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AN ARDURRA COMPANY

TOWN OF BLACK MOUNTAIN

BLACK MOUNTAIN STORMWATER MASTER PLAN

Appendix | December 2025





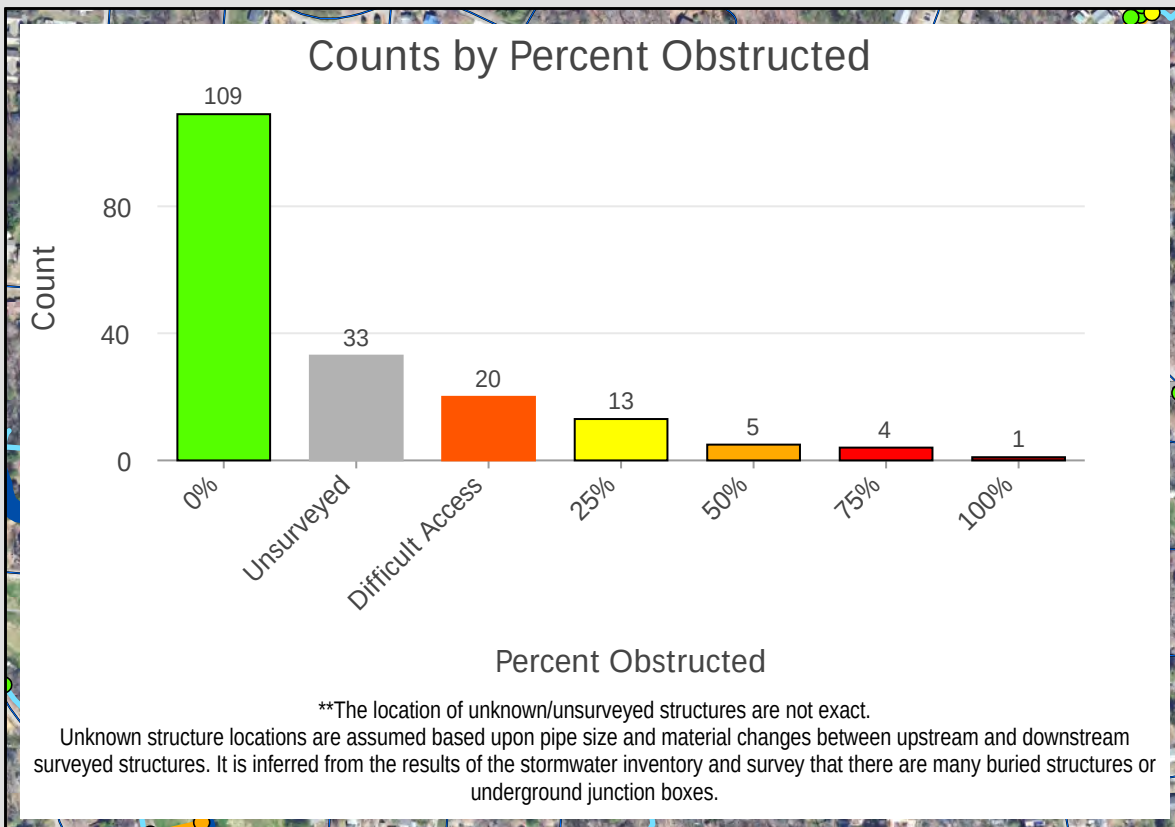

APPENDIX A
MAPS

Figure A-1 Downtown Obstructed Structures

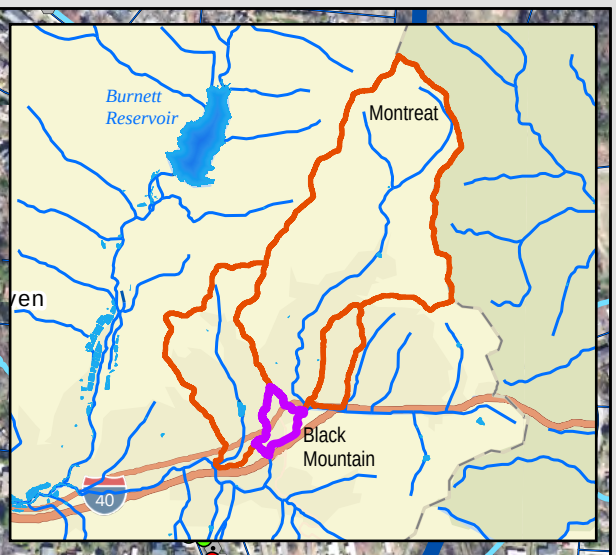
Figure A-2 Tomahawk Branch Obstructed Structures

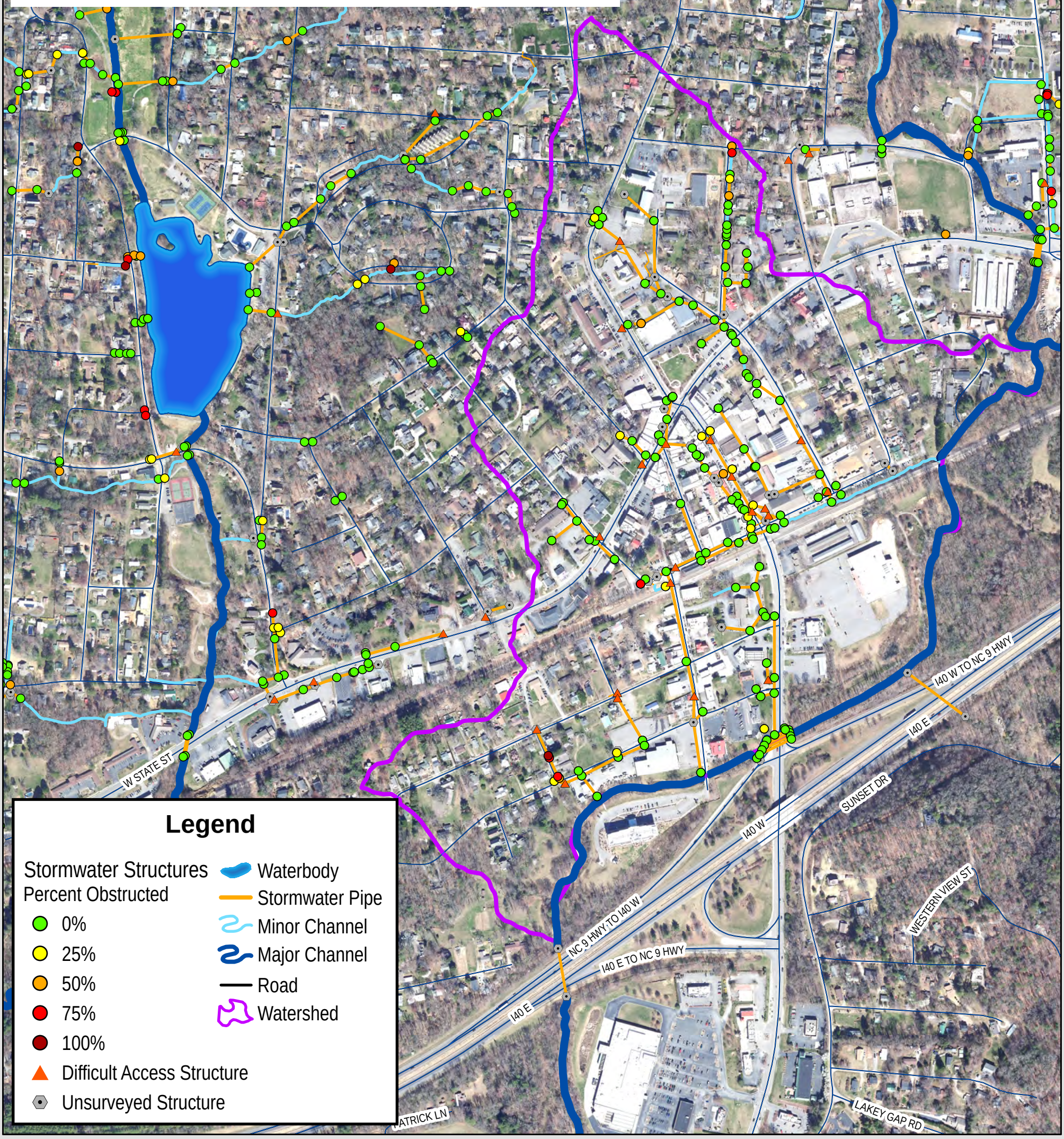
Figure A-3 Flat Creek Obstructed Structures

Figure A-4 Tributary 35 / Avena Rd Obstructed Structures



**The location of unknown/unsurveyed structures are not exact.
Unknown structure locations are assumed based upon pipe size and material changes between upstream and downstream surveyed structures. It is inferred from the results of the stormwater inventory and survey that there are many buried structures or underground junction boxes.





Legend

Stormwater Structures
Percent Obstructed
- 0%
- 25%
- 50%
- 75%
- 100%
- Difficult Access Structure
- Unsurveyed Structure

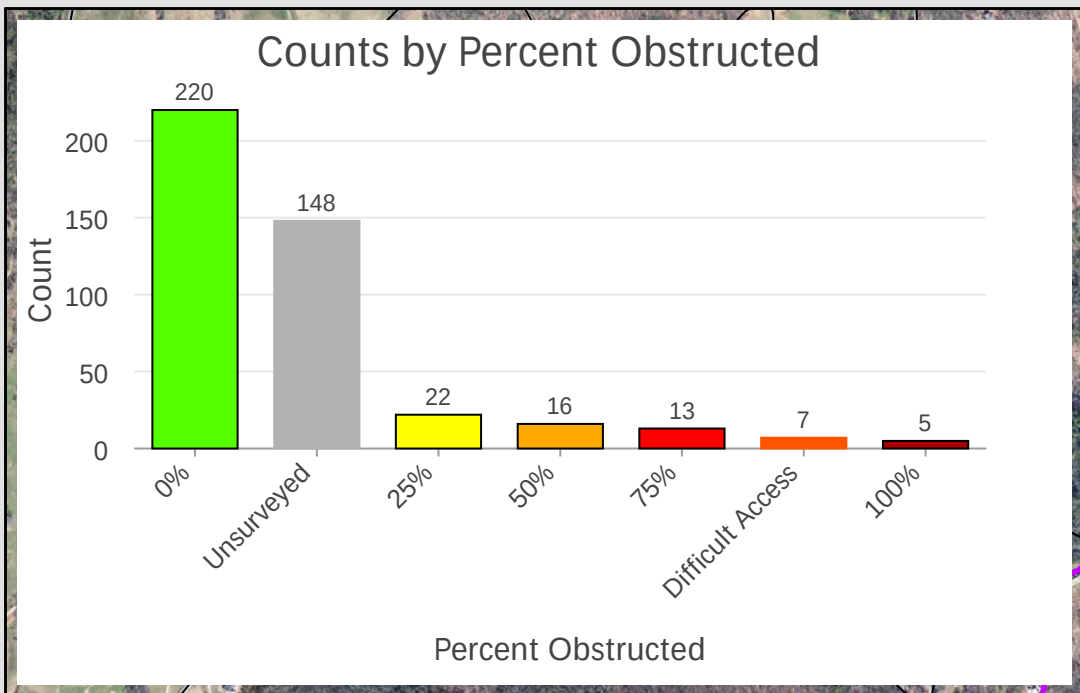
- Waterbody
- Stormwater Pipe
- Minor Channel
- Major Channel
- Road
- Watershed

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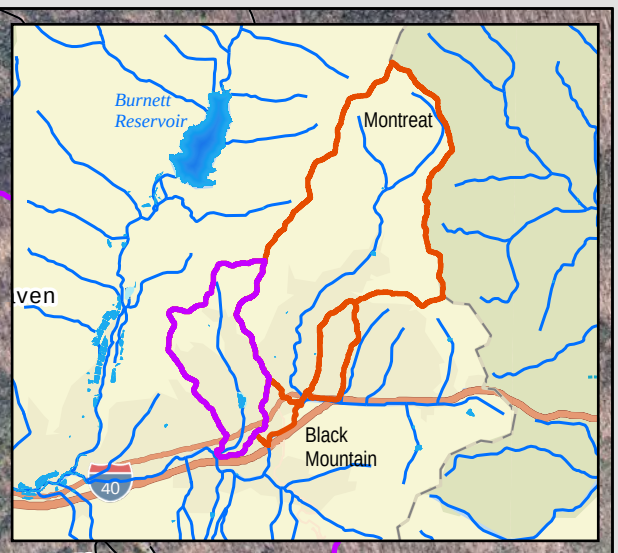
Figure A-1: Obstructed & Difficult Access Stormwater Structures
DOWNTOWN DRAINAGE SYSTEM
Town of Black Mountain Stormwater Master Plan

0 250 500 Feet
1 in = 500 ft

N W E S



**The location of unknown/unsurveyed structures are not exact.
Unkown structure locations are assumed based upon pipe size and material changes between upstream and downstream surveyed structures. It is inferred from the results of the stormwater inventory and survey that there are many buried structures or underground junction boxes.



SO HI TRL
HI VIEW DR
SELDOM HOME DR
TEMPLE RD
PINNACLE DR
CHAPEL RD
ALLEN MOUNTAIN DR
NORTH FORK RD
FAIRWAY DR
HILLTOP RD
VIEW ST
WHISPERING WIND DR
REED RD
MOUNT ALLEN HTS
VALLEY RIDGE LN
FRANCES AVE
CARVER AVE
W STATE ST
NC 9 HWY; TO I40 W
VETERANS PARK DR
I40 W
I40 E
BRIERBROOK RD
PATRICK LN
WHITE PINE DR

Legend

Stormwater Structures
Percent Obstructed
- 0%
- 25%
- 50%
- 75%
- 100%
- Difficult Access Structure
- Unsurveyed Structure

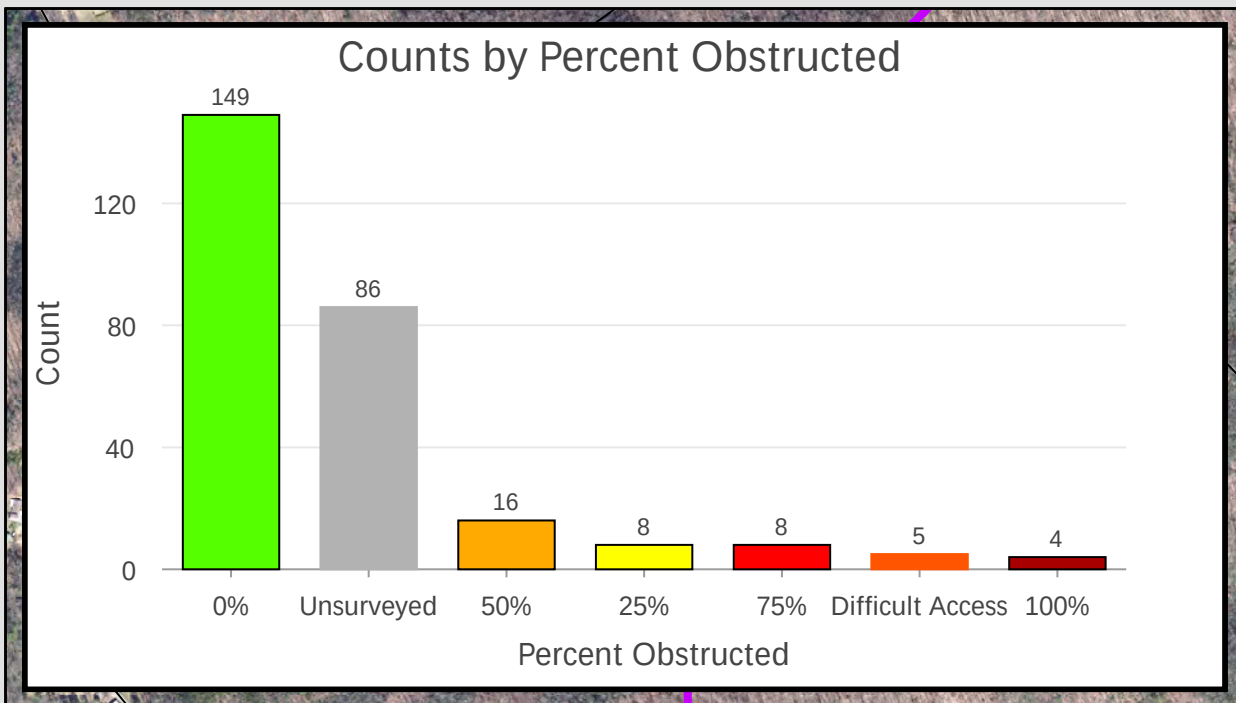
- Waterbody
- Stormwater Pipe
- Minor Channel
- Major Channel
- Road
- Watershed

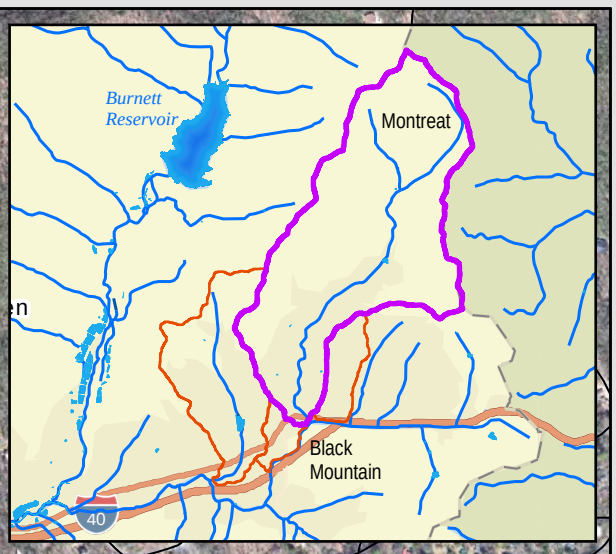
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Figure A-2: Obstructed & Difficult Access Stormwater Structures
TOMAHAWK BRANCH PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 500 1,000 Feet
1 in = 1,000 ft

N W E S





**The location of unknown/unsurveyed structures are not exact.
Unknown structure locations are assumed based upon pipe size and material changes between upstream and downstream surveyed structures. It is inferred from the results of the stormwater inventory and survey that there are many buried structures or underground junction boxes.

Legend

Stormwater Structures
Percent Obstructed
- 0%
- 25%
- 50%
- 75%
- 100%
- Difficult Access Structure
- Unsurveyed Structure

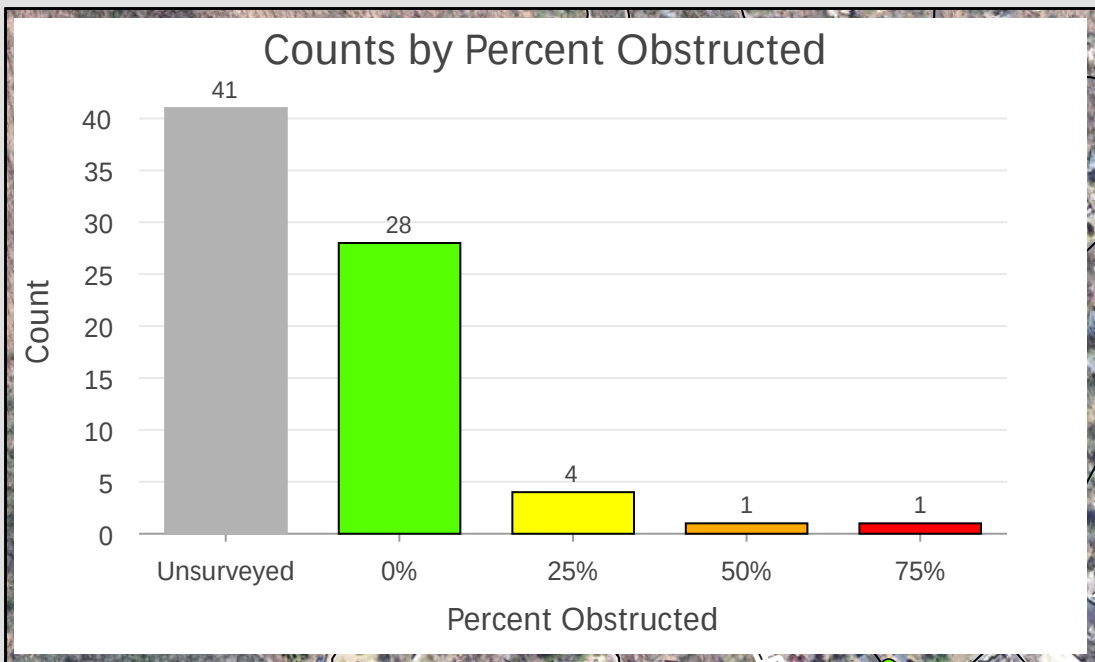
- Waterbody
- Stormwater Pipe
- Minor Channel
- Major Channel
- Road
- Watershed

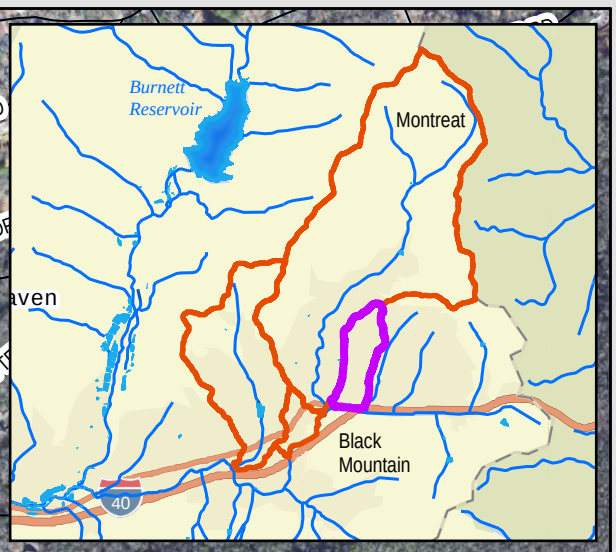
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Figure A-3: Obstructed & Difficult Access Stormwater Structures
FLAT CREEK TRIBUTARY 1 PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 400 800 Feet
1 in = 800 ft

N W E S





**The location of unknown/unsurveyed structures are not exact.
Unkown structure locations are assumed based upon pipe size and material changes between upstream and downstream surveyed structures. It is inferred from the results of the stormwater inventory and survey that there are many buried structures or underground junction boxes.

