



Town of Chapel Hill Eastwood Lake Subwatershed Study



Volume II: Appendices



June 2020

TOWN OF CHAPEL HILL

Eastwood Lake Subwatershed Study Volume II: Appendices

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Town of Chapel Hill
405 Martin Luther King, Jr. Boulevard
Chapel Hill, NC 27514

Prepared by
W. K. Dickson & Co., Inc.
Raleigh, NC
919/782/0495
NC License No. F-0374

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Three (3) different models were used to develop design flows for the primary and secondary systems. For each system analyzed, the hydrologic model(s) was selected based on the complexity of the stormwater conveyance system.

The USACE HEC-HMS model was selected to model the primary systems defined as Booker Creek. HEC-HMS simulates the surface runoff response to precipitation for an interconnected system of surfaces, channels, and ponds. Input data for the HEC-HMS model was developed using topographic, land use, and soils maps in GIS to delineate and calculate the basin areas and SCS hydrologic parameters. The HEC-HMS model offers a variety of methods for simulating the rainfall-runoff response, hydrograph development, channel and pond routing. The selection of methods for the analyses is based on the study objectives, data availability, and watershed characteristics. The precipitation data for the 24-hour duration, NRCS Type II storm was used to represent the synthetic rainfall event. The NRCS curve number approach was selected to calculate runoff volumes from the precipitation data, and the sub-basin unit hydrographs for these flood volumes were developed using the NRCS lag times. Where appropriate, reservoir routing was selected to model attenuation behind culvert embankments.

For the secondary systems that may: (a) have significant backwater effects from rising water surface elevations within the primary systems, (b) have attenuation within drainage ditches or behind roadways, and (c) show a sensitivity to the timing response of runoff to rainfall, SWMM developed by the EPA was selected as the hydrologic and hydraulic model. The NRCS curve number approach was selected to calculate runoff volumes from the precipitation data, and the sub-basin unit hydrographs for these flood volumes were developed using the watershed width parameter. SWMM simulates the surface runoff response to precipitation for an interconnected system of surfaces, channels, and ponds. Input data for the SWMM model was developed using topographic data, land use data, and soils maps in GIS to delineate and calculate the basin areas and NRCS hydrologic parameters. The SWMM model offers a variety of methods for simulating the rainfall-runoff response, hydrograph development, and channel routing. One advantage to using SWMM to model both hydrology and hydraulics is that channel routing is modeled in the EXTRAN (hydraulics) block automatically based on the geometry and nature of the conveyance system. This eliminates the need to iterate between a hydrologic model and a hydraulic model to produce reasonable flows.

Some project areas with smaller drainage areas and less complex conveyance systems required a less rigorous approach. Hydraflow Storm Sewers, an extension of AutoCAD Civil 3D, was used to generate peak flows using the Rational Method. Table A-1 lists the different systems and the modeling methodology applied to each system.

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Table A-1: Project Area Model Selection

Project Area	Model Selection
Booker Creek	HEC-HMS
Shady Lawn Road System	SWMM
Arlington Street #1 System	SWMM
Arlington Street #2 System	SWMM
Rock Creek Road Closed System	Hydraflow Storm Sewers
South Lakeshore Drive/Ridgecrest Drive System	SWMM
South Lakeshore Drive/Woodhaven Road System	SWMM
South Lakeshore Drive/Rolling Road System	SWMM
South Lakeshore Drive System	SWMM
Allard Road System	SWMM
Curtis Road System	SWMM
Woodshire Lane/Huntington Drive System	SWMM

Watershed Delineation and Connectivity

Watersheds were delineated for the entire Booker Creek utilizing digital LiDAR data available from the State of North Carolina and the stormwater inventory. The preliminary watersheds were created using automated procedures in a GIS platform and then adjusted as necessary based on the conveyance system and known ridge lines. Each flood control project watershed for the primary systems was subdivided into subwatersheds selected at hydrologically and hydraulically significant points, such as major roadway crossings, stream convergences, known problem areas, etc. Sixty-six (66) sub-basins were delineated for the entire Booker Creek watershed including the Booker Headwaters, Crow Branch, Cedar Fork, and Eastwood Lake, and Lower Booker Creek subwatersheds. The sub-basins ranged in size from 14 to 118 acres. Additional sub-basins were delineated as necessary for the secondary systems to accurately model the hydraulics of the system. Each sub-basin for the secondary systems was selected as the area that drained to each inlet modeled on the secondary system. The watershed maps included in Appendix C illustrate the subwatershed and hydrologic connectivity for the primary system located in the Eastwood Lake subwatershed.

NRCS Curve Numbers

The NRCS curve number approach was used in computing the runoff response. Runoff curve numbers (RCNs) were generated by using the NRCS document entitled Urban Hydrology for Small Watersheds, dated June 1986 and commonly referred to as TR-55. This method relates the drainage characteristics of the hydrologic soil group, land use category, and antecedent moisture conditions (AMC) to a runoff curve number. The runoff curve number and an estimate of the initial surface moisture storage capacity are used to calculate a total runoff depth for a storm in a basin.

The AMC refers to the total rainfall in a 5-day period preceding a storm and relates to the soil moisture condition at the beginning of the storm event. The AMC value can be used as a calibration tool in the hydrologic computations where AMC-1 represents "dry" conditions

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and AMC-3 represents "wet" conditions. The average antecedent moisture conditions (AMC-2) are generally considered most representative for the humid southeastern portion of the country and were used for the hydrologic calculations in this study.

TR-55 provides CN values for typical land use categories. However, those values can vary based on the specific development within a community. To more accurately calculate land cover, the impervious percentage was determined for each subwatershed utilizing the impervious GIS coverage provided by the Town. The data was field checked to ensure it represented actual field conditions. Within the HEC-HMS model, both the CN value and the percent impervious can be included as input parameters. The HEC-HMS model assumes that all runoff from the designated impervious coverages enters the system and that no infiltration occurs. However, in some instances runoff will drain from impervious surfaces to pervious surfaces allowing some infiltration. One example would be water that drains off of a building across a lawn or other pervious area prior to entering the conveyance system. Therefore, to best represent the actual hydrologic conditions of the watershed, the directly connected impervious area (DCIA) should be calculated to match the definition of impervious area in HEC-HMS. The estimation of DCIA based on actual impervious area is calculated using the Sutherland Equations developed for the Massachusetts Small MS4 Permit, 2014. The equations varied based on land use. Appendix E shows the impervious area based on GIS and the adjusted DCIA. The portion of the impervious area that is not defined as DCIA is included in the weighted curve numbers along with all pervious areas within the watershed. Table A-2 shows the CN values used for impervious and pervious surfaces.

Table A-2: Curve Numbers Based on Land Cover and Soil Groups

Land Use Category	Soil Group			
	A	B	C	D
Impervious Surface	98	98	98	98
Open Space, Good	39	61	74	80
Woods, Good	30	55	70	77

A composite runoff curve numbers (RCN) was calculated for each of the sub-basins from the grass cover (open space), woods, and impervious area not assumed to be DCIA. A summary of the hydrologic input data for the primary systems, including the runoff curve numbers, lag time, and DCIA is shown in Table A-8. The detailed calculations are included in Appendix E (runoff curve numbers and DCIA) and Appendix F (times of concentration).

Soils

The NRCS curve number method uses basin characteristics, such as soil types and land use, to compute the runoff response. The infiltration rate of a soil influences the volume of surface runoff that results from given storm events. Soils with high infiltration rates produce lower runoff than soils with lower infiltration rates. The Soil Conservation Service has prepared soil maps for Orange County that identify four (4) primary soil groups. This data is

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available digitally and was obtained for the Town of Chapel Hill. The groups (A, B, C, and D) correspond to decreasing rates of infiltration. A general description of the four (4) soil groups taken from the USDA, SCS, NEH-4 (1972) is presented in Table A-3.

Table A-3: Hydrologic Soils Groups

Soil Group	Description
A	Group A soils have high infiltration rates even when thoroughly wetted and consist chiefly of deep, well to excessively drained sand or gravels. These soils have a high rate of water transmission (greater than 0.3 inches per hour).
B	Group B soils have moderate infiltration rates even when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission (0.15 to 0.3 inches per hour).
C	Group C soils have slow infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission (0.5 to 0.15 inches per hour).
D	Group D soils have a very slow infiltration rate when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission (0 to 0.05 inches per hour).
B/D C/D	The first letter applies to the drained condition and the second to the undrained condition. For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 60 centimeters (24 inches) below the surface.

Soils within the watershed are predominantly NRCS hydrologic soil groups B soils, although five (5) different hydrologic soil groups are represented in some quantity throughout the Booker Creek watershed (See Table A-4 and Appendix C).

Table A-4: Area Distribution of Hydrologic Soil Groups – Entire Booker Creek

Soil Group	Total Area (acre)	Percent of Total Area
B	2,048	50.9%
C	527	13.1%
D	1,046	26.0%
B/D	113	2.8%
C/D	224	5.6%

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The distribution of soils within the Eastwood Lake subwatershed are shown in Table A-5. Soils within the subwatershed are predominantly NRCS hydrologic soil groups B soils, although five (5) different hydrologic soil groups are represented in some quantity.

Table A-5: Area Distribution of Hydrologic Soil Groups – Eastwood Lake

Soil Group	Total Area (acre)	Percent of Total Area
B	378	53.8%
C	100	14.3%
D	140	19.9%
B/D	9	1.3%
C/D	31	4.4%

The remaining 6.6% of the Eastwood Lake subwatershed is composed of water.

Land Use

Land use is the watershed cover condition as it relates to the actual type of development and zoning within the watershed. Land use influences the runoff characteristics of a watershed, and combined with other basin characteristics, is used to determine the SCS curve number for the basin.

The existing land use was determined based on Town of Chapel Hill GIS data including impervious coverage, land use, and zoning. Eight (8) land use categories were delineated within the Booker Creek Watershed based on the information provided (See Appendix C). Aerial photography and field observation was used to check the coverages which were revised as applicable.

In its entirety, the Booker Creek Watershed covers an area of approximately 4,000 acres (6.3 square miles). The Eastwood Lake subwatershed is approximately 700 acres of this total area. Land use in the Eastwood Lake subwatershed is mostly residential with a small percentage of office, and institutional as shown on the Existing Conditions Land Use Map included in Appendix C. As shown on the Existing Conditions Land Use Map, the subwatershed is predominately built out. Similarly, the overall Booker Creek watershed is mostly built out with areas of the upper watershed located in the Booker Headwaters and Crow Branch subwatersheds that have not been developed to their zoned uses. Impervious percentages for each subwatershed are based on actual impervious coverages within the watershed as noted above.

The future land use condition was adjusted based on Town zoning, feedback from Town planning staff, upcoming development projects (<http://www.townofchapelhill.org/town-hall/departments-services/planning-and-sustainability/development>), analysis of Town focus areas, and adjustments related to redevelopment. The changes made to the develop the future land use conditions are as follows:

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- Incorporate the Carolina North plan including the requirement to provide detention for up to the 50-year storm event.
- Assign specific land use and impervious values for the Ephesus-Fordham area and Northern Area Task Force focus areas.
- Assign impervious values for undeveloped areas zoned for future development or anticipated rezoning based on known development projects. Impervious values are assigned based on typical impervious percentages for land uses within the watershed or based on Town ordinances.
- Zoning does not account for single lot redevelopment. Estimating the extent of single lot redevelopment is difficult as it can widely vary within a community, however it can be assumed that single lot redevelopment typically occurs for older houses. Additionally, the impact of single lot redevelopment is most significant for larger lots where the percentage of impervious area can be significantly increased. The future land use conditions assumes that low density residential lots with homes built prior to 1990 would have an aggregate 25% increase in impervious area due to single lot redevelopment. Protected neighborhoods either through neighborhood conservations such as Coker Hills or those areas within the Jordan Lake water supply area assumed no increase in impervious area as a result of single lot redevelopment.

Percentages of each existing and future land use groups and the correlating acreage are listed in the table below.

Table A-6: Eastwood Lake Subwatershed Land Use

Land Use Category	Existing		Future	
	Area (acres)	Percent of Basin Area	Area (acres)	Percent of Basin Area
Office/Institutional/Mixed Used	46	6.5%	28	4.0%
High Density Residential	34	4.8%	34	4.8%
Medium Density Residential	14	2.0%	14	2.0%
Low Density Residential	598	84.8%	598	84.8%
Parks/Open Space	6	0.9%	-	-
Right-of-Way	7	1.0%	7	1.0%
University (Carolina North)	-	-	24	3.4%

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Table A-7: Entire Booker Creek Watershed Land Use

Land Use Category	Existing		Future	
	Area (acres)	Percent of Basin Area	Area (acres)	Percent of Basin Area
Commercial	20	0.5%	125	3.1%
Office/Institutional/Mixed Used	256	6.4%	278	6.9%
High Density Residential	167	4.2%	272	6.8%
Medium Density Residential	470	11.7%	505	12.6%
Low Density Residential	2,175	54.1%	2,183	54.3%
Parks/Open Space	510	12.7%	228	5.7%
Right-of-Way	133	3.3%	173	4.3%
Development Opportunity Area*	292	7.3%	-	-
University	-	-	259	6.4%

Table A-8: Summary of Hydrologic Input Data for Booker Creek Watershed

Drainage Basin ID	Drainage Area (acre)	Existing RCN	Future RCN	Lag Time (minutes)
BOOKER HEADWATERS				
BH-10	89.01	63	64	47.86
BH-20	49.08	66	67	32.20
BH-30	105.65	70	72	55.57
BH-40	67.59	71	72	16.69
BH-50	75.19	69	71	25.89
BH-60	82.84	69	71	51.96
BH-70	40.25	71	71	18.49
BH-80	65.63	71	72	35.10
BH-90	60.53	68	70	57.65
BH-100	70.93	71	71	35.29
BH-110	75.11	63	68	20.14
BH-120	17.58	67	69	17.44
BH-130	64.34	76	77	37.04
CEDAR FORK				
CF-10	50.49	65	67	16.69
CF-20	49.21	73	76	59.15
CF-30	28.70	66	68	41.40
CF-40	59.43	66	70	46.88
CF-50	18.65	62	63	20.44
CF-60	78.95	66	68	55.38
CF-70	76.95	67	68	67.79
CF-80	113.17	67	68	29.70
CF-90	118.24	65	66	43.55

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Drainage Basin ID	Drainage Area (acre)	Existing RCN	Future RCN	Lag Time (minutes)
CF-100	54.63	66	66	13.52
CF-110	28.23	65	66	23.14
CF-120	61.50	64	65	20.76
CF-130	96.90	69	70	43.08
CF-140	27.19	64	65	28.00
CF-150	32.54	65	66	16.06
CROW BRANCH				
CB-10	92.60	64	73	61.29
CB-20	72.01	58	67	47.50
CB-30	17.27	58	73	46.52
CB-40	32.87	68	79	21.95
CB-50	46.08	77	84	43.69
CB-60	20.46	71	82	28.50
CB-70	95.93	71	78	62.90
CB-80	53.16	67	68	29.14
EASTWOOD LAKE				
EL-10	88.88	76	76	16.29
EL-20	88.02	72	72	13.80
EL-30	76.64	65	66	17.36
EL-40	47.93	74	75	17.12
EL-50	74.07	68	69	16.41
EL-60	90.90	65	65	24.21
EL-70	60.22	72	73	23.90
EL-80	58.71	71	71	16.83
EL-90	64.09	73	74	18.01
EL-100	55.77	85	85	25.25
LOWER BOOKER CREEK				
LBC-10	62.29	70	70	29.25
LBC-20	54.09	73	73	26.64
LBC-30	102.27	80	81	66.19
LBC-40	100.15	81	81	17.20
LBC-50	14.22	65	68	15.41
LBC-60	90.92	72	73	19.59
LBC-70	69.09	69	70	17.26
LBC-80	41.07	81	82	39.52
LBC-90	73.64	83	83	57.37
LBC-100	18.60	82	82	53.40
LBC-110	21.31	81	83	54.32
LBC-120	31.87	81	82	56.95
LBC-130	23.08	82	82	37.94
LBC-140	56.73	81	81	32.15
LBC-150	69.01	71	72	31.82

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Drainage Basin ID	Drainage Area (acre)	Existing RCN	Future RCN	Lag Time (minutes)
LBC-160	49.68	76	76	30.16
LBC-170	17.56	84	85	18.10
LBC-180	91.01	80	82	21.44
LBC-190	32.44	80	80	33.80
LBC-200	107.57	78	78	51.01

Table A-9: Summary of Impervious Data for Booker Creek Watershed

Drainage Basin ID	Existing Total Impervious Area (sq. ft.)	Existing Percent Impervious (%)	Existing DCIA (%)	Future Total Impervious Area (sq. ft.)	Future Percent Impervious (%)	Future DCIA (%)
BOOKER HEADWATERS						
BH-10	862,717	22.3	7.8	994,248	25.6	9.9
BH-20	563,703	26.4	13.5	607,466	28.4	15.1
BH-30	908,027	19.7	8.8	1,379,727	30.0	16.4
BH-40	718,391	24.4	12.1	846,371	28.7	15.4
BH-50	229,167	7.0	0.5	535,301	16.3	6.6
BH-60	885,718	24.5	9.2	1,188,854	32.9	15.2
BH-70	517,931	29.5	16.1	517,931	29.5	16.1
BH-80	771,030	27.0	14.0	943,356	33.0	19.0
BH-90	336,725	12.8	3.0	691,901	26.2	10.3
BH-100	768,428	24.9	9.4	851,720	27.6	11.2
BH-110	899,829	27.5	14.4	1,898,079	58.0	44.2
BH-120	186,628	24.4	9.1	270,647	35.3	17.1
BH-130	534,003	19.1	6.0	705,194	25.2	9.6
CEDAR FORK						
CF-10	1,174,127	53.4	47.3	1,223,465	55.6	49.7
CF-20	628,431	29.3	15.9	1,096,693	51.2	36.6
CF-30	167,855	13.4	1.8	299,850	24.0	8.9
CF-40	483,642	18.7	5.8	885,949	34.2	16.2
CF-50	121,403	14.9	5.8	155,426	19.1	8.4
CF-60	666,805	19.4	6.2	945,252	27.5	11.2
CF-70	918,352	27.4	14.3	1,120,172	33.4	19.3
CF-80	899,024	18.2	5.6	1,174,813	23.8	8.8
CF-90	701,665	13.6	3.4	928,699	18.0	5.5
CF-100	331,698	13.9	3.5	405,544	17.0	5.0
CF-110	234,516	19.1	6.0	277,042	22.5	8.0
CF-120	478,626	17.9	5.4	609,840	22.8	8.1
CF-130	541,798	12.8	1.6	706,543	16.7	2.8
CF-140	227,570	19.2	6.1	312,073	26.4	10.4
CF-150	214,040	15.1	4.0	312,360	22.0	7.7
CROW BRANCH						
CB-10	53,592	1.3	0.02*	1,246,957	36.8	24.9

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Drainage Basin ID	Existing Total Impervious Area (sq. ft.)	Existing Percent Impervious (%)	Existing DCIA (%)	Future Total Impervious Area (sq. ft.)	Future Percent Impervious (%)	Future DCIA (%)
CB-20	22,098	0.7	0.00*	1,220,630	38.9	24.3
CB-30	23,027	3.1	0.00*	1,501,121	69.2	53.5
CB-40	21,825	1.5	0.02*	956,534	70.0	57.2
CB-50	95,344	4.7	0.2	1,132,168	70.0	58.6
CB-60	20,796	2.3	0.05*	624,171	70.0	54.8
CB-70	746,939	17.9	5.4	1,865,392	46.1	26.3
CB-80	561,427	24.2	9.0	692,168	29.9	12.9
EASTWOOD LAKE						
EL-10	1,265,918	32.7	19.3	1,385,644	36.9	21.4
EL-20	880,272	23.0	8.1	1,185,494	30.7	9.8
EL-30	514,738	15.4	4.2	747,211	22.4	7.9
EL-40	497,585	23.8	8.8	562,925	27.0	10.8
EL-50	571,758	17.7	5.3	827,753	25.7	9.9
EL-60	831,450	21.0	7.1	923,376	23.3	8.5
EL-70	364,084	13.9	3.5	524,541	20.0	6.5
EL-80	369,906	14.5	3.8	520,194	20.3	6.7
EL-90	377,759	13.5	3.4	574,731	20.6	6.8
EL-100	319,755	13.2	3.2	481,129	19.8	6.4
LOWER BOOKER CREEK						
LBC-10	475,048	17.5	7.3	541,076	19.9	8.9
LBC-20	578,487	24.6	9.2	653,644	27.7	11.4
LBC-30	1,109,571	24.9	9.5	1,365,101	30.6	13.5
LBC-40	1,253,554	28.7	15.4	1,483,558	34.0	19.8
LBC-50	54,099	8.7	0.8	156,537	25.3	9.7
LBC-60	975,294	24.6	9.3	1,114,970	28.2	11.6
LBC-70	657,730	21.9	7.6	810,756	26.9	10.8
LBC-80	476,176	26.6	13.7	734,587	41.1	26.3
LBC-90	1,226,850	38.2	23.7	1,396,916	43.5	28.7
LBC-100	351,773	43.4	36.9	415,397	51.3	45.1
LBC-110	274,647	29.6	16.1	457,149	49.2	34.6
LBC-120	427,918	30.8	17.1	518,155	37.3	22.8
LBC-130	328,781	32.7	18.7	423,612	42.1	27.3
LBC-140	1,446,699	58.5	52.9	1,456,076	58.9	53.3
LBC-150	1,231,430	41.0	26.2	1,334,909	44.4	29.6
LBC-160	1,126,082	52.0	45.9	1,343,020	62.1	56.7
LBC-170	134,030	17.5	7.3	495,199	64.7	48.0
LBC-180	1,623,788	41.0	34.4	2,319,251	58.5	44.7
LBC-190	248,546	17.6	5.2	286,154	20.2	6.7
LBC-200	793,065	16.9	4.9	796,137	17.0	4.9

*Minimum DCIA value input into the HEC-HMS model was 0.1%.

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Rainfall

Rainfall distributions for Chapel Hill are derived using the NRCS Type II standard distribution. Total rainfall volumes for the modeled frequency storms were based on data obtained from Appendix 2-A of the Town of Chapel Hill's Design Manual. Table A-10 shows the total rainfall volumes used for this study.

Table A-10: Design Storm Rainfall Depths

Design Storm	Rainfall Depth (in)
2-year, 24-hour	3.60
10-year, 24-hour	5.38
25-year, 24-hour	6.41
50-year, 24-hour	7.21
100-year, 24-hour	8.00

While the depth-duration-frequency curves are calculated based on real rainfall data, the rainfall data used for the SWMM and HEC-HMS models represent the Type II synthetic rainfall distribution. Actual runoff is based on several factors including rainfall intensity, duration and the antecedent moisture conditions of the watershed.

Hydrograph Translation

The lag time, as defined by the NRCS for use in the NRCS dimensionless unit hydrograph method, is the time, or lag, between the center of mass of rainfall excess and the peak of the unit hydrograph. The lag time is based on the subwatershed time of concentration, or travel time, and is a function of the subwatershed size, shape, slope, cover, and other basin characteristics. For the NRCS method, the subwatershed lag time is calculated to be 0.6 times the time of concentration for each subwatershed.

The times of concentration for the subwatersheds were calculated from the methodology described in TR-55. A summary of the calculations is shown in Appendix F. The longest flow path is divided into three types of flow; overland flow, shallow concentrated flow, and channel flow. A spreadsheet was developed to tabulate the incremental travel times for each type of flow for each sub-basin. The incremental travel times were totaled and multiplied by 0.6 to compute the lag time for each sub-basin. The equation detailing the travel time for sheet flow is as follows:

$$T_t = \frac{.007 (nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

- T_t = Travel Time in hours
- n = Manning Roughness Coefficient (Paved=0.011, Unpaved=0.24)
- L = flow length in feet
- P_2 = 2-year, 24 hour rainfall = 3.76 inches
- S = slope of hydraulic grade line (land slope in ft/ft)

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For shallow concentrated flow, the velocity (V) is calculated for either paved or unpaved sections by using the following equations:

$$\begin{aligned}\text{Unpaved } V &= 16.1345 (S)^{1/2} \\ \text{Paved } V &= 20.3282 (S)^{1/2}\end{aligned}$$

The travel time for shallow flow is then calculated by dividing the flow length (L in feet) by velocity as follows:

$$T_t = \text{Travel Time} = L / (3600 * V)$$

The open channel travel times are determined by a modified version of the Manning equation, which is as follows:

$$V = \frac{1.49 R^{2/3} S^{0.5}}{n}$$

V	= Average full-flow velocity (ft/s)
R	= Hydraulic radius (ft)
S	= Slope of hydraulic grade line (ft/ft)
n	= Manning roughness coefficient

Instead of a time of concentration parameter, the SWMM model uses a watershed width parameter to create the unit hydrograph used in the model that will translate the rainfall into runoff. The watershed width is a parameter unique to SWMM that typically represents the watershed area divided by the longest flow path. The width parameter is typically calibrated to flow gauge data, if available. The Eastwood Lake subwatershed lacks flow gauge data, so the peak flows from SWMM were compared to flows developed using the Rational Method. Based on the flow comparison, the watershed widths for each basin were increased in some instances to produce reasonable flows. Increasing the watershed width parameters is not an uncommon practice for calibrating models for areas with gradual slopes and moderate conveyance systems.

Channel Elements

Flood peaks attenuate, or reduce, as they travel downstream due to the storage characteristic of the stream reach. The Muskingum-Cunge routing method in HEC-HMS was selected to define the storage characteristic of selected stream reaches in the Eastwood Lake subwatershed. It can be described as a hydrologic routing method based on physical parameters of the channel and floodplain. Input data for this method consists of representative channel/floodplain sections, reach length, Manning's roughness coefficient,

and channel bed slope. This method provides advantages over other hydrologic techniques based on the relative size and slope of the channels and floodplains in the watershed.

Structure and Pond Routing

Reservoir storage routing was used for routing hydrographs through the storage areas upstream from undersized structures (culverts). HEC-HMS is able to model the effects of an undersized culvert through inputs defining the relationship between water volume or area and elevation and the relationship between outflow and water surface elevations. The relationship between outflow and water surface elevations is developed using an iterative process between HEC-HMS and HEC-RAS. A rating curve generated using HEC-RAS defines the outflow of the water leaving this system.

Structures having fill heights greater than or equal to 50% of the height of the structure were assumed to provide significant peak flow attenuation and, therefore, were routed in the HEC-HMS model. In addition, any structure which exhibited significant upstream floodplain storage or significant backwater from the HEC-RAS model output would be analyzed for providing peak flow attenuation.

For each structure, the cutoff point in the backwater pool was determined where the structure routing ends and upstream channel routing begins. This determination was necessary so that available storage areas calculated for channel and structure routing did not overlap. The following procedure was used for this determination:

- The approximate limit of the 100-year frequency flood backwater pool was delineated in the topographic map.
- The distance from the upstream face of the structure to the upstream limit of the pool was measured.
- From the upstream end of the backwater pool, a distance equal to 20% of the total pool length was measured in the downstream direction and the point marked on the topographic map.
- Through this point a line was drawn perpendicular to the contour lines.
- This line was then designated as the cutoff point to be used as the upstream limit of the channel routing.

For each structure, the elevation-storage relation for the Modified Puls method was derived by calculating the surface area of the topographic contours from the upstream face of the structure to the routing cutoff point associated with the structure. A pair of “SA” (storage area) – “SE” (elevation) records, the elevation-storage relation for each structure was input from the delineated information. To avoid interpolating storage areas for each stage-discharge point, a separate stage-discharge relation was entered into the HEC-HMS model

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on a pair of “SQ” (discharge) – “SE” (elevation) records based on the HEC-RAS model output.

However, the method described in the previous paragraph does not account for the reduction in tailwater on the structure due to the attenuation effects of the upstream storage, which in turn can affect the stage-discharge relation of the structure. Therefore, an iterative process for storage structures was followed with an objective to obtain a set of peak discharge values, runoff volumes, and water surface elevations that are “balanced” between the two models. The process was initiated by inputting a set of discharges into the HEC-RAS model to develop a set of discharge-storage relations for each reach. This initial set of relations was input into the HEC-HMS model. These values were supplemented by the depth-storage relation for each structure.

The HEC-HMS model was run with these values to derive new discharges at downstream locations. These new values were input into the HEC-RAS model and it was recomputed. The new discharges and water surface elevations listed in the HEC-HMS summary output were compared with the discharges listed in the previous HEC-RAS run. When the values stabilized, the model was considered “balanced.” If not, then additional iterations were performed. Typically, three iterations are adequate to derive a balanced model.

Summary of Hydrologic Model Results

The HEC-HMS model was used to compute peak runoff for the 2-, 10-, 25-, 50- and 100- year design storms for the existing conditions.

The results of the hydrologic model are summarized in Table A-11. The HEC-HMS input and output are included in Appendix H. Additionally, a CD is included in Appendix J and contains the digital files for the HEC-HMS model.

Table A-11: Existing Conditions Flows from HEC-HMS for Eastwood Lake Subwatershed

HEC-HMS Node	Road Name / Location	HEC-RAS Station	Storm Event				
			2-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
ADD-CB-BH	Confluence of Crow Branch and Booker Creek	21577	505	1,018	1,318	1,600	1,837
Piney Mountain Rd – Booker Ck	Piney Mountain Road	20223	566	1,022	1,373	1,661	1,899
ADD-EL-50	Upstream of Eastwood Lake	16524	603	1,059	1,419	1,714	1,950
N Lakeshore Dr – Booker Ck	North Lakeshore Drive	15024	615	1,070	1,431	1,728	1,964
Eastwood Lake	Downstream of Eastwood Lake	11352	668	1,641	2,217	2,614	2,850

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Comparison of Peak Flows

For comparison purposes, flood peaks were estimated using the U.S. Geological Survey (USGS) publications entitled "The National Flood-Frequency Program – Methods for Estimating Flood Magnitude and Frequency in Rural and Urban Areas in North Carolina – USGS Fact Sheet 007-00" (2001) and "Methods for Estimating the Magnitude and Frequency of Floods for Urban and Small, Rural Streams in Georgia, South Carolinas, and North Carolina" (2014) at key locations within the watershed. Table A-12 compares the peak flows determined from the USGS regional regression equations for the Piedmont region and hydrologic region 1 versus the peak flows from HEC-HMS. Additionally, the peak flows from HEC-HMS were also compared to available FEMA flows.

Table A-12: Comparison of Existing Conditions Peak Flows

Methodology	Location	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)
HEC-HMS	Confluence of Crow Branch and Booker Creek	505	1,018	1,318	1,600	1,837
	Piney Mountain Road	566	1,022	1,373	1,661	1,899
	Upstream of Eastwood Lake	603	1,059	1,419	1,714	1,950
	North Lakeshore Drive	615	1,070	1,431	1,728	1,964
	Downstream of Eastwood Lake	668	1,641	2,217	2,614	2,850
USGS – Regional Regression Equations: Urban Piedmont (2001)	Confluence of Crow Branch and Booker Creek	396	840	1,215	1,398	1,576
	Piney Mountain Road	454	943	1,350	1,548	1,738
	Upstream of Eastwood Lake	486	1,002	1,429	1,638	1,838
	North Lakeshore Drive	501	1,027	1,462	1,674	1,877
	Downstream of Eastwood Lake	754	1,477	2,050	2,336	2,606
FEMA Flows	Confluence of Crow Branch and Booker Creek	-	833	-	1,420	1,610
	Piney Mountain Road	-	833	-	1,420	1,610
	Upstream of Eastwood Lake	-	964	-	1,620	1,840
	North Lakeshore Drive	-	964	-	1,620	1,840
	Downstream of Eastwood Lake	-	1,210	-	2,010	3,020

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Methodology	Location	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)
USGS – Regional Regression Equations: Hydrologic Region 1 (2011)	Confluence of Crow Branch and Booker Creek	456	877	1,104	1,278	1,459
	Piney Mountain Road	517	984	1,236	1,427	1,627
	Upstream of Eastwood Lake	552	1,058	1,332	1,540	1,759
	North Lakeshore Drive	567	1,085	1,365	1,579	1,803
	Downstream of Eastwood Lake	840	1,645	2,094	2,440	2,807

Appendix B:

Hydraulic Analysis

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The purpose of the hydraulic modeling analysis is to determine an existing level of flooding for the stormwater drainage network and to develop proposed solutions to mitigate flooding, on both the primary systems and the secondary systems. Three (3) different modeling methodologies were used depending on the complexity and location of the conveyance system. For the primary system comprised of Booker Creek, HEC-RAS was used for hydraulic modeling. For smaller less complex secondary systems, Hydraflow Storm Sewers was used to calculate the hydraulic grade lines using an energy grade based approach, while more complex secondary systems were modeled using SWMM. Table B-1 lists the project areas that were modeled using each approach.

Table B-1: Project Area Model Selection

Project Area	Model Selection
Booker Creek	HEC-HMS
Shady Lawn Road System	SWMM
Arlington Street #1 System	SWMM
Arlington Street #2 System	SWMM
Rock Creek Road Closed System	Hydraflow Storm Sewers
South Lakeshore Drive/Ridgecrest Drive System	SWMM
South Lakeshore Drive/Woodhaven Road System	SWMM
South Lakeshore Drive/Rolling Road System	SWMM
South Lakeshore Drive System	SWMM
Allard Road System	SWMM
Curtis Road System	SWMM
Woodshire Lane/Huntington Drive System	SWMM

HEC-RAS Model

The HEC-RAS model calculates water surface profiles for steady, gradually varied flow, both sub-critical and supercritical, for user-specified discharges. The standard step backwater analysis for sub-critical flow was modeled for the Booker Creek Primary System. The model calculates the effect of obstructions, such as culverts, and building structures in the channel and floodplain on the water surface profile. The hydraulic computations are based on the solution of a one-dimensional energy equation with energy loss due to friction evaluated by Manning's equation.

Input data for the HEC-RAS computer model includes the following:

- Cross-section geometry of the channel and floodplain.
- Roughness coefficients to describe the characteristics of the channel and floodplain.
- Size, shape, and characteristics of culverts and roadways along the stream reach.
- Energy loss coefficients for flow in the channel and at roadway crossings.

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Primary System Study Limits

As discussed with the Town of Chapel Hill stormwater staff, study limits for the hydraulic evaluation of the primary system include Booker Creek from Eastwood Lake at the downstream end to its confluence with Crows Branch at the upstream end.

Stormwater Inventory

For the Eastwood Lake Subwatershed Study, stormwater utility infrastructure throughout the watershed was collected by WK Dickson personnel to compile a GIS stormwater inventory database for the Town. This was accomplished by using GPS as the primary means of data capture. WK Dickson employed survey grade GPS to locate the x, y, and z coordinates of each visible stormwater system structure and conventional surveying techniques to obtain other attributes including but not limited to size, material, slope, and length. Additionally, attributes were also collected for select streams and open channel. Data was obtained for those streams and open channels required to complete connectivity for modeling purposed. The data was collected using horizontal datum NAD 1983 and vertical datum NAVD 1988

Attributes collected as part of the inventory were used to populate the various models. Field visits and digital photographs for each structure and channel were used to estimate the roughness coefficients and energy loss coefficients. The topographic data used for the Eastwood Lake Subwatershed Study was the State of North Carolina's LiDAR data.

Cross Sections

Cross sections utilized in the HEC-RAS model were based on the existing FEMA cross sections (where available). These surveyed cross sections were augmented with additional cross sections surveyed by WK Dickson. The surveyed cross section points were then merged with the digital elevation model based on the LiDAR data. Cross sections were located perpendicular to the flow and at intervals along the stream to characterize the flow capacity of the channel and floodplain for the primary system. Along stream reaches where the shape, size, and geometry of the cross-section are varying, cross sections were cut at closer intervals than for reaches having little change in channel characteristic. Additional sections were cut as required by the HEC-RAS program to sufficiently model structures such as culverts.

Surveyed cross sections are identified by station number, which for the HEC-RAS model, refers to the approximate linear distance upstream from a reference point on the main channel or tributary reach. The cross sections depict the locations of cut sections from field topographic surveys. Similarly, the cross section at each road crossing represents the top-of-road cross section. The cross sections just upstream and just downstream of highest point of roadway (commonly referred to as the weir) represent the locations of the upstream and

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downstream faces, respectively, of the bridge or culvert in an area not impacted by roadway fill.

Roughness Coefficients

Manning's roughness coefficients, or 'n' values, represent the resistance to flow and influence the flow capacity of channels and floodplains. The HEC-RAS model uses these coefficients to compute friction loss longitudinally in the channel and floodplain. The roughness value is a function of the type and density of the vegetation, channel bottom and stream bank material, degree of channel meandering, and depth of flow.

Roughness coefficients were determined for all stream reaches for which hydraulic analyses were performed. The "horizontal variation in n-values" option was enabled to allow for correct modeling of the widely varied surfaces on a given cross-section. The right or left bank of the stream is referenced facing downstream. Roughness coefficients used in this study are listed in Table B-2.

Table B-2: Roughness Coefficients

Location	Range of 'n' values
Main Channel	0.04 - 0.055
Left Overbank	0.14 - 0.2
Right Overbank	0.14 - 0.2

All roughness coefficients were estimated through field observation and by referencing standard engineering manuals.

Culvert and Roadway Data

Culverts generally have different characteristics than the channel and floodplains away from roadway crossings. Often culverts constrict flood flows in the channel and floodplain, which may create backwater effects upstream of the structure. The constriction can produce increased velocities and result in localized scour.

For culvert analysis, the HEC-RAS model utilizes the concepts of "inlet" control and "outlet" control to simplify complicated culvert hydraulics. Inlet control flow occurs when the flow carrying capacity of the culvert entrance is less than the flow capacity of the culvert barrel. Outlet control flow occurs when the culvert carrying capacity is limited by downstream conditions or by the flow capacity of the culvert barrel.

During inlet control computations, the culvert inlet acts as either a weir or an orifice, and the resulting headwater is computed. The equations used by HEC-RAS are the same as those developed by the Federal Highway Administration during extensive laboratory testing, which describe the inlet control headwater under various conditions.

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For outlet control flow conditions, the required headwater is computed considering various conditions. For culverts flowing full, a form of the Bernoulli Equation, which considers friction losses, entrance losses and exit losses is utilized. Friction losses are based on Manning's equation. Entrance losses are computed as a coefficient times the velocity head in the culvert at the upstream end. Exit losses are computed as a coefficient times the change in velocity head from just inside the culvert (at the downstream end) to outside the culvert.

When the culvert is not flowing full, the direct step backwater procedure is used to calculate the profile through the culvert up to the culvert inlet. An entrance loss is then computed and added to the energy inside the culvert to obtain the upstream headwater. Culvert input data for the HEC-RAS model include:

- Shape and dimensions of the structure openings;
- Culvert length;
- Entrance loss coefficient, exit loss coefficient and coefficient of discharge for weir flow during roadway overtopping;
- Upstream and downstream invert elevations;
- Federal Highway Administration chart number for the culvert type;
- Top-of-road elevations to describe the weir during roadway overtopping and the weir crest length; and
- Four cross sections are required; one cross section sufficiently downstream of the culvert that flow is not affected by the culvert, one at the downstream end of the culvert, one at the upstream end of the culvert, and one located far enough upstream that the culvert has no effect on flow.

Energy Loss Coefficients

Contraction and expansion of flow produces energy losses caused by the transition. The magnitude of these losses is related to the velocity and the estimated loss coefficient. Where the transitions are gradual, the losses are small. At abrupt changes in cross-sectional area, the losses are higher. Energy losses resulting from expansion are greater than losses associated with contraction. Energy loss coefficients used for the Eastwood Lake subwatershed hydraulic models are presented in Table B-3.

Table B-3: Energy Loss Coefficients

Type of Transition	Expansion	Contraction
None	0	0
Gradual	0.3	0.1
Culvert sections	0.5	0.3

Starting Water Surface Elevation

The starting water surface elevations for HEC-RAS model was set based on values calculated in the Little Creek FEMA HEC-RAS models.

Model Run Descriptions and Assumptions

The HEC-RAS model was used to compute flood elevations at each cross-section for the Booker Creek Primary System for the 2-, 10-, 25-, 50- and 100-year floods. A hard copy of the HEC-RAS input and output is included in Appendix H, while a digital copy of the input and output is located on the CD in Appendix J.

The hydraulic analysis for this study is based only on the condition of unobstructed flow. Therefore, flood elevations shown on the profiles are considered valid only if hydraulic structures remain unobstructed and do not fail. Flood elevations may be raised by debris blockage of the culvert, channel, or floodplain.

Model Validation

Efforts were made to verify the models for various storm events. Feedback obtained from the questionnaires was reviewed for relevant information that could be used to verify the model. The comments and responses received were not specific enough to verify the model. Likewise, the information received during the public meetings was not useful for the purposes of verifying the models. The Town Staff was able to provide some feedback that was useful during the model validation process.

During the validation process, the flows and water surface elevations initially calculated were determined to be significantly higher than the FEMA flow and base flood elevations. Furthermore, the results from the initial existing conditions model were not aligned with some of the feedback received from the Town. The flows were calibrated to get results to more closely match FEMA flows, USGS Regional Regression flows, and Town feedback.

Open Channel Systems and Roadway Flooding

Two (2) roadway crossings were analyzed for flooding potential in the Eastwood Lake Subwatershed Study. All roadway crossings that were analyzed in this study are listed in Tables B-4 and B-5 along with the minimum top-of-road elevations and the 2-, 10-, 25-, 50- and 100-year flood elevations at the crossing for existing and future conditions with projects.

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Table B-4: Hydraulic Performance of Roadway Crossings – Existing Conditions

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
North Lakeshore Drive	301.63	100	298.73	301.06	302.31	302.52	302.61
Piney Mountain Road	385.66	100	378.56	383.64	386.70	387.32	387.72

*Bold text indicates the existing water surface has exceeded the crest or low point in the road thereby causing flooding.

** Green shade indicates crossing meets desired level of service. Red shade indicates crossing does not meet desired level of service.

Table B-5: Hydraulic Performance of Roadway Crossings – Future Conditions with Projects

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
North Lakeshore Drive (Existing Bridge)	301.63	100	298.52	301.51	302.26	302.43	302.47
Piney Mountain Road (Existing Bridge with Proposed Floodplain Culverts)	385.66	100	379.20	383.21	385.42	386.61	387.00

*Bold text indicates the existing water surface has exceeded the crest or low point in the road thereby causing flooding.

** Green shade indicates crossing meets desired level of service. Red shade indicates crossing does not meet desired level of service.

In addition to the roadway crossings, the open channel systems were also analyzed as part of this study. Tables summarizing the existing, future, and alternative flows and water surface elevations for the 2-, 10-, 25-, 50- and 100-year storm events have been included at the end of this appendix.

Hydraflow Storm Sewers

The purpose of the hydrologic analysis for the secondary systems, or closed systems, was to estimate the peak runoff that would flow to the catch basins and into the closed system. The rational method was used for the closed system hydrologic analysis. The rational method can be expressed as follows:

$$Q = CiA$$

- Q = maximum rate of runoff (cfs)
- C = runoff coefficient representing a ration of runoff to rainfall
- i = average rainfall intensity for a duration equal to the time of concentration (in/hr)
- A = drainage area contributing to the design location (acres)

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SWMM

SWMM is a dynamic rainfall-runoff model capable of modeling the hydrologic response of a watershed and hydraulic routing throughout a stormwater conveyance system. The model calculates the effect of backwater, flat or negative slopes, energy losses, and minor headlosses associated with bends, entrances and exits.

Input data for the EPA SWMM (hydraulics) computer model include the following:

- Conveyance pipes including structure inverts, pipe sizes and lengths;
- Open channel cross section geometries;
- Roughness coefficients for pipes and channels;
- Energy loss coefficients for flow in the pipes and channels;
- Storage rating curves; and
- Overland flow characteristics.

SWMM provides an accurate evaluation of the existing and proposed conditions because it combines hydrology and hydraulics while accounting for the routing effects of the channel and overbank storage areas. Because hydrology and hydraulics are combined, changes to peak flows or water surface elevations resulting from proposed modifications to the existing channels or culverts are calculated in the model in one (1) step. Additionally, changes to flows from proposed pipes and channel improvements are seen both upstream and downstream, reducing the potential for a stormwater system having increased flooding downstream.

Energy Loss Coefficients

Contraction and expansion of flow produces energy losses caused by the transition. The magnitude of these losses is related to the velocity and the estimated loss coefficient. Where the transitions are gradual, the losses are small. At abrupt changes in cross-sectional area, the losses are higher. Energy losses resulting from expansion are greater than losses associated with contraction. Energy loss coefficients used for the hydraulic SWMM models are presented in Table B-6.

Table B-6: Energy Loss Coefficients for SWMM Models

Type of Transition	Expansion	Contraction
None	0	0
Manhole/Inlet	0.7	0.5
Open Channel	1	0.5–Headwall/ 0.9 - Projecting

Additional energy losses for structures having bends were divided between the two (2) joining pipes. The bend losses used for this project are based on NCDOT values and are shown below in Table B-7.

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Table B-7: Bend Loss Coefficients

Angle (°)	Loss Coefficient	Angle (°)	Loss Coefficient
90	0.70	40	0.38
80	0.66	30	0.28
70	0.61	25	0.22
60	0.55	20	0.16
50	0.47	15	0.10

Table B-8: Eastwood Lake Subwatershed Study: Infrastructure Capacity

Location	Existing Size/Material	Existing Capacity (cfs)	Proposed Size/Material	Proposed Capacity (cfs)
North Lakeshore Drive	Bridge	1,140	No Change	No Change
Piney Mountain Road	Bridge	1,114	Existing Bridge with Proposed Floodplain Culvert (7' x 5' RCBC)	1,529

Table B-9: Eastwood Lake
Subwatershed Study - Flow and WSEL Comparison (2-Year)

**Table B-10: Eastwood Lake
Subwatershed Study - Flow and WSEL Comparison (10-Year)**

Station	10-Year Existing Flow (cfs)	10-Year Future Flow (cfs)	10-Year Alternative Flow (cfs)	10-Year Existing WSEL (feet)	10-Year Future WSEL (feet)	10-Year Alternative WSEL (feet)	Difference in 10-Year WSEL: Future vs. Alternative (feet)
BOOKER CREEK							
22230.4	Bridge						
22205.4	734.00	842.00	108.00	426.19	426.52	423.53	-2.99
22061.4	734.00	842.00	108.00	404.82	405.14	402.28	-2.86
21877	734.00	842.00	108.00	393.48	393.78	392.39	-1.39
21577.4	1018.00	1128.00	1006.00	390.07	390.27	390.05	-0.22
21329	1018.00	1128.00	1006.00	387.16	387.38	387.13	-0.25
21024.2	1018.00	1128.00	1006.00	386.21	386.80	384.43	-2.37
20803	1018.00	1128.00	1006.00	385.99	386.59	383.85	-2.74
20582.7	1018.00	1128.00	1006.00	385.99	386.59	383.85	-2.74
20391.6	1018.00	1184.00	1051.00	385.94	386.55	382.87	-3.68
20349.6	Bridge						
20307.6	505.00	1134.00	1028.00	379.17	380.10	379.19	-0.91
20223	505.00	1134.00	1028.00	376.23	376.52	376.25	-0.27
20024.2	505.00	1134.00	1028.00	372.60	372.83	372.62	-0.21
19751	505.00	1134.00	1028.00	367.64	367.97	367.67	-0.30
19524.2	505.00	1134.00	1028.00	361.82	362.11	361.84	-0.27
19222	505.00	1134.00	1028.00	352.80	353.04	352.82	-0.22
19024.2	505.00	1134.00	1028.00	349.57	349.91	349.60	-0.31
18833	505.00	1134.00	1028.00	346.21	346.50	346.23	-0.27
18524.2	505.00	1134.00	1028.00	341.67	341.99	341.71	-0.28
18317	505.00	1134.00	1028.00	339.23	339.58	339.25	-0.33
18024.2	505.00	1134.00	1028.00	335.23	335.44	335.25	-0.19
17810	505.00	1134.00	1028.00	332.20	332.55	332.23	-0.32
17524.2	505.00	1134.00	1028.00	330.92	331.23	330.95	-0.28
17294	505.00	1134.00	1028.00	329.61	329.88	329.63	-0.25
17020	505.00	1134.00	1028.00	326.10	326.31	326.12	-0.19
16807	505.00	1134.00	1028.00	323.00	323.26	323.00	-0.26
16524.2	603.00	1165.00	1057.00	320.29	320.55	320.29	-0.26
16219	603.00	1165.00	1057.00	315.31	315.61	315.30	-0.31
16024.2	603.00	1165.00	1057.00	311.33	311.64	311.33	-0.31
15740	603.00	1165.00	1057.00	304.79	305.05	304.79	-0.26
15524.2	603.00	1165.00	1057.00	302.06	302.44	302.26	-0.18
15291	603.00	1165.00	1057.00	301.31	301.99	301.81	-0.18
15183.4	603.00	1165.00	1057.00	301.06	301.75	301.62	-0.13
15150.4	Bridge						
15117.4	603.00	1165.00	1057.00	298.62	298.78	299.12	0.34
15024.2	603.00	1174.00	1065.00	298.55	298.72	299.14	0.42
14764	603.00	1174.00	1065.00	297.60	297.75	297.58	-0.17
14524.2	603.00	1174.00	1065.00	297.22	297.33	297.18	-0.15
14034.8	603.00	1174.00	1065.00	297.21	297.31	297.16	-0.15
13555.6	603.00	1174.00	1065.00	297.16	297.25	297.12	-0.13
13024.2	603.00	1174.00	1065.00	297.11	297.19	297.06	-0.13
12524.2	603.00	1174.00	1065.00	297.07	297.15	297.02	-0.13
12024.2	603.00	1174.00	1065.00	297.05	297.13	297.01	-0.12
11747.1	603.00	1174.00	1065.00	297.05	297.12	297.00	-0.12
11352.3	668.00	1773.00	1538.00	297.05	297.12	297.00	-0.12
11341.3	Inl Strcut						

**Table B-11: Eastwood Lake
Subwatershed Study - Flow and WSEL Comparison (25-Year)**

**Table B-12: Eastwood Lake
Subwatershed Study - Flow and WSEL Comparison (50-Year)**

Station	50-Year Existing Flow (cfs)	50-Year Future Flow (cfs)	50-Year Alternative Flow (cfs)	50-Year Existing WSEL (feet)	50-Year Future WSEL (feet)	50-Year Alternative WSEL (feet)	Difference in 50-Year WSEL: Future vs. Alternative (feet)
BOOKER CREEK							
22230.4	Bridge						
22205.4	1158.00	1270.00	165.00	427.40	427.69	424.01	-3.68
22061.4	1158.00	1270.00	165.00	405.95	406.23	402.64	-3.59
21877	1158.00	1270.00	165.00	394.36	394.59	393.56	-1.03
21577.4	1600.00	1750.00	1585.00	390.94	391.14	390.92	-0.22
21329	1600.00	1750.00	1585.00	388.18	388.33	388.16	-0.17
21024.2	1600.00	1750.00	1585.00	387.63	387.92	387.40	-0.52
20803	1600.00	1750.00	1585.00	387.33	387.61	387.07	-0.54
20582.7	1600.00	1750.00	1585.00	387.33	387.6	387.07	-0.53
20391.6	1600.00	1820.00	1648.00	387.28	387.55	387.01	-0.54
20349.6	Bridge						
20307.6	1600.00	1804.00	1642.00	381.46	382.39	382.11	-0.28
20223	1600.00	1804.00	1642.00	377.34	377.65	377.40	-0.25
20024.2	1600.00	1804.00	1642.00	373.55	373.83	373.61	-0.22
19751	1600.00	1804.00	1642.00	369.08	369.46	369.17	-0.29
19524.2	1600.00	1804.00	1642.00	363.05	363.42	363.13	-0.29
19222	1600.00	1804.00	1642.00	353.89	354.25	353.97	-0.28
19024.2	1600.00	1804.00	1642.00	351.03	350.90	351.12	0.22
18833	1600.00	1804.00	1642.00	347.75	348.88	347.84	-1.04
18524.2	1600.00	1804.00	1642.00	342.94	343.33	343.02	-0.31
18317	1600.00	1804.00	1642.00	340.62	340.90	340.69	-0.21
18024.2	1600.00	1804.00	1642.00	336.20	336.51	336.27	-0.24
17810	1600.00	1804.00	1642.00	333.75	334.22	333.86	-0.36
17524.2	1600.00	1804.00	1642.00	332.29	332.68	332.37	-0.31
17294	1600.00	1804.00	1642.00	330.79	331.15	330.86	-0.29
17020	1600.00	1804.00	1642.00	327.08	327.35	327.14	-0.21
16807	1600.00	1804.00	1642.00	324.33	324.58	324.30	-0.28
16524.2	1714.00	1853.00	1689.00	321.71	321.98	321.67	-0.31
16219	1714.00	1853.00	1689.00	316.97	317.26	316.90	-0.36
16024.2	1714.00	1853.00	1689.00	312.95	313.24	312.90	-0.34
15740	1714.00	1853.00	1689.00	306.17	306.36	306.13	-0.23
15524.2	1714.00	1853.00	1689.00	303.40	303.55	303.43	-0.12
15291	1714.00	1853.00	1689.00	303.14	303.30	303.20	-0.10
15183.4	1714.00	1853.00	1689.00	302.52	302.57	302.64	0.07
15150.4	Bridge						
15117.4	1714.00	1853.00	1689.00	299.21	299.34	299.95	0.61
15024.2	1714.00	1865.00	1699.00	299.34	299.48	300.05	0.57
14764	1714.00	1865.00	1699.00	298.47	298.61	298.45	-0.16
14524.2	1714.00	1865.00	1699.00	297.90	298.00	297.88	-0.12
14034.8	1714.00	1865.00	1699.00	297.82	297.90	297.80	-0.10
13555.6	1714.00	1865.00	1699.00	297.73	297.80	297.71	-0.09
13024.2	1714.00	1865.00	1699.00	297.62	297.68	297.61	-0.07
12524.2	1714.00	1865.00	1699.00	297.54	297.58	297.53	-0.05
12024.2	1714.00	1865.00	1699.00	297.51	297.54	297.49	-0.05
11747.1	1714.00	1865.00	1699.00	297.50	297.54	297.49	-0.05
11352.3	2614.00	2685.00	2563.00	297.49	297.53	297.48	-0.05
11341.3	Inl Strcut						

**Table B-13: Eastwood Lake
Subwatershed Study - Flow and WSEL Comparison (100-Year)**

Table B-14: Eastwood Lake Subwatershed Study: At-Risk Properties/Structures (25-Year)

Address	LAG (feet NAVD)	Calculated Water Surface Elevations (feet NAVD)		
		Existing 25-Year Flood	Future 25-Year Flood	Alternative 25-Year Flood
BOOKER CREEK				
1818 N LAKESHORE DR	297.10	297.60	297.71	297.55
2144 LAKESHORE CT	296.53	297.33	297.39	297.28
104 DARLIN CR	387.39	387.71	388.04	387.68
107 DARLIN CR	391.62	390.59	390.77	390.60
601 KENSINGTON DR	300.45	302.71	302.92	302.83
606 CONCORDIA CT	307.67	305.63	305.92	305.62
601 ROCK CREEK RD	300.00	302.71	302.92	302.83
603 ROCK CREEK RD	301.94	302.86	303.06	302.96

Table B-14: Eastwood Lake Subwatershed Study: At-Risk Properties/Structures (100-Year)

Address	LAG (feet NAVD)	Calculated Water Surface Elevations (feet NAVD)		
		Existing 100-Year Flood	Future 100-Year Flood	Alternative 100-Year Flood
BOOKER CREEK				
1818 N LAKESHORE DR	297.10	298.05	298.13	297.99
2144 LAKESHORE CT	296.53	297.60	297.63	297.57
104 DARLIN CR	387.39	388.41	388.53	388.32
107 DARLIN CR	391.62	391.78	391.94	391.66
601 KENSINGTON DR	300.45	303.41	303.54	303.36
606 CONCORDIA CT	307.67	307.71	307.85	307.59
601 ROCK CREEK RD	300.00	303.41	303.54	303.36
603 ROCK CREEK RD	301.94	303.53	303.66	303.48

Appendix C:

Watershed, Land Use, and Soils Maps

List of Contents:

1. Booker Creek Watershed Map
 2. Booker Headwaters Sub-Watershed Map
 3. Cedar Fork Sub-Watershed Map
 4. Crow Branch Sub-Watershed Map
 5. Eastwood Lake Sub-Watershed Map
 6. Lower Booker Creek Sub-Watershed Map
 7. Booker Creek Existing Land Use Map
 8. Booker Creek Future Land Use Map
 9. Booker Creek Soils Map
-

Eastwood Lake Subwatershed Study

Appendix C-1 Sub-Watershed Map

0 0.25 0.5 1 Miles

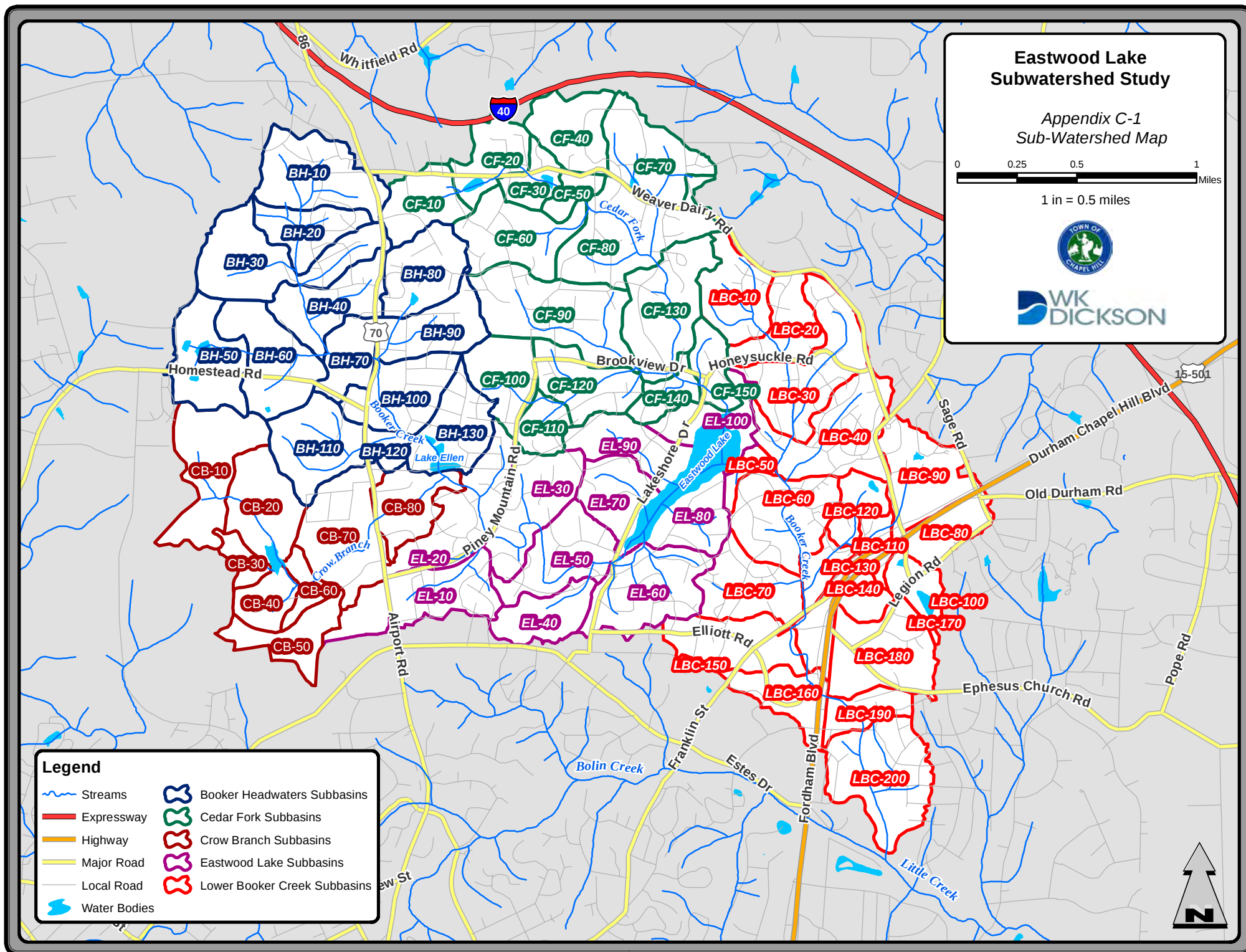
1 in = 0.5 miles



WK
DICKSON

Legend

- Streams
- Expressway
- Highway
- Major Road
- Local Road
- Water Bodies
- Booker Headwaters Subbasins
- Cedar Fork Subbasins
- Crow Branch Subbasins
- Eastwood Lake Subbasins
- Lower Booker Creek Subbasins



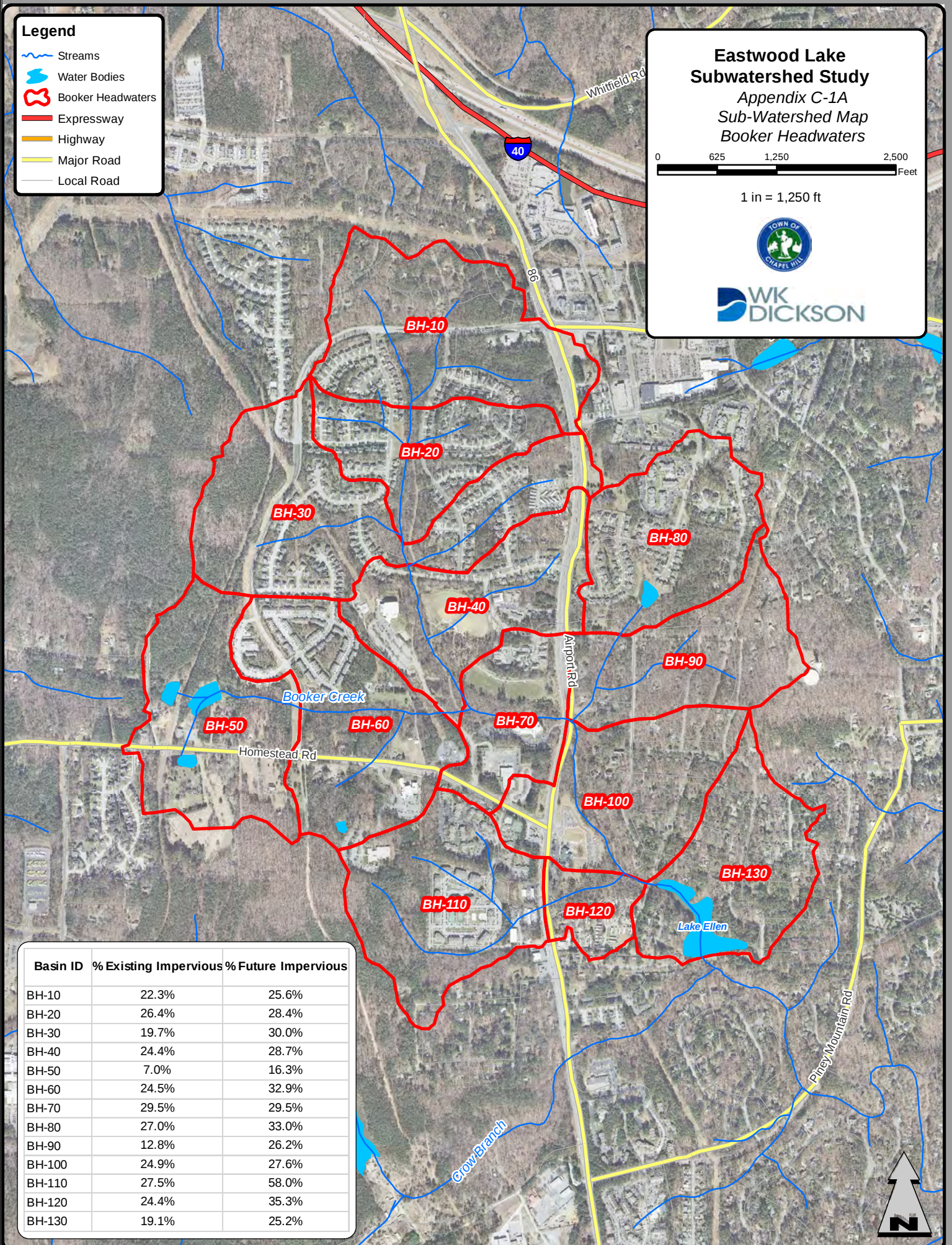
Legend

- Streams
- Water Bodies
- Booker Headwaters
- Expressway
- Highway
- Major Road
- Local Road

Eastwood Lake Subwatershed Study Appendix C-1A Sub-Watershed Map Booker Headwaters

0 625 1,250 2,500 Feet

1 in = 1,250 ft



Basin ID % Existing Impervious % Future Impervious

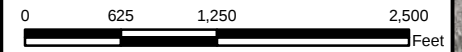
BH-10	22.3%	25.6%
BH-20	26.4%	28.4%
BH-30	19.7%	30.0%
BH-40	24.4%	28.7%
BH-50	7.0%	16.3%
BH-60	24.5%	32.9%
BH-70	29.5%	29.5%
BH-80	27.0%	33.0%
BH-90	12.8%	26.2%
BH-100	24.9%	27.6%
BH-110	27.5%	58.0%
BH-120	24.4%	35.3%
BH-130	19.1%	25.2%



Legend

- Streams
- Water Bodies
- Cedar Fork Subbasins
- Expressway
- Highway
- Major Road
- Local Road

Eastwood Lake Subwatershed Study
Appendix C-1B
 Sub-Watershed Map
 Cedar Fork



1 in = 1,250 ft



Basin ID	% Existing Impervious	% Future Impervious
CF-10	53.4%	55.6%
CF-20	29.3%	51.2%
CF-30	13.4%	24.0%
CF-40	18.7%	34.2%
CF-50	14.9%	19.1%
CF-60	19.4%	27.5%
CF-70	27.4%	33.4%
CF-80	18.2%	23.8%
CF-90	13.6%	18.0%
CF-100	13.9%	17.0%
CF-110	19.1%	22.5%
CF-120	17.9%	22.8%
CF-130	12.8%	16.7%
CF-140	19.2%	26.4%
CF-150	15.1%	22.0%





Legend

Streams

Crow Branch Subbasins

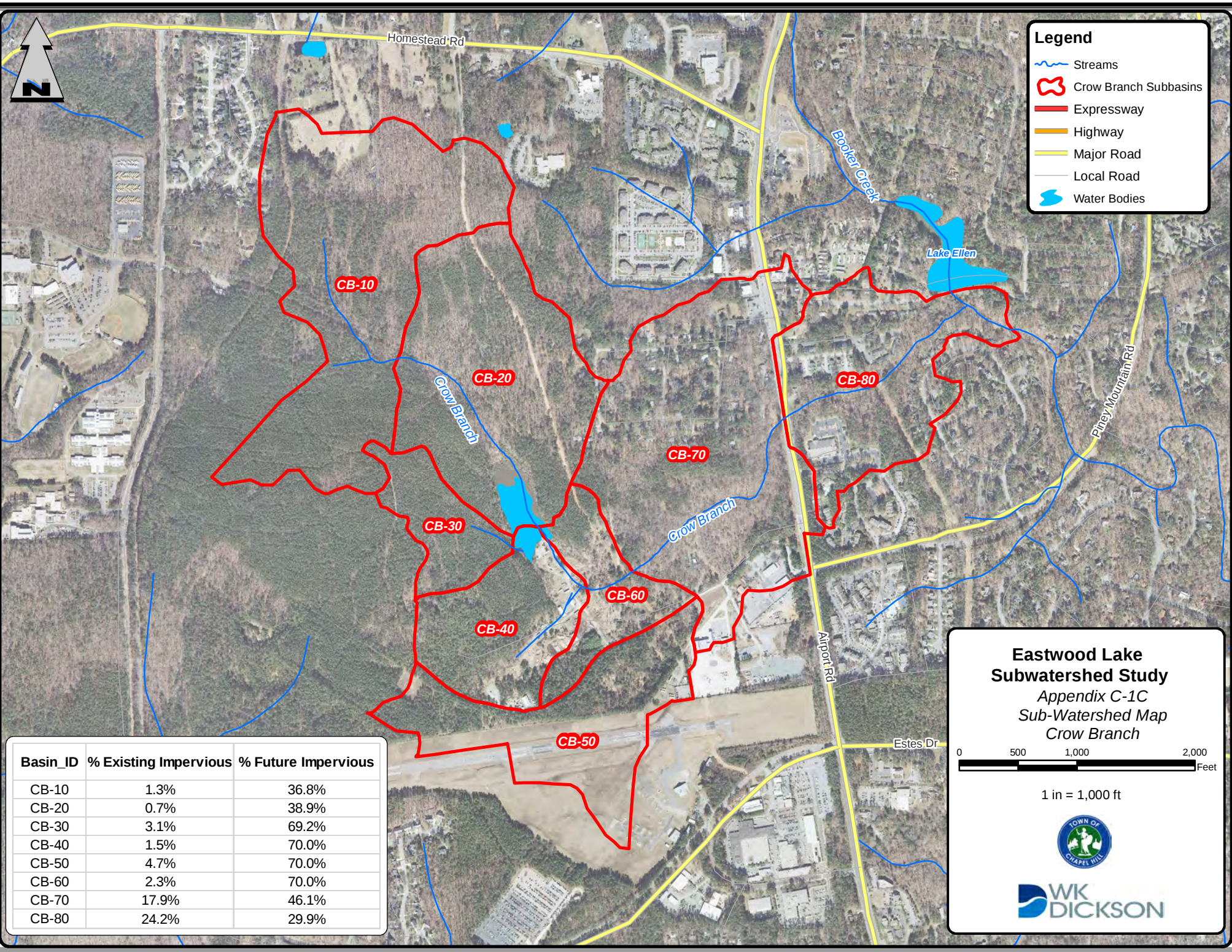
Expressway

Highway

Major Road

Local Road

Water Bodies



Basin_ID	% Existing Impervious	% Future Impervious
CB-10	1.3%	36.8%
CB-20	0.7%	38.9%
CB-30	3.1%	69.2%
CB-40	1.5%	70.0%
CB-50	4.7%	70.0%
CB-60	2.3%	70.0%
CB-70	17.9%	46.1%
CB-80	24.2%	29.9%

**Eastwood Lake
Subwatershed Study**
Appendix C-1C
Sub-Watershed Map
Crow Branch

05001,0002,000

Feet

1 in = 1,000 ft

Basin ID	% Existing Impervious	% Future Impervious
EL-10	32.7%	36.9%
EL-20	23.0%	30.7%
EL-30	15.4%	22.4%
EL-40	23.8%	27.0%
EL-50	17.7%	25.7%
EL-60	21.0%	23.3%
EL-70	13.9%	20.0%
EL-80	14.5%	20.3%
EL-90	13.5%	20.6%
EL-100	13.2%	19.8%

Legend

 Streams

 Eastwood Lake Subbasins

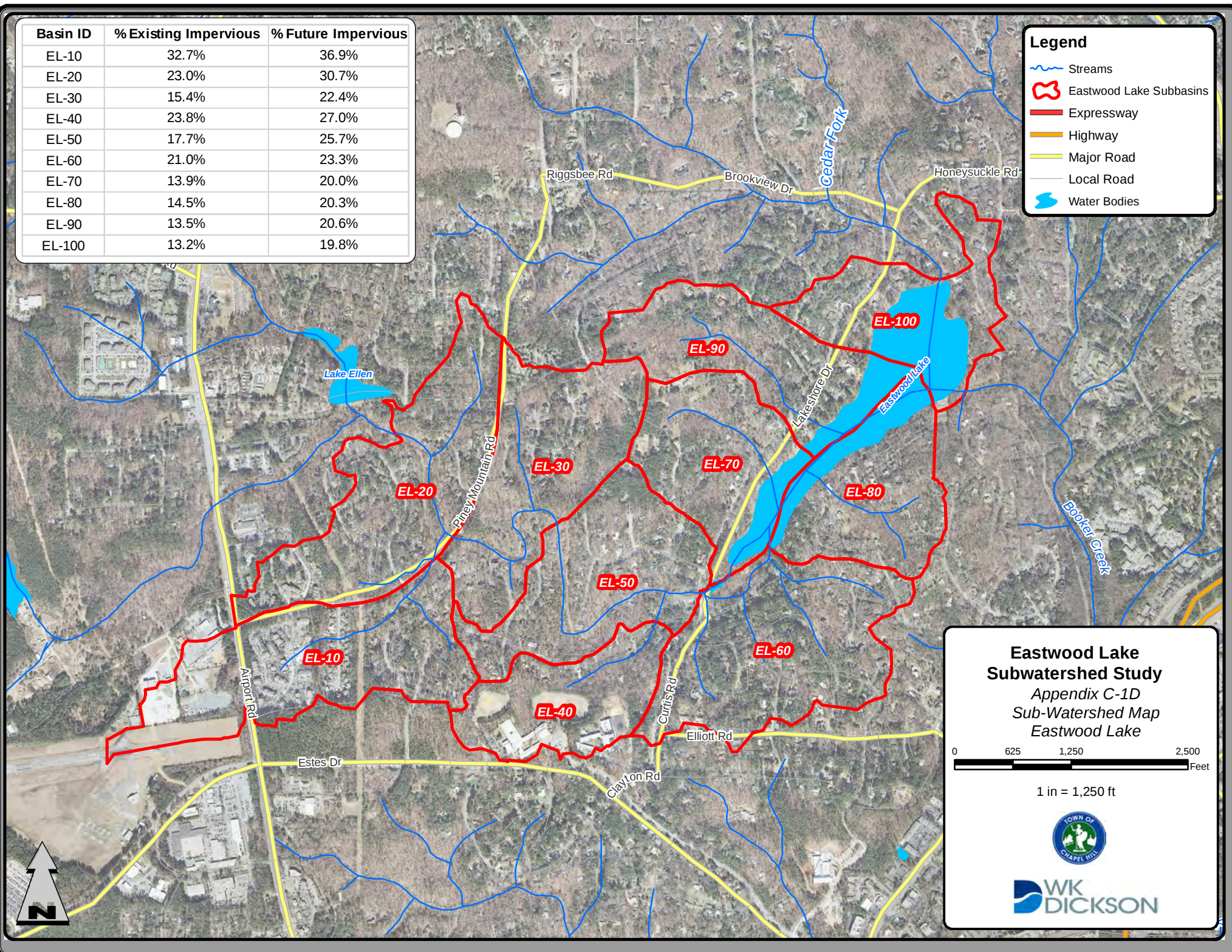
 Expressway

 Highway

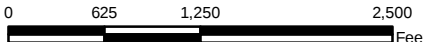
 Major Road

 Local Road

 Water Bodies



Eastwood Lake Subwatershed Study
Appendix C-1D
Sub-Watershed Map
Eastwood Lake


1 in = 1,250 ft






Legend

- Streams
- Water Bodies
- Lower Booker Creek
- Expressway
- Highway
- Major Road
- Local Road

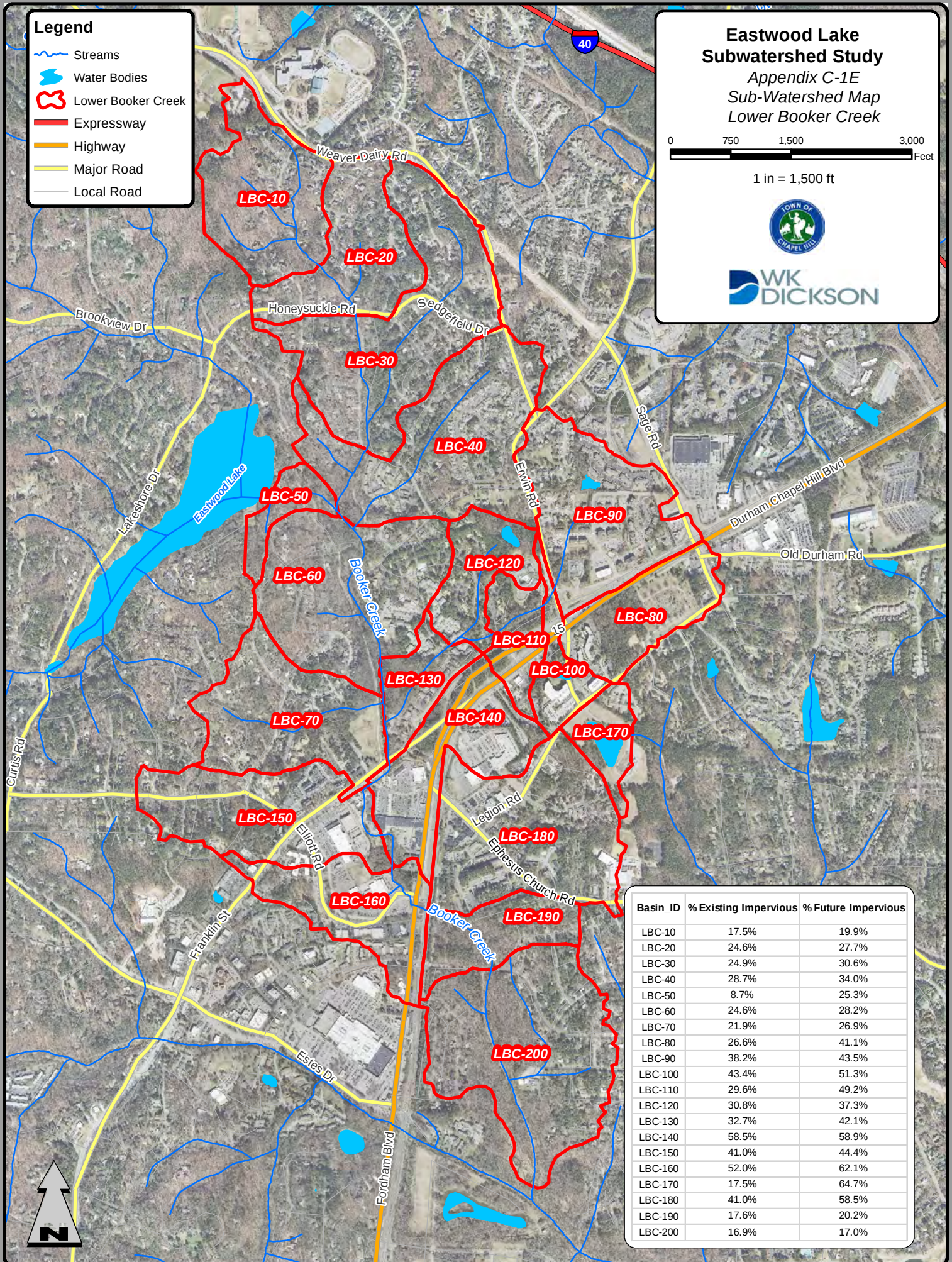
Eastwood Lake Subwatershed Study Appendix C-1E Sub-Watershed Map Lower Booker Creek

0 750 1,500 3,000
Feet

1 in = 1,500 ft



WK
DICKSON



Basin_ID	% Existing Impervious	% Future Impervious
LBC-10	17.5%	19.9%
LBC-20	24.6%	27.7%
LBC-30	24.9%	30.6%
LBC-40	28.7%	34.0%
LBC-50	8.7%	25.3%
LBC-60	24.6%	28.2%
LBC-70	21.9%	26.9%
LBC-80	26.6%	41.1%
LBC-90	38.2%	43.5%
LBC-100	43.4%	51.3%
LBC-110	29.6%	49.2%
LBC-120	30.8%	37.3%
LBC-130	32.7%	42.1%
LBC-140	58.5%	58.9%
LBC-150	41.0%	44.4%
LBC-160	52.0%	62.1%
LBC-170	17.5%	64.7%
LBC-180	41.0%	58.5%
LBC-190	17.6%	20.2%
LBC-200	16.9%	17.0%

Eastwood Lake Subwatershed Study

Appendix C-2 Existing Land Use Map

0 0.25 0.5 1 Miles

1 in = 0.5 miles



WK
DICKSON

Legend

Streams	Existing Land Use
Expressway	Office/Institutional/Mixed Use
Highway	Commercial
Major Road	High Density Residential
Local Road	Medium Density Residential
Water Bodies	Low Density Residential
	Park/Open Space
	Right-of-Way
	Development Opportunity Area



Eastwood Lake Subwatershed Study

Appendix C-3 Future Land Use Map

0 0.25 0.5 1 Miles

1 in = 0.5 miles

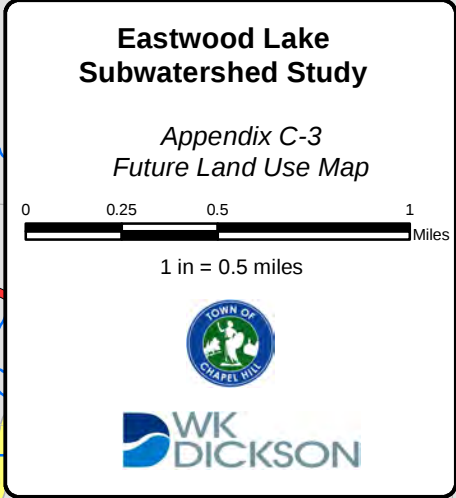


Eastwood Lake Subwatershed Study

Appendix C-3 Future Land Use Map

0 0.25 0.5 1 Miles

1 in = 0.5 miles

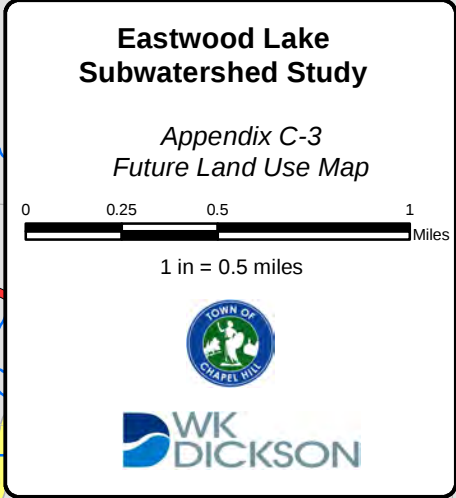


Eastwood Lake Subwatershed Study

Appendix C-3 Future Land Use Map

0 0.25 0.5 1 Miles

1 in = 0.5 miles

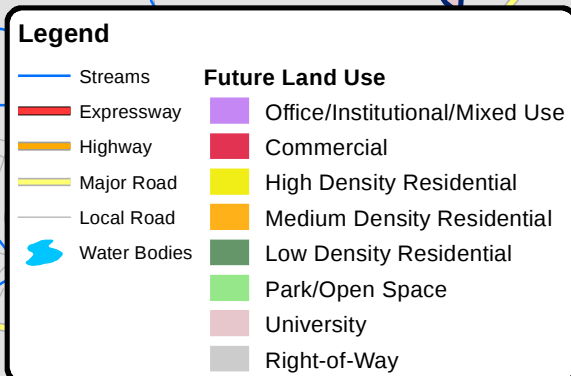


Eastwood Lake Subwatershed Study

Appendix C-3 Future Land Use Map

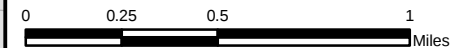
0 0.25 0.5 1 Miles

1 in = 0.5 miles



Eastwood Lake Subwatershed Study

Appendix C-4 Soils Map



1 in = 0.5 miles

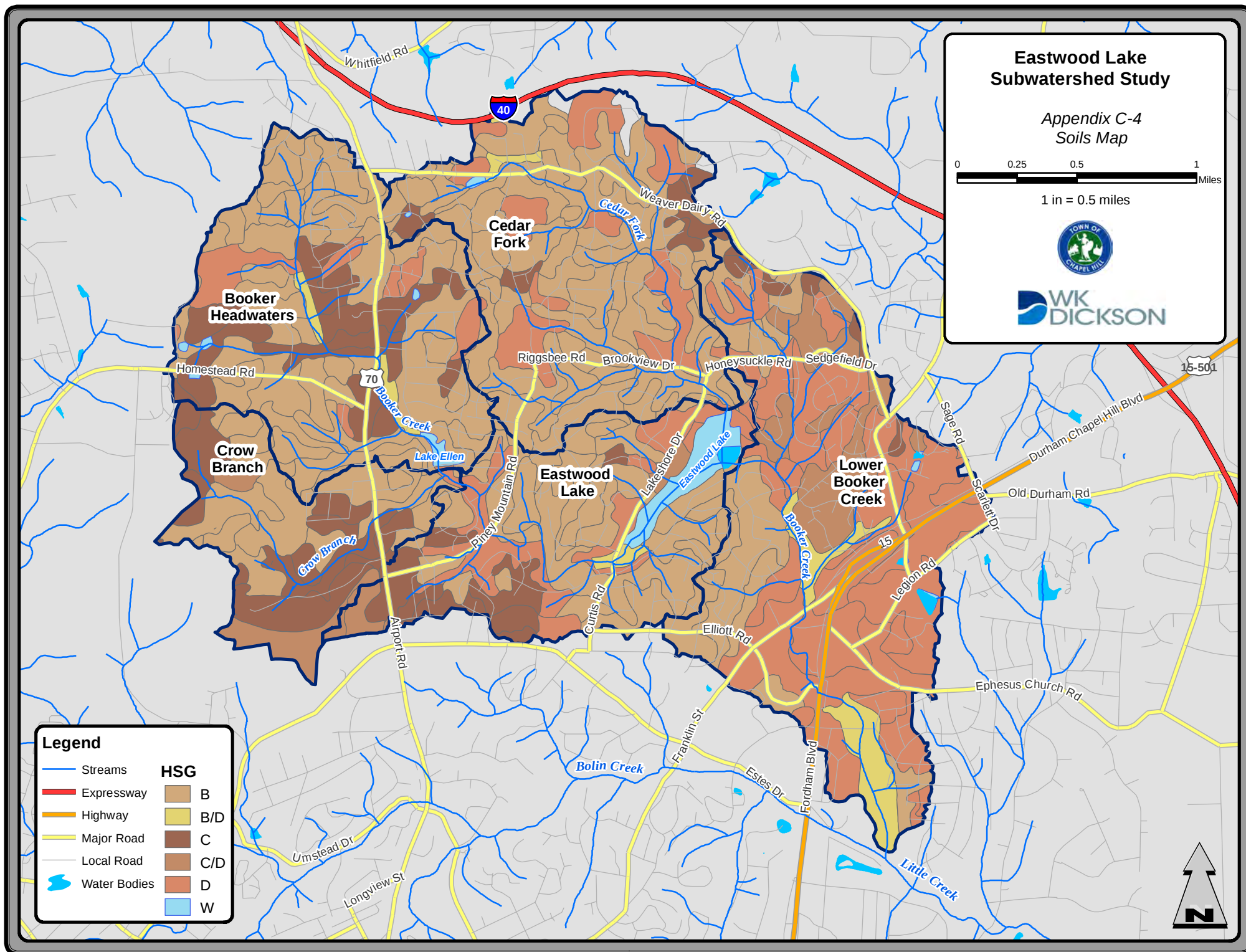


Legend

- Streams
- Expressway
- Highway
- Major Road
- Local Road
- Water Bodies

HSG

- B
- B/D
- C
- C/D
- D
- W



Appendix D:

Citizen Input

List of Contents:

1. General Survey Results
2. Eastwood Lake Subwatershed Questionnaire
3. Eastwood Lake Public Meeting Minutes
 - a. Public Meeting 2, Session 1 – December 7, 2017
 - b. Public Meeting 2, Session 2 – December 7, 2017

APPENDIX D

CITIZEN INPUT - RESULTS OF SURVEYS

Table D-1A: General Survey Results – Entire Booker Creek Watershed

Survey Question Number	Question	Survey Response				
		Yes	No	No Response	Do Not Know	Maybe
1	Have you ever experienced flooding on your system property?	70	36	11	-	-
4	Do streets and/or common areas in your neighborhood flood?	48	61	12	-	-
5	Have you noticed any increase or decrease in flooding/drainage on your property due to nearby construction, landscaping, or changes to the drainage system?	46	60	14	-	-
6	Do you have a stream or drainage channel near your property?	88	12	10	10	-
8/12	Would you like to learn more about how you could help to prevent erosion and manage stormwater on your property?	60	21	21	-	22

Table D-1B: General Survey Results – Eastwood Lake Subwatershed

Survey Question Number	Question	Survey Response				
		Yes	No	No Response	Do Not Know	Maybe
1	Have you ever experienced flooding on your system property?	27	25	-	-	-
4	Do streets and/or common areas in your neighborhood flood?	16	36	-	-	-
5	Have you noticed any increase or decrease in flooding/drainage on your property due to nearby construction, landscaping, or changes to the drainage system?	18	33	1	-	-
6	Do you have a stream or drainage channel near your property?	39	9	1	3	-
12	Would you like to learn more about how you could help to prevent erosion and manage stormwater on your property?	25	10	2	-	15

APPENDIX D

CITIZEN INPUT - RESULTS OF SURVEYS

Table D-2A: Frequency and Location of Flooding Question Responses (Question 2)
Entire Booker Creek Watershed

	Flooding Location							
	Storage Building	HVAC Unit	Crawl Space	Home's First Floor	Basement	Yard flooding from stream/channel	Yard flooding from street runoff	Yard flooding from adjacent property
Less than once per year	9	15	14	19	20	4	12	9
Once per year	14	1	4	-	1	9	7	6
2-3 times per year	7	3	9	1	7	37	19	34
More than 3 times per year	1	-	4	-	-	5	8	9
Every time it rains	-	-	1	-	-	6	7	6

Table D-2B: Frequency and Location of Flooding Question Responses (Question 2)
Eastwood Lake Subwatershed

	Flooding Location							
	Storage Building	HVAC Unit	Crawl Space	Home's First Floor	Basement	Yard flooding from stream/channel	Yard flooding from street runoff	Yard flooding from adjacent property
Less than once per year	4	2	3	2	4	4	2	3
Once per year	-	-	-	-	1	2	3	-
2-3 times per year	-	-	2	-	2	7	4	6
More than 3 times per year	1	-	2	-	-	3	4	5
Every time it rains	-	-	1	-	-	3	4	3

APPENDIX D

CITIZEN INPUT - RESULTS OF SURVEYS

Table D-3A: Areas Showing Signs of Erosion (Soil Loss) (Question 7) – Entire Booker Creek Watershed

Item	Number of Responses
Road	9
Yard	54
Building/House	7
Fence	7
Driveway	25
Steep Slope	33
Stream of Drainage Channel	64

Table D-3B: Areas Showing Signs of Erosion (Soil Loss) (Question 7) –Eastwood Lake Subwatershed

Item	Number of Responses
Road	2
Yard	24
Building/House	1
Fence	2
Driveway	11
Steep Slope	17
Stream of Drainage Channel	25

Eastwood Lake Subwatershed Study
Questionnaire
Chapel Hill Stormwater Master Plan

The Town of Chapel Hill's Stormwater Management Program has contracted with W. K. Dickson to conduct a study of the Eastwood Lake subwatershed. This study will identify and prioritize stormwater projects that will help lessen drainage and flooding impacts, stabilize streams, and improve water quality.

Please take this brief questionnaire to let us know what you are experiencing. Thank you for your participation!

1. Have you experienced flooding on your property? ☐ Yes ☐ No

2. Please check all conditions below that apply to you and indicate the frequency of occurrence. "Water" pertains only to that coming from creeks or precipitation, not from leaks in the sanitary sewer system or irrigation problems.

- ☐ Water enters storage buildings/sheds _____
- ☐ Water floods HVAC units _____
- ☐ Water stands in crawl space _____
- ☐ Water floods the basement _____
- ☐ Water enters the home's first floor _____
- ☐ Yard floods from nearby stream or drainage channel _____
- ☐ Yard floods from street runoff _____
- ☐ Yard floods because of runoff from adjacent property _____

FREQUENCY

- A.** Less than once a year
- B.** Once a year
- C.** 2-3 times a year

3. If known, please list dates, locations, and depth of water (ex: On May 10, 2014, at my mailbox it was 2 feet deep) to help us correlate flooding events with rainfall amounts.

4. Do streets in your neighborhood flood? ☐ Yes ☐ No

If you can, please describe the locations and depth of water. If you have photos, please consider sending them to us via email or attaching labeled copies to this questionnaire.

5. Have you noticed any increase or decrease in flooding/drainage on your property due to nearby construction, landscaping, or changes to the drainage systems? If yes, what were those changes and the approximate timeframe?

☐ Yes ☐ No

Comments: _____

6. Do you have a stream or drainage channel on or near your property?

☐ Yes ☐ No ☐ Don't know

7. If yes, please check below all areas near or on your property that show signs of erosion (soil loss):

☐ Road ☐ Yard ☐ Building/House ☐ Fence ☐ Driveway ☐ Steep slope

☐ Stream or drainage channel

☐ Other _____

8. I would be willing to participate in a stream maintenance program (e.g. allowing for stream bank restoration, sampling for water quality, installing rain gauges, diverting stormwater to cisterns or rain barrels, etc.).

☐ Definitely ☐ Maybe ☐ Never ☐ I need assistance ☐ I can't help but I will allow access to the creek through my property ☐ Other _____

10. If a cost-sharing program was made available along with training, would you be willing to install a stormwater BMP (e.g. rain garden, cistern, backyard wetland, etc.)

☐ Yes ☐ No ☐ Maybe

11. What is the biggest water quality challenge in your neighborhood?

12. Would you like to learn more about how you could help prevent erosion and manage stormwater on your property?

☐ Yes ☐ No ☐ Maybe

Name: _____

Property Address: _____

How long have you lived or worked at this location? _____

Primary Residence or Business (if different from Property Address): _____

Phone (Optional): _____

E-mail Address (Optional if you would like ongoing communication during this study):

Is there anything else you would like us to know about stormwater issues in your area?

For more information, visit www.bookercreekplanning.org

Please provide the survey back to us by:

E-mail: comments@eastwoodlakesws.org

**By Direct Mail:
c/o PEQ, Inga Kennedy
3205 Huddlestone Drive, Unit 303
Raleigh, NC 27512**



Town of Chapel Hill
Stormwater Management Program
Eastwood Lake Subwatershed Study UPDATE

Meeting Summary
Public Meeting 2, Session 1
December 7, 2017, 11:30 AM

Town of Chapel Hill and Consultant Attendees

Sue Burke, Stormwater Engineer, Town of Chapel Hill	Kevin Nunnery, Biohabitats
Tom Murray, Project Manager, WK Dickson	Ted Brown, Biohabitats
Ben Carroll, WK Dickson	Inga Kennedy, PEQ
Ebony Hagans, WK Dickson	

1. Welcome and Purpose of Meeting

Residents of the Eastwood Lake subwatershed were invited to attend a public meeting on December 7, 2017 at the Chapel Hill public library, to receive an update on the Eastwood Lake subwatershed study including the existing conditions findings and the proposed solutions.

Two meetings were held, one the morning and evening of the 7th to accommodate residents' work schedules. Each meeting began with a presentation followed by a question and answer session. Following the meeting, attendees were invited to view maps of the Eastwood Lake subwatershed summarizing the proposed solutions and to speak with staff and consultants about any questions or concerns. This summary represents the morning meeting.

