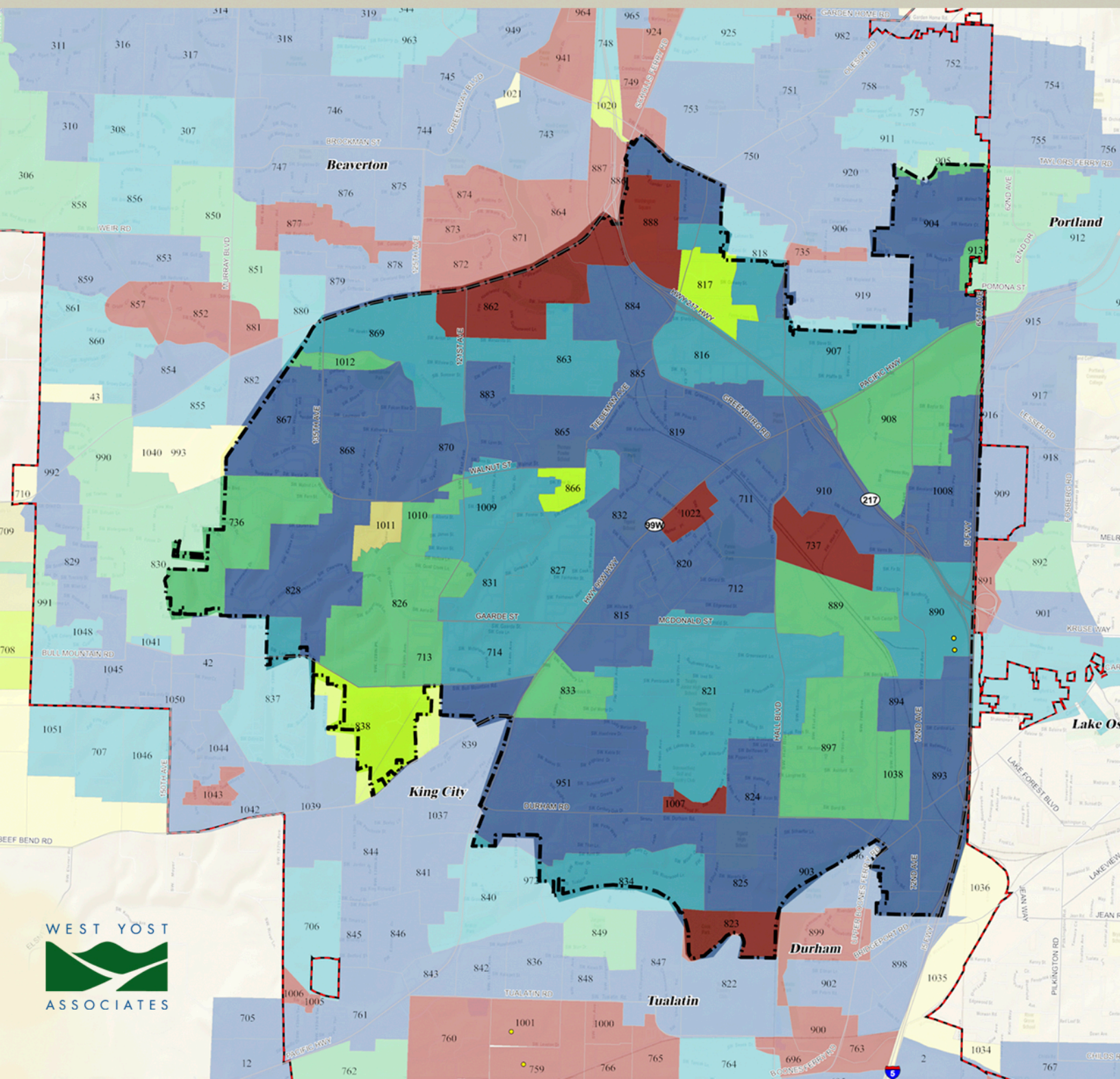
CITY OF TIGARD
Oregon

Sanitary Sewer Master Plan Appendices



APPENDIX A

Oregon Water Quality Standards (excerpt)

The Oregon Administrative Rules containing OARs filed through June 13, 2008[1]

DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER POLLUTION

DIVISION 41 (excerpts)

WATER QUALITY STANDARDS: BENEFICIAL USES, POLICIES, AND CRITERIA FOR OREGON

340-041-0009

Bacteria

(6) Sewer Overflows in winter: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm. However, the following exceptions apply:

(a) The Commission may on a case-by-case basis approve a bacteria control management plan to be prepared by the permittee, for a basin or specified geographic area which describes hydrologic conditions under which the numeric bacteria criteria would be waived. These plans will identify the specific hydrologic conditions, identify the public notification and education processes that will be followed to inform the public about an event and the plan, describe the water quality assessment conducted to determine bacteria sources and loads associated with the specified hydrologic conditions, and describe the bacteria control program that is being implemented in the basin or specified geographic area for the identified sources;

(b) Facilities with separate sanitary and storm sewers existing on January 10, 1996, and which currently experience sanitary sewer overflows due to inflow and infiltration problems, must submit an acceptable plan to the Department at the first permit renewal, which describes actions that will be taken to assure compliance with the discharge prohibition by January 1, 2010. Where discharges occur to a receiving stream with sensitive beneficial uses, the Department may negotiate a more aggressive schedule for discharge elimination;

(c) On a case-by-case basis, the beginning of winter may be defined as October 15, if the permittee so requests and demonstrates to the Department's satisfaction that the risk to beneficial uses, including water contact recreation, will not be increased due to the date change.

(7) Sewer Overflows in summer: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of May 22

[1] http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html

through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm. The following exceptions apply:

(a) For facilities with combined sanitary and storm sewers, the Commission may on a case-by-case basis approve a bacteria control management plan such as that described in subsection (6)(a) of this rule;

(b) On a case-by-case basis, the beginning of summer may be defined as June 1 if the permittee so requests and demonstrates to the Department's satisfaction that the risk to beneficial uses, including water contact recreation, will not be increased due to the date change;

(c) For discharge sources whose permit identifies the beginning of summer as any date from May 22 through May 31: If the permittee demonstrates to the Department's satisfaction that an exceedance occurred between May 21 and June 1 because of a sewer overflow, and that no increase in risk to beneficial uses, including water contact recreation, occurred because of the exceedance, no violation may be triggered, if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

APPENDIX B

Detailed Land Use and Development Condition Data

Table B-1. Detailed Land Use and Development Condition Data - Existing Conditions (2006)

	Net Acreage by Land Use Category, acres																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
21	-	3.90	-	-	-	-	-	-	1.54	-	-	-	-	-	-	-	0.303	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	1.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	5.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	2.73	-	-	0.0251	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	1.71	-	-	-	-	-	-	-	-	-	-	-	-	-	0.159	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.36	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.76	-	-	-	-	-	-	-	-	-
31	-	-	-	-	1.66	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.66	-	-	-	-	-	-	-	-	-
33	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	6.78	-	-	-	-	-	-	-	-	-
34	-	-	-	-	9.15	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0000	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.19	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	1.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	3.27	-	-	-	-	-	-	-	417	9.15	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	9.81	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	34.4	-	-	-	-	-	-	-	0.197	-	-	-	-	-	-	-	-	-	-	-
40	-	0.901	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	30.7	-	-	-	-	-	-	-	-	5.74	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.20	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	4.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.52	1.30	-	-	45.7	-	-	-	-	-	-	-
50	-	1.35	-	-	-	-	-	0.0168	113	5.87	-	-	-	-	-	-	-	-	-	-	-	4.21	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.61	34.3	-	-	2.82	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	45.1	-	-	-	-	-	-	-	-	4.08	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	25.2	-	-	-	-	-	-	-	-	0.0120	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.78	196	-	-	0.686	-	-	-	-	-	-	-
57	-	-	-	-	3.97	-	-	-	-	17.1	-	-	-	1.20	-	-	16.3	4.05	31.2	-	0.0535	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-	-	5.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	28.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	9.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	5.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	17.5	-	-	-	-	-	-	-	5.73	-	0.0067	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	33.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.98	-	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-	-	-	3.59	-	-	30.7	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.03	-	-	-	2.36	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.03	-	-	0.330	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	8.92	-	-	-	-	-	-	-	-	0.265	-	-	-	-	-	-	-	-	-	-
84	-	-	-	-	-	-	-	-	-	8.15	-	-	-	-	17.8	-	-	3.84	-	-	14.5	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	41.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	2.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	0.151	-	-	-	-	-	-	-	-	-	-	-	-	-	29.6	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	3.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.203	-	8.49	-	-	-	-	-	-	-	-	-
101	-	-	-	-	0.997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	286	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	66.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	203	-	-	-	-	-	-	-	-	-	-	-	-	-	31.2	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.8	-	-	0.0909	-	-	-	-	-	-	-	-	-	-
107	-	0.0001	-	-	-	-	-	-	52.2	0.0024	-	-	-	-	-	-	3.11	0.135	-	-	3.47	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.34	-	-	4.98	-	-	-	-	-	-	-
109	-	-	-	-	-	-	-	-	86.1	5.52	-	-	-	-	-	-	4.98	-	-	-	12.1	-	-	-	-	-	-	-
110	-	0.0834	-	-	-	-	-	-	-	3.97	-	-	-	-	-	-	-	39.6	-	-	2.96	-	-	-	-	-	-	-
111	-	8.61	-	-	-	-	-	-	-	14.4	-	-	-	-	-	-	-	5.58	-	-	3.85	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.618	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	12.8	-	-	53.7	-	-	-	-	-	-	-
114	-	-	-	-	-	-	-	-	-	0.0013	-	-	-	-	-	-	-	-	-	-	14.5	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.946	-	-	4.57	-	-	-	-	-	-	-
116	-	-	-	-	-	-	-	-	15.4	14.5	-	-	-	-	-	-	-	6.10	-	-	-	-	-	-	-	-	-	-
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	-	-	15.4	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	8.16	-	-	20.1	-	-	-	-	-	-	-
119	-	-	-	-	-	-	-	-	-	7.41	-	-	-	-	-	-	49.0	-	-	-	65.8	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.171	-	-	14.6	-	-	-	-	-	-	-

Table B-1. Detailed Land Use and Development Condition Data - Existing Conditions (2006)

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
121	-	-	-	-	-	-	-	-	-	17.9	-	-	-	-	-	-	-	-	-	-	13.1	-	-	-	-	-	-	-
122	-	-	-	-	-	-	-	-	18.7	4.12	-	-	-	-	-	-	-	-	-	-	10.8	-	-	-	-	-	-	-
123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	24.9	-	-	-	-	-	-	-
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.796	-	-	30.9	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.85	-	-	13.1	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0048	-	-	17.3	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0835	-	-	31.3	-	-	-	-	-	-	-
128	-	13.6	-	-	-	-	-	-	0.198	11.2	0.497	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	-	-	-
129	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.7	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	2.19	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.2	-	5.38	0.943	-	-	-	-	-	-	-	-	-	-
132	-	-	-	-	-	-	-	-	-	3.97	-	-	-	-	9.49	-	-	1.92	-	-	31.7	-	-	-	-	-	-	-
133	-	-	-	-	-	-	-	-	-	4.48	-	-	-	-	39.0	-	-	1.62	-	-	9.65	-	-	-	-	-	-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.997	-	-	11.9	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.12	-	-	16.2	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.2	-	-	-	-	-	-	-
137	-	-	-	-	-	-	-	-	-	3.10	-	-	-	-	-	-	-	-	-	-	24.6	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.51	-	-	18.2	-	-	-	-	-	-	-
139	-	-	-	-	-	-	-	-	0.965	21.6	-	-	-	-	25.2	-	0.0000	5.26	-	-	74.2	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	2.34	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.63	-	-	-	3.52	-	-	-	-	-	-	-
142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.7	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	7.71	-	-	-	5.21	0.421	-	-	-	-	-	59.3	-	-	-	-	-	-	-
144	-	6.52	-	-	-	-	-	-	-	6.70	-	-	-	-	87.5	-	11.2	-	-	-	8.90	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	1.97	-	-	-	1.85	-	-	-	0.390	-	-	24.5	-	-	-	-	-	-	-
146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.193	-	-	1.50	-	-	10.9	-	-	-	-	-	-	-
147	-	-	-	-	-	-	-	-	-	12.7	-	-	-	5.45	-	-	5.61	4.51	-	-	6.50	-	-	-	-	-	-	-
148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.32	-	-	1.84	-	-	1.20	-	-	-	-	-	-	-
149	-	-	-	-	-	-	-	-	-	3.93	-	-	-	-	8.60	-	-	1.45	-	-	3.71	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	6.12	-	-	-	-	-	-	18.1	-	-	-	7.23	-	-	-	-	-	-	-
151	-	20.5	-	-	-	-	-	-	0.0019	16.9	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-
152	-	4.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	-	-	-	21.1	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.13	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.14	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.5	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.6	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	1.41	-	-	-	-	7.11	-	-	-	-	-	6.66	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	31.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	83.7	-	-	-	-	-	-	-	0.0024	0.0050	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	84.9	-	-	-	-	-	-	-	-	2.06	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.39	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	0.0303	-	-	-	-	-	57.3	-	-	2.81	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.2	-	-	11.2	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	49.6	-	-	0.146	-	-	-	-	0.146	-	-	0.449	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.2	-	-	3.79	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.0	-	-	4.69	-	-	-	-	-	-	-	-	-	-
210	-	0.0009	-	-	-	-	-	-	-	7.41	88.3	-	-	-	4.18	-	-	31.5	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98.6	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.0	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	4.51	-	-	-	-	-	-	-	10.5	-	-	-	-	17.6	-	-	15.3	-	-	23.5	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60.3	-	-	2.76	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	26.1	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	0.0058	-	-	-	-	-
219	-	-	-	-	-	-	8.50	-	-	-	-	-	-	-	33.0	-	-	13.2	-	-	5.81	2.77	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	4.34	0.0146	-	-	3.56	46.1	-	-	1.54	-	-	-	-	-	-	-	-	-	-
221	-	7.52	-	-	-	-	-	-	12.2	7.68	20.0	-	-	-	-	-	-	0.0023	-	-	-	-	-	-	-	-	-	-
222	-	51.8	-	-	-	-	-	-	-	18.4	44.9	-	-	24.3	18.7	-	-	0.0433	-	-	-	-	-	-	-	-	-	-
223	-	10.6	-	-	-	-	-	-	-	0.0017	0.276	-	-	0.920	-	-	-	0.783	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	22.5	-	-	-	-	-	-	-	-	10.3	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	1.99	0.141	-	-	-	-	-	-	30.2	31.8	-	-	7.18	-	-	-	-	-	-	-
231	-	61.6	-	0.0852	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	0.0073	-	-	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	14.1	-	-	-	-	-	-	-	59.3	-	-	-	-	-	-	-	-	-	-	-
236	-	17.2	-	-	-	-	-	-	37.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	-	9.45	-	-	-	-	-	-	-	15.9	-	-	-	-	-	-	4.44	4.23	-	-	4.03	-	-	-	-	-	-	-
347	-	0.0075	-	-	-	-	-	-	-	8.10	-	-	-	-	-	-	-	15.6	-	-	90.5	-	-	-	-	-	-	-
371	-	-	-	-	14.5	-	-	-	4.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-1. Detailed Land Use and Development Condition Data - Existing Conditions (2006)

	Net Acreage by Land Use Category, acres																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
372	-	-	-	-	-	-	-	-	24.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
373	-	-	-	-	-	-	-	-	75.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	-	4.19	-	-	-	-	-	-	-	23.3	-	-	-	-	-	-	-	-	-	-	13.6	-	-	-	-	-	-	-
375	-	0.453	-	-	-	-	-	-	-	6.74	-	-	-	-	-	-	0.0022	9.12	-	-	35.0	-	-	-	-	-	-	-
376	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	-	-	-	12.3	-	-	-	-	-	-	-
377	-	-	-	-	-	-	-	-	-	23.9	-	-	-	-	-	-	-	3.07	-	-	4.34	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.5	-	-	-	-	-	-	-
379	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	96.7	-	-	-	-	-	-	-	-	-	-	-	-	-
380	-	22.4	-	-	-	-	-	-	12.4	21.3	-	-	-	-	13.2	-	-	0.619	-	-	40.3	-	-	-	-	-	-	-
381	-	-	-	-	-	-	-	-	-	32.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
382	-	-	-	-	-	-	-	-	88.7	0.269	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0004	-	-	-	9.02	-	-	-	-	-	-	-
386	-	-	-	-	-	-	-	-	-	3.48	-	-	-	-	-	-	19.5	-	-	-	19.1	-	-	-	-	-	-	-
389	-	55.2	-	-	-	-	-	-	0.0151	-	-	-	-	-	-	-	-	-	-	-	2.14	-	-	-	-	-	-	-
391	-	-	-	-	-	-	-	-	18.1	18.9	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-
393	-	-	-	-	-	-	-	-	42.0	11.1	-	-	-	-	-	-	-	1.27	-	-	13.6	-	-	-	-	-	-	-
394	-	6.32	-	-	-	-	-	-	6.76	11.2	-	-	-	-	-	-	0.0002	2.66	-	-	68.0	-	-	-	-	-	-	-
395	-	8.93	-	-	-	-	-	-	-	8.03	-	-	-	-	-	-	8.45	4.62	-	-	82.6	-	-	-	-	-	-	-
396	-	-	-	-	-	-	-	-	2.19	22.2	11.1	-	-	-	-	-	-	0.429	-	-	3.16	-	-	-	-	-	-	-
397	-	-	-	-	0.0138	-	-	-	-	-	-	-	-	-	-	-	-	0.0049	-	-	31.9	0.0197	-	-	-	-	-	-
398	-	-	-	-	0.0029	-	-	-	-	2.51	-	-	-	-	-	-	-	0.0322	-	-	64.3	0.0018	-	-	-	-	-	-
399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	0.684	-	-	-	-	-	-	-	9.19	-	-	35.5	-	-	-	-	-	-	-
401	-	-	-	-	-	-	-	-	-	18.0	-	-	-	-	6.69	-	-	-	-	-	4.76	-	-	-	-	-	-	-
402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.3	-	-	41.8	-	-	-	-	-	-	-
403	-	-	-	-	-	-	-	-	25.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404	-	-	-	-	-	-	-	-	32.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	23.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
406	-	17.1	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-	53.3	-	-	-	-	-	-	-
407	-	12.5	-	-	-	-	-	-	-	50.0	-	-	-	-	-	-	0.0134	-	-	-	207	-	-	-	-	-	-	-
408	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	17.2	-	-	96.3	-	-	-	-	-	-	-
409	-	3.76	-	-	-	-	-	-	-	18.5	-	-	-	-	25.3	-	-	4.87	-	-	59.1	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54.2	-	-	-	-	-	-	-	-	-	-	-	-	-
411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.9	-	-	-	-	-	28.8	-	-	-	-	-	-	-
412	-	-	-	-	-	-	-	-	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	-	-	-	-	-	-	-	-	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
414	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	-	21.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
416	-	-	-	-	-	-	137	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-
417	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	0.257	-	-	-	-	-	-	-	-	-	-
418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.31	-	-	-	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	16.2	-	-	-	-	10.7	-	-	2.06	-	-	3.95	5.79	-	-	-	-	-	-
421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29.0	-	-	0.299	-	-	-	-	-	-	-	-	-	-
422	-	-	-	-	-	-	-	-	112	-	-	-	-	-	1.63	-	-	14.1	-	-	-	-	-	-	-	-	-	-
423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.905	-	-	23.6	-	-	-	-	-	-	-
424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-
427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.86	-	-	19.3	-	-	-	-	-	-	-
428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-	14.4	-	-	-	-	-	-	-
429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.101	-	-	6.32	-	-	-	-	-	-	-
432	-	4.21	-	-	-	-	-	-	93.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
448	-	-	-	-	42.2	-	-	-	3.60	-	-	-	-	-	-	-	0.0026	-	54.1	-	0.0000	-	-	-	-	-	-	-
449	-	-	0.932	-	1.58	-	-	-	-	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	-	-	-	-	-
457	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
458	-	-	-	-	-	-	-	-	55.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
466	-	0.0105	-	-	-	-	-	-	1.27	-	-	-	-	-	12.1	-	2.99	-	-	-	-	-	-	-	-	-	-	-
467	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	4.53	-	-	20.5	0.0017	-	-	-	-	-	-
470	-	-	-	-	-	-	-	-	-	1.81	-	-	-	-	-	-	-	2.16	-	-	2.04	-	-	-	-	-	-	-
480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.31	-	-	-	36.5	-	-	-	-	-	-	-
512	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	18.7	-	-	-	-	-	-	-	-	-	-	-
513	-	0.442	-	-	-	-	-	-	3.89	1.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
514	-	-	-	-	-	-	-	-	-	5.02	-	-	-	-	-	-	-	92.6	-	-	-	-	-	-	-	-	-	-
515	-	-	-	-	-	-	-	-	-	5.46	-	-	-	-	4.82	-	-	14.0	-	-	10.00	-	-	-	-	-	-	-
516	-	-	-	-	-	-	-	-	-	10.9	-	-	-	-	-	-	-	8.04	-	-	20.3	-	-	-	-	-	-	-
517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0029	9.31	-	-	14.9	-	-	-	-	-	-	-

Table B-1. Detailed Land Use and Development Condition Data - Existing Conditions (2006)

	Net Acreage by Land Use Category, acres																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
518	-	-	-	-	-	-	-	-	-	4.92	-	-	-	-	-	-	0.0003	1.92	-	-	12.2	-	-	-	-	-	-	-
519	-	-	-	-	-	-	-	-	-	5.96	-	-	-	-	-	-	9.71	-	-	-	30.9	-	-	-	-	-	-	-
520	-	-	-	-	-	-	-	-	-	3.84	-	-	-	-	-	-	-	-	-	-	20.9	-	-	-	-	-	-	-
521	-	-	-	-	-	-	-	-	-	9.74	-	-	-	-	-	-	0.0065	-	-	-	28.5	-	-	-	-	-	-	-
522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	36.2	-	-	-	-	-	-	-
523	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	-	-
524	-	-	-	-	-	-	-	-	-	0.339	-	-	-	-	-	-	-	-	-	-	27.7	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47.6	-	-	-	-	-	-	-
526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.7	-	-	-	-	-	-	-
527	-	-	-	-	-	-	-	-	-	0.0034	-	-	-	-	-	-	-	-	-	-	36.2	-	-	-	-	-	-	-
528	-	-	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	0.833	-	-	4.83	-	-	-	-	-	-	-
529	-	-	-	-	-	-	-	-	-	1.76	-	-	-	-	-	-	-	3.67	-	-	36.5	-	-	-	-	-	-	-
530	-	-	-	-	-	-	-	-	-	1.30	-	-	-	-	-	-	-	0.333	-	-	12.0	-	-	-	-	-	-	-
531	-	-	-	-	-	-	-	-	-	3.64	-	-	-	-	-	-	9.51	2.99	-	-	36.2	-	-	-	-	-	-	-
532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	14.0	-	-	-	-	-	-	-
533	-	-	-	-	-	-	-	-	-	1.32	-	-	-	-	-	-	-	2.62	-	-	10.7	-	-	-	-	-	-	-
534	-	-	-	-	0.110	-	-	-	-	5.34	-	-	-	-	-	-	-	24.7	-	-	-	-	-	-	-	-	-	-
535	-	2.36	-	-	-	-	-	-	22.6	-	-	-	-	-	4.71	-	-	-	-	-	-	-	-	-	-	-	-	-
536	-	-	-	-	-	-	-	-	28.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
537	-	23.2	-	-	-	-	-	-	7.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.08	-	-	-	-	-	-	-	-	-	-	-	-	-
539	-	-	-	-	-	-	-	-	14.1	6.61	-	-	-	-	-	-	-	0.370	-	-	0.0811	-	-	-	-	-	-	-
540	-	-	-	-	-	-	-	-	-	6.03	-	-	-	-	-	-	-	-	-	-	0.0689	-	-	-	-	-	-	-
541	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	-	-	-	1.86	-	-	21.3	-	-	-	-	-	-	-
542	-	1.61	-	-	-	-	-	-	-	8.75	-	-	-	-	15.3	-	0.515	-	-	-	1.48	-	-	-	-	-	-	-
543	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
544	-	-	-	-	-	-	-	-	3.89	-	-	-	-	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-
545	-	-	-	-	-	-	-	-	3.42	2.62	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-	-	-	-
546	-	-	-	-	-	-	-	-	0.555	-	-	-	-	-	22.8	-	-	-	-	-	-	-	-	-	-	-	-	-
547	-	-	-	-	-	-	-	-	1.70	-	-	-	-	-	19.6	-	-	-	-	-	-	-	-	-	-	-	-	-
548	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.6	-	-	-	-	-	-	-	-	-	-	-	-	-
549	-	-	-	-	-	-	-	-	0.708	11.6	-	-	-	-	-	-	5.04	0.362	-	-	-	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.98	-	-	-	-	-	-	-	-	-	-	-	-	-
551	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.1	-	-	-	-	-	-	-	-	-	-	-	-	-
552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.6	-	-	-	-	-	-	-	-	-	-	-	-	-
553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.3	-	-	-	-	-	-	-	-	-	-	-	-	-
554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.27	-	0.0001	-	-	-	6.40	-	-	-	-	-	-	-
555	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.41	-	-	-	-	-	16.1	-	-	-	-	-	-	-
556	-	-	-	-	-	-	-	-	-	0.142	-	-	-	-	9.01	-	-	-	-	-	-	-	-	-	-	-	-	-
557	-	-	-	-	-	-	-	-	-	1.93	-	-	-	-	-	-	0.0038	1.72	-	-	33.3	-	-	-	-	-	-	-
558	-	-	-	-	-	-	-	-	-	6.16	-	-	-	-	-	-	35.8	5.46	-	-	-	-	-	-	-	-	-	-
559	-	-	-	-	-	-	-	-	-	3.56	-	-	-	-	-	-	-	13.8	-	-	59.9	-	-	-	-	-	-	-
560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.98	-	-	-	43.2	-	-	-	-	-	-	-
561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
562	-	-	-	-	-	-	-	-	-	5.07	-	-	-	-	-	-	-	-	-	-	18.9	-	-	-	-	-	-	-
563	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-	-	-	-	59.0	-	-	-	-	-	-	-
564	-	-	-	-	-	-	-	-	-	3.44	-	-	-	-	-	-	-	4.50	-	-	36.1	-	-	-	-	-	-	-
565	-	-	-	-	0.213	-	-	-	-	0.971	-	-	-	-	-	-	-	3.07	-	-	21.1	0.0803	-	-	-	-	-	-
566	-	-	-	-	-	-	-	-	26.3	8.76	-	-	-	-	-	-	0.0203	-	-	-	44.0	-	-	-	-	-	-	-
567	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
568	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.13	-	-	3.77	-	-	-	-	-	-	-
569	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.5	-	-	-	-	-	-	-	-	-	-	-	-	-
578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.52	-	-	-	-	-	-	-	-	-	-	-	-	-
583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-
584	-	-	-	-	-	-	-	-	-	14.7	2.57	-	-	-	17.5	-	-	-	-	-	1.27	-	-	-	-	-	-	-
585	-	-	-	-	-	-	-	-	-	5.89	-	-	-	-	-	-	-	0.0306	-	-	19.2	-	-	-	-	-	-	-
586	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.7	-	-	-	-	-	-	-	-	-	-	-	-	-
587	-	30.8	-	-	0.0000	-	-	-	22.9	-	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-
590	-	-	-	-	0.610	-	-	-	-	-	-	-	-	-	-	-	-	1.09	-	-	2.24	-	-	-	-	-	-	-
591	-	5.95	-	-	-	-	-	-	-	7.06	-	-	-	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-1A. Percent of Buildout Development - Existing Conditions (2006)

	Percent of Buildout Net Acreage by Land Use Category																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
21	-	61%	-	-	-	-	-	-	12%	-	-	-	-	-	-	-	5%	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	15%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	4%	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19%	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8%	-	-	-	-	-	-	-	-	-
31	-	-	-	-	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12%	-	-	-	-	-	-	-	-	-
33	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	-	-	-	-	-	-	-	-
34	-	-	-	-	45%	-	-	-	-	-	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	9%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	31%	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	55%	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	76%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
40	-	4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	61%	-	-	-	-	-	-	-	-	51%	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5%	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	35%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	21%	-	-	87%	-	-	-	-	-	-	-
50	-	100%	-	-	-	-	-	61%	61%	91%	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	90%	-	-	28%	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	73%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	66%	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
57	-	-	-	-	9%	-	-	-	-	29%	-	-	-	25%	-	-	99%	56%	52%	-	1%	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	41%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	54%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	95%	-	89%	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	63%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	4%	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	48%	-	-	-	-	-	-	-	-	7%	-	-	-	-	-	-	-	-	-	-
84	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	48%	-	-	100%	-	-	100%	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	4%	-	-	-	-	-	-	-	-	-	-	-	-	-	44%	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2%	-	34%	-	-	-	-	-	-	-	-	-
101	-	-	-	-	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	42%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	81%	-	-	-	-	-	-	-	-	-	-	-	-	-	55%	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97%	-	-	100%	-	-	-	-	-	-	-	-	-	-
107	-	100%	-	-	-	-	-	-	87%	100%	-	-	-	-	-	-	54%	1%	-	-	100%	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52%	-	-	100%	-	-	-	-	-	-	-
109	-	-	-	-	-	-	-	-	85%	85%	-	-	-	-	-	-	100%	-	-	-	91%	-	-	-	-	-	-	-
110	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	99%	-	-	100%	-	-	-	-	-	-	-
111	-	85%	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-	80%	-	-	100%	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66%	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	77%	-	-	87%	-	-	-	-	-	-	-
114	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63%	-	-	62%	-	-	-	-	-	-	-
116	-	-	-	-	-	-	-	-	91%	97%	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	-	-
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
119	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	98%	-	-	-	-	-	-	-

Table B-1A. Percent of Buildout Development - Existing Conditions (2006)

	Percent of Buildout Net Acreage by Land Use Category																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
121	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
122	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	97%	-	-	-	-	-	-	-
123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	85%	-	-	-	-	-	-	-
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33%	-	-	100%	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39%	-	-	100%	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-	-	98%	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3%	-	-	95%	-	-	-	-	-	-	-
128	-	100%	-	-	-	-	-	-	100%	100%	100%	-	-	-	-	-	-	-	-	-	92%	-	-	-	-	-	-	-
129	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	100%	9%	-	-	-	-	-	-	-	-	-	-
132	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	-	47%	-	-	100%	-	-	-	-	-	-	-
133	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	99%	-	-	69%	-	-	95%	-	-	-	-	-	-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52%	-	-	93%	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
137	-	-	-	-	-	-	-	-	-	92%	-	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69%	-	-	86%	-	-	-	-	-	-	-
139	-	-	-	-	-	-	-	-	11%	78%	-	-	-	-	100%	-	%	31%	-	-	75%	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	100%	-	-	-	-	-	96%	-	-	-	-	-	-	-
144	-	92%	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	100%	-	-	-	100%	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	80%	-	-	-	86%	-	-	-	14%	-	-	88%	-	-	-	-	-	-	-
146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	46%	-	-	84%	-	-	-	-	-	-	-
147	-	-	-	-	-	-	-	-	-	89%	-	-	-	100%	-	-	100%	100%	-	-	53%	-	-	-	-	-	-	-
148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	60%	-	-	71%	-	-	-	-	-	-	-
149	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	97%	-	-	60%	-	-	97%	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
151	-	100%	-	-	-	-	-	-	100%	98%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
152	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	97%	-	-	-	-	-	100%	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	60%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	80%	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	74%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	4%	-	-	-	-	-	69%	-	-	100%	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89%	-	-	100%	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	85%	-	-	100%	-	-	-	-	100%	-	-	9%	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67%	-	-	100%	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75%	-	-	100%	-	-	-	-	-	-	-	-	-	-
210	-	%	-	-	-	-	-	-	-	100%	100%	-	-	-	89%	-	-	97%	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84%	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58%	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	97%	-	-	-	-	-	-	-	100%	-	-	-	-	62%	-	-	55%	-	-	65%	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80%	-	-	53%	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	68%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-
219	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	97%	-	-	93%	-	-	100%	100%	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	91%	18%	-	-	57%	98%	-	-	29%	-	-	-	-	-	-	-	-	-	-
221	-	43%	-	-	-	-	-	-	61%	100%	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
222	-	96%	-	-	-	-	-	-	-	100%	91%	-	-	95%	93%	-	-	6%	-	-	-	-	-	-	-	-	-	-
223	-	100%	-	-	-	-	-	-	-	7%	4%	-	-	27%	-	-	-	20%	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	84%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	72%	100%	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
231	-	100%	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	79%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
236	-	97%	-	-	-	-	-	-	83%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	-	100%	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	97%	55%	-	-	44%	-	-	-	-	-	-	-
347	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	56%	-	-	93%	-	-	-	-	-	-	-
371	-	-	-	-	100%	-	-	-	25%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-1A. Percent of Buildout Development - Existing Conditions (2006)

	Percent of Buildout Net Acreage by Land Use Category																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
372	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
373	-	-	-	-	-	-	-	-	68%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	-	100%	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	-	-
375	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
376	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76%	-	-	-	100%	-	-	-	-	-	-	-
377	-	-	-	-	-	-	-	-	-	67%	-	-	-	-	-	-	-	24%	-	-	83%	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
379	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	84%	-	-	-	-	-	-	-	-	-	-	-	-	-
380	-	74%	-	-	-	-	-	-	86%	72%	-	-	-	-	100%	-	-	7%	-	-	100%	-	-	-	-	-	-	-
381	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
382	-	-	-	-	-	-	-	-	100%	21%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
386	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
389	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	68%	-	-	-	-	-	-	-
391	-	-	-	-	-	-	-	-	96%	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
393	-	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	9%	-	-	100%	-	-	-	-	-	-	-
394	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	100%	51%	-	-	90%	-	-	-	-	-	-	-
395	-	60%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	48%	-	-	87%	-	-	-	-	-	-	-
396	-	-	-	-	-	-	-	-	100%	79%	94%	-	-	-	-	-	-	100%	-	-	71%	-	-	-	-	-	-	-
397	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	%	-	-	97%	8%	-	-	-	-	-	-
398	-	-	-	-	50%	-	-	-	-	100%	-	-	-	-	-	-	-	%	-	-	98%	18%	-	-	-	-	-	-
399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	22%	-	-	-	-	-	-	-	38%	-	-	73%	-	-	-	-	-	-	-
401	-	-	-	-	-	-	-	-	-	97%	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-
402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78%	-	-	93%	-	-	-	-	-	-	-
403	-	-	-	-	-	-	-	-	47%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404	-	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
406	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-
407	-	57%	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	98%	-	-	-	95%	-	-	-	-	-	-	-
408	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	89%	-	-	79%	-	-	-	-	-	-	-
409	-	36%	-	-	-	-	-	-	-	100%	-	-	-	-	68%	-	-	24%	-	-	70%	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88%	-	-	-	-	-	-	-	-	-	-	-	-	-
411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76%	-	-	-	-	-	87%	-	-	-	-	-	-	-
412	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
414	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
416	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-
417	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17%	-	-	1%	-	-	-	-	-	-	-	-	-	-
418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78%	-	-	-	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	87%	-	-	-	-	37%	-	-	52%	-	-	87%	100%	-	-	-	-	-	-
421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93%	-	-	20%	-	-	-	-	-	-	-	-	-	-
422	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	100%	-	-	63%	-	-	-	-	-	-	-	-	-	-
423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	98%	-	-	-	-	-	-	-
424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14%	-	-	94%	-	-	-	-	-	-	-
432	-	100%	-	-	-	-	-	-	90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
448	-	-	-	-	35%	-	-	-	36%	-	-	-	-	-	-	-	100%	-	33%	-	100%	-	-	-	-	-	-	-
449	-	-	23%	-	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	-	-	-	-	-	-	-	-
457	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
458	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
466	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	99%	-	100%	-	-	-	-	-	-	-	-	-	-	-
467	-	-	-	-	24%	-	-	-	-	-	-	-	-	-	-	-	-	11%	-	-	52%	100%	-	-	-	-	-	-
470	-	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	99%	-	-	-	-	-	-	-
512	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
513	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
514	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
515	-	-	-	-	-	-	-	-	-	93%	-	-	-	-	100%	-	-	100%	-	-	100%	-	-	-	-	-	-	-
516	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	83%	-	-	99%	-	-	-	-	-	-	-
517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-

Table B-1A. Percent of Buildout Development - Existing Conditions (2006)

	Percent of Buildout Net Acreage by Land Use Category																											
Land Use	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
518	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	99%	-	-	-	-	-	-	-
519	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	78%	-	-	-	-	-	-	-
520	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	93%	-	-	-	-	-	-	-
521	-	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	100%	-	-	-	98%	-	-	-	-	-	-	-
522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	92%	-	-	-	-	-	-	-
523	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
524	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	65%	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-
527	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
528	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	95%	-	-	-	-	-	-	-
529	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	64%	-	-	70%	-	-	-	-	-	-	-
530	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	5%	-	-	85%	-	-	-	-	-	-	-
531	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	13%	-	-	94%	-	-	-	-	-	-	-
532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27%	-	-	95%	-	-	-	-	-	-	-
533	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	85%	-	-	84%	-	-	-	-	-	-	-
534	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
535	-	100%	-	-	-	-	-	-	92%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
536	-	-	-	-	-	-	-	-	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
537	-	94%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	-	-	-	-	-	-
539	-	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	3%	-	-	100%	-	-	-	-	-	-	-
540	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
541	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
542	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	96%	-	100%	-	-	-	100%	-	-	-	-	-	-	-
543	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
544	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
545	-	-	-	-	-	-	-	-	100%	40%	-	-	-	-	83%	-	-	-	-	-	-	-	-	-	-	-	-	-
546	-	-	-	-	-	-	-	-	72%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
547	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
548	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
549	-	-	-	-	-	-	-	-	42%	97%	-	-	-	-	-	-	100%	6%	-	-	-	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
551	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-
553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	100%	-	-	-	100%	-	-	-	-	-	-	-
555	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	99%	-	-	-	-	-	-	-
556	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	93%	-	-	-	-	-	-	-	-	-	-	-	-	-
557	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	99%	-	-	-	-	-	-	-
558	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-
559	-	-	-	-	-	-	-	-	-	64%	-	-	-	-	-	-	-	98%	-	-	100%	-	-	-	-	-	-	-
560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	90%	-	-	-	-	-	-	-
561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
562	-	-	-	-	-	-	-	-	-	45%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
563	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
564	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	16%	-	-	90%	-	-	-	-	-	-	-
565	-	-	-	-	41%	-	-	-	-	100%	-	-	-	-	-	-	-	23%	-	-	95%	22%	-	-	-	-	-	-
566	-	-	-	-	-	-	-	-	100%	99%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
567	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
568	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17%	-	-	62%	-	-	-	-	-	-	-
569	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	-	-	-	-	-	-
583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
584	-	-	-	-	-	-	-	-	-	87%	100%	-	-	-	99%	-	-	-	-	-	100%	-	-	-	-	-	-	-
585	-	-	-	-	-	-	-	-	-	97%	-	-	-	-	-	-	-	100%	-	-	79%	-	-	-	-	-	-	-
586	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-
587	-	100%	-	-	%	-	-	-	81%	-	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	-	-	-	-
590	-	-	-	-	24%	-	-	-	-	-	-	-	-	-	-	-	-	23%	-	-	34%	-	-	-	-	-	-	-
591	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-2. Detailed Land Use and Development Condition Data - 2015

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
21	-	3.90	-	-	-	-	-	-	1.54	-	-	-	-	-	-	-	0.303	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	1.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	5.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	2.73	-	-	0.0251	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	1.71	-	-	-	-	-	-	-	-	-	-	-	-	-	0.159	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.36	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.76	-	-	-	-	-	-	-	-	-
31	-	-	-	-	1.66	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.66	-	-	-	-	-	-	-	-	-
33	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	6.78	-	-	-	-	-	-	-	-	-
34	-	-	-	-	9.15	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0000	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.19	0.858	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	1.51	-	-	-	-	-	-	-	-	7.63	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	3.27	-	-	-	-	-	-	-	417	9.15	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	9.81	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	34.4	-	-	-	-	-	-	-	0.197	-	-	-	-	-	-	-	-	-	-	-
40	-	23.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	30.7	-	-	-	-	-	-	-	-	5.74	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.37	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	8.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.52	1.30	-	-	45.7	-	-	-	-	-	-	-
50	-	1.35	-	-	-	-	-	0.0168	120	5.87	-	-	-	-	-	-	-	-	-	-	-	4.21	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.61	34.3	-	-	2.82	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	45.1	-	-	-	-	-	-	-	-	4.08	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	25.2	-	-	-	-	-	-	-	-	0.0120	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.78	196	-	-	0.686	-	-	-	-	-	-	-
57	-	-	-	-	43.4	-	-	-	-	17.1	-	-	-	1.20	-	-	16.3	4.05	36.4	-	5.19	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-	-	5.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	28.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	9.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	5.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	17.5	-	-	-	-	-	-	-	5.73	-	0.0067	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	33.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.98	-	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-	-	-	3.59	-	-	30.7	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.03	-	-	-	2.36	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.03	-	-	7.36	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	8.92	-	-	-	-	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-
84	-	-	-	-	-	-	-	-	-	8.15	-	-	-	-	17.8	-	-	3.84	-	-	14.5	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	41.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	2.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	-	-	-	-	-	-	-
97	-	-	-	-	4.32	-	-	-	-	-	-	-	-	-	-	-	-	-	33.9	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	3.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.203	-	10.6	-	-	-	-	-	-	-	-	-
101	-	-	-	-	32.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	46.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	246	-	-	-	-	-	-	-	-	-	-	-	-	-	31.2	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.8	-	-	0.0909	-	-	-	-	-	-	-	-	-	-
107	-	0.0001	-	-	-	-	-	-	54.4	0.0024	-	-	-	-	-	-	3.11	3.42	-	-	3.47	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.66	-	-	4.98	-	-	-	-	-	-	-
109	-	-	-	-	-	-	-	-	86.1	5.52	-	-	-	-	-	-	4.98	-	-	-	13.4	-	-	-	-	-	-	-
110	-	0.0834	-	-	-	-	-	-	-	3.97	-	-	-	-	-	-	-	39.6	-	-	2.96	-	-	-	-	-	-	-
111	-	10.2	-	-	-	-	-	-	-	14.4	-	-	-	-	-	-	-	5.58	-	-	3.85	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.618	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	13.1	-	-	53.7	-	-	-	-	-	-	-
114	-	-	-	-	-	-	-	-	-	0.0013	-	-	-	-	-	-	-	-	-	-	14.5	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.946	-	-	5.94	-	-	-	-	-	-	-
116	-	-	-	-	-	-	-	-	15.4	14.5	-	-	-	-	-	-	-	6.10	-	-	-	-	-	-	-	-	-	-

Table B-2. Detailed Land Use and Development Condition Data - 2015

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	-	-	15.4	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	8.16	-	-	20.1	-	-	-	-	-	-	-
119	-	-	-	-	-	-	-	-	-	7.41	-	-	-	-	-	-	49.0	-	-	-	65.8	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.171	-	-	14.6	-	-	-	-	-	-	-
121	-	-	-	-	-	-	-	-	-	17.9	-	-	-	-	-	-	-	-	-	-	13.1	-	-	-	-	-	-	-
122	-	-	-	-	-	-	-	-	18.7	4.12	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-
123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	27.1	-	-	-	-	-	-	-
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.796	-	-	30.9	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.14	-	-	13.1	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0048	-	-	17.3	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.864	-	-	31.9	-	-	-	-	-	-	-
128	-	13.6	-	-	-	-	-	-	0.198	11.2	0.497	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	-	-	-
129	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.7	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	2.19	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.2	-	5.38	4.33	-	-	-	-	-	-	-	-	-	-
132	-	-	-	-	-	-	-	-	-	3.97	-	-	-	-	9.49	-	-	1.92	-	-	31.7	-	-	-	-	-	-	-
133	-	-	-	-	-	-	-	-	-	4.48	-	-	-	-	39.0	-	-	1.62	-	-	9.65	-	-	-	-	-	-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.997	-	-	11.9	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.12	-	-	16.2	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.2	-	-	-	-	-	-	-
137	-	-	-	-	-	-	-	-	-	3.10	-	-	-	-	-	-	-	-	-	-	24.6	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.51	-	-	18.2	-	-	-	-	-	-	-
139	-	-	-	-	-	-	-	-	0.965	21.6	-	-	-	-	25.2	-	0.0000	8.03	-	-	74.2	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	2.34	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.63	-	-	-	3.52	-	-	-	-	-	-	-
142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.7	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	7.71	-	-	-	5.21	0.421	-	-	-	-	-	59.6	-	-	-	-	-	-	-
144	-	7.10	-	-	-	-	-	-	-	6.70	-	-	-	-	87.5	-	11.2	1.37	-	-	8.90	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	1.97	-	-	-	1.85	-	-	-	1.08	-	-	25.7	-	-	-	-	-	-	-
146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.193	-	-	1.50	-	-	10.9	-	-	-	-	-	-	-
147	-	-	-	-	-	-	-	-	-	12.7	-	-	-	5.45	-	-	5.61	4.51	-	-	8.55	-	-	-	-	-	-	-
148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.32	-	-	1.84	-	-	1.20	-	-	-	-	-	-	-
149	-	-	-	-	-	-	-	-	-	3.93	-	-	-	-	8.60	-	-	1.45	-	-	3.71	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	6.12	-	-	-	-	-	-	18.1	-	-	-	7.23	-	-	-	-	-	-	-
151	-	20.5	-	-	-	-	-	-	0.0019	16.9	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-
152	-	4.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	-	-	-	21.1	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.13	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.14	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.5	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.6	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	1.41	-	-	-	-	7.11	-	-	-	-	-	6.66	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	31.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	83.7	-	-	-	-	-	-	-	0.0024	0.0062	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	84.9	-	-	-	-	-	-	-	-	2.06	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.39	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	0.0303	-	-	-	-	-	57.3	-	-	2.81	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.2	-	-	11.2	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	49.6	-	-	0.146	-	-	-	-	0.146	-	-	5.18	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.2	-	-	3.79	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.0	-	-	4.69	-	-	-	-	-	-	-	-	-	-
210	-	0.0009	-	-	-	-	-	-	-	7.41	88.3	-	-	-	4.18	-	-	32.3	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98.6	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.0	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	4.64	-	-	-	-	-	-	-	10.5	-	-	-	-	17.6	-	-	15.8	-	-	36.1	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60.3	-	-	2.86	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	26.1	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	0.0058	-	-	-	-	-
219	-	-	-	-	-	-	8.50	-	-	0.0085	-	-	-	-	33.0	-	-	14.2	-	-	5.81	2.77	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	4.34	0.0146	-	-	3.56	46.1	-	-	5.34	-	-	-	-	-	-	-	-	-	-
221	-	7.52	-	-	-	-	-	-	12.2	7.68	20.0	-	-	-	-	-	-	0.0023	-	-	-	-	-	-	-	-	-	-
222	-	51.8	-	-	-	-	-	-	-	18.4	44.9	-	-	24.3	18.7	-	-	0.774	-	-	-	-	-	-	-	-	-	-
223	-	10.6	-	-	-	-	-	-	-	0.0017	0.276	-	-	0.920	-	-	-	3.94	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	22.5	-	-	-	-	-	-	-	-	10.3	-	-	-	-	-	-	-	-	-	-

Table B-2. Detailed Land Use and Development Condition Data - 2015

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
226	-	-	-	-	-	-	-	-	1.99	0.141	-	-	-	-	-	-	30.2	31.8	-	-	7.18	-	-	-	-	-	-	-
231	-	61.6	-	0.0852	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	0.0073	-	-	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	14.1	-	-	-	-	-	-	-	59.3	-	-	-	-	-	-	-	-	-	-	-
236	-	17.7	-	-	-	-	-	-	37.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	-	9.48	-	-	-	-	-	-	-	15.9	-	-	-	-	-	-	4.44	4.37	-	-	9.18	-	-	-	-	-	-	-
347	-	0.0075	-	-	-	-	-	-	-	8.10	-	-	-	-	-	-	-	16.1	-	-	96.8	-	-	-	-	-	-	-
371	-	-	-	-	14.5	-	-	-	4.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
372	-	-	-	-	-	-	-	-	24.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
373	-	-	-	-	-	-	-	-	75.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	-	4.19	-	-	-	-	-	-	-	23.3	-	-	-	-	-	-	-	-	-	-	13.6	-	-	-	-	-	-	-
375	-	0.453	-	-	-	-	-	-	-	6.74	-	-	-	-	-	-	0.0022	9.12	-	-	35.0	-	-	-	-	-	-	-
376	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	0.0000	-	-	12.3	-	-	-	-	-	-	-
377	-	-	-	-	-	-	-	-	-	23.9	-	-	-	-	-	-	-	5.14	-	-	4.34	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.5	-	-	-	-	-	-	-
379	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	96.7	-	-	2.28	-	-	-	-	-	-	-	-	-	-
380	-	30.2	-	-	-	-	-	-	12.4	21.3	-	-	-	-	13.2	-	-	3.31	-	-	40.3	-	-	-	-	-	-	-
381	-	-	-	-	-	-	-	-	-	32.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
382	-	-	-	-	-	-	-	-	88.7	0.269	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0004	-	-	-	9.02	-	-	-	-	-	-	-
386	-	-	-	-	-	-	-	-	-	3.48	-	-	-	-	-	-	19.5	-	-	-	19.1	-	-	-	-	-	-	-
389	-	55.2	-	-	-	-	-	-	0.0151	-	-	-	-	-	-	-	-	-	-	-	2.62	-	-	-	-	-	-	-
391	-	-	-	-	-	-	-	-	18.1	18.9	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-
393	-	-	-	-	-	-	-	-	42.0	11.1	-	-	-	-	-	-	-	1.27	-	-	13.6	-	-	-	-	-	-	-
394	-	6.32	-	-	-	-	-	-	6.76	11.2	-	-	-	-	-	-	0.0002	2.66	-	-	68.0	-	-	-	-	-	-	-
395	-	15.0	-	-	-	-	-	-	-	8.03	-	-	-	-	-	-	8.45	4.62	-	-	82.6	-	-	-	-	-	-	-
396	-	-	-	-	-	-	-	-	2.19	22.2	11.1	-	-	-	-	-	-	0.429	-	-	4.43	-	-	-	-	-	-	-
397	-	-	-	-	0.0138	-	-	-	-	-	-	-	-	-	-	-	-	0.0049	-	-	32.9	0.0197	-	-	-	-	-	-
398	-	-	-	-	0.0029	-	-	-	-	2.51	-	-	-	-	-	-	-	0.0322	-	-	65.9	0.0018	-	-	-	-	-	-
399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	0.684	-	-	-	-	-	-	-	12.0	-	-	35.5	-	-	-	-	-	-	-
401	-	-	-	-	-	-	-	-	-	18.0	-	-	-	-	6.69	-	-	-	-	-	4.76	-	-	-	-	-	-	-
402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.3	-	-	41.8	-	-	-	-	-	-	-
403	-	-	-	-	-	-	-	-	25.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404	-	-	-	-	-	-	-	-	32.2	-	-	-	-	-	-	-	-	5.08	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	23.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
406	-	17.1	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-	53.3	-	-	-	-	-	-	-
407	-	22.0	-	-	-	-	-	-	-	50.0	-	-	-	-	-	-	0.0134	-	-	-	207	-	-	-	-	-	-	-
408	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	17.2	-	-	96.3	-	-	-	-	-	-	-
409	-	3.76	-	-	-	-	-	-	-	18.5	-	-	-	-	25.3	-	-	4.87	-	-	59.1	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54.2	-	-	-	-	-	-	-	-	-	-	-	-	-
411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.9	-	-	-	-	-	28.8	-	-	-	-	-	-	-
412	-	-	-	-	-	-	-	-	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	-	-	-	-	-	-	-	-	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
414	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	-	21.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	-	-	-	-	-	-	-	-
416	-	-	-	-	-	-	137	-	-	-	-	-	-	-	12.4	-	-	1.70	-	-	-	-	-	-	-	-	-	-
417	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	19.1	-	-	-	-	-	-	-	-	-	-
418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.31	-	-	1.72	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	16.2	-	-	-	-	10.7	-	-	2.14	-	-	3.95	5.79	-	-	-	-	-	-
421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29.0	-	-	0.349	-	-	-	-	-	-	-	-	-	-
422	-	-	-	-	-	-	-	-	112	-	-	-	-	-	1.63	-	-	22.3	-	-	-	-	-	-	-	-	-	-
423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.905	-	-	23.6	-	-	-	-	-	-	-
424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-
427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.86	-	-	19.3	-	-	-	-	-	-	-
428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-	14.4	-	-	-	-	-	-	-
429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.309	-	-	6.32	-	-	-	-	-	-	-
432	-	4.21	-	-	-	-	-	-	93.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
448	-	-	-	-	87.9	-	-	-	3.60	-	-	-	-	-	-	-	0.0026	-	54.1	-	0.0000	-	-	-	-	-	-	-
449	-	-	0.932	-	1.58	-	-	-	-	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	-	-	-	-	-

Table B-2. Detailed Land Use and Development Condition Data - 2015

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
457	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
458	-	-	-	-	-	-	-	-	55.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
466	-	0.0105	-	-	-	-	-	-	1.27	-	-	-	-	-	12.1	-	2.99	-	-	-	-	-	-	-	-	-	-	-
467	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	4.53	-	-	20.5	0.0017	-	-	-	-	-	-
470	-	-	-	-	-	-	-	-	-	1.81	-	-	-	-	-	-	-	2.16	-	-	2.04	-	-	-	-	-	-	-
480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.31	-	-	-	36.5	-	-	-	-	-	-	-
512	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	18.7	-	-	-	-	-	-	-	-	-	-	-
513	-	0.442	-	-	-	-	-	-	3.89	1.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
514	-	-	-	-	-	-	-	-	-	5.02	-	-	-	-	-	-	-	92.6	-	-	-	-	-	-	-	-	-	-
515	-	-	-	-	-	-	-	-	-	5.46	-	-	-	-	4.82	-	-	14.0	-	-	10.00	-	-	-	-	-	-	-
516	-	-	-	-	-	-	-	-	-	10.9	-	-	-	-	-	-	-	8.04	-	-	20.3	-	-	-	-	-	-	-
517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0029	9.31	-	-	14.9	-	-	-	-	-	-	-
518	-	-	-	-	-	-	-	-	-	4.92	-	-	-	-	-	-	0.0003	1.92	-	-	12.2	-	-	-	-	-	-	-
519	-	-	-	-	-	-	-	-	-	5.96	-	-	-	-	-	-	9.71	-	-	-	30.9	-	-	-	-	-	-	-
520	-	-	-	-	-	-	-	-	-	3.84	-	-	-	-	-	-	-	-	-	-	20.9	-	-	-	-	-	-	-
521	-	-	-	-	-	-	-	-	-	9.74	-	-	-	-	-	-	0.0065	-	-	-	28.5	-	-	-	-	-	-	-
522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	36.2	-	-	-	-	-	-	-
523	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	-	-
524	-	-	-	-	-	-	-	-	-	0.339	-	-	-	-	-	-	-	-	-	-	27.7	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47.6	-	-	-	-	-	-	-
526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.7	-	-	-	-	-	-	-
527	-	-	-	-	-	-	-	-	-	0.0034	-	-	-	-	-	-	-	-	-	-	36.2	-	-	-	-	-	-	-
528	-	-	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	0.833	-	-	4.83	-	-	-	-	-	-	-
529	-	-	-	-	-	-	-	-	-	1.76	-	-	-	-	-	-	-	3.67	-	-	36.5	-	-	-	-	-	-	-
530	-	-	-	-	-	-	-	-	-	1.30	-	-	-	-	-	-	-	0.333	-	-	12.0	-	-	-	-	-	-	-
531	-	-	-	-	0.225	-	-	-	-	3.64	-	-	-	-	-	-	9.51	2.99	-	-	36.2	-	-	-	-	-	-	-
532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	14.0	-	-	-	-	-	-	-
533	-	-	-	-	-	-	-	-	-	1.32	-	-	-	-	-	-	-	2.62	-	-	10.7	-	-	-	-	-	-	-
534	-	-	-	-	0.110	-	-	-	-	5.34	-	-	-	-	-	-	-	24.7	-	-	-	-	-	-	-	-	-	-
535	-	2.36	-	-	-	-	-	-	22.6	-	-	-	-	-	4.71	-	-	-	-	-	-	-	-	-	-	-	-	-
536	-	-	-	-	-	-	-	-	28.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
537	-	24.8	-	-	-	-	-	-	7.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.41	-	-	-	-	-	-	-	-	-	-	-	-	-
539	-	-	-	-	-	-	-	-	14.1	6.61	-	-	-	-	-	-	-	0.370	-	-	0.0811	-	-	-	-	-	-	-
540	-	-	-	-	-	-	-	-	-	6.03	-	-	-	-	-	-	-	-	-	-	0.0689	-	-	-	-	-	-	-
541	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	-	-	-	1.86	-	-	21.3	-	-	-	-	-	-	-
542	-	1.61	-	-	-	-	-	-	-	8.75	-	-	-	-	15.3	-	0.515	-	-	-	1.48	-	-	-	-	-	-	-
543	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
544	-	-	-	-	-	-	-	-	3.89	-	-	-	-	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-
545	-	-	-	-	-	-	-	-	3.42	2.62	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-	-	-	-
546	-	-	-	-	-	-	-	-	0.555	-	-	-	-	-	22.8	-	-	-	-	-	-	-	-	-	-	-	-	-
547	-	-	-	-	-	-	-	-	1.70	-	-	-	-	-	19.6	-	-	-	-	-	-	-	-	-	-	-	-	-
548	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.6	-	-	-	-	-	-	-	-	-	-	-	-	-
549	-	-	-	-	-	-	-	-	0.708	11.6	-	-	-	-	-	-	5.04	0.362	-	-	-	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.98	-	-	-	-	-	-	-	-	-	-	-	-	-
551	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.1	-	-	-	-	-	-	-	-	-	-	-	-	-
552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.6	-	-	-	-	-	-	-	-	-	-	-	-	-
553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.3	-	-	-	-	-	-	-	-	-	-	-	-	-
554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.27	-	0.0001	-	-	-	6.40	-	-	-	-	-	-	-
555	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.41	-	-	-	-	-	16.1	-	-	-	-	-	-	-
556	-	-	-	-	-	-	-	-	-	0.142	-	-	-	-	9.01	-	-	-	-	-	-	-	-	-	-	-	-	-
557	-	-	-	-	-	-	-	-	-	1.93	-	-	-	-	-	-	0.0038	1.72	-	-	33.3	-	-	-	-	-	-	-
558	-	-	-	-	-	-	-	-	-	6.16	-	-	-	-	-	-	35.8	5.46	-	-	-	-	-	-	-	-	-	-
559	-	-	-	-	-	-	-	-	-	3.56	-	-	-	-	-	-	-	13.8	-	-	59.9	-	-	-	-	-	-	-
560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.98	-	-	-	43.2	-	-	-	-	-	-	-
561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
562	-	-	-	-	-	-	-	-	-	5.07	-	-	-	-	-	-	-	-	-	-	18.9	-	-	-	-	-	-	-
563	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-	-	-	-	59.0	-	-	-	-	-	-	-
564	-	-	-	-	0.0738	-	-	-	-	3.44	-	-	-	-	-	-	-	4.50	-	-	36.1	-	-	-	-	-	-	-
565	-	-	-	-	0.521	-	-	-	-	0.971	-	-	-	-	-	-	-	3.07	-	-	21.1	0.0803	-	-	-	-	-	-
566	-	-	-	-	-	-	-	-	26.3	8.76	-	-	-	-	-	-	0.0203	-	-	-	44.0	-	-	-	-	-	-	-
567	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
568	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.13	-	-	6.11	-	-	-	-	-	-	-

Table B-2. Detailed Land Use and Development Condition Data - 2015

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
569	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.5	-	-	-	-	-	-	-	-	-	-	-	-	-
578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.52	-	-	-	-	-	-	-	-	-	-	-	-	-
583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-
584	-	-	-	-	-	-	-	-	-	14.7	2.57	-	-	-	17.5	-	-	-	-	-	1.27	-	-	-	-	-	-	-
585	-	-	-	-	-	-	-	-	-	5.89	-	-	-	-	-	-	-	0.0306	-	-	19.2	-	-	-	-	-	-	-
586	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.7	-	-	-	-	-	-	-	-	-	-	-	-	-
587	-	30.8	-	-	3.37	-	-	-	22.9	-	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-
590	-	-	-	-	0.610	-	-	-	-	-	-	-	-	-	-	-	-	1.09	-	-	2.24	-	-	-	-	-	-	-
591	-	5.95	-	-	-	-	-	-	-	7.06	-	-	-	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-2A. Percent of Buidout Development - 2015

Land Use Polygon ID	City: - Metro: CC	C CG	- CN	- CO	- FF	- IA	- IH	- IL	IN IMU	RM, RH MFR1	RMR MFR2	- MFR3	- MFR4	MU MUC1	SCPA MUC2	- MUC3	- PF	FP, OS POS	- RRFU	- SFR1	RL SFR2	- SFR3	- SFR4	- SFR5	- SFR6	- SFR7	- SFR8	- SFR9
	Percent of Buildout Net Acreage by Land Use Category																											
21	-	61%	-	-	-	-	-	-	12%	-	-	-	-	-	-	-	5%	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	15%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	4%	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19%	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8%	-	-	-	-	-	-	-	-	-
31	-	-	-	-	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12%	-	-	-	-	-	-	-	-	-
33	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	-	-	-	-	-	-	-	-
34	-	-	-	-	45%	-	-	-	-	-	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	34%	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	9%	-	-	-	-	-	-	-	-	34%	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	31%	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	55%	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	76%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
40	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	61%	-	-	-	-	-	-	-	-	51%	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18%	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	62%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	21%	-	-	87%	-	-	-	-	-	-	-
50	-	100%	-	-	-	-	-	61%	65%	91%	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	90%	-	-	28%	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	73%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	66%	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
57	-	-	-	-	94%	-	-	-	-	29%	-	-	-	25%	-	-	99%	56%	61%	-	100%	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	41%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	54%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	16%	-	-	-	-	-	-	-	95%	-	89%	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	63%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	48%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
84	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	48%	-	-	100%	-	-	100%	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	13%	-	-	-	-	-	-	-	-	-
97	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2%	-	43%	-	-	-	-	-	-	-	-	-
101	-	-	-	-	48%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	29%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	98%	-	-	-	-	-	-	-	-	-	-	-	-	-	55%	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97%	-	-	100%	-	-	-	-	-	-	-	-	-	-
107	-	100%	-	-	-	-	-	-	90%	100%	-	-	-	-	-	-	54%	35%	-	-	100%	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65%	-	-	100%	-	-	-	-	-	-	-
109	-	-	-	-	-	-	-	-	85%	85%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
110	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	99%	-	-	100%	-	-	-	-	-	-	-
111	-	100%	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-	80%	-	-	100%	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66%	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	79%	-	-	87%	-	-	-	-	-	-	-
114	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63%	-	-	81%	-	-	-	-	-	-	-
116	-	-	-	-	-	-	-	-	91%	97%	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	-	-

Table B-2A. Percent of Buidout Development - 2015

Land Use	Percent of Buildout Net Acreage by Land Use Category																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
119	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	98%	-	-	-	-	-	-	-
121	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
122	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	92%	-	-	-	-	-	-	-
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33%	-	-	100%	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66%	-	-	100%	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-	-	98%	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33%	-	-	97%	-	-	-	-	-	-	-
128	-	100%	-	-	-	-	-	-	100%	100%	100%	-	-	-	-	-	-	-	-	-	92%	-	-	-	-	-	-	-
129	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	100%	39%	-	-	-	-	-	-	-	-	-	-
132	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	-	47%	-	-	100%	-	-	-	-	-	-	-
133	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	99%	-	-	69%	-	-	95%	-	-	-	-	-	-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52%	-	-	93%	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
137	-	-	-	-	-	-	-	-	-	92%	-	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69%	-	-	86%	-	-	-	-	-	-	-
139	-	-	-	-	-	-	-	-	11%	78%	-	-	-	-	100%	-	%	47%	-	-	75%	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	100%	-	-	-	-	-	96%	-	-	-	-	-	-	-
144	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	100%	34%	-	-	100%	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	80%	-	-	-	86%	-	-	-	38%	-	-	93%	-	-	-	-	-	-	-
146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	46%	-	-	84%	-	-	-	-	-	-	-
147	-	-	-	-	-	-	-	-	-	89%	-	-	-	100%	-	-	100%	100%	-	-	69%	-	-	-	-	-	-	-
148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	60%	-	-	71%	-	-	-	-	-	-	-
149	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	97%	-	-	60%	-	-	97%	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
151	-	100%	-	-	-	-	-	-	100%	98%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
152	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	97%	-	-	-	-	-	100%	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	60%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	74%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	4%	-	-	-	-	-	69%	-	-	100%	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89%	-	-	100%	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	85%	-	-	100%	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67%	-	-	100%	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75%	-	-	100%	-	-	-	-	-	-	-	-	-	-
210	-	%	-	-	-	-	-	-	-	100%	100%	-	-	-	89%	-	-	100%	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84%	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58%	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	62%	-	-	57%	-	-	100%	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80%	-	-	55%	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	68%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-
219	-	-	-	-	-	-	30%	-	-	22%	-	-	-	-	97%	-	-	100%	-	-	100%	100%	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	91%	18%	-	-	57%	98%	-	-	100%	-	-	-	-	-	-	-	-	-	-
221	-	43%	-	-	-	-	-	-	61%	100%	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
222	-	96%	-	-	-	-	-	-	-	100%	91%	-	-	95%	93%	-	-	100%	-	-	-	-	-	-	-	-	-	-
223	-	100%	-	-	-	-	-	-	-	7%	4%	-	-	27%	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	84%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-