Legend

Stormwater Structures
Percent Obstructed
- 0%
- 25%
- 50%
- 75%
- 100%
- Difficult Access Structure
- Unsurveyed Structure

- Waterbody
- Stormwater Pipe
- Minor Channel
- Major Channel
- Road
- Watershed

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Figure A-4: Obstructed & Difficult Access Stormwater Structures
AVENA ROAD/TRIBUTARY 35 PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 300 600 Feet
1 in = 600 ft

N W E S

HYDROLOGIC ANALYSIS

Per the contract, PCSWMM developed by the CHI was selected as the hydrologic and hydraulic model to evaluate both the primary and secondary stormwater conveyance systems. The model uses the EPB-developed SWMM engine for computations and is particularly effective at evaluating 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.

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.

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. PCSWMM simulates the surface runoff response to precipitation for an interconnected system of surfaces, channels, and ponds. Input data for the PCSWMM model was developed using topographic data, land cover data, and soils maps in GIS to delineate and calculate the basin areas and NRCS hydrologic parameters.

The PCSWMM model offers a variety of methods for simulating the rainfall-runoff response, hydrograph development, and channel routing. One advantage to using PCSWMM 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.

B. 1 Watershed Delineation and Connectivity

Watersheds were delineated for the Town study areas utilizing digital LiDAR data available from the State of North Carolina, survey, and the stormwater inventory. The preliminary watersheds were created using automated delineation procedures in a GIS platform and then adjusted as necessary based on the conveyance system and known ridge lines. Subwatersheds were selected at hydrologically and hydraulically significant points, such as major roadway crossings, stream convergences, known problem areas, etc. Secondary systems like Downtown and Tomahawk Branch/Lake areas were delineated in more detail to effectively evaluate the closed stormwater system.

Watershed maps showing the sub-basins and hydrological connectivity are provided in Section 2 of the SWMP. In its entirety, the study covers an area of approximately 5,557 acres (8.68 square miles). Drainage areas for each of the watersheds studied are noted in Table B.1. The upper parts of the primary

system watersheds extend outside of the Town limits. However, runoff from these areas drains down the mountain and through the Town's stormwater conveyance system on its way to the Swannanoa River.

TABLE B-1: WATERSHED DRAINAGE AREAS

WATERSHED	AREA (ACRES)	PERCENT OF WATERSHED LOCATED INSIDE TOWN LIMITS
Downtown	151	100%
Tomahawk Branch	1,233	73%
Flat Creek	3,863	13%
Tributary 35 (of the Swannanoa)	310	69%
TOTAL STUDY DRAINAGE AREA	**5,557**	**42%**

B. 2 Land Cover

Land cover represents the physical surface characteristics of the watershed, describing what is present on the ground e.g., impervious surfaces, open water, forest, etc. Land cover directly influences the hydrologic response of a watershed by affecting infiltration, evapotranspiration, and surface runoff. In combination with other basin characteristics, land cover is used to estimate hydrologic parameters such as the SCS curve number for the basin.

One of the most critical land cover components in an urban environment is impervious surface coverage. Using a high-resolution impervious layer developed by Raftelis, Ardurra integrated this dataset into the overall land cover classification framework. Next, water features were identified and incorporated into the dataset using USGS data products (3DHP). After establishing impervious and water features, the National Land Cover Dataset (NLCD) was used to classify remaining areas and fill data gaps. In total, fifteen (15) land cover categories were delineated within the Town. Aerial imagery, field observations, and current development plans provided by the Town of Black Mountain (e.g., Tudor Croft Development) were used to verify and refine the land cover classifications as necessary.

Land cover within the Town is mostly forest (especially in the upper watershed of Flat Creek) and low intensity development. The overall land cover map for the watershed study is shown in Figure B-1. Acreage of each existing land cover groups and correlating percentages are listed in Tables B-2 and B-6.

Burnett Reservoir
Walkertown
Walker Branch
Flat Creek
Flat Creek
Flat Creek
Montreat
Montreat
Tomahawk Branch
MONTREAT RD
Tributary 35
Black Mountain
Downtown
E STATE ST
OLD US 70 HWY E
Swannanoa River
W STATE ST
W State St
OLD US
US 70 HWY
US Highway 70 W
NC 9 HWY
I40 W
I40 E

Legend

Land Cover
- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Evergreen Forest
- Hay/Pasture
- Herbaceous
- Impervious
- Mixed Forest
- Shrub/Scrub
- Water
- Woody Wetlands

- Swannanoa River
- Tributaries
- Waterbodies

Roads

Road Class
- Highway
- Major Road
- Local Road
- Walking Path
- Ramp
- Railroads

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Figure B-1: Land Cover
Town of Black Mountain Stormwater Master Plan

0 1,000 2,000 Feet

1 in = 2,000 ft

N
W E
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TABLE B.2: BLACK MOUNTAIN LAND COVER

LAND COVER CATEGORY	EXISTING	
	AREA (ACRES)	PERCENT OF BASIN AREA
Deciduous Forest	2046.2	37.1
Mixed Forest	1505.6	27.3
Low Intensity Development	1236.3	22.4
Impervious	517.1	9.4
Developed Open Space	107.7	2.0
Water	52.0	0.9
Medium Intensity Development	40.0	0.7
Hay/Pasture	8.8	0.2
High Intensity Development	4.0	0.1
Evergreen Forest	2.3	0.0
Grassland/Herbaceous	1.3	0.0
Woody Wetland	0.7	0.0
Shrub/Scrub	0.2	0.0

TABLE B-3: DOWNTOWN WATERSHED LAND COVER

LAND COVER CATEGORY	EXISTING	
	AREA (ACRES)	PERCENT OF BASIN AREA
Impervious	61.8	52.6
Low Intensity Development	38.6	32.8
Medium Intensity Development	13.5	11.5
High Intensity Development	3.5	3.0
Water	0.1	0.0

TABLE B-4: TOMAHAWK BRANCH LAND COVER

LAND COVER CATEGORY	EXISTING	
	AREA (ACRES)	PERCENT OF BASIN AREA
Low Intensity Development	507.9	42.0
Deciduous Forest	318.3	25.8
Impervious	189.2	15.3
Developed Open Space	103.0	8.4
Mixed Forest	78.7	6.4
Water	16.8	1.4
Medium Intensity Development	9.4	0.8
Hay/Pasture	6.6	0.5
Grassland/Herbaceous	1.3	0.1
Evergreen Forest	0.9	0.1
Woody Wetlands	0.7	0.1
Shrub/Scrub	0.2	0.0
High Intensity Development	0.1	0.0

TABLE B-5: FLAT CREEK LAND COVER

LAND COVER CATEGORY	EXISTING	
	AREA (ACRES)	PERCENT OF BASIN AREA
Deciduous Forest	1622.8	42.0
Mixed Forest	1412.4	36.6
Low Intensity Development	544.0	14.1
Impervious	227.7	5.9
Water	35.1	0.9
Medium Intensity Development	13.5	0.3
Developed Open Space	4.8	0.1
Hay/Pasture	1.6	0.0
Evergreen Forest	1.3	0.0
High Intensity Development	2.3	0.0

TABLE B-6: AVENDA ROAD/TRIBUTARY 35 LAND COVER

LAND COVER CATEGORY	EXISTING	
	AREA (ACRES)	PERCENT OF BASIN AREA
Low Intensity Development	146.3	47.1
Deciduous Forest	106.6	34.4
Impervious	38.5	12.4
Mixed Forest	14.7	4.7
Medium Intensity Development	3.6	1.2
Hay/Pasture	0.7	0.2

B. 3 Soils

The infiltration rate of 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 Buncombe County that identify four (4) primary soil groups. This data is available digitally and was obtained for the Town of Black Mountain. 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 B-7. A map of the hydrologic soil groups (HSG) is shown in Figure B-2.

TABLE B-7: HYDROLOGIC SOIL 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).

SOIL GROUP	DESCRIPTION
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).
A/D 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 study area are predominantly NRCS hydrologic soil groups A and B soils. It should be noted that all soils designated as dual hydrologic soils groups (A/D, B/D, and C/D) were assumed to be D for the hydrologic analysis. Additionally, soils that were not surveyed due to significant soil disturbance (deemed "disturbed" or "urban" soils) were also assumed to be D for the hydrologic analysis. A breakdown of the HSGs for the entire study area and each watershed is provided in Tables B-8 through B-12.

TABLE B-8: AREA DISTRIBUTION OF HYDROLOGIC SOIL GROUPS – OVERALL STUDY AREA

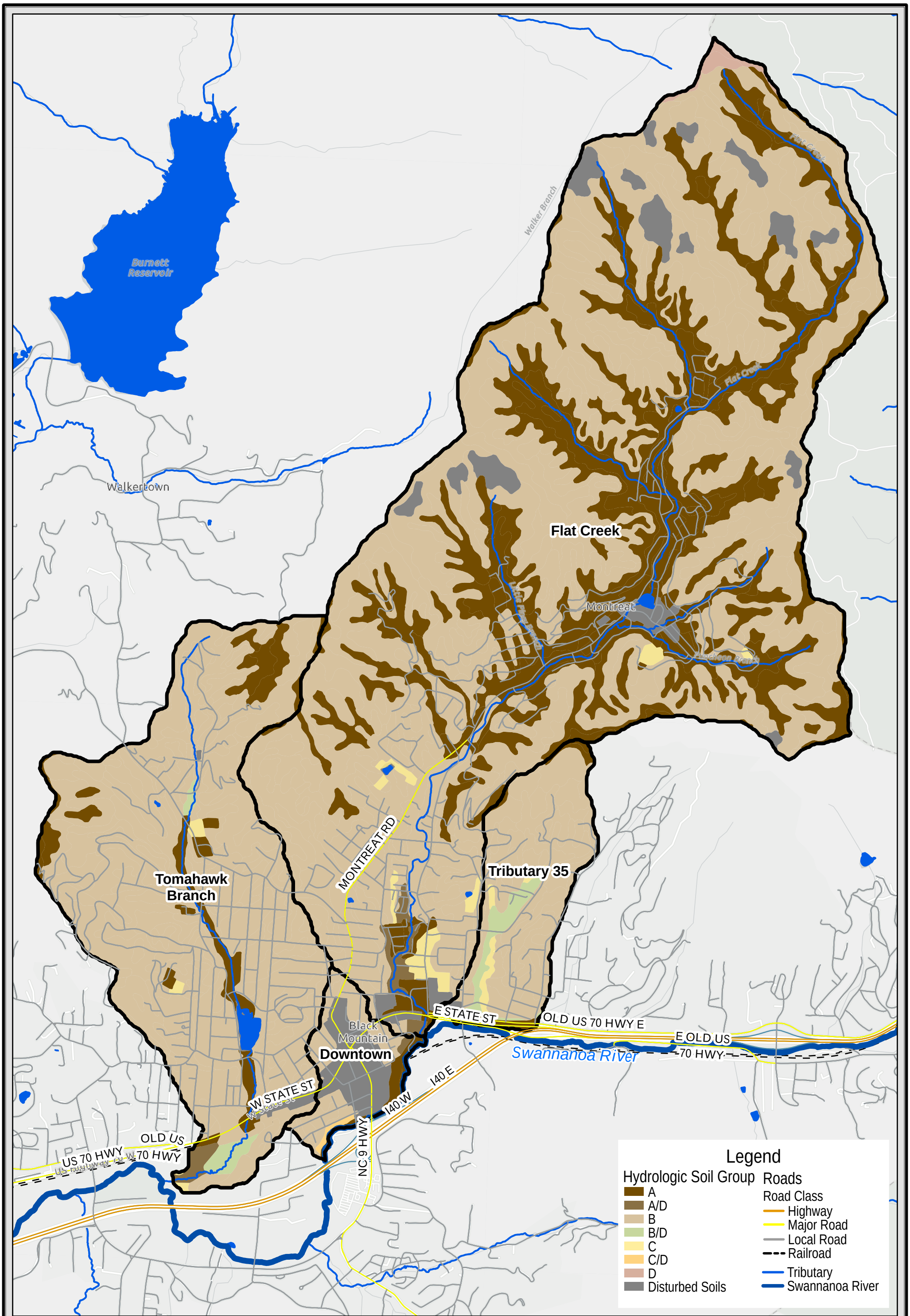
SOIL GROUP	TOTAL AREA (ACRE)	PERCENT OF TOTAL AREA
A	1,284.5	23.3%
B	3,878.2	70.2%
C	51.8	0.9%
D*	307.5	5.6%

**Includes A/D, B/D, C/D, and Non-surveyed (Null) soils*

TABLE B-9: AREA DISTRIBUTION OF HYDROLOGIC SOIL GROUPS – DOWNTOWN WATERSHED

SOIL GROUP	TOTAL AREA (ACRE)	PERCENT OF TOTAL AREA
A	1.3	1.1%
B	59.6	50.7%
D*	56.7	48.2%

**Includes A/D, B/D, C/D, and Non-surveyed (Null) soils*



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Figure B-2: Hydrologic Soil Groups
Town of Black Mountain Stormwater Master Plan

0 1,000 2,000 Feet

1 in = 2,000 ft

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TABLE B-10: AREA DISTRIBUTION OF HYDROLOGIC SOIL GROUPS – TOMAHAWK BRANCH

SOIL GROUP	TOTAL AREA (ACRE)	PERCENT OF TOTAL AREA
A	108.5	8.8%
B	1,071.3	86.9%
C	6.8	0.6%
D*	46.3	3.8%

**Includes A/D, B/D, C/D, and Non-surveyed (Null) soils*

TABLE B-11: AREA DISTRIBUTION OF HYDROLOGIC SOIL GROUPS – FLAT CREEK

SOIL GROUP	TOTAL AREA (ACRE)	PERCENT OF TOTAL AREA
A	1,162.8	30.1%
B	2488.5	64.4%
C	34.0	0.9%
D*	178.0	4.6%

**Includes A/D, B/D, C/D, and Non-surveyed (Null) soils*

TABLE B-12: AREA DISTRIBUTION OF HYDROLOGIC SOIL GROUPS – AVENA RD. / TRIBUTARY 35

SOIL GROUP	TOTAL AREA (ACRE)	PERCENT OF TOTAL AREA
A	12.4	4.0%
B	260.4	83.9%
C	11.0	3.5%
D*	26.5	8.5%

**Includes A/D, B/D, C/D, and Non-surveyed (Null) soils*

As there is a high-resolution impervious cover layer available for the Town, it became the primary basis for a mixed methods approach to determine land cover for the study area. To supplement the high-resolution impervious cover, U.S. Geological Survey 3D Hydrography Program (3DHP) data were used to capture water features with high accuracy within the study area. Areas not represented in these datasets were supplemented with classifications from the National Land Cover Database (NLCD).

To avoid double-counting impervious areas already represented in the dedicated impervious layer, all NLCD classes identified as high, medium, or low-density developed were reclassified to match the "Developed – Open Space" category. These are demarcated with an * in Table B-13.

The combined land cover and soil data were then used to assign curve numbers (CNs) based on the U.S. Army Corps of Engineers (USACE) HEC-HMS guidance. These are also noted in Table B-13 below. A composite runoff curve number was calculated for each of the sub-basins based on the weighted curve number for the sub-basin.

TABLE B-13: CURVE NUMBERS BASED ON LAND COVER AND SOIL GROUPS

LAND USE CATEGORY	SOIL GROUP			
	A	B	C	D
Water	98	98	98	98
Impervious	98	98	98	98
Developed Open Space	49	69	79	84
Low Intensity Development*	49	69	79	84
Medium Intensity Development*	49	69	79	84
High Intensity Development*	49	69	79	84
Barren Land	78	86	91	93
Deciduous Forest	45	66	77	83
Evergreen Forest	25	55	70	77
Mixed Forest	36	60	73	79
Shrub/Scrub	55	72	81	86
Grassland/Herbaceous	50	69	79	84
Pasture/Hay	49	69	79	84
Cultivated Crops	67	78	85	89
Woody Wetlands	30	58	71	78
Emergent Herbaceous Wetlands	30	58	71	78

A summary of the hydrologic input for each of the watershed models can be provided upon request.

B. 4 Rainfall

Rainfall distributions for Black Mountain are derived using the NRCS Type II standard distribution. Total rainfall volumes for the modeled frequency storms were based on data obtained from NOAA Atlas 14. Table B-14 shows the total rainfall volumes used for this study.

TABLE B-14: DESIGN STORM RAINFALL DEPTHS

DESIGN STORM	RAINFALL DEPTH (IN)
2-YR, 24HR	3.39
10-YR, 24HR	5.00
25-YR, 24HR	5.98
50-YR, 24HR	6.76
100-YR, 24HR	7.57
2-YR, 6HR	2.23
5-YR, 6HR	2.79

While the depth-duration-frequency curves are calculated based on real rainfall data, the rainfall data used for the PCSWMM represents 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.

B. 5 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. 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)

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

$$\text{Unpaved } V = 16.1345\ (S)^{1/2}$$

$$\text{Paved } V = 20.3282\ (S)^{1/2}$$

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 PCSWMM model uses a watershed width parameter to crate the unit hydrograph used in the model that will translate the rainfall into runoff. The watershed width is a parameter unique to PCSWMM 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 watersheds studied lacked flow gauge data, so the peak flows from PCSWMM were compared to flows developed using the Rational Method, USGS Regression where applicable, Stream Stats flows, and FEMA model flows. Based on the flow comparison, the watershed widths for each basin were adjusted in some instances to produce reasonable flows.

HYDRAULIC ANALYSIS

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.

The stormwater models were developed using survey, stormwater inventory, FEMA models, and LiDAR data. Detailed and limited detailed FEMA study models were downloaded from the North Carolina Flood Risk Information System (FRIS) website. The bridge data included in the FEMA models for Tomahawk Branch, Flat Creek, Flat Creek Tributary 1, and Tributary 35 (of the Swannanoa River) were imported into PCSWMM to include in the primary system analyses. The FEMA water surface elevations were also used as the fixed starting water surface elevation to evaluate the primary and secondary stormwater systems. LiDAR data available from the State of North Carolina was used to supplement open channel cross sections.

C.1 Stormwater Inventory

For the SWMP, stormwater utility infrastructure throughout the subwatershed was collected by Kee Mapping and Surveying personnel (located in Asheville, NC) to compile a GIS stormwater inventory database for the Town. This was accomplished by using GPS as the primary means of data capture 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. Data was obtained for those streams and open channels required to complete connectivity for modeling purposes. 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 some channels were used to estimate the roughness coefficients and energy loss coefficients.

C.2 Roughness Coefficients

Manning's roughness coefficients, or 'n' values, represent the resistance to flow and influence the flow capacity of channels and floodplains. The PCSWMM 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 right or left bank of the stream is referenced facing downstream. Roughness coefficients used in this study are listed in Table C-1. All roughness coefficients were estimated through field observation and by referencing standard engineering manuals.

TABLE C-1: ROUGHNESS COEFFICIENTS

LOCATION	RANGE OF 'N' VALUES
Main Channel	0.04 - 0.065
Left Overbank	0.04 - 0.16
Right Overbank	0.035 - 0.16

C.3 Starting Water Surface Elevation

The starting water surface elevations (WSEL) for the PCSWMM models were set based on the FEMA water surface elevations where available. Table C-2 indicates the number of outfalls for each watershed model and if FEMA WSELs were referenced directly from the models. Where FEMA WSELs were not directly published, the FEMA results were interpolated between storm events.

All 2-yr 24-hr, 2-yr and 5-yr 6-hr storm events used normal outfall conditions as the starting water surface elevations.

The Town is currently engaged in the Swannanoa Floodplain Bench Project, which provides additional floodplain storage along the south bank of the Swannanoa River to lower WSELs. The project is located between Hemphill Road and the Norfolk Southern Railway near the confluence with Flat Creek. The second phase of the project extends floodplain benching along the south bank to just I-40 East near Riverwalk Park and includes construction of a 1.3-acre wetland to lower WSELS.

Preliminary (unapproved) FEMA WSELS for the Swannanoa Floodplain Bench Project were provided by the Town's consultant. These were considered with the proposed capital improvement projects as the floodplain project will likely be constructed prior to recommended capital projects within the Town.

TABLE C-2: FEMA WSEL REFERENCES

Model	Outfalls to the Swannanoa River	FEMA WSELs	Swannanoa FPB Projected WSELs
Downtown	4	10-, 50-, and 100-yr	Yes
Tributary 35	Direct Confluence	10-, 50-, and 100-yr	Yes
Flat Creek	Used Flat Creek FEMA	10-, 50-, and 100-yr	No
Tomahawk	Used Tomahawk FEMA	10-, 50-, and 100-yr	No

C.4 Model Run Descriptions and Assumptions

PCSWMM 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 PCSWMM (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.

PCSWMM 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 flow from proposed pipes and channel improvements are seen both upstream and downstream, reducing the potential for a stormwater system having increased flooding downstream.

