



E Appendix - Water Resource Calculations

APPENDIX E – WATER RESOURCES CALCULATIONS

Growth Estimates per Planning Area

Planning Area 1 - Aberdeen

Zoning Class	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
High Density Residential	224.91	361.31	52.14	20	10	587	1456	782
Medium Density Residential	509.27	594.78	135.61	10	3.5	687	1704	1017
Low Density Residential	703.65	672.15	64.23	3.5	1	108	268	168
Mixed Use	117.63	410.95	158.35	20	5	1485	3683	2375
Residential Total	1,555.46	2,039.19	410.33			2867	7,111	4342
Non-Residential Zoning Class			Projected Developable Area*	Estimated Lot Coverage (ac)	EDU Conversion Ratio (# of EDU per acre of land cover)	Resulting EDUs		Resulting EDUs
Commercial	441.88	477.54	78.56	32.4	11.92 EDUs per ac of land cover	386		456
Industrial	605.01	600.08	63.52	26.2	18.76 EDUs per ac of land cover	492		580
Institutional	234.94	271.55	16.11	6.65	33.25 EDUs per ac of land cover	221		261
Open Space /Recreation/ Forested	987.55	436.48	0	N/A	N/A	0		0
Transportation	55.82	55.82	0	N/A	N/A	0		1,297
Non-Residential Total	2,325.20	1,841.47	158.19	374.61		1,099		2,594
Total	3,880.66	3,880.66	568.52			3,966		6,936

Appendix E- Water Resources Calculations

Planning Area 2 – Swan Creek

Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	360.55	360.55	0.00			0	0	0
Total	360.55	360.55	0.00			0	0	0

Planning Area 3 - Pulaski

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	47.75	47.75	27.1	3.5	1	46	114	71
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
High Intensity Commercial	120.85	120.85	21.79	N/A	8.98	107	0	126
Industrial	53.05	53.05	3.02	N/A	1.24	23	0	27
Total	221.65	221.65	51.9	N/A	N/A	176	114	224

Planning Area 4 - Barkess

Land Use Category	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	141.21	84.64	0.00	0.05	0.05	0	0	
Low Density Residential	4.66	4.65	0	3.5	1	0	0	
Medium Density Residential	45.21	234.59	166.52	10	3.5	843	2091	1248.00
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	194.87	62.06	0.00	N/A	N/A	0	0	
Total	385.95	385.94	166.52	N/A	N/A	843	2091	1248

Appendix E- Water Resources Calculations



Planning Area 5 – Old Robinhood

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	384.73	0	0	N/A	N/A	0	0	
Medium Density Residential	0	384.73	229.49	10	3.5	1,162	2,882	1,721
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Open Space / Forested	168.97	168.97	0	N/A	N/A	0	0	
Total	553.7	553.7	229.49	N/A	N/A	1,162	2,882	1,721

Planning Area 6 – Titan Terrace

Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	166.70	178.43	80.69	3.50	1.00	148	367	235
Medium Density Residential	114.44	114.44	11.72	10.00	3.50	59	146	88
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Open Space / Forested	83.26	71.54	0.00			0	0	
Total	364.40	364.41	92.41			207	513	323

Planning Area 7 - Paradise

Appendix E- Water Resources Calculations



Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	135.44	0.67	0	N/A	N/A	0	0	
Low Density Residential	75.86	0	0	N/A	N/A	0	0	
Medium Density Residential	0	210.63	129.52	10	3.5	656	1,627	971
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	40.81	40.81	0	N/A	N/A	0	0	
Total	252.11	252.11	129.52	N/A	N/A	656	1,627	971

Planning Area 8 – Aldino-Stepney

Land Use Category	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	387.60	169.83	149.90	0.05	0.05	6	15	5
Low Density Residential	109.55	0	0	3.5	1	0	0	
Medium Density Residential	0.00	440.49	273.56	10	3.5	1385	3435	2051.00
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	289.34	176.17	0.00	N/A	N/A	0	0	
Total	786.49	786.49	423.46	N/A	N/A	1391	3450	2056

Planning Area 9 - Gilbert

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	212.87	100.16	17.35	3.5	1	29	72	45
Medium Density Residential	0	112.72	28.36	10	3.5	144	357	212
Mixed Use	0	38.88	33.01	20	5	309	766	495
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	38.89	0	N/A	N/A	0	0	0	0
Total	251.76	251.76		N/A	N/A	482	1,195	752

