PENTWATER TOWNSHIP

OCEANA COUNTY, MI

SANITARY SEWER SYSTEM EVALUATION

September 2023
860431

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

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Executive Summary

Overview

Fleis & VandenBrink Engineering (F&V) was hired by Pentwater Township (Township) to evaluate the sanitary sewer system located within the Township. From approximately 1984 and pursuant to an agreement between the Township and the Village of Pentwater (Village), the sewer system has been owned, operated, and maintained by the Village. The goal of this evaluation is to assess the condition of existing infrastructure and make recommendations for a Capital Improvement Plan.

The sewer system is divided into three unconnected and district systems. On the north side of Pentwater Lake is a series of gravity sewers and two lift stations (Boathouse and Lakeview) that flow into the Village's system for treatment, referred to as the North District. There are also two sewer systems on the south side of Pentwater Lake. The first is referred to as the South Hilltop District. This system is comprised of Septic Tank Effluent Pump (STEP) systems that flow to the Hilltop series of three septic tanks, dosing chamber, then drain field system. The second system on the south side of the Lake is the South Apache Hills System, which is comprised of a series of gravity sewers, one lift station (Apache Hills), STEP systems, and a septic tank, dosing chamber, and drain field.

Field Assessment

F&V and Fleis & VandenBrink Operations (FVOP) staff performed an onsite assessment of the three lift stations and two septic systems. In general, the assessment included testing alarms, noting size and components of the station, and performing drawdown tests on the pumps. To perform a uniform assessment of each lift station, a standard field assessment form was developed. At the septic treatment systems, the septic tanks and dosing tank were assessed, the inspection ports observed, and the valves operated.

Capacity Evaluation

During the field assessment, drawdown tests were performed at each of the three lift stations. The percentage of capacity used at each lift station was calculated by comparing the average drawdown test results with the flow meter data, where available. At the Boathouse lift station, where there is not a flow meter, the peak flow was calculated for the station based on residential equivalent units (REUs).

All three lift stations have enough capacity to handle current peak flow conditions. The Apache Hills neighborhood has vacant lots with access to sanitary sewer connection; however, the current capacity of the Apache Hills lift station would not be able to handle full build out conditions of these vacant lots. Other deficiencies were noted as well at the Apache Hills lift station including the electrical and corroding structure.

Both septic systems appear to be of adequate size for the existing population they serve. Minor sizing deficiencies are likely overcome by the exceptional infiltration rate of the native sandy soil. Other deficiencies noted are operational in nature and we understand efforts are currently under way to correct them.

Recommendations

After evaluating the sanitary sewer assets, F&V has produced a list of recommendations shown in Table 1 below and listed in order of recommended prioritization. Each recommendation includes budgetary costs in 2023 dollars. Further cost analysis of each item should be completed at the time of individual projects are undertaken to refine costs.

The following report further describes what was observed and what improvements are recommended.

Table 1. Recommendations		
	Recommendation	Estimated Cost[1]
1	Pump out septic and dosing tanks	$ 15,000.00
2	Replace Apache Hills lift station control panel (completed 07/2023)	$ 3,500.00
3	Unplug Apache Hills dosing piping	$ 5,000.00
4	Investigate/ replumb Apache Hills dosing tank	$ 29,000.00
5	Investigate/ replumb Hilltop dosing tank	$ 29,000.00
6	Develop a schedule for regularly cleaning out STEP tanks[3]	$ -
7	Develop a schedule for regularly cleaning septic and dosing tanks[3]	$ -
8	Develop a schedule to switch flows between drain field halves[3]	$ -
9	Clarify NPDES flows and limits with EGLE[2]	$ 4,000.00
10	Add generators at Boathouse and Lakeview lift stations	$ 100,000.00
11	Install alarm callout system for lift stations	$ 20,000.00
12	Creation of O&M Manual and Discharge Monitoring Plan	$ 40,000.00
13	Clean Boathouse wet well	$ 5,000.00
14	Clean Apache Hills wet well (short term)	$ 5,000.00
15	Develop a schedule for regularly cleaning lift stations[3]	$ -
16	Investigate stormwater connections to sanitary system[3]	$ -
17	Replace Apache Hills wet well (long term)	$ 150,000.00
18	Install surge protector at Apache Hills lift station	$ 1,000.00
19	Bring Apache Hills conduits and junction boxes up to code	$ 15,000.00
20	Install Lakeview pump overtemp and seal fail monitors	$ 8,000.00
21	Replace all lift station pump lift chains	$ 3,000.00
22	Remove small trees in Apache Hills drain field[3]	$ -
23	Clean STEP septic tanks	$ 15,000.00
24	Replace floats at each STEP system	$ 6,000.00
25	Tie Apache Hills generator into alarm system	$ 5,000.00
26	Install radar transducer at each lift station	$ 10,000.00
27	Regrade around Boathouse to achieve drainage away from lift station	$ 10,000.00
28	Clean and televise all sanitary sewer	$ 40,000.00
29	Develop a schedule for future cleaning and televising sanitary sewers[3]	$ -

[1]Costs are in 2023 dollars.

[2]Cost assumes Township engineer supporting Township in discussions.

[3]Assumes done by FVOP & Township staff during normal operations.

Introduction

There are three sewer collection systems located within Pentwater Township, which have been owed, operated, and maintained by the Village of Pentwater since 1984. Two of the collection systems are septic tank drain field treatment systems and the third is connected to the Village's sewer system for treatment at the Village's wastewater treatment plant.

The following is a summary of the sanitary sewer assessment completed by Fleis & Vandenbrink staff. Note the individual Septic Tank Effluent Pump systems were not included in this evaluation.

General Observations

Alarms

Currently the alarms for the lift stations and individual residential systems have a local alarm including a light and in some cases a horn. This system relies on someone noticing the light and calling in the alarm to the appropriate person. This can be a reliable system at individual homes, but at municipal lift stations, the local alarm may not be seen in a timely manner.

F&V recommends an upgrade the local alarm system to a dialer system for the three lift stations. The dialer will send a callout when any station goes into alarm. This will provide a more reliable system and quicker response and allow for the callouts to identify what type of alarm has been triggered.

Permitting

The South Hilltop and South Apache Hills septic systems are regulated by EGLE's National Pollutant Discharge Elimination System (NDPES) permit. The Township's existing permit covering both the Apache Hills and Hilltop septic systems expired in 2016 and a current one is being reviewed by EGLE.

During this evaluation F&V has discovered many questions surrounding this permit. The current permit references a discharge monitoring point EQ-1. However, because the two systems are separate and physically disconnected, it is unclear what this discharge point is defined as. F&V's suspects that this is a combined flow of both systems, and since FVOP has begun operating the system, that is how it has been reported. Based on historical data provided, it appears that in previous years only the flows from Apache Hills septic system have been reported.

