Appendix B

Bermuda Run Wastewater Service Alternative-Highfill Engineering

DRAFT TECHNICAL MEMORANDUM

HIGHFILL
INFRASTRUCTURE
ENGINEERING, P.C.

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To:	Mr. Scott Jones, EI Project Engineer City/County Utilities Post Office Box 2511 Winston-Salem, NC 27102	**Copies:**	Courtney Driver
Date:	September 9, 2013 *Updated: September 23, 2013*		
From:	Paul R. Shivers, PE Tyler W. Highfill, PE	**Proj. No.:**	WIN1301
Subject:	Wastewater Service Alternatives for the Town of Bermuda Run		

Section 1 - **Background**

The City/County Utilities Commission (CCUC) would like to determine the viability of providing wastewater service to the Town of Bermuda Run, North Carolina. Currently, wastewater from the Town of Bermuda Run (TBR) inside the gates is collected and conveyed to the town owned and operated Bermuda Run Wastewater Treatment Plant in accordance with NPDES Permit No. NC0055158. The WWTP is located on the west bank of the Yadkin River at the south end of Juniper Circle within TBR. TBR would like to replace the existing WWTP with a lift station (LS) that would pump the collected water to CCUC. This proposed lift station if referred to herein as the Bermuda Run No. 1 LS.

Other wastewater from the TBR outside the gates is served by Davie County. That flow is collected at the Davie County Yadkin River LS where it is pumped to CCUC's Tanglewood LS.

The nearest CCUC locations that can accept the flow from the proposed Bermuda Run No. 1 LS are the Muddy Creek gravity interceptor which is approximately 4.5 miles distant or the Tanglewood Lift Station which is approximately 1.5 miles from the existing WWTP. The Tanglewood Lift Station currently collects flow from the Clemmons area and from Davie County and is projected to reach capacity with existing flows by 2014 per Technical Memorandum No. 1 dated February 3, 2011 by Highfill Infrastructure Engineering (HIGHFILL).

The purpose of this Technical Memorandum is to evaluate three concept-level alternatives for providing wastewater service to TBR while incorporating future wastewater needs for CCUC.

Section 2 - **Wastewater Flows**

2.1 TBR Wastewater Flow

The Bermuda Run WWTP is permitted for an average daily flow (ADF) of 193,000 gallons per day (GPD). This ADF will be used to calculate a peak daily flow (PDF) for sizing the Bermuda Run No. 1 LS.

The Bermuda Run WWTP discharge monitoring reports (DMRs) from January, 2011 through June, 2013 were tabulated. The DMR flows are summarized by year in Table 2.1.

Table 2.1 – Discharge Monitoring Report Flows

Year	Average Daily Flow (MGD)	Maximum Day Flow (MGD)
2011	0.13	0.24
2012	0.11	0.27
2013*	0.13	0.39
2011-2013*	0.12	0.39

*** data includes only January through June of 2013**

Since peak hourly flow rate for the Bermuda Run WWTP is not captured by the Town, it was estimated using the industry-accepted planning factors based on "Recommended Standards for Wastewater Facilities" prepared by the Great Lakes-Upper Mississippi Board of States and Provincial Public Health and Environmental Managers, commonly referred to as the "10-State Standards". The resulting calculated peaking factor of 3.60 was used to determine the design peak flow. The peaking factor of 3.60 applied to the WWTP permitted ADF of 193,000 GPD results in a design flow for the proposed Juniper Circle LS of 694,800 GPD or 480 GPM.

If the town elects to proceed with the proposed lift station, we recommend installing an influent flow meter to capture the actual peak hour factor for design. Also, it is interesting to note that while the annual average daily flow has remained constant over this short historic period, the maximum daily flow has increased significantly and may be worth investigation.

2.2 Existing and Proposed Tanglewood LS Wastewater Flows

The existing Tanglewood LS will be at or above capacity in 2014 without expansion or removal of flows from the lift station. Since two of the TBR wastewater service alternatives evaluate the expansion of the existing Tanglewood LS or the addition of a new Tanglewoood South LS, the existing and proposed flows to the lift station were established. Tanglewood LS currently receives wastewater flow from the Clemmons Area and from the Davie County Yadkin River LS per a current agreement with CCUC. Davie County has also requested an additional flow allocation. These flows are as follows:

- Clemmons Area ADF = 1.57 MGD (projected build-out flow by 2030 less flow diverted with Clemmons No. 1 LS modifications. *Ref: Technical Memorandum No. 1 by HIGHFILL dated February 3, 2011 and Technical Memorandum No. 3 by HIGHFILL dated May 14, 2012.*)
- Davie County Yadkin River LS ADF = 0.55 MGD (maximum ADF per existing agreement)
- Proposed additional Davie County Yadkin River LS ADF = 0.20 MGD (additional flow allocation requested on behalf of Town of Bermuda Run. *Ref: Request for Consideration letter from Lee Rollins dated August 25, 2010*)
- Proposed Town of Bermuda Run WWTP ADF = 0.19 MGD (permitted facility capacity)

2.3 Alternative Evaluation Flows

Using the average daily flows of the contributing areas and peaking factors based on "10-State Standard" method, the following design flows were established for each proposed lift station or lift station expansion in the alternatives reviewed:

- Bermuda Run No. 1 LS = 0.69 MGD or 480 GPM.
- Tanglewood LS Expansion = 6.36 MGD or 4,410 GPM (Includes all existing and proposed flow to the existing Tanglewood LS including the proposed flow from Bermuda Run No. 1 LS less Clemmons No. 1).
- Tanglewood South LS = 2.81 MGD or 1,950 GPM (Includes flow from Bermuda Run No. 1 LS, Davie County, and the proposed Davie County 200,000 GPD requested allocation).

