CHAPTER 4. XP-SWMM MODEL

An XP-SWMM model of the City's existing storm drainage system was developed, including Drains 3, 3A, 4, 5, 7, 8 and 8A and the FCOC. The model includes all detention basins/pump stations and the downstream storm drains and open channels to the FCOC. The model also includes a representation of the SSJID laterals as constant flows into the FCOC. A schematic representation of the existing system model is presented in Figure 4-1.

A model of the existing drainage system was developed first. This model was then used to evaluate proposed improvements to the system. The model was later expanded to include the remainder of the General Plan area and land uses. In addition, the South Drain and Drain 3N were added. The future system model was then used to identify improvements to serve the General Plan area at buildout. The future model is described in Chapter 5.

XP-SWMM MODEL

The XP-SWMM model has two related, but separate components. The first is a runoff layer, in which the rainfall to runoff transformation is simulated. Within the runoff layer, the watershed is divided into subsheds (Figure 4-2), which are represented at nodes. Thus for each runoff node, there is a data set, which includes information such as the tributary subshed area, the subshed impervious percentage, the ground slope, the ground roughness, the average subshed infiltration. The runoff layer calculates runoff hydrographs for each subshed given a specific storm event or rainfall hyetograph for use as input to the hydraulics layer.

The second layer is the hydraulics layer, which includes a link-node representation of the detention basin/pump station and storm drain/channel system (Figure 4-2). The hydraulics layer represents point facilities (such as detention basins, maintenance holes, drain inlets, transitions between channels and culverts) as nodes. The model represents linear/conveyance facilities (such as pump stations, drain pipes and open channels) as links. Using the inflow-hydrographs generated by the runoff layer, the model calculates the flow through the links and the resulting water surface elevation at the nodes.

Since this model has now been developed and validated for reasonableness, it can now be used to evaluate the causes of flooding under existing conditions, plan improvements to solve the existing flooding, and plan the drainage improvements needed for future development.

DATA COLLECTION AND MODEL DEVELOPMENT

This section summarizes the data collected and methodology used to develop the existing conditions model.

Hydrologic Model Data

- Hyetographs **–** The 10-Year, 24-hour and 100-Year, 24-hour design storm depth-duration-frequency information and the mean annual precipitation data are from the San Joaquin County Hydrology Manual. These data are summarized in Table 4-1.

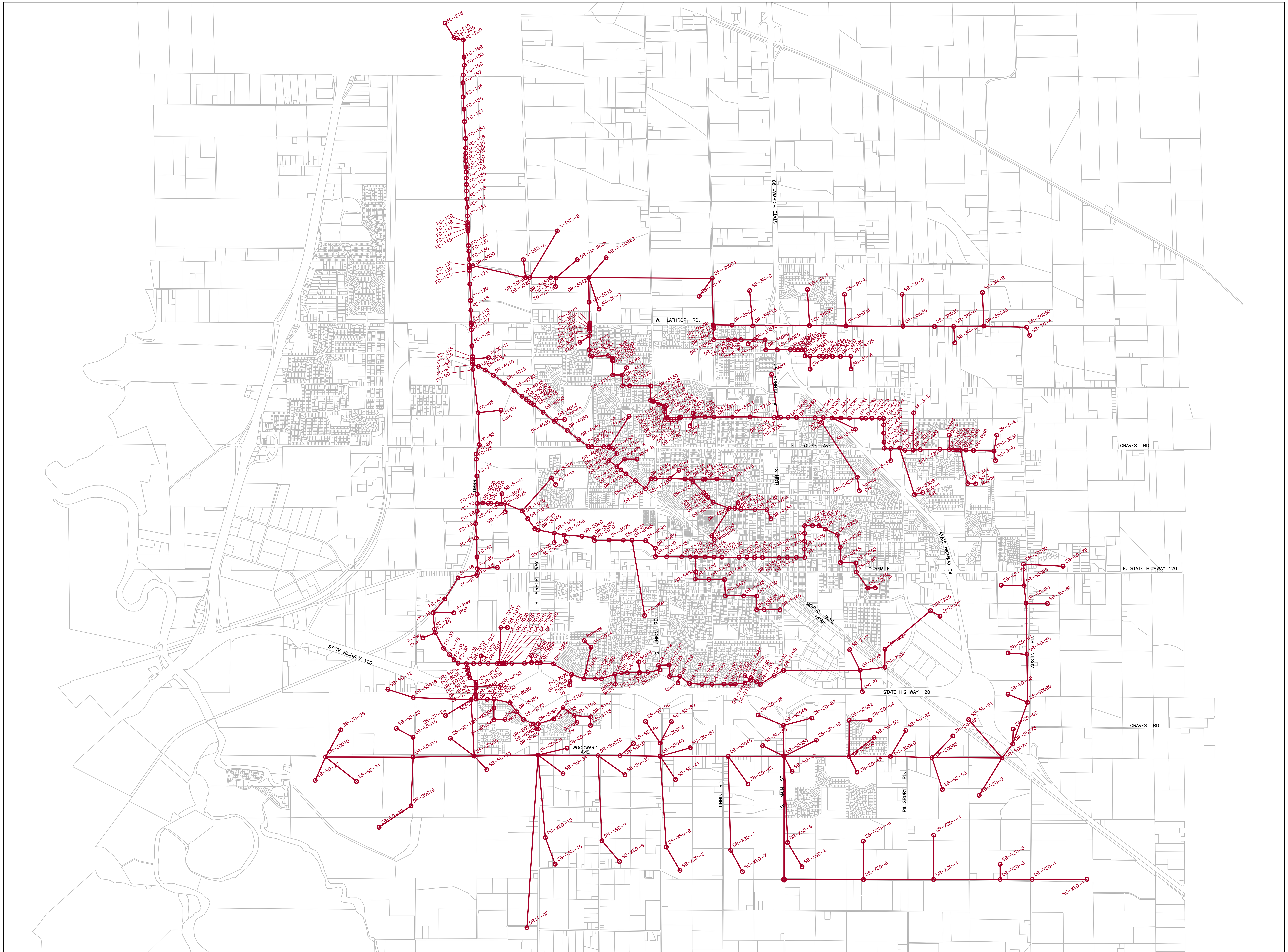

Figure 4-1

City of Manteca
Storm Drain Master Plan
SCHEMATIC OF THE XP-SWMM MODEL

LEGEND:

DR-3225 — NODE AND MODEL LINK WITH NODE NUMBER

NOTES:

1. BASE MAPPING PROVIDED BY CITY OF MANTECA

N

0 1000 2000

SCALE IN FEET

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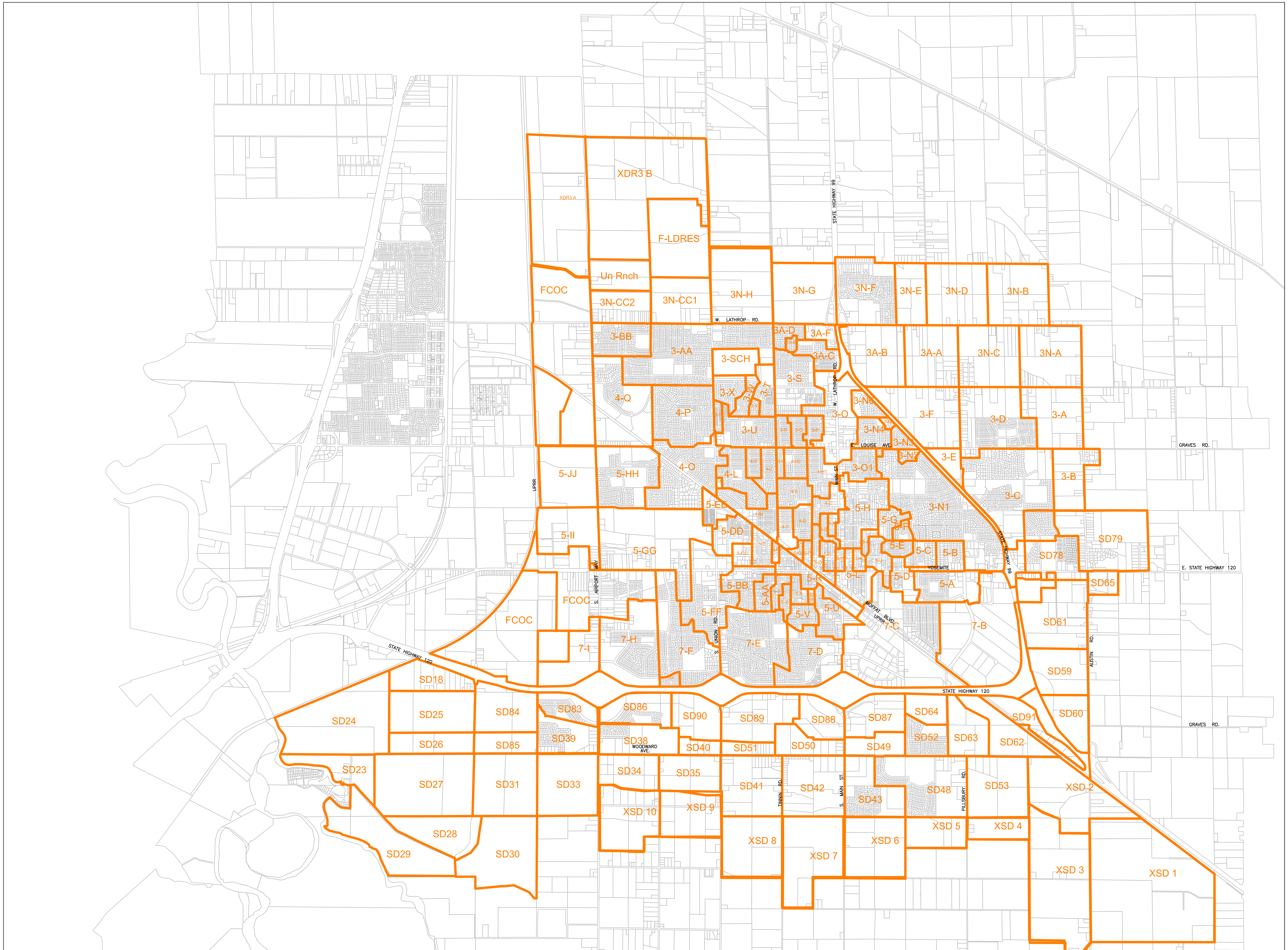

Figure 4-2

City of Manteca
Storm Drain Master Plan
SUBSHEDS

LEGEND:

SD	SUBSHEDS

NOTES:

1. BASE MAPPING PROVIDED BY CITY OF MANTECA

N

0 1000 2000
SCALE IN FEET

WEST YOST & ASSOCIATES

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- Soil Hydrologic Groups – Soil Survey Maps for the San Joaquin County were used to identify the soil types in the study area. Most of the study area falls into one of the four soil groups: Urban Group A, Urban Group B, Rural Group A, Rural Group B. Infiltration rates for these soil groups have been obtained from the San Joaquin County Hydrology Manual (Figure C-5: Infiltration Rates vs. SCS Curve Numbers). The infiltration rates are as follows:

  Urban Group A (SCS Curve # 39) – 0.92 inches/hour
  Urban Group B (SCS Curve # 61) – 0.68 inches/hour
  Rural Group A (SCS Curve # 64) – 0.64 inches/hour
  Rural Group B (SCS Curve # 75) – 0.46 inches/hour

- Other Subshed Data – Other subshed input data for representation of the ground surface and for transforming rainfall into runoff are presented in Table 4-2. These data are representative of typical conditions found in Manteca and are from the City of Sacramento Storm Water Management Model (SSWMM94) User's Manual.

