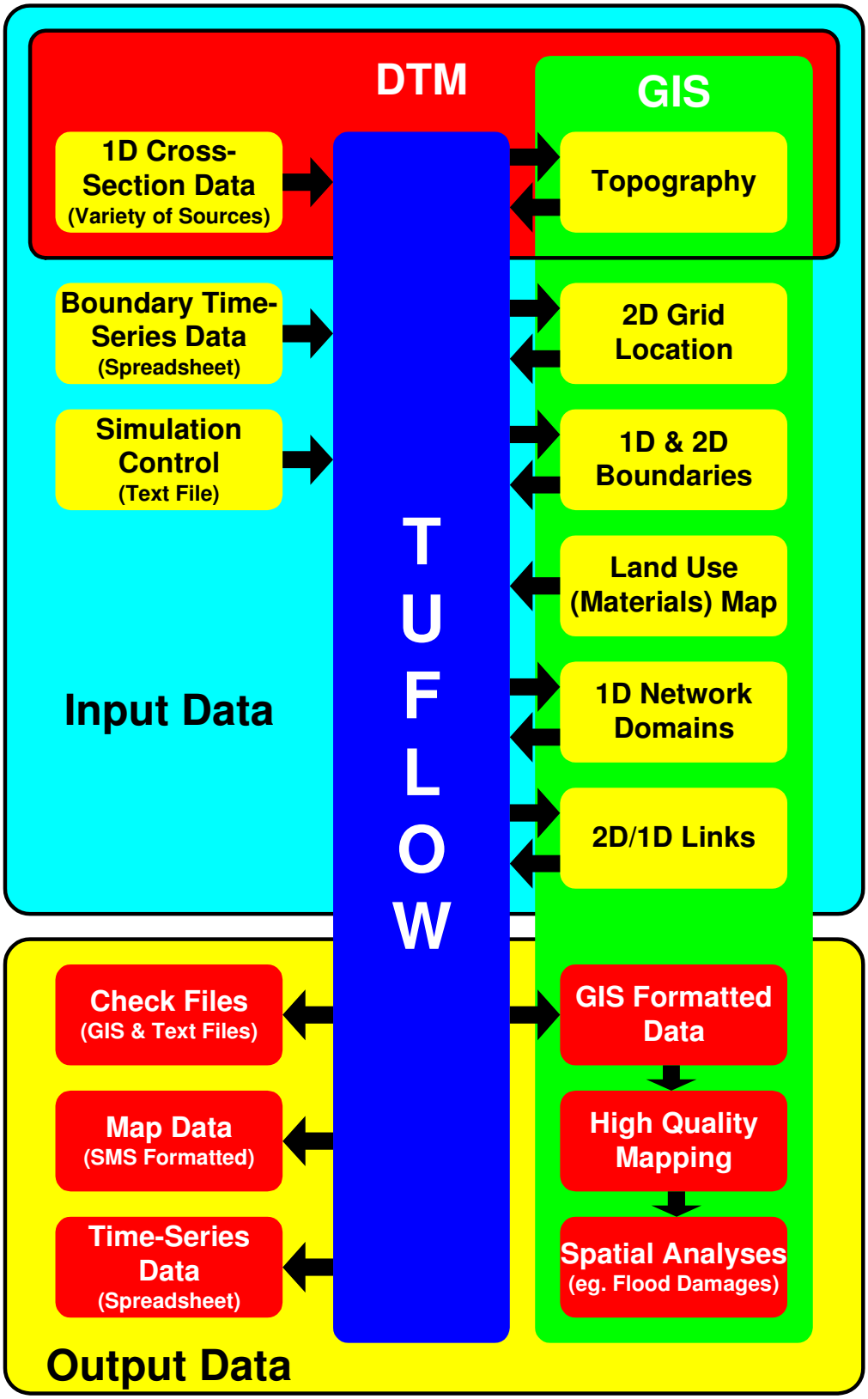
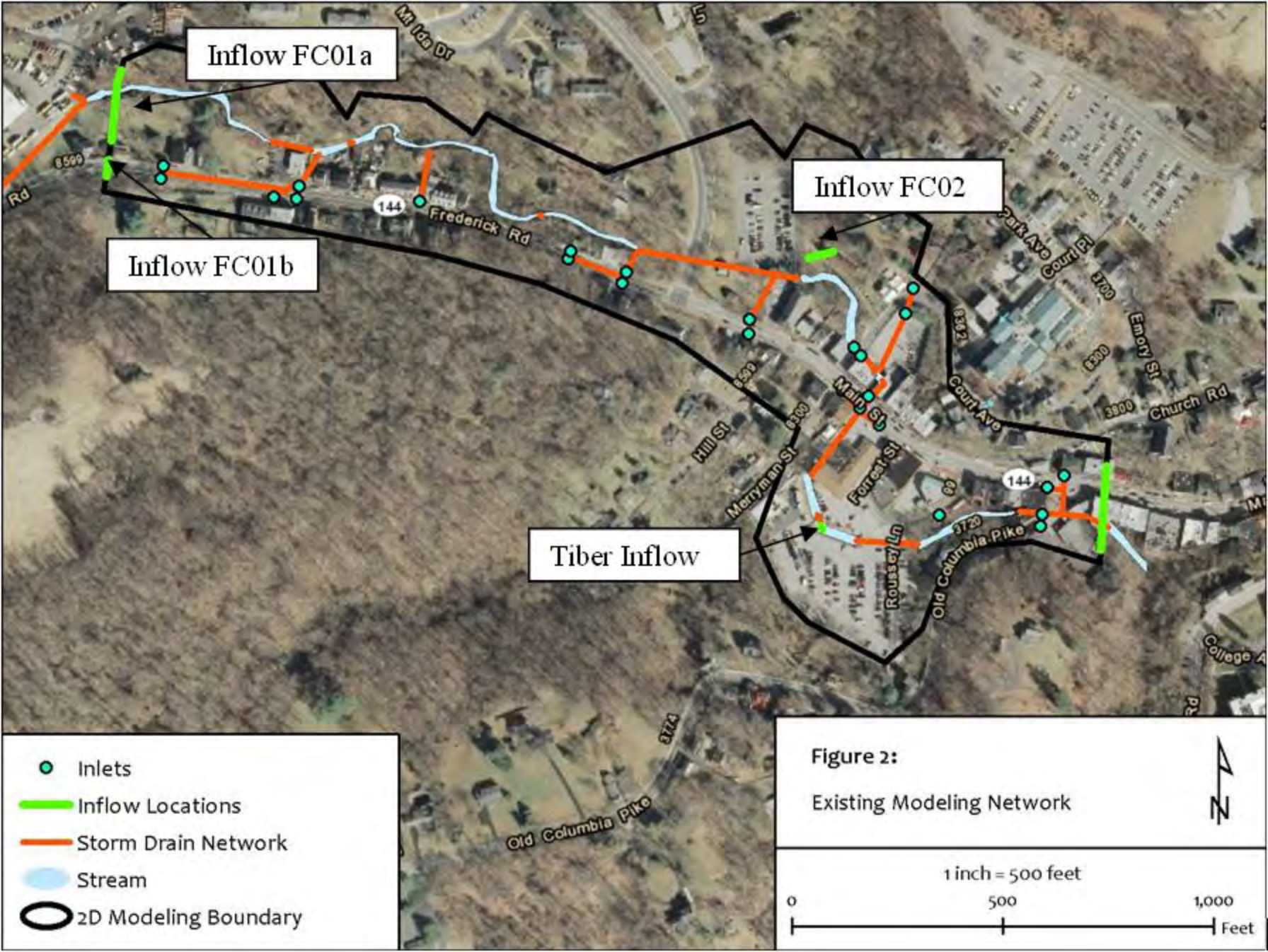
Tuflow Input and Output Structure (taken from Tuflow Manual 2010-10-AB)



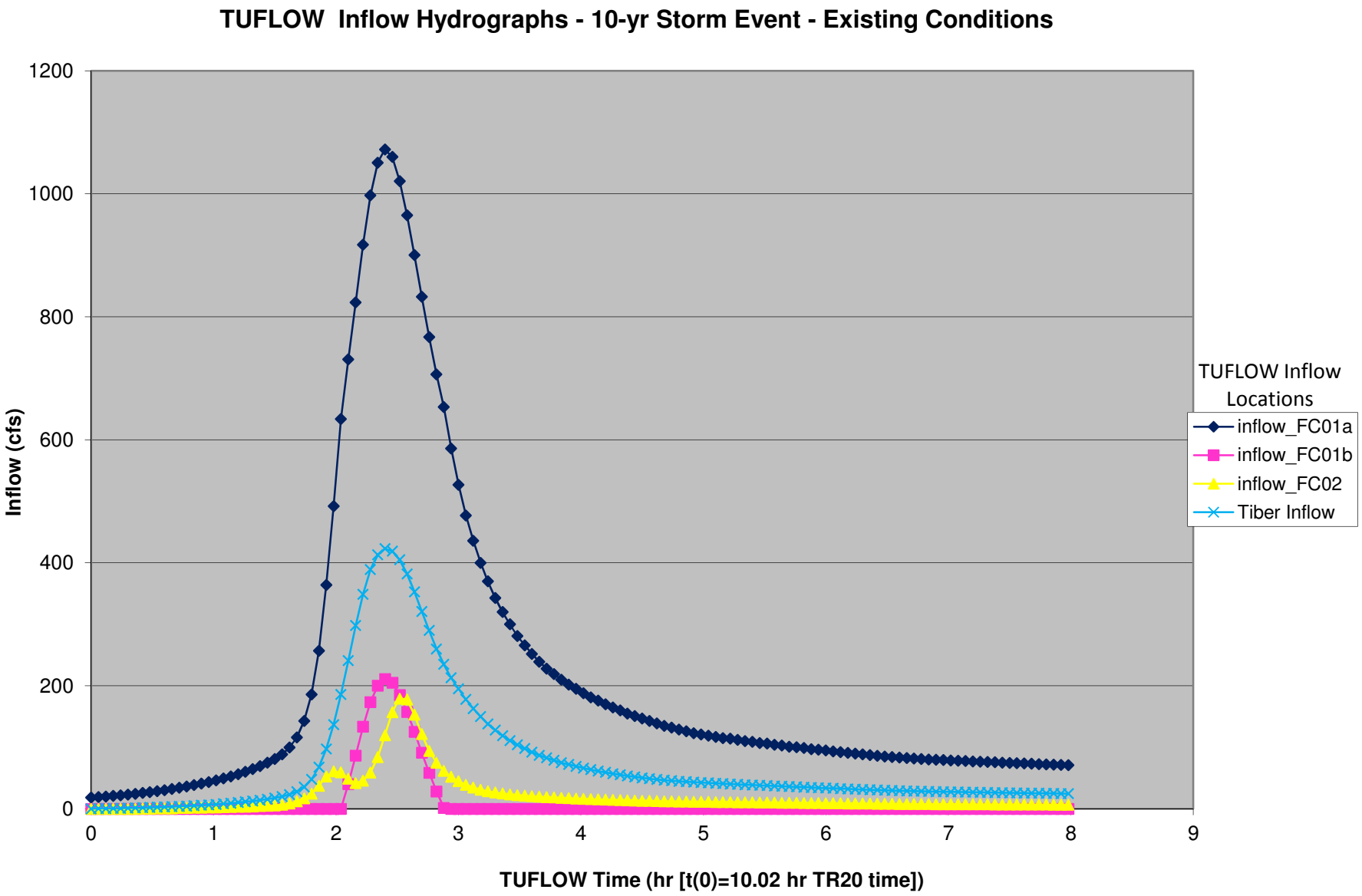

Inflow FC01a
Inflow FC01b
Inflow FC02
Tiber Inflow
Frederick Rd
Old Columbia Pike
Main St
Court Ave
Church Rd
Emory St
Park Ave
Court Pl
Hill St
Merryman St
Forrest St
Rousset Ln
Mt Ida Dr
144
Inlets
Inflow Locations
Storm Drain Network
Stream
2D Modeling Boundary
Figure 2:
Existing Modeling Network
N
1 inch = 500 feet
0
500
1,000
Feet

Tuflow Inflow Hydrograph Data- 10-yr Storm Event

TR-20 Time	Tuflow Inflow	inflow_FC01	inflow_FC01a	inflow_FC01b	inflow_FC02	Tiber Inflow
hr	hr	cfs	cfs	cfs	cfs	cfs
10.02	0	18.28	18.28	0	0	0
10.08	0.06	19.11	19.11	0	0	0.4
10.14	0.12	20.03	20.03	0	0	0.55
10.2	0.18	21.02	21.02	0	0	0.74
10.26	0.24	22.09	22.09	0	0	0.96
10.32	0.3	23.24	23.24	0	0	1.21
10.38	0.36	24.47	24.47	0	0	1.5
10.44	0.42	25.8	25.8	0	0.45	1.82
10.5	0.48	27.22	27.22	0	0.54	2.17
10.56	0.54	28.76	28.76	0	0.63	2.57
10.62	0.6	30.43	30.43	0	0.72	3
10.68	0.66	32.23	32.23	0	0.82	3.47
10.74	0.72	34.18	34.18	0	1.4	3.98
10.8	0.78	36.27	36.27	0	1.58	4.54
10.86	0.84	38.51	38.51	0	1.79	5.15
10.92	0.9	40.94	40.94	0	1.99	5.82
10.98	0.96	43.56	43.56	0	2.21	6.54
11.04	1.02	46.39	46.39	0	2.45	7.33
11.1	1.08	49.45	49.45	0	2.72	8.2
11.16	1.14	52.76	52.76	0	3.02	9.15
11.22	1.2	56.33	56.33	0	3.37	10.19
11.28	1.26	60.23	60.23	0	3.74	11.35
11.34	1.32	64.56	64.56	0	4.16	12.64
11.4	1.38	69.4	69.4	0	4.62	14.09
11.46	1.44	74.83	74.83	0	5.11	15.71
11.52	1.5	80.99	80.99	0	5.69	17.6
11.58	1.56	88.76	88.76	0	6.77	19.96
11.64	1.62	99.57	99.57	0	8.74	23.18
11.7	1.68	116	116	0	12.19	28.05
11.76	1.74	143	143	0	17.28	35.65
11.82	1.8	186	186	0	24.89	47.94
11.88	1.86	257	257	0	37.3	67.74
11.94	1.92	364	364	0	52.71	97.27
12	1.98	492	484.67	7.33	61.03	137
12.06	2.04	634	579.33	54.67	59.33	186
12.12	2.1	771	670.67	100.33	48.95	241
12.18	2.16	910	763.33	146.67	41.79	298
12.24	2.22	1051	857.33	193.67	45.85	349
12.3	2.28	1171	937.33	233.67	59.03	389
12.36	2.34	1251	990.67	260.33	84.15	413
12.42	2.4	1283	1012	271	119.88	423
12.48	2.46	1265	1000	265	157.4	419
12.54	2.52	1206	960.67	245.33	179.34	405
12.6	2.58	1123	905.33	217.67	178.1	382
12.66	2.64	1026	840.67	185.33	153.11	353
12.72	2.7	924	772.67	151.33	121.72	321
12.78	2.76	826	707.33	118.67	94.03	290
12.84	2.82	735	646.67	88.33	75.1	260
12.9	2.88	655	593.33	61.67	61.83	235
12.96	2.94	586	547.33	38.67	52.27	213
13.02	3	527	508	19	44.97	195
13.08	3.06	477	474.67	2.33	39.21	178
13.14	3.12	436	436	0	34.77	163
13.2	3.18	400	400	0	31.25	150
13.26	3.24	370	370	0	28.61	138
13.32	3.3	343	343	0	26.56	128
13.38	3.36	320	320	0	24.93	119
13.44	3.42	300	300	0	23.6	111
13.5	3.48	281	281	0	22.47	104
13.56	3.54	266	266	0	21.51	98
13.62	3.6	252	252	0	20.64	92
13.68	3.66	239	239	0	19.85	87
13.74	3.72	228	228	0	19.17	83
13.8	3.78	219	219	0	18.55	79
13.86	3.84	210	210	0	17.98	75
13.92	3.9	202	202	0	17.44	72.11
13.98	3.96	195	195	0	16.92	69.09
14.04	4.02	188	188	0	16.43	66.32
14.1	4.08	181	181	0	15.94	63.77
14.16	4.14	176	176	0	15.5	61.43
14.22	4.2	170	170	0	15.09	59.26
14.28	4.26	165	165	0	14.71	57.25
14.34	4.32	160	160	0	14.35	55.35
14.4	4.38	155	155	0	14	53.57
14.46	4.44	151	151	0	13.67	51.9
14.52	4.5	147	147	0	13.33	50.35
14.58	4.56	143	143	0	13.02	48.93
14.64	4.62	139	139	0	12.72	47.69
14.7	4.68	135	135	0	12.46	46.62
14.76	4.74	132	132	0	12.25	45.69
14.82	4.8	129	129	0	12.05	44.86
14.88	4.86	126	126	0	11.89	44.1
14.94	4.92	123	123	0	11.74	43.39
15	4.98	121	121	0	11.59	42.73
15.06	5.04	119	119	0	11.46	42.1
15.12	5.1	117	117	0	11.32	41.5
15.18	5.16	115	115	0	11.19	40.92
15.24	5.22	114	114	0	11.06	40.36
15.3	5.28	112	112	0	10.93	39.82
15.36	5.34	110	110	0	10.79	39.28
15.42	5.4	109	109	0	10.66	38.76
15.48	5.46	107	107	0	10.53	38.25
15.54	5.52	106	106	0	10.4	37.74

