10.0 Southwest Ponds (Dewey Hill Road Area)

10.1 General Description of Drainage Area

Figure 10.1 depicts the drainage area to the Southwest Ponds drainage basin and the individual subwatersheds within this area. The Southwest Ponds watershed is located in southwest Edina, bordered by West 70th Street to the north, West 78th Street to the south, Gleason Road on the west, and the SOO Line railroad on the east. The drainage basin encompasses approximately 461 acres that ultimately drain to the South Fork of Nine Mile Creek south of West 78th Street.

10.1.1 Drainage Patterns

The stormwater system within this drainage area is comprised of storm sewers, ditches, overland flow paths, wetlands, and ponding basins. The Southwest Ponds drainage basin has been divided into two major watersheds based on the drainage patterns. These major watersheds are depicted in Figure 10.2. Each major watershed has been further delineated into numerous subwatersheds. The naming convention for each subwatershed is based on the major watershed it is located within. Table 10.1 lists each major watershed and the associated subwatershed naming convention.

Table 10.1 Major Watersheds within the Southwest Ponds Drainage Basin

Major Watershed	Subwatershed Naming Convention	# of Subwatersheds	Drainage Area (acres)
Southwest Ponds	SWP_##	65	411
Nine Mile- 494	NM494_##	7	50

10.1.1.1 Southwest Ponds

The Southwest Ponds watershed encompasses approximately 411 acres. The land use within the watershed is mainly low and medium density residential, in addition to the commercial and industrial area on the eastern portion of the watershed along Cahill Road and Lewis Park. The watershed is characterized by a series of ponding basins, that ultimately outlet to the South Fork of Nine Mile Creek via a storm sewer system that travels southward from the intersection of West 78th Street and Delaney Boulevard and discharges into a detention pond north of Interstate 494. Discharge from this detention pond flows beneath Interstate 494 and enters the South Fork of Nine Mile Creek.

10.1.1.2 Nine Mile 494

The Nine Mile 494 watershed encompasses approximately 50 acres. The land use within the watershed is mainly low and medium density residential. There is one stormwater detention basin within the watershed. The watershed ultimately drains to the South Fork of Nine Mile Creek through a storm sewer system that discharges to the Creek just southeast of the intersection of Marth Court and West 78th Street, on the north side of Interstate 494

10.2 Stormwater System Analysis and Results

10.2.1 Hydrologic/Hydraulic Modeling Results

The 10-year and 100-year frequency flood analyses were performed for the Southwest Ponds drainage basin. The 10-year analysis was based on a ½-hour storm of 1.65 inches of rain. The 100-year analysis was based on a 24-hour storm event of 6 inches of rain. Table 10.2 presents the watershed information and the results for the 10-year and 100-year frequency hydrologic analyses for the Southwest Ponds basin.

The results of the 10-year and 100-year frequency hydraulic analysis for the Southwest Ponds drainage basin are summarized in Table 10.3 and Table 10.4. The column headings in Table 10.3 are defined as follows:

Node/Subwatershed ID—XP-SWMM node identification label. Each XP-SWMM node represents a manhole, catchbasin, pond, or other junction within the stormwater system.

Downstream Conduit—References the pipe downstream of the node in the storm sewer system.

Flood Elevation—The maximum water elevation reached in the given pond/manhole for each referenced storm event (mean sea level). In some cases, an additional flood elevation has been given in parenthesis. This flood elevation reflects the 100-year flood elevation of Nine Mile Creek, per the *Nine Mile Creek Watershed Management Plan*, May 1996.

Peak Outflow Rate—The peak discharge rate (cfs) from a given ponding basin for each referenced storm event. The peak outflow rates reflect the combined discharge from the pond through the outlet structure and any overflow.

NWL—The normal water level in the ponding basin (mean sea level). The normal water levels for the ponding basins were assumed to be at the outlet pipe invert or at the downstream control elevation.

Flood Bounce—The fluctuation of the water level within a given pond for each referenced storm event.

Volume Stored—The maximum volume (acre-ft) of water that was stored in the ponding basin during the storm event. The volume represents the live storage volume only.

Table 10.4 summarizes the conveyance system data used in the model and the model results for the storm sewer system within the Southwest Ponds drainage basin. The peak flows through each conveyance system for the 10-year and 100-year frequency storm events are listed in the table. The values presented represent the peak flow rate through each pipe system only and does not reflect the combined total flow from an upstream node to the downstream node when overflow from a manhole/pond occurs.

Figure 10.3 graphically represents the results of the 10-year and 100-year frequency hydraulic analyses. The figure depicts the Southwest Ponds drainage basin boundary, subwatershed boundaries, the modeled storm sewer network, surcharge conditions for the XP-SWMM nodes (typically manholes), and the flood prone areas identified in the modeling analyses.

One of the objectives of the hydraulic analyses was to evaluate the level of service provided by the current storm sewer system. The level of service of the system was examined by determining the surcharge conditions of the manholes and catch basins within the storm sewer system during the 10-year and 100-year frequency storm events. An XP-SWMM node was considered surcharged if the hydraulic grade line at that node breached the ground surface (rim elevation). Surcharging is typically the result of limited downstream capacity and tailwater impacts. The XP-SWMM nodes depicted on Figure 10.3 were color coded based on the resulting surcharge conditions. The green nodes signify no surcharging occurred during the 100-year or 10-year frequency storm event, the yellow nodes indicate surcharging during the 100-year frequency event, and the red nodes identify that surcharging is likely to occur during both a 100-year and 10-year frequency storm event. Figure 10.3 illustrates that several XP-SWMM nodes within the Southwest Ponds drainage basin are predicted to experience surcharged conditions during both the 10-year and 100-year frequency storm events. This indicates a probability greater than 10 percent *in any year* that the system will be overburdened and unable to meet the desired level of service at these locations. These manholes and catch basins are more likely to experience inundation during the smaller, more frequent storm events of various durations.

Another objective of the hydraulic analysis was to evaluate the level of protection offered by the current stormwater system. Level of protection is defined as the capacity provided by a municipal drainage system (in terms of pipe capacity and overland overflow capacity) to prevent property damage and assure a reasonable degree of public safety following a rainstorm. A 100-year frequency event is recommended as a standard for design of stormwater management basins. To evaluate the level of protection of the stormwater system within the Southwest Ponds drainage area, the 100-year frequency flood elevations for the ponding basins and depressed areas were compared to the low elevations of structures surrounding each basin. The low elevations were initially determined using 2-foot topographic information and aerial imagery in ArcView. Where 100-year frequency flood levels of the ponding areas appeared to potentially threaten structures, detailed low house elevations were obtained through field surveys. The areas that were determined to flood and threaten structures during the 100-year frequency storm event are listed in Table 10.5 and highlighted in Figure 10.3. Discussion and recommended implementation considerations for these areas are included in Section 10.3.

10.2.2 Water Quality Modeling Results

The effectiveness of the stormwater system in removing stormwater pollutants such as phosphorus was analyzed using the P8 water quality model. The P8 model simulates the hydrology and phosphorus loads introduced from the watershed of each pond and the transport of phosphorus throughout the stormwater system. Since site-specific data on pollutant wash-off rates and sediment characteristics were not available, it was necessary to make assumptions based on national average values. Due to such assumptions and lack of in-lake water quality data for model calibration, the modeling results were analyzed based on the percent of phosphorus removal that occurred and not based on actual phosphorus concentrations.

