2018 Water System Master Plan

Town of Shelby, Wisconsin

SHLBY 145278 | June 12, 2018

SEH

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June 12, 2018

RE: 2018 Water System Master Plan
Town of Shelby, Wisconsin
SEH No. SHLBY 145278 4.00

Mr. Carroll Vizecky
Town of Shelby
2800 Ward Avenue
La Crosse, WI 54601

Dear Mr. Vizecky:

SEH is please to present this 2018 Water System Master Plan. This report describes the existing water system and its current condition and also provides a road map for future water system expansion. Please see the executive summary in the following pages for a briefing of the content of the report.

If you have any questions regarding the content of this report, please call me at 715.861.1946 at your convenience.

Sincerely,

Joshua Bohnert, PE
Professional Engineer

JJB
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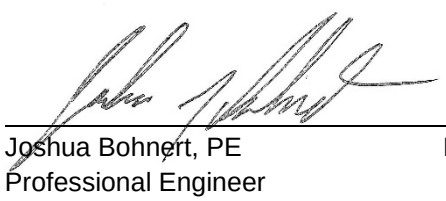
2018 Water System Master Plan

2018 Water System Master Plan
Town of Shelby, Wisconsin

Prepared for:
Town of Shelby
2800 Ward Avenue
La Crosse, WI 54601
608-788-1032

Prepared by:
Short Elliott Hendrickson Inc.
329 Jay Street, Suite 301
La Crosse, WI 54601-4034
608.782.3161

I, Joshua Bohnert, hereby certify that I am a registered Professional Engineer in the State of Wisconsin in accordance with ch. A-E 4, Wis. Adm. Code and that this report has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code.



44995-6	6/12/2018
PE Number	Date

Joshua Bohnert, PE
Professional Engineer

Executive Summary

This 2018 Water Master Plan provides the Town a summary of its existing water system, along with an engineer's review of the existing facilities, and plans for how the water system may expand over time. Chapter 0 describes the outline, Chapter 1 describes the overall water system, Chapter 2 discusses the existing and future water needs, Chapter 3 provides an in depth analysis of the water system and a critical review of the condition of existing facilities and Chapter 4 provides recommendations for capital improvements.

Figure 1-1 shows the existing water system schematic. Figure 1-2 shows the existing water system map. Figure 4-3 shows the future water system master plan layout. Table 4-1 shows the capital improvements plan.

This report provides a single source for much of the basic information for the water system. Tables and figures characterize the existing facilities and water needs. Appendices in this report include data for the various facilities in the system. Fire protection, pressure and water demands are discussed. Future water system expansion is discussed.

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2018 Water System Master Plan

Prepared for Town of Shelby

0 Introduction

The Town of Shelby (Town) requested for consultation in the planning of its drinking water distribution system which serves a number of customers within the Town of Shelby. This report provides the analysis and recommendations required by the Town per the contract signed with Short Elliott Hendrickson, Inc. (SEH) titled *Connecting Arbor Hills to Wedgewood Water System*.

Each part of the project was completed in stages to assure project objectives are addressed efficiently. The work completed in this evaluation can be utilized in the future as the basis for a system wide evaluation to include pumping and distribution analysis and improvement planning.

0.1 Project Need

The Town of Shelby contains approximately 4,716 residents located in west central Wisconsin along the Mississippi River. The Town is bordered by the City of La Crosse to the west with wooded bluffs and coulees throughout. Most of the agricultural areas are located to the east. The Town of Shelby was has owned and operated a municipal water system since 1955.

The Town of Shelby Sanitary District #2 provides water and sewer services to the Town. It served 474 customers in 2017, and this number is anticipated to increase. The Town has reported that multiple private wells within the Town have high levels of iron, to the point where household plumbing and appliances are being compromised. The Town is interested in extending its water system to provide quality water to its residents as well as provide a higher level of fire protection. The Town is also desiring to characterize and document the existing state of its current water system. For the prudent and efficient use of limited financial resources, it is essential that the Town's water system facilities be prepared for short term as well as long term needs. This report is a comprehensive plan for the existing and future anticipated needs of the Town's drinking water facilities and distribution system.

What the Town calls "systems" in the contract, this report will call "pressure zones" or "zones" for clarity. The "system" in this report is the collection of all water mains, wells, tanks, pumping station, valves, hydrants and all other water facilities owned and operated by the Town.

0.2 Scope

0.2.1 Task 1 – Existing Areas Served by Arbor Hills, Wedgewood and Skyline Water Systems (Existing Water Distribution System)

- Review existing service area planning reports including past planning studies, and available Town planning and other related documents.
- Utilize La Crosse County Lidar Mapping to evaluate each system.
- Meet with and review information from appropriate planning individuals or agencies.

- Create one map of the boundaries of the Water Utility's existing water service pressure zones.

0.2.2 Task 2 – Water Needs Analysis

- Three existing and one potential future service area will be reviewed for water needs as described above.
- Estimates of water needs will be developed based on projections of service population, land use and probable user consumption characteristics. Historical sales and pumpage statistics, and experience history information will be used to project future water needs. Overall water needs will be characterized by major customer classification and presented in terms of average, maximum, and peak conditions.
- An important first step will be to review the current service area needs. Then future service area expansion scenarios and growth projections will be evaluated by spreadsheet analysis. Special large volume customer requirements are not included in this study, but can be investigated separately.
- Fire protection needs will be investigated for planning sub-districts. General flow capacity requirements will be outlined based on typical land use classifications, ISO and industry standards, and applicable codes or regulations. These estimates will be used to evaluate the adequacy of existing supply, storage, and distribution systems.

0.2.3 Task 3 – Review of Existing Facilities

The Town owns four-supply and four-underground storage facilities that operate in three separate pressure zones. This task involves the inspection and/or review and evaluation of all existing water system facilities owned, operated and maintained by the Town of Shelby that are used and useful in serving the Town water system. Water system facilities to be reviewed include:

- Water supply facilities
- Pumping facilities, equipment and appurtenances
- Water storage facilities
- Transmission and distribution piping (paper review)
- Hydrants, valves and services (paper review)
- Review and evaluate historical well performance based on available Town records.
- Review facility and equipment historical maintenance records where available.
- Review historical infrastructure replacement program based on available records

0.2.4 Task 4 – Technical Memo, Evaluation and Recommendations

Improvements planning involves the systematic evaluation of capital improvements required to either correct existing service or operational deficiencies, or support planned future service area growth. Improvements required to address existing deficiencies include such items as age, obsolescence and operational limitations or pressure/flow deficiencies with the existing distribution system. Water system improvements required to support future service area growth may include additional pressure zones and/or zone boundary modifications, booster pumping, distribution storage, or upgrading and expansion of the distribution system. Possible water system improvements that will be evaluated include:

- Expand distribution system into new service areas
- Connect existing pressure zones for efficiencies and reliability
- Need for new supply wells

- Supply/storage/booster pumping system improvements
- Standby power
- Replacement of small or substandard water mains
- Major trunk main extensions or improvements

As part of the improvement planning process, estimates of probable cost will be developed for all recommended improvements. Cost estimates will be based on current year dollars, and will include provisions for legal, administrative and engineering cost components.

0.3 Report Format

The format of this report will follow the outline prescribed in the signed agreement. Each task will be specifically addressed in a clear and concise manner. The main objective of this report is depict how the Town's water system was constructed as of February 2018 and how the Town intends to serve water to future areas.

1 Existing Water Distribution System

This section summarizes how the Town's existing water system is constructed and operated as of February 2018. For this report, the existing system is defined as all water mains and facilities constructed as of February 19, 2018.

1.1.1 Water System Schematic

The existing water system schematic is shown in Figure 1-1. The water system is comprised of three separate pressure zones: Arbor Hills, Wedgewood and Skyline. The three pressure zones operated at three difference hydraulic grade lines and cannot be interconnected without additional pumping facilities and/or pressure reducing valves.

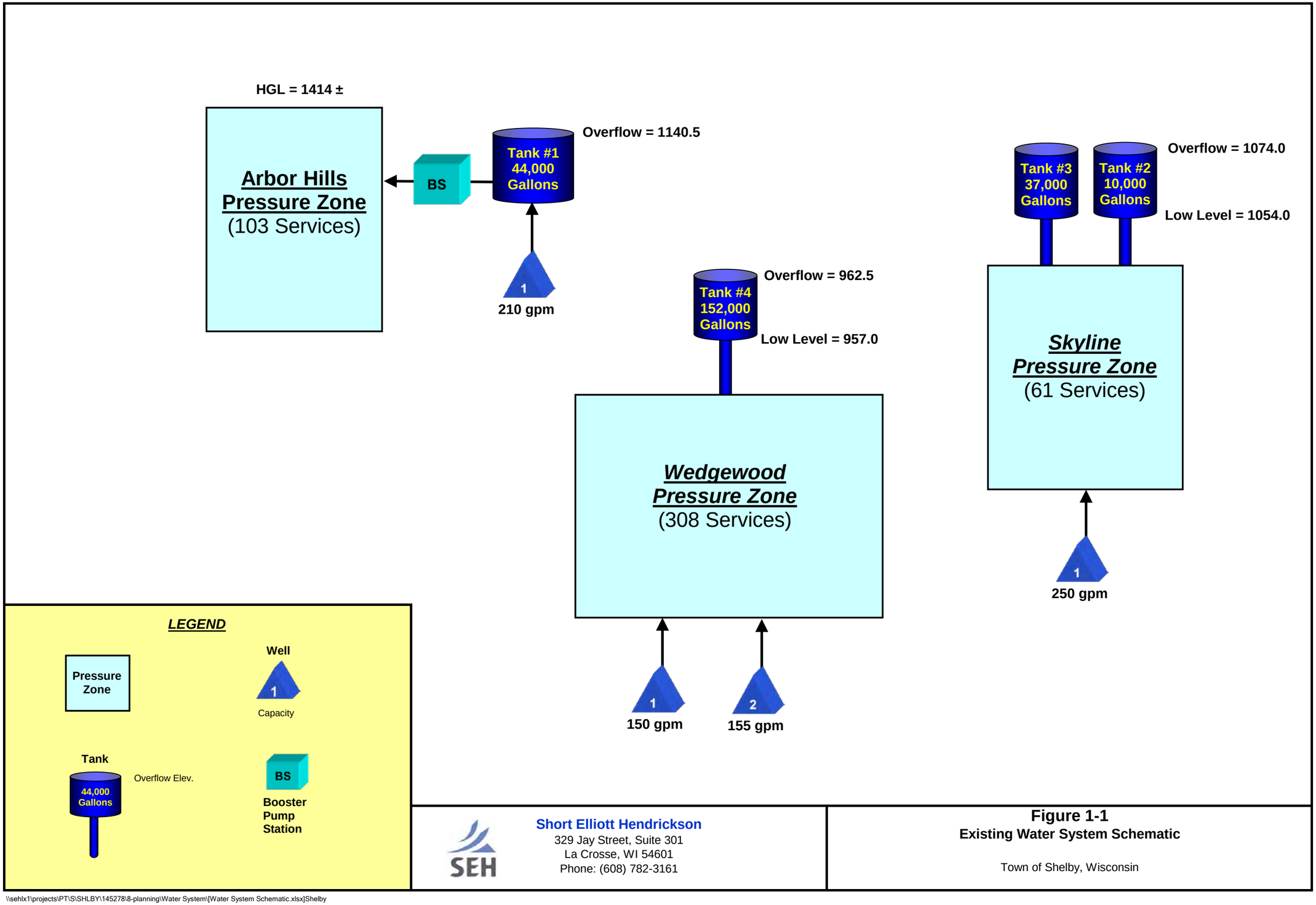
Chapter 3 will provide an in-depth review of all facilities in each pressure zone.

1.1.2 Water System Map

The existing water system map is shown in Figure 1-2. The Wedgewood pressure zone lies in the center of the Town's water system, with the Arbor Hills zone to the north and Skyline zone to the southeast. A pressure reducing valve within the Wedgewood zone reduces pressure to the homes south of State Highway 33 (STH 33), otherwise known as the terraces. The Wedgewood and Arbor Hills zones are in close proximity. The Skyline zone, however, is relatively remote from the other two zones.

1.1.3 Planning Area

SEH and the Town met on February 26, 2018 to discuss potential areas to be served based on the Town's near term and long term needs. Figure 1-3 shows the existing and future service areas. Approximately 695 additional units are anticipated to be added to the existing 472 current customers. This number of 695 additional units may change over time, and acts as the planned number of additional units that the calculations of this report plan for. As this number changes, the results of this report should also be updated.



