TOWN OF SHARPSBURG

Town Hall - 110 West Railroad Street
Sharpsburg, North Carolina 27878

STORM DRAINAGE STUDY 2022

TEG Project No. 20210173

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1.1 Brief Description

The Town of Sharpsburg is located at the apex of the Nash, Wilson and Edgecombe County lines. Sharpsburg is bound by the City of Rocky Mount to the north and west, the Township of Upper Town Creek to the east and the Town of Elm City to the south. US Hwy 301, a four-lane highway, runs through the heart of Sharpsburg and connects the City of Wilson to the City of Rocky Mount.

Most of the existing land use for the service area is residential. The area also supports several commercial and industrial users along Highway 301 including a pre-cast concrete manufacturer and two metal fabrication facilities, and it also serves the Rocky Mount-Wilson Airport.

The study area consists of the entire jurisdictional limits of the Town (See Map 2). The project will focus primarily on known storm drainage problems and issues the Town is experiencing, with particular focus on the issues witnessed by Town Council and by citizens who provided input into the study public meeting process. Given the large scope of the study, the comments of the Town leadership and citizens helped to guide this investigation toward those items with the most noticeable effect on the public residing and working in the Town.

This study was first conceived as a response to ongoing flooding in the Creekside Drive area but once public discussions about flooding issues arose, other areas known to the Town leadership and citizens were brought forward as problems that must be addressed. The Town decided on a review of the known problems throughout the Town and through a Request for Proposals process, The East Group was retained to study the problems, gather information, perform analysis, and formulate proposed solutions for the Town. The results of this study are the subject of this report.

In order to conduct the study, a team formed out of discussions with Town leadership. The team included:

Mayor Robert Williams – Mayor Williams attended meetings with us provided information concerning drainage problems and issues facing the Town Citizens.

Commissioner Don Patel - Mr. Patel provided insight on several of the drainage problems including the areas around the Bright Leaf Motel, Sharpe Road and the North Basin.

Commissioner David Pride – As a long-time resident of the Town, Mr. Pride provided background on how the drainage systems have changed over time and in

particular on how conditions have changed in the Wilson County portion of the South Basin between the railroad and Heffener Road.

Tracy Sullivan - Town Clerk and Acting Manager – Mrs. Sullivan coordinated meetings with us and asked questions regarding policy on drainage issues and kept us informed of citizen comments and issues with drainage.
Brian Sullivan – Public Works Director – Mr. Sullivan informed us of maintenance challenges and needs which Public Works has regarding the maintenance of drainage. He had key insights on the problems the Town has had with regards to drainage.

Myriah Shewchuck, ASLA – Mrs. Shewchuck managed the public outreach portion of the project and helped us plan the public meeting. She put together the online survey for the project and helped lead discussions that helped the team discover the needs the citizens wished to convey to the team.

Alex Flint, Project Engineer – Mr. Flint performed hydraulic analysis and helped conduct the site reconnaissance.

Todd Tripp, Project Manager – Mr. Tripp helped compile the comments, rank the problems and prepare the report.

The East Group has divided the Town jurisdiction into three main areas of study based upon natural drainage patterns. These three areas represent the three main drainage basins of the Town. Each of these basins respond independently to rain events and have their own independent drainage system. We gave each of the three basins a name designation and they are described as follows:

Figure 1-Creekside Drive Flooding

North Basin – This system includes the Creekside, Hilltop, and Kentucky Court Areas and consists of approximately 981 Acres or 1-1/2 square miles. This basin is large with approximately 8,900 LF of main channel and includes runoff from areas well outside the corporate limits of the Town. This large upstream area is a major factor in the extensive standing water that occurs on Creekside Drive. Public feedback and analysis show just how inadequate the drainage facilities are for this

system. In the public meetings and survey, we received such comments as "lost my car," and "lost a pickup truck" (from separate homeowners). Analysis shows that the system at the intersection of Oak Forest and Creekside will receive about 500 cubic feet (3,700 gallons) per **second** in the 10-year storm but is only capable of carrying approximately 100 CFS. This disparity continues along the outfall along Judge Street where there were several public survey complaints of "floods all or almost all of my yard" down to Mill Branch Road. See Map 3.2 Issue Location and Severity.

South Basin – This basin begins in the Sharpe Road area just outside the Town southeastern corporate limits. The basin includes approximately 484 acres of woodland, farmland, and residential areas. Within the basin, two main waterways provide the majority of the drainage. One of the waterways, carries the discharge from Sharpe Road eastward through the Bright Leaf Motel property and actually under the motel to US Highway 301. The other of the two waterways picks up a large drainage area west of Greenleaf Road and drains it through an apartment complex into a 36-inch pipe that begins at the back of the Speedy Wok Chinese Restaurant and also joins up with the US Highway 301 drainage system. These two main waterways join and cross 310 near the Dollar General (4301 Hathaway Boulevard /US 301). This combined drainage way flows under a double culvert on the CSXT rail line and eastward into Wilson County and the Dawes Street area and then on to the Weaver Mobile Home Park. Multiple open channels within the mobile home park join the waterway on its eastward course toward Heffner Road's double 60-inch culvert.

Central Basin – This 73-acre basin originates in the Joyner Avenue area just west of D&J Tire Center and Joyner Exxon and flows eastward toward 301 and the CSXT rail line. It connects behind the Budget Inn, Consolidated Industrial Supply, Williams Body Shop and other businesses at a ditch that runs northward along the rail western right-of-way limit toward Cokey Swamp.

The most severe flooding reported by citizens during the study outreach was in the South Basin in the Greenleaf Street Area. This is the only location where residents reported water inside their homes. The second most severe was in the North Basin on Oak Forest Drive and Judge Street. The flooding in the Oak Forest Drive area near the large channel on Creekside has been photographed on at least one occasion showing large ponded areas that covered the roadway and connected multiple home lots with deep standing water which made the area nearly or completely impassible by cars. Other complaints included having to move cars in advance of oncoming storm events to safer locations, vehicles lost to flooding, including multiple incidents of this, and in the South Basin, residents recall boat rescue in the aftermath of Hurricane Floyd in the Greenleaf Street Area.

1.2 Existing Conditions

Analysis has shown that the drainage infrastructure of both the North Basin and the South Basin are very much undersized. Some of the piping in the system, notably in

the South Basin, suffers from corrosion which may lead to collapse of some of the existing piping. Some of this existing piping is laid to a reverse grade which impacts capacity and requires backwater to achieve flow. To the North, the Creekside System is controlled by two major culverts that are less than ½ the size really needed for a reasonable design storm.

1.3 Methodology

The study included the following items:

Site Reconnaissance: Two separate trips into the noted problem areas were conducted with representatives of the Town Council to see the known problem areas and in some cases, we interviewed citizens to get their take on what is happening in regards to the drainage of their properties. In one noted case, the Bright Leaf Motel, a major drainageway serving a probable 100 acres or more of drainage flows through an undersized and failing pipe system under the structure itself. It was important to obtain the input of citizens concerning such issues.

Survey: Noted problem areas were surveyed to determine structure sizes and grades for the hydraulic analysis.

Public Input: An online citizen survey and a public meeting was conducted to seek out citizen input and try and capture the existing problems so that they might be analyzed.

Reconnaissance: Two separate trips into the noted problem areas were conducted with representatives of the Town Council to see the known problem areas and in some cases, we interviewed citizens to get their take on what is happening in regards to the drainage of their properties. In one noted case, the Bright Leaf Motel, a major drainageway serving a probable 100 acres or more of drainage flows through an undersized and failing pipe system under the structure itself. It was important to obtain the input of citizens concerning such issues.

Analysis: Hydraulic analysis was performed to compare the required capacity to the actual capacity.

Results: Analysis was conducted on the main drainage paths for the North Basin and the South Basin. All of the major components along the flow paths analyzed were significantly undersized in relation to the typical 10-year design storm. Larger storm events should, according to the analysis result in major backwater. In fact, public comment and historical photos show that significant flooding is occurring at Creekside Drive in the North Basin and at Greenleaf Street in the South Basin. Attachment 1 provides an analysis of the existing pipe culverts for the North and the South Basins and provides a recommended upsize to meet the design criteria of carrying the 10-year storm.

