Non-Point Source Modeling of the Rouge River Watershed

by

Paul Szlaga
Karen Ridgway

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Detroit, MI
(313) 567-3990

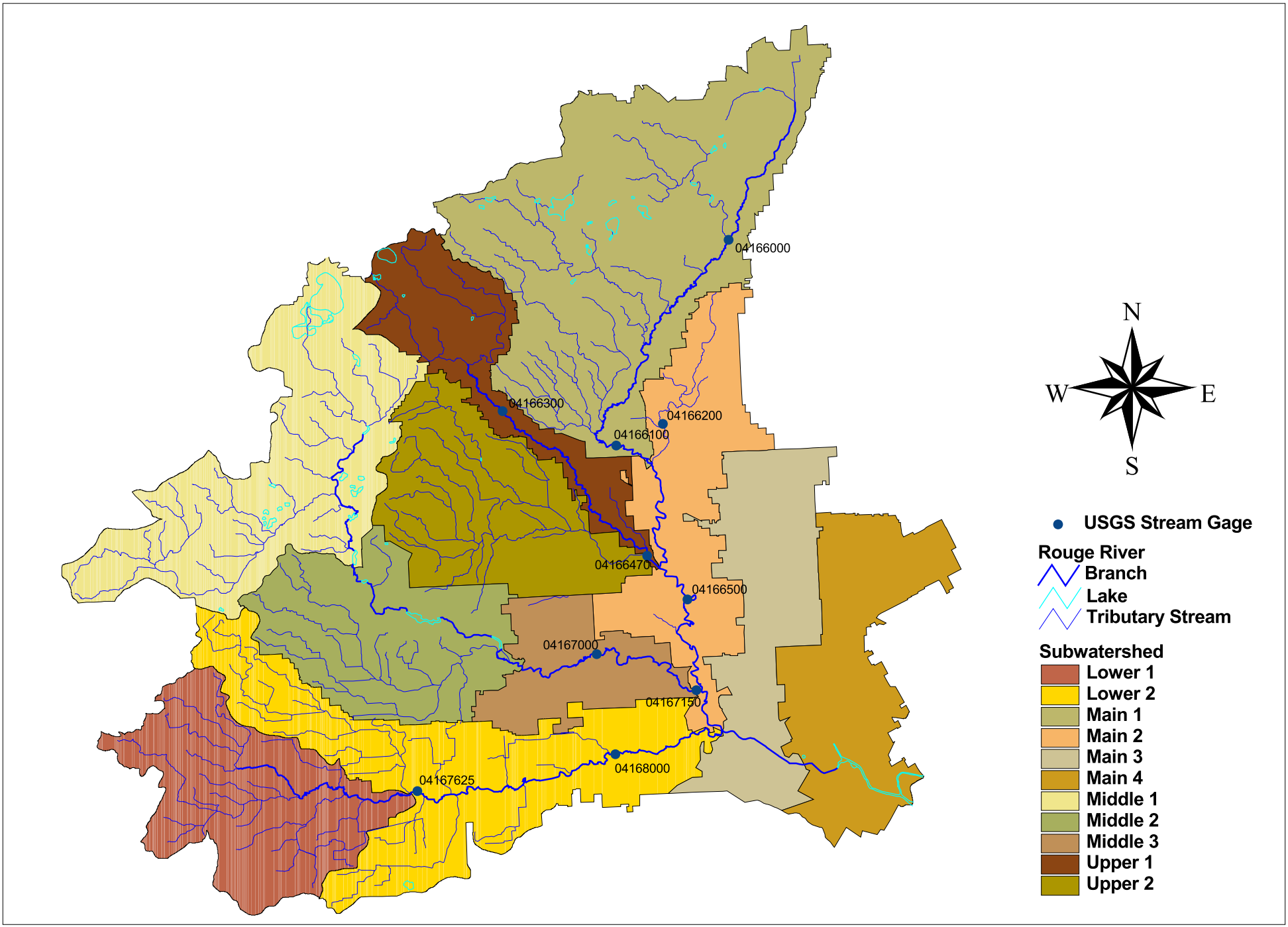
Introduction

The purpose of this study is to estimate existing pollution loads within the Rouge River Watershed. This work was done in order to develop an updated Watershed Management Plan that contains a range of Best Management Practice (BMP) measures that may be applied in the watershed to reduce pollutant loads.

The Watershed Management Model (WMM) program was updated to estimate existing pollutant loads from the 335 subareas in the watershed. The WMM program was previously developed, applied, and calibrated to the Rouge River during the Rouge River National Wet Weather Demonstration Project in the mid-1990's using Year 1990 land use conditions. The previous WMM work was obtained, reviewed and updated to estimate existing pollutant loadings in the watershed based on Year 2000 land use conditions. The WMM program was also updated for CSO control and sewer separation projects undertaken since 1994.

Figure 1 shows the subwatersheds used in the WMM program as well as the locations of the 10 USGS stream gages used in the hydrologic analysis. Appendix A, Subwatershed Subareas, contains more detailed maps of the subareas found in each subwatershed. Appendix B, Stormwater Management Areas, contains detailed maps of the Stormwater Management Areas (SWMAs).

Figure 1. Rouge Subwatersheds and USGS Stream Gage Locations



WMM Modeling

The WMM program was revised using year 2000 land use data from SEMCOG. Combined sewer areas that underwent sewer separation work and combined sewer areas now served by CSO basins were updated in the model. Climatologic data, event mean concentrations, directly connected impervious area (DCIA) percentages, Point Sources, CSO flow rates and concentrations, CSO basin removal rates, and the suspended fraction were reused from the previous WMM modeling efforts. Appendix C, WMM Model Input Data provides tables of all of the data input into the WMM program as well as a list of references used in obtaining the data. Existing pollutant loads in tons or counts per year are given for the eleven subwatersheds of the Rouge River in Appendix D, Existing Pollutant Loads from WMM by Subwatershed. Existing pollutant loads in tons or counts per year are given for the seven Storm Water Management Areas (SWMA) of the Rouge River in Appendix E, Existing Pollutant Loads from WMM by SWMA.

Proposed Pollutant Load Reductions

Pollutant load reductions were calculated for the BMP alternative with storage that performs similar to an infiltration basin in the WMM program. The BMP was only applied to the developed land uses in each subarea in the WMM program.

Forty-five years of hourly Metro Airport precipitation data from January 1960 to January 2005 were analyzed to estimate the fraction of the average annual runoff volume that may be captured by the proposed BMP alternative. The precipitation was assumed to be rain and the storm events

were separated by a dry period of at least twenty-four hours. For each subarea in the WMM program, this fraction was used as the spatial coverage of the BMP. Table 1 presents this fraction of average annual runoff.

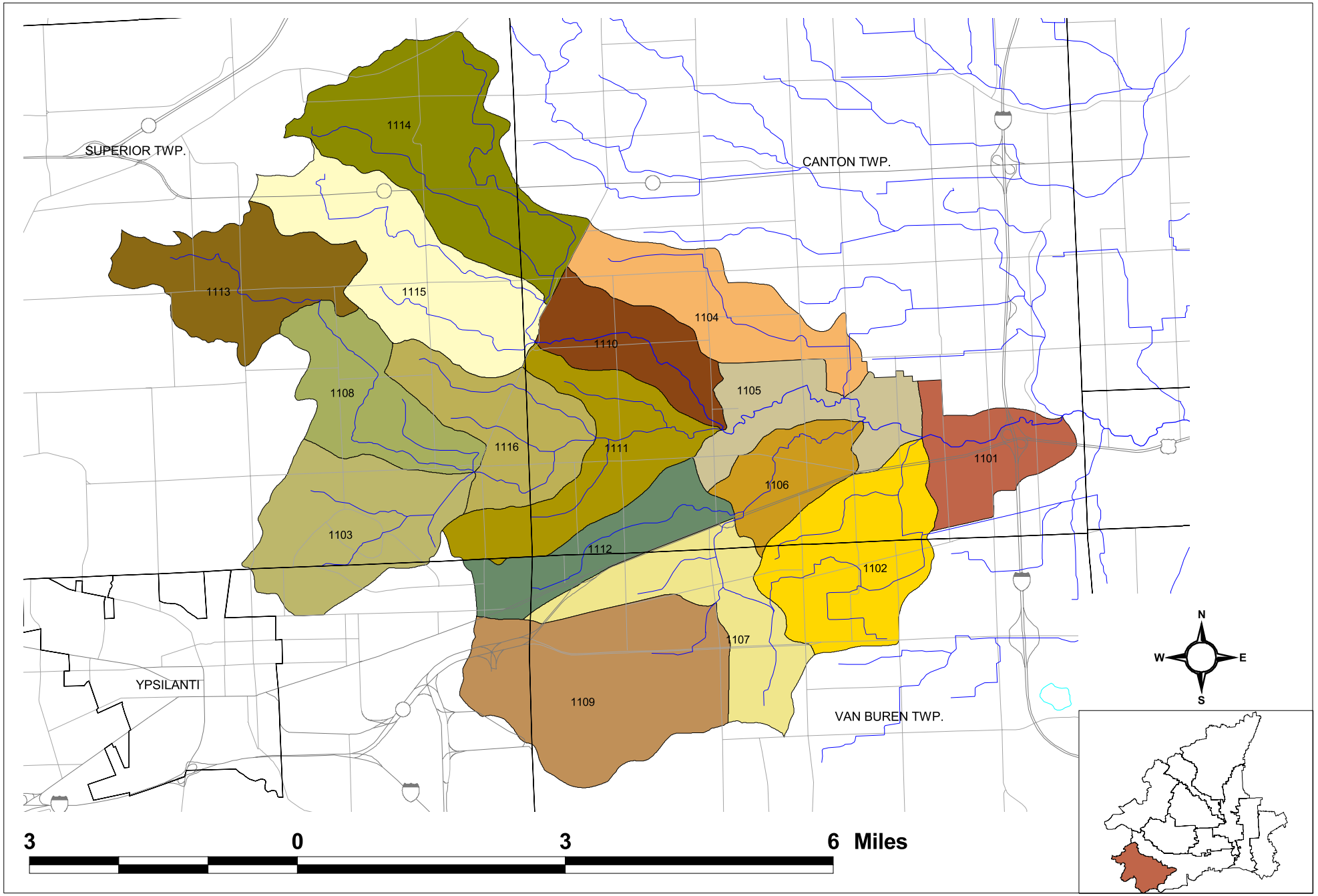
Removal rates for this alternative can be found in Appendix C. Appendix F, Proposed Pollutant Load Reductions from WMM by SWMA presents WMM's predicted pollutant load reductions should this BMP be implemented.

Table 1. Fraction of Average Annual Runoff from Developed Areas Needed to be Captured by the Proposed BMP

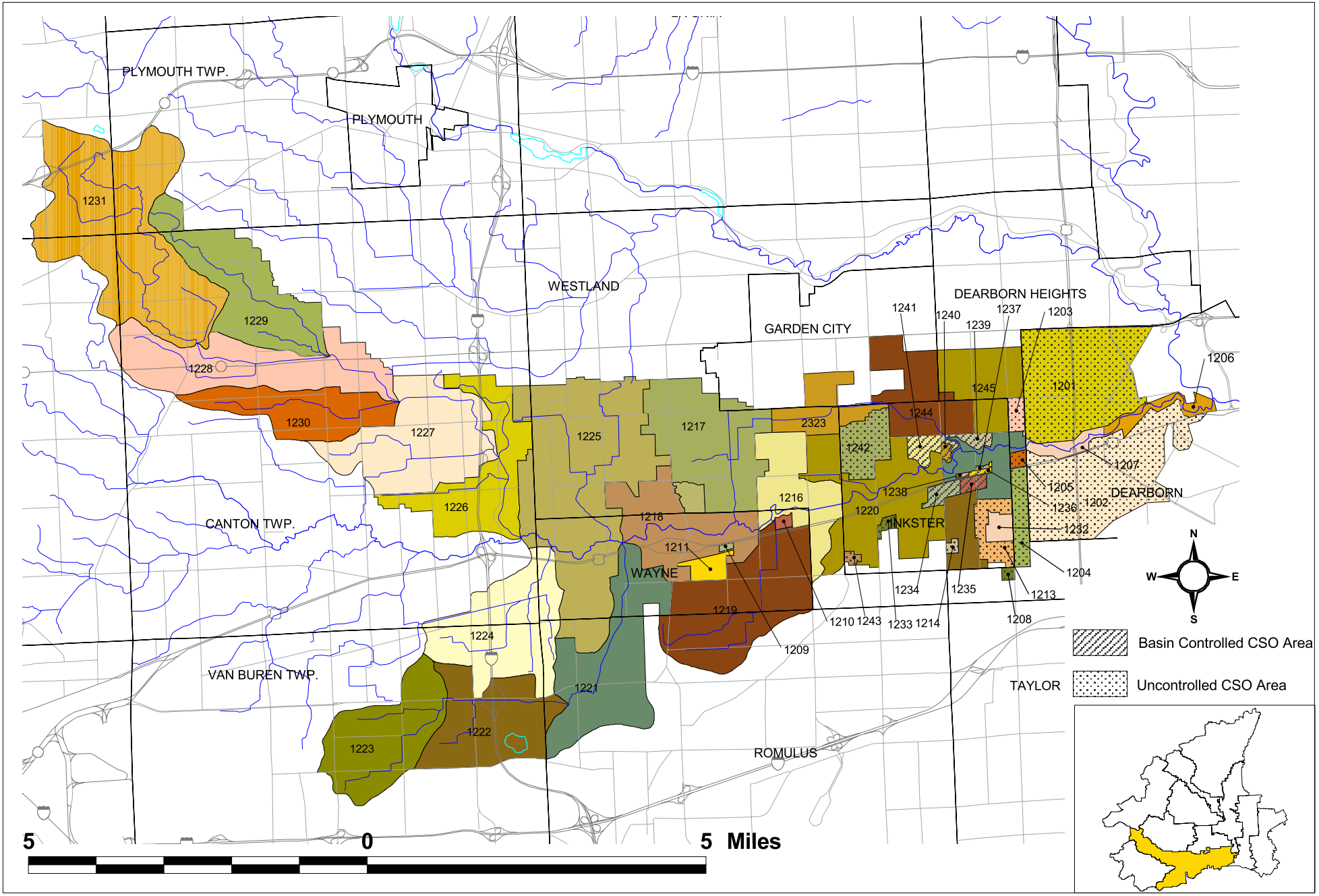
USGS Gage	SWMA	SWMA Area (acres)	Area of Developed Land in SWMA (acres)	Proposed BMP Storage Volume (ft^3)	Proposed BMP Storage Volume (Inches Over SWMA Area)	Proposed BMP Storage Volume (Inches over Developed Area of SWMA Area)	Estimated Fraction of Average Annual Runoff from Developed Areas Captured by the Proposed BMP
Lower Rouge at Wayne	Lower 1	39,785	14,922	52,280,081	0.36	0.97	0.79
Lower Rouge at Inkster	Lower 2	21,312	16,437	21,971,053	0.28	0.37	0.48
Main Rouge at Southfield	Main 1-2	65,891	55,093	80,366,249	0.34	0.40	0.51
Evans Ditch at Southfield	Evans Ditch	5,757	4,880	6,666,459	0.32	0.38	0.49
Main Rouge at Detroit	Main 3-4	58,451	53,425	44,345,193	0.21	0.23	0.34
Middle Rouge near Garden City	Middle 1	51,589	26,396	40,450,061	0.22	0.42	0.52
Middle Rouge near Garden City	Middle 3	20,727	18,879	16,251,690	0.22	0.24	0.35
Upper Rouge at Farmington	Upper	40,768	32,454	47,060,317	0.32	0.40	0.50

