DEQ Mixing Zone Study

Appendix F

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
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RECEIVED
JAN 13 2011
City of Dayton

January 12, 2011

Ms. Christy Ellis
City of Dayton
Post Office Box 339
Dayton, OR 97114

RE: **Mixing Zone Study**
City of Dayton
File No. 23458
Permit No. 101742
Yamhill County

Dear Ms. Ellis:

DEQ has completed the Mixing Zone study that was conducted for the City of Dayton (City) Wastewater Treatment Plant (WWTP) outfall by DEQ laboratory staff in October, 2009. DEQ used the conductivity gathered in this study to estimate the dilutions in the City's Mixing Zone and Zone of Initial Dilution. The field study report and the subsequent analysis are attached. Please keep these with the (WWTP) records.

If you have any questions or concerns, please call me at (503) 378-5319.

Sincerely,

Mark E. Hamlin

Mark E. Hamlin
Water Quality Specialist
Western Region-Salem Office

Cc: Source File, DEQ Salem Office
Steve Sagmiller, PW Director, City of Dayton, P.O. Box 339, Dayton, OR 97114

Memorandum

Date: January 12, 2011

To: Dayton Mixing Zone File

From: Mary Pfauth

Subject: Mixing Zone Study Review

Executive Summary

DEQ's laboratory (LEAD) conducted a mixing zone study for the City of Dayton on October 19, 2009. Their report is attached to this memo. The study included conductivity mapping and environmental mapping. Water Quality permit writer Mary Pfauth used conductivity mapping to determine the appropriate dilutions to apply at the edge of the mixing zone (MZ) and zone of initial dilution (ZID). The final estimated dilution for the MZ is 37 and the final dilution for the ZID is 10. Environmental mapping demonstrated that no critical habitat, active salmon redds, or other resources are in the vicinity of the City's outfall.

Conductivity Mapping

Several steps are needed to estimate the dilution at the edge of the mixing zone and ZID during critical flow conditions. The first step is to calculate dilutions during the field study. Often times, the field study conditions do not represent worst-case low flow conditions. For example, the stream flow during the study may be higher than the 7Q10 flow and/or the effluent flow may be lower than the dry weather design flow. In these cases, dilutions calculated during the field study need to be adjusted to reflect critical flow conditions. DEQ has developed a simple approach to estimate dilutions summarized in a document titled "How to Estimate Dilution from Conductivity Data." This approach is discussed below.

Field Study Dilution Calculations

The lab performed conductivity mapping as part of the mixing zone study. Conductivity mapping uses conductivity as an effluent tracer to estimate dilutions within the mixing zone and to map out the location of the plume. The lab was unable to measure stream flow because the field crew could not wade the River at the time of the study. Table 1 below shows the results of the conductivity mapping. The data indicate that the plume tends to remain near the left bank of the Yamhill River. As indicated in the LEAD report, the outfall is located on the left bank (as observed looking downstream).

Table 1: Conductivity mapping data

Dist d/s	L Bank		Mid- channel	R Bank
Outfall	220	ZID	166	166
10 ft	-		-	-
20 ft	186	MZ	166	166
60 ft	176		166	166
80ft	176		166	166
100 ft	-		-	-
120 ft	175		166	166
160 ft	176		166	166
200 ft	175		166	165

Background	166
Effluent	685

The mixing zone IMD states that the minimum dilution should be applied at the edge of the ZID and the average dilution should apply at the edge of the mixing zone. The highest conductivity value at the edge of the ZID is 220 µmhos. The average conductivity within the plume at the edge of the mixing zone was 180. Field study dilutions were calculated at the edge of the ZID and mixing zone as follows:

ZID: $D = \frac{(C_e - C_b)}{(C_p - C_b)} = \frac{685-166}{220-166} = \frac{519}{54} = 9.6;$

MZ: $D = \frac{(C_e - C_b)}{(C_p - C_b)} = \frac{685-166}{180-166} = \frac{519}{14} = \mathbf{37};$

Where:
D = Dilution
C_e = Conductivity effluent
C_b = Conductivity background
C_p = Conductivity in the plume

Dilution at Complete Mix Calculations

Data needed to estimate mixing zone and ZID dilutions during critical flow conditions are included in Table 2. The effluent and stream flow data are used to calculate the dilutions that would occur when the effluent is completely mixed with the stream. The 7Q10 was calculated as described below. Note that, because DEQ was unable to collect stream flow data on the date of the study, DEQ assumed that the flow was equal to the 7Q10 flow. There is no USGS gage located at Dayton, therefore, DEQ used flow data from the USGS gages located on the North Yamhill at Yamhill and the South Yamhill River at McMinnville. Both gages are upstream of Dayton. DEQ estimated the Dayton 7Q10 by calculating the 7Q10 at each of the McMinnville and Yamhill gages and then summing these two values (see Table 3).

Table 2: Critical MZ Summary Data

Field Study Data	
Stream Flow	139 cfs
Effluent Flow	0.40 cfs (0.259 mgd)
Background Conductivity	166µmhos
Effluent Conductivity	685 µmhos
Maximum Conductivity at ZID	220 µmhos
Average Conductivity at MZ	180 µmhos
Critical Flow Statistics	
7Q10 flow (winter)	139 cfs
ADWDF	0.35 cfs (0.23 mgd)

Table 3: 7Q10 Summary Data

Location	7Q10
North Yamhill at Yamhill	66 cfs
South Yamhill at McMinnville	73 cfs
Yamhill at Dayton	139 cfs (est.)