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

15.6	5.58	104	104	0	10.26	37.24
15.66	5.64	103	103	0	10.13	36.74
15.72	5.7	101	101	0	10	36.25
15.78	5.76	100	100	0	9.86	35.75
15.84	5.82	99	99	0	9.73	35.26
15.9	5.88	97	97	0	9.59	34.77
15.96	5.94	96	96	0	9.46	34.28
16.02	6	94.82	94.82	0	9.32	33.79
16.08	6.06	93.52	93.52	0	9.19	33.31
16.14	6.12	92.24	92.24	0	9.06	32.82
16.2	6.18	90.99	90.99	0	8.94	32.34
16.26	6.24	89.72	89.72	0	8.81	31.87
16.32	6.3	88.46	88.46	0	8.69	31.41
16.38	6.36	87.27	87.27	0	8.57	30.98
16.44	6.42	86.14	86.14	0	8.45	30.56
16.5	6.48	85.1	85.1	0	8.33	30.17
16.56	6.54	84.15	84.15	0	8.21	29.8
16.62	6.6	83.27	83.27	0	8.1	29.46
16.68	6.66	82.46	82.46	0	8	29.14
16.74	6.72	81.72	81.72	0	7.93	28.85
16.8	6.78	81.04	81.04	0	7.86	28.57
16.86	6.84	80.39	80.39	0	7.79	28.31
16.92	6.9	79.79	79.79	0	7.74	28.07
16.98	6.96	79.22	79.22	0	7.68	27.84
17.04	7.02	78.67	78.67	0	7.63	27.62
17.1	7.08	78.13	78.13	0	7.58	27.41
17.16	7.14	77.62	77.62	0	7.53	27.2
17.22	7.2	77.11	77.11	0	7.48	27
17.28	7.26	76.62	76.62	0	7.43	26.81
17.34	7.32	76.13	76.13	0	7.39	26.62
17.4	7.38	75.65	75.65	0	7.34	26.43
17.46	7.44	75.17	75.17	0	7.29	26.25
17.52	7.5	74.69	74.69	0	7.24	26.06
17.58	7.56	74.22	74.22	0	7.19	25.88
17.64	7.62	73.74	73.74	0	7.14	25.7
17.7	7.68	73.27	73.27	0	7.1	25.52
17.76	7.74	72.8	72.8	0	7.05	25.35
17.82	7.8	72.32	72.32	0	7	25.17
17.88	7.86	71.85	71.85	0	6.95	24.99
17.94	7.92	71.38	71.38	0	6.9	24.82
18	7.98	70.9	70.9	0	6.85	24.64

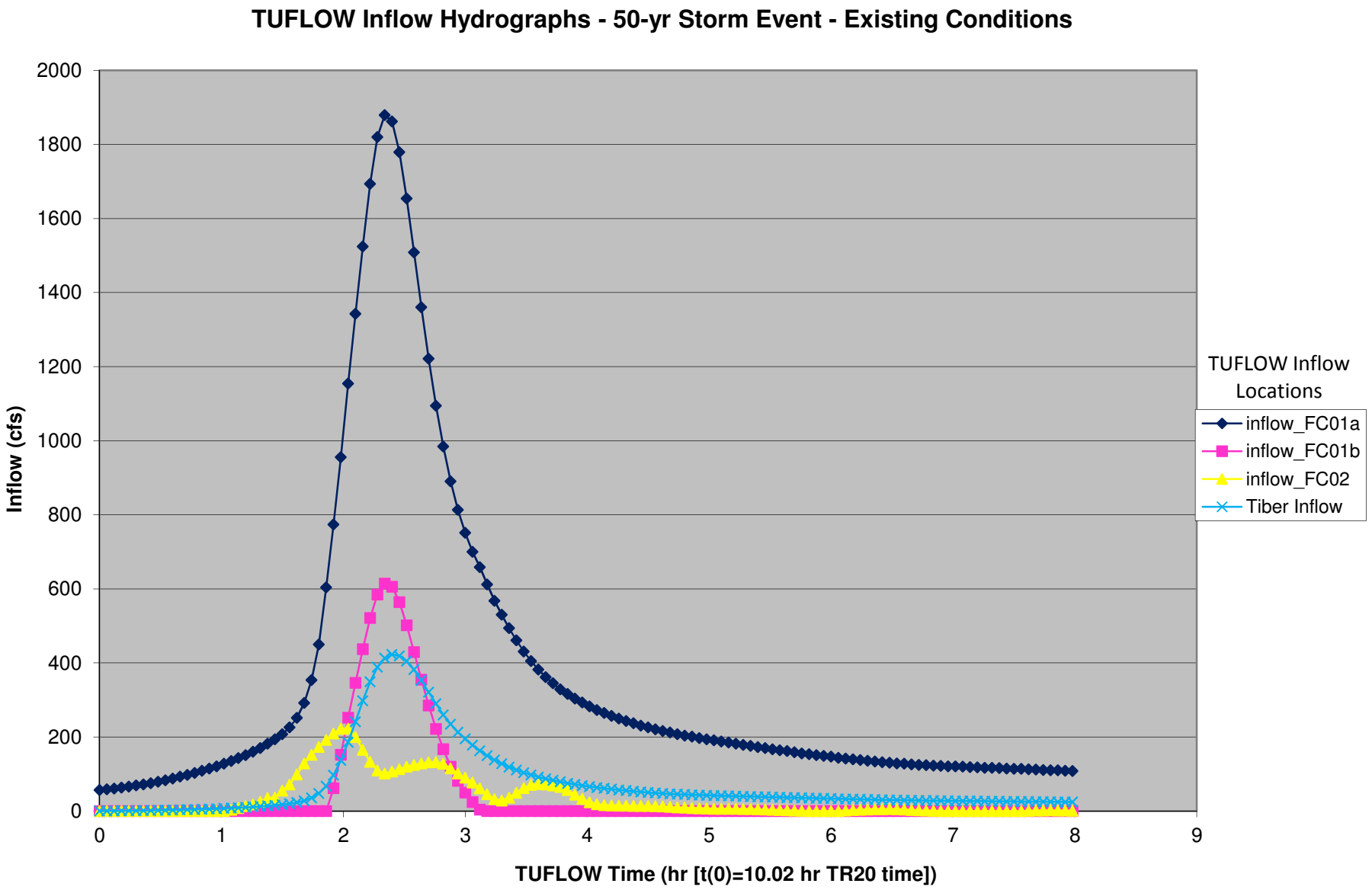

TUFLOW Inflow Hydrographs - 10-yr Storm Event - Existing Conditions
Inflow (cfs)
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02 hr TR20 time])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

Tuflow Inflow Hydrograph Data- 50-yr Storm Event

TR-20 Time hr	Tuflow Inflow hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
10.02	0	56.93	56.93	0	0	0
10.08	0.06	58.95	58.95	0	0	0.4
10.14	0.12	61.19	61.19	0	0	0.55
10.2	0.18	63.65	63.65	0	0	0.74
10.26	0.24	66.32	66.32	0	0	0.96
10.32	0.3	69.17	69.17	0	0.04	1.21
10.38	0.36	72.22	72.22	0	0.16	1.5
10.44	0.42	75.61	75.61	0	0.33	1.82
10.5	0.48	79.39	79.39	0	0.5	2.17
10.56	0.54	83.54	83.54	0	0.61	2.57
10.62	0.6	88	88	0	0.61	3
10.68	0.66	93	93	0	0.5	3.47
10.74	0.72	98	98	0	0.35	3.98
10.8	0.78	103	103	0	0.23	4.54
10.86	0.84	109	109	0	0.14	5.15
10.92	0.9	115	115	0	0.09	5.82
10.98	0.96	121	121	0	0.06	6.54
11.04	1.02	128	128	0	0.53	7.33
11.1	1.08	135	135	0	3.33	8.2
11.16	1.14	143	143	0	8.17	9.15
11.22	1.2	151	151	0	13.23	10.19
11.28	1.26	160	160	0	18.03	11.35
11.34	1.32	170	170	0	25.13	12.64
11.4	1.38	182	182	0	35.71	14.09
11.46	1.44	194	194	0	36.24	15.71
11.52	1.5	208	208	0	55.8	17.6
11.58	1.56	226	226	0	71.95	19.96
11.64	1.62	252	252	0	99.04	23.18
11.7	1.68	292	292	0	128.64	28.05
11.76	1.74	354	354	0	152.69	35.65
11.82	1.8	450	450	0	173.51	47.94
11.88	1.86	604	559.3333333	44.66666667	192.65	67.74
11.94	1.92	836	714	122	209.83	97.27
12	1.98	1108	895.3333333	212.6666667	222.21	137
12.06	2.04	1407	1094.666667	312.3333333	223.05	186
12.12	2.1	1689	1282.666667	406.3333333	200.69	241
12.18	2.16	1962	1464.666667	497.3333333	165.85	298
12.24	2.22	2215	1633.333333	581.6666667	133.28	349
12.3	2.28	2405	1760	645	109.88	389
12.36	2.34	2494	1819.333333	674.6666667	101.76	413
12.42	2.4	2468	1802	666	106.65	423
12.48	2.46	2344	1719.333333	624.6666667	113.23	419
12.54	2.52	2156	1594	562	119.98	405
12.6	2.58	1938	1448.666667	489.3333333	125.07	382
12.66	2.64	1716	1300.666667	415.3333333	128.94	353
12.72	2.7	1507	1161.333333	345.6666667	131.71	321
12.78	2.76	1317	1034.666667	282.3333333	132.67	290
12.84	2.82	1152	924.6666667	227.3333333	127.72	260
12.9	2.88	1011	830.6666667	180.3333333	115.4	235
12.96	2.94	895	753.3333333	141.6666667	101.93	213
13.02	3	802	691.3333333	110.6666667	90.2	195
13.08	3.06	725	640	85	77.45	178
13.14	3.12	663	598.6666667	64.33333333	61.57	163
13.2	3.18	612	564.6666667	47.33333333	45.55	150
13.26	3.24	568	535.3333333	32.66666667	32.88	138
13.32	3.3	530	510	20	28.92	128
13.38	3.36	494	486	8	36.55	119
13.44	3.42	461	461	0	49.71	111
13.5	3.48	431	431	0	62.22	104
13.56	3.54	405	405	0	70.95	98
13.62	3.6	382	382	0	73.28	92
13.68	3.66	362	362	0	71.97	87
13.74	3.72	345	345	0	69.69	83
13.8	3.78	329	329	0	65.65	79
13.86	3.84	316	316	0	56.84	75
13.92	3.9	304	304	0	44.45	72.11
13.98	3.96	293	293	0	32.98	69.09
14.04	4.02	283	283	0	24.11	66.32
14.1	4.08	273	273	0	18.94	63.77
14.16	4.14	265	265	0	16.42	61.43
14.22	4.2	257	257	0	15.37	59.26
14.28	4.26	250	250	0	14.87	57.25
14.34	4.32	243	243	0	14.58	55.35
14.4	4.38	237	237	0	14.36	53.57
14.46	4.44	231	231	0	14.2	51.9
14.52	4.5	226	226	0	14.05	50.35
14.58	4.56	221	221	0	13.55	48.93
14.64	4.62	216	216	0	12.52	47.69
14.7	4.68	212	212	0	11.33	46.62
14.76	4.74	208	208	0	10.32	45.69
14.82	4.8	204	204	0	9.44	44.86
14.88	4.86	201	201	0	8.55	44.1
14.94	4.92	197	197	0	7.71	43.39
15	4.98	194	194	0	7.04	42.73
15.06	5.04	191	191	0	6.54	42.1
15.12	5.1	188	188	0	6.25	41.5
15.18	5.16	185	185	0	6.06	40.92
15.24	5.22	182	182	0	5.94	40.36
15.3	5.28	179	179	0	5.75	39.82
15.36	5.34	176	176	0	5.31	39.28
15.42	5.4	173	173	0	4.66	38.76
15.48	5.46	170	170	0	4.05	38.25
15.54	5.52	167	167	0	3.52	37.74
15.6	5.58	164	164	0	2.88	37.24
15.66	5.64	162	162	0	2.13	36.74
15.72	5.7	159	159	0	1.45	36.25
15.78	5.76	156	156	0	0.93	35.75
15.84	5.82	154	154	0	0.57	35.26
15.9	5.88	151	151	0	0.36	34.77
15.96	5.94	149	149	0	0.22	34.28
16.02	6	147	147	0	0.19	33.79
16.08	6.06	144	144	0	0.58	33.31
16.14	6.12	142	142	0	1.59	32.82
16.2	6.18	140	140	0	2.79	32.34
16.26	6.24	138	138	0	3.81	31.87
16.32	6.3	136	136	0	4.53	31.41
16.38	6.36	134	134	0	4.95	30.98
16.44	6.42	132	132	0	5.18	30.56
16.5	6.48	131	131	0	5.3	30.17
16.56	6.54	129	129	0	5.13	29.8
16.62	6.6	128	128	0	4.32	29.46
16.68	6.66	126	126	0	3.2	29.14
16.74	6.72	125	125	0	2.17	28.85
16.8	6.78	124	124	0	1.37	28.57
16.86	6.84	123	123	0	0.84	28.31
16.92	6.9	122	122	0	0.53	28.07
16.98	6.96	121	121	0	0.33	27.84
17.04	7.02	121	121	0	0.21	27.62
17.1	7.08	120	120	0	0.13	27.41
17.16	7.14	119	119	0	0.08	27.2
17.22	7.2	118	118	0	0.05	27
17.28	7.26	117	117	0	0.03	26.81
17.34	7.32	117	117	0	0.02	26.62
17.4	7.38	116	116	0	0.01	26.43

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

17.46	7.44	115	115	0	0	26.25
17.52	7.5	114	114	0	0.03	26.06
17.58	7.56	114	114	0	0.26	25.88
17.64	7.62	113	113	0	0.8	25.7
17.7	7.68	112	112	0	1.45	25.52
17.76	7.74	111	111	0	1.97	25.35
17.82	7.8	110	110	0	2.16	25.17
17.88	7.86	110	110	0	1.91	24.99
17.94	7.92	109	109	0	1.41	24.82
18	7.98	108	108	0	0.95	24.64

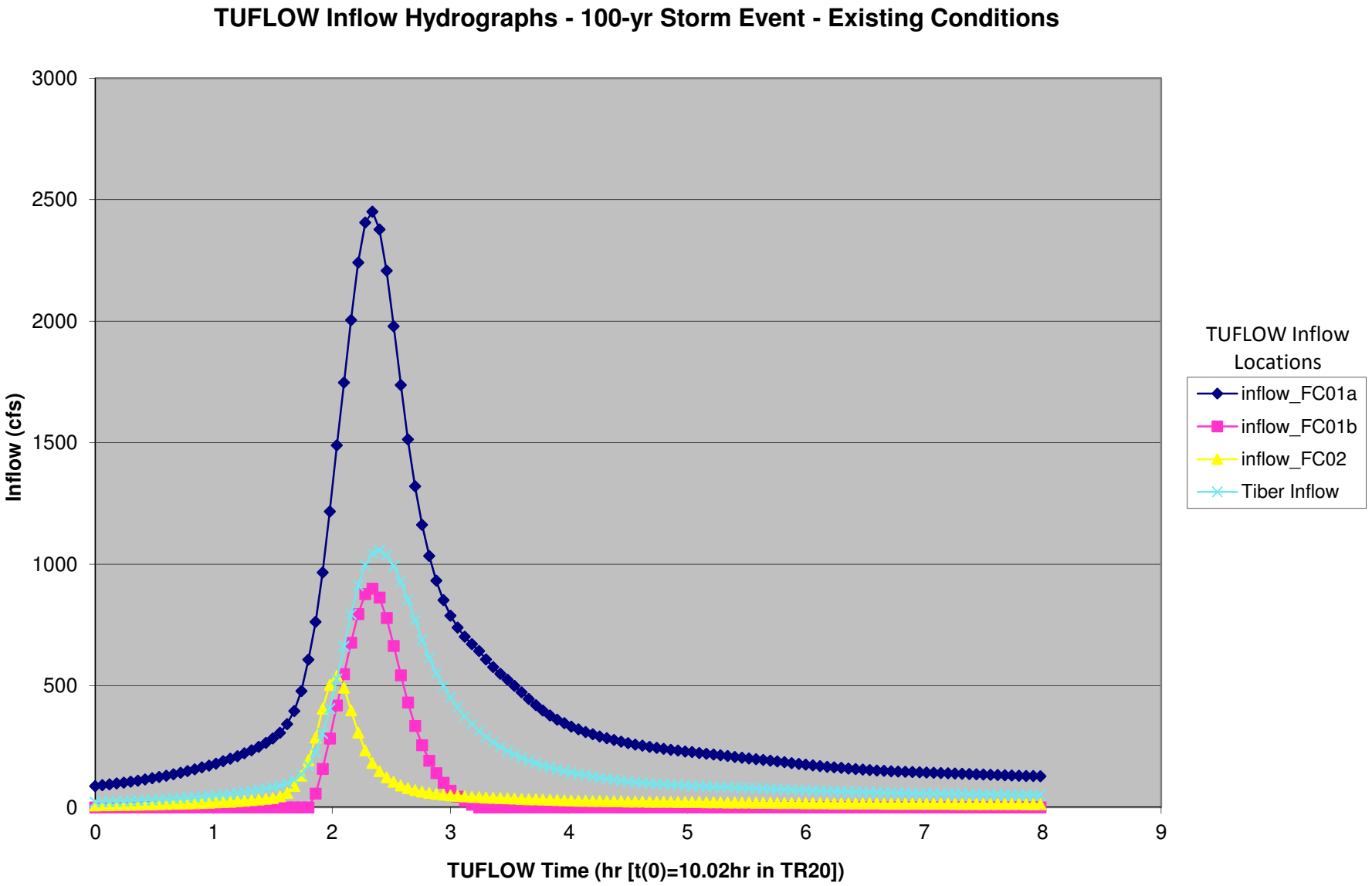

TUFLOW Inflow Hydrographs - 50-yr Storm Event - Existing Conditions
Inflow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02 hr TR20 time])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

