
City of Spokane RPWRF

*Annual Wet Weather Operations Report
2024*

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1. Introduction

The City of Spokane RPWRF NPDES Permit (WA0024473) requires the annual submission of a Wet Weather Operations Report. The requirements for Wet Weather monitoring and reporting are outlined in section S5.F of the permit. The requirements specific to this report are shown below (S5.F.6):

6. *The Permittee must report on the facility's monthly DMR all data from bypass monitoring listed in table S2A Table 13 of this permit except the PCB testing. PCB testing results must be submitted in excel format as a submittal with the laboratory documentation for each event. In addition, the Permittee must submit an annual Wet Weather Operations Report **by September 15 each year** that summarizes all bypass occurrences for the previous year.*
 - a. *The report must include:*
 - i. *Evaluation of each event wet weather operations.*
 1. *Date and time of event.*
 2. *Precipitation resulting in the event*
 3. *Flows treated and flows bypassed*
 - ii. *Identification of exceedance of any limits during events.*
 - iii. *Discussion of wet weather effluent PCB concentrations compared to non- bypass events.*

RPWRF upgraded its plant in 2021 to meet Waste Load Allocations established by the Spokane River Dissolved Oxygen TMDL. Dubbed Next Level Treatment (NLT), a 50 MGD tertiary membrane system was installed to meet these requirements. As part of this system's design, high flows due to precipitation and snowmelt can exceed the capacity of the NLT system and only receive secondary treatment. Further information on the design of this system is discussed in the RPWRF NLT Wet Weather Operations Tech Memo, submitted to Ecology in January, 2023.

The permit requirements related to Wet Weather monitoring went into effect September 1, 2022. This report covers only the events that took place after that time.

2. Results and Discussion

A summary of the Wet Weather events for 2024 are shown below in Table 1. Fourteen events occurred in 2024. Flow was maximized through the membrane facility during all events, and storage within the rest of the RPWRF facility was utilized to the extent possible before requiring blending of secondary and tertiary effluent. Both treated wastewater streams are rejoined before receiving full disinfection using sodium hypochlorite and dechlorination with sodium bisulfite.

The event on 12/21/2024 was partially the result of one of the two membrane trains being forced offline due to a faulty sensor. The net result was that the membrane facility capacity was cut in half for

approximately 30 of the 36 hour bypass. This issue was reported to Ecology promptly. For further details on this event, see letter dated 1/10/2025.

CSO related bypasses of the activated sludge/secondary system are also possible in extreme wet weather/flow events. No CSO related bypasses occurred in 2024.

Table 1 – Summary of 2024 Wet Weather Events

Event #	Event Start Date/Time	Event End Date/Time	Event Duration (hours)	Precipitation amount causing event (inches)*	Flows treated through membrane facility (MG)	Flows bypassing membrane facility (MG)	Total effluent flow during event (MG)
1	1/9/24 5:44 AM	1/9/24 3:50 PM	2.67	0.28	5.27	0.23	5.50
2	1/22/24 2:52 AM	1/22/24 11:52 PM	9.00	0.28	18.48	3.73	22.21
3	1/27/24 12:58 PM	1/27/24 8:52 PM	7.90	0.35	16.32	4.35	20.67
4	2/12/24 7:08 AM	2/12/24 1:28 PM	6.33	0.38	12.46	1.16	13.62
5	2/29/24 1:28 PM	2/29/24 6:10 PM	4.70	0.32	9.72	2.90	12.62
6	11/2/24 11:36 AM	11/2/24 12:56 PM	1.33	0.47	2.81	0.38	3.19
7	11/4/24 1:00 PM	11/4/24 2:28 AM	1.47	0.23	3.13	0.68	3.81
8	11/13/24 12:56 PM	11/13/24 6:52 PM	6.43	0.70	13.99	5.62	19.61
9	11/22/24 7:46 AM	11/24/24 11:00 PM	63.23	1.57	122.76	30.00	152.76
10	12/17/24 10:20 PM	12/18/24 9:50 AM	11.50	0.63	22.58	3.89	26.47
11	12/21/24 2:10 PM	12/23/24 2:04 AM	35.90	0.42	42.02	18.97	60.99
12	12/24/24 8:54 AM	12/24/24 9:22 PM	12.47	0.57	25.76	9.72	35.48
13	12/26/24 5:30 AM	12/26/24 5:30 PM	12.00	0.39	23.1	3.08	26.18
14	12/29/24 10:56 AM	12/30/24 11:36 PM	36.67	0.95	69.17	34.10	103.27

