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MEMORANDUM

TO: Ben Pirri and Amy Pirri

FROM: Weston & Sampson

DATE: November 5, 2026

SUBJECT: Carlisle Town Center Wastewater Distribution System Process and Considerations: Feasibility Study, Phase I

Project Background

Weston & Sampson was retained by Ben Pirri and Amy Pirri (Proponent), project leaders and future operators of the historic Ferns Country Store (The Ferns, 8 Lowell Street) to perform a Feasibility Study to evaluate options to install wastewater infrastructure to transport sewage flows from Carlisle Town Center for treatment at the existing wastewater treatment facility (WWTF) located at Banta-Davis field (304 Bedford Road) and currently serving the Carlisle Public Schools. The facility is currently operating under Groundwater Discharge Permit #783-3, issued by the Massachusetts Department of Environmental Protection (MassDEP). The Carlisle Public School WWTF is permitted to discharge a maximum flow of 13,500 gallons per day (GPD) of treated effluent to the subsurface disposal fields located north-east of the WWTF. Phase I of the feasibility study included analysis of potential connections from the Ferns and the Gleason Public Library (22 Bedford Road), with consideration given for future connection of additional public facilities within the Town Center.

The Proponent is proposing to renovate and reopen the Ferns. The existing septic was designed for a flow of 970 GPD to treat wastewater from the property, which most recently included a modest café. Title 5 design flow criteria stipulates that for this use a new or updated septic system should be designed for a minimum flow of 1,000 GPD and will therefore require a new or updated system to reopen at previous levels of use. It is crucial to note that this does not account for any other prior or future uses at the property, including but not limited to retail or residential space. Space constraints and nitrogen loading limitations have previously been reported on and would add complexity, cost, and risks to water resources to any new or upgraded system for this property. At a minimum, the renovation would include the original design flow, plus that attributed to a 2-bedrooom apartment, giving an estimated design flow of 1,190 GPD. Depending on the final layout of the café and final renovation plans, design flow could be higher, and could include a 2-bedroom apartment, a 49-seat full-service café, and a 2,000 square foot retail store. Maximum buildout will be subject to the same approvals as lower estimates. For this maximum use case the design flow for this development is 2,035 GPD, based on Title 5 regulations.

The existing septic system was found to be inadequate for prior/existing use and both scenarios outlined above, thus requiring significant improvements to the system or a separate wastewater connection,

regardless of any significant increase in flow. Improvements or a separate connection will be required for even a relatively modest renovation of the property.

The Town of Carlisle has also expressed a desire to provide wastewater connections to public buildings within the area, beginning with the Gleason Public Library. Water use data obtained for the period between July 9, 2024 to July 14, 2026 shows average daily usage of 112 GPD.

With the shared interests of the Ferns and the Town of Carlisle, the feasibility study is primarily focused on providing wastewater infrastructure from the selected properties to the existing WWTF.

Feasibility Considerations

Weston & Sampson's analysis of the many factors involved with Phase I is described below. Among these factors, the following two are critical when determining a path forward.

WWTF Treatment Capacity

The feasibility of any proposed additional connections to the WWTF will primarily depend on the determination of existing treatment capacity as determined by MassDEP.

Effluent flows from the plant and water use data from the school have been obtained for the period from April 1, 2020 through September 30, 2026 and have been evaluated to confirm accuracy of data and to determine estimates of existing flows to/from the WWTF. A comprehensive analysis of potential connections and future flows will be necessary for required MassDEP permitting, as described later in this memo.

Comments received from MassDEP on November 2, 2026 and November 3, 2026 have confirmed that determination of proposed wastewater flow quantities to and remaining capacity at the WWTF shall be calculated as follows:

- Calculated design flow from the Gleason Public Library will be considered 200% of average daily water usage for at least a 2-year period. Water use data from July 9, 2024 to July 14, 2026 shows average water use to be 112 GPD. 200% of this figure gives a calculated design flow of 224 GPD.
- Title 5 regulations stipulate a design flow for the full buildout scenario at the Ferns will be 2,035 GPD.
- Many sources of data were analyzed to determine existing flow from the Carlisle Public Schools and ensure accuracy of effluent flow data provided. For each source, data from summer months (June-August), effluent data from the period between November 2025 and March 2026, and effluent data corresponding to periods where work was completed at the WWTF was removed to utilize data from periods where the school was at full occupancy, thus removing artificially low summer data from the analysis, and to expunge data determined to be erroneous.
    - In accordance with MassDEP's Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal (The Guidelines – July 2018), two data sets were analyzed to calculate available hydraulic capacity at the treatment plant:

- In accordance with section IV.B.1, paragraph 2 of the Guidelines, 2 years' worth of effluent flow data from the WWTF was examined to develop a baseline of the existing hydraulic load expected at the WWTF from the Carlisle Public Schools. Two (2) years of average flow may be considered to assess available capacity if the facility has flow equalization sized to accommodate peak flows. The average of 2 years' worth of daily effluent flow was considered to assess available capacity and provide the following result:
    - Excluding the periods noted above, effluent flow data from May 1, 2023 to September 30, 2026 was used to calculate an average daily effluent flow of 2,432 GPD.
- In accordance with guidance provided by MassDEP and section IV.B.1, paragraph 3 of the Guidelines, 2 years' worth of effluent flow data from the WWTF was examined to develop a baseline of the existing peak hydraulic load expected at the WWTF from the Carlisle Public Schools. The average of 2 years' worth of maximum daily effluent flow per month was considered to assess available capacity and provide the following result:
    - Excluding the periods noted above, effluent flow data from May 1, 2023 to September 30, 2026 was used to calculate an average of the maximum daily flow per month of 5,032 GPD.
- It is our understanding that the existing WWTF has a 7,000 gallon flow equalization tank. If in the determination of MassDEP the flow equalization capacity is sufficient to accommodate peak flows, it may be acceptable to set existing flow from Carlisle Public Schools at 2,432 GPD, as explained above. However, for the purposes of this study, and in compliance with direction offered by MassDEP officials, 5,032 GPD will be used for the calculation of unused or available hydraulic capacity at the WWTF.
    - As noted above and in accordance with The Guidelines, available capacity is calculated as follows:

	13,500 GPD	(permitted flow rate)
-	5,032 GPD	(average of max. daily flow per month)
	8,468 GPD	(available capacity)

- Water use data from May 2023 to September 2026 showed an average daily usage of approx. 1,872 GPD. Review and comparison of this data reinforced the accuracy of effluent flow data from this period and used in calculation of available capacity.
- Effluent meter readings and maintenance data from May 2023 to September 2026 was reviewed to ensure the accuracy of data used and to determine if any data should be excluded from use in the calculation of available capacity. As noted above, analysis resulted in the exclusion of effluent data from the period between November 2025 and March 2026 and also verified the accuracy of other time periods used for calculations.

As previously stated, at the time of permitting a final review and analysis of recent effluent flows, pump station flows, water use data, and analysis of the flow constituents for the proposed connections, including additional pollutant loading, if any, is needed. Please also note that, as stipulated in the Groundwater Discharge Permit, average annual flows above 80% of the WWTF's yearly design capacity may require additional reporting and potential modifications to the plant. With that said, at this stage and using analysis of data up to September 30, 2026, reported design flow for the Ferns at maximum buildout, 200% water use from the library, and the available capacity at the existing WWTF, it appears that adequate capacity exists at the WWTF to treat flows from the Ferns at maximum buildout, the Gleason Public Library, and Carlisle Public Schools.

	13,500 GPD	(permitted flow rate, WWTF)
-	5,032 GPD	(average of max. daily flow per month, Carlisle Public School)
	8,468 GPD	(available capacity, WWTF)
	2,035 GPD	(design flow, Ferns at full buildout)
-	224 GPD	(design flow, Gleason Public Library)
	6,209 GPD	**(remaining capacity after proposed connections, WWTF)**

It is important to note that the Proponent spoke with School Officials and future buildout could result in additional 1,000 GPD which would likely be able to be treated in the estimated available 6,209 GPD capacity at the WWTF remaining after future connection of the proposed properties.

Design Considerations

As a part of this study, analysis of conveyance strategies and routing was completed, including gravity sewer, pump stations and force mains, and low-pressure sewer. Routes were considered to convey wastewater from the Gleason Public Library to the WWTF.