Table B-2A. Percent of Buidout Development - 2015

Land Use	Percent of Buildout Net Acreage by Land Use Category																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
226	-	-	-	-	-	-	-	-	72%	100%	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
231	-	100%	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	79%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
236	-	100%	-	-	-	-	-	-	83%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	-	100%	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	97%	57%	-	-	100%	-	-	-	-	-	-	-
347	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	58%	-	-	100%	-	-	-	-	-	-	-
371	-	-	-	-	100%	-	-	-	25%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
372	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
373	-	-	-	-	-	-	-	-	68%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	-	100%	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	-	-
375	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
376	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76%	34%	-	-	100%	-	-	-	-	-	-	-
377	-	-	-	-	-	-	-	-	-	67%	-	-	-	-	-	-	-	40%	-	-	83%	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
379	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	84%	-	-	34%	-	-	-	-	-	-	-	-	-	-
380	-	100%	-	-	-	-	-	-	86%	72%	-	-	-	-	100%	-	-	39%	-	-	100%	-	-	-	-	-	-	-
381	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
382	-	-	-	-	-	-	-	-	100%	21%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
386	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
389	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	84%	-	-	-	-	-	-	-
391	-	-	-	-	-	-	-	-	96%	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
393	-	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	9%	-	-	100%	-	-	-	-	-	-	-
394	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	100%	51%	-	-	90%	-	-	-	-	-	-	-
395	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	48%	-	-	87%	-	-	-	-	-	-	-
396	-	-	-	-	-	-	-	-	100%	79%	94%	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
397	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	%	-	-	100%	8%	-	-	-	-	-	-
398	-	-	-	-	50%	-	-	-	-	100%	-	-	-	-	-	-	-	%	-	-	100%	18%	-	-	-	-	-	-
399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	22%	-	-	-	-	-	-	-	49%	-	-	73%	-	-	-	-	-	-	-
401	-	-	-	-	-	-	-	-	-	97%	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-
402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78%	-	-	93%	-	-	-	-	-	-	-
403	-	-	-	-	-	-	-	-	47%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404	-	-	-	-	-	-	-	-	30%	-	-	-	-	-	-	-	-	34%	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
406	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-
407	-	100%	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	98%	-	-	-	95%	-	-	-	-	-	-	-
408	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	89%	-	-	79%	-	-	-	-	-	-	-
409	-	36%	-	-	-	-	-	-	-	100%	-	-	-	-	68%	-	-	24%	-	-	70%	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88%	-	-	-	-	-	-	-	-	-	-	-	-	-
411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76%	-	-	-	-	-	87%	-	-	-	-	-	-	-
412	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
414	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
416	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	99%	-	-	100%	-	-	-	-	-	-	-	-	-	-
417	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17%	-	-	100%	-	-	-	-	-	-	-	-	-	-
418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78%	-	-	100%	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	87%	-	-	-	-	37%	-	-	54%	-	-	87%	100%	-	-	-	-	-	-
421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93%	-	-	24%	-	-	-	-	-	-	-	-	-	-
422	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-	-	-	-
423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	98%	-	-	-	-	-	-	-
424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43%	-	-	94%	-	-	-	-	-	-	-
432	-	100%	-	-	-	-	-	-	90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
448	-	-	-	-	72%	-	-	-	36%	-	-	-	-	-	-	-	100%	-	33%	-	100%	-	-	-	-	-	-	-
449	-	-	23%	-	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	-	-	-	-	-	-	-	-	-

Table B-2A. Percent of Buidout Development - 2015

Land Use	Percent of Buildout Net Acreage by Land Use Category																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
457	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
458	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
466	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	99%	-	100%	-	-	-	-	-	-	-	-	-	-	-
467	-	-	-	-	24%	-	-	-	-	-	-	-	-	-	-	-	-	11%	-	-	52%	100%	-	-	-	-	-	-
470	-	-	-	-	-	-	-	-	-	90%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	99%	-	-	-	-	-	-	-
512	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
513	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
514	-	-	-	-	-	-	-	-	-	95%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
515	-	-	-	-	-	-	-	-	-	93%	-	-	-	-	100%	-	-	100%	-	-	100%	-	-	-	-	-	-	-
516	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	83%	-	-	99%	-	-	-	-	-	-	-
517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	100%	-	-	-	-	-	-	-
518	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	99%	-	-	-	-	-	-	-
519	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	-	-	-	78%	-	-	-	-	-	-	-
520	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	93%	-	-	-	-	-	-	-
521	-	-	-	-	-	-	-	-	-	98%	-	-	-	-	-	-	100%	-	-	-	98%	-	-	-	-	-	-	-
522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	92%	-	-	-	-	-	-	-
523	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
524	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	65%	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-
526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94%	-	-	-	-	-	-	-
527	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
528	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	95%	-	-	-	-	-	-	-
529	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	64%	-	-	70%	-	-	-	-	-	-	-
530	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	5%	-	-	85%	-	-	-	-	-	-	-
531	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	100%	13%	-	-	94%	-	-	-	-	-	-	-
532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27%	-	-	95%	-	-	-	-	-	-	-
533	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	85%	-	-	84%	-	-	-	-	-	-	-
534	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-
535	-	100%	-	-	-	-	-	-	92%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
536	-	-	-	-	-	-	-	-	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
537	-	100%	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
539	-	-	-	-	-	-	-	-	98%	100%	-	-	-	-	-	-	-	3%	-	-	100%	-	-	-	-	-	-	-
540	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
541	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	100%	-	-	100%	-	-	-	-	-	-	-
542	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	96%	-	100%	-	-	-	100%	-	-	-	-	-	-	-
543	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
544	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
545	-	-	-	-	-	-	-	-	100%	40%	-	-	-	-	83%	-	-	-	-	-	-	-	-	-	-	-	-	-
546	-	-	-	-	-	-	-	-	72%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
547	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
548	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
549	-	-	-	-	-	-	-	-	42%	97%	-	-	-	-	-	-	100%	6%	-	-	-	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
551	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-
553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	100%	-	-	-	100%	-	-	-	-	-	-	-
555	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	99%	-	-	-	-	-	-	-
556	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	93%	-	-	-	-	-	-	-	-	-	-	-	-	-
557	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	99%	-	-	-	-	-	-	-
558	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-
559	-	-	-	-	-	-	-	-	-	64%	-	-	-	-	-	-	-	98%	-	-	100%	-	-	-	-	-	-	-
560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	90%	-	-	-	-	-	-	-
561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
562	-	-	-	-	-	-	-	-	-	45%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
563	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-
564	-	-	-	-	10%	-	-	-	-	96%	-	-	-	-	-	-	-	16%	-	-	90%	-	-	-	-	-	-	-
565	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	-	23%	-	-	95%	22%	-	-	-	-	-	-
566	-	-	-	-	-	-	-	-	100%	99%	-	-	-	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-	-
567	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
568	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17%	-	-	100%	-	-	-	-	-	-	-

Table B-2A. Percent of Buidout Development - 2015

Land Use	Percent of Buildout Net Acreage by Land Use Category																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
569	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96%	-	-	-	-	-	-	-	-	-	-	-	-	-
583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-
584	-	-	-	-	-	-	-	-	-	87%	100%	-	-	-	99%	-	-	-	-	-	100%	-	-	-	-	-	-	-
585	-	-	-	-	-	-	-	-	-	97%	-	-	-	-	-	-	-	100%	-	-	79%	-	-	-	-	-	-	-
586	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	-	-	-	-	-	-	-	-	-	-	-	-	-
587	-	100%	-	-	100%	-	-	-	81%	-	-	-	-	-	-	-	-	80%	-	-	-	-	-	-	-	-	-	-
590	-	-	-	-	24%	-	-	-	-	-	-	-	-	-	-	-	-	23%	-	-	34%	-	-	-	-	-	-	-
591	-	100%	-	-	-	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B-3. Detailed Land Use and Development Condition Data - Buildout

Land Use Polygon ID	City: - Metro: CC	C CG	- CN	- CO	- FF	- IA	- IH	- IL	IN IMU	RM, RH MFR1	RMR MFR2	- MFR3	- MFR4	MU MUC1	SCPA MUC2	- MUC3	- PF	FP, OS POS	- RRFU	- SFR1	RL SFR2	- SFR3	- SFR4	- SFR5	- SFR6	- SFR7	- SFR8	- SFR9
	Net Acreage by Land Use Category, acres																											
21	-	6.41	-	-	-	-	-	-	13.3	-	-	-	-	-	-	-	6.19	0.0013	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	0.0195	-	-	0.0004	34.1	-	-	-	-	-	-	-	-	5.52	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	34.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	70.2	-	-	0.0251	0.0155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	74.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	25.7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.159	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.5	-	-	-	-	-	-	-	-	-
30	-	-	-	-	33.9	-	-	-	-	-	-	-	-	-	-	-	-	-	22.2	-	-	-	-	-	-	-	-	-
31	-	-	-	-	24.0	-	-	-	-	-	-	-	-	-	-	-	-	-	49.4	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.3	-	-	-	-	-	-	-	-	-
33	-	-	-	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	24.6	-	-	-	-	-	-	-	-	-
34	-	-	-	-	20.5	-	-	-	-	-	-	-	-	-	-	-	0.0001	-	0.966	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.19	2.54	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	17.1	-	-	-	-	-	-	-	18.8	22.6	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	10.6	-	-	-	-	-	-	-	427	9.15	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	93.9	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	45.2	-	-	-	-	-	-	-	0.197	-	-	-	-	-	-	-	-	-	-	-
40	-	23.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	50.2	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	0.0029	-	-	-	-	-	-	-	-	-	-	-	-	-	42.1	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.52	6.19	-	-	52.8	-	-	-	-	-	-	-
50	-	1.35	-	-	-	-	-	0.0277	184	6.48	-	-	-	-	-	-	0.0088	-	-	-	-	4.21	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.61	38.2	-	-	10.2	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	62.0	-	-	-	-	-	-	-	-	4.08	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	37.9	-	-	-	-	-	-	-	-	4.43	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.78	196	-	-	0.686	-	-	-	-	-	-	-
57	-	-	-	-	45.9	-	-	-	-	58.6	-	-	-	4.81	-	-	16.5	7.20	59.4	-	5.19	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-	-	5.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	69.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-	-	-	-	-	9.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	9.58	-	-	-	-	-	-	-	-	0.448	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	112	-	-	-	-	-	-	-	6.02	-	0.0075	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	53.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-	-	-	3.59	-	-	30.7	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.03	-	-	-	2.36	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.03	-	-	7.36	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	18.7	-	-	-	-	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-
84	-	-	-	-	-	-	-	-	-	8.15	-	-	-	-	36.8	-	-	3.84	-	-	14.5	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	41.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	9.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	0.0035	-	-	232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	12.6	-	-	-	-	-	-	-	-	-
97	-	-	-	-	4.32	-	-	-	-	-	-	-	-	-	-	-	-	-	67.4	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.5	-	25.0	-	-	-	-	-	-	-	-	-
101	-	-	-	-	66.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	573	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-
105	-	-	-	-	250	-	-	-	-	-	-	-	-	-	-	-	-	-	57.1	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.4	-	-	0.0909	-	-	-	-	-	-	-	-	-	-
107	-	0.0001	-	-	-	-	-	-	60.1	0.0024	-	-	-	-	-	-	5.76	9.86	-	-	3.47	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.56	-	-	4.98	-	-	-	-	-	-	-
109	-	-	-	-	-	-	-	-	101	6.51	-	-	-	-	-	-	4.98	-	-	-	13.4	-	-	-	-	-	-	-
110	-	0.0834	-	-	-	-	-	-	-	3.97	-	-	-	-	-	-	-	39.8	-	-	2.96	-	-	-	-	-	-	-
111	-	10.2	-	-	-	-	-	-	-	15.3	-	-	-	-	-	-	-	7.01	-	-	3.85	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44.5	-	-	0.929	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	16.5	-	-	61.8	-	-	-	-	-	-	-
114	-	-	-	-	-	-	-	-	-	0.0013	-	-	-	-	-	-	-	-	-	-	14.5	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.50	-	-	7.37	-	-	-	-	-	-	-
116	-	-	-	-	-	-	-	-	16.9	14.9	-	-	-	-	-	-	-	20.5	-	-	-	-	-	-	-	-	-	-

Table B-3. Detailed Land Use and Development Condition Data - Buildout

Land Use Polygon ID	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	-	-	15.4	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	8.16	-	-	20.1	-	-	-	-	-	-	-
119	-	-	-	-	-	-	-	-	-	7.41	-	-	-	-	-	-	49.0	-	-	-	65.8	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.171	-	-	14.8	-	-	-	-	-	-	-
121	-	-	-	-	-	-	-	-	-	17.9	-	-	-	-	-	-	-	-	-	-	13.1	-	-	-	-	-	-	-
122	-	-	-	-	-	-	-	-	18.7	4.12	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-
123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	29.4	-	-	-	-	-	-	-
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.41	-	-	30.9	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.79	-	-	13.1	-	-	-	-	-	-	-
126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.574	-	-	17.5	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.64	-	-	32.8	-	-	-	-	-	-	-
128	-	13.6	-	-	-	-	-	-	0.198	11.2	0.497	-	-	-	-	-	-	-	-	-	12.5	-	-	-	-	-	-	-
129	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.7	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	2.19	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62.3	-	5.38	11.0	-	-	-	-	-	-	-	-	-	-
132	-	-	-	-	-	-	-	-	-	3.97	-	-	-	-	9.49	-	-	4.09	-	-	31.9	-	-	-	-	-	-	-
133	-	-	-	-	-	-	-	-	-	4.48	-	-	-	-	39.3	-	-	2.35	-	-	10.1	-	-	-	-	-	-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.92	-	-	12.8	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.12	-	-	16.2	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.2	-	-	-	-	-	-	-
137	-	-	-	-	-	-	-	-	-	3.38	-	-	-	-	-	-	-	-	-	-	25.8	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.66	-	-	21.1	-	-	-	-	-	-	-
139	-	-	-	-	-	-	-	-	8.89	27.7	-	-	-	-	25.2	-	1.42	16.9	-	-	99.6	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	2.34	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.63	-	-	-	3.52	-	-	-	-	-	-	-
142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.7	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	7.72	-	-	-	5.21	0.421	-	-	-	-	-	61.8	-	-	-	-	-	-	-
144	-	7.10	-	-	-	-	-	-	-	6.70	-	-	-	-	87.5	-	11.2	4.07	-	-	8.90	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	2.48	-	-	-	2.15	-	-	-	2.83	-	-	27.7	-	-	-	-	-	-	-
146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.193	-	-	3.24	-	-	13.0	-	-	-	-	-	-	-
147	-	-	-	-	-	-	-	-	-	14.3	-	-	-	5.45	-	-	5.62	4.51	-	-	12.4	-	-	-	-	-	-	-
148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.32	-	-	3.06	-	-	1.69	-	-	-	-	-	-	-
149	-	-	-	-	-	-	-	-	-	3.93	-	-	-	-	8.83	-	-	2.43	-	-	3.81	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	6.43	-	-	-	-	-	-	18.1	-	-	-	7.23	-	-	-	-	-	-	-
151	-	20.5	-	-	-	-	-	-	0.0019	17.2	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-
152	-	4.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	-	-	-	21.1	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.13	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.14	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.0	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.0	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	1.41	-	-	-	-	7.32	-	-	-	-	-	6.66	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	0.407	51.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	53.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	0.0000	83.7	-	-	-	-	-	-	-	0.0024	0.0062	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	-	2.06	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.39	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	0.702	-	-	-	-	-	83.5	-	-	2.81	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77.0	-	-	11.2	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	58.0	-	-	0.147	-	-	-	-	0.147	-	-	5.18	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.3	-	-	3.79	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.4	-	-	4.69	-	-	-	-	-	-	-	-	-	-
210	-	4.60	-	-	-	-	-	-	-	7.41	88.3	-	-	-	4.68	-	-	32.3	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	23.9	-	-	-	-	-	117	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.1	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	4.64	-	-	-	-	-	-	-	10.5	-	-	-	-	28.5	-	-	27.9	-	-	36.1	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75.6	-	-	5.17	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	38.6	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	0.0058	-	-	-	-	-
219	-	-	-	-	-	-	28.1	-	-	0.0385	0.0000	-	-	-	33.8	-	-	14.2	-	-	5.81	2.77	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	4.78	0.0815	-	-	6.30	47.0	-	-	5.34	-	-	-	-	-	-	-	-	-	-
221	-	17.5	-	-	-	-	-	-	20.0	7.68	20.0	-	-	-	-	-	-	0.0023	-	-	-	-	-	-	-	-	-	-
222	-	53.9	-	-	-	-	-	-	-	18.4	49.3	-	-	25.5	20.1	-	-	0.774	-	-	-	-	-	-	-	-	-	-
223	-	10.6	-	-	-	-	-	-	-	0.0225	7.59	-	-	3.38	-	-	-	3.94	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	26.7	-	-	-	-	-	-	-	-	10.3	-	-	-	-	-	-	-	-	-	-

Table B-3. Detailed Land Use and Development Condition Data - Buildout

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
226	-	-	-	-	-	-	-	-	2.74	0.141	-	-	-	-	-	-	30.2	31.9	-	-	7.18	-	-	-	-	-	-	-
231	-	61.6	-	0.0852	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	0.0073	-	-	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	0.0007	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	17.7	-	-	-	-	-	-	-	59.3	-	-	-	-	-	-	-	-	-	-	-
236	-	17.7	-	-	-	-	-	-	45.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	-	9.48	-	-	-	-	-	-	-	19.9	-	-	-	-	-	-	4.60	7.63	-	-	9.18	-	-	-	-	-	-	-
347	-	0.0075	-	-	-	-	-	-	-	8.10	-	-	-	-	-	-	-	27.9	-	-	96.8	-	-	-	-	-	-	-
371	-	-	-	-	14.5	-	-	-	16.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
372	-	-	-	-	-	-	-	-	48.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
373	-	-	-	-	-	-	-	-	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	-	4.19	-	-	-	-	-	-	-	23.5	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-
375	-	0.453	-	-	-	-	-	-	-	6.74	-	-	-	-	-	-	0.0022	9.12	-	-	35.2	-	-	-	-	-	-	-
376	-	-	-	-	-	-	-	-	-	0.152	-	-	-	-	-	-	10.3	0.0001	-	-	12.3	-	-	-	-	-	-	-
377	-	-	-	-	-	-	-	-	-	35.8	-	-	-	-	-	-	-	12.8	-	-	5.20	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.7	-	-	-	-	-	-	-
379	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	115	-	-	6.75	-	-	-	-	-	-	-	-	-	-
380	-	30.2	-	-	-	-	-	-	14.5	29.5	-	-	-	-	13.2	-	-	8.57	-	-	40.3	-	-	-	-	-	-	-
381	-	-	-	-	-	-	-	-	-	32.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
382	-	-	-	-	-	-	-	-	88.7	1.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0004	-	-	-	9.02	-	-	-	-	-	-	-
386	-	-	-	-	-	-	-	-	-	3.48	-	-	-	-	-	-	19.5	-	-	-	19.1	-	-	-	-	-	-	-
389	-	55.2	-	-	-	-	-	-	0.0151	-	-	-	-	-	-	-	-	-	-	-	3.13	-	-	-	-	-	-	-
391	-	-	-	-	-	-	-	-	18.7	18.9	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-
393	-	-	-	-	-	-	-	-	43.0	11.1	-	-	-	-	-	-	-	13.8	-	-	13.6	-	-	-	-	-	-	-
394	-	6.32	-	-	-	-	-	-	6.76	11.2	-	-	-	-	-	-	0.0002	5.23	-	-	75.9	-	-	-	-	-	-	-
395	-	15.0	-	-	-	-	-	-	-	8.03	-	-	-	-	-	-	8.45	9.55	-	-	95.0	-	-	-	-	-	-	-
396	-	-	-	-	-	-	-	-	2.19	28.3	11.8	-	-	-	-	-	-	0.429	-	-	4.43	-	-	-	-	-	-	-
397	-	-	-	-	0.0138	-	-	-	-	-	-	-	-	-	-	-	-	21.9	-	-	32.9	0.262	-	-	-	-	-	-
398	-	-	-	-	0.0059	-	-	-	-	2.51	-	-	-	-	-	-	-	17.8	-	-	65.9	0.0098	-	-	-	-	-	-
399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	3.15	-	-	-	-	-	-	-	24.4	-	-	48.4	-	-	-	-	-	-	-
401	-	-	-	-	-	-	-	-	-	18.5	-	-	-	-	6.69	-	-	-	-	-	4.76	-	-	-	-	-	-	-
402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.7	-	-	44.8	-	-	-	-	-	-	-
403	-	-	-	-	-	-	-	-	53.3	-	-	-	-	-	-	-	-	6.19	-	-	-	-	-	-	-	-	-	-
404	-	-	-	-	-	-	-	-	107	-	-	-	-	-	-	-	-	15.0	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	23.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
406	-	17.1	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-	56.4	-	-	-	-	-	-	-
407	-	22.0	-	-	-	-	-	-	-	52.7	-	-	-	-	-	-	0.0137	-	-	-	219	-	-	-	-	-	-	-
408	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	19.3	-	-	122	-	-	-	-	-	-	-
409	-	10.5	-	-	-	-	-	-	-	18.5	-	-	-	-	37.2	-	-	20.7	-	-	84.0	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61.9	-	-	-	-	-	-	-	-	-	-	-	-	-
411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	-	-	-	-	-	33.2	-	-	-	-	-	-	-
412	-	-	-	-	-	-	-	-	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	-	-	-	-	-	-	-	-	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
414	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	-	21.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	-	-	-	-	-	-	-	-
416	-	-	-	-	-	-	137	-	-	-	-	-	-	-	12.5	-	-	1.70	-	-	-	-	-	-	-	-	-	-
417	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.8	-	-	19.1	-	-	-	-	-	-	-	-	-	-
418	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	-	-	1.72	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	18.6	-	-	-	-	29.2	-	-	3.95	-	-	4.54	5.79	-	-	-	-	-	-
421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.2	-	-	1.48	-	-	-	-	-	-	-	-	-	-
422	-	-	-	-	-	-	-	-	124	-	-	-	-	-	1.63	-	-	22.3	-	-	-	-	-	-	-	-	-	-
423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.905	-	-	24.1	-	-	-	-	-	-	-
424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	-
426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-
427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.86	-	-	19.3	-	-	-	-	-	-	-
428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-	14.4	-	-	-	-	-	-	-
429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.717	-	-	6.72	-	-	-	-	-	-	-
432	-	4.21	-	-	-	-	-	-	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
448	-	-	-	-	122	-	-	-	9.98	-	-	-	-	-	-	-	0.0026	-	166	-	0.0000	-	-	-	-	-	-	-
449	-	-	3.98	-	128	-	-	-	-	-	-	-	-	-	-	-	-	-	61.8	-	-	-	-	-	-	-	-	-

Table B-3. Detailed Land Use and Development Condition Data - Buildout

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
457	-	-	-	-	-	-	-	-	30.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
458	-	-	-	-	-	-	-	-	56.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
466	-	0.0105	-	-	-	-	-	-	1.27	-	-	-	-	-	12.2	-	2.99	-	-	-	-	-	-	-	-	-	-	-
467	-	-	-	-	4.13	-	-	-	-	-	-	-	-	-	-	-	-	39.6	1.56	-	39.0	0.0017	0.0858	-	-	-	-	-
470	-	-	-	-	-	-	-	-	-	2.01	-	-	-	-	-	-	-	2.16	-	-	2.04	-	-	-	-	-	-	-
480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.31	-	-	-	36.7	-	-	-	-	-	-	-
512	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	18.7	-	-	-	-	-	-	-	-	-	-	-
513	-	0.442	-	-	-	-	-	-	3.89	1.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
514	-	-	-	-	-	-	-	-	-	5.26	-	-	-	-	-	-	-	92.6	-	-	-	-	-	-	-	-	-	-
515	-	-	-	-	-	-	-	-	-	5.85	-	-	-	-	4.82	-	-	14.0	-	-	10.00	-	-	-	-	-	-	-
516	-	-	-	-	-	-	-	-	-	10.9	-	-	-	-	-	-	-	9.74	-	-	20.5	-	-	-	-	-	-	-
517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0029	9.31	-	-	14.9	-	-	-	-	-	-	-
518	-	-	-	-	-	-	-	-	-	4.92	-	-	-	-	-	-	0.0003	1.92	-	-	12.3	-	-	-	-	-	-	-
519	-	-	-	-	-	-	-	-	-	5.96	-	-	-	-	-	-	9.71	-	-	-	39.4	-	-	-	-	-	-	-
520	-	-	-	-	-	-	-	-	-	3.84	-	-	-	-	-	-	-	-	-	-	22.5	-	-	-	-	-	-	-
521	-	-	-	-	-	-	-	-	-	9.95	-	-	-	-	-	-	0.0065	-	-	-	28.9	-	-	-	-	-	-	-
522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	39.4	-	-	-	-	-	-	-
523	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	-	-
524	-	-	-	-	-	-	-	-	-	0.339	-	-	-	-	-	-	-	-	-	-	42.7	-	-	-	-	-	-	-
525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48.0	-	-	-	-	-	-	-
526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.8	-	-	-	-	-	-	-
527	-	-	-	-	-	-	-	-	-	0.0034	-	-	-	-	-	-	-	-	-	-	36.2	-	-	-	-	-	-	-
528	-	-	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	0.833	-	-	5.09	-	-	-	-	-	-	-
529	-	-	-	-	-	-	-	-	-	1.83	-	-	-	-	-	-	-	5.71	-	-	52.4	-	-	-	-	-	-	-
530	-	-	-	-	-	-	-	-	-	1.30	-	-	-	-	-	-	-	6.14	-	-	14.2	-	-	-	-	-	-	-
531	-	-	-	-	0.225	-	-	-	-	3.64	-	-	-	-	-	-	9.51	23.3	-	-	38.4	0.0001	-	-	-	-	-	-
532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.15	-	-	14.7	-	-	-	-	-	-	-
533	-	-	-	-	-	-	-	-	-	1.32	-	-	-	-	-	-	-	3.09	-	-	12.7	-	-	-	-	-	-	-
534	-	-	-	-	0.110	-	-	-	-	5.34	-	-	-	-	-	-	-	24.7	-	-	-	-	-	-	-	-	-	-
535	-	2.36	-	-	-	-	-	-	24.6	-	-	-	-	-	4.71	-	-	-	-	-	-	-	-	-	-	-	-	-
536	-	-	-	-	-	-	-	-	37.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
537	-	24.8	-	-	-	-	-	-	7.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.41	-	-	-	-	-	-	-	-	-	-	-	-	-
539	-	-	-	-	-	-	-	-	14.3	6.61	-	-	-	-	-	-	-	12.9	-	-	0.0811	-	-	-	-	-	-	-
540	-	-	-	-	-	-	-	-	-	6.03	-	-	-	-	-	-	-	-	-	-	0.0689	-	-	-	-	-	-	-
541	-	-	-	-	-	-	-	-	-	17.7	-	-	-	-	-	-	-	1.86	-	-	21.3	-	-	-	-	-	-	-
542	-	1.61	-	-	-	-	-	-	-	8.75	-	-	-	-	16.0	-	0.515	-	-	-	1.48	-	-	-	-	-	-	-
543	-	-	-	-	-	-	-	-	5.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
544	-	-	-	-	-	-	-	-	3.89	-	-	-	-	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-
545	-	-	-	-	-	-	-	-	3.42	6.61	-	-	-	-	4.45	-	-	0.613	-	-	-	-	-	-	-	-	-	-
546	-	-	-	-	-	-	-	-	0.774	-	-	-	-	-	22.8	-	-	-	-	-	-	-	-	-	-	-	-	-
547	-	-	-	-	-	-	-	-	1.70	-	-	-	-	-	19.6	-	-	-	-	-	-	-	-	-	-	-	-	-
548	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.7	-	-	-	-	-	-	-	-	-	-	-	-	-
549	-	-	-	-	-	-	-	-	1.68	12.0	-	-	-	-	-	-	5.04	6.14	-	-	-	-	-	-	-	-	-	-
550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.98	-	-	-	-	-	-	-	-	-	-	-	-	-
551	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.1	-	-	-	-	-	-	-	-	-	-	-	-	-
552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.1	-	-	-	-	-	-	-	-	-	-	-	-	-
553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.3	-	-	-	-	-	-	-	-	-	-	-	-	-
554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.27	-	0.0001	-	-	-	6.40	-	-	-	-	-	-	-
555	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.41	-	-	-	-	-	16.3	-	-	-	-	-	-	-
556	-	-	-	-	-	-	-	-	-	0.142	-	-	-	-	9.67	-	-	-	-	-	-	-	-	-	-	-	-	-
557	-	-	-	-	-	-	-	-	-	1.93	-	-	-	-	-	-	0.0038	1.72	-	-	33.6	-	-	-	-	-	-	-
558	-	-	-	-	-	-	-	-	-	6.16	-	-	-	-	-	-	35.8	5.46	-	-	-	-	-	-	-	-	-	-
559	-	-	-	-	-	-	-	-	-	5.57	-	-	-	-	-	-	-	14.1	-	-	59.9	-	-	-	-	-	-	-
560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.98	-	-	-	48.1	-	-	-	-	-	-	-
561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-
562	-	-	-	-	-	-	-	-	-	11.2	-	-	-	-	-	-	-	-	-	-	19.0	-	-	-	-	-	-	-
563	-	-	-	-	-	-	-	-	-	24.9	-	-	-	-	-	-	-	-	-	-	59.0	-	-	-	-	-	-	-
564	-	-	-	-	0.718	-	-	-	-	3.59	-	-	-	-	-	-	-	27.5	-	-	40.1	0.0223	-	-	-	-	-	-
565	-	-	-	-	0.521	-	-	-	-	0.971	-	-	-	-	-	-	-	13.6	-	-	22.2	0.370	-	-	-	-	-	-
566	-	-	-	-	-	-	-	-	26.3	8.85	-	-	-	-	-	-	0.0203	-	-	-	44.0	-	-	-	-	-	-	-
567	-	-	-	-	0.0002	-	-	-	0.684	-	-	-	-	-	-	-	-	9.34	-	-	-	-	-	-	-	-	-	-
568	-	-	-	-	-	-	-	-	-	2.41	-	-	-	-	-	-	-	18.6	-	-	6.11	-	-	-	-	-	-	-

Table B-3. Detailed Land Use and Development Condition Data - Buildout

Land Use	Net Acreage by Land Use Category, acres																											
	City: -	C	-	-	-	-	-	-	IN	RM, RH	RMR	-	-	MU	SCPA	-	-	FP, OS	-	-	RL	-	-	-	-	-	-	-
Polygon ID	Metro: CC	CG	CN	CO	FF	IA	IH	IL	IMU	MFR1	MFR2	MFR3	MFR4	MUC1	MUC2	MUC3	PF	POS	RRFU	SFR1	SFR2	SFR3	SFR4	SFR5	SFR6	SFR7	SFR8	SFR9
569	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.5	-	-	-	-	-	-	-	-	-	-	-	-	-
578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.72	-	-	-	-	-	-	-	-	-	-	-	-	-
583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-
584	-	-	-	-	-	-	-	-	-	16.9	2.57	-	-	-	17.6	-	-	-	-	-	1.27	-	-	-	-	-	-	-
585	-	-	-	-	-	-	-	-	-	6.06	-	-	-	-	-	-	-	0.0306	-	-	24.1	-	-	-	-	-	-	-
586	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29.1	-	-	-	-	-	-	-	-	-	-	-	-	-
587	-	30.8	-	-	3.37	-	-	-	28.2	-	-	-	-	-	-	-	-	22.4	-	-	-	-	-	-	-	-	-	-
590	-	-	-	-	2.52	-	-	-	-	-	-	-	-	-	-	-	-	4.65	-	-	6.62	-	-	-	-	-	-	-
591	-	5.95	-	-	-	-	-	-	-	7.06	-	-	-	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Aggregate Unit Wastewater Flow Rate by Service Area

Table C-1. Average Dry Weather Flows by Land Use Area - Existing Conditions (2006)

Land Use Polygon ID	ADWF Calibration Factor	Gross Acreage	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
			Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
21	1.55	36.2	-	-	-	-	5.75	0.0102	5.75	0.0102	1,769
24	0.49	91.0	-	-	-	-	1.92	0.0010	1.92	0.0010	537
25	1.00	109.5	-	-	-	-	5.25	-	5.25	-	-
26	0.49	70.2	-	-	-	-	2.75	0.0000	2.75	0.0000	4.89
27	1.00	74.2	-	-	-	-	-	-	-	-	-
28	0.49	114.6	-	0.0000	-	-	1.87	-	1.87	0.0000	0.634
29	0.49	83.2	-	0.0000	-	-	6.36	-	6.36	0.0000	7.42
30	0.49	218.9	-	0.0000	-	-	1.76	-	1.76	0.0000	7.42
31	0.49	140.7	-	0.0001	-	-	9.45	-	9.45	0.0001	6.12
32	0.49	66.4	-	0.0000	-	-	3.66	-	3.66	0.0000	7.42
33	0.49	117.4	-	0.0001	-	-	6.78	-	6.78	0.0001	7.42
34	0.49	65.3	-	0.0000	-	-	9.15	-	9.15	0.0000	0.0000
35	1.00	349.0	-	-	-	-	6.19	0.0068	6.19	0.0068	1,098
36	1.00	150.5	-	-	-	-	1.51	0.0017	1.51	0.0017	1,098
37	1.61	447.0	-	-	-	-	429	0.743	429	0.743	1,731
38	1.46	111.9	-	-	-	-	24.7	0.0436	24.7	0.0436	1,769
39	1.00	158.6	-	-	-	-	34.6	0.0379	34.6	0.0379	1,098
40	1.00	42.2	-	-	-	-	0.901	0.0010	0.901	0.0010	1,098
41	0.54	76.2	-	-	-	-	36.4	0.0183	36.4	0.0183	503
46	1.00	55.2	-	0.0000	-	-	2.20	-	2.20	0.0000	15.2
47	0.54	88.3	-	-	-	-	4.77	0.0029	4.77	0.0029	597
49	1.00	143.4	45.7	0.0127	-	-	9.82	0.0094	55.5	0.0220	397
50	0.54	195.8	10.1	0.0073	-	-	114	0.0682	124	0.0756	608
51	1.00	56.0	2.82	0.0008	-	-	41.9	0.0084	44.7	0.0091	204
52	0.49	83.7	-	-	-	-	49.2	0.0242	49.2	0.0242	493
53	0.49	117.4	-	-	-	-	25.2	0.0135	25.2	0.0135	537
54	0.49	199.3	0.686	0.0001	-	-	199	0.0015	199	0.0016	7.97
57	1.00	197.7	17.2	0.0350	1.20	0.0017	55.5	0.0179	73.9	0.0546	739
61	1.00	38.1	-	-	-	-	5.84	0.0064	5.84	0.0064	1,098
62	1.00	141.0	-	-	-	-	28.4	0.0311	28.4	0.0311	1,098
63	1.00	45.1	-	-	-	-	9.04	0.0099	9.04	0.0099	1,098
64	0.54	107.6	-	-	-	-	5.13	0.0031	5.13	0.0031	597
65	0.54	118.3	-	0.0000	-	-	23.3	0.0139	23.3	0.0139	597
69	0.84	84.7	-	-	-	-	33.3	0.0366	33.3	0.0366	1,098
70	1.00	63.6	-	-	8.98	0.0230	-	-	8.98	0.0230	2,563
71	1.00	107.3	30.7	0.0085	-	-	3.59	-	34.3	0.0085	248
72	1.00	168.0	2.36	0.0007	-	-	8.03	0.0088	10.4	0.0095	913
82	1.00	40.0	-	-	7.03	0.0181	0.330	-	7.36	0.0181	2,453
83	1.00	96.3	-	-	-	-	9.18	0.0098	9.18	0.0098	1,068
84	1.00	145.7	22.7	0.0204	17.8	0.0457	3.84	-	44.3	0.0661	1,493
85	1.00	77.0	-	-	-	-	41.4	0.0454	41.4	0.0454	1,098
86	0.54	63.1	-	-	-	-	2.89	0.0017	2.89	0.0017	597
95	1.00	236.9	-	-	-	-	-	-	-	-	-
96	1.00	175.1	-	-	-	-	-	-	-	-	-
97	1.00	276.6	-	0.0004	-	-	29.7	-	29.7	0.0004	15.1
99	1.00	171.2	-	-	-	-	3.06	0.0034	3.06	0.0034	1,098
100	1.00	319.5	-	0.0001	-	-	8.69	0.0002	8.69	0.0004	40.5
101	1.00	66.2	-	-	-	-	0.997	-	0.997	-	-
102	1.00	573.0	-	-	-	-	286	-	286	-	-
103	1.00	214.2	-	-	-	-	66.0	-	66.0	-	-
104	1.00	134.6	-	-	-	-	-	-	-	-	-
105	1.00	307.0	-	0.0005	-	-	234	-	234	0.0005	2.02
106	1.00	172.2	-	-	24.8	0.0636	0.0909	-	24.9	0.0636	2,558
107	1.00	95.6	3.48	0.0010	-	-	55.5	0.0608	58.9	0.0618	1,049
108	1.00	66.1	4.98	0.0014	-	-	1.34	-	6.32	0.0014	218
109	1.00	155.1	17.7	0.0145	-	-	91.1	0.100	109	0.115	1,054
110	1.00	218.5	6.93	0.0088	-	-	39.7	0.0001	46.6	0.0089	191
111	1.00	73.4	18.2	0.0300	-	-	14.2	0.0095	32.4	0.0394	1,217
112	1.00	139.0	0.618	0.0002	-	-	-	-	0.618	0.0002	277
113	1.00	158.8	59.1	0.0258	-	-	12.8	-	71.9	0.0258	358
114	1.00	112.9	14.5	0.0040	-	-	-	-	14.5	0.0040	277
115	1.00	145.3	4.57	0.0013	-	-	0.946	-	5.51	0.0013	230
116	1.00	52.3	14.5	0.0293	-	-	21.5	0.0169	36.0	0.0462	1,282
117	1.00	75.9	15.4	0.0043	-	-	13.0	-	28.4	0.0043	150
118	1.00	180.0	33.1	0.0317	-	-	8.16	-	41.3	0.0317	768
119	1.00	122.2	73.2	0.0331	-	-	49.0	0.0539	122	0.0870	712
120	1.00	54.1	14.6	0.0040	-	-	0.171	-	14.7	0.0040	274
121	1.00	150.8	31.0	0.0397	-	-	-	-	31.0	0.0397	1,279
122	1.00	53.9	15.0	0.0113	-	-	18.7	0.0205	33.7	0.0318	945
123	1.00	35.0	24.9	0.0069	-	-	5.57	-	30.5	0.0069	226
124	1.00	99.1	30.9	0.0086	-	-	0.796	-	31.7	0.0086	270
125	1.00	93.1	13.1	0.0036	-	-	1.85	-	14.9	0.0036	243
126	1.00	191.2	17.3	0.0048	-	-	0.0048	-	17.3	0.0048	277
127	1.00	36.2	31.3	0.0087	-	-	0.0835	-	31.4	0.0087	276
128	1.00	43.1	23.3	0.0280	-	-	13.8	0.0152	37.1	0.0432	1,164
129	1.00	57.0	23.7	0.0066	-	-	10.4	0.0114	34.1	0.0180	527
130	1.00	106.3	20.5	0.0095	-	-	-	-	20.5	0.0095	462
131	1.00	78.7	-	-	17.2	0.0440	6.32	0.0059	23.5	0.0499	2,125
132	1.00	71.4	35.7	0.0168	9.49	0.0244	1.92	-	47.1	0.0412	873
133	1.00	72.7	14.1	0.0117	39.0	0.100	1.62	-	54.8	0.112	2,043
134	1.00	101.6	11.9	0.0033	-	-	0.997	-	12.9	0.0033	256
135	1.00	123.5	16.2	0.0045	-	-	1.12	-	17.4	0.0045	259
136	1.00	84.7	33.2	0.0092	-	-	-	-	33.2	0.0092	277
137	1.00	43.8	27.7	0.0130	-	-	-	-	27.7	0.0130	472
138	1.00	51.7	18.2	0.0050	-	-	2.51	-	20.7	0.0050	244
139	1.00	179.7	95.8	0.0639	25.2	0.0645	6.23	0.0011	127	0.129	1,018
140	1.00	114.1	14.7	0.0081	-	-	-	-	14.7	0.0081	554
141	1.00	65.8	3.52	0.0010	-	-	9.63	0.0106	13.1	0.0116	880
142	1.00	111.5	33.7	0.0093	-	-	-	-	33.7	0.0093	277
143	1.00	135.3	67.0	0.0320	5.63	0.0084	-	-	72.6	0.0403	555
144	1.00	125.5	15.6	0.0160	87.5	0.225	17.7	0.0195	121	0.260	2,153
145	1.00	96.9	26.5	0.0108	1.85	0.0026	0.390	-	28.7	0.0134	465
146	1.00	97.4	10.9	0.0030	0.193	0.0005	1.50	-	12.6	0.0035	279
147	1.00	160.2	19.2	0.0274	5.45	0.0076	10.1	0.0062	34.8	0.0412	1,184
148	1.00	60.5	1.20	0.0003	2.32	0.0059	1.84	-	5.36	0.0063	1,171

Table C-1. Average Dry Weather Flows by Land Use Area - Existing Conditions (2006)

Land Use Polygon ID	ADWF Calibration Factor	Gross Acreage	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
			Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
149	1.00	60.0	7.64	0.0089	8.60	0.0221	1.45	-	17.7	0.0310	1,753
150	1.00	132.0	13.3	0.0143	-	-	18.1	0.0199	31.4	0.0342	1,088
151	1.00	106.9	28.0	0.0371	-	-	20.5	0.0226	48.5	0.0597	1,229
152	1.00	152.9	21.1	0.0058	-	-	4.95	0.0054	26.0	0.0113	434
153	1.00	86.7	4.13	0.0011	-	-	-	-	4.13	0.0011	277
154	1.00	110.5	9.14	0.0025	-	-	-	-	9.14	0.0025	277
155	1.00	135.7	35.5	0.0098	-	-	-	-	35.5	0.0098	277
156	1.00	158.6	22.6	0.0063	-	-	-	-	22.6	0.0063	277
157	1.00	117.6	8.07	0.0047	7.11	0.0183	-	-	15.2	0.0229	1,511
167	0.54	109.2	-	-	-	-	0.0004	0.0000	0.0004	0.0000	597
168	0.54	155.1	-	-	-	-	31.9	0.0190	31.9	0.0190	597
202	1.00	178.2	-	-	-	-	83.7	0.0920	83.7	0.0920	1,099
203	1.00	203.2	-	-	-	-	87.0	0.0934	87.0	0.0934	1,073
204	1.00	124.3	-	-	5.39	0.0138	-	-	5.39	0.0138	2,568
205	1.00	181.3	-	-	57.3	0.147	2.84	0.0000	60.1	0.147	2,447
206	1.00	88.2	-	-	68.2	0.175	11.2	-	79.4	0.175	2,205
207	0.69	96.5	0.146	0.0003	0.146	0.0004	50.0	0.109	50.3	0.110	2,180
208	1.00	71.2	-	-	28.2	0.0725	3.79	-	32.0	0.0725	2,264
209	1.00	94.8	-	-	16.0	0.0411	4.69	-	20.7	0.0411	1,986
210	1.00	137.4	95.8	0.410	4.18	0.0107	31.5	0.0000	131	0.421	3,202
212	1.00	141.0	-	-	98.6	0.253	-	-	98.6	0.253	2,568
213	1.00	117.9	-	-	26.0	0.0668	-	-	26.0	0.0668	2,568
214	1.00	119.3	33.9	0.0276	17.6	0.0451	19.8	0.0050	71.3	0.0777	1,090
215	1.00	81.6	-	-	60.3	0.155	2.76	-	63.1	0.155	2,456
218	0.68	143.2	0.0058	0.0000	0.0061	0.0000	26.1	0.0573	26.1	0.0573	2,199
219	0.95	84.7	8.58	0.0027	33.0	0.0846	21.7	0.0187	63.2	0.106	1,677
220	1.00	140.7	4.36	0.0088	49.6	0.123	1.54	-	55.5	0.132	2,378
221	1.00	65.2	27.7	0.105	-	-	19.7	0.0217	47.4	0.127	2,670
222	1.00	168.0	63.3	0.238	43.0	0.0821	51.8	0.0569	158	0.377	2,382
223	1.00	110.8	0.278	0.0012	0.920	0.0013	11.4	0.0117	12.6	0.0142	1,127
224	1.00	119.3	-	-	-	-	32.8	0.0247	32.8	0.0247	755
226	1.00	102.1	7.32	0.0023	-	-	64.0	0.0354	71.3	0.0377	529
231	1.00	61.7	-	-	-	-	61.7	0.0679	61.7	0.0679	1,100
232	0.54	119.3	-	-	-	-	0.0083	0.0000	0.0083	0.0000	547
235	0.54	77.0	-	-	-	-	73.4	0.0438	73.4	0.0438	597
236	1.00	63.1	-	-	-	-	54.7	0.0600	54.7	0.0600	1,098
346	1.00	139.2	20.0	0.0332	-	-	18.1	0.0153	38.1	0.0485	1,273
347	1.00	366.8	98.6	0.0414	-	-	15.6	0.0000	114	0.0414	363
371	0.54	38.9	-	-	-	-	18.6	0.0025	18.6	0.0025	132
372	0.32	127.2	-	-	-	-	24.2	0.0266	24.2	0.0266	1,098
373	0.54	116.8	-	-	-	-	75.0	0.0823	75.0	0.0823	1,098
374	1.00	157.3	36.8	0.0506	-	-	4.19	0.0046	41.0	0.0552	1,346
375	1.00	126.7	41.8	0.0233	-	-	9.58	0.0005	51.3	0.0238	463
376	1.00	33.8	12.3	0.0034	-	-	7.79	0.0086	20.0	0.0120	597
377	1.00	53.9	28.3	0.0494	-	-	3.07	-	31.3	0.0494	1,576
378	1.00	195.5	21.5	0.0060	-	-	-	-	21.5	0.0060	277
379	1.00	124.3	-	-	96.7	0.248	2.59	0.0028	99.2	0.251	2,525
380	1.00	136.2	61.6	0.0540	13.2	0.0339	35.4	0.0382	110	0.126	1,144
381	1.00	137.5	32.1	0.0645	-	-	-	-	32.1	0.0645	2,010
382	1.00	108.2	0.269	0.0005	-	-	88.7	0.0974	89.0	0.0979	1,100
385	1.00	111.7	9.02	0.0025	-	-	0.0004	0.0000	9.02	0.0025	277
386	1.00	45.9	22.6	0.0123	-	-	19.5	0.0215	42.1	0.0338	802
389	1.00	238.2	2.14	0.0006	-	-	55.2	0.0607	57.3	0.0613	1,069
391	1.00	160.2	18.9	0.0380	-	-	33.1	0.0364	52.0	0.0744	1,431
393	1.00	81.5	24.7	0.0261	-	-	43.3	0.0462	68.0	0.0723	1,063
394	1.00	105.4	79.2	0.0414	-	-	15.7	0.0144	95.0	0.0558	588
395	1.00	136.0	90.6	0.0391	-	-	22.0	0.0191	113	0.0582	517
396	1.00	47.2	36.5	0.0952	-	-	2.62	0.0024	39.1	0.0976	2,497
397	1.00	55.1	31.9	0.0089	-	-	0.0187	-	32.0	0.0089	277
398	1.00	86.2	66.8	0.0229	-	-	0.0352	-	66.9	0.0229	342
399	1.00	24.9	18.3	0.0051	-	-	-	-	18.3	0.0051	277
400	1.00	76.0	36.2	0.0112	-	-	9.19	-	45.4	0.0112	247
401	1.00	73.0	22.8	0.0376	6.69	0.0172	-	-	29.5	0.0548	1,859
402	1.00	101.6	41.8	0.0116	-	-	15.3	-	57.2	0.0116	203
403	0.54	59.5	-	-	-	-	25.1	0.0150	25.1	0.0150	597
404	1.00	122.5	-	-	-	-	32.2	0.0353	32.2	0.0353	1,098
405	1.00	76.3	-	-	-	-	23.6	0.0259	23.6	0.0259	1,098
406	1.00	91.5	71.3	0.0511	-	-	17.1	0.0188	88.4	0.0699	790
407	1.00	293.7	257	0.158	-	-	12.6	0.0138	270	0.172	637
408	1.00	156.0	111	0.0566	-	-	17.2	-	128	0.0566	441
409	1.00	170.9	77.7	0.0537	25.3	0.0650	8.63	0.0041	112	0.123	1,101
410	1.00	61.9	-	-	54.2	0.139	-	-	54.2	0.139	2,568
411	1.00	134.9	28.8	0.0080	76.9	0.198	-	-	106	0.206	1,944
412	0.32	255.1	-	-	-	-	255	0.280	255	0.280	1,098
413	1.00	213.8	-	-	-	-	111	0.122	111	0.122	1,098
414	1.00	72.0	-	-	-	-	15.1	0.0166	15.1	0.0166	1,100
415	1.00	52.9	-	-	-	-	21.2	0.0233	21.2	0.0233	1,100
416	0.55	151.7	-	-	12.4	0.0318	137	0.302	150	0.334	2,230
417	1.00	86.8	-	-	11.3	0.0291	0.257	-	11.6	0.0291	2,511
418	1.00	134.6	-	-	9.31	0.0239	-	-	9.31	0.0239	2,568
420	1.00	62.2	25.9	0.0359	10.7	0.0275	2.06	-	38.7	0.0635	1,640
421	1.00	47.9	-	-	29.0	0.0744	0.299	-	29.3	0.0744	2,541
422	1.00	148.3	-	-	1.63	0.0042	126	0.123	127	0.127	997
423	1.00	79.6	23.6	0.0066	-	-	0.905	-	24.5	0.0066	267
424	1.00	87.3	14.3	0.0040	-	-	-	-	14.3	0.0040	277
425	1.00	26.8	12.3	0.0034	-	-	-	-	12.3	0.0034	277
426	1.00	24.9	24.9	0.0069	-	-	-	-	24.9	0.0069	277
427	1.00	23.2	19.3	0.0054	-	-	3.86	-	23.2	0.0054	231
428	1.00	31.8	14.4	0.0040	-	-	10.0	0.0110	24.4	0.0150	614
429	1.00	80.0	11.3	0.0031	-	-	-	-	11.3	0.0031	277
430	1.00	69.0	6.32	0.0018	-	-	0.101	-	6.42	0.0018	273
432	1.00	107.7	-	-	-	-	97.3	0.107	97.3	0.107	1,098
448	1.00	298.2	0.0000	0.0008	-	-	99.9	0.0040	99.9	0.0048	47.9
449	0.54	193.4	-	0.0001	-	-	19.9	0.0006	19.9	0.0007	35.2
457	1.00	49.6	-	-	-	-	-	-	-	-	-

Table C-1. Average Dry Weather Flows by Land Use Area - Existing Conditions (2006)

Land Use Polygon ID	ADWF Calibration Factor	Gross Acreage	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
			Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
458	1.00	56.8	-	-	-	-	55.9	0.0614	55.9	0.0614	1,098
466	0.49	43.5	-	-	12.1	0.0152	4.27	0.0023	16.3	0.0174	1,067
467	1.61	84.4	20.5	0.0091	-	-	5.53	-	26.0	0.0091	351
470	0.49	27.4	3.85	0.0021	-	-	2.16	-	6.01	0.0021	342
480	1.61	46.0	36.5	0.0163	-	-	9.31	0.0165	45.8	0.0327	715
512	1.40	133.8	-	-	-	-	134	0.237	134	0.237	1,769
513	1.48	59.4	1.69	0.0055	-	-	4.33	0.0077	6.02	0.0131	2,180
514	0.49	108.5	5.02	0.0049	-	-	92.6	-	97.7	0.0049	50.6
515	0.49	34.7	15.5	0.0067	4.82	0.0060	14.0	-	34.3	0.0128	372
516	1.61	62.3	31.2	0.0445	-	-	8.04	-	39.3	0.0445	1,133
517	1.61	36.2	14.9	0.0067	-	-	9.31	0.0000	24.3	0.0067	275
518	1.61	26.8	17.1	0.0214	-	-	1.92	0.0000	19.1	0.0214	1,122
519	1.61	97.6	36.8	0.0331	-	-	9.71	0.0172	46.6	0.0503	1,079
520	1.61	119.9	24.8	0.0218	-	-	-	-	24.8	0.0218	878
521	1.61	168.8	38.2	0.0442	-	-	0.0065	0.0000	38.2	0.0442	1,157
522	1.61	66.6	36.2	0.0161	-	-	15.1	0.0266	51.3	0.0428	834
523	1.61	21.0	14.2	0.0387	-	-	-	-	14.2	0.0387	2,728
524	1.61	130.3	28.1	0.0135	-	-	-	-	28.1	0.0135	479
525	1.61	48.0	47.6	0.0212	-	-	-	-	47.6	0.0212	446
526	1.61	159.8	31.7	0.0141	-	-	-	-	31.7	0.0141	446
527	1.61	96.5	36.2	0.0161	-	-	-	-	36.2	0.0161	446
528	1.61	129.7	17.2	0.0422	-	-	0.833	-	18.0	0.0422	2,341
529	1.61	127.6	38.2	0.0219	-	-	3.67	-	41.9	0.0219	524
530	1.61	58.1	13.3	0.0096	-	-	0.333	-	13.7	0.0096	702
531	1.61	75.2	39.9	0.0279	-	-	12.5	0.0168	52.4	0.0447	854
532	1.61	20.9	14.0	0.0062	-	-	1.63	-	15.6	0.0062	399
533	1.61	96.0	12.0	0.0090	-	-	2.62	-	14.6	0.0090	617
534	1.61	36.8	5.34	0.0173	-	-	24.8	-	30.2	0.0173	574
535	0.49	40.5	-	-	4.71	0.0059	24.9	0.0134	29.6	0.0193	651
536	0.49	37.5	-	-	-	-	28.2	0.0152	28.2	0.0152	537
537	0.49	43.5	-	-	-	-	30.9	0.0166	30.9	0.0166	537
538	0.49	55.8	-	-	8.08	0.0101	-	-	8.08	0.0101	1,255
539	1.48	85.7	6.70	0.0215	-	-	14.4	0.0249	21.1	0.0463	2,192
540	1.61	100.6	6.10	0.0196	-	-	-	-	6.10	0.0196	3,206
541	1.61	52.1	38.8	0.0660	-	-	1.86	-	40.6	0.0660	1,624
542	1.61	64.4	10.2	0.0290	15.3	0.0633	2.12	0.0038	27.7	0.0961	3,470
543	0.49	90.7	-	-	-	-	5.40	0.0029	5.40	0.0029	537
544	0.49	48.9	-	-	10.5	0.0131	3.89	0.0021	14.4	0.0152	1,061
545	0.49	45.8	2.62	0.0026	3.70	0.0046	3.42	0.0018	9.74	0.0091	930
546	0.49	53.9	-	-	22.8	0.0286	0.555	0.0003	23.3	0.0289	1,238
547	0.49	51.7	-	-	19.6	0.0247	1.70	0.0009	21.3	0.0256	1,198
548	0.49	36.2	-	-	35.6	0.0447	-	-	35.6	0.0447	1,255
549	0.49	24.9	11.6	0.0114	-	-	6.11	0.0031	17.7	0.0145	819
550	0.49	153.9	-	-	6.98	0.0088	-	-	6.98	0.0088	1,255
551	0.49	131.5	-	-	26.1	0.0328	-	-	26.1	0.0328	1,255
552	0.49	148.8	-	-	31.6	0.0397	-	-	31.6	0.0397	1,255
553	0.49	111.7	-	-	25.3	0.0317	-	-	25.3	0.0317	1,255
554	0.49	94.6	6.40	0.0009	9.27	0.0116	0.0001	0.0000	15.7	0.0125	798
555	0.49	101.3	16.1	0.0022	6.41	0.0080	-	-	22.5	0.0102	454
556	0.49	114.9	0.142	0.0001	9.01	0.0113	-	-	9.15	0.0114	1,251
557	1.61	85.8	35.3	0.0211	-	-	1.72	0.0000	37.0	0.0211	571
558	1.61	55.7	6.16	0.0199	-	-	41.3	0.0634	47.4	0.0833	1,756
559	1.61	79.6	63.5	0.0382	-	-	13.8	-	77.2	0.0382	495
560	1.61	58.1	43.2	0.0193	-	-	9.98	0.0176	53.2	0.0369	694
561	1.61	107.7	18.3	0.0082	-	-	-	-	18.3	0.0082	446
562	1.61	66.5	24.0	0.0248	-	-	-	-	24.0	0.0248	1,037
563	1.61	84.0	84.0	0.107	-	-	-	-	84.0	0.107	1,275
564	1.61	96.1	39.6	0.0272	-	-	4.50	-	44.1	0.0272	618
565	1.61	203.9	22.2	0.0126	-	-	3.28	-	25.4	0.0126	495
566	1.49	79.3	52.8	0.0480	-	-	26.4	0.0466	79.2	0.0946	1,195
567	1.00	31.7	-	-	-	-	-	-	-	-	-
568	0.49	27.1	3.77	0.0005	-	-	3.13	-	6.91	0.0005	74.0
569	0.49	99.5	-	-	30.5	0.0382	-	-	30.5	0.0382	1,255
578	0.49	42.6	-	-	4.52	0.0057	-	-	4.52	0.0057	1,255
583	0.49	113.0	-	-	15.1	0.0189	-	-	15.1	0.0189	1,255
584	1.61	115.7	18.6	0.0668	17.5	0.0722	-	-	36.1	0.139	3,854
585	1.61	58.3	25.0	0.0276	-	-	0.0306	-	25.1	0.0276	1,101
586	0.49	143.5	-	-	28.7	0.0360	-	-	28.7	0.0360	1,255
587	0.49	110.2	-	-	-	-	71.8	0.0289	71.8	0.0289	402
590	1.61	108.8	2.24	0.0010	-	-	1.70	-	3.94	0.0010	253
591	0.49	65.7	7.06	0.0069	15.2	0.0190	5.95	0.0032	28.2	0.0292	1,036

Table C-2. Average Dry Weather Flows by Land Use Area - 2015

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
21	-	-	-	-	5.75	0.0102	5.75	0.0102	1,769
24	-	-	-	-	0.766	0.0010	0.766	0.0010	1,343
25	-	-	-	-	2.10	0.0199	2.10	0.0199	9,500
26	-	-	-	-	1.10	0.0104	1.10	0.0104	9,426
27	-	-	-	-	-	-	-	-	-
28	0.159	0.0006	-	-	0.587	0.0065	0.747	0.0071	9,500
29	6.36	0.0242	-	-	(3.8134)	-	2.54	0.0242	9,500
30	1.76	0.0067	-	-	(1.0581)	-	0.705	0.0067	9,500
31	7.79	0.0296	-	-	(4.0067)	0.0063	3.78	0.0359	9,500
32	3.66	0.0139	-	-	(2.1953)	-	1.46	0.0139	9,500
33	6.78	0.0257	-	-	(4.0649)	0.0000	2.71	0.0257	9,500
34	0.0000	0.0000	-	-	3.66	0.0348	3.66	0.0348	9,500
35	-	-	-	-	7.05	0.0068	7.05	0.0068	964
36	-	-	-	-	9.14	0.0017	9.14	0.0017	182
37	-	-	-	-	429	0.743	429	0.743	1,731
38	-	-	-	-	24.7	0.0436	24.7	0.0436	1,769
39	-	-	-	-	34.6	0.0379	34.6	0.0379	1,098
40	-	-	-	-	23.5	0.0837	23.5	0.0837	3,561
41	-	-	-	-	36.4	0.0183	36.4	0.0183	503
46	7.37	0.0280	-	-	-	-	7.37	0.0280	3,800
47	-	-	-	-	8.58	0.0168	8.58	0.0168	1,955
49	45.7	0.0127	-	-	9.82	0.0094	55.5	0.0220	397
50	10.1	0.0073	-	-	121	0.0942	131	0.102	772
51	2.82	0.0008	-	-	41.9	0.0084	44.7	0.0091	204
52	-	-	-	-	49.2	0.0242	49.2	0.0242	493
53	-	-	-	-	25.2	0.0135	25.2	0.0135	537
54	0.686	0.0001	-	-	199	0.0015	199	0.0016	8
57	58.7	0.178	1.20	0.0017	63.8	0.183	124	0.363	2,932
61	-	-	-	-	5.84	0.0064	5.84	0.0064	1,098
62	-	-	-	-	28.4	0.0311	28.4	0.0311	1,098
63	-	-	-	-	9.04	0.0099	9.04	0.0099	1,098
64	-	-	-	-	5.13	0.0031	5.13	0.0031	597
65	0.0067	0.0000	-	-	23.3	0.0139	23.3	0.0139	598
69	-	-	-	-	33.3	0.0366	33.3	0.0366	1,098
70	-	-	8.98	0.0230	-	-	8.98	0.0230	2,563
71	30.7	0.0085	-	-	3.59	0.0000	34.3	0.0085	248
72	2.36	0.0007	-	-	8.03	0.0088	10.4	0.0095	913
82	-	-	7.03	0.0181	7.36	-	14.4	0.0181	1,255
83	-	-	-	-	12.6	0.0098	12.6	0.0098	777
84	22.7	0.0204	17.8	0.0457	3.84	-	44.3	0.0661	1,493
85	-	-	-	-	41.4	0.0454	41.4	0.0454	1,098
86	-	-	-	-	2.89	0.0017	2.89	0.0017	597
95	-	-	-	-	116	0.880	116	0.880	7,600
96	1.63	0.0062	-	-	12.9	0.0488	14.5	0.0550	3,800
97	33.9	0.129	-	-	4.32	0.0164	38.3	0.145	3,800
99	-	-	-	-	1.22	0.0034	1.22	0.0034	2,744
100	10.6	0.0404	-	-	0.203	0.0002	10.8	0.0406	3,749
101	-	-	-	-	32.1	0.122	32.1	0.122	3,800
102	-	-	-	-	-	-	-	-	-
103	-	-	-	-	46.0	0.175	46.0	0.175	3,800
104	-	-	-	-	94.2	0.512	94.2	0.512	5,429
105	31.2	0.118	-	-	163	0.933	194	1.05	5,429
106	-	-	24.8	0.0636	0.0909	-	24.9	0.0636	2,558
107	3.48	0.0010	-	-	60.9	0.0687	64.4	0.0697	1,082
108	4.98	0.0014	-	-	1.66	-	6.65	0.0014	208
109	18.9	0.0152	-	-	91.1	0.100	110	0.115	1,049
110	6.93	0.0088	-	-	39.7	0.0001	46.6	0.0089	191
111	18.2	0.0300	-	-	15.8	0.0152	34.0	0.0451	1,329
112	0.618	0.0002	-	-	-	-	0.618	0.0002	277
113	59.1	0.0258	-	-	13.1	-	72.2	0.0258	357
114	14.5	0.0040	-	-	-	-	14.5	0.0040	277
115	5.94	0.0021	-	-	0.946	-	6.89	0.0021	300
116	14.5	0.0293	-	-	21.5	0.0169	36.0	0.0462	1,282
117	15.4	0.0043	-	-	13.0	-	28.4	0.0043	150
118	33.1	0.0317	-	-	8.16	-	41.3	0.0317	768
119	73.2	0.0331	-	-	49.0	0.0539	122	0.0870	712
120	14.6	0.0040	-	-	0.171	-	14.7	0.0040	274
121	31.0	0.0397	-	-	-	-	31.0	0.0397	1,279
122	15.3	0.0115	-	-	18.7	0.0205	34.0	0.0320	942
123	27.1	0.0082	-	-	5.57	-	32.7	0.0082	251
124	30.9	0.0086	-	-	0.796	-	31.7	0.0086	270
125	13.1	0.0036	-	-	3.14	-	16.2	0.0036	223
126	17.3	0.0048	-	-	0.0048	-	17.3	0.0048	277
127	31.9	0.0090	-	-	0.864	-	32.8	0.0090	276
128	23.3	0.0280	-	-	13.8	0.0152	37.1	0.0432	1,164
129	23.7	0.0066	-	-	10.4	0.0114	34.1	0.0180	527
130	20.5	0.0095	-	-	-	-	20.5	0.0095	462
131	-	-	17.2	0.0440	9.71	0.0059	26.9	0.0499	1,857
132	35.7	0.0168	9.49	0.0244	1.92	-	47.1	0.0412	873
133	14.1	0.0117	39.0	0.100	1.62	-	54.8	0.112	2,043
134	11.9	0.0033	-	-	0.997	-	12.9	0.0033	256
135	16.2	0.0045	-	-	1.12	-	17.4	0.0045	259
136	33.2	0.0092	-	-	-	-	33.2	0.0092	277
137	27.7	0.0130	-	-	-	-	27.7	0.0130	472
138	18.2	0.0050	-	-	2.51	-	20.7	0.0050	244
139	95.8	0.0645	25.2	0.0645	9.00	0.0011	130	0.130	1,001
140	14.7	0.0081	-	-	-	-	14.7	0.0081	554
141	3.52	0.0010	-	-	9.63	0.0106	13.1	0.0116	880
142	33.7	0.0093	-	-	-	-	33.7	0.0093	277
143	67.3	0.0321	5.63	0.0084	-	-	72.9	0.0405	555

