PRELIMINARY

ROCKY RIDGE AND LAKEWOOD SEWER PUMP STATIONS PREDESIGN REPORT

Prepared for Lake Whatcom Water and Sewer District

July 2022

LWWSD 21.0130

Prepared by:
RH2 Engineering, Inc.
Pacific Meridian Plaza
4164 Meridian Street, Suite 302
Bellingham, WA 98226
1.800.720.8052 / rh2.com

PRELIMINARY

Lake Whatcom Water and Sewer District

Rocky Ridge And Lakewood Sewer Pump Stations Predesign Report

July 2022

Prepared by RH2 Engineering, Inc.

Prepared for Lake Whatcom Water and Sewer District

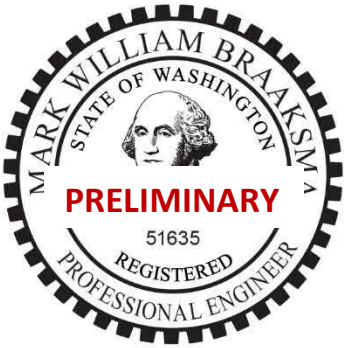
Note: This Preliminary Design Report was completed under the direct supervision of the following Licensed Professional Engineers registered in the State of Washington.

Sincerely,

RH2 ENGINEERING, INC.

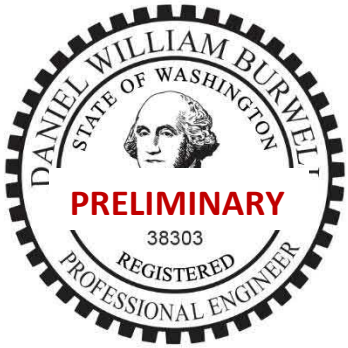
Project Engineer

Signed: 07/XX/2022



Electrical Engineer

Signed: 07/XX/2022



Project Manager

Signed: 07/XX/2022

Lake Whatcom Water and Sewer District

Rocky Ridge And Lakewood Sewer Pump Stations Predesign Report

Table of Contents

Lake Whatcom Water and Sewer District

Rocky Ridge And Lakewood Sewer Pump Stations Predesign Report

Table of Contents

Tables

Figures

Appendices

Lake Whatcom Water and Sewer District

Rocky Ridge And Lakewood Sewer Pump Stations Predesign Report

Executive Summary

The Rocky Ridge and Lakewood Sewer Pump Stations (RR and LW PSs), which are part of Lake Whatcom Water and Sewer District's (District) sewer infrastructure, are in need of rehabilitation. The RR and LW PSs have been identified as part of the District's long-term plan to replace all pump stations greater than 40 years old. These stations are beginning to approach the end of their lifespan and the maintenance frequency has increased.

Data from the District's supervisory control and data acquisition (SCADA) system was analyzed monthly from 2015 to 2021 and hourly between January 1, 2021 and December 31, 2021, to determine historical flow rates for the RR and LW PSs. The maximum historic peak daily flow rate of 38 gallons per minute (gpm) was seen during a 48-hour period on November 22, and 23, 2021. This was a historic storm and flood event. Average daily flows for the year-long study period were 2 gpm. Build-out projections for the flow rates will not vary significantly as Rocky Ridge has only five undeveloped lots that will not add significant flows.

Both stations service small sewer basins with similar hydraulics (100 gpm pumps ranging in discharge head of 70 to 85 feet). Both stations utilize 230 Volt, 3-phase power drops. Each pump station contains two pumps ranging from 10 to 15 horsepower each. Both stations will have their power runs replaced as repairs in the past 40 years have required splicing and may be damaged. The power drops themselves will be reused to save cost. **Alternatives 1** through **3** will include a meter placed near Lake Whatcom Boulevard to reduce lake front disturbance.

Four alternatives were reviewed to replace the Rocky Ridge and Lakewood Pump Stations.

- **Alternative 1** – Smith & Loveless dry prime pump station with custom control panel meeting District standard requirements. This is basically a like-for-like replacement of the existing station with improvements to controls and monitoring. The cost for this alternative is estimated at $1.5 million.
- **Alternative 2** – Gorman Rupp belt drive pump station with custom control panel meeting District standard requirements. This is like **Alternative 1** with a different pump station manufacturer. The cost for this alternative is estimated at $1.2 million.
- **Alternative 3** – Flygt submersible pump station with custom control panel meeting District standard requirements. This alternative is similar to what was done at the District's Par, Strawberry Point, and Boulevard Pump Stations. The cost for this alternative is estimated at $1.4 million.
- **Alternative 4** – E-One individual home grinder pumps with 2-inch force mains connecting to existing force main or gravity sewer routed to the nearest existing piping from each home. The E-One pumps are semi-positive displacement (pump to the same pressure within a narrow flow range) pumps with a grinder head at the pump intake to

reduce clogging potential. Rocky Ridge would include 12 pump stations. Lakewood would include 7 pump stations. Future pumps and force mains would be required with new development. The cost for this alterative is estimated at $1.6 million.

RH2 Engineering, Inc., (RH2) recommends, in concurrence with District staff, **Alternative 1** or **2** for the rehabilitation of the RR and LW PSs, which are summarized as follows:

- Pumps: Two 10 to 15 horsepower (hp) Smith & Loveless or Gorman Rupp top-mounted packaged pump stations with an adjacent pedestal-mounted custom control panel.
- Meter: Place a meter in Lake Whatcom Boulevard to measure flows from each station away from the shoreline.
- Generator: Provide plug in connections and a manual transfer switch at the power drops on Lake Whatcom Boulevard.
- Electrical: House electrical/telemetry controls and panels in pedestal-mounted enclosures near the wet well. Power drops will not be rebuilt, but service lines will be replaced from the power drop down to the pump stations.
- Force Main: Connect the discharge of the pump stations to the existing force main. This will maintain a scour velocity of approximately 5 feet per second to maintain the force main and keep solids from building up or settling at low points. A future project in the next 40 or more years is anticipated to be the lining of the gravity sewer mains and force mains.

Total Preliminary Project Cost

A preliminary total project cost estimate for the chosen alternative is $1.2 to $1.5 million. Alternative 1 may come down in cost as happened during bidding of the Edgewater and Dellesta projects. Bidding competition will help keep costs down. The evaluation of various alternatives for the RR and LW PSs varied from $1.2 million to $1.6 million in total project costs, with add ons ranging from of $130,000 to $180,000 to improve access. The add ons were not chosen at this time but can be pursued in design or added later as needed.

Chapter 1 – Introduction

Background

The Lake Whatcom Water and Sewer District (District) serves the area around Lake Whatcom. The District owns, operates, and maintains approximately 367,000 linear feet (lf) (70 miles) of gravity sewer pipe, 77,000 lf of force main pipe, and 28 sewer pump stations. As part of the District's long-term plan, the Rocky Ridge and Lakewood Sewer Pump Stations are both due for replacement. This Predesign Report (Report) addresses the rehabilitation of the Rocky Ridge and Lakewood Sewer Pump Stations (RR and LW PSs).

This Report includes an alternatives analysis to replace the RR and LW PSs. RH2 Engineering, Inc., (RH2) prepared a review of existing and future conditions, summarized alternatives to consider, prepared preliminary construction and project cost estimates, and evaluated alternatives based on RH2 and District preferences. The District's chosen alternative is described in the **Conclusion** and **Executive Summary** sections.

The RR and LW PSs are situated in the Lake Whatcom watershed along the south side of the lake within easements and/or on private property. Both stations are Smith & Loveless (S&L) wet well mounted, dry prime pump stations housed within a hinged fiberglass cover. Apart from the cover there are a couple of electrical components onsite. The stations were constructed in the late 1970s, and the pumps, motors, valves, electrical controls, and telemetry system have reached the end of their design life.

The RR and LW PSs are located east of the Boulevard Pump Station and west of the Airport Pump Station. The Rocky Ridge PS is accessed via Woodcliff Lane and a trail down to the station. The Lakewood PS is accessed from a private driveway and access/maintenance easement and a trail on Western Washington University (WWU) land to the site.

Each station is relatively small, consisting of duplicate pumps with flow capacities of 100 gallons per minute (gpm) and significant discharge head to pump south and up to Lake Whatcom Boulevard, which is approximately 70 feet higher than the shoreline locations of the pump stations. The power services to both stations are currently 230 Volt, 3-phase power.

The project will require Whatcom County Shoreline Substantial Development, Variance, and Conditional Use Permits. Regardless of the alternative chosen, there will be minor expansion of the existing footprints due to pump control and telemetry panel replacements to meet District standards. Refer to the **Permitting Information** section in this chapter for details.

The focus of the predesign study is to find the most economic and low maintenance replacement option. Due to their remote locations, careful consideration is necessary, as getting equipment and parts to the site will be costly, both for construction and long-term maintenance. During construction, shipment of materials will likely require a barge and offloading by crane or excavator on the barge.

The District desired to review existing conditions and formulate a rehabilitation plan. To accomplish this, conditions were assessed, a survey of the basins was completed by aerial drone, alternatives were reviewed, and a preferred alternative was chosen.

Once chosen, design will progress to 30 percent to complete shoreline permitting. Final design will then be completed, with construction scheduled for summer of 2023 or potentially 2024. Construction may be delayed due to District budgets and material and labor availability due to the COVID pandemic.

Rocky Ridge

The Rocky Ridge Sewage Basin (RRSB) receives sewage from 12 properties along the lake, encompassing approximately 11 acres. **Figure 1-1** shows the RRSB. The basin has five unbuilt lots and the new pump station will be designed with this in mind. The sewage is pumped and transported via the existing 4-inch ductile iron force main to a manhole in Lake Whatcom Boulevard that flows west (down Lake) to the Boulevard Pump Station. Boulevard Pump Station pumps west to a hill at Strawberry Point where it flows by gravity towards the Cable Street Pump Station where it is again pumped into the City of Bellingham's system at Flynn Street and Electric Avenue.

Lakewood

The Lakewood Sewage Basin (LWSB) receives sewage from 7 properties along the lake, encompassing approximately 4 acres. **Figure 1-2** shows the LWSB. The basin is fully built out with no further growth expected. The sewage is pumped and transported via the existing 4-inch ductile iron force main to a manhole south of Lake Whatcom Boulevard that flows east (up Lake) to the Airport Pump Station. The Airport Pump Station pumps west to the same hill at Strawberry Point as described in the **Rocky Ridge** section above, combining with Rocky Ridge's sewage.

NOTE: FOR PARCELS WITH MISSING OR INCOMPLETE SIDE SEWER AS-BUILT INFORMATION, THE SEWER CONNECTION LINE HAS BEEN ASSUMED AND DRAWN DENOTED WITH "UNK SS"

PRELIMINARY

FIGURE 1-1: ROCKY RIDGE SEWER BASIN

SEWER PUMP STATION IMPROVEMENTS

SCALE: 1" = 100'

0" 1/2" 1"

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022

FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrfix-e-predesign.dwg

PRELIMINARY

NOTE: FOR PARCELS WITH MISSING OR INCOMPLETE SIDE SEWER AS-BUILT INFORMATION, THE SEWER CONNECTION LINE HAS BEEN ASSUMED AND DRAWN DENOTED WITH "UNK SS"

FIGURE 1-2: LAKEWOOD SEWER BASIN

SEWER PUMP STATION IMPROVEMENTS

SCALE: 1" = 100'

0" 1/2" 1"

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022

FILE PATH: J:\Data\LWWSD\21-0310\CAD\rtw-e-predesign.dwg

Permitting Information

Due to the RR and LW PSs location within 100 feet of Lake Whatcom, the pump stations will require Shoreline Variance and Conditional Use Permits. It is important to note that expansion of the existing structures and impervious areas also will require Shoreline Substantial Development Permits. Accommodating a functional, maintainable, and accessible system within the existing footprint and in the sewage basin may require some compromises if a shoreline exemption is pursued. The pump stations are bordered on the north side by the lake. During design, a detailed temporary erosion and sediment control plan will be incorporated to protect the lake. In addition, the RR and LW PSs are on private property. If a structure over 200 square feet and/or a retaining wall 4 feet high or higher is required, a building permit will be needed.

The chosen alternative includes a slight expansion of footprint for the electrical panels. Because the locations are right on the shoreline, Whatcom County will review any expansion as requiring a Shoreline Substantial Development Permit.

State Environmental Policy Act (SEPA) permitting will be completed by the District's SEPA official. Projects with more than 500 square feet of disturbance or more than 50 cubic yards of excavation must be completed between June 1st and September 30th to comply with Whatcom County's watershed construction window.

Any project in the Lake Whatcom Watershed Overlay District will require the preparation of a Construction Stormwater Pollution Prevention Plan. The projects are anticipated to create less than 501 square feet of impervious surfaces excluding the add on options and the installation of new power services. The new power services would be classified as exempt from stormwater management as they involve the installation of below-grade cabling and wiring (direct burial or conduit encased). The add-ons for improving access to each of the pump stations would require additional stormwater permitting and the preparation of a full stormwater site plan report. These add ons also would require mitigation in addition to the above-referenced permitting items.

Chapter 2 – Flow Monitoring

Estimation of Future Sewer Flows

The RRSB has 12 built parcels and 5 vacant parcels. As a result, the rehabilitation of the RR PS will account for residential units being constructed on all parcels able to be developed. Currently, 70 percent of the basin is developed. To determine flows from these additional parcels, equivalent residential units (ERUs) are applied, which is a standard unit of measure equal to what one single-family residence sends to the sewer system per day averaged for a year. Peaking factors for peak day and peak hour are applied and compared to historical pump run times to verify flows.

The existing zoning and the sewer basin development history make it straightforward to predict the future basin flow. Upon analyzing recorded data provided by the District, as well as pump drawdown testing discussed in the **Pump Testing** section of this Report, existing flow rates and developments were utilized to develop future flow assumptions. The flow rate of existing ERUs per parcel was then applied to future parcels.

The LWSB is fully developed with seven parcels. This basin is not expected to expand as it is surrounded by Lake Whatcom, the Airport Sewage Basin, and the WWU Sewage Basin.

Infiltration and Inflow

The association between peak storm events and peak flows within the RRSB and LWSB indicate that infiltration and inflow (I&I) does not pose an extreme issue for the pump stations. The analysis was based on several factors, including daily pump run data provided by the District, the basin's developed parcels, and historical precipitation values provided by the District and verified through a nearby weather station. The US Environmental Protection Agency (EPA) thresholds for wet weather and dry weather flows were used as a guide in determining if excessive infiltration and inflow posed an issue to the pump stations. The infiltration criterion was based on gallons per person per day (gppd). To determine this value, the average of the peak 7- to 14-day event during which there was no precipitation was divided by the population served. Assuming that there were 2.59 people per household (from the District's *2020 Comprehensive Sewer Plan*), the total population was determined for the basin. The results shown in **Table 2.1** indicate that the RR and LW PSs are below the thresholds for both infiltration and inflow and do not require further study at this time. Excessive I&I is considered to be gppd flow above EPA thresholds of 120 gppd in dry weather periods and 275 gppd in wet weather periods.

Table 2.1

RR and LW PSs I&I Analysis

	Dry Flow		Wet Flow	
	gpd	gppd	gpd	gppd
Rocky Ridge	832	27	6,045	194
Lakewood	722	40	4,538	250
EPA Thresholds		120		275

J:\Data\LWWSD\21-0310\15 Predesign Rocky Ridge and Lakewood Historical Pump Run Time.xlsx , I&I

Force Main

The force mains from the RR and LW PSs rises in elevation by approximately 70 feet along their approximate 350 lf and 500 lf horizontal length, respectively, to the connection points and the transition to gravity in and near Lake Whatcom Boulevard. The force main pipe for both stations is labelled ductile iron (DI) pipe, and this was confirmed by maintenance staff and checked in the wet well of each station.

With average flow rates at full buildout estimated at 2 gallons per minute (gpm) for each station, the 4-inch force main is oversized. The 4-inch force main is generally a standard minimum diameter, balancing the need for a non-clog system and flows at 100 gpm to scour the main. The District would like construction of the replacement system to utilize the least cost method. The existing 4-inch force mains could be sliplined with 2-inch high-density polyethylene (HDPE) force main to allow for smaller pumps. This will increase the risk of a possible clog (although grinder pumps will allow a maximum 1-inch sphere into the main). A 2-inch force main will be scoured with a velocity of 5 feet per second with a 50 gpm pump.

The existing force main may need to be excavated at sharp bends to get the 2-inch main sliplined. The force main was placed in steep, poorly accessible, and rocky terrain that will be expensive to replace and/or slipline.

With the force main having no known failures, slightly larger pumps (100 gpm rated vs. 50 gpm rated) appear to be more cost effective compared to smaller pumps and a replaced or sliplined force main.

The exception is where new main is needed for **Alternative 4** (as shown on **Figures 4-4** and **4-5**) where individual pump stations and 2-inch force mains connect to the existing forcemain. This abandons the gravity collection system but adds significant force main, pumps, and controls to maintain.

The District has inspected the gravity and force mains and found a belly at the west end of the Lakewood gravity sewer near the last service. No short-term improvements are planned for is pipe system. In the next 20 to 60 years the pipe will need rehabilitation. Due to access, steep slopes and shoreline proximity, cured-in-place pipe (CIPP) rehabilitation and/or sliplining of smaller diameter pipe should be considered. The cost for these improvements was estimated in **Table 2.2** and is based on CIPP, which is likely costlier but should be compared again before pursuing the rehabilitation.

Table 2.2

CIPP Future Project Cost

Alternative	Description	Rocky Ridge Construction Cost	Lakewood Construction Cost	Design Engineering	Construction Oversight	Total Project Cost
Future Project	Rehab Pipe	$316,000	$227,000	$98,000	$44,000	$685,000

J:\Data\LWWSD\21-0310\15 Predesign\Report\Appendices\Appendix A Summary Tab

Pump Testing

Pump data provided by the District's supervisory control and data acquisition (SCADA) equipment only accounted for pump on/off times. To determine actual flow rates, field testing, in the form of drawdown testing, was completed. Field testing was completed on January 19, 2022. The testing is volumetric based and determines actual flow rates using the relationship of volume changes over time in the wet well taking into consideration inflow from homes, visible leaks in the wet well, and observed flow into the wet well from full to semi-full gravity sewer inlets. Utilizing this data produced the flow rates shown in **Table 2.3**.

Table 2.3

Pump Flow

Pump Station	Pump 1 Flow	Pump 2 Flow	Pump Design (Flow and TDH)	
Unit	gpm	gpm	gpm	feet
Rocky Ridge	140	122	100	70
Lakewood	67	104	100	85

J:\Data\LWWSD\21-0310\15 Predesign RR and LW Flow Testing.xlsx summary tab

Currently, the Rocky Ridge pumps average run times were 31 minutes per day in 2021. The Lakewood pumps average run times were approximately 18 minutes per day in 2021.

Historic and Projected Flow Rates

Flows from pump run data were compared with possible growth within the Rocky Ridge sewer basin. All undeveloped lots within the basin were assumed to be developed based on GIS data made available by the District. **Figure 1-1** shows the RRSB and the developed and undeveloped lots.

Average daily demand (ADD) was estimated using a value of 180 gallons per day (gpd) per ERU for the RRSB as outlined in the District's *2020 Sewer Comprehensive Plan*. From the ADD, the peak daily demand (PDD) was approximated through the use of the District's ADD to PDD factor of 3. Lastly, the peak hourly flow (PHF) was calculated using a PHF of 4 since the basin has less than 500 ERUs. The existing 12 developed parcels and the future developed parcels result in a total of 17 parcels and the flows established in **Table 2.4**. The pump run data is from the District's SCADA system pump run times and the pump flow rates discussed in the **Pump Testing** section. Note the Pump Run Data Raw column shows the flows into the pump stations based on run times during the historic flooding event that occurred in November 2021.

The LWSB will not expand and is fully developed so future flows will be similar to existing flows.

Table 2.4

RR and LW PS Existing and Design Flow

Flow in gpm	Comprehensive Plan				Pump Run Data and Peak Factors			Pump Run Data Raw	
Rocky Ridge	Parcels	ADD	PDD	PHF	ADD	PDD	PHF	ADD	PDD
Existing Developed Parcels	12	1.5	4.5	18.0	2.1	6.4	25.6	2.1	37.7
Undeveloped Parcels	5	0.6	1.9	7.5					
Total	17	2.1	6.4	25.5	3.0	9.1	36.3		
Lakewood	Parcels	ADD	PDD	PHF	*ADD*	PDD	PHF	ADD	PDD
Total	7	0.9	2.6	10.5	1.0	3.1	12.5	1.0	38.1

J:\Data\LWWSD\21-0310\15 Predesign Rocky Ridge and Lakewood Historical Pump Run Time.xlsx , Future Flows

Total Discharge Head (TDH) was calculated based on the known length of the force main of approximately 350 and 500 feet for Rocky Ridge and Lakewood, respectively. The inside diameter of 4 inches for the DI pipe, a "C" factor of 130, and any headlosses through known fittings were checked and confirmed to match the design flow and TDH of the existing pumps as stated on construction records provided by the District.

There is a correlation between storm events and peak flows. This is not significant, as described in the **Infiltration and Inflow** section. The correlation is due to improvements in infiltration and inflow reductions to the existing sewer infrastructure, including manhole lid seals, pipe repairs, and manhole and wet well grouting and sealing. Maintenance staff are concerned about a portion of the gravity collection system at Lakewood that is ***in*** Lake Whatcom. Refer to **Photos 1** and **2** showing the manhole at typical lake level and during the flooding event in November 2021.

Photo 1 (Normal Lake Level) and 2 (Flood Level). Lakewood Manhole in Lake Whatcom. November 2021.

Maintaining 5 feet per second in the force main is advised for centrifugal pumps. It is less important for semi-positive displacement pumps because flow volume is near constant and pressure will increase to push out any solid buildup out of the pipeline.

Chapter 3 – Construction Considerations

Access

Rocky Ridge

Rocky Ridge is located on private property with no easement for its location or access to the site. Based on conversations with District staff and neighbors, access was originally from the property southeast of the pump station when the property was undeveloped. The property owner submitted plans to build, which notified the District that access would be restricted. The District sued to maintain access but lost the suit. This resulted in the access available today which is directly down from Woodcliff Lane. In the 1980s, Woodcliff Lane was a thru road but a landslide caused it to become two dead-ends. This creates difficulty with access to the site and how the power drop runs from Lake Whatcom Boulevard via the west dead end and how the best access by automobile is via the east dead end.

It is advised that any improvements be completed after obtaining an access easement and permanent easement for the facility. Costs for this effort are not included in the construction cost estimate in this Report. The District will pursue easements on its own during the predesign and design process.

District staff advised providing an elevated walkway/stairway with a lift or equipment funicular from an old, graded road (just below Woodcliff Lane) that is now grass covered down to the station. At the station, District staff advised a raised area surrounding the wet well with a landing area of approximately 100 square feet. The cost for this work was accounted for separately. Because of the cost and permitting complexity, it will not be pursued at this time. If desired, permitting will require mitigation on or offsite to build this improvement.

Lakewood

Lakewood is located between a private residence and the Lakewood facility owned by WWU. The District has access and permanent easements for the facility. The easement is a strip of unimproved land below a driveway 20 feet wide. The driveway itself is also in the easement. The unimproved strip of land is very steep with no vehicle access. District staff requested an access road to reach the station if possible. The cost for this improvement was separated from the general pump station improvements and could be added to the design. If desired, permitting will require mitigation on or offsite to build this improvement. The grade down to the station would be approximately 18 percent, which may prove difficult to negotiate with District service trucks, especially with a run out leading to the lake.

Power Utility Service Entrance

Puget Sound Energy (PSE) was approached to provide costs for a new power service entrance to each station matching District standards, which is 480, Volt 3-phase. Costs range from $40,000 to $60,000 per station. The existing power services are 230 Volt 3-phase. The existing services are large enough to handle the pump variations for **Alternatives 1** through **3**, and pump suppliers can provide the pump stations with either 230 or 480 Volt motors.

The existing power services do not appear to be across private property, therefore, upgrades by PSE to meet modern easement requirements do not appear to be in conflict. PSE will need to maintain the existing power service with no additional cost to the District if it is to be reused with the improvements. RH2 recommends reusing the existing power services at both stations.

Lakewood In Lake Components

The majority of the gravity collection system for the Lakewood Pump Station is in Lake Whatcom. This includes an epoxy-coated manhole and approximately 600 feet of 8-inch gravity sewer pipe. The construction records show the gravity line on the shore approximately 5 feet from the lake. After the pipe was installed, the City of Bellingham built the Lake Whatcom dam which raised the lake approximately 5 feet. Staff would like to move any sewer components in the lake out of the lake but realize the construction cost, permitting, and easement effort to be costly (**Photos 1** and **2**).

Temporary Pumping

During construction, a temporary pumping system will be located in the upstream manholes or in the existing wet well. The LW PS already has a bypass connection to the force main that was installed for emergency preparedness. The bypass pump port is located south of the wet well. There are three alternative temporary pumping systems to consider:

1. The contractor provides and operates the temporary sewage pumps. The discharge from the pump would be routed via hose to the bypass connection system;
2. The contractor purchases a trailer-mounted sewage pump as part of the construction contract. The contractor operates and maintains the pump for temporary pumping. Upon completion of construction, the trailer-mounted sewage pump is delivered to the District for future projects and/or maintenance; or
3. Specific **to Alternative 4**, no temporary pumping would be needed as adequate storage is available to complete force main tie ins as individual pumps would connect to the existing force main until the wet well itself no longer receives sewage.

The preferred alternative for the Smith & Loveless or Gorman Rupp replacement pump station requires downtime for approximately 2 weeks. This downtime will include SCADA system upgrades and the replacement of the existing pump station. During this time, the wet well does not need to be fully rehabilitated if infiltration is observed to be negligible. If the District does not need to bypass the wet well, considerable cost savings can be realized. LW PS will be fairly easy to pump out of the last manhole, but this manhole is in the lake. RR PS has two inlets into the wet well so a “wet well in a wet well” concept is likely needed for temporary pumping.

The ”wet well in a wet well” concept would include a pump in a vertical large diameter pipe set inside the wet well and connected to the gravity inlets. This allows access to rehabilitate the wet well with no sewage in contact with the existing concrete walls, chamfer, and floor.

Buoyancy Control

The existing RR and LW PS wet wells are 6-foot-diameter concrete cylinders per onsite review and construction records. The wet well floor, walls, chamfer, and pump station lid weight will need to be compared to the buoyant forces, assuming groundwater is at or near the surface of the lake. A buoyancy control plan will be necessary by the contractor to ensure the wet well will not float at any point throughout the construction process. This is particularly important if the chamfer in the wet well needs to be removed. Typically, this has been accommodated by placing ecology blocks on top of the wet well walls.

Minimizing Lake View Blockage

From past experience with residents neighboring District facilities, a primary concern tends to be lake view blockage; therefore, the District wants to minimize this issue. Ideas include reducing or not utilizing an awning. In addition, reducing heights of electrical panels may also reduce view blockage of the lake.

During design, Whatcom County comments and additional comments from the neighbors may fine tune the location of the electrical panels, balancing the wants and needs of the neighbors and the permitting authority.

Force Main Modification

As discussed in the **Chapter 2 – Flow Monitoring, Force Main** section, the force main could be rehabilitated by CIPP or sliplined with smaller diameter pipe for **Alternatives 1** through **3. Alternative 4** would include 2-inch force mains from each house to a common force main, which would require rehabilitation long term. The cost of sliplining or replacing the 4-inch force main is high and unnecessary at this time. A future project cost associated with the force main is discussed in the **Force Main** section.

RH2 recommends reuse of the existing 4-inch force mains as much as possible as no known repairs have been completed and the piping is most likely capable of at least another 50 years of use.

Upon completion of the projects, if reduced flows below approximately 10 percent of calculations are seen, the force main outlets should be inspected as tubercles could be present. These tubercles can be augered out with special cutting machines to increase flow capacity.

Chapter 4 – Alternatives

"Outside the Box" Alternatives

Directional Drill Between Stations

The two stations are about 2,400 feet apart. A directional drill in sandstone over this distance on a shoreline will be nearly impossible to place in a straight line for gravity flow to the other station to eliminate the need for one of the stations. In addition, the variability in rock quality will cause frack outs of the drilling fluid that will most likely get into the lake. While the drilling fluid is inert, Whatcom County will require mitigation for containing any frack outs, and the frack outs will be difficult to locate and then contain. The Country Club directional drill project cost was about $400,000 and was approximately one third the distance. In addition, the cost of getting the equipment to the shoreline, price escalation due to COVID, inflation, material shortages, and labor scarcity, and easements for more than 19 properties and this pipe alone is estimated at $1.5 million; therefore, it was not considered further.