Gravity Collection System: Three (3) distinct routes were analyzed for a majority gravity collection system. Minor variations of these routes were also considered and found to have same or similar drawbacks.

1. Starting on Bedford Road, in front of the Gleason Public Library, west on Bedford Road to School Street, south on School Street to Church Street, east on Church Street to Carlisle Public School entrance driveway, south along the driveway to discharge point at the existing wastewater pump station for the school and pumped via existing infrastructure to the WWTF.
    a. Lidar elevation data obtained through MassGIS shows that this route would require excessively deep sewers (up to 30 ft) and one (1) new pump station with associated force main, or more shallow sewers (6-7 ft) with no less than two (2) new pump stations with associated force mains.
2. Starting on Bedford Road, in front of the Gleason Public Library, south through the library parking lot, south cross country to Church Street, east on Church Street to Carlisle Public School entrance driveway, south along the driveway to discharge point at the existing wastewater pump station for the school and pumped via existing infrastructure to the WWTF.
    a. Lidar elevation data obtained through MassGIS shows that this route would require excessively deep sewers (up to 30 ft) and one (1) new pump station with associated force main, or more shallow sewers (6-7 ft) with no less than two (2) new pump stations with associated force mains.

   b. A utility easement will need to be acquired for the cross-country section of this route.

   c. The cross-country portion of this route includes hiking trails and mapped wetland resources

3. Starting on Bedford Road, in front of the Gleason Public Library, east on Bedford Street to Banta Davis Field entrance driveway, south along driveway to existing WWTF.

   a. Lidar elevation data obtained through MassGIS shows that this route would require excessively deep sewers (up to 40 ft) and one (1) new pump station with associated force main, or more shallow sewers (6-7 ft) with no less than two (2) new pump stations with associated force mains.

It is our determination that this conveyance method is not ideal for the proposed connections. Due to the issues outlined above, costs associated with permitting and constructing a majority gravity wastewater collection system within the study area will be excessively high and will be immediate. The town will also incur higher ongoing operations and maintenance costs in relation to other options. In addition to these, gravity systems allow for the possibility of infiltration and inflow (I/I) to enter the system. I/I is stormwater or groundwater that enters the system through illicit connections or defects that otherwise would not require treatment. Once combined with sewage flow, I/I requires treatment, reducing excess WWTF capacity over time. With limited existing treatment capacity, this is a major concern for the future.

Wastewater Pump Stations and Force Mains: One (1) route was analyzed for a collection system comprised primarily of pump stations and pressure force main. The same route was also discussed and analyzed in a recent study by Beals Associates, Inc.

1. Starting on Bedford Road, in front of the Gleason Public Library, south through library parking lot via gravity main to new pump station in parking lot, south cross country to Church Street, east on Church Street to Carlisle Public School entrance driveway, south along the driveway to discharge point at the existing wastewater pump station for the school and pumped via existing infrastructure to the WWTF.

   a. Lidar elevation data obtained through MassGIS shows that this route would require one (1) new pump station with associated force main and three (3) access manholes for air release valves or cleanouts.

   b. Space is limited within the library property and potential sites for the new pump station are adjacent to mapped wetland resources and foundations of historic properties.

   c. A utility easement will need to be acquired for the cross-country section of this route.

   d. The cross-country portion of this route includes hiking trails and mapped wetland resources

It is our determination that this conveyance method is not ideal for the proposed connections. Due to the issues outlined above, costs associated with permitting and constructing a collection system comprised primarily of pump stations and pressure force main within the study area will be high and immediate. The pump station will need to be sized for future connections from the start, adding additional initial cost. The town will also incur higher ongoing operations and maintenance costs in

relation to other options. Furthermore, in order to expand the system to allow for additional connections, gravity or pressure sewer will need to be extended and connected to the new pumping station. As before, gravity sewer allows for the possibility of I/I to enter the system, needlessly using up limited treatment capacity at the WWTF.

Low Pressure Sewer and Grinder Pumps: One (1) route was analyzed for a collection system comprised primarily of low-pressure sewer and grinder pumps.