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Phone: (608) 782-3161

Figure 1-1
Existing Water System Schematic

Town of Shelby, Wisconsin

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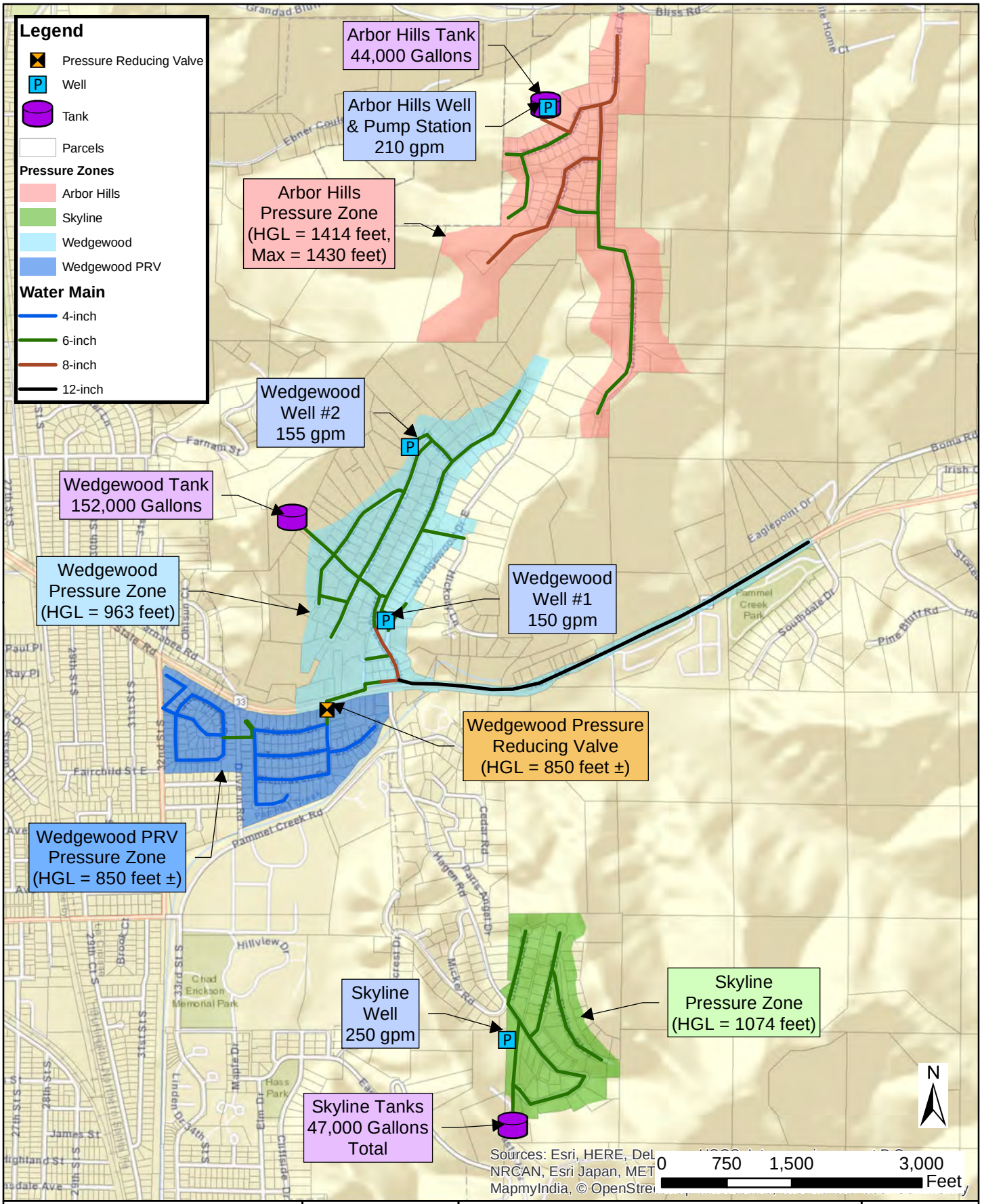

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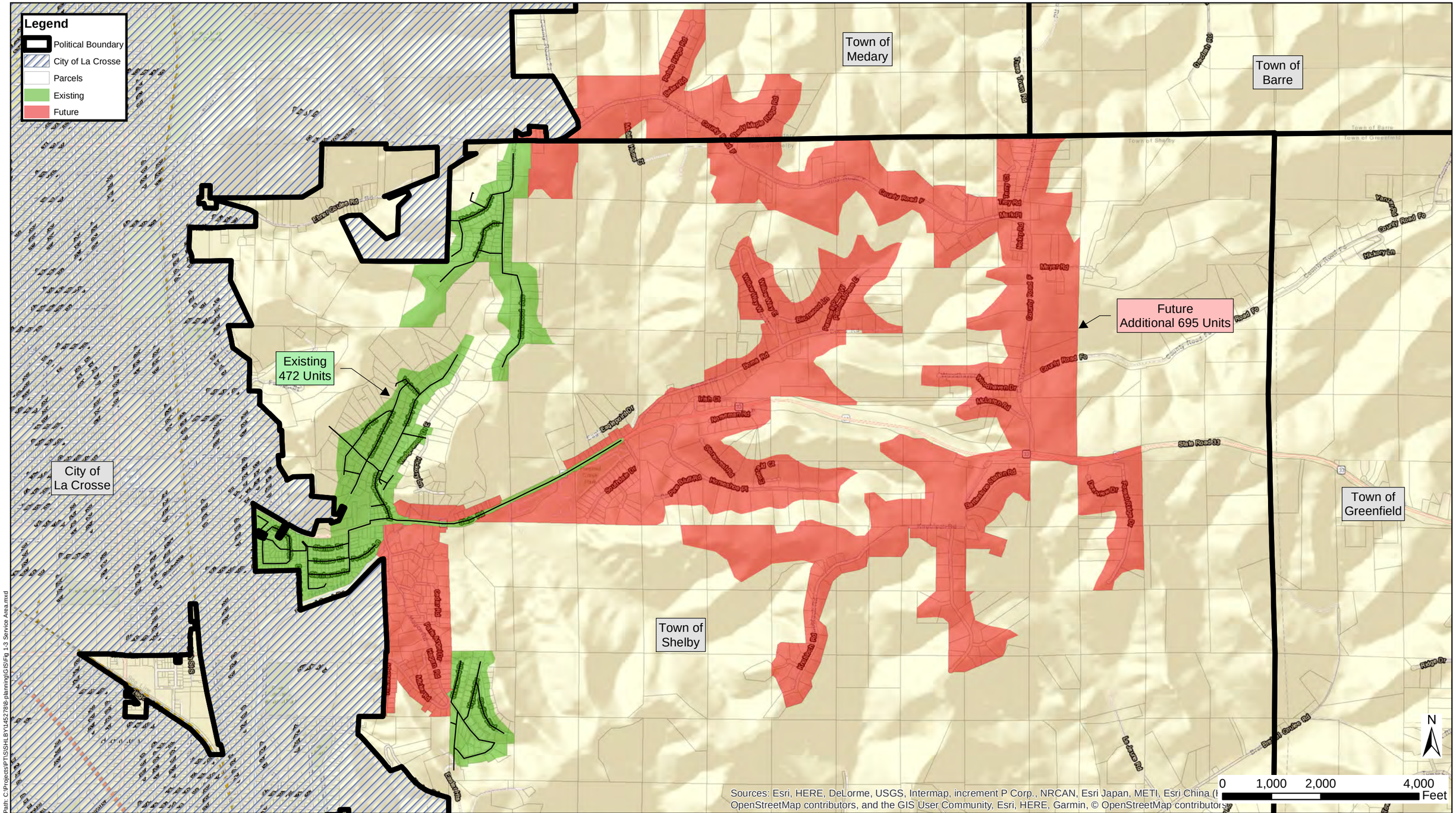
Print Date: 5/22/2018

Map by: jbohnert
Projection: NAD_1983_HARN_WISCRS_LaCrosse_County_Feet
Source: SEH File

Water System Map

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 1-2



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Future Service Area

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 1-3

1.1.4 Service Area Elevations

The Town of Shelby is located along the Mississippi River, located where the upper Driftless Area descends to the Mississippi River Valley. The Town's topography is highly varied, with elevations changing tens of feet over short distances. In the water service area in Figure 1-3, the elevations range from 660 feet to 1270 feet.

According to Wisconsin Statue NR 811.70(4), water mains must have pressure on the range of 35 to 100 psi. This corresponds to a maximum elevation range of 150 feet within a given pressure zone. Based on the range of elevations in the Town, multiple pressure zones are required.

Figure 1-4 depicts the elevations in the water service area. The elevations between each pressure zone differ on the order of 100 to 400 feet. The high variability in elevation will make planning critical for the Town's water system, as the Town will need to understand how a site's elevation will affect how it may be served public water.

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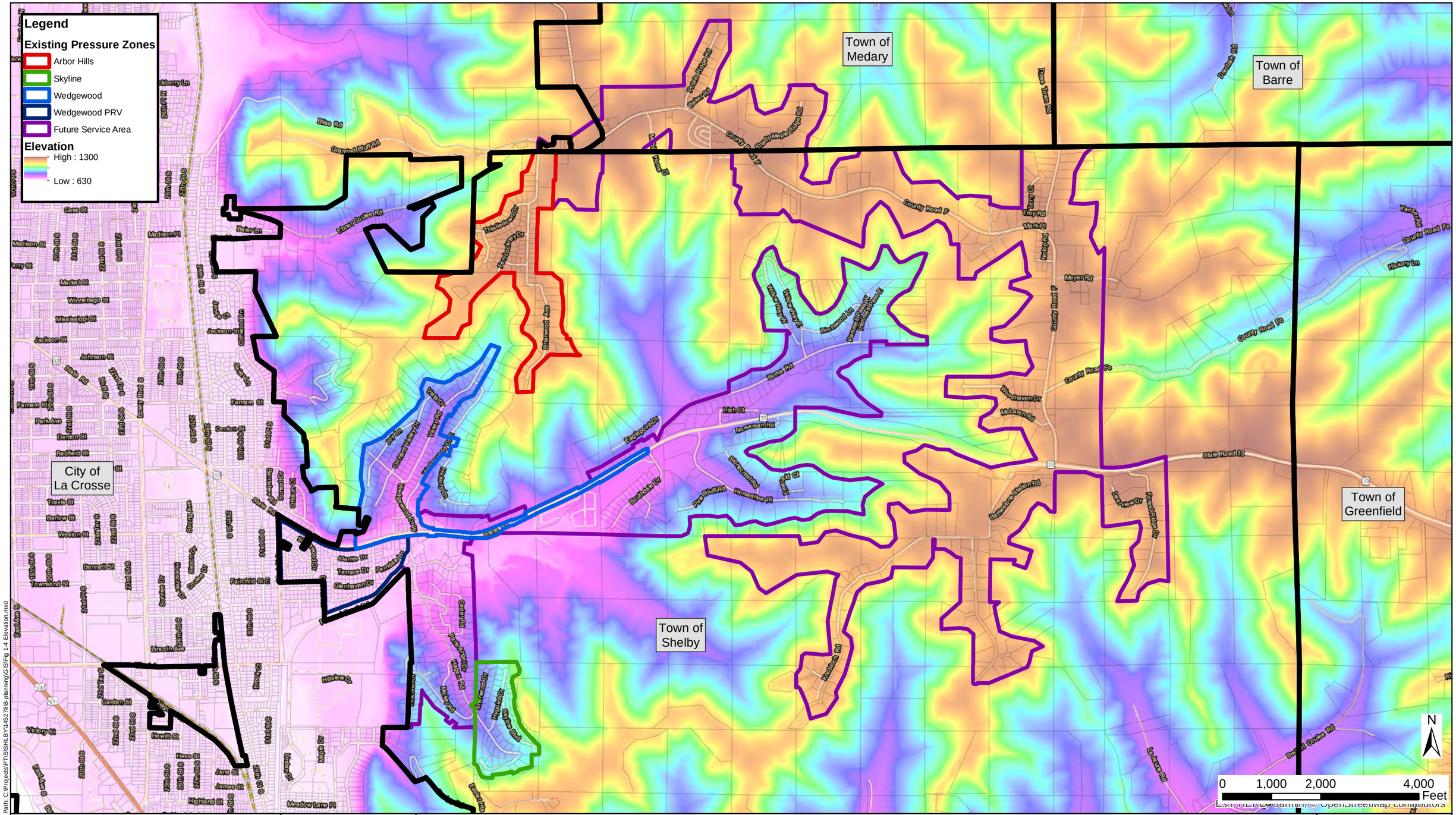

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Future Service Area Elevations

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 1-4

2 Water Needs Analysis

This sections reviews the historical water use of the Town and provides projections of future water needs for the future service areas in Figure 1-3.