*Precipitation monitoring taken from NWS gage at Spokane International Airport

Table 2 shows the monitoring results for each event along with the permit limits, where applicable. Data is all collected from the RPWRF Effluent at the outfall prior to entering the Spokane River. No exceedances of permit limits occurred during the 2024 events. The seasonal limits for the DO-TMDL related parameters of CBOD, Ammonia, and Total Phosphorus only apply for the months of March through October. None of the bypasses occurred during this critical season for nutrients. Elevated values were noted for the total residual chlorine readings on the 2/29/2024, 12/21/2024, and 12/24/2024 events. However, when compiled with the rest of the readings for the day and month, no permit limit excursions occurred. The 1/22/2024 event had an elevated e. coli value of 172.5 #/100 mL. The monthly and weekly limits for E. coli are geomeans of 100 CFU/100 mL and 150 CFU/100 mL, respectively. When compiled with the rest of the weekly and monthly data, e. coli was still well below both limits (weekly geomean of 2.4 #/100 mL and monthly geomean of 1.3 #/100 mL).

Table 2 – Summary of 2024 Wet Weather Event Sampling at RPWRF Effluent

Parameter	Units	Event 1 - 1/09/2024	Event 2 - 1/22/2024	Event 3 - 1/27/2024	Event 4 - 2/12/2024	Event 5 - 2/29/2024	Most stringent Permit Limit
Temperature (event max)	Degrees C	13.40	11.79	12.41	12.52	11.65	
Dissolved Oxygen (event min)	mg/L	10.28	10.45	10.63	10.64	10.37	
pH (event min)	pH units	6.18	6.34	6.37	6.39	6.31	6.0 (daily min)
pH (event max)	pH units	6.23	6.47	6.47	6.56	6.37	9.0 (daily max)
Total Residual Chlorine	ug/L	<4.0	5.5	<4.0	<4.0	10.5	8.5 ug/L (avg. month)
Hardness	mg/L	202	285	225	217	202	
Total Alkalinity	mg/L	83	97	121	112	92	
Total Cadmium	ug/L	0.028	0.030	0.031	0.027	0.017	0.066 ug/L (avg. month)
Total Lead	ug/L	0.257	0.159	0.324	0.264	0.203	0.583 ug/L (avg. month)
Total Zinc	ug/L	33.1	30.6	35.9	29.7	26.5	46.7 ug/L (avg. month)
Total CBOD5	mg/L	<2	2	<2	<2	<2	25 mg/L (avg. month)
Total CBOD5	Lbs/Day	826	988	1,047	861	1,075	1,780.6 lbs/day Seasonal Limit only
Total CBOD5	% Removal	98.5	98.3	98.1	98.2	98.5	85% Removal (avg. month)
Total Suspended Solids (TSS)	mg/L	0.7	5.8	1.4	0.7	1.6	30 mg/L (avg. month)
Total Suspended Solids (TSS)	Lbs/Day	289	2864	733	301	860	10,660 lbs/day (avg. month)
Total Suspended Solids (TSS)	% Removal	99.7	96.4	99.2	99.7	99.3	85% Removal (avg. month)
Escherichia coli	#/100ml	7.5	172.5	0	<1	35	100 CFU/100 mL (monthly geomean)
Fecal Coliform	#/100ml	<2	<20	2	<2	2	100 CFU/100 mL (monthly geomean)
Ammonia	mg N/L	0.055	4.01	0.057	0.103	0.351	
Ammonia	Lbs N/Day	22.6	1,978	29.9	44.2	189	75.6 lbs/day Seasonal Limit only
Soluble Reactive Phosphorus	ug P/L	4	7	4	3	9.2	
Total Phosphorus	ug P/L	43.9	143	43.0	12.1	54.0	
Total Phosphorus	Lbs P/Day	18.1	70.6	22.5	5.21	29.0	17.81 lbs/day Seasonal Limit only
Total PBDEs - EPA 1614	pg/L	929	2,758	753	261	1,721	

