Appendix 5-8: Water Budgets and Total Phosphorus Mass Balance Budgets and Treatment Performance in STA Treatment Cells and Flow-ways

Michael Chimney

Table 1. Annual and period-of-record water budgets for Stormwater Treatment Area (STA) treatment cells and flow-ways.[a]

	Inflows[b]				Outflows[b]						
	I_s	I_g	P	∑inflow	O_s	O_g	ET	∑outflow	ΔS	r	ε
STA-1E, Cell 3											
WY2007	30.3	0.0	2.1	32.4	51.7	0.0	3.1	54.8	-0.8	21.7	49.8%
WY2008	120.1	0.0	2.7	122.8	152.0	0.0	3.1	155.1	1.3	33.6	24.2%
POR	150.4	0.0	4.8	155.2	203.7	0.0	6.3	210.0	0.5	55.3	30.3%
%In	96.9%	0.0%	3.1%	*%Out*	97.0%	0.0%	3.0%		0.3%		
STA-1E, Cell 4N											
WY2007	51.7	0.0	2.3	54.0	58.8	0.0	3.4	62.2	-0.1	8.1	14.0%
WY2008	152.0	0.0	2.9	154.9	175.1	0.0	3.4	178.5	0.7	24.4	14.6%
POR	203.7	0.0	5.2	208.9	233.9	0.0	6.9	240.8	0.6	32.5	14.4%
%In	97.5%	0.0%	2.5%	*%Out*	97.1%	0.0%	2.9%		0.3%		
STA-1E, Cell 4S											
WY2007	58.8	0.0	2.7	61.5	48.2	0.0	4.0	52.2	0.1	-9.2	-16.2%
WY2008	175.1	0.0	3.4	178.5	146.8	0.0	4.0	150.8	0.7	-27.1	-16.4%
POR	233.9	0.0	6.1	240.0	195.0	0.0	8.0	203.0	0.8	-36.2	-16.4%
%In	97.5%	0.0%	2.5%	*%Out*	96.0%	0.0%	4.0%		0.3%		
STA-1E, Cell 5											
WY2007	45.3	0.0	2.0	47.4	28.3	0.0	3.0	31.3	0.0	-16.0	-40.7%
WY2008	7.5	0.0	2.6	10.2	11.9	0.0	3.0	14.9	1.1	5.9	47.2%
POR	52.9	0.0	4.6	57.5	40.2	0.0	6.1	46.3	1.1	-10.1	-19.5%
%In	92.0%	0.0%	8.0%	*%Out*	86.8%	0.0%	13.2%		2.0%		
STA-1E, Cell 6											
WY2007	66.7	0.0	3.7	70.4	64.3	0.0	5.6	69.9	0.0	-0.6	-0.8%
WY2008	19.6	0.0	4.8	24.4	30.3	0.0	5.6	35.9	0.4	12.0	39.8%
POR	86.3	0.0	8.5	94.8	94.6	0.0	11.2	105.8	0.4	11.4	11.4%
%In	91.0%	0.0%	9.0%	*%Out*	89.4%	0.0%	10.6%		0.5%		
STA-1E, Cell 7											
WY2007	31.6	0.0	1.5	33.0	38.4	0.0	2.2	40.7	0.0	7.6	20.6%
WY2008	13.0	0.0	1.9	14.9	7.7	0.0	2.2	9.9	0.0	-5.0	-39.9%
POR	44.6	0.0	3.4	48.0	46.1	0.0	4.5	50.6	0.0	2.6	5.4%
%In	92.9%	0.0%	7.1%	*%Out*	91.2%	0.0%	8.8%		0.0%		
STA-1W, Cell 1											
WY2001	125.5	1.9	5.2	132.6	94.8	7.7	8.3	110.8	-1.9	-23.7	-19.5%
WY2002	157.0	3.1	7.8	167.8	154.0	6.5	7.8	168.2	0.8	1.2	0.7%
WY2003	298.7	3.1	6.2	308.0	316.6	5.9	7.5	330.0	2.9	24.9	7.8%
WY2004	193.7	3.0	5.0	201.7	193.7	4.6	7.5	205.9	-1.1	3.0	1.5%
WY2005	205.1	2.3	6.4	213.8	272.8	2.6	7.8	283.1	-0.1	69.3	27.9%
WY2006	139.3	2.1	6.7	148.1	136.5	0.4	7.9	144.8	0.9	-2.4	-1.6%
WY2007	121.3	0.0	5.8	127.1	100.6	0.0	7.9	108.5	-3.1	-21.7	-18.4%
WY2008	45.4	0.0	7.2	52.6	34.6	0.0	7.9	42.5	3.2	-6.8	-14.3%
POR	1285.9	15.4	50.3	1351.7	1303.6	27.7	62.7	1393.9	1.6	43.8	3.2%
%In	95.1%	1.1%	3.7%	*%Out*	93.5%	2.0%	4.5%		0.1%		

Table 1. Continued.