Appendix A. Subwatershed Subareas

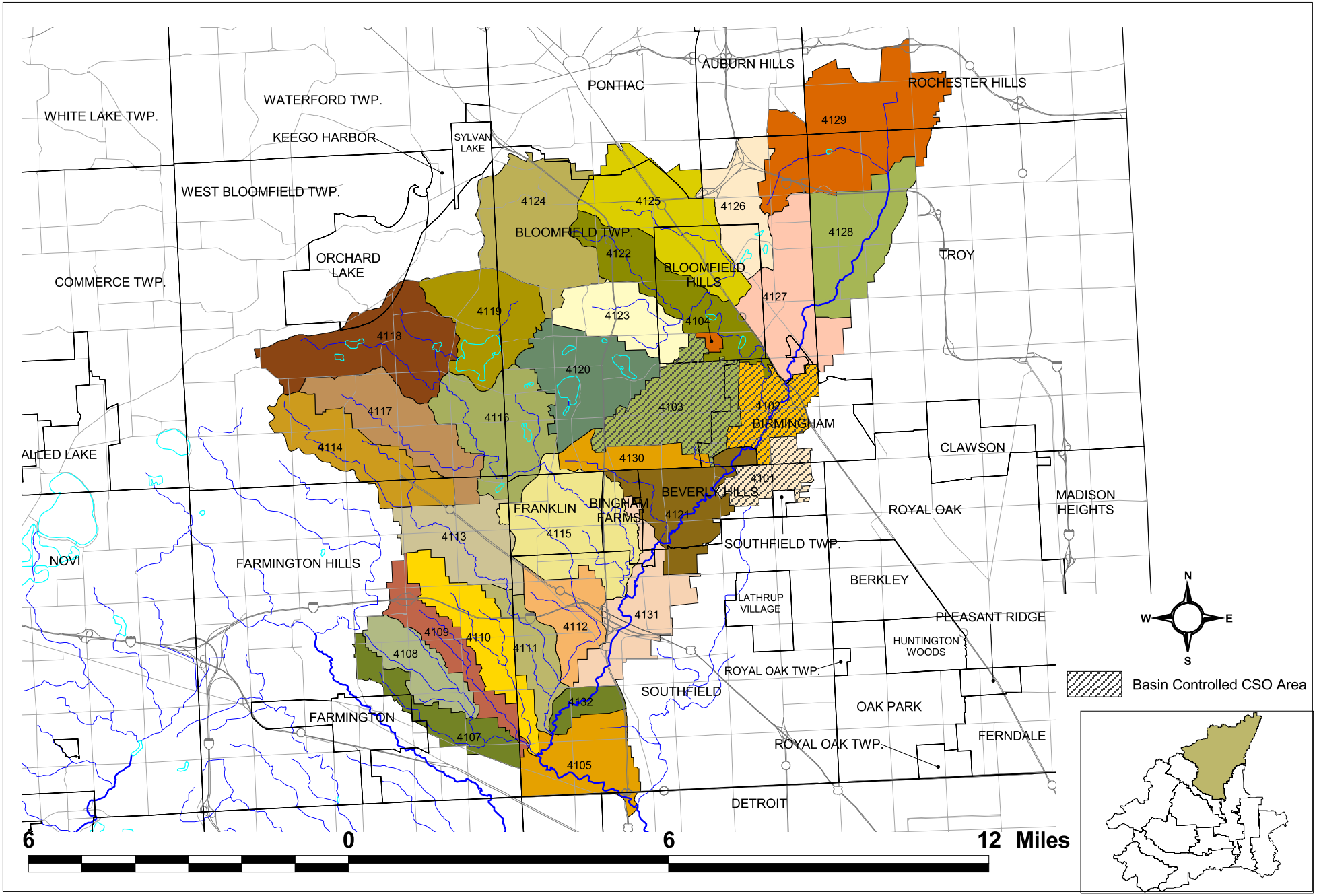
Lower 1 Subareas



Lower 2 Subareas



Main 1 Subareas



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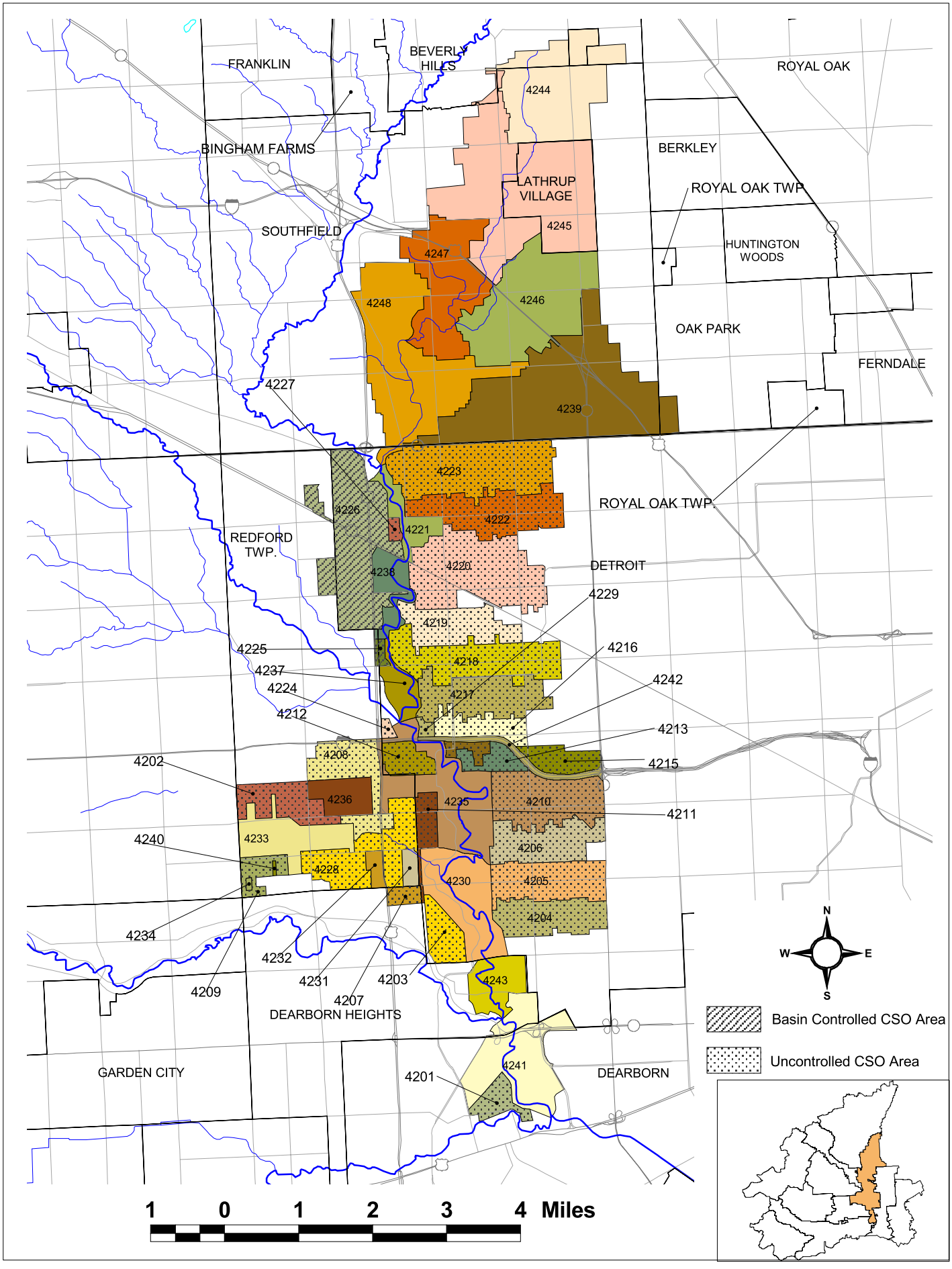
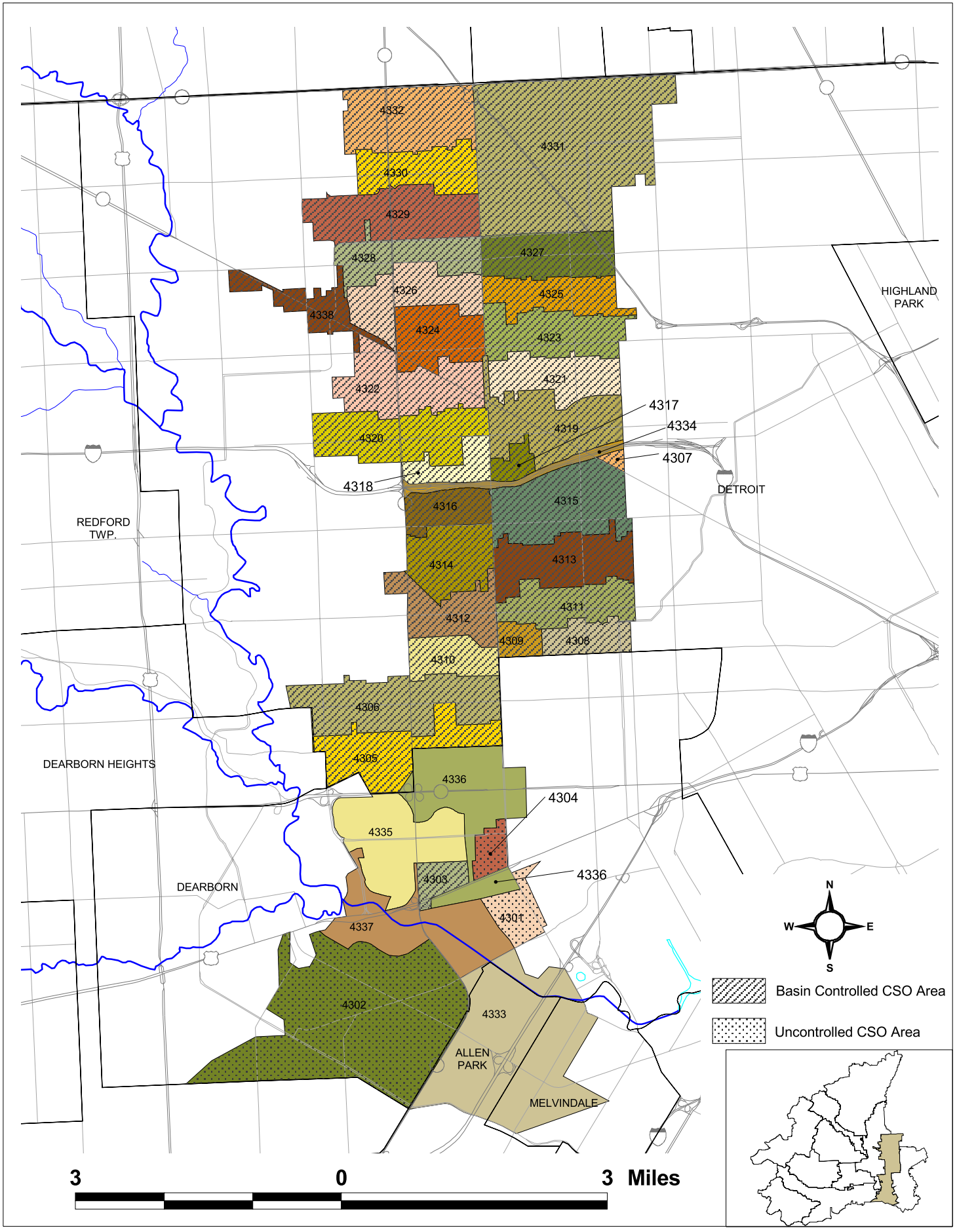
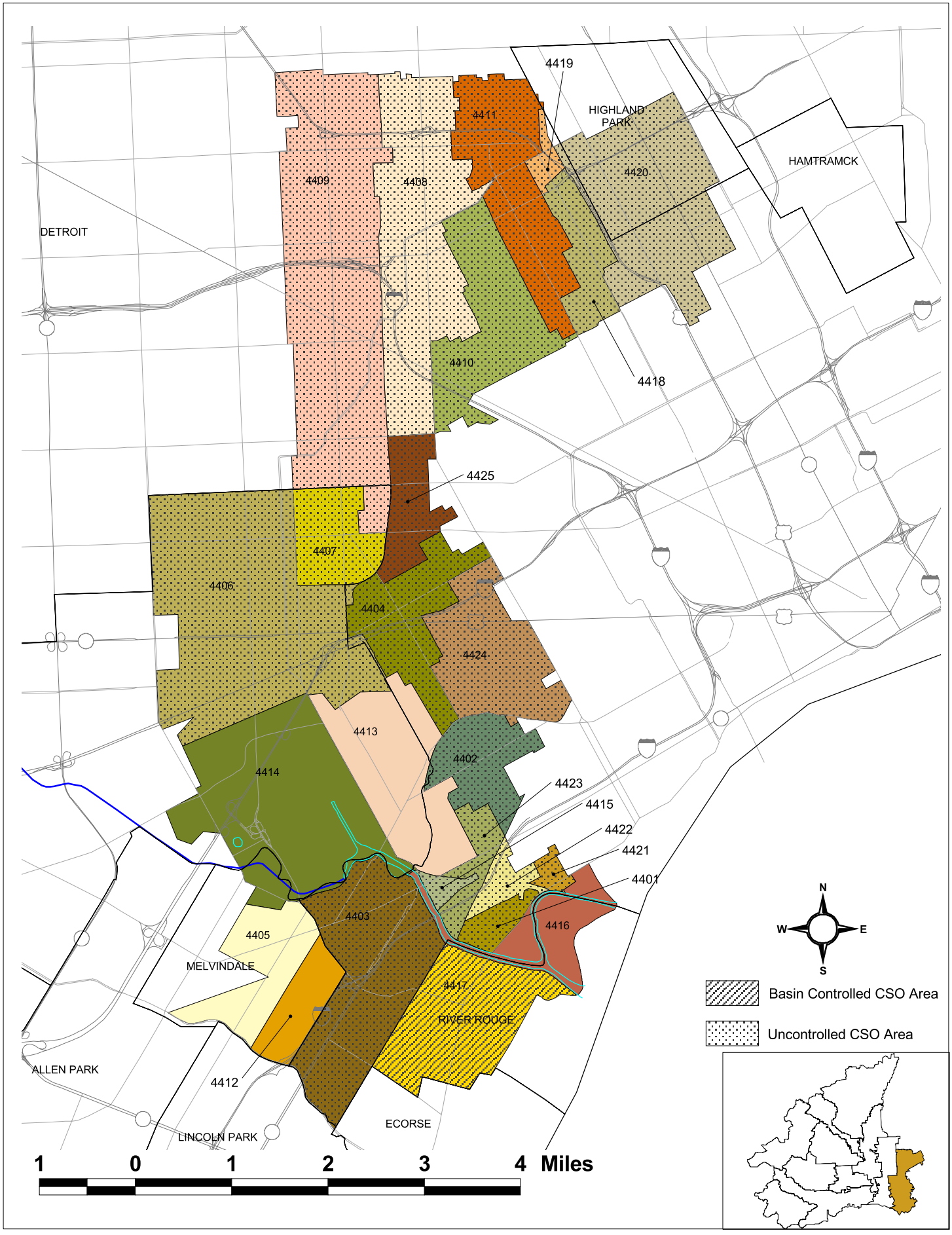


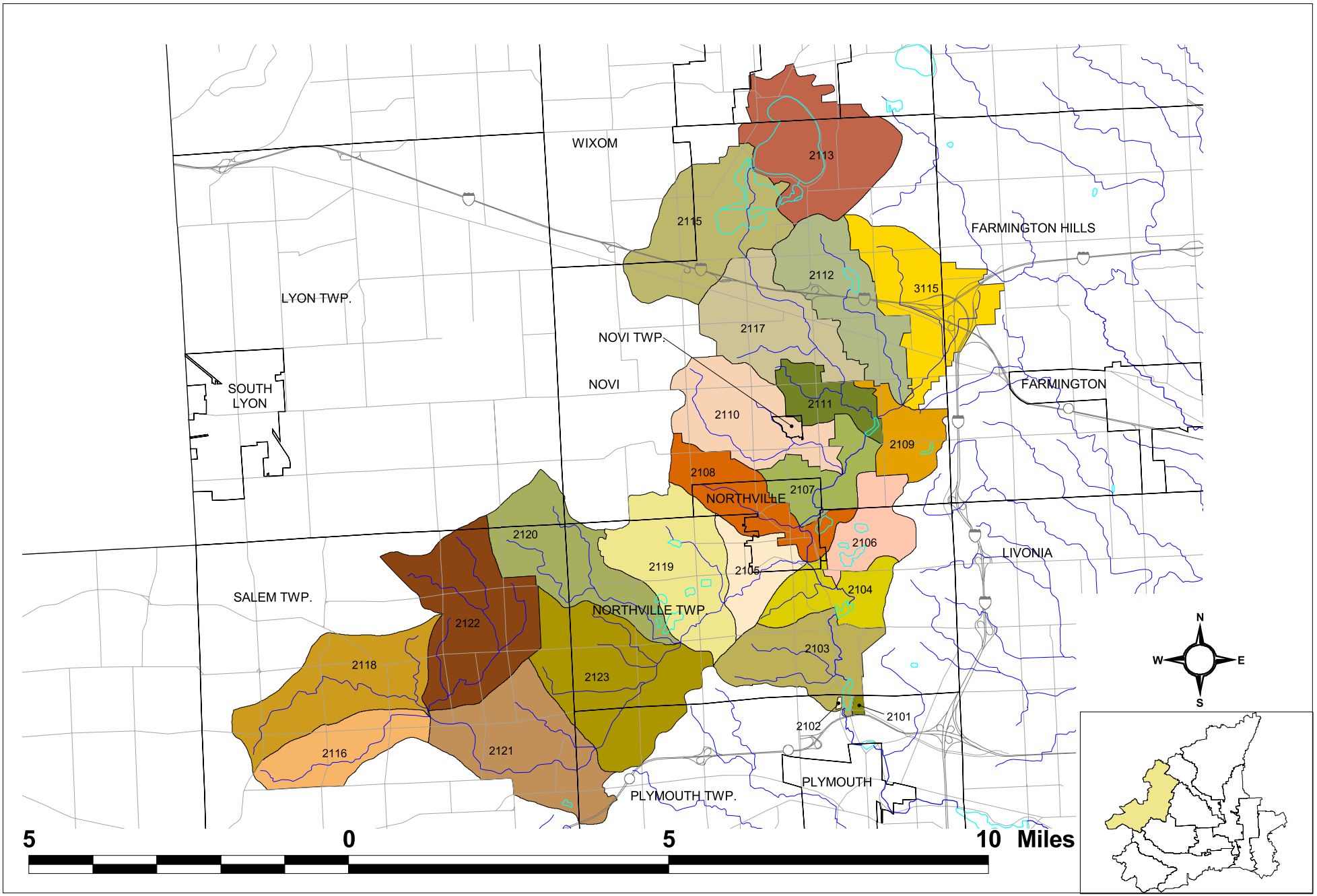
Main 3 Subareas



Main 4 Subareas



Middle 1 Subareas



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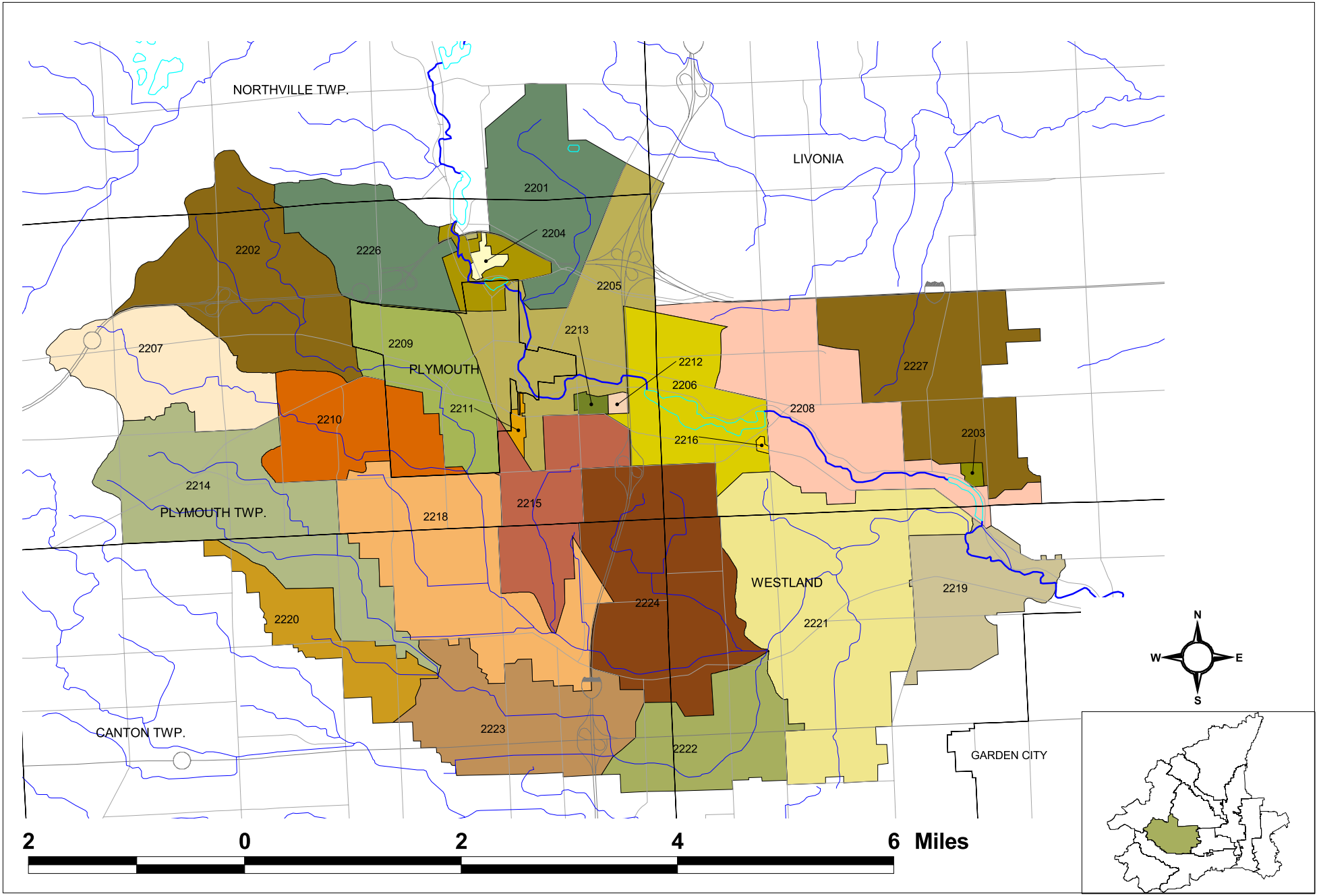