Tuflow Inflow Hydrograph Data- 100-yr Storm Event

TR-20 Time hr	inflow_time_hr hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
10.02	0	87.58	87.58	0	8.34	21.46
10.08	0.06	91	91	0	8.74	22.34
10.14	0.12	94	94	0	9.16	23.29
10.2	0.18	98	98	0	9.64	24.32
10.26	0.24	102	102	0	10.15	25.42
10.32	0.3	106	106	0	10.69	26.61
10.38	0.36	110	110	0	11.26	27.88
10.44	0.42	115	115	0	11.86	29.24
10.5	0.48	120	120	0	12.48	30.7
10.56	0.54	125	125	0	13.15	32.26
10.62	0.6	130	130	0	13.85	33.92
10.68	0.66	136	136	0	14.64	35.68
10.74	0.72	142	142	0	15.49	37.57
10.8	0.78	149	149	0	16.44	39.59
10.86	0.84	156	156	0	17.45	41.75
10.92	0.9	164	164	0	18.51	44.08
10.98	0.96	172	172	0	19.63	46.58
11.04	1.02	180	180	0	20.81	49.26
11.1	1.08	190	190	0	22.15	52.15
11.16	1.14	200	200	0	23.68	55.28
11.22	1.2	210	210	0	25.53	58.68
11.28	1.26	222	222	0	27.64	62.41
11.34	1.32	235	235	0	30	66.54
11.4	1.38	249	249	0	32.6	71.12
11.46	1.44	265	265	0	35.35	76.21
11.52	1.5	283	283	0	38.79	82.09
11.58	1.56	307	307	0	45.87	89.3
11.64	1.62	342	342	0	59.91	99.12
11.7	1.68	396	396	0	88.08	114
11.76	1.74	479	476	3	130.97	136
11.82	1.8	608	562	46	194.14	171
11.88	1.86	819	702.67	116.33	287.35	226
11.94	1.92	1124	906	218	406.59	304
12	1.98	1501	1157.33	343.67	504.11	406
12.06	2.04	1909	1429.33	479.67	541.25	528
12.12	2.1	2297	1688	609	492.83	662
12.18	2.16	2682	1944.67	737.33	399.27	795
12.24	2.22	3038	2182	856	307.77	912
12.3	2.28	3284	2346	938	234.25	997
12.36	2.34	3352	2391.33	960.67	182.41	1046
12.42	2.4	3242	2318	924	149.17	1058
12.48	2.46	2987	2148	839	123.66	1038
12.54	2.52	2644	1919.33	724.67	105.26	993
12.6	2.58	2282	1678	604	90.83	929
12.66	2.64	1946	1454	492	79.53	853
12.72	2.7	1657	1261.33	395.67	71.12	770
12.78	2.76	1418	1102	316	64.77	689
12.84	2.82	1226	974	252	59.88	615
12.9	2.88	1074	872.67	201.33	56	552
12.96	2.94	953	792	161	52.79	498
13.02	3	858	728.67	129.33	50.12	452
13.08	3.06	785	680	105	47.83	411
13.14	3.12	728	642	86	45.79	374
13.2	3.18	682	611.33	70.67	43.97	342
13.26	3.24	643	585.33	57.67	42.36	314
13.32	3.3	609	562.67	46.33	40.94	289
13.38	3.36	577	541.33	35.67	39.64	268
13.44	3.42	550	523.33	26.67	38.4	249
13.5	3.48	525	506.67	18.33	37.2	232
13.56	3.54	500	490	10	36.04	217
13.62	3.6	473	472	1	34.94	204
13.68	3.66	446	446	0	33.89	192
13.74	3.72	421	421	0	32.91	182
13.8	3.78	398	398	0	31.99	172
13.86	3.84	378	378	0	31.1	164
13.92	3.9	361	361	0	30.24	156
13.98	3.96	346	346	0	29.4	149
14.04	4.02	332	332	0	28.59	143
14.1	4.08	321	321	0	27.82	137
14.16	4.14	310	310	0	27.12	132
14.22	4.2	301	301	0	26.54	127
14.28	4.26	292	292	0	26.05	122
14.34	4.32	284	284	0	25.64	118
14.4	4.38	277	277	0	25.28	114
14.46	4.44	270	270	0	24.94	110
14.52	4.5	264	264	0	24.63	107
14.58	4.56	258	258	0	24.34	103
14.64	4.62	254	254	0	24.04	101
14.7	4.68	249	249	0	23.75	98
14.76	4.74	245	245	0	23.46	96
14.82	4.8	241	241	0	23.17	94
14.88	4.86	237	237	0	22.89	93
14.94	4.92	234	234	0	22.61	91
15	4.98	230	230	0	22.32	90
15.06	5.04	227	227	0	22.04	88.37
15.12	5.1	223	223	0	21.75	87.05
15.18	5.16	220	220	0	21.46	85.78
15.24	5.22	217	217	0	21.18	84.56
15.3	5.28	214	214	0	20.89	83.37
15.36	5.34	211	211	0	20.61	82.21
15.42	5.4	207	207	0	20.32	81.07
15.48	5.46	204	204	0	20.03	79.95
15.54	5.52	201	201	0	19.74	78.85
15.6	5.58	198	198	0	19.45	77.76
15.66	5.64	195	195	0	19.16	76.68
15.72	5.7	192	192	0	18.87	75.61
15.78	5.76	189	189	0	18.58	74.55
15.84	5.82	186	186	0	18.29	73.49
15.9	5.88	182	182	0	18	72.43
15.96	5.94	179	179	0	17.7	71.38
16.02	6	176	176	0	17.41	70.33
16.08	6.06	173	173	0	17.14	69.29
16.14	6.12	170	170	0	16.88	68.25
16.2	6.18	167	167	0	16.66	67.22
16.26	6.24	164	164	0	16.47	66.22
16.32	6.3	162	162	0	16.32	65.24
16.38	6.36	159	159	0	16.19	64.3
16.44	6.42	157	157	0	16.06	63.41
16.5	6.48	155	155	0	15.94	62.57
16.56	6.54	153	153	0	15.84	61.78
16.62	6.6	151	151	0	15.73	61.05
16.68	6.66	150	150	0	15.63	60.37
16.74	6.72	148	148	0	15.52	59.74
16.8	6.78	147	147	0	15.42	59.15
16.86	6.84	146	146	0	15.32	58.6
16.92	6.9	145	145	0	15.22	58.07
16.98	6.96	144	144	0	15.12	57.58
17.04	7.02	143	143	0	15	57.1
17.1	7.08	142	142	0	14.9	56.64
17.16	7.14	141	141	0	14.8	56.2
17.22	7.2	140	140	0	14.7	55.77
17.28	7.26	139	139	0	14.6	55.35
17.34	7.32	138	138	0	14.49	54.94
17.4	7.38	137	137	0	14.39	54.53

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

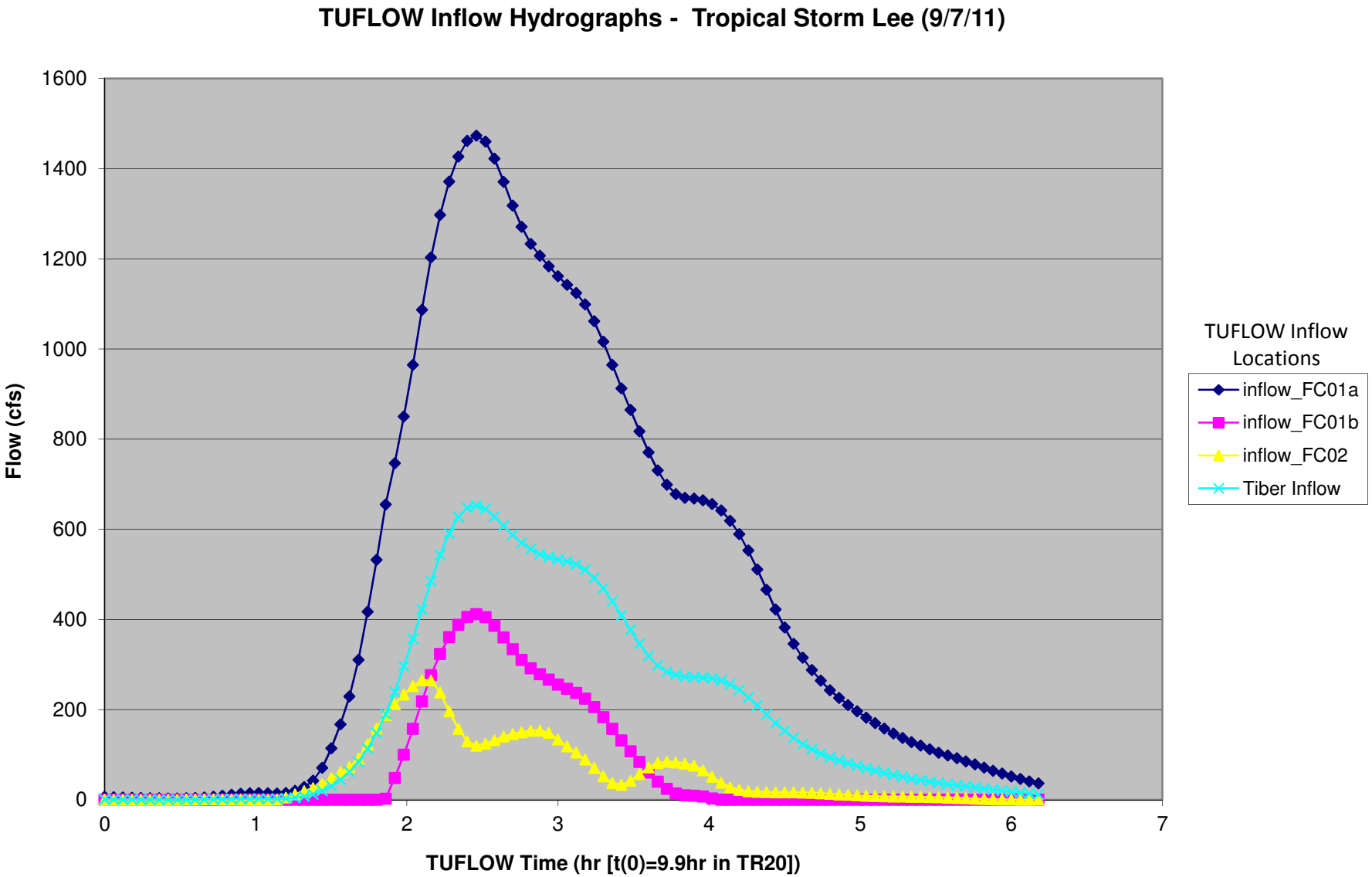
17.46	7.44	136	136	0	14.29	54.13
17.52	7.5	135	135	0	14.19	53.74
17.58	7.56	134	134	0	14.08	53.35
17.64	7.62	133	133	0	13.97	52.96
17.7	7.68	132	132	0	13.87	52.58
17.76	7.74	131	131	0	13.77	52.2
17.82	7.8	130	130	0	13.66	51.82
17.88	7.86	129	129	0	13.56	51.44
17.94	7.92	129	129	0	13.46	51.06
18	7.98	128	128	0	13.35	50.68


TUFLOW Inflow Hydrographs - 100-yr Storm Event - Existing Conditions
Inflow (cfs)
3000
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02hr in TR20])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

:al Storm Lee Event -9/7/11- 24 hour rainfall data)

Tuflow Inflow Time hr	TR-20 Time hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
0	9.9	6.53	6.53	0	0.01	0.84
0.06	9.96	5.65	5.65	0	0.01	0.71
0.12	10.02	4.89	4.89	0	0.01	0.6
0.18	10.08	4.28	4.28	0	0	0.5
0.24	10.14	3.79	3.79	0	0	0.42
0.3	10.2	3.42	3.42	0	0	0.35
0.36	10.26	3.14	3.14	0	0.01	0.3
0.42	10.32	2.96	2.96	0	0.08	0.28
0.48	10.38	2.94	2.94	0	0.27	0.31
0.54	10.44	3.17	3.17	0	0.57	0.4
0.6	10.5	3.8	3.8	0	0.87	0.56
0.66	10.56	5	5	0	1.07	0.79
0.72	10.62	6.75	6.75	0	1.06	1.08
0.78	10.68	8.94	8.94	0	0.87	1.39
0.84	10.74	11.26	11.26	0	0.62	1.66
0.9	10.8	13.25	13.25	0	0.4	1.87
0.96	10.86	14.53	14.53	0	0.25	1.98
1.02	10.92	14.88	14.88	0	0.16	2
1.08	10.98	14.29	14.29	0	0.1	1.95
1.14	11.04	13.51	13.51	0	0.79	2.07
1.2	11.1	15.03	15.03	0	4.89	2.8
1.26	11.16	19.9	19.9	0	11.94	4.44
1.32	11.22	27.86	27.86	0	19.27	7.37
1.38	11.28	42.36	42.36	0	26.03	12.3
1.44	11.34	71	71	0	35.24	19.99
1.5	11.4	114	114	0	48.33	30.67
1.56	11.46	167	167	0	61.25	44.35
1.62	11.52	229	229	0	72.74	62
1.68	11.58	310	310	0	91.86	84
1.74	11.64	417	417	0	123.63	113
1.8	11.7	532	511.33	20.67	158.44	148
1.86	11.76	657	594.67	62.33	188.04	190
1.92	11.82	795	686.67	108.33	212.18	239
1.98	11.88	950	790	160	233.59	296
2.04	11.94	1122	904.67	217.33	251.96	357
2.1	12	1305	1026.67	278.33	265.4	422
2.16	12.06	1479	1142.67	336.33	264.54	485
2.22	12.12	1621	1237.33	383.67	237.96	543
2.28	12.18	1732	1311.33	420.67	196.02	591
2.34	12.24	1815	1366.67	448.33	157.37	627
2.4	12.3	1867	1401.33	465.67	129.67	648
2.46	12.36	1885	1413.33	471.67	119.99	653
2.52	12.42	1865	1400	465	124.5	645
2.58	12.48	1808	1362	446	132	628
2.64	12.54	1731	1310.67	420.33	140.19	608
2.7	12.6	1652	1258	394	146.03	588
2.76	12.66	1581	1210.67	370.33	149.71	570
2.82	12.72	1525	1173.33	351.67	153.07	556
2.88	12.78	1485	1146.67	338.33	153.77	545
2.94	12.84	1450	1123.33	326.67	148.38	538
3	12.9	1417	1101.33	315.67	134.03	533
3.06	12.96	1388	1082	306	118.46	529
3.12	13.02	1361	1064	297	104.66	522
3.18	13.08	1323	1038.67	284.33	89.3	510
3.24	13.14	1267	1001.33	265.67	70.96	492
3.3	13.2	1199	956	243	52.13	469
3.36	13.26	1122	904.67	217.33	37.49	440
3.42	13.32	1044	852.67	191.33	33.38	409
3.48	13.38	972	804.67	167.33	42.15	377
3.54	13.44	901	757.33	143.67	57.3	346
3.6	13.5	831	710.67	120.33	71.7	319
3.66	13.56	771	670.67	100.33	81.74	298
3.72	13.62	723	638.67	84.33	84.4	284
3.78	13.68	692	618	74	82.84	277
3.84	13.74	680	610	70	80.19	273
3.9	13.8	677	608	69	75.53	272
3.96	13.86	671	604	67	65.36	271
4.02	13.92	659	596	63	51.11	269
4.08	13.98	642	584.67	57.33	37.91	264
4.14	14.04	619	569.33	49.67	27.71	256
4.2	14.1	589	549.33	39.67	21.77	244
4.26	14.16	553	525.33	27.67	18.87	227
4.32	14.22	511	497.33	13.67	17.66	209
4.38	14.28	466	466	0	17.08	189
4.44	14.34	422	422	0	16.75	170
4.5	14.4	382	382	0	16.5	153
4.56	14.46	346	346	0	16.32	137
4.62	14.52	315	315	0	16.13	123
4.68	14.58	288	288	0	15.56	112
4.74	14.64	264	264	0	14.37	102
4.8	14.7	243	243	0	13	94
4.86	14.76	226	226	0	11.84	87
4.92	14.82	210	210	0	10.84	81
4.98	14.88	196	196	0	9.82	75.31
5.04	14.94	182	182	0	8.84	69.8
5.1	15	170	170	0	8.07	64.56
5.16	15.06	158	158	0	7.51	59.63
5.22	15.12	147	147	0	7.16	54.99
5.28	15.18	137	137	0	6.95	50.7
5.34	15.24	128	128	0	6.81	46.77
5.4	15.3	120	120	0	6.6	43.2
5.46	15.36	112	112	0	6.09	40
5.52	15.42	104	104	0	5.35	37.13
5.58	15.48	98	98	0	4.65	34.52
5.64	15.54	92	92	0	4.03	32.06
5.7	15.6	85	85	0	3.3	29.67
5.76	15.66	78.54	78.54	0	2.44	27.33
5.82	15.72	71.2	71.2	0	1.67	25
5.88	15.78	64.45	64.45	0	1.07	22.67
5.94	15.84	57.99	57.99	0	0.65	20.32
6	15.9	51.84	51.84	0	0.41	17.98
6.06	15.96	46.02	46.02	0	0.25	15.68
6.12	16.02	40.6	40.6	0	0.22	13.53
6.18	16.08	36.32	36.32	0	0.68	11.64

Comments
t=0= 9.9 hrs in TR-20 (24 hr storm event)
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow
USES A 6.18 HR INFLOW DURATION.
STORM EVENT.