2. Overview of PowerPoint Presentation

Tom Murray kicked off the presentation portion of the meeting and spoke on the following topics:

- Overall Agenda and Goals.
- Progress Update.
- Watershed Characteristics.
- Public Outreach.
- Existing Conditions Evaluation.
- Possible Solutions.
- Stream Stabilization.
- Lower Booker Creek Storage Projects.
- Alternatives Development.

- Neighborhood Retrofits – green street, grass swales, downspout disconnects, rain gardens, cisterns.
- Outfall Screening.
- Next steps moving forward.

A copy of this presentation can be found on the project website.

3. Verbal Questions/Comments by Participants during and following the Presentation

- **Question:** Are the recommended 200-foot buffer widths achievable in the Eastwood Lake subwatershed for the proposed projects?
Response: The achievable buffer width will vary for each project. For most of the projects identified in the project area, 200-ft is not feasible. The restored buffer width will be evaluated on a case-by-case basis for each of the identified projects. (Tom Murray)
- **Question:** The bulldozing taking place along Piney Mountain Road near Lake Ellen, is it associated with the proposed WK Dickson projects?
Response: No, this is an OWASA project with no connection to the discussed projects. (Sue Burke)
- **Question:** Was there erosion before the breach at Lake Ellen?
Response: Yes, it is an ongoing issue. The erosion has occurred over many years. After the breach, it is less frequent but once breach is repaired similar erosion will occur. (Tom Murray)
- **Comment:** Piney Mountain Road resident (adjacent to bridge crossing) that would be impacted by Woodshire/Huntington restoration/stabilization project expressed concerns about the feasibility of the project as shown. It would be difficult to relocate the stream as proposed due to sewer line/easement, topography, and loss of land.
Response: We are aware of these constraints and want to reiterate that these projects are conceptual. Upon further evaluation, if project is not feasible then it will not be included in the report. (Tom Murray)
- **Question:** Have you contacted individual property owners that will be impacted by retrofits?
Response: Some individual property owners have been contacted, those who requested contact to provide feedback but none regarding retrofits. It is premature for acquisitions coordination until project moves to design phase. (Tom Murray)
- **Question:** Could pedestrian trails and greenways be considered with the stream stabilization easements?
Response: It depends. It is more likely for larger projects but could be considered where the opportunity presents itself; always looking for multi-purpose projects. (Tom Murray)
- **Question:** Is the entire study area being looked at for neighborhood retrofits or just Forest Creek as shown on slide?
Response: Forest Creek is just an example, more will be identified in the report. (Tom Murray)

- **Question:** What type of feedback are you interested in receiving at this point?
Response: Any that you would like to provide. Feedback about the overall process, stormwater in Town, individual concerns about the identified project, etc. (Tom Murray)
- **Question:** For the spot stabilization projects, what happens if property owners do not want construction on their property?
Response: It will be handled on a case-by case basis; the project may need to be re-evaluated to determine if the project would still make sense without full property owner involvement. It can be challenging to get all property owners on board. (Tom Murray)
- **Question:** Any quantitative maps with flows and how much water to lake and in watershed?
Response: This type of information will be included in the report which will be available on the website. (Tom Murray)
- **Question:** Aren't most people in Chapel Hill enthusiastic about protecting the environment?
Response: There is a lot of positive engagement, but some just need educating about pet waste disposal, mowing habits, disconnected downspouts, etc. (Tom Murray)
- **Comment:** Reach out to organized homeowners associations to get more involvement and participation.
Response: The meeting flyer is forwarded to the HOA presidents. Several of them post it to list-servs. This is how several meeting attendees found out about today's meeting. As part of sign-in, we poll how participants found out about the meeting. (Inga Kennedy)



Town of Chapel Hill
Stormwater Management Program
Eastwood Lake Subwatershed Study UPDATE

Meeting Summary
Public Meeting 2, Session 2
December 7, 2017, 5:30 PM

Town of Chapel Hill and Consultant Attendees

Sue Burke, Stormwater Engineer, Town of Chapel Hill	Kevin Nunnery, Biohabitats
Tom Murray, Project Manager, WK Dickson	Ted Brown, Biohabitats
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2. Overview of PowerPoint Presentation

Tom Murray kicked off the presentation portion of the meeting and spoke on the following topics:

- Overall Agenda and Goals.
- Progress Update.
- Watershed Characteristics.
- Public Outreach.
- Existing Conditions Evaluation.
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- Alternatives Development.

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3. Verbal Questions/Comments by Participants during and following the Presentation

- **Question:** Are there concerns about the North Lakeshore bridge accommodating flow?
Response: Not currently, the bridge is providing a 10-year level of service. Ideally, we would like for this bridge crossing to provide a 25-year level of service. However, it is a new bridge, about 15-16 years old with no known structural issues. (Tom Murray)
- **Question:** Is there the potential for Eastwood Lake to be considered for detention/storage?
Response: This was evaluated as part of the Lower Booker Creek Study. To provide a benefit, the lake would need to be lowered 1 to 2 feet. It is private lake and therefore would require buy-in from the surrounding property owners. There is not an interest to pursue this by the HOA. (Tom Murray/Sue Burke)
- **Question:** Is there a plan to work more closely with OWASA?
Response: Yes, it makes sense to coordinate more closely with them. More communication is necessary between OWASA and the Town regarding project coordination. There is also a need to help OWASA better understand stormwater impacts on easement maintenance. (Tom Murray/Sue Burke)
- **Question:** Explain Lake Ellen retrofits.
Response: Similar to Eastwood Lake, it is a private lake. Lake Ellen has been breached and the HOA has expressed an interest in partnering with the Town to restore it. It is still conceptual. (Tom Murray)
- **Question:** What would the Piney Mountain storage entail?
Response: It is in HOA common area. The floodplain would be graded out to reduce downstream flows. There would be tree removal and excavation to increase floodplain volume accessible to flows as shown on slide. (Tom Murray)
- **Question:** Please comment on the relative ranking and timeline for implementation.
Response: The ranking will be included with the draft report. It will be merged with the Lower Booker Creek list and reevaluated on a continuous basis based on funding and needs. The timeline for implementation depends on a combination of funding and ranking. (Tom Murray)

Appendix E:

SCS Hydrology Calculations

List of Contents:

1. Existing Curve Number Calculations
 - a. Booker Headwaters
 - b. Cedar Fork
 - c. Crow Branch
 - d. Eastwood Lake
 - e. Lower Booker Creek
 2. Future Curve Number Calculations
 - a. Booker Headwaters
 - b. Cedar Fork
 - c. Crow Branch
 - d. Eastwood Lake
 - e. Lower Booker Creek
 3. Impervious Calculations
 - a. Booker Headwaters – Existing and Future Conditions
 - b. Cedar Fork – Existing and Future Conditions
 - c. Crow Branch – Existing and Future Conditions
 - d. Eastwood Lake – Existing and Future Conditions
 - e. Lower Booker Creek – Existing and Future Conditions
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BOOKER HEADWATERS

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: BH-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.86	0.02009	1260
Open Space, Good	B	61	13.84	0.02163	844
Woods, Good	B	55	55.36	0.08650	3045
Totals =			82.06	0.12822	5149

Total (weighted) RCN = total product/total area = 62.75

RCN used = 63

Basin: BH-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.30	0.00984	617
Open Space, Good	B	61	14.46	0.02259	882
Woods, Good	B	55	14.15	0.02211	778
Woods, Good	C	70	6.32	0.00988	442
Woods, Good	D	77	1.13	0.00177	87
Woods, Good	B/D	77	0.08	0.00013	6
Totals =			42.44	0.06631	2813

Total (weighted) RCN = total product/total area = 66.29

RCN used = 66

Basin: BH-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.59	0.01811	1136
Open Space, Good	B	61	9.65	0.01508	589
Open Space, Good	C	74	1.40	0.00219	104
Open Space, Good	D	80	5.91	0.00923	473
Woods, Good	B	55	34.47	0.05385	1896
Woods, Good	C	70	5.60	0.00875	392
Woods, Good	D	77	26.38	0.04122	2031
Woods, Good	B/D	77	1.40	0.00218	107
Totals =			96.39	0.15061	6727

Total (weighted) RCN = total product/total area = 69.79

RCN used = 70

BOOKER HEADWATERS

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: BH-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.35	0.01305	818
Open Space, Good	B	61	23.47	0.03666	1431
Open Space, Good	C	74	10.46	0.01635	774
Open Space, Good	D	80	0.10	0.00016	8
Open Space, Good	B/D	80	1.74	0.00272	139
Woods, Good	B	55	2.37	0.00371	131
Woods, Good	C	70	8.91	0.01392	623
Woods, Good	B/D	77	4.05	0.00633	312
Totals =			59.45	0.09289	4237

Total (weighted) RCN = total product/total area = 71.27

RCN used = 71

Basin: BH-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.89	0.00764	479
Open Space, Good	B	61	2.51	0.00392	153
Open Space, Good	C	74	21.02	0.03284	1555
Woods, Good	B	55	28.23	0.04410	1552
Woods, Good	C	70	10.79	0.01687	756
Woods, Good	D	77	4.67	0.00730	360
Water	-	100	2.71	0.00424	271
Totals =			74.82	0.11691	5127

Total (weighted) RCN = total product/total area = 68.52

RCN used = 69

Basin: BH-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.69	0.01983	1244
Open Space, Good	C	74	24.43	0.03817	1808
Open Space, Good	D	80	0.65	0.00101	52
Woods, Good	B	55	36.49	0.05702	2007
Woods, Good	C	70	0.94	0.00147	66
Totals =			75.20	0.11750	5176

Total (weighted) RCN = total product/total area = 68.83

RCN used = 69

BOOKER HEADWATERS

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: BH-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.43	0.00848	532
Open Space, Good	B	61	2.44	0.00381	149
Open Space, Good	C	74	8.90	0.01391	659
Woods, Good	B	55	7.79	0.01216	428
Woods, Good	C	70	9.22	0.01441	646
Totals =			33.78	0.05278	2414

Total (weighted) RCN = total product/total area = 71.45

RCN used = 71

Basin: BH-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.51	0.01330	834
Open Space, Good	B	61	18.78	0.02935	1146
Open Space, Good	C	74	0.13	0.00020	9
Woods, Good	B	55	5.52	0.00863	304
Woods, Good	C	70	14.82	0.02315	1037
Woods, Good	D	77	8.03	0.01255	618
Water	-	100	0.64	0.00101	64
Totals =			56.43	0.08818	4013

Total (weighted) RCN = total product/total area = 71.11

RCN used = 71

Basin: BH-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.89	0.00920	577
Open Space, Good	B	61	26.40	0.04125	1610
Woods, Good	B	55	4.05	0.00633	223
Woods, Good	C	70	12.23	0.01911	856
Woods, Good	D	71	9.64	0.01506	684
Woods, Good	B/D	77	0.48	0.00075	37
Totals =			58.69	0.09170	3988

Total (weighted) RCN = total product/total area = 67.95

RCN used = 68

BOOKER HEADWATERS

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: BH-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.95	0.01711	1073
Open Space, Good	B	61	14.23	0.02223	868
Open Space, Good	C	74	8.54	0.01335	632
Open Space, Good	D	80	0.92	0.00144	74
Woods, Good	B	55	15.06	0.02353	828
Woods, Good	C	70	6.96	0.01088	487
Woods, Good	B/D	77	7.56	0.01181	582
Totals =			64.23	0.10035	4545

Total (weighted) RCN = total product/total area = 70.76

RCN used = 71

Basin: BH-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.82	0.01534	962
Open Space, Good	B	61	10.94	0.01710	667
Open Space, Good	C	74	1.28	0.00200	95
Open Space, Good	D	80	1.34	0.00209	107
Woods, Good	B	55	40.88	0.06388	2249
Totals =			64.27	0.10041	4080

Total (weighted) RCN = total product/total area = 63.49

RCN used = 63

Basin: BH-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.68	0.00419	263
Open Space, Good	B	61	5.96	0.00932	364
Open Space, Good	C	74	1.13	0.00177	84
Woods, Good	B	55	5.06	0.00791	278
Woods, Good	C	70	1.13	0.00177	79
Woods, Good	B/D	77	0.02	0.00003	1
Totals =			15.98	0.02497	1069

Total (weighted) RCN = total product/total area = 66.88

RCN used = 67

BOOKER HEADWATERS

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: BH-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.40	0.01313	823
Open Space, Good	C	74	32.34	0.05053	2393
Woods, Good	B	55	12.08	0.01888	664
Woods, Good	C	70	1.00	0.00156	70
Woods, Good	D	77	0.73	0.00113	56
Woods, Good	B/D	77	0.21	0.00033	16
Water	-	100	5.72	0.00894	572
Totals =			60.48	0.09450	4595

Total (weighted) RCN = total product/total area = 75.98

RCN used = 76

CEDAR FORK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CF-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.07	0.00480	301
Open Space, Good	B	61	15.03	0.02348	917
Open Space, Good	C	74	2.09	0.00327	155
Open Space, Good	D	80	0.07	0.00012	6
Woods, Good	B	55	7.25	0.01133	399
Woods, Good	C	70	2.09	0.00327	146
Water	-	100	0.07	0.00011	7
Totals =			29.67	0.04637	1930

Total (weighted) RCN = total product/total area = 65.05

RCN used = 65

Basin: CF-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.62	0.01034	649
Open Space, Good	B	61	7.65	0.01196	467
Open Space, Good	D	80	2.09	0.00327	167
Open Space, Good	B/D	80	2.24	0.00350	179
Woods, Good	B	55	10.38	0.01622	571
Woods, Good	D	77	8.30	0.01296	639
Woods, Good	B/D	77	2.22	0.00347	171
Water	-	100	1.90	0.00296	190
Totals =			41.40	0.06469	3033

Total (weighted) RCN = total product/total area = 73.25

RCN used = 73

Basin: CF-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.34	0.00522	327
Open Space, Good	B	61	10.54	0.01647	643
Open Space, Good	B/D	80	0.49	0.00077	39
Woods, Good	B	55	10.09	0.01577	555
Woods, Good	D	77	3.23	0.00504	249
Woods, Good	B/D	77	0.49	0.00077	38
Totals =			28.18	0.04403	1851

Total (weighted) RCN = total product/total area = 65.68

RCN used = 66

CEDAR FORK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CF-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.66	0.01197	751
Open Space, Good	A	39	0.75	0.00117	29
Open Space, Good	B	61	4.86	0.00760	297
Open Space, Good	D	80	3.26	0.00509	261
Woods, Good	A	30	2.97	0.00464	89
Woods, Good	B	55	23.43	0.03661	1289
Woods, Good	D	77	13.05	0.02039	1005
Totals =			55.98	0.08747	3720

Total (weighted) RCN = total product/total area = 66.45

RCN used = 66

Basin: CF-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.71	0.00267	168
Open Space, Good	B	61	6.16	0.00962	376
Open Space, Good	D	80	0.28	0.00044	22
Woods, Good	B	55	9.15	0.01430	503
Woods, Good	D	77	0.28	0.00044	21
Totals =			17.58	0.02747	1090

Total (weighted) RCN = total product/total area = 62.03

RCN used = 62

Basin: CF-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.43	0.01630	1022
Open Space, Good	B	61	18.46	0.02885	1126
Open Space, Good	C	74	0.19	0.00030	14
Open Space, Good	D	80	0.95	0.00148	76
Woods, Good	B	55	32.47	0.05074	1786
Woods, Good	C	70	0.58	0.00090	40
Woods, Good	D	77	11.00	0.01718	847
Totals =			74.08	0.11575	4912

Total (weighted) RCN = total product/total area = 66.30

RCN used = 66

CEDAR FORK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CF-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.05	0.01570	985
Open Space, Good	A	39	6.34	0.00991	247
Open Space, Good	B	61	10.56	0.01650	644
Open Space, Good	C	74	1.92	0.00299	142
Open Space, Good	D	80	6.57	0.01027	526
Woods, Good	A	30	1.96	0.00306	59
Woods, Good	B	55	15.84	0.02476	871
Woods, Good	C	70	2.87	0.00449	201
Woods, Good	D	77	9.82	0.01535	756
Totals =			65.95	0.10304	4432

Total (weighted) RCN = total product/total area = 67.21

RCN used = 67

Basin: CF-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	14.34	0.02241	1405
Open Space, Good	A	39	0.03	0.00004	1
Open Space, Good	B	61	41.38	0.06465	2524
Open Space, Good	C	74	6.80	0.01062	503
Open Space, Good	D	80	5.57	0.00870	445
Woods, Good	A	30	0.03	0.00004	1
Woods, Good	B	55	30.51	0.04767	1678
Woods, Good	C	70	5.84	0.00912	408
Woods, Good	D	77	2.39	0.00373	184
Totals =			106.86	0.16697	7149

Total (weighted) RCN = total product/total area = 66.90

RCN used = 67

Basin: CF-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.10	0.01891	1186
Open Space, Good	B	61	35.69	0.05576	2177
Open Space, Good	C	74	0.51	0.00080	38
Open Space, Good	D	80	4.86	0.00759	389
Woods, Good	B	55	43.17	0.06745	2374
Woods, Good	C	70	4.63	0.00724	324
Woods, Good	D	71	13.26	0.02072	942
Totals =			114.23	0.17848	7430

Total (weighted) RCN = total product/total area = 65.05

RCN used = 65

CEDAR FORK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 3/18/2016 (Revised 12/12/2016)

Basin: CF-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.69	0.00889	558
Open Space, Good	B	61	4.70	0.00734	287
Woods, Good	B	55	29.43	0.04598	1619
Woods, Good	D	77	12.89	0.02014	992
Totals =			52.71	0.08235	3455

Total (weighted) RCN = total product/total area = 65.56

RCN used = 66

Basin: CF-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.69	0.00577	362
Open Space, Good	B	61	19.42	0.03034	1185
Woods, Good	B	55	3.43	0.00536	189
Totals =			26.54	0.04147	1735

Total (weighted) RCN = total product/total area = 65.37

RCN used = 65

Basin:CF-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.68	0.01200	753
Open Space, Good	B	61	14.62	0.02285	892
Open Space, Good	D	80	2.64	0.00412	211
Woods, Good	B	55	30.60	0.04782	1683
Woods, Good	D	77	2.64	0.00412	203
Totals =			58.18	0.09091	3742

Total (weighted) RCN = total product/total area = 64.32

RCN used = 64

CEDAR FORK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 3/18/2016 (Revised 12/12/2016)

Basin: CF-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.84	0.01694	1062
Open Space, Good	B	61	27.70	0.04328	1690
Open Space, Good	C	74	1.86	0.00291	138
Woods, Good	B	55	22.89	0.03577	1259
Woods, Good	C	70	1.45	0.00227	102
Woods, Good	D	77	30.55	0.04774	2352
Totals =			95.30	0.14891	6603

Total (weighted) RCN = total product/total area = 69.29

RCN used = 69

Basin: CF-140

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.57	0.00558	350
Open Space, Good	B	61	5.91	0.00924	361
Open Space, Good	D	80	1.11	0.00173	89
Woods, Good	B	55	13.83	0.02161	761
Woods, Good	D	77	1.11	0.00173	85
Totals =			25.53	0.03989	1645

Total (weighted) RCN = total product/total area = 64.44

RCN used = 64

Basin: CF-150

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.60	0.00563	353
Open Space, Good	B	61	4.25	0.00664	259
Open Space, Good	D	80	2.10	0.00328	168
Woods, Good	B	55	18.36	0.02869	1010
Woods, Good	D	77	2.91	0.00454	224
Totals =			31.22	0.04879	2014

Total (weighted) RCN = total product/total area = 64.51

RCN used = 65

CROW BRANCH

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CB-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.21	0.00189	119
Woods, Good	B	55	41.01	0.06408	2256
Woods, Good	C	70	44.78	0.06997	3135
Woods, Good	C/D	77	4.37	0.00683	337
Totals =			91.37	0.14277	5845

Total (weighted) RCN = total product/total area = 63.97

RCN used = 64

Basin: CB-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	0.50	0.00078	49
Woods, Good	B	55	62.59	0.09779	3442
Woods, Good	C	70	2.41	0.00376	168
Woods, Good	C/D	77	6.51	0.01017	501
Totals =			72.00	0.11250	4161

Total (weighted) RCN = total product/total area = 57.79

RCN used = 58

Basin: CB-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	0.00	0.00000	0
Woods, Good	B	55	13.64	0.02130	750
Woods, Good	C	70	3.55	0.00555	249
Totals =			17.19	0.02686	999

Total (weighted) RCN = total product/total area = 58.10

RCN used = 58

CROW BRANCH

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CB-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	0.49	0.00077	48
Open Space, Good	B	61	0.80	0.00125	49
Open Space, Good	C	74	4.94	0.00772	366
Woods, Good	B	55	7.20	0.01126	396
Woods, Good	C	70	18.61	0.02907	1302
Woods, Good	C/D	77	0.32	0.00050	25
Totals =			32.37	0.05057	2186

Total (weighted) RCN = total product/total area = 67.54

RCN used = 68

Basin: CB-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.08	0.00325	204
Open Space, Good	C/D	80	11.86	0.01853	949
Woods, Good	C	70	12.16	0.01900	851
Woods, Good	C/D	77	17.79	0.02780	1370
Totals =			43.89	0.06858	3374

Total (weighted) RCN = total product/total area = 76.87

RCN used = 77

Basin: CB-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	0.47	0.00073	46
Open Space, Good	C	74	5.12	0.00799	379
Woods, Good	B	55	0.65	0.00101	36
Woods, Good	C	70	14.22	0.02222	996
Totals =			20.46	0.03196	1456

Total (weighted) RCN = total product/total area = 71.17

RCN used = 71

CROW BRANCH

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: CB-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.99	0.01873	1175
Open Space, Good	B	61	4.65	0.00727	284
Open Space, Good	C	74	8.37	0.01308	619
Open Space, Good	C/D	80	1.17	0.00182	93
Woods, Good	B	55	19.96	0.03119	1098
Woods, Good	C	70	32.66	0.05103	2286
Totals =			78.79	0.12312	5555

Total (weighted) RCN = total product/total area = 70.50

RCN used = 71

Basin: CB-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.09	0.01264	793
Open Space, Good	B	61	8.69	0.01359	530
Open Space, Good	C	74	0.65	0.00101	48
Woods, Good	B	55	20.86	0.03259	1147
Woods, Good	C	70	7.20	0.01126	504
Woods, Good	D	77	2.87	0.00449	221
Totals =			48.37	0.07557	3244

Total (weighted) RCN = total product/total area = 67.07

RCN used = 67

EASTWOOD LAKE

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: EL-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.53	0.01958	1228
Open Space, Good	B	61	1.35	0.00211	82
Open Space, Good	C	74	6.72	0.01049	497
Open Space, Good	D	80	2.59	0.00405	207
Open Space, Good	C/D	80	10.21	0.01595	817
Woods, Good	B	55	6.48	0.01013	357
Woods, Good	C	70	22.49	0.03514	1574
Woods, Good	D	77	9.38	0.01465	722
Totals =			71.75	0.11211	5484

Total (weighted) RCN = total product/total area = 76.44

RCN used = 76

Basin: EL-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.86	0.02009	1260
Open Space, Good	B	61	10.55	0.01649	644
Open Space, Good	C	74	2.19	0.00342	162
Open Space, Good	D	80	4.95	0.00773	396
Woods, Good	B	55	22.18	0.03466	1220
Woods, Good	C	70	8.40	0.01313	588
Woods, Good	D	77	19.80	0.03094	1525
Totals =			80.93	0.12646	5795

Total (weighted) RCN = total product/total area = 71.60

RCN used = 72

Basin: EL-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.61	0.01345	844
Open Space, Good	B	61	16.80	0.02626	1025
Open Space, Good	C	74	0.52	0.00082	39
Open Space, Good	D	80	1.72	0.00268	137
Woods, Good	B	55	36.83	0.05755	2026
Woods, Good	C	70	2.09	0.00327	146
Woods, Good	D	77	6.86	0.01073	529
Totals =			73.44	0.11475	4746

Total (weighted) RCN = total product/total area = 64.62

RCN used = 65

EASTWOOD LAKE

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: EL-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.22	0.01128	708
Open Space, Good	B	61	3.50	0.00547	214
Open Space, Good	C	74	3.06	0.00478	226
Open Space, Good	D	80	5.00	0.00781	400
Woods, Good	B	55	5.77	0.00902	317
Woods, Good	C	70	12.23	0.01911	856
Woods, Good	D	77	6.94	0.01084	534
Totals =			43.72	0.06831	3255

Total (weighted) RCN = total product/total area = 74.46

RCN used = 74

Basin: EL-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.20	0.01438	902
Open Space, Good	B	61	12.90	0.02015	787
Open Space, Good	C	74	1.61	0.00251	119
Open Space, Good	D	80	1.28	0.00201	103
Open Space, Good	B/D	80	1.13	0.00177	91
Woods, Good	B	55	24.90	0.03891	1370
Woods, Good	C	70	6.43	0.01005	450
Woods, Good	D	77	11.55	0.01805	889
Woods, Good	B/D	77	1.13	0.00177	87
Totals =			70.14	0.10959	4797

Total (weighted) RCN = total product/total area = 68.39

RCN used = 68

Basin: EL-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.66	0.01978	1241
Open Space, Good	B	61	15.40	0.02407	940
Open Space, Good	D	80	0.45	0.00070	36
Woods, Good	B	55	48.87	0.07636	2688
Woods, Good	D	77	2.67	0.00418	206
Woods, Good	B/D	77	4.23	0.00662	326
Water	-	100	0.18	0.00029	18
Totals =			84.47	0.13198	5454

Total (weighted) RCN = total product/total area = 64.57

RCN used = 65

EASTWOOD LAKE

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 3/18/2016 (Revised 12/12/2016)

Basin: EL-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.25	0.00977	613
Open Space, Good	B	61	7.44	0.01163	454
Open Space, Good	C	74	1.24	0.00194	92
Open Space, Good	D	80	0.87	0.00136	70
Open Space, Good	C/D	80	0.18	0.00028	15
Woods, Good	B	55	22.31	0.03486	1227
Woods, Good	C	70	1.24	0.00194	87
Woods, Good	D	77	8.70	0.01360	670
Woods, Good	B/D	77	1.49	0.00233	115
Woods, Good	C/D	77	0.18	0.00028	14
Water	-	100	8.19	0.01280	819
Totals =			58.11	0.09080	4175

Total (weighted) RCN = total product/total area = 71.85

RCN used = 72

Basin: EL-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.29	0.00983	616
Open Space, Good	B	61	9.32	0.01456	568
Woods, Good	B	55	28.61	0.04470	1573
Water	-	100	12.30	0.01922	1230
Totals =			56.51	0.08830	3988

Total (weighted) RCN = total product/total area = 70.57

RCN used = 71

Basin: EL-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.52	0.01019	639
Open Space, Good	B	61	5.45	0.00851	332
Open Space, Good	C	74	0.72	0.00112	53
Open Space, Good	D	80	1.33	0.00207	106
Open Space, Good	C/D	80	2.02	0.00315	161
Woods, Good	B	55	23.57	0.03683	1296
Woods, Good	C	70	0.72	0.00112	50
Woods, Good	D	77	6.85	0.01070	527
Woods, Good	C/D	77	6.05	0.00945	466
Water	-	100	8.77	0.01370	877
Totals =			61.98	0.09684	4508

Total (weighted) RCN = total product/total area = 72.74

RCN used = 73

EASTWOOD LAKE

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: EL-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.56	0.00869	545
Open Space, Good	B	61	4.11	0.00641	250
Open Space, Good	D	80	5.11	0.00798	409
Open Space, Good	C/D	80	0.04	0.00006	3
Woods, Good	B	55	3.00	0.00469	165
Woods, Good	D	77	17.53	0.02739	1350
Woods, Good	C/D	77	0.10	0.00015	7
Water	-	100	18.52	0.02895	1852
Totals =			53.96	0.08431	4581

Total (weighted) RCN = total product/total area = 84.90

RCN used = 85

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.34	0.00991	621
Open Space, Good	B	61	4.66	0.00728	284
Open Space, Good	C	74	1.40	0.00219	104
Open Space, Good	D	80	1.91	0.00299	153
Open Space, Good	C/D	80	0.44	0.00068	35
Woods, Good	B	55	20.33	0.03177	1118
Woods, Good	C	70	5.43	0.00848	380
Woods, Good	D	77	17.22	0.02690	1326
Totals =			57.73	0.09020	4021

Total (weighted) RCN = total product/total area = 69.66

RCN used = 70

Basin: LBC-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.29	0.01295	812
Open Space, Good	B	61	4.92	0.00770	300
Open Space, Good	C	74	1.62	0.00254	120
Open Space, Good	D	80	1.55	0.00242	124
Open Space, Good	C/D	80	2.36	0.00369	189
Woods, Good	B	55	13.38	0.02090	736
Woods, Good	C	70	1.17	0.00183	82
Woods, Good	D	77	4.71	0.00737	363
Woods, Good	C/D	77	11.09	0.01733	854
Totals =			49.10	0.07672	3580

Total (weighted) RCN = total product/total area = 72.92

RCN used = 73

Basin: LBC-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	15.80	0.02469	1548
Open Space, Good	B	61	0.00	0.00001	0
Open Space, Good	C	74	1.09	0.00170	81
Open Space, Good	D	80	13.85	0.02164	1108
Open Space, Good	C/D	80	4.91	0.00767	393
Woods, Good	B	55	1.70	0.00265	93
Woods, Good	C	70	4.89	0.00763	342
Woods, Good	D	77	32.47	0.05074	2500
Woods, Good	C/D	77	17.87	0.02792	1376
Totals =			92.58	0.14465	7442

Total (weighted) RCN = total product/total area = 80.38

RCN used = 80

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.35	0.02086	1308
Open Space, Good	D	80	12.85	0.02008	1028
Open Space, Good	C/D	80	8.95	0.01398	716
Woods, Good	D	77	28.70	0.04485	2210
Woods, Good	C/D	77	20.88	0.03263	1608
Totals =			84.74	0.13240	6870

Total (weighted) RCN = total product/total area = 81.08

RCN used = 81

Basin: LBC-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.13	0.00177	111
Woods, Good	B	55	8.73	0.01364	480
Woods, Good	D	77	4.56	0.00712	351
Totals =			14.42	0.02253	942

Total (weighted) RCN = total product/total area = 65.32

RCN used = 65

Basin: LBC-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.95	0.02180	1367
Open Space, Good	B	61	9.52	0.01487	580
Open Space, Good	B/D	80	1.06	0.00166	85
Open Space, Good	C/D	80	3.82	0.00597	306
Woods, Good	B	55	24.01	0.03752	1321
Woods, Good	D	77	12.65	0.01977	974
Woods, Good	B/D	77	6.01	0.00939	463
Woods, Good	C/D	77	11.46	0.01791	882
Totals =			82.48	0.12887	5978

Total (weighted) RCN = total product/total area = 72.48

RCN used = 72

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.87	0.01542	967
Open Space, Good	B	61	7.84	0.01225	478
Open Space, Good	D	80	8.77	0.01371	702
Woods, Good	B	55	27.89	0.04357	1534
Woods, Good	D	77	9.14	0.01428	704
Woods, Good	B/D	77	0.28	0.00043	21
Totals =			63.78	0.09966	4406

Total (weighted) RCN = total product/total area = 69.08

RCN used = 69

Basin: LBC-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.29	0.00827	518
Open Space, Good	D	80	15.07	0.02355	1206
Woods, Good	D	77	15.07	0.02355	1160
Totals =			35.43	0.05536	2884

Total (weighted) RCN = total product/total area = 81.41

RCN used = 81

Basin: LBC-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.75	0.01680	1054
Open Space, Good	C	74	2.75	0.00430	204
Open Space, Good	D	80	31.02	0.04846	2481
Open Space, Good	C/D	80	0.42	0.00065	33
Woods, Good	D	77	8.77	0.01371	676
Woods, Good	C/D	77	1.67	0.00261	129
Water	-	100	0.84	0.00132	84
Totals =			56.23	0.08786	4661

Total (weighted) RCN = total product/total area = 82.89

RCN used = 83

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.21	0.00189	119
Open Space, Good	D	80	7.47	0.01167	598
Woods, Good	D	77	2.67	0.00417	206
Water	-	100	0.40	0.00063	40
Totals =			11.75	0.01836	962

Total (weighted) RCN = total product/total area = 81.85

RCN used = 82

Basin: LBC-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.88	0.00450	282
Open Space, Good	D	80	5.98	0.00934	478
Open Space, Good	B/D	80	0.50	0.00078	40
Woods, Good	D	77	7.21	0.01127	555
Woods, Good	B/D	77	1.32	0.00206	102
Totals =			17.89	0.02795	1457

Total (weighted) RCN = total product/total area = 81.47

RCN used = 81

Basin: LBC-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.37	0.00683	428
Open Space, Good	D	80	1.56	0.00244	125
Open Space, Good	C/D	80	2.37	0.00370	189
Woods, Good	D	77	6.24	0.00975	480
Woods, Good	B/D	77	1.80	0.00281	139
Woods, Good	C/D	77	9.46	0.01478	729
Water	-	100	0.65	0.00102	65
Totals =			26.45	0.04132	2155

Total (weighted) RCN = total product/total area = 81.48

RCN used = 81

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.23	0.00505	317
Open Space, Good	D	80	3.74	0.00585	300
Open Space, Good	B/D	80	2.02	0.00316	162
Open Space, Good	C/D	80	0.33	0.00051	26
Woods, Good	D	77	0.27	0.00042	21
Woods, Good	B/D	77	8.19	0.01280	631
Woods, Good	C/D	77	0.98	0.00153	76
Totals =			18.77	0.02932	1531

Total (weighted) RCN = total product/total area = 81.59

RCN used = 82

Basin: LBC-140

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.23	0.00505	317
Open Space, Good	D	80	10.22	0.01597	818
Woods, Good	D	77	13.30	0.02078	1024
Totals =			26.75	0.04180	2158

Total (weighted) RCN = total product/total area = 80.68

RCN used = 81

Basin: LBC-150

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.18	0.01591	998
Open Space, Good	B	61	7.02	0.01097	428
Open Space, Good	D	80	5.80	0.00906	464
Woods, Good	B	55	18.68	0.02919	1027
Woods, Good	D	77	9.30	0.01454	716
Totals =			50.99	0.07966	3634

Total (weighted) RCN = total product/total area = 71.27

RCN used = 71

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-160

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.06	0.00478	300
Open Space, Good	B	61	2.58	0.00404	158
Open Space, Good	D	80	6.58	0.01028	526
Open Space, Good	B/D	80	0.05	0.00008	4
Woods, Good	B	55	2.96	0.00463	163
Woods, Good	D	77	11.66	0.01821	898
Totals =			26.89	0.04202	2049

Total (weighted) RCN = total product/total area = 76.17

RCN used = 76

Basin: LBC-170

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.79	0.00280	175
Open Space, Good	D	80	2.90	0.00453	232
Woods, Good	D	77	8.66	0.01353	667
Water	-	100	2.92	0.00456	292
Totals =			16.27	0.02542	1366

Total (weighted) RCN = total product/total area = 83.97

RCN used = 84

Basin: LBC-180

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.95	0.00930	583
Open Space, Good	D	80	8.06	0.01259	645
Open Space, Good	B/D	80	0.09	0.00014	7
Woods, Good	D	77	45.49	0.07108	3503
Woods, Good	B/D	77	0.09	0.00014	7
Totals =			59.68	0.09325	4745

Total (weighted) RCN = total product/total area = 79.50

RCN used = 80

LOWER BOOKER CREEK

SCS Runoff Curve Number - Existing Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 3/18/2016 (Revised 12/12/2016)

Basin: LBC-190

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.01	0.00627	393
Open Space, Good	D	80	3.99	0.00623	319
Woods, Good	D	77	11.81	0.01845	909
Woods, Good	B/D	77	10.94	0.01710	843
Totals =			30.75	0.04805	2464

Total (weighted) RCN = total product/total area = 80.13

RCN used = 80

Basin: LBC-200

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.93	0.02020	1267
Open Space, Good	B	61	3.40	0.00531	207
Open Space, Good	D	80	11.63	0.01817	930
Woods, Good	B	55	7.93	0.01239	436
Woods, Good	D	77	27.13	0.04239	2089
Woods, Good	B/D	77	39.28	0.06137	3024
Totals =			102.29	0.15982	7954

Total (weighted) RCN = total product/total area = 77.76

RCN used = 78

BOOKER HEADWATERS

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/26/2016 (Revised 12/12/2106)

Basin: BH-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.98	0.02184	1370
Open Space, Good	B	61	17.71	0.02767	1080
Woods, Good	B	55	49.79	0.07780	2738
Totals =			81.48	0.12731	5189

Total (weighted) RCN = total product/total area = 63.68

RCN used = 64

Basin: BH-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.51	0.01017	638
Open Space, Good	B	61	14.46	0.02259	882
Woods, Good	B	55	13.15	0.02055	723
Woods, Good	C	70	6.32	0.00988	442
Woods, Good	D	77	1.13	0.00177	87
Woods, Good	B/D	77	0.08	0.00013	6
Totals =			41.65	0.06508	2779

Total (weighted) RCN = total product/total area = 66.72

RCN used = 67

Basin: BH-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	14.33	0.02239	1404
Open Space, Good	B	61	12.99	0.02030	792
Open Space, Good	C	74	1.40	0.00219	104
Open Space, Good	D	80	6.62	0.01034	530
Woods, Good	B	55	25.09	0.03920	1380
Woods, Good	C	70	5.60	0.00875	392
Woods, Good	D	77	21.03	0.03286	1619
Woods, Good	B/D	77	1.40	0.00218	107
Totals =			88.45	0.13820	6328

Total (weighted) RCN = total product/total area = 71.55

RCN used = 72

BOOKER HEADWATERS

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/26/2016 (Revised 12/12/2106)

Basin: BH-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.01	0.01408	883
Open Space, Good	B	61	23.47	0.03667	1432
Open Space, Good	C	74	10.46	0.01634	774
Open Space, Good	D	80	0.10	0.00016	8
Open Space, Good	B/D	80	1.74	0.00272	139
Woods, Good	C	70	8.46	0.01322	592
Woods, Good	B/D	77	4.05	0.00633	312
Totals =			57.29	0.08952	4140

Total (weighted) RCN = total product/total area = 72.26

RCN used = 72

Basin: BH-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.32	0.01144	717
Open Space, Good	B	61	2.51	0.00392	153
Open Space, Good	C	74	21.02	0.03284	1555
Woods, Good	B	55	21.53	0.03363	1184
Woods, Good	C	70	10.79	0.01687	756
Woods, Good	D	77	4.67	0.00730	360
Water	-	100	2.71	0.00424	271
Totals =			70.55	0.11024	4997

Total (weighted) RCN = total product/total area = 70.82

RCN used = 71

Basin: BH-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	14.69	0.02295	1440
Open Space, Good	C	74	24.42	0.03816	1807
Open Space, Good	D	80	0.65	0.00101	52
Woods, Good	B	55	29.53	0.04614	1624
Woods, Good	C	70	0.94	0.00147	66
Totals =			70.23	0.10973	4989

Total (weighted) RCN = total product/total area = 71.03

RCN used = 71

BOOKER HEADWATERS

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/26/2016 (Revised 12/12/2106)

Basin: BH-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.43	0.00848	532
Open Space, Good	B	61	2.44	0.00381	149
Open Space, Good	C	74	8.90	0.01391	659
Woods, Good	B	55	7.79	0.01216	428
Woods, Good	C	70	9.22	0.01441	646
Totals =			33.78	0.05278	2414

Total (weighted) RCN = total product/total area = 71.45

RCN used = 71

Basin: BH-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.22	0.01441	904
Open Space, Good	B	61	18.78	0.02935	1146
Open Space, Good	C	74	0.13	0.00020	9
Woods, Good	B	55	2.53	0.00396	139
Woods, Good	C	70	14.82	0.02315	1037
Woods, Good	D	77	7.83	0.01223	603
Water	-	100	0.64	0.00101	64
Totals =			53.95	0.08430	3902

Total (weighted) RCN = total product/total area = 72.33

RCN used = 72

Basin: BH-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.63	0.01505	944
Open Space, Good	B	61	26.40	0.04125	1610
Woods, Good	B	55	4.05	0.00633	223
Woods, Good	C	70	5.93	0.00926	415
Woods, Good	D	71	9.64	0.01506	684
Woods, Good	B/D	77	0.48	0.00075	37
Totals =			56.13	0.08770	3913

Total (weighted) RCN = total product/total area = 69.72

RCN used = 70

BOOKER HEADWATERS

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/26/2016 (Revised 12/12/2106)

Basin: BH-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.58	0.01809	1135
Open Space, Good	B	61	14.23	0.02223	868
Open Space, Good	C	74	8.54	0.01335	632
Open Space, Good	D	80	0.92	0.00144	74
Woods, Good	B	55	14.16	0.02213	779
Woods, Good	C	70	6.96	0.01088	487
Woods, Good	B/D	77	6.56	0.01025	505
Totals =			62.96	0.09837	4480

Total (weighted) RCN = total product/total area = 71.16

RCN used = 71

Basin: BH-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.38	0.01622	1017
Open Space, Good	B	61	10.24	0.01600	625
Open Space, Good	C	74	1.28	0.00200	95
Open Space, Good	D	80	1.34	0.00209	107
Woods, Good	B	55	20.88	0.03263	1149
Totals =			44.13	0.06895	2993

Total (weighted) RCN = total product/total area = 67.82

RCN used = 68

Basin: BH-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.20	0.00500	314
Open Space, Good	B	61	5.07	0.00792	309
Open Space, Good	C	74	1.13	0.00177	84
Woods, Good	B	55	4.17	0.00652	229
Woods, Good	C	70	1.13	0.00177	79
Woods, Good	B/D	77	0.02	0.00003	1
Totals =			14.72	0.02300	1016

Total (weighted) RCN = total product/total area = 69.05

RCN used = 69

BOOKER HEADWATERS

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/26/2016 (Revised 12/12/2106)

Basin: BH-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.00	0.01563	980
Open Space, Good	C	74	32.34	0.05053	2393
Woods, Good	B	55	12.08	0.01888	664
Woods, Good	C	70	1.00	0.00156	70
Woods, Good	D	77	0.73	0.00113	56
Woods, Good	B/D	77	0.21	0.00033	16
Water	-	100	5.72	0.00894	572
Totals =			62.08	0.09700	4752

Total (weighted) RCN = total product/total area = 76.55

RCN used = 77

CROW BRANCH

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date:05/02/2016 (Revised 12/12/2016)

Basin: CB-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.82	0.02159	1354
Open Space, Good	B	61	16.94	0.02647	1033
Open Space, Good	C	74	17.18	0.02684	1271
Open Space, Good	C/D	80	0.65	0.00102	52
Woods, Good	B	55	6.23	0.00973	343
Woods, Good	C	70	12.48	0.01950	873
Woods, Good	C/D	77	2.21	0.00345	170
Totals =			69.50	0.10860	5097

Total (weighted) RCN = total product/total area = 73.33

RCN used = 73

Basin: CB-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.54	0.01647	1033
Open Space, Good	B	61	13.32	0.02081	813
Open Space, Good	C	74	0.72	0.00113	53
Open Space, Good	C/D	80	0.62	0.00097	50
Woods, Good	B	55	25.03	0.03911	1377
Woods, Good	C/D	77	4.43	0.00692	341
Totals =			54.66	0.08541	3666

Total (weighted) RCN = total product/total area = 67.07

RCN used = 67

Basin: CB-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.14	0.00334	210
Open Space, Good	B	61	3.91	0.00611	239
Open Space, Good	C	74	0.83	0.00130	61
Open Space, Good	D	80	0.15	0.00023	12
Woods, Good	B	55	0.60	0.00094	33
Totals =			7.63	0.01192	555

Total (weighted) RCN = total product/total area = 72.69

RCN used = 73

CROW BRANCH

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date:05/02/2016 (Revised 12/12/2016)

Basin: CB-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.35	0.00680	426
Open Space, Good	B	61	2.40	0.00375	146
Open Space, Good	C	74	7.21	0.01127	534
Open Space, Good	D	80	0.10	0.00016	8
Totals =			14.06	0.02197	1114

Total (weighted) RCN = total product/total area = 79.25

RCN used = 79

Basin: CB-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	5.27	0.00823	516
Open Space, Good	C	74	3.84	0.00600	284
Open Space, Good	C/D	80	10.00	0.01563	800
Totals =			19.11	0.02986	1601

Total (weighted) RCN = total product/total area = 83.76

RCN used = 84

Basin: CB-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.11	0.00486	305
Open Space, Good	B	61	0.20	0.00031	12
Open Space, Good	C	74	5.95	0.00930	440
Totals =			9.26	0.01447	757

Total (weighted) RCN = total product/total area = 81.78

RCN used = 82

CROW BRANCH

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date:05/02/2016 (Revised 12/12/2016)

Basin: CB-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	22.66	0.03541	2221
Open Space, Good	B	61	20.13	0.03145	1228
Open Space, Good	C	74	26.10	0.04078	1931
Open Space, Good	C/D	80	1.82	0.00284	146
Totals =			70.71	0.11048	5526

Total (weighted) RCN = total product/total area = 78.14

RCN used = 78

Basin: CB-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.03	0.01411	885
Open Space, Good	B	61	8.69	0.01359	530
Open Space, Good	C	74	0.65	0.00101	48
Woods, Good	B	55	20.86	0.03259	1147
Woods, Good	C	70	7.20	0.01126	504
Woods, Good	D	77	2.87	0.00449	221
Totals =			49.31	0.07704	3336

Total (weighted) RCN = total product/total area = 67.66

RCN used = 68

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: CF-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.99	0.00467	293
Open Space, Good	B	61	15.03	0.02348	917
Open Space, Good	C	74	2.09	0.00327	155
Open Space, Good	D	80	0.07	0.00012	6
Woods, Good	B	55	3.15	0.00492	173
Woods, Good	C	70	2.09	0.00327	146
Water	-	100	0.07	0.00011	7
Totals =			25.49	0.03984	1697

Total (weighted) RCN = total product/total area = 66.57

RCN used = 67

Basin: CF-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.17	0.01120	703
Open Space, Good	B	61	7.65	0.01196	467
Open Space, Good	D	80	2.09	0.00327	167
Open Space, Good	B/D	80	2.24	0.00350	179
Woods, Good	B	55	5.38	0.00841	296
Woods, Good	D	77	2.60	0.00406	200
Woods, Good	B/D	77	2.22	0.00347	171
Water	-	100	1.90	0.00296	190
Totals =			31.25	0.04883	2373

Total (weighted) RCN = total product/total area = 75.92

RCN used = 76

Basin: CF-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.34	0.00678	425
Open Space, Good	B	61	10.54	0.01647	643
Open Space, Good	B/D	80	0.49	0.00077	39
Woods, Good	B	55	7.85	0.01227	432
Woods, Good	D	77	3.23	0.00504	249
Woods, Good	B/D	77	0.49	0.00077	38
Totals =			26.94	0.04209	1826

Total (weighted) RCN = total product/total area = 67.77

RCN used = 68

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by: EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: CF-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.69	0.01670	1048
Open Space, Good	A	39	0.75	0.00117	29
Open Space, Good	B	61	4.86	0.00760	297
Open Space, Good	D	80	3.26	0.00509	261
Woods, Good	A	30	2.97	0.00464	89
Woods, Good	B	55	14.21	0.02220	782
Woods, Good	D	77	13.05	0.02039	1005
Totals =			49.79	0.07780	3510

Total (weighted) RCN = total product/total area = 70.49

RCN used = 70

Basin: CF-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.01	0.00314	197
Open Space, Good	B	61	6.16	0.00962	376
Open Space, Good	D	80	0.28	0.00044	22
Woods, Good	B	55	8.79	0.01374	484
Woods, Good	D	77	0.28	0.00044	21
Totals =			17.52	0.02737	1100

Total (weighted) RCN = total product/total area = 62.79

RCN used = 63

Basin: CF-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.87	0.02011	1261
Open Space, Good	B	61	18.46	0.02885	1126
Open Space, Good	C	74	0.19	0.00030	14
Open Space, Good	D	80	0.95	0.00148	76
Woods, Good	B	55	30.39	0.04749	1671
Woods, Good	C	70	0.58	0.00090	40
Woods, Good	D	77	11.00	0.01718	847
Totals =			74.44	0.11631	5036

Total (weighted) RCN = total product/total area = 67.66

RCN used = 68

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: CF-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.85	0.01695	1063
Open Space, Good	A	39	6.34	0.00991	247
Open Space, Good	B	61	10.56	0.01650	644
Open Space, Good	C	74	1.92	0.00299	142
Open Space, Good	D	80	6.57	0.01027	526
Woods, Good	A	30	1.96	0.00306	59
Woods, Good	B	55	11.84	0.01851	651
Woods, Good	C	70	2.87	0.00449	201
Woods, Good	D	77	9.82	0.01535	756
Totals =			62.75	0.09804	4290

Total (weighted) RCN = total product/total area = 68.38

RCN used = 68

Basin: CF-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	17.04	0.02663	1670
Open Space, Good	A	39	0.03	0.00004	1
Open Space, Good	B	61	41.38	0.06465	2524
Open Space, Good	C	74	6.80	0.01062	503
Open Space, Good	D	80	5.57	0.00870	445
Woods, Good	A	30	0.03	0.00004	1
Woods, Good	B	55	30.51	0.04767	1678
Woods, Good	C	70	5.84	0.00912	408
Woods, Good	D	77	2.39	0.00373	184
Totals =			109.56	0.17119	7414

Total (weighted) RCN = total product/total area = 67.67

RCN used = 68

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: CF-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	14.86	0.02322	1456
Open Space, Good	B	61	35.69	0.05576	2177
Open Space, Good	C	74	0.51	0.00080	38
Open Space, Good	D	80	4.86	0.00759	389
Woods, Good	B	55	43.17	0.06745	2374
Woods, Good	C	70	4.63	0.00724	324
Woods, Good	D	71	13.26	0.02072	942
Totals =			116.99	0.18279	7700

Total (weighted) RCN = total product/total area = 65.82

RCN used = 66

Basin: CF-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.60	0.01031	647
Open Space, Good	B	61	4.70	0.00734	287
Woods, Good	B	55	29.43	0.04598	1619
Woods, Good	D	77	12.89	0.02014	992
Totals =			53.62	0.08378	3544

Total (weighted) RCN = total product/total area = 66.11

RCN used = 66

Basin: CF-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.11	0.00642	403
Open Space, Good	B	61	19.42	0.03034	1185
Woods, Good	B	55	3.43	0.00536	189
Totals =			26.96	0.04213	1776

Total (weighted) RCN = total product/total area = 65.88

RCN used = 66

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin:CF-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	9.01	0.01408	883
Open Space, Good	B	61	14.62	0.02285	892
Open Space, Good	D	80	2.64	0.00412	211
Woods, Good	B	55	30.60	0.04782	1683
Woods, Good	D	77	2.64	0.00412	203
Totals =			59.51	0.09299	3872

Total (weighted) RCN = total product/total area = 65.07

RCN used = 65

Basin: CF-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.50	0.02109	1323
Open Space, Good	B	61	27.70	0.04328	1690
Open Space, Good	C	74	1.86	0.00291	138
Woods, Good	B	55	22.89	0.03577	1259
Woods, Good	C	70	1.45	0.00227	102
Woods, Good	D	77	30.55	0.04774	2352
Totals =			97.96	0.15307	6864

Total (weighted) RCN = total product/total area = 70.07

RCN used = 70

CEDAR FORK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: CF-140

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.33	0.00677	424
Open Space, Good	B	61	5.91	0.00924	361
Open Space, Good	D	80	1.11	0.00173	89
Woods, Good	B	55	13.83	0.02161	761
Woods, Good	D	77	1.11	0.00173	85
Totals =			26.29	0.04108	1720

Total (weighted) RCN = total product/total area = 65.41

RCN used = 65

Basin: CF-150

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.67	0.00730	458
Open Space, Good	B	61	4.25	0.00664	259
Open Space, Good	D	80	2.10	0.00328	168
Woods, Good	B	55	18.36	0.02869	1010
Woods, Good	D	77	2.91	0.00454	224
Totals =			32.29	0.05046	2119

Total (weighted) RCN = total product/total area = 65.62

RCN used = 66

EASTWOOD LAKE

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: EL-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.78	0.01997	1252
Open Space, Good	B	61	1.35	0.00211	82
Open Space, Good	C	74	6.72	0.01049	497
Open Space, Good	D	80	2.59	0.00405	207
Open Space, Good	C/D	80	8.19	0.01279	655
Woods, Good	B	55	6.48	0.01013	357
Woods, Good	C	70	22.49	0.03514	1574
Woods, Good	D	77	9.38	0.01465	722
Totals =			69.97	0.10933	5347

Total (weighted) RCN = total product/total area = 76.41

RCN used = 76

Basin: EL-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.74	0.02147	1347
Open Space, Good	B	61	10.55	0.01649	644
Open Space, Good	C	74	2.19	0.00342	162
Open Space, Good	D	80	4.95	0.00773	396
Woods, Good	B	55	21.18	0.03309	1165
Woods, Good	C	70	8.76	0.01370	614
Woods, Good	D	77	18.00	0.02812	1386
Totals =			79.38	0.12403	5713

Total (weighted) RCN = total product/total area = 71.97

RCN used = 72

Basin: EL-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.11	0.01736	1089
Open Space, Good	B	61	16.80	0.02626	1025
Open Space, Good	C	74	0.52	0.00082	39
Open Space, Good	D	80	1.72	0.00268	137
Woods, Good	B	55	34.45	0.05384	1895
Woods, Good	C	70	2.09	0.00327	146
Woods, Good	D	77	6.86	0.01073	529
Totals =			73.56	0.11494	4860

Total (weighted) RCN = total product/total area = 66.06

RCN used = 66

EASTWOOD LAKE

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: EL-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.74	0.01209	759
Open Space, Good	B	61	3.50	0.00547	214
Open Space, Good	C	74	3.06	0.00478	226
Open Space, Good	D	80	5.00	0.00781	400
Woods, Good	B	55	5.77	0.00902	317
Woods, Good	C	70	12.23	0.01911	856
Woods, Good	D	77	6.94	0.01084	534
Totals =			44.24	0.06913	3306

Total (weighted) RCN = total product/total area = 74.73

RCN used = 75

Basin: EL-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.64	0.01819	1141
Open Space, Good	B	61	12.90	0.02015	787
Open Space, Good	C	74	1.61	0.00251	119
Open Space, Good	D	80	1.28	0.00201	103
Open Space, Good	B/D	80	1.13	0.00177	91
Woods, Good	B	55	24.90	0.03891	1370
Woods, Good	C	70	6.43	0.01005	450
Woods, Good	D	77	11.55	0.01805	889
Woods, Good	B/D	77	1.13	0.00177	87
Totals =			72.58	0.11340	5036

Total (weighted) RCN = total product/total area = 69.39

RCN used = 69

Basin: EL-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	13.51	0.02111	1324
Open Space, Good	B	61	15.40	0.02407	940
Open Space, Good	D	80	0.45	0.00070	36
Woods, Good	B	55	48.87	0.07636	2688
Woods, Good	D	77	2.67	0.00418	206
Woods, Good	B/D	77	4.23	0.00662	326
Water	-	100	0.18	0.00029	18
Totals =			85.32	0.13331	5537

Total (weighted) RCN = total product/total area = 64.90

RCN used = 65

EASTWOOD LAKE

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: EL-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.12	0.01269	796
Open Space, Good	B	61	7.44	0.01163	454
Open Space, Good	C	74	1.24	0.00194	92
Open Space, Good	D	80	0.87	0.00136	70
Open Space, Good	C/D	80	0.18	0.00028	15
Woods, Good	B	55	22.31	0.03486	1227
Woods, Good	C	70	1.24	0.00194	87
Woods, Good	D	77	8.70	0.01360	670
Woods, Good	B/D	77	1.49	0.00233	115
Woods, Good	C/D	77	0.18	0.00028	14
Water	-	100	8.19	0.01280	819
Totals =			59.98	0.09372	4358

Total (weighted) RCN = total product/total area = 72.66

RCN used = 73

Basin: EL-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.01	0.01252	785
Open Space, Good	B	61	9.32	0.01456	568
Woods, Good	B	55	28.61	0.04470	1573
Water	-	100	12.32	0.01925	1232
Totals =			58.25	0.09102	4159

Total (weighted) RCN = total product/total area = 71.39

RCN used = 71

Basin: EL-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.81	0.01377	863
Open Space, Good	B	61	5.45	0.00851	332
Open Space, Good	C	74	0.72	0.00112	53
Open Space, Good	D	80	1.33	0.00207	106
Open Space, Good	C/D	80	2.02	0.00315	161
Woods, Good	B	55	23.57	0.03683	1296
Woods, Good	C	70	0.72	0.00112	50
Woods, Good	D	77	6.85	0.01070	527
Woods, Good	C/D	77	6.05	0.00945	466
Water	-	100	8.77	0.01370	877
Totals =			64.27	0.10042	4733

Total (weighted) RCN = total product/total area = 73.64

RCN used = 74

EASTWOOD LAKE

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: EL-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	7.47	0.01167	732
Open Space, Good	B	61	4.11	0.00641	250
Open Space, Good	D	80	5.11	0.00798	409
Open Space, Good	C/D	80	0.04	0.00006	3
Woods, Good	B	55	3.00	0.00469	165
Woods, Good	D	77	17.53	0.02739	1350
Woods, Good	C/D	77	0.10	0.00015	7
Water	-	100	18.52	0.02895	1852
Totals =			55.87	0.08730	4769

Total (weighted) RCN = total product/total area = 85.35

RCN used = 85

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-10

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.87	0.01073	673
Open Space, Good	B	61	4.66	0.00728	284
Open Space, Good	C	74	1.40	0.00219	104
Open Space, Good	D	80	1.91	0.00299	153
Open Space, Good	C/D	80	0.44	0.00068	35
Woods, Good	B	55	20.33	0.03177	1118
Woods, Good	C	70	5.43	0.00848	380
Woods, Good	D	77	17.22	0.02690	1326
Totals =			58.26	0.09103	4073

Total (weighted) RCN = total product/total area = 69.92

RCN used = 70

Basin: LBC-20

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	8.86	0.01384	868
Open Space, Good	B	61	4.92	0.00770	300
Open Space, Good	C	74	1.62	0.00254	120
Open Space, Good	D	80	1.55	0.00242	124
Open Space, Good	C/D	80	2.36	0.00369	189
Woods, Good	B	55	13.38	0.02090	736
Woods, Good	C	70	1.17	0.00183	82
Woods, Good	D	77	4.71	0.00737	363
Woods, Good	C/D	77	11.09	0.01733	854
Totals =			49.67	0.07761	3636

Total (weighted) RCN = total product/total area = 73.21

RCN used = 73

Basin: LBC-30

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	17.58	0.02747	1723
Open Space, Good	B	61	0.00	0.00001	0
Open Space, Good	C	74	1.09	0.00170	81
Open Space, Good	D	80	13.85	0.02164	1108
Open Space, Good	C/D	80	4.91	0.00767	393
Woods, Good	B	55	1.70	0.00265	93
Woods, Good	C	70	4.89	0.00763	342
Woods, Good	D	77	32.47	0.05074	2500
Woods, Good	C/D	77	17.87	0.02792	1376
Totals =			94.36	0.14743	7616

Total (weighted) RCN = total product/total area = 80.72

RCN used = 81

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan
 Prepared by :EVH
 Checked by: TLM
 Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-40

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	14.20	0.02219	1392
Open Space, Good	D	80	12.85	0.02008	1028
Open Space, Good	C/D	80	8.95	0.01398	716
Woods, Good	D	77	28.70	0.04485	2210
Woods, Good	C/D	77	20.88	0.03263	1608
Totals =			85.59	0.13373	6954

Total (weighted) RCN = total product/total area = 81.25

RCN used = 81

Basin: LBC-50

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.22	0.00347	218
Woods, Good	B	55	8.73	0.01364	480
Woods, Good	D	77	4.56	0.00712	351
Totals =			15.51	0.02423	1049

Total (weighted) RCN = total product/total area = 67.62

RCN used = 68

Basin: LBC-60

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	15.01	0.02345	1471
Open Space, Good	B	61	9.52	0.01487	580
Open Space, Good	B/D	80	1.06	0.00166	85
Open Space, Good	C/D	80	3.82	0.00597	306
Woods, Good	B	55	24.01	0.03752	1321
Woods, Good	D	77	12.65	0.01977	974
Woods, Good	B/D	77	6.01	0.00939	463
Woods, Good	C/D	77	11.46	0.01791	882
Totals =			83.54	0.13053	6082

Total (weighted) RCN = total product/total area = 72.80

RCN used = 73

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-70

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	11.15	0.01742	1093
Open Space, Good	B	61	7.84	0.01225	478
Open Space, Good	D	80	8.77	0.01371	702
Woods, Good	B	55	27.89	0.04357	1534
Woods, Good	D	77	9.14	0.01428	704
Woods, Good	B/D	77	0.28	0.00043	21
Totals =			65.06	0.10166	4532

Total (weighted) RCN = total product/total area = 69.65

RCN used = 70

Basin: LBC-80

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	6.06	0.00947	594
Open Space, Good	D	80	9.75	0.01523	780
Woods, Good	D	77	15.07	0.02355	1160
Totals =			30.88	0.04825	2534

Total (weighted) RCN = total product/total area = 82.07

RCN used = 82

Basin: LBC-90

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.91	0.01705	1069
Open Space, Good	C	74	2.75	0.00430	204
Open Space, Good	D	80	31.02	0.04846	2481
Open Space, Good	C/D	80	0.42	0.00065	33
Woods, Good	D	77	8.77	0.01371	676
Woods, Good	C/D	77	1.67	0.00261	129
Water	-	100	0.84	0.00132	84
Totals =			56.39	0.08811	4676

Total (weighted) RCN = total product/total area = 82.93

RCN used = 83

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-100

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	1.15	0.00180	113
Open Space, Good	D	80	7.47	0.01167	598
Woods, Good	D	77	2.19	0.00342	169
Water	-	100	0.40	0.00063	40
Totals =			11.21	0.01752	919

Total (weighted) RCN = total product/total area = 81.97

RCN used = 82

Basin: LBC-110

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.13	0.00489	307
Open Space, Good	D	80	5.40	0.00844	432
Open Space, Good	B/D	80	2.01	0.00314	161
Woods, Good	D	77	3.01	0.00470	232
Woods, Good	B/D	77	0.15	0.00023	12
Totals =			13.70	0.02141	1143

Total (weighted) RCN = total product/total area = 83.42

RCN used = 83

Basin: LBC-120

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.63	0.00723	454
Open Space, Good	D	80	1.56	0.00244	125
Open Space, Good	C/D	80	2.37	0.00370	189
Woods, Good	D	77	6.24	0.00975	480
Woods, Good	B/D	77	1.80	0.00281	139
Woods, Good	C/D	77	8.41	0.01314	648
Water	-	100	0.65	0.00102	65
Totals =			25.66	0.04009	2100

Total (weighted) RCN = total product/total area = 81.83

RCN used = 82

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-130

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.41	0.00533	334
Open Space, Good	D	80	3.74	0.00585	300
Open Space, Good	B/D	80	2.02	0.00316	162
Open Space, Good	C/D	80	0.33	0.00051	26
Woods, Good	D	77	0.27	0.00042	21
Woods, Good	B/D	77	8.19	0.01280	631
Woods, Good	C/D	77	0.98	0.00153	76
Totals =			18.95	0.02960	1549

Total (weighted) RCN = total product/total area = 81.74

RCN used = 82

Basin: LBC-140

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	3.21	0.00502	315
Open Space, Good	D	80	10.02	0.01566	802
Woods, Good	D	77	13.17	0.02057	1014
Totals =			26.40	0.04125	2130

Total (weighted) RCN = total product/total area = 80.69

RCN used = 81

Basin: LBC-150

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	10.22	0.01597	1002
Open Space, Good	B	61	7.02	0.01097	428
Open Space, Good	D	80	5.80	0.00906	464
Woods, Good	B	55	16.47	0.02574	906
Woods, Good	D	77	9.30	0.01454	716
Totals =			48.82	0.07627	3516

Total (weighted) RCN = total product/total area = 72.03

RCN used = 72

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-160

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.67	0.00417	262
Open Space, Good	B	61	2.58	0.00404	158
Open Space, Good	D	80	6.58	0.01028	526
Open Space, Good	B/D	80	0.05	0.00008	4
Woods, Good	B	55	2.96	0.00463	163
Woods, Good	D	77	11.66	0.01821	898
Totals =			26.50	0.04141	2010

Total (weighted) RCN = total product/total area = 75.85

RCN used = 76

Basin: LBC-170

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	2.94	0.00459	288
Open Space, Good	D	80	2.90	0.00453	232
Woods, Good	D	77	3.29	0.00514	253
Totals =			9.13	0.01427	773

Total (weighted) RCN = total product/total area = 84.72

RCN used = 85

Basin: LBC-180

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.52	0.01956	1227
Open Space, Good	D	80	8.06	0.01259	645
Open Space, Good	B/D	80	0.09	0.00014	7
Woods, Good	D	77	37.62	0.05878	2897
Totals =			58.29	0.09108	4776

Total (weighted) RCN = total product/total area = 81.93

RCN used = 82

LOWER BOOKER CREEK

SCS Runoff Curve Number - Future Conditions

Project: Lower Booker Creek Subwatershed Study and Plan

Prepared by :EVH

Checked by: TLM

Date: 4/28/16 (Revised 12/12/2016)

Basin: LBC-190

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	4.41	0.00689	432
Open Space, Good	D	80	3.99	0.00623	319
Woods, Good	D	77	11.04	0.01725	850
Woods, Good	B/D	77	10.84	0.01694	835
Totals =			30.28	0.04732	2436

Total (weighted) RCN = total product/total area = 80.45

RCN used = 80

Basin: LBC-200

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Impervious Surface	-	98	12.97	0.02027	1271
Open Space, Good	B	61	3.40	0.00531	207
Open Space, Good	D	80	11.63	0.01817	930
Woods, Good	B	55	7.93	0.01239	436
Woods, Good	D	77	27.13	0.04239	2089
Woods, Good	B/D	77	39.28	0.06137	3024
Totals =			102.33	0.15989	7958

Total (weighted) RCN = total product/total area = 77.77

RCN used = 78

BOOKER HEADWATERS - EXISTING CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
BH-10	89.01	19.81	22.3%	LDR	7.8
BH-20	49.08	12.94	26.4%	MDR	13.5
BH-30	105.65	20.85	19.7%	MDR	8.8
BH-40	67.59	16.49	24.4%	MDR	12.1
BH-50	75.19	5.26	7.0%	DIS	0.5
BH-60	82.84	20.33	24.5%	LDR	9.2
BH-70	40.25	11.89	29.5%	MDR	16.1
BH-80	65.63	17.70	27.0%	MDR	14.0
BH-90	60.53	7.73	12.8%	LDR	3.0
BH-100	70.93	17.64	24.9%	LDR	9.4
BH-110	75.11	20.66	27.5%	MDR	14.4
BH-120	17.58	4.28	24.4%	LDR	9.1
BH-130	64.34	12.26	19.1%	LDR	6.0

BOOKER HEADWATERS - FUTURE CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
BH-10	89.01	22.82	25.6%	LDR	9.9
BH-20	49.08	13.95	28.4%	MDR	15.1
BH-30	105.65	31.67	30.0%	MDR	16.4
BH-40	67.59	19.43	28.7%	MDR	15.4
BH-50	75.19	12.29	16.3%	MDR	6.6
BH-60	82.84	27.29	32.9%	LDR	15.2
BH-70	40.25	11.89	29.5%	MDR	16.1
BH-80	65.63	21.66	33.0%	MDR	19.0
BH-90	60.53	15.88	26.2%	LDR	10.3
BH-100	70.93	19.55	27.6%	LDR	11.2
BH-110	75.11	43.57	58.0%	MDR	44.2
BH-120	17.58	6.21	35.3%	LDR	17.1
BH-130	64.34	16.19	25.2%	LDR	9.6

Table 1. Sutherland Equations to Determine DCIA (%)

Watershed Selection Criteria	Assumed Land Use	Equation (where $IA(\%) \geq 1$)
Average: Mostly storm sewered with curb & gutter, no dry wells or infiltration, residential rooftops not directly connected	Commercial, Industrial, Institutional, Open land, and Med. density residential	$DCIA = 0.1(IA)^{1.5}$
Highly connected: Same as above, but residential rooftops are connected	High density residential	$DCIA = 0.4(IA)^{1.2}$
Totally connected: 100% storm sewered with all IA connected	--	$DCIA = IA$
Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	Low density residential	$DCIA = 0.04(IA)^{1.7}$
Mostly disconnected: Small percentage of urban area is storm sewered, or 70% or more infiltrate/disconnected	Agricultural; Forested	$DCIA = 0.01(IA)^2$

Source: Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massachusetts Small MS4 P

CEDAR FORK - EXISTING CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
CF-10	50.49	26.95	53.4%	HDR	47.3
CF-20	49.21	14.43	29.3%	MDR	15.9
CF-30	28.70	3.85	13.4%	DIS	1.8
CF-40	59.43	11.10	18.7%	LDR	5.8
CF-50	18.65	2.79	14.9%	MDR	5.8
CF-60	78.95	15.31	19.4%	LDR	6.2
CF-70	76.95	21.08	27.4%	MDR	14.3
CF-80	113.17	20.64	18.2%	LDR	5.6
CF-90	118.24	16.11	13.6%	LDR	3.4
CF-100	54.63	7.61	13.9%	LDR	3.5
CF-110	28.23	5.38	19.1%	LDR	6.0
CF-120	61.50	10.99	17.9%	LDR	5.4
CF-130	96.90	12.44	12.8%	DIS	1.6
CF-140	27.19	5.22	19.2%	LDR	6.1
CF-150	32.54	4.91	15.1%	LDR	4.0

CEDAR FORK - FUTURE CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
CF-10	50.49	28.09	55.6%	HDR	49.7
CF-20	49.21	25.18	51.2%	MDR	36.6
CF-30	28.70	6.88	24.0%	LDR	8.9
CF-40	59.43	20.34	34.2%	LDR	16.2
CF-50	18.65	3.57	19.1%	MDR	8.4
CF-60	78.95	21.70	27.5%	LDR	11.2
CF-70	76.95	25.72	33.4%	MDR	19.3
CF-80	113.17	26.97	23.8%	LDR	8.8
CF-90	118.24	21.32	18.0%	LDR	5.5
CF-100	54.63	9.31	17.0%	LDR	5.0
CF-110	28.23	6.36	22.5%	LDR	8.0
CF-120	61.50	14.00	22.8%	LDR	8.1
CF-130	96.90	16.22	16.7%	DIS	2.8
CF-140	27.19	7.16	26.4%	LDR	10.4
CF-150	32.54	7.17	22.0%	LDR	7.7

Table 1. Sutherland Equations to Determine DCIA (%)

Watershed Selection Criteria	Assumed Land Use	Equation (where $IA(\%) \geq 1$)
Average: Mostly storm sewered with curb & gutter, no dry wells or infiltration, residential rooftops not directly connected	Commercial, Industrial, Institutional, Open land, and Med. density residential	$DCIA=0.1(IA)^{1.5}$
Highly connected: Same as above, but residential rooftops are connected	High density residential	$DCIA=0.4(IA)^{1.2}$
Totally connected: 100% storm sewered with all IA connected	--	$DCIA=IA$
Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	Low density residential	$DCIA=0.04(IA)^{1.7}$
Mostly disconnected: Small percentage of urban area is storm sewered, or 70% or more infiltrate/disconnected	Agricultural; Forested	$DCIA=0.01(IA)^2$

Source: Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massachusetts Small MS4 Permi-

CROW BRANCH - EXISTING CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
CB-10	92.60	1.23	1.3%	DIS	0.0
CB-20	72.01	0.51	0.7%	DIS	0.0
CB-30	17.27	0.53	3.1%	DIS	0.0
CB-40	32.87	0.50	1.5%	DIS	0.0
CB-50	46.08	2.19	4.7%	DIS	0.2
CB-60	20.46	0.48	2.3%	DIS	0.1
CB-70	95.93	17.15	17.9%	LDR	5.4
CB-80	53.16	12.89	24.2%	LDR	9.0

CROW BRANCH - FUTURE CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
CB-10	92.60	28.63	36.8%	MDR	24.9
CB-20	72.01	28.02	38.9%	MDR	24.3
CB-30	17.27	34.46	69.2%	MDR	53.5
CB-40	32.87	21.96	70.0%	MDR	57.2
CB-50	46.08	25.99	70.0%	MDR	58.6
CB-60	20.46	14.33	70.0%	LDR	54.8
CB-70	95.93	42.82	46.1%	LDR	26.3
CB-80	53.16	15.89	29.9%	LDR	12.9

Table 1. Sutherland Equations to Determine DCIA (%)

Watershed Selection Criteria	Assumed Land Use	Equation (where IA(%) ≥ 1)
Average: Mostly storm sewered with curb & gutter, no dry wells or infiltration, residential rooftops not directly connected	Commercial, Industrial, Institutional, Open land, and Med. density residential	$DCIA = 0.1(IA)^{1.5}$
Highly connected: Same as above, but residential rooftops are connected	High density residential	$DCIA = 0.4(IA)^{1.2}$
Totally connected: 100% storm sewered with all IA connected	--	$DCIA = IA$
Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	Low density residential	$DCIA = 0.04(IA)^{1.7}$
Mostly disconnected: Small percentage of urban area is storm sewered, or 70% or more infiltrate/disconnected	Agricultural; Forested	$DCIA = 0.01(IA)^2$

Source: Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massachusetts Small MS4 P

EASTWOOD LAKE - EXISTING CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
EL-10	88.88	29.06	32.7%	MDR	19.3
EL-20	88.02	20.21	23.0%	LDR	8.1
EL-30	76.64	11.82	15.4%	LDR	4.2
EL-40	47.93	11.42	23.8%	LDR	8.8
EL-50	74.07	13.13	17.7%	LDR	5.3
EL-60	90.90	19.09	21.0%	LDR	7.1
EL-70	60.22	8.36	13.9%	LDR	3.5
EL-80	58.71	8.49	14.5%	LDR	3.8
EL-90	64.09	8.67	13.5%	LDR	3.4
EL-100	55.77	7.34	13.2%	LDR	3.2

EASTWOOD LAKE - FUTURE CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
EL-10	88.88	31.81	36.9%	MDR	21.4
EL-20	88.02	27.22	30.7%	LDR	9.8
EL-30	76.64	17.15	22.4%	LDR	7.9
EL-40	47.93	12.92	27.0%	LDR	10.8
EL-50	74.07	19.00	25.7%	LDR	9.9
EL-60	90.90	21.20	23.3%	LDR	8.5
EL-70	60.22	12.04	20.0%	LDR	6.5
EL-80	58.71	11.94	20.3%	LDR	6.7
EL-90	64.09	13.19	20.6%	LDR	6.8
EL-100	55.77	11.05	19.8%	LDR	6.4

Table 1. Sutherland Equations to Determine DCIA (%)

Watershed Selection Criteria	Assumed Land Use	Equation (where $IA(\%) \geq 1$)
Average: Mostly storm sewered with curb & gutter, no dry wells or infiltration, residential rooftops not directly connected	Commercial, Industrial, Institutional, Open land, and Med. density residential	$DCIA=0.1(IA)^{1.5}$
Highly connected: Same as above, but residential rooftops are connected	High density residential	$DCIA=0.4(IA)^{1.2}$
Totally connected: 100% storm sewered with all IA connected	--	$DCIA=IA$
Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	Low density residential	$DCIA=0.04(IA)^{1.7}$
Mostly disconnected: Small percentage of urban area is storm sewered, or 70% or more infiltrate/disconnected	Agricultural; Forested	$DCIA=0.01(IA)^2$

Source: Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massachusetts Small MS4

LOWER BOOKER CREEK - EXISTING CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
LBC-10	62.29	10.91	17.5%	MDR	7.3
LBC-20	54.09	13.28	24.6%	LDR	9.2
LBC-30	102.27	25.47	24.9%	LDR	9.5
LBC-40	100.15	28.78	28.7%	MDR	15.4
LBC-50	14.22	1.24	8.7%	DIS	0.8
LBC-60	90.92	22.39	24.6%	LDR	9.3
LBC-70	69.09	15.10	21.9%	LDR	7.6
LBC-80	41.07	10.93	26.6%	MDR	13.7
LBC-90	73.64	28.16	38.2%	MDR	23.7
LBC-100	18.60	8.08	43.4%	HDR	36.9
LBC-110	21.31	6.31	29.6%	MDR	16.1
LBC-120	31.87	9.82	30.8%	MDR	17.1
LBC-130	23.08	7.55	32.7%	MDR	18.7
LBC-140	56.73	33.21	58.5%	HDR	52.9
LBC-150	69.01	28.27	41.0%	MDR	26.2
LBC-160	49.68	25.85	52.0%	HDR	45.9
LBC-170	17.56	3.08	17.5%	MDR	7.3
LBC-180	91.01	37.28	41.0%	HDR	34.4
LBC-190	32.44	5.71	17.6%	LDR	5.2
LBC-200	107.57	18.21	16.9%	LDR	4.9

LOWER BOOKER CREEK - FUTURE CONDITIONS					
Basin_ID	Total Area (Acres)	Impervious Area (Acres)	% Impervious	Assumed Land Use	DCIA%
LBC-10	62.29	12.42	19.9%	MDR	8.9
LBC-20	54.09	15.01	27.7%	LDR	11.4
LBC-30	102.27	31.34	30.6%	LDR	13.5
LBC-40	100.15	34.06	34.0%	MDR	19.8
LBC-50	14.22	3.59	25.3%	LDR	9.7
LBC-60	90.92	25.60	28.2%	LDR	11.6
LBC-70	69.09	18.61	26.9%	LDR	10.8
LBC-80	41.07	16.86	41.1%	MDR	26.3
LBC-90	73.64	32.07	43.5%	MDR	28.7
LBC-100	18.60	9.54	51.3%	HDR	45.1
LBC-110	21.31	10.49	49.2%	MDR	34.6
LBC-120	31.87	11.90	37.3%	MDR	22.8
LBC-130	23.08	9.72	42.1%	MDR	27.3
LBC-140	56.73	33.43	58.9%	HDR	53.3
LBC-150	69.01	30.65	44.4%	MDR	29.6
LBC-160	49.68	30.83	62.1%	HDR	56.7
LBC-170	17.56	11.37	64.7%	LDR	48.0
LBC-180	91.01	53.24	58.5%	MDR	44.7
LBC-190	32.44	6.57	20.2%	LDR	6.7
LBC-200	107.57	18.28	17.0%	LDR	4.9

Table 1. Sutherland Equations to Determine DCIA (%)

Watershed Selection Criteria	Assumed Land Use	Equation (where $IA(\%) \geq 1$)
Average: Mostly storm sewered with curb & gutter, no dry wells or infiltration, residential rooftops not directly connected	Commercial, Industrial, Institutional, Open land, and Med. density residential	$DCIA = 0.1(IA)^{1.5}$
Highly connected: Same as above, but residential rooftops are connected	High density residential	$DCIA = 0.4(IA)^{1.2}$
Totally connected: 100% storm sewered with all IA connected	—	$DCIA = IA$
Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	Low density residential	$DCIA = 0.04(IA)^{1.7}$
Mostly disconnected: Small percentage of urban area is storm sewered, or 70% or more infiltrate/disconnected	Agricultural; Forested	$DCIA = 0.01(IA)^2$

Source: Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massa

Appendix F:

Time of Concentration Calculations

List of Contents:

1. Booker Headwaters
 2. Cedar Fork
 3. Crow Branch
 4. Eastwood Lake
 5. Lower Booker Creek
-

Project: Lower Booker Creek Subwatershed Study

Prepared by: EVH

Checked by: TLM

Date: 3/31/2016 (Revised 12/12/2016)

Time of Concentration - Booker Creek Watershed

Sub-basin	Sheet Flow						Shallow Concentration					Channel Flow										Lag	Validation
	Description	n	Flow Length (ft)	P-2 (in)	Land Slope (ft/ft)	Tt (min)	Surface Description 0--Unpaved/1-Paved	Flow Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Tt (min)	Channel Area (ft2)	Channel Perimeter (ft)	Hydraulic Radius (ft)	Slope (ft/ft)	n	Velocity (ft/s)	Flow Length (ft)	Tt (min)	Tc (min)		(min)	(min)
BOOKER HEADWATERS																							
BH-10	Woods	0.40	300	3.58	0.023	45.97	0	488	0.033	2.92	2.78	8	7.7	1.04	0.022	0.045	5.01	1332	4.43	53.18		31.91	47.86
BH-20	Woods	0.40	300	3.58	0.027	43.58	0	543	0.048	3.53	2.56	Pipe			0.054	0.013	5.00	739	2.46	53.66		32.20	
												8	7.7	1.04	0.013	0.045	3.93	1193	5.05				
BH-30	Woods	0.40	300	3.58	0.047	34.84	0	419	0.074	4.39	1.59	Pipe			0.044	0.013	5.00	180	0.60	61.74		37.05	55.57
												8	7.7	1.04	0.001	0.04	1.16	1076.75	15.41				
												Pipe			0.056	0.013	5.00	89	0.30				
												8	7.7	1.04	0.013	0.04	4.36	1076.75	4.12				
												Pipe			0.027	0.013	5.00	73	0.24				
												8	7.7	1.04	0.010	0.04	3.86	1076.75	4.65				
BH-40	Woods	0.40	291	3.58	0.072	28.56	1	226	0.053	4.68	0.80	Pipe			0.037	0.013	5.00	709	2.36	37.09		22.26	16.69
												8	7.7	1.04	0.028	0.03	8.49	396	0.78				
												Pipe			0.029	0.013	5.00	175	0.58				
												8	7.7	1.04	0.042	0.04	7.87	212	0.45				
												16.5	10.7	1.54	0.012	0.045	4.79	1023	3.56				
BH-50	Woods	0.40	300	3.58	0.037	38.37	0	172	0.035	3.01	0.95	16.5	10.7	1.54	0.017	0.04	6.42	1385	3.60	43.16		25.89	
												Pipe			0.027	0.013	5.00	73	0.24				
BH-60	Woods	0.40	300	3.58	0.047	34.84	1	195	0.031	3.57	0.91	8	7.7	1.04	0.001	0.04	0.99	1088	18.32	57.73		34.64	51.96
												16.5	10.7	1.54	0.002	0.04	2.02	444	3.67				
BH-70	Woods	0.40	230	3.58	0.074	23.43	0	605	0.010	1.61	6.28	8	7.7	1.04	0.033	0.04	6.95	302	0.72	30.81		18.49	
												16.5	10.7	1.54	0.015	0.04	6.02	137	0.38				
BH-80	Woods	0.40	300	3.58	0.020	48.89	0	398	0.020	2.29	2.90	Pipe			0.014	0.013	5.00	359	1.20	58.51		35.10	
												8	7.7	1.04	0.026	0.04	6.20	1408	3.79				
												16.5	10.7	1.54	0.006	0.045	3.36	348	1.73				
BH-90	Woods	0.40	300	3.58	0.050	33.89	0	209	0.115	5.47	0.64	16.5	10.7	1.54	0.032	0.04	8.90	188	0.35	64.06		38.43	57.65
												Pipe			0.019	0.013	5.00	106	0.35				
												16.5	10.7	1.54	0.001	0.045	1.50	2600	28.82				
BH-100	Woods	0.40	300	3.58	0.073	29.08	1	174	0.126	7.23	0.40	8	7.7	1.04	0.053	0.04	8.83	900	1.70	39.21		23.53	35.29
												16.5	10.7	1.54	0.008	0.045	4.02	1939	8.04				
BH-110	Woods	0.40	300	3.58	0.100	25.68	0	465	0.099	5.07	1.53	16.5	10.7	1.54	0.013	0.045	5.11	1948	6.35	33.56		20.14	
BH-120	Woods	0.40	192	3.58	0.042	25.51	1	289	0.035	3.78	1.27	8	7.7	1.04	0.067	0.04	9.91	387	0.65	29.07		17.44	
												16.5	10.7	1.54	0.009	0.045	4.31	422	1.63				
BH-130	Woods	0.40	296	3.58	0.068	29.72	0	400	0.068	4.19	1.59	8	7.7	1.04	0.030	0.04	6.62	900	2.27	41.16		24.69	37.04
												16.5	10.7	1.54	0.009	0.045	4.26	1939	7.58				

Project: Lower Booker Creek Subwatershed Study

Prepared by: EVH

Checked by: TLM

Date: 3/31/2016 (Revised 12/12/2016)

Time of Concentration - Booker Creek Watershed

Sub-basin	Sheet Flow						Shallow Concentration					Channel Flow										Lag	Validation
	Description	n	Flow Length (ft)	P-2 (in)	Land Slope (ft/ft)	Tt (min)	Surface Description 0--Unpaved/1-Paved	Flow Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Tt (min)	Channel Area (ft2)	Channel Perimeter (ft)	Hydraulic Radius (ft)	Slope (ft/ft)	n	Velocity (ft/s)	Flow Length (ft)	Tt (min)	Tc (min)		(min)	(min)
CROW BRANCH																							
CB-10	Woods	0.40	300	3.58	0.027	43.58	0	685	0.026	2.62	4.37	108.5	27.7	3.92	0.014	0.045	9.94	1867	3.13	51.07		30.64	61.29
CB-20	Woods	0.40	300	3.58	0.053	33.03	0	309	0.078	4.50	1.15	16.5	10.7	1.54	0.049	0.045	9.79	900	1.53	39.59		23.75	47.50
												108.5	27.7	3.92	0.008	0.045	7.43	1731	3.88				
CB-30	Woods	0.40	219	3.58	0.023	36.05	0	297	0.044	3.38	1.47	16.5	10.7	1.54	0.067	0.045	11.48	862	1.25	38.77		23.26	46.52
CB-40	Woods	0.40	258	3.58	0.039	33.26	0	291	0.027	2.68	1.81	16.5	10.7	1.54	0.016	0.045	5.56	507	1.52	36.59		21.95	
CB-50	Woods	0.40	300	3.58	0.013	57.50	0	532	0.004	0.99	8.96	8	7.7	1.04	0.006	0.035	3.48	629	3.01	72.81		43.69	
												16.5	10.7	1.54	0.012	0.045	4.90	981	3.34				
CB-60	Woods	0.40	300	3.58	0.027	43.58	0	316	0.022	2.40	2.19	16.5	10.7	1.54	0.022	0.045	6.56	683	1.74	47.51		28.50	
CB-70	Woods	0.40	300	3.58	0.027	43.58	0	141	0.071	4.30	0.55	16.5	10.7	1.54	0.026	0.04	7.96	1017	2.13	52.42		31.45	62.90
												108.5	27.7	3.92	0.003	0.045	4.80	1776	6.16				
CB-80	Woods	0.40	300	3.58	0.027	43.58	0	155	0.039	3.17	0.81	16.5	10.7	1.54	0.035	0.04	9.32	428	0.77	48.57		29.14	
												108.5	27.7	3.92	0.012	0.045	9.15	1875	3.41				

Project: Lower Booker Creek Subwatershed Study

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Checked by: TLM

Date: 3/31/2016 (Revised 12/12/2016)

Time of Concentration - Booker Creek Watershed

Sub-basin	Sheet Flow						Shallow Concentration					Channel Flow										Lag	Validation
	Description	n	Flow Length (ft)	P-2 (in)	Land Slope (ft/ft)	Tt (min)	Surface Description 0--Unpaved/1-Paved	Flow Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Tt (min)	Channel Area (ft2)	Channel Perimeter (ft)	Hydraulic Radius (ft)	Slope (ft/ft)	n	Velocity (ft/s)	Flow Length (ft)	Tt (min)	Tc (min)		(min)	(min)
CEDAR FORK																							
CF-10	Grass	0.24	300	3.58	0.053	21.95	0	197	0.030	2.82	1.17	Pipe			0.008	0.013	5.00	711	2.37	27.81		16.69	
												16.5	10.7	1.54	0.019	0.045	6.08	849	2.33				
CF-20	Woods	0.40	300	3.58	0.027	43.58	0	177	0.023	2.43	1.22	8	7.7	1.04	0.030	0.04	6.62	934	2.35	49.29		29.57	59.15
												16.5	10.7	1.54	0.020	0.045	6.25	803	2.14				
CF-30	Woods	0.40	300	3.58	0.030	41.57	0	458	0.035	3.02	2.53	16.5	10.7	1.54	0.031	0.045	7.75	881	1.90	46.00		27.60	41.40
CF-40	Woods	0.40	300	3.58	0.027	43.58	0	591	0.024	2.48	3.97	16.5	10.7	1.54	0.023	0.045	6.76	1844	4.55	52.09		31.25	46.88
CF-50	Grass	0.24	203	3.58	0.010	31.55	0	385	0.052	3.68	1.74	16.5	10.7	1.54	0.014	0.04	5.99	276	0.77	34.07		20.44	
CF-60	Woods	0.40	300	3.58	0.043	35.89	0	562	0.041	3.26	2.87	16.5	10.7	1.54	0.015	0.045	5.42	2404	7.40	46.15		27.69	55.38
CF-70	Woods	0.40	300	3.58	0.020	48.89	0	596	0.062	4.02	2.47	16.5	10.7	1.54	0.020	0.045	6.23	1917	5.13	56.49		33.89	67.79
CF-80	Woods	0.40	300	3.58	0.027	43.58	0	446	0.058	3.90	1.91	16.5	10.7	1.54	0.028	0.04	8.32	1288	2.58	49.50		29.70	
												108.5	27.7	3.92	0.007	0.045	6.82	588	1.44				
CF-90	Woods	0.40	300	3.58	0.077	28.56	0	383	0.133	5.89	1.08	8	7.7	1.04	0.037	0.04	7.33	136	0.31	36.29		21.77	43.55
												16.5	10.7	1.54	0.047	0.045	9.64	3664	6.33				
CF-100	Woods	0.40	300	3.58	0.100	25.68	0	570	0.154	6.34	1.50	8	7.7	1.04	0.046	0.04	8.23	474	0.96	30.05		18.03	13.52
												16.5	10.7	1.54	0.011	0.045	4.68	537	1.91				
CF-110	Woods	0.40	300	3.58	0.043	35.89	0	126	0.095	4.98	0.42	8	7.7	1.04	0.043	0.04	7.92	1071	2.25	38.56		23.14	
CF-120	Woods	0.40	300	3.58	0.077	28.56	0	222	0.045	3.42	1.08	8	7.7	1.04	0.063	0.04	9.60	887	1.54	34.60		20.76	
												16.5	10.7	1.54	0.022	0.045	6.60	1351	3.41				
CF-130	Woods	0.40	300	3.58	0.060	31.51	0	325	0.037	3.10	1.75	8	7.7	1.04	0.051	0.04	8.60	711	1.38	35.90		21.54	43.08
												16.5	10.7	1.54	0.046	0.045	9.48	720	1.27				
CF-140	Woods	0.40	300	3.58	0.140	22.45	0	592	0.068	4.19	2.35	8	7.7	1.04	0.029	0.04	6.49	971	2.49	46.67		28.00	
												108.5	27.7	3.92	0.001	0.045	2.27	2643	19.37				
CF-150	Woods	0.40	256	3.58	0.109	21.83	0	249	0.064	4.09	1.01	8	7.7	1.04	0.046	0.04	8.23	1079	2.19	26.77		16.06	
												108.5	27.7	3.92	0.009	0.045	8.05	843	1.74				

Project: Lower Booker Creek Subwatershed Study
Prepared by: EVH
Checked by: TLM
Date: 3/31/2016 (Revised 12/12/2016)

Time of Concentration - Booker Creek Watershed

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Appendix G:

Preliminary Opinion of Probable Construction Costs

List of Contents:

1. Unit Cost Table
2. Flood Control Projects

Unit Costs - Eastwood Lake Subwatershed Plan

Item Description		Unit	Unit Price
1	Mobilization (10%)	LS	
2	Comprehensive Grading (20%)	LS	
3	Excavation	CY	\$ 25.00
4	Hauling	CY	\$ 4.00
5	Clearing & Grubbing	AC	\$ 20,000.00
6	Channel Grading including seeding	SY	\$ 15.00
7	Construction Staking (0-300000)	LS	\$ 3,000.00
8	Construction Staking (300000-800000)	LS	\$ 6,000.00
9	Construction Staking (Greater than 800000)	LS	\$ 10,000.00
10	Select Material	CY	\$ 25.00
11	Flowable Fill	CY	\$ 500.00
12	8" Perforated PVC Underdrain	LF	\$ 10.00
13	8" PVC Pipe, SDR 35	LF	\$ 10.00
14	15" PVC Pipe, SDR 35	LF	\$ 18.00
15	18" PVC Pipe, SDR 35	LF	\$ 25.00
16	24" PVC Pipe, SDR 35	LF	\$ 28.00
17	12" R.C. Pipe Culvert, Class III	LF	\$ 70.00
18	15" R.C. Pipe Culvert, Class III	LF	\$ 80.00
19	18" R.C. Pipe Culvert, Class III	LF	\$ 90.00
20	18" R.C. Pipe Culvert, Class IV	LF	\$ 100.00
21	24" R.C. Pipe Culvert, Class III	LF	\$ 110.00
22	24" R.C. Pipe Culvert, Class IV	LF	\$ 120.00
23	30" R.C. Pipe Culvert, Class III	LF	\$ 130.00
24	30" R.C. Pipe Culvert, Class IV, 0' - 6' depth	LF	\$ 140.00
25	36" R.C. Pipe Culvert, Class III	LF	\$ 150.00
26	36" R.C. Pipe Culvert, Class IV	LF	\$ 160.00
27	36" Steel Pipe Culvert (Tunnel Installation)	LF	\$ 800.00
28	42" R.C. Pipe Culvert, Class III	LF	\$ 180.00
29	42" R.C. Pipe Culvert, Class IV	LF	\$ 190.00
30	48" R.C. Pipe Culvert, Class III	LF	\$ 210.00
31	48" R.C. Pipe Culvert, Class IV	LF	\$ 220.00
32	48" Steel Pipe Culvert (Tunnel Installation)	LF	\$ 1,100.00
33	54" R.C. Pipe Culvert, Class III	LF	\$ 240.00
34	60" R.C. Pipe Culvert, Class III	LF	\$ 260.00
35	60" Steel Pipe Culvert (Tunnel Installation)	LF	\$ 1,500.00
36	66" R.C. Pipe Culverts, Class III	LF	\$ 280.00
37	72" R.C. Pipe Culvert, Class III	LF	\$ 320.00
38	72" R.C. Pipe Culvert, Class IV	LF	\$ 370.00
39	72" Steel Pipe Culvert (Tunnel Installation)	LF	\$ 1,800.00
40	78" R.C. Pipe Culvert, Class III	LF	\$ 350.00
41	4' x 4' Precast R.C. Box Culvert	LF	\$ 600.00
42	5' x 3' Precast R.C. Box Culvert	LF	\$ 650.00
43	5' x 4' Precast R.C. Box Culvert	LF	\$ 700.00
44	6' x 3' Precast R.C. Box Culvert	LF	\$ 800.00
45	6' x 4' Precast R.C. Box Culvert	LF	\$ 850.00
46	6' x 5' Precast R.C. Box Culvert	LF	\$ 900.00
47	6' x 6' Precast R.C. Box Culvert	LF	\$ 950.00
48	7' x 5' Precast R.C. Box Culvert	LF	\$ 950.00
49	7' x 6' Precast R.C. Box Culvert	LF	\$ 1,100.00
50	7' x 7' Reinforced Concrete Box Culvert	LF	\$ 1,400.00
51	8' x 4' Precast R.C. Box Culvert	LF	\$ 900.00
52	8' x 5' Precast R.C. Box Culvert	LF	\$ 1,000.00
53	8' X 6' Reinforced Concrete Box Culvert	LF	\$ 1,400.00
54	9' x 5' Precast R.C. Box Culvert	LF	\$ 1,300.00
55	9' X 6' Reinforced Concrete Box Culvert	LF	\$ 1,500.00
56	10 x 5' Precast R.C. Box Culvert	LF	\$ 1,500.00
57	11' x 6' Precast R.C. Box Culvert	LF	\$ 1,800.00
58	11' x 7' Precast R.C. Box Culvert	LF	\$ 2,000.00
59	Drainage Structures, Manhole	EA	\$ 5,000.00
60	Drainage Structures, Inlet	EA	\$ 3,500.00
61	Drainage Structures, DOT Standard Endwall	EA	\$ 6,000.00
62	Drainage Structures, Box Culvert Custom Endwall	EA	\$ 20,000.00
63	BMP Outlet Structure	EA	\$ 6,000.00
64	Convert Yard Inlet to Junction Box	EA	\$ 1,500.00
65	Curb Cut	EA	\$ 400.00
66	Flared End Section, 18 inch	EA	\$ 1,000.00
67	Flared End Section, 36 inch	EA	\$ 2,500.00
68	Flared End Section, 42 inch	EA	\$ 2,500.00
69	Flared End Section, 48 inch	EA	\$ 3,000.00
70	Custom Junction Box	EA	\$ 15,000.00
71	Concrete Curb and Gutter	LF	\$ 35.00
72	6" Concrete Driveway Replacement	EA	\$ 1,500.00
73	4" Concrete Sidewalk	LF	\$ 40.00
74	Concrete Pipe Plug	EA	\$ 450.00

