9.0 Nine Mile South Fork

9.1 General Description of Drainage Area

Figure 9.1 depicts the drainage area to the South Fork of Nine Mile Creek and the individual subwatersheds within this area. The Nine Mile South Fork drainage basin is located in the southwest corner of Edina and includes a small portion of Eden Prairie. Several land-locked lakes are located within this drainage basin, including Arrowhead Lake and Indianhead Lake. These areas would become tributary to the South Fork of Nine Mile Creek only under extreme flooding circumstances (storms greater than the 100-year frequency storm event).

9.1.1 Drainage Patterns

The stormwater system within this drainage area is comprised of storm sewers, ditches, overland flow paths, wetlands, and ponding basins. The Nine Mile South Fork drainage basin has been divided into several major watersheds based on the drainage patterns. These major watersheds are depicted in Figure 9.2. Each major watershed has been further delineated into many subwatersheds. The naming convention for each subwatershed is based on the major watershed it is located within. Table 9.1 lists each major watershed and the associated subwatershed naming convention.

Table 9.1 Major Watersheds within the Nine Mile South Fork Drainage Basin

Major Watershed	Subwatershed Naming Convention	# of Subwatersheds	Drainage Area (acres)
Arrowhead Lake	AH_##	31	178
Indianhead	IH_##	12	107
Pawnee Pond	PA_##	13	39
Eden Prairie	EP_##	2	204
Braemar Arena/Public Works	BA_##	4	25
Nine Mile South Fork	NMSB_##	92	775

9.1.1.1 Arrowhead Lake

The Arrowhead Lake watershed extends north of T.H. 62 and is bordered on the west side by T.H. 169 and generally bordered on the east and south side by Indian Hills Road/Pass. The 178-acre watershed is comprised of mainly single family residential land use, however portions of T.H. 62 and the T.H. 62/T.H. 169 intersection are tributary to the lake. Within the watershed there are three stormwater detention basins that ultimately drain to Arrowhead Lake. Arrowhead Lake is a land-locked basin covering approximately 22 acres.

9.1.1.2 Indianhead Lake

The Indianhead Lake watershed is located southeast of Arrowhead Lake. Within the 107-acre watershed, there are two stormwater detention basins and Indianhead Lake. The residential watershed ultimately drains to Indianhead Lake via storm sewer networks and overland flow channels. Indianhead Lake is a land-locked basin covering approximately 14 acres.

9.1.1.3 Pawnee Pond

The Pawnee Pond watershed is approximately 39 acres. The watershed is a residential area consisting of two stormwater detention basins, Pawnee Pond and a smaller basin east of the intersection of Apache Road and Sally Lane. The Pawnee Pond is located directly north of Apache Road, bordered by Indian Way West on the west, Pawnee Road on the east, and Indian Hills Road on the north. The normal elevation of Pawnee Pond is controlled at Elevation 862 MSL by a pumped outlet. The outflow from Pawnee Pond flows westerly through a cross-culvert beneath T.H. 169, south on the west side of T.H. 169 and ultimately into the Braemar Branch of Nine Mile Creek.

9.1.1.4 Eden Prairie

The Eden Prairie watershed consists of approximately 204 acres of land west of T.H. 169 that drains to the South Fork of Nine Mile Creek via the Braemar Branch of Nine Mile Creek. Stormwater runoff from this area flows through a succession of storm sewer systems and ponding basins, eventually outleting to the drainageway that drains south along the west side of T.H. 169. The Eden Prairie watershed boundaries were based on the watershed divides from the *Nine Mile Creek Watershed District Water Management Plan* (May 1996). Land use within this area consists mainly of industrial and office property.

9.1.1.5 Braemar Arena/Public Works

The Braemar Arena/Public Works watershed includes drainage from the south parking lot of the Braemar Arena, Braemar Boulevard, and the Public Works and Public Safety Training Site. The remaining portion of the Braemar Sports Complex parking lot that does not drain to the south drains westerly to the T.H. 169 drainage system. The 25-acre Braemar Arena/Public Works watershed drains southward through a storm sewer system to a 0.24-acre stormwater detention pond. The normal water level of this detention pond is controlled at Elevation 846 MSL, by a 24-inch diameter outlet pipe that discharges southerly into the floodplain of the South Fork of Nine Mile Creek.

9.1.1.6 Nine Mile South Fork

The Nine Mile South Fork watershed is comprised of 92 subwatersheds that drains through the drainage system of the Braemar Golf Course, ultimately discharging to the South Fork of Nine Mile Creek. The 775-acre watershed encompasses a wide range of land uses, including residential, industrial, wetlands, open area/park, and the golf course. The storm water system throughout this area is characterized by storm sewer, ditches, ponds, and overland flow networks. The extent of the Nine Mile South Fork watershed spans west of T.H. 169, where drainage from the Washington Avenue storm sewer system combines with flows from the Eden Prairie and Pawnee Pond

watersheds. This stormwater flows easterly under T.H. 169 through a large culvert, located midway between Hamilton Road and West 69th Street, and discharges into the Braemar Branch of Nine Mile Creek. The Braemar Branch drains southward through Braemar Park towards the Braemar Golf Course. The Braemar Branch flows through several ponding basins on the west side of the golf course before discharging into the South Fork. Stormwater from the remaining portion of the Nine Mile South Fork watershed flows through a series of storm sewer pipes, wetlands, and ponds on the eastern side of the Braemar Golf Course before reaching the South Fork of Nine Mile Creek.

9.2 Stormwater System Analysis and Results

9.2.1 Hydrologic/Hydraulic Modeling Results

The 10-year and 100-year frequency flood analyses were performed for the Nine Mile South Fork Watershed. 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 9.2 presents the watershed information and the results for the 10-year and 100-year hydrologic analyses.

The results of the 10-year and 100-year frequency hydraulic analyses for the Nine Mile South Fork drainage area are summarized in Table 9.3 and Table 9.4. The column headings in Table 9.3 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 9.4 summarizes the conveyance system data used in the model and the model results for the storm sewer system within the Nine Mile South Fork drainage area. 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 9.3 graphically represents the results of the 10-year and 100-year frequency hydraulic analyses. The figure depicts the Nine Mile South Fork drainage area 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 9.3 were color coded based on the resulting surcharge conditions. The green nodes signify no surcharging occurred during the 100-year or 10-year storm event, the yellow nodes indicate surcharging during the 100-year event, and the red nodes identify that surcharging is likely to occur during both a 100-year and 10-year frequency storm event. Figure 9.3 illustrates that several XP-SWMM nodes within the Nine Mile South Fork drainage area 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 manhole and catch basin 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 Nine Mile South Fork 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 flood levels of the ponding areas appeared to potentially threaten structures, low house elevations were obtained through field surveys. The areas that were predicted to flood and threaten structures during the 100-year frequency storm event are highlighted in Figure 9.3. Discussion and recommended implementation considerations for these areas are included in Section 9.3.

9.2.2 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 8.4 depicts the results of the water quality modeling for the Nine Mile South Fork 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.

9.3 Implementation Considerations

The XP-SWMM hydrologic and hydraulic modeling analyses and P8 water quality analysis helped to identify locations throughout the watershed where improvements to the City's stormwater management system may be warranted. The following sections discuss potential mitigation alternatives that were identified as part of the 2003 modeling analyses. As opportunities to address the identified flooding issues and water quality improvements arise, such as street reconstruction projects or public facilities improvements, the City will use a comprehensive approach to stormwater management. The comprehensive approach will include consideration of infiltration or volume retention practices to address flooding and/or water quality improvements, reduction of impervious

surfaces, increased storm sewer capacity where necessary to alleviate flooding, construction and/or expansion of water quality basins, and implementation of other stormwater BMPs to reduce pollutant loading to downstream waterbodies.

9.3.1 Flood Protection Projects

The 2003 hydrologic and hydraulic modeling analysis identified several locations within the Nine Mile South Fork drainage basin where the 100-year level of protection is not provided by the current stormwater system. The problem areas identified in 2003 are discussed below.

As part of the 2003 modeling analysis, potential corrective measures were identified for the problem areas for purposes of developing planning-level cost estimates. These preliminary corrective measures are also discussed below. As the City evaluates the flooding issues and potential system modifications in these areas, consideration will be given to other potential system modifications, including implementation of stormwater infiltration or volume retention practices, where soils are conducive.

9.3.1.1 6309 Post Lane (AH_31)

A depression area exists in the backyard area of 6309 Post Lane. The depression area receives stormwater from a direct watershed of 1.7 acres. Stormwater collected in the depression area enters a 30-inch storm sewer system through a catchbasin located at the low point of the backyard. Upstream of the backyard depression area, the 30-inch system receives stormwater from the T.H. 62 and T.H. 169 interchange and discharge from the Arrowhead Pointe pond (AH_4). During intense rain storms, such as the 100-year frequency event, the capacity of the 30-inch system is limited from upstream drainage, preventing the backyard area from being drained. Under current conditions, the 100-year frequency flood elevation in the backyard depression area is 883.4 MSL. This flood elevation is above the low entry of the home at 6309 Post Lane, surveyed at 880.6 MSL.

To alleviate the flooding of the backyard area, it is necessary to restrict the flow in the 30-inch system from upstream drainage areas during the time period of the backyard inundation. Currently, stormwater from the T.H. 62 and T.H. 169 interchange is collected in a series of ditches and enters the 30-inch storm sewer system through a flared end section on the north side of T.H. 62 (subwatershed AH_25) and a catchbasin/manhole inlet on the southeast side of the interchange (subwatershed AH_29). To retard the flow in the 30-inch system during the time period of the backyard inundation, it is recommended that a control structure be installed at the catchbasin/manhole inlet in the ditch southeast of the T.H. 62 and T.H. 169 interchange (node AH_29). The control structure should consist of a 6-inch orifice at elevation 882 MSL to allow low flows through during smaller storm events and to allow the ditches to completely drain. A 6-foot weir at elevation 887 MSL will restrict high flows through the system during the time period of the backyard inundation and take advantage of available temporary storage in the highway ditches.

In addition, it is recommended that the control structure from the Arrowhead Pointe pond (AH_4) be modified to restrict flow from the pond during the time period of the backyard inundation. It is

recommended that the control structure consist of a 4-inch diameter orifice at elevation 884 MSL and a 6-foot weir at elevation 887 MSL. With implementation of these recommendations, the resulting 100-year frequency flood elevation in the backyard depression area is 880.5 MSL, below the low entry elevation at 6309 Post Lane.

9.3.1.2 Braemar Golf Course (NMSB_62)

The predicted 100-year flood elevation of the NMSB_62 watershed is 840.9 MSL. Based on the 6-foot topographic information from the City, it appears that this flood level will impact the Executive Course clubhouse at the Braemar Golf Course. Anecdotal information suggests this structure has been affected by flood waters in the past.

9.3.1.3 Paiute Pass & Sally Lane Intersection (NMSB_83, NMSB_84)

The storm sewer system at the Paiute Pass and Sally Lane intersection collects stormwater from a total drainage area of approximately 27 acres. The system discharges into the Braemar Branch, west of Sally Lane, via two 24-inch pipes. During the 10-year and 100-year storm events, the Paiute Pass/Sally Lane intersection is inundated with stormwater and ponding occurs. Based on topographic information from the City, ponding will occur in this intersection to Elevation 863.6 MSL. As water levels rise higher than this, water will begin to encroach upon the homes west of Sally Lane (7000, 7004, 7008 Sally Lane) and eventually flow to the Braemar Ditch via overland flow. It is recommended that the topography of this area be examined in further detail and a controlled positive overflow path be constructed between the homes if necessary to ensure the homes are protected from flood waters.

9.3.1.4 7009 & 7013 Sally Lane Backyard Depression Area (NMSB_70)

A backyard depression area exists behind the homes along Sally Lane and Paiute Pass. A 12-inch piped outlet exists from this area, draining northward and connecting to the system along Paiute Pass. During the 100-year storm event, the predicted flood elevation reaches 864.5 MSL, assuming an overland flow channel from this area. Based on topographic information from the City, this flood elevation encroaches upon the homes at 7009 and 7013 Sally Lane. It is recommended that the topography of this area be further examined to determine the elevation at which the flooded area will drain west toward Sally Lane via overland flow. If necessary, a controlled positive overflow should be constructed between the homes to prevent flood water from damaging the structures.