Planning Area 10 – Long/Heat

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	102.06	0	0	N/A	N/A	0	0	
Mixed Use	0	102.06	37.43	20	5	350	868	561
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Institutional	151.14	151.14	68.89	N/A	37.89	945	0	1116
Open Space / Forested	40.91	40.91	0	N/A	N/A	0	0	
Total	294.11	294.11	133.5	N/A	N/A	1,294	868	1,677

Planning Area 11 – Grays

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	280.78	360.92	272.77	3.5	1	460	1141	715
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Open Space / Forested	556.05	475.91	0	N/A	N/A	0	0	
Institutional	0.04	0.04	0	N/A	N/A	0	0	
Total	836.87	836.87	272.77	N/A	N/A	460	1141	715

Planning Area 12 – Bush Chapel

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	235.12	0	0	N/A	N/A	0	0	
Low Density Residential	132.63	0	0	N/A	N/A	0	0	
Medium Density Residential	0	247.42	148.68	10	3.5	753	1,867	1,115
High Density Residential	0	132.63	78.48	20	10	883	2,190	1,177
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Industrial	9.33	9.33	7.85	N/A	3.23	61	0	71
Open Space / Forested	391.48	355.58	0	N/A	N/A	0	0	
Total	775.93	775.93	235.01	N/A	N/A	1,697	4,057	2,363

Planning Area 13 – Old Philadelphia

Appendix E- Water Resources Calculations



Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	35.94	0	0	N/A	N/A	0	0	
Medium Density Residential	0	55.89	26.44	10	3.5	134	332	198
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
High Intensity Commercial	57.86	57.86	2.98	N/A	1.22	15	0	17
Industrial	5.34	5.34	0	N/A	N/A	0	0	
Open Space / Forested	67.45	47.5	0	N/A	N/A	0	0	
Total	166.59	166.59	29.57	N/A	N/A	149	332	215

Appendix E- Water Resources Calculations



Water Flows for City of Aberdeen & Proposed Growth Areas (in GPD) for Average Density Yield

Location		EDU	City		No Planned Service ⁴		Total (City + No Planned Service)	
			AD ¹	PD ²	AD ¹	PD ²	AD ¹	PD ²
Planning Area 1—Aberdeen	Existing ³	5,301	1,325,268	1,709,596			1,325,268	1,709,596
	Infill	3,966	991,500	1,279,035			991,500	1,279,035
Planning Area 2—Swan Creek		0	0	0			0	0
Planning Area 3—Pulaski		114	28,500	36,765			28,500	36,765
Planning Area 4—Barkess		843	210,750	271,868			210,750	271,868
Planning Area 5—Old Robinhood		1,162	290,500	374,745			290,500	374,745
Planning Area 6—Titan Terrace		207	51,750	66,758			51,750	66,758
Planning Area 7—Paradise		656	164,000	211,560			164,000	211,560
Planning Area 8—Aldino-Stepney		1,391			347,750	448,598	347,750	448,598
Planning Area 9—Gilbert		482			120,500	155,445	120,500	155,445
Planning Area 10—Long/Heat		1,294	323,500	417,315			323,500	417,315
Planning Area 11—Grays		460			115,000	148,350	115,000	148,350
Planning Area 12—Bush Chapel		1,697	424,250	547,283			424,250	547,283
Planning Area 13—Old Philadelphia		149			37,250	48,053	37,250	48,053
New Demand		12,421	2,484,750	3,205,328	620,500	800,445	3,105,250	4,005,773
Total (Existing + New)		17,722	3,810,018	4,484,363	620,500	800,445	4,096,750	5,284,808
Currently Available from City Sources (wells and bulk purchase)			3,300,000	4,000,000			3,300,000	4,000,000
80% Permit Capacity			2,640,000	3,200,000			2,640,000	3,200,000

¹Average Day (AD) demand determined as 248 gpd/EDU.

²Peaking Factor of 1.29 and is used to determine Peak Day (PD) demand. See Table 10-2 for Peak Factor calculation.

³Existing EDUs based on average daily influent flow from 2017 to 2021 (5-yr average) divided by 250 gpd/EDU.

⁴Areas mapped as “No Planned Service” in the Harford County Water and Sewer Master Plan. Proposed EDU’s for these growth areas is zero. Infrastructure extension to these areas is not expected in the near future.