	Inflows[b]				Outflows[b]						
	I_s	I_g	P	∑inflow	O_s	O_g	ET	∑outflow	ΔS	r	ε
STA-1W, Cell 2											
WY2001	38.5	0.0	3.7	42.2	47.4	0.0	5.9	53.3	0.0	11.1	23.3%
WY2002	66.3	0.0	5.5	71.8	61.7	0.0	5.5	67.2	0.0	-4.6	-6.6%
WY2003	146.7	0.0	4.4	151.1	152.1	0.0	5.4	157.5	0.0	6.3	4.1%
WY2004	75.0	0.0	3.6	78.6	136.2	0.0	5.4	141.6	-1.7	61.3	55.7%
WY2005	97.6	0.0	4.1	101.7	48.1	0.0	4.9	53.0	-0.9	-49.5	-64.0%
WY2006	--	0.0	4.2	4.2	7.0	0.0	5.0	12.0	0.6	8.3	102.5%
WY2007	--	0.0	3.7	3.7	--	0.0	5.0	5.0	-0.6	0.8	17.7%
WY2008	30.8	0.0	4.5	35.3	--	0.0	5.0	5.0	1.6	-28.7	-142%
POR	454.9	0.0	33.8	488.7	452.5	0.0	42.1	494.6	-0.9	5.1	1.0%
%In	93.1%	0.0%	6.9%	*%Out*	91.5%	0.0%	8.5%		-0.2%		
STA-1W, Cell 3											
WY2001	80.9	2.2	3.6	86.6	79.9	7.4	5.7	93.0	-0.5	5.9	6.6%
WY2002	133.3	3.4	5.4	142.2	127.5	6.2	5.4	139.1	0.5	-2.6	-1.8%
WY2003	250.8	3.4	4.3	258.6	205.2	5.6	5.2	216.0	0.9	-41.6	-17.5%
WY2004	154.3	3.3	3.5	161.1	131.8	4.4	5.2	141.5	-1.1	-20.7	-13.7%
WY2005	187.5	2.5	4.4	194.4	161.3	2.3	5.3	168.9	0.2	-25.3	-13.9%
WY2006	131.8	2.3	4.6	138.7	113.5	0.3	5.5	119.3	0.3	-19.1	-14.8%
WY2007	98.3	0.0	4.0	102.3	101.2	0.0	5.5	106.7	-1.7	2.7	2.5%
WY2008	2.6	0.0	4.9	7.5	14.6	0.0	5.5	20.1	1.9	14.4	104.4%
POR	1039.5	17.0	34.8	1091.3	935.0	26.2	43.4	1004.6	0.5	-86.3	-8.2%
%In	95.3%	1.6%	3.2%	*%Out*	93.1%	2.6%	4.3%		<0.1%		
STA-1W, Cell 4											
WY2001	47.4	0.0	1.3	48.7	38.8	0.0	2.1	40.9	0.0	-7.8	-17.5%
WY2002	61.7	0.0	2.0	63.7	80.7	0.0	2.0	82.7	0.0	19.0	26.0%
WY2003	152.1	0.0	1.6	153.7	194.4	0.0	1.9	196.3	0.0	42.6	24.4%
WY2004	136.2	0.0	1.3	137.5	126.1	0.0	1.9	128.0	-0.6	-10.1	-7.6%
WY2005	48.1	0.0	1.5	49.6	82.4	0.0	1.9	84.3	-0.3	34.3	51.2%
WY2006	7.0	0.0	1.6	8.6	0.6	0.0	1.9	2.5	0.3	-5.8	-104%
WY2007	--	0.0	1.4	1.4	8.3	0.0	1.9	10.2	-0.3	8.5	147.1%
WY2008	--	0.0	1.7	1.7	29.9	0.0	1.9	31.8	0.6	30.7	183.3%
POR	452.5	0.0	12.4	464.9	561.2	0.0	15.4	576.6	-0.3	111.4	21.4%
	97.3%	0.0%	2.7%		97.3%	0.0%	2.7%		-0.1%		
STA-1W, Cell 5 Flow-way											
WY2001	-14.9	0.0	10.9	-4.0	17.7	0.0	17.5	35.2	-10.9	28.2	180.8%
WY2002	45.0	0.0	16.4	61.4	197.9	0.0	16.5	214.4	3.8	156.7	113.7%
WY2003	435.9	0.0	13.2	449.1	427.5	0.0	15.9	443.4	-2.0	-7.7	-1.7%
WY2004	140.6	0.0	10.6	151.2	130.0	0.0	14.9	144.9	-3.6	-9.9	-6.7%
WY2005	233.7	0.0	12.3	246.0	232.4	0.0	14.9	247.3	-3.6	-2.3	-0.9%
WY2006	44.2	0.0	12.9	57.1	51.8	0.0	15.2	67.0	-3.6	6.3	10.2%
WY2007	1.9	0.0	11.2	13.1	35.5	0.0	15.2	50.7	-3.6	34.0	106.7%
WY2008	50.9	0.0	13.7	64.6	118.7	0.0	15.2	133.9	-3.6	65.7	66.2%
POR	937.3	0.0	101.2	1038.5	1211.5	0.0	125.2	1336.7	-27.0	271.1	22.8%
%In	90.3%	0.0%	9.7%	*%Out*	90.6%	0.0%	9.4%		-2.6%		

Table 1. Continued.