Pneumatic Pump Stations

If installed, Pneumatic pumps would introduce a new type of system that the District would have to maintain and buy parts for. Air compressors in general are higher maintenance than a small sewage pump. Power costs to run the compressors will be higher than a sewage pump due to pipe lengths and friction losses in the air pipe and sewage pipe. Seattle had "air ejector" pneumatic pump stations (https://www.youtube.com/watch?v=8ROFfOxypno) and City of Seattle staff disliked them. Seattle has phased them out. The air compressors were difficult to maintain.

RH2 also is concerned the addition of air to the cast iron (CI) force mains would cause tubercle growth, as seen at the outlet of the Cable Street force main in 2009. The end of the Cable Street force main was augured out to remove tubercles as this reduced capacity. Tubercles grow where the pipe sees mixing of sewage and air, causing bacterial growth and resulting in ferrous oxide deposition (tubercles). They are not easy to remove. Therefore, this type of pump station was not considered further.

Pump Selection

A variety of pump manufacturers were evaluated for this pump station, including Smith and S&L, Gorman Rupp, Flygt, and E-One. The current S&L package system installed at the RR and LW PS has been reliable with minimal maintenance over the past 40 years and no major shut downs. This maintenance history makes S&L a strong choice for the replacement pumps. S&L standard designs and controls are cost effective but customization of the controls drives cost up. Edgewater and Dellesta PSs were replaced with S&L systems but adding a Gorman Rupp equivalent would reduce costs by about $50,000 per station per discussion with local contractors.

- **Alternative 1**: S&L packaged station, top mount type, electrical, and control in dog house with one panel on a pedestal. Reference **Figure 4-1** for a schematic layout of this alternative.
- **Alternative 2**: Gorman Rupp belt drive pumps, electrical, and control in dog house with one panel on a pedestal. Reference **Figure 4-2** for a schematic layout of this alternative.
- **Alternative 3**: Flygt N-impeller submersible pumps, electrical, control in pedestal-mounted panels. Reference **Figure 4-3** for a schematic layout of this alternative.
- **Alternative 4**: E-one grinder/semi-positive displacement pumps at each household. Install 2-inch force main to connect to the existing force main. Reference **Figures 4-4** and **4-5** for schematic layout for this alternative for Rocky Ridge and Lakewood sewer basins, respectively.

After reviewing the pump information with District staff, S&L or Gorman Rupp are preferred for the RR and LW PSs for the following reasons:

1. Less footprint for the check valve vault outside of the wet well footprint.
2. Lower capital cost.
3. Low maintenance cost.
4. Less downtime to swap out pump stations.
5. Less disruption to property, less conflict with neighbors, and less mitigation cost.

Pump Requirements

- Flow: 100 gpm for **Alternatives 1**, **2**, and **3**.
- Flow: **Alternative 4** E-One pumps will be about 7 gpm per household.
- TDH: 70 feet at Rocky Ridge; 85 feet at Lakewood.

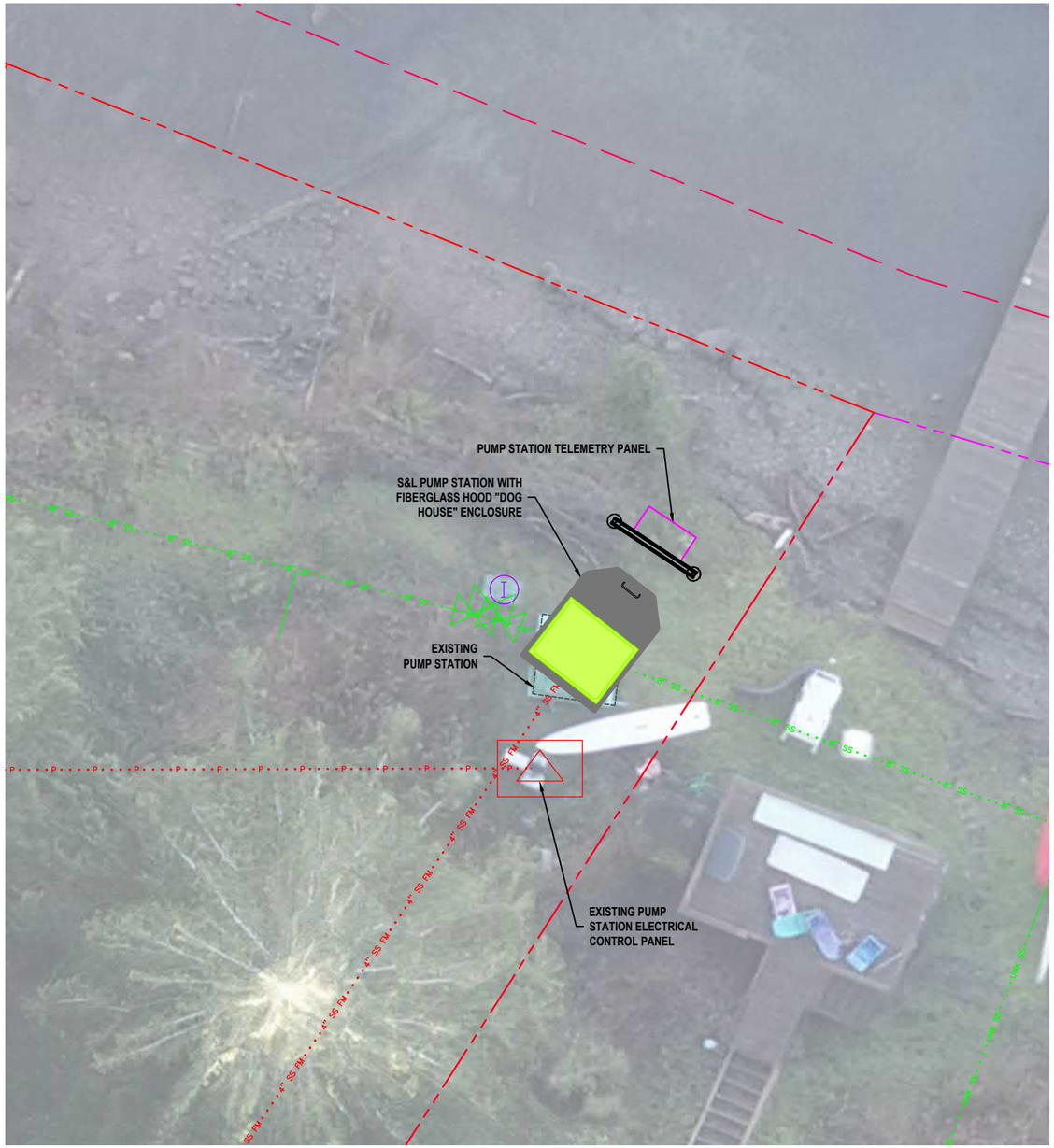
Pump Station Mechanical

Four mechanical alternatives are being provided for consideration by the District. **Alternatives 1** and **2** include a pump station set above the wet well with check valves and a pump control panel set above the wet well (S&L and Gorman Rupp). **Alternative 3** is based on the use of submersible pumps with ball check valves set beside it (Flygt).

Alternative 4 is a reconfiguration of the collection system with semi-positive displacement grinder pumps (E-One) provided to each household with 2-inch-diameter forcemain connected to the existing 4-inch forcemain or Sudden Valley forcemain.

To reduce footprint expansion near the Lake, a meter vault for each station will be installed at the end of the force mains in Lake Whatcom Boulevard. This will reduce costs by not requiring mitigation for the footprint expansion adjacent to Lake Whatcom. The meter also will be more accessible.

PRELIMINARY



ROCKY RIDGE SEWER PUMP STATION
1" = 10'

LAKEWOOD SEWER PUMP STATION
1" = 10'

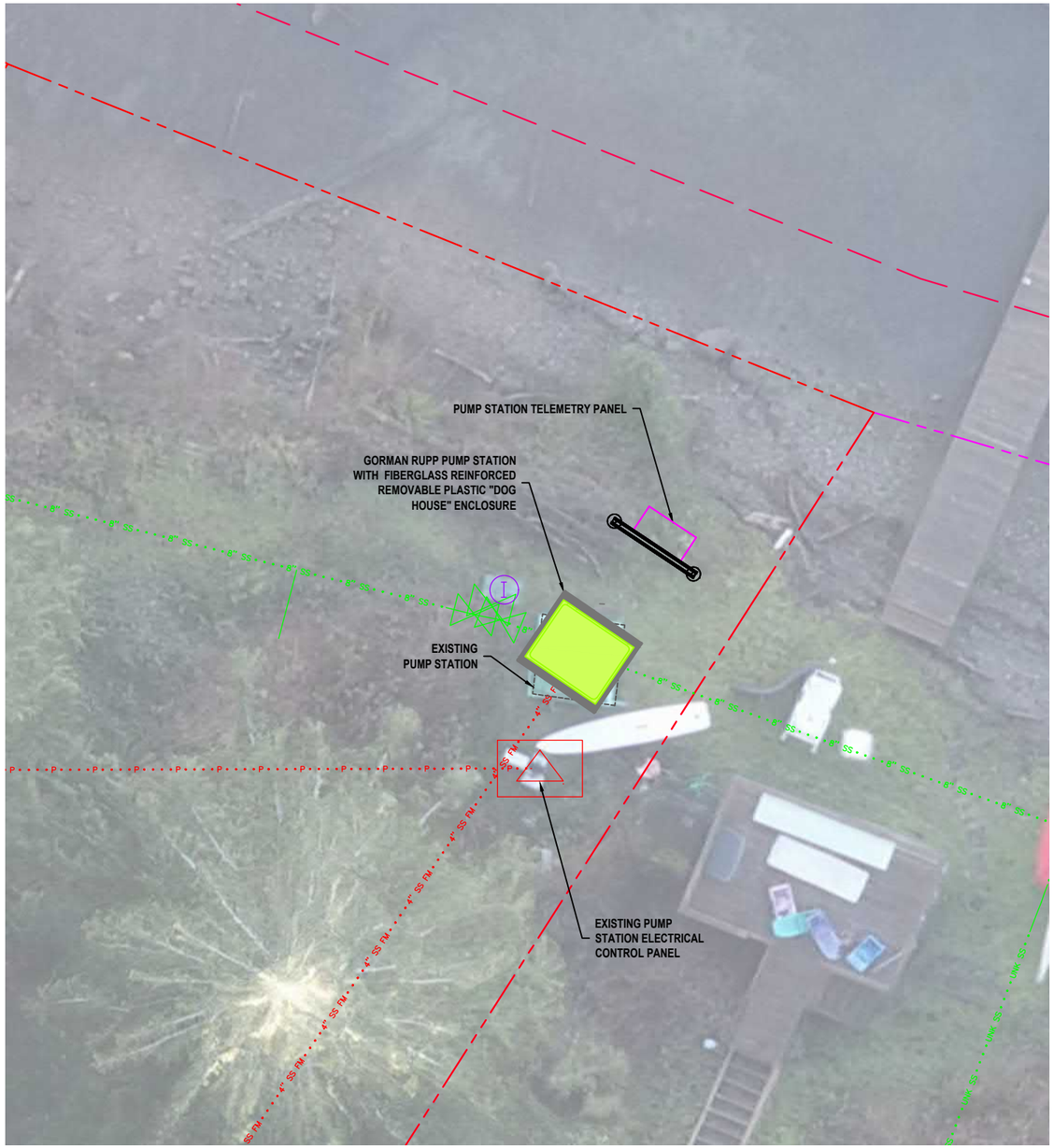
FIGURE 4-1: S&L PUMP STATION DESIGN

SEWER PUMP STATION IMPROVEMENTS

SCALE: NTS
0" 1/2" 1"
DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022
FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrlw-e-predesign.dwg

PRELIMINARY



ROCKY RIDGE SEWER PUMP STATION
1" = 10'

LAKEWOOD SEWER PUMP STATION
1" = 10'

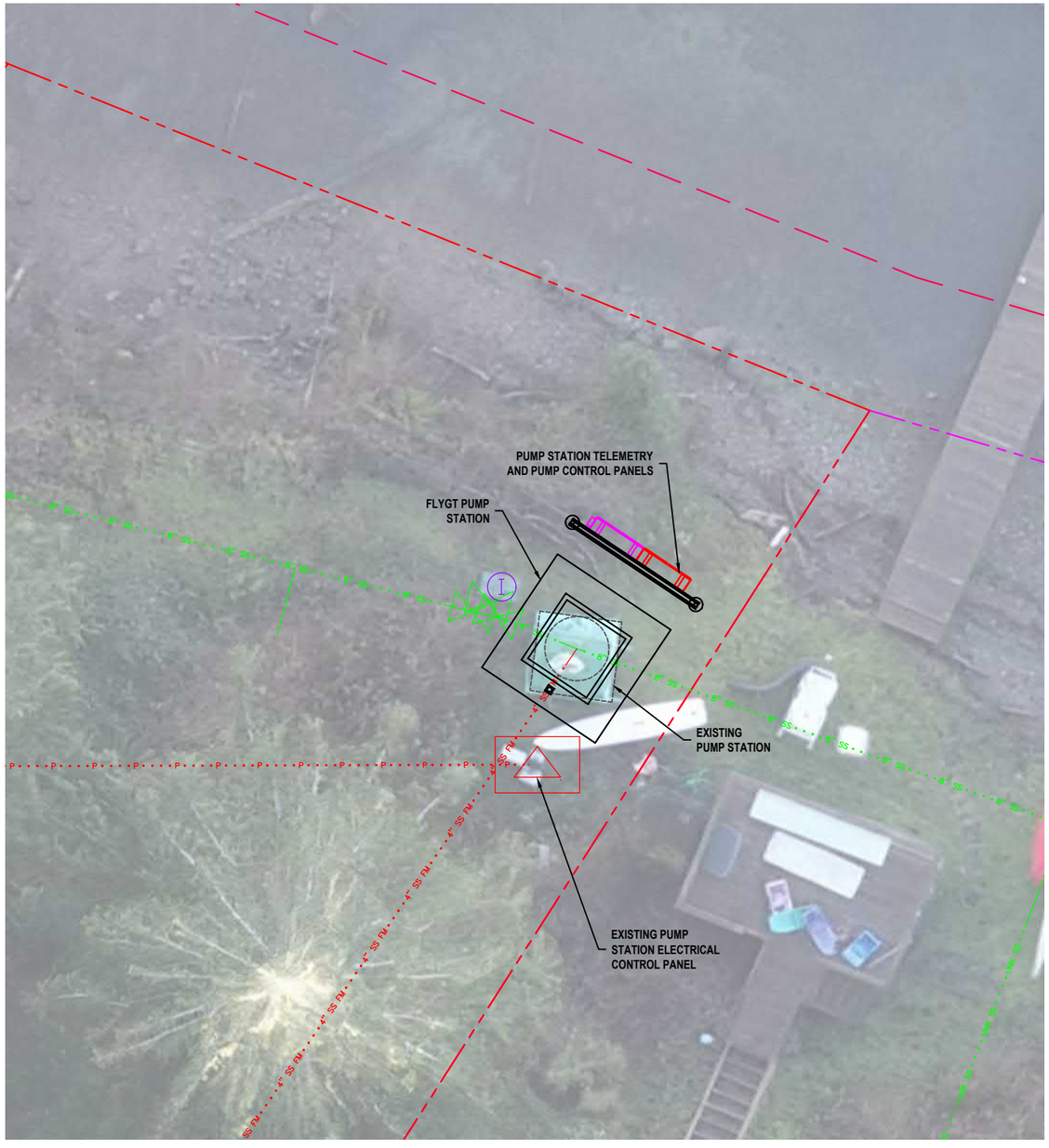
FIGURE 4-2: GORMAN RUPP PUMP STATION DESIGN

SEWER PUMP STATION IMPROVEMENTS

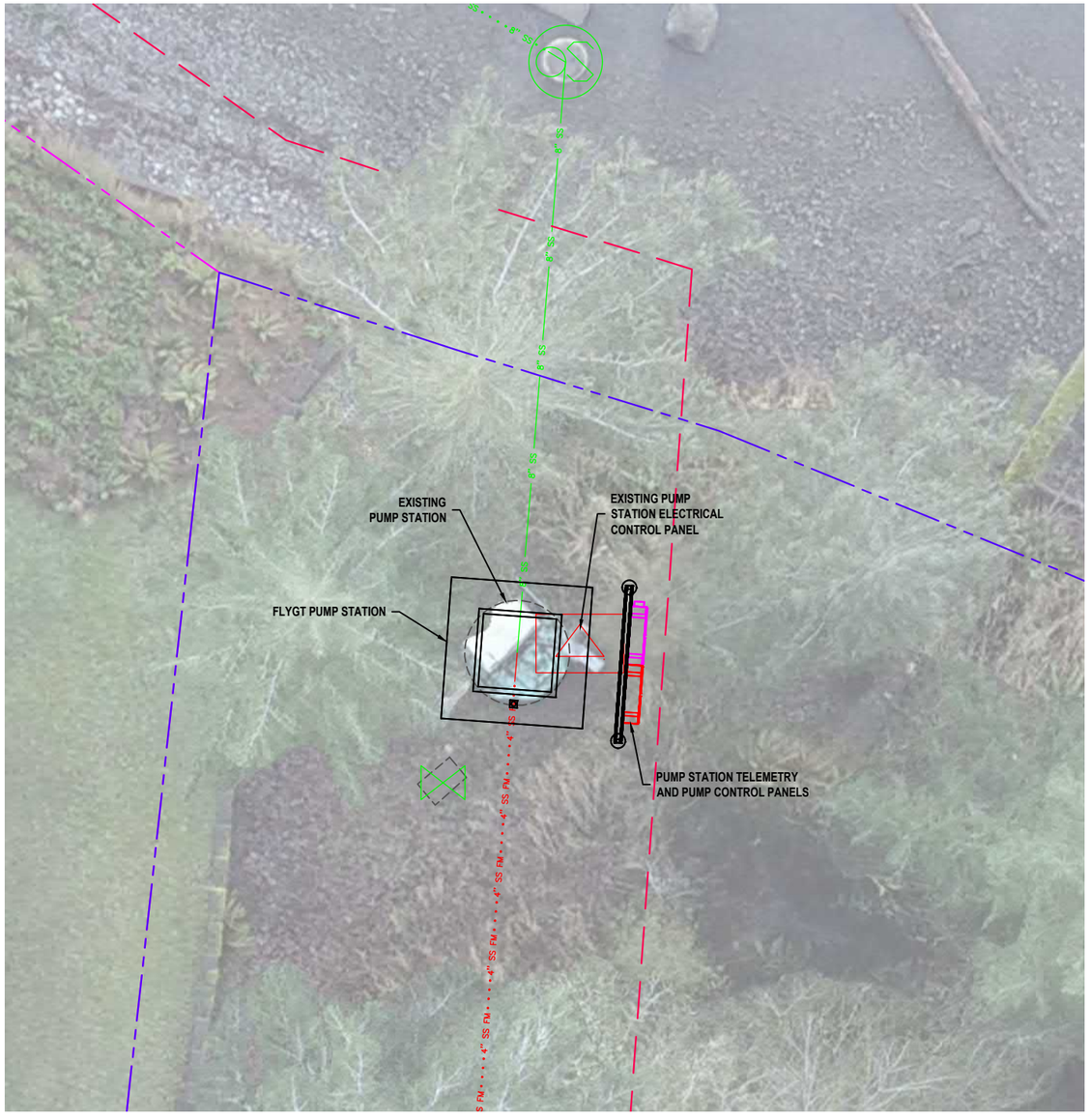
SCALE: NTS
0" 1/2" 1"
DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022
FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrlw-e-predesign.dwg

PRELIMINARY



ROCKY RIDGE SEWER PUMP STATION
1" = 10'



LAKEWOOD SEWER PUMP STATION
1" = 10'

FIGURE 4-3: FLYGT PUMP STATION DESIGN

SEWER PUMP STATION IMPROVEMENTS

SCALE:NTS

0" 1/2" 1"

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022

FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrlw-e-predesign.dwg

PRELIMINARY

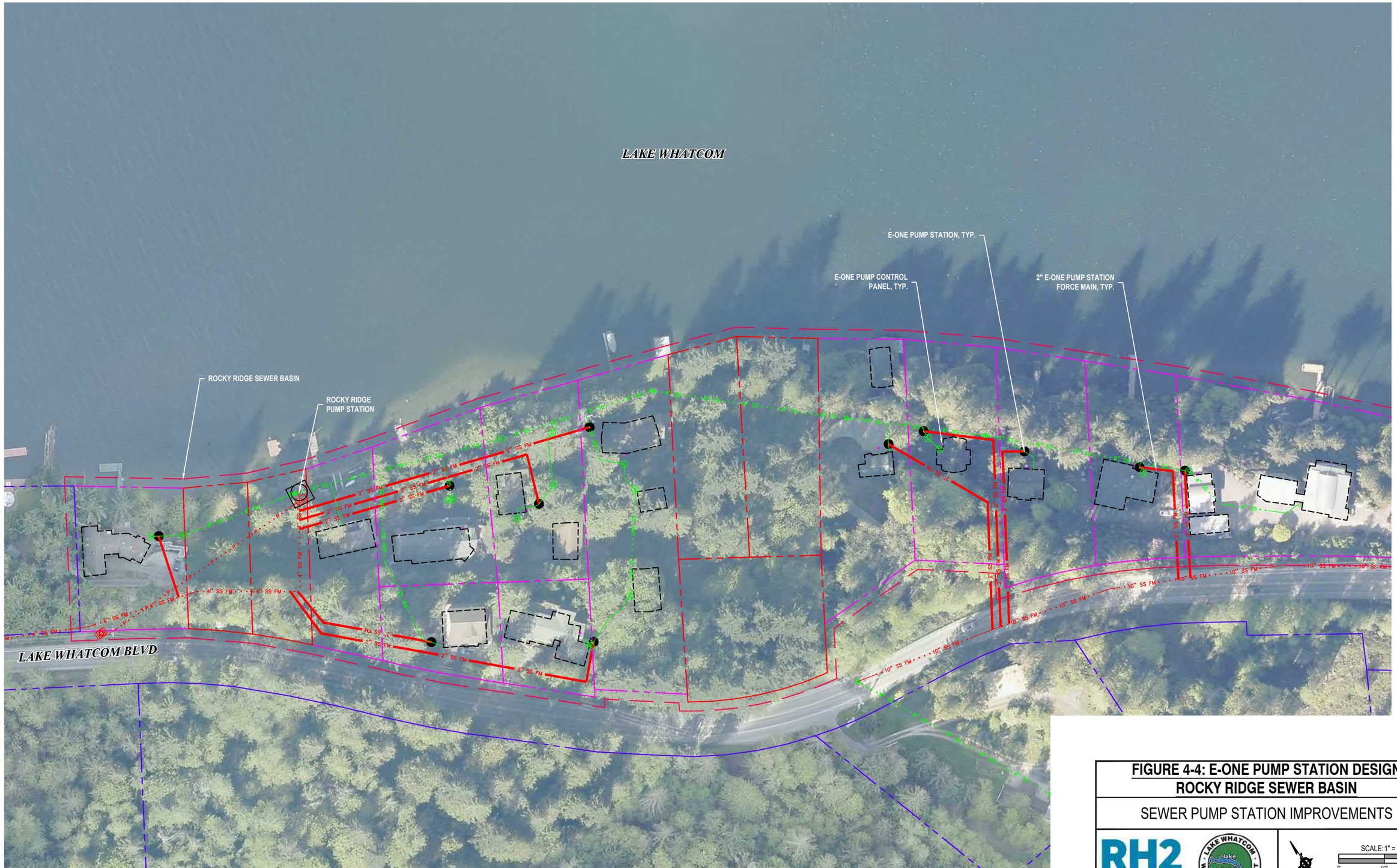


FIGURE 4-4: E-ONE PUMP STATION DESIGN ROCKY RIDGE SEWER BASIN

SEWER PUMP STATION IMPROVEMENTS

SCALE: 1" = 100'

0" 1/2" 1"

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022

FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrfie-e-predesign.dwg

PRELIMINARY

FIGURE 4-5: E-ONE PUMP STATION DESIGN LAKEWOOD SEWER BASIN

SEWER PUMP STATION IMPROVEMENTS

RH2

LAKE WHATCOM WATER & SEWER DISTRICT

SCALE: 1" = 100'

0" 1/2" 1"

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 6/21/2022

FILE PATH: J:\Data\LWWSD\21-0310\CAD\rrfw-e-predesign.dwg

Pump Station Electrical

The existing power supply at the RR and LW PSs is a 230 Volt, 3-phase power. The District prefers that the voltage at the pump station be upgraded to 480 Volt, 3-phase but will accept a replacement power conduit and conductor reusing the existing power service of the same voltage.

A new secondary power service connection will need to be installed between the transformers and the pump station. The proposed electrical service size required to operate the proposed pump motors and other miscellaneous equipment is approximately 50 Amps for **Alternatives 1**, **2**, and **3**. The connected electrical load consists of two pump motors and a single phase distribution panel.

For **Alternative 4**, E-One pumps will be connected to homeowner power drops, and the power drop to the existing stations would be removed and/or abandoned.

The preferred electrical equipment to be installed for the pump station is specified in the following sections. The pump station equipment will be powered through the use of a combination of a custom telemetry and pump control panel and a single phase distribution panel with a pump manufacturer supplied pump control panel. The lighting panel will power all lights, receptacles, and miscellaneous devices at the facility operating at 120-volt, single phase, including ventilation and the telemetry control panel.

Common Telemetry and Control System Work

Alternatives 1 through 3

A proposed Remote Telemetry Unit (RTU) will be installed at the RR and LW PSs for providing automatic control of the pumps. RH2 recommends the District install an Allen-Bradley CompactLogix programmable logic controller (PLC) in the proposed RTU to maintain consistency with the District's other recently installed PLCs.

The RTU will also include an Allen-Bradley touch screen operator interface that will be compatible with the District's other telemetry equipment. The touch screen operator interface will give the operator full access to all setpoints, local controls, and alarm information.

The RTU also will have the ability to communicate to the operator interface and pump control panel via an Ethernet network. The Ethernet switch in the RTU will include a fiber hub for connecting a future fiber optic network. The RTU will have an Uninterruptible Power Supply (UPS) to assist with power conditioning and isolation. The RTU also will have a Direct Current (DC) battery backup in case of a total Alternating Current (AC) power failure. Communication to the District's Master Telemetry Unit (MTU) will be via a direct-leased telephone line connection similar to the District's other RTUs. The RTU will be designed per the District's previously developed telemetry panel construction standards.

RH2 will perform all work associated with programming the proposed RTU, and the District will perform all work associated with programming the Human Machine Interface (HMI) computer.

Instrumentation at the RR and LW PSs will include:

- A radar level transducer for monitoring the wet well level;
- A back-up wet well float system in case of level transducer failure (provided by pump manufacturer);
- A low float disable switch for cleaning the wet well;
- A non-labeled intrusion disable switch;
- Intrusion switches on panels, if any;
- A magnetic flow meter (further details are discussed later in this section); and
- Pressure transmitter on discharge (force main) piping.

The level transducer will be specified as an Endress + Hauser. It is similar to a General Electric (GE) PTX (Druck) level transducer but rated for Class 1, Division 1 hazardous locations such as the wet well. GE no longer produces a Druck-type transducer that is rated for such locations.

The District has standardized on Toshiba and Endress + Hauser magnetic flow meters. The Ethernet/IP integration of Endress + Hauser would only be of use to the District if the District wants to use a higher-level Rockwell PLC such as a CompactLogix L2 series. The Micrologix 1400 PLC that the District standardized on does not have Ad-on Profiles (AOP) capabilities. AOP is Allen-Bradley terminology for how equipment and instrumentation is integrated into their software via Ethernet communications. An Allen-Bradley variable frequency drive (VFD) or Ethernet/IP device such as the Endress + Hauser flow meter requires an AOP software package to be loaded directly into the PLC programming software for communications purposes. When you load the AOP into the programming software, all of the input/output (I/O) and configuration settings are automatically loaded into the PLC programming software, making setup and commissioning of the device quick and efficient.

Alternative 4

E-One has a standard control panel that would be mounted to a pedestal or the side of each home at or adjacent to each pump station. It would have an alarm light and audible alarm. This is the most common system. It is controlled from a float system and would alarm at high level.

E-One provides a higher level of control with its “Sentry Advisor” panel. This panel adds a cellular communication system to alarm the homeowner and District. The cost of this system adds $440 per pump station and a $100 annual fee to maintain the cellular network by E-One. Because 99 percent of E-One’s systems do not utilize this ad on, it was assumed the District would not require it. It could be provided based on District or homeowner preference.

