City of Washington
NORTH CAROLINA

COMMITTEE OF THE WHOLE

September 23, 2013
5:30 PM

Opening of Meeting

Nondenominational Invocation

Roll Call

Approval/Amendments to Agenda

1. **Authorize/Adopt**: Authorize Mayor to Execute a Financial Assistance Award with the US Department of Commerce for Various Water and Sewer Projects **and** Adopt Grant Project Ordinance **and** Adopt Budget Ordinance Amendment **(page 2)**

2. **Memo**: Jack's Creek Engineering Report Summary **(page 8)**

3. **Memo:** Iron Creek Drainage **(page 50)**

4. **Memo**: 2013 AFG Grant **(page 53)**

5. **Memo**: Proposed NCDOT Project to Widen 15th Street and 2014 Resurfacing Plan**(page 54)**

6. **Discussion**: Lighthouse Restroom & Boater Facilities Bid Opening

7. **Discussion**: Scheduling for October Council meeting

8. **Closed Session**: Under NCGS § 143-318.11(a)(1) Disclosure of confidential information and 143-318.10(e) the public records act, NCGS 143-318.11(a)(3) Attorney Client Privilege – including Roulhac, et al vs. City of Washington (11-CVS-1150) and James L. Davis vs. City of Washington (09-OSP-06499)

9. **Adjourn** – Until Monday, October _____, 2013 at 5:30pm in the Council Chambers at the Municipal Building.

Agenda Date: 09-23-13

City of Washington
NORTH CAROLINA

REQUEST FOR CITY COUNCIL ACTION

To:	**Mayor Jennings & Members of the City Council**
From:	**Allen Lewis, Public Works Director**
Date:	**09-16-13**
Subject:	**Authorize Mayor to Execute a Financial Assistance Award with the US Department of Commerce for Various Water and Sewer Projects and Adopt Grant Project Ordinance and Budget Ordinance Amendment.**
Applicant Presentation:	**N/A**
Staff Presentation:	**Allen Lewis**

RECOMMENDATION:

I move Council authorize the Mayor to execute the attached Financial Assistance Award with the US Department of Commerce for various water and sewer projects and adopt the attached grant project ordinance and budget ordinance amendment.

BACKGROUND AND FINDINGS:

In October of 2012, Council authorized staff to apply for EDA funding for various water and sewer projects totaling approximately $2,000,000. At the time, we were under the impression that the maximum amount of funding available would be $1,000,000, with a 50% match. During the application process we were encouraged to submit a request for funding of all of the proposed projects and received funding for a total of $1,442,049 as indicated on the attached Financial Assistance Award. The total project cost approved for these projects is $2,852,156. There are a total of five (5) projects included in this grant award; the construction of a 16" water line from the water treatment plant to US 264, the design and construction of a liquid chlorine feed system at the water plant, the design and construction of a new sewer pump station at Water and Bonner streets and the design and installation of generators with automatic switch gears at the wastewater treatment plant and the sewer lift station at US 264 and Cherry Run. There is also a grant project ordinance attached as well as a budget ordinance amendment to provide the remaining funds necessary for these projects.

PREVIOUS LEGISLATIVE ACTION

October 8, 2012 – staff authorized to seek grant assistance.

FISCAL IMPACT

___ Currently Budgeted (Account _____) _X__ Requires additional appropriation ___No Fiscal Impact

SUPPORTING DOCUMENTS

See attached.

City Attorney Review:	_____ Date	By September 23, 2013 (if applicable)
Finance Dept Review:	_____ Date	By Page 2 of 54 (if applicable)
City Manager Review:	9/18 Date	Concur Recommend Denial ____ No Recommendation_____

UNITED STATES DEPARTMENT OF COMMERCE
Economic Development Administration
Atlanta Regional Office
Suite 1820
401 West Peachtree St., N.W.
Atlanta, Georgia 30308-3510

SEP 1 1 2013

In reply refer to:
Investment No. 04-79-06833

The Honorable Archie Jennings
Mayor, City of Washington
102 E. Second Street
Washington, North Carolina 27889

Dear Mayor Jennings:

I am pleased to inform you that the Department of Commerce's Economic Development Administration (EDA) has approved your application for a $1,442,049 EDA investment to support construction of critical infrastructure improvements to support the retention and expansion of existing industries City-wide as well as small businesses located in the city's historic downtown.

Enclosed are two signed copies of the Financial Assistance Award. Your agreement to the terms and conditions of the award should be indicated by the signature of your principal official on each of the signed copies of the Financial Assistance Award. One of the executed copies should be returned to H. Philip Paradice, Jr., Regional Director, Atlanta Regional Office, Economic Development Administration, 401 West Peachtree Street, N.W, Suite 1820, Atlanta, Georgia 30308-3510. If not signed and returned within 30 days of receipt, EDA may declare the Award null and void.

Please do not make any commitments in reliance on this award until you have carefully reviewed and accepted the terms and conditions. Any commitments entered into prior to obtaining the approval of EDA in accordance with its regulations and requirements will be at your own risk.

EDA's mission is to lead the federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. EDA implements this mission by making strategic investments in the nation's most economically distressed communities that encourage private sector collaboration and creation of higher-skill, higher wage jobs. EDA investments are results driven, embracing the principles of technological innovation, entrepreneurship and regional development.

I share your expectations regarding the impact of this investment and look forward to working with you to meet the economic development needs of your community.

Sincerely,

H. Philip Paradice, Jr.
Regional Director

Enclosures: Form CD-450 Financial Assistance Award (2)
Exhibit A – Special Award Conditions
Attachment No. 1 – Form ED-508 Budget
EDA Standard Terms and Conditions for Construction Projects, dated March 12, 2013

FORM CD-450 (REV. 3-13)	U.S. DEPARTMENT OF COMMERCE	☑ GRANT ☐ COOPERATIVE AGREEMENT
FINANCIAL ASSISTANCE AWARD		AWARD PERIOD: 45 months after approval
RECIPIENT NAME: City of Washington		AWARD NUMBER: 04-79-06833
STREET ADDRESS: 102 E. Second Street		FEDERAL SHARE OF COST: $ 1,442,049
CITY, STATE, ZIP CODE: Washington, North Carolina 27889		RECIPIENT SHARE OF COST: $ 1,410,107
AUTHORITY: PW & Econ. Dev. Act of 1965, as amended (42 U.S.C. §3121, et. seq.)		TOTAL ESTIMATED COST: $ 2,852,156

CFDA NO. AND PROJECT TITLE: 11.307 Economic Adjustment Program / Infrastructure Improvement

BUREAU	FUND	FCFY	PROJECT-TASK	ORGANIZATION	OBJECT CLASS
20	40	13	0406833-000	04	4110

This Award approved by the Grants Officer is issued in triplicate and constitutes an obligation of Federal funding. By signing the three documents, the Recipient agrees to comply with the Award provisions checked below and attached. Upon acceptance by the Recipient, two signed Award documents shall be returned to the Grants Officer and the third document shall be retained by the Recipient. If not signed and returned without modification by the Recipient within 30 days of receipt, the Grants Officer may unilaterally terminate this Award.

- ☐ Department of Commerce Financial Assistance Standard Terms and Conditions (January 2013)
- ☑ Special Award Conditions
- ☑ Line Item Budget
- ☐ 15 CFR Part 14, Uniform Administrative Requirements for Grants and Agreements with Insitutions of Higher Education, Hospitals, Other Nonprofit, and Commercial Organizations
- ☑ 15 CFR Part 24, Uniform Administrative Requirements for Grants and Agreements to State and Local Governments
- ☐ OMB Circular A-21, Cost Principles for Educational Institutions
- ☑ OMB Circular A-87, Cost Principles for State, Local, and Indian Tribal Governments
- ☐ OMB Circular A-122, Cost Principles for Nonprofit Organizations
- ☑ 48 CFR Part 31, Contract Cost Principles and Procedures
- ☑ OMB Circular A-133, Audits of States, Local Governments, and Nonprofit Organizations
- ☑ Other(s): EDA Standard Terms and Conditions for Construction Projects, dated March 12, 2013

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER	TITLE	DATE
H. Philip Paradice, Jr.	Director, Atlanta Region	9/11/13
TYPED NAME AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL	**TITLE**	**DATE**
Archie Jennings	Mayor, City of Washington	

GRANT PROJECT ORDINANCE FOR THE EDA
GRANT AWARD
CITY OF WASHINGTON, N.C.
FOR THE FISCAL YEAR 2013-2014

BE IT ORDAINED by the City Council of the City of Washington, North Carolina, that pursuant to Section 13.2 of Chapter 159 of the General Statutes of North Carolina, the following grant project ordinance is hereby adopted:

Section 1. The project authorized is to provide funds for the design and construction of water and sewer infrastructure improvements.

Section 2. The officers of this unit are hereby directed to proceed with the project within the terms of the grant agreements and documents.

Section 3. The following amounts are appropriated for the project:

76-90-8221-0400	Admin. & Legal- Water Line	$ 10,280
76-90-8221-0405	Architectural & Eng. - Water Line	62,092
76-90-8221-0410	Other Architect & Eng.- Water Line	19,738
76-90-8221-0420	Proj. Insp. Fees & Audit- Water Line	37,628
76-90-8221-4500	Construction- Water Line	940,704
76-90-8221-9900	Contingency- Water Line	102,391
76-90-8221-0401	Admin. & Legal- Liquid Chlorine	3,068
76-90-8221-0406	Architect & Eng. - Liquid Chlorine	18,529
76-90-8221-0415	Other Arch. & Eng - Liquid Chlorine	5,890
76-90-8221-0425	Inspect Fees - Liquid Chlorine	11,229
76-90-8221-4505	Construction- Liquid Chlorine	280,722
76-90-8221-9901	Contingency- Liquid Chlorine	30,555
77-90-8221-0400	Admin. & Legal- Cherry Run	1,070
77-90-8221-0405	Architectural & Eng. - Cherry Run	6,460
77-90-8221-0410	Other Architect & Eng. - Cherry Run	2,053
77-90-8221-0420	Proj. Inspect Fees- Cherry Run	3,915
77-90-8221-4500	Construction- Cherry Run	97,866
77-90-8221-9900	Contingency- Cherry Run	10,652
77-90-8221-0401	Admin. & Legal- Generator	5,066
77-90-8221-0406	Architectural & Eng. - Generator	30,599
77-90-8221-0411	Other Architect & Eng. - Generator	9,727
77-90-8221-0425	Proj. Inspect Fees- Generator	18,543
77-90-8221-4505	Construction-Water & Bonner	463,577
77-90-8221-9901	Contingency-Water & Bonner	50,458
77-90-8221-0402	Admin. & Legal-Water & Bonner	5,516
77-90-8221-0407	Architect & Eng. -Water & Bonner	33,319
77-90-8221-0412	Other Architect .-Water & Bonner	10,591
77-90-8221-0426	Proj. Inspect Fees-Water & Bonner	20,191

77-90-8221-4506	Construction-Water & Bonner	504,784
77-90-8221-9902	Contingency-Water & Bonner	54,943
	Total	$2,852,156

Section 4. The following revenue is anticipated to be available to complete this project:

76-90-3480-0000	EDA Grant Funds- Water	$ 769,939
77-90-3480-0000	EDA Grant Funds- Sewer	672,110
76-90-3980-0000	City Contribution-Trans. Water Fund	706,133
77-90-3980-0000	City Contribution-Trans. Sewer Fund	703,974
	Total	$2,852,156

Section 5. The Finance Officer is hereby directed to maintain within the Grant Project Fund sufficient detailed accounting records to satisfy the requirements of the EDA grant agreements.

Section 6. Funds may be advanced from the Water and Sewer Funds for the purpose of making payments that are due. Reimbursement requests should be made to the granting agency in an orderly and timely manner.

Section 7. The Finance Director is directed to report, on a monthly basis, the financial status of each project element in Section 3 and on the total grant revenues received or claimed.

Section 8. The Budget Officer is directed to include a detail analysis of past and future costs and revenues on this grant project in every budget submission made to the City Council.

Section 9. Copies of this grant project ordinance shall be furnished to the City Clerk, Budget Officer, and Finance Director for direction in carrying out this project.

Section 10. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

Section 11. This ordinance shall become effective upon its adoption.

Adopted this the 23rd day of September, 2013.