	Inflows[b]				Outflows[b]						
	I_s	I_g	P	∑inflow	O_s	O_g	ET	∑outflow	ΔS	r	ε
STA-2, Cell 1											
WY2003	57.2	0.3	10.3	67.8	36.9	0.3	10.5	47.7	5.7	-14.4	-24.9%
WY2004	78.1	0.0	9.4	87.4	61.3	0.4	10.7	72.4	-2.1	-17.2	-21.5%
WY2005	67.8	0.0	8.9	76.8	71.4	0.4	10.1	81.9	0.5	5.6	7.1%
WY2006	72.6	0.0	10.4	83.1	70.8	0.4	10.9	82.0	-0.2	-1.2	-1.5%
WY2007	72.4	0.0	8.8	81.2	81.8	0.6	10.4	92.8	-2.6	9.0	10.3%
WY2008	94.0	0.0	10.8	104.8	76.6	0.6	10.5	87.7	2.5	-14.7	-15.2%
POR	442.1	0.4	58.7	501.1	398.9	2.7	63.0	464.5	3.8	-32.8	-6.8%
%In	88.2%	0.1%	11.7%	*%Out*	85.9%	0.6%	13.6%		0.8%		
STA-2, Cell 2											
WY2003	149.3	0.3	11.5	161.1	123.8	0.4	11.8	135.9	4.0	-21.2	-14.3%
WY2004	111.6	0.1	10.4	122.2	110.8	0.6	11.9	123.3	-2.0	-1.0	-0.8%
WY2005	177.9	0.1	10.0	188.0	164.3	0.9	11.2	176.4	-1.7	-13.3	-7.3%
WY2006	160.3	0.0	11.6	172.0	121.6	0.8	12.1	134.5	0.2	-37.3	-24.3%
WY2007	146.6	0.1	9.9	156.5	145.6	1.0	11.6	158.2	-2.1	-0.5	-0.3%
WY2008	74.2	0.2	12.1	86.5	76.0	0.2	11.7	87.9	2.5	3.9	4.5%
POR	819.9	0.9	65.4	886.2	742.1	3.9	70.2	816.2	0.8	-69.3	-8.1%
%In	92.5%	0.1%	7.4%	*%Out*	90.9%	0.5%	8.6%		0.1%		
STA-2, Cell 3											
WY2003	178.7	0.0	11.5	190.2	144.7	17.1	11.8	173.6	2.1	-14.6	-8.0%
WY2004	137.8	0.0	10.4	148.3	129.3	14.0	11.9	155.2	-3.6	3.3	2.2%
WY2005	173.2	0.0	10.0	183.1	155.9	10.0	11.2	177.2	-0.4	-6.4	-3.5%
WY2006	150.8	0.0	11.6	162.4	133.0	10.0	12.1	155.2	-0.7	-8.0	-5.0%
WY2007	75.4	0.0	9.9	85.2	86.2	9.2	11.6	107.0	-0.1	21.7	22.6%
WY2008	109.0	0.0	12.1	121.0	116.6	11.0	11.7	139.3	1.8	20.1	15.4%
POR	824.8	0.0	65.4	890.3	765.8	71.4	70.2	907.5	-1.0	16.1	1.8%
	92.6%	0.0%	7.4%	*%Out*	84.4%	7.9%	7.7%		-0.1%		
STA-3/4, Cell 1A											
WY2006	284.0	0.0	16.9	300.9	548.8	0.0	16.5	565.4	-8.6	255.9	59.1%
WY2007	207.1	0.0	12.8	219.9	19.5	0.0	16.4	35.9	-3.1	-187.0	-146%
WY2008	155.5	0.0	14.4	169.9	223.5	0.0	16.6	240.1	6.4	76.6	37.4%
POR	646.6	0.0	44.2	690.8	791.9	0.0	49.5	841.4	-5.2	145.4	19.0%
%In	93.6%	0.0%	6.4%	*%Out*	94.1%	0.0%	5.9%		-0.8%		
STA-3/4, Cell 1B											
WY2006	548.6	0.0	19.4	568.0	467.2	0.0	19.0	486.1	-10.1	-91.9	-17.4%
WY2007	22.2	0.0	14.7	36.9	189.6	0.0	18.8	208.4	3.9	175.4	143.0%
WY2008	223.5	0.0	16.6	240.1	158.7	0.0	19.0	177.7	3.7	-58.7	-28.1%
POR	794.3	0.0	50.7	845.0	815.5	0.0	56.8	872.3	-2.5	24.7	2.9%
%In	94.0%	0.0%	6.0%	*%Out*	93.5%	0.0%	6.5%		-0.3%		

Table 1. Continued.

	Inflows[b]				Outflows[b]						
	I_s	I_g	P	∑inflow	O_s	O_g	ET	∑outflow	ΔS	r	ε
STA-3/4, Cell 2A											
WY2006	261.7	0.0	14.1	275.9	399.6	0.0	13.8	413.5	-4.8	132.8	38.5%
WY2007	121.8	0.0	10.7	132.6	49.3	0.0	13.7	63.0	-3.2	-72.8	-74.5%
WY2008	98.1	0.0	12.1	110.1	-79.0	0.0	13.9	-65.1	5.8	-169.5	-753%
POR	481.6	0.0	37.0	518.6	369.9	0.0	41.4	411.3	-2.2	-109.5	-23.5%
%In	92.9%	0.0%	7.1%	*%Out*	89.9%	0.0%	10.1%		-0.4%		
STA-3/4, Cell 2B											
WY2006	399.6	0.0	16.1	415.7	323.5	0.0	15.7	339.3	-1.7	-78.2	-20.7%
WY2007	49.3	0.0	12.2	61.5	147.7	0.0	15.6	163.3	-2.1	99.7	88.7%
WY2008	-79.0	0.0	13.8	-65.3	94.0	0.0	15.8	109.8	3.9	179.0	803.8%
POR	369.9	0.0	42.1	412.0	565.3	0.0	47.2	612.4	0.2	200.6	39.2%
%In	89.8%	0.0%	10.2%	*%Out*	92.3%	0.0%	7.7%		<0.1%		
STA-3/4, Cell 3											
WY2006	94.6	0.0	25.5	120.1	117.7	0.0	24.9	142.6	-3.7	18.8	14.3%
WY2007	102.2	0.0	19.4	121.6	101.1	0.0	24.7	125.8	-0.2	4.0	3.2%
WY2008	151.0	0.0	21.8	172.8	112.6	0.0	25.0	137.6	7.0	-28.2	-18.1%
POR	347.9	0.0	66.6	414.4	331.4	0.0	74.6	406.0	3.1	-5.4	-1.3%
%In	83.9%	0.0%	16.1%	*%Out*	81.6%	0.0%	18.4%		0.7%		
STA-5, North											
WY2001	45.5	0.0	8.1	53.6	25.4	10.5	11.9	47.7	-2.4	-8.3	-16.3%
WY2002	122.7	0.0	7.5	130.2	103.3	11.4	11.2	125.9	2.4	-1.9	-1.5%
WY2003	127.6	0.0	10.1	137.7	124.5	9.3	10.8	144.6	-0.1	6.8	4.8%
WY2004	139.5	0.0	9.6	149.1	124.6	10.6	10.8	146.0	1.2	-1.9	-1.3%
WY2005	114.6	2.0	8.9	125.4	90.4	7.8	10.7	108.9	-3.4	-19.9	-17.0%
WY2006	171.8	0.5	8.5	180.8	139.1	12.7	10.9	162.7	0.0	-18.1	-10.5%
WY2007	70.2	0.0	8.9	79.1	79.8	8.8	11.1	99.7	0.1	20.6	23.0%
WY2008	15.2	1.2	9.5	25.9	4.8	2.9	10.9	18.5	1.8	-5.6	-25.2%
POR	807.1	3.6	71.1	881.9	691.9	73.8	88.3	854.0	-0.4	-28.3	-3.3%
%In	91.5%	0.4%	8.1%	*%Out*	81.0%	8.6%	10.3%		-0.1%		
STA-5, South											
WY2001	57.4	1.3	8.1	66.8	23.9	25.5	11.9	61.3	-2.6	-8.2	-12.8%
WY2002	114.7	0.4	7.5	122.6	52.3	23.3	11.2	86.8	2.1	-33.8	-32.2%
WY2003	119.6	0.0	10.1	129.7	73.5	33.3	10.8	117.6	-0.3	-12.3	-10.0%
WY2004	92.1	0.0	9.6	101.8	46.7	27.9	10.8	85.4	1.5	-15.0	-16.0%
WY2005	68.4	0.0	8.9	77.3	59.6	33.8	10.7	104.1	-1.1	25.8	28.4%
WY2006	123.4	18.2	8.5	150.1	109.0	19.7	10.9	139.7	-3.2	-13.7	-9.5%
WY2007	36.6	5.8	8.9	51.3	3.9	4.0	11.1	18.9	0.7	-31.7	-90.3%
WY2008	9.8	7.1	9.5	26.4	4.0	0.7	10.9	15.5	1.1	-9.8	-46.7%
POR	622.0	32.9	71.1	726.1	372.8	168.1	88.3	629.2	-1.8	-98.6	-14.6%
%In	85.7%	4.5%	9.8%	*%Out*	59.3%	26.7%	14.0%		-0.2%		