Table 4-1. Depth-Duration-Frequency

Time Duration	10-yr Depth of Rainfall, inches	100-yr Depth of Rainfall, inches
5-min	0.22	0.32
10-min	0.30	0.42
15-min	0.35	0.50
30-min	0.46	0.65
1-hr	0.61	0.86
2-hr	0.80	1.14
3-hr	0.94	1.34
6-hr	1.25	1.77
12-hr	1.65	2.34
24-hr	2.17	3.08
48-hr	2.86	4.07

Table 4-2. Subshed Input Data

Item	Urban Group A		Urban Group B		Rural Group A		Rural Group B	
	Imperv Areas	Perv Areas	Imperv Areas	Perv Areas	Imperv Areas	Perv Areas	Imperv Areas	Perv Areas
Depression Storage, inches	0.10	0.35	0.10	0.35	0.10	0.40	0.10	0.40
Roughness "N" Value	0.020	0.25	0.020	0.25	0.020	0.25	0.020	0.25
Percent of Area with Zero Detention	0	N/A	0	N/A	0	N/A	0	N/A
Initial Max Infiltration Rate, in/hr	1.0		1.0		1.0		1.0	
Final Min (Asymptotic) Infiltration Rate, in/hr	0.92		0.68		0.64		0.46	
Decay Rate of Infiltration, 1/sec	0.0007		0.0018		0.0007		0.0018	

- Impervious Percentage – The City's land use planning data was used to determine the average percent imperviousness for each subshed. Table 4-3 lists the land uses and the associated percent imperviousness. The impervious percentages are based on Figure C-3 from the San Joaquin County Hydrology Manual. The impervious percentage of each subshed was based on an area weighted average of the land uses within the subshed.
- Topography – An average slope of 0.001 was used for all subsheds (average slope across the City). This average slope is consistent with the City of Manteca Storm Drainage Master Plan, dated November 2000, prepared by Carter Burgess.
- Subshed Width – This variable was used to "calibrate" the runoff model to be consistent with the peak runoff rates resulting from the use of the rational method described in the City design standards. Presented in Figure 4-3 are results from the rational method analysis from the Year 2000 Carter Burgess Master Plan, along with the calibration curves developed to fit the rational method results. The subshed width was determined using the following equations so that the peak runoff rates would nearly equal the calibration curve peak runoff rates.
  - Subshed width/acre = 12 + 0.56 (Percent Impervious – 40), but not less than 10 feet/acre.
  - Subshed width = Subshed width /acre * Subshed acreage.

Table 4-3. Land Use and Percent Imperviousness

LU Codes	Land Use Category	Percent Impervious
Agricultural (AG), Open Space (OS)	Natural/Agricultural	10
Park (P),	Public Park	15
School	School	40
Low Density Residential (LDR), Very Low Density Residential (VLDR)	Low Density Residential	15
Medium Density Residential (MDR)	Medium Density Residential	40
High Density Residential (HDR)	High Density Residential	70
Business Park (BP), Public/Quasi Public District (PQP), Business/Industrial Park (BIP), Commercial Mixed Use (CMU), General Commercial (GC), Heavy Industrial (HI), Light Industrial (LI), Neighborhood (NCC), UTILITY	Commercial	90

Hydrologic Model Development

The XP-SWMM software uses the hydrologic data described above to simulate the rainfall to runoff process. The result of the hydrologic model is a runoff hydrograph that enters the storm drain conveyance system. For each subshed, the specific values of each parameter are presented in Table 4-4, and the subsheds are shown on Figure 4-2.

Table 4-4. Runoff Layer Subshed Input Data

Subshed Node	Area, acres	Width, feet	Percent Impervious, %	Average Ground Slope, ft/ft
Drain 7				
SprklsUpr	102.6	4054	89.1	0.001
Spreckles	242.7	9587	89.1	0.001
COTTA PARK	129.1	2561	54.0	0.001
Quail	126.5	1695	42.5	0.001
Brock El	181.0	2172	40.0	0.001
MOHR WEST	9.7	116	40.0	0.001
Roberts	129.3	2342	50.9	0.001
DutraPk	29.6	355	40.0	0.001
DR-7055	101.5	3247	75.7	0.001
Drain 8 and 8A				
Dutra Pk	87.0	1824	56.0	0.001
BellaVsta	150.7	2475	47.9	0.001
Drain 5				
DR-5445	53.3	983	51.5	0.001
DR-5435	27.3	331	40.2	0.001
DR-5430	4.3	43	36.3	0.001
DR-5425	17.2	172	36.2	0.001
DR-5420	13.7	137	36.1	0.001
DR-5415	16.4	174	37.6	0.001
DR-5405	54.2	1146	56.3	0.001
Curr Gr	85.0	2277	66.4	0.001
DR-5255	40.7	803	53.8	0.001
DR-5250	30.0	379	41.1	0.001
DR-5245	36.9	702	52.5	0.001
DR-5240	19.5	237	40.3	0.001
DR-5235	13.5	135	35.3	0.001
DR-5225	27.2	272	34.1	0.001
DR-5215	113.1	2029	50.6	0.001
DR-5205	10.6	169	47.1	0.001
DR-5160	21.5	596	68.1	0.001
DR-5153	10.9	378	80.6	0.001
DR-5155	52.8	1579	72.0	0.001
DR-5150	8.8	367	93.2	0.001

Table 4-4. Runoff Layer Subshed Input Data, cont'd…

Subshed Node	Area, acres	Width, feet	Percent Impervious, %	Average Ground Slope, ft/ft
DR-5145	17.5	502	69.8	0.001
DR-5140	25.2	612	61.9	0.001
DR-5133	9.4	244	64.7	0.001
DR-5135	7.3	212	70.3	0.001
DR-5130 #1	64.9	1806	68.3	0.001
DR-5130 #2	6.4	125	53.2	0.001
DR-5118	29.6	701	60.8	0.001
DR-5110	18.6	568	73.1	0.001
DR-5105	50.2	1488	71.5	0.001
DR-5095	31.4	1058	78.7	0.001
DR-5085 #1	118.0	2414	55.1	0.001
DR-5085 #2	10.0	277	68.1	0.001
DR-5075	261.9	4170	47.0	0.001
Vil Tcno	148.8	1685	38.8	0.001
DR-5030	119.8	1198	30.4	0.001
DR-5000	148.9	1489	32.0	0.001
Drain 4				
DR-4165	30.0	301	36.5	0.001
DR-4160	10.0	100	31.2	0.001
DR-4150	31.9	319	35.2	0.001
DR-4230	8.4	174	55.5	0.001
DR-4225	12.3	141	39.1	0.001
DR-4220	32.4	843	65.1	0.001
DR-4215	27.5	374	42.9	0.001
BayMdws	40.4	404	33.1	0.001
WalnutPl	31.4	581	51.6	0.001
DR-4205	28.2	670	61.0	0.001
DR-4149	19.6	216	38.2	0.001
GreyStn	66.4	674	36.7	0.001
DR-4145	29.3	542	51.6	0.001
DR-4140	2.6	26	18.0	0.001
MyrsPk	171.6	2184	41.3	0.001
StFrancs	38.0	380	36.2	0.001
DR-4090	113.8	1138	36.2	0.001
Prmvra	186.6	1866	29.6	0.001

Table 4-4. Runoff Layer Subshed Input Data, cont'd…

Subshed Node	Area, acres	Width, feet	Percent Impervious, %	Average Ground Slope, ft/ft
Drain 3				
DR-3350 #1	140.7	1407	13.1	0.001
DR-3350 #2	92.1	921	15.1	0.001
SprgMeadw	233.1	2773	39.8	0.001
DiamdOaks	187.4	1874	26.6	0.001
ButtonEst	70.0	833	39.8	0.001
DR-3310	31.8	1295	91.2	0.001
DR-3255	170.6	1706	22.0	0.001
SHASTAPRK	311.5	4645	45.2	0.001
SPRINGTIME	102.0	1422	43.5	0.001
DR-3245	40.8	510	40.9	0.001
KMart	11.0	337	73.3	0.001
DR-3225	167.5	5133	73.3	0.001
DR-3215	20.2	244	40.1	0.001
DR-3212	20.9	209	36.3	0.001
DR-3211 #1	20.1	201	34.7	0.001
DR-3211 #2	106.7	1765	48.1	0.001
DR-3210	39.1	391	30.1	0.001
ColonyPk	76.0	942	40.7	0.001
DR-3205	7.4	74	28.5	0.001
DR-3200	23.0	235	36.8	0.001
DR-3135 #1	37.4	486	41.8	0.001
DR-3135 #2	11.2	205	51.1	0.001
Doxey	271.1	3498	41.6	0.001
Chdwk	82.2	1009	40.5	0.001
DR-3049	118.0	1185	36.5	0.001
DR-3040	118.0	1185	36.5	0.001
Drain 3A				
DR-3A175	139.7	1397	15.0	0.001
DR-3A130	147.0	1470	20.2	0.001
DR-3A085	25.3	1040	91.9	0.001
Crest Wd	26.8	395	44.9	0.001
DR-3A070	14.0	206	44.9	0.001
DR-3A060 #1	25.3	302	39.9	0.001
DR-3A060 #2	6.6	70	37.4	0.001
DR-3A035	164.2	4975	72.7	0.001

Hydraulic Model Data

- FCOC – Most of the FCOC data used in the hydraulic model was from the South San Joaquin Irrigation District French Camp Outlet Canal Hydraulic Capacity Evaluation Final Report, dated July 2002 (prepared by CH2MHill). These data included channel cross-sections and inverts; culvert sizes, materials, and invert elevations; and tail water elevations.
- Storm Drain – Much of the storm drain data was from the survey information provided in the City's Reconnaissance Study Reports (Wong Engineers Inc. and Mid-Valley Engineers). The data included the flow line, rim elevations, and cross section data along the drains.
- Detention Basins and Pump Stations - The storage basin and pump station data were taken from 'as-built" drawings (when available) for the detention basins and pump stations.

If as-built drawings were not available, the information was taken from the detention basin and pump station summary tables provided by the City. Reasonable assumptions were made about pump on/off elevations. Constant pumping rates were assumed (versus using actual pump curves).