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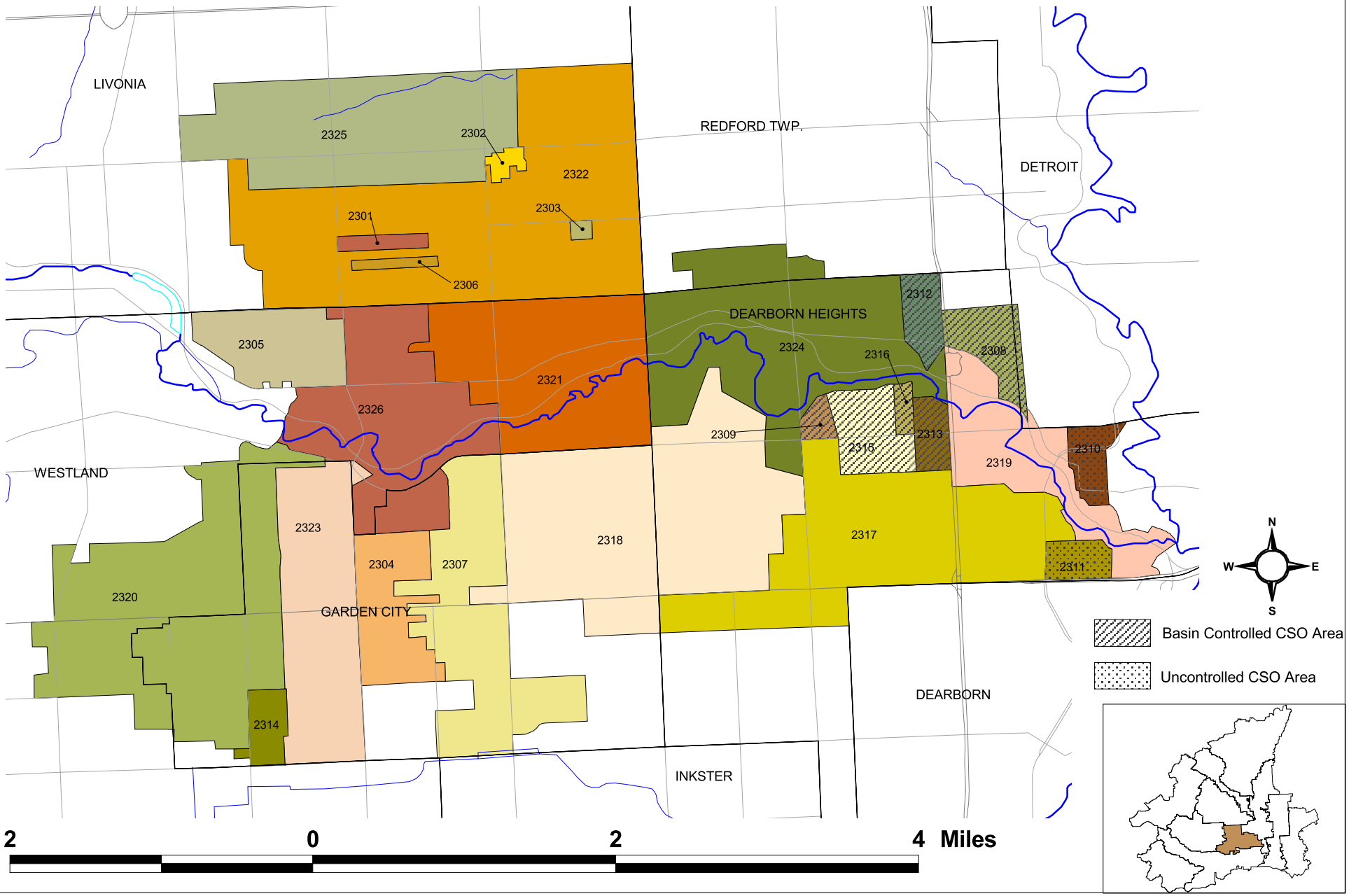
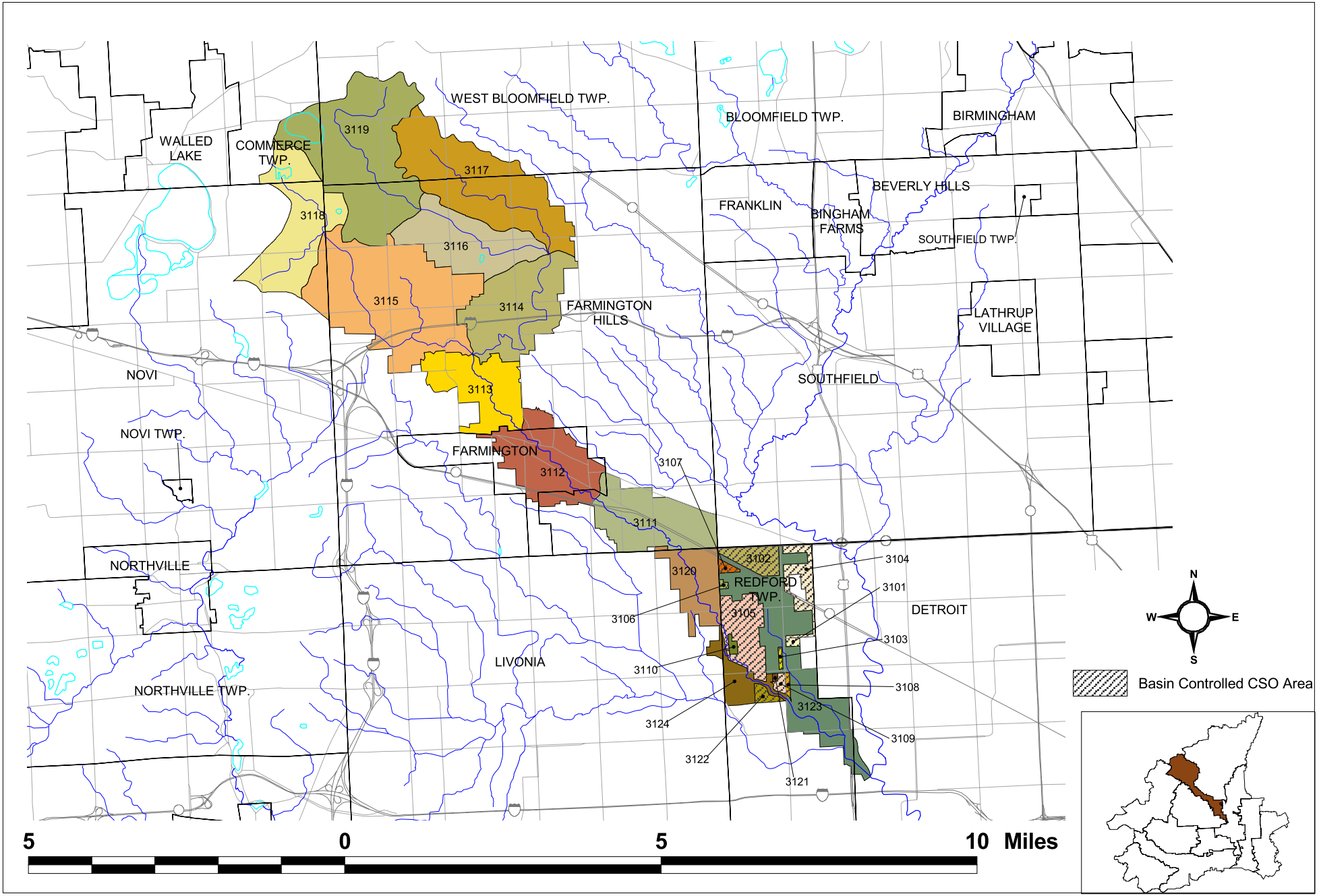
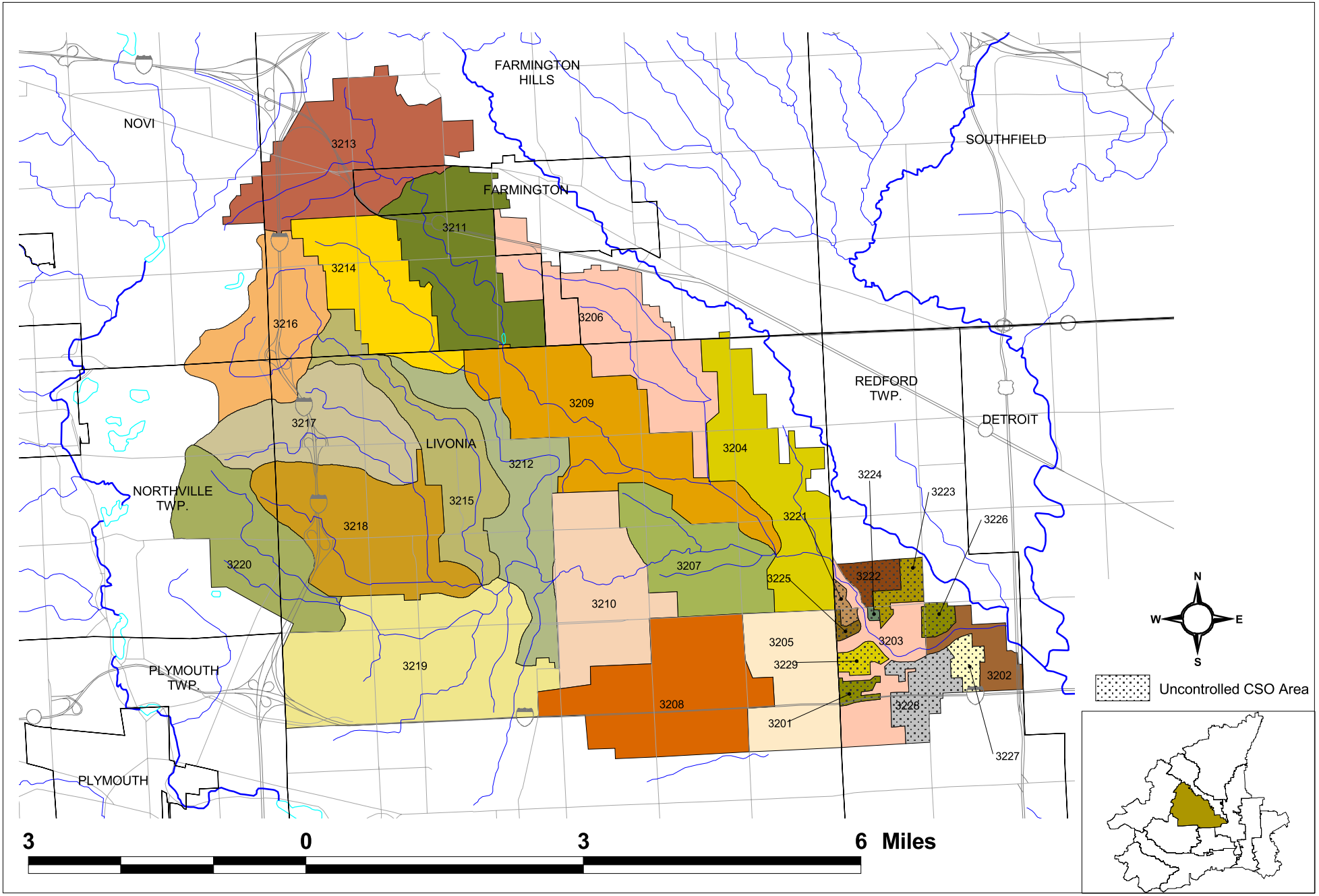