Table 1. Continued.

	Inflows[b]				Outflows[b]						
	I_s	I_g	P	∑inflow	O_s	O_g	ET	∑outflow	ΔS	r	ε
STA-6, Cell 3											
WY2003	30.9	1.0	1.2	33.2	19.1	8.5	1.3	28.9	0.4	-3.9	-12.7%
WY2004	24.1	0.1	1.4	25.6	22.4	11.7	1.3	35.4	-0.4	9.4	30.8%
WY2005	23.0	0.5	1.3	24.7	13.0	8.3	1.3	22.7	0.2	-1.8	-7.5%
WY2006	20.5	1.6	1.1	23.3	15.9	5.0	1.3	22.2	-0.1	-1.1	-5.0%
WY2007	18.3	1.5	0.7	20.5	10.2	8.8	1.3	20.3	-0.1	-0.3	-1.4%
WY2008	3.4	3.2	1.1	7.7	1.2	5.0	1.3	7.6	0.3	0.2	2.2%
POR	120.2	7.9	6.9	134.9	81.8	47.2	8.0	137.0	0.3	2.4	1.8%
%In	89.1%	5.8%	5.1%	*%Out*	59.7%	34.5%	5.8%		0.2%		
STA-6, Cell 5											
WY2003	34.7	0.0	3.1	37.9	24.9	5.5	3.4	33.8	0.8	-3.3	-9.2%
WY2004	24.1	0.0	3.5	27.6	25.4	4.3	3.4	33.0	-0.8	4.6	15.2%
WY2005	19.9	0.1	3.2	23.2	14.3	3.9	3.4	21.7	0.0	-1.5	-6.9%
WY2006	14.4	1.0	2.9	18.3	14.6	2.0	3.4	20.0	0.1	1.8	9.5%
WY2007	17.0	0.3	1.8	19.2	10.5	5.0	3.4	18.8	0.0	-0.3	-1.8%
WY2008	4.9	1.1	2.9	8.8	1.8	2.0	3.4	7.2	0.3	-1.3	-16.5%
POR	114.9	2.5	17.5	135.0	91.4	22.8	20.4	134.6	0.3	-0.1	-0.1%
%In	85.1%	1.9%	13.0%	*%Out*	67.9%	17.0%	15.1%		0.2%		

[a] All water budget terms expressed as hm^3 (= 1,000,000 m^3); 1 hm^3 ≈ 810.7 ac-ft

[b] I_s = surface water inflow I_g = groundwater inflow; P = precipitation; O_s = surface water outflow; O_g = groundwater outflow; ET = evapotranspiration; ΔS = change in storage volume; r = water budget residual: (Σoutflow +ΔS)- Σinflow; ε = water budget error: r ÷ [(Σinflow+Σoutflow)/2]

Table 2. Annual and period of record total phosphorus (TP) mass balance budgets for STA treatment cells and flow-ways.[a]

	Inflows[b]			Outflows[b]				
	I_s	P	∑inflow	O_s	O_g	∑outflow	Retained	% Ret
STA-1E, Cell 3								
WY2007	4.344	0.008	4.353	3.449	0.000	3.449	0.904	20.8%
WY2008	15.659	0.011	15.670	15.623	0.000	15.623	0.048	0.3%
POR	20.004	0.019	20.023	19.071	0.000	19.071	0.951	4.8%
%In	99.90%	0.10%	*% Out*	100.00%	0.00%			
STA-1E, Cell 4N								
WY2007	3.449	0.009	3.458	1.724	0.000	1.724	1.734	50.1%
WY2008	15.623	0.012	15.634	4.752	0.000	4.752	10.883	69.6%
POR	19.071	0.021	19.092	6.476	0.000	6.476	12.617	66.1%
%In	99.89%	0.10%	*% Out*	100.00%	0.00%			
STA-1E, Cell 4S								
WY2007	2.756	0.011	2.767	1.055	0.000	1.055	1.712	61.9%
WY2008	6.061	0.014	6.074	2.724	0.000	2.724	3.350	55.2%
POR	8.817	0.024	8.842	3.779	0.000	3.779	5.063	57.3%
%In	99.72%	0.12%	*% Out*	100.00%	0.00%			
STA-1E, Cell 5								
WY2007	20.578	0.008	20.586	6.894	0.000	6.894	13.693	66.5%
WY2008	1.098	0.010	1.108	1.558	0.000	1.558	-0.450	-40.6%
POR	21.676	0.019	21.694	8.452	0.000	8.452	13.242	61.0%
%In	99.91%	0.09%	*% Out*	100.00%	0.00%			
STA-1E, Cell 6								
WY2007	15.267	0.015	15.282	10.178	0.000	10.178	5.103	33.4%
WY2008	2.359	0.019	2.378	1.510	0.000	1.510	0.868	36.5%
POR	17.626	0.034	17.660	11.688	0.000	11.688	5.972	33.8%
%In	99.81%	0.19%	*% Out*	100.00%	0.00%			
STA-1E, Cell 7								
WY2007	8.039	0.006	8.045	8.373	0.000	8.373	-0.328	-4.1%
WY2008	1.759	0.008	1.767	0.801	0.000	0.801	0.966	54.7%
POR	9.798	0.014	9.811	9.174	0.000	9.174	0.638	6.5%
%In	99.86%	0.14%	*% Out*	100.00%	0.00%			
STA-1W, Cell 1								
WY2001	13.425	0.021	13.445	6.247	0.648	6.895	6.550	48.7%
WY2002	16.340	0.031	16.371	9.467	0.517	9.984	6.387	39.0%
WY2003	45.207	0.025	45.232	31.970	0.725	32.695	12.537	27.7%
WY2004	23.391	0.020	23.411	22.425	0.549	22.974	0.438	1.9%
WY2005	43.326	0.026	43.351	64.154	0.576	64.730	-21.379	-49.3%
WY2006	27.867	0.027	27.894	26.613	0.083	26.695	1.198	4.3%
WY2007	27.707	0.023	27.731	20.157	0.000	20.157	7.574	27.3%
WY2008	6.374	0.029	6.402	4.293	0.000	4.293	2.110	33.0%
POR	203.636	0.201	203.837	185.323	3.098	188.422	15.416	7.6%
%In	99.90%	0.10%	*% Out*	98.36%	1.64%			

