Hallocks Mill Sewer District Sewer Service Extensions and Crystal Lake Pump Station Improvements

Town of Yorktown, NY

GHD | One Remington Park Drive, Cazenovia NY 13035 USA

11144247 | April 2018

HALLOCKS MILL SEWER DISTRICT SEWER SERVICE EXTENSIONS

AND CRYSTAL LAKE PUMP STATION IMPROVEMENTS

TOWN OF YORKTOWN, NY

Prepared for

TOWN OF YORKTOWN, NY

Prepared by

GHD CONSULTING SERVICES INC.
One Remington Park Drive
Cazenovia, NY 13035

April 2018

Project No. 11144247

Table of Contents

Tables

Figures

Hallocks Mill Sewer Service Extensions

Crystal Lake Pump Station Improvements

Appendices

1. Executive Summary

The Hallocks Mill Sewer District (HMSD), located in the northeast portion of the Town of Yorktown, Westchester County, NY, is partially sewered. Unsewered areas of the HMSD are serviced by residential septic systems which have generally been installed on small lots with steep slopes and environmental constraints which are not ideal for septic system performance. There have been reported occurrences of septic system failures within unsewered areas, as well as information indicating unreported failures have also occurred.

Septic system failures within the HMSD have the potential to create an environmental and public safety hazard. The Town of Yorktown and the HMSD are part of the New York City (NYC) Croton watershed, which supplies drinking water to NYC. Septic system failures in the HMSD could potentially contaminate ground and surface water in the area with septage. Through this potential contamination, wastewater, bacteria, and excess nutrients may enter the Croton watershed, influencing the NYC drinking water supply.

In consideration of unsewered residents, the frequency of septic pumpouts, and the potential impacts of septic failure within the HMSD, the Town of Yorktown has retained GHD Consulting Services Inc. to complete a schematic design report for sewer service extension in selected subareas (Figure 1). Those subareas include Sunrise Street, Sparkle Lake, Birch Street, Ridge Street, Broadview Road, and Carolina Road. The areas were evaluated for projected wastewater flows, the suitability of gravity or low pressure sewer, anticipated main diameters, and constructability.

Sewer service extensions on Sunrise Street and Granite Springs Road will result in additional flows being conveyed to the Crystal Lake Pump Station. Several pieces of mechanical equipment at the pump station are reaching the end of their design life and are placing an increased maintenance burden on operations staff. Due to concerns for the station's capacity and aging components, an assessment has been performed to further define the condition and provide recommendations for improvements.

Based on information provided by the Town of Yorktown, site inspections by GHD staff, record drawings, previous studies, and our assessment as detailed in this report, the following improvements are recommended as part of this project:

1. Extend sewer service to unsewered areas selected for this evaluation using a combination of gravity and low pressure sewer service, as described herein.
2. Make improvements to the Crystal Lake Pump Station including replacement of mechanical equipment (i.e., pumps, accessories), generator, process controls, lighting, electrical, HVAC, architectural, and miscellaneous equipment.

2. Project Background and History

The Hallocks Mill Sewer District (HMSD) is located in the northeast portion of the Town of Yorktown, Westchester County, NY. The HMSD was established as a sewer service area to provide for the wastewater needs of the hamlet of Yorktown Heights and surrounding areas. Portions of the District were sewered with the intention that the remaining areas within the District would eventually be sewered. Collected wastewater is treated at the Yorktown Heights Water Pollution Control Plant (WPCP). The plant effluent discharges to Hallocks Mill Brook, which flows to the Muscoot River and ultimately the New Croton Reservoir, which is part of the New York City (NYC) Croton watershed.

Septic system failures within the HMSD are a significant concern. Unsewered subareas of the HMSD consist of small lots with steep slopes and environmental constraints that do not provide ideal conditions for septic system operation. Residents in these and other subareas have requested sewers be constructed to serve their subareas.

The Westchester County Department of Planning outlines the number of failures and septic system pumpout frequency in a presentation entitled "Septic Pumpout Initial Review," 2015. A slide from this presentation with information specific to the Town of Yorktown has been included in Appendix B. Septic pumpout data utilized in the presentation was provided by the Westchester County Department of Health. The data was compiled from 2007 through 2015 from various locations within the County, including the Town of Yorktown. During this period, over 400 septic system pumpouts were conducted within the unsewered subareas of the HMSD, but only 6 septic system failures were reported within the Birch Street subarea and 1 reported within the Sparkle Lake subarea. The number of pumpouts in relation to the number of septic system failures reported indicates that septic system failures are, for the most part, not being reported.

Septic system failures within the HMSD have the potential to create an environmental and public safety hazard. The Town of Yorktown and the HMSD are part of the New York City (NYC) Croton watershed, which supplies drinking water to NYC. Septic system failures in the HMSD could potentially contaminate ground and surface water in the area with septage, through this potential contamination, wastewater, bacteria, and excess nutrients may enter the Croton watershed, influencing the NYC drinking water supply.

A report titled *"Hallocks Mill Sewer District Sewer Service Extensions"* was completed by GHD in February 2010 which evaluated potential sewer extensions within the Town to provide sanitary wastewater service to additional residents. The results of the report have been evaluated and approximately 57,000 linear feet (660 to 680 residences) of sewer extensions for the Sparkle Lake, Sunrise Street, Birch Street, Ridge Street, Broadview Drive, and Carolina Road subareas have been selected to progress through schematic design. It is anticipated that sewage flow will be directed to the WPCP.

In addition to the sewer extensions, the Crystal Lake Pump Station has components which must be upgraded to reliably accommodate wastewater flow from additional users. Several pieces of mechanical equipment are reaching the end of their design life and placing an increased maintenance burden on operations staff. GHD performed a review of existing pump station information. Based on available documentation provided by the Town and manufacturer's

representatives, visual inspection, and discussions with Town personnel, recommendations for pump station upgrades have been incorporated into this report with an opinion of probable cost. Probable construction costs are in 2017 dollars.

A report titled *"Hallocks Mill Sewer District Flow Monitoring and Capacity Analysis"* was completed by GHD in February 2012 which evaluated existing sewers and summarized interceptor hydraulics based on computer modeling. The 2012 report suggested that existing sewers receiving additional flow from service extensions may exceed their calculated capacity, resulting in surcharging. The Town will need to proceed with the completion of applicable improvements to existing sewers prior to the construction of expanded sewer service as described in this report.

3. Hallocks Mill Sewer District Sewer Service Extensions

3.1 Site Information

The HMSD is located in the northeast portion of the Town of Yorktown, Westchester County, NY. Portions of the District were initially sewered with the intention that the remaining areas within the District would eventually be sewered. Approximately 1,404 parcels out of 5,164 in the HMSD are unsewered (Table 3-1).

The February 2010 *"Hallocks Mill Sewer District Sewer Service Extensions"* (2010 HMSD Extensions Report) established the Sunrise Street, Sparkle Lake, Birch Street, Ridge Street, Broadview Road, and Carolina Road subareas as high priorities for sewer service extensions based on identified and potential septic failures. Approximately 670 unsewered parcels are located in these subareas (Table 3-2). Multiple residential units, such as multi-family housing or apartments, may be located on a parcel. Based on a review of the Town of Yorktown's online 2016 tax parcel data and aerial imagery, units in the six subareas appear to be primarily classified as single-family residential.

These subareas currently utilize septic systems for residential wastewater treatment, but consist of small lots with steep slopes and environmental constraints that do not provide ideal conditions for subsurface treatment systems. Residents in these subareas have requested that the Town construct sewers to serve their parcels, as discussed in the 2010 HMSD Extensions Report.

Table 3-1 Hallocks Mill Sewer District Parcel Count

Hallocks Mill Sewer District Summary	Parcels
Parcels within Sewer District	5,164
Parcels connected to HMSD sewer	3,562
Undevelopable parcels	198
Unsewered parcels	1,404

Table 3-2 Hallocks Mill Sewer District Subarea Parcel Count

Hallocks Mill Sewer District Subareas	Parcels
Sunrise Street	26
Sparkle Lake	65
Birch Street	342
Ridge Street	164
Broadview Road	46
Carolina Road	23

Preliminary sewer system configurations were created based on the Town of Yorktown online 2016 tax parcel data, survey data, and the 2010 HMSD Extensions Report. Figure 1 presents an overview of the HMSD with a preliminary system configuration for each subarea. In many subareas, a combination of both types of sewers is recommended due to elevation constraints. Preliminary sewer configurations for each subarea are described herein and further depicted in Figures 2 through 4.

New service extensions will be connected to the existing HMSD gravity sewer system at various locations. Collected wastewater will be treated at the Yorktown Heights WPCP. The plant effluent discharges to Hallocks Mill Brook, which flows to the Muscoot River and ultimately the New Croton Reservoir, part of the NYC Croton watershed.

3.1.1 Survey Data

A detailed survey of the streets within the selected subareas is being conducted (by others) concurrently with the preparation of this report. The survey will include identification of existing utilities and gradelines of the selected subareas, and ground-based imaging will be used to determine elevations at the frontage of each residence. Westchester County GIS data will be relied upon in areas where data is incomplete. The completed survey is to be used during detailed design. Survey data will be based on North American Vertical Datum 1988 (NAVD88).

3.1.2 Geologic Conditions

The general surficial geology of the area is mapped as glacial till materials with a thickness of up to 30 meters. Glacial till materials are an unsorted mixture of sand, gravel, silt, and clay. The bedrock geology is mapped as biotite granitic gneiss. Per the USDA Soil Survey, the soils in this area are mapped as well-drained Urban and Paxton soils, gently sloping to moderately steep. The rate of water movement is moderate in the surface layer and subsoil

Ten borings were completed in the area to provide preliminary soils information (Appendix C). The borings were extended to 20 feet in general and encountered fine sand, silt, and gravel. The soils are classified as glacial till in each boring. In Boring B-1, water was observed at 9 feet deep at the completion of boring; no water was encountered in Borings B-2 through B-10. The water level observed may be due to levels not having been stabilized and may not be representative of the groundwater table in the area. Note that groundwater level may vary based on the weather and seasonal changes.

General soil characteristics were similar in areas where preliminary soil borings were performed. Based on preliminary information, construction characteristics will be similar in the selected subareas. Excavations for sewer infrastructure installation are anticipated to be approximately 6 to 10 feet deep for the majority of linear construction. The compact glacial till soils recorded by soil borings are appropriate for open-cut construction.

Excavation, foundation construction, and backfilling activities should be performed in a dry environment and according to OSHA standards. Based on boring log information, it appears that most construction activities will not encounter water. However, seasonal changes in groundwater level have not been investigated and could influence construction, especially at depths below

20 feet. As a preliminary observation, water encountered may be removed with sumps and pumps if necessary. Subgrades should be graded to prevent ponding and to promote drainage away from construction and traffic activities.

Based on boring logs, bedrock was not encountered; however, decomposed schist, a weathered bedrock which is easily broken apart, was observed in Boring B-10. The boring was able to proceed through the decomposed schist. However, this may indicate that bedrock is present at deeper depths and that schist or granite gneiss would be typical of the bedrock mapped in this area. Based on the information in the boring logs, a large amount of rock removal is not anticipated during sewer installation at depths of 6 to 10 feet. Bedrock may be encountered during installation of sewer at depths greater than 10 feet. Further soil borings, and potentially rock cores if bedrock is encountered, are recommended to be performed during detailed design to confirm the amount of rock removal that may be anticipated.

3.1.3 Environmental Resources

Environmental impacts have been considered during the schematic design process and preventative measures will be addressed further during detailed design to avoid and minimize adverse environmental impacts during construction. The project will be reviewed per the requirements of the State Environmental Quality Review (SEQR) Act to determine if it will have a significant impact on surrounding environmental resources or areas of historical significance. Environmental resources in the project area have been identified on Figure 5.

An extension of utility distribution facilities classifies as a Type II action as specified in 617.5 of SEQR regulations. Based on preliminary review, this project is anticipated to be classified as a Type II action under SEQR. A coordinated review, which is a process under the SEQR Act in which involved agencies perform an integrated, parallel environmental review, will be performed during detailed design to address potential concerns, interests, and comments from involved agencies. The Town of Yorktown is required to be the lead agency per SEQR requirements. The Town will determine the significance of the interests and concerns in the scoping of an Environmental Impact Statement if it is determined to be required under SEQR. The coordinated review process is anticipated to result in a negative declaration being issued by the Town.

Clean Water State Revolving Fund and New York State Environmental Facilities Corporation funding may require that an environmental review be performed despite a project being classified as a Type II action. Based on the scope of the project, the environmental resources in the project area (Figure 5), and GHD's experience, an environmental review will be required. Completion of a Long Form SEQR and Environmental Assessment Form should be anticipated during detailed design. If the Town pursues alternate sources of funding, the environmental review requirements of those funding agencies will be assessed at that time.

3.2 Ownership and Service Area

Roadways and existing sewers anticipated to be disturbed during construction in the six unsewered subareas are owned by the Town of Yorktown, NY. The Town owns from the centerline to the right-of-way within roadways. The remaining property anticipated to be disturbed is owned by

landowners and residents of the Town. These persons will be contacted by the Town during detailed design to discuss access and other logistics for service installation.

Easements are anticipated for the proposed gravity main in the Birch Street subarea (discussed in Section 3.6.1) which would cross approximately six properties south of Linden Place and discharge to the existing sewer main on Granite Springs Road. Alternatives have been considered and detailed in this report, but have been determined to be cost prohibitive. Individual landowners will be contacted by the Town during detailed design to discuss establishing easements before the start of construction.

3.2.1 Population Projection

U.S. Census Bureau data from years 2000 and 2010 show a slight decline in the Town of Yorktown's population (36,318 to 36,081) with a projected increase in population after 2010. Data from Cornell University's program on applied demographics indicates that the population of Westchester County, as a whole, is anticipated to grow by approximately 1.4 percent between 2015 and 2025. At this time, there are very few remaining undeveloped lots and no known planned development within the subareas to be sewered. A significant population increase is therefore not anticipated in the subareas discussed in this report.

This project is not intended to promote growth within the Town; rather, it is intended to expand sewer access to parcels with environmental constraints which diminish the efficiency of on-site septic systems. Preliminary calculations show that the proposed 8-inch gravity sewer mains have capacity to accommodate full buildout based on the current unit per parcel configuration within the six residential HMSD subareas under consideration.

3.3 Existing Facilities and Present Condition

Households in the unsewered subareas are currently served by septic systems, but small lot sizes, steep slopes, and other environmental constraints (see Figure 5) do not provide ideal conditions for subsurface wastewater treatment and result in poor performance. Septic system failures are a significant concern of both the Town of Yorktown and Westchester County.

In the Westchester County Department of Planning's presentation entitled "Septic Pumpout Initial Review," 2015, the number of failures and septic system pumpout frequency from 2007 through 2015 in various locations within the County was documented, including the Town of Yorktown (Appendix B). During this period, over 400 septic system pumpouts were conducted within the unsewered subareas of the HMSD, but only 6 septic system failures were reported within the Birch Street subarea and 1 reported within the Sparkle Lake subarea. The number of pumpouts in relation to the number of reported septic system failures reported indicates that septic system failures are, for the most part, not being reported. Providing sewer service to the parcels within these subareas would mitigate concerns of poor performing septic systems and septic failure.

Septic system failures within the HMSD have the potential to create an environmental and public safety hazard. The Town of Yorktown and the HMSD are part of the NYC Croton watershed, which supplies drinking water to NYC. Septic system failures in the HMSD could potentially contaminate

ground and surface water in the area with septage by allowing wastewater, bacteria, and excess nutrients to enter the Croton watershed, influencing the NYC drinking water supply.

The GHD February 2012 report *"Hallocks Mill Sewer District Flow Monitoring and Capacity Analysis"* evaluated existing sewers and summarized sewer interceptor hydraulics based on computer modeling. The report briefly discussed how flow contributed from new development may subsequently increase flows in existing sewers to above calculated capacity. There is a potential for the existing sewer to surcharge in such locations with additional flow. The Town will need to complete the applicable improvements to the existing sewer system prior to the construction of the HMSD sewer service extensions described in this report.

Yorktown's WPCP is currently permitted for an effluent flow 12-month rolling average of 1.5 million gallons per day (mgd) and receives an average daily flow of approximately 1.2 mgd (2010 HMSD Extensions Report). The ability of the WPCP to process additional flow has not been assessed as part of this report.

3.4 Project Need

As described in Section 3.3, the Westchester County Department of Planning has identified the occurrence of septic system failures within the Town of Yorktown. Sewerable parcels in the HMSD were originally intended to be sewered, but approximately 1,404 are currently not (Table 3-1).

This project focuses on the approximately 670 unsewered parcels in high priority subareas, identified in the 2010 HMSD Extensions Report. These unsewered subareas are known to have steep slopes, small lot sizes, and other environmental characteristics that do not provide ideal conditions for subsurface wastewater treatment and result in poor performance. Providing sewer service to units within these subareas would better protect water resources and limit potential human exposure to environmental pollutants.