Upper 1 Subareas

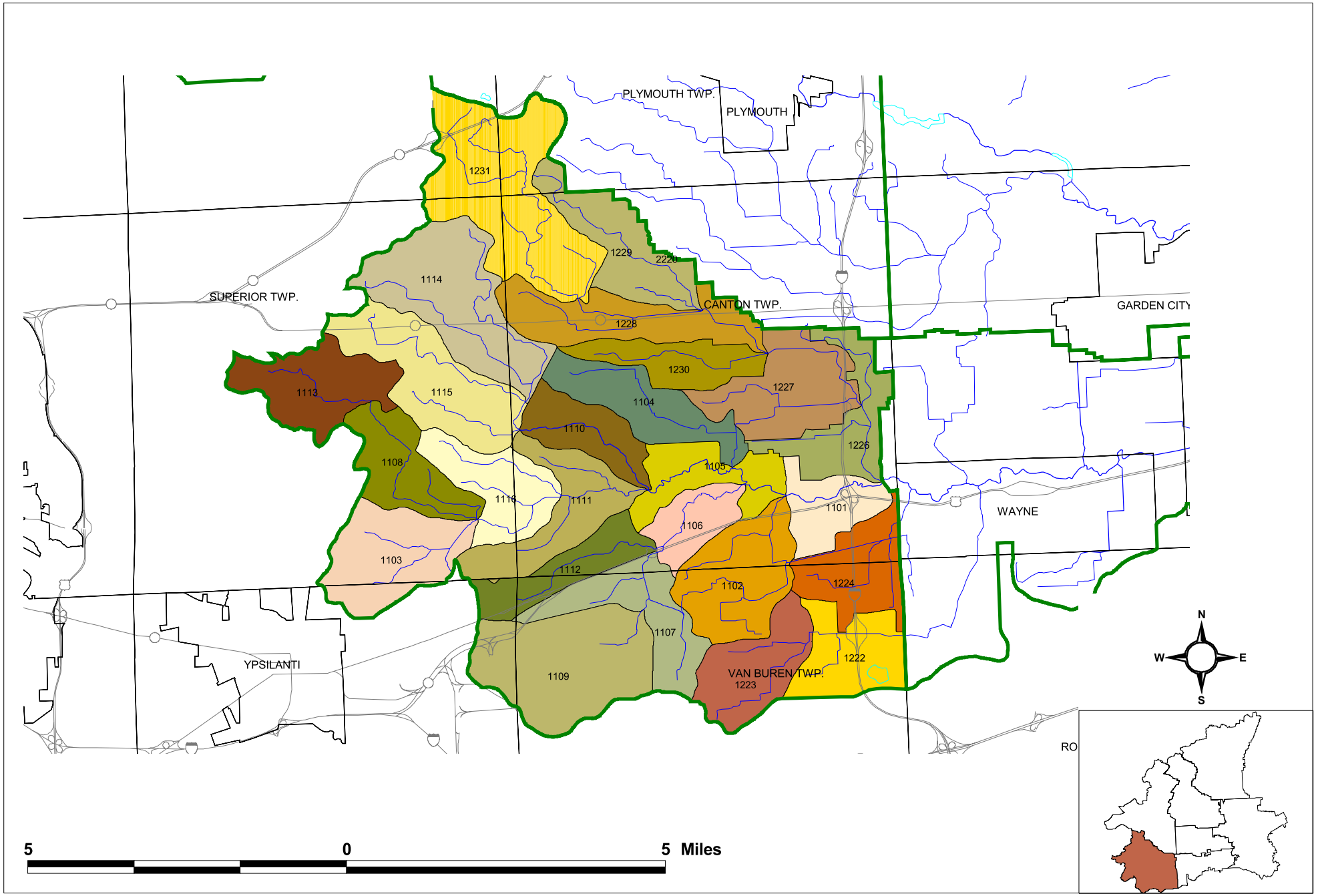


Upper 2 Subareas

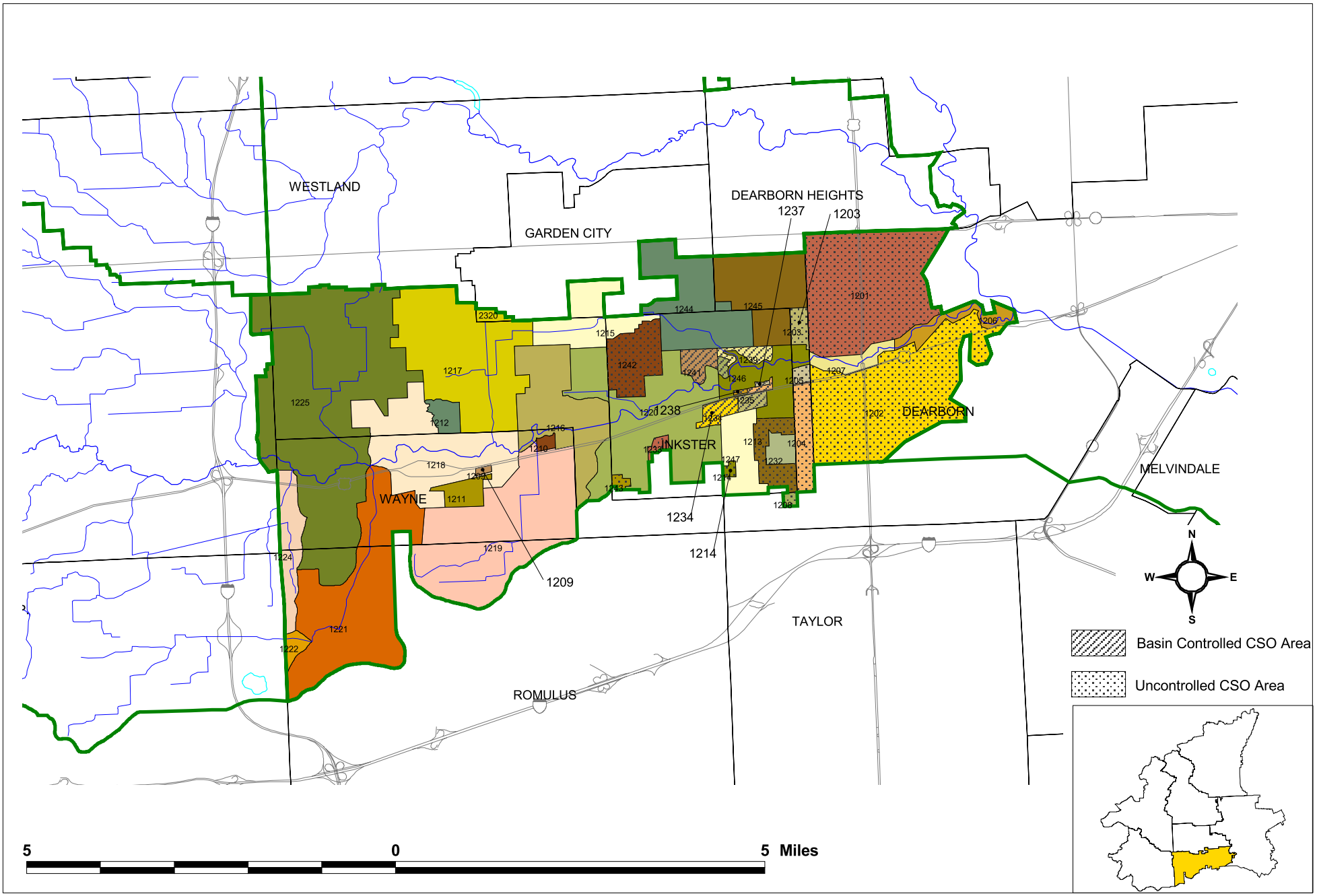


Appendix B. Stormwater Management Areas

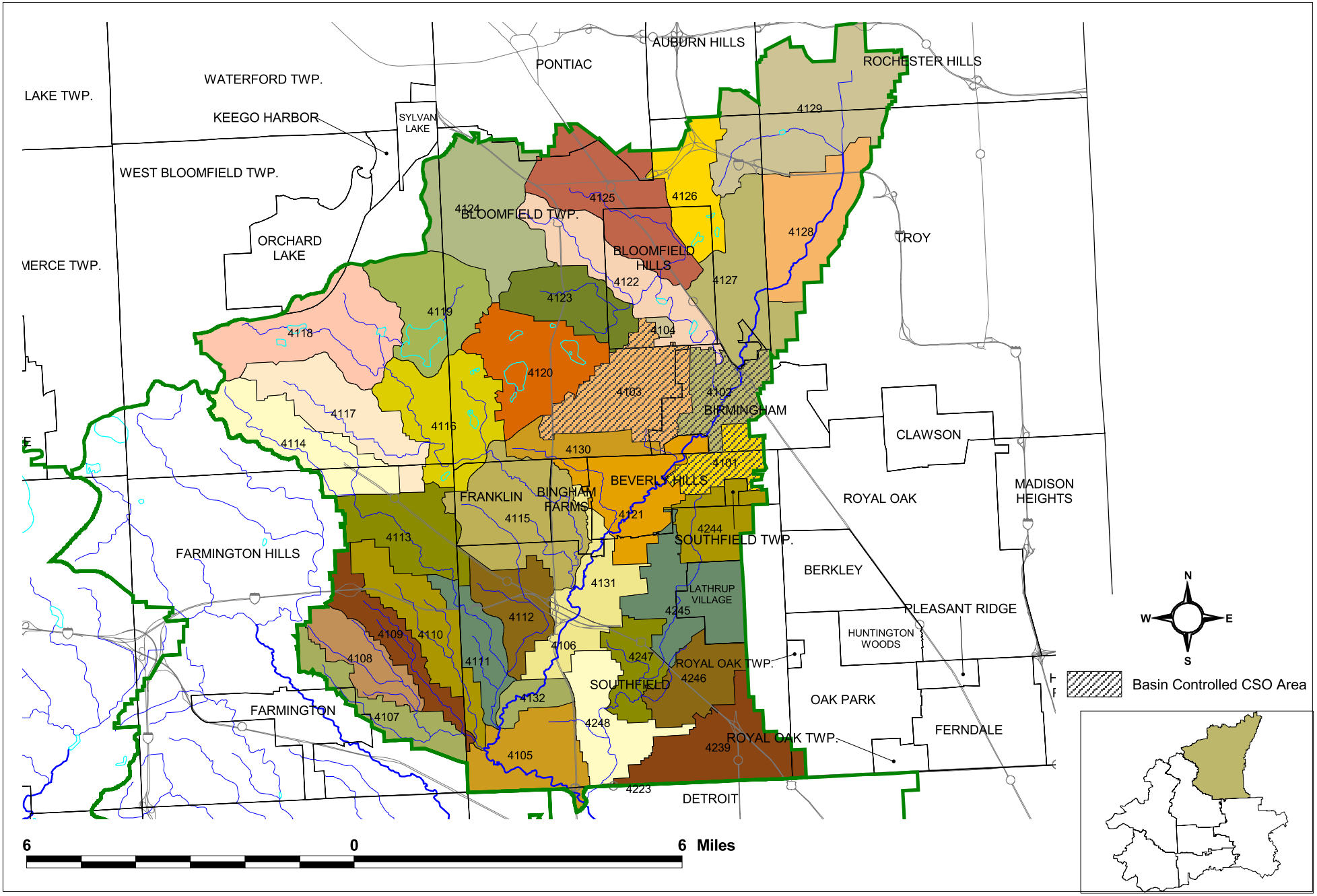
Lower 1 Subareas



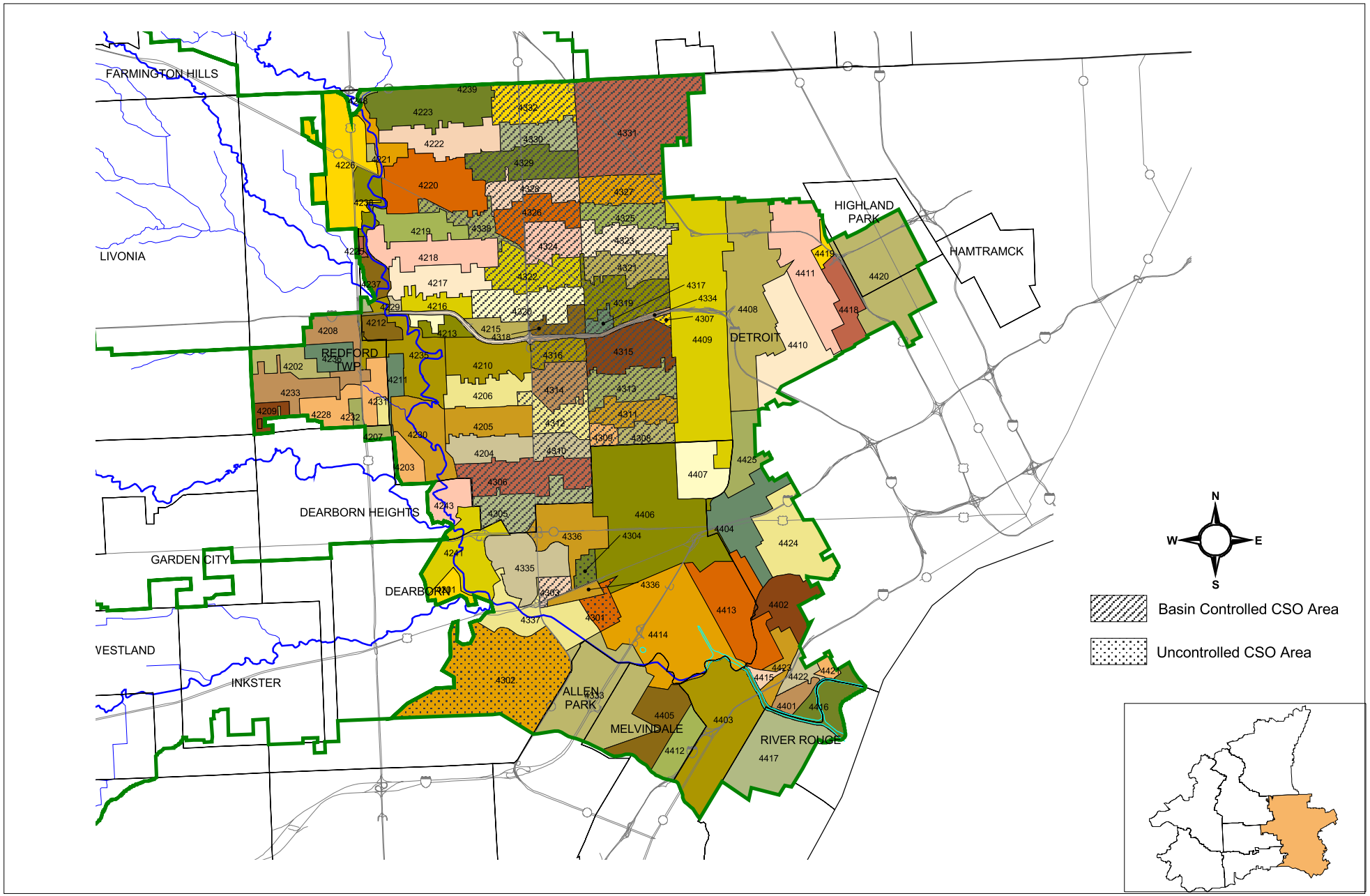
Lower 2 Subareas



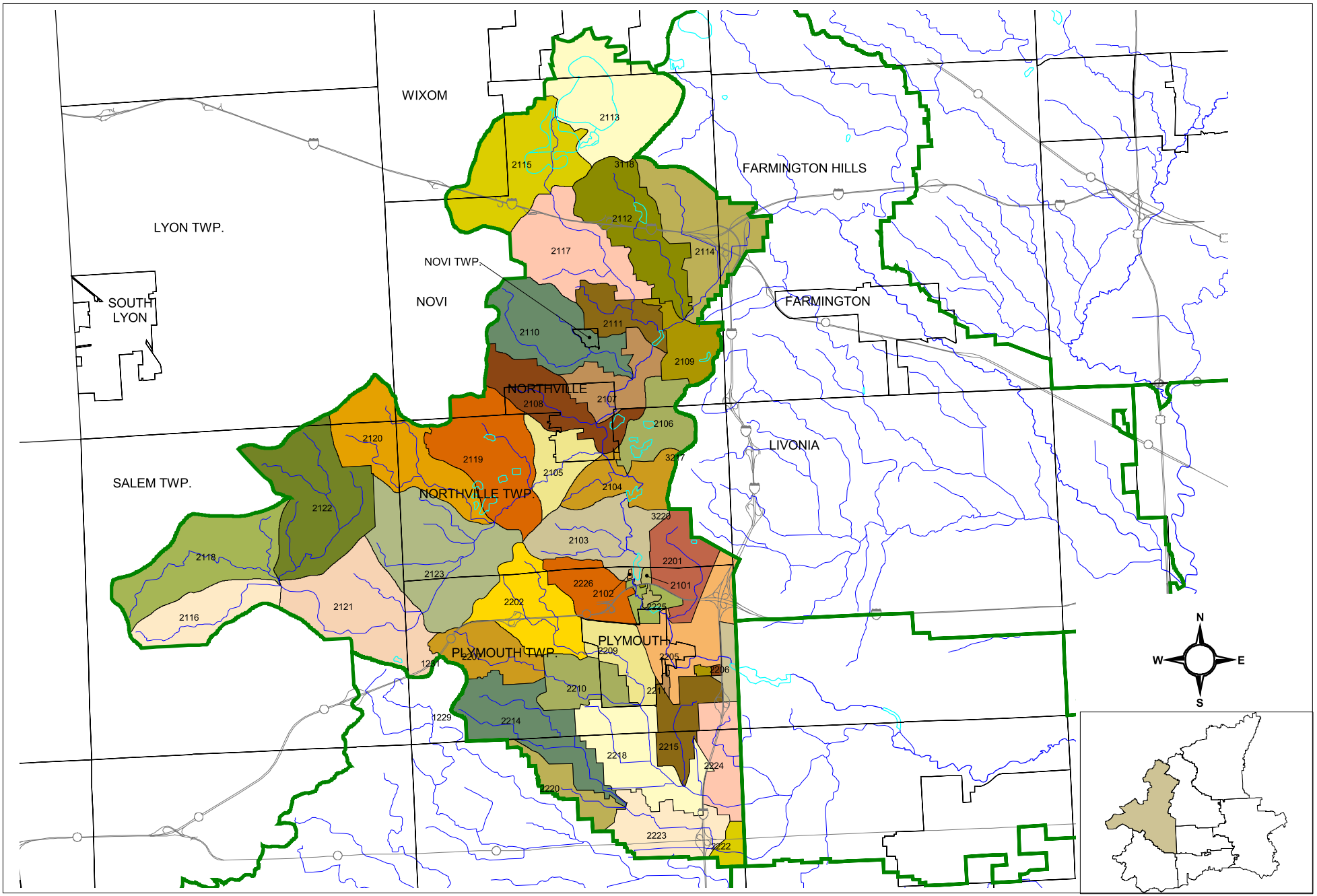
Main 1-2 Subareas



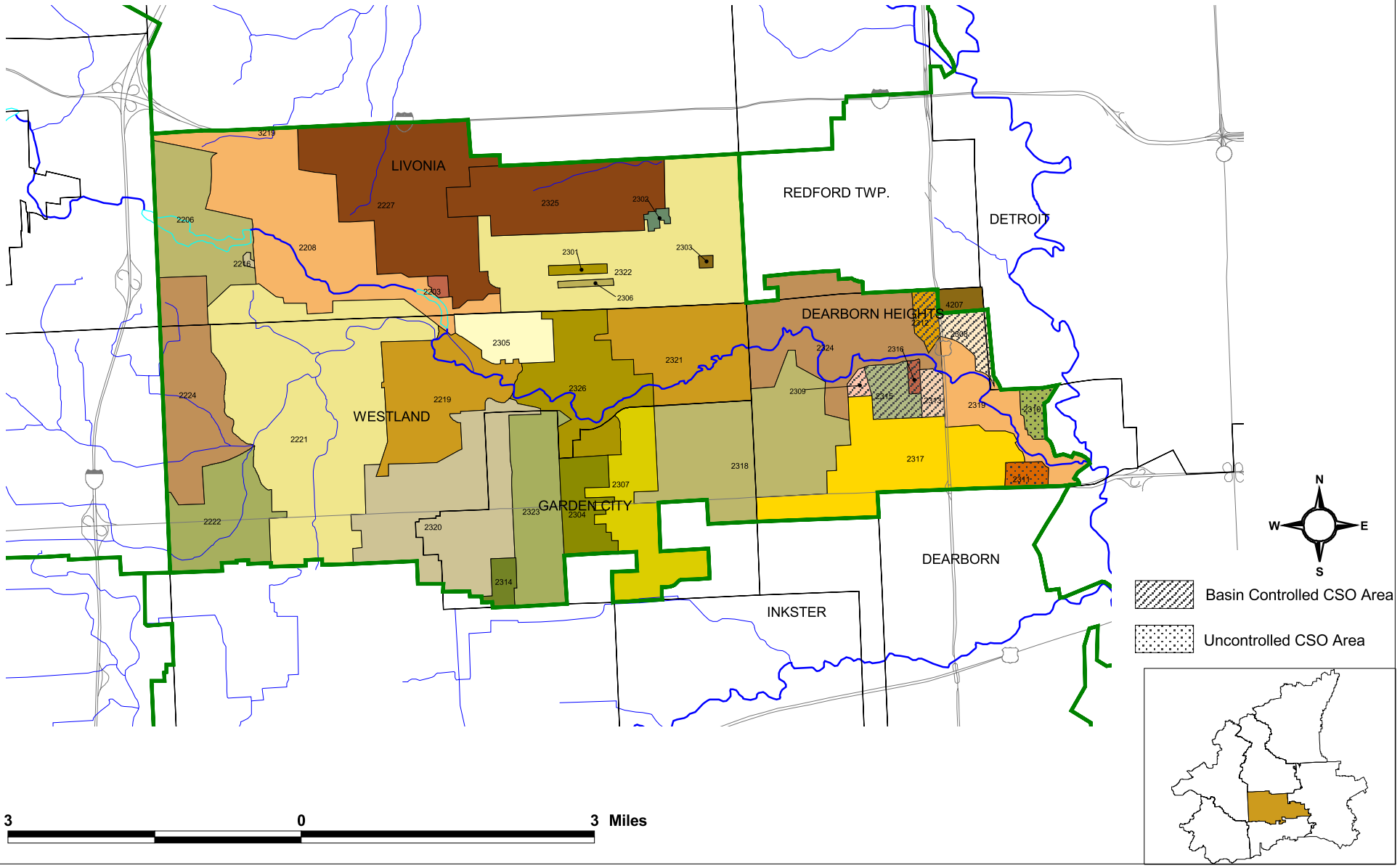
Main 3-4 Subareas



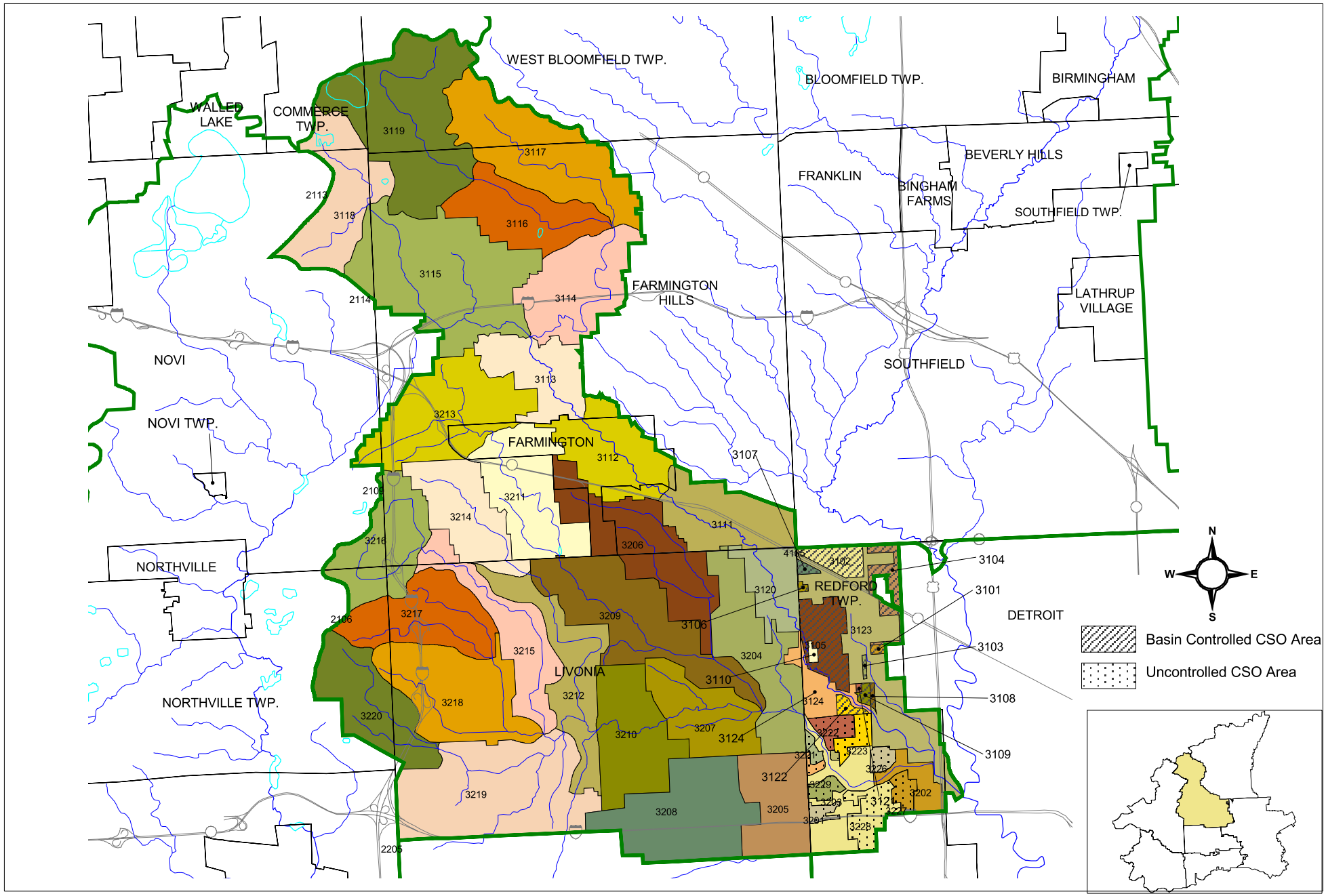
Middle 1 Subareas



Middle 3 Subareas



Upper Subareas



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Appendix C. WMM Model Input Data

Table C1. Lower 1 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
1101	964.51	104.54	7.63	18.5	152.46	9.53	42.08	286.88	103.31	239.58	12.7
1102	1849.79	264.26	16.02	467.97	296.57	1.38	66.89	267.45	32.96	436.29	11.8
1103	1823.43	503.43	113.08	330.73	667.78	66.63	67.19	5.24	0	69.35	4.1
1104	1441.49	87.49	355.94	301.86	544.53	7.24	41.16	15.11	0	88.16	5.8
1105	1153.29	151.71	80	58.47	417.74	63.71	6.01	26.48	4.11	345.06	15.1
1106	806.07	177.68	96.78	21.05	313.73	0	34	38.89	28.87	95.07	8.1
1107	1458.72	173.02	22.85	410	184.46	0	70.65	66.07	49.3	482.37	15.7
1108	1330.11	182.22	0	1076.68	58.86	0	0	0	0	12.35	0.6
1109	2700.91	194.04	8.92	325.94	21.24	0	23.32	1729.57	117.8	280.08	6.0
1110	1045.9	81.4	271.21	382.74	154.85	0	6.05	0	0	149.65	7.9
1111	1549.92	307.06	22.95	714.78	266.81	0	2.03	0	0	236.29	7.5
1112	1067.9	290.41	0	269.29	253.12	0	52.66	37.4	30.36	134.66	7.3
1113	1570.71	933.71	54.55	328.45	180.42	0	14.5	0	0	59.08	2.4
1114	2599.51	973.91	150.77	1091.32	224.5	0	11.79	52.3	0	94.92	2.3
1115	2149.3	654.76	22.53	1246.22	127.69	0	5.36	0	0	92.74	2.2
1116	1365.31	83.69	0	1171.3	51.38	0	0	0	0	58.94	2.1
Total	**24876.87**	**5163.33**	**1223.23**	**8215.3**	**3916.14**	**148.49**	**443.69**	**2525.39**	**366.71**	**2874.59**	**6.4**
	DCIA	**0**	**3.6**	**0**	**5**	**0**	**11.3**	**2.2**	**0**	**43.3**	

Table C2. Lower 2 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
1201	1678.8	5.21	82.84	0	1385.65	1.91	152.19	0	47.92	3.08	21.4
1202	1798.53	7.59	57.13	0	1065.47	82.88	415.4	95.81	57.03	17.22	26.2
1203	77.38	0.2	0	0	76.4	0.78	0	0	0	0	21.8
1204	226.65	3.01	0.01	0	113.21	0.24	61.71	44.07	4.4	0	33.4
1205	35.67	0	0	0	27.7	0	5.82	0	0.86	1.29	22.6
1206	208.7	0	24.63	0	14.11	3.69	18.47	0	3.48	144.32	5.7
1207	152.88	0	84.23	0	20.69	2.91	18.5	0	3.97	22.58	10.5
1208	22.46	0	0	0	16.99	0	5.47	0	0	0	24.9
1209	12.57	0	0	0	0	0	2.95	5.85	3.77	0	39.2
1210	29.85	0	0.31	0	27.1	2.44	0	0	0	0	22.5
1211	133.37	3.9	0	0	85.12	6.91	12.84	20.99	0	3.61	29.5
1212	105.73	0	0	0	96.24	1.38	8.11	0	0	0	22.9
1213	223.81	11.81	0	1.2	174.51	8.13	26.94	1.22	0	0	22.7
1214	20.76	0.34	0	0	16.3	0	4.12	0	0	0	24.0
1215	516.05	1.2	51.64	0	242.87	64.45	140.98	0	0	14.91	24.5
1216	932.22	45.3	145.41	77.54	421.84	16.29	116.73	3.28	9.2	96.63	15.8
1217	1619.62	37.51	6.3	0	1120.88	56.64	284.56	3.84	0	109.89	22.5
1218	1241.22	47.82	30.88	0	535.5	24.88	314.7	106.07	17.21	164.16	24.7
1219	1871.56	118.83	300.33	17.52	798.9	81.03	251.48	49.49	17.49	236.49	18.0
1220	1512.37	121.61	196.08	73.9	622.23	28.11	167.36	61.23	30.88	210.97	16.8
1221	1718.06	178.76	103.69	115.05	336.26	7	19.13	576.52	7.79	373.86	27.4
1222	1376.51	149.39	255.47	132.35	94.98	30.38	22.22	306.63	102.88	282.21	18.6
1223	1407.32	193.61	153.16	228.8	367.94	26.42	60.76	51.46	0	325.17	10.8
1224	1674.49	166.49	87.79	59.39	189.8	6.83	28.85	646.24	56.53	432.57	29.2
1225	3469.68	201.43	98.95	142.99	1453.21	60.45	224.62	741.6	23.81	522.62	26.3
1226	1314.63	205.81	142.98	1.69	495.6	149.14	19.48	43.15	57.6	199.18	15.3
1227	1817.58	83.48	68.58	12.22	1056.18	146.42	55.82	108.97	51.2	234.71	20.6
1228	1798.69	281.65	61.08	349.31	587.76	42.83	212.53	0	0	263.53	12.2
1229	1547.22	385.13	34.6	98.22	918.22	0	40.67	0	0	70.38	13.9
1230	1040.04	160.42	12.24	227.8	413.52	13.21	80.9	66.63	0	65.32	16.1
1231	3341.58	1021.08	174.83	742.65	1058.2	0	42.53	13.76	74.71	213.82	7.8
1232	101.18	4.68	9.3	0.54	82.39	0	2.15	0	0	2.12	18.9
1233	33.62	3.89	0	0	25.96	0.09	3.08	0.46	0	0.14	21.0
1234	86.58	15.4	1.88	0	11.05	8.95	29.43	6.97	8.45	4.45	23.6
1235	53.43	4.65	0	0	22.56	0.38	10.09	9.98	5.77	0	28.5

1236	18.6	0	0	0	7.76	0	9.85	0	0.88	0.11	27.6
1237	6.89	0	0	0	6.89	0	0	0	0	0	21.7
1238	6.55	0	1.06	0	1.89	0	3.6	0	0	0	26.3
1239	76.36	1.85	0	0	71.01	0	2.35	0.13	0	1.02	21.4
1240	22.01	1.26	0.02	0	17.25	0	3.48	0	0	0	22.5
1241	110.81	2.8	1.36	0	103.79	0	2.85	0	0	0.01	21.3
1242	384.17	3.38	4.83	0	314.41	1.73	59.72	0	0	0.1	23.4
1243	25.28	0	0.53	0	18.16	6.59	0	0	0	0	24.5
1244	874.78	38.47	0.15	0	649.32	15.39	163.3	8.15	0	0	23.9
1245	746.78	15.59	10.05	0	568.91	82.19	64.22	0	0	5.82	23.3
1246	422.36	19.34	64.92	0	98.34	9.05	51.96	32.1	6.93	139.72	15.9
1247	321.73	5.2	0	0	259.68	0	23.25	33.6	0	0	27.0
Total	**36217.13**	**3548.09**	**2267.26**	**2281.17**	**16092.75**	**989.72**	**3245.17**	**3038.2**	**592.76**	**4162.01**	**19.6**
	DCIA	**0**	**4.9**	**0**	**21.7**	**33.9**	**35**	**66.6**	**0**	**0**	