Table 2. Continued.

	Inflows[b]			Outflows[b]				
	I_s	P	∑inflow	O_s	O_g	∑outflow	Retained	% Ret
STA-1W, Cell 2								
WY2001	4.300	0.015	4.315	3.678	0.000	3.678	0.637	14.8%
WY2002	6.300	0.022	6.323	3.599	0.000	3.599	2.723	43.1%
WY2003	23.266	0.018	23.284	20.733	0.000	20.733	2.551	11.0%
WY2004	10.606	0.014	10.620	18.868	0.000	18.868	-8.247	-77.7%
WY2005	30.353	0.016	30.369	14.222	0.000	14.222	16.147	53.2%
WY2006	--	0.017	0.017	0.922	0.000	0.922	-0.905	<-900%
WY2007	--	0.015	0.015	--	0.000	0.000	0.015	100.0%
WY2008	4.075	0.018	4.093	--	0.000	0.000	4.093	100.0%
POR	78.901	0.135	79.036	62.022	0.000	62.022	17.014	21.5%
%In	99.83%	0.17%	*% Out*	100.00%	0.00%			
STA-1W, Cell 3								
WY2001	2.288	0.014	2.302	2.133	0.203	2.336	-0.034	-1.5%
WY2002	3.819	0.022	3.841	3.338	0.169	3.507	0.334	8.7%
WY2003	12.480	0.017	12.498	8.405	0.253	8.657	3.840	30.7%
WY2004	13.324	0.014	13.338	6.462	0.289	6.751	6.587	49.4%
WY2005	33.056	0.018	33.073	18.516	0.324	18.840	14.233	43.0%
WY2006	26.340	0.018	26.359	14.530	0.048	14.578	11.781	44.7%
WY2007	20.552	0.016	20.568	16.766	0.000	16.766	3.802	18.5%
WY2008	0.134	0.020	0.154	1.713	0.000	1.713	-1.559	<-900%
POR	111.993	0.139	112.132	71.863	1.286	73.149	38.983	34.8%
%In	99.88%	0.12%	*% Out*	98.24%	1.76%			
STA-1W, Cell 4								
WY2001	3.678	0.005	3.683	1.028	0.000	1.028	2.655	72.1%
WY2002	3.599	0.008	3.607	2.189	0.000	2.189	1.418	39.3%
WY2003	20.733	0.006	20.739	13.348	0.000	13.348	7.391	35.6%
WY2004	18.868	0.005	18.873	9.327	0.000	9.327	9.546	50.6%
WY2005	14.222	0.006	14.228	12.776	0.000	12.776	1.452	10.2%
WY2006	0.922	0.006	0.928	0.089	0.000	0.089	0.839	90.4%
WY2007	--	0.006	0.006	1.047	0.000	1.047	-1.042	<-900%
WY2008	--	0.007	0.007	0.779	0.000	0.779	-0.772	<-900%
POR	62.022	0.049	62.071	40.584	0.000	40.584	21.487	34.6%
%In	99.92%	0.08%	*% Out*	100.00%	0.00%			

Table 2. Continued.