ATTEST:

CITY CLERK MAYOR

AN ORDINANCE TO AMEND THE BUDGET ORDINANCE OF THE CITY OF WASHINGTON, N.C. FOR THE FISCAL YEAR 2013-2014

BE IT ORDAINED by the City Council of the City of Washington, North Carolina:

Section 1. That the following accounts of the Water and Sewer Fund revenue budget be increased by the respective amounts indicated for the City's cost share of the EDA Grant.:

30-90-9910-3991	Fund Balance Appropriated	$ 706,133
32-90-9910-3991	Fund Balance Appropriated	703,974
	Total	$ 1,410,107

Section 2. That the following accounts of Water and Sewer Fund appropriations budget be increased by the respective amounts indicated for the City's cost share of the EDA Grant.:

30-90-6610-9285	Transfer to Grant Fund	$ 706,133
32-90-6610-9280	Transfer to Grant Fund	703,974
	Total	$ 1,410,107

Section 3. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

Section 4. This ordinance shall become effective upon its adoption.

Adopted this the 23rd day of September, 2013.

_____
MAYOR

ATTEST:

_____
CITY CLERK

City of Washington
NORTH CAROLINA

MEMORANDUM

DATE: September 16, 2013

TO: Mayor and City Council

FROM: Allen Lewis
Public Works Director

SUBJECT: Jack's Creek.

Please find attached a copy of a drainage basin study done for Jack's Creek in September of 1999 by Jarvis Associates, P.A., as well as a planning and engineering report for improvements in Jack's Creek also done by Jarvis, as requested at the August 26 Council meeting. The study goes into detail about the existing problems as well as possible solutions, with those solutions proposed to start at the downstream end of the creek, as did the study done by Rivers and Associates in 2007 and mentioned to you several times since their report. Jarvis also proposed to raise Main Street to provide access during large storm events that normally flood Main Street from abnormally high tides. While in theory this will provide the access suggested, when the tide got up to the 8.0 elevation proposed for the new bridge, access would still be denied. Jarvis had also proposed removing the berm at Park Drive adjacent to the stormwater pump station and installing a bridge with a weir. The weir would allow water to flow out of the creek at a lower elevation than the existing berm. Likewise though, it would allow water to flow back into town during times of high tides, not just abnormally high tides. The system of box culverts with flood gates installed in 2004 in essence accomplished the same thing but also prevents high tide from inundating the City unless it breaches the berm. In order to breach the berm at Park Drive, the tide would have to exceed 8.0'. At that point, numerous streets within the City are under water already and we are at the mercy of the storm event and have to wait for the water to recede as we continue to run the pumps at the stormwater pump station, assuming that we are able to remain there and do not need to evacuate the site. As noted numerous times in the past, when the water level in the river falls at least 6" below the water level on the north side of Park Drive, the flood gates on the box culverts will start to open. As it becomes obvious that the tide is going out, we will crank open the flood gates and let the water out of town as quickly as the river will take it.

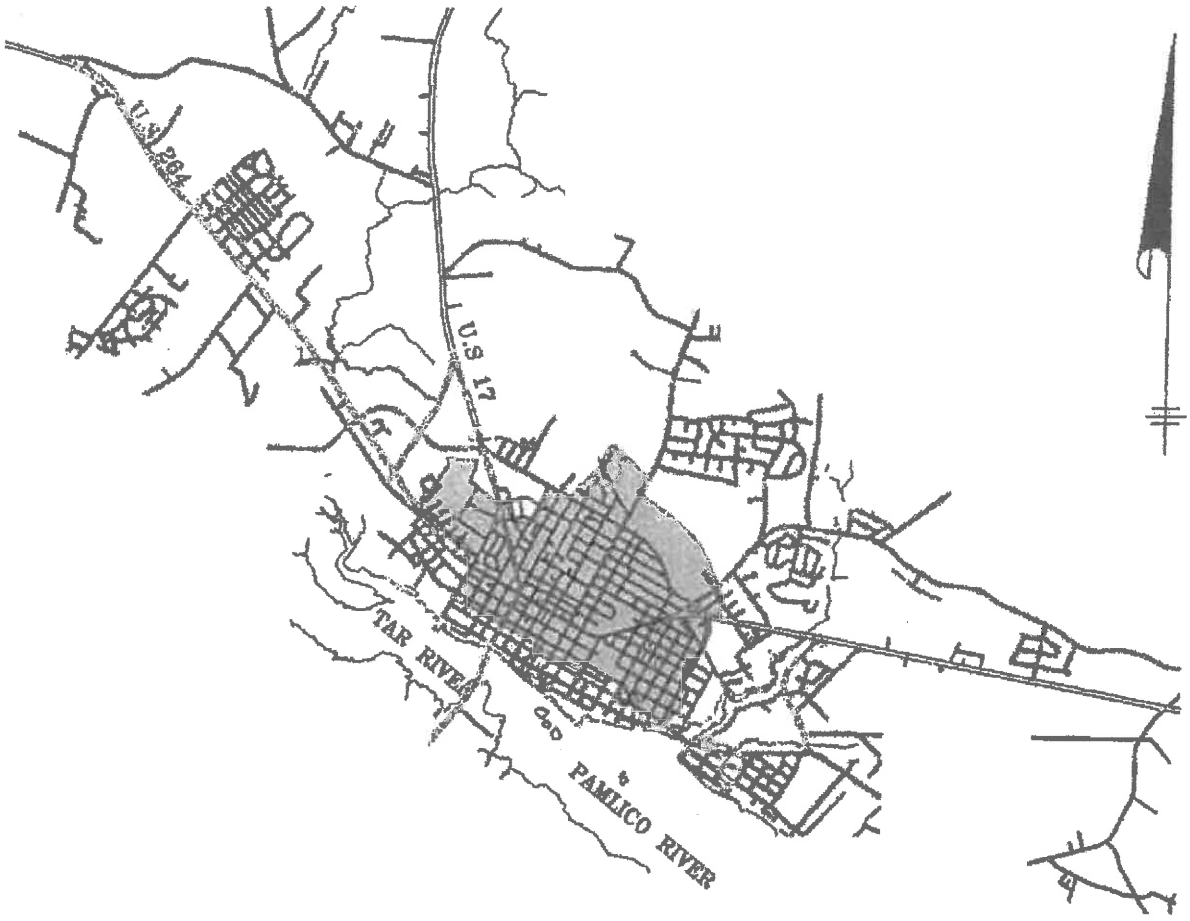
Again, we did not ultimately build what was proposed in the Jarvis reports, but the system in place accomplishes the same thing without having the creek inundated with an above average high tide.

/al

Attachments

Book in Conference on Allen table

CITY OF WASHINGTON



JACK'S CREEK DRAINAGE BASIN STUDY

PREPARED BY

JARVIS ASSOCIATES, P.A.
130 EAST SECOND STREET, WASHINGTON, NC

NORTH CAROLINA PROFESSIONAL SEAL 5242 ENGINEER RALPH SAMUEL

TABLE OF CONTENTS

INTRODUCTION

The Jack's Creek Basin encompasses over 90% of the drainage area of the corporate limits of Washington, NC consisting of 1161 acres. The drainage basin has been delineated as shown on Exhibit A in the Appendix. This drainage basin, aside from the areas that drain directly into the Pamlico River, at one time drained all of the Washington corporate limits. The city has grown in size and now drains to other drainage basins including Cherry Run and Runyon Creek.

Since the Jack's Creek Basin was developed prior to any stormwater regulations and flooding was not a serious problem, the city did not require drainage structures to be sized to handle any future development. As you will note in further documentation of this study, the Jack's Creek Basin is approximately 95% built upon and the existing drainage facility is undersized in several areas to adequately handle the design storms.

As noted, this study covers three major concerns with Jack's Creek: the breaching of the Creek with the Pamlico River as well as frequent flooding of major thoroughfares and local streets during intense rainfall events.2

FACTORS AFFECTING STREET WATER

Streets historically have served adjacent land use for ease of access as well as a conduit for land as well as street drainage in addition to being a conveyor of through traffic.

Local streets that allow parking on both sides with lower volume of Average Daily Traffic (ADT) can tolerate more gutter spread than more traffic oriented streets.

We have defined three types of streets: a. Local
b. Collector/Feeder
c. Thoroughfare

Local is defined as narrower streets with low ADT volumes and parking allowed on both sides.

Collector/Feeder streets are defined as wider streets funneling traffic through areas to the thoroughfares. Parking is allowed on one or both sides. Examples: Bonner Street, Charlotte Street, Bridge Street.

Thoroughfares are defined as wider, large ADT volume streets serving adjacent land use as well as transient vehicles, no parking, and all available space is used to carry traffic. Examples: Carolina Avenue, John Small Avenue, Third Street, Hudnell Street, 15th Street, and to some extent, Market Street which falls between a collector and a thoroughfare.

Properly functioning drainage systems are composed of several factors:

a.) Collection and Conveyance System: These are ditches and streets with or without curb and gutter).

b.) Inlets: These can be pipes at the tail end of a ditch but most notably Catch Basins in the flow line of the curb and gutter. Basically there are three types of inlets: 1.) Grated inlet, 2.) Curb inlet, 3.) Combination of the two above. Grates can be

located as interceptor inlets along the longitudinal slope and at the sag point of the roadway where 100% of the flow to the inlet must be received.

c.) Conduits: These are generally pipes but can be ditches that convey the collected water to another basin or to a point of discharge. Pipes should be designed to accommodate the flow from a projected land use. They should be designed to pass a design storm of some long-term frequency (10 or more years) and not require a head on the pipe higher than six inches below the flow line of the gutter.

d.) Receiving Stream: This can be ditches, creeks, or rivers. The receiving system may impact the efficiency of the conduit system by the elevation of the tailwater. The head (height of water above the pipe) must be overcome either by pipe size or head on the pipe at the upstream end.

DEFINITIONS

- Spread = T is defined as the width of the flow in the gutter and street.
- Slope = S is the longitudinal slope of the street.
- Transverse Slope = Sx is the cross section slope of the roadway from the centerline crown elevation to the edge of the pavement.
- Gutter Slope = Sw is the cross section slope of the gutter section between the edge of pavement and the flow line.
- Velocity = V is the velocity of the flow within the spread T.
- Flow Volume = Q is total surface volume of water within the spread T comprised of both street runoff and adjacent property runoff.
- Interceptor Inlet Efficiency = E is the ratio of intercepted flow to the total flow to the basin.
- Bypass Flow = B is the flow not collected into the interceptor inlet and must be added to the total surface flow at this next inlet.

CATCH BASIN EFFICIENCY

There are many types of catch basin sizes and configurations. Predominantly in the city of Washington, there are three types:

1.) Grated Inlet:

The grated inlet is generally a 2' X 2' slotted inlet located in the curb line of the street. They generally are efficient for low flows. Higher flows yield a greater volume of interception but along with greater velocities. As the flow increases, splash over occurs and the efficiency of the basin begins to decrease. The efficiency of the predominant slotted basin in Washington is a function of longitudinal slope S, transverse slope Sx, and total flow Q. The efficiency of slotted drain inlets either as interceptor inlets or more particularly sag inlets may lose 50% to 100% of their inlet capacity due to debris including leaves, pine straw, etc. Normal design practice is to allow for 50% lost inlet capacity to debris.

2.) Curb Inlets:

This type inlet has an opening in the curb without any grate openings. The advantage of this type inlet is that it does not block debris as readily as a grated inlet. The main disadvantage is that for water interception on a longitudinal slope, it is very inefficient. It acts as a weir, and to utilize the cross section opening area, water must be to the top of the curb. In order to work better, the cross slope of the street Sx should be near 5% to force the water out of the travel lanes to the gutter. In a sag situation, the curb inlet is not as impacted by debris as the grated inlet but again requires deep water at the opening. Water deeper than the top of the curb forces the basin to act as an orifice. Often many openings and extra piping are required to relieve the spread (T). This type basin alone in flat country with minimum cross-sections (Sx) is not recommended as having much efficiency. Many of the curb inlet openings are three feet or four feet wide. Often, making the inlets wider on an intercept condition will have no impact on the efficiency of the inlet. The required opening for total interceptions of flow is not practiced in general applications. As an example, a typical local street with a longitudinal slope (S) of 0.3%, cross slope (Sx) of 2.0%, gutter slope (Sw) of 4.0%, roughness coefficient 0.016, and a total flow of 4 CFS, the total length of curb inlet required to intercept all the flow is 23

feet. A standard 2' X 2' slotted inlet will intercept 0.8 CFS which is 20% of the total Q with 3 2 CFS as bypass.

3.) Combination Inlets:

This is perhaps the most common inlet used in Washington and is the preferred inlet by the North Carolina Department of Transportation. Generally, the combination inlet is twice as efficient as a curb inlet, and 1.4 times more efficient than a grated inlet. This inlet has the advantage of not clogging as easily as a grated inlet and can still drain with the grate partially clogged. The efficiency of any grated inlet is influenced not by the longitudinal length of the grate but by the perimeter of the grate and in particular the width intercepting the gutter flow. Unfortunately it is not practical under intercept flow conditions to make the width wider than the gutter width.