The 2-, 10-, 25-, 50- and 100-year 24-hour storm events were modeled as well as the 2- and 5-year 6-hour storm events. 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.

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 PCSWMM models are presented in Table C-3.

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 C-4.

TABLE C-3: ENERGY LOSS COEFFICIENTS FOR PCSWMM MODELS

TYPE OF TRANSITION	EXPANSION	CONTRACTION
None	0	0
Manhole/Inlet	0.7	0.5
Open Channel	1	0.5–Headwall/ 0.9 - Projecting

TABLE C-4: 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

APPENDIX D
CONDITION ASSESSMENT METHODOLOGY

D.1 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
- 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:
    - Road centerlines
    - Building footprints
    - Soils
    - Hydrography
    - Critical Facilities

D.2 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 Town of Black Mountain stormwater system asset infrastructure data is noted in Table D-1. Attributes assigned to these assets and considered for the stormwater system included the following:

- Unique ID
- Pipe diameter
- Pipe material
- Pipe length
- Pipe slope
- Pipe condition

- Proximity to corrosive soils
- Proximity to transportation infrastructure
- Proximity to buildings
- Proximity to hydrographic features
- Proximity to critical facilities

The stormwater system assets listed below were incorporated into the prioritization tool.

TABLE D-1: STORMWATER SYSTEM ASSET SUMMARY

ASSET NAME	NUMBER	UNITS
Unknown Storm Pipe	12,828	LF
Irregular Dimension Storm Pipe	2,205	LF
4” Storm Pipe	38	LF
6” Storm Pipe	67	LF
8” Storm Pipe	432	LF
10” Storm Pipe	281	LF
12" Storm Pipe	3,934	LF
15" Storm Pipe	7,256	LF
16” Storm Pipe	111	LF
18" Storm Pipe	6,984	LF
20” Storm Pipe	144	LF
21" Storm Pipe	45	LF
24” Storm Pipe	6,335	LF
30" Storm Pipe	2,286	LF
36" Storm Pipe	2,019	LF
42" Storm Pipe	70	LF
48" Storm Pipe	938	LF
60” Storm Pipe	146	LF
66” Storm Pipe	193	LF
90” Storm Pipe	183	LF
Inlet	246	EA
Junction Box	52	EA
Pipe End	631	EA
Manhole	14	EA
Unknown Structure	251	EA

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 Black Mountain, the critical facilities were determined to be a combination of schools, fire stations, medical facilities, police stations, libraries, hazardous waste facilities, and nursing homes/assisted living facilities. Within the study area it was determined that there are thirty critical facilities. The critical facilities identified are as follows: nursing homes/assisted living facilities (4), medical facilities (5), fire stations (2), police stations (3), hazardous waste facilities (3), a library (1), and schools (12).

Soil Corrosivity

Corrosion is a significant factor affecting the long-term integrity of stormwater infrastructure. The degree of soil corrosivity varies depending on the material composition of the asset, as soils influence concrete and metallic structures differently. For this analysis, WK Dickson utilized data from the USDA SSURGO (Soil Survey Geographic Database), which provides corrosivity ratings classified as 'Low', Moderate', or 'High' for both concrete and metallic materials. These ratings are based on soil drainage class, total acidity, electrical resistivity and conductivity. Each stormwater asset was spatially overlaid with the SSURGO soil areas to determine the soil unit in which it was located. The corresponding corrosivity rating for that soil was then applied to the asset based on its material type. For pipes intersecting multiple soil units, the corrosivity rating associated with the soil encompassing the majority of the pipe's length was assigned. Plastic assets e.g., HDPE, CPP, CPE, PVC, etc. were given a rating of 0, as plastic materials are not subject to corrosion.

Within the USDA SSURGO database, some soil areas are not included in the soil survey due to extensive disturbance from development. This condition is common in the downtown area of Black Mountain due to the extent of development in this area. Because these soils lack reliable data, WK Dickson assigned a moderate corrosivity rating to all non-plastic stormwater assets within these soil regions to provide a reasonable, conservative estimate of potential corrosion risk.

D. 3 GIS Data Audit

WK Dickson performed an audit of the Town's GIS data 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
- 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 D-2 and D-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 D-2: STORMWATER PIPES ATTRIBUTE RELIABILITY

STORMWATER PIPES – LIKELIHOOD		STORMWATER PIPES – CONSEQUENCE	
FIELD	DATA SET	FIELD	DATA SET
Installation Date	0.0%	Proximity to Hydrographic features	100.0%
Pipe Length	100.0%	Pipe Diameter	75.1%
Age	0.0%	Proximity to Critical Facilities	100.0%
Remaining Life	0.0%	Proximity to Transportation Infrastructure	100.0%
Material Type	73.5%	Proximity to Buildings	100.0%
Pipe Slope	45.8%	**Average**	**93.8%**
Corrosive Soils	100.0%		
Condition	75.1%		
Proximity to Frequent Flooding Locations	100.0%		
Average	**82.4%**		

TABLE D-3: STORMWATER STRUCTURE ATTRIBUTE RELIABILITY

STORMWATER STRUCTURES – LIKELIHOOD		STORMWATER STRUCTURES – CONSEQUENCE	
FIELD	DATA SET	FIELD	DATA SET
Installation Date	0.00%	Proximity to Hydrographic Features	100.00%
Proximity to Frequent Flooding Locations	100.00%	Proximity to Buildings	100.00%
Age	0.00%	Proximity to Critical Facilities	100.00%
Remaining Life	0.00%	Proximity to Transportation Infrastructure	100.00%
Material Type	71.5%	**Average**	**100.00%**
Structure Obstructions	62.7%		
Condition	64.7%		
Corrosive Soils	100.00%		
Average	**79.8%**		

As shown in Tables D-2 and D-3, data reliability was sufficiently high to obtain a good measure of the criticality of each asset. Average values were calculated without including the reliability ratings of the fields: “Installation Date”, “Age”, and “Remaining Life”. This is because despite not having adequate age data, the other available data was sufficient enough to evaluate the infrastructure.

D. 4 Criticality Scoring and Methodology

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
- Establishment of final scoring system and documentation of methodology
- Application of scoring criteria to system assets to obtain ranking and thresholds

Each attribute was assigned between 2 to 6 factors with a scoring range between 0 and 100. Scores were added together within the likelihood of failure category and the consequence of failure category to develop a total cumulative score.

Tables D-4 through D-7 summarize the final attributes, attribute factors, and factor 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.

D. 5 Results

Criticality Results for the Stormwater Pipes are provided in Section 4 of the SWMP. Maps of the criticality results for the Stormwater Structures are shown in Figures D-1 through D-4.

D-1 Downtown Secondary System – Criticality Analysis Stormwater Structures

D-2 Tomahawk Branch Primary System – Criticality Analysis Stormwater Structures

D-3 Flat Creek Primary System – Criticality Analysis Stormwater Structures

D-4 Tributary 35 / Avena Rd Primary System – Criticality Analysis Stormwater Structures

TABLE D-4: STORMWATER PIPES SCORING MATRIX – LIKELIHOOD OF FAILURE

ATTRIBUTE	ATTRIBUTE FACTOR	ATTRIBUTE FACTOR SCORING
Slope	Less than 0.2%	50
	Between 0.2% and 1%	20
	Between 1% and 2% or Null	0
	Between 2% and 4%	50
	Greater than 4%	100
Corrosive Soils*	High	100
	Moderate or Null	80
	Low	60
Condition	Needs Repair	100
	Poor	80
	Fair or Unknown	50
	Good	20
	Excellent	0
Material*	Brick/VCP	100
	CMP/CPP	80
	CPE/HDPE/Other/Unknown	40
	DIP/Steel/CAS	20
	PRE/PVC/RCP/CSU/PCCP/CP/CON	0
Proximity to Frequent Flooding Locations	Less than or equal to 100 feet	100
	Greater than 100 feet	0

**Category considers pipe material in the analysis.*

TABLE D-5: STORMWATER PIPES SCORING MATRIX – CONSEQUENCE OF FAILURE

ATTRIBUTE	ATTRIBUTE FACTOR	ATTRIBUTE FACTOR SCORING
Pipe Diameter	Greater than 42	100
	37 to 42	80
	25 to 36	60
	16 to 24	40
	8 to 15	20
	Less than 8	0
	Unknown/Null	50
Proximity to Transportation Infrastructure	Under Railroad	100
	Under Road	60
	Not Under Road	0
Proximity to Building	Underneath Building	200
	Less than 20 feet from Building	100
	Greater than 20 feet from Building	0
Proximity to Critical Facility	Underneath Facility	200
	Less than 100 feet from Facility	100
	Greater than 100 feet from Facility	0
Proximity to Waterbody / Waterway	Less than or equal to 25 feet	100
	26 to 50 feet	50
	Greater than 50 feet	0

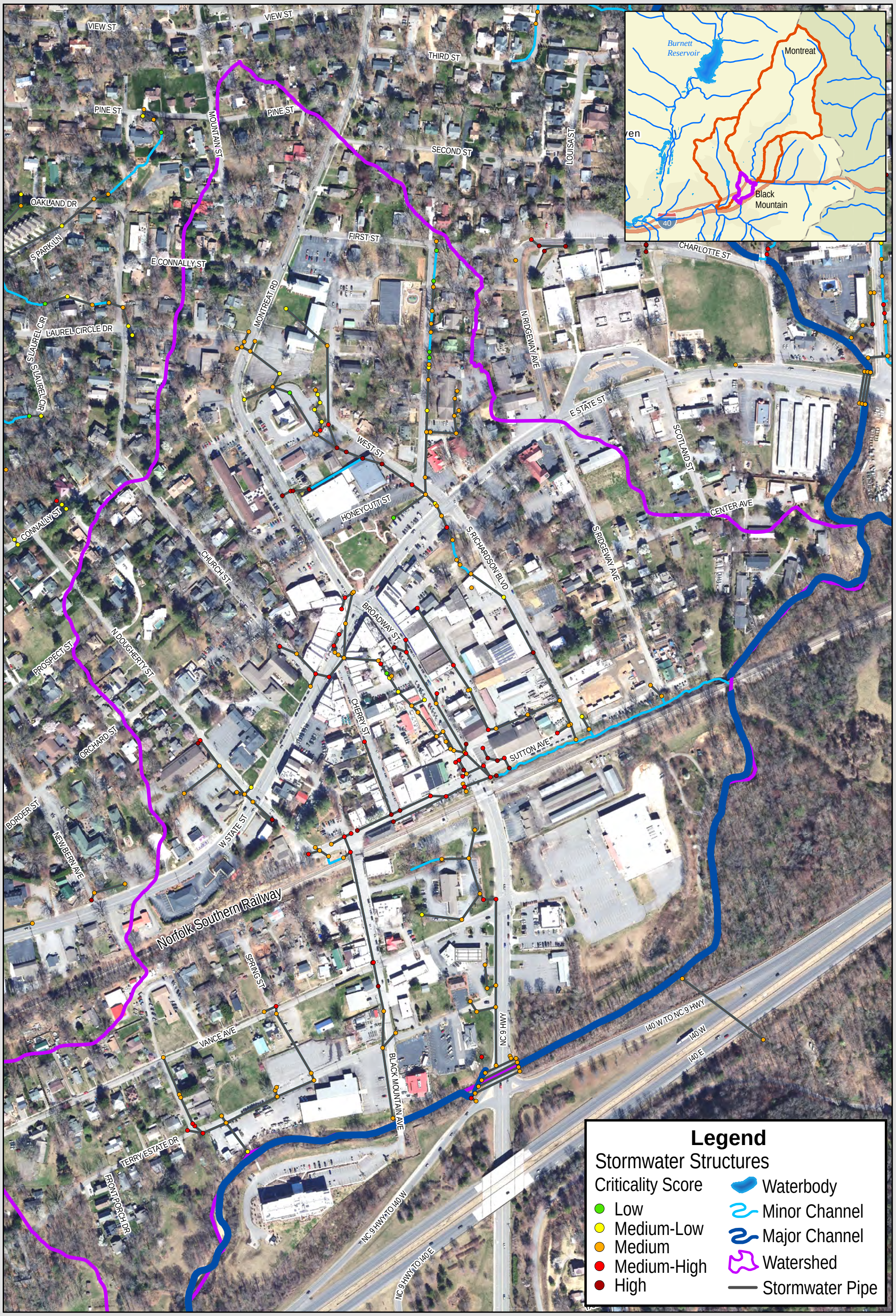
TABLE D-6: STORMWATER STRUCTURE SCORING MATRIX – LIKELIHOOD OF FAILURE

ATTRIBUTE	ATTRIBUTE FACTOR	ATTRIBUTE FACTOR SCORING
Corrosive Soils*	High	100
	Moderate or Null	80
	Low	60
Proximity to Frequent Flooding Location	Less than or equal to 100 feet	100
	Greater than 100 feet	0
Material*	Brick/VCP/Stone	100
	CMP/CPP	80
	Concrete Block	60
	HDPE/Other/Unknown	40
	DIP	20
	PVC/PreCast/RCP/Concrete	0
Percent Obstructed	100%	50
	75%	30
	50%	15
	25% or Null	5
	0%	0
Condition	Needs Repair	100
	Poor	80
	Fair or Unknown	50
	Good	20
	Excellent	0

**Category considers pipe material in the analysis.*

TABLE D-7: STORMWATER STRUCTURE SCORING MATRIX – CONSEQUENCE OF FAILURE

ATTRIBUTE	ATTRIBUTE FACTOR	ATTRIBUTE FACTOR SCORING
Proximity to Waterbody / Waterway	Up to 100 feet	100
	101 feet to 500 feet	50
	Greater than 500 feet	0
Proximity to Transportation Infrastructure	Within 100 feet of Railroad	100
	Within 50 feet of Roadway	60
	Not Within 50 feet of Roadway	0
Proximity to Building	Within 20 feet of Building	100
	Greater than 20 feet from Building	0
Proximity to Critical Facility	Within 100 feet of Facility	100
	Not within 100 feet of Facility	0



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Figure D-1: Criticality Analysis Results - Stormwater Structures
DOWNTOWN SECONDARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 150 300 Feet
1 in = 300 ft

N
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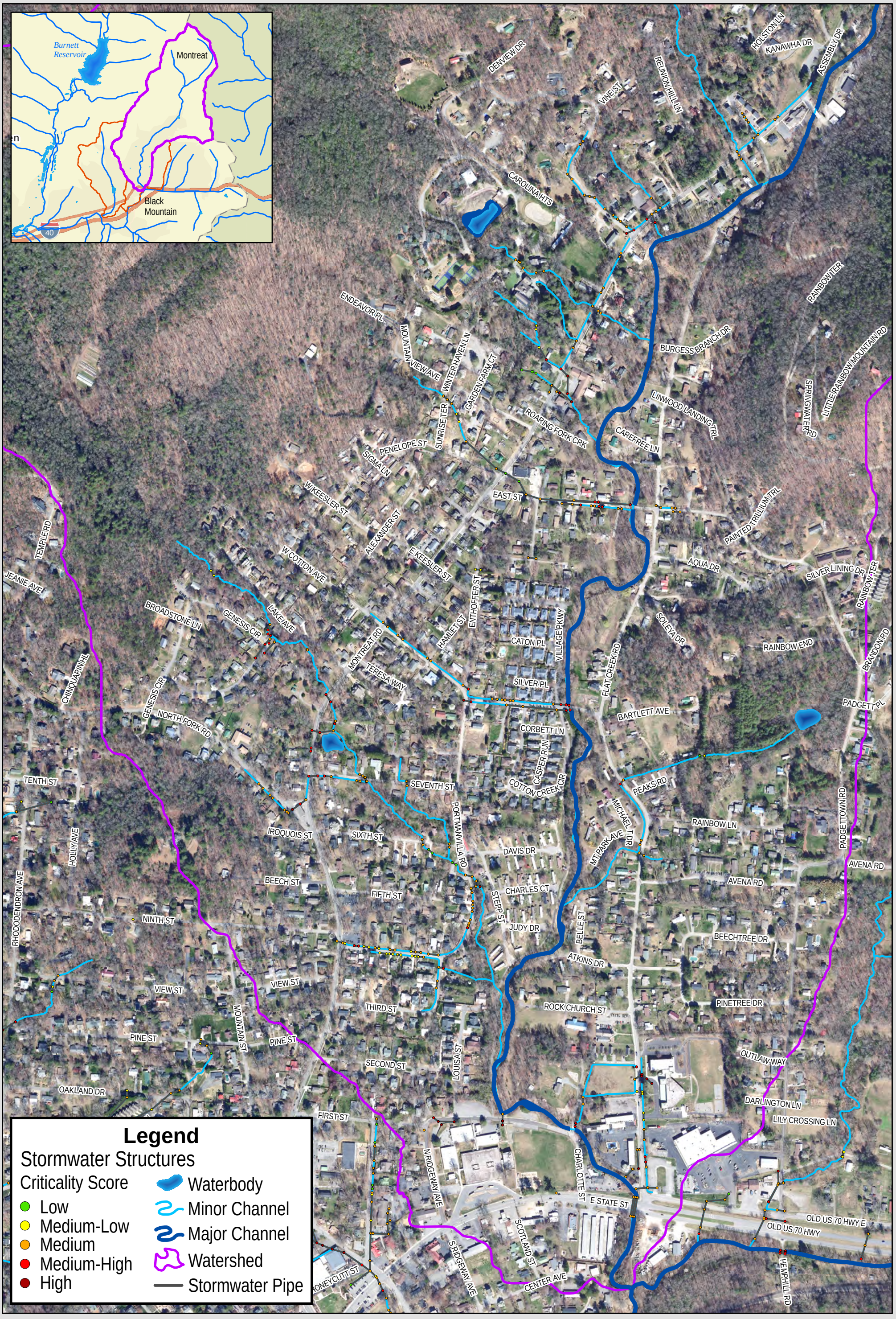


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Figure D-2: Criticality Analysis Results - Stormwater Structures
TOMAHAWK BRANCH PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 300 600 Feet
1 in = 600 ft

N
W E
S



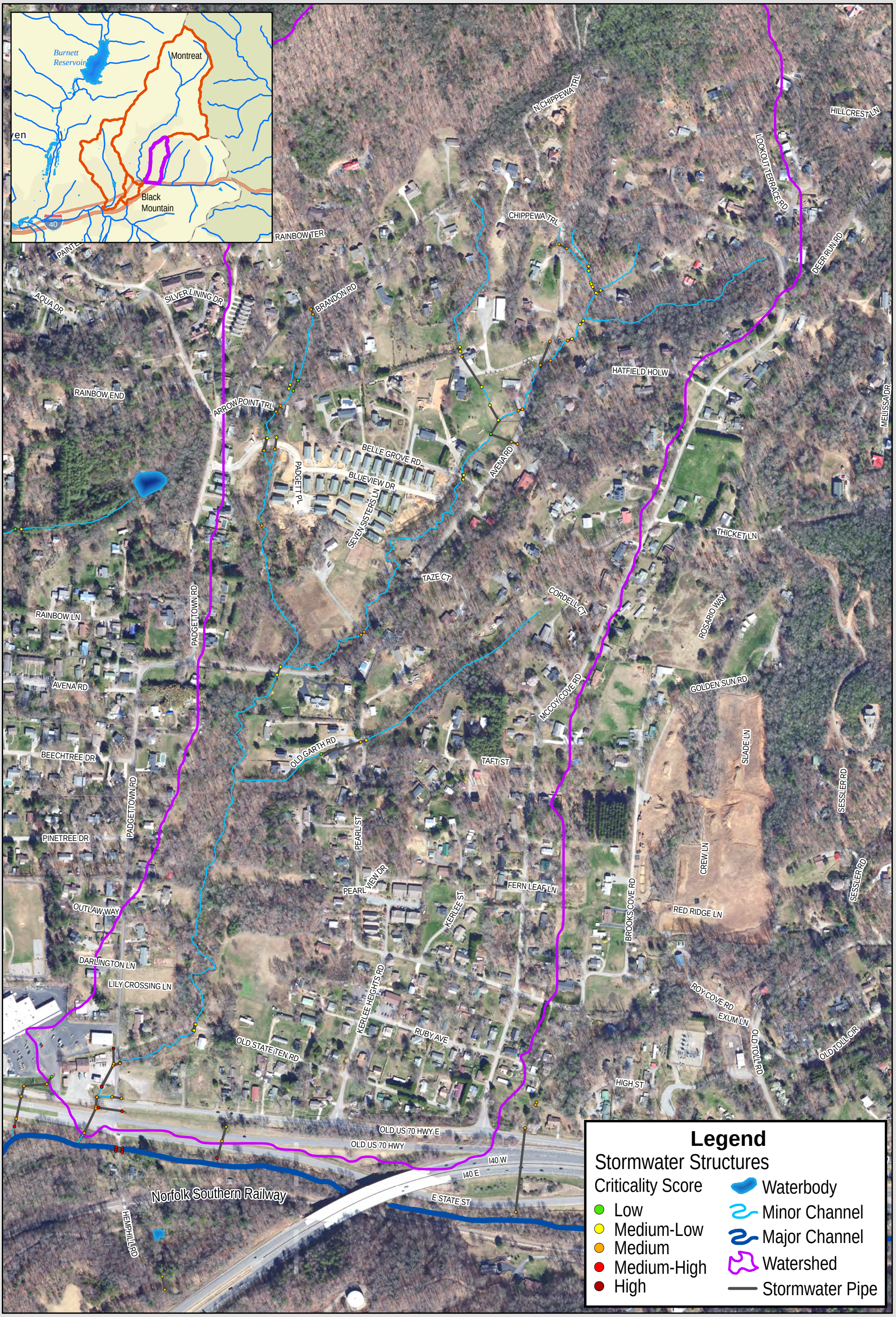
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Figure D-3: Criticality Analysis Results - Stormwater Structures
FLAT CREEK TRIBUTARY 1 PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 250 500 Feet

