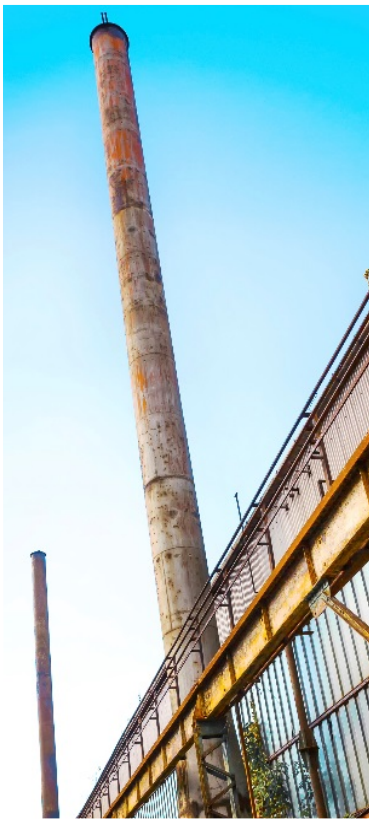
Design Report

West Side Sewer Extension Project

South & Center Chautauqua Lake Sewer Districts



Executive Summary

The South and Center Chautauqua Lake Sewer Districts (SCCLSD) owns and operates its own wastewater collection and treatment system which consists of gravity sewers, vacuum sewers, low pressure sewers, traditional pump stations, and a Wastewater Treatment Plant (WWTP). The SCCLSD serves communities along the east, south, and west sides of Chautauqua Lake in Chautauqua County, New York. Chautauqua Lake (the Lake) is one of the primary sources of cultural and recreational attraction in Chautauqua County, as well as serving as the drinking water supply for multiple Public Water Systems and individual users.

In 2004 the New York State Department of Environmental Conservation (NYSDEC) officially designated the Lake as an impaired water body per Section 303(d) of the federal Clean Water Act, primarily due to the excessive phosphorous loading that is causing problematic growth of underwater nuisance vegetation and algal blooms. A Total Maximum Daily Load (TMDL) phosphorous allocation was completed in 2012 and identified various sources of phosphorous loadings to the Lake. One source identified was the private septic systems utilized by properties not served by a public WWTP. Approximately 20 percent of shoreline properties in the north basin and 34 percent of shoreline properties in the south basin rely on individual septic systems for sewage disposal. Many of these septic systems do not meet current standards and are nearing the end of their useful life. Based on this fact, the SCCLSD decided to pursue extending their service area along the Route 394 beltway on the west side of the Lake, and the project has been identified as the West Side Sewer Extension.

The West Side Sewer Extension proposed improvements have been grouped into three phases:

- Phase 1 inclusive of the southwest side of the lake between the existing SCCLSD boundary and Stow.
- Phase 2 inclusive of the northwest side of the lake between Stow and North Chautauqua Lake Sewer District.
- Phase 3 inclusive of the Hamlet of Ashville.

This report provides the basis of design for the Phase 1 expansion, while also examining the impacts of the Phase 2 and 3 expansion on existing and proposed infrastructure.

The West Side Sewer Extension Phase 1 project is anticipated to generally consist of the following infrastructure:

- 223 Simplex Grinder Pump Stations
- 6 Duplex Grinder Pump Stations (2 stations with a primary pump and spare and 4 stations with a primary pump and a secondary pump with no spare)
- New Hadley Bay Pumping Station
- Sunrise Cove Pumping Station Upgrade
- New SR 394 Pumping Station
- Goose Creek Pumping Station Upgrade
- 25,000 LF of 1.25-inch HDPE lateral piping
- 21,000 LF of 2-inch HDPE force main
- 7,200 LF of 3-inch HDPE force main
- 750 LF of 8-inch HDPE force main
- 21,650 LF of 10-inch HDPE force main
- Combination air-vacuum relief valves

- In-line isolation valves
- Force main clean outs
- Check valves

A summary of the Engineer's Opinion of Probable Project Cost for the Phase 1 base bid improvements is presented below. Following the base bid summary are summaries of two alternate items that were discussed during a March 19, 2020 value engineering meeting between SCCLSD staff, the Board's Technical Committee and GHD. These items will be included in the bid package as bid alternates.

Base Bid - Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
Force Main Installation – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, and testing)	50,600 LF	$7,860,000
Simplex/Duplex Grinder Pump – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	229 EA	$3,935,000
New Hadley Bay Pumping Station – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration. power supply, and testing)	1 EA	$500,000
Sunrise Cove Pump Station Improvements – Complete (Including labor, materials and appurtenances, demolition, bypass pumping, and testing)	1 EA	$75,000
New SR 394 Pumping Station – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, power supply, and testing)	1 EA	$675,000
Improvements to Goose Creek Pump Station and Interconnection to Existing Force Main – Complete (Including labor, materials and appurtenances, demolition, pump replacement, excavation, backfill, restoration, and testing)	1 LS	$210,000
Land Acquisition (New pumping station site and easements)	TBD	$75,000
	Subtotal:	***$13,330,000***
	10% Contingency:	$1,340,000
	Engineering, Legal, and Administration:	$1,810,000
	Project Cost (2020):	***$16,480,000***
	Project Cost with Construction Cost Escalated ~2% to2022 Construction Period:	***$16,800,000***

The two alternatives to the base design presented in this report will be detail designed and may be included as alternates in the construction bid documents. This approach will allow SCCLSD to receive actual contractor bids and analyze in relation to the funds available for the project while allowing the Base Bid contract value to remain as low as feasible.

Alternate 'A' Bid: Extend SR 394 Force Main to Sherman's Bay - Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
Force Main Installation – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, and testing)	3,600 LF	$650,000
DEDUCT – Downsize New SR 394 Pumping Station – Complete	1 LS	($75,000)
DEDUCT - Improvements to Goose Creek Pump Station and Interconnection to Existing Force Main – Complete (Including labor, materials and appurtenances, demolition, pump replacement, excavation, backfill, restoration, and testing)	1 LS	($210,000)
Subtotal:		***$365,000***
10% Contingency:		$35,000
Project Cost (2020):		***$400,000***
Project Cost with Construction Cost Escalated ~2% to 2022 Construction Period:		***$410,000***

Alternate 'B' Bid: Design of "Duplex Lift Stations - Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
DEDUCT - Duplex Grinder Station without installed spare – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	4 EA	($80,000)
Duplex Grinder Station with installed spare – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	4 EA	$340,000
Subtotal:		***$260,000***
10% Contingency:		$30,000
Project Cost (2020):		***$290,000***
Project Cost with Construction Cost Escalated ~2% to 2022 Construction Period:		***$300,000***

With the project bid documents organized as presented above, the Engineer's Opinion of Probable Project Cost Base Bid project is $16,800,000. The combination of the Base Bid and Alternate Bid(s) A and B increase the Engineer's Opinion of Probable Project Cost to $17,510,000.

The table below presents the projected current and future hydraulic loading of Phase 1, 2, and 3 of the West Side Sewer Extension, as well as the existing Sunrise Cove, Goose Creek, and Sherman's Bay Pumping Stations. The New Hadley Bay Pumping Station will be designed to accommodate flows from Phase 2 and areas of Stow and Hadley Bay of Phase 1. The New SR 394 Pumping Station will be designed to accommodate flows from Sunrise Cove, Phase 1, and Phase 2.

Projected Current and Future Hydraulic Loadings

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ start of Phase 3 (Year = 2034)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2041)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)	Future Flow (gpm) @ Phase 3, 20-year buildout (Year = 2053)
Goose Creek Pumping Station	231	275	311	370	370	370
Sherman's Bay Service Area	273	325	367	437	437	437
West Side Sewer Service Area	312	680	850	1,010	1,107	1,125
Total Conveyance Requirement	***816***	***1,280***	***1,528***	***1,817***	***1,914***	***1,932***
Approx. % of Current Sherman's Bay Pump Station Capacity	***68%***	***107%***	***127%***	***151%***	***160%***	***161%***

Note: Sherman's Bay Pump Station currently has a rated capacity of 1,200 gpm.

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1. Project Background and History

The South and Center Chautauqua Lake Sewer Districts (SCCLSD) were formed in 1970 after studies indicated significant health and environmental issues were occurring as a result of on-site disposal of sewage. The Chautauqua County Health Department stopped most development in the area until adequate public sanitary facilities could be implemented. Subsequently, the SCCLSD constructed a Publically Owned Treatment Works (POTW) Wastewater Treatment Plant (WWTP) which was placed into operation in 1980. The creation of the SCCLSD and construction of their WWTP allowed the consolidation of the sewage collection and treatment for three Villages and four Towns.

Since that time, the SCCLSD has continued to own and operate their WWTP, as well as expand their service area by means of furthering the collection system. Presently, the SCCLSD serves approximately 5,000 customer connections, covering approximately 180 square miles and 8 communities including Lakewood, Celoron, Ellery, North Harmony, Harmony, Busti, Bemus Point, and Ellicott. Existing infrastructure utilized to service these areas generally consists of the following, and as shown in Figure 1.1:

- Wastewater Treatment Plant
- Pumping Stations
- Gravity sewer lines
- Vacuum sewer lines
- Force main/pressure sewer lines.

The SCCLSD is extending its sanitary sewer system to include the west side of Chautauqua Lake and service approximately 770 developed parcels that currently have private septic systems. The extension is required as the result of existing private septic systems not meeting standards and/or approaching the end of their useful life. These septic systems are a source of phosphorus loading to Chautauqua Lake via direct or tributary waterways discharging into the lake. In 2002, the lake phosphorus level exceeded the New York State Department of Environmental Conservation (NYSDEC) water quality guidance value of 0.020 mg/L, which is in place to protect recreational uses of lakes. In 2004, Chautauqua Lake was officially designated as an impaired waterbody by the NYSDEC per Section 303(d) of the Federal Clean Water Act. In 2012, a Total Maximum Daily Load (TMDL) phosphorus allocation for the lake was completed. The TMDL identified a number of sources that contribute to the lake's excessive phosphorus levels, with one of those contributors being private septic systems within the lake's watershed.

Based on the findings of the 2012 TMDL, NYSDEC reporting, and the water quality of Chautauqua Lake, SCCLSD retained the services of a consulting engineer to examine the feasibility of extending public sewer to all properties contiguous to Route 394 (maximum depth of 500 feet from centerline to the west) and properties between the Lake and Route 394 along the west side of the Lake, in the Towns of North Harmony and Chautauqua. In addition, portions of the Hamlet of Ashville would be transferred from private to public sewers. This previous work was summarized in the July 2015 *Sewer Extension for West Side Sewer Chautauqua Lake, Engineering Report for Sewer Extension* (2015 Sewer Extension Report), and the September 2017 Map, Plan, and Report titled *Sewer*

Extension through the Hamlet of Stow for the West Side of Chautauqua Lake (Phase 1 of the West Side Sewer Extension) (2017 Phase 1 Sewer Extension Report), both prepared by O'Brien & Gere.

The proposed improvements from the 2015 Sewer Extension Report were grouped into three phases:

- Phase 1 inclusive of the southwest side of the lake between the existing SCCLSD boundary and Stow.
- Phase 2 inclusive of the northwest side of the lake between Stow and North Chautauqua Lake Sewer District.
- Phase 3 inclusive of the Hamlet of Ashville.

This report provides the basis of design for Phase 1 of the expansion project and will outline projected hydraulic loads, sizes of pipelines, new pump requirements (new customer grinder stations and intermediate pumping stations), and rehabilitation requirements to the existing Sunrise Cove and/or Sherman's Bay and Lakewood pumping stations.

1.1 Site Information

The existing SCCLSD service area is shown on Figure 1.1. Phase 1 of the West Side Sewer Extension is primarily located in the Town of North Harmony extending from north of the intersection of Route 394 and North Maple to the northern limits of the Hamlet of Stow, which is depicted on Figure 1.2. The Town of North Harmony is located within Chautauqua County, New York along the southwest shore line of Chautauqua Lake, approximately 15 miles north of the City of Jamestown and 70 miles southwest of the City of Buffalo. The Town of North Harmony, which was established in 1919 from part of the Town of Harmony, totals approximate 42 square miles and is home to over 2,200 residents (2010 Census) with over 900 households.

The primary soils within the project area are Busti Silt Loam (BsB and BsC), Canandaigua Silt Loam (Cb and Cc), Chautauqua Silt Loam (CkB, CkC, and CkD), and Raynham Silt Loam (Rf) (Source: USDA NRCS Soil Survey, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx). These soils are classified as "very limited" for shallow excavation operations resulting from the potential of soils saturation, high probability of unstable excavation walls, and high probability of having high dust levels during construction. To alleviate potential construction issues, the use of trench shields for wall stability, trash pumps for ground water control, and/or the use of trenchless installation methods may be required.

The topography within the project and surrounding area can be described as rolling hills from north to south along Route 394 and easterly side slopes from Route 394 to Chautauqua Lake. The project boundary is within several FEMA-regulated 100-year floodplains. The areas with potential influences of floodways can be found on FEMA Community-Plan Numbers 361076 0016 B, 3610760 0018 B, 3610760 0031 B, 3610760 033 B, and 361060 0004 C. These panels have not been included within this report. The floodplains should not present an issue for this project as the majority of the facilities are buried pipelines. The design team will make themselves aware of the flood levels when locating above ground infrastructure as well as buried infrastructure that could be a potential source of inflow.

Portions of the project boundaries are found within archaeological sensitive areas found north of Ramsey Road through the Hamlet of Stow and south of Cheneys Road through the Sherman's Bay

pumping station. These areas will be cleared through SHPO prior to bidding the project and at this time do not present a major concern as the pipeline will be installed in previously disturbed areas between the roadway and existing utilities. Additionally, the contract will be developed to provide the contractor the ability to install the underground pipelines through trenchless installation methods.

1.2 Ownership and Service Area

The West Side Sewer Extension service area is currently serviced by private septic systems and individually maintained by the corresponding property owner. Many of these systems are failing or reaching the end of their useful life. These failing systems are one of the leading contributors to elevated phosphorus levels within Chautauqua Lake. To reduce the phosphorus levels within the lake, Chautauqua County (County) elected to expand the SCCLSD service area and install public sewers to be owned and operated by the SCCLSD. The new facilities will be conveyed through a series of existing pumping stations (Sherman's Bay and Lakewood Pumping Stations) to the existing SCCLSD Wastewater Treatment Plant (WWTP).

The WWTP service area covers communities along the southern and eastern border of Chautauqua Lake, which includes portions of the Towns of Busti, Ellery, Ellicott, North Harmony (including the Hamlet of Ashville), and the Villages of Celoron and Lakewood. The historical populations (Town/Village wide not just service area) since 1980 and the estimated 2018 populations for each of these communities are presented in Table 1.1. Over the last several decades, the area has witnessed a continuous decline in its population. Based on the last 48 years of available census data, the total population of the area has decreased by roughly 16 percent. The 2018 U.S. Census Bureau annual population estimates resulted in a regional estimated population of 25,892.

Table 1.1 U.S. Census Historical Population

Year	Town of Busti	Town of Ellery	Town of Ellicott	Town of North Harmony	Village of Celoron	Village of Lakewood	Region
1980	8,728	4,617	9,979	2,263	1,405	3,941	30,933
1990	8,050 (-7.8%)	4,534 (-1.8%)	9,457 (-5.2%)	2,301 (+1.7%)	1,232 (-12.3%)	3,564 (-9.6%)	29,138 (-5.8%)
2000	7,760 (-3.6%)	4,576 (+0.9%)	9,280 (-1.9%)	2,521 (+9.6%)	1,295 (+5.1%)	3,258 (-8.6%)	28,690 (-1.5%)
2010	7,351 (-5.3%)	4,528 (-1.0%)	8,714 (-6.1%)	2,267 (-10.1%)	1,112 (-14.1%)	3,002 (-7.9%)	26,974 (-6.0%)
2018	7,209 (-1.9%)	4,339 (-4.2%)	8,333 (-4.4%)	2,157 (-4.9%)	1,037 (-6.7%)	2,817 (-6.2%)	25,892 (-4.0%)

Source: www.census.gov Key: Population (% change from previous Census)

Even with a regional decline in population, it is still reasonable to project some population growth resulting from the installation of a public sewer system within the West Side Sewer Extension service area. The largest potential for growth would be anticipated along the Route 394 corridor near the Interstate 86/Route 17 exit ramp as there are large vacant parcels prime for residential subdivisions or commercial hotel developments. Based on the current dense population along the Chautauqua Lake shorelines, minimal growth is expected in those areas. Previous reports that have been accepted by regulating bodies estimated an aggressive growth rate of 2.5 percent per year over the next 20 years for a total population change of approximately 65 percent for the West Side Sewer Extension service area as well as the downstream service area for the West Side Sewer Extension.

1.3 Existing Facilities and Present Condition

As mentioned previously, the West Side Sewer Extension area is currently serviced by private septic systems with the majority of them either failing or reaching the end of their useful life. These systems, which are tributary to the Chautauqua Lake watershed, are partly responsible for increasing the phosphorus loading on the lake to unacceptable levels. With the NYSDEC designating the lake as an impaired waterbody and the development of a TMDL phosphorus allocation for the lake, the SCCLSD has chosen to expand their service area to reduce the phosphorus loading contributions from failing septic systems.

Sanitary wastewater will be collected through a series of grinder pumps, force mains, and intermediate pumping stations to convey flow to the existing Sherman's Bay Pumping Station, which ultimately conveys flow to the WWTP. The Sherman's Bay Pumping Station, which was built in 1973, operates with two constant speed pumps with design points of 1,200 gpm at 117 feet of head. The station discharges through a 12-inch force main conveying flow to a 24-inch gravity inceptor sewer, which is tributary to the Lakewood Pumping Station. The Lakewood Pumping Station, which also was built in 1973, operates with two variable-speed pumps with design points of 2,600 gpm at 64 feet of head and one constant-speed pump with a design point of 1,700 gpm at 40 feet of head. The Lakewood Pumping Station discharges through a 20-inch force main conveying flow to a 30-inch gravity interceptor sewer, which is tributary to the WWTP. An overall flow schematic is included as Appendix A of this Report.

The WWTP was placed online in 1980 and was designed to be a two-stage activated sludge facility with aeration and nitrification tanks that provide carbonaceous oxidation and nitrification, respectively. The facility has a rated capacity of 4.1 million gallons per day (mgd) with average flows ranging from 2.0 to 2.3 mgd. The WWTP service area is predominately residential with some commercial and industrial areas, providing wastewater treatment to approximately 5,000 customers.

The 2015 Sewer Extension Report examined the WWTP capacity to determine if the treatment plant had adequate capacity to accept and treat the flows from the West Side Sewer Extension. It was determined that the limiting factor for the WWTP is the first stage clarification process with a peak hourly flow rate of 9.2 mgd. Based on the projected design loads of the existing SCCLSD service area coupled with the West Side Sewer Extension area, and an in-depth analysis of the various processes at the treatment plant, the existing WWTP will be able to convey and process average day flow and average day and maximum day organic, solids, phosphorous and TKN loads. The 2015 Sewer Extension Report found that the WWTP will not be able to provide complete primary

and secondary treatment at peak hourly flows greater than 9.2 mgd, and that flows will become restricted above 15.2 mgd with surcharging/backup conditions occurring.

1.4 Definition of the Problem

The West Side Sewer Extension service area is currently serviced by private septic systems and individually maintained by the corresponding property owner. Many of these systems are failing or reaching the end of their useful life. These failing systems are a contributor to elevated phosphorus levels within Chautauqua Lake. To reduce the phosphorus levels within the lake, the County elected to expand the SCCLSD service area and install public sewers to be owned and operated by the District. Flows from the new collection facilities will be conveyed through a series of existing pumping stations (Sherman's Bay and Lakewood Pumping Stations) to the existing WWTP, as outlined in Section 1.3 of this Report and seen in Appendix A.

This design report will determine the service area hydraulic loads, both current and future, which will be utilized to determine size of the proposed infrastructure. Additionally, the existing collection system that this service area will be directly tributary to will be reviewed to determine if sufficient capacity is available and detail any recommendation for improvements.

1.5 Financial Status

The project will be financed through a combination of grants and New York State Environmental Facilities Corporation (NYSEFC) Clean Water State Revolving Fund (CWSRF) funding at a rate of 0 percent for 30 years. The September 2017 Phase 1 Sewer Extension Report included the anticipated project cost of $16,888,000 (2017 dollars) with $8,916,000 being financed through NYSEFC and the remaining $7,972,000 through grants.

Debt service and operation/maintenance costs will be spread evenly across equivalent dwelling units (EDU) in the sewer extension service area. An EDU is equal to a single family dwelling water usage. The estimated cost per EDU is $1,000 annually with $646 contributing to capital cost and $354 for operation and maintenance of facilities. The $1,000 annual EDU charge will be applied to all developed properties and a $100 annual charge will be applied to all undeveloped properties.

Properties within the sewer extension area that are already serviced by SCCLSD via the existing Town of North Harmony Sewer District will remain responsible for their existing applicable district charge with no financial responsibilities for the West Side Sewer Expansion project.

It should be noted that the annual EDU charge does not include the private property lateral or interior plumbing improvements to connect to the public sewer system or the permit fees to SCCLSD. Each user will be responsible to pay the cost to install a sewer lateral from their dwelling to the proposed SCCLSD collection system grinder pump. The connection locations will vary based on topography, but it is SCCLSD's desire to have the connection point located near the right-of-way. The owner's expense will vary depending on type of service and subsurface conditions.

2. Alternatives Analysis & Recommended Alternative

The alternatives analysis for the providing technically feasible and cost-effective public sewers to the un-sewered areas along the west side of Chautauqua Lake (West Side Sewer Extension) was

previously conducted and presented in the 2015 Sewer Extension Report. The 2015 Sewer Extension Report evaluated six potential alternatives, which are generally described below along with the corresponding conclusions associated with each alternative:

1. Alternative 1 – Septic Tank System (No Action)
    - Maintaining the use of private septic systems while also addressing the excessive phosphorous loadings of Chautauqua Lake would require either the installation of advanced treatment between septic tanks and absorption fields, or installation of a holding tank with subsequent removal and disposal of contents at a nearby WWTP.
    - This alternative was not recommended because it would not reliably provide reduction in phosphorous loading to the Lake.
2. Alternative 2 – Gravity Collection System
    - Installation of traditional gravity flow collection sewer systems and lift stations.
    - This alternative was not recommended due to the known poor soil conditions and high groundwater in the area which would increase construction risks and costs, as well as the rolling hilly terrain causing deeper gravity sewer installations and many lift stations, furthering increasing project cost.
3. Alternative 3 – Grinder Pump / Pressure Sewer Collection System
    - This type of system lends itself well to the hilly terrain of the project area. Small diameter pipes following the surface topography with shallower bury depth would work well with the poor soil conditions and high groundwater of the project area.
    - SCCLSD owns and operates other grinder pump collection systems currently, are familiar with these types of systems and maintenance required, and have been an effective collection system.
4. Alternative 4 – Vacuum Sewer Collection System
    - Installation of a vacuum sewer system. As the name implies the collection system is operated under a partial vacuum. This type of system can overcome the variable terrain seen in the West Side Sewer Extension area.
    - The SCCLSD currently owns, operates, and maintains vacuum sewers in portions of their collection system. The SCCLSD has had difficulty with maintenance and consider the required maintenance costs to be excessive. Due to this reason, this alternative was not recommended.
5. Alternative 5 – Effluent Sewer Collection System
    - Two different types of effluent sewer collections systems were examined; septic tank effluent pump (STEP) and septic tank effluent gravity (STEG).
    - STEP systems would still require pumping out of the septic tanks on a routine basis, which would become an additional maintenance requirement placed on the SCCLSD. Also, while the STEP system provides primary treatment at the septic tank, the SCCLSD WWTP is designed to provide full treatment, and the when the septic tanks are pumped out they would be disposed of at the WWTP, negating any positive effects of initial

primary treatment provided by the STEP systems. Ultimately, this alternative was not recommended for these reasons.

- STEG systems rely on gravity flows effluent from septic tanks, similar to Alternative 2, and was therefore not recommended.

6. Alternative 6 – Cluster / Decentralized Collection System

- This alternative considered smaller "cluster" collection systems to serve individual areas, with each collection systems flows being treated at a separate wastewater treatment facility. It was estimated that eight or more individual cluster collection system and treatment facilities would be required to service the West Side Sewer Extension area, with each treatment facility requiring to be permitted by the NYSDEC.
- This alternative was not recommended due to regulatory requirements and increased project costs associated with multiple treatment facilities.

The goal of the West Side Sewer Extension is to provide:

- Environmentally sound alternative to the reliance on septic systems by the residents along the western shore line of Chautauqua Lake.
- Long-term protection of area water resources, in particular, Chautauqua Lake, ground water, and local streams and creeks.

The 2015 Sewer Extension Report identified Alternative 3 – Grinder Pump / Pressure Sewer Collection System as the preferred alternate as it was the most efficient and cost-effective means to implement the West Side Sewer Extension. The 2015 Sewer Extension Report also recommended to evaluate the use of gravity sewer during preliminary design to minimize the need for grinder pump stations and to save on future operation and maintenance costs.

The 2017 Phase 1 Sewer Extension Report identified the new District boundary, conceptual project facilities, and estimated project cost. The proposed facilities included a combination of gravity sewers, pressure sewers, grinder pumping stations, sewage pumping stations, and upgrades to the Sunrise Cove Pumping Station. The major components of the system included:

- 15,500 feet of gravity sewers
- 36,300 feet of pressure sewers
- 3 intermediate pumping stations
- 200 grinder pumping stations
- New Sunrise Cove Pumping Station

The 2017 Phase 1 Sewer Extension Report included an estimated total project cost of $16,888,000 (2017 dollars), including construction, engineering, legal, administration, and contingency.

This design report will further evaluate the district hydraulic loads to determine required pipeline sizes, pump sizes, existing pumping station improvements, and updated project cost estimates.

3. Basis of Design Recommendations

The basis of design recommendations will discuss in greater detail the proposed sewer system(s) in the new service area, complete a detailed analysis of current and future hydraulic loads of the

proposed West Side Sewer Extension service areas, and further evaluate existing downstream infrastructure that will be required to convey the new flows from the project.

3.1 Proposed Sewer System Improvements

As presented in Section 2 of this report, a grinder pump/low pressure sewer system was ultimately selected for the West Side Sewer Extension. While the 2017 Phase 1 Sewer Extension Report assumed approximately 15,500 feet of gravity sewers, preliminary layouts of gravity sewers included sewers that were in excess of 12 feet deep. Due to the assumed poor soil conditions and high groundwater in the area, the SCCLSD and GHD agreed that a small number of preliminary soil borings should be completed to further determine the feasibility of deeper gravity sewer lines. In November 2019, nine soil borings were completed throughout the Phase 1 project area where gravity sewers were contemplated. The soil boring logs from this subsurface investigation are included as Appendix D. The preliminary subsurface investigation indicated mostly moist silty-sandy overburden ranging from 10 to 15 feet, with two of the borings indicating refusal at 10 to 13 feet depth which is assumed to be the bedrock interface. Approximately half of the borings also indicated groundwater table anywhere from 5 to 8 feet below ground surface. Due to higher construction risks and increased project costs associated with these types of subsurface conditions, it was agreed between the SCCLSD and GHD that the Phase 1 project area is not conducive to gravity sewers and therefore the proposed system would be designed completely as a low pressure system.

In order to minimize the number of individual grinder pumps, grinder pumps will be located so as to service two parcels as topography, distance, and available space allows. Grinder pumps will be located within existing public right-of-ways (ROWs) where feasible. In areas near the Lake where the public road ROW is substantially higher in elevation than the lakeside houses, it is not feasible to locate the grinder pumps in the ROW due to the fact that the private lateral connections to the grinder stations could be up to 25 feet deep. In these situations, the grinder pump stations will be located closer to the house(s) either to the side or between the house(s) and the Lake. These instances will require new permanent easements.

Grinder pumps and force main piping systems must be designed to achieve flushing velocities of 2 to 5 feet per second at least once a day. Grinder pump discharge laterals are typically 1-1/4 inches in diameter, and discharge to central force mains that generally are 2 inches or larger diameter. High-density polyethylene (HDPE) pipe with fused joints is widely utilized for low pressure sewer systems and is a very appropriate piping material choice for trenchless installations, specifically horizontal directional drilling (HDD) which is anticipated to compose a substantial amount of the installation methods for the project due to various creek and road crossings as well as the poor subsurface conditions described above.

Flows from the West Side Sewer Extension Phase 1 and 2 areas will be conveyed to the south end of the project area. A pumping station will be required along Hadley Bay Road near Interstate 86 to collect flows from Phase 2, Stow, and Hadley Bay areas and boost system pressures to overcome a significant elevation increase along State Route 394 (SR 394) near Ramsey Road. The new Hadley Bay pumping station will also maintain adequate flow velocities within the force main to prevent buildup of solids which could potentially cause ongoing maintenance and operational issues.

Intermediate duplex pumping stations will be installed on four “branch” lines before connecting to the force main along SR 394. These branch lines will receive flows from multiple lake side simplex

grinder pump stations. Intermediate duplex pump stations are required to boost pressure allowing each branch force main to discharge into the SR 394 force main. The duplex pump stations will be bid with two different designs.

1. Under the Base Bid, each duplex pumping station will be designed without an installed spare and pump selection will be such that both pumps will operate concurrently to achieve the full range of head/flow requirements.

2. Under a duplex pump station Alternate Bid Item (Alternate 'B'), each duplex pumping station will be designed with an installed spare and pump selection will be such that each pump individually can achieve the entire range of flow/head requirements.

A pumping station will also be required at the south end of the Phase 1 service area to again boost system pressures to overcome a substantial elevation increase along SR 394 between the existing Sunrise Cove Pumping Station and the Sherman's Bay Pumping Station. With the addition of the new SR 394 pumping station the existing Sunrise Cove Pumping Station will be retrofitted to house new pumps and the existing 4-inch force main will be replaced with a 3-inch HDPE force main from the existing pumping station to the new SR 394 Pumping Station. The gravity flows that are currently collected at Sunrise Cove Pump Station will continue to do so with the exception of the BOCES School which will connect directly to the new SR 394 Pumping Station.

From the new pumping station flows will be conveyed to the Sherman's Bay Pumping Station in one of two alternates.

1. Under the Base Bid, a new 10-inch HDPE force main along SR 394 will combine with the existing Goose Creek 8-inch PVC force main which discharges to the Sherman's Bay Pumping Station. With the combination of flows from the new SR 394 Pumping Station and the existing Goose Creek Pumping Station hydraulic improvements are required at the Goose Creek Pumping Station. The Goose Creek Pumping Station will be retrofitted to replace the existing discharge pumps with new pumps with higher discharge head capabilities.

2. Under a force main Alternate Bid Item (Alternate 'A'), a new 10-inch HDPE force main along SR 394 before discharging directly to the Sherman's Bay Pumping Station. The new force main will not combine with the existing Goose Creek force main and thereby no hydraulic improvements are required at the Goose Creek Pumping Station.

From the Sherman's Bay Pumping Station existing infrastructure will be utilized to convey flows to the SCCLSD WWTP. Flows from Sherman's Bay Pumping Station are pumped through a 12-inch PVC force main, and are subsequently conveyed through 24/27/30-inch gravity sewers to the Lakewood Pump Station. The Lakewood Pump Station 20-inch DIP discharge force main conveys flows to the Celoron Interceptor which empties to the SCCLSD WWTP.

The West Side Sewer Extension Phase 1 project is anticipated to generally consist of the following infrastructure under the Base Bid:

- 223 Simplex Grinder Pump Stations
- 6 Duplex Grinder Pump Stations (2 stations with a primary pump and spare and 4 stations with a primary pump and a secondary pump with no spare)

- New Hadley Bay Pumping Station
- Sunrise Cove Pumping Station Upgrade
- New SR 394 Pumping Station
- Goose Creek Pumping Station Upgrade
- 25,000 LF of 1.25-inch HDPE lateral piping
- 21,000 LF of 2-inch HDPE force main
- 7,200 LF of 3-inch HDPE force main
- 750 LF of 8-inch HDPE force main
- 21,650 LF of 10-inch HDPE force main
- Combination air-vacuum relief valves
- In-line isolation valves
- Check valves
- Force main clean outs

An itemized Engineer's Opinion of Probable Project Cost (OPPC) for Phase 1 (inclusive of the Base Bid and Alternates) is included as Appendix C. A summary of the Base Bid and Alternate OPPC are seen in Table 3.1, Table 3.2, and Table 3.3 below.

Table 3.1 Base Bid: Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
Force Main Installation – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, and testing)	50,600 LF	$7,860,000
Simplex/Duplex Grinder Pump – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	229 EA	$3,935,000
New Hadley Bay Pumping Station – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration. power supply, and testing)	1 EA	$500,000
Sunrise Cove Pump Station Improvements – Complete (Including labor, materials and appurtenances, demolition, bypass pumping, and testing)	1 EA	$75,000
New SR 394 Pumping Station – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, power supply, and testing)	1 EA	$675,000
Improvements to Goose Creek Pump Station and Interconnection to Existing Force Main – Complete (Including labor, materials and appurtenances, demolition, pump replacement, excavation, backfill, restoration, and testing)	1 LS	$210,000
Land Acquisition (New pumping station site and easements)	TBD	$75,000
	Subtotal:	***$13,330,000***
	10% Contingency:	$1,340,000
	Engineering, Legal, and Administration:	$1,810,000
	Project Cost (2020):	***$16,480,000***
	Project Cost w/ Construction Cost Escalated ~2% to 2022 Construction Period:	***$16,800,000***

Table 3.2 Alternate 'A' Bid: Extend SR 394 Force Main to Sherman's Bay - Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
Force Main Installation – Complete (Including labor, materials and appurtenances, excavation, installation, backfill, restoration, and testing)	3,600 LF	$650,000
DEDUCT – Downsize New SR 394 Pumping Station – Complete	1 LS	($75,000)
DEDUCT - Improvements to Goose Creek Pump Station and Interconnection to Existing Force Main – Complete (Including labor, materials and appurtenances, demolition, pump replacement, excavation, backfill, restoration, and testing)	1 LS	($210,000)
Subtotal:		***$365,000***
10% Contingency:		$35,000
Project Cost (2020):		***$400,000***
Project Cost with Construction Cost Escalated ~2% to 2022 Construction Period:		***$410,000***

Table 3.3 Alternate 'B' Bid*: Design of "Duplex Lift Stations - Engineer's Opinion of Probable Project Cost

Item	QTY	Total Cost
DEDUCT - Duplex Grinder Station without installed spare – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	4 EA	($80,000)
Duplex Grinder Station with installed spare – Complete (Including labor, materials and appurtenances, excavation, installation, lateral connection, backfill, restoration. power supply, and testing)	4 EA	$340,000
Subtotal:		***$260,000***
10% Contingency:		$30,000
Project Cost (2020):		***$290,000***
Project Cost with Construction Cost Escalated ~2% to 2022 Construction Period:		***$300,000***

**Alternate 'B' Bid: Provides additional station flexibility with having a spare pump*

3.2 Current and Future Hydraulic Loads

The hydraulic loads of the new district are a critical component of design. As such the potential loads of the West Side Sewer Extension were carefully evaluated and will be incorporated into the final design. The West Side Sewer Extension will largely service new customers but will also include existing customers tributary to the Sunrise Cove Pumping Station as well as the future customers within Phase 2 of the West Side Sewer Extension. As a result, both existing and future demands will be factored into the final design.

In addition to the West Side Sewer Extension to improve phosphorus levels within Chautauqua Lake portions of the Hamlet of Ashville (Phase 3) will transferred to public sewers. The Hamlet of Ashville hydraulic loads are not directly tributary to the West Side Sewer Extension but are tributary to the Sherman's Bay Pumping Station. As mentioned previously, the Sherman's Bay Pumping Station is the collection point for the West Side Sewer Extension. Therefore, when evaluating the Sherman's Bay Pumping Station the future Hamlet of Ashville's hydraulic load should be considered.

3.2.1 Projected Demands

The estimated average day hydraulic load for new sewer customers in the West Side Sewer Extension were based on the number of currently developed parcels. Generally, developed parcels with single family residences/small users were projected to have an estimated hydraulic loading of 260 gpd. This hydraulic load was agreed upon and approved with acceptance of the 2015 Sewer Extension Report. The 260 gpd is a reasonable number based off two methods:

- The per capita hydraulic load is 100 gpd, in accordance with Ten State Standards, and the average house hold size of 2.61 people per dwelling unit (100 gpd * 2.61 = 261 gpd).
- The NYSDOH hydraulic flow rates for new construction is 110 gpd/bedroom. 2.4 bedrooms per household was assumed the sewer area (110 gpd/bedroom * 2.4 bedroom = 264).

As mentioned in Section 1.2, the population of the communities serviced by the WWTP has generally been in decline over the last nearly 50 years. However, it is still reasonable to project some population growth resulting from the installation of a public sewer system within the West Side Sewer Extension service area. The largest potential for growth would be anticipated along the Route 394 corridor near the Interstate 86/Route 17 exit ramp as there are large vacant parcels prime for residential subdivisions or commercial hotel developments. Based on the current dense population along the Chautauqua Lake shorelines, minimal growth is expected in those areas. Previous reports that have been accepted by regulating bodies estimated an aggressive growth rate of 2.5 percent per year over the next 20 years for a total population change of approximately 65 percent.

The total hydraulic load of the all phases of the West Side Sewer Extension is summarized in Tables 3.4, 3.5, and 3.6 which is based upon the data in Appendix A.

Table 3.4 West Side Sewer Extension (Ph. 1 and 2) Hydraulic Load Projection

Service Area	Current			Future (20 years)		
	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)
Phase 1	420	109,440	404,929	690	180,000	666,720
Sunrise Cove (Inclusive of BOCES School)	35	10,080	42,335	60	15,840	67,680
Phase 2	466	122,400	440,640	763	198,720	715,680
Total West Side Service Area	***921***	***241,920***	***887,904***	***1,513***	***394,560***	***1,450,080***

Table 3.5 Hamlet of Ashville (Phase 3) Hydraulic Load Projection

Service Area	Current			Future (20 years)		
	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)
Hamlet of Ashville (Phase 3)	100	27,360	112,176	165	43,200	177,120

Table 3.6 Existing Service Area Hydraulic Load Projection

Service Area	Current			Future (20 years)		
	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)	EDUs	Average Day Hydraulic Load (gpd)	Peak Hour Hydraulic Load (gpd)
Goose Creek	330	86,400	319,680	544	141,120	522,720
Sherman's Bay	390	102,240	378,288	644	167,040	619,200
Lakewood	3,555	924,480	2,588,544	5,825	1,514,880	4,242,240

3.3 Existing Pump Station Analysis

The existing conveyance facilities were evaluated during the development of the 2015 Sewer Extension Report. The evaluation conducted at the time of that report reviewed the West Side Sewer Extension discharging into the Goose Creek Pumping Station, which conveys flow to the Sherman's Bay Pumping Station via an 8-inch PVC force main which discharges into a 21-inch gravity sewer at the Sherman's Bay Pumping Station. The Sherman's Bay Pumping Station conveys flow the Lakewood Pumping Station via a 12-inch PVC force main which discharges into a 24-inch gravity sewer that increases to a 30-inch gravity sewer near the Lakewood Pumping Station. The Lakewood Pumping Station conveys flow to the WWTP via 20-inch DIP force main that discharges into a 30-inch gravity sewer known as the Celoron Interceptor that increases to a 36-inch gravity sewer as it connects with the Livingston Interceptor and the Bonita Pumping Station force main.