2.1 Historical Water Use

2.1.1 Total Water Use

Water sales and pumping records from the Wisconsin Public Service Commission (PSC) were reviewed and are summarized in Table 2-1. In 2016, the Town pumped around 82,000 gallons per day (gpd) on an annual average basis. The maximum day demand in 2016 was reported to be 244,000 gpd. In 2012, a drought year, the maximum day demand was reported to be 315,000 gpd.

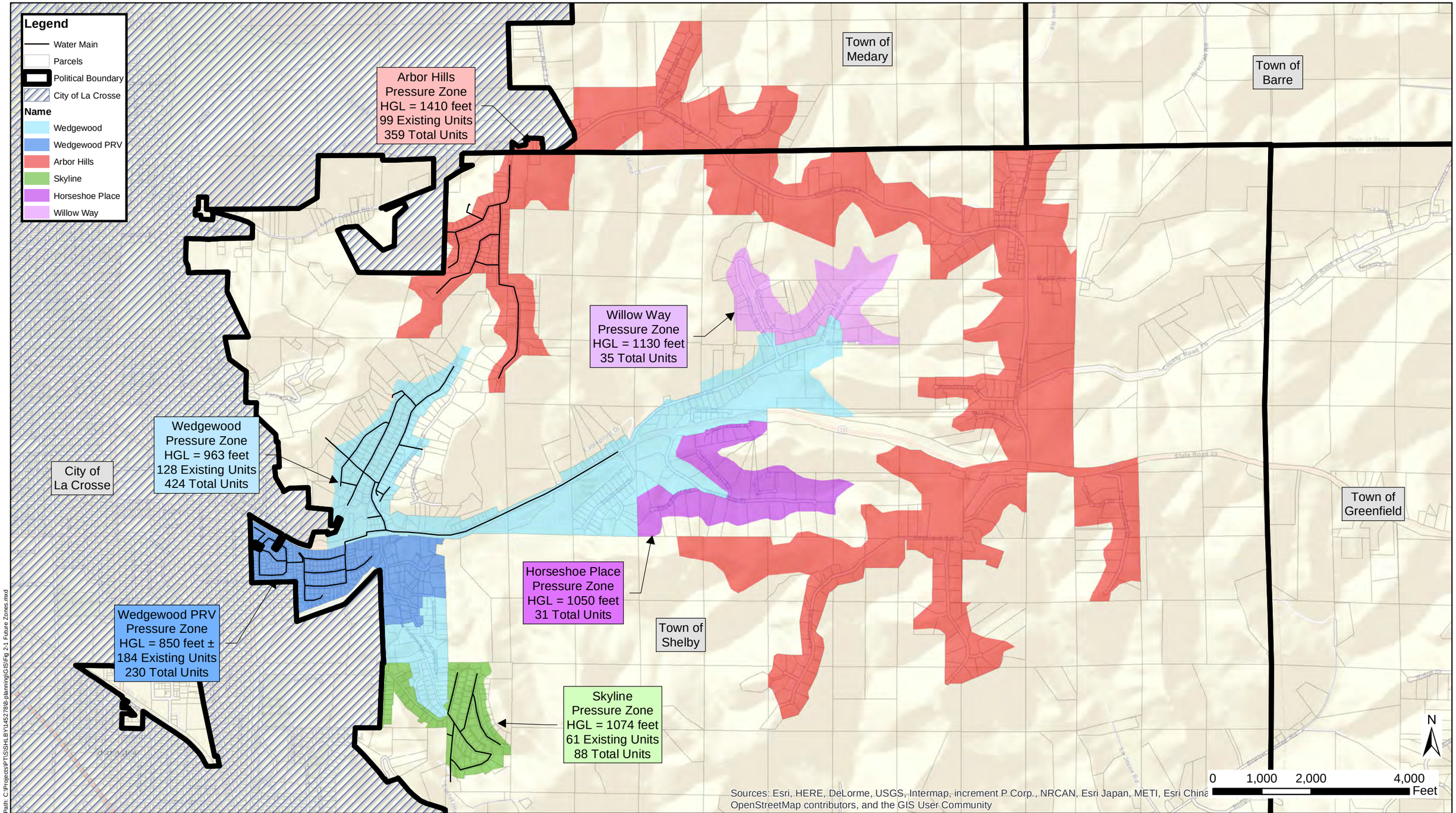
Table 2-1: Historical Water Use

Year	Average Day (gpd)	Maximum Day (gpd)
2008	98,350	182,000
2009	99,079	196,000
2010	92,449	192,000
2011	103,375	213,000
2012	105,473	**315,000**
2013	94,332	284,000
2014	80,800	238,000
2015	84,082	192,000
2016	82,153	244,000
2017	84,397	280,000

Historical monthly water data supports the argument to use year 2012 as the design basis. A comparison of monthly water use between year 2012 and year 2017 is shown in Figure 2-1. A drastic difference is seen in the monthly water use in year 2012 during the summer months, when rainfall was lacking. In year 2017, on the other hand, more timely rainfall occurred during the summer months. The lack of rainfall in year 2012 drove up the summer water use, especially the maximum day demand.

2.1.2 Per-Capita Water Use

Historical water use can be used to predict future water needs if properly characterized. Typically, water use can be related to the service population of a utility. Because the entire Town population is not served by the Town's water system, the entire Town population cannot be used. Instead, an estimate of the service population can be calculated based on the reported number of customers each year, multiplied by the 2010 census value of 2.45 persons per home.



Path: C:\Projects\PTS\SHLBY\145278\8-planning\GIS\Fig 2-1 Future Zones.mxd

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Future Pressure Zones

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 2-1

Table 2-2 shows the historical per-capita water use in the Town. From 2014 to 2017, the Town pumped approximately 72 gallons per capita per day (gpcd) on an annual average basis, representing water use in a typical year. In 2012, a drought year, the Town pumped 276 gpcd on the maximum day. For future planning purposes, an average day per-capita demand of **72 gpcd** will be used for typical water use with a maximum day demand of **276 gpcd** to account for drought lawn watering.

There was a drastic shift in the number of customers from year 2011 to year 2012. During this period, the Wedgewood Terraces were connected to the system. It is believed the values for 2011 do not fully represent the water system during this transition period. Thus, the year 2011 values are not being used for planning.

Table 2-2: Historical Water Use on Per-Capita Basis

Year	Estimated Served Population[1]	Average Day Demand (gpcd)	Maximum Day Demand (gpcd)
2008	677	145	269
2009	677	146	289
2010	704	131	273
2011	704	147	303
2012	1,143	92	276
2013	1,143	83	248
2014	1,155	70	206
2015	1,155	73	166
2016	1,153	71	212
2017	1,156	73	242

1. Population based on 2.45 persons per household from 2010 census

2.1.3 Water Use by Zone

Because the water system is split into three distinct, hydraulically disconnected pressure zones, it is imperative to properly quantify the historical water use of each zone. In January 2017, the Town reported the number of customers and the total water use in each zone, shown in Table 2-3 and Figure 1-1.

Table 2-3: Water Services per Pressure Zone

Pressure Zone	Service Connections	Percent Customers	Total Water Use (gpd)	Percent Water Use
Arbor Hills	103	22%	18,114	21%
Skyline	61	13%	12,570	15%
Wedgewood	308	65%	53,956	64%
Total	**472**	**100%**	**84,641**	**100%**

Table 2-3 shows there is a very close relationship to the number of customers and the total water use in terms of percentages. Thus, for future planning, the number of customers will be used to predict future water needs in each pressure zone.

2.2 Future Water Needs Projections

The Town is seeking to extend service a number of existing units within the Town and provide the ability to serve water to future developments when they occur.

Figure 2-1 showed the layout of the units in the service area. In total, the Town currently serves 472 units and plans to serve approximately 1,043 units, an increase of 221 percent. Because the Town is almost entirely residential, the future water needs should scale proportionally with the service population. Thus, the town could expect a future water need of 221 percent of current needs.

As Table 2-1 previously showed, water needs vary from year to year. Year 2012 was a drought year and represents a condition of high lawn watering. Using the values from Section 2.1.2 of 72 gpcd for average day (AD) demand (typical-year) and 276 gpcd for maximum day (MD) demand (drought year), Table 2-4 sets the future total maximum day demand of approximately 705,000 gpd on a drought year. Typical annual day water use from year to year would be around 184,000 gpd. Table 2-4 was calculated according to Equation 1 and Equation 2.

Table 2-4: Future Water Needs

Period	Units	Typical-Year Average Day (gpd)	Drought-Year Maximum Day (gpd)
2012-2017	472	82,858	315,000
Future 2040	1,043	184,000	705,000

Equation 1 (Typical Year)

$$AD_{Typical} = Units\ x\ 2.45\ persons/unit\ x\ 72\ gpcd$$

Equation 2 (Drought-Year):

$$MD_{Drought} = Units\ x\ 2.45\ persons/unit\ x\ 276\ gpcd$$

Peak flow rate will be of concern to the Town wherever closed loop pressure zones are constructed in the future. Equation 3 provides a means to estimate peak flow in a drought year with a typical peak factor of 1.65 and is more conservative than NR 110.13(c)(2). Equation 3 does not account for fire protection and fire protection must be added.

Equation 3 (Drought-Year):

$$Peak\ Flow_{Drought} = Units\ x\ 0.78\ gpm/unit$$

2.3 Future Pressure Zones

Water service is drastically affected by elevation, because elevation and pressure are connected. Figure 1-4 showed a color representation of the elevations in the Town of Shelby. Due the high variation in elevation from location to location in the Town, future pressure zones must be determined in order to allocate future demands for future capital improvements.

Figure 2-1 showed the planned pressure zones with the number of units per zone. Figure 2-1 will be the basis for determining future water needs per pressure zone. If a zone is dependent upon another zone for supply, the demands that zone must be added to the supplying zone.

Table 2-5 provides the estimates of future water needs with the full expansion of the water system. By 2040, if all existing units connect to the Town's water system and development occurs, the future maximum day demand could be as high as 0.79 mgd (789,100 gpd), equal to a flow rate of approximately 550 gpm.

Table 2-5: Future Water Needs per Pressure Zone

Pressure Zone	Planned Units	Typical Average Day Demand (gpd)	Drought Maximum Day Demand (gpd)
Wedgewood	424	74,800	286,700
Wedgewood PRV	230	40,600	155,500
Willow Way	35	6,200	23,700
Horseshoe Place	31	5,500	21,000
Skyline	88	15,500	59,500
Arbor Hills	359	63,300	242,800
Total	**1,167**	**205,900**	**789,100**

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3 Review of Existing Facilities

This section provides an in-depth review of all facilities in the Town's water system. SEH toured all well facilities on February 26 & 27, 2018 to assess each facility. The Town provided a maintenance record of each facility, shown in Appendix B.

3.1 Supply Wells

A summary of all supply wells is shown in Table 3-1. The total capacity of all wells is approximately 1.10 million gallon per day (mgd), assuming the wells may be continuously pumped 24 hours per day. It is common for utilities to remove a well from service for a short period for routine maintenance and/or repairs. Table 3-1 shows what the firm capacity would be with the largest well offline. The following sections provide a detailed review of each well facility.

Table 3-1: Water Supply Wells

Well Name	Capacity (gpm)	Daily Capacity (mgd)[1]
Wedgwood Well #1	150	0.22
Wedgwood Well #2	155	0.22
Arbor Hills Well #1	210	0.30
Skyline Well #1	250	0.36
	Total Capacity	1.10
	Minus Largest Well	0.36
	Firm Capacity	0.74

1. Assumes the well may be continuously pumped 24 hours per day with all other wells operating.

3.2 Storage Tanks

A summary of all storage tanks is shown in Table 3-2. Each storage tank is a buried reservoir. All tanks, except for the Arbor Hills Tank #1, are floating system tanks. Arbor Hills Tank #1 requires high service pumps to be utilized. As previously stated, the maintenance record of each facility is shown in Appendix B.

Table 3-2: Water Storage Facilities

Tank Name	Construction	Capacity (gallons)
Arbor Hills Tank #1	Buried Concrete	44,000
Skyline Tank #2	Buried Concrete	10,000
Skyline Tank #3	Buried Concrete	37,000
Wedgewood Tank #4	Buried Concrete	152,000
	Total Capacity	243,000

3.3 Walkthrough of All Facilities

3.3.1.1 Wedgewood Well #1

3.3.1.1.1 Description

The Wedgewood Well #1 site contains a supply well within a well house.

3.3.1.1.2 Location

Wedgewood Well #1 is located on Wedgewood Drive East (N43.792962°, W91.199289°) within the Wedgewood pressure zone. This well is one of two wells in the Wedgewood zone.

3.3.1.1.3 Borehole

The well was constructed in 1956. A six-inch borehole was drilled to a depth of 375 feet below the ground surface (bgs) elevation of approximately 723 feet. A 12-inch casing was constructed to a depth of 63 feet, and a 6-inch casing was constructed to a depth of 130 feet bgs. As of December 2017, the static water level was 119 feet bgs. The well construction report is contained in Appendix C.