Table C-2. Average Dry Weather Flows by Land Use Area - 2015

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
144	15.6	0.0160	87.5	0.225	19.7	0.0216	123	0.262	2,136
145	27.7	0.0115	1.85	0.0026	1.08	-	30.6	0.0141	459
146	10.9	0.0030	0.193	0.0005	1.50	-	12.6	0.0035	279
147	21.3	0.0286	5.45	0.0076	10.1	0.0062	36.9	0.0424	1,151
148	1.20	0.0003	2.32	0.0059	1.84	-	5.36	0.0063	1,171
149	7.64	0.0089	8.60	0.0221	1.45	-	17.7	0.0310	1,753
150	13.3	0.0143	-	-	18.1	0.0199	31.4	0.0342	1,088
151	28.0	0.0371	-	-	20.5	0.0226	48.5	0.0597	1,229
152	21.1	0.0058	-	-	4.95	0.0054	26.0	0.0113	434
153	4.13	0.0011	-	-	-	-	4.13	0.0011	277
154	9.14	0.0025	-	-	-	-	9.14	0.0025	277
155	35.5	0.0098	-	-	-	-	35.5	0.0098	277
156	22.6	0.0063	-	-	-	-	22.6	0.0063	277
157	8.07	0.0047	7.11	0.0183	-	-	15.2	0.0229	1,511
167	-	-	-	-	0.0004	0.0000	0.0004	0.0000	597
168	-	-	-	-	31.9	0.0190	31.9	0.0190	597
202	-	-	-	-	83.7	0.0920	83.7	0.0920	1,099
203	-	-	-	-	87.0	0.0934	87.0	0.0934	1,073
204	-	-	5.39	0.0138	-	-	5.39	0.0138	2,568
205	-	-	57.3	0.147	2.84	0.0000	60.1	0.147	2,447
206	-	-	68.2	0.177	11.2	-	79.4	0.177	2,229
207	0.146	0.0003	0.146	0.0004	54.8	0.109	55.1	0.110	1,993
208	-	-	28.2	0.0734	3.79	-	32.0	0.0734	2,289
209	-	-	16.0	0.0411	4.69	-	20.7	0.0411	1,986
210	95.8	0.410	4.18	0.0107	32.3	0.0000	132	0.421	3,181
212	-	-	98.6	0.253	-	-	98.6	0.253	2,568
213	-	-	26.0	0.0668	-	-	26.0	0.0668	2,568
214	46.5	0.0350	17.6	0.0451	20.4	0.0054	84.5	0.0855	1,011
215	-	-	60.3	0.155	2.86	-	63.2	0.155	2,452
218	0.0058	0.0000	0.0061	0.0000	26.1	0.0573	26.1	0.0573	2,199
219	8.59	0.0027	33.0	0.0846	22.7	0.0187	64.2	0.106	1,651
220	4.36	0.0088	49.6	0.123	5.34	-	59.3	0.132	2,226
221	27.7	0.105	-	-	19.7	0.0217	47.4	0.127	2,670
222	63.3	0.238	43.0	0.0821	52.6	0.0571	159	0.377	2,372
223	0.278	0.0012	0.920	0.0013	14.6	0.0117	15.8	0.0141	898
224	-	-	-	-	32.8	0.0247	32.8	0.0247	755
226	7.32	0.0023	-	-	64.0	0.0354	71.3	0.0377	529
231	-	-	-	-	61.7	0.0679	61.7	0.0679	1,100
232	-	-	-	-	0.0083	0.0000	0.0083	0.0000	547
235	-	-	-	-	73.4	0.0438	73.4	0.0438	597
236	-	-	-	-	55.2	0.0619	55.2	0.0619	1,122
346	25.1	0.0362	-	-	18.3	0.0154	43.4	0.0516	1,189
347	105	0.0451	-	-	16.1	0.0000	121	0.0451	373
371	-	-	-	-	18.6	0.0576	18.6	0.0576	3,093
372	-	-	-	-	24.2	0.0266	24.2	0.0266	1,098
373	-	-	-	-	75.0	0.0823	75.0	0.0823	1,098
374	36.8	0.0506	-	-	4.19	0.0046	41.0	0.0552	1,346
375	41.8	0.0233	-	-	9.58	0.0005	51.3	0.0238	463
376	12.3	0.0034	-	-	7.79	0.0086	20.0	0.0120	597
377	28.3	0.0494	-	-	5.14	-	33.4	0.0494	1,478
378	21.5	0.0060	-	-	-	-	21.5	0.0060	277
379	-	-	96.7	0.248	4.87	0.0028	102	0.251	2,468
380	61.6	0.0540	13.2	0.0339	45.9	0.0667	121	0.155	1,281
381	32.1	0.0645	-	-	-	-	32.1	0.0645	2,010
382	0.269	0.0005	-	-	88.7	0.0974	89.0	0.0979	1,100
385	9.02	0.0025	-	-	0.0004	0.0000	9.02	0.0025	277
386	22.6	0.0123	-	-	19.5	0.0215	42.1	0.0338	802
389	2.62	0.0009	-	-	55.2	0.0607	57.8	0.0616	1,065
391	18.9	0.0380	-	-	33.1	0.0364	52.0	0.0744	1,431
393	24.7	0.0261	-	-	43.3	0.0462	68.0	0.0723	1,063
394	79.2	0.0414	-	-	15.7	0.0144	95.0	0.0558	588
395	90.6	0.0391	-	-	28.1	0.0413	119	0.0803	677
396	37.8	0.0960	-	-	2.62	0.0024	40.4	0.0984	2,437
397	33.0	0.0094	-	-	0.0187	0.0001	33.0	0.0095	288
398	68.4	0.0238	-	-	0.0352	0.0000	68.5	0.0238	348
399	18.3	0.0051	-	-	-	-	18.3	0.0051	277
400	36.2	0.0112	-	-	12.0	-	48.2	0.0112	233
401	22.8	0.0376	6.69	0.0172	-	-	29.5	0.0548	1,859
402	41.8	0.0116	-	-	15.3	-	57.2	0.0116	203
403	-	-	-	-	25.1	0.0150	25.1	0.0150	597
404	-	-	-	-	37.3	0.0353	37.3	0.0353	948
405	-	-	-	-	23.6	0.0259	23.6	0.0259	1,098
406	71.3	0.0511	-	-	17.1	0.0188	88.4	0.0699	790
407	257	0.158	-	-	22.0	0.0483	279	0.206	739
408	111	0.0566	-	-	17.2	-	128	0.0566	441
409	77.7	0.0537	25.3	0.0650	8.63	0.0041	112	0.123	1,101
410	-	-	54.2	0.139	-	-	54.2	0.139	2,568
411	28.8	0.0080	76.9	0.198	-	-	106	0.206	1,944
412	-	-	-	-	255	0.280	255	0.280	1,098
413	-	-	-	-	111	0.122	111	0.122	1,098
414	-	-	-	-	15.1	0.0166	15.1	0.0166	1,100
415	-	-	-	-	22.8	0.0233	22.8	0.0233	1,021
416	-	-	12.4	0.0318	139	0.302	152	0.334	2,205
417	-	-	11.3	0.0291	19.1	-	30.4	0.0291	955
418	-	-	9.31	0.0239	1.72	-	11.0	0.0239	2,167
420	25.9	0.0359	10.7	0.0275	2.14	-	38.8	0.0635	1,637
421	-	-	29.0	0.0744	0.349	-	29.3	0.0744	2,537
422	-	-	1.63	0.0042	134	0.123	135	0.127	937
423	23.6	0.0066	-	-	0.905	-	24.5	0.0066	267
424	14.3	0.0040	-	-	-	-	14.3	0.0040	277

Table C-2. Average Dry Weather Flows by Land Use Area - 2015

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
425	12.3	0.0034	-	-	-	-	12.3	0.0034	277
426	24.9	0.0069	-	-	-	-	24.9	0.0069	277
427	19.3	0.0054	-	-	3.86	-	23.2	0.0054	231
428	14.4	0.0040	-	-	10.0	0.0110	24.4	0.0150	614
429	11.3	0.0031	-	-	-	-	11.3	0.0031	277
430	6.32	0.0018	-	-	0.309	-	6.63	0.0018	264
432	-	-	-	-	97.3	0.107	97.3	0.107	1,098
448	54.1	0.206	-	-	91.5	0.338	146	0.544	3,733
449	17.4	0.0661	-	-	2.51	0.0065	19.9	0.0727	3,650
457	-	-	-	-	-	-	-	-	-
458	-	-	-	-	55.9	0.0614	55.9	0.0614	1,098
466	-	-	12.1	0.0152	4.27	0.0023	16.3	0.0174	1,067
467	20.5	0.0091	-	-	5.53	0.0038	26.0	0.0129	498
470	3.85	0.0021	-	-	2.16	-	6.01	0.0021	342
480	36.5	0.0163	-	-	9.31	0.0165	45.8	0.0327	715
512	-	-	-	-	134	0.237	134	0.237	1,769
513	1.69	0.0055	-	-	4.33	0.0077	6.02	0.0131	2,180
514	5.02	0.0049	-	-	92.6	-	97.7	0.0049	51
515	15.5	0.0067	4.82	0.0060	14.0	-	34.3	0.0128	372
516	31.2	0.0445	-	-	8.04	-	39.3	0.0445	1,133
517	14.9	0.0067	-	-	9.31	0.0000	24.3	0.0067	275
518	17.1	0.0214	-	-	1.92	0.0000	19.1	0.0214	1,122
519	36.8	0.0331	-	-	9.71	0.0172	46.6	0.0503	1,079
520	24.8	0.0218	-	-	-	-	24.8	0.0218	878
521	38.2	0.0442	-	-	0.0065	0.0000	38.2	0.0442	1,157
522	36.2	0.0161	-	-	15.1	0.0266	51.3	0.0428	834
523	14.2	0.0387	-	-	-	-	14.2	0.0387	2,728
524	28.1	0.0135	-	-	-	-	28.1	0.0135	479
525	47.6	0.0212	-	-	-	-	47.6	0.0212	446
526	31.7	0.0141	-	-	-	-	31.7	0.0141	446
527	36.2	0.0161	-	-	-	-	36.2	0.0161	446
528	17.2	0.0422	-	-	0.833	-	18.0	0.0422	2,341
529	38.2	0.0219	-	-	3.67	-	41.9	0.0219	524
530	13.3	0.0096	-	-	0.333	-	13.7	0.0096	702
531	39.9	0.0279	-	-	12.7	0.0177	52.6	0.0456	867
532	14.0	0.0062	-	-	1.63	-	15.6	0.0062	399
533	12.0	0.0090	-	-	2.62	-	14.6	0.0090	617
534	5.34	0.0173	-	-	24.8	0.0004	30.2	0.0177	587
535	-	-	4.71	0.0059	24.9	0.0134	29.6	0.0193	651
536	-	-	-	-	28.2	0.0152	28.2	0.0152	537
537	-	-	-	-	32.5	0.0224	32.5	0.0224	692
538	-	-	8.41	0.0119	-	-	8.41	0.0119	1,419
539	6.70	0.0215	-	-	14.4	0.0249	21.1	0.0463	2,192
540	6.10	0.0196	-	-	-	-	6.10	0.0196	3,206
541	38.8	0.0660	-	-	1.86	-	40.6	0.0660	1,624
542	10.2	0.0290	15.3	0.0633	2.12	0.0038	27.7	0.0961	3,470
543	-	-	-	-	5.40	0.0029	5.40	0.0029	537
544	-	-	10.5	0.0131	3.89	0.0021	14.4	0.0152	1,061
545	2.62	0.0026	3.70	0.0046	3.42	0.0018	9.74	0.0091	930
546	-	-	22.8	0.0286	0.555	0.0003	23.3	0.0289	1,238
547	-	-	19.6	0.0247	1.70	0.0009	21.3	0.0256	1,198
548	-	-	35.6	0.0447	-	-	35.6	0.0447	1,255
549	11.6	0.0114	-	-	6.11	0.0031	17.7	0.0145	819
550	-	-	6.98	0.0088	-	-	6.98	0.0088	1,255
551	-	-	26.1	0.0328	-	-	26.1	0.0328	1,255
552	-	-	31.6	0.0397	-	-	31.6	0.0397	1,255
553	-	-	25.3	0.0317	-	-	25.3	0.0317	1,255
554	6.40	0.0009	9.27	0.0116	0.0001	0.0000	15.7	0.0125	798
555	16.1	0.0022	6.41	0.0080	-	-	22.5	0.0102	454
556	0.142	0.0001	9.01	0.0113	-	-	9.15	0.0114	1,251
557	35.3	0.0211	-	-	1.72	0.0000	37.0	0.0211	571
558	6.16	0.0199	-	-	41.3	0.0634	47.4	0.0833	1,756
559	63.5	0.0382	-	-	13.8	-	77.2	0.0382	495
560	43.2	0.0193	-	-	9.98	0.0176	53.2	0.0369	694
561	18.3	0.0082	-	-	-	-	18.3	0.0082	446
562	24.0	0.0248	-	-	-	-	24.0	0.0248	1,037
563	84.0	0.107	-	-	-	-	84.0	0.107	1,275
564	39.6	0.0272	-	-	4.57	0.0003	44.2	0.0275	623
565	22.2	0.0126	-	-	3.59	0.0020	25.7	0.0146	566
566	52.8	0.0480	-	-	26.4	0.0466	79.2	0.0946	1,195
567	-	-	-	-	-	-	-	-	-
568	6.11	0.0019	-	-	3.13	-	9.24	0.0019	203
569	-	-	30.5	0.0382	-	-	30.5	0.0382	1,255
578	-	-	4.52	0.0057	-	-	4.52	0.0057	1,255
583	-	-	15.1	0.0189	-	-	15.1	0.0189	1,255
584	18.6	0.0668	17.5	0.0722	-	-	36.1	0.139	3,854
585	25.0	0.0276	-	-	0.0306	-	25.1	0.0276	1,101
586	-	-	28.7	0.0360	-	-	28.7	0.0360	1,255
587	-	-	-	-	75.1	0.0417	75.1	0.0417	555
590	2.24	0.0010	-	-	1.70	0.0023	3.94	0.0033	842
591	7.06	0.0069	15.2	0.0190	5.95	0.0032	28.2	0.0292	1,036

Table C-3. Average Dry Weather Flows by Land Use Area - Buildout

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
21	-	-	-	-	25.9	0.0837	25.9	0.0837	3,238
24	-	-	-	-	39.6	0.119	39.6	0.119	2,998
25	-	-	-	-	34.0	0.129	34.0	0.129	3,800
26	-	-	-	-	70.2	0.267	70.2	0.267	3,799
27	-	-	-	-	74.2	0.282	74.2	0.282	3,800
28	0.159	0.0006	-	-	25.7	0.0975	25.8	0.0981	3,800
29	33.5	0.127	-	-	-	-	33.5	0.127	3,800
30	22.2	0.0843	-	-	33.9	0.129	56.1	0.213	3,800
31	49.4	0.188	-	-	24.0	0.0910	73.4	0.279	3,800
32	30.3	0.115	-	-	-	-	30.3	0.115	3,800
33	24.6	0.0935	-	-	13.4	0.0510	38.0	0.145	3,800
34	0.966	0.0037	-	-	20.5	0.0779	21.5	0.0816	3,800
35	-	-	-	-	8.73	0.0068	8.73	0.0068	778
36	-	-	-	-	58.4	0.127	58.4	0.127	2,180
37	-	-	-	-	447	0.808	447	0.808	1,807
38	-	-	-	-	112	0.363	112	0.363	3,242
39	-	-	-	-	45.4	0.0777	45.4	0.0777	1,710
40	-	-	-	-	23.5	0.0837	23.5	0.0837	3,561
41	-	-	-	-	61.5	0.0896	61.5	0.0896	1,458
46	42.1	0.160	-	-	0.0029	0.0000	42.1	0.160	3,800
47	-	-	-	-	13.8	0.0359	13.8	0.0359	2,600
49	52.8	0.0168	-	-	14.7	0.0094	67.5	0.0262	388
50	10.7	0.0099	-	-	185	0.327	196	0.337	1,723
51	10.2	0.0051	-	-	45.8	0.0084	56.0	0.0135	240
52	-	-	-	-	66.0	0.0860	66.0	0.0860	1,302
53	-	-	-	-	42.4	0.0602	42.4	0.0602	1,421
54	0.686	0.0001	-	-	199	0.0015	199	0.0016	7.97
57	123	0.441	4.81	0.0123	69.7	0.193	198	0.647	3,273
61	-	-	-	-	5.84	0.0064	5.84	0.0064	1,098
62	-	-	-	-	69.2	0.181	69.2	0.181	2,609
63	-	-	-	-	9.04	0.0099	9.04	0.0099	1,098
64	-	-	-	-	10.0	0.0193	10.0	0.0193	1,928
65	0.0075	0.0000	-	-	118	0.362	118	0.362	3,057
69	-	-	-	-	53.2	0.109	53.2	0.109	2,054
70	-	-	11.3	0.0354	-	-	11.3	0.0354	3,141
71	30.7	0.0085	-	-	3.59	0.0000	34.3	0.0085	248
72	2.36	0.0007	-	-	8.03	0.0088	10.4	0.0095	913
82	-	-	7.03	0.0181	7.36	-	14.4	0.0181	1,255
83	-	-	-	-	22.4	0.0455	22.4	0.0455	2,035
84	22.7	0.0204	36.8	0.149	3.84	-	63.3	0.169	2,671
85	-	-	-	-	41.9	0.0472	41.9	0.0472	1,129
86	-	-	-	-	9.66	0.0265	9.66	0.0265	2,745
95	-	-	-	-	232	0.880	232	0.880	3,800
96	12.6	0.0477	-	-	12.9	0.0488	25.4	0.0965	3,800
97	67.4	0.256	-	-	4.32	0.0164	71.7	0.272	3,800
99	-	-	-	-	135	0.487	135	0.487	3,601
100	25.0	0.0951	-	-	11.5	0.0416	36.5	0.137	3,741
101	-	-	-	-	66.2	0.252	66.2	0.252	3,800
102	-	-	-	-	573	2.18	573	2.18	3,800
103	-	-	-	-	158	0.601	158	0.601	3,800
104	0.0003	0.0000	-	-	135	0.512	135	0.512	3,800
105	57.1	0.217	-	-	250	0.949	307	1.17	3,800
106	-	-	25.4	0.0671	0.0909	-	25.5	0.0671	2,630
107	3.48	0.0010	-	-	75.7	0.0994	79.2	0.100	1,268
108	4.98	0.0014	-	-	2.56	-	7.54	0.0014	183
109	19.9	0.0194	-	-	106	0.155	126	0.175	1,386
110	6.93	0.0088	-	-	39.9	0.0001	46.9	0.0089	190
111	19.2	0.0341	-	-	17.2	0.0152	36.4	0.0492	1,355
112	0.929	0.0004	-	-	44.5	-	45.4	0.0004	7.77
113	67.2	0.0304	-	-	16.5	-	83.7	0.0304	364
114	14.5	0.0040	-	-	-	-	14.5	0.0040	277
115	7.37	0.0029	-	-	1.50	-	8.87	0.0029	327
116	14.9	0.0309	-	-	37.4	0.0224	52.3	0.0534	1,020
117	15.4	0.0043	-	-	13.0	-	28.4	0.0043	150
118	33.1	0.0317	-	-	8.16	-	41.3	0.0317	768
119	73.2	0.0331	-	-	49.0	0.0539	122	0.0870	712
120	14.8	0.0042	-	-	0.171	-	15.0	0.0042	280
121	31.1	0.0398	-	-	-	-	31.1	0.0398	1,282
122	15.3	0.0115	-	-	18.7	0.0207	34.0	0.0321	945
123	29.4	0.0095	-	-	5.57	-	35.0	0.0095	273
124	30.9	0.0086	-	-	2.41	-	33.3	0.0086	257
125	13.1	0.0036	-	-	4.79	-	17.9	0.0036	203
126	17.5	0.0049	-	-	0.574	-	18.1	0.0049	273
127	32.8	0.0096	-	-	2.64	-	35.5	0.0096	270
128	24.2	0.0285	-	-	13.8	0.0152	38.0	0.0437	1,149
129	23.7	0.0066	-	-	10.4	0.0114	34.1	0.0180	527
130	20.5	0.0095	-	-	-	-	20.5	0.0095	462
131	-	-	62.3	0.288	16.3	0.0059	78.7	0.294	3,739
132	35.9	0.0169	9.49	0.0244	4.09	-	49.4	0.0412	834
133	14.6	0.0120	39.3	0.102	2.35	-	56.3	0.114	2,022
134	12.8	0.0038	-	-	1.92	-	14.7	0.0038	259
135	16.2	0.0045	-	-	1.12	-	17.4	0.0045	259
136	33.2	0.0092	-	-	-	-	33.2	0.0092	277
137	29.2	0.0150	-	-	-	-	29.2	0.0150	512
138	21.1	0.0067	-	-	3.66	-	24.8	0.0067	272
139	127	0.105	25.2	0.0645	27.2	0.0352	180	0.205	1,141
140	14.7	0.0081	-	-	-	-	14.7	0.0081	554
141	3.52	0.0010	-	-	9.63	0.0106	13.1	0.0116	880
142	33.7	0.0093	-	-	-	-	33.7	0.0093	277
143	69.5	0.0334	5.63	0.0084	-	-	75.1	0.0418	556

Table C-3. Average Dry Weather Flows by Land Use Area - Buildout

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
144	15.6	0.0160	87.5	0.225	22.4	0.0216	125	0.262	2,090
145	30.2	0.0148	2.15	0.0034	2.83	-	35.2	0.0182	518
146	13.0	0.0043	0.193	0.0005	3.24	-	16.5	0.0048	289
147	26.7	0.0377	5.45	0.0076	10.1	0.0062	42.3	0.0515	1,218
148	1.69	0.0006	2.32	0.0059	3.06	-	7.07	0.0066	929
149	7.74	0.0090	8.83	0.0233	2.43	-	19.0	0.0323	1,700
150	13.7	0.0156	-	-	18.1	0.0199	31.7	0.0355	1,118
151	28.3	0.0383	-	-	20.5	0.0226	48.8	0.0608	1,246
152	21.1	0.0058	-	-	4.95	0.0054	26.0	0.0113	434
153	4.13	0.0011	-	-	-	-	4.13	0.0011	277
154	9.14	0.0025	-	-	-	-	9.14	0.0025	277
155	36.0	0.0101	-	-	-	-	36.0	0.0101	281
156	23.0	0.0065	-	-	-	-	23.0	0.0065	282
157	8.07	0.0047	7.32	0.0194	-	-	15.4	0.0241	1,565
167	-	-	-	-	52.3	0.191	52.3	0.191	3,659
168	-	-	-	-	53.1	0.0966	53.1	0.0966	1,820
202	-	-	-	-	83.7	0.0920	83.7	0.0920	1,099
203	-	-	-	-	117	0.205	117	0.205	1,743
204	-	-	5.39	0.0138	-	-	5.39	0.0138	2,568
205	-	-	83.5	0.289	3.51	0.0025	87.0	0.291	3,348
206	-	-	77.0	0.225	11.2	-	88.2	0.225	2,546
207	0.147	0.0003	0.147	0.0004	63.2	0.171	63.5	0.172	2,703
208	-	-	42.3	0.149	3.79	-	46.1	0.149	3,241
209	-	-	21.4	0.0702	4.69	-	26.1	0.0702	2,692
210	95.8	0.410	4.68	0.0134	36.9	0.0168	137	0.440	3,205
212	-	-	117	0.353	23.9	0.0874	141	0.441	3,126
213	-	-	45.1	0.170	-	-	45.1	0.170	3,770
214	46.5	0.0350	28.5	0.104	32.5	0.0054	108	0.145	1,346
215	-	-	75.6	0.238	5.17	-	80.8	0.238	2,941
218	0.0058	0.0000	0.0061	0.0000	38.6	0.149	38.6	0.149	3,858
219	8.62	0.0029	33.8	0.0893	42.3	0.162	84.7	0.254	3,002
220	4.86	0.0113	53.3	0.137	5.34	-	63.6	0.148	2,328
221	27.7	0.105	-	-	37.5	0.0867	65.2	0.192	2,939
222	67.7	0.280	45.6	0.0927	54.7	0.0649	168	0.437	2,603
223	7.61	0.0701	3.38	0.0085	14.6	0.0117	25.5	0.0903	3,537
224	-	-	-	-	37.0	0.0401	37.0	0.0401	1,085
226	7.32	0.0023	-	-	64.9	0.0382	72.2	0.0405	560
231	-	-	-	-	61.7	0.0679	61.7	0.0679	1,100
232	-	-	-	-	0.0083	0.0000	0.0083	0.0000	547
235	-	-	-	-	77.0	0.0571	77.0	0.0571	742
236	-	-	-	-	63.1	0.0908	63.1	0.0908	1,440
346	29.1	0.0532	-	-	21.7	0.0160	50.8	0.0692	1,361
347	105	0.0451	-	-	28.0	0.0000	133	0.0451	339
371	-	-	-	-	30.7	0.102	30.7	0.102	3,315
372	-	-	-	-	48.0	0.114	48.0	0.114	2,367
373	-	-	-	-	111	0.213	111	0.213	1,926
374	38.5	0.0523	-	-	4.19	0.0046	42.7	0.0569	1,332
375	41.9	0.0234	-	-	9.58	0.0005	51.5	0.0239	464
376	12.4	0.0040	-	-	10.3	0.0177	22.7	0.0217	957
377	41.0	0.100	-	-	12.8	-	53.9	0.100	1,863
378	21.7	0.0061	-	-	-	-	21.7	0.0061	280
379	-	-	115	0.347	9.34	0.0028	124	0.350	2,813
380	69.8	0.0887	13.2	0.0339	53.2	0.0743	136	0.197	1,445
381	32.3	0.0655	-	-	-	-	32.3	0.0655	2,026
382	1.29	0.0049	-	-	88.7	0.0974	90.0	0.102	1,136
385	9.02	0.0025	-	-	0.0004	0.0000	9.02	0.0025	277
386	22.6	0.0123	-	-	19.5	0.0215	42.1	0.0338	802
389	3.13	0.0012	-	-	55.2	0.0607	58.3	0.0619	1,061
391	18.9	0.0380	-	-	33.8	0.0389	52.7	0.0768	1,459
393	24.7	0.0261	-	-	56.8	0.0497	81.5	0.0758	930
394	87.1	0.0460	-	-	18.3	0.0144	105	0.0604	573
395	103	0.0463	-	-	33.0	0.0413	136	0.0876	644
396	44.6	0.129	-	-	2.62	0.0024	47.2	0.131	2,776
397	33.2	0.0096	-	-	21.9	0.0001	55.1	0.0097	176
398	68.4	0.0238	-	-	17.8	0.0000	86.2	0.0238	276
399	18.3	0.0051	-	-	-	-	18.3	0.0051	277
400	51.6	0.0292	-	-	24.4	-	76.0	0.0292	384
401	23.3	0.0398	6.69	0.0172	-	-	30.0	0.0569	1,899
402	44.8	0.0133	-	-	19.7	-	64.5	0.0133	207
403	-	-	-	-	59.5	0.118	59.5	0.118	1,985
404	-	-	-	-	122	0.311	122	0.311	2,537
405	-	-	-	-	23.6	0.0259	23.6	0.0259	1,098
406	74.4	0.0529	-	-	17.1	0.0188	91.5	0.0717	783
407	272	0.176	-	-	22.0	0.0483	294	0.224	763
408	137	0.0715	-	-	19.3	-	156	0.0715	459
409	103	0.0682	37.2	0.129	31.2	0.0289	171	0.226	1,323
410	-	-	61.9	0.181	-	-	61.9	0.181	2,921
411	33.2	0.0105	102	0.332	-	-	135	0.342	2,536
412	-	-	-	-	255	0.280	255	0.280	1,098
413	-	-	-	-	111	0.122	111	0.122	1,098
414	-	-	-	-	15.1	0.0166	15.1	0.0166	1,100
415	-	-	-	-	22.8	0.0233	22.8	0.0233	1,021
416	-	-	12.5	0.0323	139	0.302	152	0.335	2,207
417	-	-	67.8	0.334	19.1	-	86.8	0.334	3,849
418	-	-	12.0	0.0383	1.72	-	13.7	0.0383	2,797
420	29.0	0.0467	29.2	0.128	3.95	-	62.2	0.174	2,805
421	-	-	31.2	0.0864	1.48	-	32.7	0.0864	2,645
422	-	-	1.63	0.0042	147	0.170	148	0.174	1,173
423	24.1	0.0068	-	-	0.905	-	25.0	0.0068	272
424	14.3	0.0040	-	-	-	-	14.3	0.0040	277

Table C-3. Average Dry Weather Flows by Land Use Area - Buildout

Land Use Polygon ID	Residential		Mixed Use Commercial		Other Non-Residential		Totals		Aggregate Unit Flow Factor, gpd/acre
	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	Net Upstream Acres	ADWF, mgd	
425	12.3	0.0034	-	-	-	-	12.3	0.0034	277
426	24.9	0.0069	-	-	-	-	24.9	0.0069	277
427	19.3	0.0054	-	-	3.86	-	23.2	0.0054	231
428	14.4	0.0040	-	-	10.0	0.0110	24.4	0.0150	614
429	11.3	0.0031	-	-	-	-	11.3	0.0031	277
430	6.72	0.0020	-	-	0.717	-	7.44	0.0020	267
432	-	-	-	-	108	0.145	108	0.145	1,345
448	166	0.633	-	-	132	0.490	298	1.12	3,764
449	61.8	0.235	-	-	132	0.497	193	0.732	3,782
457	-	-	-	-	30.9	0.113	30.9	0.113	3,659
458	-	-	-	-	56.8	0.0648	56.8	0.0648	1,140
466	-	-	12.2	0.0160	4.27	0.0023	16.5	0.0183	1,111
467	40.7	0.0260	-	-	43.8	0.0157	84.4	0.0417	494
470	4.05	0.0029	-	-	2.16	-	6.21	0.0029	466
480	36.7	0.0164	-	-	9.31	0.0165	46.0	0.0329	714
512	-	-	-	-	134	0.237	134	0.237	1,769
513	1.69	0.0055	-	-	4.33	0.0077	6.02	0.0131	2,180
514	5.26	0.0060	-	-	92.6	-	97.9	0.0060	61.0
515	15.8	0.0084	4.82	0.0060	14.0	-	34.7	0.0144	415
516	31.4	0.0446	-	-	9.74	-	41.2	0.0446	1,084
517	14.9	0.0067	-	-	9.31	0.0000	24.3	0.0067	275
518	17.2	0.0214	-	-	1.92	0.0000	19.1	0.0214	1,119
519	45.4	0.0380	-	-	9.71	0.0172	55.1	0.0552	1,003
520	26.4	0.0227	-	-	-	-	26.4	0.0227	861
521	38.9	0.0454	-	-	0.0065	0.0000	38.9	0.0454	1,168
522	39.4	0.0180	-	-	15.1	0.0266	54.4	0.0446	820
523	14.2	0.0387	-	-	-	-	14.2	0.0387	2,728
524	43.1	0.0222	-	-	-	-	43.1	0.0222	516
525	48.0	0.0215	-	-	-	-	48.0	0.0215	447
526	33.8	0.0154	-	-	-	-	33.8	0.0154	454
527	36.2	0.0161	-	-	-	-	36.2	0.0161	446
528	17.5	0.0424	-	-	0.833	-	18.3	0.0424	2,316
529	54.2	0.0315	-	-	5.71	-	59.9	0.0315	526
530	15.5	0.0108	-	-	6.14	-	21.6	0.0108	502
531	42.1	0.0292	-	-	33.1	0.0177	75.2	0.0469	624
532	14.7	0.0067	-	-	6.15	-	20.9	0.0067	320
533	14.1	0.0102	-	-	3.09	-	17.2	0.0102	596
534	5.34	0.0173	-	-	24.8	0.0004	30.2	0.0177	587
535	-	-	4.71	0.0059	27.0	0.0209	31.7	0.0268	847
536	-	-	-	-	37.5	0.0493	37.5	0.0493	1,312
537	-	-	-	-	32.5	0.0224	32.5	0.0224	692
538	-	-	8.41	0.0119	-	-	8.41	0.0119	1,419
539	6.70	0.0215	-	-	27.2	0.0258	33.9	0.0472	1,391
540	6.10	0.0196	-	-	-	-	6.10	0.0196	3,206
541	39.0	0.0670	-	-	1.86	-	40.9	0.0670	1,639
542	10.2	0.0290	16.0	0.0667	2.12	0.0038	28.3	0.0995	3,513
543	-	-	-	-	5.40	0.0029	5.40	0.0029	537
544	-	-	10.5	0.0131	3.89	0.0021	14.4	0.0152	1,061
545	6.61	0.0195	4.45	0.0087	4.04	0.0018	15.1	0.0300	1,990
546	-	-	22.8	0.0286	0.774	0.0011	23.6	0.0297	1,260
547	-	-	19.6	0.0247	1.70	0.0009	21.3	0.0256	1,198
548	-	-	35.7	0.0449	-	-	35.7	0.0449	1,259
549	12.0	0.0132	-	-	12.9	0.0067	24.9	0.0198	798
550	-	-	6.98	0.0088	-	-	6.98	0.0088	1,255
551	-	-	26.1	0.0328	-	-	26.1	0.0328	1,255
552	-	-	32.1	0.0422	-	-	32.1	0.0422	1,316
553	-	-	25.3	0.0317	-	-	25.3	0.0317	1,255
554	6.40	0.0009	9.27	0.0116	0.0001	0.0000	15.7	0.0125	798
555	16.3	0.0023	6.41	0.0080	-	-	22.7	0.0103	455
556	0.142	0.0001	9.67	0.0149	-	-	9.81	0.0150	1,531
557	35.5	0.0213	-	-	1.72	0.0000	37.2	0.0213	571
558	6.16	0.0199	-	-	41.3	0.0634	47.4	0.0833	1,756
559	65.5	0.0467	-	-	14.1	-	79.6	0.0467	588
560	48.1	0.0221	-	-	9.98	0.0176	58.1	0.0398	684
561	18.3	0.0082	-	-	-	-	18.3	0.0082	446
562	30.2	0.0508	-	-	-	-	30.2	0.0508	1,684
563	84.0	0.107	-	-	-	-	84.0	0.107	1,275
564	43.7	0.0302	-	-	28.2	0.0027	72.0	0.0329	458
565	23.6	0.0135	-	-	14.1	0.0020	37.7	0.0155	411
566	52.9	0.0484	-	-	26.4	0.0466	79.3	0.0950	1,199
567	-	-	-	-	10.0	0.0025	10.0	0.0025	250
568	8.52	0.0121	-	-	18.6	-	27.1	0.0121	447
569	-	-	30.5	0.0382	-	-	30.5	0.0382	1,255
578	-	-	4.72	0.0068	-	-	4.72	0.0068	1,433
583	-	-	15.1	0.0189	-	-	15.1	0.0189	1,255
584	20.8	0.0761	17.6	0.0731	-	-	38.4	0.149	3,882
585	30.2	0.0312	-	-	0.0306	-	30.2	0.0312	1,033
586	-	-	29.1	0.0380	-	-	29.1	0.0380	1,308
587	-	-	-	-	84.8	0.0609	84.8	0.0609	718
590	6.62	0.0036	-	-	7.17	0.0096	13.8	0.0131	952
591	7.06	0.0069	15.2	0.0190	5.95	0.0032	28.2	0.0292	1,036

APPENDIX D

General Flow Data Analysis Approach (Excerpt from the 1995 *Collection System Needs Analysis Report*)

APPENDIX B-2
DRY SEASON FLOW DATA ANALYSIS
EXCERPT FROM
1995 COLLECTION SYSTEM NEEDS ANALYSIS REPORT

DRY-SEASON FLOW DATA ANALYSIS
Excerpt from Section 4 of the *1995 Collection System Needs Analysis Report*
Prepared by HDR Engineering, Inc.

GENERAL APPROACH

To conduct a collection system analysis, there are three basic flow components that must be evaluated and characterized:

- **Dry Weather Flow (DFW)** is the collection system base flow or the sanitary flow component. Typically, this base flow has consistent, predictable daily and weekly flow patterns. These flow patterns are dictated by the land use contributing to the flow.
- **Wet Weather Infiltration (WWI)** is assumed to be a constant flow during the wet weather season. WWI is site specific and depends on the ground water elevation and the physical condition of the collection system. Infiltration into the collection system is only possible in sewers and laterals with defects such as cracks and open joints.
- **Storm-Related Infiltration and Inflow (SRI/I)** is infrequent flow that is closely correlated to specific storm events in the service area. The storm-related infiltration portion is caused by pipe defects coupled with temporary changes in the ground water elevation resulting from a storm. Storm-related inflow results from interconnections between the storm and sanitary sewer collection systems, or direct inflows into the sewer system through manholes and broken pipes. Isolating storm-related infiltration from inflows is difficult; however, the flow response time to a storm event is significantly shorter for inflows than for infiltration, and is typically used as an indicator parameter.

For USA's collection system, these flow components were defined by analyzing flow data collected at 123 monitoring stations and rainfall data collected at 14 locations throughout the study area. The general approach to the flow data analysis (shown in Figure 4-1) included the following steps:

- **Dry Weather Data Analysis.** Unit flow factors for average dry weather flow (ADWF) and diurnal flow curves were developed for model input.
- **Wet Weather Data Analysis.** The WWI flow component was assessed using flow data on non-storm days (i.e., flow data that is not influenced by a specific storm event).
- **Storm-Related Flow Data Analysis.** Storm-related flow responses were analyzed to determine the volume and pattern of flow into the collection system.

- **Unit Flow Generation Factors Development.** A set of unit flow factors was developed based on the ADWF, WWI and SRI/I data. These factors were used to extrapolate flow conditions for unmonitored basins and for future conditions.
- **Plant Influent Analysis.** Flow records from the treatment plants were analyzed to define wet and dry weather seasons for the above analysis. The records also were used to determine the average dry and wet weather flows and hourly flow patterns for model calibration purposes.
- **Point Source Flow Contributions.** Point source flows, such as large industries, were identified and site-specific data were collected. These data were used to define average daily flows and diurnal flow patterns for point sources.

The following discussion outlines the methods used to analyze flow data, identify flow characteristics, and predict specific hydraulic conditions that will occur in the collection system.

Analysis of Flow Monitor Data --

Figure 4-2 is a schematic flow diagram of the analytical procedure used to analyze the DWF data. There are two components to this procedure: analysis of ADWFs, and definition of diurnal curves.

Average Dry Weather Flow --

The ADWF data from the flow monitoring stations were combined in a single database, which included land use data for each monitored basin. The land use data, extracted from the Block Group Database, are expressed in terms of development units, either dwelling units (DU) or 1,000 square foot of commercial and industrial development. The land use information is divided into 15 land use categories.

The objective of the analysis was to define the unit flow factors to be used to generate flow assignments for the collection system model. These unit flow factors predict the wastewater contribution per development unit for each land use category (e.g., the land use factor for weekday flows from the Single Family Residential No. 1 (SFRI) category is approximately 143 gpd/DU). Using multiple regression analysis, units flow factors for both weekday and weekend flows were defined for each land use category. These are summarized in Table 4-1.

Table 4-1. Unit Flow Factors for ADWF Assignment

Land Use Category		Population Density (cap/DU) [5]	Weekday Unit Flow Factors		Weekend Unit Flow Factors		Units
Acronym	Description		Median	STD [4]	Median	STD [4]	
SFR1	Single Family Residential (1-3/acre)	2.4	160	14.46	171	14.07	gpd/DU
SFR2	Single Family Residential (3-4/acre)	2.4	160	14.46	171	14.07	gpd/DU
SFR3	Single Family Residential (4-6/acre)	2.4	160	14.46	171	14.07	gpd/DU
MFR1	Multi Family Residential (2-25/acre)	2.3	200	18.08	213	17.58	gpd/DU
MFR2	Multi Family Residential (>25/acre)	2.3	200	18.08	213	17.58	gpd/DU
RR	Rural Residential	2.3	160	14.46	171	14.07	gpd/DU
CN	Neighborhood Commercial	n.a.	84	21.66	65	21.05	gpd/1000 sf
CG	General commercial	n.a.	84	21.66	65	21.05	gpd/1000 sf
CC	Central Commercial	n.a.	84	21.66	65	21.05	gpd/1000 sf
CO	Office Commercial	n.a.	84	21.66	65	21.05	gpd/1000 sf
IL	Light Industry	n.a.	84	21.66	65	21.05	gpd/1000 sf
IMU	Multi-use Industrial	n.a.	84	21.66	65	21.05	gpd/1000 sf
IH	Heavy Industrial [1]	n.a.	168	43.3	130	42.1	gpd/1000 sf
PF	Public Facilities [2]	n.a.					
NZ	Not Zoned Areas [3]	n.a.					

Notes:
1) Excluding identified "wet" industries.
2) Public facilities with significant inflow should be treated as point inflows.
3) Not zoned areas such as highway right of ways.
4) Standard deviation.
5) Assumed target population densities from demographics study.

The correlation between the recorded and predicted flows using the unit flow factors for the flow monitor basins is illustrated in Figure 4-3. The following assumptions were made in the unit flow factor analysis:

- 1992 flow monitoring data were used to match the 1992 land use/demographic data.
- All single-family residential categories, including the rural residential land use categories, were grouped together as category SFR.
- All multiple family categories were grouped together as category MFR.
- All commercial, light industrial and multi-use industrial categories were grouped together and called CO/IL.
- Trial runs proved that a better correlation can be obtained by assuming a SFR to MFR unit flow factor ratio of 1.25, and a CO/IL to IH (heavy industrial) flow factor ratio of 2.0. These ratios correspond to typical observed ratios in other collection systems.
- Flow contributions from "wet" industries were deducted from the total basin flows, but the development area for the particular industry was not deducted from the land use database. This approach was adopted by assuming that the "wet" flow is a process-related flow, and that the industry still contributes to the base ADWF.
- In the multiple regression analysis, it was assumed that all cross correlation between factors was negligible.

Diurnal Flow Patterns --

Diurnal flow patterns are defined as a dimensionless hourly flow with a daily average of 1.0. Diurnal flow is calculated by dividing the hourly flow by the average flow for that day. The approach for defining typical diurnal flow patterns is shown in Figure 4-2. The objectives of the analysis were to categorize the flow patterns according to land use, and to define the anticipated variation in the peak flow conditions. An analysis of the diurnal curves at USA's subbasin monitoring stations indicated that four basic curve patterns occur. These are illustrated in Figure 4-4 for average weekday and weekend conditions.

The factors most likely to influence diurnal curve patterns are basin size, basin configuration and land use. A comparison of data for the four curve types shown in Figure 4-4 proved land use to be the predominant factor, which is consistent with previous experience classifying diurnal curves. Four land use parameters were used to define the relationship between land use and diurnal curve type. These parameters were then used to assign curve types to subbasins for which monitoring data were not available.

The following is a description of the land use parameters and their influence on the diurnal curve pattern:

- **Ratio of Single Family Residential to Multi-Family Residential (SFR/MFR).** Experience showed that basins with a higher ratio of single family residential dwelling units to multi-family residential units are likely to have higher morning peaks and lower mid-afternoon lows.
- **Ratio of Residential Dwellings to Commercial and Industrial Development (RES/COM).** Basins with higher RES/COM ratios proved to have higher morning peaks and lower mid-afternoon lows.
- **Ratio of Industrial to Commercial Development (IND/COM).** Basins with high ratios of industrial to commercial development in combination with low RES/COM ratios proved to have relatively flat diurnal curves.
- **Industrial Development per Acre (IND/acre).** Basins with IND/acre values of more than 1,000 ft^2/acre in combination with low RES/COM values proved to have very flat curves. This illustrates a predominantly industrial flow component.

Table 4-2 summarizes information for each curve type with respect to diurnal peak and land use characteristics. Figure 4-5 summarizes information on the land use parameter ratios for each curve type.

Table 4-2. Diurnal Curve Category Definitions

Parameter	Diurnal Curve Category			
	Type 1	Type 2	Type 3	Type 4
Weekly Peak Occurrence Time	6:00 a.m. to 8:00 a.m.	6:00 a.m. to 8:00 a.m.	6:00 a.m. to 8:00 a.m.	9:00 a.m. to 11:00
Weekday Peak	1.75 to 2.2	1.50 to 1.75	1.25 to 1.50	1.10 to 1.50
SFR/MFR	>2	>2	<2	N/A
RES/COM	2 to 20	>20	2 to 20	<2
IND/COM	<3	<3	<3	>3
IND/acre	<1	<1	<1	>1
Other Characteristics	Low early morning and mid-afternoon lows.	Medium early morning and mid-afternoon lows.	Medium early morning and mid-afternoon lows.	High early morning low and almost no mid-afternoon low

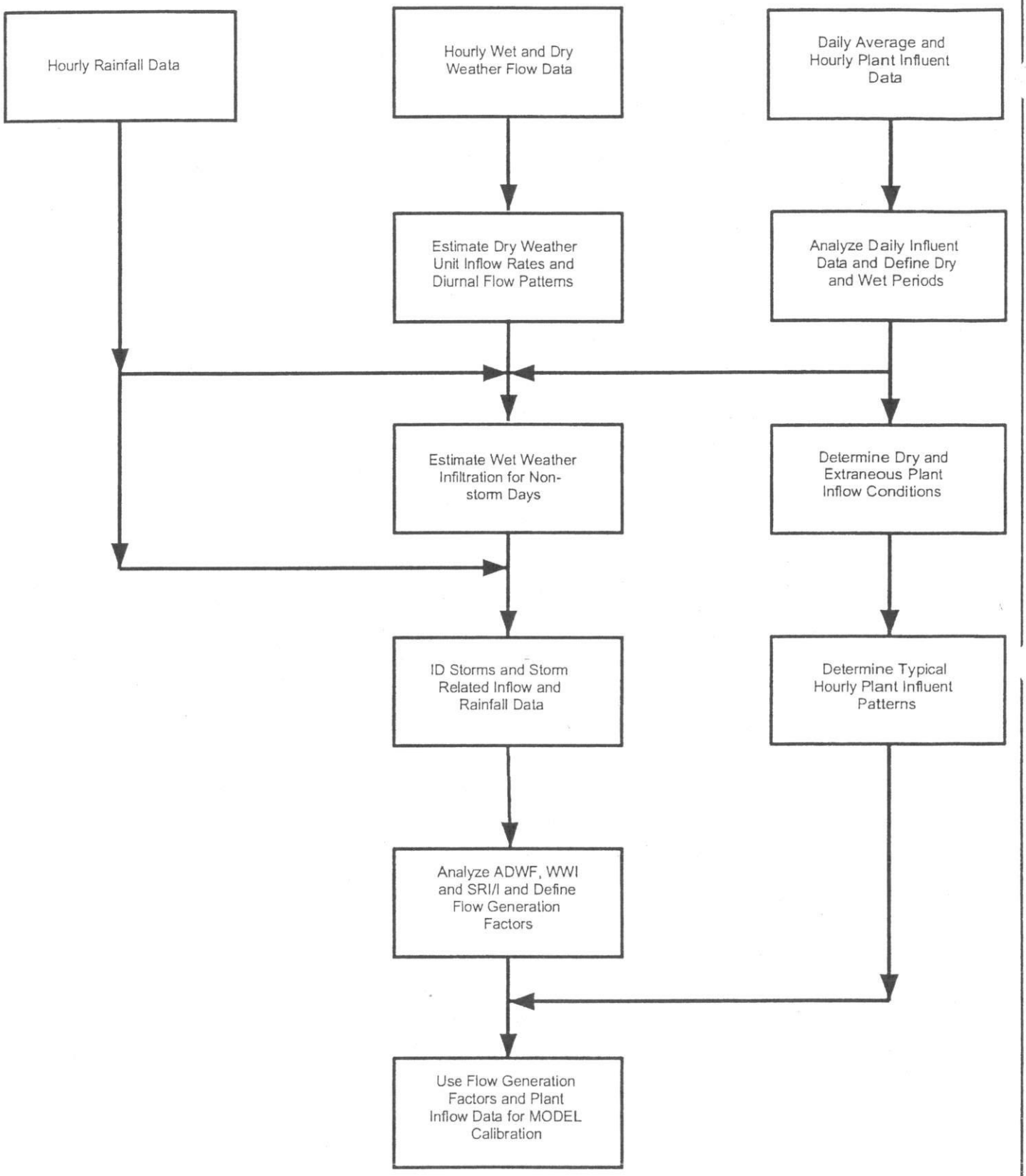
Diurnal Curve Peaking Factor Adjustments --

The curves shown in Figure 4-4 represent average diurnal flow patterns from the drainage basins. When combined with the ADWF from the basins, they simulate ADWF conditions in the collection system. However, for collection system evaluation purposes, flow conditions other than the average daily flows (e.g., maximum-day flows) may be needed. To simulate these flow conditions, the peaking factor for the diurnal curves must be adjusted. This was accomplished by preparing a log-normal distribution analysis on the peaking factors for each diurnal curve category to predict the maximum-day peaking factor (the 99.7 percentile). Based on this analysis, each value in the diurnal curve was adjusted proportionately to increase the steepness of the curve, while maintaining a unit average daily flow.

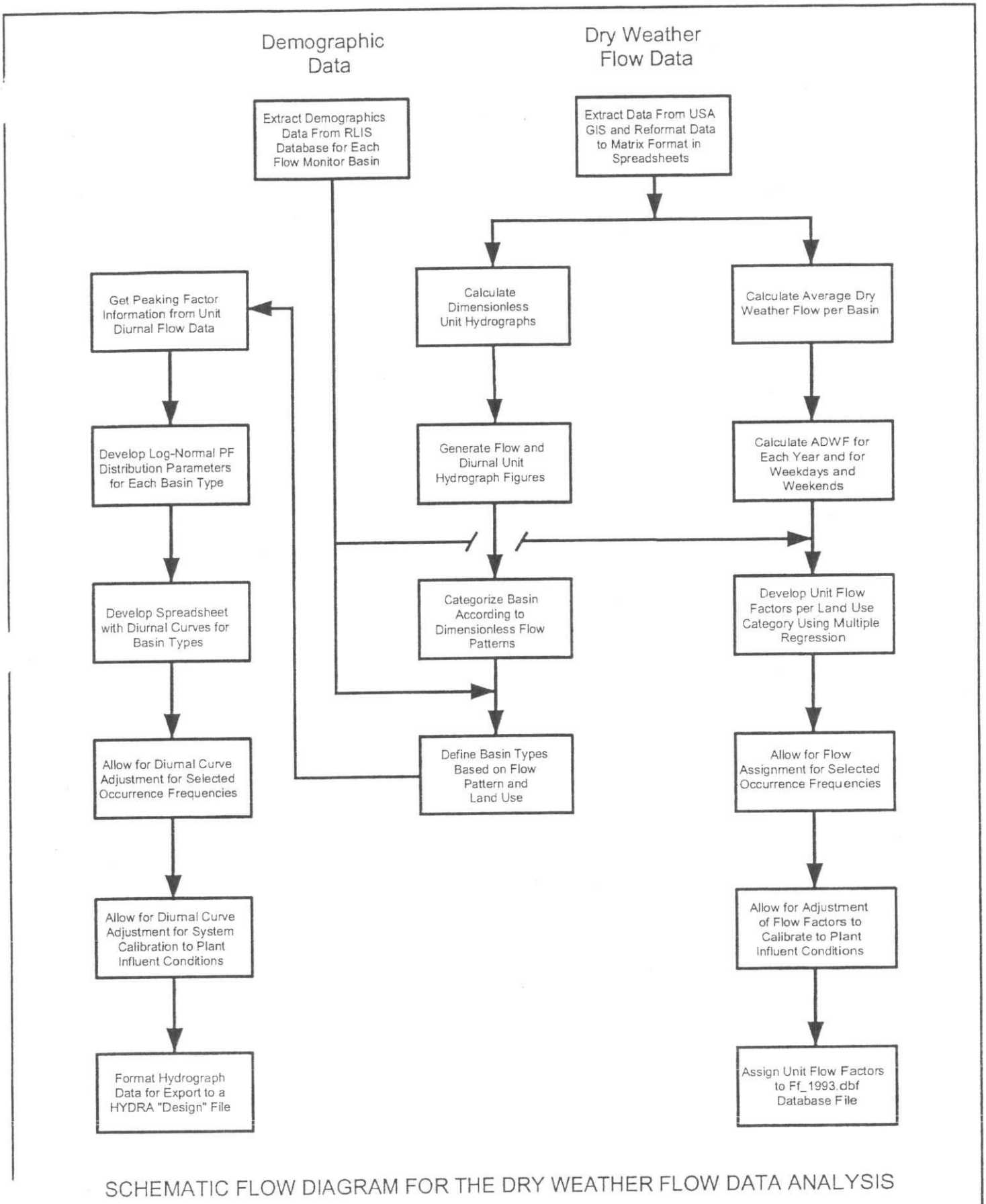
A second adjustment was to calibrate the diurnal curves for the individual collection systems. In this step, the steepness of the diurnal curves within a particular collection system (such as Forest Grove) was adjusted to match the observed diurnal flow pattern at the downstream treatment plant. This step was necessary to calibrate the flow patterns generated from "typical" curves to the basin-wide characteristics of the particular collection system.

Two additional diurnal curve adjustments were considered, a lag time adjustment and a basin size adjustment. The lag time adjustment could be applied to compensate for the time of concentration between the point of entry and the flow monitor station. In the model, flow is routed into the furthest upstream point in the collection system. This results in a lag between the observed flows and the model prediction. The diurnal curve timing can be corrected to compensate for the lag time. However, a lag in the diurnal curve will not influence the design flows predicted by the model. Therefore, the lag time adjustment was not considered essential and was ignored.

The average size of the sanitary service area used in the model is smaller than that of the flow monitoring basins. It is expected that the diurnal curve peak at the point of entry for the smaller service area will be higher than what is observed at the downstream flow monitor. An evaluation of the influence of basin size on the peaking factors showed that the increase is relatively small. It was concluded that if such an adjustment were needed, it would be incorporated in the calibration adjustment factor. Thus, no separate basin size adjustment was applied.

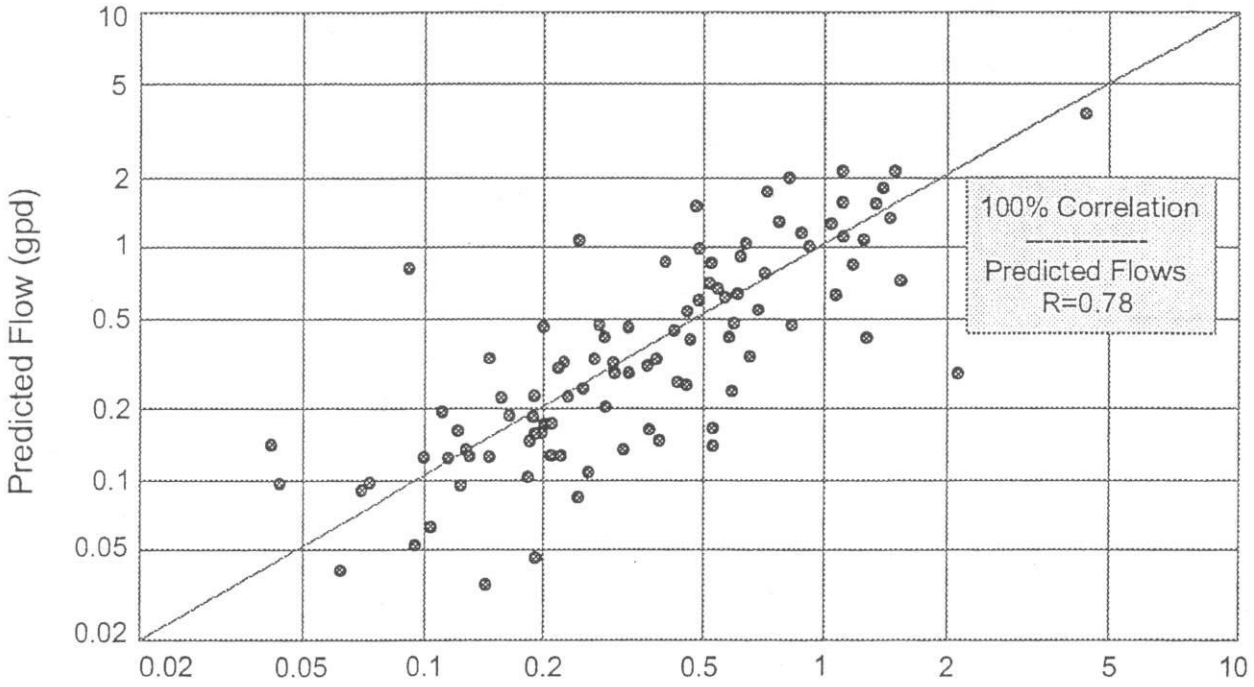


SCHEMATIC FLOW DIAGRAM OF THE GENERAL DATA ANALYSIS APPROACH

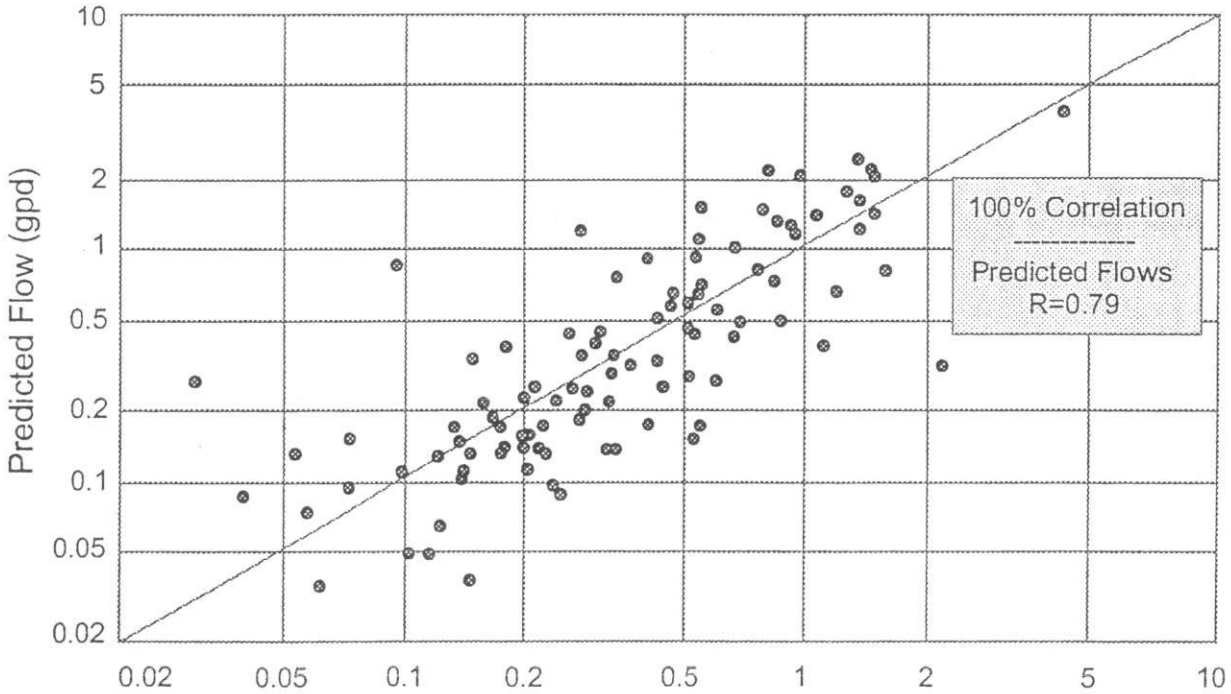


SCHEMATIC FLOW DIAGRAM FOR THE DRY WEATHER FLOW DATA ANALYSIS

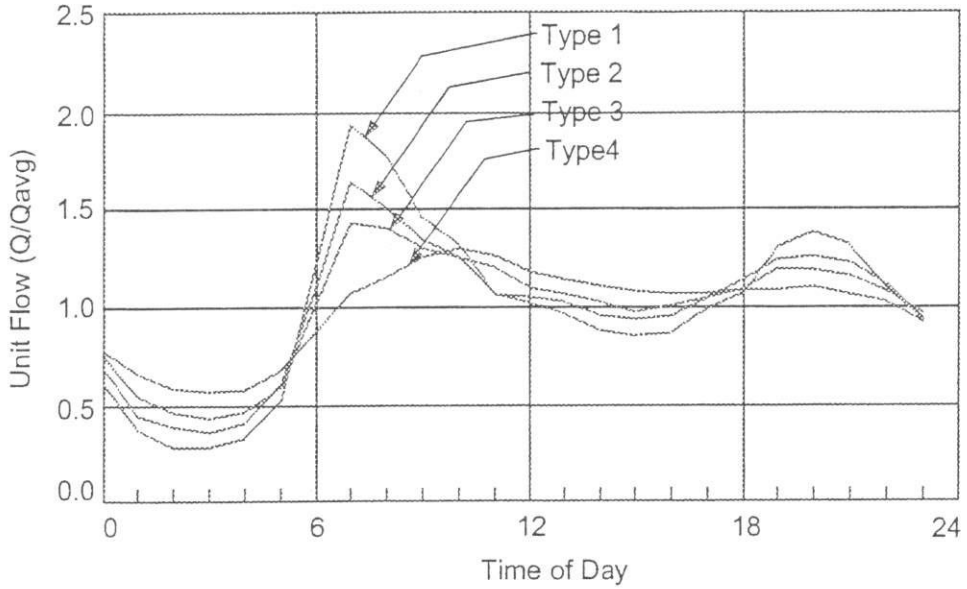
Appendix B-2
Figure 4-2



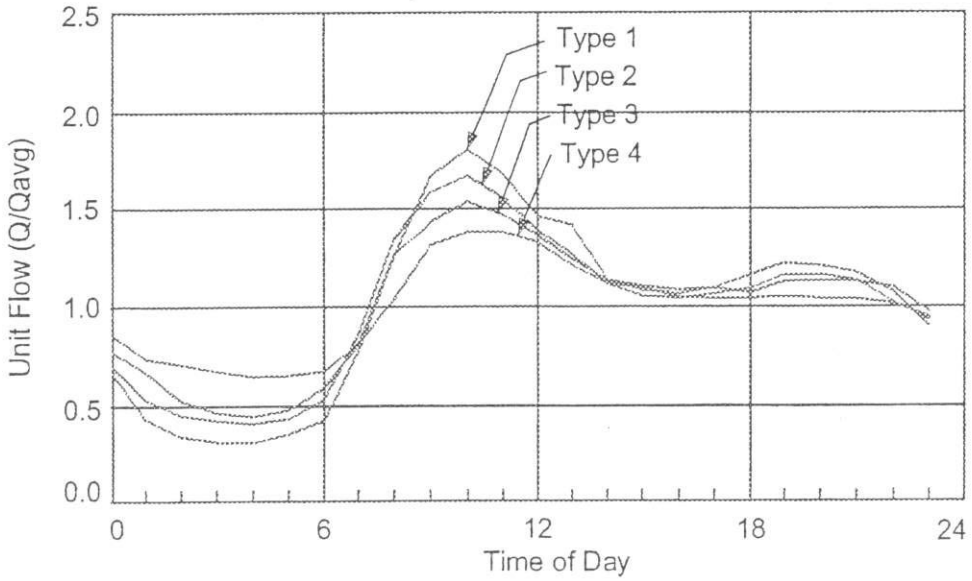
(a) COMPARISON BETWEEN OBSERVED AND PREDICTED WEEKDAY FLOWS USING GENERATED UNIT FLOW FACTORS



(b) COMPARISON BETWEEN OBSERVED AND PREDICTED WEEKEND FLOWS USING GENERATED UNIT FLOW FACTORS



(a) AVERAGE WEEKDAY UNIT DIURNAL FLOW CURVES FOR BASIN TYPES



(b) AVERAGE WEEKEND UNIT DIURNAL FLOW CURVES FOR BASIN TYPES

APPENDIX E

Flow Monitoring Data Analysis **(I&I Analysis; Chapter 4 from the 2000 MP)**

4. Flow Monitoring Data Analysis

The update and analysis of flow monitoring data focused on defining input parameters to the Hydra defects database for each of the basin models. Previous collection system evaluations developed inflow/infiltration hydrographs outside of the Hydra software that were injected into the sewer system as point flows. Therefore, a new approach to wet-season data analysis was needed to convert flow-monitoring information into Hydra *Defects.dbf* file inputs. Dry-season flow monitoring data were also updated, but only for the purpose of separating base sanitary flows from wet-season flow data. This chapter describes the methods used to define extraneous flows and to estimate system responses for the 5-year 24-hour design storm.

4.1. Approach

The approach to generating inflow and infiltration focused on setting up Hydra's *Defects.dbf* database for each of the four basin models. Two I/I components were modeled: average wet season infiltration (WWI) and storm-responsive inflow/infiltration (SRI). The average wet seasonal rate was modeled using the *WET_Q* parameter, which is input in gallons per day. The latter was modeled using the rapid infiltration parameters as follows:

- *RAP_AREA* field: Area in square feet that generates stormwater, which enters the system through major defects. The model imposes a rainfall hyetograph (contained in a storm or **.STO* file) onto this area to compute a stormwater runoff volume.
- *RAP_BEGIN* field: Beginning hour when SRI is "seen" by the system relative to the beginning of the storm.
- *RAP_MAX* field: Time between maximum rainfall intensity and maximum rapid infiltration response.
- *RAP_END* field: Time from the ending of the storm to the end of significant infiltration.

Rapid infiltration is normally delayed behind the rainfall and will continue to contribute flow to the sewer system after the storm has ended. The beginning, maximum and ending times and the storm hyetograph form the SRI hydrograph shape.

The Hydra defects database also provides a method for simulating direct storm flow into the system (*STO* fields). However, storm inflow from direct connections to the sewer system, such as roof drains, is difficult to separate from storm-responsive infiltration in analyzing flow monitoring data. Generally, it is necessary to obtain sufficient field information on direct-connection problems to justify the use of storm inflow parameters. In addition, the flow monitoring data indicates that there is generally a lag between rainfall and SRI. Therefore, the quantification of direct storm inflow was not included in this analysis.

Recently collected flow data (since that used in the 1995 work), along with hourly rainfall, was added to the flow monitoring data analysis worksheets. The current analysis of flow monitoring data more closely relates rainfall to SRI response than previous planning efforts.

Defects databases were set up for the four treatment plant basins based on the flow monitoring data analysis results. Also, unique *Defects.dbf* files were needed for the buildout condition, since the service areas that were added (e.g. URAs) will only contribute I/I and sanitary flow when developed.