Item Description		Unit	Unit Price
75	Asphalt Milling/Overlay	SY	\$ 30.00
76	Asphalt Replacement (Surface, Base Course, & Milling)	SY	\$ 70.00
77	ABC Stone	TN	\$ 35.00
78	Rip Rap Stone, Class B	TN	\$ 65.00
79	Rip Rap Stone, Class 1	TN	\$ 70.00
80	Rip Rap Stone, Class A	TN	\$ 65.00
81	#5 stone	TN	\$ 50.00
82	#57 stone	TN	\$ 65.00
83	Gravel Walkway #78 stone	TN	\$ 65.00
84	Stone Boulder	TN	\$ 200.00
85	Sand 2S	CY	\$ 60.00
86	Rock Grade Control	EA	\$ 10,000.00
87	Traffic Control (Single 2-lane road)	LS	\$ 15,000.00
88	Traffic Control (4+ lane road or multiple 2-lane roads)	LS	\$ 30,000.00
89	Erosion Control (1-2 acre LOD)	LS	\$ 15,000.00
90	Erosion Control (2-5 acre LOD)	LS	\$ 30,000.00
91	Erosion Control (Greater than 5 acre LOD)	LS	\$ 50,000.00
92	Erosion Control Matting	SY	\$ 10.00
93	Fence Removal / Replacement	LF	\$ 50.00
94	4' Personnel Gates	EA	\$ 375.00
95	20' Roadway Gates	EA	\$ 400.00
96	Soil Media	CY	\$ 50.00
97	BMP Plantings	SF	\$ 2.00
98	Riparian Seed Mix	SY	\$ 1.50
99	Live Staking	SY	\$ 15.00
100	Seeding and Mulching	AC	\$ 7,500.00
101	Wood Retaining Wall (4' high)	LF	\$ 100.00
102	Log Grade Control Structure	EA	\$ 2,000.00
103	Gabion Wall	LF	\$ 300.00
104	Foundation Protection	EA	\$ 15,000.00
105	Utility Relocations (Minor Water line adjustments)	LS	\$ 15,000.00
106	Utility Relocations (Substantial Water line adjustments including)	LS	\$ 3,000.00
107	Utility Relocations (Substantial sanitary sewer and water line adjustments)	LS	\$ 50,000.00
108	Buffer Plantings	SY	\$ 4.00
109	PICP (Permeable Pavers), 3.5" thick	SF	\$ 20.00
110	Hauling	CY	\$ 45.00
111	Cascade Boulder	TN	\$ 75.00
112	Cobble	TN	\$ 75.00

Shady Lawn System

<i>Item Number</i>	<i>Item Description</i>	<i>Quantities</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Amount</i>
1	Mobilization (10%)	1	LS	\$ 8,200.00	\$ 8,200.00
2	Comprehensive Grading (20%)*	1	LS	\$ 13,800.00	\$ 13,800.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	71	CY	\$ 25.00	\$ 1,780.00
5	18" R.C. Pipe Culvert, Class III	143	LF	\$ 90.00	\$ 12,870.00
6	Drainage Structures, Inlet	2	EA	\$ 3,500.00	\$ 7,000.00
7	Flared End Section, 18 inch	2	EA	\$ 1,000.00	\$ 2,000.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	86	SY	\$ 70.00	\$ 5,990.00
9	Concrete Curb and Gutter	30	LF	\$ 35.00	\$ 1,050.00
10	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
11	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
12	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 90,700.00
30% Contingency					\$27,200.00
Total					\$ 117,900.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					35,400.00
Total Opinion of Project Cost					\$ 153,300.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Arlington Street #1 System

Item Number	Item Description	Quantities	Unit	Unit Price	Amount
1	Mobilization (10%)	1	LS	\$ 5,600.00	\$ 5,600.00
2	Comprehensive Grading (20%)*	1	LS	\$ 9,400.00	\$ 9,400.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	81	CY	\$ 25.00	\$ 2,040.00
5	Channel Grading including seeding	367	SY	\$ 15.00	\$ 5,500.00
6	24" R.C. Pipe Culvert, Class III	22	LF	\$ 110.00	\$ 2,420.00
7	Drainage Structures, Inlet	2	EA	\$ 3,500.00	\$ 7,000.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	27	SY	\$ 70.00	\$ 1,880.00
9	Traffic Control (Single 2-lane road)	1	LS	\$ 5,000.00	\$ 5,000.00
10	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
11	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 61,800.00
30% Contingency					\$18,500.00
Total					\$ 80,300.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					24,100.00
Total Opinion of Project Cost					\$ 104,400.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Arlington Street #2 System

Item Number	Item Description	Quantities	Unit	Unit Price	Amount
1	Mobilization (10%)	1	LS	\$ 7,200.00	\$ 7,200.00
2	Comprehensive Grading (20%)*	1	LS	\$ 12,000.00	\$ 12,000.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	63	CY	\$ 25.00	\$ 1,590.00
5	24" R.C. Pipe Culvert, Class III	102	LF	\$ 110.00	\$ 11,220.00
6	Drainage Structures, Inlet	1	EA	\$ 3,500.00	\$ 3,500.00
7	Asphalt Replacement (Surface, Base Course, & Milling)	61	SY	\$ 70.00	\$ 4,270.00
8	Concrete Curb and Gutter	30	LF	\$ 35.00	\$ 1,050.00
9	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
10	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
11	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 78,800.00
30% Contingency					\$23,600.00
Total					\$ 102,400.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					30,700.00
Total Opinion of Project Cost					\$ 133,100.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

South Lakeshore Drive/Ridgecrest Drive System

<i>Item Number</i>	<i>Item Description</i>	<i>Quantities</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Amount</i>
1	Mobilization (10%)	1	LS	\$ 6,700.00	\$ 6,700.00
2	Comprehensive Grading (20%)*	1	LS	\$ 11,200.00	\$ 11,200.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	63	CY	\$ 25.00	\$ 1,580.00
5	18" R.C. Pipe Culvert, Class III	127	LF	\$ 90.00	\$ 11,430.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	74	SY	\$ 70.00	\$ 5,190.00
7	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
8	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
9	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 74,100.00
30% Contingency					\$22,200.00
Total					\$ 96,300.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					28,900.00
Total Opinion of Project Cost					\$ 125,200.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

South Lakeshore Drive/Rolling Road Closed System

Item Number	Item Description	Quantities	Unit	Unit Price	Amount
1	Mobilization (10%)	1	LS	\$ 11,700.00	\$ 11,700.00
2	Comprehensive Grading (20%)*	1	LS	\$ 19,400.00	\$ 19,400.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	128	CY	\$ 25.00	\$ 3,200.00
5	36" R.C. Pipe Culvert, Class III	74	LF	\$ 150.00	\$ 11,100.00
6	48" R.C. Pipe Culvert, Class III	49	LF	\$ 210.00	\$ 10,290.00
7	Drainage Structures, DOT Standard Endwall	4	EA	\$ 6,000.00	\$ 24,000.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	101	SY	\$ 70.00	\$ 7,080.00
9	Drainage Structures, Inlet	1	EA	\$ 3,500.00	\$ 3,500.00
10	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
11	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
12	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 128,300.00
30% Contingency					\$38,500.00
Total					\$ 166,800.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					50,000.00
Total Opinion of Project Cost					\$ 216,800.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Woodshire Lane/Huntington Drive System

<i>Item Number</i>	<i>Item Description</i>	<i>Quantities</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Amount</i>
1	Mobilization (10%)	1	LS	\$ 20,000.00	\$ 20,000.00
2	Comprehensive Grading (20%)*	1	LS	\$ 33,400.00	\$ 33,400.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	105	CY	\$ 25.00	\$ 2,610.00
5	30" R.C. Pipe Culvert, Class III	52	LF	\$ 130.00	\$ 6,760.00
6	4' x 5' Precast R.C. Box Culvert	84	LF	\$ 700.00	\$ 58,800.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	\$ 20,000.00	\$ 40,000.00
8	Drainage Structures, DOT Standard Endwall	2	EA	\$ 6,000.00	\$ 12,000.00
9	Asphalt Replacement (Surface, Base Course, & Milling)	75	SY	\$ 70.00	\$ 5,230.00
10	Drainage Structures, Inlet	1	EA	\$ 3,500.00	\$ 3,500.00
11	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
12	Erosion Control (1-2 acre LOD)	1	LS	\$ 5,000.00	\$ 5,000.00
13	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 220,300.00
30% Contingency					\$66,100.00
Total					\$ 286,400.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					85,900.00
Total Opinion of Project Cost					\$ 372,300.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Piney Mountain Road Improvements (With 3 Storage Areas)

<i>Item Number</i>	<i>Item Description</i>	<i>Quantities</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Amount</i>
1	Mobilization (10%)	1	LS	\$ 19,300.00	\$ 19,300.00
2	Comprehensive Grading (20%)*	1	LS	\$ 32,200.00	\$ 32,200.00
3	Construction Staking (0-300000)	1	LS	\$ 3,000.00	\$ 3,000.00
4	Select Material	111	CY	\$ 25.00	\$ 2,780.00
5	7' x 5' Precast R.C. Box Culvert	65	LF	\$ 950.00	\$ 61,750.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	116	SY	\$ 70.00	\$ 8,090.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	\$ 20,000.00	\$ 40,000.00
8	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
9	Erosion Control (1-2 acre LOD)	1	LS	\$ 15,000.00	\$ 15,000.00
10	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
Subtotal					\$ 197,100.00
30% Contingency					\$59,100.00
Total					\$ 256,200.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					76,900.00
Total Opinion of Project Cost					\$ 333,100.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Piney Mountain Road Improvements (Without 3 Storage Areas)

Item Number	Item Description	Quantities	Unit	Unit Price	Amount
1	Mobilization (10%)	1	LS	\$ 24,600.00	\$ 24,600.00
2	Comprehensive Grading (20%)*	1	LS	\$ 41,000.00	\$ 41,000.00
3	Clearing & Grubbing	0.5	AC	\$ 20,000.00	\$ 10,000.00
4	Construction Staking (300000-800000)	1	LS	\$ 6,000.00	\$ 6,000.00
5	Select Material	165	CY	\$ 25.00	\$ 4,130.00
6	10' x 6' Precast R.C. Box Culvert	65	LF	\$ 1,300.00	\$ 84,500.00
7	Asphalt Replacement (Surface, Base Course, & Milling)	116	SY	\$ 70.00	\$ 8,090.00
8	Drainage Structures, Box Culvert Custom Endwall	2	EA	\$ 20,000.00	\$ 40,000.00
9	Utility Relocations (Minor Water line adjustments)	1	LS	\$ 15,000.00	\$ 15,000.00
10	Erosion Control (1-2 acre LOD)	1	LS	\$ 15,000.00	\$ 15,000.00
11	Traffic Control (Single 2-lane road)	1	LS	\$ 15,000.00	\$ 15,000.00
12	Rip Rap Stone, Class 1	100	TN	\$ 70.00	\$ 7,000.00
Subtotal					\$ 270,300.00
30% Contingency					\$81,100.00
Total					\$ 351,400.00
Design, Administration, Fiscal and Legal (30% of Construction Costs)					105,400.00
Total Opinion of Project Cost					\$ 456,800.00

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Appendix H:

Hydraulic & Hydrologic Input and Output Data

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7. Alternative SWMM Output (10-Year)

- a. Shady Lawn Road System
- b. Arlington Street #1 System
- c. Arlington Street #2 System
- d. South Lakeshore Drive/Ridgecrest Drive System
- e. South Lakeshore Drive/Rolling Road System

EXISTING CONDITIONS: HEC-HMS OUTPUT

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	29.8	01Jan2015, 12:45	6.9
BH-20	0.07669	29.9	01Jan2015, 12:25	5
ADD-BH-10-20	0.215766	56	01Jan2015, 12:35	11.9
Reach-BH-20	0.215766	55.8	01Jan2015, 12:40	11.9
BH-30	0.165073	49.1	01Jan2015, 12:55	11.4
ADD-BH-30	0.380839	102.6	01Jan2015, 12:45	23.3
BH-40	0.105607	77.4	01Jan2015, 12:10	8
ADD-BH-40	0.486446	126.5	01Jan2015, 12:35	31.4
Reach-BH-40	0.486446	126.3	01Jan2015, 12:40	31.4
BH-60	0.129437	38.7	01Jan2015, 12:50	8.6
BH-50	0.117491	46.8	01Jan2015, 12:20	6.4
Weaver Dairy Rd Ext	0.117491	46.8	01Jan2015, 12:20	6.4
Northern Park	0.246928	73.5	01Jan2015, 12:30	15.1
ADD-BH	0.733374	196.9	01Jan2015, 12:35	46.5
BH-70	0.062883	45.8	01Jan2015, 12:10	5.1
MLK Jr. Blvd	0.796257	225.2	01Jan2015, 12:25	51.6
BH-80	0.10254	48.5	01Jan2015, 12:30	8.1
Stateside Drive	0.10254	48.5	01Jan2015, 12:30	8.1
BH-90	0.094578	21.4	01Jan2015, 13:00	5.2
ADD-BH-90	0.197118	64.2	01Jan2015, 12:35	13.3
BH-100	0.110825	98.8	01Jan2015, 12:05	8
ADD-BH-100	1.1042	315.1	01Jan2015, 12:25	72.9
Reach-BH-100	1.1042	314	01Jan2015, 12:30	72.9
BH-110	0.117356	54.4	01Jan2015, 12:15	7
MLK Jr. - Kings Br	0.117356	54.4	01Jan2015, 12:15	7
BH-120	0.02747	4.7	01Jan2015, 13:10	1.3
ADD-BH-120	1.249026	363.4	01Jan2015, 12:20	81.3
BH-130	0.100527	51.6	01Jan2015, 12:30	8.4
Lake Ellen	1.349553	400.7	01Jan2015, 12:30	89.7
CB-10	0.144686	21.1	01Jan2015, 13:05	5.9
Reach-CB-10	0.144686	21.1	01Jan2015, 13:10	5.9
CB-20	0.112513	10.5	01Jan2015, 12:55	3
ADD-CB-20	0.257199	30.9	01Jan2015, 13:05	8.8
Reach-CB-20	0.257199	30.8	01Jan2015, 13:10	8.8
CB-40	0.051355	59.4	01Jan2015, 12:15	7.7
CB-30	0.026991	2.6	01Jan2015, 12:50	0.7
ADD-CB-30-40	0.335545	44.5	01Jan2015, 13:05	17.2
CB-50	0.072003	32.4	01Jan2015, 12:40	5.8
Municipal Drive	0.072003	32.4	01Jan2015, 12:40	5.8
CB-60	0.031973	34	01Jan2015, 11:55	1.9
ADD-CB-60	0.439521	75.6	01Jan2015, 12:50	24.9
Reach-CB-60	0.439521	75.1	01Jan2015, 12:55	24.9
CB-70	0.149895	40.4	01Jan2015, 13:00	10.1
ADD-CB-70	0.589416	115	01Jan2015, 13:00	35
Reach-CB-70	0.589416	113.5	01Jan2015, 13:15	35
CB-80	0.083068	33	01Jan2015, 12:25	5.1
ADD-CB-80	0.672484	125.1	01Jan2015, 13:10	40.1
Reach-CB-80	0.672484	124.6	01Jan2015, 13:20	40.1
ADD- CB-BH	2.022037	484.5	01Jan2015, 12:35	129.8
EL-20	0.137538	107.1	01Jan2015, 12:05	10.1
ADD-EL-20	2.159575	520.8	01Jan2015, 12:30	139.9
Reach-EL-20	2.159575	518.7	01Jan2015, 12:35	139.9
EL-10	0.138871	137.6	01Jan2015, 12:10	13.7
Piney Mountain Rd	0.138871	137.6	01Jan2015, 12:10	13.7
Piney Mountain Rd -Booker Ck	2.298446	575.8	01Jan2015, 12:30	153.6
EL-30	0.119754	56.2	01Jan2015, 12:10	6.6

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach- EL-30	2.4182	609.3	01Jan2015, 12:30	160.1
EL-50	0.11573	63.8	01Jan2015, 12:10	6.7
ADD-EL-50	2.53393	640.4	01Jan2015, 12:30	166.9
Reach-EL-50	2.53393	636.5	01Jan2015, 12:40	166.8
EL-40	0.074895	59.2	01Jan2015, 12:10	6
Kensington Drive	0.074895	59.2	01Jan2015, 12:10	6
N Lakeshore Dr - Booker Ck	2.608825	657	01Jan2015, 12:35	172.9
CF-10	0.078889	80.8	01Jan2015, 12:10	8.9
Kingston Drive	0.078889	80.8	01Jan2015, 12:10	8.9
CF-20	0.076885	28.2	01Jan2015, 12:55	6.6
ADD-CF-20	0.155774	89.6	01Jan2015, 12:10	15.6
Weaver Dairy - Cedar Fk	0.155774	89.6	01Jan2015, 12:10	15.6
CF-30	0.044849	10.8	01Jan2015, 12:40	2.2
ADD-CF-30	0.200623	93.6	01Jan2015, 12:10	17.8
Cross Creek Drive	0.200623	93.6	01Jan2015, 12:10	17.8
Reach-CF-50	0.200623	93.6	01Jan2015, 12:10	17.8
CF-40	0.092855	23.1	01Jan2015, 12:45	5
Weaver Dairy Rd - 1	0.092855	23.1	01Jan2015, 12:45	5
CF-50	0.029148	9.5	01Jan2015, 12:15	1.3
ADD-CF-50	0.322626	110.4	01Jan2015, 12:15	24.1
CF-60	0.12336	27.5	01Jan2015, 12:55	6.7
Cedar Hills Circle	0.445986	120.4	01Jan2015, 12:15	30.8
Reach-CF-80	0.445986	118.9	01Jan2015, 12:25	30.8
CF-80	0.176821	63.8	01Jan2015, 12:25	10
CF-70	0.120239	29.9	01Jan2015, 13:05	8.3
Weaver Dairy Rd -2	0.120239	29.9	01Jan2015, 13:05	8.3
Kenmore Road	0.743046	197.5	01Jan2015, 12:25	49.1
Reach-CF-130	0.743046	196.4	01Jan2015, 12:30	49.1
CF-90	0.184752	41.8	01Jan2015, 12:40	8.9
CF-100	0.085353	43.2	01Jan2015, 12:10	4.3
Piney Mountain Rd - Cedar Fk	0.085353	43.2	01Jan2015, 12:10	4.3
CF-110	0.044111	29.4	01Jan2015, 12:00	2.3
ADD-CF-110	0.129464	69.5	01Jan2015, 12:05	6.6
ADD-CF-90-120	0.314216	79.2	01Jan2015, 12:05	15.5
CF-120	0.096092	35.4	01Jan2015, 12:15	4.7
Brookview Drive	1.153354	282.3	01Jan2015, 12:30	69.2
Reach-CF-140	1.153354	282.2	01Jan2015, 12:30	69.2
CF-130	0.151403	43.7	01Jan2015, 12:40	8.5
CF-140	0.042477	13.2	01Jan2015, 12:25	2.1
North Lakeshore Drive	1.347234	335.2	01Jan2015, 12:30	79.9
CF-150	0.050842	22.5	01Jan2015, 12:10	2.5
ADD-CF-150	1.398076	346.4	01Jan2015, 12:30	82.4
EL-60	0.142028	53.5	01Jan2015, 12:20	7.6
EL-90	0.100143	67.3	01Jan2015, 12:10	7.1
EL-70	0.094086	50.4	01Jan2015, 12:20	6.4
EL-80	0.091741	23.4	01Jan2015, 13:05	6
EL-100	0.087147	82.4	01Jan2015, 12:20	10
Eastwood Lake	4.522046	676.7	01Jan2015, 13:35	292.1
LBC-10	0.097332	44	01Jan2015, 12:25	6.5
U/S Limit - Sierra	0.097332	42.6	01Jan2015, 12:30	6.5
LBC-20	0.084519	49	01Jan2015, 12:20	6.6
ADD-LBC-10-20	0.181851	89.5	01Jan2015, 12:25	13.1
Reach-LBC-20	0.181851	88.8	01Jan2015, 12:25	13.1
Honeysuckle Road	0.181851	88.8	01Jan2015, 12:25	13.1
Reach-LBC-30	0.181851	88	01Jan2015, 12:35	13.1
LBC-30	0.159799	66.7	01Jan2015, 13:00	16.2

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Booker Creek Road	0.34165	141.2	01Jan2015, 12:40	29.3
Reach-LBC-40	0.34165	135.3	01Jan2015, 12:50	29.2
LBC-40	0.156492	173.4	01Jan2015, 12:10	17.3
LBC-50	0.022218	0.3	01Jan2015, 12:05	0
ADD-LBC-40-50	5.042406	784.4	01Jan2015, 13:25	338.6
LBC-60	0.142061	94.4	01Jan2015, 12:15	10.7
ADD-LBC-60	5.184467	798	01Jan2015, 13:20	349.3
Reach-LBC-60	5.184467	795.8	01Jan2015, 13:30	349.1
LBC-70	0.107956	64.5	01Jan2015, 12:10	7
LBC-130	0.03607	25.7	01Jan2015, 12:30	4.2
ADD-LBC-70-130	5.328493	811.8	01Jan2015, 13:30	360.3
LBC-90	0.115064	65.1	01Jan2015, 12:50	14.3
LBC-80	0.06417	41.5	01Jan2015, 12:35	7
Fordham Blvd - Upstream	0.06417	41.5	01Jan2015, 12:35	7
LBC-100	0.029058	18.2	01Jan2015, 12:45	3.9
Dobbins Drive	0.208292	120.1	01Jan2015, 12:45	25.2
LBC-110	0.0333	17.5	01Jan2015, 12:50	3.7
Summerfield Crossing	0.241592	137.6	01Jan2015, 12:45	28.9
LBC-120	0.049799	25.5	01Jan2015, 12:50	5.6
Foxcroft Drive	0.291391	162.2	01Jan2015, 12:45	34.5
East Franklin Street	5.619884	862.1	01Jan2015, 13:45	394.8
LBC-140	0.088638	84.2	01Jan2015, 12:25	13
ADD-LBC-140	5.708522	875.8	01Jan2015, 13:45	407.8
Reach-LBC-140	5.708522	824.8	01Jan2015, 14:10	406.3
LBC-150	0.107836	65.1	01Jan2015, 12:25	10.2
ADD-LBC-150	5.816358	833.7	01Jan2015, 14:10	416.5
LBC-160	0.077625	67	01Jan2015, 12:20	10.1
Fordham Blvd - Downstream	5.893983	839.3	01Jan2015, 14:15	426.6
LBC-180	0.14221	152.3	01Jan2015, 12:15	17.9
LBC-170	0.027436	31.3	01Jan2015, 12:10	3.1
ADD-LBC-170-180	6.063629	853	01Jan2015, 14:15	447.6
Reach-LBC-190	6.063629	851.5	01Jan2015, 14:20	447.5
LBC-190	0.05069	32.8	01Jan2015, 12:25	4.9
Willow Drive	6.114319	855.9	01Jan2015, 14:20	452.4
Reach-LBC-200	6.114319	829.9	01Jan2015, 14:50	451.5
LBC-200	0.168071	74.7	01Jan2015, 12:45	15
ADD-LBC-200	6.28239	844.3	01Jan2015, 14:50	466.5
OUTLET	6.28239	844.3	01Jan2015, 14:50	466.5

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	74.3	01Jan2015, 12:45	15.1
BH-20	0.07669	65.9	01Jan2015, 12:25	10
ADD-BH-10-20	0.215766	131.8	01Jan2015, 12:35	25.1
Reach-BH-20	0.215766	131	01Jan2015, 12:40	25.1
BH-30	0.165073	105.9	01Jan2015, 12:50	22.8
ADD-BH-30	0.380839	231.5	01Jan2015, 12:45	47.9
BH-40	0.105607	158.7	01Jan2015, 12:10	15.6
ADD-BH-40	0.486446	281.8	01Jan2015, 12:35	63.5
Reach-BH-40	0.486446	281.1	01Jan2015, 12:40	63.5
BH-60	0.129437	84.3	01Jan2015, 12:50	17.4
BH-50	0.117491	112.5	01Jan2015, 12:20	14.1
Weaver Dairy Rd Ext	0.117491	112.5	01Jan2015, 12:20	14.1
Northern Park	0.246928	170.1	01Jan2015, 12:25	31.6
ADD-BH	0.733374	446.3	01Jan2015, 12:30	95.1
BH-70	0.062883	91.9	01Jan2015, 12:10	9.7
MLK Jr. Blvd	0.796257	495.8	01Jan2015, 12:30	104.8
BH-80	0.10254	98.5	01Jan2015, 12:30	15.4
Stateside Drive	0.10254	98.5	01Jan2015, 12:30	15.4
BH-90	0.094578	51.3	01Jan2015, 12:55	11.4
ADD-BH-90	0.197118	138.3	01Jan2015, 12:35	26.8
BH-100	0.110825	203.7	01Jan2015, 12:05	15.9
ADD-BH-100	1.1042	680.2	01Jan2015, 12:25	147.5
Reach-BH-100	1.1042	678.9	01Jan2015, 12:30	147.5
BH-110	0.117356	122.9	01Jan2015, 12:15	14.3
MLK Jr. - Kings Br	0.117356	122.9	01Jan2015, 12:15	14.3
BH-120	0.02747	12.1	01Jan2015, 13:05	3
ADD-BH-120	1.249026	782.8	01Jan2015, 12:20	164.8
BH-130	0.100527	102.6	01Jan2015, 12:30	16.1
Lake Ellen	1.349553	792.7	01Jan2015, 12:45	180.9
CB-10	0.144686	59.5	01Jan2015, 13:00	14.2
Reach-CB-10	0.144686	59.3	01Jan2015, 13:05	14.2
CB-20	0.112513	38.6	01Jan2015, 12:45	8.3
ADD-CB-20	0.257199	95	01Jan2015, 12:55	22.5
Reach-CB-20	0.257199	94.5	01Jan2015, 13:05	22.5
CB-40	0.051355	94.3	01Jan2015, 12:15	12
CB-30	0.026991	9.4	01Jan2015, 12:45	2
ADD-CB-30-40	0.335545	122.5	01Jan2015, 13:00	36.4
CB-50	0.072003	65.1	01Jan2015, 12:40	11.3
Municipal Drive	0.072003	65.1	01Jan2015, 12:40	11.3
CB-60	0.031973	76.1	01Jan2015, 11:55	4.1
ADD-CB-60	0.439521	187.5	01Jan2015, 12:45	51.9
Reach-CB-60	0.439521	186	01Jan2015, 12:55	51.8
CB-70	0.149895	88.1	01Jan2015, 13:00	20.5
ADD-CB-70	0.589416	273.5	01Jan2015, 12:55	72.3
Reach-CB-70	0.589416	268.1	01Jan2015, 13:15	72.2
CB-80	0.083068	74.5	01Jan2015, 12:25	10.5
ADD-CB-80	0.672484	289.5	01Jan2015, 13:15	82.7
Reach-CB-80	0.672484	288.3	01Jan2015, 13:25	82.7
ADD- CB-BH	2.022037	998.4	01Jan2015, 12:50	263.6
EL-20	0.137538	224.3	01Jan2015, 12:05	20
ADD-EL-20	2.159575	1034.8	01Jan2015, 12:50	283.6
Reach-EL-20	2.159575	1032.8	01Jan2015, 12:55	283.5
EL-10	0.138871	254.3	01Jan2015, 12:10	24.7
Piney Mountain Rd	0.138871	254.3	01Jan2015, 12:10	24.7
Piney Mountain Rd -Booker Ck	2.298446	1028	01Jan2015, 13:10	308.2
EL-30	0.119754	135.4	01Jan2015, 12:10	14

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach- EL-30	2.4182	1048.2	01Jan2015, 13:15	322.1
EL-50	0.11573	147.5	01Jan2015, 12:10	14.3
ADD-EL-50	2.53393	1067.1	01Jan2015, 13:10	336.4
Reach-EL-50	2.53393	1066	01Jan2015, 13:25	336.3
EL-40	0.074895	118.8	01Jan2015, 12:10	11.6
Kensington Drive	0.074895	118.8	01Jan2015, 12:10	11.6
N Lakeshore Dr - Booker Ck	2.608825	1079.3	01Jan2015, 13:20	347.9
CF-10	0.078889	140.4	01Jan2015, 12:10	14.9
Kingston Drive	0.078889	140.4	01Jan2015, 12:10	14.9
CF-20	0.076885	55.2	01Jan2015, 12:55	12.4
ADD-CF-20	0.155774	159.4	01Jan2015, 12:10	27.4
Weaver Dairy - Cedar Fk	0.155774	159.4	01Jan2015, 12:10	27.4
CF-30	0.044849	27.7	01Jan2015, 12:35	4.9
ADD-CF-30	0.200623	172.3	01Jan2015, 12:10	32.3
Cross Creek Drive	0.200623	172.3	01Jan2015, 12:10	32.3
Reach-CF-50	0.200623	172.1	01Jan2015, 12:10	32.3
CF-40	0.092855	55.5	01Jan2015, 12:45	10.8
Weaver Dairy Rd - 1	0.092855	55.5	01Jan2015, 12:45	10.8
CF-50	0.029148	25.4	01Jan2015, 12:15	2.9
ADD-CF-50	0.322626	222.8	01Jan2015, 12:15	46
CF-60	0.12336	65.8	01Jan2015, 12:50	14.5
Cedar Hills Circle	0.445986	250.4	01Jan2015, 12:15	60.5
Reach-CF-80	0.445986	250.1	01Jan2015, 12:25	60.5
CF-80	0.176821	150.8	01Jan2015, 12:25	21.3
CF-70	0.120239	63.9	01Jan2015, 13:05	16.3
Weaver Dairy Rd -2	0.120239	63.9	01Jan2015, 13:05	16.3
Kenmore Road	0.743046	434.4	01Jan2015, 12:25	98.2
Reach-CF-130	0.743046	433.8	01Jan2015, 12:30	98.1
CF-90	0.184752	107.8	01Jan2015, 12:40	20
CF-100	0.085353	106.6	01Jan2015, 12:05	9.6
Piney Mountain Rd - Cedar Fk	0.085353	106.6	01Jan2015, 12:05	9.6
CF-110	0.044111	71.8	01Jan2015, 12:00	5
ADD-CF-110	0.129464	170.1	01Jan2015, 12:05	14.6
ADD-CF-90-120	0.314216	202.4	01Jan2015, 12:05	34.6
CF-120	0.096092	90.5	01Jan2015, 12:15	10.4
Brookview Drive	1.153354	648.7	01Jan2015, 12:25	143.1
Reach-CF-140	1.153354	648.3	01Jan2015, 12:30	143.1
CF-130	0.151403	103.7	01Jan2015, 12:40	18.5
CF-140	0.042477	33.2	01Jan2015, 12:20	4.6
North Lakeshore Drive	1.347234	778.3	01Jan2015, 12:30	166.3
CF-150	0.050842	57.1	01Jan2015, 12:10	5.6
ADD-CF-150	1.398076	803.9	01Jan2015, 12:30	171.8
EL-60	0.142028	129.1	01Jan2015, 12:20	16.3
EL-90	0.100143	143.2	01Jan2015, 12:10	14.3
EL-70	0.094086	109.1	01Jan2015, 12:15	13
EL-80	0.091741	51.8	01Jan2015, 13:00	12.3
EL-100	0.087147	144.2	01Jan2015, 12:15	17.5
Eastwood Lake	4.522046	1683.7	01Jan2015, 13:20	593.1
LBC-10	0.097332	95.6	01Jan2015, 12:25	13.2
U/S Limit - Sierra	0.097332	86.3	01Jan2015, 12:30	13.2
LBC-20	0.084519	99.9	01Jan2015, 12:20	12.8
ADD-LBC-10-20	0.181851	178.3	01Jan2015, 12:25	26
Reach-LBC-20	0.181851	177.1	01Jan2015, 12:25	26
Honeysuckle Road	0.181851	177.1	01Jan2015, 12:25	26
Reach-LBC-30	0.181851	175.2	01Jan2015, 12:35	26
LBC-30	0.159799	123.5	01Jan2015, 13:00	29.2

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Booker Creek Road	0.34165	274.6	01Jan2015, 12:40	55.3
Reach-LBC-40	0.34165	260	01Jan2015, 12:50	55
LBC-40	0.156492	308.4	01Jan2015, 12:10	30.4
LBC-50	0.022218	0.5	01Jan2015, 12:05	0.1
ADD-LBC-40-50	5.042406	1938.2	01Jan2015, 13:10	678.5
LBC-60	0.142061	193.6	01Jan2015, 12:10	20.9
ADD-LBC-60	5.184467	1969.9	01Jan2015, 13:10	699.5
Reach-LBC-60	5.184467	1961.8	01Jan2015, 13:20	699.1
LBC-70	0.107956	142.6	01Jan2015, 12:10	14.3
LBC-130	0.03607	45.1	01Jan2015, 12:30	7.3
ADD-LBC-70-130	5.328493	1995.8	01Jan2015, 13:20	720.7
LBC-90	0.115064	111.7	01Jan2015, 12:50	24.3
LBC-80	0.06417	74.5	01Jan2015, 12:30	12.3
Fordham Blvd - Upstream	0.06417	74.5	01Jan2015, 12:30	12.3
LBC-100	0.029058	30.4	01Jan2015, 12:45	6.4
Dobbins Drive	0.208292	208.4	01Jan2015, 12:40	43.1
LBC-110	0.0333	31.3	01Jan2015, 12:50	6.5
Summerfield Crossing	0.241592	239.2	01Jan2015, 12:45	49.6
LBC-120	0.049799	45.5	01Jan2015, 12:50	9.8
Foxcroft Drive	0.291391	281.6	01Jan2015, 12:50	59.3
East Franklin Street	5.619884	2180.8	01Jan2015, 13:25	780
LBC-140	0.088638	136.8	01Jan2015, 12:25	20.9
ADD-LBC-140	5.708522	2216	01Jan2015, 13:20	800.8
Reach-LBC-140	5.708522	1954.4	01Jan2015, 13:45	797.5
LBC-150	0.107836	122.6	01Jan2015, 12:25	18.3
ADD-LBC-150	5.816358	1975.9	01Jan2015, 13:45	815.8
LBC-160	0.077625	113.2	01Jan2015, 12:20	16.6
Fordham Blvd - Downstream	5.893983	1987.8	01Jan2015, 13:50	832.4
LBC-180	0.14221	259.3	01Jan2015, 12:15	30.1
LBC-170	0.027436	54.9	01Jan2015, 12:10	5.5
ADD-LBC-170-180	6.063629	2015.1	01Jan2015, 13:50	868
Reach-LBC-190	6.063629	2004.8	01Jan2015, 14:00	868
LBC-190	0.05069	61.7	01Jan2015, 12:25	9
Willow Drive	6.114319	2014.2	01Jan2015, 14:00	877
Reach-LBC-200	6.114319	1873.1	01Jan2015, 14:30	875.4
LBC-200	0.168071	144.9	01Jan2015, 12:45	28.3
ADD-LBC-200	6.28239	1904.5	01Jan2015, 14:30	903.6
OUTLET	6.28239	1904.5	01Jan2015, 14:30	903.6

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	104.5	01Jan2015, 12:45	20.6
BH-20	0.07669	89.3	01Jan2015, 12:25	13.3
ADD-BH-10-20	0.215766	182.6	01Jan2015, 12:35	33.8
Reach-BH-20	0.215766	181.4	01Jan2015, 12:35	33.8
BH-30	0.165073	142.2	01Jan2015, 12:50	30.1
ADD-BH-30	0.380839	316.7	01Jan2015, 12:40	64
BH-40	0.105607	209.7	01Jan2015, 12:10	20.4
ADD-BH-40	0.486446	382.8	01Jan2015, 12:35	84.3
Reach-BH-40	0.486446	382.2	01Jan2015, 12:40	84.3
BH-60	0.129437	113.8	01Jan2015, 12:45	23.1
BH-50	0.117491	154.9	01Jan2015, 12:20	19.1
Weaver Dairy Rd Ext	0.117491	154.9	01Jan2015, 12:20	19.1
Northern Park	0.246928	233	01Jan2015, 12:25	42.2
ADD-BH	0.733374	607.8	01Jan2015, 12:30	126.6
BH-70	0.062883	120.8	01Jan2015, 12:10	12.6
MLK Jr. Blvd	0.796257	660.2	01Jan2015, 12:35	139.1
BH-80	0.10254	129.9	01Jan2015, 12:30	20.1
Stateside Drive	0.10254	129.9	01Jan2015, 12:30	20.1
BH-90	0.094578	70.8	01Jan2015, 12:55	15.4
ADD-BH-90	0.197118	185.7	01Jan2015, 12:35	35.5
BH-100	0.110825	269.3	01Jan2015, 12:05	20.9
ADD-BH-100	1.1042	903.6	01Jan2015, 12:30	195.5
Reach-BH-100	1.1042	899.8	01Jan2015, 12:35	195.5
BH-110	0.117356	168.2	01Jan2015, 12:15	19
MLK Jr. - Kings Br	0.117356	168.2	01Jan2015, 12:15	19
BH-120	0.02747	17	01Jan2015, 13:05	4.2
ADD-BH-120	1.249026	1012.9	01Jan2015, 12:25	218.6
BH-130	0.100527	134	01Jan2015, 12:30	20.9
Lake Ellen	1.349553	1008.4	01Jan2015, 12:50	239.5
CB-10	0.144686	85.9	01Jan2015, 13:00	19.8
Reach-CB-10	0.144686	85.7	01Jan2015, 13:05	19.8
CB-20	0.112513	60	01Jan2015, 12:45	12.1
ADD-CB-20	0.257199	140.6	01Jan2015, 12:55	31.9
Reach-CB-20	0.257199	139.3	01Jan2015, 13:05	31.9
CB-40	0.051355	115.2	01Jan2015, 12:15	14.5
CB-30	0.026991	14.6	01Jan2015, 12:45	2.9
ADD-CB-30-40	0.335545	172.7	01Jan2015, 13:05	49.3
CB-50	0.072003	85.3	01Jan2015, 12:35	14.8
Municipal Drive	0.072003	85.3	01Jan2015, 12:35	14.8
CB-60	0.031973	102.7	01Jan2015, 11:55	5.5
ADD-CB-60	0.439521	252.5	01Jan2015, 12:45	69.6
Reach-CB-60	0.439521	251.2	01Jan2015, 12:55	69.5
CB-70	0.149895	118.5	01Jan2015, 13:00	27.2
ADD-CB-70	0.589416	369.2	01Jan2015, 12:55	96.8
Reach-CB-70	0.589416	363.4	01Jan2015, 13:15	96.7
CB-80	0.083068	101.6	01Jan2015, 12:20	14
ADD-CB-80	0.672484	391.7	01Jan2015, 13:15	110.7
Reach-CB-80	0.672484	390.6	01Jan2015, 13:25	110.7
ADD- CB-BH	2.022037	1306.1	01Jan2015, 13:05	350.2
EL-20	0.137538	297.9	01Jan2015, 12:05	26.3
ADD-EL-20	2.159575	1341.3	01Jan2015, 13:00	376.5
Reach-EL-20	2.159575	1338.8	01Jan2015, 13:10	376.3
EL-10	0.138871	325	01Jan2015, 12:10	31.5
Piney Mountain Rd	0.138871	325	01Jan2015, 12:10	31.5
Piney Mountain Rd -Booker Ck	2.298446	1368.7	01Jan2015, 13:15	407.8
EL-30	0.119754	187.6	01Jan2015, 12:10	18.8

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach- EL-30	2.4182	1393.1	01Jan2015, 13:20	426.5
EL-50	0.11573	201.5	01Jan2015, 12:10	19.2
ADD-EL-50	2.53393	1417.6	01Jan2015, 13:15	445.7
Reach-EL-50	2.53393	1416	01Jan2015, 13:25	445.6
EL-40	0.074895	155.6	01Jan2015, 12:10	15.1
Kensington Drive	0.074895	155.6	01Jan2015, 12:10	15.1
N Lakeshore Dr - Booker Ck	2.608825	1431.9	01Jan2015, 13:25	460.7
CF-10	0.078889	177.3	01Jan2015, 12:10	18.6
Kingston Drive	0.078889	177.3	01Jan2015, 12:10	18.6
CF-20	0.076885	72	01Jan2015, 12:55	16
ADD-CF-20	0.155774	202.9	01Jan2015, 12:10	34.7
Weaver Dairy - Cedar Fk	0.155774	202.9	01Jan2015, 12:10	34.7
CF-30	0.044849	39	01Jan2015, 12:35	6.7
ADD-CF-30	0.200623	222.1	01Jan2015, 12:10	41.4
Cross Creek Drive	0.200623	222.1	01Jan2015, 12:10	41.4
Reach-CF-50	0.200623	221.9	01Jan2015, 12:10	41.4
CF-40	0.092855	77.1	01Jan2015, 12:40	14.7
Weaver Dairy Rd - 1	0.092855	77.1	01Jan2015, 12:40	14.7
CF-50	0.029148	36.2	01Jan2015, 12:15	4.1
ADD-CF-50	0.322626	295.9	01Jan2015, 12:15	60.1
CF-60	0.12336	91.4	01Jan2015, 12:50	19.6
Cedar Hills Circle	0.445986	337.6	01Jan2015, 12:20	79.7
Reach-CF-80	0.445986	337.2	01Jan2015, 12:25	79.7
CF-80	0.176821	207.5	01Jan2015, 12:25	28.7
CF-70	0.120239	85.9	01Jan2015, 13:05	21.5
Weaver Dairy Rd -2	0.120239	85.9	01Jan2015, 13:05	21.5
Kenmore Road	0.743046	590.2	01Jan2015, 12:25	129.9
Reach-CF-130	0.743046	589.6	01Jan2015, 12:30	129.9
CF-90	0.184752	152	01Jan2015, 12:40	27.4
CF-100	0.085353	149	01Jan2015, 12:05	13.1
Piney Mountain Rd - Cedar Fk	0.085353	149	01Jan2015, 12:05	13.1
CF-110	0.044111	99.5	01Jan2015, 12:00	6.8
ADD-CF-110	0.129464	235.8	01Jan2015, 12:05	19.9
ADD-CF-90-120	0.314216	285.5	01Jan2015, 12:05	47.3
CF-120	0.096092	127.2	01Jan2015, 12:15	14.2
Brookview Drive	1.153354	888.2	01Jan2015, 12:25	191.4
Reach-CF-140	1.153354	887.4	01Jan2015, 12:30	191.4
CF-130	0.151403	142.4	01Jan2015, 12:40	25
CF-140	0.042477	46.8	01Jan2015, 12:20	6.3
North Lakeshore Drive	1.347234	1067.8	01Jan2015, 12:30	222.7
CF-150	0.050842	80	01Jan2015, 12:10	7.6
ADD-CF-150	1.398076	1102.7	01Jan2015, 12:30	230.3
EL-60	0.142028	178.9	01Jan2015, 12:20	22.1
EL-90	0.100143	190.7	01Jan2015, 12:10	18.9
EL-70	0.094086	146.5	01Jan2015, 12:15	17.3
EL-80	0.091741	70	01Jan2015, 13:00	16.4
EL-100	0.087147	180.7	01Jan2015, 12:15	22.1
Eastwood Lake	4.522046	2285.7	01Jan2015, 13:15	787.4
LBC-10	0.097332	128.6	01Jan2015, 12:20	17.5
U/S Limit - Sierra	0.097332	114.4	01Jan2015, 12:35	17.5
LBC-20	0.084519	131.6	01Jan2015, 12:20	16.7
ADD-LBC-10-20	0.181851	234.2	01Jan2015, 12:25	34.2
Reach-LBC-20	0.181851	232.2	01Jan2015, 12:25	34.2
Honeysuckle Road	0.181851	232.2	01Jan2015, 12:25	34.2
Reach-LBC-30	0.181851	229.6	01Jan2015, 12:35	34.2
LBC-30	0.159799	157.7	01Jan2015, 13:00	37.2

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Booker Creek Road	0.34165	356.8	01Jan2015, 12:40	71.4
Reach-LBC-40	0.34165	339.5	01Jan2015, 12:50	71.2
LBC-40	0.156492	388.5	01Jan2015, 12:10	38.3
LBC-50	0.022218	0.6	01Jan2015, 12:05	0.1
ADD-LBC-40-50	5.042406	2630.1	01Jan2015, 13:05	897
LBC-60	0.142061	257	01Jan2015, 12:10	27.4
ADD-LBC-60	5.184467	2675	01Jan2015, 13:05	924.4
Reach-LBC-60	5.184467	2666.6	01Jan2015, 13:15	923.9
LBC-70	0.107956	192.6	01Jan2015, 12:10	19
LBC-130	0.03607	56.5	01Jan2015, 12:30	9.1
ADD-LBC-70-130	5.328493	2713.7	01Jan2015, 13:15	952
LBC-90	0.115064	139.2	01Jan2015, 12:50	30.3
LBC-80	0.06417	94.3	01Jan2015, 12:30	15.6
Fordham Blvd - Upstream	0.06417	94.3	01Jan2015, 12:30	15.6
LBC-100	0.029058	37.7	01Jan2015, 12:45	7.9
Dobbins Drive	0.208292	260.9	01Jan2015, 12:40	53.8
LBC-110	0.0333	39.5	01Jan2015, 12:50	8.2
Summerfield Crossing	0.241592	299.5	01Jan2015, 12:40	62
LBC-120	0.049799	57.4	01Jan2015, 12:50	12.3
Foxcroft Drive	0.291391	358.8	01Jan2015, 12:45	74.3
East Franklin Street	5.619884	2980.9	01Jan2015, 13:15	1026.2
LBC-140	0.088638	167.6	01Jan2015, 12:25	25.5
ADD-LBC-140	5.708522	3029.2	01Jan2015, 13:15	1051.8
Reach-LBC-140	5.708522	2668.9	01Jan2015, 13:40	1046.8
LBC-150	0.107836	158.3	01Jan2015, 12:25	23.4
ADD-LBC-150	5.816358	2699.1	01Jan2015, 13:35	1070.2
LBC-160	0.077625	141	01Jan2015, 12:20	20.5
Fordham Blvd - Downstream	5.893983	2719	01Jan2015, 13:40	1090.7
LBC-180	0.14221	322.7	01Jan2015, 12:15	37.4
LBC-170	0.027436	68.8	01Jan2015, 12:10	6.9
ADD-LBC-170-180	6.063629	2756.5	01Jan2015, 13:40	1135
Reach-LBC-190	6.063629	2747.6	01Jan2015, 13:50	1134.8
LBC-190	0.05069	79	01Jan2015, 12:25	11.5
Willow Drive	6.114319	2761.8	01Jan2015, 13:45	1146.4
Reach-LBC-200	6.114319	2590.1	01Jan2015, 14:20	1143.8
LBC-200	0.168071	187.6	01Jan2015, 12:45	36.4
ADD-LBC-200	6.28239	2634.8	01Jan2015, 14:20	1180.3
OUTLET	6.28239	2634.8	01Jan2015, 14:20	1180.3

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	129.4	01Jan2015, 12:45	25.1
BH-20	0.07669	108.4	01Jan2015, 12:25	15.9
ADD-BH-10-20	0.215766	224.1	01Jan2015, 12:35	41
Reach-BH-20	0.215766	223.3	01Jan2015, 12:35	41
BH-30	0.165073	171.5	01Jan2015, 12:50	36
ADD-BH-30	0.380839	386.1	01Jan2015, 12:40	77
BH-40	0.105607	250.5	01Jan2015, 12:10	24.2
ADD-BH-40	0.486446	465.2	01Jan2015, 12:30	101.3
Reach-BH-40	0.486446	464.3	01Jan2015, 12:40	101.2
BH-60	0.129437	137.6	01Jan2015, 12:45	27.7
BH-50	0.117491	189.2	01Jan2015, 12:20	23.2
Weaver Dairy Rd Ext	0.117491	189.2	01Jan2015, 12:20	23.2
Northern Park	0.246928	284	01Jan2015, 12:25	50.9
ADD-BH	0.733374	739.2	01Jan2015, 12:30	152.1
BH-70	0.062883	143.8	01Jan2015, 12:10	14.9
MLK Jr. Blvd	0.796257	777.2	01Jan2015, 12:35	167
BH-80	0.10254	155.1	01Jan2015, 12:30	23.9
Stateside Drive	0.10254	155.1	01Jan2015, 12:30	23.9
BH-90	0.094578	86.6	01Jan2015, 12:55	18.6
ADD-BH-90	0.197118	223.9	01Jan2015, 12:35	42.5
BH-100	0.110825	321.7	01Jan2015, 12:05	24.9
ADD-BH-100	1.1042	1063.8	01Jan2015, 12:30	234.4
Reach-BH-100	1.1042	1061.8	01Jan2015, 12:35	234.3
BH-110	0.117356	205.2	01Jan2015, 12:15	22.9
MLK Jr. - Kings Br	0.117356	205.2	01Jan2015, 12:15	22.9
BH-120	0.02747	21.1	01Jan2015, 13:05	5.1
ADD-BH-120	1.249026	1201.6	01Jan2015, 12:25	262.3
BH-130	0.100527	158.9	01Jan2015, 12:30	24.7
Lake Ellen	1.349553	1191.8	01Jan2015, 12:50	287
CB-10	0.144686	107.7	01Jan2015, 13:00	24.4
Reach-CB-10	0.144686	107.4	01Jan2015, 13:05	24.4
CB-20	0.112513	78.2	01Jan2015, 12:45	15.3
ADD-CB-20	0.257199	178.6	01Jan2015, 12:55	39.8
Reach-CB-20	0.257199	176.8	01Jan2015, 13:05	39.7
CB-40	0.051355	131.8	01Jan2015, 12:15	16.5
CB-30	0.026991	19	01Jan2015, 12:45	3.7
ADD-CB-30-40	0.335545	215.7	01Jan2015, 13:05	60
CB-50	0.072003	101.4	01Jan2015, 12:35	17.5
Municipal Drive	0.072003	101.4	01Jan2015, 12:35	17.5
CB-60	0.031973	124	01Jan2015, 11:55	6.7
ADD-CB-60	0.439521	306.9	01Jan2015, 12:45	84.1
Reach-CB-60	0.439521	305.5	01Jan2015, 12:55	84.1
CB-70	0.149895	143	01Jan2015, 13:00	32.6
ADD-CB-70	0.589416	448.1	01Jan2015, 12:55	116.7
Reach-CB-70	0.589416	442.1	01Jan2015, 13:15	116.6
CB-80	0.083068	123.8	01Jan2015, 12:20	16.9
ADD-CB-80	0.672484	475.8	01Jan2015, 13:15	133.5
Reach-CB-80	0.672484	474.6	01Jan2015, 13:25	133.5
ADD- CB-BH	2.022037	1571.3	01Jan2015, 13:05	420.5
EL-20	0.137538	356.7	01Jan2015, 12:05	31.3
ADD-EL-20	2.159575	1611.2	01Jan2015, 13:05	451.8
Reach-EL-20	2.159575	1607.9	01Jan2015, 13:10	451.6
EL-10	0.138871	380.8	01Jan2015, 12:10	36.9
Piney Mountain Rd	0.138871	380.8	01Jan2015, 12:10	36.9
Piney Mountain Rd -Booker Ck	2.298446	1641.9	01Jan2015, 13:15	488.5
EL-30	0.119754	230.1	01Jan2015, 12:10	22.8

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach- EL-30	2.4182	1670.8	01Jan2015, 13:20	511.3
EL-50	0.11573	245.2	01Jan2015, 12:10	23.2
ADD-EL-50	2.53393	1698.5	01Jan2015, 13:15	534.5
Reach-EL-50	2.53393	1696.2	01Jan2015, 13:25	534.3
EL-40	0.074895	184.8	01Jan2015, 12:10	17.9
Kensington Drive	0.074895	184.8	01Jan2015, 12:10	17.9
N Lakeshore Dr - Booker Ck	2.608825	1714.7	01Jan2015, 13:25	552.2
CF-10	0.078889	206.8	01Jan2015, 12:10	21.6
Kingston Drive	0.078889	206.8	01Jan2015, 12:10	21.6
CF-20	0.076885	85.4	01Jan2015, 12:55	18.9
ADD-CF-20	0.155774	237.7	01Jan2015, 12:10	40.5
Weaver Dairy - Cedar Fk	0.155774	237.7	01Jan2015, 12:10	40.5
CF-30	0.044849	48.3	01Jan2015, 12:35	8.2
ADD-CF-30	0.200623	262.2	01Jan2015, 12:10	48.7
Cross Creek Drive	0.200623	262.2	01Jan2015, 12:10	48.7
Reach-CF-50	0.200623	261.9	01Jan2015, 12:10	48.7
CF-40	0.092855	94.8	01Jan2015, 12:40	17.8
Weaver Dairy Rd - 1	0.092855	94.8	01Jan2015, 12:40	17.8
CF-50	0.029148	45.1	01Jan2015, 12:15	5
ADD-CF-50	0.322626	355.3	01Jan2015, 12:15	71.5
CF-60	0.12336	112.3	01Jan2015, 12:50	23.7
Cedar Hills Circle	0.445986	408.8	01Jan2015, 12:20	95.2
Reach-CF-80	0.445986	408.5	01Jan2015, 12:25	95.2
CF-80	0.176821	253.5	01Jan2015, 12:25	34.7
CF-70	0.120239	103.8	01Jan2015, 13:05	25.7
Weaver Dairy Rd -2	0.120239	103.8	01Jan2015, 13:05	25.7
Kenmore Road	0.743046	717.4	01Jan2015, 12:25	155.7
Reach-CF-130	0.743046	716.8	01Jan2015, 12:30	155.7
CF-90	0.184752	188.2	01Jan2015, 12:40	33.5
CF-100	0.085353	183.6	01Jan2015, 12:05	16
Piney Mountain Rd - Cedar Fk	0.085353	183.6	01Jan2015, 12:05	16
CF-110	0.044111	122.1	01Jan2015, 12:00	8.2
ADD-CF-110	0.129464	289.2	01Jan2015, 12:05	24.2
ADD-CF-90-120	0.314216	353.6	01Jan2015, 12:05	57.7
CF-120	0.096092	157.3	01Jan2015, 12:15	17.3
Brookview Drive	1.153354	1086.5	01Jan2015, 12:25	230.7
Reach-CF-140	1.153354	1082.2	01Jan2015, 12:30	230.7
CF-130	0.151403	174	01Jan2015, 12:35	30.2
CF-140	0.042477	58	01Jan2015, 12:20	7.7
North Lakeshore Drive	1.347234	1303.7	01Jan2015, 12:30	268.7
CF-150	0.050842	98.6	01Jan2015, 12:10	9.3
ADD-CF-150	1.398076	1348.1	01Jan2015, 12:25	278
EL-60	0.142028	220.3	01Jan2015, 12:15	26.9
EL-90	0.100143	228.6	01Jan2015, 12:10	22.5
EL-70	0.094086	176.5	01Jan2015, 12:15	20.7
EL-80	0.091741	84.6	01Jan2015, 13:00	19.7
EL-100	0.087147	209	01Jan2015, 12:15	25.6
Eastwood Lake	4.522046	2645.3	01Jan2015, 13:20	945.4
LBC-10	0.097332	155.4	01Jan2015, 12:20	21
U/S Limit - Sierra	0.097332	137.4	01Jan2015, 12:35	21
LBC-20	0.084519	156.9	01Jan2015, 12:20	19.8
ADD-LBC-10-20	0.181851	279.7	01Jan2015, 12:25	40.8
Reach-LBC-20	0.181851	277.3	01Jan2015, 12:25	40.8
Honeysuckle Road	0.181851	277.3	01Jan2015, 12:25	40.8
Reach-LBC-30	0.181851	273.8	01Jan2015, 12:35	40.8
LBC-30	0.159799	184.5	01Jan2015, 13:00	43.5

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Booker Creek Road	0.34165	422.5	01Jan2015, 12:40	84.4
Reach-LBC-40	0.34165	401.9	01Jan2015, 12:50	84.1
LBC-40	0.156492	451.1	01Jan2015, 12:10	44.6
LBC-50	0.022218	0.6	01Jan2015, 12:05	0.1
ADD-LBC-40-50	5.042406	3069	01Jan2015, 12:55	1074.1
LBC-60	0.142061	307.7	01Jan2015, 12:10	32.6
ADD-LBC-60	5.184467	3143.7	01Jan2015, 12:50	1106.8
Reach-LBC-60	5.184467	3127.5	01Jan2015, 13:05	1106.1
LBC-70	0.107956	232.9	01Jan2015, 12:10	22.8
LBC-130	0.03607	65.5	01Jan2015, 12:30	10.6
ADD-LBC-70-130	5.328493	3202.7	01Jan2015, 13:00	1139.5
LBC-90	0.115064	160.6	01Jan2015, 12:50	35
LBC-80	0.06417	109.8	01Jan2015, 12:30	18.2
Fordham Blvd - Upstream	0.06417	109.8	01Jan2015, 12:30	18.2
LBC-100	0.029058	43.3	01Jan2015, 12:45	9.1
Dobbins Drive	0.208292	301.9	01Jan2015, 12:40	62.2
LBC-110	0.0333	45.9	01Jan2015, 12:45	9.5
Summerfield Crossing	0.241592	346.6	01Jan2015, 12:45	71.7
LBC-120	0.049799	66.7	01Jan2015, 12:50	14.3
Foxcroft Drive	0.291391	415.2	01Jan2015, 12:45	86
East Franklin Street	5.619884	3525.5	01Jan2015, 13:10	1225.5
LBC-140	0.088638	191.7	01Jan2015, 12:25	29.2
ADD-LBC-140	5.708522	3590.1	01Jan2015, 13:05	1254.7
Reach-LBC-140	5.708522	3167.6	01Jan2015, 13:35	1248.2
LBC-150	0.107836	186.7	01Jan2015, 12:25	27.4
ADD-LBC-150	5.816358	3204.6	01Jan2015, 13:35	1275.6
LBC-160	0.077625	162.7	01Jan2015, 12:20	23.7
Fordham Blvd - Downstream	5.893983	3228.5	01Jan2015, 13:40	1299.2
LBC-180	0.14221	372.2	01Jan2015, 12:15	43.1
LBC-170	0.027436	79.6	01Jan2015, 12:10	8
ADD-LBC-170-180	6.063629	3273.3	01Jan2015, 13:35	1350.4
Reach-LBC-190	6.063629	3267	01Jan2015, 13:45	1350.3
LBC-190	0.05069	92.6	01Jan2015, 12:25	13.5
Willow Drive	6.114319	3283.8	01Jan2015, 13:45	1363.9
Reach-LBC-200	6.114319	3131.1	01Jan2015, 14:20	1360.5
LBC-200	0.168071	221.3	01Jan2015, 12:45	42.9
ADD-LBC-200	6.28239	3185.1	01Jan2015, 14:15	1403.5
OUTLET	6.28239	3185.1	01Jan2015, 14:15	1403.5

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	154.8	01Jan2015, 12:45	29.7
BH-20	0.07669	127.7	01Jan2015, 12:25	18.6
ADD-BH-10-20	0.215766	266.6	01Jan2015, 12:35	48.3
Reach-BH-20	0.215766	266	01Jan2015, 12:35	48.3
BH-30	0.165073	201	01Jan2015, 12:50	42
ADD-BH-30	0.380839	456.9	01Jan2015, 12:40	90.4
BH-40	0.105607	291.4	01Jan2015, 12:10	28.1
ADD-BH-40	0.486446	548.6	01Jan2015, 12:35	118.5
Reach-BH-40	0.486446	547.5	01Jan2015, 12:40	118.4
BH-60	0.129437	161.8	01Jan2015, 12:45	32.3
BH-50	0.117491	223.8	01Jan2015, 12:20	27.4
Weaver Dairy Rd Ext	0.117491	223.8	01Jan2015, 12:20	27.4
Northern Park	0.246928	335.6	01Jan2015, 12:25	59.7
ADD-BH	0.733374	871.6	01Jan2015, 12:30	178.1
BH-70	0.062883	167	01Jan2015, 12:10	17.2
MLK Jr. Blvd	0.796257	886.1	01Jan2015, 12:40	195.3
BH-80	0.10254	180.3	01Jan2015, 12:30	27.7
Stateside Drive	0.10254	180.3	01Jan2015, 12:30	27.7
BH-90	0.094578	102.7	01Jan2015, 12:55	21.9
ADD-BH-90	0.197118	262.5	01Jan2015, 12:35	49.6
BH-100	0.110825	374.2	01Jan2015, 12:05	29
ADD-BH-100	1.1042	1202.9	01Jan2015, 12:35	273.9
Reach-BH-100	1.1042	1200.8	01Jan2015, 12:40	273.9
BH-110	0.117356	242.8	01Jan2015, 12:15	26.9
MLK Jr. - Kings Br	0.117356	242.8	01Jan2015, 12:15	26.9
BH-120	0.02747	25.2	01Jan2015, 13:05	6
ADD-BH-120	1.249026	1363.4	01Jan2015, 12:20	306.8
BH-130	0.100527	183.7	01Jan2015, 12:30	28.6
Lake Ellen	1.349553	1274.6	01Jan2015, 13:00	335.3
CB-10	0.144686	130	01Jan2015, 13:00	29.2
Reach-CB-10	0.144686	129.5	01Jan2015, 13:05	29.2
CB-20	0.112513	97.2	01Jan2015, 12:45	18.7
ADD-CB-20	0.257199	218.1	01Jan2015, 12:55	47.9
Reach-CB-20	0.257199	216	01Jan2015, 13:05	47.9
CB-40	0.051355	148.3	01Jan2015, 12:15	18.6
CB-30	0.026991	23.6	01Jan2015, 12:45	4.5
ADD-CB-30-40	0.335545	261.2	01Jan2015, 13:05	70.9
CB-50	0.072003	117.4	01Jan2015, 12:35	20.3
Municipal Drive	0.072003	117.4	01Jan2015, 12:35	20.3
CB-60	0.031973	145.4	01Jan2015, 11:55	7.8
ADD-CB-60	0.439521	363.9	01Jan2015, 12:50	99
Reach-CB-60	0.439521	362.2	01Jan2015, 12:55	98.9
CB-70	0.149895	167.6	01Jan2015, 13:00	38.1
ADD-CB-70	0.589416	529.7	01Jan2015, 13:00	137
Reach-CB-70	0.589416	523.3	01Jan2015, 13:15	136.9
CB-80	0.083068	146.3	01Jan2015, 12:20	19.8
ADD-CB-80	0.672484	562.4	01Jan2015, 13:15	156.7
Reach-CB-80	0.672484	561.2	01Jan2015, 13:25	156.7
ADD- CB-BH	2.022037	1828.8	01Jan2015, 13:20	492
EL-20	0.137538	415.7	01Jan2015, 12:05	36.4
ADD-EL-20	2.159575	1865.7	01Jan2015, 13:20	528.4
Reach-EL-20	2.159575	1858.7	01Jan2015, 13:25	528.2
EL-10	0.138871	436.3	01Jan2015, 12:10	42.3
Piney Mountain Rd	0.138871	436.3	01Jan2015, 12:10	42.3
Piney Mountain Rd -Booker Ck	2.298446	1888.9	01Jan2015, 13:25	570.5
EL-30	0.119754	273.3	01Jan2015, 12:10	26.9

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach- EL-30	2.4182	1916	01Jan2015, 13:30	597.5
EL-50	0.11573	289.3	01Jan2015, 12:10	27.3
ADD-EL-50	2.53393	1943.6	01Jan2015, 13:30	624.8
Reach-EL-50	2.53393	1940.3	01Jan2015, 13:40	624.6
EL-40	0.074895	214.1	01Jan2015, 12:10	20.8
Kensington Drive	0.074895	214.1	01Jan2015, 12:10	20.8
N Lakeshore Dr - Booker Ck	2.608825	1958.2	01Jan2015, 13:40	645.4
CF-10	0.078889	236.3	01Jan2015, 12:10	24.6
Kingston Drive	0.078889	236.3	01Jan2015, 12:10	24.6
CF-20	0.076885	98.8	01Jan2015, 12:55	21.8
ADD-CF-20	0.155774	272.8	01Jan2015, 12:10	46.4
Weaver Dairy - Cedar Fk	0.155774	272.8	01Jan2015, 12:10	46.4
CF-30	0.044849	57.8	01Jan2015, 12:35	9.8
ADD-CF-30	0.200623	302.6	01Jan2015, 12:10	56.1
Cross Creek Drive	0.200623	302.6	01Jan2015, 12:10	56.1
Reach-CF-50	0.200623	302.4	01Jan2015, 12:10	56.1
CF-40	0.092855	112.9	01Jan2015, 12:40	21
Weaver Dairy Rd - 1	0.092855	112.9	01Jan2015, 12:40	21
CF-50	0.029148	54.3	01Jan2015, 12:15	5.9
ADD-CF-50	0.322626	415.5	01Jan2015, 12:15	83
CF-60	0.12336	133.5	01Jan2015, 12:50	28
Cedar Hills Circle	0.445986	481.2	01Jan2015, 12:20	111
Reach-CF-80	0.445986	481	01Jan2015, 12:35	111
CF-80	0.176821	300.2	01Jan2015, 12:25	40.9
CF-70	0.120239	121.9	01Jan2015, 13:05	30
Weaver Dairy Rd -2	0.120239	121.9	01Jan2015, 13:05	30
Kenmore Road	0.743046	846.8	01Jan2015, 12:30	181.9
Reach-CF-130	0.743046	844.6	01Jan2015, 12:35	181.9
CF-90	0.184752	225.2	01Jan2015, 12:40	39.7
CF-100	0.085353	218.8	01Jan2015, 12:05	18.9
Piney Mountain Rd - Cedar Fk	0.085353	218.8	01Jan2015, 12:05	18.9
CF-110	0.044111	145.1	01Jan2015, 12:00	9.7
ADD-CF-110	0.129464	343.5	01Jan2015, 12:05	28.6
ADD-CF-90-120	0.314216	423.2	01Jan2015, 12:05	68.4
CF-120	0.096092	188	01Jan2015, 12:15	20.5
Brookview Drive	1.153354	1279.1	01Jan2015, 12:25	270.8
Reach-CF-140	1.153354	1275.8	01Jan2015, 12:30	270.9
CF-130	0.151403	206.2	01Jan2015, 12:35	35.6
CF-140	0.042477	69.4	01Jan2015, 12:20	9.1
North Lakeshore Drive	1.347234	1538.9	01Jan2015, 12:30	315.6
CF-150	0.050842	117.5	01Jan2015, 12:10	11
ADD-CF-150	1.398076	1590.2	01Jan2015, 12:25	326.6
EL-60	0.142028	262.6	01Jan2015, 12:15	31.7
EL-90	0.100143	266.6	01Jan2015, 12:10	26.3
EL-70	0.094086	206.7	01Jan2015, 12:15	24.1
EL-80	0.091741	99.4	01Jan2015, 13:00	23
EL-100	0.087147	236.9	01Jan2015, 12:15	29.1
Eastwood Lake	4.522046	2892.2	01Jan2015, 13:30	1106
LBC-10	0.097332	182.5	01Jan2015, 12:20	24.5
U/S Limit - Sierra	0.097332	154.8	01Jan2015, 12:35	24.5
LBC-20	0.084519	182.2	01Jan2015, 12:20	23
ADD-LBC-10-20	0.181851	322.5	01Jan2015, 12:25	47.5
Reach-LBC-20	0.181851	320.1	01Jan2015, 12:25	47.5
Honeysuckle Road	0.181851	320.1	01Jan2015, 12:25	47.5
Reach-LBC-30	0.181851	315.9	01Jan2015, 12:30	47.5
LBC-30	0.159799	211.2	01Jan2015, 13:00	49.9

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Booker Creek Road	0.34165	484.1	01Jan2015, 12:40	97.4
Reach-LBC-40	0.34165	462.3	01Jan2015, 12:50	97.1
LBC-40	0.156492	513.1	01Jan2015, 12:10	50.8
LBC-50	0.022218	0.7	01Jan2015, 12:05	0.1
ADD-LBC-40-50	5.042406	3337	01Jan2015, 13:05	1254
LBC-60	0.142061	358.6	01Jan2015, 12:10	37.9
ADD-LBC-60	5.184467	3404.3	01Jan2015, 12:55	1291.9
Reach-LBC-60	5.184467	3401.3	01Jan2015, 13:05	1291.3
LBC-70	0.107956	273.5	01Jan2015, 12:10	26.6
LBC-130	0.03607	74.4	01Jan2015, 12:30	12
ADD-LBC-70-130	5.328493	3485.1	01Jan2015, 12:55	1330
LBC-90	0.115064	181.8	01Jan2015, 12:50	39.6
LBC-80	0.06417	125.2	01Jan2015, 12:30	20.7
Fordham Blvd - Upstream	0.06417	125.2	01Jan2015, 12:30	20.7
LBC-100	0.029058	48.9	01Jan2015, 12:45	10.3
Dobbins Drive	0.208292	342.5	01Jan2015, 12:40	70.6
LBC-110	0.0333	52.3	01Jan2015, 12:45	10.8
Summerfield Crossing	0.241592	393.5	01Jan2015, 12:45	81.5
LBC-120	0.049799	75.9	01Jan2015, 12:50	16.3
Foxcroft Drive	0.291391	467.3	01Jan2015, 12:45	97.8
East Franklin Street	5.619884	3888.6	01Jan2015, 13:05	1427.8
LBC-140	0.088638	215.5	01Jan2015, 12:25	32.8
ADD-LBC-140	5.708522	3973.7	01Jan2015, 13:00	1460.6
Reach-LBC-140	5.708522	3531.1	01Jan2015, 13:35	1453.7
LBC-150	0.107836	215.3	01Jan2015, 12:25	31.5
ADD-LBC-150	5.816358	3573.2	01Jan2015, 13:35	1485.2
LBC-160	0.077625	184.4	01Jan2015, 12:20	26.8
Fordham Blvd - Downstream	5.893983	3603.5	01Jan2015, 13:35	1511.9
LBC-180	0.14221	421.3	01Jan2015, 12:15	48.9
LBC-170	0.027436	90.3	01Jan2015, 12:10	9.1
ADD-LBC-170-180	6.063629	3654.7	01Jan2015, 13:35	1569.9
Reach-LBC-190	6.063629	3648.2	01Jan2015, 13:40	1569.8
LBC-190	0.05069	106.1	01Jan2015, 12:25	15.5
Willow Drive	6.114319	3668.8	01Jan2015, 13:40	1585.4
Reach-LBC-200	6.114319	3518.2	01Jan2015, 14:15	1581.4
LBC-200	0.168071	254.9	01Jan2015, 12:45	49.5
ADD-LBC-200	6.28239	3581.8	01Jan2015, 14:10	1630.9
OUTLET	6.28239	3581.8	01Jan2015, 14:10	1630.9

FUTURE CONDITIONS: HEC-HMS OUTPUT

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	56.7	01Jan2015, 12:40	12.4
BH-20	0.07669	32.5	01Jan2015, 12:25	5.4
ADD-BH-10-20	0.215766	85.9	01Jan2015, 12:35	17.8
Reach-BH-20	0.215766	85.5	01Jan2015, 12:40	17.8
BH-30	0.165073	61.1	01Jan2015, 12:50	13.9
ADD-BH-30	0.380839	114.6	01Jan2015, 13:10	31.7
BH-40	0.105607	84.9	01Jan2015, 12:10	8.8
ADD-BH-40	0.486446	126.6	01Jan2015, 13:10	40.5
Reach-BH-40	0.486446	125.9	01Jan2015, 13:15	40.5
BH-60	0.129437	47.3	01Jan2015, 12:50	10.4
BH-50	0.117491	60.1	01Jan2015, 12:20	8.1
Weaver Dairy Rd Ext	0.117491	53.3	01Jan2015, 12:30	8.1
Northern Park	0.246928	95.1	01Jan2015, 12:35	18.5
ADD-BH	0.733374	188.2	01Jan2015, 12:45	59
BH-70	0.062883	45.8	01Jan2015, 12:10	5.1
MLK Jr. Blvd	0.796257	216.7	01Jan2015, 12:25	64.1
BH-80	0.10254	54.4	01Jan2015, 12:30	9
Stateside Drive	0.10254	54.4	01Jan2015, 12:30	9
BH-90	0.094578	28.2	01Jan2015, 12:55	6.7
ADD-BH-90	0.197118	76.2	01Jan2015, 12:35	15.7
BH-100	0.110825	49.9	01Jan2015, 12:30	8.3
ADD-BH-100	1.1042	337.9	01Jan2015, 12:30	88.1
Reach-BH-100	1.1042	336.9	01Jan2015, 12:30	88.1
BH-110	0.117356	108.7	01Jan2015, 12:15	13.3
MLK Jr. - Kings Br	0.117356	81	01Jan2015, 12:25	13.3
BH-120	0.02747	19.5	01Jan2015, 12:10	2.1
ADD-BH-120	1.249026	425.6	01Jan2015, 12:30	103.5
BH-130	0.100527	56.2	01Jan2015, 12:30	9.1
Lake Ellen	1.349553	464.3	01Jan2015, 12:40	112.7
CB-10	0.144686	57.9	01Jan2015, 12:55	14.1
Reach-CB-10	0.144686	57.9	01Jan2015, 13:00	14.1
CB-20	0.112513	43.7	01Jan2015, 12:45	9.4
ADD-CB-20	0.257199	98.2	01Jan2015, 12:50	23.5
Reach-CB-20	0.257199	97.5	01Jan2015, 13:00	23.5
CB-30	0.026991	17.8	01Jan2015, 12:40	3.6
CB-40	0.051355	61.5	01Jan2015, 12:15	7.6
ADD-CB-30-40	0.335545	126.2	01Jan2015, 13:00	34.7
CB-50	0.072003	59.8	01Jan2015, 12:35	11.3
Municipal Drive	0.072003	59.8	01Jan2015, 12:35	11.3
CB-60	0.031973	33.7	01Jan2015, 12:20	4.8
RT CB-50-60	0.103976	70	01Jan2015, 12:50	16.1
ADD-CB-60	0.439521	195.1	01Jan2015, 12:55	50.8
Reach-CB-60	0.439521	193.6	01Jan2015, 13:05	50.7
CB-70	0.149895	69.7	01Jan2015, 13:00	16.8
RT CB-70	0.149895	55.1	01Jan2015, 13:30	16.8
ADD-CB-70	0.589416	243	01Jan2015, 13:10	67.6
Reach-CB-70	0.589416	239.3	01Jan2015, 13:30	67.5
CB-80	0.083068	37.8	01Jan2015, 12:25	5.8
ADD-CB-80	0.672484	248.1	01Jan2015, 13:25	73.3
Reach-CB-80	0.672484	247.6	01Jan2015, 13:40	73.2
ADD- CB-BH	2.022037	599.1	01Jan2015, 12:45	185.9
EL-20	0.137538	110	01Jan2015, 12:05	10.4
ADD-EL-20	2.159575	621.6	01Jan2015, 12:45	196.4
Reach-EL-20	2.159575	618.7	01Jan2015, 12:50	196.3
EL-10	0.138871	140.4	01Jan2015, 12:10	14.1
Piney Mountain Rd	0.138871	140.4	01Jan2015, 12:10	14.1

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Piney Mountain Rd -Booker Ck	2.298446	638.6	01Jan2015, 12:55	210.4
EL-30	0.119754	60	01Jan2015, 12:10	6.8
Reach- EL-30	2.4182	655.9	01Jan2015, 12:45	217.2
EL-50	0.11573	74.8	01Jan2015, 12:10	7.8
ADD-EL-50	2.53393	679	01Jan2015, 12:40	225
Reach-EL-50	2.53393	675.7	01Jan2015, 12:50	225
EL-40	0.074895	63.5	01Jan2015, 12:10	6.4
Kensington Drive	0.074895	63.5	01Jan2015, 12:10	6.4
N Lakeshore Dr - Booker Ck	2.608825	690	01Jan2015, 12:50	231.4
CF-10	0.078889	86.1	01Jan2015, 12:10	9.4
Kingston Drive	0.078889	86.1	01Jan2015, 12:10	9.4
CF-20	0.076885	38.8	01Jan2015, 12:55	9.1
ADD-CF-20	0.155774	100.4	01Jan2015, 12:10	18.6
Weaver Dairy - Cedar Fk	0.155774	100.4	01Jan2015, 12:10	18.6
CF-30	0.044849	14.8	01Jan2015, 12:40	2.9
ADD-CF-30	0.200623	107	01Jan2015, 12:10	21.4
Cross Creek Drive	0.200623	107	01Jan2015, 12:10	21.4
Reach-CF-50	0.200623	105.7	01Jan2015, 12:15	21.4
CF-40	0.092855	35.5	01Jan2015, 12:45	7.3
Weaver Dairy Rd - 1	0.092855	29.1	01Jan2015, 13:05	7.3
CF-50	0.029148	11.2	01Jan2015, 12:15	1.5
ADD-CF-50	0.322626	125	01Jan2015, 12:15	30.3
CF-60	0.12336	34.8	01Jan2015, 12:55	8.3
Cedar Hills Circle	0.445986	140.2	01Jan2015, 12:20	38.5
Reach-CF-80	0.445986	139.7	01Jan2015, 12:25	38.5
CF-80	0.176821	73.1	01Jan2015, 12:25	11.2
CF-70	0.120239	34.5	01Jan2015, 13:05	9.4
Weaver Dairy Rd -2	0.120239	34.5	01Jan2015, 13:05	9.4
Kenmore Road	0.743046	230.8	01Jan2015, 12:30	59.2
Reach-CF-130	0.743046	230.4	01Jan2015, 12:35	59.2
CF-90	0.184752	47.9	01Jan2015, 12:40	9.9
CF-100	0.085353	44.9	01Jan2015, 12:10	4.5
Piney Mountain Rd - Cedar Fk	0.085353	44.9	01Jan2015, 12:10	4.5
CF-110	0.044111	18.5	01Jan2015, 12:20	2.5
ADD-CF-110	0.129464	61.1	01Jan2015, 12:10	7
ADD-CF-90-120	0.314216	81.1	01Jan2015, 12:15	17
CF-120	0.096092	41.2	01Jan2015, 12:15	5.3
Brookview Drive	1.153354	334.2	01Jan2015, 12:30	81.4
Reach-CF-140	1.153354	333.1	01Jan2015, 12:30	81.5
CF-130	0.151403	45.1	01Jan2015, 12:40	8.6
CF-140	0.042477	15.9	01Jan2015, 12:25	2.5
North Lakeshore Drive	1.347234	389.9	01Jan2015, 12:30	92.6
CF-150	0.050842	26.8	01Jan2015, 12:10	2.9
ADD-CF-150	1.398076	402.6	01Jan2015, 12:30	95.5
EL-60	0.142028	55.7	01Jan2015, 12:20	7.9
EL-90	0.100143	74.5	01Jan2015, 12:10	7.8
EL-70	0.094086	55.6	01Jan2015, 12:20	7
EL-80	0.091741	61.2	01Jan2015, 12:10	6.3
EL-100	0.087147	83.6	01Jan2015, 12:20	10.2
Eastwood Lake	4.522046	833.4	01Jan2015, 13:40	366
LBC-10	0.097332	45.3	01Jan2015, 12:25	6.7
U/S Limit - Sierra	0.097332	43.7	01Jan2015, 12:30	6.7
LBC-20	0.084519	50.5	01Jan2015, 12:20	6.8
ADD-LBC-10-20	0.181851	91.8	01Jan2015, 12:25	13.6
Reach-LBC-20	0.181851	91.4	01Jan2015, 12:25	13.6
Honeysuckle Road	0.181851	91.4	01Jan2015, 12:25	13.6

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

2-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-30	0.181851	91.1	01Jan2015, 12:25	13.6
LBC-30	0.159799	71.5	01Jan2015, 13:00	17.3
Booker Creek Road	0.34165	140.1	01Jan2015, 12:35	30.9
Reach-LBC-40	0.34165	135.3	01Jan2015, 12:45	30.8
LBC-40	0.156492	178.4	01Jan2015, 12:10	17.9
LBC-50	0.022218	14	01Jan2015, 12:10	1.4
ADD-LBC-40-50	5.042406	931.6	01Jan2015, 13:30	416.2
LBC-60	0.142061	102.1	01Jan2015, 12:15	11.5
ADD-LBC-60	5.184467	944.8	01Jan2015, 13:30	427.7
Reach-LBC-60	5.184467	942.7	01Jan2015, 13:40	427.6
LBC-70	0.107956	72.2	01Jan2015, 12:10	7.7
LBC-130	0.03607	27.1	01Jan2015, 12:30	4.5
ADD-LBC-70-130	5.328493	957.3	01Jan2015, 13:40	439.8
LBC-90	0.115064	66.9	01Jan2015, 12:50	14.8
LBC-80	0.06417	46.4	01Jan2015, 12:30	7.9
Fordham Blvd - Upstream	0.06417	46.4	01Jan2015, 12:30	7.9
LBC-100	0.029058	19	01Jan2015, 12:45	4.1
Dobbins Drive	0.208292	127.1	01Jan2015, 12:40	26.9
LBC-110	0.0333	20.8	01Jan2015, 12:50	4.5
Summerfield Crossing	0.241592	147.7	01Jan2015, 12:45	31.4
LBC-120	0.049799	27.4	01Jan2015, 12:50	6
Foxcroft Drive	0.291391	174.4	01Jan2015, 12:45	37.4
East Franklin Street	5.619884	968.4	01Jan2015, 14:05	477.2
LBC-140	0.088638	84.4	01Jan2015, 12:25	13
ADD-LBC-140	5.708522	978.9	01Jan2015, 14:05	490.2
Reach-LBC-140	5.708522	946.1	01Jan2015, 14:30	488.7
LBC-150	0.107836	70.1	01Jan2015, 12:25	10.9
ADD-LBC-150	5.816358	953.8	01Jan2015, 14:30	499.6
LBC-160	0.077625	73	01Jan2015, 12:20	11
Fordham Blvd - Downstream	5.893983	958.9	01Jan2015, 14:35	510.7
LBC-180	0.14221	168.5	01Jan2015, 12:15	20
LBC-170	0.027436	38.5	01Jan2015, 12:10	4.1
ADD-LBC-170-180	6.063629	971.8	01Jan2015, 14:35	534.8
Reach-LBC-190	6.063629	970.8	01Jan2015, 14:45	534.7
LBC-190	0.05069	33.2	01Jan2015, 12:25	5
Willow Drive	6.114319	974.5	01Jan2015, 14:40	539.7
Reach-LBC-200	6.114319	955.4	01Jan2015, 15:15	538.9
LBC-200	0.168071	74.7	01Jan2015, 12:45	15
ADD-LBC-200	6.28239	967.6	01Jan2015, 15:10	553.9
OUTLET	6.28239	967.6	01Jan2015, 15:10	553.9

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	107.1	01Jan2015, 12:40	22.1
BH-20	0.07669	69.5	01Jan2015, 12:25	10.5
ADD-BH-10-20	0.215766	168.6	01Jan2015, 12:35	32.6
Reach-BH-20	0.215766	167.7	01Jan2015, 12:40	32.6
BH-30	0.165073	121	01Jan2015, 12:50	26.1
ADD-BH-30	0.380839	263.2	01Jan2015, 12:55	58.7
BH-40	0.105607	167.9	01Jan2015, 12:10	16.6
ADD-BH-40	0.486446	292.8	01Jan2015, 12:55	75.3
Reach-BH-40	0.486446	291.8	01Jan2015, 13:00	75.3
BH-60	0.129437	95.5	01Jan2015, 12:45	19.7
BH-50	0.117491	129.2	01Jan2015, 12:20	16.3
Weaver Dairy Rd Ext	0.117491	114.5	01Jan2015, 12:30	16.3
Northern Park	0.246928	198.7	01Jan2015, 12:35	36.1
ADD-BH	0.733374	457.5	01Jan2015, 12:50	111.3
BH-70	0.062883	91.9	01Jan2015, 12:10	9.7
MLK Jr. Blvd	0.796257	473.6	01Jan2015, 12:55	121
BH-80	0.10254	105.6	01Jan2015, 12:30	16.6
Stateside Drive	0.10254	105.6	01Jan2015, 12:30	16.6
BH-90	0.094578	60	01Jan2015, 12:55	13.3
ADD-BH-90	0.197118	153.3	01Jan2015, 12:35	29.9
BH-100	0.110825	103.6	01Jan2015, 12:30	16.2
ADD-BH-100	1.1042	696.5	01Jan2015, 12:40	167.1
Reach-BH-100	1.1042	694.7	01Jan2015, 12:45	167.1
BH-110	0.117356	190.2	01Jan2015, 12:10	22.4
MLK Jr. - Kings Br	0.117356	141.8	01Jan2015, 12:25	22.4
BH-120	0.02747	39.6	01Jan2015, 12:10	4.1
ADD-BH-120	1.249026	844.6	01Jan2015, 12:30	193.6
BH-130	0.100527	108.1	01Jan2015, 12:30	17
Lake Ellen	1.349553	854.5	01Jan2015, 12:50	210.6
CB-10	0.144686	108.2	01Jan2015, 12:55	25.3
Reach-CB-10	0.144686	107.8	01Jan2015, 13:00	25.3
CB-20	0.112513	86.2	01Jan2015, 12:40	17.3
ADD-CB-20	0.257199	186.4	01Jan2015, 12:50	42.6
Reach-CB-20	0.257199	184.3	01Jan2015, 13:00	42.5
CB-30	0.026991	29.6	01Jan2015, 12:40	5.9
CB-40	0.051355	99.5	01Jan2015, 12:15	12.1
ADD-CB-30-40	0.335545	226	01Jan2015, 13:05	60.5
CB-50	0.072003	95	01Jan2015, 12:35	17.9
Municipal Drive	0.072003	95	01Jan2015, 12:35	17.9
CB-60	0.031973	54.3	01Jan2015, 12:20	7.7
RT CB-50-60	0.103976	111.7	01Jan2015, 12:50	25.5
ADD-CB-60	0.439521	332.7	01Jan2015, 13:00	86
Reach-CB-60	0.439521	331.1	01Jan2015, 13:05	86
CB-70	0.149895	124	01Jan2015, 12:55	29.2
RT CB-70	0.149895	98.1	01Jan2015, 13:25	29.2
ADD-CB-70	0.589416	422.1	01Jan2015, 13:10	115.2
Reach-CB-70	0.589416	416.3	01Jan2015, 13:30	115.1
CB-80	0.083068	80.7	01Jan2015, 12:25	11.4
ADD-CB-80	0.672484	433.2	01Jan2015, 13:30	126.5
Reach-CB-80	0.672484	432.1	01Jan2015, 13:40	126.5
ADD- CB-BH	2.022037	1156.2	01Jan2015, 13:10	337.1
EL-20	0.137538	227.5	01Jan2015, 12:05	20.4
ADD-EL-20	2.159575	1182.1	01Jan2015, 13:05	357.5
Reach-EL-20	2.159575	1179.6	01Jan2015, 13:15	357.4
EL-10	0.138871	257.2	01Jan2015, 12:10	25.1
Piney Mountain Rd	0.138871	257.2	01Jan2015, 12:10	25.1

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Piney Mountain Rd -Booker Ck	2.298446	1168.7	01Jan2015, 13:30	382.5
EL-30	0.119754	141.1	01Jan2015, 12:10	14.4
Reach- EL-30	2.4182	1184.1	01Jan2015, 13:35	396.9
EL-50	0.11573	161.1	01Jan2015, 12:10	15.7
ADD-EL-50	2.53393	1199.8	01Jan2015, 13:35	412.7
Reach-EL-50	2.53393	1196.9	01Jan2015, 13:45	412.6
EL-40	0.074895	124	01Jan2015, 12:10	12.2
Kensington Drive	0.074895	124	01Jan2015, 12:10	12.2
N Lakeshore Dr - Booker Ck	2.608825	1207.5	01Jan2015, 13:45	424.7
CF-10	0.078889	147.5	01Jan2015, 12:10	15.6
Kingston Drive	0.078889	147.5	01Jan2015, 12:10	15.6
CF-20	0.076885	67.4	01Jan2015, 12:55	15.5
ADD-CF-20	0.155774	173.3	01Jan2015, 12:10	31.1
Weaver Dairy - Cedar Fk	0.155774	173.3	01Jan2015, 12:10	31.1
CF-30	0.044849	33	01Jan2015, 12:35	5.8
ADD-CF-30	0.200623	189.8	01Jan2015, 12:10	37
Cross Creek Drive	0.200623	189.8	01Jan2015, 12:10	37
Reach-CF-50	0.200623	187.8	01Jan2015, 12:15	37
CF-40	0.092855	72.2	01Jan2015, 12:40	14
Weaver Dairy Rd - 1	0.092855	59	01Jan2015, 13:00	14
CF-50	0.029148	27.7	01Jan2015, 12:15	3.2
ADD-CF-50	0.322626	233.6	01Jan2015, 12:15	54.1
CF-60	0.12336	75.8	01Jan2015, 12:50	16.6
Cedar Hills Circle	0.445986	271.7	01Jan2015, 12:40	70.7
Reach-CF-80	0.445986	271.3	01Jan2015, 12:45	70.7
CF-80	0.176821	162.8	01Jan2015, 12:25	23
CF-70	0.120239	69.7	01Jan2015, 13:05	17.8
Weaver Dairy Rd -2	0.120239	69.7	01Jan2015, 13:05	17.8
Kenmore Road	0.743046	470.8	01Jan2015, 12:25	111.5
Reach-CF-130	0.743046	470.5	01Jan2015, 12:30	111.5
CF-90	0.184752	116.2	01Jan2015, 12:40	21.5
CF-100	0.085353	108.8	01Jan2015, 12:05	9.8
Piney Mountain Rd - Cedar Fk	0.085353	108.8	01Jan2015, 12:05	9.8
CF-110	0.044111	43.6	01Jan2015, 12:15	5.3
ADD-CF-110	0.129464	146.1	01Jan2015, 12:10	15.2
ADD-CF-90-120	0.314216	198.8	01Jan2015, 12:15	36.6
CF-120	0.096092	98.2	01Jan2015, 12:15	11.2
Brookview Drive	1.153354	719.4	01Jan2015, 12:30	159.3
Reach-CF-140	1.153354	718.9	01Jan2015, 12:30	159.4
CF-130	0.151403	106.2	01Jan2015, 12:40	18.8
CF-140	0.042477	36.9	01Jan2015, 12:20	5.1
North Lakeshore Drive	1.347234	854.6	01Jan2015, 12:30	183.3
CF-150	0.050842	62.6	01Jan2015, 12:10	6.1
ADD-CF-150	1.398076	882.1	01Jan2015, 12:30	189.4
EL-60	0.142028	131.6	01Jan2015, 12:20	16.7
EL-90	0.100143	151.9	01Jan2015, 12:10	15.2
EL-70	0.094086	116	01Jan2015, 12:15	13.9
EL-80	0.091741	131	01Jan2015, 12:10	12.8
EL-100	0.087147	145.4	01Jan2015, 12:15	17.8
Eastwood Lake	4.522046	1777.9	01Jan2015, 13:20	690.2
LBC-10	0.097332	97	01Jan2015, 12:25	13.5
U/S Limit - Sierra	0.097332	87.5	01Jan2015, 12:30	13.5
LBC-20	0.084519	101.6	01Jan2015, 12:20	13.1
ADD-LBC-10-20	0.181851	181	01Jan2015, 12:25	26.5
Reach-LBC-20	0.181851	179.8	01Jan2015, 12:25	26.5
Honeysuckle Road	0.181851	179.8	01Jan2015, 12:25	26.5

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

10-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-30	0.181851	179.4	01Jan2015, 12:25	26.5
LBC-30	0.159799	129	01Jan2015, 13:00	30.7
Booker Creek Road	0.34165	270.5	01Jan2015, 12:35	57.2
Reach-LBC-40	0.34165	257.2	01Jan2015, 12:45	57
LBC-40	0.156492	313.3	01Jan2015, 12:10	31.1
LBC-50	0.022218	30.7	01Jan2015, 12:10	2.9
ADD-LBC-40-50	5.042406	2033.1	01Jan2015, 13:05	781.3
LBC-60	0.142061	203.7	01Jan2015, 12:10	22
ADD-LBC-60	5.184467	2069.3	01Jan2015, 13:05	803.3
Reach-LBC-60	5.184467	2063.3	01Jan2015, 13:15	803
LBC-70	0.107956	152.4	01Jan2015, 12:10	15.3
LBC-130	0.03607	46.4	01Jan2015, 12:30	7.6
ADD-LBC-70-130	5.328493	2103	01Jan2015, 13:10	825.8
LBC-90	0.115064	113.5	01Jan2015, 12:50	24.9
LBC-80	0.06417	79.9	01Jan2015, 12:30	13.5
Fordham Blvd - Upstream	0.06417	79.9	01Jan2015, 12:30	13.5
LBC-100	0.029058	31.3	01Jan2015, 12:45	6.7
Dobbins Drive	0.208292	215.9	01Jan2015, 12:40	45
LBC-110	0.0333	34.7	01Jan2015, 12:45	7.4
Summerfield Crossing	0.241592	249.9	01Jan2015, 12:40	52.4
LBC-120	0.049799	47.5	01Jan2015, 12:50	10.3
Foxcroft Drive	0.291391	293.9	01Jan2015, 12:50	62.7
East Franklin Street	5.619884	2324.1	01Jan2015, 13:15	888.5
LBC-140	0.088638	136.9	01Jan2015, 12:25	20.9
ADD-LBC-140	5.708522	2363.8	01Jan2015, 13:15	909.4
Reach-LBC-140	5.708522	2090.3	01Jan2015, 13:45	905.9
LBC-150	0.107836	128.7	01Jan2015, 12:25	19.3
ADD-LBC-150	5.816358	2113.4	01Jan2015, 13:40	925.1
LBC-160	0.077625	119.5	01Jan2015, 12:20	17.7
Fordham Blvd - Downstream	5.893983	2129.4	01Jan2015, 13:45	942.9
LBC-180	0.14221	276.6	01Jan2015, 12:15	32.6
LBC-170	0.027436	61.9	01Jan2015, 12:10	6.6
ADD-LBC-170-180	6.063629	2159.4	01Jan2015, 13:45	982.1
Reach-LBC-190	6.063629	2153.1	01Jan2015, 13:55	982
LBC-190	0.05069	62.1	01Jan2015, 12:25	9.1
Willow Drive	6.114319	2163.2	01Jan2015, 13:55	991.2
Reach-LBC-200	6.114319	2043.2	01Jan2015, 14:30	989.4
LBC-200	0.168071	144.9	01Jan2015, 12:45	28.3
ADD-LBC-200	6.28239	2074.5	01Jan2015, 14:30	1017.7
OUTLET	6.28239	2074.5	01Jan2015, 14:30	1017.7