The 2015 Sewer Extension Report concluded that the existing gravity system did not require any improvements as these facilities had sufficient available capacity to convey the 20-year projected wastewater flows from the West Side Sewer Expansion (Phase 1 and 2) and the Hamlet of Ashville (Phase 3). No additional improvements were recommended and no additional evaluation was completed as part of this Design Report.

The 2015 Sewer Extension Report evaluated three pumping stations which included the Goose Creek, Sherman's Bay, and Lakewood Pumping Stations and concluded that additional investigations were required to determine the feasibility of these stations serving the new sewer expansion. This Design Report will review the Goose Creek, Sherman's Bay and Lakewood Pumping Stations for current and future pumping capacities.

3.3.1 Proposed Conveyance Requirements

To evaluate the Sherman's Bay and Lakewood Pumping Station the required West Side Sewer Extension including the Hamlet of Ashville hydraulic loads were evaluated. Section 3.2.1 of this Report details the projected hydraulic load of the proposed West Side Sewer Extension. The flows detailed in the tables within that Section are representative of a gravity collection system. Each of the three phases of the new sewers within the West Side Sewer Extension will be collected and transferred via a low pressure sewer system. Low pressure sewer system flows are evaluated with simultaneous grinder pump operations. Simultaneous operations determines the flow generated by grinder pumps that will run concurrently to prevent the oversizing of force mains and larger pumping stations. EPA recommended methods and guidelines were utilized to determine the approximate number of simultaneous pumps in operation.

The proposed conveyance requirements for the West Side Sewer Extension is summarized in Table 3.7 which is based upon the data in Appendix B. Note that the existing Sunrise Cove service area, which is part of the Phase 1, was evaluated separately as it is an existing gravity collection system and therefore simultaneous operation calculations would not apply. A pumping station will be required along Hadley Bay Road near Interstate 86 to collect flows from Phase 2, Stow, and Hadley Bay areas and boost system pressures to overcome a significant elevation increase along State Route 394 (SR 394) near Ramsey Road. The new Hadley Bay pumping station will also maintain adequate flow velocities within the force main to prevent buildup of solids which could potentially cause ongoing maintenance and operational issues. A pumping station will also be required at the south end of the Phase 1 service area to again boost system pressures to overcome a substantial

elevation increase along SR 394 between the existing Sunrise Cove Pumping Station and the Sherman's Bay Pumping Station.

Table 3.7 West Side Sewer Extension Flow Projection

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ start of Phase 3 (Year = 2034)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2041)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)	Future Flow (gpm) @ Phase 3, 20-year buildout (Year = 2053)
Phase 1	280	333	377	448	448	448
Sunrise Cove (Inclusive of BOCES School)	32	37	42	50	50	50
Phase 2	-	310	351	417	496	496
Phase 1 and 2 Subtotal	***312***	***680***	***770***	***915***	***994***	***994***
Hamlet of Ashville (Phase 3)	-	-	80	95	113	131
Total West Side Sewer Service Area	***312***	***680***	***850***	***1,010***	***1,107***	***1,125***

3.3.2 Existing Sherman's Bay Pumping Station

The Sherman's Bay Pumping Station, which was built in 1973, operates with two constant speed pumps with design points of 1,200 gpm at 117 feet of head. The total capacity of this station is approximately 1,200 gpd. The station conveys flow to the Lakewood Pumping Station via a 12-inch PVC force main which discharges into a 24-inch gravity sewer that increase to 30-inch gravity sewer near the Lakewood Pumping Station. The 12-inch PVC force main while maintaining pipeline velocities below 5 fps has the capacity to convey approximately 1,750 gpm and as velocities approach 6 fps the conveyance capacity increase to just over 2,100 gpm.

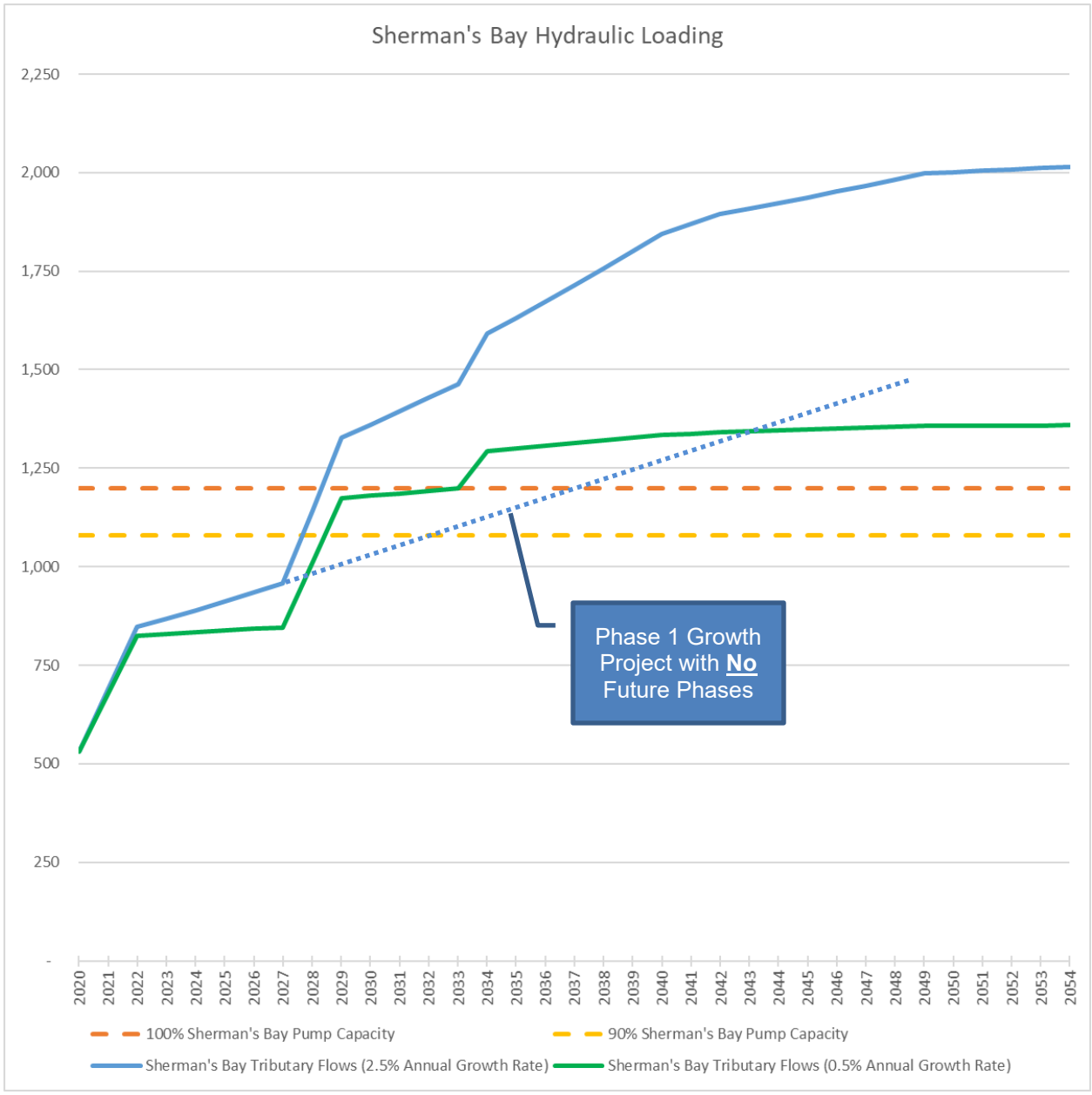
The current (includes West Side Sewer Extension full buildout) and 20-year peak hourly future conveyance requirements for the Sherman's Bay Pumping Stations are shown in Table 3.8.

Table 3.8 Sherman's Bay Pumping Station Inflow Projection

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ start of Phase 3 (Year = 2034)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2041)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)	Future Flow (gpm) @ Phase 3, 20-year buildout (Year = 2053)
Goose Creek Pumping Station	231	275	311	370	370	370
Sherman's Bay Service Area	273	325	367	437	437	437
West Side Sewer Service Area	312	680	850	1,010	1,107	1,125
Total Conveyance Requirement	***816***	***1,280***	***1,528***	***1,817***	***1,914***	***1,932***

The projected capacity of the Sherman's Bay Pumping Station as the West Side Sewer Extension develops is shown in Figure 3.1, which was developed from the Projected Hydraulic Loading for Sherman's Bay Pumping Station calculation sheet found in Appendix B. This table also illustrates a 0.50% 20 year growth rate to provide an understanding of the effect growth rate has on the station evaluation. Note that the Sherman's Bay Pumping Station as currently configured has a capacity of 1,200 gpm.

Figure 3.1 Sherman's Bay Pumping Station Hydraulic Loading



The existing Sherman's Bay Pumping Station as currently configured has sufficient capacity to convey flows from the Phase 1 service area including approximately 15-years of growth at 2.5%. However, upon the Phase 2 service area flows entering the conveyance system, the Sherman's Bay Pumping Station would likely no longer have the required conveyance capacities if communities experience an aggressive 2.5% annual growth rate.

It is not recommended to upgrade the Sherman's Bay Pumping Station pumps at this time due to the projected timing of the Phase 2 project, and the unknown of what the actual growth rate of the communities will be. The station should be re-evaluated when the timing of Phase 2 is better known,

the actual community growth rates are known, when the station reaches approximately 90 percent capacity, or significant pump repairs or replacements are required.

The existing Sherman's Bay Pumping Station 12-inch PVC discharge force main has sufficient capacity to convey the full buildout of the West Side Sewer Extension (all three phases) while maintaining pipeline velocities below 5 fps. However, if the community experiences the aggressive 20-year growth of 65%, pipeline velocities would exceed 5 fps and approach 5.5 fps near the end of the growth period. A velocity of 5.5 fps is not considered excessive and should not be considered detrimental to the project.

At this time, it is not recommended to replace the Sherman's Bay Pumping Station 12-inch PVC discharge force main as it is expected to be a minimum of 15-years before all three phases of the West Side Sewer Extension are completed and it is unknown if a 20-year growth of 65% will ever be achieved. The discharge force main should be re-evaluated at the same time when the Sherman's Bay Pumping Station is next evaluated.

3.3.3 Existing Lakewood Pumping Station

The Lakewood Pumping Station, which also was built in 1973, operates with two variable-speed pumps with design points of 2,600 gpm at 64 feet of head and one constant-speed pump with a design point of 1,700 gpm at 40 feet of head. The total capacity of this station is approximately 4,000 gpd. The Lakewood Pumping Station conveys flow to the WWTP via 20-inch force main that discharges into a 30-inch gravity sewer known as the Celoron Interceptor that increases to a 36-inch gravity sewer as it connects with the Livingston Interceptor and the Bonita Pumping Station force main. The 20-inch force main while maintaining pipeline velocities below 5 fps has the capacity to convey approximately 4,900 gpm and as velocities approach 6 fps the conveyance capacity increase to just over 5,800 gpm.

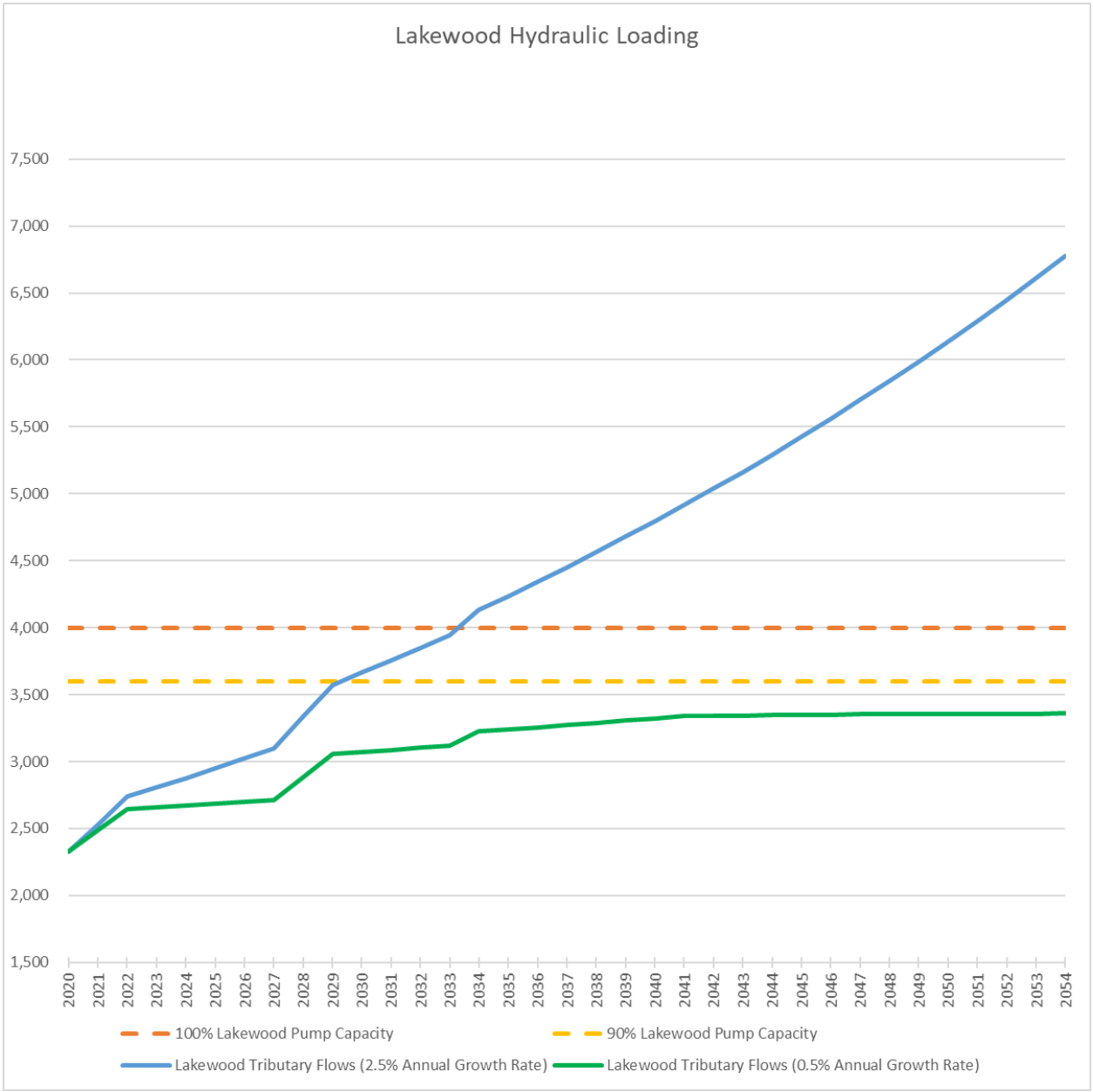
The current (includes West Side Sewer Extension full buildout) and 20-year peak hourly future conveyance requirements for the Lakewood Pumping Stations are shown in Table 3.9

Table 3.9 West Side Sewer Extension Flow Projection

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ start of Phase 3 (Year = 2034)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2041)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)	Future Flow (gpm) @ Phase 3, 20-year buildout (Year = 2053)
Sherman's Bay Pumping Station	816	1,280	1,528	1,817	1,914	1,932
Lakewood Service Area	1,891	2,248	2,543	3,023	3,023	3,023
Total Conveyance Requirement	***2,707***	***3,528***	***4,071***	***4,840***	***4,937***	***4,955***

The projected capacity of the Lakewood Pumping Station as the West Side Sewer Extension develops is shown in Figure 3.2, which was developed from the Projected Hydraulic Loading for Lakewood Pumping Station calculation sheet found in Appendix B. This Figure also illustrates a 0.50% 20 year growth rate to provide an understanding of the effect growth rate has on the station evaluation.

Figure 3.2 Lakewood Pumping Station Hydraulic Loading



The existing Lakewood Pumping Station as currently configured has sufficient capacity to convey flows from the Phase 1 service area including the entire 20-year 65% growth. The station also has sufficient capacity to accommodate the entire Phase 2 service area and approximately seven (7) years of the projected 20-year 65% growth.

It is not recommended to upgrade the Lakewood Bay Pumping Station pumps at this time due to the projected timing of the Phase 2 project, and the unknown of what the actual growth rate of the communities will be. The station should be re-evaluated when the timing of Phase 2 is better known, the actual community growth rates are known, when the station reaches approximately 90 percent capacity, or significant pump repairs or replacements are required.

At this time, it is not recommended to replace the Lakewood Pumping Station 20-inch DIP discharge force main as it is expected to be a minimum of 15-years before all three phases of the West Side Sewer Extension are completed and it is unknown if a 20-year growth of 65% will ever be achieved. The discharge force main should be re-evaluated at the same time when the Lakewood Pumping Station is next evaluated.

3.4 Transmission and Collection Design

The collection network for the proposed Phase 1 service area will include approximately 8.3 miles of new force mains consisting of 2-, 3-, 8-, and 10-inch diameter HDPE pipe. The transmission force main to convey flows from the Phase 1 service area will be comprised of approximately 2 miles of 10-inch HDPE pipe. The pipeline diameter was selected to provide a minimum velocity of at least 2 fps, not exceeding 5 fps, at a maximum design flow at least once per day. Mains will generally be installed in the ROW, preferably off to the side of pavement between the pavement's edge and other existing utilities. This placement will minimize disturbance to areas which have not been previously disturbed. The proposed pipeline will have a minimum bury depth of 4 feet within undeveloped areas and 5 feet within paved areas to prevent freezing during low flow periods. Figures 2.1 through 2.7 illustrate preliminary pipeline alignment and proposed pipeline diameters. Velocities within the pipelines were calculated and Hydraulic Grade Lines were developed which the results of the model can be found in Appendix E. To achieve the required flushing velocities for each pipeline to be utilized on this project, Table 3.10 illustrates the recommend flow ranges.

Table 3.10 Target Pipeline Velocities

Pipeline Diameter (Nominal)	Flow Rate (gpm) to Produce a Pipeline Velocity of 2 fps	Flow Rate (gpm) to Produce a Pipeline Velocity of 5 fps
2-inch	~20	~50
3-inch	~45	~110
4-inch	~80	~195
6-inch	~180	~440
8-inch	~315	~785
10-inch	~490	~1,225

**Note: Pipeline velocities for each nominal pipeline diameter will vary based on pipe class as the actual inside diameter of the pipeline changes with class.*

The pipeline facilities will be accompanied by pipeline appurtenances to provide access as well as to minimize potential damage to the infrastructure. These appurtenances include isolation valves,

check valves, air/vacuum valves, and cleanouts. The location of these facilities will be determined during detailed design and will follow these minimum guidelines:

- Isolation Valves – Isolation valves will be placed at the intersection of one collector to another, at each grinder pump location (lateral main), and at each cleanout location. Isolation valves will also be located if there are any flood hazard areas, with valves utilized to isolate such areas from the remainder of the collection system.
- Check Valves – Check valves will be placed at each grinder pump location (lateral main).
- Air/Vacuum Valves – Air/Vacuum valves will be placed at inflection points where liquid flow velocities are insufficient to purge air bubbles, generally at high points.
- Cleanouts – Cleanouts will be provided at intervals of 500 and 1,000 feet, at major changes in direction, at the upstream side of the interconnection of one collector to another, and at the end of each force main. The cleanout shall be bi-directional, where applicable, so that cleaning can be completed in either direction.

3.5 Pumping Design

3.5.1 Grinder Pumping Stations

Existing private septic systems will be replaced with grinder pump stations. In order to minimize the number of individual grinder pumps, grinder pumps will be located so as to service two parcels as topography, distance, and available space allows. Grinder pumps will be located within existing public ROWs where feasible. In areas near the Lake where the public road ROW is substantially higher in elevation than the lakeside houses, it is not feasible to locate the grinder pumps in the ROW due to the fact that the private lateral connections to the grinder stations could be up to twenty-five feet deep. In these situations, the grinder pump stations will be located closer to the house(s) either to the side or between the house(s) and the Lake. These instances will require new permanent easements. To provide power for grinder pump stations, power drops will be requested from National Grid in strategic locations to enable multiple (3-5) grinder pump stations to be powered from a single power drop. Electrical meters will be located with existing road ROWs with conduit runs extending to grinder pumps through existing road ROW's and new permanent easements.

Grinder pumps and force main piping systems must be designed to achieve flushing velocities of 2 to 5 fps at least once a day. Grinder pump discharge laterals are typically 1-1/4 inches in diameter, and discharge to central force mains that generally are 2 inches or larger diameter.

The majority of proposed grinder stations will be simplex station (duplex stations for larger users, and duplex stations for intermediate booster stations to service each "branch" connection on SR 394) with a design flow rate of 25 gpm at 150 feet for centrifugal pump simplex stations. Actual performance curve for proposed centrifugal grinder pumps that can achieve the required range of flow and head are shown in Appendix F.

3.5.2 New Hadley Bay Pumping Station

The new Hadley Bay Pumping Station will be designed to convey the 20-year projected peak hourly flow for the customer's along Stow Road, Lakeland Road, Old Bridge Road, Watson Road, Ross Street, and Mason Street within Phase 1 and Phase 2 (current hydraulic demands plus 5 years at

2.5% growth) of the West Side Sewer Extension. The projected 20-year peak hourly flow established in Section 3.3.1 and summarized in Table 3.11 is 655 gpm.

Table 3.11 New Hadley Bay Pumping Station Flow Projection

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2042)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)
Phase 1 (Stow/Hadley Bay)	90	107	147	147
Phase 2	-	310	427	508
Phase 1 and 2 Total	***90***	***417***	***574***	***655***

To determine the required pump head, the elevation and dynamic head requirements were calculated. The elevation head was determined by comparing the approximate pump elevation and the highest elevation along the force main between the new Hadley Bay Pumping Station and the new SR 394 Pumping Station. The dynamic head is determined by calculating the head loss of the force main between the new Hadley Bay Pumping Station and the new SR 394 Pumping Station at the required flow rate. Table 3.12 shows the theoretical range of the pumping station requirements.

Table 3.12 Theoretical Range of Pump Head Requirements

Flow Condition (gpm)	Pump Elevation (ft)	High Point (ft)	Elevation Change (ft)	Pipeline Length (ft)	C-Factor	Headloss (ft)	TDH (ft)
460	1,360	1,445	85	14,700	120	35	110
680	1,360	1,445	85	14,700	120	70	155

The pumping station will be designed with two centrifugal pumps, which will allow the pumps to be alternated as necessary and allow for maintenance and optimum performance. The targeted design point for the selected pump will be 680 gpm at 155 feet TDH. Actual performance curve for a centrifugal pump that can achieve the required range of flow and head are shown in Appendix F.

Initially, the anticipated operating range of the pumping station will be approximately 460 gpm at 110 feet of total dynamic head (TDH). To achieve this, the pumps must be installed with a smaller size impeller (200 mm for the preliminary pump selection, operating at approximately 58% pump efficiency). In the future, if all of the projected hydraulic loads materialize, the anticipated operating point will match the design point by upsizing to a larger impeller (230 mm for the preliminary pump

selection, operating at approximately 65% pump efficiency). The curves in Appendix F, show the operating point and operating curves for the recommended pumps.

The pumping station will be equipped with a SCADA system linked to the WWTP service center. This will allow remote operation of the pumping station in coordination with the various other pumping stations that influence its operation.

The pump station will be supplied by 3-phase power. For emergencies, the station will be equipped with a permanent natural gas fired backup generator and automatic transfer switch to allow the station to continue operation in event of power outages.

3.5.3 Sunrise Cove Pumping Station

The existing Sunrise Cove Pumping Station will retrofitted with a new submersible sewage pumps and 3-inch force main. The station modifications will be designed to convey the 20-year projected peak hourly flow for the existing Sunrise Cove service area excluding the BOCES School flow. The BOCES School flow will be redirected to discharge directly into the new SR 394 Pumping Station. The projected 20-year peak hourly flow established in Section 3.3.1 and summarized in Table 3.13 is 40 gpm.

Table 3.13 Upgraded Sunrise Cove Pumping Station Flow Projection

Service Area	Current Flow (gpm)	Future (20 years) Flow (gpm)
Sunrise Cove	30	50
BOCES School (Deduction)	10	10
New Sunrise Cove Total	***20***	***40***

To determine the required pump head, the elevation and dynamic head requirements were calculated. The elevation head was determined by comparing the approximate pump elevation and the highest elevation along the force main between the Sunrise Cove Pumping Station and the new SR 394 Pumping Station. The dynamic head is determined by calculating the headloss of the force main between the Sunrise Cove Pumping Station and the new SR 394 Pumping Station at the required flow rate. Table 3.14 shows the theoretical range of the pumping station requirements. Note, the station will be designed to pump future flow rates.

Table 3.14 Theoretical Range of Pump Head Requirements

Flow Condition (gpm)	Pump Elevation (ft)	High Point (ft)	Elevation Change (ft)	Pipeline Length (ft)	C-Factor	Headloss (ft)	TDH (ft)
20	1,290	1,385	95	1,400	120	5	100

Table 3.14 Theoretical Range of Pump Head Requirements

Flow Condition (gpm)	Pump Elevation (ft)	High Point (ft)	Elevation Change (ft)	Pipeline Length (ft)	C-Factor	Headloss (ft)	TDH (ft)
40	1,290	1,385	95	1,400	120	70	165

The pumping station will be designed with two grinder-cutter type centrifugal pumps, which will allow the pumps to be alternated as necessary and allow for maintenance and optimum performance. The targeted design point for the selected pump will be 40 gpm at 165 feet. Actual performance curve for a centrifugal pump that can achieve the required range of flow and head are shown in Appendix F.

The pumping station will be equipped with a SCADA system linked to the WWTP service center. This will allow remote operation of the pumping station in coordination with the various other pumping stations that influence its operation.

The pump station will be supplied by 3-phase power. For emergencies, the station will be equipment with an auxiliary generator receptacle and manual transfer switch to allow for a portable generator connection. The portable generator will be provided by SCCLSD as required for emergency events.

3.5.4 New SR 394 Pumping Stations

The new SR 394 Pumping Station will be design to convey the 20-year projected peak hourly flow for the West Side Sewer Extension (Phase 1, Phase 2, and Sunrise Cove). The projected 20-year peak hourly flow established in Section 3.3.1 and summarized in Table 3.15 is 1,000 gpm.

Table 3.15 New SR 394 Pumping Station Flow Projection

Service Area	Current Flow (gpm) @ end of Phase 1 (Year = 2022)	Future Flow (gpm) @ start of Phase 2 (Year = 2029)	Future Flow (gpm) @ Phase 1, 20-year buildout (Year = 2042)	Future Flow (gpm) @ Phase 2, 20-year buildout (Year = 2048)
Phase 1	280	333	448	448
Sunrise Cove (Inclusive of BOCES School)	32	37	50	50
Phase 2	-	310	417	496
Phase 1 and 2 Total	***312***	***680***	***915***	***994***

To determine the required pump head, the elevation and dynamic head requirements were calculated. The elevation head was determined by comparing the approximate pump elevation and

the highest elevation along the force main between the New SR 394 Pumping Station and the Sherman's Bay Pumping Station. The dynamic head is determined by calculating the head loss of the force main between the New SR 394 Pumping Station and the Sherman's Bay Pumping Station at the required flow rate. Table 3.16 shows the theoretical range of the pumping station requirements.

Table 3.16 Theoretical Range of Pump Head Requirements

Flow Condition (gpm)	Pump Elevation (ft)	High Point (ft)	Elevation Change (ft)	Pipeline Length (ft)	C-Factor	Headloss (ft)	TDH (ft)
700*	1,380	1,450	70	10,350	120	75	145
700**	1,380	1,450	70	10,350	120	15	85
1,000	1,380	1,450	70	10,350	120	20	90

*Base Bid (connection to Goose Creek Force Main)
** Base Bid with Alternate 'A' (new force main to Sherman's Bay PS)

To provide maximum operational flexibility and achieve a verity of flow ranges as the West Side Sewer Extension reaches full buildout, the station will be designed with a variable speed drive (VFD). The designed pump range is 700 gpm to 1,000 gpm (20-year full buildout) at a head range of 85 feet to 145 feet.

The pumping station will be designed with two centrifugal pumps, which will allow the pumps to be alternated as necessary and allow for maintenance and optimum performance. The targeted design point for the selected pump will be 1,000 gpm at 90 feet. Actual performance curve for a centrifugal pump that can achieve the required range of flow and head are shown in Appendix F.

Initially, the anticipated operating range of the pumping station will be approximately 700 gpm at 145 feet of total dynamic head (TDH) for the Base Bid or 700 gpm at 85 TDH for the Base Bid with force main alternate.

The pumping station will be equipped with a SCADA system linked to the WWTP service center. This will allow remote operation of the pumping station in coordination with the various other pumping stations that influence its operation.

The pump station will be supplied by 3-phase power. For emergencies, the station will be equipped with a permanent natural gas fired backup generator and automatic transfer switch to allow the station to continue operation in event of power outages.

The SCCLSD would like to approach the BOCES School to potentially purchase the proposed pumping station site. The site will be provided with an asphalt paved driveway for SCCLSD access, and an on-grade concrete slab for the emergency generator and automatic transfer switch.

3.5.5 Goose Creek Pumping Station

The existing Goose Creek Pumping Station will be retrofitted with new sewage pumps only under the Base Bid scenario. The station modifications will be designed to convey the 20-year projected peak hourly flow for the existing Goose Creek service area. The projected 20-year peak hourly flow established in Section 3.3.1 and summarized in Table 3.17 is 400 gpm.

Table 3.17 Upgraded Goose Creek Pumping Station Flow Projection

Service Area	Current Flow (gpm)	Future (20 years) Flow (gpm)
Goose Creek	220	370

To determine the required pump head, the elevation and dynamic head requirements were calculated along with the TDH required to operate simultaneous with the new SR 394 Pumping Station. The elevation head was determined by comparing the approximate pump elevation and the highest elevation along the force main between the Goose Creek Pumping Station and the Sherman's Bay Pumping Station. The dynamic head is determined by calculating the headloss of the force main between the Goose Creek Pumping Station and the Sherman's Bay Pumping Station as well as the TDH from the new SR 394 Pumping Station at the required flow rate. Table 3.18 shows the theoretical range of the pumping station requirements. Note, the station will be designed to pump future flow rates.

Table 3.18 Theoretical Range of Pump Head Requirements

Flow Condition (gpm)	Pump Elevation (ft)	High Point (ft)	Elevation Change (ft)	Pipeline Length (ft)	C-Factor	Headloss (ft)	SR 394 THD (ft)	TDH (ft)
400	1,315	1,318	3	3,600	120	5	179	187

The pumping station will be designed with two grinder-cutter type centrifugal pumps, which will allow the pumps to be alternated as necessary and allow for maintenance and optimum performance. The targeted design point for the selected pump will be 400 gpm at 187 feet.

3.5.6 Sherman's Bay Stations

The Sherman's Bay Pumping Station is currently operating at approximately 45 percent of its capacity. The Sherman's Bay Pumping Station as currently configured has sufficient capacity to convey flows from the Phase 1 service area including approximately 15-years of growth at 2.5%. Upon the Phase 2 service area flows entering the conveyance system, the Sherman's Bay Pumping Station would likely no longer have the required conveyance capacities if communities experience an aggressive 2.5% annual growth rate.

If the Sherman's Bay Pumping Station service area (including new and existing service areas) experiences a less aggressive growth rate of approximately 0.5%, the station would reach 100% capacity approximately twelve (12) years after the completion of the Phase 1 sewer project.

It is not recommended to upgrade the Sherman's Bay Pumping Station pumps at this time due to the projected timing of the Phase 2 project, and the unknown of what the actual growth rate of the communities will be. The station should be re-evaluated when the timing of Phase 2 is better known, the actual community growth rates are known, when the station reaches approximately 90 percent capacity, or significant pump repairs or replacements are required.

3.5.7 Lakewood Pumping Stations

The Lakewood Pumping Station is currently operating at approximately 60 percent of its capacity. The Lakewood Pumping Station as currently configured has sufficient capacity to convey flows from the Phase 1 service area including the entire 20-year 65% growth. The station also has sufficient capacity to accommodate the entire Phase 2 service area and approximately seven (7) years of the projected 20-year 65% growth.

If the Lakewood Pumping Station service area (including new and existing service areas) experiences a less aggressive growth rate of approximately 0.5%, the station would have sufficient capacity to accommodate flows for an entire 20-year growth period, at which time it would operate at approximately 85% capacity.

It is not recommended to upgrade the Lakewood Bay Pumping Station pumps at this time due to the projected timing of the Phase 2 project, and the unknown of what the actual growth rate of the communities will be. The station should be re-evaluated when the timing of Phase 2 is better known, the actual community growth rates are known, when the station reaches approximately 90 percent capacity, or significant pump repairs or replacements are required.

Engineering Report Certification

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: Design Report, West Side Sewer Extension Project

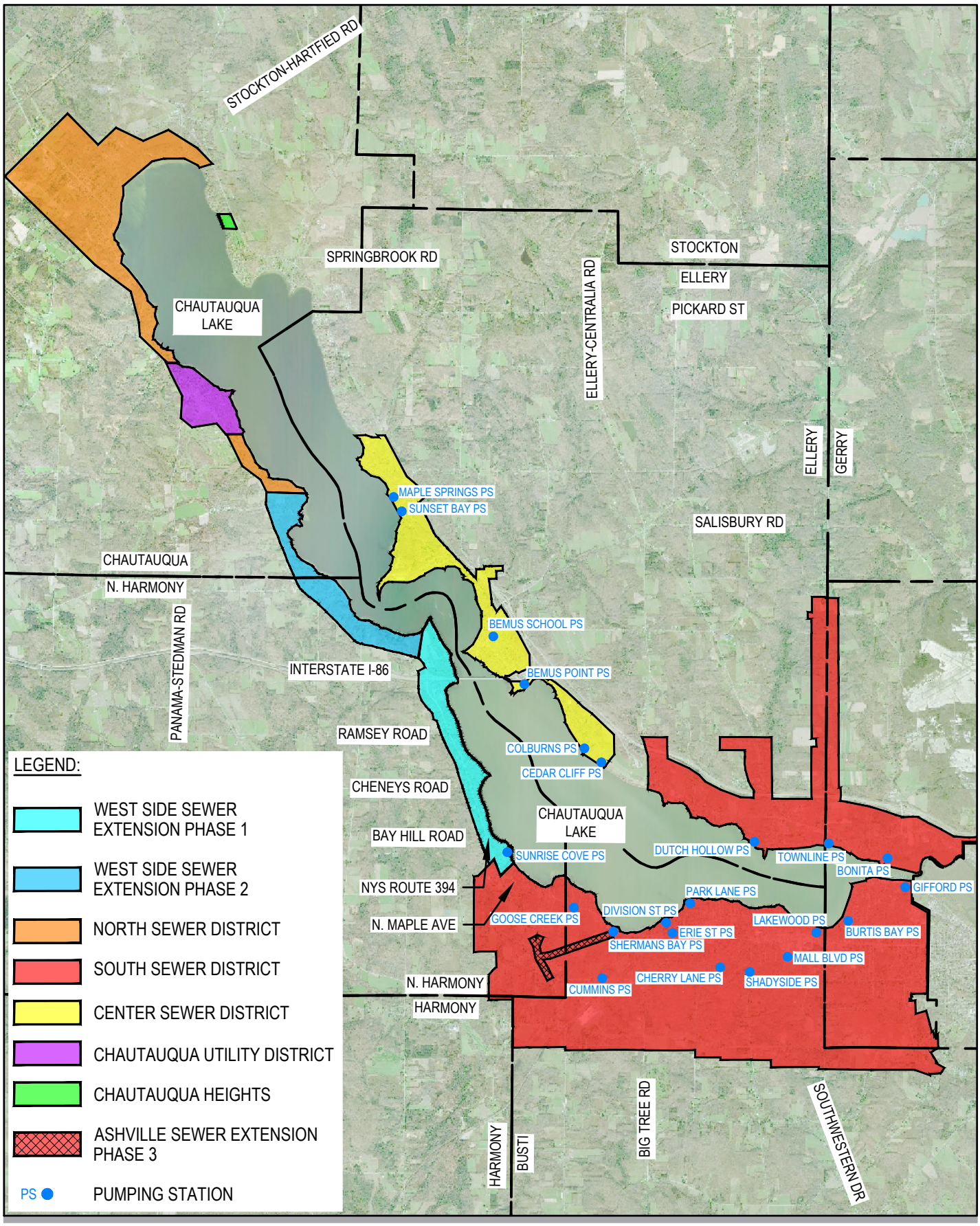
Date of Report: April 13, 2020

Professional Engineer's Name: Paul J. McGarvey, P.E.