These data analysis procedures resulted in a revised definition of defect flows, and were closely related to USA's 5-year 24-hour design storm. Figure 4-1 shows the location of USA's temporary flow monitors that were installed between 1990 and 1997.

4.2. Design Storm Criterion

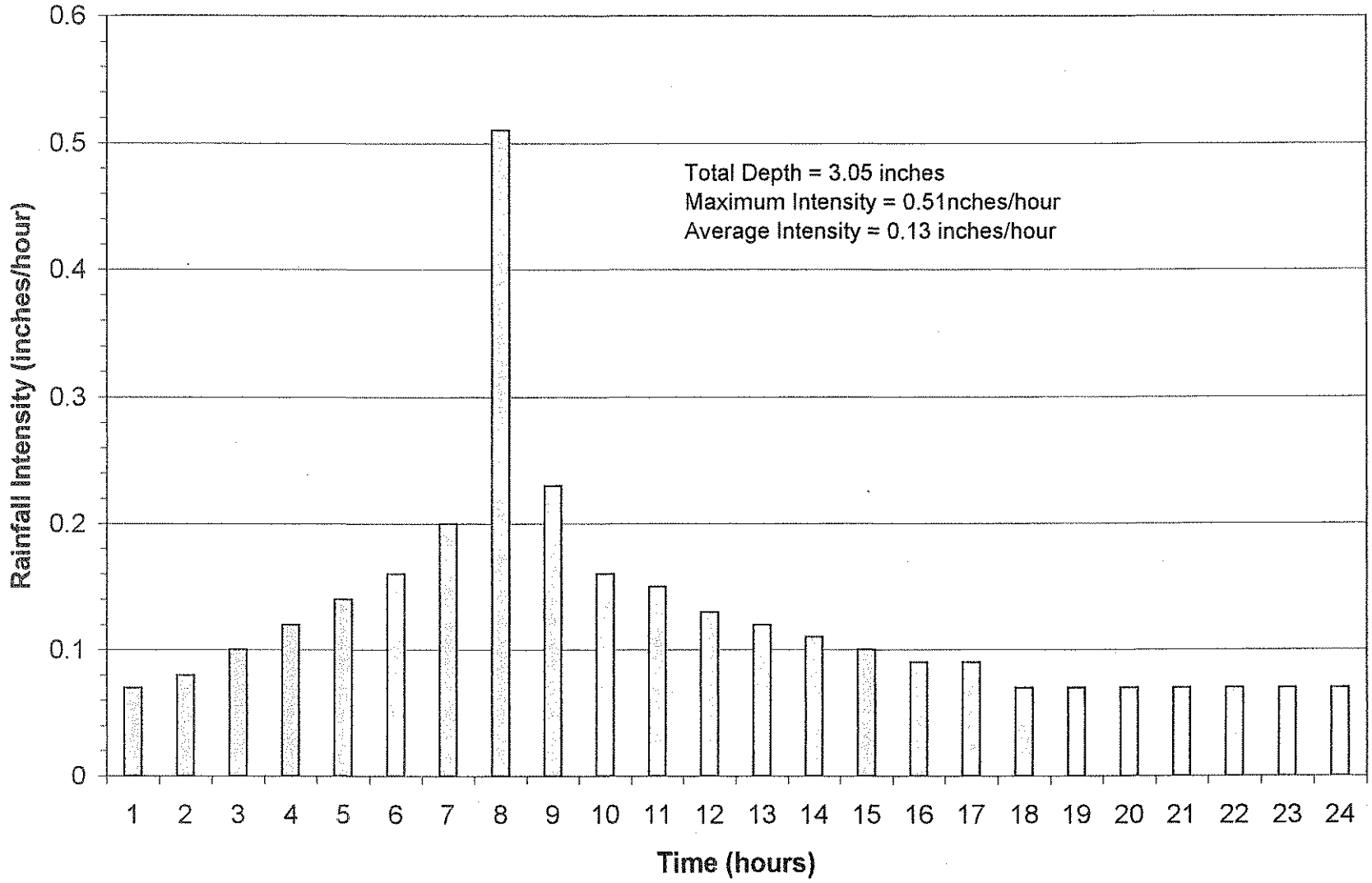
USA's NPDES permit requires that the Agency control sanitary sewer overflows (SSOs) in response to a 5-year event. SSOs include flow bypassed at the treatment plant, overflows to streams, flooded manholes and basement backups. Recent mandates by the Environmental Protection Agency have identified a receiving water-quality based approach to determining SSO control criteria. However, an SSO-control criterion is already included in USA's NPDES permit that defines the control level and compliance schedule.

The 1995 work adopted a statistical approach to I/I analysis that equated the peak 5-year response to a 20-percent frequency, or 80-percentile probability. The approach used in this analysis involves a more literal interpretation of the 5-year 24-hour storm response. In addition, a comprehensive review of the flow-monitoring data revealed that the meters did not always capture flows in response to significant rainfall events. This is because the meters were moved throughout the collection system, so the flow monitoring periods for one meter may not have coincided with the period for another located nearby. These types of inconsistencies presented problems in implementing a statistical approach to wet-season data analysis. Instead, representative wet-season SRI events were selected for each monitor and analyzed. Those events caused by rainfall events approximating the 5-year 24-hour storm, which is shown in Figure 4-2, were selected for characterizing rapid infiltration parameters. This is a synthetic rainfall event and was not derived specifically from rainfall records for the Washington County area. Synthetic rainfall events derived from regional NOAA parameters are generally less representative than events derived from local rainfall data.

An important consideration in screening the SRI representative events was antecedent conditions. In this case, the presence of wet antecedent conditions refers to the decay of the SRI response during the wet season. For instance, certain monitors show a long response to rainfall. So if a rainfall event occurs within one or two days, the SRI response may not have receded between events. This was found to be especially true in the Rock Creek system, due to the presence of a layer of clay soils that causes groundwater to be perched for long periods of time.

Determining input parameters to the defects database would be different for various design storm and antecedent conditions. The Hydra model input files are prepared from the monitoring data, and should reflect the system response that approximates the selected design event. The sewer system will respond differently under wet versus dry antecedent conditions, and under a 3-month versus a 5-year storm. Based on a comprehensive review of the available data, the USA collection system exhibits a significantly greater response to wet antecedent conditions.

Figure 4-2. 5-Year 24-Hour Design Storm



These issues were presented to USA staff for consideration. Based on USA staff and consultant discussions, it was decided that USA's 5-year 24-hour design storm would be used, and that the SRI events selected for establishing the rapid infiltration parameters would assume dry antecedent conditions (during the wet season) to the degree possible. Therefore, SRI events nested within long periods of rainfall were not used as representative of the design condition response.

4.3. Data Collection and Update

4.3.1. Seasonality

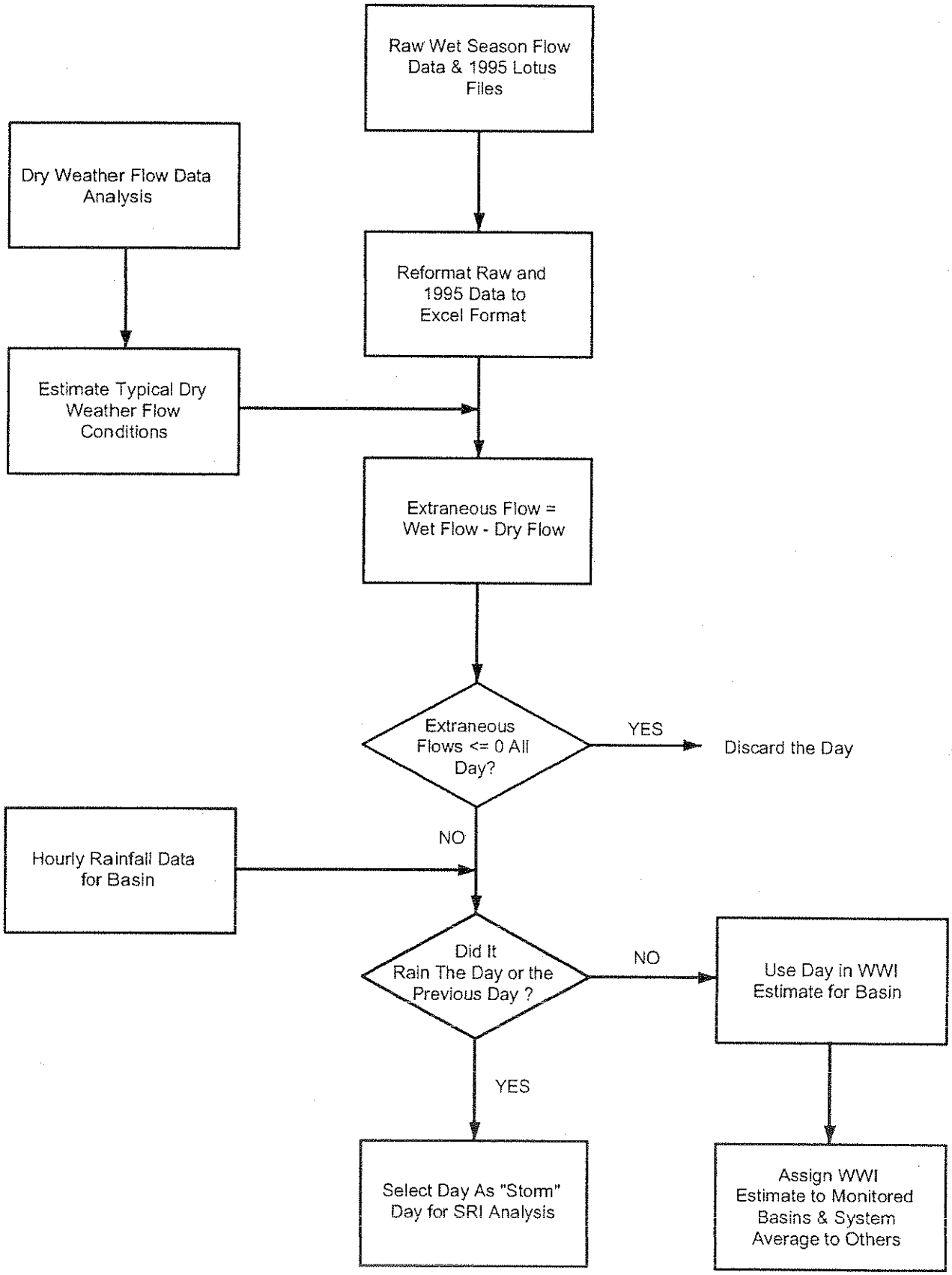
An analysis of seasonality was conducted in order to separate dry- from wet-season flows, for data added to the flow monitoring data analysis spreadsheets. The analysis method was adopted from the 1995 work, and involves creating a mass plot for each treatment plant and then identifying inflection points on the graph. The inflection points are an indication of increases and decreases in I/I flow contribution. Only recent treatment plant flows (from 1996) were analyzed. Previous definitions of dry- and wet-season changes were used for the years 1990-1995. The resulting mass plots are included in Appendix C-1, and season definition dates are summarized in Table 4-1.

4.3.2. Flow Data Update and Worksheet Templates

In order to facilitate the data update process, Excel worksheet templates and instructions were prepared for converting the 1995 Lotus worksheets. Flow and rainfall data collected since that time were added, and worksheet calculations were modified. USA staff developed procedures to convert and transpose flow and rainfall data from the flow monitor and rainfall records stored on the main computer system to the spreadsheets. Appendix C-2 contains the spreadsheet templates and instructions, and a brief memorandum providing additional details on the analysis process. Figure 4-3 is an overview of the wet-season data analysis process, and was partially adopted from the 1995 *Collection System Needs Analysis*.

Table 4-1. Unified Sewerage Agency Flow Monitoring Season Definition

Treatment Plant	Year	Dry Season End	Wet Season Start	Wet Season End	Dry Season Start
Durham	1990-1991	11-Nov-90	12-Nov-90	23-May-91	24-May-91
	1991-1992	29-Oct-91	30-Oct-90	08-May-92	09-May-92
	1992-1993	20-Nov-92	21-Nov-92	06-May-93	07-May-93
	1993-1994	05-Dec-93	06-Dec-93	14-Apr-94	15-Apr-94
	1994-1995	24-Oct-94	25-Oct-94	27-Mar-95	28-Mar-95
	1995-1996	09-Nov-95	10-Nov-95	26-May-96	27-May-95
	1996-1997	14-Nov-96	15-Nov-96	27-Mar-97	28-Mar-97
	1997-1998	10-Nov-97	11-Nov-97	05-Apr-98	06-Apr-98
	1998-1999	28-Nov-98	29-Nov-98	17-Apr-99	18-Apr-99
Rock Creek	1990-1991	09-Nov-90	10-Nov-90	25-May-91	26-May-91
	1991-1992	15-Nov-91	16-Nov-91	12-May-92	13-May-92
	1992-1993	28-Oct-92	29-Oct-92	28-Apr-93	29-Apr-93
	1993-1994	07-Dec-93	08-Dec-93	27-Apr-94	28-Apr-94
	1994-1995	24-Oct-94	25-Oct-94	01-Apr-95	02-Apr-95
	1995-1996	08-Nov-95	09-Nov-95	28-May-96	29-May-95
	1996-1997	17-Nov-96	18-Nov-96	27-Mar-97	28-Mar-97
	1997-1998	09-Nov-97	10-Nov-97	27-Mar-98	28-Mar-98
	1998-1999	18-Nov-98	19-Nov-98	28-Apr-99	29-Apr-99
Forest Grove	1990-1991	28-Nov-90	29-Nov-90	18-Apr-91	19-Apr-91
	1991-1992	14-Nov-91	15-Nov-91	02-May-92	03-May-92
	1992-1993	28-Oct-92	29-Oct-92	16-Jun-93	17-Jun-93
	1993-1994	28-Nov-93	29-Nov-93	21-Apr-94	22-Apr-94
	1994-1995	24-Oct-94	25-Oct-94	19-May-95	20-May-95
	1995-1996	08-Nov-95	09-Nov-95	02-Jun-96	03-Jun-96
	1996-1997	17-Nov-96	18-Nov-96	26-Mar-96	27-Mar-96
	1997-1998	16-Nov-97	17-Nov-97	17-Apr-98	18-Apr-98
	1998-1999	20-Nov-98	21-Nov-98	22-Apr-99	23-Apr-99
Hillsboro	1990-1991	28-Nov-90	29-Nov-90	23-May-91	24-May-91
	1991-1992	15-Nov-91	16-Nov-91	02-May-92	03-May-92
	1992-1993	19-Nov-92	20-Nov-92	12-May-93	13-May-93
	1993-1994	05-Dec-93	06-Dec-93	11-Mar-94	12-Mar-94
	1994-1995	24-Oct-94	25-Oct-94	25-Mar-95	26-Mar-95
	1995-1996	07-Nov-95	08-Nov-95	24-May-96	25-May-95
	1996-1997	15-Nov-96	16-Nov-96	27-Mar-97	28-Mar-97
	1997-1998	09-Nov-97	10-Nov-97	27-Mar-98	28-Mar-98
	1998-1999	18-Nov-98	19-Nov-98	28-Apr-99	29-Apr-99
	Shaded dates indicate that values for Rock Creek WWTP were used due to data inconsistencies.				



SCHEMATIC FLOW DIAGRAM FOR WET-SEASON INFILTRATION DATA ANALYSIS

Partially adopted from the 1995 Collection System Analysis

Figure 4-3

4.3.3. Sewer Rehabilitation Flow Data

Flow monitors that collected data downstream of sewer rehabilitation areas were subdivided according to rehabilitation project schedules. Based on construction dates provided by USA staff, the monitoring data were separated into "before" and "after" rehabilitation project periods. Table 4-2 summarizes the rehabilitation monitors and dates when work was completed.

Table 4-2. Summary of Sewer Rehabilitation Monitors

Monitor	Rehabilitation Project	Scope and Date of Work
F005	Forest Grove	Mains completed October 1993; Laterals summer 1995
D033	Cedar Hills	Mains and laterals began November 1991 and completed summer 1995
B003	Banks	Mains completed spring 1995; laterals summer 1999
H004	Hillsboro	Mains completed June 1995; no lateral rehabilitation
F001	Cornelius	Mains completed spring 1995; laterals summer 1999

In addition to those listed in the table, there were numerous temporary flow monitors set up in the rehabilitation project collection systems. These data were not used primarily because the flow monitoring data were collected only before or after the completion of construction but not both, and would therefore not provide for an analysis of I/I reduction. Most of the monitoring periods were also relatively short. For these reasons, and because a detailed analysis of sewer rehabilitation effectiveness was not part of the project scope, the temporary monitoring data were not used.

As shown in Table 4-2 rehabilitation construction was mostly accomplished in phases, which presented difficulties in separating and analyzing the flow data, and in determining effectiveness. Use of rehabilitation monitoring data is discussed further in Section 4.4.

4.3.4. Monitor Selection

Based upon a thorough review of all available data, a few of the monitors were eliminated from further analysis due to siting or data inconsistency problems. For instance, meter D035 was located on a cross-connection between the Beaverton Lateral and the Fanno Creek Interceptor, so it measured only flow diverted from the Beaverton Lateral and does not have a definitive

collection area. Other monitors such as D013B, D027A and D029A, were eliminated for data inconsistency reasons or because there were numerous upstream diversions such that the collection area could not be defined. The matrix in Appendix C-3 was created from USA's flow monitoring site database, and was enhanced to refine monitor site locations and provide a record of data use.

4.3.5. Monitor Overlap and Data Concurrency

One of the objectives in improving the system characterization of I/I flows was to separate flow data for overlapping meters. This would allow for a more accurate I/I definition for service areas between monitor sites, but requires that monitoring periods be concurrent for the meters that have been installed in sequence. For instance, monitor D017A collects 801 acres and overlaps the 496-acre area of D017B. If the records for D017B could be subtracted from D017A, then the residual data could be used to define I/I rates for the 305-acre area between the meter sites.

Worksheets were set up to sort all monitoring periods of record for the dry and wet seasons. Based on a review of the results, it was concluded that the majority of records for overlapping meters lacked concurrency. A significant amount of data would have been eliminated in order to subtract flow records and improve the characterization of I/I in areas between meter sites.

The only exception was for monitors R002A and R002B, which were installed on parallel lines. Although the monitoring periods for these meters were not entirely concurrent, the coincident flows were added together to generate a dataset that could be analyzed. Otherwise, these monitors would have been eliminated from the analysis.

4.3.6. Flow Monitor Basin Definition

Flow monitor collection areas were re-defined by USA staff using sewer and parcel information in the Agency's GIS. To the degree possible, the monitor basins were delineated to include only developed areas, since it is the existing sewer collection system that generates I/I flow. Unfortunately, area definitions were based on current parcel and sewer information, which were related to flows collected between 1990 and 1997. This meant that the area-flow relationships were not as accurate for the older flow monitoring data.

The basins that extend into the Portland system were especially difficult to define because USA has no sewer information in its GIS. Although most of these service areas were removed from the model due to the construction of the Fanno Creek Pumping Station, the monitor basins still needed to be defined, since the area computations were necessary to characterize flows collected at downstream monitors.

The results generated by USA staff were compared to the monitor acreages used in the 1995 work, and to the sum of the 1995 service areas upstream of each monitor. In many cases, the 1995 areas for these monitors, or the total area of Hydra service areas collecting to the monitors was used. In other cases, the "working" collection system and service area maps were used to make adjustments.

For the purposes of defining monitor collection areas and overlapping monitors, a spreadsheet was created to compare monitoring areas from various sources and to tabulate overlapping meter areas. This table is presented in Appendix C-4.

4.3.7. Representative Monitor Assignments

There are many approaches for quantifying and simulating I/I. The method used for analyzing the USA collection system assigns I/I rates to service areas that are connected to the modeled sewer system. The 1995 work assigned a representative monitor to each service area, and unmonitored areas were assigned typical values based on the monitored areas. This approach was adopted for the *2000 Master Plan Update*. However, a review of the 1995 monitor assignments indicated a need for refinement.

The first step was to prepare a table of Hydra service areas within monitor basins. This table was used to compare areas computed by USA, and to assign defect database input values to the service areas. Defect flow parameters (seasonal infiltration and storm-responsive infiltration) were assigned to the service areas on this basis. The tables included in Appendix C-5 were used for this purpose.

4.3.8. Data Quality and Consistency Issues

The following summarizes issues relating to the flow monitoring data available for use in preparing this *2000 Master Plan Update*:

- Rainfall data were missing for critical periods for which wet-season flow data were collected. Adjacent rain gauges were used to fill in for missing periods where possible, but it appears that there are periods when several gauges were off-line. Accurate, representative rainfall is critical in the analysis of wet weather data, since it is used to determine the difference between non-storm (WWI) and storm-related (SRI) infiltration, and to derive relationships between rainfall and SRI.
- The flow data worksheets are set up to define a storm day as having at least 0.2 inches of rain on that day or the prior day. Based on a review of the data, it appears that different areas of the system exhibit different SRI recession patterns. That is, some areas take longer than others for the SRI portion of the hydrograph to become insignificant. A uniform storm-day criterion was used for all monitors because of data reliability and consistency issues.
- The amount of flow data that have been collected concurrently is limited. Ideally, all of the monitors should be running concurrently so that records for overlapping monitors can be subtracted. This is the only way to accurately quantify I/I rates for areas in-between monitors. Dry- and wet-season monitoring periods were analyzed for all monitors to determine whether there was enough concurrency to difference records.
- Dry-season flows are subtracted from wet-season flows in order to determine I/I quantities. For each year of wet-season data, weekday and weekend dry-season flows are required. This is because dry-season flows will change over time as development occurs and changes to the sewer system take place. In many cases, average annual dry-season flows had to be estimated due to the lack of data.
- Measuring the sewered area upstream of the monitors was difficult. A measured collection area is necessary to compute unit I/I rates in terms of gallons per acre per day. The high rate of development in Washington County over this period of time has significantly changed the collection system.
- The portable monitors previously used by USA had data compilation limitations. Once the pipe surcharged, the monitor continued to record depth above the crown of the pipe and did

not have the ability to differentiate surcharge from gravity flow, thus giving erroneous values under surcharged conditions. The Badger meters installed at the permanent sites have the ability to differentiate between these two conditions.

- Several of the monitors have significant diversions upstream, and were therefore eliminated from the analysis.

An attempt was made to account for such problems by carefully selecting representative events. Unfortunately, characterizing SRI inputs to the model relies heavily on the larger wet-season events (during which the monitor manholes may be surcharged), because the design event is also large (a 5-year, 24-hour storm). Additional issues and recommendations are provided in Appendix C-8.

4.4. Definition of Wet-Season and Storm-Responsive Infiltration

Within the wet-season data worksheets, the two I/I components are separated: the average wet season rate (WWI) and the storm-responsive component (SRI), which is hydrographic. From the SRI dataset, representative "events" were selected for plotting. From these graphs, parameters were estimated that would approximate the system response to a 5-year 24-hour storm.

The following summarizes the method used to derive defect database parameters:

1. It was concluded that the flow datasets are not sufficiently consistent to allow for a statistical analysis. Therefore, the analysis of wet-season SRI was based on selected events representative of the design storm and antecedent conditions.
2. Two components of the Hydra defects database were used to model I/I flows. First, the *WET_Q* field, entered in gallons per day, was used to simulate average wet-season I/I. These values were taken from Section 3 of the wet-season spreadsheets, which averages I/I flows for non-storm days. Second, the rapid infiltration method was used to simulate SRI. The fields required are *RAP_AREA*, *RAP_BEG*, *RAP_MAX* and *RAP_END*. The *RAP_AREA* is the equivalent area of paved surface in square feet that would result in a total volume of rapid infiltration for SRI defects. The *RAP_BEG*, *RAP_MAX* and *RAP_END* are the times from the start, peak and ending times of the storm to the corresponding times of the rapid

infiltration response. A storm hyetograph is also set up in a *.*STO* file. The storm "rains" on the rapid infiltration area and generates an infiltration volume that is distributed according to the pattern defined by the beginning, maximum and ending times.

3. Graphs of SRI flows versus rainfall were prepared to define the timing pattern of SRI flows and to derive relationships between rainfall and SRI volume. The latter was used to compute *RAP_AREA* for each monitor and the former for establishing *RAP_BEG*, *RAP_MAX* and *RAP_END* hours. The rapid area is the volume of the SRI flow divided by depth of rainfall that caused the SRI response. A ratio was then computed that is the rapid area divided by the monitored basin area. This ratio was then used to determine the rapid area for each service area (sanitary subbasin) in the model.
4. For each service area, a representative monitor was selected, and the characteristics of that monitor were assigned to the service area.

Test runs of this approach were made for selected areas within the Forest Grove. The method appeared to work well, although the resulting model hydrographs exhibited less fluctuation than the monitoring data.

4.4.1. Example Monitor Data Analysis

This section provides specific examples of the methods used derive average season and rapid infiltration, or SRI, parameters. Monitor D001C, which has a collection area of 968 acres, was selected as an example. A representative rapid infiltration event for monitor D033, which collected flows from the Cedar Hills rehabilitation project, is also provided.

There are five sections to the wet-season worksheets:

Section 1: Raw wet-season flow monitoring data for a particular monitor location.

Section 2: The "residual" total flow data. Values in this section are computed from the raw monitor data less the flows for the upstream monitor or monitors, if appropriate.

Section 3: Wet-season inflow and infiltration rates, or WWI. These are the total monitored flow rates less dry-season flow, using the average yearly flow rate and the dry-season diurnal curve. Storm days are also separated from non-storm days in this section.

Section 4: Storm-responsive I/I flows. SRI flows are computed in this section from the Section 3 values less the average WWI rate for "storm" days.

Section 5: Hourly rainfall. Hourly rainfall is necessary to develop relationships between SRI flows and rainfall, and to define "storm" days.

Appendix C-2 contains further documentation on the flow data worksheets.

Average Wet Season Infiltration

Table 4-3 presents an excerpt from Section 3 of the wet-season flow worksheet for D001C. As shown in Table 4-3, the infiltration rate for this monitor is relatively low at 50 gallons per acre per day (gpad). This 50-gpad value was then assigned to the subbasins represented by this monitor, specifically, service area Nos. 8 and 105 in the Durham system.

Records identified as "Storm" days are considered to be rapid infiltration "events" and are further analyzed in Section 4 of the worksheets. The WWI rate is subtracted from the hourly I/I values in Section 3, leaving only the rapid infiltration flows.

Storm-Responsive Infiltration

Table 4-4 presents an excerpt from Section 4 of the data analysis worksheet for monitor D001C, which includes only rapid infiltration hydrographs. The representative days selected for further review and analysis are highlighted in blue. For each of these events, graphs of SRI flow (in gpm) and rainfall (in inches) versus time were prepared and are included in each worksheet. Values shown as "<0" in this section are the result of subtracting the average seasonal WWI from the flows in Section 3. If the value was negative or zero, this identifier was used. The 80th percentile calculations are for information purposes only, and are based on the non-zero values in Section 4.

Table 4-3. Example Wet Season Infiltration Calculations for D001C

USA Wet Weather Estimated I/I
Basin: D001C
Dry Weather Monitor: D001C

ADWF					
Year	1991	1992	1994	1995	1997 est
Weekday	245.7	339.6	290.0	288.2	315.0
Weekend	265.4	349.9	290.0	289.6	320.0

Monitored Area	
Total	968.0 acres
Residual	968.0 acres
(Use estimated area)	

AVERAGE WWI	
Average I/I	33.7 gpm
Std. Dev.	30.6 gpm
Average I/I	50 gpad

Unit ADWF	Weekday		0.708	0.534	0.490	0.501	0.460	0.517	0.996	1.651	1.580	1.392	1.289	1.194	1.104	1.060	1.000	0.960	0.959	1.014	1.113	1.153	1.155	1.123	1.103	0.943	Storm Limit
Unit ADWF	Weekend		0.719	0.572	0.479	0.451	0.453	0.482	0.584	0.837	1.194	1.496	1.611	1.550	1.429	1.293	1.190	1.101	1.081	1.099	1.131	1.130	1.101	1.078	1.035	0.902	0.20 in/day
SECTION 3 - INFLOW AND INFILTRATION COMPONENT (WWI & SRI) (gpm)																											
			Time of Day																								
Date	Year	Day of Week	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Hourly Average	WWI/SRI Indicator
05-DEC-91	1991	THU	NA	NA	NA	NA	NA	7.5	52.3	78.2	17.1	NA	NA	NA	NA	NA	NA	NA	NA	11.0	23.8	NA	15.1	NA	NA	NA		Storm
06-DEC-91	1991	FRI	NA	8.1	8.7	26.9	40.9	83.4	167.0	199.7	166.7	172.1	156.0	153.0	138.9	142.4	190.7	100.8	105.5	113.6	102.9	62.7	19.1	24.1	19.2	22.8		Storm
07-DEC-91	1991	SAT	41.7	61.9	66.4	71.0	46.5	49.1	41.2	33.2	84.2	70.6	62.3	53.3	27.0	18.0	0.5	14.5	37.1	60.6	27.6	4.3	NA	NA	NA	NA		Storm
08-DEC-91	1991	SUN	NA	10.2	5.8	8.7	2.5	NA	NA	NA	NA	NA	5.3	19.5	67.5	23.1	25.7	20.6	18.2	26.8	NA	30.2	14.5	14.1	NA	NA		Storm
09-DEC-91	1991	MON	NA	2.0	NA	NA	NA	4.2	37.1	69.8	6.5	NA	24.8	14.4	NA	13.8	NA	NA	NA	NA	NA	5.5	NA	5.2	NA	NA	7.6	1.0
10-DEC-91	1991	TUE	NA	NA	NA	NA	NA	NA	95.1	226.7	48.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.4	1.0
11-DEC-91	1991	WED	NA	NA	NA	NA	NA	NA	41.1	50.5	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.3	1.0
12-DEC-91	1991	THU	NA	NA	NA	NA	NA	NA	34.3	52.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	1.0
13-DEC-91	1991	FRI	NA	NA	NA	NA	NA	NA	10.4	30.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7	1.0
14-DEC-91	1991	SAT	NA	NA	NA	NA	NA	NA	NA	NA	NA	29.5	48.2	10.1	0.5	NA	NA	NA	NA	27.6	8.9	NA	NA	NA	NA	NA	5.2	1.0
15-DEC-91	1991	SUN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.5	14.3	15.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9	1.0
16-DEC-91	1991	MON	NA	NA	NA	NA	NA	NA	NA	12.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5	1.0
17-DEC-91	1991	TUE	NA	NA	NA	NA	NA	NA	55.3	173.9	6.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.8	1.0
11-Nov-94	1994	FRI	12.7	14.6	10.8	NA	NA	NA	NA	NA	NA	2.1	52.8	72.9	48.0	39.8	39.8	43.2	26.9	30.0	18.5	6.1	NA	NA	2.1	8.6	17.9	1.0
12-Nov-94	1994	SAT	29.3	29.0	16.6	14.7	3.9	10.1	16.6	25.4	68.0	44.7	68.1	64.7	62.1	63.3	67.5	42.2	43.9	32.9	30.9	44.5	11.8	8.5	NA	NA	33.3	1.0
13-Nov-94	1994	SUN	7.1	14.1	24.7	21.9	25.9	14.6	NA	NA	NA	NA	35.7	56.8	55.2	60.3	50.8	71.2	37.0	63.1	36.0	51.1	52.7	40.2	18.3	3.8	30.9	1.0
14-Nov-94	1994	MON	NA	NA	NA	NA	NA	NA	14.6	31.8	NA	20.5	NA	NA	13.2	NA	NA	NA	NA	NA	17.7	30.0	40.4	9.8	NA	4.6	7.6	1.0
15-Nov-94	1994	TUE	NA	NA	20.7	33.8	36.2	62.2	192.6	299.9	124.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	23.7	48.5	59.8	52.8	56.0	31.3	43.4	1.0
16-Nov-94	1994	WED	21.8	31.8	56.1	61.3	71.2	90.0	87.3	99.2	123.5	82.3	21.4	43.9	60.8	63.0	52.9	47.1	74.8	80.3	87.4	112.5	115.3	78.3	84.9	92.6	72.5	1.0
17-Nov-94	1994	THU	113.4	85.6	86.4	68.5	71.0	103.9	135.6	104.9	66.9	35.6	75.5	65.4	58.0	46.0	62.3	37.4	54.6	72.8	64.5	52.7	77.6	66.3	42.2	50.3	70.7	1.0
18-Nov-94	1994	FRI	45.5	48.0	44.8	25.3	36.8	64.9	64.1	38.3	32.5	19.3	23.2	33.2	23.5	7.9	19.0	35.1	43.5	36.6	16.8	29.7	9.2	NA	NA	12.1		Storm
19-Nov-94	1994	SAT	34.3	32.1	31.4	15.1	18.6	21.7	34.7	47.6	48.6	13.7	30.5	17.8	32.6	44.8	38.2	42.1	49.5	47.8	65.2	72.1	109.0	67.9	53.6	72.8		Storm
20-Nov-94	1994	SUN	68.1	61.4	54.8	38.5	30.9	19.1	NA	NA	2.8	29.2	85.9	61.6	44.7	20.4	52.1	55.0	29.5	49.2	43.5	64.2	50.1	12.1	3.4	NA		Storm
21-Nov-94	1994	MON	NA	3.0	NA	NA	NA	6.4	NA	NA	NA	NA	NA	NA	4.1	10.1	8.3	8.5	15.1	NA	12.6	15.4	19.2	22.8	16.9	NA	5.9	1.0
22-Nov-94	1994	TUE	NA	NA	4.3	2.9	1.8	9.7	131.3	255.9	102.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.4	19.1	13.2	12.9	NA	23.6	1.0
23-Nov-94	1994	WED	NA	21.2	19.0	NA	NA	NA	NA	NA	NA	33.0	7.9	NA	NA	NA	NA	0.9	0.5	NA	NA	2.6	33.9	13.6	14.3	45.4		Storm
24-Nov-94	1994	THU	62.3	71.0	60.5	27.0	30.5	21.3	NA	NA	NA	87.1	194.9	233.2	231.7	154.0	131.5	105.3	58.4	17.9	NA	NA	27.8	15.6	NA	19.5		Storm
25-Nov-94	1994	FRI	97.8	118.9	99.2	75.4	84.3	72.3	NA	NA	NA	145.3	168.9	188.1	168.8	129.5	109.5	125.7	125.8	140.0	107.1	105.5	126.9	122.5	134.9	187.9		Storm
26-Nov-94	1994	SAT	219.1	230.1	227.2	197.1	165.1	167.9	163.2	160.5	224.7	207.0	211.1	227.0	206.7	203.2	161.0	141.7	144.7	159.5	154.4	134.2	135.1	68.2	80.5	95.6		Storm
27-Nov-94	1994	SUN	105.2	115.2	114.5	87.5	68.4	93.9	81.7	37.3	37.1	36.5	43.2	96.9	88.6	120.0	172.9	179.2	184.3	170.2	153.1	134.2	121.4	149.3	115.6	116.7	109.3	1.0
28-Nov-94	1994	MON	112.8	116.7	133.4	97.6	108.6	119.6	139.7	174.4	133.6	119.8	125.2	85.1	83.4	93.8	83.1	64.8	57.3	62.0	71.5	88.2	86.2	61.3	58.1	46.8	96.8	1.0
29-Nov-94	1994	TUE	20.3	25.8	32.1	13.7	12.0	45.2	166.8	280.2	124.2	NA	NA	NA	NA	NA	NA	NA	5.4	15.6	31.4	75.5	70.1	56.7	55.6	43.8	44.8	1.0
30-Nov-94	1994	WED	21.6	20.5	16.1	8.7	18.9	26.4	74.9	112.4	107.4	80.4	99.8	132.9	166.3	208.3	270.8	390.7	469.3	377.3	336.8	293.5	280.9	248.0	232.2	210.1		Storm
01-Dec-94	1994	THU	248.2	248.6	220.6	184.4	193.9	189.4	210.4	198.8	135.2	122.1	137.7	143.9	129.6	103.9	71.7	58.1	62.0	63.6	73.0	94.8	117.8	115.5	114.3	95.5		Storm
02-Dec-94	1994	FRI	88.3	96.4	88.3	63.4	71.3	97.7	125.0	88.1	67.5	63.4	58.5	66.5	59.8	73.4	75.5	82.4	94.2	81.5	78.0	67.0	57.4	18.0	40.4	58.5	73.4	1.0
03-Dec-94	1994	SAT	95.0	76.8	67.1	64.4	53.4	50.3	53.6	59.3	79.2	54.8	73.4	92.0	96.2	92.8	68.6	88.2	91.5	113.5	74.1	47.6	41.1	34.6	27.7	45.2	68.4	1.0
04-Dec-94	1994	SUN	60.5	53.9	59.3	38.8	28.0	16.7	5.1	NA	13.9	13.5	38.8	61.2	50.0	52.5	50.7	77.8	60.8	63.5	53.5	61.1	61.7	67.2	63.6	28.9	45.0	1.0
05-Dec-94	1994	MON	21.0	26.2	21.4	8.4	22.2	39.7	56.1	8.7	17.6	20.7	17.6	16.4	30.5	21.9	11.8	16.5	22.1	26.0	28.1	29.3	36.7	24.3	22.8	15.1	23.4	1.0
06-Dec-94	1994	TUE	25.3	30.6	44.1	38.3	39.5	56.3	140.8	144.1	55.2	NA	NA	NA	NA	NA	NA	NA	8.8	26.3	52.2	52.5	76.7	NA	NA	NA		Storm
07-Dec-94	1994	WED	NA	NA	NA	NA	11.4	53.3	62.3	17.4	6.6	NA	1.0	27.1	0.6	40.8	22.1	16.9	20.8	23.5	20.3	16.0	14.8	3.3	13.2	25.0		Storm
10-Nov-95	1995	FRI	2.0	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		Storm
11-Nov-95	1995	SAT	257.3	282.3	240.0	144.6	114.2	217.2	283.4	298.6	335.8	424.5	282.1	299.8	235.4	210.0	237.4	158.0	81.8	77.0	75.9	87.7	57.8	44.0	41.4	46.6		Storm
12-Nov-95	1995	SUN	71.1	82.5	76.4	68.5	38.4	20.6	NA	NA	NA	NA	NA	NA	6.3	11.3	NA	NA	NA	NA	NA	NA	NA	0.8	NA	7.8		Storm

Table 4-4. Example Rapid Infiltration Calculations for D001C

USA Stormwater Related I/I (SRI)
Basin: D001C

80TH Percentile SRI (gpm)	151.0
80TH Percentile SRI (gpad)	225

DAILY RAINFALL (inches)					SECTION 4 - STORM RELATED I/I (SRI) (gpm)																							
Date	Rain Gage	On Day	Previous Day	Previous 2 Days	Time of Day																							Daily Average
	RVR	0.00	0.00																									
	RVR	0.00	0.00		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
05-Dec-91	RVR	0.58	0.16		<0	<0	<0	<0	<0	<0	18.7	44.5	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	2.6
06-Dec-91	RVR	0.98	0.58		<0	<0	<0	<0	7.2	49.7	133.3	166.0	133.1	138.4	122.3	119.3	105.2	108.7	157.1	67.1	71.9	80.0	69.2	29.1	<0	<0	<0	<0	64.9
07-Dec-91	RVR	0.24	0.98		8.0	28.3	32.7	37.4	12.8	15.4	7.6	<0	50.6	36.9	28.7	19.7	<0	<0	<0	<0	3.4	26.9	<0	<0	<0	<0	<0	<0	12.9
08-Dec-91	RVR	0.02	0.24		<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	33.8	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	1.4
09-Dec-91	RVR	0.05	0.02																										0.0
10-Dec-91	RVR	0.01	0.05																										0.0
11-Dec-91	RVR	0.04	0.01																										0.0
12-Dec-91	RVR	0.00	0.04																										0.0
13-Dec-91	RVR	0.00	0.00																										0.0
14-Dec-91	RVR	0.00	0.00																										0.0
15-Dec-91	RVR	0.00	0.00																										0.0
16-Dec-91	RVR	0.01	0.00																										0.0
17-Dec-91	RVR	0.00	0.01																										0.0
11-Nov-94	RVR	0.04	0.14																										0.0
12-Nov-94	RVR	0.08	0.04																										0.0
13-Nov-94	RVR	0.02	0.08																										0.0
14-Nov-94	RVR	0.00	0.02																										0.0
15-Nov-94	RVR	0.20	0.00																										0.0
16-Nov-94	RVR	0.11	0.20																										0.0
17-Nov-94	RVR	0.06	0.11																										0.0
18-Nov-94	RVR	0.36	0.06		11.8	14.4	11.2	<0	3.1	31.2	30.4	4.6	<0	<0	<0	<0	<0	<0	<0	1.4	9.8	2.9	<0	<0	<0	<0	<0	<0	5.0
19-Nov-94	RVR	0.80	0.36		0.7	<0	<0	<0	<0	<0	1.0	14.0	14.9	<0	<0	<0	<0	11.1	4.6	8.5	15.9	14.1	31.6	38.4	75.3	34.2	19.9	39.1	13.5
20-Nov-94	RVR	0.02	0.80		34.5	27.8	21.2	4.9	<0	<0	<0	<0	<0	<0	52.2	27.9	11.0	<0	18.5	21.3	<0	15.5	9.8	30.5	16.5	<0	<0	<0	12.1
21-Nov-94	RVR	0.01	0.02																										0.0
22-Nov-94	RVR	0.00	0.01																										0.0
23-Nov-94	RVR	0.22	0.00		<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	0.3	<0	<0	11.7	0.5
24-Nov-94	RVR	0.27	0.22		28.6	37.3	26.9	<0	<0	<0	<0	<0	<0	53.4	161.2	199.5	198.0	120.3	97.8	71.6	24.7	<0	<0	<0	<0	<0	<0	<0	42.5
25-Nov-94	RVR	0.28	0.27		64.1	85.2	65.5	41.7	50.7	38.6	<0	<0	<0	111.6	135.2	154.4	135.1	95.8	75.8	92.0	92.2	106.3	73.5	71.9	93.3	88.9	101.2	154.3	80.3
26-Nov-94	RVR	0.04	0.28		185.5	196.5	193.6	163.4	131.4	134.2	129.6	126.9	191.0	173.4	177.5	193.3	173.1	169.6	127.3	108.1	111.0	125.8	120.7	100.6	101.5	34.6	46.8	61.9	136.5
27-Nov-94	RVR	0.14	0.04																										0.0
28-Nov-94	RVR	0.01	0.14																										0.0
29-Nov-94	RVR	0.05	0.01																										0.0
30-Nov-94	RVR	1.55	0.05		<0	<0	<0	<0	<0	<0	41.3	78.8	73.8	46.7	66.1	99.2	132.6	174.6	237.1	357.0	435.6	343.6	303.1	259.9	247.3	214.4	198.5	176.4	145.3
01-Dec-94	RVR	0.09	1.55		214.5	214.9	187.0	150.7	160.2	155.8	176.8	165.1	101.5	88.5	104.0	110.2	96.0	70.2	38.0	24.4	28.3	30.0	39.3	61.2	84.2	81.8	80.6	61.8	105.2
02-Dec-94	RVR	0.07	0.09																										0.0
03-Dec-94	RVR	0.00	0.07																										0.0
04-Dec-94	RVR	0.00	0.00																										0.0
05-Dec-94	RVR	0.00	0.00																										0.0
06-Dec-94	RVR	0.27	0.00		<0	<0	10.4	4.6	5.8	22.6	107.2	110.5	21.6	<0	<0	<0	<0	<0	<0	<0	<0	<0	18.6	18.9	43.1	<0	<0	<0	15.1
07-Dec-94	RVR	0.01	0.27		<0	<0	<0	<0	<0	19.7	28.6	<0	<0	<0	<0	<0	<0	7.1	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	2.3
10-Nov-95	CHR	0.68	0.25		<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	0.0
11-Nov-95	CHR	1.88	0.68		223.6	248.6	206.4	110.9	80.5	183.6	249.8	264.9	302.1	390.8	248.4	266.2	201.7	176.4	203.7	124.4	48.1	43.3	42.3	54.0	24.2	10.3	7.7	13.0	155.2
12-Nov-95	CHR	0.18	1.88		37.4	48.8	42.7	34.8	4.7	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	7.0
21-Feb-97	RVR	0.00	0.02																										0.0
22-Feb-97	RVR	0.00	0.00																										0.0
23-Feb-97	RVR	0.00	0.00																										0.0
24-Feb-97	RVR	0.00	0.00																										0.0
25-Feb-97	RVR	0.13	0.00																										0.0

For illustration purposes, the November 30-December 1, 1994 rapid infiltration event was selected from the D001C records. This event produced 1.56 inches of rainfall over 16 hours. Figure 4-4 and Table 4-5 illustrate the hydrographs and summary data for this event. Figure 4-4 shows the total, dry season sanitary and rapid infiltration hydrographs. Table 4-5 lists the data used to plot the hydrograph and shows the computations used to review the event and estimate defect parameters, including total volumes, maximum hourly rates, duration, volumes, rapid infiltration area, and ratio of rapid area to monitored area.

The rapid infiltration area, which is specific to an event, is the volume under the SRI curve divided by the volume of rain. The rapid-infiltration area is divided by the monitor area to compute the ratio. This ratio was then applied to each subbasin represented by monitor D001C. For instance, infiltration characteristics for service are No. 8 in the Durham system are represented by monitor D001C. The area of service No. 8, which is 198.65 acres, is multiplied by a ratio of 0.0082, yielding an estimated rapid infiltration area of 70,955 square feet. This value was then entered into the *RAP_AREA* field of Hydra defects database.

Figure 4-5 and Table 4-6 illustrate the analysis of a representative event for monitor D033, located downstream of the Cedar Hills rehabilitation project.

Estimates for the rapid infiltration timing (*RAP_BEG*, *RAP_MAX* and *RAP_END* hours) were also taken from the plots. In most cases, both the rapid area ratio and timing were estimated from multiple events, since no single event exactly represents the 5-year 24-hour design event response.

This procedure required an intensive review of the flow monitoring data as well as engineering judgement. It also closely related rainfall to rapid-infiltration response. Because the project scope did not include a complete calibration effort for the models, a data analysis method was needed that would provide reasonable estimates of defects database inputs.

Figure 4-4. Monitor D001C - November 30-December 1, 1994 Event

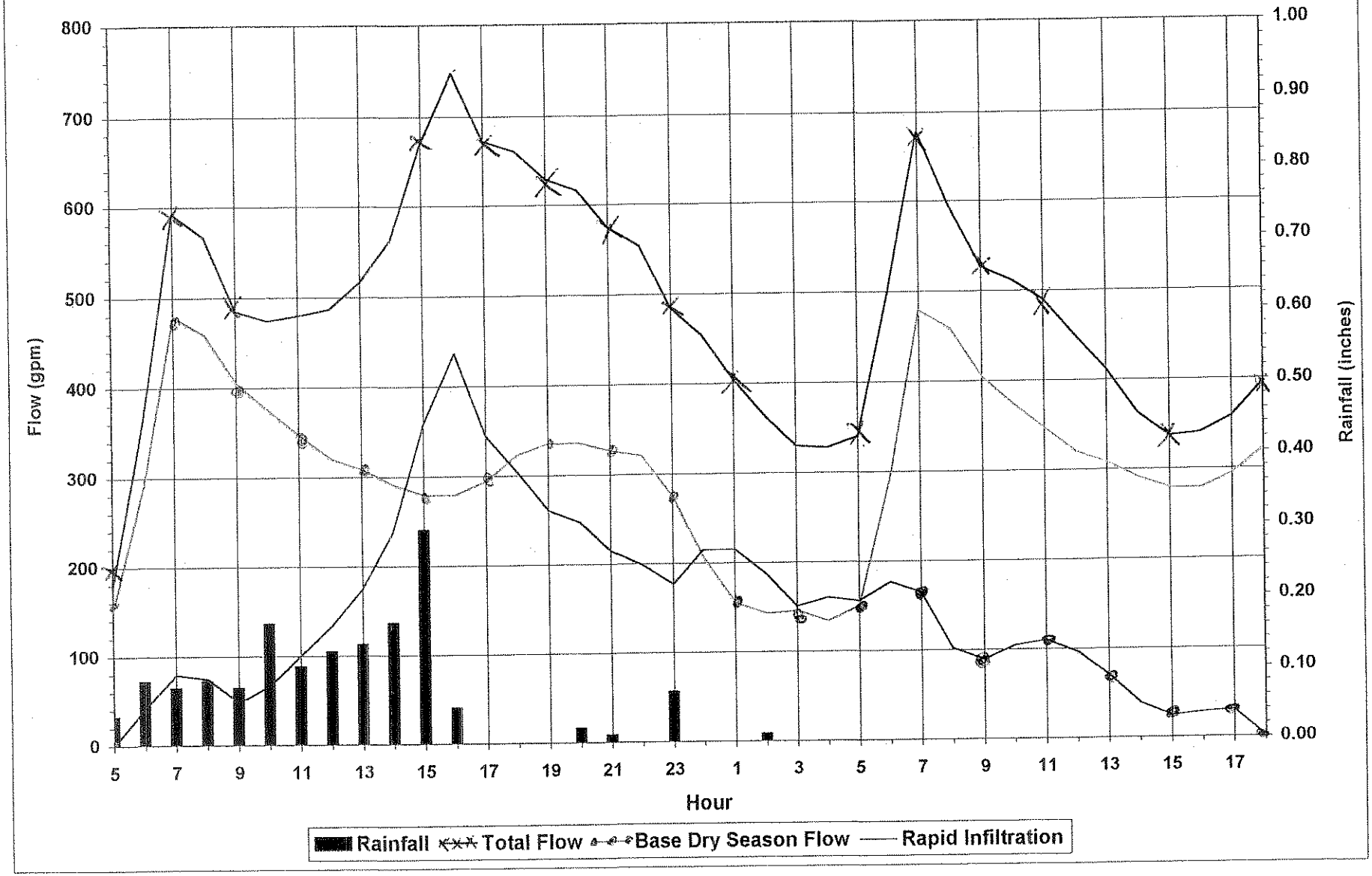


Table 4-5. Representative SRI Event Computations for D001C

Event 3 November 30-December 1, 1994				
Hour	Total	DWF	SRI	Rain
5	176.3	149.9	<0	0.04
6	363.8	288.9	41.3	0.09
7	591.2	478.7	78.8	0.08
8	565.6	458.2	73.8	0.09
9	484.0	403.7	46.7	0.08
10	473.6	373.8	66.1	0.17
11	479.0	346.2	99.2	0.11
12	486.3	320.0	132.6	0.13
13	515.8	307.5	174.6	0.14
14	560.9	290.1	237.1	0.17
15	669.1	278.4	357.0	0.30
16	747.5	278.2	435.6	0.05
17	671.4	294.1	343.6	0.00
18	659.6	322.8	303.1	0.00
19	628.1	334.5	259.9	0.00
20	615.7	334.8	247.3	0.02
21	573.7	325.6	214.4	0.01
22	552.2	320.0	198.5	0.00
23	483.6	273.5	176.4	0.07
0	453.5	205.3	214.5	0.00
1	403.5	154.9	214.9	0.00
2	362.8	142.2	187.0	0.01
3	329.6	145.2	150.7	0.00
4	327.3	133.5	160.2	0.00
5	339.3	149.9	155.8	0.00
6	499.3	288.9	176.8	0.00
7	677.5	478.7	165.1	0.00
8	593.3	458.2	101.5	0.00
9	525.8	403.7	88.5	0.00
10	511.4	373.8	104.0	0.00
11	490.1	346.2	110.2	0.00
12	449.7	320.0	96.0	0.00
13	411.4	307.5	70.2	0.00
14	361.8	290.1	38.0	0.00
15	336.5	278.4	24.4	0.00
16	340.2	278.2	28.3	0.00
17	357.7	294.1	30.0	0.00
18	395.8	322.8	0.0	0.00
Totals (cu.ft./in.)			44938	1.56
Max (gpm/gpad)			435.6	648
Rain Duration (hours)				16
Adjusted Volume (cu.ft.)			44938	
Rapid Area (sq.ft.)			345675	
Ratio of Rapid vs. Monitor Area			0.0082	

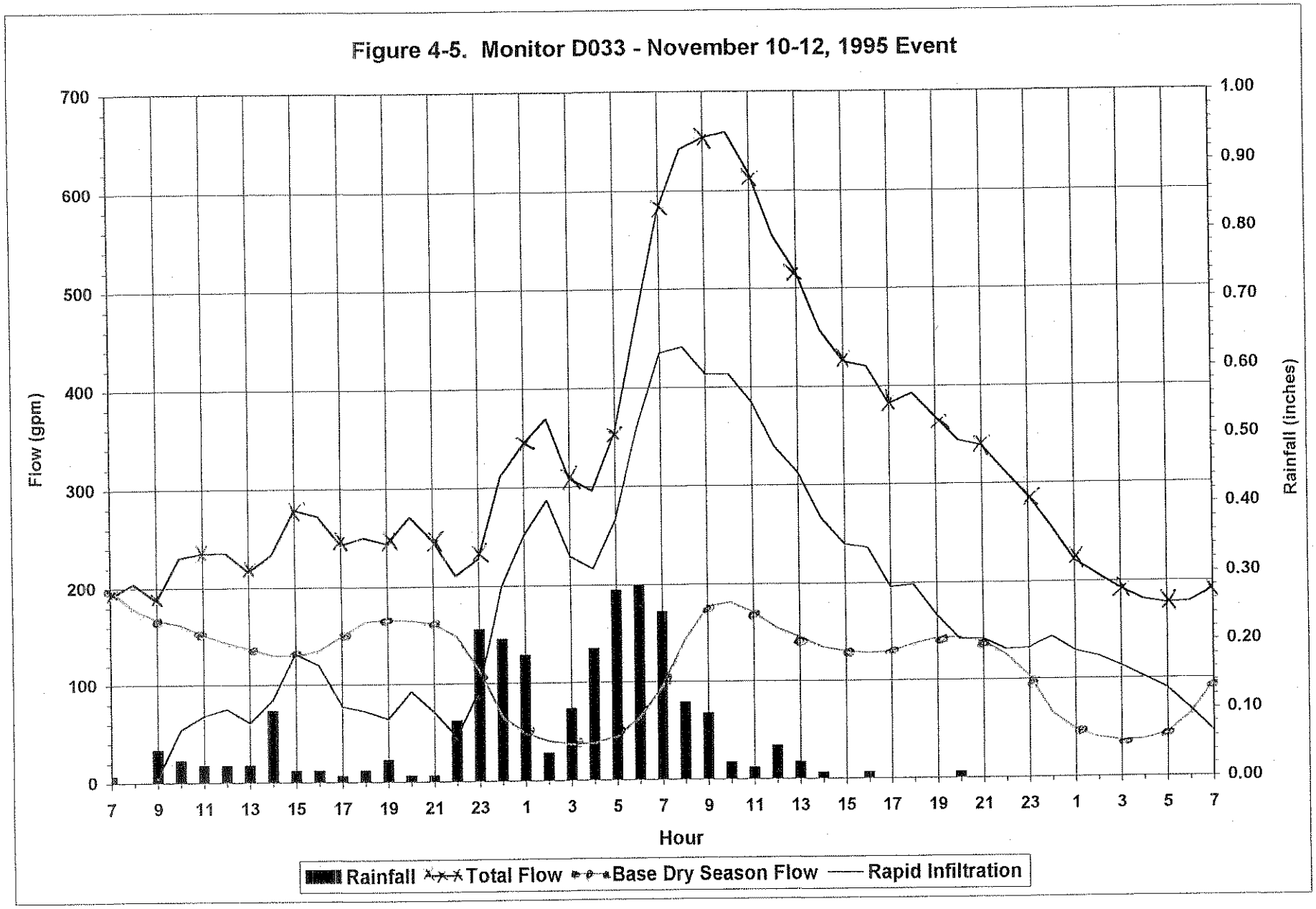


Figure 4-5. Monitor D033 - November 10-12, 1995 Event
Flow (gpm)
Rainfall (inches)
Hour
0
100
200
300
400
500
600
700
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
7 9 11 13 15 17 19 21 23 1 3 5 7 9 11 13 15 17 19 21 23 1 3 5 7
Rainfall
Total Flow
Base Dry Season Flow
Rapid Infiltration

Table 4-6. Representative SRI Event Computations for D033

Event 4 November 10-12, 1995				
Hour	Total	DWF	SRI	Rain
7	189.0	196.02		0.01
8	203.0	177.45		0.00
9	185.3	166.23	4.9	0.05
10	229.2	160.93	53.4	0.03
11	233.5	149.90	67.2	0.02
12	233.8	142.33	74.0	0.02
13	214.7	136.37	60.1	0.02
14	232.0	129.33	83.4	0.10
15	277.8	128.09	130.4	0.02
16	271.3	134.14	118.6	0.02
17	241.3	148.44	76.2	0.01
18	249.0	163.42	71.0	0.02
19	242.7	164.90	63.4	0.03
20	269.7	163.95	91.2	0.01
21	245.5	160.80	69.8	0.01
22	209.2	148.23	44.4	0.09
23	226.6	112.03	93.0	0.22
0	310.4	64.76	198.8	0.21
1	342.5	47.59	250.7	0.18
2	368.5	39.84	285.7	0.04
3	307.0	36.48	228.1	0.10
4	294.8	37.29	214.9	0.19
5	352.7	44.07	265.0	0.28
6	470.2	63.28	360.3	0.28
7	580.3	94.40	434.4	0.25
8	641.7	142.11	440.7	0.11
9	652.7	175.72	412.8	0.10
10	658.6	180.82	412.7	0.02
11	616.8	169.65	383.8	0.02
12	553.0	154.47	337.7	0.05
13	515.7	144.53	311.8	0.02
14	457.0	134.18	265.1	0.01
15	425.1	129.51	238.6	0.00
16	419.7	127.85	235.1	0.01
17	381.0	129.38	194.6	0.00
18	392.0	136.77	197.1	0.00
19	367.2	142.57	165.6	0.00
20	343.3	143.00	141.2	0.01
21	338.0	137.99	141.7	0.00
22	312.0	125.10	130.6	0.00
23	286.3	101.94	131.6	0.00
0	254.6	64.76	143.0	0.00
1	220.1	47.59	128.4	0.00
2	205.5	39.84	122.7	0.00
3	191.4	36.48	112.5	0.00
4	180.3	37.29	100.5	0.00
5	176.4	44.07	88.7	0.00
6	177.9	63.28	68.0	0.00
7	190.6	94.40	44.7	0.00
Totals (cu.ft./in.)			66483	2.55
Max (gpm/gpad)			440.7	3340
Rain Duration (hours)				33
Adjusted Volume (cu.ft.)			66483	
Rapid Area (sq.ft.)			312495	
Ratio of Rapid vs. Monitor Area			0.0378	

Sewer Rehabilitation Areas

As previously mentioned, flow monitoring records for sewer rehabilitation areas were divided into "before" and "after" periods. USA had previously analyzed the effectiveness of these projects for a sample set of rainfall events. The results indicated that sewer main rehabilitation would reduce WWI and SRI rates by 50 percent, and that service lateral rehabilitation would yield a reduction of 80 percent during those events. USA's reduction estimates were based largely on storms more frequent than a 5-year return period.

The available flow data for significant rainfall events (e.g. 2-3 inches of total depth) suggests that reduction rates are lower. However, due to data quality problems, USA's reduction ratios were used in estimating defects database parameters for rehabilitated service areas.

4.4.2. Summary of Hydra Defect Parameters

Based on the analysis of the flow monitoring data, estimated values were summarized in a table, which is presented in Appendix C-6. This table was linked to tables defining representative flow monitors and defect parameters for each service area, which are in Appendix C-7. The latter data were then copied into the defects database files.

For unmonitored subbasins within the Durham and Rock Creek systems, typical values were computed from the monitored basins, as shown on the Appendix C-6 table. For undeveloped areas, a total peak unit rate of 1650 gpad was used (300 gpad for WWI and 1350 gpad for peak SRI), which was adopted in part from the 1995 *Collection System Needs Analysis*.

The 1995 analysis suggested a value of 1850 gpad (500 gpad for WWI and 1350 gpad for peak SRI) for undeveloped areas. The 500-gpad rate represented an 80-percentile value. For this study, only average WWI rates were computed. In order to achieve consistency between the two analyses, the 300-gpad rate computed during the 1995 work was used. Rapid infiltration parameters were defined to approximate the 1350-gpad value.

4.4.3. Verification of Approach to Modeling Defects

The model verification process only involved a check on the rapid infiltration characterization method to ascertain whether the procedure would yield reasonable results. The models were not calibrated. Test runs were completed for selected locations and events. Figures 4-6 and 4-7 present graphical results for test runs completed for selected events from monitors D001C and F008, respectively.

In the case of monitor D001C, the accuracy of the results depend on the accuracy of defect inputs for the upstream meters D001A, D001B and D005, as well as the simulation of the Barnes Road diversion to the Rock Creek system. In addition, the modeled hydrograph peak occurs several hours after the metered peak flow. This problem occurs at many of the flow monitors, primarily because defect characteristics were based on monitors with collection areas that are generally larger than the service areas (sanitary subbasins). The average collection area of the monitors used for this analysis is approximately 920 acres, while the average service area (excluding additional buildout areas) is 100 acres. A few of the monitor basins are thousands of acres in size. Resolving these problems is the purpose of calibration.

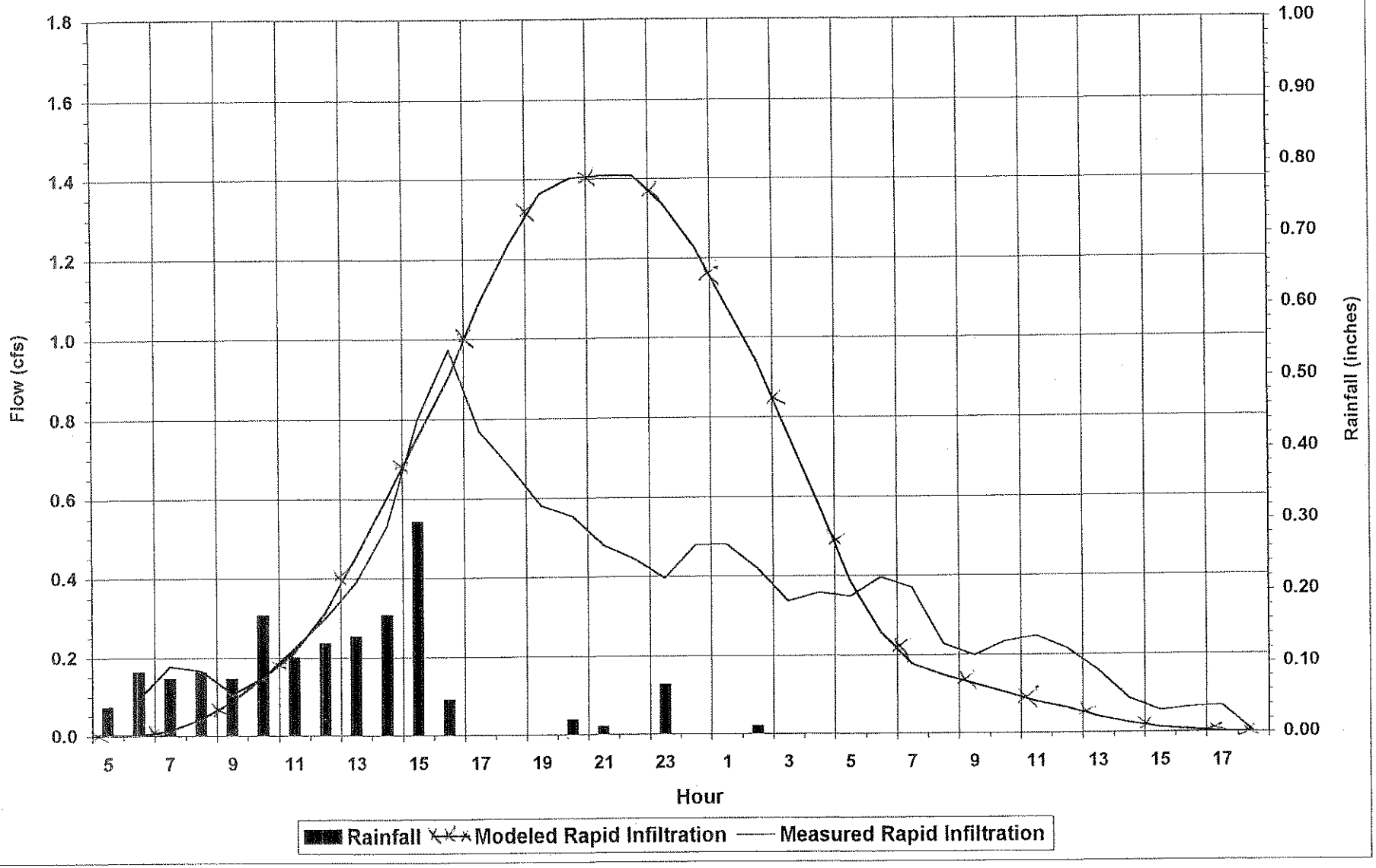
A calibration process would involve selecting representative events throughout the service area, and adjusting the rapid infiltration parameters so that a reasonable match is achieved. The Hydra databases include "tweak" fields for this purpose. For instance, model calibration would have included adjusting the *RAP* hours so that metered and modeled hydrographs would approximately match. Various rainfall/SRI events would be required, since the monitoring periods were not concurrent.

4.5. Defects Databases

The results of the flow monitoring data analysis was used to set up defects databases for each treatment plant basin model, based upon the tables in Appendix C-7. The databases vary between planning years 2000-2010 versus buildout. For instance, if a service area is currently undeveloped but will become developed at buildout then the defects databases will have no I/I contribution until buildout for that service area.

Chapter 5 describes the review of USA's I/I design characteristics based on the results of the defect characterization, and Chapter 6 presents an evaluation of rehabilitation needs.