The well casing terminates 12 inches above the finished floor with a concrete collar. A welded well seal exists, which is bolted to the concrete collar. A 1-1/4" well vent exists, terminating 24 inches above finished floor (aff). An air release valve and a smooth end sample tap on top, with the down-turned screen for the air release valve located 24 inch aff. An airline is installed which can be used to manually measure the water level.

3.3.1.1.4 Well Pump

The well pump is a submersible style pump with a 30 HP motor, set at a depth of 169 feet bgs. When activated, the well operates at a rate of 150 gpm, with a pumping water level of 149 feet bgs. The well pump does not have a variable frequency drive.

3.3.1.1.5 Process

From the well, the water passes through a proof-of-flow switch, then a tee for a fire hose connection, then a spin flow meter, then a swing check valve, then chlorine injection (-45°), then fluoride injection (-45°), then a shut off valve, then a threaded end sample tap with pressure gage, and then enters the Wedgewood distribution system.

The engineer observed the treated water sample tap was threaded and should be changed to a smooth end sample tap. The shut off valve should be relocated so the chemical injections points are downstream of the last shutoff valve. Moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested.

3.3.1.1.6 Operation

The well pump is automatically controlled according to the levels in the Wedgewood Tank. Wedgewood Valley Well #1 rotates lead and lag position with Wedgewood Valley Well #2.

The operator reported no concerns if the well was continuously pumped with other wells.

3.3.1.1.7 Chemical Equipment

The well injects 12.5 % sodium hypochlorite (chlorine) and 20 % hexafluorosilicic acid (fluoride) into the raw ground water using Jesco MAGDOS LK peristaltic pumps. Chemical pumps automatically activated and deactivated with the well pump, but are manually set for concentration. The proof of flow switch on the well process piping activates and deactivates the chemical pumps. A manual switch allows the operator to ventilate the chemical room.

Chemicals are measured by scales, accurate to ± 0.01 pounds. Chemicals are delivered in 5 gallons jugs, which act as the storage tanks. No day tank is present. An eye wash station is installed.

The engineer observed corroded piping and electrical components around the chemical feed pumps. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets. Chemical resistant paint should be placed where previous coatings have deteriorated. The chemicals are located in a room separate from the process piping, but are not separated from each other. Ventilation should be automatically activated with the door opening.

3.3.1.1.8 Auxiliary Power

This well does not have any sources of auxiliary power.

3.3.1.1.9 Floor Drain

The floor drain discharges to sanitary sewer.

3.3.1.1.10 Security

Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum. No fence or intrusion alarms present.

3.3.1.1.11 Site Grading

The site is graded to move water away from the building.

3.3.1.1.12 Other Observations

The engineer observed exposed wire nuts on the exterior of the building, and recommends a qualified electrician inspect this wiring.

Valve may be in need of exercise. Use caution as valves may be seized and could break.

3.3.1.2 Wedgewood Well #2

3.3.1.2.1 Description

The Wedgewood Well #2 site contains a supply well within a well house.

3.3.1.2.2 Location

Wedgewood Well #2 is located on Vista Drive (N43.798490°, W91.197804°) within the Wedgewood pressure zone. This well is one of two wells in the Wedgewood zone.

3.3.1.2.3 Borehole

The well was constructed in 1981. A six-inch borehole was drilled to a depth of 503 feet below the ground surface (bgs) elevation of approximately 842 feet. A 12-inch casing was constructed to a depth of 46 feet, and a 6-inch casing was constructed to a depth of 218 feet bgs. As of

December 2017, the static water level was 185 feet bgs. The well construction report is contained in Appendix C.

The well casing terminates 36 inches above the finished floor with a concrete collar. A welded well seal exists, which is bolted to the concrete collar. A 1-1/4" well vent exists, terminating 24 inches above the concrete collar. An air release valve and a smooth end sample tap on top, with the down-turned screen for the air release valve located 24 inch aff. An airline is installed which can be used to manually measure the water level.

The engineer observed the well seal plate to be moderately corroded: grinding and re-painting is recommended.

3.3.1.2.4 Well Pump

The well pump is a submersible style pump with a 30 HP motor, set at a depth of 357 feet bgs. When activated, the well operates at a rate of 155 gpm, with a pumping water level of 265 feet bgs. The well pump does not have a variable frequency drive.

3.3.1.2.5 Reservoir

One buried concrete reservoir is near the well site up the hill. The total volume is 152,000 gallons. The overflow elevation is 962.5 feet.

3.3.1.2.6 Process

From the well, the water passes through a proof-of-flow switch, then a wafer check valve, then a spin flow meter, then a shut off valve, then chlorine injection (-45°), then fluoride injection (-45°), then a smooth end sample tap with pressure gage, then a tee for a fire hose connection, and then enters the Wedgewood distribution system.

The engineer observed moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested. All process piping is in need of paint restoration. Floor seals are required at every process pipe penetration through the concrete floor.

3.3.1.2.7 Operation

The well pump is automatically controlled according to the levels in the Wedgewood Tank. Wedgewood Valley Well #2 rotates lead and lag position with Wedgewood Valley Well #1.

The operator reported no concerns if the well were continuously pumped with other wells.

3.3.1.2.8 Chemical Equipment

The well injects 12.5 % sodium hypochlorite (chlorine) and 20 % hexafluorosilicic acid (fluoride) into the raw ground water using Jesco MAGDOS LK peristaltic pumps. Chemical pumps automatically activated and deactivated with the well pump, but are manually set for concentration. The proof of flow switch on the well process piping activates and deactivates the chemical pumps. A manual switch allows the operator to ventilate the chemical room.

Chemicals are measured by scales, accurate to ± 0.01 pounds. Chemicals are delivered in 5 gallons jugs, which act as the storage tanks. No day tank is present. An eye wash station is installed.

The engineer observed corroded piping and electrical components around the chemical feed pumps. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets. Chemical resistant paint should be placed where previous coatings have deteriorated. The chemicals are located in a room separate from the process piping, but are not separated from each other. Ventilation should be automatically activated with the door opening.

3.3.1.2.9 Auxiliary Power

This well is able to receive auxiliary power from a portable generator.

3.3.1.2.10 Floor Drain

The floor drain discharges to grade.

3.3.1.2.11 Security

Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum. No fence or intrusion alarms present.

3.3.1.2.12 Site Grading

The site is mostly graded to move water away from the building; the area behind building between the building and the new retaining wall is not adequately graded to move water away from the building. The grading should be lowered and sloped to prevent standing water and water flowing into the building foundation. The exterior grade should be at least 6 inches below the floor elevation of the building.

3.3.1.2.13 Other Observations

Valve may be in need of exercise. Use caution as valves may be seized and could break.

3.3.1.3 Wedgewood Pressure Reducing Valve

3.3.1.3.1 Description

Units in the Wedgewood Terraces south of State Highway 33 were experiencing high pressure. A pressure reducing valve was constructed, and was last installed on Hiawatha Avenue (N43.790008°, W91.201967°).

3.3.1.3.2 Operation

The pressure reducing valve uses a hydraulic pilot to automatically maintain downstream pressure. The valve is set to maintain a downstream pressure of approximately 65 psi ±. A data sheet of the pressure reducing valve is in Appendix E.

3.3.1.4 Arbor Hills Well #1

3.3.1.4.1 Description

The Arbor Hills Well #1 site contains a supply well, three booster pumps, one hydropneumatic tank within a well house. The site also contains a buried reservoir and one portable electric generator.

3.3.1.4.2 Location

The Arbor Hills Well #1 is located on Thistledown Drive (N43.809042°, W91.192388°) within the Arbor Hills pressure zone. This well is the only well in the Arbor Hills zone.

3.3.1.4.3 Borehole

The well was constructed in 1970. A ten-inch borehole was drilled to a depth of 802 feet below the ground surface (bgs) elevation of approximately 1,141 feet. An 18-inch casing was constructed to a depth of 17 feet, and a 10-inch casing was constructed to a depth of 611 feet bgs. As of December 2017, the static water level was 490 feet bgs. The well construction report is contained in Appendix C.

The well casing terminates 12 inches above the finished floor with a concrete collar. A welded well seal exists, which is bolted to the concrete collar. A 1-1/4" well vent exists, terminating 24 inches above the concrete collar. An air release valve and a smooth end sample tap on top, with the down-turned opening for the air release valve located 24 inch aff. An airline is installed which can be used to manually measure the water level.

The engineer observed the well seal plate and process piping to be moderately corroded. Paint had fallen off some parts. The screen was missing from the air release valve.

3.3.1.4.4 Well Pump

The well pump is a submersible style pump with a 40 HP motor, set at a depth of 600 feet bgs to the bottom of intake. When activated, the well operates at a rate of 210 gpm, with a pumping water level of 520 feet bgs. The well pump does not have a variable frequency drive.

3.3.1.4.5 Booster Pumps

Two vertical turbine high service pumps and one submersible jockey pump is used at this site. The pump curves are included in Appendix D, showing the pump make and model numbers. Variable frequency drives are used to maintain a constant pressure, and the flows are buffered with the use of a hydropneumatic tank.

3.3.1.4.6 Hydropneumatic Tank

A 3,000 gallon hydropneumatic tank is used to equalize system demands and the operation of the booster pumps. The tank is constructed of steel and is located in the basement of the well house. Two air compressors are used to maintain pressure on the air side of the bladder in the tank.

3.3.1.4.7 Ground Storage Tank

A 44,000 gallon buried concrete reservoir is located below the well house. The well pumps water into the reservoir and the booster pumps draw water from the reservoir. The reservoir is lower than the service connections in the Arbor Hills pressure zone, and booster pumps are thus required. The overflow elevation is 1140.5 feet ±.

3.3.1.4.8 Process

From the well, the water passes through a proof-of-flow switch, then a swing check valve, then a shutoff valve, then turns up to vertical flow, then chlorine injection (0° horizontal), then fluoride injection (0° horizontal), then makes U-turn back down for an air break, then turns horizontal, then a smooth end sample tap, then passes a tee for a fire hose connection, and then falls into the buried reservoir.

From the reservoir, the water is pumped by one of three booster pumps (two high service vertical turbine and one submersible jockey pump), through a check valve, to a hydropneumatic tank,

and then to the distribution system. Between the booster pumps and hydropneumatic tank is a smooth end sample tap, a pressure gage and an electronic pressure transducer.

The engineer observed moderate corrosion on process piping, and this piping should be replaced or restored with chemical resistant paint. At the time of the inspection, it was unknown if the check valves were functional. The engineer recommends the check valve be tested. Some process piping is in need of paint restoration. Floor seals are required at every process pipe penetration through the concrete floor.

3.3.1.4.9 Operation

The well pump is automatically controlled according to the levels in the Arbor Hills Tank on site. Variable frequency drives (VFDs) on each of the three booster pumps maintain constant pressure in the hydropneumatic tank of approximately 117 psi ±, measured 3 ± feet above floor elevation (1140.5 ± feet) for a hydraulic grade line of approximately 1414 feet. The small jockey pump operates whenever low flow occur. When flow is increased or a hydrant is opened, one or both of the high service vertical turbine pumps activate(s).

The operator reported no concerns if the well were continuously pumped with other wells.

3.3.1.4.10 Chemical Equipment

The well injects 12.5 % sodium hypochlorite (chlorine) and 20 % hexafluorosilicic acid (fluoride) into the raw ground water using Jesco MAGDOS LK peristaltic pumps. Chemical pumps automatically activated and deactivated with the well pump, but are manually set for concentration. The proof of flow switch on the well process piping activates and deactivates the chemical pumps. A manual switch allows the operator to ventilate the chemical room.

Chemicals are measured by scales, accurate to ± 0.01 pounds. Chemicals are delivered in 5 gallons jugs, which act as the storage tanks. No day tank is present. An eye wash station is installed.

The engineer observed corroded piping and electrical components around the chemical feed pumps. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets. Chemical resistant paint should be placed where previous coatings have deteriorated. The chemicals are located in the same room as the process piping, and future improvements may require the addition of two separate chemical rooms.

3.3.1.4.11 Auxiliary Power

This well is able to receive auxiliary power from a portable generator, which is located on this site. The generator is Onan brand and is rated for 75 kW in 3-phase and 50 kW in single phase. The generator is mounted on a trailer and can be connected to any single well except for Wedgewood Well #1. Data for the generator is in Appendix F.

3.3.1.4.12 Floor Drain

The floor drain discharges to grade.

3.3.1.4.13 Security

Locking door, but no intrusion alarm.

3.3.1.4.14 Site Grading

Site drains away from the building.