Section 3 - **Alternative LS Site Locations**

3.1 Proposed Bermuda Run No. 1 LS Site

To minimize costs, the preferred location of a lift station to replace the existing WWTP is near the existing influent WWTP lift station. This location will minimize the amount of piping required to connect the existing collection system to the proposed lift station. However, a site visit by representatives of HIGHFILL and review of aerial photographs indicated the existing influent lift station is several hundred feet from the Yadkin River. Review of the FEMA Flood Insurance Rate Map (FIRM) with map number 3710587200K, last revised January, 2 2009, indicated the existing WWTP and influent lift station areas are within the 100-year flood zone and within the floodway. Any obstruction constructed in the floodway will require engineering analysis and modeling necessary to request a FEMA issued No-rise Certification or Letter of Map Amendment if there is a rise in flood elevation. To avoid these requirements, in all alternatives, the Bermuda Run No. 1 LS site was located approximately 700 feet northwest of the existing WWTP site where it will be completely out of the flood zone and flood way. This will require re-routing the influent gravity sewer lines to the new location. See Appendix A for flood map with existing WWTP and proposed lift station site locations.

3.2 Proposed Bermuda Run No 2 LS Site

Alternative 2 is a stand-alone alternative to replace the TBR WWTP. Based on hydraulic requirements for this alternative, a second lift station will be required and referred to herein as the Bermuda Run No. 2 LS. The site selected for the Bermuda Run No. 2 LS is located in the northeast corner of the intersection of Middlebrook Drive and Hayward Industrial Drive. This site was selected considering pump hyraulic limitations and a preference to keep the proposed lift station out of residential neighborhoods.

3.3 Proposed Tanglewood South LS Site

The existing Tanglewood LS is located within the 100-year flood plain which requires the electrical components to be located approximately 600 feet away. When reviewing alternatives for the proposed Tanglewood South LS, the site was selected to keep the proposed lift station near the existing lift station but locate it outside of the existing 100-year flood zone. Review of FEMA FIRM map number 3710588200K, last revised January 2, 2009, indicated a good location for the Tanglewood South LS was the southwestern corner of the intersection of Tanglewood Park Road and River Birch Creek Road. See Appendix A for flood map with existing and proposed site locations.

Section 4 - Bermuda Run Wastewater Service Alternatives

All of the alternatives described below include installation of a pump station at the Town of Bermuda Run WWTP to collect influent sewage flow and convey to the CCUC collection system. If implemented, the proposed Bermuda Run pump station would eliminate the need for the Town's WWTP.

4.1 Alternative 1 – Bermuda Run No. 1 LS to Expanded Tanglewood LS

This alternative was evaluated to convey wastewater from the proposed Bermuda Run LS to the existing Tanglewood LS. The existing Tanglewood LS would need to be expanded to have capacity to convey the existing and proposed flows to the Muddy Creek Interceptor.

This alternative includes an 8-inch diameter force main conveying 480 GPM of wastewater from the Bermuda Run LS site under the Yadkin River and along a golf cart path and River Birch Creek Road to Stable Road and discharging into the existing wet well. See Figure 1 for force main routing. An 8-inch diameter force main was selected to allow for sufficient scouring velocity to avoid solids deposition in the force main.

Since the Tanglewood LS will need to remain in service during the upgrade and the proposed expanded design flow of 4,410 GPM will require upgrade of the existing force main, the expansion in this evaluation includes a lift station and force main that will be hydraulically connected to the existing wet well and will operate in parallel with the existing lift station. This expansion uses the same conceptual layout used in Technical Memorandum #1, dated February 3, 2011 by HIGHFILL. With an existing capacity is 2,700 GPM, the expanded parallel system will require a design flow of 1,710 GPM.

Based on the design flow for the parallel system, a 16-inch diameter force main was selected for reduced friction head and adequate scouring velocity. The route selected for the proposed 16-inch force main is parallel to the existing 18-inch force main, extending east along a tributary, and discharging into the Muddy Creek Interceptor. See Figure 1 for the proposed alignment.

A force main route along Tanglebrook Trail and Idols Road was also reviewed, but the topography and increased length of force main indicated that the existing force main route was the most direct.

Alternative 1 includes:

- Proposed Bermuda Run LS with design capacity of 480 GPM.
- Approximately 8,000 LF of 8-inch force main from Bermuda Run LS to Tanglewood LS.
- Expansion of Tanglewood LS by 1,710 GPM to a quad-plex lift station with an overall firm capacity of 4,410 GPM.
- Approximately 20,300 LF of 16-inch force main from Tanglewood LS to the Muddy Creek Interceptor.

4.2 Alternative 2 – Bermuda Run No. 1 LS to Bermuda Run No. 2 LS to Muddy Creek Interceptor

This alternative conveys the TBR flow from the proposed Bermuda Run No. 1 LS to the Muddy Creek Interceptor via an additional Bermuda Run No. 2 LS. Based on the design flow of 480 GPM, topography and hydraulics, a single lift station will not convey the design flow all the way to Muddy Creek Interceptor. Again the most direct force main route was along Johnson Creek parallel to the existing 18-

inch force main. In this alternative, the force main will follow the same route as Alternative 1 to Johnson Creek and parallel with Johnson Creek to the proposed Bermuda Run No. 2 LS site. The force main from Bermuda Run No. 2 LS will follow the tributary west to the Muddy Creek Interceptor. See Figure 2 for force main routing and lift station locations.

Alternative 2 includes:

- Proposed Bermuda Run No. 1 LS with design capacity of 480 GPM.
- Approximately 17,700 LF of 8-inch force main from Bermuda Run LS to Bermuda Run No 2 LS.
- Proposed Bermuda Run No 2 LS with design capacity of 480 GPM.
- Approximately 8,800 LF of 8-inch force main from Bermuda Run No. 2 LS to the Muddy Creek Interceptor.
- Expansion of the Tanglewood PS by 1,430 GPM to an overall firm capacity of 4,130 GPM
- Approximately 20,000 lf of 16-inch parallel force main from Tanglewood LS to the Muddy Creek Interceptor.

One of the disadvantages of this alternative is the route of the 8-inch force main will be along the same corridor as the existing 18-inch force main, the existing gravity sewer, and the proposed force main that will be required when Tanglewood LS is expanded. If this alternative is considered, further evaluation is required to verify there is room along this corridor for approximately 14,000 lf with 4 parallel pipes.