Figure 4-6. Monitor D001C - November 30-December 1, 1994 Event
Modeled versus Metered Rapid Infiltration



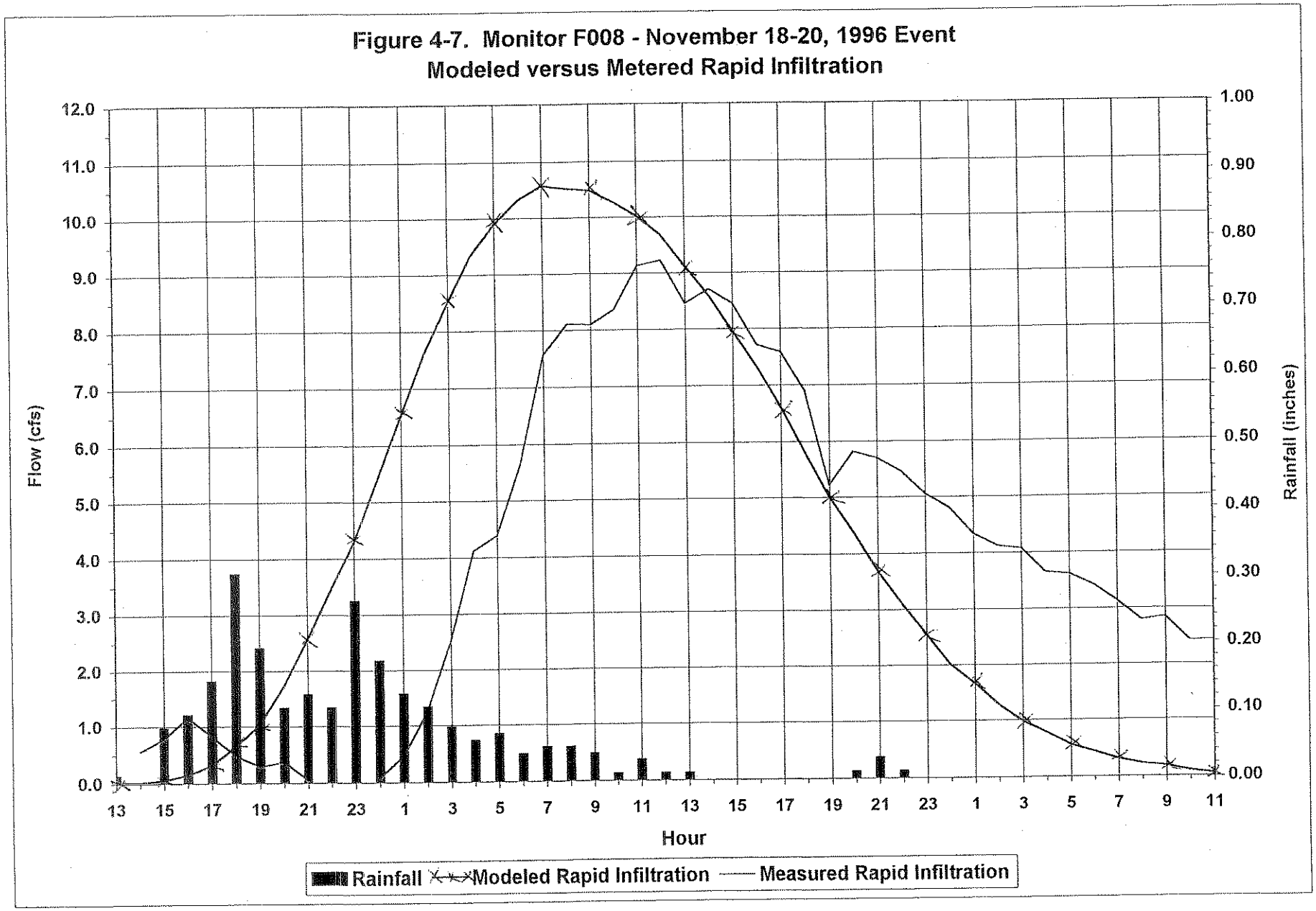


Figure 4-7. Monitor F008 - November 18-20, 1996 Event
Modeled versus Metered Rapid Infiltration
Flow (cfs)
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Rainfall (inches)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
13 15 17 19 21 23 1 3 5 7 9 11 13 15 17 19 21 23 1 3 5 7 9 11
Hour
Rainfall
Modeled Rapid Infiltration
Measured Rapid Infiltration

APPENDIX F

Modeling “Project.des” Criteria Files (Durham Model)

```
Project.Des for Durham Basin

!  DESIGN FILE FOR CLEAN WATER SERVICES MASTER PLAN MODEL (07/2008)
!  SYSTEM FACTORS AND DESIGN CRITERIA
!  MODIFIED FROM USA 1999 MASTER PLAN UPDATE (01/2001)

!  DESIGN PIPE DATA
!  (Mininum velocity changed to 2.0 fps from 1995 value)
[DPI]
Default=0.013  8  8  7  2.3  0.0010  0.8  120 0

!  DESIGN PIPE PRESSURE DATA
[PRE]
Default=100  0  5 0 0

!  EXISTING PIPE DATA
[EPI]
Default=0.013 2 0.9 0 0 0

!  MANHOLE DEFAULT DATA
[MAN]
Default=2  4  4  0

!  DIURNAL CURVES
!  Unit Diurnal Curves for Weekdays/Weekends
!  by Basin Type & Confidence Level
!  Originally generated March 3, 1995

[DIU]

Default=1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

!  Basin Type 1 - Weekday Diurnal Hydrograph - Median
DIU_1WDMed=0.51 0.28 0.21 0.21 0.24 0.41 1.25 2.20 1.97 1.57 1.37 1.20 1.02 0.93
0.82 0.80 0.84 0.98 1.19 1.34 1.36 1.33 1.20 0.87

!  Basin Type 2 - Weekday Diurnal Hydrograph - Median
DIU_2WDMed=0.58 0.39 0.31 0.29 0.31 0.52 1.21 1.77 1.60 1.40 1.31 1.19 1.08 1.02
0.95 0.91 0.95 1.06 1.21 1.28 1.28 1.24 1.14 0.88

!  Basin Type 3 - Weekday Diurnal Hydrograph - Median
DIU_3WDMed=0.59 0.40 0.32 0.29 0.29 0.43 0.98 1.63 1.60 1.44 1.37 1.27 1.15 1.06
0.99 0.94 0.96 1.05 1.19 1.27 1.28 1.25 1.15 0.89

!  Basin Type 4 - Weekday Diurnal Hydrograph - Median
DIU_4WDMed=0.55 0.41 0.35 0.31 0.32 0.39 0.70 1.15 1.30 1.43 1.53 1.44 1.36 1.30
1.26 1.16 1.12 1.13 1.16 1.16 1.18 1.10 1.01 0.79

!  Basin Type 1 - Weekend Diurnal Hydrograph - Median
DIU_1WEMed=0.59 0.38 0.26 0.22 0.22 0.25 0.37 0.72 1.29 1.78 1.94 1.80 1.56 1.35
1.19 1.14 1.12 1.14 1.20 1.26 1.24 1.20 1.07 0.85

!  Basin Type 2 - Weekend Diurnal Hydrograph - Median
DIU_2WEMed=0.65 0.47 0.37 0.32 0.31 0.34 0.48 0.81 1.31 1.65 1.73 1.62 1.44 1.29
1.17 1.10 1.09 1.12 1.17 1.21 1.23 1.17 1.05 0.86

!  Basin Type 3 - Weekend Diurnal Hydrograph - Median
DIU_3WEMed=0.69 0.52 0.42 0.37 0.35 0.37 0.47 0.73 1.15 1.53 1.66 1.59 1.44 1.29
1.18 1.13 1.10 1.13 1.16 1.19 1.22 1.18 1.09 0.91

!  Basin Type 4 - Weekend Diurnal Hydrograph - Median
DIU_4WEMed=0.73 0.58 0.48 0.41 0.41 0.42 0.50 0.70 1.02 1.45 1.57 1.57 1.44 1.35
1.21 1.17 1.10 1.10 1.13 1.14 1.12 1.08 1.01 0.83
```

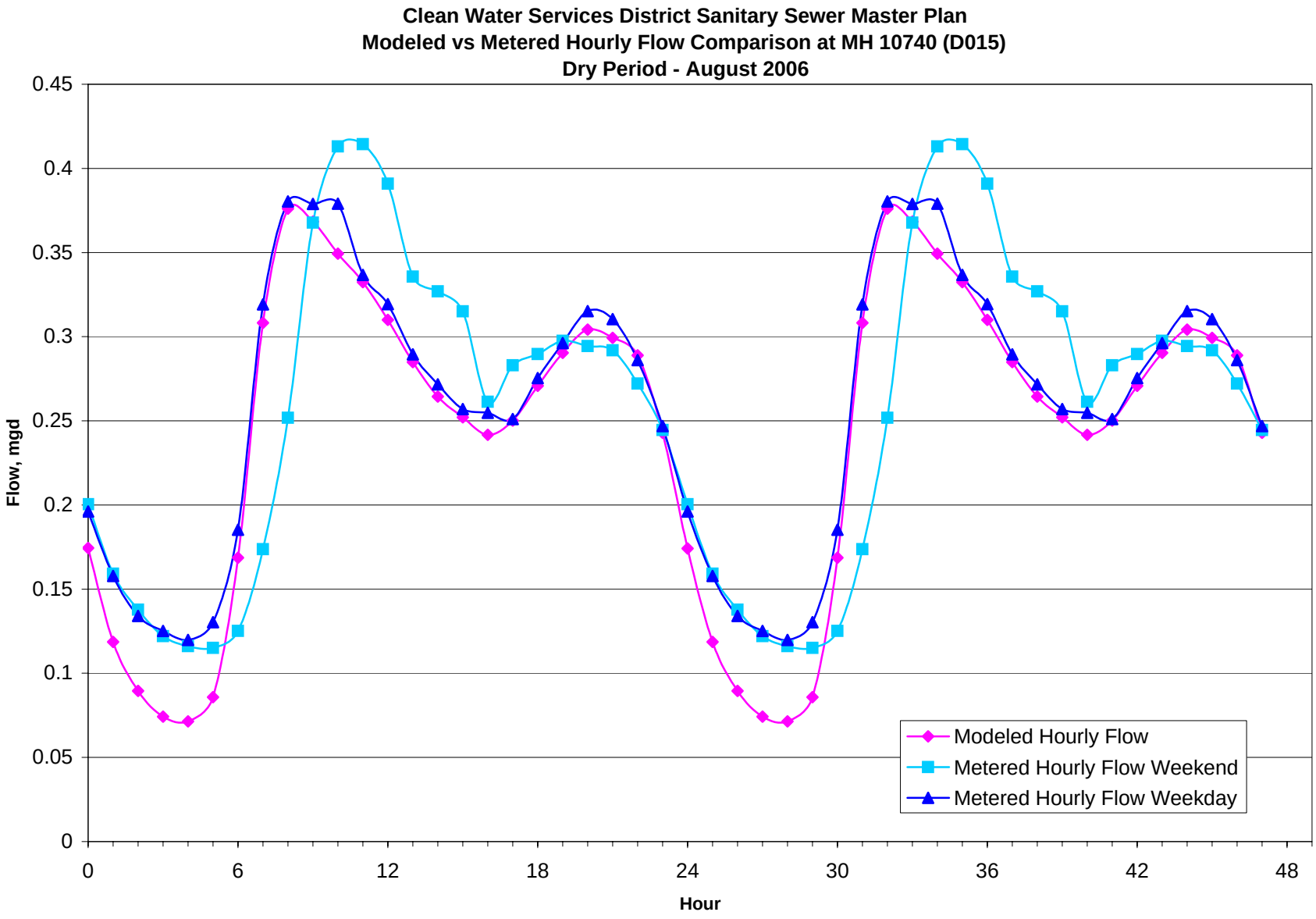
```
!   DIVERSION DETAILS

[DIV]

!  Diversion  1522 Basin  DR  Name:  Barnes Rd Diversion
!Previous model  DR01522_Divn= 0.00/0.00   2.33/1.25    5.06/2.71    7.99/4.28
10.11/5.42   10.69/5.67   11.24/5.92   11.77/6.15   12.51/6.48   13.21/6.80
15.70/7.94
DR01522_Divn= 0.00/0.00   2.33/0    5.06/0    7.99/0   10.11/0   10.69/0   11.24/0
11.77/0   12.51/0   13.21/0   15.70/0

!  Diversion 13862 Basin  DR  Name:  Fairfield Diversion
DR13862_Divn= 0.00/0.00   0.58/0.30    2.14/1.06    4.27/1.93    5.82/2.12
6.82/2.13    9.58/2.14   11.57/2.15   13.21/2.16   17.10/2.20   20.18/2.23
22.81/2.26   25.15/2.29

!  Diversion 18554 Basin  DR  Name:  SW Lombard Diversion #2
DR18554_Divn= 0.00/0.00   5.87/3.20   14.77/8.96   24.54/15.35  46.81/35.18
67.54/55.01  77.53/63.97  82.23/68.09  90.90/75.66  98.81/82.54 112.96/94.81
125.52/105.67

!  Diversion 18571 Basin  DR  Name:  5th St Diversion
DR18571_Divn= 0.00/0.00   0.15/0.15    0.71/0.53    3.24/1.70    6.28/3.16
7.61/3.99   10.57/6.71   12.91/8.71   14.84/10.33  18.05/12.98  20.75/15.17
23.13/17.09

!  Diversion 18828 Basin  DR  Name:  SW Lombard Diversion #1
DR18828_Divn= 0.00/0.00   0.39/0.13    2.30/0.70    5.73/1.46   10.02/2.54
15.29/3.81   20.77/5.02   28.78/6.35   34.05/7.08   35.42/7.74   41.25/9.96
46.30/11.76

!  Diversion 20606 Basin  DR  Name:  SW 5th St Diversion
DR20606_Divn= 0.00/0.00   1.66/0.00    3.77/0.00    6.92/0.00    7.48/0.00
7.98/0.00    8.44/0.00    8.87/0.00    9.27/0.00    9.65/0.00   10.02/0.00
10.70/0.00   11.63/0.00
REM_DR20606_Divn=0.00/0.00   1.66/0.56    3.77/1.54    6.92/3.31    7.48/3.36
7.98/3.40    8.44/3.45    8.87/3.50    9.27/3.54    9.65/3.59   10.02/3.63
10.70/3.72   11.63/3.84

!  Diversion 20760 Basin  DR  Name:  Sherwood Rd Diversion
DR20760_Divn= 0.00/0.00   0.44/0.01    1.73/0.16    3.65/0.46    5.49/0.83
5.99/1.19    6.28/1.39    6.54/1.57    6.78/1.72    7.12/1.94    7.44/2.13
8.54/2.77    9.02/3.03

!  Diversion 20834 Basin  DR  Name:  Tektronix Diversion
DR20834_Divn= 0.00/0.00   2.45/0.51    8.54/1.74   14.99/3.11   16.25/3.32
19.58/3.84   22.42/4.31   24.93/4.72   27.21/5.11   29.32/5.46   31.28/5.80
34.88/6.41   39.67/7.24

!  CWS Diversion 20834 Tektronix Diversion, Basin  DR, Name: Hocken Diversion
DR_Div_Hock= 0.00 0.00    0.69 0.14    2.82 0.58    6.12 1.25    10.11 2.07    14.23
2.91    17.74 3.63    18.15 3.71    42.88 7.76    44.32 8.01    49.67 8.92    54.50
9.75

DR_DIV_BERK=0.000 0.000 0.500 0.130 1.000 0.250 2.000 0.500 3.000 0.750 4.000 1.000
5.000 1.000 20.000 1.000

!  CWS Diversion 20911 Basin  DR  Name:  Tektronix PS Diversion from City of
Beaverton
DR_Div_Tek=0.000 0.000 7.200 0.000 7.900 1.300 10.000 3.000

!  Diversion 20911 Basin  DR  Name:  Tektronix PS Diversion
DR20911_Divn= 0.00/0.00   1.00/1.00    2.00/2.00    2.32/2.32    2.52/2.32
3.06/2.32    4.51/2.32    5.11/2.32    5.97/2.32    6.66/2.32    7.26/2.32
8.04/2.32    8.73/2.32

!  CWS Diversion 18571 5th St Diversion Basin  DR  Name:  Alger Diversion
DR_Div_Alger=0.000 0.000 0.340 0.000 1.340 0.000 3.060 0.260 5.350 0.950 8.360 2.670
18.120 7.070
```

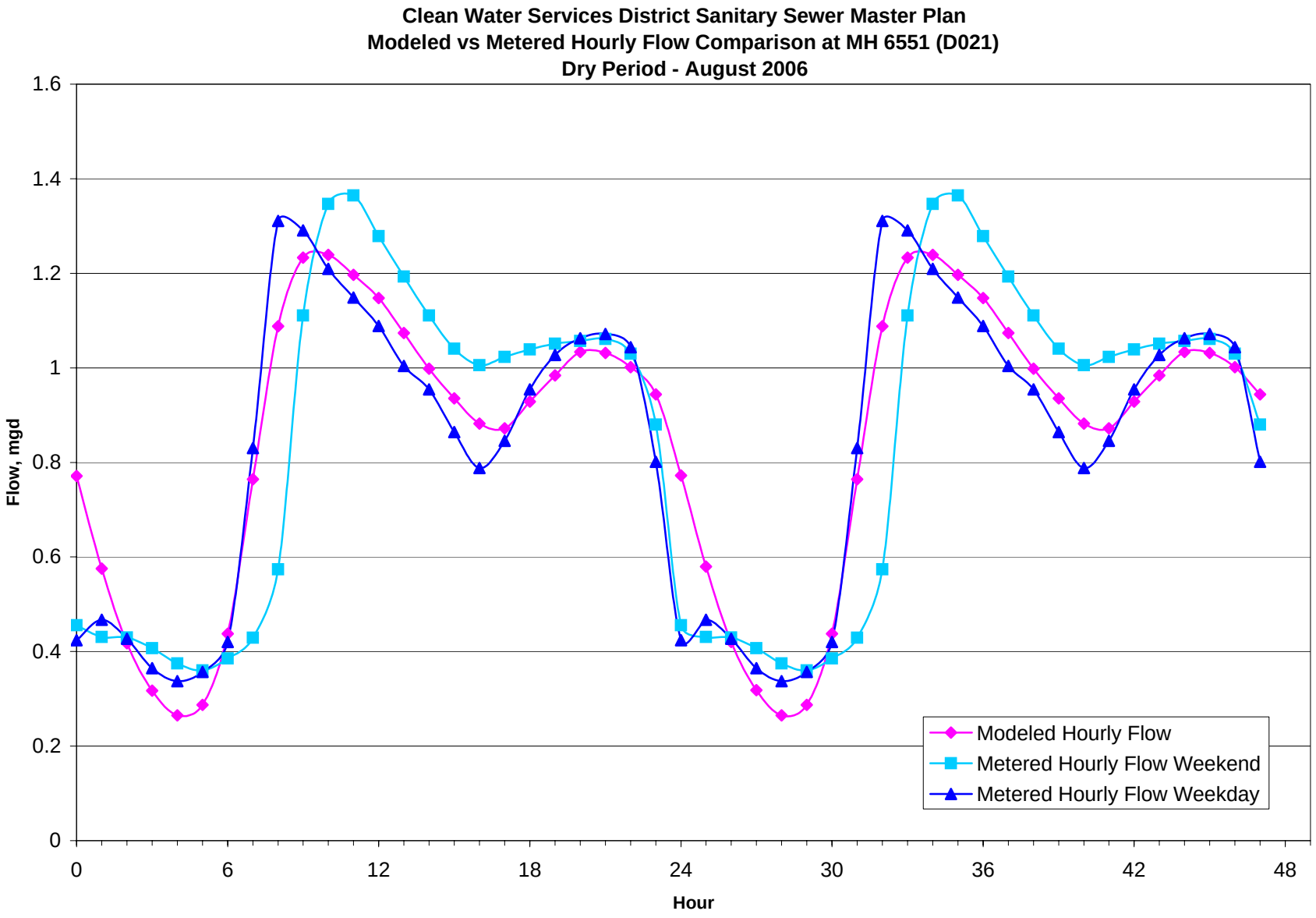
```
!  CWS Diversion 20834 Tektronix Diversion, Basin  DR, Name: Hocken Diversion
DR_Div_Hock= 0.00 0.00    0.69 0.14    2.82 0.58    6.12 1.25    10.11 2.07    14.23
2.91    17.74 3.63    18.15 3.71    42.88 7.76    44.32 8.01    49.67 8.92    54.50
9.75


DEFAULT=0.000 0.000 20.000 0.000 40.000 0.000 60.000 0.000 80.000 0.000 100.000
0.000


!  PUMPING STATIONS
!  Pumping Station Configurations

!  Command paragraphs named according to USA pumping station number
!  Pumping station numbers used as manhole numbers in the model

[PUM]

!  Upper Tualatin/Sherwood (DR)
11664_PumpDR=1   1554   0   5.79   1   1554   0   5.79

!  Beaverton PS (DR)
12681_PumpDR=2   28.3   0   1.3   2   28.3   0   1.3

!  SW Bull Mtn. (DR)
15068_PumpDR=1   665.2   0   4.01   1   712.7   0   4.01

!  Cipole (DR)
17795_PumpDR=1   296.6   0   1.29   1   346.8   0   1.29

!  Tektronix (DR)
!  (total station rating of 3250 gpm)
27865_PumpDR=2  1830.0  771.0  5.0  2  2096.0  771.0  2.2


PUM_DEFAULT=2 0.0000 0.0000 100.0000 0 0.0000 0.0000 0.0000 0 0.0000 0.0000 0.0000
```

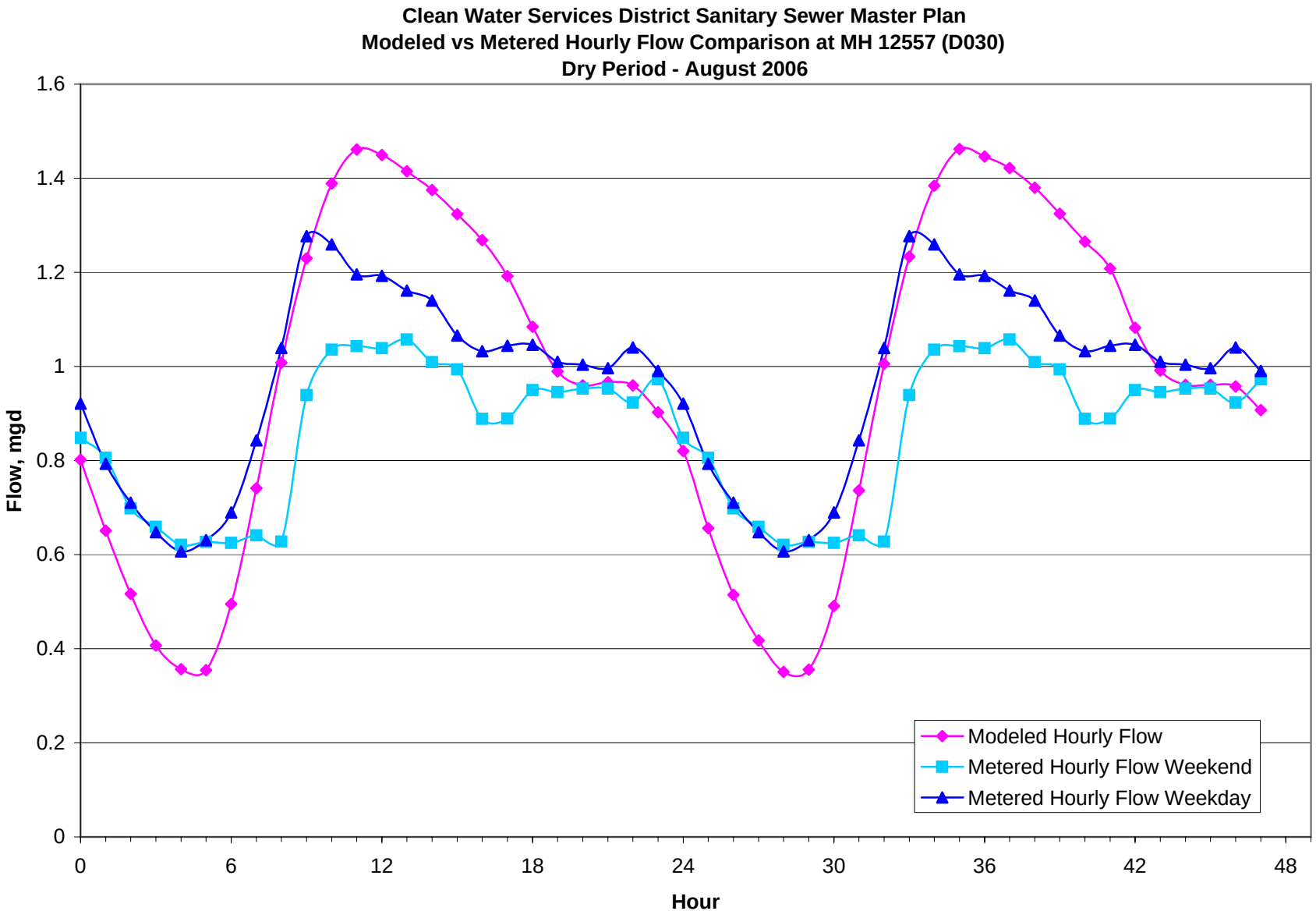
APPENDIX G

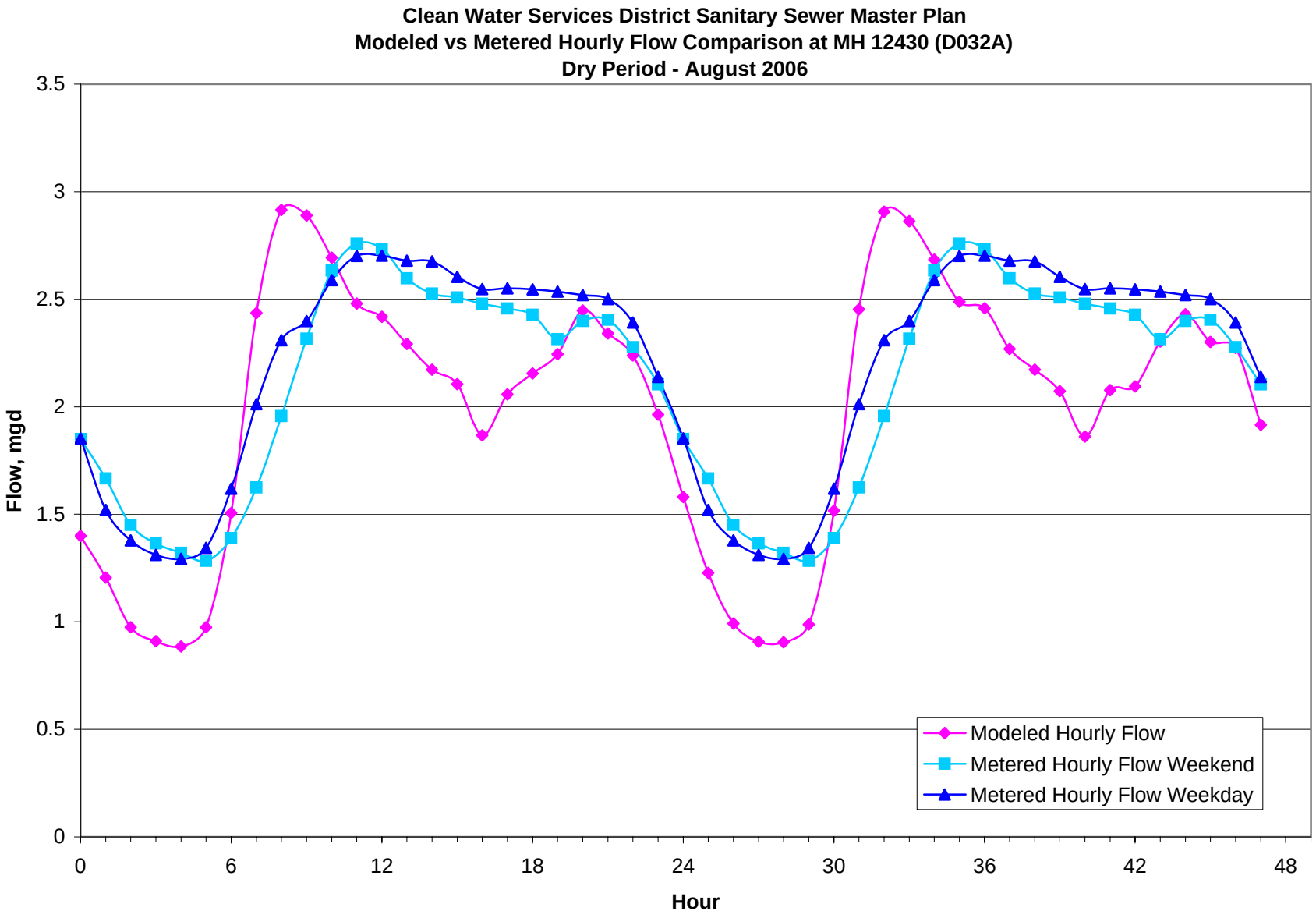
Dry Weather Flow Calibration Results
- Durham Model

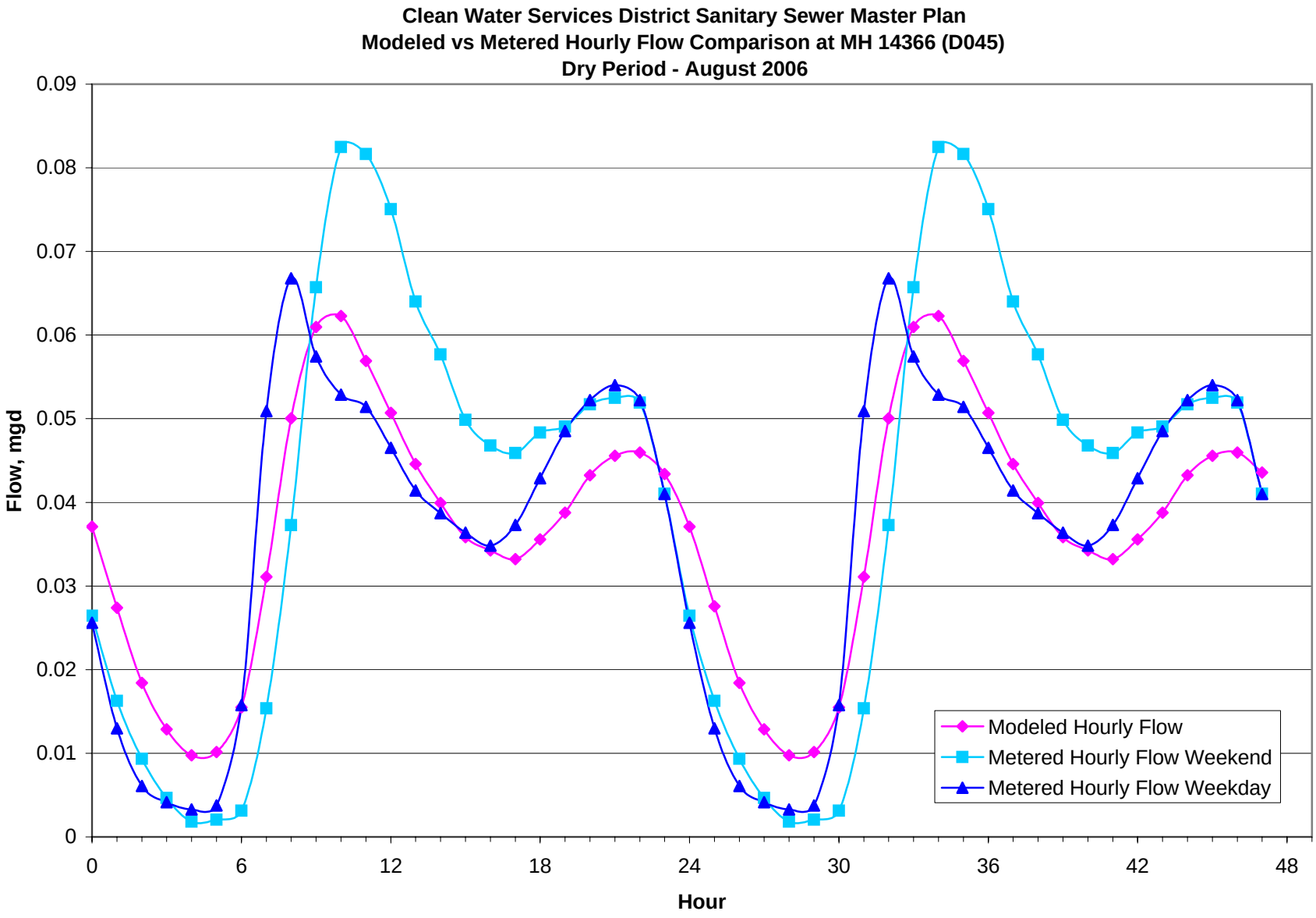
Note: These calibration results apply to the Durham Model in general, prior to additional calibration within the City of Tigard. These results are provided to document calibration of flows entering the Tigard area from upstream.

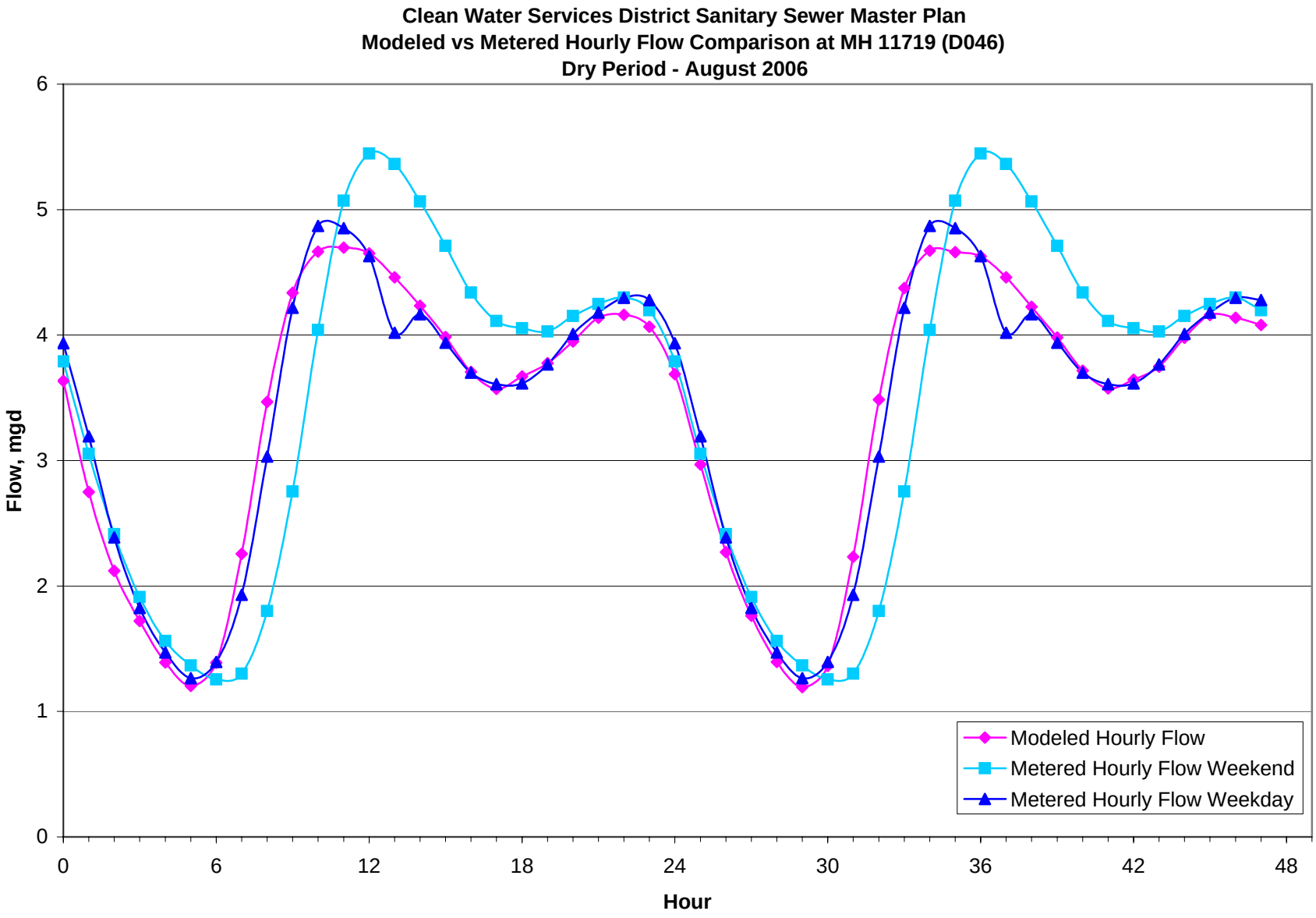

Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 10740 (D015)
Dry Period - August 2006
Flow, mgd
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
6
12
18
24
30
36
42
48
Hour
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday

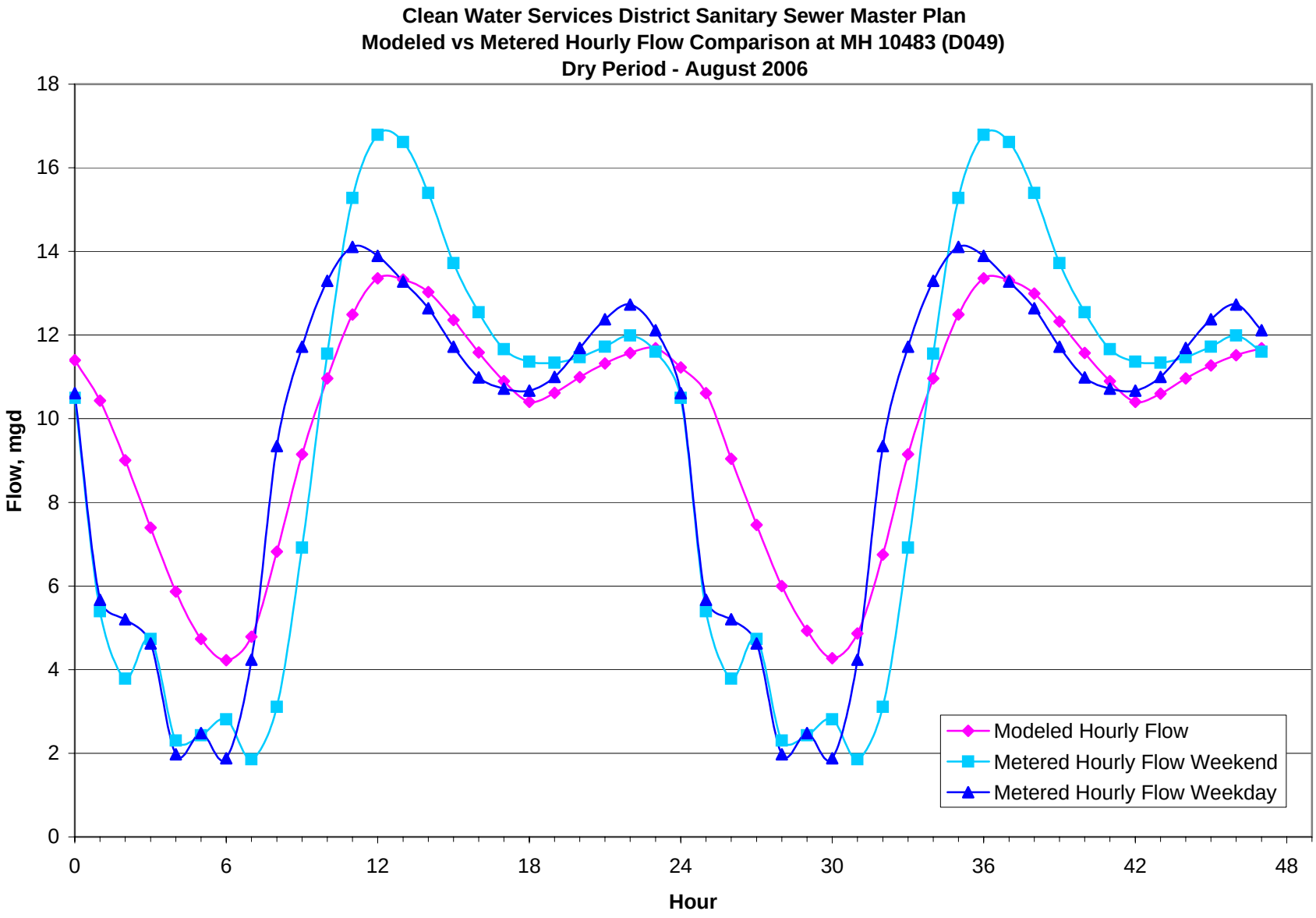

Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 6551 (D021)
Dry Period - August 2006
Flow, mgd
Hour
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday

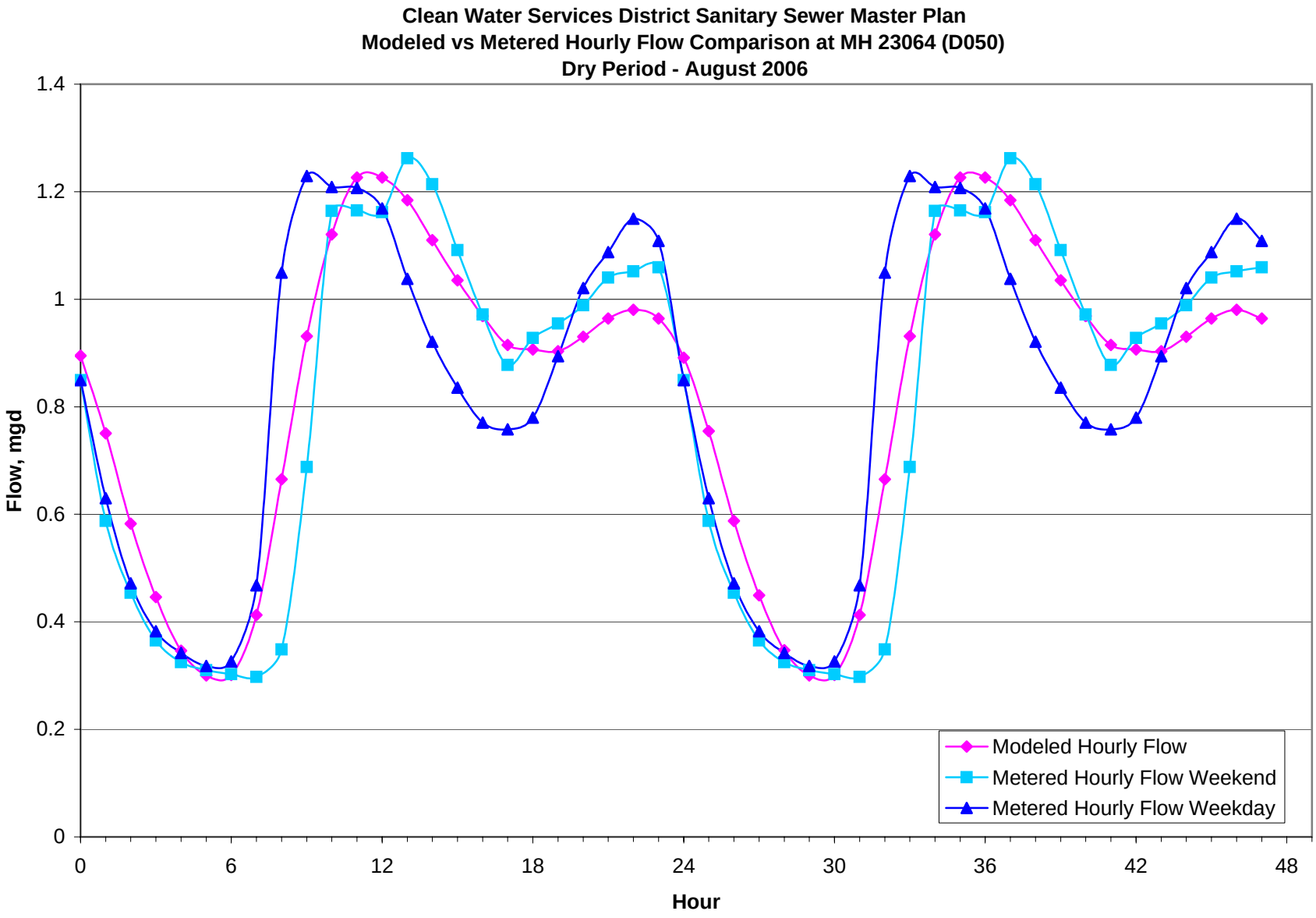

Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 12557 (D030)
Dry Period - August 2006
Flow, mgd
Hour
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday


Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 12430 (D032A)
Dry Period - August 2006
Flow, mgd
Hour
3.5
3
2.5
2
1.5
1
0.5
0
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday


Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 14366 (D045)
Dry Period - August 2006
Flow, mgd
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
6
12
18
24
30
36
42
48
Hour
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday


Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 11719 (D046)
Dry Period - August 2006
Flow, mgd
Hour
0
1
2
3
4
5
6
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday


Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 10483 (D049)
Dry Period - August 2006
Flow, mgd
Hour
0
2
4
6
8
10
12
14
16
18
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday


Clean Water Services District Sanitary Sewer Master Plan
Modeled vs Metered Hourly Flow Comparison at MH 23064 (D050)
Dry Period - August 2006
Flow, mgd
Hour
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
6
12
18
24
30
36
42
48
Modeled Hourly Flow
Metered Hourly Flow Weekend
Metered Hourly Flow Weekday

APPENDIX H

Technical Memo – Durham Model Calibration Within Tigard

TECHNICAL MEMORANDUM
City of Tigard Sanitary Sewer Master Plan
PMA Engineering / 215 W 4th Street, Suite 202 / Vancouver, WA 98660 / (360) 993-0635

TO:	Jeff Pelz, P.E., Project Manager, West Yost & Associates
FROM:	Paula M. Arsenault, P.E., PMA Engineering
COPIES:	Andy Braun, P.E., Capital Program Manager, Clean Water Services
DATE:	June 18, 2009
PROJECT:	Tigard Sewer Master Plan
SUBJECT:	Durham Model Calibration within the City of Tigard Subsystem

OVERVIEW OF EVALUATION

The purpose of this effort was to calibrate the City of Tigard subsystem within the Durham Hydra model to current conditions and reflecting the flow meter data that were collected by Clean Water Services (CWS) at 11 temporary sites throughout the City system. This was to improve the accuracy of the model in predicting wet-weather flows during design storm conditions. West-Yost & Associates (consultant for updating CWS's Sanitary Sewer Master Plan) will use the model to identify needs for relief and replacement sewers to develop a Master Plan for the City of Tigard.

PMA obtained the current version of the Durham model from WYA and made significant corrections and additions to the sewersheds (SE Layer), and then calibrated the Tigard collection system to current dry- and wet-weather conditions. Laterals in the City subsystem were calibrated only where temporary flow meters were installed. The meter installation sites were selected by the City and WYA to isolate and characterize potential capacity issues.

DATA COLLECTION AND ANALYSIS

Available Flow Meter Data

There were several temporary monitor locations on within the City of Tigard subsystem where dry- and wet-season data were collected between early 2007 and January 2008. Installation dates varied between February and May 2007, and removal dates were in early January 2008. Table 1 identifies the flow meter locations for which hourly data were available. In addition, hourly rainfall data were obtained for the District's rain gages DPR, LTR and MTR.

Table 1. Temporary Flow Monitor Sites in the City of Tigard Collection System

Manhole No.	Install Location	Diameter (inches)	Direction From MH
06634	Elmwood off SW 82nd 15in MH#6634	15	Downstream
11706	Dover Ct off SW 108th 21in MH#11706	21	Upstream
14284	Hall Blvd at Hemlock 10in MH#14284	10	Upstream
19970	Katherine 12in MH#19970	12	Upstream
19980	Summerlake Park E 10in MH#19980	10	Upstream
19993	Commercial St 15in MH#19993	15	Upstream
21142	Hunziker Rd 12in MH#21142	12	Upstream
21192	Bonita Ct Apts 10in MH#21192	10	Downstream
22345	Durham Plant 15in MH#22345	15	Downstream
56579	Ironwood Loop 18in MH#56579	18	Downstream
58900	Summerlake Park W 8in MH#58900	8	Upstream

Flow Data Analysis

The flow data files were initially reviewed to remove negative values, partial days of data and periods when instrument or level adjustments caused significant flow changes or erroneous data. The date and time formatting was revised and rainfall data were added to the flow data files. Flow and rainfall data were then copied into and processed in a wet-season data template similar to that developed during the 2000 Master Plan Update effort. The spreadsheet template contains macros that transpose the data and update named ranges and equations.

Monthly graphs of the hourly flow and rainfall data were generated in order to review the data and to define the dry-season period for each meter. The periods selected as representing dry-season conditions (generally non-storm days from mid-July to early September, depending on data availability) were then moved to a dry-season spreadsheet tool in which average weekday and weekend flows, and the diurnal pattern are computed. The average weekday and weekend dry-season hydrographs were copied into the wet-season spreadsheet tool wherein the infiltration and inflow (I/I) was separated from the base sanitary flow, and seasonal infiltration was separated from rainfall-dependent infiltration and inflow (RDII). The spreadsheet includes calculations for average wet-season infiltration rates that are the initial inputs to the WET_Q field of the Defects database.

West Yost & Associates developed a complex spreadsheet tool to generate sanitary flow injections to the model. Essentially, a land use polygon (LU Layer) was generated for each sewershed (SE Layer) included in the original (CWS Master Plan Update) model. WYA determined the land use within each LU polygon based on parcel data obtained from Metro and the constituent cities. Where available, parcel data from the cities were used and the city land use codes were converted to Metro land use codes to create a uniform coding system.

Rather than using a population-based flow-generation method as was the case for the 2000 Master Plan Update effort, WYA set up the LU database to employ an area-based unit flow method. The RES_POP and VIS_POP fields in the LU database contain developed residential and non-residential developed area, respectively, and the RES_CPC and VIS_CPS fields contain unit flows in gallons

per acre per day (gpad). The 2007 flow meter data for the Tigard sites were not analyzed to modify the flow factors developed by WYA. Instead, only the percent actives (RES_ACTIVE and VIS_ACTIVE) were adjusted during calibration.

The flow monitor summary data table (*DR Monitor Defect Summary.xls*) was modified to include the 2007 Tigard temporary flow meter sites. This spreadsheet is linked to a spreadsheet, *DR Wet Season I-I Inputs.xls* that computes inputs to the I/I defects database, *DefectWE.dbf* representing I/I for existing land use and population conditions. The I/I inputs in the spreadsheet tool values are copied to the database. All calibration adjustments are made in the spreadsheets rather than using the TWEAK factors in the Defects database.

MODEL REFINEMENTS

All of the 2007 temporary flow meter locations were added to the model AutoCAD drawing in order to determine if pipe additions or sewershed subdivisions were required. Manhole 56579, where a meter was location, was missing from the model and corrected as per the District's GIS information. Extensive corrections and additions (46 new polgons) were made to the sewershed layer using an AutoCAD map of the District's pipe network (converted from and ArcView Shape file) and a tax lot drawing provided by WYA. Sewershed connections were checked and corrected as needed. SE Layer modifications focused on the branches were flow meters were located. For sewersheds contributing to the 11 temporary meters, the representative meter assignments were modified in the spreadsheet tool *DR Monitor Defect Summary.xls*.

Given the significant changes to the SE Layer, the LU Layer polygon boundaries are no longer consistent with the sewershed boundaries.

Flow meters 06634 and 21142 collected flow from the City of Portland sewer systems. However, GIS data for the Portland collection system is not included in the District's Shape files. Therefore, the sewersheds on the eastern edge of the Tigard collection system were not modified.

MODEL CALIBRATION

This task involved multiple components that improved model accuracy in the Tigard subsystem. Calibration to dry-season conditions was performed prior to calibrating the model to selected wet-weather storm events. This is because errors in modeling sanitary flows would be carried forth into the analysis of storm event flows. Once the model was calibrated to dry-season conditions, wet-season calibration involved adjusting inputs to the Defects database from which I/I flows are injected to the model. The model was calibrated to a selected storm event as requested by WYA with moist antecedent conditions.

Dry-Season Calibration

An iterative process was used to calibrate the model whereby model inputs were adjusted, the model was run and the results graphed such that the model was calibrated to within a reasonable level of accuracy. This calibration process involved adjusting sanitary flow quantities (percent active values

only) and diurnal patterns. In addition, monitor-specific diurnal curves were created to achieve a better match between metered and modeled hydrograph shapes where needed. The four diurnal curves representing median weekday conditions that were developed for the *1995 Collection System Needs Analysis* were used in addition to the monitor-specific diurnal curves.

The results of the dry-season calibration process are presented in Figures 1 to 12. Modeled peak flows were all within 10 percent of metered values. A comparative graph is presented for permanent meter site D046 for verification purposes since WYA had previously completed an approximate calibration of the Durham model. This meter was not used for wet-weather calibration.

Wet-Season Model Calibration

Per WYA's request, the model was calibrated to a 5-day period from December 1-5, 2007. This was a significant event wherein approximately 5 inches of rainfall occurred over the simulation period as recorded at gages DPR, LTR and RVR. (Gage MTR was out of service). Hyetographs for this event are presented in Figure 13. This series of events was preceded by approximately 1 inch of rainfall from November 26-30, most of which fell between November 26-28, so antecedent conditions were moist.

Calibration was achieved by modifying Defects database inputs, running the model and graphing the results in an iterative fashion to achieve a reasonable match between metered and modeled flows for the selected event.

Hourly rainfall and flow meter data were used, and the modeling time step was 30 minutes. This level of refinement in the model time step and flow date was sufficient given the fact that the vast majority of RDII is rainfall-dependent infiltration rather than inflow, which suggest there are pipe and lateral defects as opposed to defects such as cross-connections and illicit private property connections. The flow meter data also suggests that areas of the Tigard collection system are in need of rehabilitation.

Calibration results are presented in Figures 14-24. At meter 06634, the velocity dropped out prior to the storm peak, but based on the meter data at other sites, a reasonable estimate was achieved by the model. At meters 14284, 21142 and 21192, the metered peak flows spiked in a manner that was inconsistent with the rainfall pattern, so the model results represent an estimated peak flow and pattern. Elsewhere, the model compared reasonably with the metered flows.

At meters 22345 and 56579, extraneous flow contributions were sustained at a high rate for an unusually long period of time, suggesting significant defects in the collection area upstream. It is possible that meter 56579 could be influenced by backwater from the Fanno Creek Interceptor, which was not included in this calibration work. Meter 22345 in the Durham Drive Lateral, however, is well above the ground elevation of the Upper Tualatin Interceptor and Durham WWTP influent structure to which this lateral connects.

FIGURES

Figure 1. 2007 Dry Season Flow Comparison - 06634 - Durham
Figure 2. 2007 Dry Season Flow Comparison - 11706 - Durham
Figure 3. 2007 Dry Season Flow Comparison - 14284 - Durham
Figure 4. 2007 Dry Season Flow Comparison - 19970 - Durham
Figure 5. 2007 Dry Season Flow Comparison - 19980 - Durham
Figure 6. 2007 Dry Season Flow Comparison - 19993 - Durham
Figure 7. 2007 Dry Season Flow Comparison - 21142 - Durham
Figure 8. 2007 Dry Season Flow Comparison - 21192 - Durham
Figure 9. 2007 Dry Season Flow Comparison - 22345 - Durham
Figure 10. 2007 Dry Season Flow Comparison - 56579 - Durham
Figure 11. 2007 Dry Season Flow Comparison - 58900 - Durham
Figure 12. 2007 Dry Season Flow Comparison - D046 - Durham
Figure 13. Rain Gage Data for December 1-5, 2007 Storm
Figure 14. Metered vs. Modeled Flow - Tigard Meter 06634 - December 1-5, 2007
Figure 15. Metered vs. Modeled Flow - Tigard Meter 11706 - December 1-5, 2007
Figure 16. Metered vs. Modeled Flow - Tigard Meter 14284 - December 1-5, 2007
Figure 17. Metered vs. Modeled Flow - Tigard Meter 19970 - December 1-5, 2007
Figure 18. Metered vs. Modeled Flow - Tigard Meter 19980 - December 1-5, 2007
Figure 19. Metered vs. Modeled Flow - Tigard Meter 19993 - December 1-5, 2007
Figure 20. Metered vs. Modeled Flow - Tigard Meter 21142 - December 1-5, 2007
Figure 21. Metered vs. Modeled Flow - Tigard Meter 21192 - December 1-5, 2007
Figure 22. Metered vs. Modeled Flow - Tigard Meter 22345 - December 1-5, 2007
Figure 23. Metered vs. Modeled Flow - Tigard Meter 56579 - December 1-5, 2007
Figure 24. Metered vs. Modeled Flow - Tigard Meter 58900 - December 1-5, 2007