Parameter	Units	Event 1 - 1/09/2024	Event 2 - 1/22/2024	Event 3 - 1/27/2024	Event 4 - 2/12/2024	Event 5 - 2/29/2024	Most stringent Permit Limit
Total PCBs - EPA 1668	pg/L	25.2	35.8	57.5	30.7	40.2	720 pg/L (avg. month)
Ag (Total)	ug/L		0.013	0.014			
Al (Total)	ug/L		535	215			
As (Total)	ug/L		1.20	0.55			
Be (Total)	ug/L		0.014	0.010			
Ca (Total)	ug/L	43,200	40,000	42,800	42,400	40,500	
Cr (Total)	ug/L		0.29	0.20			
Cu (Total)	ug/L		2.87	2.21			
Hg (Total)	ng/L		1.07				
Mg (Total)	ug/L	22,800	45,000	28,800	27,100	24,600	
Mo (Total)	ug/L		1.96	1.46			
Ni (Total)	ug/L		0.93	1.13			
Sb (Total)	ug/L		0.248	0.198			
Se (Total)	ug/L		<0.20	<0.20			
Tl (Total)	ug/L		<0.009	<0.009			
Total PCBs - EPA 608.3	pg/L		<52,000				720 pg/L Avg. Month

* PCB sampling by method 608.3 is only required once per year.

Table 2, Continued – Summary of 2024 Wet Weather Event Sampling at RPWRF Effluent

Parameter	Units	Event 6 - 11/02/2024	Event 7 - 11/04/2024	Event 8 - 11/13/2024	Event 9 - 11/22/2024**	Event 10 - 12/17/2024	Most stringent Permit Limit
Temperature (event max)	Degrees C	16.72	16.95	17.03	15.20	14.31	
Dissolved Oxygen (event min)	mg/L	9.50	9.09	9.19	9.38	9.93	
pH (event min)	pH units	6.58	6.53	6.45	6.19	6.35	6.0 (daily min)
pH (event max)	pH units	6.61	6.65	6.62	6.63	6.51	9.0 (daily max)
Total Residual Chlorine	ug/L	<4.0	5.0	<4.0	11.5	4.5	8.5 ug/L (avg. month)
Hardness	mg/L	159	180	196	156	206	
Total Alkalinity	mg/L	67	64	77	77	54	
Total Cadmium	ug/L	0.022	0.022	0.017	0.0175	0.027	0.066 ug/L (avg. month)
Total Lead	ug/L	0.290	0.229	0.491	0.2025	0.269	0.583 ug/L (avg. month)
Total Zinc	ug/L	32.8	27.4	32.3	21.2	31.7	46.7 ug/L (avg. month)
Total CBOD5	mg/L	<2	<2	3	<2	<2	25 mg/L (avg. month)
Total CBOD5	Lbs/Day	956	1,039	1,831	967	921	1,780.6 lbs/day Seasonal Limit only
Total CBOD5	% Removal	98.4	98.8	97.9	97.6	98.5	85% Removal (avg. month)
Total Suspended Solids (TSS)	mg/L	5.4	3.3	5.1	1.9	2.9	30 mg/L (avg. month)
Total Suspended Solids (TSS)	Lbs/Day	2,582	1,714	3,112	919	1,336	10,660 lbs/day (avg. month)
Total Suspended Solids (TSS)	% Removal	96.9	98.0	97.2	98.6	98.4	85% Removal (avg. month)
Escherichia coli	#/100ml	10.8	71.2	107	25.1	24.3	100 CFU/100 mL (monthly geomean)
Fecal Coliform	#/100ml	<2	2	<2	3	1	100 CFU/100 mL (monthly geomean)
Ammonia	mg N/L	0.040	0.508	1.433	0.078	0.069	
Ammonia	Lbs N/Day	19.3	264	875	37.9	31.9	75.6 lbs/day Seasonal Limit only
Soluble Reactive Phosphorus	ug P/L	19.6	28.2	65.1	14.5	19.1	
Total Phosphorus	ug P/L	78	118	211	89.95	104	
Total Phosphorus	Lbs P/Day	37.3	61.3	128.8	43.5	47.9	17.81 lbs/day Seasonal Limit only