4.3 Alternative 3 – Bermuda Run No. 1 LS to Proposed Tanglewood South LS

This alternative conveys the TBR flow from the proposed Bermuda Run No. 1 LS to a proposed Tanglewood South LS at the intersection of Tanglewood Park Road and River Birch Creek Road. If the Davie County existing and proposed flow is removed from the existing Tanglewood LS and extended to the proposed Tanglewood South LS, the combined design flow can be conveyed from the Tanglewood South LS with a 16-inch force main.

Alternative 3 includes:

- Proposed Bermuda Run LS with a design capacity of 480 GPM.
- Approximately 7,000 lf of 8-inch force main from Bermuda Run LS to Tanglewood South LS.
- Approximately 1,500 lf extension of the existing Davie County force main from Tanglewood LS to Tanglewood South LS.
- Proposed Tanglewood South LS with a design capacity of 1,950 GPM.
- Approximately 19,600 lf of 16-inch force main from Tanglewood South LS to Muddy Creek Interceptor.

This alternative includes the extension of the Davie County Yadkin River LS force main to the Tanglewood South LS. Further evaluation of the Davie County Yadkin River LS is required to determine the impacts to existing lift station capacity of the additional 1,500 LF of force main and approximately 8 feet of additional static head.

One of the advantages of this alternative is that it eliminates the need to expand the Tanglewood LS by removing the Davie County Yadkin River LS and the 200,000 GPD Davie County flow request.

Section 5 - **Budget and Recommendations**

5.1 Budget by Alternative

The recommended project budgets for the three alternatives described herein were developed based on the lift station site locations, conceptual site layout, and conceptual force main routes shown.

To allocate estimated costs by jurisdiction, a project budget estimate was developed for a baseline project that CCUC would need to construct to accommodate the Clemmons area tributary build-out projected flow (excluding the diverted Clemmons No. 1 LS flows) and CCUC's current contractual obligation to Davie County. The baseline expansion project includes a capacity expansion of the Tanglewood LS which would require the addition of a wet well, two new pumps, electrical gear, a parallel 12-inch force main, and ancillary items. The baseline project recommended budget is $4,380,000.

In the table below, the Town of Bermuda Run cost share is estimated to be the difference between the baseline CCUC project and each alternative evaluated. Details of the budget estimates are presented in Appendix B.

Table 5.1 – Recommended Project Budget

Alternative	Recommended Total Project Budget	Estimated CCUC Cost Share	Estimated TBR Cost Share
1	$7,370,000	$4,380,000	$2,990,000
2	$9,780,000	$4,380,000	$5,400,000
3	$7,520,000	$4,380,000	$3,140,000

5.2 Permitting Considerations

All of the alternatives considered involve crossing the Yadkin River which will require a subaqueous utility crossing easement from the State Property Office. The overall process of getting approval typically takes 6 to 8 months after the design is complete.

The infrastructure improvements identified in Alternatives 1 and 2 are below the State Environmental Policy Act (SEPA) thresholds that would require an Environmental Assessment. However, Alternative 3 would require an Environmental Assessment (EA) because the 1,950 GPM capacity of the Tanglewood South LS of exceeds the exception threshold of 1,750 GPM. The cost of performing the EA is included in the recommended budgets outlined above. The EA process typically takes 10 to 14 months, but many aspects of design can be performed in parallel with the EA progression.

5.3 Recommendations

All three of these proposed lift station site locations were selected on a conceptual basis to allow for hydraulic analysis. If the Town chooses to proceed with any of these alternatives, a detailed evaluation of lift station site locations is recommended to verify the most suitable location for any of the proposed lift stations. In addition, the force main routing will need to be refined prior to final design to determine if a

better route is available, minimize easement acquisition, and to minimize stream crossings and wetland impacts.

For the level of detail used in this conceptual evaluation Alternative 1 and 3 are practically the same cost alternatives. Alternative 3 would create a new pump station site to maintain, but it would forgo the need to invest capital funds into the Tanglewood site which is located in a significant floodplain.

If the Town of Bermuda Run chooses to proceed with obtaining wastewater service from CCUC, we recommend performing a more detailed preliminary engineering report and basis of design for the selected alternative as well as performing a detailed force main routing analysis.