3.5 Financial Status

The Town of Yorktown has several different sewer districts, the largest of which is the HMSD. The Town's wastewater infrastructure utilized by the HMSD consists of the Yorktown Heights WPCP, a major interceptor, several pumping stations, and a sanitary sewer collection system. The HMSD serves approximately 4,000 residential and commercial properties. Based on information provided by the Town, the HMSD is funded through user fees and supplemented by a fund balance. Sewer users are charged based on usage in addition to a fixed fee, which is assessed regardless of sewer usage. Sewer usage charges are based on domestic water usage per user.

Tables 3-3 and Table 3-4 summarize the 2017 revenue and expenditure budgets, respectively, for the Town of Yorktown and Hallocks Mill Sewer District.

The information in the tables below is pending, to be provided by the Town of Yorktown.

Table 3-3 Town of Yorktown/HMSD 2017 Revenue Summary

Description	Total
Sewer rent (flat rate)	
Sewer rents (metered rate based on water usage)	
Sewer charges (miscellaneous)	
Service charges (new sewers)	
Total Revenue	

Table 3-4 Town of Yorktown/HMSD 2017 Expenditure Summary

Description	Total
Operational expenditures	
Debt service	
Total Expenditures	

3.6 Alternatives Analysis

Alternatives proposed for collection of anticipated additional wastewater flows from subareas proposed for sewer service extension are presented below.

3.6.1 Alternative 1

Alternative 1 proposes to provide sewer service to unsewered parcels through a combination of gravity and low pressure sewer service as described below.

Anticipated Additional Wastewater Flow

To approximate anticipated wastewater flows from subareas, parcel-level data (utilized in the 2010 HMSD Extensions Report) and the Town of Yorktown's online 2016 GIS tax parcel data were used to tabulate the number of parcels in each subarea and number of units that would contribute wastewater to each proposed sewer main. Units were determined to be primarily classified as single-family residential. Details on flow calculations have been included in the basis of design in Section 3.9. Anticipated flows are summarized in Table 3-5.

Table 3-5 Anticipated Additional Wastewater Flows From Proposed Sewer Extensions By Subarea

Unsewered Subareas	Anticipated Additional Average Wastewater Flow[1] (mgd)	Anticipated Additional Peak Hourly Wastewater Flow With Infiltration/Inflow[2] (mgd)
Sunrise Street	0.01	0.03
Sparkle Lake	0.015	0.045
Birch Street	0.075	0.23
Ridge Street	0.037	0.11

Unsewered Subareas	Anticipated Additional Average Wastewater Flow(1) (mgd)	Anticipated Additional Peak Hourly Wastewater Flow With Infiltration/Inflow(2) (mgd)
Broadview Road	0.01	0.032
Carolina Road	0.005	0.016
TOTAL	**0.15**	**0.46**

(1) Based on additional wastewater flow of 225 gallons per parcel.
(2) Based on a peaking factor of 3 consistent with Ten-States Standards for a town the size of Yorktown and accounting for infiltration/inflow (I/I) using 250 gal/in/mile based on TR-16.
(3) Values do not take travel time into account.

Collection System Configurations

The gravity sewer is anticipated to be constructed primarily of SDR 35 PVC pipe using open-cut trench methods. Sewer mains were preliminarily sized to accommodate calculated wastewater flows from the subareas. Preliminary sizing was performed based on the parameters listed in Section 3.9, anticipated flows, and anticipated pipe slopes based on surface topography in each subarea. Preliminary sizing indicates that 8-inch diameter mains and 4-inch diameter laterals are capable of providing service to units in these subareas.

Local topography and other considerations necessitate that some sections of gravity main be buried at depths greater than 15 feet. PVC pipe with an SDR value of 28 or less may be required in these subareas. At bury depths greater than 25 feet, ductile iron pipe may be required. Applicable pipe material will be chosen by depth and soil conditions during detailed design.

If a unit is located below the elevation of the road and the invert of discharge from the unit is anticipated to be below the sewer main, a grinder pump with a low pressure service pipe will be installed. For connection to a low pressure system, it is anticipated that the private homeowner will abandon the existing septic tank and a grinder pump with wet well, controls, and electrical service will be installed. The homeowner will be responsible for continued operation of their grinder pump unit. The Westchester County Department of Health requires the wet well to have at least one day of sewage storage capacity. Low pressure sewer systems are anticipated to have 1.5- to 2.5-inch HDPE low pressure services and low pressure force mains. Further evaluation of low pressure force main sizes will be required during the detailed design phase.

Phasing construction of the overall project may increase competition during the bidding process, potentially resulting in more favorable bidding results. Phased construction of portions of the project would allow a greater number of contractors to meet the bonding and experience requirements needed to qualify for bidding. This would also allow for concurrent construction of sewers by multiple contractors in multiple subareas, potentially decreasing overall project duration.

Preliminary Subarea Collection System Configurations

Sunrise Street Subarea

The Sunrise Street subarea consists of approximately 26 unsewered parcels with residential units on Sunrise Street (Figure 4). Sunrise Street is a Town-owned paved road with no

sidewalks. Based on topographic information, survey data, and preliminary sewer capacity calculations, an 8-inch gravity sewer is anticipated in this subarea. Sewer service in this subarea will convey flow north, where it will discharge into the existing gravity sewer system at a manhole on Granite Springs Road. This wastewater flow will subsequently enter the Crystal Lake Pump Station at the north end of Crystal Lake and be pumped to a manhole on the HMSD gravity sewer system at the intersection of Sarles Drive and Granite Springs Road. Approximately 1,900 linear feet of sewer extensions are anticipated to serve this subarea. Improvements to the Crystal Lake Pump Station are anticipated to accommodate additional flow from the Sunrise Street subarea and Granite Springs Road.

Sparkle Lake Subarea

The Sparkle Lake subarea consists of approximately 65 unsewered parcels with residential units on Hyatt Street and connecting streets (Figure 4). These streets are paved, Town-owned, and without sidewalks. Due to topography and narrow roadways, this subarea is anticipated to be served by a low pressure system.

Low pressure sewer systems are typically used to service parcels which are not capable of being serviced by a gravity sewer without considerable difficulty and added expense. Each parcel will be equipped with a low pressure grinder pump and service, to be connected to a nearby gravity sewer system or larger central low pressure force main. Low pressure mains have been preliminarily sized in this report based on the requirements of Ten-States Standards. Low pressure sewer networks will require further modeling during detailed design to determine how simultaneously operating pumps will maintain total head within its operating range while also maintaining wastewater flow velocity.

Preliminary sizing indicates streets connecting to Hyatt Street may be serviced by low pressure lines ranging from 1.5- to 2.5-inch diameter. The receiving line on Hyatt Street is anticipated to initially be 2.0- to 2.5-inch diameter at the intersection with Elm Street, and will increase in size moving south. This system must be modeled during detailed design to determine whether the pipe diameter should increase to 3.0 or 4.0 inches. The receiving line is anticipated to terminate at the high point of Hyatt Street at the intersection with Locust Road. From this point, an 8-inch gravity sewer is proposed to tie into the existing 8-inch sewer main on Hyatt Street along the southern end of Sparkle Lake. Installation of additional manholes on existing gravity sewer mains may be necessary to facilitate connection of new sewer extensions.

It is anticipated that a total of 65 parcels will be served by low pressure sewers in the Sparkle Lake subarea, for a total of approximately 4,400 linear feet of added low pressure and 300 linear feet of gravity main sewer extensions.

Birch Street Subarea

The Birch Street subarea consists of approximately 342 unsewered parcels with residential units (Figure 2). These parcels are bounded by the HMSD boundary line to the north, Hyatt Street to the east, Granite Springs Road to the south, and Quinlan Street to the west. Streets within this subarea are paved, Town-owned, and are without sidewalks.

A drainage divide on Granite Springs Road at Ridge Street divides wastewater flow between two portions of the subarea. Approximately 103 units are projected to flow west to an existing 8-inch gravity sewer near the intersection of Granite Springs Road and Colonial Street. Wastewater from the remaining 239 parcels is anticipated to discharge to the existing 8-inch gravity main on Granite Springs Road between Dunning Drive and Gregory Street. Many of the parcels within the subarea are below the elevation of the road and will need grinder pumps capable of conveying household wastewater uphill to the gravity main.

Some locations on Hemlock Street, Barway Drive, and Ione Place may potentially require installation of sewers below a 15-foot depth in order to accommodate the local topography and maintain minimum slope along the entire length of the main per Ten-States Standards. This will be further assessed in the detailed design phase of the project.

An 8-inch gravity sewer main is proposed to carry flow from approximately 220 parcels to the intersection of Ione Place and Alden Road. Due to the local topography, it is proposed that the gravity main run through private property adjacent to a stream just south of Linden Place to connect with the existing gravity sewer main on Granite Springs Road. It is anticipated that easements will be required for this sewer alignment.

Alternative methods of sewer collection to avoid easements have been considered and include the following:

1. Construction of gravity sewer conveying flow to a pump station at the intersection of Ione Place and Alden Road. The pump station will convey wastewater uphill to the nearest connection with the existing sewer system.
2. Construction of a low pressure sewer system to service the 220 parcels in this area and convey wastewater uphill to the nearest connection with the existing sewer system.

Based on our experience, costs for installation of a pump station or a full low pressure system at this location are anticipated to be significantly greater than the cost of an 8-inch gravity sewer installation and procurement of easements. Individual landowners will be contacted by the Town during detailed design to discuss establishing easements before the start of construction.

Two sections of low pressure systems are anticipated for this subarea due to topographic constraints. One would collect wastewater from the 20 most northern parcels on Hickory Street and discharge into a proposed 8-inch gravity main at the high point of the street. The second would serve five parcels on Linden Place and discharge to a proposed 8-inch gravity main on Alden Road. Approximately 25,000 linear feet of combined gravity and low pressure sewer extensions are anticipated to provide sewer service in the Birch Street subarea.

Ridge Street Subarea

The Ridge Street subarea consists of approximately 164 unsewered parcels with residential units (Figure 3). This subarea is bound by Granite Springs Road to the north, Dunning Drive to the east, Hilltop Road to the south, and Crompond Road to the west. Streets in this

subarea are paved Town-owned roads without sidewalks. Preliminary sewer configurations propose gravity sewers flowing to three different connections to the existing collection system.

Approximately 58 parcels are proposed to discharge to the existing 8-inch gravity main on Granite Springs Road between Dunning Drive and Gregory Street, 27 parcels to an existing 8-inch gravity main on Ridge Street, and 79 parcels to a collector sewer in the Con Edison right-of-way. Many of the parcels within the subarea are below the elevation of the road and will require grinder pumps to convey wastewater uphill to a gravity main. Low pressure systems are proposed on Dunning Drive, Elizabeth Road, and Granite Springs Road, serving a total of 57 parcels. Some locations on Ridge Street, Dunning Drive, and Old Granite Road may potentially require installation of sewers below a 15-foot depth in order to accommodate local topography and maintain minimum slope along the entire length of the main per Ten-States Standards. This will be further assessed in the detailed design phase of the project.

Approximately 16,000 linear feet of combined gravity and low pressure sewer extensions are anticipated to serve the Ridge Street subarea.

Broadview Road Subarea

The Broadview Road subarea consists of approximately 46 unsewered parcels with residential units on Broadview Drive, Windmill Drive, Windmill Terrace, Windmill Court, and Broad Street (Figure 4). These streets are paved Town-owned roads without sidewalks. Based on topographic information and field observations, it is proposed that wastewater from 36 parcels be conveyed by new gravity main flowing south on Broad Street to an existing gravity main on Loder Street. Six parcels on Windmill Court and four at the north end of Broadview Drive are anticipated to connect to the same gravity system through a low pressure system. An 8-inch gravity main is proposed to convey wastewater from four parcels on Broad Street, north to Granite Springs Road. Approximately 23 units in this subdivision are below the elevation of the road and will need individual grinder pumps. Approximately 4,000 linear feet of combined gravity and low pressure sewer extensions will be required to serve this subarea.

Carolina Road Subarea

The Carolina Road subarea consists of approximately 23 unsewered parcels with residential units on Carolina Road, Georgia Street, and California Road (Figure 4). The streets are paved Town-owned roads without sidewalks. Approximately 1,600 linear feet of 8-inch gravity mains are proposed to service parcels in this subarea. Gravity mains will connect to an existing manhole on the gravity sewer system at the dead end of California Road, west of the parcels. Approximately eight parcels are anticipated to be serviced by low pressure systems to be connected to the proposed gravity main.

3.6.2 Opinion of Probable Cost - Alternative 1

GHD's opinion of probable cost for the gravity and low pressure sewer includes excavation, backfill, trench width pavement restoration, site restoration, manhole installation, and service lateral installation from the sewer main to the right-of-way or grinder pump. Ownership of the sewer

connection lateral or low pressure sewer system from each house to the right-of-way will rest with the homeowner. If connection is not mandatory, difficulties may be encountered in obtaining a substantial number of initial connections and thereby generating revenue to pay down funding debt. Public outreach efforts encouraging homeowners to elect for connection to the sewer collection system are recommended.

The cost for each on-site low pressure system and service is expected to be approximately $11,000 per connection. The cost of a gravity sewer connection will vary by length, depth, rock excavation, and other factors. This estimate is based on recent local installations and may vary significantly for properties with high groundwater, bedrock, and long service lengths. Costs for abandoning existing septic systems are not included. Prior to construction, the Town will discuss how the expense of sewer service equipment and connection installation on private property will be allocated between the Town and users for both gravity and low pressure connections. Assessment of a benefit charge to users who do not elect to connect will also be discussed.

An opinion of probable costs for sewer extension under Alternative 1 is presented in Table 3-6.

Table 3-6 Opinion of Probable Cost for Alternative 1

Alternative 1 Improvements	Opinion of Total Construction Costs	Contingency	Engineering	Legal/ Easements	Opinion of Total Project Cost
Sunrise Street sewer installation (26 units)	$1,400,000	$280,000	$160,000	$30,000	$1,900,000
Sparkle Lake sewer installation (65 units)	$2,600,000	$520,000	$240,000	$56,000	$3,400,000
Broadview Drive sewer installation (46 units)	$2,600,000	$520,000	$240,000	$56,000	$3,400,000
Birch Street sewer installation (342 units)	$14,300,000	$2,860,000	$1,220,000	$436,000	$18,800,000
Ridge Street sewer installation (164 units)	$8,600,000	$1,720,000	$860,000	$185,000	$11,400,000
Carolina Road sewer installation (23 units)	$1,000,000	$200,000	$110,000	$22,000	$1,300,000
Subtotal	**$30,500,000**	**$6,100,000**	**$2,800,000**	**$800,000**	**$40,200,000**

Consideration of non-monetary factors is of paramount importance in this evaluation. Providing sewer service to parcels in the six subareas will significantly mitigate potential environmental and public health impacts due to failing septic systems. With small lot sizes and topographic and environmental conditions, it is likely these residential septic systems are unable to provide sufficient wastewater treatment to protect groundwater and surface water resources in the area. This has been documented by the Westchester County Department of Public Health as discussed in this report. This alternative will also relieve residents of the burden of septic system maintenance and the hardships which may occur in the event of septic system failure.

3.6.3 Alternative 2

Under Alternative 2, a low pressure sewer collection system would be installed to serve the six subareas. Low pressure force mains would initially be installed in roadways and/or public rights-of-way in the subareas. Connection by gravity service would not be feasible due to the pressurized nature of the low pressure main, resulting in each home requiring a grinder pump and low pressure service for connection. Capital costs associated with low pressure service connections are anticipated to be higher than those associated with gravity services.

Homes known or determined to have failing septic systems would be prioritized to receive a grinder pump and service connection. Additional homes would be connected as septic systems fail or as homeowners elect to connect to the system. If connection is not mandatory, difficulties may be encountered in obtaining a substantial number of initial connections, and thereby generating revenue to pay down funding debt. Public outreach efforts encouraging homeowners to elect for connection to the low pressure sewer system would be recommended. It is anticipated that connection of applicable homes to the low pressure system, unless mandatory, would take several years or more. Allocation of connection costs and the cost of not connecting to the new system will be discussed prior to construction, similar to Alternative 1.

Similar to Alternative 1, this alternative would allow for phased construction with an extended period for grinder pump and low pressure service connection. Once the low pressure main is installed, a grinder pump station for an individual connection could be installed when needed. Under this alternative, septic systems could remain in use for longer periods of time than in Alternative 1. To support ongoing low pressure sewer service connection and minimize delays, the Town would maintain an inventory of at least 10 grinder pump stations and service piping to accommodate emergency installations in case of septic system failures or operational problems.