In 2018, 2019, and 2020, the system exceeded the annual discharge limit of 1.8M gallons. If flow from one of the two systems was being reported and EGLE's intent is that both be reported, then the limits were exceeded even further. It appears in the permit renewal application F&V was provided, a higher annual discharge limit was not requested. Annual flows since 2020 have gone back down as water levels in Lake Michigan and Pentwater Lake have receded, but this annual discharge limit could still present a problem in the future.

As lake water levels receded and annuals flows went down concurrently this is evidence of possible stormwater connections to the sanitary sewer. A likely connection is sump pumps in homes connected to the home's lateral. These connections should be investigated and if found, disconnected by the homeowner, so excessive clean water isn't being treated.

EGLE stated in a letter to the Township in August 2022 that an O&M Manual and Discharge Monitoring Plan are required as a part of the existing permit the Township is operating under and will also be required under the new permit.

F&V recommends the above issues be discussed and resolved with EGLE staff. If an O&M Manual and Discharge Monitoring Plan do not exist, F&V recommends the Township have these documents created.

Collection System

Apache Hills

The South Apache Hills District is primarily composed of a gravity flow sewer that is pumped to its septic system. Most of the system was constructed as part of the 1978 original construction. However, a 1,200 foot sewer extension was constructed during 1984 along Ottawattamie Street west of Seminole Road that consists of a STEP system involving a septic tank followed by a chamber containing a single pump which pumps to a common forcemain which discharges into the gravity flow sewer system.

Based on F&V's review of the record drawings and anecdotal evidence, it appears multiple homes are connected to individual STEP pumps. In many instances, one STEP was constructed between two homes and presumably each home connects to its septic tank. While this system would not meet current design standards and is not optimal, it is still currently operational. Future STEP pumps should be constructed one per home.

As of this writing, there appears to be 39 homes currently connected to the Apache Hills system with another 31 vacant lots that could have homes built and connections to the sewer system made. It appears this system's built-out condition includes 70 residential homes. Not all vacant lots may have access to existing infrastructure to connect to the sewer system.

Hilltop

The South Hilltop District was constructed in 1984 and is a STEP system. Wastewater from the homes are routed through septic tanks at each house and then pumped to a common forcemain which discharges to the septic tank and drain field within the Hilltop Septic System.

As stated with the Apache Hills system, evidence points to multiple homes being connected to individual STEP pumps. While this system would not meet current design standards and is not optimal, it appears to be working without significant problems. Future STEP pumps should be constructed one per home.

Anecdotal evidence from FVOP staff that are currently operating the system indicates the tanks our staff have visually inspected appear to be full of sludge and likely have not been cleaned out in a long time, well beyond the recommended 3-5 years.

North Sanitary Sewer District

The North Sanitary Sewer District consists of approximately 4,000' of gravity flow sewers and two pump stations called the Boathouse and Lakeview pump stations. The North District collection area was built as part of the 1984 sewer system project. All the sewer infrastructure within the North District collection area is within the Township limits and begin near the intersection of Longbridge Road and Monroe Road reaching northwesterly to where the forcemain discharges into the Village owned gravity sewer system near the intersection of Old State Road and Monroe Road. The forcemain is part of the Township system, and the manhole it discharges into is part of the Village system.

Recommendations (All Sewer Collection Systems):

- Clean out each home's septic tank. Approximately 6 in the Apache system and 21 in Hilltop system.
- Develop a regular schedule for pumping out the septic tanks, (3-5 years recommended).
- Clean and televise the gravity flow sewers. Thereafter, develop a system that cleans and televises the system on a regular basis, perhaps every 5 years.
- Long term recommendation: STEP system should be separated where multiple homes are connected to one STEP system when this system requires replacement.

Lift Stations

The following is a summary of each lift station. For the full field assessment reports, see Appendix A.

Boathouse

The Boathouse Lift Station is a duplex, submersible-style lift station built in 1985. Significant findings from the field review include:

- Pump lifting mechanism is a cable.
- Moderate grease and scum buildup on water surface in wet well.
- FVOP recently installed pump runtime meters, so there is no historical data on runtime hours or starts.
- Station runs off floats.
- Two 2 horsepower pumps.
- 2 inch PVC force main.
- Ground surface slopes towards wet well. This can cause rainwater to enter wet well and increase station runtimes.

Capacity Evaluation

The capacity of the station was evaluated comparing rated station capacity (based on average drawdown test results) to the peak flows. This station does not have a flow meter, so peak flows were calculated on REUs. Drawdown tests were performed on each pump during the evaluation. The breakdown of this evaluation can be found in Appendix A, Table A-1.

- The lift station currently runs at 55% capacity.
- Based on these drawdown test results, one pump would be able to keep up with the peak flows at the station.

Provided record information was used to create a basis of design for the lift station. Appendix A shows the system discharge curve with the pump curve overlayed.

Recommendations

After evaluating the lift station, F&V has the following recommendations:

- Replace pump lifting mechanism with a stainless-steel chain.
- Clean wet well.
- Install alarm callout system.
- Regrade around station to achieve drainage away from lift station.
- Install generator.

Lakeview

The Lakeview Lift Station is a duplex, submersible-style lift station built in 1985. Significant findings from the field review include:

- Pump lifting mechanism is not a stainless-steel cable and has broken.
- Station equipped with a flow meter.
- Station runs off floats.
- Pumps overtemperature and seal fail monitors are disconnected in control panel.
- Two 3 horsepower pumps.
- 3 inch PVC force main.

Capacity Evaluation

The capacity of the station was evaluated comparing rated station capacity (based on the design point) to the peak flows. The peak flows are based off the station's flow meter data. Drawdown tests were performed on each pump during the evaluation. The breakdown of this evaluation can be found in Appendix A, Table A-1.

- The lift station currently runs at 57% capacity.
- Based on these drawdown test results, one pump would be able to keep up with the peak flows at the station.

Provided record information was used to create a basis of design for the lift station. Appendix A shows the system discharge curve with the pump curve overlayed.

Recommendations

After evaluating the lift station, F&V has the following recommendations:

- Replace pump lifting mechanism with a stainless-steel chain.
- Install pump overtemperature and seal fail monitors.
- Install alarm callout system.
- Install generator.

Apache Hills

The Apache Hills Lift Station is a duplex, submersible-style lift station built in 1978. Significant findings from the field review include:

- Wet well walls are steel. The steel is beginning to corrode due to the wastewater and high water table. There is evidence of corrosion and bulging along walls of wet well. The bottom of the structure was not visible to evaluate.
- Pump lifting mechanism is a cable.
- Moderate grease and scum buildup on water surface in wet well.
- Station equipped with flow meter.
- Pump 2 making grinding noise while running.
- Generator says single-phase but confirmed three-phase power.
    - F&V suspects that a single-phase generator was ordered and then the alternator rewired for three-phase power. While onsite F&V confirmed that the generator does operate the station.
- Station runs on pressure transducer and backup float.
- Control panel is beyond its useful life.
    - 07/2023 panel components burnt out. Replacement parts were obsolete and cost prohibitive.
- No alarms on generator.
- Junction box and PVC conduits do not meet current National Electrical Code (NEC).
- Level control conduit does not have seal off.
- Two 5 horsepower pumps.
- 3 inch PVC force main.