9.3.2 Construction/Upgrade of Water Quality Basins

The 2003 P8 modeling analysis indicated that the annual removal of total phosphorus from several ponds in the Nine Mile South Fork drainage area was predicted to be below the desired 60 percent removal rate, under average year conditions. For those ponds with total phosphorus removal below 60 percent, the permanent pool storage volume was analyzed to determine if additional capacity is necessary. The ponds that exhibited deficiencies in total phosphorus removal and permanent pool volume are listed below, along with recommended pond upgrades.

Construction of new or expansion of existing water quality basins is one method to increase the pollutant removal achieved prior to stormwater reaching downstream waterbodies. Many additional techniques are available to reduce pollutant loading, including impervious surface reduction or disconnection, implementation of infiltration or volume retention BMPs, installation of underground stormwater treatment structures and sump manholes and other good housekeeping practices such as street sweeping. As opportunities arise, the City will consider all of these options to reduce the volume and improve the quality of stormwater runoff.

9.3.2.1 NMSB_3 & NMSB_2

Pond NMSB_3 is located on the Braemar Golf Course, southeast of the intersection of Valley View Road and Braemar Boulevard. This pond receives stormwater from an immediate watershed of approximately 21 acres, as well as discharge from the Braemar Branch, which drains an area of approximately 259 acres and flow from Pond NMSB_33 to the east. The pond is a Type 5 wetland and was assumed to have an average depth of 4 feet. Pond NMSB_2 is downstream of Pond NMSB_3, connected by a 30-inch equalizer pipe. Pond NMSB_2 receives stormwater from an immediate watershed of approximately 5 acres, as well as flow from the upstream NMSB_3. This pond is also a Type 5 wetland and was assumed to have an average depth of 4 feet.

The annual removal of total phosphorus from these two ponds was predicted to be below 60 percent based on the modeling results. Consequently, the MPCA recommended permanent pool storage volume for these ponds was calculated and compared with the existing dead storage volume. For the permanent pool volume analysis, the two ponds were considered as one. Based on this assumption, it was determined that the ponds are deficient in dead storage volume. It is recommended that an additional 1.2 acre-feet of dead storage volume be provided to these two ponds to meet the MPCA design criteria for detention basins.

9.3.2.2 NMSB_12

Pond NMSB_12 is located on the Braemar Golf Course, approximately 700 feet southwest of the clubhouse. The pond receives stormwater runoff from the direct watershed of approximately 12 acres, in addition to flow from the upstream wetland NMSB_56. Based on the wetland inventory, the pond is a Type 5 wetland, and was assumed to have an average depth of 4 feet. Based on this depth assumption and the pond area from the 2-foot topographic information, the current permanent pool storage volume is greater than the MPCA recommended storage volume for detention ponds. It is recommended that the basin be maintained on a regular basis to ensure the removal efficiency is provided and maintained.

9.3.2.3 NMSB_86

Pond NMSB_86 is located on the Braemar Golf Course, directly south of the clubhouse parking lot. Pond NMSB_86 is a small pond that receives stormwater runoff from a direct watershed of approximately 21 acres, as well as discharge from the upstream pond (NMSB_57). The pond discharges directly to the South Fork of Nine Mile Creek via a 30-inch pipe. The annual removal of total phosphorus from Pond NMSB_86 was predicted to be well below 60 percent based on the

modeling results. Based on the MPCA recommended storage volume for detention basins, there is not an adequate amount of permanent pool storage in this basin. It is recommended that an additional 0.15 acre-feet of dead storage volume be provided to meet the MPCA design criteria for detention basins.

9.3.2.4 NMSB_7

Pond NMSB_7 is located on the Braemar Golf Course, on the north side of Braemar Boulevard. Pond NMSB_7 is a small detention pond that receives stormwater runoff from a 2.4-acre watershed, in addition to discharge from an upstream wetland (NMSB_90). Pond NMSB_7 discharges to Pond NMSB_85 via a 24-inch pipe. Pond NMSB_7 was assumed to be shallow, with an average depth of 2.3 feet, based on Braemar Golf Course design plans. Based on this depth assumption and the pond area from the 2-foot topographic information, the current permanent pool storage volume was calculated to be 0.6 acre-feet. This permanent pool storage volume is greater than the MPCA recommended storage volume for detention ponds. However, because the water quality modeling results indicate that the total phosphorus removal in Pond NMSB_7 is below desired removal levels, it is recommended that the depth of the pond be increased to a depth of 4 feet to improve removal efficiency.

9.3.2.5 NMSB_85

Pond NMSB_85 is located on the Braemar Golf Course, downstream of Pond NMSB_7, on the north side of Braemar Boulevard. Pond NMSB_85 receives stormwater runoff from a 67.5-acre watershed, as well as discharge from Pond NMSB_85 and discharge from a backyard depression area northeast of the intersection of Gleason Road and Dewey Hill Road (NMSB_15). Based on the wetlands inventory, the pond is a Type 5, and was assumed to have an average depth of 4 feet. Based on this depth assumption and the pond area from the 2-foot topographic data, the current permanent pool storage volume is 1.3 acre-feet. This storage volume is less than the MPCA recommended permanent pool storage volume for detention basins. It is recommended that an additional 1.2 acre-feet of dead storage volume be provided to meet the MPCA design criteria for detention basins.

Table 9.2
Watershed Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
AH_1	50.1	54	226.1	18.49	154.4	4.65
AH_10	1.9	12	9.1	0.51	5.9	0.13
AH_11	1.3	21	6.2	0.52	6.8	0.13
AH_12	1.5	20	7.1	0.42	5.3	0.11
AH_13	4.3	0	17.3	1.35	6.8	0.31
AH_15	1.2	20	5.6	0.37	4.0	0.10
AH_16	0.4	20	2.2	0.19	3.1	0.05
AH_17	4.9	20	21.7	1.37	11.7	0.31
AH_18	2.3	21	10.7	0.74	7.4	0.19
AH_19	6.4	20	26.8	1.76	13.4	0.38
AH_20	6.4	8	29.3	1.60	15.4	0.37
AH_21	6.9	9	31.4	1.74	15.1	0.39
AH_22	8.6	8	36.0	2.13	13.5	0.43
AH_23	5.9	17	26.8	1.67	15.0	0.40
AH_24	3.3	28	14.6	1.01	9.1	0.24
AH_25	4.6	44	21.2	1.93	15.4	0.49
AH_26	4.2	19	18.8	1.17	10.2	0.27
AH_27	1.5	20	6.7	0.42	4.1	0.10
AH_28	4.8	50	22.7	2.12	19.5	0.54
AH_29	5.9	41	28.4	2.55	25.7	0.65
AH_3	6.3	41	30.7	2.36	33.2	0.64
AH_30	4.1	20	18.4	1.14	10.6	0.26
AH_31	1.7	20	8.1	0.50	6.4	0.13
AH_32	7.1	50	32.4	3.13	23.5	0.79
AH_33	3.1	50	15.0	1.39	13.6	0.35
AH_4	1.1	30	5.4	0.46	5.5	0.12
AH_5	3.7	20	16.0	1.05	8.3	0.23
AH_6	13.0	28	59.0	4.31	39.3	1.08
AH_7	5.6	50	26.5	2.45	21.3	0.62
AH_8	0.6	30	3.1	0.27	3.7	0.07
AH_9	5.2	43	25.0	1.99	22.7	0.53
BA_1	4.4	51	20.5	1.58	16.2	0.40
BA_2	3.1	80	13.9	1.34	9.3	0.35
BA_3	9.5	7	39.5	2.32	14.7	0.47
BA_6	7.8	9	35.4	2.11	18.1	0.51
EP_1	95.5	80	320.8	41.19	135.5	10.44
EP_2	123.7	71	296.0	50.49	101.6	12.08
IH_1	38.2	48	167.5	13.53	107.8	3.31
IH_10	6.6	16	29.3	1.77	14.6	0.39
IH_11	2.7	26	11.7	0.80	6.8	0.18
IH_12	6.3	20	26.2	1.74	13.0	0.37
IH_13	5.1	16	22.9	1.37	11.9	0.31
IH_14	5.0	32	22.3	1.65	14.5	0.40

[1] In some cases, the 10-year peak runoff rate is higher than the 100-year peak runoff rate as a result of the differences in peak intensity of the rainfall hydrographs.

Table 9.2
Watershed Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
IH_15	2.9	20	13.6	0.82	8.6	0.20
IH_3	18.4	11	73.5	4.68	28.3	0.92
IH_5	1.4	20	6.5	0.39	4.3	0.09
IH_6	15.1	15	67.1	4.02	33.1	0.89
IH_7	1.0	20	4.5	0.27	3.7	0.07
IH_8	4.7	20	21.2	1.32	11.7	0.30
NMSB_10	0.3	4	1.1	0.07	0.3	0.01
NMSB_11	1.4	2	6.5	0.36	4.8	0.10
NMSB_12	11.7	8	50.0	3.02	17.1	0.62
NMSB_13	8.1	16	35.8	2.17	18.1	0.48
NMSB_14	5.9	20	26.2	1.76	14.7	0.42
NMSB_15	2.4	20	10.8	0.66	6.5	0.15
NMSB_16	2.8	19	12.3	0.77	6.5	0.17
NMSB_17	7.6	19	34.2	2.11	18.7	0.48
NMSB_18	8.0	20	10.0	1.85	3.7	0.27
NMSB_19	6.9	20	30.8	1.94	16.9	0.44
NMSB_2	4.9	29	21.3	1.47	12.7	0.34
NMSB_20	11.6	5	41.7	2.72	12.3	0.48
NMSB_21	1.4	21	4.9	0.39	2.3	0.07
NMSB_22	9.3	20	36.9	2.69	18.2	0.59
NMSB_23	7.6	20	32.3	2.10	16.6	0.46
NMSB_24	2.0	50	9.5	0.76	11.9	0.21
NMSB_25	1.4	20	6.6	0.40	5.3	0.10
NMSB_26	6.7	20	26.7	1.85	12.9	0.38
NMSB_27	4.0	20	18.4	1.12	11.7	0.27
NMSB_28	2.4	20	7.4	0.65	3.3	0.12
NMSB_29	3.2	20	9.2	0.85	4.0	0.15
NMSB_3	20.7	10	46.8	4.86	19.9	0.79
NMSB_30	15.4	20	57.9	4.28	27.2	0.87
NMSB_31	5.0	19	23.4	1.40	14.9	0.34
NMSB_32	6.6	20	28.3	1.83	14.7	0.40
NMSB_33	4.8	10	20.5	1.21	6.3	0.22
NMSB_34	8.3	16	34.6	2.23	15.9	0.47
NMSB_35	3.1	15	12.4	0.82	5.3	0.16
NMSB_36	3.9	19	17.1	1.10	8.9	0.25
NMSB_37	4.7	20	21.4	1.32	12.6	0.31
NMSB_38	1.3	20	5.8	0.37	3.2	0.08
NMSB_39	5.1	20	23.4	1.42	14.6	0.34
NMSB_4	17.9	14	74.1	5.49	40.6	1.38
NMSB_40	3.4	18	15.6	0.97	9.3	0.23
NMSB_41	6.0	8	22.4	1.47	7.5	0.27
NMSB_42	4.5	16	21.0	1.22	13.3	0.30

[1] In some cases, the 10-year peak runoff rate is higher than the 100-year peak runoff rate as a result of the differences in peak intensity of the rainfall hydrographs.