Appendix E- Water Resources Calculations



Wastewater Flows for City of Aberdeen & Proposed Growth Areas (in GPD) for Average Density Yield

Location	EDU	City		No Planned Service ⁴		Total AWWTP Flows (City + No Planned Service)	
		AD ¹	PD ²	AD ¹	PD ²	AD ¹	PD ²
Planning Area 1—Aberdeen	Existing ³	7,133	1,783,333	6,520,000		1,783,333	6,520,000
	Infill	3,966	991,500	3,618,975		991,500	3,618,975
Planning Area 2—Swan Creek ⁴	0	0	0			0	0
Planning Area 3—Pulaski	114	28,500	104,025			28,500	104,025
Planning Area 4—Barkess	843	210,750	769,238			210,750	769,238
Planning Area 5—Old Robinhood	1,162	290,500	1,060,325			290,500	1,060,325
Planning Area 6—Titan Terrace	207	51,750	188,888			51,750	188,888
Planning Area 7—Paradise	656	164,000	598,600			164,000	598,600
Planning Area 8—Aldino-Stepney	1,391			347,750	1,269,288	347,750	1,269,288
Planning Area 9—Gilbert	482			120,500	439,825	120,500	439,825
Planning Area 10—Long/Heat	1,294	323,500	1,180,775			323,500	1,180,775
Planning Area 11—Grays	460			115,000	419,750	115,000	419,750
Planning Area 12—Bush Chapel	1,697	424,250	1,548,513			424,250	1,548,513
Planning Area 13—Old Philadelphia	149			37,250	135,963	37,250	135,963
New Demand	12,421	2,484,750	9,069,338	620,500	2,264,825	3,105,250	11,334,163
Total (Existing + New)	19,554	4,268,083	12,688,313	620,500	2,264,825	4,888,583	17,854,163
WWTP Permit Capacity		4,000,000				4,000,000	
WWTP 80% Permit Capacity		3,200,000				3,200,000	

¹Average Day (AD) demand determined as 248 gpd/EDU.

²Peaking Factor of 3.65 and is used to determine Peak Day (PD) demand. See Table 10-5 for Peak Factor calculation.

³Existing EDUs based on average daily influent flow from 2019 to 2021 (3-yr average) divided by 250 gpd/EDU.

⁴Areas mapped as “No Planned Service” in the Harford County Water and Sewer Master Plan. Proposed EDU’s for these growth areas is zero. Infrastructure extension to these areas is not expected in the near future.

STORMWATER ASSESSMENT

The non-point source pollution and stormwater management discussion in Chapter 10 is intended to inform the land use process by evaluating receiving waters and ensuring that the land use planning and management process is used as an instrument to manage non-point source pollution. This process aims to support anti-degradation goals for water quality by balancing the assimilative capacity of receiving waters with estimated pollutant loads stemming from current, and future, point- and non-point sources of water pollution. The calculations and data featured in Chapter 10 utilized the following assumptions and criteria.

- Pollutant loads from primary sources for the existing condition scenario were estimated using the Simple Method¹ calculations for each of the three watersheds covering Aberdeen and the Planning Areas. These existing conditions were compared to estimated pollutant loads from primary sources associated with the future growth scenarios for each watershed.
 - Primary sources of pollutant load in this context are total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS) and Fecal Coliform (FC). This Appendix contains calculations for all four primary sources of pollutant loads.
 - Nutrient pollution is defined as excess amounts of nitrogen and phosphorous in aquatic systems. Therefore, the comparisons within the text of Chapter 10 focus on the nitrogen and phosphorous loads.
- The only secondary pollutant load sources that were considered in this analysis were those sites with an active NPDES Discharge permit. Tables detailing wastewater treatments plants, permitted pollutant loads and permit thresholds are listed in Chapter 10.
- To develop an estimate of the non-point source pollutant loading stemming from projected future growth scenarios, impervious cover percentages associated with each generalized land use designation were derived from materials created by the Center for Watershed Protection and are shown below²:

¹ The Simple Method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$L=0.266 \times R \times C$$

Where:

L = Annual load (lbs)

R = Annual runoff (inches)

C = Pollutant concentration (mg/l)

A = Area (acres)

0.226 = A conversion factor

² See Cappiella, K. and K. Brown. 2000. *Derivations of Impervious Cover for Suburban Land Uses in the Chesapeake Bay Watershed*. Center for Watershed Protection. Ellicott City, MD.