New York State Professional Engineer License Number: 073641

Signature: Paul J. McGarvey Date: April 13, 2020

Figures



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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

SEWER DISTRICTS AND PUMPING FACILITIES

Project No. **11196997**
Report No. **001**
Date **APRIL 2020**

FIGURE 1.1

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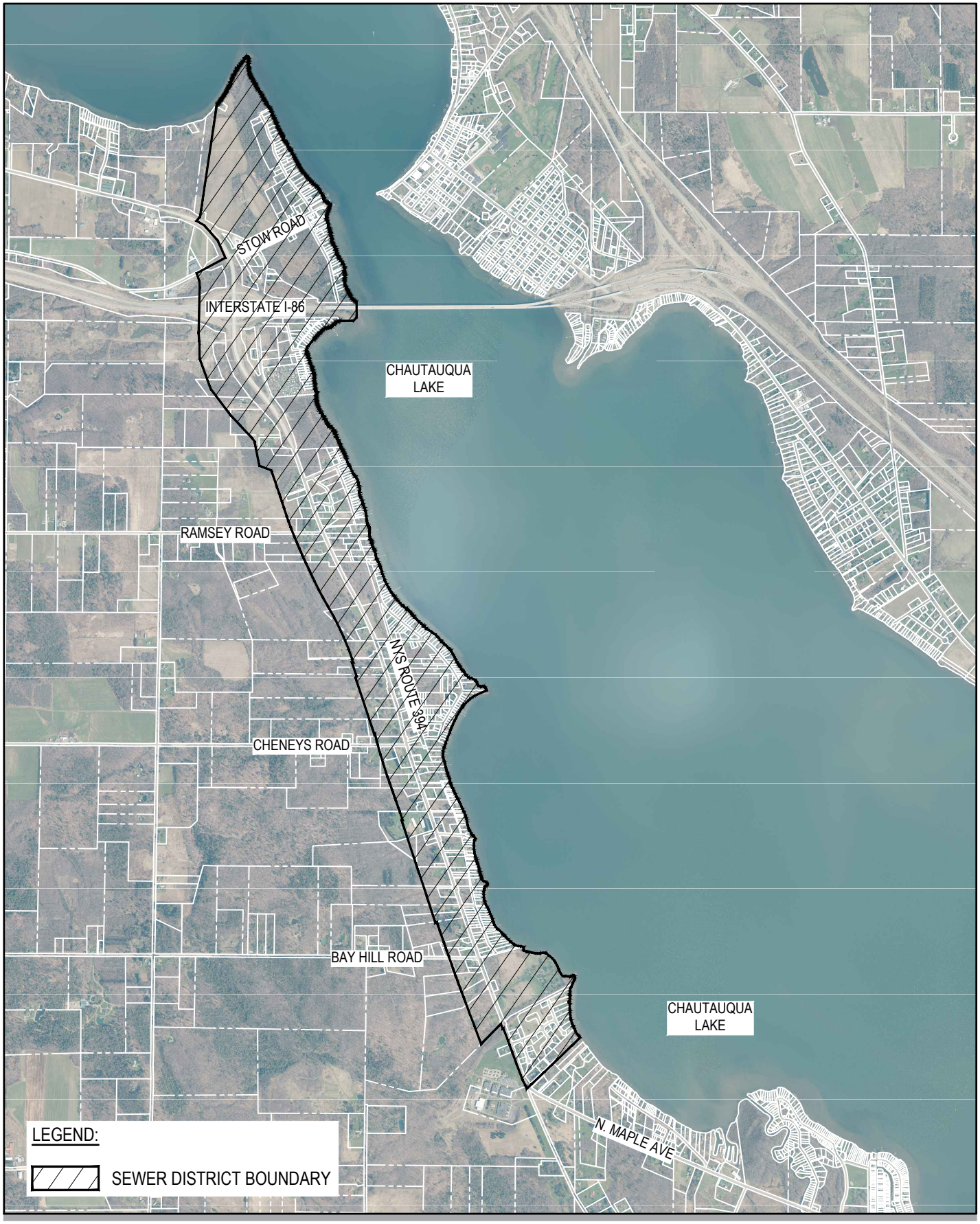

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PHASE 1 BOUNDARY MAP

Project No. **11196997**
Report No. **001**
Date **APRIL 2020**

FIGURE 1.2

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG1.2.dwg
Plot Date: 8 April 2020 - 1:36 PM

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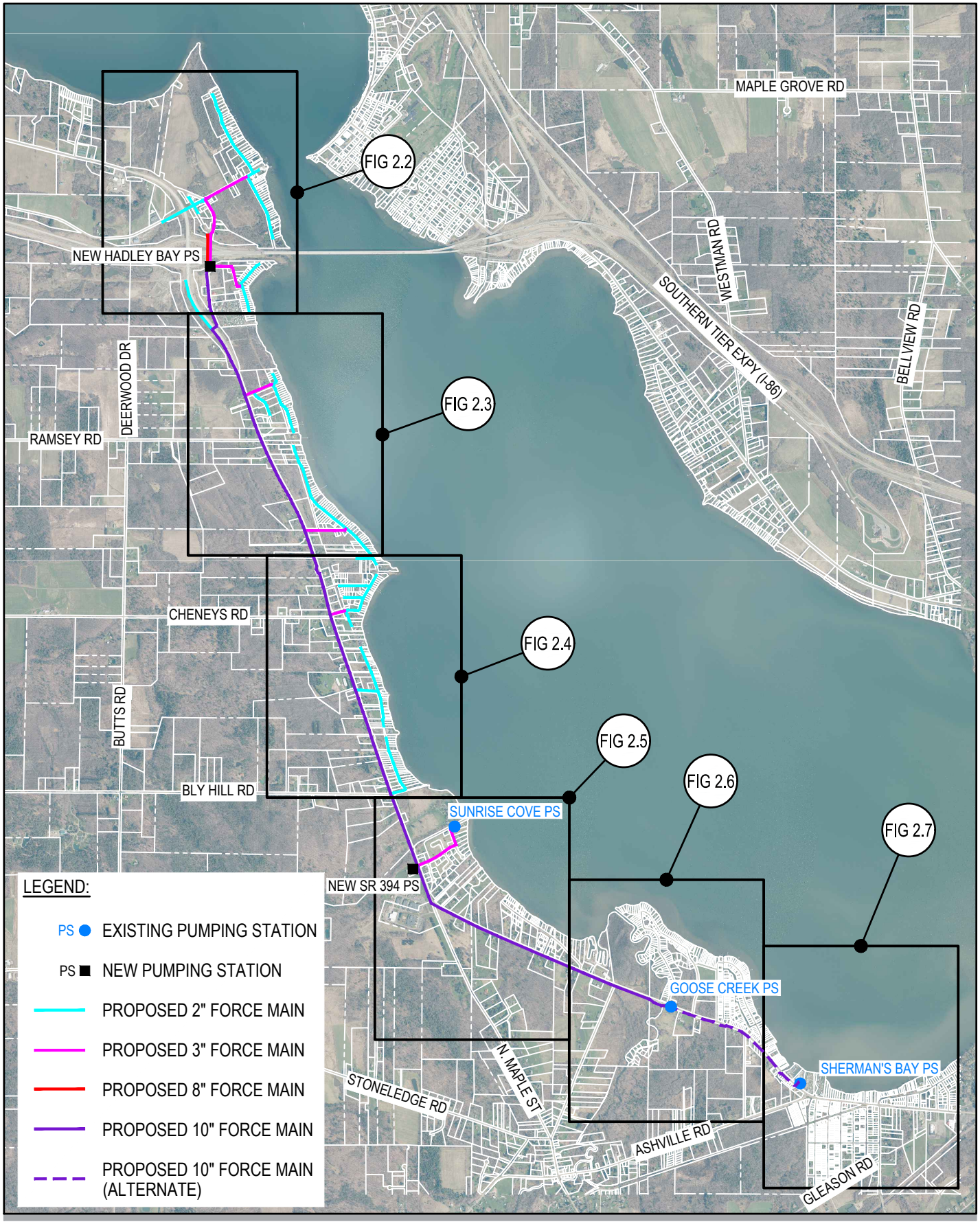

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK-KEY MAP

Project No. **11196997**
Report No. **001**
Date **APRIL 2020**

FIGURE 2.1

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.1.dwg
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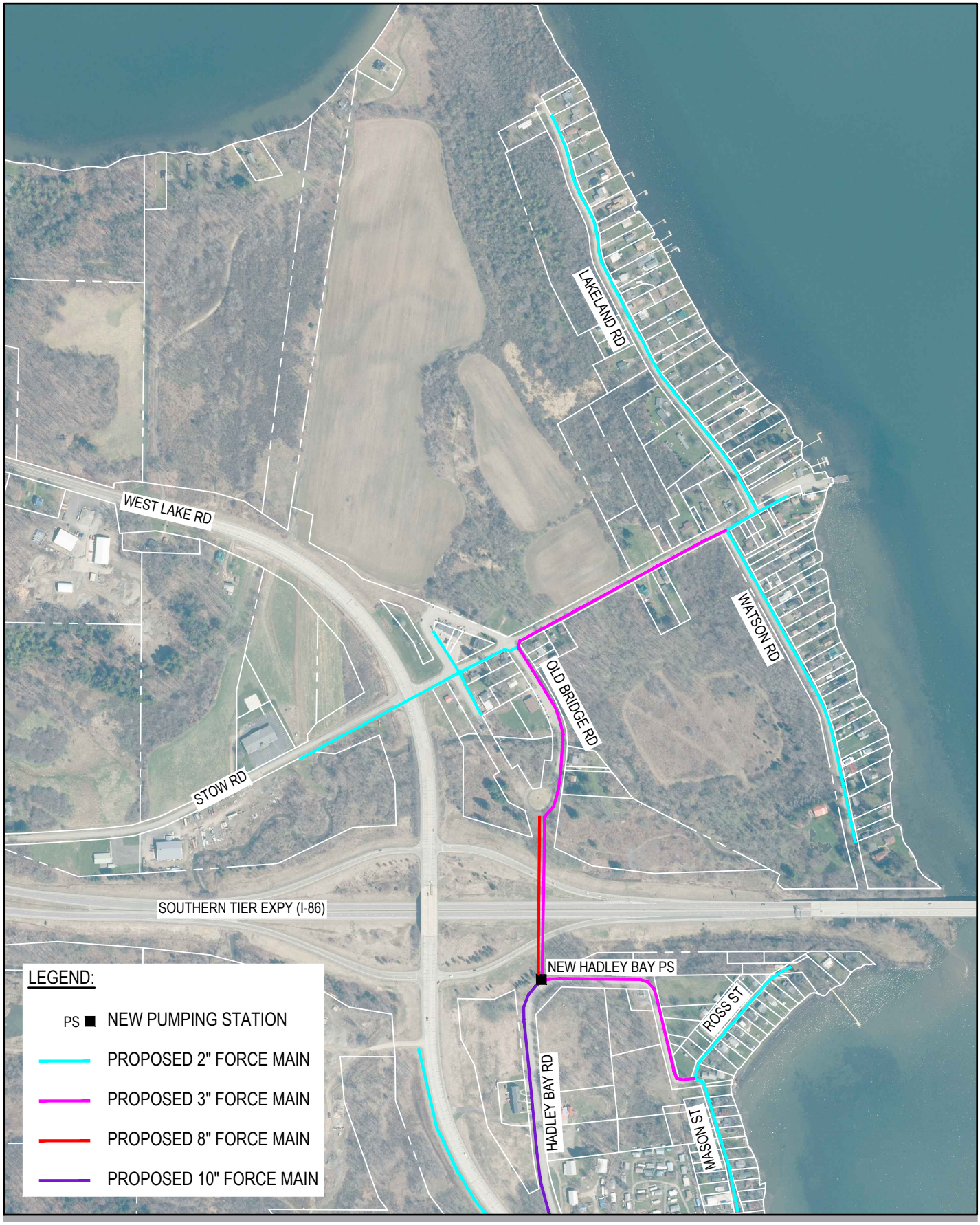

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

Project No. **11196997**
Report No. **001**
Date **APRIL 2020**

FIGURE 2.2

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.2.dwg
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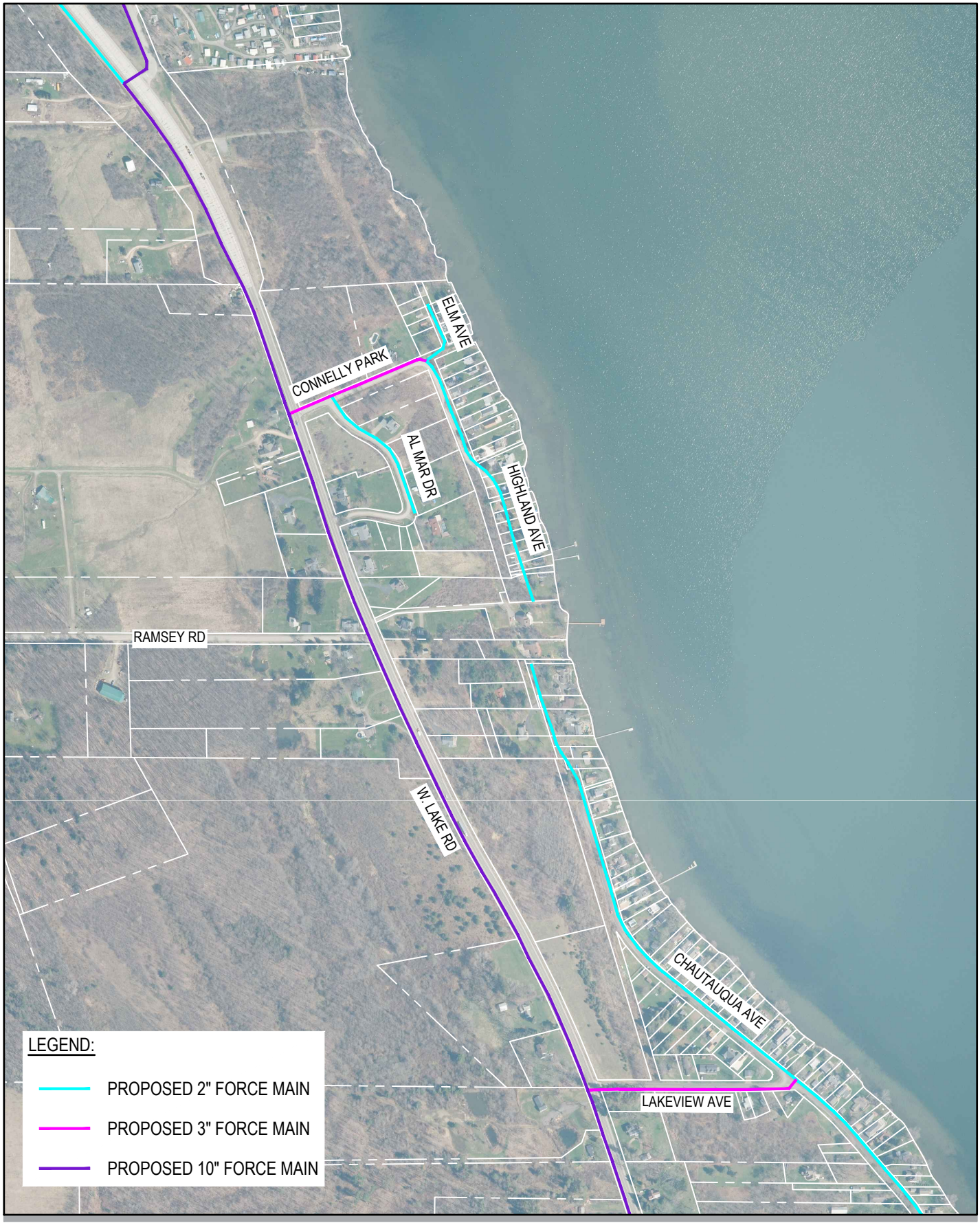

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

Project No. **11196997**
Report No. **001**
Date **APRIL 2020**

FIGURE 2.3

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.3.dwg
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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

Project No. **11196997**
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FIGURE 2.4

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.4.dwg
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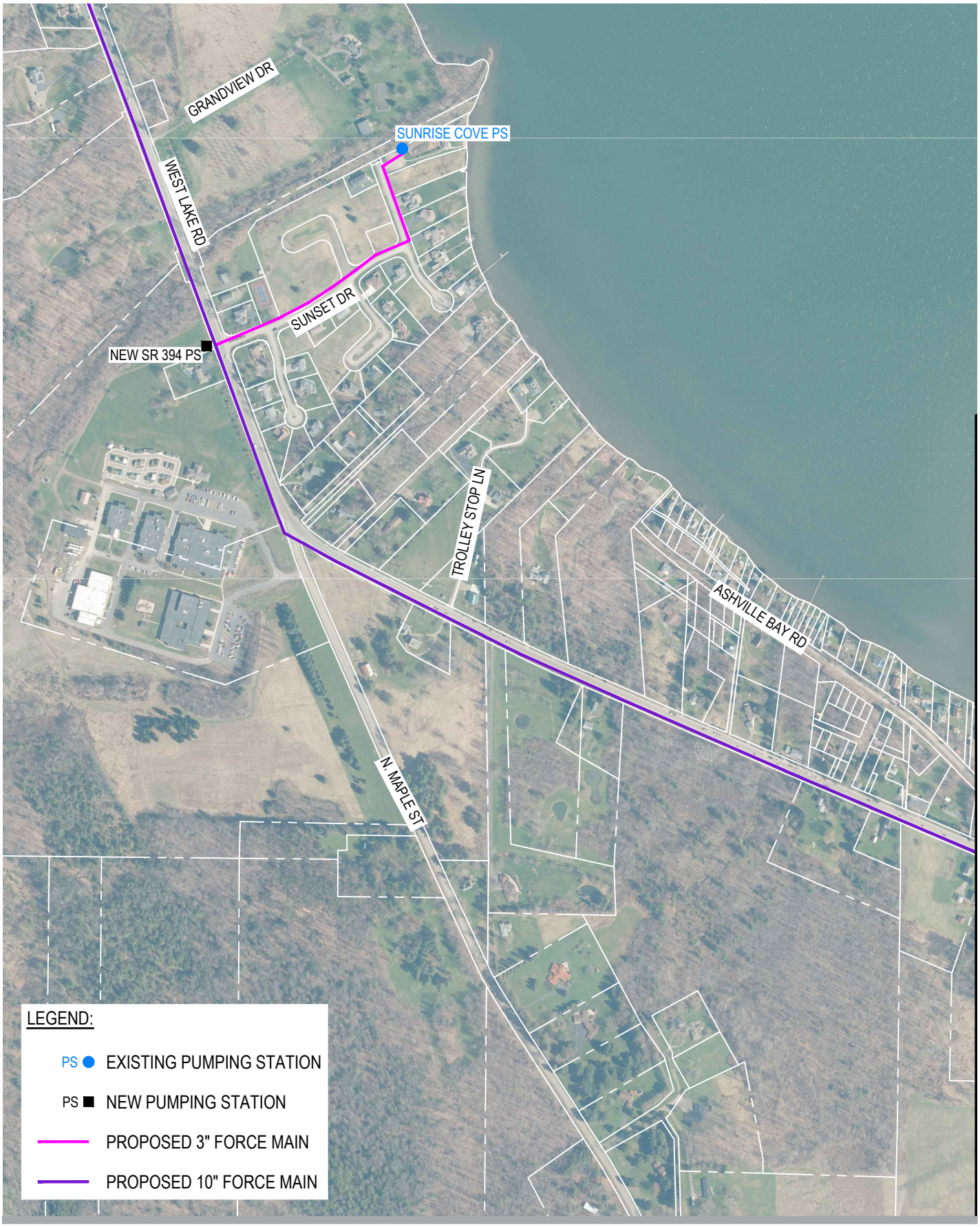

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

Project No. **11196997**
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FIGURE 2.5

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.5.dwg
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PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

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FIGURE 2.6

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.6.dwg
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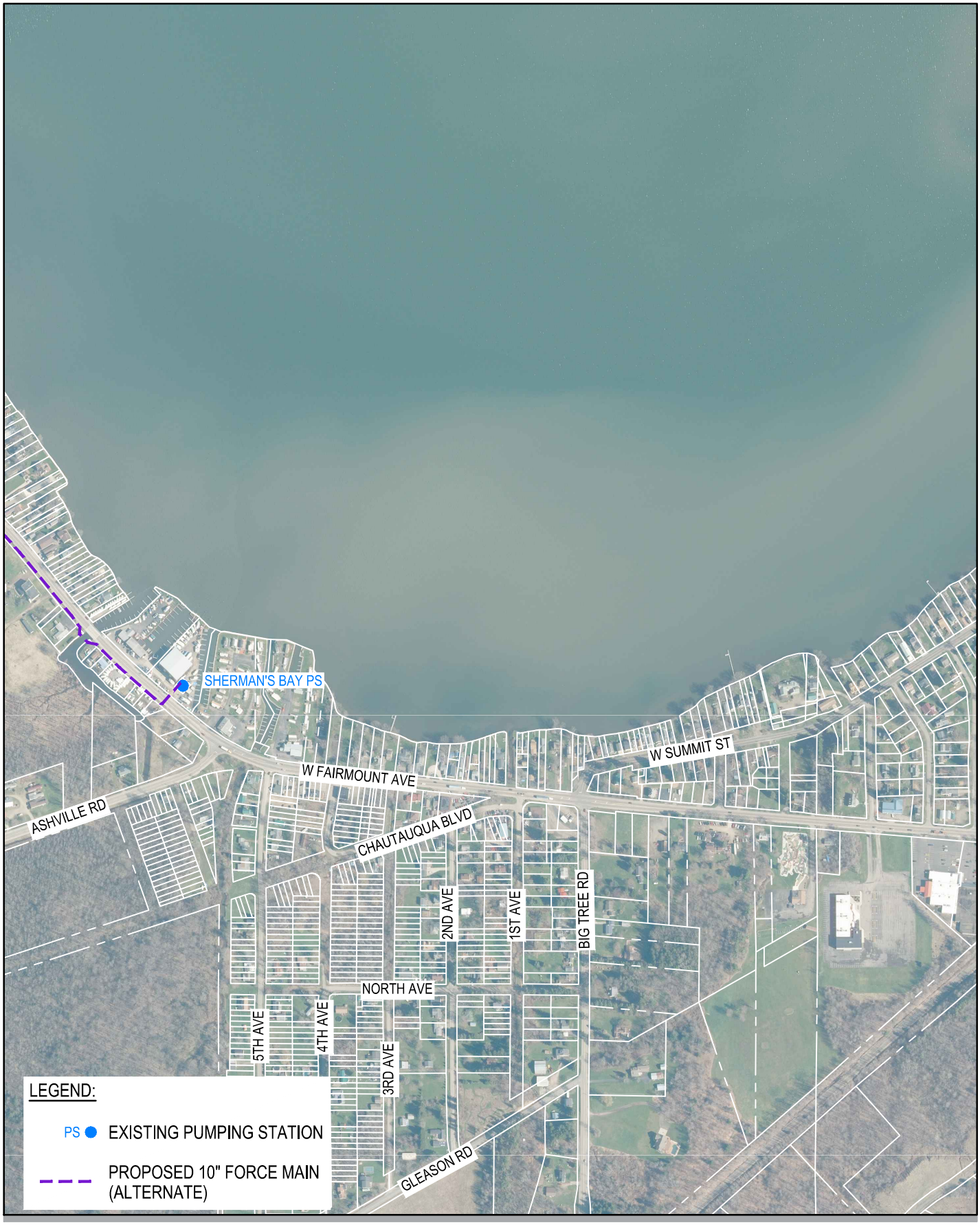

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SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
PROPOSED WEST SIDE SEWER EXTENSION

PIPE AND PUMPING SYSTEM NETWORK

Project No. **11196997**
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Date **APRIL 2020**

FIGURE 2.7

Filename: C:\Users\tdahmer\Desktop\ACAD 2018\Figures\Proposed Sewer Extension Figures\11196997-FIG2.7.dwg
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Appendices

Appendix A
Flow Schematic

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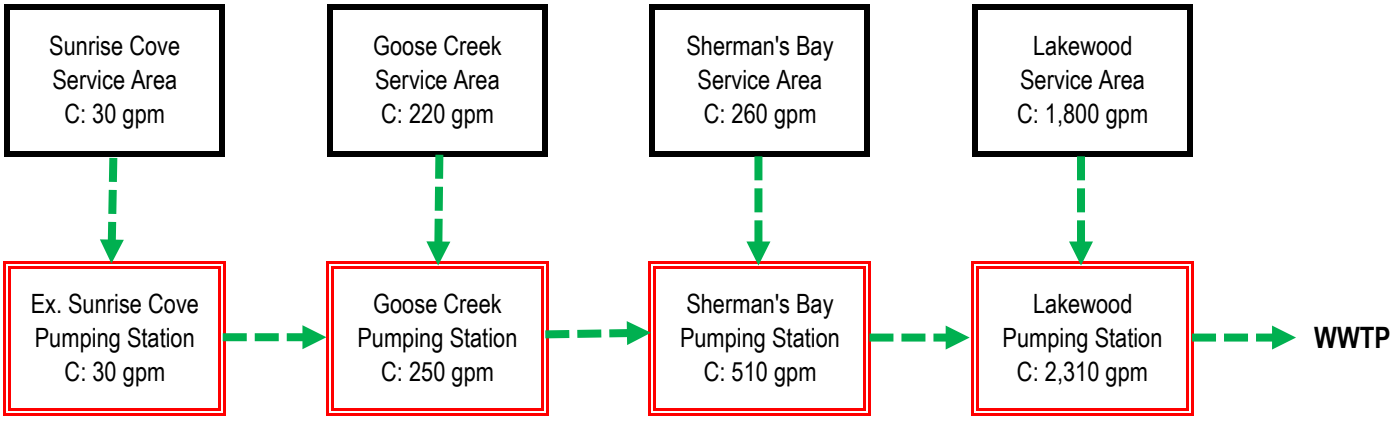
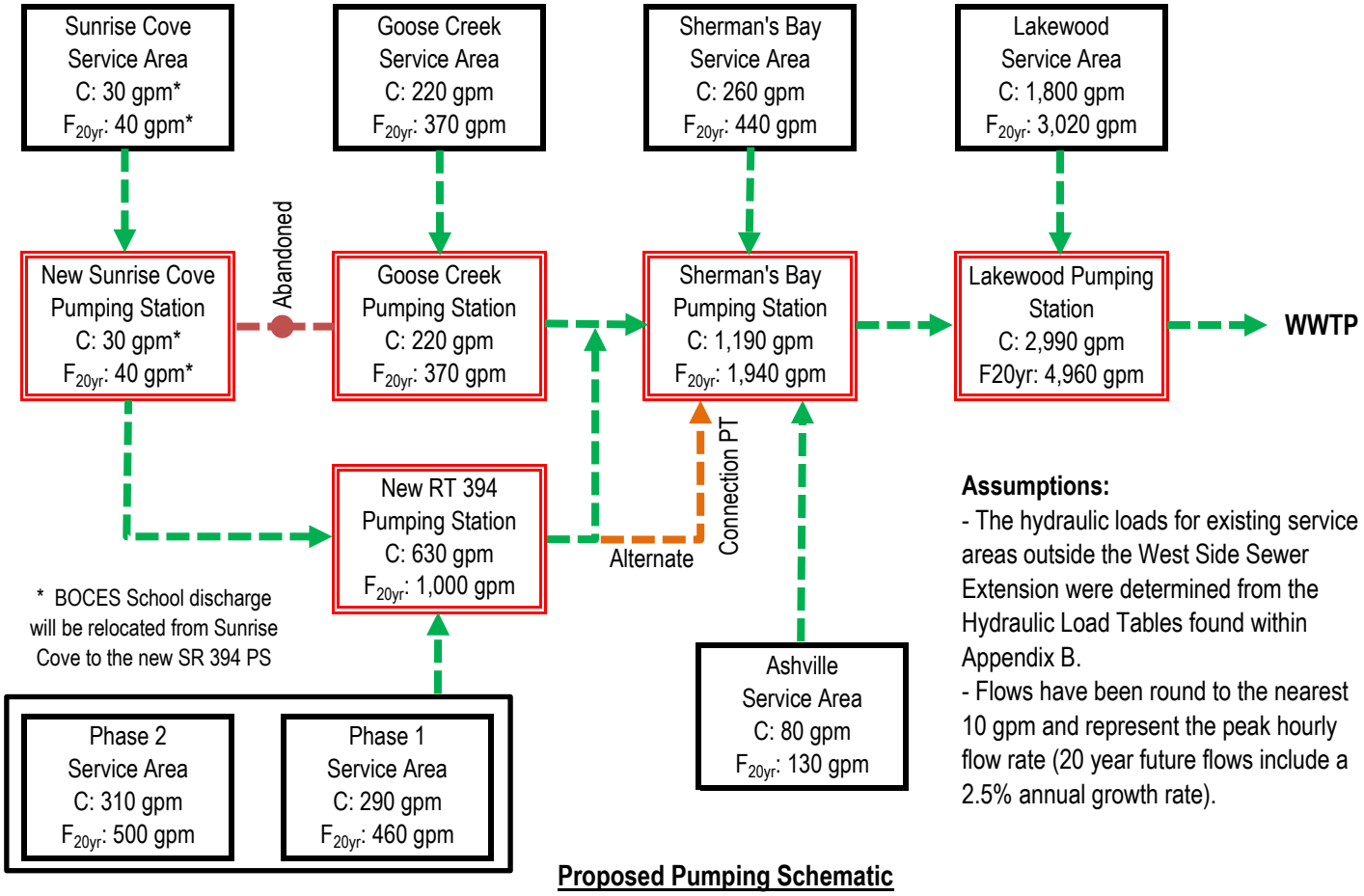
PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW
PAGE: 1 of 1

Service Area Schematic - Peak Hourly Flow Rates



Existing Pumping Schematic



Proposed Pumping Schematic

Assumptions:

- The hydraulic loads for existing service areas outside the West Side Sewer Extension were determined from the Hydraulic Load Tables found within Appendix B.
- Flows have been round to the nearest 10 gpm and represent the peak hourly flow rate (20 year future flows include a 2.5% annual growth rate).

Appendix B
Hydraulic Loads

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PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Phase 1 Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$ Developed Properties = 420 (EDU value utilized to account for large users)
P_H= Population/Household = 2.6
P_{SA}= Equivalent Service Area Population
P_G= Annual Growth Rate = 2.5%
P_T= Project 20yr Service Area Population
H_C= Hydraulic Capacity (gal/capita/day) = 100 *(Part 11.243 - Ten States Standards)*
Q_{AC}= Current Average Day Flow (gpm)
Q_A= Future Average Day Flow (gpm)
Q_P= Future Peak Hourly Flow (gpm)
Q_{PF}= Peaking Factor *(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 1,092 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 1,790 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 76 *(rounded up)* **Q_{AC} (gpd)=** 109,440

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 125 *(rounded up)* **Q_A (gpd)=** 180,000

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 3.7 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 463.0 *(rounded up)* **Q_P (Ft^3/s)=** 1.03 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 666,720

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PROJECT No.: 11196997
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West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Sunrise Cove Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$	Developed Properties =	35	(EDU value utilized to account for large users)
P_H=	Population/Household =	2.6	
P_{SA}=	Equivalent Service Area Population		
P_G=	Annual Growth Rate =	2.5%	
P_T=	Project 20yr Service Area Population		
H_C=	Hydraulic Capacity (gal/capita/day) =	100	*(Part 11.243 - Ten States Standards)*
Q_{AC}=	Current Average Day Flow (gpm)		
Q_A=	Future Average Day Flow (gpm)		
Q_P=	Future Peak Hourly Flow (gpm)		
Q_{PF}=	Peaking Factor		*(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 91 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 150 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 7 *(rounded up)* **Q_{AC} (gpd)=** 10,080

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 11 *(rounded up)* **Q_A (gpd)=** 15,840

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 4.2 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 47.0 *(rounded up)* **Q_P (Ft^3/s)=** 0.10 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 67,680

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West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Sunrise Cove Service Area (Post Phase 1 Buildout) - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$ Developed Properties = 27 (EDU value utilized to account for large users)
P_H= Population/Household = 2.6
P_{SA}= Equivalent Service Area Population
P_G= Annual Growth Rate = 2.5%
P_T= Project 20yr Service Area Population
H_C= Hydraulic Capacity (gal/capita/day) = 100 *(Part 11.243 - Ten States Standards)*
Q_{AC}= Current Average Day Flow (gpm)
Q_A= Future Average Day Flow (gpm)
Q_P= Future Peak Hourly Flow (gpm)
Q_{PF}= Peaking Factor *(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 71 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 117 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 5 *(rounded up)* **Q_{AC} (gpd)=** 7,200

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 9 *(rounded up)* **Q_A (gpd)=** 12,960

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 4.3 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 39.0 *(rounded up)* **Q_P (Ft^3/s)=** 0.09 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 56,160

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West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Phase 2 Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$	Developed Properties =	466	(EDU value utilized to account for large users)
P_H=	Population/Household =	2.6	
P_{SA}=	Equivalent Service Area Population		
P_G=	Annual Growth Rate =	2.5%	
P_T=	Project 20yr Service Area Population		
H_C=	Hydraulic Capacity (gal/capita/day) =	100	*(Part 11.243 - Ten States Standards)*
Q_{AC}=	Current Average Day Flow (gpm)		
Q_A=	Future Average Day Flow (gpm)		
Q_P=	Future Peak Hourly Flow (gpm)		
Q_{PF}=	Peaking Factor		*(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 1,212 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 1,987 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 85 *(rounded up)* **Q_{AC} (gpd)=** 122,400

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 138 *(rounded up)* **Q_A (gpd)=** 198,720

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 3.6 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 497.0 *(rounded up)* **Q_P (Ft^3/s)=** 1.11 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 715,680

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PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Hamlet of Ashville Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$ Developed Properties = 100 (EDU value utilized to account for large users)
P_H= Population/Household = 2.6
P_{SA}= Equivalent Service Area Population
P_G= Annual Growth Rate = 2.5%
P_T= Project 20yr Service Area Population
H_C= Hydraulic Capacity (gal/capita/day) = 100 *(Part 11.243 - Ten States Standards)*
Q_{AC}= Current Average Day Flow (gpm)
Q_A= Future Average Day Flow (gpm)
Q_P= Future Peak Hourly Flow (gpm)
Q_{PF}= Peaking Factor *(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 260 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 427 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 19 *(rounded up)* **Q_{AC} (gpd)=** 27,360

Q_A= PT * HC / (24 hr/day) / (60 min/hr) = 30 *(rounded up)* **Q_A (gpd)=** 43,200

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 4.1 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 123.0 *(rounded up)* **Q_P (Ft^3/s)=** 0.27 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 177,120

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PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Goose Creek Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$	Developed Properties =	330	(EDU value utilized to account for large users)
P_H=	Population/Household =	2.6	
P_{SA}=	Equivalent Service Area Population		
P_G=	Annual Growth Rate =	2.5%	
P_T=	Project 20yr Service Area Population		
H_C=	Hydraulic Capacity (gal/capita/day) =	100	*(Part 11.243 - Ten States Standards)*
Q_{AC}=	Current Average Day Flow (gpm)		
Q_A=	Future Average Day Flow (gpm)		
Q_P=	Future Peak Hourly Flow (gpm)		
Q_{PF}=	Peaking Factor		*(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 858 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 1,406 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 60 *(rounded up)* **Q_{AC} (gpd)=** 86,400

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 98 *(rounded up)* **Q_A (gpd)=** 141,120

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 3.7 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 363.0 *(rounded up)* **Q_P (Ft^3/s)=** 0.81 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 522,720

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DESIGNED BY: WWW
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Sherman's Bay Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$	Developed Properties =	390	(EDU value utilized to account for large users)
P_H=	Population/Household =	2.6	
P_{SA}=	Equivalent Service Area Population		
P_G=	Annual Growth Rate =	2.5%	
P_T=	Project 20yr Service Area Population		
H_C=	Hydraulic Capacity (gal/capita/day) =	100	*(Part 11.243 - Ten States Standards)*
Q_{AC}=	Current Average Day Flow (gpm)		
Q_A=	Future Average Day Flow (gpm)		
Q_P=	Future Peak Hourly Flow (gpm)		
Q_{PF}=	Peaking Factor		*(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 1,014 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 1,662 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 71 *(rounded up)* **Q_{AC} (gpd)=** 102,240

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 116 *(rounded up)* **Q_A (gpd)=** 167,040

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 3.7 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 430.0 *(rounded up)* **Q_P (Ft^3/s)=** 0.96 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 619,200

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DESIGNED BY: WWW
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Lakewood Service Area - Hydraulic Load Projection

Assumptions:

- Design will meet Ten States Standards
- EDU Count was derived from Sections 6 of the Sewer Extension for West Side Chautauqua Lake (July 2015) developed by O'Brien & Gere. EDU count equals Design Average Flow divided by average day hydaulic load per EDU divided by the 20 year growth rate (i.e.: 100,000 gpd / 260 gpd / 1.65 = 233)

Variables:

$D_{P=}$ Developed Properties = 3,555 (EDU value utilized to account for large users)
P_H= Population/Household = 2.6
P_{SA}= Equivalent Service Area Population
P_G= Annual Growth Rate = 2.5%
P_T= Project 20yr Service Area Population
H_C= Hydraulic Capacity (gal/capita/day) = 100 *(Part 11.243 - Ten States Standards)*
Q_{AC}= Current Average Day Flow (gpm)
Q_A= Future Average Day Flow (gpm)
Q_P= Future Peak Hourly Flow (gpm)
Q_{PF}= Peaking Factor *(Part 11.241, Figure 1 - Ten States Standards)*

Calculation:

P_{SA}= $D_P * P_H$ = 9,243 *(rounded up)*

P_T= $P_{SA} * (1+P_G)^{20}$ = 15,146 *(rounded up)*

Q_{AC}= $P_{SA} * HC / (24\ hr/day) / (60\ min/hr)$ = 642 *(rounded up)* **Q_{AC} (gpd)=** 924,480

Q_A= $PT * HC / (24\ hr/day) / (60\ min/hr)$ = 1052 *(rounded up)* **Q_A (gpd)=** 1,514,880

Q_{PF}= $(18 + (P_T / 1000)^{0.5}) / (4 + (P_T / 1000)^{0.5})$ = 2.8 *(rounded up)*

Q_P= $Q_A * Q_{PF}$ = 2946.0 *(rounded up)* **Q_P (Ft^3/s)=** 6.56 *(0.002228 ft^3 per gal)* **Q_P (gpd)=** 4,242,240

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West Side Sewer Extension
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DESIGNED BY: WWW
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Projected Hydraulic Loading for Lakewood Pumping Station

Assumptions:
- Existing pumping capacity of the Lakewood Pumping Station is approximately 4,000 gpm.
- The construction of the West Side Sewer Extension phases are 7 years apart to allow for EFC funding eligibility; Map, Plan, and Report; funding application; detailed design; and bidding.

New Service Area Annual Growth Rate: 2.5% Existing Service Area Growth Rate: 2.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 2.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2048*	*2054*
Lakewood	1,800	1,845	1,891	1,938	1,987	2,037	2,087	2,140	2,193	2,248	2,304	2,362	2,421	2,481	2,543	2,607	2,672	2,739	2,807	2,878	2,950	3,023	3,023	3,023
Sherman's Bay	260	267	273	280	287	294	302	309	317	325	333	341	350	358	367	377	386	396	406	416	426	437	437	437
Goose Creek	220	226	231	237	243	249	255	262	268	275	282	289	296	303	311	319	327	335	343	352	360	370	370	370
Sunrise Cove	30	31	32	32	33	34	35	36	37	37	38	39	40	41	42	43	45	46	47	48	49	50	50	50
Phase 1	- -	140	280	287	294	302	309	317	325	333	341	350	358	367	377	386	396	406	416	426	437	448	448	448
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	318	326	334	342	351	360	368	378	387	397	407	417	496	496
Phase 3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	80	82	84	86	88	91	93	95	113	131
Projected Lakewood PS Flow	2,310	2,508	2,707	2,775	2,844	2,915	2,988	3,063	3,294	3,528	3,616	3,706	3,799	3,894	4,071	4,173	4,277	4,384	4,494	4,606	4,721	4,839	4,936	4,954
% Capacity of Lakewood PS	58%	63%	68%	69%	71%	73%	75%	77%	82%	88%	90%	93%	95%	97%	102%	104%	107%	110%	112%	115%	118%	121%	123%	124%

New Service Area Annual Growth Rate: 0.5% Existing Service Area Growth Rate: 0.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 0.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2048*	*2054*
Lakewood	1,800	1,809	1,818	1,827	1,836	1,845	1,855	1,864	1,873	1,883	1,892	1,902	1,911	1,921	1,930	1,940	1,950	1,959	1,969	1,979	1,989	1,999	1,999	1,999
Sherman's Bay	260	261	263	264	265	267	268	269	271	272	273	275	276	277	279	280	282	283	284	286	287	289	289	289
Goose Creek	220	221	222	223	224	226	227	228	229	230	231	232	234	235	236	237	238	239	241	242	243	244	244	244
Sunrise Cove	30	30	30	30	31	31	31	31	31	31	32	32	32	32	32	32	32	33	33	33	33	33	33	33
Phase 1	- -	140	280	281	283	284	286	287	289	290	291	293	294	296	297	299	300	302	303	305	306	308	308	308
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	312	313	315	316	318	319	321	323	324	326	327	329	341	341
Phase 3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	80	80	81	81	82	82	82	83	86	88
Projected Lakewood PS Flow	2,310	2,462	2,613	2,626	2,639	2,653	2,666	2,679	2,848	3,016	3,031	3,046	3,061	3,077	3,172	3,188	3,204	3,220	3,236	3,252	3,269	3,285	3,300	3,302
% Capacity of Lakewood PS	58%	62%	65%	66%	66%	66%	67%	67%	71%	75%	76%	76%	77%	77%	79%	80%	80%	80%	81%	81%	82%	82%	82%	83%

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PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Projected Hydraulic Loading for Sherman's Bay Pumping Station

Assumptions:

- Existing pumping capacity of the Sherman's Bay Pumping Station is approximately 1,200 gpm.
- The construction of the West Side Sewer Extension phases are 7 years apart to allow for EFC funding eligibility; Map, Plan, and Report; funding application; detailed design; and bidding.