Capacity Evaluation

The capacity of the station was evaluated comparing its rated capacity (based on the design point) to the peak flows. The peak flows are based off the station's flow meter data. Drawdown tests were performed on each pump during the evaluation. The breakdown of this evaluation can be found in Appendix A, Table A-1.

- The lift station currently runs at 55% capacity.
- Based on these drawdown test results, one pump would be able to keep up with the peak flows at the station.

In the Apache Hills neighborhood there appears to be 31 vacant lots able to connect to the existing sanitary sewer system. Based on the drawdown tests completed during the field assessment, one pump would not be able to keep up with full build up conditions at this station.

Provided record information was used to create a basis of design for the lift station. Appendix A shows the system discharge curve with the pump curve overlayed.

Recommendations

After evaluating the lift station, F&V has the following recommendations:

- Replace pump lifting mechanism with a stainless-steel chain.
- Clean wet well (short term).
- Replace wet well (long term).
- Replace control panel (completed 07/2023).
- Tie-in generator to recommended alarm system.
- Bring junction box and conduit up to meet current NEC.
- Install alarm callout system.
- Install surge protection.

Septic Treatment Systems

South Apache Hills Septic and Drain Field System

Capacity Evaluation

The South Apache Hills District septic tank has a volume of 19,000 gallons, and its dosing tank has a working volume of approximately 2,500 gallons. There are 39 homes currently connected to the system with another 31 vacant lots intended for single family homes. When each vacant lot has a home built, the average daily flow will be approximately 17,500 gallons; therefore, the septic tank will provide approximately 26 hours of detention which is more than the current standard minimum of 24 hours. The dosing tank volume is approximately 2,500 gallons which would dose the drain field approximately 7 times per day which is above the current design standard that states a dosing tank shall dose “no more than three to four times per day at design flow”. Design standards should be taken into consideration when addressing dosing tank piping issues described below.

The drain field is comprised of two identical fields each having an infiltration area of 15,456 square feet, providing a total infiltration area of 30,912 square feet. The future average day flow of 17,500 gallons per day equates to an application rate of approximately 0.56 gallons per square foot, if the 31 vacant lots are built out as single family homes. This is well within the limits of reasonable acceptability given the native coarse sandy soil in the area which would likely support application rates up to 0.75 gallons per square foot per day if the soil were tested.

Based on this data, F&V concludes that the capacity of the Apache Hills septic and drain field system appears to be adequate for the future build out condition of 70 homes.

Significant Findings

Dosing Tank Piping

The septic tanks and dosing tank were full of sludge during our field inspection and effluent water exiting the dosing tank was exiting via the overflow pipe indicating the other piping in the tank was plugged, likely with sludge. Sometime after the day of the field inspection, all tanks were cleaned out; however, F&V understands the dosing tank piping is still plugged and effluent water continues to exit the tank via the overflow pipe. This situation should be resolved, and the dosing tank piping reconfigured to dose the system.

Dosing is an integral part of the operation of larger septic systems. A quote that best describes why is taken from The Michigan Criteria for Subsurface Sewage Disposal; VIII.c which says, in part “…*The purpose of a dosing tank is two-fold. It provides a much better distribution of sewage effluent in large soil absorption systems and it provides intermittent periods of wetting and drying of the soil into which the effluent percolates, thus helping the system to remain aerobic. Experience has shown that this later advantage will improve the life of the system.*”

Sludge

Upon visual inspection of the septic and dosing tanks, it appears both have excessive amounts of sludge in them. Septic tanks are made to accumulate sludge; however, dosing tanks should not have any sludge in them. It appears the septic tank sludge storage was full, and sludge began to spill into the dosing tank.

Based on the amount of sludge in the septic and dosing tank, F&V is concerned that sludge has overflowed the dosing tank and has entered the drain field. If this has occurred, it will plug the surrounding soil and eventually make the drain fields inoperable. Access view ports exist on the four corners of each of the two drain fields. All eight were opened and dried sludge was noted in the SW, SE, and NW of the westerly drain field.

Other Observations

Areas of greener grass exist in a couple places such as above the septic tank nearest to the dosing tank and near the SW corner of the westerly drain field. This indicates these areas are wetter and getting more nutrients than other areas. This could potentially indicate septic tank overflows and effluent water preferentially going to that section of the drain field.

On the day of the inspection, the valves to both halves of the drain field were open. Only one valve should be open at any given time. Optimally, the system would have an automatic alternation feature, but the original design made this alternation a manual operation by opening and closing valves.

Very small trees were growing in the drain field. These trees should be removed to prevent their roots from interfering with the drain field piping network.

Recommendations

- Clean out dosing and septic tanks.
- Unplug the dosing tank piping to prevent effluent flowing through the emergency overflow pipe.
- Investigate reason why dosing tank is no longer dosing. If necessary replumb the dosing tanks to reinstate the dosing capability.
- Develop a regular schedule for pumping out the septic and dosing tank, perhaps every three years.
- Develop a regular schedule for switching flow between drain field halves, perhaps once a month.
- Remove the small trees from the drain field.

South Hilltop Septic and Drain Field System

Capacity Evaluation

Each home within the South Hilltop District has a 1,000-gallon septic tank upstream of the STEP pumping system. Additionally, three 2,000-gallon septic tanks exist at the drain field location. Therefore, the Hilltop system has an effective septic tank volume of 7,000 gallons. The dosing tank has a working volume of approximately 1,900 gallons. There are 31 homes currently connected to the system with two vacant lots identified. The calculated average daily flow is approximately 7,750 gallons; therefore, the septic tanks will provide a total of approximately 21.5 hours of detention, slightly below the current design standards minimum of 24 hours. Design standards should be reviewed when future updates to the system occur. The dosing tank volume is approximately 1,900 gallons which would dose the drain field approximately 4 times per day which is within the current design standards that dictate a dosing tank shall dose no more than three to four times per day at design flow.

The drain field is comprised of two identical fields each having an infiltration area of 8,532 square feet, providing a total infiltration area of 17,064 square feet. At the calculated average day flow of 7,750 gallons per day, this results in an application rate of approximately 0.45 gallons per square foot; well within the limits of reasonable acceptability given the native coarse sandy soil in the area which would likely support application rates up to 0.75 gallons per square foot per day if the soil were tested.

Based on this data, F&V concludes that the capacity of the Hilltop septic and drain field system appears to be adequate for the current built-out condition of 31 homes.

Significant Findings

The condition of the Hilltop septic system is very similar to that of the Apache Hills septic system and for sake of brevity of this report all findings noted in the Apache Hills section above are the same for the Hilltop Septic System except as noted below.

Dosing Tank Piping

Based on our analysis of the dosing piping within the original design documents, field observations and anecdotal evidence provided by the Township, we believe the dosing tanks no longer dose effluent to the drain fields. Instead, the effluent water flows through the dosing tank at the constant rate of inflow. Whether this is due to the initial design or modifications made after original construction is not clear.