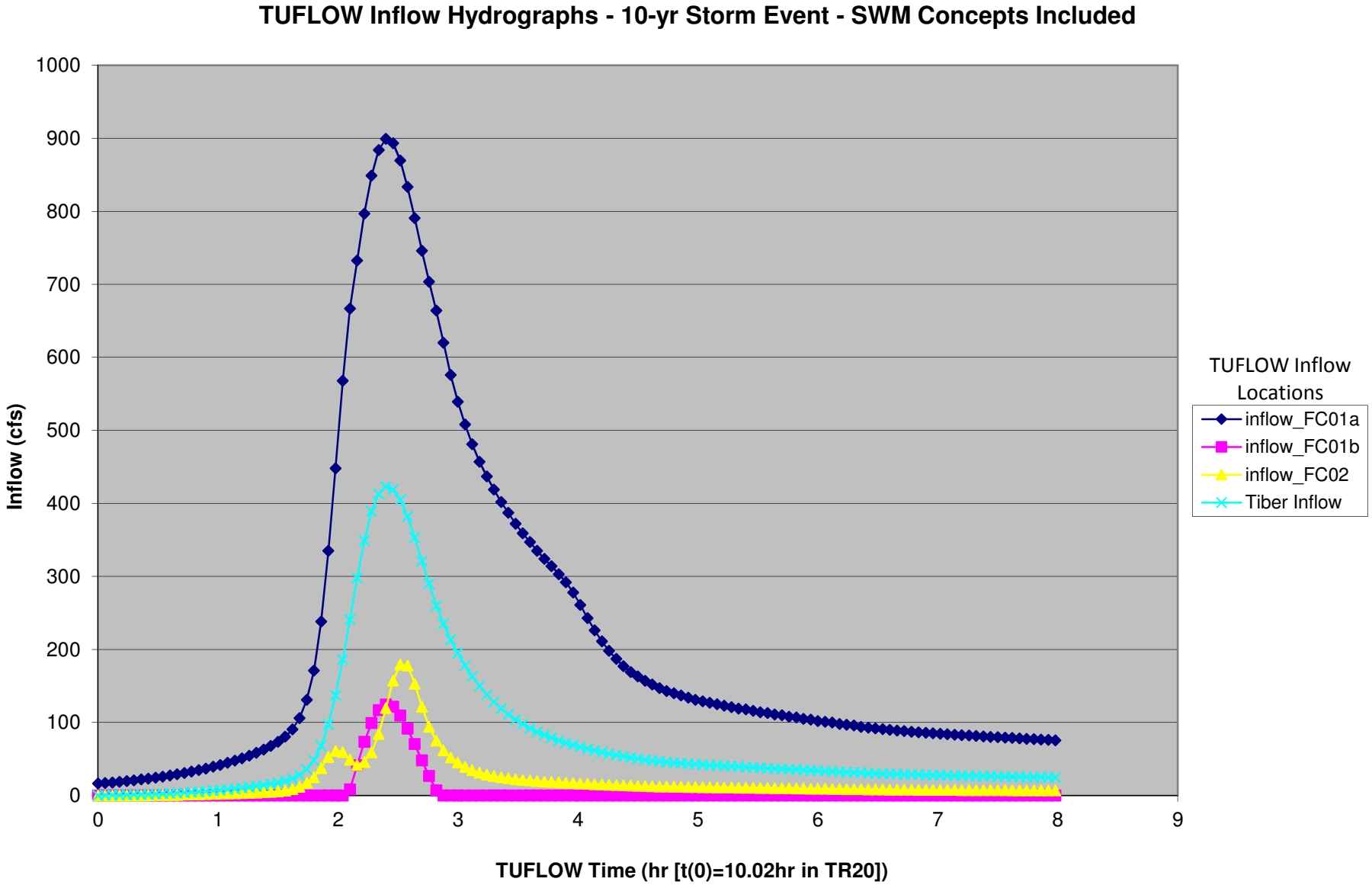

TUFLOW Inflow Hydrographs - Tropical Storm Lee (9/7/11)
Flow (cfs)
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
TUFLOW Time (hr [t(0)=9.9hr in TR20])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

Tuflow Inflow Hydrograph Data- 10-yr Storm Event- SWM Concepts Included

TR-20 Time hr	inflow_time_hr hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
10.02	0	16.25	16.25	0	0	0
10.08	0.06	17.02	17.02	0	0	0.4
10.14	0.12	17.86	17.86	0	0	0.55
10.2	0.18	18.76	18.76	0	0	0.74
10.26	0.24	19.73	19.73	0	0	0.96
10.32	0.3	20.77	20.77	0	0	1.21
10.38	0.36	21.89	21.89	0	0	1.5
10.44	0.42	23.09	23.09	0	0.45	1.82
10.5	0.48	24.37	24.37	0	0.54	2.17
10.56	0.54	25.77	25.77	0	0.63	2.57
10.62	0.6	27.27	27.27	0	0.72	3
10.68	0.66	28.91	28.91	0	0.82	3.47
10.74	0.72	30.68	30.68	0	1.4	3.98
10.8	0.78	32.59	32.59	0	1.58	4.54
10.86	0.84	34.65	34.65	0	1.79	5.15
10.92	0.9	36.86	36.86	0	1.99	5.82
10.98	0.96	39.25	39.25	0	2.21	6.54
11.04	1.02	41.83	41.83	0	2.45	7.33
11.1	1.08	44.62	44.62	0	2.72	8.2
11.16	1.14	47.63	47.63	0	3.02	9.15
11.22	1.2	50.89	50.89	0	3.37	10.19
11.28	1.26	54.46	54.46	0	3.74	11.35
11.34	1.32	58.42	58.42	0	4.16	12.64
11.4	1.38	62.84	62.84	0	4.62	14.09
11.46	1.44	67.77	67.77	0	5.11	15.71
11.52	1.5	73.35	73.35	0	5.69	17.6
11.58	1.56	80.47	80.47	0	6.77	19.96
11.64	1.62	90.5	90.5	0	8.74	23.18
11.7	1.68	106	106	0	12.19	28.05
11.76	1.74	131	131	0	17.28	35.65
11.82	1.8	171	171	0	24.89	47.94
11.88	1.86	238	238	0	37.3	67.74
11.94	1.92	335	335	0	52.71	97.27
12	1.98	448	448	0	61.03	137
12.06	2.04	568	535.3333333	32.66666667	59.33	186
12.12	2.1	675	606.6666667	68.33333333	48.95	241
12.18	2.16	774	672.6666667	101.3333333	41.79	298
12.24	2.22	870	736.6666667	133.3333333	45.85	349
12.3	2.28	948	788.6666667	159.3333333	59.03	389
12.36	2.34	1001	824	177	84.15	413
12.42	2.4	1024	839.3333333	184.6666667	119.88	423
12.48	2.46	1015	833.3333333	181.6666667	157.4	419
12.54	2.52	979	809.3333333	169.6666667	179.34	405
12.6	2.58	925	773.3333333	151.6666667	178.1	382
12.66	2.64	861	730.6666667	130.3333333	153.11	353
12.72	2.7	794	686	108	121.72	321
12.78	2.76	730	643.3333333	86.66666667	94.03	290
12.84	2.82	671	604	67	75.1	260
12.9	2.88	620	570	50	61.83	235
12.96	2.94	576	540.6666667	35.33333333	52.27	213
13.02	3	539	516	23	44.97	195
13.08	3.06	508	495.3333333	12.66666667	39.21	178
13.14	3.12	481	477.3333333	3.666666667	34.77	163
13.2	3.18	457	457	0	31.25	150
13.26	3.24	437	437	0	28.61	138
13.32	3.3	419	419	0	26.56	128
13.38	3.36	402	402	0	24.93	119
13.44	3.42	387	387	0	23.6	111
13.5	3.48	372	372	0	22.47	104
13.56	3.54	359	359	0	21.51	98
13.62	3.6	347	347	0	20.64	92
13.68	3.66	335	335	0	19.85	87
13.74	3.72	324	324	0	19.17	83
13.8	3.78	314	314	0	18.55	79
13.86	3.84	303	303	0	17.98	75
13.92	3.9	292	292	0	17.44	72.11
13.98	3.96	278	278	0	16.92	69.09
14.04	4.02	261	261	0	16.43	66.32
14.1	4.08	243	243	0	15.94	63.77
14.16	4.14	226	226	0	15.5	61.43
14.22	4.2	211	211	0	15.09	59.26
14.28	4.26	198	198	0	14.71	57.25
14.34	4.32	187	187	0	14.35	55.35
14.4	4.38	177	177	0	14	53.57
14.46	4.44	169	169	0	13.67	51.9
14.52	4.5	163	163	0	13.33	50.35
14.58	4.56	157	157	0	13.02	48.93
14.64	4.62	152	152	0	12.72	47.69
14.7	4.68	147	147	0	12.46	46.62
14.76	4.74	143	143	0	12.25	45.69
14.82	4.8	140	140	0	12.05	44.86
14.88	4.86	137	137	0	11.89	44.1
14.94	4.92	134	134	0	11.74	43.39
15	4.98	131	131	0	11.59	42.73
15.06	5.04	129	129	0	11.46	42.1
15.12	5.1	127	127	0	11.32	41.5
15.18	5.16	125	125	0	11.19	40.92
15.24	5.22	123	123	0	11.06	40.36
15.3	5.28	121	121	0	10.93	39.82
15.36	5.34	119	119	0	10.79	39.28
15.42	5.4	118	118	0	10.66	38.76
15.48	5.46	116	116	0	10.53	38.25
15.54	5.52	114	114	0	10.4	37.74
15.6	5.58	113	113	0	10.26	37.24
15.66	5.64	111	111	0	10.13	36.74
15.72	5.7	110	110	0	10	36.25
15.78	5.76	108	108	0	9.86	35.75
15.84	5.82	107	107	0	9.73	35.26
15.9	5.88	105	105	0	9.59	34.77
15.96	5.94	104	104	0	9.46	34.28
16.02	6	102	102	0	9.32	33.79
16.08	6.06	101	101	0	9.19	33.31
16.14	6.12	100	100	0	9.06	32.82
16.2	6.18	98	98	0	8.94	32.34
16.26	6.24	97	97	0	8.81	31.87
16.32	6.3	96	96	0	8.69	31.41
16.38	6.36	94	94	0	8.57	30.98
16.44	6.42	93	93	0	8.45	30.56
16.5	6.48	91.91	91.91	0	8.33	30.17
16.56	6.54	90.85	90.85	0	8.21	29.8
16.62	6.6	89.85	89.85	0	8.1	29.46
16.68	6.66	88.93	88.93	0	8	29.14
16.74	6.72	88.07	88.07	0	7.93	28.85
16.8	6.78	87.27	87.27	0	7.86	28.57
16.86	6.84	86.51	86.51	0	7.79	28.31
16.92	6.9	85.79	85.79	0	7.74	28.07
16.98	6.96	85.11	85.11	0	7.68	27.84
17.04	7.02	84.45	84.45	0	7.63	27.62
17.1	7.08	83.82	83.82	0	7.58	27.41
17.16	7.14	83.21	83.21	0	7.53	27.2
17.22	7.2	82.61	82.61	0	7.48	27
17.28	7.26	82.03	82.03	0	7.43	26.81
17.34	7.32	81.45	81.45	0	7.39	26.62
17.4	7.38	80.89	80.89	0	7.34	26.43

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

17.46	7.44	80.33	80.33	0	7.29	26.25
17.52	7.5	79.78	79.78	0	7.24	26.06
17.58	7.56	79.23	79.23	0	7.19	25.88
17.64	7.62	78.68	78.68	0	7.14	25.7
17.7	7.68	78.14	78.14	0	7.1	25.52
17.76	7.74	77.61	77.61	0	7.05	25.35
17.82	7.8	77.07	77.07	0	7	25.17
17.88	7.86	76.53	76.53	0	6.95	24.99
17.94	7.92	76	76	0	6.9	24.82
18	7.98	75.47	75.47	0	6.85	24.64

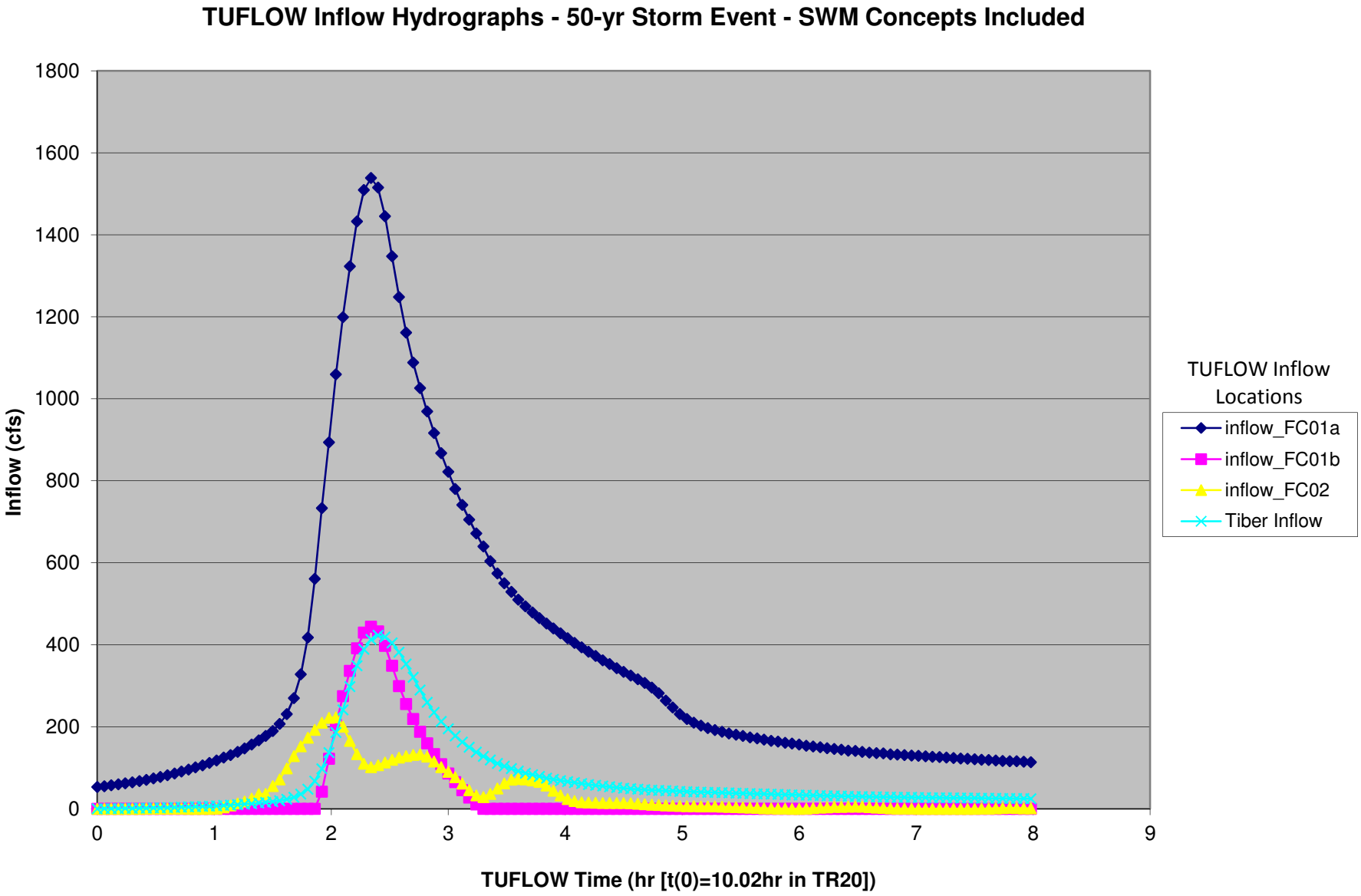

TUFLOW Inflow Hydrographs - 10-yr Storm Event - SWM Concepts Included
Inflow (cfs)
1000
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02hr in TR20])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

Tuflow Inflow Hydrograph Data- 50-yr Storm Event- SWM Concepts Included

TR-20 Time hr	inflow_time_hr hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
10.02	0	53.3	53.3	0	0	0
10.08	0.06	55.18	55.18	0	0	0.4
10.14	0.12	57.26	57.26	0	0	0.55
10.2	0.18	59.54	59.54	0	0	0.74
10.26	0.24	62.02	62.02	0	0	0.96
10.32	0.3	64.67	64.67	0	0.04	1.21
10.38	0.36	67.52	67.52	0	0.16	1.5
10.44	0.42	70.64	70.64	0	0.33	1.82
10.5	0.48	74.13	74.13	0	0.5	2.17
10.56	0.54	78	78	0	0.61	2.57
10.62	0.6	82	82	0	0.61	3
10.68	0.66	86	86	0	0.5	3.47
10.74	0.72	91	91	0	0.35	3.98
10.8	0.78	96	96	0	0.23	4.54
10.86	0.84	101	101	0	0.14	5.15
10.92	0.9	106	106	0	0.09	5.82
10.98	0.96	112	112	0	0.06	6.54
11.04	1.02	118	118	0	0.53	7.33
11.1	1.08	125	125	0	3.33	8.2
11.16	1.14	131	131	0	8.17	9.15
11.22	1.2	139	139	0	13.23	10.19
11.28	1.26	147	147	0	18.03	11.35
11.34	1.32	157	157	0	25.13	12.64
11.4	1.38	167	167	0	35.71	14.09
11.46	1.44	178	178	0	36.24	15.71
11.52	1.5	190	190	0	55.8	17.6
11.58	1.56	207	207	0	71.95	19.96
11.64	1.62	231	231	0	99.04	23.18
11.7	1.68	270	270	0	128.64	28.05
11.76	1.74	328	328	0	152.69	35.65
11.82	1.8	418	418	0	173.51	47.94
11.88	1.86	561	530.7	30.3	192.65	67.74
11.94	1.92	775	673.3	101.7	209.83	97.27
12	1.98	1016	834	182	222.21	137
12.06	2.04	1265	1000	265	223.05	186
12.12	2.1	1474	1139.3	334.7	200.69	241
12.18	2.16	1660	1263.3	396.7	165.85	298
12.24	2.22	1824	1372.7	451.3	133.28	349
12.3	2.28	1939	1449.3	489.7	109.88	389
12.36	2.34	1983	1478.7	504.3	101.76	413
12.42	2.4	1948	1455.3	492.7	106.65	423
12.48	2.46	1843	1385.3	457.7	113.23	419
12.54	2.52	1697	1288	409	119.98	405
12.6	2.58	1548	1188.7	359.3	125.07	382
12.66	2.64	1417	1101.3	315.7	128.94	353
12.72	2.7	1308	1028.7	279.3	131.71	321
12.78	2.76	1214	966	248	132.67	290
12.84	2.82	1129	909.3	219.7	127.72	260
12.9	2.88	1050	856.7	193.3	115.4	235
12.96	2.94	976	807.3	168.7	101.93	213
13.02	3	908	762	146	90.2	195
13.08	3.06	845	720	125	77.45	178
13.14	3.12	787	681.3	105.7	61.57	163
13.2	3.18	733	645.3	87.7	45.55	150
13.26	3.24	683	612	71	32.88	138
13.32	3.3	640	583.3	56.7	28.92	128
13.38	3.36	604	559.3	44.7	36.55	119
13.44	3.42	574	539.3	34.7	49.71	111
13.5	3.48	550	523.3	26.7	62.22	104
13.56	3.54	529	509.3	19.7	70.95	98
13.62	3.6	510	496.7	13.3	73.28	92
13.68	3.66	494	486	8	71.97	87
13.74	3.72	479	476	3	69.69	83
13.8	3.78	465	465	0	65.65	79
13.86	3.84	452	452	0	56.84	75
13.92	3.9	440	440	0	44.45	72.11
13.98	3.96	428	428	0	32.98	69.09
14.04	4.02	416	416	0	24.11	66.32
14.1	4.08	405	405	0	18.94	63.77
14.16	4.14	394	394	0	16.42	61.43
14.22	4.2	383	383	0	15.37	59.26
14.28	4.26	373	373	0	14.87	57.25
14.34	4.32	362	362	0	14.58	55.35
14.4	4.38	353	353	0	14.36	53.57
14.46	4.44	343	343	0	14.2	51.9
14.52	4.5	334	334	0	14.05	50.35
14.58	4.56	325	325	0	13.55	48.93
14.64	4.62	316	316	0	12.52	47.69
14.7	4.68	307	307	0	11.33	46.62
14.76	4.74	296	296	0	10.32	45.69
14.82	4.8	282	282	0	9.44	44.86
14.88	4.86	264	264	0	8.55	44.1
14.94	4.92	247	247	0	7.71	43.39
15	4.98	231	231	0	7.04	42.73
15.06	5.04	219	219	0	6.54	42.1
15.12	5.1	210	210	0	6.25	41.5
15.18	5.16	203	203	0	6.06	40.92
15.24	5.22	197	197	0	5.94	40.36
15.3	5.28	192	192	0	5.75	39.82
15.36	5.34	188	188	0	5.31	39.28
15.42	5.4	184	184	0	4.66	38.76
15.48	5.46	181	181	0	4.05	38.25
15.54	5.52	178	178	0	3.52	37.74
15.6	5.58	174	174	0	2.88	37.24
15.66	5.64	172	172	0	2.13	36.74
15.72	5.7	169	169	0	1.45	36.25
15.78	5.76	166	166	0	0.93	35.75
15.84	5.82	164	164	0	0.57	35.26
15.9	5.88	161	161	0	0.36	34.77
15.96	5.94	159	159	0	0.22	34.28
16.02	6	157	157	0	0.19	33.79
16.08	6.06	154	154	0	0.58	33.31
16.14	6.12	152	152	0	1.59	32.82
16.2	6.18	150	150	0	2.79	32.34
16.26	6.24	148	148	0	3.81	31.87
16.32	6.3	146	146	0	4.53	31.41
16.38	6.36	144	144	0	4.95	30.98
16.44	6.42	142	142	0	5.18	30.56
16.5	6.48	141	141	0	5.3	30.17
16.56	6.54	139	139	0	5.13	29.8
16.62	6.6	137	137	0	4.32	29.46
16.68	6.66	136	136	0	3.2	29.14
16.74	6.72	135	135	0	2.17	28.85
16.8	6.78	133	133	0	1.37	28.57
16.86	6.84	132	132	0	0.84	28.31
16.92	6.9	131	131	0	0.53	28.07
16.98	6.96	130	130	0	0.33	27.84
17.04	7.02	129	129	0	0.21	27.62
17.1	7.08	128	128	0	0.13	27.41
17.16	7.14	127	127	0	0.08	27.2
17.22	7.2	126	126	0	0.05	27
17.28	7.26	125	125	0	0.03	26.81
17.34	7.32	124	124	0	0.02	26.62
17.4	7.38	123	123	0	0.01	26.43