New Service Area Annual Growth Rate: 2.5% Existing Service Area Growth Rate: 2.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 2.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2048*	*2054*
Sherman's Bay	260	267	273	280	287	294	302	309	317	325	333	341	350	358	367	377	386	396	406	416	426	437	437	437
Goose Creek	220	226	231	237	243	249	255	262	268	275	282	289	296	303	311	319	327	335	343	352	360	370	370	370
Sunrise Cove	30	31	32	32	33	34	35	36	37	37	38	39	40	41	42	43	45	46	47	48	49	50	50	50
Phase 1	- -	140	280	287	294	302	309	317	325	333	341	350	358	367	377	386	396	406	416	426	437	448	448	448
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	318	326	334	342	351	360	368	378	387	397	407	417	496	496
Phase 3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	80	82	84	86	88	91	93	95	113	131
Proj. Sherman's Bay PS Flow	510	663	816	836	857	879	901	923	1,101	1,280	1,312	1,345	1,378	1,413	1,528	1,566	1,605	1,645	1,687	1,729	1,772	1,816	1,913	1,931
% Capacity of Sherman's Bay PS	43%	55%	68%	70%	71%	73%	75%	77%	92%	107%	109%	112%	115%	118%	127%	131%	134%	137%	141%	144%	148%	151%	159%	161%

New Service Area Annual Growth Rate: 0.5% Existing Service Area Growth Rate: 0.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 0.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2048*	*2054*
Sherman's Bay	260	261	263	264	265	267	268	269	271	272	273	275	276	277	279	280	282	283	284	286	287	289	289	289
Goose Creek	220	221	222	223	224	226	227	228	229	230	231	232	234	235	236	237	238	239	241	242	243	244	244	244
Sunrise Cove	30	30	30	30	31	31	31	31	31	31	32	32	32	32	32	32	32	33	33	33	33	33	33	33
Phase 1	- -	140	280	281	283	284	286	287	289	290	291	293	294	296	297	299	300	302	303	305	306	308	308	308
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	312	313	315	316	318	319	321	323	324	326	327	329	341	341
Phase 3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	80	80	81	81	82	82	82	83	86	88
Proj. Sherman's Bay PS Flow	510	653	795	799	803	807	811	815	974	1,133	1,139	1,145	1,150	1,156	1,242	1,248	1,254	1,261	1,267	1,273	1,280	1,286	1,301	1,304
% Capacity of Sherman's Bay PS	43%	54%	66%	67%	67%	67%	68%	68%	81%	94%	95%	95%	96%	96%	103%	104%	105%	105%	106%	106%	107%	107%	108%	109%

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PROJECT No.: 11196997
PROJECT Name: SCCLSD
West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Projected Hydraulic Loading for SR 394 Pumping Station

Assumptions:
- Proposed pumping capacity of the SR 394 Pumping Station is approximately 1,030 gpm.
- The construction of the West Side Sewer Extension phases are 7 years apart to allow for EFC funding eligibility; Map, Plan, and Report; funding application; detailed design; and bidding.

New Service Area Annual Growth Rate: 2.5% Existing Service Area Growth Rate: 2.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 2.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2048*
Sunrise Cove	30	31	32	32	33	34	35	36	37	37	38	39	40	41	42	43	45	46	47	48	49	50	50	50
Phase 1	- -	140	280	287	294	302	309	317	325	333	341	350	358	367	377	386	396	406	416	426	437	448	448	448
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	318	326	334	342	351	360	368	378	387	397	407	417	496	496
Projected SR 394 PS Flow	30	171	312	319	327	335	344	352	516	680	697	715	733	751	770	789	809	829	850	871	893	915	994	994
% Capacity of SR 394 PS	3%	17%	30%	31%	32%	33%	33%	34%	50%	66%	68%	69%	71%	73%	75%	77%	79%	80%	82%	85%	87%	89%	96%	96%

New Service Area Annual Growth Rate: 0.5% Existing Service Area Growth Rate: 0.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 0.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2048*
Sunrise Cove	30	30	30	30	31	31	31	31	31	31	32	32	32	32	32	32	32	33	33	33	33	33	33	33
Phase 1	- -	140	280	281	283	284	286	287	289	290	291	293	294	296	297	299	300	302	303	305	306	308	308	308
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	312	313	315	316	318	319	321	323	324	326	327	329	341	341
Projected SR 394 PS Flow	30	170	310	312	313	315	317	318	475	631	634	638	641	644	647	651	654	657	660	664	667	670	682	682
% Capacity of SR 394 PS	3%	17%	30%	30%	30%	31%	31%	31%	46%	61%	62%	62%	62%	63%	63%	63%	63%	64%	64%	64%	65%	65%	66%	66%

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West Side Sewer Extension
DATE: Tuesday, April 7, 2020

DESIGNED BY: WWW
CHECKED BY: DDW

Projected Hydraulic Loading for Hadley Bay Pumping Station

Assumptions:
- Proposed pumping capacity of the Hadley Bay Pumping Station is approximately 680 gpm.
- The construction of the West Side Sewer Extension phases are 7 years apart to allow for EFC funding eligibility; Map, Plan, and Report; funding application; detailed design; and bidding.

New Service Area Annual Growth Rate: 2.5% Existing Service Area Growth Rate: 2.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 2.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2048*
Phase 1 (Stow and Hadley Bay Area)	- -	- -	90	92	95	97	99	102	104	107	110	112	115	118	121	124	127	130	134	137	140	144	147	147
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	318	326	334	342	351	360	368	378	387	397	407	417	427	508
Proj. Hadley Bay PS Flow	0	0	90	92	95	97	99	102	259	417	427	438	449	460	472	484	496	508	521	534	547	561	575	656
% Capacity of Hadley Bay PS	0%	0%	13%	14%	14%	14%	15%	15%	38%	61%	63%	64%	66%	68%	69%	71%	73%	75%	77%	78%	80%	82%	85%	96%

New Service Area Annual Growth Rate: 0.5% Existing Service Area Growth Rate: 0.5%

Service Area	*Projected Peak Hourly Flow (gpm) - 20 Year Period at 0.5% Annual Growth From the Start of Phse Construction*																							
	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2048*
Phase 1 (Stow and Hadley Bay Area)	- -	- -	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	110
Phase 2	- -	- -	- -	- -	- -	- -	- -	- -	155	310	312	313	315	316	318	319	321	323	324	326	327	329	331	343
Proj. Hadley Bay PS Flow	0	0	90	91	92	93	94	95	251	407	410	412	415	417	420	422	425	428	430	433	435	438	441	453
% Capacity of Hadley Bay PS	0%	0%	13%	13%	14%	14%	14%	14%	37%	60%	60%	61%	61%	61%	62%	62%	63%	63%	63%	64%	64%	64%	65%	67%

Appendix C
Cost Estimate

Client: South and Center Chautauqua Lake Sewer Districts
Project: West Side Sewer Extension Project - Phase 1
GHD Project No.: 11196997
Subject: Engineer's Opinion of Probable Project Cost
Date: 04/09/2020

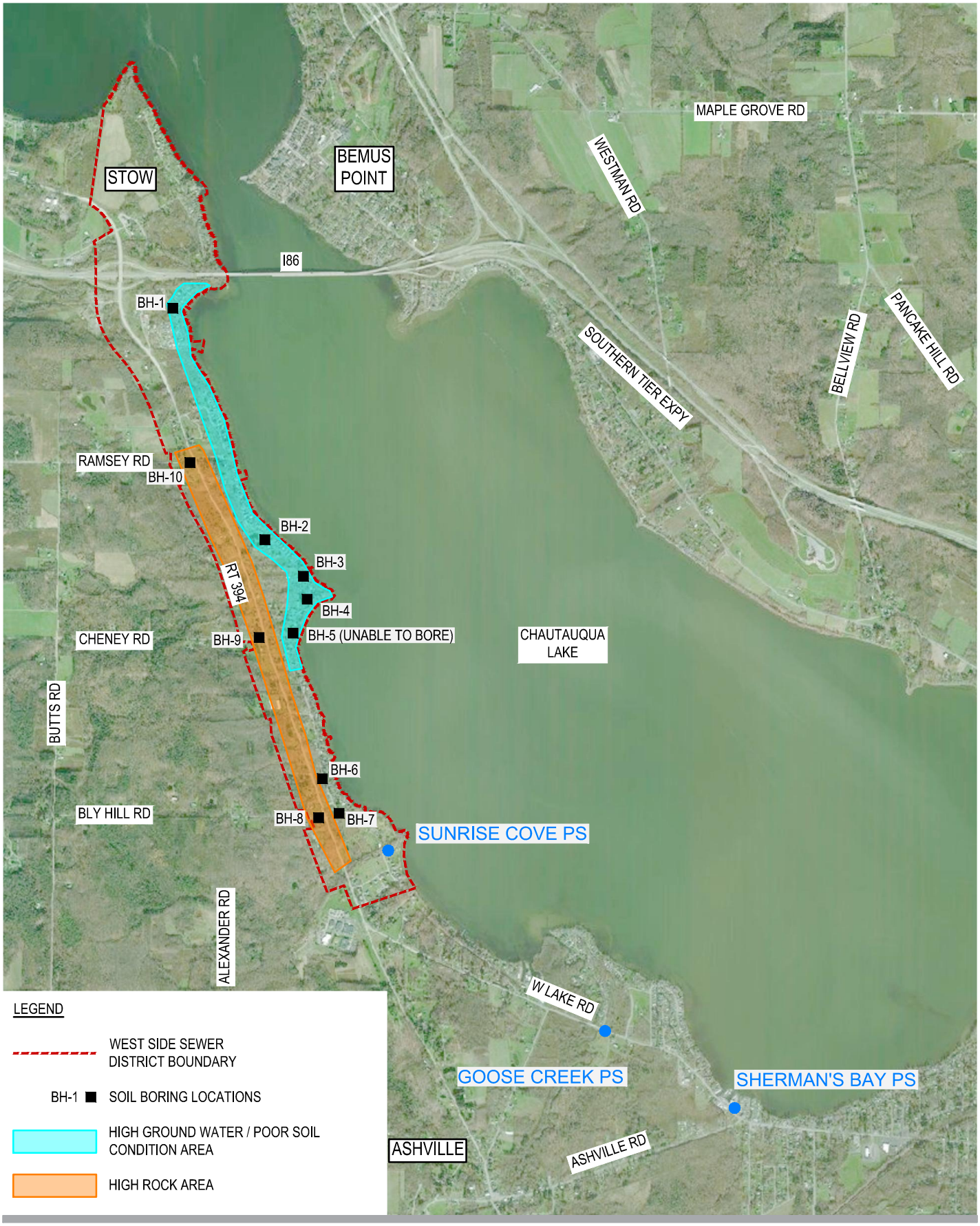
Base Bid: West Side Sewer Extension Project - Phase 1					
Item No.	**Description**	**Unit**	**Qty.**	**Unit Price**	**Total**
1	Mob./Demob.	FMaxLS	1	$350,000	$350,000
2	Maintenance and Protection of Traffic	FMinLS	1	$350,000	$350,000
3	Clearing and Grubbing	LS	1	$100,000	$100,000
4	Soil Erosion and Sedimentation Control	LS	1	$300,000	$300,000
5	1.25" HDPE Forcemain, Directional Drill or Open-cut	LF	25,000	$20	$500,000
6	2" HDPE Forcemain Installed via HDD or Open-Cut	LF	21,000	$25	$525,000
7	3" HDPE Forcemain Installed via HDD or Open-Cut	LF	7,200	$30	$216,000
8	8" HDPE Forcemain Installed via HDD or Open-Cut	LF	750	$50	$37,500
9	10" HDPE Forcemain Installed via HDD or Open-Cut	LF	21,650	$65	$1,407,250
10	Interstate I-86 Crossing via HDD	LF	750	$350	$262,500
11	Creek Crossings via HDD	EA	4	$80,000	$320,000
12	HDPE Pipeline Fittings	LS	1	$230,000	$230,000
13	2" Plug Valve	EA	50	$1,500	$75,000
14	3" Plug Valve	EA	14	$1,750	$24,500
15	8" Plug Valve	EA	3	$5,000	$15,000
16	10" Plug Valve	EA	36	$7,000	$252,000
17	Concrete Anchor Blocks	EA	202	$2,500	$505,000
18	Air/Vacuum Release - Complete	EA	36	$8,500	$306,000
19	2" Cleanout	EA	105	$3,000	$315,000
20	Lateral Kit - Complete	EA	224	$300	$67,200
21	Simplex Grinder - Complete	EA	223	$10,000	$2,230,000
22	Duplex Grinder - Complete	EA	5	$20,000	$100,000
23	Duplex Pump Station	EA	1	$85,000	$85,000
24	New Hadley Bay Pumping Station	LS	1	$500,000	$500,000
25	Sunrise Cove Pump Station Upgrades	LS	1	$75,000	$75,000
26	New SR 394 Pumping Station	LS	1	$675,000	$675,000
27	Electrical Services	EA	60	$10,000	$600,000
28	Electrical Handholes	EA	375	$1,100	$412,500
29	Select Back Fill	CY	8,150	$55	$448,250
30	Stone Driveway Restoration	SY	675	$25	$16,875
31	Asphalt Driveway Restoration	SY	1,250	$80	$100,000
32	Concrete Driveway Restoration	SY	675	$125	$84,375
33	State/County Road Restoration	SY	475	$145	$68,875
34	Town/Private Road Restoration	SY	1,925	$120	$231,000
35	Grass Restoration	SY	48,500	$12	$582,000
36	Replacement of 10/12/18/24-Inch HDPE Storm Sewer	LF	2,500	$40	$100,000
37	Repair of Well Pipe/Underdrain/Etc	LS	1	$50,000	$50,000
38	Interconnection to Existing 8" Goose Creek Force Main	LS	1	$30,000	$30,000
39	Goose Creek Pump Station Improvements	LS	1	$150,000	$150,000

40	Replacement of Existing Air/Vacuum Release Valves	EA	3	$10,000	$30,000
41	Extra Excavation and Backfill	CY	250	$100	$25,000
42	General Construction Allowance	Allowance	1	$500,000	$500,000
43	Land Acquisition	Allowance	1	$75,000	$75,000
				Estimated Construction Subtotal:	$13,330,000
				Contingency (10%):	$1,340,000
				Engineering, Legal, & Administrative (12.5%):	$1,810,000
				Estimated Construction Total (2020):	$16,480,000
				Construction & Contingency total inflated 2% for 2022:	$16,780,000

Alternate Bid 'A': Extend SR 394 Force Main to Sherman's Bay					
Item No.	**Description**	**Unit**	**Qty.**	**Unit Price**	**Total**
A-9	10" HDPE Forcemain Installed via HDD or Open-Cut	LF	3,600	$65	$234,000
A-11	Creek Crossings via HDD	EA	2	$80,000	$160,000
A-12	HDPE Pipeline Fittings	LS	1	$20,000	$20,000
A-16	10" Plug Valve	EA	4	$7,000	$28,000
A-17	Concrete Anchor Blocks	EA	8	$2,500	$20,000
A-18	Air/Vacuum Release - Complete	EA	4	$8,500	$34,000
A-19	2" Cleanout	EA	5	$3,000	$15,000
A-26	DEDUCT - Downsize New SR 394 Pumping Station	LS	1	($75,000)	($75,000)
A-29	Select Back Fill	CY	1,350	$55	$74,250
A-30	Stone Driveway Restoration	SY	75	$25	$1,875
A-31	Asphalt Driveway Restoration	SY	250	$80	$20,000
A-32	Concrete Driveway Restoration	SY	75	$125	$9,375
A-33	State/County Road Restoration	SY	25	$145	$3,625
A-34	Town/Private Road Restoration	SY	75	$120	$9,000
A-35	Grass Restoration	SY	1,500	$12	$18,000
A-38	DEDUCT - Interconnection to Existing 8" Goose Creek Force Main	LS	1	($30,000)	($30,000)
A-39	DEDUCT - Goose Creek Pump Station Improvements	LS	1	($150,000)	($150,000)
A-40	DEDUCT - Replacement of Existing Air/Vacuum Release Valves	EA	3	($10,000)	($30,000)
				Estimated Construction Subtotal:	$363,000
				Contingency (10%):	$37,000
				Estimated Alternate 'A' Bid Construction Total:	$400,000
				Construction & Contingency total inflated 2% for 2022:	$408,000

Alternate Bid 'B': Design of "Duplex" Lift Stations					
Item No.	**Description**	**Unit**	**Qty.**	**Unit Price**	**Total**
B-22	DEDUCT - Duplex Grinder without installed spare - Complete	EA	4	($20,000)	($80,000)
B-23	Duplex Pump Station with installed spare - Complete	EA	4	$85,000	$340,000
				Estimated Construction Subtotal:	$260,000
				Contingency (10%):	$26,000
				Estimated Alternate 'A' Bid Construction Total:	$286,000
				Construction & Contingency total inflated 2% for 2022:	$292,000

Appendix D
Preliminary Soil Boring Logs



N

0 3,000'

GHD

SOUTH & CENTER CHAUTAUQUA LAKE SEWER DISTRICT
WEST SIDE SEWER EXTENSION

SOIL INVESTIGATION

Project No. **11196997**
Report No.
Date **DEC 2019**

Filename: N:\US\Amherst\Projects\564\11196997\Digital_Design\ACAD 2018\Figures\Project Review Meeting\11196997-FIG003.dwg
Plot Date: 12 February 2020 - 7:56 AM

Source:

3553 Crittenden Road
Alden, NY 14004
(716) 937- 6527
www.nwcontracting.com

HOLE NUMBER: B1

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	DESCRIPTION AND CLASSIFICATION	REC	REMARKS	COMMENTS
1	12					Extremely moist, dark brown (SILT) topsoil, with trace very fine size sand, loose, with fine size roots (0.3)	1.0'	Temporary 1" piezometer	Topsoil to 0.3 foot over silty soil fill to 1.8 feet over silty slackwater sediment to 4.5 feet over water sorted and deposited sand and gravel to 6.5 feet over sandy slackwater sediment with trace gravel to end of boring
		14			24				
			10						
				7		(1.8) Extremely moist, brown (SILT) fill, with 10 to 15% gravel, trace clay, compact	1.2'	Soil backfill	
2	15								
		12			29				
			17			Extremely moist, olive gray to gray (SANDY-SILT) with little to some very fine size sand, compact, thinly bedded (4.5)	0.9'		
				19					
3	4								
		10			22				
			12			Wet, gray to brown, very gravelly (SILTY-SAND) with 40 to 50% gravel, very fine to very coarse size sand, little silt, compact in place, stratified (6.5)	1.3'	Sand backfill (5.0)	
				11					
4	7							Water level 5.3' bgs	
		2			4				Water in augers at completion 6.9' bgs
			2						
				2		Wet, brown (SILTY-SAND) with 5 to 10% fine size gravel, very fine to fine size sand, little silt, loose, thinly bedded	1.2'		
5	4								
		2			5				
			3						
				4					
6	4						1.4'		
		2			4				
			2						
				3					
						(15.0) Boring completed at 15.0' bgs		(15.0)	

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3553 Crittenden Road
Alden, NY 14004
(716) 937- 6527
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HOLE NUMBER: B2

DATE: 11/6/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	DESCRIPTION AND CLASSIFICATION	REC	REMARKS	COMMENTS
1	5					Extremely moist, dark brown (SILT) topsoil, with trace very fine size sand, loose, with fine size roots (0.3)	0.8'	Temporary 1" piezometer	Topsoil to 0.3 foot over silty soil fill with some gravel to 2.0 feet over silty soil fill to 3.0 feet over water sorted and deposited sand with some gravel to 6.0 feet over silty slackwater sediment to 13.5 feet over water sorted and deposited sand and gravel to end of boring
		12			23				
			11						
				7					
2	10					Moist, brownish gray to gray, gravelly (SILT) fill, with 20 to 40% gravel, trace very fine size sand, compact (2.0 / 3.0)	1.6'	Soil backfill	
		11							
			10		21				
				11					
3	6					Extremely moist, reddish brown (SILT) fill, with trace very fine size sand, compact	0.8'		
		8							
			8		16				
				6					
4	4					Extremely moist to wet, brown gravelly (SILTY-SAND) with 20 to 40% gravel, very fine size sand, little silt, compact, weakly stratified (6.0)	1.3'	Sand backfill (5.0)	Water level at 6.5' bgs
		2							
			3		5				
				4					
5	2					Wet, faintly mottled, olive brown (SANDY-SILT) with little very fine size sand, loose to very loose, thinly bedded with occasional (CLAYEY-SILT) lenses below 12.5'	1.5'		
		2							
			1		3				
				3					
6	2					(13.5)	1.3'		
		3				Wet, brown, very gravelly (SILTY-SAND) with 40 to 50% gravel, very fine to fine size sand, little silt, loose, stratified (15.0)			
			6		9				
				8		Boring completed at 15.0' bgs		(15.0)	

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NW CONTRACTING
3553 Crittenden Road
Alden, NY 14004
(716) 937- 6527
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Hole Number: B3

DATE: 11/6/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	5						Extremely moist, dark brown (SILT) topsoil with trace very fine size sand, compact, with numerous fine size roots (0.2)	0.8'	Topsoil to 0.2 foot over silty soil fill with trace gravel to 2.0 feet over apparent sandy soil fill with some gravel to 5.0 feet over sandy slackwater sediment with trace gravel to 6.0 feet over water sorted and deposited sand with some gravel to 12.5 feet over clayey lake sediment to end of boring
		6			13		Moist, brownish gray (SANDY-SILT) fill, with 10 to 15% gravel, little very fine size sand, compact (2.0)	1.3'	
			7				Moist, faintly mottled, brown, gravelly (SILTY-SAND) fill, with 20 to 40% gravel, compact		
				9					
2	7								
		8			19				
			11						
				13					
3	14							0.7'	
		9			17		(5.0)		
			8				Extremely moist, distinctly mottled, brown (SILTY-SAND) with 5 to 15% gravel, very fine size sand, compact, thinly bedded (6.0)	1.3'	
				8					
4	8						Extremely moist to wet, brownish gray to gray, gravelly (SILTY-SAND) with 20 to 40% gravel, very fine to fine size sand, little silt, compact to very dense below 8.0, stratified		
		8			19				
			11						
				16					
5	21							1.2'	Water level at 8.0' bgs
		33			66				
			33						
				15					
							(12.5)		
6	7						Extremely moist, gray (CLAYEY-SILT) with some clay, firm, thinly laminated with very thin coarse silt lenses	1.8	
		4			8				
			4						
				7			(15.0)		
							Boring completed at 15.0' bgs		

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CONTRACTING

3553 Crittenden Road
Alden, NY 14004
(716) 937- 6527
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HOLE NUMBER: B4

DATE: 11/6/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	REC	REMARKS	COMMENTS
1	15					0.5'	Temporary 1" piezometer	Gravel fill to 0.2 foot over sandy soil fill with little gravel and silt to 2.0 feet over silty slackwater sediment to 6.0 feet over water sorted and deposited sand and gravel to 8.0 feet over silty swamp sediment to 12.0 feet over clayey lake sediment to end of boring
		10			16			
			6					
				10				
2	6					1.0'	Soil backfill	
		6			12			
			6					
				5				
3	10					0.6'		
		6			13			
			7					
				8			Sand backfill	
4	4					0.4'		
		3			5			Water level at 6.5' bgs
			2					
				1				
5	1					1.5'		
		1			2			
			1					
				1				
6	1					1.3'		
		2			5			
			3					
				4				

Gravel fill (0.0 – 0.2)

Moist, gray, gravelly (SILTY-SAND) fill, with 15 to 25% gravel, very fine size sand, little silt, compact in place (0.2 – 2.0)

Extremely moist, faintly mottled, brown (SILT) with 10 to 15% gravel, trace clay, loose, weakly thinly bedded (2.0 – 6.0)

Wet, faintly mottled, brown, very gravelly (SILTY-SAND) with 40 to 50% fine size gravel, very fine size sand, little silt, loose, stratified (6.0 – 8.0)

Extremely moist, dark gray, mucky (SILT) with trace very fine size sand, very loose, thinly bedded with layers of fibrous wood material (8.0 – 12.0)

Extremely moist, gray (SILTY-CLAY) firm, thinly laminated with very thin coarse silt lenses (12.0 – 15.0)

Boring completed at 15.0' bgs

TEMPORARY WELL: 5.0 – 15.0

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3553 Crittenden Road
Alden, NY 14004
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Hole Number: B6

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	6						Extremely moist, dark brown to brown, very gravelly (SILTY-SAND) fill, with 40 to 50% fine size gravel, very fine size sand, little silt, compact in place (0.3)	0.8'	Sand and gravel road shoulder fill to 0.3 foot over sandy soil fill with little gravel to 2.0 feet over silty glacial drift to 6.0 feet over silty glacial till to reufsal
		22			29				
			7						
				7					
2	6						Extremely moist, brown, gravelly (SILTY-SAND) fill, with 15 to 25% gravel, very fine size sand, little silt, compact (2.0)	0.8'	
		17							
			34		51		Moist, faintly mottled, olive brown (SILT) with 5 to 15% gravel, trace very fine size sand, dense, massive to weakly thinly bedded		
				20				0.9'	
3	6								
		10							
			24		34				
				32			(6.0)		
4	17						Moist, gray (SILT) with 10 to 15% gravel, trace very fine size sand, very dense to dense with brittle consistence, massive soil structure	1.0'	
		23							
			25		48				
				21				0.8'	
5	16								
		40							
			50/3"		>90				
6	17							1.0'	
		50/5"					(13.9)		
					>50		Auger refusal at 13.9' bgs		No water at completion

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Alden, NY 14004
(716) 937- 6527
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Hole Number: B7

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	4						Extremely moist, dark brown (SILT) topsoil, with 3 to 5% fine size gravel, trace very fine size sand, loose, with fine size roots (0.3)	1.2'	Topsoil to 0.3 foot over silty lake sediment with little clay to 5.0 feet over water sorted and deposited sand with some gravel to 8.0 feet over clayey lake sediment to 12.0 feet over sandy glacial drift to end of boring
		2			5				
			3						
				5					
2	4						Moist, distinctly mottled, brown (CLAYEY-SILT) with little clay, firm to stiff, blocky soil structure	1.0'	
		6							
			9		15				
				9					
3	6							1.2'	
		6					(5.0)		
			12		18		Extremely moist becoming wet below 6.5', faintly mottled, brown, gravelly (SILTY-SAND) with 20 to 40% gravel, very fine size sand, compact, weakly stratified	0.8'	Water level at 6.5' bgs
				15					
4	6								
		10							
			10		20				
				11			(8.0)		
5	4						Extremely moist, brown (CLAYEY-SILT) with some clay, very stiff, weakly thinly laminated with very thin coarse silt lenses	0.6'	
		10							
			15		25				
				16					
							(12.0)		
							Extremely moist to wet, gray, gravelly (SILTY-SAND) with 15 to 25% gravel, very fine size sand, little silt, very dense, massive soil structure to weakly thinly bedded	1.5'	
6	16								
		33							
			26		59				
				30			(15.0)		
							Boring completed at 15.0' bgs		

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Alden, NY 14004
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Hole Number: B8

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	6						Extremely moist, dark gray, gravelly (SILTY-SAND) fill, with 20 to 40% gravel, very fine size sand, compact (0.3)	0.8'	Sand and gravel roadside fill to 0.3 foot over sandy soil fill with some gravel to 4.0 feet over water sorted and deposited sand with some gravel to 8.0 feet over silty slackwater sediment to 12.0 feet over silty glacial till to refusal
		11			21		Moist, brown, gravelly (SILTY-SAND) fill, with 20 to 40% gravel, very fine to fine size sand, compact	0.0'	
			10						
				7					
2	9								
		7							
			5		12				
				7			(4.0)		
3	30						Extremely moist becoming wet below 6.0', brown, gravelly (SILTY-SAND) with 20 to 40% gravel, very fine size sand, little to some silt, compact, weakly stratified	0.5'	
		14							
			16		30				
				23				0.8'	
4	10								
		4							
			7		11				
				11			(8.0)		
5	8						Moist, faintly mottled, olive gray (SILT) with 3 to 5% gravel, trace very fine size sand, compact, weakly thinly bedded	1.3'	
		7							
			18		25				
				18					
							(12.0)		
							Moist, olive gray, gravelly (SILT) with 15 to 25% gravel, with occasional cobbles, trace very fine size sand, very dense, massive soil structure (13.4)	0.3'	
6	50/5"						Auger refusal at 13.4' bgs		No water at completion
					>50				

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Alden, NY 14004
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Hole Number: B9

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	10				20		Moist, grayish brown, very gravelly (SILTY-SAND) fill, with 40 to 50% gravel, very fine size sand, little silt, compact (0.3)	0.8'	Sand and gravel fill to 0.3 foot over sandy soil fill with little gravel to 2.0 feet over sandy slackwater sediment to 6.0 feet over silty slackwater sediment to 8.5 feet over silty glacial drift with some gravel to reufsal
		12					Moist, brown, gravelly (SILTY-SAND) fill, with 15 to 25% gravel, very fine size sand, little silt, compact (2.0)	1.0'	
			8				Extremely moist, faintly mottled, brown (SILTY-SAND) with 5 to 15% gravel, very fine size sand, little to some silt, compact, weakly thinly bedded		
				10					
2	6				29			0.0'	
		12							
			17						
				21					
3	16				33				
		16							
			17						
				14			(6.0)	1.2'	
4	3				25		Moist to extremely moist, olive brown (SILT) with 5 to 15% gravel, trace very fine size sand, compact, thinly bedded		Water level at 6.5' bgs
		10							
			15						
				25					
5	5						(8.5)	0.2'	
		50/5"			>50		Wet, grayish brown, gravelly (SILT) with 20 to 40% gravel, with cobbles, trace very fine size sand, very dense, massive soil structure to weakly stratified		
							(10.5)		
							Auger refusal at 10.5' bgs		

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3553 Crittenden Road
Alden, NY 14004
(716) 937- 6527
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Hole Number: B10

DATE: 11/7/19 ELEVATION:

PROJECT: Subsurface Investigation for the Chautauqua Lake Sewer Project
Chautauqua Lake, New York 14722

PREPARED FOR: GHD

BORING LOCATION:

SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1	14						Topsoil 0.3	1.2'	Topsoil to 0.3 foot over silty glacial drift to 6.0 feet over silty tending towards clayey glacial till to refusal
		7			15		Moist, faintly mottled, olive brown (CLAYEY-SILT) with 5 to 15% gravel, little clay, stiff to hard, massive soil structure to weakly thinly bedded		
			8						
				5					
2	10							0.8'	
		7							
			9		16				
				12					
3	10							0.9'	
		17							
			19		36				
				21					
4	33						6.0	0.6'	
		30					Moist, faintly mottled, olive gray becoming gray below 12.5' (CLAYEY-SILT) with 5 to 15% gravel, little to some clay, hard, massive soil structure		
			50/5"		>80				
5	15							0.3'	
		50/5"			>50				
6	25							0.4'	
		50/5"					13.9		
					>50		Auger refusal at 13.9' bgs		No water at completion

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Appendix E
Hydraulic Model

285 Delaware Avenue
Buffalo, New York 14202
(716) 856-2142
www.ghd.com

Project Number: 11196997
Project Name: SCCLSD - West Side Sewer Extension
Date: April 7, 2020

Hadley Bay Pumping Station and 10" Force Main - Hydraulic Profile (Phase 1 Buildout)

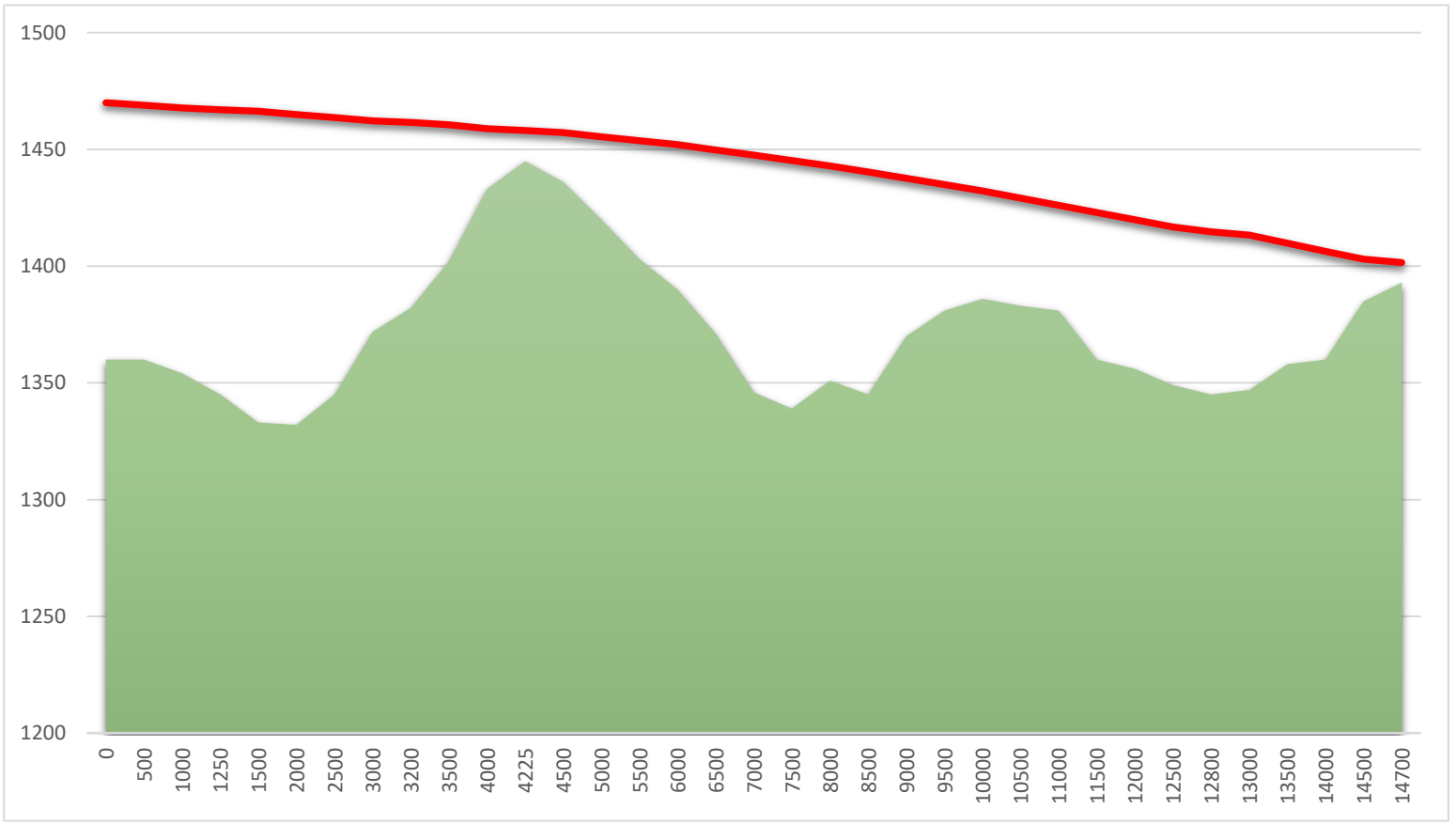
Pipe ID (in) =	9.41
Pipe C-Factor =	120
Hadley Bay PS Flow Rate =	460
Hadley Bay PS Pump Head =	110
(Target Flow Rates: 460 gpm and 680 gpm)	

	DIPS (ID)	IPS (ID)
8" HDPE DR 17	7.92	7.55
10" HDPE DR 17	9.72	9.41

Legend
High Point
Duplex Station Location

Duplex Station	Flow Rate (gpm)	Pump Status	Required TDH
Campground	50	ON	122
Connelly Park	60	ON	80
Lakeview Avenue	100	ON	79
Elm Street	60	ON	95
Longview Road	60	ON	46
Chaut Avenue	50	ON	70

Length	Elevation	Hadley Bay Flow Rate	Campground Flow Rate	Connelly Park Flow Rate	Lakeview Avenue Flow Rate	Elm Street Flow Rate	Longview Road Flow Rate	Chaut Avenue Flow Rate	Total Force Main Flow Rate	Pipe Velocity (fps)	Headloss (ft)	HGL (ft)	Pipeline Pressure (psi)
0	1360	460	0	0	0	0	0	0	460	2.12	0.0	1470	48
500	1360	460	0	0	0	0	0	0	460	2.12	1.1	1469	47
1000	1354	460	0	0	0	0	0	0	460	2.12	1.1	1468	49
1250	1345	460	50	0	0	0	0	0	510	2.35	0.7	1467	53
1500	1333	460	50	0	0	0	0	0	510	2.35	0.7	1466	58
2000	1332	460	50	0	0	0	0	0	510	2.35	1.4	1465	58
2500	1345	460	50	0	0	0	0	0	510	2.35	1.4	1464	51
3000	1372	460	50	0	0	0	0	0	510	2.35	1.4	1462	39
3200	1382	460	50	60	0	0	0	0	570	2.63	0.7	1462	34
3500	1402	460	50	60	0	0	0	0	570	2.63	1.0	1461	25
4000	1433	460	50	60	0	0	0	0	570	2.63	1.7	1459	11
4225	1445	460	50	60	0	0	0	0	570	2.63	0.8	1458	6
4500	1436	460	50	60	0	0	0	0	570	2.63	0.9	1457	9
5000	1420	460	50	60	0	0	0	0	570	2.63	1.7	1455	15
5500	1403	460	50	60	0	0	0	0	570	2.63	1.7	1454	22
6000	1390	460	50	60	0	0	0	0	570	2.63	1.7	1452	27
6500	1371	460	50	60	100	0	0	0	670	3.09	2.3	1450	34
7000	1346	460	50	60	100	0	0	0	670	3.09	2.3	1448	44
7500	1339	460	50	60	100	0	0	0	670	3.09	2.3	1445	46
8000	1351	460	50	60	100	0	0	0	670	3.09	2.3	1443	40
8500	1345	460	50	60	100	60	0	0	730	3.37	2.7	1440	41
9000	1370	460	50	60	100	60	0	0	730	3.37	2.7	1438	29
9500	1381	460	50	60	100	60	0	0	730	3.37	2.7	1435	23
10000	1386	460	50	60	100	60	0	0	730	3.37	2.7	1432	20
10500	1383	460	50	60	100	60	60	0	790	3.64	3.1	1429	20
11000	1381	460	50	60	100	60	60	0	790	3.64	3.1	1426	20
11500	1360	460	50	60	100	60	60	0	790	3.64	3.1	1423	27
12000	1356	460	50	60	100	60	60	0	790	3.64	3.1	1420	28
12500	1349	460	50	60	100	60	60	0	790	3.64	3.1	1417	29
12800	1345	460	50	60	100	60	60	50	840	3.88	2.1	1415	30
13000	1347	460	50	60	100	60	60	50	840	3.88	1.4	1413	29
13500	1358	460	50	60	100	60	60	50	840	3.88	3.5	1410	22
14000	1360	460	50	60	100	60	60	50	840	3.88	3.5	1406	20
14500	1385	460	50	60	100	60	60	50	840	3.88	3.5	1403	8
14700	1393	460	50	60	100	60	60	50	840	3.88	1.4	1402	4