- The SSJID laterals have been modeled as discharging constant flows to the FCOC, as summarized in Table 4-5.
- The following Manning's roughness coefficients were used:
  - Concrete Pipe: 0.015
  - Corrugated Metal Pipe: 0.023
  - Maintained Channels: 0.030

Table 4-5. Summary of Constant Flows Representing the SSJID Lateral System

Lateral	Constant Flow Rate, cfs	Tributary Node
Lateral Q_O	25	FC-185
Lateral R	25	FC-180
Lateral R_j	15	FC-155
Lateral R_g^d	15	FC-150
Lateral R_{gc}	10	FC-140
Lateral R_e	25	FC-135
Lateral T	25	FC-120
Lateral T_d	25	FC-105
Lateral T_{bd} & Lateral T_b	25	FC-95
Lateral Z + Lateral Y + Lateral Y_b	75	FC-15
Total	265	

Tail Water Elevations

In the FCOC study, the static 10-year tail water elevation at the north end of the FCOC (at French Camp Slough) was set at 12.2 feet NGVD, and the static 100-year tail water elevation was set at 15.5 feet NGVD. However, the outlet of the FCOC is affected by tidal variations. XP-SWMM is a dynamic model, and consequently, use of a static tail water elevation at the end of the FCOC is inappropriate. Consequently, dynamic tail water conditions were established assuming the maximum tail water elevations from the FCOC report corresponded approximately to the time of high tide.

Data from two San Joaquin River stage recorders (Garwood Bridge and Mossdale Bridge) were evaluated to determine the level of tidal fluctuation for the outlet of the FCOC. The Garwood Bridge is located in Stockton, and the tidal variation is about 4 feet. The Mossdale Bridge is located west of the City, and the tidal variation is about 2 feet. Since the outlet of the FCOC is located about halfway between these gages, a tidal variation of 3 feet was assumed.

Hydraulic Model Development

The XP-SWMM software uses the hydraulic data described above to simulate the storm drains, open channels, detention basins and pump stations, and other facilities. In the model these facilities are represented as links and nodes. The links and nodes are shown on Figure 4-2. The model uses the data to calculate flow rates and resulting water surface elevations throughout the storm drain system.

A summary of the specific elevation values used for each node is presented in Table 4-6. For the open channels in Table 4-6, the modeled ground elevation is the surveyed top of the higher of the left or right bank, and the flooding elevation is the top of the lower of the left or right bank. The channel sections are from the FCOC study or from the storm drain surveys. For piped storm drains, the ground elevation is usually the maintenance hole rim elevation, but could be the top of the detention basin or other relevant elevation. The flooding elevation was assumed to be 0.3 feet below the rim elevation to account for the typical street crown.

Table 4-6: Hydraulic Layer Model Node Data

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
Drain 7			
SprklsUpr	40.60	40.30	21.00
DRP7205	41.00	40.70	35.91
Spreckles	38.18	37.88	13.79
DR-7200	40.00	39.70	29.38
DR-7195	35.98	35.68	29.38
DR-7190	33.61	33.31	29.23
DR-7185	39.25	38.95	28.69
DR-7180	38.05	37.75	28.05
DR-7175	33.51	33.21	28.19
COTTA PARK	33.00	32.70	12.50
DR-7170	33.26	32.96	27.36
DR-7165	34.13	33.83	27.23
DR-7160	32.66	32.36	26.45
DR-7155	33.45	33.15	26.45
DR-7150	32.29	31.99	26.04
DR-7145	32.87	32.57	25.77
DR-7140	31.64	31.34	25.44
DR-7135	30.47	30.17	24.87
Quail	29.00	28.70	12.16
DR-7130	30.47	30.17	24.21
DR-7125	29.73	29.43	23.63
DR-7120	29.34	29.04	23.04
DR-7119	35.35	35.05	22.36
DR-7115	33.00	32.70	22.20
DR-7110	29.80	29.50	21.67
Brock El	27.57	27.27	24.17
DR-7105	27.80	27.50	21.31
DR-7100	26.55	26.25	21.23
DR-7095	27.10	26.80	21.00
MOHR WEST	26.76	26.46	21.65
DR-7090	26.76	26.46	19.75
DR-7085	26.00	25.70	19.12
DR-7080	26.00	25.70	18.99
Roberts	24.50	24.20	10.37
DR-7074	25.20	24.90	20.99
DR-7075	24.20	23.90	18.43
DutraPk	24.50	24.20	8.63
DR-7069	24.50	24.20	17.50
DR-7070	23.00	22.70	17.84
DR-7065	25.20	24.90	17.09
DR-7060	23.60	23.30	16.46
DR-7055	23.48	23.18	16.06
DR-7050	24.11	22.22	15.62
DR-7045	24.33	20.45	15.64
DR-7040	22.13	19.64	16.05
DR-7035	23.10	22.51	15.95
DR-7030	23.10	22.80	15.92
DR-7025	21.46	21.16	15.72

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
DR-7020	21.49	21.19	16.22
DR-7015	23.10	22.51	16.24
DR-7010	23.36	21.41	15.48
DR-7005	23.36	21.21	15.24
DR-7000	23.43	22.18	15.35
Drain 8			
DR-8115	25.20	24.90	17.31
DR-8110	23.50	23.20	17.15
Dutra Pk	20.88	20.58	4.00
DR-8105	24.50	24.20	16.87
DR-8100	23.50	23.20	16.61
DR-8095	23.00	22.70	16.36
DR-8090	23.00	21.60	16.08
DR-8085	23.00	21.45	16.03
DR-8080	23.00	21.10	15.14
DR-8075	23.00	21.10	15.07
DR-8070	23.00	22.80	14.92
DR-8065	22.80	20.90	14.74
DR-8060	22.80	20.70	14.56
DR-8055	22.80	21.70	13.29
DR-8050	22.00	21.70	13.18
DR-8045	23.20	22.90	13.06
DR-8040	27.70	27.40	13.63
DR-8035	27.70	27.40	14.08
DR-8030	22.71	21.08	14.10
DR-8025	22.71	21.08	14.10
DR-8020	22.76	22.46	13.43
DR-8015	22.71	21.08	13.36
DR-8010	22.20	21.61	14.67
DR-8005	22.20	19.67	15.32
DR-8000	21.76	19.67	15.08
Drain 8A			
DR-8030A	23.50	23.20	14.51
DR-8025A	23.50	23.20	14.18
DR-8020A	23.50	20.50	14.09
DR-8015A	23.50	19.70	13.87
DR-8010A	23.50	19.30	13.69
BellaVsta	18.00	17.70	1.96
DR-8005A	23.50	20.30	13.62
DR-8000A	23.50	20.70	13.46
Drain 5			
DR-5445	31.80	31.50	22.60
DR-5440	28.50	28.20	22.16
DR-5435	29.30	29.00	21.96
DR-5430	31.50	31.20	21.10
DR-5425	29.50	29.20	20.67
DR-5420	30.20	29.90	20.06
DR-5415	30.70	30.40	19.76
DR-5410	29.24	28.94	19.46

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
DR-5405	30.10	29.80	19.21
DR-5400	30.00	29.70	18.86
Curr Gr	36.50	36.20	14.00
DR-5260	40.00	39.70	36.68
DR-5255	40.00	39.70	33.49
DR-5250	40.00	39.70	32.35
DR-5245	40.00	39.70	30.56
DR-5240	35.00	34.70	28.67
DR-5235	34.80	34.50	27.00
DR-5230	33.20	32.90	26.70
DR-5225	34.30	34.00	27.10
DR-5220	34.40	34.10	25.66
DR-5215	33.60	33.30	24.71
DR-5210	33.60	33.30	24.44
DR-5205	34.60	34.30	24.06
DR-5200	33.80	33.50	23.82
DR-5160	35.10	34.80	23.40
DR-5153	35.45	35.15	23.04
DR-5155	35.80	35.50	22.67
DR-5150	34.90	34.60	22.32
DR-5145	34.10	33.80	21.56
DR-5140	33.10	32.80	21.24
DR-5133	33.10	32.80	20.94
DR-5135	33.10	32.80	20.63
DR-5130	31.00	30.70	19.19
DR-5125	30.00	29.70	18.96
DR-5118	29.55	29.25	18.80
DR-5120	29.10	28.80	18.64
DR-5115	29.00	28.70	18.56
DR-5110	27.10	26.80	18.32
DR-5105	26.90	26.60	18.00
DR-5100	26.30	26.00	15.00
DR-5095	26.10	25.80	17.63
DR-5090	26.50	26.20	17.32
UnionWst	29.00	28.70	23.09
DR-5085	25.60	25.30	17.05
DR-5080	28.38	24.62	16.31
DR-5075	26.88	24.62	16.04
DR-5070	25.76	24.42	15.98
DR-5065	25.27	22.64	16.01
DR-5060	25.03	24.11	14.79
St Domnc	23.00	22.70	14.74
DR-5055	24.84	24.54	14.46
DR-5050	24.84	24.20	14.35
DR-5045	23.96	23.66	14.30
DR-5040	25.00	21.70	14.24
DR-5035	25.00	18.70	13.66
Vil Tcno	23.70	23.40	7.00
DR-5028	24.30	24.00	20.30

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
DR-5030	25.00	17.60	13.10
DR-5025	21.87	21.87	13.06
DR-5020	20.85	20.26	12.87
DR-5015	20.85	20.26	12.79
DR-5010	21.84	21.54	12.78
DR-5005	21.84	20.26	8.88
DR-5000	20.95	20.95	8.78
Drain 4			
DR-4165	31.67	31.37	24.49
DR-4160	33.02	32.72	23.79
DR-4155	30.20	29.90	23.01
DR-4150	30.36	30.06	24.06
DR-4230	35.00	34.70	30.54
DR-4225	35.00	34.70	29.12
DR-4220	35.00	34.70	28.64
DR-4215	35.00	34.70	26.90
BayMdws	33.50	33.20	29.00
RDR-4210	30.00	29.70	26.39
WalnutPl	31.32	31.02	18.35
DR-4203	31.40	31.10	26.90
DR-4205	30.00	29.70	25.87
DR-4200	31.82	30.47	24.39
DR-4195	32.54	29.47	25.00
DR-4190	31.16	30.86	24.28
DR-4185	30.20	29.90	24.01
DR-4180	30.05	29.75	22.57
DR-4149	29.75	29.45	23.66
DR-4146	29.45	29.15	23.45
GreyStn	29.00	28.70	14.00
DR-4145	29.14	28.84	23.05
DR-4140	29.57	29.27	22.57
DR-4135	28.20	27.90	22.60
DR-4130	29.30	29.00	22.54
DR-4125	29.57	29.27	22.17
DR-4120	27.86	27.56	22.05
DR-4115	29.42	29.12	21.69
MyrsPk	26.00	25.70	9.00
DR-4110	29.24	28.94	21.66
DR-4105	29.24	28.94	21.44
DR-4100	26.31	26.01	19.41
DR-4095	27.82	27.52	19.02
StFrancs	26.00	25.70	20.00
DR-4090	27.24	26.94	19.06
DR-4085	26.68	26.38	17.93
DR-4080	26.10	25.80	18.12
DR-4075	27.40	27.10	17.82
DR-4070	27.00	26.70	17.75
DR-4065	25.80	25.50	17.37
DR-4060	25.00	24.70	16.82