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

17.46	7.44	122	122	0	0	26.25
17.52	7.5	121	121	0	0.03	26.06
17.58	7.56	120	120	0	0.26	25.88
17.64	7.62	119	119	0	0.8	25.7
17.7	7.68	118	118	0	1.45	25.52
17.76	7.74	117	117	0	1.97	25.35
17.82	7.8	116	116	0	2.16	25.17
17.88	7.86	116	116	0	1.91	24.99
17.94	7.92	115	115	0	1.41	24.82
18	7.98	114	114	0	0.95	24.64

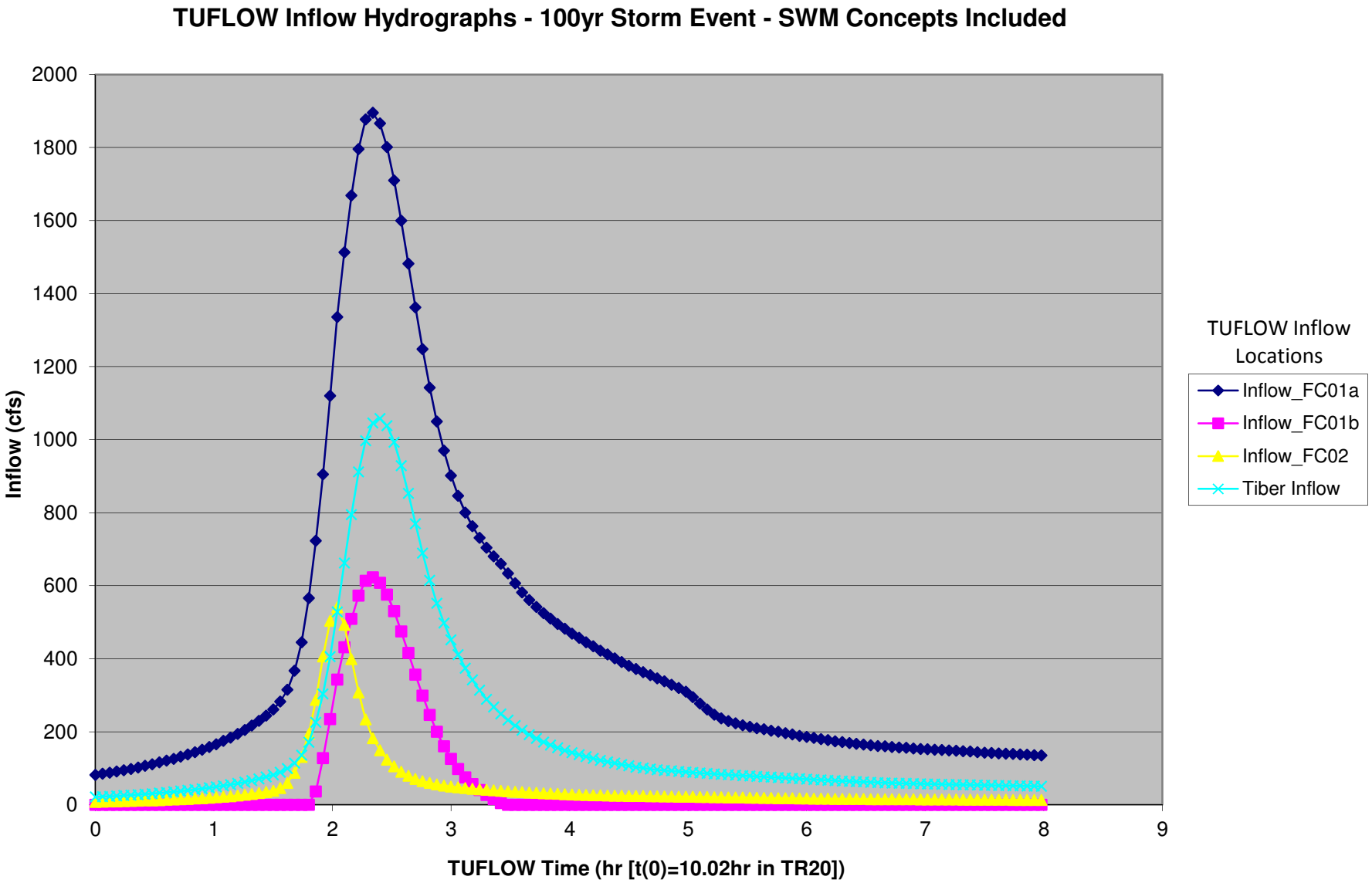

TUFLOW Inflow Hydrographs - 50-yr Storm Event - SWM Concepts Included
Inflow (cfs)
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02hr in TR20])
TUFLOW Inflow Locations
inflow_FC01a
inflow_FC01b
inflow_FC02
Tiber Inflow

Tuflow Inflow Hydrograph Data- 100-yr Storm Event- SWM Concepts Included

TR-20 Time hr	inflow_time_hr hr	inflow_FC01 cfs	inflow_FC01a cfs	inflow_FC01b cfs	inflow_FC02 cfs	Tiber Inflow cfs
10.02	0	82	82	0	8.34	21.46
10.08	0.06	85	85	0	8.74	22.34
10.14	0.12	88	88	0	9.16	23.29
10.2	0.18	91	91	0	9.64	24.32
10.26	0.24	95	95	0	10.15	25.42
10.32	0.3	98	98	0	10.69	26.61
10.38	0.36	102	102	0	11.26	27.88
10.44	0.42	107	107	0	11.86	29.24
10.5	0.48	111	111	0	12.48	30.7
10.56	0.54	116	116	0	13.15	32.26
10.62	0.6	121	121	0	13.85	33.92
10.68	0.66	126	126	0	14.64	35.68
10.74	0.72	132	132	0	15.49	37.57
10.8	0.78	138	138	0	16.44	39.59
10.86	0.84	144	144	0	17.45	41.75
10.92	0.9	151	151	0	18.51	44.08
10.98	0.96	158	158	0	19.63	46.58
11.04	1.02	166	166	0	20.81	49.26
11.1	1.08	175	175	0	22.15	52.15
11.16	1.14	184	184	0	23.68	55.28
11.22	1.2	194	194	0	25.53	58.68
11.28	1.26	205	205	0	27.64	62.41
11.34	1.32	217	217	0	30	66.54
11.4	1.38	230	230	0	32.6	71.12
11.46	1.44	244	244	0	35.35	76.21
11.52	1.5	261	261	0	38.79	82.09
11.58	1.56	283	283	0	45.87	89.3
11.64	1.62	315	315	0	59.91	99.12
11.7	1.68	367	367	0	88.08	114
11.76	1.74	445	445	0	130.97	136
11.82	1.8	566	534	32	194.14	171
11.88	1.86	760	663.3	96.7	287.35	226
11.94	1.92	1033	845.3	187.7	406.59	304
12	1.98	1355	1060	295	504.11	406
12.06	2.04	1679	1276	403	541.25	528
12.12	2.1	1945	1453.3	491.7	492.83	662
12.18	2.16	2178	1608.7	569.3	399.27	795
12.24	2.22	2369	1736	633	307.77	912
12.3	2.28	2491	1817.3	673.7	234.25	997
12.36	2.34	2518	1835.3	682.7	182.41	1046
12.42	2.4	2474	1806	668	149.17	1058
12.48	2.46	2377	1741.3	635.7	123.66	1038
12.54	2.52	2240	1650	590	105.26	993
12.6	2.58	2075	1540	535	90.83	929
12.66	2.64	1898	1422	476	79.53	853
12.72	2.7	1719	1302.7	416.3	71.12	770
12.78	2.76	1547	1188	359	64.77	689
12.84	2.82	1389	1082.7	306.3	59.88	615
12.9	2.88	1250	990	260	56	552
12.96	2.94	1130	910	220	52.79	498
13.02	3	1028	842	186	50.12	452
13.08	3.06	944	786	158	47.83	411
13.14	3.12	875	740	135	45.79	374
13.2	3.18	820	703.3	116.7	43.97	342
13.26	3.24	772	671.3	100.7	42.36	314
13.32	3.3	731	644	87	40.94	289
13.38	3.36	696	620.7	75.3	39.64	268
13.44	3.42	665	600	65	38.4	249
13.5	3.48	634	579.3	54.7	37.2	232
13.56	3.54	607	561.3	45.7	36.04	217
13.62	3.6	582	544.7	37.3	34.94	204
13.68	3.66	561	530.7	30.3	33.89	192
13.74	3.72	542	518	24	32.91	182
13.8	3.78	525	506.7	18.3	31.99	172
13.86	3.84	510	496.7	13.3	31.1	164
13.92	3.9	495	486.7	8.3	30.24	156
13.98	3.96	482	478	4	29.4	149
14.04	4.02	469	469	0	28.59	143
14.1	4.08	457	457	0	27.82	137
14.16	4.14	445	445	0	27.12	132
14.22	4.2	434	434	0	26.54	127
14.28	4.26	422	422	0	26.05	122
14.34	4.32	412	412	0	25.64	118
14.4	4.38	401	401	0	25.28	114
14.46	4.44	391	391	0	24.94	110
14.52	4.5	381	381	0	24.63	107
14.58	4.56	372	372	0	24.34	103
14.64	4.62	363	363	0	24.04	101
14.7	4.68	355	355	0	23.75	98
14.76	4.74	346	346	0	23.46	96
14.82	4.8	338	338	0	23.17	94
14.88	4.86	329	329	0	22.89	93
14.94	4.92	320	320	0	22.61	91
15	4.98	310	310	0	22.32	90
15.06	5.04	295	295	0	22.04	88.37
15.12	5.1	277	277	0	21.75	87.05
15.18	5.16	261	261	0	21.46	85.78
15.24	5.22	247	247	0	21.18	84.56
15.3	5.28	237	237	0	20.89	83.37
15.36	5.34	229	229	0	20.61	82.21
15.42	5.4	223	223	0	20.32	81.07
15.48	5.46	218	218	0	20.03	79.95
15.54	5.52	214	214	0	19.74	78.85
15.6	5.58	210	210	0	19.45	77.76
15.66	5.64	207	207	0	19.16	76.68
15.72	5.7	203	203	0	18.87	75.61
15.78	5.76	200	200	0	18.58	74.55
15.84	5.82	196	196	0	18.29	73.49
15.9	5.88	193	193	0	18	72.43
15.96	5.94	189	189	0	17.7	71.38
16.02	6	186	186	0	17.41	70.33
16.08	6.06	183	183	0	17.14	69.29
16.14	6.12	180	180	0	16.88	68.25
16.2	6.18	177	177	0	16.66	67.22
16.26	6.24	174	174	0	16.47	66.22
16.32	6.3	172	172	0	16.32	65.24
16.38	6.36	169	169	0	16.19	64.3
16.44	6.42	167	167	0	16.06	63.41
16.5	6.48	165	165	0	15.94	62.57
16.56	6.54	163	163	0	15.84	61.78
16.62	6.6	161	161	0	15.73	61.05
16.68	6.66	160	160	0	15.63	60.37
16.74	6.72	158	158	0	15.52	59.74
16.8	6.78	157	157	0	15.42	59.15
16.86	6.84	156	156	0	15.32	58.6
16.92	6.9	154	154	0	15.22	58.07
16.98	6.96	153	153	0	15.12	57.58
17.04	7.02	152	152	0	15	57.1
17.1	7.08	151	151	0	14.9	56.64
17.16	7.14	150	150	0	14.8	56.2
17.22	7.2	149	149	0	14.7	55.77
17.28	7.26	148	148	0	14.6	55.35
17.34	7.32	147	147	0	14.49	54.94
17.4	7.38	146	146	0	14.39	54.53

Comments
*24hr duration event generated using Atlas 14
cumulative rain depth and TR-20 default hydrograph
*for modeling purposes, inflows begin at t=10.02hr and run for 8 hours.
This captures maximum event flooding and eliminates tails.
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow

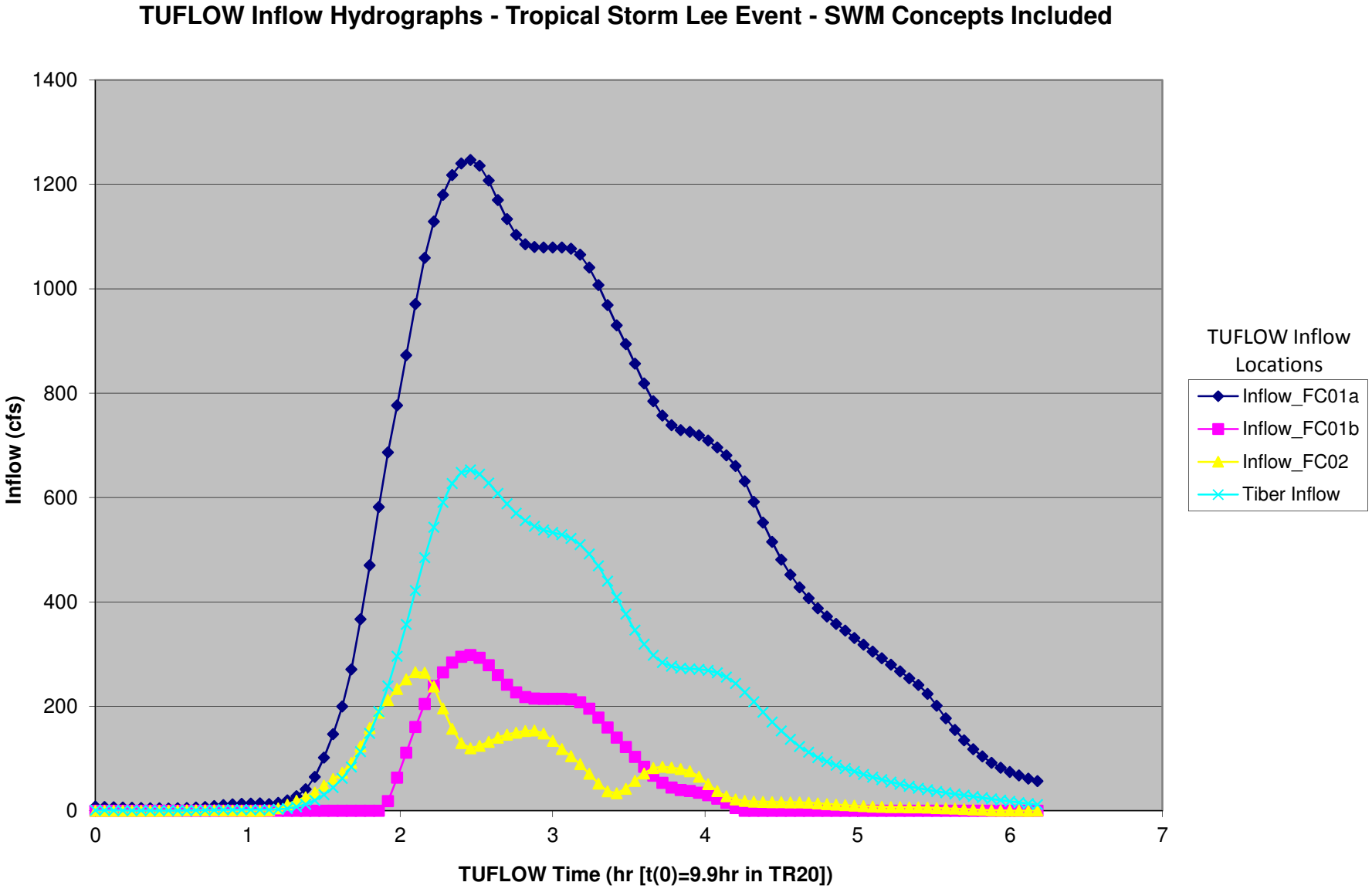
17.46	7.44	144	144	0	14.29	54.13
17.52	7.5	143	143	0	14.19	53.74
17.58	7.56	142	142	0	14.08	53.35
17.64	7.62	141	141	0	13.97	52.96
17.7	7.68	140	140	0	13.87	52.58
17.76	7.74	139	139	0	13.77	52.2
17.82	7.8	138	138	0	13.66	51.82
17.88	7.86	137	137	0	13.56	51.44
17.94	7.92	136	136	0	13.46	51.06
18	7.98	135	135	0	13.35	50.68