It would be cost prohibitive to design and construct a stormwater system that would collect and pass without rise all the water introduced to the system. The Federal Highway Administration (FHWA) HEC-22 Manual (formerly HEC-12) recommends the spread T be according to the following:

Road Classification	Design Return Period	Design Spread
* Thoroughfare < 45 MPH	10 Year	Gutter + 3 Feet
Thoroughfare > 45 MPH	10 Year	Gutter
Thoroughfare Sag Point	50 Year	Gutter + 3 Feet
Collector/Feeder Low Volume	10 Year	½ Driving Lane
Collector High Volume	10 Year	Gutter
Collector Sag Point	10 Year	½ Driving Lane
Local Streets Low Volume	5 Year	½ Driving Lane
Local Streets High Volume	10 Year	½ Driving Lane
Local Streets Sag Point	10 Year	½ Driving Lane

* The normal street has a gutter section and full width travel lanes. Third Street, Fifteenth Street, and Carolina Avenue are examples. John Small Avenue utilizes the entire gutter section as a travel lane as does Bonner Street and Market Street in the way they are resurfaced and utilized. This is a serious problem on John Small Avenue and more inlet capacity is needed if the present cross section is to remain.

Our field data collection has been very extensive, and horizontal and vertical control has been established throughout the study area. We have located all catch basins, manholes, ditches, street widths, and sufficient ground shots to complete a topographic map of the study area. We have observed all but lost or inaccessible structures for size and clearness. We have determined pipe sizes, basin type and size, and observed the open ditches. We have determined the top and invert elevation of all-accessible pipes and basins. Any intersection not specifically addressed in this report has all the information needed to prepare a hydraulic design included in the computer-stored data.

STORM DRAINAGE DESIGN CRITERIA

Observations have been made from historical data, interviews with City of Washington staff and reports from the local meteorological expertise. There are three scenarios associated with flooding in the Jack's Creek basin. The first is the result of a high intense, short duration storm that overpowers the inlet and conduit system. This is the most frequent occurrence and can happen several times a year. Prior to the gathering of information resulting from this study, it was thought that the pump capacity at Park Drive caused the flooding on city streets. This is not the case at all. The City of Washington maintains a water level in Jack's Creek at – 2.00 feet mean sea level. The normal level of water in the Pamlico River varies between +0.75 feet and +1.0 feet MSL. With the exception of the western end of Willow Street and 4th Street, the elevation of water in Jack's Creek at 3.5 feet MSL and below has no impact on the street flooding. During a recent summer storm prior to the hurricane influence, 2.75 inches of rain was recorded at the Estuarium in less than half an hour. Street flooding was severe and of long duration. Jack's Creek rose from – 2.00 feet MSL to +1.42 feet MSL. The elevation of water on 5th Street between Brown and Charlotte Streets was 5.2 feet +/-; the elevation of water at Respess and 3rd Streets was at 7.2 feet +/-; the elevation of water at Market and 12th Streets was at 7.0 feet +/-. This clearly indicates that the inlet capacity as well as the conduit capacity are inadequate for the storm occurrences being experienced. The City of Washington is not alone with downstream systems becoming overpowered by upstream development which was never considered in the design. This is an excellent example of why stormwater design should be based on land use and management plans implemented.

Storm drainage design should be based on statistical occurrences of repeat storms. Many municipalities as well as the North Carolina Department of Transportation have adopted standards to be utilized in the design of stormwater systems. It has only been in the last few years that emphasis has been placed in managing stormwater instead of releasing it as fast as possible. Common design practice utilizes the 10-year storm for off-road piping and ditching. Pipes crossing under the road normally at sag points are designed not to have overtopping of the roadway from the 25-year storm. The inadequacy of the piping

and inlet system is by far the most menacing culprit affecting street flooding, not the pumping capacity at Park Drive.

The second scenario is when Jack's Creek swells to elevation 5.5 feet MSL overtopping the berm at Bug Park and draining to the Pamlico River. When this happens, generally rainfalls of longer duration, all the same plus additional intersections and low areas will flood. Although many of the flooded streets will have water elevations above the 5.5 feet elevation, the inlet capacity pipe friction loss, debris, etc. will not allow the head on the water of the flooded streets to push the water from the system. This is a case where the pumping ability of Jack's Creek is paramount to the reduction of street flooding. In addition to the pumping capacity, gravity discharge to the river must be installed and fitted with a redundant check valve system. The upgrading of the inlet and piping system will allow much quicker street flooding drawdown and will respond directly to the draw down of Jack's Creek.

The third scenario to cause flooding in Jack's Creek and city streets is the breaching of the berm at Bug Park allowing the Pamlico River to flow across Park Drive. The current breach occurs at elevation 5.5 feet. The withdrawal of the river leaves Jack's Creek at full capacity and must be pumped to bring any flooding relief. When Jack's Creek is at elevation 5.5 feet, the storage capacity is 10,120,000 cubic feet or 75,697,600 gallons. The current pumping capacity is 90,000 GPM. To reduce the elevation from 5.5 feet to 3.5 feet, which will allow the streets to drain, nine hours of pumping time is required to displace 6,378,000 cubic feet of water. An additional 5.2 hours are needed to reduce the elevation to the normal one of – 2.0 feet. With no additional flow into the system, 14.2 hours are required to cycle the system. Areas that are impacted by the breaching of the Pamlico River and Jack's Creek can be seen on Exhibit B.

RECOMMENDATIONS FOR IMPROVEMENTS

The first recommendation must address establishing a stormwater management design policy and the implementation of procedural changes in the handling of yard trash. Leaves, pine straw, and general yard debris has a significant impart on the efficiency of basin inlet capacity. With the exception of the peak leaf season, all yard trash should be bagged. During peak leaf season, the leaves should not be placed in the gutter, rather behind the curb or even better at the property line. Yard trash can double the cost of providing for adequate drainage.

As streets are resurfaced, more asphalt should be placed in the center of the road and feather to the edge at the gutter line. This is a simple and relatively inexpensive way to improve the transverse slope and force more water to the gutter line. Other specific recommendations are as follows:

- Minimum Longitudinal Slope (S) – 0.4%
- Minimum Transverse Slope (Sx) – 2.0%
- Minimum Gutter Slope (Sw) – 4.0%
- Storm drainage piping not within street right-of-way (generally at sag points) shall be designed according to the 25 year one hour storm. The pipe entrance, discharge, and inlets shall be designed so that the Head Water under design conditions shall be no closer to the flow line of the curb than six inches below. The ratio of maximum headwater depth divided by the pipe diameter HW/D shall be no greater than 1.2.
- Local Street Spread (T) shall not exceed twelve feet at its maximum width. This allows for the spread to include parking spaces and one half of the driving lane. This will allow a one way driving lane or two ways with a minimum of water to be encountered. At the point where the spread approaches the maximum, a combination catch basin should be installed. Given the general conditions in Washington, the following parameters are typical and used for illustrative purposes:

Example = Longitudinal Slope S = 0.5%

Combination Transverse and Curb Slope = 3%

Spread = 12 feet

Combination Basin @ curb opening = 4'

Grate = 2' X 2'

N = 0.016

Allowable Flow Q = 5.2 CFS

Q intercepted by curb opening = 1.40 CFS

Q intercepted by grate = 2.05 CFS

Total intercepted = 3.45 CFS

Q Bypassed = 1.75 CFS

The bypass flow must be added to the accumulated flow from the street and adjacent land use until the total again approaches 5.2 CFS when another basin must be installed. Street conditions other than illustrated herein may modify the actual allowable flow Q. The use of interceptor basins has not been done extensively enough to take some of the burden off the sag basins.

Collector Street Spread (T) should not exceed eight feet. The collector streets under consideration include Market Street and Bonner Street where there is parking allowed on only one side and ample residual lane space is available to accommodate the stormwater spread. Given the same generic but typical conditions as illustrated in the local street spread, the total allowable flow Q in an eight-foot spread is 1.8 CFS. The curb opening efficiency E = 0.42 and Q intercepted by the curb opening of 0.76 CFS. The grated inlet efficiency E = 0.65: E = 0.72, therefore the total intercepted flow is 0.72 (1.04) = 0.75, total intercepted flow = 1.51 CFS and the bypass flow is 0.29 CFS. Comparing the allowable flow in the local street of 5.2 CFS to the allowable flow in the collector street of 1.8 CFS, one can easily conclude that more emphasis on drainage structures must be given to streets that carry more vehicles.

Thoroughfare street spread (T) should not exceed five feet. This allows for two feet in the gutter and three feet in the travel lane. This recommendation applies to regulatory speeds

of less than 45 MPH. The spread should be confined to the gutter (2 feet) for speeds greater than 45 MPH. Repeating the parameters of the previous example, the allowable flow for a five feet spread is 0.5 CFS. The curb opening will intercept 0.34 CFS; the grate will intercept 0.14 CFS for a total interception of 0.48 CFS; i.e. all the design flow. Discounting flow from the adjacent land use, a normal thoroughfare like 15th Street will produce 0.5 CFS of water every 250 linear feet of curb line. The flow from adjacent land use can significantly impact the accumulation of water to the catch basins.

To reduce the frequency of flooding in certain intersections as shown on Exhibit D, we have recommended increasing inlet capacity and pipe size to carry the design storm. These recommendations for improvements can be found on Exhibit F. All design criteria set forth in this report was used to make these recommendations.

It has very long been my opinion that residential streets should be designed to accommodate both the adjacent land use and as a conveyance of stormwater. This theory can be expanded to make all streets compliment adjacent land use and convey its drainage. It can happen to meet both agendas if properly designed. The North Carolina D.O.T. has of late designed their streets and thoroughfares with little to no regard to the drainage of the adjacent land use to the travel lanes. They provide for adjacent land use drainage outside the roadway. The retrofit of existing streets to an acceptable standard will be very expensive. The construction of thoroughfare and collector streets to the recommended standard will also be very expensive when providing for adjacent land use drainage. The duplication of drainage systems beyond the roadway is also very expensive. Due to the general topography of the area, it is my opinion that the streets can provide an aesthetic appearance, compliment the adjacent land use with a reasonable grade to access the property, and still serve the drainage needs. In commercial areas adjacent to thoroughfares and collector streets, the stormwater management plan should restrict the amount of direct flow to the streets. For disturbed areas over one acre, all water is required by the North Carolina Division of Water Quality to pass through a treatment system prior to being discharged. The City of Washington should implement a policy that for all commercial in-fill, redevelopment, or construction that the provisions

required by the North Carolina D.W.Q. for detention, treatment, discharge velocity, volume of discharge, etc. should apply. For sites unable to comply, a fee in lieu of should be assessed to the development to assist the community in properly detaining and treating the stormwater. Commercial developments that are existing in Washington could not be built the same way today because the emphasis on stormwater management has addressed many of the concerns we are now having to consider rebuilding.

We recommend that the requirement for curb and gutter on residential streets be abandoned. In areas that have been given Nutrient Sensitive Waters (NSW) curb and gutter is prohibited. Roadside ditches become part of the linear waterway treatment system and it separates the conveyance of water from the conveyance of traffic. The installation of curb and gutter mandates the placement of a treatment system at the tail end of the project that otherwise could have been eliminated. The council may want to have some dialog concerning, not requiring, curb and gutter in any types of development to aid in drainage and pretreatment to enhance water quality. Open drainage has a tendency, versus curb and gutter, to offset the storm hydrographs to spread the peak of the discharge thus not overpowering the receiving system. In any event it is reasonable, from a stormwater management point of view, that post development discharge velocities from site development should not exceed the predevelopment discharge velocity. The predevelopment discharge velocity should be computed using the highest density single family zone runoff coefficient. For sites unable to accomplish the required velocity, there must be a fee in lieu of to help the public on a greater scale manage discharge velocity, volume, and quality.

Under rainfall scenarios, rather than Pamlico River breach, the volume of water that has normally been stored in the streets, yards, and parking lots must be compensated for by additional storage in Jack's Creek. The volume obviously varies but typically is approximately 100,000 cubic feet, or 748,000 gallons. The storage that will come from the widening of Jack's Creek must be below the elevation of 3.5 feet MSL to prevent street flooding. It need not be a perpetual wet area and can have multi use as a linear park or other recreation areas between elevation 2.0 feet MSL and 3.5 feet MSL. Three to

three and one half acres of ground above elevation 3.5 feet must be lowered to 3.5 feet MSL and be sculpted aesthetically to elevation 2.0 which is the typical elevation of the existing top of the bank of Jack's Creek.