Due to concerns of poor septic system performance and septic failure in the six HMSD subareas, this approach to service connection could pose potential environmental issues. Further, if households elect to wait until septic system failure occurs to connect to the low pressure line, additional monetary costs due to property damage would be borne by homeowners. The cost for electric power to the grinder pumps, although minor, would also be the responsibility of the homeowners.

A well-planned, pre-emptive sewer extension that minimizes septic failures and includes homeowner engagement, as would take place under Alternative 1, would decrease many of these risks.

Opinion of Probable Cost - Alternative 2

GHD's opinion of probable cost for low pressure sewer includes excavation, backfill, trench width pavement restoration, site restoration, manhole installation, and service lateral installation from the low pressure main to the grinder pump. Excavation and backfill costs are lower for Alternative 2 because pressure mains are anticipated to be installed at a shallower depth than gravity sewer main. In this alternative, applicable homes would receive a grinder pump station and low pressure service, a factor that adds significant cost over Alternative 1. Installation and connection cost of each low pressure system is anticipated to be approximately $14,000 per household in addition to

low pressure force main installation costs. Grinder pump installation costs are estimated to be greater than those anticipated for Alternative 1 due to the uncertainty in scheduled installation. Costs for abandoning existing septic systems are not included.

Table 3-7 summarizes the opinion of probable cost for Alternative 2.

Table 3-7 Opinion of Probable Cost for Alternative 2

Alternative 2	Opinion of Probable Cost
Low pressure sewer system, identified subareas	$38,000,000
Total Construction Costs	**$38,000,000**
Contingency	$7,600,000
Engineering	$2,500,000
Legal/Easements	$700,000
TOTAL	**$49,000,000**

Non-monetary factors under this scenario would involve relatively larger risks to natural resources and to homeowners. As described above, this scenario potentially allows poor performing septic systems to continue operating until detection of failure, posing a significant threat to groundwater, surface water, homeowner property, and potential human exposure to unsanitary conditions. The approach to collection under this alternative is less efficient in managing environmental concerns than the proactive approach of Alternative 1, which strives to minimize the potential of septic failure.

3.6.4 Alternative 3

The third alternative is No Action, which would not address the limited subsurface treatment capabilities within the six identified subareas (2010 HMSD Extensions Report) nor the issue of failing septic systems as indicated by the Westchester County Department of Planning (Appendix B). This alternative may lead to unacceptable pollutant loadings to groundwater and surface waters which could potentially impact the Croton watershed and ultimately the NYC drinking water supply. Homeowners would remain responsible for septic system maintenance, including impacts from eventual septic system failure. This alternative does not meet the Town's stated plans to complete sewering of the District and mitigate potential public health and environmental impacts. Therefore, Alternative 3 is not considered a viable alternative.

3.7 HMSD Sewer Service Extensions - Comparison and Recommendation of Alternatives

3.7.1 Alternative Comparison and Recommendation

GHD recommends that the Town pursue Alternative 1 to sewer the six HMSD subareas with a combination of gravity sewer and low pressure sewer systems. Alternative 1 is recommended over Alternative 2 due to superior environmental and public health benefits, as well as reduced cost.

Alternative 3, the No Action option, is not recommended due to non-monetary factors of environmental protection and public health. A comparison of alternatives is presented in Table 3-8.

Table 3-8 Summary and Comparison of Alternatives

Alternative	Advantages	Disadvantages	Non-Monetary Factors	Cost
1 - Sewer expansion via a combination of gravity and low pressure systems	• Lowest number of grinder pumps • Defined construction period • Proactive • Lowest cost	• Greater installation depths	• Mitigates environmental concerns in the most timely manner • Centralizes collection and treatment	$40.2 million
2 - Sewer expansion solely through a low pressure sewer system; units utilize a grinder pump	Shallower installation depths	• Highest number of grinder pumps • phased installation with no defined construction completion • Higher cost	Poor septic system performance and/or failures may be addressed more slowly	$49 million
3 - No action	No advantages identified	See "Non-Monetary Factors"	Eventual septic system failure, environmental and human health concerns	N/A

3.7.2 Smart Growth Assessment

New York State's grants program supports communities that incorporate smart growth principles in their project development. The concept is to apply smart growth principles to help protect water resources by limiting urban sprawl while protecting existing water-related infrastructure. A community's choice of location and type of stormwater, wastewater, and water quality infrastructure may impact its future development.

The New York State Smart Growth Public Infrastructure Policy Act, enacted in 2010, requires a determination be made that a project meets applicable smart growth criteria. The review of smart growth criteria for an individual project will assist in determining if a project is eligible for financial assistance. Smart growth is intended to supplement existing environmental review policy (i.e., SEQR) by maximizing the social, economic, and environmental benefits of municipal infrastructure development while minimizing unnecessary environmental impacts, disinvestment in urban and suburban communities, and the loss of open space resulting from urban sprawl development.

A smart growth assessment has been completed for the proposed improvements. A Smart Growth Assessment Form is included in Appendix D.

3.7.3 Project Schedule

Table 3-9 outlines the anticipated project schedule, including construction phases. This is expected to be a multi-year project, with phasing to be determined by the Town of Yorktown. Upon commencement of engineering final design, it is anticipated the total project could be completed within four years. Such a time frame is dependent upon project phasing, which could extend project completion.

Table 3-9 Anticipated Project Schedule

Task/Phase	Time to Complete Task
Engineering, easements, and regulatory approvals	12-18 months
Bid	5 weeks
Notice of Award	4 weeks
Notice to Proceed	4 weeks
Substantial Completion	18 months
Final completion	24 months

3.7.4 Next Steps

It is anticipated the Town of Yorktown will continue to move forward with the recommended alternatives for the Hallocks Mill sewer service extensions as well as the Crystal Lake Pump Station improvements. After review and appropriate authorization proceedings, available state and federal funding will be pursued. Town funds and resources will also be allocated for these projects.

The Town of Yorktown previously conducted multiple Board presentations and meetings to engage stakeholders. The Town will continue to support community engagement by holding public meetings throughout the completion of design and construction.

3.8 Summary of Recommendations and Basis of Design

3.8.1 Summary of Recommendations

Based on GHD's findings, the following capital improvements are recommended:

1. Discuss distribution of connection expense to new users and assessment of a benefit charge to those choosing to remain unconnected.
2. Discuss proceeding with required capacity improvements to the existing sewer system as outlined in previous reports.
3. Install a combination of gravity and low pressure sewer to the subareas referred to as Sunrise Street, Sparkle Lake, Birch Street, Ridge Street, Broadview Road, and Carolina Road.
4. Make improvements to the Crystal Lake Pump Station to accommodate anticipated additional flows.

3.9 Basis of Design - Hallocks Mill Sanitary Sewer Extensions

3.9.1 Projected Flows

An average daily flow was calculated based on the parameters outlined in Table 3-10. A peaking factor of 3 was used for the HMSD population of approximately 11,000 as recommended by Ten-States Standards. This peaking factor accounts for anticipated flow fluctuations throughout the day and projects anticipated flows during peak hour periods.

I/I was added to peak hour wastewater flows to obtain the design flow conditions anticipated to be experienced by each new gravity sewer line during peak hour conditions. An I/I value of 250 gal/in/mile, as provided by TR-16, and estimated main and lateral dimensions were used to calculate the expected I/I in subareas. The combined residential unit peak flow and I/I values used are less than the more conservative flow values in Ten-States Standards; however, Ten-States Standards permit the use of more accurate estimates of residential wastewater generation based on flow data. This study utilizes values cited in the 2010 HMSD Extensions Report and the 2012 "*HMSD Flow Monitoring and Capacity Analysis"* derived from sewer and water use records that were supplied by the Town.

Table 3-10 Summary of Calculated Flow Projection Parameters

Flow Projection Parameter	Value
Primary unit classification	Single-family residential
Units per parcel	1
Average household size (residents) (1)	2.8
Average daily flow per capita (gpd/capita) (1)	80
Average daily flow per unit (gpd/unit)	225
Peaking factor	3
Infiltration and inflow (gpd/inch diameter/mile)	250
Length/diameter of main	Varies by location

(1) Established in 2010 HMSD Sewer Extensions Report.

The calculation of flows does not account for travel time through the system. Travel time is the length of time it takes for wastewater to travel from one part of the collection system to another.

A summary of anticipated wastewater flows from sewer service extension areas is presented in Table 3-5 of this report. The Yorktown WPCP is currently permitted for an effluent flow 12-month rolling average of 1.5 mgd and, as of 2010, receives approximately 1.2 mgd (2010 HMSD Extensions Report). The ability of the WPCP to process additional flow from service extensions has not been assessed as part of this report.

Proposed sewer design criteria has been summarized in Table 3-11.

Table 3-11 Design Criteria – Hallocks Mills Sewer District Sewer Extension

Gravity Sewer Systems (in Compliance With Ten-States Standards for Wastewater Facilities)	
Gravity sewer pipe	• ANSI/ASTM D3034 and D2412 • SDR 35 PVC, SDR 28 or less for >15-foot depth • Ductile iron Class 52, >25-foot depth • Bell and spigot joints with rubber gaskets conforming to ASTM F477
Low pressure sewer pipe	HDPE, DR-11, butt fused
Minimum depth of cover	5 feet
Manhole construction	4-foot diameter precast concrete, conforming to ASTM C478
Maximum manhole spacing	400 feet
Pipe sizes used	8-inch diameter (gravity main)
Minimum slope	0.4 percent
Manning's coefficient	0.013
Pipe capacity	75%
Theoretical capacity at minimum slope and 75% full flow	310 gpm
Service connections	• Connections to existing service laterals to be made with shielded Fernco-type couplings • 4-inch at 2% minimum slope or 6-inch at 2% minimum slope
Minimum offsets for parallel utilities and details for utility crossings	Per Ten-States Standards for Wastewater Facilities
Low Pressure Sewer Systems (in Compliance With Ten-States Standards for Wastewater Facilities)	
Pipe specification	HDPE
Minimum depth of cover	5 feet
Pipe sizes used	Predominantly 1.5-inch to 2.5-inch
Manning's coefficient	0.013

4. Crystal Lake Pump Station Improvements

4.1 Site Information

The Crystal Lake Pump Station is located off Granite Springs Road in Yorktown, NY, near the intersection of Granite Springs Road and Curry Street. Construction of the pump station was originally completed in 1984 (*Operations and Maintenance Manual* by Alfred Crew Consulting Engineers) and currently serves approximately 35 residential units. The site is enclosed by a 6-foot high chain link fence and consists of maintained grass areas as well as dense tree-covered areas that provide a visual barrier from nearby Sunrise Street, Curry Street, and Crystal Lake, located to the southeast. The pump station is a one-story masonry block building with a buried concrete wet well and buried concrete valve vault. The concrete wet well and valve vault are separate from the masonry block building. An underground fuel storage tank which provides fuel for the generator is located to the west of the Generator Building.

4.1.1 Existing Site Plan

The existing Crystal Lake Pump Station site is shown in Figure 6. It is recommended that a boundary and topographic survey of the Crystal Lake Pump Station be performed during detailed design, including identification of existing utilities, location of wetland flags, tree locations, and grade lines of the surrounding area.

4.1.2 Geologic Conditions

As described in Section 3.1, the general surficial geology of the HMSD area is characterized as glacial till materials with a thickness of up to 98 feet. Of the 10 soil borings taken during the conceptual design phase to ascertain preliminary soils information, Boring B-1 is closest to the pump station, located approximately 900 feet south/southwest of the station. Water was observed at a 9-foot depth following drilling of Boring B-1. Refer to Section 3.1 for more detailed information on surficial geology in the area.

4.1.3 Environmental Resources

Using the wetland identification tools available through the New York State Department of Environmental Conservation (NYSDEC) website and Town of Westchester Parcel Viewer, state-regulated freshwater wetlands have been identified adjacent to the site. The building, wet well, and valve vault are not within the regulated wetlands area; however, they do lie within the state-regulated 100-foot buffer zone adjacent to the wetlands. During detailed design, it is recommended the wetlands in this area be delineated and located by survey. It is also recommended that NYSDEC be contacted to determine permit requirements for the applicable construction in this area. At a minimum, it is anticipated that a NYSDEC freshwater wetlands permit will be required.

An underground gasoline storage tank which provides fuel to the station's emergency generator is located to the west of the Generator Building as shown in Figure 6. The condition of the tank is

unknown. It is recommended the fuel storage tank be excavated and disposed of. Excavation and disposal will need to be performed in conformance with Westchester County Department of Health (WCDH) and NYSDEC requirements, which will be further examined during detailed design. Soil sampling is also anticipated.

4.1.4 Floodplain Considerations

According to FEMA's Flood Insurance Rate Map and the Town of Westchester Parcel Viewer, a portion of the driveway leading to the pump station lies within the "Zone A" 100-year floodplain. The building, wet well, and valve vault are not within the flood hazard area. Based on discussion with operations staff, there has been no known damage to the station due to flood impacts. Improvements to mitigate potential damage to the station in the event of a flood have been incorporated into this report.

4.2 Ownership and Service Area

The Crystal Lake Pump Station is owned and operated by the Town of Yorktown, NY through the Hallocks Mill Sewer District. The pump station currently serves 35 residential units on Sunrise Street, Curry Street, Weatherby Street, and Granite Springs Road. If the proposed sewer service extensions are constructed, this pump station would service approximately 39 additional units -- 26 from Sunrise Street and 13 from Granite Springs Road -- as described in Section 3.6 of this report.

4.3 Existing Facilities and Present Condition

4.3.1 Civil/Site

Original construction of the Crystal Lake Pump Station was completed in 1984, making the station approximately 34 years old. The site contains a one-story, 12-foot by 16-foot masonry block Generator Building that houses a standby generator, automatic transfer switch, and various control panels. A buried gasoline storage tank which provides fuel for the generator is located to the west of the generator building. The site also contains a buried concrete wet well and buried concrete valve vault located to the east of the building. Process piping does not enter the building.

An asphalt drive provides access to the station from Granite Springs Road. The asphalt surface is cracking in several areas and a layer of grass and moss has grown over much of the surface. There is an existing 6-foot high chain link fence with barbed wire surrounding the site. A 12-foot wide double-leaf swing gate located to the northeast of the building allows entry to the pump station site. An existing utility pole located outside of the fenced area to the northwest of the building provides power to the station via underground conduits. The utility pole carries overhead wires from utility pole No. D5910 located on Granite Springs Road. Based on existing records, there is an underground 1-1/4-inch copper water service to the station. Refer to Figure 6 for an existing site layout of the pumping station.

4.3.2 Process/Mechanical

Wet Well

Based on visual inspection and record drawings provided by the Town, the wet well is constructed of 7-foot diameter precast concrete sections with a flat concrete slab top. The wet well is approximately 17 feet deep. Both the wet well and valve vault are considered to be an entry permit-required confined space and were examined by GHD staff, to the extent possible, from the entrance of access points.

The wet well is accessed from the top through one of two openings. The first access point, intended for personnel access, is through a removable 24-inch diameter cast iron cover. An aluminium grated platform is mounted approximately 10 feet above the wet well floor and can be reached from the 24-inch opening by a ladder mounted to the interior wall of the wet well.

The second access point to the interior of the wet well is a rectangular aluminium access hatch, adjacent to the 24-inch opening. The hatch is intended to facilitate removal of the pumps during maintenance. A control panel, air intake, and air exhaust stack are mounted on top of the wet well. Cracks or spalling were not observed on the interior of the wet well. Refer to Figure 7 for existing wet well configuration.

Valve Vault

Based on visual inspections and record drawings provided by the Town, the valve vault is constructed of 5-foot diameter precast concrete sections with a flat concrete slab top. The valve vault is approximately 8 feet deep. A 3-foot by 3-foot aluminum access hatch provides entry to the valve vault from the top. An aluminum ladder is mounted on the interior wall for personnel access to the equipment inside the valve vault. Cracks or spalling were not observed on the interior of the valve vault.

Clear standing water was observed at a level above the piping and valves in the valve vault. The water had none of the odors generally associated with raw sewage. Further inspection of the hatch revealed the presence of standing water in the hatch gutters. For these reasons, the standing water has been attributed to precipitation entering through the hatch. It is also possible that groundwater could be infiltrating into the valve vault, but this could not be verified without further inspection. It is recommended the water be removed from the valve vault and the water level in the vault be monitored for indications of groundwater infiltration.

Pump Equipment and Process Piping

According to record drawings, influent enters the wet well and freely discharges from the collection system via a single 8-inch diameter, ductile iron gravity sewer pipe. The wet well houses two submersible pumps which are used to periodically lift and transfer influent through the force main to the gravity collection system downstream. The existing pumps are functional; however, they are located at the bottom of the wet well and could not be visually inspected. The pumps are believed to be original equipment and are reaching the end of their design life. Pump model, condition, and approximate age are to be confirmed during detailed design. During this evaluation, it was determined the original pump model is no longer manufactured. Information on the existing pumps

is based on the *Operations and Maintenance Manual* by Alfred Crew Consulting Engineers and summarized in Table 4-1.

