

Underwood Engineers, Inc.

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Civil-Environmental

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November 30, 2009

Mr. David Sullivan, Town administrator
Town of Windham
3 North Lowell Road
PO Box 120
Windham, New Hampshire 03079

Re: Windham/Salem Sewer Line Interconnection Feasibility Study
Windham, New Hampshire

Dear Mr. Sullivan,

This letter report is submitted in accordance with our contract dated October 20, 2008. This report:

- Summarizes possible connection points in Salem for future municipal sewers serving Cobbetts Pond, Canobie Lake and the Route 111 areas.
- Identifies preferential sewer routing along the NHDOT I-93 widening project
- Provides flow projections from planned sewer service areas
- Provides relative cost, magnitude of cost for infrastructure for planning and feasibility
- Identifies items for consideration, relating to inter-municipal connectivity of sewers
- Identifies possible funding programs and/or participation by stakeholders

1.0 Purpose

Sewer planning is necessary to address future ground and surface water quality in the following areas:

- A. Cobbetts Pond Area
- B. Canobie Lake Area
- C. Wall Street Area
- D. Gateway Area

Inter-Municipal Sewer Connection Feasibility

The Town of Windham does not operate a Waste Water Treatment Facility (WWTF) or municipal sewers. NHDOT will re-construct I-93 and it is desirable to identify potential sewer routing from the Rte 111 interchange area to the Town of Salem. The feasibility for an inter-municipal sewer connection to Salem will depend on downstream capacity of Salem's sewer system, Town of Salem approval and approval of the Greater Lawrence Sanitary District (GLSD). The Sewer mapping of existing sewers and planned sewers within the Town

of Salem were reviewed. Five inter-municipal connection points are identified. The locations are as follows (*see Figure 1*):

1. North Broadway (Section 3.1)
2. Northeastern Boulevard (Section 3.2)
3. Lowell Road (Section 3.3)
4. Existing 21" Gravity Interceptor Green Acres Drive (Section 3.4)
5. Manor Parkway (Section 3.5)

Planned sewer service areas and possible sewer connection points are delineated on the Sewer Routing Options Schematic, referenced as Figure 1.

All of the options identify potential sewer routing within the I-93 corridor. The extent of future work along the highway is dependant on preferential tie in locations, review of down-stream sewer capacities (present and future) and Town of Salem approval.

Additional considerations that may influence the Town of Salem approval may include:

- Salem needs for downstream improvements within their existing system
- Reduction in maintenance burden to existing systems
- Salem need for sewer extensions, if any

2.0 Sewer Service Areas

2.1 Cobbetts Pond

Plan for sewer extensions to Salem and Windham, included in the regional wastewater agreement with the GLSD, was based on a map of the Spicket River watershed. It should be noted that Cobbetts Pond is not in the Spicket River Watershed. Cobbetts Pond has a surface area of approximately 340 Acres and is located just to the west of I-93. The shoreline of the pond is densely populated. Seasonal cottages have been converted to year round homes. Frontage along the shoreline typically ranges from 50 to 100 feet, and there are approximately 250 homes along the shore and an additional 400+/- homes in the outlying area. Cobbetts Pond is listed as impaired water, for dissolved oxygen saturation.

Outside the scope of the work associated with this report, the Cobbetts Pond Improvement Association (CPIA) is determined to gain an understanding of pollutants, and a watershed restoration plan is being developed. The CPIA is investigating and providing detailed information concerning the numerous private septic systems located along the shoreline. Soils along the shoreline are predominantly classified as well drained with moderately rapid or rapid permeability, based on Rockingham County soils mapping. Depth to bedrock (based on soils maps) ranges from 2 to 3 feet along the western shore to more than 5 feet on the eastern shoreline

Conversion of cottages to significantly larger year round homes has undoubtedly increased septic loading to receiving soils up gradient of the pond. Sub-surface septic systems may have deficiencies. Some of the older systems may not meet current installation guidelines. Generally, it can be anticipated that sewage loading from the densely populated shoreline will have a negative long-term impact to water quality. Plans for extension of sewer to the area should be considered.

2.2 Canobie Lake

Canobie Lake is the designated water supply for the Town of Salem. It has a surface area of approximately 373 Acres and is located the east of I-93. The Windham/Salem town line bisects the lake in the east west direction. Similar to Cobbetts Pond, the shoreline appears to be fully developed, although not as densely populated. Frontage along the shoreline typically ranges from 100 to 200 feet, and there are approximately 70 homes along the shore and an additional 30 +/- homes in the outlying area. Municipal sewers to this area could service approximately 180 residential properties. Plans for sewer extension to this area should be considered for protection of the Canobie Lake water supply.