1.4 Recommended Solutions

Many of the drainage structures in the North Basin and in the South Basin are in poor condition. The major pipes are also undersized for a reasonable design storm. We would recommend that a 10-year storm be considered the standard design storm for culverts and storm sewers. A 10-year storm is the rate of flow that is expected, on average, to occur once every 10 years based upon a statistical analysis of past rainfall events. The 10-year storm was used for the analysis but we not that often, the structures are inadequate for the significantly smaller 2-year storm. In order to correct this deficiency, the pipes must be upsized or supplemented. An alternate approach of creating stormwater detention was considered, however, the condition of much of the drainage system is such that it needs replacing anyway. Given the need for replacement, an upgrade in the pipe system is the indicated solution. Attachment 1 provides the location and recommending sizing of the pipe replacements.

Northern Basin – Based upon the study, we recommend the replacement of the culverts at Oak Forest Drive, at Holley Drive, and channel regrading along Creekside Drive and new wing walls for the culverts. Work to improve the inlet conditions for the Oak Forest Drive Culvert will be required as a large and poorly channelized flow arrives at the culvert and some of the flood backwater occurs due to the inability to conduct this flow into the culvert crossing.

Southern Basin – Extensive flooding occurs on Greenleaf Street and in the vicinity of the Dollar General. The report recommends the replacement and upsizing of all of the mainline pipe components in the system and these are included in the cost estimate. Details of the recommended pipe sizes are shown in Attachment 1.

Central Basin – The central basin did not receive any complaints in the public outreach or public survey, but a field inspection indicates that the pipes and channels need to be cleaned out. Particularly the outfall along Langley Drive. Other storm drain pipes need cleaning as well.

Projected Costs – This report does not include improvements to the Central Basin, which did not receive negative comments in the public meeting or the public survey. For now, the Central Basin should receive attention by cleaning out existing inlets and channels. The projected costs for Northern Basin Improvements described in Attachment 1 are approximately $679,400. The projected cost for improvements to the South Basin is $2,848,400. The total projected costs for storm drainage improvements for both the North and South Basins combined is $3,527,800.

Potential Permitting & Easement Challenges – It appears that the work contemplated presents no special environmental permitting challenges and can be covered by standard erosion control and stormwater permits. In some cases, a

US Army Corps of Engineers Nationwide Permit and NCDEQ 401 Water Quality Certification may be required. The lack of easements will present a challenge and may require right-of-entry agreements to allow work to proceed where easements do not exist.

1.5 Funding Options – There has been 1 round of Local Assistance for Stormwater Infrastructure Investment (LASII). Money may be available for a second round and should be pursued if possible. CWMTF money is available but is problematic in that it requires a stormwater quality/pollutant focus. In theory detention projects could receive eligibility for funding if the project is focusing more than 50% of the cost on detention. This will necessarily reduce the structure replacement and upgrade portion of the work that is really needed. Other options are available and should be investigated. Give the condition of the storm drainage, a source of ongoing revenue is needed to support a phased approach to replacing aging infrastructure and funding routine maintenance and cleaning. The Town is investigating a stormwater utility fee earmarked for drainage work. This might be the be the best arrangement to help maintain drainage and would create additional points for a LASII funding application.

1.6 Policy Efforts Supporting Effective Drainage Systems

As stated above, the Town is investigating a possible stormwater utility to help maintain its stormwater systems. Other potential policy investigations or efforts might include:

Lack of Easement Access – Ensure that before a project outlined in this report moves forward that a property search is conducted the presence or absence of easements and where lacking, a right-of-entry agreement is developed with the help of an attorney and is presented to the adjacent owners to ensure the project can move forward. Property owners along the improvements may be willing to agree given that they stand to gain by the project addressing flooding issues in their neighborhoods and their properties. Going forward it will be important to have an agreement ready to go in the case that citizens come forward with drainage work so that the Town's improvements will be contingent on having an agreement. This will help the Town be protected from being responsible for improvements on private property.

Private Drainage and Impacts – The Town should consider means to ensure that any changes to private drainage that carry public water are reviewed. Public water is drainage from road or street rights-of-way or from multiple upstream properties. An impact to a drainage channel or structure carrying public water affects multiple upstream citizens. For this reason, some attention should be given to changes to these drainage channels. Examples include any new driveway added, any changes to the main line drainage features shown on Map 2.2 or Map 2.3. These kinds of changes should come to the attention of code officials at site plan review.

Policy for Future Drainage Complaints – Future complaints should include a checklist that will remind those negotiating with homeowners to complete work. The checklist should include a pre-requisite that the property owner grants an easement of a right-of-entry for future maintenance, repairs, or replacement. The agreement should prohibit structures being placed over drainage features or structures.

Stormwater Funding – Funding is likely available but the Town should consider a stormwater fee to create a funding source to deal with the large number of drainage issues existing in Town. The fee could be based upon the amount of impervious surface on each particular lot to create a prorate share for each residence of business or based upon a standard fee for each residence. Ongoing capital planning based upon follow up study would help determine the fee amount.

End of Summary

2.0 Existing Conditions

The Town of Sharpsburg is located at the junction of the Nash, Wilson and Edgecombe County lines. Sharpsburg is bound by the City of Rocky Mount to the north and west, the Township of Upper Town Creek to the east and the Town of Elm City to the south. See Map 1 for the location of Sharpsburg. US Hwy 301, a four-lane highway, runs through the heart of Sharpsburg and connects the City of Wilson to the City of Rocky Mount. In the past this roadway was a major conduit for travelers to move up and down the eastern coast of the United States prior to the construction of Interstate 95.

Much of the storm drainage system serving the Town is a series of drainage channels and culverts. The flow direction is generally from the east to the west. Due to the Town being bisected by US Highway 301, a large drainage area to the west is forced to flow eastward through just a few culvert crossings under US 301. These structures are strategically important to maintaining drainage performance for the Town. As the flow continues eastward, the flow is controlled again by a rail embankment owned by CSX Transportation that also bisects the Town from north to south. The drainage facilities north of Main Street lying between US 301 and the railroad is diverted northward to Cokey Swamp. The land area north of Sharpe Road and east of US 301 flows northward to Cokey Swamp and through series of open channels to a northern crossing of US 301. This channel system carries the runoff of approximately 981 acres at the US 301 crossing and has street culverts that are generally undersized and some are relatively dilapidated. Generally, these structures create backwater that contribute to flooding in the northern areas of Town. The drainage facilities to the south converge into an underground storm drainage system that extends under the CSXT rail line and conducts the flow through a residential neighborhood. This southern storm sewer carries the runoff of approximately 350 acres is older and is apparently leaking as evidenced by some sink holes over the pipe. Where the pipe can be seen, corrosion is visible. This pipe system,

2.1 Reasons for This Study

In general, the drainage system is not performing satisfactorily. Extensive flooding in the Oak Forest Drive and Creekside Drive area has been known and documented for several years. The public has been requesting action on this recurrent flooding issue. Citizens in the Creekside area have indicated that some of them monitor weather reports and move their vehicles to neighboring yards and properties when a storm event is known to be approaching. Downstream of the Creekside Area, the Hilltop Area has experienced flooding and hurricane related damage has resulted in structure buyouts in that area as a FEMA funded loss mitigation measure. In addition, some of the main drainage trunk line in the southern part of Town is apparently failing as evidenced by sink holes in yards and on the street curb line. Failures have been seen in the vicinity of the Bright Leaf Motel and at other locations near the Weaver Mobile Home Park. The Greenleaf

Street area and Sharpe Road have flooded extensively in hurricane events. There are inadequacies in hydraulic capacity and structural failures that are bringing drainage issues forward to public comment and causing citizen dissatisfaction with the drainage system.

The conditions that were noted to us as known problems at the start of this study included:

1. Flooding around the Creekside Drive channel.
2. Flooding on Kentucky Avenue.
3. Flooding near the Ann Beasley Park on Mill Branch Road.
4. Flooding in the Hilltop Drive area.
5. Flooding in the areas behind businesses
6. Beaver dams on the Cokey Swamp crossing of US Highway 301.
7. Flooding on Sharpe Road
8. Flooding at the apartments on Greenleaf Street.
9. Parking lot subsidence at the Bright Leaf Motel.
10. Flooding at the canal at Dollar General on US Highway 301.
11. Settlement and sink holes at Railroad Street SE near Dawes Street.
12. Flooding at a culvert crossing at 608 Martin Luther King Circle.
13. Flooding due to beaver dams at 301 South and at Heffner Road.