Panel Placement

Alternatives 1 and **2** will have pump control panels housed inside a pump supplier dog house. A telemetry panel will be on a pedestal outside the dog house to connect to the District control system. **Alternative 3** would have two exterior panels; one for pump control backup, and one for primary pump control and telemetry as no dog house would be provided.

Alternative 4 panels were described previously.

Smith & Loveless

RH2 recommends utilizing the Everlast Series 1000 level control system from S&L. A telemetry panel would connect to S&L's float control system to operate the pumps off level control provided by a radar controller. The float control would be a backup placed at the extreme limits outside of the radar unit. This will separate the S&L system from the District's custom controls simply and cleanly.

Gorman Rupp

The Gorman Rupp controls will be virtually the same as the S&L controls.

Flygt

RH2 recommends utilizing the standard Flygt pump control system. A telemetry panel would connect to Flygt's float control system as a backup. This is virtually identical to the S&L control system.

E-One

Controls will be monitored periodically by the District, and homeowners can alert the District if an alarm light or sound is observed.

Electrical Equipment Details

Alternatives 1 through 3

The preferred electrical equipment to be installed at the RR and LW PSs will consist of the following.

- A pump control panel with across-the-line start for operating pumps.
- A 240/120 Volt, single phase step-down transformer located separately in its own enclosure.
- A 240/120 Volt, single phase lighting distribution panel located separately in its own enclosure.
- A 3-phase surge protective device located in its own enclosure.
- Digital power meter located in the pump control panel.
- Phase loss protection and monitoring located in the pump control panel.
- Main service disconnect switch.
- A heater.
- Outdoor fluorescent or LED lighting on electrical equipment cover and inside telemetry panel.
- Telemetry panel.
- Generator pig tail connection with a manual transfer switch located at the power drop on Lake Whatcom Boulevard.

Alternative 4

The preferred electrical equipment to be installed at each home will include:

- A pump control panel; and
- A 240/120 Volt, single phase circuit connected to each home.

Total Project Capital Costs

There are many sub-alternatives within each component of the RR and LW PSs, alternatives including pump selection, panel placement and integration, and public vs. private pumping system. To analyze the alternatives, two approaches are taken. One approach is the least capital cost to construct a functioning station. The second approach is the preferred choices as identified by District staff. The final recommendation is a subjective weighing of the cost differences between these alternatives to determine if the preferred alternative is worth the additional cost.

The total project costs, including construction, mitigation if any, engineering, and construction oversight are summarized in **Table 4.1**. **Appendix A** contains the preliminary cost estimates for **Alternatives 1**, **2, 3,** and **4**. Costs for easements are not included in the estimates as they are difficult to estimate particularly for waterfront property that may not be buildable. The District should pursue permanent easements for the sites including where the power service and forcemain are located.

A comparison of sliplining 2-inch force main vs. reusing 4-inch force main with larger pumps is included, proving the larger pump and reuse of the 4-inch force main is less expensive.

District staff add ons and the rehabilitation of piping are provided as standalone costs that could be added to **Alternatives 1** through **3** as subjectively needed. Mitigation costs (at a 2:1 disturbance ratio) are estimated for these add ons. The add ons include an elevated walkway to RR with a 100 square foot landing raised around the wet well, and a graded gravel driveway and associated stormwater control at LW.

Table 4.1

Project Capital Costs

Alternative	Description	Rocky Ridge Construction Cost	Lakewood Construction Cost	Design Engineering	Construction Oversight	Total Project Cost
Alternative 1	S&L	$596,000	$563,000	$209,000	$93,000	**$1,459,000**
Alternative 2	Gorman Rupp	$507,000	$475,000	$177,000	$79,000	**$1,237,000**
Alternative 3	Flygt Submersible	$554,000	$528,000	$195,000	$87,000	**$1,363,000**
Alternative 4	E-One Grinder	$808,000	$491,000	$234,000	$104,000	**$1,636,000**
Add On	Stairway and Landing	$110,000		$20,000	$9,000	**$138,000**
Add On	Driveway		$140,000	$26,000	$12,000	**$177,000**
Future Project	Rehab Pipe	$316,000	$227,000	$98,000	$44,000	**$685,000**

J:\Data\LWWSD\21-0310\15 Predesign\Report\Appendices\Appendix A RR and LW Predesign Cost Estimates.xls, Summary Tab

Alternative 4 costs do not include access easements, permanent easements, or costs for coordination with homeowners. The terrain in each basin will be difficult to work in to trench 18 inches down to place 2-inch force main. The District may choose to add water supply to these homes as most are on their own lake draw system. This may provide a carrot for consent

to do the work and obtain easements at reduced or no cost. Due to the subjective nature of property value and the coordination required, this alternative is not preferred.

Maintenance Costs

When first conceived by District Staff, **Alternative 4**, E-One pump stations, staff assumed capital costs would be paid for by the District and donated to homeowners and homeowners would take over the improvements and maintain them. Washington State Department of Ecology has rules generally requiring sewage collection systems to be maintained by a public entity. Therefore the maintenance of the E-one pump stations would be completed by the District.

RH2 reviewed maintenance costs provided by District staff and estimated costs based on previous experience for replacement of electrical and mechanical equipment for pump stations similar to RR and LW. RH2 then gathered information from Correct Equipment to compare maintenance costs of the **Alternative 4** E-One pump station alternative.

Costs were reviewed for an assumed life span of 40 years as like now. The costs are summarized in **Table 4.2**.

Table 4.2

Maintenance Costs

Alternative	Description	Rocky Ridge Maintenance Costs	Lakewood Maintenance Costs	Total Maintenance Cost
Alternative 1-3	2 Pump Stations	$125,000	$125,000	**$250,000**
Alternative 4*	17 E-one Stations	$392,000	$232,000	**$624,000**

*Assumes no costs for undeveloped lots - difficult to Develop

Alternative 4, E-One pumps were assumed to last 20 years. One percent replacement per year for electrical panels was assumed for E-one panels. For **Alternatives 1 through 3**, major equipment was assumed to last 40 years but routine maintenance was assumed, including impeller replacement, vacuum prime replacement, and periodic inspections and cleaning.

From **Table 4.2**, it is obvious that having 17 pump stations versus 2 would increase maintenance costs. In addition, the E-One control panels are less robust than the more industrial and protected control equipment the District has standardized on. **Alternative 4** is not preferred due to its high maintenance cost.

Chapter 5 – Conclusion

There are many factors to consider in choosing the best alternative. Operations and maintenance are major factors, including cleaning wet wells, controlling odors, and monitoring pump operation. Some of these factors are subjective and dependent on District preference. The pump selections are clearly defined based on the need for low maintenance, non-clog pumps.

Total preliminary project costs were analyzed for the least cost alternative and the preferred alternative to determine the subjective justification for the increase in cost to obtain a station that better fits the needs and wants of the District. The project cost range was determined to be $1.3 million to $1.7 million. Justifications, described as follows, for the least cost alternative are separated by pumps and electrical housing. The cost difference between the least cost alternative and the highest cost alternative is approximately 30 percent (**Appendix A**). With District staff approval and public approval the project can proceed to design.

Pumps

Alternative 1 or **2**, the S&L or Gorman Rupp top-mounted pump station is preferred for the following reasons:

1. This alternative is among the lowest capital cost.
2. The footprint of the pump station minimizes expansion onsite adjacent to Lake Whatcom, which is a critical area.

Mechanical

The pump station will house the pumps, check valves and pump control panel. District staff prefer ball check valves as they are reliable and close drip tight. Ball check valves are possible with the Gorman Rupp pump station. S&L will provide “rapid-jack” check valves that the District finds acceptable. The flow meter will be placed uphill of the pump station to minimize footprint expansion near the lake and provide better accessibility.

Electrical Housing

The electrical equipment will be placed on a pedestal adjacent to the wet well.

Appendix A
Cost Estimates

PRELIMINARY

Lake Whatcom Water and Sewer District
Edgewater and Dellesta Sewer Pump Stations Improvements
Final Construction Cost Estimate

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Alternative 1

Description - S&L Pump Station		Quantity	Unit	Unit Price	Total Cost
Schedule A - Rocky Ridge Sewer Pump Station Improvements					
1A	Mobilization/Demobilization	1	LS	$28,035	$29,000
2A	Civil and Mechanical Sewer Pump Station Improvements	1	LS	$225,654	$226,000
3A	Electrical Sewer Pump Station Improvements	1	LS	$158,450	$159,000
4A	Force Main	1	LS	$5,417	$6,000
5A	Trench Safety and Shoring	1	LS	$550	$1,000
6A	Unscheduled Excavation	25	CY	$1,500	$1,500
7A	Unscheduled Backfill	50	Ton	$2,000	$2,000
8A	Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9A	On-Site Owner Training	1	LS	$1,000	$1,000
10A	Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs					$429,500
Sales Tax					$36,937
Contingency					$128,850
Total Construction Costs with Tax					$595,287

Schedule B - Lakewood Sewer Pump Station Improvements					
1B	Mobilization/Demobilization	1	LS	$26,502	$27,000
2B	Sewer Pump Station Improvements	1	LS	$223,588	$224,000
3B	Electrical Sewer Pump Station Improvements	1	LS	$139,550	$140,000
4B	Force Main	1	LS	$5,417	$5,500
5B	Trench Safety and Shoring	1	LS	$550	$600
6B	Unscheduled Excavation	25	CY	$1,500	$1,500
7B	Unscheduled Backfill	50	Ton	$2,000	$2,000
8B	Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9B	On-Site Owner Training	1	LS	$1,000	$1,000
10B	Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs					$405,600
Sales Tax					$34,882
Contingency					$121,680
Total Construction Costs with Tax					$562,162

PRELIMINARY

Lake Whatcom Water and Sewer District
Edgewater and Dellesta Sewer Pump Stations Improvements
Final Construction Cost Estimate

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Alternative 2

Description - Gorman Rupp	Quantity	Unit	Unit Price	Total Cost
Schedule A - Rocky Ridge Sewer Pump Station Improvements				
1A Mobilization/Demobilization	1	LS	$23,905	$24,000
2A Civil and Mechanical Sewer Pump Station Improvements	1	LS	$166,904	$167,000
3A Electrical Sewer Pump Station Improvements	1	LS	$158,450	$159,000
4A Force Main	1	LS	$5,417	$6,000
5A Trench Safety and Shoring	1	LS	$550	$1,000
6A Unscheduled Excavation	25	CY	$1,500	$1,500
7A Unscheduled Backfill	50	Ton	$2,000	$2,000
8A Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9A On-Site Owner Training	1	LS	$1,000	$1,000
10A Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$365,500
Sales Tax				$31,433
Contingency				$109,650
Total Construction Costs with Tax				$506,583

Schedule B - Lakewood Sewer Pump Station Improvements				
1B Mobilization/Demobilization	1	LS	$22,372	$23,000
2B Sewer Pump Station Improvements	1	LS	$164,838	$165,000
3B Electrical Sewer Pump Station Improvements	1	LS	$139,550	$140,000
4B Force Main	1	LS	$5,417	$5,500
5B Trench Safety and Shoring	1	LS	$550	$600
6B Unscheduled Excavation	25	CY	$1,500	$1,500
7B Unscheduled Backfill	50	Ton	$2,000	$2,000
8B Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9B On-Site Owner Training	1	LS	$1,000	$1,000
10B Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$342,600
Sales Tax				$29,464
Contingency				$102,780
Total Construction Costs with Tax				$474,844

PRELIMINARY

Lake Whatcom Water and Sewer District
Edgewater and Dellesta Sewer Pump Stations Improvements
Final Construction Cost Estimate

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Alternative 3

Description - Flygt Pump Station	Quantity	Unit	Unit Price	Total Cost
Schedule A - Rocky Ridge Sewer Pump Station Improvements				
1A Mobilization/Demobilization	1	LS	$26,075	$27,000
2A Civil and Mechanical Sewer Pump Station Improvements	1	LS	$169,032	$170,000
3A Electrical Sewer Pump Station Improvements	1	LS	$185,450	$186,000
4A Force Main	1	LS	$6,751	$7,000
5A Trench Safety and Shoring	1	LS	$550	$1,000
6A Unscheduled Excavation	25	CY	$1,500	$1,500
7A Unscheduled Backfill	50	Ton	$2,000	$2,000
8A Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9A On-Site Owner Training	1	LS	$1,000	$1,000
10A Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$399,500
Sales Tax				$34,357
Contingency				$119,850
Total Construction Costs with Tax				$553,707

Schedule B - Lakewood Sewer Pump Station Improvements				
1B Mobilization/Demobilization	1	LS	$24,892	$25,000
2B Sewer Pump Station Improvements	1	LS	$173,389	$174,000
3B Electrical Sewer Pump Station Improvements	1	LS	$166,550	$167,000
4B Force Main	1	LS	$5,417	$5,500
5B Trench Safety and Shoring	1	LS	$550	$600
6B Unscheduled Excavation	25	CY	$1,500	$1,500
7B Unscheduled Backfill	50	Ton	$2,000	$2,000
8B Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9B On-Site Owner Training	1	LS	$1,000	$1,000
10B Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$380,600
Sales Tax				$32,732
Contingency				$114,180
Total Construction Costs with Tax				$527,512

PRELIMINARY

Lake Whatcom Water and Sewer District
Edgewater and Dellesta Sewer Pump Stations Improvements
Final Construction Cost Estimate

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Alternative 4

Description - E-One	Quantity	Unit	Unit Price	Total Cost
Schedule A - Rocky Ridge Sewer Pump Station Improvements				
1A Mobilization/Demobilization	1	LS	$38,045	$39,000
2A Civil and Mechanical Sewer Pump Station Improvements	1	LS	$251,185	$252,000
3A Electrical Sewer Pump Station Improvements	1	LS	$97,200	$98,000
4A Force Main	1	LS	$183,641	$184,000
5A Trench Safety and Shoring	1	LS	$550	$1,000
6A Unscheduled Excavation	25	CY	$1,500	$1,500
7A Unscheduled Backfill	50	Ton	$2,000	$2,000
8A Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9A On-Site Owner Training	1	LS	$1,000	$1,000
10A Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$582,500
Sales Tax				$50,095
Contingency				$174,750
Total Construction Costs with Tax				$807,345

Schedule B - Lakewood Sewer Pump Station Improvements				
1B Mobilization/Demobilization	1	LS	$23,093	$24,000
2B Sewer Pump Station Improvements	1	LS	$162,866	$163,000
3B Electrical Sewer Pump Station Improvements	1	LS	$56,700	$57,000
4B Force Main	1	LS	$100,748	$100,800
5B Trench Safety and Shoring	1	LS	$550	$600
6B Unscheduled Excavation	25	CY	$1,500	$1,500
7B Unscheduled Backfill	50	Ton	$2,000	$2,000
8B Miscellaneous Owner-Directed Work	1	LS	$3,000	$3,000
9B On-Site Owner Training	1	LS	$1,000	$1,000
10B Construction Records	1	LS	$1,000	$1,000
Subtotal Construction Costs				$353,900
Sales Tax				$30,435
Contingency				$106,170
Total Construction Costs with Tax				$490,505

PRELIMINARY

Lake Whatcom Water and Sewer District
Edgewater and Dellesta Sewer Pump Stations Improvements
Final Construction Cost Estimate

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Description - Add Ons and Future Projects	Quantity	Unit	Unit Price	Total Cost
Schedule A - Rocky Ridge Stairway and Platform				
11A Mobilization/Demobilization	1	LS	$5,530	$6,000
12A Elevated Stairway	1	LS	$44,967	$45,000
13A Raised Platform	1	LS	$27,743	$28,000
14A Mitigation	1	LS	$5,683	$6,000
Subtotal Construction Costs				$79,000
Sales Tax				$6,715
Contingency				$23,700
Total Construction Costs with Tax				$109,415
Schedule B - Lakewood Driveway				
11B Mobilization/Demobilization	1	LS	$6,580	$7,000
12B Driveway to PS	1	LS	$48,312	$49,000
13B Mitigation	1	LS	$44,990	$45,000
Subtotal Construction Costs				$101,000
Sales Tax				$8,585
Contingency				$30,300
Total Construction Costs with Tax				$139,885
Future Pipe Rehabilitation				
11B Mobilization/Demobilization	1	LS	$25,620	$26,000
5A Rocky Ridge - Pipe Cured In Place Improvements	1	LS	$212,245	$213,000
5B Lakewood - Pipe Cured In Place Improvements	1	LS	$152,845	$153,000
Subtotal Construction Costs				$392,000
Sales Tax				$33,320
Contingency				$117,600
Total Construction Costs with Tax				$542,920

PRELIMINARY

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Maintenance Costs for 40 Years

1 Pump Station	Times per Year	Cost					
		Crew	Hours	Miles	Misc Parts	Cost Per	Total Cost
Visits	12	1	2			$80	$1,920
Truck	12	1		9		$0.58	$63
Power	12.5	hp	48		9.321	kw	$49
Routine Maintenance	2	2	2			$80	$640
Parts	0.1	2	2		$4,000	$80	$432
Per Year	1						$3,104
Years of Use	40						$125,000
Number of Stations	2						$250,000

Actual Costs	3/17/2022				
Rich Munson	$ Spent	Bill Start Date	Today	$/Year	40 Years
Rocky Ridge	$3,266	12/16/2019	6/8/2022	$1,317	$52,689
Lakewood	$3,044			$1,228	$49,108
					$50,898

Rocky Ridge E-One	Times per Year	Cost					
		Crew	Hours	Miles	Misc Parts	Cost Per	Total Cost
Visits	1	1	2			$80	$160
Truck	1	1		9		$0.58	$5
Power	0	hp	0		9.321	kw	$0
Routine Maintenance	12	2	2			$80	$3,840
Parts	12	2	2		$162	$80	$5,782
Per Year	1						$9,787
Years of Use	40						$392,000

Lakewood E-One	Times per Year	Cost					
		Crew	Hours	Miles	Misc Parts	Cost Per	Total Cost
Visits	1	1	2			$80	$160
Truck	1	1		9		$0.58	$5
Power	0	hp	0		9.321	kw	$0
Routine Maintenance	7	2	2			$80	$2,240
Parts	7	2	2		$162	$80	$3,373
Per Year	1						$5,778
Years of Use	40						$232,000

PRELIMINARY

Rocky Ridge and Lakewood Sewer Pump Station Improvements
Lake Whatcom Water and Sewer District

~2/1/23 Bid Opening

Capital Costs (not rounded)

Alternative	Description	Rocky Ridge Construction Cost	Lakewood Construction Cost	Design Engineering	Construction Oversight	Total Project Cost
Alternative 1	S&L	$595,287	$562,162	$208,341	$92,596	**$1,458,385**
Alternative 2	Gorman Rupp	$506,583	$474,844	$176,657	$78,514	**$1,236,598**
Alternative 3	Flygt Submersible	$553,707	$527,512	$194,619	$86,497	**$1,362,335**
Alternative 4	E-One Grinder	$807,345	$490,505	$233,613	$103,828	**$1,635,292**
Add On	Stairway and Landing	$109,415		$19,695	$8,753	**$137,863**
Add On	Driveway		$139,885	$25,179	$11,191	**$176,255**
Future Project	Rehab Pipe	$315,962	$226,958	$97,726	$43,434	**$684,079**

Capital Costs (rounded)

Alternative	Description	Rocky Ridge Construction Cost	Lakewood Construction Cost	Design Engineering	Construction Oversight	Total Project Cost
Alternative 1	S&L	$596,000	$563,000	$209,000	$93,000	**$1,459,000**
Alternative 2	Gorman Rupp	$507,000	$475,000	$177,000	$79,000	**$1,237,000**
Alternative 3	Flygt Submersible	$554,000	$528,000	$195,000	$87,000	**$1,363,000**
Alternative 4	E-One Grinder	$808,000	$491,000	$234,000	$104,000	**$1,636,000**
Add On	Stairway and Landing	$110,000		$20,000	$9,000	**$138,000**
Add On	Driveway		$140,000	$26,000	$12,000	**$177,000**
Future Project	Rehab Pipe	$316,000	$227,000	$98,000	$44,000	**$685,000**

Maintenance Costs in 40 Years

Alternative	Description	Rocky Ridge Maintenance Costs	Lakewood Maintenance Costs	Total Maintenance Cost
Alternative 1-3	2 Pump Stations	$125,000	$125,000	**$250,000**
Alternative 4*	17 E-one Stations	$392,000	$232,000	**$624,000**

*Assumes no costs for undeveloped lots - difficult to Develop

Future Project Costs

Alternative	Description	Rocky Ridge Construction Cost	Lakewood Construction Cost	Design Engineering	Construction Oversight	Total Project Cost
Future Project	Rehab Pipe	$316,000	$227,000	$98,000	$44,000	**$685,000**

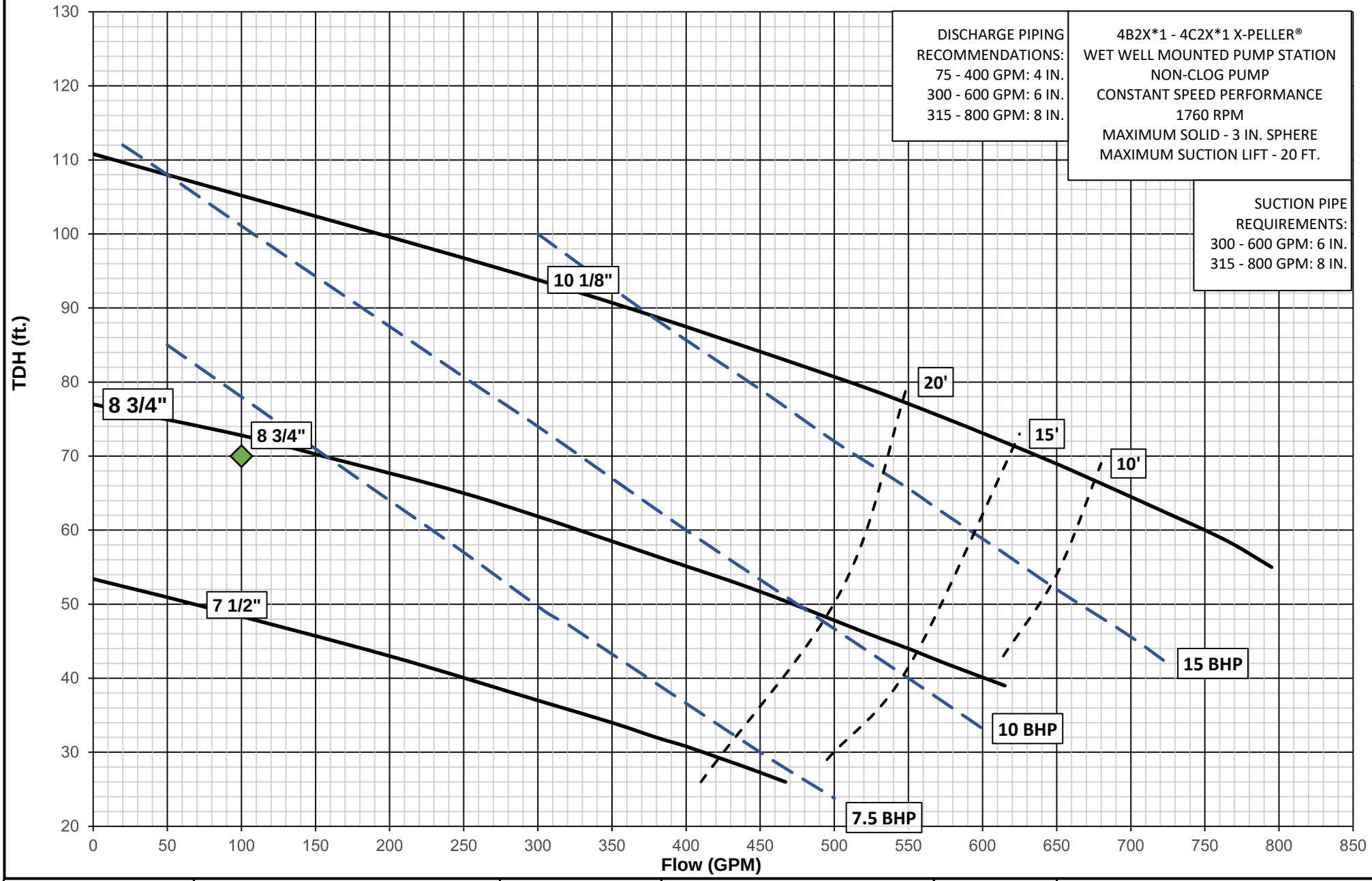
Appendix B
Pump Alternatives

Smith & Loveless

PRELIMINARY

Pump Curve

Smith & Loveless Inc.

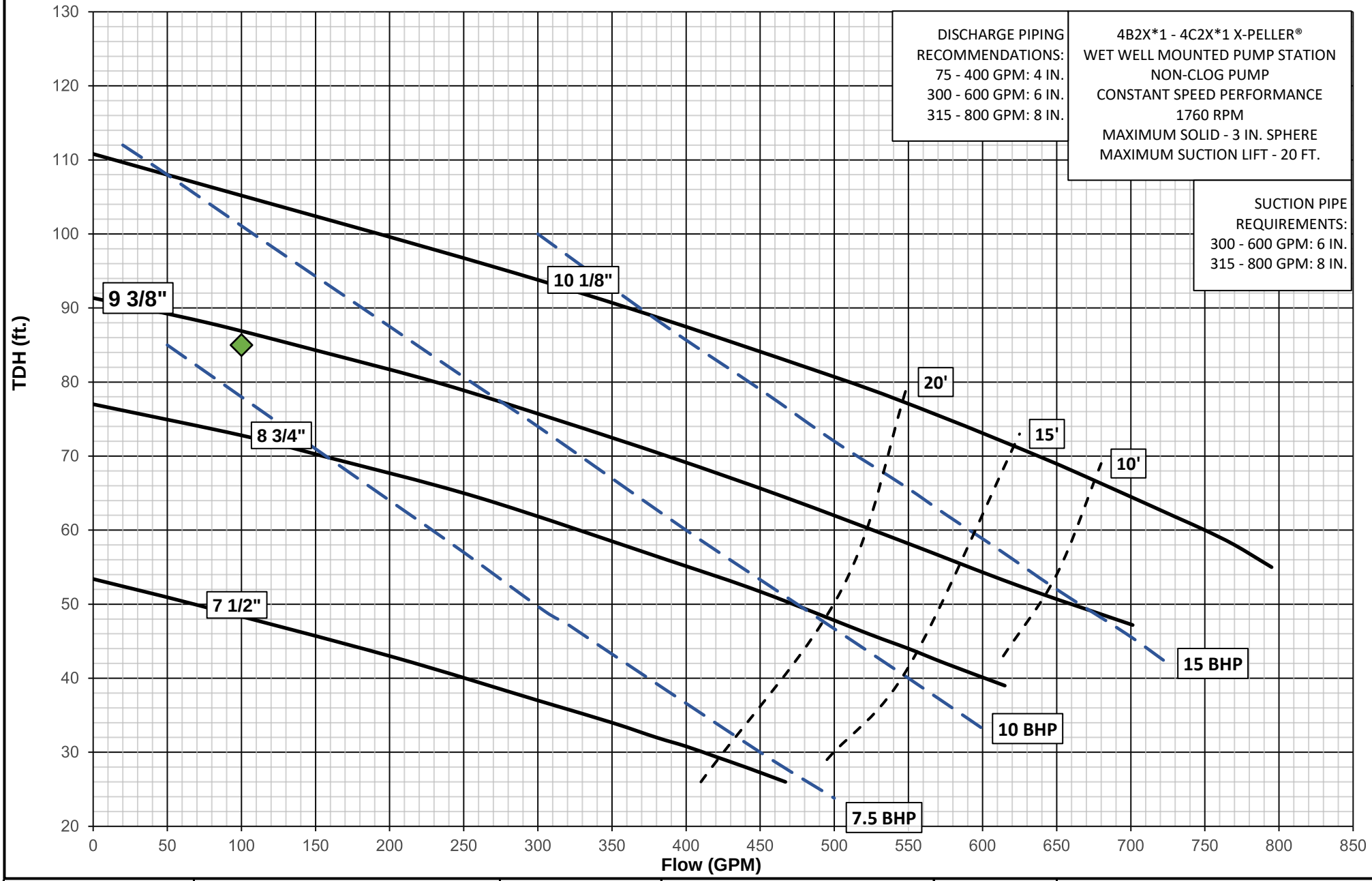


Location:	Lake Whatcom	Design Point:	100 GPM @ 70 ft.	Pump Model:	4B2X*1, 1760 RPM
Project Name:	Rocky Ridge	Impeller Trim:	8 - 3/4 Inches	HP & Efficiency:	10 HP & 25.8%

PRELIMINARY

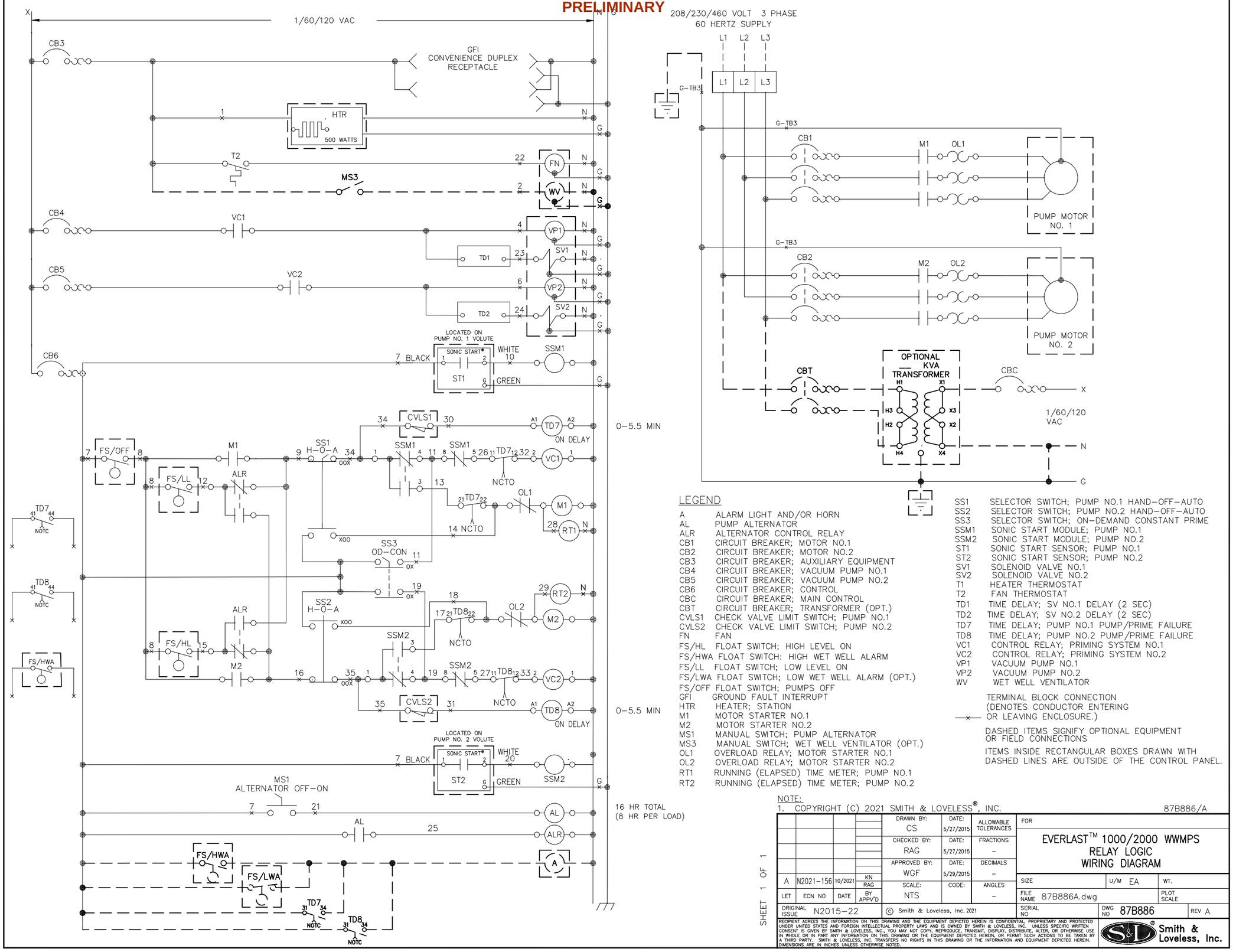
Pump Curve

Smith & Loveless Inc.