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
Prmvra	22.61	22.31	7.38
DR-4053	24.00	23.70	20.25
DR-4055	25.00	24.70	18.34
DR-4050	23.40	23.10	15.86
DR-4045	25.00	24.70	15.41
DR-4040	25.20	24.90	14.91
DR-4035	24.16	23.66	14.40
DR-4030	24.16	23.66	14.10
DR-4025	22.83	22.70	12.90
DR-4020	22.80	21.07	13.23
DR-4015	23.59	23.07	13.31
DR-4010	22.67	21.95	12.62
DR-4005	21.63	21.63	12.06
DR-4000	19.27	19.23	10.69
Drain 3			
DR-3350	40.10	39.85	35.38
DR-3345	39.90	39.60	34.50
SprgMeadw	42.00	41.70	19.20
DR-3342	41.20	40.90	36.62
DR-3340	39.43	39.13	32.07
DR-3339	39.43	39.13	32.00
DR-3335	38.90	38.90	33.15
DiamdOaks	40.00	39.70	26.00
DR-3330	37.75	37.45	30.93
DR-3325	38.52	38.22	30.57
DR-3320	39.04	38.74	29.74
DR-3315	38.95	38.65	28.65
ButtonEst	41.08	40.78	23.32
DR-3308	41.60	41.30	37.09
DR-3310	38.00	37.70	31.20
DR-3305	37.20	37.20	30.80
DR-3300	36.90	36.55	30.50
DR-3295	38.45	36.90	29.70
DR-3290	39.20	37.75	30.10
DR-3285	38.05	37.45	30.20
DR-3280	40.00	39.70	29.84
DR-3279	40.00	39.70	29.76
DR-3275	40.05	39.15	29.70
DR-3270	39.50	39.20	30.10
DR-3269	39.50	39.20	30.03
DR-3265	40.55	40.10	30.15
DR-3260	40.30	40.10	29.45
DR-3255	37.00	36.70	25.00
SHASTAPRK	39.00	38.70	21.00
DR-SHSTA	38.00	37.70	30.41
SPRINGTIME	33.00	32.70	26.00
DR-3250	34.55	34.25	24.80
DR-3245	33.27	32.97	24.62
DR-3240	34.50	34.20	24.98

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
DR-3235	35.90	33.70	25.60
DR-3230	35.60	33.35	25.50
KMart	40.31	40.01	36.23
DR-3225	33.11	32.81	26.63
DR-3220	32.81	32.51	24.92
DR-3215	30.72	30.42	24.67
DR-3212	30.22	29.92	24.32
DR-3211	29.70	29.40	23.96
DR-3210	29.49	29.19	23.80
ColonyPk	30.00	29.70	23.05
DR-3205	29.50	29.20	22.06
DR-3200	28.82	28.52	20.42
DR-3199	28.42	28.12	20.50
DR-3195	25.67	25.37	20.67
DR-3190	25.98	25.68	20.08
DR-3185	28.02	27.72	21.20
DR-3180	24.03	23.73	21.13
DR-3175	23.95	23.65	21.05
DR-3170	23.63	23.33	20.93
DR-3165	23.85	23.55	20.85
DR-3160	23.51	23.21	20.46
DR-3155	23.34	23.04	20.24
DR-3150	27.18	26.88	20.00
DR-3145	26.56	26.26	19.66
DR-3140	28.16	27.86	19.11
DR-3135	27.00	26.70	18.90
DR-3130	27.00	26.70	18.50
DR-3125	26.80	26.50	17.90
DR-3120	28.15	27.85	17.68
Doxey	26.00	25.70	8.50
DR-3115	27.28	26.98	17.60
DR-3110	25.62	25.32	17.79
DR-3100	24.85	24.55	17.46
DR-3095	27.00	25.25	17.33
DR-3090	26.80	26.55	17.23
DR-3085	26.65	26.65	17.08
DR-3080	27.20	26.40	17.07
DR-3075	26.70	26.25	16.99
DR-3070	26.20	25.90	16.94
Chdwk	23.50	23.20	7.04
DR-3065	25.90	25.65	16.92
DR-3060	26.00	25.70	16.83
DR-3059	26.00	25.70	16.80
DR-3055	26.85	26.25	16.77
DR-3050	25.33	25.03	16.74
DR-3049	25.33	25.03	16.72
DR-3040	26.00	25.70	15.79
DR-3030	26.00	25.70	15.54
DR-3020	26.00	25.70	13.50

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
DR-3005	23.00	22.70	13.42
DR-3000	20.00	19.70	10.50
Drain 3A			
DR-3A175	40.80	37.62	33.61
DR-3A160	39.40	39.10	29.94
DR-3A150	38.94	38.64	31.91
DR-3A145	38.94	38.64	31.89
DR-3A140	39.15	37.32	31.73
DR-3A135	37.48	36.46	30.80
DR-3A130	36.65	36.25	29.52
DR-3A125	36.57	35.87	29.35
DR-3A120	36.00	35.70	26.65
DR-3A115	36.00	35.70	26.85
DR-3A110	35.29	35.18	27.79
DR-3A100	34.01	33.61	26.51
DR-3A095	32.24	31.94	22.13
DR-3A085	32.15	31.85	26.16
DR-3A080	32.36	32.06	24.63
DR-3A075	33.34	33.04	24.55
Crest Wd	32.13	31.83	26.96
DR-3A070	32.42	32.12	20.95
DR-3A065	31.00	30.70	22.31
DR-3A060	31.04	30.74	22.26
DR-3A055	30.67	30.37	21.99
DR-3A050	32.04	31.74	21.67
DR-3A045	32.05	31.75	22.31
DR-3A040	30.61	30.31	22.28
DR-3A035	30.61	30.31	22.25
PS-15	30.00	29.70	22.14
DR-3A030	30.00	29.70	23.00
DR-3A020	30.00	29.70	21.21
FCOC			
FC-25	23.50	21.50	14.90
FC-30	22.90	20.80	13.90
FC-35	22.90	20.80	13.15
FC-36	24.30	20.60	14.30
FC-37	24.80	20.30	14.40
FC-40	23.30	22.30	14.86
FC-45	24.80	22.30	13.86
FC-46	24.60	24.10	14.00
FC-47	25.80	25.20	13.60
FC-48	28.90	26.70	13.80
FC-50	26.60	26.70	12.77
FC-55	26.60	26.70	12.12
FC-60	28.90	26.70	11.47
FC-61	28.90	24.60	13.10
FC-62	24.50	22.30	14.00
FC-65	24.50	22.30	14.00
FC-66	24.70	19.80	11.70

Table 4-6: Hydraulic Layer Model Node Data, cont'd…

Node	Modeled Ground Elev, feet	Flooding Elev, feet	Invert Elev, feet
FC-70	24.70	19.80	8.34
FC-75	24.70	19.80	12.10
FC-77	22.10	21.80	11.20
FC-78	21.90	21.80	10.20
FC-80	21.90	21.80	9.62
FC-85	21.90	21.80	9.53
FC-86	22.50	19.90	10.70
FC-90	22.50	19.90	10.70
FC-95	22.50	19.90	9.24
FC-96	22.50	22.00	11.60
FC-100	22.50	22.00	11.60
FC-105	22.50	22.00	11.20
FC-106	22.50	22.50	9.60
FC-107	23.40	22.70	10.40
FC-110	23.40	22.70	10.17
FC-115	23.40	22.70	9.50
FC-116	20.60	19.40	7.80
FC-120	20.60	19.40	7.80
FC-121	23.50	23.20	9.10
FC-125	23.50	19.58	11.70
FC-130	23.50	19.58	11.50
FC-135	18.17	18.17	10.01
FC-136	20.95	19.44	10.60
FC-137	21.65	18.14	10.53
FC-140	21.65	20.27	10.64
FC-145	22.10	20.06	10.49
FC-146	21.54	20.53	9.07
FC-147	23.80	23.60	9.39
FC-148	23.63	22.68	9.68
FC-150	23.24	22.20	10.57
FC-151	22.47	22.18	10.14
FC-152	22.31	20.73	10.41
FC-153	20.68	18.04	10.68
FC-154	19.56	19.55	9.44
FC-155	19.56	21.42	10.01
FC-156	20.98	20.47	8.51
FC-157	20.33	20.09	8.90
FC-160	23.85	23.08	9.84
FC-165	23.85	23.08	9.84
FC-170	21.92	21.55	7.10
FC-175	21.92	21.55	6.90
FC-176	24.50	22.90	6.20
FC-180	24.50	22.90	6.20
FC-181	24.30	20.30	6.10
FC-185	24.30	20.30	6.10
FC-186	24.30	21.30	6.10
FC-187	22.80	19.80	3.70
FC-190	23.70	18.70	2.20
FC-195	23.00	18.70	1.40
FC-196	22.80	18.80	3.70
FC-200	23.00	22.80	2.80
FC-205	22.80	22.80	0.50
FC-210	22.80	22.50	0.40
FC-215	23.00	22.80	0.30

* Note: Without one foot topography to accurately delineate the floodplain, the model cannot accurately predict flood depths (particularly as depths approach/exceed 2 feet).

Model Results

The hydrologic and hydraulic model results for existing, pre-master plan conditions are presented and evaluated below.

Hydrologic Model Results

Presented in Table 4-7 is a summary of the 10-year and 100-year peak runoff rates and unit runoff (runoff per acre) for each subshed. The unit runoff rates range from about 0.2 cfs per acre to about 0.6 cfs per acre for the 10-year storm and from about 0.3 to 1.0 cfs per acre for the 100-year storm. The peak runoff rates are also presented in Figure 4-3, and as shown the peak runoff rates agree well with the rational method calibration curve runoff rates for the 10-year storm. The hydrologic model appears to produce reasonable runoff rates for both the 10- and 100-year storms.

Hydraulic Model Results

The hydraulic model uses the runoff hydrographs from the hydrologic model to calculate the flow in the pipe/channel system and the resulting water surface elevations. Presented in Table 4-8 are the maximum water surface elevations and the estimated flooding depths (the depth of the water surface above the ground elevation). The model results indicate that for drains 3, 7, 8, and 8A there would be significant flooding in the 10-year storm. Also presented in Table 4-8 are the node results for the 100-year storm. The model does indicate flooding depths greater than two feet at several locations. However, without one foot topographic mapping to accurately define the potential storage volume at these nodes, the level of accuracy of the flooding depths is low. It should be noted that the model does not analyze flows and water surface elevations for the storm drain systems upstream of the detention basins.