Table 9.2
Watershed Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
NMSB_43	6.7	16	28.2	1.78	13.2	0.38
NMSB_44	0.6	3	2.8	0.14	2.1	0.04
NMSB_45	20.5	5	44.1	4.72	12.8	0.66
NMSB_46	1.2	50	5.7	0.43	6.6	0.11
NMSB_47	2.7	2	11.8	0.63	4.5	0.13
NMSB_49	0.6	43	2.8	0.20	3.3	0.05
NMSB_5	24.6	6	27.4	4.84	10.1	0.48
NMSB_50	1.9	52	9.1	0.70	11.1	0.19
NMSB_51	3.4	50	16.4	1.26	18.5	0.34
NMSB_52	5.3	20	24.8	1.55	15.4	0.38
NMSB_56	27.4	8	83.5	6.43	27.6	1.11
NMSB_57	20.6	15	81.0	5.45	35.5	1.10
NMSB_58	3.6	20	16.7	1.00	11.6	0.25
NMSB_59	3.8	20	17.5	1.06	11.1	0.25
NMSB_6	1.7	14	7.6	0.45	3.9	0.10
NMSB_61	2.3	80	10.2	0.99	9.2	0.26
NMSB_62	7.3	6	23.1	1.72	6.7	0.28
NMSB_63	2.7	50	13.1	1.03	16.2	0.28
NMSB_64	2.7	50	13.1	1.00	16.0	0.27
NMSB_65	1.3	50	6.4	0.48	8.3	0.13
NMSB_66	10.0	19	39.8	2.74	19.0	0.57
NMSB_67	5.8	12	26.0	1.50	12.9	0.34
NMSB_68	4.8	80	21.7	2.08	22.5	0.56
NMSB_69	6.5	15	28.2	2.06	17.9	0.53
NMSB_7	2.4	16	10.4	0.74	5.2	0.18
NMSB_70	2.9	17	13.2	0.79	7.6	0.18
NMSB_71	5.6	50	26.9	2.12	31.0	0.57
NMSB_72	8.4	17	34.8	2.27	16.1	0.47
NMSB_73	69.6	74	218.5	29.01	87.2	7.17
NMSB_74	0.7	22	3.3	0.23	4.0	0.06
NMSB_75	1.6	20	7.3	0.45	4.6	0.11
NMSB_76	1.4	16	6.5	0.58	7.6	0.15
NMSB_77	4.5	10	20.3	1.38	7.0	0.31
NMSB_78	5.6	20	24.4	1.58	13.0	0.36
NMSB_79	1.2	23	5.5	0.35	5.1	0.09
NMSB_8	9.8	16	39.8	3.07	19.1	0.72
NMSB_80	0.5	63	2.4	0.19	4.0	0.05
NMSB_81	0.6	50	2.8	0.22	3.3	0.06
NMSB_82	2.6	16	11.3	0.70	5.4	0.15
NMSB_83	10.7	20	36.7	2.94	16.7	0.57
NMSB_84	3.1	20	14.1	0.88	8.8	0.21
NMSB_85	16.7	9	56.2	4.49	19.7	0.89

[1] In some cases, the 10-year peak runoff rate is higher than the 100-year peak runoff rate as a result of the differences in peak intensity of the rainfall hydrographs.

Table 9.2
Watershed Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
NMSB_86	20.7	2	37.0	4.50	8.3	0.54
NMSB_87	8.8	75	42.2	3.74	37.3	0.99
NMSB_88	1.8	72	8.7	0.74	12.3	0.20
NMSB_90	29.8	35	118.2	9.38	65.5	2.07
NMSB_91	2.4	20	11.0	0.66	7.1	0.16
NMSB_92	0.4	19	1.7	0.10	1.3	0.03
NMSB_93	0.9	28	4.3	0.27	4.5	0.07
NMSB_94	4.7	20	19.1	1.30	9.4	0.27
NMSB_95	5.9	20	25.8	1.65	13.8	0.37
NMSB_96	1.6	21	7.3	0.45	4.7	0.11
NMSB_97	6.8	17	26.8	1.82	12.2	0.37
NMSB_98	0.9	20	4.0	0.25	2.4	0.06
NMSB_99	4.4	20	19.1	1.23	9.9	0.27
PA_1	7.6	37	35.6	2.49	27.3	0.62
PA_10	2.2	20	10.5	0.63	7.4	0.16
PA_11	1.0	20	4.6	0.27	3.8	0.07
PA_12	2.1	20	9.4	0.60	8.4	0.16
PA_13	0.6	21	2.7	0.16	2.2	0.04
PA_2	1.6	17	7.4	0.44	4.3	0.10
PA_3	8.6	12	36.6	2.20	15.6	0.46
PA_4	1.5	20	6.8	0.41	4.5	0.10
PA_5	2.6	20	12.3	0.74	8.8	0.18
PA_6	3.9	26	17.6	1.20	11.3	0.29
PA_7	1.5	20	6.9	0.45	5.3	0.12
PA_8	3.9	20	17.1	1.09	9.1	0.24
PA_9	1.7	20	8.2	0.49	6.6	0.13

[1] In some cases, the 10-year peak runoff rate is higher than the 100-year peak runoff rate as a result of the differences in peak intensity of the rainfall hydrographs.

Table 9.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Nine Mile South Fork (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[1] (ft)	Invert Elevation	Type of Storage[2]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
513	365p	874.9	869.11				873.3		
514	366p	874.9	868.79	street			873.7		
516	368p	872.6	864.18				869.7		
519	370p	887.0	880.89				887.0		
520	371p	887.8	882.51				887.7		
521	372p	891.5	885.41				891.4		
523	374p	869.8	868.23				869.5		
534	382p	879.1	871.23				874.5		
536	384p	879.3	870.75	street			874.1		
537	385p	878.5	870.01				873.0		
539	387p	874.7	868.48				869.9		
541	389p	868.2	863.59				866.7		
543	390p	881.1	872.33				877.3		
546	393p	868.8	866.57				868.2		
548	1948p	869.2	865.96				868.3		
549	395p	868.3	866.96				868.0		
552	397p	884.3	884.32				884.3		
553	398p	883.5	883.52				883.5		
555	399p	882.0	876.30				879.0		
560	402p	946.4	945.70				946.1		
561	403p	878.3	871.54				876.5		
564	405p	883.8	879.64				881.8		
565	406p	883.2	877.78				881.4		
566	407p	880.5	876.28				879.1		
570	409p	882.1	872.96				879.5		
571	2092p	884.7	873.45				882.1		
575	413p	887.6	884.77				887.7		
576	414p	887.6	883.94				887.7		
578	416p	887.6	882.95				887.2		
580	418p	886.8	879.02				886.0		
581	419p	885.4	879.11				884.0		
1034	811p	890.5	886.07				890.4		
1035	812p	876.3	868.60				876.3		
1036	813p	868.8	863.48				868.8		
1037	814p	868.1	862.74				868.1		
1038	815p	868.0	862.46				867.9		
1042	818p	866.9	863.14				866.4		
1043	819p	864.3	858.82				864.3		
1045	822p	863.6	856.34				862.7		
1047	823p	863.6	854.59				860.9		
1048	824p	863.6	854.59				860.9		
1049	825p	863.6	854.35				860.9		
1052	828p	863.6	855.46				860.9		
1053	829p	863.6	855.02				860.9		
1059	overland to NMSB_90	851.0	850.44				851.0		
1060	833p	854.4	851.23				856.4		
1061	834p	855.5	851.58				856.6		
1062	835p	869.6	863.90				864.4		
1063	836p	877.9	873.52				874.4		
1064	837p	878.6	874.70				878.3		
1068	840p	881.4	879.34				880.6		
1071	overland to NMSB_90	844.8	844.26				844.8		
1073	overland to NMSB_90	844.8	842.34				842.8		
1075	844p	860.2	855.18				860.2		
1077	overland to NMSB_90	845.0	844.47				844.9		
1078	846p	856.5	849.00				856.9		
1080	848p	883.3	877.00				880.0		
1081	849p	883.9	876.83				879.8		
1083	851p	882.6	873.53				879.2		
1085	853p	879.6	870.10				879.2		
1092	859p	958.2	957.52				957.9		
1093	860p	942.2	937.00				939.7		
1094	861p	930.4	930.00				930.3		
1095	862p	901.8	901.25				901.7		
1096	863p	886.3	885.56				886.0		
1098	868p	878.8	872.11	street			874.5		
1100	866p	895.2	894.77				895.2		

[1] 100-year flood elevation based on 24-hour event. Flood elevation from a 10-day snowmelt event should also be evaluated prior to final design/determination.

[2] byd = backyard depression

Table 9.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Nine Mile South Fork (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[1] (ft)	Invert Elevation	Type of Storage[2]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
1101	867p	881.4	878.25				878.6		
1102	869p	878.2	872.02				874.2		
1103	870p	877.1	871.62				873.6		
1104	871p	875.2	870.85				872.3		
1105	872p	870.3	865.47				869.4		
1106	873p	869.6	862.82				868.6		
1109	876p	863.7	854.91				860.9		
1111	overland to NMSB_85	847.2	843.96				845.3		
1256	992p	883.7	880.06				883.7		
1257	993p	871.7	865.29				870.8		
1260	995p	844.3	842.07				844.2		
1261	3254p	844.2	841.40				844.1		
1593	1274p	889.2	886.68				888.1		
1644	1354p	875.6	873.03				875.3		
1651	1360p	884.9	878.21				884.7		
1654	1608p	890.6	883.10				889.7		
1656	1363p	894.5	886.67				894.4		
1872	1516p	840.5	836.76				837.9		
1879	1520p	869.8	860.00				864.1		
1880	1521p	888.7	887.98				888.4		
1881	1522p	918.4	917.88				918.7		
1883	1607p	854.7	849.84				854.4		
1885	1524p	856.0	850.91				855.7		
1886	1606p	856.7	851.40				856.5		
1932	1618p	883.9	877.51				883.4		
2076	to Braemar Branch	869.7	869.01				869.1		
2078	to Braemar Branch	854.7	852.28				852.7		
2081	1650p	853.4	850.58				853.7		
2082	to Braemar Branch	852.0	850.25				851.2		
2204	1755p	864.9	859.12				864.1		
2205	1756p	865.4	860.00				864.4		
2209	1759_p	844.9	843.02				844.1		
2242	1790p	857.8	848.00				852.2		
2244	1791p	860.1	852.74				856.6		
2246	1794p	876.0	868.91				874.7		
2247	1795p	877.3	870.00				876.4		
2344	to Braemar Branch	857.0	851.90				853.9		
2400	1945p	888.2	887.00				892.7		
2401	1946p	885.5	884.53				885.1		
2402	2541p	880.0	878.98				879.6		
2405	2106p	869.0	865.46				867.9		
2407	2108p	870.6	866.61				870.6		
2409	2105p	868.9	865.79				870.0		
2437	1978p	889.6	882.82				886.3		
2571	2115p	886.4	880.18				885.3		
2596	2102p	871.3	867.94				870.3		
2599	outfall to T.H. 169	886.2					886.2		
2601	outfall to T.H. 169	883.7					883.6		
2603	2086p	885.8	876.0				883.1		
2604	2098p	886.4	876.3				883.9		
2605	2095p	886.7	877.5				884.1		
2613	outfall to Creek	832.9	825.4				829.8		
2619	2123p	841.8	836.1				838.1		
2622	2125p	843.9	837.9				841.3		
2628	ditch	843.2	839.5				841.6		
2633	outfall to Creek	832.9	825.6				827.2		
2637	2085p	886.6	881.0				884.4		
2640	overland to AH_25	893.8	893.4				893.7		
2641	2091p	888.2	876.3				885.0		
2643	2088p	884.2	873.4				881.6		
2644	2096p	887.0	882.0				882.3		
2646	ditch west of T.H. 169	866.3	863.4				864.1		
2647	2107p	868.3	865.1				867.4		
2648	ditch west of T.H. 169	866.8	864.3				865.1		
2649	2109p	869.6	866.4				870.8		
2650	ditch west of T.H. 169	866.9	866.0				866.4		
2652	ditch west of T.H. 169	877.8	877.6				877.7		

[1] 100-year flood elevation based on 24-hour event. Flood elevation from a 10-day snowmelt event should also be evaluated prior to final design/determination.