Location:	Lake Whatcom	Design Point:	100 GPM @ 85 ft.	Pump Model:	4B2X*1, 1760 RPM
Project Name:	Lakewood	Impeller Trim:	9 - 3/8 Inches	HP & Efficiency:	10 HP & 26.3%

PRELIMINARY



LEGEND

A	ALARM LIGHT AND/OR HORN
AL	PUMP ALTERNATOR
ALR	ALTERNATOR CONTROL RELAY
CB1	CIRCUIT BREAKER; MOTOR NO.1
CB2	CIRCUIT BREAKER; MOTOR NO.2
CB3	CIRCUIT BREAKER; AUXILIARY EQUIPMENT
CB4	CIRCUIT BREAKER; VACUUM PUMP NO.1
CB5	CIRCUIT BREAKER; VACUUM PUMP NO.2
CB6	CIRCUIT BREAKER; CONTROL
CBC	CIRCUIT BREAKER; MAIN CONTROL
CBT	CIRCUIT BREAKER; TRANSFORMER (OPT.)
CVLS1	CHECK VALVE LIMIT SWITCH; PUMP NO.1
CVLS2	CHECK VALVE LIMIT SWITCH; PUMP NO.2
FN	FAN
FS/HL	FLOAT SWITCH; HIGH LEVEL ON
FS/HWA	FLOAT SWITCH: HIGH WET WELL ALARM
FS/LL	FLOAT SWITCH; LOW LEVEL ON
FS/LWA	FLOAT SWITCH; LOW WET WELL ALARM (OPT.)
FS/OFF	FLOAT SWITCH; PUMPS OFF
GFI	GROUND FAULT INTERRUPT
HTR	HEATER; STATION
M1	MOTOR STARTER NO.1
M2	MOTOR STARTER NO.2
MS1	MANUAL SWITCH; PUMP ALTERNATOR
MS3	MANUAL SWITCH; WET WELL VENTILATOR (OPT.)
OL1	OVERLOAD RELAY; MOTOR STARTER NO.1
OL2	OVERLOAD RELAY; MOTOR STARTER NO.2
RT1	RUNNING (ELAPSED) TIME METER; PUMP NO.1
RT2	RUNNING (ELAPSED) TIME METER; PUMP NO.2
SS1	SELECTOR SWITCH; PUMP NO.1 HAND-OFF-AUTO
SS2	SELECTOR SWITCH; PUMP NO.2 HAND-OFF-AUTO
SS3	SELECTOR SWITCH; ON-DEMAND CONSTANT PRIME
SSM1	SONIC START MODULE; PUMP NO.1
SSM2	SONIC START MODULE; PUMP NO.2
ST1	SONIC START SENSOR; PUMP NO.1
ST2	SONIC START SENSOR; PUMP NO.2
SV1	SOLENOID VALVE NO.1
SV2	SOLENOID VALVE NO.2
T1	HEATER THERMOSTAT
T2	FAN THERMOSTAT
TD1	TIME DELAY; SV NO.1 DELAY (2 SEC)
TD2	TIME DELAY; SV NO.2 DELAY (2 SEC)
TD7	TIME DELAY; PUMP NO.1 PUMP/PRIME FAILURE
TD8	TIME DELAY; PUMP NO.2 PUMP/PRIME FAILURE
VC1	CONTROL RELAY; PRIMING SYSTEM NO.1
VC2	CONTROL RELAY; PRIMING SYSTEM NO.2
VP1	VACUUM PUMP NO.1
VP2	VACUUM PUMP NO.2
WV	WET WELL VENTILATOR

TERMINAL BLOCK CONNECTION
(DENOTES CONDUCTOR ENTERING
OR LEAVING ENCLOSURE.)

DASHED ITEMS SIGNIFY OPTIONAL EQUIPMENT
OR FIELD CONNECTIONS

ITEMS INSIDE RECTANGULAR BOXES DRAWN WITH
DASHED LINES ARE OUTSIDE OF THE CONTROL PANEL.

NOTE:
1.

87B886/A

SHEET 1 OF 1

				DRAWN BY: CS	DATE: 5/27/2015	ALLOWABLE TOLERANCES
				CHECKED BY: RAG	DATE: 5/27/2015	FRACTIONS –
				APPROVED BY: WGF	DATE: 5/29/2015	DECIMALS –
A	N2021-156	10/2021	KN	SCALE: NTS	CODE:	ANGLES –
LET	ECN NO	DATE	BY APPV'D			

FOR

EVERLAST™ 1000/2000 WWMPS
RELAY LOGIC
WIRING DIAGRAM

SIZE	U/M EA	WT.
FILE NAME 87B886A.dwg		PLOT SCALE
ORIGINAL ISSUE N2015-22	SERIAL NO	DWG NO 87B886 REV A

Smith & Loveless, Inc.

Gorman Rupp

PRELIMINARY

Granich Engineered Products, Inc
1313 South 96th Street
Seattle, WA 98108
Phone: 866-859-2940
Fax: 206-315-2939
Website: www.granich.com

Quote

To:	**Dan Burwell**	**Fax:**	
From:	**Dakota Bartles**	**Date:**	**2/9/2022**
Re:	**Gorman Rupp 6x6 Station**	**Pages:**	

We are pleased to offer the following equipment for your consideration:

(1)- Gorman Rupp 6 X 6 above ground lift station with duplex Super T Series 2" x 2 " self-priming non clog sewage pumps, v-belt driven by 5 HP, 1750 rpm, 3/60/460 ODP motors. Station piping includes individual suction lines, individual swing check valves, a 3-way plug valve and individual automatic air release valves. Station Controls will be housed in a NEMA 1 SS enclosure with Primary Submersible Transducer with Independent (Redundant) Floats. (2 provided).
The entire pump station is plumbed, wired and factory tested and U.L. Labeled. Includes 5 year warranty.
Estimated Conditions of service – 100 GPM @ 50-60' TDH.

In addition, the station shall include the following optional features and equipment:

1. Station Heater
2. Station Insulation
3. Pump Drain Kit
4. External Alarm Light -115 VAC (shipped loose for field mounting by contractor)
5. Check Valve, Plug Valve, Automatic Air Release Valve
6. Gauge Kits (Suction and Discharge Gauges)
7. Factory Representative present for Start-up and Operator Training
8. Submittals & O&M Manuals. (Four copies of each)

Price:……$68,500.00

PRELIMINARY

Prices are FOB Factory with FFA to job site.
Please allow 6-8 weeks for submittals and approximately 10-12 weeks ARO.

Please call me if you have any questions or need additional information.

Regards,
Dakota Bartles
Granich Engineered Products, Inc

PRELIMINARY

RELIASOURCE®

Feb 2021 | LSIS6X6

6X6 LIFT STATION INFORMATION SHEET

ABOVE-GROUND LIFT STATION

Standard Mechanical and Electrical

Station Type	6 X 6 Duplex Pumps
Station Specs	• Max Capacity 1300 GPM (82.0 lps) • Max Head: 150' (45.7 m) • Max Solids 3" (76.2 mm) • Max Temperature 160°F (71°C) • Assembled and tested in Gorman Rupp's USA Facilities
Pump Specs	• Super T Series® 2" (50 mm), 3" (75 mm), 4" (100 mm), 6 (150 mm) • Ultra V Series® 3" (75 mm), 4" (100 mm), 6 (150 mm)
Pump Motor	• Voltage: 200 V 3P, 230 V 1P, 230 V 3P, 460 V 3P • Cycles: 60 hz • Horsepower: 2 HP to 25 HP
Station Piping	• Individual suction spools • Individual swing check valves • 3-way plug valve w/duplex pumps • Individual automatic air release valves • Station ships fully assembled and wired. Pumps, piping, controls and fiberglass enclosure mounted on a common steel base.
Enclosure	• Enlcosure: Low-silhouette, fiberglass construction • Variety of vinyl wraps available • Removable or hinged door panel for easy pump and control access • Resists corrosion, mildew, fungus, mold and UV rays
Control Panel Assembly	• InteGRinex® Liquid Level controls designed to handle basic pump station requirements • NEMA Rated Automatic controls to operate pump and warning systems • Available U.L. and C.S.A. listings • Fully customized control panels available • NEMA Rated Control Enclosures

5 YEAR WARRANTY PACKAGED SYSTEM

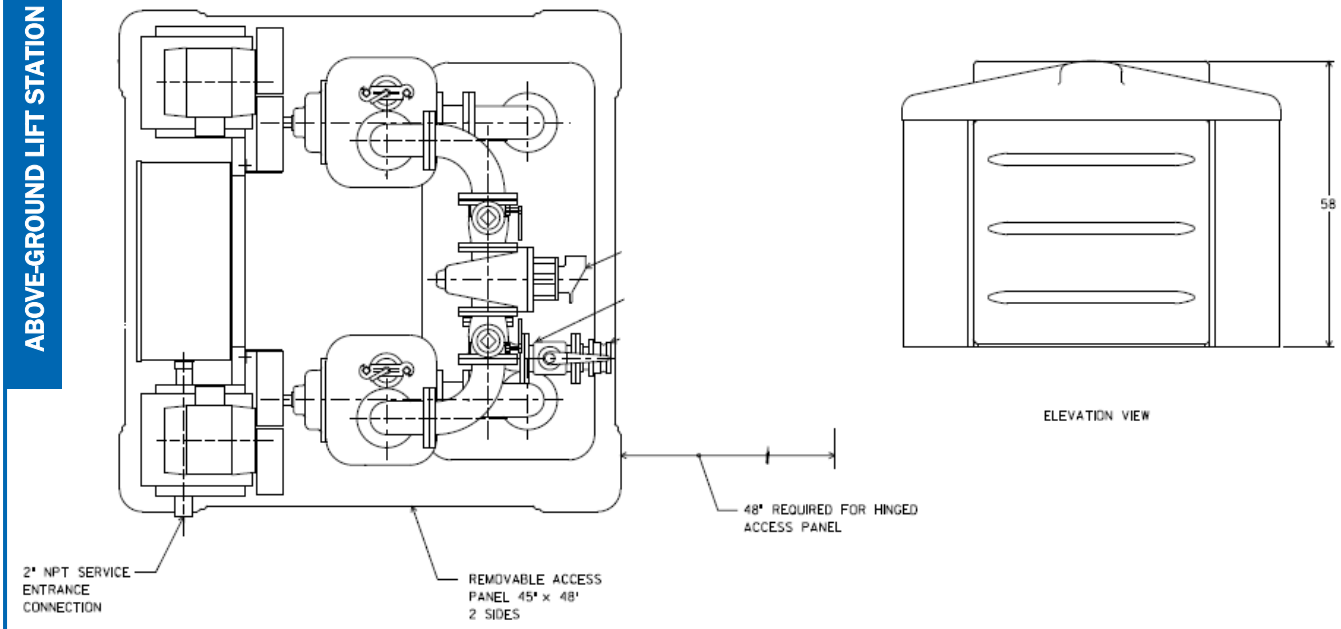
GORMAN-RUPP PUMPS The Pump People

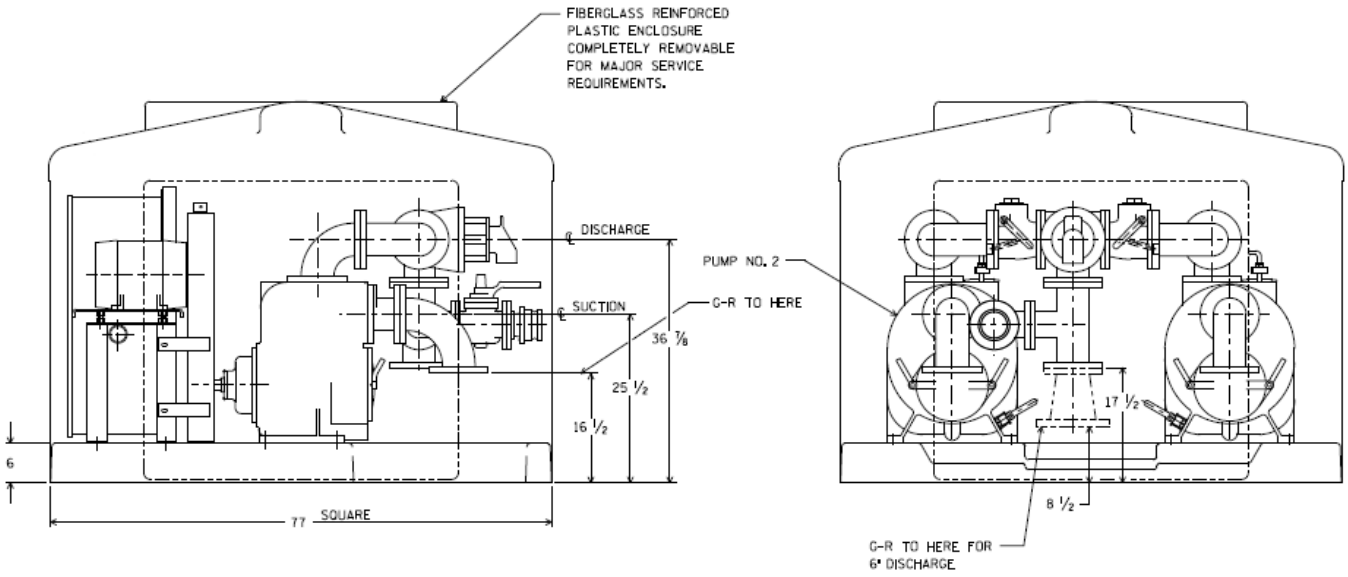
RELIASOURCE®

Feb 2021 | LSIS6X6

6X6 SAMPLE OUTLINE DRAWING

ABOVE-GROUND LIFT STATION





Note: Drawing is a general layout of a lift station, for drawings specific to your application please contact your Gorman-Rupp Distributor.

GORMAN-RUPP PUMPS
P.O. BOX 1217
MANSFIELD, OHIO 44901-1217 | USA
TEL: 419.755.1011 | FAX: 419.755.1251
GRPUMPS.COM

Self Priming Centrifugal Pump

Super T SERIES

VARIOUS PATENTS APPLY

Model T2D60S-B

Size 2” x 2”

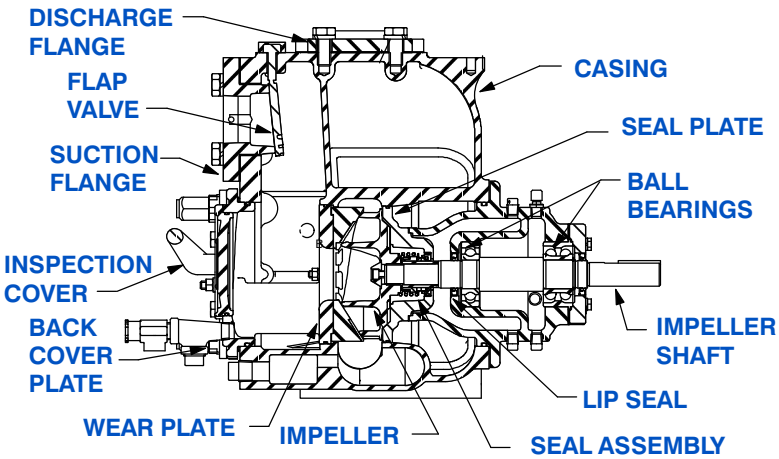
5 YEAR WARRANTY SUPER T SERIES

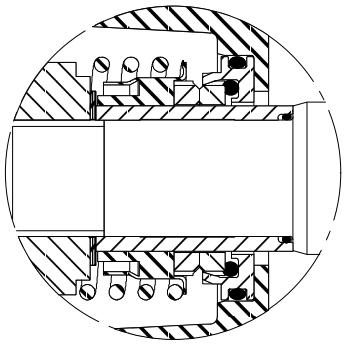
PUMP SPECIFICATIONS

Size: 2” x 2” (51 mm x 51 mm) NPT - Female.
Casing: Gray Iron 30.
Maximum Operating Pressure 102 psi (703 kPa).*
Semi-Open Type, Two Vane Impeller: Ductile Iron 65-45-12.
Handles 3/4” (19,1 mm) Diameter Spherical Solids.
Impeller Shaft: Alloy Steel 4150.
Shaft Sleeve: Alloy Steel 4130.
Replaceable Wear Plate: Carbon Steel ASTM A36.
Removable Back Cover Plate: Gray Iron 30.
Removable Inspection Cover Plate: Gray Iron 30; 3.2 lbs. (1,45 kg.).
Flap Valve: Neoprene w/Nylon and Steel Reinforcing.
Seal Plate: Gray Iron 30.
Bearing Housing: Gray Iron 30.
Radial Bearings: Open Single Row Ball.
Thrust Bearings: Open Double Row Ball.
Bearing and Seal Cavity Lubrication: SAE 30 Non-Detergent Oil.
Flanges: Gray Iron 30.
Gaskets: Buna-N w/Compressed Synthetic Fibers, Vegetable Fiber, PTFE, Cork and Rubber.
O-Rings: Buna-N, Fluorocarbon (DuPont Viton® or Equivalent).
Hardware: Standard Plated Steel.
Brass Pressure Relief Valve.
Bearing and Seal Cavity Oil Level Sight Gauges.
Optional Equipment: Automatic Air Release Valve. Metal Bellows Seal. 120V/240V Casing Heater. High Pump Temperature Shutdown Kit. Gray Iron 30 Suction and Discharge Spool Flanges:
2” ASA **(Specify Model T2D60S-B /F)**.
50 mm DIN 2527 (PN 16) **(Specify Model T2D60S-B /FM)**.

**Consult Factory for Applications Exceeding Maximum Pressure and/or Temperature Indicated.*

Shown with Optional Suction & Discharge Spool Flanges (Available in ASA or DIN Standard Sizes).





SEAL DETAIL

Mechanical, Oil-Lubricated, Double Floating, Self-Aligning. Silicon Carbide Rotating and Stationary Faces. Stainless Steel 316 Stationary Seat. Fluorocarbon Elastomers (DuPont Viton® or Equivalent). Stainless Steel 18-8 Cage and Spring. Maximum Temperature of Liquid Pumped, 160°F (71°C).*

PRELIMINARY

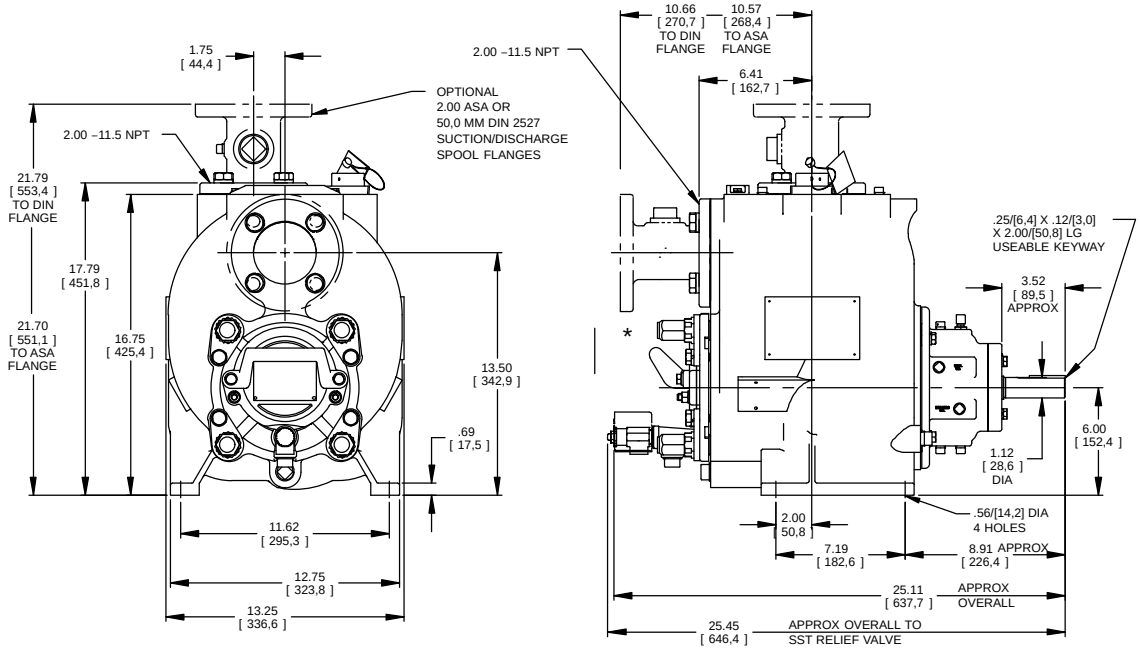
Specification Data

SECTION 55, PAGE 1941

APPROXIMATE DIMENSIONS and WEIGHTS

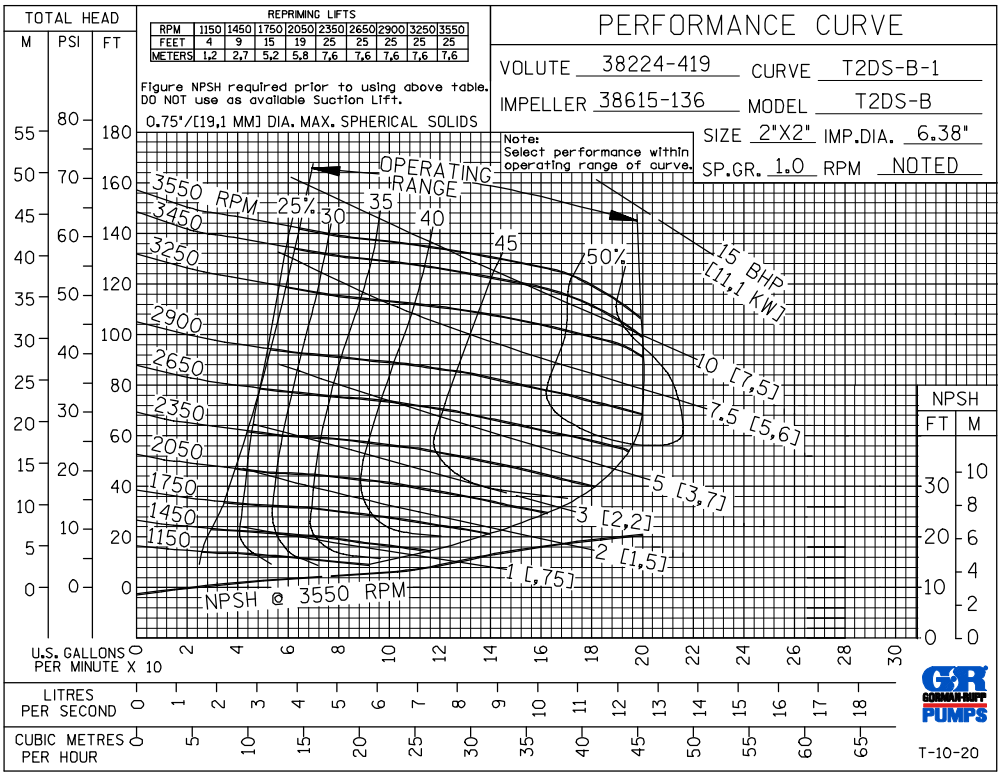
NET WEIGHT:	**242 LBS. (110 KG.)***
SHIPPING WEIGHT:	**254 LBS. (115 KG.)***
EXPORT CRATE:	**6.4 CU. FT. (0,18 CU. M.)**

***ADD 8 LBS. (3,6 KG.) W/EACH SPOOL FLANGE**



* 18.00/[457,2] RECOMMENDED FOR REMOVAL OF BACK COVER PLATE
T2CSC–B – 8.50/[215,9] REQUIRED FOR REMOVAL OF BACK COVER PLATE
T2DS–B / T2ESC–B – 9.50 / [241,3] REQUIRED FOR REMOVOVAL OF BACK COVER PLATE

T2CSC–B
T2DS–B
T2ESC–B



GORMAN-RUPP PUMPS

www.grpumps.com

Specifications Subject to Change Without Notice

Printed in U.S.A.

C D S W

Discharge Check Valves

4” and 6”

LEFT HAND CHECK VALVE SHOWN

SPECIFICATIONS

Valve Body: Gray Iron No. 30.

Valve Arm: 316 Stainless Steel.

Wetted Hardware: 303/304 Stainless Steel.

Valve Weight: Gray Iron No. 30.

Flap Valve: Nitrile.

O-Rings: Buna-N.

Size	Part Number	
	Left Hand	Right Hand
4” (102 mm)	46421–214	46421–215
6” (152 mm)	46421–416	46421–417

DESCRIPTION

Available in 4” or 6” (102 mm or 152 mm) Sizes for Left Hand (LH) or Right Hand (RH) Piping Installations. Valves are Weighted and Spring-Loaded to Ensure Positive Closure. Full Body Design Allows for Passage of 3” (76,2 mm) Diameter Solids.