3.3.1.4.15 Other Observations

Process piping was in need of recoating. The upturn bend between the well and the reservoir show include an air vacuum/air release valve to prevent siphoning and remove air pockets.

Valve may be in need of exercise. Use caution as valves may be seized and could break.

3.3.1.5 Skyline Well #1

3.3.1.5.1 Description

The Skyline Well #1 site contains a supply well within a well house. Just up the hill from the site to the south are the Skyline reservoirs, which are operated as one tank.

3.3.1.5.2 Location

The Skyline Well #1 is located on Hagen Road (N43.779462°, W91.194042°) within the Skyline pressure zone. This well is the only well in the Skyline zone.

3.3.1.5.3 Borehole

The well was constructed in 1967. An eight-inch borehole was drilled to a depth of 457 feet below the ground surface (bgs) elevation of approximately 842 feet. A 12-inch casing was constructed to a depth of 84 feet, and an 8-inch casing was constructed to a depth of 322 feet bgs. As of December 2017, the static water level was 198 feet bgs. The well construction report is contained in Appendix C.

The well casing terminates 12 inches above the finished floor with a concrete collar. A welded well seal exists, which is bolted to the concrete collar. A 1-1/4" well vent exists, terminating 24 inches above the concrete collar. An air release valve and a smooth end sample tap on top, with the down-turned screen for the air release valve located 24 inch aff. An airline is installed which can be used to manually measure the water level.

The engineer observed the well seal plate to be moderately corroded.

3.3.1.5.4 Well Pump

The well pump is a submersible style pump with a 40 HP motor, set at a depth of 316 feet bgs. When activated, the well operates at a rate of 250 gpm, with a pumping water level of 228 feet bgs. The well pump does not have a variable frequency drive.

3.3.1.5.5 Reservoirs

Two buried concrete reservoirs are near the well site within the hill. One is 10,000 gallons and the other is 37,000 gallons. Collectively the total volume is 47,000 gallons and the two tanks are operated as one tank. The overflow elevation of the tanks is 1074.0 feet.

3.3.1.5.6 Process

From the well, the water passes through a wafer check valve, then a proof-of-flow switch, then a smooth end sample tap with pressure gage, then a spin flow meter, then a shut off valve, then chlorine injection (-45°), then fluoride injection (-45°), then a smooth end sample tap, then a shutoff valve, and then enters the Skyline distribution system.

The engineer observed moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested. Some process piping is in need of paint restoration. Floor seals are required at every process pipe penetration through the concrete floor.

3.3.1.5.7 Operation

The well pump is automatically controlled according to the levels in the Skyline Tank.

The operator reported no concerns if the well were continuously pumped with other wells.

3.3.1.5.8 Chemical Equipment

The well injects 12.5 % sodium hypochlorite (chlorine) and 20 % hexafluorosilicic acid (fluoride) into the raw ground water using Jesco MAGDOS LK peristaltic pumps. Chemical pumps automatically activated and deactivated with the well pump, but are manually set for concentration. The proof of flow switch on the well process piping activates and deactivates the chemical pumps. A manual switch allows the operator to ventilate the chemical room.

Chemicals are measured by scales, accurate to ± 0.01 pounds. Chemicals are delivered in 5 gallons jugs, which act as the storage tanks. No day tank is present. An eye wash station is installed.

The engineer observed corroded piping and electrical components around the chemical feed pumps. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets. Chemical resistant paint should be placed where previous coatings have deteriorated. The chemicals are located in a room separate from the process piping, but are not separated from each other. Ventilation should be automatically activated with the door opening.

3.3.1.5.9 Auxiliary Power

This well is able to receive auxiliary power from a portable generator.

3.3.1.5.10 Floor Drain

The floor drain discharges to grade.

3.3.1.5.11 Security

Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum. No fence or intrusion alarms present.

3.3.1.5.12 Site Grading

The site is in immediately need of grading work. The DNR (Charlie Cameron) ordered the ground around the site be lowered below the floor elevation and not be embanked against the building wall. The engineer recommends the site be promptly designed and contracted to construct the site around the well house to the appropriate arrangement.

3.3.1.5.13 Other Observations

Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum. Paint on concrete walls was deteriorated. Several electrical sockets were highly

corroded and should be inspected and repaired by a qualified electrician. Several areas of paint were eroded on the concrete walls.

A crack exists in the rear wall of the well house, which is currently holding the weight of the soil bearing against it. This wall holds the electrical equipment of the well house.

The door auto-close mechanism was not-functional. The door should close automatically to prevent freezing or security issues.

Valve may be in need of exercise. Use caution as valves may be seized and could break.

3.4 Existing System Hydraulics

The water system should be checked for its ability to provide pressure and fire protection to its customers. Wisconsin Chapter NR 811.70(4) requires pressure to be between 35 and 100 psi at ground level. Chapter NR 811.70(6) requires a minimum of 500 gpm flow at all points in the water system network while maintaining 20 psi at all points in the water system network at ground level.

SEH constructed a water model of the Town's water system in order to estimate the existing pressure and fire protection abilities of the system. Using La Crosse County LIDAR elevation data, accurate elevation data was imported into the water model. Calibration was not part of this report scope, however, reasonable assumptions can be made about pipe C-factors. Table 3-3 reports which C-factors were assumed for each water main diameter.

Table 3-3: C-Factor Assumptions

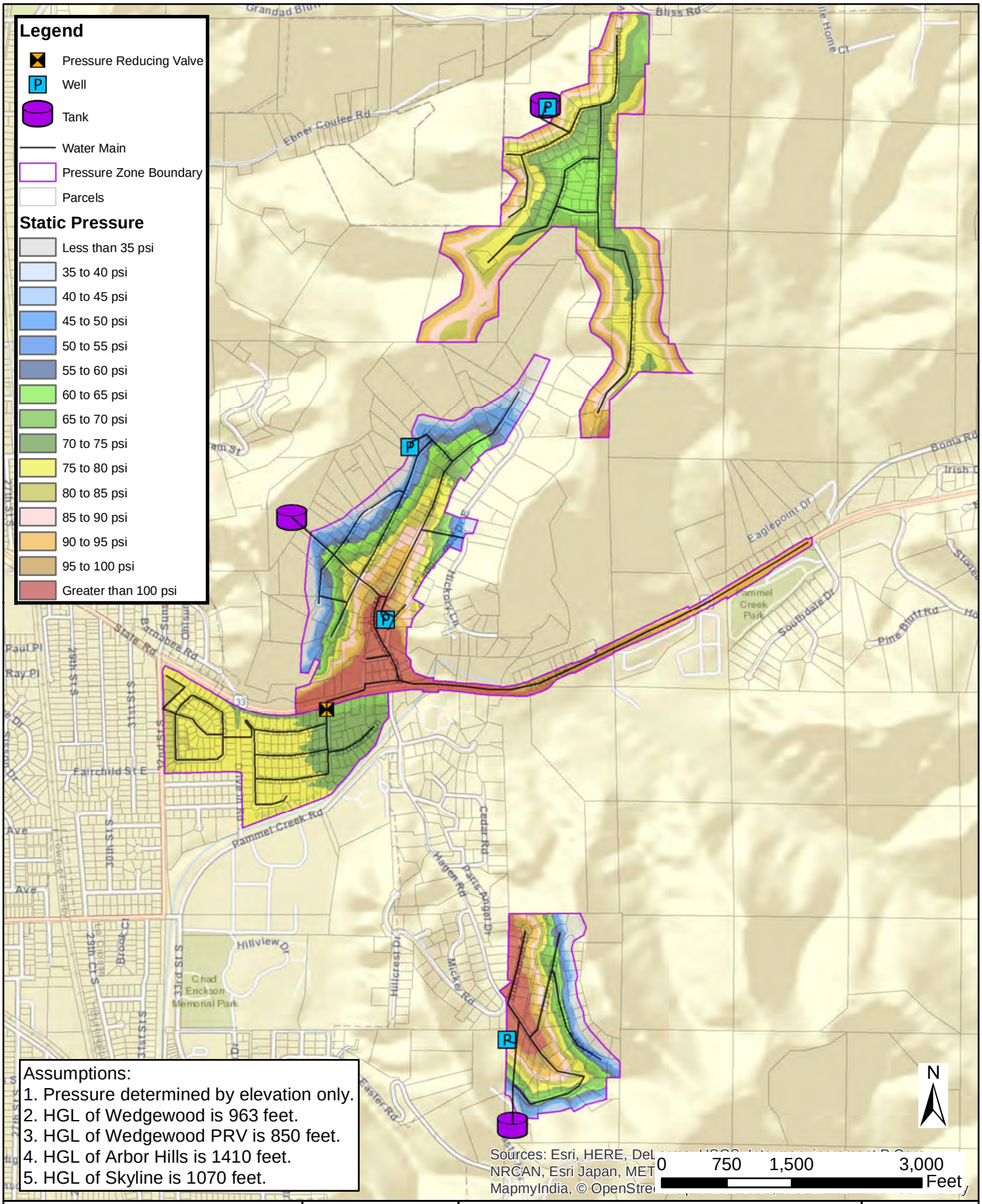
Diameter	C-Factor
4-inch	110
6-inch	120
8-inch	130
12-inch	135

3.4.1 Static Pressure

Figure 3-1 shows the static pressure in the water system. In most locations, pressures are within the NR 811.70 required range of 35 to 100 psi. There are areas where pressures exceed 100 psi, such as along Highway 33 in the lower elevation area of the Wedgewood pressure zone, and the lower areas of the Skyline pressure zone.

3.4.2 Available Flow for Fire Protection

Figure 3-2 shows the estimate available flow for fire protection at 20 psi in the water system, according to the assumptions of the computer water model. Figure 3-2 points out some dead-end areas and high elevation areas where the available flow is less than 500 gpm at 20 psi.



Path: C:\Projects\PTS\SHLBY\145278\8-planning\GIS\Fig 3-1 Static Pressure.mxd

SEH
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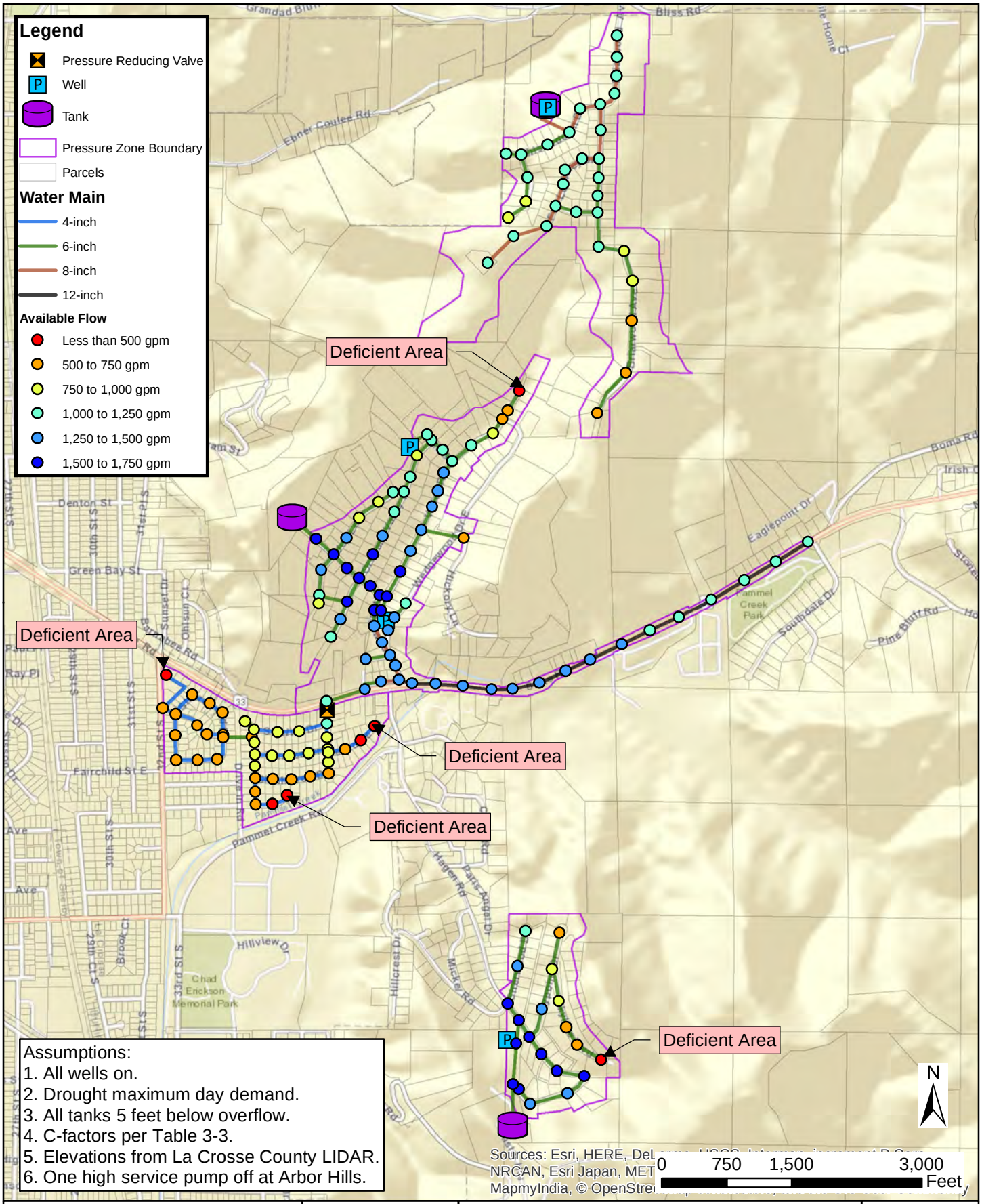
Project: SHLBY 145278
Print Date: 5/8/2018

Map by: jbohnert
Projection: NAD_1983_HARN_WISCRS_LaCrosse_County_Feet
Source: SEH File

Static Pressure

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 3-1



Path: C:\Projects\PTS\SHLBY\145278\8-planning\GIS\Fig 3-2 Available Flow.mxd

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Source: SEH File

Available Flow at 20 psi

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 3-2

3.5 Supply & Storage Needs Analysis

Now that the water system hydraulics have been characterized, the future pressure zones have been established and future water needs have been established, the supply and storage needs of the system per pressure zone may be addressed.