1 in = 500 ft

N W E S



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Figure D-4: Criticality Analysis Results - Stormwater Structures
AVENA ROAD/TRIBUTARY 35 WATERSHED
Town of Black Mountain Stormwater Master Plan

0 200 400 Feet
1 in = 400 ft

N
W E
S

APPENDIX E
PROPOSED CAPITAL IMPROVEMENT PLAN

Downtown Proposed Projects Map (17 Projects)

Downtown Project Sheets and Planning Level Opinions of Cost

Tomahawk Branch Proposed Projects Map (3 Projects)

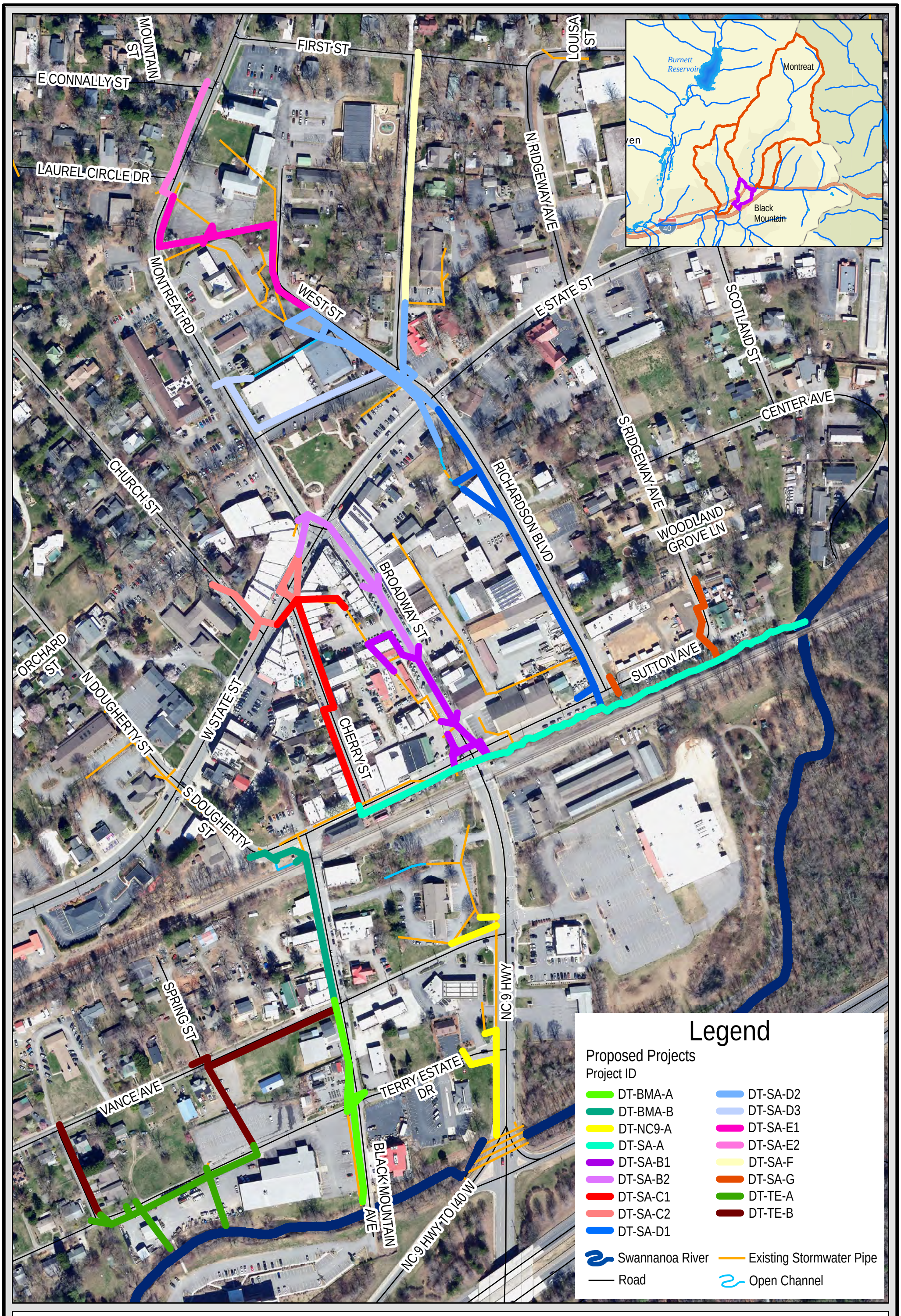
Tomahawk Branch Sheets and Planning Level Opinions of Cost

Flat Creek Proposed Projects Map (4 Projects)

Flat Creek Branch Sheets and Planning Level Opinions of Cost

Tributary 35 / Avena Rd Proposed Projects Map (5 Projects)

Tributary 35 / Avena Rd Sheets and Planning Level Opinions of Cost



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Figure E-1: Proposed Stormwater Improvement Projects
DOWNTOWN DRAINAGE SYSTEM
Town of Black Mountain Stormwater Master Plan

0 100 200 Feet
1 in = 200 ft

N W E S

PROJECT NAME: **Sutton Ave and Open Channel Stormwater Improvements** PROJECT ID: **DT-SA-A**

PROJECT INFORMATION

LOCATION: Sutton Ave: Cherry St to Broadway St outfall
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 1360

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 25 LF of new 42" RCP across Sutton Ave at Cherry St.
- Replace existing pipe on south side of Sutton Ave with 280 LF of 42" RCP.
- Replace existing pipe in the Broadway St/SuttonAve intersection with 100 LF of 48" RCP.
- Replace exising outfall pipe with 20 LF of 60" RCP.
- Install 940 LF of channel improvements from the outfall to the confluence with the Swannanoa River.*

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	3
Criticality Bonus	2
FINAL PROJECT SCORE:	**88**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Sutton Ave at Cherry St	< 2-YR	50-YR	100
Sutton Ave at Broadway St	< 2-YR	50-YR	100
Future Outfall Projects*	< 2-YR	50-YR	100

**Open Channel improvements along existing roadside channel from outfall at Broadway St to the confluence with the Swannanoa River provide capacity for future outfall improvements at Richardson Blvd and S. Ridgeway Ave.*

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,394,000
Design and Permitting	$ 493,800
Other Project Costs	$ 362,200
Total Project	**$ 2,250,000**

PROJECT AREA MAP



PROJECT NAME **Sutton Ave and Open Channel Stormwater Improvements** PROJECT ID: **DT-SA-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 420

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 51,060.00	$ 51,100.00
Erosion Control	1	LS	$ 41,850.00	$ 41,900.00
Traffic Control	1	LS	$ 16,740.00	$ 16,700.00
Moderate Utility Conflict	1	LS	$ 125,550.00	$ 125,600.00
Unclassified Excavation/Hauling	500	CY	$ 72.00	$ 36,000.00
Infrastructure Removal and Disposal	400	LF	$ 115.00	$ 46,000.00
Structure Removal and Disposal	6	EA	$ 6,800.00	$ 40,800.00
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	6	EA	$ 12,000.00	$ 72,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	400	LF	$ 670.00	$ 268,000.00
New Pipe: 60-inch	20	LF	$ 875.00	$ 17,500.00
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	940	LF	$ 350.00	$ 329,000.00
Roadway/Sidewalk Replacement	240	SY	$ 110.00	$ 26,400.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 322,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,394,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 69,700.00
Design and Permitting	20%	$ 278,800.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ 150,000.00
Geotechnical Investigation	1%	$ 13,900.00
Structural Evaluation	1%	$ 13,900.00
Real Estate	2%	$ 27,900.00
Utility Relocation	2%	$ 27,900.00
Project Maintenance (3yr)	5%	$ 69,700.00
Construction Inspections	10%	$ 139,400.00
Construction	100%	$ 1,394,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 2,250,000.00

PROJECT NAME: **Broadway St Stormwater Improvements Phase I** PROJECT ID: **DT-SA-B1**

PROJECT INFORMATION

LOCATION: Broadway St in Downtown Business District
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 700

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 24" pipe in Broadway St with 325 LF of 42-inch RCP.
- Replace existing catch basins and connecting pipes along Broadway with larger pipes.
- Re-route private system to proposed Broadway system and remove pipe under structure.
- Install upsized and new crossings and connections at Montreat Rd and Sutton Ave.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**83**

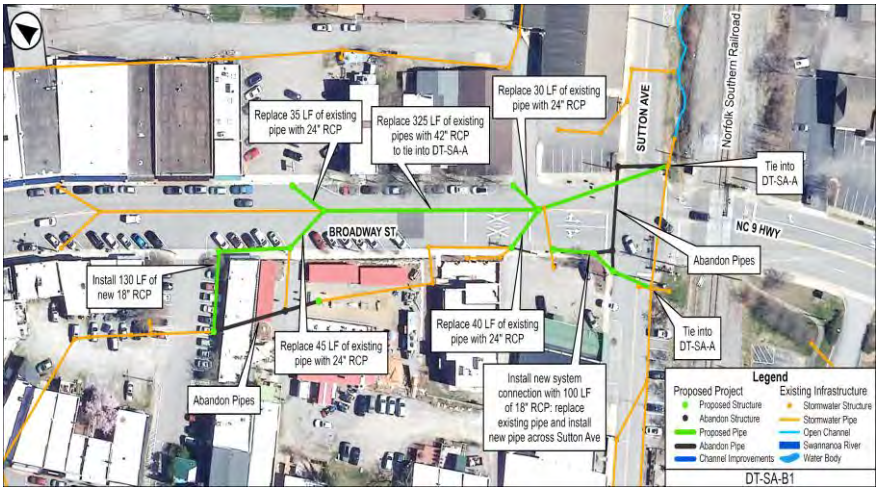
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Broadway St at Sutton Ave	< 2-YR	50-YR	100
Side system along Broadway	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,390,000
Design and Permitting	$ 278,000
Other Project Costs	$ 361,000
Total Project	**$ 2,029,000**

PROJECT AREA MAP



PROJECT NAME **Broadway St Stormwater Improvements Phase I** PROJECT ID: **DT-SA-B1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 700
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 50,915.00	$ 50,900.00
Erosion Control	1	LS	$ 37,160.00	$ 37,200.00
Traffic Control	1	LS	$ 14,864.00	$ 14,900.00
Major Utility Conflict	1	LS	$ 222,960.00	$ 223,000.00
Unclassified Excavation/Hauling	500	CY	$ 72.00	$ 36,000.00
Infrastructure Removal and Disposal	720	LF	$ 115.00	$ 82,800.00
Structure Removal and Disposal	15	EA	$ 6,800.00	$ 102,000.00
Standard Structure	9	EA	$ 8,600.00	$ 77,400.00
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	375	LF	$ 390.00	$ 146,300.00
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	325	LF	$ 670.00	$ 217,800.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	380	SY	$ 110.00	$ 41,800.00
New Concrete Curb and Gutter	125	LF	$ 110.00	$ 13,800.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 321,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,390,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 69,500.00
Design and Permitting	20%	$ 278,000.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 13,900.00
Structural Evaluation	1%	$ 13,900.00
Real Estate	2%	$ 27,800.00
Utility Relocation	2%	$ 27,800.00
Project Maintenance (3yr)	5%	$ 69,500.00
Construction Inspections	10%	$ 139,000.00
Construction	100%	$ 1,390,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 2,029,000.00

PROJECT NAME: **Broadway St Stormwater Improvements Phase II** PROJECT ID: **DT-SA-B2**

PROJECT INFORMATION

LOCATION: Broadway St north to Montreat Rd
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 615

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 24" pipe in Broadway St with 210 LF of 36-inch RCP.
- Install 285 LF of new 30-inch RCP from 36-inch RCP in Broadway St across E State St.
- Replace 30 LF of existing pipe across Montreat Rd at E State St with 30-inch RCP.
- Remove pipe across Montreat flowing to first catch basin on W. State St.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	4
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**88**

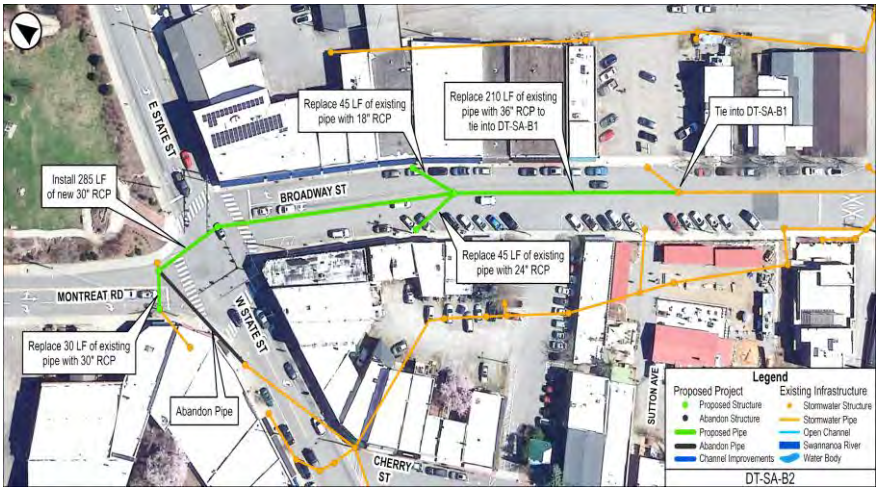
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
E State St at Broadway St	NA	50-YR	New Crossing
Montreat Rd at E State St	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 885,000
Design and Permitting	$ 177,000
Other Project Costs	$ 230,000
Total Project	**$ 1,292,000**

PROJECT AREA MAP



PROJECT NAME **Broadway St Stormwater Improvements Phase II** PROJECT ID: **DT-SA-B2**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 615
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 32,425.00	$ 32,400.00
Erosion Control	1	LS	$ 26,580.00	$ 26,600.00
Traffic Control	1	LS	$ 10,632.00	$ 10,600.00
Moderate Utility Conflict	1	LS	$ 79,740.00	$ 79,700.00
Unclassified Excavation/Hauling	620	CY	$ 72.00	$ 44,600.00
Infrastructure Removal and Disposal	435	LF	$ 115.00	$ 50,000.00
Structure Removal and Disposal	5	EA	$ 6,800.00	$ 34,000.00
Standard Structure	6	EA	$ 8,600.00	$ 51,600.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	90	LF	$ 390.00	$ 35,100.00
New Pipe: 30-inch to 36-inch	525	LF	$ 535.00	$ 280,900.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	310	SY	$ 110.00	$ 34,100.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 204,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 885,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 44,300.00
Design and Permitting	20%	$ 177,000.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 8,900.00
Structural Evaluation	1%	$ 8,900.00
Real Estate	2%	$ 17,700.00
Utility Relocation	2%	$ 17,700.00
Project Maintenance (3yr)	5%	$ 44,300.00
Construction Inspections	10%	$ 88,500.00
Construction	100%	$ 885,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,292,000.00

PROJECT NAME: **Cherry St Stormwater Improvements Phase I** PROJECT ID: **DT-SA-C1**

PROJECT INFORMATION

LOCATION: Cherry St from W State St to Sutton Ave
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 690

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe on Cherry St with 270 LF of 36-inch RCP and tie into 42-inch RCP at Sutton Ave.
- Install 330 LF of new 36-inch RCP along Cherry St. from W. State St.
- Replace existing pipe crossing Cherry St at W State St with 85 LF of 36-inch RCP.
- Remove pipe under structure at corner of W State St and Cherry St. to re-route flow to right-of-way.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	24
Public or Privately-Owned Land	4
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**75**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Cherry St at W State St	< 2-YR	50-YR	100
Cherry St at Sutton Ave	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,034,000
Design and Permitting	$ 206,800
Other Project Costs	$ 269,200
Total Project	**$ 1,510,000**

PROJECT AREA MAP



PROJECT NAME **Cherry St Stormwater Improvements Phase I** PROJECT ID: **DT-SA-C1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 690
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 37,855.00	$ 37,900.00
Erosion Control	1	LS	$ 31,030.00	$ 31,000.00
Traffic Control	1	LS	$ 12,412.00	$ 12,400.00
Moderate Utility Conflict	1	LS	$ 93,090.00	$ 93,100.00
Unclassified Excavation/Hauling	860	CY	$ 72.00	$ 61,900.00
Infrastructure Removal and Disposal	500	LF	$ 115.00	$ 57,500.00
Structure Removal and Disposal	3	EA	$ 6,800.00	$ 20,400.00
Standard Structure	4	EA	$ 8,600.00	$ 34,400.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	690	LF	$ 535.00	$ 369,200.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	390	SY	$ 110.00	$ 42,900.00
New Concrete Curb and Gutter	300	LF	$ 110.00	$ 33,000.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 239,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,034,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 51,700.00
Design and Permitting	20%	$ 206,800.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 10,300.00
Structural Evaluation	1%	$ 10,300.00
Real Estate	2%	$ 20,700.00
Utility Relocation	2%	$ 20,700.00
Project Maintenance (3yr)	5%	$ 51,700.00
Construction Inspections	10%	$ 103,400.00
Construction	100%	$ 1,034,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,510,000.00

PROJECT NAME: **Cherry St Stormwater Improvements Phase II** PROJECT ID: **DT-SA-C2**

PROJECT INFORMATION

LOCATION: Church St and W State St
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 420

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing crossings at Church St and W State St with 50 LF of 30-inch RCP and 50 LF of 36-inch RCP.
- Replace existing pipe along Church St with 24-inch RCP and connect to new system at W. State St/Cherry St.
- Install 160 LF of 18-inch RCP along W. State St to redirect flow to proposed Cherry St system.
- Remove remaining connection between Montreat Rd and Cherry St.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	4
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**88**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
W State St at Church St	< 2-YR	50-YR	100
W State St east of Cherry St	2-YR	50-YR	100
Church St at W State St	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 699,000
Design and Permitting	$ 139,800
Other Project Costs	$ 182,200
Total Project	**$ 1,021,000**

PROJECT AREA MAP



PROJECT NAME **Cherry St Stormwater Improvements Phase II** PROJECT ID: **DT-SA-C2**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 420
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 25,635.00	$ 25,600.00
Erosion Control	1	LS	$ 21,015.00	$ 21,000.00
Traffic Control	1	LS	$ 8,406.00	$ 8,400.00
Moderate Utility Conflict	1	LS	$ 63,045.00	$ 63,000.00
Unclassified Excavation/Hauling	340	CY	$ 72.00	$ 24,500.00
Infrastructure Removal and Disposal	440	LF	$ 115.00	$ 50,600.00
Structure Removal and Disposal	8	EA	$ 6,800.00	$ 54,400.00
Standard Structure	7	EA	$ 8,600.00	$ 60,200.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	325	LF	$ 390.00	$ 126,800.00
New Pipe: 30-inch to 36-inch	95	LF	$ 535.00	$ 50,800.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	260	SY	$ 110.00	$ 28,600.00
New Concrete Curb and Gutter	210	LF	$ 110.00	$ 23,100.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 161,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 699,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 35,000.00
Design and Permitting	20%	$ 139,800.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 7,000.00
Structural Evaluation	1%	$ 7,000.00
Real Estate	2%	$ 14,000.00
Utility Relocation	2%	$ 14,000.00
Project Maintenance (3yr)	5%	$ 35,000.00
Construction Inspections	10%	$ 69,900.00
Construction	100%	$ 699,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,021,000.00

PROJECT NAME: **Police Station / Post Office Stormwater Improvements Phase I** PROJECT ID: **DT-SA-D1**

PROJECT INFORMATION

LOCATION: Richardson Blvd / Post Office
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 1600

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 150 LF of 3' x 7' RCBC along Richardson Blvd to the outfall in the open channel along Sutton Ave.
- Install 570 LF of twin 42-inch RCP north along Richardson Blvd to the post office.
- Install 190 LF of 42-inch pipe to the intersection with E State St.
- Install 70 LF of new 36-inch RCP adjacent to the post office to reroute flow to the right-of-way.
- Project allows for stormwater improvements upstream at Police Station.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	0
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**71**

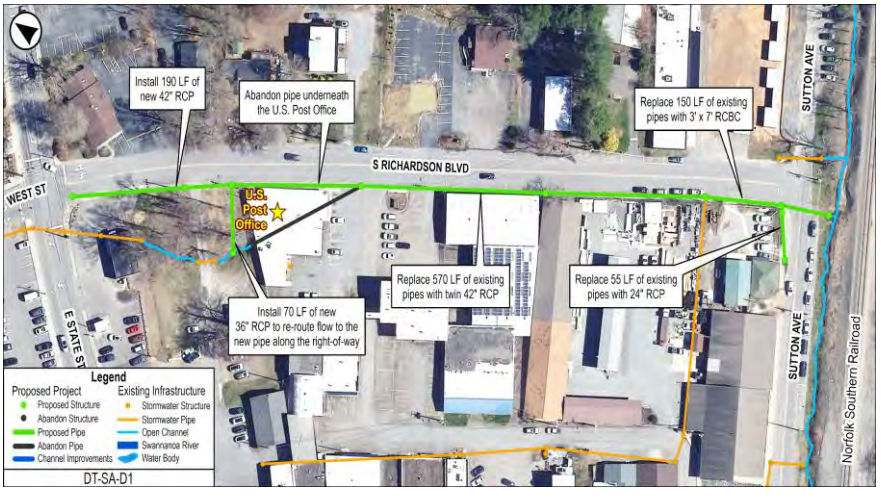
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Sutton Ave at Richardson	< 2-YR	50-YR	100
Post Office Infrastructure	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 2,913,000
Design and Permitting	$ 632,600
Other Project Costs	$ 757,400
Total Project	**$ 4,303,000**