Figures

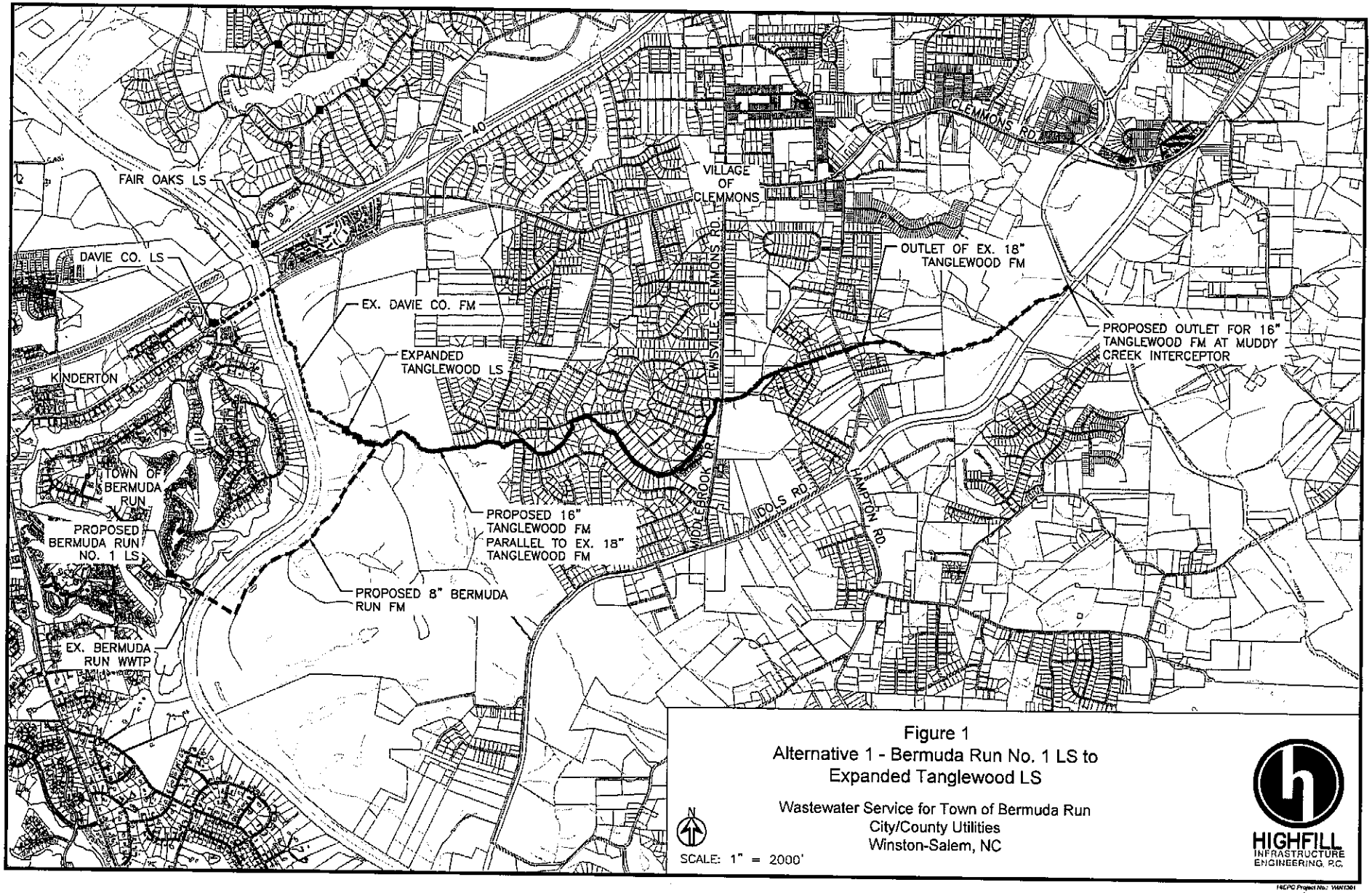


Figure 1
Alternative 1 - Bermuda Run No. 1 LS to Expanded Tanglewood LS

Wastewater Service for Town of Bermuda Run
City/County Utilities
Winston-Salem, NC

HIGHFILL INFRASTRUCTURE ENGINEERING, P.C.

HIEPC Project No.: WINT001
September 11, 2013

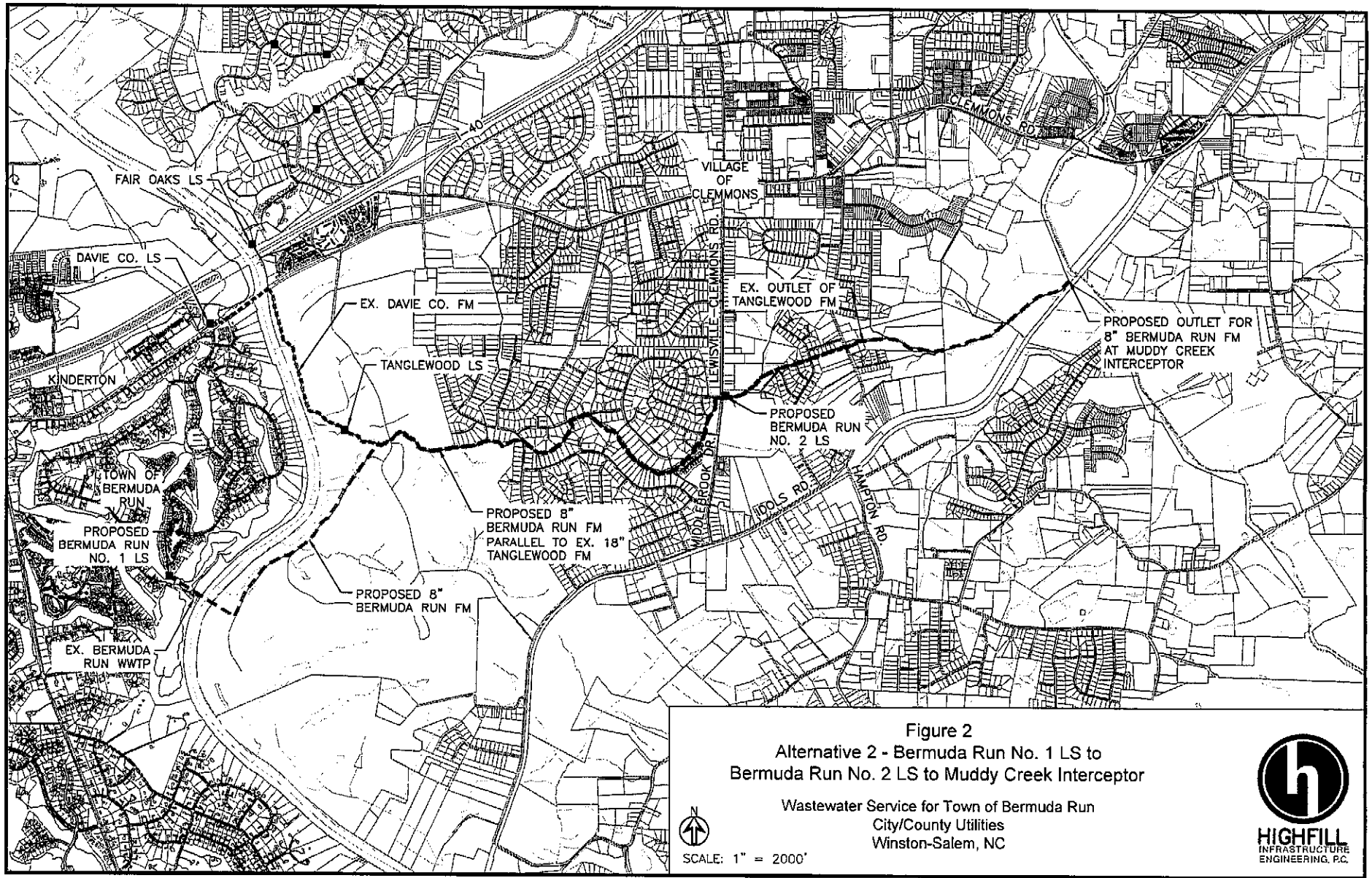


Figure 2
Alternative 2 - Bermuda Run No. 1 LS to
Bermuda Run No. 2 LS to Muddy Creek Interceptor

Wastewater Service for Town of Bermuda Run
City/County Utilities
Winston-Salem, NC

HIGHFILL
INFRASTRUCTURE
ENGINEERING, P.C.