Table 4-1 Existing Wet Well Pump Information

Manufacturer	Model No.	Rated Capacity	Rated TDH
Flygt	CP3126.180	80 gpm	70 feet

Float control switches within the wet well operate the pumps in a lead-lag configuration. The role of lead pump is alternated each pumping cycle. Influent is pumped from the wet well to the valve vault through two parallel 4-inch ductile iron pipes (DIP). The parallel pipes run underground between the wet well and valve vault and could not be visually inspected. The condition of these pipes should be determined during detailed design, if possible. Refer to Figure 7 for existing piping configuration within the wet well.

Within the valve vault, each discharge branch is equipped with a 4-inch check valve and a 4-inch gate valve for manual flow control. Flow is combined at a 4-inch diameter cross before exiting the valve vault through a 4-inch DIP force main. An emergency bypass connection is located on the cross. The piping and fittings within the valve vault were fully submerged, but exterior corrosion was still visible.

Combined flow is conveyed from the valve vault through a buried 4-inch DIP force main. The force main discharges into sewer manhole 28.2111, approximately 560 feet west of the Crystal Lake Pump Station near the intersection of Granite Springs Road and Sarles Drive. The condition of the buried force main was not determined as part of this report.

The existing average daily flow to the station was calculated to be 6.2 gpm, and the existing peak hourly flow was calculated to be 16 gpm. Flow calculations are further described in Section 4.9 of this report.

4.3.3 Structural

The Crystal Lake Pump Station Generator Building has a footprint of 16 feet by 12 feet, measured to the outside faces of walls. The building was constructed with an 8-inch thick reinforced concrete slab floor, masonry block walls, and a pitched concrete slab roof. A reinforced foundation section extending 4 feet 8 inches below the top of slab is located beneath the generator. The existing exterior masonry and concrete walls, as well as concrete slab roof, have limited cosmetic deterioration.

Visual inspection was only performed on areas of the pump station wet well and valve vault which were not submerged. The inspection of the pump station wet well, valve vault, and Generator Building indicates the structures are in good condition. The interior surface of the wet well and valve vault shows minimal visible signs of corrosion, concrete spalling, or cracking. In addition, the wet well and valve vault frames and hatches appear to be in good condition with minimal signs of corrosion. Clear water was visible in the valve vault above the level of the valves, but is believed to be from precipitation based on standing water inside the hatch frame. Further investigation of the

potential inflow of groundwater to the valve vault, as well as further assessment of the condition of the currently submerged areas of the wet well and valve vault, will be required during detailed design.

4.3.4 Electrical

The majority of the electrical equipment presently in use at the pump station is the original equipment installed when the station was first commissioned, and is at or beyond its useful life.

The New York State Electric and Gas (NYSEG) Company provides the Crystal Lake Pump Station electrical service entrance. An underground feeder from NYSEG pole-mounted transformers provides a 125-amp, 3-phase, 4-wire, 208Y/120V service to a revenue meter located on the exterior of the generator building. The pump station is protected by a 100-amp, 3-pole main service circuit breaker which feeds into an automatic transfer switch (ATS). A panelboard downstream of the ATS (Panelboard A) houses a circuit breaker that provides power and overcurrent protection to pump station equipment.

A 30 kW, gasoline-fueled engine gen-set, located inside the generator building, provides standby power in the event of loss of utility power. The gen-set is equipped with a day tank, also located inside the generator building, as well as an underground storage tank. The interior gasoline day tank, as installed inside the pump station building, would not be permitted under present day codes and regulations.

Power is distributed from Panelboard A to a pump control panel, pump station lighting, a 3 kW unit heater, ventilation fan, hot water heater, hand dryer, convenience receptacles, and auxiliary generator equipment (i.e., battery charger, generator control panel).

Existing interior lighting fixtures appear to be 1 foot by 4 feet in dimension, with two 40-watt fluorescent lamps per fixture. One 250-watt metal halide floodlight on the outside wall of the pump station building provides exterior lighting. Lighting for the wet well is provided by 150-watt explosionproof fixtures.

Original wet well equipment includes two submersible pumps, float switches, lighting, ventilation fan, alarm/panic switch, and limit switch at the entrance hatch. The pump control panel is located inside the pump station building. The wet well is classified as an electrically hazardous area per NFPA 820. The classified area extends above and around the access hatch as well as ventilation openings. The equipment installed inside the wet well appears to be rated for use in hazardous areas. However, there is conduit and a pull/junction box on the exterior of the wet well within the hazardous area that extends beyond the access hatch, and ventilation that does not appear to be rated for use in hazardous areas.

4.3.5 HVAC

The existing Generator Building is ventilated by a sidewall exhaust fan, intake louver, and high limit thermostat. A discharge louver is connected by ductwork to the generator and discharges air from the generator to outdoors. The same intake louver used to provide ventilation air to the room provides combustion and cooling air to the generator. The building is heated with one electric unit

heater. The heating and ventilation equipment appears to be original to the building construction and is either non-operational or is reaching the end of its useful life and in need of replacement.

4.3.6 Instrumentation

The existing station has no appreciable instrumentation or controls. To satisfy Ten-States Standards, a wireless-based Marshall alarm system notifies the operations staff of high wet well level via a float in the wet well. The Marshall alarm service company receives an alarm at a control center and notifies the on-call operator(s) with a voice call using a notification list periodically updated by the Town.

Pump control is facilitated via an existing relay-based pump control panel.

4.3.7 Architectural

The existing Generator Building consists of uninsulated concrete block walls and an uninsulated concrete roof with its top surface formed with a slight slope to facilitate drainage. These existing features are structurally sound, but do little to contain energy costs. The existing appearance of the building is not consistent with the residential character of its neighborhood. Proposed upgrades to the building include insulation and cladding improvements.

4.3.8 Plumbing

The facility is provided with a 1-1/4-inch water service which is protected with a reduced pressure zone (RPZ) backflow preventer upon entering the building. The potable water service then feeds hose bibbs and a service sink with water heater. The floor drains and service sink water flow by gravity to the 8-inch influent sewer, which then flows to the wet well. There is currently no backflow prevention between the hose bibbs and the service sink and no visible non-potable labeling. The plumbing and associated equipment appear to be original to the building construction, show minor signs of corrosion, and are recommended for partial replacement.

4.4 Project Need

The Crystal Lake Pump Station was constructed in 1984 and is approximately 34 years old. Several pieces of equipment are reaching the end of their design life, placing an increased maintenance burden on operations staff. Failure of the major components at the station is a significant concern for the Town of Yorktown and those being served by the pump station. Failure at the station also poses an environmental and public safety hazard, as raw sewage could potentially overflow into Crystal Lake, influencing the Croton watershed which supplies drinking water to New York City.

A schematic design of sewer service extensions is being performed to mitigate septic system failures within the HMSD in the Town of Yorktown, NY. Service extensions on Sunrise Street and Granite Springs Road are anticipated to convey additional flow to the Crystal Lake Pump Station. The additional flow to the station would place increased demand on the existing pumps and equipment, which have been in place since the original construction. Replacement of the existing pumps to provide uninterrupted sewer service in this area will prompt related upgrades to be performed to bring the station within regulatory standards. Improvements are proposed to accommodate additional flows anticipated from extended sewer service and to replace equipment

reaching the end of its design life, which will decrease the maintenance burden on the operations staff.

4.5 Financial Status

Refer to Section 3.5 of this report.

4.6 Alternatives Analysis

4.6.1 Alternative 1

Alternative 1 is a targeted approach with the objectives of upgrading pump station equipment to reliably accommodate anticipated additional flow, rehabilitating specific pump station components which are reaching the end of their design life, performing upgrades as required for regulatory compliance when modifying an existing station, and decreasing the maintenance burden of the operations staff. Under this alternative, improvements will be focused on replacement of major components essential to the station's operation. Improvements will address the station's ability to handle anticipated additional flows from potential sewer extensions in the Sunrise Street area and Granite Springs Road, as well as improve control, monitoring, and emergency operations. Civil/site, process/mechanical, electrical, HVAC, instrumentation and control, and architectural improvements are recommended.

Civil/Site

Civil/site improvements are recommended to renew aging site features. It is recommended the following improvements be made at the site.

1. Remove growth from the existing asphalt and install new 1-inch thick asphalt overlay with crown to improve drainage and prolong the useful life of the driveway.
2. Replace the existing perimeter fence with a new 6-foot high chain link fence equipped with privacy slots and barbed wire.
3. Replace double-leaf swing gate in kind.
4. Remove and dispose of underground fuel storage tank in accordance with WCDH and NYSDEC guidelines and regulations.

Process/Mechanical

Process/mechanical improvements will include replacement of several pieces of equipment within the wet well and valve vault. During the demolition process and installation of new equipment, temporary bypass pumping will be required for continued service to existing units.

Within the valve vault, the valves, piping, and fittings are visibly corroded and will be replaced in kind with new ductile iron components. Refer to Figure 9 for valve vault improvements.

Within the wet well, the existing piping, valves, and fittings are visibly corroded and will be replaced in kind with new ductile iron components. The existing pumps are reaching the end of their design life and are no longer manufactured. Existing pumps will be replaced with new submersible pumps

capable of handling existing and additional flow to the station resulting from the HMSD sewer service extensions. The new pumps and piping will adhere to the requirements of Ten-States Standards for Wastewater Facilities. Refer to Figure 8 for proposed wet well improvements. Technical details of preliminary design and pump sizing are contained in Section 4.9.

Pump control will be facilitated through a new PLC-based Station Control Panel (SCP). Pump motor starters will be installed in a stand-alone enclosure external to the SCP as further explained herein. Refer to Figure 10 for recommended Generator Building improvements.

The following recommendations are made to upgrade the process/mechanical components at the pump station:

1. Replace existing wet well pumps with submersible pumps capable of accommodating anticipated flow.
2. Replace piping, fittings, and valves within the wet well and valve vault.
3. Install new davit crane to assist in pump removal and maintenance.

Structural

Structural improvements are not recommended for the wet well, valve vault, and Generator Building at this time. Replacement of existing hatches and manhole covers with watertight equipment is recommended for the valve vault and wet well to reduce the influence of precipitation on the water level inside these structures. Hatches are discussed in the architectural section below. If, during detailed design, it is determined that groundwater infiltrates the existing wet well or valve vault, it is recommended that a corrosion-resistant waterproof liner be installed on the interior surface of the structure to minimize groundwater intrusion.

The following recommendations are made to upgrade non-structural components of the wet well and valve vault at the pump station:

1. Install new watertight manhole cover and hatches on the wet well and valve vault.
2. If groundwater intrusion is determined during detailed design, apply corrosion-resistant waterproof liner to interior surfaces of wet well and/or valve vault

Electrical

The majority of the electrical equipment presently in use at the pump station is the original equipment installed when the station was first commissioned and is at or beyond its useful life. Improvements to the electrical system are recommended to renew aging components and to support related upgrades. Codes and standards to be used in design of electrical upgrades include:

1. NFPA 70 - National Electric Code (NEC)
2. NFPA 101 - Life Safety Code
3. Illuminating Engineering Society (IEL)
4. NFPA 820, Fire Protection in Wastewater Treatment and Collection Facilities

The existing electrical service to the pump station will be replaced due to age and design life. We do not anticipate an increase in the size of the existing service entrance.

The emergency generator will be replaced. GHD recommends the new generator be a diesel-fueled, skid-mounted generator with subbase fuel tank. If the generator is to remain in service until the new generator comes on-line, a weatherproof, sound-attenuated enclosure should also be provided. If the existing generator is to be replaced in its current location, it is recommended the same type of equipment be provided, with the exception of the sound-attenuated enclosure. Installation into the existing building will be facilitated by an oversized exhaust louver. Temporary emergency power will be supplied to the station while the existing generator is out of service during construction.

The existing ATS will be replaced. The new ATS will be located inside the existing building adjacent to the service entrance equipment. The ATS will be integrated into the power distribution system such that the entire pump station electrical distribution system will be connected to the generator when the ATS is in the 'emergency' position.

New pump station electrical enclosures and control panels will be part of the improvements and be specified as NEMA 12. The interior of the pump station building has been preliminarily defined as a non-classified dry area.

Electrical equipment installed in hazardous areas will be in NEMA 7 explosionproof enclosures or will be rated intrinsically safe. Equipment enclosures installed outdoors, not in hazardous areas, will be specified as NEMA 4X. Conduit will be replaced inside the pump station building and wet well.

Replacement of existing lighting fixtures with LED fixtures is recommended.

The following recommendations are made to upgrade the electrical system at the pump station:

1. Design electrical improvements in support of pump and motor replacement.
2. Design electrical improvements in support of HVAC equipment replacement.
3. Replace electrical service entrance equipment.
4. Replace existing generator with new pad-mounted standby generator in a sound attenuated enclosure with automatic transfer switch.
5. Replace panelboards.
6. Upgrade alarm and telemetry equipment.
7. Upgrade lighting.
8. Install new conduit and conductors throughout.

HVAC

Due to waste heat from the electrical equipment and the generator, the Generator Room HVAC will be sized based on ASHRAE 62.1-2016 and maintain the room temperature under 100°F. A new sidewall exhaust fan and intake louver controlled by a Hand/Off/Auto switch and high limit thermostat will be provided. Current louver sizes and wall openings may need to be increased in

size depending on what air flow is required for the ventilation system. The required room ventilation rate and louver sizes will be determined during design.

New non-acoustical discharge and intake louvers for the generator will be provided. Louvers will be sized based on required air flows as determined by the generator manufacturer. Intake and exhaust louvers will have a motor-operated damper behind them. A high heat motor-operated damper will be installed prior to the generator discharge louver. A standard horizontal electric unit heater will provide heat for the room.

The following recommendations are made to upgrade the HVAC system in the building:

1. Replace current sidewall exhaust fan with a new fan sized to maintain 100°F in the room.
2. Replace existing louvers with new louvers. Existing openings may need to be enlarged or additional openings may be necessary depending on required air flows.
3. Provide motor-operated dampers behind intake and exhaust louvers to prevent infiltration of air when the ventilation system or generator are not running. The generator discharge louver will have a high heat motor-operated damper behind it.
4. Coordinate louver installation with generator replacement to facilitate installation of a new larger generator in the building, if needed.
5. Install high limit thermostat to activate ventilation due to high heat.
6. Replace the electric unit heater.

Plumbing

Plumbing and associated equipment appear to be original to the building construction and show minor signs of corrosion. It is recommended the following improvements be made to the plumbing system.

1. Install labels at sink and hose bibbs clearly indicating that water is non-potable.
2. Replace piping from RPZ backflow preventer to outlets.
3. Install new service sink.
4. Replace water heater with new unit.

Instrumentation

In November 2017, the Town completed a SCADA Condition Assessment/Evaluation in which wastewater pumping station control system standards were developed to provide consistency between wastewater stations, facilitate predictive alarming, provide fault-tolerant backup controls, and provide the capability for continuous, real-time monitoring through the wastewater treatment plant's existing Wonderware-based SCADA system. Recommendations for the Crystal Lake Pump Station are to conform to the standards developed in the 2017 SCADA Condition Assessment/ Evaluation as pertains to this pump station, and include the following improvements:

1. Installation of a programmable logic controller (PLC)-based SCP.

2. Locate pump motor starters in a stand-alone enclosure external to the SCP.
3. Design equipment and instrumentation to provide SCP inputs and outputs (I/O), to be determined during detailed design.
4. Install a Backup Float Control Panel (BUFCP) as a backup control mechanism to maintain operations in the event of an SCP failure or wet well level transmitter failure. Provide a stand-alone enclosure to contain the BUFCP controls. The BUFCP shall utilize relay-based control logic and function in the following sequence:
    a. Wet well level rises to the High Level float. An alarm is generated and both Lead and Lag pumps start. Triggering of a float inhibits primary controls from functioning to prevent pumps from being controlled from multiple sources, e.g. the primary control system and BUFCP.
    b. Wet well level lowers to All Pumps Off level and all pumps stop.
    c. Level rises to Pump 1 Start level and Pump 1 starts.
    d. If level continues to rise to Pump 2 Start level, Pump 2 starts.
    e. Wet well level lowers to All Pumps Off level and all pumps stop.
    f. Pumps remain under BUFCP control until an operator visits the site and presses an acknowledge pushbutton panel mounted to the BUFCP enclosure.
5. Maintain use of the wireless Marshall alarming system to monitor SCP Critical Failure/Fault, Building Intrusion, and Wet Well Level High (initial activation level of the BUFCP).
6. Program the PLC to support full remote monitoring, alarming, and control through the wastewater plant's existing SCADA system.

Architectural

Proposed upgrades to the building include insulation and cladding improvements. There are many possible approaches to improving the wall insulation and appearance, but given the minimal available interior space of the building, a system that is installed to the exterior surface of the existing walls is recommended.