	Inflows[b]			Outflows[b]				
	I_s	P	∑inflow	O_s	O_g	∑outflow	Retained	% Ret
STA-1W,								
WY2001	-1.270	0.044	-1.226	1.286	0.000	1.286	-2.512	204.9%
WY2002	5.546	0.066	5.612	19.482	0.000	19.482	-13.870	-247%
WY2003	67.469	0.053	67.522	29.728	0.000	29.728	37.794	56.0%
WY2004	19.965	0.043	20.007	5.878	0.000	5.878	14.129	70.6%
WY2005	59.251	0.049	59.300	40.753	0.000	40.753	18.547	31.3%
WY2006	9.267	0.051	9.318	11.390	0.000	11.390	-2.072	-22.2%
WY2007	0.412	0.045	0.457	1.267	0.000	1.267	-0.810	-177%
WY2006	6.641	0.042	6.683	0.537	0.011	0.548	6.135	91.8%
WY2007	10.960	0.035	10.995	0.766	0.021	0.787	10.208	92.8%
WY2008	8.149	0.043	8.192	0.887	0.018	0.905	7.288	89.0%
POR	41.631	0.235	41.866	4.257	0.084	4.341	37.525	89.6%
%In	99.44%	0.56%	*% Out*	98.05%	1.95%			
STA-2, Cell 2								
WY2003	10.279	0.046	10.325	2.486	0.013	2.499	7.826	75.8%
WY2004	10.571	0.042	10.613	1.750	0.022	1.773	8.840	83.3%
WY2005	20.302	0.040	20.342	6.266	0.057	6.324	14.018	68.9%
WY2006	17.139	0.046	17.185	3.310	0.044	3.354	13.831	80.5%
WY2007	27.211	0.039	27.250	7.980	0.103	8.082	19.168	70.3%
WY2008	9.241	0.048	9.289	2.759	0.015	2.774	6.515	70.1%
POR	94.743	0.262	95.004	24.551	0.254	24.806	70.199	73.9%
%In	99.72%	0.28%	*% Out*	98.97%	1.03%			
STA-2, Cell 3								
WY2003	9.528	0.046	9.574	2.246	0.493	2.739	6.835	71.4%
WY2004	11.368	0.042	11.410	1.701	0.463	2.163	9.246	81.0%
WY2005	18.874	0.040	18.913	2.521	0.420	2.941	15.973	84.5%
WY2006	13.166	0.046	13.212	2.301	0.390	2.691	10.521	79.6%
WY2007	9.716	0.039	9.755	2.203	0.529	2.732	7.023	72.0%
WY2008	12.296	0.048	12.344	1.969	0.481	2.450	9.894	80.2%
POR	74.947	0.262	75.209	12.941	2.775	15.716	59.493	79.1%
%In	99.65%	0.35%	*% Out*	82.34%	17.66%			
STA-3/4, Cell 1A								
WY2006	35.700	0.068	35.767	33.199	0.000	33.199	2.569	7.2%
WY2007	28.233	0.051	28.284	0.861	0.000	0.861	27.423	97.0%
WY2008	14.137	0.058	14.195	9.046	0.000	9.046	5.148	36.3%
POR	78.070	0.177	78.246	43.106	0.000	43.106	35.140	44.9%
%In	99.77%	0.23%	*% Out*	100.00%	0.00%			
STA-3/4, Cell 1B								
WY2006	33.188	0.078	33.266	11.909	0.000	11.909	21.357	64.2%
WY2007	0.959	0.059	1.018	4.299	0.000	4.299	-3.281	-
WY2008	9.046	0.066	9.113	3.107	0.000	3.107	6.006	65.9%
POR	43.194	0.203	43.397	19.314	0.000	19.314	24.083	55.5%
%In	99.53%	0.47%	*% Out*	100.00%	0.00%			

Table 2. Continued.

	Inflows[b]			Outflows[b]				
	I_s	P	∑inflow	O_s	O_g	∑outflow	Retained	% Ret
STA-3/4, Cell 2A								
WY2006	33.974	0.057	34.030	24.156	0.000	24.156	9.874	29.0%
WY2007	13.262	0.043	13.305	1.124	0.000	1.124	12.181	91.6%
WY2008	5.176	0.048	5.225	-0.999	0.000	-0.999	6.223	119.1%
POR	52.412	0.148	52.559	24.281	0.000	24.281	28.278	53.8%
%In	99.72%	0.28%	*% Out*	100.00%	0.00%			
STA-3/4, Cell 2B								
WY2006	24.392	0.064	24.456	8.088	0.000	8.088	16.368	66.9%
WY2007	1.499	0.049	1.548	3.282	0.000	3.282	-1.734	-112%
WY2008	-1.174	0.055	-1.119	2.140	0.000	2.140	-3.259	291.3%
POR	24.717	0.168	24.885	13.511	0.000	13.511	11.374	45.7%
%In	99.32%	0.68%	*% Out*	100.00%	0.00%			
STA-3/4, Cell 3								
WY2006	9.072	0.102	9.174	2.562	0.000	2.562	6.612	72.1%
WY2007	11.509	0.077	11.586	2.584	0.000	2.584	9.002	77.7%
WY2008	8.449	0.087	8.536	1.981	0.000	1.981	6.555	76.8%
POR	29.029	0.266	29.296	7.127	0.000	7.127	22.169	75.7%
%In	99.09%	0.91%	*% Out*	100.00%	0.00%			
STA-5, North Flow-way								
WY2001	5.584	0.033	5.616	3.598	1.388	4.986	0.630	11.2%
WY2002	23.606	0.030	23.636	8.762	1.456	10.218	13.418	56.8%
WY2003	23.428	0.040	23.468	17.965	1.508	19.473	3.995	17.0%
WY2004	21.015	0.039	21.053	8.406	1.065	9.471	11.582	55.0%
WY2005	15.037	0.036	15.073	5.662	0.704	6.366	8.707	57.8%
WY2006	27.966	0.034	28.000	12.444	1.530	13.974	14.026	50.1%
WY2007	18.613	0.036	18.648	11.911	1.752	13.663	4.986	26.7%
WY2008	1.256	0.038	1.294	0.426	0.245	0.671	0.623	48.1%
POR	136.505	0.285	136.789	69.174	9.648	78.822	57.967	42.4%
%In	99.79%	0.21%	*% Out*	87.76%	12.24%			
STA-5, South Flow-way								
WY2001	10.815	0.033	10.848	1.288	2.564	3.852	6.996	64.5%
WY2002	26.156	0.030	26.186	4.110	3.119	7.229	18.957	72.4%
WY2003	35.285	0.040	35.325	8.491	6.155	14.646	20.679	58.5%
WY2004	28.327	0.039	28.365	8.000	6.403	14.403	13.962	49.2%
WY2005	10.938	0.036	10.973	6.558	4.477	11.035	-0.062	-0.6%
WY2006	25.399	0.034	25.433	11.199	2.871	14.070	11.363	44.7%
WY2007	3.623	0.036	3.659	0.947	0.615	1.562	2.096	57.3%
WY2008	1.327	0.038	1.366	0.410	0.078	0.488	0.878	64.3%
POR	141.870	0.285	142.155	41.004	26.282	67.286	74.869	52.7%
%In	99.8%	0.2%	*% Out*	60.94%	39.06%			

Table 2. Continued.