Critical flow: $D_{c100} = \frac{(Q_e+Q_r)}{(Q_e)} = \frac{0.35+139}{0.35} = 398$ (using ADWDF)

Where:

D_{c100} = dilution at 100% mix (critical flow conditions, 7Q10)

Q_e = Effluent flow (ADWDF)

Q_r = River flow (7Q10)

Estimated Critical Flow Dilutions

The final step is to estimate the ZID and mixing zone dilutions that would occur under critical flow conditions. First we calculate the ratio (R) of the ultimate dilution under critical flow conditions to the ultimate dilution during the field study. Because the field study dilution at 100% mix is the same as that at 7Q10 conditions, the ratio is 1:

$$R = \frac{(D_{c100})}{(D_{f100})} = \frac{398}{398} = 1$$

Where:

D_{f100} = Field study dilution at 100% mix

D_{c100} = Critical flow dilution at 100% mix

This ratio is then multiplied by the mixing zone and ZID dilutions to calculate the final estimated dilutions that would occur under critical flow conditions.

$$D_e = ratio \times D$$

The resulting estimated dilutions are shown in Table 4. Using this ratio technique yields a conservative estimate of the dilution at the edge of the mixing zone.

Table 4: Dilution results

Scenario	Q_e	Q_r	D_{100}	R	D_{MZ}	D_{ZID}	Final D_{MZ}	Final D_{ZID}
7Q10	0.35 cfs	139 cfs	398	1	37	10*	37	10*

* Calculated value rounded to 10.

Environmental Mapping

LEAD conducted an environmental mapping exercise as described in their report. The lab did not find any critical habitat or other resources within the vicinity of the mixing zone. DEQ contacted the Oregon Department of Fish and Wildlife district biologist, Tom Murtaugh, who confirmed that there are no active salmon redds in the vicinity of the Dayton WWTP mixing zone.

Report

Dayton WWTP
Mixing Zone Study
Final Report
May 2010

State of Oregon
Department of
Environmental
Quality

Last Updated 5/24/2010
By: Lori Pillsbury
DEQ09-LAB-0023-TR

This report prepared by:

Oregon Department of Environmental Quality
Laboratory & Environmental Assessment Division
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DEQ Staff Participating in Study
Michael Mulvey, LEAD
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Table of Contents

State of Oregon
Department of
Environmental
Quality

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Background

The City of Dayton operates a domestic wastewater treatment facility with an average winter discharge flow of 0.46 million gallons per day (MGD). Under permit # 101742, the facility is permitted to discharge to the Yamhill River from November 1 through April 30. The facility has a permitted mixing zone defined as *that portion of the Yamhill River where the effluent mixes with 25 percent of the stream flow but in no case shall it extend farther than 35 feet out from the outfall pipe, and from a point ten feet upstream of the outfall to a point 100 feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within ten feet of the point of discharge.*

In order to attempt to evaluate 7Q10 low flow conditions, this study was conducted just prior to the permitted discharge season. The facility was granted permission to discharge outside its normal discharge window. In an attempt to sample a representative discharge, the facility was encouraged to begin discharging a few days prior to the sampling date.

Project Summary

Laboratory staff conducted a field mixing zone survey of this site on October 19, 2009. The facility was discharging during the study.

Based on the Regulatory Mixing Zone Internal Management Directive (ODEQ, 2007) and permit staff best professional judgment, this facility meets the two criteria for a Level 1 study:

1. The discharge has no reasonable potential to exceed acute criteria other than potentially chlorine or ammonia and available dilution of greater than 20 times 25% of critical flow
2. The discharge not classified as a "Major".

This report contains data required for this level.

Quality Assurance / Quality Control

Samples were collected at the compliance location for outfall 001 at the facility and three in-stream locations on the Yamhill River. All sampling was conducted following the quality assurance and quality control (QA/QC) procedures outlined in the Quality Assurance Project Plan, Mixing Zone Studies, DEQ06-LAB-0041-QAPP. A complete sampling plan for this project is contained in the Sample and Analysis Plan (SAP), DEQ09-LAB-0023-SAP.

All sampling activities outlined in the SAP were conducted during this study. In addition to the parameters outlined in the SAP, samples for total recoverable metals were added to this study. This addition was made to collect additional data about metals in the receiving waterbody. Previous ambient samples at this location indicated elevated levels of copper and lead.

A duplicate sample was collected at the upstream sampling location and met all applicable QA/QC criteria. In addition, a transfer blank was collected. No analytes were detected in the transfer blank above the laboratory's Level of Quantitation (LOQ).