Table 3.2 Impervious Cover (%) for Various Land Uses
(adapted from: Capiella and Brown, 2000)

Land Use Category	Sample Number (N)	Mean Impervious Cover (%)
Agriculture	8	2
Open Urban Land	11	9
2 Acre Lot Residential	12	11
1 Acre Lot Residential	23	14
1/2 Acre Lot Residential	20	21
1/4 Acre Lot Residential	23	28
1/8 Acre Lot Residential	10	33
Townhome Residential	20	41
Multifamily Residential	18	44
Institutional	30	34
Light Industrial	20	53
Commercial	23	72
Roadway*	--	80

* % for roadway was obtained using best professional judgment

- Converting the impervious cover to quantifiable pollutant loads for each land use class also utilized research from the Center for Watershed Protection in conjunction with the University of Alabama.
 - The pollutant concentrations from urban land³ uses were calculated using the following values⁴:
 - Total Nitrogen (mg/l)
 - Residential 2.1
 - Commercial 2.1
 - Roadway 2.3
 - Industrial 2.2
 - Total Phosphorus (mg/l)
 - Residential 0.31
 - Commercial 0.22

³ Urban land includes seven general categories: residential, commercial, industrial, forest, rural and open water. Residential land use is then broken into four more detailed land use categories: low-, medium-, and high-density and multifamily.

⁴ Values obtain from Pitt, R., Maestre, A., Morquecho, R., Brown, T., Schueler, T., Capiella, K., and Sturm, P. (2005). *Evaluation of NPDES Phase I Municipal Stormwater Monitoring Data*. University of Alabama and the Center for Watershed Protection.

- Roadway 0.25
- Industrial 0.25
- The pollutant concentrations from the non-urban⁵ land uses were calculated using the following values⁶:
 - Total Nitrogen (lbs/acre/year)
 - Forest 2.0
 - Rural 5.0
 - Total Phosphorus (lbs/acre/year)
 - Forest 0.2
 - Rural 0.5
- For the purposes of these calculations:
 - “Park” land use was considered “Forest”
 - “Agricultural” land use was considered “Rural”
 - “Municipal,” “Mixed Office,” “University,” and “Military” land uses were considered “Commercial”
 - “Transportation” land use was considered “Roadway”
- The analysis to compare the pollutant loads associated with the existing conditions against pollutant loads from proposed conditions did not integrate (as a discount or credit) any existing or proposed stormwater control programs such as public education efforts, erosion and sediment controls, street sweeping, impervious cover disconnection, stream restoration, or similar direct and indirect treatment methods.

⁵ Non-urban land includes rural land and forest.

⁶ Values utilized are roughly the average of the values noted in Lizarraga, J. 1997. Estimation and Analysis of Nutrient and Suspended Sediment Loads at Selected Sites in the Potomac River Basin, 1993-1995. USGS. *Water Resources Investigations Report*. 97-4154 .

Appendix E- Water Resources Calculations



Stormwater Pollutant Source Primary Loads

Current Land Use by Watershed

Row Labels	Sum of REV_ACRES
Aberdeen Proving Ground	420.955666
High-Density Residential	4.845200871
Highway Commercial	94.86369644
Industrial	96.35528298
Institutional	5.421981418
Low-Density Residential	32.39558846
Medium-Density Residential	164.6882365
Open Space / Forested	13.3458302
Recreation/Open Space	5.127945258
Transportation	3.911903828
Bush River	1019.740474
High-Density Residential	57.1204676
Highway Commercial	181.2867892
Industrial	446.1799794
Institutional	20.15514882
Low-Density Residential	94.64862772
Medium-Density Residential	125.1168393
Mixed-Use	0.344505063
Open Space / Forested	74.21370903
Recreation/Open Space	16.71095798
Transportation	3.963450191
Swan Creek	2439.984748
High-Density Residential	162.943621
Highway Commercial	160.6508585
Industrial	62.48182204
Institutional	209.3678257
Low-Density Residential	576.606243
Medium-Density Residential	219.4630016
Mixed-Use	117.287577
Neighborhood Commercial	5.079642621
Open Space / Forested	644.0901212
Recreation/Open Space	234.0651388
Transportation	47.94889629
Grand Total	3880.680888