Figure 10.4 depicts the results of the water quality modeling for the Southwest Ponds drainage basin. The figure shows the fraction of total phosphorus removal for each water body as well as the cumulative total phosphorus removal in the watershed. The individual water bodies are colored various shades of blue, indicating the percent of the total annual mass of phosphorus entering the water body that is removed (through settling). It is important to note that the percent of phosphorus removal is based on total phosphorus, including phosphorus in the soluble form. Therefore, the removal rates in downstream ponds will likely decrease due to the large soluble fraction of incoming phosphorus that was unsettleable in upstream ponds. The watersheds are depicted in various shades of gray, indicating the cumulative total phosphorus removal achieved. The cumulative percent removal represents the percent of the total annual mass of phosphorus entering the watershed that is removed in the pond and all upstream ponds.

Ponds that had an average annual total phosphorus removal rate of 60 percent or greater, under average climatic conditions, were considered to be performing well. For those ponds with total phosphorus removal below 60 percent, the permanent pool storage volume was analyzed to determine if additional capacity is necessary. Based on recommendations from the MPCA publication *Protecting Water Quality in Urban Areas*, March 2000, the permanent pool for detention ponds should be equal to or greater than the runoff from a 2.0-inch rainfall, in addition to the sediment storage for at least 25 years of sediment accumulation. For ponds with less than 60 percent total phosphorus removal, the recommended storage volume was calculated for each pond within the drainage basin and compared to the existing permanent pool storage volume.

10.3 Implementation Considerations

The problem areas identified through the hydrologic and hydraulic XP-SWMM analyses and P8 water quality analysis were investigated to determine possible mitigation alternatives. These alternatives are discussed below.

10.3.1 Increased Storm Sewer Capacity Projects

The 100-year frequency hydraulic analysis identified several locations within the Southwest Ponds drainage basin where the 100-year level of protection is not provided by the current stormwater system. The problems and potential corrective measures for these areas are discussed below.

10.3.1.1 7411 Coventry Way (SWP_14)

A small stormwater pond is located in the backyard of 7411 Coventry Way. The small stormwater pond outlets to a larger pond located directly east, across Delaney Boulevard (SWP_5) through a 15-inch storm sewer system. During extreme storm events, such as the 100-year frequency event, the flood elevation of the larger pond east of Delaney Boulevard increases and flow reverses in the 15-inch system connecting the two ponds, equalizing the ponds. The 100-year frequency flood elevation for both ponds (SWP_14 and SWP_5) is 833.6 MSL. Based on the 2-foot topographic data, this flood elevation would affect the structure at 7411 Coventry Way. To prevent flooding at 7411 Coventry Way, it is recommended that a flapgate be installed at the outlet of the small pond to prevent backflow from the larger pond. With installation of a flapgate, the 100-year frequency flood elevation of the small pond is 830.6 MSL.

10.3.1.2 7317 Cahill Road (SWP_46)

A low depression area exists along Cahill Road just north of the Cahill and Dewey Hill Road intersection and extends eastward into the parking lot of 7317 Cahill Road. During intense rainfall events, such as the 100-year frequency storm, this low area becomes inundated. The 100-year frequency flood elevation in this area is 833.8 MSL. Based on the 2-foot topographic data, this flood elevation will impact the structure at 7317 Cahill Road. However, because the flood elevations of the two stormwater ponds in Lewis Park north of Dewey Hill Road (SWP_35 and SWP_34) and the stormwater pond on the south side of Dewey Hill Road (SWP_5) are nearly as high, options to reduce the flooding of the road and parking lot of 7317 Cahill Road are limited. It is recommended that options to lower the flood elevation of this area be further investigated as road improvement projects are planned in the area in the future.

10.3.1.3 7709 Stonewood Court (NM494_4)

A stormwater pond is located northeast of the Stonewood Court and Gleason Road intersection. The basin is drained by a 12-inch storm sewer pipe with a negative slope that acts as an inlet and an outlet, depending upon the water level in the pond. The water level of the pond is controlled by the pipe invert downstream of the outlet on the west side of Gleason Road at Elevation 828.1 MSL. If the water level in the pond is below 828.1 MSL, the storm sewer system that collects stormwater from Tanglewood Court and Gleason Road discharges to the pond. If the water elevation is higher than 828.1 MSL, discharge from the stormwater pond will combine with stormwater from the Tanglewood Court and Gleason Road system and will continue flowing southward towards the South Fork of Nine Mile Creek.

During the 100-year frequency storm event, the flood elevation of this stormwater pond reaches 832.5 MSL. Based on a field survey, this flood elevation will impact the structure at 7723 Stonewood Court (low house elevation of 831.97 MSL). To protect this structure from the 100-year flood elevation, it is recommended that the capacity of the downstream storm sewer system along Stonewood Court be increased. Based on modeling results, increasing the size of pipes 1011p and 1012p from 12-inch diameter to 24-inch diameter will reduce the 100-year flood elevation of the stormwater pond to 831.81 MSL, slightly below the low house elevation.

10.3.2 Construction/Upgrade of Water Quality Basins

Results of the water quality modeling in the Southwest Ponds drainage basin indicated that the annual removal of total phosphorus from several ponds was predicted to be below the desired 60 percent removal rate, under average year conditions. For those basins with total phosphorus removal below 60 percent, the permanent pool storage volume was analyzed to determine if additional capacity is necessary. All of the basins were found to have sufficient dead storage volume, based on the MPCA recommended permanent pool storage volume for detention basins. As a result, no recommendations for water quality basin upgrades in the Southwest Ponds drainage basin are being made at this time.

Table 10.2
Watershed Modeling Results for Subwatersheds in the Southwest Ponds Drainage Basin (Revised 12/2006)