HIEPC Project No.: WIN1301
September 11, 2013

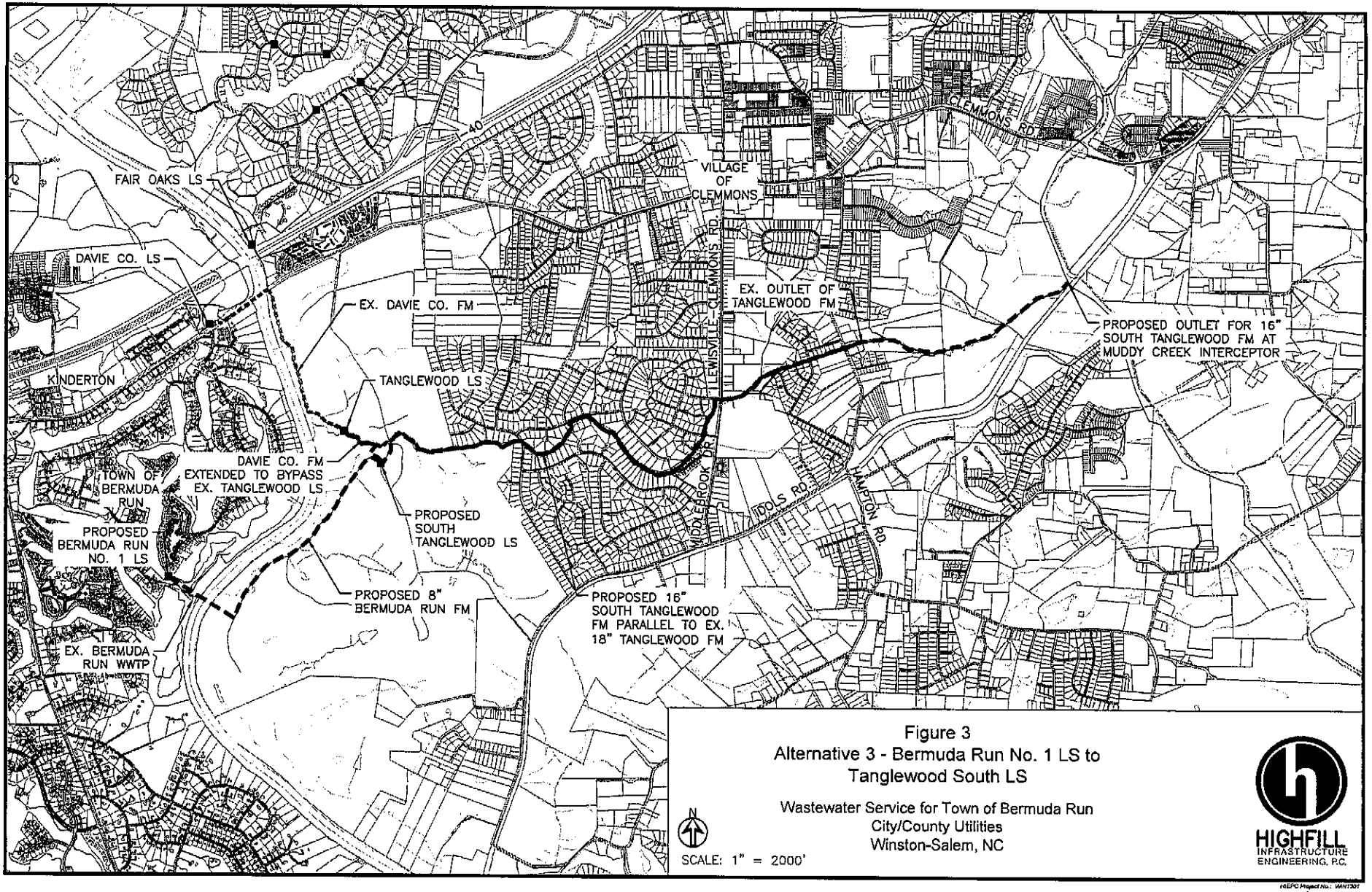


Figure 3
Alternative 3 - Bermuda Run No. 1 LS to Tanglewood South LS

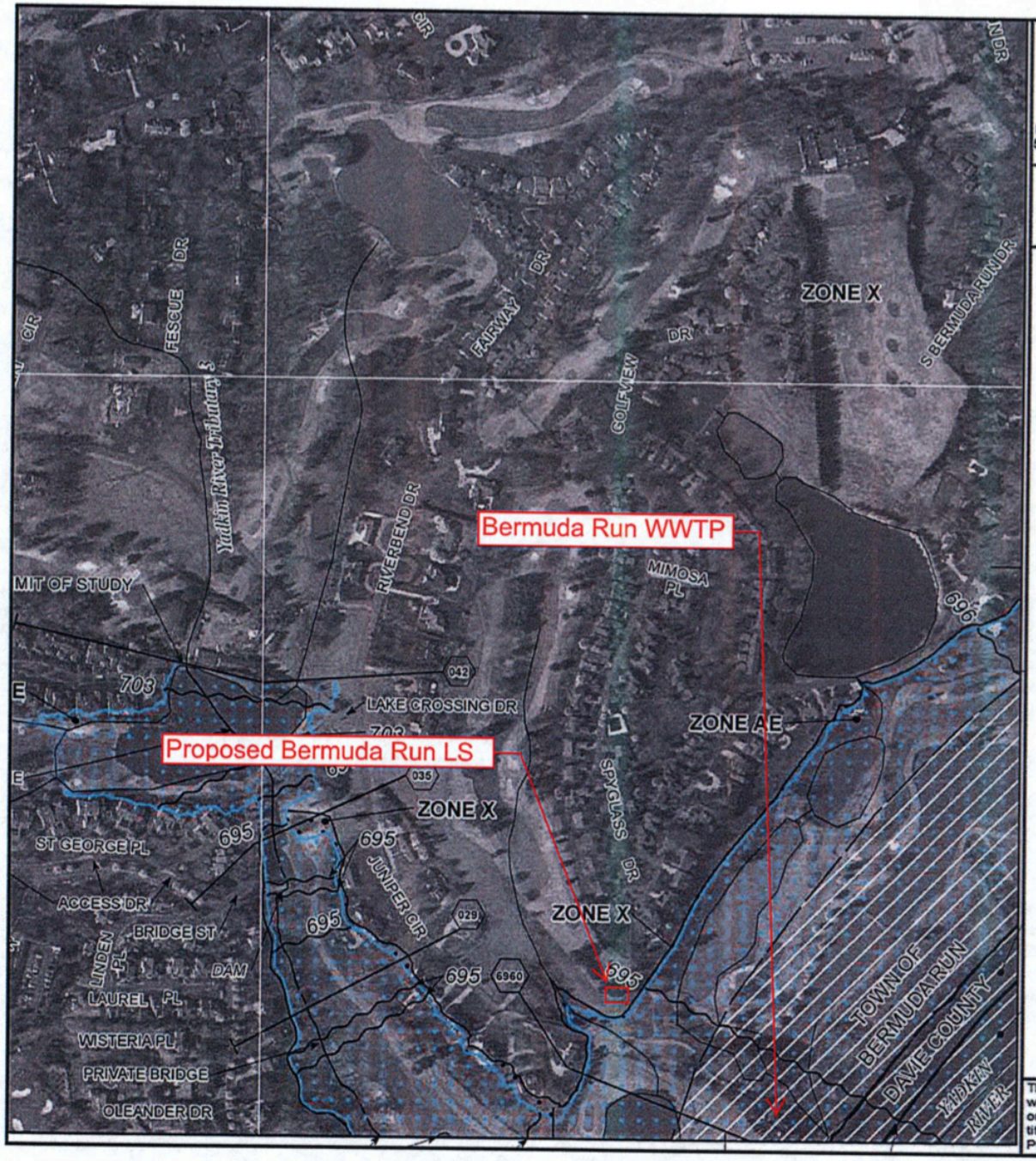
Wastewater Service for Town of Bermuda Run
City/County Utilities
Winston-Salem, NC

HIEPC Project No.: WNT301
September 11, 2013

Appendix A

Flood Insurance Rate Map No. 3710587200K with TBR WWTP and LS Locations

Flood Insurance Rate Map No. 3710588200K with Tanglewood & Tanglewood South LS Locations