Sludge

All eight drain field visual inspection ports were opened and inspected. These ports differ from the Apache Hills system and are not directly connected to the drain field piping. They are PVC pipes installed in the ground with visible access to the drain field soil. Each of the eight ports has clean dry sand in the bottom of it.

Other Observations

No other observations specific to the Hilltop system were noted.

Recommendations

- Investigate reason why dosing tank is no longer dosing. If necessary replumb the dosing tanks to reinstate the dosing capability.
- Develop a regular schedule for pumping out the 3 septic tanks and dosing tank, perhaps every three years.
- Develop a regular schedule for switching flow between drain field halves, perhaps once a month.

Potential Funding Sources

Several options for funding are available for consideration. Most of these sources are better suited for a substantial size project. These sources are primarily based on loans, but a grant may possible as well.

Clean Water State Revolving Fund (CWSRF)

The State of Michigan has a revolving loan program to assist communities in financing wastewater projects such as the recommendations considered in this report. The loan takes the form of municipal bonds which currently have government subsidized rates of approximately 1.875% with a term ranging from 20 to 40 years. The State is currently offering partial project grants with ARRA funds that have been placed in this funding system. It is not known if these grant monies will be available in FY 2025.

United States Department of Agriculture – Rural Development (RD)

The federal government offers funding for projects such as the recommendations considered in this report through RD. Each year Michigan's office of RD gets a grant funding pool that is highly sought after. Additionally, they offer loans from an extensive loan pool. Applications for this program can be submitted at any time of the year and will take about 6 months to prepare. The loan takes the form of municipal bonds which currently have government subsidized rates of approximately 3.5% with a 40-year term.

Self-Initiated Municipal Bonds

A municipality can pursue self-initiated municipal bonds without the requirements of federal and state loan administration paperwork that the CWSRF and RD programs require. However, these bonds would not

have government subsidized interest rates. These bonds currently have an interest rate of approximately 4.25% and a have a 20-year term.

Other Funding Sources

From time to time, various state and federal agencies offer funding sources for recommendations such as the ones considered in this report. F&V continually watches for these funding sources and communicates with our clients the kind of projects they want to fund to see if there is a fit. We will continue watch for these sources and advise if an opportunity arises.

APPENDIX A

Individual Lift Station Assessment Reports
Table A-1. Average and Peak Flows
Lift Station System Discharge Curve

LIFT STATION ASSESSMENT FORM

Client: Pentwater Township Date: 5/18/2023

Lift Station Number & Name: Boathouse

Lift Station Location: Near 5164 Monroe Rd.

Evaluators: Paul Harig and Danell Smith

Section 1: General Information

A. Year of Construction: 1985

B. Year(s) of Renovations(s): Unknown

C. Source of Information:

Section 2: Wet Well

A.	Material of wet well walls:	Concrete	**Fiberglass**	Steel	Other	
B.	Condition of wet well walls:	Excellent	**Good**	Fair	Poor	Very Poor
C.	Condition of pump removal guides:	Excellent	**Good**	Fair	Poor	Very Poor
D.	Condition of pump lift chain:	Excellent	**Good**	Fair	Poor	Very Poor
E.	Condition of discharge piping:	Excellent	**Good**	Fair	Poor	Very Poor
F.	Material of wet well top:	Concrete	**Fiberglass**	Steel	Other	
G.	Condition of wet well top:	Excellent	**Good**	Fair	Poor	Very Poor
H.	Condition of access hatches:	**Excellent**	Good	Fair	Poor	Very Poor
I.	Is wet well vented?	**Yes**	No			
J.	Amount of grease/scum/debris build-up on water surface:	None	Minimal	**Moderate**	Significant	
K.	Grease ring/water level staining above pipe invert?				Yes	**No**

L. Size of wet well: 3 foot dia.

M. Notes: Pump lift chain is cable not chain

Section 3: Valve Chamber N/A

A.	Material of valve chamber wall:	Concrete	Fiberglass	Steel	Other	
	a. If steel, is cathodic protection is provided?					
	b. If steel, thickness:					
B.	Condition of valve chamber wall:	Excellent	Good	Fair	Poor	Very Poor
C.	Material of valve chamber top:	Concrete	Fiberglass	Steel	Other	
D.	Condition of valve chamber top:	Excellent	Good	Fair	Poor	Very Poor
E.	Condition of access hatches:	Excellent	Good	Fair	Poor	Very Poor

Section 4: Pump & Valve Housing N/A

A.	Station Configuration:		Can	Built in Place		
	a. If can, condition of dehumidifier		Excellent	Good	Fair	Poor	Very Poor
	b. If can, condition of exhaust fan		Excellent	Good	Fair	Poor	Very Poor
B.	Material of construction:	Brick	Block	Steel	Other	
	a. If steel, is cathodic protection provided?					
	b. If steel, thickness (inch):	Access Tube				
		Ceiling				

Floor

Wall

C. Sump Pump: Yes No

Section 5: Valves

A. Does the station have a bypass connection? [Yes] No

a. Size of bypass connection: 2 inch

b. Material of bypass connection: Ductile Iron [PVC] Cast Iron Other _____

Section 6: Equipment

A.

	Pump No. 1	Pump No. 2
Make	Hydromatic	Hydromatic
Model No.	HP200M2-2	HP200M2-2
Run time (hours)	8.7	8.82
Design point	Unknown	Unknown
Drawdown Results (gpm)	24.9	29.6
Drawdown Both Pumps (gpm)	36.0	

B. Source of pump information: O&M Manual | Record Drawings | [O&M Staff (verbal)] | Other: Ops staff pulled pumps

C. Are pumps noisy or vibrating? Yes [No]

D. Swirl in wet well while pump operates? Yes [No] N/A

E. Does the station have a flow meter? Yes [No]

a. If so, type and size of meter: _____

F. Notes: 2 HP pumps. FVOP only pulled one pump - assumed that pumps match. Runtime hours only since FVOP installed meters.

Section 7: Electrical

A. Service power: 120 | [208] | 480 Volts | [1 phase] | 3 phase

B. Condition of electric service: [Excellent] | [Good] | Fair | Poor | Very Poor

C. Is surge protection provided? [Yes] | No

D. Seal of fittings provided between the wet well and electrical/ control panel? [Yes] | No

E. Are electrical/ control panels located within 3' of wet well hatch or 5' of vent? Yes | [No]

Section 8: Generator

A. Is there an on-site generator? Yes [No]

a. Size of on-site generator? _____

B. Transfer Switch: Automatic [Manual]

Section 9: Pump and Motor Controls

A. Condition of control panel: Excellent [Good] Fair Poor Very Poor

B. How many float switches are installed? 4 floats

C. Other level sensors (ultrasonic, radar, pressure transducer, bubbler) only floats

D. Pump controls (relay logic, PLC-based, VFD, proprietary controller) relay logic

F. Station alarm:

Alarm telemetry (autodialer, radio, cell phone, SCADA, none) None. Local - light and buzzer

Local Audio	Local Visual	Alarm Function	Alarm Telemetry

a. Pump Seal Fail	X	X		
b. High Level	X	X		

Section 10: Forcemain

A. Forcemain material: Ductile Iron | **PVC** | Concrete | Cast Iron | Steel | Other _____

B. Forcemain size (in): 2 inch

Section 11: Site

A.	Positive drainage away from station?	Yes	**No**
B.	Site maintained?	**Yes**	No
C.	Can the site be easily accessed for maintenance?	**Yes**	No
D.	Is the station locked?	**Yes**	No
E.	Noticeable odor issues?	Yes	**No**

Section 12: Building **N/A**

A.	Building construction:	Brick	Block	Other	_____
B.	Roof construction:	Asphalt shingle	Metal	Flat membrane	Other _____
C.	Condition of building:	Excellent	Good	Fair	Poor	Very Poor
D.	Condition of roof:	Excellent	Good	Fair	Poor	Very Poor

General Remarks:

Generators need cords. FVOP installed runtme hours and starts. Station now locked. Clean out wet well. Alarm callout.