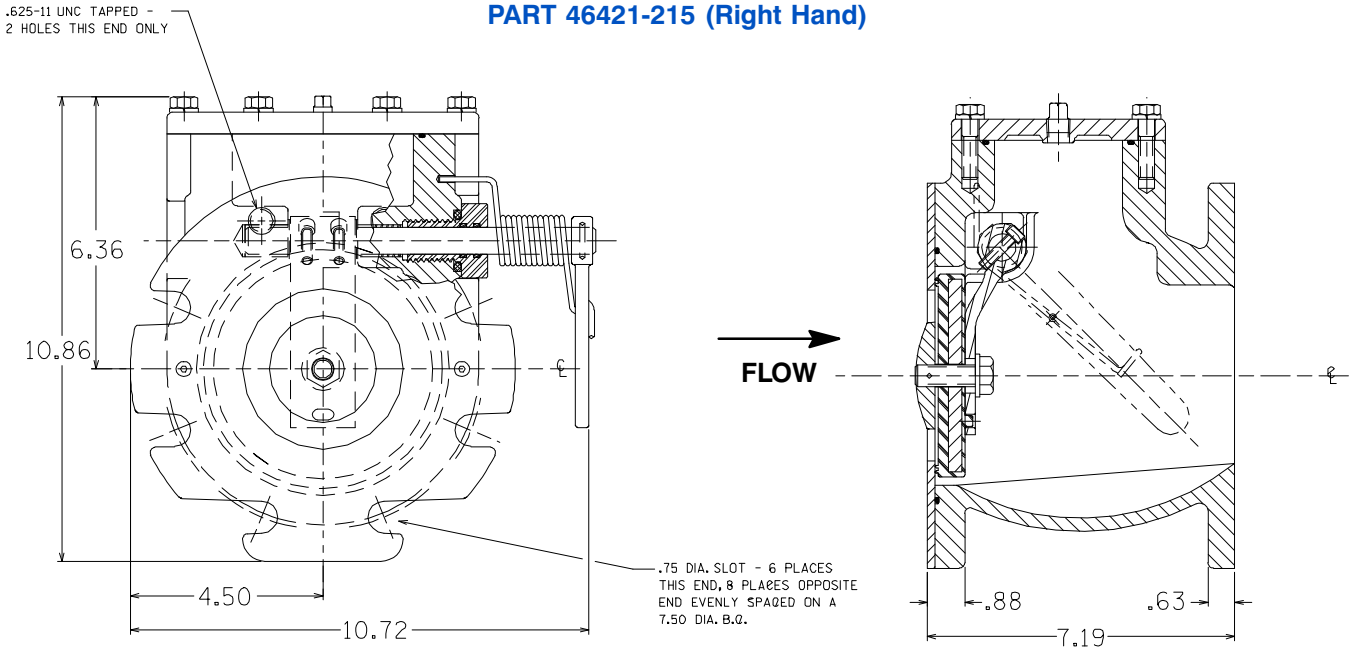
Solid Cast Iron Body and Simple Design Provide Dependable Service and Easy Maintenance. Access Cover Allows Servicing of all Internal Parts Without Removing Check Valve From System Piping.

Check Valve Assemblies Include a Stainless Steel Seat and Spring.

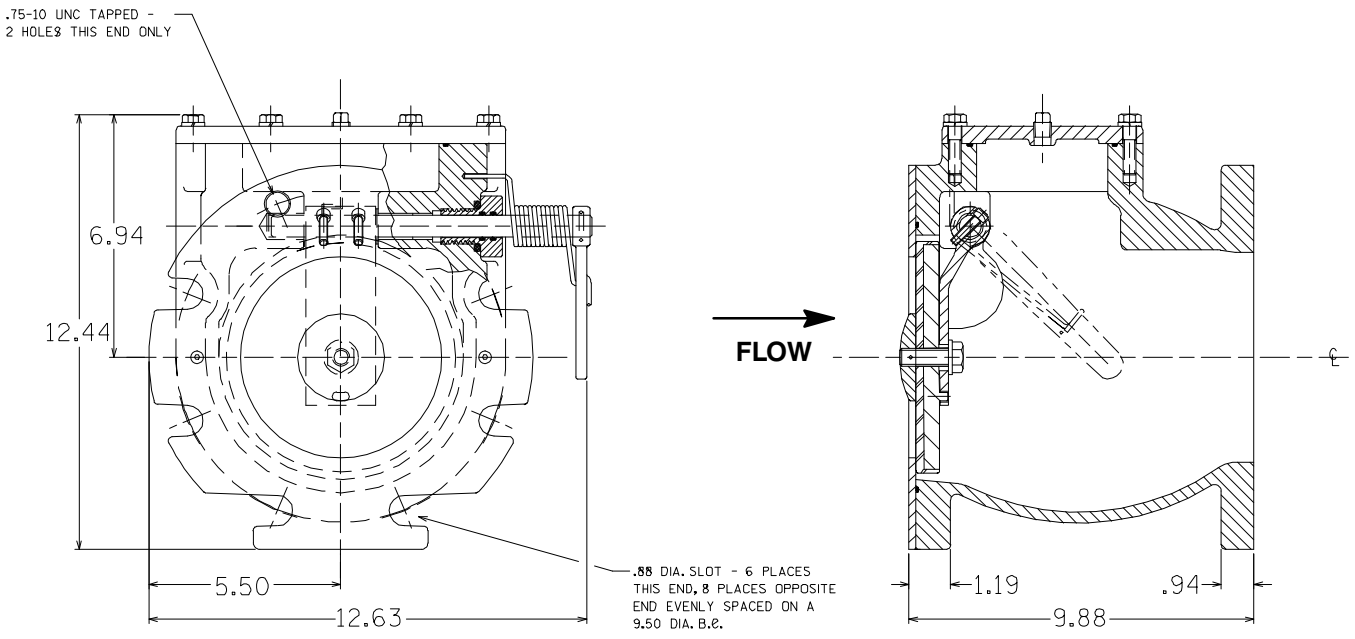
Mounting Hardware Not Included.

Specification Data SECTION 10, PAGE 1300	APPROXIMATE DIMENSIONS and WEIGHTS	**NET WEIGHT: 4” (102 mm) 47 LBS. (21,3 KG.)** **NET WEIGHT: 6” (152 mm) 78 LBS. (35,4 KG.)**

4” (102 mm) VALVE ASSEMBLY
PART 46421-214 (Left Hand)
PART 46421-215 (Right Hand)

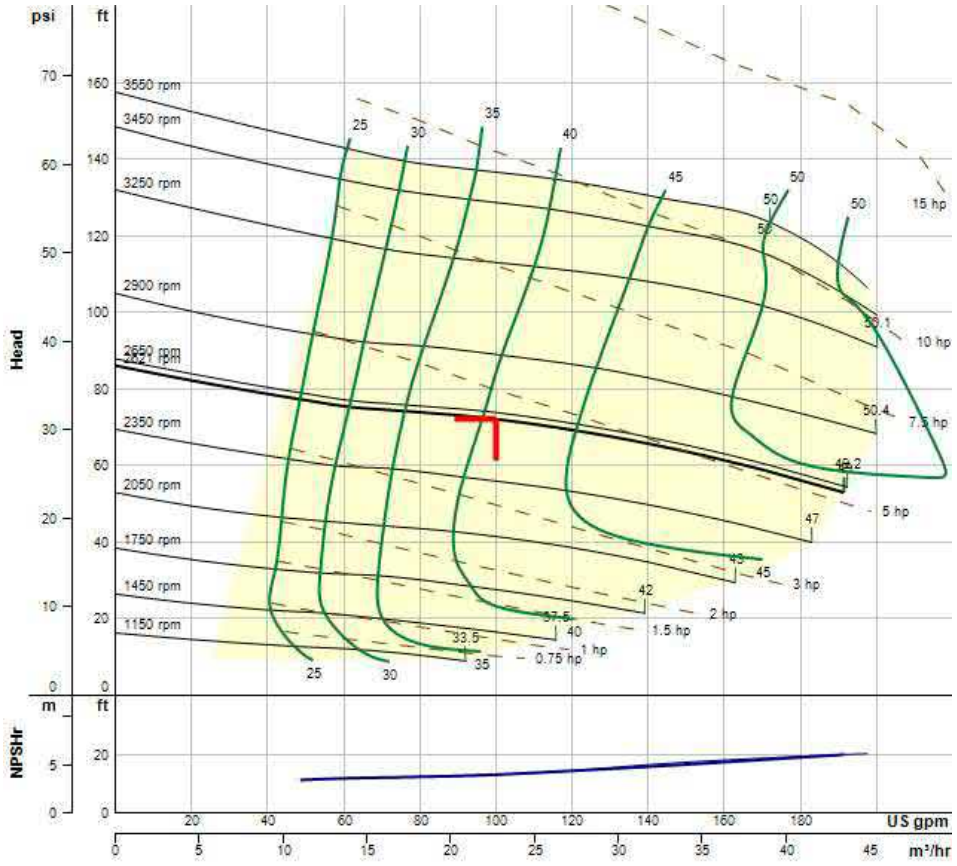


6” (152 mm) VALVE ASSEMBLY
PART 46421-416 (Left Hand)
PART 46421-417 (Right Hand)



T2D60S-B Self Priming

Suction	2" (50 mm)
Discharge	2" (50 mm)
Solids Handling	0.75" (19 mm)
Casing	Cast Iron
Impeller/Rotor	Ductile Iron
Seal Material	Silicon Carbide
Flange	NPT
Drive Type	Basic
Unit Weight	N/A



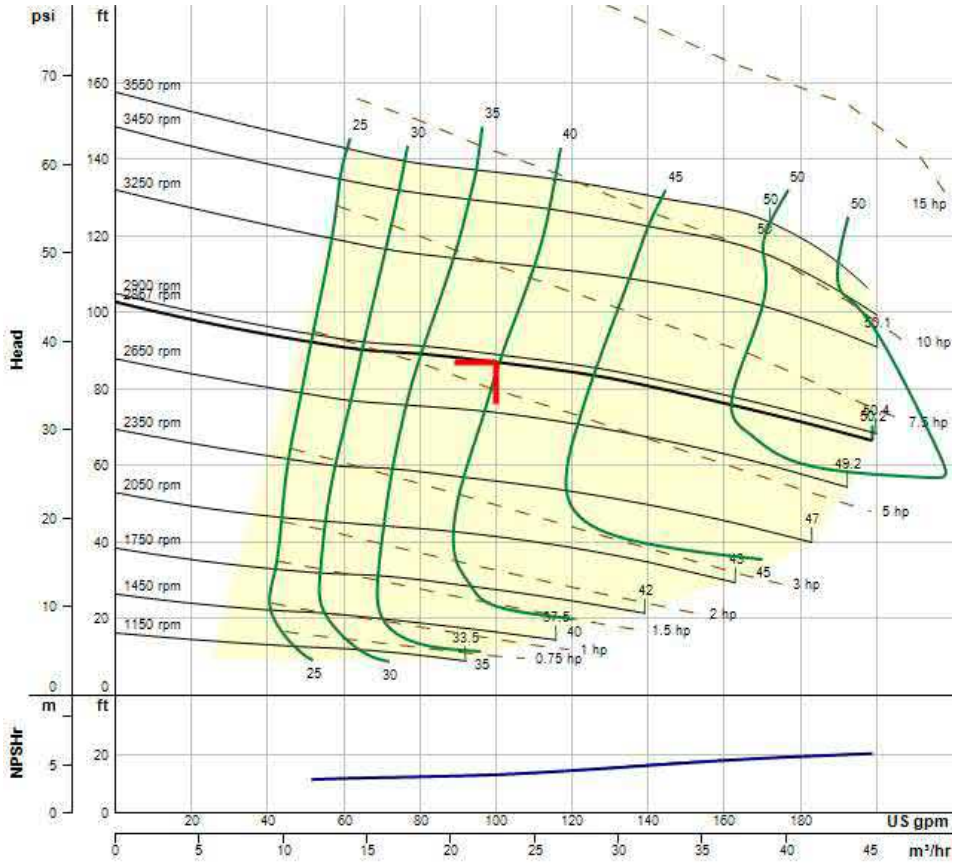
Curve Info		
Type	T-SERIES	
Curve	T2DS-B-1	
Impeller	38615-136	
Speed	2621 rpm	
Diameter	6.38 in	

Data Point		
Flow	100	US gpm
Head	72	ft
NPSHr	13.1	ft
Efficiency	41	%
Power	4.46	hp

This curve is provided for preliminary selection only. Please consult factory before making final pump or motor selections. Not NSF certified.

T2D60S-B Self Priming

Suction	2" (50 mm)
Discharge	2" (50 mm)
Solids Handling	0.75" (19 mm)
Casing	Cast Iron
Impeller/Rotor	Ductile Iron
Seal Material	Silicon Carbide
Flange	NPT
Drive Type	Basic
Unit Weight	N/A



Curve Info		
Type	T-SERIES	
Curve	T2DS-B-1	
Impeller	38615-136	
Speed	2867 rpm	
Diameter	6.38 in	

Data Point		
Flow	100	US gpm
Head	87	ft
NPSHr	13.1	ft
Efficiency	40	%
Power	5.52	hp

This curve is provided for preliminary selection only. Please consult factory before making final pump or motor selections. Not NSF certified.

Flygt

PRELIMINARY

16120 Woodinville-Redmond Road NE, Suite 3
Woodinville, WA 98072 Phone: (425) 486-9499

2501 Columbia Way Suite 300
Vancouver, WA 98661 Phone: (360) 694-9175

1/28/2022 **Quote #: 37742 - 0**

To: RH2 - Bellingham
Attn: Dan Burwell
Email: dburwell@rh2.com
Phone: (360) 684-1548

Project Name: Rocky Ridge and Lakewood Pump Station Retrofit

The following is Whitney Equipment Company's proposal for equipment we can furnish for the above referenced project. A detailed list of the equipment and services included in this proposal is shown in the following Scope of Supply. Only items listed in the Scope of Supply are included in this proposal. This proposal is valid for 30 days from the date listed above. Please contact us to verify pricing and availability beyond 30 days as pricing and availability may vary. The conditions of sale associated with this proposal are attached.

Engineering calculations and design services are included only when specifically listed in the Scope of Supply. Field or startup services are not included unless specifically listed in the Scope of Supply. If additional field or onsite assistance is needed beyond what is included in the Scope of Supply, it can be supplied at a rate of $165.00/hour at the job site, plus travel time and expense. Unless specifically listed in the following Scope of Supply, we do not include haulage, unloading including provision of lifting equipment, permits, bonds, insurance, installation, sales or use taxes or duties of any kind, power, chemicals, water, concrete, grout, anchor bolts, controls, wire, conduit, lights, fans, piping, valves, fittings, drains, meters, gauges, signs, safety equipment, labor, tools, field paint, lubricants, or any other items not listed as included.

Prices are firm for 30 days. Purchaser must also pay any costs incurred for additional field or onsite assistance no later than 30 days after receipt of an invoice for field or onsite services from Whitney Equipment Company.

The equipment will be coated with the manufacturers' standard preparation and coatings unless special coatings are listed in the Scope of Supply. Equipment will be prepared for shipment per the manufacturers' standard packing procedure. The purchaser is responsible for receiving all items including promptly inspecting for damage, noting damages, and filing for all missing or damaged items in a timely manner. Freight shall be standard ground or ocean freight unless otherwise listed. The purchaser is responsible for proper storage and handling of the equipment per the manufacturer's recommendations prior to installation to ensure warranty coverage. Warranty coverage shall be manufacturer's standard warranty unless specifically listed in the Scope of Supply.

This job is being handled by Sydney Schumacher, phone 425-375-3436. Please call if you need further information or prices.

PRELIMINARY

SCOPE OF SUPPLY

Quantity	Product / Description	Price per Unit	Total Price
2 each	**Rocky Ridge 4" FM: Flygt NP 3085 SH3-255 Rated at 100gpm @70'TDH** Including 3phase/230V/4hp FM Rated Motor, Hard Iron Adaptive N Impeller, Fluid and Leakage Sensor, and 50ft of Standard Power Cable.	**$9,361.00**	**$18,722.00**
2 each	**NP 3085 Standard Accessories** Including 3" Discharge Elbow, 2" 304 Upper Guide Bar Bracket, 2" 304 Guide Rails, Lifting Assembly, Cable Holder, Grip Eye, Safety Hooks, and Cable Grips.	**$2,310.00**	**$4,620.00**
2 each	**Rocky Ridge 2" FM: Flygt MP 3069 HT3-255 Rated at 45gpm @87'TDH** Including 3phase/230V/3.8hp FM Rated Motor, Fluid and Leakage Sensor, and 30ft of Standard Power Cable.	**$3,734.50**	**$7,469.00**
2 each	**MP 3069 Standard Accessories** Including 2" Discharge Elbow, P Install Kit (Including Sliding Bracket, 3/4" 304 Upper Guide Bar Bracket, and Anchor Bolts), 3/4" 304 Guide Rails, Lifting Assembly, Cable Holder, Grip Eye, Safety Hooks, and Cable Grips.	**$1,155.00**	**$2,310.00**
2 each	**Lakewood 4" FM: Flygt NP 3102 SH3-256 Rated at 100gpm @85'TDH** Including 3phase/230V/7.2hp FM Rated Premium Efficient Motor, Hard Iron Adaptive N Impeller, Fluid and Leakage Sensor, and 50ft of Standard Power Cable.	**$11,220.00**	**$22,440.00**
2 each	**NP 3102 Standard Accessories** Including 3" Discharge Elbow, 2" 304 Upper Guide Bar Bracket, 2" 304 Guide Rails, Lifting Assembly, Cable Holder, Grip Eye, Safety Hooks, and Cable Grips.	**$2,310.00**	**$4,620.00**
2 each	**Lakewood 2" FM: Flygt MP 3102 HT3-267 Rated at 45gpm @110'TDH** Including 3phase/230V/3.8hp FM Rated Motor, Fluid and Leakage Sensor, and 30ft of Standard Power Cable.	**$8,800.00**	**$17,600.00**
2 each	**MP 3102 Standard Accessories** Including 1 1/2" Discharge Elbow, 3/4" 304 Upper Guide Bar Bracket, 3/4" 304 Guide Rails, Lifting Assembly, Cable Holder, Grip Eye, Safety Hooks, and Cable Grips.	**$1,182.50**	**$2,365.00**

1 each	**Stacon Duplex Control Panel (For Either 4" or 2" FM Option)** Including NEMA 4X Enclosure, Four 40ft Anchor Scientific Floats, Auto Dialer (connected to the existing phone), and Timer (for Odor Control).	**$10,220.00**	**$10,220.00**

Lead Times: 12-16 Weeks
Freight Terms: FOB Factory, prepaid and added to invoice. Freight will depend on the option selected.
Note: This is a budget-level quote and numbers should be used for planning purposes. The cost will likely be less come time for purchase. We recommend using an eccentric reducer to connect to discharge pipe for the 3" and 1 ½" elbows.

Sales tax is not included unless specified.
Payment Terms: Net 30

Sincerely,
Sydney Schumacher,

Purchaser's Signature: By signing below, I certify that I am an authorized representative with the authority to enter into contracts on behalf of the company identified below, and that I accept the terms included with this proposal.

_____	_____
Signature Date	Print Name and Title
BILL TO	SHIP TO
_____	_____
Company or Organization Bill To	Company or Organization Ship To
_____	_____
Bill To Address	Ship To Address
_____	_____
City/State/Zip	City/State/Zip
_____	_____
Billing Contact Name	Shipping Contact Name
_____	_____
Billing Contact Email	Shipping Contact Email
_____	_____
Billing Contact Phone Number	Shipping Contact Phone Number

PO # if applicable _____

If using a Purchase Order:
Make PO out to
Whitney Equipment Company Inc
16120 Woodinville Redmond Rd NE #3
Woodinville, WA 98072
Email: sales@weci.com

WHITNEY EQUIPMENT CO., INC.
WOODINVILLE, WA
STANDARD CONDITONS OF SALE

These are Whitney Equipment Co., Inc., the Seller, Standard Terms and Conditions and the basis of our offer to the Buyer, unless specifically altered in writing as permitted herein. Any changes may affect the quoted price. These Standard Terms and Conditions and the bid quote, purchase order, or other order form to which they are attached (the "Bid Quote") form a contract between Buyer and Seller for the sale of products described in the Bid Quote (the "Contract").

ACCEPTANCE: Submission of this Contract to Buyer constitutes Seller's offer to the Buyer and on acceptance becomes a binding contract on the terms set forth herein. Buyer's acceptance is expressly limited to the terms of this Contract. Seller rejects all terms included in any response by the Buyer to this Contract that are in conflict with, inconsistent with, or in addition to the terms and conditions contained herein. But if a conflict arises between the terms of a purchase order first issued by Buyer and the terms of this Contract, the terms of this Contract shall take precedence.

ENTIRE AGREEMENT: The Contract comprises the entire agreement between the Buyer and the Seller, and supersedes all prior or contemporaneous understandings, agreements, negotiations, representations and warranties, and communications, both written and oral. This Contract prevails over any terms and conditions of purchase provided by Buyer, regardless of whether or when the Buyer has submitted its purchase order or such terms. In addition, implied terms and conditions from the Buyer's contracts with other entities are not valid or enforceable with respect this Contract. Fulfillment of the Buyer's order does not constitute acceptance of any of Buyer's terms and conditions and does not serve to modify or amend this Contract.

GOVERNING LAWS: Seller will comply with all laws applicable to Seller during sale of the products. Buyer will comply with all laws applicable to Buyer during operation or use of the products. The laws of the State of Washington shall govern the validity, interpretation, and enforcement of any order of which these provisions are a part, without giving effect to any rules governing the conflict of laws. Assignment may be made only with written consent of both parties. Buyer shall be liable to the Seller for any attorney's fees and costs incurred by Seller in enforcing any of its rights hereunder. Unless otherwise specified, any reference to Buyer's order is for identification only.

JURISDICTION AND VENUE: Any legal suit, action or proceeding arising out of relating to this Contract shall be commended in federal or state court located King County, Washington and Seller and Buyer (i) irrevocably submit to the exclusive jurisdiction and venue of any such court in any such suit, action or proceeding and (ii) irrevocably waive (to the extent permitted by applicable law) any objection which they now or hereafter may have to the laying of venue of any such action or proceeding brought in any of the foregoing courts in and of the State of Washington, and any objection on the ground that any such action or proceeding in any such court has been brought in an inconvenient forum.

ATTORNEYS FEES AND EXPERT COSTS: The prevailing party in any legal suit, action, or proceeding arising out of relating to the Contract shall be awarded its reasonable attorneys' fees and experts costs.

WARRANTY:
THE SELLER MAKES NO WARRANTIES ON ANY PRODUCTS OR SERVICES PROVIDED UNDER THIS CONTRACT, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY, (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY, WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE. BUT THE BUYER SHALL RECEIVE WARRANTIES, IF ANY, PROVIDED BY THE MANUFACTURER OF THE PRODUCTS SOLD UNDER THIS CONTRACT. THE SELLER IS EXPRESSLY EXCLUDED FROM ANY WARRANTY AND ALL CHARGES, FOR LABOR, INSTALLATION, REMOVAL, REPAIR, REINSTALLATION, SHIPPING, UTILITIES, EQUIPMENT RENTAL, OTHER REQUIRED MATERIALS, OR ANY OTHER ITEMS. THE PARTIES AGREE THAT THE BUYER'S SOLE AND EXCLUSIVE REMEDIES SHALL BE AGAINST THE PRODUCT MANUFACTURER AS PROVIDED HEREIN. THE BUYER AGREES THAT NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, DOWN TIME, OPERATING OR MAINTENANCE COSTS, INJURY TO PERSONS OR PROPERTY, OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO BUYER. BUYER SHALL FOLLOW ALL STORAGE, OPERATION, AND MAINTENANCE PROCEDURES SPECIFIED BY THE MANUFACTURER FOR WARRANTY COVERAGE, FAILURE TO FOLLOW THESE PROCEDURES INCLUDING DOCUMENTATION MAY RESULT IN LOSS OF WARRANTY COVERAGE.

TAXES: Seller does not include any Federal, State, City, County, or other sales, custom duties, or taxes such as sales, use, excise, retailer's, occupation or similar taxes and fees, in the Contract Price unless otherwise explicitly stated in writing. Any taxes not included in the Bid Quote will be added to the Contract Price. In lieu of paying such taxes to the Seller, the Buyer may furnish the Seller with a Tax Exemption Certificate or other legal and appropriate taxing authorities at any time.

PAYMENT TERMS: All quotations or proposals are in US Dollars unless explicitly stated otherwise in writing. Seller shall submit invoices for payment to Buyer for percentages of the Contract Price as described in Bid Quote. Buyer must pay all invoices submitted by Seller no later than 30 days after the date of the invoice. the shipment is delayed by the Buyer, date of readiness for shipment shall be deemed the date of shipment for payment purposes. The Seller may require advance payment or a certificate of deposit, or may otherwise modify credit terms, should the Buyer's credit standing not meet the Seller's requirements. A service charge of 2.5% per month on the unpaid balance will be charged on all overdue monies payable. Buyer shall not assign or transfer their contract or any interest in it, or monies payable under it, without the written consent of Seller and any assignment made without such consent shall be null and void. Buyer agrees to pay all collection costs and costs of suit, including reasonable attorney fees, in the event Seller institutes collection action for overdue account. Seller expressly reserves all available lien rights in connection with any transaction between the parties. Unless explicitly agreed upon in writing, retainage against the contract amount is not allowed. The Seller reserves the right to re-possess all equipment that is not paid for in full per this Contract's payment terms.

CREDIT CARD PAYMENTS: All credit card payments will require an additional 2% surcharge in addition to the Contract Price listed in the Contract. All credit card payments over $5000.00 require written pre-approval by the Seller prior to processing; approval is not guaranteed.

CREDIT: Buyer is required to provide all necessary credit information to Seller with each order, including bank reference, bonding company, or other necessary information with complete names, addresses, phone numbers, personal references, and account and bond numbers. The Seller will determine, in its sole discretion, what is acceptable and what credit rating is required for the Seller to allow a purchase on credit.

PRICE: The prices specified are in U.S. currency, payable free of all expense to the Seller for collection charges.

STARTUP PAYMENTS: If startup services are included in this Contract, the pre-agreed upon payment amount shall be due when startup is complete. If startup is delayed more than 90 days after equipment delivery, payment for startup shall be due 90 days after equipment delivery prior to the startup occurring. Delaying in paying this portion of the contract is subject to the PAYMENT TERMS above.

SHIPMENTS AND DELIVERY: Delivery and shipping times are Seller's best estimate and do not include product approval time or order processing time. Seller is not liable for any damages, fees, costs, expenses or penalties arising from (1) loss of or damage to product in transit or (2) delays in shipping or delivery of the product, including all delays caused by an accident; riots; insurrections; national emergency; labor disputes of every kind however caused; embargoes; non-delivery by suppliers; delays of carriers or postal authorities; or governmental restrictions, prohibitions, or requirements. Seller may, in its sole discretion, without liability or penalty, make partial shipments of products to Buyer. Each shipment will constitute

a separate sale, and Buyer shall pay for the units shipped whether such shipment is in whole or partial fulfillment of Buyer's order. Cost of handling and freight is only included when it is explicitly listed in this Contract.

NON-DELIVERY: The quantity of any installment of products as recorded by Seller on dispatch from Seller's place of business is conclusive evidence of the quantity received by Buyer on delivery unless Buyer can provide conclusive evidence proving the contrary. Any liability of Seller for non-delivery of the products shall be limited to replacing the products within a reasonable time or adjusting the invoice respecting such products to reflect the actual quantity delivered.

APPROVALS: Buyer is responsible for obtaining approval on products from project owners and engineers. The Seller represents only those products are as described in this Contract. The Seller does not warrant that the products described will be approved or otherwise satisfactory to project owners or engineers, or that products meet project specifications. Seller does not guarantee compliance with any codes or laws unless explicitly stated in this Contract. Performance of the overall system that incorporates the products is not guaranteed.

OCCUPATIONAL SAFETY AND HEALTH ACT of 1970 – Seller does not warrant or represent that any of Seller's products by themselves or in a system or with other equipment will conform to or comply with the provisions of the Occupational Safety and Health Act of 1970 and the standards and regulations issued thereunder, or any other federal, state, or local law or regulation of the same or similar nature.