Watershed Information			100-Year Storm Results 24-Hour Event		10-Year Storm Results 1/2-Hour Event	
Watershed ID	Total Area (ac)	% Impervious Area	Peak Runoff Rate (cfs)	Total Volume Runoff (ac-ft)	Peak Runoff Rate (cfs)	Total Volume Runoff (ac-ft)
NM494_1	9.5	19	42.4	2.60	22.6	0.54
NM494_2	5.4	18	23.7	1.39	11.1	0.25
NM494_3	7.1	13	28.8	1.77	11.4	0.31
NM494_4	5.3	30	24.3	1.70	16.6	0.39
NM494_5	12.9	20	53.7	3.63	27.2	0.74
NM494_6	7.7	22	35.2	2.22	21.0	0.49
NM494_7	2.1	20	9.6	0.59	5.6	0.13
SWP_1	4.2	44	20.0	1.61	16.6	0.40
SWP_10	4.5	34	20.0	1.34	12.5	0.27
SWP_11	2.6	30	10.6	0.70	5.6	0.12
SWP_12	2.0	27	9.1	0.54	6.0	0.11
SWP_13	1.3	13	6.3	0.38	5.0	0.10
SWP_14	2.7	21	12.7	0.87	8.5	0.21
SWP_15	0.7	19	2.5	0.21	1.2	0.04
SWP_16	3.9	30	16.9	1.14	9.8	0.23
SWP_17	2.8	30	7.3	0.77	3.0	0.12
SWP_18	3.3	20	15.1	0.92	9.5	0.21
SWP_19	6.4	20	29.6	1.80	18.3	0.41
SWP_2	13.3	48	62.8	5.08	50.7	1.25
SWP_20	3.6	20	16.2	1.02	9.7	0.23
SWP_21	2.9	16	13.6	0.84	10.2	0.21
SWP_22	6.3	20	27.0	1.75	13.9	0.36
SWP_23	3.3	20	15.3	0.92	10.4	0.22
SWP_24	3.9	20	14.5	1.06	6.8	0.20
SWP_25	2.9	20	13.1	0.82	7.4	0.18
SWP_26	3.1	20	13.5	0.86	7.2	0.18
SWP_27	8.2	4	32.4	1.93	10.4	0.33
SWP_28	8.9	8	38.1	2.15	14.6	0.39
SWP_29	4.6	44	21.6	1.58	17.4	0.37
SWP_3	29.1	26	121.8	8.45	66.6	1.70
SWP_30	2.5	34	10.7	0.78	6.4	0.17
SWP_31	11.0	50	51.0	4.21	37.8	1.02
SWP_32	23.6	71	108.3	9.51	72.8	2.23
SWP_33	2.3	30	10.3	0.73	6.9	0.17
SWP_34	16.7	18	75.2	5.65	44.0	1.31
SWP_35	11.3	21	48.4	3.89	27.0	0.88
SWP_36	7.7	20	35.9	2.21	23.7	0.52
SWP_37	2.3	22	10.5	0.87	7.3	0.20
SWP_38	4.7	19	21.4	1.32	12.5	0.29
SWP_39	12.9	20	58.0	3.63	32.5	0.78
SWP_4	13.0	38	60.4	4.75	46.3	1.16
SWP_40	2.6	35	12.3	0.82	9.5	0.19
SWP_41	2.5	65	11.9	0.95	13.1	0.23
SWP_42	4.3	46	18.8	1.40	11.1	0.28
SWP_43	3.5	59	16.1	1.28	10.4	0.28
SWP_44	2.4	74	11.2	1.03	7.8	0.25

Table 10.2
Watershed Modeling Results for Subwatersheds in the Southwest Ponds Drainage Basin (Revised 12/2006)

Watershed Information			100-Year Storm Results 24-Hour Event		10-Year Storm Results 1/2-Hour Event	
Watershed ID	Total Area (ac)	% Impervious Area	Peak Runoff Rate (cfs)	Total Volume Runoff (ac-ft)	Peak Runoff Rate (cfs)	Total Volume Runoff (ac-ft)
SWP_45	1.4	78	6.3	0.61	4.8	0.15
SWP_46	11.6	63	49.1	4.52	26.9	1.03
SWP_47	21.5	22	76.2	6.35	36.5	1.24
SWP_48	0.8	15	3.7	0.20	2.5	0.05
SWP_49	3.7	20	17.2	1.04	10.7	0.24
SWP_5	6.5	54	31.3	2.56	37.8	0.68
SWP_50	8.4	20	36.5	2.41	19.6	0.51
SWP_51	6.9	20	29.0	1.90	14.7	0.38
SWP_52	8.2	20	36.9	2.30	20.4	0.49
SWP_53	13.5	20	55.3	3.86	27.6	0.79
SWP_54	12.3	20	55.9	3.48	32.5	0.76
SWP_55	3.5	20	15.7	0.98	8.7	0.21
SWP_56	7.5	20	33.7	2.30	19.6	0.52
SWP_57	1.7	30	7.8	0.48	4.8	0.09
SWP_58	2.0	30	9.4	0.64	6.8	0.15
SWP_59	12.3	37	52.6	4.07	30.7	0.87
SWP_6	5.1	20	19.2	1.29	8.5	0.20
SWP_60	9.8	29	32.0	2.91	14.7	0.54
SWP_61	5.3	20	23.4	1.39	11.8	0.26
SWP_62	1.7	20	7.8	0.47	5.8	0.11
SWP_63	6.9	10	27.0	1.75	10.0	0.32
SWP_64	2.1	70	10.3	0.95	10.8	0.24
SWP_66	4.6	20	18.2	1.36	9.1	0.28
SWP_7	1.7	27	7.6	0.50	5.1	0.11
SWP_8	2.6	29	12.2	0.82	10.0	0.20
SWP_9	2.2	20	10.6	0.69	9.0	0.18

Table 10.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Southwest Ponds Drainage Basin (Revised 12/2006)

Subwatershed or Node	Downstream Conduit	100-Year Storm Results 24-Hour Event				10-Year Storm Results 1/2-Hour Event		
		Flood Elevation (ft)	Type of Storage[1]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
1171	920	938.4				935.13		
1172	921	932.4				926.61		
1173	922	928.3				925.27		
1174	923	923.8				923.36		
1175	924	923.7				922.86		
1176	925	922.6				921.62		
1177	926	917.2				917.22		
1178	927	899.0				897.16		
1180	934	884.4				883.99		
1182	930	886.4				886.24		
1183	931	890.0				889.86		
1184	932	894.5				894.35		
1185	933	896.9				896.78		
1186	935	881.1				878.53		
1187	936	871.4				868.23		
1188	937	854.7				854.40		
1190	939	847.7				845.67		
1191	940	845.7	street			843.73		
1192	941	843.6				841.87		
1193	942	841.0				839.72		
1197	945	842.4				842.42		
1198	946	846.4				846.36		
1205	952	835.0				832.69		
1207	953	834.4				832.11		
1208	955	833.8				831.53		
1210	956	833.8				831.37		
1211	957	833.8				831.31		
1212	959	833.8				831.28		
1215	960	833.8				831.24		
1216	961	833.8				831.22		
1219	963	835.8				834.71		
1267	1000	844.9				842.78		
1270	1002	842.7				840.53		
1271	1003	842.7				840.40		
1276	1006	844.5				839.55		
1277	1007	845.4	street			840.33		
1283	1012p	834.6				834.52		
1285	1014	831.7				827.60		
1286	1015	831.6				826.50		
1288	outfall	821.3				820.51		
1289	1017p	836.2				836.24		
1290	1018p	840.9				835.66		
1291	1019p	840.9				836.15		
1292	1020p	841.3				838.33		
1295	1023	840.7				838.32		
1296	1024	840.4				836.24		
1299	1026	838.4				838.31		
1306	1619	834.2				833.65		
1310	1033	833.6				829.77		
1318	1039	830.2				829.01		
132	1028	835.4				833.35		
1322	1041	833.4				829.73		
1326	1044	829.9				825.65		
1327	1045	825.7				825.41		
1328	1046	825.5				825.23		
1330	1048p	822.3				821.60		
1331	1049p	822.3				818.29		
1332	1050p	822.2				814.65		
1333	1051p	817.8				813.26		
1334	1052p	815.5				812.01		
1335	outfall	815.3				810.30		
1344	1057	833.8				831.23		
1350	1062	834.4				834.17		
1354	1066	831.7				830.70		
1356	1065	830.8				828.84		
1660	1367	901.6				900.50		
1661	1368	920.0				919.57		

Table 10.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Southwest Ponds Drainage Basin (Revised 12/2006)