Parameter	Units	Event 6 - 11/02/2024	Event 7 - 11/04/2024	Event 8 - 11/13/2024	Event 9 - 11/22/2024**	Event 10 - 12/17/2024	Most stringent Permit Limit
Total PBDEs - EPA 1614	pg/L	1,582	2,050	3,411	1,612	1,214	
Total PCBs - EPA 1668	pg/L	79.5	88.0	219	115	59.6	720 pg/L (avg. month)
Ag (Total)	ug/L						
Al (Total)	ug/L						
As (Total)	ug/L						
Be (Total)	ug/L						
Ca (Total)	ug/L	38,000	33,300	40,100	33,900		
Cr (Total)	ug/L						
Cu (Total)	ug/L						
Hg (Total)	ng/L	1.00					
Mg (Total)	ug/L	20,700	18,400	23,300	17,400		
Mo (Total)	ug/L						
Ni (Total)	ug/L						
Sb (Total)	ug/L						
Se (Total)	ug/L						
Tl (Total)	ug/L						
Total PCBs - EPA 608.3	pg/L						720 pg/L Avg. Month

*PCB sampling by method 608.3 is only required once per year.

**Effluent sampled twice during 11/22/2024 event. Reported results are the average of these two samples.

Table 2, Continued – Summary of 2024 Wet Weather Event Sampling at RPWRF Effluent

Parameter	Units	Event 11 - 12/21/2024	Event 12 - 12/24/2024	Event 13 - 12/26/2024	Event 14 - 12/29/2024	Most stringent Permit Limit
Temperature (event max)	Degrees C	14.11	13.80	13.22	13.08	
Dissolved Oxygen (event min)	mg/L	9.71	9.9	9.92	9.92	
pH (event min)	pH units	6.49	6.3	6.14	6.33	6.0 (daily min)
pH (event max)	pH units	6.77	6.49	6.46	6.71	9.0 (daily max)
Total Residual Chlorine	ug/L	13	9.5	5	<4.0	8.5 ug/L (avg. month)
Hardness	mg/L	209	188	188	195	
Total Alkalinity	mg/L	94	73	68	92	
Total Cadmium	ug/L	0.022	0.018	0.009	0.020	0.066 ug/L (avg. month)
Total Lead	ug/L	0.321	0.244	0.131	0.224	0.583 ug/L (avg. month)
Total Zinc	ug/L	31	30.7	19.3	24.9	46.7 ug/L (avg. month)
Total CBOD5	mg/L	<2	<2	<2	2	25 mg/L (avg. month)
Total CBOD5	Lbs/Day	680	1,139	874	1,128	1,780.6 lbs/day Seasonal Limit only
Total CBOD5	% Removal	98.6	97.9	98.3	97.7	85% Removal (avg. month)
Total Suspended Solids (TSS)	mg/L	0.3	1.6	0.7	5.0	30 mg/L (avg. month)
Total Suspended Solids (TSS)	Lbs/Day	102	912	306	2,819	10,660 lbs/day (avg. month)
Total Suspended Solids (TSS)	% Removal	99.8	98.9	99.5	95.3	85% Removal (avg. month)
Escherichia coli	#/100ml	1	26.2	4.1	29.5	100 CFU/100 mL (monthly geomean)
Fecal Coliform	#/100ml	<2	4	<2	<2	100 CFU/100 mL (monthly geomean)
Ammonia	mg N/L	0.0191	0.1584	0.0405	0.0056	
Ammonia	Lbs N/Day	6.5	90.2	17.7	3.2	75.6 lbs/day Seasonal Limit only
Soluble Reactive Phosphorus	ug P/L	6	9.7	7.4	10.7	
Total Phosphorus	ug P/L	27.2	38.0	32.8	81.0	
Total Phosphorus	Lbs P/Day	9.23	21.6	14.3	45.7	17.81 lbs/day Seasonal Limit only
Total PBDEs - EPA 1614	pg/L	280	486	309	1397	

Parameter	Units	Event 11 - 12/21/2024	Event 12 - 12/24/2024	Event 13 - 12/26/2024	Event 14 - 12/29/2024	Most stringent Permit Limit
Total PCBs - EPA 1668	pg/L	12.9	27.4	39.7	54.0	720 pg/L (avg. month)
Ag (Total)	ug/L					
Al (Total)	ug/L					
As (Total)	ug/L					
Be (Total)	ug/L					
Ca (Total)	ug/L	42,800	40,200	41,500	41,900	
Cr (Total)	ug/L					
Cu (Total)	ug/L					
Hg (Total)	ng/L					
Mg (Total)	ug/L	24,900	21,300	20,600	22,000	
Mo (Total)	ug/L					
Ni (Total)	ug/L					
Sb (Total)	ug/L					
Se (Total)	ug/L					
Tl (Total)	ug/L					
Total PCBs - EPA 608.3	pg/L					720 pg/L Avg. Month

* PCB sampling by method 608.3 is only required once per year.