2.2 Terrain & Cover Conditions

The Town exists at the edge of the coastal plain province of North Carolina and has a very flat grade. A review of topographic mapping and information shows that the average slope of the ground surfaces throughout the Town is approximately 0.2 % to 0.3%. In such terrain, piped systems often operate in a low-velocity, surcharged condition and tend to flow full with inlets bubbling over and creating standing water throughout the areas they serve. Terrain is a significant challenge to draining the land surface in Sharpsburg. A mitigating condition is that as much as 50 % of the existing drainage basins is made up of forests and farmland since much of the drainage areas served by Town systems are outside the corporate limits to the west of Town. This upstream agricultural land drains toward Town because of the natural slope of the land which falls toward the east. Undeveloped land generally infiltrates a larger fraction of rainfall volume than urban landscapes. This currently undeveloped terrain is a blessing with regards to drainage due to the soils capacity to absorb water, but it does provide a potential for difficulty as the land develops. Developing land will cause a greater fraction of rainfall volumes to run off the site and further overload drainage facilities. The project lies within the Tar-Pamlico Basin in an NCDEQ-designated Phase II Stormwater area and thus are subject to controls for nutrients. When the plans for a developing in the Sharpsburg vicinity exceeds 24% impervious surface, stormwater controls are required to be part of the plan. Impervious surfaces include pavements such as used in parking lots, drives, and roadways as well as rooftops. Projects with less than 24% impervious surface

must employ sheet flow and limit the use of pipes to convey stormwater. The purpose of these state regulations is to limit the increase in stormwater flows due to development and control the export of nitrogen and phosphorous that occurs when stormwater runs off instead of infiltrating the ground. These development restrictions lessen the negative impacts of development on our rivers and streams. A side benefit is that because of these rules, the negative effect of development on the Town's drainage systems will be muted. Increases in peak flow in drainage systems will still be present after development, however, and it will negatively impact drainage performance. As a result, dealing with the current drainage deficiencies is a positive step in preparing for future economic development as well as mitigating current flooding problems. It must be kept in mind that the long-term trend for stormwater in Sharpsburg is that the required stormwater capacity of its mainline pipes and channels is going to grow due to future development but perhaps it will not grow as quickly as it has in the past due to the NCDEQ stormwater regulations.

2.3 System Overview

For the sake of organizing and analyzing the drainage of the Town we divided the report to discuss individually the three natural drainage basins of the Town. There is a separate independent basin to the north, one to the south, and a smaller, central basin. The drainage pathways of these three basins are shown below in Figure 4. The drainage for the northern basin is shown in red, the drainage for the southern basin is shown in purple and the central basin drainage pathway is shown in green.

Figure 2- The Three Drainage Basins

North Drainage Basin - To the north, a natural channel known as Cokey Swamp receives runoff from 981 acres or approximately 1.5 square miles of basin and we designate this drainage system, which acts independently from the remainder of town, as the North Drainage Basin. The system serving the North Basin begins in the fields east of Oak Forest Drive and flows through an open channel to a culvert crossing of Oak Forest. The system continues westward though an open channel with culverts at Holley Drive and then to an open channel just north of Kentucky Avenue to a culvert at Mill Branch and from there through an open channel north of Hilltop on to US301 to the CSXT Railroad ditch and culvert. The system has experienced flooding issues in the past at Oak Forest Drive. In the aftermath of Hurricane Floyd, 6 to 8 free-standing apartment units were cleared at Hilltop Drive and removed as part of a FEMA Hazard Mitigation effort

to reduce the chances of future flooding. Several of the culverts or of corrugated metal piping and equipped with masonry headwalls with wingwalls. The wingwalls of the culverts at Oak Forest and Holly Drive appear to be failing and are also restrictive of flow. In general, the culverts appear to be nearing their useful life due to corrosion and abrasion, but more importantly, they are generally undersized for the flow that they are tasked with carrying.

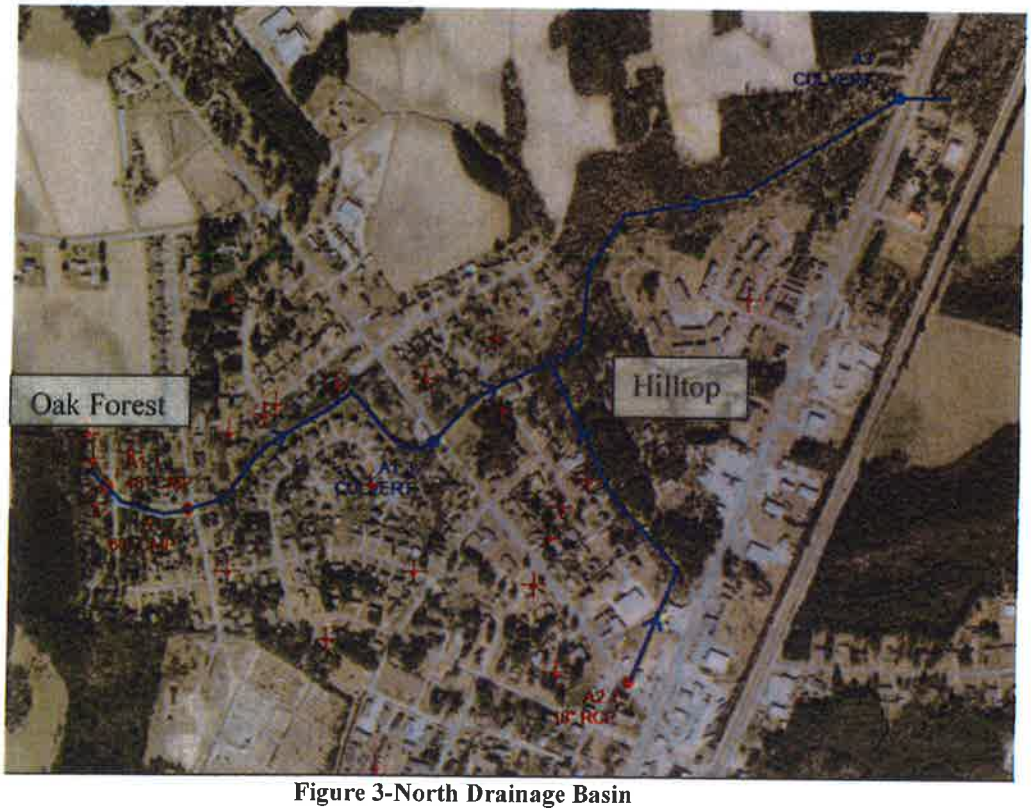

Figure 3-North Drainage Basin

South Drainage Basin - The South Basin includes approximately 484 acres are delivered to the US Highway 301 right-of-way through two main channels: One of the channels originates in agricultural fields and delivers its runoff eastward to an underground storm sewer system serving an existing apartment complex

through an existing 24-inch CMP at the existing Speedy Wok on US Highway 301.

Figure 4-South Drainage Basin - 30" CMP just upstream of Speedy Wok

A drainage ditch serving Sharpe Road also continues eastward to an open channel which flows to a point directly behind the Bright Leaf Motel. Underground piping conducts this flow under the Motel building and parking lot to the US Highway 301 road ditch. This surface runoff converges to a single culvert crossing of US 301and outfalls to a channel that follows the Dollar General property to the CSXT rail line. A double corrugated metal pipe (CMP) carries to the flow under the railroad and to an underground system that extends eastward between Dawes Drive and Martin Luther King Jr. Circle where it turns southeastward to cross under Armstrong Drive and Queen Street to the vicinity of the Brickyard Pump Station location.

Figure 5-South Basin Drainage Pattern

The pipe system discharges to an open channel which flows approximately 2,000 LF to the east to a double CMP culvert at Heffner Road. Between Brickyard pump station and Heffner Road, a large mobile home park served by a series of open ditches drains to and connects with the main drainage channel serving the South Basin. A field reconnaissance of the South Basin revealed numerous issues related to the condition of the system. The Bright Leaf Motel tributary of the South Basin is problematic because public drainage relies on a pipe system under a private property building (Bright Leaf Motel). The drop inlets leading up to the building are dilapidated. The slabs surrounding the building are settling indicating voids underneath the slabs and thus leaks or failure in the piping. Should the piping collapse, the drainage of Sharp Road would be disconnected and stopped from effectively draining that area of Town. In addition, the Greenleaf Street area, which is drained by the enclosed storm sewer passing through the Speedy Wok property, has suffered from historic flooding. We were informed at the public meeting that residents of Greenleaf were evacuated by boat in the aftermath of Hurricane Floyd. Obviously, the storm sewer is undersized and this is borne out by the analysis included in this report. At SE Railroad Street and Dawes Drive, several reoccurring sink holes occur on the storm sewer which appear to be the result of corrosion of the CMP pipe at that location. This pipe system is the main drainage system for the South Basin and its failure would result in near cessation of drainage action for the South Basin resulting in routine flooding of all upstream areas including the motel, the Dollar General, Sharpe Road and all of the southern US Highway 301 area in that vicinity. Separate from those issues, many of the main line pipes in the South Basin are reverse grade and thus drain sluggishly.