LIMITATION OF LIABILITY - NEITHER SELLER, NOR ITS SUPPLIERS SHALL BE LIABLE, WHETHER IN CONTRACT, WARRANTY, FAILURE OF A REMEDY TO ACHIEVE ITS INTENDED OR ESSENTIAL PURPOSES, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, INDEMNITY OR ANY OTHER LEGAL THEORY, FOR LOSS OF USE, REVENUE OR PROFIT, OR FOR COSTS OF CAPITAL OR OF SUBSTITUTE USE OR PERFORMANCE, OR FOR INDIRECT, SPECIAL, LIQUIDATED, INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR ANY OTHER LOSS OR COST OF A SIMILAR TYPE, OR FOR CLAIMS BY BUYER FOR DAMAGES OF BUYER'S CUSTOMERS. SELLER'S AGGREGATE LIABILITY ARISING OUT OF OR RELATING TO THIS CONTRACT SHALL NOT EXCEED THE CONTRACT PRICE, PROVIDED HOWEVER, IF THE BID QUOTE INCLUDES FIELD OR STARTUP SERVICE, SELLER'S LIABILITY FOR SAID SERVICES SHALL BE LIMITED TO THE VALUE OF THE SERVICES. BUYER AND SELLER AGREE THAT THE EXCLUSIONS AND LIMITATIONS SET FORTH IN THIS ARTICLE ARE SEPARATE AND INDEPENDENT FROM ANY REMEDIES WHICH BUYER MAY HAVE HEREUNDER AND SHALL BE GIVEN FULL FORCE AND EFFECT REGARDLESS OF WHETHER ANY OR ALL SUCH REMEDIES SHALL BE DEEMED TO HAVE FAILED OF THEIR ESSENTIAL PURPOSE.

STORAGE – If for any reason Buyer fails to accept products that have been delivered by Seller, or if Seller is unable to deliver the products because Buyer has not provided appropriate instructions, documents, licenses, or authorizations, then Seller may place the products in storage at Buyer's cost and expense, which includes the cost of storage, shipping fees, insurance, and other incidental expenses. The Buyer carries risk of loss for products in storage.

TITLE - Title to the products and risk of loss or damage passes to Buyer upon delivery of the products at the Point of Delivery listed in the Bid Quote. As collateral security for the payment of the Contract Price for the products, Buyer hereby grants to Seller a lien on and security interest in and to all of the right, title and interest of Buyer in, to, and under the products, wherever located, and whether now existing or hereafter arising or acquired from time to time, and in all accessions thereto and replacements or modifications thereof, as well as all proceeds (including insurance proceeds) of the foregoing. The security interest granted under this provision constitutes a purchase money security interest under the Washington Uniform Commercial Code. Buyer agrees to perform all additional acts necessary to perfect and maintain said security interest.

INSURANCE: Buyer shall, at its own expense, purchase, maintain and carry adequate insurance for the products to protect against loss or damage from any external cause, including losses from fire, wind, water, or other causes. Insurance coverage must be maintained with insurance companies legally authorized to do business where said products are located in an amount at least equal to the value of said products until the products are accepted and paid for in full. Upon Seller's request, Buyer shall provide Seller with a certificate of insurance from Buyer's insurer evidencing the insurance coverage that is satisfactory to Seller. The certificate of insurance must name Seller as an additional insured. In no case does the Contract Price, even if inclusive of freight, cover the cost of insurance beyond the Point of Delivery specified in the Bid Quote]

CANCELLATION: The Buyer may cancel its order only upon written notice, and in turn will make payment to Seller of reasonable cancellation charges specified by Seller.

ORAL STATEMENTS: The Seller's personnel may have made oral statements about the products described in this Contract during the sales process. Such statements do not constitute warranties or guarantees and shall not be relied on by the Buyer. The entire contract is embodied in this writing. This writing constitutes the final expression of the parties' agreement, and it is a complete and exclusive statement of the terms of that agreement.

CHANGES: Seller reserve the right to make changes and to substitute other material as needed to make shipments and fulfill orders under this Contract.

ERRORS: Seller reserves the right to correct clerical or stenographic errors or omissions.

STATUTE OF LIMITATIONS - To the extent permitted by applicable law, any lawsuit for breach of contract, including breach of warranty, arising out of the transactions covered by this order, must be commenced by the Buyer not later than twelve (12) months from the delivery of Seller's Products or the last day Seller performed any services, whichever is earlier.

INSPECTION: Buyer shall inspect Seller's Products upon receipt, and if Buyer's inspection reveals any defects in the Products, Buyer shall notify the Seller within three (3) days after receipt of the Products of any claim Buyer might have concerning such defects in the Products discovered by Buyer. Buyer's failure to notify Seller within such a three (3) day period shall constitute a waiver by Buyer of all claims covering such defects in the Products. It is the Buyer's responsibility to inspect for shipping damage upon delivery and to initiate a damage claim with the freight carrier. Damage occurring in-transit by the freight carrier must be claimed by the Buyer and is not the Seller's responsibility.

NOT INCLUDED: Seller does not include any item not specifically listed as included. References to specifications and drawings in the Scope of Supply section of the Bid Quote does not indicate that all items in those documents are included in the Scope of Supply. Unless clearly included in this Contract, engineering and design services are not included in this Contract.

FREIGHT: Prices quoted are F.O.B. point of manufacture and do not include freight unless specifically listed as included. Title passed to the Buyer at the Point of Delivery listed in the Bid Quote and all freight claims are the responsibility of the Buyer.

BACKCHARGES will not be accepted unless approved by Seller, in writing, before any work is done.

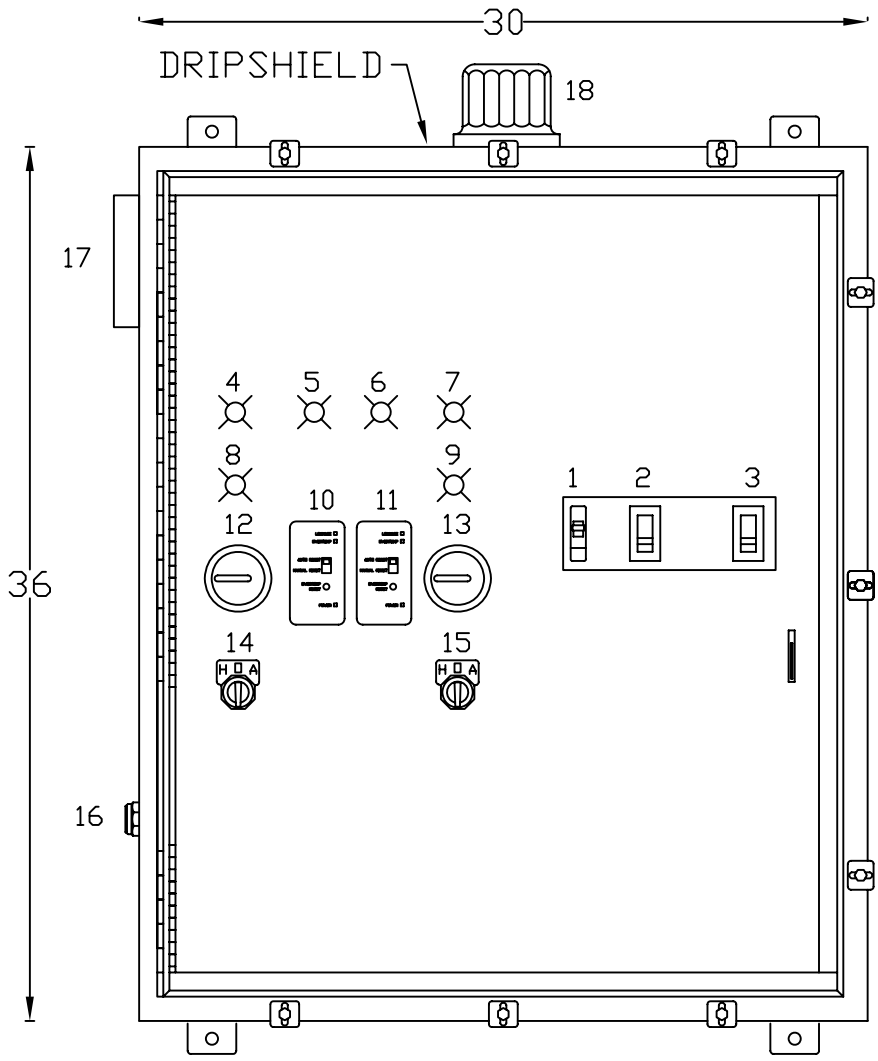
DELAYS: Price and terms and conditions are subject to revision if manufacture is not released at time of order placement or drawings for approval are not returned within 30 days from receipt by customer, or manufacture is released and subsequently held or delayed by the customer for more than 30 days, or customer requests longer than quoted shipment. If Seller suffers delay in performance due to any cause beyond its control, including but not limited to act of God, war, pandemic, act or failure to act of government, act or omission of Buyer, fire, flood, strike or labor troubles, sabotage, or delay in obtaining from others suitable services, materials, components, equipment or transportation, the time of performance shall be extended a period of time equal to the period of the delay and its consequences. Seller will give Buyer notice in writing within a reasonable time after the Seller becomes aware of any such delay.

DECOMPOSITION AND WEAR: Decomposition by chemical action and wear caused by the presence of abrasive materials shall not constitute defects.

BUYER DATA - Timely performance is contingent upon the Buyer supplying to the Seller, when needed, all required technical information, including drawing and submittal approval, and all required commercial documentation. The Buyer shall also supply and complete all shipping delivery information, pre-delivery checklists, and pre-startup checklists in a timely manner or the overall schedule of the project may be impacted at no cost to the Seller regardless of any potential agreed upon damages.

BUYER SUPPLIED COMPONENTS - Buyer acknowledges that the products purchased by Buyer under this Contract may contain products supplied by the Buyer or supplied by a third party at the Buyer's direction ("Buyer Supplied Components"). Buyer Supplied Components are not covered by any warranty or guarantee in this Contract. For the avoidance of doubt, Seller makes no representations or warranties with respect to any Buyer Supplied Components. Seller disclaims any liability arising from Buyer Supplied Components delivered late, damaged, defective, or nonconforming. In no event shall Seller be liable for consequential, indirect, incidental, special, exemplary, punitive damages, or lost profits, arising out of or relating to late delivery of or defective Buyer Supplied Components. Subject to the terms and conditions of this Contract, Buyer shall indemnify, defend and hold harmless Seller and its representatives/officers, directors, employees, agents, affiliates, successors and permitted assigns ("Indemnified Party") against any and all losses, damages, liabilities, deficiencies, claims, actions, judgments, settlements, interest, awards, penalties, fines, costs, or expenses of whatever kind, including attorney and expert fees, fees and costs of enforcing any right to indemnification under this Contract, and the cost of pursuing any insurance providers, incurred by Indemnified Party in a final judgment relating to any third-party claims arising from defective Buyer Supplied Components.

PRELIMINARY



OUTER DOOR HAS BEEN REMOVED FOR CLARITY

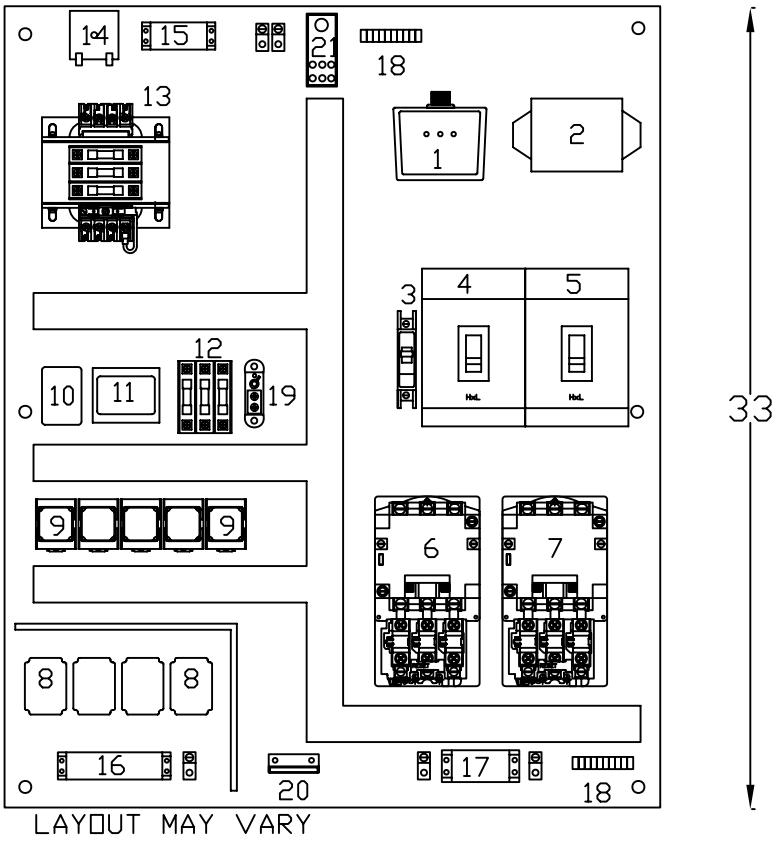
1 - CCB CONTROL CIRCUIT BREAKER
2 - MB1 MOTOR BREAKER 1
3 - MB2 MOTOR BREAKER 2
4 - PL1 OFF LEVEL
5 - PL2 LEAD LEVEL
6 - PL3 LAG LEVEL
7 - PL4 HIGH LEVEL
8 - RL1 RUN LIGHT 1
9 - RL2 RUN LIGHT 2
10 - MC1 MINI CAS 1
11 - MC2 MINICAS 2
12 - ETM1 ELAPSED TIME METER 1
13 - ETM2 ELAPSED TIME METER 2
14 - HOA HAND-OFF-AUTO SWITCH PUMP 1
15 - HOA HAND-OFF-AUTO SWITCH PUMP 2
16 - ASB ALARM SILENCE BUTTON
17 - AH ALARM HORN
18 - AL ALARM LIGHT

INTRINSIC RAPID RELEASE			
QUOTE NO.	DATE	DRAWN BY	REVISION
BBABAB	11/07/2006	B.A.S.	

BBABAB

ITT-FLYGT

ITT-FLYGT CORP.
TRUMBULL, CT 06611



LAYOUT MAY VARY

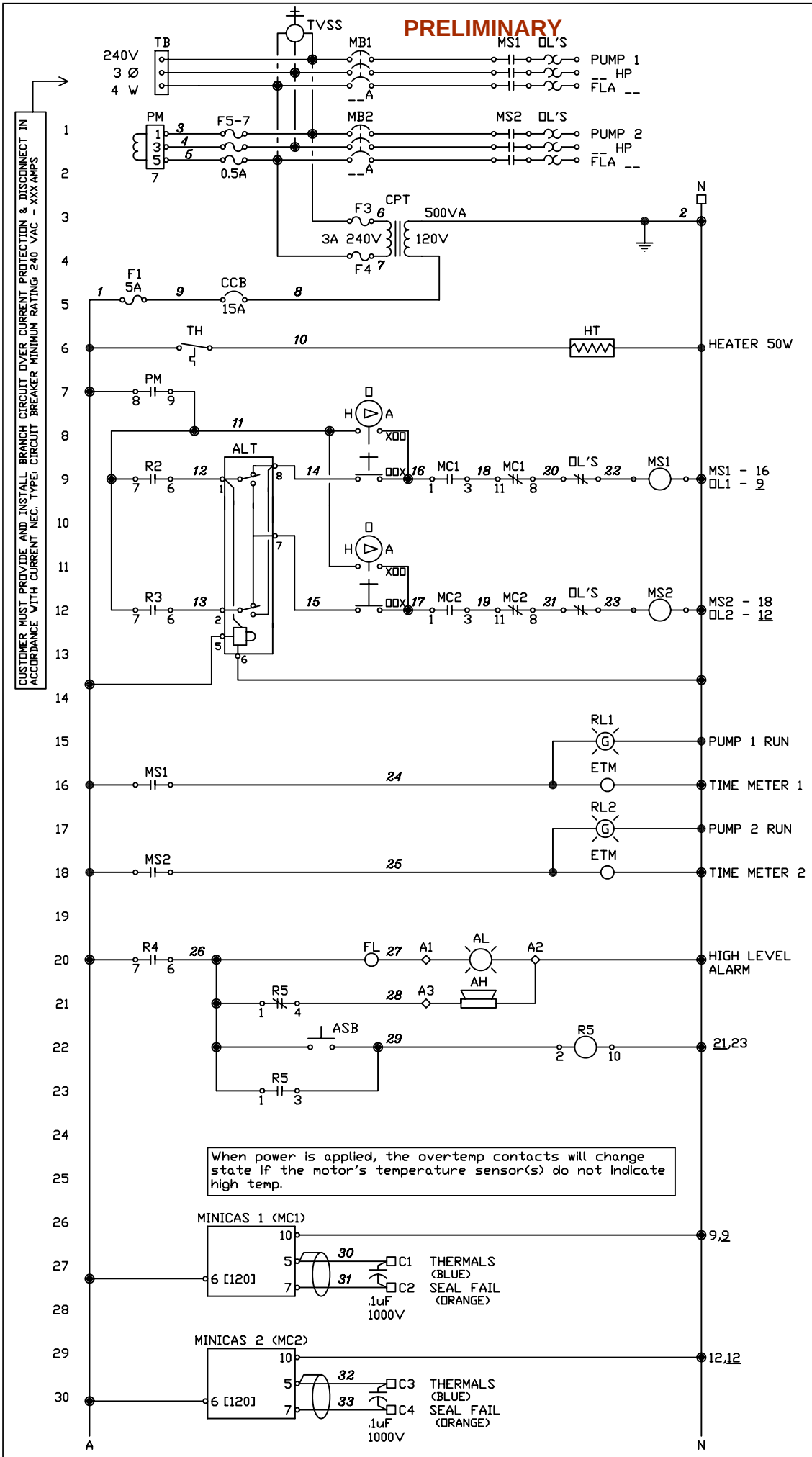
1 - TVSS SURGE ARRESTOR
2 - TB POWER TERMINAL BLOCK
3 - CCB CONTROL CIRCUIT BREAKER
4 - MB1 MOTOR BREAKER 1
5 - MB2 MOTOR BREAKER 2
6 - MS1 MOTOR STARTER 1
7 - MS2 MOTOR STARTER 2
8 - ISR1-4 INTRINSICALLY SAFE RELAY 1-4
9 - R1-5 RELAY 1-5
10 - ALT ALTERNATOR
11 - PM PHASE MONITOR
12 - FUSE BLOCKS
13 - CPT CONTROL POWER TRANSFORMER
14 - FL FLASHER
15 - TSA TERMINAL STRIP A
16 - TSB TERMINAL STRIP B
17 - TSC TERMINAL STRIP C
18 - GB GROUND BUS BAR
19 - TH THERMOSTAT
20 - HT HEATER
21 - NB NEUTRAL BLOCK

INTRINSIC RAPID RELEASE			
QUOTE NO.	DATE	DRAWN BY	REVISION
BBABAB	11/07/2006	B.A.S.	

BBABAB

ITT-FLYGT

ITT-FLYGT CORP.
TRUMBULL, CT 06611

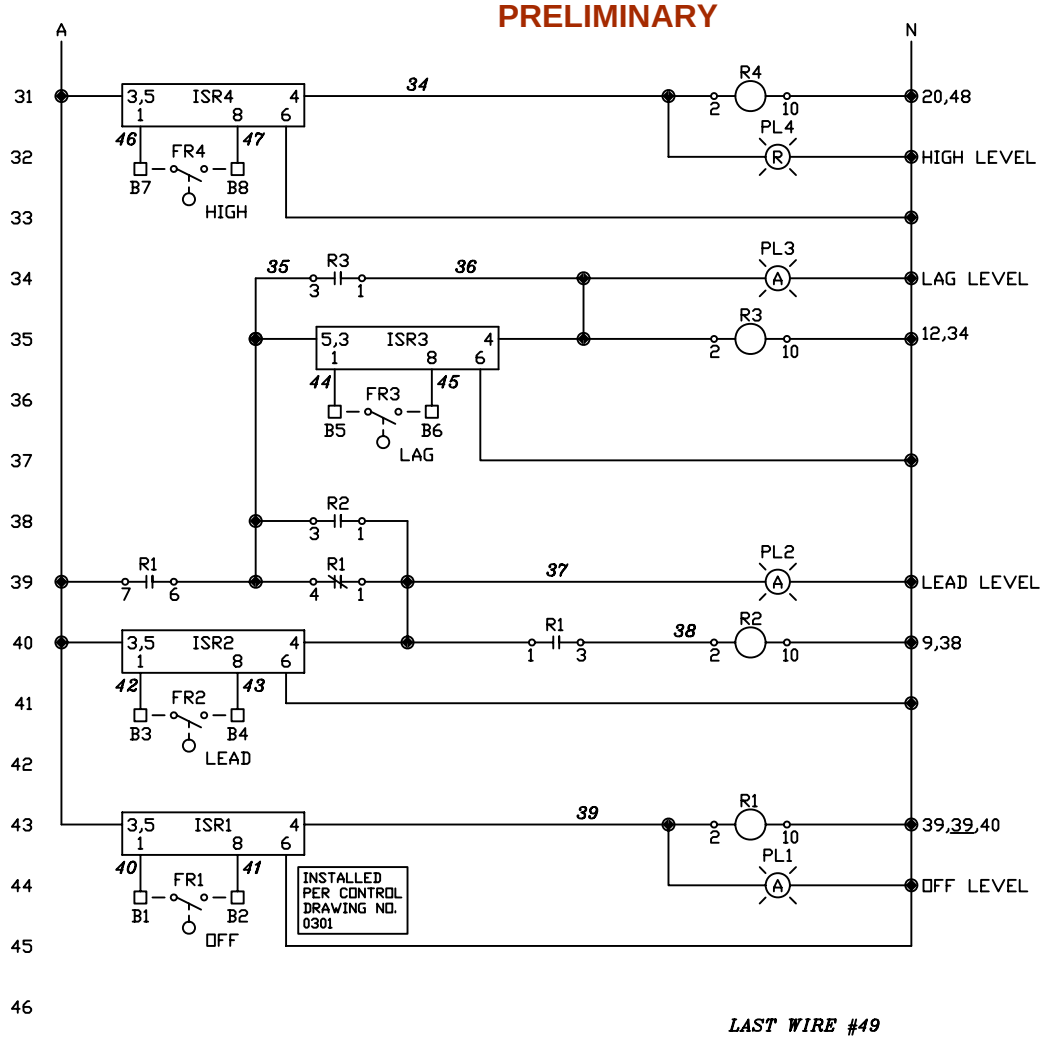


BBABAB	INTRINSIC RAPID RELEASE	
	QUOTE NO.	DATE
	BBABAB	6/04/2009

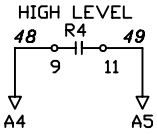
DRAWN BY: B.A.S.
REVISION:

ITT-FLYGT CORP.
TRUMBULL, CT 06611

PRELIMINARY



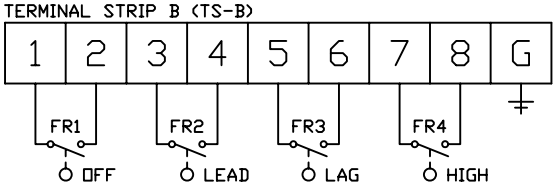
LAST WIRE #49



THE CIRCUIT WIRING IN THE HAZARDOUS AREA MUST NOT EXCEED 1000 FEET BASED ON CABLE WITH 60pF/FT CAPACITANCE AND 0.2uH/FT INDUCTANCE

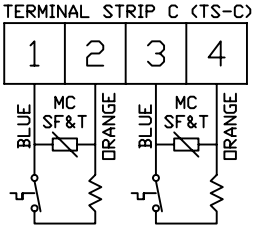
Intrinsically safe wiring terminals
'Install in accordance with Article 504 of the National Electrical Code.'

TERMINAL STRIP B (TS-B)



Nonintrinsically safe wiring terminals

TERMINAL STRIP C (TS-C)



FLYGT PUMPS LEAD COLOR CODE	
L1 (PHASE A)	RED
L2 (PHASE B)	WHITE
L3 (PHASE C)	BLACK
GROUND\EARTH	GREEN W/ YELLOW
GROUND CHECK	YELLOW
(MC PIN 5-)	BLUE
(MC PIN 7+)	ORANGE

CUSTOMER				
JOB NAME				
ENCLOSURE UL TYPE RATING:				UL TYPE 1
VOLTAGE	240V	PHASE 3		HZ 60
H.P.	#1	#2	#3 X	#4 X
F.L.A.			X	X
TOTAL F.L.A.				
SERIAL #	R09-		DATE:	6/1/05
SCCR:	5KA SYMMETRICAL RMS,240V MAX.			

MANUFACTURED BY:
STA CON INC 2525 S. OBT APOPKA FL 32703

INTRINSIC RAPID RELEASE		
QUOTE NO.	DATE	DRAWN BY
BBABAB	6/04/2009	B.A.S.

BBABAB

ITT-FLYGT

ITT-FLYGT CORP.
TRUMBULL, CT 06611

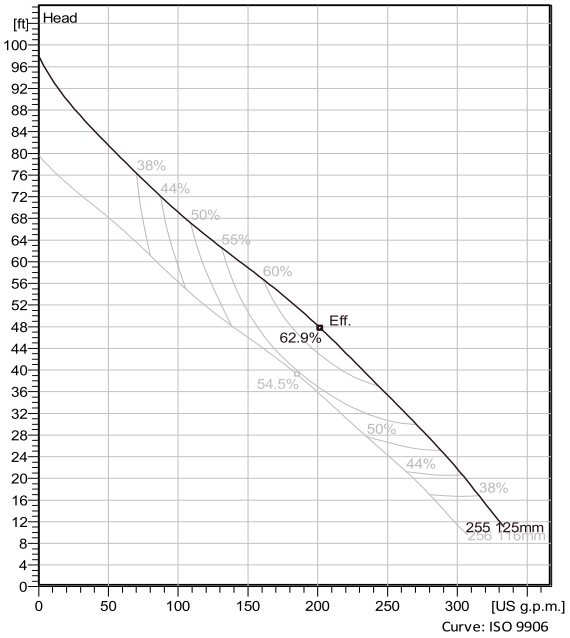
PRELIMINARY

NP 3085 SH 3~ Adaptive 255

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

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



Configuration

Motor number
N3085.070 15-09-2AL-W 4hp

Installation type
P - Semi permanent, Wet

Impeller diameter
125 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
125 mm

Discharge diameter
3 inch

Inlet diameter
80 mm

Maximum operating speed
3445 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

NP 3085 SH 3~ Adaptive 255

Technical specification

Motor - General

Motor number N3085.070 15-09-2AL-W 4hp	**Phases** 3~	**Rated speed** 3445 rpm	**Rated power** 4 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 9.9 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 230 V	**Insulation class** H	**Type of Duty** S1
Version code 070			

Motor - Technical

Power factor - 1/1 Load 0.92	**Motor efficiency - 1/1 Load** 82.2 %	**Total moment of inertia** 0.0066 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.90	**Motor efficiency - 3/4 Load** 84.0 %	**Starting current, direct starting** 62 A	
Power factor - 1/2 Load 0.84	**Motor efficiency - 1/2 Load** 83.8 %	**Starting current, star-delta** 20.7 A	

Project	**Created by**	Sydney Schumacher	
Block	**Created on**	1/27/2022	**Last update** 1/27/2022