Photographs

X	Assessment form showing name of lift station
X	Site
X	Wet well top
	Valve vault top
	Building exterior
	Building interior

	Transformer (pole or ground)
X	Electric service meter
X	Transfer switch
X	Disconnect switch
	Permanent generator
X	Control panel exterior
X	Control panel interior - backplane
X	Control panel interior - face of door
X	Seal off fittings (conduits to wet well)

X	Wet well hatch door & frame
X	Pump guide rails
X	Wet well interior
X	Pump nameplate
	Pump & motor

	Suction connection into wet well
X	Pump discharge piping
	Valve vault hatch door & frame
	Valve vault valves
X	Bypass connection
X	Bypass valve

LIFT STATION ASSESSMENT FORM

Client: Pentwater Township Date: 5/18/2023

Lift Station Number & Name: Lakeview

Lift Station Location: Near 5394 W. Lakeview Dr.

Evaluators: Paul Harig and Danell Smith

Section 1: General Information

A. Year of Construction: 1985

B. Year(s) of Renovations(s): Unknown

C. Source of Information:

Section 2: Wet Well

A.	Material of wet well walls:	Concrete	**Fiberglass**	Steel	Other	
B.	Condition of wet well walls:	Excellent	**Good**	Fair	Poor	Very Poor
C.	Condition of pump removal guides:	Excellent	**Good**	Fair	Poor	Very Poor
D.	Condition of pump lift chain:	Excellent	Good	Fair	Poor	**Very Poor**
E.	Condition of discharge piping:	Excellent	**Good**	Fair	Poor	Very Poor
F.	Material of wet well top:	Concrete	**Fiberglass**	Steel	Other	
G.	Condition of wet well top:	Excellent	**Good**	Fair	Poor	Very Poor
H.	Condition of access hatches:	Excellent	**Good**	Fair	Poor	Very Poor
I.	Is wet well vented?	Yes	**No**			
J.	Amount of grease/scum/debris build-up on water surface:		**None**	Minimal	Moderate	Significant
K.	Grease ring/water level staining above pipe invert?				Yes	**No**

L. Size of wet well: 4 foot dia.

M. Notes: Pump lift cable broken

Section 3: Valve Chamber N/A

A.	Material of valve chamber wall:	**Concrete**	Fiberglass	Steel	Other	
	a. If steel, is cathodic protection is provided?					
	b. If steel, thickness:					
B.	Condition of valve chamber wall:	Excellent	**Good**	Fair	Poor	Very Poor
C.	Material of valve chamber top:	Concrete	Fiberglass	Steel	Other	**MH cover**
D.	Condition of valve chamber top:	Excellent	**Good**	Fair	Poor	Very Poor
E.	Condition of access hatches:	Excellent	**Good**	Fair	Poor	Very Poor

F. Notes: Meter pit also concrete in good condition.

Section 4: Pump & Valve Housing **N/A**

A.	Station Configuration:	Can	Built in Place			
	a. If can, condition of dehumidifier	Excellent	Good	Fair	Poor	Very Poor
	b. If can, condition of exhaust fan	Excellent	Good	Fair	Poor	Very Poor
B.	Material of construction:	Brick	Block	Steel	Other	
	a. If steel, is cathodic protection provided?					
	b. If steel, thickness (inch):	Access Tube	Ceiling			

Floor
Wall

C. Sump Pump: Yes No

Section 5: Valves

A. Does the station have a bypass connection? Yes No

a. Size of bypass connection: 3 inch

b. Material of bypass connection: Ductile Iron PVC Cast Iron Other _____

Section 6: Equipment

A.

	Pump No. 1	Pump No. 2
Make	Barnes	Barnes
Model No.	SGV3072L	SGV3072L
Run time (hours)	Unknown	Unknown
Design point	Unknown	Unknown
Drawdown Results	35.7	23.5
Drawdown Both Pumps (gpm)	40.4	

B. Source of pump information: O&M Manual | Record Drawings | O&M Staff (verbal) | Other: Ops pulled pumps

C. Are pumps noisy or vibrating? Yes No

D. Swirl in wet well while pump operates? Yes No N/A

E. Does the station have a flow meter? Yes No

a. If so, type and size of meter: ABB MagMaster

F. Notes: 3 HP pumps. FVOP only pulled one pump - assumed that pumps match.

Section 7: Electrical

A. Service power: 120 | 208 | 480 Volts | 1 phase | 3 phase

B. Condition of electric service: Excellent | Good | Fair | Poor | Very Poor

C. Is surge protection provided? Yes No

D. Seal of fittings provided between the wet well and electrical/ control panel? Yes No

E. Are electrical/ control panels located within 3' of wet well hatch or 5' of vent? Yes No

Section 8: Generator

A. Is there an on-site generator? Yes No

a. Size of on-site generator? _____

B. Transfer Switch: Automatic Manual

C. Fuel Source: Natural Gas Propane Diesel

D. Generator Hours: _____

E. Exercise schedule frequency _____

F. Does generator start and run strong? Yes No

G. Does transfer switch load to generator? Yes No

H. Condition of generator and ancillary equip: Excellent Good Fair Poor Very Poor

Section 9: Pump and Motor Controls

A. Condition of control panel: Excellent Good Fair Poor Very Poor

B. How many float switches are installed? 4 floats

a. Do float switches properly operate pumps? Yes No

C. Other level sensors (ultrasonic, radar, pressure transducer, bubbler) no

D. Pump controls (relay logic, PLC-based, VFD, proprietary controller) relay logic

F. Station alarm:

Alarm telemetry (autodialer, radio, cell phone, SCADA, none) None. Local - light & buzzer

	Local Audio	Local Visual	Alarm Function	Alarm Telemetry
a. High Level	X	X		
b. Low Level				
c. Pup 1 Overtemp				
d. Pump 2 Overtemp				
e. Pump 1 Seal Fail				
f. Pump 2 Seal Fail				

H. Notes: Overtemp and seal fail disconnected and sitting in bottom of panel

Section 10: Forcemain

A. Forcemain material: Ductile Iron PVC Concrete Cast Iron Steel Other

B. Forcemain size (in): 3 inch

Section 11: Site

A.	Positive drainage away from station?	Yes	No
B.	Site maintained?	Yes	No
C.	Can the site be easily accessed for maintenance?	Yes	No
D.	Is the station locked?	Yes	No
E.	Noticeable odor issues?	Yes	No

Section 12: Building N/A

A.	Building construction:	Brick	Block	Other		
B.	Roof construction:	Asphalt shingle	Metal	Flat membrane	Other	
C.	Condition of building:	Excellent	Good	Fair	Poor	Very Poor
D.	Condition of roof:	Excellent	Good	Fair	Poor	Very Poor

General Remarks:

Need to mount run time hours and starts meter in panel.