Appendix E- Water Resources Calculations

Future Land Use by Watershed

Row Labels	Sum of REV_ACRES
Aberdeen Proving Ground	420.955666
High-Density Residential	41.19451543
Highway Commercial	84.85621531
Industrial	96.35528298
Institutional	5.421981418
Low-Density Residential	4.255489376
Medium-Density Residential	155.366382
Mixed-Use	18.24273342
Neighborhood Commercial	0.537269513
Open Space / Forested	5.685947412
Recreation/Open Space	5.127945258
Transportation	3.911903828
Bush River	1019.740474
High-Density Residential	109.1263634
Highway Commercial	191.6012356
Industrial	446.1799794
Institutional	28.51476069
Low-Density Residential	74.45781537
Medium-Density Residential	124.4488654
Open Space / Forested	27.06495158
Recreation/Open Space	14.38305268
Transportation	3.963450191
Swan Creek	2439.984748
Central Commercial	0.47611436
High-Density Residential	210.9843561
Highway Commercial	195.7165748
Industrial	57.54861904
Institutional	237.6227182
Integrated Business Commercial	0.332467952
Low-Density Residential	593.444159
Medium-Density Residential	314.9637524
Mixed-Use	392.7025389
Neighborhood Commercial	4.024399231
Open Space / Forested	330.4778303
Recreation/Open Space	53.74232127
Transportation	47.94889629
Grand Total	3880.680888

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Planning Area Current Land Use	
Row Labels	Sum of REV_Acres
Aldino-Stepney	786.4945455
Agriculture	387.6046386
Swan Creek	387.6046386
Low Density Residential	109.5491604
Swan Creek	109.5491604
Open Space / Forested	289.3407464
Swan Creek	289.3407464
Barkess	385.9570118
Agriculture	141.2135892
Swan Creek	141.2135892
Low Density Residential	4.657025699
Swan Creek	4.657025699
Medium Density Residential	45.21427774
Swan Creek	45.21427774
Open Space / Forested	194.8721192
Swan Creek	194.8721192
Bush Chapel	764.7412286
Agriculture	235.1213822
Bush River	235.1213822
Industrial	9.338940663
Bush River	9.338940663
Low Density Residential	132.6297306
Bush River	132.6297306
Open Space / Forested	387.6511752
Bush River	387.6511752
Gilbert	251.7561097
Low Density Residential	212.8684396
Swan Creek	212.8684396
Open Space / Forested	38.88767009
Swan Creek	38.88767009
Grays	836.8679489
Institutional	0.038025123
Bush River	0.038025123
Low Density Residential	280.7849032
Bush River	280.7849032
Open Space / Forested	556.0450206
Bush River	556.0450206

Appendix E- Water Resources Calculations

Long/Heat	290.701212
Agriculture	0.000168708
Swan Creek	0.000168708
Institutional	150.1096867
Bush River	147.1380964
Swan Creek	2.971590276
Low Density Residential	99.68120042
Bush River	38.16236244
Swan Creek	61.51883798
Open Space / Forested	40.91015622
Bush River	40.91015622
Old Philadelphia	167.0524376
High Intensity Commercial	58.31520099
Bush River	58.31520099
Industrial	5.350898289
Bush River	5.350898289
Low Density Residential	35.9384194
Bush River	35.9384194
Open Space / Forested	67.44791895
Bush River	67.44791895
Old Robinhood	508.3018718
Low Density Residential	339.3261119
Swan Creek	339.3261119
Open Space / Forested	168.9757599
Swan Creek	168.9757599
Paradise	252.0239972
Agriculture	135.5024113
Swan Creek	135.5024113
Low Density Residential	75.70923824
Swan Creek	75.70923824
Open Space / Forested	40.81234772
Swan Creek	40.81234772
Pulaski	221.5622667
High Intensity Commercial	120.9054864
Swan Creek	120.9054864
Industrial	52.98841982
Swan Creek	52.98841982
Low Density Residential	47.66836045
Swan Creek	47.66836045
Swan Creek	360.5587927

Appendix E- Water Resources Calculations

Agriculture	360.5587927
Swan Creek	360.5587927
Titan Terrace	409.1225955
Low Density Residential	166.6884158
Swan Creek	166.6884158
Medium Density Residential	113.7499464
Swan Creek	113.7499464
Open Space / Forested	128.6842333
Swan Creek	128.6842333
Grand Total	5235.140018