2.3 Wall Street Area

The Wall Street Area is primarily zoned for industrial/commercial use. The area encompasses both sides of Indian Rock Road from I-93 westerly approximately 4,500 LF with an approximate area of 140 acres. This area is within the Cobbetts Pond Watershed and sewer extensions to this area should be considered, for long term planning, as the area will undoubtedly be promoted for development.

2.4 Gateway Area

The Gateway Area is also zoned for industrial/commercial use. The area is east of I-93 with an approximate area of 60 acres. Sewer extensions to this area are contemplated as a means to responsible development in this area.

2.5 Existing Municipal Sewers

The Greater Lawrence Sewer District Currently (GLSD) receives all of Salem's sanitary sewer flow. The GLSD treatment plant is capable of treating 52 million gallons of wastewater per day (MGD) and as of 2006 was treating approximately 30 MGD serving four (4) Massachusetts communities and Salem New Hampshire.

Where the Salem's WWTF was de-commissioned in 1986 the major connection points for discharges from Salem's sewer system includes three (3) interceptors; two of which could be considered for an interconnection (see alternatives section below). These interceptors are 21" in diameter along Cross Street and 42" at the downstream end of the system along Garabedian Drive.

3.0 Sewer Routing Alternatives Evaluation

It is anticipated that a future Windham sewage collection system for the targeted service areas would include the following:

- Low pressure sewers servicing shoreline areas of Cobbetts Pond and Canobie Lake
- Gravity sewers would be extended from a sewage pumping station, located at the northeast corner of Cobbetts Pond (near I-93, Exit #3, Rte 111 interchange) west along Rte 111 (Gateway Area) and south along I-93 to Rte 111A.
- A main sewage pumping station (near I-93, Exit #3, Rte 111 interchange) would pump all sewage through a forcemain to an agreed upon discharge point within the Town of Salem's sewer system.

It is anticipated that the Salem discharge point will not significantly change the Windham sewage collection system as described above, including low-pressure sewers, gravity sewers and main sewage pumping station. Capital costs, submitted for this alternatives evaluation, are therefore limited to anticipated cost for forcemain and gravity interceptors from the Windham main pumping station to the Salem connection point. Actual cost for construction and long-term maintenance of sewer conveyance to Salem's system will require Town of Salem and GLSD involvement, and additional studies beyond the scope of this report.

See attached Decision Matrix for a summary of alternatives.

3.1 Alternative #1 – Connection on North Broadway

DESCRIPTION

Construct forcemain to Range Road to Old Rockingham Road, Salem. UEI evaluated downstream pipe capacities and found the existing sewers are near maximum capacity. It is anticipated that the magnitude of downstream improvements will be prohibitive, for interconnection at this location. Further analysis to the extent of upgrades was not completed.

In summary this option includes the following

- Install 9,000 LF of forcemain
- Sewer runs east along Rte. 111 to existing sewer manhole on Old Rockingham Road
- Capacity analysis of downstream pipes

OPINION OF COST

\$1.1M to \$1.4⁽¹⁾⁽²⁾

- (1) Cost for comparison of routing from Rte 111 to Salem connection point does not include main pumping station of sewage collectors.
- (2) Does not include upgrades to downstream sewers.

3.2 Alternative #2 – Connection on Northeastern Boulevard

DESCRIPTION

Alternative #2 utilizes the existing I-93 corridor. A sanitary forcemain would be constructed along the west side of I-93 to Brookdale Road. Since Brookdale Road crosses I-93 as an overpass, trenchless methods will be required to cross the interstate and the forcemain would extend to Northeastern Boulevard. The existing connection for this alternative is a 12” diameter pipe eventually increasing to a 21” interceptor. Further capacity analysis must be complete to confirm there is adequate downstream capacity at this location.

In summary, this option includes the following:

- 14,000 LF of forcemain
- Construction along I-93 corridor
- Trenchless installation methods
- Capacity analysis of downstream pipes

ADVANTAGES

- Work within I-93 corridor may reduce permitting/easements
- Shortest connection route

DISADVANTAGES

- Town of Salem may want to retain reserve capacity on Northeastern Boulevard for future development.
- May require upgrades to downstream sewer.

OPINION OF COST

\$1.6M to \$1.9M ⁽¹⁾⁽²⁾

- (1) Cost for comparison of routing from Rte 111 to Salem connection point does not include main pumping station of sewage collectors.
- (2) Does not include upgrades to downstream sewers.