1. Starting on Bedford Road, in front of the Gleason Public Library, west on Bedford Road to School Street, south on School Street to Church Street, east on Church Street to Carlisle Public School entrance driveway, south along the driveway to discharge point at the existing wastewater pump station for the school and pumped via existing infrastructure to the WWTF.
    a. Lidar elevation data obtained through MassGIS shows that this route would require three (3) air release valves or cleanouts.
    b. Each connection requires a grinder pump unit complete with manhole for storage, electrical, and alarms. Adjacent properties may share a unit. Grinder pump units have numerous installation options, including both indoor and outdoor.

Through analysis of the three (3) conveyance methods outlined in this section, it is our determination that a low-pressure sewer and grinder pumps are the best method to convey wastewater beginning in front of the Gleason Public Library to the existing WWTF. When compared to other methods, clear advantages to this method stand out and are outlined below:

- Construction and permitting costs
    - Low-pressure sewer does not require consistent, downhill slope as with gravity systems and can therefore depth can be adjusted up or down to account for surface or bedrock elevation changes.
    - Similar to pump station/force mains, relatively high and low points in the main will require either a cleanout or air release valve. For the pump station/force main, these require a full sized (typically 4 ft diameter) manhole structure. For low pressure sewers, they are much smaller, similar in size to a water shutoff valve box (typically less than 1 ft diameter.
    - Low pressure main will not cross adjacent wetland resources.
    - Grinder pump units are much smaller than pump stations/wet wells and have various options for installation, while still providing storage in case of power or equipment failure. This size and flexibility simplify permitting and construction.
    - Grinder pump units can be installed as connections are approved and allow for a highly modular system. Costs for this do not need to be incurred all at once and can be spread out as needed.
    - Costs for grinder pumps and service laterals for private connections are typically borne by the property owner.

- Operation and maintenance costs
    - Operation and maintenance costs for a low-pressure system are estimated to be much lower than those of other methods. Current manufacturers estimate operation and service costs of the grinder pump units to be less than $70.00 per year. The mean-time between service calls is stated to be between 8 and 10 years. This information was obtained from Environment One Corporation (E/One).
    - Major repairs are much less expensive than other methods. The need for a major pump rebuild has proven to be between 15 and 20 years and typically costing between $1,000 and $3,000. This information was obtained from Environment One Corporation (E/One).
    - Costs for repair, operation, and maintenance of private grinder pump units is typically borne by the property owner.
- Miscellaneous
    - Low-pressure systems eliminate potential I/I from the system, preserving already limited capacity of the system.
    - Piping required for this type of system is much smaller than other methods. It has been estimated that a single, 2-inch main will likely have sufficient capacity to convey all potential flow up to the remaining treatment capacity of the WWTF.
    - Considering existing excess treatment capacity at the WWTF, potential connections to the collection system can be made to one low-pressure force main as they are approved. Stubs for future expansion and/or connections will be installed where needed as the main is installed. If consideration for a large expansion of treatment capacity is needed, it is possible to install a second, dry main in the same trench to minimize future construction costs and disruption.

MassDEP Approval and Permitting

Approvals from MassDEP are required when adding additional connections or making modifications to existing WWTFs governed by a groundwater discharge permit. Analysis of wastewater flows from September 2026 through permitting and design, and the wastewater components of those flows will be necessary in order to move forward. The Proponent and representatives from the Town of Carlisle have been in discussions with representatives from MassDEP, and they have overall been receptive to potentially adding additional connections to the system, have provided ongoing review and comments of flow calculations, and have stated that a BRP WP 11 – Groundwater Discharge Renewal with Plan Approval is required. The completed wastewater analysis and preliminary plan will be a major component of this submittal and subsequent approval.

Preliminary Feasibility Conclusions

It is important to stress that a complete review by MassDEP of the factors that will determine feasibility is not yet complete. Additionally, any discussion of feasibility hinges on MassDEP approvals, including but not limited to the BRP WP-11 permit. Both tasks are within the design scope.

At this stage, based off the preliminary analysis it appears that a connection to the WWTF is feasible based on flow data as described above and the outcome of discussions held between MassDEP, the Town of Carlisle, and the Proponent. It is also appears that a low-pressure sewer option is the most feasible method for the new connections. This method bypasses the need for additional new pump stations which are large and costly to build and operate, avoids construction through nearby wetland resources, eliminates the need to obtain easements, minimizes/eliminates infiltration/inflow, is easier to construct, and allows for a simpler approach to additional future connections to the system.