The basic requirement for water supply and booster station capacity shall meet all of the following parameters:

1. The total system supply shall meet or exceed the maximum day demand with the largest well out of service.

2. Each pressure zone must have the ability to meet or exceed its own maximum day demand with the largest well or booster pump out of service.

The basic requirements for storage shall at a minimum meet or exceed the sum of the following two parameters:

1. Equalization storage on the maximum day (approximately 150,000 gallons per MGD), equal to 120,000 gallons for the future maximum day demand of 0.79 mgd, divided across all pressure zones designed to have storage.

2. Fire protection storage for each pressure zone must meet the Town's minimum 1,000 gpm, which is greater than the requirement of NR 811.70. Each pressure zone will be required to provide 1,000 gpm for three hours. Where storage is lacking, the fire protection may be provided by reliable pumping stations with backup power supply and redundant pumping units.

Thus, the **minimum** storage volume for the Town of Shelby is planned to be **300,000 gallons** upon full expansion of the water system. This volume does not take into account hydraulic separation of the distribution system.

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3.5.1 Total System

Now that criteria has been established, the Town's water system may be analyzed for supply and storage. Table 3-4 provides an analysis of the system's supply and storage capacity. Table 3-4 assumes the system is able to freely move water from any location to any other location, which is currently not true. Interzone transfer stations (booster stations) and return flow valves would be required to move water between the various pressure zones.

According to the assumptions of this report, Table 3-4 shows a minor deficiency in supply and a somewhat substantial deficiency in storage upon full system expansion.

Table 3-4: Total System Analysis

Parameter	Existing	Future
Maximum Day Demand (gpd)	319,200	789,100
Firm Supply Capacity (gpd)[1]	741,600	
Firm Supply Mass Balance (gpd)[3]	422,400	-47,500
Firm Supply Mass Balance (gpm)[3]	**293**	**-33**
Total Supply Capacity (gpd)	1,101,600	
Total Supply Mass Balance (gpd)	782,400	312,500
Total Supply Mass Balance (gpm)[3]	543	217
Maximum Day Equalization Volume	50,000	120,000
Fire Protection Volume[2]	180,000	180,000
Total Storage Needs	230,000	300,000
Existing Elevated Storage Volume[3]	199,000	199,000
Storage Mass Balance (gallons)[4]	**-31,000**	**-101,000**

1. Firm Supply is the total of all wells minus the largest well (Skyline Well #1).
2. Fire protection was calculated from 1,000 gpm for 3 hours.
3. Does not include the Arbor Hills tank, since the tank is not elevated.
4. A positive value indicated surplus and a negative value indicates deficiency.

3.5.2 Wedgewood Pressure Zone

The Wedgewood pressure zone is anticipated to supply itself plus the future Willow Way and Horseshoe Place pressure zones. Thus, the Wedgewood pressure zone must have sufficiency supply and storage capacity to sustain the combined needs of these three pressure zones.

The Wedgewood pressure zone is analyzed in Table 3-5. According to the assumptions of this report, Table 3-5 shows a mass balance deficiency of 188 gpm in the Wedgewood pressure zone upon full system expansion when compared to the firm supply capacity. The firm supply deficiency means that either a new well will be required or the Wedgewood zone will be dependent upon the combination of Skyline and/or Arbor Hills for additional supply if one of the wells are offline in the Wedgewood pressure zone.

Apart from supply, Table 3-5 shows a deficiency in fire protection storage of approximately 98,000 gallons (rounded to 100,000 gallons) upon full system expansion. **Wedgewood has an immediate need to provide additional fire protection.**

Table 3-5: Wedgewood Analysis

Parameter	Existing	Future
Maximum Day Demand (gpd)[1]	208,300	486,900
Firm Supply Capacity (gpd)[2]	216,000	
Firm Supply Mass Balance (gpd)[3]	7,700	-270,900
Firm Supply Mass Balance (gpm)[3]	**5**	**-188**
Total Supply Capacity (gpd)	439,200	
Total Supply Mass Balance (gpd)	230,900	-47,700
Total Supply Mass Balance (gpm)[3]	160	-33
Maximum Day Equalization Volume	30,000	70,000
Fire Protection Volume[4]	180,000	180,000
Total Storage Needs	210,000	250,000
Existing Storage Volume	152,000	152,000
Storage Mass Balance (gallons)[3]	**-58,000**	**-98,000**

1. Includes Willow Way and Horseshoe Place.
2. Firm Supply is the total of all wells minus the largest well (Wedgewood Well #1).
3. A positive value indicated surplus and a negative value indicates deficiency.
4. Fire protection was calculated from 1,000 gpm for 3 hours.

3.5.3 Skyline Pressure Zone

The Skyline pressure zone is analyzed in Table 3-6. According to the assumptions of this report, Table 3-6 shows a mass balance deficiency of 41 gpm in the Skyline pressure zone upon full system expansion when compared to the firm supply capacity. The firm supply deficiency means that either a new well will be required or the Skyline zone will be dependent upon the combination of Wedgewood and/or Arbor Hills for additional supply if the Skyline well is offline.

Apart from supply, Table 3-6 shows a deficiency in fire protection storage of approximately 142,000 gallons (rounded to 150,000 gallons) upon full system expansion. **Skyline has an immediate need to provide additional fire protection.**

Table 3-6: Skyline Analysis

Parameter	Existing	Future
Maximum Day Demand (gpd)[1]	41,200	59,500
Firm Supply Capacity (gpd)[2]	0	
Firm Supply Mass Balance (gpd)[3]	-41,200	-59,500
Firm Supply Mass Balance (gpm)[3]	**-29**	**-41**
Total Supply Capacity (gpd)	360,000	
Total Supply Mass Balance (gpd)	318,800	300,500
Total Supply Mass Balance (gpm)[3]	221	209
Maximum Day Equalization Volume	6,000	9,000
Fire Protection Volume[4]	180,000	180,000
Total Storage Needs	186,000	189,000
Existing Storage Volume	47,000	47,000
Storage Mass Balance (gallons)[3]	**-139,000**	**-142,000**

1. Includes Willow Way and Horseshoe Place.
2. Firm Supply is zero since Skyline has only one well.
3. A positive value indicated surplus and a negative value indicates deficiency.
4. Fire protection was calculated from 1,000 gpm for 3 hours.

3.5.4 Arbor Hills Pressure Zone

The Arbor Hills pressure zone is analyzed in Table 3-7. According to the assumptions of this report, Table 3-7 shows a mass balance deficiency of 169 gpm in the Arbor Hills pressure zone upon full system expansion when compared to the firm supply capacity. The firm supply deficiency means that either a new well will be required or the Arbor Hills zone will be dependent upon the combination of Wedgewood and/or Skyline for additional supply if the Arbor Hills well is offline.

Apart from supply, Table 3-7 shows a deficiency in fire protection storage of approximately 172,000 gallons (rounded to 200,000 gallons) upon full system expansion. **Arbor Hills has an immediate need of approximately 150,000 gallons of storage to provide fire protection.**

Table 3-7: Arbor Hills Analysis

Parameter	Existing	Future
Maximum Day Demand (gpd)[1]	69,600	242,800
Firm Supply Capacity (gpd)[2]	0	
Firm Supply Mass Balance (gpd)[3]	-69,600	-242,800
Firm Supply Mass Balance (gpm)[3]	**-48**	**-169**
Total Supply Capacity (gpd)	302,400	
Total Supply Mass Balance (gpd)	232,800	59,600
Total Supply Mass Balance (gpm)[3]	162	41
Maximum Day Equalization Volume	10,000	36,000
Fire Protection Volume[4]	180,000	180,000
Total Storage Needs	190,000	216,000
Existing Storage Volume	44,000	44,000
Storage Mass Balance (gallons)[3]	**-146,000**	**-172,000**

1. Includes Willow Way and Horseshoe Place.
2. Firm Supply is zero since Arbor Hills has only one well.
3. A positive value indicated surplus and a negative value indicates deficiency.
4. Fire protection was calculated from 1,000 gpm for 3 hours.

4 Evaluation & Recommendations

4.1 Existing Facility Maintenance

4.1.1 Wedgewood Valley Well #1

4.1.1.1 Process

1. Replace treated water sample tap with a smooth end sample tap.
2. The shut off valve should be relocated so the chemical injections points are downstream of the last shutoff valve.
3. Moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint.
4. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested.
5. Cautiously exercise valves in case valves have seized.

4.1.1.2 Chemical Room

1. Corroded piping should be restored.
2. Corroded electrical components exist around the chemical feed pumps. A licensed electrician should inspect these items.
3. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets.
4. Chemical resistant paint should be placed where previous coatings have deteriorated.
5. Ventilation should be automatically activated with the door opening.

4.1.1.3 Auxiliary Power

1. Add a generator connection to the well house.

4.1.1.4 Security

1. Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum.
2. Add intrusion alarm.

4.1.1.5 Exterior

1. Exposed wire nuts were found on the exterior of the building. Have a licensed electrician make required repairs.

4.1.2 Wedgewood Well #2

4.1.2.1 Borehole

1. The engineer observed the well seal plate to be moderately corroded. Repair the seal plate.

4.1.2.2 Process

1. The engineer observed moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint.
2. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested.
3. All process piping is in need of paint restoration.
4. Floor seals are required at every process pipe penetration through the concrete floor.
5. Cautiously exercise valves in case valves have seized.

4.1.2.3 Chemical Room

1. Corroded piping should be restored.
2. Corroded electrical components exist around the chemical feed pumps. A licensed electrician should inspect these items.
3. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets.
4. Chemical resistant paint should be placed where previous coatings have deteriorated.
5. Ventilation should be automatically activated with the door opening.

4.1.2.4 Security

1. Doors were secured only by a locking knob, and should be upgraded with dead bolts as a minimum.
2. Add intrusion alarm.

4.1.2.5 Site Grading

1. The site is mostly graded to move water away from the building; the area behind building between the building and the new retaining wall is not adequately graded to move water away from the building. The grading should be lowered and sloped to prevent standing water and water flowing into the building foundation. The exterior grade should be at least 6 inches below the floor elevation of the building.

4.1.3 Arbor Hills Well #1

4.1.3.1 Borehole

1. The well seal plate and process piping to be moderately corroded. Process piping paint should be restored.
2. The screen was missing from the air release valve.

4.1.3.2 Process

1. The engineer observed moderate corrosion on process piping, and this piping should be replaced or restored with chemical resistant paint.
2. At the time of the inspection, it was unknown if the check valves were functional. The engineer recommends the check valve be tested.
3. Some process piping is in need of paint restoration.
4. Floor seals are required at every process pipe penetration through the concrete floor.
5. Cautiously exercise valves in case valves have seized.
6. The upturn bend between the well and the reservoir show include an air vacuum/air release valve to prevent siphoning and remove air pockets.

4.1.3.3 Chemical Room

1. Corroded piping should be restored.
2. Corroded electrical components exist around the chemical feed pumps. A licensed electrician should inspect these items.
3. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets.
4. Chemical resistant paint should be placed where previous coatings have deteriorated.
5. Ventilation should be automatically activated with the door opening.