Table 4-7. Runoff Layer Model Results

Subshed Node	Area, acres	Percent Impervious, %	10-yr Peak Runoff, cfs	10-yr Unit Runoff, cfs/ac	100-yr Peak Runoff, cfs	100-yr Unit Runoff, cfs/ac
Drain 7						
SprklsUpr	102.6	89	60.0	0.58	95.8	0.93
Spreckles	242.7	89	141.8	0.58	226.7	0.93
COTTA PARK	129.1	54	41.5	0.32	66.5	0.51
Quail	126.5	43	29.6	0.23	47.4	0.37
Brock El	181.0	40	38.8	0.21	62.2	0.34
MOHR WEST	9.7	40	2.1	0.21	3.3	0.34
Roberts	129.3	51	38.6	0.30	61.7	0.48
DutraPk	29.6	40	6.3	0.21	10.2	0.34
DR-7055	101.5	76	49.2	0.48	78.6	0.77
Drain 8 and 8A						
Dutra Pk	87.0	56	29.3	0.34	46.9	0.54
BellaVsta	150.7	48	41.5	0.28	66.4	0.44
Drain 5						
DR-5445	53.3	52	16.1	0.30	25.8	0.48
DR-5435	27.3	40	5.9	0.22	9.4	0.35
DR-5430	4.3	36	0.8	0.19	1.3	0.30
DR-5425	17.2	36	3.2	0.19	5.1	0.30
DR-5420	13.7	36	2.5	0.19	4.1	0.30
DR-5415	16.4	38	3.2	0.20	5.1	0.31
DR-5405	54.2	56	18.4	0.34	29.4	0.54
Curr Gr	85.0	66	35.3	0.41	56.4	0.66
DR-5255	40.7	54	13.0	0.32	20.8	0.51
DR-5250	30.0	41	6.7	0.22	10.7	0.36
DR-5245	36.9	53	11.5	0.31	18.3	0.50
DR-5240	19.5	40	4.2	0.22	6.8	0.35
DR-5235	13.5	35	2.5	0.18	4.0	0.29
DR-5225	27.2	34	4.9	0.18	7.9	0.29
DR-5215	113.1	51	33.5	0.30	53.6	0.47
DR-5205	10.6	47	2.9	0.27	4.6	0.43
DR-5160	21.5	68	9.2	0.43	14.7	0.68
DR-5153	10.9	81	5.7	0.52	9.1	0.83
DR-5155	52.8	72	24.1	0.46	38.6	0.73
DR-5150	8.8	93	5.4	0.61	8.6	0.98

Table 4-7. Runoff Layer Model Results, cont'd…

Subshed Node	Area, acres	Percent Impervious, %	10-yr Peak Runoff, cfs	10-yr Unit Runoff, cfs/ac	100-yr Peak Runoff, cfs	100-yr Unit Runoff, cfs/ac
DR-5145	17.5	70	7.7	0.44	12.3	0.70
DR-5140	25.2	62	9.6	0.38	15.4	0.61
DR-5133	9.4	65	3.8	0.40	6.1	0.64
DR-5135	7.3	70	3.3	0.44	5.2	0.71
DR-5130	64.9	68	29.9	0.46	44.5	0.69
DR-5118	29.6	61	11.1	0.37	17.7	0.60
DR-5110	18.6	73	8.7	0.47	13.8	0.74
DR-5105	50.2	72	22.7	0.45	36.4	0.72
DR-5095	31.4	79	15.9	0.51	25.5	0.81
DR-5085	118.0	55	43.2	0.37	62.3	0.53
DR-5075	261.9	47	70.3	0.27	112.6	0.43
Vil Tcno	148.8	39	30.5	0.21	48.9	0.33
DR-5030	119.8	30	20.5	0.17	32.8	0.27
DR-5000	148.9	32	26.1	0.18	41.8	0.28
Drain 4						
DR-4165	30.0	37	5.6	0.19	9.0	0.30
DR-4160	10.0	31	1.7	0.17	2.8	0.28
DR-4150	31.9	35	5.8	0.18	9.4	0.29
DR-4230	8.4	56	2.8	0.33	4.5	0.53
DR-4225	12.3	39	2.5	0.21	4.1	0.33
DR-4220	32.4	65	13.1	0.41	21.0	0.65
DR-4215	27.5	43	6.5	0.24	10.4	0.38
BayMdws	40.4	33	7.2	0.18	11.5	0.29
WalnutPl	31.4	52	9.5	0.30	15.3	0.49
DR-4205	28.2	61	10.6	0.37	16.9	0.60
DR-4149	19.6	38	3.9	0.20	6.3	0.32
GreyStn	66.4	37	12.5	0.19	20.1	0.30
DR-4145	29.3	52	8.9	0.30	14.2	0.49
DR-4140	2.6	18	0.3	0.13	0.6	0.21
MyrsPk	171.6	41	38.5	0.22	61.8	0.36
StFrancs	38.0	36	7.1	0.19	11.3	0.30
DR-4090	113.8	36	21.1	0.19	33.9	0.30
Prmvra	186.6	30	31.5	0.17	50.5	0.27

Table 4-7. Runoff Layer Model Results, cont'd…

Subshed Node	Area, acres	Percent Impervious, %	10-yr Peak Runoff, cfs	10-yr Unit Runoff, cfs/ac	100-yr Peak Runoff, cfs	100-yr Unit Runoff, cfs/ac
Drain 3						
DR-3350	140.7	13	27.0	0.19	25.2	0.18
SprgMeadw	233.1	40	49.6	0.21	79.6	0.34
DiamdOaks	187.4	27	30.0	0.16	48.1	0.26
ButtonEst	70.0	40	14.9	0.21	23.9	0.34
DR-3310	31.8	91	19.1	0.60	30.5	0.96
DR-3255	170.6	22	24.9	0.15	39.8	0.23
SHASTAPRK	311.5	45	79.3	0.25	127.1	0.41
SPRINGTIME	102.0	43	24.6	0.24	39.4	0.39
DR-3245	40.8	41	9.0	0.22	14.5	0.35
KMart	11.0	73	5.1	0.47	8.2	0.75
DR-3225	167.5	73	78.1	0.47	124.9	0.75
DR-3215	20.2	40	4.4	0.22	7.0	0.35
DR-3212	20.9	36	3.9	0.19	6.2	0.30
DR-3211	20.1	35	33.2	1.66	5.9	0.29
DR-3210	39.1	30	6.7	0.17	10.7	0.27
ColonyPk	76.0	41	16.7	0.22	26.8	0.35
DR-3205	7.4	29	1.2	0.17	2.0	0.27
DR-3200	23.0	37	4.4	0.19	7.0	0.30
DR-3135	37.4	42	11.9	0.32	13.7	0.37
Doxey	271.1	42	61.5	0.23	98.6	0.36
Chdwk	82.2	41	17.9	0.22	28.8	0.35
DR-3049	118.0	37	22.1	0.19	35.4	0.30
DR-3040	118.0	37	22.1	0.19	35.4	0.30
Drain 3A						
DR-3A175	139.7	15	16.8	0.12	26.8	0.19
DR-3A130	147.0	20	20.6	0.14	32.9	0.22
DR-3A085	25.3	92	15.3	0.61	24.5	0.97
Crest Wd	26.8	45	6.8	0.25	10.8	0.40
DR-3A070	14.0	45	3.5	0.25	5.7	0.40
DR-3A060	25.3	40	6.7	0.26	8.7	0.34
DR-3A035	164.2	73	75.9	0.46	121.3	0.74

Table 4-8: Hydraulic Layer Model Node Results

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet
Drain 7						
SprklsUpr	40.60	40.30	33.69	-6.61	34.43	-5.87
DRP7205	41.00	40.70	41.56	0.86	41.69	0.98
Spreckles	38.18	37.88	33.91	-3.97	35.53	-2.35
DR-7200	40.00	39.70	40.70	1.00	40.77	1.07
DR-7195	35.98	35.68	34.45	-1.23	34.54	-1.14
DR-7190	33.61	33.31	34.28	0.97	34.38	1.07
DR-7185	39.25	38.95	34.01	-4.94	34.10	-4.86
DR-7180	38.05	37.75	33.94	-3.81	34.03	-3.72
DR-7175	33.51	33.21	33.78	0.57	33.89	0.67
COTTA PARK	33.00	32.70	26.14	-6.56	27.72	-4.98
DR-7170	33.26	32.96	33.71	0.75	33.81	0.85
DR-7165	34.13	33.83	33.41	-0.42	33.53	-0.30
DR-7160	32.66	32.36	32.93	0.57	33.04	0.67
DR-7155	33.45	33.15	32.68	-0.47	32.79	-0.36
DR-7150	32.29	31.99	32.40	0.41	32.51	0.52
DR-7145	32.87	32.57	31.86	-0.71	31.97	-0.60
DR-7140	31.64	31.34	31.41	0.07	31.52	0.18
DR-7135	30.47	30.17	30.85	0.68	30.96	0.79
Quail	29.00	28.70	25.84	-2.86	27.16	-1.54
DR-7130	30.47	30.17	30.33	0.16	30.47	0.29
DR-7125	29.73	29.43	29.81	0.38	30.04	0.61
DR-7120	29.34	29.04	28.94	-0.10	29.24	0.20
DR-7119	35.35	35.05	28.14	-6.91	28.50	-6.55
DR-7115	33.00	32.70	27.74	-4.96	28.14	-4.56
DR-7110	29.80	29.50	26.77	-2.73	27.24	-2.26
Brock El	27.57	27.27	26.19	-1.08	26.65	-0.62
DR-7105	27.80	27.50	26.21	-1.29	26.65	-0.85
DR-7100	26.55	26.25	25.49	-0.76	25.82	-0.43
DR-7095	27.10	26.80	25.19	-1.61	25.46	-1.34
MOHR WEST	26.76	26.46	25.82	-0.64	26.79	0.32
DR-7090	26.76	26.46	24.98	-1.48	25.22	-1.24
DR-7085	26.00	25.70	24.66	-1.04	24.84	-0.86
DR-7080	26.00	25.70	24.60	-1.11	24.75	-0.95
Roberts	24.50	24.20	20.45	-3.75	21.28	-2.92
DR-7074	25.20	24.90	25.68	0.78	25.91	1.01
DR-7075	24.20	23.90	24.24	0.34	24.35	0.45
DutraPk	24.50	24.20	16.97	-7.23	18.21	-5.99
DR-7069	24.50	24.20	24.62	0.41	24.65	0.45
DR-7070	23.00	22.70	23.92	1.22	24.03	1.33
DR-7065	25.20	24.90	23.54	-1.36	23.70	-1.20
DR-7060	23.60	23.30	23.18	-0.12	23.39	0.09
DR-7055	23.48	23.18	22.27	-0.91	22.60	-0.58
DR-7050	24.11	22.22	22.27	0.05	22.60	0.38
DR-7045	24.33	20.45	22.27	1.82	22.60	2.15 *
DR-7040	22.13	19.64	22.27	2.63	22.60	2.96 *
DR-7035	23.10	22.51	22.27	-0.25	22.60	0.09
DR-7030	23.10	22.80	22.27	-0.54	22.60	-0.20
DR-7025	21.46	21.16	22.27	1.11	22.60	1.44

