Branchville Wastewater Treatment Options

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COPY:

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1 Proposed Development Schemes

In order to better evaluate sanitary sewer options, the following three development scenarios were considered:

1. 25 units of an average of 1.5 bedroom residential development + 10,000 sf new retail/restaurant
2. 50 units of an average of 1.5 bedroom residential development + 15,000 sf new retail/restaurant
3. 100 units of an average of 1.5 bedroom residential development + 20,000 sf new retail/restaurant

Conservatively assuming that generated wastewater flows are 3 people/residential unit using 75 gallons/person/day, and 0.1 gallons per day/square foot for retail/office, potential flow rates range from 6,625 gpd to 24,500 gpd.

2 Existing Wastewater Treatment Plants

There are three existing wastewater treatment plants in the Branchville area:

1. South Street Wastewater Treatment Facility
2. Route 7 Wastewater Treatment Facility
3. Georgetown Wastewater Treatment Facility

The three wastewater treatment plants each have positive and negative aspects associated with them.

2.1 South Street

The South Street WWTP is located on South Street, east of the downtown business district. The treatment plant provides service to Sewer District No. 1, which includes downtown Ridgefield and the residential areas surrounding the downtown area. The Town is currently undergoing preparation of a Wastewater Facilities Plan for this facility, which includes the design and construction of an eventual upgrade of the plant. Therefore, it is feasible to assume that capacity for the Branchville area would be available at this plant when the treatment facility is upgraded.

There are two potential routes to connect the Branchville area to this plant. The first is to extend south from the existing sanitary sewer mains on Sunset Lane, and then follow the Ridgefield Rail Trail to Route 102, and then southeasterly along Route 102 to the Branchville area.

The second option is to extend south from the existing sanitary sewer mains in Prospect Ridge Ridge Road, and then continue along Route 102 southeasterly to the Branchville area. Connection to the South Street plant would require the construction of 2.8 to 3 miles of sanitary sewer force main, at an estimated cost of $4.4 million to $6.3 million. The Sewer District would also need to be expanded to incorporate the Branchville area.

2.2 Route 7 Treatment Plant

The Town of Ridgefield owns and operates a second treatment plant located on Ethan Allen Highway (U.S. Route 7) behind the medical office building. This plant treats sewage generated by Sewer District No. 2, which includes a majority of the businesses along U.S. Route 7 north of Great Pond Road. Treatment capacity at this plant is fully allocated, and the facility cannot accept any new flows unless the plant is expanded or existing flow capacity reallocated to the Branchville area. Service could be extended to the Branchville area by construction of a force main from the plant 3.4 miles southward along U.S. Route 7. Estimated cost of this extension is $7.2 million. The Sewer District would need to be expanded to incorporate the Branchville area.

2.3 Georgetown Wastewater Treatment Plant

The Georgetown WWTP is located slightly over a mile from the Branchville area, and offers by far, the shortest connection length. The connection would be extended north from the Georgetown WWTP, up along North Main Street to Church Street, and then northerly along U.S. Route 7. The cost of this connection is estimated to be $2.5 million.

Treatment capacity at this plant is also fully allocated, and the facility cannot accept any new flows unless the plant is expanded or existing flow capacity reallocated to the Branchville area. Additionally, since the plant is located in Redding, an intermunicipal agreement with the Town of Redding would be required.

3 Package Treatment Plant Options

A package treatment plant is a local treatment plant designed to treat small flows. They are often available in pre-fabricated modular units. These treatment plants are best suited for subsurface discharge (similar to a septic system), as opposed to surface discharge to a river or stream (similar to the existing treatment plants). Discharges to surface waters have much more stringent regulatory requirements, including effluent treatment limits, which can make them cost prohibitive. Subsurface disposal plants have much lower permitting requirements, however, the receiving soils must be conducive to subsurface discharge. The more favorable the soils, the smaller and less costly the package treatment plant will be.

3.1 Soil Suitability

Initial screening of the soil types in the project area at the start of this project was based solely upon a review of information included in the NRCS Soil Survey. This review concluded that soils in the area were generally limited for subsurface sewage disposal. However, during the charrette meetings, we were informed that there are pockets of suitable soil in the area. Additionally, discussions with the Health Department revealed that there are no known failing septic systems in the area.

Soils in the study area include Ridgebury, Saco and Rippowam soils which are poorly drained and typically found in wetland areas. Ridgebury soils are typically found on slopes between 0 to 8 percent. This component is on depressions on uplands. The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, densic material, is 14 to 32 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 10 percent.

Hinckley soils are found on both sides of U.S. Route 7 south of Route 102, as well as at the intersection of Route 102 and Playground Road. The Hinckley component makes up 40 percent of the map unit. Slopes are 3 to 15 percent. This component is on eskers on valleys, kames on valleys, outwash plains on valleys, terraces on valleys. The parent material consists of sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent.

Udorthents, soils whose composition is unknown because of fill deposition, but are generally well draining occur at the Route 102 / U.S. Route 7 intersection, dividing the two pockets of Hinckley soil described above. The little league field behind the CVS was mentioned by the First Selectman as a site that was believed to have suitable underlying materials. The Udorthents component makes up 50 percent of the map unit. Slopes are 0 to 25 percent. This component is on urban land. The parent material consists of drift. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded

The balance of soils in the project area are Charlton – Hollis complex soils, which are loamy and rocky, with shallow bedrock depths and bedrock outcrops.