Central Basin – The Central Basin consists of approximately 73 acres with the southern drainage divide lying between Gold Street and Main Street, the western

boundary follows Barnhill Avenue north to Mill Branch Road and then northeast toward US Highway 301 (Hathaway Boulevard) northward to Cokey Swamp. The eastern drainage boundary is the CSXT rail line. The basin is served by a series of channels and storm sewer which seems to be largely adequate for the required design flow. The main challenge of this basin is to clean and maintain the numerous inlets such that clogging is minimized. There were very few complaints for this part of the system uncovered in the online survey or public meeting.

2.4 Condition of the System Tables follow that show the conditions of key features of the Town's drainage systems where the condition could be determined from the ground surface. In addition, a determination has been made as to whether the structures are inadequate from a functional standpoint. An analysis was performed to determine this based on the drainage areas and ground covers served by the structures. The analysis will be described in a subsequent section, but for the most part, the main drainage is not adequate for the typical design storm for local streets, the 10-year storm. In fact, most of the structures are inadequate for the smaller 2-year storm. The 10-year storm is that storm that is sufficiently large or intense that it occurs on average once per year. Actual events can in the short term exceed probability meaning there can be multiple consecutive 10-year storms in a given year, but in the long term, a storm equivalent to the 10-year storm will occur once every 10-years. Much of the drainage system serving the Town now was constructed prior to the 1980's. In general, the corrugated metal piping (CMP) is at least somewhat corroded and in some cases is at the point of impending failure. Where these problems are known, they are noted below. Detailed examinations using robotic video inspection was beyond the scope of this study, but is something that should be considered in future action regarding the drainage system. Particularly in the South Basin where there is a significant amount of inaccessible underground piping thought to be in dilapidated condition.

Major Drainage Pipe Analysis

Struct. ID	No. of Pipes	Dia. In.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity (cfs)	Notes
North Drainage Basin								
P1	1	48	85	CMP	Under Oak Forest Dr near intersection of Creekside Dr	421	99	Pipe is sloped wrong direction
P2	1	60	84	CMP	Under Holly Dr at Creekside Dr intersection	409	179	Pipe is sloped wrong direction

Struct. ID	No. of Pipes	Dia. In.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity	Notes
Struct. ID	**No. of Pipes**	**Dia. In.**	**Pipe Size Req'd (in)**	**Pipe Type**	**Location**	**Q_{10} (cfs)**	**Current Capacity**	**Notes**
P3	1	42	**46**	CMP	Under Joyner Ave	82	**69**	Outlets to ditch
South Drainage Basin								
P1	1	36	**64**	RCP	Under Greenleaf St.	195	**59**	Pipe is sloped wrong direction
P2	1	36	**64**	RCP	Apartment off Greenleaf St. Parking Lot	193	**59**	Pipe is sloped wrong direction
P3	1	36	**64**	RCP	Apartment off Greenleaf St. Parking Lot to ditch behind apartment	194	**59**	Outlets to ditch
DITCH1		-	**67**		Between Greenleaf St. and 301 beside apartment	223		Ditch is sloped wrong direction
P4	1	24	**66**	CMP	Behind Speedy Wok	216	**21**	Pipe is sloped wrong direction
P5	1	36	**67**	RCP?	Beside Speedy Wok	217	**59**	Pipe is sloped wrong direction
P6	1	36	**66**	RCP	Between Speedy Wok and 301	216	**59**	No visible failures

Major Drainage Pipe Analysis- (Cont'd)

Struct. ID	No. of Pipes	Dia. In.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity	Notes
P7	1	56	**68**	RCP	Under 301 between Speedy Wok and Dollar General	226	**178**	No visible failures

Struct. ID	No. of Pipes	Dia. in.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity	Notes
P8	1	24	39	RCP	Behind Motel across to in front of the Post Office	53	21	Sink Holes and subsided concrete above the route of the storm pipe - threat of collapse
P9	1	36	42	RCP	Between Post Office and Dollar General	63	59	
P10	1	48	42	RCP	Under Dollar General Entrance	65	121	
Ditch2		-	78		Ditch between Dollar General and Basepoint Building	328		
P11	1	48	78	CMP	Beside 611 SE Railroad St	328	121	Sink Holes and Signs of Potential Impending Collapse
P12	1	15	14	RCP	Beside 104 MLK Jr. Circle	3	7	
P13	1	18	15	RCP	Under MLK Jr Circle	4	10	
P14	1	18	18	RCP	Between MLK Jr Circle and Dawes Dr.	6	10	
P15	2	36	78	RCP	Behind 104 Dawes Dr	328	59	
P16	2	36	78	RCP	Intersection of Dawes Dr and Vick St	331	59	

Major Drainage Pipe Analysis- (Cont'd)

Struct. ID	No. of Pipes	Dia. In.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity	Notes
P17	2	36	78	RCP	Beside 713 Queen St	332	59	

Struct. ID	No. of Pipes	Dia. In.	Pipe Size Req'd (in)	Pipe Type	Location	Q_{10} (cfs)	Current Capacity	Notes
P18	1	15	16	RCP	Near Intersection of Lincoln St and Railroad St	5	7	
P19	1	15	**18**	RCP	Under Lincoln St near intersection at Railroad St	7	7	
P20	1	18	**22**	CMP	Between 101 & 105 Lincoln St.	11	10	
P21	1	15	13	RCP	In front of 608 MLK Jr Circle	3	**7**	
P22	1	25	**32**	RCP	Beside 609 MLK Jr Circle	30	**24**	
P23	1	15	**19**	RCP	In front of 124 B St	8	7	
							0	
P24	2	15	**33**	RCP	Beside 202 MLK Jr Circle	34	**7**	
P25	1	24	**33**	RCP	Beside 202 MLK Jr Circle	34	**21**	
P26	1	18	**36**	RCP	Beside 118 Weaver Circle	43	**10**	
P27	1	24	**36**	RCP	Across St. from 118 Weaver circle	43	**21**	
P28	1	24	**41**	RCP	Beside 118 Weaver Circle	60	**21**	
P - Final	2	60	**96**	CMP	Under Heffner Rd	573.2		This culvert is only a year or two old

3.0 Methodology- An investigation of the existing conditions as well as an analysis of the system was conducted to determine the causes of the noted problems. In addition, a public input program was conducted to obtain citizen feedback on the drainage problems they experience so that we might examine the root causes of the problems and report. The intent of this study is to discover problems that the public may be having relative to drainage, examine the systems that may be causing those problems, determine the components that are inadequate, and recommend solutions to alleviate the problem. In addition, we set out to determine the condition of the main lines serving the problem areas and note those components that need replacement or warrant a more detailed look.

3.1 Site Reconnaissance – On September 15, 2021 we met with Mr. David Pride and Mr. Don Patel and Town leadership and rode to the site of the known problems with the system and discovered some of the structures that are exhibiting problems. These locations were noted for survey. This kickoff was followed up with several additional site visits to explore the drainage problems and note them for further study or for ground survey.

3.2 Ground Survey- In order to perform a hydraulic analysis of drainage problems noted in the site visits, survey of the pipe sizes and elevations were obtained. This information allows us to compare the calculated capacity of those structures responsible for the drainage problems and compare them to the estimated required capacity given the drainage basin draining to those problem structures. The survey information has been transferred onto an Autocad file of an overall map of the Town with an aerial photo background that can be used in the future to further design for storm drainage improvements. The survey information has been used in a concept level analysis of the storm drainage system main culverts and features.