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	139.5	01Jan2015, 12:40	28.2
BH-20	0.07669	93.3	01Jan2015, 12:25	13.8
ADD-BH-10-20	0.215766	221.9	01Jan2015, 12:35	42
Reach-BH-20	0.215766	220.8	01Jan2015, 12:35	42
BH-30	0.165073	158.4	01Jan2015, 12:50	33.8
ADD-BH-30	0.380839	349.6	01Jan2015, 12:55	75.8
BH-40	0.105607	219.5	01Jan2015, 12:10	21.4
ADD-BH-40	0.486446	391.1	01Jan2015, 12:50	97.2
Reach-BH-40	0.486446	389.9	01Jan2015, 12:55	97.2
BH-60	0.129437	126	01Jan2015, 12:45	25.6
BH-50	0.117491	172.9	01Jan2015, 12:20	21.6
Weaver Dairy Rd Ext	0.117491	152.4	01Jan2015, 12:30	21.6
Northern Park	0.246928	264.7	01Jan2015, 12:35	47.2
ADD-BH	0.733374	615	01Jan2015, 12:45	144.4
BH-70	0.062883	120.8	01Jan2015, 12:10	12.6
MLK Jr. Blvd	0.796257	638.6	01Jan2015, 12:50	157
BH-80	0.10254	137.4	01Jan2015, 12:30	21.4
Stateside Drive	0.10254	137.4	01Jan2015, 12:30	21.4
BH-90	0.094578	80.2	01Jan2015, 12:55	17.5
ADD-BH-90	0.197118	201.9	01Jan2015, 12:35	38.9
BH-100	0.110825	137.4	01Jan2015, 12:30	21.2
ADD-BH-100	1.1042	943.1	01Jan2015, 12:40	217.1
Reach-BH-100	1.1042	940.3	01Jan2015, 12:45	217.2
BH-110	0.117356	240.6	01Jan2015, 12:10	28
MLK Jr. - Kings Br	0.117356	179.3	01Jan2015, 12:25	28
BH-120	0.02747	52.3	01Jan2015, 12:10	5.3
ADD-BH-120	1.249026	1106.9	01Jan2015, 12:35	250.4
BH-130	0.100527	139.7	01Jan2015, 12:30	21.9
Lake Ellen	1.349553	1084.8	01Jan2015, 12:55	272.4
CB-10	0.144686	139.2	01Jan2015, 12:55	32.2
Reach-CB-10	0.144686	138.6	01Jan2015, 13:00	32.2
CB-20	0.112513	113.2	01Jan2015, 12:40	22.3
ADD-CB-20	0.257199	242.1	01Jan2015, 12:50	54.5
Reach-CB-20	0.257199	239.4	01Jan2015, 13:00	54.4
CB-30	0.026991	36.7	01Jan2015, 12:40	7.2
CB-40	0.051355	121.9	01Jan2015, 12:15	14.8
ADD-CB-30-40	0.335545	288	01Jan2015, 13:05	76.4
CB-50	0.072003	115.5	01Jan2015, 12:35	21.7
Municipal Drive	0.072003	115.5	01Jan2015, 12:35	21.7
CB-60	0.031973	66.4	01Jan2015, 12:20	9.4
RT CB-50-60	0.103976	136.1	01Jan2015, 12:50	31.1
ADD-CB-60	0.439521	417.8	01Jan2015, 12:55	107.5
Reach-CB-60	0.439521	415.5	01Jan2015, 13:05	107.5
CB-70	0.149895	156.8	01Jan2015, 12:55	36.7
RT CB-70	0.149895	120.9	01Jan2015, 13:30	36.7
ADD-CB-70	0.589416	528.4	01Jan2015, 13:10	144.2
Reach-CB-70	0.589416	522.2	01Jan2015, 13:30	144.1
CB-80	0.083068	108.5	01Jan2015, 12:20	15
ADD-CB-80	0.672484	544.1	01Jan2015, 13:25	159.1
Reach-CB-80	0.672484	543.2	01Jan2015, 13:40	159.1
ADD- CB-BH	2.022037	1500.8	01Jan2015, 13:15	431.4
EL-20	0.137538	301.1	01Jan2015, 12:05	26.7
ADD-EL-20	2.159575	1530.3	01Jan2015, 13:15	458.1
Reach-EL-20	2.159575	1527.1	01Jan2015, 13:20	458
EL-10	0.138871	327.9	01Jan2015, 12:10	31.9
Piney Mountain Rd	0.138871	327.9	01Jan2015, 12:10	31.9

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Piney Mountain Rd -Booker Ck	2.298446	1543.1	01Jan2015, 13:30	489.9
EL-30	0.119754	194	01Jan2015, 12:10	19.4
Reach- EL-30	2.4182	1562.8	01Jan2015, 13:35	509.3
EL-50	0.11573	216	01Jan2015, 12:10	20.8
ADD-EL-50	2.53393	1582.9	01Jan2015, 13:35	530.1
Reach-EL-50	2.53393	1580.3	01Jan2015, 13:45	530
EL-40	0.074895	161.1	01Jan2015, 12:10	15.7
Kensington Drive	0.074895	161.1	01Jan2015, 12:10	15.7
N Lakeshore Dr - Booker Ck	2.608825	1593.6	01Jan2015, 13:45	545.7
CF-10	0.078889	185.1	01Jan2015, 12:10	19.4
Kingston Drive	0.078889	185.1	01Jan2015, 12:10	19.4
CF-20	0.076885	84.7	01Jan2015, 12:50	19.3
ADD-CF-20	0.155774	218	01Jan2015, 12:10	38.8
Weaver Dairy - Cedar Fk	0.155774	218	01Jan2015, 12:10	38.8
CF-30	0.044849	44.9	01Jan2015, 12:35	7.8
ADD-CF-30	0.200623	241.2	01Jan2015, 12:10	46.5
Cross Creek Drive	0.200623	241.2	01Jan2015, 12:10	46.5
Reach-CF-50	0.200623	238.6	01Jan2015, 12:15	46.5
CF-40	0.092855	95.5	01Jan2015, 12:40	18.1
Weaver Dairy Rd - 1	0.092855	78	01Jan2015, 13:00	18.1
CF-50	0.029148	38.8	01Jan2015, 12:15	4.4
ADD-CF-50	0.322626	302.3	01Jan2015, 12:15	69
CF-60	0.12336	102.4	01Jan2015, 12:50	21.9
Cedar Hills Circle	0.445986	356.7	01Jan2015, 12:40	90.9
Reach-CF-80	0.445986	356.3	01Jan2015, 12:45	90.9
CF-80	0.176821	220.5	01Jan2015, 12:25	30.6
CF-70	0.120239	92.2	01Jan2015, 13:05	23.1
Weaver Dairy Rd -2	0.120239	92.2	01Jan2015, 13:05	23.1
Kenmore Road	0.743046	624.5	01Jan2015, 12:30	144.7
Reach-CF-130	0.743046	623.5	01Jan2015, 12:30	144.7
CF-90	0.184752	161.3	01Jan2015, 12:40	29.1
CF-100	0.085353	151.3	01Jan2015, 12:05	13.3
Piney Mountain Rd - Cedar Fk	0.085353	151.3	01Jan2015, 12:05	13.3
CF-110	0.044111	60.1	01Jan2015, 12:15	7.2
ADD-CF-110	0.129464	201.5	01Jan2015, 12:10	20.5
ADD-CF-90-120	0.314216	277.1	01Jan2015, 12:15	49.6
CF-120	0.096092	135.7	01Jan2015, 12:15	15.2
Brookview Drive	1.153354	966.5	01Jan2015, 12:30	209.4
Reach-CF-140	1.153354	966.1	01Jan2015, 12:30	209.4
CF-130	0.151403	145.5	01Jan2015, 12:40	25.3
CF-140	0.042477	50.9	01Jan2015, 12:20	6.9
North Lakeshore Drive	1.347234	1153	01Jan2015, 12:30	241.6
CF-150	0.050842	85.9	01Jan2015, 12:10	8.2
ADD-CF-150	1.398076	1190	01Jan2015, 12:30	249.9
EL-60	0.142028	181.6	01Jan2015, 12:15	22.5
EL-90	0.100143	200	01Jan2015, 12:10	19.9
EL-70	0.094086	153.9	01Jan2015, 12:15	18.2
EL-80	0.091741	175.1	01Jan2015, 12:10	16.9
EL-100	0.087147	181.8	01Jan2015, 12:15	22.3
Eastwood Lake	4.522046	2358.8	01Jan2015, 13:15	895.1
LBC-10	0.097332	130.2	01Jan2015, 12:20	17.8
U/S Limit - Sierra	0.097332	115.7	01Jan2015, 12:35	17.8
LBC-20	0.084519	133.3	01Jan2015, 12:20	17
ADD-LBC-10-20	0.181851	237.1	01Jan2015, 12:25	34.8
Reach-LBC-20	0.181851	235.1	01Jan2015, 12:25	34.8
Honeysuckle Road	0.181851	235.1	01Jan2015, 12:25	34.8

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

25-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-30	0.181851	234.5	01Jan2015, 12:25	34.8
LBC-30	0.159799	163.3	01Jan2015, 13:00	38.8
Booker Creek Road	0.34165	350.9	01Jan2015, 12:35	73.6
Reach-LBC-40	0.34165	334.9	01Jan2015, 12:45	73.3
LBC-40	0.156492	393.3	01Jan2015, 12:10	39.1
LBC-50	0.022218	41.3	01Jan2015, 12:10	3.9
ADD-LBC-40-50	5.042406	2714.2	01Jan2015, 13:00	1011.4
LBC-60	0.142061	267.8	01Jan2015, 12:10	28.6
ADD-LBC-60	5.184467	2770.8	01Jan2015, 12:55	1040
Reach-LBC-60	5.184467	2762.3	01Jan2015, 13:05	1039.4
LBC-70	0.107956	203.1	01Jan2015, 12:10	20.1
LBC-130	0.03607	57.9	01Jan2015, 12:30	9.5
ADD-LBC-70-130	5.328493	2821.8	01Jan2015, 13:05	1069
LBC-90	0.115064	140.9	01Jan2015, 12:50	30.9
LBC-80	0.06417	99.6	01Jan2015, 12:30	16.8
Fordham Blvd - Upstream	0.06417	99.6	01Jan2015, 12:30	16.8
LBC-100	0.029058	38.5	01Jan2015, 12:45	8.2
Dobbins Drive	0.208292	268.2	01Jan2015, 12:40	55.8
LBC-110	0.0333	43	01Jan2015, 12:45	9.1
Summerfield Crossing	0.241592	310.2	01Jan2015, 12:45	65
LBC-120	0.049799	59.4	01Jan2015, 12:50	12.8
Foxcroft Drive	0.291391	369.8	01Jan2015, 12:45	77.8
East Franklin Street	5.619884	3122.4	01Jan2015, 13:10	1146.8
LBC-140	0.088638	167.8	01Jan2015, 12:25	25.6
ADD-LBC-140	5.708522	3177.4	01Jan2015, 13:10	1172.3
Reach-LBC-140	5.708522	2801.8	01Jan2015, 13:35	1167
LBC-150	0.107836	164.8	01Jan2015, 12:25	24.4
ADD-LBC-150	5.816358	2834.4	01Jan2015, 13:35	1191.4
LBC-160	0.077625	147.3	01Jan2015, 12:20	21.7
Fordham Blvd - Downstream	5.893983	2856.5	01Jan2015, 13:35	1213.1
LBC-180	0.14221	340.1	01Jan2015, 12:15	40
LBC-170	0.027436	75.5	01Jan2015, 12:10	8.1
ADD-LBC-170-180	6.063629	2897.7	01Jan2015, 13:35	1261.3
Reach-LBC-190	6.063629	2891.2	01Jan2015, 13:45	1261.2
LBC-190	0.05069	79.4	01Jan2015, 12:25	11.6
Willow Drive	6.114319	2905.8	01Jan2015, 13:45	1272.8
Reach-LBC-200	6.114319	2758.8	01Jan2015, 14:20	1270
LBC-200	0.168071	187.6	01Jan2015, 12:45	36.4
ADD-LBC-200	6.28239	2805.2	01Jan2015, 14:15	1306.5
OUTLET	6.28239	2805.2	01Jan2015, 14:15	1306.5

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	165.8	01Jan2015, 12:40	33.1
BH-20	0.07669	112.6	01Jan2015, 12:25	16.5
ADD-BH-10-20	0.215766	264.9	01Jan2015, 12:35	49.6
Reach-BH-20	0.215766	263.2	01Jan2015, 12:35	49.6
BH-30	0.165073	188.3	01Jan2015, 12:50	39.9
ADD-BH-30	0.380839	439.5	01Jan2015, 12:45	89.6
BH-40	0.105607	260.5	01Jan2015, 12:10	25.4
ADD-BH-40	0.486446	500	01Jan2015, 12:45	114.9
Reach-BH-40	0.486446	495.5	01Jan2015, 12:50	114.9
BH-60	0.129437	150.4	01Jan2015, 12:45	30.4
BH-50	0.117491	208	01Jan2015, 12:20	25.8
Weaver Dairy Rd Ext	0.117491	178.5	01Jan2015, 12:30	25.8
Northern Park	0.246928	315.2	01Jan2015, 12:35	56.2
ADD-BH	0.733374	776.8	01Jan2015, 12:45	171.1
BH-70	0.062883	143.8	01Jan2015, 12:10	14.9
MLK Jr. Blvd	0.796257	774.8	01Jan2015, 12:55	186
BH-80	0.10254	162.8	01Jan2015, 12:30	25.2
Stateside Drive	0.10254	162.8	01Jan2015, 12:30	25.2
BH-90	0.094578	96.4	01Jan2015, 12:55	20.9
ADD-BH-90	0.197118	240.7	01Jan2015, 12:35	46.2
BH-100	0.110825	164.5	01Jan2015, 12:30	25.2
ADD-BH-100	1.1042	1134.3	01Jan2015, 12:40	257.4
Reach-BH-100	1.1042	1129.7	01Jan2015, 12:40	257.4
BH-110	0.117356	280.8	01Jan2015, 12:10	32.5
MLK Jr. - Kings Br	0.117356	209.1	01Jan2015, 12:25	32.5
BH-120	0.02747	62.6	01Jan2015, 12:10	6.3
ADD-BH-120	1.249026	1323.3	01Jan2015, 12:35	296.1
BH-130	0.100527	164.7	01Jan2015, 12:30	25.8
Lake Ellen	1.349553	1270.8	01Jan2015, 13:00	321.9
CB-10	0.144686	163.8	01Jan2015, 12:55	37.7
Reach-CB-10	0.144686	163	01Jan2015, 13:00	37.7
CB-20	0.112513	135.1	01Jan2015, 12:40	26.3
ADD-CB-20	0.257199	284.7	01Jan2015, 12:50	64
Reach-CB-20	0.257199	281.6	01Jan2015, 13:00	64
CB-30	0.026991	42.3	01Jan2015, 12:40	8.3
CB-40	0.051355	139.5	01Jan2015, 12:15	16.9
ADD-CB-30-40	0.335545	331.3	01Jan2015, 13:10	89.2
CB-50	0.072003	131.5	01Jan2015, 12:35	24.7
Municipal Drive	0.072003	131.5	01Jan2015, 12:35	24.7
CB-60	0.031973	75.8	01Jan2015, 12:20	10.7
RT CB-50-60	0.103976	153.7	01Jan2015, 12:50	35.4
ADD-CB-60	0.439521	477.2	01Jan2015, 13:00	124.5
Reach-CB-60	0.439521	473.9	01Jan2015, 13:10	124.5
CB-70	0.149895	182.6	01Jan2015, 12:55	42.6
RT CB-70	0.149895	139.4	01Jan2015, 13:30	42.6
ADD-CB-70	0.589416	604.9	01Jan2015, 13:10	167.2
Reach-CB-70	0.589416	598.5	01Jan2015, 13:30	167.1
CB-80	0.083068	131	01Jan2015, 12:20	17.9
ADD-CB-80	0.672484	624.3	01Jan2015, 13:30	185
Reach-CB-80	0.672484	623.1	01Jan2015, 13:40	185
ADD- CB-BH	2.022037	1785	01Jan2015, 13:15	506.9
EL-20	0.137538	359.9	01Jan2015, 12:05	31.7
ADD-EL-20	2.159575	1821.1	01Jan2015, 13:10	538.6
Reach-EL-20	2.159575	1815.4	01Jan2015, 13:20	538.5
EL-10	0.138871	383.6	01Jan2015, 12:10	37.3
Piney Mountain Rd	0.138871	383.6	01Jan2015, 12:10	37.3

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Piney Mountain Rd -Booker Ck	2.298446	1836.2	01Jan2015, 13:25	575.8
EL-30	0.119754	237.1	01Jan2015, 12:10	23.5
Reach- EL-30	2.4182	1858.9	01Jan2015, 13:30	599.2
EL-50	0.11573	260.2	01Jan2015, 12:10	24.9
ADD-EL-50	2.53393	1883.7	01Jan2015, 13:30	624.1
Reach-EL-50	2.53393	1878.2	01Jan2015, 13:40	623.9
EL-40	0.074895	190.6	01Jan2015, 12:10	18.6
Kensington Drive	0.074895	190.6	01Jan2015, 12:10	18.6
N Lakeshore Dr - Booker Ck	2.608825	1894.3	01Jan2015, 13:40	642.5
CF-10	0.078889	215	01Jan2015, 12:10	22.4
Kingston Drive	0.078889	215	01Jan2015, 12:10	22.4
CF-20	0.076885	98.4	01Jan2015, 12:50	22.4
ADD-CF-20	0.155774	253.5	01Jan2015, 12:10	44.8
Weaver Dairy - Cedar Fk	0.155774	253.5	01Jan2015, 12:10	44.8
CF-30	0.044849	54.4	01Jan2015, 12:35	9.3
ADD-CF-30	0.200623	282.2	01Jan2015, 12:10	54.1
Cross Creek Drive	0.200623	282.2	01Jan2015, 12:10	54.1
Reach-CF-50	0.200623	279.4	01Jan2015, 12:15	54.1
CF-40	0.092855	114.1	01Jan2015, 12:40	21.5
Weaver Dairy Rd - 1	0.092855	93.3	01Jan2015, 13:00	21.5
CF-50	0.029148	47.9	01Jan2015, 12:15	5.3
ADD-CF-50	0.322626	357.7	01Jan2015, 12:15	81
CF-60	0.12336	123.8	01Jan2015, 12:50	26.2
Cedar Hills Circle	0.445986	425	01Jan2015, 12:40	107.2
Reach-CF-80	0.445986	424.6	01Jan2015, 12:45	107.2
CF-80	0.176821	267.1	01Jan2015, 12:25	36.8
CF-70	0.120239	110.3	01Jan2015, 13:05	27.5
Weaver Dairy Rd -2	0.120239	110.3	01Jan2015, 13:05	27.5
Kenmore Road	0.743046	748.9	01Jan2015, 12:25	171.5
Reach-CF-130	0.743046	748.3	01Jan2015, 12:30	171.5
CF-90	0.184752	198.1	01Jan2015, 12:40	35.3
CF-100	0.085353	186	01Jan2015, 12:05	16.2
Piney Mountain Rd - Cedar Fk	0.085353	186	01Jan2015, 12:05	16.2
CF-110	0.044111	73.6	01Jan2015, 12:15	8.7
ADD-CF-110	0.129464	246.6	01Jan2015, 12:10	24.9
ADD-CF-90-120	0.314216	341.8	01Jan2015, 12:10	60.2
CF-120	0.096092	166.2	01Jan2015, 12:15	18.4
Brookview Drive	1.153354	1169.8	01Jan2015, 12:25	250
Reach-CF-140	1.153354	1167.2	01Jan2015, 12:30	250
CF-130	0.151403	177.5	01Jan2015, 12:35	30.6
CF-140	0.042477	62.2	01Jan2015, 12:20	8.3
North Lakeshore Drive	1.347234	1395.6	01Jan2015, 12:30	289
CF-150	0.050842	104.8	01Jan2015, 12:10	9.9
ADD-CF-150	1.398076	1440.1	01Jan2015, 12:30	298.9
EL-60	0.142028	223.1	01Jan2015, 12:15	27.3
EL-90	0.100143	238.1	01Jan2015, 12:10	23.7
EL-70	0.094086	184.1	01Jan2015, 12:15	21.7
EL-80	0.091741	210.3	01Jan2015, 12:10	20.2
EL-100	0.087147	210.1	01Jan2015, 12:15	25.9
Eastwood Lake	4.522046	2688	01Jan2015, 13:35	1059.8
LBC-10	0.097332	157	01Jan2015, 12:20	21.3
U/S Limit - Sierra	0.097332	138.8	01Jan2015, 12:35	21.3
LBC-20	0.084519	158.6	01Jan2015, 12:20	20.1
ADD-LBC-10-20	0.181851	282.6	01Jan2015, 12:25	41.4
Reach-LBC-20	0.181851	280.1	01Jan2015, 12:25	41.4
Honeysuckle Road	0.181851	280.1	01Jan2015, 12:25	41.4

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

50-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-30	0.181851	279.4	01Jan2015, 12:25	41.4
LBC-30	0.159799	190.1	01Jan2015, 13:00	45.2
Booker Creek Road	0.34165	415.1	01Jan2015, 12:35	86.6
Reach-LBC-40	0.34165	396	01Jan2015, 12:45	86.4
LBC-40	0.156492	455.8	01Jan2015, 12:10	45.4
LBC-50	0.022218	49.8	01Jan2015, 12:10	4.7
ADD-LBC-40-50	5.042406	3109.4	01Jan2015, 12:45	1196.2
LBC-60	0.142061	318.9	01Jan2015, 12:10	33.9
ADD-LBC-60	5.184467	3220.7	01Jan2015, 12:40	1230.1
Reach-LBC-60	5.184467	3193.4	01Jan2015, 12:55	1229.6
LBC-70	0.107956	243.8	01Jan2015, 12:10	24
LBC-130	0.03607	66.8	01Jan2015, 12:30	10.9
ADD-LBC-70-130	5.328493	3294.6	01Jan2015, 12:50	1264.5
LBC-90	0.115064	162.3	01Jan2015, 12:50	35.6
LBC-80	0.06417	115.1	01Jan2015, 12:30	19.4
Fordham Blvd - Upstream	0.06417	115.1	01Jan2015, 12:30	19.4
LBC-100	0.029058	44.2	01Jan2015, 12:45	9.4
Dobbins Drive	0.208292	309.1	01Jan2015, 12:40	64.3
LBC-110	0.0333	49.4	01Jan2015, 12:45	10.5
Summerfield Crossing	0.241592	357.8	01Jan2015, 12:40	74.8
LBC-120	0.049799	68.7	01Jan2015, 12:50	14.9
Foxcroft Drive	0.291391	428.1	01Jan2015, 12:45	89.7
East Franklin Street	5.619884	3638	01Jan2015, 13:00	1354.2
LBC-140	0.088638	191.9	01Jan2015, 12:25	29.2
ADD-LBC-140	5.708522	3720	01Jan2015, 13:00	1383.4
Reach-LBC-140	5.708522	3258.9	01Jan2015, 13:30	1377.1
LBC-150	0.107836	193.4	01Jan2015, 12:25	28.5
ADD-LBC-150	5.816358	3300.4	01Jan2015, 13:30	1405.6
LBC-160	0.077625	169	01Jan2015, 12:20	24.9
Fordham Blvd - Downstream	5.893983	3327.8	01Jan2015, 13:35	1430.5
LBC-180	0.14221	389.5	01Jan2015, 12:15	45.9
LBC-170	0.027436	86.1	01Jan2015, 12:10	9.2
ADD-LBC-170-180	6.063629	3377.3	01Jan2015, 13:30	1485.6
Reach-LBC-190	6.063629	3370.9	01Jan2015, 13:40	1485.5
LBC-190	0.05069	93	01Jan2015, 12:25	13.6
Willow Drive	6.114319	3389.9	01Jan2015, 13:35	1499.1
Reach-LBC-200	6.114319	3248.3	01Jan2015, 14:15	1495.7
LBC-200	0.168071	221.3	01Jan2015, 12:45	42.9
ADD-LBC-200	6.28239	3303.9	01Jan2015, 14:15	1538.6
OUTLET	6.28239	3303.9	01Jan2015, 14:15	1538.6

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	192.3	01Jan2015, 12:40	38.1
BH-20	0.07669	132.1	01Jan2015, 12:25	19.3
ADD-BH-10-20	0.215766	308.5	01Jan2015, 12:35	57.4
Reach-BH-20	0.215766	307	01Jan2015, 12:35	57.4
BH-30	0.165073	218.2	01Jan2015, 12:50	46.1
ADD-BH-30	0.380839	513.4	01Jan2015, 12:45	103.5
BH-40	0.105607	301.7	01Jan2015, 12:10	29.3
ADD-BH-40	0.486446	591.3	01Jan2015, 12:40	132.8
Reach-BH-40	0.486446	583.9	01Jan2015, 12:50	132.7
BH-60	0.129437	174.9	01Jan2015, 12:45	35.2
BH-50	0.117491	243.2	01Jan2015, 12:20	30.1
Weaver Dairy Rd Ext	0.117491	206.1	01Jan2015, 12:30	30.1
Northern Park	0.246928	366	01Jan2015, 12:35	65.3
ADD-BH	0.733374	929.7	01Jan2015, 12:45	198.1
BH-70	0.062883	167	01Jan2015, 12:10	17.2
MLK Jr. Blvd	0.796257	903.2	01Jan2015, 12:55	215.3
BH-80	0.10254	188.2	01Jan2015, 12:30	29.1
Stateside Drive	0.10254	188.2	01Jan2015, 12:30	29.1
BH-90	0.094578	112.9	01Jan2015, 12:50	24.4
ADD-BH-90	0.197118	279.8	01Jan2015, 12:35	53.5
BH-100	0.110825	191.7	01Jan2015, 12:30	29.3
ADD-BH-100	1.1042	1282.9	01Jan2015, 12:40	298.1
Reach-BH-100	1.1042	1281.7	01Jan2015, 12:45	298.1
BH-110	0.117356	321	01Jan2015, 12:10	36.9
MLK Jr. - Kings Br	0.117356	224.8	01Jan2015, 12:25	36.9
BH-120	0.02747	72.9	01Jan2015, 12:10	7.3
ADD-BH-120	1.249026	1503.1	01Jan2015, 12:35	342.3
BH-130	0.100527	189.6	01Jan2015, 12:30	29.7
Lake Ellen	1.349553	1282.2	01Jan2015, 13:15	372
CB-10	0.144686	188.5	01Jan2015, 12:55	43.2
Reach-CB-10	0.144686	187.7	01Jan2015, 13:05	43.2
CB-20	0.112513	157.1	01Jan2015, 12:40	30.4
ADD-CB-20	0.257199	326.6	01Jan2015, 12:50	73.6
Reach-CB-20	0.257199	323.4	01Jan2015, 13:00	73.6
CB-30	0.026991	47.8	01Jan2015, 12:40	9.4
CB-40	0.051355	156.8	01Jan2015, 12:15	19
ADD-CB-30-40	0.335545	377.4	01Jan2015, 13:10	101.9
CB-50	0.072003	147.3	01Jan2015, 12:35	27.7
Municipal Drive	0.072003	147.3	01Jan2015, 12:35	27.7
CB-60	0.031973	85.1	01Jan2015, 12:20	12
RT CB-50-60	0.103976	168.3	01Jan2015, 12:50	39.7
ADD-CB-60	0.439521	536.3	01Jan2015, 13:05	141.6
Reach-CB-60	0.439521	534.3	01Jan2015, 13:10	141.6
CB-70	0.149895	208.2	01Jan2015, 12:55	48.6
RT CB-70	0.149895	157.9	01Jan2015, 13:30	48.6
ADD-CB-70	0.589416	684.5	01Jan2015, 13:15	190.2
Reach-CB-70	0.589416	676.7	01Jan2015, 13:30	190.2
CB-80	0.083068	153.8	01Jan2015, 12:20	20.9
ADD-CB-80	0.672484	706.5	01Jan2015, 13:30	211.1
Reach-CB-80	0.672484	704.2	01Jan2015, 13:40	211
ADD- CB-BH	2.022037	1978.8	01Jan2015, 13:40	583
EL-20	0.137538	418.9	01Jan2015, 12:05	36.8
ADD-EL-20	2.159575	2009.6	01Jan2015, 13:40	619.8
Reach-EL-20	2.159575	2007	01Jan2015, 13:45	619.7
EL-10	0.138871	439.1	01Jan2015, 12:10	42.7
Piney Mountain Rd	0.138871	439.1	01Jan2015, 12:10	42.7

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Piney Mountain Rd -Booker Ck	2.298446	2035	01Jan2015, 13:45	662.4
EL-30	0.119754	280.8	01Jan2015, 12:10	27.6
Reach- EL-30	2.4182	2057.2	01Jan2015, 13:50	689.9
EL-50	0.11573	304.7	01Jan2015, 12:10	29.1
ADD-EL-50	2.53393	2080.9	01Jan2015, 13:50	719
Reach-EL-50	2.53393	2077.2	01Jan2015, 14:00	718.9
EL-40	0.074895	219.9	01Jan2015, 12:10	21.4
Kensington Drive	0.074895	219.9	01Jan2015, 12:10	21.4
N Lakeshore Dr - Booker Ck	2.608825	2092.6	01Jan2015, 14:00	740.3
CF-10	0.078889	244.9	01Jan2015, 12:10	25.5
Kingston Drive	0.078889	244.9	01Jan2015, 12:10	25.5
CF-20	0.076885	112	01Jan2015, 12:50	25.4
ADD-CF-20	0.155774	289.1	01Jan2015, 12:10	50.9
Weaver Dairy - Cedar Fk	0.155774	289.1	01Jan2015, 12:10	50.9
CF-30	0.044849	64.1	01Jan2015, 12:35	10.9
ADD-CF-30	0.200623	323.4	01Jan2015, 12:10	61.8
Cross Creek Drive	0.200623	323.4	01Jan2015, 12:10	61.8
Reach-CF-50	0.200623	320.1	01Jan2015, 12:15	61.8
CF-40	0.092855	132.9	01Jan2015, 12:40	24.9
Weaver Dairy Rd - 1	0.092855	108.7	01Jan2015, 13:00	24.9
CF-50	0.029148	57.2	01Jan2015, 12:15	6.3
ADD-CF-50	0.322626	413.4	01Jan2015, 12:15	93
CF-60	0.12336	145.6	01Jan2015, 12:50	30.6
Cedar Hills Circle	0.445986	493.8	01Jan2015, 12:40	123.6
Reach-CF-80	0.445986	493.2	01Jan2015, 12:45	123.6
CF-80	0.176821	314.2	01Jan2015, 12:25	43.1
CF-70	0.120239	128.6	01Jan2015, 13:05	31.8
Weaver Dairy Rd -2	0.120239	128.6	01Jan2015, 13:05	31.8
Kenmore Road	0.743046	873.8	01Jan2015, 12:30	198.5
Reach-CF-130	0.743046	871.5	01Jan2015, 12:35	198.5
CF-90	0.184752	235.5	01Jan2015, 12:40	41.7
CF-100	0.085353	221.2	01Jan2015, 12:05	19.2
Piney Mountain Rd - Cedar Fk	0.085353	221.2	01Jan2015, 12:05	19.2
CF-110	0.044111	87.3	01Jan2015, 12:15	10.2
ADD-CF-110	0.129464	292.3	01Jan2015, 12:10	29.3
ADD-CF-90-120	0.314216	408	01Jan2015, 12:10	71
CF-120	0.096092	197.3	01Jan2015, 12:15	21.7
Brookview Drive	1.153354	1364.2	01Jan2015, 12:25	291.2
Reach-CF-140	1.153354	1360.4	01Jan2015, 12:30	291.2
CF-130	0.151403	209.9	01Jan2015, 12:35	36.1
CF-140	0.042477	73.8	01Jan2015, 12:20	9.8
North Lakeshore Drive	1.347234	1630.9	01Jan2015, 12:30	337
CF-150	0.050842	124	01Jan2015, 12:10	11.7
ADD-CF-150	1.398076	1683.4	01Jan2015, 12:25	348.7
EL-60	0.142028	265.5	01Jan2015, 12:15	32.1
EL-90	0.100143	276.3	01Jan2015, 12:10	27.4
EL-70	0.094086	214.4	01Jan2015, 12:15	25.2
EL-80	0.091741	245.8	01Jan2015, 12:10	23.5
EL-100	0.087147	238	01Jan2015, 12:15	29.4
Eastwood Lake	4.522046	2929.3	01Jan2015, 13:35	1226.4
LBC-10	0.097332	184.1	01Jan2015, 12:20	24.8
U/S Limit - Sierra	0.097332	155.7	01Jan2015, 12:35	24.8
LBC-20	0.084519	183.9	01Jan2015, 12:20	23.3
ADD-LBC-10-20	0.181851	324.6	01Jan2015, 12:25	48.1
Reach-LBC-20	0.181851	322.6	01Jan2015, 12:25	48.1
Honeysuckle Road	0.181851	322.6	01Jan2015, 12:25	48.1

Town of Chapel Hill - Eastwood Lake Subwatershed Study - HMS Output

100-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-30	0.181851	321.5	01Jan2015, 12:25	48.1
LBC-30	0.159799	216.8	01Jan2015, 13:00	51.5
Booker Creek Road	0.34165	474.8	01Jan2015, 12:35	99.7
Reach-LBC-40	0.34165	454.8	01Jan2015, 12:45	99.4
LBC-40	0.156492	517.6	01Jan2015, 12:10	51.7
LBC-50	0.022218	58.5	01Jan2015, 12:10	5.5
ADD-LBC-40-50	5.042406	3371.1	01Jan2015, 13:00	1382.9
LBC-60	0.142061	370.1	01Jan2015, 12:10	39.2
ADD-LBC-60	5.184467	3462.7	01Jan2015, 12:40	1422.2
Reach-LBC-60	5.184467	3459.1	01Jan2015, 12:50	1421.5
LBC-70	0.107956	284.7	01Jan2015, 12:10	27.9
LBC-130	0.03607	75.6	01Jan2015, 12:30	12.4
ADD-LBC-70-130	5.328493	3587.6	01Jan2015, 12:45	1461.8
LBC-90	0.115064	183.5	01Jan2015, 12:50	40.2
LBC-80	0.06417	130.4	01Jan2015, 12:30	22
Fordham Blvd - Upstream	0.06417	130.4	01Jan2015, 12:30	22
LBC-100	0.029058	49.7	01Jan2015, 12:45	10.6
Dobbins Drive	0.208292	349.5	01Jan2015, 12:40	72.8
LBC-110	0.0333	55.7	01Jan2015, 12:45	11.9
Summerfield Crossing	0.241592	404	01Jan2015, 12:45	84.7
LBC-120	0.049799	77.9	01Jan2015, 12:50	16.9
Foxcroft Drive	0.291391	479.8	01Jan2015, 12:40	101.5
East Franklin Street	5.619884	3997.7	01Jan2015, 13:00	1563.3
LBC-140	0.088638	215.7	01Jan2015, 12:25	32.8
ADD-LBC-140	5.708522	4103	01Jan2015, 12:55	1596.1
Reach-LBC-140	5.708522	3614.8	01Jan2015, 13:30	1589.4
LBC-150	0.107836	222.1	01Jan2015, 12:25	32.6
ADD-LBC-150	5.816358	3662	01Jan2015, 13:30	1622
LBC-160	0.077625	190.6	01Jan2015, 12:20	28
Fordham Blvd - Downstream	5.893983	3697.1	01Jan2015, 13:30	1650.1
LBC-180	0.14221	438.4	01Jan2015, 12:15	51.7
LBC-170	0.027436	96.5	01Jan2015, 12:10	10.3
ADD-LBC-170-180	6.063629	3753.6	01Jan2015, 13:25	1712.1
Reach-LBC-190	6.063629	3748.9	01Jan2015, 13:35	1712
LBC-190	0.05069	106.5	01Jan2015, 12:25	15.6
Willow Drive	6.114319	3771.5	01Jan2015, 13:35	1727.6
Reach-LBC-200	6.114319	3619.2	01Jan2015, 14:10	1723.6
LBC-200	0.168071	254.9	01Jan2015, 12:45	49.5
ADD-LBC-200	6.28239	3688.4	01Jan2015, 14:05	1773
OUTLET	6.28239	3688.4	01Jan2015, 14:05	1773

**ALTERNATIVE CONDITIONS:
HEC-HMS OUTPUT**

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

2-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	33.9	01Jan2015, 12:45	7.7
BH-20	0.07669	32.5	01Jan2015, 12:25	5.4
ADD-BH-10-20	0.215766	62.4	01Jan2015, 12:35	13.1
Parkside Storage	0.215766	8	01Jan2015, 16:00	12
Reach-BH-20	0.215766	8	01Jan2015, 16:10	11.9
BH-30	0.165073	61.1	01Jan2015, 12:50	13.9
ADD-BH-30	0.380839	49.4	01Jan2015, 13:25	25.8
BH-40	0.105607	84.9	01Jan2015, 12:10	8.8
ADD-BH-40	0.486446	92.9	01Jan2015, 12:10	34.6
Reach-BH-40	0.486446	90.9	01Jan2015, 12:15	34.6
BH-60	0.129437	47.3	01Jan2015, 12:50	10.4
BH-50	0.117491	60.1	01Jan2015, 12:20	8.1
Weaver Dairy Rd Ext	0.117491	53.3	01Jan2015, 12:30	8.1
Northern Park	0.246928	95.1	01Jan2015, 12:35	18.5
ADD-BH	0.733374	165.2	01Jan2015, 12:25	53.1
BH-70	0.062883	45.8	01Jan2015, 12:10	5.1
MLK Jr. Blvd	0.796257	203.1	01Jan2015, 12:20	58.2
BH-80	0.10254	54.4	01Jan2015, 12:30	9
Stateside Drive	0.10254	54.4	01Jan2015, 12:30	9
BH-90	0.094578	28.2	01Jan2015, 12:55	6.7
ADD-BH-90	0.197118	76.2	01Jan2015, 12:35	15.7
BH-100	0.110825	49.9	01Jan2015, 12:30	8.3
ADD-BH-100	1.1042	317	01Jan2015, 12:25	82.2
MLK - Storage	1.1042	291.7	01Jan2015, 12:40	82.1
Reach-BH-100	1.1042	291.7	01Jan2015, 12:40	82.1
Lake Ellen	1.349553	360	01Jan2015, 12:55	106.7
BH-110	0.117356	108.7	01Jan2015, 12:15	13.3
MLK Jr. - Kings Br	0.117356	81	01Jan2015, 12:25	13.3
BH-120	0.02747	19.5	01Jan2015, 12:10	2.1
ADD-BH-120	1.249026	370.8	01Jan2015, 12:35	97.6
BH-130	0.100527	56.2	01Jan2015, 12:30	9.1
CB-10	0.144686	57.9	01Jan2015, 12:55	14.1
Reach-CB-10	0.144686	57.9	01Jan2015, 12:55	14.1
CB-20	0.112513	25.1	01Jan2015, 12:45	5.5
ADD-CB-20	0.257199	82.4	01Jan2015, 12:55	19.6
Reach-CB-20	0.257199	81.9	01Jan2015, 13:00	19.6
CB-40	0.051355	61.5	01Jan2015, 12:15	7.6
CB-30	0.026991	17.8	01Jan2015, 12:40	3.6
ADD-CB-30-40	0.335545	110.7	01Jan2015, 13:00	30.8
CB-50	0.072003	59.8	01Jan2015, 12:35	11.3
Municipal Drive	0.072003	59.8	01Jan2015, 12:35	11.3
CB-60	0.031973	33.7	01Jan2015, 12:20	4.8
RT CB-50-60	0.103976	70	01Jan2015, 12:50	16.1
ADD-CB-60	0.439521	179.8	01Jan2015, 12:55	46.9
Reach-CB-60	0.439521	178.4	01Jan2015, 13:05	46.9
CB-70	0.149895	69.7	01Jan2015, 13:00	16.8
RT CB-70	0.149895	55.1	01Jan2015, 13:30	16.8
ADD-CB-70	0.589416	227.7	01Jan2015, 13:10	63.7
Reach-CB-70	0.589416	224.3	01Jan2015, 13:30	63.6
CB-80	0.083068	37.8	01Jan2015, 12:25	5.8
ADD-CB-80	0.672484	233	01Jan2015, 13:30	69.4
Reach-CB-80	0.672484	232.5	01Jan2015, 13:40	69.4
ADD- CB-BH	2.022037	535	01Jan2015, 13:05	176.1
EL-20	0.137538	110	01Jan2015, 12:05	10.4
ADD-EL-20	2.159575	549.6	01Jan2015, 13:05	186.5
Reach-EL-20	2.159575	549.6	01Jan2015, 13:05	186.5

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

2-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EL-10	0.138871	140.4	01Jan2015, 12:10	14.1
Piney Mountain Rd	0.138871	140.4	01Jan2015, 12:10	14.1
Piney Mountain Rd -Booker Ck	2.298446	513.2	01Jan2015, 13:35	200.6
EL-30	0.119754	60	01Jan2015, 12:10	6.8
Reach- EL-30	2.4182	520.7	01Jan2015, 13:40	207.4
EL-50	0.11573	74.8	01Jan2015, 12:10	7.8
ADD-EL-50	2.53393	528.7	01Jan2015, 13:40	215.3
Reach-EL-50	2.53393	528.2	01Jan2015, 13:50	215.2
EL-40	0.074895	63.5	01Jan2015, 12:10	6.4
Kensington Drive	0.074895	63.5	01Jan2015, 12:10	6.4
N Lakeshore Dr - Booker Ck	2.608825	533.9	01Jan2015, 13:50	221.7
CF-10	0.078889	86.1	01Jan2015, 12:10	9.4
Kingston Drive	0.078889	86.1	01Jan2015, 12:10	9.4
CF-20	0.076885	38.8	01Jan2015, 12:55	9.1
ADD-CF-20	0.155774	100.4	01Jan2015, 12:10	18.6
Weaver Dairy - Cedar Fk	0.155774	100.4	01Jan2015, 12:10	18.6
CF-30	0.044849	10.6	01Jan2015, 13:05	2.9
ADD-CF-30	0.200623	102.8	01Jan2015, 12:10	21.4
Cross Creek Drive	0.200623	102.8	01Jan2015, 12:10	21.4
Reach-CF-50	0.200623	100.8	01Jan2015, 12:15	21.4
CF-40	0.092855	35.5	01Jan2015, 12:45	7.3
Weaver Dairy Rd - 1	0.092855	29.1	01Jan2015, 13:05	7.3
CF-50	0.029148	11.2	01Jan2015, 12:15	1.5
ADD-CF-50	0.322626	120.1	01Jan2015, 12:15	30.3
CF-60	0.12336	34.8	01Jan2015, 12:55	8.3
Cedar Hills Circle	0.445986	134.2	01Jan2015, 12:15	38.5
Reach-CF-80	0.445986	134	01Jan2015, 12:25	38.5
CF-80	0.176821	73.1	01Jan2015, 12:25	11.2
CF-70	0.120239	34.5	01Jan2015, 13:05	9.4
Weaver Dairy Rd -2	0.120239	34.5	01Jan2015, 13:05	9.4
Kenmore Road	0.743046	224.9	01Jan2015, 12:25	59.2
Reach-CF-130	0.743046	223.9	01Jan2015, 12:30	59.2
CF-90	0.184752	47.9	01Jan2015, 12:40	9.9
CF-100	0.085353	44.9	01Jan2015, 12:10	4.5
Piney Mountain Rd - Cedar Fk	0.085353	44.9	01Jan2015, 12:10	4.5
CF-110	0.044111	18.5	01Jan2015, 12:20	2.5
ADD-CF-110	0.129464	61.1	01Jan2015, 12:10	7
ADD-CF-90-120	0.314216	81.1	01Jan2015, 12:15	17
CF-120	0.096092	67.9	01Jan2015, 12:00	5.3
Brookview Drive	1.153354	313.2	01Jan2015, 12:30	81.4
Reach-CF-140	1.153354	311.9	01Jan2015, 12:30	81.4
CF-130	0.151403	48	01Jan2015, 12:40	9.2
CF-140	0.042477	15.9	01Jan2015, 12:25	2.5
North Lakeshore Drive	1.347234	371.6	01Jan2015, 12:30	93.1
CF-150	0.050842	26.8	01Jan2015, 12:10	2.9
ADD-CF-150	1.398076	384.3	01Jan2015, 12:30	96
EL-60	0.142028	55.7	01Jan2015, 12:20	7.9
EL-90	0.100143	74.5	01Jan2015, 12:10	7.8
EL-70	0.094086	97.4	01Jan2015, 12:00	7
EL-80	0.091741	61.2	01Jan2015, 12:10	6.3
EL-100	0.087147	83.6	01Jan2015, 12:20	10.2
Eastwood Lake	4.522046	701.4	01Jan2015, 14:05	356.3
LBC-10	0.097332	45.3	01Jan2015, 12:25	6.7
U/S Limit - Sierra	0.097332	43.7	01Jan2015, 12:30	6.7
LBC-20	0.084519	50.5	01Jan2015, 12:20	6.8
ADD-LBC-10-20	0.181851	91.8	01Jan2015, 12:25	13.6

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

2-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-20	0.181851	91.4	01Jan2015, 12:25	13.6
Honeysuckle Road	0.181851	91.4	01Jan2015, 12:25	13.6
Reach-LBC-30	0.181851	90.5	01Jan2015, 12:35	13.6
LBC-30	0.159799	71.5	01Jan2015, 13:00	17.3
Booker Creek Road	0.34165	147.9	01Jan2015, 12:40	30.9
Reach-LBC-40	0.34165	141.9	01Jan2015, 12:50	30.8
LBC-40	0.156492	115.3	01Jan2015, 12:30	17.9
LBC-50	0.022218	14	01Jan2015, 12:10	1.4
ADD-LBC-40-50	5.042406	782.4	01Jan2015, 13:45	406.5
LBC-60	0.142061	102.1	01Jan2015, 12:15	11.5
ADD-LBC-60	5.184467	793.7	01Jan2015, 13:45	418
Reach-LBC-60	5.184467	793.3	01Jan2015, 13:50	417.8
LBC-70	0.107956	72.2	01Jan2015, 12:10	7.7
LBC-130	0.03607	27.1	01Jan2015, 12:30	4.5
ADD-LBC-70-130	5.328493	806.4	01Jan2015, 13:45	430.1
LBC-90	0.115064	66.9	01Jan2015, 12:50	14.8
LBC-80	0.06417	46.4	01Jan2015, 12:30	7.9
Fordham Blvd - Upstream	0.06417	46.4	01Jan2015, 12:30	7.9
LBC-100	0.029058	19	01Jan2015, 12:45	4.1
Dobbins Drive	0.208292	127.1	01Jan2015, 12:40	26.9
LBC-110	0.0333	20.8	01Jan2015, 12:50	4.5
Summerfield Crossing	0.241592	147.7	01Jan2015, 12:45	31.4
LBC-120	0.049799	27.4	01Jan2015, 12:50	6
Foxcroft Drive	0.291391	174.4	01Jan2015, 12:45	37.4
East Franklin Street	5.619884	871	01Jan2015, 13:55	467.4
LBC-140	0.088638	93.7	01Jan2015, 12:20	13
ADD-LBC-140	5.708522	881.8	01Jan2015, 13:50	480.5
Reach-LBC-140	5.708522	853.7	01Jan2015, 14:25	479.1
LBC-150	0.107836	70.1	01Jan2015, 12:25	10.9
ADD-LBC-150	5.816358	861.9	01Jan2015, 14:20	490
LBC-160	0.077625	73	01Jan2015, 12:20	11
Fordham Blvd - Downstream	5.893983	867.6	01Jan2015, 14:30	501
LBC-180	0.14221	168.5	01Jan2015, 12:15	20
LBC-170	0.027436	38.5	01Jan2015, 12:10	4.1
ADD-LBC-170-180	6.063629	880.9	01Jan2015, 14:25	525.2
Reach-LBC-190	6.063629	880.2	01Jan2015, 14:35	525
LBC-190	0.05069	33.2	01Jan2015, 12:25	5
Willow Drive	6.114319	884	01Jan2015, 14:35	530
Reach-LBC-200	6.114319	869	01Jan2015, 15:10	529.2
LBC-200	0.168071	74.7	01Jan2015, 12:45	15
ADD-LBC-200	6.28239	881.6	01Jan2015, 15:05	544.2
OUTLET	6.28239	881.6	01Jan2015, 15:05	544.2

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

10-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	80.1	01Jan2015, 12:45	16.2
BH-20	0.07669	69.5	01Jan2015, 12:25	10.5
ADD-BH-10-20	0.215766	140.8	01Jan2015, 12:35	26.7
Parkside Storage	0.215766	18.5	01Jan2015, 15:20	25
Reach-BH-20	0.215766	18.5	01Jan2015, 15:25	25
BH-30	0.165073	121	01Jan2015, 12:50	26.1
ADD-BH-30	0.380839	102.2	01Jan2015, 13:20	51
BH-40	0.105607	167.9	01Jan2015, 12:10	16.6
ADD-BH-40	0.486446	185.6	01Jan2015, 12:10	67.6
Reach-BH-40	0.486446	181.4	01Jan2015, 12:15	67.6
BH-60	0.129437	95.5	01Jan2015, 12:45	19.7
BH-50	0.117491	129.2	01Jan2015, 12:20	16.3
Weaver Dairy Rd Ext	0.117491	114.5	01Jan2015, 12:30	16.3
Northern Park	0.246928	198.7	01Jan2015, 12:35	36.1
ADD-BH	0.733374	336.9	01Jan2015, 12:25	103.6
BH-70	0.062883	91.9	01Jan2015, 12:10	9.7
MLK Jr. Blvd	0.796257	412.3	01Jan2015, 12:20	113.3
BH-80	0.10254	105.6	01Jan2015, 12:30	16.6
Stateside Drive	0.10254	105.6	01Jan2015, 12:30	16.6
BH-90	0.094578	60	01Jan2015, 12:55	13.3
ADD-BH-90	0.197118	153.3	01Jan2015, 12:35	29.9
BH-100	0.110825	103.6	01Jan2015, 12:30	16.2
ADD-BH-100	1.1042	651.6	01Jan2015, 12:25	159.4
MLK - Storage	1.1042	620	01Jan2015, 12:35	159.4
Reach-BH-100	1.1042	619.3	01Jan2015, 12:35	159.4
Lake Ellen	1.349553	683.6	01Jan2015, 12:55	202.8
BH-110	0.117356	190.2	01Jan2015, 12:10	22.4
MLK Jr. - Kings Br	0.117356	141.8	01Jan2015, 12:25	22.4
BH-120	0.02747	39.6	01Jan2015, 12:10	4.1
ADD-BH-120	1.249026	763.1	01Jan2015, 12:35	185.8
BH-130	0.100527	108.1	01Jan2015, 12:30	17
CB-10	0.144686	108.2	01Jan2015, 12:55	25.3
Reach-CB-10	0.144686	108.1	01Jan2015, 12:55	25.3
CB-20	0.112513	64.6	01Jan2015, 12:45	12.5
ADD-CB-20	0.257199	170.2	01Jan2015, 12:50	37.8
Reach-CB-20	0.257199	168.5	01Jan2015, 13:00	37.7
CB-40	0.051355	99.5	01Jan2015, 12:15	12.1
CB-30	0.026991	29.6	01Jan2015, 12:40	5.9
ADD-CB-30-40	0.335545	211.4	01Jan2015, 13:00	55.7
CB-50	0.072003	95	01Jan2015, 12:35	17.9
Municipal Drive	0.072003	95	01Jan2015, 12:35	17.9
CB-60	0.031973	54.3	01Jan2015, 12:20	7.7
RT CB-50-60	0.103976	111.7	01Jan2015, 12:50	25.5
ADD-CB-60	0.439521	319.5	01Jan2015, 12:55	81.2
Reach-CB-60	0.439521	317.6	01Jan2015, 13:05	81.2
CB-70	0.149895	124	01Jan2015, 12:55	29.2
RT CB-70	0.149895	98.1	01Jan2015, 13:25	29.2
ADD-CB-70	0.589416	408.1	01Jan2015, 13:10	110.4
Reach-CB-70	0.589416	402.1	01Jan2015, 13:30	110.3
CB-80	0.083068	80.7	01Jan2015, 12:25	11.4
ADD-CB-80	0.672484	419	01Jan2015, 13:30	121.6
Reach-CB-80	0.672484	418.2	01Jan2015, 13:40	121.6
ADD- CB-BH	2.022037	987.9	01Jan2015, 13:15	324.5
EL-20	0.137538	227.5	01Jan2015, 12:05	20.4
ADD-EL-20	2.159575	1011.1	01Jan2015, 13:15	344.9
Reach-EL-20	2.159575	1011.1	01Jan2015, 13:15	344.9

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

10-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EL-10	0.138871	257.2	01Jan2015, 12:10	25.1
Piney Mountain Rd	0.138871	257.2	01Jan2015, 12:10	25.1
Piney Mountain Rd -Booker Ck	2.298446	1018	01Jan2015, 13:25	370
EL-30	0.119754	141.1	01Jan2015, 12:10	14.4
Reach- EL-30	2.4182	1034.3	01Jan2015, 13:30	384.4
EL-50	0.11573	161.1	01Jan2015, 12:10	15.7
ADD-EL-50	2.53393	1050.7	01Jan2015, 13:30	400.1
Reach-EL-50	2.53393	1048.9	01Jan2015, 13:40	400
EL-40	0.074895	124	01Jan2015, 12:10	12.2
Kensington Drive	0.074895	124	01Jan2015, 12:10	12.2
N Lakeshore Dr - Booker Ck	2.608825	1060	01Jan2015, 13:40	412.2
CF-10	0.078889	147.5	01Jan2015, 12:10	15.6
Kingston Drive	0.078889	147.5	01Jan2015, 12:10	15.6
CF-20	0.076885	67.4	01Jan2015, 12:55	15.5
ADD-CF-20	0.155774	173.3	01Jan2015, 12:10	31.1
Weaver Dairy - Cedar Fk	0.155774	173.3	01Jan2015, 12:10	31.1
CF-30	0.044849	23.6	01Jan2015, 13:05	5.8
ADD-CF-30	0.200623	179.5	01Jan2015, 12:10	37
Cross Creek Drive	0.200623	179.5	01Jan2015, 12:10	37
Reach-CF-50	0.200623	176	01Jan2015, 12:15	37
CF-40	0.092855	72.2	01Jan2015, 12:40	14
Weaver Dairy Rd - 1	0.092855	59	01Jan2015, 13:00	14
CF-50	0.029148	27.7	01Jan2015, 12:15	3.2
ADD-CF-50	0.322626	221.8	01Jan2015, 12:15	54.1
CF-60	0.12336	75.8	01Jan2015, 12:50	16.6
Cedar Hills Circle	0.445986	259.7	01Jan2015, 12:50	70.7
Reach-CF-80	0.445986	259.5	01Jan2015, 12:55	70.7
CF-80	0.176821	162.8	01Jan2015, 12:25	23
CF-70	0.120239	69.7	01Jan2015, 13:05	17.8
Weaver Dairy Rd -2	0.120239	69.7	01Jan2015, 13:05	17.8
Kenmore Road	0.743046	456.8	01Jan2015, 12:25	111.5
Reach-CF-130	0.743046	456.8	01Jan2015, 12:30	111.5
CF-90	0.184752	116.2	01Jan2015, 12:40	21.5
CF-100	0.085353	108.8	01Jan2015, 12:05	9.8
Piney Mountain Rd - Cedar Fk	0.085353	108.8	01Jan2015, 12:05	9.8
CF-110	0.044111	43.6	01Jan2015, 12:15	5.3
ADD-CF-110	0.129464	146.1	01Jan2015, 12:10	15.2
ADD-CF-90-120	0.314216	198.8	01Jan2015, 12:15	36.6
CF-120	0.096092	160.7	01Jan2015, 12:00	11.2
Brookview Drive	1.153354	666.9	01Jan2015, 12:30	159.4
Reach-CF-140	1.153354	665.8	01Jan2015, 12:30	159.4
CF-130	0.151403	109.4	01Jan2015, 12:40	19.4
CF-140	0.042477	36.9	01Jan2015, 12:20	5.1
North Lakeshore Drive	1.347234	804.8	01Jan2015, 12:30	184
CF-150	0.050842	62.6	01Jan2015, 12:10	6.1
ADD-CF-150	1.398076	832.3	01Jan2015, 12:30	190.1
EL-60	0.142028	131.6	01Jan2015, 12:20	16.7
EL-90	0.100143	151.9	01Jan2015, 12:10	15.2
EL-70	0.094086	200.7	01Jan2015, 12:00	13.9
EL-80	0.091741	131	01Jan2015, 12:10	12.8
EL-100	0.087147	145.4	01Jan2015, 12:15	17.8
Eastwood Lake	4.522046	1588.4	01Jan2015, 13:30	677.5
LBC-10	0.097332	97	01Jan2015, 12:25	13.5
U/S Limit - Sierra	0.097332	87.5	01Jan2015, 12:30	13.5
LBC-20	0.084519	101.6	01Jan2015, 12:20	13.1
ADD-LBC-10-20	0.181851	181	01Jan2015, 12:25	26.5

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

10-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-20	0.181851	179.8	01Jan2015, 12:25	26.5
Honeysuckle Road	0.181851	179.8	01Jan2015, 12:25	26.5
Reach-LBC-30	0.181851	177.8	01Jan2015, 12:35	26.5
LBC-30	0.159799	129	01Jan2015, 13:00	30.7
Booker Creek Road	0.34165	282.3	01Jan2015, 12:40	57.2
Reach-LBC-40	0.34165	267.4	01Jan2015, 12:50	57
LBC-40	0.156492	203.8	01Jan2015, 12:25	31.1
LBC-50	0.022218	30.7	01Jan2015, 12:10	2.9
ADD-LBC-40-50	5.042406	1860.9	01Jan2015, 13:15	768.6
LBC-60	0.142061	203.7	01Jan2015, 12:10	22
ADD-LBC-60	5.184467	1893	01Jan2015, 13:10	790.6
Reach-LBC-60	5.184467	1889.4	01Jan2015, 13:20	790.3
LBC-70	0.107956	152.4	01Jan2015, 12:10	15.3
LBC-130	0.03607	46.4	01Jan2015, 12:30	7.6
ADD-LBC-70-130	5.328493	1925.2	01Jan2015, 13:15	813.2
LBC-90	0.115064	113.5	01Jan2015, 12:50	24.9
LBC-80	0.06417	79.9	01Jan2015, 12:30	13.5
Fordham Blvd - Upstream	0.06417	79.9	01Jan2015, 12:30	13.5
LBC-100	0.029058	31.3	01Jan2015, 12:45	6.7
Dobbins Drive	0.208292	215.9	01Jan2015, 12:40	45
LBC-110	0.0333	34.7	01Jan2015, 12:45	7.4
Summerfield Crossing	0.241592	249.9	01Jan2015, 12:40	52.4
LBC-120	0.049799	47.5	01Jan2015, 12:50	10.3
Foxcroft Drive	0.291391	293.9	01Jan2015, 12:50	62.7
East Franklin Street	5.619884	2141.4	01Jan2015, 13:15	875.8
LBC-140	0.088638	152	01Jan2015, 12:20	20.9
ADD-LBC-140	5.708522	2173.8	01Jan2015, 13:15	896.7
Reach-LBC-140	5.708522	1933.6	01Jan2015, 13:45	893.5
LBC-150	0.107836	128.7	01Jan2015, 12:25	19.3
ADD-LBC-150	5.816358	1955.7	01Jan2015, 13:45	912.8
LBC-160	0.077625	119.5	01Jan2015, 12:20	17.7
Fordham Blvd - Downstream	5.893983	1969.7	01Jan2015, 13:50	930.5
LBC-180	0.14221	276.6	01Jan2015, 12:15	32.6
LBC-170	0.027436	61.9	01Jan2015, 12:10	6.6
ADD-LBC-170-180	6.063629	1998.1	01Jan2015, 13:50	969.7
Reach-LBC-190	6.063629	1990.8	01Jan2015, 14:00	969.5
LBC-190	0.05069	62.1	01Jan2015, 12:25	9.1
Willow Drive	6.114319	2000.2	01Jan2015, 14:00	978.6
Reach-LBC-200	6.114319	1884.3	01Jan2015, 14:35	977
LBC-200	0.168071	144.9	01Jan2015, 12:45	28.3
ADD-LBC-200	6.28239	1915.2	01Jan2015, 14:30	1005.2
OUTLET	6.28239	1915.2	01Jan2015, 14:30	1005.2

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

25-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	111	01Jan2015, 12:45	21.8
BH-20	0.07669	93.3	01Jan2015, 12:25	13.8
ADD-BH-10-20	0.215766	192.7	01Jan2015, 12:35	35.6
Parkside Storage	0.215766	23.5	01Jan2015, 15:20	33.5
Reach-BH-20	0.215766	23.5	01Jan2015, 15:30	33.5
BH-30	0.165073	158.4	01Jan2015, 12:50	33.8
ADD-BH-30	0.380839	156.1	01Jan2015, 13:10	67.2
BH-40	0.105607	219.5	01Jan2015, 12:10	21.4
ADD-BH-40	0.486446	244.1	01Jan2015, 12:10	88.6
Reach-BH-40	0.486446	238.8	01Jan2015, 12:15	88.6
BH-60	0.129437	126	01Jan2015, 12:45	25.6
BH-50	0.117491	172.9	01Jan2015, 12:20	21.6
Weaver Dairy Rd Ext	0.117491	152.4	01Jan2015, 12:30	21.6
Northern Park	0.246928	264.7	01Jan2015, 12:35	47.2
ADD-BH	0.733374	446.6	01Jan2015, 12:20	135.8
BH-70	0.062883	120.8	01Jan2015, 12:10	12.6
MLK Jr. Blvd	0.796257	524.8	01Jan2015, 12:25	148.4
BH-80	0.10254	137.4	01Jan2015, 12:30	21.4
Stateside Drive	0.10254	137.4	01Jan2015, 12:30	21.4
BH-90	0.094578	80.2	01Jan2015, 12:55	17.5
ADD-BH-90	0.197118	201.9	01Jan2015, 12:35	38.9
BH-100	0.110825	137.4	01Jan2015, 12:30	21.2
ADD-BH-100	1.1042	854.9	01Jan2015, 12:30	208.5
MLK - Storage	1.1042	840.7	01Jan2015, 12:35	208.4
Reach-BH-100	1.1042	840.4	01Jan2015, 12:35	208.4
Lake Ellen	1.349553	931.3	01Jan2015, 12:55	263.6
BH-110	0.117356	240.6	01Jan2015, 12:10	28
MLK Jr. - Kings Br	0.117356	179.3	01Jan2015, 12:25	28
BH-120	0.02747	52.3	01Jan2015, 12:10	5.3
ADD-BH-120	1.249026	1030	01Jan2015, 12:30	241.7
BH-130	0.100527	139.7	01Jan2015, 12:30	21.9
CB-10	0.144686	139.2	01Jan2015, 12:55	32.2
Reach-CB-10	0.144686	139.1	01Jan2015, 12:55	32.2
CB-20	0.112513	90.6	01Jan2015, 12:45	17.1
ADD-CB-20	0.257199	226.2	01Jan2015, 12:50	49.3
Reach-CB-20	0.257199	223.8	01Jan2015, 13:00	49.3
CB-40	0.051355	121.9	01Jan2015, 12:15	14.8
CB-30	0.026991	36.7	01Jan2015, 12:40	7.2
ADD-CB-30-40	0.335545	276.1	01Jan2015, 13:00	71.3
CB-50	0.072003	115.5	01Jan2015, 12:35	21.7
Municipal Drive	0.072003	115.5	01Jan2015, 12:35	21.7
CB-60	0.031973	66.4	01Jan2015, 12:20	9.4
RT CB-50-60	0.103976	136.1	01Jan2015, 12:50	31.1
ADD-CB-60	0.439521	407.3	01Jan2015, 12:55	102.3
Reach-CB-60	0.439521	404.7	01Jan2015, 13:05	102.3
CB-70	0.149895	156.8	01Jan2015, 12:55	36.7
RT CB-70	0.149895	120.9	01Jan2015, 13:30	36.7
ADD-CB-70	0.589416	516.8	01Jan2015, 13:10	139
Reach-CB-70	0.589416	509.4	01Jan2015, 13:30	138.9
CB-80	0.083068	108.5	01Jan2015, 12:20	15
ADD-CB-80	0.672484	532.5	01Jan2015, 13:25	153.9
Reach-CB-80	0.672484	530.8	01Jan2015, 13:40	153.9
ADD- CB-BH	2.022037	1289.9	01Jan2015, 13:10	417.5
EL-20	0.137538	301.1	01Jan2015, 12:05	26.7
ADD-EL-20	2.159575	1322.4	01Jan2015, 13:05	444.1
Reach-EL-20	2.159575	1322.4	01Jan2015, 13:05	444.1

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

25-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EL-10	0.138871	327.9	01Jan2015, 12:10	31.9
Piney Mountain Rd	0.138871	327.9	01Jan2015, 12:10	31.9
Piney Mountain Rd -Booker Ck	2.298446	1355.9	01Jan2015, 13:10	476
EL-30	0.119754	194	01Jan2015, 12:10	19.4
Reach- EL-30	2.4182	1379.5	01Jan2015, 13:20	495.4
EL-50	0.11573	216	01Jan2015, 12:10	20.8
ADD-EL-50	2.53393	1403.3	01Jan2015, 13:20	516.2
Reach-EL-50	2.53393	1399.7	01Jan2015, 13:30	516
EL-40	0.074895	161.1	01Jan2015, 12:10	15.7
Kensington Drive	0.074895	161.1	01Jan2015, 12:10	15.7
N Lakeshore Dr - Booker Ck	2.608825	1415	01Jan2015, 13:30	531.8
CF-10	0.078889	185.1	01Jan2015, 12:10	19.4
Kingston Drive	0.078889	185.1	01Jan2015, 12:10	19.4
CF-20	0.076885	84.7	01Jan2015, 12:50	19.3
ADD-CF-20	0.155774	218	01Jan2015, 12:10	38.8
Weaver Dairy - Cedar Fk	0.155774	218	01Jan2015, 12:10	38.8
CF-30	0.044849	32	01Jan2015, 13:05	7.8
ADD-CF-30	0.200623	227	01Jan2015, 12:10	46.5
Cross Creek Drive	0.200623	227	01Jan2015, 12:10	46.5
Reach-CF-50	0.200623	222.6	01Jan2015, 12:15	46.5
CF-40	0.092855	95.5	01Jan2015, 12:40	18.1
Weaver Dairy Rd - 1	0.092855	78	01Jan2015, 13:00	18.1
CF-50	0.029148	38.8	01Jan2015, 12:15	4.4
ADD-CF-50	0.322626	286.2	01Jan2015, 12:15	69
CF-60	0.12336	102.4	01Jan2015, 12:50	21.9
Cedar Hills Circle	0.445986	340.4	01Jan2015, 12:45	90.9
Reach-CF-80	0.445986	340.1	01Jan2015, 12:55	90.9
CF-80	0.176821	220.5	01Jan2015, 12:25	30.6
CF-70	0.120239	92.2	01Jan2015, 13:05	23.1
Weaver Dairy Rd -2	0.120239	92.2	01Jan2015, 13:05	23.1
Kenmore Road	0.743046	605.8	01Jan2015, 12:25	144.7
Reach-CF-130	0.743046	603.9	01Jan2015, 12:30	144.7
CF-90	0.184752	161.3	01Jan2015, 12:40	29.1
CF-100	0.085353	151.3	01Jan2015, 12:05	13.3
Piney Mountain Rd - Cedar Fk	0.085353	151.3	01Jan2015, 12:05	13.3
CF-110	0.044111	60.1	01Jan2015, 12:15	7.2
ADD-CF-110	0.129464	201.5	01Jan2015, 12:10	20.5
ADD-CF-90-120	0.314216	277.1	01Jan2015, 12:15	49.6
CF-120	0.096092	221.3	01Jan2015, 12:00	15.2
Brookview Drive	1.153354	892.2	01Jan2015, 12:30	209.4
Reach-CF-140	1.153354	890.8	01Jan2015, 12:30	209.4
CF-130	0.151403	148.8	01Jan2015, 12:35	26
CF-140	0.042477	50.9	01Jan2015, 12:20	6.9
North Lakeshore Drive	1.347234	1081.1	01Jan2015, 12:30	242.4
CF-150	0.050842	85.9	01Jan2015, 12:10	8.2
ADD-CF-150	1.398076	1118	01Jan2015, 12:30	250.6
EL-60	0.142028	181.6	01Jan2015, 12:15	22.5
EL-90	0.100143	200	01Jan2015, 12:10	19.9
EL-70	0.094086	264.9	01Jan2015, 12:00	18.2
EL-80	0.091741	175.1	01Jan2015, 12:10	16.9
EL-100	0.087147	181.8	01Jan2015, 12:15	22.3
Eastwood Lake	4.522046	2187.2	01Jan2015, 13:25	880.8
LBC-10	0.097332	130.2	01Jan2015, 12:20	17.8
U/S Limit - Sierra	0.097332	115.7	01Jan2015, 12:35	17.8
LBC-20	0.084519	133.3	01Jan2015, 12:20	17
ADD-LBC-10-20	0.181851	237.1	01Jan2015, 12:25	34.8

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

25-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-20	0.181851	235.1	01Jan2015, 12:25	34.8
Honeysuckle Road	0.181851	235.1	01Jan2015, 12:25	34.8
Reach-LBC-30	0.181851	232.5	01Jan2015, 12:35	34.8
LBC-30	0.159799	163.3	01Jan2015, 13:00	38.8
Booker Creek Road	0.34165	364.8	01Jan2015, 12:40	73.6
Reach-LBC-40	0.34165	347.2	01Jan2015, 12:50	73.3
LBC-40	0.156492	256.5	01Jan2015, 12:25	39.1
LBC-50	0.022218	41.3	01Jan2015, 12:10	3.9
ADD-LBC-40-50	5.042406	2588.9	01Jan2015, 13:05	997.1
LBC-60	0.142061	267.8	01Jan2015, 12:10	28.6
ADD-LBC-60	5.184467	2640.1	01Jan2015, 13:00	1025.7
Reach-LBC-60	5.184467	2633	01Jan2015, 13:10	1025.1
LBC-70	0.107956	203.1	01Jan2015, 12:10	20.1
LBC-130	0.03607	57.9	01Jan2015, 12:30	9.5
ADD-LBC-70-130	5.328493	2690.5	01Jan2015, 13:05	1054.7
LBC-90	0.115064	140.9	01Jan2015, 12:50	30.9
LBC-80	0.06417	99.6	01Jan2015, 12:30	16.8
Fordham Blvd - Upstream	0.06417	99.6	01Jan2015, 12:30	16.8
LBC-100	0.029058	38.5	01Jan2015, 12:45	8.2
Dobbins Drive	0.208292	268.2	01Jan2015, 12:40	55.8
LBC-110	0.0333	43	01Jan2015, 12:45	9.1
Summerfield Crossing	0.241592	310.2	01Jan2015, 12:45	65
LBC-120	0.049799	59.4	01Jan2015, 12:50	12.8
Foxcroft Drive	0.291391	369.8	01Jan2015, 12:45	77.8
East Franklin Street	5.619884	2987.6	01Jan2015, 13:10	1132.5
LBC-140	0.088638	186.3	01Jan2015, 12:20	25.6
ADD-LBC-140	5.708522	3032.2	01Jan2015, 13:10	1158
Reach-LBC-140	5.708522	2670.1	01Jan2015, 13:35	1153.2
LBC-150	0.107836	164.8	01Jan2015, 12:25	24.4
ADD-LBC-150	5.816358	2702.8	01Jan2015, 13:35	1177.6
LBC-160	0.077625	147.3	01Jan2015, 12:20	21.7
Fordham Blvd - Downstream	5.893983	2723.9	01Jan2015, 13:40	1199.3
LBC-180	0.14221	340.1	01Jan2015, 12:15	40
LBC-170	0.027436	75.5	01Jan2015, 12:10	8.1
ADD-LBC-170-180	6.063629	2763.1	01Jan2015, 13:35	1247.4
Reach-LBC-190	6.063629	2757.3	01Jan2015, 13:45	1247.3
LBC-190	0.05069	79.4	01Jan2015, 12:25	11.6
Willow Drive	6.114319	2771.9	01Jan2015, 13:45	1259
Reach-LBC-200	6.114319	2613.7	01Jan2015, 14:20	1256.4
LBC-200	0.168071	187.6	01Jan2015, 12:45	36.4
ADD-LBC-200	6.28239	2660.6	01Jan2015, 14:15	1292.8
OUTLET	6.28239	2660.6	01Jan2015, 14:15	1292.8

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

50-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	136.3	01Jan2015, 12:45	26.4
BH-20	0.07669	112.6	01Jan2015, 12:25	16.5
ADD-BH-10-20	0.215766	234.9	01Jan2015, 12:35	42.9
Parkside Storage	0.215766	27	01Jan2015, 15:25	40.4
Reach-BH-20	0.215766	27	01Jan2015, 15:35	40.4
BH-30	0.165073	188.3	01Jan2015, 12:50	39.9
ADD-BH-30	0.380839	190.7	01Jan2015, 13:05	80.2
BH-40	0.105607	260.5	01Jan2015, 12:10	25.4
ADD-BH-40	0.486446	291	01Jan2015, 12:10	105.5
Reach-BH-40	0.486446	284.7	01Jan2015, 12:15	105.5
BH-60	0.129437	150.4	01Jan2015, 12:45	30.4
BH-50	0.117491	208	01Jan2015, 12:20	25.8
Weaver Dairy Rd Ext	0.117491	178.5	01Jan2015, 12:30	25.8
Northern Park	0.246928	315.2	01Jan2015, 12:35	56.2
ADD-BH	0.733374	529.7	01Jan2015, 12:20	161.7
BH-70	0.062883	143.8	01Jan2015, 12:10	14.9
MLK Jr. Blvd	0.796257	599.5	01Jan2015, 12:30	176.6
BH-80	0.10254	162.8	01Jan2015, 12:30	25.2
Stateside Drive	0.10254	162.8	01Jan2015, 12:30	25.2
BH-90	0.094578	96.4	01Jan2015, 12:55	20.9
ADD-BH-90	0.197118	240.7	01Jan2015, 12:35	46.2
BH-100	0.110825	164.5	01Jan2015, 12:30	25.2
ADD-BH-100	1.1042	1002.8	01Jan2015, 12:30	248
MLK - Storage	1.1042	979	01Jan2015, 12:35	247.9
Reach-BH-100	1.1042	978.4	01Jan2015, 12:35	247.9
Lake Ellen	1.349553	1036.1	01Jan2015, 13:00	312.4
BH-110	0.117356	280.8	01Jan2015, 12:10	32.5
MLK Jr. - Kings Br	0.117356	209.1	01Jan2015, 12:25	32.5
BH-120	0.02747	62.6	01Jan2015, 12:10	6.3
ADD-BH-120	1.249026	1191.6	01Jan2015, 12:30	286.6
BH-130	0.100527	164.7	01Jan2015, 12:30	25.8
CB-10	0.144686	163.8	01Jan2015, 12:55	37.7
Reach-CB-10	0.144686	163.8	01Jan2015, 12:55	37.7
CB-20	0.112513	111.8	01Jan2015, 12:45	20.9
ADD-CB-20	0.257199	271.2	01Jan2015, 12:50	58.6
Reach-CB-20	0.257199	268.2	01Jan2015, 13:00	58.5
CB-40	0.051355	139.5	01Jan2015, 12:15	16.9
CB-30	0.026991	42.3	01Jan2015, 12:40	8.3
ADD-CB-30-40	0.335545	322.2	01Jan2015, 13:05	83.7
CB-50	0.072003	131.5	01Jan2015, 12:35	24.7
Municipal Drive	0.072003	131.5	01Jan2015, 12:35	24.7
CB-60	0.031973	75.8	01Jan2015, 12:20	10.7
RT CB-50-60	0.103976	153.7	01Jan2015, 12:50	35.4
ADD-CB-60	0.439521	469.9	01Jan2015, 13:00	119.1
Reach-CB-60	0.439521	466.8	01Jan2015, 13:05	119.1
CB-70	0.149895	182.6	01Jan2015, 12:55	42.6
RT CB-70	0.149895	139.4	01Jan2015, 13:30	42.6
ADD-CB-70	0.589416	597.1	01Jan2015, 13:10	161.8
Reach-CB-70	0.589416	589.4	01Jan2015, 13:30	161.7
CB-80	0.083068	131	01Jan2015, 12:20	17.9
ADD-CB-80	0.672484	615.6	01Jan2015, 13:25	179.6
Reach-CB-80	0.672484	614.5	01Jan2015, 13:40	179.6
ADD- CB-BH	2.022037	1575.8	01Jan2015, 13:15	492
EL-20	0.137538	359.9	01Jan2015, 12:05	31.7
ADD-EL-20	2.159575	1610.2	01Jan2015, 13:15	523.7
Reach-EL-20	2.159575	1610	01Jan2015, 13:15	523.7

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

50-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EL-10	0.138871	383.6	01Jan2015, 12:10	37.3
Piney Mountain Rd	0.138871	383.6	01Jan2015, 12:10	37.3
Piney Mountain Rd -Booker Ck	2.298446	1643.3	01Jan2015, 13:20	561
EL-30	0.119754	237.1	01Jan2015, 12:10	23.5
Reach- EL-30	2.4182	1668.1	01Jan2015, 13:25	584.3
EL-50	0.11573	260.2	01Jan2015, 12:10	24.9
ADD-EL-50	2.53393	1694.2	01Jan2015, 13:25	609.2
Reach-EL-50	2.53393	1688.6	01Jan2015, 13:35	609
EL-40	0.074895	190.6	01Jan2015, 12:10	18.6
Kensington Drive	0.074895	190.6	01Jan2015, 12:10	18.6
N Lakeshore Dr - Booker Ck	2.608825	1705.4	01Jan2015, 13:35	627.6
CF-10	0.078889	215	01Jan2015, 12:10	22.4
Kingston Drive	0.078889	215	01Jan2015, 12:10	22.4
CF-20	0.076885	98.4	01Jan2015, 12:50	22.4
ADD-CF-20	0.155774	253.5	01Jan2015, 12:10	44.8
Weaver Dairy - Cedar Fk	0.155774	253.5	01Jan2015, 12:10	44.8
CF-30	0.044849	38.9	01Jan2015, 13:00	9.3
ADD-CF-30	0.200623	264.9	01Jan2015, 12:10	54.1
Cross Creek Drive	0.200623	264.9	01Jan2015, 12:10	54.1
Reach-CF-50	0.200623	259.6	01Jan2015, 12:15	54.1
CF-40	0.092855	114.1	01Jan2015, 12:40	21.5
Weaver Dairy Rd - 1	0.092855	93.3	01Jan2015, 13:00	21.5
CF-50	0.029148	47.9	01Jan2015, 12:15	5.3
ADD-CF-50	0.322626	338	01Jan2015, 12:15	81
CF-60	0.12336	123.8	01Jan2015, 12:50	26.2
Cedar Hills Circle	0.445986	405.3	01Jan2015, 12:45	107.2
Reach-CF-80	0.445986	404.9	01Jan2015, 12:50	107.2
CF-80	0.176821	267.1	01Jan2015, 12:25	36.8
CF-70	0.120239	110.3	01Jan2015, 13:05	27.5
Weaver Dairy Rd -2	0.120239	110.3	01Jan2015, 13:05	27.5
Kenmore Road	0.743046	727	01Jan2015, 12:25	171.4
Reach-CF-130	0.743046	725.5	01Jan2015, 12:30	171.5
CF-90	0.184752	198.1	01Jan2015, 12:40	35.3
CF-100	0.085353	186	01Jan2015, 12:05	16.2
Piney Mountain Rd - Cedar Fk	0.085353	186	01Jan2015, 12:05	16.2
CF-110	0.044111	73.6	01Jan2015, 12:15	8.7
ADD-CF-110	0.129464	246.6	01Jan2015, 12:10	24.9
ADD-CF-90-120	0.314216	341.8	01Jan2015, 12:10	60.2
CF-120	0.096092	270.7	01Jan2015, 12:00	18.4
Brookview Drive	1.153354	1075.7	01Jan2015, 12:30	250
Reach-CF-140	1.153354	1074	01Jan2015, 12:30	250
CF-130	0.151403	180.9	01Jan2015, 12:35	31.4
CF-140	0.042477	62.2	01Jan2015, 12:20	8.3
North Lakeshore Drive	1.347234	1305.9	01Jan2015, 12:30	289.7
CF-150	0.050842	104.8	01Jan2015, 12:10	9.9
ADD-CF-150	1.398076	1350.4	01Jan2015, 12:30	299.7
EL-60	0.142028	223.1	01Jan2015, 12:15	27.3
EL-90	0.100143	238.1	01Jan2015, 12:10	23.7
EL-70	0.094086	316	01Jan2015, 12:00	21.7
EL-80	0.091741	210.3	01Jan2015, 12:10	20.2
EL-100	0.087147	210.1	01Jan2015, 12:15	25.9
Eastwood Lake	4.522046	2601.5	01Jan2015, 13:25	1044.3
LBC-10	0.097332	157	01Jan2015, 12:20	21.3
U/S Limit - Sierra	0.097332	138.8	01Jan2015, 12:35	21.3
LBC-20	0.084519	158.6	01Jan2015, 12:20	20.1
ADD-LBC-10-20	0.181851	282.6	01Jan2015, 12:25	41.4

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

50-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-20	0.181851	280.1	01Jan2015, 12:25	41.4
Honeysuckle Road	0.181851	280.1	01Jan2015, 12:25	41.4
Reach-LBC-30	0.181851	276.6	01Jan2015, 12:35	41.4
LBC-30	0.159799	190.1	01Jan2015, 13:00	45.2
Booker Creek Road	0.34165	430.5	01Jan2015, 12:40	86.6
Reach-LBC-40	0.34165	409.7	01Jan2015, 12:50	86.3
LBC-40	0.156492	297.7	01Jan2015, 12:25	45.4
LBC-50	0.022218	49.8	01Jan2015, 12:10	4.7
ADD-LBC-40-50	5.042406	3159.2	01Jan2015, 12:50	1180.7
LBC-60	0.142061	318.9	01Jan2015, 12:10	33.9
ADD-LBC-60	5.184467	3241.2	01Jan2015, 12:50	1214.6
Reach-LBC-60	5.184467	3213.6	01Jan2015, 13:00	1213.9
LBC-70	0.107956	243.8	01Jan2015, 12:10	24
LBC-130	0.03607	66.8	01Jan2015, 12:30	10.9
ADD-LBC-70-130	5.328493	3293	01Jan2015, 12:55	1248.8
LBC-90	0.115064	162.3	01Jan2015, 12:50	35.6
LBC-80	0.06417	115.1	01Jan2015, 12:30	19.4
Fordham Blvd - Upstream	0.06417	115.1	01Jan2015, 12:30	19.4
LBC-100	0.029058	44.2	01Jan2015, 12:45	9.4
Dobbins Drive	0.208292	309.1	01Jan2015, 12:40	64.3
LBC-110	0.0333	49.4	01Jan2015, 12:45	10.5
Summerfield Crossing	0.241592	357.8	01Jan2015, 12:40	74.8
LBC-120	0.049799	68.7	01Jan2015, 12:50	14.9
Foxcroft Drive	0.291391	428.1	01Jan2015, 12:45	89.7
East Franklin Street	5.619884	3631.9	01Jan2015, 13:05	1338.5
LBC-140	0.088638	213	01Jan2015, 12:20	29.2
ADD-LBC-140	5.708522	3690	01Jan2015, 13:05	1367.7
Reach-LBC-140	5.708522	3221.6	01Jan2015, 13:30	1361.3
LBC-150	0.107836	193.4	01Jan2015, 12:25	28.5
ADD-LBC-150	5.816358	3263.1	01Jan2015, 13:30	1389.9
LBC-160	0.077625	169	01Jan2015, 12:20	24.9
Fordham Blvd - Downstream	5.893983	3289.6	01Jan2015, 13:35	1414.7
LBC-180	0.14221	389.5	01Jan2015, 12:15	45.9
LBC-170	0.027436	86.1	01Jan2015, 12:10	9.2
ADD-LBC-170-180	6.063629	3338.6	01Jan2015, 13:30	1469.8
Reach-LBC-190	6.063629	3330.9	01Jan2015, 13:40	1469.5
LBC-190	0.05069	93	01Jan2015, 12:25	13.6
Willow Drive	6.114319	3349.2	01Jan2015, 13:40	1483.2
Reach-LBC-200	6.114319	3181.7	01Jan2015, 14:15	1479.8
LBC-200	0.168071	221.3	01Jan2015, 12:45	42.9
ADD-LBC-200	6.28239	3238.7	01Jan2015, 14:10	1522.7
OUTLET	6.28239	3238.7	01Jan2015, 14:10	1522.7

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

100-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
BH-10	0.139076	162.2	01Jan2015, 12:40	31.1
BH-20	0.07669	132.1	01Jan2015, 12:25	19.3
ADD-BH-10-20	0.215766	277.9	01Jan2015, 12:35	50.4
Parkside Storage	0.215766	30.1	01Jan2015, 15:35	47.4
Reach-BH-20	0.215766	30.1	01Jan2015, 15:40	47.4
BH-30	0.165073	218.2	01Jan2015, 12:50	46.1
ADD-BH-30	0.380839	224.3	01Jan2015, 13:05	93.4
BH-40	0.105607	301.7	01Jan2015, 12:10	29.3
ADD-BH-40	0.486446	338.3	01Jan2015, 12:10	122.7
Reach-BH-40	0.486446	330.3	01Jan2015, 12:15	122.6
BH-60	0.129437	174.9	01Jan2015, 12:45	35.2
BH-50	0.117491	243.2	01Jan2015, 12:20	30.1
Weaver Dairy Rd Ext	0.117491	206.1	01Jan2015, 12:30	30.1
Northern Park	0.246928	366	01Jan2015, 12:35	65.3
ADD-BH	0.733374	616.8	01Jan2015, 12:20	187.9
BH-70	0.062883	167	01Jan2015, 12:10	17.2
MLK Jr. Blvd	0.796257	703.5	01Jan2015, 12:25	205.1
BH-80	0.10254	188.2	01Jan2015, 12:30	29.1
Stateside Drive	0.10254	188.2	01Jan2015, 12:30	29.1
BH-90	0.094578	112.9	01Jan2015, 12:50	24.4
ADD-BH-90	0.197118	279.8	01Jan2015, 12:35	53.5
BH-100	0.110825	191.7	01Jan2015, 12:30	29.3
ADD-BH-100	1.1042	1171.5	01Jan2015, 12:30	287.9
MLK - Storage	1.1042	1133.8	01Jan2015, 12:35	287.8
Reach-BH-100	1.1042	1133	01Jan2015, 12:35	287.8
Lake Ellen	1.349553	1045.5	01Jan2015, 13:10	361.6
BH-110	0.117356	321	01Jan2015, 12:10	36.9
MLK Jr. - Kings Br	0.117356	224.8	01Jan2015, 12:25	36.9
BH-120	0.02747	72.9	01Jan2015, 12:10	7.3
ADD-BH-120	1.249026	1376.7	01Jan2015, 12:35	332
BH-130	0.100527	189.6	01Jan2015, 12:30	29.7
CB-10	0.144686	188.5	01Jan2015, 12:55	43.2
Reach-CB-10	0.144686	188.4	01Jan2015, 12:55	43.2
CB-20	0.112513	133.6	01Jan2015, 12:40	24.8
ADD-CB-20	0.257199	316.5	01Jan2015, 12:50	68
Reach-CB-20	0.257199	313.3	01Jan2015, 13:00	68
CB-40	0.051355	156.8	01Jan2015, 12:15	19
CB-30	0.026991	47.8	01Jan2015, 12:40	9.4
ADD-CB-30-40	0.335545	371.5	01Jan2015, 13:05	96.3
CB-50	0.072003	147.3	01Jan2015, 12:35	27.7
Municipal Drive	0.072003	147.3	01Jan2015, 12:35	27.7
CB-60	0.031973	85.1	01Jan2015, 12:20	12
RT CB-50-60	0.103976	168.3	01Jan2015, 12:50	39.7
ADD-CB-60	0.439521	533.6	01Jan2015, 13:00	136
Reach-CB-60	0.439521	530.6	01Jan2015, 13:10	136
CB-70	0.149895	208.2	01Jan2015, 12:55	48.6
RT CB-70	0.149895	157.9	01Jan2015, 13:30	48.6
ADD-CB-70	0.589416	678.6	01Jan2015, 13:10	184.6
Reach-CB-70	0.589416	671.3	01Jan2015, 13:30	184.5
CB-80	0.083068	153.8	01Jan2015, 12:20	20.9
ADD-CB-80	0.672484	701.1	01Jan2015, 13:30	205.4
Reach-CB-80	0.672484	699.5	01Jan2015, 13:40	205.4
ADD- CB-BH	2.022037	1738.3	01Jan2015, 13:40	567
EL-20	0.137538	418.9	01Jan2015, 12:05	36.8
ADD-EL-20	2.159575	1769.1	01Jan2015, 13:40	603.8
Reach-EL-20	2.159575	1769.1	01Jan2015, 13:40	603.8

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

100-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EL-10	0.138871	439.1	01Jan2015, 12:10	42.7
Piney Mountain Rd	0.138871	439.1	01Jan2015, 12:10	42.7
Piney Mountain Rd -Booker Ck	2.298446	1803.1	01Jan2015, 13:40	646.5
EL-30	0.119754	280.8	01Jan2015, 12:10	27.6
Reach- EL-30	2.4182	1827.7	01Jan2015, 13:45	674
EL-50	0.11573	304.7	01Jan2015, 12:10	29.1
ADD-EL-50	2.53393	1852.4	01Jan2015, 13:45	703.1
Reach-EL-50	2.53393	1850.7	01Jan2015, 13:55	703
EL-40	0.074895	219.9	01Jan2015, 12:10	21.4
Kensington Drive	0.074895	219.9	01Jan2015, 12:10	21.4
N Lakeshore Dr - Booker Ck	2.608825	1866.6	01Jan2015, 13:55	724.4
CF-10	0.078889	244.9	01Jan2015, 12:10	25.5
Kingston Drive	0.078889	244.9	01Jan2015, 12:10	25.5
CF-20	0.076885	112	01Jan2015, 12:50	25.4
ADD-CF-20	0.155774	289.1	01Jan2015, 12:10	50.9
Weaver Dairy - Cedar Fk	0.155774	289.1	01Jan2015, 12:10	50.9
CF-30	0.044849	45.9	01Jan2015, 13:00	10.9
ADD-CF-30	0.200623	302.9	01Jan2015, 12:10	61.8
Cross Creek Drive	0.200623	302.9	01Jan2015, 12:10	61.8
Reach-CF-50	0.200623	296.9	01Jan2015, 12:15	61.8
CF-40	0.092855	132.9	01Jan2015, 12:40	24.9
Weaver Dairy Rd - 1	0.092855	108.7	01Jan2015, 13:00	24.9
CF-50	0.029148	57.2	01Jan2015, 12:15	6.3
ADD-CF-50	0.322626	390.2	01Jan2015, 12:15	93
CF-60	0.12336	145.6	01Jan2015, 12:50	30.6
Cedar Hills Circle	0.445986	470.7	01Jan2015, 12:45	123.6
Reach-CF-80	0.445986	469.9	01Jan2015, 12:50	123.6
CF-80	0.176821	314.2	01Jan2015, 12:25	43.1
CF-70	0.120239	128.6	01Jan2015, 13:05	31.8
Weaver Dairy Rd -2	0.120239	128.6	01Jan2015, 13:05	31.8
Kenmore Road	0.743046	845	01Jan2015, 12:25	198.5
Reach-CF-130	0.743046	843.3	01Jan2015, 12:30	198.5
CF-90	0.184752	235.5	01Jan2015, 12:40	41.7
CF-100	0.085353	221.2	01Jan2015, 12:05	19.2
Piney Mountain Rd - Cedar Fk	0.085353	221.2	01Jan2015, 12:05	19.2
CF-110	0.044111	87.3	01Jan2015, 12:15	10.2
ADD-CF-110	0.129464	292.3	01Jan2015, 12:10	29.3
ADD-CF-90-120	0.314216	408	01Jan2015, 12:10	71
CF-120	0.096092	320.8	01Jan2015, 12:00	21.7
Brookview Drive	1.153354	1256.8	01Jan2015, 12:30	291.2
Reach-CF-140	1.153354	1255.3	01Jan2015, 12:30	291.2
CF-130	0.151403	213.3	01Jan2015, 12:35	36.8
CF-140	0.042477	73.8	01Jan2015, 12:20	9.8
North Lakeshore Drive	1.347234	1529.2	01Jan2015, 12:30	337.8
CF-150	0.050842	124	01Jan2015, 12:10	11.7
ADD-CF-150	1.398076	1581.3	01Jan2015, 12:30	349.5
EL-60	0.142028	265.5	01Jan2015, 12:15	32.1
EL-90	0.100143	276.3	01Jan2015, 12:10	27.4
EL-70	0.094086	367.2	01Jan2015, 12:00	25.2
EL-80	0.091741	245.8	01Jan2015, 12:10	23.5
EL-100	0.087147	238	01Jan2015, 12:15	29.4
Eastwood Lake	4.522046	2823.1	01Jan2015, 13:25	1209.7
LBC-10	0.097332	184.1	01Jan2015, 12:20	24.8
U/S Limit - Sierra	0.097332	155.7	01Jan2015, 12:35	24.8
LBC-20	0.084519	183.9	01Jan2015, 12:20	23.3
ADD-LBC-10-20	0.181851	324.6	01Jan2015, 12:25	48.1