	Inflows[b]			Outflows[b]				
	I_s	P	∑inflow	O_s	O_g	∑outflow	Retained	% Ret
STA-6, Cell 3								
WY2003	0.973	0.005	0.978	0.496	0.242	0.738	0.240	24.5%
WY2004	0.799	0.006	0.805	0.277	0.237	0.514	0.291	36.1%
WY2005	1.767	0.005	1.772	0.239	0.312	0.551	1.221	68.9%
WY2006	1.527	0.005	1.532	0.500	0.241	0.740	0.791	51.7%
WY2007	1.084	0.003	1.087	0.438	0.443	0.880	0.207	19.0%
WY2008	0.207	0.005	0.211	0.070	0.296	0.366	-0.155	-73.3%
POR	6.357	0.027	6.385	2.019	1.771	3.790	2.595	40.6%
%In	99.57%	0.43%	*% Out*	53.28%	46.72%			
STA-6, Cell 5								
WY2003	1.107	0.013	1.119	0.643	0.158	0.801	0.318	28.4%
WY2004	0.888	0.014	0.902	0.284	0.088	0.372	0.530	58.7%
WY2005	1.420	0.013	1.433	0.276	0.146	0.422	1.011	70.5%
WY2006	1.207	0.012	1.219	0.193	0.068	0.261	0.958	78.6%
WY2007	3.851	0.007	3.858	0.487	0.514	1.001	2.857	74.1%
WY2008	0.383	0.012	0.395	0.047	0.092	0.139	0.256	64.9%
POR	8.856	0.070	8.927	1.930	1.066	2.996	5.930	66.4%
%In	99.21%	0.79%	*% Out*	64.42%	35.58%			

[a] All budget terms expressed as metric tons of phosphorus

[b] I_s = surface water inflow; P = precipitation; O_s = surface water outflow; O_g = groundwater outflow; Retained = Σinflow – Σoutflow; %Ret = (retained/Σinflow)*100

Table 3. Summary of annual and period of record hydraulic loading rate (HLR), TP areal loading rate, inflow and outflow flow-weighted mean (FWM) TP concentrations, and TP removal coefficient (k) for STA treatment cells and flow-ways.[a]

				FWM TP conc.		
		HLR	TP loading	Inflow	Outflow	k
		(cm/day)	(mg P/m^2/yr)	(mg/L)	(mg/L)	(m/yr)
STA-1E, Cell 3	WY2007	3.5	1.823	0.143	0.067	13.2
	WY2008	13.8	6.570	0.130	0.103	13.6
	POR	8.6	4.196	0.133	0.094	13.0
STA-1E, Cell 4N	WY2007	5.4	1.321	0.067	0.029	17.4
	WY2008	15.9	5.985	0.103	0.027	83.4
	POR	10.7	3.653	0.094	0.028	51.1
STA-1E, Cell 4S	WY2007	6.3	0.906	0.039	0.022	11.4
	WY2008	17.4	1.992	0.031	0.019	29.4
	POR	11.8	1.449	0.034	0.019	20.6
STA-1E, Cell 5	WY2007	5.4	8.905	0.454	0.244	9.9
	WY2008	0.9	0.475	0.145	0.131	0.4
	POR	3.1	4.690	0.410	0.210	6.7
STA-1E, Cell 6	WY2007	4.3	3.596	0.229	0.157	5.8
	WY2008	1.3	0.556	0.120	0.050	5.2
	POR	2.8	2.076	0.204	0.123	5.4
STA-1E, Cell 7	WY2007	5.1	4.752	0.255	0.218	3.2
	WY2008	2.1	1.040	0.135	0.104	1.6
	POR	3.6	2.896	0.220	0.199	1.3
STA-1W, Cell 1	WY2000	3.1	1.822	0.161	0.073	13.9
	WY2001	5.7	2.226	0.107	0.066	8.8
	WY2002	7.1	2.710	0.104	0.061	13.6
	WY2003	13.6	7.497	0.151	0.101	20.6
	WY2004	8.8	3.879	0.121	0.116	1.4
	WY2005	9.3	7.185	0.211	0.235	-4.3
	WY2006	6.3	4.622	0.200	0.195	0.6
	WY2007	5.5	4.595	0.229	0.200	2.4
	WY2008	2.1	1.057	0.140	0.124	0.8
	POR	6.8	3.955	0.158	0.135	4.1
STA-1W, Cell 2	WY2000	4.8	2.346	0.134	0.092	5.8
	WY2001	2.8	1.129	0.112	0.078	4.1
	WY2002	4.8	1.654	0.095	0.058	8.2
	WY2003	10.6	6.110	0.159	0.136	5.9
	WY2004	5.4	2.785	0.141	0.138	0.6
	WY2005	7.0	7.971	0.311	0.296	1.0
	WY2006	--	--	--	0.132	--
	WY2007	--	--	--	--	--
	WY2008	2.2	1.070	0.132	--	--
	POR	4.2	2.563	0.168	0.132	3.6

Table 3. Continued.

		HLR (cm/day)	TP loading (mg P/m^2/yr)	FWM TP conc. Inflow (mg/L)	FWM TP conc. Outflow (mg/L)	k (m/yr)
STA-1W, Cell 3	WY2000	9.0	0.773	0.024	0.025	-1.6
	WY2001	5.3	0.551	0.028	0.027	1.1
	WY2002	8.8	0.920	0.029	0.026	2.9
	WY2003	16.5	3.006	0.050	0.041	10.7
	WY2004	10.2	3.209	0.086	0.049	19.5
	WY2005	12.4	7.961	0.176	0.115	18.0
	WY2006	8.7	6.344	0.200	0.128	13.2
	WY2007	6.5	4.950	0.209	0.166	5.6
	WY2008	0.2	0.043	0.051	0.117	-1.7
	POR	8.6	3.171	0.098	0.070	10.2
STA-1W, Cell 4	WY2000	9.8	3.284	0.092	0.027	52.4
	WY2001	9.0	2.539	0.078	0.027	31.9
	WY2002	11.7	2.484	0.058	0.027	37.6
	WY2003	28.7	14.311	0.136	0.069	82.1
	WY2004	25.7	13.023	0.138	0.074	56.7
	WY2005	9.1	9.816	0.296	0.155	29.1
	WY2006	1.3	0.636	0.132	0.148	-0.3
	WY2007	--	--	--	0.127	--
	WY2008	--	--	--	0.026	--
	POR	10.6	5.121	0.132	0.067	29.6
STA-1W, Cell 5 Flow-way	WY2001	-0.4	-0.120	0.085	0.073	<0.1
	WY2002	1.1	0.480	0.123	0.098	2.4
	WY2003	10.3	5.840	0.155	0.069	29.9
	WY2004	3.3	1.728	0.142	0.045	13.4
	WY2005	5.5	5.128	0.253	0.175	7.4
	WY2006	1.0	0.802	0.210	0.220	-0.2
	WY2007	0.0	0.036	0.216	0.036	2.9
	WY2008	1.2	0.786	0.179	0.031	12.8
	POR	2.8	1.856	0.181	0.094	7.7
STA-2, Cell 1	WY2003	2.2	0.450	0.057	0.014	9.1
	WY2004	3.0	0.840	0.078	0.014	16.9
	WY2005	2.6	0.911	0.097	0.010	21.9
	WY2006	2.8	0.920	0.090	0.008	24.8
	WY2007	2.7	1.519	0.151	0.009	29.8
	WY2008	3.6	1.129	0.087	0.012	23.8
	POR	2.8	0.962	0.094	0.011	21.2