PRELIMINARY

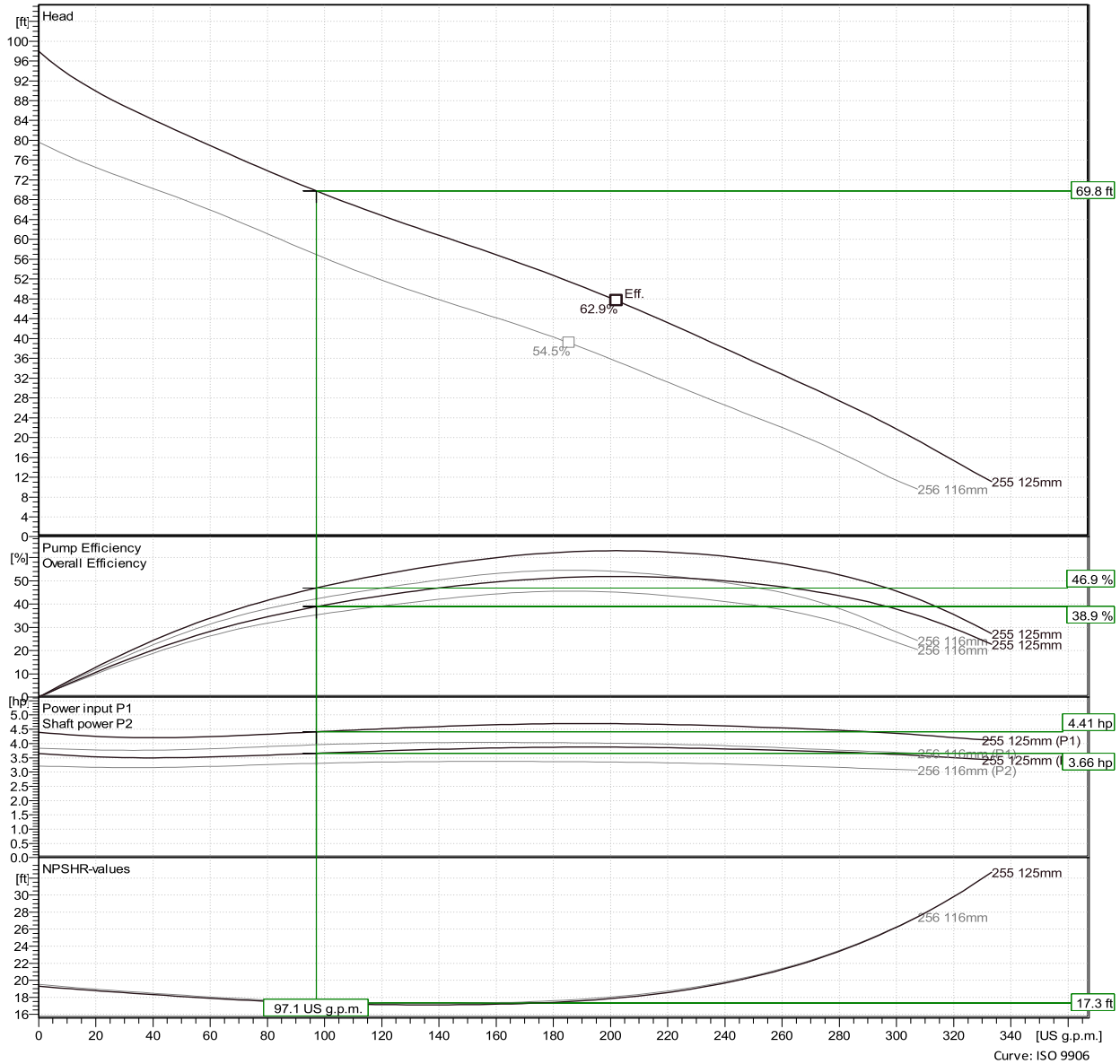
NP 3085 SH 3~ Adaptive 255

Performance curve

Duty point

Flow	Head
97.1 US g.p.m.	69.8 ft

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



Curve: ISO 9906

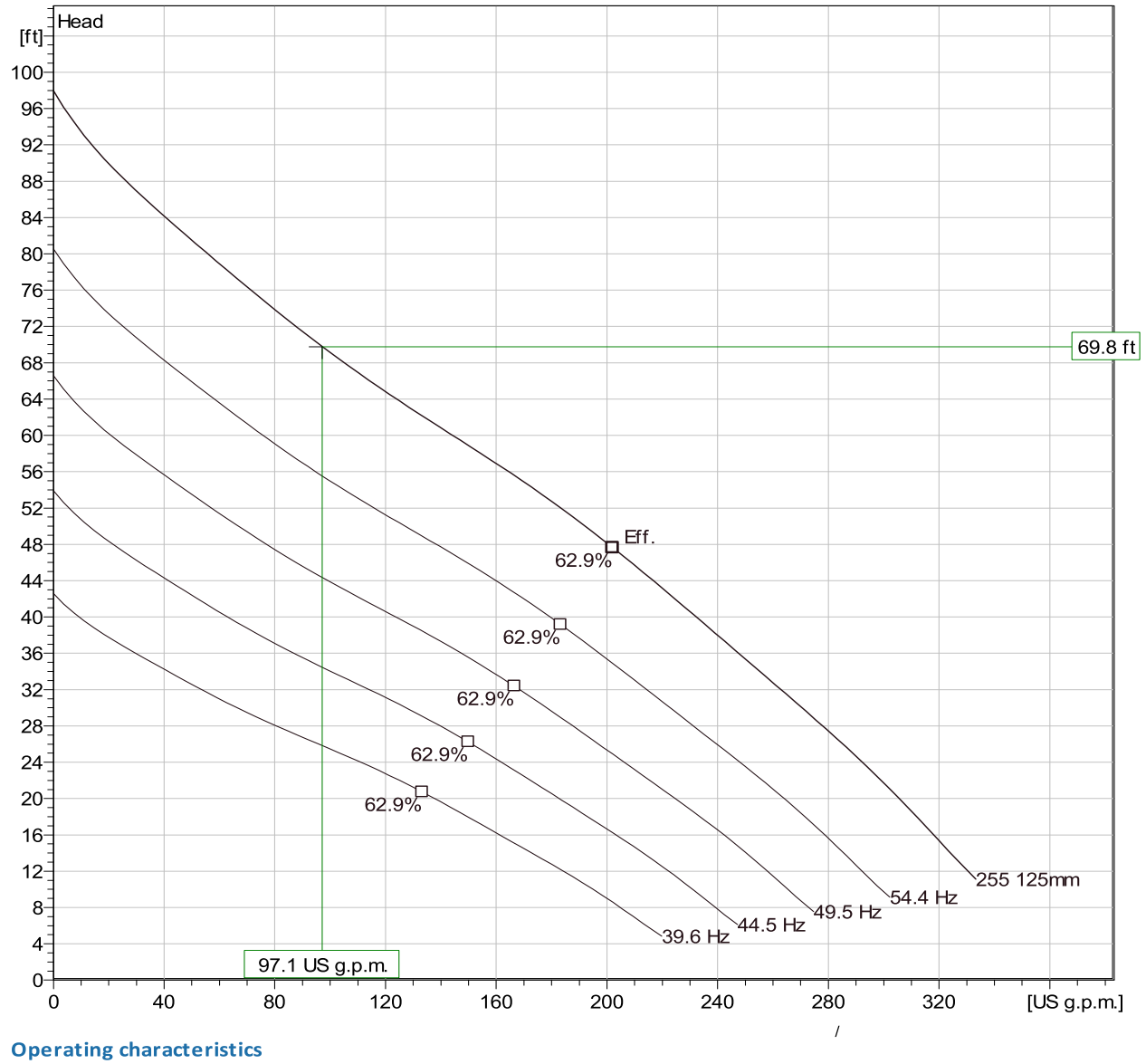
Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

PRELIMINARY

NP 3085 SH 3~ Adaptive 255

Duty Analysis

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



Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	97.1	69.8	3.66	97.1	69.8	3.66	46.9 %	564	17.3

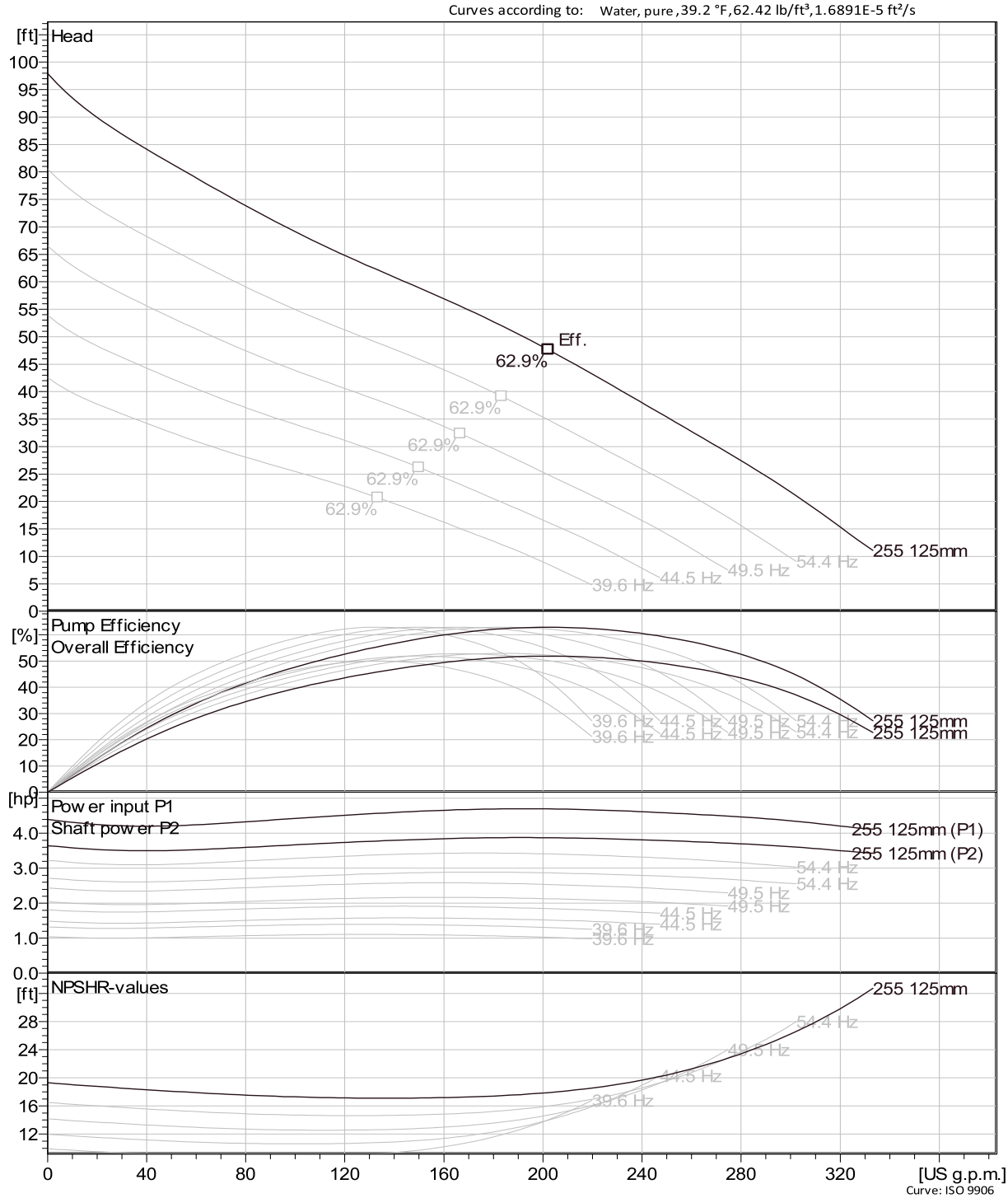
Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

NP 3085 SH 3~ Adaptive 255

VFD Curve

FLYGT a xylem brand

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



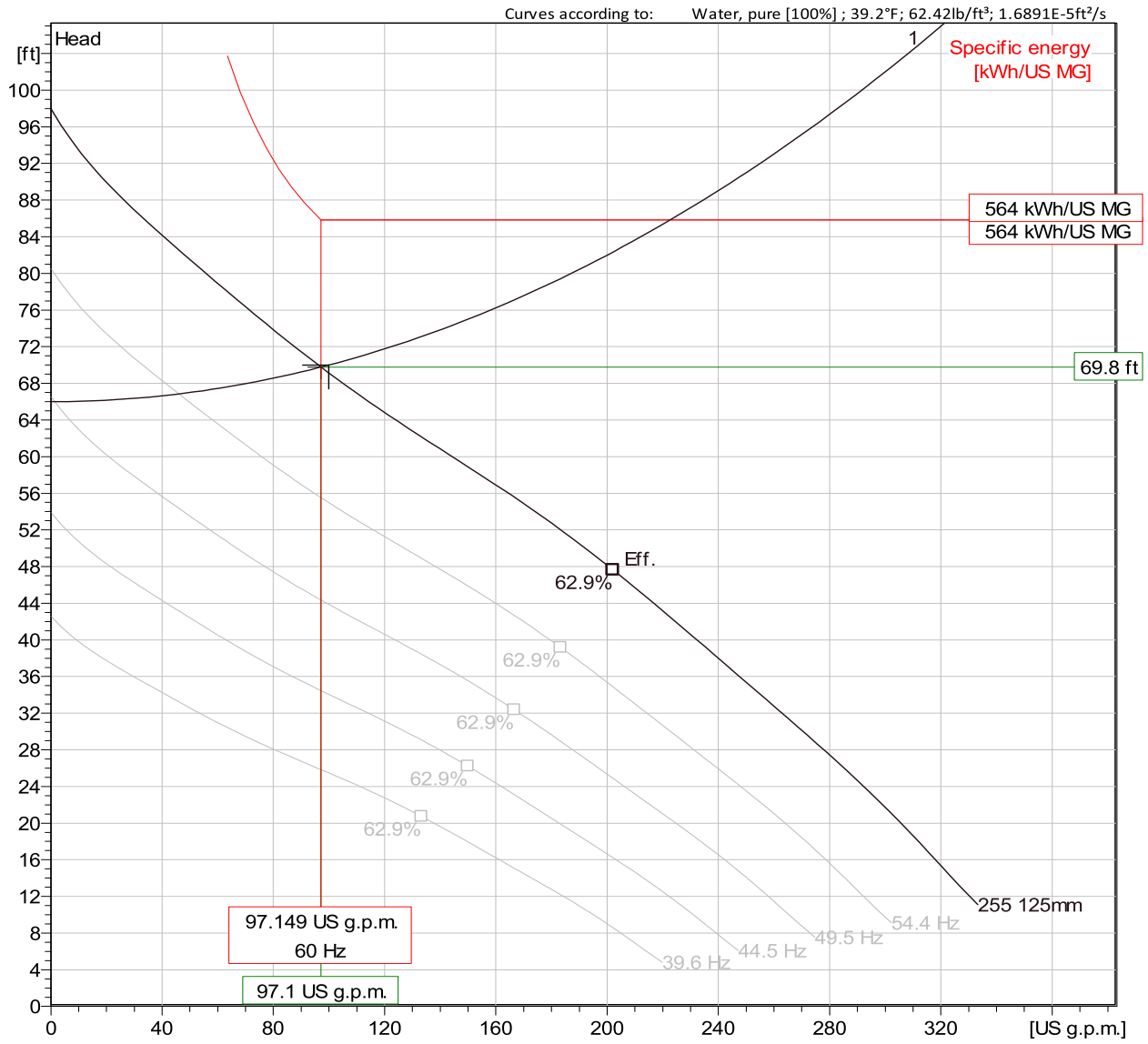
Curve: ISO 9906

Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

PRELIMINARY

NP 3085 SH 3~ Adaptive 255

VFD Analysis



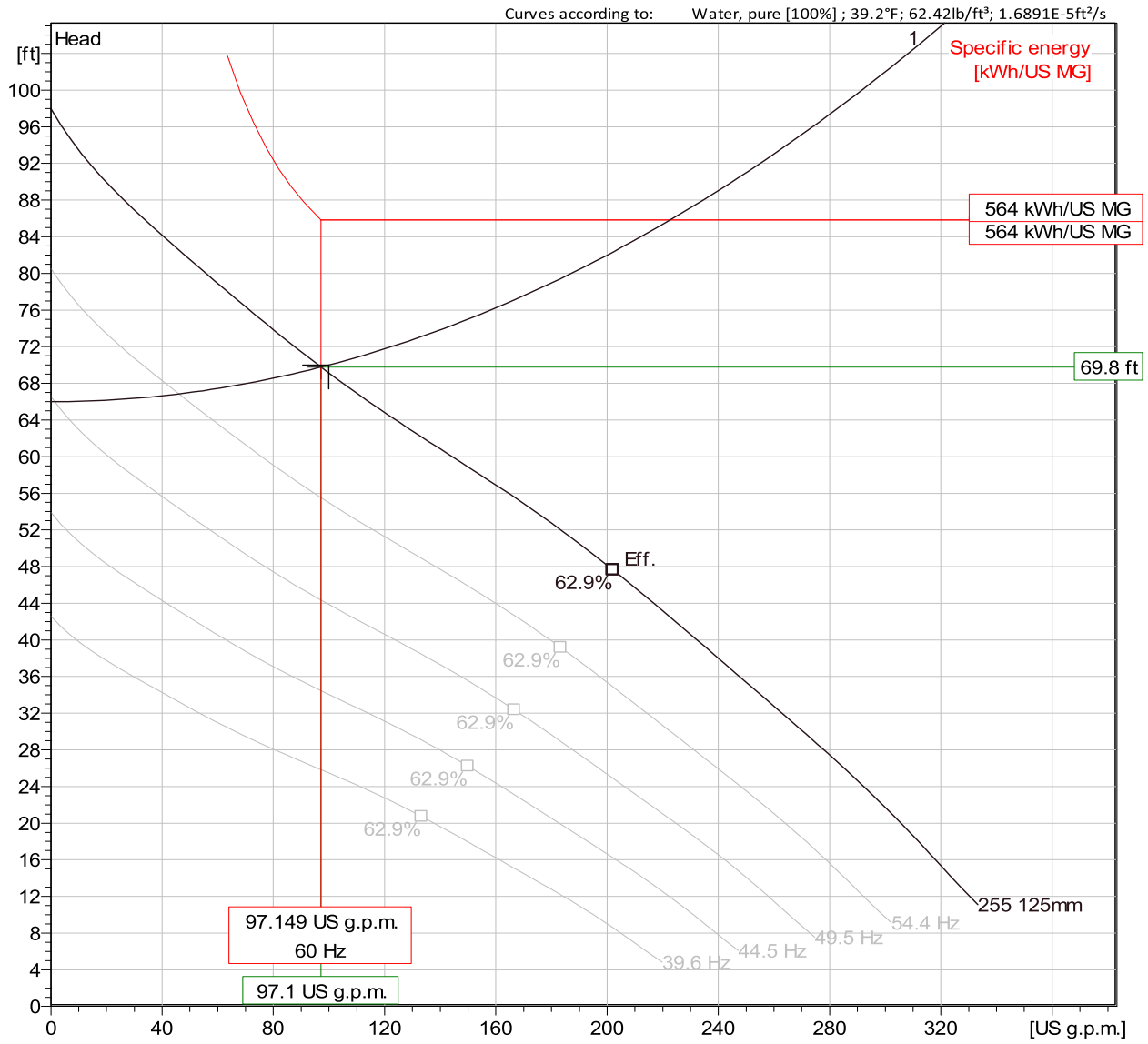
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	97.1	69.8	3.66	97.1	69.8	3.66	46.9 %	564	17.3
1	54.4 Hz	44.4	66.8	2.59	44.4	66.8	2.59	28.9 %	862	15.4
1	49.5 Hz	0.38	66	2.02	0.38	66	2.02	0.315 %	78900	14.1
1	44.5 Hz									

Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

NP 3085 SH 3~ Adaptive 255

VFD Analysis



Operating Characteristics

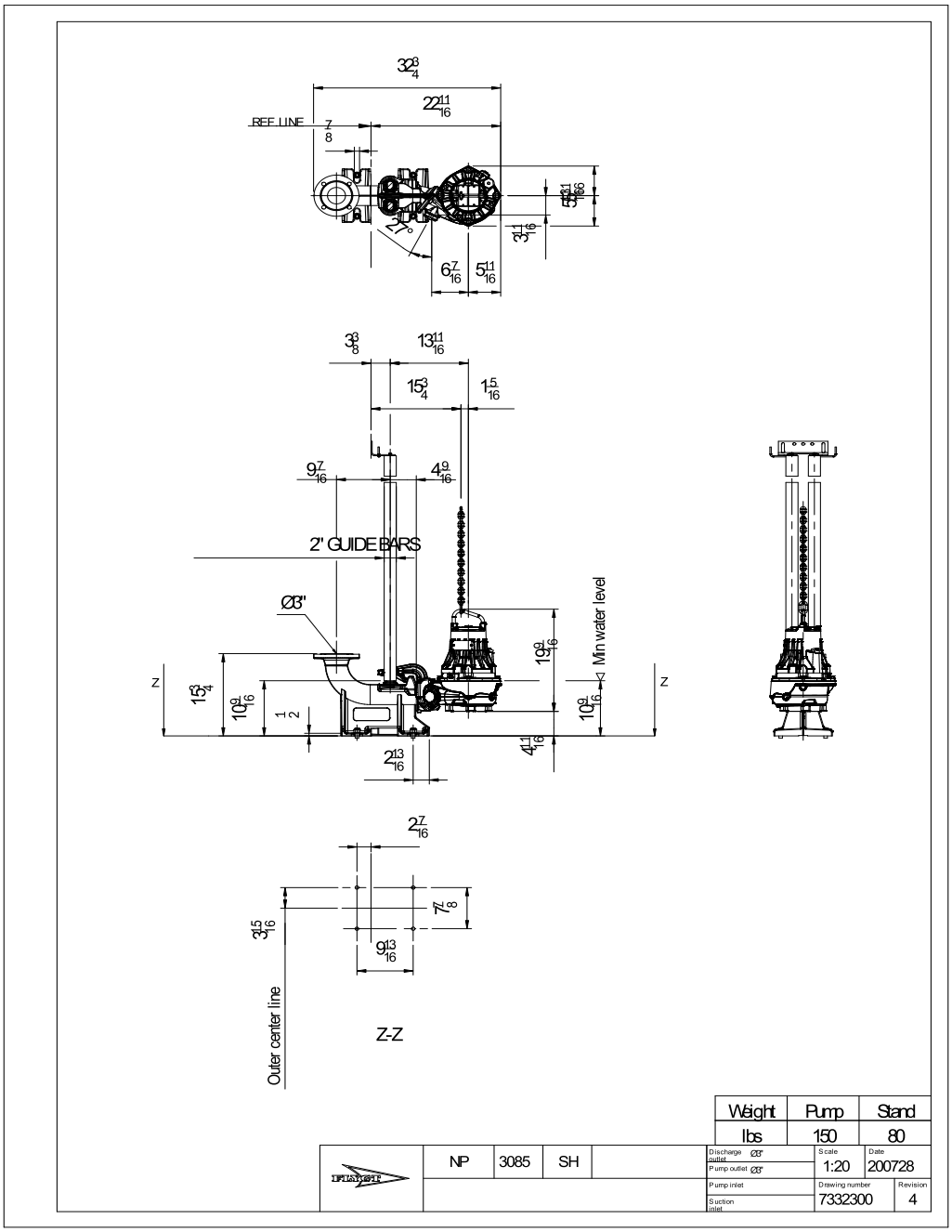
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	39.6 Hz									

Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

PRELIMINARY

NP 3085 SH 3~ Adaptive 255

Dimensional drawing



Weight	Pump	Stand
lbs	150	80

NP	3085	SH		Discharge outlet Ø3" / Pump outlet Ø3"	Scale 1:20	Date 200728
				Pump inlet / Suction inlet	Drawing number 7332300	Revision 4

Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

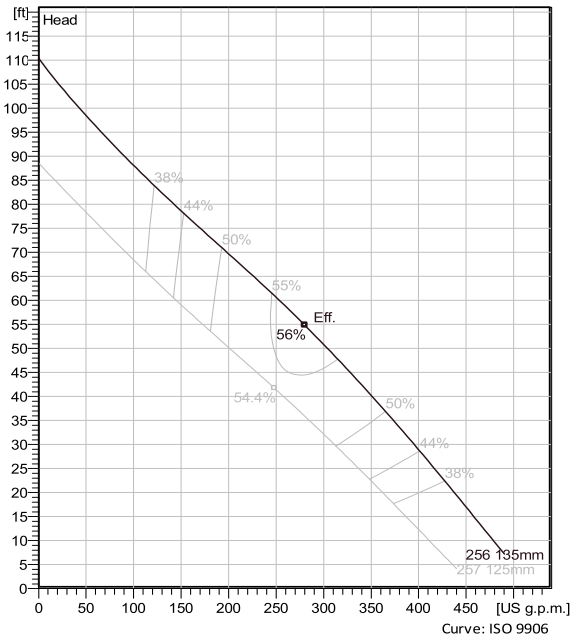
PRELIMINARY

NP 3102 SH 3~ Adaptive 256

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

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



Configuration

Motor number
N3102.930 18-10-2AS-W IE3 7.2hp

Installation type
P - Semi permanent, Wet

Impeller diameter
135 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
135 mm

Discharge diameter
3 inch

Inlet diameter
100 mm

Maximum operating speed
3600 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project	**Created by**	Sydney Schumacher	
Block	**Created on**	1/27/2022	**Last update** 1/27/2022

PRELIMINARY

NP 3102 SH 3~ Adaptive 256

Technical specification

Motor - General

Motor number N3102.930 18-10-2AS-W IE3 7.2hp	**Phases** 3~	**Rated speed** 3600 rpm	**Rated power** 7.2 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 17 A	**Stator variant** 66
Frequency 60 Hz	**Rated voltage** 230 V	**Insulation class** H	**Type of Duty** S1
Version code 930			

Motor - Technical

Power factor - 1/1 Load 0.87	**Motor efficiency - 1/1 Load** 89.8 %	**Total moment of inertia** 0.0107 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.83	**Motor efficiency - 3/4 Load** 90.0 %	**Starting current, direct starting** 144 A	
Power factor - 1/2 Load 0.74	**Motor efficiency - 1/2 Load** 88.0 %	**Starting current, star-delta** 48 A	

Project	**Created by**	Sydney Schumacher	
Block	**Created on**	1/27/2022	**Last update** 1/27/2022

PRELIMINARY

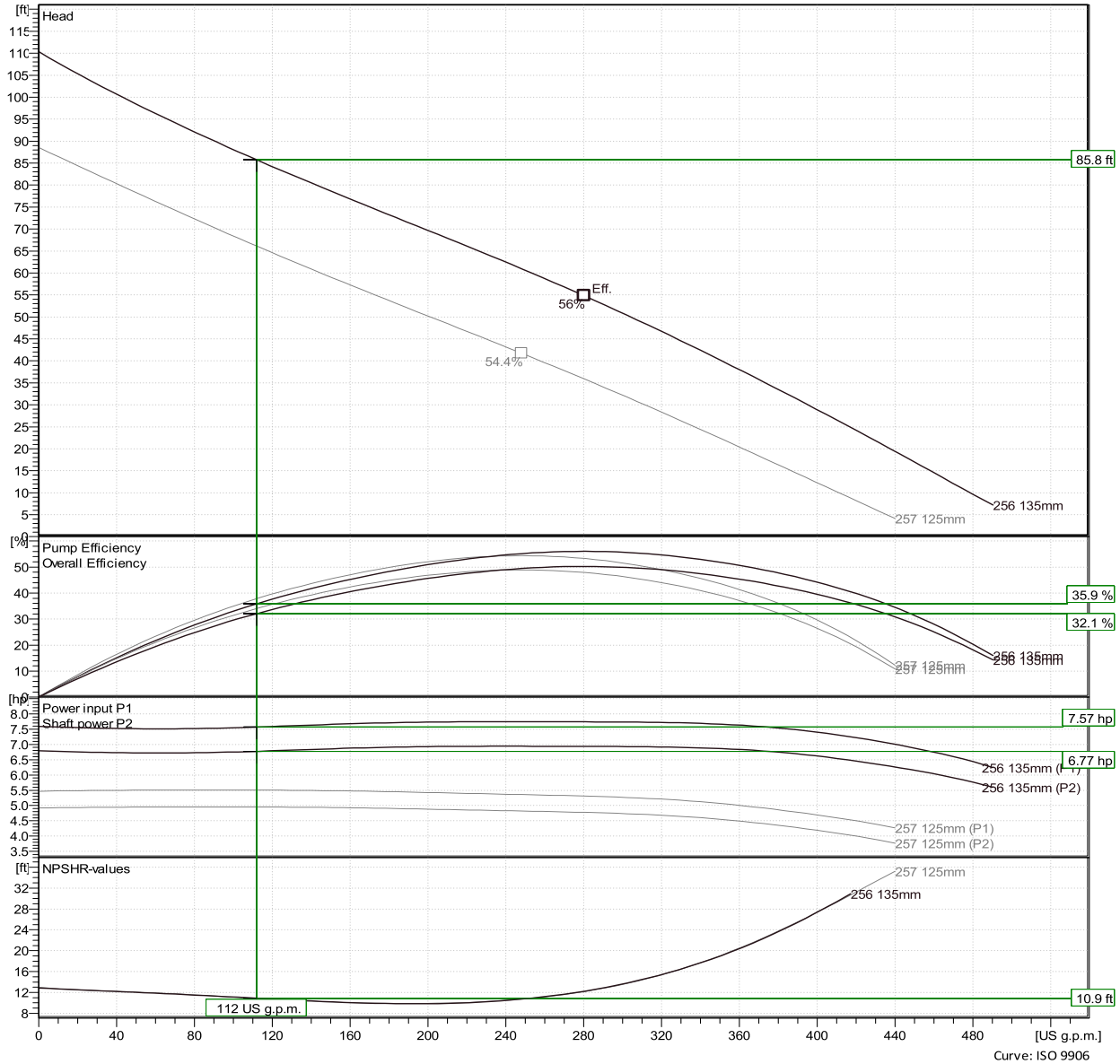
NP 3102 SH 3~ Adaptive 256

Performance curve

Duty point

Flow	Head
112 US g.p.m.	85.8 ft

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



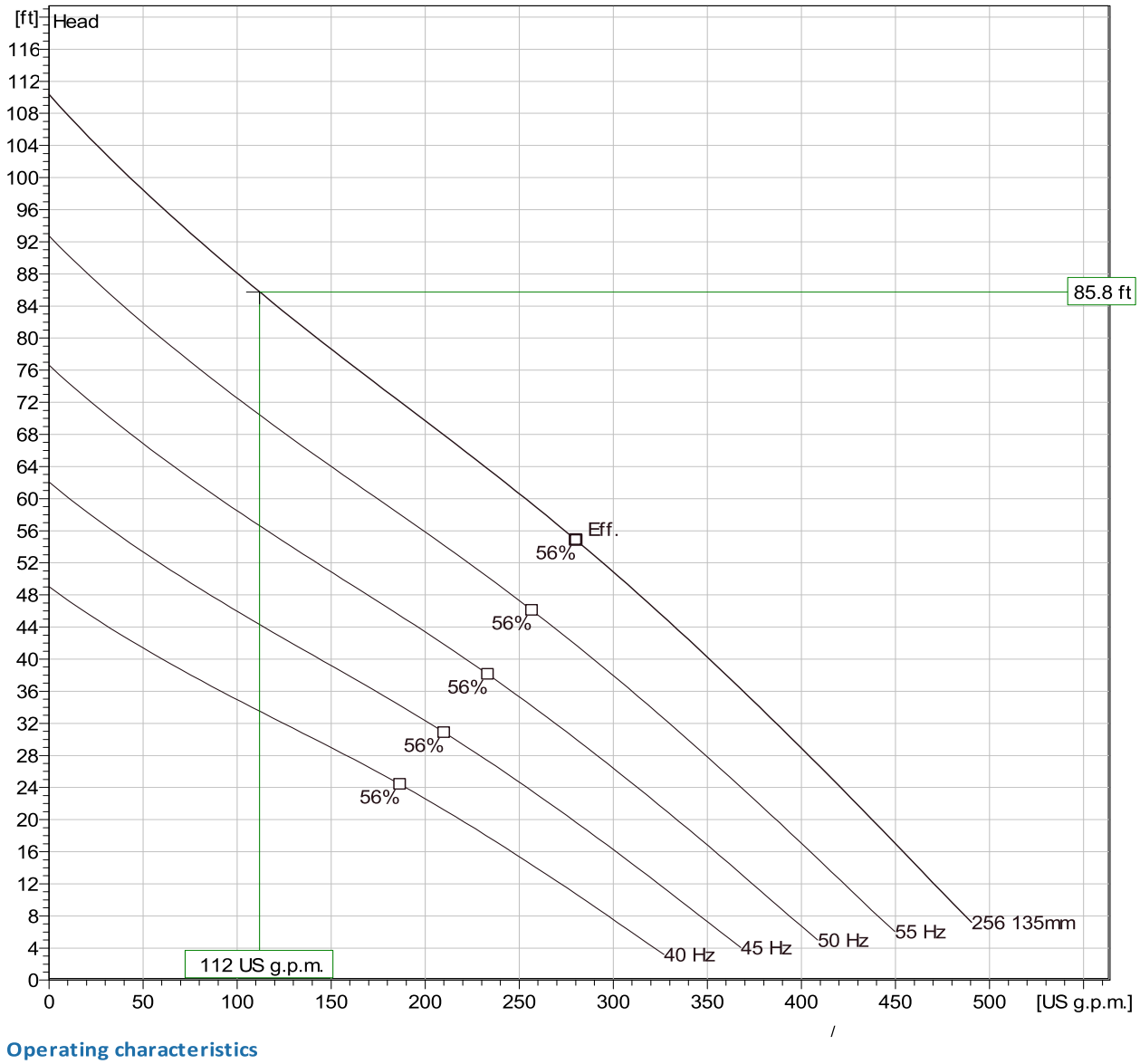
Curve: ISO 9906

Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

NP 3102 SH 3~ Adaptive 256

Duty Analysis

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



Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	112	85.8	6.77	112	85.8	6.77	35.9 %	840	10.9