Environmental Mapping

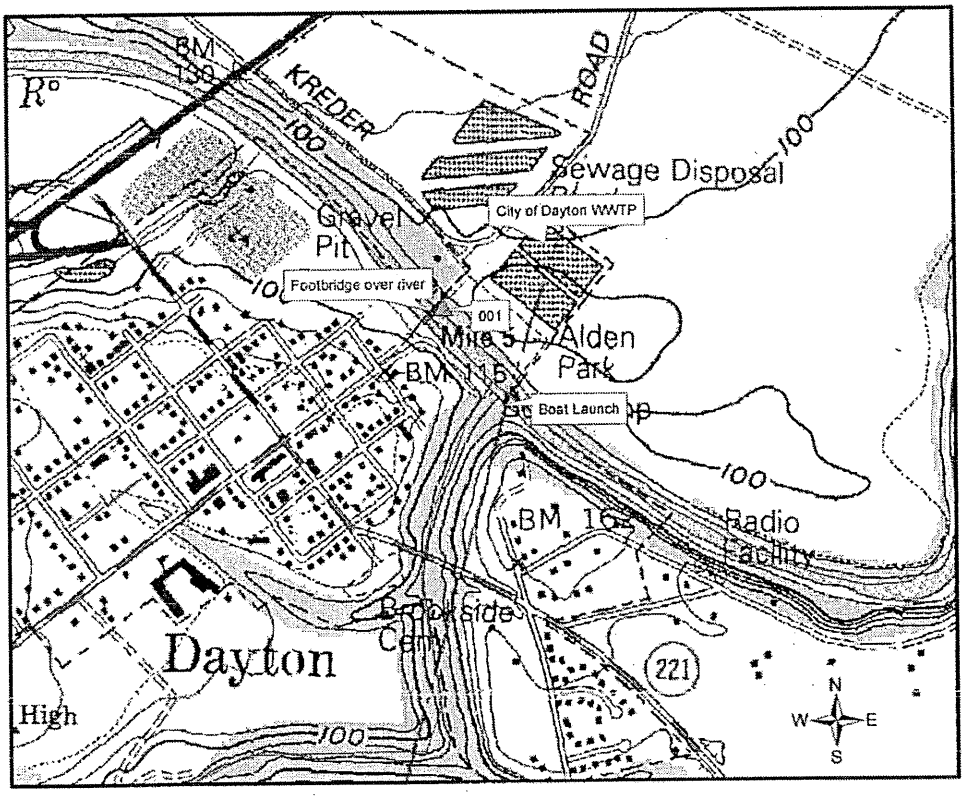
This section of the report is intended to characterize and represent critical habitats, critical resources, and other beneficial uses of the receiving waterbody in the area surrounding the outfall. This portion was completed both in the field and through office research. A schematic of the field sampling area (drawn at the time of sampling) can be found in Appendix C.

The City of Dayton WWTP discharges into the Yamhill River at RM 5.0 through Outfall 001. The outfall is contained within the Yamhill Sub-Basin of the Willamette Basin. Figure 1 shows the location of this outfall on the USGS Quad Map of the area. Based on the ODFW fish habitat maps and Division 41, Water Quality Standards, Figure 340A (Fish Use Designations, Willamette Basin) and 340B (Salmon and Steelhead Spawning Use Designations) (ODEQ, 2010b), the Yamhill River is utilized by salmon and trout for rearing and migration. Resident trout spawning is also a designated beneficial use from January 1 – May 1.

A Total Maximum Daily Load (TMDL) for the Yamhill River is currently under development for pollutants that violate water quality standards to protect designated beneficial uses of the river under the federal Clean Water Act. The permitted discharge season for the City of Dayton is November 1 – April 30. During this time period, the Yamhill River is listed as water quality limited on the 303D List (year round) for chlorophyll-a, *E. coli*, iron, manganese, and temperature. It is listed for dissolved oxygen for the time period of January 1 – May 1.

There are public access sites to this portion of the river. The Yamhill River is utilized for recreation. A public boat launch and park is located downstream of the outfall and a foot bridge is just upstream of the outfall. No drinking water intakes are located within ½ mile downstream of the outfall. No other NPDES discharges are located within ½ mile upstream or downstream of the outfall (based on information contained in DEQ Facility Profiler database), accessed April 2010.

Figure 1 – USGS Quad Map of area surrounding Dayton WWTP's outfall



Outfall Description

Dayton WWTP is currently permitted to discharge treated domestic wastewater through outfall 001 to the Yamhill River. The outfall is a single port pipe located on the left bank (looking downstream) of the river. At the time of sampling, the end of the pipe was approximately five feet above the water level, but it appeared that at times of high flow in the river, the pipe would be submerged, Figure 2. The actual diameter of the pipe could not be determined as the end of the pipe was not clearly visible due to brush.

Mixing Zone / Receiving Water Conditions

The mixing zone for this facility is defined as *that portion of the Yamhill River where the effluent mixes with 25 percent of the stream flow but in no case shall it extend farther than 35 feet out from the outfall pipe, and from a point ten feet upstream of the outfall to a point 100 feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within ten feet of the point of discharge.*

Yamhill River Stream Flow
The field crew was unable to collect flow and depth measurements during the survey because the river was not wadeable. Stream velocity was estimated to be 0.14 ft/sec using the Marsh McBirney flow meter at mid channel. Flow at the right bank was estimated to be 0.05 ft/sec and 0.03 ft/sec at the left bank. Depth at mid channel was greater than 6 feet.

Conductivity Mapping (All conductivity measurements are temperature compensated to 25°C)

Conductivity mapping was completed during this field study. Figure 3 provides a visual representation of the conductivity data collected. The field crew was unable to find large variations in the conductivity moving downstream. However, conductivity measurements along the left side of the river were elevated at approximately 5% above background through the length of the mixing zone.

Figure 2 – Location of outfall pipe

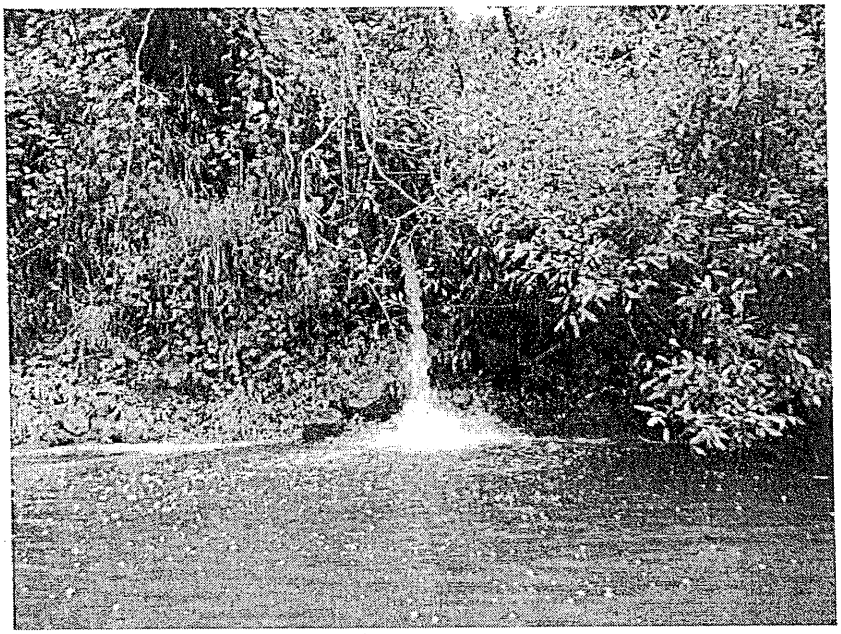


Figure 3 – Conductivity mapping (all measurements in µmhos/cm, temperature compensated to 25°C)