Subwatershed or Node	Downstream Conduit	100-Year Storm Results 24-Hour Event				10-Year Storm Results 1/2-Hour Event		
		Flood Elevation (ft)	Type of Storage[1]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
1662	1369	938.3				935.32		
1663	1370	945.5				944.42		
1665	1613	925.1				924.99		
1667	1372	929.7				927.97		
1676	1380	838.0				836.56		
1678	1381	833.8				831.25		
1857	1506	850.7				848.46		
1859	1508	845.4				840.53		
1860	1509	847.0				841.81		
1866	1512	845.9				843.60		
1894	1529	825.8				825.42		
1895	1530	828.3				827.16		
2424	1966p	836.5				836.41		
2425	1967p	836.9				836.86		
2426	1968p	837.4				837.13		
2492	2023	833.8	park	826.3	7.4	830.94	832.6	4.2
2494	2025	942.2	ditch	937.4	4.8	937.38	833.3	3.8
2497	2030	834.5				833.06		
2498	2029	834.1				832.08		
2499	2027	833.8				831.47		
NM494_1	1016	824.7				822.31		
NM494_2	1008p	840.9				834.04		
NM494_3	1969p	837.8				837.54		
NM494_4	1009p	832.5	pond	828.2	4.4	829.56	818.8	3.5
NM494_5	1013p	832.6				831.95		
NM494_6	1011p	835.6				835.36		
NM494_7	1021p	841.8	byd	838.0	3.8	840.01	828.2	1.4
SWP_1	1044	830.0	pond	827.0	3.0	827.39	826.0	6.0
SWP_10	1067	832.1	pond	830.1	2.0	830.96	827.2	8.2
SWP_11	1061	838.8	ditch	835.0	3.8	837.21	838.0	2.0
SWP_12	1064	830.4				828.77		
SWP_13	1043	830.5				829.11		
SWP_14	1032	833.6	pond	828.5	5.1	829.77	835.0	2.2
SWP_15	1034	833.6				829.77		
SWP_16	1037	835.5				835.20		
SWP_17	1055	833.6				829.78		
SWP_18	1507	853.0				852.79		
SWP_19	1029	847.4				847.20		
SWP_2	2022	830.0	pond	828.0	2.0	829.01	827.8	2.0
SWP_20	1505	840.9	street			839.72		
SWP_21	1053	833.6	street			829.77		
SWP_22	1511	845.9	street			843.57		
SWP_23	1513	851.7				851.68		
SWP_24	1001	843.0	byd	838.0	5.0	840.91	827.1	2.7
SWP_25	1004	842.6				840.20		
SWP_26	999	843.7	street			840.40		
SWP_27	1510	847.1				843.12		
SWP_28	1005	844.4				839.46		
SWP_29	1047	825.3				825.18		
SWP_3	1028	839.5	pond	836.5	3.0	837.33	841.5	1.6
SWP_30	1531	829.2				829.09		
SWP_31	landlocked	828.5	pond	827.1	1.4	827.45	817.6	7.6
SWP_32	landlocked	837.5	ditch	833.5	4.0	837.11	836.5	0.8
SWP_33	landlocked	839.8	depression	836.4	3.4	838.25	824.3	4.8
SWP_34	2046_p	833.8	pond	828.0	5.8	831.22	827.1	0.4
SWP_35	1054	833.8	pond	828.0	5.8	831.22	833.5	3.6
SWP_36	1379	839.6				839.06		
SWP_37	landlocked	836.6	pond	835.4	1.2	835.96	828.0	3.3
SWP_38	948	835.5				835.25		
SWP_39	947	857.3				857.19		
SWP_4	1040	830.4	pond	828.6	1.9	829.15	835.4	0.6
SWP_40	landlocked	835.7	pond	828.1	7.6	829.25	829.7	5.6
SWP_41	1383	838.8				834.98		
SWP_42	1620	838.5				833.75		
SWP_43	1059	837.2				832.84		
SWP_44	1058	836.4				832.30		
SWP_45	1382	833.8				831.34		

Table 10.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Southwest Ponds Drainage Basin (Revised 12/2006)

Subwatershed or Node	Downstream Conduit	100-Year Storm Results 24-Hour Event				10-Year Storm Results 1/2-Hour Event		
		Flood Elevation (ft)	Type of Storage[1]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
SWP_46	3239_p	833.8	street/park lot			832.80		
SWP_47	950	835.9	pond	832.0	3.9	833.59	830.3	2.6
SWP_48	1056	833.8	street			831.22		
SWP_49	1371	958.4				956.04		
SWP_5	1054	833.6	pond	828.0	5.6	829.77	828.3	4.6
SWP_50	1366	898.9				898.81		
SWP_51	938p	851.6				849.35		
SWP_52	1373	944.8				935.25		
SWP_53	1377	851.6	street			848.87		
SWP_54	928	887.6				887.42		
SWP_55	1376	942.4	street			936.94		
SWP_56	929	884.8				884.51		
SWP_57	3299_p	836.8	pond	835.4	1.4	836.04	927.0	8.2
SWP_58	landlocked	840.8	depression	838.2	2.6	839.63	843.0	5.8
SWP_59	1038	830.7	wetland	828.7	2.0	829.42	880.5	6.9
SWP_6	1022	843.8	byd	837.9	5.9	843.40	936.0	0.9
SWP_60	1566	835.9	parking lot			835.26		
SWP_61	1025	840.4	street			835.73		
SWP_62	landlocked	844.6	byd	838.8	5.8	842.24	838.2	1.4
SWP_63	954	833.8	depression	828.8	5.1	831.53	828.7	0.8
SWP_64	2028	835.3	parking lot			834.93		
SWP_66	2024p	851.3	street			849.91		
SWP_7	1042	832.6				829.55		
SWP_8	1027	839.4				838.49		
SWP_9	landlocked	828.5	depression	823.0	5.5	826.40	828.8	2.8

Table 10.4
Conduit Modeling Results for Subwatersheds in the Southwest Ponds Drainage Basin (Revised 12/2006).