GRID NORTH

MAP SCALE 1" = 500' (1 : 6,000)

250 0 250 500 750 1,000 FEET

50 0 150 300 METERS

PANEL 5872K

FIRM

FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5872

(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	CID No.	PANEL	SUFFIX
BERMUDA RUN, TOWN OF	370685	5872	K
CLEMMONS, VILLAGE OF	370531	5872	K
DAVIE COUNTY	370308	5872	K
FORSYTH COUNTY	375349	5872	K

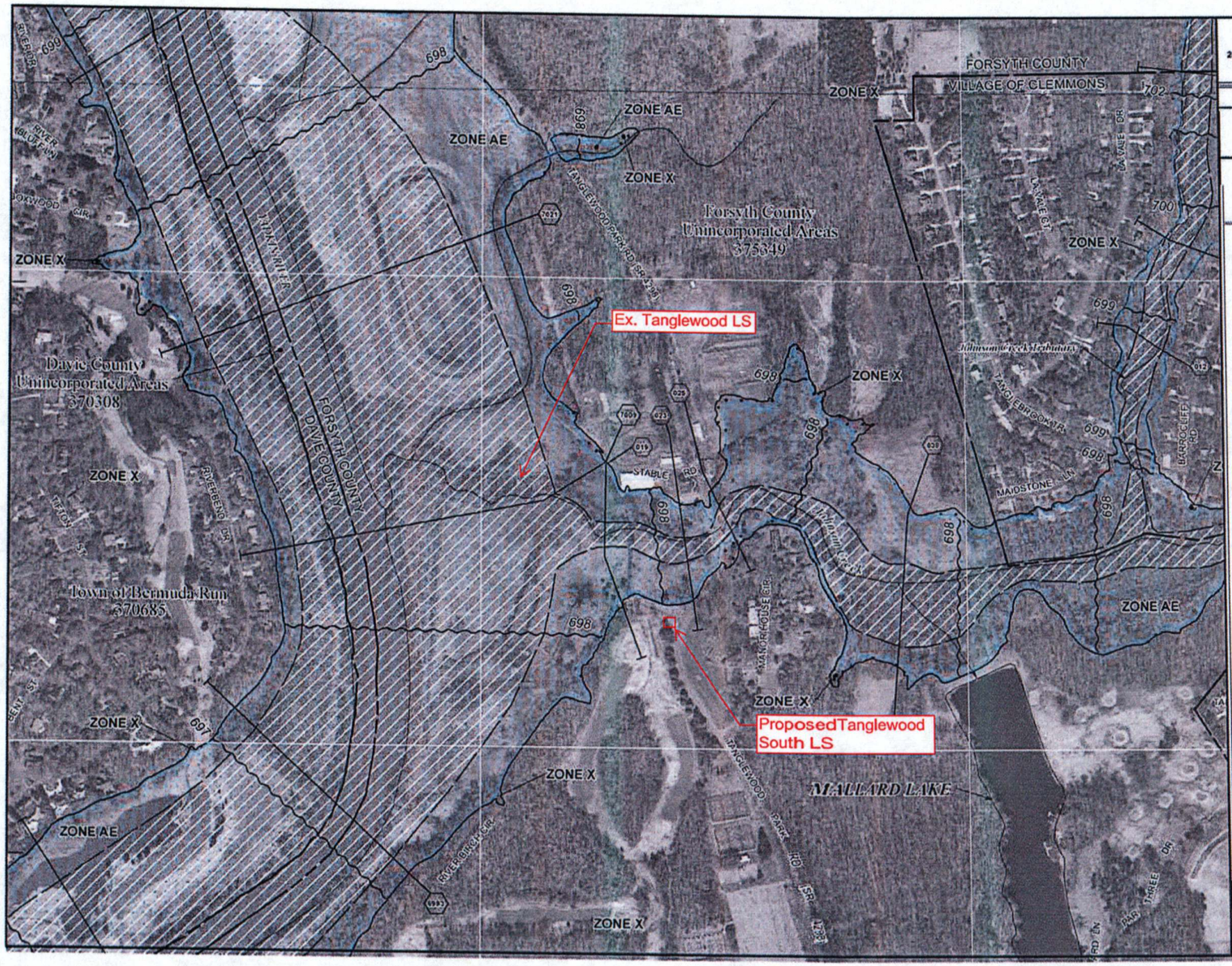
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP REVISED
JANUARY 2, 2009