[2] byd = backyard depression

Table 9.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Nine Mile South Fork (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[1] (ft)	Invert Elevation	Type of Storage[2]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
2653	2111p	882.7	878.8				882.9		
2655	2113p	886.9	886.1				887.8		
2656	2114p	886.0	884.3				887.5		
2657	ditch west of T.H. 169	884.1	883.8				883.9		
2659	2117p	868.7	864.8				868.7		
2660	2118p	867.1	863.1	hwy ditch	863.1	4.0	867.3	863.1	4.1
2661	ditch west of T.H. 169	866.1	862.2				862.9		
2673	2521p	882.1	879.6				881.0		
2676	2524p	875.8	875.4				876.0		
2677	2525p	872.9	870.8				873.4		
2679	2527p	878.5	877.7				878.7		
2694	2621p	845.1	843.1				844.5		
2695	2622p	846.3	843.3				845.4		
2704	ditch west of T.H. 169	889.1	888.3				888.3		
2727	2183p	872.6	870.8				870.8		
2728	2180p	872.7	872.5				872.5		
2729	2182p	873.0	873.0				873.0		
2730	2181p	874.3	874.3				874.3		
2731	2540p	866.8	863.0				866.2		
2733	2244_p	841.1	837.8				838.0		
2868	3189_p	886.8	880.9				885.6		
2869	3188_p	886.8	881.0				885.6		
2870	3186_p	886.9	881.1				885.6		
2871	3187_p	887.0	881.1				885.7		
2874	3251_p	844.1	840.8				844.0		
2875	3253_p	844.0	839.4				843.9		
2947	3287_p	887.0	882.6				884.3		
2951	outfall to Creek	833.1	832.0				833.2		
AH_1	landlocked	878.3	871.5	lake	875.8	2.5	876.4	875.8	0.6
AH_3	3191_p	887.1	881.2	hwy ditch	881.2	5.9	885.7	881.2	4.6
AH_4	2087p	888.2	883.4	pond	885.5	2.7	886.6	885.5	1.1
AH_5	408p	881.8	872.6	street			879.1		
AH_6	404p	884.3	877.7	pond	880.0	4.3	882.1	880.0	2.1
AH_7	2119p	888.7	884.4	hwy ditch	884.4	4.2	888.0	884.4	3.5
AH_8	411p	886.1	879.4				884.9		
AH_9	1365p	888.9	885.5	parking lot	885.5	3.4	888.2	885.5	2.7
BA_1	2049p	877.7	874.9				876.5		
BA_2	2033p	893.9	887.5				888.2		
BA_3	1793p	872.7	865.1				866.3		
BA_6	3289_p	851.4	844.9	pond	846.0	5.4	847.2	846.0	1.2
EP_1	2190p	872.7	865.4	ponds	865.4	7.4	871.1	865.4	5.7
EP_2	2155p	890.6	886.0	ponds	886.0	4.6	887.1	886.0	1.1
IH_1	landlocked	864.6	861.7	lake	862.7	1.9	863.2	862.7	0.5
IH_3	360p	872.5	863.9	depression	863.9	8.6	869.1	863.9	5.2
IH_5	367p	874.9	868.2				871.1		
IH_6	363p	874.9	869.6	street			873.5		
IH_7	369p	874.8	870.0	street			874.7		
IH_8	1355p	893.9	887.0				893.7		
PA_1	2100p	868.0	861.5	pond	864.0	4.0	863.6	862.0	1.6
PA_2	landlocked	887.0	881.3	byd	881.3	5.7	884.7	881.3	3.4
PA_3	396p	877.4	867.8	street			871.8		
PA_4	388p	873.1	866.9				869.0		
PA_5	392p	891.9	882.9				891.9		
PA_6	381p	877.0	872.5	pond	872.5	4.5	874.3	872.5	1.8
PA_7	391p	879.8	874.5	depression	874.5	5.3	877.4	874.5	2.9
PA_8	386p	877.9	869.1				871.6		
PA_9	landlocked	888.9	885.0	depression	885.0	3.9	886.5	885.0	1.5
AH_10	401p	953.5	951.3				952.0		
AH_11	417p	887.5	882.2				887.2		
AH_12	3288_p	887.0	884.1	byd	884.1	2.9	885.2	884.1	1.1
AH_13	412p	887.9	885.7	school yard	885.7	2.2	887.4	885.7	1.7
AH_15	415p	887.6	883.3				887.3		
AH_16	1272p	884.2	878.5				882.1		
AH_17	1364p	899.3	893.4				899.2		
AH_18	2090p	891.4	890.6				891.1		
AH_19	1362p	885.2	879.0				885.0		
AH_20	1361p	885.3	879.3				885.1		

[1] 100-year flood elevation based on 24-hour event. Flood elevation from a 10-day snowmelt event should also be evaluated prior to final design/determination.

[2] byd = backyard depression

Table 9.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Nine Mile South Fork (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[1] (ft)	Invert Elevation	Type of Storage[2]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
AH_21	400p	884.6	877.9				880.8		
AH_22	1359p	882.2	876.3				881.9		
AH_23	1275p	890.0	885.6				888.4		
AH_24	1273p	891.1	888.1				889.7		
AH_25	2097p	887.0	878.7	hwy ditch	878.7	8.3	884.3	878.7	5.6
AH_26	2094p	905.0	898.1				905.1		
AH_27	landlocked	894.5	893.5	byd	893.5	1.0	894.3	893.5	0.8
AH_28	2093p	886.7	881.6	hwy ditch	881.6	5.1	884.8	881.6	3.2
AH_29	2098p	887.2	884.0	hwy ditch	884.0	3.2	885.2	884.0	1.2
AH_30	1977p	905.2	898.1	street			898.8		
AH_31	2139p	883.4	873.1	byd	875.8	7.6	880.9	875.8	5.1
AH_32	2104p	886.6	880.7	hwy ditch	880.7	5.9	884.2	880.7	3.6
AH_33	3190_p	886.8	880.5				885.5		
IH_10	1944p	892.3	891.5				892.4		
IH_11	373p	874.2	872.9				873.9		
IH_12	1353p	880.3	873.8				880.1		
IH_13	362p	880.2	873.3				879.1		
IH_14	2501p	874.9	869.3	pond	869.8	5.0	871.9	869.8	2.0
IH_15	1357p	923.5	914.8				920.2		
PA_10	380p	894.5	887.5				894.5		
PA_11	landlocked	884.0	879.4	byd	879.4	4.6	882.3	879.4	2.9
PA_12	383p	879.5	870.8	street			874.6		
PA_13	landlocked	890.1	887.8	byd	887.8	2.3	889.3	887.8	1.5
NMSB_2	2131p	843.7	838.3	pond	840.2	3.5	843.0	841.7	1.3
NMSB_3	2130p	844.9	838.4	pond	840.2	4.7	844.1	841.7	2.4
NMSB_4	Braemar Branch	850.0	845.3				848.1		
NMSB_5	2531p	840.9	834.0	pond	835.6	5.3	838.1	835.6	2.5
NMSB_6	2120p	841.9	834.0	pond	835.6	6.3	841.2	835.6	5.6
NMSB_7	2536p	842.4	836.3	pond	836.3	6.1	839.3	836.3	3.0
NMSB_8	overland to NMSB_90	844.9	840.4	pond	842.4	2.5	843.6	842.4	1.2
NMSB_10	1515p	840.0	836.4				837.8		
NMSB_11	1519p	842.3	837.1				841.8		
NMSB_12	2133p	832.9	825.9	pond	826.9	6.0	827.8	826.0	1.8
NMSB_13	875p	869.1	857.4	street			862.9		
NMSB_14	877p	856.1	851.5				858.1		
NMSB_15	994p	844.7	841.8	byd	841.8	2.9	842.6	841.8	0.8
NMSB_16	3291_p	844.5	839.8				844.5		
NMSB_17	3255_p	844.4	841.2				844.4		
NMSB_18	864p	880.3	875.9				876.3		
NMSB_19	1557p	903.3	897.5				901.1		
NMSB_20	2620p	848.1	843.5	depression	843.5	4.5	846.3	843.5	2.7
NMSB_21	865p	943.3	943.0				943.2		
NMSB_22	1652p	881.0	872.5	street			876.4		
NMSB_23	850p	884.6	876.0	street			879.7		
NMSB_24	2529p	876.8	875.0	hwy ditch	875.0	1.8	875.7	875.0	0.7
NMSB_25	1523p	929.4	927.3				929.6		
NMSB_26	854p	878.8	870.0		870.0	8.8	871.4	870.0	1.5
NMSB_27	852p	880.7	871.2	byd	871.2	9.5	878.9	871.2	7.8
NMSB_28	855p	875.4	867.4				869.4		
NMSB_29	856p	872.6	866.5				867.9		
NMSB_30	874p	869.6	860.8	street			868.7		
NMSB_31	857p	866.2	859.4				865.1		
NMSB_32	843p	862.1	856.5				862.0		
NMSB_33	2700p (inlet/outlet)	844.9	839.0	pond	840.2	4.7	844.1	841.7	2.4
NMSB_34	847p	873.2	866.9	byd	866.9	6.3	869.0	866.9	2.1
NMSB_35	2522p	883.6	880.0	street			881.9		
NMSB_36	842p	849.0	842.5				848.3		
NMSB_37	845p	858.2	851.9	street			858.1		
NMSB_38	858p	977.4	976.9				977.3		
NMSB_39	832p	853.9	851.0				856.4		
NMSB_40	841p	846.9	844.9				847.0		
NMSB_41	2124p	843.5	838.0	depression	838.0	5.5	842.8	838.0	4.8
NMSB_42	831p	854.6	848.5				850.8		
NMSB_43	1525p	856.8	851.6				856.7		
NMSB_44	1517p	841.8	835.3				838.1		
NMSB_45	1528p	847.7	839.1	depression	840.2	7.5	847.2	840.0	7.2
NMSB_46	1647p	858.6	854.1	hwy ditch	854.1	4.6	863.9	854.1	9.8

[1] 100-year flood elevation based on 24-hour event. Flood elevation from a 10-day snowmelt event should also be evaluated prior to final design/determination.

[2] byd = backyard depression

Table 9.3
Hydraulic Modeling Results for XP-SWMM Subwatersheds/Nodes in the Nine Mile South Fork (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[1] (ft)	Invert Elevation	Type of Storage[2]	NWL (ft)	Flood Bounce (ft)	Flood Elevation (ft)	NWL (ft)	Flood Bounce (ft)
NMSB_47	1514p	840.6	836.3				838.1		
NMSB_49	1646p	870.5	869.1				871.9		
NMSB_50	1649p	864.0	862.8	hwy ditch	862.8	1.2	863.9	862.8	1.1
NMSB_51	2526p	876.7	875.4				877.0		
NMSB_52	1883p	858.2	852.1				854.2		
NMSB_56	2132p	839.5	837.6				831.4		
NMSB_57	2137p	839.3	835.4	pond	835.6	3.7	837.8	835.6	2.2
NMSB_58	991p	897.3	894.1				897.1		
NMSB_59	landlocked	866.3	859.4	byd	859.4	6.9	864.7	859.4	5.3
NMSB_61	2611p	884.3					884.2		
NMSB_62	2502p	840.9	834.0	hwy ditch	835.6	5.3	837.9	835.6	2.3
NMSB_63	2530p	870.2	865.0	hwy ditch	865.0	5.3	869.5	865.0	4.5
NMSB_64	1965p	864.3	857.2	hwy ditch	857.2	7.0	866.2	857.2	9.0
NMSB_65	1963p	862.7	855.7	hwy ditch	855.7	7.0	865.5	855.7	9.8
NMSB_66	816_p	868.0	862.4				867.8		
NMSB_67	810p	910.9	903.0	street			905.2		
NMSB_68	2610	886.4					886.5		
NMSB_69	Braemar Branch	860.0	853.3				855.5		
NMSB_70	821p	864.5	857.3	byd	857.3	7.2	863.8	857.3	6.5
NMSB_71	1753p	863.1	856.4				863.0		
NMSB_72	820p	864.3	858.3				864.2		
NMSB_73	2122p	866.1	856.0	ditch	856.0	10.1	859.7	856.0	3.7
NMSB_74	1751p	861.6	856.1				857.6		
NMSB_75	817p	872.6	867.4	street			868.6		
NMSB_76	1752p	863.0	856.1				862.1		
NMSB_77	Braemar Branch	860.6	854.4	ditch			857.6		
NMSB_78	809p	863.9	860.7				864.1		
NMSB_79	2134p	867.1	863.4				866.2		
NMSB_80	2523p	877.3	876.9				877.5		
NMSB_81	1964p	863.2	856.8				865.7		
NMSB_82	838p	880.3	875.0	ditch	875.0	5.3	879.5	875.0	4.5
NMSB_83	826p	863.6	854.2	street			860.9		
NMSB_84	830p	863.6	853.9	street			860.9		
NMSB_85	2121p	842.2	836.0	pond	836.3	5.9	838.5	836.0	2.5
NMSB_86	2136p	833.5	828.4	pond	828.4	5.1	833.0	828.4	4.6
NMSB_87	1757p	866.7	863.0	ditch	863.0	3.7	865.8	863.0	2.8
NMSB_88	2528p	879.8	878.8				880.1		
NMSB_90	2720p	844.9	839.0	wetland	839.0	5.9	842.6	839.0	3.5
NMSB_91	1949p	869.6	865.7		865.7	3.9	868.4	865.7	2.7
NMSB_92	394p	869.0	866.4				868.3		
NMSB_93	2110p	882.9	879.4				883.0		
NMSB_94	2116p	872.0	867.7				871.9		
NMSB_95	1951p	871.2	866.9				871.1		
NMSB_96	1950p	871.4	866.8				870.6		
NMSB_97	1952p	871.5	867.6				871.1		
NMSB_98	2112p	894.5	894.2				894.4		
NMSB_99	2103p	871.4	867.7	depression	867.7	3.7	870.1	867.7	2.3

[1] 100-year flood elevation based on 24-hour event. Flood elevation from a 10-day snowmelt event should also be evaluated prior to final design/determination.

