



APPENDIX F

Water Balance Inputs & Calculations

Monthly Water Balance Analysis - Thornthwaite and Mather model
Township of North Dumfries - Storm Water Management Master Plan, Community of Ayr
The Corporation of the Township of North Dumfries

Total Site Area (ha)		12.80			
Land Description Factors	Area A (Agricultural)	Sub-Area B (Forest)	Sub-Area C (Category)		
	Topography	0.10	0.20	0.20	
	Soils	0.10	0.20	0.20	
	Cover	0.10	0.20	0.20	
Sum (Infiltration Factor)		0.30	0.60	0.60	
Soil Moisture Capacity (mm)		200	100	100	
Site Area		10.80	2.00	0.00	
Percentage of Total Site Area		84%	16%	0%	

100%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Climate Data (Data from Roseville Climate Station, Ontario via Environment Canada Website - 2018)													
Average Daily Temperature (°C)	-6.4	-3.2	-1.4	2.2	17.0	18.8	21.2	21.4	17.8	10.0	-0.4	-1.3	8.0
Precipitation (mm)	64.0	83.2	36.7	97.9	60.1	90.1	52.1	126.7	64.2	85.3	80.7	63.9	904.9
Evapotranspiration Analysis (Sub-Area A)													
Heat Index	0.0	0.0	0.0	0.3	6.4	7.4	8.9	9.1	6.9	2.9	0.0	0.0	42
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	7.7	80.7	90.6	103.7	105.3	85.2	43.7	0.0	0.0	517
Potential Evapotranspiration Adjusting Factor for Latitude	0.81	0.81	1.03	1.12	1.27	1.29	1.30	1.20	1.05	0.95	0.81	0.77	
Adjusted Potential Evapotranspiration (mm)	0	0	0	9	103	117	135	127	89	41	0	0	620
PET (Malstrom, 1969) (mm/month)	0	0	0	9	103	117	135	127	89	41	0	0	620
Precipitation - PET (mm)	64	83	37	89	-42	-27	-83	0	-25	44	81	64	285
Accumulated Potential Water Loss (APWL)	0	0	0	0	-42	-69	-152	-152	-177	-133	-52	0	-778
Storage (S)	200	200	200	200	162	142	94	93	83	126	200	200	
Change in Storage	0	0	0	0	-38	-20	-48	0.0	-11	44	74	0	0
Actual Evapotranspiration (mm)	0	0	0	9	98	110	100	127	75	41	0	0	561
Recharge/Runoff Analysis													
Water Surplus (mm)	64	83	37	89	0	0	0	0	0	0	7	64	344
Potential Infiltration (l)	19	25	11	27	0	0	0	0	0	0	2	19	103
Potential Direct Surface Water Runoff (R)	45	58	26	62	0	0	0	0	0	0	5	45	241
Evapotranspiration (m ³)	0	0	0	940	10,618	11,900	10,829	13,687	8,121	4,464	0	0	60,559
Runoff (m ³)	4,838	6,290	2,775	6,743	0	0	0	0	0	0	542	4,831	26,019
Infiltration (m ³)	2,074	2,696	1,189	2,890	0	0	0	0	0	0	232	2,070	11,151

Evapotranspiration Analysis (Sub-Area B)													
Accumulated Potential Water Loss (APWL)	0	0	0	0	-42	-69	-152	-152	-177	-49	0	0	
Storage (S)	100	100	100	100	65	50	22	22	17	61	100	100	
Change in Storage	0	0	0	0	-35	-15	-28	0	-5	44	39	0	0
Actual Evapotranspiration (mm)	0	0	0	9	95	105	80	127	69	41	0	0	526
Recharge/Runoff Analysis													
Water Surplus (mm)	64	83	37	89	0	0	0	0	0	0	42	64	379
Potential Infiltration (l)	38	50	22	54	0	0	0	0	0	0	25	38	227
Potential Direct Surface Water Runoff (R)	26	33	15	36	0	0	0	0	0	0	17	26	151
Evapotranspiration (m ³)	0	0	0	174	1893	2107	1609	2534	1381	827	0	0	10524
Runoff (m ³)	512	666	294	714	0	0	0	0	0	0	333	511	3029
Infiltration (m ³)	768	998	440	1070	0	0	0	0	0	0	500	767	4544