Town of Chapel Hill -Eastwood Lake Subwatershed Study - HMS Output

100-YEAR ALTERNATIVE				
Hydrologic Element	Drainage Area (mi²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-LBC-20	0.181851	322.6	01Jan2015, 12:25	48.1
Honeysuckle Road	0.181851	322.6	01Jan2015, 12:25	48.1
Reach-LBC-30	0.181851	318.6	01Jan2015, 12:30	48.1
LBC-30	0.159799	216.8	01Jan2015, 13:00	51.5
Booker Creek Road	0.34165	491.7	01Jan2015, 12:40	99.7
Reach-LBC-40	0.34165	469.8	01Jan2015, 12:50	99.4
LBC-40	0.156492	338.5	01Jan2015, 12:25	51.7
LBC-50	0.022218	58.5	01Jan2015, 12:10	5.5
ADD-LBC-40-50	5.042406	3426	01Jan2015, 12:50	1366.2
LBC-60	0.142061	370.1	01Jan2015, 12:10	39.2
ADD-LBC-60	5.184467	3535.7	01Jan2015, 12:40	1405.4
Reach-LBC-60	5.184467	3522.5	01Jan2015, 12:50	1404.7
LBC-70	0.107956	284.7	01Jan2015, 12:10	27.9
LBC-130	0.03607	75.6	01Jan2015, 12:30	12.4
ADD-LBC-70-130	5.328493	3639.2	01Jan2015, 12:50	1445
LBC-90	0.115064	183.5	01Jan2015, 12:50	40.2
LBC-80	0.06417	130.4	01Jan2015, 12:30	22
Fordham Blvd - Upstream	0.06417	130.4	01Jan2015, 12:30	22
LBC-100	0.029058	49.7	01Jan2015, 12:45	10.6
Dobbins Drive	0.208292	349.5	01Jan2015, 12:40	72.8
LBC-110	0.0333	55.7	01Jan2015, 12:45	11.9
Summerfield Crossing	0.241592	404	01Jan2015, 12:45	84.7
LBC-120	0.049799	77.9	01Jan2015, 12:50	16.9
Foxcroft Drive	0.291391	479.8	01Jan2015, 12:40	101.5
East Franklin Street	5.619884	4040.6	01Jan2015, 13:00	1546.6
LBC-140	0.088638	239.4	01Jan2015, 12:20	32.8
ADD-LBC-140	5.708522	4115.9	01Jan2015, 13:00	1579.4
Reach-LBC-140	5.708522	3586.8	01Jan2015, 13:30	1572
LBC-150	0.107836	222.1	01Jan2015, 12:25	32.6
ADD-LBC-150	5.816358	3638.5	01Jan2015, 13:25	1604.6
LBC-160	0.077625	190.6	01Jan2015, 12:20	28
Fordham Blvd - Downstream	5.893983	3672.7	01Jan2015, 13:30	1632.7
LBC-180	0.14221	438.4	01Jan2015, 12:15	51.7
LBC-170	0.027436	96.5	01Jan2015, 12:10	10.3
ADD-LBC-170-180	6.063629	3731.9	01Jan2015, 13:25	1694.7
Reach-LBC-190	6.063629	3723.8	01Jan2015, 13:35	1694.5
LBC-190	0.05069	106.5	01Jan2015, 12:25	15.6
Willow Drive	6.114319	3747.7	01Jan2015, 13:30	1710.2
Reach-LBC-200	6.114319	3565.6	01Jan2015, 14:10	1706.1
LBC-200	0.168071	254.9	01Jan2015, 12:45	49.5
ADD-LBC-200	6.28239	3636.5	01Jan2015, 14:05	1755.6
OUTLET	6.28239	3636.5	01Jan2015, 14:05	1755.6

**EXISTING CONDITIONS:
HEC-RAS OUTPUT**

HEC-RAS Plan: Existing

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	26670.3	2-Year	197.00	470.17	472.19	472.19	472.93	0.028175	6.92	28.46	19.44	1.01
Reach - 1	26670.3	10-Year	446.00	470.17	473.97		474.65	0.010760	6.60	68.07	25.76	0.68
Reach - 1	26670.3	25-Year	608.00	470.17	475.71		476.17	0.003984	5.50	127.45	46.54	0.45
Reach - 1	26670.3	50-Year	739.00	470.17	476.66		477.07	0.002927	5.33	200.16	97.44	0.40
Reach - 1	26670.3	100-Year	872.00	470.17	477.55		477.91	0.002202	5.11	317.04	145.99	0.35
Reach - 1	26133.4	2-Year	197.00	467.03	470.88	468.57	470.95	0.000797	2.17	106.64	43.71	0.20
Reach - 1	26133.4	10-Year	446.00	467.03	473.28	469.48	473.40	0.000715	2.88	186.17	56.17	0.21
Reach - 1	26133.4	25-Year	608.00	467.03	475.30	469.97	475.42	0.000495	2.91	253.29	66.15	0.18
Reach - 1	26133.4	50-Year	739.00	467.03	476.26	470.32	476.40	0.000499	3.15	285.07	70.88	0.19
Reach - 1	26133.4	100-Year	872.00	467.03	477.15	470.65	477.31	0.000504	3.37	314.76	132.75	0.19
Reach - 1	26050.4		Culvert									
Reach - 1	25967.4	2-Year	197.00	463.47	465.50	465.01	465.82	0.008982	4.55	46.78	31.23	0.60
Reach - 1	25967.4	10-Year	446.00	463.47	466.57	465.93	467.16	0.009141	6.28	81.70	38.57	0.66
Reach - 1	25967.4	25-Year	608.00	463.47	467.12	466.41	467.87	0.009287	7.11	99.84	42.31	0.68
Reach - 1	25967.4	50-Year	739.00	463.47	467.50	466.76	468.38	0.009542	7.74	112.42	44.91	0.70
Reach - 1	25967.4	100-Year	872.00	463.47	467.84	467.09	468.86	0.009853	8.33	123.83	46.90	0.72
Reach - 1	25524.2	2-Year	197.00	456.43	458.45	458.45	459.19	0.028097	6.92	28.48	19.45	1.01
Reach - 1	25524.2	10-Year	446.00	456.43	459.55	459.55	460.70	0.025022	8.62	51.76	22.95	1.01
Reach - 1	25524.2	25-Year	608.00	456.43	460.09	460.09	461.48	0.023420	9.45	64.78	24.79	1.00
Reach - 1	25524.2	50-Year	739.00	456.43	460.50	460.50	462.04	0.021907	9.99	76.21	29.95	0.99
Reach - 1	25524.2	100-Year	872.00	456.43	460.89	460.89	462.58	0.020451	10.44	88.69	33.47	0.98
Reach - 1	24962.5	2-Year	197.00	444.33	447.13		447.43	0.007515	4.41	44.70	21.94	0.54
Reach - 1	24962.5	10-Year	446.00	444.33	448.26		448.88	0.009297	6.32	71.53	25.92	0.64
Reach - 1	24962.5	25-Year	608.00	444.33	448.77		449.61	0.010186	7.34	85.48	28.24	0.69
Reach - 1	24962.5	50-Year	739.00	444.33	449.07		450.11	0.011482	8.22	94.00	29.56	0.74
Reach - 1	24962.5	100-Year	872.00	444.33	449.38	448.77	450.62	0.012239	8.95	103.52	30.97	0.77
Reach - 1	24504.7	2-Year	335.00	437.03	439.67	439.67	440.62	0.025146	7.84	43.25	24.95	1.00
Reach - 1	24504.7	10-Year	734.00	437.03	441.09	441.09	442.48	0.018388	9.54	89.78	47.57	0.93
Reach - 1	24504.7	25-Year	979.00	437.03	441.76	441.76	443.33	0.016577	10.27	125.63	59.11	0.92
Reach - 1	24504.7	50-Year	1158.00	437.03	442.24	442.24	443.87	0.015093	10.59	156.00	66.99	0.89
Reach - 1	24504.7	100-Year	1321.00	437.03	442.58	442.58	444.31	0.014749	11.00	179.27	69.44	0.89

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	23991.1	2-Year	335.00	426.45	431.80		431.93	0.001247	2.99	195.94	179.29	0.25
Reach - 1	23991.1	10-Year	734.00	426.45	433.36		433.52	0.001300	3.73	531.35	239.95	0.27
Reach - 1	23991.1	25-Year	979.00	426.45	434.13		434.28	0.001220	3.92	718.05	249.89	0.27
Reach - 1	23991.1	50-Year	1158.00	426.45	434.64		434.79	0.001168	4.02	848.62	259.20	0.26
Reach - 1	23991.1	100-Year	1321.00	426.45	435.07		435.22	0.001125	4.10	962.05	262.74	0.26
Reach - 1	23524.2	2-Year	335.00	425.63	431.51		431.56	0.000489	2.02	409.71	180.60	0.16
Reach - 1	23524.2	10-Year	734.00	425.63	432.99		433.06	0.000692	2.86	710.53	215.80	0.20
Reach - 1	23524.2	25-Year	979.00	425.63	433.74		433.83	0.000728	3.15	874.46	219.46	0.21
Reach - 1	23524.2	50-Year	1158.00	425.63	434.25		434.34	0.000742	3.33	986.56	221.90	0.21
Reach - 1	23524.2	100-Year	1321.00	425.63	434.68		434.78	0.000751	3.48	1083.48	223.99	0.21
Reach - 1	23024.2	2-Year	335.00	425.63	431.36		431.37	0.000261	1.45	756.07	321.19	0.12
Reach - 1	23024.2	10-Year	734.00	425.63	432.79		432.81	0.000335	1.95	1223.88	331.58	0.14
Reach - 1	23024.2	25-Year	979.00	425.63	433.54		433.56	0.000349	2.14	1473.56	336.73	0.14
Reach - 1	23024.2	50-Year	1158.00	425.63	434.04		434.07	0.000358	2.27	1645.64	344.21	0.15
Reach - 1	23024.2	100-Year	1321.00	425.63	434.48		434.51	0.000362	2.37	1796.09	348.83	0.15
Reach - 1	22524.2	2-Year	335.00	419.97	431.31		431.32	0.000053	1.09	588.22	92.11	0.06
Reach - 1	22524.2	10-Year	734.00	419.97	432.65		432.70	0.000162	2.06	720.25	109.97	0.11
Reach - 1	22524.2	25-Year	979.00	419.97	433.34		433.42	0.000231	2.56	799.99	122.67	0.13
Reach - 1	22524.2	50-Year	1158.00	419.97	433.81		433.91	0.000280	2.89	859.53	131.22	0.14
Reach - 1	22524.2	100-Year	1321.00	419.97	434.21		434.33	0.000322	3.16	913.90	138.57	0.15
Reach - 1	22396.4	2-Year	335.00	420.03	431.32	421.57	431.32	0.000000	0.06	5409.63	747.78	0.00
Reach - 1	22396.4	10-Year	734.00	420.03	432.68	422.03	432.68	0.000001	0.12	6429.89	768.39	0.01
Reach - 1	22396.4	25-Year	979.00	420.03	433.39	422.22	433.39	0.000001	0.14	6967.91	779.13	0.01
Reach - 1	22396.4	50-Year	1158.00	420.03	433.88	422.33	433.88	0.000001	0.16	7334.86	786.41	0.01
Reach - 1	22396.4	100-Year	1321.00	420.03	434.29	422.41	434.29	0.000001	0.18	7652.15	792.67	0.01
Reach - 1	22383.4		Inl Struct									
Reach - 1	22370.4	2-Year	335.00	425.91	428.09	428.09	428.79	0.027750	6.70	49.97	36.65	1.01
Reach - 1	22370.4	10-Year	734.00	425.91	429.57		430.26	0.012730	6.66	110.27	45.20	0.75
Reach - 1	22370.4	25-Year	979.00	425.91	430.72		431.26	0.006956	5.88	166.36	51.90	0.58
Reach - 1	22370.4	50-Year	1158.00	425.91	431.62		432.07	0.004718	5.39	214.98	57.07	0.49
Reach - 1	22370.4	100-Year	1321.00	425.91	432.32		432.73	0.003751	5.15	256.35	61.13	0.44

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	22255.4	2-Year	335.00	422.25	426.88	425.49	427.23	0.004275	4.73	75.34	25.36	0.45
Reach - 1	22255.4	10-Year	734.00	422.25	428.74	426.89	429.41	0.004711	6.63	126.42	29.66	0.51
Reach - 1	22255.4	25-Year	979.00	422.25	429.67	427.61	430.51	0.004810	7.47	155.16	32.18	0.53
Reach - 1	22255.4	50-Year	1158.00	422.25	430.53	428.09	431.42	0.004311	7.70	183.74	34.51	0.51
Reach - 1	22255.4	100-Year	1321.00	422.25	431.13	428.51	432.10	0.004228	8.06	205.77	38.38	0.51
Reach - 1	22230.4	Bridge										
Reach - 1	22205.4	2-Year	335.00	421.56	424.80	424.80	425.80	0.024676	8.03	42.30	22.14	0.99
Reach - 1	22205.4	10-Year	734.00	421.56	426.19	426.19	427.85	0.020547	10.37	75.31	25.36	0.99
Reach - 1	22205.4	25-Year	979.00	421.56	426.91	426.91	428.90	0.019160	11.37	94.15	27.03	0.99
Reach - 1	22205.4	50-Year	1158.00	421.56	427.40	427.40	429.60	0.018384	12.00	107.56	28.15	0.98
Reach - 1	22205.4	100-Year	1321.00	421.56	427.82	427.82	430.20	0.017807	12.51	119.56	29.13	0.98
Reach - 1	22061.4	2-Year	335.00	400.80	403.48	403.48	404.47	0.038849	7.97	42.01	21.54	1.01
Reach - 1	22061.4	10-Year	734.00	400.80	404.82	404.82	406.41	0.034076	10.10	72.79	23.67	1.01
Reach - 1	22061.4	25-Year	979.00	400.80	405.49	405.49	407.40	0.031711	11.09	88.80	24.24	1.00
Reach - 1	22061.4	50-Year	1158.00	400.80	405.95	405.95	408.07	0.030197	11.68	100.10	24.64	1.00
Reach - 1	22061.4	100-Year	1321.00	400.80	406.35	406.35	408.65	0.029142	12.18	109.96	24.98	1.00
Reach - 1	21877	2-Year	335.00	390.67	392.59	392.59	393.27	0.037863	6.77	50.48	39.23	1.04
Reach - 1	21877	10-Year	734.00	390.67	393.48	393.48	394.34	0.031487	8.32	103.91	67.05	1.02
Reach - 1	21877	25-Year	979.00	390.67	394.05	394.05	394.82	0.023743	8.27	158.73	143.93	0.91
Reach - 1	21877	50-Year	1158.00	390.67	394.36	394.22	395.10	0.021164	8.37	204.42	147.31	0.88
Reach - 1	21877	100-Year	1321.00	390.67	394.70	394.38	395.38	0.017359	8.18	256.10	152.14	0.81
Reach - 1	21577.4	2-Year	505.00	383.59	388.70		389.06	0.005421	4.92	134.56	97.13	0.42
Reach - 1	21577.4	10-Year	1018.00	383.59	390.07		390.59	0.006296	6.40	290.64	125.31	0.48
Reach - 1	21577.4	25-Year	1318.00	383.59	390.59		391.21	0.006952	7.13	357.09	130.82	0.51
Reach - 1	21577.4	50-Year	1600.00	383.59	390.94		391.68	0.008035	7.95	403.47	140.66	0.55
Reach - 1	21577.4	100-Year	1837.00	383.59	391.26		392.06	0.008401	8.40	449.64	144.66	0.57
Reach - 1	21329	2-Year	505.00	380.12	384.85	384.85	386.24	0.032187	9.46	53.36	19.50	1.01
Reach - 1	21329	10-Year	1018.00	380.12	387.16	387.16	388.24	0.014903	8.77	205.13	173.78	0.74
Reach - 1	21329	25-Year	1318.00	380.12	387.71	387.71	388.79	0.013865	9.16	315.26	221.71	0.73
Reach - 1	21329	50-Year	1600.00	380.12	388.18	388.18	389.19	0.012531	9.25	428.29	252.63	0.70
Reach - 1	21329	100-Year	1837.00	380.12	388.41	388.41	389.47	0.013058	9.71	486.12	257.96	0.72

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	21024.2	2-Year	505.00	375.87	381.38		381.72	0.003570	4.67	113.78	29.56	0.38
Reach - 1	21024.2	10-Year	1018.00	375.87	384.84		385.07	0.001445	4.31	618.84	320.72	0.27
Reach - 1	21024.2	25-Year	1318.00	375.87	387.01		387.09	0.000532	3.06	1423.46	392.17	0.17
Reach - 1	21024.2	50-Year	1600.00	375.87	387.66		387.74	0.000529	3.18	1681.51	397.20	0.17
Reach - 1	21024.2	100-Year	1837.00	375.87	388.10		388.19	0.000546	3.32	1857.15	401.43	0.17
Reach - 1	20803	2-Year	505.00	373.95	379.83		380.47	0.009640	6.41	78.79	19.94	0.57
Reach - 1	20803	10-Year	1018.00	373.95	384.38		384.68	0.002085	4.86	416.91	136.96	0.30
Reach - 1	20803	25-Year	1318.00	373.95	386.74		386.92	0.001045	4.06	842.82	241.47	0.22
Reach - 1	20803	50-Year	1600.00	373.95	387.37		387.56	0.001141	4.40	1002.40	269.10	0.23
Reach - 1	20803	100-Year	1837.00	373.95	387.78		388.00	0.001239	4.70	1117.23	287.34	0.24
Reach - 1	20582.7	2-Year	505.00	372.04	379.71		379.85	0.000921	3.06	221.12	70.88	0.21
Reach - 1	20582.7	10-Year	1018.00	372.04	384.39		384.46	0.000342	2.65	1042.40	258.89	0.14
Reach - 1	20582.7	25-Year	1318.00	372.04	386.74		386.79	0.000207	2.33	1701.03	302.02	0.11
Reach - 1	20582.7	50-Year	1600.00	372.04	387.37		387.42	0.000239	2.58	1891.36	309.48	0.12
Reach - 1	20582.7	100-Year	1837.00	372.04	387.78		387.84	0.000269	2.79	2019.01	313.43	0.13
Reach - 1	20391.6	2-Year	505.00	371.31	378.56	376.41	379.30	0.005977	7.48	112.71	58.68	0.52
Reach - 1	20391.6	10-Year	1018.00	371.31	383.68	378.91	384.20	0.002325	6.88	324.62	296.64	0.36
Reach - 1	20391.6	25-Year	1318.00	371.31	386.70	380.05	386.74	0.000305	2.91	1927.37	361.20	0.13
Reach - 1	20391.6	50-Year	1600.00	371.31	387.32	381.21	387.36	0.000334	3.13	2152.17	365.87	0.14
Reach - 1	20391.6	100-Year	1837.00	371.31	387.72	382.17	387.77	0.000366	3.33	2301.23	368.94	0.15
Reach - 1	20349.6		Bridge									
Reach - 1	20307.6	2-Year	505.00	371.56	376.65	376.65	378.60	0.025599	11.82	61.41	19.59	1.00
Reach - 1	20307.6	10-Year	1018.00	371.56	379.40	379.40	381.79	0.017466	13.56	129.84	66.42	0.90
Reach - 1	20307.6	25-Year	1318.00	371.56	380.63	380.63	382.58	0.013156	13.09	247.81	85.27	0.80
Reach - 1	20307.6	50-Year	1600.00	371.56	381.46	381.46	383.35	0.012090	13.37	330.65	132.02	0.78
Reach - 1	20307.6	100-Year	1837.00	371.56	382.44	382.44	383.83	0.008780	12.20	513.71	223.74	0.68
Reach - 1	20223	2-Year	505.00	370.12	374.56	374.56	375.74	0.030695	8.74	57.80	24.77	1.01
Reach - 1	20223	10-Year	1018.00	370.12	376.23	376.23	377.59	0.019161	9.55	141.81	90.50	0.86
Reach - 1	20223	25-Year	1318.00	370.12	376.89	376.89	378.29	0.016771	9.95	208.36	107.42	0.83
Reach - 1	20223	50-Year	1600.00	370.12	377.34	377.34	378.85	0.016606	10.55	258.02	115.33	0.84
Reach - 1	20223	100-Year	1837.00	370.12	377.69	377.69	379.28	0.016310	10.95	300.06	121.62	0.84

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	20024.2	2-Year	505.00	366.75	370.90	370.12	371.55	0.011122	6.53	86.69	36.11	0.64
Reach - 1	20024.2	10-Year	1018.00	366.75	372.60		373.61	0.010273	8.30	154.88	48.37	0.66
Reach - 1	20024.2	25-Year	1318.00	366.75	373.16	372.27	374.47	0.011687	9.51	184.67	58.16	0.71
Reach - 1	20024.2	50-Year	1600.00	366.75	373.55	372.93	375.20	0.013558	10.72	208.70	66.20	0.78
Reach - 1	20024.2	100-Year	1837.00	366.75	373.88	373.21	375.79	0.014703	11.57	232.56	78.95	0.82
Reach - 1	19751	2-Year	505.00	361.35	366.22	365.93	367.28	0.023041	8.23	61.32	22.56	0.88
Reach - 1	19751	10-Year	1018.00	361.35	367.64	367.64	369.31	0.025990	10.39	101.10	42.69	0.98
Reach - 1	19751	25-Year	1318.00	361.35	368.42	368.42	370.19	0.021513	10.80	144.27	65.67	0.92
Reach - 1	19751	50-Year	1600.00	361.35	369.08	369.08	370.89	0.018530	11.03	194.20	83.19	0.87
Reach - 1	19751	100-Year	1837.00	361.35	369.52	369.52	371.39	0.017589	11.37	231.80	89.30	0.86
Reach - 1	19524.2	2-Year	505.00	356.87	360.22	360.20	361.43	0.028840	8.83	57.45	24.56	0.99
Reach - 1	19524.2	10-Year	1018.00	356.87	361.82	361.82	363.45	0.021185	10.42	120.33	51.89	0.91
Reach - 1	19524.2	25-Year	1318.00	356.87	362.51	362.51	364.34	0.019794	11.19	157.69	56.43	0.91
Reach - 1	19524.2	50-Year	1600.00	356.87	363.05	363.05	365.08	0.019424	11.91	189.35	60.26	0.91
Reach - 1	19524.2	100-Year	1837.00	356.87	363.47	363.47	365.65	0.019145	12.45	215.37	63.01	0.92
Reach - 1	19222	2-Year	505.00	348.54	351.56	351.56	352.57	0.029391	8.10	63.72	34.74	1.00
Reach - 1	19222	10-Year	1018.00	348.54	352.80	352.80	354.30	0.023793	9.93	114.58	45.61	0.97
Reach - 1	19222	25-Year	1318.00	348.54	353.37	353.37	355.14	0.022788	10.82	141.56	48.59	0.97
Reach - 1	19222	50-Year	1600.00	348.54	353.89	353.89	355.85	0.021666	11.48	167.28	51.27	0.97
Reach - 1	19222	100-Year	1837.00	348.54	354.31	354.31	356.41	0.020718	11.93	189.04	52.79	0.96
Reach - 1	19024.2	2-Year	505.00	343.08	347.77		348.28	0.006944	5.71	88.57	23.64	0.52
Reach - 1	19024.2	10-Year	1018.00	343.08	349.57		350.51	0.007666	7.77	139.74	36.23	0.58
Reach - 1	19024.2	25-Year	1318.00	343.08	350.41	348.61	351.53	0.007792	8.60	193.12	96.09	0.60
Reach - 1	19024.2	50-Year	1600.00	343.08	351.03	349.33	352.29	0.007978	9.25	263.35	141.22	0.61
Reach - 1	19024.2	100-Year	1837.00	343.08	350.94	350.02	352.67	0.011046	10.80	251.97	131.96	0.72
Reach - 1	18833	2-Year	505.00	339.27	344.27	344.27	345.73	0.031481	9.69	52.11	17.85	1.00
Reach - 1	18833	10-Year	1018.00	339.27	346.21	346.21	348.08	0.022412	11.11	109.19	41.77	0.91
Reach - 1	18833	25-Year	1318.00	339.27	347.00	347.00	349.12	0.021247	12.00	145.93	54.60	0.91
Reach - 1	18833	50-Year	1600.00	339.27	347.75	347.75	349.95	0.019043	12.39	193.38	71.42	0.88
Reach - 1	18833	100-Year	1837.00	339.27	348.93	348.93	350.45	0.011531	10.83	356.00	158.78	0.70
Reach - 1	18524.2	2-Year	505.00	333.12	339.74		339.95	0.001737	3.76	143.76	30.93	0.28
Reach - 1	18524.2	10-Year	1018.00	333.12	341.67		342.14	0.002564	5.54	221.17	48.90	0.35

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	18524.2	25-Year	1318.00	333.12	342.39		343.03	0.003126	6.50	264.47	84.66	0.40
Reach - 1	18524.2	50-Year	1600.00	333.12	342.94		343.73	0.003608	7.28	318.93	104.32	0.43
Reach - 1	18524.2	100-Year	1837.00	333.12	343.39		344.27	0.003891	7.81	365.95	108.55	0.45
Reach - 1	18317	2-Year	505.00	331.33	337.67	337.67	338.90	0.033045	8.96	61.82	34.74	0.95
Reach - 1	18317	10-Year	1018.00	331.33	339.23	339.23	340.81	0.025065	10.55	139.70	66.73	0.90
Reach - 1	18317	25-Year	1318.00	331.33	340.09	340.09	341.60	0.020128	10.67	210.92	97.60	0.83
Reach - 1	18317	50-Year	1600.00	331.33	340.62	340.62	342.19	0.019234	11.13	264.84	105.09	0.82
Reach - 1	18317	100-Year	1837.00	331.33	340.94	340.94	342.64	0.019874	11.74	299.21	109.60	0.84
Reach - 1	18024.2	2-Year	505.00	328.79	333.70		334.15	0.005667	5.36	100.15	32.35	0.47
Reach - 1	18024.2	10-Year	1018.00	328.79	335.23		336.11	0.007528	7.65	158.67	45.70	0.57
Reach - 1	18024.2	25-Year	1318.00	328.79	335.75		336.95	0.009122	8.95	184.43	52.09	0.64
Reach - 1	18024.2	50-Year	1600.00	328.79	336.20	335.04	337.70	0.010460	10.05	208.85	63.49	0.69
Reach - 1	18024.2	100-Year	1837.00	328.79	336.56	335.62	338.28	0.011320	10.84	233.01	71.83	0.73
Reach - 1	17810	2-Year	505.00	326.23	330.53	330.53	331.69	0.030984	8.61	58.64	25.45	1.00
Reach - 1	17810	10-Year	1018.00	326.23	332.20	332.00	333.51	0.021939	9.18	114.47	45.16	0.90
Reach - 1	17810	25-Year	1318.00	326.23	333.06	332.62	334.37	0.016362	9.27	160.20	61.56	0.81
Reach - 1	17810	50-Year	1600.00	326.23	333.75	333.13	335.09	0.013799	9.45	208.34	76.39	0.76
Reach - 1	17810	100-Year	1837.00	326.23	334.29	333.56	335.64	0.012328	9.58	251.90	86.77	0.73
Reach - 1	17524.2	2-Year	505.00	322.82	329.03		329.28	0.002203	4.03	137.77	35.98	0.31
Reach - 1	17524.2	10-Year	1018.00	322.82	330.92		331.42	0.003043	5.80	234.09	71.81	0.38
Reach - 1	17524.2	25-Year	1318.00	322.82	331.68		332.31	0.003453	6.60	292.95	82.05	0.41
Reach - 1	17524.2	50-Year	1600.00	322.82	332.29		333.04	0.003814	7.29	345.87	93.97	0.44
Reach - 1	17524.2	100-Year	1837.00	322.82	332.74		333.60	0.004126	7.85	393.43	114.58	0.46
Reach - 1	17294	2-Year	505.00	322.18	328.00		328.48	0.005860	5.75	121.91	56.72	0.48
Reach - 1	17294	10-Year	1018.00	322.18	329.61		330.38	0.006823	7.65	244.34	92.10	0.55
Reach - 1	17294	25-Year	1318.00	322.18	330.25		331.16	0.007378	8.51	307.23	102.82	0.58
Reach - 1	17294	50-Year	1600.00	322.18	330.79		331.80	0.007751	9.18	363.89	110.47	0.60
Reach - 1	17294	100-Year	1837.00	322.18	331.20	330.13	332.29	0.007956	9.66	410.67	115.65	0.62
Reach - 1	17020.0	2-Year	505.00	321.41	325.08	324.93	325.87	0.017531	7.37	94.86	70.10	0.78
Reach - 1	17020.0	10-Year	1018.00	321.41	326.10	326.10	327.35	0.020082	9.72	176.97	90.64	0.88
Reach - 1	17020.0	25-Year	1318.00	321.41	326.65	326.65	328.02	0.019464	10.45	229.07	101.89	0.89
Reach - 1	17020.0	50-Year	1600.00	321.41	327.08	327.08	328.57	0.019296	11.10	275.38	110.93	0.90

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	17020.0	100-Year	1837.00	321.41	327.40	327.40	329.00	0.019458	11.63	311.56	117.51	0.91
Reach - 1	16807	2-Year	505.00	318.05	321.44		322.12	0.017355	6.65	75.92	33.00	0.77
Reach - 1	16807	10-Year	1018.00	318.05	323.00	322.46	323.81	0.012394	7.39	183.95	108.34	0.69
Reach - 1	16807	25-Year	1318.00	318.05	323.78		324.54	0.009670	7.38	280.07	142.25	0.63
Reach - 1	16807	50-Year	1600.00	318.05	324.33		325.10	0.008630	7.56	365.86	162.98	0.61
Reach - 1	16807	100-Year	1837.00	318.05	324.74		325.51	0.008087	7.72	433.45	171.07	0.60
Reach - 1	16524.2	2-Year	603.00	313.59	318.76		319.33	0.006696	6.07	99.86	23.89	0.52
Reach - 1	16524.2	10-Year	1059.00	313.59	320.29	318.48	321.20	0.007157	7.70	173.71	107.53	0.56
Reach - 1	16524.2	25-Year	1419.00	313.59	321.12	319.38	322.16	0.007307	8.50	264.39	111.29	0.58
Reach - 1	16524.2	50-Year	1714.00	313.59	321.71	320.74	322.83	0.007306	9.00	330.99	113.88	0.59
Reach - 1	16524.2	100-Year	1950.00	313.59	322.17		323.32	0.007180	9.30	383.72	115.89	0.59
Reach - 1	16219	2-Year	603.00	307.88	313.82	313.82	315.35	0.032946	9.92	60.82	20.18	1.01
Reach - 1	16219	10-Year	1059.00	307.88	315.31	315.31	317.20	0.028870	11.05	97.68	32.17	0.99
Reach - 1	16219	25-Year	1419.00	307.88	316.28	316.28	318.36	0.023896	11.66	137.88	48.84	0.93
Reach - 1	16219	50-Year	1714.00	307.88	316.97	316.97	319.16	0.021435	12.08	174.96	57.87	0.91
Reach - 1	16219	100-Year	1950.00	307.88	317.43	317.43	319.74	0.020635	12.50	202.88	63.83	0.90
Reach - 1	16024.2	2-Year	603.00	304.23	309.68		310.18	0.005328	5.65	112.24	29.96	0.47
Reach - 1	16024.2	10-Year	1059.00	304.23	311.33		312.12	0.005696	7.18	166.62	35.97	0.51
Reach - 1	16024.2	25-Year	1419.00	304.23	312.30		313.32	0.006162	8.23	208.52	50.46	0.54
Reach - 1	16024.2	50-Year	1714.00	304.23	312.95		314.16	0.006565	9.00	244.19	58.93	0.57
Reach - 1	16024.2	100-Year	1950.00	304.23	313.43		314.78	0.006837	9.56	273.67	64.05	0.58
Reach - 1	15740	2-Year	603.00	297.95	303.10	303.10	304.55	2.487171	9.65	62.49	22.00	1.01
Reach - 1	15740	10-Year	1059.00	297.95	304.79	304.79	306.27	1.689121	9.79	109.17	36.61	0.88
Reach - 1	15740	25-Year	1419.00	297.95	305.63	305.63	307.13	1.315985	9.76	144.92	50.61	0.80
Reach - 1	15740	50-Year	1714.00	297.95	306.17	306.17	307.70	1.092860	9.57	175.24	60.99	0.74
Reach - 1	15740	100-Year	1950.00	297.95	306.47	306.47	308.11	1.023933	9.62	194.39	65.25	0.72
Reach - 1	15524.2	2-Year	603.00	293.18	300.10		300.37	0.001682	4.25	170.97	88.14	0.31
Reach - 1	15524.2	10-Year	1059.00	293.18	302.06		302.41	0.001620	5.03	407.58	166.41	0.31
Reach - 1	15524.2	25-Year	1419.00	293.18	303.01		303.41	0.001738	5.62	585.41	208.57	0.33
Reach - 1	15524.2	50-Year	1714.00	293.18	303.40		303.89	0.002069	6.31	670.71	229.57	0.36
Reach - 1	15524.2	100-Year	1950.00	293.18	303.65		304.23	0.002352	6.85	733.11	255.72	0.39

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	15291	2-Year	603.00	292.67	298.98		299.61	0.007631	6.35	94.91	22.91	0.55
Reach - 1	15291	10-Year	1059.00	292.67	301.31	298.84	301.80	0.004576	5.96	388.55	348.34	0.44
Reach - 1	15291	25-Year	1419.00	292.67	302.71		302.92	0.001987	4.56	1013.22	491.78	0.30
Reach - 1	15291	50-Year	1714.00	292.67	303.14		303.33	0.001955	4.70	1224.08	504.10	0.30
Reach - 1	15291	100-Year	1950.00	292.67	303.41		303.61	0.001994	4.87	1363.27	512.06	0.31
Reach - 1	15183.4	2-Year	603.00	292.43	298.73	296.30	299.02	0.002389	4.42	153.90	41.45	0.35
Reach - 1	15183.4	10-Year	1059.00	292.43	301.06	297.42	301.45	0.001903	5.12	249.37	119.77	0.34
Reach - 1	15183.4	25-Year	1419.00	292.43	302.31	298.21	302.68	0.001615	5.25	601.44	323.80	0.32
Reach - 1	15183.4	50-Year	1714.00	292.43	302.52	298.80	303.02	0.002163	6.17	674.49	403.31	0.37
Reach - 1	15183.4	100-Year	1950.00	292.43	302.61	299.27	303.23	0.002652	6.89	717.04	447.30	0.41
Reach - 1	15150.4	Bridge										
Reach - 1	15117.4	2-Year	603.00	292.69	297.82	296.55	298.35	0.005901	5.86	111.11	34.04	0.53
Reach - 1	15117.4	10-Year	1059.00	292.69	298.62	297.68	299.70	0.009600	8.42	139.92	37.55	0.70
Reach - 1	15117.4	25-Year	1419.00	292.69	299.01	298.50	300.64	0.013049	10.36	154.90	41.75	0.83
Reach - 1	15117.4	50-Year	1714.00	292.69	299.21	299.06	301.39	0.016595	12.00	163.57	44.86	0.94
Reach - 1	15117.4	100-Year	1950.00	292.69	299.54	299.54	302.00	0.017238	12.76	179.48	50.06	0.97
Reach - 1	15024.2	2-Year	603.00	291.44	297.73		297.96	0.001462	4.14	286.46	135.44	0.31
Reach - 1	15024.2	10-Year	1059.00	291.44	298.55		298.97	0.002416	5.85	420.04	175.78	0.41
Reach - 1	15024.2	25-Year	1419.00	291.44	299.02		299.59	0.003042	6.89	505.30	182.33	0.47
Reach - 1	15024.2	50-Year	1714.00	291.44	299.34		300.02	0.003546	7.68	563.57	185.41	0.51
Reach - 1	15024.2	100-Year	1950.00	291.44	299.54	298.47	300.46	0.004511	8.82	604.06	271.98	0.58
Reach - 1	14764	2-Year	603.00	290.94	296.60	295.55	297.21	0.006626	6.63	200.76	263.37	0.59
Reach - 1	14764	10-Year	1059.00	290.94	297.60		298.06	0.005516	6.71	528.01	397.76	0.54
Reach - 1	14764	25-Year	1419.00	290.94	298.10		298.53	0.005229	6.99	738.80	439.96	0.54
Reach - 1	14764	50-Year	1714.00	290.94	298.47		298.86	0.004842	7.04	903.19	450.86	0.52
Reach - 1	14764	100-Year	1950.00	290.94	298.71		299.09	0.004757	7.17	1014.05	458.07	0.52
Reach - 1	14524.2	2-Year	603.00	290.48	296.34		296.49	0.001256	3.63	547.73	415.59	0.29
Reach - 1	14524.2	10-Year	1059.00	290.48	297.22		297.38	0.001390	4.26	931.24	447.00	0.31
Reach - 1	14524.2	25-Year	1419.00	290.48	297.62		297.81	0.001645	4.84	1112.95	467.59	0.34
Reach - 1	14524.2	50-Year	1714.00	290.48	297.90		298.12	0.001895	5.35	1246.59	481.39	0.37
Reach - 1	14524.2	100-Year	1950.00	290.48	298.10		298.34	0.002036	5.66	1343.54	484.56	0.39

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	14034.8	2-Year	603.00	287.46	296.37		296.38	0.000048	0.97	2186.00	434.52	0.06
Reach - 1	14034.8	10-Year	1059.00	287.46	297.21		297.22	0.000096	1.48	2559.53	459.89	0.09
Reach - 1	14034.8	25-Year	1419.00	287.46	297.57		297.59	0.000147	1.87	2729.11	475.50	0.11
Reach - 1	14034.8	50-Year	1714.00	287.46	297.82		297.84	0.000191	2.18	2850.49	485.96	0.13
Reach - 1	14034.8	100-Year	1950.00	287.46	297.99		298.02	0.000229	2.42	2934.96	490.96	0.14
Reach - 1	13555.6	2-Year	603.00	287.38	296.35		296.36	0.000045	0.95	2197.37	415.61	0.06
Reach - 1	13555.6	10-Year	1059.00	287.38	297.16		297.17	0.000093	1.46	2539.79	432.39	0.09
Reach - 1	13555.6	25-Year	1419.00	287.38	297.50		297.52	0.000143	1.85	2687.76	441.84	0.11
Reach - 1	13555.6	50-Year	1714.00	287.38	297.73		297.75	0.000189	2.17	2790.39	449.33	0.12
Reach - 1	13555.6	100-Year	1950.00	287.38	297.88		297.91	0.000230	2.41	2859.97	454.34	0.14
Reach - 1	13024.2	2-Year	603.00	287.30	296.33		296.33	0.000047	0.98	2138.87	412.76	0.06
Reach - 1	13024.2	10-Year	1059.00	287.30	297.11		297.12	0.000097	1.49	2462.93	417.93	0.09
Reach - 1	13024.2	25-Year	1419.00	287.30	297.42		297.44	0.000150	1.90	2593.53	422.62	0.11
Reach - 1	13024.2	50-Year	1714.00	287.30	297.62		297.65	0.000200	2.22	2680.21	425.71	0.13
Reach - 1	13024.2	100-Year	1950.00	287.30	297.76		297.79	0.000244	2.48	2736.09	427.75	0.14
Reach - 1	12524.2	2-Year	603.00	287.22	296.31		296.31	0.000036	0.86	2546.92	491.22	0.05
Reach - 1	12524.2	10-Year	1059.00	287.22	297.07		297.08	0.000074	1.31	2928.05	508.26	0.08
Reach - 1	12524.2	25-Year	1419.00	287.22	297.36		297.37	0.000116	1.67	3075.47	511.48	0.10
Reach - 1	12524.2	50-Year	1714.00	287.22	297.54		297.56	0.000154	1.95	3169.70	512.76	0.11
Reach - 1	12524.2	100-Year	1950.00	287.22	297.66		297.68	0.000189	2.18	3227.47	513.54	0.12
Reach - 1	12024.2	2-Year	603.00	287.14	296.30		296.30	0.000012	0.51	4374.06	738.22	0.03
Reach - 1	12024.2	10-Year	1059.00	287.14	297.05		297.06	0.000026	0.78	4930.59	739.96	0.05
Reach - 1	12024.2	25-Year	1419.00	287.14	297.33		297.34	0.000041	1.00	5137.67	740.61	0.06
Reach - 1	12024.2	50-Year	1714.00	287.14	297.51		297.51	0.000056	1.18	5267.48	741.02	0.07
Reach - 1	12024.2	100-Year	1950.00	287.14	297.61		297.62	0.000069	1.32	5345.01	741.26	0.07
Reach - 1	11747.1	2-Year	603.00	284.16	296.30		296.30	0.000004	0.35	7159.03	1112.58	0.02
Reach - 1	11747.1	10-Year	1059.00	284.16	297.05		297.05	0.000008	0.55	8000.42	1129.53	0.03
Reach - 1	11747.1	25-Year	1419.00	284.16	297.33		297.33	0.000013	0.70	8315.42	1137.68	0.04
Reach - 1	11747.1	50-Year	1714.00	284.16	297.50		297.50	0.000018	0.83	8513.19	1150.20	0.04
Reach - 1	11747.1	100-Year	1950.00	284.16	297.60		297.61	0.000023	0.93	8631.85	1153.34	0.05
Reach - 1	11352.3	2-Year	668.00	273.46	296.30	277.46	296.30	0.000001	0.17	3905.86	560.43	0.01
Reach - 1	11352.3	10-Year	1641.00	273.46	297.05	279.20	297.05	0.000006	0.39	4399.74	593.49	0.02

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	11352.3	25-Year	2217.00	273.46	297.32	279.93	297.33	0.000009	0.51	4564.02	600.79	0.03
Reach - 1	11352.3	50-Year	2614.00	273.46	297.49	280.37	297.50	0.000012	0.59	4667.30	605.23	0.03
Reach - 1	11352.3	100-Year	2850.00	273.46	297.59	280.61	297.60	0.000014	0.63	4728.99	607.61	0.04
Reach - 1	11341.3		Inl Struct									
Reach - 1	11330.3	2-Year	668.00	277.80	281.74	281.74	283.12	0.013840	9.76	99.28	52.52	0.92
Reach - 1	11330.3	10-Year	1641.00	277.80	284.08	284.08	286.07	0.011384	12.50	260.43	83.14	0.91
Reach - 1	11330.3	25-Year	2217.00	277.80	285.06	285.06	287.35	0.011186	13.74	347.51	95.20	0.93
Reach - 1	11330.3	50-Year	2614.00	277.80	285.70	285.70	288.12	0.010815	14.35	410.91	103.09	0.93
Reach - 1	11330.3	100-Year	2850.00	277.80	286.05	286.05	288.55	0.010684	14.70	447.34	107.36	0.93
Reach - 1	11228.2	2-Year	668.00	274.45	278.67	278.47	280.21	0.018174	9.98	68.41	35.01	0.93
Reach - 1	11228.2	10-Year	1641.00	274.45	281.61	281.61	283.31	0.010590	11.35	282.67	117.67	0.78
Reach - 1	11228.2	25-Year	2217.00	274.45	282.48	282.48	284.36	0.010781	12.45	388.06	124.58	0.81
Reach - 1	11228.2	50-Year	2614.00	274.45	282.96	282.96	285.00	0.011206	13.23	448.57	129.19	0.83
Reach - 1	11228.2	100-Year	2850.00	274.45	283.24	283.24	285.36	0.011345	13.62	485.01	132.28	0.84
Reach - 1	10952.4	2-Year	668.00	270.52	274.14	274.14	275.29	0.016677	8.74	89.43	47.13	0.97
Reach - 1	10952.4	10-Year	1641.00	270.52	276.05	276.05	277.89	0.013420	11.40	211.31	73.31	0.95
Reach - 1	10952.4	25-Year	2217.00	270.52	276.72	276.72	279.10	0.014713	13.10	262.88	81.85	1.02
Reach - 1	10952.4	50-Year	2614.00	270.52	277.60	277.60	279.83	0.011460	12.85	351.61	120.56	0.92
Reach - 1	10952.4	100-Year	2850.00	270.52	278.01	278.01	280.21	0.010531	12.88	402.78	126.24	0.90
Reach - 1	10524.2	2-Year	668.00	263.63	268.71	267.47	269.34	0.006101	6.45	136.53	119.53	0.59
Reach - 1	10524.2	10-Year	1641.00	263.63	270.00	270.00	271.35	0.011039	10.12	312.79	162.95	0.82
Reach - 1	10524.2	25-Year	2217.00	263.63	270.58	270.58	272.23	0.012095	11.46	415.17	194.58	0.88
Reach - 1	10524.2	50-Year	2614.00	263.63	271.26	271.26	272.74	0.009868	11.21	560.40	231.45	0.81
Reach - 1	10524.2	100-Year	2850.00	263.63	271.49	271.49	272.99	0.009775	11.44	614.74	237.99	0.81
Reach - 1	10136.9	2-Year	668.00	261.02	268.74		268.79	0.000384	2.27	1044.57	590.43	0.16
Reach - 1	10136.9	10-Year	1641.00	261.02	269.99		270.09	0.000709	3.50	1847.68	686.27	0.23
Reach - 1	10136.9	25-Year	2217.00	261.02	270.67		270.78	0.000752	3.83	2327.17	725.62	0.24
Reach - 1	10136.9	50-Year	2614.00	261.02	271.22		271.31	0.000709	3.88	2730.05	757.03	0.23
Reach - 1	10136.9	100-Year	2850.00	261.02	271.79		271.87	0.000577	3.66	3176.72	787.94	0.21
Reach - 2	10024.2	2-Year	780.00	262.00	268.68		268.73	0.000787	2.48	1109.55	602.09	0.19
Reach - 2	10024.2	10-Year	1902.00	262.00	269.90		269.98	0.001316	3.66	1906.20	702.31	0.26

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	10024.2	25-Year	2578.00	262.00	270.58		270.66	0.001321	3.93	2392.69	738.78	0.27
Reach - 2	10024.2	50-Year	3067.00	262.00	271.13		271.20	0.001221	3.98	2808.08	773.18	0.26
Reach - 2	10024.2	100-Year	3326.00	262.00	271.72		271.79	0.000988	3.77	3293.37	876.61	0.24
Reach - 2	9691.7	2-Year	780.00	260.63	267.84	265.62	268.23	0.002982	5.42	296.79	430.33	0.40
Reach - 2	9691.7	10-Year	1902.00	260.63	269.38	268.50	269.50	0.001501	4.52	1589.65	522.25	0.30
Reach - 2	9691.7	25-Year	2578.00	260.63	269.99	268.50	270.15	0.001749	5.16	1920.91	553.82	0.33
Reach - 2	9691.7	50-Year	3067.00	260.63	270.55	268.51	270.71	0.001773	5.44	2235.98	577.25	0.33
Reach - 2	9691.7	100-Year	3326.00	260.63	271.29	268.51	271.41	0.001278	4.89	2672.31	609.66	0.29
Reach - 2	9676.2		Bridge									
Reach - 2	9660.7	2-Year	780.00	260.97	266.18	265.96	267.61	0.016944	9.64	85.48	240.28	0.89
Reach - 2	9660.7	10-Year	1902.00	260.97	268.90	268.00	269.15	0.003019	5.92	1185.01	473.48	0.41
Reach - 2	9660.7	25-Year	2578.00	260.97	269.88	268.13	270.09	0.002416	5.83	1678.55	529.58	0.38
Reach - 2	9660.7	50-Year	3067.00	260.97	270.47	268.45	270.67	0.002252	5.92	1996.66	561.81	0.37
Reach - 2	9660.7	100-Year	3326.00	260.97	270.75	268.58	270.96	0.002292	6.12	2158.96	574.04	0.38
Reach - 2	9524.2	2-Year	780.00	259.17	265.36		265.87	0.005941	5.79	169.96	92.07	0.48
Reach - 2	9524.2	10-Year	1902.00	259.17	268.29		268.67	0.003413	5.99	892.82	406.65	0.39
Reach - 2	9524.2	25-Year	2578.00	259.17	269.40		269.71	0.002741	5.89	1408.38	487.09	0.36
Reach - 2	9524.2	50-Year	3067.00	259.17	270.06		270.33	0.002395	5.79	1734.74	498.83	0.34
Reach - 2	9524.2	100-Year	3326.00	259.17	270.38		270.64	0.002262	5.75	1896.95	503.14	0.33
Reach - 2	9024.2	2-Year	780.00	256.05	263.59		263.90	0.002648	4.49	207.55	76.17	0.33
Reach - 2	9024.2	10-Year	1902.00	256.05	266.45		267.00	0.003198	6.45	521.67	149.98	0.39
Reach - 2	9024.2	25-Year	2578.00	256.05	267.37		268.08	0.003746	7.46	667.67	164.14	0.43
Reach - 2	9024.2	50-Year	3067.00	256.05	267.93		268.74	0.004092	8.10	761.05	169.34	0.45
Reach - 2	9024.2	100-Year	3326.00	256.05	268.21		269.06	0.004254	8.41	808.46	171.92	0.46
Reach - 2	8588.6	2-Year	780.00	255.57	260.77		261.66	0.012727	7.56	103.11	27.00	0.68
Reach - 2	8588.6	10-Year	1902.00	255.57	264.07	262.90	264.97	0.007178	8.19	471.07	236.57	0.56
Reach - 2	8588.6	25-Year	2578.00	255.57	265.50		266.19	0.005031	7.79	859.26	329.61	0.48
Reach - 2	8588.6	50-Year	3067.00	255.57	266.22		266.83	0.004381	7.69	1103.90	347.53	0.45
Reach - 2	8588.6	100-Year	3326.00	255.57	266.57		267.15	0.004154	7.68	1224.82	356.18	0.45
Reach - 2	8024.2	2-Year	780.00	250.67	259.57		259.77	0.001300	3.62	246.70	50.92	0.24
Reach - 2	8024.2	10-Year	1902.00	250.67	263.12		263.38	0.001243	4.63	983.44	406.44	0.25

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	8024.2	25-Year	2578.00	250.67	264.98		265.13	0.000767	4.05	1971.10	584.02	0.20
Reach - 2	8024.2	50-Year	3067.00	250.67	265.75		265.88	0.000702	4.03	2432.05	624.37	0.19
Reach - 2	8024.2	100-Year	3326.00	250.67	266.11		266.24	0.000677	4.03	2660.70	639.94	0.19
Reach - 2	7524.2	2-Year	791.00	249.35	259.09		259.23	0.000841	3.14	352.02	200.15	0.20
Reach - 2	7524.2	10-Year	1926.00	249.35	263.01		263.05	0.000282	2.37	2709.11	701.57	0.12
Reach - 2	7524.2	25-Year	2619.00	249.35	264.90		264.92	0.000185	2.12	4091.19	769.27	0.10
Reach - 2	7524.2	50-Year	3129.00	249.35	265.66		265.69	0.000183	2.18	4690.37	791.26	0.10
Reach - 2	7524.2	100-Year	3400.00	249.35	266.02		266.05	0.000183	2.22	4975.55	796.60	0.10
Reach - 3	7024.2	2-Year	807.00	250.01	258.55		258.71	0.001291	3.49	495.48	393.79	0.24
Reach - 3	7024.2	10-Year	1961.00	250.01	262.89		262.92	0.000255	2.15	2607.46	543.66	0.11
Reach - 3	7024.2	25-Year	2671.00	250.01	264.81		264.83	0.000186	2.04	3707.19	597.97	0.10
Reach - 3	7024.2	50-Year	3205.00	250.01	265.56		265.59	0.000212	2.27	4190.09	733.47	0.11
Reach - 3	7024.2	100-Year	3502.00	250.01	265.92		265.95	0.000214	2.32	4454.98	747.43	0.11
Reach - 3	6790.2	2-Year	807.00	249.25	258.43		258.51	0.000513	2.31	383.02	92.14	0.15
Reach - 3	6790.2	10-Year	1961.00	249.25	262.68		262.82	0.000533	3.20	999.53	216.18	0.17
Reach - 3	6790.2	25-Year	2671.00	249.25	264.60		264.75	0.000494	3.41	1643.03	411.88	0.16
Reach - 3	6790.2	50-Year	3205.00	249.25	265.33		265.50	0.000551	3.73	1952.22	449.42	0.17
Reach - 3	6790.2	100-Year	3502.00	249.25	265.67		265.86	0.000590	3.92	2112.14	491.05	0.18
Reach - 3	6733.5	2-Year	856.00	250.49	258.41	252.96	258.48	0.000310	2.02	427.39	135.97	0.13
Reach - 3	6733.5	10-Year	2155.00	250.49	262.64	254.67	262.79	0.000404	3.17	691.31	316.34	0.17
Reach - 3	6733.5	25-Year	2951.00	250.49	264.61	255.55	264.71	0.000267	2.86	2271.79	441.68	0.14
Reach - 3	6733.5	50-Year	3531.00	250.49	265.34	256.14	265.45	0.000298	3.14	2611.10	505.84	0.15
Reach - 3	6733.5	100-Year	3904.00	250.49	265.67	256.48	265.80	0.000328	3.34	2790.40	542.93	0.16
Reach - 3	6670.0		Culvert									
Reach - 3	6606.5	2-Year	856.00	249.54	258.24	252.00	258.29	0.000218	1.82	475.93	236.95	0.11
Reach - 3	6606.5	10-Year	2155.00	249.54	262.06	253.72	262.21	0.000363	3.06	714.64	329.05	0.16
Reach - 3	6606.5	25-Year	2951.00	249.54	263.83	254.60	263.92	0.000251	2.80	2346.83	451.61	0.13
Reach - 3	6606.5	50-Year	3531.00	249.54	264.88	255.18	264.98	0.000253	2.96	2879.75	571.13	0.14
Reach - 3	6606.5	100-Year	3904.00	249.54	265.40	255.54	265.51	0.000270	3.13	3197.56	657.11	0.14
Reach - 3	6606.4	2-Year	856.00	249.54	258.15	252.17	258.26	0.000526	2.72	340.15	52.35	0.16
Reach - 3	6606.4	10-Year	2155.00	249.54	261.81	254.39	262.13	0.000946	4.62	730.40	400.56	0.23

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	6606.4	25-Year	2951.00	249.54	263.58	255.50	263.85	0.000798	4.65	1910.28	740.85	0.22
Reach - 3	6606.4	50-Year	3531.00	249.54	264.72	256.27	264.93	0.000652	4.43	2781.10	782.61	0.20
Reach - 3	6606.4	100-Year	3904.00	249.54	265.26	256.73	265.46	0.000617	4.41	3214.48	810.13	0.20
Reach - 3	6268.9		Culvert									
Reach - 3	5547.5	2-Year	856.00	250.00	257.91	254.66	258.17	0.001740	4.23	261.70	108.56	0.31
Reach - 3	5547.5	10-Year	2155.00	250.00	261.22	257.30	261.74	0.002035	6.17	588.67	489.19	0.36
Reach - 3	5547.5	25-Year	2951.00	250.00	263.29	258.45	263.36	0.000406	3.16	2610.76	892.39	0.17
Reach - 3	5547.5	50-Year	3531.00	250.00	264.55	259.21	264.58	0.000204	2.40	3749.05	937.78	0.12
Reach - 3	5547.5	100-Year	3904.00	250.00	265.10	259.69	265.13	0.000169	2.25	4272.72	960.51	0.11
Reach - 3	5486.5	2-Year	856.00	249.08	257.75	253.41	258.06	0.001669	4.56	252.24	101.17	0.29
Reach - 3	5486.5	10-Year	2155.00	249.08	261.15	256.76	261.57	0.001850	6.11	776.18	458.40	0.32
Reach - 3	5486.5	25-Year	2951.00	249.08	263.21	258.39	263.31	0.000597	3.88	1934.68	783.01	0.19
Reach - 3	5486.5	50-Year	3531.00	249.08	264.52	259.22	264.56	0.000265	2.76	3348.50	936.09	0.13
Reach - 3	5486.5	100-Year	3904.00	249.08	265.08	259.71	265.12	0.000216	2.55	3876.28	952.17	0.12
Reach - 3	5420.5	2-Year	856.00	248.52	257.70	252.47	257.92	0.001158	3.83	279.88	110.00	0.23
Reach - 3	5420.5	10-Year	2155.00	248.52	261.01	255.50	261.45	0.001746	5.87	714.41	398.91	0.30
Reach - 3	5420.5	25-Year	2951.00	248.52	263.16	257.12	263.27	0.000593	3.83	1895.40	784.94	0.18
Reach - 3	5420.5	50-Year	3531.00	248.52	264.50	258.13	264.55	0.000256	2.68	3452.07	916.30	0.12
Reach - 3	5420.5	100-Year	3904.00	248.52	265.07	258.72	265.10	0.000212	2.50	3972.53	942.48	0.11
Reach - 3	5370.5	2-Year	856.00	249.58	257.58	253.31	257.85	0.001480	4.27	261.14	123.58	0.27
Reach - 3	5370.5	10-Year	2155.00	249.58	261.04	256.35	261.33	0.001338	5.23	1246.28	541.48	0.28
Reach - 3	5370.5	25-Year	2951.00	249.58	263.18	257.83	263.23	0.000364	3.07	3280.97	1086.93	0.15
Reach - 3	5370.5	50-Year	3531.00	249.58	264.51	258.76	264.53	0.000177	2.28	4778.06	1137.82	0.11
Reach - 3	5370.5	100-Year	3904.00	249.58	265.07	259.48	265.09	0.000145	2.12	5417.44	1139.37	0.10
Reach - 3	5319.5	2-Year	856.00	249.46	257.64	253.64	257.74	0.000841	3.12	788.76	365.42	0.20
Reach - 3	5319.5	10-Year	2155.00	249.46	261.15	256.83	261.22	0.000535	3.24	2051.45	446.53	0.17
Reach - 3	5319.5	25-Year	2951.00	249.46	263.15	257.54	263.21	0.000414	3.19	2797.88	642.26	0.16
Reach - 3	5319.5	50-Year	3531.00	249.46	264.46	258.02	264.51	0.000367	3.20	3288.80	702.21	0.15
Reach - 3	5319.5	100-Year	3904.00	249.46	265.01	258.22	265.07	0.000373	3.31	3497.30	709.90	0.15
Reach - 3	5270.5	2-Year	856.00	250.41	257.62	253.73	257.70	0.000735	2.80	866.41	413.92	0.19
Reach - 3	5270.5	10-Year	2155.00	250.41	261.14	256.57	261.19	0.000403	2.74	2307.61	480.64	0.15

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	5270.5	25-Year	2951.00	250.41	263.14	257.39	263.19	0.000308	2.70	3140.80	662.50	0.14
Reach - 3	5270.5	50-Year	3531.00	250.41	264.45	257.82	264.49	0.000272	2.71	3686.33	724.56	0.13
Reach - 3	5270.5	100-Year	3904.00	250.41	265.01	258.07	265.05	0.000276	2.81	3917.88	735.81	0.13
Reach - 3	5219.5	2-Year	856.00	249.89	257.60	253.41	257.66	0.000602	2.58	922.93	419.17	0.17
Reach - 3	5219.5	10-Year	2155.00	249.89	261.12	256.44	261.17	0.000404	2.77	2191.96	486.66	0.15
Reach - 3	5219.5	25-Year	2951.00	249.89	263.12	257.18	263.17	0.000326	2.80	2914.37	728.78	0.14
Reach - 3	5219.5	50-Year	3531.00	249.89	264.43	257.52	264.48	0.000296	2.85	3385.94	836.61	0.13
Reach - 3	5219.5	100-Year	3904.00	249.89	265.00	257.74	265.04	0.000258	2.73	4068.43	849.07	0.13
Reach - 3	5169.5	2-Year	856.00	249.88	257.57	253.71	257.63	0.000515	2.49	851.85	384.92	0.16
Reach - 3	5169.5	10-Year	2155.00	249.88	261.09	255.79	261.15	0.000438	2.99	1974.65	489.75	0.16
Reach - 3	5169.5	25-Year	2951.00	249.88	263.09	256.40	263.15	0.000383	3.13	2554.40	641.11	0.15
Reach - 3	5169.5	50-Year	3531.00	249.88	264.40	256.79	264.46	0.000361	3.24	2932.83	709.76	0.15
Reach - 3	5169.5	100-Year	3904.00	249.88	264.98	257.03	265.02	0.000266	2.86	3973.01	729.48	0.13
Reach - 3	5118.5	2-Year	856.00	249.56	257.51	253.85	257.60	0.000699	2.86	765.46	331.00	0.19
Reach - 3	5118.5	10-Year	2155.00	249.56	261.03	256.37	261.12	0.000582	3.44	1662.01	442.51	0.19
Reach - 3	5118.5	25-Year	2951.00	249.56	263.04	257.11	263.13	0.000492	3.55	2213.86	700.22	0.18
Reach - 3	5118.5	50-Year	3531.00	249.56	264.40	257.50	264.44	0.000228	2.60	3614.17	792.44	0.12
Reach - 3	5118.5	100-Year	3904.00	249.56	264.98	257.73	265.01	0.000162	2.25	4849.96	821.35	0.10
Reach - 3	5067.5	2-Year	856.00	249.11	257.41		257.55	0.000863	3.37	551.45	183.54	0.21
Reach - 3	5067.5	10-Year	2155.00	249.11	260.93		261.08	0.000770	4.08	1492.67	397.32	0.21
Reach - 3	5067.5	25-Year	2951.00	249.11	263.02		263.10	0.000424	3.39	2565.50	669.90	0.16
Reach - 3	5067.5	50-Year	3531.00	249.11	264.38		264.43	0.000260	2.83	3547.69	782.85	0.13
Reach - 3	5067.5	100-Year	3904.00	249.11	264.96		265.00	0.000220	2.67	4011.93	830.80	0.12
Reach - 3	5018.5	2-Year	856.00	249.02	257.34	252.82	257.50	0.001017	3.68	494.93	166.50	0.23
Reach - 3	5018.5	10-Year	2155.00	249.02	260.80	256.47	261.03	0.001094	4.85	1085.05	258.87	0.25
Reach - 3	5018.5	25-Year	2951.00	249.02	262.83	257.51	263.05	0.000963	5.07	1458.22	409.01	0.24
Reach - 3	5018.5	50-Year	3531.00	249.02	264.19	258.05	264.39	0.000806	4.95	1818.64	575.38	0.23
Reach - 3	5018.5	100-Year	3904.00	249.02	264.90	258.35	264.98	0.000401	3.60	2925.35	638.36	0.16
Reach - 3	4972.5	2-Year	856.00	249.35	257.23		257.45	0.001242	3.98	361.93	117.16	0.25
Reach - 3	4972.5	10-Year	2155.00	249.35	260.58		260.95	0.001563	5.69	822.17	155.00	0.30
Reach - 3	4972.5	25-Year	2951.00	249.35	262.63		262.99	0.001340	5.90	1160.08	167.12	0.29
Reach - 3	4972.5	50-Year	3531.00	249.35	263.98		264.33	0.001213	6.00	1391.98	188.00	0.28

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4972.5	100-Year	3904.00	249.35	264.56		264.92	0.001225	6.18	1505.37	201.13	0.28
Reach - 3	4922.5	2-Year	856.00	249.34	257.15		257.38	0.001301	3.97	266.03	55.37	0.26
Reach - 3	4922.5	10-Year	2155.00	249.34	260.21		260.83	0.002317	6.68	474.68	80.74	0.36
Reach - 3	4922.5	25-Year	2951.00	249.34	262.07		262.86	0.002407	7.60	675.35	143.53	0.38
Reach - 3	4922.5	50-Year	3531.00	249.34	263.45		264.21	0.002117	7.65	877.20	153.39	0.36
Reach - 3	4922.5	100-Year	3904.00	249.34	264.02		264.80	0.002136	7.89	969.35	173.60	0.37
Reach - 3	4871.5	2-Year	856.00	248.79	257.12		257.31	0.000984	3.66	291.16	57.90	0.23
Reach - 3	4871.5	10-Year	2155.00	248.79	260.15		260.71	0.001841	6.27	487.92	71.75	0.34
Reach - 3	4871.5	25-Year	2951.00	248.79	262.06		262.71	0.001794	6.91	713.79	184.23	0.34
Reach - 3	4871.5	50-Year	3531.00	248.79	263.48		264.07	0.001528	6.85	1011.07	235.70	0.32
Reach - 3	4871.5	100-Year	3904.00	248.79	264.09		264.64	0.001439	6.84	1159.42	250.66	0.32
Reach - 3	4817.5	2-Year	856.00	249.04	256.98	252.88	257.24	0.001452	4.20	250.46	55.81	0.28
Reach - 3	4817.5	10-Year	2155.00	249.04	259.86	255.81	260.57	0.002650	7.11	432.57	70.80	0.40
Reach - 3	4817.5	25-Year	2951.00	249.04	261.75	257.13	262.57	0.002547	7.82	634.25	165.39	0.40
Reach - 3	4817.5	50-Year	3531.00	249.04	263.29	257.95	263.97	0.001952	7.43	892.87	169.26	0.36
Reach - 3	4817.5	100-Year	3904.00	249.04	263.88	258.47	264.54	0.001891	7.52	997.53	210.91	0.35
Reach - 3	4766.5	2-Year	856.00	248.79	256.97	252.59	257.16	0.001058	3.53	275.35	59.89	0.24
Reach - 3	4766.5	10-Year	2155.00	248.79	259.88	255.11	260.40	0.001870	5.95	456.81	76.03	0.34
Reach - 3	4766.5	25-Year	2951.00	248.79	261.79	256.40	262.40	0.001796	6.57	637.25	134.00	0.34
Reach - 3	4766.5	50-Year	3531.00	248.79	263.27	257.17	263.85	0.001525	6.56	878.67	137.67	0.32
Reach - 3	4766.5	100-Year	3904.00	248.79	263.83	257.62	264.44	0.001556	6.81	955.50	138.76	0.32
Reach - 3	4696.5	2-Year	832.00	249.54	256.97	252.34	257.06	0.000501	2.48	401.73	95.28	0.17
Reach - 3	4696.5	10-Year	1964.00	249.54	259.96	254.06	260.17	0.000726	3.85	647.91	157.61	0.22
Reach - 3	4696.5	25-Year	2686.00	249.54	261.89	254.99	262.15	0.000706	4.30	807.05	176.17	0.23
Reach - 3	4696.5	50-Year	3225.00	249.54	263.42	255.62	263.59	0.000454	3.76	1422.25	245.64	0.18
Reach - 3	4696.5	100-Year	3597.00	249.54	264.00	256.00	264.16	0.000442	3.82	1566.84	259.72	0.18
Reach - 3	4645.0		Culvert									
Reach - 3	4593.5	2-Year	832.00	249.19	256.85	251.24	256.90	0.000187	1.68	539.28	99.38	0.11
Reach - 3	4593.5	10-Year	1964.00	249.19	259.40	252.55	259.53	0.000381	2.93	741.45	176.45	0.16
Reach - 3	4593.5	25-Year	2686.00	249.19	260.70	253.25	260.89	0.000469	3.54	845.10	210.85	0.19
Reach - 3	4593.5	50-Year	3225.00	249.19	261.65	253.73	261.84	0.000460	3.70	1364.00	225.49	0.19

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4593.5	100-Year	3597.00	249.19	262.30	254.05	262.51	0.000469	3.86	1514.12	235.61	0.19
Reach - 3	4500.596	2-Year	832.00	248.23	256.70	252.40	256.84	0.000988	3.00	314.72	99.57	0.23
Reach - 3	4500.596	10-Year	1964.00	248.23	259.14	254.62	259.42	0.001483	4.45	587.73	164.15	0.30
Reach - 3	4500.596	25-Year	2686.00	248.23	260.43	255.74	260.77	0.001580	4.97	740.17	170.76	0.31
Reach - 3	4500.596	50-Year	3225.00	248.23	261.33	256.51	261.71	0.001601	5.25	849.60	175.39	0.32
Reach - 3	4500.596	100-Year	3597.00	248.23	261.98	256.95	262.38	0.001573	5.38	929.67	239.95	0.32
Reach - 3	4486	Bridge										
Reach - 3	4452.7	2-Year	832.00	248.28	255.40	250.92	255.55	0.000769	3.12	290.24	166.75	0.21
Reach - 3	4452.7	10-Year	1964.00	248.28	257.58	252.85	258.02	0.001640	5.47	407.73	428.53	0.32
Reach - 3	4452.7	25-Year	2686.00	248.28	258.83	253.95	259.44	0.001940	6.47	477.85	487.77	0.35
Reach - 3	4452.7	50-Year	3225.00	248.28	259.81	254.74	260.53	0.002030	7.03	532.65	618.88	0.37
Reach - 3	4452.7	100-Year	3597.00	248.28	260.67	255.18	261.43	0.001945	7.23	581.17	691.50	0.36
Reach - 3	4387.2	Culvert										
Reach - 3	4321.7	2-Year	832.00	249.27	255.18	251.91	255.41	0.001511	3.85	227.63	52.70	0.28
Reach - 3	4321.7	10-Year	1964.00	249.27	256.75	253.85	257.51	0.003697	7.08	308.51	204.98	0.46
Reach - 3	4321.7	25-Year	2686.00	249.27	257.48	254.90	258.65	0.004978	8.75	347.70	299.40	0.54
Reach - 3	4321.7	50-Year	3225.00	249.27	258.08	255.63	259.52	0.005600	9.74	380.41	403.49	0.58
Reach - 3	4321.7	100-Year	3597.00	249.27	258.94	256.10	260.39	0.005025	9.82	427.54	444.75	0.56
Reach - 3	4294.441	2-Year	832.00	246.73	255.18		255.34	0.001113	3.36	399.37	196.74	0.24
Reach - 3	4294.441	10-Year	1964.00	246.73	256.88		257.23	0.002036	5.28	900.58	330.01	0.34
Reach - 3	4294.441	25-Year	2686.00	246.73	257.78		258.18	0.002176	5.89	1198.86	335.47	0.36
Reach - 3	4294.441	50-Year	3225.00	246.73	258.51		258.92	0.002084	6.10	1446.75	339.94	0.36
Reach - 3	4294.441	100-Year	3597.00	246.73	259.42		259.76	0.001645	5.78	1759.03	345.49	0.32
Reach - 3	4000.0	2-Year	832.00	248.37	254.62		254.78	0.003952	4.65	629.08	400.41	0.41
Reach - 3	4000.0	10-Year	1964.00	248.37	256.33		256.46	0.002883	4.92	1421.52	509.31	0.37
Reach - 3	4000.0	25-Year	2686.00	248.37	257.34		257.44	0.002217	4.82	1946.59	542.21	0.33
Reach - 3	4000.0	50-Year	3225.00	248.37	258.17		258.26	0.001742	4.63	2407.14	568.78	0.30
Reach - 3	4000.0	100-Year	3597.00	248.37	259.22		259.28	0.001127	4.06	3013.66	586.32	0.25
Reach - 3	3500.0	2-Year	832.00	246.98	253.61		253.65	0.001385	2.88	1230.91	760.15	0.24
Reach - 3	3500.0	10-Year	1964.00	246.98	255.84		255.86	0.000603	2.49	3096.77	909.55	0.17

HEC-RAS Plan: Existing (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	920.6	25-Year	2732.00	242.61	253.24	249.20	253.25	0.000218	1.86	5291.71	1013.16	0.11
Reach - 3	920.6	50-Year	3281.00	242.61	253.91	249.30	253.92	0.000216	1.94	5974.25	1023.93	0.11
Reach - 3	920.6	100-Year	3665.00	242.61	254.24	249.41	254.25	0.000227	2.04	6313.41	1032.04	0.12

FUTURE CONDITIONS: HEC-RAS OUTPUT

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	22255.4	2-Year	472.00	422.25	427.59	426.02	428.05	0.004502	5.50	93.79	27.00	0.48
Reach - 1	22255.4	10-Year	942.00	422.25	429.54	427.49	430.35	0.004802	7.35	150.85	31.82	0.53
Reach - 1	22255.4	25-Year	1225.00	422.25	430.78	428.27	431.70	0.004283	7.86	192.51	35.93	0.51
Reach - 1	22255.4	50-Year	1459.00	422.25	431.65	428.83	432.67	0.004110	8.30	226.17	41.90	0.51
Reach - 1	22255.4	100-Year	1677.00	422.25	433.45	429.36	434.30	0.002677	7.65	304.54	264.90	0.43
Reach - 1	22230.4	Bridge										
Reach - 1	22205.4	2-Year	460.00	421.56	425.28	425.28	426.51	0.022842	8.90	53.20	23.25	0.99
Reach - 1	22205.4	10-Year	842.00	421.56	426.52	426.52	428.32	0.019886	10.84	83.68	26.12	0.99
Reach - 1	22205.4	25-Year	1065.00	421.56	427.15	427.15	429.24	0.018709	11.67	100.73	27.59	0.98
Reach - 1	22205.4	50-Year	1270.00	421.56	427.69	427.69	430.01	0.017924	12.34	115.94	28.84	0.98
Reach - 1	22205.4	100-Year	1281.00	421.56	427.71	427.71	430.05	0.017965	12.39	116.57	28.89	0.98
Reach - 1	22061.4	2-Year	460.00	400.80	403.96	403.96	405.14	0.037122	8.70	52.88	22.83	1.01
Reach - 1	22061.4	10-Year	842.00	400.80	405.14	405.14	406.86	0.032402	10.51	80.38	23.94	1.00
Reach - 1	22061.4	25-Year	1065.00	400.80	405.71	405.71	407.73	0.031113	11.40	94.12	24.43	1.00
Reach - 1	22061.4	50-Year	1270.00	400.80	406.23	406.23	408.47	0.029433	12.03	106.93	24.87	1.00
Reach - 1	22061.4	100-Year	1281.00	400.80	406.25	406.25	408.51	0.029367	12.06	107.59	24.90	1.00
Reach - 1	21877	2-Year	460.00	390.67	393.01	393.01	393.65	0.028609	6.90	73.17	65.44	0.94
Reach - 1	21877	10-Year	842.00	390.67	393.78	393.78	394.58	0.026070	8.16	125.62	93.64	0.94
Reach - 1	21877	25-Year	1065.00	390.67	394.14	394.14	394.95	0.024515	8.57	172.35	144.59	0.93
Reach - 1	21877	50-Year	1270.00	390.67	394.59	394.33	395.29	0.018717	8.28	238.07	150.75	0.83
Reach - 1	21877	100-Year	1281.00	390.67	394.82	394.34	395.39	0.014105	7.55	273.96	153.51	0.73
Reach - 1	21577.4	2-Year	583.00	383.59	389.02		389.40	0.005287	5.10	167.47	105.48	0.42
Reach - 1	21577.4	10-Year	1128.00	383.59	390.27		390.83	0.006524	6.67	316.33	126.65	0.49
Reach - 1	21577.4	25-Year	1478.00	383.59	390.77		391.46	0.007646	7.63	381.03	133.98	0.54
Reach - 1	21577.4	50-Year	1750.00	383.59	391.15		391.93	0.008261	8.24	433.23	143.25	0.56
Reach - 1	21577.4	100-Year	1976.00	383.59	391.44		392.28	0.008616	8.66	475.68	147.72	0.58
Reach - 1	21329	2-Year	583.00	380.12	385.19	385.19	386.65	0.031194	9.70	60.12	20.66	1.00
Reach - 1	21329	10-Year	1128.00	380.12	387.38	387.38	388.46	0.014408	8.91	246.18	193.05	0.73
Reach - 1	21329	25-Year	1478.00	380.12	388.04	388.04	389.04	0.012531	9.08	391.27	249.15	0.70
Reach - 1	21329	50-Year	1750.00	380.12	388.33	388.33	389.37	0.012889	9.55	465.02	256.03	0.71
Reach - 1	21329	100-Year	1976.00	380.12	388.53	388.53	389.62	0.013366	9.96	517.81	260.84	0.73

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	17020.0	100-Year	2030.00	321.41	327.65	327.65	329.32	0.019471	12.01	341.33	122.66	0.92
Reach - 1	16807	2-Year	634.00	318.05	321.79		322.60	0.017738	7.21	87.94	34.29	0.79
Reach - 1	16807	10-Year	1134.00	318.05	323.26	322.73	324.08	0.011775	7.51	213.76	117.29	0.68
Reach - 1	16807	25-Year	1519.00	318.05	324.07	323.37	324.90	0.009878	7.78	323.21	157.66	0.64
Reach - 1	16807	50-Year	1804.00	318.05	324.58		325.41	0.008832	7.91	407.83	168.05	0.62
Reach - 1	16807	100-Year	2030.00	318.05	324.94		325.77	0.008366	8.06	469.49	175.24	0.61
Reach - 1	16524.2	2-Year	675.00	313.59	319.04		319.67	0.006768	6.37	106.67	24.57	0.53
Reach - 1	16524.2	10-Year	1165.00	313.59	320.55	318.75	321.51	0.007231	7.97	201.93	108.79	0.57
Reach - 1	16524.2	25-Year	1559.00	313.59	321.41	319.89	322.49	0.007310	8.75	296.73	112.56	0.59
Reach - 1	16524.2	50-Year	1853.00	313.59	321.98	321.03	323.12	0.007243	9.18	362.04	115.07	0.59
Reach - 1	16524.2	100-Year	2075.00	313.59	322.44		323.59	0.006965	9.37	415.18	117.07	0.59
Reach - 1	16219	2-Year	675.00	307.88	314.14	314.14	315.69	0.032244	9.98	67.64	22.05	1.00
Reach - 1	16219	10-Year	1165.00	307.88	315.61	315.61	317.57	0.027083	11.25	108.28	38.25	0.97
Reach - 1	16219	25-Year	1559.00	307.88	316.62	316.62	318.75	0.022628	11.87	155.13	53.23	0.92
Reach - 1	16219	50-Year	1853.00	307.88	317.26	317.26	319.51	0.020830	12.31	191.85	61.54	0.90
Reach - 1	16219	100-Year	2075.00	307.88	317.60	317.60	320.03	0.021100	12.87	213.57	65.97	0.91
Reach - 1	16024.2	2-Year	675.00	304.23	309.99		310.53	0.005354	5.92	121.55	31.07	0.47
Reach - 1	16024.2	10-Year	1165.00	304.23	311.64		312.50	0.005823	7.50	178.42	40.52	0.52
Reach - 1	16024.2	25-Year	1559.00	304.23	312.62		313.73	0.006361	8.60	225.23	54.36	0.55
Reach - 1	16024.2	50-Year	1853.00	304.23	313.24		314.53	0.006730	9.33	261.57	62.05	0.58
Reach - 1	16024.2	100-Year	2075.00	304.23	313.67	311.39	315.09	0.006966	9.83	289.30	66.55	0.59
Reach - 1	15740	2-Year	675.00	297.95	303.37	303.37	304.88	2.445524	9.84	68.60	23.19	1.01
Reach - 1	15740	10-Year	1165.00	297.95	305.05	305.05	306.55	1.608710	9.87	118.78	39.52	0.86
Reach - 1	15740	25-Year	1559.00	297.95	305.92	305.92	307.41	1.175953	9.60	160.42	56.16	0.76
Reach - 1	15740	50-Year	1853.00	297.95	306.36	306.36	307.94	1.049711	9.60	186.77	63.90	0.73
Reach - 1	15740	100-Year	2075.00	297.95	306.61	306.61	308.32	1.000241	9.67	203.60	66.84	0.72
Reach - 1	15524.2	2-Year	675.00	293.18	300.45		300.74	0.001695	4.43	204.59	102.41	0.31
Reach - 1	15524.2	10-Year	1165.00	293.18	302.44		302.80	0.001595	5.15	474.62	184.27	0.31
Reach - 1	15524.2	25-Year	1559.00	293.18	303.20		303.64	0.001891	5.94	626.51	216.56	0.35
Reach - 1	15524.2	50-Year	1853.00	293.18	303.55		304.09	0.002247	6.64	707.48	243.00	0.38
Reach - 1	15524.2	100-Year	2075.00	293.18	303.78		304.40	0.002519	7.15	765.38	267.84	0.40

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	11352.3	25-Year	2353.00	273.46	297.38	280.09	297.39	0.000010	0.53	4600.37	602.39	0.03
Reach - 1	11352.3	50-Year	2685.00	273.46	297.53	280.44	297.53	0.000013	0.60	4687.88	606.02	0.03
Reach - 1	11352.3	100-Year	2928.00	273.46	297.62	280.69	297.63	0.000015	0.65	4745.68	608.25	0.04
Reach - 1	11341.3		Inl Struct									
Reach - 1	11330.3	2-Year	823.00	277.80	282.25	282.25	283.72	0.012607	10.21	128.05	60.96	0.90
Reach - 1	11330.3	10-Year	1773.00	277.80	284.33	284.33	286.39	0.011298	12.80	280.99	86.14	0.92
Reach - 1	11330.3	25-Year	2353.00	277.80	285.29	285.29	287.62	0.011029	13.95	369.59	98.02	0.93
Reach - 1	11330.3	50-Year	2685.00	277.80	285.80	285.80	288.25	0.010810	14.47	421.25	104.32	0.93
Reach - 1	11330.3	100-Year	2928.00	277.80	286.17	286.17	288.68	0.010547	14.77	461.18	108.83	0.93
Reach - 1	11228.2	2-Year	823.00	274.45	279.26	279.26	280.91	0.016072	10.38	94.39	51.37	0.89
Reach - 1	11228.2	10-Year	1773.00	274.45	281.83	281.83	283.57	0.010639	11.62	308.09	119.37	0.79
Reach - 1	11228.2	25-Year	2353.00	274.45	282.68	282.68	284.59	0.010743	12.64	412.67	126.14	0.81
Reach - 1	11228.2	50-Year	2685.00	274.45	283.05	283.05	285.11	0.011248	13.35	459.66	130.13	0.83
Reach - 1	11228.2	100-Year	2928.00	274.45	283.33	283.33	285.47	0.011387	13.75	496.87	133.27	0.84
Reach - 1	10952.4	2-Year	823.00	270.52	274.54	274.54	275.79	0.015113	9.17	111.07	59.93	0.94
Reach - 1	10952.4	10-Year	1773.00	270.52	276.27	276.27	278.17	0.013212	11.67	227.14	75.37	0.95
Reach - 1	10952.4	25-Year	2353.00	270.52	276.83	276.83	279.38	0.015435	13.60	271.29	83.76	1.05
Reach - 1	10952.4	50-Year	2685.00	270.52	277.84	277.84	279.96	0.010436	12.58	380.85	123.84	0.89
Reach - 1	10952.4	100-Year	2928.00	270.52	277.86	277.86	280.36	0.012264	13.67	383.17	124.10	0.96
Reach - 1	10524.2	2-Year	823.00	263.63	268.94	268.02	269.73	0.007494	7.33	164.15	124.57	0.66
Reach - 1	10524.2	10-Year	1773.00	263.63	270.18	270.18	271.56	0.010888	10.31	343.29	168.02	0.82
Reach - 1	10524.2	25-Year	2353.00	263.63	270.85	270.85	272.42	0.011031	11.31	469.45	211.78	0.85
Reach - 1	10524.2	50-Year	2685.00	263.63	271.32	271.32	272.82	0.009897	11.31	575.39	233.69	0.81
Reach - 1	10524.2	100-Year	2928.00	263.63	271.57	271.57	273.07	0.009682	11.49	634.40	240.11	0.81
Reach - 1	10136.9	2-Year	823.00	261.02	269.01		269.07	0.000438	2.50	1210.57	612.09	0.18
Reach - 1	10136.9	10-Year	1773.00	261.02	270.14		270.24	0.000732	3.61	1948.08	694.77	0.23
Reach - 1	10136.9	25-Year	2353.00	261.02	270.84		270.95	0.000747	3.87	2452.32	735.52	0.24
Reach - 1	10136.9	50-Year	2685.00	261.02	271.28		271.38	0.000718	3.93	2775.69	760.51	0.24
Reach - 1	10136.9	100-Year	2928.00	261.02	271.86		271.94	0.000585	3.70	3227.54	791.30	0.22
Reach - 2	10024.2	2-Year	929.00	262.00	268.96		269.00	0.000811	2.59	1278.32	627.94	0.20
Reach - 2	10024.2	10-Year	2048.00	262.00	270.04		270.12	0.001325	3.73	2008.21	707.02	0.26

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	10024.2	25-Year	2731.00	262.00	270.75		270.83	0.001289	3.95	2521.73	749.05	0.26
Reach - 2	10024.2	50-Year	3124.00	262.00	271.19		271.26	0.001211	3.99	2855.44	777.09	0.26
Reach - 2	10024.2	100-Year	3395.00	262.00	271.78		271.85	0.000981	3.78	3350.74	883.70	0.23
Reach - 2	9691.7	2-Year	929.00	260.63	267.90	266.14	268.44	0.004010	6.34	308.47	436.77	0.47
Reach - 2	9691.7	10-Year	2048.00	260.63	269.50	268.50	269.64	0.001577	4.69	1655.35	527.51	0.31
Reach - 2	9691.7	25-Year	2731.00	260.63	270.17	268.50	270.33	0.001729	5.21	2022.65	564.52	0.33
Reach - 2	9691.7	50-Year	3124.00	260.63	270.61	268.51	270.77	0.001757	5.45	2274.26	578.85	0.33
Reach - 2	9691.7	100-Year	3395.00	260.63	271.35	268.51	271.47	0.001305	4.96	2708.21	613.72	0.29
Reach - 2	9676.2		Bridge									
Reach - 2	9660.7	2-Year	929.00	260.97	266.57	266.47	268.20	0.016823	10.29	101.20	256.44	0.91
Reach - 2	9660.7	10-Year	2048.00	260.97	269.20	268.01	269.42	0.002674	5.74	1326.06	488.97	0.39
Reach - 2	9660.7	25-Year	2731.00	260.97	270.07	268.23	270.28	0.002356	5.86	1779.84	539.43	0.38
Reach - 2	9660.7	50-Year	3124.00	260.97	270.53	268.48	270.73	0.002232	5.93	2033.94	565.70	0.37
Reach - 2	9660.7	100-Year	3395.00	260.97	270.83	268.62	271.04	0.002257	6.11	2204.55	575.94	0.37
Reach - 2	9524.2	2-Year	929.00	259.17	265.89		266.41	0.005611	5.98	226.89	125.44	0.47
Reach - 2	9524.2	10-Year	2048.00	259.17	268.56		268.96	0.003406	6.13	1011.02	467.62	0.39
Reach - 2	9524.2	25-Year	2731.00	259.17	269.61		269.91	0.002623	5.86	1514.04	494.02	0.35
Reach - 2	9524.2	50-Year	3124.00	259.17	270.13		270.40	0.002361	5.78	1771.32	499.71	0.34
Reach - 2	9524.2	100-Year	3395.00	259.17	270.46		270.72	0.002233	5.75	1939.33	505.22	0.33
Reach - 2	9024.2	2-Year	929.00	256.05	264.15		264.49	0.002659	4.79	253.23	87.81	0.33
Reach - 2	9024.2	10-Year	2048.00	256.05	266.64		267.24	0.003365	6.71	551.84	154.72	0.40
Reach - 2	9024.2	25-Year	2731.00	256.05	267.55		268.29	0.003862	7.67	697.37	165.81	0.43
Reach - 2	9024.2	50-Year	3124.00	256.05	267.99		268.81	0.004124	8.17	772.08	169.94	0.45
Reach - 2	9024.2	100-Year	3395.00	256.05	268.28		269.15	0.004296	8.49	820.77	172.58	0.46
Reach - 2	8588.6	2-Year	929.00	255.57	261.37		262.30	0.011742	7.76	120.27	34.54	0.66
Reach - 2	8588.6	10-Year	2048.00	255.57	264.44	263.14	265.26	0.006355	7.99	562.18	257.37	0.53
Reach - 2	8588.6	25-Year	2731.00	255.57	265.73		266.39	0.004827	7.77	934.43	335.32	0.47
Reach - 2	8588.6	50-Year	3124.00	255.57	266.32		266.92	0.004278	7.65	1137.28	350.09	0.45
Reach - 2	8588.6	100-Year	3395.00	255.57	266.65		267.23	0.004108	7.69	1255.37	358.28	0.44
Reach - 2	8024.2	2-Year	929.00	250.67	260.06		260.30	0.001454	4.00	272.40	53.63	0.26
Reach - 2	8024.2	10-Year	2048.00	250.67	263.65		263.87	0.001059	4.42	1223.19	509.40	0.23

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	8024.2	25-Year	2731.00	250.67	265.23		265.37	0.000738	4.02	2119.37	589.97	0.20
Reach - 2	8024.2	50-Year	3124.00	250.67	265.86		265.99	0.000686	4.00	2499.49	629.01	0.19
Reach - 2	8024.2	100-Year	3395.00	250.67	266.20		266.32	0.000673	4.03	2717.53	643.76	0.19
Reach - 2	7524.2	2-Year	941.00	249.35	259.53		259.70	0.000943	3.44	501.07	439.12	0.21
Reach - 2	7524.2	10-Year	2077.00	249.35	263.57		263.60	0.000233	2.22	3101.23	713.84	0.11
Reach - 2	7524.2	25-Year	2777.00	249.35	265.15		265.17	0.000185	2.14	4284.53	783.10	0.10
Reach - 2	7524.2	50-Year	3203.00	249.35	265.77		265.80	0.000183	2.19	4775.13	792.74	0.10
Reach - 2	7524.2	100-Year	3470.00	249.35	266.11		266.14	0.000184	2.23	5045.62	798.42	0.10
Reach - 3	7024.2	2-Year	956.00	250.01	259.04		259.18	0.001131	3.42	695.75	428.60	0.22
Reach - 3	7024.2	10-Year	2116.00	250.01	263.46		263.48	0.000221	2.07	2924.87	563.29	0.11
Reach - 3	7024.2	25-Year	2836.00	250.01	265.06		265.08	0.000187	2.07	3856.67	604.51	0.10
Reach - 3	7024.2	50-Year	3294.00	250.01	265.67		265.70	0.000213	2.28	4268.53	736.35	0.11
Reach - 3	7024.2	100-Year	3576.00	250.01	266.01		266.04	0.000214	2.33	4520.76	753.25	0.11
Reach - 3	6790.2	2-Year	956.00	249.25	258.88		258.98	0.000580	2.56	426.23	98.94	0.16
Reach - 3	6790.2	10-Year	2116.00	249.25	263.26		263.40	0.000507	3.22	1147.87	320.39	0.16
Reach - 3	6790.2	25-Year	2836.00	249.25	264.84		265.00	0.000511	3.51	1743.15	419.92	0.17
Reach - 3	6790.2	50-Year	3294.00	249.25	265.43		265.61	0.000563	3.79	1998.16	462.82	0.18
Reach - 3	6790.2	100-Year	3576.00	249.25	265.75		265.94	0.000599	3.97	2153.41	499.78	0.18
Reach - 3	6733.5	2-Year	966.00	250.49	258.87	253.12	258.94	0.000319	2.14	455.86	208.60	0.14
Reach - 3	6733.5	10-Year	2334.00	250.49	263.20	254.88	263.37	0.000403	3.26	726.62	335.57	0.17
Reach - 3	6733.5	25-Year	3132.00	250.49	264.85	255.76	264.95	0.000275	2.94	2380.01	455.93	0.14
Reach - 3	6733.5	50-Year	3639.00	250.49	265.43	256.25	265.56	0.000312	3.22	2662.43	527.04	0.15
Reach - 3	6733.5	100-Year	3999.00	250.49	265.76	256.57	265.89	0.000334	3.39	2836.08	551.22	0.16
Reach - 3	6670.0		Culvert									
Reach - 3	6606.5	2-Year	966.00	249.54	258.67	252.17	258.73	0.000232	1.95	502.84	240.75	0.12
Reach - 3	6606.5	10-Year	2334.00	249.54	262.51	253.94	262.67	0.000375	3.19	742.63	346.29	0.16
Reach - 3	6606.5	25-Year	3132.00	249.54	264.16	254.81	264.26	0.000252	2.85	2501.22	475.17	0.14
Reach - 3	6606.5	50-Year	3639.00	249.54	265.03	255.29	265.13	0.000255	2.99	2965.57	606.67	0.14
Reach - 3	6606.5	100-Year	3999.00	249.54	265.51	255.60	265.63	0.000272	3.16	3276.79	672.99	0.14
Reach - 3	6606.4	2-Year	966.00	249.54	258.56	252.39	258.69	0.000569	2.92	362.35	54.21	0.17
Reach - 3	6606.4	10-Year	2334.00	249.54	262.27	254.65	262.59	0.000932	4.71	979.08	652.27	0.23

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	6606.4	25-Year	3132.00	249.54	263.94	255.75	264.19	0.000750	4.58	2180.92	753.79	0.21
Reach - 3	6606.4	50-Year	3639.00	249.54	264.87	256.41	265.08	0.000645	4.43	2899.15	790.20	0.20
Reach - 3	6606.4	100-Year	3999.00	249.54	265.39	256.86	265.58	0.000611	4.41	3315.74	816.43	0.20
Reach - 3	6268.9		Culvert									
Reach - 3	5547.5	2-Year	966.00	250.00	258.31	254.95	258.60	0.001737	4.42	292.60	123.75	0.31
Reach - 3	5547.5	10-Year	2334.00	250.00	261.69	257.53	262.23	0.002014	6.35	673.76	747.61	0.36
Reach - 3	5547.5	25-Year	3132.00	250.00	263.69	258.75	263.74	0.000317	2.86	2972.43	893.51	0.15
Reach - 3	5547.5	50-Year	3639.00	250.00	264.70	259.33	264.73	0.000193	2.36	3894.17	942.46	0.12
Reach - 3	5547.5	100-Year	3999.00	250.00	265.22	259.78	265.25	0.000164	2.23	4391.77	969.58	0.11
Reach - 3	5486.5	2-Year	966.00	249.08	258.13	253.73	258.47	0.001764	4.84	277.22	108.39	0.30
Reach - 3	5486.5	10-Year	2334.00	249.08	261.71	257.14	262.00	0.001365	5.42	1032.79	551.28	0.28
Reach - 3	5486.5	25-Year	3132.00	249.08	263.65	258.66	263.72	0.000427	3.36	2581.89	834.83	0.16
Reach - 3	5486.5	50-Year	3639.00	249.08	264.68	259.36	264.72	0.000251	2.70	3495.02	940.82	0.12
Reach - 3	5486.5	100-Year	3999.00	249.08	265.21	259.83	265.24	0.000209	2.52	3994.72	954.93	0.11
Reach - 3	5420.5	2-Year	966.00	248.52	258.08	252.77	258.33	0.001248	4.09	305.12	117.84	0.24
Reach - 3	5420.5	10-Year	2334.00	248.52	261.49	255.89	261.88	0.001546	5.68	848.09	471.79	0.29
Reach - 3	5420.5	25-Year	3132.00	248.52	263.62	257.46	263.69	0.000396	3.20	2707.44	801.81	0.15
Reach - 3	5420.5	50-Year	3639.00	248.52	264.66	258.34	264.70	0.000243	2.63	3596.17	920.31	0.12
Reach - 3	5420.5	100-Year	3999.00	248.52	265.19	258.85	265.22	0.000205	2.47	4090.40	946.40	0.11
Reach - 3	5370.5	2-Year	966.00	249.58	257.95	253.60	258.25	0.001579	4.56	285.77	133.23	0.29
Reach - 3	5370.5	10-Year	2334.00	249.58	261.53	256.71	261.77	0.001117	4.92	1527.50	712.94	0.26
Reach - 3	5370.5	25-Year	3132.00	249.58	263.62	257.91	263.66	0.000277	2.74	3775.85	1121.37	0.13
Reach - 3	5370.5	50-Year	3639.00	249.58	264.66	258.83	264.69	0.000167	2.24	4956.64	1138.25	0.10
Reach - 3	5370.5	100-Year	3999.00	249.58	265.19	260.55	265.21	0.000140	2.09	5559.47	1139.71	0.09
Reach - 3	5319.5	2-Year	966.00	249.46	258.04	253.94	258.14	0.000768	3.09	925.58	371.78	0.20
Reach - 3	5319.5	10-Year	2334.00	249.46	261.61	257.16	261.68	0.000501	3.22	2223.01	451.55	0.17
Reach - 3	5319.5	25-Year	3132.00	249.46	263.59	257.54	263.64	0.000395	3.18	2961.27	665.73	0.15
Reach - 3	5319.5	50-Year	3639.00	249.46	264.61	258.09	264.67	0.000370	3.24	3346.92	704.92	0.15
Reach - 3	5319.5	100-Year	3999.00	249.46	265.14	258.25	265.20	0.000376	3.35	3543.56	711.13	0.15
Reach - 3	5270.5	2-Year	966.00	250.41	258.02	254.00	258.09	0.000656	2.75	1028.20	427.85	0.18
Reach - 3	5270.5	10-Year	2334.00	250.41	261.60	256.87	261.65	0.000376	2.73	2499.58	507.54	0.15