3.3 Public Input

The public input portion of the project was intended to focus this study on the problems that are most meaningful to Town citizens. The drainage system of the Town is extensive and the scope of the study is limited by budget concerns. In addition, the drainage system is not supported by a separate user fee such as the water or sewer enterprise funds. It is important to prioritize storm drainage expenditures for those structures and systems that will make the biggest impact on safety and quality of life for the citizens. In order to achieve a comprehensive look at citizen concerns, a two-part program was initiated:

1. Advertise and hold a public meeting to give the public a chance to talk with the team and share the problems that they are having and note those locations and the severity of the problems.
2. Provide and advertise an online survey to allow those who don't have time or the inclination to attend a public meeting to share their observations regarding drainage.

Public Meeting: Eleven citizens signed in to make comment and review the information at the public meeting. Several of those citizens were council members who have shared extensive information regarding the flooding problems, but there were others from the Creekside Drive and Oak Forest area in the North Basin. Citizens from Martin Luther King Circle, Mill Branch Road, and Greenleaf Street were also present. A citizen from Greenleaf Street informed us of boat rescues that occurred on Greenleaf Street in the aftermath of Hurricane Floyd. Improvements to local drainage can only provide minor improvements in such an event since it was a 500-year storm event. The high levels of backwater that would have been present at that time would have resulted in flooding even if the Town's local drainage facilities had been adequate.

Online Survey: The results of the online survey are summarized below. The questions and raw information are included in Attachment 1. There were approximately 57 responders and the questions asked were targeted to determine the frequency of flooding, the duration, the severity, and some indication of whether property damage has occurred as a result of flooding. The survey requests feedback on the frequency, duration, severity, loss of access, and damage. See the copies of the survey for the meaning of the designations in the following summary table, but in general, worst severity is A and the least severe condition is D. For example: Question 1 is, "Do you have flooding issues at your home." A response rating of "A" means, "I have issues any time it rains." A response of "C" means issues "only after a multi-day continuous heavy rain."

The results were sorted by the flooding impacts by priority with the priority given in the following order:

1. Severity with the most severe impact given to flooding within homes and the next most severe condition being that "all or almost all" of a property is flooded.
2. Damage meaning that priority is given to problems that resulted in property damage.
3. The third highest priority is given to the frequency of flooding that occurs with the highest priority given to flooding that happens, "every time it rains."
4. Duration was the fourth highest priority with standing water that remains for days or weeks being given highest priority.

Three responders indicated that their homes were flooded but one of those responders did not give a location. The two who did provide a location indicated interior flooding in homes on Greenleaf Street. This area is served by an underground storm sewer piped system that drains toward the Speedy Wok property on US Highway 301. Hydraulic analysis backed up the citizen information that there is a serious problem with capacity in this area.

The results of the public survey were plotted on Map 3.2 which is included as an attachment to this report.

Public Survey Results

Entry Number	Address	Frequency	Duration	Severity	Access	Damage	Integrity		Remarks A= most severe D= least severe
	Survey Item →	1	2	3	4	5	6	7-Other Areas Noted	
22	519 Greenleaf St Apt 8	B	B	A		A	A		
	521 Greenleaf St	C	B	A		A	B		Floyd 1999. Matthew 2016, 2-3 feet of water in apt. car in water, 3 months in hotel, expensive
	None	C	A	A	B	B	A		
1	711 Queen St	A	A	B	B	A	a	yes, Armstrong St, Dawn & MLK Circle East Main Street	5. A Both, lost my truck and well belonging part of my yard front and back
18	603 Judge Street	A	B	B	A	A	A	Judge Street	
19	101 Laurie Drive	A	B	B	B	A	B		6. Not yet
	304 Oak Forest Drive	A		B	A	A	B	Creekside Dr and a section of Oak Forest	5. lost a car, air ducts under house damage to siding storage room, fridge full of food
	212 Oak Forest Drive	B	B	B	A	A	A		Numerous complaints re: costs of water damage, have to still move cars to higher ground in impending storm
	144 Dawes Drive	A	A	B	C	B	A	Driveway	
19	412 Mill Branch Road	B	B	B	C	B	A		
	501 Greenleaf St	B	B	B	C	B	B		Moved to illinois but answering for info. There is no ditch across the street and field floods my yard
1	121 Holly Drive	C	B	B	A	B	B		1.C 209 Oak Forest

Entry Number	Address	Frequency	Duration	Severity	Access	Damage	Integrity		Remarks
	Survey Item →	1	2	3	4	5	6	7-Other Areas Noted	
	406 Pittman St	C	B	B	B	B	B	Pittman St, Farmer St	Lost car to flood and HVAC system and insulation under house
25	411 Dale Drive	C	B	B	C	B	A		
	617 Judge St	C	B/C	B/C	B	B	B	Hwy 301 coming into town, Front part of Judge St, Mill Branch walking park, front corner of Post Office parking lot	Ditch behind house has flooded whole yard twice during Floyd and Matthew Hurricanes
1	702 Mill Branch Road	B	A	C	C	A	B	301 IN FRONTOF TAYLOR'S WRECKER	5. A the ground behind my packhouse stays too wet to cut grass a big part of the summer . The pillars supporting the back of the packhouse are leaning as a result.
20	701 Judge St	B	A	C	C	A	A		water meter leaking from street, reported 3 weeks ago
26	108 Sandy Hill Ct	B	B	C	B	A	B		Permission to talk but do NOT visit
	146 Martin Luther King Cir.	B	B	C	C	A	B		
1	305 Oak Forest Dr	B	C	C	B	A	B		5. water in floor of car in driveway
2	601 Speight Drive	B	C	C	B	A	A		Storm drains caving in from erosion
27	175 Kentucky Ave	B	C	C	B	A	B		Patio floods in heavy rain and wash away my ???
28	609 Taylor Drive	C	B	C	C	A	B		3 ft in house with Floyd and damage to outside building and heat / air.

Entry Number	Address	Frequency	Duration	Severity	Access	Damage	Integrity		Remarks
	Survey Item →	1	2	3	4	5	6	7-Other Areas Noted	
	709 Judge Street	C	B/C	C		A	B		only flooded back of property thru fence, damaged fence. People are not keeping the drain tiles clean and ditches are filling
4	609 E Railroad St	C	C	C	B	A	A	7. E. Railroad St water comes up into street through drainage in the road.	5.A rain makes and leaves low places in yard
	None	A	B	C	C	B	B	Infront of my house, on main street, lot of traffic , unsafe	
	101 Katie Drive	A		C	A	B		It is the drain in ditch between houses and in rear of my house	2. depends how long it rains
1	102 Weaver Circle	B	A	C	A	B	A		
2	308 Oak Forest Drive	B	B	C	B	B	B	Oak Forest and Creekside Dr the creek needs to be cleaned more often	
23	500 Taylor Drive	B	B	C	C	B	A		
	112 MLKing Circle	B	B	C	C	B	B		
	232 Katie Drive	B	B	C	C	B	B	Shop Road	may visit with masks worn
	312 Katie Drive	B	B	C	C	B	B		
17	608 Martin Luther Circle	B	C	C	C	B	B		
16	402 Sharp Road	C	A	C	B	B	B	Sharp Road	
	214 South Barnhill Avenue	C	A	C	B	B	A	Farmer Street	Foxridge Apartments

Entry Number	Address	Frequency	Duration	Severity	Access	Damage	Integrity		Remarks
	Survey Item →	1	2	3	4	5	6	7-Other Areas Noted	
1	501 Taylor Drive	C	B	C	C	B	B		
21	108 Ruffin Place	C	B	C	C	B	B	Mill Branch Walking Parts	
24	701 West Main St	C	B	C	C	B	B		
	409 Mill Branch Rd	C	C	CC	B	B			
1	4128 S. Hathaway Blvd/ 200 Sharpe Rd	A	A		C	B	B	200 Sharpe Rd Driveway/ 4124 S Hathaway Blvd Driveway	Pictures attached
	109 Dawes Drive Street	D				B	B	109 Dawes Street	
	PO BOX 61				B	B	A	Would like for someone to check out drainage back of the Barnes Funeral Home	
1		D						Main St by Pine Grove	
2		D						No	
	No response	D						Mill Branch Road and 600 block Hwy 301 - 3200 block	
	820 Mill Branch Road	D						NO	
	NONE	D					B		
	None	D							
	699 Batchelor Road	D						699-703 Batchelor Rd, Farmer St	
	401 Holly Drive	D							
	4021 s. Hathaway Blvd.	D						Along Front Street	
	None	D						Sharpe Road	
	None	D						No	