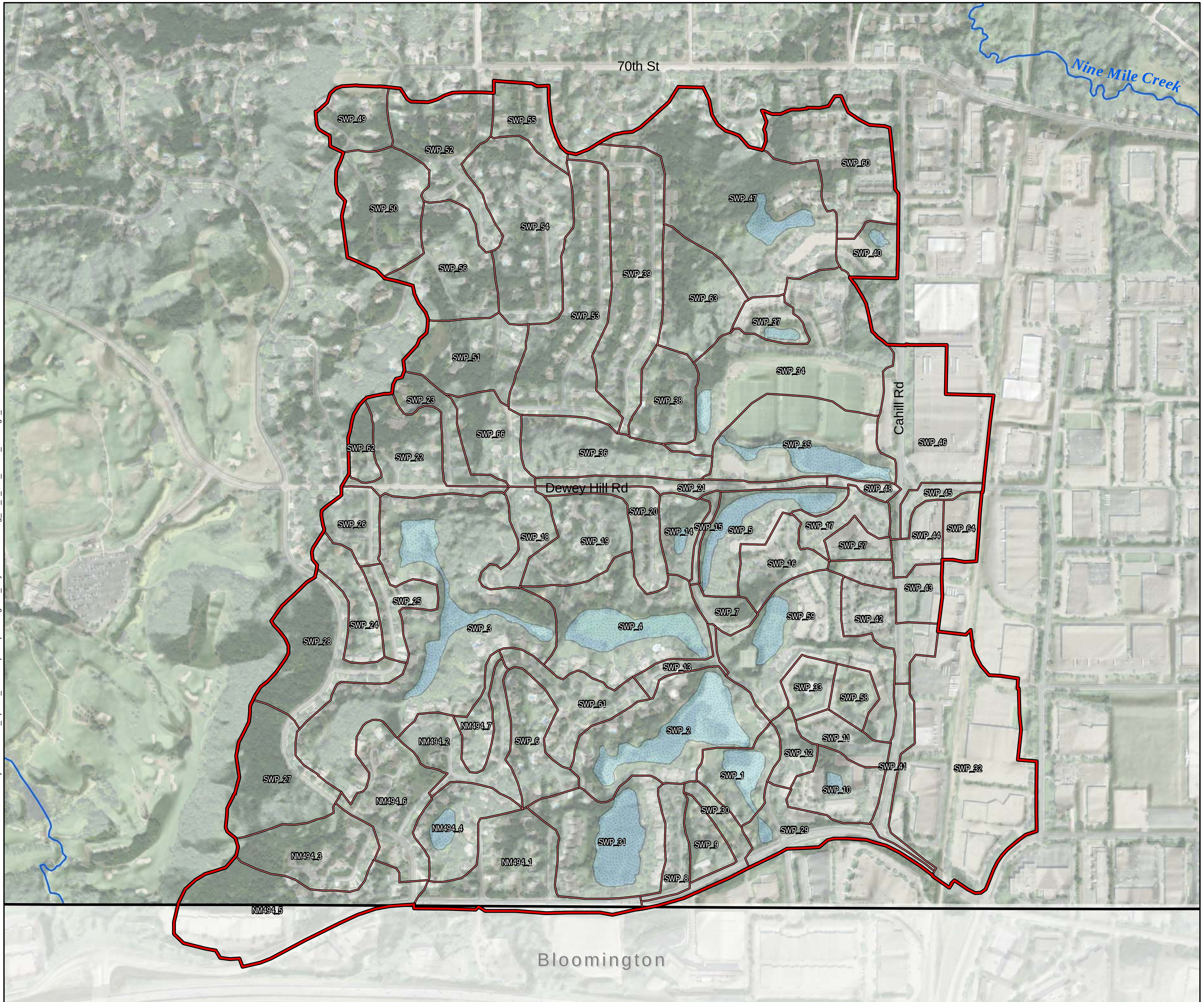
Conduit ID	Upstream Node	Downstream Node	Conduit Shape	Conduit Dimensions* (ft)	Roughness Coefficient	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Conduit Length (ft)	Slope	100Y Peak Flow through Conduit (cfs)	10Y Peak Flow through Conduit (cfs)
1000	1267	SWP_3	Circular	2	0.024	839.55	835.90	203	1.80	21.2	18.0
1001	SWP_24	1270	Circular	1.5	0.013	838.04	837.35	138	0.50	7.6	6.6
1002	1270	1271	Circular	1.5	0.013	837.35	837.15	39	0.51	7.6	6.6
1003	1271	SWP_25	Circular	1.5	0.013	837.15	836.58	113	0.50	7.6	6.6
1004	SWP_25	SWP_3	Circular	1.5	0.013	836.58	835.75	166	0.50	15.0	11.3
1005	SWP_28	SWP_3	Circular	2.25	0.013	836.64	836.00	140	0.46	48.7	23.9
1006	1276	SWP_28	Circular	2.25	0.013	836.78	836.64	35	0.40	18.9	10.8
1007	1277	1276	Circular	2	0.013	838.50	836.98	380	0.40	18.9	10.7
1008p	NM494_2	NM494_4	Circular	1.5	0.013	833.17	827.00	143	4.33	23.8	13.9
1009p	NM494_4	NM494_6	Circular	1	0.013	825.69	827.17	170	-0.87	-6.4	-6.9
1011p	NM494_6	1283	Circular	1	0.013	827.17	828.15	38	-2.58	5.6	5.6
1012p	1283	NM494_5	Circular	1	0.013	827.75	826.40	239	0.57	5.5	5.7
1013p	NM494_5	1285	Circular	2	0.013	826.00	825.45	70	0.79	37.8	37.5
1014	1285	1286	Circular	2.75	0.013	824.95	823.20	215	0.81	38.7	37.8
1015	1286	NM494_1	Circular	2.75	0.013	823.20	821.50	232	0.73	80.7	49.0
1016	NM494_1	1288	Circular	4	0.024	818.80	818.00	59	1.36	121.4	69.1
1017p	1289	NM494_6	Circular	1.25	0.013	831.68	829.00	154	1.74	4.6	5.5
1018p	1290	NM494_2	Circular	1.5	0.013	835.00	833.17	175	1.05	4.8	3.4
1019p	1291	1290	Circular	1.25	0.013	835.41	835.00	38	1.08	4.4	3.5
1020p	1292	1291	Circular	1	0.013	837.30	835.41	200	0.95	4.2	3.5
1021p	NM494_7	1292	Circular	1	0.013	838.00	837.30	140	0.50	4.2	3.5
1022	SWP_6	1295	Circular	1	0.013	837.90	836.10	177	1.02	5.5	5.4
1023	1295	1296	Circular	1	0.013	836.10	835.35	50	1.49	7.7	5.4
1024	1296	SWP_61	Circular	1.25	0.013	835.35	834.65	45	1.56	10.9	5.4
1025	SWP_61	SWP_2	Circular	1.5	0.013	834.40	826.50	240	3.29	20.5	17.1
1026	1299	SWP_8	Circular	1	0.013	833.64	831.95	135	1.25	-2.8	-1.9
1027	SWP_8	SWP_31	Circular	1	0.013	831.85	822.50	170	5.50	9.4	9.3
1028	132	SWP_4	Circular	1	0.013	831.47	828.17	122	2.71	6.7	4.8
1029	SWP_19	SWP_4	Circular	1.5	0.013	836.09	830.15	220	2.70	25.2	25.0
1032	SWP_14	1310	Circular	1.25	0.024	828.51	828.30	27	0.78	-4.0	1.6
1033	1310	SWP_15	Circular	1.25	0.024	828.30	828.05	28	0.89	-4.0	1.6
1034	SWP_15	SWP_5	Circular	1.25	0.024	828.05	827.50	62	0.89	-3.9	2.2
1037	SWP_16	SWP_59	Circular	1	0.013	829.48	828.40	27	4.00	10.9	8.8
1038	SWP_59	1318	Circular	2	0.013	828.65	827.91	74	1.00	13.4	4.1
1039	1318	SWP_2	Circular	2.5	0.024	827.62	826.53	97	1.12	13.4	4.8
1040	SWP_4	SWP_2	Circular	2.5	0.013	828.57	826.62	80	2.44	15.2	7.4
1041	1322	SWP_7	Circular	1.5	0.024	824.63	824.26	115	0.32	-5.6	-4.6
1042	SWP_7	SWP_13	Circular	1.5	0.024	824.26	823.14	255	0.44	5.0	-2.4
1043	SWP_13	SWP_2	Circular	1.5	0.024	818.33	818.23	51	0.20	8.3	5.7
1044	1326	1327	Circular	1.25	0.013	823.00	821.87	79	1.44	14.8	6.6
1045	1327	1328	Circular	1.25	0.013	821.87	820.30	124	1.27	8.9	6.9
1046	1328	SWP_29	Circular	1.25	0.013	820.30	819.64	55	1.20	11.2	7.0
1047	SWP_29	1330	Circular	1.5	0.013	817.60	816.62	183	0.54	14.5	14.5
1048p	1330	1331	Circular	1.5	0.013	816.62	815.62	187	0.53	13.9	13.5
1049p	1331	1332	Circular	1.5	0.013	815.62	814.62	98	1.02	13.9	13.6
1050p	1332	1333	Circular	2	0.013	813.12	811.72	291	0.48	27.9	13.7
1051p	1333	1334	Circular	2	0.013	811.72	810.95	161	0.48	27.8	13.8
1052p	1334	1335	Circular	3	0.024	810.95	809.28	70	2.39	27.8	13.8
1054	SWP_5	SWP_35	Arch	18" eq	0.024	826.87	826.85	120	0.02	-8.2	-6.9
1055	SWP_17	SWP_5	Circular	1.25	0.013	827.76	827.44	29	1.10	7.3	3.0
1057	1344	SWP_35	Circular	3.5	0.013	827.50	827.00	28	1.79	67.8	59.7
1058	SWP_44	1344	Circular	3	0.013	829.09	827.50	357	0.45	53.3	39.5