At breach elevation of 5.5 feet MSL there is an area of 144 acres inundated and a volume of water stored in the basin of 10,120,000 cubic feet. When the elevation drops to 3.5 feet MSL, the elevation necessary to drain the streets, there is 30.1 acres still inundated. The volume to be removed between 5.5 feet MSL and 3.5 feet MSL is 6,378,000 cubic feet requiring nine hours of pump time. The remaining 3,742,000 cubic feet to elevation – 2.0 feet MSL requires an additional 5.2 hours to pump. Much more storage volume is in Jack's Creek when the Pamlico River breaches at Bug Park. The elevation of water during Fran was 8.5 feet MSL and 9.2 feet MSL during Dennis. The 100 year flood elevation is 10.0 feet MSL with a 1.0 foot allowance for wind created surge. The river normally retreats with the same speed at which it rises. Although the surge during Dennis remained longer, the typical critical time of retreat is four hours. The breached area at Bug Park is of sufficient cross sectional area to allow rapid retreat of floodwaters generated by the river from Jack's Creek at least down to elevation 5.5 feet MSL. We only need to concern ourselves with the quantity of water in Jack's creek between elevation 5.5' MSL and 3.5' MSL and only then when the river has retreated below the 5.5' MSL elevation. The following chart shows the flow rate in GPM to pump down Jack's creek over time.

HOURS	PUMPING (GPM)
4	198,781
3	265,041
2	397,562
1	795,124

As long as the elevation of the water in Jack's creek and the Pamlico River are equivalent or above 5.5 feet MSL, there is no need to pump. As soon as a differential occurs, both pumping and the gravity system may be placed in operation. The existing pumps will

produce 90,000 GPM. Eight 42" pipes under gravity flow can handle on a falling head an average of 300,000 GPM. It is not necessary to pump at an extremely shorter duration than the retreat of the Pamlico River.

There are already two 42" pipes under Park Drive. One has not been used for some time and one was used during Floyd now appear to be operating properly. We recommend the second pipe and rising stem gate valve be repaired and that six additional 42" pipes be installed with rising stem gate valves to serve as a redundant valves to the tide flex check valves we recommended for the discharge end of the pipes. The present intake as well as the proposed intake structure should move up stream from the present location by at least 125 feet. This will lessen the pressure on the trash removal during peak pumping hours.

We have discussed and made recommendation for three scenarios. Another possible occurrence should be addressed and that is the conditions when the river has breached Jack's creek utilizing all the storage and we have the design or near design rainfall event. Under these circumstances we will have 38,000 cubic feet per second upon reaching the design time of concentration. For the one-hour storm we can expect a total volume of 13,680,000 cubic feet at the rate of 228,000 cubic feet per minute. The above in terms of gallons is 102,326,400 gallons of volume at the rate of 1,705,440 GPM. When Jack's creek is empty the volume of rainfall, the storage, pumping and pipe capacity can handle the rainfall. The pumping and gravity system can only handle without storage, 600,000 GPM leaving an inflow of 1,105,440 GPM to inundate to higher elevations to create unwanted storage. This is a low probability event but none the less can occur. This could be a good case for providing additional pumping capacity to lessen the duration time of the additional flooding. It is reasonable to assume that Jack's Creek will have under these conditions a higher elevation and that over topping to the Pamlico River will occur for the volume of water above the river elevation. Given the frequency of recent flooding a prudent recommendation is to increase the present pumping capacity by an additional 200,000 GPM. It is likely under this flood scenario that the elevation of the water in Jack's Creek will over top into other basins and reduce the pumping demands.

Main Street is high except at Jack's Creek. Access to the downtown area should be maintained during flooding and may be accomplished by rebuilding Main Street from near Charlotte Street to Hudnell Street, construct a new bridge, and berm the east and west side of Jack's Creek between Main Street and Park Drive to elevation 8.0 feet M.S.L.

We have demonstrated by this study that the vast majority of flooding that has occurred in Washington causes nuisance, diminishes public safety, impairs mobility, etc. and has not been the result of tides except during the periods of hurricanes. We feel that we have addressed measures to upgrade the pumping capacity and discharge capability, diminish the frequency and extent of rainfall occurrence flooding, and discharge the breached water at a much accelerated rate. We have studied intersections that by our knowledge or by direction from the City of Washington have been frequently flooded locations. We have found in most cases the ability of the inlets to get water in to the pipes is terribly inadequate and in some locations the pipes are undersized. We have included in our estimates the cost of repairing or enhancing the downstream pipes and inlets below a frequently flooded intersection. Generally, an inadequate pipe size remains inadequate to the discharge point. As you can see on exhibit E in the appendix, we have noted the frequently flooded intersections and the required inlet capacity as well as the required waterway areas needed to handle the design storm.

Part of the extraneous data gathered for this study has not been summarized in this report but will be furnished to the City of Washington. Included is the topographic map with sheet enlargements showing all existing pipes, basins, and outlets along with elevations, a complete survey disc for GIS use, and the total flow into each catch basin from our storm design. From our data, an analysis of pipe and inlet capacity can be quickly analyzed. We show the total drainage area into each basin. We caution anyone attempting to design catch basins, pipe sizes, etc. to use the drainage area with the design runoff coefficient according to land use, to reduce the total area of the pavement, and to use the appropriate storm frequency for the type of street that have a 0.98 runoff coefficient for the street

portion. Compute the time of concentration (Tc) for the street and add that to the Tc for the adjacent land use.

Remedial work should begin at the lowest elevation which is at Park Drive. Inlet and piping improvements will help diminish flooding in the streets but place more pressure on having proper discharge ability. We are most interested in being a part of the solution to the frequent flooding in the Washington and we will be glad to assist at any time in helping to estimate for a capital improvements budget or help schedule a flow chart of recommended work. We area available to assist you in any way possible. The final design is going to be a very involved project and needs to be studied very carefully to get the most in return for the investment.

There has been no distinction between North Carolina D.O.T. roads and local streets. The system is joint use and very dependent on each other. The pipe size increases shows the required waterway area in addition to what is there. The actual pipe size, alignment, and type will follow a specific design based on the location of conflict utilities and a cost analysis. The recommendation for additional inlets is what would be required to meet the design criteria. The actual construction would require more innovative inlets to reduce the number. Proposed inlets, depressed inlet basins behind the curb are examples of how to improve basin efficiency.

The emphasis of this study has been to get stormwater out of Jack's Creek. Nothing being proposed will preclude the use of Jack's Creek as a created wetlands. An innovative design of the wetlands will aid in the removal of surface debris. Combining stormwater management with the best management practice for treatment of stormwater seems a very worthwhile pursuit.

APPENDIX

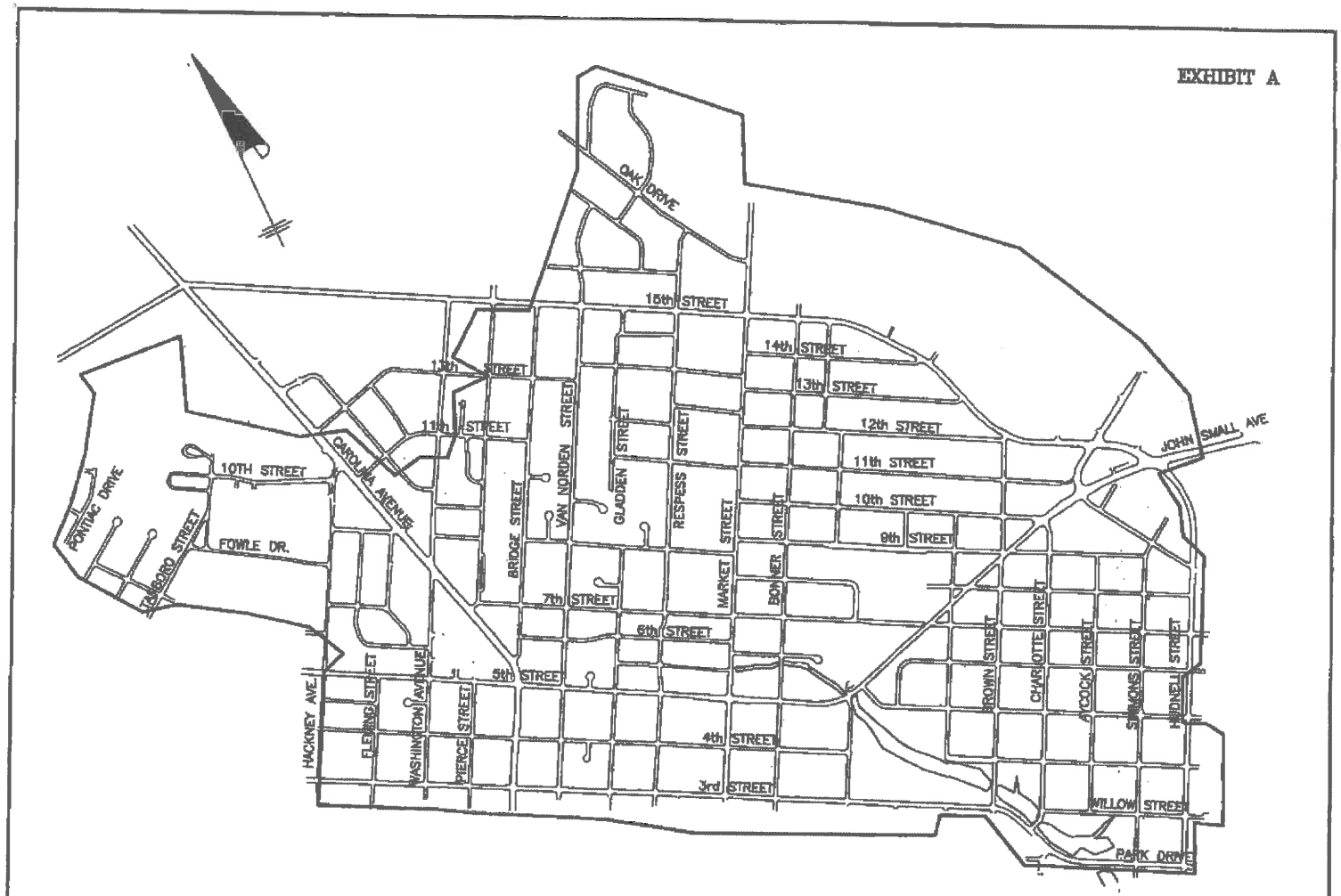
FREQUENTLY FLOODED INTERSECTION ANALYSIS

DRAINAGE AREA	LOCATION	SURFACE FLOW (Q_{25}) (CFS)	OFFSITE FLOW (Q_{10}) (CFS)	AVAILABLE INLET CAPACITY (SF)	REQUIRED INLET CAPACITY (SF)	EXISTING PIPE SIZE SURFACE FLOW	EXISTING PIPE SIZE OFFSITE FLOW	REQUIRED WATERWAY AREA (SF)
I	US 264 AND US 17	26.51	20.68	16	116	15"	36"	7.06
II	FIFTH ST. AND GLADDEN ST.	13.86	129.15	8	24	12"	36"	15.9
III	THIRD ST. AND RESPASS ST.	19.08	9.98	8	48	12"	18"	7.06
IV	RESPASS BETWEEN NINTH ST. AND ELEVENTH ST.	20.19	223.03	8	20	15"	58" x 36"	26
V	TWELTH ST. AND MARKET ST.	40.16	74.39	16	44	12"	30"	63.71
VI	NINTH ST. AND MARKET ST.	11.46	264.04	8	24	36"	65 X 40"	31
VII	NINTH ST. AND BONNER ST. ST.	19.9	0	8	32	12"	65 X 40"	1.22
VIII	TWELTH ST. AND BROWN ST.	57.9	46.87	12	152	24"	24"	31
IX	JOHN SMALL AVE. AND HARVEY ST.	7.88	2153	8	36	15"	4.5x10' CULVERT	220
X	FIFTH ST. AND TELFAIR ST.	27.7	0	8	64	15"	18"	8.75
XI	FIFTH ST. BETWEEN BROWN AND CHARLOTTE ST.	9.94	345.47	8	20	12"	72" X 42"	4.91
XII	FOURTH ST. AND McNAIR ST.	27.09	1.52	16	28	15"	18"	3.14
XIII	WILLOW ST. AND CHARLOTTE ST.	7.07	21.83	12	28	15"	15"	1.2

** NOTES:

Q_{25} IS USED TO CALCULATE PIPE SIZE FOR ROADWAY CROSSINGS AS SPECIFIED BY NCDOT
AREA OF A STANDARD NCDOT CATCHBASIN IS 4 SF.
REQUIRED CATCHBASIN AREA IS BASED ON DESIGN CRITERIA AS STATED IN THIS STUDY