Photographs

- [ ] Assessment form showing name of lift station
- [X] Site
- [X] Wet well top
- [ ] Valve vault top
- [ ] Building exterior
- [ ] Building interior

- [ ] Transformer (pole or ground)

X	Electric service meter
X	Transfer switch
X	Disconnect switch
	Permanent generator
X	Control panel exterior
X	Control panel interior - backplane
X	Control panel interior - face of door
X	Seal off fittings (conduits to wet well)

X	Wet well hatch door & frame
X	Pump guide rails
X	Wet well interior
X	Pump nameplate
X	Pump & motor
	Suction connection into wet well
X	Pump discharge piping
	Valve vault hatch door & frame
	Valve vault valves
X	Bypass connection
X	Bypass valve

LIFT STATION ASSESSMENT FORM

Client: Pentwater Township Date: 5/18/2023

Lift Station Number & Name: Apache Hills

Lift Station Location: Near 5358 Longbridge Rd.

Evaluators: Paul Harig and Danell Smith

Section 1: General Information

A. Year of Construction: 1978

B. Year(s) of Renovations(s): Unknown

C. Source of Information:

Section 2: Wet Well

A.	Material of wet well walls:	Concrete	**Fiberglass**	Steel	Other	
B.	Condition of wet well walls:	Excellent	**Good**	Fair	Poor	Very Poor
C.	Condition of pump removal guides:	Excellent	**Good**	Fair	Poor	Very Poor
D.	Condition of pump lift chain:	Excellent	Good	**Fair**	Poor	Very Poor
E.	Condition of discharge piping:	Excellent	**Good**	Fair	Poor	Very Poor
F.	Material of wet well top:	Concrete	Fiberglass	**Steel**	Other	
G.	Condition of wet well top:	Excellent	Good	Fair	**Poor**	Very Poor
H.	Condition of access hatches:	Excellent	**Good**	Fair	Poor	Very Poor
I.	Is wet well vented?	Yes	**No**			
J.	Amount of grease/scum/debris build-up on water surface:	None	Minimal	**Moderate**	Significant	
K.	Grease ring/water level staining above pipe invert?				Yes	**No**

L. Size of wet well: 4 foot dia.

M. Notes: Pump lift chain is a cable not chain.

Section 3: Valve Chamber N/A

A.	Material of valve chamber wall:	**Concrete**	Fiberglass	Steel	Other	
	a. If steel, is cathodic protection is provided?					
	b. If steel, thickness:					
B.	Condition of valve chamber wall:	Excellent	**Good**	Fair	Poor	Very Poor
C.	Material of valve chamber top:	Concrete	Fiberglass	Steel	Other	**MH Cover**
D.	Condition of valve chamber top:	Excellent	**Good**	Fair	Poor	Very Poor
E.	Condition of access hatches:	Excellent	**Good**	Fair	Poor	Very Poor

F. Notes: Meter pit also concrete in good condition and meter and valve pits filled with water

Section 4: Pump & Valve Housing N/A

A.	Station Configuration:		Can	Built in Place			
	a. If can, condition of dehumidifier		Excellent	Good	Fair	Poor	Very Poor
	b. If can, condition of exhaust fan		Excellent	Good	Fair	Poor	Very Poor
B.	Material of construction:	Brick	Block	Steel	Other		
	a. If steel, is cathodic protection provided?						
	b. If steel, thickness (inch):	Access Tube					
		Ceiling					

Floor

Wall

C. Sump Pump: Yes No

Section 5: Valves

A. Does the station have a bypass connection? [Yes] No

a. Size of bypass connection: 3 inch

b. Material of bypass connection: Ductile Iron PVC [Cast Iron] Other _____

Section 6: Equipment

A.

	Pump No. 1	Pump No. 2
Make	Hydromatic	Barnes
Model No.	HPGH500M3-2	SGV5032L
Run time (hours)	Broken	33.8
Design point	Unknown	Unknown
Drawdown Results (gpm)	38.5	23.5
Drawdown Both Pumps (gpm)	39.5	

B. Source of pump information: O&M Manual | [Record Drawings] | O&M Staff (verbal) | Other | Based on information written in control panel

C. Are pumps noisy or vibrating? [Yes] No

D. Swirl in wet well while pump operates? [Yes] [No] N/A

E. Does the station have a flow meter? [Yes] No

a. If so, type and size of meter: Kent-Taylor Mag Master

F. Notes: Pump 2 is grinding.

Section 7: Electrical

A. Service power: 120 [208] 480 Volts 1 phase [3 phase]

B. Condition of electric service: Excellent [Good] Fair Poor Very Poor

C. Is surge protection provided? Yes [No]

D. Seal of fittings provided between the wet well and electrical/ control panel? [Yes] No

E. Are electrical/ control panels located within 3' of wet well hatch or 5' of vent? [Yes] No

F. Notes: Generator says 1 phase but confirmed 3 phase.

Section 8: Generator

A. Is there an on-site generator? [Yes] No

a. Size of on-site generator? 25 KW

B. Transfer Switch: [Automatic] Manual

C. Fuel Source: [Natural Gas] Propane Diesel

D. Generator Hours: 91.8

E. Does generator start and run strong? [Yes] No

F. Does transfer switch load to generator? [Yes] No

G. Condition of generator and ancillary equip: [Excellent] Good Fair Poor Very Poor

Section 9: Pump and Motor Controls

A. Condition of control panel: Excellent Good Fair [Poor] Very Poor

B. How many float switches are installed? 1 float

a. Do float switches properly operate pumps? [Yes] No

C. Other level sensors (ultrasonic, radar, pressure transducer, bubbler): Pressure transducer

D. Pump controls (relay logic, PLC-based, VFD, proprietary controller): PLC-based

E. Operating levels:

a. Lead Pump	4
b. Lag Pump	6
c. Pump Off	2
d. High Level	5
e. Low Level	2
f. High Off	0.5
g. Low Off	0.5
h.	