Table C3. Middle 1 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
2101	32.92	0	0	0	28.77	0	2.13	0	1.9	0.12	8.1
2102	7.98	2.35	0.08	0	1.23	0	1.67	2.65	0	0	8.9
2103	1560	394.91	458.94	85.68	384.11	0.09	71.34	20.19	0.69	144.05	5.0
2104	979.5	278	117.54	23.52	202.87	142.82	91.12	17.37	0	106.26	6.8
2105	831.62	72.91	33.57	0	558.48	20.89	68.59	3.93	0	73.25	7.4
2106	913.18	100.98	74.58	0	335.77	269.43	45.79	14.59	0	72.04	8.0
2107	953.1	41.54	6.76	0	597.6	38.87	19.97	175.88	0	72.48	9.1
2108	1328.86	64.53	85.87	12.04	762.91	121.01	158	56.85	0	67.65	7.8
2109	757.1	52.17	12.4	0.01	495.05	155.52	10.13	0	0	31.82	7.2
2110	1857.57	113.21	110.28	22.73	1229	70.46	153.62	69.5	0	88.77	7.2
2111	739.65	134.23	0	51.46	243.24	84.1	77.56	54.26	0	94.8	8.3
2112	1851.27	453.52	194.34	42.52	271.6	67.1	485.97	138.83	78.5	118.89	8.6
2113	2489.09	224.22	102.58	22.79	847.43	209.57	117.31	42.29	0	922.9	11.6
2114	2057.72	313.29	14.91	81.63	370.37	123.1	75.58	363.91	645.19	69.74	15.4
2115	2372.05	560.43	245.57	107.32	142.07	6.47	103.54	535.16	56.28	615.21	11.0
2116	1222.24	486.29	0	462.7	180.68	0	2.7	0	0	89.87	2.7
2117	1891.88	366.2	3.8	47.48	724.28	15.84	250.03	372.9	45.21	66.14	8.7
2118	2211.39	401.75	82.6	1004.13	313.52	0	7.62	0.73	0	401.04	5.0
2119	2144.08	608.57	247.42	186.07	775.35	36.78	11.52	2.43	0	275.94	5.6
2120	2043.57	678.1	42.84	579.13	465.17	0	8.66	44.07	0	225.6	4.3
2121	2408.14	913.17	139.9	482.54	361.83	0	8.8	191.43	25.16	285.31	5.3
2122	2643.13	801.4	145.18	937.68	372.28	0	30.08	78.27	0	278.24	4.0
2123	2895.79	903.42	92.35	565.39	186.42	0	147.73	523.54	1.18	475.76	7.6
Total	**36191.83**	**7965.19**	**2211.51**	**4714.82**	**9850.03**	**1362.05**	**1949.46**	**2708.78**	**854.11**	**4575.88**	**7.5**
	DCIA	**0.2**	**2.6**	**0.5**	**6.2**	**10.1**	**11.8**	**16.2**	**30.8**	**20.6**	

Table C4. Middle 2 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
2201	1037.02	89.27	9.38	0	713.51	63.8	95.94	2.89	30.56	31.67	21.8
2202	1531.86	378.26	41.11	82.91	321.12	29.73	163.9	349.64	83.74	81.45	27.1
2203	25.12	0	0.14	0	22.71	0	0	0	0	2.27	22.5
2204	43.41	3.35	0.09	0	33.5	5.57	0.07	0	0.33	0.5	21.9
2205	1347.49	454.71	84.92	0	185.03	49.01	132.4	196.94	183.55	60.93	20.9
2206	976.53	139.11	49.65	0	258.17	60.03	40.13	293.16	39.69	96.59	34.4
2207	987.39	192.53	143.29	0	501.62	31.05	36.82	0	31.47	50.61	16.8
2208	1560.18	70.99	80.68	0	534.13	40.28	115.97	568.92	22.32	126.89	38.6
2209	776.3	24.2	9.62	0	441.57	39.21	182.63	79.07	0	0	28.9
2210	867.13	56.22	4.76	0	706.97	27.72	70.16	0	0	1.3	20.9
2211	35.37	7.85	0	0	20.62	0.36	1.92	4.62	0	0	23.0
2212	22.32	2.08	0	0	17.09	0	0	0	3.15	0	15.4
2213	35.2	0.56	0	0	33.15	0.09	1.4	0	0	0	20.3
2214	1783.54	363.41	6.5	7.55	1127.72	24.93	217.83	2.44	0	33.16	19.3
2215	853.08	76.25	5.48	0	203.18	14.98	52.97	481.19	19.03	0	44.2
2216	8.13	0	0	0	3.86	0.55	3.72	0	0	0	29.4
2217	3.93	0.8	0	0	0	0	2.21	0	0.92	0	21.4
2218	1735.14	149.7	44.18	0	878.05	184.02	224.88	184.56	20.64	49.11	28.2
2219	822.45	30.88	64.35	0	456.82	14.3	142.18	6.93	0	106.99	25.8
2220	597.58	75.46	10.56	18.81	455.43	13.36	17.95	0	0	6.01	18.2
2221	2511.09	194.82	67.24	0	661.28	548.29	551.5	0.03	0	487.93	33.2
2222	856	56.3	5.2	18.95	122.23	60.32	105.15	213.47	0	274.38	42.8
2223	1188.18	156.61	5.7	16.59	493.76	84.08	212.13	16	80.21	123.1	24.5
2224	1767.98	105.63	16.61	15.35	669.49	157.57	136.24	120.73	82.18	464.18	32.1
2225	265.43	54.92	21.35	0	77.31	9.35	22.97	33.55	12.95	33.03	25.9
2226	837.5	65.98	226.67	5.01	0.02	0	101.82	385.34	52.14	0.52	35.9
2227	1433.57	62.75	0.27	0	451.59	2.94	170.75	665.1	66.67	13.5	41.1
Total	**23908.92**	**2812.64**	**897.75**	**165.17**	**9389.93**	**1461.54**	**2803.64**	**3604.58**	**729.55**	**2044.12**	**29.4**
	DCIA	**2.8**	**6.1**	**0**	**19.8**	**44.9**	**37**	**64.1**	**0**	**50**	

Table C5. Middle 3 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
2301	37.49	0	0	0	37.39	0	0.1	0	0	0	16.1
2302	25.61	0	0	0	17.57	0.37	7.67	0	0	0	24.1
2303	11.16	0	0	0	7.4	0	3.76	0	0	0	24.7
2304	283.81	11.31	6.52	0	231.34	6.5	28.14	0	0	0	18.3
2305	281.91	0	0.36	0	256.58	0.35	24.62	0	0	0	18.3
2306	24.3	0	0	0	22.84	0	1.46	0	0	0	17.6
2307	675.56	0	0.03	0	590.74	3.27	80	1.52	0	0	19.3
2308	141.95	8.13	0.16	0	123.88	0	4.72	0	5.06	0	16.7
2309	32.78	0	0.03	0	32.75	0	0	0	0	0	16.0
2310	82.95	3.12	0.96	0	65.89	2.24	5.44	0.16	4.81	0.33	18.7
2311	69.65	0	0	0	60.49	0	8.23	0	0.9	0.03	19.3
2312	89.23	0	7.28	0	58.72	2.73	19.48	0	1.02	0	21.3
2313	70.29	0	3.15	0	57.24	0	9.74	0	0.16	0	18.9
2314	82.93	10.73	0	0	66.8	0.09	5.31	0	0	0	16.0
2315	162.61	0	0	0	142.87	0	19.74	0	0	0	19.2
2316	26.91	0	0	0	25.1	0	1.81	0	0	0	17.8
2317	1037.41	12.77	85.58	0	758.17	0	151.32	5.94	16.09	7.54	18.9
2318	1381.62	7.05	25.55	0	1071.23	24.07	248.71	0	0	5.01	20.8
2319	453.34	40.95	108.48	0	80.34	6.21	69.8	1.62	24.62	121.32	19.9
2320	1359.64	46.62	67.33	0	745.75	92.41	294.67	76.32	0	36.54	25.1
2321	807.79	94.46	53.79	0	381.86	40.32	146.58	4.35	0	86.43	21.0
2322	1639.67	9.67	57.1	0	1201.92	6.83	212.42	151.73	0	0	23.2
2323	640.1	14.47	13.9	0	510.11	6.91	48.53	46.18	0	0	21.0
2324	1085.91	34.54	354.98	0	542.45	35.19	76.23	0	0.97	41.55	13.6
2325	911.03	5.13	0	0	110.16	0	285.84	472.09	0	37.81	49.1
2326	791.71	21.85	136.3	0	428.11	66.71	72.21	0	0	66.53	18.5
Total	**12207.36**	**320.8**	**921.5**	**0**	**7627.7**	**294.2**	**1826.53**	**759.91**	**53.63**	**403.09**	**22.4**
	DCIA	**3.1**	**0.3**	**0.0**	**16.0**	**40.6**	**41.8**	**63.3**	**30.8**	**29.1**	

Table C6. Upper 1 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
3101	18.78	0	0	0	18.78	0	0	0	0	0	38.8
3102	197.07	0	0	0	159.58	0	28.27	0	9.22	0	43.3
3103	12.04	0	0	0	11.53	0	0.51	0	0	0	39.9
3104	209.84	1.92	5.15	0	143.31	1.06	48.88	0	9.52	0	44.6
3105	442.6	0	0	0	368.11	5.58	44.82	1.04	0	23.05	41.2
3106	10.62	0	0	0	10.62	0	0	0	0	0	38.8
3107	28.26	0	0	0	26.89	0	1.37	0	0	0	40.1
3108	15.3	0	0.49	0	14.54	0	0.27	0	0	0	38.2
3109	31.58	0	0.63	0	30.93	0	0.02	0	0	0	38.2
3110	21.4	0	0	0	12.95	0	8.24	0	0	0.21	49.0
3111	1016.14	31.53	0.05	0	544.7	77.54	253	28.3	35.29	45.73	46.6
3112	1088.6	24.13	31.01	0	601.98	62.59	290.61	16.5	32.29	29.49	45.8
3113	872.34	200.98	79.56	0	461.6	14.7	17.29	40.93	0	57.28	29.7
3114	1255.47	111.46	0	0	686.86	33.8	356.81	3.22	47.16	16.16	44.1
3115	2485.66	366.43	249.69	8.47	1136.24	170.85	145.93	192.49	56.51	159.05	35.8
3116	1070.2	42.97	66.84	0	793.46	71.12	32.18	4.51	0	59.12	36.6
3117	1823.03	227.83	103.86	2.8	1222.51	69.94	181.51	0	0	14.58	35.5
3118	1223.53	364.93	177.35	68.85	178.29	79	99.9	14.91	71.73	168.57	24.2
3119	2313.62	245.21	174.91	32.18	1093.4	325.68	112.69	12.45	0	317.1	34.0
3120	561.34	7.76	9.38	0	409.49	0	69.87	0	6.58	58.26	40.1
3121	6.26	0	0	0	6.26	0	0	0	0	0	38.8
3122	50.54	0	0.27	0	38.01	0	12.26	0	0	0	45.1
3123	1409.38	17.57	209.15	0	849.55	16.91	225.37	6.37	47.39	37.07	38.3
3124	289.03	28.22	33.28	0	155.44	0	65.14	0	0	6.95	37.3
Total	**16452.63**	**1670.94**	**1141.62**	**112.3**	**8975.03**	**928.77**	**1994.94**	**320.72**	**315.69**	**992.62**	**37.1**
	DCIA	**2.8**	**6.2**	**2.6**	**38.8**	**52.4**	**65.6**	**84.5**	**52**	**28**	

Table C7. Upper 2 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
3201	60.23	0	1.82	0	40.15	0.03	3.82	0	14.41	0	18.2
3202	255.82	8.83	48.67	0	133.4	5.47	36.36	0	7.22	15.87	17.1
3203	547.51	1.28	133.67	0	260.16	2.7	55.89	48.37	9.15	36.29	18.7
3204	1285.26	43.18	72.07	0	854.5	25.66	221.1	5.13	0	63.62	19.1
3205	888.72	10.67	92.51	0	427.85	2.04	221.54	108.4	25.71	0	21.8
3206	1508.56	96.78	0	0	1045.19	78.74	77.91	183.75	15.45	10.74	20.5
3207	962.78	84.9	7.36	0	598.56	22.11	174.45	0	0	75.4	19.3
3208	1573.66	77.81	29.92	0	760.75	10.07	238.68	373.37	75.31	7.75	24.4
3209	1780.7	228.37	55.47	0	1042.65	87.25	206.21	6.66	0	154.09	18.0
3210	1205.14	61.13	36.77	0	812.08	16.37	185.09	1.51	21.05	71.14	19.0
3211	1292.9	57.73	60.55	0	674.65	327.37	103.8	7.43	41.18	20.19	18.7
3212	1137.04	32.16	185.11	0	664.95	6.82	154.28	0	4.37	89.35	17.7
3213	1632.7	47.13	87.17	0	326.89	334.89	168.72	518.69	127.02	22.19	27.1
3214	1010.73	89.01	167.76	0	621.76	71.71	9.86	44.39	0.38	5.86	15.4
3215	1063.61	82.79	302.65	0	591.94	0	36.8	0	2.48	46.95	13.4
3216	1095.12	116.16	106.46	18	379.18	59.02	298.67	9.04	106.1	2.49	17.7
3217	1181.12	215.02	72.28	5.68	547.75	3.15	241.61	31.43	61.84	2.36	16.5
3218	1520.92	130.39	66.65	0	692.98	66.37	449.24	0	109.19	6.1	19.0
3219	2263.46	147.38	192.36	24.02	1343.78	12.11	374.94	2.46	84.29	82.12	17.6
3220	1135.14	237.92	63.8	0	458.43	68.36	269.08	0	27.33	10.22	16.2
3221	44.95	0	23.55	0	19.85	0	0.29	0	0	1.26	10.9
3222	132.23	0.04	0	0	115.94	0	14.61	0	0	1.64	18.8
3223	122.22	0	1.67	0	115.34	0	5.21	0	0	0	17.7
3224	10.82	0	0.16	0	9.48	0	1.18	0	0	0	18.4
3225	29.72	0	0.55	0	27.63	0	1.54	0	0	0	17.7
3226	75.68	0.95	1.65	0	50.52	1.83	20.73	0	0	0	20.0
3227	106.96	1.2	2.83	0	102.82	0	0	0	0	0.11	16.9
3228	301.52	8.72	4.96	0	190.19	0	41.19	32.95	23.5	0.01	21.2
3229	80.51	6.71	8.71	0	65.09	0	0	0	0	0	14.5
Total	**24305.73**	**1786.26**	**1827.13**	**47.7**	**12974.46**	**1202.07**	**3612.8**	**1373.58**	**755.98**	**725.75**	**19.1**
	DCIA	**0.5**	**3.9**	**0.5**	**17.4**	**22.7**	**28.3**	**43.4**	**19.5**	**35.7**	

Table C8. Main 1 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
4101	851.47	0	52.05	0	744.66	0	42.61	6.01	0	6.14	3.2
4102	1270.46	48.64	71.31	0	949.81	37.3	143.41	0	10.23	9.76	6.2
4103	2315.48	7.77	358.17	0	1745.05	27.61	167.46	3.89	5.53	0	3.6
4104	79.57	0	0	0	62.89	0	13.19	0	0	3.49	10.2
4105	1774.65	120.51	110.73	0	939.59	55.79	141.72	268.57	33.75	103.99	20.3
4106	712.78	32.74	3.65	0	94.23	171.37	225.87	0	155.49	29.43	23.3
4107	1210.57	77.87	1.28	0	1011.72	10.62	98.63	0.01	0	10.44	4.3
4108	1171.55	144.72	0	0	907.98	25.99	71.59	1.69	0	19.58	4.4
4109	1256.3	132.26	0	0	817.42	31.22	202.09	0	58.73	14.58	8.6
4110	1795.44	242.53	8.01	3.24	1120.22	115.76	223.06	0	54.68	27.94	8.1
4111	1025.14	248	94.87	0	441.66	86.95	71.36	36.02	17.05	29.23	9.8
4112	1284.88	107.86	223.79	0	103.9	217.12	482.17	0	130.09	19.95	21.8
4113	1781.07	55.97	251.81	0	1001.56	119.2	319.74	0	18.3	14.49	10.0
4114	1983.39	172.7	169.51	0	754.75	433.38	403.46	7.61	7.5	34.48	15.4
4115	2855.56	128.09	65.13	0	1915.25	276.32	337.98	1.66	29.51	101.62	9.9
4116	2393.49	120.16	158.33	0	1919.3	27.98	67.56	20.05	0	80.11	4.4
4117	2076.26	40.98	22.84	0	1669.89	75	259.82	1.64	0	6.09	6.5
4118	2837.98	248.09	290.85	0	1713.44	139.23	216.94	0.64	0	228.79	9.9
4119	2079.82	25.84	129.48	19.71	1346.89	176.05	67.34	0	0	314.51	13.4
4120	2232.16	27.92	9.73	0	1780.87	73.13	110.27	0	16.39	213.85	9.3
4121	1922.81	101.34	176.99	0	1378.21	28.65	151.8	5.18	0.01	80.63	6.8
4122	2048.45	121.16	110.77	0	1287.17	54.59	305.76	0	25.43	143.57	11.9
4123	1478.95	25.12	0	0	1144.55	19.05	120.06	0	27.05	143.12	10.4
4124	2921.22	118.96	235.49	0.11	1457.71	43.39	170.27	17.48	0	877.81	23.4
4125	2799.14	149.21	165.34	0	1519.7	204.21	430.16	246.8	55.86	27.86	16.2
4126	1434.05	24.15	77.07	0	771.85	270.74	27.57	2.17	186.47	74.03	9.4
4127	2340.03	137.45	51.32	0	1989.58	0.31	119.77	0	11.94	29.66	3.1
4128	2244.51	99.91	63.54	10.35	1782.56	112.5	94.51	0.01	56.26	24.87	3.9
4129	4137.23	473.74	167.16	67.53	2569.32	63.57	177.35	158.93	103.99	355.64	11.1
4130	775.98	10.5	42.17	0	614.14	24.34	81.17	0	3.66	0	5.3
4131	1151.05	57.67	16.13	0	759.93	62.62	154.15	0	33.38	67.17	11.1
4132	497.39	51.67	0.28	0	312.31	20.19	25	23.23	6.13	58.58	14.8
Total	**56738.83**	**3353.53**	**3127.8**	**100.94**	**36628.11**	**3004.18**	**5523.84**	**801.59**	**1047.43**	**3151.41**	**10.4**
	DCIA	**0**	**0**	**0**	**0**	**23**	**43.6**	**79.6**	**5.4**	**66.7**	

Table C9. Main 2 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
4201	160.17	3.3	8.08	0	126.29	0	12.85	0	0	9.65	25.6
4202	337.78	0.84	0	0	183.14	0	87.21	66.59	0	0	41.9
4203	219.74	0	0.24	0	205.97	0.41	13.1	0.02	0	0	25.4
4204	441.63	0.42	3.67	0	412.66	4.13	14.22	0	6.53	0	25.2
4205	511.69	0.23	0.88	0	420.43	4.87	77.69	0.4	7.19	0	28.3
4206	467.88	0.11	32.46	0	341.95	42.49	31.63	14.25	4.99	0	27.5
4207	71.39	0	0	0	55.32	0	10.85	0	5.2	0.02	30.3
4208	440.13	3.29	3.72	0	192.97	0	48.48	150.28	39.96	1.43	50.1
4209	144.71	2.76	0	0	103.14	3.6	35.21	0	0	0	29.8
4210	625.55	0	16.29	0	339.75	11.07	122.11	125.48	10.85	0	41.0
4211	156.32	1.09	1.91	0	139.04	0.43	10.7	1.54	0	1.61	26.1
4212	170.04	0	0.13	0	135.96	4.07	29.31	0	0.57	0	28.5
4213	144.17	0.02	0.46	0	82.48	2.43	7.63	45.54	5.61	0	45.6
4214	73.17	0	0.66	0	57.96	11.08	0.17	0.26	3.04	0	27.4
4215	204.68	0	0	0	8.24	0	92.02	99.26	5.16	0	64.6
4216	247.13	0	6.97	0	207.24	4.35	26.06	0.46	2.05	0	26.6
4217	552.04	0.23	36.03	0	481.98	3.36	30.15	0.29	0	0	24.1
4218	712.23	0	7.7	0	642.57	3	56.06	2.37	0.07	0.46	25.9
4219	446.55	0.98	27.42	0	404.61	4.37	9.06	0.11	0	0	23.4
4220	996.4	4.14	15.7	0	808.59	36.09	120.77	2.91	8.17	0.03	27.4
4221	234.88	6	164.4	0	26.48	5.39	22.39	0	1.19	9.03	13.0
4222	635.91	0.21	13.27	0	487.64	42.06	86.83	5.9	0	0	28.2
4223	945.75	0	85.58	0	723.8	9.1	118.67	8.6	0	0	25.9
4224	26.62	0	0.21	0	0	22.46	3.13	0	0.82	0	37.8
4225	34.2	0.1	1.69	0	0.81	2.66	13.48	9.82	5.6	0.04	56.5
4226	1104.4	0.98	31.22	0	783.51	80.39	191.87	2.35	13.94	0.14	29.0
4226a	470.84	0.42	13.31	0	334.04	34.27	81.80	1.00	5.94	0.06	12.38
4226b	633.56	0.56	17.91	0	449.47	46.12	110.07	1.35	8.00	0.08	16.66
4227	32.36	0	2.33	0	27.08	1.48	1.47	0	0	0	24.2
4228	581.68	7.14	0	0	465.97	0	89.92	0.98	14.12	3.55	28.6
4229	30.86	0.02	0.59	0	26.92	0	2.8	0	0.53	0	26.4
4230	681.92	3.34	667.55	0	1.35	0.02	9.25	0	0	0.41	4.8
4231	65.86	2.26	0	0	59.54	0	1.5	0	0	2.56	24.6
4232	66.29	0	3.03	0	17.24	0	43.36	0	2.66	0	40.3
4233	485.93	0.08	1.04	0	401.06	1.24	82.39	0.12	0	0	28.1