EXHIBIT A



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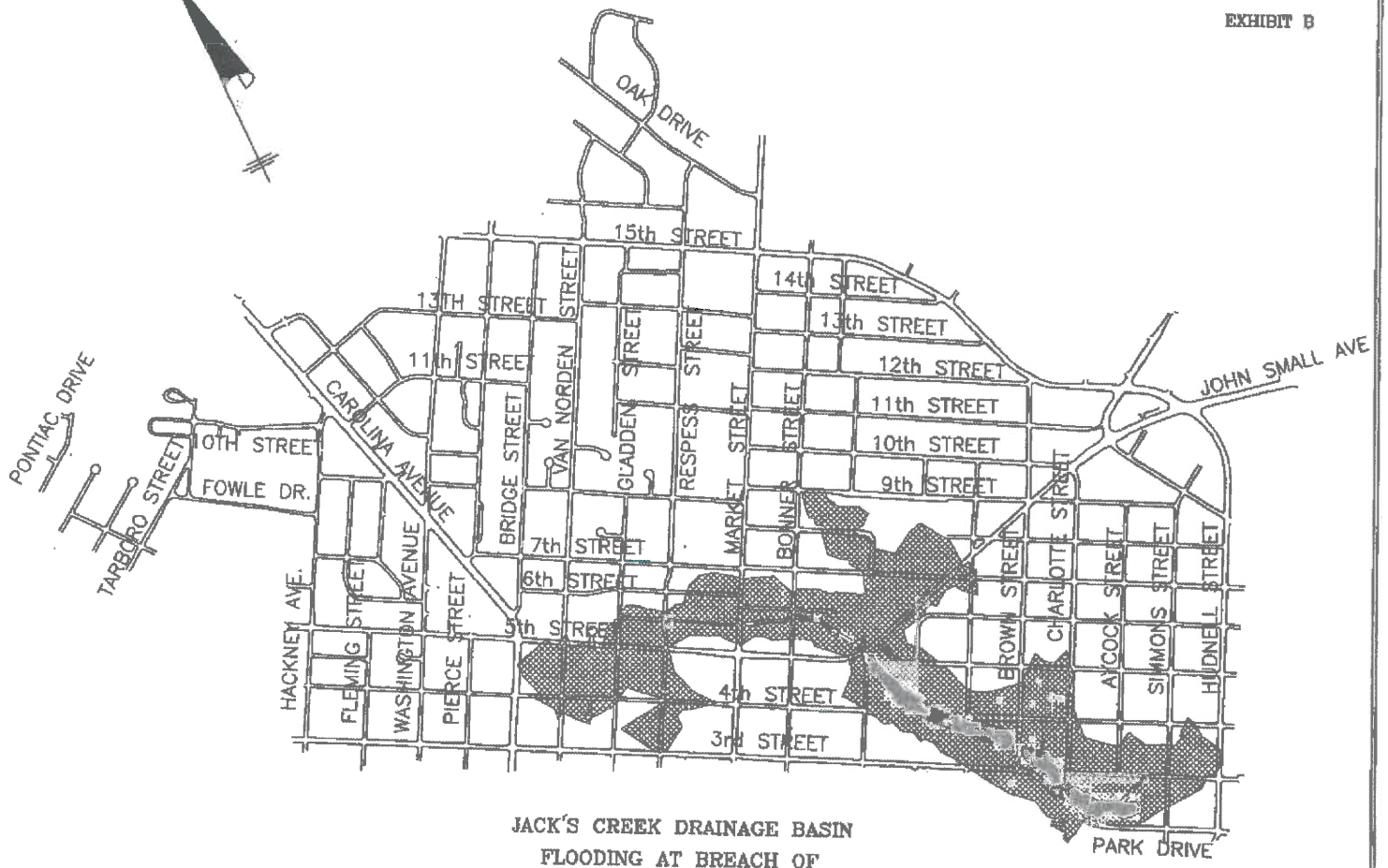
Scale 1" = 1000'

JACK'S CREEK DRAINAGE BASIN
1161 ACRES

ENGINEERS
PLANNERS
SURVEYORS

JARVIS ASSOCIATES, P.A.

EXHIBIT B


OAK DRIVE
15th STREET
14th STREET
13th STREET
12th STREET
11th STREET
10th STREET
9th STREET
7th STREET
6th STREET
5th STREET
4th STREET
3rd STREET
JOHN SMALL AVE
PARK DRIVE
PONTIAC DRIVE
TARBORO STREET
FOWLE DR.
CAROLINA AVENUE
HACKNEY AVE.
FLEMING STREET
WASHINGTON AVENUE
PIERCE STREET
BRIDGE STREET
VAN NORDEN STREET
GUADDEN STREET
RESPESS STREET
MARKET STREET
BONNER STREET
BROWN STREET
CHARLOTTE STREET
AYCOCK STREET
SIMMONS STREET
HUDNELL STREET
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Scale 1" = 1000'
JACK'S CREEK DRAINAGE BASIN
FLOODING AT BREACH OF
THE PAMLICO RIVER
ELEVATION 5.5' MSL
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EXHIBIT C

HIGH FREQUENCY
FLOODING AREAS

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CITY OF WASHINGTON
JACK'S CREEK BASIN IMPROVEMENTS
ESTIMATED COST

ITEM	QUANTITY	UNIT	COST	TOTAL
15" WATER WAY	5200	LF	$ 45.00	$ 234,000.00
18" WATERWAY	5200	LF	$ 65.00	$ 338,000.00
24" WATERWAY	5360	LF	$ 125.00	$ 670,000.00
30" WATERWAY	1000	LF	$ 150.00	$ 150,000.00
36" WATER WAY	1200	LF	$ 175.00	$ 210,000.00
42" WATER WAY	200	LF	$ 200.00	$ 40,000.00
48" WATER WAY	1000	LF	$ 225.00	$ 225,000.00
60" WATER WAY	200	LF	$ 285.00	$ 57,000.00
72" WATER WAY	700	LF	$ 300.00	$ 210,000.00
78" WATER WAY	1400	LF	$ 350.00	$ 490,000.00
102" WATER WAY	800	LF	$ 500.00	$ 400,000.00
108" WATER WAY	1200	LF	$ 550.00	$ 660,000.00
5'X12' CULVERT	280	LF	$ 1,200.00	$ 336,000.00
COMBINATION CATCH BASINS	120	EA	$ 5,000.00	$ 600,000.00
ASPHALT REMOVAL AND REPLACEMENT	22225	SY	$ 22.00	$ 488,950.00
ASPHALT OVERLAY	4200	TNS	$ 55.00	$ 231,000.00
CURB AND GUTTER REMOVAL	2500	LF	$ 5.00	$ 12,500.00
30" CURB AND GUTTER	2500	LF	$ 18.00	$ 45,000.00
UTILTY RELOCATION	1	LS	$ 50,000.00	$ 50,000.00
SEDIMENT AND EROSION CONTROL	1	LS	$ 10,000.00	$ 10,000.00
CONSTRUCTION LANDSCAPING	10	AC	$ 2,100.00	$ 21,000.00
EASEMENT ACQUISITION	30000	SF	$ 0.20	$ 6,000.00
BEDDING STONE	11250	TNS	$ 15.00	$ 168,750.00
MISCELLANEOUS CONCRETE	100	CY	$ 100.00	$ 10,000.00
REBUILD INADEQUATE BASINS	50	EA	$ 2,500.00	$ 125,000.00
GROUTING	1	LS	$ 5,000.00	$ 5,000.00
JUNCTION BOXES	15	EA	$ 6,500.00	$ 97,500.00
MANHOLES	15	EA	$ 3,000.00	$ 45,000.00
RIP RAP	500	TNS	$ 35.00	$ 17,500.00
42" STEEL OUTLET PIPES	1600	LF	$ 250.00	$ 400,000.00
42" TIDE FLEX VALVES	6	EA	$ 12,000.00	$ 72,000.00
42" GATE VALVES AND HOUSING	4	EA	$ 8,000.00	$ 32,000.00
INLET STRUCTURE	2	EA	$ 10,000.00	$ 20,000.00
CLOSE EXISTING INTAKE	1	LS	$ 5,000.00	$ 5,000.00
210,000 GPM PUMP STATION	1	LS	$ 2,000,000.00	$ 2,000,000.00
GRADING ADDITIONAL STORAGE	4000	CY	$ 6.00	$ 24,000.00
REPAIRING INOPERATIVE 42" GATE VALVE	1	LS	$ 10,000.00	$ 10,000.00
BERM MAIN STREET	1	LS	$ 650,000.00	$ 650,000.00
SUBTOTAL				$ 9,166,200.00
CONTINGENCY				$ 916,620.00
ENGINEERING & ADMINISTRATION				$ 1,374,930.00
TOTAL				$ 11,457,750.00

Planning and Engineering Report

Jack's Creek Drainage Improvements

For The

City of Washington

Prepared By

R. Sam Jarvis, PLS, PE
Jarvis Associates, PA

2-8-2001

JARVIS ASSOCIATES, P.A.

CONSULTING ENGINEERS - PLANNERS - SURVEYORS
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Engineering and Planning Report

Jack's Creek Drainage Improvements

For The

City of Washington

Prepared By

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CITY OF WASHINGTON
JACK'S CREEK PROJECT
PRELIMINARY ENGINEERING REPORT

GENERAL:

A large portion of the central part of the City of Washington is subject to flooding and does not respond adequately to existing stormwater basin and pumps. The proposed improvements are divided into two phases due to available funding. Phase I includes the installation of three 42-inch gravity pipes and elevating portions of Main Street and Simmons Street bringing them above the 100-year flood plain elevation. Phase II includes removal of an existing dike and replacing it with a bridge and construction of a 119' weir. This report includes the need, the work included, the costs, funding sources and a schedule for the construction of Phase I improvements.

NEED:

The City of Washington, North Carolina is located at the junction of the Tar and Pamlico Rivers and has an elevation range from sea level to 10 feet above sea level. The geographic conditions make the Washington area prone to flooding. The dominant sources of flooding in the area are storm surges and riverine flooding. In an attempt to control and reduce the effects of flooding a dike was constructed on Park Drive along with a combination pump and gravity pipe storm water system. The system only provides protection from storm surges up to 8.0 feet MSL. With an occurrence of a breach in the dike, the Jack's Creek basin fills very quickly. A rise in elevation above the breach level results in flooding causing all areas of the City below the storm surge elevation to become inundated.

Following a recession in the storm surge, water is trapped behind the dike. Without additional rainfall in the watershed and water flowing by gravity through the pipes and across the breached dike back into the Pamlico River, nine hours of pumping time is required to reduce the water surface elevation in the flooded streets low enough to allow traffic to pass through. In order to reduce the volume back to the original elevation requires an additional 5.2 hours of pumping. The pumping and gravity flow can only occur following the recession of the storm surge.

Severe flooding of streets and houses has occurred as a result of the dike at Park Drive. It is not unusual for these events to occur 3 to 4 times a year. During either storm surge flooding or rainfall flooding, the central business district bounded by Fifth Street, U.S. Hwy 17, and Hudnell Street is isolated by generally impassible floodwater elevations. The size of the culvert structure under Main Street at its crossing of Jack's Creek is insufficient to pass the 10-year storm. The trestle of the Seaboard Railroad, which is adjacent to Main Street, is also undersized.

WORK INCLUDED:

There are four major items in the proposed project. The first item is the installation of three 42-inch gravity pipes with tide flex valves. The tide flex valves will ensure protection of Jack's Creek from the Pamlico River tide. The second item is the elevating of portions of Main Street and Simmons Street bring them above the 100-year flood plain. This will provide access in and out of downtown Washington during periods of flooding. The elevated streets will have adequately sized openings to allow for passage of stormwater to the Pamlico River. The third item is the removal of an existing dike and the construction of a new bridge over Park Drive. The fourth item is the construction of a 119' long weir on the northern side of the new bridge set at 1.5' MSL.

The proposed project will need to be divided into separate phases due to funding restrictions. Phase I of the proposed project will consist of the installation of the three 42-inch gravity pipes and the elevating of Main Street and Simmons Street. Phase II of the proposed project will consist of the removal of the dike, the construction of the new bridge and the construction of the 119' long weir.