F. Station alarm:

Alarm telemetry (autodialer, radio, cell phone, SCADA, none): None

	Local Audio	Local Visual	Alarm Function	Alarm Telemetry
a. High Float		X		

H. Notes: High float light, no generator alarms.

Section 10: Forcemain

A. Forcemain material: Ductile Iron | **PVC** | Concrete | Cast Iron | Steel | Other

B. Forcemain size (in): 3 inch

Section 11: Site

A.	Positive drainage away from station?	**Yes**	No
B.	Site maintained?	**Yes**	No
C.	Can the site be easily accessed for maintenance?	**Yes**	No
D.	Is the station locked?	**Yes**	No
E.	Noticeable odor issues?	Yes	**No**

Section 12: Building **N/A**

A.	Building construction:	Brick	Block	Other		
B.	Roof construction:	Asphalt shingle	Metal	Flat membrane	Other	
C.	Condition of building:	Excellent	Good	Fair	Poor	Very Poor
D.	Condition of roof:	Excellent	Good	Fair	Poor	Very Poor

General Remarks:

Runtime meter - only one works. Steel wet well corrosion - see photos.

Junction box and conduits do not meet code.

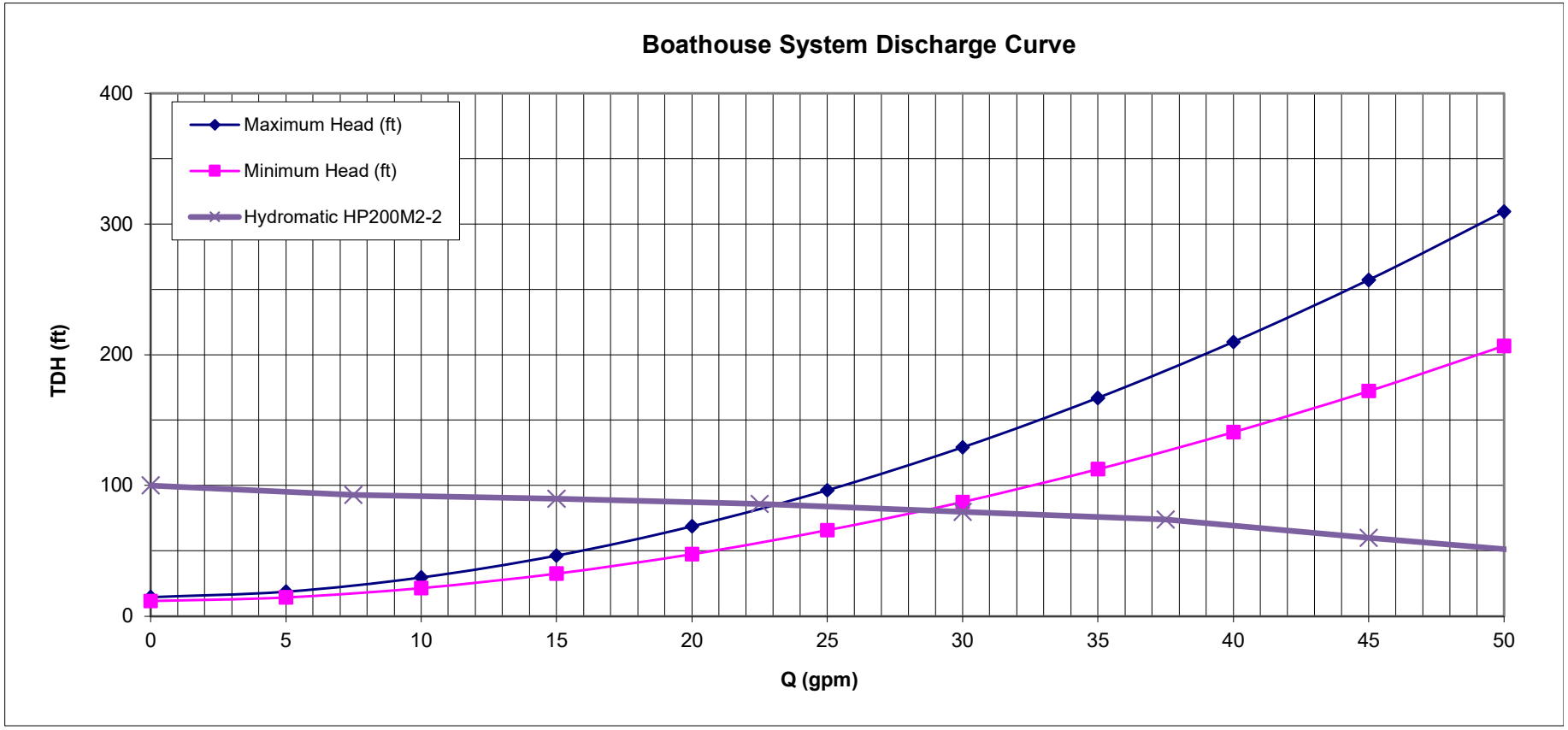
Photographs

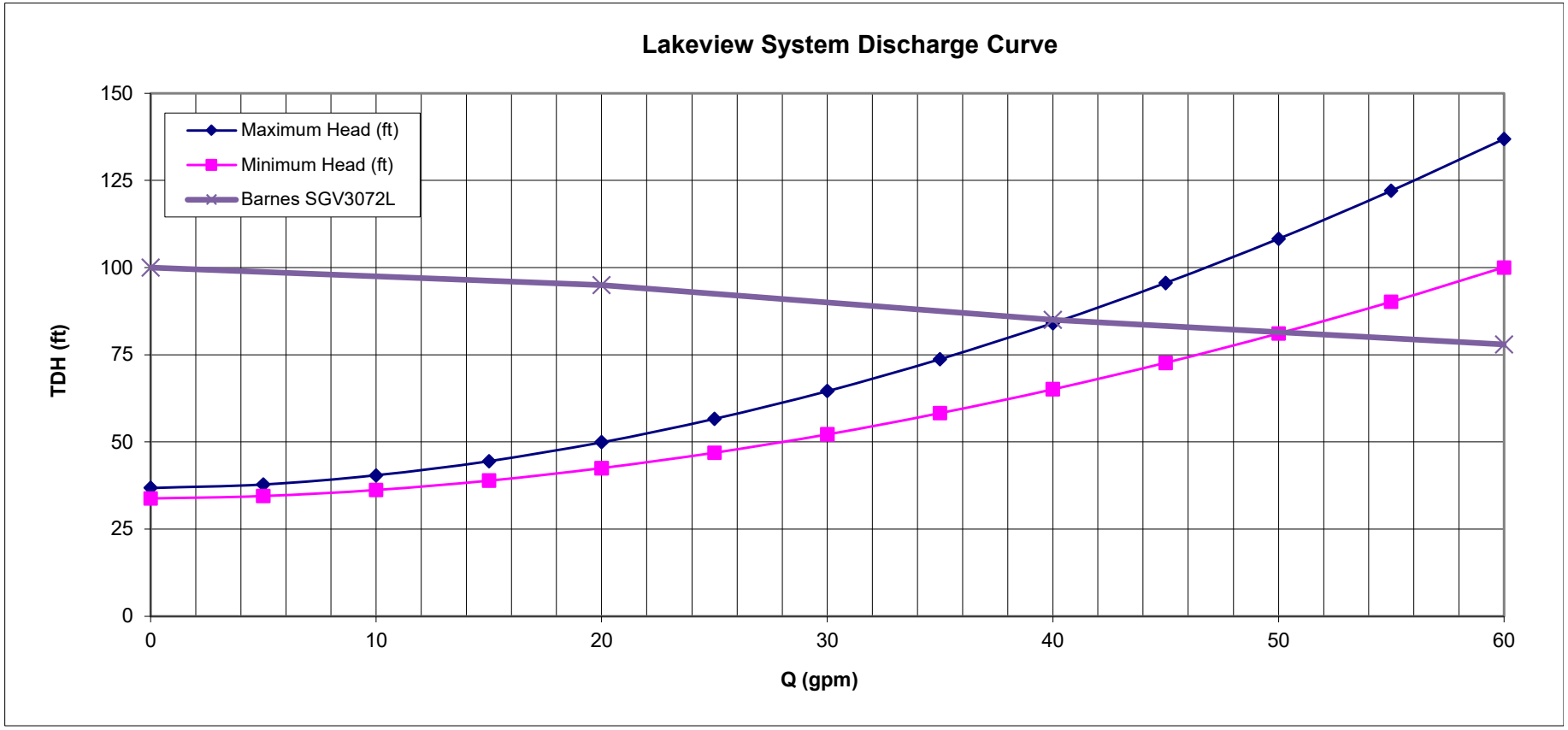
X	Assessment form showing name of lift station
X	Site
X	Wet well top
X	Valve vault top
	Building exterior
	Building interior