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet	
DR-7020	21.49	21.19	22.22	1.03	22.61	1.42	
Drain 8							
DR-7015	23.10	22.51	22.22	-0.29	22.61	0.10	
DR-7010	23.36	21.41	22.22	0.81	22.61	1.20	
DR-7005	23.36	21.21	22.21	1.00	22.60	1.39	
DR-7000	23.43	22.18	22.21	0.03	22.60	0.42	
DR-8115	25.20	24.90	22.68	-2.22	22.97	-1.93	
DR-8110	23.50	23.20	22.79	-0.41	23.00	-0.20	
Dutra Pk	20.88	20.58	14.76	-5.82	15.13	-5.45	
DR-8105	24.50	24.20	22.69	-1.51	23.02	-1.18	
DR-8100	23.50	23.20	22.67	-0.53	23.01	-0.19	
DR-8095	23.00	22.70	22.50	-0.20	22.61	-0.09	
DR-8090	23.00	21.60	22.21	0.61	22.60	1.00	
DR-8085	23.00	21.45	22.21	0.76	22.60	1.15	
DR-8080	23.00	21.10	22.21	1.11	22.60	1.50	
DR-8075	23.00	21.10	22.21	1.11	22.60	1.50	
DR-8070	23.00	22.80	22.21	-0.59	22.60	-0.20	
DR-8065	22.80	20.90	22.21	1.31	22.60	1.70	
DR-8060	22.80	20.70	22.21	1.51	22.60	1.90	
DR-8055	22.80	21.70	22.21	0.51	22.60	0.90	
DR-8050	22.00	21.70	22.21	0.51	22.60	0.90	
DR-8045	23.20	22.90	22.21	-0.69	22.60	-0.30	
DR-8040	27.70	27.40	22.21	-5.19	22.60	-4.80	
DR-8035	27.70	27.40	22.21	-5.19	22.60	-4.80	
DR-8030	22.71	21.08	22.21	1.13	22.60	1.52	
DR-8025	22.71	21.08	22.21	1.13	22.60	1.52	
DR-8020	22.76	22.46	22.21	-0.25	22.60	0.14	
DR-8015	22.71	21.08	22.21	1.13	22.60	1.52	
DR-8010	22.20	21.61	22.21	0.60	22.60	0.99	
DR-8005	22.20	19.67	22.21	2.54	22.60	2.93	*
DR-8000	21.76	19.67	22.21	2.54	22.60	2.93	*
Drain 8A							
DR-8030A	23.50	23.20	22.21	-0.99	22.60	-0.60	
DR-8025A	23.50	23.20	22.21	-0.99	22.60	-0.60	
DR-8020A	23.50	20.50	22.21	1.71	22.60	2.10	*
DR-8015A	23.50	19.70	22.21	2.51	22.60	2.90	*
DR-8010A	23.50	19.30	22.21	2.91	22.60	3.30	*
BellaVsta	18.00	17.70	12.71	-4.99	13.18	-4.52	
DR-8005A	23.50	20.30	22.21	1.91	22.60	2.30	*
DR-8000A	23.50	20.70	22.21	1.51	22.60	1.90	
DR-5445	31.80	31.50	31.40	-0.11	30.03	-1.47	
DR-5440	28.50	28.20	28.81	0.61	29.01	0.81	
DR-5435	29.30	29.00	28.82	-0.18	29.06	0.06	
DR-5430	31.50	31.20	28.97	-2.23	29.14	-2.06	
DR-5425	29.50	29.20	29.03	-0.17	29.22	0.02	
DR-5420	30.20	29.90	29.13	-0.77	29.25	-0.65	
Drain 5							
DR-5415	30.70	30.40	29.07	-1.34	29.25	-1.15	

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet	
DR-5410	29.24	28.94	28.80	-0.14	29.24	0.30	
DR-5405	30.10	29.80	28.88	-0.93	29.24	-0.56	
DR-5400	30.00	29.70	28.84	-0.86	29.12	-0.58	
Curr Gr	36.50	36.20	29.61	-6.59	31.27	-4.93	
DR-5260	40.00	39.70	37.08	-2.62	40.03	0.33	
DR-5255	40.00	39.70	36.78	-2.92	40.06	0.36	
DR-5250	40.00	39.70	36.67	-3.03	39.68	-0.02	
DR-5245	40.00	39.70	36.21	-3.49	39.01	-0.69	
DR-5240	35.00	34.70	35.06	0.36	35.34	0.64	
DR-5235	34.80	34.50	34.50	-0.01	34.69	0.19	
DR-5230	33.20	32.90	33.60	0.70	33.83	0.93	
DR-5225	34.30	34.00	33.52	-0.48	33.82	-0.18	
DR-5220	34.40	34.10	33.58	-0.52	33.86	-0.24	
DR-5215	33.60	33.30	33.63	0.33	33.91	0.61	
DR-5210	33.60	33.30	33.61	0.31	33.86	0.56	
DR-5205	34.60	34.30	33.57	-0.73	33.82	-0.48	
DR-5200	33.80	33.50	33.59	0.09	33.82	0.32	
DR-5160	35.10	34.80	34.72	-0.08	33.87	-0.93	
DR-5153	35.45	35.15	34.98	-0.17	33.89	-1.27	
DR-5155	35.80	35.50	34.53	-0.97	33.89	-1.61	
DR-5150	34.90	34.60	34.46	-0.14	33.71	-0.89	
DR-5145	34.10	33.80	33.63	-0.17	33.26	-0.54	
DR-5140	33.10	32.80	32.78	-0.02	32.98	0.18	
DR-5133	33.10	32.80	32.62	-0.18	32.62	-0.18	
DR-5135	33.10	32.80	32.60	-0.20	32.20	-0.60	
DR-5130	31.00	30.70	30.57	-0.13	30.89	0.19	
DR-5125	30.00	29.70	29.60	-0.10	30.06	0.36	
DR-5118	29.55	29.25	29.09	-0.16	29.55	0.30	
DR-5120	29.10	28.80	28.62	-0.18	28.91	0.11	
DR-5115	29.00	28.70	28.26	-0.44	28.46	-0.25	
DR-5110	27.10	26.80	27.44	0.63	27.68	0.88	
DR-5105	26.90	26.60	26.86	0.26	27.13	0.53	
DR-5100	26.30	26.00	26.36	0.36	26.64	0.64	
DR-5095	26.10	25.80	25.97	0.17	26.29	0.49	
DR-5090	26.50	26.20	25.22	-0.98	25.66	-0.54	
UnionWst	29.00	28.70	24.49	-4.21	24.87	-3.83	
DR-5085	25.60	25.30	24.52	-0.79	25.08	-0.22	
DR-5080	28.38	24.62	23.39	-1.23	23.86	-0.76	
DR-5075	26.88	24.62	23.36	-1.26	23.83	-0.79	
DR-5070	25.76	24.42	23.34	-1.08	23.81	-0.61	
DR-5065	25.27	22.64	23.32	0.68	23.79	1.15	
DR-5060	25.03	24.11	23.23	-0.88	23.65	-0.46	
St Domnc	23.00	22.70	21.98	-0.72	22.55	-0.15	
DR-5055	24.84	24.54	23.21	-1.33	23.63	-0.91	
DR-5050	24.84	24.20	23.20	-1.00	23.61	-0.59	
DR-5045	23.96	23.66	23.19	-0.47	23.61	-0.05	
DR-5040	25.00	21.70	22.52	0.82	22.71	1.01	
DR-5035	25.00	18.70	21.01	2.31	21.02	2.32	*
Vil Tcno	23.70	23.40	19.67	-3.73	20.87	-2.53	

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet	
DR-5028	24.30	24.00	21.01	-2.99	21.02	-2.98	
DR-5030	25.00	17.60	21.01	3.41	21.02	3.42	*
DR-5025	21.87	21.87	21.01	-0.86	21.02	-0.86	
DR-5020	20.85	20.26	21.01	0.75	21.02	0.75	
DR-5015	20.85	20.26	21.01	0.75	21.02	0.75	
DR-5010	21.84	21.54	21.01	-0.53	21.02	-0.52	
DR-5005	21.84	20.26	21.01	0.75	21.02	0.75	
DR-5000	20.95	20.95	21.01	0.06	21.02	0.07	
Drain 4							
DR-4165	31.67	31.37	27.21	-4.16	28.84	-2.53	
DR-4160	33.02	32.72	27.15	-5.57	28.64	-4.08	
DR-4155	30.20	29.90	27.10	-2.80	28.52	-1.38	
DR-4150	30.36	30.06	27.09	-2.97	28.50	-1.56	
DR-4230	35.00	34.70	31.19	-3.51	32.50	-2.20	
DR-4225	35.00	34.70	30.57	-4.13	32.50	-2.20	
DR-4220	35.00	34.70	30.54	-4.16	32.45	-2.25	
DR-4215	35.00	34.70	29.92	-4.78	30.93	-3.77	
BayMdws	33.50	33.20	29.90	-3.30	30.57	-2.64	
RDR-4210	30.00	29.70	29.71	0.00	30.28	0.58	
WalnutPl	31.32	31.02	27.66	-3.36	29.09	-1.93	
DR-4203	31.40	31.10	30.40	-0.70	30.28	-0.83	
DR-4205	30.00	29.70	29.50	-0.20	30.11	0.41	
DR-4200	31.82	30.47	28.41	-2.06	29.30	-1.17	
DR-4195	32.54	29.47	28.40	-1.07	29.30	-0.17	
DR-4190	31.16	30.86	28.40	-2.46	29.30	-1.56	
DR-4185	30.20	29.90	28.12	-1.78	29.10	-0.80	
DR-4180	30.05	29.75	27.17	-2.58	28.50	-1.25	
DR-4149	29.75	29.45	27.07	-2.38	28.43	-1.02	
DR-4146	29.45	29.15	26.88	-2.27	28.22	-0.93	
GreyStn	29.00	28.70	25.46	-3.24	27.03	-1.67	
DR-4145	29.14	28.84	26.51	-2.33	27.80	-1.04	
DR-4140	29.57	29.27	26.54	-2.73	27.78	-1.49	
DR-4135	28.20	27.90	26.35	-1.55	27.52	-0.38	
DR-4130	29.30	29.00	25.93	-3.08	26.97	-2.03	
DR-4125	29.57	29.27	25.47	-3.80	26.40	-2.87	
DR-4120	27.86	27.56	24.89	-2.67	25.83	-1.73	
DR-4115	29.42	29.12	24.27	-4.85	25.40	-3.72	
MyrsPk	26.00	25.70	27.83	2.13	30.86	5.16	*
DR-4110	29.24	28.94	23.37	-5.58	25.12	-3.82	
DR-4105	29.24	28.94	23.45	-5.49	25.14	-3.80	
DR-4100	26.31	26.01	22.91	-3.10	24.65	-1.36	
DR-4095	27.82	27.52	22.77	-4.75	24.43	-3.09	
StFrancs	26.00	25.70	22.05	-3.65	22.59	-3.11	
DR-4090	27.24	26.94	22.67	-4.27	24.27	-2.67	
DR-4085	26.68	26.38	22.68	-3.71	24.18	-2.20	
DR-4080	26.10	25.80	22.61	-3.19	24.08	-1.72	
DR-4075	27.40	27.10	22.47	-4.63	23.85	-3.25	
DR-4070	27.00	26.70	22.41	-4.30	23.74	-2.97	
DR-4065	25.80	25.50	22.03	-3.48	23.08	-2.42	
DR-4060	25.00	24.70	21.47	-3.23	22.17	-2.53	