PROJECT AREA MAP



PROJECT NAME **Police Station / Post Office Stormwater Improvements Phase I** PROJECT ID: **DT-SA-D1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 1600
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 106,720.00	$ 106,700.00
Erosion Control	1	LS	$ 87,475.00	$ 87,500.00
Traffic Control	1	LS	$ 34,990.00	$ 35,000.00
Moderate Utility Conflict	1	LS	$ 262,425.00	$ 262,400.00
Unclassified Excavation/Hauling	2310	CY	$ 72.00	$ 166,300.00
Infrastructure Removal and Disposal	760	LF	$ 115.00	$ 87,400.00
Structure Removal and Disposal	6	EA	$ 6,800.00	$ 40,800.00
Standard Structure	3	EA	$ 8,600.00	$ 25,800.00
Large Structure or Headwall	8	EA	$ 12,000.00	$ 96,000.00
New Pipe: 18-inch to 24-inch	50	LF	$ 390.00	$ 19,500.00
New Pipe: 30-inch to 36-inch	70	LF	$ 535.00	$ 37,500.00
New Pipe: 42-inch to 54-inch	1330	LF	$ 670.00	$ 891,100.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	150	LF	$ 1,700.00	$ 255,000.00
Rip Rap	50	TN	$ 50.00	$ 2,500.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	610	SY	$ 110.00	$ 67,100.00
New Concrete Curb and Gutter	550	LF	$ 110.00	$ 60,500.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 672,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 2,913,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 145,700.00
Design and Permitting	20%	$ 582,600.00
Environmental Permitting	-	$ 50,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 29,100.00
Structural Evaluation	1%	$ 29,100.00
Real Estate	2%	$ 58,300.00
Utility Relocation	2%	$ 58,300.00
Project Maintenance (3yr)	5%	$ 145,700.00
Construction Inspections	10%	$ 291,300.00
Construction	100%	$ 2,913,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 4,303,000.00

PROJECT NAME: **Police Station / Post Office Stormwater Improvements Phase II** PROJECT ID: **DT-SA-D2**

PROJECT INFORMATION

LOCATION: West St at E State St / Police Station
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 775

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 170 LF of new 42-inch RCP from Honeycutt St crossing E State St to tie-into proposed project DT-SA-D1.
- Install 55 LF of new 24-inch RCP and 200 LF of new 36-inch RCP in a new alignment along West St.
- Install new connecting pipes north of the police station to re-route flow to the right-of-way.
- Remove/abandon in place stormwater system running underneath police station to south of E State St.
- Install 235 LF of 24-inch RCP at the West/Midland intersection.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**87**

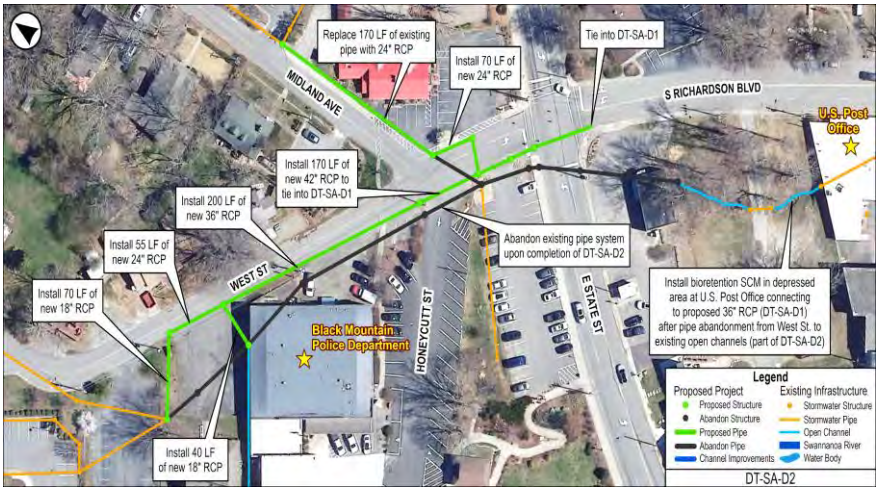
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
E State St/Richardson INT	< 2-YR	50-YR	100
West/Midland INT	< 2-YR	50-YR	100
Police Station Infrastructure	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,323,000
Design and Permitting	$ 264,600
Other Project Costs	$ 344,400
Total Project	**$ 1,932,000**

PROJECT AREA MAP



PROJECT NAME **Police Station / Post Office Stormwater Improvements Phase II** PROJECT ID: **DT-SA-D2**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 775
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 48,475.00	$ 48,500.00
Erosion Control	1	LS	$ 39,735.00	$ 39,700.00
Traffic Control	1	LS	$ 15,894.00	$ 15,900.00
Moderate Utility Conflict	1	LS	$ 119,205.00	$ 119,200.00
Unclassified Excavation/Hauling	940	CY	$ 72.00	$ 67,700.00
Infrastructure Removal and Disposal	710	LF	$ 115.00	$ 81,700.00
Structure Removal and Disposal	10	EA	$ 6,800.00	$ 68,000.00
Standard Structure	7	EA	$ 8,600.00	$ 60,200.00
Large Structure or Headwall	4	EA	$ 12,000.00	$ 48,000.00
New Pipe: 18-inch to 24-inch	400	LF	$ 390.00	$ 156,000.00
New Pipe: 30-inch to 36-inch	200	LF	$ 535.00	$ 107,000.00
New Pipe: 42-inch to 54-inch	175	LF	$ 670.00	$ 117,300.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	370	SY	$ 110.00	$ 40,700.00
New Concrete Curb and Gutter	425	LF	$ 110.00	$ 46,800.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 305,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,323,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 66,200.00
Design and Permitting	20%	$ 264,600.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 13,200.00
Structural Evaluation	1%	$ 13,200.00
Real Estate	2%	$ 26,500.00
Utility Relocation	2%	$ 26,500.00
Project Maintenance (3yr)	5%	$ 66,200.00
Construction Inspections	10%	$ 132,300.00
Construction	100%	$ 1,323,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,932,000.00

PROJECT NAME: **Police Station / Post Office Stormwater Improvements Phase III** PROJECT ID: **DT-SA-D3**

PROJECT INFORMATION

LOCATION: Montreat Rd and Honeycutt St
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 575

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe with paved over inlet across Montreat Rd at Fire Station with 35 LF of 24-inch RCP.
- Install 540 LF of new 24-inch RCP along Montreat Rd to Honeycutt St connecting to 42-inch RCP at West St.
- Remove existing pipe directing public water onto private property just north of the Fire Station.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	4
Effect of Improvements	15
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	0
FINAL PROJECT SCORE:	**81**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Montreat Rd at Fire Station	< 2-YR	50-YR	100
Honeycutt St	NA	50-YR	New System

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 632,000
Design and Permitting	$ 126,400
Other Project Costs	$ 164,600
Total Project	**$ 923,000**

PROJECT AREA MAP



PROJECT NAME **Police Station / Post Office Stormwater Improvements Phase III** PROJECT ID: **DT-SA-D3**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 575
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 23,135.00	$ 23,100.00
Erosion Control	1	LS	$ 18,960.00	$ 19,000.00
Traffic Control	1	LS	$ 7,584.00	$ 7,600.00
Moderate Utility Conflict	1	LS	$ 56,880.00	$ 56,900.00
Unclassified Excavation/Hauling	510	CY	$ 72.00	$ 36,700.00
Infrastructure Removal and Disposal	100	LF	$ 115.00	$ 11,500.00
Structure Removal and Disposal	3	EA	$ 6,800.00	$ 20,400.00
Standard Structure	4	EA	$ 8,600.00	$ 34,400.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	575	LF	$ 390.00	$ 224,300.00
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	310	SY	$ 110.00	$ 34,100.00
New Concrete Curb and Gutter	150	LF	$ 110.00	$ 16,500.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 146,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 632,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 31,600.00
Design and Permitting	20%	$ 126,400.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 6,300.00
Structural Evaluation	1%	$ 6,300.00
Real Estate	2%	$ 12,600.00
Utility Relocation	2%	$ 12,600.00
Project Maintenance (3yr)	5%	$ 31,600.00
Construction Inspections	10%	$ 63,200.00
Construction	100%	$ 632,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 923,000.00

PROJECT NAME: **West St to Montreat Rd Stormwater Improvements** PROJECT ID: **DT-SA-E1**

PROJECT INFORMATION

LOCATION: West St to Montreat Rd
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 760

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 735 LF of new 24-inch system along Montreat Rd and West St to connect to Proposed Project DT-SA-D2.
- This requires a permanent easement along the property line with the bank and church.
- Install 575 LF of new 24-inch system along Montreat Rd at Fire Station and Honeycutt Rd.
- Proposed project re-routes flow away from private property into the right-of-way.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**76**

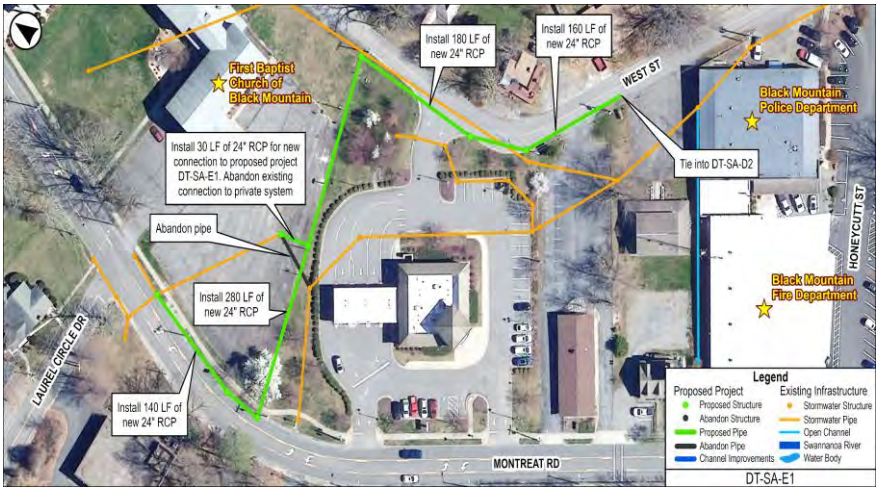
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Montreat Rd at the Church	NA	50-YR	New System
West St behind Bank	NA	50-YR	New System

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 841,000
Design and Permitting	$ 168,200
Other Project Costs	$ 218,800
Total Project	**$ 1,228,000**

PROJECT AREA MAP



PROJECT NAME **West St to Montreat Rd Stormwater Improvements** PROJECT ID: **DT-SA-E1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 760
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 30,820.00	$ 30,800.00
Erosion Control	1	LS	$ 25,260.00	$ 25,300.00
Traffic Control	1	LS	$ 10,104.00	$ 10,100.00
Moderate Utility Conflict	1	LS	$ 75,780.00	$ 75,800.00
Unclassified Excavation/Hauling	910	CY	$ 72.00	$ 65,500.00
Infrastructure Removal and Disposal	30	LF	$ 115.00	$ 3,500.00
Structure Removal and Disposal	2	EA	$ 6,800.00	$ 13,600.00
Standard Structure	8	EA	$ 8,600.00	$ 68,800.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	760	LF	$ 390.00	$ 296,400.00
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	210	SY	$ 110.00	$ 23,100.00
New Concrete Curb and Gutter	300	LF	$ 110.00	$ 33,000.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 194,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 841,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 42,100.00
Design and Permitting	20%	$ 168,200.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 8,400.00
Structural Evaluation	1%	$ 8,400.00
Real Estate	2%	$ 16,800.00
Utility Relocation	2%	$ 16,800.00
Project Maintenance (3yr)	5%	$ 42,100.00
Construction Inspections	10%	$ 84,100.00
Construction	100%	$ 841,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,228,000.00

PROJECT NAME: **Montreat Rd at Laurel Circle Dr Stormwater Improvements** PROJECT ID: **DT-SA-E2**

PROJECT INFORMATION

LOCATION:	Montreat Rd: E. Connally St to Laurel Circle Dr	STORMWATER PROJECT TYPE:	Stormwater Drainage
WATERSHED:	Downtown	DRAINAGE IMPROVEMENTS (LF):	350

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 260 LF of new 24-inch RCP along Montreat Rd from E. Connally St to Laurel Circle Dr.
- Replace 90 LF of existing pipe with 24-inch RCP across Laurel Circle Dr to tie-into proposed project DT-SA-E1.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	8
Public or Privately-Owned Land	4
Effect of Improvements	15
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**49**

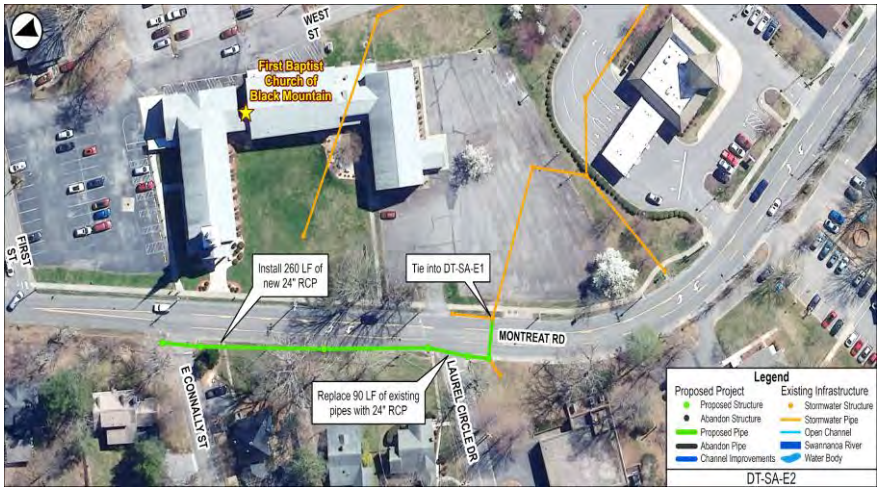
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Laurel Circle Dr	< 2-YR	25-YR	45
E Connally St at Montreat Rd	NA	25-YR	New Crossing

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 546,000
Design and Permitting	$ 109,200
Other Project Costs	$ 141,800
Total Project	**$ 797,000**

PROJECT AREA MAP



PROJECT NAME **Montreat Rd at Laurel Circle Dr Stormwater Improvements** PROJECT ID: **DT-SA-E2**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 350

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 19,975.00	$ 20,000.00
Erosion Control	1	LS	$ 14,580.00	$ 14,600.00
Traffic Control	1	LS	$ 5,832.00	$ 5,800.00
Major Utility Conflict	1	LS	$ 87,480.00	$ 87,500.00
Unclassified Excavation/Hauling	300	CY	$ 72.00	$ 21,600.00
Infrastructure Removal and Disposal	95	LF	$ 115.00	$ 10,900.00
Structure Removal and Disposal	3	EA	$ 6,800.00	$ 20,400.00
Standard Structure	6	EA	$ 8,600.00	$ 51,600.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	350	LF	$ 390.00	$ 136,500.00
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	110	SY	$ 110.00	$ 12,100.00
New Concrete Curb and Gutter	240	LF	$ 110.00	$ 26,400.00
Replace Driveway Culvert Pipe	30	LF	$ 300.00	$ 9,000.00
Replace Existing Concrete Driveway	15	SY	$ 120.00	$ 1,800.00
			Construction Contingency (30%):	$ 126,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 546,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 27,300.00
Design and Permitting	20%	$ 109,200.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 5,500.00
Structural Evaluation	1%	$ 5,500.00
Real Estate	2%	$ 10,900.00
Utility Relocation	2%	$ 10,900.00
Project Maintenance (3yr)	5%	$ 27,300.00
Construction Inspections	10%	$ 54,600.00
Construction	100%	$ 546,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 797,000.00

PROJECT NAME: **Midland Ave Stormwater Improvements** PROJECT ID: **DT-SA-F**

PROJECT INFORMATION

LOCATION: Midland Ave
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 675

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing culvert crossing at First St and Midland Ave with 30 LF of 24-inch RCP.
- Replace existing pipe and open channel system along Midland Ave with 24-inch RCP.
- Tie-into 24-inch RCP (part of proposed project DT-SA-D2) at Town Hall.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	15
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**82**

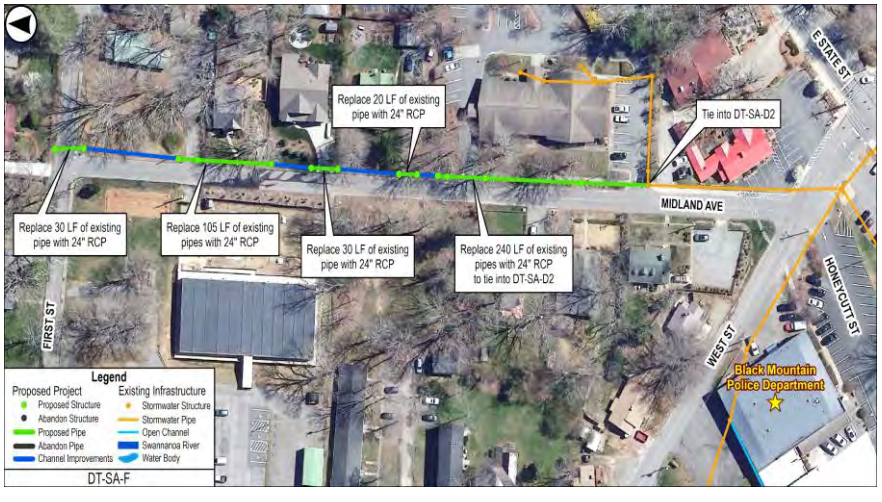
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
First St at Midland Ave	2-YR	50-YR	100
System at Town Hall	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 768,000
Design and Permitting	$ 153,600
Other Project Costs	$ 199,400
Total Project	**$ 1,121,000**

PROJECT AREA MAP



PROJECT NAME **Midland Ave Stormwater Improvements** PROJECT ID: **DT-SA-F**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 425

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 28,125.00	$ 28,100.00
Erosion Control	1	LS	$ 25,115.00	$ 25,100.00
Traffic Control	1	LS	$ 10,046.00	$ 10,000.00
Minor Utility Conflict	1	LS	$ 25,115.00	$ 25,100.00
Unclassified Excavation/Hauling	210	CY	$ 72.00	$ 15,100.00
Infrastructure Removal and Disposal	425	LF	$ 115.00	$ 48,900.00
Structure Removal and Disposal	5	EA	$ 6,800.00	$ 34,000.00
Standard Structure	13	EA	$ 8,600.00	$ 111,800.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	425	LF	$ 390.00	$ 165,800.00
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	250	LF	$ 350.00	$ 87,500.00
Roadway/Sidewalk Replacement	110	SY	$ 110.00	$ 12,100.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	70	LF	$ 300.00	$ 21,000.00
Replace Existing Concrete Driveway	40	SY	$ 120.00	$ 4,800.00
			Construction Contingency (30%):	$ 177,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 768,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 38,400.00
Design and Permitting	20%	$ 153,600.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 7,700.00
Structural Evaluation	1%	$ 7,700.00
Real Estate	2%	$ 15,400.00
Utility Relocation	2%	$ 15,400.00
Project Maintenance (3yr)	5%	$ 38,400.00
Construction Inspections	10%	$ 76,800.00
Construction	100%	$ 768,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,121,000.00

DRAFT for Review

PROJECT NAME: **S. Ridgeway Ave Stormwater Improvements** PROJECT ID: **DT-SA-G**

PROJECT INFORMATION

LOCATION: Sutton Ave at S. Ridgway Ave
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 310

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe with 50 LF of 30-inch RCP across Sutton Ave on east side of Richardson Blvd.
- Install 80 LF of new 18-inch RCP and 100 LF of new 24-inch RCP along S. Ridgeway Ave.
- Replace existing pipe with 85 LF of 36-inch RCP to outfall at the open channel along Sutton Ave.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	0
FINAL PROJECT SCORE:	**76**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Sutton Ave at Richardson	< 2-YR	50-YR	100
Sutton Ave at Ridgeway Ave	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 532,000
Design and Permitting	$ 156,400
Other Project Costs	$ 138,600
Total Project	**$ 827,000**

PROJECT AREA MAP



PROJECT NAME **S. Ridgeway Ave Stormwater Improvements** PROJECT ID: **DT-SA-G**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 310

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 19,475.00	$ 19,500.00
Erosion Control	1	LS	$ 14,215.00	$ 14,200.00
Traffic Control	1	LS	$ 5,686.00	$ 5,700.00
Major Utility Conflict	1	LS	$ 85,290.00	$ 85,300.00
Unclassified Excavation/Hauling	170	CY	$ 72.00	$ 12,200.00
Infrastructure Removal and Disposal	105	LF	$ 115.00	$ 12,100.00
Structure Removal and Disposal	3	EA	$ 6,800.00	$ 20,400.00
Standard Structure	9	EA	$ 8,600.00	$ 77,400.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	175	LF	$ 390.00	$ 68,300.00
New Pipe: 30-inch to 36-inch	135	LF	$ 535.00	$ 72,200.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	110	SY	$ 110.00	$ 12,100.00
New Concrete Curb and Gutter	75	LF	$ 110.00	$ 8,300.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 123,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 532,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 26,600.00
Design and Permitting	20%	$ 106,400.00
Environmental Permitting	-	$ 50,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 5,300.00
Structural Evaluation	1%	$ 5,300.00
Real Estate	2%	$ 10,600.00
Utility Relocation	2%	$ 10,600.00
Project Maintenance (3yr)	5%	$ 26,600.00
Construction Inspections	10%	$ 53,200.00
Construction	100%	$ 532,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 827,000.00