Reviewing the soil survey in greater detail reveals that the soils most suitable for subsurface disposal are Hinckley soils. These soils are classified as a loamy sand, and fall into Hydrologic Soil Group A, which is well-drained. However, potential issues of concern also exist in these areas specifically in regards to the depth to groundwater and depth to bedrock. Shallow groundwater and/or bedrock in these areas may preclude the use of subsurface systems. It may be necessary to raise the grade by bringing in suitable fill material to create the clearances needed for subsurface disposal.

3.2 Regulatory Requirements

Since under all development scenarios, the discharge would exceed 5,000 gpd, the package treatment system would also be subject to review and approval by of the Connecticut Department of Energy and Environmental Protection.

3.2.1 Downgradient Sensitive Receptors

CTDEEP Guidance for Design of Large-Scale On-Site Wastewater Renovation Systems requires that a travel time of 56-days be provided between the subsurface wastewater absorption system (SWAS) and sensitive receptors (e.g. the outer limit of the cone of depression of a public drinking water supply well, a surface water body used, or intended to be used, as a source of public drinking water supply, a private drinking water supply well serving an individual residence, or an impoundment used for aquaculture) and a 21-day travel time be provided to all other points of concern. The Norwalk River is classified as Surface Water Quality Class B Class B designated uses are habitat for fish and aquatic life and wildlife and recreation. Cooper Pond Brook is Class A, which designated uses include habitat for fish and other aquatic life and wildlife and recreation, and potential drinking water supplies. Travel times to these receptors will require further detailed study.

3.2.2 Soil Testing

Our review of the surficial materials and soils mapping indicates that the area is a mixture of Charlton, Udorthents and Hinckley Soils. Our prior experience with Charlton soils indicates that they are often poorly suited for groundwater discharge systems. Conversely, udorthents are generally defined as areas where the existing soils have been disturbed and fill materials have been imported to overlay the virgin substrate material.

The soils will need to be tested for depth to groundwater to evaluate the seasonal high groundwater elevation. Additionally, the hydraulic conductivity of the soil will also need to be evaluated.

3.2.3 Groundwater Mounding Analyses

CTDEEP regulations require that a three foot vertical separation be provided between the bottom of the subsurface wastewater absorption system and the groundwater mound as a result of the wastewater discharge.

3.3 Sites with Best Potential

The sites with the best potential based upon our secondary screening are those properties located in Udorthents or Hinckley soils areas. Priority should be given to Town-owned properties for further exploration. The only Town parcel meeting this requirement in the study area is at Branchville Elementary School.

Additional large parcels can also be considered for potential sites are the little league field, and the parcel immediately north at 34 Playground Road. The little league field provides more separation distance to watercourses, although the soils may be more suitable on the 34 Playground Road parcel.

3.4 Potential System Alternatives

A potential system could be the Amphidrome system which is on CTDEEP's approved list of alternative sewage treatment systems. The Amphidrome system is a biological nutrient removal (BNR) process utilizing a submerged attached growth bioreactor operating in a batch mode. The deep, bed sand filter is designed for the simultaneous removal of soluble organic matter, nitrogen and suspended solids, within a single reactor.

To achieve simultaneous oxidation of soluble material, nitrification, and denitrification in a single reactor, the process must provide aerobic and anoxic environments for the two different populations of microorganisms. The Amphidrome system utilizes two tanks and one submerged attached growth bioreactor, subsequently called Amphidrome reactor. The first tank, the anoxic/equalization tank, is where the raw wastewater enters the system.

The tank has an equalization section, a settling zone, and a sludge storage section. It serves as a primary clarifier before the Amphidrome reactor.

This Amphidrome reactor consists of the following three items: underdrain, support gravel, and filter media. The underdrain, constructed of stainless steel, is located at the bottom of the reactor. It provides support for the media and even distribution of air and water into the reactor. The underdrain has a manifold and laterals to distribute the air evenly over the entire filter bottom. The design allows for both the air and water to be delivered simultaneously, or separately, via individual pathways, to the bottom of the reactor. As the air flows up through the media the bubbles are sheared by the sand; producing finer bubbles as they rise through the filter. On top of the underdrain is 18", (five layers), of four different sizes of gravel. Above the gravel is a deep bed of coarse, round, silica sand media. The media functions as a filter; significantly reducing suspended solids, and provides the surface area for which an attached growth biomass can be maintained.

To achieve the two different environments required for the simultaneous removal of soluble organics and nitrogen, aeration of the reactor is intermittent, rather than continuous. Depending on the strength and the volume of the wastewater, a typical aeration scheme may be three to five minutes of air and ten to fifteen minutes without air. Concurrently, return cycles are scheduled every hour, regardless of the aeration sequence. During a return, water from the clear well is pumped back up through the filter and overflows into the return flow/backwash pipe. A check valve in the influent line prevents the flow from returning to the anoxic/equalization tank, via that route. The return flow/backwash is set at a fixed height above both the media and the influent line; and the flow is by gravity back to the front of the anoxic/equalization tank.

The cyclical forward and reverse flow of the waste stream, and the intermittent aeration of the filter, achieve the required hydraulic retention time and create the necessary aerobic and anoxic conditions to maintain the required level of treatment.

The following is a partial list of approved and installed Amphidrome Wastewater Systems in Connecticut:

- District 17 Middle School, Killingworth, CT
- The Mews Condominiums, Madison, CT
- Daniel Hand High School, Madison, CT

Document2