Entry Number	Address	Frequency	Duration	Severity	Access	Damage	Integrity		Remarks
	Survey Item →	1	2	3	4	5	6	7-Other Areas Noted	
	None	D							
15	none							Holly Drive and Creekside	due to ditches on both sides of the road
	130 E. Main St								
	4240 South								
	Hathaway Blvd								

3.4 Analysis – Analysis of the system was limited to the two basins that created all the significant flooding reports from citizens. There are some observations of flooding in the central basin but they are sporadic and seem to mostly stem from clogged systems in need of cleaning. We requested and obtained ground survey on the main line drainage serving the North Drainage Basin and the South Drainage Basin. We delineated the drainage basin boundaries based on the existing topography and used this information to estimate the required carrying capacity of the main storm drainage systems. We compared this required capacity to the estimated actual capacity based upon the sizes of the existing pipes and provided a determination as to whether the existing systems have sufficient capacity to carry a reasonable design storm. In this case, a reasonable design storm for these fairly large structures carrying serving large drainage basins is the 10-year storm. The results of this analysis follow. Where the existing structures are not large enough to carry a reasonable design storm, the most straightforward correct is to replace or supplement the existing pipes or structures. In order to make a decision to supplement an existing culvert with an additional culvert there are variables to consider: 1) Is the existing structure that you intend to supplement and leave in place in good condition? 2) Is there room and does the terrain lend itself to adding an additional culvert at the crossing being upgraded? 3) Are there extensive utilities or other existing infrastructure that would dictate the choice of a solution? Based on these factors we made recommendations for upgrades to the system.

3.5 Results

The analysis showed that most of the main line drainage structures to be analyzed were inadequate hydraulically to carry the required flow. The results are shown in the table below:

Pipe Analysis

Struct. ID	Exist. Pipe Diam.- Inches	Q2 (cfs)	Q10 (cfs)	Q2 Pipe Size Needed (in)	Q10 Pipe Size Needed (in)	Adequate for 2-Year Storm?	Adequate for 10-Year Storm?	Struct. Condition	Recomm. Correction
P1N	48	421	586	96.6		No	Yes	Poor	Replace
P2N	60	409	572	95.7		No	Yes	Poor	Replace
P3N	42	82	106	50.9		No	Yes	Poor	Replace
P1S	36	146.4	195.3	57.4	64.0	No	No	Poor-Bad Slope	Replace
P2S	36	144.3	192.9	57.1	63.7	No	No	Poor-Bad Slope	Replace
P3S	36	145.4	194.3	57.3	63.8	No	No	Poor-Bad Slope	Replace
DITCH1	-	166.3	222.7	60.2	67.2			Poor-Bad Slope	Inspect
P4S	24	163.6	215.9	59.8	66.4	No	No	Poor-Bad Slope	Replace
P5S	36	164.3	216.8	59.9	66.5	No	No	Poor-Bad Slope	Replace
P6S	36	161.1	216.4	59.5	66.5	No	No	Fair	Replace
P7S	56	167.9	226.0	60.4	67.6	No	No	Fair	Replace
P8S	24	40.7	53.5	35.5	39.4	No	No	Fair	Replace
P9S	36	47.7	63.3	37.7	41.9	No	No	Fair	Replace
P10S	48	49.0	65.0	38.1	42.3	Yes	Yes	Fair	Inspect
Ditch2	-	243.5	327.8	69.5	77.7			Fair	
P11S	48	243.1	327.8	69.4	77.7	No	No	Poor-Sink Holes, Corrosion	Replace
P12S	15	2.6	3.4	12.7	14.0	Yes	Yes	Fair	Inspect
P13S	18	3.5	4.5	14.1	15.5	Yes	Yes	Fair	Inspect
P14S	18	5.0	6.4	16.2	17.8	Yes	Yes	Fair	Inspect
P15S	36	242.8	328.0	69.4	77.7	No	No	Fair	Replace
P16S	36	244.5	330.8	69.6	77.9	No	No	Fair	Replace
P17S	36	245.0	332.1	69.6	78.0	No	No	Fair	Replace
P18S	15	3.7	4.8	14.5	16.0	Yes	No	Poor- Pipe Separated	Replace
P19S	15	5.2	6.8	16.5	18.1	No	No	Poor- Pipe Separated	Replace
P20S	18	8.9	11.4	20.1	22.1	No	No	Fair	Replace

Pipe Analysis

Struct. ID	Exist. Pipe Diam.- Inches	Q2 (cfs)	Q10 (cfs)	Q2 Pipe Size Needed (in)	Q10 Pipe Size Needed (in)	Adequate for 2-Year Storm?	Adequate for 10-Year Storm?	Struct. Condition	Recomm. Correction
P21S	15	2.0	2.6	11.5	12.6	Yes	Yes	Fair	Inspect
P22S	25	23.2	29.9	28.8	31.7	No	No	Fair	Replace
P23S	15	6.1	7.9	17.4	19.2	No	No	Fair	Replace
								Fair	
P24S	15	26.0	33.6	30.0	33.1	No	No	Fair	Replace
P25S	24	26.0	33.6	30.0	33.1	No	No	Fair	Replace
P26S	18	33.1	43.1	32.9	36.3	No	No	Fair	Replace
P27S	24	33.1	43.1	32.9	36.3	No	No	Fair	Replace
P28S	24	46.5	59.6	37.3	41.0	No	No	Fair	Replace
P - Final	60	418.0	573.2	85.1	95.8	No	No	Good	Replace

4.0 Recommended Solutions

4.1 Northern Basin – With some exceptions, the problems covered in the public outreach program stem from the large culverts and connecting channel on Creekside Drive. The problem area extends approximately 420 feet from Oak Forest Drive to Holly Drive along Creekside Drive. The existing 48-inch and 60-inch culverts are inadequate to drain the 500 plus acres draining to them. In order to establish adequate capacity, a double 60-inch culvert is required at both Oak Forest Drive and at Holly Drive. An improvement inlet with wing walls is needed at Oak Forest to conduct the runoff into the pipe and channel system. Some problems were reported downstream at Judge Street on the north bank of the channel between Holly Drive and the Ann Beasley Park. Some of those problems may be due to the culvert under Mill Creek. Fortunately, the culvert under Mill Creek was replaced in recent years and it appears to be of adequate capacity for the 10-year storm. Perhaps the problems noted occurred prior to the Mill Creek Drive culvert replacement. We would recommend completing the known to be required improvements as soon as funding allows and monitoring the channel to see if the problems reoccur. Some additional study at the time of design of the culvert replacements may help confirm the scope of work for future improvements downstream of Holly Drive if necessary.

Figure 6-Mill Creek Drive Replacement Culvert

In summary, the majority of issues brought forward will be addressed with the installation of 60-inch double culverts with wing walls at Oak Forest Drive and at Holly Drive. In addition, the channel along Creekside should be restored with new grading, a bench to help establish natural flow in this live stream and turf reinforcing mat to stabilize it.

During the report, we considered the use of detention in the fields upstream of Creekside drive to address the flooding. This was not pursued in earnest because of the condition of the infrastructure along Creekside Drive requires replacement in any case and a project that includes upstream detention would still include replacement of culverts and improvement of the channel which eliminates any potential savings of using the detention method.

4.2 Southern Basin: The Southern Drainage Basin requires extensive repairs and replacements in order to function adequately at a reasonable design storm. The improvements include:

1. **Structure P1S** – Replace the existing 36-inch pipe with 54-inch pipe.
2. **Structure P2S** – Replace the existing 36-inch pipe with 54-inch pipe.
3. **Structure P3S** – Replace the existing 36-inch pipe with 54-inch pipe.
4. **Structure P4S** – Replace the existing 24-inch pipe with 60-inch pipe.
5. **Structure P5S** – Replace the existing 36-inch pipe with 60-inch pipe.
6. **Structure P6S** – Replace the existing 36-inch pipe with 60-inch pipe.
7. **Structure P7S** – Leave 54-inch pipe as is.
8. **Structure P8S** – Replace the existing 24-inch pipe with 36-inch pipe.
9. **Structure P9S** – Replace the existing 36-inch pipe with 48-inch pipe.
10. **Structure P11S** – Replace dilapidated pipe with new 60-inch.
11. **Structure P15S** – Replace the existing dual 36-inch pipe with dual 60-inch pipe.
12. **Structure P16S** – Replace the existing dual 36-inch pipe with dual 60-inch pipe.
13. **Structure P17S** – Replace the existing dual 36-inch pipe with dual 60-inch pipe.
14. **Structure P24S** – Replace the existing dual 15-inch pipe with 36-inch equivalent pipe(s).
15. **Structure P26S** – Replace the existing 18-inch pipe with 36-inch equivalent pipe(s).