	Left bank	Mid channel	Right bank
200 feet DS	175	166	165
160 feet DS	176	166	166
120 feet DS	175	166	166
80 feet DS	176	166	165
60 feet DS	176	166	166
20 feet DS	186	166	166
At outfall	220	166	166

Flow

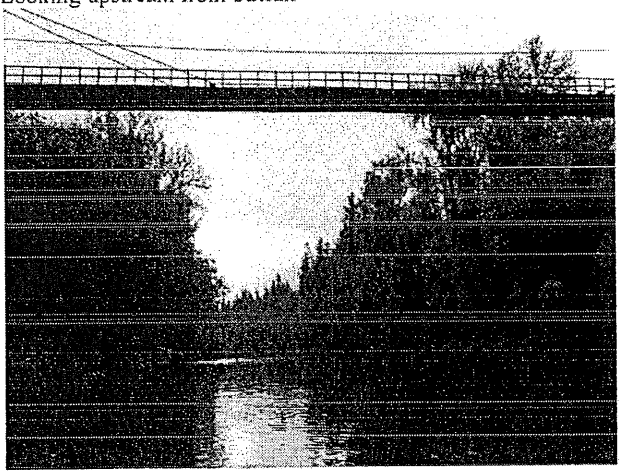
Upstream	166
Effluent at time of sampling	685

Stream bottom / bank conditions at outfall (Figure 4)

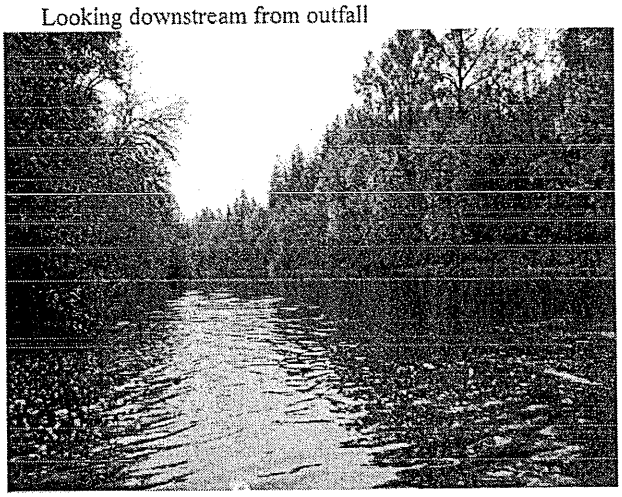
Manning's roughness coefficient (n) is a measure of the friction at the stream bottom and can be estimated from the stream bottom type and channel morphology. The sediment type of the Yamhill River at the discharge location was predominantly sand and mud with some woody debris. The average wetted width was 110 feet. Water depth at the outfall pipe was greater than 5.5 feet.

Figure 4 – Stream conditions at outfall

Looking upstream from outfall



Looking downstream from outfall



Analytical Results

Water quality samples were collected at the outfall 001 compliance point and at three in-stream (Yamhill River) locations, Table 1, Figure 5. Samples collected for biochemical oxygen demand (BOD5), nutrients (total nitrogen and phosphorus), *E. coli* and metals were transported to the ODEQ laboratory for analysis. Field parameters (pH, conductivity (temperature compensated to 25°C), dissolved oxygen, temperature, and turbidity were measured by the field sampling crew. Data are summarized in Table 2, Table 3, and Appendix A. A complete report for this sampling event can be found on the LASAR website (http://deq12.deq.state.or.us/lasar2/) under Case # 20090952 (ODEQ, 2010a).

Table 1 – Field Sampling Locations

Map ID	LASAR #	Station Name	Description
A	36072	Dayton STP, final effluent	effluent from plant, sampled at treatment plant, outfall 001
B	10363	Yamhill R., 25 feet US of Dayton outfall	Background / upstream location
C	NA	Location of Dayton outfall pipe	no samples at this location, outfall samples collected at location A at plant
D	36074	Yamhill R., 10 feet DS from Dayton outfall	downstream edge of Zone of Immediate Dilution (ZID)
E	36073	Yamhill R., 35 feet out from Dayton outfall	in-stream edge of regulatory mixing zone
F	36075	Yamhill R., 100 feet DS from Dayton outfall	downstream edge of regulatory mixing zone (RMZ)

Figure 5 – Map of facility and sampling locations (not to scale)