Water Balance Total	Inputs	Outputs	Water Balance 1	Inputs	Outputs
Precipitation (mm)	904.9		Precipitation (m ³)	115827.2	
Soil Storage (mm)		0.0	Soil Storage (m ³)		0.00
Evapotranspiration+Evaporation (mm)		555	Evapotranspiration+Evaporation (m ³)		71083
Infiltration (mm)		123	Infiltration (m ³)		15695
Runoff (mm)		227	Runoff (m ³)		29049
Total	904.9	904.9	Total	115827.2	115827.2

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Total Site Area (ha)		12.80			
Land Description Factors	Area A (Pervious)	Sub-Area B (Impervious)	Sub-Area C (Category)		
	Topography	0.10	N/A	0.20	
	Soils	0.10	N/A	0.20	
	Cover	0.10	N/A	0.20	
Sum (Infiltration Factor)		0.30	No Infiltration	0.60	
Soil Moisture Capacity (mm)		200	100	100	
Site Area		10.80	2.00	0.00	
Percentage of Total Site Area		84%	16%	0%	

100%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
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Precipitation (mm)	64.0	83.2	36.7	97.9	60.1	90.1	52.1	126.7	64.2	85.3	80.7	63.9	904.9
Evapotranspiration Analysis (Sub-Area A)													
Heat Index	0.0	0.0	0.0	0.3	6.4	7.4	8.9	9.1	6.9	2.9	0.0	0.0	42
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	7.7	80.7	90.6	103.7	105.3	85.2	43.7	0.0	0.0	517
Potential Evapotranspiration Adjusting Factor for Latitude	0.81	0.81	1.03	1.12	1.27	1.29	1.30	1.20	1.05	0.95	0.81	0.77	
Adjusted Potential Evapotranspiration (mm)	0	0	0	9	103	117	135	127	89	41	0	0	620
PET (Malstrom, 1969) (mm/month)	0	0	0	9	103	117	135	127	89	41	0	0	620
Precipitation - PET (mm)	64	83	37	89	-42	-27	-83	0	-25	44	81	64	285
Accumulated Potential Water Loss (APWL)	0	0	0	0	-42	-69	-152	-152	-177	-133	-52	0	-778
Storage (S)	200	200	200	200	162	142	94	93	83	126	200	200	
Change in Storage	0	0	0	0	-38	-20	-48	0	-11	44	74	0	0
Actual Evapotranspiration (mm)	0	0	0	9	98	110	100	127	75	41	0	0	561
Recharge/Runoff Analysis													
Water Surplus (mm)	64	83	37	89	0	0	0	0	0	0	7	64	344
Potential Infiltration (I)	19	25	11	27	0	0	0	0	0	0	2	19	103
Potential Direct Surface Water Runoff (R)	45	58	26	62	0	0	0	0	0	0	5	45	241
Evapotranspiration (m ³)	0	0	0	940	10,618	11,900	10,829	13,687	8,121	4,464	0	0	60,559
Runoff (m ³)	4,838	6,290	2,775	6,743	0	0	0	0	0	0	542	4,831	26,019
Infiltration (m ³)	2,074	2,696	1,189	2,890	0	0	0	0	0	0	232	2,070	11,151

Evaporation Analysis (Sub-Area B - Impervious)													
Evaporation Facotr (assume 20% of precipitation is evaporated from Impervious surfaces)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Actual Evaporation (mm)	13	17	7	20	12	18	10	25	13	17	16	13	181
Recharge/Runoff Analysis													
Potential Infiltration (I)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Direct Surface Water Runoff (R)	51	67	29	78	48	72	42	101	51	68	65	51	724
Evaporation (m ³)	256	333	147	392	240	360	208	507	257	341	323	256	3620
Runoff (m ³)	1024	1331	587	1566	962	1442	834	2027	1027	1365	1291	1022	14478
Infiltration (m ³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Water Balance Total	Inputs	Outputs	Water Balance 1	Inputs	Outputs
Precipitation (mm)	904.9		Precipitation (m [^])	115827.2	
Soil Storage (mm)		0.00	Soil Storage (m ^{^3})		0.00
Evapotranspiration+Evaporation (mm)		501	Evapotranspiration+Evaporation (m [^])	64178.5	
Infiltration (mm)		87	Infiltration (m ^{^3})		11151
Runoff (mm)		316	Runoff (m ^{^3})		40498
Total	904.9	904.9	Total	115827.2	115827.2