Once approvals are obtained from MassDEP, the next step in determining feasibility of this effort is availability of funding for final design, construction, etc. In addition to Town funding, SRF loan, grant opportunities, and other funding sources are available for both design and construction and will be evaluated as a part of the ongoing feasibility study.

Design Process and Considerations

Final design will encompass the shared wastewater infrastructure in the public right-of-way, stub connections for potential future expansion to additional public buildings, paving, restoration, the service connection to the Gleason Public Library, including piping, grinder pump, and electrical evaluation, and other related construction. Please see the attached Figure 1 for a preliminary layout of the routing for public wastewater infrastructure. Any costs or design for the private Ferns connection are not included and shall be completed under a separate, privately funded effort. Funding for the design is the next step in moving the project forward and has been estimated to be between $225,000 and $300,000. In addition to Town funding, SRF loan, grant opportunities, and other funding sources are available for final design. It is recommended that these additional funding sources be explored. Preparation and submittal of suitable grant applications for design is not included in the current feasibility scope.

Once funding is approved, analysis performed during the feasibility study, along with any needed preliminary plans, will be used to obtain approvals and submit permit applications required by MassDEP for the proposed connections. As previously stated, MassDEP approval is required for completion of the project.

Concurrent to the permitting effort, the Final Design phase will involve investigations into the existing conditions of the proposed project route, including subsurface and environmental investigations and site survey. These tasks are essential to providing insight into many factors affecting design and eventual construction costs, including but not limited to depth to bedrock, soil and groundwater conditions, proximity to wetland resources, and conflicts with existing utilities.

All information collected to date will then be utilized in preparing contract plans and specifications. These documents are used first to obtain additional permits and approvals, including from local boards such as the Carlisle Conservation Commission and the Historical Commission. Once all approvals are obtained, the documents will constitute a complete package of contract documents, ready for bid and award of construction. Costs for assistance for bid and award have been included in the Final Design scope.

While preparing the contract documents, an opinion of probable construction costs will also be determined and provided, along with an estimate of operations and maintenance costs for the new system. With a final cost estimate laid out, the final step to project construction will be that of construction

funding. Loan and grant opportunities are also available for construction. The scope of the design task includes research, preparation, and submittal of up to two (2) grant applications.

With all data and contract documents in hand, the Town will also need to determine how they wish to administer and manage this new infrastructure. This may include items such as connection processes and fees, sewer use rules and regulations, usage fees, and/or any needed legal agreements between parties.

Construction Process and Considerations

As previously stated, obtaining funding for project construction and completion will be the next step. Currently, the estimate for construction is between $460,000 and $1,100,000. This construction cost range does not include any costs associated with the private Ferns connection. The tasks completed under the Final Design phase will narrow this range considerably and give a better understanding of construction costs. In addition to physical construction of the new system, it is important to note that the given estimate includes full-time construction administration services and police details.

Conclusion

To date, the privately funded feasibility study has produced promising results, but analysis and approval from regulators is required throughout the Final Design phase of work. Progress has shown us that there is capacity for additional flow to the WWTF and that a low-pressure sewer system will allow for a cost effective and expandable system to transport wastewater. Discussions with MassDEP have also demonstrated their willingness to consider additional connections.

Wastewater connections to the existing WWTF are a feasible approach for treatment of wastewater from the study area. Demonstrated excess capacity at, and connection to, the plant would immediately eliminate the need for septic systems at the Ferns and the Gleason Public Library pending regulatory approval. The proposed system is modular and will allow for future connections from additional public buildings and businesses, providing treatment capacity exists and regulators approve. If connected, septic systems, and their associated footprint, will be eliminated from these properties as well. Similar projects have proven successful in other communities in the Commonwealth but are each unique to their own circumstances.

We acknowledge that the tasks listed above, and their associated costs, are significant but the potential benefits need to also be taken into consideration. Business development, Town Center modernization, and community preservation are most visible. Less visible are the potential risks associated with failing septic systems, including repair/replacement costs and risks to groundwater, drinking water, and natural resources. The cost/benefit determination and funding options are crucial decisions involved with project completion.