COST OPINIONS:

The Cost Opinion of Phase I of the proposed project is as follows:

1.	Utility Adjustments	$ 12,000
2.	Remove Curb & Gutter	$ 9,000
3.	Misc. Concrete Removal Culverts, Asphalt	$ 110,000
4.	Roadway Fill	$ 225,000
5.	6" ABC	$ 32,400
6.	2" I-2 Asphalt	$ 45,000
7.	30" Curb & Gutter	$ 39,200
8.	6' x 16' Concrete Box Culverts	$ 195,000
9.	Stabilization Stone	$ 8,100
10.	Wing Walls	$ 10,500
11.	Diking	$ 60,000
12.	Yard Inlets	$ 4,800
13.	Catch Basins	$ 7,200
14.	18" RCP	$ 25,200
15.	12" PVC	$ 6,000
16.	Basin Inlet Protection	$ 2,500
17.	Landscaping	$ 9,000
18.	Silt Fence	$ 6,650
19.	Sedimentation & Erosion Control Devices	$ 11,500
20.	54" Tide Flex Valves	$ 71,500
21.	42" Tide Flex Valves	$ 43,500
22.	42" Steel Pipe	$ 61,500
23.	Concrete Abutment for Pipe	$ 6,000

24. Concrete Flex Valve Pit/Splash Pad	$ 7,000
25. Bedding Stone	$ 10,800
26. Coffer Dam Sheeting	$ 30,000
27. Dewatering	$ 17,060
SUB TOTAL CONSTRUCTION	$1,066,410
Contingency	$ 122,388
Engineering	$ 211,202
TOTAL PROJECT COST OPINION	**$1,400,000**

FUNDING:

EDA is the primary funding source for Phase I of the proposed project. Funding for Phase II will come from the City of Washington as funds become available. Applications for funding should document the elimination of hazards such as flooding and possible sewer overflows.

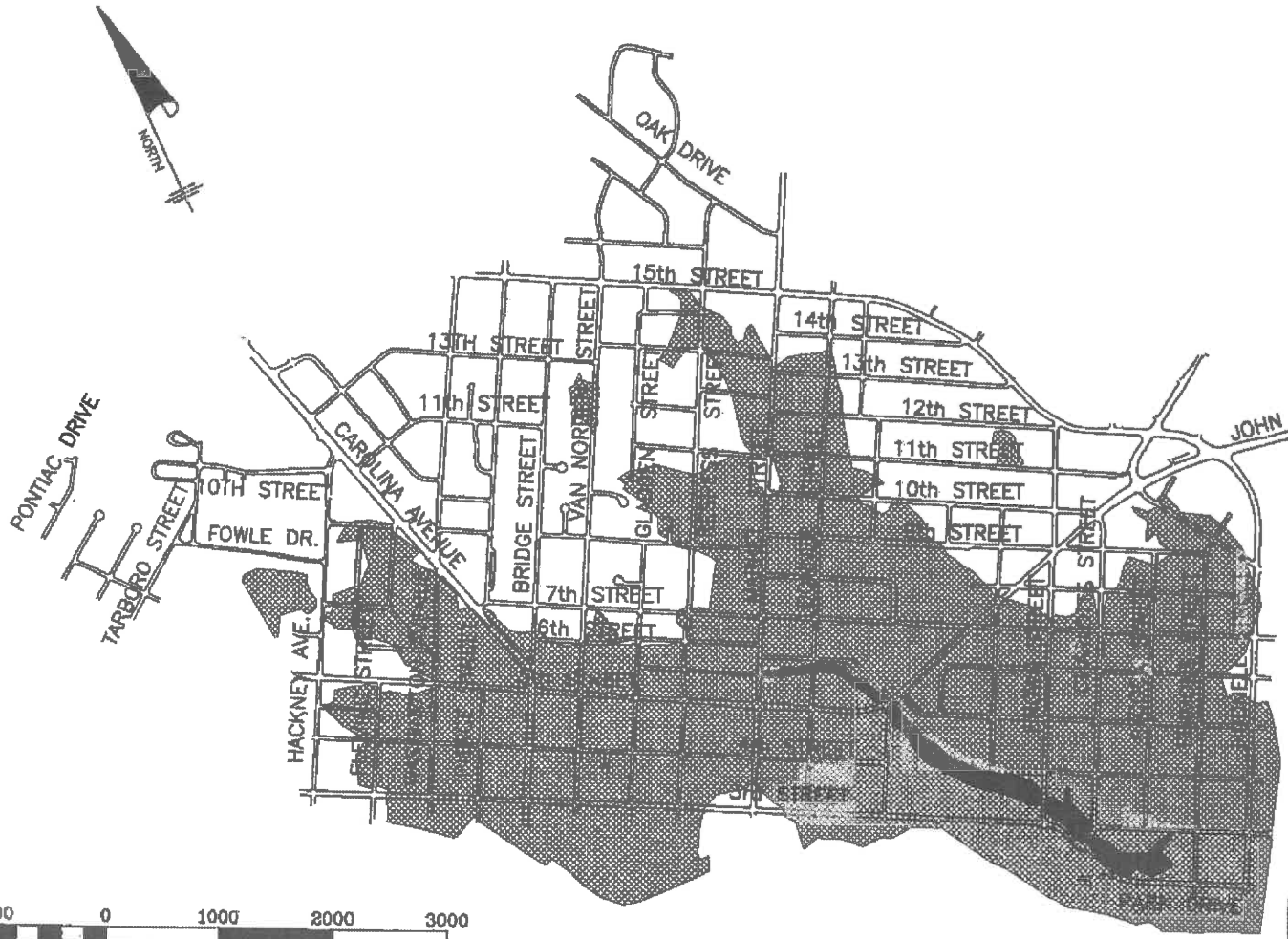
RECOMMENDATIONS:

The inability of storm surge waters to flow freely into the Pamlico River and the flooding that occurs due to the inadequate existing stormwater system poses problems for the City of Washington. It is recommended that the City of Washington begin the necessary processes for Phase I of the proposed project. It is also recommend that the City of Washington submit grant and loans applications to the appropriate agencies identifying creation of jobs and the elimination of hazards to the public. Once Phase I is complete, then the City should begin the process for implementation of Phase II as funding becomes available.

SCHEDULE:

The following project schedule is based on receiving notification of grant funding in March 2001.

Begin Design	April, 2001
Submit for Review & Permits	September, 2001
Advertise for Bids	December, 2001
Start Construction	February, 2002
Complete Construction	September, 2002



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JACK'S CREEK DRAINAGE BASIN
FLOODING AT BREACH OF
PARK DRIVE
ELEVATION 8.0' MSL

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JACK'S CREEK DRAINAGE BASIN
FLOODING AT BREACH OF
THE PAMLICO RIVER
ELEVATION 5.5' MSL

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1000 0 1000 2000 3000

Scale 1" = 1000'

JACK'S CREEK DRAINAGE BASIN
MINOR FLOODING
ELEVATION 3.5' MSL

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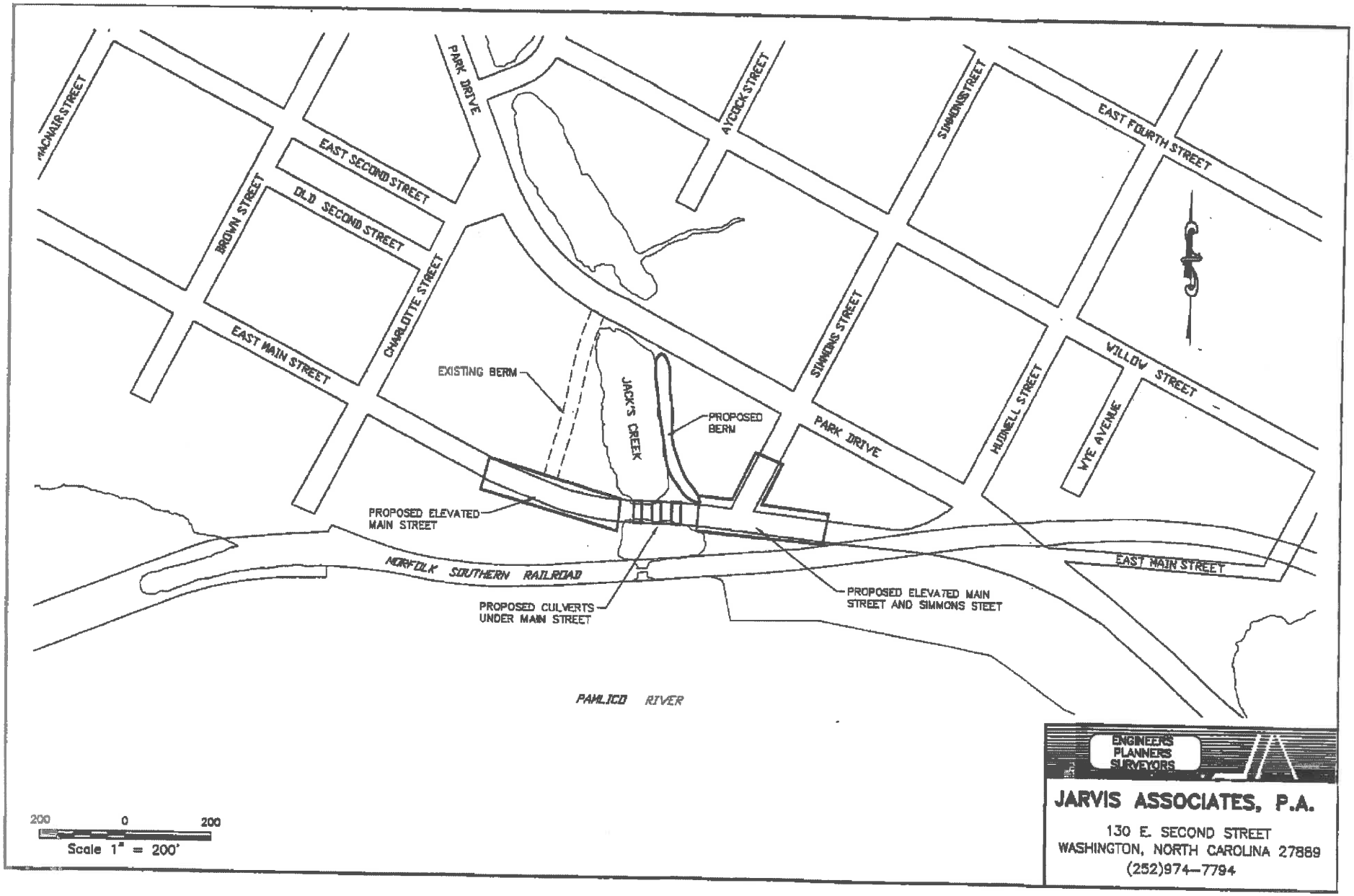
HACKNEY STREET
PARK DRIVE
AYCOCK STREET
SIMMONS STREET
EAST FOURTH STREET
EAST SECOND STREET
OLD SECOND STREET
BROWN STREET
CHARLOTTE STREET
EAST MAIN STREET
EXISTING BERM
JACK'S CREEK
PROPOSED BERM
SIMMONS STREET
HUDNELL STREET
WILLOW STREET
MYE AVENUE
PARK DRIVE
PROPOSED ELEVATED MAIN STREET
NORFOLK SOUTHERN RAILROAD
EAST MAIN STREET
PROPOSED CULVERTS UNDER MAIN STREET
PROPOSED ELEVATED MAIN STREET AND SIMMONS STEET
PAMLICO RIVER
200 0 200
Scale 1" = 200'
ENGINEERS
PLANNERS
SURVEYORS
JARVIS ASSOCIATES, P.A.
130 E. SECOND STREET
WASHINGTON, NORTH CAROLINA 27889
(252)974-7794

CONCLUSION:

We will review this information with the City of Washington and will revise the preliminary design as necessary.

Attachments

- Topographic map of Jack's Creek Drainage Basin at elevation 8.0' or more showing the area inundated by a breach of Park Drive
- Topographic map of Jack's Creek Drainage Basin at elevation 5.5' MSL, i.e. the elevation at which the dike can currently breach without additional berms.
- Topographic map of Jack's Creek Drainage Basin at elevation 3.5' MSL, i.e. the elevation that will allow vehicular traffic to flow on all but some minor city streets
- Sketch showing Main Street and Simmons Street improvements

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CITY OF WASHINGTON
JACK'S CREEK PROJECT
PARK DRIVE
REPLACEMENT ESTIMATE

04/12/2000

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	DREDGE CREEK TO -4	14000	CY	$ 5.00	$ 70,000.00
2	SETTLING BASIN DIKE	2500	CY	$ 11.00	$ 27,500.00
3	54" TIDE FLEX VALVES	4	EA	$ 16,000.00	$ 64,000.00
4	42" TIDE FLEX VALVES	3	EA	$ 12,000.00	$ 36,000.00
5	42" STEEL PIPE	360	LF	$ 150.00	$ 54,000.00
6	CONCRETE ABUTMENTS FOR PIPE	20	CY	$ 300.00	$ 6,000.00
7	CONCRETE FLEX VALVE PIT/SPLASH PAD	20	CY	$ 350.00	$ 7,000.00
8	BEDDING STONE	600	TN	$ 18.00	$ 10,800.00
9	REMOVE CURB & GUTTER	250	LF	$ 5.00	$ 1,250.00
10	REMOVE ASPHALT	600	SY	$ 10.00	$ 6,000.00
11	UNCLASSIFIED EXCAVATION	2600	CY	$ 12.00	$ 31,200.00
12	BRIDGE STRUCTURE	5760	SF	$ 70.00	$ 403,200.00
13	CONCRETE WEIR STRUCTURE	440	CY	$ 350.00	$ 154,000.00
14	CONCRETE FOOTER FOR GATES	16	CY	$ 300.00	$ 4,800.00
15	CONCRETE COLUMNS FOR GATES	18	CY	$ 300.00	$ 5,400.00
16	GATES	1624	SF	$ 40.00	$ 64,960.00
17	GATE OPERATING SYSTEM/MOTORS	7	EA	$ 10,000.00	$ 70,000.00
18	CONTROLS & TELEMETRY	1	LS	$ 20,000.00	$ 20,000.00
19	SUB DRAIN PIPE / STONE	1500	LF	$ 5.00	$ 7,500.00
20	LANDSCAPING	40000	SF	$ 0.10	$ 4,000.00
21	SILT FENCE	1000	LF	$ 3.50	$ 3,500.00
22	SEDIMENTATION & EROSION CONTROL DEVICES	1	LS	$ 5,000.00	$ 5,000.00
23	COFFER DAM / SHEETING	2	EA	$ 15,000.00	$ 30,000.00
24	DE WATERING	1	LS	$ 12,000.00	$ 12,000.00
	SUB TOTAL				$ 1,098,110.00
	CONTINGENCY				$ 109,811.00
	ENGINEERING				$ 164,716.50
	TOTAL				**$ 1,372,637.50**

2334.137
280.098
2054.04

ESTIMATE PREPARED BY: JARVIS ASSOCIATES, P.A.