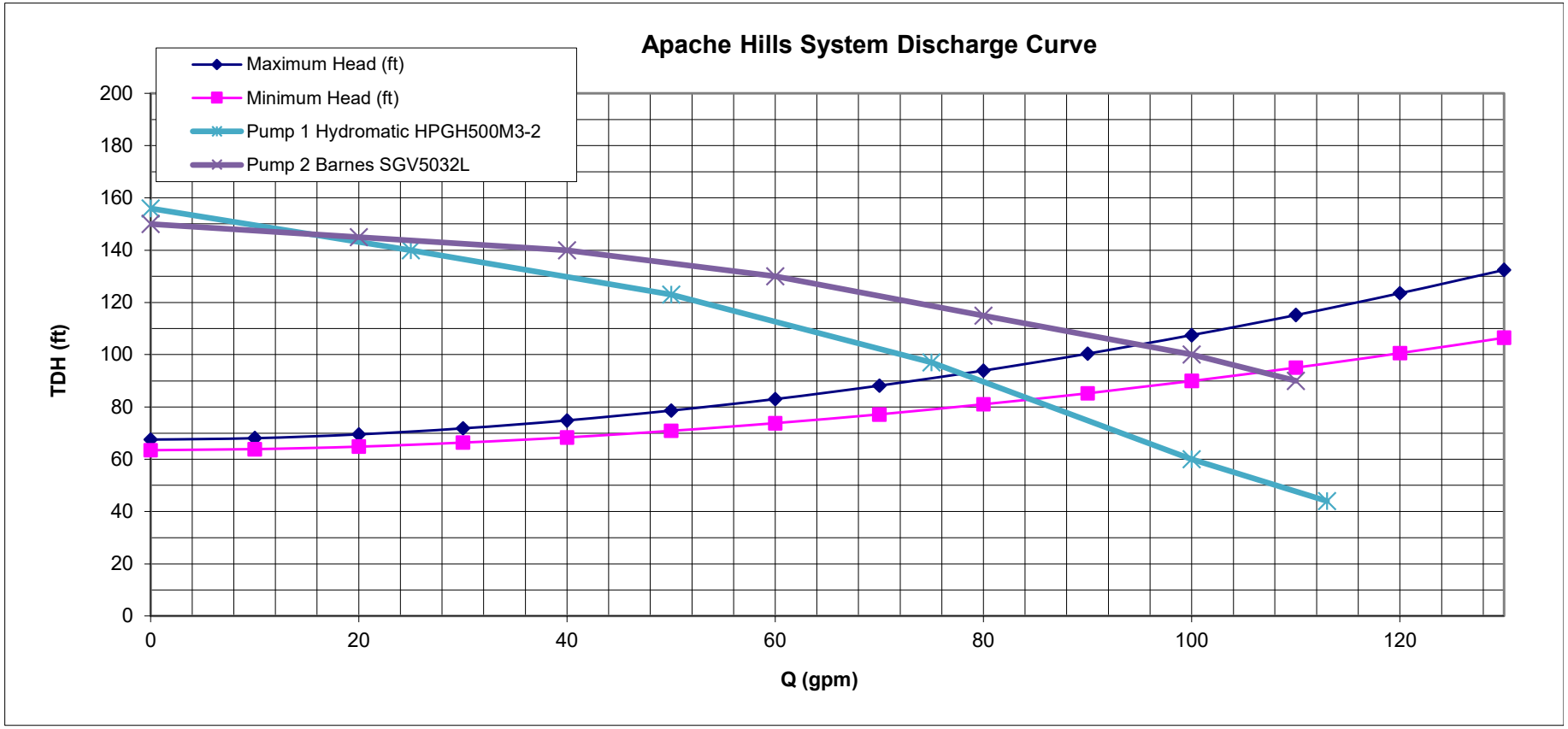
	Transformer (pole or ground)
X	Electric service meter
X	Transfer switch
X	Disconnect switch
X	Permanent generator
X	Control panel exterior
X	Control panel interior - backplane
X	Control panel interior - face of door
X	Seal off fittings (conduits to wet well)

X	Wet well hatch door & frame
X	Pump guide rails
X	Wet well interior
	Pump nameplate
	Pump & motor
	Suction connection into wet well
X	Pump discharge piping
X	Valve vault hatch door & frame
X	Valve vault valves
X	Bypass connection
X	Bypass valve

Table A-1. Existing Average and Peak Flows.						
LS Name	Average Drawdown Test (gpm)	Average Flow (gpm)*	Population Equivalents	Calculated Peaking Factor	Peak Flow (gpm)	Percentage of Capacity
Boathouse	27.2	3.5	50	4.3	14.9	55%
Lakeview	29.6	3.9	57	4.3	16.9	57%
Apache Hills	31.0	4.0	57	4.3	17.1	55%


Boathouse System Discharge Curve
Maximum Head (ft)
Minimum Head (ft)
Hydromatic HP200M2-2
TDH (ft)
400
300
200
100
0
0
5
10
15
20
25
30
35
40
45
50
Q (gpm)


Lakeview System Discharge Curve
Maximum Head (ft)
Minimum Head (ft)
Barnes SGV3072L
TDH (ft)
150
125
100
75
50
25
0
0
10
20
30
40
50
60
Q (gpm)


Apache Hills System Discharge Curve
Maximum Head (ft)
Minimum Head (ft)
Pump 1 Hydromatic HPGH500M3-2
Pump 2 Barnes SGV5032L
TDH (ft)
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Q (gpm)