PROJECT NAME: **Black Mountain Ave Stormwater Improvements Phase I** PROJECT ID: **DT-BMA-A**

PROJECT INFORMATION

LOCATION: Vance Ave to the Swannanoa River
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 585

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 85 LF of 30" RCP across Vance St at Black Mountain Ave.
- Replace 175 LF of existing pipe with 30" RCP and 36" RCP at Vance Ave intersection and moving south.
- Install 370 LF of new 36" RCP just north of the Terry Estate Dr intersection to the outfall.
- Install 40 LF of new 24" RCP across Black Mountain Ave at Terry Estate Dr.
- Remove 195 LF of existing pipe from service at Terry Estate Dr/Black Mountain Ave intersection.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	4
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**82**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Terry Estate at Black Mtn Ave	< 2-YR	50-YR	100
Vance Ave at Black Mtn Ave	< 2-YR	25-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,253,000
Design and Permitting	$ 300,600
Other Project Costs	$ 326,400
Total Project	**$ 1,880,000**

PROJECT AREA MAP



PROJECT NAME **Black Mountain Ave Stormwater Improvements Phase I** PROJECT ID: **DT-BMA-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 585

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 45,910.00	$ 45,900.00
Erosion Control	1	LS	$ 37,630.00	$ 37,600.00
Traffic Control	1	LS	$ 15,052.00	$ 15,100.00
Moderate Utility Conflict	1	LS	$ 112,890.00	$ 112,900.00
Unclassified Excavation/Hauling	860	CY	$ 72.00	$ 61,900.00
Infrastructure Removal and Disposal	370	LF	$ 115.00	$ 42,600.00
Structure Removal and Disposal	4	EA	$ 6,800.00	$ 27,200.00
Standard Structure	3	EA	$ 8,600.00	$ 25,800.00
Large Structure or Headwall	8	EA	$ 12,000.00	$ 96,000.00
New Pipe: 18-inch to 24-inch	40	LF	$ 390.00	$ 15,600.00
New Pipe: 30-inch to 36-inch	25	LF	$ 535.00	$ 13,400.00
New Pipe: 42-inch to 54-inch	520	LF	$ 670.00	$ 348,400.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	560	SY	$ 110.00	$ 61,600.00
New Concrete Curb and Gutter	450	LF	$ 110.00	$ 49,500.00
Replace Driveway Culvert Pipe	25	LF	$ 300.00	$ 7,500.00
Replace Existing Concrete Driveway	15	SY	$ 120.00	$ 1,800.00
			Construction Contingency (30%):	$ 289,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,253,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 62,700.00
Design and Permitting	20%	$ 250,600.00
Environmental Permitting	-	$ 50,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 12,500.00
Structural Evaluation	1%	$ 12,500.00
Real Estate	2%	$ 25,100.00
Utility Relocation	2%	$ 25,100.00
Project Maintenance (3yr)	5%	$ 62,700.00
Construction Inspections	10%	$ 125,300.00
Construction	100%	$ 1,253,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,880,000.00

PROJECT NAME: **Black Mountain Ave Stormwater Improvements Phase II** PROJECT ID: **DT-BMA-B**

PROJECT INFORMATION

LOCATION: S. Doughtery St to Vance Ave
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 585

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace nearly 400 LF of existing pipe along Black Mountain Ave from S. Doughtery St to Vance Ave.
- Install 160 LF of new 24" RCP at S. Doughtery St. to Black Mountain Ave.
- Replace existing culvert adjacent to the railroad tracks with 30 LF of 18" RCP.
- Install 50 LF of stormwater channel improvements as needed.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**88**

	LEVEL OF SERVICE		% REDUCTION
KEY CROSSING	EXISTING	PROPOSED	50 YR
Black Mountain Ave at RR	< 2-YR	50-YR	100
S. Dougherty St Bend	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 862,000
Design and Permitting	$ 222,400
Other Project Costs	$ 223,600
Total Project	**$ 1,308,000**

PROJECT AREA MAP



PROJECT NAME **Black Mountain Ave Stormwater Improvements Phase II** PROJECT ID: **DT-BMA-B**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 585
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 31,570.00	$ 31,600.00
Erosion Control	1	LS	$ 28,185.00	$ 28,200.00
Traffic Control	1	LS	$ 11,274.00	$ 11,300.00
Minor Utility Conflict	1	LS	$ 28,185.00	$ 28,200.00
Unclassified Excavation/Hauling	550	CY	$ 72.00	$ 39,600.00
Infrastructure Removal and Disposal	500	LF	$ 115.00	$ 57,500.00
Structure Removal and Disposal	4	EA	$ 6,800.00	$ 27,200.00
Standard Structure	6	EA	$ 8,600.00	$ 51,600.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	190	LF	$ 390.00	$ 74,100.00
New Pipe: 30-inch to 36-inch	395	LF	$ 535.00	$ 211,300.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	350	SY	$ 110.00	$ 38,500.00
New Concrete Curb and Gutter	400	LF	$ 110.00	$ 44,000.00
Replace Driveway Culvert Pipe	50	LF	$ 300.00	$ 15,000.00
Replace Existing Concrete Driveway	30	SY	$ 120.00	$ 3,600.00
			Construction Contingency (30%):	$ 199,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 862,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 43,100.00
Design and Permitting	20%	$ 172,400.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ 50,000.00
Geotechnical Investigation	1%	$ 8,600.00
Structural Evaluation	1%	$ 8,600.00
Real Estate	2%	$ 17,200.00
Utility Relocation	2%	$ 17,200.00
Project Maintenance (3yr)	5%	$ 43,100.00
Construction Inspections	10%	$ 86,200.00
Construction	100%	$ 862,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,308,000.00

PROJECT NAME: **Terry Estate Dr Stormwater Improvements Phase I** PROJECT ID: **DT-TE-A**

PROJECT INFORMATION

LOCATION: Terry Estate Drive
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 745

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipes across Terry Estate Dr in 5 locations with larger pipes.
- Replace the existing pipe on the south side of Terry Estate Dr with 55 LF of 30-inch and 400 LF of 36-inch RCP.
- Install a new 42-inch outfall pipe across the parking lot to the Swannanoa River.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	24
Public or Privately-Owned Land	4
Effect of Improvements	15
Cost Effectiveness	10
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**61**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Terry Estate Dr at Bridge St	< 2-YR	50-YR	100
Terry Estate Dr	< 2-YR	25-YR	96

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 1,310,000
Design and Permitting	$ 312,000
Other Project Costs	$ 341,000
Total Project	**$ 1,963,000**

PROJECT AREA MAP



PROJECT NAME **Terry Estate Dr Stormwater Improvements Phase I** PROJECT ID: **DT-TE-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 745
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 48,010.00	$ 48,000.00
Erosion Control	1	LS	$ 35,045.00	$ 35,000.00
Traffic Control	1	LS	$ 14,018.00	$ 14,000.00
Major Utility Conflict	1	LS	$ 210,270.00	$ 210,300.00
Unclassified Excavation/Hauling	630	CY	$ 72.00	$ 45,400.00
Infrastructure Removal and Disposal	730	LF	$ 115.00	$ 84,000.00
Structure Removal and Disposal	7	EA	$ 6,800.00	$ 47,600.00
Standard Structure	9	EA	$ 8,600.00	$ 77,400.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	120	LF	$ 390.00	$ 46,800.00
New Pipe: 30-inch to 36-inch	485	LF	$ 535.00	$ 259,500.00
New Pipe: 42-inch to 54-inch	140	LF	$ 670.00	$ 93,800.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	410	SY	$ 110.00	$ 45,100.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 302,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 1,310,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 65,500.00
Design and Permitting	20%	$ 262,000.00
Environmental Permitting	-	$ 50,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 13,100.00
Structural Evaluation	1%	$ 13,100.00
Real Estate	2%	$ 26,200.00
Utility Relocation	2%	$ 26,200.00
Project Maintenance (3yr)	5%	$ 65,500.00
Construction Inspections	10%	$ 131,000.00
Construction	100%	$ 1,310,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,963,000.00

PROJECT NAME: **Terry Estate Dr Stormwater Improvements Phase II** PROJECT ID: **DT-TE-B**

PROJECT INFORMATION

LOCATION: Vance Ave at Bridge St and Spring St
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 715

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe and stormwater roadside ditches along Bridge St with 260 LF of 24-inch RCP.
- Replace existing pipe crossing Spring St and Vance St with 70 LF of 24-inch RCP.
- Install 375 LF of new 24-inch RCP to re-route flow to Vance Ave and Black Mountain Ave rights-of-way.
- Remove/abandon in place stormwater pipe running south to Terry Estate Dr through private property.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**78**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Vance Ave at Bridge St	10-YR	50-YR	100
Vance Ave/Spring St INT	< 2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 945,000
Design and Permitting	$ 189,000
Other Project Costs	$ 246,000
Total Project	**$ 1,380,000**

PROJECT AREA MAP



PROJECT NAME **Terry Estate Dr Stormwater Improvements Phase II** PROJECT ID: **DT-TE-B**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 715
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 34,625.00	$ 34,600.00
Erosion Control	1	LS	$ 28,380.00	$ 28,400.00
Traffic Control	1	LS	$ 11,352.00	$ 11,400.00
Moderate Utility Conflict	1	LS	$ 85,140.00	$ 85,100.00
Unclassified Excavation/Hauling	590	CY	$ 72.00	$ 42,500.00
Infrastructure Removal and Disposal	580	LF	$ 115.00	$ 66,700.00
Structure Removal and Disposal	4	EA	$ 6,800.00	$ 27,200.00
Standard Structure	7	EA	$ 8,600.00	$ 60,200.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	265	LF	$ 390.00	$ 103,400.00
New Pipe: 30-inch to 36-inch	450	LF	$ 535.00	$ 240,800.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	180	SY	$ 110.00	$ 19,800.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	15	LF	$ 300.00	$ 4,500.00
Replace Existing Concrete Driveway	10	SY	$ 120.00	$ 1,200.00
			Construction Contingency (30%):	$ 218,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 945,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 47,300.00
Design and Permitting	20%	$ 189,000.00
Environmental Permitting	-	$ -
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 9,500.00
Structural Evaluation	1%	$ 9,500.00
Real Estate	2%	$ 18,900.00
Utility Relocation	2%	$ 18,900.00
Project Maintenance (3yr)	5%	$ 47,300.00
Construction Inspections	10%	$ 94,500.00
Construction	100%	$ 945,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,380,000.00

PROJECT NAME: **NC 9 Stormwater Improvements** PROJECT ID: **DT-NC9-A**

PROJECT INFORMATION

LOCATION: Vance Ave to outfall at Swannanoa River
WATERSHED: Downtown
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 595

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe along NC 9 with 280 LF of 36-inch RCP and tie-into culvert at Swannanaoa River.
- Replace existing pipe along Terry Estate Dr with 24-inch RCP and tie into proposed 36-inch pipe at NC 9.
- Install 130 LF of new 24-inch RCP to route flow along the Vance Ave right-of -way to tie into the NC 9 system.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	15
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**68**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Terry Estate Dr west of NC9	< 2-YR	50-YR	100
Terry Estate Dr at NC9	25-YR	50-YR	100
Vance Ave at NC9	25-YR	50-YR	100
Vance Ave west of NC 9	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 880,000
Design and Permitting	$ 226,000
Other Project Costs	$ 229,000
Total Project	**$ 1,335,000**

PROJECT AREA MAP



PROJECT NAME **NC 9 Stormwater Improvements** PROJECT ID: **DT-NC9-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Downtown

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 595
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 32,250.00	$ 32,300.00
Erosion Control	1	LS	$ 26,435.00	$ 26,400.00
Traffic Control	1	LS	$ 10,574.00	$ 10,600.00
Moderate Utility Conflict	1	LS	$ 79,305.00	$ 79,300.00
Unclassified Excavation/Hauling	540	CY	$ 72.00	$ 38,900.00
Infrastructure Removal and Disposal	470	LF	$ 115.00	$ 54,100.00
Structure Removal and Disposal	7	EA	$ 6,800.00	$ 47,600.00
Standard Structure	7	EA	$ 8,600.00	$ 60,200.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	315	LF	$ 390.00	$ 122,900.00
New Pipe: 30-inch to 36-inch	280	LF	$ 535.00	$ 149,800.00
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	270	SY	$ 110.00	$ 29,700.00
New Concrete Curb and Gutter	220	LF	$ 110.00	$ 24,200.00
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 203,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 880,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 44,000.00
Design and Permitting	20%	$ 176,000.00
Environmental Permitting	-	$ 50,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 8,800.00
Structural Evaluation	1%	$ 8,800.00
Real Estate	2%	$ 17,600.00
Utility Relocation	2%	$ 17,600.00
Project Maintenance (3yr)	5%	$ 44,000.00
Construction Inspections	10%	$ 88,000.00
Construction	100%	$ 880,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,335,000.00



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AN ARDURRA COMPANY

Figure E-2: Proposed Stormwater Improvement Projects
TOMAHAWK BRANCH PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 100 200
Feet
1 in = 200 ft

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W E
S

PROJECT NAME: **Laurel Circle Culvert Replacement (Tomahawk Branch)** PROJECT ID: **TB-A1**

PROJECT INFORMATION

LOCATION:	Laurel Circle Dr north of Lake Tomahawk	STORMWATER PROJECT TYPE:	Stormwater Drainage
WATERSHED:	Tomahawk Branch	DRAINAGE IMPROVEMENTS (LF):	220

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing arch culverts with 40 LF of triple 5' x 9' RCBC.
- Install floodplain benching upstream/downstream of proposed culvert (documented separately).
- Tomahawk Lake analysis is required to determine any additional measures to improve the level of service.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	8
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	15
Grant Bonus	3
Criticality Bonus	2
FINAL PROJECT SCORE:	**58**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Laurel Circle Drive	< 2-YR	10-YR	0

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 455,000
Design and Permitting	$ 186,000
Other Project Costs	$ 119,000
Total Project	**$ 760,000**

PROJECT AREA MAP



PROJECT NAME **Laurel Circle Culvert Replacement (Tomahawk Branch)** PROJECT ID: **TB-A1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tomahawk B

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 120

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 16,650.00	$ 16,700.00
Erosion Control	1	LS	$ 14,865.00	$ 14,900.00
Traffic Control	1	LS	$ 5,946.00	$ 5,900.00
Minor Utility Conflict	1	LS	$ 14,865.00	$ 14,900.00
Unclassified Excavation/Hauling	190	CY	$ 72.00	$ 13,700.00
Infrastructure Removal and Disposal	120	LF	$ 115.00	$ 13,800.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	120	LF	$ 1,700.00	$ 204,000.00
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	100	LF	$ 350.00	$ 35,000.00
Roadway/Sidewalk Replacement	50	SY	$ 110.00	$ 5,500.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 105,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 455,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 22,800.00
Design and Permitting	20%	$ 91,000.00
Environmental Permitting	-	$ 95,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 4,600.00
Structural Evaluation	1%	$ 4,600.00
Real Estate	2%	$ 9,100.00
Utility Relocation	2%	$ 9,100.00
Project Maintenance (3yr)	5%	$ 22,800.00
Construction Inspections	10%	$ 45,500.00
Construction	100%	$ 455,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 760,000.00

PROJECT NAME: **Tomahawk Branch Floodplain Benching at Golf Course** PROJECT ID: **TB-A2**

PROJECT INFORMATION

LOCATION:	Laurel Circle Dr north of Lake Tomahawk	STORMWATER PROJECT TYPE:	Floodplain Benching
WATERSHED:	Tomahawk Branch	DRAINAGE IMPROVEMENTS (LF):	500

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install approximately 500 LF of channel improvements with floodplain benching to lower WSELs.
- Floodplain benching improvements are located up and downstream of the proposed RCBC in project TB-A1.

PROJECT PRIORITIZATION AND PROPERTY REQUIREMENTS

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	8
Public or Privately-Owned Land	4
Effect of Improvements	10
Cost Effectiveness	15
Grant Bonus	3
Criticality Bonus	1
FINAL PROJECT SCORE:	**53**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Laurel Circle Drive	< 2-YR	10-YR	0

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 406,000
Design and Permitting	$ 146,200
Other Project Costs	$ 137,800
Total Project	**$ 690,000**

PROJECT AREA MAP



PROJECT NAME: **Tomahawk Branch Floodplain Benching at Golf C** PROJECT ID: **TB-A2**

PROJECT TYPE: Floodplain Benching WATERSHED: Tomahawk Branch

PLANNING LEVEL COST ESTIMATE

- Construction estimate includes 30% contingency for planning.
- Proposed project footprints are based on GIS and modeling analyses.
- Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 15,660.00	$ 15,700.00
Erosion Control	1	LS	$ 13,980.00	$ 14,000.00
Traffic Control	1	LS	$ 5,592.00	$ 5,600.00
Minor Utility Conflict	1	LS	$ 13,980.00	$ 14,000.00
Clearing and Grubbing	1110	SY	$ 5.50	$ 6,100.00
Earthwork	370	CY	$ 90.00	$ 33,300.00
Fine Grading	1110	SY	$ 18.00	$ 20,000.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Infrastructure Removal and Disposal	-	LF	$ 115.00	-
Stone, Class B	125	TN	$ 92.00	$ 11,500.00
Filter Fabric/Geotextiles	2780	SY	$ 35.00	$ 97,300.00
Plantings	1110	SY	$ 7.00	$ 7,800.00
3-gallon Container Plants	135	EA	$ 70.00	$ 9,500.00
Riffle Grade Control	2	EA	$ 4,025.00	$ 8,100.00
Floodplain Tree Removal	1	LS	$ 15,000.00	$ 15,000.00
Log Grade Control Structure	-	EA	$ 4,000.00	-
Pump Around Operation	1	LS	$ 46,000.00	$ 46,000.00
Golf Course Bridge	1	LS	$ 25,000.00	$ 25,000.00
			Construction Contingency (30%):	$ 77,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 406,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 20,300.00
Design and Permitting	20%	$ 81,200.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 4,100.00
Structural Evaluation	1%	$ 4,100.00
Real Estate	10%	$ 40,600.00
Utility Relocation	2%	$ 8,100.00
Project Maintenance (3yr)	5%	$ 20,300.00
Construction Inspections	10%	$ 40,600.00
Construction	100%	$ 406,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 690,000.00

PROJECT NAME: **Swannanoa Ave Culvert Replacement and Stream Stabilization** PROJECT ID: **TB-B**

PROJECT INFORMATION

LOCATION:	Swannanoa Ave near Cragmont Rd	STORMWATER PROJECT TYPE:	Stormwater Drainage
WATERSHED:	Tomahawk Branch	DRAINAGE IMPROVEMENTS (LF):	355

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing culvert with 30 LF of 48-inch RCP.
- Install approximately 200 LF of stream stabilization measures.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**77**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Swannanoa Ave	2-YR	25-YR	50

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 250,000
Design and Permitting	$ 115,000
Other Project Costs	$ 65,000
Total Project	**$ 430,000**

PROJECT AREA MAP



PROJECT NAME **Swannanoa Ave Culvert Replacement and Stream Stabilization** PROJECT ID: **TB-B**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tomahawk B