Figure 1

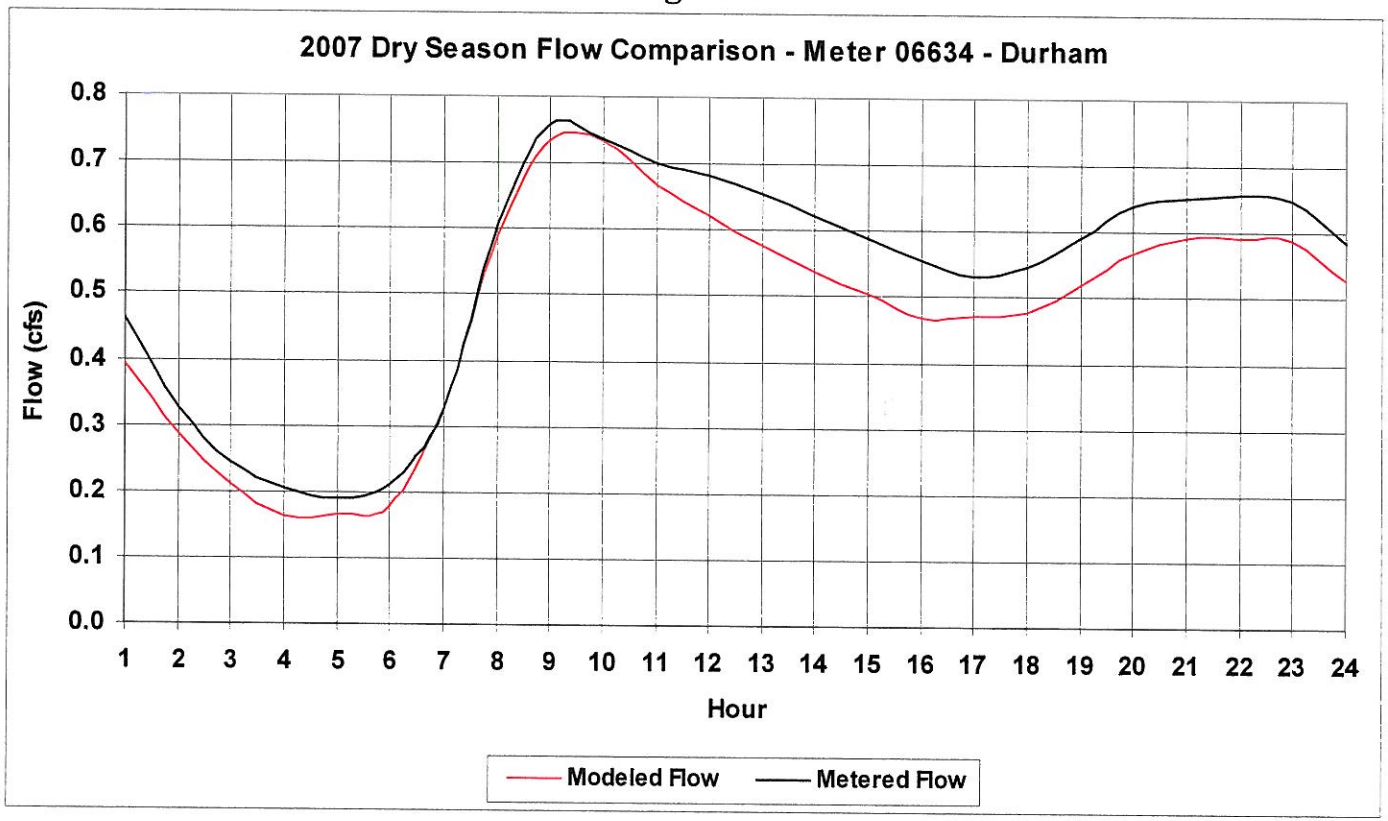

2007 Dry Season Flow Comparison - Meter 06634 - Durham
Flow (cfs)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 2

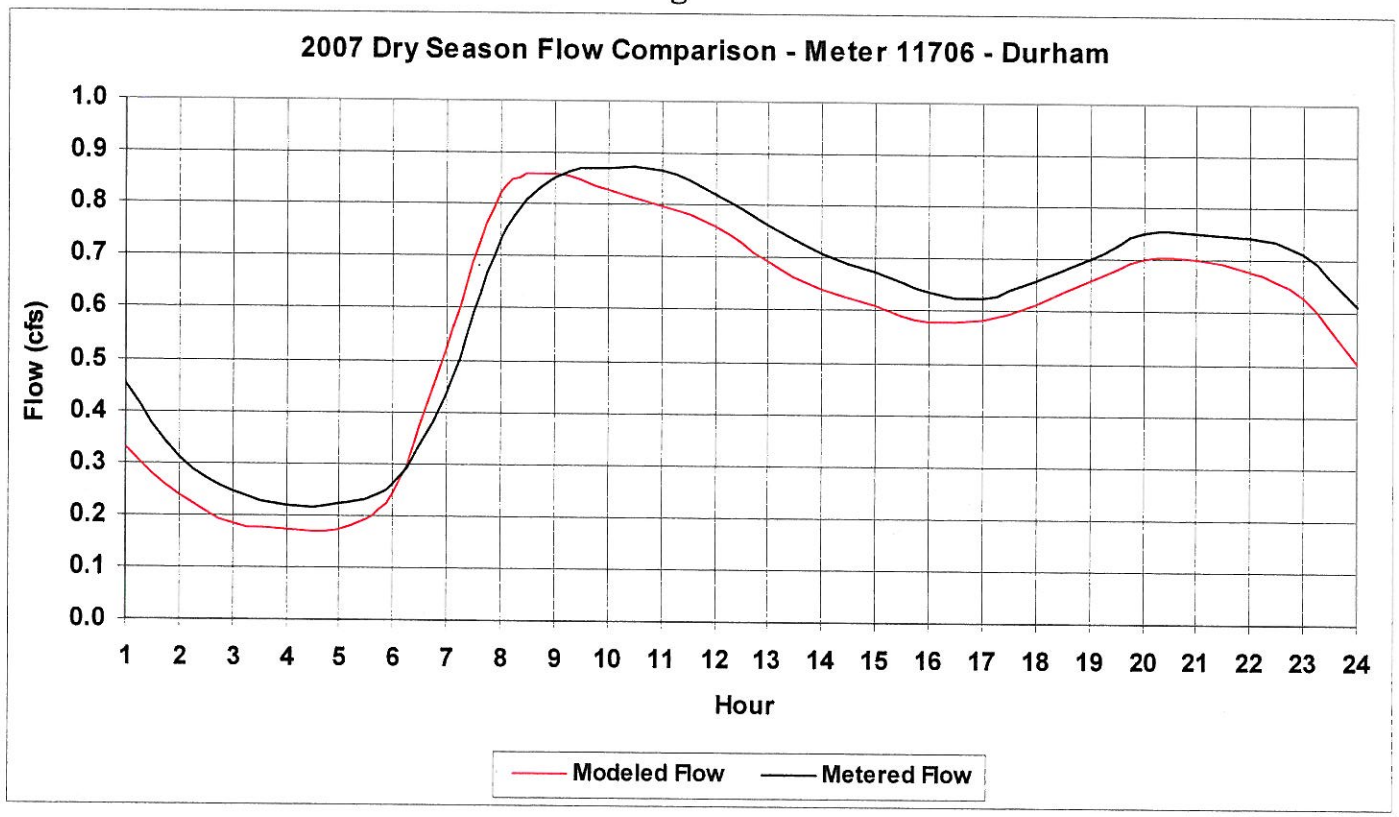

2007 Dry Season Flow Comparison - Meter 11706 - Durham
Flow (cfs)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 3

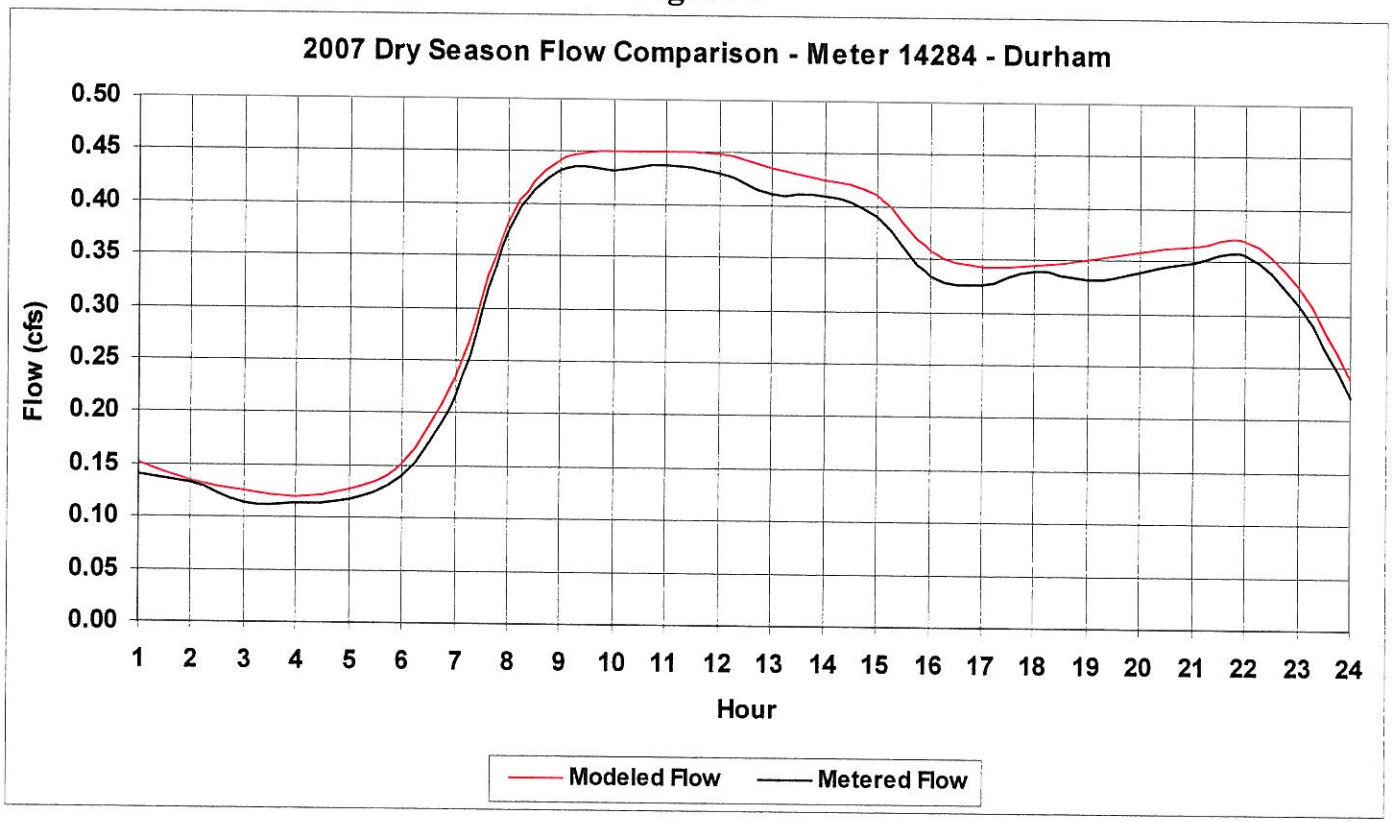

2007 Dry Season Flow Comparison - Meter 14284 - Durham
Flow (cfs)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 4

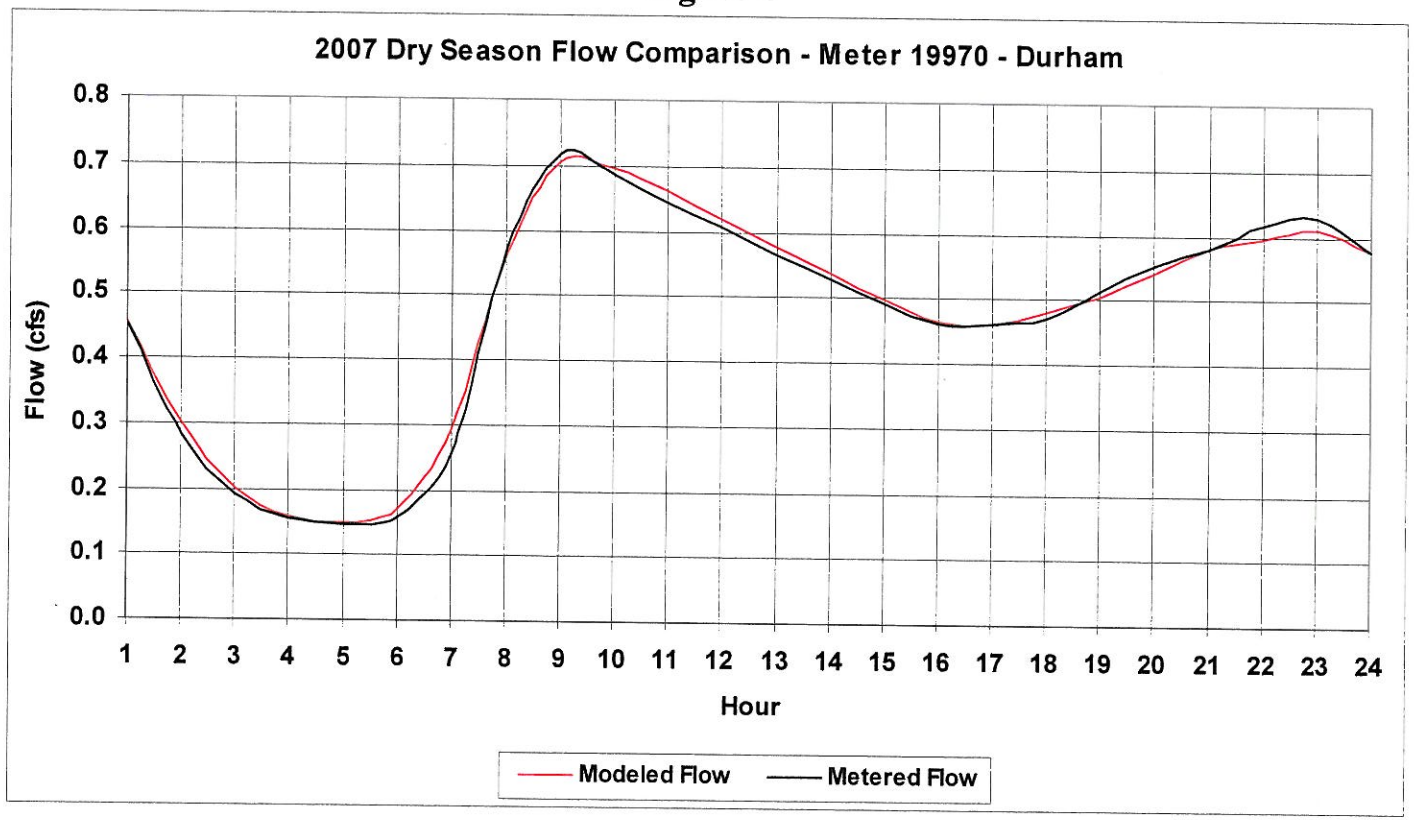

2007 Dry Season Flow Comparison - Meter 19970 - Durham
Flow (cfs)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 5

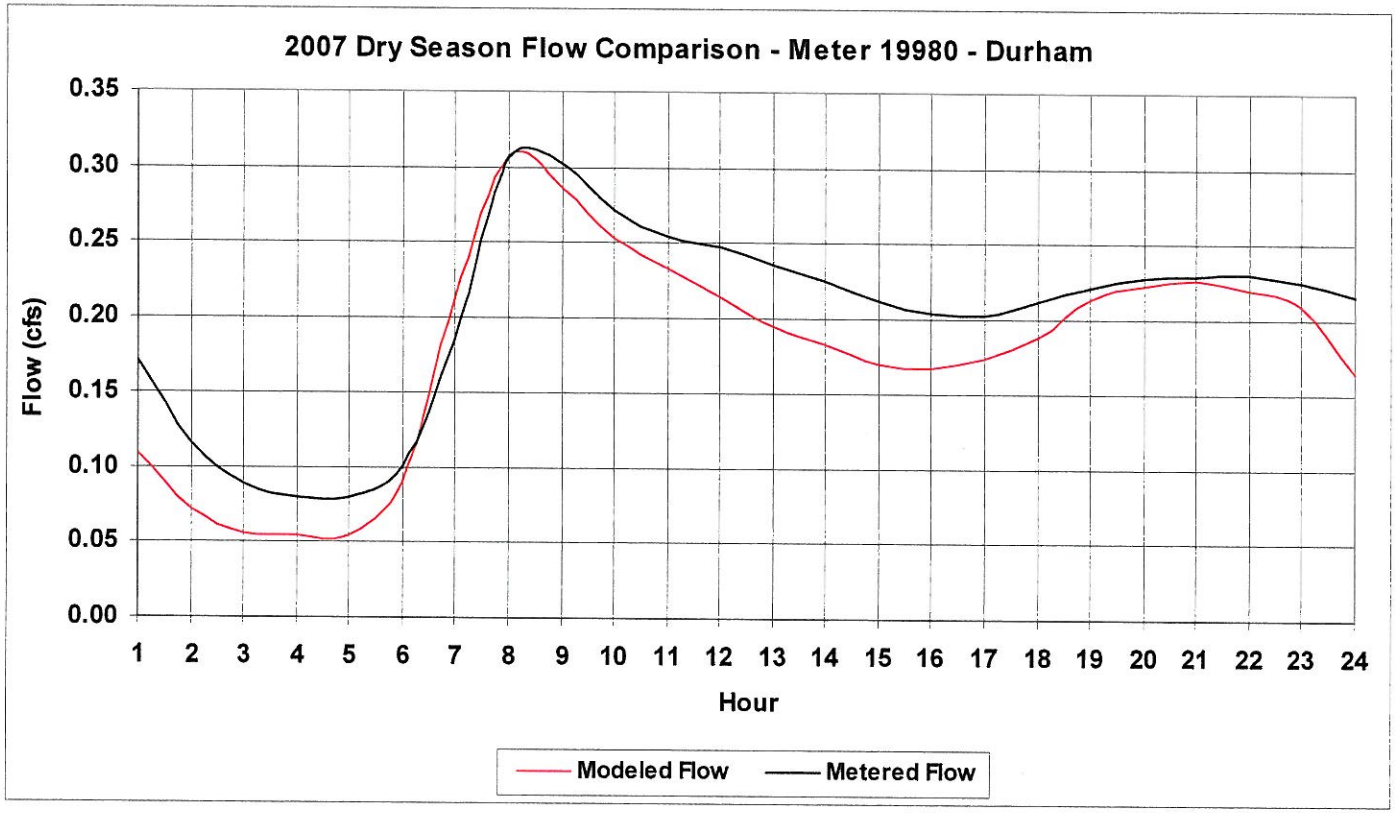

2007 Dry Season Flow Comparison - Meter 19980 - Durham
Flow (cfs)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 6

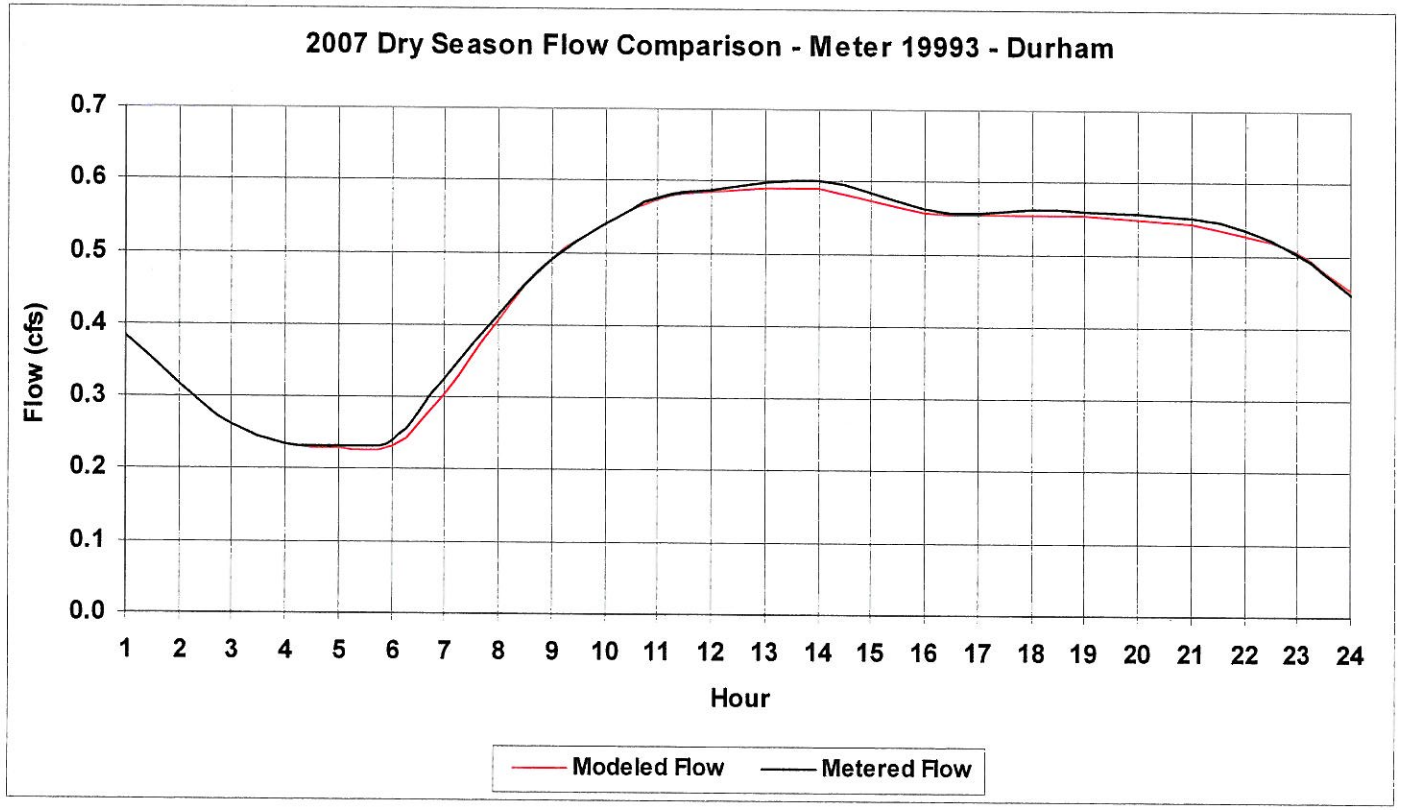

2007 Dry Season Flow Comparison - Meter 19993 - Durham
Flow (cfs)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 7

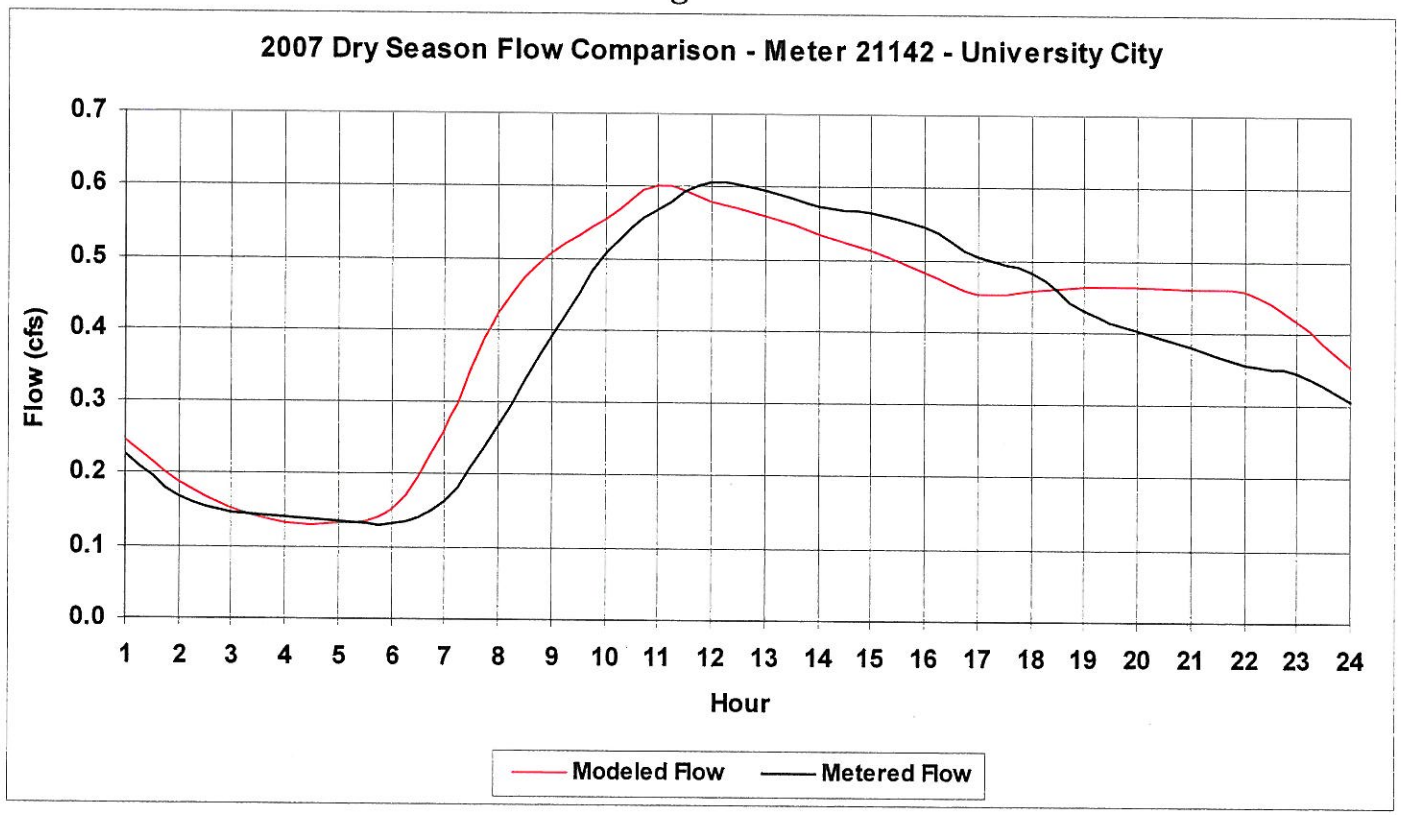

2007 Dry Season Flow Comparison - Meter 21142 - University City
Flow (cfs)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 8

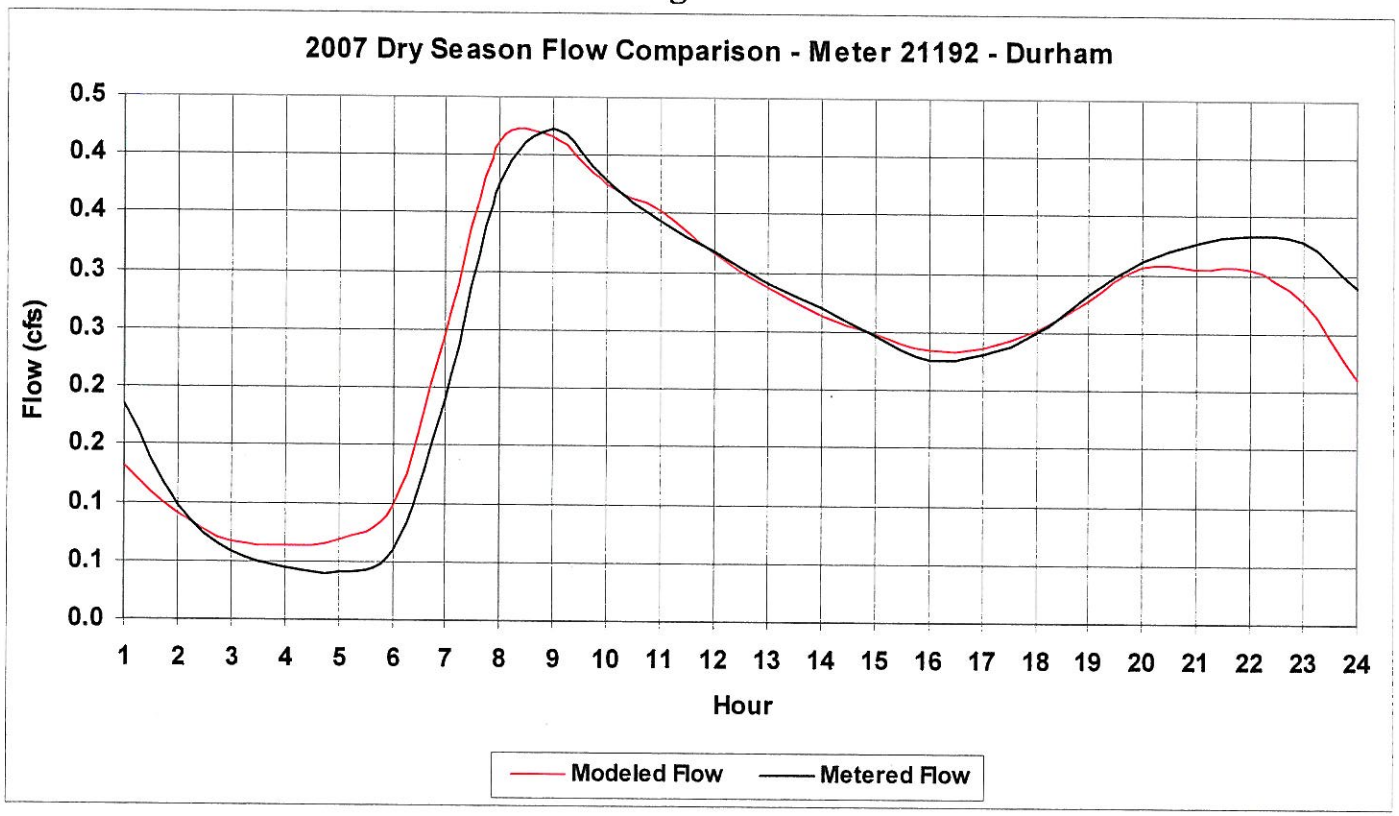

2007 Dry Season Flow Comparison - Meter 21192 - Durham
Flow (cfs)
0.5
0.4
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 9

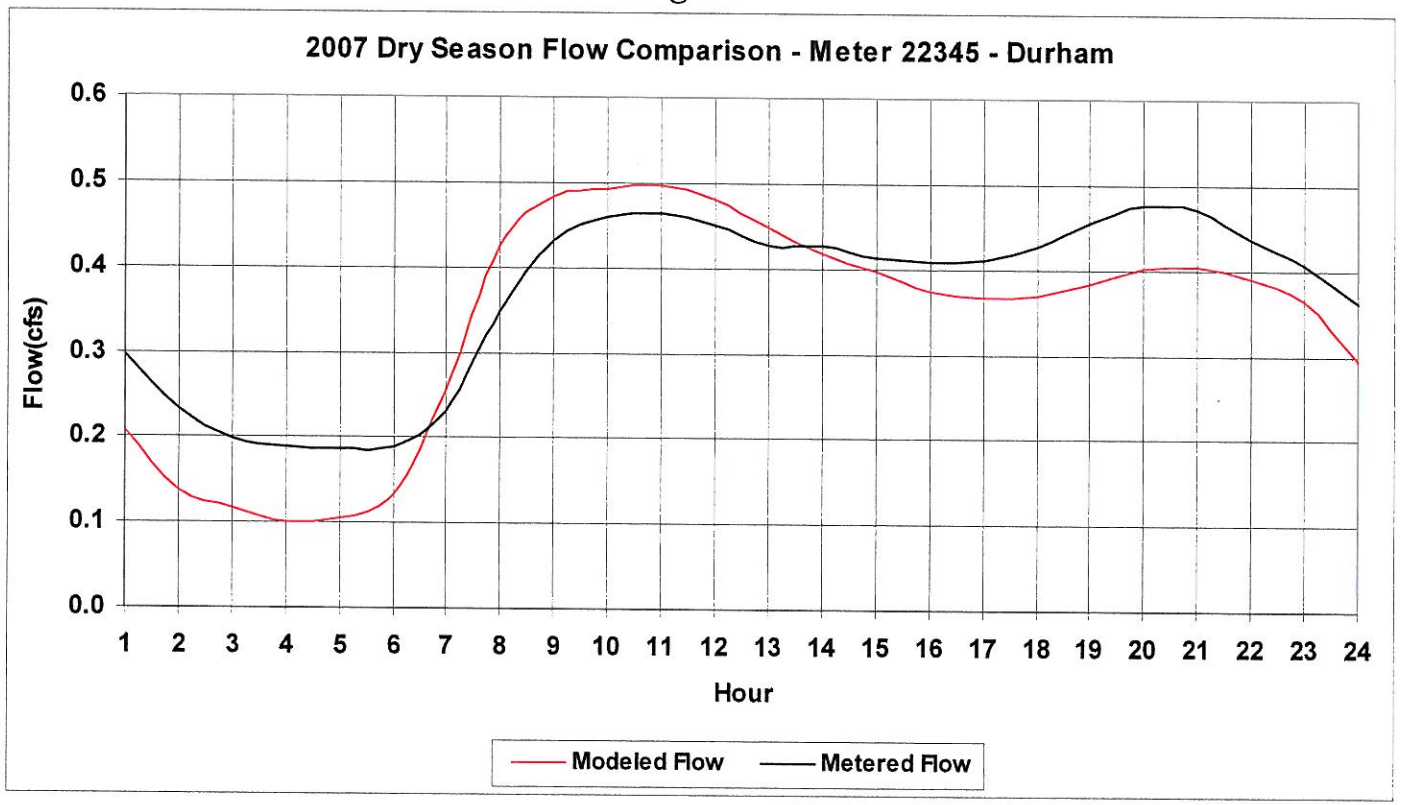

2007 Dry Season Flow Comparison - Meter 22345 - Durham
Flow(cfs)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 10

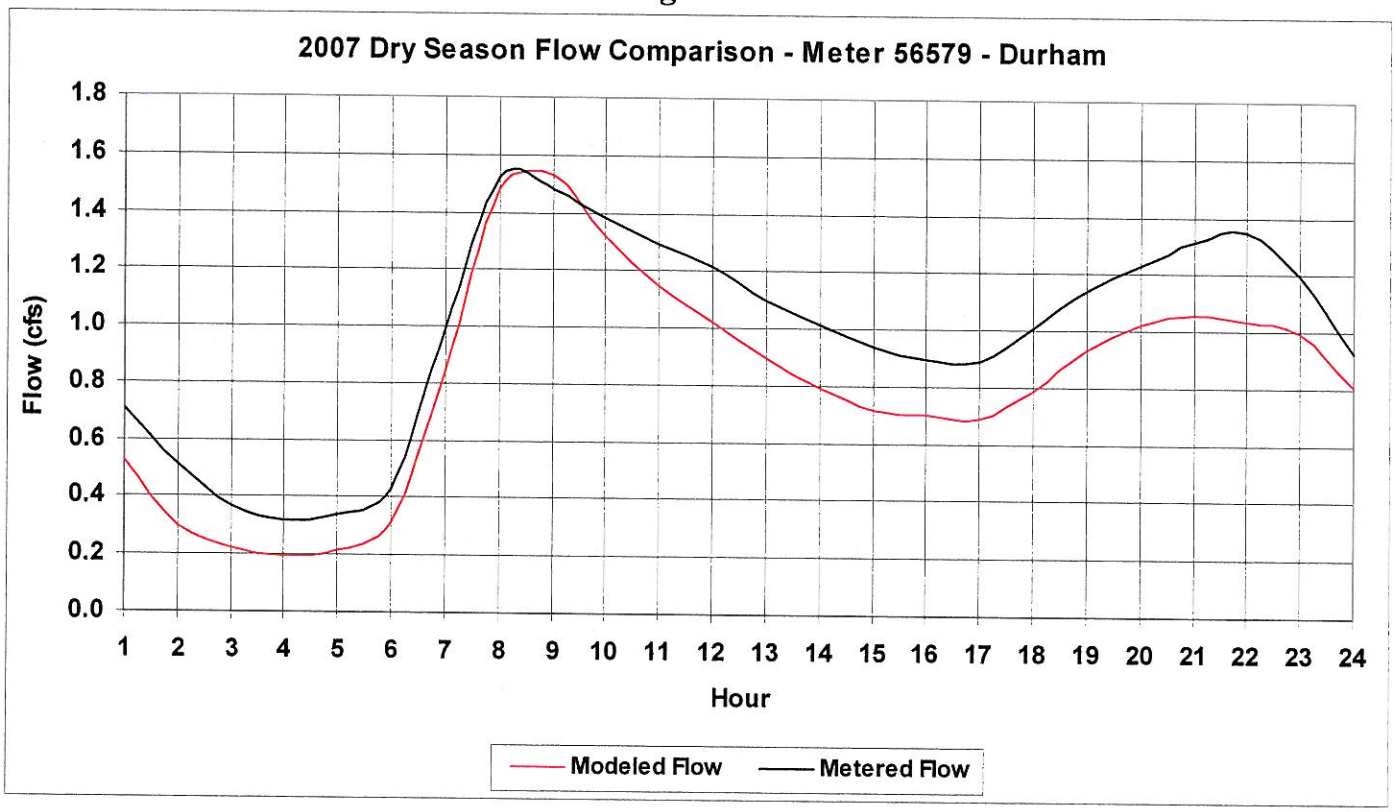

2007 Dry Season Flow Comparison - Meter 56579 - Durham
Flow (cfs)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 11

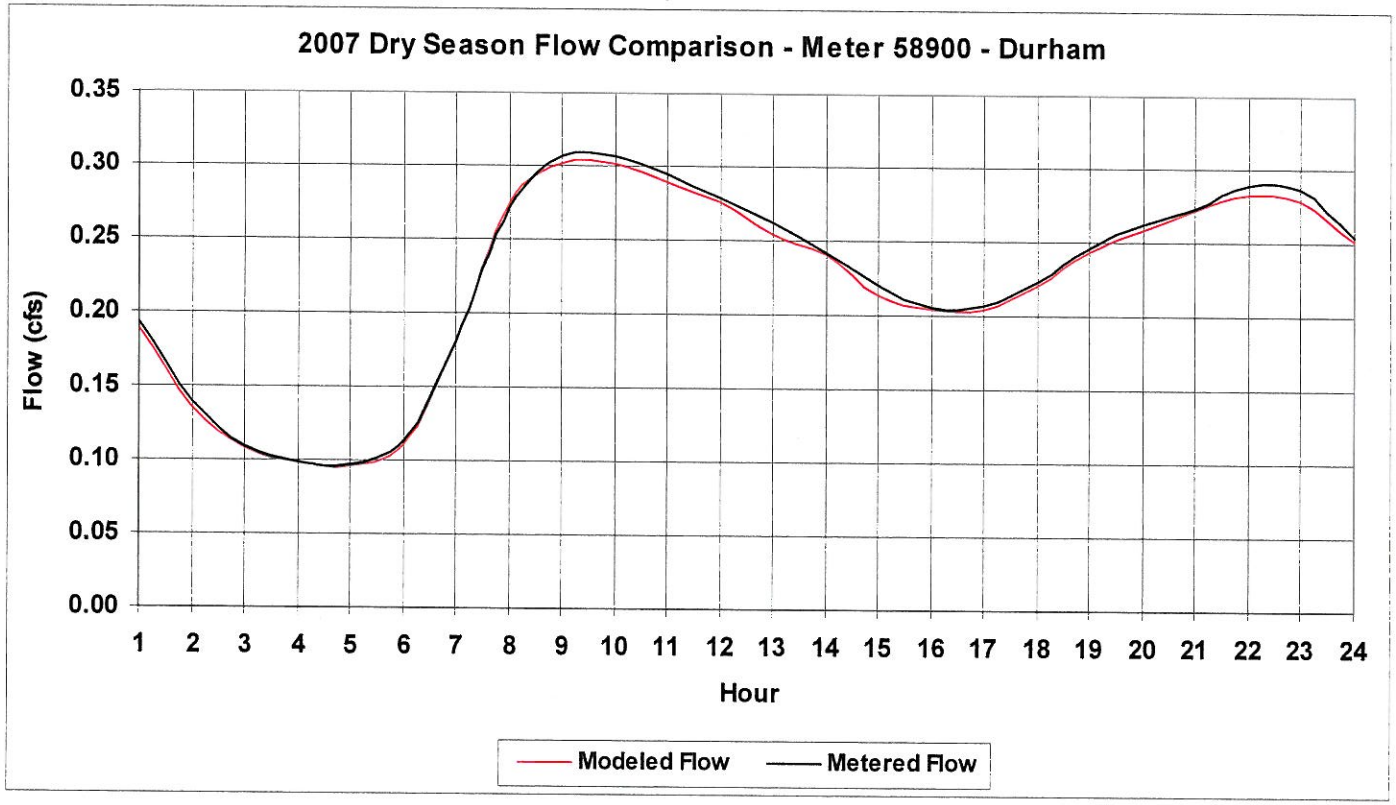

2007 Dry Season Flow Comparison - Meter 58900 - Durham
Flow (cfs)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 12

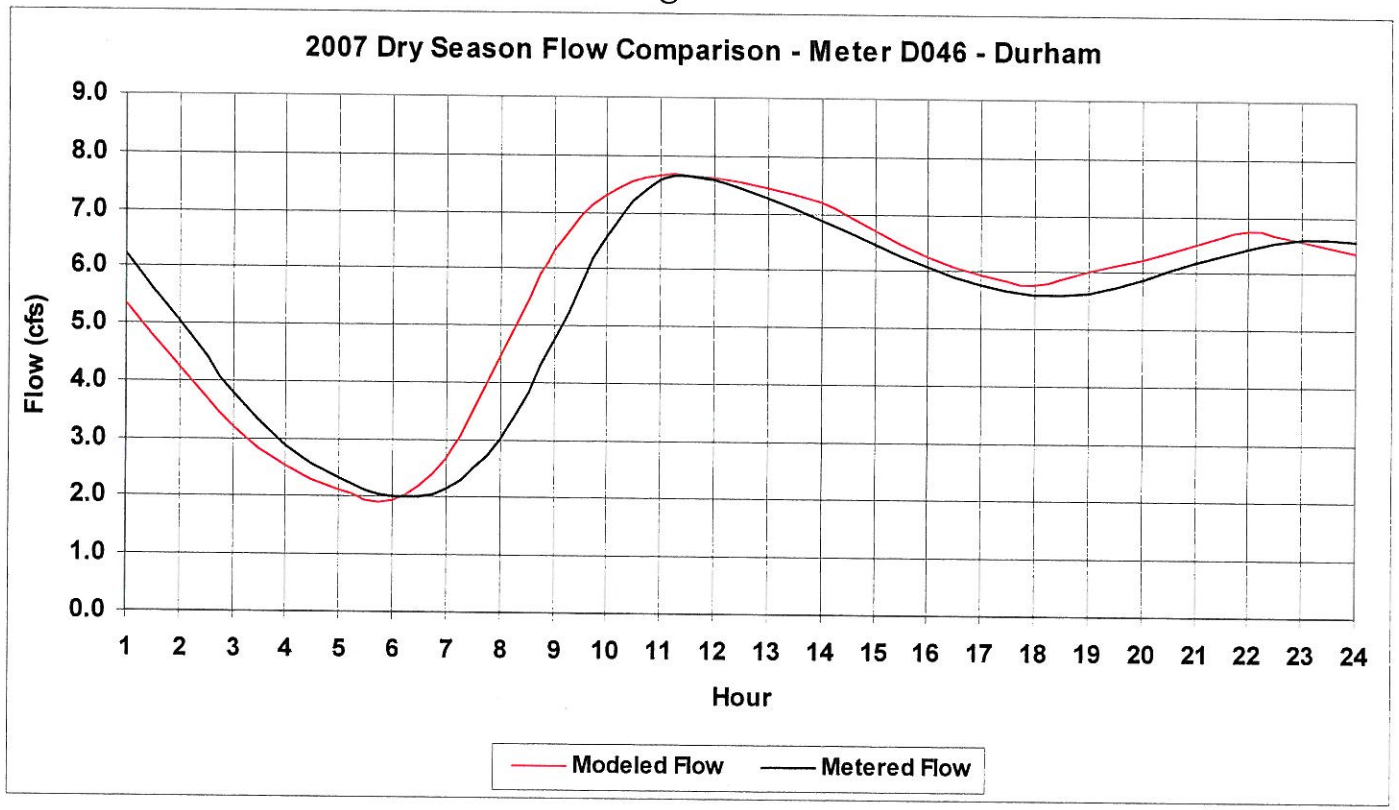

2007 Dry Season Flow Comparison - Meter D046 - Durham
Flow (cfs)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Modeled Flow
Metered Flow

Figure 13

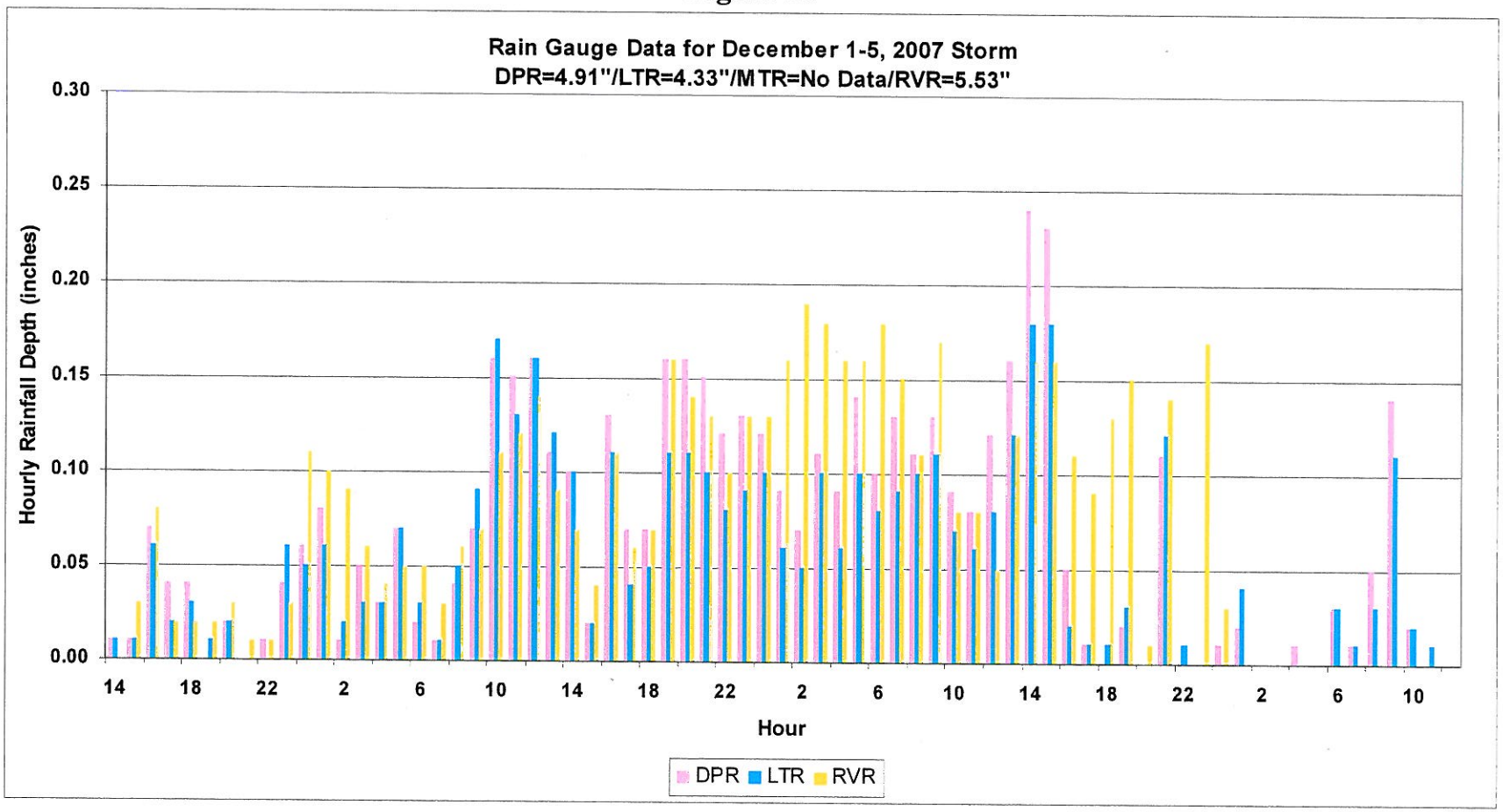

Rain Gauge Data for December 1-5, 2007 Storm
DPR=4.91"/LTR=4.33"/MTR=No Data/RVR=5.53"
Hourly Rainfall Depth (inches)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
14
18
22
2
6
10
14
18
22
2
6
10
14
18
22
2
6
10
Hour
DPR
LTR
RVR

Figure 14

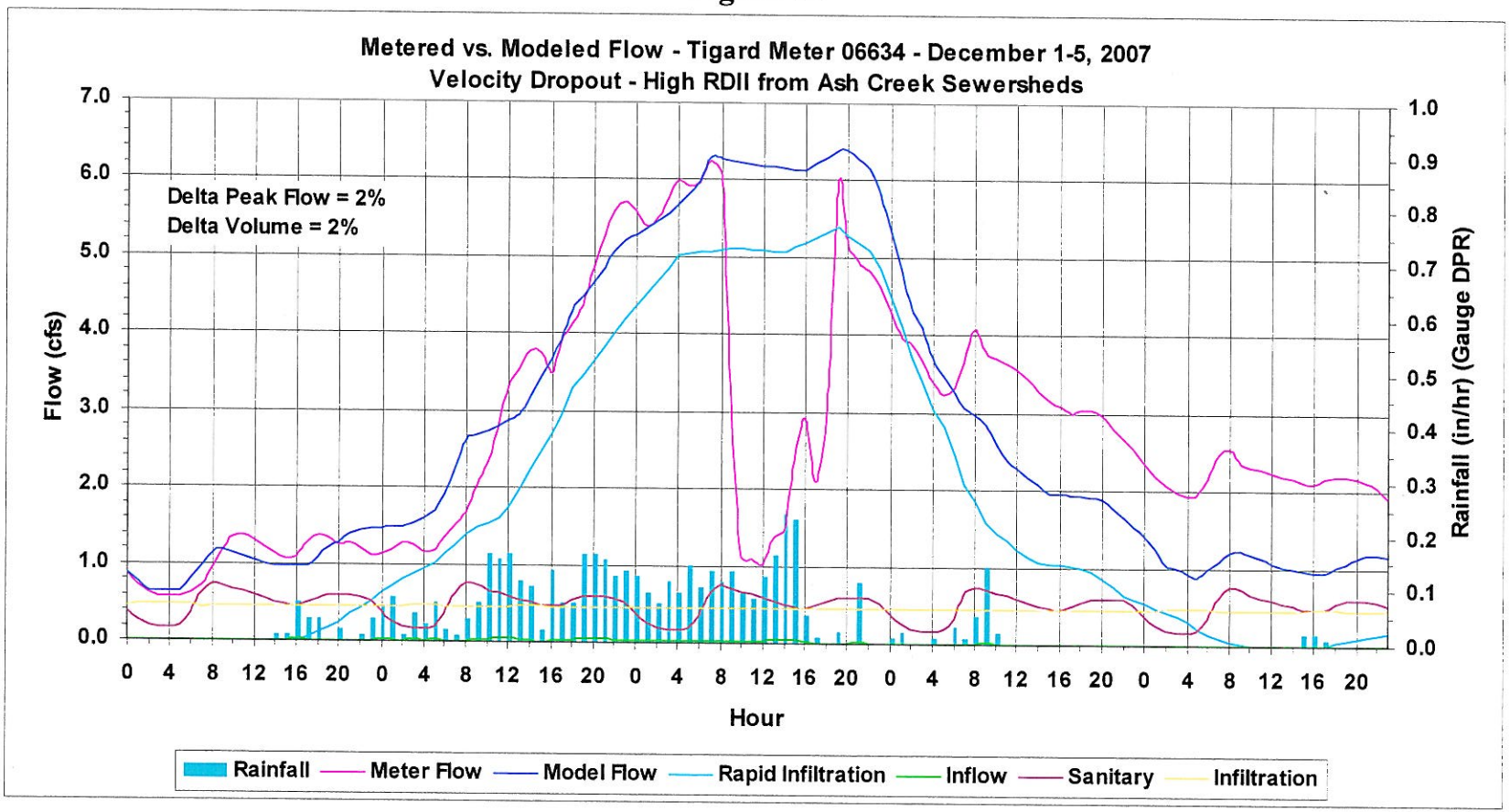

Metered vs. Modeled Flow - Tigard Meter 06634 - December 1-5, 2007
Velocity Dropout - High RDII from Ash Creek Sewersheds
Delta Peak Flow = 2%
Delta Volume = 2%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 15

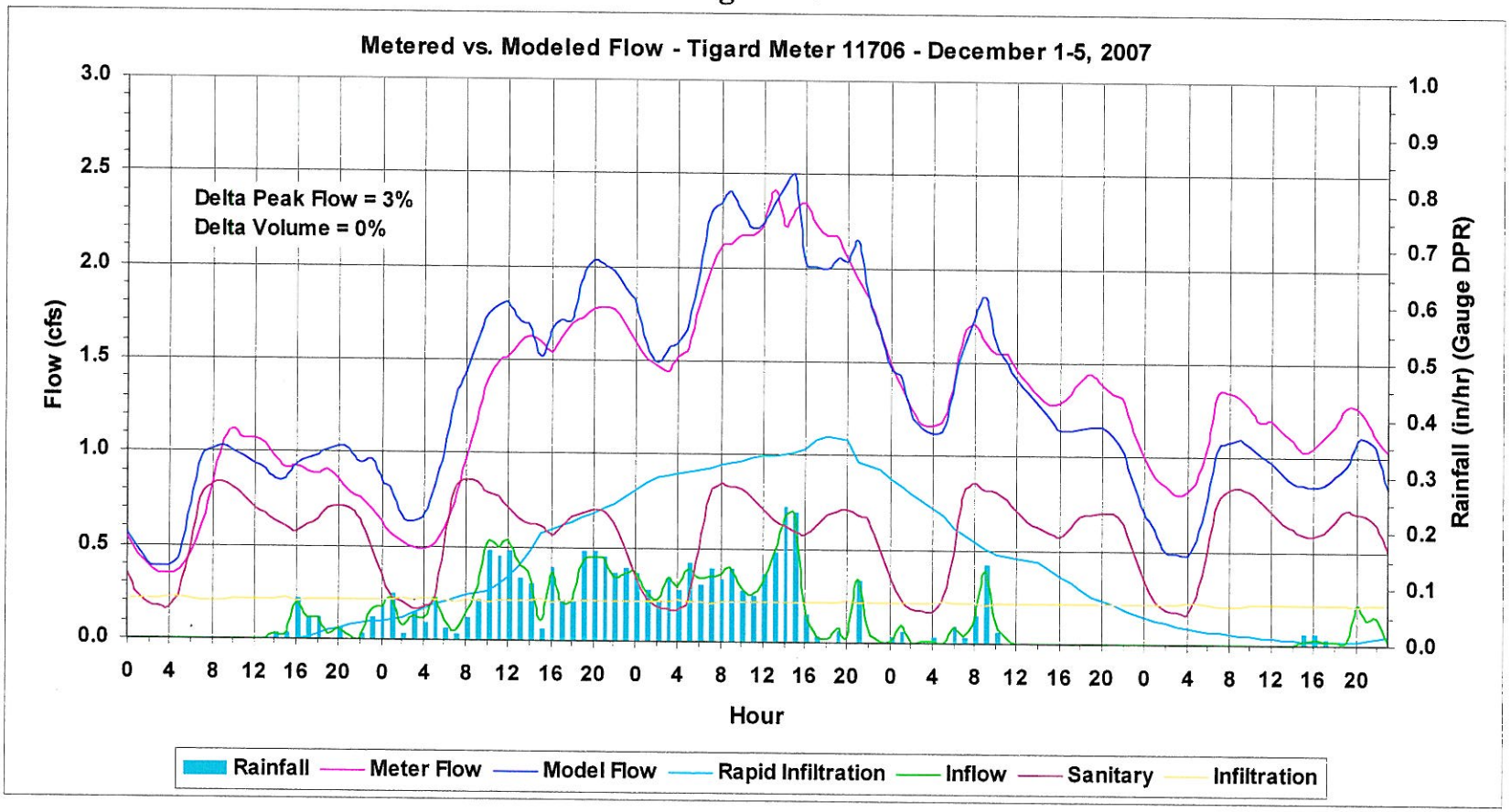

Metered vs. Modeled Flow - Tigard Meter 11706 - December 1-5, 2007
Delta Peak Flow = 3%
Delta Volume = 0%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 16

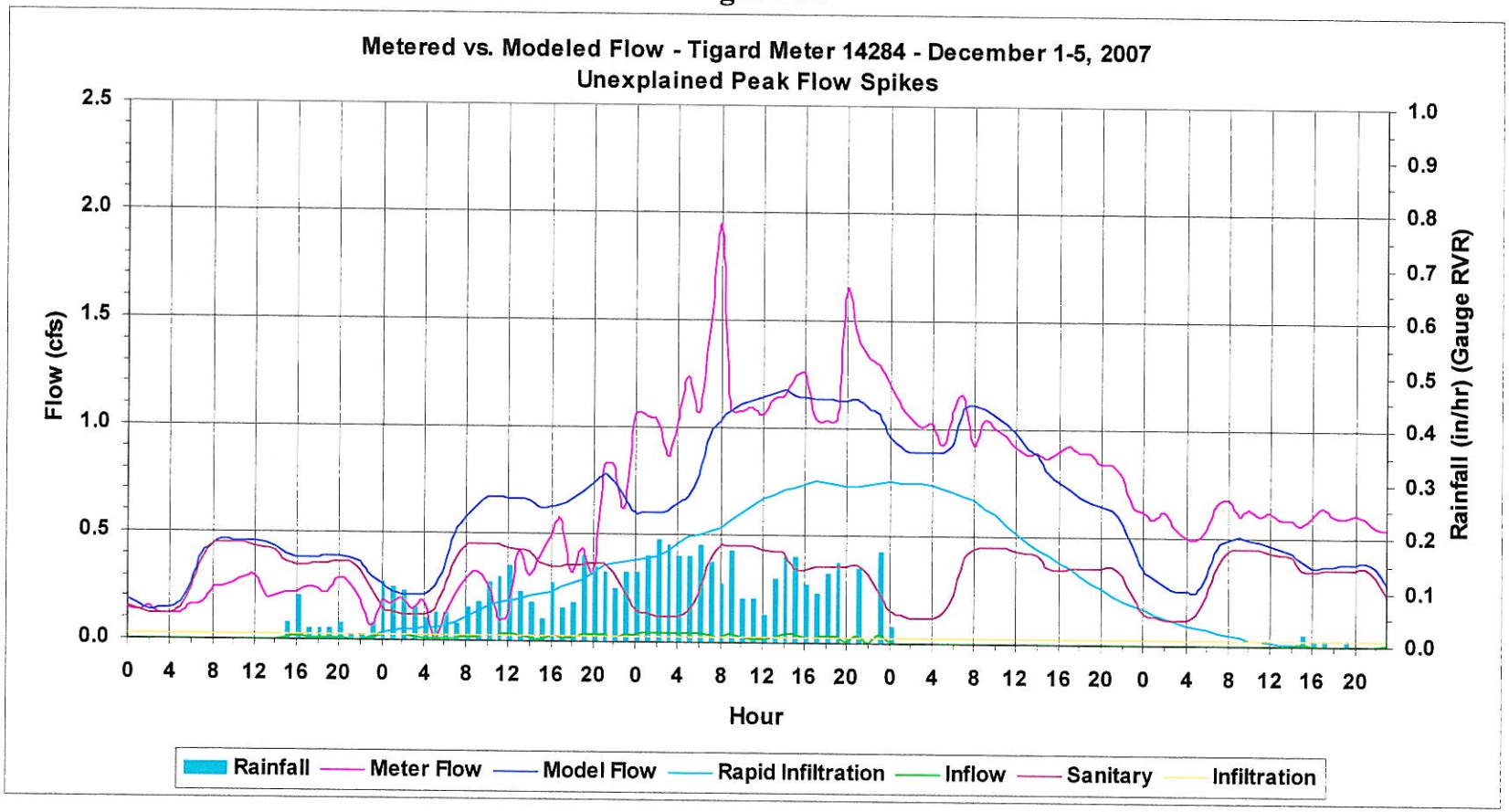

Metered vs. Modeled Flow - Tigard Meter 14284 - December 1-5, 2007
Unexplained Peak Flow Spikes
Flow (cfs)
2.5
2.0
1.5
1.0
0.5
0.0
Rainfall (in/hr) (Gauge RVR)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 17

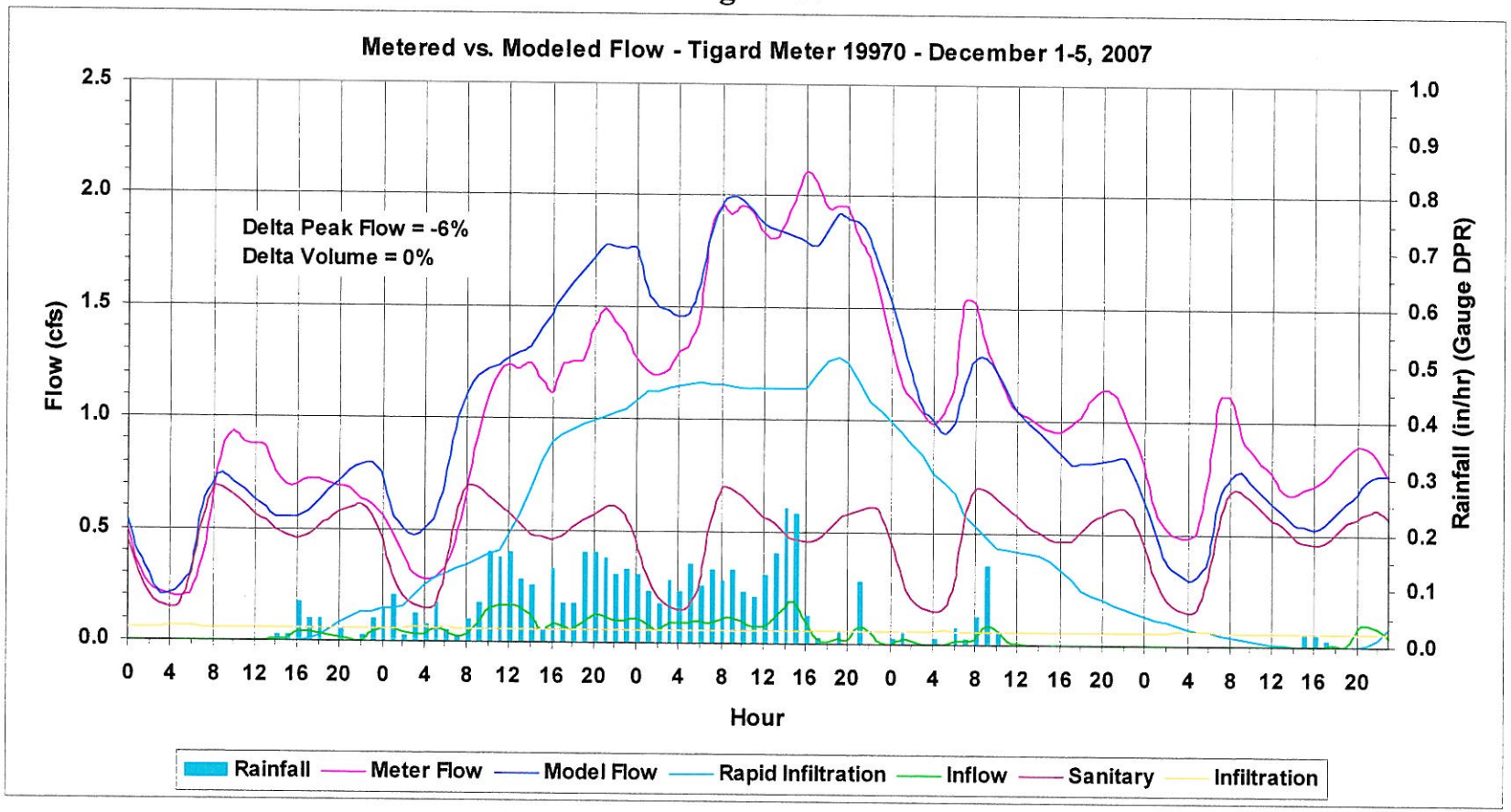

Metered vs. Modeled Flow - Tigard Meter 19970 - December 1-5, 2007
Delta Peak Flow = -6%
Delta Volume = 0%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 18

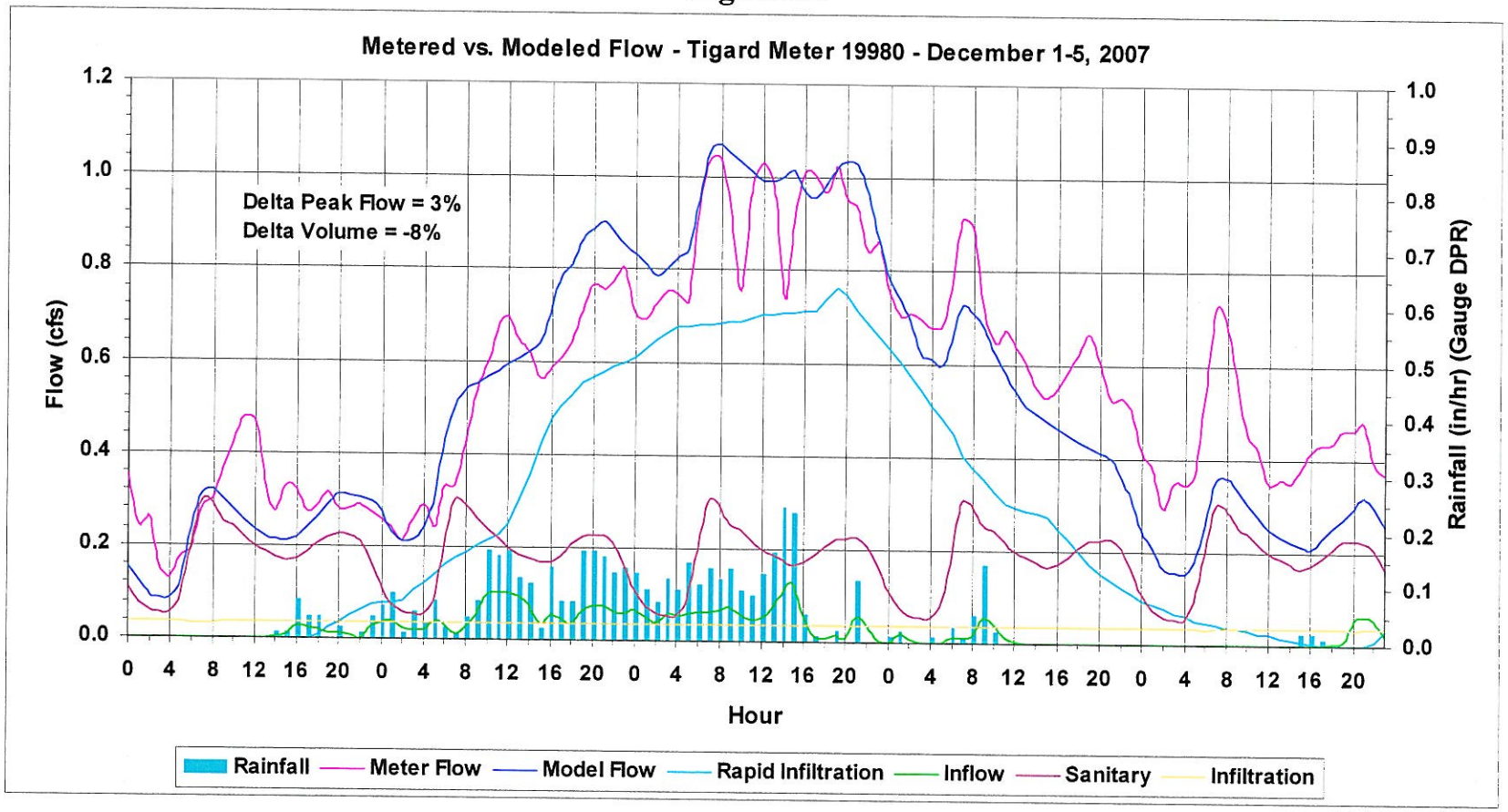

Metered vs. Modeled Flow - Tigard Meter 19980 - December 1-5, 2007
Delta Peak Flow = 3%
Delta Volume = -8%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 19

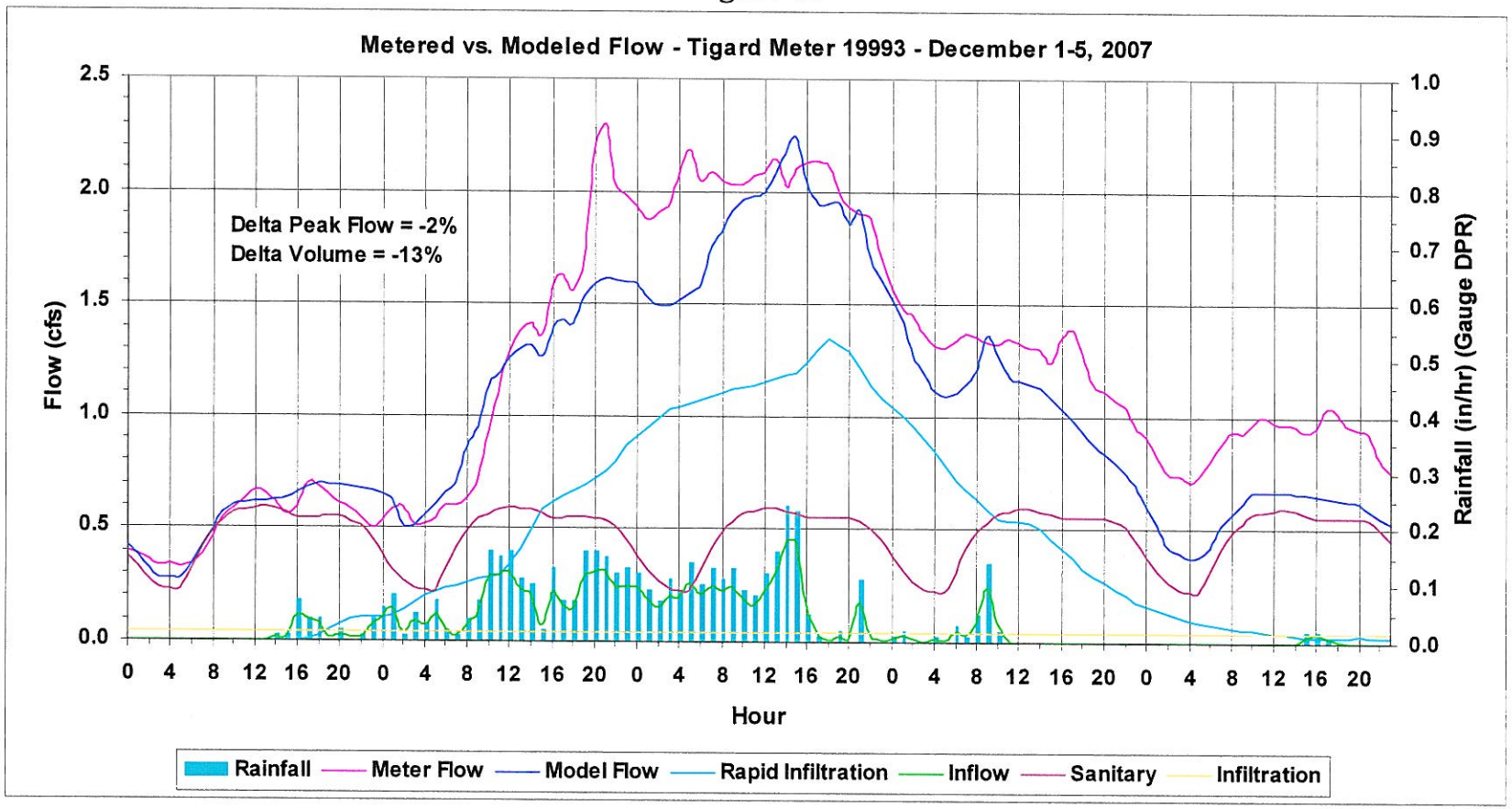

Metered vs. Modeled Flow - Tigard Meter 19993 - December 1-5, 2007
Delta Peak Flow = -2%
Delta Volume = -13%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 20

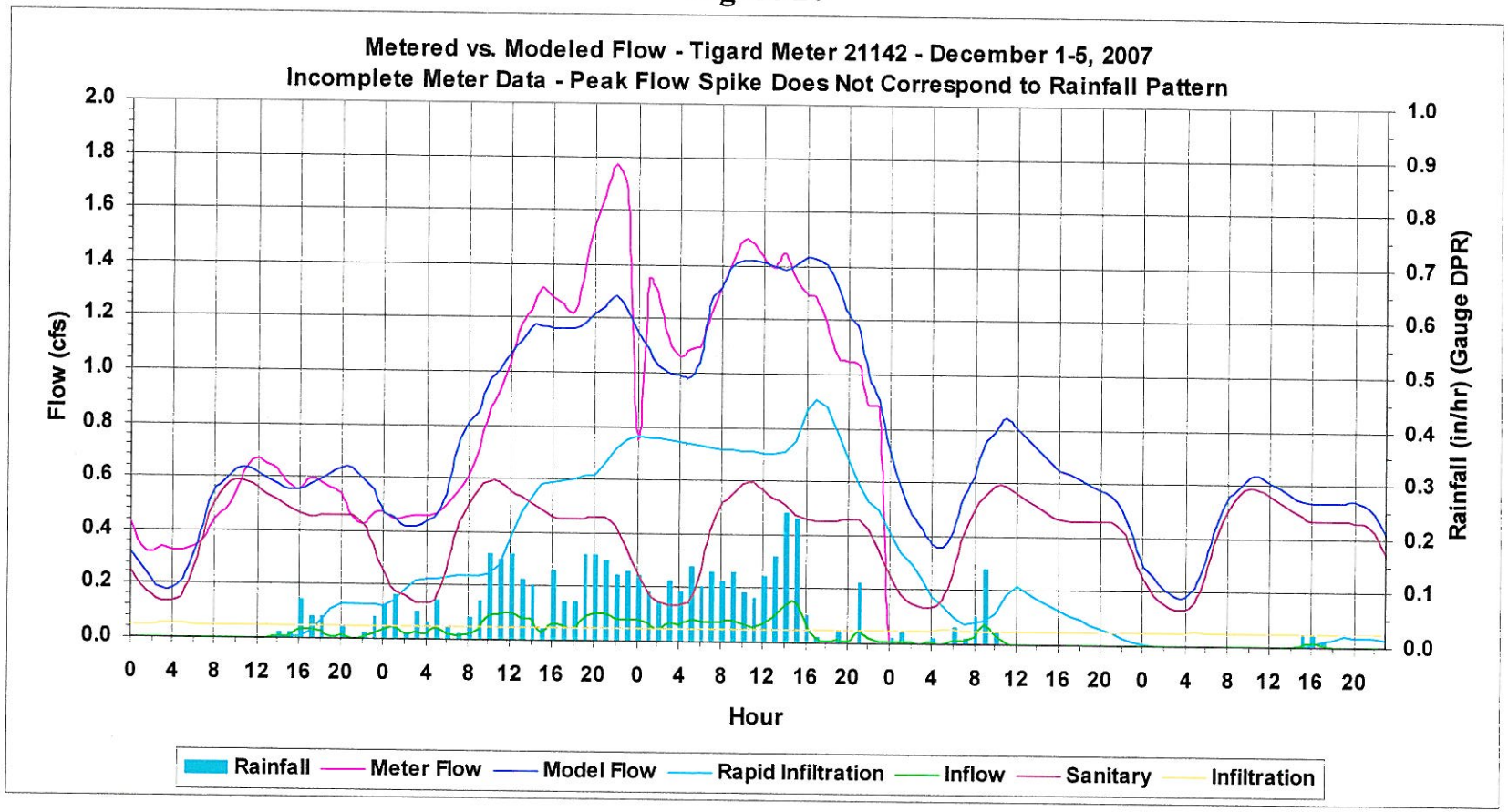

Metered vs. Modeled Flow - Tigard Meter 21142 - December 1-5, 2007
Incomplete Meter Data - Peak Flow Spike Does Not Correspond to Rainfall Pattern
Flow (cfs)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Rainfall (in/hr) (Gauge DPR)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 21