[2] byd = backyard depression

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
365p	513	514	Circular	1.25	0.024	869.11	868.79	47	0.68	3.7	-3.2
367p	IH_5	516	Circular	2	0.024	868.21	864.18	29.5	13.66	24.6	19.0
368p	516	IH_1	Circular	2	0.024	864.18	863	167.7	0.70	24.6	19.0
373p	IH_11	523	Circular	1.75	0.013	872.89	868.23	166.2	2.80	21.8	16.9
374p	523	IH_1	Circular	2	0.024	868.23	863.04	100	5.19	21.8	16.9
380p	PA_10	PA_6	Circular	1	0.024	887.5	876.42	166	6.67	6.2	2.5
381p	PA_6	534	Circular	1	0.013	872.5	872.23	139	0.19	5.3	3.1
382p	534	PA_12	Circular	1.25	0.013	871.23	870.84	28	1.39	5.3	3.2
383p	PA_12	536	Circular	1.5	0.013	870.84	870.75	22	0.41	10.1	10.6
384p	536	537	Circular	1.5	0.013	870.75	870.01	164.2	0.45	10.8	8.6
385p	537	PA_8	Circular	1.5	0.013	870.01	869.09	230	0.40	10.8	8.7
386p	PA_8	539	Circular	1.75	0.013	869.09	868.48	146.8	0.42	22.4	16.1
387p	539	PA_4	Circular	1.75	0.013	868.48	866.93	44	3.52	22.4	16.2
388p	PA_4	541	Circular	1.75	0.013	866.93	863.61	116	2.86	29.1	20.2
390p	543	PA_12	Circular	1	0.013	872.33	871.34	99	1.00	6.2	5.8
391p	PA_7	543	Circular	1.25	0.013	874.5	873.5	99	1.01	-7.6	4.7
393p	546	NMSB_92	Circular	1.5	0.013	866.57	866.38	48	0.40	-5.6	-3.0
394p	NMSB_92	548	Circular	1.5	0.013	866.38	865.96	118	0.36	-4.6	-1.9
395p	549	546	Circular	1.5	0.013	866.98	866.57	115	0.36	-5.6	-3.0
397p	552	553	Circular	1.25	0.024	884.32	883.52	67	1.19	0.0	0.0
398p	553	AH_1	Circular	1.25	0.024	883.52	874.83	94	9.24	0.0	0.0
400p	AH_21	AH_1	Circular	1.5	0.024	877.91	874.83	47.3	6.51	20.3	15.1
401p	AH_10	560	Circular	1	0.013	951.3	949.2	48	4.38	9.1	5.9
402p	560	561	Circular	1	0.024	945.7	873.43	245.5	29.44	9.1	5.9
403p	561	AH_1	Circular	2	0.013	871.54	871.5	20	0.20	9.1	5.9
404p	AH_6	564	Circular	1.75	0.013	880	879.64	62	0.58	12.1	11.7
405p	564	565	Circular	1.75	0.013	879.64	877.78	304	0.61	12.1	11.7
406p	565	566	Circular	1.75	0.013	877.78	876.28	250	0.60	15.9	14.4
407p	566	AH_1	Circular	1.75	0.013	876.28	874.69	272	0.58	15.9	14.4
409p	570	AH_5	Circular	2.5	0.013	872.96	872.63	31	1.06	40.2	35.5
411p	AH_8	AH_6	Circular	2.5	0.024	879.42	877.74	156	1.08	30.0	32.6
412p	AH_13	575	Circular	1.5	0.024	885.66	884.77	115	0.77	5.7	6.3
413p	575	576	Circular	1.5	0.013	884.77	883.94	160	0.52	5.8	6.6
414p	576	AH_15	Circular	1.5	0.013	883.94	883.48	90	0.51	5.8	6.8
415p	AH_15	578	Circular	1.5	0.013	883.29	882.95	19	1.79	6.4	7.4
416p	578	AH_11	Circular	1.5	0.013	882.95	882.2	28.5	2.63	6.6	7.5
417p	AH_11	580	Circular	1.5	0.013	882.2	882.2	14.5	0.00	15.8	16.2
418p	580	581	Circular	2	0.024	879.02	879.11	104	-0.09	15.8	16.2
419p	581	AH_6	Circular	2	0.024	879.11	879	147	0.07	15.8	16.2
809p	NMSB_78	1032	Circular	1.25	0.024	860.7	856.2	182	2.47	4.7	6.7
810p	NMSB_67	1034	Circular	1	0.013	902.96	886.43	184	8.98	11.9	10.4
817p	NMSB_75	1042	Circular	1	0.013	867.38	863.24	207	2.00	5.8	3.6
818p	1042	1043	Circular	1	0.013	863.14	858.82	216	2.00	3.9	3.6
821p	NMSB_70	1045	Circular	1	0.013	857.3	856.34	180	0.53	3.7	4.1
828p	1052	1053	Circular	1	0.013	855.46	855.02	41.7	1.06	4.9	5.6
832p	NMSB_39	1059	Circular	3	0.013	851	850.44	70	0.80	30.1	22.0
833p	1060	NMSB_39	Circular	1.75	0.013	851.23	851	24	0.96	15.0	7.8
834p	1061	1060	Circular	1.75	0.013	851.58	851.23	36	0.97	15.0	7.6
835p	1062	1061	Circular	1.25	0.013	863.9	851.58	220	5.60	15.0	6.0

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
836p	1063	1062	Circular	1	0.013	873.52	863.9	78	12.33	13.4	5.9
840p	1068	NMSB_82	Circular	1	0.013	879.34	879	36	0.94	4.7	3.5
843p	NMSB_32	1075	Circular	1.25	0.013	856.45	855.26	73	1.63	11.6	11.7
845p	NMSB_37	1078	Circular	1.75	0.013	851.93	851.21	77.7	0.93	19.0	15.7
846p	1078	1077	Circular	2	0.024	851.21	844.47	123	5.48	19.0	15.7
847p	NMSB_34	1080	Circular	1.25	0.013	881.16	877	128	3.25	-4.9	0.0
848p	1080	1081	Circular	1.25	0.013	877	876.83	103	0.17	-4.8	-3.7
849p	1081	NMSB_23	Circular	1.75	0.013	876.83	875.96	274	0.32	-4.8	-4.6
850p	NMSB_23	1083	Circular	2	0.013	875.96	873.53	118.8	2.05	26.2	13.7
851p	1083	NMSB_27	Circular	2	0.013	873.53	871.16	185	1.28	26.2	13.7
852p	NMSB_27	1085	Circular	2.5	0.013	871.16	870.44	140	0.51	15.3	11.1
854p	NMSB_26	NMSB_28	Circular	3	0.013	869.95	867.36	423	0.61	56.7	25.7
855p	NMSB_28	NMSB_29	Circular	3	0.013	867.36	866.46	273	0.33	64.1	29.0
856p	NMSB_29	NMSB_31	Circular	3	0.013	866.46	859.44	431	1.63	73.2	34.5
858p	NMSB_38	1092	Circular	1	0.013	976.85	961.03	120	13.18	5.9	3.2
859p	1092	1093	Circular	1	0.024	957.52	937.5	110	18.20	5.9	4.1
861p	1094	1095	Circular	1.25	0.013	930	902	134.1	20.88	5.8	3.2
862p	1095	1096	Circular	1.25	0.013	901.25	888.07	160	8.24	5.8	3.1
863p	1096	NMSB_18	Circular	1	0.013	885.56	875.86	147	6.60	5.8	3.2
864p	NMSB_18	1098	Circular	1.5	0.013	875.86	872.11	29	12.93	15.8	6.5
865p	NMSB_21	1100	Circular	1	0.013	942.96	894.77	128	37.65	4.9	2.3
866p	1100	1101	Circular	1	0.013	894.77	878.25	91	18.15	4.9	2.6
867p	1101	1098	Circular	1	0.013	878.25	872.11	137	4.48	4.9	2.6
868p	1098	1102	Circular	2.5	0.013	872.11	872.02	27.3	0.33	37.8	25.3
869p	1102	1103	Circular	2.5	0.013	872.02	871.62	97	0.41	37.8	25.4
870p	1103	1104	Circular	2.5	0.013	871.62	870.85	175	0.44	37.8	25.4
871p	1104	1105	Circular	2.25	0.013	870.85	865.47	289.7	1.86	37.8	25.2
875p	NMSB_13	1109	Circular	3	0.013	857.38	854.91	225	1.10	95.2	59.8
876p	1109	NMSB_14	Circular	3	0.013	854.91	851.5	310	1.10	95.2	59.9
877p	NMSB_14	1111	Circular	3	0.013	851.5	843.96	260	2.90	97.4	70.9
992p	1256	1257	Circular	1	0.013	880.06	865.29	158	9.35	9.7	10.0
993p	1257	NMSB_59	Circular	1	0.013	865.29	860.17	73	7.01	9.6	10.0
994p	NMSB_15	1260	Circular	1	0.024	842.78	842.17	152.7	0.40	0.9	0.0
1272p	AH_16	AH_6	Circular	2	0.024	878.48	877.92	156	0.36	-7.7	3.9
1273p	AH_24	1593	Circular	1.5	0.013	888.1	886.68	164	0.87	10.5	9.1
1274p	1593	AH_4	Circular	1.5	0.013	886.68	885.7	69.5	1.41	10.5	9.1
1353p	IH_12	1644	Circular	1	0.013	873.83	873.21	33.2	1.87	10.1	10.1
1354p	1644	IH_11	Circular	1.75	0.013	873.03	872.89	32	0.44	10.2	10.1
1356p	1647	IH_8	Circular	1	0.013	889.42	886.96	24.7	9.96	1.7	-2.1
1362p	AH_19	1651	Circular	1.25	0.013	879	878.21	85	0.93	7.8	8.4
1364p	AH_17	1656	Circular	1	0.013	893.4	888.46	61.5	8.03	9.7	9.9
1365p	AH_9	565	Circular	1.25	0.013	885.5	884.9	62	0.97	10.8	9.6
1514p	NMSB_47	NMSB_57	Arch	38"x57"	0.024	836.3	835.5	40	2.00	80.1	38.2
1515p	NMSB_10	NMSB_57	Circular	1	0.024	836.35	836.11	27	0.89	2.7	0.8
1516p	1872	NMSB_10	Circular	1	0.024	836.76	836.35	29	1.41	2.7	0.8
1517p	NMSB_44	NMSB_5	Circular	1	0.024	835.32	834.52	32	2.50	4.6	3.7
1521p	1880	1879	Circular	1	0.024	887.98	860	131	21.36	6.6	5.8
1522p	1881	1880	Circular	1	0.024	917.88	887.98	77.8	38.43	6.6	5.5
1523p	NMSB_25	1881	Circular	1	0.013	927.28	923	109.5	3.91	6.6	5.3