Roof cladding is proposed to include a self-adhesive vapor retarder underlayment applied to the top of the concrete, followed by 6-inch-thick insulated metal roofing panels with locked standing seams. This roof assembly is effective at very low slopes and contains no air spaces where condensation can occur.

The existing door would be replaced with a flood-resistant door of a type that operates like a typical side-swing personnel door, but which has been tested to withstand specified flood loads. The existing access hatch and manhole over the wet well and valve vault would be replaced to mitigate the intrusion of precipitation into those spaces. The existing access hatches would be replaced with watertight single leaf-hatches. The existing manhole would be replaced with a watertight manhole frame and cover.

Alternative 1 Objective

The improvements under Alternative 1 would equip the Crystal Lake Pump Station to handle existing and anticipated flows resulting from the HMSD sewer extension as well as conform to the instrumentation and control system improvements presented in the Town's 2017 SCADA evaluation. The new equipment and improvements would also reduce the maintenance burden on operations staff and provide the Town with cost savings due to reduced service and maintenance needs. The control system improvements will also provide backup control, predictive alarming, and real-time monitoring once connected to the wastewater treatment plant's SCADA system. Alternative 1 also mitigates non-monetary factors such as public safety and failing septic systems by providing the pump station with the ability to reliably handle anticipated additional flow from potential sewer extensions.

Opinion of Probable Cost - Alternative 1

An opinion of probable cost was developed based on recent contractor bids for local projects and GHD's experience. An opinion of probable costs for improvements to the Crystal Lake Pump Station, as described under Alternative 1, is presented in Table 4-2.

Table 4-2 Opinion of Probable Cost for Alternative 1

Recommended Improvements	Opinion of Cost
Mobilization/demobilization	$50,000
Demolition	$80,000
Bypass pumping	$150,000
Civil/site improvements	$100,000
Pumps and accessories	$70,000
Wet well/valve vault improvements	$30,000
Ductile iron piping, valves, and fittings	$50,000
Plumbing improvements	$10,000
Architectural improvements	$110,000
HVAC improvements	$40,000
Electrical improvements	$150,000
Instrumentation and control improvements	$70,000
Permits	$10,000
Subtotal	**$920,000**
Contingency	$230,000
Legal/Fiscal/Engineering	$190,000
TOTAL CONSTRUCTION COSTS	**$1,340,000**

4.6.2 Alternative 2

Alternative 2 is a complete replacement of the station. Similar to Alternative 1, improvements would address the station's ability to handle additional flows from potential sewer extensions in the

Sunrise Street area and Granite Springs Road, as well as renew infrastructure to ease the maintenance burden on operations staff.

Under Alternative 2, the Generator Building, wet well, and valve vault structures would be demolished and rebuilt. During the demolition process, temporary bypass pumping would be required for continued service to existing units. Temporary bypass pumping would be required for a longer duration than that of Alternative 1 due to an extended construction period.

The Generator Building would be replaced with a new, slightly larger masonry block structure, equipped with new electrical, HVAC, plumbing, and controls. Installed equipment would be similar to that provided by Alternative 1.

The existing wet well would be replaced with a new 7-foot diameter by 17-foot deep precast concrete structure. For ease of connection to the existing 8-inch gravity sewer influent line, the location of the new wet well would be in the same general area of the site as the existing. The new wet well would have new pumps, electrical, and instrumentation equipment installed, similar to that proposed in Alternative 1. The new wet well would be equipped with a watertight, double leaf access hatch. An air intake stack and exhaust stack would be installed on the top of the wet well. The wet well would be equipped with a portable davit crane for ease of pump removal. A manual pump start control panel would be installed adjacent to the wet well in addition to a new pump control panel installed inside the new Generator Building.

The existing 8-inch gravity influent line would be connected to the new wet well. New submersible pumps and level control would be as described under Alternative 1. New ductile iron piping, valves, and fittings would be installed in a similar configuration to that of the existing. The new discharge pipes would exit the wet well and convey flow to the new valve vault.

As part of Alternative 2, the existing valve vault would be replaced with a 4-foot by 5-foot by 8-foot deep precast concrete structure located in approximately the same area as the existing valve vault. The access hatch, pipes, fittings, and valves for the valve vault would be as described under Alternative 1. Discharge force main would be replaced in-kind from the valve vault to the buried gate valve 40 feet downstream of the existing valve vault, shown in Figure 1.

Opinion of Probable Cost - Alternative 2

An opinion of probable cost was developed based on recent contractor bids for local projects and GHD's experience. An opinion of probable costs for the Crystal Lake Pump Station Improvements, as described under Alternative 2, is presented in Table 4-3.

Table 4-3 Opinion of Probable Cost for Alternative 2

Recommended Improvements	Opinion of Cost
Mobilization/demobilization	$70,000
Demolition	$170,000
Bypass pumping	$170,000
Civil/site improvements	$220,000
Wet well/valve vault structures	$70,000

Recommended Improvements	Opinion of Cost
Pumps and accessories	$130,000
Ductile iron piping, valves, and fittings	$50,000
Plumbing improvements	$10,000
Architectural improvements	$310,000
HVAC improvements	$40,000
Electrical improvements	$150,000
Instrumentation and control improvements	$70,000
Permits	$20,000
Subtotal	**$1,480,000**
Contingency	$370,000
Legal/Fiscal/Engineering	$300,000
TOTAL CONSTRUCTION COSTS	**$2,150,000**

4.6.3 Alternative 3

Alternative 3 is a no action approach. Under this alternative, no improvements would be performed and the pump station would continue operating with existing equipment that is reaching the end of its design life. The sewer service extension from the Sunrise Street area and Granite Springs Road would put an increased demand on existing equipment and place it outside of original design parameters. It is expected that higher levels of maintenance would be required to continue operation of the pump station. As equipment continues to deteriorate over time, the likelihood of failure will become greater.

This alternative poses a substantial risk to public health and safety. Failure at the station would interrupt service to HMSD customers and potentially allow raw sewage overflow, contaminating Crystal Lake, adjacent wetlands, and nearby surface waters. Contamination of Crystal Lake may influence NYC's Croton watershed, which supplies drinking water to New York City. The health and environmental impacts from failure at the station far exceed the cost of either Alternative 1 or Alternative 2.

4.7 Crystal Lake Pump Station Improvements - Comparison and Recommendation of Alternatives

4.7.1 Alternative Comparison and Recommendation

GHD recommends the Town pursue Alternative 1 to rehabilitate aging equipment to reliably handle anticipated additional flows to the pump station. Alternative 1 is recommended over Alternative 2 due to replacement of similar critical components with less cost, site disturbance, and construction duration. The No Action option is not recommended due to non-monetary factors such as potential consequences associated with failure and its impact on environmental protection and public health.

A comparison of the alternatives is presented in Table 4-4. An opinion of probable cost for Alternative 1 is presented in Table 4-2.

Table 4-4 Summary and Comparison of Alternatives

Alternative	Advantages	Disadvantages	Non-Monetary Factors	Cost
1 - Targeted rehabilitation to replace equipment near the end of its useful life and improve control, monitoring, and emergency operations	• Capacity provided for increased flows • Reduced O&M costs • Improved control, monitoring, and emergency operations	Existing structures will have shorter design life in comparison with new structures	Increased protection of environment and public health	$1.34 Million
2 - Complete demolition and rebuild of the entire pump station	• Capacity provided for increased flows • New structures • Reduced O&M costs • Improved control, monitoring, and emergency operations	Longer construction time, cost prohibitive	Increased protection of environment and public health	$2.15 Million
3 - No Action	• No advantages identified	• See non-monetary factors • Higher operation and maintenance costs • Greater potential for failure	Potential risk to environment and public health	N/A

4.7.2 Project Schedule

Table 4-5 outlines the anticipated project schedule including construction phases for the Crystal Lake Pump Station.

Table 4-5 Anticipated Project Schedule

Task/Phase	Time to Complete Task
Engineering final design and regulatory approvals	4-6 months
SEQR and SHPO process	Concurrent with final design
Bid	5 weeks
Notice of Award	4 weeks
Notice to Proceed	4 weeks
Final completion	8-10 months

4.7.3 Next Steps

Refer to Section 3.7.4.

4.8 Summary of Recommendations

Improvements recommended in Alternative 1, based on GHD's findings, are described in detail in Section 4.6.1. The following is a summary of recommended capital improvements:

1. Replace existing wet well pumps with submersible pumps capable of accommodating anticipated additional flow from HMSD sewer extensions.
2. Replace piping, fittings, and valves within the wet well and valve vault.
3. Install instrumentation and controls designed in accordance with the 2017 SCADA evaluation.
4. Replace existing generator with new pad-mounted standby generator in a sound-attenuated enclosure with ATS.
5. Replace electrical components of the station, including service entrance equipment.
6. Upgrade existing HVAC components including fans, dampers, and louvers.
7. Replace piping from RPZ backflow preventer to outlets.
8. Install architectural improvements including roof cladding and building insulation.
9. Replace doors, hatches, and manhole covers with flood-resistant and watertight equipment.
10. Remove and dispose of underground fuel storage tank in accordance with WCDH guidelines and regulations.
11. Install site improvements including fencing and asphalt overlay.

4.9 Basis of Design - Crystal Lake Pump Station Improvements

The Crystal Lake Pump Station improvements have been preliminarily designed based on applicable sections of the following guidelines.

- Ten-States Standards for Wastewater Facilities, 2014 Edition.
- TR-16 Guides for the Design of Wastewater Treatment Works, 2011 Edition, revised 2016.

Ten-States Standards and TR-16 contain differing requirements for minimum flow velocity within force mains. Ten-States Standards requires that a minimum flow velocity of 2 ft/sec be maintained in force mains, while TR-16 requires a minimum of 3 ft/sec flow velocity be maintained. These flow velocity requirements are intended to prevent deposit of solids within force mains. Based on our evaluation of the station's existing pumps and piping configuration, as well as the age of the station, it has been determined that the original design was intended to provide a minimum 2 ft/sec flow velocity. It is our understanding that minimal clogging has been experienced during the station's approximately 34 years of operation.

To meet the flow velocity requirements of TR-16, pumps would need to be significantly increased in size and capacity, resulting in the potential need for a larger wet well and electrical service to accommodate them. Based on successful past performance of the station at a flow velocity of 2 ft/sec and the significant additional modifications needed to meet the flow velocity requirements of TR-16, pump and piping improvements have been preliminarily designed to meet the minimum flow velocity requirements of Ten-States Standards.

Proposed pump station design criteria is summarized in Table 4-6.

Table 4-6 Crystal Lake Pump Station Design Parameters

Design Parameter	Ten-States Standards for Wastewater Facilities Recommendation
Pump capacity	Peak hour flow
Two-pump system	Pumps shall be of the same size, each capable of handling peak hour flow
Pump opening	Capable of passing 3-inch solid sphere or equivalent solids handling capacity (grinder)
Wet well fill time	30 minutes (maximum)
Force main size	4-inch diameter (existing)
Force main velocity	2.0 ft/s (minimum) to 8.0 ft/s (maximum)

Existing Versus Anticipated Flows

The Crystal Lake Pump Station currently serves 35 residential units. Existing flows to the station are based on the 2010 HMSD Extensions Report. Proposed sewer service extensions will contribute additional flows from approximately 39 units. 26 from the Sunrise Street area and 13 from Granite Springs Road. Average daily flow and peak hourly flow were calculated for existing and proposed conditions by using the methodology described in Section 3.9 of this report.

A summary of flows for the Crystal Lake Pump Station is shown in Table 4-7.

Table 4-7 Crystal Lake Pump Station Flow Comparison

Flow to Crystal Lake Pump Station	Average Daily Flow (gpm)	Peak Hourly Flow (gpm)
Existing flow	6.2	16
Additional flow	6.9	19
Total Anticipated Flow	13.1	35

Preliminary Pump Sizing

Utilizing record drawings of the existing process piping, and rating of existing pumps, a system curve was developed for use in design. Calculations indicate the original pumps provide a minimum flow velocity of 2 ft/sec in the 4-inch DIP force main. New pumps were preliminarily sized to maintain a minimum cleansing velocity of 2-ft/sec in the force main, as required by Ten-States Standards. Existing pump rated capacity was determined to be adequate for handling anticipated

peak hourly flow to the station following installation of sewer service extensions. However, it could not be verified that the pumps provide their rated capacity after approximately 34 years of operation. Replacement of the pumps is recommended to accommodate additional flow, unless existing pump capacity and condition for continued service can be verified.

Based on design parameters for this application, two submersible pumps suitable for submersion in wastewater are recommended to replace the existing pumps at the Crystal Lake Pump Station. Each pump will be capable of handling anticipated peak hourly flow and solids.

The basis of design for new pumps at the Crystal Lake Pump Station is summarized in Table 4-8.

Table 4-8 Crystal Lake Pump Station Basis of Design - Pumps

Characteristic	Description
Number of pumps	2
Fluid	Wastewater
Rated capacity	80 gpm
TDH	70 ft
Efficiency	20 to 40%
Horsepower	6 HP
Voltage	208V/460V
Phase	3
Frequency	60 Hertz
Impeller	Semi-open, multi-vane, with cutter assembly
Explosionproof rated	Yes, to meet requirements of applicable standards

Wet Well Fill Time and Pump Cycle Times

Wet well fill time and pump cycling time were calculated based on usable wet well volume as determined by control set points and wet well dimensions. Calculations show the existing wet well is capable of accommodating anticipated peak hourly flow, following sewer service extension, in conformance with the requirements of Ten-States Standards. However, the existing control set points will require adjustment in order to accommodate additional flows. New control set points will be determined during detailed design so that the requirements of Ten-States Standards are met.

4.9.1 Recommended Bypass Pumping Configuration - Crystal Lake Pump Station

A permanent bypass connection is proposed to be installed on the force main downstream of the pump station valve vault. Excavation will be required to access the buried main. The bypass connection will be utilized for temporary bypass pumping, with the existing effluent structure being utilized as the suction manhole. The bypass pumping system shall be comprised of a primary pumping setup, a secondary (spare) on-site setup, and a third (spare) setup location within 10 minutes of the site during construction. The standby systems will be ready for operation during a

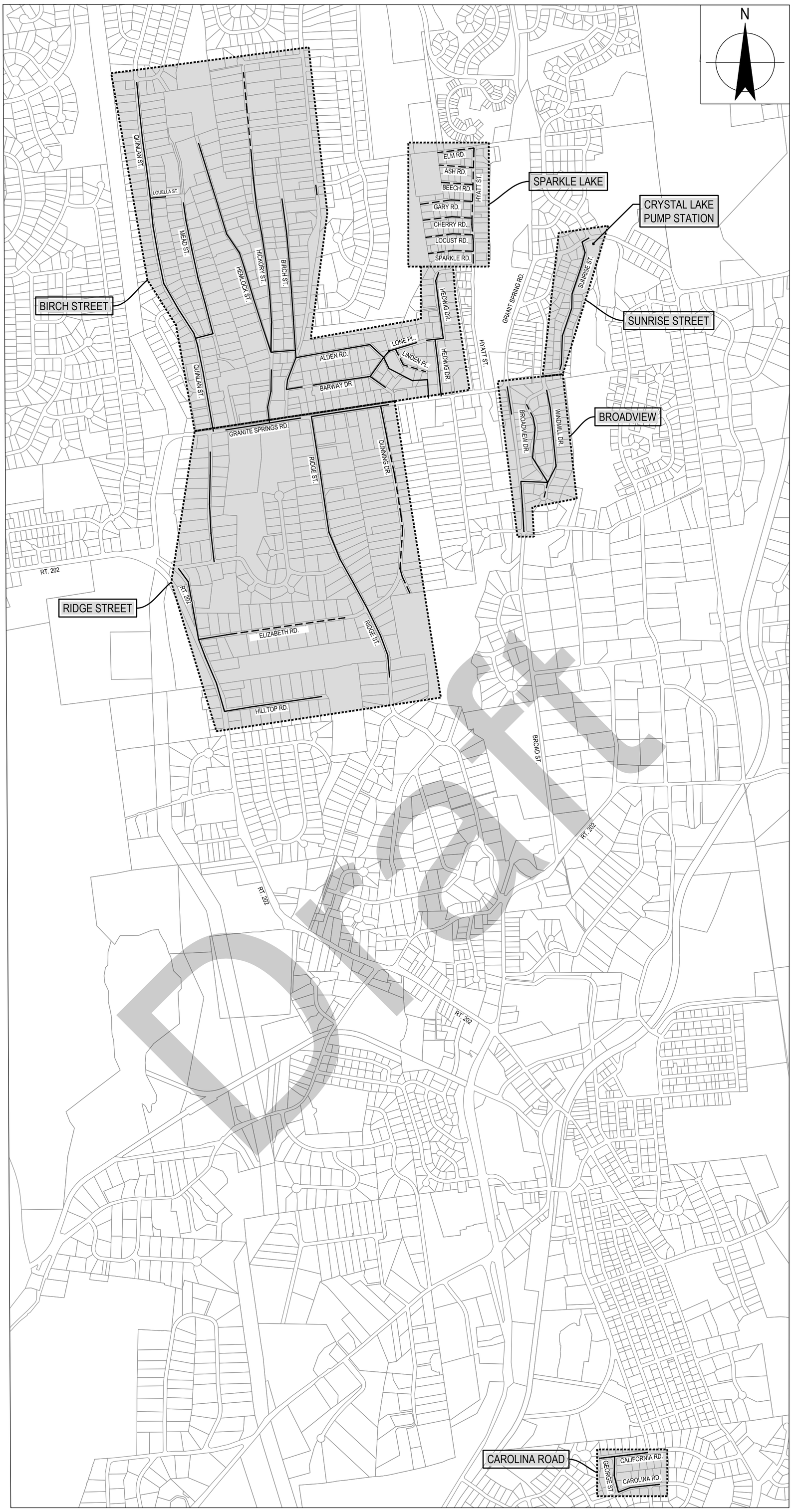
failure of the primary bypass pumping system and sized for the same pump capacity and discharge head.