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Project Number: 11196997
Project Name: SCCLSD - West Side Sewer Extension
Date: April 7, 2020

Hadley Bay Pumping Station and 10" Force Main - Hydraulic Profile (Full Buildout)

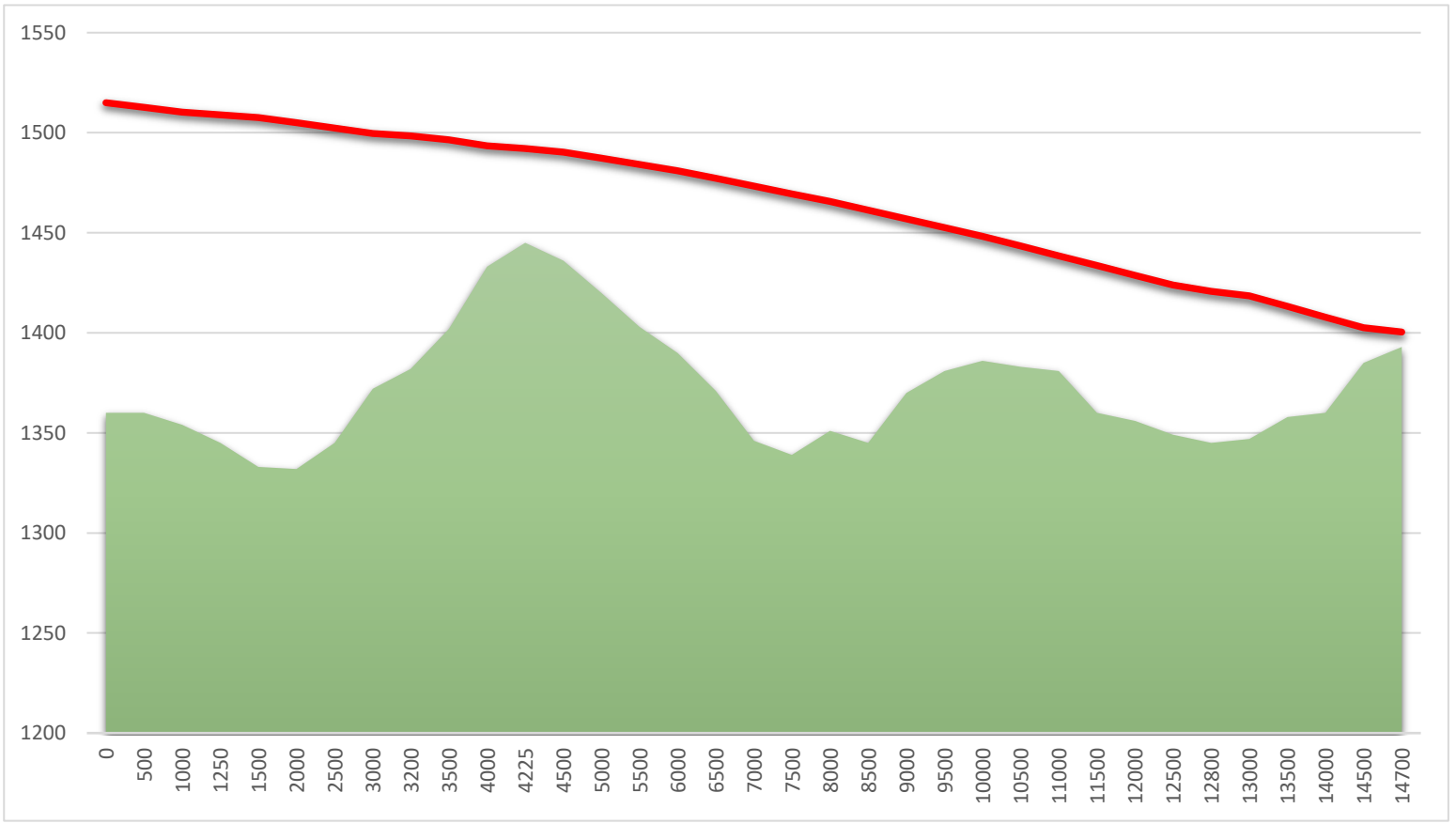
Pipe ID (in) =	9.41
Pipe C-Factor =	120
Hadley Bay PS Flow Rate =	680
Hadley Bay PS Pump Head =	155
(Target Flow Rates: 460 gpm and 680 gpm)	

	DIPS (ID)	*IPS (ID)*
8" HDPE DR 17	7.92	7.55
10" HDPE DR 17	9.72	9.41

Legend
High Point
Duplex Station Location

Duplex Station	*Flow Rate (gpm)*	*Pump Status*	*Required TDH*
Campground	50	ON	164
Connelly Park	60	ON	116
Lakeview Avenue	100	ON	106
Elm Street	60	ON	116
Longview Road	60	ON	60
Chaut Avenue	50	ON	76

Length	*Elevation*	*Hadley Bay Flow Rate*	*Campground Flow Rate*	*Connelly Park Flow Rate*	*Lakeview Avenue Flow Rate*	*Elm Street Flow Rate*	*Longview Road Flow Rate*	*Chaut Avenue Flow Rate*	*Total Force Main Flow Rate*	*Pipe Velocity (fps)*	*Headloss (ft)*	*HGL (ft)*	*Pipeline Pressure (psi)*
0	1360	680	0	0	0	0	0	0	680	3.14	0.0	1515	67
500	1360	680	0	0	0	0	0	0	680	3.14	2.3	1513	66
1000	1354	680	0	0	0	0	0	0	680	3.14	2.3	1510	68
1250	1345	680	50	0	0	0	0	0	730	3.37	1.3	1509	71
1500	1333	680	50	0	0	0	0	0	730	3.37	1.3	1508	76
2000	1332	680	50	0	0	0	0	0	730	3.37	2.7	1505	75
2500	1345	680	50	0	0	0	0	0	730	3.37	2.7	1502	68
3000	1372	680	50	0	0	0	0	0	730	3.37	2.7	1500	55
3200	1382	680	50	60	0	0	0	0	790	3.64	1.2	1498	50
3500	1402	680	50	60	0	0	0	0	790	3.64	1.9	1497	41
4000	1433	680	50	60	0	0	0	0	790	3.64	3.1	1493	26
4225	1445	680	50	60	0	0	0	0	790	3.64	1.4	1492	20
4500	1436	680	50	60	0	0	0	0	790	3.64	1.7	1490	24
5000	1420	680	50	60	0	0	0	0	790	3.64	3.1	1487	29
5500	1403	680	50	60	0	0	0	0	790	3.64	3.1	1484	35
6000	1390	680	50	60	0	0	0	0	790	3.64	3.1	1481	39
6500	1371	680	50	60	100	0	0	0	890	4.11	3.9	1477	46
7000	1346	680	50	60	100	0	0	0	890	4.11	3.9	1473	55
7500	1339	680	50	60	100	0	0	0	890	4.11	3.9	1469	56
8000	1351	680	50	60	100	0	0	0	890	4.11	3.9	1466	50
8500	1345	680	50	60	100	60	0	0	950	4.38	4.4	1461	50
9000	1370	680	50	60	100	60	0	0	950	4.38	4.4	1457	38
9500	1381	680	50	60	100	60	0	0	950	4.38	4.4	1453	31
10000	1386	680	50	60	100	60	0	0	950	4.38	4.4	1448	27
10500	1383	680	50	60	100	60	60	0	1010	4.66	4.9	1443	26
11000	1381	680	50	60	100	60	60	0	1010	4.66	4.9	1438	25
11500	1360	680	50	60	100	60	60	0	1010	4.66	4.9	1434	32
12000	1356	680	50	60	100	60	60	0	1010	4.66	4.9	1429	31
12500	1349	680	50	60	100	60	60	0	1010	4.66	4.9	1424	32
12800	1345	680	50	60	100	60	60	50	1060	4.89	3.2	1421	33
13000	1347	680	50	60	100	60	60	50	1060	4.89	2.1	1419	31
13500	1358	680	50	60	100	60	60	50	1060	4.89	5.3	1413	24
14000	1360	680	50	60	100	60	60	50	1060	4.89	5.3	1408	21
14500	1385	680	50	60	100	60	60	50	1060	4.89	5.3	1403	8
14700	1393	680	50	60	100	60	60	50	1060	4.89	2.1	1400	3



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Project Number: 11196997
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SR 394 Pumping Station and 10" Force Main Tie-In to Existing 8" Goose Creek Force Main - Hydraulic Profile (Phase 1 Buildout)

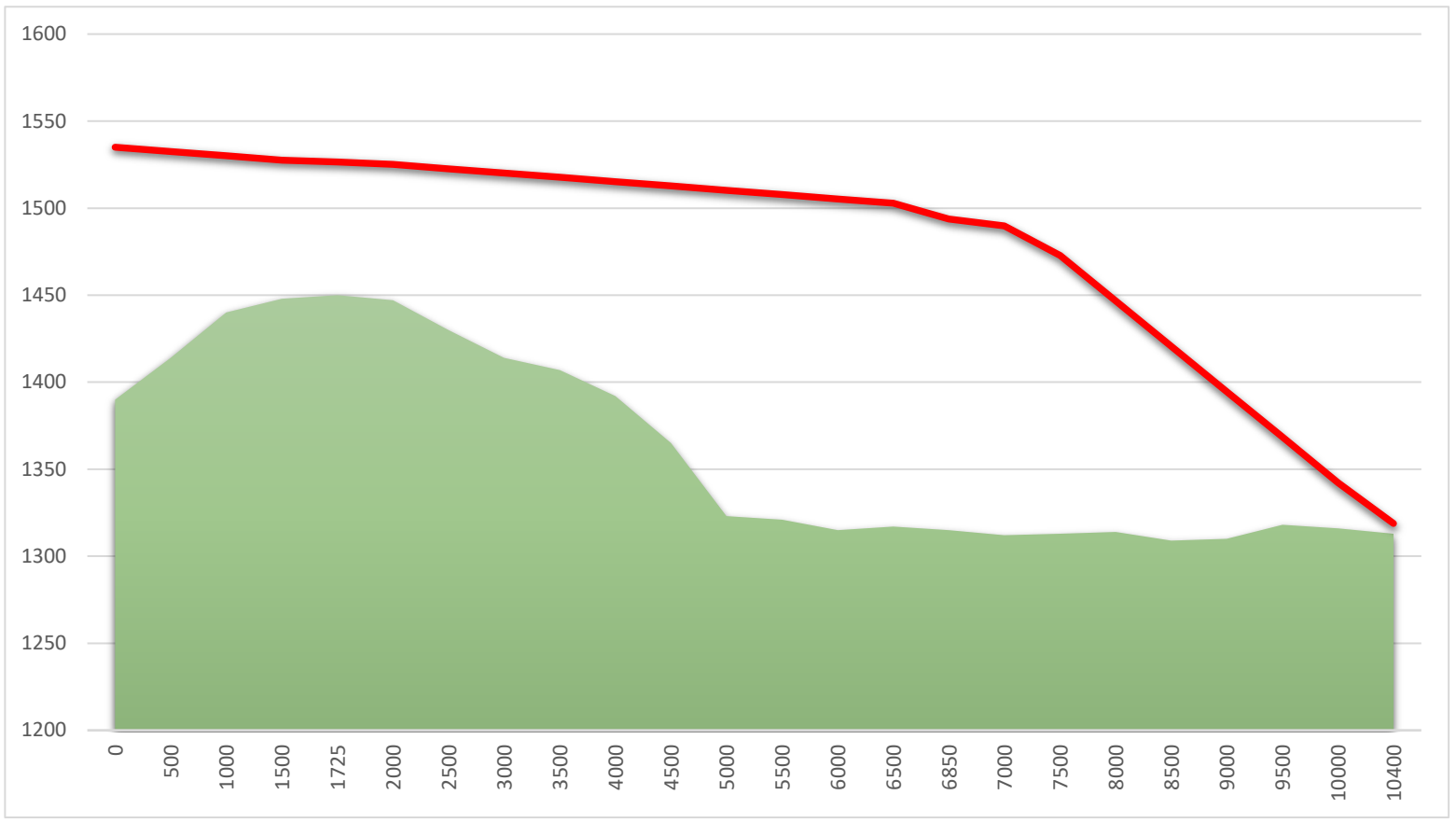
New Pipe ID (in) =	9.41
Existing Pipe ID =	7.94
Pipe C-Factor =	120
SR 394 PS Flow Rate =	700
SR 394 PS Pump Head =	145
(Target Flow Rates: 700 gpm)	

	DIPS (ID)	IPS (ID)
8" HDPE DR 17	7.92	7.55
10" HDPE DR 17	9.72	9.41

Goose Creek Flow Rate = 400 Existing

Legend
High Point
Goose Creek PS Interconnection

Length	Elevation	SR 394 Flow Rate	Goose Creek Flow Rate	Total Force Main Flow Rate	Pipe Velocity (fps)	Headloss (ft)	HGL (ft)	Pipeline Pressure (psi)
0	1390	700	0	700	3.23	0.0	1535	63
500	1414	700	0	700	3.23	2.5	1533	51
1000	1440	700	0	700	3.23	2.5	1530	39
1500	1448	700	0	700	3.23	2.5	1528	34
1725	1450	700	0	700	3.23	1.1	1526	33
2000	1447	700	0	700	3.23	1.4	1525	34
2500	1430	700	0	700	3.23	2.5	1523	40
3000	1414	700	0	700	3.23	2.5	1520	46
3500	1407	700	0	700	3.23	2.5	1518	48
4000	1392	700	0	700	3.23	2.5	1515	53
4500	1365	700	0	700	3.23	2.5	1513	64
5000	1323	700	0	700	3.23	2.5	1510	81
5500	1321	700	0	700	3.23	2.5	1508	81
6000	1315	700	0	700	3.23	2.5	1505	82
6500	1317	700	0	700	3.23	2.5	1503	80
6850	1315	700	400	1100	7.13	9.1	1494	77
7000	1312	700	400	1100	7.13	13.1	1490	77
7500	1313	700	400	1100	7.13	17.0	1473	69
8000	1314	700	400	1100	7.13	26.1	1447	57
8500	1309	700	400	1100	7.13	26.1	1421	48
9000	1310	700	400	1100	7.13	26.1	1395	37
9500	1318	700	400	1100	7.13	26.1	1368	22
10000	1316	700	400	1100	7.13	26.1	1342	11
10400	1313	700	400	1100	7.13	23.5	1319	3



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Project Number: 11196997
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Date: April 7, 2020

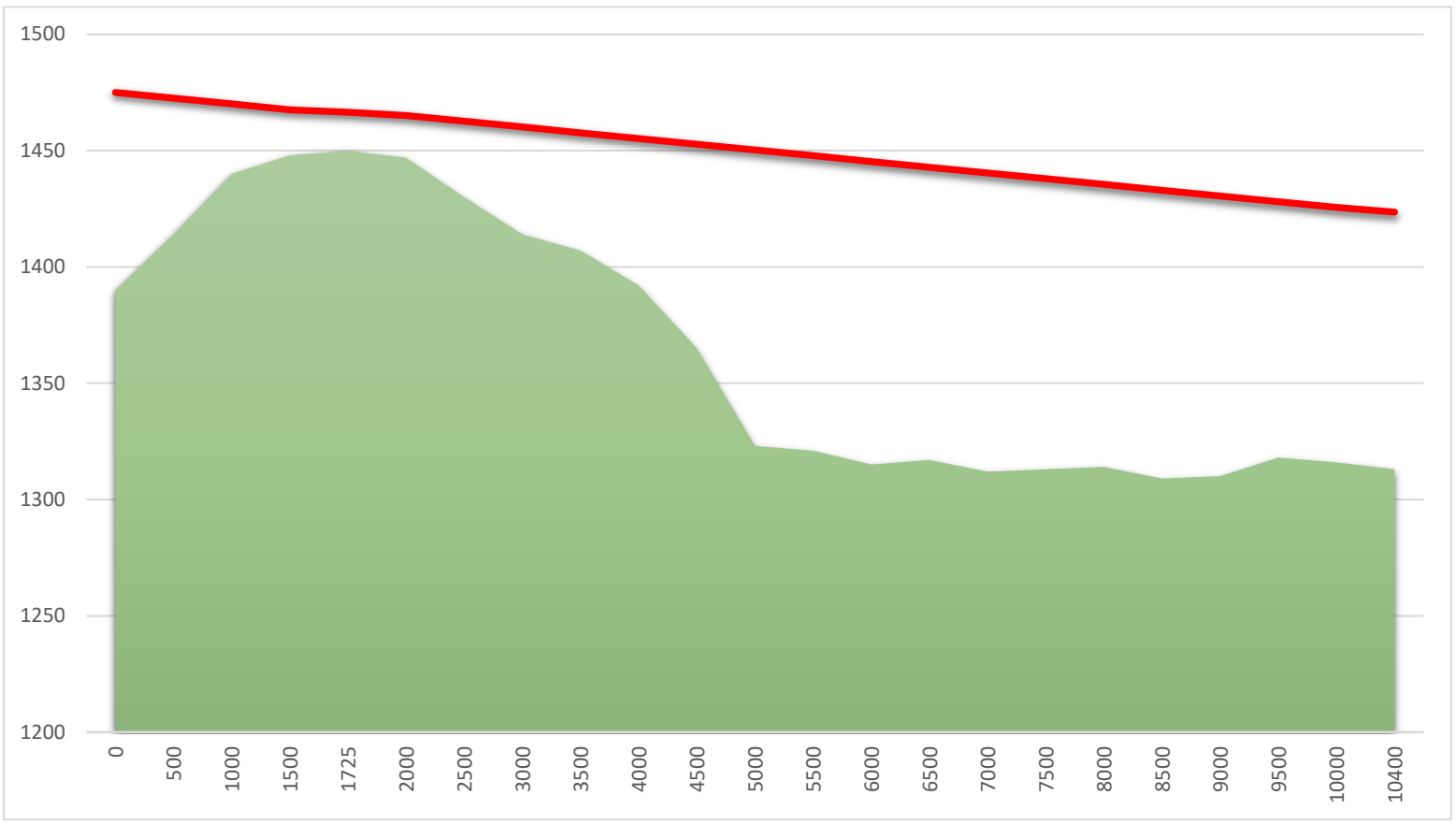
SR 394 Pumping Station and 10" Force Main (Alternate Connection) - Hydraulic Profile (Phase 1 Buildout)

Pipe ID (in) = 9.41
Pipe C-Factor = 120
SR 394 PS Flow Rate = 700
SR 394 PS Pump Head = 85
(Target Flow Rates: 700 gpm and 1,000 gpm)

	DIPS (ID)	*IPS (ID)*
8" HDPE DR 17	7.92	7.55
10" HDPE DR 17	9.72	9.41

Legend
High Point

Length	*Elevation*	*SR 394 Flow Rate*	*Total Force Main Flow Rate*	*Pipe Velocity (fps)*	*Headloss (ft)*	*HGL (ft)*	*Pipeline Pressure (psi)*
0	1390	700	700	3.23	0.0	1475	37
500	1414	700	700	3.23	2.5	1473	25
1000	1440	700	700	3.23	2.5	1470	13
1500	1448	700	700	3.23	2.5	1468	8
1725	1450	700	700	3.23	1.1	1466	7
2000	1447	700	700	3.23	1.4	1465	8
2500	1430	700	700	3.23	2.5	1463	14
3000	1414	700	700	3.23	2.5	1460	20
3500	1407	700	700	3.23	2.5	1458	22
4000	1392	700	700	3.23	2.5	1455	27
4500	1365	700	700	3.23	2.5	1453	38
5000	1323	700	700	3.23	2.5	1450	55
5500	1321	700	700	3.23	2.5	1448	55
6000	1315	700	700	3.23	2.5	1445	56
6500	1317	700	700	3.23	2.5	1443	54
7000	1312	700	700	3.23	2.5	1440	56
7500	1313	700	700	3.23	2.5	1438	54
8000	1314	700	700	3.23	2.5	1435	53
8500	1309	700	700	3.23	2.5	1433	54
9000	1310	700	700	3.23	2.5	1430	52
9500	1318	700	700	3.23	2.5	1428	48
10000	1316	700	700	3.23	2.5	1426	47
10400	1313	700	700	3.23	2.0	1424	48



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Project Name: SCCLSD - West Side Sewer Extension
Date: April 7, 2020

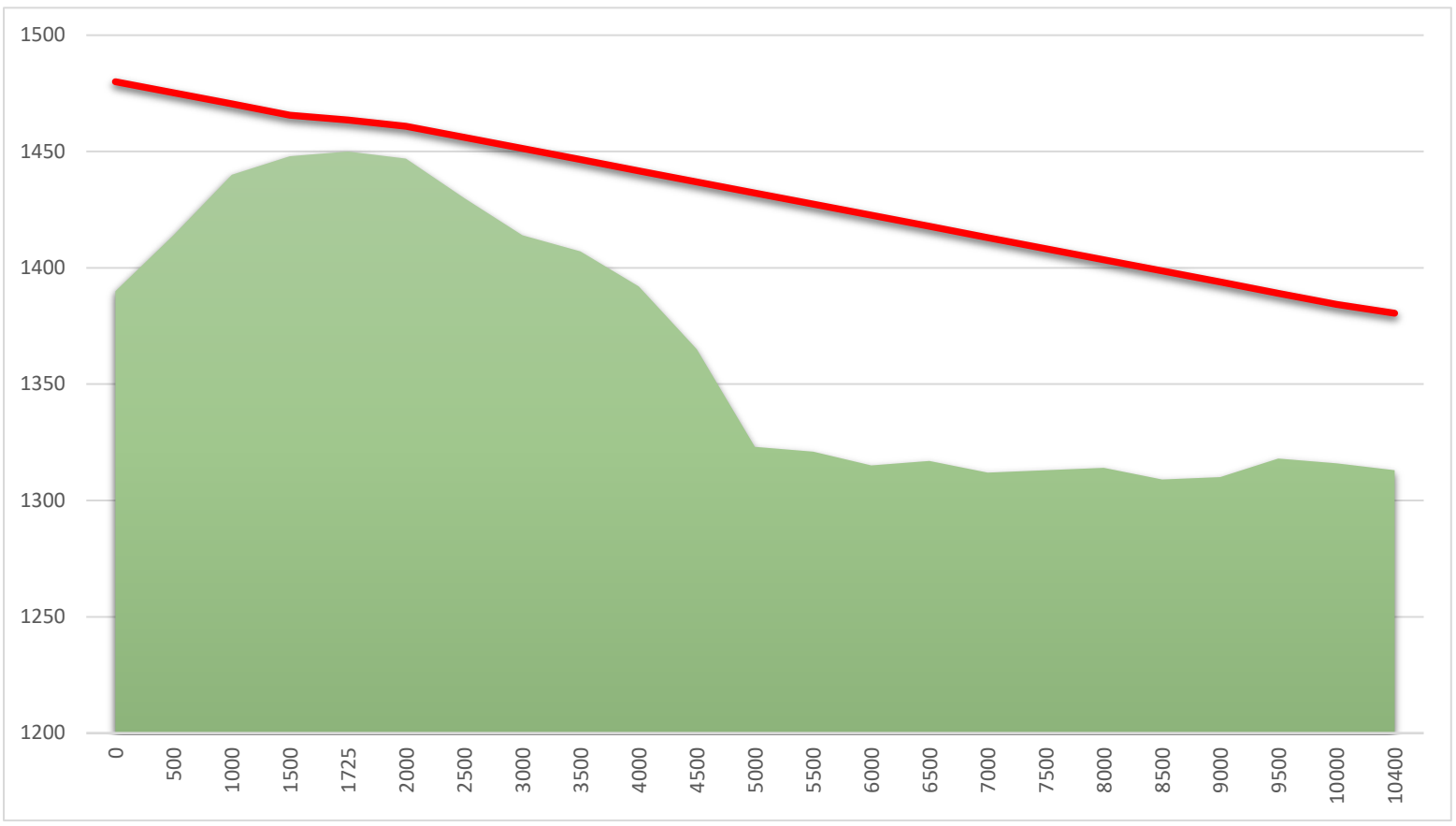
SR 394 Pumping Station and 10" Force Main - Hydraulic Profile (Full Buildout)

Pipe ID (in) = 9.41
Pipe C-Factor = 120
SR 394 PS Flow Rate = 1000
SR 394 PS Pump Head = 90
(Target Flow Rates: 700 gpm and 1,000 gpm)

	DIPS (ID)	IPS (ID)
8" HDPE DR 17	7.92	7.55
10" HDPE DR 17	9.72	9.41

Legend
High Point

Length	Elevation	SR 394 Flow Rate	Total Force Main Flow Rate	Pipe Velocity (fps)	Headloss (ft)	HGL (ft)	Pipeline Pressure (psi)
0	1390	1000	1000	4.61	0.0	1480	39
500	1414	1000	1000	4.61	4.8	1475	27
1000	1440	1000	1000	4.61	4.8	1470	13
1500	1448	1000	1000	4.61	4.8	1466	8
1725	1450	1000	1000	4.61	2.2	1463	6
2000	1447	1000	1000	4.61	2.6	1461	6
2500	1430	1000	1000	4.61	4.8	1456	11
3000	1414	1000	1000	4.61	4.8	1451	16
3500	1407	1000	1000	4.61	4.8	1447	17
4000	1392	1000	1000	4.61	4.8	1442	22
4500	1365	1000	1000	4.61	4.8	1437	31
5000	1323	1000	1000	4.61	4.8	1432	47
5500	1321	1000	1000	4.61	4.8	1427	46
6000	1315	1000	1000	4.61	4.8	1423	47
6500	1317	1000	1000	4.61	4.8	1418	44
7000	1312	1000	1000	4.61	4.8	1413	44
7500	1313	1000	1000	4.61	4.8	1408	41
8000	1314	1000	1000	4.61	4.8	1403	39
8500	1309	1000	1000	4.61	4.8	1399	39
9000	1310	1000	1000	4.61	4.8	1394	36
9500	1318	1000	1000	4.61	4.8	1389	31
10000	1316	1000	1000	4.61	4.8	1384	30
10400	1313	1000	1000	4.61	3.8	1380	29



Appendix F
Pump Curves

PENTAIR
MYERS

V2 GRINDER SERIES

SHREDDING WASTEWATER CHALLENGES

PATENTED AXIAL CUTTER TECHNOLOGY

ADVANCED HYDRAULICS

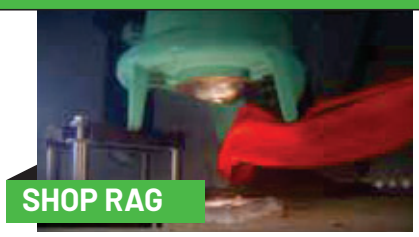
LEGENDARY SEAL LEAK DETECTION

pentair.com

MYERS® V2 SERIES SUBMERSIBLE GRINDER PUMPS

The Myers V2 series grinder is engineered from the ground up, in order to overcome the increased debris and higher pressure required in today's wastewater environment. It features a patented axial cutter design and semi-open impeller to effectively macerate challenging sewage solids into a fine slurry.

Watch the video at **www.Femyers.com**



PATENTED AXIAL CUTTER TECHNOLOGY

Easily slices through solids and trash found in domestic wastewater without roping or clogging.

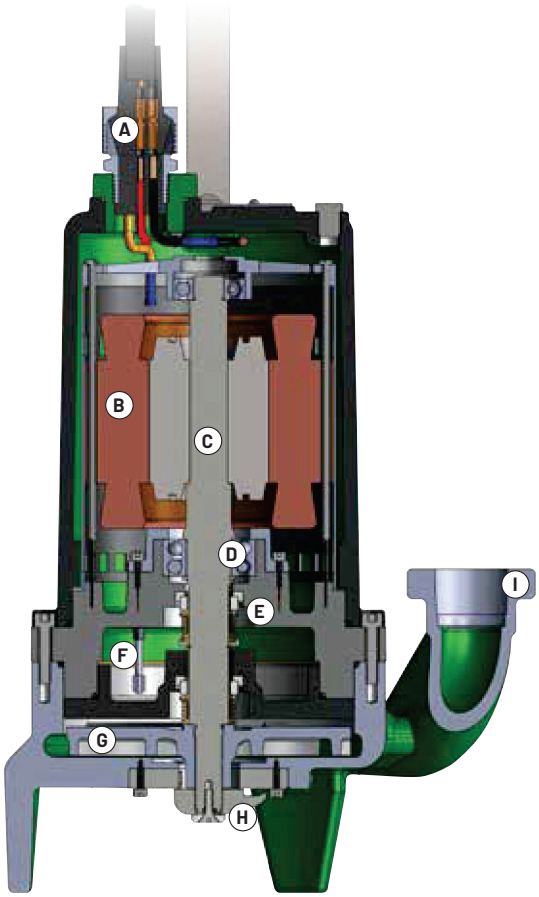
ADVANCED HYDRAULICS

The only single stage 2 HP grinder that can deliver up to 185' of lift for superior performance and reliability.

LEGENDARY SEAL LEAK DETECTION

True early warning system for reduced downtime and maintenance costs.

Features



A. Cable Entry System

- NEW! Optional quick disconnect cord available for ease of maintenance
- Cable jacket sealed by compression fitting; individual wires sealed by compression grommet for double seal protection against water ingress
- Replace power cord without disturbing motor for ease of maintenance

B. Oil-Filled Motor

- Maximizes heat dissipation; provides constant bearing lubrication for long life
- High torque start/run capacitor for single or three-phase motors, assured starting under heavy loads

C. Heavy 416 SST Shaft

- Corrosion resistant, reduces shaft deflection for long life

D. Lower Double Row Ball Bearings

- Absorb both axial and radial loads for increased durability

E. Double Mechanical Shaft Seals

- In oil-filled seal chamber for continuous lubrication, superior motor protection

F. Seal Leak Probe

- Located in seal chamber instead of motor area for true early warning of water leaks. Allows corrective action before costly motor or bearing failure occurs.
- Activates warning light in control panel

G. SST Semi-Open Impeller

- Provides improved performance, resists clogging
- Pump-out vanes help keep trash from seal, reduces pressure at seal face for longer life

H. Axial Cutter System

- Constructed of 440 SST hardened to 57-60Rc for long life
- Easily replaceable without dismantling pump

I. Volute Case

- Cast iron 1-1/4" NPT vertical flanged discharge

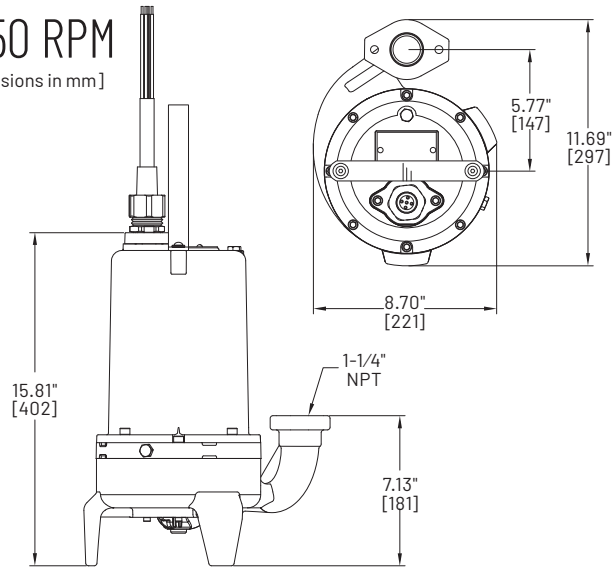
Electrical Data

	V/Ph/Hz	HP	Start Amps	FL Amps	Full Load kW	Start KVA	FL KVA	NEC Code Letter	Service Factor	Model	Standard Cord 20'	Standard Cord 35'
High Head	230/1/60	2	49	18.5	4.2	11.27	4.26	G	1	Catalog	VH20-21-20	VH20-21-35
										Eng	28148D000	28148D004
	200/3/60	2	53	12.5	3.9	18.3	4.33	L	1	Catalog	VH20-03-20	VH20-03-35
										Eng	28148D001	28148D005
	230/3/60	2	46	12	3.9	18.3	4.77	L	1	Catalog	VH20-23-20	VH20-23-35
										Eng	28148D002	28148D006
	460/3/60	2	23	6	3.9	18.3	4.77	L	1	Catalog	VH20-43-20	VH20-43-35
										Eng	28148D003	28148D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog	VH20-53-20	VH20-53-35
										Eng	28148D020	28148D021
Standard Flow	200/1/60	2	66	16	3.2	13.2	3.2	G	1	Catalog	VS20-01-20	VS20-01-35
										Eng	28151D020	28151D021
	230/1/60	2	49	13.5	3.2	11.27	3.12	G	1	Catalog	VS20-21-20	VS20-21-35
										Eng	28151D000	28151D004
	200/3/60	2	53	10	3.2	18.3	3.46	L	1	Catalog	VS20-03-20	VS20-03-35
										Eng	28151D001	28151D005
	230/3/60	2	46	9	3.2	18.3	3.58	L	1	Catalog	VS20-23-20	VS20-23-35
										Eng	28151D002	28151D006
	460/3/60	2	23	4.2	3.2	18.3	3.35	L	1	Catalog	VS20-43-20	VS20-43-35
										Eng	28151D003	28151D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog	VS20-53-20	VS20-53-35
										Eng	28151D022	28151D023
High Flow	200/1/60	2	66	16	3.2	13.2	3.2	G	1	Catalog	VF20-01-20	VF20-01-35
										Eng	28247D020	28247D021
	230/1/60	2	49	13.5	3.2	11.27	3.12	G	1	Catalog	VF20-21-20	VF20-21-35
										Eng	28247D000	28247D004
	200/3/60	2	53	10	3.2	18.3	3.46	L	1	Catalog	VF20-03-20	VF20-03-35
										Eng	28247D001	28247D005
	230/3/60	2	46	9	3.2	18.3	3.58	L	1	Catalog	VF20-23-20	VF20-23-35
										Eng	28247D002	28247D006
	460/3/60	2	23	4.2	3.2	18.3	3.35	L	1	Catalog	VF20-43-20	VF20-43-35
										Eng	28247D003	28247D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog	VF20-53-20	VF20-53-35
										Eng	28247D022	28247D023

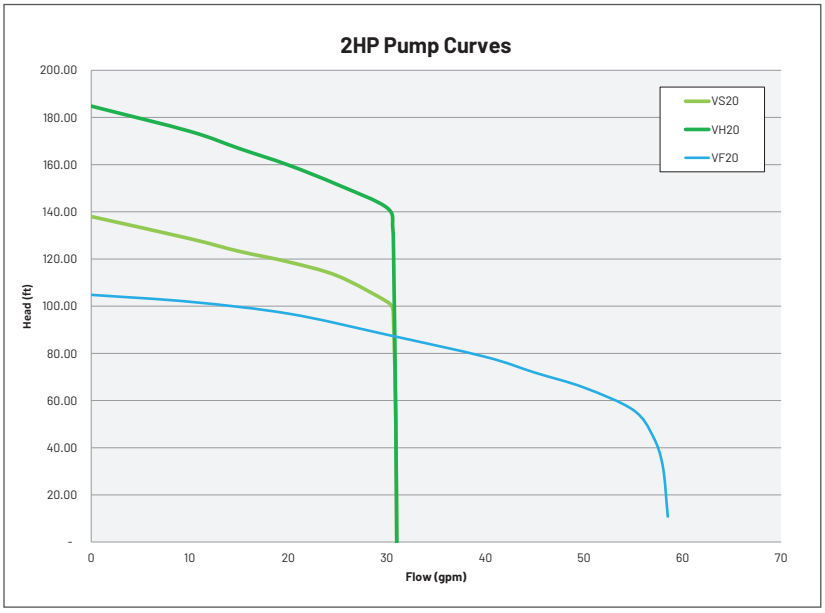
Performance Data and Dimensions

3450 RPM

[Dimensions in mm]



Product Capabilities		
Capacities To	58.5 gpm	221.4 lpm
Heads To	185 ft.	56.34 m
Liquids Handling	domestic raw sewage	
Intermittent Liquid Temp.	up to 140˚F	up to 60˚C
Winding Insulation Temp. (Class F)	311˚F	155˚C
Motor Electrical Data (Single phase motors are capacitor start type. Myers control panels or capacitor kits are recommended for proper operation and warranty.)	2 hp, 3450 rpm 1 ph – capacitor start/run. 230 volts; 60 Hz 3 ph – induction run 200, 230, 460 volts, 60 Hz	
Std. Third Party Approvals	CSA	
Acceptable pH Range	6 – 9	
Specific Gravity	.9 – 1.1	
Viscosity	28 – 35 SSU	
Discharge (Flange Dia.)	1-1/4 in.	31.75 mm
Min. Sump Diameter Simplex Duplex	 24 in. 36 in.	 61.0 cm 91.4 cm



Construction Materials	
Motor Housing, Seal Housing, Cord Cap and Volute Case	Cast Iron, Class 30, ASTM A48
Impeller	Semi-Open, Stainless Steel
Mechanical Seals: Standard Optional	 Double Tandem Carbon and Ceramic Lower Tungsten Carbide
Pump, Motor Shaft	416 SST
Fasteners	300 Series SST
Rotating Cutter, Stationary Cutter	440 SST 57-60 Rockwell

PENTAIR

1101 Myers Parkway | Ashland, OH 44805 | Ph: 855.274.8948 | pentair.com/pentair-myers

Pump ID - 1

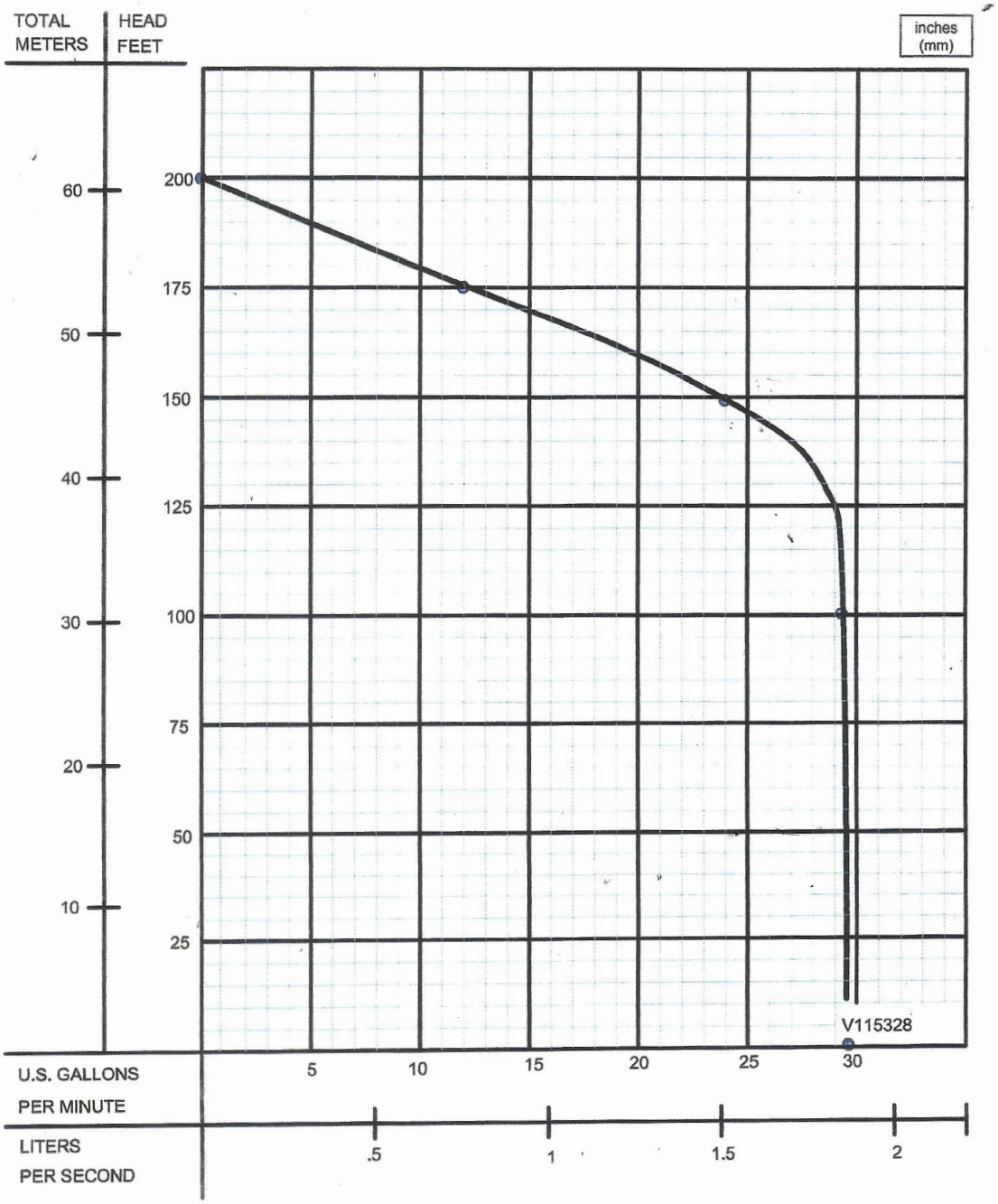
BARNES PRESSURE SYSTEMS

www.cranepumps.com

Models OGP-L & OGP-AUE

Performance Curve
2HP, 3450RPM, 60Hz

Submersible Grinder Pumps



Testing is performed with water, specific gravity 1.0 @ 68° F @ (20°C), other fluids may vary performance

WG(X)75HH/100H/150H

Standard and Explosion-Proof
7½, 10, and 15 HP High Head
Submersible Grinder Pumps

APPROVED
(WGX75HH/100H/150H only)

MYERS HIGH HEAD 7½, 10 & 15 HORSEPOWER SUBMERSIBLE CENTRIFUGAL GRINDER PUMPS ARE DESIGNED FOR MUNICIPAL, COMMERCIAL OR INDUSTRIAL APPLICATIONS. These pumps are especially suited for use in pressure sewer applications or in systems with long discharge runs or high static heads. The pumps feature a heavy-duty cutter mechanism and recessed impeller designed to efficiently grind typical sewage solids into a fine slurry.

