-206). Based on these results the Jefferson WWTP was allocated a thermal load equivalent to their facility design flow and maximum observed effluent temperatures. The thermal limit was calculated using the fish use period minimum seven-day average river flow with a recurrence interval of ten years (7Q10) and river temperatures based on the biological temperature criteria. The 7Q10 represents the critical low flow for the river while the biological criterion represents the minimum applicable temperature standard observed throughout the use period.

Revision: Jefferson WWTP Waste Load Allocation

The 2006 Willamette TMDL waste load allocation for the City of Jefferson WWTP was calculated incorrectly due to a unit error. In the original spreadsheet, the effluent flow (Q_{ps}) was input in million gallons per day (MGD) instead of cubic feet per second (cfs). Table 1 shows the corrected Q_{ps} value as well as the other factors used in equations 5 and 6. The other factors have not been modified.

Table 1. Values used to calculate the revised Jefferson WWTP WLA. No values are modified except Q$_{ps}$.

WLA factor	Rearing and Migration use period (May 16-Oct 14)	Dry weather Salmon and Steelhead Spawning use period (Oct15 –Oct 31)	Notes
$d =$	1	1	A scaling factor of 1 is used because the river's loading capacity is not limiting the WLA and therefore a river flow based adjustment is not needed.
$T_{PS} =$	23.0 $^{\circ}$C	21.0 $^{\circ}$C	Maximum observed values based on 2000-2001 grab samples (from original TMDL analysis)
$T_{RC} =$	18.0 $^{\circ}$C	13.0 $^{\circ}$C	The fish use designation period numeric biological temperature criteria.
$Q_R =$	1010 cfs	1960 cfs	River flows are equal to the use period 7Q10.
$Q_{PS} =$	0.93 cfs	0.93 cfs	The maximum observed effluent discharge is defined as the weekly facility design flow is calculated by multiplying the the monthly facility design flow (0.62 cfs) by 1.5.
$k =$	2.447	2.447	

The revised HUA and WLA for Jefferson WWTP (**Table 2**) are calculated using values shown in **Table 1** and equations 5 and 6.

The modification results in an increase to the allowed thermal load the City of Jefferson may discharge compared to the limits in the current TMDL document. This increase will still meet water quality standards for temperature. It will still meet standards because the TMDL modeling analysis approved in 2006 used the larger (correct) value to evaluate the efficacy of thermal loading limits to meet water quality standards. That analysis determined the larger limits meet water quality standards (see Willamette Basin TMDL Figure 4.146 on page 4-206). The Jefferson WWTP WLA modification does not affect the Santiam River's loading capacity or other allocations described in the original TMDL.

Table 2. Original and revised human use allowance and waste load allocations for Jefferson WWTP to replace those in the 2006 Willamette Basin TMDL.

	Salmon and Trout Rearing and Migration Period (May 16 – Oct 14)		Dry Weather Salmon and Steelhead Spawning use Period (Oct 15 – Oct 31)	
	Original	Revised	Original	Revised
HUA ($^{\circ}$C)	0.0030	0.0046	0.0024	.0038
WLA (Million Kcals/day)	7	11	12	18

Note: there is no modification to the wet weather salmon and steelhead spawning use period HUA or WLA. The values in the original TMDL are correct.