TUFLOW Inflow Hydrographs - 100yr Storm Event - SWM Concepts Included
Inflow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
TUFLOW Time (hr [t(0)=10.02hr in TR20])
TUFLOW Inflow Locations
Inflow_FC01a
Inflow_FC01b
Inflow_FC02
Tiber Inflow

pical Storm Lee Event -9/7/11- 24 hour rainfall data)

Tuflow Inflow Time	TR-20 Time	inflow_FC01	inflow_FC01a	inflow_FC01b	inflow_FC02	Tiber Inflow
hr	hr	cfs	cfs	cfs	cfs	cfs
0	9.9	8.02	8.02	0	0.01	0.84
0.06	9.96	7.25	7.25	0	0.01	0.71
0.12	10.02	6.56	6.56	0	0.01	0.6
0.18	10.08	5.96	5.96	0	0	0.5
0.24	10.14	5.45	5.45	0	0	0.42
0.3	10.2	5.05	5.05	0	0	0.35
0.36	10.26	4.72	4.72	0	0.01	0.3
0.42	10.32	4.49	4.49	0	0.08	0.28
0.48	10.38	4.41	4.41	0	0.27	0.31
0.54	10.44	4.57	4.57	0	0.57	0.4
0.6	10.5	5.07	5.07	0	0.87	0.56
0.66	10.56	5.99	5.99	0	1.07	0.79
0.72	10.62	7.3	7.3	0	1.06	1.08
0.78	10.68	8.93	8.93	0	0.87	1.39
0.84	10.74	10.67	10.67	0	0.62	1.66
0.9	10.8	12.23	12.23	0	0.4	1.87
0.96	10.86	13.33	13.33	0	0.25	1.98
1.02	10.92	13.77	13.77	0	0.16	2
1.08	10.98	14	14	0	0.1	1.95
1.14	11.04	13	13	0	0.79	2.07
1.2	11.1	15	15	0	4.89	2.8
1.26	11.16	20	20	0	11.94	4.44
1.32	11.22	28	28	0	19.27	7.37
1.38	11.28	41	41	0	26.03	12.3
1.44	11.34	65	65	0	35.24	19.99
1.5	11.4	102	102	0	48.33	30.67
1.56	11.46	147	147	0	61.25	44.35
1.62	11.52	200	200	0	72.74	62
1.68	11.58	271	271	0	91.86	84
1.74	11.64	367	367	0	123.63	113
1.8	11.7	470	470	0	158.44	148
1.86	11.76	582	582	0	188.04	190
1.92	11.82	705	686.6666667	18.33333333	212.18	239
1.98	11.88	840	776.6666667	63.33333333	233.59	296
2.04	11.94	984	872.6666667	111.3333333	251.96	357
2.1	12	1131	970.6666667	160.3333333	265.4	422
2.16	12.06	1264	1059.333333	204.6666667	264.54	485
2.22	12.12	1368	1128.666667	239.3333333	237.96	543
2.28	12.18	1445	1180	265	196.02	591
2.34	12.24	1502	1218	284	157.37	627
2.4	12.3	1535	1240	295	129.67	648
2.46	12.36	1545	1246.666667	298.3333333	119.99	653
2.52	12.42	1529	1236	293	124.5	645
2.58	12.48	1486	1207.333333	278.6666667	132	628
2.64	12.54	1430	1170	260	140.19	608
2.7	12.6	1375	1133.333333	241.6666667	146.03	588
2.76	12.66	1330	1103.333333	226.6666667	149.71	570
2.82	12.72	1303	1085.333333	217.6666667	153.07	556
2.88	12.78	1295	1080	215	153.77	545
2.94	12.84	1294	1079.333333	214.6666667	148.38	538
3	12.9	1294	1079.333333	214.6666667	134.03	533
3.06	12.96	1294	1079.333333	214.6666667	118.46	529
3.12	13.02	1290	1076.666667	213.3333333	104.66	522
3.18	13.08	1273	1065.333333	207.6666667	89.3	510
3.24	13.14	1236	1040.666667	195.3333333	70.96	492
3.3	13.2	1186	1007.333333	178.6666667	52.13	469
3.36	13.26	1128	968.6666667	159.3333333	37.49	440
3.42	13.32	1070	930	140	33.38	409
3.48	13.38	1016	894	122	42.15	377
3.54	13.44	960	856.6666667	103.3333333	57.3	346
3.6	13.5	903	818.6666667	84.33333333	71.7	319
3.66	13.56	852	784.6666667	67.33333333	81.74	298
3.72	13.62	811	757.3333333	53.66666667	84.4	284
3.78	13.68	783	738.6666667	44.33333333	82.84	277
3.84	13.74	769	729.3333333	39.66666667	80.19	273
3.9	13.8	764	726	38	75.53	272
3.96	13.86	754	719.3333333	34.66666667	65.36	271
4.02	13.92	739	709.3333333	29.66666667	51.11	269
4.08	13.98	719	696	23	37.91	264
4.14	14.04	696	680.6666667	15.33333333	27.71	256
4.2	14.1	666	660.6666667	5.333333333	21.77	244
4.26	14.16	631	631	0	18.87	227
4.32	14.22	592	592	0	17.66	209
4.38	14.28	552	552	0	17.08	189
4.44	14.34	515	515	0	16.75	170
4.5	14.4	481	481	0	16.5	153
4.56	14.46	452	452	0	16.32	137
4.62	14.52	428	428	0	16.13	123
4.68	14.58	407	407	0	15.56	112
4.74	14.64	388	388	0	14.37	102
4.8	14.7	372	372	0	13	94
4.86	14.76	358	358	0	11.84	87
4.92	14.82	345	345	0	10.84	81
4.98	14.88	331	331	0	9.82	75.31
5.04	14.94	318	318	0	8.84	69.8
5.1	15	305	305	0	8.07	64.56
5.16	15.06	292	292	0	7.51	59.63
5.22	15.12	280	280	0	7.16	54.99
5.28	15.18	267	267	0	6.95	50.7
5.34	15.24	254	254	0	6.81	46.77
5.4	15.3	241	241	0	6.6	43.2
5.46	15.36	224	224	0	6.09	40
5.52	15.42	201	201	0	5.35	37.13
5.58	15.48	177	177	0	4.65	34.52
5.64	15.54	155	155	0	4.03	32.06
5.7	15.6	135	135	0	3.3	29.67
5.76	15.66	118	118	0	2.44	27.33
5.82	15.72	104	104	0	1.67	25
5.88	15.78	91.93	91.93	0	1.07	22.67
5.94	15.84	82.48	82.48	0	0.65	20.32
6	15.9	74.36	74.36	0	0.41	17.98
6.06	15.96	67.47	67.47	0	0.25	15.68
6.12	16.02	61.34	61.34	0	0.22	13.53
6.18	16.08	56.67	56.67	0	0.68	11.64

Comments
t=0= 9.9 hrs in TR-20 (24 hr storm event)
FC01=TOTAL AT TR-20 XS76
FC01a=IF(FC01<=470, FC01, ((FC01-470)*(2/3)+470))
FC01b=FC01-FC01a
FC02=TOTAL AT TR-20 XS83 +XS85
FC03=Tiber Run Total Flow
USES A 6.18 HR INFLOW DURATION.
STORM EVENT.


TUFLOW Inflow Hydrographs - Tropical Storm Lee Event - SWM Concepts Included
Inflow (cfs)
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
TUFLOW Time (hr [t(0)=9.9hr in TR20])
TUFLOW Inflow Locations
Inflow_FC01a
Inflow_FC01b
Inflow_FC02
Tiber Inflow


Water Depth (ft)
0 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
1 - 2
2 - 3
3+
Ellicott Mills Dr
Frederick Road
100 Year Floodplain
Court Ave
Hill St
Merryman St
Church Rd
Main St
Old Columbia Pike
Ellicott City Flood Study
Flood Depth
Tropical Storm Lee
Existing Conditions
N
1 inch = 200 feet
0
200
400
Feet

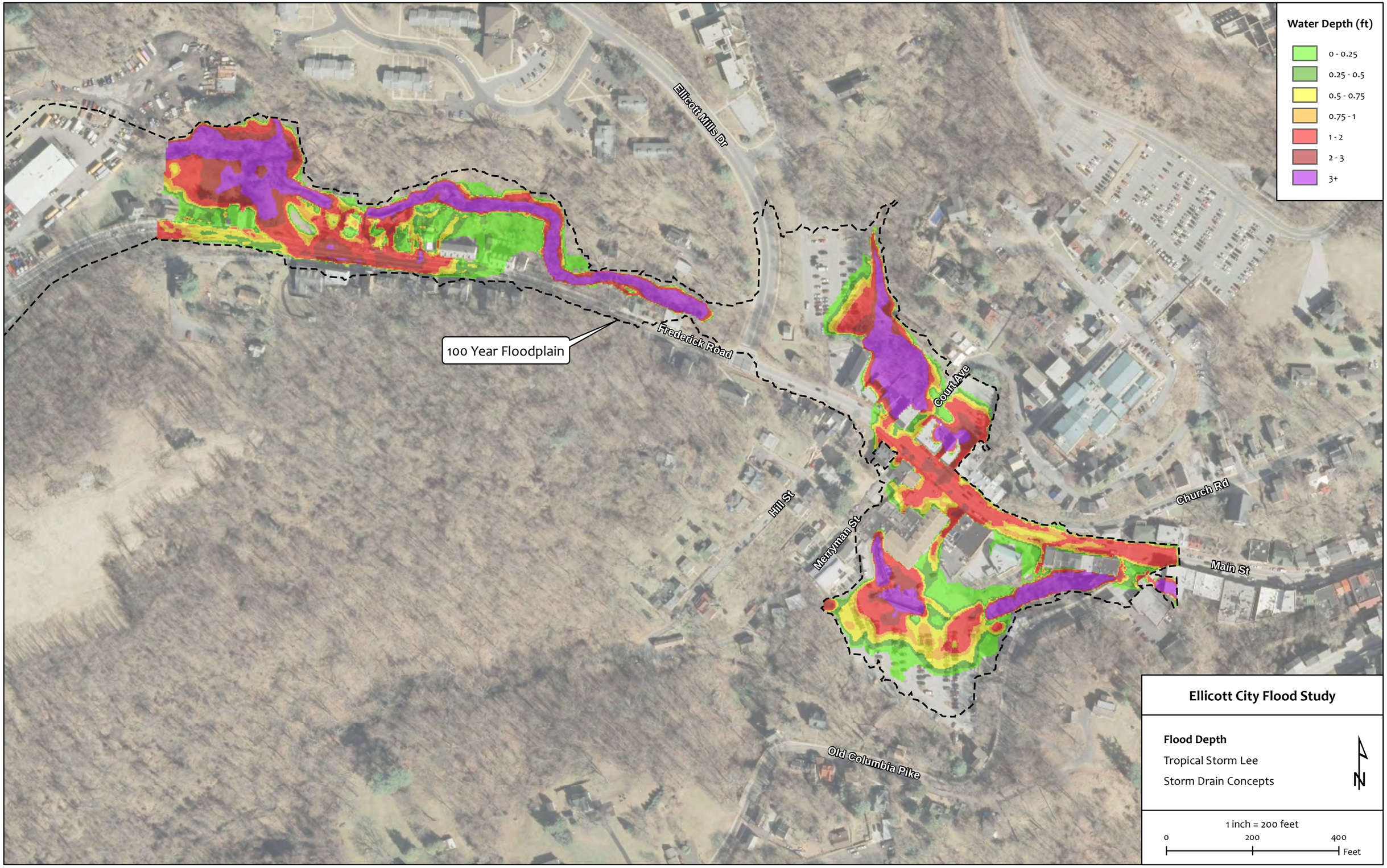
Ellicott City Flood Study

Appendix E:
Tropical Storm Lee
Existing Conditions
Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet


Water Depth (ft)
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Flood Depth
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Storm Drain Concepts
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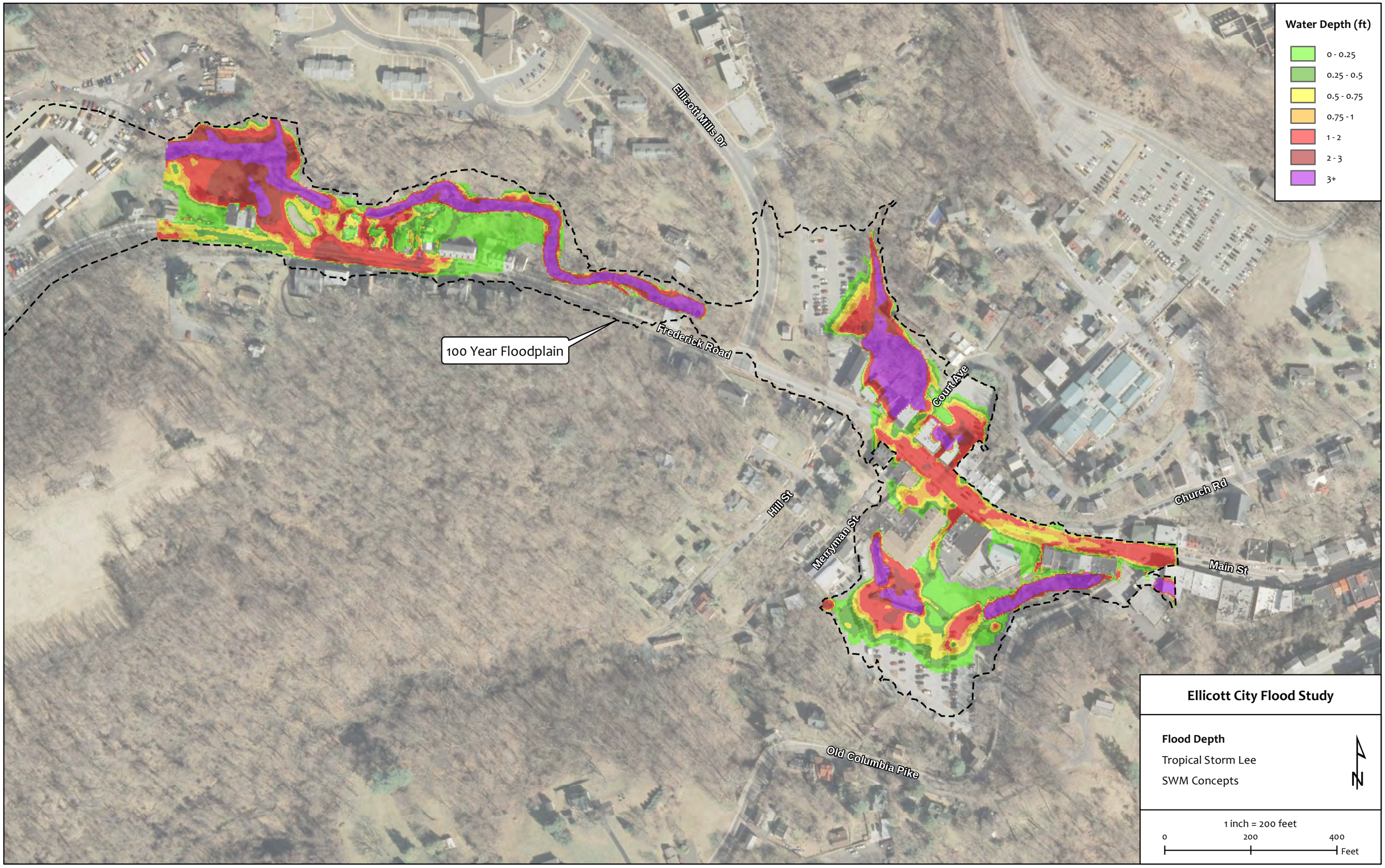
200
400
Feet

Ellicott City Flood Study

Appendix E:
Tropical Storm Lee
Storm Drain Concepts
Velocity at Time = 3 hrs

1 inch = 200 feet

0 200 400 Feet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Ellicott City Flood Study