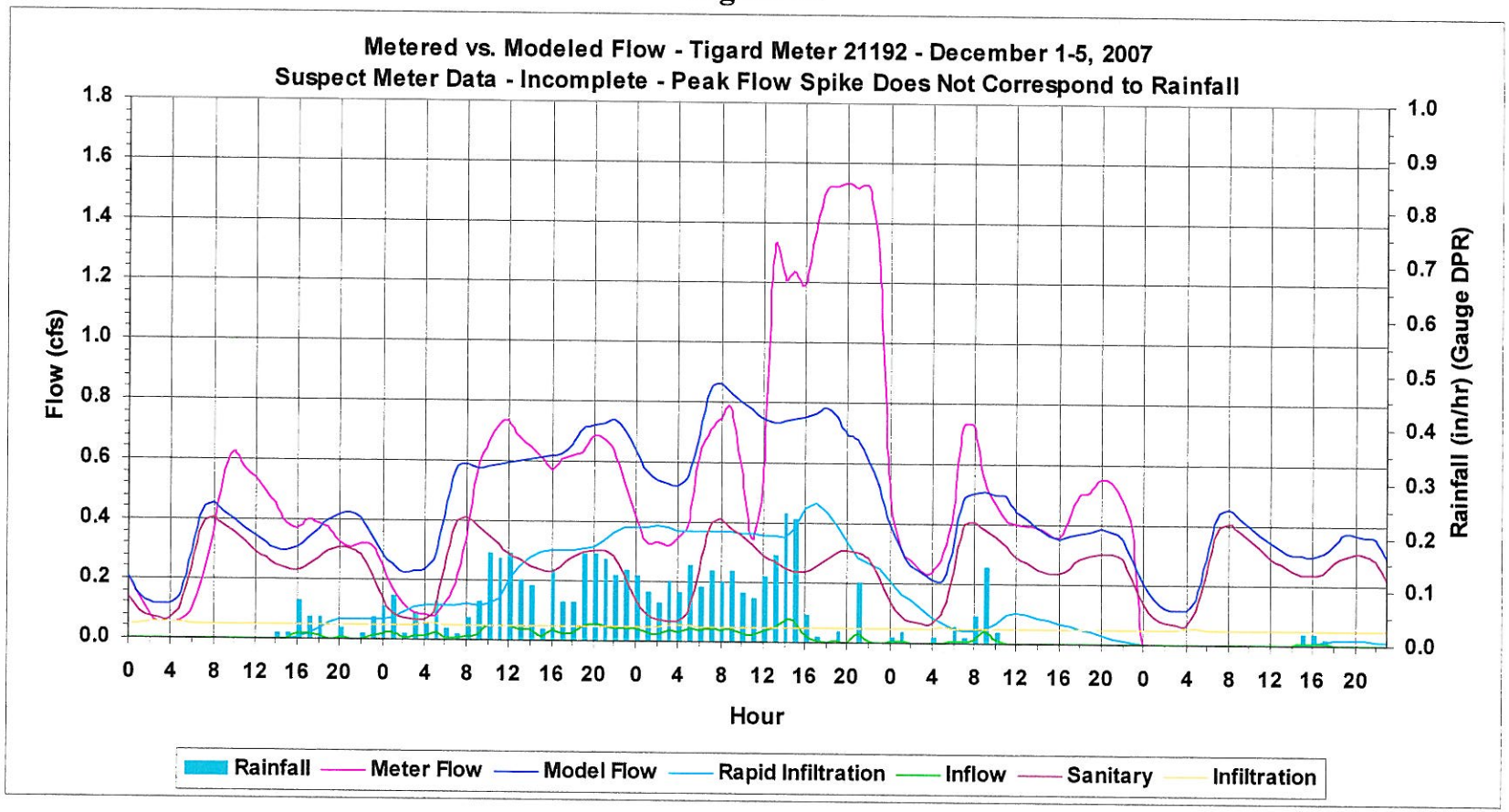

Metered vs. Modeled Flow - Tigard Meter 21192 - December 1-5, 2007
Suspect Meter Data - Incomplete - Peak Flow Spike Does Not Correspond to Rainfall
Flow (cfs)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Rainfall (in/hr) (Gauge DPR)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 22

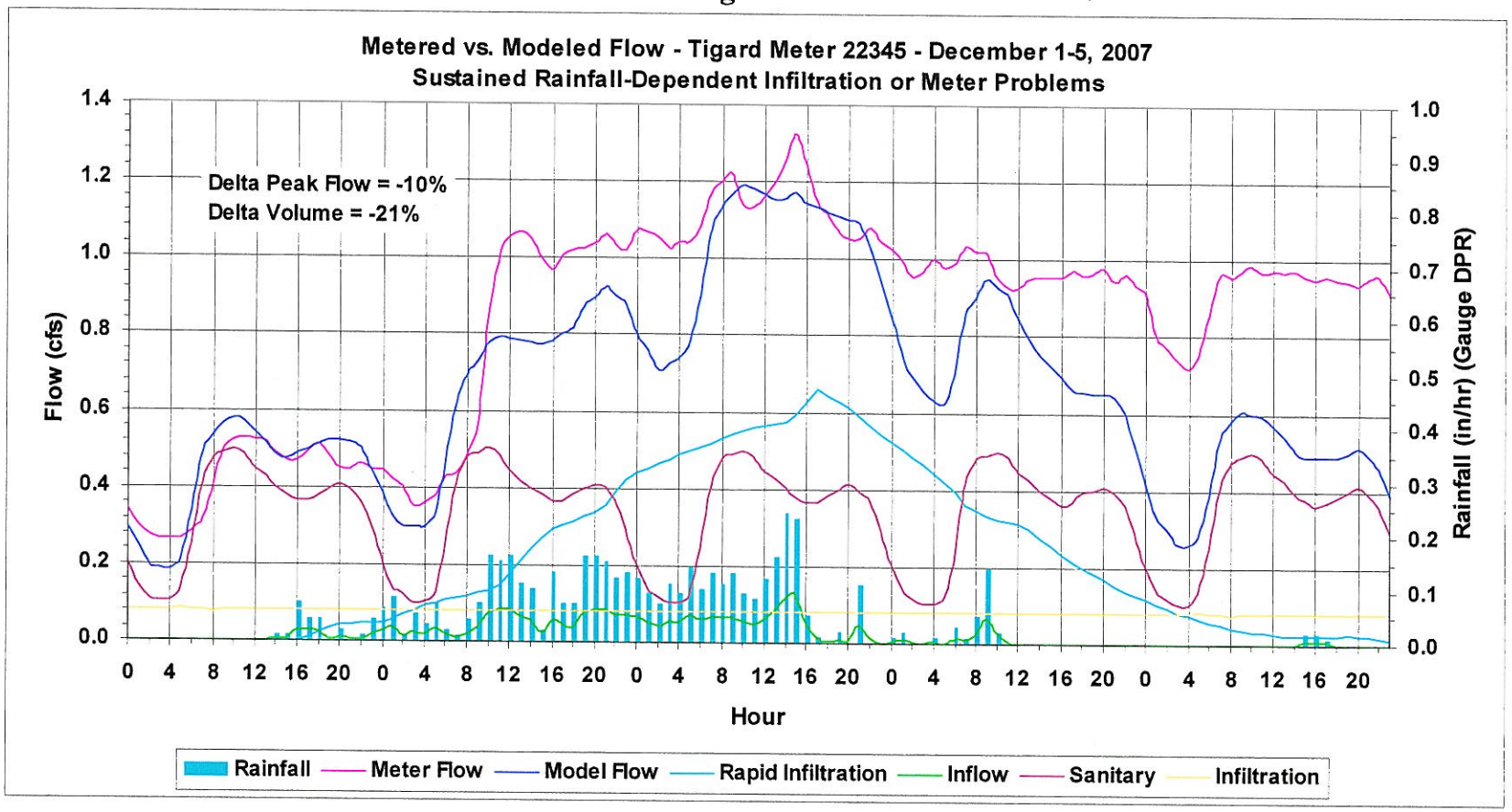

Metered vs. Modeled Flow - Tigard Meter 22345 - December 1-5, 2007
Sustained Rainfall-Dependent Infiltration or Meter Problems
Delta Peak Flow = -10%
Delta Volume = -21%
Flow (cfs)
Rainfall (in/hr) (Gauge DPR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 23

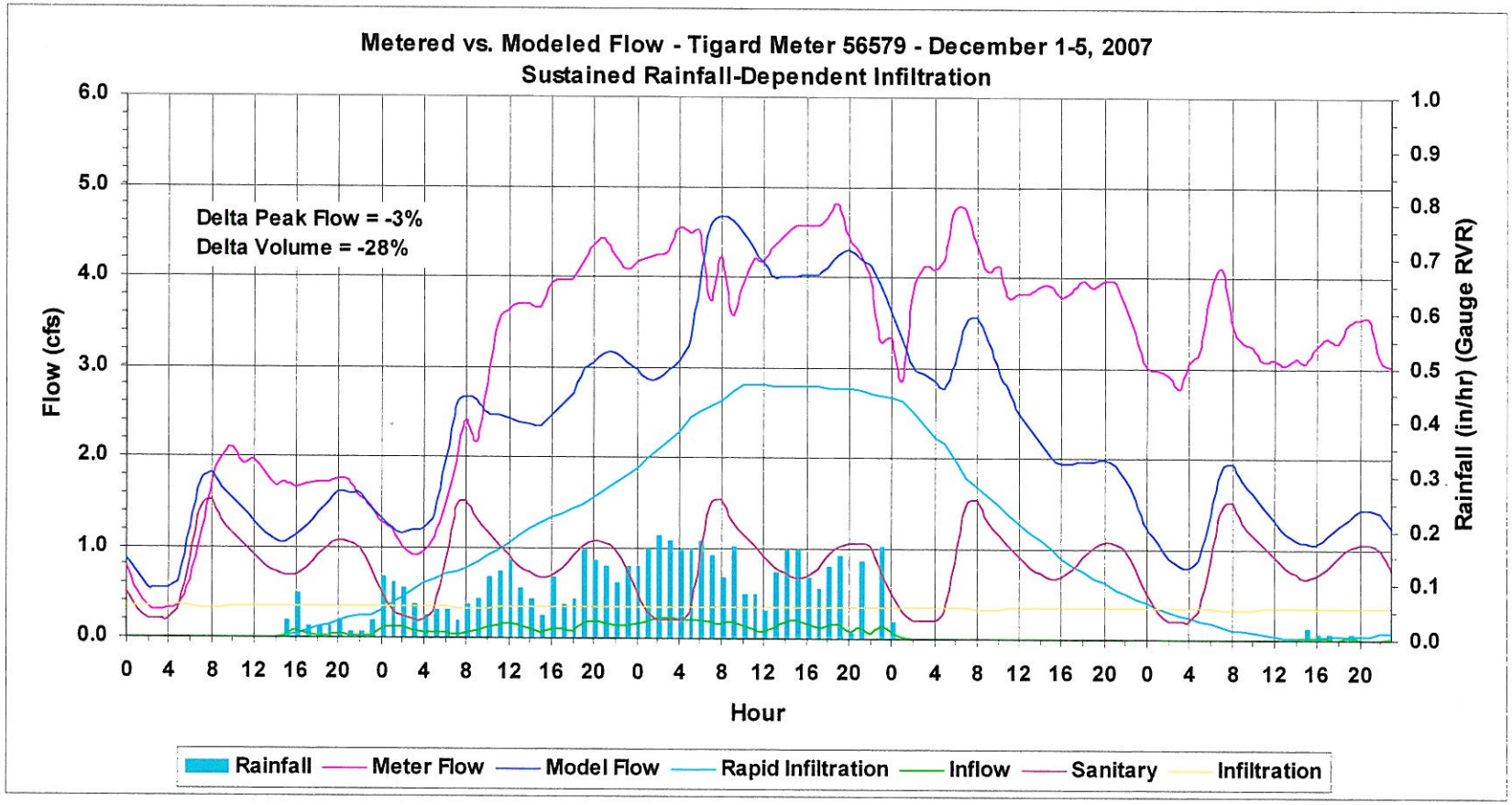
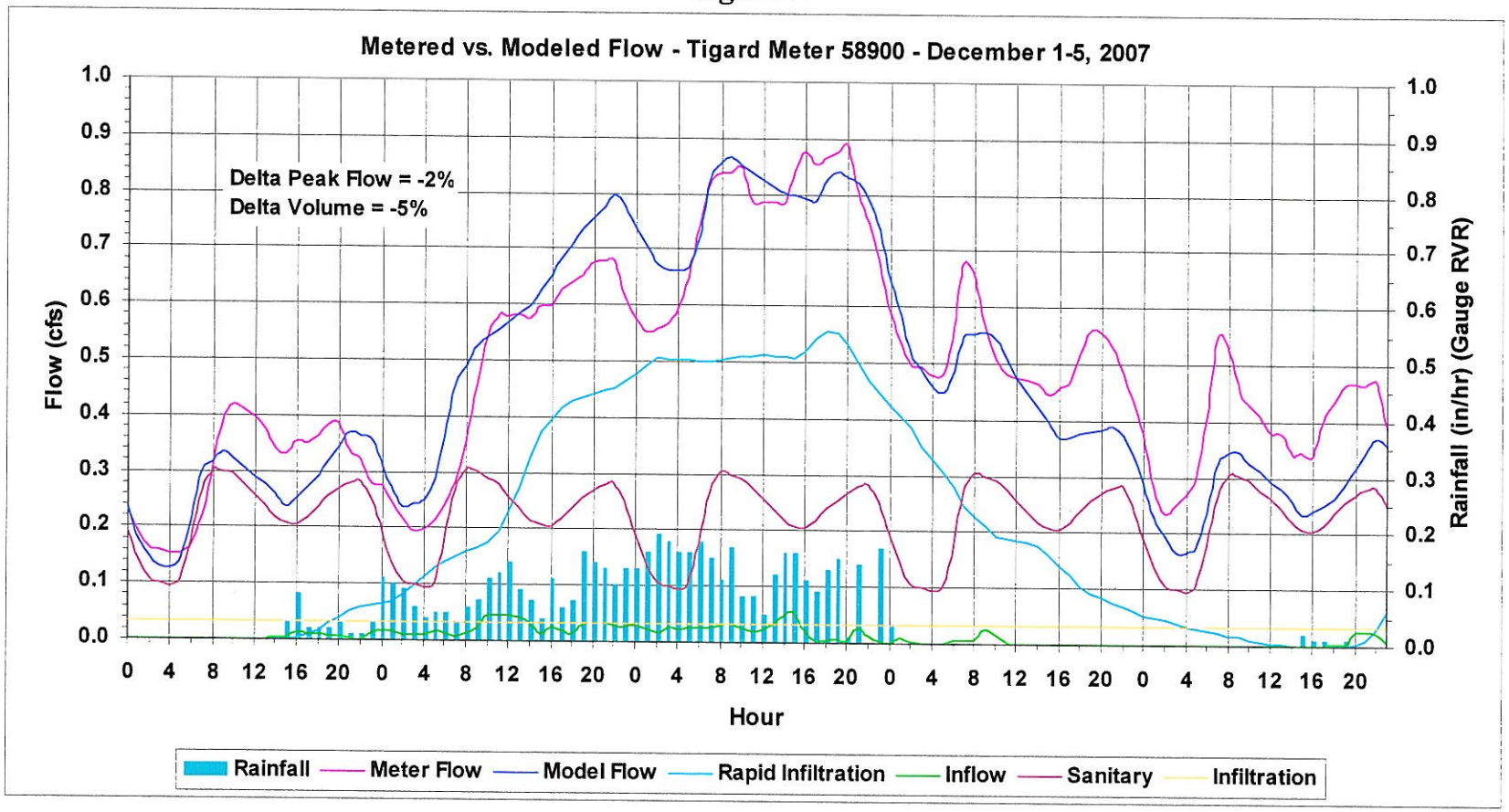

Metered vs. Modeled Flow - Tigard Meter 56579 - December 1-5, 2007
Sustained Rainfall-Dependent Infiltration
Delta Peak Flow = -3%
Delta Volume = -28%
Flow (cfs)
Rainfall (in/hr) (Gauge RVR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

Figure 24


Metered vs. Modeled Flow - Tigard Meter 58900 - December 1-5, 2007
Delta Peak Flow = -2%
Delta Volume = -5%
Flow (cfs)
Rainfall (in/hr) (Gauge RVR)
Hour
Rainfall
Meter Flow
Model Flow
Rapid Infiltration
Inflow
Sanitary
Infiltration

APPENDIX I

Summary of Gravity Sewer Capital Improvement Project Costs

Appendix I. Summary of Gravity Sewer Capital Improvement Project Costs

Project ID	CIP Timing	Model G_ID	Manholes Nos. Up_Dn	Lateral Name	Existing Diameter, inches	Length, ft	Slope	Full-pipe Capacity, mgd	Peak Wet Weather: Existing (2006) Flow, mgd	Peak Wet Weather: Remaining Capacity, mgd	EDUs Remaining	Limiting Reach EDUs Remaining	Peak Wet Weather: 2015 Flow, mgd	Peak Wet Weather: Study Area Buildout Flow, mgd	Peak Wet Weather: Buildout + Flow, mgd	Recommended Diameter, inches	Average Depth, ft	Unit Cost, $/LF	Base Construction Cost (Replacement; w/o Contingency), $	Construction Cost (Replacement; w/ Contingency), $	Total Project Cost, $	Capacity at Replacement Diameter, mgd	Portion of Improvement Allotted to SDC	SDC Improvement Cost, $
D-120	Existing	1433	21074_21142	East Tigard Trunk	12	124	0.00700	2.00	1.25	0.75	1,429	-	1.41	1.72	1.72	15	10.8	173	21,444	27,877	34,846	3.49	43%	14,898
D-120	Existing	1434	21142_21143	East Tigard Trunk	12	260	0.00300	1.26	1.25	0.00	5	-	1.41	1.72	1.72	15	9.1	162	42,045	54,659	68,323	2.29	45%	30,784
D-120	Existing	1435	21143_21144	East Tigard Trunk	12	326	0.00300	1.28	1.45	-	-	-	1.71	2.03	2.03	15	7.0	147	48,030	62,439	78,048	2.29	44%	34,394
D-120	Existing	1436	21144_21145	East Tigard Trunk	12	344	0.00300	1.24	1.45	-	-	-	1.71	2.03	2.03	15	5.5	137	47,173	61,325	76,656	2.29	46%	34,928
D-120	Existing	1437	21145_21146	East Tigard Trunk	12	391	0.00500	1.65	1.45	0.20	393	-	1.71	2.03	2.03	15	5.5	137	53,618	69,703	87,129	2.95	44%	38,393
D-120	Existing	1438	21146_21147	East Tigard Trunk	12	25	0.00200	0.92	1.45	-	-	-	1.71	2.03	2.03	15	6.0	141	3,513	4,567	5,709	1.87	51%	2,885
D-120 Total						**1,470**													**215,823**	**280,569**	**350,712**		**45%**	**156,282**
D-330	Buildout	1046	13885_13884	Scholl Trunk	27	330	0.00200	9.63	6.42	3.20	6,143	-	7.64	10.13	21.91	42	10.2	748	246,807	320,850	401,062	29.07	67%	268,222
D-330	Buildout	1045	13884_13883	Scholl Trunk	27	329	0.00200	8.99	6.42	2.56	4,916	-	7.64	10.12	21.91	42	12.8	801	263,427	342,455	428,068	29.07	69%	295,740
D-330	Buildout	1044	13883_13882	Scholl Trunk	27	115	0.00300	10.75	6.68	4.07	7,796	-	7.91	10.43	22.21	42	12.8	801	92,068	119,688	149,610	35.60	70%	104,447
D-330	Buildout	1043	13882_13881	Scholl Trunk	27	117	0.00200	8.89	6.68	2.22	4,248	-	7.91	10.43	22.20	42	16.6	877	102,614	133,398	166,747	29.07	69%	115,723
D-330	Buildout	1042	13881_13880	Scholl Trunk	27	184	0.00300	10.14	7.54	2.59	4,974	-	8.80	11.34	23.13	42	19.0	925	170,121	221,157	276,446	35.60	72%	197,710
D-330	Buildout	1041	13880_13879	Scholl Trunk	27	135	0.00300	10.50	7.54	2.96	5,675	-	8.79	11.33	23.12	42	13.4	812	109,581	142,455	178,069	35.60	70%	125,537
D-330	Buildout	1040	13879_13878	Scholl Trunk	27	255	0.00200	9.81	7.54	2.27	4,355	-	8.79	11.33	23.12	42	13.9	822	209,514	272,368	340,460	29.07	66%	225,536
D-330	Buildout	1039	13878_13877	Scholl Trunk	27	190	0.00300	10.08	7.54	2.55	4,880	-	8.79	11.32	23.11	42	12.9	802	152,438	198,170	247,712	35.60	72%	177,552
D-330	Buildout	1038	13877_13876	Scholl Trunk	27	405	0.00200	8.97	7.54	1.44	2,753	-	8.79	11.31	23.10	42	8.1	704	285,166	370,716	463,395	29.07	69%	320,362
D-330	Buildout	1037	13876_13875	Scholl Trunk	27	380	0.00200	8.97	7.53	1.44	2,759	-	8.78	11.30	23.08	42	6.8	680	258,225	335,693	419,616	29.07	69%	290,096
D-330	Buildout	1036	13875_13874	Scholl Trunk	27	226	0.00200	9.90	7.64	2.25	4,320	-	8.90	11.43	23.20	42	6.0	662	149,714	194,628	243,285	29.07	66%	160,454
D-330	Buildout	1035	13874_13873	Scholl Trunk	27	328	0.00200	9.66	7.64	2.02	3,867	-	8.90	11.42	23.18	42	7.2	686	224,946	292,429	365,537	29.07	67%	244,097
D-330	Buildout	1034	13873_13872	Scholl Trunk	27	349	0.00200	9.60	7.64	1.97	3,775	-	8.90	11.41	23.15	42	9.4	732	255,441	332,074	415,092	29.07	67%	277,927
D-330 Total						**3,343**													**2,520,060**	**3,276,079**	**4,095,098**		**68%**	**2,803,403**
D-335	Buildout	1029	13868_13867	Scholl Trunk	27	329	0.00100	7.74	5.52	2.22	4,251	-	6.71	9.15	21.32	42	8.4	710	233,650	303,744	379,681	20.55	62%	236,666
D-335	Buildout	1028	13867_16379	Scholl Trunk	27	112	0.00100	7.58	5.52	2.06	3,948	-	6.71	9.15	21.25	42	8.1	704	78,849	102,504	128,130	20.55	63%	80,862
D-335	Buildout	1061	16379_16236	Scholl Trunk	27	39	0.00200	7.87	5.56	2.31	4,424	-	6.75	9.19	21.27	42	11.5	774	30,178	39,231	49,039	29.07	73%	35,764
D-335	Buildout	1060	16236_13866	Scholl Trunk	27	231	0.00100	7.47	5.56	1.91	3,655	-	6.75	9.19	21.24	42	11.6	775	179,072	232,794	290,993	20.55	64%	185,281
D-335	Buildout	1027	13866_13865	Scholl Trunk	27	401	0.00100	7.50	5.56	1.94	3,717	-	6.75	9.19	21.21	42	7.7	696	279,227	362,995	453,744	20.55	64%	288,237
D-335	Buildout	1026	13865_13864	Scholl Trunk	27	458	0.00100	7.50	5.56	1.94	3,725	-	6.74	9.18	21.14	42	8.0	703	322,160	418,808	523,510	20.55	64%	332,506
D-335	Buildout	1025	13864_13885	Scholl Trunk	27	283	0.00100	7.54	5.55	1.99	3,818	-	6.74	9.17	21.05	42	9.1	726	205,474	267,117	333,896	20.55	63%	211,370
D-335 Total						**1,853**													**1,328,610**	**1,727,193**	**2,158,992**		**63%**	**1,370,686**
D-340	Existing	1004	10691_10692	Metzger Interceptor	30	240	0.00100	7.07	13.71	-	-	-	14.95	15.66	15.66	36	8.8	301	72,241	93,914	117,392	13.63	48%	56,470
D-340	Existing	1005	10692_10693	Metzger Interceptor	30	395	0.00300	14.08	13.71	0.38	725	-	14.95	15.66	15.66	36	8.9	302	119,413	155,237	194,046	23.60	40%	78,242
D-340	Existing	1006	10693_10694	Fanno Creek Interceptor	30	67	0.00400	16.87	13.70	3.16	6,061	-	14.94	15.66	15.66	36	11.1	323	21,624	28,111	35,138	27.25	38%	13,391
D-340	Existing	1007	10694_10696	Fanno Creek Interceptor	30	12	0.16900	109.28	13.70	95.57	183,229	-	14.94	15.66	15.66	36	12.0	331	3,974	5,166	6,457	177.13	38%	2,474
D-340 Total						**714**													**217,252**	**282,427**	**353,034**		**43%**	**150,576**
D-350	Existing	848	05043_05044	Elmwood Lateral	12	124	0.08300	6.63	4.60	2.03	3,895	-	4.85	5.02	5.02	21	7.9	189	23,474	30,517	38,146	29.49	78%	29,571
D-350	Existing	849	05044_05045	Elmwood Lateral	12	312	0.06200	5.75	4.60	1.16	2,218	-	4.85	5.02	5.02	21	7.2	184	57,450	74,686	93,357	25.49	77%	72,283
D-350	Existing	850	05045_05048	Elmwood Lateral	12	126	0.06200	5.73	4.60	1.14	2,182	-	4.85	5.02	5.02	21	13.0	228	28,713	37,327	46,659	25.49	78%	36,161
D-350	Existing	851	05048_05050	Elmwood Lateral	12	250	0.05800	5.55	4.60	0.96	1,837	-	4.85	5.02	5.02	21	13.6	233	58,151	75,597	94,496	24.65	77%	73,205
D-350	Existing	852	05050_05076	Elmwood Lateral	12	102	0.03000	4.00	4.60	-	-	-	4.85	5.02	5.02	21	6.9	182	18,579	24,153	30,191	17.73	77%	23,384
D-350	Existing	853	05076_05077	Elmwood Lateral	12	146	0.04500	4.91	4.68	0.23	440	-	4.95	5.13	5.13	21	6.7	181	26,419	34,344	42,930	21.71	77%	33,215
D-350	Existing	854	05077_05085	Elmwood Lateral	12	214	0.04100	4.68	4.68	-	-	-	4.95	5.13	5.13	21	6.7	181	38,659	50,257	62,821	20.73	77%	48,637
D-350	Existing	855	05085_05088	Elmwood Lateral	12	104	0.02100	3.36	4.68	-	-	-	4.95	5.12	5.12	21	8.4	194	20,133	26,172	32,715	14.83	77%	25,312
D-350	Existing	856	05088_05089	Elmwood Lateral	12	149	0.02600	3.74	4.68	-	-	-	4.95	5.12	5.12	21	8.7	196	29,190	37,947	47,434	16.50	77%	36,677
D-350	Existing	857	05089_05100	Elmwood Lateral	12	312	0.00900	2.16	4.68	-	-	-	4.95	5.12	5.12	21	6.3	178	55,509	72,162	90,202	9.71	78%	70,148
D-350	Existing	858	05100_05101	Elmwood Lateral	12	198	0.00900	2.18	4.73	-	-	-	5.01	5.18	5.18	21	6.6	180	35,598	46,277	57,847	9.71	78%	44,847
D-350	Existing	859	05101_05104	Elmwood Lateral	12	310	0.00900	2.15	4.73	-	-	-	5.01	5.18	5.18	21	6.8	182	56,269	73,149	91,437	9.71	78%	71,193
D-350	Existing	860	05104_05105	Elmwood Lateral	12	183	0.01200	2.58	4.73	-	-	-	5.00	5.18	5.18	21	6.3	178	32,510	42,263	52,829	11.21	77%	40,691
D-350	Existing	861	05105_06616	Elmwood Lateral	12	349	0.01200	2.49	4.90	-	-	-	5.19	5.37	5.37	21	7.5	186	65,061	84,580	105,725	11.21	78%	82,256
D-350 Total						**2,879**													**545,716**	**709,431**	**886,789**		**78%**	**687,580**
D-351	Existing	873	06616_06618	Elmwood Lateral	15	181	0.00500	3.03	4.90	-	-	-	5.19	5.37	5.37	21	8.2	192	34,767	45,197	56,496	7.24	58%	32,832
D-351	Existing	874	06618_06619	Elmwood Lateral	15	150	0.00600	3.11	4.98	-	-	-	5.28	5.46	5.46	21	8.1	191	28,689	37,295	46,619	7.93	61%	28,319
D-351	Existing	875	06619_06620	Elmwood Lateral	15	172	0.00500	3.08	4.97	-	-	-	5.28	5.46	5.46	21	7.7	188	32,419	42,145	52,681	7.24	57%	30,286
D-351	Existing	876	06620_06621	Elmwood Lateral	15	228	0.00500	3.07	4.97	-	-	-	5.28	5.46	5.46	21	7.3	185	42,256	54,933	68,667	7.24	58%	39,513
D-351	Existing	877	06621_06626	Elmwood Lateral	15	400	0.00500	3.07	4.97	-	-	-	5.28	5.46	5.46	21	10.0	206	82,216	106,881	133,601	7.24	58%	76,842
D-351	Existing	878	06626_06627	Elmwood Lateral	15	219	0.00500	3.08	4.97	-	-	-	5.27	5.46	5.46	21	10.2	207	45,301	58,891	73,614	7.24	57%	42,241
D-351	Existing	879	06627_06628	Elmwood Lateral	15	146	0.00500	3.06	4.97	-	-	-	5.27	5.46	5.46	21	7.2	184	26,900	34,970	43,713	7.24	58%	25,243
D-351	Existing	880	06628_06633	Elmwood Lateral	15	265	0.00500	3.08	4.97	-	-	-	5.27	5.46	5.46	21	10.8	211	55,998	72,798	90,997	7.24	57%	52,216
D-351	Existing	881	06633_06634	Elmwood Lateral	15	276	0.00500	3.07	5.06	-	-	-	5.38	5.56	5.56	21	10.8	211	58,250	75,725	94,656	7.24	58%	54,451
D-351	Existing	882	06634_06635	Elmwood Lateral	15	330	0.01500	5.16	5.06	0.09	176	-	5.38	5.56	5.56	21	9.0	198	65,317	84,912	106,140	12.54	59%	62,489
D-351 Total						**2,367**													**472,114**	**613,749**	**767,186**		**58%**	**444,431**
D-410	Buildout	1106	19975_19974	SW Katherine Lateral	12	265	0.00400	1.41	1.72	-	-	-	1.77	1.84	1.84	15	10.1	169	44,656	58,052	72,565	2.64	47%	33,774
D-410	Buildout	1105	19974_19973	SW Katherine Lateral	12	74	0.01300	2.67	1.72	0.95	1,814	-	1.77	1.84	1.84	15	5.7	139	10,266	13,346	16,682	4.76	44%	7,323
D-410	Buildout	1104	19973_19972	SW Katherine Lateral	12	227	0.00900	2.23	1.72	0.51	972	-	1.77	1.84	1.84	15	6.3	143	32,348	42,052	52,566	3.96	44%	22,956
D-410	Buildout	1103	19972_19971	SW Katherine Lateral	12	33	0.00100	0.70	1.72	-	-	-	1.77	1.84	1.84	15	8.9	160	5,279	6,863	8,579	1.32	47%	4,056
D-410	Buildout	1102	19971_19970	SW Katherine Lateral	12	152	0.00500	1.64	1.72	-	-	-	1.77	1.84	1.84	15	10.3	169	25,764	33,493	41,866	2.95	44%	18,558
D-410	Buildout	1101	19970_19969	SW Katherine Lateral	12	385	0.00500	1.63	1.72	-	-	-	1.77	1.84	1.84	15	12.0	181	69,760	90,687	113,359	2.95	45%	50,745

Appendix I. Summary of Gravity Sewer Capital Improvement Project Costs

Project ID	CIP Timing	Model G_ID	Manholes Nos. Up_Dn	Lateral Name	Existing Diameter, inches	Length, ft	Slope	Full-pipe Capacity, mgd	Peak Wet Weather Existing (2006) Flow, mgd	Peak Wet Weather Remaining Capacity, mgd	EDUs Remaining	Limiting Reach EDUs Remaining	Peak Wet Weather 2015 Flow, mgd	Peak Wet Weather Study Area Buildout Flow, mgd	Peak Wet Weather Buildout + Flow, mgd	Recommended Diameter, inches	Average Depth, ft	Unit Cost, $/LF	Base Construction Cost (Replacement; w/o Contingency), $	Construction Cost (Replacement; w/ Contingency), $	Total Project Cost, $	Capacity at Replacement Diameter, mgd	Portion of Improvement Allotted to SDC	SDC Improvement Cost, $
D-410	Buildout	1100	19969_19968	SW Katherine Lateral	12	329	0.00500	1.63	1.81	-	-	-	1.85	1.93	1.93	15	8.3	156	51,302	66,692	83,365	2.95	45%	37,191
D-410 Total						**1,465**													**239,374**	**311,186**	**388,982**		**45%**	**174,604**
D-525	Existing	1109	19979_19980	128th Ave Lateral	8	364	0.01500	0.96	0.90	0.06	115	-	0.93	0.95	0.95	10	19.8	195	70,954	92,241	115,301	1.73	44%	51,193
D-525	Existing	1110	19980_19981	128th Ave Lateral	8	142	0.00500	0.58	0.90	-	-	-	0.93	0.95	0.95	10	6.9	115	16,356	21,263	26,579	1.00	42%	11,276
D-525	Existing	1111	19981_19982	128th Ave Lateral	8	345	0.00500	0.53	0.90	-	-	-	0.93	0.95	0.95	10	11.1	141	48,738	63,359	79,199	1.00	47%	37,281
D-525	Existing	1112	19982_13881	128th Ave Lateral	8	324	0.01000	0.80	0.90	-	-	-	0.93	0.94	0.94	10	18.5	187	60,631	78,820	98,525	1.42	44%	43,034
D-525 Total						**1,175**													**196,680**	**255,684**	**319,604**		**45%**	**142,784**
D-530	Existing	8121	58224_57262	Lateral Starting at Entity 7705	8	239	0.00200	0.35	0.73	-	-	-	0.75	0.79	0.79	12	16.4	188	44,773	58,205	72,757	1.03	66%	47,962
D-530	Existing	8119	27262_58900	Lateral Starting at Entity 7705	8	272	0.00200	0.35	0.73	-	-	-	0.75	0.79	0.79	12	19.4	208	56,490	73,436	91,796	1.03	66%	60,397
D-530	Existing	8117	58900_58588	Lateral Starting at Entity 7705	8	334	0.00200	0.35	0.73	-	-	-	0.75	0.79	0.79	12	16.0	186	61,977	80,570	100,712	1.03	66%	66,643
D-530	Existing	8002	58588_13885	Lateral Starting at Entity 7705	8	203	0.00200	0.35	0.73	-	-	-	0.75	0.79	0.79	12	9.6	147	29,795	38,734	48,417	1.03	66%	31,887
D-530 Total						**1,048**													**193,035**	**250,945**	**313,681**		**66%**	**206,888**
Grand Total						**17,427**													**6,079,728**	**7,903,646**	**9,879,557**		**63%**	**6,234,696**

APPENDIX J

Cost Basis for Planning (from District Master Plan)

WEST YOST ASSOCIATES
Consulting Engineers

REGISTERED PROFESSIONAL ENGINEER
73588PE
Corie Peterson
OREGON
Jan. 13, 2004
CORIE PETERSON
EXPIRES: 12/31/10

TECHNICAL MEMORANDUM

DATE: March 30, 2009 Project No.: 517-03-06-14

TO: Andy Braun
Clean Water Services District

FROM: Jeff Pelz
Corie Peterson, R.C.E. #73588 Reviewed By: Ron Berry

SUBJECT: Sanitary Sewer Master Plan Update—Cost Basis for Planning

The purpose of this technical memorandum (TM) is to present the basis of estimating planning-level costs for capital improvements identified in the Sanitary Sewer Master Plan Update. This TM documents the sources of unit costs used for the cost estimates, how the estimates are applied to sewer model output and/or post analysis to estimate construction costs, the level of contingencies and other costs applied to construction costs to estimate total planning-level project costs, and the method of apportioning system development charges (SDC). Finally, this TM conveys a request for the District's review of unit costs used for cost estimating purposes within the Master Plan Update, in light of the District's recent construction experiences as well as the District's long-term budgeting policies and practices. The cost basis for planning and the request for District input are presented under the following headings:

- Gravity Sewer Costs
- Pump Station Costs
- Force Main Costs
- Construction Contingency and Other Markup Costs
- SDC Allocation of Costs
- Requested Feedback

GRAVITY SEWER COSTS

The collection system model generates a peak flow for each link of the modeled system, estimates the hydraulic conditions resulting from that peak flow, and predicts a hydraulic grade line (HGL). The HGL information is used to rank sewers and identify needed capacity improvements. Improvements are based on pipe replacement for existing sewers and construction of new sewers in growth areas. Costs take into effect sewer depth, diameter, manholes and service laterals spaced at typical intervals and typical utility conflicts expected along both collector and arterial roads in urban areas. It is understood that alternative alignments may be evaluated during preliminary design and will be compared with the master plan on the basis of costs and other factors. The purpose of the master plan is to identify the need for a given specific project, define an apparent cost-effective conceptual alignment based on very limited information, and establish a reasonable basis for predicting the project cost.

Construction cost data from the 2000 Sewer Master Plan Update by PMA Engineering is used as the basis of gravity sewer unit costs. The subject report states that the unit costs are "pipe-in-place" costs which include manholes, service laterals, and typical utility conflict avoidance but do not include project contingencies or other costs such as engineering and administration. Cost data from PMA is indexed to the December 1999 Engineering News Record 20-cities Average Construction Cost Index (ENR CCI = 6167). For the current Master Plan Update, the unit costs have been escalated based on the November 2008 index (ENR CCI = 8602). Unit construction costs for gravity sewers are presented in Table 1.

PUMP STATION COSTS

Pump station construction costs for both new pump stations and improvements needed to existing pump stations are discussed below. For design, the most cost effective improvement must be determined on a case-by-case basis at each pump station through a more detailed analysis than that used for planning. However, for the purposes of the master plan, screening criteria were developed to recommend improvements to existing pump stations based on the magnitude of the anticipated flow increase. Where the predicted buildout flow exceeds the pump station firm capacity by up to 200%, the recommended improvement is listed as an upgrade. In these instances, it is assumed that the pump station capacity can be increased by replacing mechanical and electrical equipment without significant structural modifications.

Where the flows are expected to exceed the pump station capacity by more than double the firm capacity, complete replacement is recommended as the improvement. On Figure 1, construction costs are plotted against "firm" pumping capacity for recent pump station projects within Oregon and Northern California. A best-fit curve of the data is shown for reference, but is not recommended for planning-level cost estimates because of the wide variation in data. Rather, for the case of estimating pump station replacement costs, a planning cost curve is plotted to encompass the upper end of the cost data points and is used for planning level cost estimates to prevent underestimation of pump station costs. A minimum construction cost of $500,000 is assumed for the smallest stations.

Table 1. Unit Costs for Gravity Sewers, $/LF

Depth to Invert, ft	Diameter, inches																				
	6	8	10	12	15	18	21	24	27	30	36	42	48	54	60	72	78	84	96	108	120
4	74	86	98	110	127	144	160	177	199	219	257	311	-	-	-	-	-	-	-	-	-
5	81	92	105	117	134	151	168	185	208	228	266	321	382	448	-	-	-	-	-	-	-
6	85	98	110	123	141	158	175	193	216	236	275	331	393	458	529	-	-	-	-	-	-
7	89	102	116	128	147	165	183	201	224	245	285	341	404	469	541	670	-	-	-	-	-
8	96	109	121	134	154	172	190	209	232	253	294	352	415	481	553	683	769	856	-	-	-
9	102	116	128	142	161	179	198	216	240	262	303	362	425	492	565	697	783	873	1,031	-	-
10	109	123	135	149	168	187	205	224	249	270	313	372	436	504	578	711	797	888	1,048	1,218	-
11	114	127	141	155	175	194	213	232	257	279	322	382	447	515	590	725	812	903	1,064	1,236	1,417
12	119	133	146	160	181	201	220	240	265	287	331	392	458	527	602	739	826	918	1,081	1,254	1,435
13	124	138	152	166	188	208	228	248	273	296	341	402	468	538	614	753	841	934	1,097	1,272	1,455
14	130	144	158	173	195	215	235	256	281	304	350	412	479	550	627	766	855	949	1,114	1,290	1,475
15	134	149	163	179	202	222	243	263	290	313	359	422	490	562	639	780	869	964	1,131	1,308	1,494
16	141	155	170	186	209	229	250	271	298	322	369	432	501	573	651	794	884	979	1,147	1,326	1,514
17	146	162	177	191	215	237	258	279	306	330	378	443	512	585	663	808	898	994	1,164	1,344	1,534
18	152	169	184	198	222	244	265	287	314	339	387	453	522	596	676	822	913	1,009	1,180	1,362	1,554
19	159	174	190	205	229	251	273	295	322	347	397	463	533	608	688	836	927	1,024	1,197	1,380	1,573
20	166	181	197	212	236	258	280	303	331	356	406	473	544	619	700	849	942	1,039	1,214	1,398	1,593
21	506	523	538	554	577	601	623	646	675	700	750	817	890	967	1,048	1,198	1,292	1,391	1,565	1,752	1,947
22	529	544	561	576	600	624	646	669	699	724	775	843	916	993	1,075	1,227	1,321	1,421	1,597	1,785	1,982
23	550	566	582	598	622	646	669	692	722	748	800	868	942	1,020	1,103	1,256	1,351	1,451	1,629	1,819	2,017
24	570	587	604	620	644	669	692	716	746	772	824	894	968	1,047	1,130	1,285	1,381	1,482	1,661	1,852	2,052
25	591	608	625	642	667	692	715	739	769	796	849	919	994	1,074	1,158	1,314	1,411	1,512	1,693	1,885	2,087
26	612	630	647	664	689	714	738	762	793	820	874	944	1,020	1,101	1,185	1,343	1,440	1,543	1,725	1,919	2,122
27	635	651	670	686	711	737	761	785	816	843	898	970	1,046	1,127	1,213	1,372	1,470	1,573	1,757	1,952	2,156
28	656	674	690	708	734	760	784	809	840	867	923	995	1,072	1,154	1,241	1,401	1,500	1,603	1,788	1,985	2,191
29	676	695	713	730	756	782	807	832	864	891	948	1,021	1,098	1,181	1,268	1,430	1,530	1,634	1,820	2,018	2,226
30	697	716	734	752	778	805	830	855	887	915	972	1,046	1,124	1,208	1,296	1,459	1,559	1,664	1,852	2,052	2,261

Notes:
1. Costs are for construction only and do not include Engineering & Administration and Contingencies.
2. Costs of manholes and sevice laterals are assumed to be included in unit costs.
3. Source costs are from Clean Water Services' 2000 Sewer Master Plan Update by PMA Engineering, dated August 2001. Costs escalated to November 2008 (ENR CCI = 8602).

Similarly, for estimating pump station upgrade costs, a planning cost curve is plotted on Figure 1 to encompass the upper end of upgrade cost data points and is used to prevent under estimation of pump station upgrade costs.

For reference, Figure 1 includes upper and lower bounds of costs based on those published in "Pumping Station Design", 2nd Ed. by Sanks for new wastewater pump stations with submersible pumps. All historical cost data on Figure 1 is adjusted to current (November 2008) costs using the 20 cities average ENR CCI.

FORCE MAIN COSTS

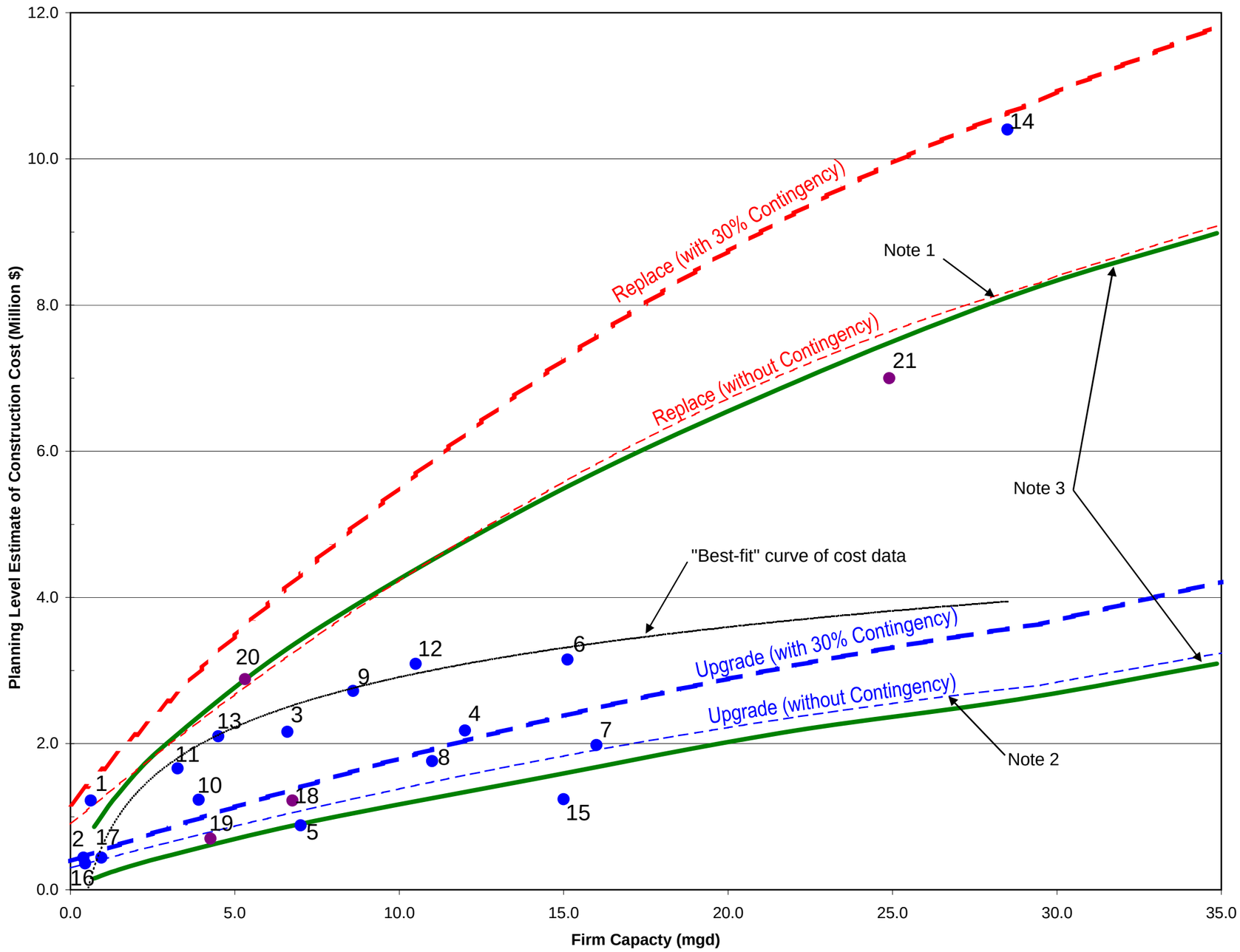
In this master plan, existing force mains are generally recommended for improvement when anticipated flow velocities would exceed 9 feet per second under the predicted peak flow conditions. The type of improvement (replacement versus paralleling) was selected based upon existing force main length, diameter, and the anticipated peak flow in the force main. It should be noted that the type of improvement (replacement versus paralleling) assumed for planning is a preliminary recommendation based upon very limited information. A more detailed comparison of force main alternatives (including a condition assessment) will be completed on a case-by-case basis during the design phase to analyze the interrelation between the characteristics of available pumping equipment and headloss system curves in force mains to determine the optimal combination of pump station and force main improvements.

WYA typically estimates the construction cost of force main improvements to range between $10 and $15 per inch diameter per foot of length (e.g. the unit construction cost for 10 inch diameter force main would range from $100 to $150 per lineal foot). For this cost range, the unit cost value of $10 per inch diameter per foot of length is used for "easy" construction conditions, such as construction in an open field without the need for asphalt patching of trenches, utility conflict avoidance, or traffic control, whereas the value of $15 per inch diameter per foot length is used for "difficult" construction conditions, such as construction with high traffic control requirements and/or with dense utility conflict avoidance needs. For this master plan, a value of $12 per inch diameter per foot of length is used reflecting a typical level of construction difficulty. The unit cost includes typical utility avoidance, sewage air relief valves, repaving saw-cut trench areas in existing streets, and moderate traffic control during construction.

CONSTRUCTION CONTINGENCY AND OTHER MARKUPS

Unit costs are based on limited information appropriate for use in master planning. A variety of factors will affect actual costs, including as yet unidentified field conditions that affect the difficulty of construction. General economic conditions, as well as construction materials, market conditions and bidding climate can also dramatically affect cost.

Total estimated capital costs include a contingency allowance of 30%, which is intended to reflect a "planning level" of project development. As a given project becomes more defined through the design process, this contingency allowance may be appropriately reduced.



	Project	Date	Capacity	Adjusted Cost ($Million)
Completed New or Replacement Pump Stations				
1.	South Airport 63rd (Portland, OR)	2004	0.6	1.22
2.	South Airport 66th (Portland, OR)	2004	0.4	0.44
3.	Mary's River (Corvallis, OR)	2002	6.6	2.16
4.	Brooklane (Corvallis, OR)	2003	12.0	2.18
5.	Creswell WTS (Creswell, OR)	2004	7.0	0.88
6.	Harlow Rd. (Springfield, OR)	2007	15.1	3.15
7.	Westside Interceptor (Lebanon, OR)	2001	16.0	1.98
8.	SSSD WWTF (Klamath Falls, OR)	2001	11.0	1.76
9.	Leisure Town Rd. (Vacaville, CA)	1996	8.6	2.72
10.	Vaca Valley Pkwy (Vacaville, CA)	1998	3.9	1.23
11.	Horse Creek (Vacaville, CA)	1999	3.3	1.66
12.	System 9 Sanguinetti (Stockton, CA)	2004	10.5	3.09
13.	System 9 Origone (Stockton, CA)	2004	4.5	2.10
14.	Lower Tualatin (Tualatin, OR)	2008	28.5	10.40
Completed Upgrades				
15.	Aloha #3 Upgrade (Hillsoboro, OR)	2008	15.0	1.24
16.	Saum Creek Upgrade (Tualatin, OR)	2008	0.5	0.36
17.	RC Ranch Upgrade (Hillsboro, OR)	2008	0.9	0.44
Planning or Predesign Estimates (Future Projects)				
18.	Sherwood Upgrade[1] (Sherwood, OR)	2008	6.8	1.22
19.	River Rd Upgrade[1] (Hillsboro, OR)	2008	4.3	0.70
20.	North Plains[1] (North Plains, OR)	2008	5.3	2.88
21.	Dawson Creek[1] (Hillsboro, OR)	2008	24.9	7.00

[1] Clean Water Services 2008 Cost Estimate

Note 1.
Replacement Costs Curve equations:
Construction Cost, $ = -4,200 x FC ^ 2 + 375,000 x FC + 900,000
(applicable range: 0 mgd < FC <= 30 mgd)
= 140,000 x FC + 4,200,000
(applicable range: FC > 30 mgd)
where, FC means "Firm Capacity" in mgd

Note 2.
Upgrade Costs Curve equations:
Construction Cost, $ = -1,200 x FC ^ 2 + 120,000 x FC + 300,000
(applicable range: 0 mgd < FC <= 30 mgd)
= 80,000 x FC + 450,000
(applicable range: FC > 30 mgd)

Note 3. Range of Costs from Sanks "Pumping Station Design", 2nd Ed., Figure 29-3 ("firm" capacity of submersible pumps)

Note 4. Historical Costs from Completed Pump Stations and Sanks are adjusted to ENR 20 Cities Average CCI for November 2008 (CCI=8602)

Figure 1. Wastewater Pump Station Planning Costs

N:\Clients\517 Clean Water Services\03-06-14 Sanitary Sewer Master Plan\ENG\PS Cost Curve Spreadsheet2.xls

WEST YOST ASSOCIATES
Consulting Engineers

Other project costs such as engineering, construction management, District administration costs associated with the project, legal costs, and environmental compliance costs are incorporated in an allowance of 25% of the estimated construction cost plus the contingency allowance. Land acquisition and financing costs are not explicitly included in the capital cost estimate and must be accounted for during the budgeting process if expected to be significant.

SDC ALLOCATION OF COSTS

For each gravity sewer replacement that will provide additional capacity to accommodate growth, the construction cost has been apportioned in part to system development charges (SDCs). The allocation to SDCs is proportional to the capacity provided in excess of current capacity. Where a project is needed, the percentage increase in total gravity flow (un-surcharged) capacity provided by the replacement sewer, represents the SDC share of capacity.

Example: An existing 10-inch sewer will be replaced with a 12-inch sewer.

The full-pipe, un-surcharged capacity of the 10-inch sewer is 0.90 mgd.

The full-pipe, un-surcharged capacity of the new 12-inch sewer is 1.44 mgd.

The SDC allocation of cost would be 37.5%, as follows:

$$(1.44 - 0.90) \div 1.44 \times 100\% = 37.5\%$$

This calculation is performed on a link-by-link basis, and then summed for the given improvement. The overall ratio of total SDC allocation to total cost for the given project may be used to determine the final SDC share once actual final costs are known.

JDP:nmp

APPENDIX K

Clean Water Services Performance and Reporting Standards

Sanitary, Storm and Surface Water Management Performance and Reporting Standards (Attachment A)

R&O 07-46
R&O 08-21
R&O 09-21

October 23, 2007 Version R&O 7-46 Plus 2008 Amendments in R&O 8-21 Plus 2009 Amendments in R&O 09-21;

Scanned R&O's are available on Clean Water Services website

I. Field Operations Services

A. Collection Systems Maintenance Programs

1. Sanitary Line Cleaning

Activity: ..... Routine, Small Lines
Facility Description: .....All public sanitary sewer lines up to 18" in diameter
Maintenance Standard: ..... At least 35% of the system annually,
.....and every line cleaned at least every 4 years
Recommended Maintenance Frequency:....Good slope and condition -- 3 to 4 year freq.
Poor slope or older lines -- 1 to 2 year frequency
Problem areas -- Up to weekly
Performance Benchmark: .....3,212 feet per day
Equipment and Crew Recommendation: ..... Sewer-jet truck, crew of 2
Special Notes and Requirement.....As needed in the field

Activity: .....Routine, Large Lines
Facility Description: .....All public sanitary sewer lines 21" to 24" in diameter
Maintenance Frequency: ..... 6-year frequency, problem areas more often as needed
Performance Benchmark: .....3,212 feet per day
Equipment and Crew Recommendation: .....Sewer-jet truck, crew of 2 or 3
Special Notes and Requirement.....As needed in the field

Activity: ..... Non routine
Facility Description: .....All public sanitary sewer lines, all sizes
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Sewer-jet truck, crew of 2 or as needed
Special Notes and Requirement:.....As needed in the field
Measurement Criteria: .....Footage and cubic yards of material removed

2. Storm Line Cleaning

Activity: ..... Routine
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Standard: ..... At least 25% of the system annually,
.....and every line cleaned at least every 6 years
Recommended Maintenance Frequency:....Good slope and condition -- 5 to 6 year freq.
Poor slope or older lines -- 1 to 4 year frequency
Problem areas -- Up to weekly
Performance Benchmark: .....2,370 feet per day
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:.....As needed in the field
Measurement Criteria: .....Footage cleaned and cubic yards of material removed

Activity: ..... Non routine
Facility Description: ..... All storm pipe lines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:.....As needed in the field
Measurement Criteria: .....Footage cleaned and cubic yards of material removed

3. Sanitary Manhole Maintenance

Activity: ..... Adjust to Grade
Facility Description: .....All public sanitary sewer manholes
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... 2 per day
Equipment and Crew Recommendation: ..... Crew truck, compressor, crew of 2 or 3
Special Notes and Requirement:..... As needed in the field
Measurement Criteria: ..... Number completed

Activity: ..... Sealing
Facility Description: .....All public sanitary sewer manholes
Maintenance Frequency: ..... Initially as needed, repeat as needed
Performance Benchmark: ..... 1 per day
Equipment and Crew Recommendation:Crew truck and Manhole sealing van, crew of 4
Special Notes and Requirement:..... Use of automated sealing equipment recommended
Measurement Criteria: ..... Number completed

Activity: ..... Repair
Facility Description: .....All public sanitary sewer manholes
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Crew truck, and crew of 2 or 3
Special Notes and Requirement:..... Coordination with other local gov. agencies
Measurement Criteria: .....Number repaired

4. Storm Manhole Maintenance

Activity: ..... Adjust to Grade
Facility Description: ..... All public storm system manholes
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... 1 to 2 per day
Equipment and Crew Recommendation: .....Crew truck, compressor, crew of 2
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number adjusted

Activity: ..... Repair
Facility Description: ..... All public storm system manholes
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....Crew truck, crew of 2 or 3
Special Notes and Requirement:..... None
Measurement Criteria: .....Number repaired

5. Root Control – Sanitary Lines/Infrastructure

Activity: ..... Mechanical
Facility Description: .....All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... 1 to 5 year frequency as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Sewer Jet truck, crew of 2
Special Notes and Requirement:..... As needed in the field
Measurement Criteria: .....Footage cleaned

Activity: ..... Chemical
Facility Description: .....All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... 3 to 5 years in sewer lines with root problems
Performance Benchmark: ..... 2,000 feet per day

Equipment & Crew Recommendation:....Root foaming trailer, sewer jet truck crew of 2
Special Notes and Requirement:..... Special chemical handling required
Unit Costs for Estimating: .....As needed in the field
Measurement Criteria: .....Footage treated

6. Root Control – Storm Lines/Infrastructure

Activity: .....Mechanical
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: ..... 1 to 5 year frequency as needed
Performance Benchmark: .....No standard, non-routine
Equipment & Crew Recommendation:..... Comb. cleaner, or Sewer Jet Truck, crew of 2
Special Notes and Requirement:.....As needed in the field
Measurement Criteria: .....Footage cleaned

Activity: ..... Chemical
Facility Description: .....Not currently approved for use in storm systems
Maintenance Frequency: .....None
Performance Benchmark: .....None
Equipment and Crew Recommendation: .....None
Measurement Criteria: .....Footage treated

7. TV Inspection – Sanitary

Activity: .....Routine, Small Lines
Facility Description: .....All public sanitary sewer lines up to 15" in diameter
Maintenance Frequency: ..... 7-year frequency, problem lines as needed
Performance Benchmark: .....2,114 feet per day
Equipment and Crew Recommendation: .....TV van, self-propelled color camera crew of 2 (1 person crew in residential areas possible)
Special Notes and Requirement: .....Need to closely coordinate with line cleaning
Measurement Criteria: .....Footage TV'd

Activity: .....Routine, Large Lines
Facility Description: .....All public sanitary sewer lines 18" to 24" in diameter
Maintenance Frequency: ..... 7-year frequency, problem lines as needed
Performance Benchmark: .....2,114 feet per day
Equipment and Crew Recommendation: .....TV van, self-propelled color camera, long TV cable, crew of 2 to 3
Special Notes and Requirement: .....Need to closely coordinate with line cleaning
Measurement Criteria: .....Footage TV'd

Activity: ..... Routine, Trunklines
Facility Description: .....All public sanitary sewer lines over 24" in diameter
Maintenance Frequency: ..... 9-year frequency, problem lines as needed
Performance Benchmark: .....2,114 feet per day
Equipment and Crew Recommendation: .....TV van, color camera, camera float, long TV cable, crew of 2 to 3
Special Notes and Requirement: .....Need to closely coordinate with line cleaning
Measurement Criteria: .....Footage TV'd

Activity: .....Non Routine
Facility Description: .....All public sanitary sewer lines, all sizes
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ....TV van, self propelled color camera or float, crew of 1 to 3 as needed, cleaner truck if line requires cleaning

Special Notes and Requirement:.....None
Measurement Criteria: .....Footage TV'd

Activity: .....Post construction acceptance
Facility Description: .....All public sanitary sewer lines, all sizes
Maintenance Frequency: .....Prior to acceptance of public storm system
Performance Benchmark: .....N/A
Equipment and Crew Recommendation: .....N/A
Special Notes and Requirement:.....None
Measurement Criteria: .....Footage TV'd

Activity: .....1-Year warranty
Facility Description: .....All public sanitary sewer lines, all sizes
Maintenance Frequency: ..... Within 2 months before end of maintenance period
Performance Benchmark: ..... 1,900 feet per day after lines are cleaned
Equipment and Crew Recommendation: .....
TV van, self propelled color camera
crew of 2, cleaner truck if line requires cleaning
Special Notes and Requirement:.....None
Measurement Criteria: .....Footage TV'd

Activity: ..... Laterals
Facility Description: ..... Private property laterals
Maintenance Frequency: .....
Not done routinely as a part of District program, non-routine only
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Mini-camera van
and/or self-launching camera system
Special Notes and Requirement:.....None
Measurement Criteria: .....Number TV'd

8. TV Inspection - Storm

TV Inspection Standard: See Sanitary Sewer TV Standard

Activity: .....Routine
Facility Description: .....All public storm lines
Maintenance Frequency: ..... 8-year frequency, problem lines as needed
Performance Benchmark: .....1,575 feet per day
Equipment and Crew Recommendation: .....
TV van, self-propelled color camera, adjustable height platform, crew of 2
Special Notes and Requirement:.....Need to closely coordinate with line cleaning
Measurement Criteria: .....Footage TV'd

Activity: .....Non Routine
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
TV van, self-propelled color camera,
adjustable height platform, crew of 2, cleaner truck if line requires cleaning
Special Notes and Requirement:.....
Measurement Criteria: .....Footage TV'd

Activity: .....Post construction acceptance
Facility Description: .....All public storm lines

Maintenance Frequency: .....Prior to acceptance of public storm system
Performance Benchmark: .....N/A
Equipment and Crew Recommendation: .....N/A
Special Notes and Requirement:.....None
Measurement Criteria: .....Footage TV'd

Activity: .....1-Year warranty
Facility Description: .....All public storm lines
Maintenance Frequency: ..... Within 2 months before end of maintenance period
Performance Benchmark: ..... 1,700 feet per day after lines are cleaned
Equipment and Crew Recommendation: .....None
TV van, self-propelled color camera, adjustable height platform,
crew of 2, cleaner truck if line requires cleaning
Special Notes and Requirement:.....
Measurement Criteria: .....Footage TV'd

9. General TV Standards

a. All TV inspections shall follow NASSCO-PACP standards, and procedures. All TV operators shall be certified to use this rating system.

b. Inspections shall be performed using a software suite that allows the capture of digital video, still images in real time, and the recording of observation locations. All observations shall be entered on an electronic log sheet and cross- referenced with their occurrence in the video.

c. Quality – Under normal circumstances, the pipe to be inspected shall be recently cleaned prior to inspection to allow all defects to be recorded during the inspection. Fog in the pipe that limits the view during the inspection is not acceptable. The camera lighting shall allow a clear picture up to five pipe diameter lengths away for the entire periphery of the sewer, and the lighting shall be adjusted to eliminate hot spots.

d. Direction – Under normal circumstances, the TV inspection shall start at the upstream manhole and proceed downstream. The direction of flow shall be clearly marked on the video screen and the electronic log form.

e. TV footage measurement -- The TV inspection system shall be equipped to measure the length of each segment. The video counter shall be zeroed at the beginning of each new video inspection, and at any intermediate manhole.

f. Camera -- The CCTV camera shall record in color and shall be capable of panning the lens through a 360-degree arc about the vertical axis and tilting it at least 90 degrees to the longitudinal axis. For pipes larger than 6 feet in diameter, the equipment shall have a zoom feature capable of providing general views looking along the pipe up to five pipe diameter lengths away, and close up views of features.

g. Clean Water Services manhole and feature numbers shall be used on all reports. Where inspections are performed by a City or contractor, the reports shall use CWS numbering or unique facility numbers consistent with GIS data transferred to the District in accordance with Section II.C .

h. Digital Recordings – Video format shall be Mpeg1 with a frame size of 320x240, a frame rate of 29.97 or 30 frames per second and a bit-rate of 1150 kbps. The information shall be written to a DVD or other data digital transfer device along with a report that has digital links to the survey data. These links shall provide direct access to portions of the reach showing the chosen defect or pipe condition.

i. Still Photographs -- During CCTV inspections, still digital color photos shall be taken of major defects and to document typical conditions within any reach. The photographs shall be in JPEG format, stored on DVD's or other digital storage medium. The digital photograph files shall be accessible directly from the defect log.

j. Delivery of Work Product – For Cities or contractors doing the TV program, completed TV inspection video, still pictures, and inspection reports that comply with the standards of this section shall be delivered to the District every two weeks, or as agreed to by the District and City.