3.3 Alternative #3 – Connection on Lowell Road

DESCRIPTION

Similar to alternative #2, the forcemain would be constructed along the west side of I-93 within the highway R-O-W. The forcemain would extend to Lowell Road. A new 21-inch gravity interceptor would then extend from Lowell Road to Green Acre Drive. The future 21-inch interceptor is generally referred to as the West Side Interceptor within the Town’s

planning documents. Extension of the 21-inch interceptor to the Lowell road area would be necessary for both Alternative #3 and Alternative #5.

In summary the, this option includes the following:

- 20,300 LF of 12" forcemain
- 9,100 LF of 21" gravity interceptor
- Construction along I-93 corridor

ADVANTAGES

- Work within I-93 corridor may reduce permitting/easements
- Extends Salem service area
- Extension of 21-inch interceptor to Lowell road may present Salem opportunity to eliminate their own pumping stations on Stiles Road and Keywadin Drive.

DISADVANTAGES

- Significant permitting and easement will be required for cross country interceptor

OPINION OF COST

\$3.0M to \$3.7M ⁽¹⁾

- (1) Cost for comparison of routing from Rte 111 to Salem connection point does not include main pumping station of sewage collectors.

3.4 Alternative #4 – Connection to Existing 21" Gravity Interceptor

DESCRIPTION

Alternate 4 includes approximately 28,000 feet (5.3 miles) of forcemain along the west side of I-93 to Cross Street. The proposed sewer corridor is also within planned rail transit area.

In summary the, this option includes the following:

- 28,000 LF of 12" forcemain
- Construction along I-93 corridor and town right-of-way

ADVANTAGES

- Work within I-93 corridor and on Cross Street may reduce permitting/easements
- Forcemain can be installed at shallower depth. There are less conflicts with other utilities and is less expensive than interceptor construction

DISADVANTAGES

- Sewer corridor within planned area for rail transit, additional easements/permits may be required.

OPINION OF COST

\$2.4M to \$2.9M ⁽¹⁾⁽²⁾

- (1) Cost for comparison of routing from Rte 111 to Salem connection point does not include main pumping station of sewage collectors.
- (2) Does not include upgrades to downstream sewers.

3.5 Alternative #5 – Connection on Manor Parkway

DESCRIPTION

Alternate #5 would involve a shorter forcemain connection to Salem's sewer system. However, it is anticipated that downstream upgrades would be required, to the receiving pumping station on Keywadin, to the downstream collection system or construction of a new 21-inch interceptor (as shown in Alternate #3) would be required to facilitate the additional flows coming from the

Windham sewer service areas described in Section 2. A sewage capacity analysis will need to be completed for existing sewers downstream of Manor Parkway.

New gravity sewers installed on Stiles Road to a planned 21-inch interceptor on Lowell Road may eliminate the need for pumping stations on Stiles road as well as the main pumping station on Keywadin Drive.

In summary the, this option includes the following:

- 12,800 feet of forcemain
- 10,200 LF of 21" gravity interceptor
- 5,000 LF of gravity collectors (10" to 18").

ADVANTAGES

- Work within I-93 corridor may reduce permitting/easements
- 21" gravity interceptor should provide adequate capacity
- May eliminate two pumping stations in Salem and free-up capacity in other interceptors
- Shorter forcemain, less problematic

DISADVANTAGES

- Will require replacement of existing sewers in Stiles Road
- Easement required for connection to Manor Parkway

OPINION OF COST

\$3.4M to \$4.1M ⁽¹⁾⁽²⁾

- (1) Cost for comparison of routing from Rte 111 to Salem connection point does not include main pumping station of sewage collectors.
- (2) Does not include upgrades to downstream sewers.

4.0 Sewage Flow Allocations

Table 4.1 (below) provides a summary of projected average daily flows for each

TABLE 4.1: SUMMARY OF FLOWS

| Service Area | Units | | Average Daily Flow /Unit (gals.) | Average Daily Flow (gal/day) |
|----------------------------------|--------------------|---------------------|----------------------------------|------------------------------|
| | Commercial (acres) | Residential (homes) | | |
| Cobbetts Pond | | 650 | 210 | 136,500 |
| Canobie Lake | | 100 | 210 | 21,000 |
| Wall Street Area | 140 | | 800 | 112,000 |
| Rte 111 Gateway | 60 | | 800 | 48,000 |
| Total Average Daily Flow: | | | | 317,500 |

4.1 GLSD

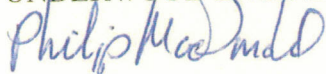
The Town of Salem entered into an agreement with the Greater Lawrence Sanitary District (GLSD) in July 1982. The term of the agreement is thirty (30) years. Under the terms of Salem's agreement with the GLSD, Salem can deliver 5.0 million gallons daily (MGD) as an average daily flow. The 5 MGD average daily flow is based on The Town's 201 Facilities Plan Update (G/Underwood Engineers, June 1982). Sewage flow allocations in Salem's 201 Facilities plan included 310,500 gals/day from Windham. The Town of Salem has not built out sewers to their potential and is anticipated that their actual sewage flows to the GLSD are considerably less than the allocated 5.0 MGD in the GLSD agreement.