The next step in this process will be allocating funds for the design and permitting of the proposed system. It will be determined at the Fall 2026 Special Town Meeting, with debate and votes by the residents of the Carlisle, whether or not Town funds will be used for the design phase of the project.

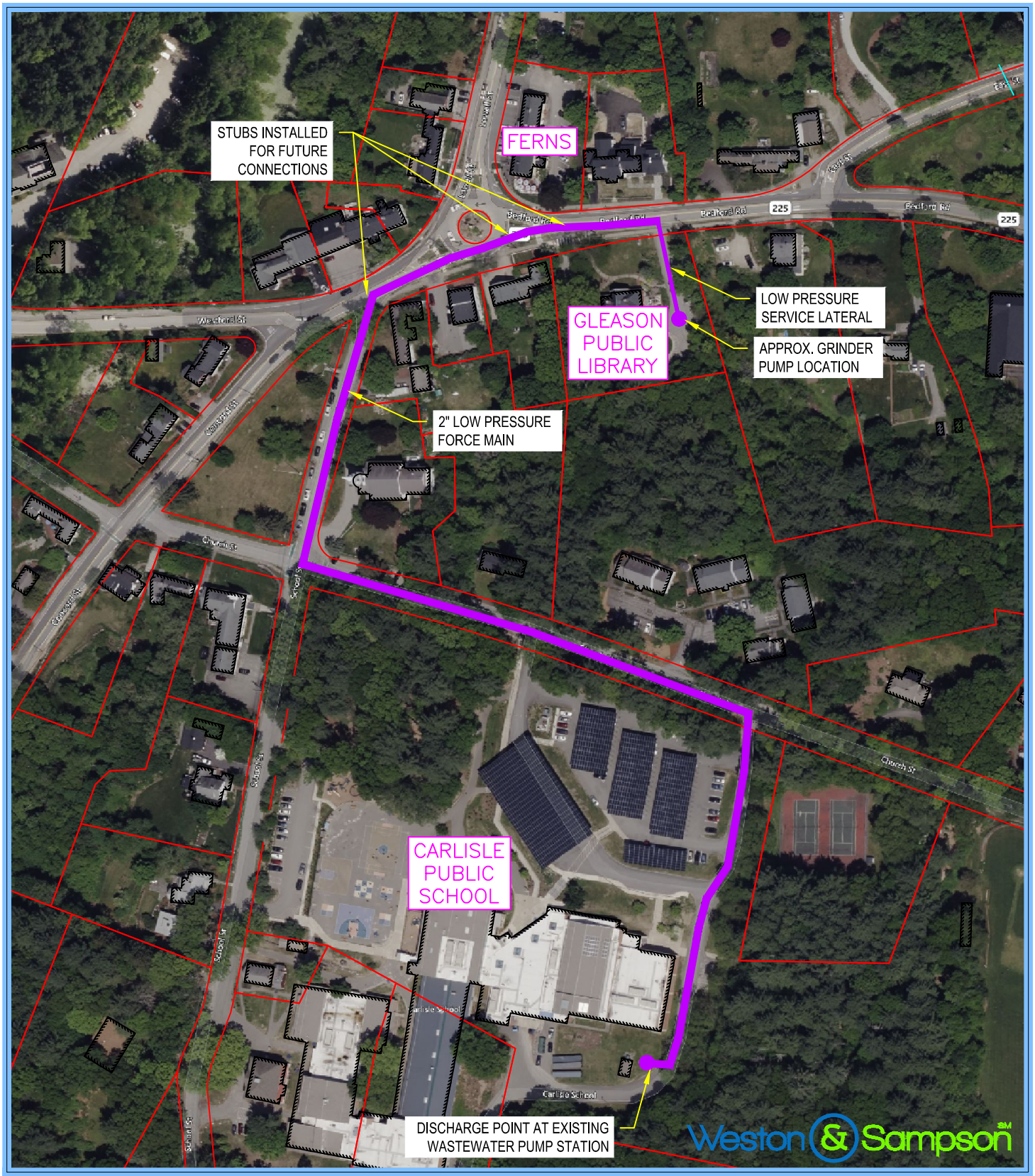

FIGURE 1
CARLISLE, MA
CARLISLE CENTER SEWER EXTENSION
PRELIMINARY SEWER ROUTE
NOT TO SCALE

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