4.1.3.4 Security

1. Add intrusion alarm.

4.1.4 Skyline Well #1

4.1.4.1 Borehole

1. The well seal plate and process piping to be moderately corroded. Process piping paint should be restored.

4.1.4.2 Process

1. The engineer observed moderate to substantial corrosion existed on the spool piece with the chemical injection points, and this piping should be replaced or restored with chemical resistant paint.
2. At the time of the inspection, it was unknown if the check valve was functional. The engineer recommends the check valve be tested.
3. Some process piping is in need of paint restoration.
4. Floor seals are required at every process pipe penetration through the concrete floor.
5. Cautiously exercise valves in case valves have seized.

4.1.4.3 Chemical Room

1. Corroded piping should be restored.
2. Corroded electrical components exist around the chemical feed pumps. A licensed electrician should inspect these items.
3. Power strips and sockets should be located above and not below chemical work areas, as chemicals drip onto power strips and sockets.
4. Chemical resistant paint should be placed where previous coatings have deteriorated.
5. Ventilation should be automatically activated with the door opening.

4.1.4.4 Security

1. Add intrusion alarm.
2. The door auto-close mechanism was not-functional. The door should close automatically to prevent freezing or security issues.

4.1.4.5 Site Grading

1. The site is in immediately need of grading work. The DNR (Charlie Cameron) ordered the ground around the site be lowered below the floor elevation and not be embanked against the building wall. The engineer recommends the site be promptly designed and contracted to construct the site around the well house to the appropriate arrangement.

4.1.4.6 Building

1. Paint on concrete walls was deteriorated.
2. Several electrical sockets were highly corroded and should be inspected and repaired by a qualified electrician.
3. Several areas of paint were eroded on the concrete walls.
4. A crack exists in the rear wall of the well house, which is currently holding the weight of the soil bearing against it. This wall holds the electrical equipment of the well house.

4.2 Future Water System Pressure

The future pressure zones in Figure 2-1 were delineated based on pressures due to elevation. Figure 4-1 shows what the future pressures in the system would be with the pressure zone in Figure 2-1.

4.3 Future Water System Improvements

Various deficiencies in the water system were found in this study, and the purpose of this section is to provide recommended capital improvements to remedy the deficiencies. The following recommendations have the expansion schedule of Figure 1-3 in mind, adjusted as required for system reliability. Figures 4-2 shows a schematic of short term improvements. Figure 4-3 shows a map of all short term and long term improvements.

4.3.1 Short Term Improvements

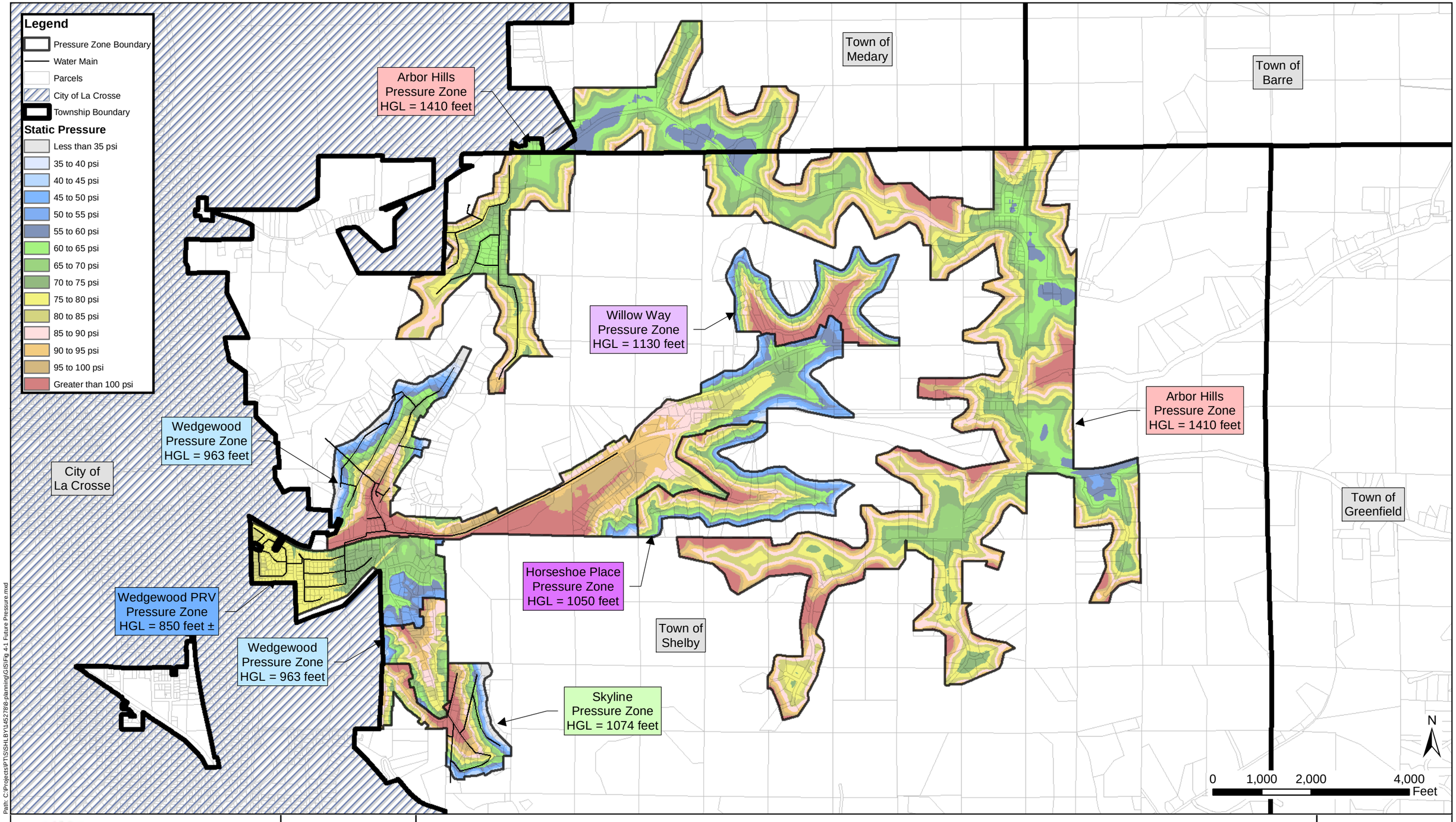
The following short term improvements are intended to interconnect the system to provide redundancy and reliability for supply and storage. These improvements are in response to deficiencies found previously in this report. Water mains would be constructed as the Town extends service, and water mains are not specifically addressed case by case.

4.3.1.1 Arbor Hills Well #2.

A new well in the Arbor Hills pressure zone (Arbor Hills Well #2 in Figure 4-2) would be constructed to connect provide additional supply to both the Wedgewood and Arbor Hills pressure zones. With Arbor Hills Well #2, a SCADA controlled flow control valve (Arbor Hills Control Valve #1 in in Figure 4-2) transmission line to the Wedgewood pressure zone would be constructed. With this arrangement, Arbor Hills Well #2 would provide redundancy to the Arbor Hills pressure zone if the Arbor Hills well was offline, and likewise would provide redundancy to the Wedgewood pressure zone if a Wedgewood well were offline through Arbor Hills Control Valve #1.

The anticipated Arbor Hills Well #2 would have a maximum capacity of approximately 250 gpm (similar to Skyline Well #1 and Arbor Hills Well #1) with a variable frequency drive. Arbor Hills Control Valve #1 would contain a hydraulically operated pilot with orifice plate to set a fixed flow rate from the Arbor Hills zone to the Wedgewood zone. Arbor Hills Control Valve #1 would be constructed with Arbor Hills Well #2 and would be connected to the Arbor Hills Well #2 control panel. Arbor Hills Control Valve #1 could be constructed in either an underground vault or an above grade enclosure in the Wedgewood pressure zone, separate from the Arbor Hills Well #2 structure.

Additional water mains would be required to be constructed with Arbor Hills Control Valve #1. The water mains will experience pressure on the order of 150 to 200 psi due to the descent in elevation, and special engineering is required for the higher pressure. **Approximately 0.3 miles of water main could be required** for Arbor Hills Control Valve #1, apart from service mains in the vicinity and water mains previously discussed.



Path: C:\Projects\PT\SHLBY\145278\8-planning\GIS\Fig 4-1 Future Pressure.mxd

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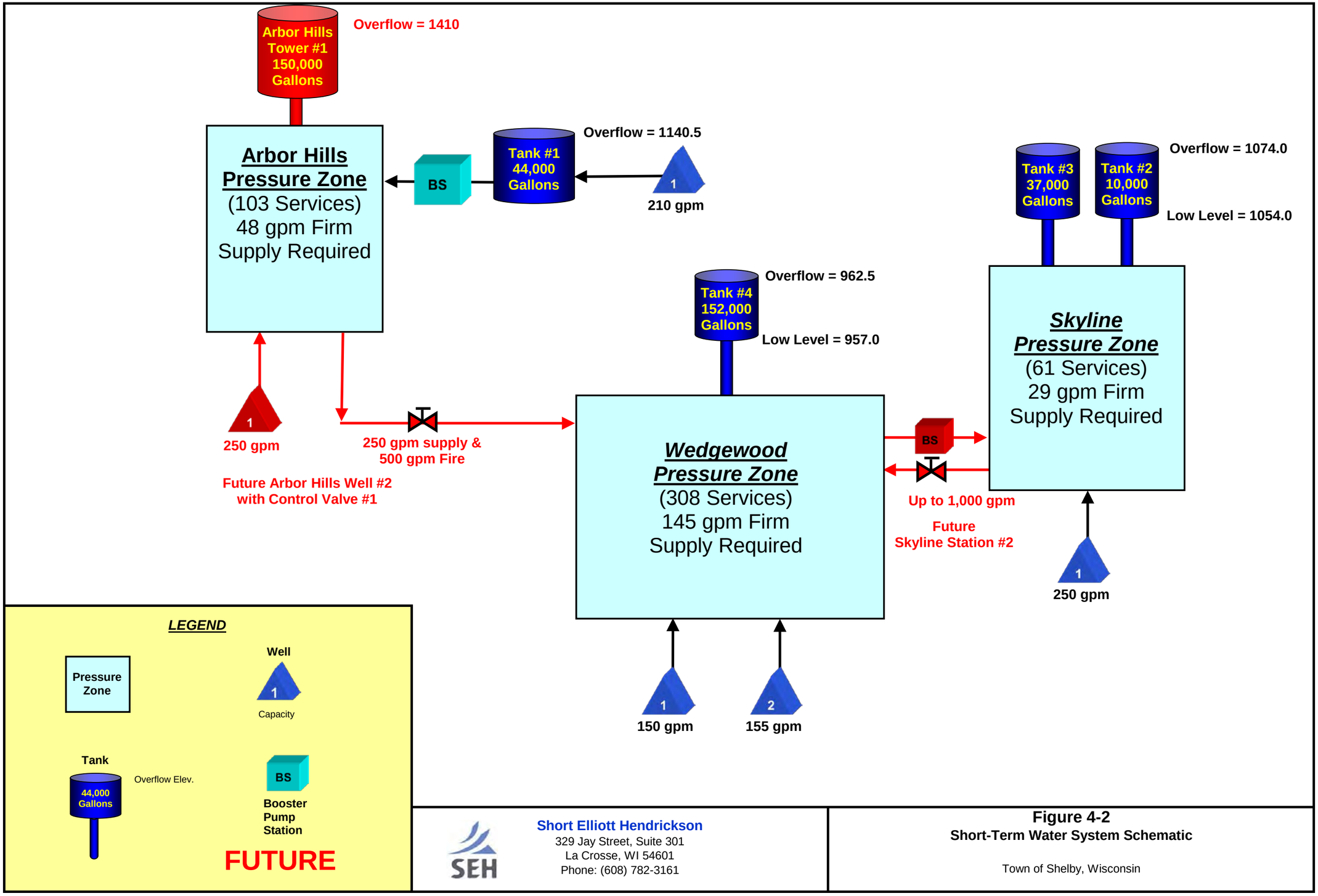
Project: SHLBY 145278
Print Date: 5/22/2018

Map by: jbohnert
Projection: NAD_1983_HARN_WISCRS_LaCrosse_County_Feet
Source: SEH File