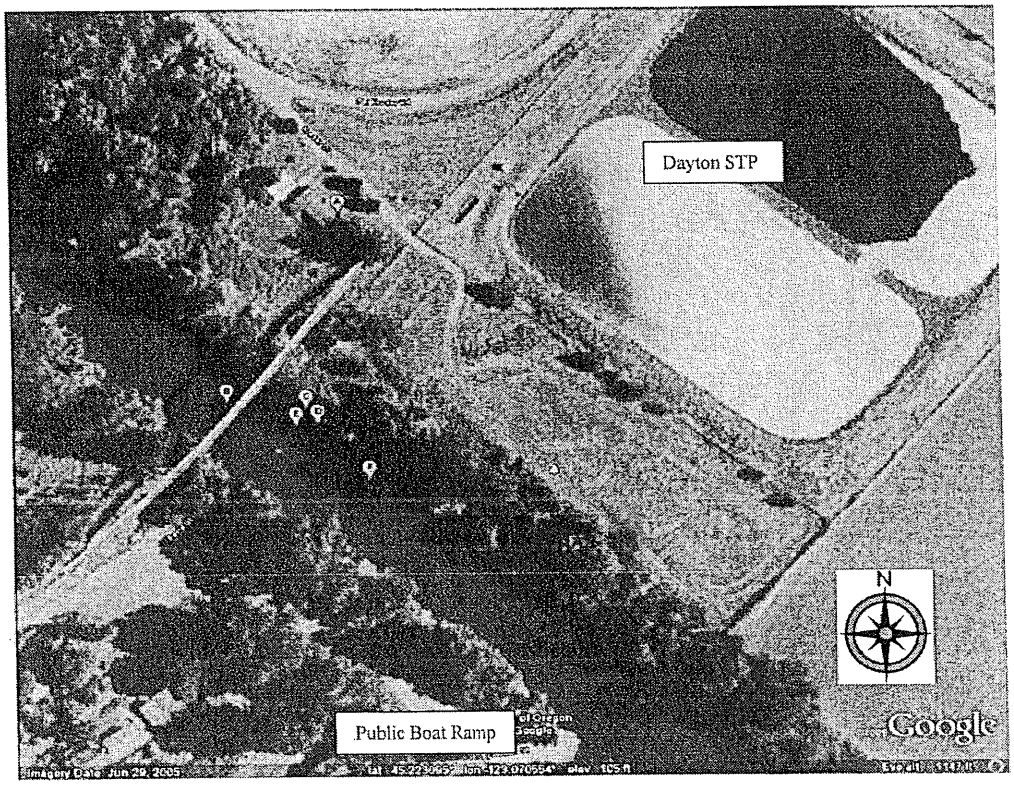


Table 2 – Summary of analytical results for sampling event dated October 19, 2009 (ODEQ, 2010a)

Parameter	Units	Acute Water Quality Criteria	Chronic Water Quality Criteria	Permit Limit [a]	Outfall 001 (plant discharge)	Yamhill R., 25 feet US of Dayton outfall [b]	Yamhill R., 10 feet DS of Dayton outfall	Yamhill R., 35 feet out from Dayton outfall	Yamhill R., 100 feet DS of Dayton outfall
Conductivity	µmhos/cm				685	165	197	166	175
Dissolved Oxygen	mg/L	Cold water – Not less than 8.0 mg/L or 90% saturation			2.0	9.9	9.9	9.9	10.1
DO % saturation	%				20	95	95	95	96
pH	s.u	6.5 ≤ pH ≤ 8.5		6.0 ≤ pH ≤ 9.0	7.4	7.3	7.4	7.3	7.3
Temperature	° C	18 °C (cold water species)			14.7	13.3	13.3	13.2	13.2
Turbidity	NTU	no more than 10% increase above background			15	5	6	4	5
E. coli	MPN/ 100mL	406		406	5	22	6	14	33
Alkalinity	mg/L		20		238	52	63	55	53
Ammonia as N	mg/L	17.5 [c]	5.08 [c]		2.67	< 0.02	0.14	< 0.02	0.05
BOD_5	mg/L			45 (W) 30 (M)	14	2.2	3.4	2.4	2.9
Nitrate/Nitrite as N	mg/L				0.0062	0.432	0.408	0.431	0.430
Total Kjeldahl Nitrogen (TKN)	mg/L				7.3	0.3	0.7	0.3	0.4
Total Organic Carbon (TOC)	mg/L				31	3	5	3	4
Total Phosphorus	mg/L				2.62	0.12	0.26	0.13	0.17
Total Suspended Solids (TSS)	mg/L			80 (W) 50 (M)	11	4	7	5	5

[a] Permit Limits are expressed as single sample limits unless otherwise specified, i.e. W = weekly average effluent concentrations; M = monthly average effluent concentrations. If no limit exists in permit, none is specified in this column.

[b] Duplicate samples collected at this location. All analytical parameters measured were within QA/QC range for a duplicate sample.

[c] Ammonia criteria based on upstream temperature and pH (EPA, 1999).

Based on past data results, metals may be a concern in the receiving water body, therefore, analyses for total metals were added to this study. Table 3 summarizes these results.

Table 3 – Results of samples for total metals (only includes those parameters detected in one or more samples) (ODEQ, 2010a)

Parameter	Units	Acute Water Quality Criteria [a]	Chronic Water Quality Criteria [a]	Outfall 001 (plant discharge)	Yamhill R., 25 feet US of Dayton outfall	Yamhill R., 10 feet DS of Dayton outfall	Yamhill R., 35 feet out from Dayton outfall	Yamhill R., 100 feet DS of Dayton outfall
Metal Cations (Total)								
Aluminum	mg/L			0.067	0.305	0.357	0.311	0.344
Boron	mg/L			0.087	0.025	0.027	0.024	0.024
Calcium	mg/L			44.8	14.1	15.7	14.4	14.6
Iron	mg/L		1000	0.438	0.610	0.664	0.612	0.667
Magnesium	mg/L			8.59	5.03	5.16	5.02	5.03
Manganese	mg/L			0.271	0.0292	0.0444	0.0316	0.0366
Potassium	mg/L			9.94	1.35	1.83	1.48	1.50
Silicon	mg/L			35.5	18.3	19.3	18.3	18.5
Sodium	mg/L			89.2	10.9	15.1	11.7	12.1
Hardness	mg/L			147	55.9	60.5	56.6	57.1
Total Priority Pollutant Metals								
Barium	µg/L			22.9	15.2	15.9	15.9	15.6
Cobalt	µg/L			0.51	0.21	0.29	0.25	0.26
Copper	µg/L	10.3	7.2	< 1.5	1.9	2.1	2.1	1.9
Nickel	µg/L	927	96.4	1.1	< 1.0	1.0	< 1.0	< 1.0

[a] For hardness based criteria, the hardness from the upstream receiving water sample was used for calculations.