In addition, there is approximately 33 acres of drainage area coming off Sharpe Road to the Bright Leaf Motel. There is an existing drainage canal that feeds this runoff to a pipe system that runs under the motel. This pipe system is failing. A better approach would be to divert this runoff down Sharpe Road to the US Highway 301 drainage system. The runoff will wind up at the same location as it does now if diverted as proposed, but the route would no longer be under the building through the failing piping. This diversion would be very expensive and it is not clear without discussions with all parties and with legal

counsel what kind of cost-sharing arrangement for this work would be fair or achievable without further work. Refer to Map 4.2.16 in Attachment 1 for a view of this option. We would be glad to discuss it further. An arrangement with the motel owner, with NCDOT, and with the Town would be required to implement this drainage diversion.

Figure 7-South Basin Drainage Structures

4.3 Central Basin: We recommend drainage basin cleanout and subsequent inspection of this system before proceeding further with any improvements

4.4 Projected Costs

Budgetary Concept Cost
Town of Sharpsburg, North Carolina

North Drainage Basin

Item No.	Description	Quantity	Unit	Projected Unit Cost	Projected Total
1	Demolition	1	LS	$40,000.00	$40,000
2	Channel Restoration	1	LS	$180,000.00	$180,000
3	Subgrade - No 57 Washed Stone	800	TN	$75.00	$60,000
4	Aggregate Base Course	400	TN	$75.00	$30,000
5	Asphalt Pavement	150	TN	$125.00	$18,750
6	Piping and Inlets	1	LS	$165,000	$165,000
7	Erosion and Sedimentation Control	1	LS	$7,500.00	$25,000
	Total				**$518,750**

South Drainage Basin

Item No.	Description	Quantity	Unit	Projected Unit Cost	Projected Total
1	Demolition	1	LS	$50,000.00	$50,000
2	Earthwork	4,500	CY	$25.00	$112,500
3	Subgrade - No 57 Washed Stone	1,200	TN	$75.00	$90,000
4	Aggregate Base Course	800	TN	$75.00	$60,000
5	Asphalt Pavement	2,100	TN	$125.00	$262,500
6	Concrete Thickened Edge Slab	50	CY	$200.00	$10,000
7	Piping and Inlets	1	LS	$1,565,000	$1,565,000
8	Erosion and Sedimentation Control	1	LS	$7,500.00	$25,000
	Total				**$2,175,000**

Subtotal For Construction	**$2,693,750**
Engineering	**$296,000**
Contingency-20%	**$538,000**
Total Projected Cost	**$3,527,750**

4.5 Potential Permitting & Easement Challenges

Much of the required replacements of storm piping and inlets lie within existing developed sites and thus do not present any particular challenge with regards to permitting. Some of the channel work will impact natural streams which are often referred to as "blue-line streams" by virtue of showing up on USGS

mapping as a blue line. These streams, which typically drain a square mile of drainage area or more, are designated by NCDEQ as live streams. They require more careful permitting as they are known to serve as habitat for aquatic life. An example of a probable blue-line stream is the Creekside Drive channel in the North Basin. Permitting will require obtaining a stream determination from NCDEQ and if it is confirmed to be, state and federal agencies will have an interest in reviewing the project and providing oversight through the permitting process. The permitting for this type of work can often be permitted though the following permit applications:

- **US Army Corps of Engineers, Nationwide Permit for Streambank Stabilization NWP-13** – This permit is applied for using a joint application form that also is used to apply for the NCDEQ 401 Water Quality Certification. Review time is approximately 90 days typically but may take up to 120 days depending on NCDEQ comments.
- **NCDEQ Erosion and Sedimentation Plan Review Approval** – This review is intended to ensure compliance with state law controlling work that creates sedimentation and erosion. The work is required to control sediments and prevent them being deposited on downstream properties.
- **NCDOT Encroachment Agreement** – Work within NCDOT rights-of-way will require NCDOT approval.
- **Railroad Encroachment Agreement** – Certain improvements, such as the culverts under the railroad serving the south drainage basin will require a railroad encroachment agreement. This approval and agreement may be challenging to obtain and might include agreements to close certain street railway crossings and extensive review of insurance requirements and Town legal review.

Easement Concerns: Various streets and properties within the Town drain to culverts and channels that lie on private property. In some cases, an easement may have been obtained but in many of these, there may not be an easement for the drainage facilities. There are both drainage channels that are eroding and undersized and pipes that are failing which carry runoff from Town streets and upstream private owners for which no easement is available to give the Town access to the facilities to replace or repair them. There are multiple methods of approaching this problem.

- Obtain easements and record easement maps- This can be pursued on a project-by-project basis and requires legal services and professional land surveyor services.
- Since the desire of citizens for functional drainage and their interest in protecting their property is a driver for drainage work, they would likely be in favor of limited access to the property for installation of improvements and ongoing maintenance. A right-of-entry agreement is a potential vehicle for granting the Town access to the project. The citizens could sign up to agree to the project, the Town could pursue funding for the project, and as part of the preliminary work the residents could be asked if they agree to a right-of-access agreement to give the Town

easement/access rights to install the work and to return as mandatory to maintain or repair the facilities. Should the residents not agree, the project would be put on hold until agreement can be obtained.

- Chapter 40A of the North Carolina General Statutes references a right of eminent domain for, "Establishing drainage programs and programs to prevent obstructions to the natural flow of streams, creeks and natural water channels or improving drainage facilities. The authority contained in this subdivision is in addition to any authority contained in Chapter 156." Chapter 156 deals with drainage issues and allows for a party to request access through the lands of others to alleviate flooding. An attorney would be required to understand the application of these statutes relative to improving the Town's drainage. Eminent domain can serve as an alternative should cooperative measures not be achievable by agreement with individual land owners.
- In one notable case of the Bright Leaf Motel, some of the piping lies under the building. Public water is conducted under a private building. In order to deal with this, the lowest liability approach might be to establish a diversion around the building. Since the original builder of the motel built the building over the stormwater conveyance, they would be expected to grout or otherwise manage the failing storm drain pipe and could then close that system off if desired while the public water would be conveyed around the site and down the US Highway 301 road frontage to the culvert crossline near the Dollar General.

4.6 Maintenance Work Required

In our ground reconnaissance we observed conditions that could be improved with some additional maintenance. There were inlets that were full of leaves and debris and this is not unusual in small towns with limited staff to address these needs. The Town does have an existing vacuum truck for removal of sewer blockages and problems and this system could also be put to use in addressing debris in the existing storm sewer piping and inlets. We would suggest that entire piping system be cleaned periodically. One way to address this would be to divide the Town into 5 to 10 sections and clean at least one section every year. In the course of 5 to 10 years the entire system would be cleaned. Alternatively, contract help could be hired to perform such work to put the Town on a good footing to maintain the system in the future. After a comprehensive cleaning, the same strategy of dividing the Town into sections and performing the work in one section every year on a rotating basis should keep the system from being very degraded in performance due to debris.