04/12/2000

CITY OF WASHINGTON
JACK'S CREEK PROJECT
RAIL ROAD CROSSING
REPLACEMENT ESTIMATE

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	REMOVE RAIL, BALLAST, TIES	1	LS	$ 10,000.00	$ 10,000.00
2	REMOVE EX. CONCRETE WALLS	1	LS	$ 6,000.00	$ 6,000.00
3	BEDDING STONE	100	TNS	$ 18.00	$ 1,800.00
4	UNCLASSIFIED EXCAVATION	200	CY	$ 12.00	$ 2,400.00
5	CONCRETE BENTS	35	CY	$ 350.00	$ 12,250.00
6	CONCRETE ABUTMENTS	30	CY	$ 350.00	$ 10,500.00
7	CONCRETE BEAMS	136	LF	$ 75.00	$ 10,200.00
8	RELAY TIES, RAIL	1	LS	$ 6,000.00	$ 6,000.00
9	SEDIMENTATION & EROSION CONTROL	1	LS	$ 2,000.00	$ 2,000.00
10	LANDSCAPING/BALLAST STONE	1	LS	$ 1,000.00	$ 1,000.00
11	COFFER DAMS / SHEETING	1	LS	$ 25,000.00	$ 25,000.00
12	DEWATERING	1	LS	$ 10,000.00	$ 10,000.00
	SUB TOTAL				$ 97,150.00
	CONTINGENCY				$ 9,715.00
	ENGINEERING				$ 14,572.50
	TOTAL				**$ 121,437.50**

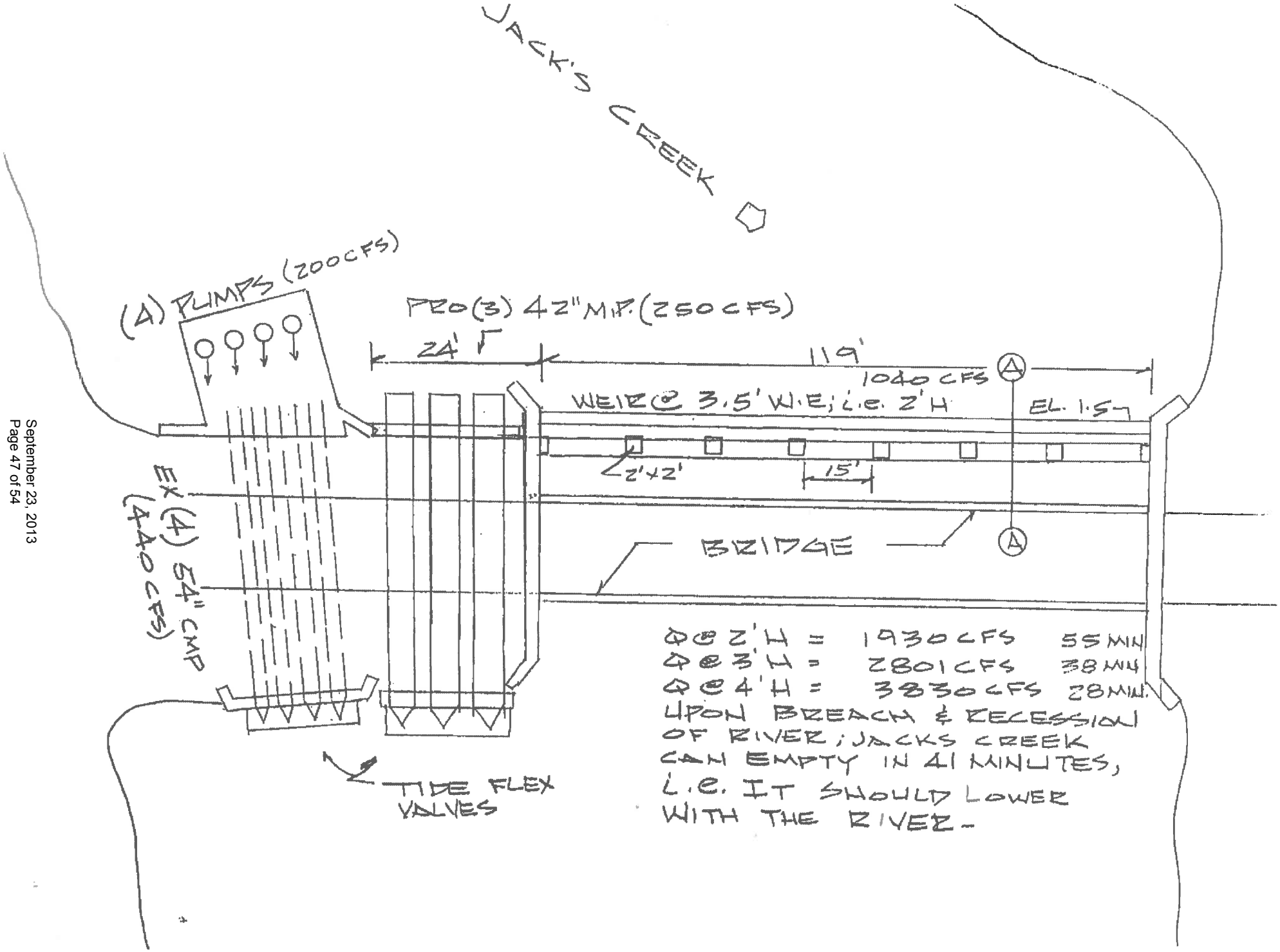
ESTIMATE PREPARED BY: JARVIS ASSOCIATES, P.A.