MAP NUMBER
3710587200K

State of North Carolina
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



GRID NORTH

MAP SCALE 1" = 500' (1 : 6,000)

250 0 250 500 750 1,000 FEET

0 150 300 METERS

PANEL 5882K

FIRM

FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5882

(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	CID No.	PANEL	SUFFIX
BERMUDA RUN, TOWN OF	370685	5882	K
CLEMMONS, VILLAGE OF	370531	5882	K
DAVIE COUNTY	370308	5882	K
FORSYTH COUNTY	375349	5882	K

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP REVISED
JANUARY 2, 2009

MAP NUMBER
3710588200K

State of North Carolina
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix B

Alterntative 1 Budget Estimate

Alternative 2 Budget Estimate

Alternative 3 Budget Estimate

Tanglewood LS Expansion With Current Allocated Flow Budget Estimate

Alternative 1 - Bermuda Run No. 1 LS to Expanded Tanglewood LS
Conceptual Design Phase Project Budget Estimate
Wastewater Service for Town of Bermuda Run
City/County Utilities, Winston-Salem, NC
HIGHFILL Project No. WIN1301

9/11/2013
by: JTT
chk'd: TWH

	Units	Unit Cost	Extended
8" Force Main with appurt.	7,300 LF	$ 75.00	$ 547,500
16" Force Main with appurt.	20300 LF	$ 147.00	$ 2,984,100
10" Horizontal Directional Drill	700 LF	$ 265.00	$ 185,500
		FM Subtotal	$ 3,717,100
Expanded Tanglewood LS (4,410 GPM Firm Capacity)			
Bypass Pumping	1 LS	$ 65,000	$ 65,000
New Wetwell (10'x10'x30')	1 LS	$ 234,000	$ 234,000
Valve Vault (8'x8'x10') incl valves	1 LS	$ 53,000	$ 53,000
Pumps (2 @ 148 hp) and wetwell piping	1 LS	$ 190,000	$ 190,000
SCADA/RTU I/O Mods	1 LS	$ 26,500	$ 26,500
Generator w/ belly tank & ATS	1 LS	$ 200,000	$ 200,000
Surge Relief Valve and Vault	1 LS	$ 34,000	$ 34,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 117,000	$ 117,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 143,000	$ 143,000
		LS Subtotal	$ 1,062,500
Bermuda Run No. 1 LS (480 GPM Firm Capacity)			
Bypass Pumping (2 weeks)	1 LS	$ 49,000	$ 49,000
16" SS extension to new wetwell	600 LF	$ 180	$ 108,000
New Wetwell (6' Dia. x 30' deep)	1 LS	$ 40,000	$ 40,000
Valve Vault	1 LS	$ 20,000	$ 20,000
Pumps (2 @ 20 hp) and wetwell piping	1 LS	$ 53,000	$ 53,000
SCADA/RTU allowance	1 LS	$ 40,000	$ 40,000
Generator & ATS	1 LS	$ 75,000	$ 75,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 60,000	$ 60,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 50,000	$ 50,000
WWTP Demolition and Site Restoration	1 LS	$ 100,000	$ 100,000
		LS Subtotal	$ 595,000

FM Total	$ 3,717,100
LS Total	$ 1,657,500
FM+LS Total	$ 5,374,600
Contingency (20%)	$ 1,075,000
FM Easements (note 1)	$ 117,300
Professional Services	$ 806,000
Project Budget	**$ 7,372,900**

Notes:

1. Assume 50% of route is within R/W, 35% of route would require 20 foot wide permanent easement @ $10.00/LF and, 15% of route would require add'l 10 foot wide permanent easement @ $5.00/LF

Alternative 2 - Bermuda Run No. 1 LS to Bermuda Run No. 2 LS to Muddy Creek Interceptor
Conceptual Design Phase Project Budget Estimate
Wastewater Service for Town of Bermuda Run
City/County Utilities, Winston-Salem, NC
HIGHFILL Project No. WIN1301

9/11/2013
by: JTT
chk'd: TWH

	Units	Unit Cost	Extended
8" Force Main with appurt.	26,200 LF	$ 75.00	$ 1,965,000
16" Force Main with appurt.	20,000 LF	$ 147.00	$ 2,940,000
10" Horizontal Directional Drill	700 LF	$ 265.00	$ 185,500
		FM Subtotal	$ 5,090,500
Bermuda Run No. 1 LS (480 GPM Firm Capacity)			
Bypass Pumping (2 weeks)	1 LS	$ 49,000	$ 49,000
16" SS extension to new wetwell	600 LF	$ 180	$ 108,000
New Wetwell (6' Dia. x 30' deep)	1 LS	$ 40,000	$ 40,000
Valve Vault	1 LS	$ 20,000	$ 20,000
Pumps (2 @ 65 hp) and wetwell piping	1 LS	$ 132,000	$ 132,000
SCADA/RTU allowance (CITI, LLC)	1 LS	$ 40,000	$ 40,000
Generator & ATS	1 LS	$ 75,000	$ 75,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 60,000	$ 60,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 50,000	$ 50,000
WWTP Demolition and Site Restoration	1 LS	$ 100,000	$ 100,000
		LS Subtotal	$ 674,000
Bermuda Run No. 2 LS (480 GPM Firm Capacity)			
New Wetwell (6' Dia. x 15' deep)	1 LS	$ 20,000	$ 20,000
Valve Vault	1 LS	$ 20,000	$ 20,000
Pumps (2 @ 28 hp) and wetwell piping	1 LS	$ 61,000	$ 61,000
SCADA/RTU allowance (CITI, LLC)	1 LS	$ 40,000	$ 40,000
Generator & ATS	1 LS	$ 75,000	$ 75,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 60,000	$ 60,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 50,000	$ 50,000
Property Acquisition	1 LS	$ 10,700	$ 10,700
		LS Subtotal	$ 336,700
Expanded Tanglewood LS (4,130 GPM Firm Capacity)			
Bypass Pumping	1 LS	$ 65,000	$ 65,000
New Wetwell (10'x10'x30')	1 LS	$ 234,000	$ 234,000
Valve Vault (8'x8'x10') incl valves	1 LS	$ 53,000	$ 53,000
Pumps (2 @ 148 hp) and wetwell piping	1 LS	$ 190,000	$ 190,000
SCADA/RTU I/O Mods	1 LS	$ 26,500	$ 26,500
Generator w/ belly tank & ATS	1 LS	$ 200,000	$ 200,000
Surge Relief Valve and Vault	1 LS	$ 34,000	$ 34,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 117,000	$ 117,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 143,000	$ 143,000
		LS Subtotal	$ 1,062,500
		FM Total	$ 5,090,500
		LS Total	$ 2,073,200
		FM+LS Total	$ 7,163,700
		Contingency (20%)	$ 1,433,000
		FM Easements (note 1)	$ 111,400
		Professional Services	$ 1,075,000
		Project Budget	**$ 9,783,100**