PLANNING LEVEL COST ESTIMATE

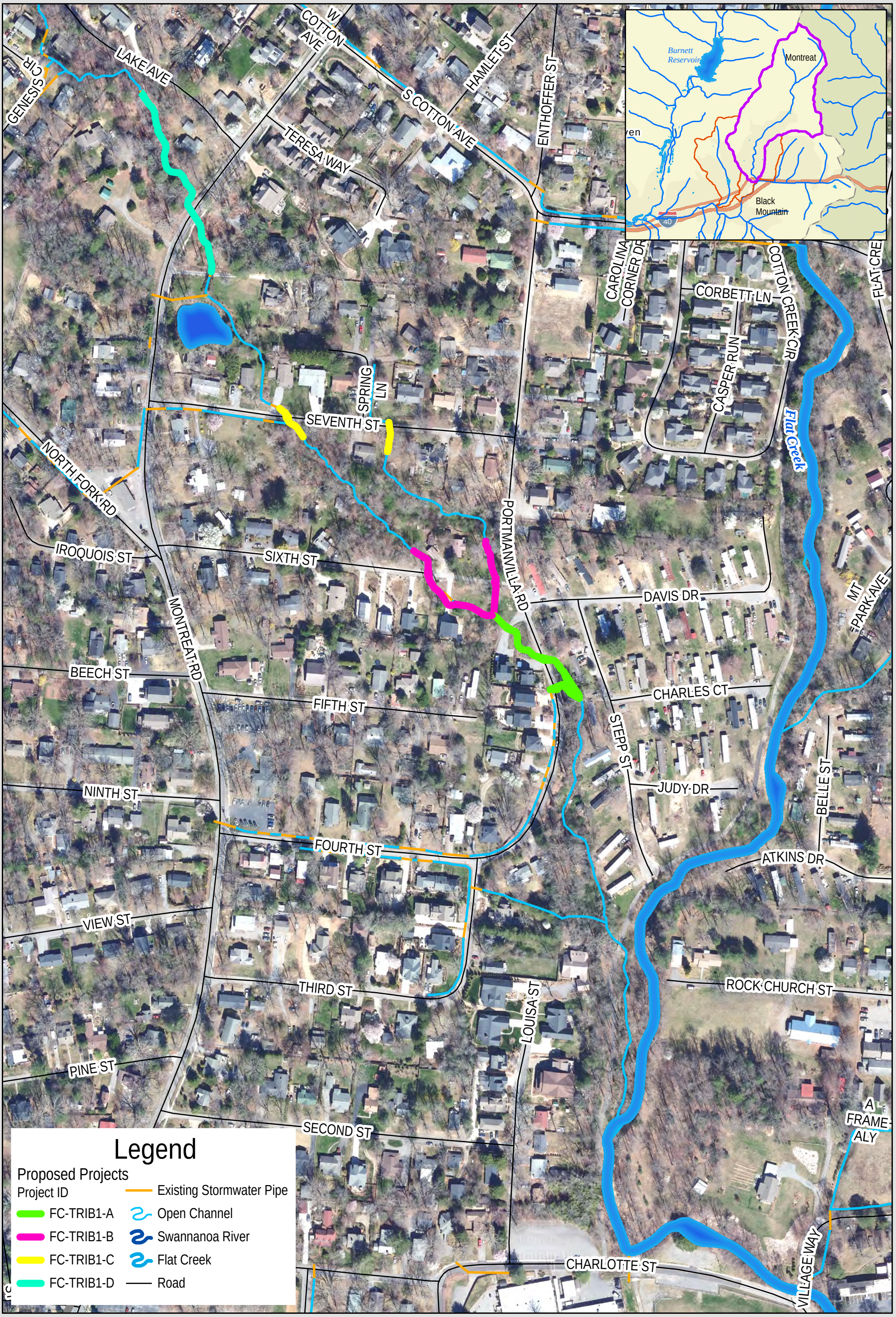
Construction cost includes 30% contingency for planning. Improvements (LF): 35
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 9,140.00	$ 9,100.00
Erosion Control	1	LS	$ 8,155.00	$ 8,200.00
Traffic Control	1	LS	$ 3,262.00	$ 3,300.00
Minor Utility Conflict	1	LS	$ 8,155.00	$ 8,200.00
Unclassified Excavation/Hauling	40	CY	$ 72.00	$ 2,900.00
Infrastructure Removal and Disposal	35	LF	$ 115.00	$ 4,000.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	2	EA	$ 8,600.00	$ 17,200.00
Large Structure or Headwall	-	EA	$ 12,000.00	-
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	35	LF	$ 670.00	$ 23,500.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	320	LF	$ 350.00	$ 112,000.00
Roadway/Sidewalk Replacement	20	SY	$ 110.00	$ 2,200.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 58,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 250,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 12,500.00
Design and Permitting	20%	$ 50,000.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 2,500.00
Structural Evaluation	1%	$ 2,500.00
Real Estate	2%	$ 5,000.00
Utility Relocation	2%	$ 5,000.00
Project Maintenance (3yr)	5%	$ 12,500.00
Construction Inspections	10%	$ 25,000.00
Construction	100%	$ 250,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 430,000.00



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Figure E-3: Proposed Stormwater Improvement Projects
FLAT CREEK TRIBUTARY 1 PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 100 200 Feet
1 in = 200 ft

N
W E
S

PROJECT NAME: **Portmanvilla Rd Stormwater Improvements** PROJECT ID: **FC-TRIB1-A**

PROJECT INFORMATION

LOCATION: Portmanvilla Rd near Davis Dr
WATERSHED: Flat Creek
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 540

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 15-inch CMP with 35 LF of twin 22.5" x 36.25" (30" Eq) Concrete Arch Pipe.
- Replace existing 30-inch CMP with 45 LF of twin 31.31" x 51.13" (42" Eq) Concrete Arch Pipe.
- Replace existing upstream private pipe with 25 LF of twin 31.31" x 51.13" (42" Eq) Concrete Arch Pipe.
- Replace existing downstream private pipe with 40 LF of twin 31.31" x 51.13" (42" Eq) Concrete Arch Pipe.
- Install approximately 250 LF of stream stabilization measures.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	15
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**87**

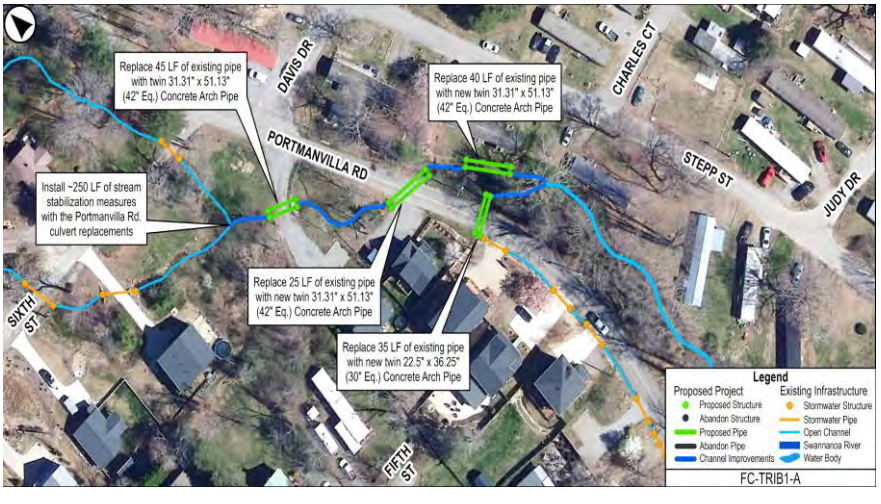
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Portmanvilla Rd (15" CMP)	< 2-YR	50-YR	100
Portmanvilla Rd (30" RCP)	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 572,000
Design and Permitting	$ 179,400
Other Project Costs	$ 148,600
Total Project	**$ 900,000**

PROJECT AREA MAP



PROJECT NAME **Portmanvilla Rd Stormwater Improvements** PROJECT ID: **FC-TRIB1-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Flat Creek

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 290
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 20,940.00	$ 20,900.00
Erosion Control	1	LS	$ 17,160.00	$ 17,200.00
Traffic Control	1	LS	$ 6,864.00	$ 6,900.00
Moderate Utility Conflict	1	LS	$ 51,480.00	$ 51,500.00
Unclassified Excavation/Hauling	270	CY	$ 72.00	$ 19,400.00
Infrastructure Removal and Disposal	140	LF	$ 115.00	$ 16,100.00
Structure Removal and Disposal	2	EA	$ 6,800.00	$ 13,600.00
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	4	EA	$ 12,000.00	$ 48,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	290	LF	$ 500.00	$ 145,000.00
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	250	LF	$ 350.00	$ 87,500.00
Roadway/Sidewalk Replacement	60	SY	$ 110.00	$ 6,600.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	15	LF	$ 300.00	$ 4,500.00
Replace Existing Concrete Driveway	10	SY	$ 120.00	$ 1,200.00
			Construction Contingency (30%):	$ 132,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 572,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 28,600.00
Design and Permitting	20%	$ 114,400.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 5,700.00
Structural Evaluation	1%	$ 5,700.00
Real Estate	2%	$ 11,400.00
Utility Relocation	2%	$ 11,400.00
Project Maintenance (3yr)	5%	$ 28,600.00
Construction Inspections	10%	$ 57,200.00
Construction	100%	$ 572,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 900,000.00

PROJECT NAME: **6th Street Culvert Replacements and Stream Stabilization** PROJECT ID: **FC-TRIB1-B**

PROJECT INFORMATION

LOCATION: 6th St near Portmanvilla Rd
WATERSHED: Flat Creek
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 500

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 15-inch CMP with 20 LF of twin 22.5" x 36.25" (30" Eq) Concrete Arch Pipe.
- Replace existing 42-inch CMP with 30 LF of twin 26.625" x 43.75" (36" Eq) Concrete Arch Pipe.
- Install approximately 150 LF of stream stabilization measures upstream of the proposed culverts.
- Install approximately 250 LF of stream stabilization measures downstream of the proposed culverts.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	2
FINAL PROJECT SCORE:	**78**

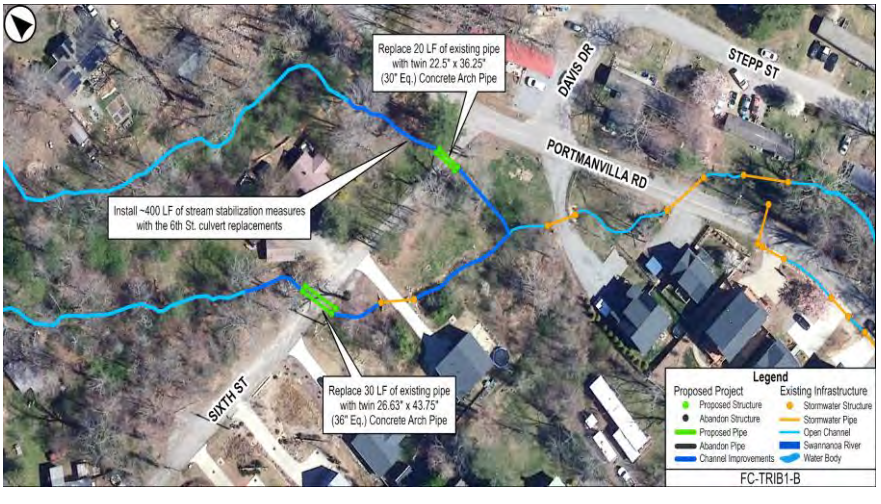
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
6th St at Portmanvilla Rd	< 2-YR	50-YR	100
6th Street	10-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 389,000
Design and Permitting	$ 142,800
Other Project Costs	$ 101,200
Total Project	**$ 633,000**

PROJECT AREA MAP



PROJECT NAME **6th Street Culvert Replacements and Stream Stabilization** PROJECT ID: **FC-TRIB1-B**

PROJECT TYPE: Stormwater Drainage WATERSHED: Flat Creek

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 100
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 14,250.00	$ 14,300.00
Erosion Control	1	LS	$ 12,725.00	$ 12,700.00
Traffic Control	1	LS	$ 5,090.00	$ 5,100.00
Minor Utility Conflict	1	LS	$ 12,725.00	$ 12,700.00
Unclassified Excavation/Hauling	70	CY	$ 72.00	$ 5,000.00
Infrastructure Removal and Disposal	50	LF	$ 115.00	$ 5,800.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	2	EA	$ 8,600.00	$ 17,200.00
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	100	LF	$ 500.00	$ 50,000.00
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	400	LF	$ 350.00	$ 140,000.00
Roadway/Sidewalk Replacement	50	SY	$ 110.00	$ 5,500.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	15	LF	$ 300.00	$ 4,500.00
Replace Existing Concrete Driveway	10	SY	$ 120.00	$ 1,200.00
			Construction Contingency (30%):	$ 90,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 389,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 19,500.00
Design and Permitting	20%	$ 77,800.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 3,900.00
Structural Evaluation	1%	$ 3,900.00
Real Estate	2%	$ 7,800.00
Utility Relocation	2%	$ 7,800.00
Project Maintenance (3yr)	5%	$ 19,500.00
Construction Inspections	10%	$ 38,900.00
Construction	100%	$ 389,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 633,000.00

PROJECT NAME: **7th Street Culvert Replacements and Stream Stabilization** PROJECT ID: **FC-TRIB1-C**

PROJECT INFORMATION

LOCATION: 7th St near Portmanvilla Rd
WATERSHED: Flat Creek
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 210

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 15-inch CPP with 25 LF of 22.5" x 36.25" (30" Eq) Concrete Arch Pipe.
- Replace existing triple 24-inch CMP with 25 LF of twin 22.5" x 36.25" (30" Eq) Concrete Arch Pipe.
- Install approximately 110 LF of stream stabilization measures.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**87**

KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
7th St at Portmanvilla Rd	< 2-YR	50-YR	100
7th Street	2-YR	25-YR	78

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 233,000
Design and Permitting	$ 111,600
Other Project Costs	$ 60,400
Total Project	**$ 405,000**

PROJECT AREA MAP



PROJECT NAME **7th Street Culvert Replacements and Stream Stabilization** PROJECT ID: **FC-TRIB1-C**

PROJECT TYPE: Stormwater Drainage WATERSHED: Flat Creek

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 100
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 8,525.00	$ 8,500.00
Erosion Control	1	LS	$ 7,615.00	$ 7,600.00
Traffic Control	1	LS	$ 3,046.00	$ 3,000.00
Minor Utility Conflict	1	LS	$ 7,615.00	$ 7,600.00
Unclassified Excavation/Hauling	60	CY	$ 72.00	$ 4,300.00
Infrastructure Removal and Disposal	100	LF	$ 115.00	$ 11,500.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	2	EA	$ 8,600.00	$ 17,200.00
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	100	LF	$ 500.00	$ 50,000.00
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	110	LF	$ 350.00	$ 38,500.00
Roadway/Sidewalk Replacement	50	SY	$ 110.00	$ 5,500.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 54,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 233,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 11,700.00
Design and Permitting	20%	$ 46,600.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 2,300.00
Structural Evaluation	1%	$ 2,300.00
Real Estate	2%	$ 4,700.00
Utility Relocation	2%	$ 4,700.00
Project Maintenance (3yr)	5%	$ 11,700.00
Construction Inspections	10%	$ 23,300.00
Construction	100%	$ 233,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 405,000.00

PROJECT NAME: **Montreat Road Culvert Replacement (Flat Creek)** PROJECT ID: **FC-TRIB1-D**

PROJECT INFORMATION

LOCATION: Montreat Rd near Lake Ave
WATERSHED: Tomahawk Branch
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 350

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing 24-inch CMP with 50 LF of 42-inch RCP.
- Install approximately 200 LF of stream stabilization measures upstream.
- Install approximately 100 LF of stream stabilization measures downstream of the proposed culvert.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	3
Criticality Bonus	1
FINAL PROJECT SCORE:	**88**

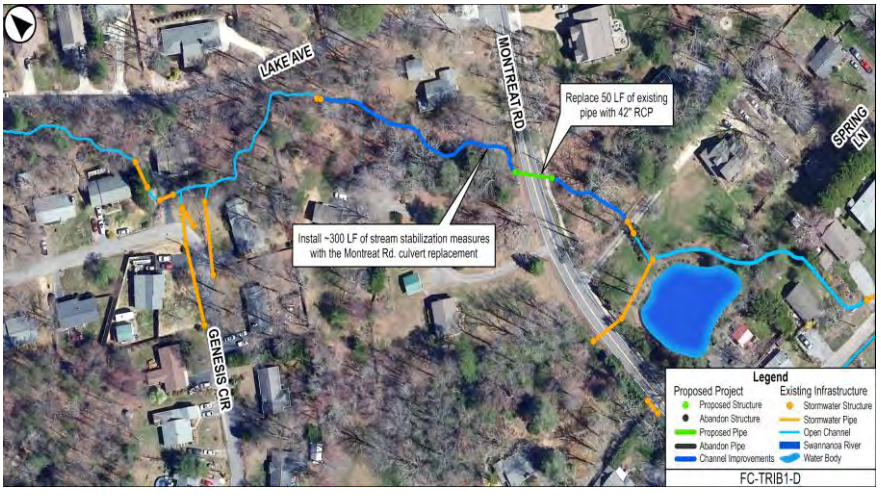
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Montreat Rd near Lake Ave	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 329,000
Design and Permitting	$ 130,800
Other Project Costs	$ 86,200
Total Project	**$ 546,000**

PROJECT AREA MAP



PROJECT NAME **Montreat Road Culvert Replacement (Flat Creek)** PROJECT ID: **FC-TRIB1-D**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tomahawk B

PLANNING LEVEL COST ESTIMATE

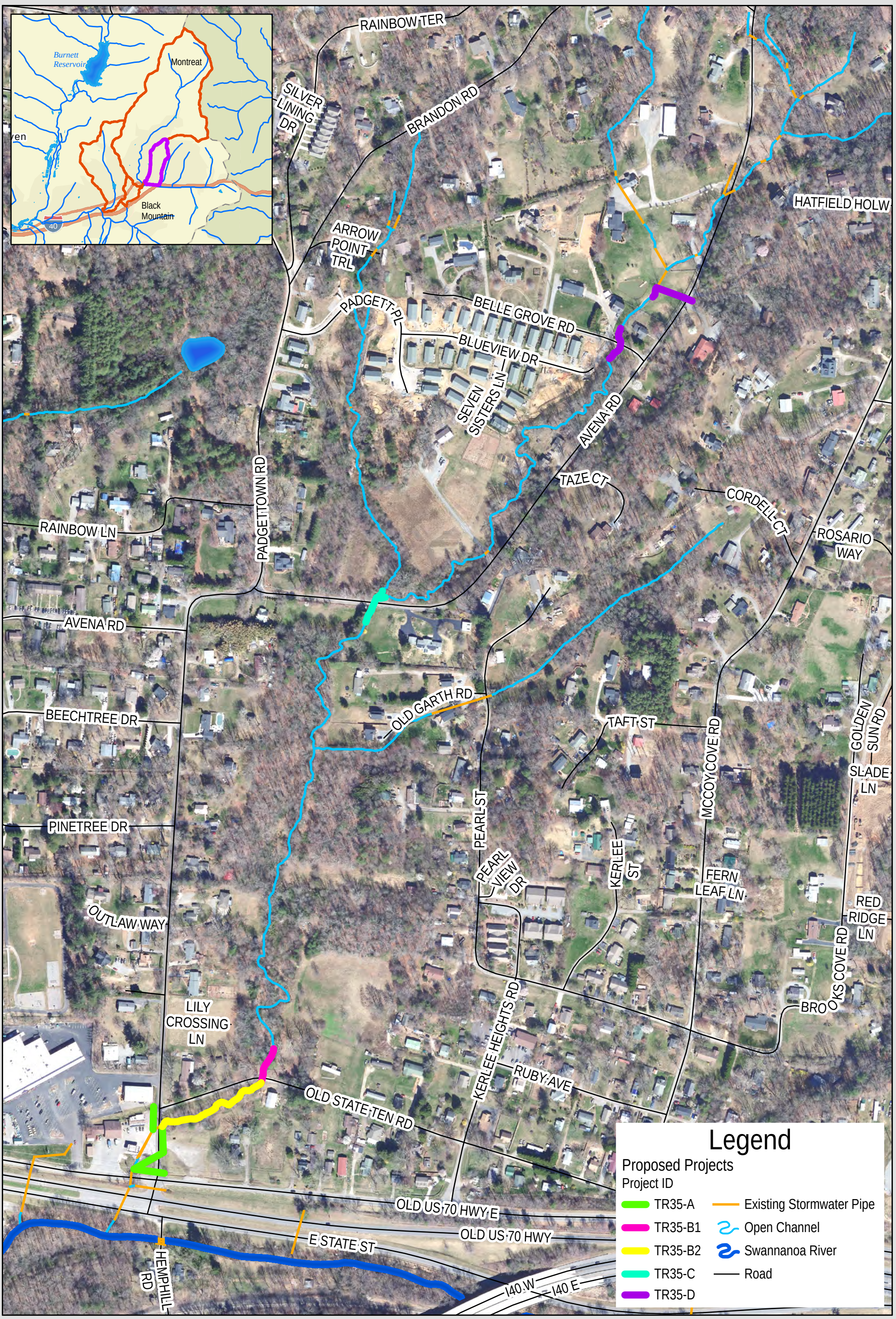
Construction cost includes 30% contingency for planning. Improvements (LF): 50
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 12,060.00	$ 12,100.00
Erosion Control	1	LS	$ 8,805.00	$ 8,800.00
Traffic Control	1	LS	$ 3,522.00	$ 3,500.00
Major Utility Conflict	1	LS	$ 52,830.00	$ 52,800.00
Unclassified Excavation/Hauling	60	CY	$ 72.00	$ 4,300.00
Infrastructure Removal and Disposal	50	LF	$ 115.00	$ 5,800.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	50	LF	$ 670.00	$ 33,500.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	300	LF	$ 350.00	$ 105,000.00
Roadway/Sidewalk Replacement	20	SY	$ 110.00	$ 2,200.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 76,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 329,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 16,500.00
Design and Permitting	20%	$ 65,800.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 3,300.00
Structural Evaluation	1%	$ 3,300.00
Real Estate	2%	$ 6,600.00
Utility Relocation	2%	$ 6,600.00
Project Maintenance (3yr)	5%	$ 16,500.00
Construction Inspections	10%	$ 32,900.00
Construction	100%	$ 329,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 546,000.00



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Figure E-4: Proposed Stormwater Improvement Projects
AVENA ROAD/TRIBUTARY 35 PRIMARY SYSTEM
Town of Black Mountain Stormwater Master Plan

0 150 300 Feet
1 in = 300 ft

N W E S

PROJECT NAME: **Padgettown Rd Stormwater Improvements** PROJECT ID: **TR35-A**

PROJECT INFORMATION

LOCATION: Padgettown Rd/US Hwy 70E Intersection
WATERSHED: Tributary 35
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 460

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install 145 LF of twin 60-inch RCP by-pass system to depression area south of the gas station.
- Replace existing pipe across Padgettown Road at Old US 70E with twin 48" RCP.
- Excavate and enlarge existing open channel and outfall area downstream of gas station.
- Existing conditions severly limit options to provide desired LOS. An option is presented herein.
- Additional survey and engineering investigation required to determine constructability and achievable LOS.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	16
Public or Privately-Owned Land	8
Effect of Improvements	15
Cost Effectiveness	15
Grant Bonus	3
Criticality Bonus	1
FINAL PROJECT SCORE:	**62**