4234	8	0	0	0	8	0	0	0	0	0	24.0
4235	863.51	2.88	621.08	0	11.29	11.5	76.06	91.03	43.99	5.68	20.2
4236	243.27	4.3	68.39	0	8.38	0	5.73	148.24	0	8.23	55.5
4237	194.23	0.79	175.82	0	8.47	0	7.5	0.59	0	1.06	7.1
4238	259.68	1.2	243.49	0	7.36	0	3.69	0.14	1.63	2.17	6.0
4239	2081.98	88.89	1.96	0	987.71	67.32	669.29	148.16	118.65	0	37.6
4240	5.14	0	0	0	3.45	0	1.69	0	0	0	31.9
4241	845.54	42.22	161.16	0	81.53	15.41	225.21	0.02	86.55	233.44	34.5
4242	134.59	0	0	0	4.44	0	4.05	8	118.1	0	60.6
4243	322.04	16.79	40.97	0	115.03	11.64	57.27	0	1.11	79.23	29.6
4244	1156.33	0	114.25	0	755.37	82.64	204.07	0	0	0	27.1
4245	2070.24	32.34	87.76	0	1430.61	70.31	414.12	0	35.1	0	28.7
4246	1274.07	181.05	82.42	0	662.93	19.89	275.77	15.77	35.4	0.84	27.2
4247	962.86	40.87	17.17	0	322.75	114.09	345.06	15.72	80.4	26.8	37.4
4248	1567.74	148.61	160.35	0	952.09	99.32	158.49	29.6	0	19.28	24.7
Total	**24039.28**	**597.48**	**2908.05**	**0**	**13731.1**	**792.67**	**3950.34**	**994.8**	**659.18**	**405.66**	**29.2**
	DCIA	**4.9**	**4.1**	**2.8**	**24**	**35.8**	**48**	**83.5**	**60.9**	**41.6**	

Table C10. Main 3 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
4301	211.97	9.76	26.39	0	112.47	27.79	21.24	14.32	0	0	31.6
4302	2174.07	7.14	18.89	0	953.31	2.76	739.15	19.93	354.81	78.08	43.0
4303	136.64	0.71	0	0	0	0	111.93	0	24	0	58.0
4304	123.61	1.04	2.31	0	99.72	1.26	14.49	0	4.79	0	30.3
4305	574.78	0.15	4	0	495.03	6.62	61.12	0.38	7.48	0	29.5
4306	797.46	0	13.29	0	660.68	18.35	87.08	1.41	16.65	0	29.9
4307	26.96	0	0	0	16.42	5.24	3.5	0	1.8	0	33.7
4308	225.94	0	7.04	0	142.03	10.02	40.58	26.27	0	0	38.1
4309	119.26	0	0	0	100.86	7.45	9.13	1.82	0	0	29.5
4310	269.57	0	2.9	0	212.56	0.71	24.05	22.59	6.76	0	33.8
4311	413.95	0	5.35	0	232.16	8.66	61.91	105.87	0	0	44.8
4312	399.54	0	13.36	0	232.18	18.17	113.38	7.02	15.43	0	37.2
4313	554.47	0	15.92	0	386.5	11.79	41.25	99.01	0	0	37.8
4314	437.66	0	56.02	0	318.81	5.99	47.72	4.09	5.03	0	28.8
4315	720.69	0	8.52	0	383.09	23.73	115.65	185.96	3.74	0	45.5
4316	263.09	0	24.52	0	207.3	0.65	20.47	0.69	9.46	0	28.4
4317	102.23	0	0	0	78.12	3.06	9.66	11.3	0.09	0	35.1
4318	200.44	0	1.09	0	113.19	9.82	28.42	45.09	2.83	0	43.6
4319	637.41	0	1.02	0	355.65	38.55	134.23	94.43	13.53	0	41.9
4320	645.41	0	0	0	533.44	20.13	63.33	13.74	14.77	0	30.9
4321	428.23	0	4.23	0	268.85	16.6	51.07	87.48	0	0	41.1
4322	612.17	0	5.13	0	489.29	29.21	59.16	0.39	28.99	0	30.6
4323	502.88	0	0	0	374.59	38.92	86.47	2.9	0	0	32.3
4324	410.66	0.42	9.59	0	330.09	23.42	35.92	0	11.22	0	29.5
4325	390.4	0	0.5	0	318.77	14.8	55.14	1.19	0	0	30.7
4326	491.62	0.2	5.93	0	414.69	10.86	39.31	0.08	20.55	0	29.5
4327	482.26	0	10.68	0	277.82	10.31	165	0.24	18.21	0	38.1
4328	408.67	0.27	3.34	0	298.53	10.43	84.75	2.59	8.76	0	33.6
4329	659.1	0	25.71	0	534.24	0.62	81.35	1.28	15.9	0	30.1
4330	406.38	0	4.39	0	326.38	0.72	61.97	0.06	12.86	0	31.5
4331	2084.58	0.5	85.29	0	1638.25	46.33	263.58	3.63	47	0	30.3
4332	658.36	0	19.31	0	543.32	6.77	64.21	0	24.75	0	29.7
4333	1674.39	133.27	24.89	0	311.27	32.4	223.79	722.64	141.89	84.24	56.0
4334	141.87	0	0.57	0	13.85	0.81	1.63	3.6	121.41	0	53.1
4335	739.38	94.07	0	0	0.64	66.52	483.76	0	27.41	66.98	48.8

4336	816.44	72.56	45.84	0	23.27	56.24	308.99	185.66	123.88	0	53.5
4337	772.38	177.41	150.98	0	13.22	0	218.76	61.07	98.83	52.11	38.0
4338	284.27	0.09	0	0	189.66	4.13	75.68	0.18	14.53	0	36.1
Total	**20999.19**	**497.59**	**597**	**0**	**12000.25**	**589.84**	**4108.83**	**1726.91**	**1197.36**	**281.41**	**38.1**
	DCIA	**4.2**	**15.4**	**4.6**	**25.5**	**34.9**	**58.9**	**81**	**55.6**	**50**	

Table C11. Main 4 Land Use Breakdown and DCIA

Subarea	Total Acres	Forest/ Rural Open	Urban Open	Agricultural/Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	Area-weighted DCIA
4401	159.96	0	0.97	0	0	0	75.6	83.36	0	0.03	62.8
4402	529.83	0	84.02	0	317.62	61.32	59.43	7.44	0	0	27.0
4403	1466.26	7.22	49.88	0	659.21	17.75	227.23	482.34	5.49	17.14	46.5
4404	775.3	0.03	38.74	0	374.71	67.49	116.85	144.28	33.2	0	39.7
4405	618.37	62.11	18.53	0	310.48	18.45	95.38	112.04	0.29	1.09	37.2
4406	2709.21	61.7	72.7	0	1434.36	37.23	501.39	476.01	125.82	0	39.5
4407	509.99	20.67	6.42	0	272	7.08	67.81	136.01	0	0	41.8
4408	1790.36	0.19	10.7	0	916.92	202.73	295.52	261.27	103.03	0	39.4
4409	2824.9	16.83	92.15	0	1731.93	157.16	416.64	281.59	128.6	0	35.2
4410	1004.77	1.29	21.98	0	508.62	273.9	152.18	18.48	28.32	0	32.9
4411	1094.13	1.62	14.92	0	518.38	226.39	171.57	128.55	32.7	0	37.7
4412	357.6	38.56	0	0	0.54	0	8.23	297.29	12.98	0	69.4
4413	1109.42	62.04	298.99	0	165.82	20.87	66.36	490.86	4.45	0.03	44.9
4414	1947.99	240.97	56.31	0	11.58	89.08	66.24	1224.01	124.9	134.9	64.8
4415	71.94	1.76	0.14	0	11.14	0.02	14.87	44.01	0	0	61.7
4416	465.34	0.82	0.4	0	0.51	0	60.93	375.58	0	27.1	74.8
4417	1060.94	69.94	28.38	0	459.42	29.2	113.36	360.2	0	0.44	44.7
4418	411.26	0.76	1.45	0	263.31	62.08	67.72	4.38	11.56	0	31.9
4419	88.68	0	0.92	0	25.92	14.76	13.71	22.42	10.95	0	47.2
4420	1559.74	45.12	21.55	0	1019.86	133.03	208.17	29.41	102.6	0	31.6
4421	74.46	0	8.35	0	40.14	1.95	14.18	9.84	0	0	34.8
4422	162.52	0	37.16	0	22.66	9.59	19.63	73.4	0.04	0.04	48.3
4423	244.36	0.29	10.28	0	113.72	13.16	23.46	83.45	0	0	45.2
4424	948.25	3.27	30.09	0	289.53	75.61	175.26	340.94	33.55	0	49.5
4425	428.13	0	1.93	0	281.95	49.05	53	42.2	0	0	34.4
Main 4	**22413.71**	**635.19**	**906.96**	**0**	**9750.33**	**1567.9**	**3084.72**	**5529.36**	**758.48**	**180.77**	**42.7**
	DCIA	**15.1**	**7.8**	**4.6**	**25.5**	**35.4**	**47**	**77.8**	**55.6**	**100**	

Table C12. Land Use Breakdown for each Subwatershed and DCIA Values.

Rouge Subwatershed	Drainage Area (acres)	2000 Land Use Breakdown								
		Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands
Main 1	56,739	5.9%	5.5%	0.2%	64.6%	5.3%	9.7%	1.4%	1.8%	5.6%
Main 2	24,039	2.5%	12.1%	0.0%	57.1%	3.3%	16.4%	4.1%	2.7%	1.7%
Main 3	20,999	2.4%	2.8%	0.0%	57.1%	2.8%	19.6%	8.2%	5.7%	1.3%
Main 4	22,414	2.8%	4.0%	0.0%	43.5%	7.0%	13.8%	24.7%	3.4%	0.8%
Middle 1	36,192	22.0%	6.1%	13.0%	27.2%	3.8%	5.4%	7.5%	2.4%	12.6%
Middle 2	23,909	11.8%	3.8%	0.7%	39.3%	6.1%	11.7%	15.1%	3.1%	8.5%
Middle 3	12,207	2.6%	7.5%	0.0%	62.5%	2.4%	15.0%	6.2%	0.4%	3.3%
Upper 1	16,453	10.2%	6.9%	0.7%	54.6%	5.6%	12.1%	1.9%	1.9%	6.0%
Upper 2	24,306	7.3%	7.5%	0.2%	53.4%	4.9%	14.9%	5.7%	3.1%	3.0%
Lower 1	24,877	20.8%	4.9%	33.0%	15.7%	0.6%	1.8%	10.2%	1.5%	11.6%
Lower 2	36,217	9.8%	6.3%	6.3%	44.4%	2.7%	9.0%	8.4%	1.6%	11.5%

Rouge Subwatershed	Drainage Area (acres)	DCIA by Landuse (%)									Overall WMM DCIA (%)
		Forest/ Rural Open	Urban Open	Agricultural/ Pasture	Medium Density Residential	High Density Residential	Commercial	Industrial	Highways	Water/ Wetlands	
Main 1	56,739	0.0	0.0	0.0	0.0	23.0	43.6	79.6	5.4	66.7	10.4
Main 2	24,039	4.9	4.1	2.8	24.0	35.8	48.0	83.5	60.9	41.6	29.2
Main 3	20,999	4.2	15.4	4.6	25.5	34.9	58.9	81.0	55.6	50.0	38.1
Main 4	22,414	15.1	7.8	4.6	25.5	35.4	47.0	77.8	55.6	100.0	42.7
Middle 1	36,192	0.2	2.6	0.5	6.2	10.1	11.8	16.2	30.8	20.6	7.5
Middle 2	23,909	2.8	6.1	0.0	19.8	44.9	37.0	64.1	0.0	50.0	29.4
Middle 3	12,207	3.1	0.3	0.0	16.0	40.6	41.8	63.3	30.8	29.1	22.4
Upper 1	16,453	2.8	6.2	2.6	38.8	52.4	65.6	84.5	52.0	28.0	37.1
Upper 2	24,306	0.5	3.9	0.5	17.4	22.7	28.3	43.4	19.5	35.7	19.1
Lower 1	24,877	0.0	3.6	0.0	5.0	0.0	11.3	2.2	0.0	43.3	6.4
Lower 2	36,217	0.0	4.9	0.0	21.7	33.9	35.0	66.6	0.0	0.0	19.6

Table C13. CSO Area Flow Rates in MGD.

CSO Area	Flow Rate (mgd)
1201	0.6547
1202	0.7014
1203	0.0192
1204	0.2256
1205	0.0082
1208	0.0224
1213	0.2227
1214	0.0063
1233	0.0335
1234	0.0192
1235	0.0163
1236	0.0090
1237	0.0033
1238	0.0020
1239	0.0370
1240	0.0027
1241	0.1452
1242	0.1370
1243	0.0027
2308	0.0849
2309	0.0055
2310	0.0603
2311	0.0247
2312	0.0192
2313	0.0411
2315	0.0932
2316	0.0027
3101	0.0060
3102	0.1237
3103	0.0038
3104	0.1317
3105	0.2779
3106	0.0067
3107	0.0177
3108	0.0049
3109	0.0100
3121	0.0039
3122	0.0055

CSO Area	Flow Rate (mgd)
3201	0.0116
3221	0.0164
3222	0.0685
3223	0.0440
3224	0.0015
3225	0.0040
3226	0.0272
3227	0.0438
3228	0.0579
3229	0.0155
4101	0.6110
4102	0.4630
4103	1.3041
4201	0.0779
4202	0.1975
4203	0.1041
4204	1.6614
4205	1.9249
4206	0.1947
4207	0.0685
4208	0.2573
4209	0.0846
4210	0.2603
4211	0.1068
4212	0.0782
4213	0.0600
4214	0.0759
4215	0.2412
4216	0.2564
4217	0.1507
4218	0.1945
4219	0.0575
4220	1.8027
4222	0.1452
4223	0.2247
4224	0.0122
4225	0.0082
4226a	0.2184

CSO Area	Flow Rate (mgd)
4226b	0.2939
4227	0.0082
4228	0.3401
4229	0.0320
4301	0.1031
4302	1.0574
4303	0.1479
4304	0.1338
4305	0.3924
4306	0.5444
4307	0.0184
4308	0.1542
4309	0.0814
4310	0.1840
4311	0.2826
4312	0.2728
4313	0.3785
4314	0.2988
4315	0.4920
4316	0.1796
4317	0.1205
4318	0.1368
4319	0.4352
4320	0.4406
4321	0.2923
4322	0.4179
4323	0.3433
4324	0.2804
4325	0.2665
4326	0.3356
4327	0.3292
4328	0.2790
4329	0.4500
4330	0.2774
4331	1.4231
4332	0.4495
4338	0.1941
4401	0.0189

CSO Area	Flow Rate (mgd)
4402	0.1979
4403	0.7370
4404	0.3870
4406	2.9320
4407	0.1904
4408	0.6686
4409	1.0549
4410	0.3752
4411	0.4086
4415	0.0085
4417	?
4418	0.1536
4419	0.0331
4420	0.5825
4421	0.0329
4422	0.0712
4423	0.0575
4424	0.4733
4425	0.1599

Source: Brink, 1994

Table C14. 2008 WMM Subarea Jurisdictions.

Subarea	Jurisdiction
1101	Storm
1102	Storm
1103	Storm
1104	Storm
1105	Storm
1106	Storm
1107	Storm
1108	Storm
1109	Storm
1110	Storm
1111	Storm
1112	Storm
1113	Storm
1114	Storm
1115	Storm
1116	Storm
1201	Combined
1202	Combined
1203	Combined
1204	Combined
1205	Combined
1206	Storm
1207	Storm
1208	Combined
1209	Storm
1210	Storm
1211	Storm
1212	Storm
1213	Combined
1214	Combined
1215	Storm
1216	Storm
1217	Storm
1218	Storm
1219	Storm
1220	Storm
1221	Storm
1222	Storm
1223	Storm
1224	Storm
1225	Storm
1226	Storm
1227	Storm
1228	Storm
1229	Storm
1230	Storm
1231	Storm
1232	Storm
1233	Combined

Subarea	Jurisdiction
1234	Combined
1235	Combined
1236	Combined
1237	Combined
1238	Combined
1239	Combined
1240	Combined
1241	Combined
1242	Combined
1243	Combined
1244	Storm
1245	Storm
1246	Storm
1247	Storm
2101	Storm
2102	Storm
2103	Storm
2104	Storm
2105	Storm
2106	Storm
2107	Storm
2108	Storm
2109	Storm
2110	Storm
2111	Storm
2112	Storm
2113	Storm
2114	Storm
2115	Storm
2116	Storm
2117	Storm
2118	Storm
2119	Storm
2120	Storm
2121	Storm
2122	Storm
2123	Storm
2201	Storm
2202	Storm
2203	Storm
2204	Storm
2205	Storm
2206	Storm
2207	Storm
2208	Storm
2209	Storm
2210	Storm
2211	Storm
2212	Storm

Subarea	Jurisdiction
2213	Storm
2214	Storm
2215	Storm
2216	Storm
2217	Storm
2218	Storm
2219	Storm
2220	Storm
2221	Storm
2222	Storm
2223	Storm
2224	Storm
2225	Storm
2226	Storm
2227	Storm
2301	Storm
2302	Storm
2303	Storm
2304	Storm
2305	Storm
2306	Storm
2307	Storm
2308	Combined
2309	Combined
2310	Combined
2311	Combined
2312	Combined
2313	Combined
2314	Storm
2315	Combined
2316	Combined
2317	Storm
2318	Storm
2319	Storm
2320	Storm
2321	Storm
2322	Storm
2323	Storm
2324	Storm
2325	Storm
2326	Storm
3101	Combined
3102	Combined
3103	Combined
3104	Combined
3105	Combined
3106	Combined
3107	Combined
3108	Combined

Subarea	Jurisdiction
3109	Combined
3110	Storm
3111	Storm
3112	Storm
3113	Storm
3114	Storm
3115	Storm
3116	Storm
3117	Storm
3118	Storm
3119	Storm
3120	Storm
3121	Combined
3122	Combined
3123	Storm
3124	Storm
3201	Combined
3202	Storm
3203	Combined
3204	Storm
3205	Storm
3206	Storm
3207	Storm
3208	Storm
3209	Storm
3210	Storm
3211	Storm
3212	Storm
3213	Storm
3214	Storm
3215	Storm
3216	Storm
3217	Storm
3218	Storm
3219	Storm
3220	Storm
3221	Combined
3222	Combined
3223	Combined
3224	Combined
3225	Combined
3226	Combined
3227	Combined
3228	Combined
3229	Combined
4101	Combined
4102	Combined
4103	Combined
4104	Storm

Table C15. CSO Controls Added to Current WMM Model.