Planning Area Future Land Use

Row Labels	Sum of REV_Acres
Aldino-Stepney	786.4945455
Agriculture	169.8316571
Swan Creek	169.8316571
Medium Density Residential	440.4910325
Swan Creek	440.4910325
Open Space / Forested	176.1718558
Swan Creek	176.1718558
Barkess	385.9570118
Agriculture	84.64145381
Swan Creek	84.64145381
Low Density Residential	4.657025699
Swan Creek	4.657025699
Medium Density Residential	234.5931431
Swan Creek	234.5931431
Open Space / Forested	62.06538918
Swan Creek	62.06538918
Bush Chapel	764.7412286
High Density Residential	132.6297306
Bush River	132.6297306
Industrial	9.338940663
Bush River	9.338940663
Medium Density Residential	247.4263093
Bush River	247.4263093
Open Space / Forested	375.346248
Bush River	375.346248

Appendix E- Water Resources Calculations

Gilbert	251.7561097
Low Density Residential	100.1436726
Swan Creek	100.1436726
Medium Density Residential	112.7247671
Swan Creek	112.7247671
Mixed Use	38.88767009
Swan Creek	38.88767009
Grays	836.8679489
Institutional	0.038025123
Bush River	0.038025123
Low Density Residential	360.9150392
Bush River	360.9150392
Open Space / Forested	475.9148846
Bush River	475.9148846
Long/Heat	290.701212
Agriculture	0.000168708
Swan Creek	0.000168708
Institutional	150.1096867
Bush River	147.1380964
Swan Creek	2.971590276
Mixed Use	99.68120042
Bush River	38.16236244
Swan Creek	61.51883798
Open Space / Forested	40.91015622
Bush River	40.91015622
Old Philadelphia	167.0524376
High Intensity Commercial	58.31520099
Bush River	58.31520099
Industrial	5.350898289
Bush River	5.350898289
Medium Density Residential	55.89070391
Bush River	55.89070391
Open Space / Forested	47.49563444
Bush River	47.49563444
Old Robinhood	508.3018718
Low Density Residential	0.026819838
Swan Creek	0.026819838
Medium Density Residential	339.299292
Swan Creek	339.299292
Open Space / Forested	168.9757599

Appendix E- Water Resources Calculations

Swan Creek	168.9757599
Paradise	252.0239972
Agriculture	0.674371808
Swan Creek	0.674371808
Medium Density Residential	210.5372777
Swan Creek	210.5372777
Open Space / Forested	40.81234772
Swan Creek	40.81234772
Pulaski	221.5622667
High Intensity Commercial	120.9054864
Swan Creek	120.9054864
Industrial	52.98841982
Swan Creek	52.98841982
Low Density Residential	47.66836045
Swan Creek	47.66836045
Swan Creek	360.5587927
Agriculture	360.5587927
Swan Creek	360.5587927
Titan Terrace	409.1225955
Low Density Residential	223.8328734
Swan Creek	223.8328734
Medium Density Residential	113.7499464
Swan Creek	113.7499464
Open Space / Forested	71.53977567
Swan Creek	71.53977567
Grand Total	5235.140018

Appendix E- Water Resources Calculations



Loads from Primary Sources - Simple Method Calculations

Swan Watershed - Aberdeen Existing - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year
Residential	LDR (<1du/acre)	576.606	11	2	0.26	55	20000	2.8	0.4	90	130	1,643	214	51,895	74,864
	MDR (1-4 du/acre)	219.463	21	2	0.26	55	20000	4.6	0.6	126	208	1,003	130	27,579	45,705
	HDR (>4 du/acre)	162.9436	33	2	0.26	55	20000	6.6	0.9	182	302	1,081	141	29,729	49,269
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		283.018	72	2	0.26	55	20000	13.3	1.7	367	608	3,777	491	103,868	172,138
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		47.9489	80	2	0.26	55	20000	14.7	1.9	405	671	706	92	19,412	32,172
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		271.8496	53	2	0.26	55	20000	10.1	1.3	277	459	2,739	356	75,327	124,838
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		878.1552						2.5	0.2	100	12	2,195	176	87,816	10,538
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
Rural								4.6	0.7	100	39	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
Total		2439.9843	22.52054023					5.386929	0.655313	162.1423	208.8228	13,144	1,599	395,625	509,524

Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	2439.9843
Stream Length (miles)	
Planning Horizon (years)	20