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet
Prmvra	22.61	22.31	18.12	-4.19	18.96	-3.35
DR-4053	24.00	23.70	20.61	-3.09	21.20	-2.50
DR-4055	25.00	24.70	20.46	-4.24	21.02	-3.68
DR-4050	23.40	23.10	19.38	-3.72	20.13	-2.97
DR-4045	25.00	24.70	19.37	-5.33	20.11	-4.59
DR-4040	25.20	24.90	19.37	-5.53	20.11	-4.79
DR-4035	24.16	23.66	19.37	-4.29	20.11	-3.55
DR-4030	24.16	23.66	19.37	-4.29	20.11	-3.55
DR-4025	22.83	22.70	19.37	-3.33	20.11	-2.59
DR-4020	22.80	21.07	19.37	-1.70	20.11	-0.96
DR-4015	23.59	23.07	19.37	-3.70	20.11	-2.96
DR-4010	22.67	21.95	19.37	-2.58	20.11	-1.84
DR-4005	21.63	21.63	19.37	-2.26	20.11	-1.52
DR-4000	19.27	19.23	19.37	0.14	20.11	0.88
Drain 3						
DR-3350	40.10	39.85	37.13	-2.72	37.53	-2.33
DR-3345	39.90	39.60	35.61	-3.99	36.65	-2.95
SprgMeadw	42.00	41.70	35.45	-6.25	37.40	-4.30
DR-3342	41.20	40.90	36.92	-3.98	36.92	-3.98
DR-3340	39.43	39.13	35.41	-3.72	36.64	-2.49
DR-3339	39.43	39.13	35.36	-3.77	36.57	-2.56
DR-3335	38.90	38.90	35.34	-3.56	36.56	-2.34
DiamdOaks	40.00	39.70	37.72	-1.98	39.95	0.25
DR-3330	37.75	37.45	35.34	-2.11	36.57	-0.89
DR-3325	38.52	38.22	35.34	-2.88	36.57	-1.66
DR-3320	39.04	38.74	34.56	-4.18	35.61	-3.13
DR-3315	38.95	38.65	33.99	-4.66	35.08	-3.57
ButtonEst	41.08	40.78	35.53	-5.26	36.34	-4.44
DR-3308	41.60	41.30	37.09	-4.21	37.26	-4.04
DR-3310	38.00	37.70	33.79	-3.91	34.93	-2.77
DR-3305	37.20	37.20	33.79	-3.41	34.93	-2.27
DR-3300	36.90	36.55	33.77	-2.78	34.92	-1.63
DR-3295	38.45	36.90	33.76	-3.14	34.92	-1.98
DR-3290	39.20	37.75	33.75	-4.00	34.92	-2.83
DR-3285	38.05	37.45	33.74	-3.71	34.91	-2.54
DR-3280	40.00	39.70	33.74	-5.96	34.91	-4.79
DR-3279	40.00	39.70	33.67	-6.03	34.77	-4.93
DR-3275	40.05	39.15	33.67	-5.48	34.77	-4.38
DR-3270	39.50	39.20	33.67	-5.54	34.77	-4.43
DR-3269	39.50	39.20	33.64	-5.56	34.72	-4.48
DR-3265	40.55	40.10	33.64	-6.46	34.72	-5.38
DR-3260	40.30	40.10	33.63	-6.47	34.71	-5.39
DR-3255	37.00	36.70	33.63	-3.07	34.71	-1.99
SHASTAPRK	39.00	38.70	33.18	-5.52	35.26	-3.45
DR-SHSTA	38.00	37.70	38.43	0.73	38.52	0.82
SPRINGTIME	33.00	32.70	33.46	0.76	34.26	1.56
DR-3250	34.55	34.25	33.25	-1.00	33.98	-0.27
DR-3245	33.27	32.97	33.11	0.13	33.74	0.77

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet
DR-3240	34.50	34.20	32.81	-1.39	33.36	-0.84
DR-3235	35.90	33.70	32.81	-0.89	33.36	-0.34
DR-3230	35.60	33.35	32.81	-0.54	33.35	0.00
KMart	40.31	40.01	38.68	-1.34	39.29	-0.72
DR-3225	33.11	32.81	32.81	0.00	33.35	0.54
DR-3220	32.81	32.51	32.62	0.11	33.16	0.65
DR-3215	30.72	30.42	31.01	0.59	31.32	0.90
DR-3212	30.22	29.92	30.11	0.19	30.42	0.50
DR-3211	29.70	29.40	29.42	0.02	29.90	0.50
DR-3210	29.49	29.19	28.47	-0.72	29.07	-0.12
ColonyPk	30.00	29.70	26.85	-2.86	27.79	-1.91
DR-3205	29.50	29.20	27.97	-1.23	28.47	-0.73
DR-3200	28.82	28.52	27.59	-0.93	28.06	-0.46
DR-3199	28.42	28.12	27.55	-0.57	28.01	-0.11
DR-3195	25.67	25.37	25.97	0.60	26.11	0.74
DR-3190	25.98	25.68	25.05	-0.63	25.09	-0.59
DR-3185	28.02	27.72	26.51	-1.21	26.90	-0.82
DR-3180	24.03	23.73	24.81	1.08	24.90	1.17
DR-3175	23.95	23.65	24.48	0.83	24.54	0.89
DR-3170	23.63	23.33	24.30	0.97	24.34	1.01
DR-3165	23.85	23.55	24.13	0.58	24.10	0.55
DR-3160	23.51	23.21	23.89	0.68	23.80	0.59
DR-3155	23.34	23.04	23.77	0.73	23.61	0.57
DR-3150	27.18	26.88	23.73	-3.15	23.46	-3.42
DR-3145	26.56	26.26	23.73	-2.53	23.40	-2.86
DR-3140	28.16	27.86	23.73	-4.13	23.40	-4.46
DR-3135	27.00	26.70	23.72	-2.98	23.39	-3.31
DR-3130	27.00	26.70	23.64	-3.06	23.20	-3.50
DR-3125	26.80	26.50	23.52	-2.98	23.01	-3.49
DR-3120	28.15	27.85	23.48	-4.37	22.94	-4.91
Doxey	26.00	25.70	22.45	-3.25	23.70	-2.00
DR-3115	27.28	26.98	23.44	-3.54	22.87	-4.11
DR-3110	25.62	25.32	23.42	-1.90	22.83	-2.49
DR-3100	24.85	24.55	23.37	-1.18	22.77	-1.78
DR-3095	27.00	25.25	23.36	-1.89	22.76	-2.49
DR-3090	26.80	26.55	23.34	-3.21	22.75	-3.80
DR-3085	26.65	26.65	23.31	-3.34	22.71	-3.94
DR-3080	27.20	26.40	23.31	-3.09	22.50	-3.90
DR-3075	26.70	26.25	23.27	-2.98	22.46	-3.79
DR-3070	26.20	25.90	23.24	-2.66	22.40	-3.50
Chdwk	23.50	23.20	17.89	-5.31	18.09	-5.11
DR-3065	25.90	25.65	23.25	-2.40	22.34	-3.32
DR-3060	26.00	25.70	23.22	-2.48	22.34	-3.36
DR-3059	26.00	25.70	23.20	-2.50	22.33	-3.37
DR-3055	26.85	26.25	23.18	-3.07	22.33	-3.93
DR-3050	25.33	25.03	23.16	-1.87	22.33	-2.70
DR-3049	25.33	25.03	23.15	-1.88	22.26	-2.77
DR-3040	26.00	25.70	23.12	-2.58	22.21	-3.49
DR-3030	26.00	25.70	21.02	-4.68	20.60	-5.10
DR-3020	26.00	25.70	21.01	-4.69	20.59	-5.11
DR-3005	23.00	22.70	19.28	-3.42	19.21	-3.49
DR-3000	20.00	19.70	19.24	-0.46	19.19	-0.51