The grinder pumps are available in standard and FM Listed explosion-proof construction for use in Class 1, Groups C & D hazardous locations.

Myers grinder pumps can be installed in a variety of packaged systems. Factory-assembled simplex or duplex packages with guide rail systems are available. Individual rail components are also available for installation in onsite concrete systems. Myers offers a complete line of submersible sump, sewage, effluent, grinder, non-clog wastewater pumps, controls, basins and accessories. For additional information, please contact your local Myers representative or the Myers Ashland, Ohio sales office at 419-289-1144.

ADVANTAGES BY DESIGN

IDEAL FOR USE IN PRESSURE SEWER SYSTEMS.

- Recessed impeller provides steep non-overloading operating curve.

DURABLE MOTOR WILL DELIVER MANY YEARS OF RELIABLE SERVICE.

- Oil-filled motor for maximum heat dissipation and constant bearing lubrication.
- Recessed impeller reduces radial bearing loads; increases bearing life.
- High-torque three phase motors for assured starting under heavy load.
- Seal leak probes and on-winding heat sensors warn of seal leak condition, and stop motor if motor overheats. Helps prevent costly motor damage.

DESIGNED FOR EASY MAINTENANCE.

- Shredding ring and grinder impeller are replaceable without dismantling pump or motor.

PRODUCT CAPABILITIES

Capacities To	150 gpm	568 lpm
Heads To	257 ft.	78 m
Liquids Handling	domestic raw sewage	
Intermittent Liquid Temp.	up to140ºF	up to 60ºC
Winding Insulation Temp. (Class H)	356°F	180°C
Motor Electrical Data	3450 RPM 7½, 10 and15 HP 200/230/460/575 volts 3 phase, 60 Hz	
Std. Third Party Approvals	CSA	
Optional Approvals	FM Class 1, Groups C & D (WGX75HH/100H/150H only)	
Acceptable pH Range	6 – 9	
Specific Gravity	.9 – 1.1	
Viscosity	28 – 35 SSU	
Discharge (Flange Dim.)	2½ in.	63.5 mm

NOTE: Consult factory for applications outside of these recommendations.

Construction Materials	
Motor Housing, Seal Housing, Cord Cap and Volute Case	cast iron, Class 30 ASTM A48
Impeller, recessed	ductile iron
Power and Control Cord	25 ft. SOOW
Mechanical Seals Standard Optional	double tandem carbon and ceramic lower tungsten, carbide
Pump, Motor Shaft	416 SST
Fasteners	300 series SST
Shredding Ring and Grinder Impeller	440 SST, 58-60 Rockwell

WHERE INNOVATION MEETS TRADITION

Myers®
Pentair Water

HEAT SENSOR
Protects motor from burnout due to excessive heat from any overload condition. Automatically resets when motor has cooled.

CABLE ENTRY SYSTEM
Provides double seal protection. Cable jacket sealed by compression grommet. Individual wires sealed by epoxy potting.

BALL BEARINGS
Upper and lower ball bearings support shaft and rotor and take axial and radial loads.

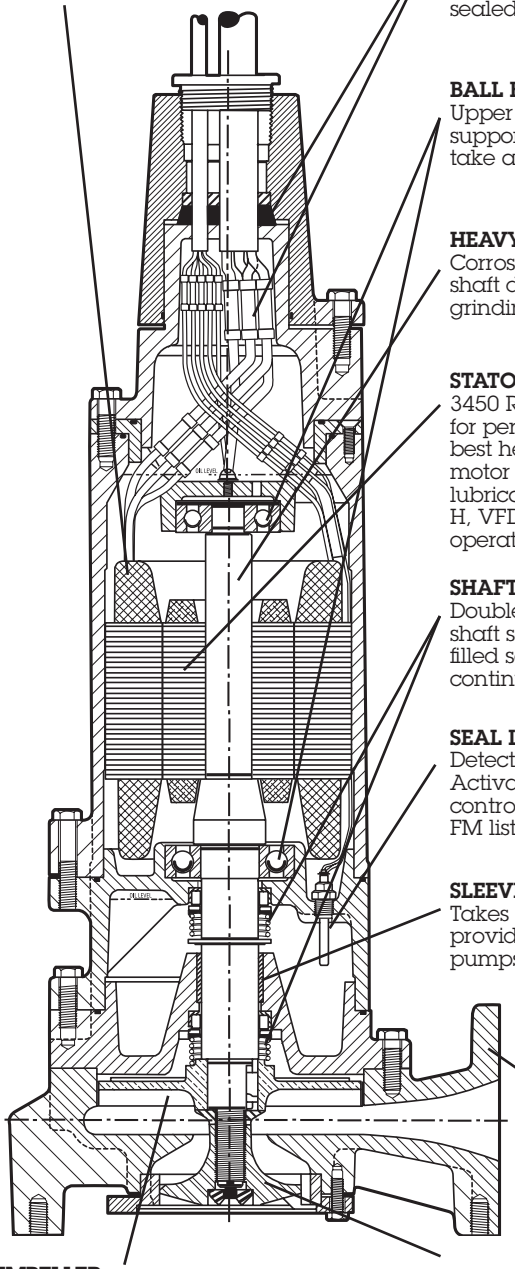
HEAVY 416 SST SHAFT
Corrosion resistant. Reduces shaft deflection due to grinding loads.

STATOR
3450 RPM, 3 phase. Press fit for perfect alignment and best heat transfer. Oil-filled motor conducts heat and lubricates bearings. Class H, VFD/continuous duty operation.

SHAFT SEALS
Double tandem mechanical shaft seals protect motor. Oil-filled seal chamber provides continuous lubrications.

SEAL LEAK PROBES
Detect water in seal housing. Activates warning light in control panel. (Test resistor on FM listed pumps only.)

SLEEVE BEARING
Takes radial shock load; provides flame path. (FM listed pumps only.)



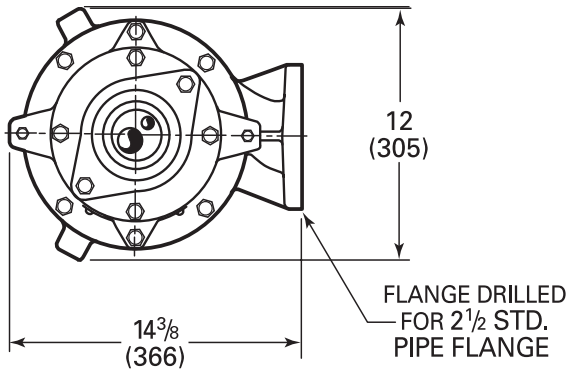
VOLUTE CASE
Cast iron; horizontal discharge. (Drilled for 2½" pipe flange.)

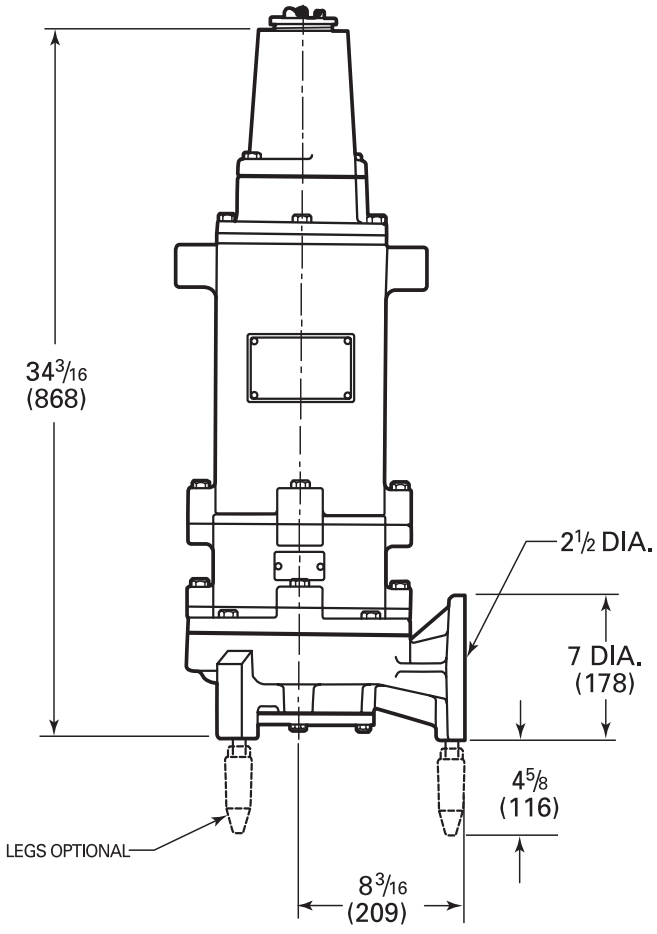
IMPELLER
Ductile iron recessed impeller handles ground slurry without clogging or binding. Provides unobstructed flow passage. Reduces radial loads. Pump-out vanes help keep trash from seal; reduces pressure at seal faces.

GRINDER ASSEMBLY
Grinder impeller and shredding ring are replaceable without dismantling pump. Constructed of 440 SST hardened to 58-60 Rockwell.

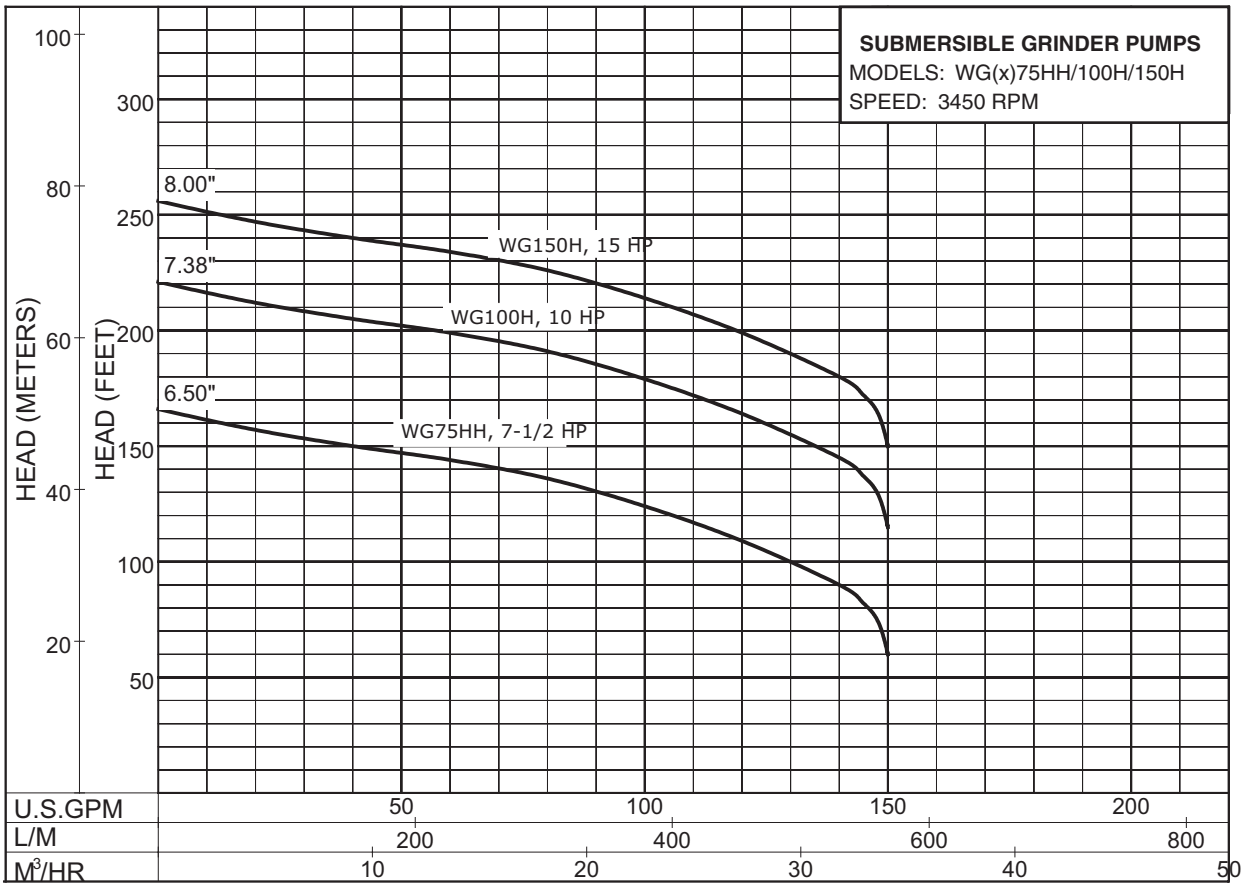
DIMENSIONS

( ) Dimensions in mm





PUMP PERFORMANCE



Available Models		Motor Electrical Data											
Standard	Explosion-Proof	HP	Volts	Phase	Hertz	Start Amps	Run Amps	Run KW	Service Factor KW	Start KVA	Run KVA	NEC Code Letter	Service Factor
WG75HH-03-25	WGX75HH-03-25	7½	200	3	60	192.7	39.7	8.1	11.9	66.8	10.6	H	1.0
WG75HH-23-25	WGX75HH-23-25	7½	230	3	60	167.6	34.5	8.1	11.9	66.8	10.6	H	1.0
WG75HH-43-25	WGX75HH-43-25	7½	460	3	60	83.8	17.3	8.1	11.9	66.8	10.6	H	1.0
WG75HH-53-25	WGX75HH-53-25	7½	575	3	60	67.0	13.8	8.1	11.9	66.8	10.6	H	1.0
WG100H-03-25	WGX100H-03-25	10	200	3	60	256.2	55.6	10.2	15.5	88.7	11.8	G	1.0
WG100H-23-25	WGX100H-23-25	10	230	3	60	222.8	48.4	10.2	15.5	88.7	11.8	G	1.0
WG100H-43-25	WGX100H-43-25	10	460	3	60	111.4	24.2	10.2	15.5	88.7	11.8	G	1.0
WG100H-53-25	WGX100H-53-25	10	575	3	60	89.1	19.4	10.2	15.5	88.7	11.8	G	1.0
WG150H-03-25	WGX150H-03-25	15	200	3	60	256.2	68.4	17.6	19.7	88.7	16.0	D	1.0
WG150H-23-25	WGX150H-23-25	15	230	3	60	222.8	59.5	17.6	19.7	88.7	16.0	D	1.0
WG150H-43-25	WGX150H-43-25	15	460	3	60	111.4	29.8	17.6	19.7	88.7	16.0	D	1.0
WG150H-53-25	WGX150H-53-25	15	575	3	60	89.1	23.8	17.6	19.7	88.7	16.0	D	1.0

WG(X)75HH/100H/150H

SPECIFICATIONS

PUMP MODEL – Pump shall be of the centrifugal type Myers model _____ or equal with an integrally built-in grinder unit and submersible type motor. The grinder unit shall be capable of macerating all material in normal domestic and commercial sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like to a fine slurry that will pass freely through the pump and 2" discharge pipe. Discharge shall be standard 2_" flange. Pump and motor assembly shall be FM listed for Class 1, Groups C & D explosion-proof service.

OPERATING CONDITIONS – Pump shall have a capacity of _____ GPM at a total head of _____ feet and shall use a ____ HP motor operating at 3450 RPM.

MOTOR – Pump motor shall be of the totally enclosed, submersible, squirrel cage induction type rated _____ horsepower at 3450 RPM, 60 Hz.

Motor shall be for three phase 200 volts_____, 230 volts_____, 460 volts_____ or 575 volts_____. Three phase motors shall be NEMA B type.

Stator winding shall be of the open type with Class H insulation good for 180°C (356°F) maximum operating temperature. Winding housing shall be filled with a clean high dielectric oil that lubricates bearings and seals and transfers heat from windings and rotor to outer shell. Air-filled motors that do not have the superior heat dissipating capabilities of oil-filled motors shall not be considered equal.

Motor shall have two heavy-duty ball bearings to support pump shaft and take radial and thrust loads and a sleeve guide bushing directly above the lower seal to take radial load and act as flame path for seal chamber. Ball bearings shall be designed for 50,000 hours B-10 life. Stator shall be heat shrunk into motor housing.

A heat sensor thermostat shall be attached to top end of motor winding and shall be connected in series with the magnetic contactor coil in control box to stop motor if motor winding temperature reaches 150°C (302°F). Thermostat to reset automatically when motor cools. Three heat sensors shall be used on 3 phase motors.

The common motor pump and grinder shaft shall be of #416 stainless steel threaded to take pump impeller and grinder impeller.

SEALS – Motor shall be protected by two mechanical seals mounted in tandem with a seal chamber between the seals. Seal chamber shall be oil filled to lubricate seal face and to transmit heat from shaft to outer shell.

Seal face shall be carbon and ceramic and lapped to a flatness of one light band. Lower seal faces shall be _____ carbide (optional).

A double electrode shall be mounted in the seal chamber to detect any water entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control box. This signal shall not stop motor but shall act as a warning only, indicating service is required.

PUMP IMPELLER – The pump impeller shall be of the recessed Myers type to provide an open unobstructed passage through the volute for the ground solids. Impeller shall be ductile iron and shall be driven by a stainless key. Enclosed or semiopen pump impellers that might become obstructed during grinding or add excessive radial loads shall not be considered as equal.

GRINDER CONSTRUCTION – Grinder assembly shall consist of a single rotating grinder impeller and a single stationary shredding ring mounted directly below pump volute inlet. Grinder impeller shall thread onto shaft and shall be locked with a screw and washer. Shredding ring shall be held in place by a steel retaining clamp. Both shredding ring and grinder impeller shall be removable without dismantling pump. No adjustment of grinder assembly shall be necessary for proper grinder operation. Multiple grinder impeller assemblies requiring initial or periodic axial adjustment for proper operation shall not be considered equal. Grinder impeller and shredding ring shall be made of 440C stainless steel hardened to 58-60 Rockwell.

CORROSION PROTECTION – All iron castings shall be pretreated with phosphate and chromic rinse and to be painted before machining and all machined surfaces exposed to the sewage water to be repainted. All fasteners to be 304 stainless steel.

BEARING END CAP – Upper motor bearing cap shall be a separate casting for easy mounting and replacement.

POWER CABLES – Power cord and control cord shall be double sealed. The power and control conductor shall be single strand sealed with epoxy potting compound and then clamped in place with rubber seal bushing to seal outer jacket against leakage and to provide for strain pull. Cords shall withstand a pull of 300 pounds.

Insulation of power and control cords shall be type SOOW. Both control and power cords shall have a green carrier ground conductor that attaches to motor frame.

Myers®
Pentair Water

F. E. Myers, 1101 Myers Parkway, Ashland, Ohio 44805-1969
419/289-1144, FAX: 419/289-6658, www.femyers.com

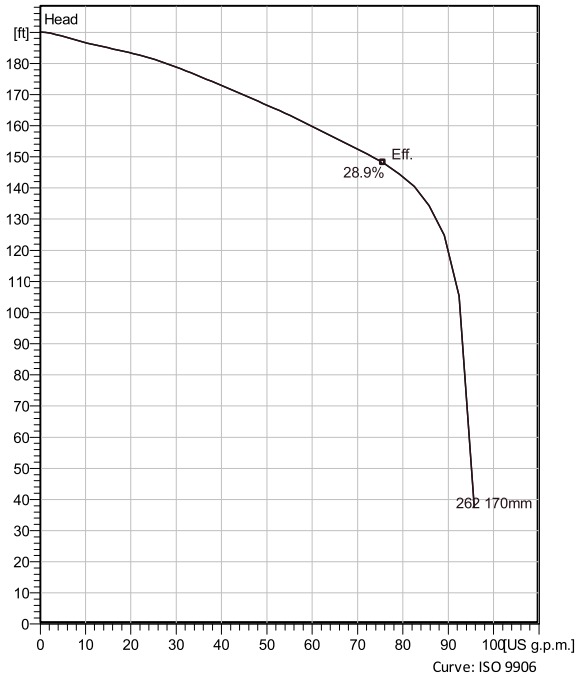
Myers (Canada), 269 Trillium Drive, Kitchener, Ontario N2G 4W5
519/748-5470, FAX: 519/748-2553

MP 3127 HT 3~ 262

Semi-open multi-channel impellers with integral grinder cutter in single volute casing for liquids containing solids and fibres.

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
M3127.890 21-11-2AL-W 11hp

Installation type
P - Semi permanent, Wet

Impeller diameter
170 mm

Discharge diameter
1 15/16 inch

Pump information

Impeller diameter
170 mm

Discharge diameter
1 15/16 inch

Inlet diameter
50 mm

Maximum operating speed
3495 rpm

Number of blades
6

Materials

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project	**Created by**	**Last update**
Block	**Created on** 2/7/2020	

MP 3127 HT 3~ 262

Technical specification

Motor - General

Motor number M3127.890 21-11-2AL-W 11hp	**Phases** 3~	**Rated speed** 3495 rpm	**Rated power** 11 hp
Approval FM	**Number of poles** 2	**Rated current** 13 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1

Motor - Technical

Power factor - 1/1 Load 0.92	**Motor efficiency - 1/1 Load** 87.6 %	**Total moment of inertia** 0.285 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.90	**Motor efficiency - 3/4 Load** 88.4 %	**Starting current, direct starting** 110 A	
Power factor - 1/2 Load 0.85	**Motor efficiency - 1/2 Load** 87.7 %	**Starting current, star-delta** 36.7 A	

Project	**Created by**		**Last update**
Block	**Created on**	2/7/2020	

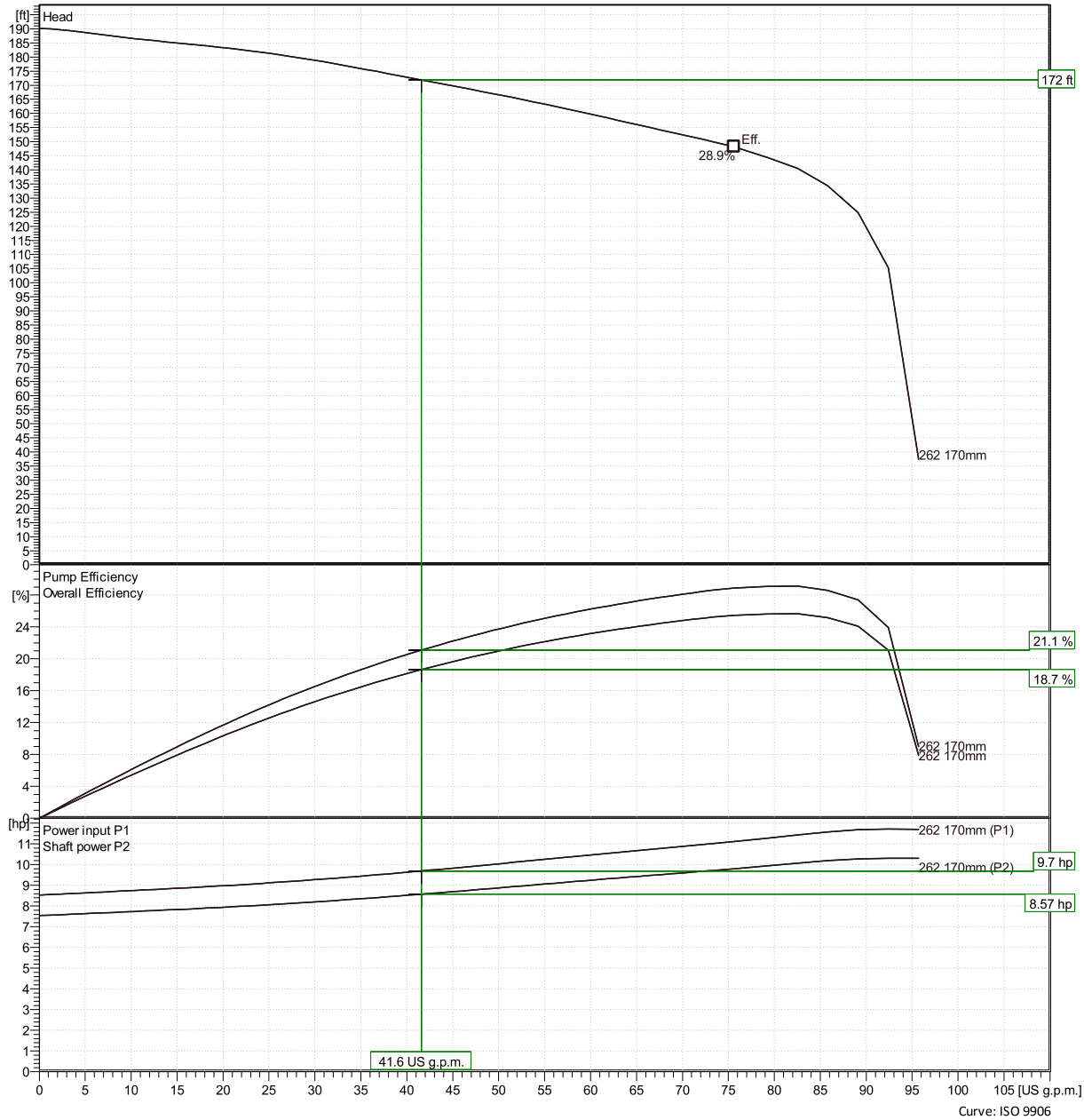
MP 3127 HT 3~ 262

Performance curve

Duty point

Flow	Head
41.6 US g.p.m.	172 ft

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



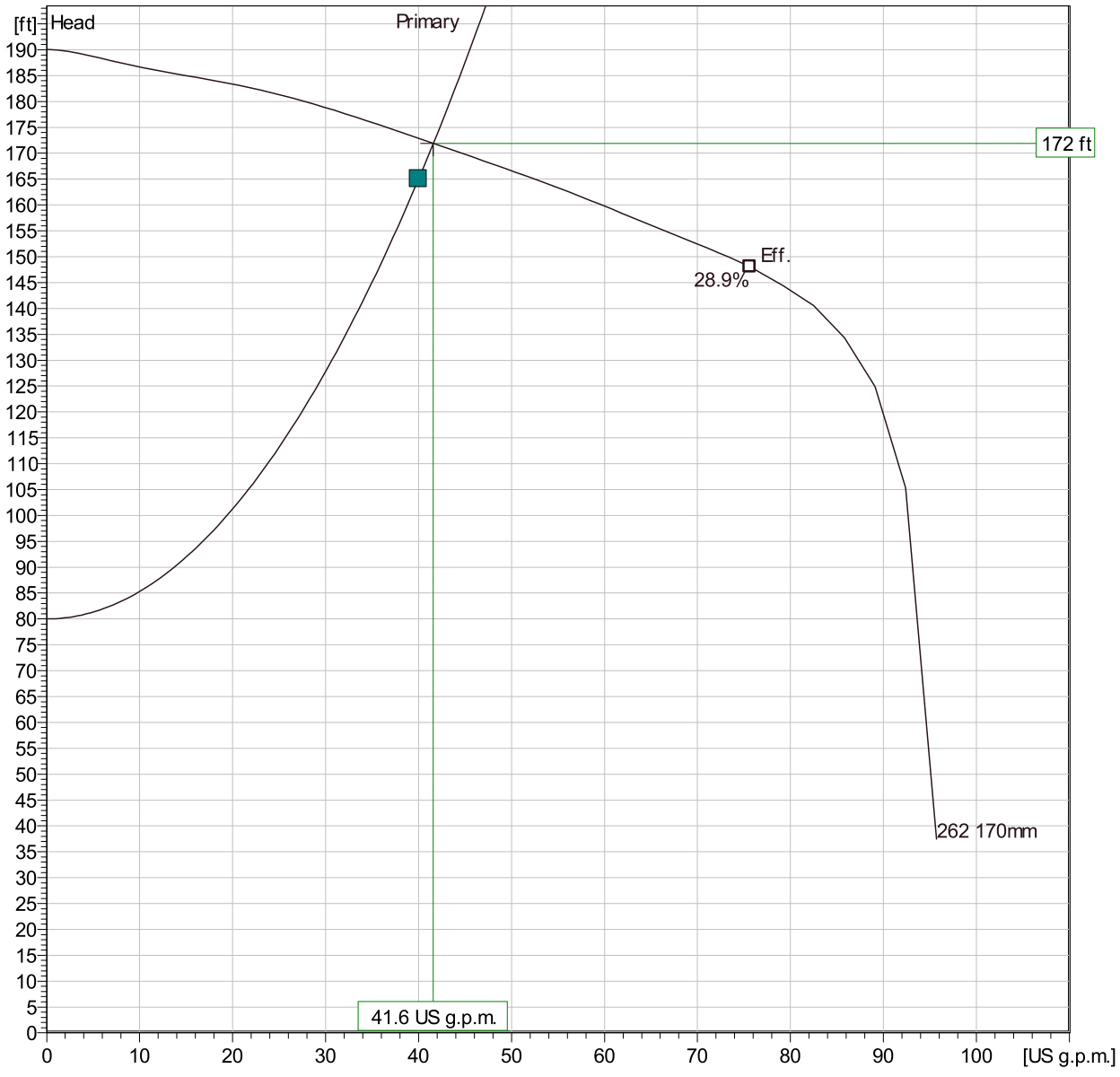
Curve: ISO 9906

Project	Created by	Last update
Block	Created on 2/7/2020	

MP 3127 HT 3~ 262

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

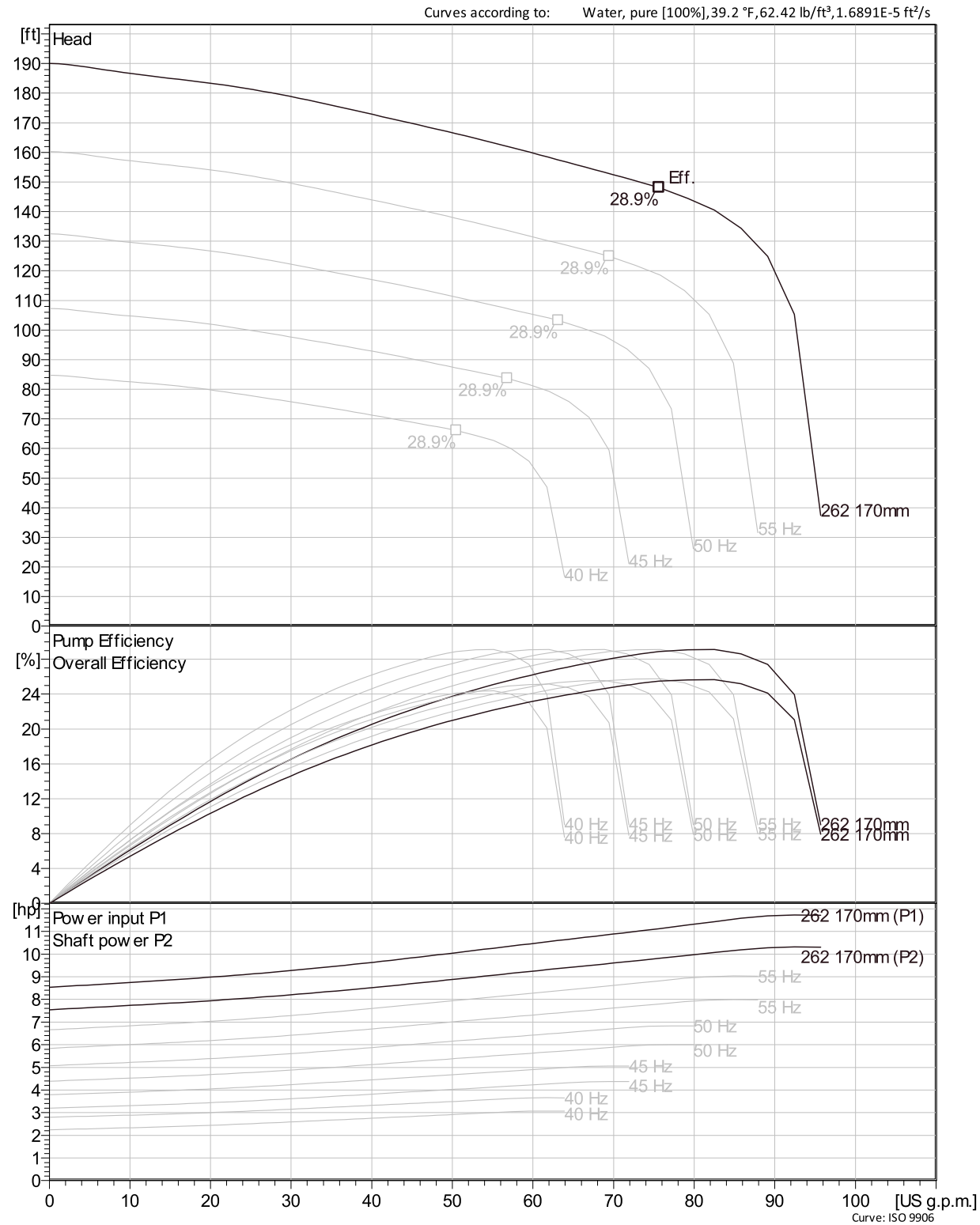
Operating characteristics

Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
Primary	41.6 US g.p.m.	172 ft	8.57 hp	41.6 US g.p.m.	172 ft	8.57 hp	21.1 %	2900 kWh/US M	