CSO Area	Retention Basin
1234	Inkster
1235	Inkster
1236	Inkster
1237	Inkster
1238	Inkster
1239	Inkster
1240	Inkster
1241	Inkster
2308	Dearborn Heights
2309	Dearborn Heights
2312	Dearborn Heights
2313	Dearborn Heights
2315	Dearborn Heights
2316	Dearborn Heights
3101	Redford
3102	Redford
3103	Redford
3104	Redford
3105	Redford
3106	Redford
3107	Redford
3108	Redford
3109	Redford
3121	Redford
3122	Redford
4101	Acacia Park
4102	Birmingham
4103	Bloomfield Village
4225	Puritan-Fenkell
4226a	Seven Mile
4226b	Puritan-Fenkell
4303	Hubbell-Southfield
4305	Hubbell-Southfield
4306	Hubbell-Southfield
4307	Hubbell-Southfield
4308	Hubbell-Southfield
4309	Hubbell-Southfield
4310	Hubbell-Southfield
4311	Hubbell-Southfield
4312	Hubbell-Southfield
4313	Hubbell-Southfield
4314	Hubbell-Southfield
4315	Hubbell-Southfield
4316	Hubbell-Southfield
4317	Hubbell-Southfield
4318	Hubbell-Southfield
4319	Hubbell-Southfield
4320	Hubbell-Southfield
4321	Hubbell-Southfield
4322	Hubbell-Southfield
4323	Hubbell-Southfield
4324	Hubbell-Southfield
4325	Hubbell-Southfield
4326	Hubbell-Southfield
4327	Hubbell-Southfield
4328	Hubbell-Southfield
4329	Hubbell-Southfield
4330	Hubbell-Southfield
4331	Hubbell-Southfield
4332	Hubbell-Southfield
4338	Hubbell-Southfield
4417	River Rouge

Table 2.3
Percent Directly Connected Impervious Area by Land Use for Each Rouge Subwatershed

Land use	Rouge Subwatershed Percent Directly Connected Impervious Area										
	Lower 1	Lower 2	Middle 1	Middle 2	Middle 3	Upper 1	Upper 2	Main 1	Main 2	Main 3	Main 4
Forest/Rural Open	0.0	0.0	0.3	2.8	4.0	2.8	0.0	0.0	4.9	4.2	15.1
Urban Open	3.6	4.9	5.3	6.1	0.4	6.2	4.5	0.0	4.1	15.4	7.8
Agricultural/Pasture	0.0	0.0	0.0	0.0	N/A	2.6	0.0	0.0	2.8	4.6	4.6
Low Density Residential	0.0	11.8	5.3	2.0	9.0	12.7	0.0	0.0	0.0	N/A	0.0
Medium Density Residential	5.0	21.7	12.2	19.8	18.3	38.8	20.2	0.0	24.0	25.5	25.5
High Density Residential	0.0*	33.9	21.7	44.9	54.8	52.4	26.4	23.0	35.8	34.9	35.4
Commercial	11.3	35.0	24.0	37.0	52.8	65.6	32.9	43.6	48.0	58.9	47.0
Industrial	2.2	66.6	35.5	64.1	90.3	84.5	50.5	79.6	83.5	81.0	77.8
Highway	0.0	0.0	0.0	0.0	0.0	52.0	22.7	5.4	60.9	55.6	55.6
Water/Wetlands	43.3	0.0	41.6	50.0	41.6	28.0	41.6	66.7	41.6	50.0	100.0

*This value is based on the one available sample area examined. The sample area was not typical of high density residential areas in other subwatersheds.
N/A = Not Applicable - no acreage in this subwatershed.
Source: Kluitenberg, 1994.

Table 2.4
Calibrated DCIA Values Used for the Upper 2, Middle 1 and Middle 3 Subwatersheds

Land use	Middle One				Upper 2	Middle 3	
	Subset A (2101, 2102)	Subset B (2109, 2111-2115, 2117)	Subset C (2105, 2116, 2118-2123)	Subset D (2103, 2104, 2106-2108, 2110)	All Subareas	Subset A (2317-2326)	Subset B (2301- 2316)
Forest/Rural Open	1.6%	0.1%	0.2%	0.1%	0.5%	2.8%	5.8%
Urban Open	27.9%	2.6%	3.0%	2.3%	3.9%	0.3%	0.6%
Agricultural/Pasture	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Low Density Residential	27.9%	2.6%	3.0%	2.3%	3.0%	6.3%	13.1%
Medium Density Residential	64.2%	5.9%	7.0%	5.3%	17.4%	12.8%	26.5%
High Density Residential	100.0%	10.5%	12.5%	9.5%	22.7%	38.4%	79.5%
Commercial	100.0%	11.7%	13.8%	10.5%	28.3%	37.0%	76.6%
Industrial	100.0%	16.3%	19.3%	14.7%	43.4%	63.2%	100.0%
Highway	30.8%	30.8%	30.8%	30.8%	19.5%	30.8%	30.8%
Water/Wetlands	100.0%	20.2%	23.9%	18.2%	35.7%	29.1%	60.3%

Source: Rohrer, 1997.

Table 2.5
Summary of Event Mean Concentrations for the Rouge Watershed

Land Use Category	BOD (mg/L)	TSS (mg/L)	F-COLI * (counts/100 mL)	TP (mg/L)	DP (mg/L)	TKN (mg/L)	NO23 (mg/L)	Pb (ug/L)	Cu (ug/L)	Zn (ug/L)	Cd (ug/L)
Forest/Rural Open	3	51	1,360,544,100	0.11	0.027	0.94	0.80	0.0	0.0	0.0	0.0
Urban Open	3	51	22,675,735,000	0.11	0.03	0.94	0.80	14.2	0.0	40.2	0.8
Agricultural	3	145	22,675,735,000	0.37	0.09	1.92	4.06	0.0	0.0	0.0	0.0
Low Density Residential	38	70	113,378,675,000	0.52	0.27	3.32	1.83	56.9	26.2	161.1	3.9
Medium Density Residential	38	70	113,378,675,000	0.52	0.27	3.32	1.83	56.9	26.2	161.1	3.9
High Density Residential	14	97	76,643,984,300	0.24	0.08	1.17	2.12	40.5	33.0	217.9	3.2
Commercial	21	77	11,791,382,200	0.33	0.17	1.74	1.23	49.3	37.0	156.3	2.7
Industrial	24	149	2,721,088,200	0.32	0.11	2.08	1.89	72.4	58.0	670.8	4.8
Highways	24	141	2,721,088,200	0.43	0.22	1.82	0.83	49.3	37.0	156.3	2.7
Water/Wetlands	4	6	1,360,544,100	0.08	0.04	0.79	0.59	11.1	6.5	30.3	0.6

* Note that for Fecal Coliform, a conversion factor must of 4,535,000 must be used when entering values into WMM for Windows.
Source: Cave, et al., 1994.

was divided into those for Johnson Creek (Subgroup C including subareas: 2105, 2116, 2118-2123), as discussed in Section 2.2) and those for the remainder of the Middle 1 Subwatershed Subareas. Baseflow concentrations for the Middle 3 Subwatershed were determined to be the same for all subareas in the subwatershed.
Table 2.8 presents recommended baseflow concentrations for the Upper 2, Middle 1 and Middle 3 Rouge Subwatersheds.

Table 2.8
Baseflow Pollutant Load Concentrations
for the Upper 2, Middle 1 and Middle 3 Subwatersheds

Parameter	Units	Upper 2	Middle 1 (Johnson Creek)	Middle 1 (Excluding Johnson Creek)	Middle 3
BOD	(mg/L)	2.0	3.5	5.0	2.0
TSS	(mg/L)	30.0	5.0	30.0	30.0
Total-P	(mg/L)	0.05	0.03	0.03	0.08
Dissolved-P	(mg/L)	0.04	0.02	0.01	0.05
TKN	(mg/L)	0.90	0.25	1.00	0.80
NO2+NO3	(mg/L)	0.80	0.25	0.80	0.70
Lead	(ug/L)	2.8	5.0	10.0	10.0
Copper	(ug/L)	3.0	2.0	5.0	5.0
Zinc	(ug/L)	3	33	100	100
Cadmium	(ug/L)	0.30	0.18	0.35	.030
Fecal Coliform	(#/100 mL)	300	130	300	300

Source: Quasebarth, et al., 1997

2.7 POINT SOURCE DISCHARGES. Pollutant loadings from point source discharges such as package wastewater treatment plants (WWTP), regional WWTPs, and industrial sources can also be estimated to determine the relative contributions of point versus other watershed pollution loadings. An inventory of package plants and industrial discharges within each subbasin can be developed from utility location maps and discharge permit data. Package plants and industrial dischargers usually are assumed to be discharging effluent at their permit limits where compliance monitoring data are not available. Where data on permit limits are not readily available, package plant discharges can be represented by following effluent concentrations which are based on typical effluent limits for secondary WWTPs:

- Total-P 6.0 mg/L
- Total-N 12.0 mg/L
- Lead 0.0 mg/L
- Zinc 0.0 mg/L

If permit data on industrial discharges are not available, then pollutant loads for each point source discharge are estimated for each subbasin by multiplying the discharge flow rate by the effluent concentration.

The BMP was applied to the amount of acreage increased within each urban land use category. The pollutant removal rates for the 100 year on site detention basin can be found in Table 6.

Plan One. The plan one scenario was simulated using the planned land use coverage. This scenario assumed that all new development would be controlled with extended dry detention basins rather than 100 year detention basins. This plan also assumed that an illicit discharge elimination plan would be in effect, as required under the Michigan NPDES General Storm Water Permit. This program was modeled to provide a 75 percent reduction in illicit connection and failing septic system discharges.

Plan Two. This plan was also simulated using the planned land use coverage. This scenario assumed that all new development would be controlled with wetland detention basins rather than extended dry or 100 year detention basins. This plan also assumed that an illicit discharge elimination plan would be in effect, as required under the Michigan NPDES General Storm Water Permit. This program was modeled to provide a complete removal (100 percent reduction) of all illicit connection and failing septic system discharges. Additionally, half of the agricultural land use was modeled to use conservation tillage and half of the low density residential development was modeled to use a cluster site plan. This cluster site plan development would allow a reduction in impervious area of 30% for the low density residential land use category. Pollutant load reductions for these and all other storm water BMPs used in the Middle 1 Subwatershed modeling effort can be found in Table 6.

Table 6
Summary of BMP Removal Rates for WMM

Parameter	100 Year Detention	Extended Dry Detention	Wetland Detention	Infiltration Basin	Conservation Tillage	Cluster Site Development
BOD	2%	30%	45%	90%	0%	0%
TSS	25%	90%	75%	90%	50%	30%
Fecal Coliform	4%	90%	90%	90%	0%	0%
Total P	0%	30%	50%	80%	50%	30%
Dissolved P	0%	0%	40%	80%	50%	30%
TKN	1%	20%	30%	50%	50%	0%
NO_2+NO_3-N	0%	0%	30%	100%	50%	0%
Lead	1%	80%	75%	70%	0%	0%
Copper	3%	60%	45%	70%	0%	0%
Zinc	5%	50%	40%	70%	0%	0%
Cadmium	3%	80%	65%	70%	0%	0%

Plan Three. Plan three was simulated using the planned land use coverage. This scenario assumed that all urban development would be controlled with wetland detention basins, except in subareas 2118 and 2122. All urban development in subareas 2118 and 2122 would use infiltration basins as their BMPs. This plan also assumed that an illicit discharge elimination plan would be in effect, which

Table 2.11
CSO Pollutant Loading Factors for the Rouge Watershed

Parameter	Units	Concentration
BOD	mg / L	66
TSS	mg / L	267
Fecal Coliform	# / 100	1,000,000
Total - P	mg / L	1.17
Dissolved - P	mg / L	0.31
TKN	mg / L	2.66
$NO_3 + NO_2$	mg / L	0.81
Lead	ug / L	14.2
Copper	ug / L	27.7
Zinc	ug / L	104.3
Cadmium	ug / L	1.9

N / A = Not Available, default of zero used.
Source: Harold, 1995.

An alternative method of CSO control involves the use of CSO detention facilities. The effectiveness of these CSO controls may be for each CSO control option modeled. The WMM applies a constant removal percentage associated with each of the treatment control alternatives for each of the modeled constituents in the following manner:

$$CSOMASS_{Scenario} = \sum CSO_{SB} * (1 - CSOREM_{SB,\ Scenario}) \qquad \textit{(Equation 2-6)}$$

Where:

CSOMASS = annual CSO pollution load discharged from the CSO subarea;

CSO = annual CSO pollution load generated from the CSO subarea;

CSOREM = percent of annual pollution load captured by the control alternative; and

Scenario = CSO pollution loading control scenario.

CSO removal rates should be determined based upon detention time, basin dimensions and configuration. Removal rates for the CSO controls modeled in the Rouge Watershed are shown in Table 2.12.

2.9 FAILING SEPTIC TANK IMPACTS. Many of the residential developments within the U.S. rely on household septic tanks and soil absorption fields for wastewater treatment and disposal. The nonpoint pollution loading factors for low density residential areas, which are typically served by septic tank systems, are based on test watershed conditions where the septic systems were in good working order and made no significant contribution to the monitored nonpoint pollution loads. In fact, septic tank systems typically have a limited useful life expectancy and failures are known to occur, causing localized water quality

Table 2.12
Removal Rates for Rouge Watershed CSO Controls

Basin Name	Annual Percent Reduction in Pollutant Load											
	Flow	TSS	BOD	F-Coli	Total P	Dissolved P	TKN	NO2+NO3	Lead	Copper	Zinc	Cadmium
River Rouge	84%	88%	86%	99.8%	86%	84%	85%	84%	88%	86%	86%	88%
Dearborn Heights	93%	95%	94%	99.8%	94%	93%	94%	93%	95%	94%	94%	95%
Redford Twp.	75%	83%	80%	98.8%	79%	75%	78%	75%	83%	80%	79%	83%
Inkster	75%	78%	77%	94.3%	77%	75%	76%	75%	78%	77%	77%	78%
Hubbell-Southfield	30%	45%	39%	89.2%	37%	30%	36%	30%	44%	39%	38%	44%
Seven Mile	67%	81%	74%	98.3%	72%	67%	71%	67%	79%	75%	74%	79%
Puritan/Fenkell	66%	79%	72%	97.5%	71%	66%	70%	66%	77%	73%	72%	77%
Dearborn Tunnel	96%	98%	97%	99.9%	97%	96%	97%	96%	98%	98%	97%	98%
Acacia Park	87%	89%	88%	99.0%	88%	87%	88%	87%	89%	88%	88%	89%
Birmingham	75%	80%	78%	98.0%	77%	75%	77%	75%	80%	78%	77%	80%
Bloomfield Village	82%	86%	84%	98.8%	84%	82%	83%	82%	85%	84%	84%	85%

Source: Mercer, 1997.

Appendix C. References

Brink, P., “Overflow Volumes for GDRS Outfalls to the Rouge River,” Rouge Project, 1994.

Cave, K., T. Quasebarth and E. Harold, “Selection of Stormwater Pollution Loading Factors,” Rouge Project, (RPO-MOD-TM34), 1994.

Harold, E.M., “Update of the CSO Loading Factors,” Rouge Roject, 1995.

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Mercer, G., “Estimated Reductions of Pollutants in CSO Overflow: CSO Demonstration Basins (REVISED),” Rouge Project, 1997.

Quasebarth, T. and R. Wagner, “Updated Dry Weather Water Quality Analyses – Upper 2, Middle 1 and Middle 3 Subwatersheds,” Rouge Project, 1997.

Rohrer, C.A., “Middle 1 Subwatershed WMM Modeling for Subwatershed Management Plan Development.” Rouge Project, 1998.

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Appendix D. Existing Pollutant Loads from WMM by Subwatershed

Table D1. Estimated Existing Pollutant Loads for the Main 1 Subwatershed

Main 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	112,175	1,353,188	9	77,194	1,542,566
Cd	lbs/yr	102	183	0	2	287
Cu	lbs/yr	198	1,696	0	33	1,927
DP	lbs/yr	2,402	9,850	0	406	12,658
F-Coli	counts/yr	3.55E+08	2.88E+15	0	4.28E+14	3.30E+15
NO23	lbs/yr	32,050	88,388	3	1,061	121,502
Pb	lbs/yr	403	2,686	0	15	3,104
TKN	lbs/yr	78,521	124,798	9	3,254	206,582
TP	lbs/yr	4,808	20,191	1	1,385	26,385
TSS	lbs/yr	3,117,024	4,237,410	357	279,019	7,633,810
Zn	lbs/yr	4,006	10,500	0	123	14,629

Table D2. Estimated Existing Pollutant Loads for the Main 2 Subwatershed

Main 2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	47,528	797,314	1,222	1,761,722	2,607,786
Cd	lbs/yr	45	101	2	49	197
Cu	lbs/yr	85	940	18	740	1,783
DP	lbs/yr	1,020	5,830	37	8,306	15,193
F-Coli	counts/yr	1.50E+08	1.64E+15	0	1.19E+17	1.21E+17
NO23	lbs/yr	13,577	45,797	489	21,700	81,563
Pb	lbs/yr	168	1,532	5	377	2,082
TKN	lbs/yr	33,269	70,385	1,197	71,096	175,947
TP	lbs/yr	2,036	11,791	98	31,253	45,178
TSS	lbs/yr	1,320,473	2,529,373	30,590	7,102,502	10,982,938
Zn	lbs/yr	1,697	5,886	89	2,785	10,457

Table D3. Estimated Existing Pollutant Loads for the Main 3 Subwatershed

Main 3 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	41,301	328,178	0	1,475,379	1,844,858
Cd	lbs/yr	35	54	0	38	127
Cu	lbs/yr	73	619	0	616	1,308
DP	lbs/yr	883	2,218	0	7,765	10,866
F-Coli	counts/yr	1.31E+08	2.11E+14	0	3.26E+16	3.29E+16
NO23	lbs/yr	11,803	21,592	0	20,294	53,689
Pb	lbs/yr	149	816	0	296	1,261
TKN	lbs/yr	28,908	28,284	0	61,839	119,031
TP	lbs/yr	1,772	4,957	0	26,848	33,577
TSS	lbs/yr	1,147,704	1,627,012	0	5,481,411	8,256,127
Zn	lbs/yr	1,478	4,997	0	2,364	8,839

Table D4. Estimated Existing Pollutant Loads for the Main 4 Subwatershed

Main 4 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	44,329	407,863	1,420,655	1,717,455	3,590,302
Cd	lbs/yr	41	79	977	48	1,146
Cu	lbs/yr	81	880	9,514	721	11,196
DP	lbs/yr	951	2,152	41,914	8,069	53,086
F-Coli	counts/yr	1.40E+08	2.07E+14	0	1.18E+17	1.18E+17
NO23	lbs/yr	12,665	31,089	3,113,478	21,087	3,178,319
Pb	lbs/yr	159	1,132	9,392	369	11,052
TKN	lbs/yr	31,031	36,295	724,906	69,243	861,475
TP	lbs/yr	1,900	5,684	54,898	30,459	92,941
TSS	lbs/yr	1,231,740	2,310,000	37,532,207	6,954,697	48,028,644
Zn	lbs/yr	1,580	9,506	21,890	2,715	35,691

Table D5. Estimated Existing Pollutant Loads for the Lower 1 Subwatershed

Lower 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	87,833	255,062	288,693	0	631,588
Cd	lbs/yr	4	36	37	0	77
Cu	lbs/yr	93	289	209	0	591
DP	lbs/yr	1,405	2,184	21,492	0	25,081
F-Coli	counts/yr	1.56E+08	5.55E+14	0	0	5.55E+14
NO23	lbs/yr	30,215	38,500	405,288	0	474,003
Pb	lbs/yr	17	482	476	0	975
TKN	lbs/yr	33,374	36,709	57,409	0	127,492
TP	lbs/yr	3,162	5,579	31,240	0	39,981
TSS	lbs/yr	1,563,324	1,529,056	816,363	0	3,908,743
Zn	lbs/yr	2,354	2,212	1,066	0	5,632

Table D6. Estimated Existing Pollutant Loads for the Lower 2 Subwatershed

Lower 2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	127,861	1,438,970	3,657	420,129	1,990,617
Cd	lbs/yr	5	195	1	12	212
Cu	lbs/yr	135	1,754	4	177	2,070
DP	lbs/yr	2,046	9,685	0	1,977	13,708
F-Coli	counts/yr	2.E+08	3.E+15	0	3.E+16	3.E+16
NO23	lbs/yr	43,985	92,457	91	5,166	141,699
Pb	lbs/yr	23	2,821	2	89	2,935
TKN	lbs/yr	48,590	130,467	1,463	16,941	197,461
TP	lbs/yr	4,606	20,753	91	7,441	32,891
TSS	lbs/yr	2,275,563	4,855,699	7,313	1,697,104	8,835,679
Zn	lbs/yr	3,421	14,604	53	665	18,743