[b] Duplicate samples collected at this location. All analytical parameters measured were within QA/QC range for a duplicate sample.

Conclusions

Based on the data collected during the field study the Dayton WWPT is in compliance with the discharge permit for this facility. The following items may warrant additional consideration.

Dissolved oxygen – The dissolved oxygen in the effluent (2.0 mg/L) was well below the cold water criteria minimum of 8.0 mg/L and the spawning criteria (11.0 mg/L) applicable from January 1 – May 1. No in-stream reduction in dissolved oxygen was measured in the mixing zone.

Nutrients – TKN and total phosphorus in the effluent were elevated over background levels. A slight elevation was also measured at the edge of the ZID and the edge of the RMZ.

Iron and Manganese – The permit required iron and manganese monitoring for the first year. Also, the Yamhill River is water quality limited for iron and manganese for the protection of human health. Iron in the effluent was measured at 0.438 mg/L and manganese was measured at 0.271 mg/L. These results are total recoverable. Per the *Iron and Manganese Criteria Memo* dated November 4, 2008 from Debra Sturdevant, the iron and manganese criteria in Table 20 (300 µg/L and 50 µg/L, respectively) are to be based on dissolved concentrations. Therefore, the measured concentrations during this study cannot be directly compared to the criteria.

The chronic criterion for the protection of aquatic life for iron in Table 20 is 1 mg/L. This is based on total recoverable and the effluent is in compliance with this level.

Mixing Dynamics – Based on the limited data collected during the conductivity mapping exercise, it appears that the effluent plume remains on the left side of the river as it moves downstream. However, only a slight elevation in conductivity was recorded.

References

Environmental Protection Agency (EPA), 1999. 1999 Update of Ambient Water Quality Criteria for Ammonia (Freshwater), http://www.epa.gov/waterscience/criteria/ammonia/99update.pdf.

Lower Columbia River Estuary Partnership (LCREP), 2007. Lower Columbia River and Estuary Ecosystem Monitoring: Water Quality and Salmon Sampling Report, Portland, OR.

Oregon Department of Environmental Quality (ODEQ), 2010a. Laboratory Analytical Storage and Retrieval Database (LASAR), http://www.deq.state.or.us/news/databases.htm, Case # 20090952.

Oregon Department of Environmental Quality (ODEQ), 2010b. Oregon Administrative Rules, Division 41, http://www.deq.state.or.us/regulations/rules.htm.

Oregon Department of Environmental Quality (ODEQ), 2005. Reasonable Potential Analysis, Internal Management Directive, September 2005. http://www.deq.state.or.us/wq/pubs/imds/rpatoxics.pdf.

Oregon Department of Environmental Quality (ODEQ), 2007. Regulatory Mixing Zone, Internal Management Directive, December 2007. http://deq05/wq/wqpermits/PCGuidance.htm.

Oregon Department of Fish and Wildlife (ODFW), 2010. Fish Distribution Maps. http://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistmaps, accessed April, 2010.

Appendix A – Field Data Sheet & Chain of Custody

Oregon Department of Environmental Quality
Laboratory and Environmental Assessment Division Chain of Custody Record [1]

Sampling Event Name [2]: *Dayton STP Mixing Zone Evaluation*

* Office Use Only *
Sampling Event #: 20090952 Page 1 of 4

Fund Code [3]: *37443* QAPP/SAP # [4]: *DEQ09-LAB-0023-SAP*

Report Recipients [5]: *Lori Pillsbury, Mark Hamlin (WR)*

Sampling Event Collector (s) [6]: *Lori Pillsbury,* Mike Hallway

Sampling Agency [6]: *DEQ*

Project Manager and Contact # [7]: *Lori Pillsbury, 503-693-5735*

Expected Turnaround Time (Default 45 days) [8]: *Default*

Item	LASAR ID # [10]	Station Name [11]	Sub-Project [12]	Date [13] / Time	QC Type [14] / Matrix [15]	P / R	C / DP	BOD / DO	STP / S	TM		
1	36077	*Dayton STP, final effluent*	2011	10/7/09	S	—	—	—	STP S761	TM 1601		STP 272
				0945	Matrix EFF	R1100	—	—	SC055			
2	10363	*Yamhill R., 25 feet US of Dayton outfall*	2011	10/7/09	FP	P1012	C1444	67	—	TM 1679		
				1107	SW	R2296	—	—	—			
3	36073	*Yamhill R., 35 feet out from Dayton outfall*	2011	10/7/09	S	P2911	C1361	X75	—	TM 1682		
				1053	SW	R2048	—	—	—			
4	36074	*Yamhill R., 10 feet DS of Dayton outfall*	2011	10/7/09	S	P1206	C1308	AN22	—	TM 1205		
				1100	SW	R524	—	—	—			
5	36075	*Yamhill R., 100 feet DS of Dayton outfall*	2011	10/7/09	S	P1370	C1501	373D	—	TM 1567		
				1052	SW	R2467	—	—	—			
6	10363	Yamhill R. 25 feet *Field Duplicate* US of Dayton outfall	2011	10/7/09	FD	P1295	C1446	347C	—	TM 1679		
				1108	SW	R2219	—	—	—			

Event Comments:

Chain of Custody [17]