Project	**Created by**		**Last update**
Block	**Created on**	2/7/2020	

MP 3127 HT 3~ 262

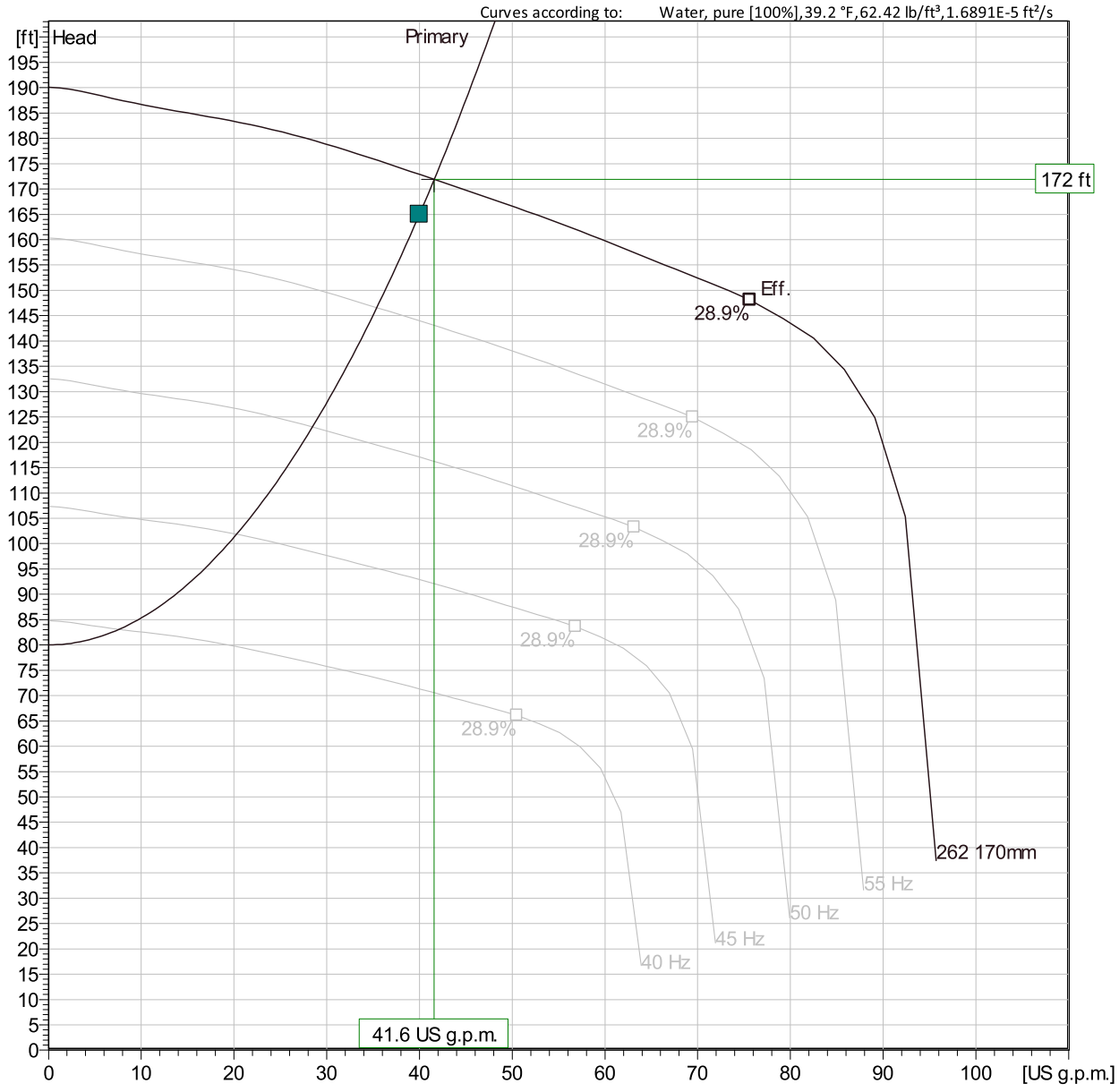
VFD Curve



Project	**Created by**		**Last update**
Block	**Created on**	2/7/2020	

MP 3127 HT 3~ 262

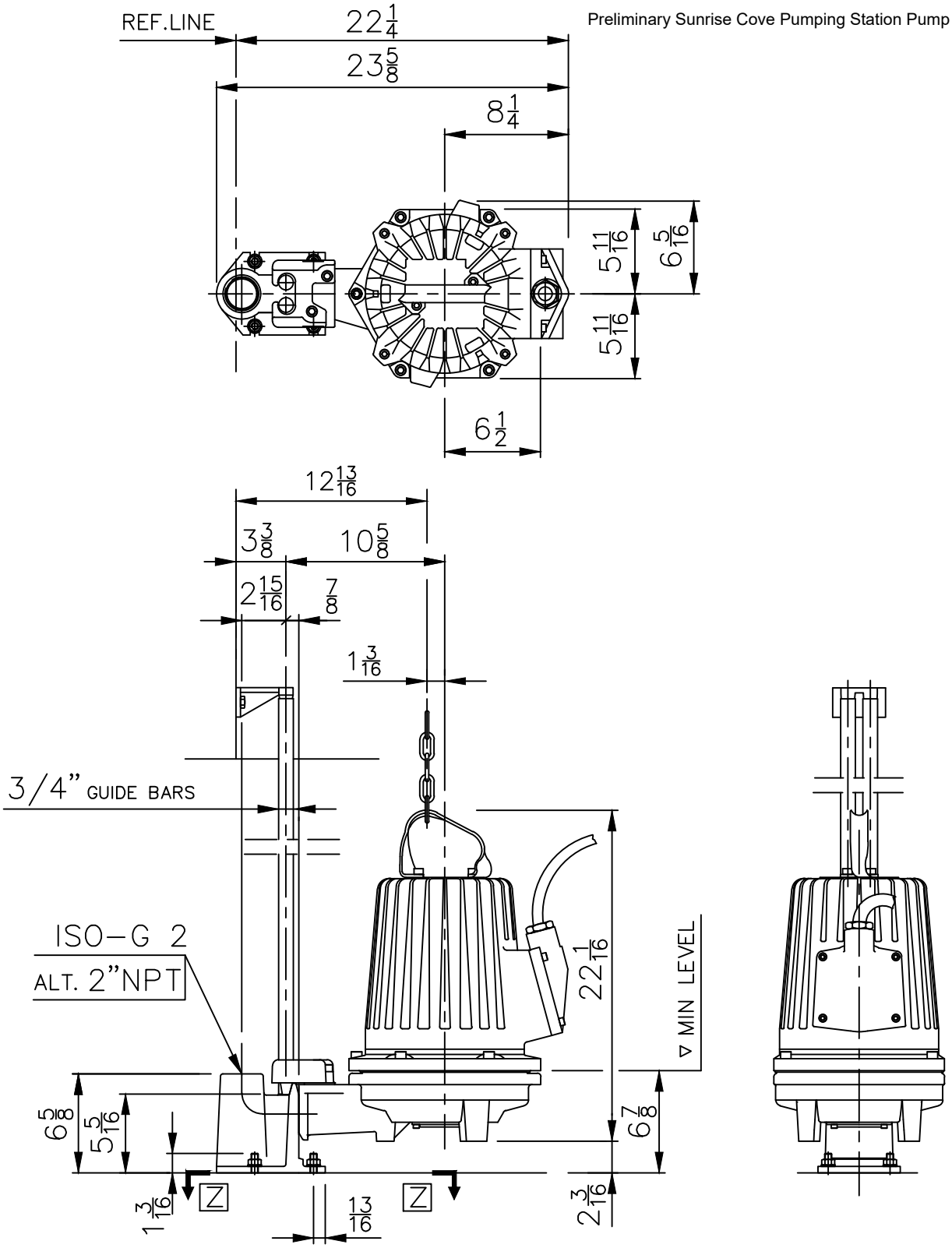
VFD Analysis



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
Primary	59.9 Hz	41.6 US g.p.m	172 ft	8.57 hp	41.6 US g.p.m	172 ft	8.57 hp	21.1 %	2900 kWh/US M	
Primary	55 Hz	35.5 US g.p.m	147 ft	6.58 hp	35.5 US g.p.m	147 ft	6.58 hp	20 %	2620 kWh/US M	
Primary	50 Hz	28.5 US g.p.m	123 ft	4.86 hp	28.5 US g.p.m	123 ft	4.86 hp	18.3 %	2430 kWh/US M	

Project	**Created by**		**Last update**
Block	**Created on**	2/7/2020	



Weight (lbs)	
Pump	Discharge
245	16

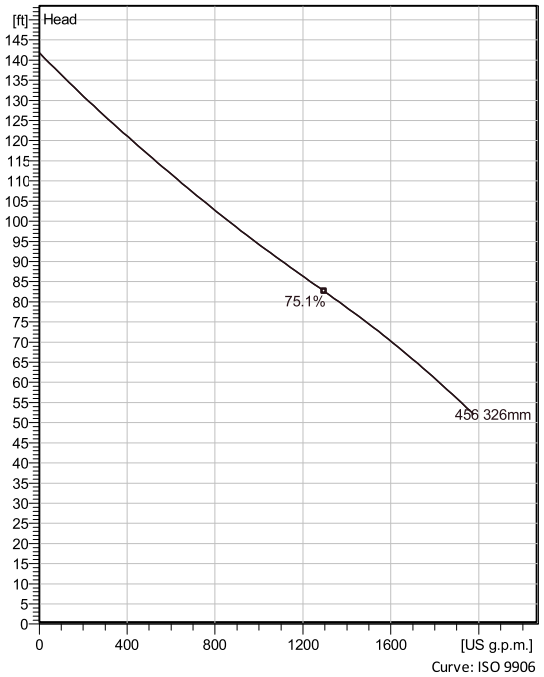
FLYGT	MP	3127	HT,LT		Discharge outlet ISO–G 2	Scale 1:10	Date 190311
					Pump outlet ø2"		
					Pump inlet	Drawing number 5391100	Revision 7
					Suction inlet		

NP 3202 HT 3~ 456

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.185 30-19-4AA-W 30KW

Installation type
P - Semi permanent, Wet

Impeller diameter
326 mm

Discharge diameter
5 7/8 inch

Pump information

Impeller diameter
326 mm

Discharge diameter
5 7/8 inch

Inlet diameter
200 mm

Maximum operating speed
1470 rpm

Number of blades
2

Materials

Impeller
Hard-Iron ™

Project	**Created by**	**Last update**
Block	**Created on** 2/24/2020	

NP 3202 HT 3~ 456

Technical specification

Motor - General

Motor number N3202.185 30-19-4AA-W 30KW	**Phases** 3~	**Rated speed** 1470 rpm	**Rated power** 40 hp
Approval No	**Number of poles** 4	**Rated current** 56 A	**Stator variant** 1
Frequency 50 Hz	**Rated voltage** 380 V	**Insulation class** H	**Type of Duty** S1

Motor - Technical

Power factor - 1/1 Load 0.90	**Motor efficiency - 1/1 Load** 90.0 %	**Total moment of inertia** 7.89 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.87	**Motor efficiency - 3/4 Load** 91.5 %	**Starting current, direct starting** 340 A	
Power factor - 1/2 Load 0.79	**Motor efficiency - 1/2 Load** 91.5 %	**Starting current, star-delta** 113 A	

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

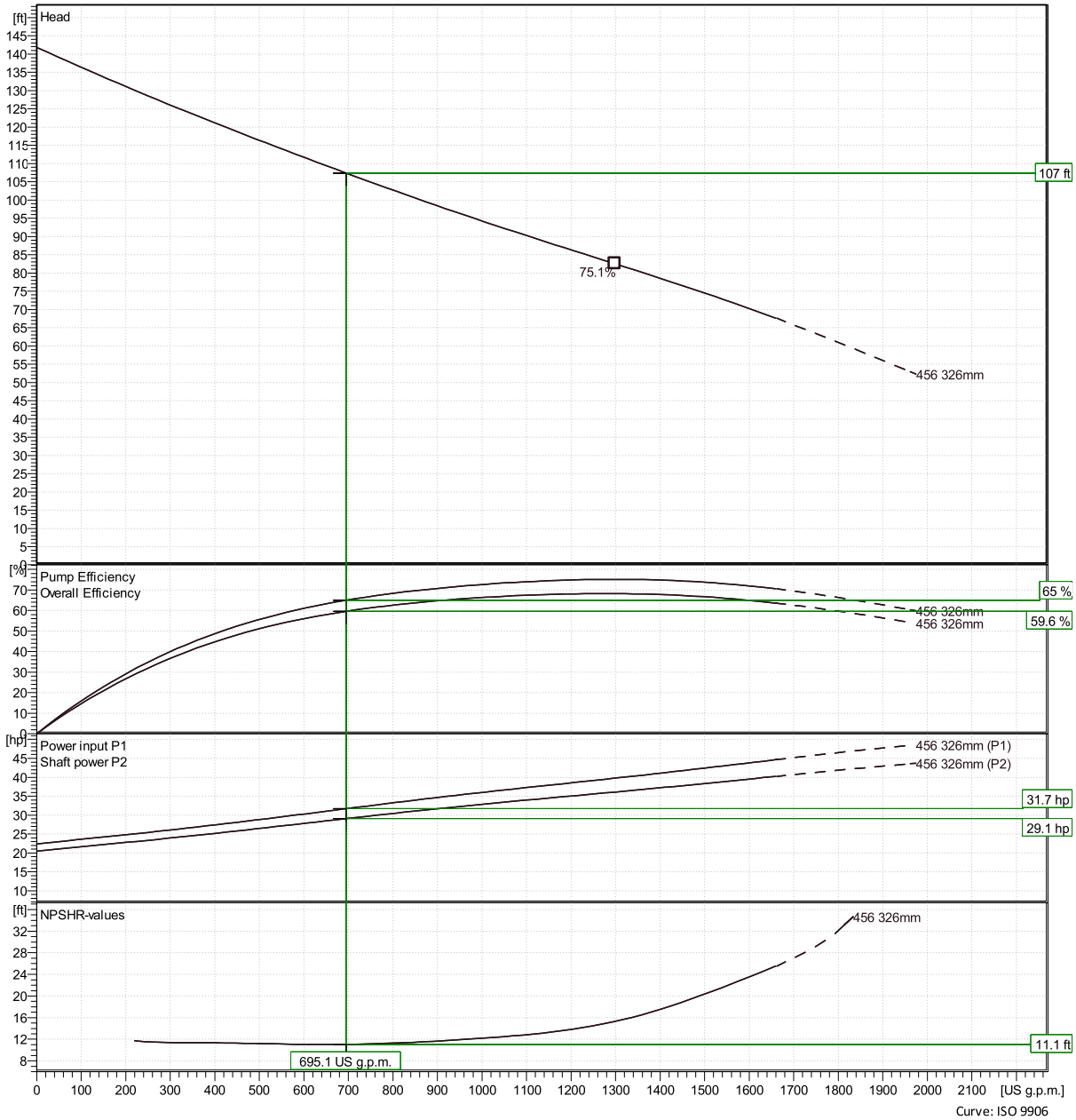
NP 3202 HT 3~ 456

Performance curve

Duty point

Flow	Head
695 US g.p.m.	107 ft

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

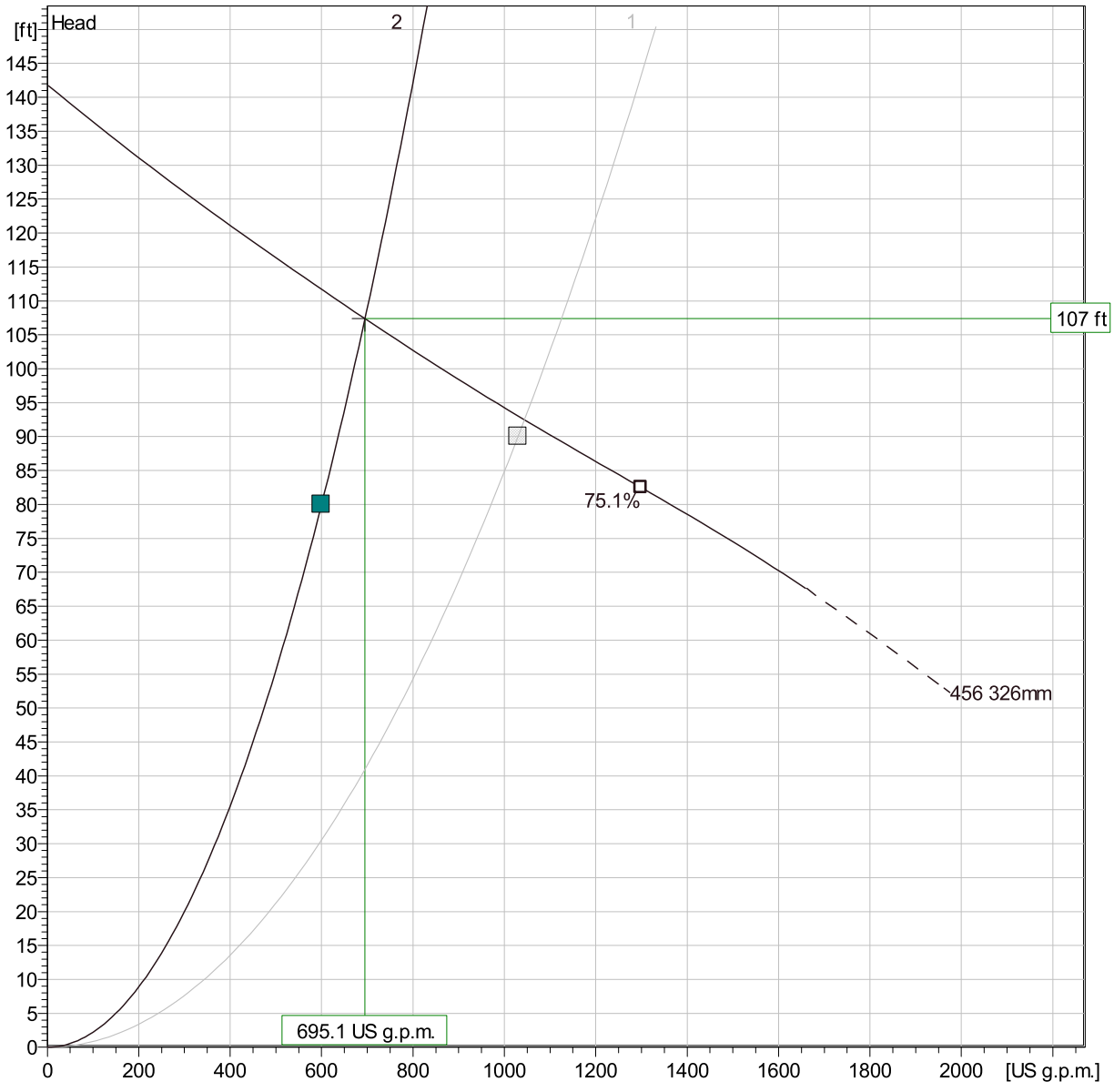


Project	Created by	Last update
Block	Created on	2/24/2020

NP 3202 HT 3~ 456

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Operating characteristics

Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
2	695 US g.p.m.	107 ft	29.1 hp	695 US g.p.m.	107 ft	29.1 hp	65 %	567 kWh/US M(	11.1 ft
1	1040 US g.p.m.	92.5 ft	33.3 hp	1040 US g.p.m.	92.5 ft	33.3 hp	73.3 %	435 kWh/US M(	12.4 ft

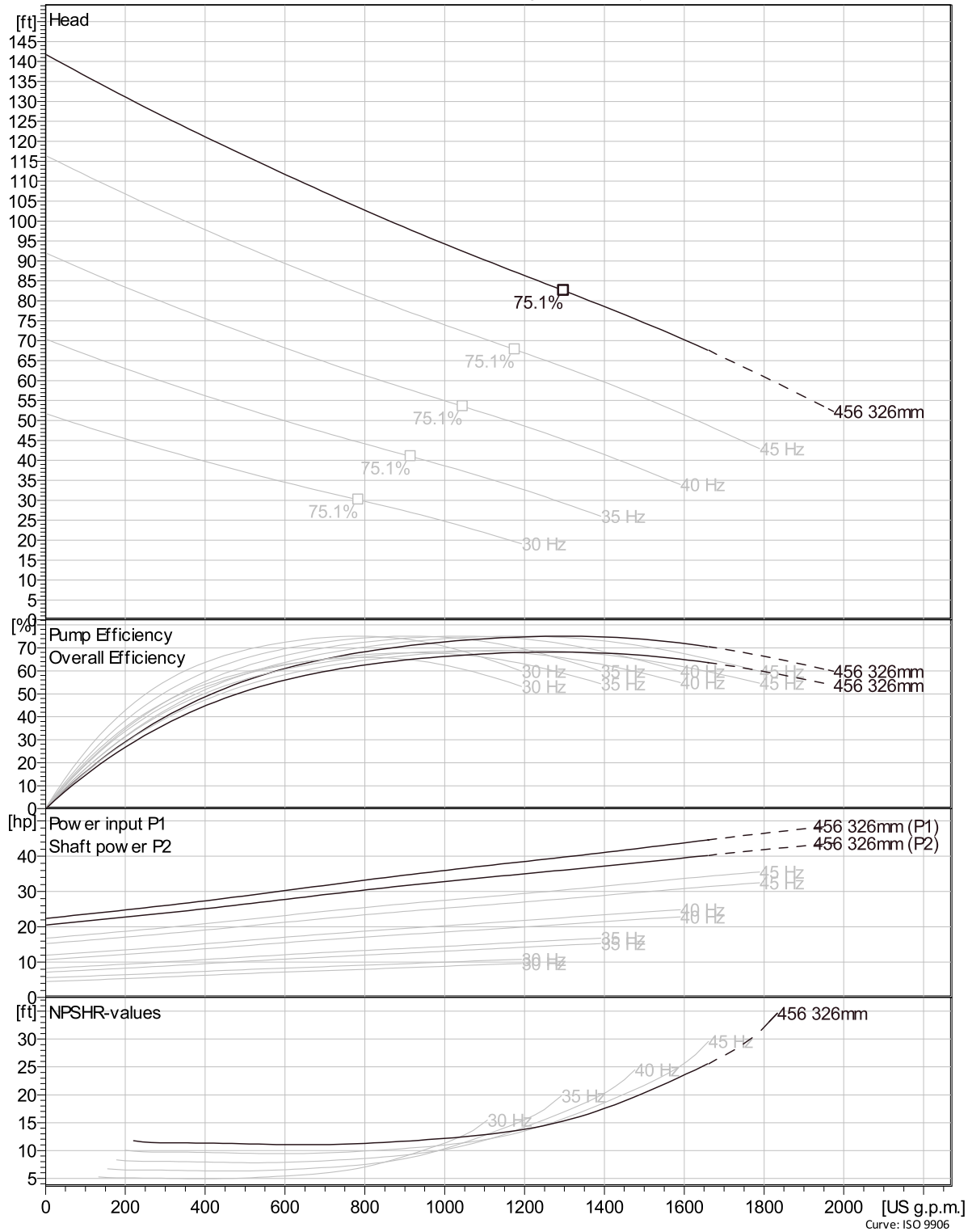
Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

VFD Curve

FLYGT a xylem brand

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

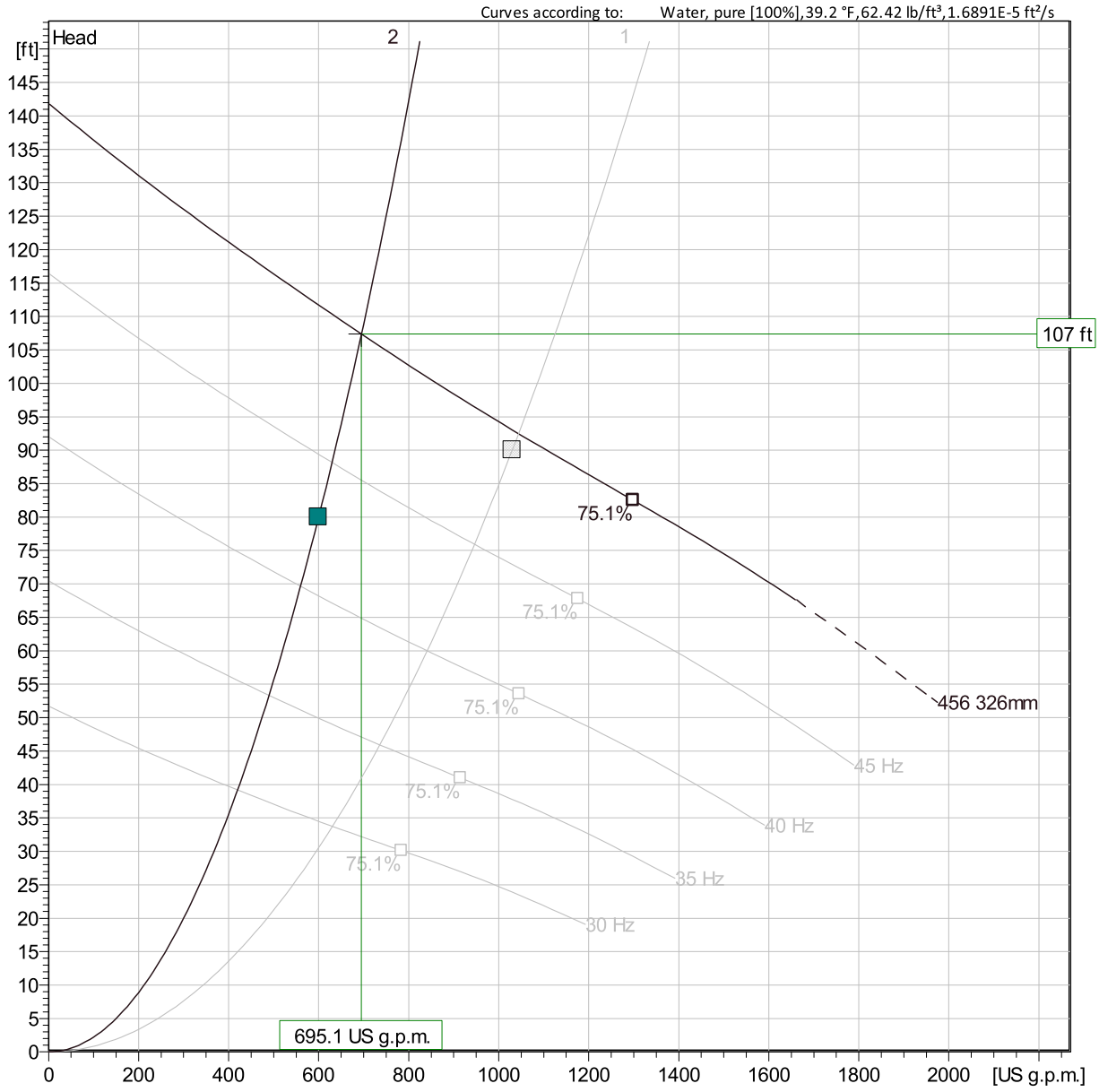


Curve: ISO 9906

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

VFD Analysis



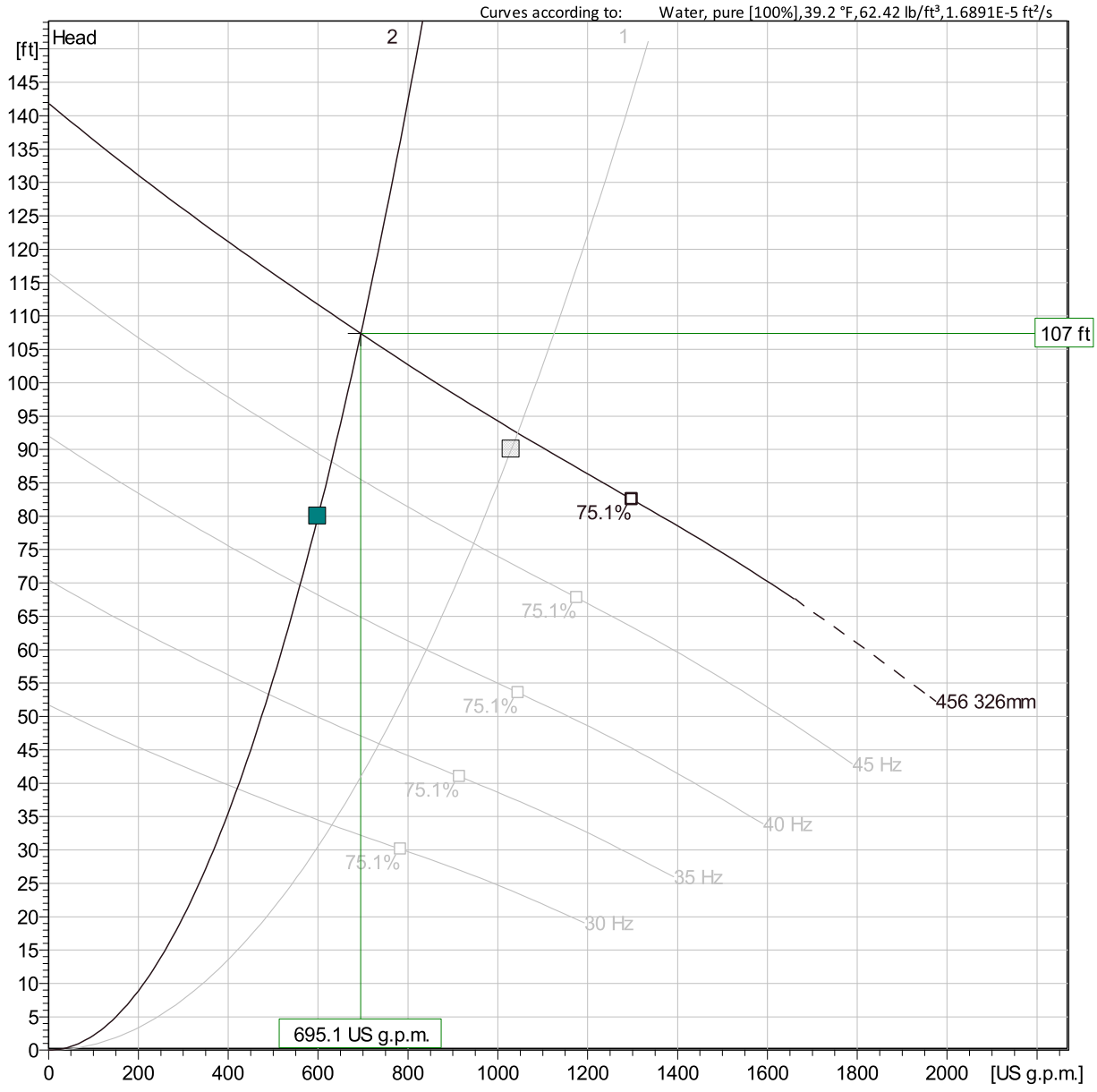
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
2	49.7 Hz	695 US g.p.m.	107 ft	29.1 hp	695 US g.p.m.	107 ft	29.1 hp	65 %	567 kWh/US M	11.1 ft
2	45 Hz	629 US g.p.m.	88 ft	21.5 hp	629 US g.p.m.	88 ft	21.5 hp	65 %	464 kWh/US M	9.42 ft
2	40 Hz	559 US g.p.m.	69.5 ft	15.1 hp	559 US g.p.m.	69.5 ft	15.1 hp	65 %	370 kWh/US M	7.8 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

VFD Analysis



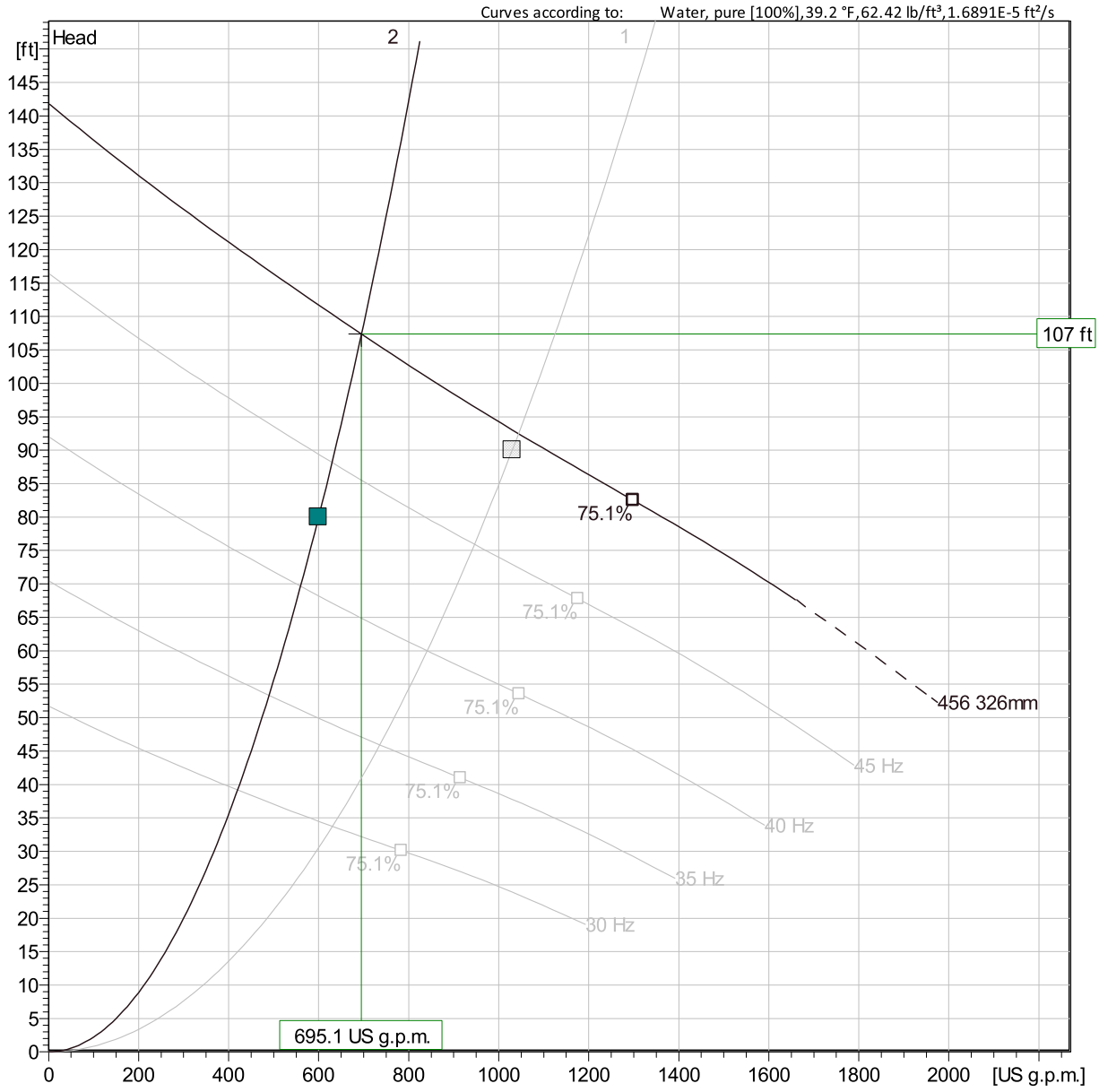
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
2	35 Hz	489 US g.p.m.	53.2 ft	10.1 hp	489 US g.p.m.	53.2 ft	10.1 hp	65 %	288 kWh/US M	6.3 ft
2	30 Hz	419 US g.p.m.	39.1 ft	6.38 hp	419 US g.p.m.	39.1 ft	6.38 hp	65 %	222 kWh/US M	4.93 ft
1	49.7 Hz	1040 US g.p.m	92.5 ft	33.3 hp	1040 US g.p.m	92.5 ft	33.3 hp	73.3 %	435 kWh/US M	12.4 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

VFD Analysis



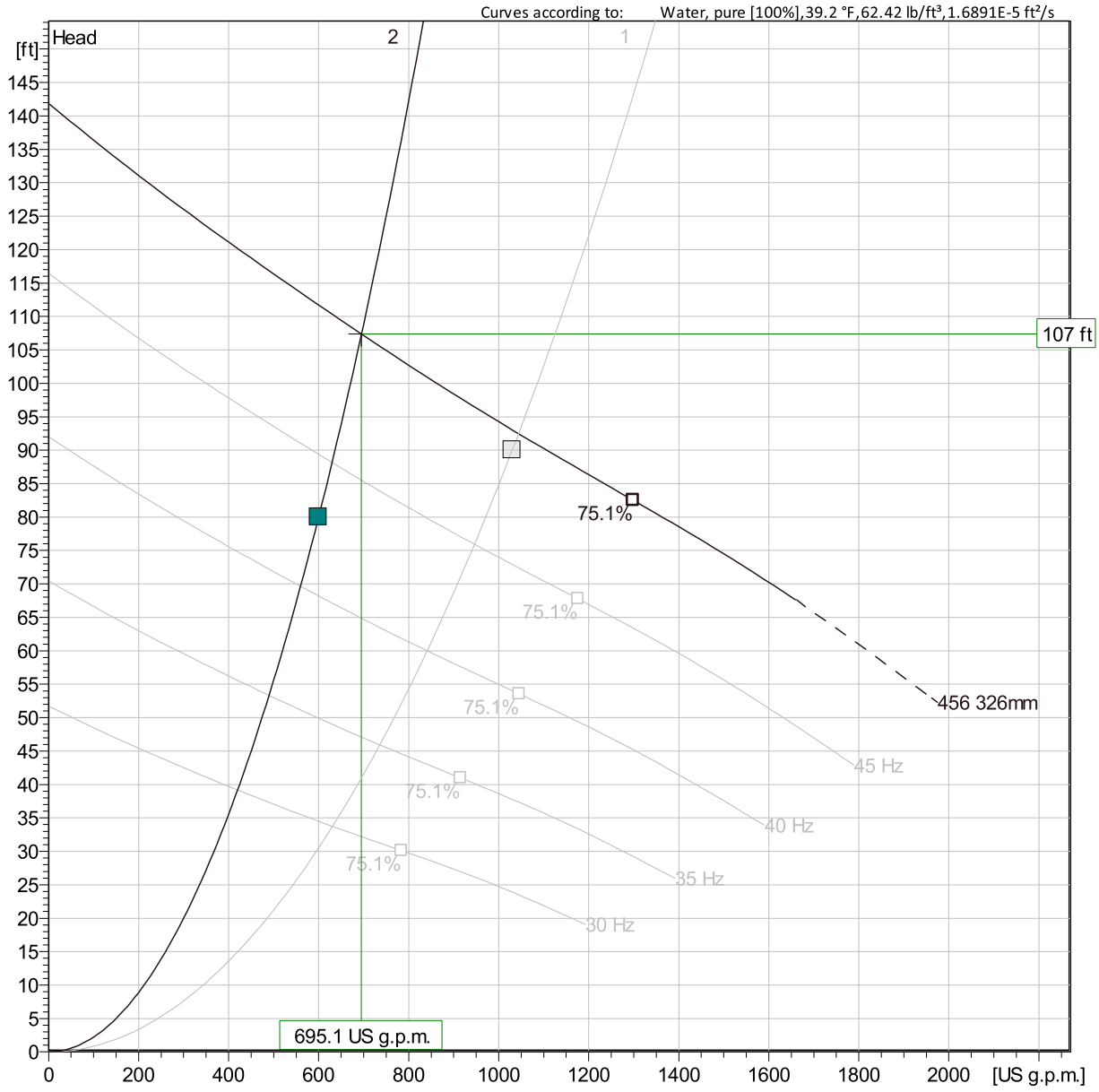
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1	45 Hz	946 US g.p.m.	75.9 ft	24.8 hp	946 US g.p.m.	75.9 ft	24.8 hp	73.3 %	355 kWh/US M	10.6 ft
1	40 Hz	841 US g.p.m.	60 ft	17.4 hp	841 US g.p.m.	60 ft	17.4 hp	73.3 %	282 kWh/US M	8.79 ft
1	35 Hz	736 US g.p.m.	45.9 ft	11.7 hp	736 US g.p.m.	45.9 ft	11.7 hp	73.3 %	219 kWh/US M	7.1 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