10. Inspection, Maintenance & Repair of Trunk-lines & Lines in Stream Corridors

Activity: ..... TV Inspection
Facility Description: ..... Public sewer lines 24" and larger
Maintenance Frequency: ..... 7-year frequency
Performance Benchmark: ..... 3,000 feet per day
Equipment and Crew Recommendation: .....
2 or 3 person crew depending on access
TV truck with large transport and high capacity reel.
Special Notes and Requirement: ..... Contracted and in-house
Measurement Criteria: ..... Footage inspected

Activity: ..... Surface Inspection, replace manhole lids
Facility Description: ..... Public sewer lines in stream corridors
Maintenance Frequency: ..... 1 to 2-year frequency
Performance Benchmark: ..... 6000 feet per day
Equipment and Crew Recommendation: ..... Pickup truck, crew of 2
Special Notes and Requirement: .....
Normally combined with Marker Post activity.
Activity includes removing manhole covers and visually inspecting interior from the surface. Time includes marker post activity.
Measurement Criteria: ..... Footage inspected, manholes inspected

Activity: ..... Marker Posts
Facility Description: ..... Public sewer lines in stream corridors and remote areas
Maintenance Frequency: ..... Replace as needed
Performance Benchmark: ..... 20 per day
Equipment and Crew Recommendation: ..... Crew truck, crew of 2
Special Notes and Requirement: ... Normally combined with Surface Inspection activity.
Measurement Criteria: ..... Number installed or repaired

Activity: ..... Install self-closing lids
Facility Description: ..... Public sewer lines 24" and larger
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Crew truck, crew of 2
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Number installed or repaired

Activity: ..... Cleaning
Facility Description: ..... Public sewer lines 24" and larger
Maintenance Frequency: ..... 5-year frequency, more often in problem areas
Performance Benchmark: ..... Non-routine, no defined standard
Equipment and Crew Recommendation: Sewer Jet truck, "Parachute" winch, crew of 3
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Footage cleaned and cubic yards of material removed

Activity: .....Repair
Facility Description: ..... Public sewer lines 24" and larger
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Construction or repair equipment as needed, crew size as needed
Special Notes and Requirement:..... None
Measurement Criteria: .....Number repaired

11. Siphon Maintenance - Sanitary

Activity: .....Clean siphons
Facility Description: .....All public sanitary sewer siphons
Maintenance Frequency: ..... Annual, more often in problem areas
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation:Combination Cleaner or Sewer Jet truck, crew of 3
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number cleaned and cubic yards of material removed

12. Customer Response and Investigation - Sanitary

Activity: ..... Customer Response and Investigation
Facility Description: ..... All public sanitary sewer facilities
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Pickup truck, crew of 1. Crew of 2 for remote areas
Special Notes and Requirement:..... None
Measurement Criteria: .....Number of responses

13. Emergency Response - Sanitary

Activity: ..... Emergency Response
Facility Description: ..... All public sanitary sewer facilities
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....None
Sewer Jet truck, crew of 2, additional equipment and crew as needed
Special Notes and Requirement:.....
Measurement Criteria: .....Number of responses

14. Laterals in Public Right of Way - Sanitary

Activity: ..... Investigation
Facility Description: ..... Private laterals as defined in District R&O
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....See TV Activity
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number investigated

Activity: .....Repair
Facility Description: ..... Private laterals as defined in District R&O
Maintenance Frequency: .....As needed due to structural failure
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Construction equipment as needed, crew as needed
Special Notes and Requirement:.....

Property owner responsible for demonstrating defect is in public R/W and that it is a structural failure
Measurement Criteria: .....Number repaired

15. Other Non-routine Work - Sanitary

Activity: .....Other Non-routine Work
Facility Description: ..... All public sanitary sewer facilities
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....As needed
Special Notes and Requirement:.....None
Measurement Criteria: ..... Hours of work

16. Catch Basins - Storm

Activity: ..... Cleaning
Facility Description: .....Public catch basins – with sump
Maintenance Frequency: ..... Once per year, problem areas more frequently
Performance Benchmark: ..... Sumped - 30 per day
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:.....None
Measurement Criteria: ..... Number cleaned and cubic yards of material removed

Activity: ..... Cleaning
Facility Description: ..... Public catch basins – no sump (flow through)
Maintenance Frequency: ..... Once per year, problem areas more frequently
Performance Benchmark: .....Un-sumped - 80 per day
Equipment and Crew Recommendation: .....
Inspect as a part of line cleaning, or 2 person crew with a pick-up truck or B-10
Special Notes and Requirement:.....
Clean catch basins with debris, otherwise just inspect
Measurement Criteria: ..... Number cleaned and cubic yards of material removed

17. Water Quality Manholes – Storm

Activity: ..... Cleaning
Facility Description: ..... Public water quality manholes
Maintenance Frequency: ..... Twice per year or more frequently as required
Performance Benchmark: .....10 per day
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:.....None
Measurement Criteria: ..... Number cleaned and cubic yards of material removed

18. Surface Retention/Detention Facility (Water quality and quantity facilities, not including filter vault facilities) – Storm

Activity: .....Mowing
Facility Description: ..... Large open areas
Maintenance Frequency: .....4 to 6 times per year
Performance Benchmark: .....5 to 9 facilities per day
Equipment and Crew Recommendation: .....
Crew truck, trailer, riding mower, crew of 1 or 2
Special Notes and Requirement:.....All routine functions done at the same time
Measurement Criteria: .....Hours and acreage

Activity: ..... Trimming
Facility Description: .....Confined, small, or steep areas
Maintenance Frequency: .....4 to 6 times per year

Performance Benchmark: ..... 5 to 9 facilities per day
Equipment and Crew Recommendation: .....
Crew truck, trailer, weed eater, walk-behind mower, crew of 1 or 2
Special Notes and Requirement:..... All routine functions done at the same time
Measurement Criteria: ..... Hours and footage

Activity: .....Spraying herbicides
Facility Description: ..... Fence-lines, perimeters, not for contact with water
Maintenance Frequency: ..... 1 to 3 times per year as needed
Performance Benchmark: ..... 10 to 12 facilities per day
Equipment and Crew Recommendation: ..... Crew truck, sprayer, crew of 1
Special Notes and Requirement:.....
Special chemical handling required. All routine functions done at the same time
Measurement Criteria: ..... Acreage and gallons sprayed

Activity: .....Levee/Bank maintenance
Facility Description: .....Levees, banks, retaining walls
Maintenance Frequency: .....Non-routine as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement:.....
Measurement Criteria: .....Number repaired

Activity: ..... Inlet/outlet maintenance
Facility Description: .....Inlets, outlets, grates, sumps
Maintenance Frequency: ..... Clean once per year
Performance Benchmark: .....
10 to 20 per day with equipment access, 3 to 5 per day no equipment access
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number maintained and cubic yards removed

Activity: .....Garbage removal
Facility Description: .....Treatment area
Maintenance Frequency: .....Non-routine as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Crew truck, crew of 1
Special Notes and Requirement:..... None
Measurement Criteria: ..... Facilities cleaned

Activity: .....Silt/debris removal/Coring out
Facility Description: .....Treatment area
Maintenance Frequency: .....5 to 10 years as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement:..... None
Measurement Criteria: .....Number cleaned and cubic yards removed

Activity: .....Inspection
Facility Description: .....Entire facility
Maintenance Frequency: ..... 4 times per year during rainy season
Performance Benchmark: ..... 5 to 9 facilities per day
Equipment and Crew Recommendation: ..... Pickup truck, crew of 1
Special Notes and Requirement:..... None
Measurement Criteria: .....Number of facilities inspected

Activity: .....Watering and fertilizing
Facility Description: ..... Planted areas
Maintenance Frequency: .....
Watering - weekly to monthly in summer as needed
Fertilizing - 1 or 2 times per year as needed to establish plants (first two years)
Performance Benchmark: ..... No Standard, non-routine
Equipment and Crew Recommendation: .....Pickup truck, sprayer, crew of 1
Special Notes and Requirement:.....
Only fertilize outside of the treatment area, and when needed to establish plantings
Measurement Criteria: .....Number of facilities and acreage watered or fertilized

Activity: ..... Planting and replanting
Facility Description: .....Areas requiring increased planting
Maintenance Frequency: .....Non-routine as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: .....
Crew truck, trailer, hydroseeder, crew of 2 or as needed
Special Notes and Requirement:.....None
Measurement Criteria: .....Number of facilities and acreage

Activity: ..... Reshaping and Reconstructing
Facility Description: .....Areas requiring upgrading
Maintenance Frequency: .....Non-routine as needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement:..... NOne
Measurement Criteria: .....Number of facilities

19. Filter Vault Maintenance

Activity: .....Filter Vault Inspection
Facility Description: ..... Publicly maintained proprietary treatment facilities
Maintenance Frequency: ..... 2 times/year until buildout; yearly thereafter
Performance Benchmark: .....1 facility per day
Equipment and Crew Recommendation: .....Combination cleaner, 3-man crew
Special Notes and Requirement:.....
..... Include removing at least 1 canister cover to determine load
Measurement Criteria: .....Number of facilities

Activity: .....Filter Replacement
Facility Description: ..... Publicly maintained proprietary treatment facilities
Maintenance Frequency: ..... Yearly, or as determined by inspection
Performance Benchmark: .....24 filters per day
Equipment and Crew Recommendation: ..... Combination cleaner, 3-man crew
Special Notes and Requirement:.....None
Measurement Criteria: .....Number of filters

20. Customer Response and Investigation – Storm

Activity: ..... Customer Response and Investigation
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Pickup truck, crew of 1. Crew of 2 for remote areas
Special Notes and Requirement:.....None

21. Emergency Response and Storm Patrol – Storm

Activity: ..... Emergency Response
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Combination cleaner truck, crew of 2, additional equipment and crew as needed
Special Notes and Requirement:.....None
Measurement Criteria: .....Number of responses

22. Washington County Roadside Ditch Program – Storm

Activity: .....Remove Debris
Facility Description: ..... Roadside ditches in County roads
Maintenance Frequency: .....
Major roads -- Once each 5 Years
Minor roads -- Once each 8 Years
Performance Benchmark: .....1,200 feet per day
Equipment and Crew Recommendation: .....
2 dump trucks, trackhoe, crew truck, crew of 4, flaggers as needed
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: .....Footage cleaned and cubic yards removed

Activity: .....Hydro-seeding
Facility Description: ..... Roadside ditches in County roads
Maintenance Frequency: .....Following cleaning
Performance Benchmark: .....15,000 sq. ft. per day
Equipment and Crew Recommendation: ..... Crew truck, hydroseeder, crew of 2
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: ..... Acreage treated

Activity: ..... Ditch armoring
Facility Description: ..... Roadside ditches in County roads
Maintenance Frequency: ..... Following cleaning, in highly erodeable areas
Performance Benchmark: ..... 400 ft. per day
Equipment and Crew Recommendation: .....
Dump truck, trackhoe, crew truck, crew of 4, flaggers as needed
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: ..... Footage protected

Activity: ..... Clean roadside pipes and culverts
Facility Description: .....Roadside pipes and culverts in County roads
Maintenance Frequency: .....
Major Roads - once each 5 years
Minor Roads - once each 8 years
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: ..... Combination cleaner truck, crew of 2
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: ..... Footage and cubic yards removed

23. Washington County Roadside Pipes and Culverts – Storm

Activity: ..... Repair/replace roadside pipes and culverts
Facility Description: .....Roadside pipes and culverts in County roads
Maintenance Frequency: .....No standard, non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: .....Number repaired or replaced

Activity: .....Install new roadside pipes and culverts
Facility Description: ..... County roads without curb and gutter
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed

Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: ..... Number installed

Activity: .....Remove roadside pipes and culverts; re-establish roadside ditch
Facility Description: ..... County roads
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement:..... Performed as funded by Country Road Fund
Measurement Criteria: ..... Footage of ditch re-established

24. Street Sweeping – Storm

Activity: ..... Routine
Facility Description: .....Public streets with curbs
Maintenance Frequency: .....
Local streets - Once per month
Downtown areas - Up to weekly as needed
Performance Benchmark: ..... 15.6 curb miles per day per sweeper
Equipment and Crew Recommendation: .....
Regenerative air sweeper or equivalent water quality sweeper. Crew of 1
It is a requirement that the sweeping speed be 4 to 7 mph
Mechanical sweeper is not acceptable for this activity.
Sweeper must be equipped with an independent recording device that records speed while sweeping (broom activated, pickup head down, blower on), miles swept, and hours swept. Operator supplied data is not sufficient
Special Notes and Requirement: ..... None
Measurement Criteria: .....Curb miles swept and cubic yards of material

Activity: ..... Non routine
Facility Description: ..... Public streets
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Regenerative air or mechanical sweeper, crew of 1
Special Notes and Requirement: ..... None
Measurement Criteria: .....Curb miles swept and cubic yards of material

Activity: ..... Related to leaf program
Facility Description: ..... Public streets in leaf pick-up areas
Maintenance Frequency: ..... Following leaf machine
Performance Benchmark: ..... 20 curb miles per day
Equipment and Crew Recommendation: ..... Regenerative air sweeper, crew of 1
Special Notes and Requirement:..... None
Measurement Criteria: .....Curb miles swept and cubic yards of material

25. Street Sweeping/Leaf Program Material Processing and Disposal – Storm

Activity: .....Material Transportation
Facility Description: .....Sweeping and leaf program areas
Maintenance Frequency: .....Replace drop box once per week
Performance Benchmark: ..... 1 to 1-1/2 hours per drop box
Equipment and Crew Recommendation: .....Hook-lift truck, crew of 1
Special Notes and Requirement:..... None
Measurement Criteria:
Cubic yards of material transported and number of boxes hauled

Activity: ..... Processing and Sorting
Facility Description: ..... Material processing yard
Maintenance Frequency: ..... Sort material as needed
Performance Benchmark: ..... 200 cy. Per day
Equipment and Crew Recommendation: ..... Vibrating screen, loader, crew of 1
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Cubic yards of material processed

Activity: ..... Disposal
Facility Description: ..... Material processing yard
Maintenance Frequency: ..... As needed
Performance Benchmark: ..... 1 hour per load
Equipment and Crew Recommendation: .....
Hook-lift truck, Dump truck, loader, crew of 1
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Cubic yards of material and number of boxes hauled

26. Creek and Stream Maintenance – Storm

Activity: ..... Debris Removal
Facility Description: .....
Public creeks and streams and those that affect public systems if not maintained
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Number of locations and cubic yards

Activity: ..... Planting and Restoration
Facility Description: .....
Public creeks and streams and those that affect public systems if not maintained
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....
Crew truck, trailer, hydroseeder, crew as needed
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Number of locations and acreage restored

Activity: ..... Bank stabilization
Facility Description: .....
Public creeks and streams and those that affect public systems if not maintained
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Construction equipment, crew as needed
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Number of locations

Activity: ..... Garbage/Nuisance/Hazard removal
Facility Description: .....
Public creeks and streams and those that affect public systems if not maintained
Maintenance Frequency: ..... Non-routine
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Crew truck, crew as needed
Special Notes and Requirement: ..... None
Measurement Criteria: ..... Number of locations and cubic yards of material

27. Leaf Program – Storm

Activity: ..... Formal curbside program
Facility Description: .....High leaf generation areas
Maintenance Frequency: .....Every 2 weeks, 4 times total in leaf season
Performance Benchmark: ..... 75 cubic yards per day
Equipment and Crew Recommendation: ..... Leaf machine, 2 leaf trucks, crew of 3
Special Notes and Requirement:.....
Send notice to affected area giving guidelines
of how to put leaves in street for pick-up
Measurement Criteria: .....Curb miles and cubic yards of material

Activity: ..... Increased Recycling
Facility Description: .....High leaf generation areas
Maintenance Frequency: .....Double frequency of recycle can pick-up
Performance Benchmark: ..... Contracted with recycler
Equipment and Crew Recommendation: ..... Contracted
Special Notes and Requirement:.....
Negotiate extra pick-up of recycle can with garbage hauler through the leaf season
Measurement Criteria: .....Number of pickups and cubic yards of material

Activity: ..... Leaf drop day
Facility Description: .....High school, public works yard, other open areas
Maintenance Frequency: ..... 1 to 4 times per year as needed in the leaf season
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: .....
2 to 4 dump trucks, backhoe or trackhoe, crew as needed
Special Notes and Requirement:
Crew removes leaves from plastic bags. Can be run with voluntary food donation.
Measurement Criteria: .....Number of days and cubic yards of material

28. Catch Basin and Storm Line Material Processing and Disposal – Storm

Activity: ..... Processing and Sorting
Facility Description: .....Material processing yard
Maintenance Frequency: .....As needed
Performance Benchmark: .....No standard, non-routine
Equipment and Crew Recommendation: .....Loader to turn material, crew of 1
Special Notes and Requirement:.. Material must be de-watered to pass "paint-filter" test
Measurement Criteria: ..... Cubic yards of material

Activity: ..... Disposal
Facility Description: .....Certified landfill
Maintenance Frequency: .....As needed
Performance Benchmark: ..... 1 hour per load
Equipment and Crew Recommendation: ..Hook-lift truck, dump truck, loader, crew of 1
Special Notes and Requirement:.....None
Measurement Criteria: ..... Cubic yards and number of boxes hauled

29. Culvert Maintenance – Storm

Activity: ..... Clean culverts
Facility Description: ..... Culverts under 36" crossing under public streets
Maintenance Frequency: .....Non-routine
Performance Standard: .....Non routine, no defined standard
Equipment and Crew Recommendation: .....
Combination cleaner truck or dragline, loader, and dump trucks, crew as needed
Special Notes and Requirement:.....None

Measurement Criteria: ..... Number cleaned and cubic yards of material

30. Other Non routine Work – Storm

Activity: .....Other Non-routine Work
Facility Description: .....All storm facilities listed in this R&O
Maintenance Frequency: .....As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: .....As needed
Special Notes and Requirement:.....None
Measurement Criteria: ..... Hours and number of locations

31. Vector Control - Sanitary

Activity: .....Chemical baiting
Facility Description: ..... All public sanitary sewer lines
Maintenance Frequency: As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Sewer jet truck, crew of 2
Special Notes and Requirement:..... Control of small rodents (rats, mice, etc.)
Measurement Criteria: .....None

32. Vector Control - Storm

Activity: .....Mosquito Control (West Nile Virus)
Facility Description: ...All public sumped catch basins and facilities with ponding water
Maintenance Frequency: As specified by product
Performance Benchmark: ..... 100 catch basins per day
Equipment and Crew Recommendation: ..... Pickup truck, crew of 2
Special Notes and Requirement:.....None
Measurement Criteria: .....Number of catch basins and facilities treated

Activity: .....Beavers, Nutria and beaver dams
Facility Description:Public creeks and streams and those that affect public systems if not .....maintained
Maintenance Frequency: Non Routine
Performance Benchmark: .....None
Equipment and Crew Recommendation: ..... Pickup truck, crew of 2
Special Notes and Requirement:..... Response depends on circumstance and includes trapping, ...Relocation, dam removal, and others
Measurement Criteria: .....Number of responses

Activity: .....Rodents
Facility Description: .....All public storm lines
Maintenance Frequency: Non Routine
Performance Benchmark: .....None
Equipment and Crew Recommendation: ..... Pickup truck, crew of 2
Special Notes and Requirement:.....Trapping is normally the only option .....Generally chemical baiting is not allowed in the storm system unless the product is approved
Measurement Criteria: .....Number of responses

33. Access Road Maintenance – Sanitary and Storm

Activity: ..... Grading, Paving, Vegetation Control, General Maintenance
Facility Description: ..... Roads within or leading to public sanitary or storm facilities
Maintenance Frequency: As needed
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation: ..... Equipment and crew as needed
Special Notes and Requirement:..... Level of maintenance determined by condition
..... Review easement document to determine maintenance responsibilities
Measurement Criteria: ..... None

34. Utility Locates – Sanitary and Storm

Activity: ..... Utility Locating
Facility Description: ..... All underground public storm and sanitary sewer
..... facilities, and private sanitary sewer and storm laterals in the public right of way
Maintenance Frequency: As requested
Performance Benchmark: ..... Locates marked as required by State locating rules
Equipment and Crew Recommendation: ..... Pickup truck or car, crew of 1
Special Notes and Requirement:..... Must be a member of Oregon One Call System
..... Must comply with Oregon utility locating rules
Measurement Criteria: ..... Compliance with locating rules

B. Local Collection System Repairs

1. Sanitary Line Major and Minor Repairs

Activity: ..... Dig
Facility Description: ..... All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... As Required
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation:
Standard construction equipment (backhoe, trackhoe, dump truck, shoring, etc.), crew size as needed
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number completed

Activity: ..... Link Pipe
Facility Description: ..... All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... As required
Performance Benchmark: ..... 3 to 5 per day
Equipment and Crew Recommendation: ..... Link pipe van, crew of 2
Special Notes and Requirement:..... None
Measurement Criteria: ..... Number installed

Activity: ..... Sealing
Facility Description: ..... All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... Initial sealing as needed, repeated 5 to 10 year frequency
Performance Benchmark: ..... 300 feet per day tested and sealed
Equipment and Crew Recommendation: ..... Joint sealing van, crew of 2
Special Notes and Requirement:..... Requires special material storage and handling
Measurement Criteria: ..... Number of joints sealed

Activity: ..... Re-Lining
Including pipe bursting, slip-lining or epoxy-liner installation
Facility Description: ..... All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: ..... As required
Performance Benchmark: ..... 50 to 500 feet per day depending on method

Equipment and Crew Recommendation: ..... Varies with method
Special Notes and Requirement:.....None
Measurement Criteria: .....Footage

2. Sanitary Capital Improvement and Rehabilitation Projects

Activity: .....Dig
Facility Description: .....All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: .....As required
Performance Benchmark: ... Normally installed by competitive bid w/ private contractor
Equipment and Crew Recommendation: .....
Standard construction equipment (backhoe, trackhoe, dump truck, shoring, etc.), crew size as needed
Special Notes and Requirement:.....None
Measurement Criteria: .....Number completed

Activity: ..... Rehabilitation Projects
Facility Description: .....All public sanitary sewer lines under 24" in diameter
Maintenance Frequency: .....As required
Performance Benchmark: ..... Competitive to private contractor installation
Equipment and Crew Recommendation: .....None
Standard construction equipment (backhoe, trackhoe, dump truck, shoring, etc.), crew as needed
Special Notes and Requirement:.....
Measurement Criteria: .....Footage and Number of Laterals Rehabilitated

3. Storm Line Major and Minor Repairs

Activity: .....Dig
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As Required
Performance Benchmark: ..... Non routine, no defined standard
Equipment and Crew Recommendation:
Standard construction equipment (backhoe, trackhoe, dump truck, shoring, etc.), crew size as needed
Special Notes and Requirement:.....None
Measurement Criteria: .....Number repaired

Activity: .....Link Pipe
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As required
Performance Benchmark: .....3 to 5 per day
Equipment and Crew Recommendation: ..... Link pipe van, crew of 2
Special Notes and Requirement:.....None
Measurement Criteria: .....Number installed

Activity: .....New Facilities and Replacements
Facility Description: ..... All storm pipelines meeting criteria of Exh A Sec 1.B
Maintenance Frequency: .....As required
Performance Benchmark: ..... Competitive to private contractor installation
Equipment and Crew Recommendation: .....
Standard construction equipment (backhoe, trackhoe, dump truck, shoring, etc.), crew size as needed

Special Notes and Requirement:.....None
Measurement Criteria: ..... Number installed

C. Geographical Information Systems (GIS)

This section applies to inventory and location information on all sanitary and stormwater facilities within the service area including inside the Cities as necessary for permit compliance, master planning, system modeling, flow monitoring and asset management.

1. Sanitary and storm sewer systems shall be mapped using an electronic mapping system (GIS).
2. District shall identify feature classes/data elements necessary for permit compliance, master planning, system modeling, flow monitoring and asset management. GIS systems of the sanitary and storm systems must contain these data elements. Data elements may be stored in MMIS as an alternate.
3. All facilities shall have a unique facility number, or the system must store the District's facility number.
4. Sanitary and storm sewer mapping shall be updated on a regular basis to include all new facilities installed by the jurisdiction or through development activity and any upgrades which affect size, slope, location, or pipe material.
5. Updated GIS data (including any GIS data stored in MMIS) shall be transferred between District and other jurisdictions' systems at a minimum frequency of quarterly, or as otherwise approved by the District.

D. Maintenance Management Information Systems (MMIS)

This section applies to systems used to track work elements identified in Section I.A. (Collection Systems Maintenance Programs) and any work elements identified in I.B (Local Collection System Repairs) which are performed by non-contracted crews.

1. MMIS shall track all field work orders and have the ability to generate reports showing current and historic work orders and management reports.
2. MMIS system must inter-relate to GIS to graphically show such things as scheduled and completed work.
3. District shall identify data elements and work categories necessary for permit compliance, reporting, program oversight, and coordination of repair and maintenance work. MMIS systems for the sanitary and storm systems must contain these data elements in the same general work order format and the same work categories.

E. After Hours Calls and Emergencies

A jurisdiction performing any portion of the system maintenance and repair of the storm and sanitary system must also have a system to receive after hours calls and to mobilize emergency crews that meets the following criteria:

1. There shall be a written after hours and emergency response procedure in place showing the phone numbers that the public is given for emergency contacts, how calls are routed during regular and after hours, who is responsible for making decisions and taking action, and what records are to be kept. If resolving the problem requires structural repairs, a capital improvement, increased maintenance, source control, cross connection repair, or other similar action, there must be a process in place to refer the problem to the appropriate person or department.

2. The appropriate after-hours number shall be advertised as part of the jurisdiction's storm and sanitary sewer public information program and clearly specify that the number is available 24/7.

3. The system will include a procedure to relay the incident report or complaint call to the appropriate first responder.

4. If sufficient information can not be gathered over the phone, the first responder will respond with a goal of being on site within 1 hour, and no longer than within 2 hours for emergencies involving public health, safety, damage to the environment, or property damage that potentially is within the responsibility of the overall District program, and by the next business day for those calls that are not an emergency.

5. All complaint calls must be logged. The log must include the details of the call (date and time, name, phone number, and address of caller, description of complaint, etc.), and who the call was referred to for resolution. The log must indicate or link to a source that indicates the actual problem found during the investigation, and the actions taken. The records must be retrievable from the system and must be able to provide a report that links the call to the response and final resolution. Records of calls taken by outside parties such as answering services or 911 also need to be accessible in the same manner. If a problem is referred to another jurisdiction or program, the person contacted should be noted. Records need to be maintained for a minimum of three years.

6. For sewer overflows caused by a defect in the public system, the records must include a completed Overflow Notification form.

II. Engineering, Inspection, and Support Elements

A. Development Plan Review Services

Ensure that all sanitary and stormwater facilities within the District's service boundary meet all minimum design and construction standards outlined in the District's Design and Construction Standards (D&C Standards).

1. Service Provider Letter (SPLs)

a. Prescreen Issuance

i. Using aerial photos, photographs, resource maps, utility maps, and other resources, review Prescreen Site Assessment applications for requirements to perform additional site assessment on the basis of:

1) Possible existence of water quality sensitive areas on or within 200' of project site; and

2) Type of proposed activity.

ii. Issue PreScreen Site Assessment to applicant on District-approved forms.

iii. Keep database (electronic preferred) of information on all applications and determinations.

b. Service Provider Letter Issuance

i. Issue SPLs pursuant to D&C Standards, including consideration for applicable mitigation requirements from other regulatory agencies (e.g., US Army Corps of Engineers and the Oregon Division of State Lands).

ii. Use forms approved by the District.

iii. Keep database (electronic preferred) of information on all applications, including requirements, correspondence, and response times.

2. Land Use Comments Submittal

a. Submit comments within the land use comment period for all land use applications subject to regulation under the D&C Standards.

b. At a minimum, include general condition to meet the requirements of D&C Standards and provide specific conditions as necessary, including but not limited to:

- Vegetated corridors and sensitive areas protections as specified in the SPL
- Analysis of sanitary and storm/surface water systems, including downstream flow impact analysis
- Public sanitary and storm system extensions to upstream properties
- Separate lateral services to individual lots
- Public water quality and quantity facilities, where appropriate

3. Land Use Review and Approval

a. Prior to Land Use Application being deemed "complete", ensure that land use applications for activities defined as development or redevelopment in the D&C Standards include a SPL.

b. Include conditions of approval to meet conditions submitted under II.A.2.

4. Plan Review

Review plans for conformance with D&C Standards and land use conditions of approval which apply to provision of sanitary sewer and storm sewer service and vegetated corridors. As early as possible, identify variances from standards and obtain District approval of proposed alternative.

For cities performing plan review: When plan reviewer believes plans to be in substantial compliance with the D&C Standards, transmit plans to District. Transmittal shall include name of the plan reviewer seeking approval and a description and explanation of any known variances. District shall complete its review within 15 working days from receipt of the plans and return comments to city. City may consider plans as approved by District if District fails to provide comments within 15 working days. City shall require incorporation of District redline comments prior to final approval.

5. Development Permit Issuance

This section applies to "public works", "site development", or other permit types covering the permitting, construction and inspection of storm, sanitary, and vegetated corridor improvements.

Issue permits for sanitary and storm sewer construction, connection, modification, and disconnection only when other regulatory requirements (i.e., U.S. Army Corps of Engineers and/or Oregon Division of State Lands) have been addressed and/or permits obtained. If early site development permit issuance is allowed, require that any activities undertaken prior to other regulatory (DSL and COE) approval is at the applicant's risk.

B. Development Inspection Services

Ensure all sanitary and stormwater facilities within the service boundary are constructed in accordance with the D&C Standards. The following are descriptions of major tasks associated with development inspection services.

1. New development inspection

Inspect all projects constructing sanitary and storm facilities (including all public conveyance elements and private and public water quality/quantity and vegetated corridor enhancement and mitigation sites) at least once per week during construction of the facilities covered by the D&C Standards; and more frequently depending on the nature and stage of the project.

2. New development final approval

Prior to issuing final approvals, receive and approve all required as-built drawings; TV inspect all new pipe system; review the TV records; require correction of identified deficiencies; review and approve testing results; require removal of erosion control and best management practices measures as specified in D&C Standards and by any additional permit condition.

3. Cross-connection identification/notification and correction

Meet Illicit Discharge Elimination requirements outlined in NPDES Watershed-Based Waste Discharge Permit (Permit) and MS4 Storm Water Management Plan (SWMP).

As identified, pursue the abatement of cross-connections. Within 15 working days of identification, eliminate identified cross-connections using immediate notification to responsible parties (owners/operators of property) and escalating abatement procedures, up to and including correction and billing of the responsible party. (There may be mitigating circumstances that may preclude meeting this timeline. However, the intent of the abatement process is to ensure initial action within 15 working days and continued action to correct.)

Inspect all cross-connection corrections with qualified personnel and document correction to DEQ.

4. Erosion Control Inspection

   Meet inspection frequencies as required by the Permit and SWMP.

5. Erosion Control Enforcement Program

   Employ an active enforcement program to allow inspection staff to gain timely compliance and correction of identified deficiencies (i.e., compliance within 48 hours). Include the following minimum enforcement procedures.

   - Verbal warnings
   - Deficiency Notice (DN)
   - Stop Work Orders (SW)
   - Issuance of Civil Penalties

6. Erosion Control Wet Weather Management

   Issue wet weather letters to all active and inactive development projects. Using District supplied template, issue one letter by September 15th each year, with a second reminder letter by September 30th each year. During wet weather periods, inspect all sites at least weekly.

7. Erosion Control and Vegetated Corridor Training

   District will lead development, coordination, presentation, and promotion of erosion control inspection training at least once a year and vegetated corridor inspection training at least twice a year.

   All staff performing erosion control inspection shall attend erosion control inspection training as required by the Permit and SWMP.

   All staff performing vegetated corridor inspection shall attend annual training for erosion control.

C. Capital Projects

Coordinate the CIP Program to provide adequate sanitary and storm system capacity and prevent storm-related overflows from the sanitary system as specified in the

Permit and by law, i.e., overflows prohibited except during a storm event greater than the one-in-five-year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten-year, 24-hour duration storm from May 22 through October 31 and all storm-related overflows prohibited after January 1, 2010.

1. Master Planning

   Prepare sanitary and storm sewer Master Plans for the entire service area. For sanitary sewer, analyze pipes greater than 10-inch in diameter. Include smaller pipe system if flow monitoring indicates additional analysis for the sewershed is needed. For storm sewer, analyze an average subbasin size of 25-acres and include all pipes greater than 15-inch in diameter.

   Incorporate appropriate data from local master plans for additional detail in District-wide Master Plan.

   Incorporate city-identified population and growth projections in the analysis.

2. System Monitoring

   Monitor system performance through sewer flow monitoring, stream flow monitoring, and water quality monitoring in accordance with the NPDES Watershed Discharge Permit requirements. Coordinate monitoring program for the entire service area to achieve maximum efficiency. Locate monitoring equipment to assist with master planning and project selection process.

D. Joint Cities-District Capital Project Review Committee

A Joint City-District Capital Project Review Committee (CIP Committee) is hereby established to ensure Cities and District collaboratively prioritize capital improvement projects.

Clean Water Services (District) and member Cities are required to participate in the CIP Committee.

1. Purpose:

   The CIP Committee will annually update, revise and prioritize the list of regional sanitary conveyance and storm and surface water capital improvement projects. (The Committee will not review Wastewater Treatment Projects.) The Committee shall initially focus its prioritization on sanitary conveyance projects, including I/I abatement projects and capacity-related sanitary pump station projects, with system-wide infrastructure planning in mind. The Committee shall recommend the prioritized projects to be included in the regional CIP to the Board as part of the District's annual budget process.

   Capital Improvement Projects are prioritized to meet the following objectives:

   - Personal Health and Safety

- Environmental Health
- Permit compliance
- Operational, Maintenance and Cost Effectiveness
- Development Responsiveness

2. Committee Governance

The CIP Committee is comprised of representatives from each local service provider (Beaverton, Cornelius, Forest Grove, Hillsboro, Sherwood, Tigard, Tualatin, and the District). The District representative also represents Durham, King City, North Plains Gaston and Banks. Each Committee representative is responsible for coordinating the interests of various disciplines, including but not limited to operations and maintenance, water, transportation, etc. The District provides administrative support for the Committee.

a. CIP Committee Duties

CIP Committee members shall:

i. Regularly attend and participate in CIP Committee meetings.
ii. Review CIP Committee materials prior to the meeting.
iii. Prepare and submit Capital Project Priority Ranking Applications to the Committee.
iv. Review and evaluate Capital Project Priority Ranking Applications, and award "committee discretionary points."
v. Recommend construction design and management responsibilities for implementation of projects, as needed.

b. CIP Committee Roles

i. **Chairperson.** The CIP Committee shall elect a chairperson. The chairperson shall provide an agenda for each meeting and conduct all CIP Committee meetings. Election of the Chairperson shall occur annually at the Committee's first meeting after the start of the fiscal year. A person may be elected chairperson a maximum of three consecutive years.

ii. **Recorder.** The District shall provide a recorder to perform administrative and recording duties, including collection and assemblage of the Capital Project Priority Ranking Applications, retention of issue papers, meeting logistics and sending meeting notices, and general support to the chairperson. The recorder shall provide a written summary of each meeting to the CIP Committee not more than two weeks following the meeting. The recorder is not a Committee member.

c. CIP Committee Meetings

i. **Regular and Special Committee Meetings.** The CIP Committee shall meet regularly as needed but not less than twice annually at the time and place to be determined by the CIP Committee members. Any member may request special meetings. The Chairperson shall determine whether a special meeting is needed. Regular meeting notices shall be provided not less than ten (10) working days prior to the meeting. Special meeting notices shall be provided not less than five (5) working days prior to the meeting.

ii. **Quorum and Majority Vote.** A quorum consists of a District representative and four (4) City representatives. A majority vote of members present shall constitute the acts of the Committee.

iii. **Proxies**. A Committee member of record may vote at any meeting either in person, by proxy, or may designate an alternate to attend the meeting and have voting privileges.

iv. **Meeting Records.** A written summary of all meetings in which a quorum is present shall be kept. The summary shall include any minority opinion on any action taken.

v. **Bylaw Review.** The Committee will review its Bylaws at the last regular meeting of the year to evaluate whether changes are required.

E. Industrial Pretreatment – Fats Oils and Grease Abatement Program

Meet requirements of District Industrial Sewer Use R&O 98-26 or revised to assist in managing pollutants at their source and reduce impacts of fats, oils, and grease in the collection system.

F. Service and Information Requests

Receive and process inquiries and requests for information for sanitary and storm sewer system.

III. Business and Customer Related Services

A. Customer Billing

1. Regular Service Charge Billings

Regular billing consists of preparing and sending the regular billing, typically monthly or bi-monthly, of all sanitary and storm water service charges to all customers within the designated service area. The customer account files are regularly updated with move-in and move-out information and updated based on new construction/development within the service area. In addition, the billing jurisdiction records, tracks, and is able to identify the total number of equivalent

dwelling units being billed for storm water and sanitary sewer. Combined billing may occur where multiple utility services are provided by the billing jurisdiction and are combined into one bill.

2. Remittance Handling

Payments for billed services are receipted each business day and these payments are posted to the appropriate accounts within 7 business days. Service charge receipts are designated as stormwater or sanitary sewer and deposited to the corresponding account or fund.

3. Winter Average Update

Effective July 1 of each year and on the specific schedule established in the District's current Rates and Charges Resolution and Order, calculate the updated winter average water consumption for each customer and update and revise average placed into the billing calculation for the customer's variable/usage portion of their service charge for the coming 12 month period.

4. Account Update

Prior to the next billing cycle, update stormwater and sanitary sewer customer accounts by the billing jurisdiction based on the previous activities related to discontinuation of service, move-in/outs, new accounts or changes to billing address.

B. Customer Service

1. Billing Revision Request

Review customers' requests to change in billing status and if approved by the responsible jurisdiction, incorporate changes into the customer account file with the requested/approved billing revision reflected in the next full billing cycle.

2. Billing and Customer Support

Staff is available during its normal business hours to receive questions and requests from customers relating to billing and account status, and to receive and respond to other general inquiries relating to the storm and sanitary sewer program.

C. Bad Debt Expense

1. Enforcement Procedure Documentation

a) For accounts combined with water service billing, apply non or under-payment of sewer and stormwater bills to the water utility which establishes termination of water service as the preferred response to any

non or under-payment. Initiate collection procedures through a letter no later than at the 60 day past due point with water termination procedures beginning no later than at the 90 day past due point.

b) Follow the collection procedure in C.2 below, for accounts that are sewer and/or storm only (no joint water account).

2. Collection Procedure

In those cases where water service termination does not produce payment, billing jurisdiction initiates collection procedures against the past due account. Collection procedures may be delayed until the past due account becomes large enough to warrant the collection process defined as more than 3 months past due, more than $500 past due, or both.

IV. Reporting Standards

Individual Cities are responsible to perform certain elements of the overall storm and sanitary sewer program. These responsibilities are defined in the intergovernmental agreements between each City and the District. Following are the reporting requirements for each element of the program. If a City is responsible for an element of the program, then the City is also responsible for the reporting requirements.

The District shall specify the format and exact content of each report, and may revise the format and content periodically.

A. Field Maintenance and Repair

1. General - City provide access to City MMIS to allow CWS to monitor Field Operations work orders, or, upon request from CWS, City must generate reports showing current and historical work orders and other management reports.

2. TV Inspection and Line Cleaning – On a bi-weekly or monthly schedule as determined by CWS, the City shall provide a list to the District of storm and sanitary lines TV inspected and/or cleaned by the City the prior weeks.

3. Street Sweeping Material -- City shall provide to District testing results of sweeper debris (THP and TCLP tests) every 6 months

4. Quarterly Performance Report – City shall provide to the District a quarterly report no later than the end of the month following each quarter showing the quantity of work performed (such as number of catch basins cleaned) and secondary reporting criteria if any (such as cubic yards of material removed) in each category.

The report shall also include a summary of street sweeping recording device readings showing dates, miles swept, and average speed while sweeping. City

shall provide or make available the original street sweeping device charts on request.

5. City shall "certify" each quarterly report with the following:

Certification Statement, 40 CFR 122.22 (d)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date_____

B. Finance and Accounting – City shall provide to the District:

1. Annually no later than January 1 for the prior Fiscal Year, a summary of expenditures from Storm and Sanitary Sewer funds including SDC's and Capital Funds. If available, the CAFR for the sewer and storm fund reporting, and the "Homebuilder Report" for SDC's would meet this requirement.

2. Annually, no later than July 31 of each year, a summary of positions funded in the current Fiscal Year by storm or sanitary sewer funds. This requirement can be met by providing a copy of the storm and sanitary portion from the current adopted line item budget.

3. Annually no later than August 1 if the amount exceeds 1% of the annual City storm and sanitary sewer revenue,

a) a listing of all over 90 day past due storm and sanitary sewer accounts and the status of actions taken to obtain payment

b) a listing of any write offs taken by the City relative to past due storm and sanitary sewer accounts.

4. Monthly, no later than the end of the month following that month,

a) a summary of storm and sanitary sewer revenue received including SDC's.

b) a total of all equivalent dwelling units for stormwater and for sanitary sewer

C. Engineering and Inspection

1. Monthly, no later than the 10th of each month, issuance of storm and sanitary permits by the cities is to be documented and forwarded to the District. This report can be combined with Finance and Accounting Reporting element.

2. Monthly, no later than the 10th of each month, justification for each water quality fee-in-lieu granted will be documented and reported to the District. This report can be combined with Finance and Accounting Reporting element.

3. Monthly, no later than the 10th of each month, report any discrepancies identified in engineering and environmental plan review to the District.

4. Monthly, no later than the 10th of each month, report erosion control inspections conducted.

5. Twice annually, report vegetated corridor inspections completed.

D. Capital Improvement Construction

Annually, no later than October 1 of each year, report summary of CIP implementation status of sanitary, storm, and surface water projects listed in the previous year CIP, including:

a) Actual vs. planned schedule to date

b) Actual vs. planned budget to date

c) Description and justification for scope variance, if applicable

E. District Summary Reports

District shall compile information from the reports identified in sections IV.A.-D., incorporate data from its own performance of the same functions and provide the following summary reports to all jurisdictions:

1. Field Operations Quarterly Report

2. Annual Field Operation Summary and Reports necessary for compliance with the Permit

3. Annual Financial Summary Report

4. Quarterly Engineering and Inspection Report

5. Annual Engineering Summary Report and Reports necessary for compliance with the Permit

6. Annual CIP Implementation Summary

V. Enforcement – The following procedures shall be used where there is an identified or suspected deficiency in the performance of an element or Activity of the Local City Program by a member City:

A. Monitoring – CWS shall set up a system to monitor the city performance of each element and Activity of the Local City Program

B. Notification – Each city shall designate a "responsible city contact" person. In the event that CWS believes an element or Activity of the Local City Program is not being performed up to the established standard, CWS will notify the city contact person. The city contact person will be responsible for disseminating that notice to all appropriate staff and administration at the city.

C. Initial Meeting – Following the initial notice, CWS and city will meet to review the elements or Activities of the program in question. In the event that CWS and city disagree on whether the program element or Activity is being performed up to standard, CWS will make the final decision.

D. Plan of Action – In the event of an identified deficiency, City shall develop and submit to CWS within two weeks a schedule that includes development of a plan of action for bringing the specific program element or Activity into compliance. The plan of action must show how the program standard will be met in a timely manner. CWS will review the schedule to determine if it is reasonable and appropriate.

E. Failure to Meet Standard – In the event the program element or Activity in question is not corrected within the established schedule, the City and CWS may agree on a revised plan of action, or CWS may recommend to the City staff that it take over that element or Activity of the program. If the City does not agree on CWS taking over that element or Activity, CWS may notify the City that the issue will be taken to the CWS Board in accordance with the current City/CWS operating agreement.

F. Single Errors – This procedure is not intended to require that a City be "perfect" in its execution of the City Program elements and Activities. Errors and isolated deficiencies will occur from time to time. This procedure is meant to address programmatic deficiencies.

VI. Response to Sanitary Sewer Overflows and Spills

A. Definitions:

1. A "sanitary sewer overflow" or "overflow" is a release of sewage caused by a fault in the publicly maintained system. The sewage may reach the ground, a waterway, or be confined to a structure. Typically, sewage will escape from the public conveyance system through a broken pipe or a manhole. Sewage may escape through a portion of the private system, such as a manhole, cleanout or plumbing fixture, but if it was caused by a fault in a public system it is still classified as an "overflow". The "fault" in the public system may be a structural defect or damage, a blockage, unexpected result of maintenance activity, or insufficient capacity.

2. A "spill" is a release of sewage caused by a fault in a private system. Examples of spills include backups due to a plugged private lateral or cross connections between a private sanitary system and a storm system.

3. "Incidental maintenance and repair leakage" includes drops of sewage resulting from regular maintenance and repair activities such as from tools like cleaner hoses and TV cameras, and from materials such as pipe fittings. To meet this definition the quantity must be minor and must be fully contained so as to not cause a public health hazard or risk to the environment. For incidental leakages that meet this definition, no further actions are required under these standards.

4. “Illicit discharges” are volumes of sewage, or other prohibited material, that reach the stormwater system or waters of the state but that do not come directly from a sewage system. Examples are a septic hauler truck or a public combination cleaner truck that has an accident while traveling on a road and spills sewage from its tank, or a failing septic system that is discharging to the ground and reaching a storm drain. These incidents should be addressed under MS4 rules and procedures, and no further action is required under these standards.

5. The “publicly maintained system” includes those sewer collection facilities that meet the definition of Section 1.B of this R&O. It does not include the portion of private laterals on which responsible agencies perform structural repairs through the rules in a separate District R&O. It does not include sewer systems on property owned by a public entity such as laterals and building lines in public buildings, parks, etc that do not otherwise meet the definition in Section 1.B.

6. “Responsible agency” is either CWS or a member City, based on Appendix A of the IGA between CWS and each member City. For “overflows”, the responsible agency is the agency that is maintaining that public facility. For “spills”, the responsible agency is the agency that is maintaining the local public sanitary sewer collection system in that area.

B. Initial Response

1. The responsible agency must respond to every report of an incident that may involve the release of sewage. The response must continue until the incident is completely resolved or it is determined that further action is not the responsibility of the agency.

2. Investigation. The agency responsible for the maintenance of the local public sanitary sewer system is responsible for the initial response and investigation. The responsible agency will treat the incident as an emergency with a goal of the investigation beginning within one hour regardless of the day of the week or time of day. The agency will make sufficient effort to determine the category and the type of facility. This may be accomplished in some cases by a phone call, but may also require a crew to be dispatched to the site.

3. Determine the Category. The responsible agency shall investigate to determine if the incident is an “overflow” or a “spill” (see definitions above). Until the determination of the cause is made, it should be assumed that it is an overflow from the public system.

4. Determination of the Facility. If it is determined to be an overflow, the agency responsible for the initial response shall determine who is

responsible for the next steps in the response, and shall immediately notify that agency. For public sewer facilities within the District's boundary, it shall be the agency responsible for the maintenance of that facility as shown in the IGA between CWS and the City. If the facility is outside the District's boundary, the responsible jurisdiction shall be notified.

C. Response Actions to Overflows:

1. Establish Control (abate the cause). The agency responsible for responding to an overflow is determined in Section 2.d above. The responsible agency shall take immediate action to abate the cause of the overflow. This may include such actions as unplugging a blocked line, or setting up pumps to pump around a problem area to relieve an overflow. The goal is to stop the overflow as quickly as possible.

2. Establish Containment. The responsible agency shall act immediately to identify the area and extent of the overflow, and shall take action to contain the overflow if it is not already contained by the topography. Containment may include such things as creating a berm to contain the overflow or covering storm drain inlets. The goal is to keep the sewage where it can be easily cleaned up without damage to the environment.

3. Clean Up. The responsible agency will clean up the area affected by the overflow in a timely manner. Clean-up may include removing debris and solids using hand labor, using a vacuum truck, washing the area with chlorinated water, or using a street sweeper. The responsible agency shall evaluate spills and should clean areas where there is a reasonable potential for sewage to enter public waters or the public stormwater system, or if there is a public health danger.

4. Sample Collection. The responsible agency shall collect samples for bacteriological analyses for any overflow or spill that may have reached public waters. The samples shall be gathered following established sampling protocols and the responsible agency shall flag the sample sites so they may be located for follow-up sampling. The samples shall be collected within 1 hour of arrival at the site of the overflow. The samples shall be delivered to the CWS lab for analysis.

5. Post warning signs. The responsible agency shall post warning signs when the overflow affects an area where there is the likelihood of public access and in public areas such as parks, schools, playgrounds, or waterways with public access.

6. Initial Communication. The responsible agency will contact DEQ and CWS regarding overflows as provided in the Sanitary Sewer Overflow Response

instructions in the spill kit. Contact must be made as soon as possible and no later than 24 hours after the responsible agency became aware of the incident.

7. Documentation. The responsible agency shall document the incident by completing the Overflow Notification form provided by CWS and emailing it within 24 hours to event@cleanwaterservices.org

8. 5-Day Letter. CWS will prepare and submit a detailed "5-day letter" to DEQ for all overflows unless DEQ states the letter is not needed. The responsible agency will ensure that the responders and supervisors are available to provide any additional information requested by CWS or DEQ. The responsible agency will respond immediately to requests for additional information.

9. Additional Public Notice. The responsible agency will provide any additional public notice, such as further signage, public radio announcements, door hangers, etc., as directed by DEQ or CWS.

10. Additional samples and removal of warning signs. CWS shall take additional samples following abatement of the overflow and cleanup of the area. This shall be repeated until test results show no further contamination at which time CWS shall notify the responsible agency who shall then remove the posted warning signs.

11. Analysis and Correction. The responsible agency will document the fault in the public system that was the cause of the overflow. The responsible agency shall analyze the cause and determine those actions needed to prevent reoccurrence of the overflow. The responsible agency shall take timely action to implement measures to prevent a reoccurrence. These actions may include a capital project to increase capacity, increased maintenance, increased FOG enforcement, or correcting a pipe defect.

12. Monthly reports. The responsible agency shall send CWS a written report by the fifth day of each month reporting any overflows that were that agency's responsibility during the previous month.

D. Response Actions to Spills

1. Establish Control (abate the cause). The responsible agency shall advise the property owner on steps they should take.

2. Establish Containment. The responsible agency shall evaluate the situation and act to contain sewage if there is a threat to human health or the environment such as where the spill is in an area accessible to the public or may reach the stormwater conveyance system or a body of water.

3. Initial Communication. For spills that may threaten human health or the

environment, the responsible agency shall notify DEQ and CWS as a courtesy.

4. Follow up. The responsible agency shall monitor the spill to assure the private party is taking action to abate the spill. If not, the responsible agency shall use its own enforcement powers or shall pass the responsibility to another agency with enforcement powers to abate the spill.

ATTACHMENT A
Changes Under Consideration in May 2010, Subject to Final Adoption:

Amendment to the Sanitary Sewer and SWM Work programs and standards, priorities, and policies contained in R&O No. 07-46 as amended by R&O No. 08-21 and R&O 09-21.

The following Sections are hereby amended, added, or deleted:

1. Delete the last sentence from the "Maintenance Frequency" definition in Section 2.D.

   Maintenance Frequency – An adopted standard defining the long term annual target goals for the overall program for the typical system. It is recognized that some facilities will require varying from the standard frequency due to unusual characteristics. It is also recognized that from year to year, conditions will vary and so specified maintenance frequencies may not be achieved each year. ~~Achieving maintenance frequencies is subject to the provision of adequate program funding.~~

2. Amend Section I.A.9 of the standards to read

   I. Field Operations Services

   A. Collection Systems Maintenance Programs

   9. General TV Standards

      a. All TV inspections shall follow NASSCO-PACP standards, and procedures. All TV operators shall be certified to use this rating system.

      b. Inspections shall be performed using a software suite that allows the capture of digital video, still images in real time, and the recording of observation locations. All observations shall be entered on an electronic log sheet and cross- referenced with their occurrence in the video. All inspection data to be delivered in a NASSCO Ver. 4.x database.

      c. Quality – Under normal circumstances, the pipe to be inspected shall be recently cleaned prior to inspection to allow all defects to be recorded during the inspection. Fog in the pipe that limits the view during the inspection is not acceptable. The camera lighting shall allow a clear picture up to five pipe diameter lengths away for the entire periphery of the sewer, and the lighting shall be adjusted to eliminate hot spots.

      d. Direction – Under normal circumstances, the TV inspection shall start at the upstream manhole and proceed downstream. The direction of flow shall be clearly marked on the video screen and the electronic log form.

      e. TV footage measurement -- The TV inspection system shall be equipped to measure the length of each segment. The video counter shall be zeroed

at the beginning of each new video inspection, and at any intermediate manhole.

f. Camera -- The CCTV camera shall record in color and shall be capable of panning the lens through a 360-degree arc about the vertical axis and tilting it at least 90 degrees to the longitudinal axis. For pipes larger than 6 feet in diameter, the equipment shall have a zoom feature capable of providing general views looking along the pipe up to five pipe diameter lengths away, and close up views of features.

g. Clean Water Services manhole and feature numbers shall be used on all reports. Where inspections are performed by a City or contractor, the reports shall use CWS numbering or unique facility numbers consistent with GIS data transferred to the District in accordance with Section II.C .

h. Digital Recordings – Video format shall be Mpeg1 with a frame size of 320x240, a frame rate of 29.97 or 30 frames per second and a bit-rate of 1150 kbps. The information shall be written to a DVD or other data digital transfer device or by arrangement, the District's secure file transfer appliance. Inspection information shall be stored in a NASSCO PACP version 4.x database. Links to the inspection video shall be stored in the media tables within the PACP database using relative file references.

i. Still Photographs -- During CCTV inspections, still digital color photos may be taken of major defects and to document typical conditions within any reach. They may optionally be included with the PACP database and inspection video, but if they are included, the photographs shall be in JPEG format and in the PACP database, and relative references to the stills must be included in the media tables.

j. Delivery of Work Product – For Cities or contractors doing the TV program, completed TV inspection video, still pictures, and inspection reports that comply with the standards of this section shall be delivered to the District every two weeks, or as agreed to by the District and City.

3. Amend Section I.A.17

I. Field Operations Services

A. Collection Systems Maintenance Programs

17. Water Quality Manholes – Storm

Activity:..... Cleaning
Facility Description:.....Public water quality manholes
Maintenance Frequency:...Twice per year or more frequently as required
Performance Benchmark:.....10 per day

Equipment and Crew Recommendation:Combination cleaner truck, crew of 2
Special Notes and Requirement:. Spring cleaning is only if full of debris. Otherwise the "cleaning" is limited to removing floatables and oil from the top.
Measurement Criteria:Number cleaned and cubic yards of material removed

4. Amend Section II.A, Subsections 1 and 4.

II. Engineering, Inspection, and Support Elements

A. Development Plan Review Services

Ensure that all sanitary and stormwater facilities within the District's service boundary meet all minimum design and construction standards outlined in the District's Design and Construction Standards (D&C Standards).

1. Service Provider Letter (SPLs)

a. Prescreen Issuance

i. Using aerial photos, photographs, District Provided resource maps, utility maps, and other resources, review Sensitive Area Prescreening Site Assessment applications for requirements to perform additional site assessment on the basis of:

1) Possible existence of water quality sensitive areas on or within 200' of the project site; and

2) Type of proposed activity.

ii. Issue Sensitive Area Prescreening ~~PreScreen~~ Site Assessment to applicant on District-approved forms.

iii. Keep database (electronic preferred) of information on all applications and determinations.

b. Service Provider Letter Issuance

i. Issue SPLs pursuant to D&C Standards, including consideration for applicable mitigation requirements from other regulatory agencies (e.g., US Army Corps of Engineers and the Oregon Department ~~Division~~ of State Lands).

ii. Use forms approved by the District.

iii. Keep a database (electronic preferred) of information on all applications, including requirements, correspondence, and response times.

4. Plan Review

Review plans for conformance with D&C Standards and land use conditions of approval which apply to provision of sanitary sewer, ~~and~~ storm sewer service and vegetated corridors. As early as possible, identify exceptions ~~variances~~ from standards and obtain District approval of proposed alternative.

For cities performing plan review: When the plan reviewer believes plans to be in substantial compliance with the D&C Standards, transmit the plans to District. Transmittal shall include name of the plan reviewer seeking approval and a description and explanation of any known exceptions ~~variances~~. District shall complete its review within 15 working days from receipt of the plans and return comments to city. City may consider plans as approved by District if District fails to provide comments within 15 working days. City shall require incorporation of District ~~redline~~ comments prior to final approval.

5. Amend Section II.B, Subsections 2, 4, 6, 7, and 8.

II. Engineering, Inspection, and Support Elements

B. Development Inspection Services

2. New development final approval

Prior to issuing final approvals, receive and approve all required as-built drawings; TV inspect all new pipe systems; review the TV records; require correction of identified deficiencies; review and approve testing results; require removal of appropriate erosion control measures. ~~and best management practices measures as specified in D&C Standards and by any additional permit condition.~~ Final approval does not relieve the owner of responsibility for any other Federal, State, or local permit conditions.

4. Erosion Control Inspection

Meet inspection frequencies as required by the Permit and SWMP. Maintain documentation (inspections log or notes) of erosion control deficiencies.

6. Erosion Control Wet Weather Management

Issue wet weather letters to all active and inactive development projects. Using the District supplied template, issue a ~~one~~ letter by September 15th each year, with a second reminder letter by September 30th each year. During wet weather periods, inspect all development sites at least weekly.

7. Maintenance Assurance Inspection of Landscaping in Water Quality Facilities and Vegetated Corridors

Conduct and document inspection of landscaping for vegetated corridors and for water quality facilities in accordance with the D&C Standards.

8. Erosion Control and Water Quality Facility ~~Vegetated Corridor~~ Training

District will lead development, coordination, presentation, and promotion of erosion control inspection training ~~at least once a year~~ and water quality facility standards and design ~~vegetated corridor inspection~~ training at least once ~~twice~~ a year.

All staff performing erosion control inspection shall attend erosion control inspection training as required by the Permit and SWMP.

~~All staff performing vegetated corridor inspection shall attend annual training for erosion control.~~

6. Amend Section II.C.2

II. Engineering, Inspection, and Support Elements

C. Capital Projects

2. System Monitoring

Monitor system performance through sewer flow monitoring, stream flow monitoring, and water quality monitoring in accordance with the NPDES Watershed Discharge Permit requirements. Coordinate monitoring program for the entire service area to achieve maximum efficiency. Locate monitoring equipment to assist with master planning and project selection process.

Provide a project specific map showing flow monitoring requests for proposed CIP projects including sanitary capacity improvements and for I and I abatement projects at least 1 year prior to start of design.

7. Amend Section II.E

II. Engineering, Inspection, and Support Elements

E. Industrial Pretreatment – Fats Oils and Grease Abatement Program

~~Meet requirements of District Industrial Sewer Use R&O 98-26 or revised to assist in managing pollutants at their source and reduce impacts of fats, oils, and grease in the collection system.~~

Clean Water Services has developed a Fat, Oil and Grease (FOG) Abatement Program in cooperation with other Metro-area municipalities, the Oregon Restaurant Association and pumping companies that service grease removal devices (see

http://preferredpumper.org). The FOG Abatement Program meets the requirements of the District's Industrial Sewer Use R&O 09-1. The District and its member Cities are working collaboratively to implement the FOG Abatement Program and are actively communicating with the food service establishments within the service area. Implementation of the program will be completed in FY '09-'10, and on-going inspections and education will continue indefinitely. On-line training is available for both municipal FOG inspectors and managers of food service establishments at www.cleanwaterservices.org/fog .

- All Food Service Establishments (FSEs)* in each member city will have one inspection by June 30, 2011.

After that, each FSE will be inspected annually. The District will do the same in unincorporated Washington County and for member cities who wish to defer the program to the District, for a fee to be negotiated.

- Inspectors will see one full pump out** of each Grease Removal Device (GRD)*** every five years.

- Member cities will report back to the District twice a year. The template for this data management system will be developed in continuing conversations with the member cities.

*FSEs refers to Food Service Establishments or "serving establishments" as defined in the State of Oregon Plumbing Specialty Code, Chapter 10 Section 1014.1.

**One full pump out constitutes seeing the Grease Removal Device (GRD) empty, which typically occurs at the time of maintenance (pump out).

***Grease Removal Device (GRD) refers to the FOG treatment device, typically a grease trap or grease interceptor.

8. Add Section II.G

II. Engineering, Inspection, and Support Elements

G. Private Water Quality Facility Management Program

This program is to ensure adequate maintenance of privately-owned water quality facilities (PWQFs). The program has four major elements – Inventory, Inspection, Education and Outreach, and Enforcement, which are supported by program management.

1. Inventory of PWQFs

a) Annually update and maintain an inventory of existing and newly- added facilities, including the area treated.
b) Inventory shall be available in an electronic format (Excel, Access) and include location, owner, current rating and type.
c) Maintenance Agreements are required for all new facilities as described in the D&C Standards.

2. Inspection of PWQFs

a) At a minimum, inspect 25% of sites annually and all sites in a four-year cycle. Assess the condition of all water quality facilities on each site inspected including pretreatment structures associated with the treatment train.
b) Send annual letters to every PWQF owner as a reminder of their obligation to maintain the PWQFs.
c) Develop and maintain an electronic database for inspections that includes location, owner, date of inspections, condition assessment rating, and follow-up actions. Also retain correspondence to PWQF owners and supporting materials from inspections.
d) When inspection requires entry onto private property, permission may be provided through a maintenance agreement, by the owner or owner's representative, or by procedures in code, ordinance or other regulation.

3. Education and Outreach for PWQF Management Program:

a) District will provide and periodically update educational materials about PWQF maintenance and inspection for Cities and Owners.
b) District will provide a website with educational materials for PWQF Management.
c) Annually, Cities and District shall evaluate the effectiveness of the outreach program and appropriately adapt activities.

4. Enforcement of PWQF Management Program:

a) Enforcement Procedures

Employ an active enforcement program to allow timely compliance and correction of identified deficiencies, including the following minimum enforcement procedures.

- Education on Required Corrective Maintenance Actions
- Establishment and Monitoring of Corrective Work Plans
- Deficiency Notices
- Issuance of Civil Penalties

Progressive enforcement shall be used if compliance is not achieved by education and coaching. All contacts and notices must be documented.

Enforcement Procedures By Condition of Water Quality Facility	
Rating/Problem	**Enforcement**
For Facilities with regular inspection ratings	
Note: For all Facilities with regular inspections, ensure annual notice has been sent and there is a recent inspection before proceeding with any enforcement.	
1 – Excellent 2 – Good 3 – Fair	• No additional action unless rating falls to poor/very poor (4 or 5). For facilities in fair (3) condition, it may be appropriate to contact the owner and explain how items needing maintenance could be improved.
4 – Poor 5 – Very Poor	• Follow Enforcement Procedures • Use established Abatement Procedures, if necessary.

9. Amend Section III.A.3

III. Business and Customer Related Services

A. Customer Billing

3. Winter Average Update

~~Effective July 1 of each year and on the specific schedule established in the District's current Rates and Charges Resolution and Order, calculate the updated winter average water consumption for each customer and update and revise average placed into the billing calculation for the customer's variable/usage portion of their service charge for the coming 12 month period.~~ A new Winter Average will be determined each year for each customer effective with the charges incurred no earlier than July 1 and no later than September 1 of that year, based on schedule established in the District's current Rates and Charges

Resolution and Order (Section II E. 1. a.). Updated winter average will be used in billing calculation for customer's variable/usage portion of their sewer service charge for the coming 12 month period.

10. Amend Section IV.C

IV. Reporting Standards

C. Engineering and Inspection

1. Monthly, no later than the 15th ~~10th~~ of each month, issuance of storm and sanitary permits by the cities is to be documented and forwarded to the District. This Connection report can be combined with Finance and Accounting Reporting element.

2. Monthly, no later than the 15th ~~10th~~ of each month, permitted project, water quality facility information, substantial completion, and justification for each water quality fee-in-lieu granted will be documented and reported to the District in the Site Development Permit Form report. ~~This report can be combined with Finance and Accounting Reporting element.~~

~~3. Monthly, no later than the 10th of each month, report any discrepancies identified in engineering and environmental plan review to the District.~~

3. Monthly, no later than the 15th ~~10th~~ of each month, report erosion control inspections conducted.

~~4. Twice annually, report vegetated corridor inspections completed.~~

4. Other Engineering Submittals:

For each plan review, a transmittal shall be submitted to District noting any ~~major~~ attachments to the design plans, and engineering and environmental exceptions. Other engineering submittals may be required for specific performance standard elements not included in the report requirements above.

Engineering data for MS4 report tracking measures, not covered in the reports above, will be separately submitted annually.

5. Quarterly, no later than 30 days after end of quarter, send updated GIS data as specified in (I. C. 5).

6. Annually, no later than July 30 of each year, report on the following for Private Water Quality Facility Management Program:

a) For Inspections:
   - Number of inspections performed for sites and facilities.

- Number of Facilities rated Poor/Very Poor
- Number of facility ratings improved to fair/good/excellent in FY
- Number of corrective improvements plans established
- Number of Deficiency Notices
- Number of Civil Citations

b) Number of annual notices sent

c) Updated inventory list with number of sites, number of facilities and area treated

11. Amend Section IV.D

IV. Reporting Standards

D. Capital Improvement Construction

1. Annually, no later than October 1 of each year, report summary of CIP implementation status of sanitary, storm, and surface water projects listed in the previous year CIP, including:

a) Actual vs. planned schedule for the prior fiscal year ~~to date~~

b) Actual (unaudited) expenditures vs. planned budget for the prior fiscal year ~~to date~~

c) Description and justification for scope variance, if applicable.

d) Annually, no later than the 10th of January, report summary of CIP actual expenditures for the first two quarters of the current fiscal year

e) Annually, no later than the 10th of January, report summary of CIP projected expenditures for the last two quarters of the current fiscal year.

WEST YOST

ASSOCIATES