Notes:

1. Assume 50% of route is within R/W, 35% of route would require 20 foot wide permanent easement @ $10.00/LF and, 15% of route would require add'l 10 foot wide permanent easement @ $5.00/LF

Alternative 3 - Bermuda Run No. 1 LS to Tanglewood South LS
Conceptual Design Phase Project Budget Estimate
Wastewater Service for Town of Bermuda Run
City/County Utilities, Winston-Salem, NC
HIGHFILL Project No. WIN1301

9/11/2013
by: JTT
chk'd: TWH

	Units	Unit Cost	Extended
8" Force Main with appurt.	6,700 LF	$ 75.00	$ 502,500
16" Force Main with appurt.	21000 LF	$ 147.00	$ 3,087,000
10" Horizontal Directional Drill	700 LF	$ 265.00	$ 185,500
		FM Subtotal	$ 3,775,000
Tanglewood South LS (1,950 GPM Firm Capacity)			
New Wetwell (10'x10'x30')	1 LS	$ 234,000	$ 234,000
Valve Vault (8'x8'x10') incl valves	1 LS	$ 53,000	$ 53,000
Pumps (2 @ 127 hp) and wetwell piping	1 LS	$ 178,000	$ 178,000
SCADA/RTU allowance (CITI, LLC)	1 LS	$ 40,000	$ 40,000
Generator w/ belly tank & ATS	1 LS	$ 200,000	$ 200,000
Surge Relief Valve and Vault	1 LS	$ 34,000	$ 34,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 117,000	$ 117,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 143,000	$ 143,000
Property Acquisition	1 LS	$ 21,400	$ 21,400
		LS Subtotal	$ 1,020,400
Bermuda Run No. 1 LS (480 GPM Firm Capacity)			
Bypass Pumping (2 weeks)	1 LS	$ 49,000	$ 49,000
16" SS extension to new wetwell	600 LF	$ 180	$ 108,000
New Wetwell (6' Dia. x 30' deep)	1 LS	$ 40,000	$ 40,000
Valve Vault	1 LS	$ 20,000	$ 20,000
Pumps (2 @ 20 hp) and wetwell piping	1 LS	$ 53,000	$ 53,000
SCADA/RTU allowance (CITI, LLC)	1 LS	$ 40,000	$ 40,000
Generator & ATS	1 LS	$ 75,000	$ 75,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 60,000	$ 60,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 50,000	$ 50,000
WWTP Demolition and Site Restoration	1 LS	$ 100,000	$ 100,000
		LS Subtotal	$ 595,000

FM Total	$ 3,775,000
LS Total	$ 1,615,400
FM+LS Total	$ 5,390,400
Contingency (20%)	$ 1,078,000
FM Easements (note 1)	$ 117,700
Professional Services (note 2)	$ 934,000
Project Budget	**$ 7,520,100**

Notes:

1. Assume 50% of route is within R/W, 35% of route would require 20 foot wide permanent easement @ $10.00/LF and, 15% of route would require add'l 10 foot wide permanent easement @ $5.00/LF
2. Professional Services includes $125,000 for preparation of an EA.

Tanglewood LS Expansion With Current Allocated Flow
Conceptual Design Phase Project Budget Estimate
Wastewater Service for Town of Bermuda Run
City/County Utilities, Winston-Salem, NC
HIGHFILL Project No. WIN1301

9/20/2013
PRS
chk'd: TWH

	Units	Unit Cost	Extended
12" Force Main with appurt.	20,000 LF	$ 110.00	$ 2,200,000
		FM Subtotal	$ 2,200,000
Expanded Tanglewood LS			
Bypass Pumping	1 LS	$ 23,000	$ 23,000
New Wetwell (10'x10'x30')	1 LS	$ 234,000	$ 234,000
Valve Vault (8'x8'x10') incl valves	1 LS	$ 53,000	$ 53,000
Pumps (2 @ 127 hp) and wetwell piping	1 LS	$ 151,000	$ 151,000
SCADA/RTU I/O Mods	1 LS	$ 26,500	$ 26,500
Generator w/ belly tank & ATS	1 LS	$ 200,000	$ 200,000
Surge Relief Valve and Vault	1 LS	$ 34,000	$ 34,000
Miscellaneous Valves, Painting, Fence, Site Work, etc.	1 LS	$ 117,000	$ 117,000
Electrical (Pump Controls, Starters, Wiring, etc)	1 LS	$ 143,000	$ 143,000
		LS Subtotal	$ 981,500
		FM Total	$ 2,200,000
		LS Total	$ 981,500
		FM+LS Total	$ 3,181,500
		Contingency (20%)	$ 636,000
		FM Easements (note 1)	$ 85,000
		Professional Services	$ 477,000
		Project Budget	**$ 4,379,500**

Notes:

1. Assume 50% of route is within R/W, 35% of route would require 20' foot wide permanent easement @ 10/LF and, 15% of route would require add'l 10 foot wide permanent easement @ $5.00/LF