Table 10.4
Conduit Modeling Results for Subwatersheds in the Southwest Ponds Drainage Basin (Revised 12/2006).

Conduit ID	Upstream Node	Downstream Node	Conduit Shape	Conduit Dimensions* (ft)	Roughness Coefficient	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Conduit Length (ft)	Slope	100Y Peak Flow through Conduit (cfs)	10Y Peak Flow through Conduit (cfs)
1059	SWP_43	SWP_44	Circular	3	0.013	830.25	829.19	236	0.45	42.6	31.7
1061	SWP_11	1350	Circular	1	0.013	835.00	834.14	215	0.40	4.5	3.3
1062	1350	SWP_10	Circular	1	0.013	833.70	829.70	93	4.30	4.5	3.3
1064	SWP_12	SWP_1	Circular	2	0.024	827.64	826.49	115	1.00	14.8	5.9
1065	1356	SWP_12	Circular	1.5	0.024	828.14	827.64	28	1.79	8.6	2.8
1066	1354	1356	Circular	1.5	0.013	830.14	828.14	250	0.80	8.6	2.8
1067	SWP_10	1354	Circular	1.5	0.013	828.10	830.20	18	-11.67	8.6	2.8
1366	SWP_50	1185	Circular	1.5	0.013	893.30	891.49	97	1.87	22.5	24.0
1367	1660	SWP_50	Circular	1.5	0.013	896.48	893.30	112	2.85	15.4	12.5
1368	1661	1660	Circular	1.25	0.013	919.00	896.48	232	9.72	17.2	11.7
1369	1662	1661	Circular	1.25	0.013	933.48	919.00	160	9.04	17.3	10.8
1370	1663	1662	Circular	1.25	0.013	943.71	933.48	146	7.00	17.1	10.6
1371	SWP_49	1663	Circular	1.25	0.013	953.06	943.71	272	3.44	14.6	10.6
1372	1667	1665	Circular	1.75	0.013	919.71	918.15	178	0.88	24.6	20.2
1373	SWP_52	1667	Circular	1.5	0.013	927.02	919.96	181	3.90	29.9	20.3
1376	SWP_55	1171	Circular	1.5	0.013	936.04	933.77	148	1.53	15.6	8.7
1377	SWP_53	1190	Circular	1.75	0.013	843.04	842.71	41	0.82	29.6	25.3
1379	SWP_36	1676	Circular	4.5	0.013	835.00	834.46	150	0.36	165.6	145.9
1380	1676	SWP_35	Circular	4.5	0.024	834.46	824.12	110	9.40	165.3	144.7
1381	1678	1344	Circular	2.5	0.013	827.61	827.50	8	1.38	17.7	20.2
1382	SWP_45	1678	Circular	2	0.013	828.15	827.61	117	0.46	10.9	11.8
1383	SWP_41	SWP_42	Circular	2.5	0.013	833.80	831.87	386	0.50	14.4	13.1
1505	SWP_20	1306	Circular	1	0.013	834.92	832.52	130	1.85	7.8	7.4
1506	1857	SWP_19	Circular	1.5	0.013	837.84	836.29	172	0.90	15.1	9.3
1507	SWP_18	1857	Circular	1.25	0.013	841.23	838.05	218	1.46	9.2	9.2
1508	1859	1277	Circular	1.75	0.013	839.06	838.60	28	1.64	17.1	10.4
1509	1860	1859	Circular	1.75	0.013	840.70	839.06	186	0.88	18.3	10.5
1510	SWP_27	1860	Circular	1.75	0.013	841.53	840.70	208	0.40	14.2	10.4
1511	SWP_22	1267	Circular	2	0.013	840.23	839.55	25	2.72	21.2	19.2
1512	1866	SWP_22	Circular	1.5	0.013	840.50	840.23	38	0.71	10.9	9.0
1513	SWP_23	1866	Circular	1	0.013	848.04	840.50	310	2.43	5.9	5.9
1529	1894	SWP_29	Circular	1.25	0.013	818.40	817.80	91	0.66	4.1	3.5
1530	1895	1894	Circular	1	0.013	818.95	818.30	242	0.27	3.8	3.6
1531	SWP_30	1895	Circular	1	0.013	824.30	822.30	54	3.72	4.7	5.5
1566	SWP_60	1219	Special	1.52	0.013	832.30	832.21	47	0.19	12.6	13.5
1613	1665	1175	Circular	1.75	0.013	917.93	916.85	117	0.92	21.9	20.9
1619	1306	SWP_4	Circular	1.25	0.013	832.52	828.53	243	1.64	7.8	7.4
1620	SWP_42	SWP_43	Circular	2.5	0.013	831.77	830.65	284	0.39	28.8	23.5
1966p	2424	1289	Circular	1.25	0.013	831.96	831.68	50	0.56	4.6	5.4
1967p	2425	2424	Circular	1.25	0.013	832.63	831.96	120	0.56	4.6	5.4
1968p	2426	2425	Circular	1.25	0.013	833.33	832.63	125	0.56	4.6	6.0
1969p	NM494_3	2426	Circular	1.25	0.013	833.89	833.33	100	0.56	4.6	6.5
2023	2492	1216	Circular	1	0.024	826.34	826.00	125	0.27	-2.6	-1.7
2024p	SWP_66	SWP_51	Circular	1.5	0.013	843.51	843.00	127	0.40	16.2	8.5
2025	2494	SWP_52	Circular	1	0.013	937.38	937.00	38	1.00	7.3	0.0
2027	2499	SWP_45	Circular	1.75	0.013	828.60	828.35	38	0.66	6.6	7.4
2028	SWP_64	2497	Circular	1	0.013	831.50	829.91	33	4.82	6.7	7.9
2029	2498	2499	Circular	1.5	0.013	829.32	829.01	71	0.44	6.6	7.9
2030	2497	2498	Circular	1.25	0.013	829.70	829.32	71	0.53	6.7	7.9
2046_p	SWP_35	SWP_34	Circular	1.5	0.013	824.52	827.93	109	-3.13	-5.7	4.9
3239_p	SWP_46	1678	Circular	1.5	0.013	828.25	827.60	196	0.33	8.6	9.5
3299_p	SWP_57	SWP_44	Circular	1	0.01	836.00	830.80	150	3.47	2.6	0.0

Table 10.4
Conduit Modeling Results for Subwatersheds in the Southwest Ponds Drainage Basin (Revised 12/2006).