Table D7. Estimated Existing Pollutant Loads for the Middle 1 Subwatershed

Middle 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	495,982	646,284	49,120	0	1,191,386
Cd	lbs/yr	13	90	5	0	108
Cu	lbs/yr	242	772	152	0	1,167
DP	lbs/yr	1,339	4,802	428	0	6,569
F-Coli	counts/yr	2.97E+08	1.36E+15	0	0	1.36E+15
NO23	lbs/yr	28,819	55,076	97,555	0	181,450
Pb	lbs/yr	199	1,248	6	0	1,454
TKN	lbs/yr	148,124	68,176	8,432	0	224,732
TP	lbs/yr	3,351	10,794	2,453	0	16,598
TSS	lbs/yr	569,706	2,722,154	146,883	0	3,438,743
Zn	lbs/yr	1,976	5,753	658	0	8,387

Table D8. Estimated Existing Pollutant Loads for the Middle 2 Subwatershed

Middle 2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	249,852	1,311,483	2,198	0	1,563,533
Cd	lbs/yr	7	197	0	0	204
Cu	lbs/yr	120	1,903	9	0	2,032
DP	lbs/yr	674	8,559	10	0	9,242
F-Coli	counts/yr	1.50E+08	2.45E+15	0	0	2.45E+15
NO23	lbs/yr	14,519	88,998	464	0	103,981
Pb	lbs/yr	102	2,831	1	0	2,934
TKN	lbs/yr	74,616	118,651	271	0	193,538
TP	lbs/yr	1,687	18,857	18	0	20,562
TSS	lbs/yr	286,994	4,946,819	1,574	0	5,235,387
Zn	lbs/yr	995	16,222	9	0	17,227

Table D9. Estimated Existing Pollutant Loads for the Middle 3 Subwatershed

Middle 3 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	127,569	635,517	630	20,070	783,786
Cd	lbs/yr	3	81	0	1	85
Cu	lbs/yr	60	726	3	8	797
DP	lbs/yr	344	4,437	3	97	4,881
F-Coli	counts/yr	7.64E+07	1.40E+15	0	1.18E+15	2.58E+15
NO23	lbs/yr	7,413	36,412	99	252	44,176
Pb	lbs/yr	52	1,199	1	5	1,256
TKN	lbs/yr	38,097	55,784	150	808	94,839
TP	lbs/yr	863	9,028	9	356	10,255
TSS	lbs/yr	146,531	1,843,434	1,243	79,187	2,070,395
Zn	lbs/yr	509	5,156	17	32	5,715

Table D10. Estimated Existing Pollutant Loads for the Upper 1 Subwatershed

Upper 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	67,381	1,229,159	20,721	23,802	1,341,063
Cd	lbs/yr	27	147	2	1	177
Cu	lbs/yr	58	1,221	50	10	1,339
DP	lbs/yr	696	8,860	131	139	9,825
F-Coli	counts/yr	1.03E+08	3.13E+15	0	9.81E+13	3.23E+15
NO23	lbs/yr	7,205	69,843	4,985	363	82,396
Pb	lbs/yr	30	2,157	12	4	2,204
TKN	lbs/yr	14,170	108,775	1,859	1,058	125,862
TP	lbs/yr	1,164	17,699	646	443	19,952
TSS	lbs/yr	248,605	3,254,567	73,741	81,852	3,658,765
Zn	lbs/yr	1,975	7,486	725	40	10,225

Table D11. Estimated Existing Pollutant Loads for the Upper 2 Subwatershed

Upper 2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	99,536	1,117,322	258	58,402	1,275,518
Cd	lbs/yr	44	140	0	2	186
Cu	lbs/yr	86	1,212	0	24	1,323
DP	lbs/yr	1,029	7,927	3	275	9,234
F-Coli	counts/yr	1.52E+08	2.61E+15	0	4.01E+15	6.62E+15
NO23	lbs/yr	10,641	64,313	27	717	75,698
Pb	lbs/yr	44	2,057	0	13	2,114
TKN	lbs/yr	20,935	98,910	54	2,353	122,252
TP	lbs/yr	1,715	16,074	4	1,033	18,826
TSS	lbs/yr	367,243	3,228,312	939	236,267	3,832,761
Zn	lbs/yr	2,919	8,243	7	92	11,261

Appendix E. Existing Pollutant Loads from WMM by SWMA

Table E1. Estimated Existing Pollutant Loads for the Main 1-2 SWMA

Main 1-2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	130,137	478,115	12	77,194	685,458
Cd	lbs/yr	119	15	0	2	136
Cu	lbs/yr	229	201	0	33	463
DP	lbs/yr	2,787	2,246	0	406	5,439
F-Coli	counts/yr	4.12E+08	3.28E+16	0	4.28E+14	3.33E+16
NO23	lbs/yr	37,182	5,870	4	1,061	44,117
Pb	lbs/yr	467	102	0	15	584
TKN	lbs/yr	91,095	19,275	12	3,254	113,636
TP	lbs/yr	5,578	8,478	1	1,385	15,441
TSS	lbs/yr	3,616,026	1,934,000	476	279,019	5,829,521
Zn	lbs/yr	4,648	755	1	123	5,527

Table E2. Estimated Existing Pollutant Loads for the Main 3-4 SWMA

Main 3-4 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	113,943	908,024	1,421,874	4,938,006	7,381,847
Cd	lbs/yr	103	158	979	134	1,375
Cu	lbs/yr	207	1,744	9,532	2,070	13,553
DP	lbs/yr	2,442	5,627	41,951	24,046	74,066
F-Coli	counts/yr	3.61E+08	6.77E+14	0	2.70E+17	2.71E+17
NO23	lbs/yr	32,555	63,886	3,113,966	62,834	3,273,240
Pb	lbs/yr	406	2,329	9,397	1,040	13,171
TKN	lbs/yr	79,757	80,812	726,100	201,463	1,088,132
TP	lbs/yr	4,884	13,337	54,996	88,256	161,474
TSS	lbs/yr	3,166,111	4,673,722	37,562,678	19,488,396	64,890,907
Zn	lbs/yr	4,068	16,308	21,979	7,838	50,193

Table E3. Estimated Existing Pollutant Loads for the Lower 1 SWMA

Lower 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	140,452	814,830	288,693	0	1,243,974
Cd	lbs/yr	6	110	37	0	153
Cu	lbs/yr	149	944	209	0	1,301
DP	lbs/yr	2,248	5,984	21,492	0	29,724
F-Coli	counts/yr	2.49E+08	1.83E+15	0	0	1.83E+15
NO23	lbs/yr	48,316	77,131	405,288	0	530,735
Pb	lbs/yr	27	1,557	476	0	2,059
TKN	lbs/yr	53,369	89,103	57,409	0	199,881
TP	lbs/yr	5,057	13,868	31,240	0	50,166
TSS	lbs/yr	2,499,523	3,495,965	816,363	0	6,811,851
Zn	lbs/yr	3,762	7,761	1,066	0	12,588

Table E4. Estimated Existing Pollutant Loads for the Lower 2 SWMA

Lower 2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	62,992	673,202	3,657	420,129	1,159,981
Cd	lbs/yr	3	90	1	12	104
Cu	lbs/yr	66	796	4	177	1,043
DP	lbs/yr	1,008	4,610	0	1,977	7,595
F-Coli	counts/yr	1.12E+08	1.48E+15	0	2.83E+16	3.E+16
NO23	lbs/yr	21,670	40,459	91	5,166	67,386
Pb	lbs/yr	11	1,298	2	89	1,401
TKN	lbs/yr	23,940	59,841	1,463	16,941	102,185
TP	lbs/yr	2,269	9,597	91	7,441	19,398
TSS	lbs/yr	1,121,364	2,091,791	7,313	1,697,104	4,917,571
Zn	lbs/yr	1,685	6,147	53	665	8,551

Table E5. Estimated Existing Pollutant Loads for the Middle 1 SWMA

Middle 1 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	630,043	1,334,536	51,301	0	2,015,880
Cd	lbs/yr	17	188	5	0	211
Cu	lbs/yr	306	1,692	161	0	2,159
DP	lbs/yr	1,701	9,372	437	0	11,510
F-Coli	counts/yr	3.77E+08	2.74E+15	0	0	2.74E+15
NO23	lbs/yr	36,610	99,547	98,016	0	234,173
Pb	lbs/yr	255	2,665	7	0	2,927
TKN	lbs/yr	188,159	130,108	8,700	0	326,967
TP	lbs/yr	4,256	20,653	2,471	0	27,380
TSS	lbs/yr	723,696	5,147,309	148,446	0	6,019,451
Zn	lbs/yr	2,509	13,371	667	0	16,548

Table E6. Estimated Existing Pollutant Loads for the Middle 3 SWMA

Middle 3 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	236,868	1,192,434	647	20,070	1,450,019
Cd	lbs/yr	6	170	0	1	177
Cu	lbs/yr	113	1,605	3	8	1,730
DP	lbs/yr	640	8,027	3	97	8,766
F-Coli	counts/yr	1.42E+08	2.37E+15	0	1.18E+15	3.55E+15
NO23	lbs/yr	13,764	76,889	103	252	91,008
Pb	lbs/yr	96	2,467	1	5	2,568
TKN	lbs/yr	70,740	106,866	153	808	178,566
TP	lbs/yr	1,600	17,131	9	356	19,096
TSS	lbs/yr	272,078	4,112,200	1,254	79,187	4,464,719
Zn	lbs/yr	946	12,751	17	32	13,746

Table E7. Estimated Existing Pollutant Loads for the Upper 1-2 SWMA

Upper 1-2 Pollutant Loads						
Pollutant	Units	Source				Total
		Baseflow	Storm Water	Point Sources	CSO	
BOD	lbs/yr	166,917	2,346,481	20,979	82,204	2,616,581
Cd	lbs/yr	71	287	2	2	363
Cu	lbs/yr	144	2,433	50	34	2,662
DP	lbs/yr	1,725	16,787	134	414	19,060
F-Coli	counts/yr	2.55E+08	5.74E+15	0	4.11E+15	9.85E+15
NO23	lbs/yr	17,846	134,156	5,012	1,080	158,094
Pb	lbs/yr	75	4,214	12	17	4,319
TKN	lbs/yr	35,105	207,685	1,913	3,411	248,114
TP	lbs/yr	2,879	33,773	650	1,476	38,778
TSS	lbs/yr	615,848	6,482,879	74,680	318,119	7,491,526
Zn	lbs/yr	4,894	15,729	732	132	21,487

Appendix F. Proposed Pollutant Load Reductions from WMM by SWMA

Table F1. Estimated Pollutant Load Reductions for the Main 1-2 SWMA for 100% BMP Acheivement (20-30 years)

Main 1-2 Pollutant Loads											
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	130,137	1,978,519	77,194	2,185,850	33	1,097,486	77,194	1,304,818	20	40%
Cd	lbs/yr	119	259	2	380	0.0058	176	2	297	0.0045	22%
Cu	lbs/yr	229	2,390	33	2,653	0.0403	1,568	33	1,830	0.0278	31%
DP	lbs/yr	2,787	14,423	406	17,616	0.2673	8,794	406	11,987	0.1819	32%
F-Coli	counts/yr	4.12E+08	4.25E+15	4.28E+14	4.68E+15	7.11E+10	2.32E+15	4.28E+14	2.75E+15	4.17E+10	41%
NO23	lbs/yr	37,182	122,980	1,061	161,224	2.4468	66,200	1,061	104,443	1.5851	35%
Pb	lbs/yr	467	3,837	15	4,319	0.0656	2,523	15	3,006	0.0456	30%
TKN	lbs/yr	91,095	178,950	3,254	273,299	4.1477	137,062	3,254	231,410	3.5120	15%
TP	lbs/yr	5,578	29,286	1,385	36,249	0.5501	17,945	1,385	24,907	0.3780	31%
TSS	lbs/yr	3,616,026	6,030,074	279,019	9,925,118	151	3,390,242	279,019	7,285,287	111	27%
Zn	lbs/yr	4,648	14,581	123	19,352	0.2937	9,530	123	14,301	0.2170	26%

Table F2. Estimated Pollutant Load Reductions for the Main 3-4 SWMA for 100% BMP Acheivement (20-30 years)

Main 3-4 Pollutant Loads											
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	113,943	908,024	4,938,006	5,959,973	102	636,085	1,337,962	2,087,989	36	65%
Cd	lbs/yr	103	158	134	396	0.0068	121	33	257	0.0044	35%
Cu	lbs/yr	207	1,744	2,070	4,021	0.0688	1,335	543	2,085	0.0357	48%
DP	lbs/yr	2,442	5,627	24,046	32,115	0.5494	4,154	7,310	13,906	0.2379	57%
F-Coli	counts/yr	3.61E+08	6.77E+14	2.70E+17	2.71E+17	4.63E+12	4.88E+14	1.51E+16	1.56E+16	2.66E+11	94%
NO23	lbs/yr	32,555	63,886	62,834	159,274	2.7249	43,704	19,106	95,364	1.6315	40%
Pb	lbs/yr	406	2,329	1,040	3,774	0.0646	1,791	259	2,457	0.0420	35%
TKN	lbs/yr	79,757	80,812	201,463	362,032	6.1938	68,018	56,368	204,144	3.4926	44%
TP	lbs/yr	4,884	13,337	88,256	106,477	1.8217	9,876	24,432	39,192	0.6705	63%
TSS	lbs/yr	3,166,111	4,673,722	19,488,396	27,328,229	468	3,307,714	4,763,986	11,237,811	192	59%
Zn	lbs/yr	4,068	16,308	7,838	28,214	0.4827	12,471	2,145	18,684	0.3196	34%

Table F3. Estimated Pollutant Load Reductions for the Lower 1 SWMA for 100% BMP Acheivement (20-30 years)

Lower 1 Pollutant Loads											
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	140,452	814,830	0	955,281	24	304,220	0	444,672	11	53%
Cd	lbs/yr	6	110	0	116	0.0029	56	0	62	0.0016	46%
Cu	lbs/yr	149	944	0	1,092	0.0275	474	0	622	0.0156	43%
DP	lbs/yr	2,248	5,984	0	8,232	0.2069	2,986	0	5,233	0.1315	36%
F-Coli	counts/yr	2.49E+08	1.83E+15	0	1.83E+15	4.59E+10	7.03E+14	0	7.03E+14	1.77E+10	62%
NO23	lbs/yr	48,316	77,131	0	125,447	3.1531	44,451	0	92,766	2.3317	26%
Pb	lbs/yr	27	1,557	0	1,583	0.0398	795	0	821	0.0206	48%
TKN	lbs/yr	53,369	89,103	0	142,472	3.5811	64,505	0	117,874	2.9628	17%
TP	lbs/yr	5,057	13,868	0	18,926	0.4757	7,584	0	12,641	0.3177	33%
TSS	lbs/yr	2,499,523	3,495,965	0	5,995,488	151	1,916,794	0	4,416,317	111	26%
Zn	lbs/yr	3,762	7,761	0	11,522	0.2896	3,765	0	7,526	0.1892	35%

Table F4. Estimated Pollutant Load Reductions for the Lower 2 SWMA for 100% BMP Acheivement (20-30 years)

Lower 2 Pollutant Loads											
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	62,992	673,202	420,129	1,156,324	54	382,338	104,926	550,256	26	52%
Cd	lbs/yr	3	90	12	104	0.0049	58	3	63	0.0030	39%
Cu	lbs/yr	66	796	177	1,039	0.0488	525	45	635	0.0298	39%
DP	lbs/yr	1,008	4,610	1,977	7,595	0.3563	2,856	537	4,401	0.2065	42%
F-Coli	counts/yr	1.12E+08	1.48E+15	2.83E+16	2.98E+16	1.40E+12	8.47E+14	1.79E+15	2.63E+15	1.24E+11	91%
NO23	lbs/yr	21,670	40,459	5,166	67,295	3.1576	21,855	1,402	44,928	2.1081	33%
Pb	lbs/yr	11	1,298	89	1,399	0.0656	863	21	895	0.0420	36%
TKN	lbs/yr	23,940	59,841	16,941	100,722	4.7261	45,854	4,412	74,206	3.4819	26%
TP	lbs/yr	2,269	9,597	7,441	19,307	0.9059	5,978	1,859	10,107	0.4742	48%
TSS	lbs/yr	1,121,364	2,091,791	1,697,104	4,910,258	230	1,212,587	406,294	2,740,245	129	44%
Zn	lbs/yr	1,685	6,147	660	8,493	0.3985	4,039	165	5,889	0.2763	31%

Table F5. Estimated Pollutant Load Reductions for the Middle 1 SWMA for 100% BMP Acheivement (20-30 years)

Middle 1 Pollutant Loads										
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	630,043	1,334,536	0	1,964,579	38	755,136	0	1,385,179	27	29%
Cd	lbs/yr	17	188	0	205	0.0040	124	0	141	0.0027	31%
Cu	lbs/yr	306	1,692	0	1,998	0.0387	1,116	0	1,422	0.0276	29%
DP	lbs/yr	1,701	9,372	0	11,073	0.2146	5,895	0	7,596	0.1472	31%
F-Coli	counts/yr	3.77E+08	2.74E+15	0	2.74E+15	5.30E+10	1.54E+15	0	1.54E+15	2.98E+10	44%
NO23	lbs/yr	36,610	99,547	0	136,157	2.6393	60,029	0	96,639	1.8732	29%
Pb	lbs/yr	255	2,665	0	2,920	0.0566	1,766	0	2,021	0.0392	31%
TKN	lbs/yr	188,159	130,108	0	318,268	6.1693	102,148	0	290,307	5.6273	9%
TP	lbs/yr	4,256	20,653	0	24,909	0.4828	13,273	0	17,529	0.3398	30%
TSS	lbs/yr	723,696	5,147,309	0	5,871,005	114	3,152,781	0	3,876,476	75	34%
Zn	lbs/yr	2,509	13,371	0	15,881	0.3078	8,738	0	11,248	0.2180	29%

Table F6. Estimated Pollutant Load Reductions for the Middle 3 SWMA for 100% BMP Acheivement (20-30 years)

Middle 3 Pollutant Loads										
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	217,824	1,192,434	20,070	1,430,328	69	813,149	6,908	1,037,881	50	27%
Cd	lbs/yr	6	170	1	176	0.0085	127	0	133	0.0064	25%
Cu	lbs/yr	104	1,605	8	1,718	0.0829	1,205	3	1,312	0.0633	24%
DP	lbs/yr	588	8,027	97	8,712	0.4203	5,797	37	6,421	0.3098	26%
F-Coli	counts/yr	1.30E+08	2.37E+15	1.18E+15	3.55E+15	1.71E+11	1.62E+15	7.38E+13	1.69E+15	8.18E+10	52%
NO23	lbs/yr	12,658	76,889	252	89,799	4.3325	50,816	94	63,569	3.0669	29%
Pb	lbs/yr	88	2,467	5	2,560	0.1235	1,855	1	1,945	0.0938	24%
TKN	lbs/yr	65,056	106,866	808	172,729	8.3335	88,701	284	154,041	7.4319	11%
TP	lbs/yr	1,471	17,131	356	18,958	0.9146	12,375	122	13,968	0.6739	26%
TSS	lbs/yr	250,208	4,112,200	79,187	4,441,595	214	2,801,248	25,246	3,076,703	148	31%
Zn	lbs/yr	868	12,751	32	13,651	0.6586	9,496	11	10,375	0.5006	24%

Table F7. Estimated Pollutant Load Reductions for the Upper 1-2 SWMA for 100% BMP Acheivement (20-30 years)

Upper 1-2 Pollutant Loads											
Pollutant	Units	Baseflow	Current Pollutant Loads				Predicted Pollutant Loads w/BMPs and CSO Treatment				% Reduction
			Storm Water	CSO	Total	Total per Acre	Storm Water	CSO	Total	Total per Acre	
BOD	lbs/yr	166,917	2,346,481	82,204	2,595,602	64	1,304,589	51,720	1,523,226	37	41%
Cd	lbs/yr	71	287	2	361	0.0088	191	1	264	0.0065	27%
Cu	lbs/yr	144	2,433	34	2,612	0.0641	1,594	22	1,760	0.0432	33%
DP	lbs/yr	1,725	16,787	414	18,926	0.4642	10,198	276	12,199	0.2992	36%
F-Coli	counts/yr	2.55E+08	5.74E+15	4.11E+15	9.85E+15	2.42E+11	3.19E+15	8.95E+14	4.08E+15	1.00E+11	59%
NO23	lbs/yr	17,846	134,156	1,080	153,082	3.7550	70,485	721	89,052	2.1844	42%
Pb	lbs/yr	75	4,214	17	4,306	0.1056	2,770	11	2,855	0.0700	34%
TKN	lbs/yr	35,105	207,685	3,411	246,201	6.0391	157,786	2,200	195,091	4.7854	21%
TP	lbs/yr	2,879	33,773	1,476	38,128	0.9352	20,627	940	24,446	0.5996	36%
TSS	lbs/yr	615,848	6,482,879	318,119	7,416,846	182	3,700,749	190,066	4,506,663	111	39%
Zn	lbs/yr	4,894	15,729	132	20,755	0.5091	10,301	84	15,278	0.3748	26%