4.9.2 Recommended Sequence of Construction

A general sequence of construction for the Crystal Lake Pump Station is:

1. Set up bypass pumping.
2. Pressure test bypass pumping equipment and piping.
3. Submit pressure testing data sheet to WCDH for acceptance prior to start-up.
4. Start up bypass pumping.
5. Rehabilitate pump station.
6. Install underground piping and perform pressure testing, as needed.
7. Submit pressure testing data sheet to WCDH for acceptance prior to pump station start-up.
8. Start up pump station, which shall include:
    a. Manufacturer's startup services for new equipment.
    b. Training for new equipment and systems.
    c. Point-to-point testing services and SCP programming services.
    d. Multi-day reliability testing.
9. Disassemble bypass pumping system.
10. Turn over operation of station to the Town.

Figures



NOTE:

1. TAX MAP INFORMATION FROM WESTCHESTER COUNTY GIS.

LEGEND	
GRAVITY SEWER (GS)	———
LOW PRESSURE SEWER (LPS)	– – – –
CRYSTAL LAKE PUMP STATION	■

0 200 400 600 800

SCALE 1"=800' AT ORIGINAL SIZE

NOT FOR CONSTRUCTION

GHD

TOWN OF YORKTOWN, NEW YORK
HALLOCKS MILL SEWER DISTRICT

SITE MAP

Project No. **111-44247**
Date **FEB 2018**

FIGURE 1

Filename: G:\111\11144247 Yorktown Hallocks Mill Crystal Lake\CADD\Drawings\Civil\111-44247_SITE MAP.dwg
Plot Date: 1 February 2018 - 9:50 AM

Source:

SEE RIDGE STREET (FIG-3) FOR CONTINUATION

BIRCH STREET PLAN

SCALE 1" = 200'

NOTE:

1. TAX MAP INFORMATION FROM WESTCHESTER COUNTY GIS.

LEGEND	
SOIL BORING	B-#
EXISTING SEWER MANHOLE	○
EXISTING SEWER	———
GRAVITY SEWER (GS)	———
LOW PRESSURE SEWER (LPS)	- - - -
CRYSTAL LAKE PUMP STATION	■

0 100 200 300 400'

SCALE 1"=200' AT ORIGINAL SIZE

NOT FOR CONSTRUCTION

GHD

TOWN OF YORKTOWN, NEW YORK
HALLOCKS MILL SEWER DISTRICT

BIRCH STREET

Project No. **111-44247**
Date **FEB 2018**

FIGURE 2

Filename: G:\111\11144247 Yorktown Hallocks Mill Crystal Lake\CADD\Drawings\Civil\111-44247_FIGURES.dwg
Plot Date: 1 February 2018 - 8:58 AM

Source:

SEE BIRCH STREET (FIG - 2) FOR CONTINUATION

RIDGE STREET PLAN

SCALE 1" = 200'

NOTE:

1. TAX MAP INFORMATION FROM WESTCHESTER COUNTY GIS.

LEGEND	
SOIL BORING	B-#
EXISTING SEWER MANHOLE	
EXISTING SEWER	
GRAVITY SEWER (GS)	
LOW PRESSURE SEWER (LPS)	
CRYSTAL LAKE PUMP STATION	

0 100 200 300 400'

SCALE 1"=200' AT ORIGINAL SIZE

NOT FOR CONSTRUCTION

TOWN OF YORKTOWN, NEW YORK
HALLOCKS MILL SEWER DISTRICT

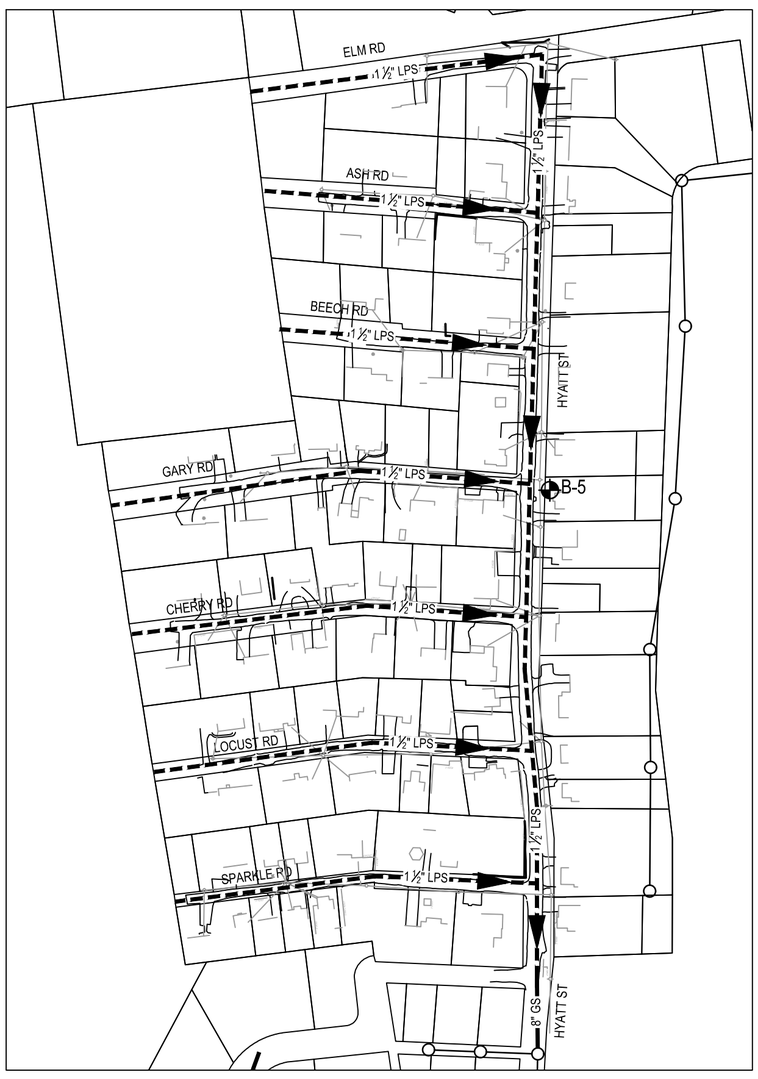
RIDGE STREET

Project No. **111-44247**
Date **FEB 2018**

FIGURE 3

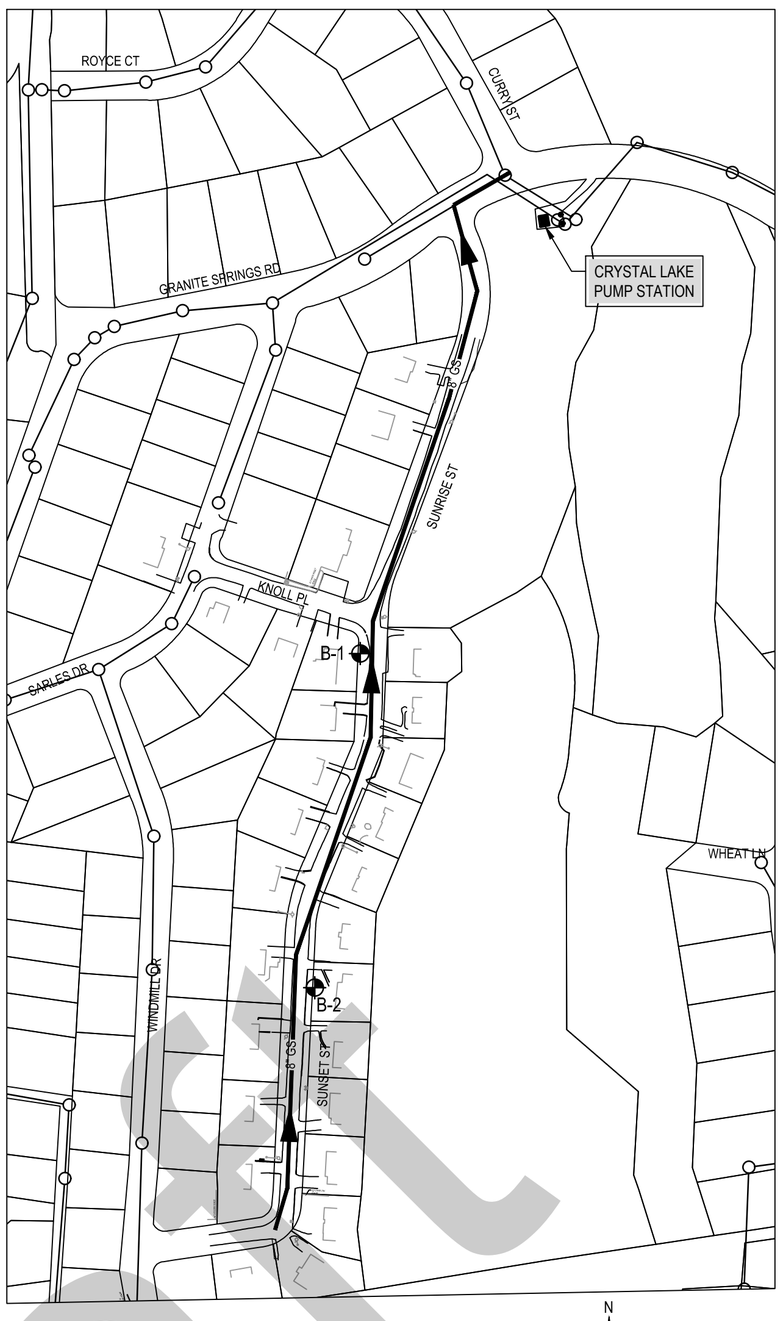
Filename: G:\111\11144247 Yorktown Hallocks Mill Crystal Lake\CADD\Drawings\Civil\111-44247_FIGURES.dwg
Plot Date: 1 February 2018 - 8:59 AM

Source:



SPARKLE LAKE PLAN

SCALE 1" = 200'



SUNRISE STREET PLAN

SCALE 1" = 200'

BROADVIEW DRIVE PLAN

SCALE 1" = 200'

CAROLINA ROAD PLAN

SCALE 1" = 200'

NOTE:

1. TAX MAP INFORMATION FROM WESTCHESTER COUNTY GIS.

LEGEND	
SOIL BORING	B-#
EXISTING SEWER MANHOLE	
EXISTING SEWER	
GRAVITY SEWER (GS)	
LOW PRESSURE SEWER (LPS)	
CRYSTAL LAKE PUMP STATION	

0 100 200 300 400'

SCALE 1"=200' AT ORIGINAL SIZE

NOT FOR CONSTRUCTION

TOWN OF YORKTOWN, NEW YORK
HALLOCKS MILL SEWER DISTRICT

SPARKLE LAKE, SUNRISE ST., BROADVIEW, & CAROLINA ROAD

Project No. **111-44247**
Date **FEB 2018**

FIGURE 4

Filename: G:\111\11144247 Yorktown Hallocks Mill Crystal Lake\CADD\Drawings\Civil\111-44247_FIGURES.dwg
Plot Date: 1 February 2018 - 9:01 AM

Source:

Legend

- Ridge St Unsewered Sub Area
- Birch St Unsewered Sub Area
- Granite Springs Road - Unsewered Sub Area
- Broadview - Unsewered Sub Area
- Sunrise Street - Unsewered Sub Area
- Sparkle Lake Unsewered Sub Area
- Carolina Rd Unsewered Sub Area
- Underhill Ave Unsewered Sub Area
- Baldwin Rd Unsewered Sub Area
- Van Cortlandt Circle Unsewered Sub Area
- Trelawn/Willoway Unsewered Sub Area
- Quaker Church St Unsewered Sub Area
- Unsewered
- HMSD Parcels

SCALE:

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

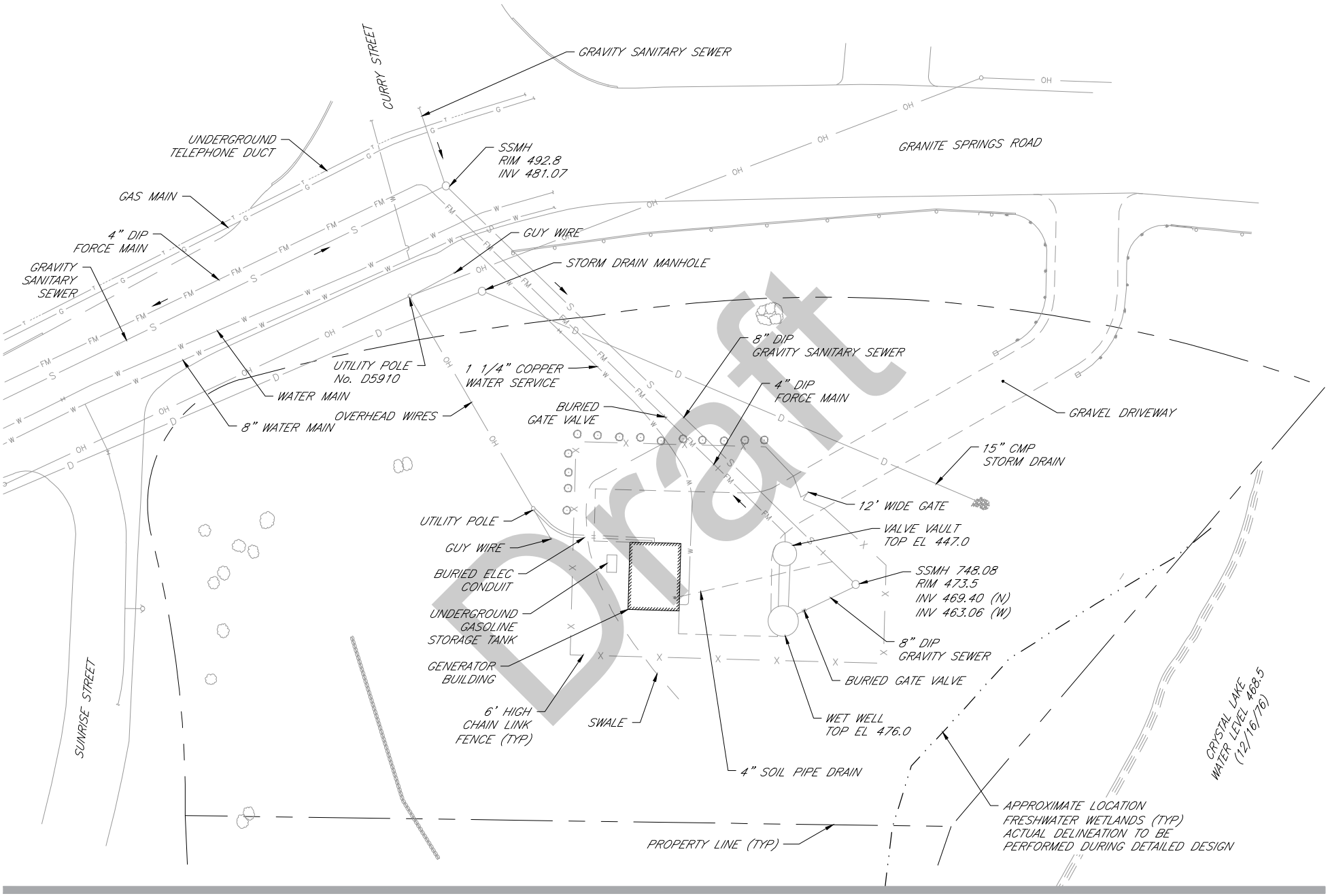
- HMSD Boundary
- DEC Wetlands
- Floodplains
- Hydric Soils
- Steep Slopes
- Critical Environmental Area
- Streams
- Lakes

GHD

FEBRUARY 2018

N

Town of Yorktown, NY
Hallocks Mill Sewer District
Environmental Constraints
FIGURE 5