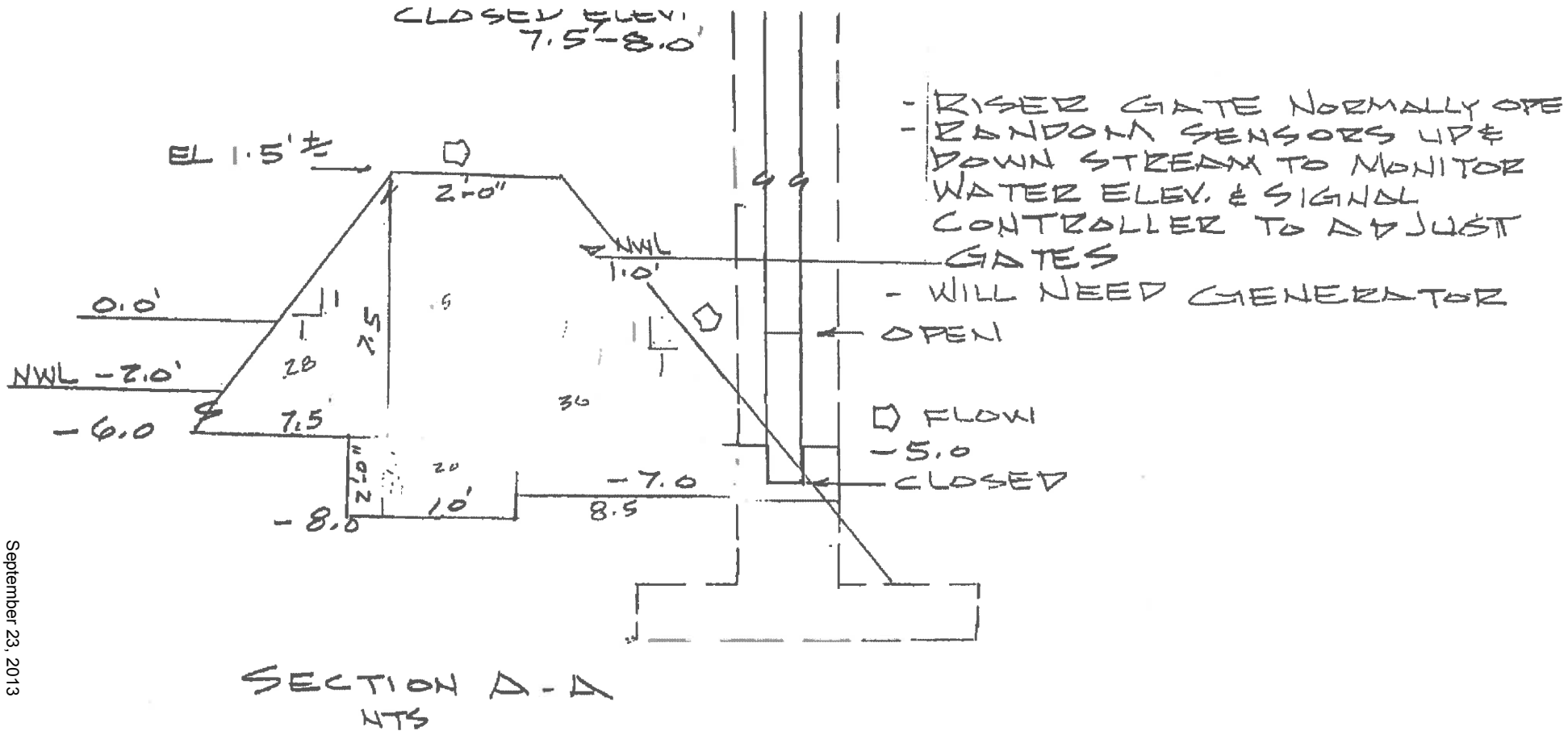
04/12/2000

CITY OF WASHINGTON
JACK'S CREEK PROJECT
MAIN STREET
REPLACEMENT ESTIMATE

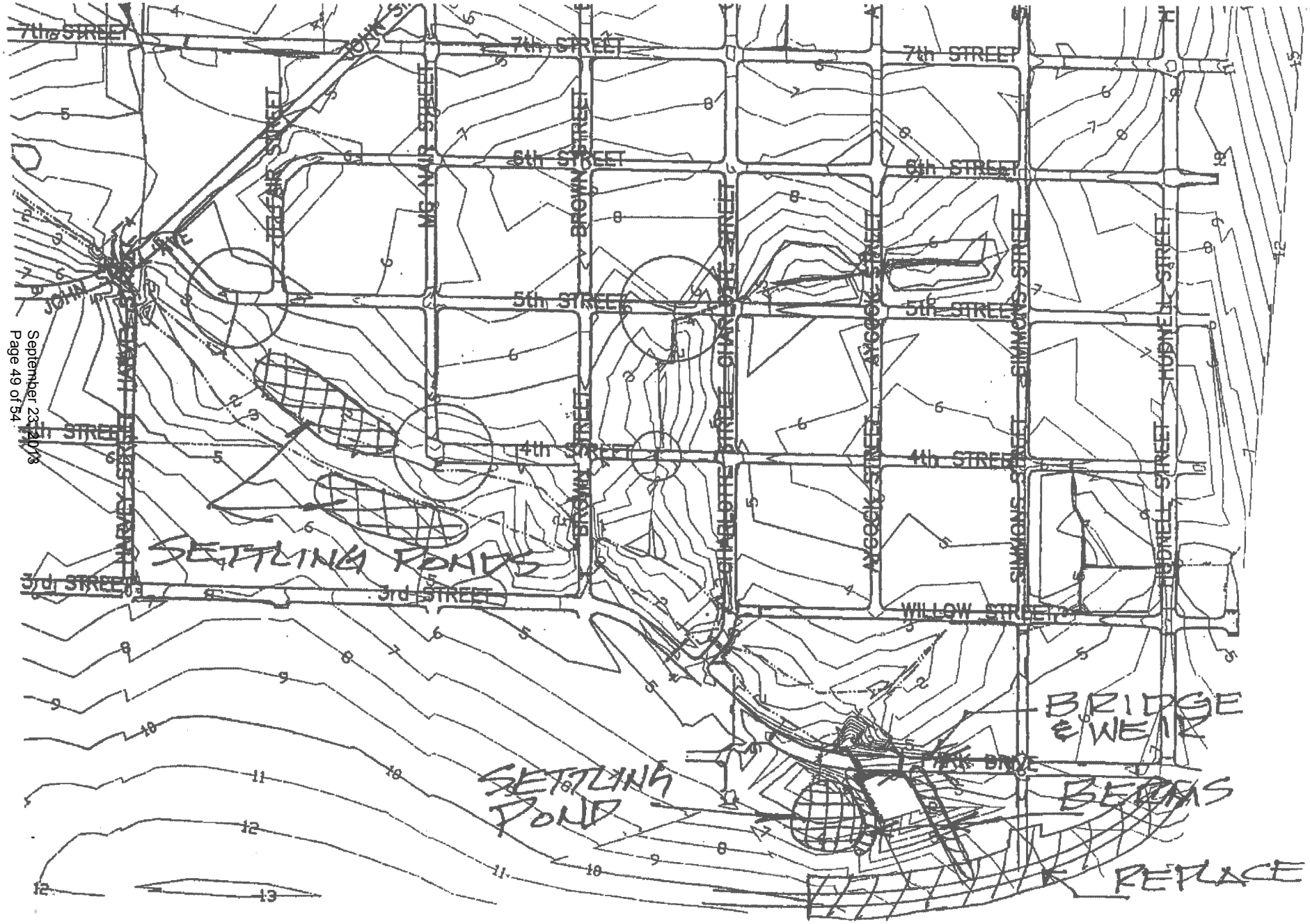
ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	UTILITY ADJUSTMENTS	1	LS	$ 10,000.00	$ 10,000.00
2	REMOVE CURB & GUTTER	1200	LF	$ 5.00	$ 6,000.00
3	MISC. CONC REMOVAL CULVERTS, ASPHALT	1	LS	$ 100,000.00	$ 100,000.00
4	ROADWAY FILL	15000	CY	$ 11.00	$ 165,000.00
5	6" ABC	1800	TN	$ 18.00	$ 32,400.00
6	2" I-2 ASPHALT	600	TN	$ 75.00	$ 45,000.00
7	30" CURB & GUTTER	2800	LF	$ 14.00	$ 39,200.00
8	6' X 16' CONC. BOX CULVERTS	520	CY	$ 300.00	$ 156,000.00
9	STABILIZATION STONE	450	TN	$ 18.00	$ 8,100.00
10	WING WALLS	30	CY	$ 350.00	$ 10,500.00
11	LANDSCAPING	80000	SF	$ 0.10	$ 8,000.00
12	DIKING	4000	CY	$ 11.00	$ 44,000.00
13	SILT FENCE	1600	LF	$ 3.50	$ 5,600.00
14	YARD INLETS	4	EA	$ 1,000.00	$ 4,000.00
15	CATCH BASINS	6	EA	$ 1,200.00	$ 7,200.00
16	18" RCP	600	LF	$ 42.00	$ 25,200.00
17	12" PVC	400	LF	$ 10.00	$ 4,000.00
18	GENERAL EROSION CONTROL DEVICES	1	LS	$ 6,500.00	$ 6,500.00
19	BASIN INLET PROTECTION	10	EA	$ 250.00	$ 2,500.00
20	SETTLING BASIN	2000	CY	$ 11.00	$ 22,000.00
21	DREDGE BAY AREA	12000	CY	$ 5.00	$ 60,000.00
22	SUB DRAIN PIPE / STONE	1600	LF	$ 5.00	$ 8,000.00

SUB TOTAL	$	769,200.00
CONTINGENCY	$	76,920.00
ENGINEERING	$	115,380.00
TOTAL	$	**961,500.00**


JACK'S CREEK
(4) PUMPS (200CFS)
PRO(3) 42" M.P. (250 CFS)
24'
119'
1040 CFS
WEIR @ 3.5' W.E; i.e. 2'H
EL. 1.5
2'x2'
15'
EX (4) 54" CMP (440 CFS)
BRIDGE
TIDE FLEX VALVES
Q @ 2'H = 1930 CFS 55 MIN
Q @ 3'H = 2801 CFS 38 MIN
Q @ 4'H = 3830 CFS 28 MIN.
UPON BREACH & RECESSION OF RIVER; JACKS CREEK CAN EMPTY IN 41 MINUTES, I.E. IT SHOULD LOWER WITH THE RIVER.



SECTION A-A
NTS


7th STREET
6th STREET
5th STREET
4th STREET
3rd STREET
WILLOW STREET
JOHN STREET
MAIN STREET
BROWN STREET
CHARLOTTE STREET
HOWELL STREET
SIMMONS STREET
SETTLING PONDS
SETTLING POND
BRIDGE & WEIR
BERMS
REPLACE

City of Washington
NORTH CAROLINA

MEMORANDUM

DATE: September 16, 2013

TO: Mayor and City Council

FROM: Allen Lewis
Public Works Director

SUBJECT: Iron Creek Drainage.

Please find attached a copy of a letter from John A. Core, P.E., with The Wooten Company regarding this subject. It should be noted that other alternatives were discussed in addition to the possibility of raising Ore Court. In the end though, the most economically viable option, regardless of the minimum results, was the possibility of raising the road. I would like to point out the last sentence in the next to last paragraph of the attached letter. "While raising the road would mitigate flooding during smaller storms, it will not be effective for storms equal to or greater than the 10-year storm." These types of events, 10-year storms, are when street flooding occurs at this time. As such, raising the road would not have an effect during these, or worse, rain events.

/al

THE
WOOTEN
COMPANY

ENGINEERING

PLANNING

ARCHITECTURE

July 3, 2013

Washington City Council
c/o Mr. Allen Lewis
Public Works Director
City of Washington
102 E. Second Street
Washington, NC 27889

Re: Ore Court – Preliminary Evaluation
Summary for Mayor and Washington City Council
Washington, North Carolina
TWC No. 2838

Dear Mayor Jennings & Washington City Council Members:

As requested by the City of Washington, The Wooten Company has completed a preliminary evaluation of flooding issues during rain events along Ore Court in the Iron Creek Subdivision. More specifically it was requested that the option of raising the elevation of Ore Court to mitigate flooding be evaluated. For this evaluation flooding caused by the 10-year storm (a storm event that will occur on average once every ten (10) years) was used to assess the effectiveness of the proposed improvements. In addition an estimate of probable cost for the raising Ore Court was prepared.

Ore Court is off of Ore Drive approximately 0.40 miles east of the US Highway 264 crossing of Mitchell Branch Creek and is located in the 100-year flood zone. Based on this preliminary evaluation, Ore Court cannot be raised to the degree necessary to prevent flooding of the roadway during the 10-year storm. It appears that the roadway can be raised approximately 0.75 feet higher than its current elevation which would place the low point of Ore Court at approximately nine (9) feet. However, during the 10-year storm water will back up at the culvert crossing under Ore Drive and cause the flood elevation to be at least 10.4 feet at Ore Court.

Two different data sets were used to assess the flood elevation for this evaluation. First, available federal flood information including the Federal Emergency Management Agency (FEMA)/Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS) were studied. These documents showed that the approximate flood elevation in the area of Ore Court as 9.1 feet during the 10-year storm. In addition to the federal flood information, existing data from the Iron Creek Subdivision Stormwater Narrative was used along with topographic data collected by The Wooten Company. Using a combination of the sources listed above, results show that water backs up at the culvert under Ore Drive and will cause the 10-year flood elevation to be 10.4 feet. At this point, a detailed hydrologic/hydraulic analysis has not been completed.

120 North Boylan Avenue
Raleigh NC 27603-1423

919.828.0531
fax 919.834.3589

It was also relayed to us that residents along Ore Court have reported that during heavy rain events water is backing up in the roadway and, in extreme events, up to the bottom of the mailboxes at the low point on the south side of the street (approximately 3.5 feet above the back of curb or an elevation of 11.6 feet). A review of the survey data collected shows that Ore Court cannot be raised to this height as it would be higher than the garage floors of the homes along Ore Court. The maximum possible height of Ore Court was derived by raising the roadway without creating other drainage issues along Ore Court. The results showed that the roadway could be raised approximately 0.75 feet to an elevation of 9.1' at the low point. Consistent with the City's request, an Estimate of Probable Cost for raising the roadway was generated which shows an Estimated Construction Cost of $331,000 and a Total Project Cost of $425,000.

While evaluating the possibility of raising the roadway at Ore Court to allow access during large rain events, we considered other possible options to help alleviate flooding. These options included large pumping facilities or large pumping facilities combined with berms. The extent of pumping facilities required to offer relief to Ore Court have not been determined as it was beyond the scope of this preliminary evaluation. Though the extent of pumping facilities have not been determined, it should be noted that due to the location of the existing 100-year flood plain, and the amount of flow experienced in the Iron Creek sub-division, significant infrastructure improvements and design/permitting efforts would be required and do not seem to be economically feasible.

As discussed above, it appears that the flood elevation for Ore Court, based on our preliminary evaluation, is 10.4 feet during the 10-year storm. Also, it appears that Ore Court cannot be raised higher than 9.1 feet at the low point without causing additional drainage issues. While raising the road would mitigate flooding during smaller storms, it will not be effective for storms equal to or greater than the 10-year storm.

Please note that these findings, with additional details, are discussed in a letter addressed to Mr. Allen Lewis dated July 3, 2013. Should you have any questions or would like to discuss further, please do not hesitate to contact us.

Sincerely,

THE WOOTEN COMPANY
120 N. Boylan Avenue
Raleigh, NC 27603
919.828-0531
License No. F-0115

John A. Core, P.E.

cc: TWC File (w/o encl)

MEMORANDUM

To: Mayor Jennings & City Council

From: Robbie Rose, Fire Chief

Subject: 2013 AFG Grant

Date: September 16, 2013

In anticipation of the opening of the application period for the FEMA Assistance to Firefighters Grant in the near future, I am writing to give you an overview of our plans for this process. As we were recently informed that we would not be awarded the 2012 grant, we intend to roll that application over into the 2013 process. That grant consisted of two thermal image cameras, washing and drying equipment for firefighting gear, and a vehicle exhaust system for station one at a total application cost of $70,000. The 95% federal share of that grant would be $66,500 and our 5% match would be $3,500. In addition on the 2013 grant we are also considering adding a fire engine to the application in the amount of $350,000. This would represent a 95% federal share of $332,500 and our 5% match of $17,500.

The grant writer will charge a fee of $50 to roll over the 2012 grant and his normal fee of $500 to add the fire engine to the 2013 application.

This memo is for your informational purposes only, and I can answer additional questions as required as we will come back to you during a regular council meeting requesting formal support to enter into the application process.

City of Washington
NORTH CAROLINA

MEMORANDUM

DATE: September 23, 2013

TO: Mayor and City Council

FROM: Brian M. Alligood, City Manager

SUBJECT: Proposed NCDOT Project to Widen 15th Street and 2014 Resurfacing Plan

On August 29, 2013 Allen Lewis, Public Works Director and I met with Dwayne Alligood, Division 2 Operations Engineer and Haywood Daughtry, Eastern Regional Field Operations Engineer to discuss upcoming proposed NCDOT projects within the City of Washington.

NCDOT is proposing to widen a 0.64 mile segment of 15th Street from Carolina Avenue (US 17 Business) to Pierce Street. It was reported that based on NCDOT data, this section of road has three (3) times the amount of crashes compared to similar sections of roads across the State. The proposed project will widen the existing 48' four-lane undivided section to a 64' four-lane divided section with a 16' median and 7' berms. In order to address the crash concerns, the median section will be a channelized left-turn only median. Traffic movements at signalized intersections will not be changed but left-turn movements throughout the remaining section will be controlled by channelization. The total cost of the project is estimated at $3.2M with NCDOT paying the entire share.

NCDOT officials have stated that they anticipate concerns being raised by business owners that channelization will impede customer access to their property when compared to a free-flowing median. Based on past history with similar projects, officials believe this disruption to be minimal and far outweighed by the reduction in crashes and improved traffic safety. NCDOT has asked that Council support this design in order for the project to continue. After the first of the year NCDOT officials will make a presentation to Council on the proposed project and seek formal support.

In addition as part of its 2014 resurfacing program, NCDOT is planning to resurface 5th Street (US 264) from 15th Street to Hudnell Street at an estimated cost of $2M and 3rd Street (NC 32) from Bridge Street (US 17 Business) to Washington Park at an estimated cost of $650,000.