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	5270.5	25-Year	3132.00	250.41	263.58	257.43	263.62	0.000293	2.69	3322.38	693.93	0.13
Reach - 3	5270.5	50-Year	3639.00	250.41	264.61	257.87	264.65	0.000274	2.74	3750.86	727.12	0.13
Reach - 3	5270.5	100-Year	3999.00	250.41	265.13	258.11	265.18	0.000279	2.84	3969.23	750.70	0.13
Reach - 3	5219.5	2-Year	966.00	249.89	258.00	253.74	258.06	0.000550	2.56	1068.56	423.40	0.17
Reach - 3	5219.5	10-Year	2334.00	249.89	261.58	256.76	261.63	0.000382	2.78	2358.99	523.24	0.15
Reach - 3	5219.5	25-Year	3132.00	249.89	263.56	257.30	263.61	0.000313	2.80	3071.40	788.61	0.14
Reach - 3	5219.5	50-Year	3639.00	249.89	264.60	257.57	264.64	0.000255	2.66	3898.86	840.53	0.13
Reach - 3	5219.5	100-Year	3999.00	249.89	265.12	257.79	265.16	0.000261	2.76	4120.64	851.69	0.13
Reach - 3	5169.5	2-Year	966.00	249.88	257.98	254.15	258.03	0.000461	2.44	1075.74	393.81	0.16
Reach - 3	5169.5	10-Year	2334.00	249.88	261.55	255.93	261.61	0.000424	3.02	2108.66	552.41	0.16
Reach - 3	5169.5	25-Year	3132.00	249.88	263.52	256.54	263.59	0.000373	3.16	2680.47	683.98	0.15
Reach - 3	5169.5	50-Year	3639.00	249.88	264.58	256.84	264.62	0.000261	2.78	3816.99	711.25	0.13
Reach - 3	5169.5	100-Year	3999.00	249.88	265.13	257.09	265.15	0.000104	1.80	5275.38	758.13	0.08
Reach - 3	5118.5	2-Year	966.00	249.56	257.92	254.19	258.00	0.000660	2.88	869.07	332.60	0.19
Reach - 3	5118.5	10-Year	2334.00	249.56	261.49	256.55	261.58	0.000560	3.47	1780.47	477.39	0.19
Reach - 3	5118.5	25-Year	3132.00	249.56	263.49	257.30	263.57	0.000411	3.33	2522.26	742.07	0.16
Reach - 3	5118.5	50-Year	3639.00	249.56	264.58	257.57	264.61	0.000174	2.29	4523.45	802.10	0.11
Reach - 3	5118.5	100-Year	3999.00	249.56	265.11	257.77	265.14	0.000159	2.24	4957.74	823.72	0.10
Reach - 3	5067.5	2-Year	966.00	249.11	257.82		257.96	0.000852	3.47	631.91	212.25	0.21
Reach - 3	5067.5	10-Year	2334.00	249.11	261.42		261.55	0.000681	3.94	1695.76	435.03	0.20
Reach - 3	5067.5	25-Year	3132.00	249.11	263.48		263.54	0.000355	3.16	2881.74	707.20	0.15
Reach - 3	5067.5	50-Year	3639.00	249.11	264.55		264.59	0.000247	2.77	3683.32	792.46	0.13
Reach - 3	5067.5	100-Year	3999.00	249.11	265.09		265.13	0.000213	2.64	4122.78	845.68	0.12
Reach - 3	5018.5	2-Year	966.00	249.02	257.74	253.13	257.91	0.001010	3.79	561.93	167.36	0.23
Reach - 3	5018.5	10-Year	2334.00	249.02	261.27	256.86	261.50	0.001064	4.91	1166.96	273.74	0.25
Reach - 3	5018.5	25-Year	3132.00	249.02	263.28	257.70	263.50	0.000917	5.06	1561.44	456.04	0.24
Reach - 3	5018.5	50-Year	3639.00	249.02	264.48	258.15	264.57	0.000453	3.76	2664.31	615.51	0.17
Reach - 3	5018.5	100-Year	3999.00	249.02	265.04	258.44	265.11	0.000387	3.56	3012.56	651.38	0.16
Reach - 3	4972.5	2-Year	966.00	249.35	257.62		257.85	0.001276	4.17	408.30	122.32	0.26
Reach - 3	4972.5	10-Year	2334.00	249.35	261.04		261.42	0.001558	5.83	894.83	166.70	0.30
Reach - 3	4972.5	25-Year	3132.00	249.35	263.08		263.44	0.001287	5.92	1236.06	167.27	0.28
Reach - 3	4972.5	50-Year	3639.00	249.35	264.16		264.51	0.001214	6.05	1427.20	194.35	0.28

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4972.5	100-Year	3999.00	249.35	264.68		265.05	0.001232	6.24	1531.22	203.32	0.28
Reach - 3	4922.5	2-Year	966.00	249.34	257.51		257.78	0.001395	4.25	286.81	58.45	0.27
Reach - 3	4922.5	10-Year	2334.00	249.34	260.65		261.30	0.002321	6.87	510.80	83.52	0.37
Reach - 3	4922.5	25-Year	3132.00	249.34	262.54		263.31	0.002284	7.59	743.46	144.35	0.37
Reach - 3	4922.5	50-Year	3639.00	249.34	263.63		264.40	0.002115	7.71	905.42	160.76	0.37
Reach - 3	4922.5	100-Year	3999.00	249.34	264.14		264.93	0.002147	7.96	990.84	175.94	0.37
Reach - 3	4871.5	2-Year	966.00	248.79	257.48		257.71	0.001059	3.92	312.53	59.56	0.25
Reach - 3	4871.5	10-Year	2334.00	248.79	260.59		261.18	0.001864	6.48	519.62	73.74	0.34
Reach - 3	4871.5	25-Year	3132.00	248.79	262.51		263.18	0.001778	7.05	802.28	205.61	0.34
Reach - 3	4871.5	50-Year	3639.00	248.79	263.68		264.25	0.001494	6.84	1057.57	243.12	0.32
Reach - 3	4871.5	100-Year	3999.00	248.79	264.22		264.77	0.001426	6.85	1192.71	253.07	0.31
Reach - 3	4817.5	2-Year	966.00	249.04	257.33	253.17	257.63	0.001553	4.48	270.39	57.64	0.29
Reach - 3	4817.5	10-Year	2334.00	249.04	260.29	256.13	261.04	0.002656	7.32	463.59	73.05	0.40
Reach - 3	4817.5	25-Year	3132.00	249.04	262.29	257.39	263.06	0.002293	7.65	725.24	166.86	0.38
Reach - 3	4817.5	50-Year	3639.00	249.04	263.48	258.12	264.15	0.001924	7.44	925.55	194.84	0.36
Reach - 3	4817.5	100-Year	3999.00	249.04	264.00	258.59	264.67	0.001888	7.56	1020.79	217.76	0.35
Reach - 3	4766.5	2-Year	966.00	248.79	257.32	252.84	257.54	0.001125	3.76	296.02	61.75	0.25
Reach - 3	4766.5	10-Year	2334.00	248.79	260.32	255.43	260.87	0.001872	6.13	486.28	78.46	0.34
Reach - 3	4766.5	25-Year	3132.00	248.79	262.31	256.65	262.91	0.001685	6.55	699.80	135.29	0.33
Reach - 3	4766.5	50-Year	3639.00	248.79	263.45	257.30	264.03	0.001527	6.62	903.42	138.12	0.32
Reach - 3	4766.5	100-Year	3999.00	248.79	263.95	257.73	264.56	0.001572	6.88	972.00	138.92	0.33
Reach - 3	4696.5	2-Year	955.00	249.54	257.33	252.57	257.43	0.000546	2.68	431.02	98.14	0.18
Reach - 3	4696.5	10-Year	2132.00	249.54	260.40	254.27	260.63	0.000727	3.98	684.56	162.50	0.22
Reach - 3	4696.5	25-Year	2860.00	249.54	262.40	255.20	262.67	0.000685	4.37	849.42	180.89	0.22
Reach - 3	4696.5	50-Year	3336.00	249.54	263.61	255.74	263.77	0.000450	3.77	1467.82	250.21	0.18
Reach - 3	4696.5	100-Year	3706.00	249.54	264.12	256.10	264.29	0.000445	3.85	1603.32	329.06	0.18
Reach - 3	4645.0		Culvert									
Reach - 3	4593.5	2-Year	955.00	249.19	257.18	251.41	257.23	0.000213	1.85	565.42	102.46	0.12
Reach - 3	4593.5	10-Year	2132.00	249.19	259.72	252.73	259.86	0.000404	3.08	766.76	188.91	0.17
Reach - 3	4593.5	25-Year	2860.00	249.19	261.03	253.41	261.21	0.000441	3.49	1228.38	215.94	0.18
Reach - 3	4593.5	50-Year	3336.00	249.19	261.82	253.83	262.02	0.000466	3.76	1403.87	228.22	0.19

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4593.5	100-Year	3706.00	249.19	262.47	254.14	262.69	0.000472	3.91	1555.79	238.35	0.19
Reach - 3	4500.596	2-Year	955.00	248.23	257.01	252.70	257.17	0.001082	3.23	346.55	106.12	0.24
Reach - 3	4500.596	10-Year	2132.00	248.23	259.45	254.90	259.75	0.001514	4.58	624.27	165.75	0.30
Reach - 3	4500.596	25-Year	2860.00	248.23	260.72	255.97	261.08	0.001589	5.06	776.00	172.28	0.32
Reach - 3	4500.596	50-Year	3336.00	248.23	261.50	256.65	261.89	0.001607	5.31	870.76	176.77	0.32
Reach - 3	4500.596	100-Year	3706.00	248.23	262.16	257.06	262.56	0.001571	5.42	952.20	272.91	0.32
Reach - 3	4486	Bridge										
Reach - 3	4452.7	2-Year	955.00	248.28	255.67	251.16	255.85	0.000889	3.44	304.16	198.18	0.23
Reach - 3	4452.7	10-Year	2132.00	248.28	257.88	253.12	258.37	0.001719	5.72	424.80	442.61	0.33
Reach - 3	4452.7	25-Year	2860.00	248.28	259.14	254.22	259.79	0.001977	6.67	495.52	510.10	0.36
Reach - 3	4452.7	50-Year	3336.00	248.28	260.01	254.87	260.75	0.002041	7.13	543.90	641.35	0.37
Reach - 3	4452.7	100-Year	3706.00	248.28	260.87	255.33	261.65	0.001950	7.32	592.35	707.69	0.37
Reach - 3	4387.2	Culvert										
Reach - 3	4321.7	2-Year	955.00	249.27	255.39	252.15	255.67	0.001760	4.26	238.35	60.21	0.31
Reach - 3	4321.7	10-Year	2132.00	249.27	256.95	254.10	257.80	0.003973	7.47	319.06	220.29	0.48
Reach - 3	4321.7	25-Year	2860.00	249.27	257.67	255.14	258.93	0.005203	9.09	358.12	351.65	0.56
Reach - 3	4321.7	50-Year	3336.00	249.27	258.21	255.79	259.70	0.005704	9.92	387.24	409.59	0.59
Reach - 3	4321.7	100-Year	3706.00	249.27	259.08	256.24	260.58	0.005063	9.96	435.50	449.41	0.56
Reach - 3	4294.441	2-Year	955.00	246.73	255.39		255.59	0.001283	3.68	446.87	240.57	0.26
Reach - 3	4294.441	10-Year	2132.00	246.73	257.11		257.48	0.002059	5.42	978.06	331.44	0.35
Reach - 3	4294.441	25-Year	2860.00	246.73	258.01		258.42	0.002154	5.97	1277.98	336.90	0.36
Reach - 3	4294.441	50-Year	3336.00	246.73	258.66		259.07	0.002059	6.13	1498.32	340.86	0.36
Reach - 3	4294.441	100-Year	3706.00	246.73	259.59		259.93	0.001616	5.79	1816.30	346.50	0.32
Reach - 3	4000.0	2-Year	955.00	248.37	254.80		254.96	0.004026	4.80	702.39	411.54	0.41
Reach - 3	4000.0	10-Year	2132.00	248.37	256.61		256.72	0.002589	4.82	1564.29	513.16	0.35
Reach - 3	4000.0	25-Year	2860.00	248.37	257.61		257.71	0.002038	4.75	2094.53	548.47	0.32
Reach - 3	4000.0	50-Year	3336.00	248.37	258.34		258.43	0.001666	4.59	2503.96	574.63	0.29
Reach - 3	4000.0	100-Year	3706.00	248.37	259.39		259.46	0.001083	4.04	3117.60	588.67	0.24
Reach - 3	3500.0	2-Year	955.00	246.98	253.85		253.89	0.001264	2.83	1414.11	771.15	0.24
Reach - 3	3500.0	10-Year	2132.00	246.98	256.17		256.19	0.000533	2.42	3404.29	915.57	0.16

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	3500.0	25-Year	2860.00	246.98	257.26		257.28	0.000431	2.40	4407.31	927.69	0.15
Reach - 3	3500.0	50-Year	3336.00	246.98	258.05		258.07	0.000365	2.35	5151.44	954.62	0.14
Reach - 3	3500.0	100-Year	3706.00	246.98	259.20		259.22	0.000247	2.10	6263.56	971.00	0.12
Reach - 3	3185.2	2-Year	971.00	246.10	253.02	250.21	253.31	0.002113	4.29	235.61	721.65	0.34
Reach - 3	3185.2	10-Year	2165.00	246.10	254.93	252.14	255.64	0.003474	6.81	371.64	874.58	0.45
Reach - 3	3185.2	25-Year	2909.00	246.10	255.67	253.11	256.67	0.004384	8.17	433.97	892.45	0.52
Reach - 3	3185.2	50-Year	3396.00	246.10	256.35	253.71	257.46	0.004398	8.66	494.93	907.51	0.53
Reach - 3	3185.2	100-Year	3779.00	246.10	257.84	254.15	258.76	0.002981	7.96	641.69	1072.19	0.45
Reach - 3	3157.2		Bridge									
Reach - 3	3129.2	2-Year	971.00	245.86	252.68	249.97	252.97	0.002271	4.39	229.51	689.09	0.35
Reach - 3	3129.2	10-Year	2165.00	245.86	253.48	251.91	254.56	0.006761	8.37	280.13	830.26	0.61
Reach - 3	3129.2	25-Year	2909.00	245.86	253.98	252.88	255.60	0.009167	10.29	315.54	850.48	0.72
Reach - 3	3129.2	50-Year	3396.00	245.86	254.39	253.47	256.30	0.010010	11.22	347.11	864.25	0.77
Reach - 3	3129.2	100-Year	3779.00	245.86	254.58	253.93	256.80	0.011206	12.10	362.81	870.78	0.81
Reach - 3	2957.4	2-Year	971.00	243.96	252.72		252.73	0.000258	1.65	2159.40	844.11	0.11
Reach - 3	2957.4	10-Year	2165.00	243.96	253.80		253.82	0.000494	2.53	3075.46	859.23	0.16
Reach - 3	2957.4	25-Year	2909.00	243.96	254.54		254.57	0.000518	2.76	3719.12	868.39	0.17
Reach - 3	2957.4	50-Year	3396.00	243.96	255.10		255.13	0.000494	2.81	4208.62	876.49	0.17
Reach - 3	2957.4	100-Year	3779.00	243.96	255.44		255.47	0.000500	2.90	4508.92	882.06	0.17
Reach - 3	2362.9	2-Year	971.00	243.50	252.47		252.51	0.000576	2.52	1624.81	703.90	0.17
Reach - 3	2362.9	10-Year	2165.00	243.50	253.28		253.37	0.001275	4.04	2205.40	729.79	0.26
Reach - 3	2362.9	25-Year	2909.00	243.50	254.03		254.11	0.001238	4.25	2752.81	747.48	0.26
Reach - 3	2362.9	50-Year	3396.00	243.50	254.63		254.71	0.001087	4.17	3210.50	761.40	0.25
Reach - 3	2362.9	100-Year	3779.00	243.50	254.97		255.05	0.001074	4.25	3471.89	769.25	0.25
Reach - 3	1661.6	2-Year	971.00	242.95	252.31		252.32	0.000151	1.31	2677.79	751.36	0.09
Reach - 3	1661.6	10-Year	2165.00	242.95	252.78		252.81	0.000518	2.53	3036.37	760.55	0.16
Reach - 3	1661.6	25-Year	2909.00	242.95	253.50		253.52	0.000572	2.83	3599.07	825.81	0.17
Reach - 3	1661.6	50-Year	3396.00	242.95	254.15		254.18	0.000532	2.87	4165.62	903.14	0.17
Reach - 3	1661.6	100-Year	3779.00	242.95	254.49		254.51	0.000541	2.97	4475.54	933.89	0.17
Reach - 3	920.6	2-Year	971.00	242.61	252.25	248.37	252.25	0.000053	0.84	4297.09	996.23	0.05
Reach - 3	920.6	10-Year	2165.00	242.61	252.56	248.99	252.57	0.000211	1.73	4606.72	1001.47	0.11

HEC-RAS Plan: Future (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	920.6	25-Year	2909.00	242.61	253.24	249.20	253.25	0.000248	1.98	5291.71	1013.16	0.12
Reach - 3	920.6	50-Year	3396.00	242.61	253.91	249.34	253.92	0.000231	2.01	5974.25	1023.93	0.12
Reach - 3	920.6	100-Year	3779.00	242.61	254.24	249.43	254.25	0.000241	2.11	6313.41	1032.04	0.12

**ALTERNATIVE CONDITIONS:
HEC-RAS OUTPUT
(ALL PROJECTS)**

HEC-RAS Plan: Prop 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	26670.3	2-Year	165.00	470.17	472.01	472.01	472.68	0.028898	6.59	25.05	18.88	1.01
Reach - 1	26670.3	10-Year	337.00	470.17	474.90		475.12	0.002373	3.74	97.44	34.13	0.34
Reach - 1	26670.3	25-Year	447.00	470.17	475.05		475.40	0.003659	4.76	102.57	34.60	0.42
Reach - 1	26670.3	50-Year	530.00	470.17	476.14		476.42	0.002206	4.34	156.66	76.69	0.34
Reach - 1	26670.3	100-Year	617.00	470.17	476.78		477.05	0.001868	4.32	213.19	118.20	0.32
Reach - 1	26133.4	2-Year	203.00	467.03	470.95	468.59	471.02	0.000795	2.19	108.83	44.17	0.20
Reach - 1	26133.4	10-Year	413.00	467.03	474.66	469.37	474.72	0.000303	2.15	231.95	62.98	0.14
Reach - 1	26133.4	25-Year	546.00	467.03	474.61	469.80	474.73	0.000541	2.87	230.51	62.77	0.19
Reach - 1	26133.4	50-Year	648.00	467.03	475.78	470.08	475.90	0.000461	2.92	269.35	68.54	0.18
Reach - 1	26133.4	100-Year	753.00	467.03	476.41	470.35	476.56	0.000489	3.15	290.30	76.49	0.18
Reach - 1	26050.4		Culvert									
Reach - 1	25967.4	2-Year	203.00	463.47	465.53	465.03	465.85	0.009037	4.61	47.66	31.43	0.60
Reach - 1	25967.4	10-Year	412.00	463.47	473.12	465.81	473.16	0.000121	1.60	382.42	98.05	0.09
Reach - 1	25967.4	25-Year	525.00	463.47	466.84	466.18	467.51	0.009301	6.72	90.58	40.40	0.67
Reach - 1	25967.4	50-Year	600.00	463.47	467.09	466.40	467.83	0.009267	7.07	99.05	42.15	0.68
Reach - 1	25967.4	100-Year	704.00	463.47	467.40	466.68	468.25	0.009460	7.57	109.23	44.25	0.70
Reach - 1	25524.2	2-Year	203.00	456.43	458.48	458.48	459.23	0.027778	6.96	29.18	19.56	1.00
Reach - 1	25524.2	10-Year	412.00	456.43	473.12		473.13	0.000014	0.73	1514.65	201.70	0.03
Reach - 1	25524.2	25-Year	525.00	456.43	459.83	459.83	461.09	0.023837	9.01	58.42	23.91	1.00
Reach - 1	25524.2	50-Year	600.00	456.43	460.06	460.06	461.44	0.023535	9.42	64.10	24.70	1.00
Reach - 1	25524.2	100-Year	704.00	456.43	460.39	460.39	461.90	0.022326	9.86	73.05	29.09	0.99
Reach - 1	24962.5	2-Year	203.00	444.33	458.60		458.60	0.000008	0.49	888.28	119.66	0.02
Reach - 1	24962.5	10-Year	412.00	444.33	473.12		473.13	0.000002	0.37	2849.28	136.00	0.01
Reach - 1	24962.5	25-Year	525.00	444.33	448.54		449.25	0.009578	6.80	78.95	27.18	0.66
Reach - 1	24962.5	50-Year	600.00	444.33	448.78		449.59	0.009799	7.22	85.84	28.30	0.68
Reach - 1	24962.5	100-Year	704.00	444.33	449.04		450.00	0.010687	7.89	93.16	29.43	0.71
Reach - 1	24504.7	2-Year	317.00	437.03	458.60		458.60	0.000003	0.39	2115.25	162.90	0.01
Reach - 1	24504.7	10-Year	652.00	437.03	473.12		473.13	0.000001	0.40	4481.85	162.90	0.01
Reach - 1	24504.7	25-Year	855.00	437.03	441.41	441.41	442.91	0.017656	9.97	106.35	53.22	0.93
Reach - 1	24504.7	50-Year	1003.00	437.03	441.82	441.82	443.40	0.016487	10.34	129.07	60.11	0.92
Reach - 1	24504.7	100-Year	1172.00	437.03	442.27	442.27	443.91	0.015083	10.63	157.91	67.19	0.89

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	22255.4	2-Year	418.00	422.25	458.59	425.82	458.59	0.000000	0.16	9045.72	346.10	0.00
Reach - 1	22255.4	10-Year	850.00	422.25	473.12	427.24	473.12	0.000000	0.20	14073.81	346.10	0.01
Reach - 1	22255.4	25-Year	1151.00	422.25	433.60	428.07	433.99	0.001193	5.16	311.62	277.07	0.29
Reach - 1	22255.4	50-Year	1336.00	422.25	433.76	428.55	434.26	0.001520	5.88	318.93	292.18	0.32
Reach - 1	22255.4	100-Year	1539.00	422.25	433.61	429.04	434.30	0.002126	6.89	312.05	278.42	0.38
Reach - 1	22230.4	Bridge										
Reach - 1	22205.4	2-Year	56.00	421.56	422.91	422.91	423.40	0.032407	5.63	9.95	10.13	1.00
Reach - 1	22205.4	10-Year	108.00	421.56	423.53	423.53	424.15	0.030159	6.29	17.16	13.98	1.00
Reach - 1	22205.4	25-Year	140.00	421.56	423.86	423.86	424.46	0.029866	6.20	22.59	18.94	1.00
Reach - 1	22205.4	50-Year	165.00	421.56	424.01	424.01	424.66	0.029210	6.46	25.54	19.93	1.00
Reach - 1	22205.4	100-Year	190.00	421.56	424.15	424.15	424.85	0.028087	6.71	28.34	20.41	1.00
Reach - 1	22061.4	2-Year	56.00	400.80	401.87	401.87	402.24	0.051450	4.88	11.48	15.84	1.01
Reach - 1	22061.4	10-Year	108.00	400.80	402.28	402.28	402.81	0.046217	5.84	18.49	17.74	1.01
Reach - 1	22061.4	25-Year	140.00	400.80	402.49	402.49	403.10	0.044371	6.29	22.24	18.40	1.01
Reach - 1	22061.4	50-Year	165.00	400.80	402.64	402.64	403.31	0.042938	6.58	25.09	18.89	1.01
Reach - 1	22061.4	100-Year	190.00	400.80	402.78	402.78	403.51	0.042335	6.86	27.72	19.32	1.01
Reach - 1	21877	2-Year	56.00	390.67	391.58	391.58	391.81	0.050346	3.76	14.51	32.27	1.01
Reach - 1	21877	10-Year	108.00	390.67	392.39		392.49	0.006432	2.56	42.90	37.87	0.42
Reach - 1	21877	25-Year	140.00	390.67	393.02		393.08	0.002588	2.08	73.94	65.48	0.28
Reach - 1	21877	50-Year	165.00	390.67	393.56		393.60	0.001403	1.79	109.19	67.32	0.22
Reach - 1	21877	100-Year	190.00	390.67	393.81		393.85	0.001261	1.81	129.00	101.39	0.21
Reach - 1	21577.4	2-Year	549.00	383.59	388.89		389.26	0.005330	5.02	153.54	102.03	0.42
Reach - 1	21577.4	10-Year	1006.00	383.59	390.05		390.57	0.006267	6.36	287.80	125.16	0.48
Reach - 1	21577.4	25-Year	1311.00	383.59	390.60		391.20	0.006844	7.08	357.96	130.93	0.51
Reach - 1	21577.4	50-Year	1585.00	383.59	390.92		391.66	0.007996	7.92	400.80	140.43	0.55
Reach - 1	21577.4	100-Year	1744.00	383.59	391.14		391.92	0.008258	8.23	431.92	143.14	0.56
Reach - 1	21329	2-Year	549.00	380.12	385.03	385.03	386.48	0.031913	9.63	56.98	20.13	1.01
Reach - 1	21329	10-Year	1006.00	380.12	387.13	387.13	388.22	0.014990	8.76	200.38	171.42	0.74
Reach - 1	21329	25-Year	1311.00	380.12	387.68	387.68	388.78	0.014246	9.24	307.25	218.58	0.73
Reach - 1	21329	50-Year	1585.00	380.12	388.16	388.16	389.17	0.012535	9.23	423.74	252.20	0.70
Reach - 1	21329	100-Year	1744.00	380.12	388.32	388.32	389.36	0.012860	9.53	463.88	255.92	0.71

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	21024.2	2-Year	549.00	375.87	381.63		381.99	0.003544	4.81	121.08	30.48	0.38
Reach - 1	21024.2	10-Year	1006.00	375.87	384.43		384.74	0.001946	4.83	490.40	310.20	0.31
Reach - 1	21024.2	25-Year	1311.00	375.87	386.38		386.50	0.000796	3.59	1179.38	386.62	0.20
Reach - 1	21024.2	50-Year	1585.00	375.87	387.40		387.49	0.000605	3.35	1577.58	395.12	0.18
Reach - 1	21024.2	100-Year	1744.00	375.87	387.83		387.92	0.000570	3.34	1749.84	398.78	0.18
Reach - 1	20803	2-Year	549.00	373.95	380.06		380.74	0.009705	6.58	83.43	20.25	0.57
Reach - 1	20803	10-Year	1006.00	373.95	383.85		384.23	0.002747	5.33	347.99	122.24	0.34
Reach - 1	20803	25-Year	1311.00	373.95	386.01		386.26	0.001490	4.62	677.85	211.91	0.26
Reach - 1	20803	50-Year	1585.00	373.95	387.07		387.29	0.001292	4.60	924.04	255.90	0.24
Reach - 1	20803	100-Year	1744.00	373.95	387.51		387.73	0.001270	4.68	1039.94	275.19	0.24
Reach - 1	20582.7	2-Year	549.00	372.04	379.94		380.09	0.000957	3.19	238.08	74.82	0.21
Reach - 1	20582.7	10-Year	1006.00	372.04	383.85		383.95	0.000436	2.90	906.08	250.59	0.15
Reach - 1	20582.7	25-Year	1311.00	372.04	386.02		386.09	0.000271	2.58	1489.75	284.80	0.13
Reach - 1	20582.7	50-Year	1585.00	372.04	387.07		387.13	0.000263	2.67	1800.11	306.53	0.13
Reach - 1	20582.7	100-Year	1744.00	372.04	387.50		387.57	0.000269	2.76	1933.93	310.80	0.13
Reach - 1	20391.6	2-Year	578.00	371.31	378.31	376.83	379.39	0.009040	8.97	105.91	34.02	0.63
Reach - 1	20391.6	10-Year	1051.00	371.31	382.87	379.04	383.58	0.003380	7.90	268.44	271.78	0.42
Reach - 1	20391.6	25-Year	1375.00	371.31	385.09	380.31	385.78	0.002709	8.01	357.85	338.49	0.39
Reach - 1	20391.6	50-Year	1648.00	371.31	387.01	381.30	387.07	0.000409	3.42	2040.10	363.55	0.16
Reach - 1	20391.6	100-Year	1805.00	371.31	387.45	381.68	387.50	0.000400	3.44	2199.03	366.84	0.15
Reach - 1	20349.6		Mult Open									
Reach - 1	20307.6	2-Year	524.00	371.56	376.76	376.76	378.75	0.025300	11.95	63.54	20.01	1.00
Reach - 1	20307.6	10-Year	1028.00	371.56	379.19	379.19	381.84	0.020033	14.23	123.62	63.67	0.96
Reach - 1	20307.6	25-Year	1365.00	371.56	380.75	380.75	382.72	0.013136	13.21	258.02	88.56	0.80
Reach - 1	20307.6	50-Year	1642.00	371.56	382.11	382.11	383.51	0.008761	11.92	443.70	206.88	0.67
Reach - 1	20307.6	100-Year	1803.00	371.56	382.38	382.38	383.77	0.008784	12.15	501.43	220.88	0.68
Reach - 1	20223	2-Year	524.00	370.12	374.63	374.63	375.83	0.030504	8.79	59.60	25.19	1.01
Reach - 1	20223	10-Year	1028.00	370.12	376.25	376.25	377.62	0.019021	9.56	144.21	91.49	0.86
Reach - 1	20223	25-Year	1365.00	370.12	376.97	376.97	378.39	0.016675	10.04	217.26	108.88	0.83
Reach - 1	20223	50-Year	1642.00	370.12	377.40	377.40	378.93	0.016600	10.63	265.12	116.42	0.84
Reach - 1	20223	100-Year	1803.00	370.12	377.65	377.65	379.22	0.016263	10.88	294.88	120.87	0.84

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	20024.2	2-Year	524.00	366.75	370.97	370.19	371.64	0.011134	6.62	89.16	36.30	0.64
Reach - 1	20024.2	10-Year	1028.00	366.75	372.62		373.64	0.010326	8.34	155.86	48.66	0.66
Reach - 1	20024.2	25-Year	1365.00	366.75	373.26	372.37	374.60	0.011811	9.67	189.98	59.37	0.72
Reach - 1	20024.2	50-Year	1642.00	366.75	373.61	372.98	375.31	0.013814	10.89	212.32	67.46	0.79
Reach - 1	20024.2	100-Year	1803.00	366.75	373.83	373.17	375.71	0.014609	11.47	228.59	78.31	0.81
Reach - 1	19751	2-Year	524.00	361.35	366.31	366.01	367.37	0.022875	8.28	63.28	22.96	0.88
Reach - 1	19751	10-Year	1028.00	361.35	367.67	367.67	369.35	0.025751	10.40	102.39	43.84	0.97
Reach - 1	19751	25-Year	1365.00	361.35	368.51	368.51	370.32	0.021298	10.90	150.63	68.05	0.92
Reach - 1	19751	50-Year	1642.00	361.35	369.17	369.17	370.98	0.018261	11.08	201.41	84.40	0.87
Reach - 1	19751	100-Year	1803.00	361.35	369.46	369.46	371.32	0.017671	11.32	226.69	88.49	0.86
Reach - 1	19524.2	2-Year	524.00	356.87	360.27	360.27	361.53	0.029106	8.97	58.72	24.87	0.99
Reach - 1	19524.2	10-Year	1028.00	356.87	361.84	361.84	363.48	0.021129	10.45	121.60	52.05	0.91
Reach - 1	19524.2	25-Year	1365.00	356.87	362.61	362.61	364.46	0.019681	11.31	163.21	57.14	0.91
Reach - 1	19524.2	50-Year	1642.00	356.87	363.13	363.13	365.18	0.019342	12.01	194.14	60.77	0.91
Reach - 1	19524.2	100-Year	1803.00	356.87	363.42	363.42	365.57	0.019154	12.37	211.81	62.64	0.92
Reach - 1	19222	2-Year	524.00	348.54	351.61	351.61	352.65	0.029195	8.18	65.71	35.39	1.00
Reach - 1	19222	10-Year	1028.00	348.54	352.82	352.82	354.33	0.023726	9.96	115.55	45.72	0.97
Reach - 1	19222	25-Year	1365.00	348.54	353.46	353.46	355.26	0.022577	10.94	145.89	49.05	0.97
Reach - 1	19222	50-Year	1642.00	348.54	353.97	353.97	355.96	0.021463	11.56	171.25	51.67	0.97
Reach - 1	19222	100-Year	1803.00	348.54	354.25	354.25	356.33	0.020794	11.86	186.11	52.62	0.96
Reach - 1	19024.2	2-Year	524.00	343.08	347.86		348.38	0.006926	5.79	90.65	23.66	0.52
Reach - 1	19024.2	10-Year	1028.00	343.08	349.60		350.54	0.007660	7.80	140.94	36.63	0.58
Reach - 1	19024.2	25-Year	1365.00	343.08	350.51	348.73	351.67	0.007866	8.73	203.29	103.26	0.60
Reach - 1	19024.2	50-Year	1642.00	343.08	351.12	349.41	352.39	0.007953	9.32	277.00	152.36	0.61
Reach - 1	19024.2	100-Year	1803.00	343.08	350.90	349.89	352.59	0.010895	10.68	246.15	126.21	0.72
Reach - 1	18833	2-Year	524.00	339.27	344.35	344.35	345.84	0.031367	9.77	53.65	18.11	1.00
Reach - 1	18833	10-Year	1028.00	339.27	346.23	346.23	348.11	0.022485	11.16	110.06	41.97	0.91
Reach - 1	18833	25-Year	1365.00	339.27	347.14	347.14	349.27	0.020596	12.03	154.32	57.93	0.90
Reach - 1	18833	50-Year	1642.00	339.27	347.84	347.84	350.06	0.018957	12.48	199.80	73.40	0.88
Reach - 1	18833	100-Year	1803.00	339.27	348.88	348.88	350.40	0.011512	10.78	348.14	158.39	0.70
Reach - 1	18524.2	2-Year	524.00	333.12	339.83		340.06	0.001769	3.83	146.72	31.80	0.28
Reach - 1	18524.2	10-Year	1028.00	333.12	341.71		342.18	0.002576	5.57	222.75	49.23	0.35

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	18524.2	25-Year	1365.00	333.12	342.49		343.15	0.003222	6.65	272.64	91.83	0.40
Reach - 1	18524.2	50-Year	1642.00	333.12	343.02		343.82	0.003663	7.38	327.32	105.09	0.43
Reach - 1	18524.2	100-Year	1803.00	333.12	343.33		344.19	0.003852	7.74	359.42	107.97	0.45
Reach - 1	18317	2-Year	524.00	331.33	337.74	337.74	338.99	0.032548	9.04	64.29	35.78	0.95
Reach - 1	18317	10-Year	1028.00	331.33	339.25	339.25	340.84	0.025157	10.60	140.89	67.42	0.90
Reach - 1	18317	25-Year	1365.00	331.33	340.20	340.20	341.71	0.019722	10.71	221.49	99.11	0.82
Reach - 1	18317	50-Year	1642.00	331.33	340.69	340.69	342.27	0.019304	11.23	271.39	105.96	0.83
Reach - 1	18317	100-Year	1803.00	331.33	340.90	340.90	342.57	0.019805	11.66	294.23	108.96	0.84
Reach - 1	18024.2	2-Year	524.00	328.79	333.78		334.24	0.005732	5.45	102.57	32.90	0.48
Reach - 1	18024.2	10-Year	1028.00	328.79	335.25		336.14	0.007584	7.70	159.54	45.91	0.58
Reach - 1	18024.2	25-Year	1365.00	328.79	335.83		337.07	0.009358	9.14	188.36	52.84	0.65
Reach - 1	18024.2	50-Year	1642.00	328.79	336.27	335.14	337.81	0.010625	10.20	213.01	65.05	0.70
Reach - 1	18024.2	100-Year	1803.00	328.79	336.51	335.50	338.20	0.011205	10.73	229.50	70.87	0.72
Reach - 1	17810	2-Year	524.00	326.23	330.61	330.61	331.77	0.030852	8.65	60.56	26.05	1.00
Reach - 1	17810	10-Year	1028.00	326.23	332.23	332.02	333.54	0.021649	9.18	115.90	45.77	0.89
Reach - 1	17810	25-Year	1365.00	326.23	333.18	332.71	334.50	0.015852	9.30	167.76	64.28	0.80
Reach - 1	17810	50-Year	1642.00	326.23	333.86	333.20	335.20	0.013407	9.45	216.63	78.47	0.75
Reach - 1	17810	100-Year	1803.00	326.23	334.21	333.50	335.57	0.012495	9.56	245.68	85.37	0.74
Reach - 1	17524.2	2-Year	524.00	322.82	329.11		329.37	0.002264	4.12	140.38	36.43	0.31
Reach - 1	17524.2	10-Year	1028.00	322.82	330.95		331.45	0.003057	5.83	236.11	72.19	0.38
Reach - 1	17524.2	25-Year	1365.00	322.82	331.79		332.44	0.003513	6.72	301.85	83.43	0.42
Reach - 1	17524.2	50-Year	1642.00	322.82	332.37		333.15	0.003894	7.41	353.88	101.48	0.44
Reach - 1	17524.2	100-Year	1803.00	322.82	332.68		333.52	0.004086	7.77	386.43	111.98	0.46
Reach - 1	17294	2-Year	524.00	322.18	328.01		328.53	0.006231	5.95	122.75	57.12	0.50
Reach - 1	17294	10-Year	1028.00	322.18	329.63		330.41	0.006846	7.68	246.46	92.54	0.55
Reach - 1	17294	25-Year	1365.00	322.18	330.35		331.28	0.007451	8.63	316.75	104.16	0.59
Reach - 1	17294	50-Year	1642.00	322.18	330.86		331.89	0.007791	9.27	372.28	111.42	0.61
Reach - 1	17294	100-Year	1803.00	322.18	331.15		332.23	0.007913	9.59	404.43	114.97	0.62
Reach - 1	17020.0	2-Year	524.00	321.41	325.23	324.99	325.96	0.015345	7.13	105.57	72.46	0.74
Reach - 1	17020.0	10-Year	1028.00	321.41	326.12	326.12	327.37	0.020046	9.74	178.77	91.06	0.88
Reach - 1	17020.0	25-Year	1365.00	321.41	326.72	326.72	328.12	0.019403	10.56	237.03	103.50	0.89
Reach - 1	17020.0	50-Year	1642.00	321.41	327.14	327.14	328.65	0.019313	11.19	281.94	112.15	0.90

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	17020.0	100-Year	1803.00	321.41	327.35	327.35	328.94	0.019502	11.57	305.94	116.51	0.91
Reach - 1	16807	2-Year	524.00	318.05	321.34		322.15	0.021123	7.19	72.84	32.67	0.85
Reach - 1	16807	10-Year	1028.00	318.05	323.00	322.49	323.82	0.012624	7.46	184.08	108.38	0.70
Reach - 1	16807	25-Year	1365.00	318.05	323.77	323.11	324.59	0.010421	7.65	279.36	141.94	0.65
Reach - 1	16807	50-Year	1642.00	318.05	324.30		325.12	0.009351	7.83	360.61	162.34	0.63
Reach - 1	16807	100-Year	1803.00	318.05	324.58		325.40	0.008855	7.92	407.09	167.96	0.62
Reach - 1	16524.2	2-Year	538.00	313.59	318.48		319.00	0.006679	5.79	93.21	23.78	0.51
Reach - 1	16524.2	10-Year	1057.00	313.59	320.29	318.47	321.19	0.007155	7.69	173.15	107.50	0.56
Reach - 1	16524.2	25-Year	1407.00	313.59	321.09	319.35	322.13	0.007307	8.48	261.54	111.18	0.58
Reach - 1	16524.2	50-Year	1689.00	313.59	321.67	320.69	322.78	0.007273	8.95	326.42	113.71	0.59
Reach - 1	16524.2	100-Year	1850.00	313.59	321.98	321.02	323.11	0.007250	9.18	361.23	115.04	0.59
Reach - 1	16219	2-Year	538.00	307.88	313.50	313.50	315.01	0.033390	9.85	54.63	18.32	1.01
Reach - 1	16219	10-Year	1057.00	307.88	315.30	315.30	317.20	0.028902	11.04	97.50	32.06	0.99
Reach - 1	16219	25-Year	1407.00	307.88	316.25	316.25	318.32	0.024013	11.64	136.44	48.46	0.94
Reach - 1	16219	50-Year	1689.00	307.88	316.90	316.90	319.10	0.021815	12.08	170.93	56.96	0.91
Reach - 1	16219	100-Year	1850.00	307.88	317.25	317.25	319.50	0.020810	12.30	191.63	61.50	0.90
Reach - 1	16024.2	2-Year	538.00	304.23	309.39		309.84	0.005314	5.40	103.61	28.89	0.46
Reach - 1	16024.2	10-Year	1057.00	304.23	311.33		312.11	0.005693	7.17	166.41	35.95	0.51
Reach - 1	16024.2	25-Year	1407.00	304.23	312.27		313.28	0.006154	8.20	206.95	50.08	0.54
Reach - 1	16024.2	50-Year	1689.00	304.23	312.90		314.09	0.006534	8.94	241.08	58.23	0.57
Reach - 1	16024.2	100-Year	1850.00	304.23	313.23		314.52	0.006726	9.33	261.19	61.99	0.58
Reach - 1	15740	2-Year	538.00	297.95	302.86	302.86	304.23	2.489301	9.41	57.20	20.92	1.00
Reach - 1	15740	10-Year	1057.00	297.95	304.79	304.79	306.26	1.694295	9.80	108.90	36.51	0.88
Reach - 1	15740	25-Year	1407.00	297.95	305.62	305.62	307.11	1.302905	9.70	144.58	50.48	0.79
Reach - 1	15740	50-Year	1689.00	297.95	306.13	306.13	307.66	1.101706	9.57	173.05	60.31	0.74
Reach - 1	15740	100-Year	1850.00	297.95	306.35	306.35	307.94	1.050580	9.60	186.53	63.86	0.73
Reach - 1	15524.2	2-Year	538.00	293.18	299.79		300.03	0.001611	4.01	147.49	59.62	0.30
Reach - 1	15524.2	10-Year	1057.00	293.18	302.26		302.58	0.001456	4.85	441.15	176.61	0.30
Reach - 1	15524.2	25-Year	1407.00	293.18	303.08		303.46	0.001642	5.49	600.97	211.63	0.32
Reach - 1	15524.2	50-Year	1689.00	293.18	303.43		303.91	0.001990	6.20	679.32	238.41	0.36
Reach - 1	15524.2	100-Year	1850.00	293.18	303.59		304.12	0.002189	6.58	717.65	244.64	0.38

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	15291	2-Year	538.00	292.67	298.76		299.32	0.006916	5.98	89.96	22.07	0.52
Reach - 1	15291	10-Year	1057.00	292.67	301.81		302.11	0.002772	4.92	585.84	437.65	0.35
Reach - 1	15291	25-Year	1407.00	292.67	302.83		303.01	0.001749	4.33	1070.17	495.14	0.29
Reach - 1	15291	50-Year	1689.00	292.67	303.20		303.38	0.001790	4.53	1257.48	506.02	0.29
Reach - 1	15291	100-Year	1850.00	292.67	303.36		303.55	0.001872	4.70	1337.82	510.61	0.30
Reach - 1	15183.4	2-Year	538.00	292.43	298.53	296.11	298.78	0.002194	4.12	146.14	38.27	0.34
Reach - 1	15183.4	10-Year	1057.00	292.43	301.62	297.42	301.90	0.001317	4.48	423.83	215.88	0.28
Reach - 1	15183.4	25-Year	1407.00	292.43	302.45	298.19	302.80	0.001461	5.05	651.14	363.98	0.30
Reach - 1	15183.4	50-Year	1689.00	292.43	302.64	298.75	303.10	0.001961	5.93	726.72	452.42	0.35
Reach - 1	15183.4	100-Year	1850.00	292.43	302.69	299.09	303.23	0.002265	6.40	752.46	465.77	0.38
Reach - 1	15150.4	Bridge										
Reach - 1	15117.4	2-Year	538.00	292.69	298.01	296.37	298.39	0.003969	4.97	117.56	34.88	0.44
Reach - 1	15117.4	10-Year	1057.00	292.69	299.12	297.68	299.98	0.006690	7.54	159.78	43.53	0.59
Reach - 1	15117.4	25-Year	1407.00	292.69	299.66	298.50	300.88	0.008324	9.00	185.56	52.36	0.67
Reach - 1	15117.4	50-Year	1689.00	292.69	299.95	299.02	301.52	0.010033	10.22	203.42	66.37	0.75
Reach - 1	15117.4	100-Year	1850.00	292.69	300.05	299.34	301.86	0.011343	10.99	210.07	69.30	0.79
Reach - 1	15024.2	2-Year	542.00	291.44	297.95		298.12	0.001011	3.54	319.80	159.11	0.26
Reach - 1	15024.2	10-Year	1065.00	291.44	299.14		299.43	0.001579	5.02	526.03	183.37	0.34
Reach - 1	15024.2	25-Year	1416.00	291.44	299.69		300.14	0.002171	6.21	647.48	305.40	0.40
Reach - 1	15024.2	50-Year	1699.00	291.44	300.05		300.59	0.002517	6.90	778.96	389.07	0.44
Reach - 1	15024.2	100-Year	1863.00	291.44	300.23		300.79	0.002617	7.14	849.23	393.06	0.45
Reach - 1	14764	2-Year	542.00	290.94	296.55	295.33	297.08	0.005716	6.13	187.53	256.89	0.55
Reach - 1	14764	10-Year	1065.00	290.94	297.58		298.06	0.005715	6.82	520.99	394.88	0.55
Reach - 1	14764	25-Year	1416.00	290.94	298.07		298.52	0.005381	7.06	727.65	439.08	0.55
Reach - 1	14764	50-Year	1699.00	290.94	298.45		298.84	0.004868	7.04	894.37	450.29	0.53
Reach - 1	14764	100-Year	1863.00	290.94	298.63		299.01	0.004773	7.12	975.01	455.55	0.52
Reach - 1	14524.2	2-Year	542.00	290.48	296.37		296.48	0.000980	3.22	559.28	416.97	0.25
Reach - 1	14524.2	10-Year	1065.00	290.48	297.18		297.34	0.001476	4.37	911.52	446.54	0.32
Reach - 1	14524.2	25-Year	1416.00	290.48	297.57		297.77	0.001718	4.93	1090.74	462.63	0.35
Reach - 1	14524.2	50-Year	1699.00	290.48	297.88		298.10	0.001898	5.35	1236.86	480.97	0.37
Reach - 1	14524.2	100-Year	1863.00	290.48	298.03		298.26	0.001980	5.55	1310.37	483.81	0.38

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	14034.8	2-Year	542.00	287.46	296.39		296.40	0.000038	0.87	2194.63	435.39	0.05
Reach - 1	14034.8	10-Year	1065.00	287.46	297.16		297.17	0.000099	1.50	2540.19	458.81	0.09
Reach - 1	14034.8	25-Year	1416.00	287.46	297.52		297.54	0.000149	1.88	2707.29	473.27	0.11
Reach - 1	14034.8	50-Year	1699.00	287.46	297.80		297.83	0.000190	2.17	2841.55	485.43	0.12
Reach - 1	14034.8	100-Year	1863.00	287.46	297.94		297.96	0.000215	2.33	2906.48	489.28	0.13
Reach - 1	13555.6	2-Year	542.00	287.38	296.38		296.38	0.000036	0.85	2207.46	416.51	0.05
Reach - 1	13555.6	10-Year	1065.00	287.38	297.12		297.13	0.000096	1.47	2521.00	431.47	0.09
Reach - 1	13555.6	25-Year	1416.00	287.38	297.45		297.47	0.000145	1.86	2667.01	440.31	0.11
Reach - 1	13555.6	50-Year	1699.00	287.38	297.71		297.74	0.000187	2.15	2782.52	448.76	0.12
Reach - 1	13555.6	100-Year	1863.00	287.38	297.83		297.86	0.000214	2.32	2836.92	452.69	0.13
Reach - 1	13024.2	2-Year	542.00	287.30	296.36		296.36	0.000038	0.88	2151.00	412.86	0.05
Reach - 1	13024.2	10-Year	1065.00	287.30	297.06		297.08	0.000100	1.51	2444.05	417.25	0.09
Reach - 1	13024.2	25-Year	1416.00	287.30	297.37		297.39	0.000153	1.91	2573.07	421.89	0.11
Reach - 1	13024.2	50-Year	1699.00	287.30	297.61		297.63	0.000198	2.21	2673.20	425.46	0.13
Reach - 1	13024.2	100-Year	1863.00	287.30	297.71		297.74	0.000227	2.38	2718.19	427.07	0.14
Reach - 1	12524.2	2-Year	542.00	287.22	296.34		296.34	0.000028	0.77	2563.33	491.70	0.05
Reach - 1	12524.2	10-Year	1065.00	287.22	297.02		297.03	0.000077	1.33	2904.37	507.50	0.08
Reach - 1	12524.2	25-Year	1416.00	287.22	297.31		297.32	0.000118	1.68	3050.04	511.13	0.10
Reach - 1	12524.2	50-Year	1699.00	287.22	297.53		297.54	0.000152	1.94	3161.65	512.65	0.11
Reach - 1	12524.2	100-Year	1863.00	287.22	297.62		297.64	0.000175	2.09	3209.63	513.30	0.12
Reach - 1	12024.2	2-Year	542.00	287.14	296.34		296.34	0.000010	0.45	4399.95	738.30	0.03
Reach - 1	12024.2	10-Year	1065.00	287.14	297.01		297.01	0.000027	0.79	4895.66	739.85	0.05
Reach - 1	12024.2	25-Year	1416.00	287.14	297.28		297.29	0.000042	1.01	5100.42	740.49	0.06
Reach - 1	12024.2	50-Year	1699.00	287.14	297.49		297.50	0.000055	1.17	5256.11	740.98	0.07
Reach - 1	12024.2	100-Year	1863.00	287.14	297.58		297.59	0.000064	1.26	5321.58	741.19	0.07
Reach - 1	11747.1	2-Year	542.00	284.16	296.33		296.33	0.000003	0.31	7198.39	1113.15	0.02
Reach - 1	11747.1	10-Year	1065.00	284.16	297.00		297.00	0.000009	0.55	7946.99	1128.14	0.03
Reach - 1	11747.1	25-Year	1416.00	284.16	297.28		297.28	0.000014	0.71	8258.17	1136.25	0.04
Reach - 1	11747.1	50-Year	1699.00	284.16	297.49		297.49	0.000018	0.82	8495.78	1142.07	0.04
Reach - 1	11747.1	100-Year	1863.00	284.16	297.57		297.58	0.000021	0.89	8596.11	1152.39	0.04
Reach - 1	11352.3	2-Year	697.00	273.46	296.33	277.53	296.33	0.000001	0.18	3922.34	560.92	0.01
Reach - 1	11352.3	10-Year	1538.00	273.46	297.00	279.05	297.00	0.000005	0.36	4371.95	592.25	0.02

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	11352.3	25-Year	2107.00	273.46	297.27	279.79	297.28	0.000009	0.48	4534.15	599.47	0.03
Reach - 1	11352.3	50-Year	2563.00	273.46	297.48	280.32	297.48	0.000012	0.57	4658.29	604.88	0.03
Reach - 1	11352.3	100-Year	2789.00	273.46	297.56	280.55	297.57	0.000013	0.62	4710.36	606.89	0.03
Reach - 1	11341.3	Inl Struct										
Reach - 1	11330.3	2-Year	697.00	277.80	281.83	281.83	283.24	0.013675	9.88	104.17	54.07	0.92
Reach - 1	11330.3	10-Year	1538.00	277.80	283.88	283.88	285.82	0.011488	12.27	244.00	80.66	0.91
Reach - 1	11330.3	25-Year	2107.00	277.80	284.89	284.89	287.12	0.011204	13.52	331.25	93.06	0.93
Reach - 1	11330.3	50-Year	2563.00	277.80	285.61	285.61	288.03	0.010927	14.31	401.63	101.97	0.93
Reach - 1	11330.3	100-Year	2789.00	277.80	285.95	285.95	288.44	0.010789	14.65	436.60	106.12	0.93
Reach - 1	11228.2	2-Year	697.00	274.45	278.73	278.64	280.35	0.018569	10.21	70.82	36.89	0.94
Reach - 1	11228.2	10-Year	1538.00	274.45	281.39	281.39	283.09	0.010884	11.24	256.96	113.69	0.79
Reach - 1	11228.2	25-Year	2107.00	274.45	282.35	282.35	284.17	0.010634	12.21	370.95	123.48	0.80
Reach - 1	11228.2	50-Year	2563.00	274.45	282.90	282.90	284.92	0.011168	13.14	440.70	128.51	0.83
Reach - 1	11228.2	100-Year	2789.00	274.45	283.18	283.18	285.27	0.011257	13.50	476.76	131.58	0.84
Reach - 1	10952.4	2-Year	697.00	270.52	274.21	274.21	275.39	0.016534	8.86	92.67	47.24	0.97
Reach - 1	10952.4	10-Year	1538.00	270.52	275.89	275.89	277.65	0.013449	11.14	199.81	71.77	0.95
Reach - 1	10952.4	25-Year	2107.00	270.52	276.62	276.62	278.87	0.014303	12.74	254.52	79.91	1.00
Reach - 1	10952.4	50-Year	2563.00	270.52	277.45	277.45	279.75	0.012145	13.00	334.54	109.81	0.95
Reach - 1	10952.4	100-Year	2789.00	270.52	277.95	277.95	280.12	0.010524	12.78	394.18	125.30	0.89
Reach - 1	10524.2	2-Year	697.00	263.63	268.68	267.57	269.38	0.006797	6.79	133.07	112.90	0.62
Reach - 1	10524.2	10-Year	1538.00	263.63	269.86	269.86	271.17	0.010942	9.88	291.41	155.70	0.81
Reach - 1	10524.2	25-Year	2107.00	263.63	270.42	270.42	272.06	0.012411	11.37	385.34	177.72	0.88
Reach - 1	10524.2	50-Year	2563.00	263.63	271.20	271.20	272.68	0.009960	11.18	546.11	228.95	0.81
Reach - 1	10524.2	100-Year	2789.00	263.63	271.44	271.44	272.93	0.009769	11.37	601.80	236.59	0.81
Reach - 1	10136.9	2-Year	697.00	261.02	268.70		268.76	0.000433	2.41	1024.69	587.50	0.17
Reach - 1	10136.9	10-Year	1538.00	261.02	269.86		269.96	0.000696	3.43	1757.39	676.25	0.23
Reach - 1	10136.9	25-Year	2107.00	261.02	270.55		270.65	0.000747	3.77	2237.25	718.43	0.24
Reach - 1	10136.9	50-Year	2563.00	261.02	271.20		271.29	0.000691	3.83	2714.82	755.87	0.23
Reach - 1	10136.9	100-Year	2789.00	261.02	271.78		271.86	0.000557	3.59	3165.73	787.21	0.21
Reach - 2	10024.2	2-Year	764.00	262.00	268.65		268.69	0.000786	2.47	1090.01	599.39	0.19
Reach - 2	10024.2	10-Year	1769.00	262.00	269.77		269.84	0.001301	3.59	1814.33	698.53	0.26

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	10024.2	25-Year	2464.00	262.00	270.45		270.53	0.001348	3.92	2299.31	735.11	0.27
Reach - 2	10024.2	50-Year	3029.00	262.00	271.11		271.18	0.001208	3.95	2793.08	771.93	0.26
Reach - 2	10024.2	100-Year	3285.00	262.00	271.71		271.77	0.000973	3.74	3281.88	875.18	0.23
Reach - 2	9691.7	2-Year	764.00	260.63	267.82	265.57	268.21	0.002895	5.34	294.24	428.84	0.40
Reach - 2	9691.7	10-Year	1769.00	260.63	269.27	268.43	269.38	0.001418	4.35	1533.25	517.06	0.29
Reach - 2	9691.7	25-Year	2464.00	260.63	269.86	268.50	270.02	0.001755	5.11	1848.70	547.17	0.33
Reach - 2	9691.7	50-Year	3029.00	260.63	270.54	268.51	270.69	0.001742	5.39	2229.79	576.99	0.33
Reach - 2	9691.7	100-Year	3285.00	260.63	271.28	268.51	271.40	0.001250	4.83	2669.52	609.34	0.28
Reach - 2	9676.2		Bridge									
Reach - 2	9660.7	2-Year	764.00	260.97	266.13	265.91	267.54	0.016975	9.56	84.07	237.28	0.89
Reach - 2	9660.7	10-Year	1769.00	260.97	268.68	268.00	268.94	0.003238	5.99	1079.39	464.48	0.43
Reach - 2	9660.7	25-Year	2464.00	260.97	269.74	268.05	269.95	0.002464	5.81	1604.06	523.40	0.38
Reach - 2	9660.7	50-Year	3029.00	260.97	270.46	268.39	270.65	0.002212	5.87	1990.87	561.20	0.37
Reach - 2	9660.7	100-Year	3285.00	260.97	270.78	268.56	270.98	0.002191	6.00	2175.09	574.71	0.37
Reach - 2	9524.2	2-Year	764.00	259.17	265.30		265.80	0.005976	5.77	164.50	88.92	0.48
Reach - 2	9524.2	10-Year	1769.00	259.17	268.03		268.43	0.003613	6.01	791.79	375.98	0.40
Reach - 2	9524.2	25-Year	2464.00	259.17	269.24		269.56	0.002824	5.90	1331.23	481.59	0.36
Reach - 2	9524.2	50-Year	3029.00	259.17	270.06		270.32	0.002335	5.71	1735.01	498.83	0.33
Reach - 2	9524.2	100-Year	3285.00	259.17	270.43		270.67	0.002136	5.61	1922.25	504.27	0.32
Reach - 2	9024.2	2-Year	764.00	256.05	263.53		263.83	0.002647	4.46	202.73	75.12	0.33
Reach - 2	9024.2	10-Year	1769.00	256.05	266.21		266.74	0.003135	6.26	486.28	145.69	0.38
Reach - 2	9024.2	25-Year	2464.00	256.05	267.26		267.93	0.003608	7.27	649.59	163.11	0.42
Reach - 2	9024.2	50-Year	3029.00	256.05	268.06		268.81	0.003761	7.83	783.68	170.57	0.43
Reach - 2	9024.2	100-Year	3285.00	256.05	268.47		269.23	0.003735	8.01	853.63	178.66	0.43
Reach - 2	8588.6	2-Year	764.00	255.57	260.79		261.64	0.011982	7.36	103.81	27.06	0.66
Reach - 2	8588.6	10-Year	1769.00	255.57	264.06	262.63	264.84	0.006290	7.65	467.01	235.93	0.52
Reach - 2	8588.6	25-Year	2464.00	255.57	265.65		266.22	0.004128	7.15	910.43	333.61	0.44
Reach - 2	8588.6	50-Year	3029.00	255.57	266.89		267.29	0.002828	6.48	1342.07	363.01	0.37
Reach - 2	8588.6	100-Year	3285.00	255.57	267.49		267.83	0.002354	6.16	1562.64	372.92	0.34
Reach - 2	8024.2	2-Year	764.00	250.67	259.76		259.94	0.001133	3.44	256.79	52.00	0.22
Reach - 2	8024.2	10-Year	1769.00	250.67	263.39		263.58	0.000915	4.04	1097.89	447.19	0.21

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	8024.2	25-Year	2464.00	250.67	265.28		265.39	0.000585	3.59	2146.33	591.05	0.18
Reach - 2	8024.2	50-Year	3029.00	250.67	266.61		266.69	0.000430	3.29	2988.75	657.44	0.15
Reach - 2	8024.2	100-Year	3285.00	250.67	267.26		267.32	0.000364	3.12	3417.90	693.88	0.14
Reach - 2	7524.2	2-Year	773.00	249.35	259.36		259.49	0.000700	2.93	431.97	363.89	0.18
Reach - 2	7524.2	10-Year	1797.00	249.35	263.31		263.34	0.000203	2.04	2920.91	708.22	0.10
Reach - 2	7524.2	25-Year	2508.00	249.35	265.21		265.23	0.000147	1.91	4333.64	784.13	0.09
Reach - 2	7524.2	50-Year	3083.00	249.35	266.56		266.57	0.000120	1.84	5404.05	812.36	0.08
Reach - 2	7524.2	100-Year	3374.00	249.35	267.20		267.22	0.000110	1.81	5935.38	831.42	0.08
Reach - 3	7024.2	2-Year	784.00	250.01	259.01		259.11	0.000777	2.83	686.29	427.39	0.18
Reach - 3	7024.2	10-Year	1832.00	250.01	263.22		263.24	0.000188	1.88	2791.66	557.19	0.10
Reach - 3	7024.2	25-Year	2567.00	250.01	265.14		265.16	0.000147	1.85	3906.27	606.67	0.09
Reach - 3	7024.2	50-Year	3160.00	250.01	266.49		266.51	0.000136	1.89	4885.09	760.13	0.09
Reach - 3	7024.2	100-Year	3488.00	250.01	267.14		267.16	0.000127	1.88	5385.04	773.36	0.08
Reach - 3	6790.2	2-Year	784.00	249.25	258.91		258.98	0.000384	2.09	429.32	99.41	0.13
Reach - 3	6790.2	10-Year	1832.00	249.25	263.06		263.17	0.000408	2.86	1089.45	273.00	0.15
Reach - 3	6790.2	25-Year	2567.00	249.25	264.97		265.09	0.000400	3.13	1796.99	424.18	0.15
Reach - 3	6790.2	50-Year	3160.00	249.25	266.32		266.45	0.000389	3.28	2454.59	555.22	0.15
Reach - 3	6790.2	100-Year	3488.00	249.25	266.97		267.10	0.000381	3.34	2831.72	603.64	0.15
Reach - 3	6733.5	2-Year	844.00	250.49	258.90	252.93	258.95	0.000240	1.86	457.74	213.41	0.12
Reach - 3	6733.5	10-Year	2046.00	250.49	263.02	254.55	263.15	0.000326	2.91	714.97	329.23	0.15
Reach - 3	6733.5	25-Year	2864.00	250.49	264.86	255.46	265.05	0.000390	3.51	830.32	456.65	0.17
Reach - 3	6733.5	50-Year	3501.00	250.49	266.31	256.11	266.42	0.000254	3.03	2602.35	652.47	0.14
Reach - 3	6733.5	100-Year	3899.00	250.49	266.98	256.49	267.07	0.000217	2.88	3644.12	759.29	0.13
Reach - 3	6670.0		Culvert									
Reach - 3	6606.5	2-Year	844.00	249.54	258.75	251.98	258.80	0.000171	1.68	507.89	241.47	0.10
Reach - 3	6606.5	10-Year	2046.00	249.54	262.49	253.60	262.61	0.000290	2.80	741.27	345.31	0.14
Reach - 3	6606.5	25-Year	2864.00	249.54	263.76	254.50	263.95	0.000405	3.55	820.79	447.63	0.17
Reach - 3	6606.5	50-Year	3501.00	249.54	264.57	255.17	264.82	0.000497	4.09	871.34	533.48	0.19
Reach - 3	6606.5	100-Year	3899.00	249.54	265.26	255.53	265.37	0.000281	3.17	3108.50	638.81	0.15
Reach - 3	6606.4	2-Year	844.00	249.54	258.68	252.15	258.78	0.000415	2.51	368.92	54.75	0.15
Reach - 3	6606.4	10-Year	2046.00	249.54	262.32	254.22	262.57	0.000712	4.12	1013.70	663.87	0.20

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	6606.4	25-Year	2864.00	249.54	263.70	255.39	263.94	0.000706	4.40	2001.96	745.26	0.21
Reach - 3	6606.4	50-Year	3501.00	249.54	264.58	256.23	264.81	0.000683	4.51	2674.87	776.84	0.21
Reach - 3	6606.4	100-Year	3899.00	249.54	265.13	256.71	265.34	0.000654	4.52	3108.58	803.49	0.20
Reach - 3	6268.9		Culvert									
Reach - 3	5931.4	2-Year	844.00	249.82	258.59	252.43	258.70	0.000478	2.62	349.09	53.11	0.16
Reach - 3	5931.4	10-Year	2046.00	249.82	261.96	254.50	262.26	0.000892	4.46	682.58	363.56	0.23
Reach - 3	5931.4	25-Year	2864.00	249.82	263.16	255.67	263.53	0.001067	5.20	1403.01	712.67	0.25
Reach - 3	5931.4	50-Year	3501.00	249.82	263.89	256.51	264.27	0.001102	5.47	1937.45	742.16	0.26
Reach - 3	5931.4	100-Year	3899.00	249.82	264.37	257.01	264.73	0.001080	5.54	2292.12	759.04	0.26
Reach - 3	5454.5	2-Year	844.00	248.76	257.66		258.12	0.003071	5.63	218.18	74.71	0.39
Reach - 3	5454.5	10-Year	2046.00	248.76	260.05	257.95	261.16	0.005279	9.10	497.14	262.20	0.54
Reach - 3	5454.5	25-Year	2864.00	248.76	261.39	259.61	262.41	0.004674	9.41	910.84	357.68	0.52
Reach - 3	5454.5	50-Year	3501.00	248.76	262.67		263.34	0.003206	8.43	1801.19	896.69	0.44
Reach - 3	5454.5	100-Year	3899.00	248.76	263.70		264.06	0.001899	6.86	2767.46	970.24	0.34
Reach - 3	5024.2	2-Year	844.00	248.44	256.12		256.58	0.004247	5.94	312.07	189.02	0.45
Reach - 3	5024.2	10-Year	2046.00	248.44	258.85		259.25	0.003057	6.62	922.14	277.42	0.41
Reach - 3	5024.2	25-Year	2864.00	248.44	260.49		260.83	0.002323	6.53	1446.22	354.66	0.37
Reach - 3	5024.2	50-Year	3501.00	248.44	262.02		262.27	0.001612	5.99	2086.65	447.15	0.31
Reach - 3	5024.2	100-Year	3899.00	248.44	263.19		263.38	0.001154	5.42	2649.48	507.33	0.27
Reach - 3	4718.573	2-Year	844.00	249.06	255.93		256.02	0.000725	2.38	354.06	78.91	0.20
Reach - 3	4718.573	10-Year	2046.00	249.06	258.46		258.66	0.001112	3.54	584.27	125.06	0.26
Reach - 3	4718.573	25-Year	2864.00	249.06	260.13		260.35	0.000980	3.78	873.82	224.82	0.25
Reach - 3	4718.573	50-Year	3501.00	249.06	261.73		261.93	0.000737	3.65	1275.37	277.54	0.22
Reach - 3	4718.573	100-Year	3899.00	249.06	262.96		263.13	0.000566	3.43	1669.17	372.18	0.20
Reach - 3	4696.5	2-Year	846.00	249.91	255.93	251.97	256.00	0.000458	2.22	408.90	85.96	0.16
Reach - 3	4696.5	10-Year	1903.00	249.91	258.45	253.21	258.63	0.000668	3.43	609.61	115.54	0.21
Reach - 3	4696.5	25-Year	2633.00	249.91	260.09	253.93	260.33	0.000692	3.94	739.91	175.36	0.22
Reach - 3	4696.5	50-Year	3214.00	249.91	261.63	254.44	261.90	0.000631	4.15	862.52	214.09	0.22
Reach - 3	4696.5	100-Year	3588.00	249.91	262.82	254.75	263.09	0.000563	4.19	957.18	232.61	0.21
Reach - 3	4645.0		Culvert									

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4593.5	2-Year	846.00	249.19	255.75	251.25	255.81	0.000337	2.02	451.66	89.05	0.14
Reach - 3	4593.5	10-Year	1903.00	249.19	258.07	252.49	258.24	0.000583	3.29	635.94	127.43	0.20
Reach - 3	4593.5	25-Year	2633.00	249.19	259.47	253.20	259.70	0.000670	3.91	746.73	179.05	0.22
Reach - 3	4593.5	50-Year	3214.00	249.19	260.60	253.73	260.88	0.000693	4.27	837.16	209.29	0.23
Reach - 3	4593.5	100-Year	3588.00	249.19	261.48	254.04	261.78	0.000668	4.41	906.70	222.91	0.23
Reach - 3	4500.596	2-Year	846.00	248.23	255.44		255.69	0.002179	4.01	215.85	59.03	0.34
Reach - 3	4500.596	10-Year	1903.00	248.23	257.52		258.03	0.003202	5.80	403.82	116.98	0.42
Reach - 3	4500.596	25-Year	2633.00	248.23	258.94		259.49	0.002907	6.15	614.09	163.16	0.42
Reach - 3	4500.596	50-Year	3214.00	248.23	260.21		260.71	0.002366	6.00	824.68	169.64	0.38
Reach - 3	4500.596	100-Year	3588.00	248.23	261.19		261.63	0.001940	5.74	993.86	174.67	0.35
Reach - 3	4452.7	2-Year	846.00	248.28	255.43	250.94	255.59	0.000802	3.20	291.57	169.68	0.21
Reach - 3	4452.7	10-Year	1903.00	248.28	257.43	252.76	257.89	0.001705	5.52	399.83	421.03	0.32
Reach - 3	4452.7	25-Year	2633.00	248.28	258.68	253.84	259.34	0.002085	6.65	469.30	467.92	0.37
Reach - 3	4452.7	50-Year	3214.00	248.28	259.71	254.65	260.51	0.002225	7.32	527.12	607.84	0.38
Reach - 3	4452.7	100-Year	3588.00	248.28	260.57	255.11	261.41	0.002150	7.55	575.24	684.43	0.38
Reach - 3	4387.2		Culvert									
Reach - 3	4321.7	2-Year	846.00	249.27	255.20	251.93	255.44	0.001540	3.90	228.86	53.47	0.29
Reach - 3	4321.7	10-Year	1903.00	249.27	256.67	253.75	257.41	0.003591	6.93	304.71	199.38	0.45
Reach - 3	4321.7	25-Year	2633.00	249.27	257.43	254.84	258.56	0.004899	8.64	344.72	277.91	0.54
Reach - 3	4321.7	50-Year	3214.00	249.27	258.07	255.62	259.50	0.005582	9.72	379.90	403.04	0.58
Reach - 3	4321.7	100-Year	3588.00	249.27	258.93	256.10	260.38	0.005017	9.81	427.04	444.46	0.56
Reach - 3	4294.441	2-Year	846.00	246.73	255.20		255.37	0.001133	3.40	404.36	201.79	0.25
Reach - 3	4294.441	10-Year	1903.00	246.73	256.80		257.14	0.002023	5.22	872.81	329.50	0.34
Reach - 3	4294.441	25-Year	2633.00	246.73	257.71		258.11	0.002176	5.86	1175.96	335.05	0.36
Reach - 3	4294.441	50-Year	3214.00	246.73	258.50		258.90	0.002083	6.09	1442.60	339.87	0.36
Reach - 3	4294.441	100-Year	3588.00	246.73	259.41		259.75	0.001645	5.77	1755.23	345.42	0.32
Reach - 3	4000.0	2-Year	846.00	248.37	254.64		254.80	0.003965	4.67	637.13	401.79	0.41
Reach - 3	4000.0	10-Year	1903.00	248.37	256.23		256.36	0.002998	4.96	1370.59	507.06	0.37
Reach - 3	4000.0	25-Year	2633.00	248.37	257.26		257.37	0.002266	4.83	1904.47	539.65	0.33
Reach - 3	4000.0	50-Year	3214.00	248.37	258.16		258.25	0.001744	4.62	2399.90	567.08	0.30
Reach - 3	4000.0	100-Year	3588.00	248.37	259.21		259.27	0.001129	4.06	3006.88	586.16	0.25

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	3500.0	2-Year	846.00	246.98	253.63		253.68	0.001373	2.88	1250.77	761.35	0.24
Reach - 3	3500.0	10-Year	1903.00	246.98	255.72		255.74	0.000616	2.48	2994.59	905.89	0.17
Reach - 3	3500.0	25-Year	2633.00	246.98	256.87		256.89	0.000475	2.44	4049.66	921.87	0.16
Reach - 3	3500.0	50-Year	3214.00	246.98	257.86		257.87	0.000380	2.36	4966.50	947.52	0.14
Reach - 3	3500.0	100-Year	3588.00	246.98	259.01		259.02	0.000255	2.11	6073.84	969.32	0.12
Reach - 3	3185.2	2-Year	862.00	246.10	252.88	249.97	253.12	0.001830	3.92	227.51	680.39	0.31
Reach - 3	3185.2	10-Year	1933.00	246.10	254.53	251.82	255.17	0.003415	6.49	339.04	861.02	0.45
Reach - 3	3185.2	25-Year	2682.00	246.10	255.32	252.84	256.27	0.004388	7.94	404.68	884.53	0.52
Reach - 3	3185.2	50-Year	3273.00	246.10	256.18	253.57	257.27	0.004395	8.55	479.62	903.86	0.53
Reach - 3	3185.2	100-Year	3662.00	246.10	257.66	254.03	258.56	0.003005	7.89	622.79	1069.68	0.45
Reach - 3	3157.2	Bridge										
Reach - 3	3129.2	2-Year	862.00	245.86	252.61	249.74	252.85	0.001880	3.95	225.42	667.19	0.31
Reach - 3	3129.2	10-Year	1933.00	245.86	253.38	251.58	254.27	0.005738	7.61	273.11	825.40	0.56
Reach - 3	3129.2	25-Year	2682.00	245.86	253.93	252.60	255.33	0.007997	9.57	312.09	848.68	0.68
Reach - 3	3129.2	50-Year	3273.00	245.86	254.38	253.32	256.16	0.009331	10.82	346.58	864.03	0.74
Reach - 3	3129.2	100-Year	3662.00	245.86	254.59	253.79	256.67	0.010472	11.71	363.58	871.10	0.79
Reach - 3	2957.4	2-Year	862.00	243.96	252.64		252.65	0.000221	1.51	2088.87	842.93	0.11
Reach - 3	2957.4	10-Year	1933.00	243.96	253.62		253.64	0.000452	2.38	2926.21	856.78	0.15
Reach - 3	2957.4	25-Year	2682.00	243.96	254.40		254.43	0.000484	2.64	3600.43	867.21	0.16
Reach - 3	2957.4	50-Year	3273.00	243.96	255.04		255.07	0.000476	2.75	4154.07	875.55	0.16
Reach - 3	2957.4	100-Year	3662.00	243.96	255.39		255.42	0.000484	2.85	4460.13	880.82	0.17
Reach - 3	2362.9	2-Year	862.00	243.50	252.43		252.46	0.000477	2.28	1593.60	702.69	0.16
Reach - 3	2362.9	10-Year	1933.00	243.50	253.16		253.23	0.001133	3.77	2116.41	722.87	0.25
Reach - 3	2362.9	25-Year	2682.00	243.50	253.93		254.00	0.001133	4.03	2680.35	743.48	0.25
Reach - 3	2362.9	50-Year	3273.00	243.50	254.59		254.66	0.001040	4.07	3177.63	760.41	0.24
Reach - 3	2362.9	100-Year	3662.00	243.50	254.94		255.01	0.001033	4.16	3442.85	768.38	0.24
Reach - 3	1661.6	2-Year	862.00	242.95	252.30		252.30	0.000120	1.16	2668.57	751.18	0.08
Reach - 3	1661.6	10-Year	1933.00	242.95	252.74		252.76	0.000426	2.29	3003.46	759.69	0.15
Reach - 3	1661.6	25-Year	2682.00	242.95	253.46		253.48	0.000498	2.63	3569.00	823.53	0.16
Reach - 3	1661.6	50-Year	3273.00	242.95	254.13		254.16	0.000499	2.78	4151.06	902.09	0.17
Reach - 3	1661.6	100-Year	3662.00	242.95	254.47		254.50	0.000512	2.88	4462.20	932.28	0.17

HEC-RAS Plan: Prop 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	920.6	2-Year	862.00	242.61	252.25	248.33	252.25	0.000042	0.75	4297.09	996.23	0.05
Reach - 3	920.6	10-Year	1933.00	242.61	252.56	248.88	252.57	0.000168	1.54	4606.72	1001.47	0.10
Reach - 3	920.6	25-Year	2682.00	242.61	253.24	249.15	253.25	0.000210	1.82	5291.71	1013.16	0.11
Reach - 3	920.6	50-Year	3273.00	242.61	253.91	249.31	253.92	0.000214	1.94	5974.25	1023.93	0.11
Reach - 3	920.6	100-Year	3662.00	242.61	254.24	249.39	254.25	0.000227	2.04	6313.41	1032.04	0.12

**ALTERNATIVE CONDITIONS:
HEC-RAS OUTPUT
(PINEY MOUNTAIN ROAD
FLOODPLAIN CULVERT ONLY)**

HEC-RAS Plan: Piney Mt FP

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	26670.3	2-Year	176.00	470.17	472.07	472.07	472.77	0.028500	6.70	26.28	19.08	1.01
Reach - 1	26670.3	10-Year	426.00	470.17	473.98		474.59	0.009722	6.29	68.29	25.89	0.65
Reach - 1	26670.3	25-Year	585.00	470.17	475.82		476.23	0.003414	5.17	133.42	71.68	0.42
Reach - 1	26670.3	50-Year	731.00	470.17	476.91		477.28	0.002447	5.03	229.77	127.09	0.37
Reach - 1	26670.3	100-Year	891.00	470.17	478.38		478.61	0.001295	4.25	444.52	157.79	0.28
Reach - 1	26133.4	2-Year	211.00	467.03	471.03	468.62	471.11	0.000793	2.22	111.73	44.76	0.20
Reach - 1	26133.4	10-Year	449.00	467.03	473.30	469.49	473.42	0.000714	2.89	187.03	56.30	0.21
Reach - 1	26133.4	25-Year	619.00	467.03	475.43	470.00	475.55	0.000486	2.91	257.60	66.80	0.18
Reach - 1	26133.4	50-Year	764.00	467.03	476.54	470.38	476.68	0.000480	3.16	294.47	89.87	0.18
Reach - 1	26133.4	100-Year	937.00	467.03	478.05	470.82	478.21	0.000434	3.32	344.64	166.76	0.18
Reach - 1	26050.4		Culvert									
Reach - 1	25967.4	2-Year	211.00	463.47	465.57	465.06	465.91	0.009005	4.68	49.02	31.72	0.61
Reach - 1	25967.4	10-Year	447.00	463.47	466.57	465.93	467.16	0.009139	6.29	81.83	38.59	0.66
Reach - 1	25967.4	25-Year	611.00	463.47	467.13	466.42	467.88	0.009294	7.13	100.14	42.37	0.68
Reach - 1	25967.4	50-Year	750.00	463.47	467.53	466.79	468.42	0.009564	7.79	113.42	45.11	0.70
Reach - 1	25967.4	100-Year	865.00	463.47	467.82	467.08	468.83	0.009829	8.30	123.28	46.82	0.72
Reach - 1	25524.2	2-Year	211.00	456.43	458.52	458.52	459.29	0.027875	7.05	29.91	19.68	1.01
Reach - 1	25524.2	10-Year	447.00	456.43	459.55	459.55	460.70	0.025018	8.63	51.83	22.96	1.01
Reach - 1	25524.2	25-Year	611.00	456.43	460.10	460.10	461.49	0.023378	9.46	65.04	24.86	1.00
Reach - 1	25524.2	50-Year	750.00	456.43	460.53	460.53	462.09	0.021791	10.04	77.19	30.21	0.99
Reach - 1	25524.2	100-Year	865.00	456.43	460.87	460.87	462.55	0.020517	10.42	88.02	33.23	0.98
Reach - 1	24962.5	2-Year	211.00	444.33	447.17		447.50	0.008131	4.63	45.61	22.07	0.57
Reach - 1	24962.5	10-Year	447.00	444.33	448.35		448.94	0.008441	6.14	73.95	26.34	0.61
Reach - 1	24962.5	25-Year	611.00	444.33	448.74		449.60	0.010645	7.46	84.47	28.08	0.70
Reach - 1	24962.5	50-Year	750.00	444.33	449.07		450.15	0.011749	8.33	94.23	29.60	0.75
Reach - 1	24962.5	100-Year	865.00	444.33	449.31	448.75	450.57	0.012773	9.04	101.32	30.65	0.79
Reach - 1	24504.7	2-Year	328.00	437.03	439.64	439.64	440.58	0.025249	7.80	42.54	24.73	1.00
Reach - 1	24504.7	10-Year	680.00	437.03	440.77	440.77	442.26	0.022511	9.85	76.02	35.27	1.02
Reach - 1	24504.7	25-Year	916.00	437.03	441.58	441.58	443.12	0.017200	10.14	115.38	56.06	0.93
Reach - 1	24504.7	50-Year	1109.00	437.03	442.09	442.09	443.73	0.015709	10.56	146.38	64.87	0.90
Reach - 1	24504.7	100-Year	1263.00	437.03	442.47	442.47	444.16	0.014787	10.84	171.49	68.63	0.89

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	23991.1	2-Year	328.00	426.45	432.16		432.25	0.000832	2.57	265.26	198.31	0.21
Reach - 1	23991.1	10-Year	680.00	426.45	433.74		433.84	0.000803	3.06	622.99	244.58	0.21
Reach - 1	23991.1	25-Year	916.00	426.45	434.56		434.66	0.000774	3.25	828.11	258.77	0.21
Reach - 1	23991.1	50-Year	1109.00	426.45	435.17		435.27	0.000743	3.36	988.20	263.97	0.21
Reach - 1	23991.1	100-Year	1263.00	426.45	435.78		435.87	0.000664	3.34	1150.59	274.75	0.20
Reach - 1	23524.2	2-Year	328.00	425.63	431.97		432.00	0.000313	1.71	497.29	198.36	0.13
Reach - 1	23524.2	10-Year	680.00	425.63	433.52		433.56	0.000407	2.31	825.77	218.39	0.15
Reach - 1	23524.2	25-Year	916.00	425.63	434.32		434.37	0.000445	2.60	1002.25	222.24	0.16
Reach - 1	23524.2	50-Year	1109.00	425.63	434.93		434.99	0.000463	2.78	1138.32	225.16	0.17
Reach - 1	23524.2	100-Year	1263.00	425.63	435.55		435.61	0.000437	2.84	1279.41	228.16	0.17
Reach - 1	23024.2	2-Year	328.00	425.63	431.89		431.90	0.000145	1.16	927.09	325.34	0.09
Reach - 1	23024.2	10-Year	680.00	425.63	433.41		433.42	0.000184	1.53	1430.43	335.85	0.10
Reach - 1	23024.2	25-Year	916.00	425.63	434.20		434.22	0.000204	1.74	1700.20	345.89	0.11
Reach - 1	23024.2	50-Year	1109.00	425.63	434.80		434.82	0.000214	1.87	1911.26	353.86	0.11
Reach - 1	23024.2	100-Year	1263.00	425.63	435.43		435.45	0.000203	1.92	2137.94	366.29	0.11
Reach - 1	22524.2	2-Year	472.00	419.97	431.81		431.84	0.000088	1.45	635.75	95.34	0.08
Reach - 1	22524.2	10-Year	942.00	419.97	433.24		433.31	0.000221	2.49	787.83	120.92	0.12
Reach - 1	22524.2	25-Year	1225.00	419.97	433.98		434.08	0.000297	3.00	881.83	134.29	0.15
Reach - 1	22524.2	50-Year	1459.00	419.97	434.54		434.67	0.000355	3.37	960.12	144.45	0.16
Reach - 1	22524.2	100-Year	1677.00	419.97	435.14		435.30	0.000402	3.70	1054.78	168.24	0.17
Reach - 1	22396.4	2-Year	472.00	420.03	431.83	421.77	431.83	0.000000	0.08	5792.90	755.54	0.01
Reach - 1	22396.4	10-Year	942.00	420.03	433.29	422.19	433.29	0.000001	0.14	6890.06	777.58	0.01
Reach - 1	22396.4	25-Year	1225.00	420.03	434.05	422.36	434.05	0.000001	0.17	7466.89	789.02	0.01
Reach - 1	22396.4	50-Year	1459.00	420.03	434.63	422.49	434.63	0.000001	0.19	7911.45	797.77	0.01
Reach - 1	22396.4	100-Year	1677.00	420.03	435.25	422.60	435.25	0.000001	0.20	8384.81	807.04	0.01
Reach - 1	22383.4		Inl Struct									
Reach - 1	22370.4	2-Year	472.00	425.91	428.47	428.47	429.31	0.026061	7.37	64.06	38.82	1.01
Reach - 1	22370.4	10-Year	942.00	425.91	430.56		431.11	0.007479	5.97	157.85	50.94	0.60
Reach - 1	22370.4	25-Year	1225.00	425.91	431.91		432.34	0.004274	5.28	231.81	58.76	0.47
Reach - 1	22370.4	50-Year	1459.00	425.91	432.89		433.27	0.003183	4.99	292.10	64.43	0.41
Reach - 1	22370.4	100-Year	1677.00	425.91	434.43		434.71	0.001594	4.25	416.29	100.76	0.31

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	22255.4	2-Year	472.00	422.25	427.59	426.02	428.05	0.004502	5.50	93.79	27.00	0.48
Reach - 1	22255.4	10-Year	942.00	422.25	429.54	427.49	430.35	0.004802	7.35	150.85	31.82	0.53
Reach - 1	22255.4	25-Year	1225.00	422.25	430.78	428.27	431.70	0.004283	7.86	192.51	35.93	0.51
Reach - 1	22255.4	50-Year	1459.00	422.25	431.65	428.83	432.67	0.004110	8.30	226.17	41.90	0.51
Reach - 1	22255.4	100-Year	1677.00	422.25	433.45	429.36	434.30	0.002677	7.65	304.54	264.90	0.43
Reach - 1	22230.4	Bridge										
Reach - 1	22205.4	2-Year	460.00	421.56	425.28	425.28	426.51	0.022842	8.90	53.20	23.25	0.99
Reach - 1	22205.4	10-Year	842.00	421.56	426.52	426.52	428.32	0.019886	10.84	83.68	26.12	0.99
Reach - 1	22205.4	25-Year	1065.00	421.56	427.15	427.15	429.24	0.018709	11.67	100.73	27.59	0.98
Reach - 1	22205.4	50-Year	1270.00	421.56	427.69	427.69	430.01	0.017924	12.34	115.94	28.84	0.98
Reach - 1	22205.4	100-Year	1281.00	421.56	427.71	427.71	430.05	0.017965	12.39	116.57	28.89	0.98
Reach - 1	22061.4	2-Year	460.00	400.80	403.96	403.96	405.14	0.037122	8.70	52.88	22.83	1.01
Reach - 1	22061.4	10-Year	842.00	400.80	405.14	405.14	406.86	0.032402	10.51	80.38	23.94	1.00
Reach - 1	22061.4	25-Year	1065.00	400.80	405.71	405.71	407.73	0.031113	11.40	94.12	24.43	1.00
Reach - 1	22061.4	50-Year	1270.00	400.80	406.23	406.23	408.47	0.029433	12.03	106.93	24.87	1.00
Reach - 1	22061.4	100-Year	1281.00	400.80	406.25	406.25	408.51	0.029367	12.06	107.59	24.90	1.00
Reach - 1	21877	2-Year	460.00	390.67	393.01	393.01	393.65	0.028609	6.90	73.17	65.44	0.94
Reach - 1	21877	10-Year	842.00	390.67	393.78	393.78	394.58	0.026070	8.16	125.62	93.64	0.94
Reach - 1	21877	25-Year	1065.00	390.67	394.14	394.14	394.95	0.024515	8.57	172.35	144.59	0.93
Reach - 1	21877	50-Year	1270.00	390.67	394.59	394.33	395.29	0.018698	8.28	238.19	150.76	0.83
Reach - 1	21877	100-Year	1281.00	390.67	394.82	394.34	395.39	0.014105	7.55	273.96	153.51	0.73
Reach - 1	21577.4	2-Year	583.00	383.59	389.02		389.40	0.005287	5.10	167.47	105.48	0.42
Reach - 1	21577.4	10-Year	1128.00	383.59	390.27		390.83	0.006524	6.67	316.33	126.65	0.49
Reach - 1	21577.4	25-Year	1478.00	383.59	390.81		391.48	0.007470	7.57	385.42	134.75	0.53
Reach - 1	21577.4	50-Year	1750.00	383.59	391.14		391.93	0.008268	8.24	433.07	143.23	0.56
Reach - 1	21577.4	100-Year	1976.00	383.59	391.44		392.28	0.008616	8.66	475.68	147.72	0.58
Reach - 1	21329	2-Year	583.00	380.12	385.19	385.19	386.65	0.031190	9.70	60.12	20.66	1.00
Reach - 1	21329	10-Year	1128.00	380.12	387.38	387.38	388.46	0.014408	8.91	246.18	193.05	0.73
Reach - 1	21329	25-Year	1478.00	380.12	387.99	387.99	389.04	0.013106	9.24	380.38	245.69	0.71
Reach - 1	21329	50-Year	1750.00	380.12	388.33	388.33	389.37	0.012872	9.54	465.35	256.06	0.71
Reach - 1	21329	100-Year	1976.00	380.12	388.53	388.53	389.62	0.013366	9.96	517.81	260.84	0.73

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	21024.2	2-Year	583.00	375.87	381.90		382.26	0.003323	4.83	129.49	31.64	0.38
Reach - 1	21024.2	10-Year	1128.00	375.87	384.66		384.99	0.002039	5.05	562.41	314.26	0.32
Reach - 1	21024.2	25-Year	1478.00	375.87	386.39		386.55	0.001006	4.04	1182.15	386.79	0.23
Reach - 1	21024.2	50-Year	1750.00	375.87	387.36		387.47	0.000756	3.74	1561.00	394.80	0.20
Reach - 1	21024.2	100-Year	1976.00	375.87	388.00		388.10	0.000668	3.65	1815.98	400.40	0.19
Reach - 1	20803	2-Year	583.00	373.95	380.56		381.16	0.007718	6.22	95.76	31.20	0.51
Reach - 1	20803	10-Year	1128.00	373.95	383.96		384.42	0.003237	5.85	362.03	125.38	0.37
Reach - 1	20803	25-Year	1478.00	373.95	385.91		386.23	0.001973	5.28	658.04	179.20	0.30
Reach - 1	20803	50-Year	1750.00	373.95	386.93		387.22	0.001684	5.21	888.73	249.73	0.28
Reach - 1	20803	100-Year	1976.00	373.95	387.60		387.87	0.001563	5.22	1065.01	279.19	0.27
Reach - 1	20582.7	2-Year	583.00	372.04	380.48		380.61	0.000813	3.09	280.55	85.94	0.20
Reach - 1	20582.7	10-Year	1128.00	372.04	383.97		384.08	0.000517	3.17	935.16	252.29	0.17
Reach - 1	20582.7	25-Year	1478.00	372.04	385.92		386.00	0.000361	2.96	1459.15	283.50	0.14
Reach - 1	20582.7	50-Year	1750.00	372.04	386.93		387.01	0.000338	3.01	1757.82	304.67	0.14
Reach - 1	20582.7	100-Year	1976.00	372.04	387.59		387.67	0.000334	3.08	1961.62	311.66	0.14
Reach - 1	20391.6	2-Year	638.00	371.31	378.98	377.15	379.99	0.007573	8.78	124.63	64.12	0.59
Reach - 1	20391.6	10-Year	1184.00	371.31	382.65	379.55	383.60	0.004666	9.16	271.19	256.75	0.50
Reach - 1	20391.6	25-Year	1537.00	371.31	385.79	381.27	385.89	0.000751	4.37	1426.57	350.04	0.21
Reach - 1	20391.6	50-Year	1820.00	371.31	386.86	381.97	386.93	0.000539	3.89	1983.20	362.37	0.18
Reach - 1	20391.6	100-Year	2039.00	371.31	387.52	382.45	387.59	0.000493	3.83	2226.95	367.41	0.17
Reach - 1	20349.6		Mult Open									
Reach - 1	20307.6	2-Year	634.00	371.56	377.39	377.39	379.53	0.023194	12.50	76.87	22.44	0.98
Reach - 1	20307.6	10-Year	1134.00	371.56	380.10	380.10	382.00	0.013404	12.64	205.66	75.51	0.80
Reach - 1	20307.6	25-Year	1519.00	371.56	380.80	380.80	383.18	0.015839	14.56	261.89	89.80	0.88
Reach - 1	20307.6	50-Year	1804.00	371.56	382.39	382.39	383.78	0.008748	12.14	503.09	221.27	0.67
Reach - 1	20307.6	100-Year	2030.00	371.56	383.24	383.24	384.42	0.007282	11.68	714.11	275.31	0.62
Reach - 1	20223	2-Year	634.00	370.12	375.00	375.00	376.30	0.029417	9.13	69.51	28.53	1.00
Reach - 1	20223	10-Year	1134.00	370.12	376.52	376.52	377.88	0.017652	9.64	170.16	99.77	0.84
Reach - 1	20223	25-Year	1519.00	370.12	377.21	377.21	378.70	0.016650	10.39	243.96	113.15	0.84
Reach - 1	20223	50-Year	1804.00	370.12	377.65	377.65	379.22	0.016264	10.88	295.03	120.89	0.84
Reach - 1	20223	100-Year	2030.00	370.12	377.94	377.94	379.60	0.016453	11.34	330.13	125.93	0.85