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
1646p	NMSB_49	2076	Circular	1	0.013	869.11	869.01	64	0.16	2.8	3.2
1647p	NMSB_46	2078	Circular	2	0.013	854.06	852.28	106	1.68	33.8	20.8
1649p	NMSB_50	2081	Circular	2	0.013	862.77	850.58	154	7.92	39.5	40.4
1650p	2081	2082	Circular	3	0.013	850.58	850.5	10	0.80	39.5	40.3
1751p	NMSB_74	2194	Circular	2.5	0.013	856.13	856.09	42	0.10	14.4	4.4
1752p	NMSB_76	2196	Circular	2.25	0.013	856.1	855.89	23.9	0.88	49.3	52.1
1755p	2204	NMSB_71	Circular	2.25	0.013	859.12	856.46	304	0.88	21.1	23.4
1756p	2205	2204	Circular	2	0.013	860	859.12	12.5	7.04	18.2	23.1
1757p	NMSB_87	2205	Circular	2	0.024	863	860	75	4.00	18.2	23.1
1793p	BA_3	2244	Circular	2.25	0.013	865.14	852.74	200.5	6.18	70.8	41.9
1794p	2246	BA_3	Circular	2.25	0.013	871.32	869.41	219.7	0.87	34.2	25.0
1944p	IH_10	2400	Circular	2	0.013	891.51	887	30	15.03	29.3	14.7
1945p	2400	2401	Circular	2	0.013	887	884.53	35	7.06	29.3	14.6
1946p	2401	2402	Circular	2	0.013	884.53	878.98	50	11.10	29.3	14.6
1948p	548	NMSB_91	Circular	1.25	0.013	865.96	865.73	70	0.33	-4.6	2.1
1949p	NMSB_91	2405	Circular	1.75	0.013	865.73	865.46	31	0.87	18.0	14.0
1950p	NMSB_96	2407	Circular	2	0.013	866.82	866.61	31	0.68	19.2	12.9
1951p	NMSB_95	2409	Circular	1	0.013	866.86	865.79	31	3.45	9.7	8.6
1963p	NMSB_65	NMSB_46	Circular	2	0.013	856.8	855.74	210	0.50	28.7	20.6
1964p	NMSB_81	NMSB_65	Circular	2	0.013	856.8	855.74	18	5.89	23.5	21.1
1965p	NMSB_64	NMSB_81	Circular	2	0.013	857.22	856.8	100	0.42	20.8	18.5
1977p	AH_30	2437	Circular	1.25	0.013	898.05	885.03	186	7.00	17.7	11.1
1978p	2437	AH_3	Circular	1.5	0.013	882.82	882.75	31	0.23	17.7	10.4
2033p	BA_2	2247	Circular	1.25	0.013	887.5	870	333.7	5.24	13.8	9.3
2049p	BA_1	2247	Circular	2.25	0.013	874.9	870	53.6	9.14	20.5	16.0
2085p	2637	AH_32	Circular	1.5	0.013	880.95	880.7	23	1.09	6.9	10.3
2086p	2603	571	Circular	2.5	0.013	876	873.45	110	2.32	33.8	31.6
2087p	AH_4	2644	Circular	1	0.013	883.41	885.5	18	-11.61	4.0	3.1
2088p	2643	AH_31	Circular	2.5	0.013	873.4	873.05	74	0.47	37.6	34.4
2090p	AH_18	2641	Circular	1.25	0.013	890.59	883.17	56.2	13.20	10.4	7.2
2092p	571	2643	Circular	2.5	0.013	873.45	873.4	25	0.20	33.8	31.6
2093p	AH_28	2637	Circular	1.5	0.024	881.59	881.59	30	0.00	6.9	10.3
2094p	AH_26	2640	Circular	2	0.013	898.13	893.39	27	17.56	18.8	10.5
2095p	2605	2604	Circular	2.5	0.013	877.5	876.32	177	0.67	19.9	23.9
2096p	2644	2643	Circular	1.25	0.013	882	881.55	15	3.00	5.3	4.1
2097p	AH_25	2605	Circular	2.5	0.013	878.67	877.5	145	0.81	19.9	31.2
2098p	AH_29	2603	Circular	2.5	0.013	876.32	876	148	0.22	32.4	30.6
2100p	PA_1	549	Circular	1.5	0.013	867	866.96	10	0.40	-3.5	-3.5
2102p	2596	NMSB_97	Circular	1	0.013	867.94	867.56	36	1.06	5.3	-5.4
2103p	NMSB_99	2596	Circular	1	0.013	867.73	867.94	20	-1.05	5.3	-5.4
2104p	AH_32	2604	Circular	2	0.013	880.68	880	300	0.23	16.4	12.2
2105p	2409	2646	Circular	1.25	0.013	865.79	863.35	118	2.07	9.7	9.3
2106p	2405	2647	Circular	1.75	0.013	865.46	865.09	49	0.76	18.0	14.0
2107p	2647	2648	Circular	1.75	0.013	865.09	864.43	69	0.96	18.0	15.2
2108p	2407	2649	Circular	2	0.013	866.61	866.4	49	0.43	19.2	12.9
2109p	2649	2650	Circular	2	0.013	866.4	865.95	68	0.66	19.2	12.9
2110p	NMSB_93	2653	Circular	1	0.013	879.36	878.84	34	1.53	3.7	2.4
2111p	2653	2652	Circular	1	0.013	878.84	877.59	120	1.04	3.7	2.4
2112p	NMSB_98	2655	Circular	1	0.013	894.17	886.07	43	18.84	4.0	2.4

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork Drainage Basin (Revised 12/2006).

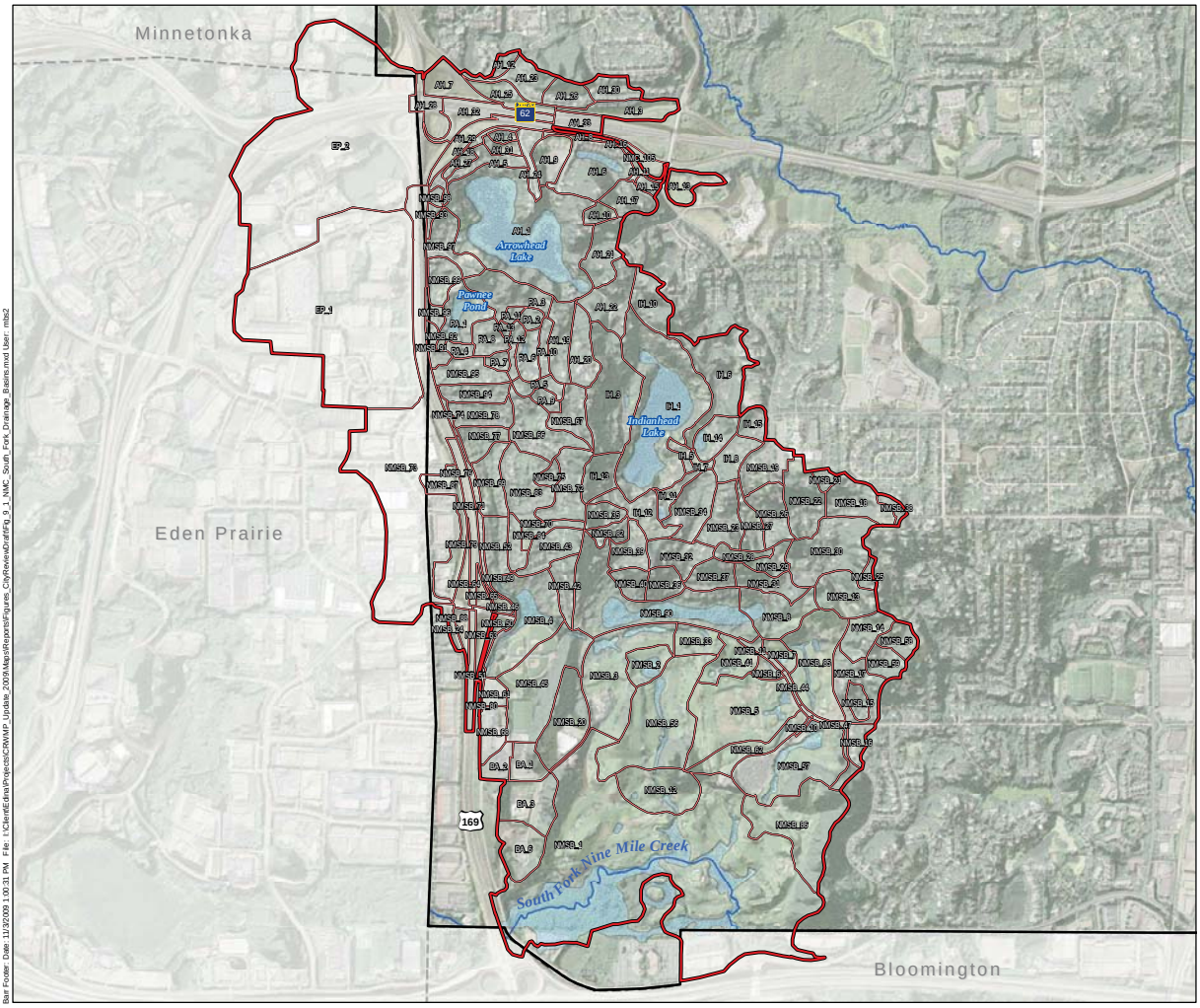
Conduit ID	Upstream Node	Downstream Node	Conduit Shape	Conduit Dimensions* (ft)	Roughness Coefficient	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Conduit Length (ft)	Slope	100Y Peak Flow through Conduit (cfs)	10Y Peak Flow through Conduit (cfs)
2113p	2655	2656	Circular	1	0.013	886.07	884.28	57	3.14	4.0	2.4
2115p	2571	AH_8	Circular	2.5	0.013	880.18	880.52	28	-1.21	27.4	29.8
2116p	NMSB_94	2659	Circular	1	0.013	867.68	864.77	82	3.55	7.8	7.4
2117p	2659	2660	Circular	1	0.013	864.77	863.11	49	3.39	7.8	7.6
2118p	2660	2661	Circular	1.25	0.013	863.11	862.2	70	1.30	7.8	8.2
2119p	AH_7	AH_25	Circular	2	0.024	884.42	883.6	412	0.20	11.1	8.2
2121p	NMSB_85	NMSB_47	Arch	38"x57"	0.024	836	836.3	100	-0.30	76.6	35.0
2122p	NMSB_73	2663	Arch	72" eq	0.013	856.03	855.42	200	0.31	346.1	127.4
2124p	NMSB_41	NMSB_11	Circular	1	0.013	838	837.09	85	1.07	4.9	4.8
2125p	2622	NMSB_7	Circular	2	0.013	837.93	836.3	240	0.68	20.2	20.2
2133p	NMSB_12	2633	Circular	4	0.024	825.87	825.56	26	1.19	61.2	18.1
2136p	NMSB_86	NMSB_1	Circular	2.5	0.024	828.4	828.3	250	0.04	20.1	19.2
2139p	AH_31	570	Circular	2.5	0.013	873.05	872.96	132.5	0.07	40.2	35.5
2155p	EP_2	2704	Circular	1.5	0.024	888.59	888.33	20	1.30	8.3	0.0
2180p	2728	2727	Circular	1.25	0.013	872.52	870.77	175	1.00	-0.4	0.0
2183p	2727	BA_3	Circular	1.5	0.013	870.77	870.48	29	1.00	2.1	0.0
2501p	IH_14	513	Circular	1	0.024	869.83	869.11	89.5	0.80	3.7	-3.2
2502p	NMSB_62	1872	Circular	1	0.024	837	836.76	17	1.41	2.7	0.8
2521p	2673	1068	Circular	1	0.013	879.58	879.34	30	0.80	4.7	3.5
2522p	NMSB_35	2673	Circular	1	0.013	879.96	879.58	48	0.79	4.7	3.5
2523p	NMSB_80	2676	Circular	1	0.013	876.88	876.04	28	3.00	2.4	4.0
2524p	2676	2677	Circular	2	0.013	875.43	872.44	189	1.58	2.4	4.3
2525p	2677	NMSB_63	Circular	3	0.013	870.8	870.33	65	0.72	27.5	34.0
2526p	NMSB_51	2677	Circular	2	0.013	875.39	870.8	100	4.59	25.1	30.5
2527p	2679	NMSB_51	Circular	2	0.013	877.69	875.39	175	1.31	8.7	12.3
2528p	NMSB_88	2679	Circular	2	0.013	878.81	877.71	64	1.72	8.7	12.3
2529p	NMSB_24	NMSB_64	Circular	1.5	0.013	875	861.08	177	7.86	9.0	16.2
2530p	NMSB_63	NMSB_50	Circular	2	0.013	864.95	863.69	178	0.71	30.6	28.5
2540p	2731	IH_1	Circular	3	0.024	865	861.7	160	2.06	29.3	14.6
2541p	2402	2731	Circular	2	0.013	878.98	865	190	7.36	29.3	14.6
2610p	NMSB_68	2599	Circular	2	0.013	884.78	884.51	16.00	1.7	21.7	22.5
2611p	NMSB_61	2601	Circular	1.5	0.013	883.01	882.47	65.00	0.8	10.2	9.2
2620p	NMSB_20	2695	Circular	1.25	0.013	843.52	843.32	40	0.50	10.7	8.4
2622p	2695	2694	Circular	1.25	0.013	843.32	843.14	36	0.50	10.7	8.4
2702p	NMSB_85	2619	Circular	1	0.013	836.6	836.07	21	2.52	4.1	3.6
2720p	NMSB_90	2622	Circular	2	0.013	839.02	837.93	160	0.68	20.2	20.2
3254p	1261	NMSB_17	Circular	1	0.013	841.4	841.17	35	0.66	-2.5	-2.7
396p	PA_3	PA_1	Circular	1.25	0.013	867.8	863.37	177	2.50	14.8	13.1
816_p	NMSB_66	1040	Circular	1	0.013	862.37	860.97	235	0.60	5.5	5.5
2101p	2595	549	Circular	0.66	0.010	867.5	867.5	5	0.00	0.6	0.6
2091p	2641	2603	Circular	1	0.013	876.27	876	8	3.38	9.7	6.8
2123p	2619	NMSB_44	Circular	1	0.013	836.07	835.32	30	2.50	4.1	3.6
1883p	NMSB_52	2344	Rectangular	6	0.012	852.1	851.9	108.3	0.18	420.2	219.4
1528p	NMSB_45	1893	Circular	6	0.024	839.11	838.76	70	0.50	281.7	216.3
1759_p	2209	2210	Circular	2	0.013	843.02	842.9	24	0.50	0.7	8.4
1795p	2247	2246	Circular	2.25	0.013	871	871.32	218.7	-0.15	30.6	25.1
2241_p	NMSB_85	2733	Circular	1	0.024	836.8	837.79	40	-2.48	3.0	0.9
2244_p	2733	NMSB_47	Circular	1	0.013	837.79	836.3	39	3.82	3.0	0.9
2532_p	NMSB_15	2687	Circular	1	0.008	841.8	837.75	270	1.50	8.4	6.5