Relinquished By:	Agency/Company	Date/Time	Received by:	Agency/Company	Date/Time	Location
[illegible]	DEQ	10/7/09 1340	[illegible]	DEQ	10/7/09 1340	

Rev. 1.0 12-Mar-09 DEQ06-LAB-0034-FORM COC - WQ SW

Oregon Department of Environmental Quality

Laboratory and Environmental Assessment Division Water Quality Field Data Record [1]

Office Use Only

Sampling Event #: 20090952 Page 2 of 4

Sampling Event Name [2]: *Dayton STP Mixing Zone Evaluation*

Fund Code [3]: 37443 OAPP/SAP # [4]: *DEQ09-LAB-0023-SAP*

Sampling Event Collector (s) [6]: *Lori Pillsbury,* [illegible]

Project Manager and Contact # [7]: *Lori Pillsbury, 503-693-5735*

Report Recipients [5]: *Lori Pillsbury, Mark Hamlin (WR)*

Sampling Agency [6]: *DEQ*

Expected Turnaround Time (Default 45 days) [9]: *Default*

Item	LASAR ID # [10]	Station Name [11]	Date [12] / Time	QC Type [14] / Elevation [15]	Temp [20] (C)	Cond. [21] (umhos)	pH [22] (SU)	Alk. [23] (mg/L)	DO [24] (mg/L)	DO Sat [25] (%)	Turb. [26] (NTU)	TRC (mg/L)		
1	36072	*Dayton STP, final effluent*	10/19/09 / 0945	S / 2500	14.7	285	7.4	—	2.0	19.8	15	—		
					Item Comment: N 45.22285 W 123.07196									
2	10363	*Yamhill R., 25 feet US of Dayton outfall*	10/19/09 / 1:07	FP / <500	13.3	165	7.3	—	9.9	95	5	—		
					Item Comment:									
3	36073	*Yamhill R., 35 feet out from Dayton outfall*	10/19/09 / 1058	S / <500	13.2	166	7.3	—	9.9	95	4	—		
					Item Comment: N 45.22309 W 123.07179									
4	36074	*Yamhill R., 10 feet DS of Dayton outfall*	10/19/09 / 1100	S / <500	13.3	197	7.4	—	9.9	95	6	—		
					Item Comment: N 45.22316 W 123.07175									
5	36075	*Yamhill R., 100 feet DS of Dayton outfall*	10/19/09 / 1052	S / <500	13.2	175	7.3	—	10.1	96	5	—		
					Item Comment: N 45.22278 W 123.07132									
6	10363	*Field Duplicate* Yamhill R, 25 feet US of Dayton outfall	10/19/09 / 1108	FD / <500	13.3	165	7.3	—	9.9	95	5	—		
					Item Comment:									

	pH Meter #: [illegible]	Initials	Time	Temp.	Meter Reading	Diff.	±0.15U (y/n)
Pre	7	[illegible]					✓
	4						↓
	10						
Post	7	LAP	1330	21.6	7.02	—	Y
	4 10	↓	1330	21.8	10.00	-0.06	↓
	10 4	↓					

QC [33] Check	Meter #	Initials	Date	Time	Meter Reading	True Value	Diff. or % Rec	Control Limit
Cond. Low:	[illegible]	LAP	10/19/09	0910	151	147.7	2	≤ 7%
Cond. High:	↓		↓	↓	1409	1412	<1	≤ 7%
pH (LIS):	↓							
Turb. Low:		LAP		0900	4.55	4.60	<1	≤ 5%
Turb. Mid.:		↓		↓	49.5	49.6	<1	≤ 5%
Turb. High:		↓	↓	↓	483	480	<1	≤ 3%

DEQ08-LAB-0056-FORM Field Data - WQ.XLS

22-Mar-09

Rev 1.0

Oregon Department of Environmental Quality

Laboratory and Environmental Assessment Division Chain of Custody Record [1]

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Sampling Event #: 20090S-2 Page 3 of 4

Sampling Event Name [2]: Dayton STP Mixing Zone Evaluation

Fund Code [3]: 37443 QAPP/SAP #[4]: DEQ09-LAB-0023-SAP Report Recipients [5]: Lori Pillsbury, Mark Hamlin (WR)

Sampling Event Collector (s) [6]: Lori Pillsbury, Mike Mulvey Sampling Agency [7]: DEQ

Project Manager and Contact # [8]: Lori Pillsbury, 503-693-5735 Expected Turnaround Time (Default 45 days) [9]: Default

Sample Information						Bottle Numbers [16]						
Item	LASAR ID # [10]	Station Name [11]	Sub-Project # [12]	Date [13] / Time	QC Type [14] / Matrix [15]	P / R	C / DP	BOD / DO	STR / S	TM		
7	10000	Transfer Blank	2011	12/19/09 1215	TSFB SW	P1538 21745	— —	— —	— —	TM 1e30		

Event Comments:

Chain of Custody [17]

Relinquished By:	Agency/Company	Date/Time	Received by:	Agency/Company	Date/Time	Location

12-Mar-09 DEQ06-LAB-0054-FORM \ COC - WQ SW

Rev. 1.0

Oregon Department of Environmental Quality

Laboratory and Environmental Assessment Division Water Quality Field Data Record [1]

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Sampling Event #: 2009095 2 Page 4 of 4

Sampling Event Name [2]: Dayton STP Mixing Zone Evaluation

Fund Code [3]: 37443 QAPP/SAP # [4]: DEQ09-LAB-0023-SAP

Sampling Event Collector (s) [6]: Lori Pillsbury, M. Kervinen

Project Manager and Contact # [7]: Lori Pillsbury, 503-693-5735

Report Recipients [5]: Lori Pillsbury, Mark Hamlin (WR)