Appendix E- Water Resources Calculations



Loads from Primary Sources - Simple Method Calculations

Swan Watershed - Aberdeen Future Growth - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year
Residential	LDR (<1du/acre)	593.444	11	2	0.26	55	20000	2.8	0.4	90	130	1,691	220	53,410	77,050
	MDR (1-4 du/acre)	314.964	21	2	0.26	55	20000	4.6	0.6	126	208	1,439	187	39,580	65,594
	HDR (>4 du/acre)	210.984	33	2	0.26	55	20000	6.6	0.9	182	302	1,400	182	38,494	63,795
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		200.55	72	2	0.26	55	20000	13.3	1.7	367	608	2,676	348	73,602	121,979
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		47.949	80	2	0.26	55	20000	14.7	1.9	405	671	706	92	19,413	32,172
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		687.874	53	2	0.26	55	20000	10.1	1.3	277	459	6,931	901	190,604	315,884
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		384.22						2.5	0.2	100	12	961	77	38,422	4,611
Rural								4.6	0.7	100	39	-	-	-	-
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
Total		2439.985	30.67127134					6.476916	0.822316	185.8713	279.1349	15,804	2,006	453,523	681,085

Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	2439,985
Stream Length (miles)	
Planning Horizon (years)	20

Appendix E- Water Resources Calculations



Loads from Primary Sources - Simple Method Calculations

Swan - Existing - Growth Areas

PRIMARY SOURCES - Land Use			Concentrations				Annual Loading Rates				Annual Load				
	Area (Acres)	Impervious Cover %	TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year	
Residential	LDR (<1du/acre)	1017.98559	11	2	0.26	55	20000	2.8	0.4	90	130	2,900	377	91,619	132,171
	MDR (1-4 du/acre)	158.9642241	21	2	0.26	55	20000	4.6	0.6	126	208	726	94	19,976	33,106
	HDR (>4 du/acre)		33	2	0.26	55	20000	6.6	0.9	182	302	-	-	-	-
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		120.9054864	72	2	0.26	55	20000	13.3	1.7	367	608	1,614	210	44,372	73,538
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Roadway			80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	-
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Industrial		55.96	53	2	0.26	55	20000	10.1	1.3	277	459	564	73	15,506	25,698
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Forest	861.57287						2.5	0.2	100	12	2,154	172	86,157	10,339	
Rural		1024.8796						4.6	0.7	100	39	4,714	717	102,488	39,970
Open Water							12.8	0.5	155						
Active Construction															
Vacant Lots							0	0	0	0					
Total	3240.267771	8.087962808					3.91086	0.507437	111.1385	97.15899	12,672	1,644	360,118	314,821	

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	3240.267771
Stream Length (miles)	
Planning Horizon (years)	20

Appendix E- Water Resources Calculations

Loads from Primary Sources - Simple Method Calculations

Swan - Future Growth - Growth Areas

PRIMARY SOURCES - Land Use				Concentrations				Annual Loading Rates				Annual Load			
		Area (Acres)	Impervious Cover %	TN	TP	TSS	FC	TN	TP	TSS	FC	TN	TP	TSS	FC
				mg/l	mg/l	mg/l	MPN/100 ml	lb/acre	lb/acre	lb/acre	billion/acre	lb/year	lb/year	lb/year	# billion/year
Residential	LDR (<1du/acre)	380.8419	11	2	0.26	55	20000	2.8	0.4	90	130	1,085	141	34,276	49,447
	MDR (1-4 du/acre)	1446.855	21	2	0.26	55	20000	4.6	0.6	126	208	6,612	859	181,817	301,322
	HDR (>4 du/acre)		33	2	0.26	55	20000	6.6	0.9	182	302	-	-	-	-
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		120.905	72	2	0.26	55	20000	13.3	1.7	367	608	1,614	210	44,372	73,537
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway			80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		156.3665	53	2	0.26	55	20000	10.1	1.3	277	459	1,576	205	43,328	71,806
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		519.565						2.5	0.2	100	12	1,299	104	51,957	6,235
												-	-	-	-
												-	-	-	-
												-	-	-	-
Rural		615.706						4.6	0.7	100	39	2,832	431	61,571	24,013
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
Open Water								12.8	0.5	155		-	-	-	-
Active Construction												-	-	-	-
Vacant Lots								0	0	0	0				
Total		3240.2394	15.91419461					4.634449	0.601817	128.7929	162.4446	15,017	1,950	417,320	526,359

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	3240.2394
Stream Length (miles)	
Planning Horizon (years)	20