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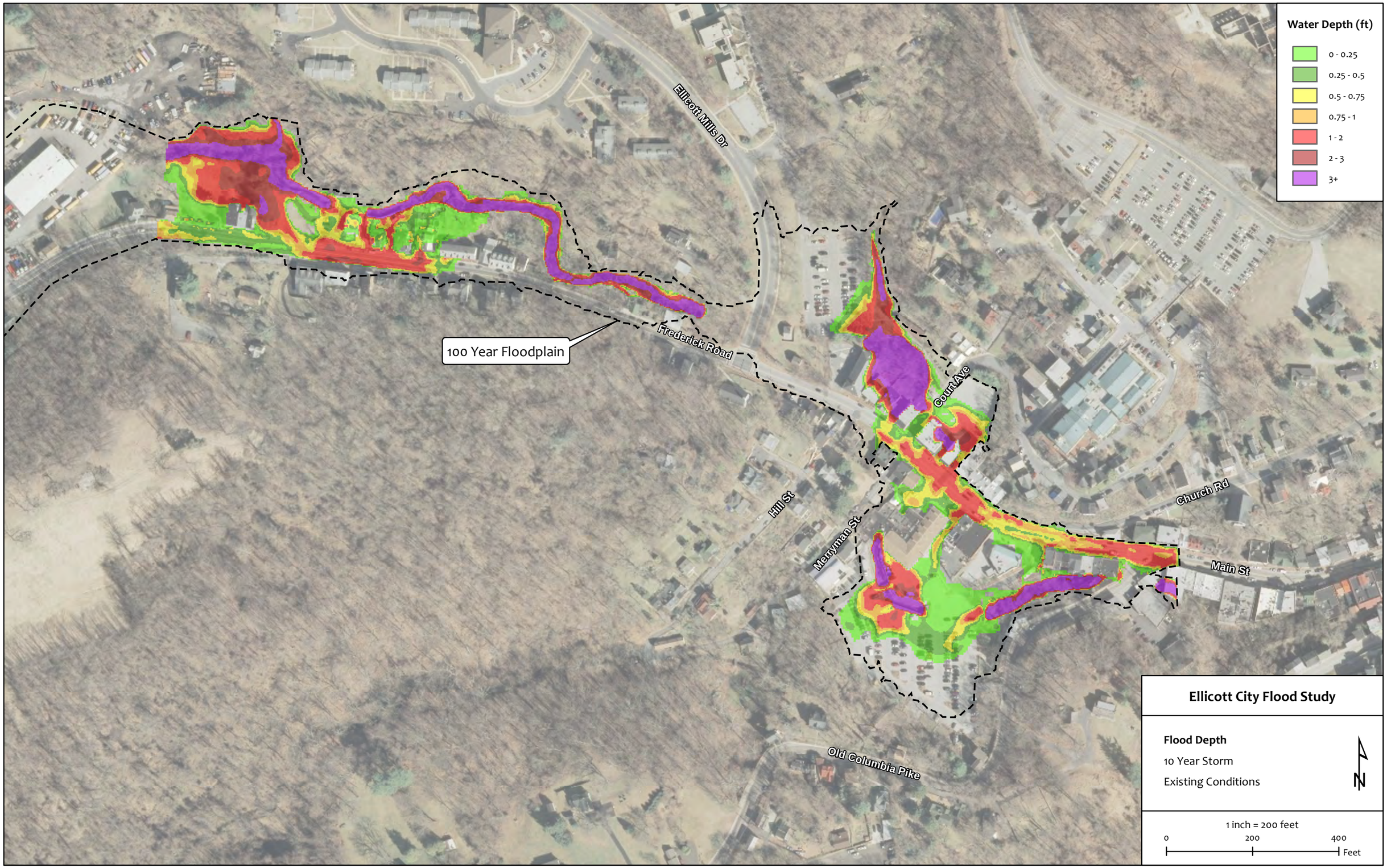
Tropical Storm Lee
SWM Concepts
Velocity at Time = 3 hrs

1 inch = 200 feet

0 200 400 Feet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Flood Depth
10 Year Storm
Existing Conditions
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Feet

Ellicott City Flood Study

Appendix E:
10 Year Storm
Existing Conditions
Velocity at Time = 3 hrs

1 inch = 200 feet

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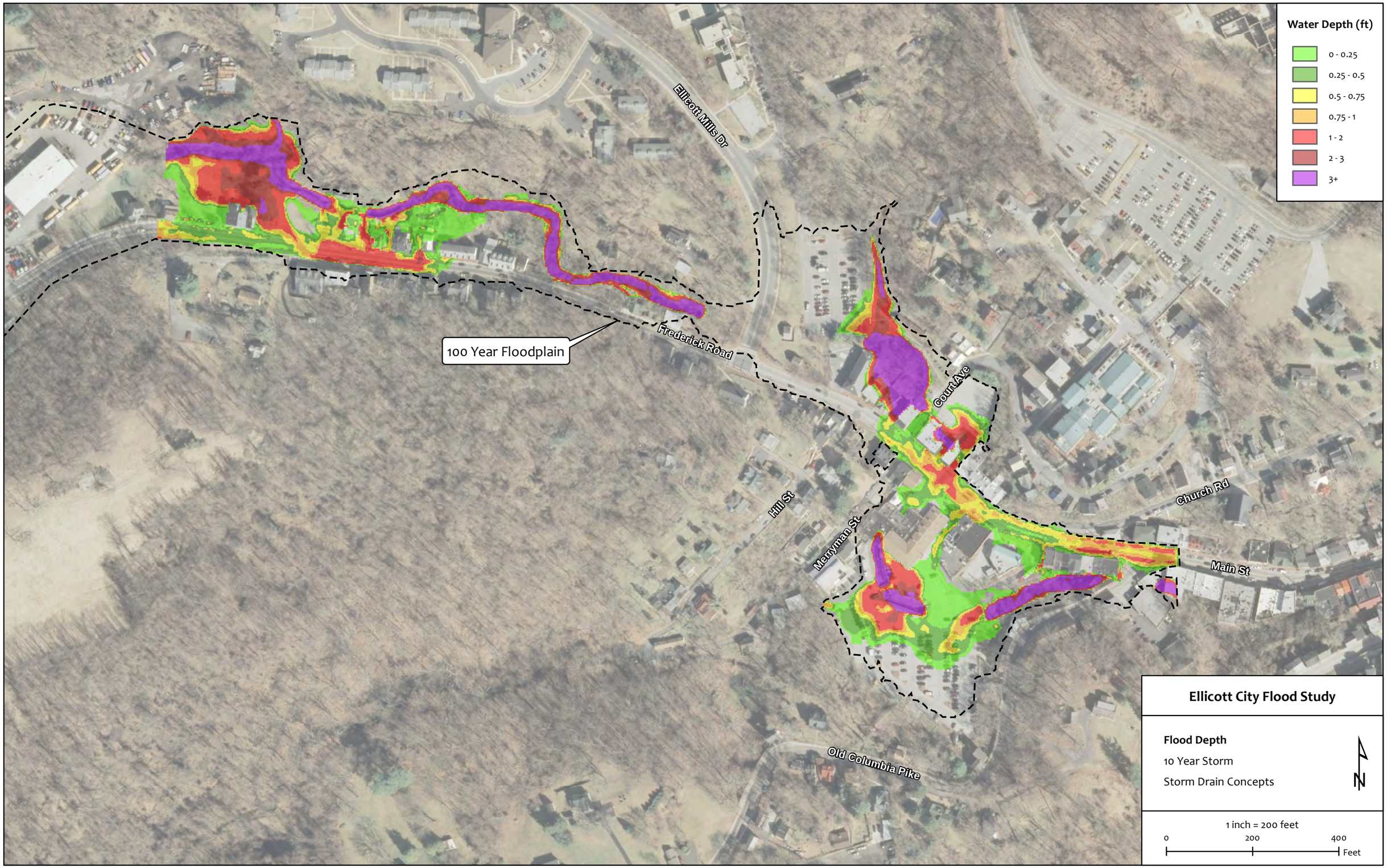
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Flood Depth
10 Year Storm
Storm Drain Concepts
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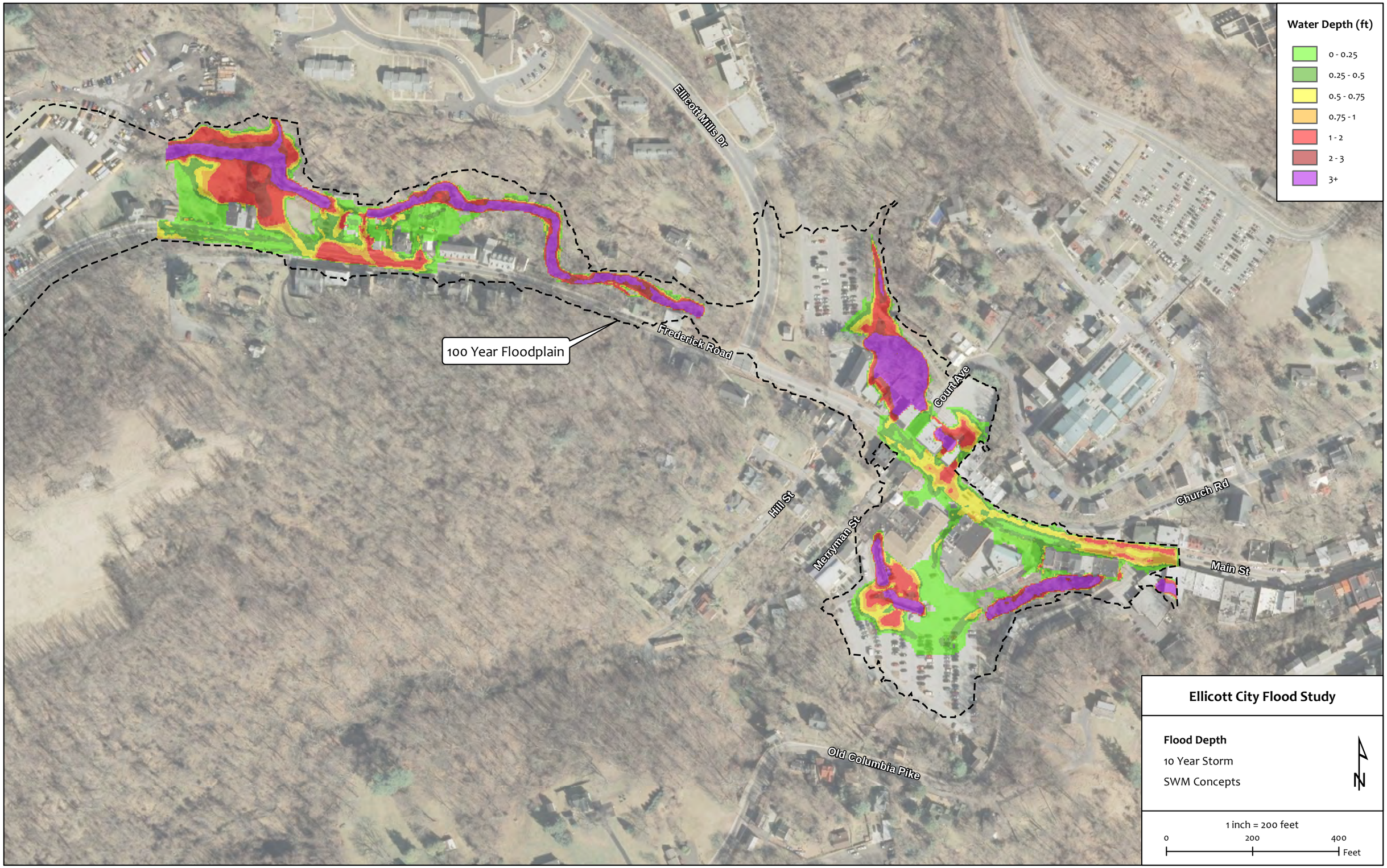
400
Feet

Ellicott City Flood Study

Appendix E:
10 Year Storm
Storm Drain Concepts
Velocity at Time = 3 hrs

1 inch = 200 feet

0 200 400 Feet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Flood Depth
10 Year Storm
SWM Concepts
N
1 inch = 200 feet
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400
Feet

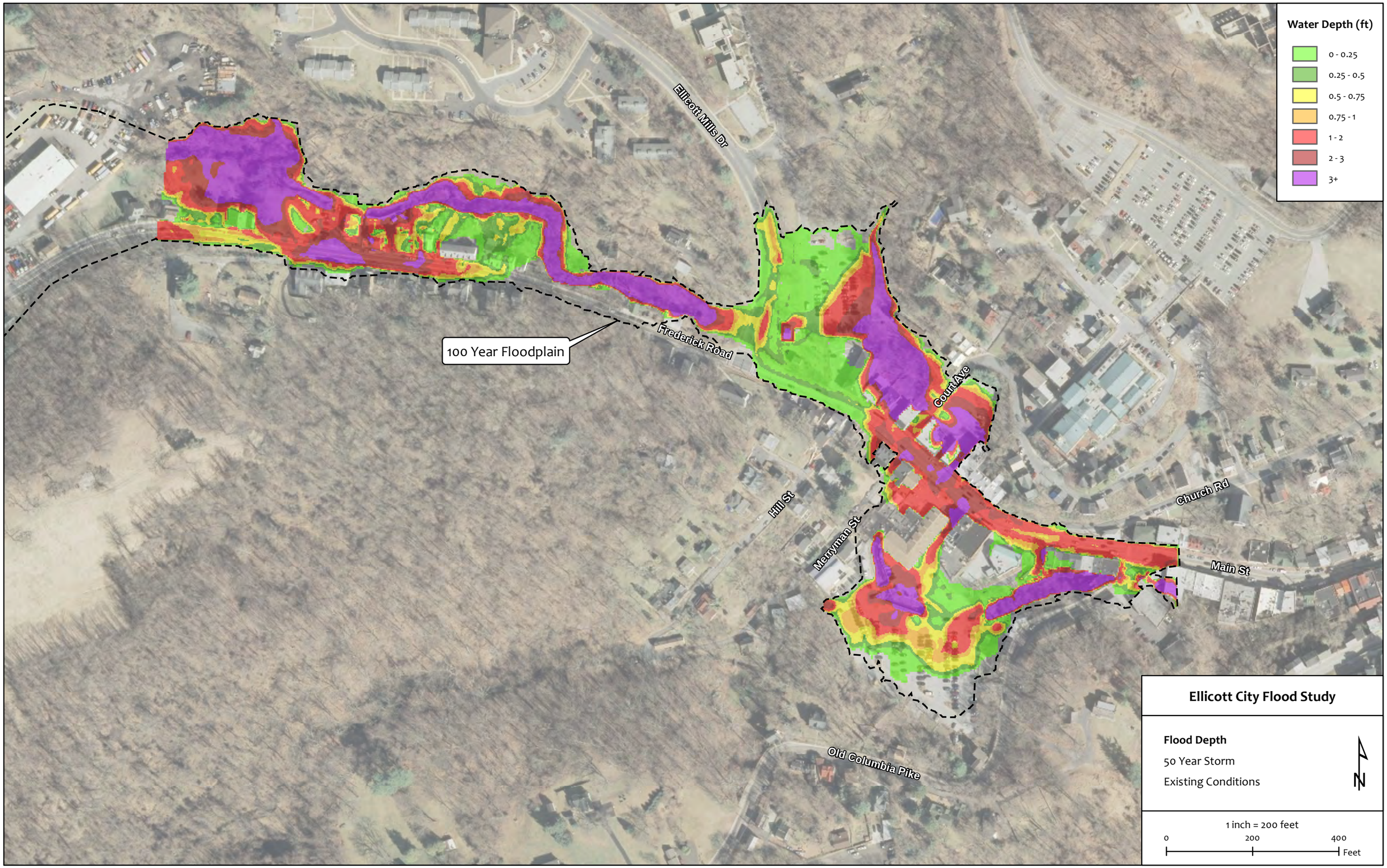
Ellicott City Flood Study

Appendix E:
10 Year Storm
SWM Concepts
Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet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Flood Depth
50 Year Storm
Existing Conditions
N
1 inch = 200 feet
0
200
400
Feet

Ellicott City Flood Study

Appendix E:

50 Year Storm

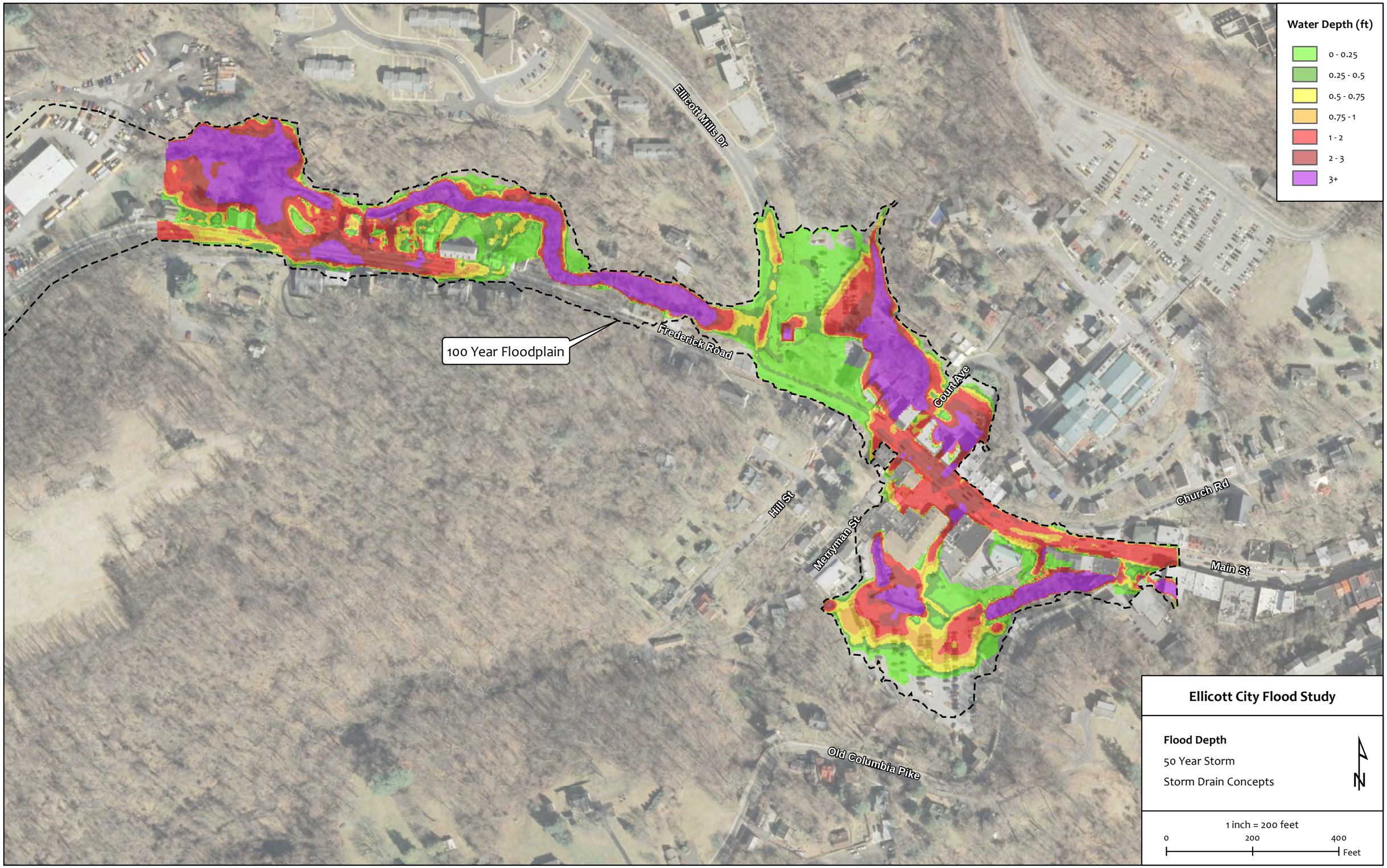
Existing Conditions

Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet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Flood Depth
50 Year Storm
Storm Drain Concepts
N
1 inch = 200 feet
0
200
400
Feet