N

NOT FOR CONSTRUCTION

NOT TO SCALE

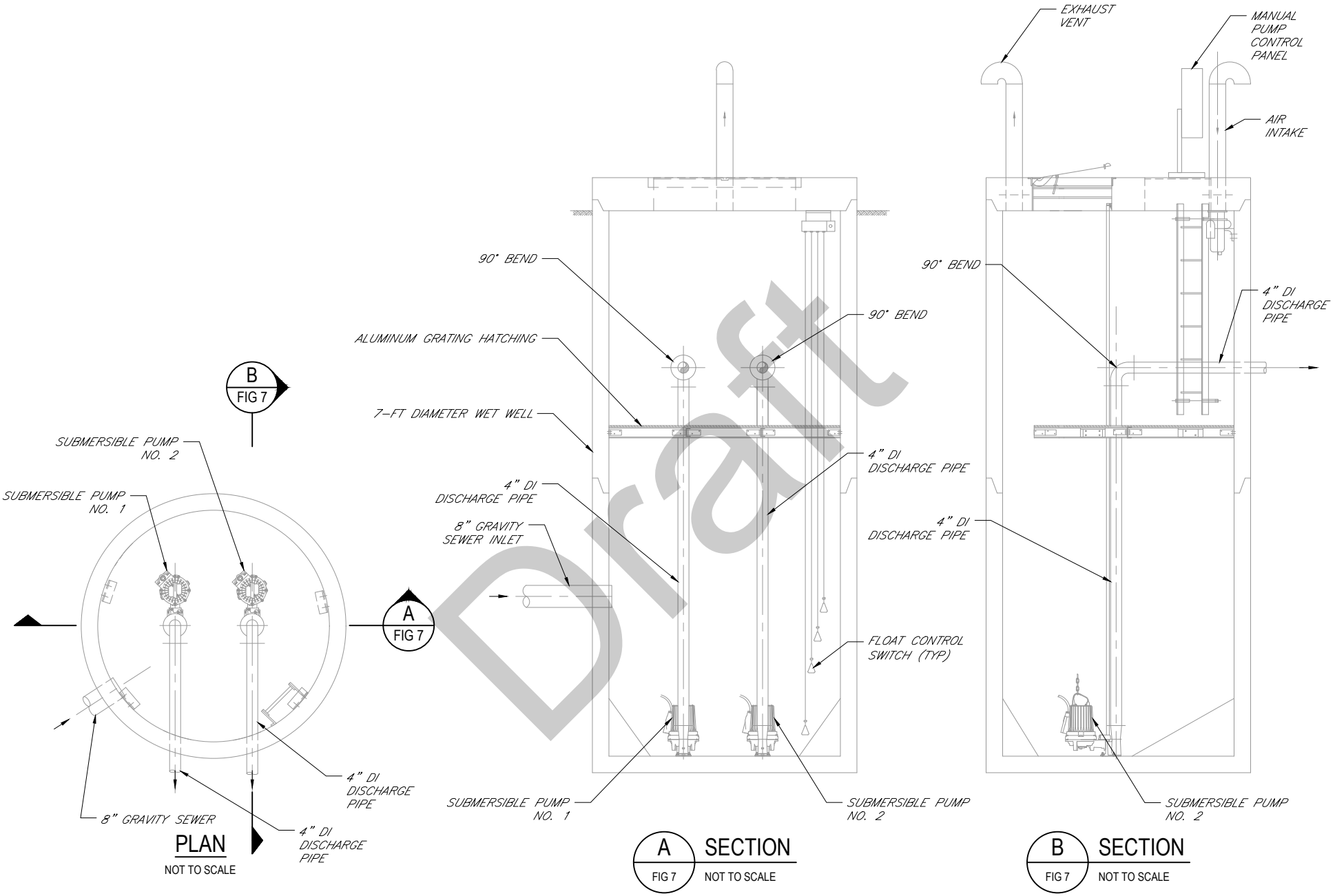
GHD

HALLOCKS MILL SEWER EXTENSION & CRYSTAL LAKE PUMP STATION
EXISTING PUMP STATION
SITE PLAN

Project No. 111-44247

Date FEB 2018

FIGURE 6



N

NOT FOR CONSTRUCTION

NOT TO SCALE

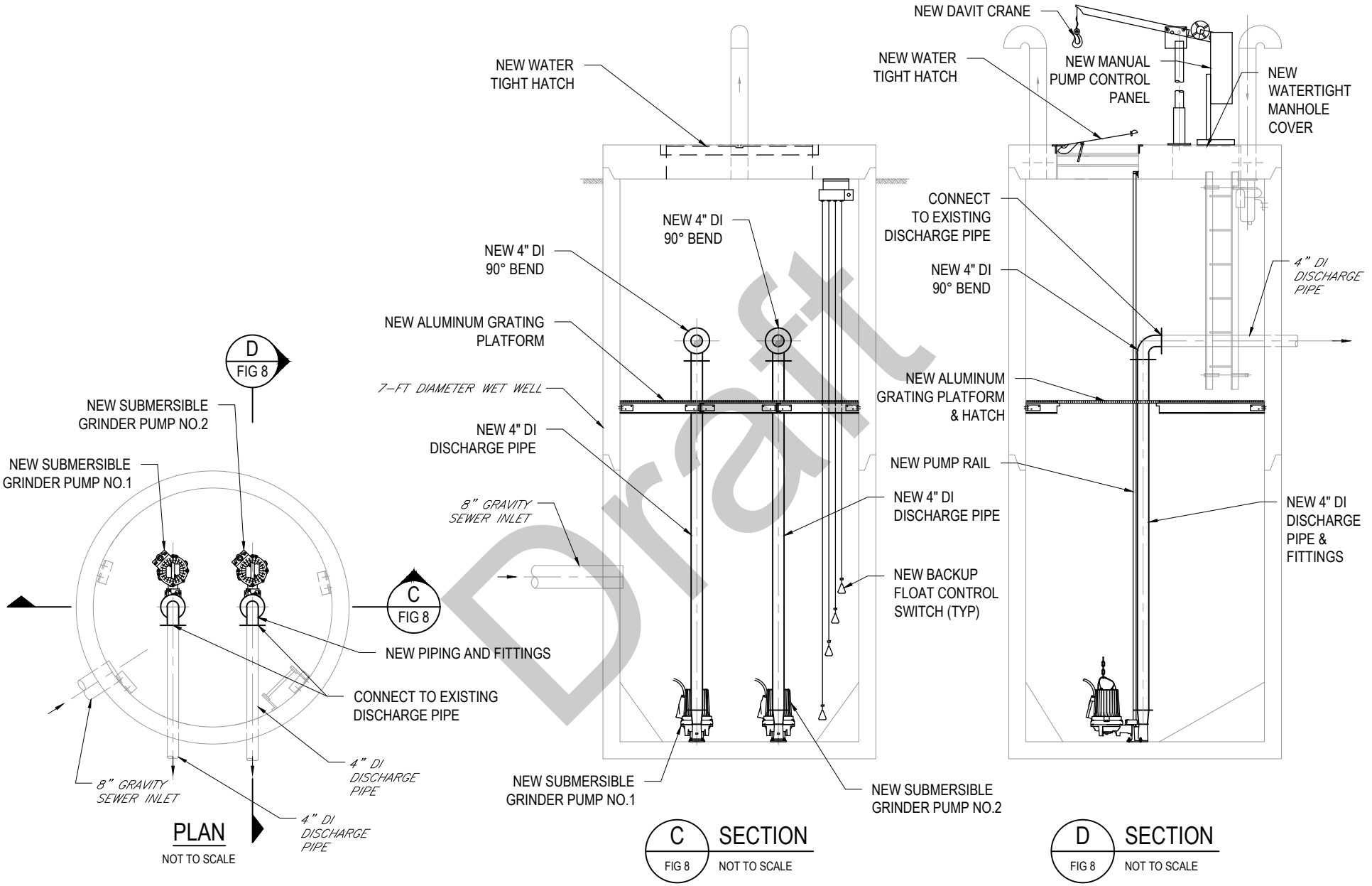
GHD

HALLOCKS MILL SEWER EXTENSION & CRYSTAL LAKE PUMP STATION
EXISTING WET WELL

Project No. 111-44247

Date FEB 2018

FIGURE 7



NOT FOR CONSTRUCTION

NOT TO SCALE

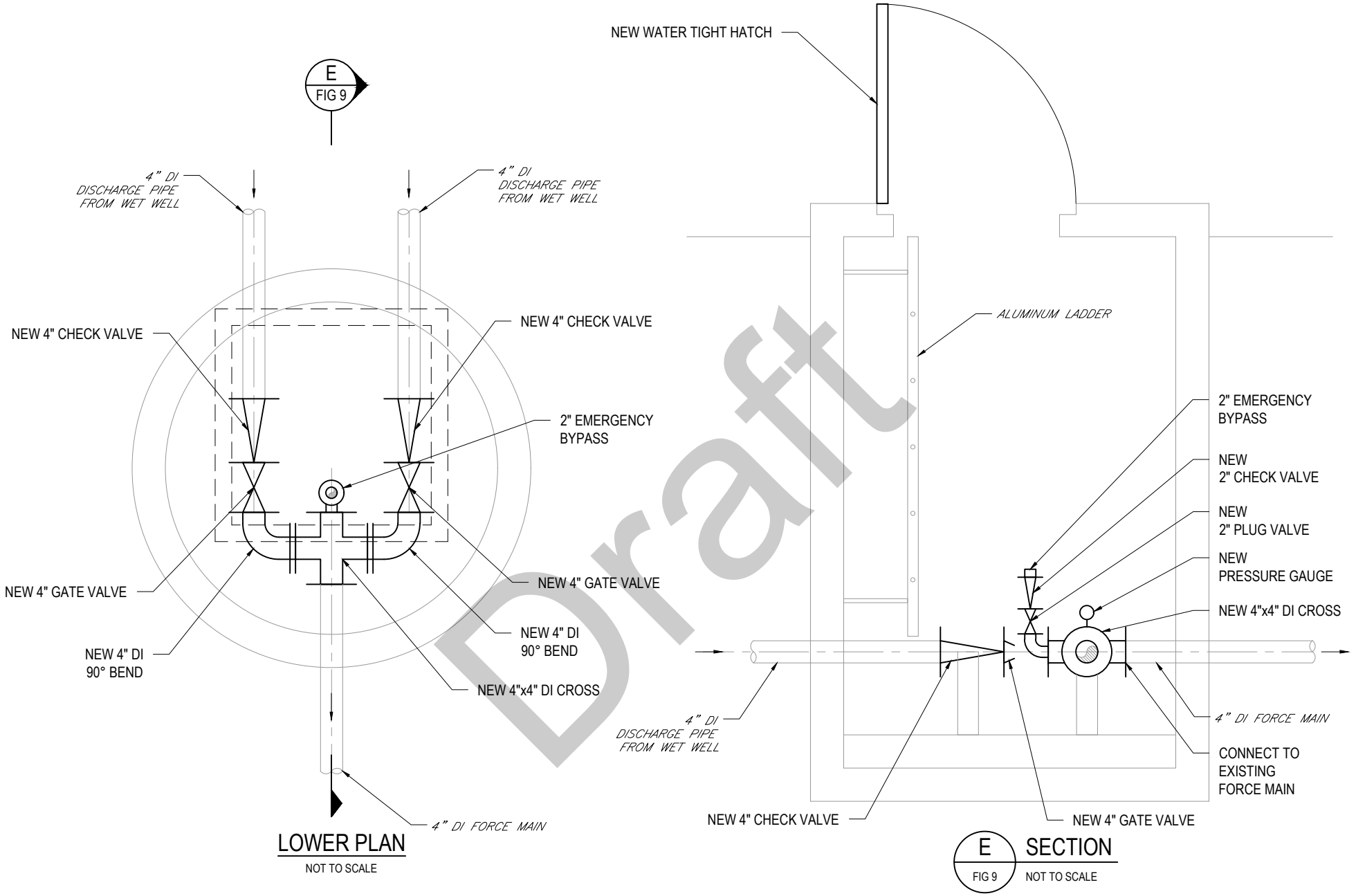
GHD

HALLOCKS MILL SEWER EXTENSION & CRYSTAL LAKE PUMP STATION RECOMMENDED WET WELL IMPROVEMENTS ALTERNATIVE 1

Project No. 111-44247

Date FEB 2018

FIGURE 8



N

NOT FOR CONSTRUCTION

NOT TO SCALE

GHD

HALLOCKS MILL SEWER EXTENSION & CRYSTAL LAKE PUMP STATION RECOMMENDED VALVE VAULT IMPROVEMENTS ALTERNATIVE 1

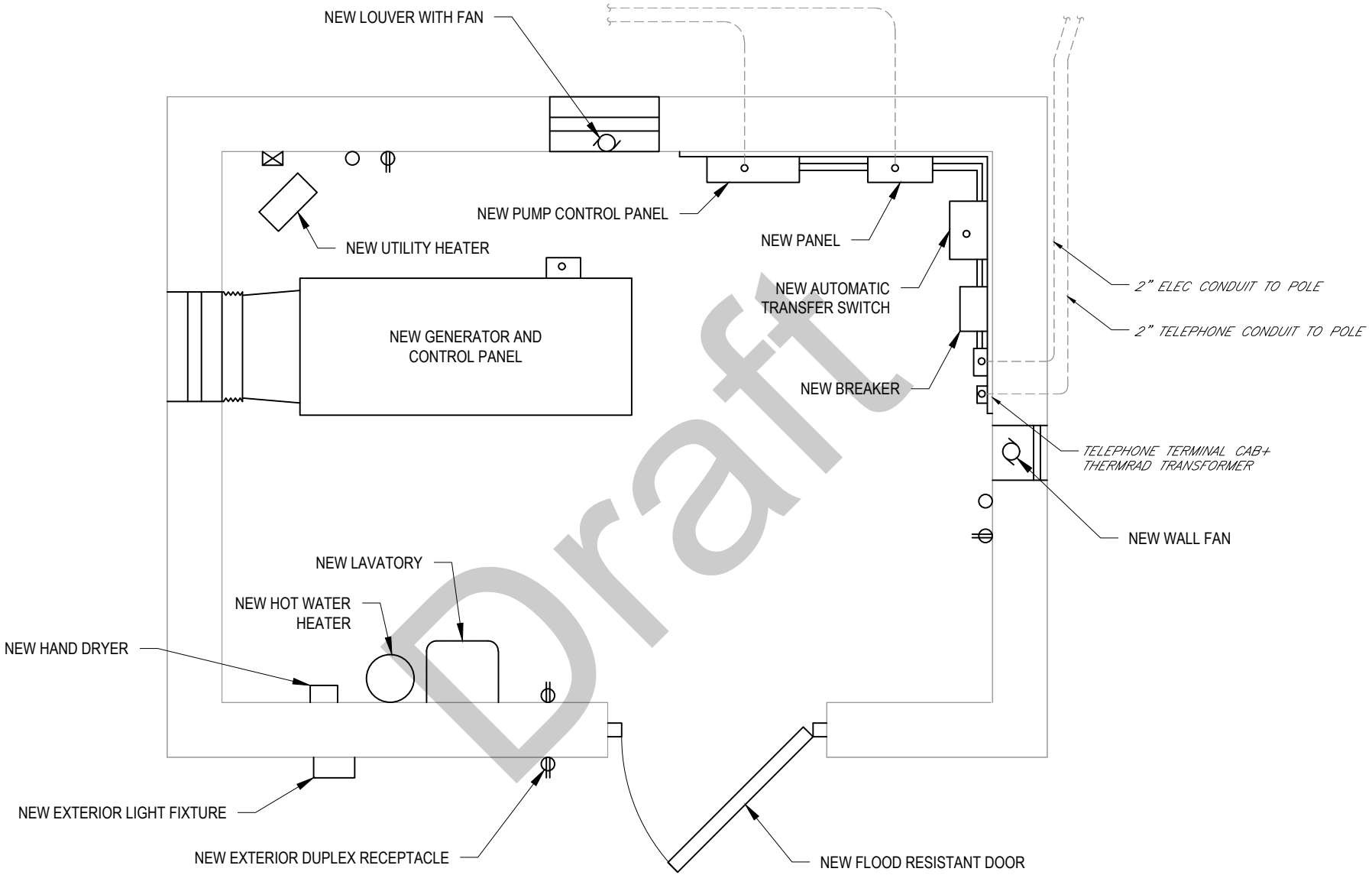
Project No. 111-44247

Date FEB 2018

FIGURE 9

Filename: G:\111\11144247 Yorktown Hallocks Mill Crystal Lake\CADD\Drawings\Pump Station\111-44247-C05.dwg
Plot Date: 2 February 2018 - 9:35 AM

Source:



PLAN

NOT TO SCALE

N

NOT FOR CONSTRUCTION

NOT TO SCALE

GHD

HALLOCKS MILL SEWER EXTENSION & CRYSTAL LAKE PUMP STATION RECOMMENDED GENERATOR BUILDING IMPROVEMENTS ALTERNATIVE 1

Project No. 111-44247

Date FEB 2018

FIGURE 10

Appendices

Appendix A – Engineering Report Certification

Appendix C: Engineering Report Certification
(required for EFC financial assistance)

Engineering Report Certification

To Be Provided by the Professional Engineer Preparing the Report

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: Hallocks Mill Sewer Service Extensions and Crystal Lake Pump Station Improvements

Date of Report: February 2018

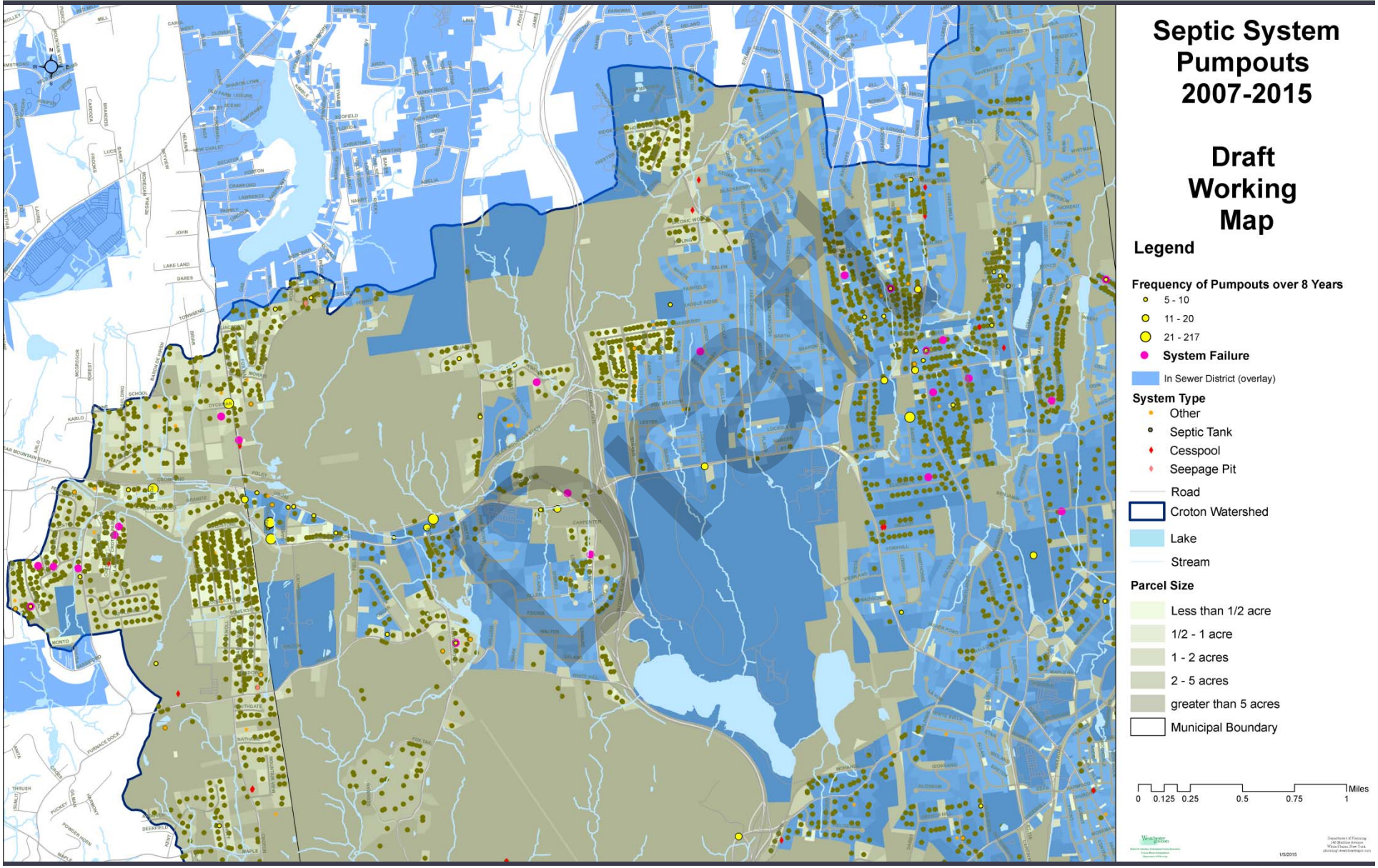
Professional Engineer's Name: Robert Butterworth, PE, BCEE- Principal GHD

Signature:

Date:

Appendix B – Westchester County Department of Planning - Septic Pumpout Initial Data Review Slide

Septic System Failures & Frequent Pumpouts



Route 202/35 Corridor, Town of Cortlandt/Yorktown

Westchestergov.com Robert P. Astorino Westchester County Executive

Appendix C – Soil Boring Reports

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-1
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2795 Sunrise Street, Yorktown Heights, NY — **START DATE:** 11/28/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/28/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS	
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
	1	0/2	3	4	7	10				0/.25	Gray Fine Sand, Slightly Silty with Brick & Asphalt	
										.25/17	Brown Fine Sand, Slightly Silty with Gravel (Till)	
5	2	4/6	15	20	25	24						
	3	10/12	24	23	18	10						
10												
										17/20	Brown and Gray Fine Sand, Slightly Silty with Gravel (Till)	
15	4	15/17	20	25	20	28						
	5											
20	5	18/20	74	76	87	91					EOB @ 20'	
25												
30												
35												

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/28/2017		9

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-2
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2750 Sunrise Street, Yorktown Heights, NY — **START DATE:** 11/28/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/28/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	12	10	16	19				0/.5	Brown Fine Sand, Slightly Silty with Gravel and Surface Organics
										.5/7	Brown Fine-Medium Fine Sand with Trace Silt
5	2	4/6	26	39	56	61				7/13	Brown Fine Sand, Slightly Silty with Gravel (Till)
	3	10/12	30	34	30	60					
10											
										13/20	Brown and Gray Fine Sand, Slightly Silty with Gravel (Till)
15	4	15/17	42	60	100/4"						
	5	18/20	72	79	85	96					EOB @ 20'
20											
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/28/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-3
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2659 Windmill Drive, Yorktown Heights, NY — **START DATE:** 11/29/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/29/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS	
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
	1	0/2	26	30	41	56				0/.50	Asphalt and Base Rock	
										.50/20	Brown Fine Sand, Slightly Silty with Gravel	
5	2	4/6	30	28	26	32						
	3	10/12	26	48	88	85						
10												
15	4	15/17	80	72	89	100/5”						
	5	18/20	61	79	90	100/3”					EOB @ 20’	
20												
25												
30												
35												

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2”
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24”	HAMMER FALL - SPOON	30”
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/28/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-4
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2660 Broadview Drive, Yorktown Heights, NY — **START DATE:** 11/29/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/29/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	7	7	9	12				0/.50	Brown Fine Sand, Slightly Silty with Surface Organics
										.50/20	Brown Fine Sand, Slightly Silty with Gravel (Till)
5	2	4/6	20	27	45	53					
	3	10/12	21	18	25	30					
10											
15	4	15/17	40	44	60	52					
	5	18/20	53	71	84	96					
20											EOB @ 20'
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/29/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-5
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2924 Hyatt Street, Yorktown Heights, NY — **START DATE:** 11/29/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/29/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS	
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
	1	0/2	8	12	15	15				0/.50	Brown Fine Sand, Slightly Silty with Surface Organics	
										.50/ 18'9"	Brown Fine Sand, Slightly Silty with Gravel	
5	2	4/6	15	21	19	30						
	3	10/12	22	60	62	70						
10												
15	4	15/17	88	79	82	86						
	5	18/20	90	100/3"							EOB @ 18'9"	
20												
25												
30												
35												

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/29/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-6
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: Across the Street from 416 Barway Drive Yortown Heights, NY — **START DATE:** 11/30/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/30/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS	
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
_	1	0/2	3	4	5	6				0/.50	Brown Fine Sand, Slightly Silty with Surface Organics	
_										.50/13	Brown Fine Sand, Slightly Silty with Gravel (Till)	
_ 5	2	4/6	12	17	28	32						
_												
_	3	10/12	30	52	90	95				13/ 19'4"	Brown and Gray Fine Sand, Slightly Silty with Gravel (Till)	
_ 10												
_												
_	4	15/17	70	60	88	97						
_ 15												
_												
_	5	18/20	71	92	100/4"						EOB @ 19'4"	
_ 20												
_												
_												
_ 25												
_												
_												
_ 30												
_												
_												
_ 35												
_												

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/30/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-7
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: End of Birch Street, Yorktown Heights, NY — **START DATE:** 11/30/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 11/30/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	8	8	7	4				0/1.5	Asphalt (Fill) with Brown Fine Sand; Slightly Silty
										1.5/ 21'11"	Brown Fine Sand, Slightly Silty with Gravel
5	2	4/6	18	19	30	34					
	3	10/12	38	49	56	100/1"					
10											
	4	15/17	36	62	90	100/1"					
15											
	5	18/20	69	74	81	100/5"					EOB @ 21'11"
20											
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
11/30/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-8
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 495 Elizabeth Rd, Yorktown Heights, NY — **START DATE:** 12/01/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 12/01/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	2	4	3	4				0/.5	Brown Sand with Surface Organics
										.5/6	Brown Fine Sand, Trace Silt and Gravel
5	2	4/6	17	9	8	10					
										6/13	Brown Fine Sand, Slightly Silty with Gravel (Till)
	3	10/12	8	12	12	20					
10										13/20	Gray and Brown Sand, Slightly Silty with Gravel (Till)
15	4	15/17	32	25	33	36					
	5	18/20	36	42	48	57					
20											EOB @ 20'
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
12/01/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-9
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 2635 Dunning Drive, Yorktown Heights, NY — **START DATE:** 12/01/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 12/01/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	7	9	12	16				0/.25	Brown Fine Sand; Slightly Silty with Surface Organics
										.25/ 19.5	Brown Fine Sand, Slightly Silty with Gravel (Till)
5	2	4/6	17	21	28	36					
	3	10/12	27	35	56	68					
10											
15	4	15/17	88	65	92	98					
	5	18/20	79	92	100/5"						EOB @ 19'5"
20											
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2"
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
12/01/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Bus.: (845) 553-9200 Fax.: (845) 553-9199

ALLIED DRILLING, INC.

25 Greenbush Road South, #3, Orangeburg, NY 10962

BORING NO. B-10
SHEET 1 of 1

BORING LOG

PROJECT: Hallocks Mill Sewer Extensions — **PROJECT NO.:**
LOCATION: 263 California Road, Yorktown Heights, NY — **START DATE:** 12/01/2017
CLIENT: GHD Consulting Services, Inc. — **FINISH DATE:** 12/01/2017
INSPECTOR: _____ **DRILLER:** Tony H. Martin **HELPER:** Donny Mitchell — **RIG:** CME-55

			SOIL BLOWS / 6"					ROCK CORE			SOIL/ROCK DESCRIPTION & REMARKS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)		
	1	0/2	8	13	23	30				0/3.5	Brown Fine Sand; Slightly Silty with Gravel
											Brown Fine Sand, Slightly Silty with Gravel (Till)
5	2	4/6	46	79	100/2”					13.5/ 16.4”	Decomposed Schist Rock
	3	10/12	70	90	100/1”						
10											
15	4	15/17	82	97	100/1”						EOB @ 16’4”
20											
25											
30											
35											

TOOLS & EQUIPMENT USED

CASING SIZE	HW	SPOON SIZE	2”
CASING HAMMER	300	SPOON HAMMER	140
HAMMER FALL - CASING	24”	HAMMER FALL - SPOON	30”
CORE BARREL USED		DRILLING MUD USED	
CORE BIT USED		UNDISTURBED SAMPLER	
AUGER SIZE		STANDBY TIME	

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	At Completion	
12/01/2017		None

OBSERVATION WELL

DEPTH (FT.)		SCREEN LENGTH (FT)

Appendix D – Smart Growth Assessment Form

Appendix D: Smart Growth Assessment Form
(required for EFC financial assistance)

Smart Growth Assessment Form

This form should be completed by the applicant's project engineer or other design professional.[1]

Applicant Information

Applicant: Town of Yorktown, NY Project No.: 11144247

Project Name: Hallocks Mill Sewer Service Extension

Is project construction complete? ☐ Yes, date: X No

Project Summary: (provide a short project summary in plain language including the location of the area the project serves)
Installation of approximately 11 miles of new sanitary sewer service, and associated infrastructure upgrades, within previously unsewered areas of the Hallocks Mill Sewer District in the Town of Yorktown, NY.

Section 1 – Screening Questions

1. Prior Approvals

1A. Has the project been previously approved for EFC financial assistance? ☐ Yes X No

1B. If so, what was the project number(s) for the prior approval(s)? Project No.:

Is the scope of the project substantially the same as that which was approved? ☐ Yes ☐ No

IF THE PROJECT WAS PREVIOUSLY APPROVED BY EFC'S BOARD AND THE SCOPE OF THE PROJECT HAS NOT MATERIALLY CHANGED, THE PROJECT IS **NOT** SUBJECT TO SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

2. New or Expanded Infrastructure

2A. Does the project add new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant? X Yes ☐ No
Note: A new infrastructure project adds wastewater collection/water mains or a wastewater treatment/water treatment plant where none existed previously

2B. Will the project result in either: ☐ Yes X No

An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing treatment system;

OR

An increase such that a NYSDEC water withdrawal permit will need to be obtained or modified, or result in the NYSDOH approving an increase in the capacity of the water treatment plant?

[1] If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

Note: An expanded infrastructure project results in an increase of the SPDES permitted flow capacity for the wastewater treatment system, or an increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system.

IF THE ANSWER IS "NO" TO BOTH "2A" and "2B" ON THE PREVIOUS PAGE, THE PROJECT IS NOT SUBJECT TO FURTHER SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

3. Court or Administrative Consent Orders

3A. Is the project expressly required by a court or administrative consent order? ☐ Yes X No

3B. If so, have you previously submitted the order to NYS EFC or DOH? If not, please attach. ☐ Yes ☐ No

Section 2 – Additional Information Needed for Relevant Smart Growth Criteria

EFC has determined that the following smart growth criteria are relevant for EFC-funded projects and that projects must meet each of these criteria to the extent practicable:

1. Uses or Improves Existing Infrastructure

1A. Does the project use or improve existing infrastructure? X Yes ☐ No

Please describe:

Proposed sewers will connect to the existing collection system. The existing Crystal Lake pump station is proposed to be upgraded, utilizing the existing facility, to accomodate additional from proposed sewers. New wastewater flow is anticipated to be recieved by the existing Yorktown Heights Water Pollution Control Plant.

2. Serves a Municipal Center

Projects must serve an area in either 2A, 2B or 2C to the extent practicable.

2A. Does the project serve an area **limited** to one or more of the following municipal centers?

i. A City or incorporated Village X Yes ☐No
ii. A central business district ☐Yes ☐No
iii. A main street ☐Yes ☐No
iv. A downtown area ☐Yes ☐No
v. A Brownfield Opportunity Area ☐Yes ☐No
(for more information, go to www.dos.ny.gov & search "Brownfield")
vi. A downtown area of a Local Waterfront Revitalization Program Area ☐Yes ☐No
(for more information, go to www.dos.ny.gov and search "Waterfront Revitalization")
vii. An area of transit-oriented development ☐Yes ☐No
viii. An Environmental Justice Area ☐Yes ☐No
(for more information, go to www.dec.ny.gov/public/899.html)
ix. A Hardship/Poverty Area ☐Yes ☐No
Note: Projects that primarily serve census tracts and block numbering areas with a poverty rate of at least twenty percent according to the latest census data

Please describe all selections:

The Town of Yorktown, NY was incorporated in 1788 and is served by the Hallocks Mill Sewer District for wastewater collection and treatment.

2B. If the project serves an area located outside of a municipal center, does it serve an area located adjacent to a municipal center which has clearly defined borders, designated for concentrated development in a municipal or regional comprehensive plan and exhibit strong land use, transportation, infrastructure and economic connections to an existing municipal center? ☐Yes ☐No

Please describe:

2C. If the project is not located in a municipal center as defined above, is the area designated by a comprehensive plan and identified in zoning ordinance as a future municipal center? ☐Yes ☐No

Please describe and reference applicable plans:

3. Resiliency Criteria

3A. Was there consideration of future physical climate risk due to sea-level rise, storm surge, and/or flooding during the planning of this project? X Yes ☐No

Please describe:

The Crystal Lake Pump station was assessed for it's location within established FEMA flood plains.

Signature Block: By entering your name in the box below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant:	Phone Number:
(Name & Title of Project Engineer or Design Professional or Authorized Municipal Representative)	
(Signature)	(Date)

www.ghd.com