Conduit ID	Upstream Node	Downstream Node	Conduit Shape	Conduit Dimensions* (ft)	Roughness Coefficient	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Conduit Length (ft)	Slope	100Y Peak Flow through Conduit (cfs)	10Y Peak Flow through Conduit (cfs)
1053	SWP_21	SWP_5	Circular	1.5	0.024	827.09	826.85	24	1.00	13.6	10.2
2022	SWP_2	SWP_1	Circular	2	0.024	828.00	827.00	36	2.78	11.6	4.5
920	1171	1172	Circular	1.5	0.013	933.77	931.50	148	1.53	15.6	8.6
921	1172	1173	Circular	1.25	0.013	924.95	920.66	56	7.66	15.5	8.6
922	1173	1174	Circular	1.25	0.013	920.66	917.63	101	3.00	13.2	8.6
923	1174	1175	Circular	1.5	0.013	917.63	917.36	26	1.04	8.5	8.6
924	1175	1176	Circular	2	0.013	916.39	915.87	55	0.95	33.2	28.1
925	1176	1177	Circular	2	0.013	915.87	912.84	316	0.96	35.5	28.1
926	1177	1178	Circular	1.75	0.013	912.84	896.03	286	5.88	36.6	29.6
927	1178	SWP_54	Circular	1.75	0.013	896.03	880.54	276	5.60	31.6	24.9
928	SWP_54	1180	Circular	2	0.013	880.54	878.54	67	3.01	43.0	39.9
929	SWP_56	1180	Circular	2.5	0.013	878.00	876.80	60	2.00	33.7	39.8
930	1182	SWP_56	Circular	1.75	0.013	881.21	878.00	117	2.76	22.6	26.3
931	1183	1182	Circular	1.75	0.013	884.73	881.21	149	2.36	22.6	24.2
932	1184	1183	Circular	1.75	0.013	889.11	884.73	219	2.00	22.1	23.8
933	1185	1184	Circular	1.75	0.013	891.49	889.11	74	3.24	26.1	26.1
934	1180	1186	Circular	2.5	0.013	876.80	874.12	144	1.86	86.5	86.5
935	1186	1187	Circular	2.25	0.013	874.12	863.96	106	9.56	99.7	89.5
936	1187	1188	Circular	2.25	0.013	863.96	847.78	172	9.43	87.3	78.6
937	1188	SWP_51	Circular	2.5	0.013	847.78	843.50	210	2.04	62.2	61.9
938p	SWP_51	1190	Circular	3.5	0.013	838.32	837.14	346	0.34	105.7	93.4
939	1190	1191	Circular	4	0.013	837.14	836.68	211	0.22	133.6	117.7
940	1191	1192	Circular	4	0.013	836.68	835.90	253	0.31	126.1	112.0
941	1192	1193	Circular	4	0.013	835.90	835.21	312	0.22	126.1	112.0
942	1193	SWP_36	Circular	4	0.013	835.21	834.99	96	0.23	137.7	112.2
945	1197	SWP_36	Circular	1.75	0.013	837.17	836.50	168	0.40	19.5	19.5
946	1198	1197	Circular	1.5	0.013	840.48	837.42	70	4.40	18.7	18.6
947	SWP_39	1198	Circular	1.5	0.013	852.04	840.48	195	5.93	24.0	23.9
948	SWP_38	SWP_34	Circular	1.25	0.013	829.67	829.52	15	1.00	15.6	15.3
950	SWP_47	1205	Circular	1.25	0.013	831.98	830.58	277	0.51	3.8	3.9
952	1205	1207	Circular	1.25	0.013	830.58	829.82	170	0.45	3.7	3.6
953	1207	1208	Circular	1.25	0.013	829.82	828.12	211	0.81	3.7	3.6
954	SWP_63	1208	Circular	1	0.013	828.75	828.12	50	1.26	-2.3	4.3
955	1208	1210	Circular	1.5	0.013	828.12	827.65	118	0.40	4.1	5.4
956	1210	1211	Circular	1.75	0.013	827.65	827.09	140	0.40	4.0	5.4
957	1211	1212	Circular	2.25	0.024	827.09	826.54	71	0.78	4.0	5.4
959	1212	1215	Circular	2	0.013	826.54	826.34	89	0.23	4.0	5.4
960	1215	1216	Circular	2	0.013	826.34	825.85	89	0.55	-13.2	5.4
961	1216	SWP_34	Circular	3	0.024	825.85	826.02	210	-0.08	-14.5	-8.5
963	1219	SWP_47	Arch	24" eq	0.013	832.21	831.78	213	0.20	12.6	13.5
999	SWP_26	SWP_3	Circular	1.5	0.024	839.05	836.00	164	1.86	10.7	7.1