Sampling Agency [8]: DEQ

Expected Turnaround Time (Default 45 days) [9]: Default

Item	LASAR ID # [10]	Station Name [11]	Date [12] / Time	QC Type [16] / Elevation [17]	Temp [20] (C)	Cond. [21] (umhos)	pH [22] (SU)	Alk. [23] (mg/L)	DO [24] (mg/L)	DO Sat [25] (%)	Turb. [26] (NTU)	TRC (mg/L)		
7	10000	Transfer Blank	10/19/09 1215	TSFB	15.9	1		—	—	—	<1	—		
					Item Comment:									
					Item Comment:									
					Item Comment:									
					Item Comment:									
					Item Comment:									
					Item Comment:									

pH Meter #:		Initials	Time	Temp.	Meter Reading	Diff.	<0.1 SU (y/n)
Pre	7						
	4						
	10						
Post	7						
	4						
	10						

QC [30] Check	Meter #	Initials	Date	Time	Meter Reading	True Value	Diff. or % Rec	Control Limit
Cond. Low:								≤ 7%
Cond. High:								≤ 7%
pH (LIS):								
Turb. Low:								≤ 5%
Turb. Mid.:								≤ 5%
Turb. High:								≤ 5%

Appendix B – Field Summary Sheet

Mixing Zone
Field Summary Sheet

General Facility Information

Facility Name: *Dayton STP*	Address: *416 Ferry Street Dayton, OR*	Date of Survey:
		County: *Yamhill*
Facility Contact: *Pat Jackson*	Phone #: *503-437-0641*	IMD Study Level: *1*
Receiving Waterbody: *Yamhill River*	NPDES Permit #: *101742* Expiration Date: *12/31/2009*	Facility Type: IW / DW Major / Minor
Function of Facility (brief description): *Domestic wastewater treatment facility*		
Discharge Timing & Type: (i.e. seasonality of discharge, batch, continuous) *winter season discharge, Nov. 1 – April 30*		

Outfall Information

Outfall Designation: 001	Flow at time of sampling:	Water Depth @ outfall: 5.5 feet	River mile:
Type of Outfall: (i.e. single, multi-port) single	Orientation of outfall (σ): 45° (on slope of bank) (in degrees related to bottom of stream, 0° (H), 90° (V))	Diameter of pipe: not visible b/c of brush	Latitude / Longitude: N45.22285 W123.07196
Nearest bank to outfall (looking downstream): Left on bank		Outfall distance from nearest bank (looking downstream): on bank ~5 feet above H2O level	
Discharge direction in relation to flow (i.e. perpendicular / horizontal): perpendicular		CORMIX Form completed: Yes / No	

Sampling Locations – Data Collection

Yamhill R.

Parameter	Outfall	Site 1	Site 2	Site 3	Site 4
Description of Sample Site	Dayton WWTP facility	25' us @ FootBridge	35' out from 001	10 feet DS of 001	100 feet DS of 001
Latitude / Longitude	N45.22285 W123.07196	—	N45.22309 W123.07179	N45.22316 W123.07176	N45.22278 W123.07130
River Mile					
Field Parameters collected	(Y) / N	(Y) / N	(Y) / N	(Y) / N	(Y) / N
Water Quality Samples collected	(Y) / N	(Y) / N	(Y) / N	(Y) / N	(Y) / N
Substrate Type					
Stream slope					
Stream Bottom Description (Manning's Roughness description)		sandy/ muddy some debris	←	→	→

Mixing Zone
Field Summary Sheet

Other Data Collection

Conductivity Mapping Completed (Yes) / No
If Yes, attach field form with complete information
If No, provide explanation:

Velocity Transects Completed Yes / (No)
If Yes, attach form measurement form (Stream Discharge Field Sheet).
If No, provice explanation:
Stream was not wadeable, velocity estimated from Marsh McB @ R bank (0.05 ft/s) Mid (0.14 ft/s) L (0.03 ft/s)

Macroinvertebrate Sampling Yes / (No)
If Yes, complete macroinvertebrate field forms & attach.

Photos Taken (Yes) / No
Take photos of all sampling locations including the outfall and outfall pipe if possible.

Ambient Weather Conditions
cloudy, cool

Additional Notes:
Outfall was visible on bank ~ 5 feet above H_2O level

* Manning's Roughness Coefficient – *n*

Description	*n*
Bare earth, straight	0.020 – 0.030
Bare earth, winding	0.040 – 0.05
Mountain streams, gravel, cobbles	0.040 – 0.050
Mountain streams, gravel, cobbles, boulders	0.050 – 0.70
Grass lined, weeds	0.030 – 0.00
Heavy brush, timber	0.10 – 0.12
Major rivers	0.030 – 0.035
Sluggish with pools	0.040 – 0.050

Appendix C – Stream Description & Conductivity Mapping

Mixing Zone
Stream Description & Conductivity Mapping Summary

Sampling Event:	Receiving Waterbody:	Date of Survey:
Dayton mt	Yamhill R.	Oct. 19, 2009
		County: Yamhill
Bank Full Width:	Wetted Width:	
	110'	

effluent SpC = 685 umhos/cm

Conductivity Mapping
(include approximate location on stream sketch)

L Mid R

Location	Latitude/Longitude	Field Conductivity (µmhos/cm)		
		Surface	Mid	Bottom
upstream/background			166	
@ outfall		220	166	166
20' DS		186	166	166
60' DS		176	166	166
80' DS		176	166	165
120' DS		175	166	166
160' DS		176	166	166
200' DS		175	166	165

Mixing Zone
Stream Description & Conductivity Mapping Summary

Notes / Sketch (include other outfalls or inputs in the stream reach evaluated, note obstructions to flow observed):