Table 3. Continued.

				FWM TP conc.		
		HLR (cm/day)	TP loading (mg P/m^2/yr)	Inflow (mg/L)	Outflow (mg/L)	k (m/yr)
STA-2, Cell 2	WY2003	4.2	1.066	0.069	0.020	17.5
	WY2004	3.2	1.097	0.095	0.016	20.7
	WY2005	5.1	2.106	0.114	0.038	19.2
	WY2006	4.5	1.778	0.108	0.027	20.0
	WY2007	4.2	2.823	0.186	0.055	18.5
	WY2008	2.1	0.959	0.125	0.036	9.6
	POR	3.9	1.638	0.116	0.033	16.9
STA-2, Cell 3	WY2003	5.3	1.039	0.053	0.016	21.8
	WY2004	4.1	1.240	0.082	0.013	26.8
	WY2005	5.2	2.059	0.109	0.016	34.3
	WY2006	4.1	1.436	0.096	0.018	24.0
	WY2007	2.3	1.060	0.129	0.026	14.3
	WY2008	3.3	1.341	0.113	0.017	23.4
	POR	4.0	1.363	0.092	0.017	24.1
STA-3/4, Cell 1A	WY2006	6.3	2.903	0.126	0.060	24.7
	WY2007	4.6	2.296	0.138	0.044	10.4
	WY2008	3.5	1.150	0.091	0.040	12.5
	POR	4.8	2.116	0.121	0.054	15.6
STA-3/4, Cell 1B	WY2006	10.6	2.351	0.060	0.023	37.0
	WY2007	0.4	0.068	0.043	0.021	5.6
	WY2008	4.3	0.641	0.040	0.019	10.0
	POR	5.1	1.020	0.054	0.022	18.1
STA-3/4, Cell 2A	WY2006	6.8	3.303	0.133	0.061	24.4
	WY2007	3.2	1.289	0.109	0.023	13.0
	WY2008	2.6	0.503	0.053	0.013	1.3
	POR	4.2	1.698	0.110	0.067	6.8
STA-3/4, Cell 2B	WY2006	9.0	2.083	0.063	0.025	27.4
	WY2007	1.3	0.128	0.027	0.022	1.7
	WY2008	-2.0	-0.100	0.014	0.024	-0.1
	POR	2.8	0.703	0.069	0.024	13.5
STA-3/4, Cell 3	WY2006	1.4	0.489	0.096	0.021	9.1
	WY2007	1.5	0.621	0.113	0.025	8.3
	WY2008	2.2	0.456	0.056	0.018	7.8
	POR	1.7	0.522	0.083	0.021	8.4
STA-5, North	WY2001	1.4	0.671	0.129	0.142	-0.4
Flow-way	WY2002	4.0	2.839	0.195	0.085	11.2
	WY2003	4.2	2.817	0.184	0.144	3.6
	WY2004	4.5	2.527	0.155	0.069	12.5
	WY2005	3.7	1.808	0.133	0.063	9.2
	WY2006	5.6	3.363	0.166	0.090	11.4
	WY2007	1.9	2.238	0.322	0.189	3.9
	WY2008	0.3	0.151	0.122	0.090	0.3
	POR	3.2	2.052	0.176	0.103	5.8

Table 3. Continued.

				FWM TP conc.		
		HLR (cm/day)	TP loading (mg P/m^2/yr)	Inflow (mg/L)	Outflow (mg/L)	k (m/yr)
STA-5, South Flow-way	WY2001	1.9	1.300	0.189	0.054	6.1
	WY2002	3.8	3.145	0.228	0.079	10.7
	WY2003	3.9	4.243	0.295	0.116	10.9
	WY2004	2.9	3.406	0.318	0.171	5.0
	WY2005	2.2	1.315	0.161	0.110	2.9
	WY2006	4.1	3.054	0.206	0.103	9.7
	WY2007	0.7	0.436	0.182	0.245	-0.4
	WY2008	0.4	0.160	0.112	0.103	0.1
	POR	2.5	2.132	0.235	0.110	5.6
STA-6, Cell 3	WY2003	9.3	1.071	0.031	0.026	5.2
	WY2004	6.7	0.806	0.033	0.012	23.1
	WY2005	6.3	1.782	0.077	0.018	26.1
	WY2006	5.7	1.540	0.074	0.031	15.9
	WY2007	5.0	1.093	0.059	0.043	4.7
	WY2008	0.9	0.208	0.061	0.057	0.2
	POR	5.6	1.084	0.053	0.025	13.1
STA-6, Cell 5	WY2003	4.1	0.477	0.032	0.026	2.7
	WY2004	2.6	0.351	0.037	0.011	11.6
	WY2005	2.1	0.562	0.072	0.019	8.9
	WY2006	1.6	0.477	0.084	0.013	10.6
	WY2007	1.8	1.522	0.226	0.047	8.6
	WY2008	0.5	0.151	0.079	0.026	1.5
	POR	2.1	0.592	0.077	0.021	8.9

[a] All HLRs and TP loading rates calculated based on inflow surface water volumes