City of Edina Boundary

Roads/Highways

Creek/Stream

Lake/Wetland

Southwest Ponds Drainage Basin

Subwatershed

Imagery Source: Aerials Express, 2008

N

Feet

600 0 600

Meters

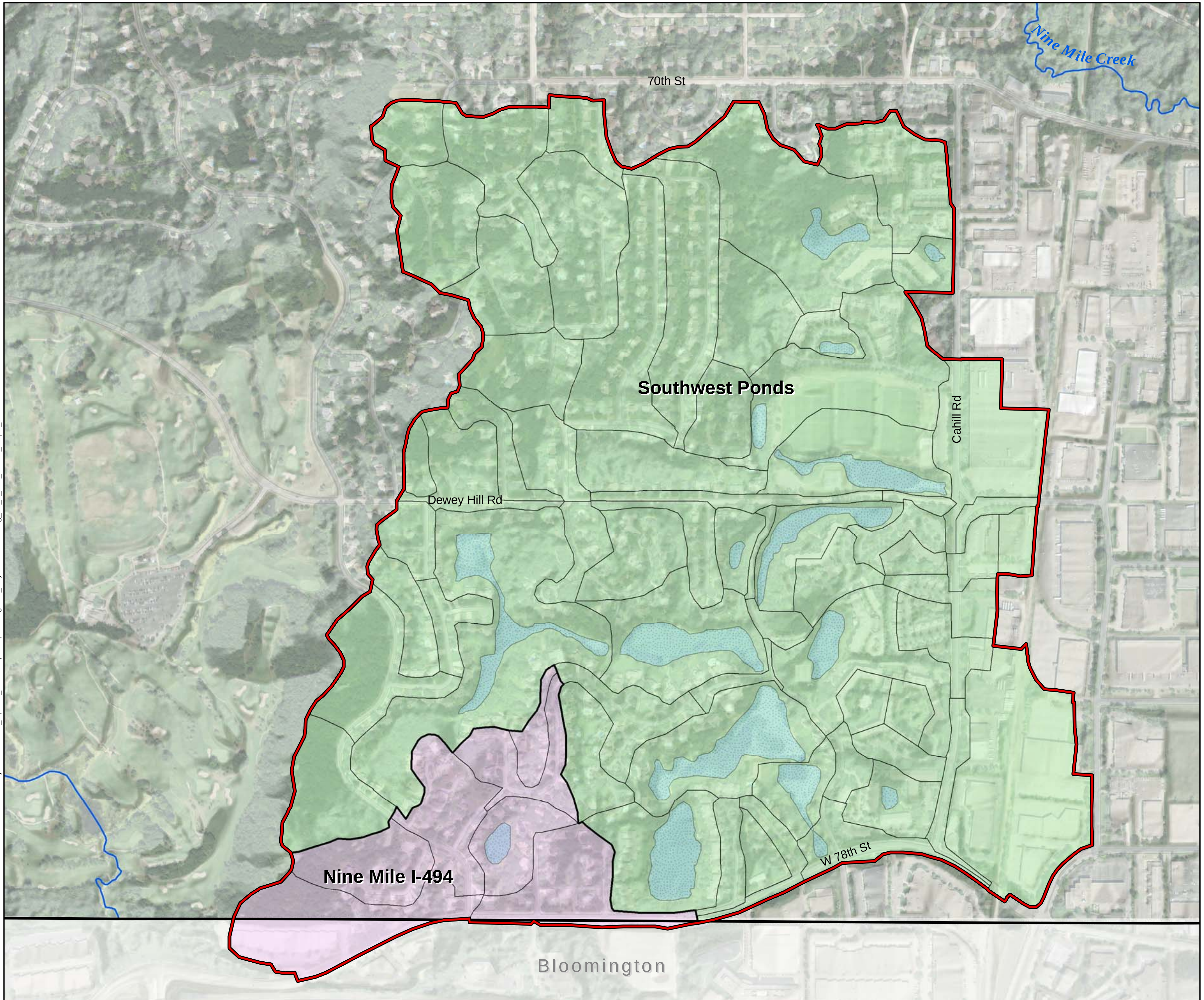
200 0 200

DRAFT

Figure 10.1

SOUTHWEST PONDS
DRAINAGE BASIN
Comprehensive Water Resource
Management Plan
City of Edina, Minnesota

Barr Footer: Date: 11/3/2009 10:47:51 AM File: I:\Client\Edina\Projects\CRWMP_Update_2009\Maps\Reports\Figures_CityReviewDraft\Fig_10_1_SW_Ponds_Drainage_Basins.mxd User: mbs2



City of Edina Boundary
Roads/Highways
Creek/Stream
Lake/Wetland
Southwest Ponds Drainage Basin
Major Watershed
Subwatershed

Imagery Source: Aerials Express, 2008

N

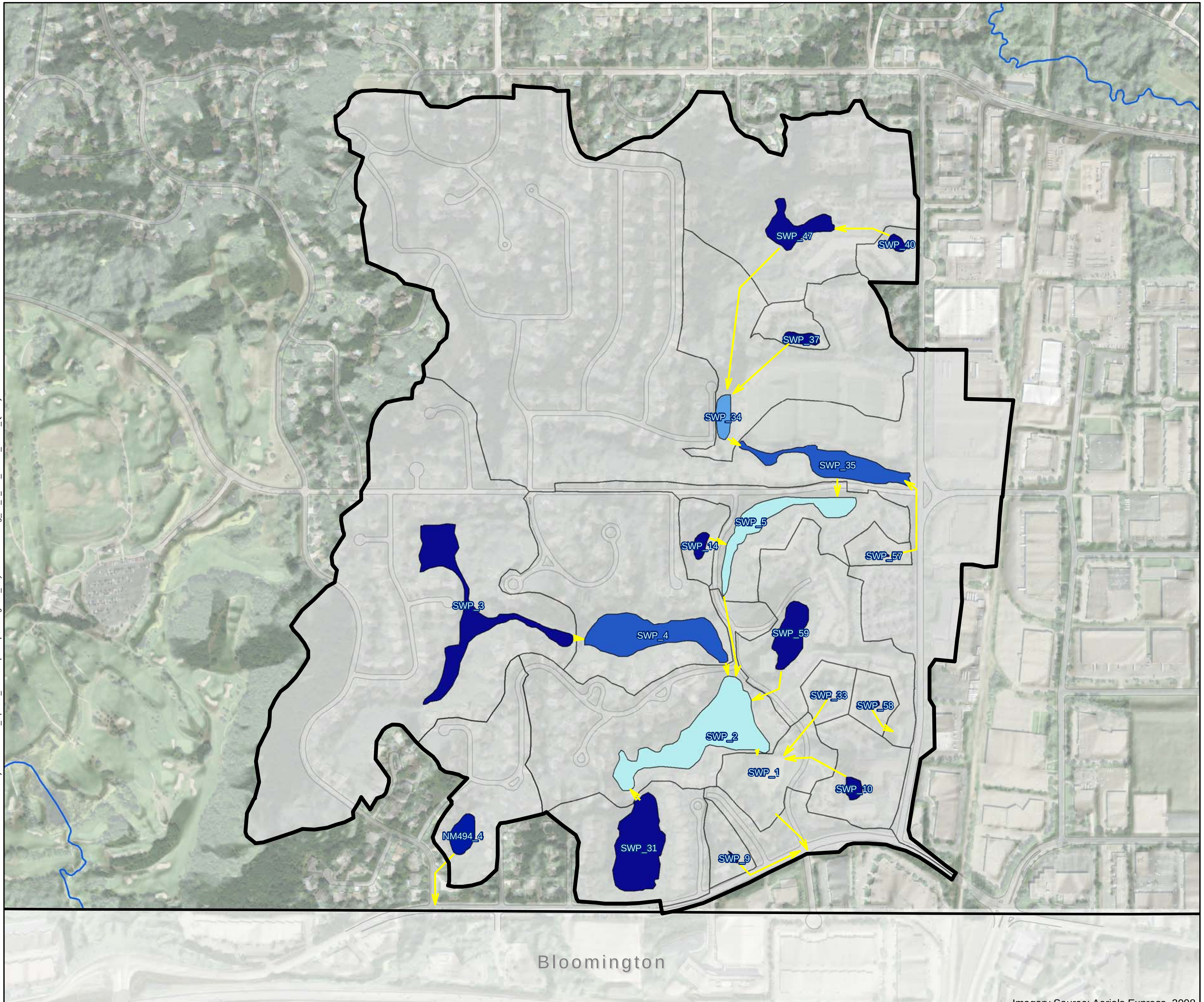
Feet
1,200 0

Meters
400 0

DRAFT

Figure 10.2

SOUTHWEST PONDS
MAJOR WATERSHEDS
Comprehensive Water Resource
Management Plan
City of Edina, Minnesota



CITY OF EDINA, MINNESOTA
INCORPORATED 1888

Percent TP Removal in Water Body*

This number represents the percent of the total annual mass of phosphorus entering the water body that is removed.

- 0 - 25% (Poor/No Removal)
- 25 - 40% (Moderate Removal)
- 40 - 60% (Good Removal)
- 60 - 100% (Excellent Removal)

Cumulative TP Removal in Watershed*

This number represents the percent of the total annual mass of phosphorus entering the watershed and upstream watersheds that is removed in the pond and all upstream ponds.

- 0 - 25% (Poor/No Removal)
- 25 - 40% (Moderate Removal)
- 40 - 60% (Good Removal)
- 60 - 100% (Excellent Removal)

*Data based on results of P8 modeling.

Flow Direction

N

Feet
600 0 600

Meters
200 0 200

DRAFT

Figure 10.4

SOUTHWEST PONDS
WATER QUALITY
MODELING RESULTS
Comprehensive Water Resource
Management Plan
City of Edina, Minnesota