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

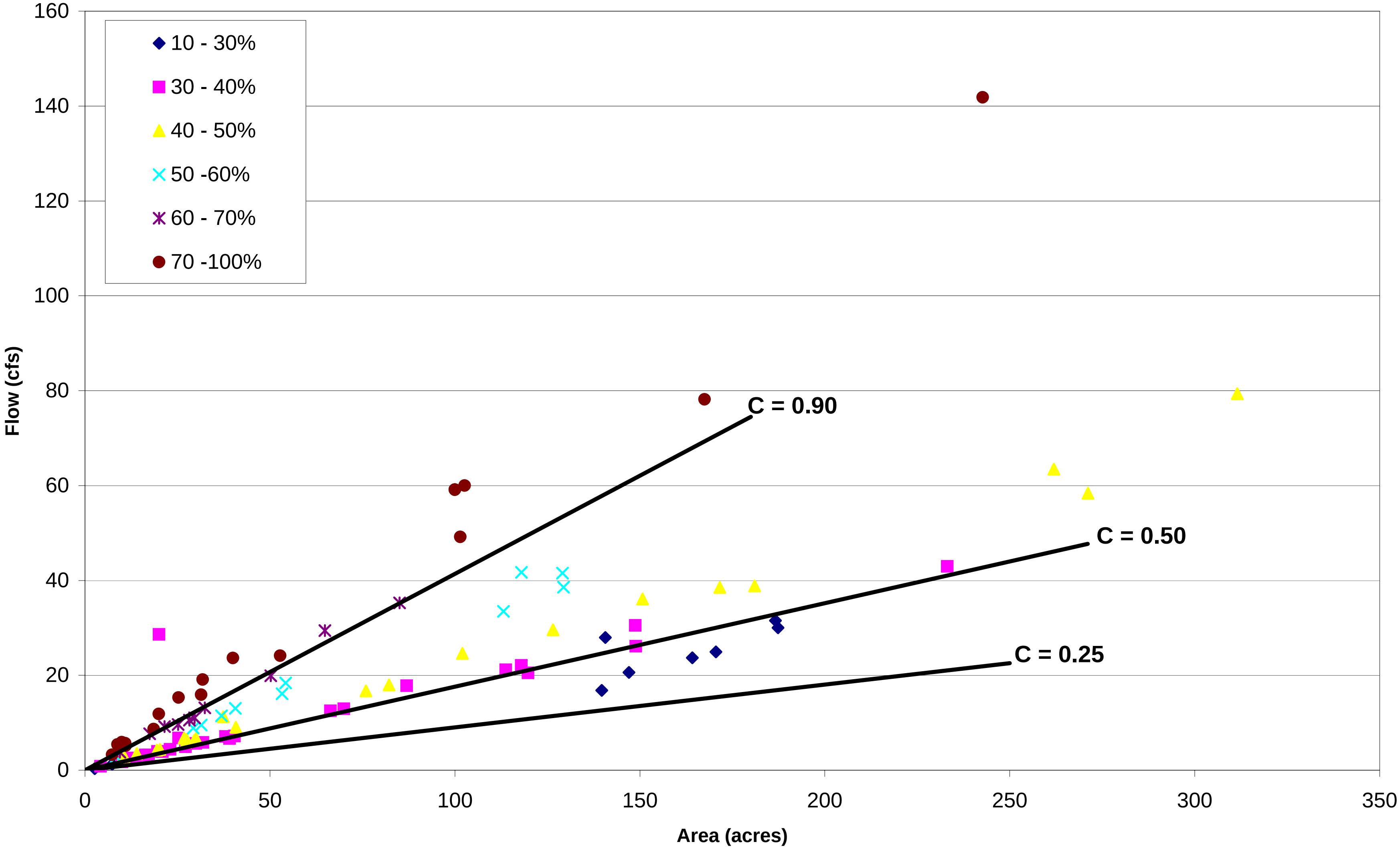
Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet
Drain 3A						
DR-3A175	40.80	37.62	34.66	-2.96	34.87	-2.76
DR-3A160	39.40	39.10	33.43	-5.67	33.87	-5.23
DR-3A150	38.94	38.64	33.20	-5.45	33.66	-4.98
DR-3A145	38.94	38.64	32.84	-5.80	33.48	-5.16
DR-3A140	39.15	37.32	32.81	-4.51	33.47	-3.85
DR-3A135	37.48	36.46	32.81	-3.65	33.47	-2.99
DR-3A130	36.65	36.25	32.78	-3.47	33.45	-2.80
DR-3A125	36.57	35.87	32.78	-3.09	33.45	-2.42
DR-3A120	36.00	35.70	32.78	-2.92	33.45	-2.25
DR-3A115	36.00	35.70	32.42	-3.28	32.61	-3.09
DR-3A110	35.29	35.18	32.42	-2.76	32.61	-2.57
DR-3A100	34.01	33.61	32.42	-1.19	32.61	-1.00
DR-3A095	32.24	31.94	32.42	0.48	32.61	0.67
DR-3A085	32.15	31.85	32.29	0.44	32.43	0.58
DR-3A080	32.36	32.06	32.03	-0.03	32.15	0.09
DR-3A075	33.34	33.04	31.74	-1.31	31.82	-1.22
Crest Wd	32.13	31.83	27.13	-4.71	31.50	-0.33
DR-3A070	32.42	32.12	31.38	-0.74	31.54	-0.58
DR-3A065	31.00	30.70	31.26	0.56	31.38	0.68
DR-3A060	31.04	30.74	31.40	0.66	31.35	0.61
DR-3A055	30.67	30.37	31.19	0.81	31.31	0.94
DR-3A050	32.04	31.74	31.15	-0.59	31.26	-0.48
DR-3A045	32.05	31.75	31.12	-0.63	31.22	-0.53
DR-3A040	30.61	30.31	31.12	0.81	31.21	0.90
DR-3A035	30.61	30.31	31.11	0.80	31.21	0.90
PS-15	30.00	29.70	31.05	1.35	31.14	1.44
DR-3A030	30.00	29.70	25.54	-4.17	25.58	-4.12
DR-3A020	30.00	29.70	23.89	-5.81	23.92	-5.79
FCOC						
FC-25	23.50	21.50	22.21	0.71	22.60	1.10
FC-30	22.90	20.80	22.21	1.41	22.60	1.80
FC-35	22.90	20.80	21.22	0.42	22.23	1.43
FC-36	24.30	20.60	21.20	0.60	22.22	1.62
FC-37	24.80	20.30	21.17	0.87	22.22	1.92
FC-40	23.30	22.30	21.24	-1.06	22.22	-0.09
FC-45	24.80	22.30	21.18	-1.12	22.21	-0.09
FC-46	24.60	24.10	21.11	-2.99	22.21	-1.89
FC-47	25.80	25.20	21.08	-4.12	22.20	-3.00
FC-48	28.90	26.70	21.07	-5.63	22.20	-4.50
FC-50	26.60	26.70	21.06	-5.64	22.20	-4.50
FC-55	26.60	26.70	21.06	-5.64	21.50	-5.20
FC-60	28.90	26.70	21.05	-5.65	21.03	-5.67
FC-61	28.90	24.60	21.05	-3.55	21.03	-3.57
FC-62	24.50	22.30	21.04	-1.26	21.03	-1.27
FC-65	24.50	22.30	21.01	-1.29	21.02	-1.28
FC-66	24.70	19.80	21.01	1.21	21.02	1.22
FC-70	24.70	19.80	21.01	1.21	21.02	1.22
FC-75	24.70	19.80	20.99	1.19	21.00	1.20
FC-77	22.10	21.80	20.98	-0.82	21.00	-0.80
FC-78	21.90	21.80	20.98	-0.82	21.00	-0.80

Table 4-8: Hydraulic Layer Model Node Results, cont'd…

Subshed Node	Modeled Gr Elev, feet	Flooding Elev, feet	10-yr Max WSEL, feet	10-yr Flooding Depth, feet	100-yr Max WSEL, feet	100-yr Flooding Depth, feet
FC-80	21.90	21.80	20.98	-0.82	21.00	-0.80
FC-85	21.90	21.80	20.26	-1.54	20.60	-1.20
FC-86	22.50	19.90	20.24	0.34	20.59	0.69
FC-90	22.50	19.90	20.23	0.33	20.59	0.69
FC-95	22.50	19.90	19.37	-0.53	20.11	0.21
FC-96	22.50	22.00	19.36	-2.64	20.11	-1.89
FC-100	22.50	22.00	19.36	-2.64	20.11	-1.89
FC-105	22.50	22.00	19.36	-2.64	20.11	-1.90
FC-106	22.50	22.50	19.34	-3.16	20.10	-2.40
FC-107	23.40	22.70	19.33	-3.37	20.09	-2.61
FC-110	23.40	22.70	19.33	-3.37	20.09	-2.61
FC-115	23.40	22.70	19.33	-3.37	19.25	-3.45
FC-116	20.60	19.40	19.33	-0.07	19.25	-0.15
FC-120	20.60	19.40	19.32	-0.08	19.25	-0.15
FC-121	23.50	23.20	19.28	-3.92	19.22	-3.98
FC-125	23.50	19.58	19.25	-0.33	19.19	-0.39
FC-130	23.50	19.58	19.24	-0.34	19.19	-0.39
FC-135	18.17	18.17	19.24	1.07	19.19	1.02
FC-136	20.95	19.44	19.17	-0.27	19.15	-0.30
FC-137	21.65	18.14	19.14	1.00	19.12	0.98
FC-140	21.65	20.27	19.12	-1.15	19.12	-1.16
FC-145	22.10	20.06	19.09	-0.97	19.10	-0.96
FC-146	21.54	20.53	19.07	-1.46	19.07	-1.46
FC-147	23.80	23.60	19.03	-4.57	19.05	-4.55
FC-148	23.63	22.68	19.00	-3.69	19.03	-3.65
FC-150	23.24	22.20	18.94	-3.26	19.00	-3.20
FC-151	22.47	22.18	18.90	-3.28	18.98	-3.20
FC-152	22.31	20.73	18.87	-1.86	18.96	-1.77
FC-153	20.68	18.04	18.83	0.79	18.94	0.90
FC-154	19.56	19.55	18.81	-0.74	18.93	-0.62
FC-155	19.56	21.42	18.72	-2.70	18.89	-2.54
FC-156	20.98	20.47	18.72	-1.76	18.88	-1.59
FC-157	20.33	20.09	18.70	-1.39	18.87	-1.22
FC-160	23.85	23.08	18.67	-4.41	18.86	-4.22
FC-165	23.85	23.08	18.66	-4.42	18.85	-4.23
FC-170	21.92	21.55	18.66	-2.89	18.86	-2.70
FC-175	21.92	21.55	16.50	-5.05	17.67	-3.88
FC-176	24.50	22.90	16.39	-6.51	17.64	-5.26
FC-180	24.50	22.90	16.37	-6.53	17.63	-5.27
FC-181	24.30	20.30	16.23	-4.07	17.58	-2.72
FC-185	24.30	20.30	16.13	-4.17	17.55	-2.75
FC-186	24.30	21.30	15.92	-5.39	17.47	-3.83
FC-187	22.80	19.80	15.76	-4.04	17.42	-2.38
FC-190	23.70	18.70	15.72	-2.98	17.40	-1.30
FC-195	23.00	18.70	13.18	-5.52	15.95	-2.75
FC-196	22.80	18.80	12.99	-5.82	15.90	-2.90
FC-200	23.00	22.80	12.89	-9.91	15.88	-6.93
FC-205	22.80	22.80	12.90	-9.90	15.88	-6.92
FC-210	22.80	22.50	13.23	-9.28	16.71	-5.80
FC-215	23.00	22.80	12.20	-10.60	15.50	-7.30

* Note: Without one foot topography to accurately delineate the floodplain, the model cannot accurately predict flood depths (particularly as depths approach/exceed 2 feet).

Figure 4-3. Comparison of XP-SWMM Peak Runoff Rates with Calibration Curves



MASTER PLAN MODEL

The XP-SWMM model was expanded and modified for use in preparing the Storm Drain Master Plan. Land uses were modified to reflect the 2003 General Plan map. Parameters such as percent impervious were not changed, only the land use designation. Some lands on the periphery of the City were changed from agriculture or open space to higher value uses in accordance with the plan. The newly developing South Area was added to the model with the South Drain and alternative outfall locations. Planned Drain 3N was added along with the diversion of Drain 3A to 3N.

The updated "future conditions" model was used to help evaluate proposed improvements. Master Plan modeling is based on a 10-year, 48-hour design storm. The dynamic model allowed comparison over time of different pipe diameters, channels and culverts. The model also allowed varying the operation of detention basins and pumps to have the greatest impact on downstream flooding. These studies included maximizing the basin storage used and delaying pump start water surface elevations until there was sufficient downstream capacity. At key locations, controls were built in to show how the system operates with SSJID requirements in place.

Modeling results are discussed within the analysis discussion of each drain in Chapter 5.