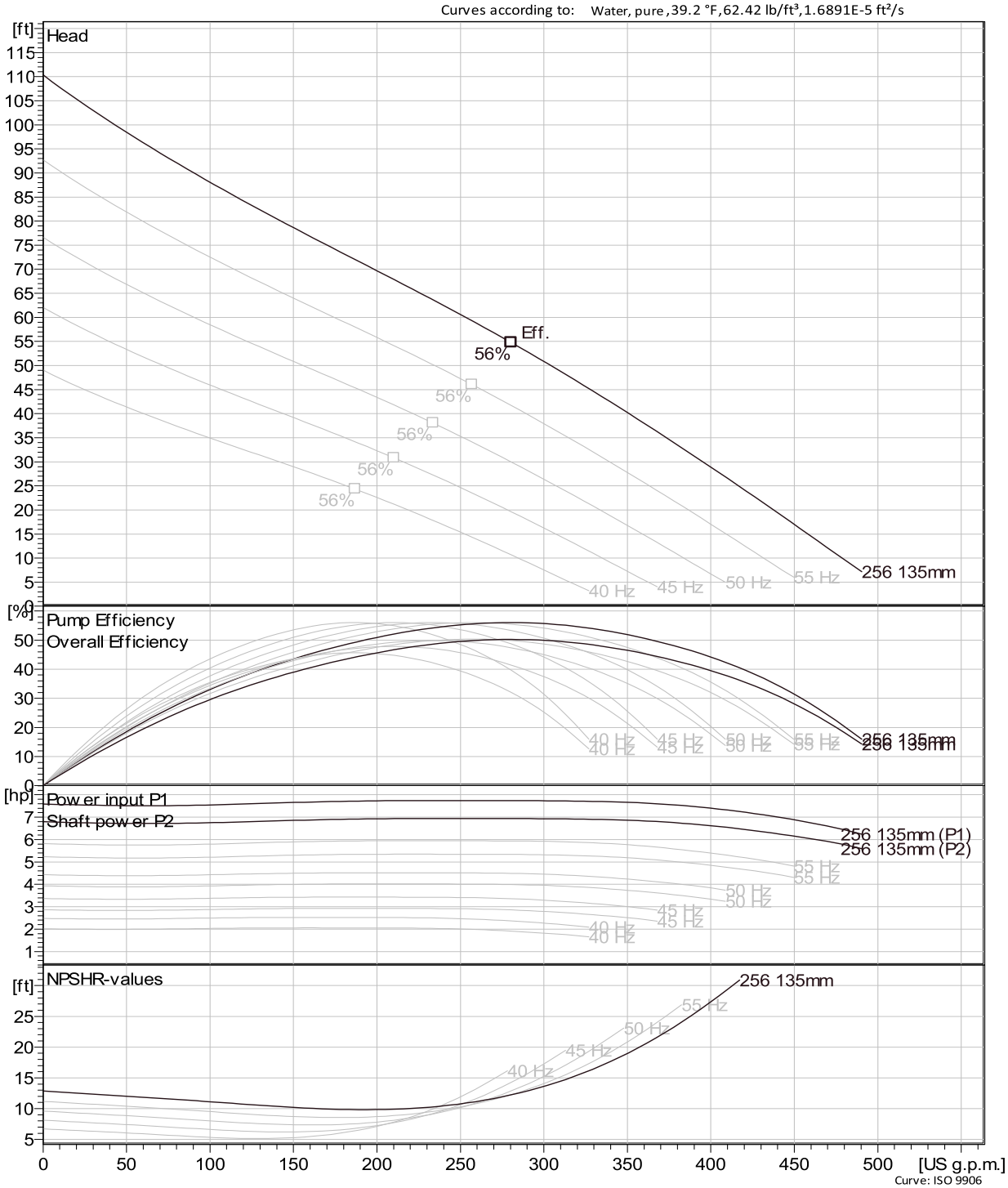
Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

NP 3102 SH 3~ Adaptive 256

VFD Curve

FLYGT a xylem brand

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



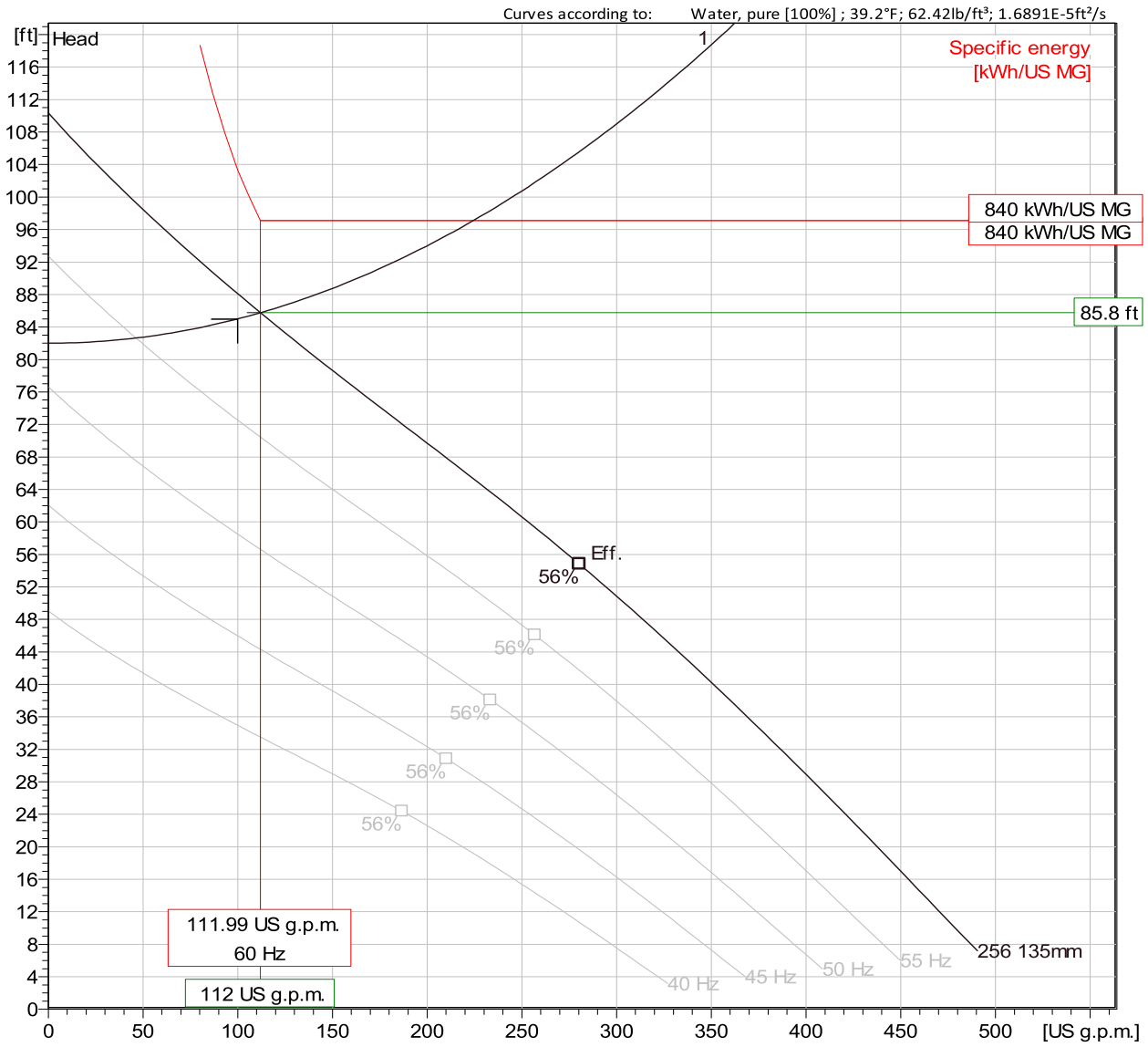
Curve: ISO 9906

Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

PRELIMINARY

NP 3102 SH 3~ Adaptive 256

VFD Analysis



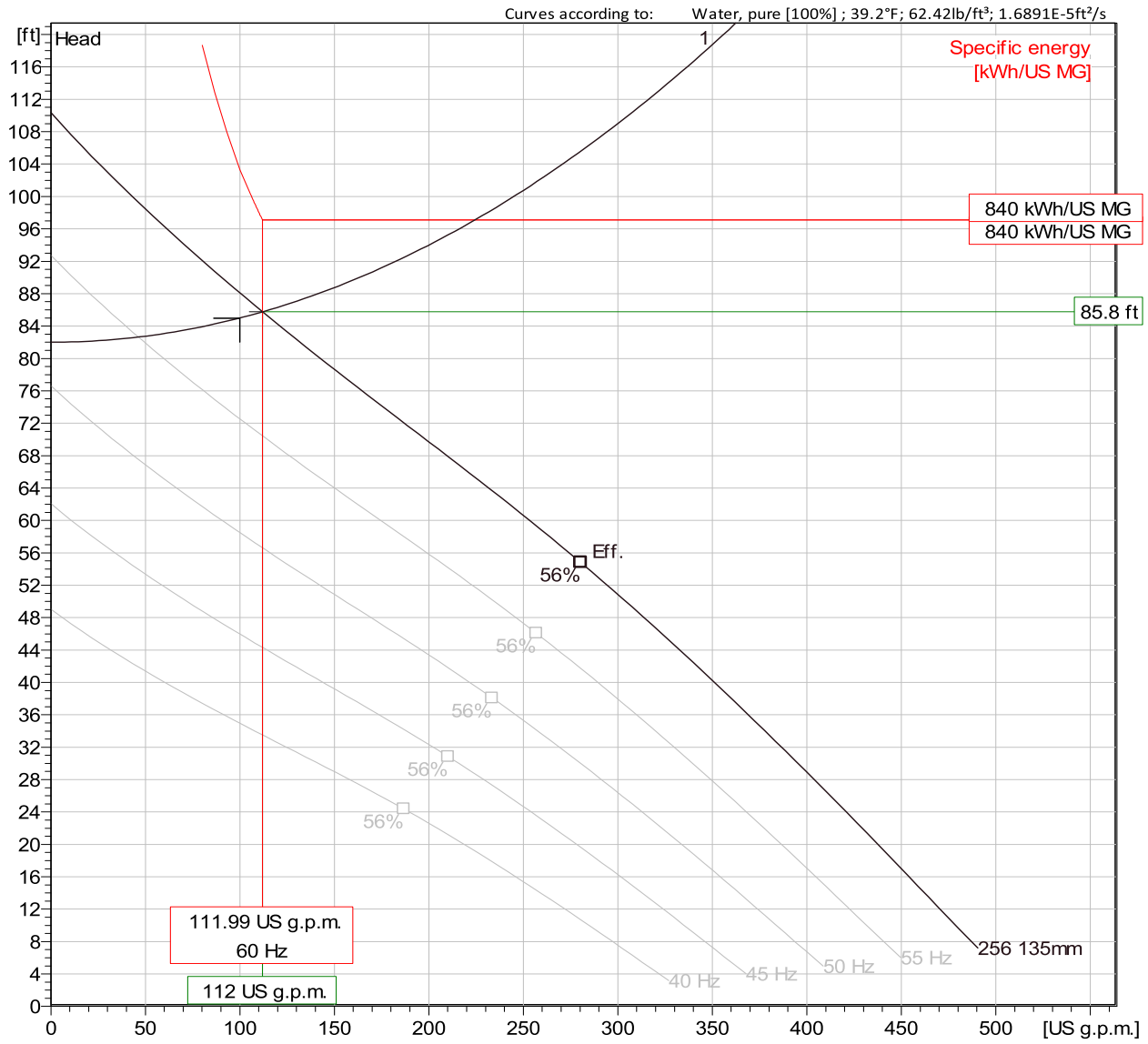
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	112	85.8	6.77	112	85.8	6.77	35.9 %	840	10.9
1	55 Hz	46.3	82.6	5.18	46.3	82.6	5.18	18.7 %	1540	10.5
1	50 Hz									
1	45 Hz									

Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

NP 3102 SH 3~ Adaptive 256

VFD Analysis



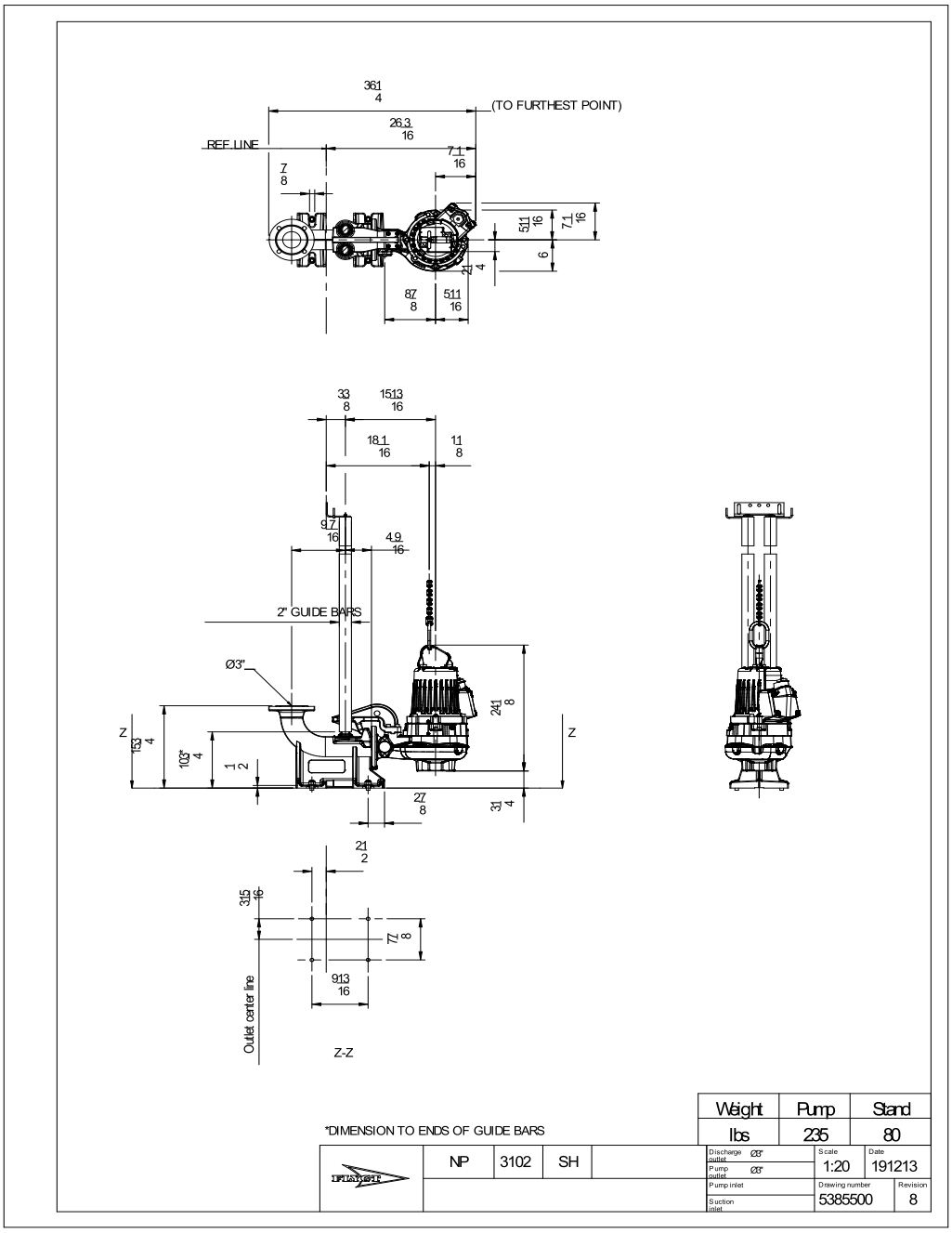
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project		**Created by**	Sydney Schumacher		
Block		**Created on**	1/27/2022	**Last update**	1/27/2022

NP 3102 SH 3~ Adaptive 256

Dimensional drawing

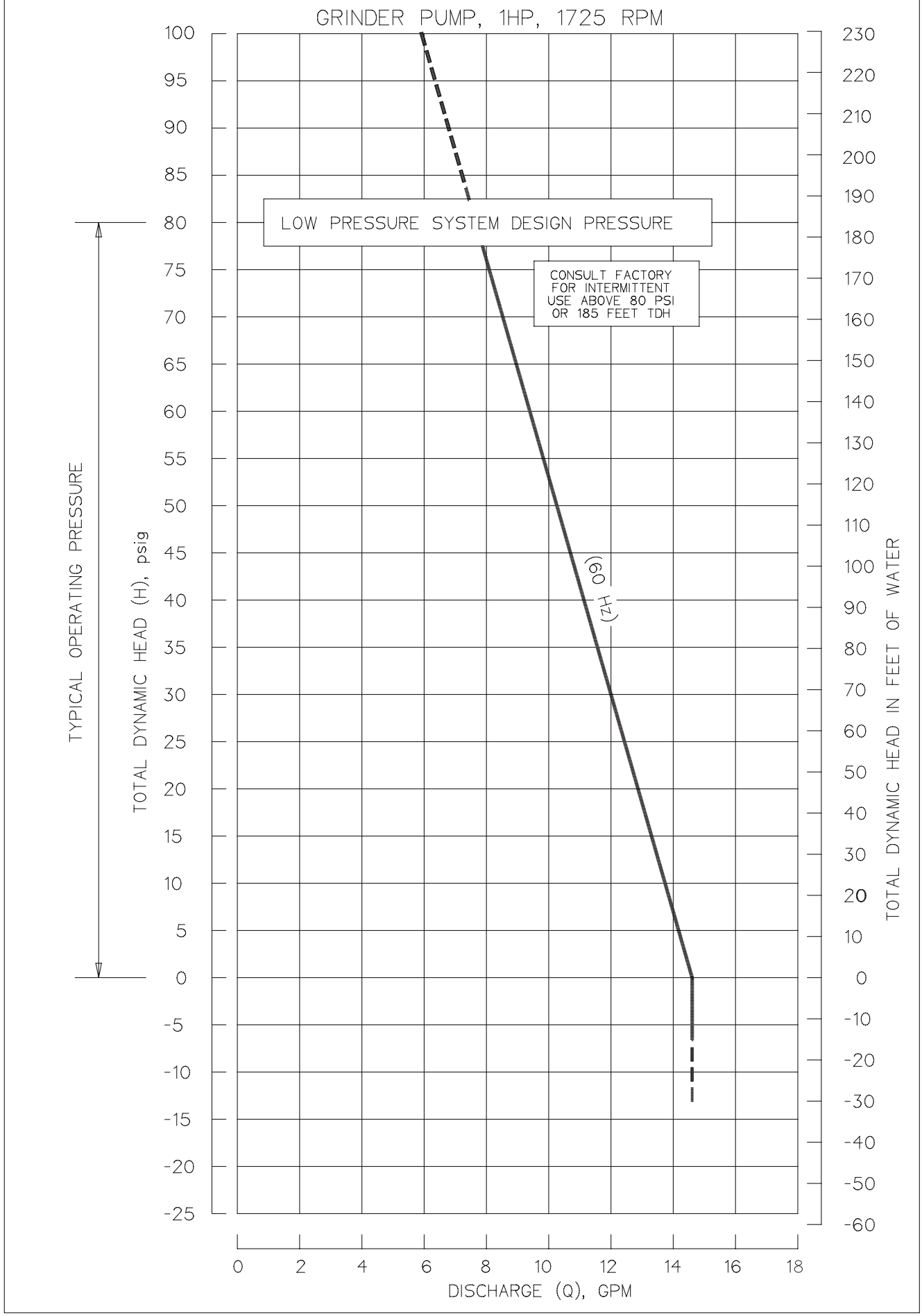


Project		**Created by**	Sydney Schumacher
Block		**Created on**	1/27/2022 **Last update** 1/27/2022

E-One

PRELIMINARY

E|ONE SPD PUMP PERFORMANCE CURVE



PRELIMINARY

Environment One Pump & Lateral Installation Example

E-One install Kit Options

DISCHARGE WHIP & COMPRESSION FITTINGS

-PA1836P01: Discharge Whip 1.25" SS Male NPT x 1.25" SS Female NPT, SDR 11 HDPE, 48" long: $82.00 (each)

-PA1836P02: Discharge Whip 1.25" SS Male NPT x 1.25" SS Male NPT, SDR 11 HDPE, 48" long: $82.00 (each)

-PA1864P02: Compression Coupling, 1.25" x 1.25" (SDR 11 or Other): $18.00 (each)

-PA1864P01: Compression Coupling, 1.50" x 1.25" (SDR 11 or Other): $19.00 (each)

UNILATERAL & CURB BOX ASSEMBLY

-NB0184P01: Curb Stop Assembly. SS, No fittings (1.25" NPT Female Each End): $118.00 (each)

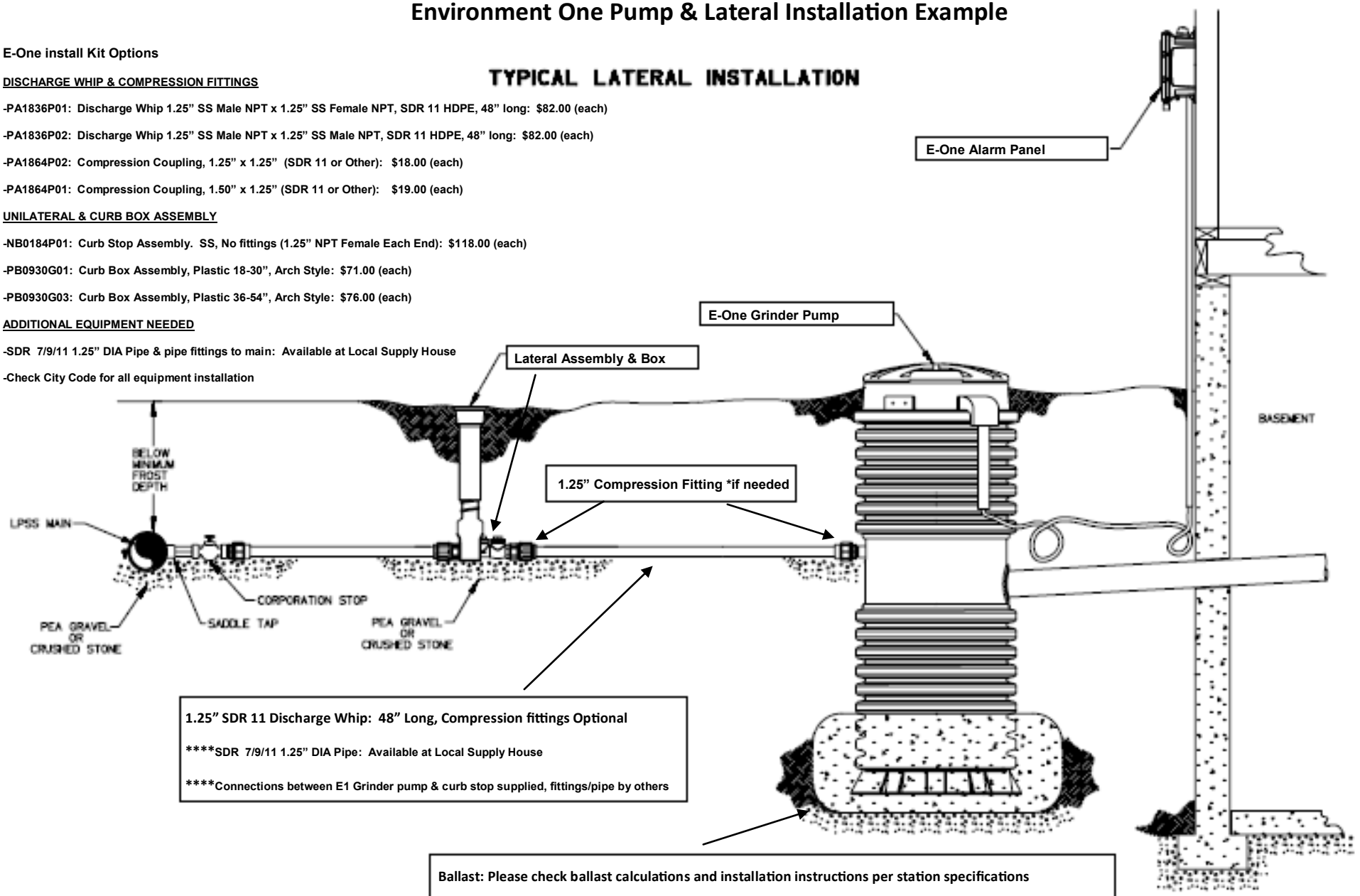
-PB0930G01: Curb Box Assembly, Plastic 18-30", Arch Style: $71.00 (each)

-PB0930G03: Curb Box Assembly, Plastic 36-54", Arch Style: $76.00 (each)

ADDITIONAL EQUIPMENT NEEDED

-SDR 7/9/11 1.25" DIA Pipe & pipe fittings to main: Available at Local Supply House

-Check City Code for all equipment installation



environment | one CORPORATION

LM000114 REV. A