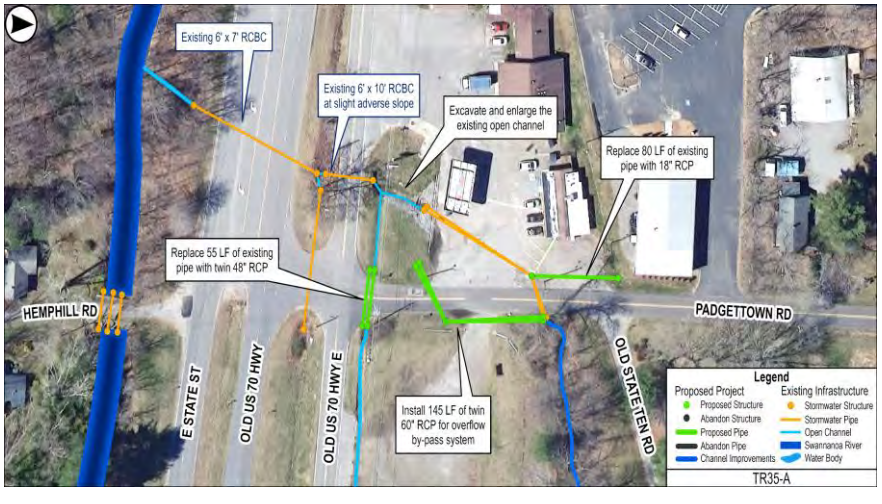
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Padgettown at Old US70E	2-YR	25-YR	80
Gas Station (Twin 36")	2-YR	10-YR	76
Padgettown Rd (Twin 36")	< 2-YR	10-YR	68
Padgettown Rd (Twin 60")	NA	25-YR	New Crossing

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 909,000
Design and Permitting	$ 276,800
Other Project Costs	$ 236,200
Total Project	**$ 1,422,000**

PROJECT AREA MAP



PROJECT NAME **Padgettown Rd Stormwater Improvements** PROJECT ID: **TR35-A**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tributary 35

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 460
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 33,290.00	$ 33,300.00
Erosion Control	1	LS	$ 24,300.00	$ 24,300.00
Traffic Control	1	LS	$ 9,720.00	$ 9,700.00
Major Utility Conflict	1	LS	$ 145,800.00	$ 145,800.00
Unclassified Excavation/Hauling	770	CY	$ 72.00	$ 55,400.00
Infrastructure Removal and Disposal	125	LF	$ 115.00	$ 14,400.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Standard Structure	1	EA	$ 8,600.00	$ 8,600.00
Large Structure or Headwall	5	EA	$ 12,000.00	$ 60,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	90	LF	$ 670.00	$ 60,300.00
New Pipe: 60-inch	290	LF	$ 875.00	$ 253,800.00
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	-	LF	$ 350.00	-
Roadway/Sidewalk Replacement	100	SY	$ 110.00	$ 11,000.00
Earthwork	105	CY	$ 90.00	$ 9,500.00
Fine Grading	550	SY	$ 18.00	$ 9,900.00
Plantings	250	SY	$ 7.00	$ 1,800.00
			Construction Contingency (30%):	$ 210,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 909,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 45,500.00
Design and Permitting	20%	$ 181,800.00
Environmental Permitting	-	$ 95,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 9,100.00
Structural Evaluation	1%	$ 9,100.00
Real Estate	2%	$ 18,200.00
Utility Relocation	2%	$ 18,200.00
Project Maintenance (3yr)	5%	$ 45,500.00
Construction Inspections	10%	$ 90,900.00
Construction	100%	$ 909,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 1,422,000.00

PROJECT NAME: **Old State 10 Rd Culvert Replacement and Stream Stabilization** PROJECT ID: **TR35-B1**

PROJECT INFORMATION

LOCATION:	Old State 10 Rd Culvert Crossing	STORMWATER PROJECT TYPE:	Stormwater Drainage
WATERSHED:	Tributary 35	DRAINAGE IMPROVEMENTS (LF):	160

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe with 30 LF of twin 4'x6' RCBC under Old State 10 Rd.
- Install 100 LF of upstream channel improvements to accommodate flow into new RCBC.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	4
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**77**

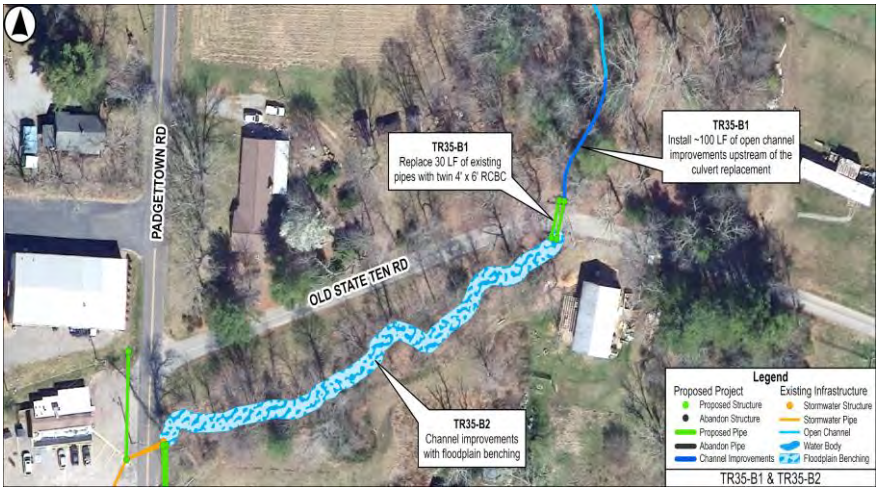
	LEVEL OF SERVICE		% REDUCTION
KEY CROSSING	EXISTING	PROPOSED	50 YR
Old State 10 Road (Twin 36")	2-YR	25-YR	91

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 351,000
Design and Permitting	$ 165,200
Other Project Costs	$ 91,800
Total Project	**$ 608,000**

PROJECT AREA MAP



PROJECT NAME **Old State 10 Rd Culvert Replacement and Stream Stabilization** PROJECT ID: **TR35-B1**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tributary 35

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 60
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 12,860.00	$ 12,900.00
Erosion Control	1	LS	$ 9,385.00	$ 9,400.00
Traffic Control	1	LS	$ 3,754.00	$ 3,800.00
Major Utility Conflict	1	LS	$ 56,310.00	$ 56,300.00
Unclassified Excavation/Hauling	70	CY	$ 72.00	$ 5,000.00
Infrastructure Removal and Disposal	30	LF	$ 115.00	$ 3,500.00
Structure Removal and Disposal	2	EA	$ 6,800.00	$ 13,600.00
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	-	LF	$ 670.00	-
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	60	LF	$ 1,700.00	$ 102,000.00
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	100	LF	$ 350.00	$ 35,000.00
Roadway/Sidewalk Replacement	30	SY	$ 110.00	$ 3,300.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 81,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 351,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 17,600.00
Design and Permitting	20%	$ 70,200.00
Environmental Permitting	-	$ 95,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 3,500.00
Structural Evaluation	1%	$ 3,500.00
Real Estate	2%	$ 7,000.00
Utility Relocation	2%	$ 7,000.00
Project Maintenance (3yr)	5%	$ 17,600.00
Construction Inspections	10%	$ 35,100.00
Construction	100%	$ 351,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 608,000.00

PROJECT NAME: **Tributary 35 Floodplain Benching at Old State 10 Rd** PROJECT ID: **TR35-B2**

PROJECT INFORMATION

LOCATION: Old State 10 Road near Padgettown Rd
WATERSHED: Tributary 35
STORMWATER PROJECT TYPE: Floodplain Benching
DRAINAGE IMPROVEMENTS (LF): 350

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Install approximately 350 LF of channel improvements with floodplain benching to lower WSELs.
- Floodplain benching improvements are located downstream of the proposed RCBC in project TR35-B1.

PROJECT PRIORITIZATION AND PROPERTY REQUIREMENTS

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	16
Public or Privately-Owned Land	4
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	3
Criticality Bonus	1
FINAL PROJECT SCORE:	**66**

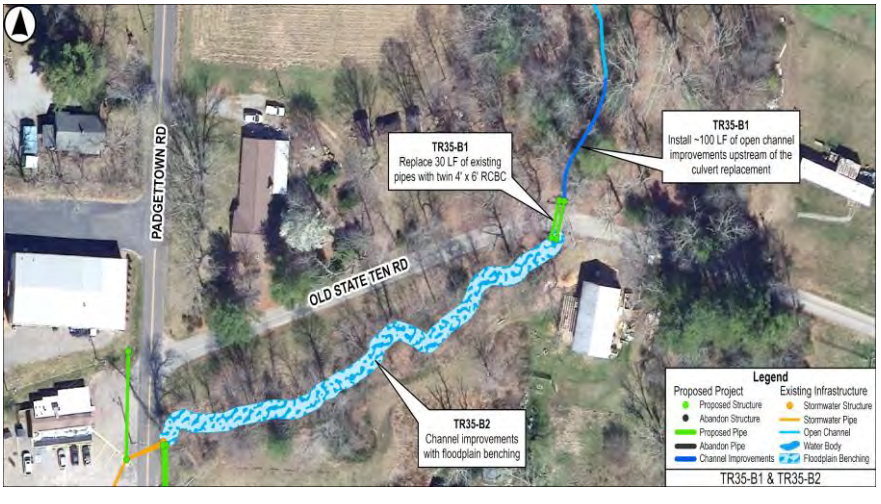
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Padgettown Rd (Twin 36")	< 2-YR	10-YR	68
Old State 10 Road (Twin 36")	2-YR	25-YR	91

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 234,000
Design and Permitting	$ 111,800
Other Project Costs	$ 79,200
Total Project	**$ 425,000**

PROJECT AREA MAP



PROJECT NAME: **Tributary 35 Floodplain Benching at Old State 10** PROJECT ID: **TR35-B2**

PROJECT TYPE: Floodplain Benching WATERSHED: Tributary 35

PLANNING LEVEL COST ESTIMATE

- Construction estimate includes 30% contingency for planning.
- Proposed project footprints are based on GIS and modeling analyses.
- Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 9,090.00	$ 9,100.00
Erosion Control	1	LS	$ 8,120.00	$ 8,100.00
Traffic Control	1	LS	$ 3,248.00	$ 3,200.00
Minor Utility Conflict	1	LS	$ 8,120.00	$ 8,100.00
Clearing and Grubbing	390	SY	$ 5.50	$ 2,100.00
Earthwork	0	CY	$ 90.00	$ -
Fine Grading	390	SY	$ 18.00	$ 7,000.00
Structure Removal and Disposal	-	EA	$ 6,800.00	-
Infrastructure Removal and Disposal	-	LF	$ 115.00	-
Stone, Class B	75	TN	$ 92.00	$ 6,900.00
Filter Fabric/Geotextiles	1940	SY	$ 35.00	$ 67,900.00
Plantings	390	SY	$ 7.00	$ 2,700.00
3-gallon Container Plants	95	EA	$ 70.00	$ 6,700.00
Riffle Grade Control	2	EA	$ 4,025.00	$ 8,100.00
Floodplain Tree Removal	1	LS	$ 15,000.00	$ 15,000.00
Log Grade Control Structure	-	EA	$ 4,000.00	-
Pump Around Operation	1	LS	$ 46,000.00	$ 46,000.00

Construction Contingency (30%): $ 43,000.00

PLANNING LEVEL OPINION OF CONSTRUCTION COST: **$ 234,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 11,700.00
Design and Permitting	20%	$ 46,800.00
Environmental Permitting	-	$ 65,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 2,300.00
Structural Evaluation	1%	$ 2,300.00
Real Estate	10%	$ 23,400.00
Utility Relocation	2%	$ 4,700.00
Project Maintenance (3yr)	5%	$ 11,700.00
Construction Inspections	10%	$ 23,400.00
Construction	100%	$ 234,000.00

PLANNING LEVEL OPINION OF TOTAL PROJECT COST: $ 425,000.00

PROJECT NAME: **Avena Road Culvert Replacement and Stream Stabilizaton** PROJECT ID: **TR35-C**

PROJECT INFORMATION

LOCATION: Avena Road near Padgettown Rd
WATERSHED: Tributary 35
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 230

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe with 40 LF of twin 48" RCP across Avena Rd.
- Install approximately 120 LF of stream stabilization measures.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	12
Street Flooding	32
Public or Privately-Owned Land	8
Effect of Improvements	10
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**85**

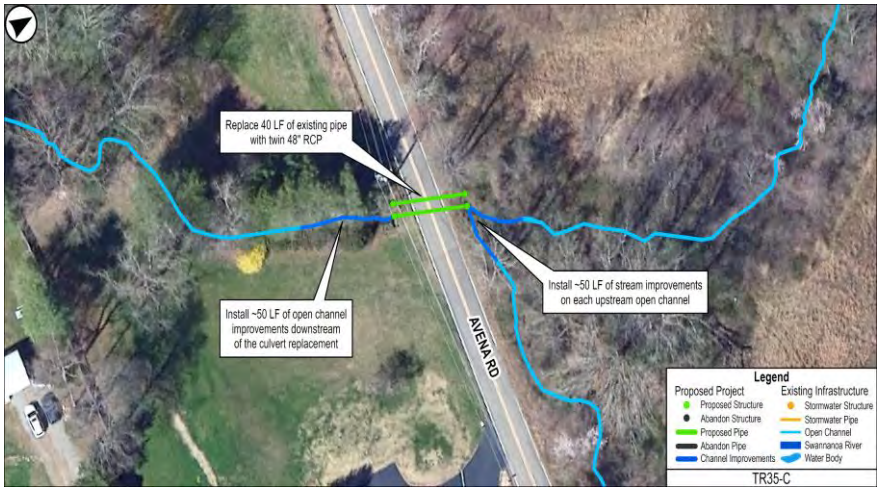
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Avena Road	2-YR	25-YR	97

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 235,000
Design and Permitting	$ 142,000
Other Project Costs	$ 61,000
Total Project	**$ 438,000**

PROJECT AREA MAP



PROJECT NAME **Avena Road Culvert Replacement and Stream Stabilizaton** PROJECT ID: **TR35-C**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tributary 35

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning. Improvements (LF): 80
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 8,605.00	$ 8,600.00
Erosion Control	1	LS	$ 7,680.00	$ 7,700.00
Traffic Control	1	LS	$ 3,072.00	$ 3,100.00
Minor Utility Conflict	1	LS	$ 7,680.00	$ 7,700.00
Unclassified Excavation/Hauling	120	CY	$ 72.00	$ 8,600.00
Infrastructure Removal and Disposal	40	LF	$ 115.00	$ 4,600.00
Structure Removal and Disposal	1	EA	$ 6,800.00	$ 6,800.00
Standard Structure	-	EA	$ 8,600.00	-
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	-	LF	$ 535.00	-
New Pipe: 42-inch to 54-inch	80	LF	$ 670.00	$ 53,600.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	150	LF	$ 350.00	$ 52,500.00
Roadway/Sidewalk Replacement	20	SY	$ 110.00	$ 2,200.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 54,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 235,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 11,800.00
Design and Permitting	20%	$ 47,000.00
Environmental Permitting	-	$ 95,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 2,400.00
Structural Evaluation	1%	$ 2,400.00
Real Estate	2%	$ 4,700.00
Utility Relocation	2%	$ 4,700.00
Project Maintenance (3yr)	5%	$ 11,800.00
Construction Inspections	10%	$ 23,500.00
Construction	100%	$ 235,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 438,000.00

PROJECT NAME: **Bellgrove Road/Avena Road Stormwater Improvements** PROJECT ID: **TR35-D**

PROJECT INFORMATION

LOCATION: Bellegrove Rd and Avena Rd Culvert Crossings
WATERSHED: Tributary 35
STORMWATER PROJECT TYPE: Stormwater Drainage
DRAINAGE IMPROVEMENTS (LF): 475

PROJECT DESCRIPTION

To improve level of service for surrounding roadways and reduce flood risk to nearby property owners:

- Replace existing pipe with 20 LF of twin 48" RCP under Bellegrove Rd.
- Install approximately 140 LF of stream stabilization measures with the Bellgrove culvert.
- Replace existing pipe with 135 LF of 30" RCP under Avena Rd.
- Install 35 LF of channel improvements downstream of 30" RCP.

PROJECT PRIORITIZATION and LEVEL OF SERVICE

CRITERIA	TOTAL SCORE
Utility Conflict	8
Street Flooding	24
Public or Privately-Owned Land	8
Effect of Improvements	20
Cost Effectiveness	20
Grant Bonus	2
Criticality Bonus	1
FINAL PROJECT SCORE:	**83**

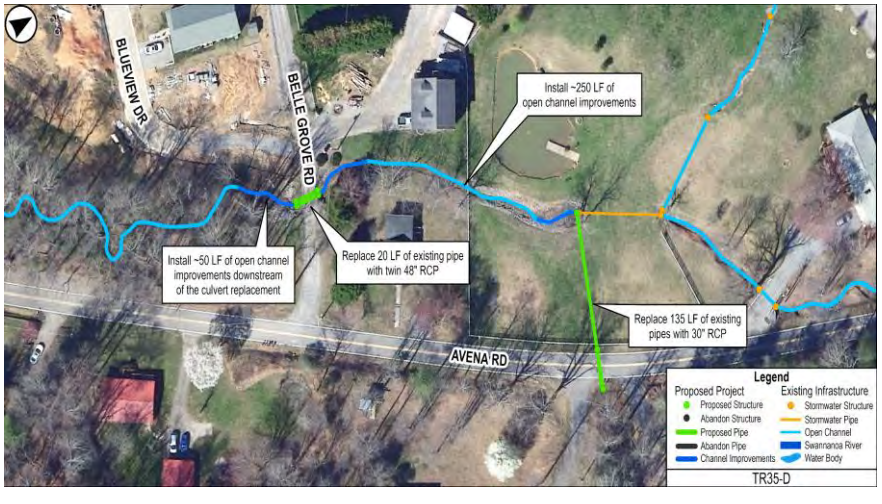
KEY CROSSING	LEVEL OF SERVICE EXISTING	LEVEL OF SERVICE PROPOSED	% REDUCTION 50 YR
Bellegrove Road	2-YR	50-YR	100
Avena Road	2-YR	50-YR	100

PLANNING LEVEL OPINION OF COST

Construction estimate includes 30% contingency for planning. Design and permitting includes environmental permitting estimates. Proposed project footprints are based on GIS and modeling analyses. Detailed planning level costs are provided separately.

ITEM	COST OPINION
Construction	$ 499,000
Design and Permitting	$ 194,800
Other Project Costs	$ 130,200
Total Project	**$ 824,000**

PROJECT AREA MAP



PROJECT NAME **Bellgrove Road/Avena Road Stormwater Improvements** PROJECT ID: **TR35-D**

PROJECT TYPE: Stormwater Drainage WATERSHED: Tributary 35

PLANNING LEVEL COST ESTIMATE

Construction cost includes 30% contingency for planning.
Proposed project footprints are based on GIS and modeling analyses.
Real estate, if privately-owned land, is estimated based on property value.

Improvements (LF): 175

CONSTRUCTION COST:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Mobilization	1	LS	$ 18,295.00	$ 18,300.00
Erosion Control	1	LS	$ 14,995.00	$ 15,000.00
Traffic Control	1	LS	$ 5,998.00	$ 6,000.00
Moderate Utility Conflict	1	LS	$ 44,985.00	$ 45,000.00
Unclassified Excavation/Hauling	180	CY	$ 72.00	$ 13,000.00
Infrastructure Removal and Disposal	155	LF	$ 115.00	$ 17,800.00
Structure Removal and Disposal	3	EA	$ 6,800.00	$ 20,400.00
Standard Structure	2	EA	$ 8,600.00	$ 17,200.00
Large Structure or Headwall	2	EA	$ 12,000.00	$ 24,000.00
New Pipe: 18-inch to 24-inch	-	LF	$ 390.00	-
New Pipe: 30-inch to 36-inch	135	LF	$ 535.00	$ 72,200.00
New Pipe: 42-inch to 54-inch	40	LF	$ 670.00	$ 26,800.00
New Pipe: 60-inch	-	LF	$ 875.00	-
Arch Pipe (22.5" - 31.3")	-	LF	$ 500.00	-
Large RCBC	-	LF	$ 1,700.00	-
Rip Rap	25	TN	$ 50.00	$ 1,300.00
Open Channel Improvements	300	LF	$ 350.00	$ 105,000.00
Roadway/Sidewalk Replacement	20	SY	$ 110.00	$ 2,200.00
New Concrete Curb and Gutter	-	LF	$ 110.00	-
Replace Driveway Culvert Pipe	-	LF	$ 300.00	-
Replace Existing Concrete Driveway	-	SY	$ 120.00	-
			Construction Contingency (30%):	$ 115,000.00
			PLANNING LEVEL OPINION OF CONSTRUCTION COST:	**$ 499,000.00**

PROJECT COST:

PROJECT BUDGET ITEM	% of CONSTRUCTION	AMOUNT
Survey	5%	$ 25,000.00
Design and Permitting	20%	$ 99,800.00
Environmental Permitting	-	$ 95,000.00
Railroad Permitting/Coordination	-	$ -
Geotechnical Investigation	1%	$ 5,000.00
Structural Evaluation	1%	$ 5,000.00
Real Estate	2%	$ 10,000.00
Utility Relocation	2%	$ 10,000.00
Project Maintenance (3yr)	5%	$ 25,000.00
Construction Inspections	10%	$ 49,900.00
Construction	100%	$ 499,000.00
PLANNING LEVEL OPINION OF TOTAL PROJECT COST:		$ 824,000.00