Ellicott City Flood Study

Appendix E:

50 Year Storm

Storm Drain Concepts

Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet


Water Depth (ft)
0 - 0.25
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Flood Depth
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Ellicott City Flood Study

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50 Year Storm
SWM Concepts
Velocity at Time = 3 hrs

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1 inch = 200 feet

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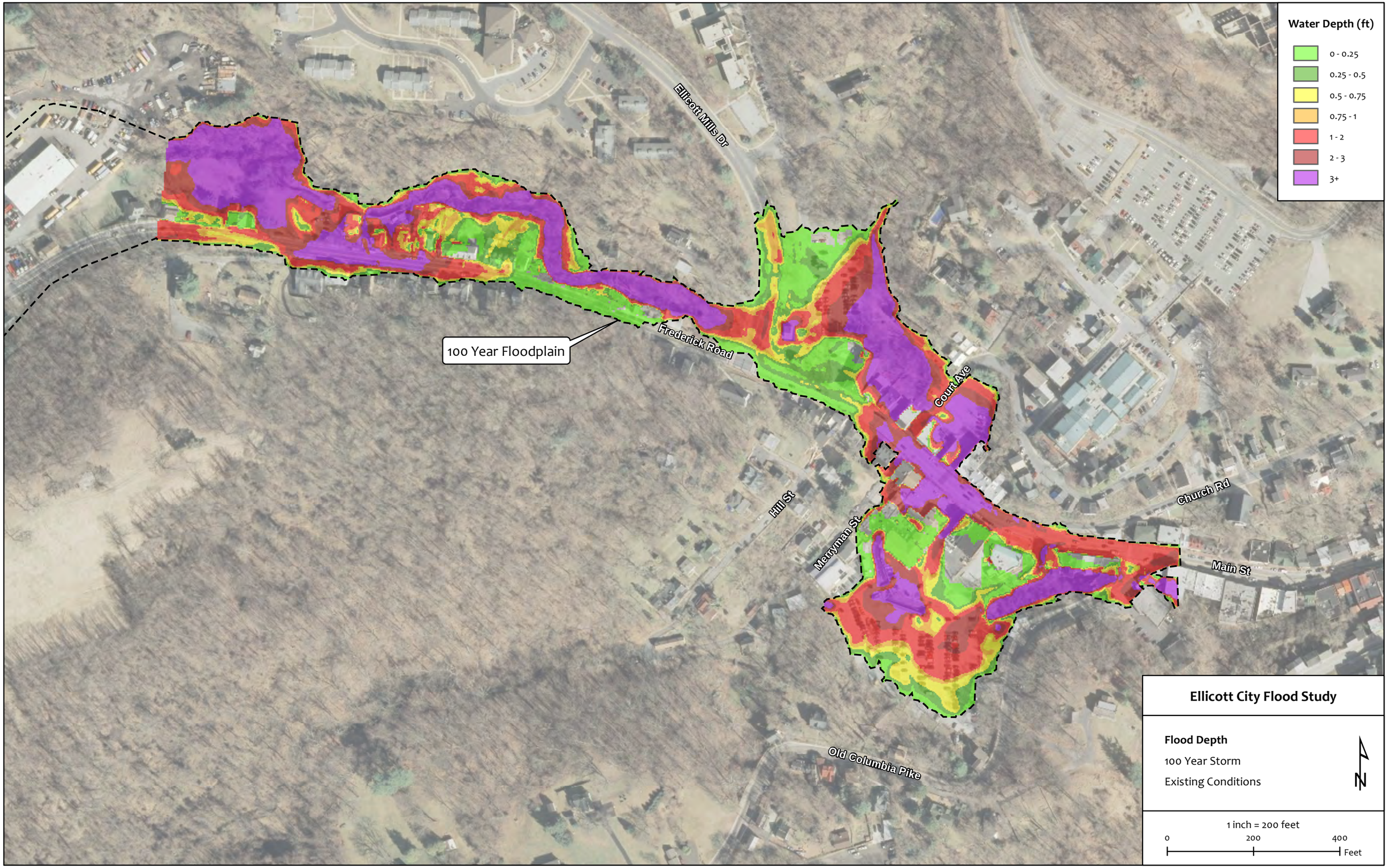
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Flood Depth
100 Year Storm
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400
Feet

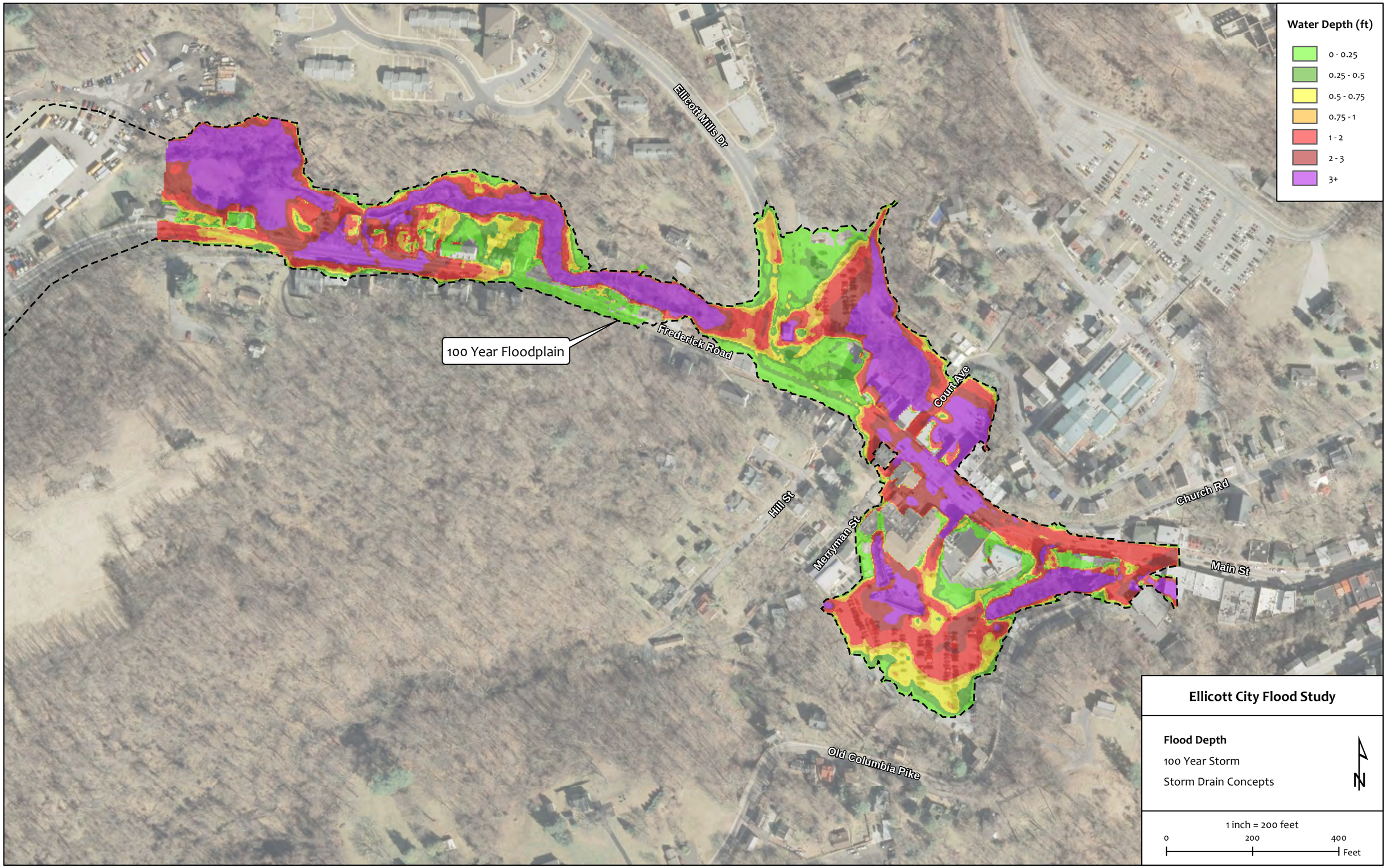
Ellicott City Flood Study

Appendix E:
100 Year Storm
Existing Conditions
Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet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100 Year Storm
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400
Feet

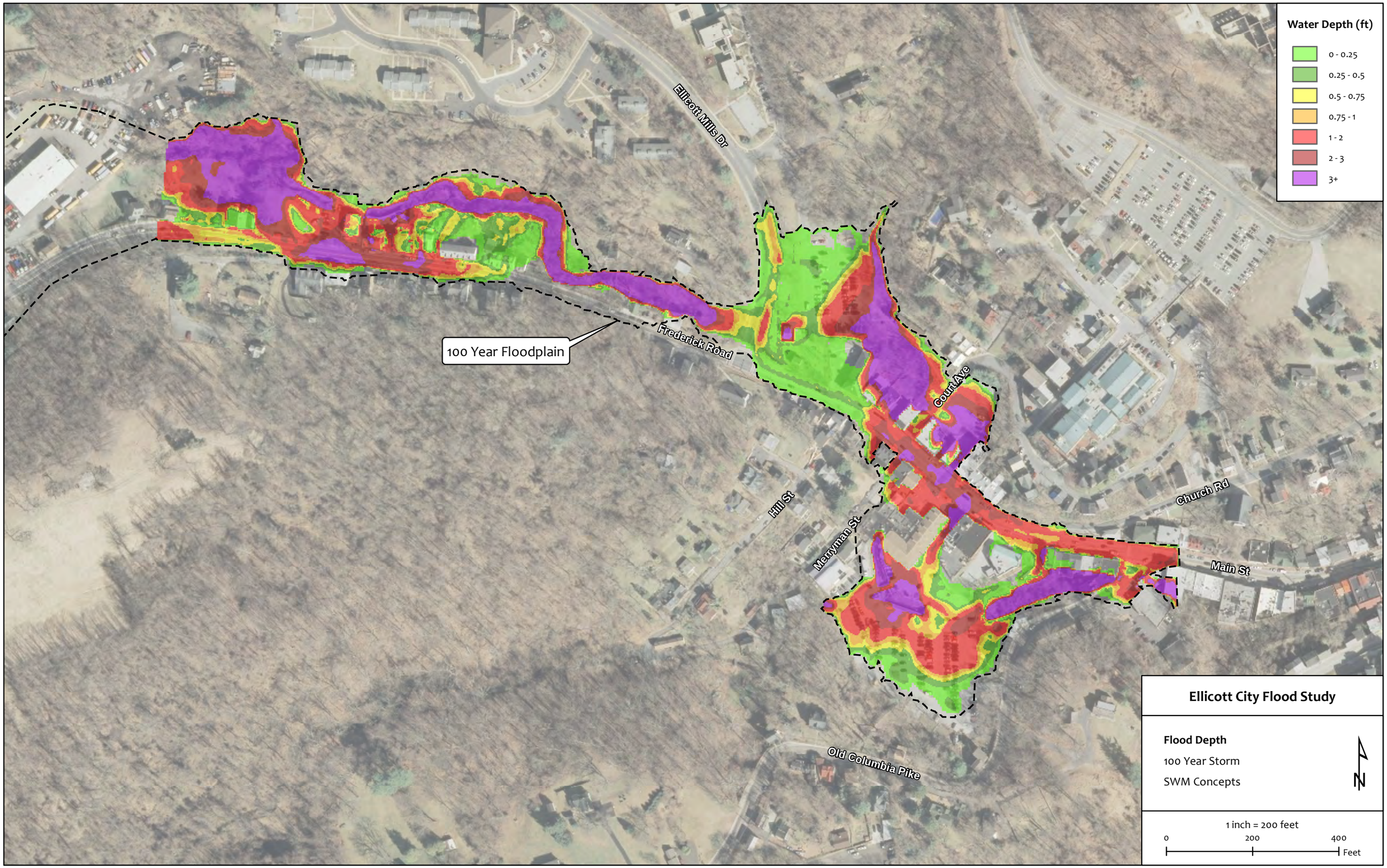
Ellicott City Flood Study

Appendix E:
100 Year Storm
Storm Drain Concepts
Velocity at Time = 3 hrs

N

1 inch = 200 feet

0 200 400 Feet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Flood Depth
100 Year Storm
SWM Concepts
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1 inch = 200 feet
0
200
400
Feet

Ellicott City Flood Study

Appendix E:
100 Year Storm
SWM Concepts
Velocity at Time = 3 hrs

1 inch = 200 feet

0 200 400 Feet

Ellicott City Flood Study

Flood Extent Comparisons

10 Year Storm

N

1 inch = 200 feet

0 200 400 Feet


Extent of Flooding
SWM Concepts
Storm Drain Concepts
Existing Conditions
Ellicott Mills Dr
100 Year Floodplain
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Main St
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Flood Extent Comparisons
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1 inch = 200 feet
0
200
400
Feet


Extent of Flooding
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Flood Extent Comparisons
Tropical Storm Lee
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0
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400
Feet

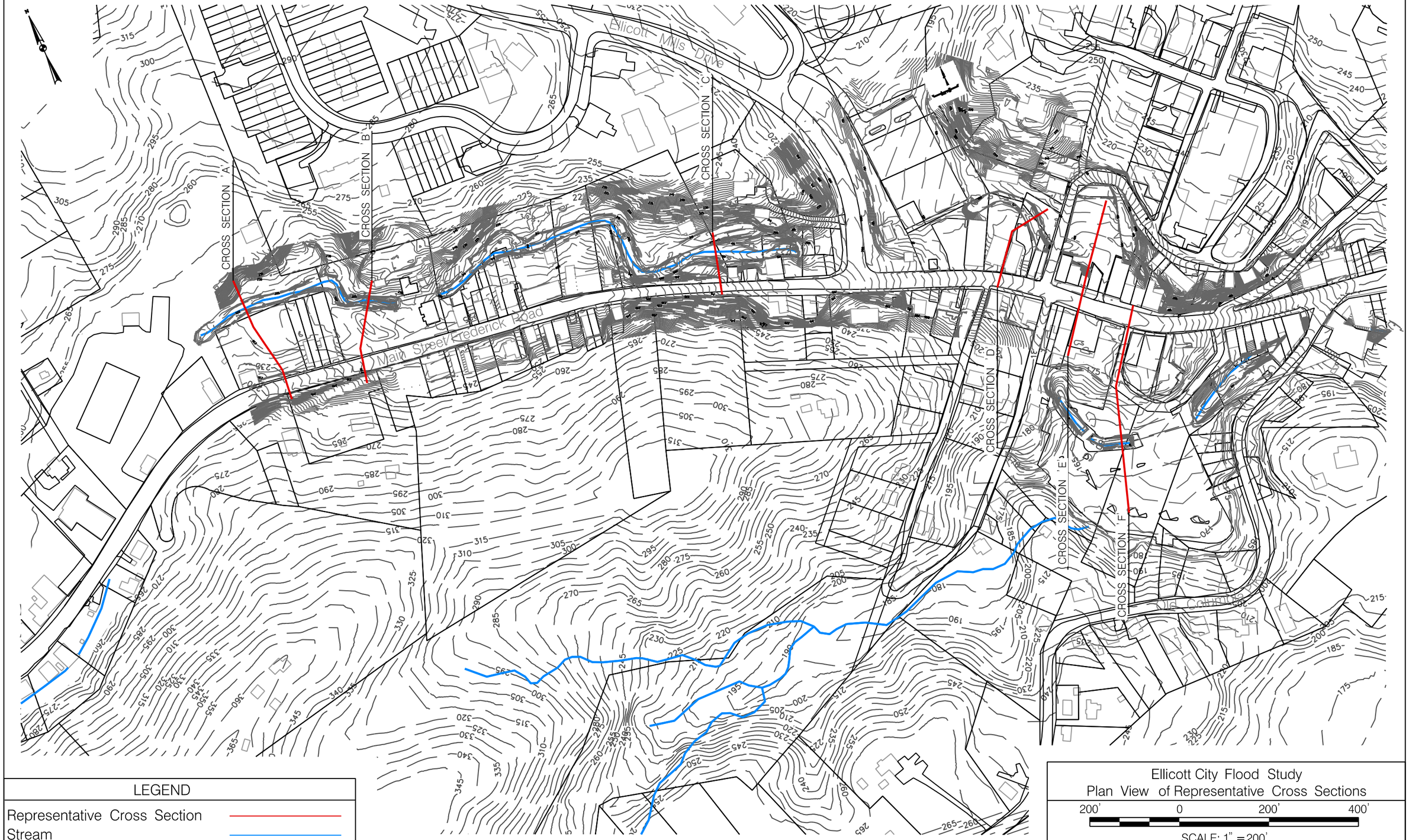
Concept Flows

Comparison of Flow Characteristics of Concepts as Modeled with Tuflow and HY-8 (plus hand calculated friction losses).

	HY-8 + Friction Losses			Tuflow (SD only model)		
	Max Head ft	Max Q cfs	Max Velocity fps	Max Head ft	Max Q cfs	Max Velocity fps
Concept 5	12.19	165	13.75	10.02	191.4	15.24
Concept 6	12.75	185	19.69	12.82	193.3	15.39

Flow characteristics of culvert in Parking Lot D before and after culvert expansion prescribed by Concept 7. Modeled with Tuflow.

	Before expansion		After Expansion	
	Max Q cfs	Max Velocity fps	Max Q cfs	Max Velocity fps
Concept 7	1648	14.18	2049.7	12.98



LEGEND

Representative Cross Section

Stream

Ellicott City Flood Study

Plan View of Representative Cross Sections

200' 0 200' 400'

SCALE: 1" = 200'