5.0 RECOMMENDATIONS

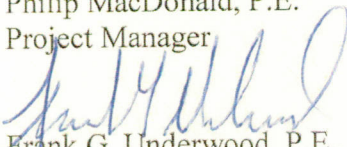
- Submit letter report to Town of Salem for review
- Initiate discussions with NHDOT concerning sewer corridors
- Informally meet with Salem to review considerations for inter-municipal sewer connection. This meeting may include the Town Manager/Administrator and selectmen from each board. In a more formal setting the Town's may wish to convene a joint work session.
- Obtain septic system investigation report and water quality monitoring reports from the Cobbetts Pond Improvement Association (CPIA)
- Flow allocations for Windham that require Salem and/or GLSD approval must be addressed and is beyond the scope of this report.

Please call if there are any questions

Very Truly Yours,
UNDERWOOD ENGINEERS, INC.



Philip MacDonald, P.E.
Project Manager



Frank G. Underwood, P.E.,
President

DJR/PDM

Encl.

Windham/Salem Sewer Interconnect
Windham, New Hampshire

DECISION MATRIX - SUMMARY OF ALTERNATIVES

November 25, 2009

| Alt. | Description | Interceptor | | Pump Station | Trenchless Methods | Opinion of Cost | |
|--|--|-------------|------------|--------------|--------------------|-----------------|----------------|
| | | Gravity | Force Main | | | Cost/ft. | Extended Total |
| 1 | Sewer forcemain connection to existing 12" sewer on Old Rockingham Road, Salem. Sewer corridor runs east along Rte. 111 to existing SMH on Old Rockingham Road, near Salem/Windham Town line. Salem sewers below this point are at capacity and additional studies are necessary to determine the extent of downstream upgrades. | | 9000 | Y | N | \$140 | \$1,260,000 |
| Probable Range of Construction Costs: | | | | \$1.1 | to | \$1.4 | Million |
| 2 | Sewer forcemain connection to existing 12" sewer on Northeastern Blvd. Sewer corridor runs south along I-93 corridor to Brookdale Road, east on Brookdale to Northeastern Blvd. There may be some available capacity at this tie in but Salem will likely reserve capacity for future development. Similar to Alt. 1, an analysis of downstream sewer capacities will need to be completed, to determine extent of upgrades. | 700 | 13,300 | Y | Y | \$125 | \$1,662,500 |
| Probable Range of Construction Costs: | | | | \$1.6 | to | \$1.9 | Million |
| 3 | Extend Salems 21-inch interceptor on Cross Street along planned x-country corridor to Lowell Road, and construct south along I-93 corridor to Lowell Road. forcemain and 21" gravity interceptor to connect into existing 21" gravity interceptor at Cross St. Forcemain shall run from Rte. 111 (I-93 exit 3) and follow the interstate corridor to Lowell Rd. | 9,100 | 20,300 | Y | N | \$90 | \$1,827,000 |
| Probable Range of Construction Costs: | | | | \$3.0 | to | \$3.7 | Million |
| 4 | Sewer forcemain connection to existing 21" gravity interceptor at Cross St. Sewer corridor runs south along I-93 corridor and south on Cross Street (approx. 1800') to existing 21" interceptor. | | 28,000 | Y | N | \$95 | \$2,660,000 |
| Probable Range of Construction Costs: | | | | \$2.4 | to | \$2.9 | Million |
| 5 | Sewer forcemain connection to existing 12" sewer on Manor Parkway. A new gravity sewer would be installed on Stiles Road to Lowell Road. The 21-inch planned west side interceptor would be constructed from that point to Green Acre Drive. The 12" line on Manor Parkway may have available capacity (steep slope). This alternative may be favorable to Salem whereas potential to eliminate 2 pumping stations. | 15,200 | 12,800 | Y | N | \$90 | \$1,152,000 |
| Probable Range of Construction Costs: | | | | \$3.4 | to | \$4.1 | Million |

NOTES:

1. Opinions of Cost do not include collection system or Main Pumping Station. Cost are intended for comparism values only, representing magnitude of project cost for sewage conveyance from Rte 111 to Salem connection point, including 30% Eng. & Contingency