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	20024.2	2-Year	634.00	366.75	371.38	370.55	372.13	0.010858	7.06	104.17	37.46	0.64
Reach - 1	20024.2	10-Year	1134.00	366.75	372.83		373.95	0.010878	8.80	166.07	51.62	0.68
Reach - 1	20024.2	25-Year	1519.00	366.75	373.46	372.69	375.00	0.012955	10.37	202.53	64.39	0.76
Reach - 1	20024.2	50-Year	1804.00	366.75	373.83	373.17	375.71	0.014611	11.47	228.71	78.33	0.81
Reach - 1	20024.2	100-Year	2030.00	366.75	374.17	373.76	376.22	0.015081	12.08	255.76	81.93	0.83
Reach - 1	19751	2-Year	634.00	361.35	366.70	366.43	367.88	0.023422	8.73	72.61	24.79	0.90
Reach - 1	19751	10-Year	1134.00	361.35	367.97	367.97	369.68	0.023638	10.52	117.31	54.87	0.95
Reach - 1	19751	25-Year	1519.00	361.35	368.90	368.90	370.70	0.019309	10.98	179.09	79.50	0.89
Reach - 1	19751	50-Year	1804.00	361.35	369.46	369.46	371.32	0.017670	11.32	226.83	88.51	0.86
Reach - 1	19751	100-Year	2030.00	361.35	369.81	369.81	371.77	0.017455	11.73	258.35	93.37	0.87
Reach - 1	19524.2	2-Year	634.00	356.87	360.62	360.62	362.03	0.028309	9.53	67.69	27.78	1.00
Reach - 1	19524.2	10-Year	1134.00	356.87	362.11	362.11	363.81	0.020410	10.71	135.48	53.78	0.91
Reach - 1	19524.2	25-Year	1519.00	356.87	362.91	362.91	364.87	0.019353	11.68	181.07	59.36	0.91
Reach - 1	19524.2	50-Year	1804.00	356.87	363.42	363.42	365.57	0.019156	12.37	211.90	62.65	0.92
Reach - 1	19524.2	100-Year	2030.00	356.87	363.83	363.83	366.09	0.018592	12.77	238.15	65.32	0.91
Reach - 1	19222	2-Year	634.00	348.54	351.92	351.92	353.06	0.027048	8.59	77.14	38.71	0.98
Reach - 1	19222	10-Year	1134.00	348.54	353.04	353.04	354.64	0.023130	10.27	125.63	46.85	0.97
Reach - 1	19222	25-Year	1519.00	348.54	353.74	353.74	355.65	0.022115	11.32	159.51	50.48	0.97
Reach - 1	19222	50-Year	1804.00	348.54	354.25	354.25	356.34	0.020791	11.86	186.20	52.62	0.96
Reach - 1	19222	100-Year	2030.00	348.54	354.61	354.61	356.85	0.020385	12.33	205.15	53.74	0.96
Reach - 1	19024.2	2-Year	634.00	343.08	348.33		348.94	0.006915	6.25	101.85	23.81	0.53
Reach - 1	19024.2	10-Year	1134.00	343.08	349.91	348.15	350.93	0.007739	8.13	155.15	55.04	0.59
Reach - 1	19024.2	25-Year	1519.00	343.08	350.83	349.14	352.07	0.008029	9.11	238.35	117.62	0.61
Reach - 1	19024.2	50-Year	1804.00	343.08	350.90	349.89	352.59	0.010898	10.68	246.32	126.39	0.72
Reach - 1	19024.2	100-Year	2030.00	343.08	351.19	350.68	353.07	0.011631	11.35	288.48	160.31	0.74
Reach - 1	18833	2-Year	634.00	339.27	344.81	344.81	346.42	0.030290	10.20	62.47	22.15	1.00
Reach - 1	18833	10-Year	1134.00	339.27	346.50	346.50	348.49	0.022271	11.53	121.65	44.46	0.92
Reach - 1	18833	25-Year	1519.00	339.27	347.59	347.59	349.72	0.018987	12.16	182.44	67.91	0.87
Reach - 1	18833	50-Year	1804.00	339.27	348.88	348.88	350.40	0.011512	10.78	348.38	158.40	0.70
Reach - 1	18833	100-Year	2030.00	339.27	349.20	349.20	350.76	0.011564	11.12	400.38	160.98	0.71
Reach - 1	18524.2	2-Year	634.00	333.12	340.33		340.61	0.001954	4.25	163.76	36.43	0.30
Reach - 1	18524.2	10-Year	1134.00	333.12	341.99		342.51	0.002763	5.91	237.00	53.26	0.37

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	18524.2	25-Year	1519.00	333.12	342.79		343.53	0.003496	7.09	302.70	102.82	0.42
Reach - 1	18524.2	50-Year	1804.00	333.12	343.33		344.19	0.003853	7.74	359.61	107.99	0.45
Reach - 1	18524.2	100-Year	2030.00	333.12	343.64		344.63	0.004245	8.31	394.02	111.81	0.47
Reach - 1	18317	2-Year	634.00	331.33	338.14	338.14	339.48	0.029379	9.40	80.27	43.69	0.92
Reach - 1	18317	10-Year	1134.00	331.33	339.58	339.58	341.14	0.023004	10.63	164.88	79.89	0.87
Reach - 1	18317	25-Year	1519.00	331.33	340.50	340.50	342.03	0.019182	10.95	251.47	103.28	0.82
Reach - 1	18317	50-Year	1804.00	331.33	340.90	340.90	342.58	0.019807	11.66	294.38	108.97	0.84
Reach - 1	18317	100-Year	2030.00	331.33	341.38	341.20	342.98	0.017747	11.62	348.35	115.73	0.81
Reach - 1	18024.2	2-Year	634.00	328.79	334.20		334.74	0.005990	5.95	117.06	35.99	0.49
Reach - 1	18024.2	10-Year	1134.00	328.79	335.44		336.44	0.008167	8.17	168.65	48.00	0.60
Reach - 1	18024.2	25-Year	1519.00	328.79	336.07	334.85	337.47	0.010049	9.72	201.60	55.30	0.68
Reach - 1	18024.2	50-Year	1804.00	328.79	336.51	335.50	338.20	0.011208	10.73	229.60	70.90	0.72
Reach - 1	18024.2	100-Year	2030.00	328.79	336.83	335.96	338.72	0.011957	11.42	252.91	77.01	0.75
Reach - 1	17810	2-Year	634.00	326.23	331.00	331.00	332.23	0.030063	8.87	71.50	29.24	1.00
Reach - 1	17810	10-Year	1134.00	326.23	332.55	332.22	333.85	0.019136	9.18	131.56	51.90	0.85
Reach - 1	17810	25-Year	1519.00	326.23	333.56	333.01	334.90	0.014433	9.40	193.96	72.63	0.77
Reach - 1	17810	50-Year	1804.00	326.23	334.22	333.51	335.57	0.012490	9.56	245.86	85.41	0.74
Reach - 1	17810	100-Year	2030.00	326.23	334.67	333.88	336.05	0.011553	9.72	287.01	93.31	0.72
Reach - 1	17524.2	2-Year	634.00	322.82	329.60		329.92	0.002438	4.54	159.27	39.33	0.33
Reach - 1	17524.2	10-Year	1134.00	322.82	331.23		331.78	0.003203	6.12	257.48	76.16	0.39
Reach - 1	17524.2	25-Year	1519.00	322.82	332.12		332.84	0.003710	7.10	330.62	89.50	0.43
Reach - 1	17524.2	50-Year	1804.00	322.82	332.68		333.53	0.004087	7.77	386.63	112.05	0.46
Reach - 1	17524.2	100-Year	2030.00	322.82	333.08		334.02	0.004324	8.23	435.34	129.02	0.47
Reach - 1	17294	2-Year	634.00	322.18	328.44		329.03	0.006400	6.41	149.91	68.64	0.51
Reach - 1	17294	10-Year	1134.00	322.18	329.88		330.70	0.007047	8.00	269.46	97.16	0.56
Reach - 1	17294	25-Year	1519.00	322.18	330.64		331.63	0.007670	9.01	347.46	108.35	0.60
Reach - 1	17294	50-Year	1804.00	322.18	331.15		332.23	0.007914	9.59	404.61	114.99	0.62
Reach - 1	17294	100-Year	2030.00	322.18	331.51		332.66	0.008132	10.03	446.90	119.51	0.63
Reach - 1	17020.0	2-Year	634.00	321.41	325.44	325.28	326.31	0.016965	7.86	121.43	76.87	0.78
Reach - 1	17020.0	10-Year	1134.00	321.41	326.31	326.31	327.62	0.020003	10.05	196.38	94.99	0.89
Reach - 1	17020.0	25-Year	1519.00	321.41	326.96	326.96	328.42	0.019295	10.91	262.47	108.48	0.89
Reach - 1	17020.0	50-Year	1804.00	321.41	327.35	327.35	328.94	0.019500	11.57	306.11	116.54	0.91

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	17020.0	100-Year	2030.00	321.41	327.65	327.65	329.32	0.019471	12.01	341.33	122.66	0.92
Reach - 1	16807	2-Year	634.00	318.05	321.79		322.60	0.017738	7.21	87.94	34.29	0.79
Reach - 1	16807	10-Year	1134.00	318.05	323.26	322.73	324.08	0.011775	7.51	213.76	117.29	0.68
Reach - 1	16807	25-Year	1519.00	318.05	324.07	323.37	324.90	0.009878	7.78	323.21	157.66	0.64
Reach - 1	16807	50-Year	1804.00	318.05	324.58		325.41	0.008832	7.91	407.83	168.05	0.62
Reach - 1	16807	100-Year	2030.00	318.05	324.94		325.77	0.008366	8.06	469.49	175.24	0.61
Reach - 1	16524.2	2-Year	675.00	313.59	319.04		319.67	0.006768	6.37	106.67	24.57	0.53
Reach - 1	16524.2	10-Year	1165.00	313.59	320.55	318.75	321.51	0.007231	7.97	201.93	108.79	0.57
Reach - 1	16524.2	25-Year	1559.00	313.59	321.41	319.89	322.49	0.007310	8.75	296.73	112.56	0.59
Reach - 1	16524.2	50-Year	1853.00	313.59	321.98	321.03	323.12	0.007243	9.18	362.04	115.07	0.59
Reach - 1	16524.2	100-Year	2075.00	313.59	322.44		323.59	0.006965	9.37	415.18	117.07	0.59
Reach - 1	16219	2-Year	675.00	307.88	314.14	314.14	315.69	0.032244	9.98	67.64	22.05	1.00
Reach - 1	16219	10-Year	1165.00	307.88	315.61	315.61	317.57	0.027083	11.25	108.28	38.25	0.97
Reach - 1	16219	25-Year	1559.00	307.88	316.62	316.62	318.75	0.022628	11.87	155.13	53.23	0.92
Reach - 1	16219	50-Year	1853.00	307.88	317.26	317.26	319.51	0.020830	12.31	191.85	61.54	0.90
Reach - 1	16219	100-Year	2075.00	307.88	317.60	317.60	320.03	0.021100	12.87	213.57	65.97	0.91
Reach - 1	16024.2	2-Year	675.00	304.23	309.99		310.53	0.005354	5.92	121.55	31.07	0.47
Reach - 1	16024.2	10-Year	1165.00	304.23	311.64		312.50	0.005823	7.50	178.42	40.52	0.52
Reach - 1	16024.2	25-Year	1559.00	304.23	312.62		313.73	0.006361	8.60	225.23	54.36	0.55
Reach - 1	16024.2	50-Year	1853.00	304.23	313.24		314.53	0.006730	9.33	261.57	62.05	0.58
Reach - 1	16024.2	100-Year	2075.00	304.23	313.67	311.39	315.09	0.006966	9.83	289.30	66.55	0.59
Reach - 1	15740	2-Year	675.00	297.95	303.37	303.37	304.88	2.445524	9.84	68.60	23.19	1.01
Reach - 1	15740	10-Year	1165.00	297.95	305.05	305.05	306.55	1.608710	9.87	118.78	39.52	0.86
Reach - 1	15740	25-Year	1559.00	297.95	305.92	305.92	307.41	1.175953	9.60	160.42	56.16	0.76
Reach - 1	15740	50-Year	1853.00	297.95	306.36	306.36	307.94	1.049711	9.60	186.77	63.90	0.73
Reach - 1	15740	100-Year	2075.00	297.95	306.61	306.61	308.32	1.000241	9.67	203.60	66.84	0.72
Reach - 1	15524.2	2-Year	675.00	293.18	300.55		300.83	0.001592	4.34	215.20	104.93	0.30
Reach - 1	15524.2	10-Year	1165.00	293.18	302.62		302.94	0.001442	4.97	507.70	190.21	0.30
Reach - 1	15524.2	25-Year	1559.00	293.18	303.30		303.72	0.001796	5.83	648.21	221.63	0.34
Reach - 1	15524.2	50-Year	1853.00	293.18	303.59		304.13	0.002193	6.58	718.46	244.77	0.38
Reach - 1	15524.2	100-Year	2075.00	293.18	303.79		304.41	0.002496	7.12	769.89	268.46	0.40

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	15291	2-Year	675.00	292.67	299.50		300.11	0.007096	6.30	107.21	24.85	0.53
Reach - 1	15291	10-Year	1165.00	292.67	302.30		302.51	0.002033	4.43	812.38	479.76	0.30
Reach - 1	15291	25-Year	1559.00	292.67	303.06		303.24	0.001727	4.39	1187.31	501.97	0.29
Reach - 1	15291	50-Year	1853.00	292.67	303.36		303.55	0.001873	4.70	1339.56	510.71	0.30
Reach - 1	15291	100-Year	2075.00	292.67	303.57		303.77	0.001981	4.92	1443.90	516.62	0.31
Reach - 1	15183.4	2-Year	675.00	292.43	299.29	296.48	299.58	0.002057	4.41	176.18	50.13	0.33
Reach - 1	15183.4	10-Year	1165.00	292.43	302.04	297.67	302.32	0.001266	4.55	524.29	263.52	0.28
Reach - 1	15183.4	25-Year	1559.00	292.43	302.57	298.49	302.98	0.001746	5.57	697.50	436.78	0.33
Reach - 1	15183.4	50-Year	1853.00	292.43	302.69	299.10	303.23	0.002269	6.41	753.34	466.22	0.38
Reach - 1	15183.4	100-Year	2075.00	292.43	302.72	299.49	303.38	0.002799	7.13	764.74	472.17	0.42
Reach - 1	15150.4	Bridge										
Reach - 1	15117.4	2-Year	675.00	292.69	298.43	296.74	298.91	0.004440	5.62	132.03	36.71	0.48
Reach - 1	15117.4	10-Year	1165.00	292.69	299.29	297.92	300.26	0.007265	8.03	167.22	46.11	0.62
Reach - 1	15117.4	25-Year	1559.00	292.69	299.84	298.75	301.23	0.009164	9.64	196.06	63.84	0.71
Reach - 1	15117.4	50-Year	1853.00	292.69	300.05	299.34	301.86	0.011373	11.00	210.14	69.33	0.80
Reach - 1	15117.4	100-Year	2075.00	292.69	300.15	299.84	302.33	0.013454	12.10	217.02	72.24	0.87
Reach - 1	15024.2	2-Year	687.00	291.44	298.38		298.58	0.001157	3.98	391.27	173.22	0.29
Reach - 1	15024.2	10-Year	1174.00	291.44	299.33		299.65	0.001676	5.27	561.57	185.30	0.35
Reach - 1	15024.2	25-Year	1570.00	291.44	299.89		300.40	0.002389	6.63	718.90	376.23	0.43
Reach - 1	15024.2	50-Year	1865.00	291.44	300.23		300.79	0.002616	7.14	850.58	393.13	0.45
Reach - 1	15024.2	100-Year	2086.00	291.44	300.46		301.05	0.002732	7.44	942.75	400.19	0.46
Reach - 1	14764	2-Year	687.00	290.94	296.83	295.80	297.41	0.006396	6.67	263.64	292.25	0.58
Reach - 1	14764	10-Year	1174.00	290.94	297.75		298.23	0.005677	6.95	589.28	421.93	0.55
Reach - 1	14764	25-Year	1570.00	290.94	298.29		298.70	0.005023	7.01	823.81	445.63	0.53
Reach - 1	14764	50-Year	1865.00	290.94	298.61		299.00	0.004851	7.16	969.29	455.18	0.53
Reach - 1	14764	100-Year	2086.00	290.94	298.83		299.22	0.004768	7.28	1070.73	461.72	0.53
Reach - 1	14524.2	2-Year	687.00	290.48	296.55		296.70	0.001258	3.74	636.06	428.25	0.29
Reach - 1	14524.2	10-Year	1174.00	290.48	297.33		297.50	0.001518	4.51	980.25	450.97	0.33
Reach - 1	14524.2	25-Year	1570.00	290.48	297.74		297.95	0.001863	5.22	1167.41	477.94	0.36
Reach - 1	14524.2	50-Year	1865.00	290.48	298.00		298.24	0.002042	5.61	1295.31	483.48	0.38
Reach - 1	14524.2	100-Year	2086.00	290.48	298.19		298.44	0.002145	5.87	1387.86	485.55	0.40

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	14034.8	2-Year	687.00	287.46	296.57		296.58	0.000056	1.07	2273.47	443.19	0.07
Reach - 1	14034.8	10-Year	1174.00	287.46	297.31		297.32	0.000113	1.61	2605.46	463.69	0.10
Reach - 1	14034.8	25-Year	1570.00	287.46	297.67		297.69	0.000172	2.04	2779.06	480.57	0.12
Reach - 1	14034.8	50-Year	1865.00	287.46	297.90		297.93	0.000218	2.34	2891.24	488.38	0.13
Reach - 1	14034.8	100-Year	2086.00	287.46	298.07		298.10	0.000254	2.55	2971.68	493.11	0.14
Reach - 1	13555.6	2-Year	687.00	287.38	296.55		296.55	0.000053	1.05	2279.10	419.77	0.06
Reach - 1	13555.6	10-Year	1174.00	287.38	297.25		297.27	0.000109	1.59	2579.50	434.34	0.09
Reach - 1	13555.6	25-Year	1570.00	287.38	297.59		297.61	0.000168	2.02	2728.73	444.85	0.12
Reach - 1	13555.6	50-Year	1865.00	287.38	297.80		297.83	0.000218	2.33	2822.08	451.62	0.13
Reach - 1	13555.6	100-Year	2086.00	287.38	297.95		297.98	0.000256	2.56	2888.28	456.20	0.15
Reach - 1	13024.2	2-Year	687.00	287.30	296.52		296.53	0.000055	1.08	2217.89	413.43	0.07
Reach - 1	13024.2	10-Year	1174.00	287.30	297.19		297.21	0.000114	1.63	2497.40	419.17	0.10
Reach - 1	13024.2	25-Year	1570.00	287.30	297.50		297.52	0.000177	2.07	2626.60	423.80	0.12
Reach - 1	13024.2	50-Year	1865.00	287.30	297.68		297.71	0.000231	2.40	2703.28	426.53	0.14
Reach - 1	13024.2	100-Year	2086.00	287.30	297.80		297.84	0.000273	2.63	2756.18	428.57	0.15
Reach - 1	12524.2	2-Year	687.00	287.22	296.50		296.50	0.000042	0.94	2639.56	493.90	0.06
Reach - 1	12524.2	10-Year	1174.00	287.22	297.15		297.15	0.000088	1.43	2966.29	509.48	0.08
Reach - 1	12524.2	25-Year	1570.00	287.22	297.43		297.44	0.000137	1.82	3109.70	511.94	0.11
Reach - 1	12524.2	50-Year	1865.00	287.22	297.58		297.60	0.000179	2.11	3190.76	513.04	0.12
Reach - 1	12524.2	100-Year	2086.00	287.22	297.69		297.71	0.000213	2.32	3245.15	513.78	0.13
Reach - 1	12024.2	2-Year	687.00	287.14	296.49		296.49	0.000015	0.56	4511.96	738.65	0.03
Reach - 1	12024.2	10-Year	1174.00	287.14	297.13		297.13	0.000031	0.86	4983.96	740.13	0.05
Reach - 1	12024.2	25-Year	1570.00	287.14	297.40		297.40	0.000049	1.10	5183.62	740.75	0.06
Reach - 1	12024.2	50-Year	1865.00	287.14	297.54		297.55	0.000065	1.27	5293.72	741.10	0.07
Reach - 1	12024.2	100-Year	2086.00	287.14	297.64		297.65	0.000077	1.40	5366.51	741.33	0.08
Reach - 1	11747.1	2-Year	687.00	284.16	296.49		296.49	0.000004	0.39	7366.75	1115.48	0.02
Reach - 1	11747.1	10-Year	1174.00	284.16	297.12		297.12	0.000010	0.60	8081.26	1131.64	0.03
Reach - 1	11747.1	25-Year	1570.00	284.16	297.39		297.39	0.000016	0.77	8385.01	1139.38	0.04
Reach - 1	11747.1	50-Year	1865.00	284.16	297.54		297.54	0.000021	0.90	8552.66	1151.24	0.05
Reach - 1	11747.1	100-Year	2086.00	284.16	297.63		297.64	0.000026	0.99	8664.07	1154.19	0.05
Reach - 1	11352.3	2-Year	823.00	273.46	296.48	277.81	296.49	0.000002	0.21	3993.25	578.59	0.01
Reach - 1	11352.3	10-Year	1773.00	273.46	297.12	279.38	297.12	0.000006	0.41	4441.90	595.37	0.02

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	11352.3	25-Year	2353.00	273.46	297.38	280.09	297.39	0.000010	0.53	4600.37	602.39	0.03
Reach - 1	11352.3	50-Year	2685.00	273.46	297.53	280.44	297.53	0.000013	0.60	4687.88	606.02	0.03
Reach - 1	11352.3	100-Year	2928.00	273.46	297.62	280.69	297.63	0.000015	0.65	4745.68	608.25	0.04
Reach - 1	11341.3		Inl Struct									
Reach - 1	11330.3	2-Year	823.00	277.80	282.25	282.25	283.72	0.012607	10.21	128.05	60.96	0.90
Reach - 1	11330.3	10-Year	1773.00	277.80	284.33	284.33	286.39	0.011298	12.80	280.99	86.14	0.92
Reach - 1	11330.3	25-Year	2353.00	277.80	285.29	285.29	287.62	0.011029	13.95	369.59	98.02	0.93
Reach - 1	11330.3	50-Year	2685.00	277.80	285.80	285.80	288.25	0.010810	14.47	421.25	104.32	0.93
Reach - 1	11330.3	100-Year	2928.00	277.80	286.17	286.17	288.68	0.010547	14.77	461.18	108.83	0.93
Reach - 1	11228.2	2-Year	823.00	274.45	279.26	279.26	280.91	0.016072	10.38	94.39	51.37	0.89
Reach - 1	11228.2	10-Year	1773.00	274.45	281.83	281.83	283.57	0.010639	11.62	308.09	119.37	0.79
Reach - 1	11228.2	25-Year	2353.00	274.45	282.68	282.68	284.59	0.010743	12.64	412.67	126.14	0.81
Reach - 1	11228.2	50-Year	2685.00	274.45	283.05	283.05	285.11	0.011248	13.35	459.66	130.13	0.83
Reach - 1	11228.2	100-Year	2928.00	274.45	283.33	283.33	285.47	0.011387	13.75	496.87	133.27	0.84
Reach - 1	10952.4	2-Year	823.00	270.52	274.54	274.54	275.79	0.015113	9.17	111.07	59.93	0.94
Reach - 1	10952.4	10-Year	1773.00	270.52	276.27	276.27	278.17	0.013212	11.67	227.14	75.37	0.95
Reach - 1	10952.4	25-Year	2353.00	270.52	276.83	276.83	279.38	0.015435	13.60	271.29	83.76	1.05
Reach - 1	10952.4	50-Year	2685.00	270.52	277.84	277.84	279.96	0.010436	12.58	380.85	123.84	0.89
Reach - 1	10952.4	100-Year	2928.00	270.52	277.86	277.86	280.36	0.012264	13.67	383.17	124.10	0.96
Reach - 1	10524.2	2-Year	823.00	263.63	268.94	268.02	269.73	0.007494	7.33	164.16	124.58	0.66
Reach - 1	10524.2	10-Year	1773.00	263.63	270.16	270.16	271.56	0.011096	10.38	339.78	167.52	0.83
Reach - 1	10524.2	25-Year	2353.00	263.63	270.85	270.85	272.42	0.011031	11.31	469.45	211.78	0.85
Reach - 1	10524.2	50-Year	2685.00	263.63	271.32	271.32	272.82	0.009897	11.31	575.39	233.69	0.81
Reach - 1	10524.2	100-Year	2928.00	263.63	271.57	271.57	273.07	0.009682	11.49	634.40	240.11	0.81
Reach - 1	10136.9	2-Year	823.00	261.02	269.01		269.07	0.000438	2.50	1210.59	612.10	0.18
Reach - 1	10136.9	10-Year	1773.00	261.02	270.14		270.24	0.000733	3.61	1947.45	694.72	0.23
Reach - 1	10136.9	25-Year	2353.00	261.02	270.85		270.95	0.000743	3.86	2456.70	735.87	0.24
Reach - 1	10136.9	50-Year	2685.00	261.02	271.65		271.73	0.000560	3.57	3065.05	780.49	0.21
Reach - 1	10136.9	100-Year	2928.00	261.02	271.89		271.97	0.000574	3.68	3250.57	792.82	0.21
Reach - 2	10024.2	2-Year	929.00	262.00	268.96		269.00	0.000811	2.59	1278.34	627.94	0.20
Reach - 2	10024.2	10-Year	2048.00	262.00	270.04		270.12	0.001326	3.73	2007.50	706.98	0.26

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	10024.2	25-Year	2731.00	262.00	270.76		270.83	0.001282	3.94	2526.51	749.46	0.26
Reach - 2	10024.2	50-Year	3124.00	262.00	271.58		271.64	0.000951	3.65	3173.42	844.95	0.23
Reach - 2	10024.2	100-Year	3395.00	262.00	271.82		271.88	0.000959	3.74	3378.03	887.05	0.23
Reach - 2	9691.7	2-Year	929.00	260.63	267.90	266.14	268.44	0.004010	6.34	308.48	436.78	0.47
Reach - 2	9691.7	10-Year	2048.00	260.63	269.50	268.50	269.64	0.001579	4.69	1654.51	527.43	0.31
Reach - 2	9691.7	25-Year	2731.00	260.63	270.18	268.50	270.34	0.001718	5.20	2028.27	565.11	0.32
Reach - 2	9691.7	50-Year	3124.00	260.63	271.17	268.51	271.28	0.001216	4.73	2599.94	601.15	0.28
Reach - 2	9691.7	100-Year	3395.00	260.63	271.39	268.51	271.51	0.001273	4.92	2733.46	615.90	0.29
Reach - 2	9676.2		Bridge									
Reach - 2	9660.7	2-Year	929.00	260.97	266.57	266.47	268.20	0.016822	10.29	101.21	256.44	0.91
Reach - 2	9660.7	10-Year	2048.00	260.97	269.19	268.01	269.42	0.002678	5.75	1325.30	488.87	0.39
Reach - 2	9660.7	25-Year	2731.00	260.97	270.09	268.23	270.29	0.002337	5.84	1786.12	540.14	0.38
Reach - 2	9660.7	50-Year	3124.00	260.97	270.58	268.48	270.77	0.002167	5.86	2058.67	568.26	0.37
Reach - 2	9660.7	100-Year	3395.00	260.97	270.91	268.62	271.11	0.002132	5.98	2251.56	577.89	0.36
Reach - 2	9524.2	2-Year	929.00	259.17	265.89		266.41	0.005611	5.98	226.91	125.45	0.47
Reach - 2	9524.2	10-Year	2048.00	259.17	268.56		268.95	0.003418	6.13	1009.15	467.54	0.39
Reach - 2	9524.2	25-Year	2731.00	259.17	269.63		269.93	0.002586	5.82	1523.49	494.22	0.35
Reach - 2	9524.2	50-Year	3124.00	259.17	270.19		270.45	0.002263	5.68	1802.35	500.56	0.33
Reach - 2	9524.2	100-Year	3395.00	259.17	270.57		270.81	0.002089	5.60	1993.28	508.21	0.32
Reach - 2	9024.2	2-Year	929.00	256.05	264.15		264.49	0.002657	4.78	253.31	87.82	0.33
Reach - 2	9024.2	10-Year	2048.00	256.05	266.63		267.23	0.003395	6.73	549.11	154.43	0.40
Reach - 2	9024.2	25-Year	2731.00	256.05	267.62		268.34	0.003732	7.58	709.58	166.49	0.43
Reach - 2	9024.2	50-Year	3124.00	256.05	268.21		268.96	0.003751	7.90	808.64	171.93	0.43
Reach - 2	9024.2	100-Year	3395.00	256.05	268.58		269.37	0.003807	8.14	874.72	181.77	0.44
Reach - 2	8588.6	2-Year	929.00	255.57	261.44		262.35	0.011114	7.62	122.98	37.30	0.65
Reach - 2	8588.6	10-Year	2048.00	255.57	264.72		265.40	0.005257	7.45	634.99	273.34	0.48
Reach - 2	8588.6	25-Year	2731.00	255.57	266.21		266.70	0.003503	6.87	1099.25	347.17	0.41
Reach - 2	8588.6	50-Year	3124.00	255.57	267.11		267.49	0.002646	6.37	1421.64	367.02	0.36
Reach - 2	8588.6	100-Year	3395.00	255.57	267.62		267.95	0.002346	6.20	1609.14	374.23	0.34
Reach - 2	8024.2	2-Year	929.00	250.67	260.27		260.50	0.001317	3.88	284.00	54.81	0.24
Reach - 2	8024.2	10-Year	2048.00	250.67	264.08		264.26	0.000864	4.09	1457.66	559.38	0.21

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 2	8024.2	25-Year	2731.00	250.67	265.87		265.97	0.000520	3.49	2508.48	629.62	0.17
Reach - 2	8024.2	50-Year	3124.00	250.67	266.85		266.92	0.000405	3.22	3144.32	661.40	0.15
Reach - 2	8024.2	100-Year	3395.00	250.67	267.38		267.45	0.000366	3.14	3505.20	732.31	0.14
Reach - 2	7524.2	2-Year	941.00	249.35	259.85		259.99	0.000745	3.14	654.09	508.05	0.19
Reach - 2	7524.2	10-Year	2077.00	249.35	264.02		264.04	0.000183	2.01	3428.74	736.76	0.10
Reach - 2	7524.2	25-Year	2777.00	249.35	265.81		265.83	0.000135	1.89	4804.17	793.30	0.09
Reach - 2	7524.2	50-Year	3203.00	249.35	266.79		266.81	0.000117	1.83	5596.72	818.15	0.08
Reach - 2	7524.2	100-Year	3470.00	249.35	267.33		267.34	0.000111	1.83	6037.37	839.13	0.08
Reach - 3	7024.2	2-Year	956.00	250.01	259.52		259.61	0.000716	2.84	911.94	461.73	0.18
Reach - 3	7024.2	10-Year	2116.00	250.01	263.93		263.95	0.000174	1.89	3194.12	572.86	0.10
Reach - 3	7024.2	25-Year	2836.00	250.01	265.73		265.75	0.000153	1.94	4316.28	738.61	0.09
Reach - 3	7024.2	50-Year	3294.00	250.01	266.73		266.75	0.000134	1.90	5066.19	765.64	0.09
Reach - 3	7024.2	100-Year	3576.00	250.01	267.26		267.28	0.000127	1.89	5479.41	774.70	0.08
Reach - 3	6790.2	2-Year	956.00	249.25	259.39		259.47	0.000460	2.37	478.54	106.59	0.15
Reach - 3	6790.2	10-Year	2116.00	249.25	263.76		263.88	0.000420	3.02	1319.04	352.13	0.15
Reach - 3	6790.2	25-Year	2836.00	249.25	265.56		265.69	0.000400	3.22	2060.85	479.99	0.15
Reach - 3	6790.2	50-Year	3294.00	249.25	266.56		266.68	0.000390	3.32	2587.29	567.82	0.15
Reach - 3	6790.2	100-Year	3576.00	249.25	267.09		267.22	0.000385	3.37	2904.61	610.93	0.15
Reach - 3	6733.5	2-Year	966.00	250.49	259.38	253.12	259.44	0.000256	2.00	487.80	238.63	0.13
Reach - 3	6733.5	10-Year	2334.00	250.49	263.70	254.88	263.85	0.000350	3.13	757.84	357.30	0.16
Reach - 3	6733.5	25-Year	3132.00	250.49	265.43	255.76	265.64	0.000406	3.68	866.04	526.87	0.17
Reach - 3	6733.5	50-Year	3639.00	250.49	266.56	256.25	266.65	0.000217	2.83	3341.57	682.23	0.13
Reach - 3	6733.5	100-Year	3999.00	250.49	267.09	256.57	267.19	0.000230	2.98	3732.52	761.09	0.13
Reach - 3	6670.0		Culvert									
Reach - 3	6606.5	2-Year	966.00	249.54	259.21	252.17	259.26	0.000187	1.83	536.30	247.94	0.11
Reach - 3	6606.5	10-Year	2334.00	249.54	262.99	253.94	263.14	0.000328	3.07	773.02	369.96	0.15
Reach - 3	6606.5	25-Year	3132.00	249.54	264.10	254.81	264.32	0.000446	3.78	841.86	470.34	0.18
Reach - 3	6606.5	50-Year	3639.00	249.54	264.75	255.29	265.02	0.000514	4.19	882.81	546.40	0.20
Reach - 3	6606.5	100-Year	3999.00	249.54	265.42	255.60	265.54	0.000280	3.19	3215.80	660.80	0.15
Reach - 3	6606.4	2-Year	966.00	249.54	259.12	252.39	259.24	0.000461	2.73	393.14	56.71	0.16
Reach - 3	6606.4	10-Year	2334.00	249.54	262.86	254.65	263.11	0.000716	4.25	1389.27	711.76	0.21

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	6606.4	25-Year	3132.00	249.54	264.08	255.75	264.31	0.000699	4.46	2286.88	758.79	0.21
Reach - 3	6606.4	50-Year	3639.00	249.54	264.78	256.41	265.00	0.000674	4.51	2825.13	785.45	0.20
Reach - 3	6606.4	100-Year	3999.00	249.54	265.31	256.86	265.51	0.000634	4.48	3250.40	812.37	0.20
Reach - 3	6268.9		Culvert									
Reach - 3	5931.4	2-Year	966.00	249.82	259.02	252.67	259.15	0.000532	2.86	372.08	55.00	0.17
Reach - 3	5931.4	10-Year	2334.00	249.82	262.44	254.93	262.78	0.000977	4.79	910.60	610.59	0.24
Reach - 3	5931.4	25-Year	3132.00	249.82	263.47	256.03	263.85	0.001090	5.33	1629.55	727.06	0.26
Reach - 3	5931.4	50-Year	3639.00	249.82	264.06	256.69	264.43	0.001096	5.50	2060.77	748.07	0.26
Reach - 3	5931.4	100-Year	3999.00	249.82	264.54	257.14	264.89	0.001043	5.49	2425.02	765.27	0.25
Reach - 3	5454.5	2-Year	966.00	248.76	257.97		258.50	0.003356	6.07	241.91	77.97	0.41
Reach - 3	5454.5	10-Year	2334.00	248.76	260.49	258.48	261.63	0.005287	9.41	622.66	296.91	0.54
Reach - 3	5454.5	25-Year	3132.00	248.76	261.94	260.74	262.80	0.004019	9.03	1194.89	675.89	0.48
Reach - 3	5454.5	50-Year	3639.00	248.76	262.96		263.56	0.002900	8.15	2064.47	928.87	0.42
Reach - 3	5454.5	100-Year	3999.00	248.76	263.94		264.25	0.001667	6.51	3003.87	975.97	0.32
Reach - 3	5024.2	2-Year	966.00	248.44	256.46		256.90	0.004018	6.02	376.62	193.86	0.44
Reach - 3	5024.2	10-Year	2334.00	248.44	259.37		259.76	0.002898	6.72	1072.23	307.37	0.40
Reach - 3	5024.2	25-Year	3132.00	248.44	261.06		261.39	0.002209	6.61	1665.37	420.94	0.36
Reach - 3	5024.2	50-Year	3639.00	248.44	262.35		262.58	0.001488	5.87	2236.48	462.65	0.30
Reach - 3	5024.2	100-Year	3999.00	248.44	263.47		263.64	0.001064	5.28	2790.63	514.03	0.26
Reach - 3	4718.573	2-Year	966.00	249.06	256.23		256.33	0.000795	2.56	377.65	81.09	0.21
Reach - 3	4718.573	10-Year	2334.00	249.06	258.97		259.18	0.001135	3.71	656.08	159.68	0.26
Reach - 3	4718.573	25-Year	3132.00	249.06	260.73		260.95	0.000897	3.78	1014.22	244.24	0.24
Reach - 3	4718.573	50-Year	3639.00	249.06	262.07		262.27	0.000695	3.61	1372.58	293.44	0.22
Reach - 3	4718.573	100-Year	3999.00	249.06	263.25		263.41	0.000535	3.38	1778.73	393.12	0.19
Reach - 3	4696.5	2-Year	955.00	249.91	256.22	252.13	256.31	0.000492	2.38	432.35	87.42	0.17
Reach - 3	4696.5	10-Year	2132.00	249.91	258.95	253.44	259.15	0.000687	3.62	649.39	133.13	0.22
Reach - 3	4696.5	25-Year	2860.00	249.91	260.67	254.14	260.92	0.000673	4.04	785.99	197.99	0.22
Reach - 3	4696.5	50-Year	3336.00	249.91	261.96	254.55	262.23	0.000617	4.18	888.83	219.24	0.22
Reach - 3	4696.5	100-Year	3706.00	249.91	263.17	254.86	263.39	0.000476	3.92	1549.76	237.95	0.19
Reach - 3	4645.0		Culvert									

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	4593.5	2-Year	955.00	249.19	256.03	251.41	256.10	0.000370	2.19	473.57	91.63	0.15
Reach - 3	4593.5	10-Year	2132.00	249.19	258.51	252.72	258.70	0.000617	3.50	671.03	142.96	0.21
Reach - 3	4593.5	25-Year	2860.00	249.19	259.91	253.41	260.16	0.000682	4.06	782.13	196.46	0.22
Reach - 3	4593.5	50-Year	3336.00	249.19	260.84	253.83	261.13	0.000695	4.34	855.83	212.95	0.23
Reach - 3	4593.5	100-Year	3706.00	249.19	261.71	254.13	262.01	0.000669	4.47	924.78	226.45	0.23
Reach - 3	4500.596	2-Year	955.00	248.23	255.68		255.96	0.002403	4.29	230.20	62.41	0.35
Reach - 3	4500.596	10-Year	2132.00	248.23	257.95		258.49	0.003180	5.99	456.26	126.11	0.43
Reach - 3	4500.596	25-Year	2860.00	248.23	259.44		259.97	0.002681	6.10	695.56	165.70	0.40
Reach - 3	4500.596	50-Year	3336.00	248.23	260.47		260.96	0.002273	5.97	868.98	170.97	0.38
Reach - 3	4500.596	100-Year	3706.00	248.23	261.44		261.87	0.001874	5.71	1037.35	175.94	0.35
Reach - 3	4452.7	2-Year	955.00	248.28	255.66	251.16	255.85	0.000914	3.49	303.79	197.65	0.23
Reach - 3	4452.7	10-Year	2132.00	248.28	257.84	253.11	258.37	0.001837	5.89	422.57	439.63	0.34
Reach - 3	4452.7	25-Year	2860.00	248.28	259.08	254.16	259.79	0.002152	6.93	491.78	505.38	0.37
Reach - 3	4452.7	50-Year	3336.00	248.28	259.92	254.80	260.75	0.002245	7.45	539.16	631.89	0.39
Reach - 3	4452.7	100-Year	3706.00	248.28	260.78	255.24	261.65	0.002161	7.66	587.03	699.06	0.38
Reach - 3	4387.2		Culvert									
Reach - 3	4321.7	2-Year	955.00	249.27	255.39	252.15	255.67	0.001760	4.26	238.35	60.21	0.31
Reach - 3	4321.7	10-Year	2132.00	249.27	256.95	254.10	257.80	0.003973	7.47	319.06	220.29	0.48
Reach - 3	4321.7	25-Year	2860.00	249.27	257.67	255.14	258.93	0.005203	9.09	358.12	351.65	0.56
Reach - 3	4321.7	50-Year	3336.00	249.27	258.21	255.79	259.70	0.005704	9.92	387.24	409.59	0.59
Reach - 3	4321.7	100-Year	3706.00	249.27	259.08	256.24	260.58	0.005063	9.96	435.50	449.41	0.56
Reach - 3	4294.441	2-Year	955.00	246.73	255.39		255.59	0.001283	3.68	446.87	240.57	0.26
Reach - 3	4294.441	10-Year	2132.00	246.73	257.11		257.48	0.002059	5.42	978.06	331.44	0.35
Reach - 3	4294.441	25-Year	2860.00	246.73	258.01		258.42	0.002154	5.97	1277.98	336.90	0.36
Reach - 3	4294.441	50-Year	3336.00	246.73	258.66		259.07	0.002059	6.13	1498.32	340.86	0.36
Reach - 3	4294.441	100-Year	3706.00	246.73	259.59		259.93	0.001616	5.79	1816.30	346.50	0.32
Reach - 3	4000.0	2-Year	955.00	248.37	254.80		254.96	0.004026	4.80	702.39	411.54	0.41
Reach - 3	4000.0	10-Year	2132.00	248.37	256.61		256.72	0.002589	4.82	1564.29	513.16	0.35
Reach - 3	4000.0	25-Year	2860.00	248.37	257.61		257.71	0.002038	4.75	2094.53	548.47	0.32
Reach - 3	4000.0	50-Year	3336.00	248.37	258.34		258.43	0.001666	4.59	2503.96	574.63	0.29
Reach - 3	4000.0	100-Year	3706.00	248.37	259.39		259.46	0.001083	4.04	3117.60	588.67	0.24

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	3500.0	2-Year	955.00	246.98	253.85		253.89	0.001264	2.83	1414.11	771.15	0.24
Reach - 3	3500.0	10-Year	2132.00	246.98	256.17		256.19	0.000533	2.42	3404.29	915.57	0.16
Reach - 3	3500.0	25-Year	2860.00	246.98	257.26		257.28	0.000431	2.40	4407.31	927.69	0.15
Reach - 3	3500.0	50-Year	3336.00	246.98	258.05		258.07	0.000365	2.35	5151.44	954.62	0.14
Reach - 3	3500.0	100-Year	3706.00	246.98	259.20		259.22	0.000247	2.10	6263.56	971.00	0.12
Reach - 3	3185.2	2-Year	971.00	246.10	253.02	250.21	253.31	0.002113	4.29	235.61	721.65	0.34
Reach - 3	3185.2	10-Year	2165.00	246.10	254.93	252.14	255.64	0.003474	6.81	371.64	874.58	0.45
Reach - 3	3185.2	25-Year	2909.00	246.10	255.67	253.11	256.67	0.004384	8.17	433.97	892.45	0.52
Reach - 3	3185.2	50-Year	3396.00	246.10	256.35	253.71	257.46	0.004398	8.66	494.93	907.51	0.53
Reach - 3	3185.2	100-Year	3779.00	246.10	257.84	254.15	258.76	0.002981	7.96	641.69	1072.19	0.45
Reach - 3	3157.2	Bridge										
Reach - 3	3129.2	2-Year	971.00	245.86	252.68	249.97	252.97	0.002271	4.39	229.51	689.09	0.35
Reach - 3	3129.2	10-Year	2165.00	245.86	253.48	251.91	254.56	0.006761	8.37	280.13	830.26	0.61
Reach - 3	3129.2	25-Year	2909.00	245.86	253.98	252.88	255.60	0.009167	10.29	315.54	850.48	0.72
Reach - 3	3129.2	50-Year	3396.00	245.86	254.39	253.47	256.30	0.010010	11.22	347.11	864.25	0.77
Reach - 3	3129.2	100-Year	3779.00	245.86	254.58	253.93	256.80	0.011206	12.10	362.81	870.78	0.81
Reach - 3	2957.4	2-Year	971.00	243.96	252.72		252.73	0.000258	1.65	2159.40	844.11	0.11
Reach - 3	2957.4	10-Year	2165.00	243.96	253.80		253.82	0.000494	2.53	3075.46	859.23	0.16
Reach - 3	2957.4	25-Year	2909.00	243.96	254.54		254.57	0.000518	2.76	3719.12	868.39	0.17
Reach - 3	2957.4	50-Year	3396.00	243.96	255.10		255.13	0.000494	2.81	4208.62	876.49	0.17
Reach - 3	2957.4	100-Year	3779.00	243.96	255.44		255.47	0.000500	2.90	4508.92	882.06	0.17
Reach - 3	2362.9	2-Year	971.00	243.50	252.47		252.51	0.000576	2.52	1624.81	703.90	0.17
Reach - 3	2362.9	10-Year	2165.00	243.50	253.28		253.37	0.001275	4.04	2205.40	729.79	0.26
Reach - 3	2362.9	25-Year	2909.00	243.50	254.03		254.11	0.001238	4.25	2752.81	747.48	0.26
Reach - 3	2362.9	50-Year	3396.00	243.50	254.63		254.71	0.001087	4.17	3210.50	761.40	0.25
Reach - 3	2362.9	100-Year	3779.00	243.50	254.97		255.05	0.001074	4.25	3471.89	769.25	0.25
Reach - 3	1661.6	2-Year	971.00	242.95	252.31		252.32	0.000151	1.31	2677.79	751.36	0.09
Reach - 3	1661.6	10-Year	2165.00	242.95	252.78		252.81	0.000518	2.53	3036.37	760.55	0.16
Reach - 3	1661.6	25-Year	2909.00	242.95	253.50		253.52	0.000572	2.83	3599.07	825.81	0.17
Reach - 3	1661.6	50-Year	3396.00	242.95	254.15		254.18	0.000532	2.87	4165.62	903.14	0.17
Reach - 3	1661.6	100-Year	3779.00	242.95	254.49		254.51	0.000541	2.97	4475.54	933.89	0.17

HEC-RAS Plan: Piney Mt FP (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 3	920.6	2-Year	971.00	242.61	252.25	248.37	252.25	0.000053	0.84	4297.09	996.23	0.05
Reach - 3	920.6	10-Year	2165.00	242.61	252.56	248.99	252.57	0.000211	1.73	4606.72	1001.47	0.11
Reach - 3	920.6	25-Year	2909.00	242.61	253.24	249.20	253.25	0.000248	1.98	5291.71	1013.16	0.12
Reach - 3	920.6	50-Year	3396.00	242.61	253.91	249.34	253.92	0.000231	2.01	5974.25	1023.93	0.12
Reach - 3	920.6	100-Year	3779.00	242.61	254.24	249.43	254.25	0.000241	2.11	6313.41	1032.04	0.12

**EXISTING CONDITIONS:
HYDRAFLOW STORM SEWERS
(10-YEAR EVENT)**

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	10.000	-75.030	Hdwl	0.00	0.05	0.50	5.0	311.00	1.30	311.13	24	Cir	0.013	0.68	316.43	OUT
2	1	22.740	0.000	Curb	0.00	0.99	0.56	10.0	311.23	4.13	312.17	24	Cir	0.013	0.50	319.27	EL0131
3	2	39.270	5.519	Curb	0.00	0.85	0.52	5.0	312.27	2.88	313.40	24	Cir	0.013	1.10	319.90	EL0130
4	3	51.920	-43.720	Curb	0.00	1.73	0.61	15.0	316.30	2.66	317.68	24	Cir	0.013	0.50	321.88	EL0134
5	4	40.740	14.750	Curb	0.00	3.02	0.54	30.0	317.88	4.74	319.81	18	Cir	0.013	1.00	323.41	EL0135
6	1	30.280	-23.464	None	0.00	0.00	0.00	0.0	312.43	3.93	313.62	18	Cir	0.013	0.41	319.62	EL0136
7	6	223.050	-20.694	MH	0.00	0.00	0.00	0.0	316.82	7.18	332.84	18	Cir	0.013	0.49	337.24	EL0143
8	7	137.640	-25.945	Curb	0.00	0.35	0.56	5.0	334.44	8.67	346.37	24	Cir	0.013	1.18	349.57	EL0139
9	8	76.040	-8.212	Curb	0.00	0.50	0.58	5.0	346.57	3.89	349.53	15	Cir	0.013	1.16	355.03	EL0138
10	9	36.330	46.920	Comb	0.00	0.30	0.57	5.0	349.83	7.05	352.39	15	Cir	0.013	1.00	358.69	EL0137
11	8	38.160	48.669	Curb	0.00	1.55	0.51	15.0	346.47	8.46	349.70	18	Cir	0.013	0.50	353.20	EL0140
12	11	38.920	-15.600	Curb	0.00	3.07	0.53	30.0	350.10	13.16	355.22	18	Cir	0.013	0.83	358.62	EL0141
13	12	31.870	-29.628	Curb	0.00	1.68	0.56	15.0	355.32	5.08	356.94	15	Cir	0.013	1.00	360.24	EL0142
14	End	43.224	-0.150	MH	0.00	0.21	0.50	5.0	296.58	0.67	296.87	24	Cir	0.020	0.15	302.47	EL0005
15	14	31.000	1.950	MH	0.00	0.21	0.50	5.0	296.97	-0.13	296.93	24	Cir	0.020	0.15	303.63	EL0006
16	15	136.000	0.860	Curb	0.00	1.51	0.50	15.0	297.33	0.21	297.62	24	Cir	0.013	0.50	301.82	EL0007
17	16	83.000	0.430	Curb	0.00	0.89	0.50	10.0	297.72	1.94	299.33	24	Cir	0.013	0.50	302.93	EL0008
18	17	224.000	-0.150	Curb	0.00	0.40	0.50	5.0	299.43	0.88	301.41	24	Cir	0.013	1.00	304.51	EL0011
Rock Creek - Existing												Number of lines: 18				Date: 10/25/2018	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	OUT	28.02	24	Cir	10.000	311.00	311.13	1.300	313.00	313.13	0.84	313.97	End	OpenHeadwall
2	EL0131	13.50	24	Cir	22.740	311.23	312.17	4.134	313.97	314.03	0.15	314.18	1	Curb-Horiz
3	EL0130	11.50	24	Cir	39.270	312.27	313.40	2.878	314.18	314.62	n/a	314.62 j	2	Curb-Horiz
4	EL0134	9.93	24	Cir	51.920	316.30	317.68	2.658	317.01	318.81	0.23	318.81	3	Curb-Horiz
5	EL0135	6.05	18	Cir	40.740	317.88	319.81	4.737	318.81	320.76	n/a	320.76	4	Curb-Horiz
6	EL0136	14.59	18	Cir	30.280	312.43	313.62	3.930	313.97	315.02	n/a	315.02 j	1	None
7	EL0143	14.71	18	Cir	223.050	316.82	332.84	7.182	317.59	334.24	n/a	334.24	6	Manhole
8	EL0139	14.84	24	Cir	137.640	334.44	346.37	8.668	335.08	347.76	0.75	347.76	7	Curb-Horiz
9	EL0138	3.25	15	Cir	76.040	346.57	349.53	3.893	347.76	350.26	n/a	350.26 j	8	Curb-Horiz
10	EL0137	1.23	15	Cir	36.330	349.83	352.39	7.047	350.26	352.83	0.16	352.83	9	Combination
11	EL0140	12.43	18	Cir	38.160	346.47	349.70	8.464	347.76	351.03	0.44	351.03	8	Curb-Horiz
12	EL0141	9.53	18	Cir	38.920	350.10	355.22	13.155	351.03	356.41	0.52	356.41	11	Curb-Horiz
13	EL0142	4.89	15	Cir	31.870	355.32	356.94	5.083	356.41	357.84	n/a	357.84 j	12	Curb-Horiz
14	EL0005	8.10	24	Cir	43.224	296.58	296.87	0.671	301.33*	301.46*	0.02	301.48	End	Manhole
15	EL0006	7.61	24	Cir	31.000	296.97	296.93	-0.129	301.48*	301.56*	0.01	301.57	14	Manhole
16	EL0007	7.27	24	Cir	136.000	297.33	297.62	0.213	301.57*	301.71*	0.04	301.76	15	Curb-Horiz
17	EL0008	3.53	24	Cir	83.000	297.72	299.33	1.940	301.76*	301.78*	0.01	301.79	16	Curb-Horiz
18	EL0011	1.44	24	Cir	224.000	299.43	301.41	0.884	301.79	301.93	0.08	302.00	17	Curb-Horiz

Rock Creek - Existing

Number of lines: 18

Run Date: 10/25/2018

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	PE_EL0132	0.18	20.48	20.66	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	CB_EL0131	3.34	19.84	2.70	20.48	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.030	0.013	0.48	14.67	0.46	14.00	0.0	1
3	CB_EL0130	3.19	17.33	2.52	17.99	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.030	0.013	0.46	14.00	0.44	13.33	0.0	2
4	CB_EL0134	5.48	14.78	2.94	17.33	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.048	0.013	0.51	10.48	0.48	9.92	0.0	3
5	CB_EL0135	6.05	0.00	1.43	4.62	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.048	0.013	0.32	6.65	0.30	6.17	0.0	4
6	UGPJ_EL036	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
7	JB_EL0143	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
8	CB_EL0139	1.41	1.33	0.90	1.84	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.057	0.013	0.25	4.54	0.21	3.93	0.0	2
9	CB_EL0138	2.09	0.00	0.76	1.33	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.057	0.013	0.22	4.12	0.19	3.58	0.0	8
10	CB_EL0137	1.23	0.00	1.14	0.09	Comb	6.0	3.00	0.00	3.00	2.00	0.020	2.00	0.050	0.050	0.013	0.18	3.60	0.07	1.40	0.0	11
11	CB_EL0140	4.11	8.37	2.31	10.16	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.057	0.013	0.44	7.91	0.41	7.44	0.0	4
12	CB_EL0141	6.04	4.23	1.99	8.27	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.051	0.013	0.40	7.84	0.37	7.29	0.0	11
13	CB_EL0142	4.89	0.00	0.66	4.23	Curb	6.0	4.00	0.00	0.00	0.00	0.200	2.00	0.050	0.051	0.013	0.20	3.88	0.19	3.76	0.0	12
14	JB_EL0005	0.76	0.00	0.00	0.76	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
15	JB_EL0006	0.76	0.00	0.00	0.76	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
16	CB_EL0007	3.92	2.54	1.43	5.03	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.040	0.013	0.32	7.55	0.30	7.00	0.0	Off
17	CB_EL0008	2.68	0.86	1.00	2.54	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.040	0.013	0.26	6.00	0.23	5.25	0.0	16
18	CB_EL0011	1.44	0.00	0.59	0.86	Curb	6.0	4.00	0.00	0.00	0.00	0.020	2.00	0.050	0.040	0.013	0.19	4.20	0.16	3.50	0.0	17
Rock Creek - Existing														Number of lines: 18				Run Date: 10/25/2018				
NOTES: Inlet N-Values = 0.016; Intensity = 105.70 / (Inlet time + 16.80) ^ 0.87; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in)	(cfs)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K)	(24)
1	24	28.02	311.00	313.00	2.00	3.14	8.92	1.24	314.24	1.536	10.000	311.13	313.13	2.00	3.14	8.92	1.24	314.37	1.509	1.522	0.152	0.68	0.84
2	24	13.50	311.23	313.97	2.00	3.14	4.30	0.29	314.26	0.356	22.740	312.17	314.03	1.86	3.04	4.44	0.31	314.33	0.308	0.332	0.076	0.50	0.15
3	24	11.50	312.27	314.18	1.91	2.00	3.72	0.51	314.69	0.000	39.270	313.40	314.62 j	1.22**	2.00	5.75	0.51	315.13	0.000	0.000	n/a	1.10	n/a
4	24	9.93	316.30	317.01	0.71*	1.00	9.96	0.46	317.47	0.000	51.920	317.68	318.81	1.13**	1.82	5.45	0.46	319.27	0.000	0.000	n/a	0.50	0.23
5	18	6.05	317.88	318.81	0.93	1.15	5.28	0.41	319.22	0.000	40.740	319.81	320.76	0.95**	1.18	5.13	0.41	321.17	0.000	0.000	n/a	1.00	n/a
6	18	14.59	312.43	313.97	1.50	1.71	8.26	1.06	315.03	1.930	30.280	313.62	315.02 j	1.40**	1.71	8.51	1.13	316.14	1.669	1.799	n/a	0.41	n/a
7	18	14.71	316.82	317.59	0.77*	0.91	16.10	1.14	318.73	0.000	223.050	332.84	334.24	1.40**	1.72	8.57	1.14	335.38	0.000	0.000	n/a	0.49	n/a
8	24	14.84	334.44	335.08	0.64*	0.87	17.05	0.63	335.71	0.000	137.640	346.37	347.76	1.39**	2.33	6.38	0.63	348.39	0.000	0.000	n/a	1.18	0.75
9	15	3.25	346.57	347.76	1.19	0.74	2.70	0.30	348.06	0.000	76.040	349.53	350.26 j	0.73**	0.74	4.40	0.30	350.56	0.000	0.000	n/a	1.16	0.35
10	15	1.23	349.83	350.26	0.43	0.37	3.35	0.16	350.42	0.000	36.330	352.39	352.83	0.44**	0.38	3.22	0.16	352.99	0.000	0.000	n/a	1.00	0.16
11	18	12.43	346.47	347.76	1.29	1.61	7.70	0.88	348.63	0.000	38.160	349.70	351.03	1.33**	1.66	7.50	0.88	351.91	0.000	0.000	n/a	0.50	0.44
12	18	9.53	350.10	351.03	0.93	1.15	8.27	0.62	351.65	0.000	38.920	355.22	356.41	1.19**	1.51	6.33	0.62	357.03	0.000	0.000	n/a	0.83	0.52
13	15	4.89	355.32	356.41	1.09	0.94	4.30	0.42	356.83	0.000	31.870	356.94	357.84 j	0.90**	0.94	5.19	0.42	358.26	0.000	0.000	n/a	1.00	0.42
14	24	8.10	296.58	301.33	2.00	3.14	2.58	0.10	301.43	0.304	43.224	296.87	301.46	2.00	3.14	2.58	0.10	301.56	0.304	0.304	0.131	0.15	0.02
15	24	7.61	296.97	301.48	2.00	3.14	2.42	0.09	301.57	0.268	31.000	296.93	301.56	2.00	3.14	2.42	0.09	301.65	0.268	0.268	0.083	0.15	0.01
16	24	7.27	297.33	301.57	2.00	3.14	2.32	0.08	301.66	0.103	136.000	297.62	301.71	2.00	3.14	2.31	0.08	301.80	0.103	0.103	0.141	0.50	0.04
17	24	3.53	297.72	301.76	2.00	3.14	1.12	0.02	301.78	0.024	83.000	299.33	301.78	2.00	3.14	1.12	0.02	301.80	0.024	0.024	0.020	0.50	0.01
18	24	1.44	299.43	301.79	2.00	3.14	0.46	0.00	301.79	0.004	224.000	301.41	301.93	0.52	0.64	2.25	0.08	302.00	0.191	0.098	0.219	1.00	0.08

Rock Creek - Existing

Number of lines: 18

Run Date: 10/25/2018

Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $Sf/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

EXISTING CONDITIONS: SWMM OUTPUT

Existing Conditions - Shady Lawn (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Existing Conditions - Shady Lawn (10-Year)
Starting WSELs interpolated between HEC-RAS XS 13024 and 13556
2-Year = 296.25'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 8_EL0186_PE

	Volume acre-feet	Depth inches
Runoff Quantity Continuity		
Total Precipitation	5.004	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	1.852	1.993
Surface Runoff	3.107	3.344
Final Surface Storage	0.054	0.058
Continuity Error (%)	-0.193	

	Volume acre-feet	Volume 10 ⁶ gal
Flow Routing Continuity		
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3.102	1.011
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3.094	1.008
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.016	0.005
Final Stored Volume	0.025	0.008
Continuity Error (%)	-0.003	

Time-Step Critical Elements

Link 15_RCP_EL0187 (12.76%)
Link 15_RCP_EL0180 (1.21%)

Highest Flow Instability Indexes

All links are stable.

Existing Conditions - Shady Lawn (10-Year)

Routing Time Step Summary

```

Minimum Time Step      :      0.50 sec
Average Time Step      :      9.63 sec
Maximum Time Step      :     10.00 sec
Percent in Steady State :      0.00
Average Iterations per Step :    2.00
  
```

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Shadylawn_10	5.38	0.00	0.00	1.95	3.38	0.26	6.04	0.628
Shadylawn_20	5.39	0.00	0.00	1.07	4.28	0.06	1.39	0.794
Shadylawn_30	5.38	0.00	0.00	2.21	3.12	0.16	3.67	0.580
Shadylawn_40	5.38	0.00	0.00	2.59	2.75	0.01	0.20	0.511
Shadylawn_50	5.38	0.00	0.00	2.15	3.19	0.12	2.71	0.592
Shadylawn_60	5.39	0.00	0.00	1.86	3.49	0.04	0.91	0.647
Shadylawn_70	5.38	0.00	0.00	1.96	3.38	0.11	2.47	0.627
Shadylawn_80	5.39	0.00	0.00	2.22	3.12	0.06	1.40	0.579
Shadylawn_90	5.39	0.00	0.00	2.07	3.27	0.14	3.26	0.608
Shadylawn_100	5.39	0.00	0.00	1.53	3.82	0.06	1.25	0.709

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0610_DI	JUNCTION	0.07	0.31	347.12	0 13:00
2_EL611_SI*	JUNCTION	0.08	0.35	339.65	0 13:00
3_EL0612_PE	JUNCTION	0.05	0.30	320.30	0 13:00
4_EL0181_PE	JUNCTION	0.28	1.83	306.23	0 13:01
5_EL0182_CB	JUNCTION	0.20	1.71	306.04	0 13:00
6_EL0183_CB	JUNCTION	0.24	1.68	305.33	0 13:00
7_EL0184_PE	JUNCTION	0.09	0.50	303.84	0 13:00
1_EL0188_PE	JUNCTION	0.28	0.61	401.99	0 13:00
2_EL0189_DI	JUNCTION	0.40	0.93	382.24	0 13:00
3_EL0190_CB*	JUNCTION	0.17	1.17	375.77	0 13:00
4_EL0191_PE	JUNCTION	0.13	0.69	371.92	0 13:00
5_EL0179_PE	JUNCTION	0.31	2.54	307.82	0 13:01
6_EL0180_CB	JUNCTION	0.70	2.96	307.64	0 13:01
7_EL0187_DA*	JUNCTION	0.23	2.09	307.03	0 13:03
8_EL0186_PE	JUNCTION	0.10	0.53	300.67	0 13:03
SHADYLAWN_1	OUTFALL	9.80	9.80	297.15	0 00:00
SHADYLAWN_2	OUTFALL	9.80	9.80	297.15	0 00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0610_DI	JUNCTION	2.47	2.47	0 12:59	0.105	0.105
2_EL611_SI*	JUNCTION	1.40	3.87	0 13:00	0.061	0.166
3_EL0612_PE	JUNCTION	0.00	3.87	0 13:00	0.000	0.166
4_EL0181_PE	JUNCTION	0.00	3.86	0 13:00	0.000	0.166

Existing Conditions - Shady Lawn (10-Year)

5_EL0182_CB	JUNCTION	3.26	6.85	0	12:59	0.143	0.309
6_EL0183_CB	JUNCTION	0.00	6.85	0	13:00	0.000	0.309
7_EL0184_PE	JUNCTION	1.25	8.10	0	13:00	0.056	0.365
1_EL0188_PE	JUNCTION	6.04	6.04	0	13:00	0.257	0.257
2_EL0189_DI	JUNCTION	1.39	7.43	0	13:00	0.063	0.320
3_EL0190_CB*	JUNCTION	3.66	11.08	0	13:00	0.158	0.477
4_EL0191_PE	JUNCTION	0.20	11.24	0	13:00	0.008	0.486
5_EL0179_PE	JUNCTION	0.00	11.22	0	13:00	0.000	0.486
6_EL0180_CB	JUNCTION	2.71	13.42	0	13:01	0.119	0.603
7_EL0187_DA*	JUNCTION	0.00	13.45	0	13:02	0.000	0.603
8_EL0186_PE	JUNCTION	0.91	14.05	0	13:03	0.041	0.644
SHADYLAWN_1	OUTFALL	0.00	8.09	0	13:00	0.000	0.364
SHADYLAWN_2	OUTFALL	0.00	14.05	0	13:03	0.000	0.644

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
6_EL0183_CB	JUNCTION	0.40	0.335	1.615

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
SHADYLAWN_1	95.02	0.74	8.09	0.364
SHADYLAWN_2	93.92	1.30	14.05	0.644
System	94.47	2.04	21.76	1.008

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
15_RCP_EL0610	CONDUIT	2.47	0 13:00	9.60	0.12	0.26
18_RCP_EL0611	CONDUIT	3.87	0 13:00	13.61	0.10	0.22
SHADYLAWN_DITCH_1	CONDUIT	3.86	0 13:00	2.24	0.12	0.65
15_RCP_EL0181	CONDUIT	4.08	0 13:03	3.33	1.80	1.00
OVER_15_RCP_EL0181	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
15_RCP_EL0182	CONDUIT	6.85	0 13:00	5.58	0.77	1.00
15_RCP_EL0183	CONDUIT	6.85	0 13:00	7.44	0.47	0.70
SHADYLAWN_CHANNEL_1	CONDUIT	8.09	0 13:00	3.91	0.28	0.75
15_RCP_0188	CONDUIT	6.04	0 13:00	9.04	0.23	0.53
15_RCP_EL0189	CONDUIT	7.42	0 13:00	8.18	0.51	0.72
15_RCP_EL0190	CONDUIT	11.05	0 13:00	11.60	0.58	0.74
OVER_15_RCP_EL0190	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
SHADYLAWN_DITCH_2	CONDUIT	11.22	0 13:00	4.34	0.20	0.73
15_RCP_EL0179	CONDUIT	6.50	0 13:17	5.30	0.77	1.00
OVER_15_RCP_EL0179	CONDUIT	7.74	0 13:02	1.88	0.00	0.13
15_RCP_EL0187	CONDUIT	9.61	0 12:53	7.95	2.23	1.00

Existing Conditions - Shady Lawn (10-Year)

OVER_15_RCP_EL0187	CONDUIT	6.98	0	13:02	4.84	0.00	0.05
15_RCP_EL0180	CONDUIT	10.89	0	13:03	12.04	0.68	0.71
OVER_15_RCP_EL0180	CONDUIT	2.48	0	13:03	5.60	0.00	0.02
SHADYLAWN_CHANNEL_2	CONDUIT	14.05	0	13:03	3.27	0.14	0.68

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction Up Dry	of Down Dry	Time Sub Crit	in Sup Crit	Flow Up Crit	Class Down Crit	---- Crit	Avg. Froude Number	Avg. Flow Change
15_RCP_EL0610	2.86	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	2.65	0.0000
18_RCP_EL0611	1.85	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	5.14	0.0000
SHADYLAWN_DITCH_1	1.00	0.04	0.00	0.00	0.95	0.01	0.00	0.00	0.00	0.22	0.0000
15_RCP_EL0181	4.82	0.04	0.03	0.00	0.04	0.00	0.89	0.00	0.00	0.48	0.0004
OVER_15_RCP_EL0181	45.25	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
15_RCP_EL0182	4.54	0.04	0.00	0.00	0.04	0.17	0.00	0.75	0.00	1.50	0.0002
15_RCP_EL0183	30.53	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	2.26	0.0001
SHADYLAWN_CHANNEL_1	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.00	0.11	0.0001
15_RCP_0188	2.27	0.04	0.02	0.00	0.75	0.19	0.00	0.00	0.00	0.56	0.0001
15_RCP_EL0189	1.33	0.04	0.08	0.00	0.00	0.88	0.00	0.00	0.00	2.04	0.0001
15_RCP_EL0190	5.60	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	3.56	0.0001
OVER_15_RCP_EL0190	10.48	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
SHADYLAWN_DITCH_2	1.00	0.04	0.00	0.00	0.41	0.54	0.00	0.00	0.00	0.95	0.0000
15_RCP_EL0179	4.57	0.04	0.00	0.00	0.95	0.00	0.00	0.01	0.00	0.35	0.0002
OVER_15_RCP_EL0179	14.50	0.95	0.02	0.00	0.01	0.00	0.02	0.00	0.00	0.01	0.0000
15_RCP_EL0187	2.74	0.05	0.04	0.00	0.88	0.03	0.00	0.00	0.00	0.50	0.0007
OVER_15_RCP_EL0187	9.61	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.0000
15_RCP_EL0180	2.49	0.04	0.05	0.00	0.00	0.91	0.00	0.00	0.00	3.75	0.0002
OVER_15_RCP_EL0180	8.68	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.0000
SHADYLAWN_CHANNEL_2	1.27	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.00	0.08	0.0000

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
15_RCP_EL0181	0.31	0.31	0.31	0.50	0.01
15_RCP_EL0182	0.35	0.35	0.35	0.01	0.28
15_RCP_EL0179	0.85	0.85	0.85	0.01	0.23
15_RCP_EL0187	0.30	0.30	0.30	0.97	0.01

Analysis begun on: Thu Oct 25 13:39:54 2018
Analysis ended on: Thu Oct 25 13:39:54 2018
Total elapsed time: < 1 sec

Existing Conditions - Arlington 1 and 2 (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Existing Conditions - Arlington 1 and 2 (10-Year)
Starting WSELs from HEC-RAS XS 13556 (Arlington 1) and XS 14035 (Arlington 2)
2-Year = 296.26', 296.27'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 15.00 sec

WARNING 02: maximum depth increased for Node 3_EL0166_PE
WARNING 02: maximum depth increased for Node 10_EL0175_PE
WARNING 02: maximum depth increased for Node 14_EL0177_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	11.955	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	4.759	2.144
Surface Runoff	7.082	3.190
Final Surface Storage	0.135	0.061
Continuity Error (%)	-0.180	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	7.072	2.305
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	7.057	2.300
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.118	0.038
Final Stored Volume	0.210	0.068
Continuity Error (%)	-1.071	

Time-Step Critical Elements

Link 24_RCP_EL0172 (9.71%)

Existing Conditions - Arlington 1 and 2 (10-Year)

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.53 sec
Average Time Step : 14.64 sec
Maximum Time Step : 15.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10 ⁶ gal	Peak Runoff CFS	Runoff Coeff
Arlington1_10	5.39	0.00	0.00	1.44	3.91	0.06	1.44	0.725
Arlington1_20	5.38	0.00	0.00	2.75	2.57	0.70	16.21	0.477
Arlington1_30	5.39	0.00	0.00	2.44	2.90	0.06	1.40	0.538
Arlington1_40	5.39	0.00	0.00	2.10	3.24	0.02	0.50	0.602
Arlington1_50	5.38	0.00	0.00	0.73	4.62	0.02	0.32	0.857
Arlington1_60	5.38	0.00	0.00	1.76	3.58	0.02	0.52	0.665
Arlington1_70	5.39	0.00	0.00	1.75	3.60	0.19	4.46	0.668
Arlington1_80	5.39	0.00	0.00	1.15	4.19	0.08	1.84	0.779
Arlington1_90	5.38	0.00	0.00	1.09	4.25	0.09	2.10	0.789
Arlington2_10	5.39	0.00	0.00	1.87	3.47	0.09	2.00	0.645
Arlington2_20	5.38	0.00	0.00	2.14	3.20	0.08	1.72	0.594
Arlington2_30	5.39	0.00	0.00	2.06	3.28	0.08	1.72	0.609
Arlington2_40	5.38	0.00	0.00	2.02	3.32	0.18	4.10	0.616
Arlington2_50	5.38	0.00	0.00	2.11	3.23	0.04	1.02	0.599
Arlington2_60	5.38	0.00	0.00	2.32	3.02	0.08	1.88	0.562
Arlington2_70	5.39	0.00	0.00	0.80	4.55	0.09	1.91	0.844
Arlington2_80	5.38	0.00	0.00	1.57	3.77	0.05	1.18	0.701
Arlington2_90	5.38	0.00	0.00	1.82	3.52	0.30	7.19	0.654
Arlington2_100	5.38	0.00	0.00	1.16	4.18	0.07	1.59	0.776

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0164_CB	JUNCTION	0.03	0.17	327.20	0 12:59
2_EL0165_JB*	JUNCTION	0.06	0.31	323.66	0 13:00
3_EL0166_PE	JUNCTION	0.03	0.17	320.08	0 13:01
4_EL0170_PE	JUNCTION	0.06	0.33	309.66	0 13:02
5_EL0171_DI	JUNCTION	0.20	1.16	308.77	0 13:00
6_EL0178_DI	JUNCTION	0.25	2.30	307.80	0 13:01
7_EL0172_JB	JUNCTION	0.47	2.78	307.11	0 13:01
8_EL0173_CB	JUNCTION	0.36	3.26	306.61	0 13:01
9_EL0174_CB	JUNCTION	0.43	3.16	306.09	0 13:02
10_EL0175_PE	JUNCTION	0.10	0.54	303.26	0 13:02
11_EL0167_PE	JUNCTION	0.10	0.49	307.89	0 12:59
12_EL0168_DI	JUNCTION	0.16	0.85	305.73	0 13:00
13_EL0169_CB	JUNCTION	0.11	0.50	304.98	0 13:00
14_EL0177_PE	JUNCTION	0.13	0.65	300.04	0 13:01
1_EL0153_CB	JUNCTION	0.06	0.26	396.59	0 12:59

Existing Conditions - Arlington 1 and 2 (10-Year)

2_EL0154_CB	JUNCTION	0.10	0.56	391.56	0	12:59
3_EL0155_PE	JUNCTION	0.04	0.23	387.76	0	13:00
4_EL0163_DA*	JUNCTION	0.10	0.50	360.25	0	13:00
5_EL0156_CB	JUNCTION	0.17	1.10	346.06	0	12:59
6_EL0157_PDST	JUNCTION	0.07	0.37	340.22	0	13:00
7_EL0159_DI	JUNCTION	0.06	0.29	355.10	0	12:59
8_EL0160_CB	JUNCTION	0.07	0.30	349.62	0	12:59
9_EL0161_CB	JUNCTION	0.11	0.56	343.04	0	13:00
10_EL0162_PDST	JUNCTION	0.04	0.22	338.26	0	13:00
11_JUNCTION_1	JUNCTION	0.12	0.58	330.08	0	13:00
12_EL0615_PE	JUNCTION	0.26	1.41	310.69	0	13:00
13_EL0616_DA*	JUNCTION	0.31	1.49	308.49	0	13:00
14_EL0617_PE	JUNCTION	0.11	0.56	303.73	0	13:01
ARLINGTON1*	OUTFALL	9.77	9.77	297.17	0	00:00
ARLINGTON2*	OUTFALL	9.72	9.72	297.22	0	00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0164_CB	JUNCTION	1.44	1.44	0 12:59	0.064	0.064
2_EL0165_JB*	JUNCTION	0.00	1.44	0 13:00	0.000	0.064
3_EL0166_PE	JUNCTION	0.00	1.44	0 13:00	0.000	0.064
4_EL0170_PE	JUNCTION	0.00	1.44	0 13:01	0.000	0.064
5_EL0171_DI	JUNCTION	16.20	17.62	0 12:59	0.699	0.762
6_EL0178_DI	JUNCTION	1.40	18.83	0 13:00	0.060	0.822
7_EL0172_JB	JUNCTION	0.00	18.43	0 13:00	0.000	0.822
8_EL0173_CB	JUNCTION	0.50	18.72	0 13:01	0.022	0.843
9_EL0174_CB	JUNCTION	0.32	18.95	0 13:01	0.015	0.858
10_EL0175_PE	JUNCTION	0.52	19.31	0 13:02	0.023	0.881
11_EL0167_PE	JUNCTION	4.46	4.46	0 12:59	0.190	0.190
12_EL0168_DI	JUNCTION	1.84	6.29	0 12:59	0.082	0.272
13_EL0169_CB	JUNCTION	0.00	6.27	0 13:00	0.000	0.272
14_EL0177_PE	JUNCTION	2.10	27.31	0 13:01	0.093	1.246
1_EL0153_CB	JUNCTION	2.00	2.00	0 12:59	0.089	0.089
2_EL0154_CB	JUNCTION	1.72	3.72	0 12:59	0.075	0.165
3_EL0155_PE	JUNCTION	0.00	3.71	0 13:00	0.000	0.165
4_EL0163_DA*	JUNCTION	1.72	5.42	0 12:59	0.076	0.240
5_EL0156_CB	JUNCTION	4.10	9.48	0 12:59	0.181	0.421
6_EL0157_PDST	JUNCTION	0.00	9.47	0 13:00	0.000	0.421
7_EL0159_DI	JUNCTION	1.88	1.88	0 12:59	0.080	0.080
8_EL0160_CB	JUNCTION	1.91	3.78	0 12:59	0.089	0.169
9_EL0161_CB	JUNCTION	0.00	3.78	0 13:00	0.000	0.169
10_EL0162_PDST	JUNCTION	0.00	3.77	0 13:00	0.000	0.169
11_JUNCTION_1	JUNCTION	2.20	15.40	0 12:59	0.092	0.682
12_EL0615_PE	JUNCTION	7.18	22.50	0 12:59	0.304	0.985
13_EL0616_DA*	JUNCTION	1.59	24.00	0 12:59	0.070	1.055
14_EL0617_PE	JUNCTION	0.00	23.94	0 13:00	0.000	1.056
ARLINGTON1*	OUTFALL	0.00	27.20	0 13:01	0.000	1.244
ARLINGTON2*	OUTFALL	0.00	23.94	0 13:01	0.000	1.055

Node Surge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Existing Conditions - Arlington 1 and 2 (10-Year)

 Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
ARLINGTON1*	93.92	2.50	27.20	1.244
ARLINGTON2*	93.80	2.14	23.94	1.055
System	93.86	4.64	51.08	2.299

 Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
15_RCP_EL0164	CONDUIT	1.44	0 13:00	8.82	0.03	0.19
15_RCP_EL0165	CONDUIT	1.44	0 13:00	8.82	0.08	0.19
ARLINGTON1_CHANNEL_1	CONDUIT	1.44	0 13:01	2.63	0.01	0.12
24_RCP_EL0170	CONDUIT	1.43	0 13:02	5.26	0.03	0.14
24_RCP_EL0171	CONDUIT	17.45	0 13:00	8.44	0.43	0.79
24_RCP_EL0178	CONDUIT	18.43	0 13:00	5.87	0.56	1.00
OVER_24_RCP_EL0178	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
24_RCP_EL0172	CONDUIT	18.27	0 13:01	5.81	2.68	1.00
OVER_24_RCP_EL0172	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
24_RCP_EL0173	CONDUIT	18.67	0 13:01	5.94	0.95	1.00
OVER_24_RCP_EL0173	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
24_RCP_EL0174	CONDUIT	18.87	0 13:02	8.99	0.55	0.63
ARLINGTON1_CHANNEL_2	CONDUIT	19.30	0 13:02	5.67	0.01	0.15
24_RCP_EL0167	CONDUIT	4.45	0 12:59	6.95	0.11	0.26
24_RCP_EL0168	CONDUIT	6.27	0 13:00	6.04	0.21	0.37
24_RCP_EL0169	CONDUIT	6.28	0 13:00	9.14	0.12	0.29
ARLINGTON1_CHANNEL_3	CONDUIT	27.20	0 13:01	0.84	0.02	0.58
15_RCP_EL0153	CONDUIT	2.00	0 13:00	11.78	0.07	0.20
15_RCP_EL0154	CONDUIT	3.71	0 13:00	11.46	0.17	0.31
ARLINGTON2_CHANNEL_1*	CONDUIT	3.71	0 13:00	2.98	0.02	0.24
15_RCP_EL0163	CONDUIT	5.40	0 13:00	13.04	0.25	0.37
15_RCP_EL0156	CONDUIT	9.47	0 13:00	13.16	0.48	0.59
ARLINGTON2_CHANNEL_2*	CONDUIT	9.46	0 13:00	5.11	0.05	0.32
15_RCP_EL0159	CONDUIT	1.87	0 13:00	9.45	0.10	0.22
15_RCP_EL0160	CONDUIT	3.78	0 13:00	12.07	0.11	0.30
15_RCP_EL0161	CONDUIT	3.77	0 13:00	11.51	0.21	0.31
ARLINGTON2_CHANNEL_3	CONDUIT	3.77	0 13:00	2.68	0.02	0.27
ARLINGTON2_CHANNEL_4	CONDUIT	15.35	0 13:00	2.59	0.12	0.66
15_RCP_1*	CONDUIT	10.75	0 12:39	8.79	0.75	1.00
OVER_15_RCP_1*	CONDUIT	11.89	0 13:00	5.73	0.01	0.10
15_RCP_2*	CONDUIT	10.46	0 13:01	11.36	0.62	0.73
OVER_15_RCP_2*	CONDUIT	13.47	0 13:00	5.34	0.03	0.12
ARLINGTON2_CHANNEL_5*	CONDUIT	23.94	0 13:01	3.79	0.11	0.69

 Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Time in Flow Down Dry	Class Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
15_RCP_EL0164	131.83	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.79	0.0000

Existing Conditions - Arlington 1 and 2 (10-Year)

15_RCP_EL0165	6.97	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.07	0.0000
ARLINGTON1_CHANNEL_1	3.33	0.04	0.00	0.00	0.90	0.05	0.00	0.00	0.71	0.0000
24_RCP_EL0170	42.06	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.01	0.0000
24_RCP_EL0171	5.08	0.04	0.00	0.00	0.01	0.12	0.00	0.83	2.12	0.0001
24_RCP_EL0178	5.43	0.04	0.00	0.00	0.09	0.67	0.00	0.20	1.23	0.0002
OVER_24_RCP_EL0178	10.44	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
24_RCP_EL0172	6.95	0.04	0.01	0.00	0.03	0.00	0.93	0.00	0.56	0.0009
OVER_24_RCP_EL0172	17.98	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
24_RCP_EL0173	7.39	0.04	0.00	0.00	0.13	0.06	0.00	0.77	1.01	0.0003
OVER_24_RCP_EL0173	19.02	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
24_RCP_EL0174	31.71	0.04	0.00	0.00	0.00	0.96	0.00	0.00	1.71	0.0002
ARLINGTON1_CHANNEL_2	8.80	0.04	0.00	0.00	0.34	0.61	0.00	0.00	1.11	0.0000
24_RCP_EL0167	4.39	0.04	0.00	0.00	0.00	0.03	0.00	0.92	2.03	0.0000
24_RCP_EL0168	22.85	0.04	0.00	0.00	0.00	0.00	0.00	0.96	1.47	0.0001
24_RCP_EL0169	3.90	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.43	0.0000
ARLINGTON1_CHANNEL_3	2.24	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.01	0.0000
15_RCP_EL0153	16.14	0.04	0.00	0.00	0.00	0.00	0.00	0.96	4.28	0.0000
15_RCP_EL0154	12.73	0.04	0.00	0.00	0.00	0.96	0.00	0.00	5.15	0.0001
ARLINGTON2_CHANNEL_1*	1.62	0.04	0.00	0.00	0.88	0.07	0.00	0.00	0.70	0.0000
15_RCP_EL0163	7.10	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.59	0.0001
15_RCP_EL0156	6.19	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.80	0.0002
ARLINGTON2_CHANNEL_2*	4.03	0.04	0.00	0.00	0.05	0.91	0.00	0.00	1.19	0.0000
15_RCP_EL0159	6.06	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.14	0.0000
15_RCP_EL0160	19.39	0.04	0.00	0.00	0.00	0.06	0.00	0.90	5.26	0.0000
15_RCP_EL0161	5.68	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.63	0.0001
ARLINGTON2_CHANNEL_3	5.74	0.04	0.00	0.00	0.94	0.01	0.00	0.00	0.66	0.0000
ARLINGTON2_CHANNEL_4	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.62	0.0000
15_RCP_1*	5.89	0.04	0.00	0.00	0.05	0.90	0.00	0.00	2.02	0.0003
OVER_15_RCP_1*	13.08	0.95	0.01	0.00	0.00	0.04	0.00	0.00	0.08	0.0000
15_RCP_2*	5.39	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.98	0.0002
OVER_15_RCP_2*	8.37	0.95	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.0000
ARLINGTON2_CHANNEL_5*	3.41	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.09	0.0000

Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Hours Capacity Limited
24_RCP_EL0178	0.09	0.09	0.10	0.01	0.01
24_RCP_EL0172	0.12	0.12	0.13	0.73	0.01
24_RCP_EL0173	0.38	0.38	0.38	0.01	0.37
15_RCP_1*	0.53	0.53	0.53	0.01	0.01

Analysis begun on: Thu Oct 25 13:42:12 2018
Analysis ended on: Thu Oct 25 13:42:13 2018
Total elapsed time: 00:00:01

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)
ALLARD Starting WSELs from HEC-RAS XS 14764
2-Year = 296.42'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 3_EL0120_PE
WARNING 02: maximum depth increased for Node JUNCTION_1
WARNING 02: maximum depth increased for Node 4_EL0126_PE
WARNING 02: maximum depth increased for Node 4_EL0090_PE
WARNING 02: maximum depth increased for Node 7_EL0048_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	39.530	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	17.551	2.391
Surface Runoff	21.551	2.936
Final Surface Storage	0.496	0.068
Continuity Error (%)	-0.171	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	21.513	7.010
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.104	0.034
External Outflow	21.565	7.027
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.359	0.117
Final Stored Volume	0.569	0.185
Continuity Error (%)	-0.718	

Highest Continuity Errors

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

Node 3_EL0083_PE (1.95%)

Time-Step Critical Elements

Link 24_HDPVC_EL0089 (19.77%)

Highest Flow Instability Indexes

Link S_LAKESHORE_CHANNEL (10)

Link 24_RCP_EL0086 (2)

Link S_LAKESHORE_ROLLING_CHANNEL_1 (2)

Link S_LAKESHORE_ROLLING_CHANNEL_2 (2)

Link 24_HDPVC_EL0089 (2)

Routing Time Step Summary

Minimum Time Step : 1.76 sec

Average Time Step : 9.54 sec

Maximum Time Step : 10.00 sec

Percent in Steady State : 0.00

Average Iterations per Step : 2.01

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
S_Lakeshore_Ridgecrest_10	5.39	0.00	0.00	2.76	2.57	0.75	16.89	0.477
S_Lakeshore_Ridgecrest_20	5.39	0.00	0.00	2.39	2.95	0.81	18.30	0.547
S_Lakeshore_Ridgecrest_30	5.38	0.00	0.00	2.35	2.99	0.16	3.61	0.556
S_Lakeshore_Woodhaven_10	5.38	0.00	0.00	2.49	2.83	0.41	9.09	0.526
S_Lakeshore_Woodhaven_20	5.38	0.00	0.00	2.20	3.15	0.03	0.64	0.584
S_Lakeshore_Woodhaven_30	5.39	0.00	0.00	2.20	3.14	0.04	0.83	0.583
S_Lakeshore_Woodhaven_40	5.39	0.00	0.00	2.24	3.10	0.16	3.56	0.575
S_Lakeshore_Woodhaven_50	5.39	0.00	0.00	1.13	4.22	0.02	0.44	0.783
S_Lakeshore_Woodhaven_60	5.39	0.00	0.00	2.78	2.56	0.01	0.28	0.475
S_Lakeshore_Woodhaven_70	5.38	0.00	0.00	2.42	2.92	0.21	4.91	0.541
S_Lakeshore_Rolling_10	5.39	0.00	0.00	2.38	2.94	1.55	33.85	0.546
S_Lakeshore_Rolling_20	5.39	0.00	0.00	2.28	3.05	1.43	31.74	0.566
S_Lakeshore_Rolling_30	5.38	0.00	0.00	2.10	3.24	0.03	0.74	0.601
S_Lakeshore_Rolling_40	5.39	0.00	0.00	1.80	3.54	0.06	1.42	0.658
S_Lakeshore_10	5.39	0.00	0.00	1.85	3.49	0.16	3.66	0.649
Allard_10	5.39	0.00	0.00	2.41	2.92	1.03	23.05	0.542
Allard_20	5.38	0.00	0.00	2.36	2.98	0.05	1.17	0.553
Allard_30	5.39	0.00	0.00	2.05	3.29	0.11	2.48	0.611

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0123_PE*	JUNCTION	0.30	2.11	324.82	0 13:00
2_EL0122_PE	JUNCTION	0.09	0.54	322.02	0 13:00
3_EL0120_PE	JUNCTION	0.18	1.03	322.11	0 13:01
4_EL0118_PE	JUNCTION	0.10	0.54	317.44	0 13:01

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

1_EL0112_PE	JUNCTION	0.09	0.44	332.32	0	13:00
2_EL0113_JB	JUNCTION	0.08	0.39	327.37	0	13:00
3_EL0114_DI	JUNCTION	0.08	0.32	324.33	0	13:00
JUNCTION_1	JUNCTION	0.13	0.70	308.84	0	13:00
1_EL0590_PE	JUNCTION	0.24	1.57	345.16	0	13:00
2_EL0591_PE	JUNCTION	0.08	0.43	330.02	0	13:00
3_EL0125_DA*	JUNCTION	0.15	0.75	318.07	0	13:00
4_EL0126_PE	JUNCTION	0.20	0.95	309.07	0	13:00
JUNCTION_2*	JUNCTION	0.18	0.88	308.63	0	13:00
1_EL0086_SI*	JUNCTION	0.36	2.57	318.07	0	12:58
2_EL0087_PE	JUNCTION	0.26	2.18	315.62	0	13:00
3_EL0089_PE	JUNCTION	0.64	2.87	315.65	0	13:01
4_EL0090_PE	JUNCTION	0.18	1.00	313.69	0	13:02
5_EL0092_PE	JUNCTION	0.75	2.74	306.81	0	12:59
6_EL0094_PE	JUNCTION	0.20	1.00	304.05	0	13:00
1_EL0081_DA*	JUNCTION	0.09	0.47	299.47	0	13:00
2_EL0082_CB	JUNCTION	0.14	0.80	298.53	0	13:00
3_EL0083_PE	JUNCTION	0.37	0.56	297.84	0	00:01
1_EL0043_PE	JUNCTION	0.27	1.55	329.73	0	13:00
2_EL0044_CB	JUNCTION	0.24	1.28	328.78	0	13:00
3_EL0045_CB	JUNCTION	0.25	1.35	327.61	0	13:00
4_EL0046_JB	JUNCTION	0.20	0.91	320.89	0	13:01
6_EL0047_JB	JUNCTION	0.15	0.84	306.85	0	13:01
7_EL0048_PE	JUNCTION	0.16	0.83	302.25	0	13:01
3A_EL0115_DA*	JUNCTION	0.03	0.11	331.17	0	12:59
S_LAKESHORE_WOODHAVEN	OUTFALL	9.72	9.72	297.22	0	00:00
S_LAKESHORE_RIDGECREST	OUTFALL	9.82	9.82	297.12	0	00:00
S_LAKESHORE_ROLLING	OUTFALL	6.29	6.29	297.24	0	00:00
S_LAKESHORE	OUTFALL	6.71	6.71	297.65	0	00:00
S_LAKESHORE_ALLARD	OUTFALL	6.68	6.68	297.62	0	00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0123_PE*	JUNCTION	9.08	9.08	0 12:59	0.406	0.406
2_EL0122_PE	JUNCTION	0.00	9.05	0 13:00	0.000	0.406
3_EL0120_PE	JUNCTION	0.64	9.56	0 13:00	0.028	0.434
4_EL0118_PE	JUNCTION	0.83	10.20	0 13:00	0.037	0.470
1_EL0112_PE	JUNCTION	3.55	3.55	0 12:59	0.158	0.158
2_EL0113_JB	JUNCTION	0.00	3.55	0 13:00	0.000	0.158
3_EL0114_DI	JUNCTION	0.00	3.98	0 13:00	0.000	0.178
JUNCTION_1	JUNCTION	5.19	19.31	0 13:00	0.224	0.873
1_EL0590_PE	JUNCTION	18.29	18.29	0 12:59	0.812	0.812
2_EL0591_PE	JUNCTION	0.00	18.19	0 13:00	0.000	0.812
3_EL0125_DA*	JUNCTION	16.87	16.87	0 12:59	0.750	0.750
4_EL0126_PE	JUNCTION	0.00	16.86	0 13:00	0.000	0.750
JUNCTION_2*	JUNCTION	3.61	38.51	0 13:00	0.157	1.718
1_EL0086_SI*	JUNCTION	31.71	31.71	0 12:59	1.428	1.428
2_EL0087_PE	JUNCTION	0.00	53.65	0 12:47	0.000	1.544
3_EL0089_PE	JUNCTION	0.74	76.57	0 12:49	0.033	1.573
4_EL0090_PE	JUNCTION	0.00	39.24	0 13:02	0.000	1.454
5_EL0092_PE	JUNCTION	35.23	73.62	0 12:59	1.611	3.065
6_EL0094_PE	JUNCTION	0.00	71.48	0 13:00	0.000	3.063
1_EL0081_DA*	JUNCTION	3.66	3.66	0 12:59	0.159	0.159
2_EL0082_CB	JUNCTION	0.00	3.66	0 13:00	0.000	0.159
3_EL0083_PE	JUNCTION	0.00	12.89	0 00:00	0.000	0.193
1_EL0043_PE	JUNCTION	23.04	23.04	0 12:59	1.030	1.030
2_EL0044_CB	JUNCTION	0.00	23.02	0 13:00	0.000	1.030
3_EL0045_CB	JUNCTION	1.17	24.14	0 13:00	0.050	1.080
4_EL0046_JB	JUNCTION	0.00	24.14	0 13:01	0.000	1.080
6_EL0047_JB	JUNCTION	0.00	24.14	0 13:01	0.000	1.080
7_EL0048_PE	JUNCTION	2.48	26.38	0 13:01	0.107	1.187
3A_EL0115_DA*	JUNCTION	0.44	0.44	0 12:59	0.021	0.021

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

S_LAKESHORE_WOODHAVEN	OUTFALL	0.00	19.28	0	13:00	0.000	0.873
S_LAKESHORE_RIDGECREST	OUTFALL	0.00	38.27	0	13:00	0.000	1.716
S_LAKESHORE_ROLLING	OUTFALL	0.00	70.85	0	13:00	0.000	3.062
S_LAKESHORE	OUTFALL	0.00	12.89	0	00:00	0.000	0.223
S_LAKESHORE_ALLARD	OUTFALL	0.00	26.36	0	13:01	0.000	1.186

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
S_LAKESHORE_WOODHAVEN	95.33	1.80	19.28	0.873
S_LAKESHORE_RIDGECREST	94.77	3.56	38.27	1.716
S_LAKESHORE_ROLLING	94.64	6.33	70.85	3.062
S_LAKESHORE	99.89	0.41	12.89	0.223
S_LAKESHORE_ALLARD	95.08	2.45	26.36	1.186
System	95.94	14.54	158.29	7.061