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
3186_p	2870	2869	Circular	3	0.013	881.06	881.01	35.1	0.14	21.1	26.8
3187_p	2871	2870	Circular	3	0.013	881.13	881.06	92.8	0.08	21.1	30.1
3188_p	2869	2868	Circular	3	0.013	881.01	880.89	13.7	0.88	21.1	24.8
3189_p	2868	AH_33	Circular	3	0.013	880.89	880.46	110.5	0.39	21.1	23.0
3190_p	AH_33	2571	Circular	2.5	0.013	880.46	880.18	40	0.70	27.4	29.8
3191_p	AH_3	2871	Circular	3	0.013	881.15	881.13	28.5	0.07	21.1	32.1
3287_p	2947	AH_25	Circular	1.5	0.024	882.6	881.59	87	1.16	3.6	4.6
3288_p	AH_12	2947	Circular	1	0.013	884.1	882.6	106	1.42	3.7	4.6
3289_p	BA_6	2951	Circular	2	0.009	846	832	360	3.89	35.7	45.2
360p	IH_3	IH_1	Circular	1.5	0.024	863.85	862.85	312	0.32	9.3	6.4
362p	IH_13	IH_1	Circular	1.25	0.024	873.27	863	116.7	8.80	12.4	11.9
363p	IH_6	IH_14	Circular	1	0.024	869.57	869.32	30.5	0.82	5.0	5.5
366p	514	IH_5	Circular	1.5	0.024	868.79	868.21	107.2	0.54	10.5	10.5
369p	IH_7	514	Circular	1.5	0.024	870	868.79	34	3.56	12.6	13.1
370p	519	IH_7	Circular	1.5	0.024	880.89	870	184	5.92	14.7	15.6
371p	520	519	Circular	1.5	0.024	882.51	880.89	50	3.24	13.7	15.9
372p	521	520	Circular	1	0.013	885.41	882.51	110	2.64	7.9	7.9
389p	541	PA_1	Circular	1.75	0.013	863.61	863.26	9.5	3.68	26.7	20.2
392p	PA_5	543	Circular	1	0.013	882.88	876.55	331	1.91	7.4	6.9
399p	555	AH_1	Circular	3	0.024	876.3	874.8	31.2	4.81	77.4	41.9
408p	AH_5	AH_1	Circular	2.5	0.013	872.63	872.3	213	0.15	51.0	38.8
811p	1034	1035	Circular	1	0.013	886.07	869.1	190	8.93	10.7	9.6
812p	1035	1036	Circular	1	0.013	868.6	863.48	132	3.88	8.2	8.2
813p	1036	1037	Circular	1	0.013	863.48	862.74	54.5	1.36	3.8	3.8
814p	1037	1038	Circular	1	0.013	862.74	862.46	29	0.97	2.7	2.7
815p	1038	NMSB_66	Circular	1	0.013	862.46	862.37	35.5	0.25	3.0	-2.9
819p	1043	NMSB_72	Circular	1	0.013	858.82	858.52	28	1.07	1.9	-2.3
820p	NMSB_72	1045	Circular	1.25	0.013	858.28	856.34	125	1.55	9.0	11.2
822p	1045	1047	Circular	1.25	0.013	856.34	854.59	135.3	1.29	8.8	9.1
823p	1047	1048	Circular	1.25	0.013	854.59	854.59	28.7	0.00	5.2	5.0
824p	1048	1049	Circular	1.25	0.013	854.59	854.35	22	1.09	6.0	4.6
825p	1049	NMSB_83	Circular	1.5	0.013	854.35	854.17	29.1	0.62	10.4	5.3
826p	NMSB_83	1051	Circular	2	0.024	854.17	852.93	213	0.58	16.3	18.9
827p	1047	1052	Circular	1	0.013	854.59	855.46	24.7	-3.52	4.5	5.8
829p	1053	NMSB_84	Circular	1.5	0.013	855.02	853.94	91.2	1.18	4.9	5.6
830p	NMSB_84	1055	Circular	2	0.024	853.94	853.29	168	0.39	17.5	20.4
831p	NMSB_42	1057	Circular	2	0.024	848.5	846.7	50	3.60	32.7	20.6
837p	1064	1063	Circular	1	0.013	874.7	873.52	133	0.89	6.1	5.0
838p	NMSB_82	1064	Circular	1	0.013	875	874.7	38.5	0.78	6.0	5.0
841p	NMSB_40	1071	Circular	1	0.013	844.91	844.26	31.2	2.08	4.7	4.4
842p	NMSB_36	1073	Circular	1.5	0.024	842.52	842.34	20	0.90	21.0	10.0
844p	1075	NMSB_37	Circular	1.25	0.013	855.18	852.48	153	1.76	11.4	11.2
853p	1085	NMSB_26	Circular	1	0.013	871.77	871.5	5	5.40	19.7	13.5
857p	NMSB_31	1090	Circular	1.5	0.013	859.44	840.39	132	14.43	36.2	43.1
860p	1093	1094	Circular	1	0.024	937	934.55	122.4	2.00	4.4	3.2
872p	1105	1106	Circular	2.25	0.013	865.47	862.82	100	2.65	29.0	25.2
873p	1106	NMSB_30	Circular	2	0.013	862.82	860.8	52	3.88	23.4	23.9
874p	NMSB_30	NMSB_13	Circular	2.5	0.013	860.8	857.38	524	0.65	49.4	45.5
991p	NMSB_58	1256	Circular	1	0.013	894.1	880.06	109	12.88	11.6	11.6

Table 9.4
Conduit Modeling Results for Subwatersheds in the Nine Mile South Fork 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)
995p	1260	1261	Circular	1	0.024	842.07	841.7	68.2	0.54	-1.5	-2.2
1275p	AH_23	AH_25	Circular	1.5	0.013	885.6	884.04	26	6.00	23.0	15.0
1355p	IH_8	521	Circular	1.5	0.013	886.96	885.41	62	2.50	18.9	18.6
1357p	IH_15	IH_8	Circular	1	0.013	914.8	886.96	506.4	5.50	9.0	8.3
1359p	AH_22	555	Circular	1.5	0.013	876.3	876.3	28	0.00	29.6	28.5
1360p	1651	AH_22	Circular	1.5	0.013	878.21	876.8	227	0.62	13.5	13.8
1361p	AH_20	1651	Circular	1.25	0.013	879.26	878.21	56	1.88	7.8	6.4
1363p	1656	1654	Circular	1	0.013	886.67	884.45	60.5	3.67	9.9	9.8
1519p	NMSB_11	NMSB_6	Circular	1.25	0.024	837.09	834.5	100	2.59	4.9	5.2
1520p	1879	NMSB_13	Circular	2	0.013	860	859	34	2.94	6.6	11.6
1524p	1885	1883	Circular	1.75	0.013	850.91	850.04	217.7	0.40	12.8	11.9
1525p	NMSB_43	1886	Circular	1.75	0.013	851.6	851.4	51.6	0.39	12.3	11.4
1557p	NMSB_19	1932	Circular	1.25	0.013	897.5	877.51	259	7.72	17.7	16.6
1606p	1886	1885	Circular	1.75	0.013	851.4	850.91	122.7	0.40	14.6	11.9
1607p	1883	NMSB_42	Circular	1.25	0.013	849.84	848.5	335	0.40	7.5	7.6
1608p	1654	AH_11	Circular	1.5	0.013	883.1	882.2	82.8	1.09	14.2	11.7
1618p	1932	1085	Circular	1.5	0.013	877.51	870.1	176	4.21	17.9	16.6
1652p	NMSB_22	1098	Circular	1.75	0.013	872.49	872.11	95	0.40	23.0	16.8
1753p	NMSB_71	NMSB_76	Circular	2.25	0.013	856.36	856.1	22	1.18	41.3	42.6
1790p	2242	BA_6	Circular	2.25	0.013	848	844.88	203.2	1.54	48.6	40.2
1791p	2244	2242	Circular	2.25	0.013	852.74	848	205.1	2.31	52.8	39.9
1952p	NMSB_97	NMSB_96	Circular	1.75	0.013	867.56	866.82	250	0.30	12.1	8.0
2114p	2656	2657	Circular	1.25	0.013	884.28	883.76	95	0.55	3.6	2.5
2120p	NMSB_6	NMSB_5	Circular	1	0.024	834	834	200	0.00	2.5	3.0
2130p	NMSB_3	NMSB_2	Circular	4	0.024	838.41	838.27	105	0.13	63.7	23.8
2131p	NMSB_2	2628	Circular	2	0.024	840.2	839.45	50.7	1.48	16.8	2.6
2132p	NMSB_56	NMSB_12	Circular	3	0.024	837.6	826.37	188	5.97	19.6	27.6
2134p	NMSB_79	2204	Circular	1.25	0.013	863.44	859.12	349	1.24	5.3	5.2
2137p	NMSB_57	NMSB_86	Circular	2.5	0.024	835.6	828.39	210	3.43	32.4	19.9
2181p	2730	2729	Circular	1	0.013	874.3	872.95	269	0.50	0.0	0.0
2182p	2729	2728	Circular	1	0.013	872.95	872.52	87	0.49	0.0	0.0
2190p	EP_1	2648	Circular	1.5	0.013	865.36	864.3	100	1.06	20.5	7.1
2531p	NMSB_5	NMSB_62	Circular	1	0.024	834	834	40	0.00	-2.6	2.3
2535p	NMSB_62	NMSB_57	Circular	1.5	0.024	835.6	835.6	130	0.00	6.1	-3.4
2536p	NMSB_7	NMSB_85	Circular	2	0.024	836.3	836.3	70	0.00	-12.3	12.9
2621p	2694	2209	Circular	1.5	0.013	843.14	843.02	24	0.50	10.7	8.4
2700p	NMSB_3	NMSB_33	Circular	1	0.013	839	839	300	0.00	1.9	2.6
3251_p	2874	2875	Circular	1	0.013	840.82	839.36	35	4.17	2.5	2.9
3253_p	2875	2876	Circular	1	0.024	839.36	835.44	260	1.51	3.3	3.4
3255_p	NMSB_17	2874	Circular	1	0.013	841.17	840.82	35	1.00	3.0	3.6
3291_p	NMSB_16	2875	Circular	1	0.013	839.75	839.36	69	0.57	3.2	3.1



CITY OF EDINA, MINNESOTA
INCORPORATED 1888

- City of Edina Boundary
- Roads/Highways
- Creek/Stream
- Lake/Wetland
- Nine Mile Creek - South Fork Drainage Basin
- Subwatershed