5.0 Funding Options -

Multiple sources of funding are available for drainage improvements, but many of the sources identified can be very limited in application for the Town. The available sources include:

- Local Assistance for Stormwater Infrastructure Investments (LASII)
- Clean Water Management Trust Fund (CWMTF)

- BRIC Funding
- North Carolina Land and Water Fund
- Stormwater Fee

5.1 Local Assistance for Stormwater Infrastructure Investments (LASII) – The North Carolina General Assembly appropriated $1.69 billion from the state's allocation of the American Rescue Plan Act for drinking water, wastewater, and stormwater investments in Sections 12.13 and 12.14 of the Current Operations Appropriations Act of 2021 (S.L. 2021-180). As of fall of 2022, the status of these funds earmarked for drainage was as follows:

NC DEQ Fund	Purpose	Allocated directly for specific local governments (directed projects), approx.	Approximate remaining for grant funding (undirected funds)
Local Assistance for Stormwater Infrastructure Investments Fund (ARPA stormwater grants)	Grants for local governments for projects that will improve or create infrastructure for controlling stormwater quantity and quality	$18.5 million	$82.0 million
		Total funds: approx. $100.5 million	

At least a portion of the unallocated $82M will likely be available in the spring application cycle. The spring 2023 application deadline is not yet set but it is typically in early May. The program will be competitive with the largest points granted for water quality solutions, but there is a project purpose with substantial points give for flood reduction and management of stormwater quantity. At present, the Town is rightfully focused on quantity but some strategies for the northern basin flooding could potentially be accomplished with the use of stormwater detention and thus gain points for quality. Such a strategy may not be the best approach for the town and can be discussed as additional planning is carried out. Points are available for creating a stormwater utility. Guidance for this funding is located at the following link:

https://deq.nc.gov/media/30999/download?attachment

5.2 Clean Water Management Trust Fund (CWMTF) – Funding is available for stormwater projects that improve water quality. The funding prioritizes water quality over water quantity problems. A project aimed directly at reduction of flooding is not likely to be funded unless the strategy for dealing with flooding enhances the quality of the runoff. One common measure that accomplishes this is stormwater detention. The temporary capture of runoff with a timed, throttled release at some lower rate of discharge that would otherwise occurs. This reduces the sediments and nutrients in the runoff. The limits for detention are cost and land acquisition. Two potential detention sites are 1) West of Oak Forest Drive upstream of Creekside Drive, 2) West of Greenleaf Drive upstream of the main southern outfall serving US Highway 301.

Figure 8-Potential Detention Facility - North Basin

Figure 9- Potential Detention Facility – South Basin

In the case of the Oak Forest detention project, it would require the facility to be designed to control a drainage basin of more than 700 acres. The southern, Greenleaf Road detention facility would control about 400 acres of drainage basin. Such significant facilities will be required to temporarily store hundreds of acre-feet of water to make a significant downstream impact. This may prove infeasible but it will more than likely be very expensive depending on the design storm and intended discharge target. Since the infrastructure downstream has

significant components that are beyond their useful life, such a scheme does not eliminate the need for downstream culvert replacements and channel improvements. That being the case, the CWMTF funding will likely be an add-on to the real work of infrastructure replacement and upgrade that is needed. This is not likely a significant funding source for the most significant drainage problems for the Town but it might be a part of a solution in the future. Especially if the upstream properties develop.

5.3 **Building Resilient Infrastructure in Communities (BRIC)** – Funding has been available for shovel-ready infrastructure projects under BRIC. The Town has been in the process of studying the shortcomings of its stormwater system and planning for future work and developing a management system to maintain the stormwater infrastructure. At the conclusion of this study and report, some of these shortcomings have become apparent and preliminary scope and cost estimates and information concerning permitting are now available. We recommend that the North Carolina Department of Public Safety be approached to discuss funding availability and a potential application for grant funding.

5.4 **North Carolina Land and Water Fund** - In the Fiscal year 2021-2022 the state legislature appropriated $15M for work in North Carolina to reduce flooding and improve water quality. This work is limited to enhancement and restoration of floodplains, wetlands, and natural areas. There may be some opportunity for funding in certain cases where stormwater detention would help. The most relevant work under this funding would be upstream detention for the southern basin upstream of Greenleaf St. apartments upstream of the historically heavily flooded area there and perhaps upstream of the Creekside Drive area.

5.5 **Stormwater Fee** – There is no direct payment by "customers" to the Town to pay for stormwater service and there is no actual stormwater utility in the Town. Stormwater work, when it occurs, is funded through the general fund in response to needs detected by the staff or because of citizen complaint. There is no system of recurring structure or channel replacements or improvements. Establishing a utility can provide for a more efficient and regular maintenance of stormwater systems and responses to sink hole, failures and flooding. Establishing a utility will not immediately address all problems as they took years to develop but it can start the Town on the path to addressing the shortcomings. The fee could be set up as a fee per month per residence of for businesses an equivalent residential unit based on square footage. The City of Greenville, NC and other municipalities could provide a model for the Sharpsburg fee and it could be made a part of the monthly water and sewer billings. Setting up a fee could support a new utility that includes a maintenance plan and a capital improvements plan. Setting up a utility also helps in the scoring of LASII funding applications.

6.0 Policy Efforts Supporting Effective Drainage Systems

6.1 Lack of Easement Access – Many of the proposed improvements lie on private property. Detailed investigations of rights-of-way are beyond the scope of this report but it is suspected that easements do not exist for some of the existing pipelines. For example, the pipes under the Bright Leaf Motel. If easements do exist for that pipe reach, the motel building would be in violation of it.

6.2 Working with NCDOT – Some of the complaints involve runoff either delivered from roadside drainage to the property of Sharpsburg citizens or drainage that arrives at an NCDOT roadway and must be conveyed by NCDOT structures. On notable problem is Sharpe Road. It was noted by Town management as flooding severely at times enough to close the road. Some of the problem is due to the existing NCDOT drainage system. Consultation with NCDOT might help develop a rationale whereby NCDOT either participates in the cost of a Town project to improve this drainage or NCDOT might agree to correct the drainage problems on NCDOT right-of-way and have the Town address problems with its system.

6.3 Working with CSXT Work on the main storm drainage outfall for the south basin will involve the railroad. The outfall from the Dollar General is conducted under the railroad right-of-way by two existing culverts which are inadequate and in poor repair. The culvert repair, which is included in the cost estimate for the south basin, might be rightfully attributed to the railroad. With adequate presentation and discussion, CSXT might participate in the cost of the project to the extent that the problems are attributable to their facilities but this is an open question as the Town or any single party does not hold much sway with the railroad legal team. At the least, they may cooperate with the encroachment agreement that will be necessary for such work.

6.4 Private Drainage and Impacts To Public Drainage- Changes to private property can affect the drainage systems of the town. For example, if an existing ditch is enclosed with a pipeline, and the new pipe is of inadequate size, this can cause flooding upstream of the change implemented by the private property owner. Changes to existing pipes and streams on private property can impact other citizens. It is of interest to the town to ensure that changes receive some review to ensure that they do not adversely affect neighboring citizens or the Town.

6.5 Potential Zoning Safeguards for the Town-In order to protect the Town against future drainage problems, some measures should be included in the site-review process:

- Require any party altering drainage facilities provide a plan for the work to the Town for review.

- Require new driveways to receive a drive permit. If the drive connection is to a Town Street, require the new connection to meet Town requirements with regards to the drive culvert.
- For any new developments, require as a minimum that the development provide evidence of approval by the NCDEQ regional office for stormwater. New developments that are high-density with regards to new impervious surfaces are required to control runoff to pre-development levels. This control will keep development from heavily impacting the Town's drainage infrastructure. This is very important for new developments to the west which are upstream of the Town's systems. Uncontrolled development there will further overload the Town's already overloaded drainage systems.

6.6 **Policy for Future Drainage Complaints**-In the future, when private citizens complain regarding drainage, the Town should evaluate if this is a location that is on an outfall that drains public water. Public water is runoff that is generated from multiple combined properties that are conveyed in a Town-owned Street drainage system. If the Town's streets are draining to this problem location, then it's public water or runoff and the Town has a vested interest in assisting in the resolution of the drainage problem. If public water is not involved, the Town will want to be helpful but the resolution is really a private matter. For drainage problems involving public water, the Town should require a right-of-entry agreement as a condition of performing any improvements. The Town's legal counsel should be asked for consultation on drawing up a sample format agreement for such work. Ideally, this right of entry agreement could be recorded and would grant the Town the right to enter as necessary to install, repair, and maintain the drainage work as required to keep the system functioning at the expected performance level.

6.7 **Capital Planning** – In order to set up a stormwater utility fee there should be a determination of the needs of the system. Review of the system capacity from this initial study has provided locations where undersized components are causing problems. In addition, the study has shown that some of the components are failing. Additional study of the condition of the system should be carried out, especially where those components seem to be of adequate size and should be suitable if they are in good condition. As the needs are confirmed or identified, a methodology of ranking the problems will be needed. Once the most pressing problems are confirmed, they can be placed in a ranked order listing of capital improvements to be accomplished for the system. A capital plan would add a cost estimate for the work to this listing, project the funding that may be available through the stormwater fee and outside sources, and set a date goal for each of the projects. The time period for completion of the Capital Improvements Plan (CIP) projects will be dependent on the funding availability. Ideally, the CIP will be a living documents that is updated periodically. As the system ages, and is improved, the needs on the CIP will require an update. A good CIP process will help avoid serious drainage issues in the future.