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth	
12_CLAY_EL0123	CONDUIT	5.74	0 13:00	8.86	0.77	0.77	
OVER_12_CLAY_EL0123	CONDUIT	3.32	0 13:00	3.07	0.01	0.05	
S_LAKESHORE_WOODHAVEN_CHANNEL_1	CONDUIT		8.95	0 13:00	2.59	0.02	0.26
15_RCP_EL0120	CONDUIT	9.44	0 13:01	11.67	0.53	0.63	
S_LAKESHORE_WOODHAVEN_CHANNEL_2	CONDUIT		10.20	0 13:01	5.92	0.15	0.41
15_RCP_EL0112	CONDUIT	3.55	0 13:00	10.33	0.19	0.32	
15_RCP_EL0113	CONDUIT	3.55	0 13:00	12.19	0.15	0.29	
15_RCP_EL0114	CONDUIT	3.98	0 13:00	8.41	0.15	0.41	
S_LAKESHORE_WOODHAVEN_CHANNEL_3	CONDUIT		19.28	0 13:00	5.11	0.23	0.73
15_RCP_EL0590	CONDUIT	13.61	0 13:00	17.84	0.63	0.67	
OVER_15_RCP_EL0590	CONDUIT	4.58	0 13:00	6.44	0.00	0.04	
S_LAKESHORE_RIDGECREST_CHANNEL_1*	CONDUIT		18.17	0 13:00	5.20	0.02	0.22
24_RCP_EL0125	CONDUIT	16.86	0 13:00	13.33	0.22	0.42	
S_LAKESHORE_RIDGECREST_CHANNEL_2	CONDUIT		16.82	0 13:00	2.94	0.08	0.30
S_LAKESHORE_RIDGECREST_CHANNEL_3	CONDUIT		38.27	0 13:00	1.98	0.06	0.65
24_RCP_EL0086	CONDUIT	29.15	0 12:56	10.04	0.60	1.00	
OVER_24_RCP_EL0086	CONDUIT	3.06	0 12:58	4.55	0.00	0.11	
S_LAKESHORE_ROLLING_CHANNEL_1	CONDUIT		75.87	0 12:49	3.34	0.06	0.68
24_HDPVC_EL0089	CONDUIT	18.65	0 13:02	7.40	2.28	0.75	
OVER_24_HDPVC_EL0089	CONDUIT	20.60	0 13:01	2.46	0.13	0.37	
S_LAKESHORE_ROLLING_CHANNEL_2	CONDUIT		38.94	0 13:02	4.26	0.23	0.75
24_RCP_EL0092	CONDUIT	23.02	0 13:00	9.18	0.71	0.75	
OVER_24_RCP_EL0092	CONDUIT	48.46	0 13:00	12.07	0.06	0.21	

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

S_LAKESHORE_ROLLING_CHANNEL_3	CONDUIT	70.85	0	13:00	2.42	0.06	0.64
18_RCP_EL0081	CONDUIT	3.66	0	13:00	7.77	0.11	0.36
18_RCP_EL0082	CONDUIT	3.65	0	13:00	5.74	0.29	0.39
S_LAKESHORE_CHANNEL	CONDUIT	12.89	0	00:00	0.88	0.03	0.59
30_RCP_EL0043	CONDUIT	23.02	0	13:00	8.51	0.31	0.55
30_RCP_EL0044	CONDUIT	23.02	0	13:00	9.31	0.30	0.51
30_RCP_EL0045	CONDUIT	24.14	0	13:01	11.01	0.31	0.46
TWIN_18_RCP_EL0047	CONDUIT	24.14	0	13:01	11.95	0.38	0.56
30_RCP_EL0046	CONDUIT	24.14	0	13:01	15.40	0.26	0.36
S_LAKESHORE_ALLARD_CHANNEL	CONDUIT	26.36	0	13:01	3.04	0.17	0.71
15_CLAY_EL0115	CONDUIT	0.44	0	13:00	3.36	0.02	0.17

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Down Dry	Time Sub Crit	in Flow Sup Crit	Class Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change		
12_CLAY_EL0123	5.42	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.94	0.0002		
OVER_12_CLAY_EL0123	9.02	0.96	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.0000		
S_LAKESHORE_WOODHAVEN_CHANNEL_1	21.31	0.04	0.00	0.00	0.01	0.95	0.00	0.00	3.88	0.0001	0.51	0.0000
15_RCP_EL0120	3.70	0.04	0.00	0.00	0.00	0.00	0.19	0.77	0.00	0.00	1.09	0.0000
S_LAKESHORE_WOODHAVEN_CHANNEL_2	1.36	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.11	0.0000		
15_RCP_EL0112	6.32	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.87	0.0000		
15_RCP_EL0113	12.83	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.98	0.0000		
15_RCP_EL0114	3.04	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.0000		
S_LAKESHORE_WOODHAVEN_CHANNEL_3	1.00	0.00	0.04	0.00	0.00	0.95	0.01	0.00	0.00	0.12	0.0001	
15_RCP_EL0590	1.88	0.04	0.00	0.00	0.00	0.96	0.00	0.00	5.86	0.0001		
OVER_15_RCP_EL0590	4.47	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.13	0.0000		
S_LAKESHORE_RIDGECREST_CHANNEL_1*	2.66	0.04	0.00	0.00	0.00	0.00	0.29	0.67	0.00	0.00	1.09	0.0000
24_RCP_EL0125	4.07	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.13	0.0000		
S_LAKESHORE_RIDGECREST_CHANNEL_2	2.12	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.46	0.0000
S_LAKESHORE_RIDGECREST_CHANNEL_3	1.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.04	0.0000
24_RCP_EL0086	5.21	0.04	0.00	0.00	0.04	0.92	0.00	0.00	2.89	0.0003		
OVER_24_RCP_EL0086	9.74	0.97	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.0000		
S_LAKESHORE_ROLLING_CHANNEL_1	36.14	0.04	0.00	0.00	0.00	0.95	0.01	0.00	0.00	0.31	0.0003	
24_HDPVC_EL0089	3.67	0.04	0.00	0.00	0.06	0.90	0.00	0.00	1.07	0.0044		
OVER_24_HDPVC_EL0089	4.33	0.94	0.01	0.00	0.00	0.00	0.05	0.00	0.02	0.0002		
S_LAKESHORE_ROLLING_CHANNEL_2	1.00	0.04	0.01	0.00	0.00	0.95	0.00	0.00	0.00	0.28	0.0004	
24_RCP_EL0092	3.76	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.03	0.0003		
OVER_24_RCP_EL0092	12.50	0.90	0.00	0.00	0.00	0.00	0.00	0.10	0.27	0.0000		
S_LAKESHORE_ROLLING_CHANNEL_3	1.21	0.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.04	0.0000	
18_RCP_EL0081	23.21	0.04	0.00	0.00	0.00	0.04	0.00	0.92	3.14	0.0000		
18_RCP_EL0082	4.46	0.00	0.00	0.00	0.90	0.10	0.00	0.00	0.39	0.0001		
S_LAKESHORE_CHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0001		
30_RCP_EL0043	13.32	0.04	0.00	0.00	0.00	0.05	0.00	0.91	2.00	0.0001		
30_RCP_EL0044	7.43	0.04	0.00	0.00	0.00	0.10	0.00	0.86	2.22	0.0001		
30_RCP_EL0045	8.79	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.23	0.0001		
TWIN_18_RCP_EL0047	5.00	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.35	0.0002		
30_RCP_EL0046	1.05	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.89	0.0001		
S_LAKESHORE_ALLARD_CHANNEL	1.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.07	0.0000	
15_CLAY_EL0115	6.47	0.04	0.00	0.00	0.05	0.91	0.00	0.00	1.24	0.0000		

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
24_RCP_EL0086	0.12	0.12	0.13	0.01	0.11
24_HDPVC_EL0089	0.01	0.01	0.01	1.40	0.01

Existing Conditions - South Lakeshore: d,e,f,g,h (10-Year)

Analysis begun on: Thu Oct 25 13:45:18 2018
Analysis ended on: Thu Oct 25 13:45:18 2018
Total elapsed time: < 1 sec

Existing Conditions - Curtis (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Existing Conditions - Curtis (10-Year)
Starting WSELs from HEC-RAS XS 15024
2-Year = 297.42'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 10_EL0019_PE
WARNING 02: maximum depth increased for Node 11_EL0017_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	10.837	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	4.745	2.358
Surface Runoff	5.984	2.974
Final Surface Storage	0.125	0.062
Continuity Error (%)	-0.157	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	5.975	1.947
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.204	0.067
External Outflow	6.080	1.981
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.024	0.008
Final Stored Volume	0.102	0.033
Continuity Error (%)	0.361	

Highest Continuity Errors

Node 13_EL0017_PE (1.43%)

Existing Conditions - Curtis (10-Year)

Time-Step Critical Elements

None

Highest Flow Instability Indexes

Link CURTIS_CHANNEL_2 (4)

Routing Time Step Summary

Minimum Time Step	:	1.18 sec
Average Time Step	:	9.97 sec
Maximum Time Step	:	10.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10 ⁶ gal	Peak Runoff CFS	Runoff Coeff
Curtis_10	5.38	0.00	0.00	2.02	3.32	0.06	1.32	0.616
Curtis_20	5.39	0.00	0.00	1.54	3.81	0.04	0.86	0.707
Curtis_30	5.39	0.00	0.00	2.57	2.77	0.09	2.11	0.514
Curtis_40	5.39	0.00	0.00	2.34	3.00	0.13	3.00	0.557
Curtis_50	5.39	0.00	0.00	2.31	3.03	0.08	1.79	0.563
Curtis_60	5.38	0.00	0.00	2.07	3.27	0.03	0.78	0.607
Curtis_70	5.39	0.00	0.00	2.14	3.20	0.01	0.34	0.593
Curtis_80	5.38	0.00	0.00	2.08	3.26	0.12	2.65	0.605
Curtis_90	5.39	0.00	0.00	1.92	3.42	0.05	1.15	0.635
Curtis_100	5.38	0.00	0.00	2.49	2.84	1.17	25.92	0.527
Curtis_110	5.39	0.00	0.00	2.12	3.22	0.04	0.92	0.599
Curtis_120	5.38	0.00	0.00	2.17	3.17	0.03	0.62	0.589
Curtis_130	5.39	0.00	0.00	1.64	3.70	0.09	2.12	0.688

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0029_CB	JUNCTION	0.05	0.22	407.37	0 12:59
2_EL0028_CB	JUNCTION	0.06	0.27	395.83	0 12:59
3_EL0027_CB	JUNCTION	0.11	0.54	371.17	0 13:00
4_EL0026_CB	JUNCTION	0.11	0.57	353.42	0 13:00
5_EL0025_CB	JUNCTION	0.12	0.63	339.50	0 13:00
6_EL0023_CB	JUNCTION	0.15	0.76	328.46	0 13:00
7_EL0022_CB	JUNCTION	0.26	3.78	316.56	0 13:00
8_EL0021_CB	JUNCTION	0.33	2.96	314.36	0 13:00
9_EL0020_CB	JUNCTION	0.30	2.87	313.13	0 13:00
10_EL0019_PE	JUNCTION	0.13	0.71	308.28	0 13:01
11_EL0017_PE	JUNCTION	0.33	1.96	302.22	0 13:03
12_EL0016_JB	JUNCTION	0.21	0.98	300.48	0 13:03
13_EL0017_PE	JUNCTION	2.51	2.93	299.49	0 13:03
CURTIS	OUTFALL	7.56	7.56	299.06	0 00:00

Existing Conditions - Curtis (10-Year)

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0029_CB	JUNCTION	1.32	1.32	0 12:59	0.058	0.058
2_EL0028_CB	JUNCTION	0.86	2.18	0 12:59	0.039	0.098
3_EL0027_CB	JUNCTION	5.10	7.28	0 12:59	0.220	0.318
4_EL0026_CB	JUNCTION	1.78	9.05	0 12:59	0.078	0.396
5_EL0025_CB	JUNCTION	0.78	9.82	0 13:00	0.035	0.431
6_EL0023_CB	JUNCTION	2.99	12.78	0 13:00	0.131	0.562
7_EL0022_CB	JUNCTION	1.15	13.93	0 13:00	0.051	0.613
8_EL0021_CB	JUNCTION	25.89	39.46	0 12:59	1.172	1.785
9_EL0020_CB	JUNCTION	0.92	40.18	0 13:00	0.041	1.825
10_EL0019_PE	JUNCTION	0.00	39.87	0 13:01	0.000	1.825
11_EL0017_PE	JUNCTION	0.00	39.81	0 13:01	0.000	1.825
12_EL0016_JB	JUNCTION	0.00	39.17	0 13:03	0.000	1.822
13_EL0017_PE	JUNCTION	2.74	49.77	0 00:01	0.121	2.010
CURTIS	OUTFALL	0.00	49.77	0 00:01	0.000	2.048

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
CURTIS	99.98	3.25	49.77	2.048
System	99.98	3.25	49.77	2.048

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
15_RCP_EL0029	CONDUIT	1.32	0 13:00	9.40	0.06	0.17
15_RCP_EL0028	CONDUIT	2.18	0 13:00	9.76	0.10	0.24
18_RCP_EL0027	CONDUIT	7.27	0 13:00	12.99	0.26	0.35
18_RCP_EL0026	CONDUIT	9.04	0 13:00	15.18	0.28	0.37
18_RCP_EL0025	CONDUIT	9.81	0 13:00	14.97	0.30	0.40
18_RCP_EL0023	CONDUIT	12.78	0 13:00	9.58	0.51	0.75
18_RCP_EL0022	CONDUIT	13.88	0 13:01	7.85	0.93	1.00
OVER_18_RCP_EL0022	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

Existing Conditions - Curtis (10-Year)

30_RCP_EL0021	CONDUIT	39.27	0	13:00	8.00	0.54	1.00
OVER_30_RCP_EL0021	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
30_RCP_EL0020	CONDUIT	39.87	0	13:01	12.59	0.23	0.64
CURTIS_CHANNEL_1	CONDUIT	39.81	0	13:01	2.68	0.00	0.13
36_RCP_EL0017	CONDUIT	39.17	0	13:03	10.13	0.37	0.54
36_RCP_EL0016	CONDUIT	39.18	0	13:03	4.02	0.23	0.65
OVER_36_RCP_EL0016	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
CURTIS_CHANNEL_2	CONDUIT	49.77	0	00:01	3.74	0.35	1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Time in Flow Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
15_RCP_EL0029	2.40	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.39	0.0000
15_RCP_EL0028	1.05	0.04	0.00	0.00	0.00	0.02	0.00	0.94	3.50	0.0000
18_RCP_EL0027	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.10	0.0001
18_RCP_EL0026	1.77	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.57	0.0001
18_RCP_EL0025	3.24	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.55	0.0001
18_RCP_EL0023	1.00	0.04	0.00	0.00	0.00	0.05	0.00	0.91	2.78	0.0001
18_RCP_EL0022	2.45	0.04	0.00	0.00	0.03	0.30	0.00	0.63	1.54	0.0002
OVER_18_RCP_EL0022	5.61	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
30_RCP_EL0021	7.22	0.04	0.00	0.00	0.02	0.09	0.00	0.85	2.03	0.0001
OVER_30_RCP_EL0021	8.76	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
30_RCP_EL0020	29.77	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.65	0.0001
CURTIS_CHANNEL_1	2.25	0.04	0.00	0.00	0.95	0.01	0.00	0.00	0.46	0.0000
36_RCP_EL0017	11.31	0.04	0.00	0.00	0.00	0.00	0.00	0.96	1.82	0.0001
36_RCP_EL0016	1.21	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.06	0.0001
OVER_36_RCP_EL0016	2.40	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
CURTIS_CHANNEL_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.03	0.0005

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
18_RCP_EL0022	0.43	0.43	0.44	0.01	0.42
30_RCP_EL0021	0.11	0.11	0.11	0.01	0.10
CURTIS_CHANNEL_2	23.98	23.98	23.98	0.01	0.01

Analysis begun on: Thu Oct 25 13:46:09 2018
Analysis ended on: Thu Oct 25 13:46:09 2018
Total elapsed time: < 1 sec

Existing Conditions - Woodshire & Huntington (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Existing Conditions - Woodshire & Huntington (10-Year)
Starting WSELs from HEC-RAS XS 20583
2-Year = 379.27'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 8_EL0530_PE
WARNING 02: maximum depth increased for Node 9_EL0529_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	30.259	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	9.012	1.604
Surface Runoff	20.906	3.720
Final Surface Storage	0.420	0.075
Continuity Error (%)	-0.263	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	20.868	6.800
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	20.776	6.770
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.080	0.026
Continuity Error (%)	0.059	

Time-Step Critical Elements

Link 24_RCP_EL0530 (6.67%)
Link 24_RCP_EL0531 (3.21%)

Highest Flow Instability Indexes

Existing Conditions - Woodshire & Huntington (10-Year)

All links are stable.

Routing Time Step Summary

```

Minimum Time Step      :      7.39 sec
Average Time Step      :      9.89 sec
Maximum Time Step      :     10.00 sec
Percent in Steady State :      0.00
Average Iterations per Step :      2.00
  
```

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Woodshire&Huntington_10	5.39	0.00	0.00	1.32	4.00	3.30	70.04	0.743
Woodshire&Huntington_20	5.39	0.00	0.00	1.85	3.47	0.34	7.73	0.645
Woodshire&Huntington_30	5.38	0.00	0.00	2.34	2.98	0.24	5.71	0.554
Woodshire&Huntington_40	5.39	0.00	0.00	2.13	3.20	0.25	5.68	0.594
Woodshire&Huntington_50	5.38	0.00	0.00	1.98	3.36	0.40	8.86	0.623
Woodshire&Huntington_60	5.39	0.00	0.00	1.78	3.56	0.35	7.99	0.660
Woodshire&Huntington_70	5.39	0.00	0.00	1.73	3.58	1.48	31.23	0.665
Woodshire&Huntington_80	5.39	0.00	0.00	1.53	3.80	0.46	10.57	0.706

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0329_JB	JUNCTION	0.61	3.27	429.46	0 13:00
2_EL0330_PE	JUNCTION	0.24	1.33	426.93	0 13:00
3_EL0332_PE	JUNCTION	0.72	4.09	426.37	0 13:00
4_EL0333_PE	JUNCTION	0.21	1.12	423.05	0 13:01
5_EL0531_PE	JUNCTION	0.55	4.36	420.22	0 13:01
6_EL0534_PE	JUNCTION	0.25	1.32	416.48	0 13:00
7_JUNCTION*	JUNCTION	0.25	1.34	408.34	0 13:00
8_EL0530_PE	JUNCTION	0.99	2.69	388.41	0 13:00
9_EL0529_PE	JUNCTION	0.17	0.86	383.50	0 13:01
Outfall*	OUTFALL	0.17	0.86	372.86	0 13:01

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0329_JB	JUNCTION	70.03	70.03	0 13:00	3.291	3.290
2_EL0330_PE	JUNCTION	7.73	77.66	0 13:00	0.341	3.631
3_EL0332_PE	JUNCTION	5.71	83.13	0 13:00	0.243	3.873
4_EL0333_PE	JUNCTION	0.00	81.36	0 13:01	0.000	3.868
5_EL0531_PE	JUNCTION	5.68	86.57	0 13:01	0.250	4.117
6_EL0534_PE	JUNCTION	8.86	94.65	0 13:00	0.399	4.513
7_JUNCTION*	JUNCTION	39.21	133.48	0 13:00	1.820	6.331
8_EL0530_PE	JUNCTION	10.56	143.18	0 13:00	0.457	6.784
9_EL0529_PE	JUNCTION	0.00	143.21	0 13:01	0.000	6.772
Outfall*	OUTFALL	0.00	143.41	0 13:01	0.000	6.770

Existing Conditions - Woodshire & Huntington (10-Year)

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
Outfall*	92.65	12.28	143.41	6.770
System	92.65	12.28	143.41	6.770

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
48_RCP_EL0329	CONDUIT	69.95	0 13:00	9.40	0.60	0.57
CHANNEL_1	CONDUIT	77.49	0 13:00	1.98	0.22	0.72
48_RCP_EL0332	CONDUIT	81.36	0 13:01	9.58	0.55	0.64
OVER_48_RCP_EL0332	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
CHANNEL_2	CONDUIT	81.34	0 13:01	3.26	0.21	0.72
24_RCP_EL0531	CONDUIT	64.41	0 13:01	11.57	0.87	0.83
OVER_24_RCP_EL0531	CONDUIT	22.07	0 13:01	4.30	0.03	0.13
CHANNEL_3	CONDUIT	94.61	0 13:01	5.84	0.28	0.53
CHANNEL_4	CONDUIT	132.86	0 13:00	4.89	0.29	0.77
24_RCP_EL0530	CONDUIT	26.93	0 13:01	11.22	0.62	0.71
OVER_24_RCP_EL0530	CONDUIT	116.29	0 13:01	12.60	0.01	0.09
CHANNEL_5	CONDUIT	143.41	0 13:01	19.25	0.00	0.09

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction Up Dry	of Down Dry	Time Sub Crit	in Flow Sup Crit	Class Up Crit	--- Down Crit	Avg. Froude Number	Avg. Flow Change
48_RCP_EL0329	2.32	0.04	0.00	0.00	0.01	0.95	0.00	0.00	1.55	0.0001
CHANNEL_1	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.15	0.0000
48_RCP_EL0332	7.01	0.04	0.00	0.00	0.02	0.94	0.00	0.00	1.54	0.0001
OVER_48_RCP_EL0332	4.42	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
CHANNEL_2	1.00	0.04	0.01	0.00	0.95	0.00	0.00	0.00	0.37	0.0000
24_RCP_EL0531	7.63	0.04	0.00	0.00	0.02	0.94	0.00	0.00	1.94	0.0004
OVER_24_RCP_EL0531	6.94	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.0000
CHANNEL_3	1.00	0.04	0.00	0.00	0.93	0.03	0.00	0.00	0.74	0.0001
CHANNEL_4	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.25	0.0001
24_RCP_EL0530	2.60	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.39	0.0001
OVER_24_RCP_EL0530	7.51	0.81	0.00	0.00	0.00	0.00	0.00	0.19	0.51	0.0000
CHANNEL_5	5.79	0.04	0.00	0.00	0.05	0.91	0.00	0.00	3.21	0.0000

Existing Conditions - Woodshire & Huntington (10-Year)

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
24_RCP_EL0531	0.01	0.01	0.01	0.69	0.01

Analysis begun on: Thu Oct 25 13:36:57 2018

Analysis ended on: Thu Oct 25 13:36:57 2018

Total elapsed time: < 1 sec

ALTERNATIVE: SWMM OUTPUT

Alternative - Shady Lawn (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Alternative - Shady Lawn (10-Year)
Starting WSELs interpolated between HEC-RAS XS 13024 and 13556
2-Year = 296.25'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	5.004	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	1.852	1.993
Surface Runoff	2.979	3.206
Final Surface Storage	0.181	0.194
Continuity Error (%)	-0.169	

	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.972	0.968
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	2.961	0.965
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.016	0.005
Final Stored Volume	0.026	0.008
Continuity Error (%)	0.037	

Time-Step Critical Elements

Link 15_RCP_EL0181 (1.94%)
Link PROP_18_RCP_EL0187 (1.10%)

Highest Flow Instability Indexes

All links are stable.

Alternative - Shady Lawn (10-Year)

Routing Time Step Summary

```

Minimum Time Step      :      0.50 sec
Average Time Step      :      9.90 sec
Maximum Time Step      :     10.00 sec
Percent in Steady State :      0.00
Average Iterations per Step :    2.00
  
```

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Shadylawn_10	5.38	0.00	0.00	1.95	2.84	0.22	1.69	0.527
Shadylawn_20	5.39	0.00	0.00	1.07	4.28	0.06	1.39	0.794
Shadylawn_30	5.38	0.00	0.00	2.21	3.12	0.16	3.67	0.580
Shadylawn_40	5.38	0.00	0.00	2.59	2.75	0.01	0.20	0.511
Shadylawn_50	5.38	0.00	0.00	2.15	3.19	0.12	2.71	0.592
Shadylawn_60	5.39	0.00	0.00	1.86	3.49	0.04	0.91	0.647
Shadylawn_70	5.38	0.00	0.00	1.96	3.38	0.11	2.47	0.627
Shadylawn_80	5.39	0.00	0.00	2.22	3.12	0.06	1.40	0.579
Shadylawn_90	5.39	0.00	0.00	2.07	3.27	0.14	3.26	0.608
Shadylawn_100	5.39	0.00	0.00	1.53	3.82	0.06	1.25	0.709

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0610_DI	JUNCTION	0.06	0.31	347.12	0 12:59
2_EL611_SI*	JUNCTION	0.08	0.35	339.65	0 12:59
3_EL0612_PE	JUNCTION	0.05	0.30	320.30	0 13:00
4_EL0181_PE	JUNCTION	0.27	1.83	306.23	0 13:01
5_EL0182_CB	JUNCTION	0.19	1.72	306.04	0 12:59
6_EL0183_CB	JUNCTION	0.23	1.69	305.34	0 12:59
7_EL0184_PE	JUNCTION	0.08	0.50	303.84	0 13:00
1_EL0188_PE	JUNCTION	0.26	0.41	401.79	0 13:00
2_EL0189_DI	JUNCTION	0.39	0.69	382.00	0 13:00
3_EL0190_CB*	JUNCTION	0.15	0.72	375.32	0 13:00
4_EL0191_PE	JUNCTION	0.12	0.53	371.76	0 13:00
5_EL0179_PE	JUNCTION	0.19	1.55	306.33	0 13:01
6_EL0180_CB	JUNCTION	0.95	2.32	306.00	0 13:00
7_EL0187_DA*	JUNCTION	0.18	0.87	305.31	0 13:02
8_EL0186_PE	JUNCTION	0.09	0.44	300.08	0 13:00
SHADYLAWN_1	OUTFALL	9.80	9.80	297.15	0 00:00
SHADYLAWN_2	OUTFALL	9.80	9.80	297.15	0 00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0610_DI	JUNCTION	2.47	2.47	0 12:59	0.105	0.105
2_EL611_SI*	JUNCTION	1.40	3.87	0 12:59	0.061	0.166
3_EL0612_PE	JUNCTION	0.00	3.87	0 13:00	0.000	0.166
4_EL0181_PE	JUNCTION	0.00	3.86	0 13:00	0.000	0.166
5_EL0182_CB	JUNCTION	3.26	6.86	0 12:59	0.143	0.309

Alternative - Shady Lawn (10-Year)

6_EL0183_CB	JUNCTION	0.00	6.85	0	13:00	0.000	0.309
7_EL0184_PE	JUNCTION	1.25	8.10	0	12:59	0.056	0.365
1_EL0188_PE	JUNCTION	1.68	1.68	0	12:59	0.214	0.214
2_EL0189_DI	JUNCTION	1.39	3.07	0	12:59	0.063	0.277
3_EL0190_CB*	JUNCTION	3.66	6.72	0	12:59	0.158	0.435
4_EL0191_PE	JUNCTION	0.20	6.90	0	13:00	0.008	0.443
5_EL0179_PE	JUNCTION	0.00	6.87	0	13:00	0.000	0.443
6_EL0180_CB	JUNCTION	2.71	9.04	0	12:59	0.119	0.561
7_EL0187_DA*	JUNCTION	0.00	9.04	0	13:00	0.000	0.560
8_EL0186_PE	JUNCTION	0.91	9.90	0	13:00	0.041	0.601
SHADYLAWN_1	OUTFALL	0.00	8.09	0	13:00	0.000	0.365
SHADYLAWN_2	OUTFALL	0.00	9.90	0	13:00	0.000	0.600

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
6_EL0183_CB	JUNCTION	0.40	0.336	1.614

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
SHADYLAWN_1	94.88	0.66	8.09	0.365
SHADYLAWN_2	93.76	1.07	9.90	0.600
System	94.32	1.73	17.98	0.965

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
15_RCP_EL0610	CONDUIT	2.47	0 12:59	9.60	0.12	0.26
18_RCP_EL0611	CONDUIT	3.87	0 13:00	13.61	0.10	0.22
SHADYLAWN_DITCH_1	CONDUIT	3.86	0 13:00	2.24	0.12	0.65
15_RCP_EL0181	CONDUIT	4.09	0 13:03	3.33	1.80	1.00
OVER_15_RCP_EL0181	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
15_RCP_EL0182	CONDUIT	6.85	0 13:00	5.58	0.77	1.00
15_RCP_EL0183	CONDUIT	6.85	0 13:00	7.45	0.47	0.70
SHADYLAWN_CHANNEL_1	CONDUIT	8.09	0 13:00	3.93	0.28	0.75
15_RCP_0188	CONDUIT	1.68	0 13:00	4.22	0.06	0.36
15_RCP_EL0189	CONDUIT	3.06	0 13:00	6.14	0.21	0.44
15_RCP_EL0190	CONDUIT	6.71	0 13:00	10.99	0.35	0.50
OVER_15_RCP_EL0190	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
SHADYLAWN_DITCH_2	CONDUIT	6.87	0 13:00	5.02	0.12	0.68
PROP_18_RCP_EL0179	CONDUIT	6.73	0 13:03	3.81	0.33	1.00
OVER_15_RCP_EL0179	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
PROP_18_RCP_EL0187	CONDUIT	9.04	0 13:00	6.05	0.59	0.79
OVER_15_RCP_EL0187	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

Alternative - Shady Lawn (10-Year)

PROP_18_RCP_EL0180	CONDUIT	9.04	0	13:00	12.23	0.35	0.44
OVER_15_RCP_EL0180	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
SHADYLAWN_CHANNEL_2	CONDUIT	9.90	0	13:00	2.46	0.10	0.65

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Down Dry	Time in Sub Crit	Flow Sup Crit	Class Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
15_RCP_EL0610	2.86	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.62	0.0000
18_RCP_EL0611	1.85	0.04	0.00	0.00	0.00	0.96	0.00	0.00	5.13	0.0000
SHADYLAWN_DITCH_1	1.00	0.04	0.00	0.00	0.00	0.95	0.01	0.00	0.22	0.0000
15_RCP_EL0181	4.82	0.04	0.03	0.00	0.04	0.00	0.89	0.00	0.47	0.0004
OVER_15_RCP_EL0181	45.25	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
15_RCP_EL0182	4.54	0.04	0.00	0.00	0.03	0.15	0.00	0.77	1.51	0.0002
15_RCP_EL0183	30.53	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.27	0.0001
SHADYLAWN_CHANNEL_1	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.10	0.0001
15_RCP_0188	2.27	0.04	0.07	0.00	0.70	0.20	0.00	0.00	0.53	0.0000
15_RCP_EL0189	1.33	0.04	0.10	0.00	0.00	0.85	0.00	0.00	2.00	0.0000
15_RCP_EL0190	5.60	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.57	0.0001
OVER_15_RCP_EL0190	10.48	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
SHADYLAWN_DITCH_2	1.00	0.04	0.00	0.00	0.19	0.76	0.00	0.00	1.26	0.0000
PROP_18_RCP_EL0179	6.39	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.17	0.0001
OVER_15_RCP_EL0179	7.92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
PROP_18_RCP_EL0187	4.33	0.04	0.13	0.00	0.83	0.00	0.00	0.00	0.22	0.0001
OVER_15_RCP_EL0187	5.27	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
PROP_18_RCP_EL0180	2.78	0.04	0.13	0.00	0.00	0.83	0.00	0.00	3.45	0.0001
OVER_15_RCP_EL0180	8.68	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
SHADYLAWN_CHANNEL_2	1.25	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.07	0.0000

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
15_RCP_EL0181	0.31	0.31	0.31	0.50	0.01
15_RCP_EL0182	0.35	0.35	0.35	0.01	0.28
PROP_18_RCP_EL0179	0.09	0.09	0.09	0.01	0.01

Analysis begun on: Thu Oct 25 13:49:15 2018
Analysis ended on: Thu Oct 25 13:49:15 2018
Total elapsed time: < 1 sec

Alternative - Arlington 1 and 2 (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Alternative - Arlington 1 and 2 (10-Year)

Starting WSELs from HEC-RAS XS 13556 (Arlington 1) and XS 14035 (Arlington 2)
2-Year = 296.26', 296.27'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 3_EL0166_PE
WARNING 02: maximum depth increased for Node 10_EL0175_PE
WARNING 02: maximum depth increased for Node 14_EL0177_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	11.955	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	4.759	2.144
Surface Runoff	7.082	3.190
Final Surface Storage	0.135	0.061
Continuity Error (%)	-0.180	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	7.072	2.305
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	7.060	2.301
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.118	0.038
Final Stored Volume	0.210	0.068
Continuity Error (%)	-1.109	

Time-Step Critical Elements

Link 24_RCP_EL0172 (9.71%)

Alternative - Arlington 1 and 2 (10-Year)

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.50 sec
Average Time Step : 9.77 sec
Maximum Time Step : 10.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.01

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Arlington1_10	5.39	0.00	0.00	1.44	3.91	0.06	1.44	0.725
Arlington1_20	5.38	0.00	0.00	2.75	2.57	0.70	16.21	0.477
Arlington1_30	5.39	0.00	0.00	2.44	2.90	0.06	1.40	0.538
Arlington1_40	5.39	0.00	0.00	2.10	3.24	0.02	0.50	0.602
Arlington1_50	5.38	0.00	0.00	0.73	4.62	0.02	0.32	0.857
Arlington1_60	5.38	0.00	0.00	1.76	3.58	0.02	0.52	0.665
Arlington1_70	5.39	0.00	0.00	1.75	3.60	0.19	4.46	0.668
Arlington1_80	5.39	0.00	0.00	1.15	4.19	0.08	1.84	0.779
Arlington1_90	5.38	0.00	0.00	1.09	4.25	0.09	2.10	0.789
Arlington2_10	5.39	0.00	0.00	1.87	3.47	0.09	2.00	0.645
Arlington2_20	5.38	0.00	0.00	2.14	3.20	0.08	1.72	0.594
Arlington2_30	5.39	0.00	0.00	2.06	3.28	0.08	1.72	0.609
Arlington2_40	5.38	0.00	0.00	2.02	3.32	0.18	4.10	0.616
Arlington2_50	5.38	0.00	0.00	2.11	3.23	0.04	1.02	0.599
Arlington2_60	5.38	0.00	0.00	2.32	3.02	0.08	1.88	0.562
Arlington2_70	5.39	0.00	0.00	0.80	4.55	0.09	1.91	0.844
Arlington2_80	5.38	0.00	0.00	1.57	3.77	0.05	1.18	0.701
Arlington2_90	5.38	0.00	0.00	1.82	3.52	0.30	7.19	0.654
Arlington2_100	5.38	0.00	0.00	1.16	4.18	0.07	1.59	0.776

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0164_CB	JUNCTION	0.03	0.17	327.20	0 13:00
2_EL0165_JB*	JUNCTION	0.06	0.31	323.66	0 13:00
3_EL0166_PE	JUNCTION	0.03	0.17	320.08	0 13:00
4_EL0170_PE	JUNCTION	0.06	0.33	309.66	0 13:01
5_EL0171_DI	JUNCTION	0.20	1.20	308.81	0 13:00
6_EL0178_DI	JUNCTION	0.25	2.45	307.95	0 13:00
7_EL0172_JB	JUNCTION	0.47	2.90	307.23	0 13:01
8_EL0173_CB	JUNCTION	0.36	3.36	306.71	0 13:01
9_EL0174_CB	JUNCTION	0.43	3.24	306.17	0 13:01
10_EL0175_PE	JUNCTION	0.10	0.54	303.26	0 13:01
11_EL0167_PE	JUNCTION	0.10	0.49	307.89	0 13:00
12_EL0168_DI	JUNCTION	0.16	0.85	305.73	0 13:00
13_EL0169_CB	JUNCTION	0.11	0.50	304.98	0 13:00
14_EL0177_PE	JUNCTION	0.13	0.65	300.04	0 13:01
1_EL0153_CB	JUNCTION	0.06	0.26	396.59	0 13:00

Alternative - Arlington 1 and 2 (10-Year)

2_EL0154_CB	JUNCTION	0.10	0.56	391.56	0	13:00
3_EL0155_PE	JUNCTION	0.04	0.23	387.76	0	13:00
4_EL0163_DA*	JUNCTION	0.10	0.50	360.25	0	13:00
5_EL0156_CB	JUNCTION	0.17	1.10	346.06	0	13:00
6_EL0157_PDST	JUNCTION	0.07	0.37	340.22	0	13:00
7_EL0159_DI	JUNCTION	0.06	0.29	355.10	0	13:00
8_EL0160_CB	JUNCTION	0.07	0.30	349.62	0	13:00
9_EL0161_CB	JUNCTION	0.11	0.56	343.04	0	13:00
10_EL0162_PDST	JUNCTION	0.04	0.22	338.26	0	13:00
11_JUNCTION_1	JUNCTION	0.12	0.57	330.07	0	13:00
12_EL0615_PE	JUNCTION	0.22	1.34	309.87	0	13:00
13_EL0616_DA*	JUNCTION	0.26	1.82	308.07	0	13:00
14_EL0617_PE	JUNCTION	0.11	0.57	302.99	0	13:01
ARLINGTON1*	OUTFALL	9.77	9.77	297.17	0	00:00
ARLINGTON2*	OUTFALL	9.72	9.72	297.22	0	00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0164_CB	JUNCTION	1.44	1.44	0 12:59	0.064	0.064
2_EL0165_JB*	JUNCTION	0.00	1.44	0 13:00	0.000	0.064
3_EL0166_PE	JUNCTION	0.00	1.44	0 13:00	0.000	0.064
4_EL0170_PE	JUNCTION	0.00	1.44	0 13:00	0.000	0.064
5_EL0171_DI	JUNCTION	16.18	17.61	0 13:00	0.699	0.762
6_EL0178_DI	JUNCTION	1.40	18.88	0 13:00	0.060	0.822
7_EL0172_JB	JUNCTION	0.00	18.60	0 13:00	0.000	0.822
8_EL0173_CB	JUNCTION	0.50	18.99	0 13:00	0.022	0.843
9_EL0174_CB	JUNCTION	0.32	19.24	0 13:01	0.015	0.858
10_EL0175_PE	JUNCTION	0.52	19.72	0 13:01	0.023	0.881
11_EL0167_PE	JUNCTION	4.46	4.46	0 12:59	0.190	0.190
12_EL0168_DI	JUNCTION	1.84	6.29	0 12:59	0.082	0.272
13_EL0169_CB	JUNCTION	0.00	6.28	0 13:00	0.000	0.272
14_EL0177_PE	JUNCTION	2.10	27.89	0 13:00	0.093	1.247
1_EL0153_CB	JUNCTION	2.00	2.00	0 12:59	0.089	0.089
2_EL0154_CB	JUNCTION	1.72	3.72	0 12:59	0.075	0.165
3_EL0155_PE	JUNCTION	0.00	3.72	0 13:00	0.000	0.165
4_EL0163_DA*	JUNCTION	1.72	5.43	0 13:00	0.076	0.240
5_EL0156_CB	JUNCTION	4.10	9.50	0 12:59	0.181	0.421
6_EL0157_PDST	JUNCTION	0.00	9.49	0 13:00	0.000	0.421
7_EL0159_DI	JUNCTION	1.88	1.88	0 12:59	0.080	0.080
8_EL0160_CB	JUNCTION	1.91	3.78	0 12:59	0.089	0.169
9_EL0161_CB	JUNCTION	0.00	3.78	0 13:00	0.000	0.169
10_EL0162_PDST	JUNCTION	0.00	3.78	0 13:00	0.000	0.169
11_JUNCTION_1	JUNCTION	2.19	15.44	0 13:00	0.092	0.682
12_EL0615_PE	JUNCTION	7.18	22.55	0 13:00	0.304	0.986
13_EL0616_DA*	JUNCTION	1.59	23.88	0 13:00	0.070	1.055
14_EL0617_PE	JUNCTION	0.00	23.86	0 13:00	0.000	1.055
ARLINGTON1*	OUTFALL	0.00	27.82	0 13:01	0.000	1.245
ARLINGTON2*	OUTFALL	0.00	23.86	0 13:01	0.000	1.055

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
9_EL0174_CB	JUNCTION	0.36	1.037	1.263

Alternative - Arlington 1 and 2 (10-Year)

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
ARLINGTON1*	94.37	2.48	27.82	1.245
ARLINGTON2*	94.32	2.11	23.86	1.055
System	94.35	4.59	51.69	2.300

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
15_RCP_EL0164	CONDUIT	1.44	0 13:00	8.80	0.03	0.19
15_RCP_EL0165	CONDUIT	1.44	0 13:00	8.82	0.08	0.19
ARLINGTON1_CHANNEL_1	CONDUIT	1.44	0 13:00	2.57	0.01	0.13
24_RCP_EL0170	CONDUIT	1.44	0 13:01	5.24	0.03	0.14
24_RCP_EL0171	CONDUIT	17.49	0 13:00	8.34	0.43	0.80
24_RCP_EL0178	CONDUIT	18.60	0 13:00	5.92	0.57	1.00
OVER_24_RCP_EL0178	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
24_RCP_EL0172	CONDUIT	18.51	0 13:00	5.89	2.71	1.00
OVER_24_RCP_EL0172	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
24_RCP_EL0173	CONDUIT	18.96	0 13:01	6.03	0.96	1.00
24_RCP_EL0174	CONDUIT	19.25	0 13:01	9.14	0.56	0.64
ARLINGTON1_CHANNEL_2	CONDUIT	19.71	0 13:01	5.69	0.01	0.15
24_RCP_EL0167	CONDUIT	4.45	0 13:00	6.95	0.11	0.26
24_RCP_EL0168	CONDUIT	6.28	0 13:00	6.01	0.21	0.37
24_RCP_EL0169	CONDUIT	6.28	0 13:00	8.92	0.12	0.29
ARLINGTON1_CHANNEL_3	CONDUIT	27.82	0 13:01	0.86	0.02	0.58
15_RCP_EL0153	CONDUIT	2.00	0 13:00	11.77	0.07	0.20
15_RCP_EL0154	CONDUIT	3.72	0 13:00	11.41	0.17	0.31
ARLINGTON2_CHANNEL_1*	CONDUIT	3.72	0 13:00	2.98	0.02	0.24
15_RCP_EL0163	CONDUIT	5.41	0 13:00	13.05	0.25	0.37
15_RCP_EL0156	CONDUIT	9.49	0 13:00	13.08	0.48	0.59
ARLINGTON2_CHANNEL_2*	CONDUIT	9.49	0 13:00	5.16	0.05	0.32
15_RCP_EL0159	CONDUIT	1.88	0 13:00	9.45	0.10	0.22
15_RCP_EL0160	CONDUIT	3.78	0 13:00	12.05	0.11	0.30
15_RCP_EL0161	CONDUIT	3.78	0 13:00	11.49	0.21	0.31
ARLINGTON2_CHANNEL_3	CONDUIT	3.78	0 13:00	2.68	0.02	0.27
ARLINGTON2_CHANNEL_4	CONDUIT	15.40	0 13:00	3.13	0.12	0.64
PROP_24_RCP_1*	CONDUIT	22.35	0 13:00	8.54	0.44	0.79
OVER_15_RCP_1*	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
PROP_24_RCP_2*	CONDUIT	23.86	0 13:00	12.76	0.40	0.60
OVER_15_RCP_2*	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
ARLINGTON2_CHANNEL_5*	CONDUIT	23.86	0 13:01	3.76	0.12	0.69

Flow Classification Summary

Alternative - Arlington 1 and 2 (10-Year)

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Time in Flow Down Dry	Class Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
15_RCP_EL0164	87.88	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.78	0.0000
15_RCP_EL0165	4.65	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.07	0.0000
ARLINGTON1_CHANNEL_1	2.22	0.04	0.00	0.00	0.91	0.04	0.00	0.00	0.70	0.0000
24_RCP_EL0170	28.04	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.02	0.0000
24_RCP_EL0171	3.39	0.04	0.00	0.00	0.01	0.12	0.00	0.83	2.12	0.0001
24_RCP_EL0178	3.62	0.04	0.00	0.00	0.09	0.67	0.00	0.20	1.23	0.0001
OVER_24_RCP_EL0178	6.96	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
24_RCP_EL0172	4.63	0.04	0.01	0.00	0.02	0.00	0.93	0.00	0.56	0.0006
OVER_24_RCP_EL0172	11.98	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
24_RCP_EL0173	4.93	0.04	0.00	0.00	0.13	0.06	0.00	0.77	1.01	0.0002
24_RCP_EL0174	21.14	0.04	0.00	0.00	0.00	0.96	0.00	0.00	1.71	0.0001
ARLINGTON1_CHANNEL_2	5.87	0.04	0.00	0.00	0.34	0.61	0.00	0.00	1.10	0.0000
24_RCP_EL0167	2.92	0.04	0.00	0.00	0.00	0.03	0.00	0.92	2.03	0.0000
24_RCP_EL0168	15.24	0.04	0.00	0.00	0.00	0.00	0.00	0.96	1.47	0.0000
24_RCP_EL0169	2.60	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.41	0.0000
ARLINGTON1_CHANNEL_3	1.49	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.01	0.0000
15_RCP_EL0153	10.76	0.04	0.00	0.00	0.00	0.00	0.00	0.96	4.28	0.0000
15_RCP_EL0154	8.49	0.04	0.00	0.00	0.00	0.96	0.00	0.00	5.15	0.0000
ARLINGTON2_CHANNEL_1*	1.08	0.04	0.00	0.00	0.88	0.07	0.00	0.00	0.70	0.0000
15_RCP_EL0163	4.74	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.60	0.0001
15_RCP_EL0156	4.13	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.80	0.0001
ARLINGTON2_CHANNEL_2*	2.69	0.04	0.00	0.00	0.05	0.91	0.00	0.00	1.20	0.0000
15_RCP_EL0159	4.04	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.15	0.0000
15_RCP_EL0160	12.93	0.04	0.00	0.00	0.00	0.06	0.00	0.90	5.26	0.0000
15_RCP_EL0161	3.78	0.04	0.00	0.00	0.00	0.96	0.00	0.00	4.64	0.0000
ARLINGTON2_CHANNEL_3	3.83	0.04	0.00	0.00	0.94	0.01	0.00	0.00	0.66	0.0000
ARLINGTON2_CHANNEL_4	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.74	0.0000
PROP_24_RCP_1*	5.23	0.04	0.00	0.00	0.01	0.95	0.00	0.00	2.24	0.0001
OVER_15_RCP_1*	8.72	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
PROP_24_RCP_2*	4.80	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.98	0.0001
OVER_15_RCP_2*	5.58	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
ARLINGTON2_CHANNEL_5*	2.23	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.09	0.0000

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
24_RCP_EL0178	0.11	0.11	0.12	0.01	0.01
24_RCP_EL0172	0.14	0.14	0.14	0.73	0.01
24_RCP_EL0173	0.36	0.36	0.36	0.01	0.36

Analysis begun on: Thu Oct 25 13:50:23 2018
 Analysis ended on: Thu Oct 25 13:50:24 2018
 Total elapsed time: 00:00:01

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)
ALLARD Starting WSELs from HEC-RAS XS 14764
2-Year = 296.42'

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

***** Analysis Options *****

Flow Units CFS
Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method CURVE_NUMBER
Flow Routing Method DYNWAVE
Starting Date MAY-05-2016 00:00:00
Ending Date MAY-06-2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Wet Time Step 00:10:00
Dry Time Step 00:10:00
Routing Time Step 10.00 sec

WARNING 02: maximum depth increased for Node 3_EL0120_PE
WARNING 02: maximum depth increased for Node JUNCTION_1
WARNING 02: maximum depth increased for Node 4_EL0126_PE
WARNING 02: maximum depth increased for Node 1_EL0086_SI*
WARNING 02: maximum depth increased for Node 2_EL0087_PE
WARNING 02: maximum depth increased for Node 4_EL0090_PE
WARNING 02: maximum depth increased for Node 7_EL0048_PE

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	39.530	5.385
Evaporation Loss	0.000	0.000
Infiltration Loss	17.551	2.391
Surface Runoff	21.551	2.936
Final Surface Storage	0.496	0.068
Continuity Error (%)	-0.171	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	21.512	7.010
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.104	0.034
External Outflow	21.575	7.031
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.359	0.117
Final Stored Volume	0.568	0.185
Continuity Error (%)	-0.762	

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

Highest Continuity Errors

Node 3_EL0083_PE (1.95%)

Time-Step Critical Elements

Link 12_CLAY_EL0123 (2.76%)

Link PROP_36_EL0089 (1.02%)

Highest Flow Instability Indexes

Link S_LAKESHORE_CHANNEL (10)

Routing Time Step Summary

Minimum Time Step : 6.76 sec

Average Time Step : 9.93 sec

Maximum Time Step : 10.00 sec

Percent in Steady State : 0.00

Average Iterations per Step : 2.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
S_Lakeshore_Ridgecrest_10	5.39	0.00	0.00	2.76	2.57	0.75	16.89	0.477
S_Lakeshore_Ridgecrest_20	5.39	0.00	0.00	2.39	2.95	0.81	18.30	0.547
S_Lakeshore_Ridgecrest_30	5.38	0.00	0.00	2.35	2.99	0.16	3.61	0.556
S_Lakeshore_Woodhaven_10	5.38	0.00	0.00	2.49	2.83	0.41	9.09	0.526
S_Lakeshore_Woodhaven_20	5.38	0.00	0.00	2.20	3.15	0.03	0.64	0.584
S_Lakeshore_Woodhaven_30	5.39	0.00	0.00	2.20	3.14	0.04	0.83	0.583
S_Lakeshore_Woodhaven_40	5.39	0.00	0.00	2.24	3.10	0.16	3.56	0.575
S_Lakeshore_Woodhaven_50	5.39	0.00	0.00	1.13	4.22	0.02	0.44	0.783
S_Lakeshore_Woodhaven_60	5.39	0.00	0.00	2.78	2.56	0.01	0.28	0.475
S_Lakeshore_Woodhaven_70	5.38	0.00	0.00	2.42	2.92	0.21	4.91	0.541
S_Lakeshore_Rolling_10	5.39	0.00	0.00	2.38	2.94	1.55	33.85	0.546
S_Lakeshore_Rolling_20	5.39	0.00	0.00	2.28	3.05	1.43	31.74	0.566
S_Lakeshore_Rolling_30	5.38	0.00	0.00	2.10	3.24	0.03	0.74	0.601
S_Lakeshore_Rolling_40	5.39	0.00	0.00	1.80	3.54	0.06	1.42	0.658
S_Lakeshore_10	5.39	0.00	0.00	1.85	3.49	0.16	3.66	0.649
Allard_10	5.39	0.00	0.00	2.41	2.92	1.03	23.05	0.542
Allard_20	5.38	0.00	0.00	2.36	2.98	0.05	1.17	0.553
Allard_30	5.39	0.00	0.00	2.05	3.29	0.11	2.48	0.611

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
1_EL0123_PE*	JUNCTION	0.27	2.11	324.82	0 13:00
2_EL0122_PE	JUNCTION	0.08	0.54	322.02	0 13:00
3_EL0120_PE	JUNCTION	0.16	1.03	322.11	0 13:01
4_EL0118_PE	JUNCTION	0.09	0.54	317.44	0 13:01
1_EL0112_PE	JUNCTION	0.08	0.44	332.32	0 12:59

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

2_EL0113_JB	JUNCTION	0.08	0.39	327.37	0	13:00
3_EL0114_DI	JUNCTION	0.07	0.32	324.33	0	13:00
JUNCTION_1	JUNCTION	0.12	0.70	308.84	0	13:00
1_EL0590_PE	JUNCTION	0.20	1.26	344.60	0	12:59
2_EL0591_PE	JUNCTION	0.08	0.43	330.02	0	13:00
3_EL0125_DA*	JUNCTION	0.13	0.75	318.07	0	12:59
4_EL0126_PE	JUNCTION	0.18	0.95	309.07	0	13:00
JUNCTION_2*	JUNCTION	0.17	0.88	308.63	0	13:00
1_EL0086_SI*	JUNCTION	0.27	1.61	316.11	0	12:59
2_EL0087_PE	JUNCTION	0.18	2.23	314.67	0	13:02
3_EL0089_PE	JUNCTION	0.48	2.98	314.76	0	13:01
4_EL0090_PE	JUNCTION	0.17	0.98	312.67	0	13:01
5_EL0092_PE	JUNCTION	0.54	3.75	306.32	0	12:59
6_EL0094_PE	JUNCTION	0.19	0.99	302.54	0	13:00
1_EL0081_DA*	JUNCTION	0.08	0.47	299.47	0	12:59
2_EL0082_CB	JUNCTION	0.12	0.80	298.53	0	13:00
3_EL0083_PE	JUNCTION	0.37	0.56	297.84	0	00:01
1_EL0043_PE	JUNCTION	0.25	1.55	329.73	0	12:59
2_EL0044_CB	JUNCTION	0.22	1.28	328.78	0	13:00
3_EL0045_CB	JUNCTION	0.23	1.35	327.61	0	13:00
4_EL0046_JB	JUNCTION	0.19	0.91	320.89	0	13:01
6_EL0047_JB	JUNCTION	0.14	0.84	306.85	0	13:01
7_EL0048_PE	JUNCTION	0.15	0.83	302.25	0	13:01
3A_EL0115_DA*	JUNCTION	0.03	0.11	331.17	0	12:59
S_LAKESHORE_WOODHAVEN	OUTFALL	9.72	9.72	297.22	0	00:00
S_LAKESHORE_RIDGECREST	OUTFALL	9.82	9.82	297.12	0	00:00
S_LAKESHORE_ROLLING	OUTFALL	6.29	6.29	297.24	0	00:00
S_LAKESHORE	OUTFALL	6.71	6.71	297.65	0	00:00
S_LAKESHORE_ALLARD	OUTFALL	6.71	6.71	297.65	0	00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
1_EL0123_PE*	JUNCTION	9.09	9.09	0 12:59	0.406	0.406
2_EL0122_PE	JUNCTION	0.00	9.05	0 13:00	0.000	0.406
3_EL0120_PE	JUNCTION	0.64	9.56	0 13:00	0.028	0.434
4_EL0118_PE	JUNCTION	0.83	10.20	0 13:00	0.037	0.470
1_EL0112_PE	JUNCTION	3.55	3.55	0 12:59	0.158	0.158
2_EL0113_JB	JUNCTION	0.00	3.55	0 13:00	0.000	0.158
3_EL0114_DI	JUNCTION	0.00	3.98	0 13:00	0.000	0.178
JUNCTION_1	JUNCTION	5.19	19.31	0 12:59	0.224	0.873
1_EL0590_PE	JUNCTION	18.30	18.30	0 12:59	0.812	0.812
2_EL0591_PE	JUNCTION	0.00	18.27	0 13:00	0.000	0.812
3_EL0125_DA*	JUNCTION	16.88	16.88	0 12:59	0.750	0.750
4_EL0126_PE	JUNCTION	0.00	16.86	0 13:00	0.000	0.750
JUNCTION_2*	JUNCTION	3.61	38.60	0 13:00	0.157	1.718
1_EL0086_SI*	JUNCTION	31.73	31.73	0 12:59	1.428	1.428
2_EL0087_PE	JUNCTION	0.00	71.92	0 13:02	0.000	1.509
3_EL0089_PE	JUNCTION	0.74	97.89	0 13:00	0.033	1.544
4_EL0090_PE	JUNCTION	0.00	38.99	0 13:01	0.000	1.458
5_EL0092_PE	JUNCTION	35.25	72.58	0 12:59	1.611	3.069
6_EL0094_PE	JUNCTION	0.00	65.50	0 13:00	0.000	3.067
1_EL0081_DA*	JUNCTION	3.66	3.66	0 12:59	0.159	0.159
2_EL0082_CB	JUNCTION	0.00	3.66	0 13:00	0.000	0.159
3_EL0083_PE	JUNCTION	0.00	12.89	0 00:00	0.000	0.193
1_EL0043_PE	JUNCTION	23.05	23.05	0 12:59	1.030	1.030
2_EL0044_CB	JUNCTION	0.00	23.02	0 13:00	0.000	1.030
3_EL0045_CB	JUNCTION	1.17	24.14	0 13:00	0.050	1.080
4_EL0046_JB	JUNCTION	0.00	24.14	0 13:01	0.000	1.080
6_EL0047_JB	JUNCTION	0.00	24.14	0 13:01	0.000	1.080
7_EL0048_PE	JUNCTION	2.48	26.38	0 13:01	0.107	1.187
3A_EL0115_DA*	JUNCTION	0.44	0.44	0 12:59	0.021	0.021
S_LAKESHORE_WOODHAVEN	OUTFALL	0.00	19.28	0 13:00	0.000	0.873

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

S_LAKESHORE_RIDGECREST	OUTFALL	0.00	38.35	0	13:00	0.000	1.716
S_LAKESHORE_ROLLING	OUTFALL	0.00	65.31	0	13:00	0.000	3.066
S_LAKESHORE	OUTFALL	0.00	12.89	0	00:00	0.000	0.223
S_LAKESHORE_ALLARD	OUTFALL	0.00	26.37	0	13:01	0.000	1.186

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
S_LAKESHORE_WOODHAVEN	95.14	1.53	19.28	0.873
S_LAKESHORE_RIDGECREST	94.57	3.02	38.35	1.716
S_LAKESHORE_ROLLING	94.60	5.37	65.31	3.066
S_LAKESHORE	99.89	0.36	12.89	0.223
S_LAKESHORE_ALLARD	94.88	2.08	26.37	1.186
System	95.81	12.36	152.86	7.064

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
12_CLAY_EL0123	CONDUIT	5.74	0 13:00	8.85	0.77	0.77
OVER_12_CLAY_EL0123	CONDUIT	3.32	0 13:00	3.07	0.01	0.05
S_LAKESHORE_WOODHAVEN_CHANNEL_1	CONDUIT		8.95	0 13:00	2.61	0.02
15_RCP_EL0120	CONDUIT	9.44	0 13:01	11.67	0.53	0.63
S_LAKESHORE_WOODHAVEN_CHANNEL_2	CONDUIT		10.20	0 13:01	5.93	0.15
15_RCP_EL0112	CONDUIT	3.55	0 13:00	10.33	0.19	0.32
15_RCP_EL0113	CONDUIT	3.55	0 13:00	12.19	0.15	0.29
15_RCP_EL0114	CONDUIT	3.98	0 13:00	8.41	0.15	0.41
S_LAKESHORE_WOODHAVEN_CHANNEL_3	CONDUIT		19.28	0 13:00	5.11	0.23
PROP_18_RCP_EL0590	CONDUIT	18.27	0 13:00	18.23	0.53	0.56
OVER_15_RCP_EL0590	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
S_LAKESHORE_RIDGECREST_CHANNEL_1*	CONDUIT		18.25	0 13:00	5.21	0.02
24_RCP_EL0125	CONDUIT	16.86	0 13:00	13.33	0.22	0.42
S_LAKESHORE_RIDGECREST_CHANNEL_2	CONDUIT		16.82	0 13:00	2.93	0.08
S_LAKESHORE_RIDGECREST_CHANNEL_3	CONDUIT		38.35	0 13:00	1.98	0.06
PROP_36_RCP_EL0086	CONDUIT	32.17	0 12:59	10.19	0.23	0.63
OVER_24_RCP_EL0086	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
S_LAKESHORE_ROLLING_CHANNEL_1	CONDUIT		97.20	0 13:00	4.08	0.07
PROP_36_EL0089	CONDUIT	38.99	0 13:01	8.27	1.05	0.66
OVER_24_HDPVC_EL0089	CONDUIT	0.00	0 00:00	0.00	0.00	0.02
S_LAKESHORE_ROLLING_CHANNEL_2	CONDUIT		38.69	0 13:01	4.27	0.22
PROP_48_RCP_EL0092	CONDUIT	65.50	0 13:00	10.14	0.45	0.64
OVER_24_RCP_EL0092	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
S_LAKESHORE_ROLLING_CHANNEL_3	CONDUIT		65.31	0 13:00	2.24	0.06

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

18_RCP_EL0081	CONDUIT	3.66	0	13:00	7.78	0.11	0.36			
18_RCP_EL0082	CONDUIT	3.65	0	13:00	5.74	0.29	0.39			
S_LAKESHORE_CHANNEL	CONDUIT	12.89	0	00:00	0.88	0.03	0.59			
30_RCP_EL0043	CONDUIT	23.02	0	13:00	8.51	0.31	0.55			
30_RCP_EL0044	CONDUIT	23.02	0	13:00	9.31	0.30	0.51			
30_RCP_EL0045	CONDUIT	24.14	0	13:01	11.01	0.31	0.46			
TWIN_18_RCP_EL0047	CONDUIT	24.15	0	13:01	11.95	0.38	0.56			
30_RCP_EL0046	CONDUIT	24.14	0	13:01	15.40	0.26	0.36			
S_LAKESHORE_ALLARD_CHANNEL	CONDUIT	26.37	0	13:01	3.04	0.17	0.71			
15_CLAY_EL0115	CONDUIT	0.44	0	12:59	3.36	0.02	0.17			

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Dry	Fraction of Up Dry	Down Dry	Time in Flow Sub Crit	Sup Crit	Class Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change		
12_CLAY_EL0123	5.42	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.98	0.0002		
OVER_12_CLAY_EL0123	9.02	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.0000		
S_LAKESHORE_WOODHAVEN_CHANNEL_1	21.31	0.04	0.00	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.50	0.0000
15_RCP_EL0120	3.70	0.04	0.00	0.00	0.01	0.95	0.00	0.00	3.90	0.0001		
S_LAKESHORE_WOODHAVEN_CHANNEL_2	1.36	0.04	0.00	0.00	0.00	0.00	0.20	0.76	0.00	0.00	1.08	0.0000
15_RCP_EL0112	6.32	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.09	0.0000		
15_RCP_EL0113	12.83	0.04	0.00	0.00	0.00	0.00	0.00	0.96	3.85	0.0000		
15_RCP_EL0114	3.04	0.04	0.00	0.00	0.00	0.95	0.00	0.00	3.00	0.0000		
S_LAKESHORE_WOODHAVEN_CHANNEL_3	1.00	0.00	0.04	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.11	0.0001
PROP_18_RCP_EL0590	2.09	0.04	0.00	0.00	0.00	0.96	0.00	0.00	5.83	0.0001		
OVER_15_RCP_EL0590	4.44	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000		
S_LAKESHORE_RIDGECREST_CHANNEL_1*	2.66	0.04	0.00	0.00	0.00	0.00	0.30	0.66	0.00	0.00	1.08	0.0000
24_RCP_EL0125	4.07	0.04	0.00	0.00	0.00	0.00	0.96	0.00	3.13	0.0000		
S_LAKESHORE_RIDGECREST_CHANNEL_2	2.12	0.04	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.45	0.0000
S_LAKESHORE_RIDGECREST_CHANNEL_3	1.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.03	0.0000
PROP_36_RCP_EL0086	6.67	0.04	0.00	0.00	0.00	0.95	0.00	0.00	2.93	0.0001		
OVER_24_RCP_EL0086	9.44	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000		
S_LAKESHORE_ROLLING_CHANNEL_1	36.14	0.04	0.00	0.00	0.00	0.95	0.01	0.00	0.00	0.43	0.0002	
PROP_36_EL0089	5.20	0.04	0.00	0.00	0.02	0.94	0.00	0.00	1.24	0.0013		
OVER_24_HDPVC_EL0089	4.33	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000		
S_LAKESHORE_ROLLING_CHANNEL_2	1.00	0.04	0.01	0.00	0.00	0.95	0.00	0.00	0.00	0.39	0.0003	
PROP_48_RCP_EL0092	5.25	0.04	0.00	0.00	0.00	0.96	0.00	0.00	2.16	0.0002		
OVER_24_RCP_EL0092	12.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000		
S_LAKESHORE_ROLLING_CHANNEL_3	1.15	0.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.03	0.0000
18_RCP_EL0081	23.21	0.04	0.00	0.00	0.00	0.03	0.00	0.93	3.14	0.0000		
18_RCP_EL0082	4.46	0.00	0.00	0.00	0.93	0.07	0.00	0.00	0.36	0.0001		
S_LAKESHORE_CHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0001		
30_RCP_EL0043	13.32	0.04	0.00	0.00	0.00	0.04	0.00	0.92	2.01	0.0001		
30_RCP_EL0044	7.43	0.04	0.00	0.00	0.00	0.07	0.00	0.89	2.22	0.0001		
30_RCP_EL0045	8.79	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.23	0.0001		
TWIN_18_RCP_EL0047	5.00	0.04	0.00	0.00	0.00	0.96	0.00	0.00	3.36	0.0002		
30_RCP_EL0046	1.05	0.04	0.00	0.00	0.00	0.00	0.00	0.96	2.87	0.0001		
S_LAKESHORE_ALLARD_CHANNEL	1.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.06	0.0000	
15_CLAY_EL0115	6.47	0.04	0.00	0.00	0.05	0.91	0.00	0.00	1.24	0.0000		

Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
PROP_36_EL0089	0.01	0.01	0.01	0.02	0.01

Analysis begun on: Thu Oct 25 13:52:34 2018
Analysis ended on: Thu Oct 25 13:52:35 2018

Alternative - South Lakeshore: Rolling & Ridgecrest (10-Year)

Total elapsed time: 00:00:01

Appendix I:

Condition Assessment Methodology

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

DATA COLLECTION AND ANALYSIS

Since running the prioritization tool is highly dependent upon existing infrastructure data, WK Dickson worked closely with the Town to compile as much available data regarding the stormwater infrastructure as possible. The data collection and analysis tasks included:

- Inventory and review of stormwater GIS database and attributes;
- Collection and review of relevant transportation and geographic data;
- Summary and analysis of data reviewed; and
- Confidence level and applicability to the prioritization tool.

As a result, the following information pertaining to the stormwater infrastructure was collected and analyzed for the prioritization tool:

- GIS data and attributes for stormwater systems
- GIS data for the following relevant layers:
 - o Road centerlines;
 - o Building footprints;
 - o Soils;
 - o Hydrography; and
 - o Critical Facilities.

SUMMARY OF EXISTING FACILITIES

In order to clearly identify critical infrastructure for each utility, WK Dickson separated the stormwater infrastructure database into stormwater pipes and stormwater structures. The following discussion presents a summary of the stormwater system assets and relative attributes that were incorporated into the prioritization tool for the criticality assessment.

Stormwater System Assets

The Eastwood Lake stormwater system infrastructure data includes 889 assets. The only pipe end type that was included in the analysis was headwall, since stub and flared end section are part of the pipe itself. Attributes assigned to these assets and considered for the stormwater system included the following:

- Unique ID;
- Pipe diameter;
- Pipe material;
- Installation date;
- Pipe length;
- Pipe slope;
- Capacity for drainage impoundment;
- Soil data;

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

- Proximity to transportation facilities;
- Proximity to buildings; and
- Proximity to critical facility.

Table I-1 summarizes the stormwater system assets that were incorporated into the prioritization tool.

Table I-1: Stormwater System Asset Summary

Asset Name	Number	Units
Unknown Storm Pipe	2,750	LF
8" Storm Pipe	30	LF
12" Storm Pipe	428	LF
15" Storm Pipe	12,295	LF
18" Storm Pipe	4,136	LF
24" Storm Pipe	4,127	LF
30" Storm Pipe	796	LF
36" Storm Pipe	1,291	LF
42" Storm Pipe	416	LF
48" Storm Pipe	207	LF
Catch Basin	213	EA
Drop Inlet	34	EA
Junction Box	32	EA
Pipe End	58	EA
Pond Structure	3	EA
Slab Top Inlet	15	EA
Difficult Access	24	EA
Underground Junction	3	EA

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CONDITION ASSESSMENT METHODOLOGY

Critical Facilities

Critical facilities are those service locations within the system where failure of infrastructure would have an impact on a large concentration of customers or customers that provide critical operations. In the case of Chapel Hill, the critical facilities were determined to be a combination of schools, emergency response stations, as well as parks and select commercial facilities. The following critical facilities located in the Eastwood Lake subwatershed were identified:

- Guy B. Phillips Middle School; and
- Estes Hills Elementary School.

GIS DATA AUDIT

WK Dickson performed an audit of the Town's GIS data in order to establish a confidence level for utilizing the data in the creation of the criticality assessment tool. The audit consisted of the following tasks:

- Review of GIS layer data to determine ability to assess for the criticality analysis;
- Review of attribute fields utilized for the assessment tool;
- Analysis of attribute data for use in the assessment tool; and
- Review of weighted criticality scoring values to determine audit locations/databases.

The data collection and audit enabled the tool to be applied with a high level of confidence and reliability. Tables I-2 and I-3 summarize the reliability of the attribute data based on the percentage of data available for each attribute relative to the total number of assets. Reliability can be improved over time as more information is entered into and linked to the GIS database.

Table I-2: Stormwater Pipes Attribute Reliability

Stormwater Pipes – Likelihood		Stormwater Pipes – Consequence	
Field	Data Set	Field	Data Set
Installation Date	83.90%	Proximity to Impaired Streams	100.00%
Pipe Length	100.00%	Pipe Diameter	90.65%
Age	83.90%	Proximity to Critical Facilities	100.00%
Remaining Life	83.90%	Under Roadway	100.00%
Material Type	96.81%	Proximity to Buildings	100.00%
Under Roadway	100.00%	Potential for Water Impoundment	100.00%
Pipe Slope	78.18%	Average	98.44%
Corrosive Soils	100.00%		
Average	90.84%		

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CONDITION ASSESSMENT METHODOLOGY

Table I-3: Stormwater Structure Attribute Reliability

Stormwater Pipes – Likelihood		Stormwater Pipes – Consequence	
Field	Data Set	Field	Data Set
Installation Date	90.08%	Potential for Water Impoundment	100.00%
Age	90.08%	Proximity to Streams	100.00%
Remaining Life	90.08%	Proximity to Impaired Streams	100.00%
Material Type	90.83%	Proximity to Buildings	100.00%
Corrosive Soils	100.00%	Proximity to Critical Facilities	100.00%
Average	92.21%	In Roadway	100.00%
		Average	100.00%

As shown in Tables I-2 and I-3, data reliability was sufficiently high to obtain a full measure of the criticality of each asset.

CRITICALLY SCORING AND METHODOLOGY

WK Dickson coordinated with the Town's staff to establish the criticality scoring criteria and assign weighted values for use in the prioritization tool. Attribute scoring categories provide a quantitative value for the likelihood and consequence of failure and associated criticality score summation. Tasks for the criticality scoring and methodology included:

- Establishment of scoring criteria and attribute factors;
- Prioritization of scoring criteria (weighted attribute scoring;)
- Establishment of final scoring system and documentation of methodology; and
- Application of scoring criteria to system assets to obtain ranking and thresholds.

System scoring was established based on each attribute having a total weighted score factor multiplied by an attribute weight factor. Each attribute was assigned between 2 to 6 factors with a scoring range between 0 and 10. The attribute factor was then multiplied by an attribute weighting score to develop a total attribute score. Scores were added together within the likelihood of failure category and the consequence of failure category.

Tables I-4 through I-7 summarize the final attributes, attribute factors, factor scoring, and weighted attribute scoring used in the prioritization tool for the criticality assessment.

Limitations of the scoring system included availability of data, accuracy of data, and associated reliability scoring as discussed in the GIS data audit section. Where limitations were identified, attribute weighting was adjusted to reflect lack of data. Therefore, the limitation would not skew the scoring as an extreme value, i.e. assuming zero for no data would indicate a recent install date.

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

Throughout the assessment data review and progress meetings, certain assumptions were made to provide higher data reliability and represent actual system conditions. Assumptions of attribute values were limited to only information the Town could verify with a high probability of accuracy. Where availability of data was limited, the weighting of that category was adjusted so that known system elements governed the criticality score. The following assumptions and efforts were made throughout the project to provide the most reliable asset scoring:

- Remaining Useful Life (RUL) – Remaining Useful Life considers the estimated life cycle of the asset based on material and calculates its remaining life based on the install date.
- Impoundment – Potential for water impoundment considers the following pipes and structures as higher criticality due to the potential for large quantities of stormwater to be detained and subsequently released if the given structure or pipe fails:
 - o Pipes and structures that make up the outlets of stormwater detention facilities; and
 - o Pipes and structures that make up road or railroad crossings.
- Information regarding corrosive soils was linked to GIS from County soil maps. Soil survey data rank metallic and cementitious pipe risk of corrosion as low, moderate or high based on soil drainage class, total acidity, electrical resistivity and conductivity.

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

Table I-4: Stormwater Pipes Scoring Matrix – Likelihood of Failure

Attribute	Attribute Weighted Scoring	Attribute Factor	Attribute Factor Weighting
Remaining Useful Life (RUL)*	16.00	Less than 10%	10
		Between 10 and 39%	8
		Between 40 and 49%	6
		Between 50 and 69%	4
		Between 70 and 89%	2
		Greater than 89%	0
Slope	20.00	Less than 0.2%	3
		Between 0.2% and 1%	1
		Between 1% and 2%	3
		Between 2% and 4%	3
		Greater than 4%	6
Corrosive Soils	4.00	Corrosive Soil/Metallic Pipe	10
		Non-Corrosive	0
Location under Transportation Facilities	20.00	Under Interstate/Highway	10
		Under Railroad	8
		Under Local Road	2

*Category considers pipe material in the analysis.

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

Table I-5: Stormwater Pipes Scoring Matrix – Consequence of Failure

Attribute	Attribute Weighted Scoring	Attribute Factor	Attribute Factor Weighting
Pipe Diameter	12.00	Greater than 42	10
		37 to 42	8
		25 to 36	6
		16 to 24	4
		8 to 15	2
		Less than 8	0
Proximity to Transportation Infrastructure	20.00	Under Interstate/Highway	10
		Under Railroad	8
		Under Local Road	2
Proximity to Building	16.00	Within Building Footprint	10
		Up to 20 feet from Building	5
		Greater than 20 feet	0
Potential for Water Impoundment	8.00	Potential Impoundment	10
		No Potential Impoundment	0
Proximity to Critical Facility	20.00	Up to 100 feet from Building	10
		Greater than 100 feet	0
Proximity to Impaired Streams	8.00	Up to 25 feet from stream	10
		26 to 50 feet from stream	5
		Greater than 50 feet	0
Proximity to Streams	8.00	Up to 25 feet from stream	10
		26 to 50 feet from stream	5
		Greater than 50 feet	0

Table I-6: Stormwater Structure Scoring Matrix – Likelihood of Failure

Attribute	Attribute Weighted Scoring	Attribute Factor	Attribute Factor Weighting
Remaining Useful Life (RUL)*	18.00	Less than 10%	10
		Between 10 and 39%	8
		Between 40 and 49%	6
		Between 50 and 69%	4
		Between 70 and 89%	2
		Greater than 89%	0
Corrosive Soils	8.0	Corrosive Soil	10
		Non-Corrosive	0

*Category considers manhole material in the analysis.

APPENDIX I

CONDITION ASSESSMENT METHODOLOGY

Table I-7: Stormwater Structure Scoring Matrix – Consequence of Failure

Attribute	Attribute Weighted Scoring	Attribute Factor	Attribute Factor Weighting
Proximity to Streams	14.00	Up to 100 feet	10
		101 feet to 500 feet	5
		Greater than 500 feet	0
Proximity to Impaired Streams	24.00	Up to 100 feet	10
		101 feet to 500 feet	5
		Greater than 500 feet	0
Proximity to Transportation Infrastructure	14.00	Under Interstate/Highway ROW	10
		Under Railroad ROW	8
		Under Local Road ROW	2
Proximity to Building	14.00	Within Building Footprint	10
		Up to 20 feet from Building	5
		Greater than 20 feet	0
Proximity to Critical Facility	18.00	Within Building Footprint	10
		Up to 25 feet from Building	5
		Greater than 25 feet	0
Potential for Water Impoundment	8.00	Potential Impoundment	10
		No Potential Impoundment	0

Eastwood Lake Subwatershed Study - System Prioritization											
System ID	System Location	Maintained By	# of Pipes	# of Structures	Total Pipe Score	Total Structure Score	Average Pipe Score	Average Structure Score	Total Average Score	Highest Pipe Criticality	Highest Structure Criticality
1	Lakeshore Ln	ToCH	6	7	2124	1520	354	217	571	3	4
2	Red Bud Rd	ToCH	8	9	3580	2170	448	241	689	4	5
3	N Lakeshore Dr/Lakeshore Ct	ToCH	10	11	3816	2430	382	221	603	3	4
4	2113 N Lakeshore Dr	ToCH	1	2	504	420	504	210	714	4	3
5	2106 N Lakeshore Dr	ToCH	6	8	2612	2040	435	255	690	3	5
6	2009 S Lakeshore Dr	ToCH	2	3	848	660	424	220	644	3	4
7	Intersection of Ridgecrest Dr & S Lakeshore Dr	ToCH	1	2	504	420	504	210	714	4	3
8	1917 S Lakeshore Dr	ToCH	1	2	420	420	420	210	630	3	3
9	1901 S Lakeshore Dr	ToCH	3	5	1348	1070	449	214	663	4	4
10	1825 S Lakeshore Dr	ToCH	4	5	1956	1150	489	230	719	4	5
11	Intersection of Woodhaven Rd & Rolling Rd	ToCH	3	4	1276	660	425	165	590	4	4
12	Intersection of Knollwood Dr & Rolling Rd	ToCH	6	8	2792	1360	465	170	635	4	4
13	Michaux Rd between Allard Rd & Vernon Hills Ct	ToCH	9	10	3928	2080	436	208	644	4	4
14	East end of Allard Rd	ToCH	4	5	1888	1060	472	212	684	4	4
15	Intersection of Audubon Rd & Michaux Rd	ToCH	5	6	2344	1200	469	200	669	4	4
16	1816 S Lakeshore Dr	ToCH	2	4	768	840	384	210	594	3	3
17	1810 S Lakeshore Dr	ToCH	1	2	468	420	468	210	678	3	3
18	1808 S Lakeshore Dr	ToCH	2	3	716	610	358	203	561	2	4
19	1806 S Lakeshore Dr	ToCH	5	6	2476	1460	495	243	739	4	5
20	Intersection of Allard Rd & Lyons Rd	ToCH	2	3	620	450	310	150	460	2	3
21	414 Lyons Rd	ToCH	4	5	1908	1060	477	212	689	4	4
22	405 N Elliott Rd	ToCH	2	3	764	450	382	150	532	3	3
23	N Lakeshore Dr/Kenmore Rd	ToCH	9	10	3964	2210	440	221	661	4	5
24	Kenmore Rd between N Lakeshore Dr & Shadylawn Rd	ToCH	4	5	1576	590	394	118	512	3	3
25	Intersection of Kenmore Rd & Shadylawn Rd	ToCH	3	4	1020	280	340	70	410	2	1
26	624 Shadylawn Rd	ToCH	1	2	552	280	552	140	692	4	2
27	Summit Rd/Shadylawn Rd	ToCH	3	4	1152	520	384	130	514	3	3
28	Shadylawn Rd between Summit Rd & N Lakeshore Dr	ToCH	2	3	752	420	376	140	516	2	3
29	2004 N Lakeshore Dr	ToCH	3	4	1092	800	364	200	564	2	4
30	2000 N Lakeshore Dr	ToCH	3	4	1172	750	391	188	578	3	4
31	1831 N Lakeshore Dr	ToCH	6	7	2728	2070	455	296	750	3	5
32	1833 N Lakeshore Dr	ToCH	3	4	1184	1080	395	270	665	3	5
33	1818 N Lakeshore Dr	ToCH	2	3	840	630	420	210	630	3	3
34	Intersection of N Lakeshore Dr & Rock Creek Rd	ToCH	1	2	364	400	364	200	564	2	4
35	601 Rock Creek Rd	ToCH	5	6	1876	1660	375	277	652	3	5
36	Intersection of N Lakeshore Dr & Kensington Dr	ToCH	3	4	1684	1340	561	335	896	5	5
37	Intersection of N Lakeshore Dr & S Lakeshore Dr	ToCH	3	4	1228	1080	409	270	679	3	5
38	2122 Meares Rd	Private	1	2	340	280	340	140	480	2	2
39	604 Arlington St	ToCH	2	3	728	540	364	180	544	2	4
40	620 Arlington St	ToCH	3	4	1632	950	544	238	782	5	4
41	622 Arlington St	ToCH	2	3	1148	640	574	213	787	5	4
42	624 Arlington St	ToCH	2	3	928	520	464	173	637	4	3
43	Rock Creek Rd/Croom Ct/Wells Ct	ToCH	13	14	6852	3770	527	269	796	4	5
44	600 Kensington Dr	ToCH	1	2	420	560	420	280	700	3	4
45	Intersection of Kensington Dr & Concordia Ct	ToCH	7	8	3480	2160	497	270	767	4	5
46	611 Kensington Dr	ToCH	1	2	496	420	496	210	706	4	3
47	Intersection of Kensington Dr & Beech Tree Ct	ToCH	7	9	2880	2420	411	269	680	4	5
48	Curtis Rd between N Elliott Rd & Allard Rd	ToCH	13	14	5920	2910	455	208	663	4	5
49	919 Shadylawn Rd	Private	1	2	364	140	364	70	434	2	1
50	645 Rock Creek Rd	ToCH	3	4	1332	1200	444	300	744	4	5
51	Totten Pl	ToCH	3	4	1132	990	377	248	625	3	4
52	625 Kensington Dr	ToCH	3	5	1588	1290	529	258	787	4	5
53	627 Kensington Dr	ToCH	1	2	492	420	492	210	702	4	3
54	629 Kensington Dr	ToCH	1	2	552	280	552	140	692	4	2
55	500 N Estes Dr	ToCH	1	2	400	400	400	200	600	2	4
56	500 N Estes Dr	ToCH	2	3	752	710	376	237	613	3	4
57	500 N Estes Dr	ToCH	5	6	1404	1020	281	170	451	2	3

Eastwood Lake Subwatershed Study - System Prioritization											
System ID	System Location	Maintained By	# of Pipes	# of Structures	Total Pipe Score	Total Structure Score	Average Pipe Score	Average Structure Score	Total Average Score	Highest Pipe Criticality	Highest Structure Criticality
58	500 N Estes Dr	ToCH	3	4	984	500	328	125	453	2	3
59	500 N Estes Dr	ToCH	1	2	340	70	340	35	375	2	1
60	500 N Estes Dr	ToCH	4	6	1300	1120	325	187	512	2	4
61	635 Kensington Dr	ToCH	1	2	472	420	472	210	682	3	3
62	Intersection of Kensington Dr & Wellington Dr	ToCH	6	7	2840	1370	473	196	669	4	4
63	706 Wellington Dr	ToCH	4	5	2292	1410	573	282	855	5	5
64	Porter Pl	ToCH	2	3	916	660	458	220	678	3	4
65	235 Huntington Dr	ToCH	1	2	424	400	424	200	624	3	4
66	104 Nuttall Pl	Private	2	3	728	730	364	243	607	3	4
67	Intersection of Nuttall Pl & Collinson Dr	Private	10	11	4104	2410	410	219	629	4	4
68	100 Nuttall Pl	Private	1	2	528	280	528	140	668	4	2
69	105 Catesby Ln	ToCH	2	3	704	540	352	180	532	2	4
70	Intersection of Eastwood Rd & Piney Mountain Rd	ToCH	4	5	1352	780	338	156	494	2	4
71	Billie Holiday Ct	Private	4	6	1536	1200	384	200	584	3	5
72	Intersection of Louis Armstrong Ct & Piney Mountain Rd	ToCH	3	4	1312	920	437	230	667	4	4
73	Intersection of Forest Hill Rd & Seminole Dr	ToCH	1	2	408	140	408	70	478	3	1
74	247 Seminole Dr	ToCH	1	2	388	210	388	105	493	2	2
75	242 Indian Trail Dr	ToCH	1	2	488	420	488	210	698	4	3
76	Intersection of Forest Hill Rd & Indian Trail Dr	ToCH	1	2	608	280	608	140	748	5	2
77	235 Forest Hill Rd	ToCH	1	2	548	280	548	140	688	4	2
78	162 Lake Ellen Dr	ToCH	1	2	548	280	548	140	688	4	2
79	147 Lake Ellen Dr	ToCH	1	2	468	280	468	140	608	3	2
80	Intersection of Priestly Creek Dr & Oosting Dr	ToCH	6	7	2956	1930	493	276	768	5	5
81	101 Oosting Dr	ToCH	1	2	284	260	284	130	414	1	3
82	100 Collinson Dr	Private	1	2	420	420	420	210	630	3	3
83	100 Priestly Creek Dr	ToCH	1	2	380	350	380	175	555	2	3
84	Intersection of Piney Mountain Rd & Priestly Creek Dr	ToCH	1	2	388	350	388	175	563	2	3
85	105 Priestly Creek Dr	ToCH	2	3	888	800	444	267	711	4	4
86	Old Forest Creek Dr/Darlin Cir	ToCH	6	7	2448	1700	408	243	651	4	4
87	137 Old Forest Creek Dr	ToCH	6	7	2812	2000	469	286	754	4	5
88	112 Mendel Dr	ToCH	2	3	768	560	384	187	571	2	4
89	231 Huntington Dr	ToCH	1	2	548	420	548	210	758	4	3
90	Pinchot Ln	ToCH	1	2	528	470	528	235	763	4	4
91	Old Forest Creek Dr/Piney Mountain Rd	ToCH	9	10	4048	1770	450	177	627	4	4
92	223 Huntington Dr	ToCH	3	4	1800	800	600	200	800	5	4
93	Somerset Dr/Huntington Dr	ToCH	7	8	2248	1210	321	151	472	2	3
94	221 Huntington Dr	ToCH	1	2	504	310	504	155	659	4	3
95	216 Huntington Dr	ToCH	2	3	828	520	414	173	587	3	3
96	217 Huntington Dr	ToCH	2	4	680	560	340	140	480	2	2
97	Linnaeus Pl	ToCH	5	6	2204	1300	441	217	657	4	4
98	110 Linnaeus Pl	ToCH	1	2	340	280	340	140	480	2	2
99	108 Linnaeus Pl	ToCH	1	2	340	280	340	140	480	2	2
100	Timber Hollow Ct	ToCH	1	2	340	280	340	140	480	2	2
101	Behind 105 Woodshire Ln	ToCH	1	2	480	280	480	140	620	3	2
102	Woodshire Ln	ToCH	8	9	4044	1960	506	218	723	4	4
103	Timber Hollow Ct/Mendal Dr	ToCH	10	11	3628	2180	363	198	561	4	4
104	Piney Mountain Rd/Timber Hollow Ct	ToCH	8	9	2840	1590	355	177	532	3	3
105	Behind 110 Woodshire Ln	ToCH	1	2	360	290	360	145	505	2	2
106	Shadowood Apartments	Private/NCDOT/ToCH	31	33	14920	7750	481	235	716	5	5
107	Intersection of N Estes Dr & MLK Jr Blvd	NCDOT	1	2	708	400	708	200	908	5	4

Appendix J:

Digital Copy of Hydrologic and Hydraulic Models

**DIGITAL COPY OF
HYDROLOGIC AND
HYDRAULIC MODELS TO
BE INCLUDED WITH
SEALED REPORT**

Appendix K:

Stream Assessment Data

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION	
STATION #	RIVERMILE	STREAM CLASS
LAT	LONG	RIVER BASIN
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE TIME	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE __ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE __ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE __ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE __ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE __ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE __ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score _____

OVERALL STREAM CONDITION																					
	Optimal					Suboptimal					Marginal					Poor					
IN-STREAM HABITAT <i>(May modify criteria based on appropriate habitat regime)</i>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).					40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
VEGETATIVE PROTECTION <i>(score each bank, determine sides by facing downstream)</i>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
	Left Bank	10		9		8	7		6		5	4		3		2	1		0		
	Right Bank	10		9		8	7		6		5	4		3		2	1		0		
BANK EROSION <i>(facing downstream)</i>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.					Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure					Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.					
	Left Bank	10		9		8	7		6		5	4		3		2	1		0		
	Right Bank	10		9		8	7		6		5	4		3		2	1		0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.					High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.					High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.					High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OVERALL BUFFER AND FLOODPLAIN CONDITION																					
	Optimal					Suboptimal					Marginal					Poor					
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.					Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.					Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.					Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.					
	Left Bank	10		9		8	7		6		5	4		3		2	1		0		
	Right Bank	10		9		8	7		6		5	4		3		2	1		0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest					Predominant floodplain vegetation type is young forest					Predominant floodplain vegetation type is shrub or old field					Predominant floodplain vegetation type is turf or crop land					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water					Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water					Either all wetland or all non-wetland habitat, evidence of standing/ponded water					Either all wetland or all non-wetland habitat, no evidence of standing/ponded water					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures					Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function					Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function					Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Sub Total In-stream: ____ /80 + Buffer/Floodplain: ____ /80 = Total Survey Reach ____ /160																					

Riparian Buffer Enhancement



Before



After



Streambank Stabilization



Head-cut Stabilization and Stream Channel Grade Control



Perched Culvert Rectification



Stream Channel Restoration/Relocation



Regenerative Stormwater Conveyances (RSC)



Appendix L:

Prioritization Matrix

List of Contents:

1. Eastwood Lake Project Prioritization Matrix
2. Category Summary for Prioritization Matrix

Project Prioritization Matrix

CATEGORY	Public Health and Safety		Severity of Street Flooding (Public ROW)		Cost Effectiveness		Effect of Improvements		Water Quality - BMP		Water Quality - Erosion Control		Implementation Constraints		Constructibility		TOTAL WEIGHTED SCORE	
Primary System Projects																		
Piney Mountain Road - Culvert	3	30	3	30	3	30	3	18	0	0	0	0	3	9	1	3	120	
Secondary System Projects																		
Woodshire Lane/Huntington Road	1	10	1	10	3	30	3	18	0	0	3	18	3	9	3	9	104	
Shady Lawn Road System	1	10	1	10	3	30	1	6	0	0	1	6	5	15	5	15	92	
Arlington Street #1 System	3	30	1	10	5	50	1	6	0	0	0	0	5	15	3	9	120	
Arlington Street #2 System	1	10	1	10	3	30	1	6	0	0	0	0	5	15	3	9	80	
South Lakeshore Drive/Ridgecrest Drive System	3	30	1	10	5	50	1	6	0	0	1	6	5	15	3	9	126	
South Lakeshore Drive/Rolling Road System	1	10	3	30	3	30	3	18	0	0	3	18	3	9	3	9	124	

Category	General Description	Score	Evaluation Criteria
Public Health and Safety	Evaluates potential impact of flooding on public health and safety. Generally, refers to flooding in and around habitable structures.	5	Flood water depth and/or velocity completely surrounds and threatens the structural integrity of habitable structures or vehicles. Finished Floor Flooding Occurs during the design storm.
		3	Flood water surrounds structure but does not cause imminent danger. Crawl space and HVAC units are flooded.
		1	Yard flooding occurs and flood waters are near HVAC, crawl spaces or foundations.
		0	Minor yard flooding may occur but habitable structure is not directly affected.
Severity of Street Flooding (Town Owned)	Evaluates impact of flood depths to or through an area	5	Street spread requirements are not met and are so severe that the street becomes impassable during the design storm or street flooding has spread into private property. Flooding is noted on NCDOT roads as a result spread issues on adjacent town owned street.
		4	
		3	Street spread requirements are not met and the streets are passable only through the center of the street. Flooding noted on collector and local streets.
		2	
		1	Spread requirements exceeded but street flooding is considered minor nuisance for traffic.
		0	Spread requirements are met.
Cost Effectiveness	Evaluates the benefit/cost of the proposed improvements	5	Project benefit ratio is greater than 1.5
		3	Project benefit ratio is between 0.5 and 1.5
		1	Project benefit ratio is between 0.075 and 0.5
		0	Project ratio is less than 0.075
Effect of Improvements	Evaluates the number of drainage issues resolved and the number of citizens positively affected	5	Multiple major drainage issues are being resolved through the proposed improvements such as street spread and increased drainage capacity. Proposed improvements would resolve major drainage issues for more than 5 properties.
		4	
		3	Single drainage issue is being resolved and it is considered major. Proposed improvements would resolve drainage issues for 3-5 properties.
		2	
		1	Single drainage issue is being resolved and it is considered major. Proposed improvements would resolve drainage issues for 2-3 properties.
		0	Single drainage issue is being resolved and it is considered minor. Proposed improvements would resolve drainage issue(s) for a single property at most.
Water Quality/Quantity	Evaluates the impact a BMP would have on water quality, water quantity and NPDES Phase II Compliance	5	Provides both water quantity and water quality benefits. Does not use manufactured or proprietary BMP technology. Incorporates some form of green solution such as infiltration, LID, sustainability etc. Is considered a BMP retrofit.
		3	Provides water quality benefits but does not provide water quantity benefit. Is considered a BMP retrofit
		1	Improvements will have minimal impacts on water quality and would primarily serve as a demonstration project. Is considered a BMP retrofit.
		0	Improvements will have no measurable impact on water quality and would serve only as a demonstration project.
Open Channel - Erosion Control	Evaluates the severity of erosion control issues and impact on water quality	5	Severe erosion problems are evident and are contributing significantly to water quality issues.
		3	Moderate erosion problems are evident and are contributing to water quality issues.
		1	Minor erosion control issues are evident and are contributing to water quality issues.
		0	Minor erosion control issues are evident and are not contributing to water quality issues in a significant way.

Implementation Constraints	Considers potential constraints that may either delay or make the project too difficult to construct. Some examples would include significant permitting issues, high mitigation costs, numerous easement needs, required partnering with other communities, the NCDOT, or railroads.	5	Only minor local or state permits required. Does not involve ACOE, DWQ or FEMA.
			Proposed improvements can be completed without permanent or temporary easements.
			Project can proceed independent of other stormwater improvements identified in the master plan.
		3	Requires State and Federal permits that are typically easy to obtain such as Nationwide permits, FEMA No Rise etc.
			Primarily requires temporary easements with only a few permanent easements needed to build the project.
			Improvements may have limited coordination with other projects such as DOT widening, GUC utility improvements or down stream drainage improvements. Significant delays in the schedule due to this coordination is not anticipated.
			Project can proceed independent of other stormwater improvements identified in the master plan.
			Project is self mitigating or requires very minor mitigation.
		1	Numerous permits required including federal, state and local agencies. Examples would include an individual permit or FEMA CLOMR/LOMR.
			Extensive permanent and temporary easements are required.
			Project can not proceed independent of other stormwater improvements identified in the master plan.
Constructability	Evaluates relative constructability of the project including site constraints, traffic and neighborhood impacts, and impacts on adjacent property owners.	5	Limited to no site constraints.
			Limited to no utility conflicts.
			Limited to no impacts on adjacent property owners.
			Limited to no impacts on traffic or surround neighborhoods.
		3	Some site constraints exist but are considered fairly minor.
			Some utility conflicts exist but are routine and do not require major utility relocation.
			Some traffic and neighborhood impacts occur but are fairly minor. Examples include temporary lane closures, occasional hauling or traffic detours though adjacent neighborhoods.
		1	Site constraints exist and are fairly major.
			Utility conflicts exist and require rerouting or relocation of existing utilities.
			Traffic and neighborhood impacts occur and are fairly major. Examples included extended road closures or hauling operations.

Weight Factor	Criteria
10	Public Health and Safety
	Severity of Street Flooding (Town Owned)
	Cost Effectiveness
6	Effect of Improvements
	Water Quality - Quantity
	Open Channel - Erosion Control
	Implementation Constraints
	Grant Funding
3	Construction Impacts
	Constructability

The above table presents the weighting factors that will be applied to the prioritization criteria, with the reason being that some criteria are viewed as more important (i.e. deserve a higher weighting) than others. So each score of each prioritization criteria will be multiplied by the assigned weight factor for that prioritization criteria category as shown in the Priority Matrix.