VFD Analysis



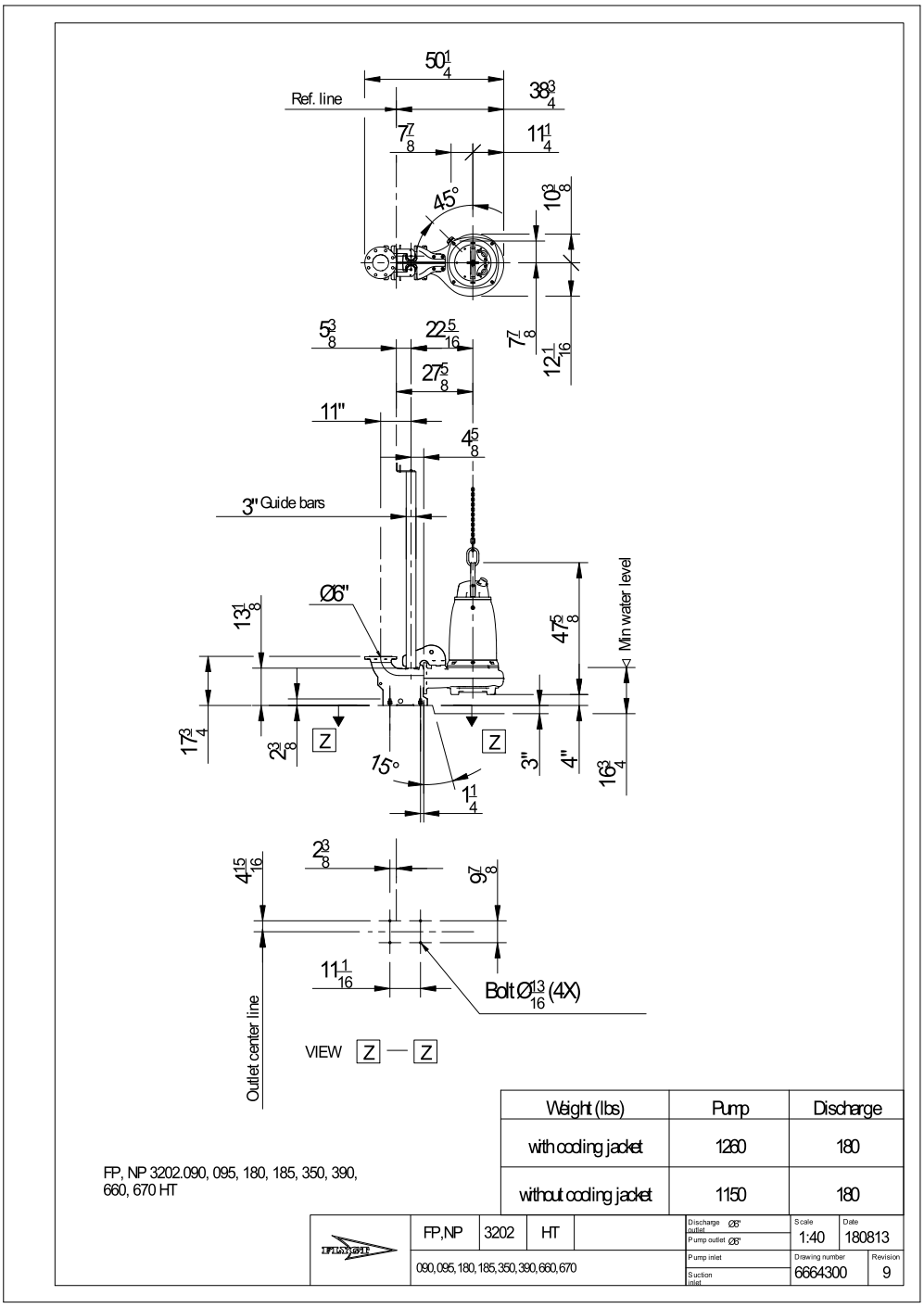
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1	30 Hz	631 US g.p.m.	33.7 ft	7.34 hp	631 US g.p.m.	33.7 ft	7.34 hp	73.3 %	167 kWh/US M	5.55 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 HT 3~ 456

Dimensional Drawing



Weight (lbs)	Pump	Discharge
with cooling jacket	1260	180
without cooling jacket	1150	180

FP, NP 3202.090, 095, 180, 185, 350, 390, 660, 670 HT

FLYGT	FP,NP	3202	HT	Discharge outlet Ø8"	Scale 1:40	Date 180813
090,095,180,185,350,390,660,670				Pump outlet Ø8"		
				Pump inlet	Drawing number 6664300	Revision 9
				Suction inlet		

Project	**Created by**	**Last update**
Block	**Created on** 2/24/2020	

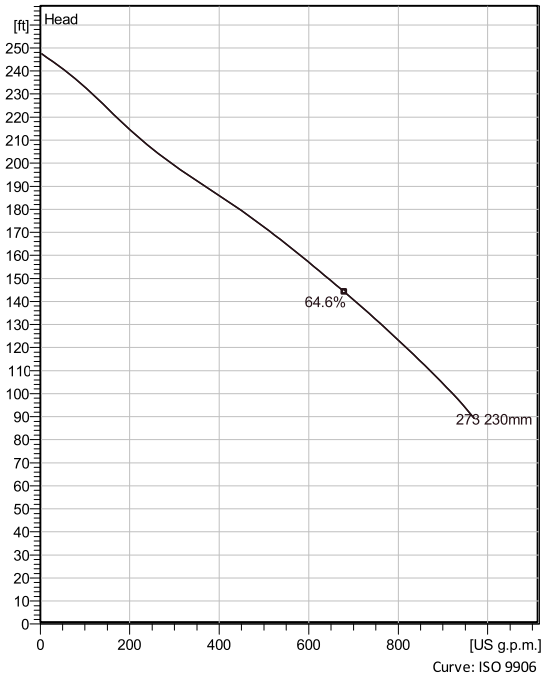
NP 3202 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

FLYGT a xylem brand

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.185 30-19-2AA-W 32KW

Installation type
P - Semi permanent, Wet

Impeller diameter
230 mm

Discharge diameter
3 15/16 inch

Pump information

Impeller diameter
230 mm

Discharge diameter
3 15/16 inch

Inlet diameter
150 mm

Maximum operating speed
2950 rpm

Number of blades
2

Materials

Impeller
Hard-Iron ™

Project	**Created by**	**Last update**
Block	**Created on** 2/24/2020	

NP 3202 SH 3~ 273

Technical specification

Motor - General

Motor number N3202.185 30-19-2AA-W 32KW	**Phases** 3~	**Rated speed** 2950 rpm	**Rated power** 43 hp
Approval No	**Number of poles** 2	**Rated current** 58 A	**Stator variant** 38
Frequency 50 Hz	**Rated voltage** 380 V	**Insulation class** H	**Type of Duty** S1

Motor - Technical

Power factor - 1/1 Load 0.93	**Motor efficiency - 1/1 Load** 90.1 %	**Total moment of inertia** 3.76 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.92	**Motor efficiency - 3/4 Load** 90.6 %	**Starting current, direct starting** 405 A	
Power factor - 1/2 Load 0.88	**Motor efficiency - 1/2 Load** 90.0 %	**Starting current, star-delta** 135 A	

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

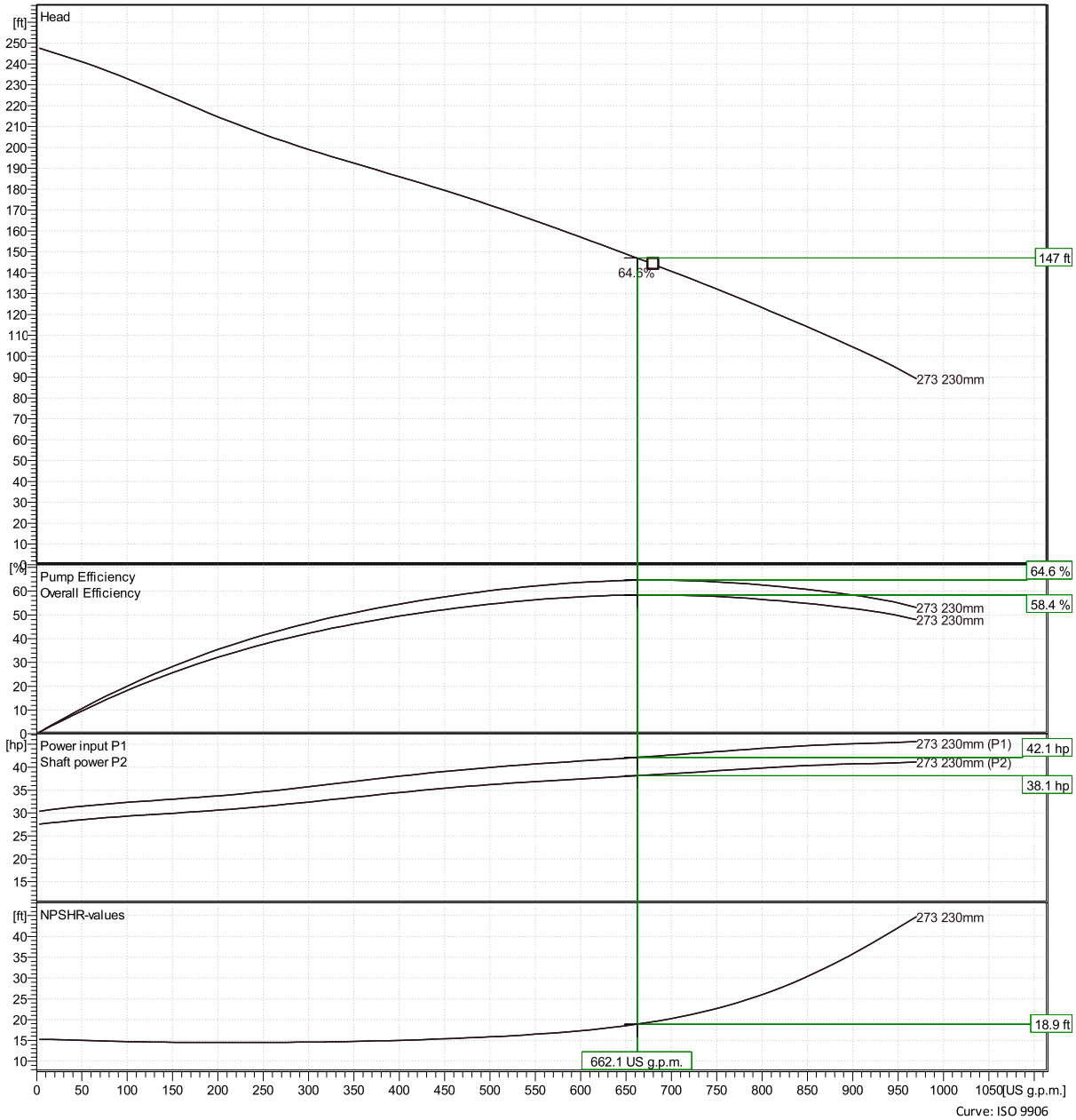
NP 3202 SH 3~ 273

Performance curve

Duty point

Flow	Head
662 US g.p.m.	147 ft

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

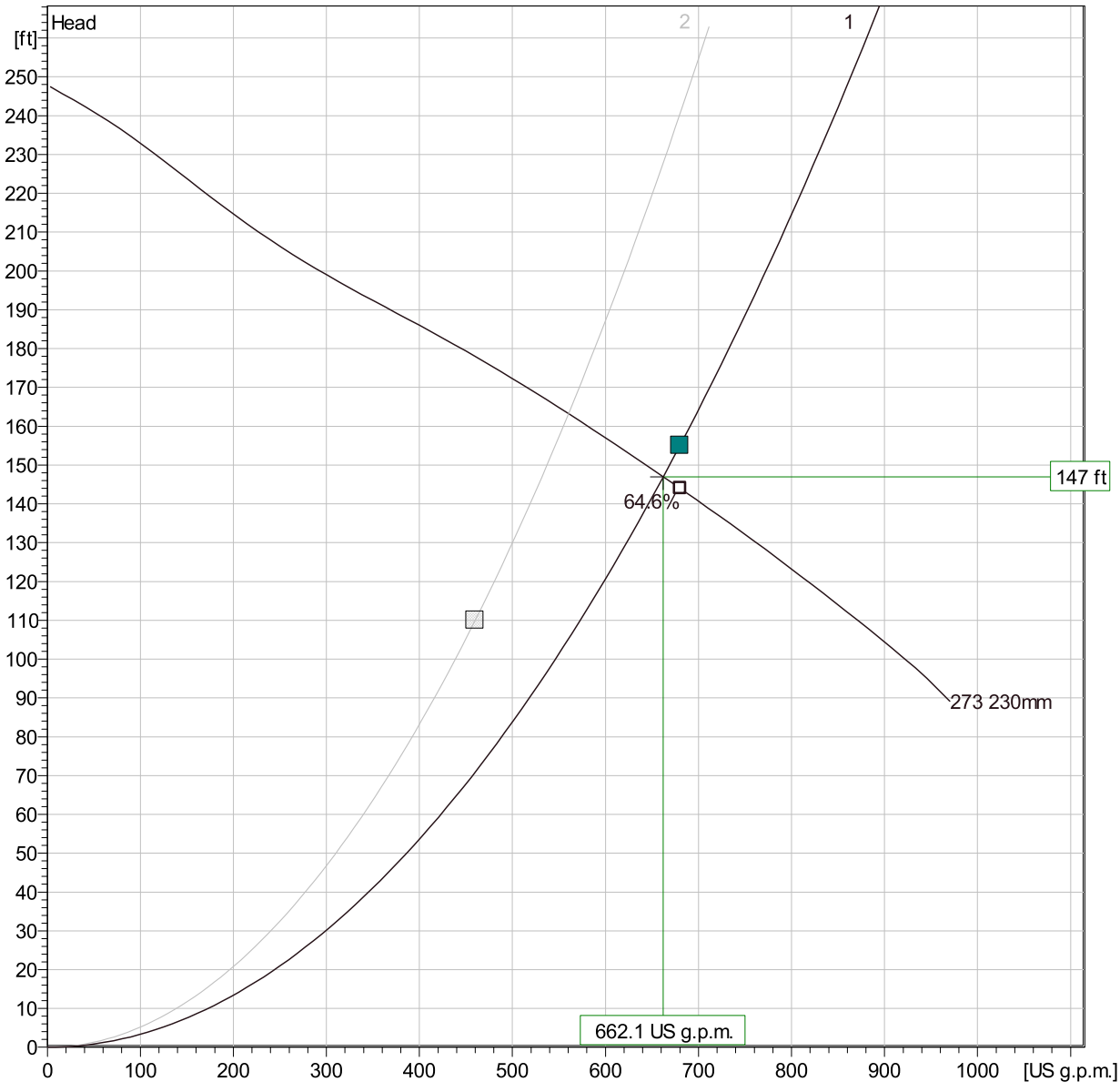


Project	Created by	Last update
Block	Created on	2/24/2020

NP 3202 SH 3~ 273

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Operating characteristics

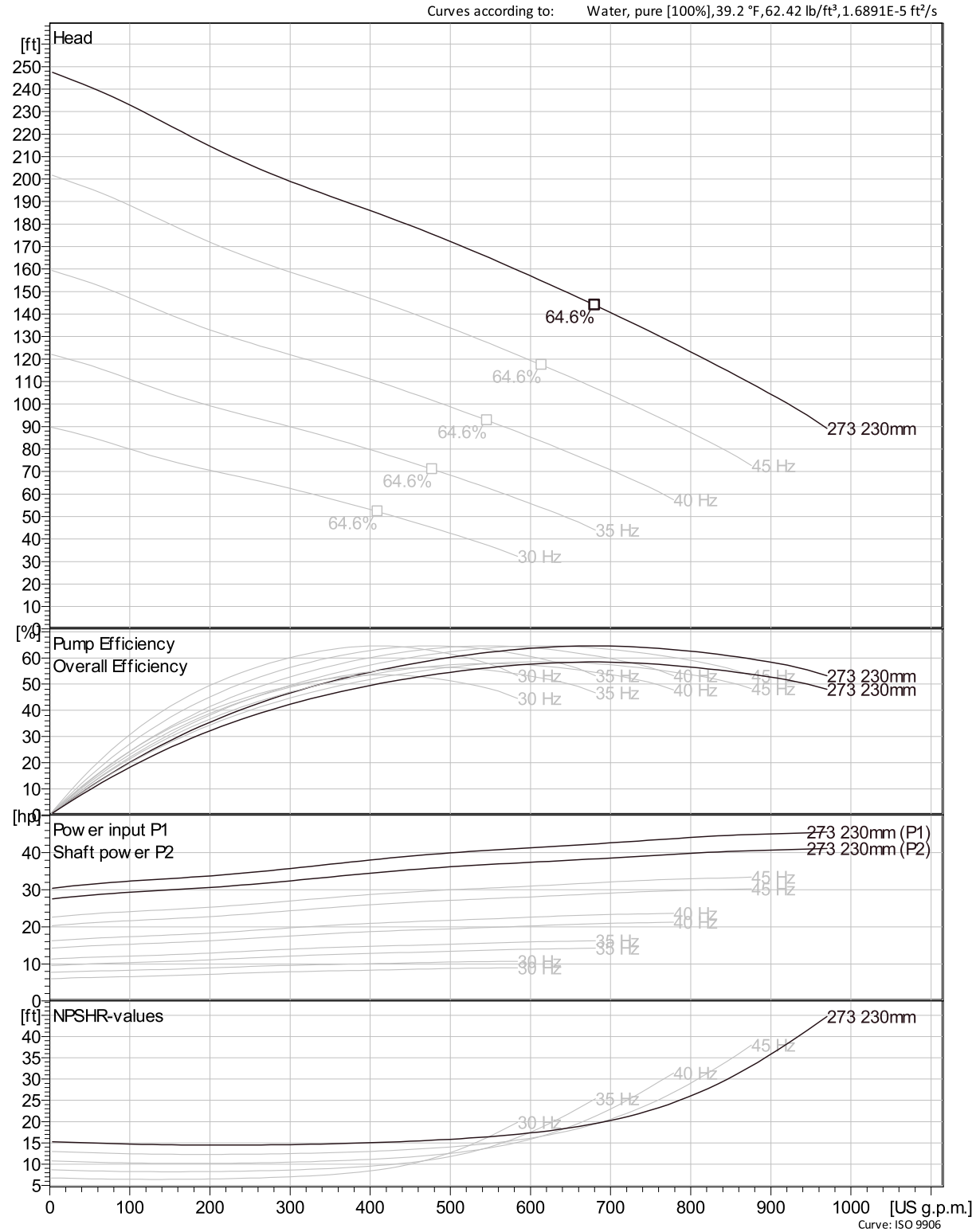
Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
2	560 US g.p.m.	163 ft	37 hp	560 US g.p.m.	163 ft	37 hp	62.6 %	906 kWh/US M(	16.6 ft
1	662 US g.p.m.	147 ft	38.1 hp	662 US g.p.m.	147 ft	38.1 hp	64.6 %	791 kWh/US M(	18.9 ft

Project	Created by		Last update
Block	Created on	2/24/2020	

NP 3202 SH 3~ 273

VFD Curve

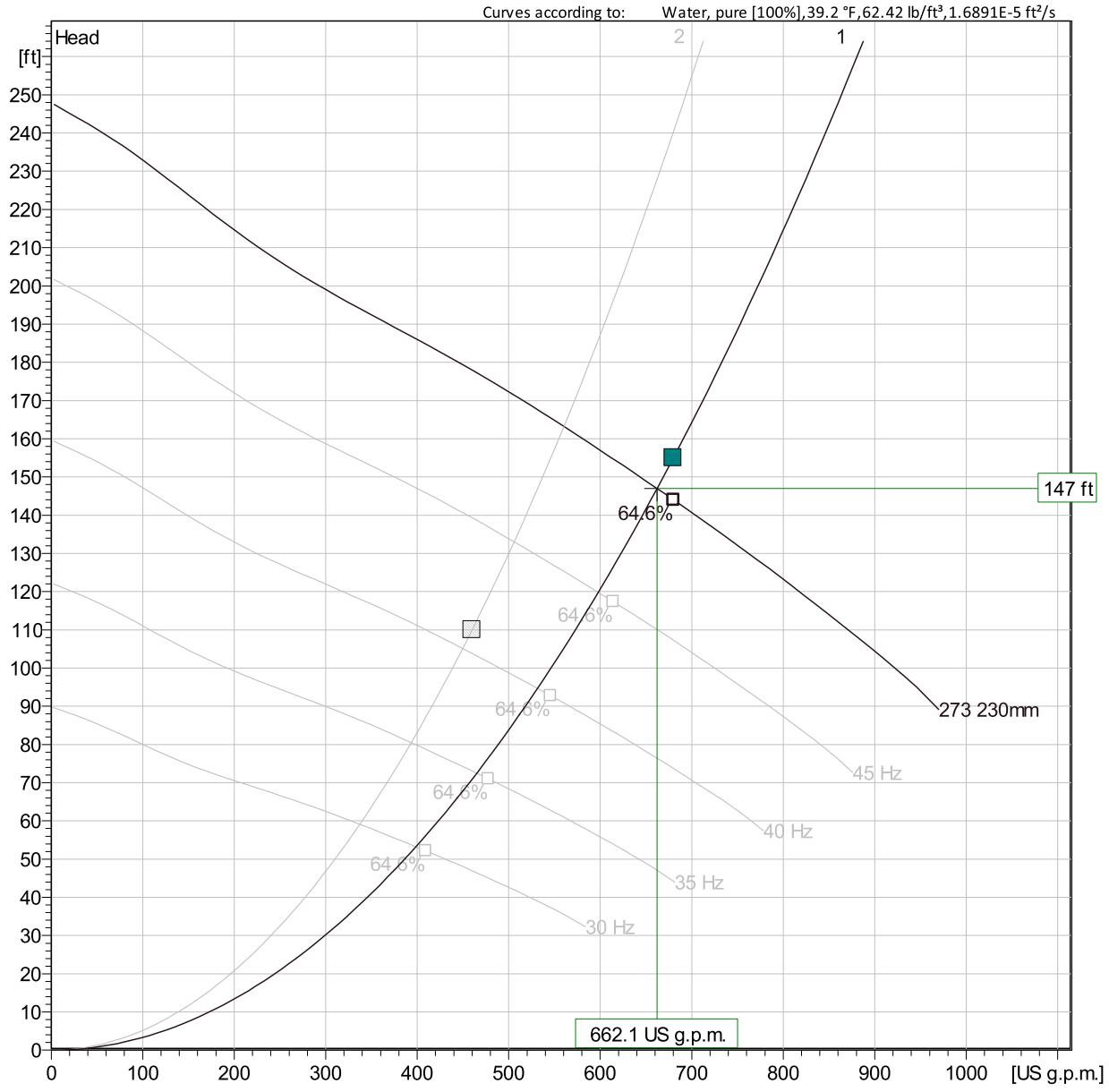
FLYGT a xylem brand



Project		**Created by**	**Last update**
Block		**Created on**	2/24/2020

NP 3202 SH 3~ 273

VFD Analysis



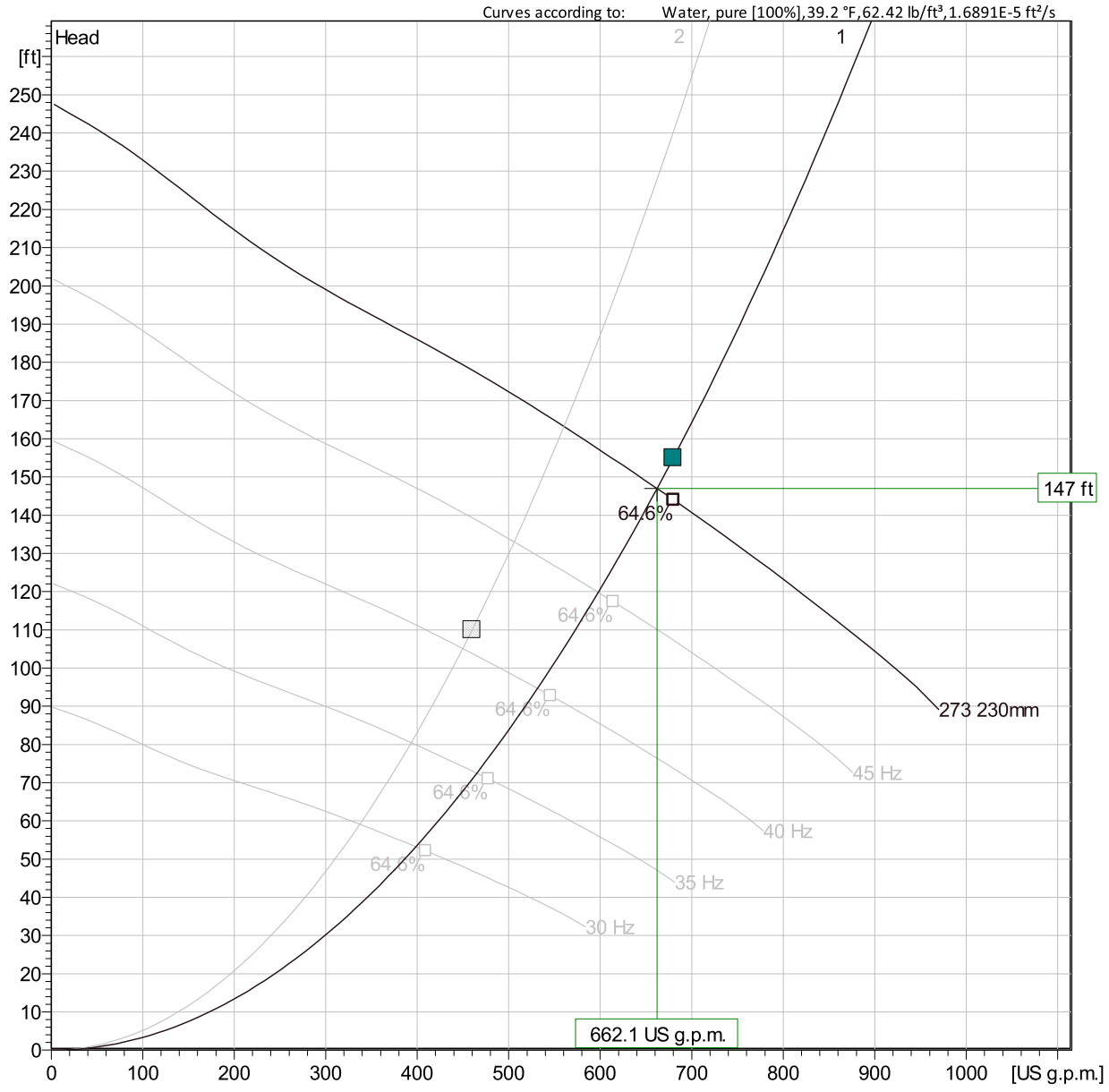
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
2	49.8 Hz	560 US g.p.m.	163 ft	37 hp	560 US g.p.m.	163 ft	37 hp	62.6 %	906 kWh/US M	16.6 ft
2	45 Hz	506 US g.p.m.	133 ft	27.3 hp	506 US g.p.m.	133 ft	27.3 hp	62.6 %	740 kWh/US M	14.2 ft
2	40 Hz	450 US g.p.m.	105 ft	19.2 hp	450 US g.p.m.	105 ft	19.2 hp	62.6 %	592 kWh/US M	11.7 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 SH 3~ 273

VFD Analysis



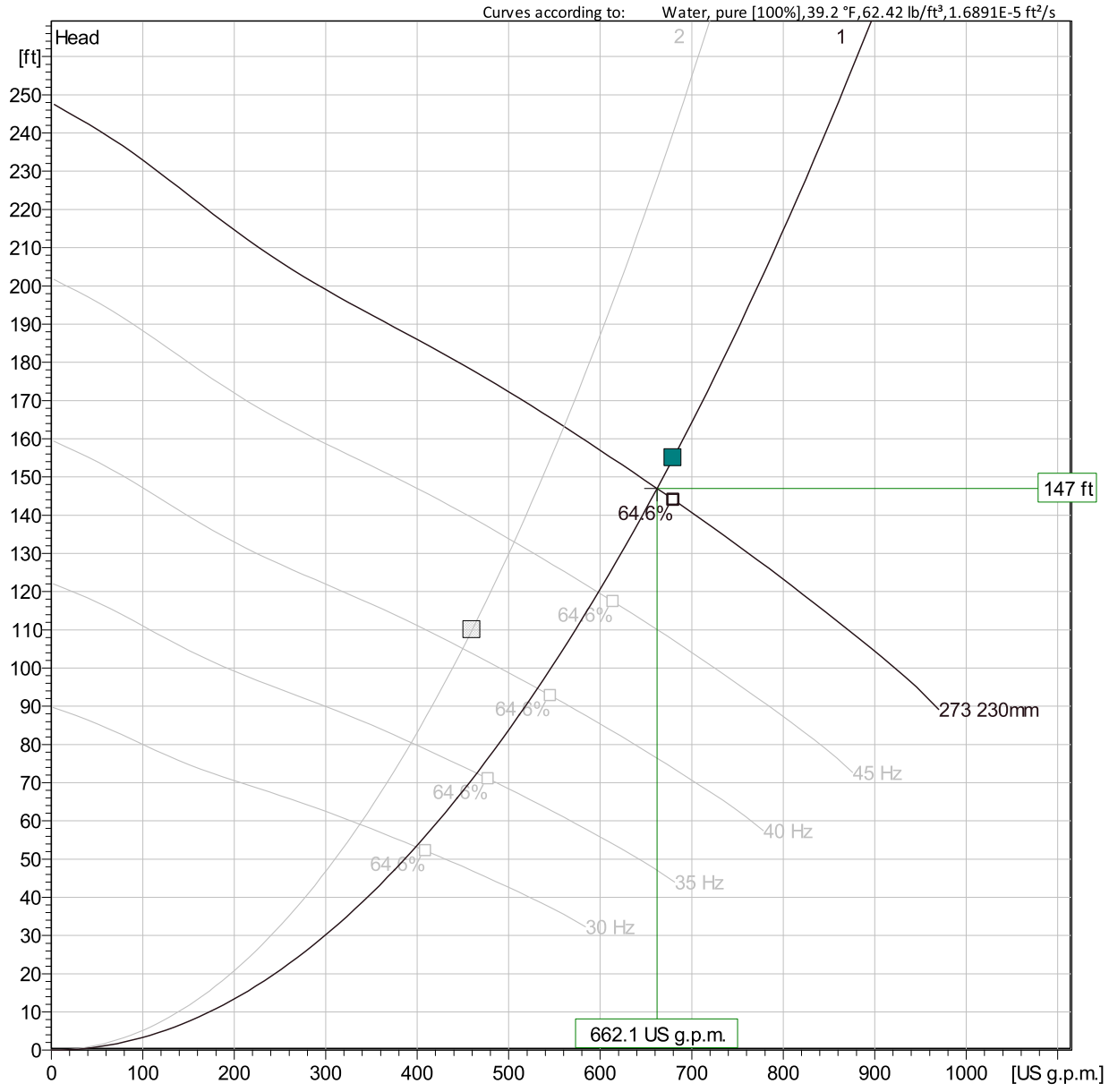
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
2	35 Hz	394 US g.p.m.	80.6 ft	12.8 hp	394 US g.p.m.	80.6 ft	12.8 hp	62.6 %	465 kWh/US M	9.47 ft
2	30 Hz	338 US g.p.m.	59.3 ft	8.09 hp	338 US g.p.m.	59.3 ft	8.09 hp	62.6 %	362 kWh/US M	7.4 ft
1	49.8 Hz	662 US g.p.m.	147 ft	38.1 hp	662 US g.p.m.	147 ft	38.1 hp	64.6 %	791 kWh/US M	18.9 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 SH 3~ 273

VFD Analysis



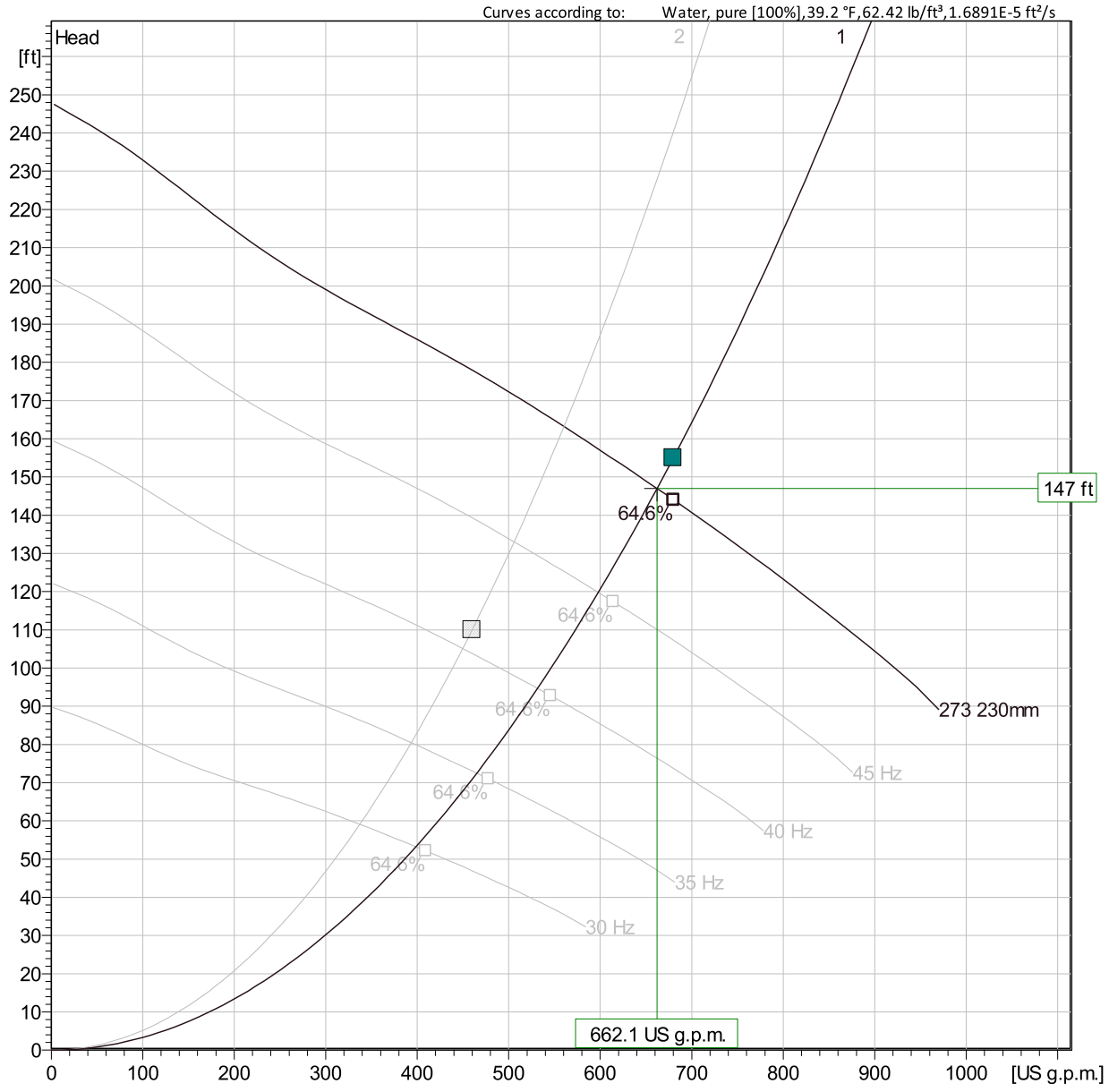
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1	45 Hz	599 US g.p.m.	120 ft	28.2 hp	599 US g.p.m.	120 ft	28.2 hp	64.6 %	645 kWh/US M	16.1 ft
1	40 Hz	532 US g.p.m.	94.9 ft	19.8 hp	532 US g.p.m.	94.9 ft	19.8 hp	64.6 %	516 kWh/US M	13.3 ft
1	35 Hz	466 US g.p.m.	72.6 ft	13.3 hp	466 US g.p.m.	72.6 ft	13.3 hp	64.6 %	405 kWh/US M	10.8 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 SH 3~ 273

VFD Analysis



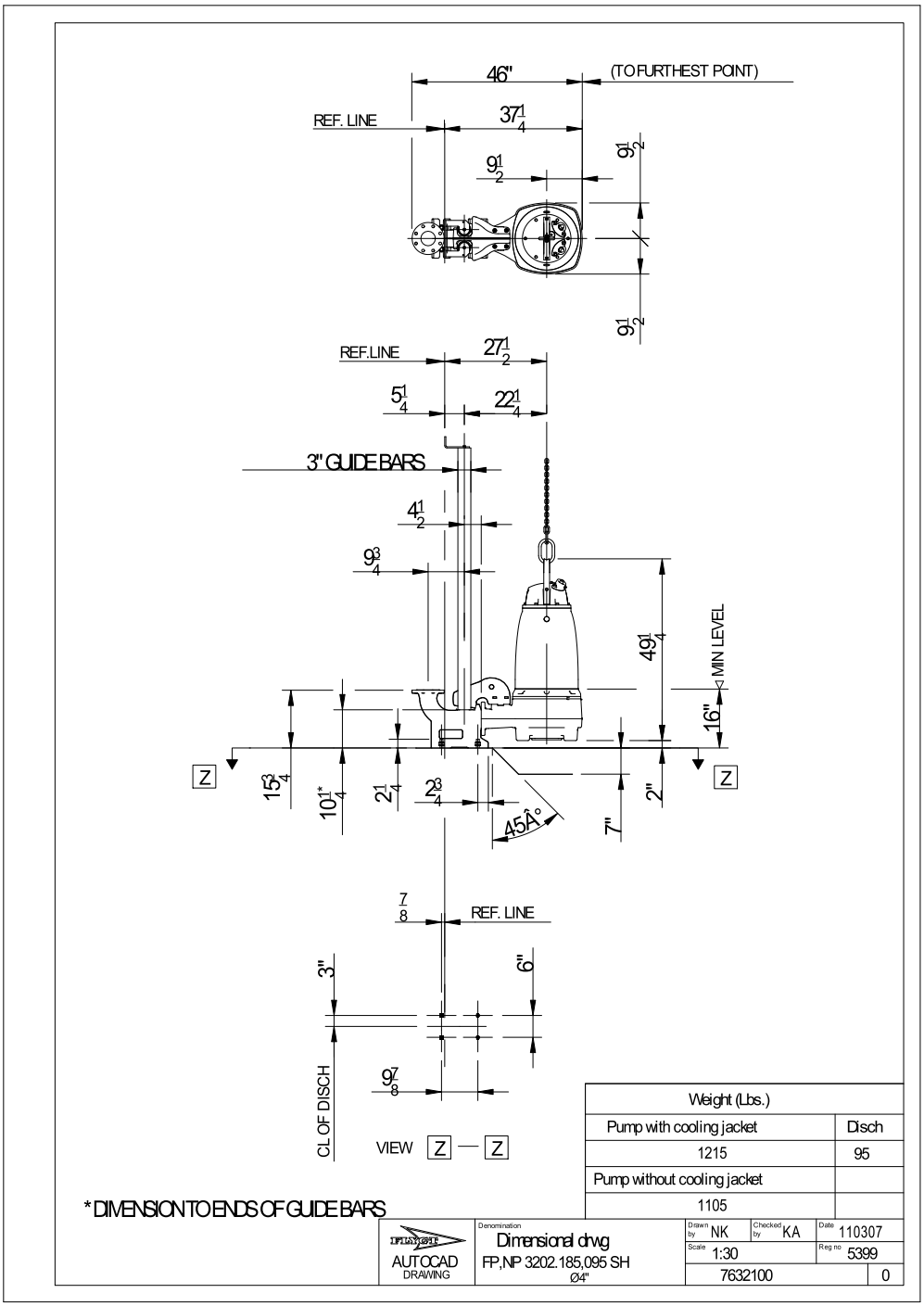
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1	30 Hz	399 US g.p.m.	53.4 ft	8.34 hp	399 US g.p.m.	53.4 ft	8.34 hp	64.6 %	314 kWh/US M	8.41 ft

Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

NP 3202 SH 3~ 273

Dimensional Drawing



Project	**Created by**		**Last update**
Block	**Created on**	2/24/2020	

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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