Imagery Source: Aerials Express, 2008

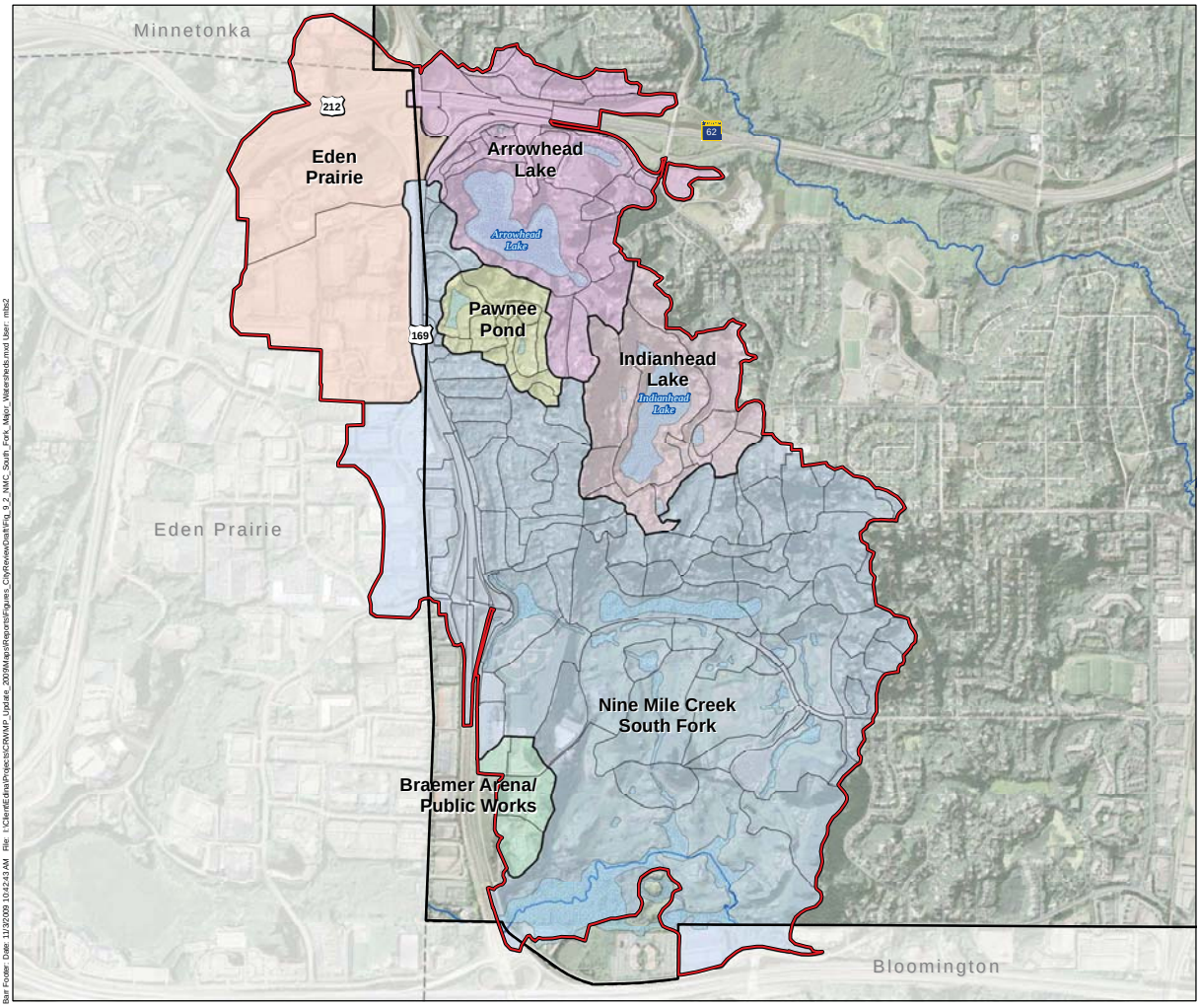
N

Feet
1,200 0 1,200

Meters
400 0 400

Figure 9.1

NINE MILE CREEK SOUTH FORK DRAINAGE BASIN
Comprehensive Water Resource Management Plan
City of Edina, Minnesota



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City of Edina Boundary
Roads/Highways
Creek/Stream
Lake/Wetland
Nine Mile Creek South Fork Drainage Basin
Major Watershed
Subwatershed

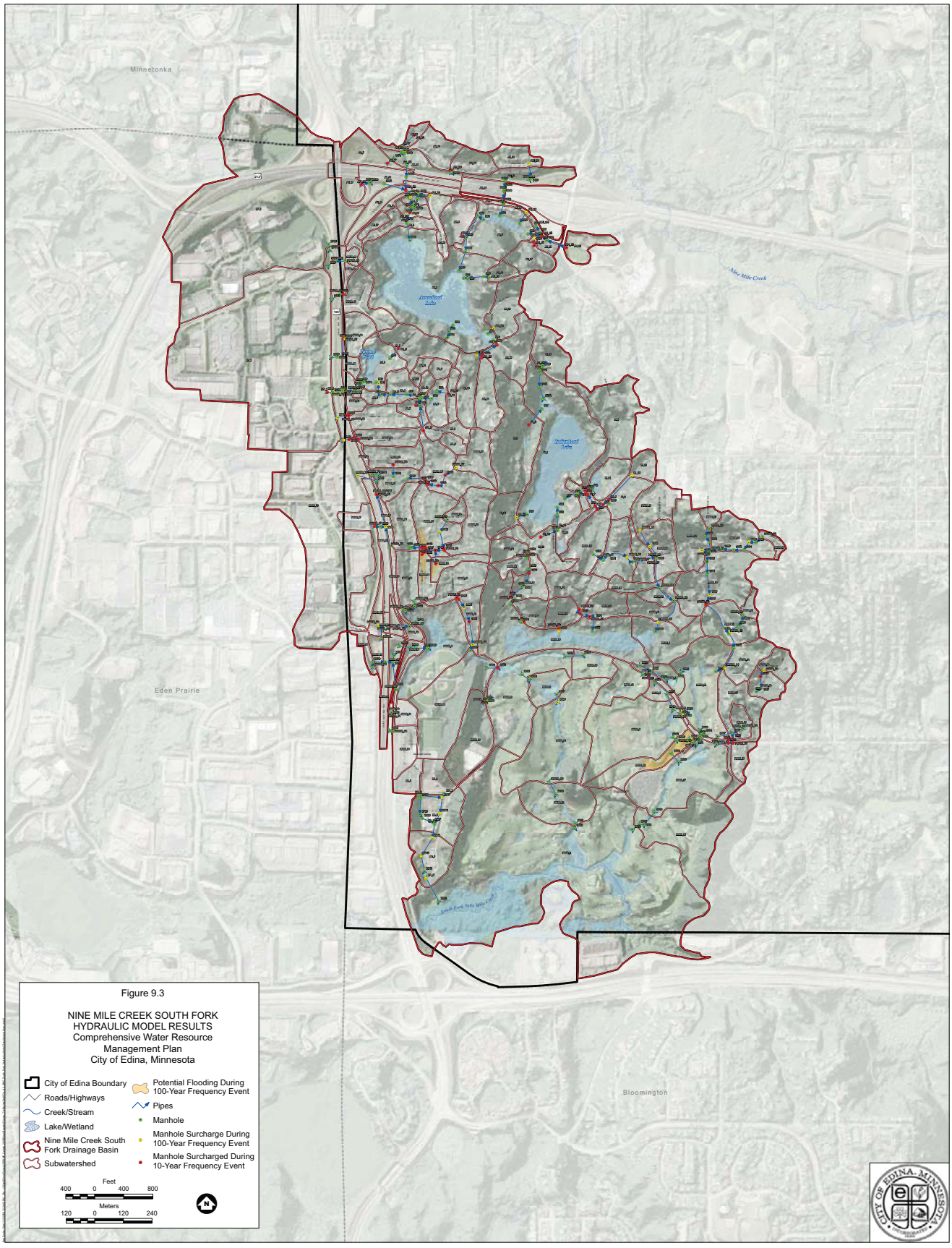
Imagery Source: Aerials Express, 2008

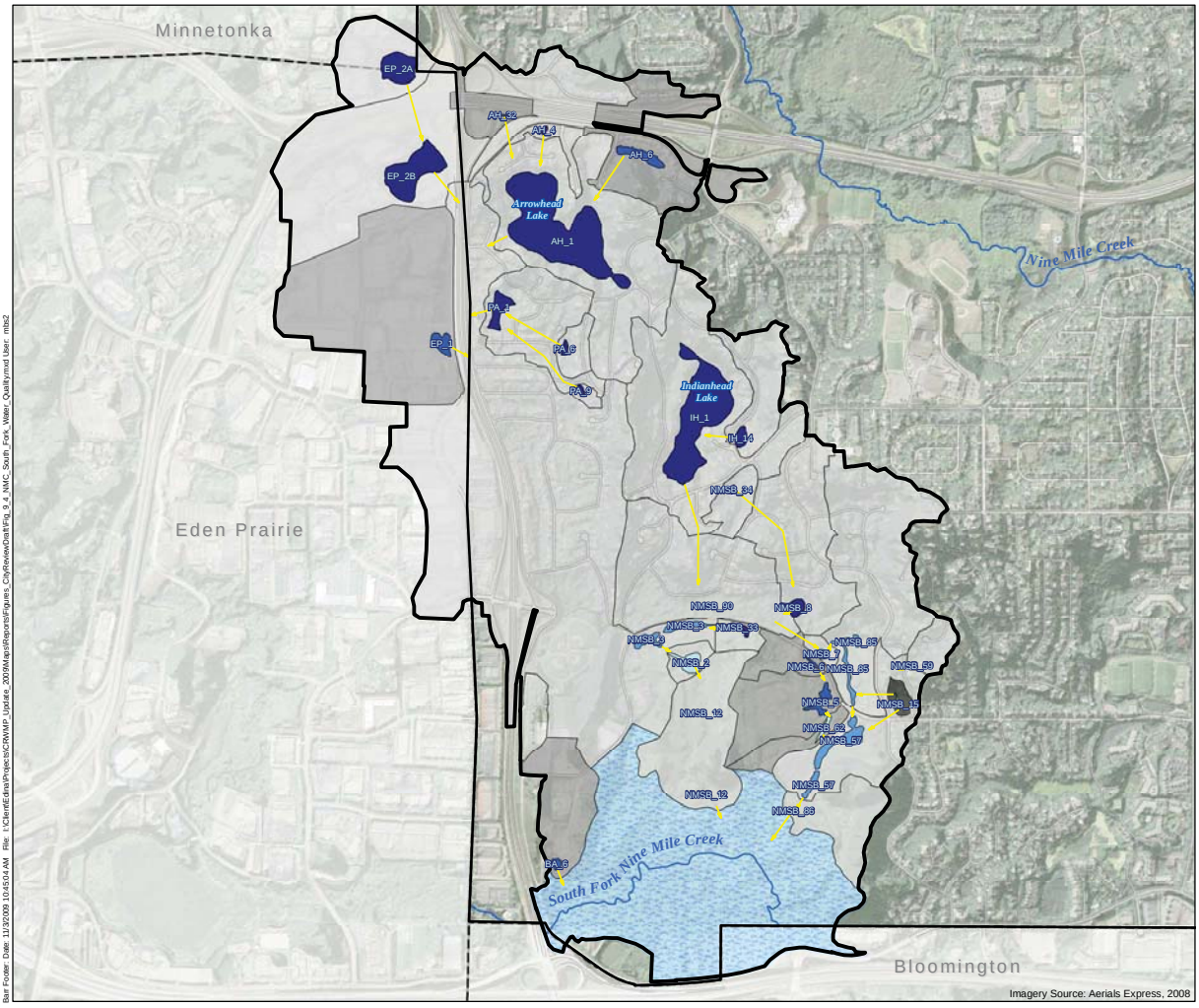
Feet
1,200 0 1,200

Meters
400 0 400

Figure 9.2

NINE MILE CREEK SOUTH FORK
MAJOR WATERSHEDS
Comprehensive Water Resource
Management Plan
City of Edina, Minnesota


Minnetonka
Eden Prairie
Bloomington
Nine Mile Creek
Figure 9.3
NINE MILE CREEK SOUTH FORK
HYDRAULIC MODEL RESULTS
Comprehensive Water Resource
Management Plan
City of Edina, Minnesota
City of Edina Boundary
Roads/Highways
Creek/Stream
Lake/Wetland
Nine Mile Creek South
Fork Drainage Basin
Subwatershed
Potential Flooding During
100-Year Frequency Event
Pipes
Manhole
Manhole Surcharge During
100-Year Frequency Event
Manhole Surcharged During
10-Year Frequency Event
Feet
400 0 400 800
Meters
120 0 120 240
N
CITY OF EDINA · MINNESOTA



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.

- 25 - 40% (Moderate Removal)
- 40 - 60% (Good Removal)
- 60 - 100% (Excellent Removal)

*Data based on results of P8 modeling.

- Area Draining Directly to the South Fork of Nine Mile Creek
- Flow Direction

N

Feet
1,200 0 1,200

Meters
400 0 400

Figure 9.4

NINE MILE CREEK SOUTH FORK
WATER QUALITY
MODELING RESULTS
Comprehensive Water Resource Management Plan
City of Edina, Minnesota