Table 3 shows a comparison between method 1668C Total PCB data with the membrane facility providing full treatment (non-bypass conditions) and the wet weather bypass event data for 2024. Data has been blank corrected using a 10x censoring factor.

Based on the approximately three years of full-treatment membrane facility data and the bypass data for 2024, no statistically significant differences in the total PCB data were observed. While still only a limited amount of data exists with the membrane facility online, total PCB results for the 2024 wet weather events were all within the range of concentrations seen from when the membrane facility is fully treating all effluent.

The RPWRF team continues to gain knowledge and improve the performance of the membrane facility system. Wet weather events increased in 2024 mainly due to above average precipitation in the fall and winter of 2024. During 2024, RPWRF treated 11.95 billion gallons of incoming wastewater, of which 11.83 billion gallons were treated through the membrane facility. Put another way, 99.0% of all RPWRF flows were treated through the membrane facility, with the remaining 1.0% receiving standard secondary treatment plus disinfection.

Table 3 - Total PCB Comparison

Sample Point	Sampling Event	Sample Date	Total PCBs (pg/L):
Plant Effluent	Quarterly Sampling	7/14/2021	280.3
Plant Effluent	Quarterly Sampling	11/9/2021	38.6
Plant Effluent	Quarterly Sampling	4/12/2022	8.0
Plant Effluent	Quarterly Sampling	7/7/2022	31.2
Plant Effluent	Quarterly Sampling	10/12/2022	19.6
Plant Effluent	Quarterly Sampling	1/19/2023	60.0
Plant Effluent	Quarterly Sampling	5/10/2023	37.8
Plant Effluent	Quarterly Sampling	7/19/2023	83.2
Plant Effluent	Quarterly Sampling	10/11/2023	46.0
Plant Effluent	Quarterly Sampling	1/10/2024	18.9
Plant Effluent	Quarterly Sampling	4/11/2024	68.4
Plant Effluent	Quarterly Sampling	7/9/2024	13.6
Plant Effluent	Quarterly Sampling	10/23/2024	40.0
			Average 57.4
			Median 38.6
			St. Dev 67.7
			Min 8.0
			Max 280.3

Table 3 Continued - Total PCB Comparison

Sample Point	Sampling Event	Sample Date	Total PCBs (pg/L):
Plant Effluent	Wet Weather Event 1	1/9/2024	25.2
Plant Effluent	Wet Weather Event 2	1/22/2024	35.8
Plant Effluent	Wet Weather Event 3	1/27/2024	57.5
Plant Effluent	Wet Weather Event 4	2/12/2024	30.7
Plant Effluent	Wet Weather Event 5	2/29/2024	40.2
Plant Effluent	Wet Weather Event 6	11/2/2024	79.5
Plant Effluent	Wet Weather Event 7	11/4/2024	88.0
Plant Effluent	Wet Weather Event 8	11/13/2024	218.7
Plant Effluent	Wet Weather Event 9	11/22/2024	118.0
Plant Effluent	Wet Weather Event 10	12/17/2024	59.6
Plant Effluent	Wet Weather Event 11	12/21/2024	12.9
Plant Effluent	Wet Weather Event 12	12/24/2024	27.4
Plant Effluent	Wet Weather Event 13	12/26/2024	39.7
Plant Effluent	Wet Weather Event 14	12/29/2024	54.0
			Average 63.4
			Median 47.1
			St. Dev 50.9
			Min 12.9
			Max 218.7

3. References

Ecology, 2022. National Pollutant Discharge Elimination System Waste Discharge Permit No. WA-002447-3. Washington State Department of Ecology, Olympia, WA.

Jacobs, 2023. RPWRF NLT Wet Weather Operations Technical Memorandum. Jacobs Engineering Group Inc, Corvallis, OR.