Future Static Pressure

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 4-1



Short Elliott Hendrickson
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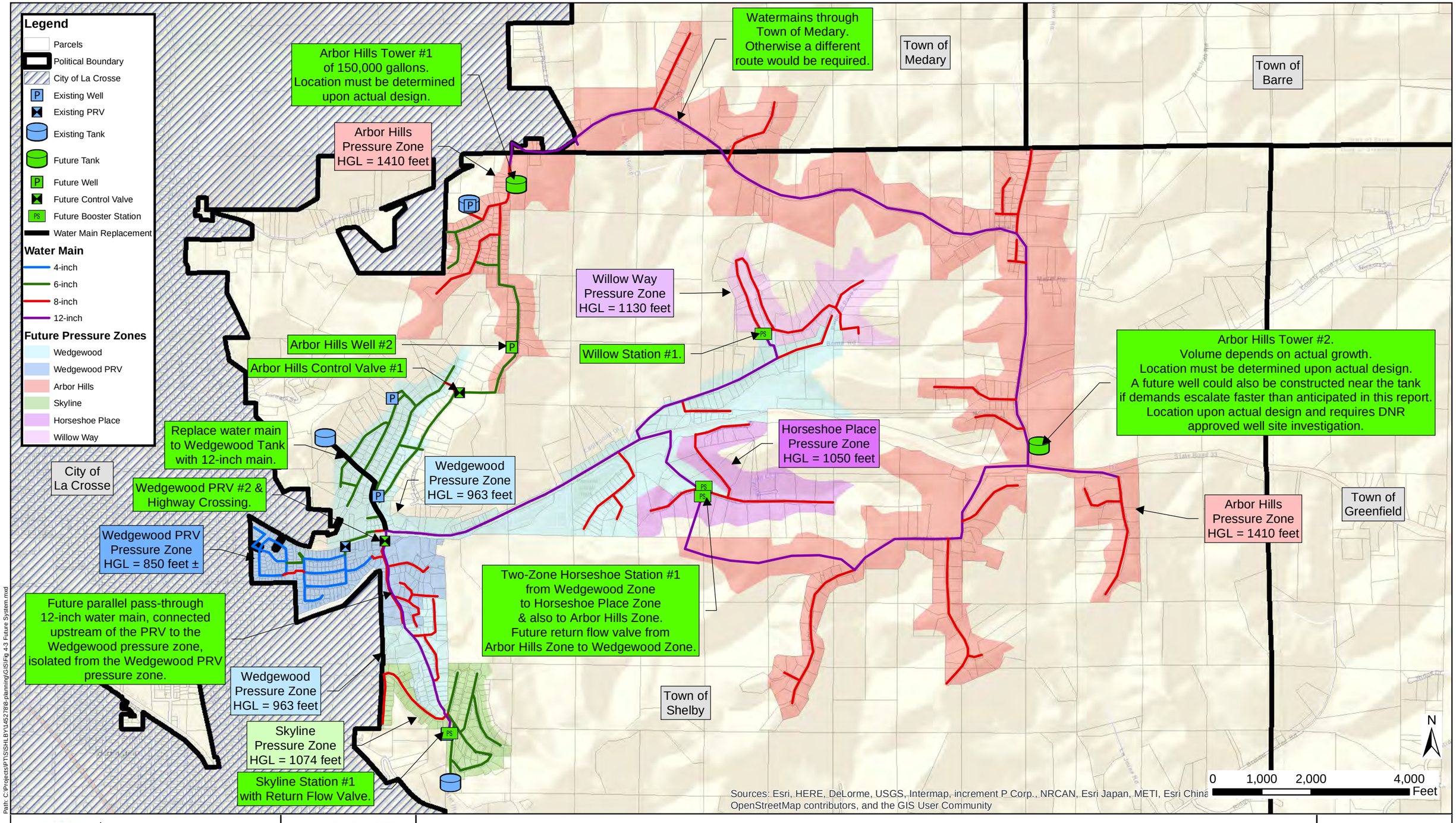
Figure 4-2
Short-Term Water System Schematic

Town of Shelby, Wisconsin

\\sehlx1\projects\PT\S\SHLBY\145278\8-planning\Water System\[Water System Schematic.xlsx]Short Term Shelby



Path: C:\Projects\P T\SSH\LBY\145278\8-planning\GIS\Fig 4-3 Future System.mxd

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Source: SEH File

Future Water System Map

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 4-3

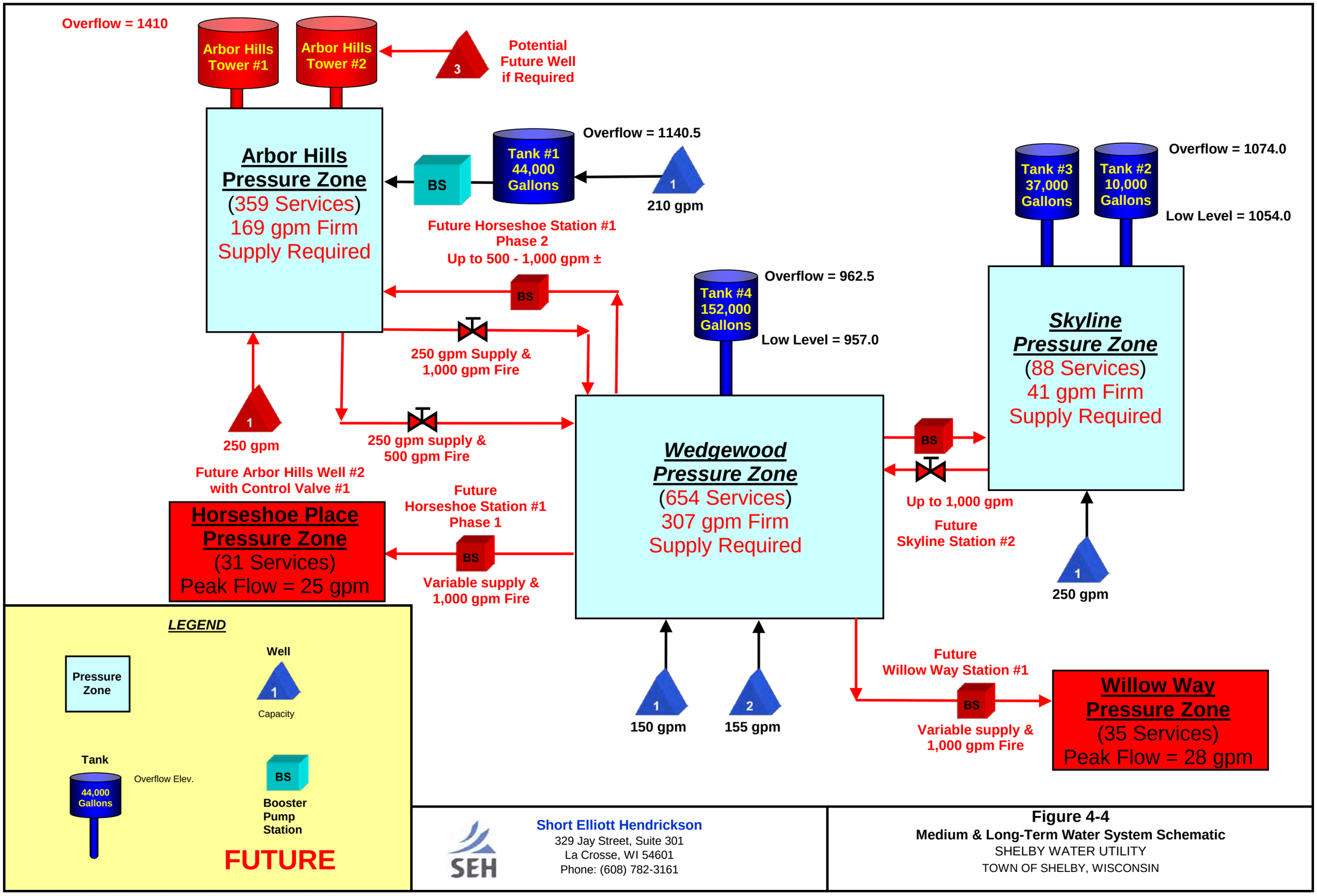

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Figure 4-4
Medium & Long-Term Water System Schematic
SHELBY WATER UTILITY
TOWN OF SHELBY, WISCONSIN

\\sehlx1\projects\PT\S\SHLBY\145278\8-planning\Water System\[Water System Schematic.xlsx]Future Shelby

4.3.1.2 Wedgewood - Skyline Interzone Transfer Station.

The Wedgewood – Skyline Interzone Transfer Station (Skyline Station #1 in Figure 4-2) would be constructed to connect the Wedgewood and Skyline pressure zones. Skyline Station #1 would provide redundancy to the Skyline pressure zone if the Skyline well was offline, and likewise would provide redundancy to the Wedgewood pressure zone if a Wedgewood well were offline.

The anticipated Skyline Station #1 would include two 1,000 gpm pumps with variable frequency drives which would provide redundancy to the Skyline well and support fire protection in the Skyline pressure zone. Skyline Station #1 would also contain a SCADA controlled flow control valve to enable flow from the Skyline pressure zone to the Wedgewood pressure zone. On-site automatic backup power would be provided for the station.

Additional water mains would be required to be constructed with Skyline Station #1. SEH recommends 12-inch water main to connect the Wedgewood pressure zone to Skyline Station #1, passing through the Wedgewood PRV pressure zone disconnected from the Wedgewood PRV pressure zone. **Approximately 1.3 miles of 12-inch main is anticipated to provide adequate transmission main abilities throughout the Wedgewood pressure zone**, apart from the surrounding service mains in the vicinity and water mains previously discussed.

4.3.1.3 Arbor Hills Water Tower #1

The Arbor Hills Water Tower #1 (Arbor Hills Tower #1 in Figure 4-2) would provide the Arbor Hills pressure zone pressure stability and easier operation. Arbor Hills Tower #1 would supplement fire protection and equalize demand in the Arbor Hills pressure zone. With the construction of the flow control valve at Arbor Hills Well #2, Arbor Hills Tower #1 would also support the Wedgewood pressure zone and its dependencies.

Table 3-7 previously showed some degree of deficiency in the Arbor Hills pressure zone for storage. Arbor Hills Tower #1 would enable the Town to continue growth in the upland areas, providing adequate storage to meet the requirement of NR 811.82(1).

NR 811.82 states:

Elevated storage is not required for a boosted pressure zone where the primary pressure zone can provide minimum pressures of 35 psi at street elevation in all areas of the boosted zone. Elevated storage facilities shall be provided for a boosted pressure zone serving more than 50 living units in any of the following situations:

1. *If the primary pressure zone cannot maintain pressures of 3 psi or greater at street elevation in all areas served by the booster pumps including situations where emergency power is provided.*
2. *If the primary pressure zone provides pressures of 3 to 35 psi at street elevation in all areas served by the booster pumps and an emergency power source is not provided for the booster station.*

The anticipated hydraulic grade of the Arbor Hills pressure zone exceeds the overflow elevation of the ground storage tank. Thus, with 103 existing units, **the Arbor Hills pressure zone is in immediate need of elevated storage per NR 811.82(1).**

For the immediate needs of the Arbor Hills pressure zone, a water tower of **150,000 gallons** is recommended based on Table 3-7.

The specific location of Arbor Hills Tower #1 will need to be determined during actual design. Special consideration must be made to future expansion and the proximity of the new tower to the La Crosse Regional Airport. The location in Figure 4-2 would allow the Arbor Hills Tower #1 to serve the future expansion areas without replacing existing 6-inch mains in the Arbor Hills pressure zone.

4.3.2 Medium Term Improvements

The following medium term improvements are intended to extend service throughout the service area as expansion occurs. These improvements are meant to follow the expansion schedule in Figure 1-3. Water mains would be constructed as the Town extends service, and water mains are not specifically addressed case by case.

4.3.2.1 Wedgewood Pressure Reducing Valve #2

Figure 1-3 showed the Wedgewood PRV pressure zone to expand east. To provide redundancy and reliability to these new units, a second pressure reducing valve and highway crossing would be prudent (Wedgewood PRV #2 in Figure 4-2). Wedgewood PRV #2 could be constructed in either an underground vault of an above-grade enclosure.

Wedgewood PRV #2 would be constructed with the parallel 12-inch pass-through main to the Skyline Station #1 previously discussed **upstream** of the valve and not downstream. The Wedgewood PRV zone would have its own water mains separate from this pass through water main.

4.3.2.2 Wedgewood - Horseshoe Place Interzone Transfer Station Phase 1

The Wedgewood - Horseshoe Place Interzone Transfer Station (Horseshoe Station #1 in Figure 4-2) would provide service to the units with the future Horseshoe Place pressure zone. Horseshoe Station #1 would be constructed in two phases: the first phase to meet the medium term Horseshoe Place pressure zone needs and the second phase to meet the long term future Arbor Hills pressure zone needs.

Horseshoe Station #1 would be constructed with enough space for the short term and the long term needs of the system. Only the pumps for the short term needs would be installed, and space for the future needs would be provided for later installation.

Horseshoe Station #1 in the medium term is anticipated to contain two 1,000 gpm fire pumps on variable frequency drives plus two 0 to 100 gpm jockey pumps on variable frequency drives with a hydropneumatic tank (Phase 1). The redundant jockey pumps would provide the continuous pressure to the pressure zone, with the fire pumps able to support as required. Additional space and process would be provided for the Phase 2 pumps. Another option would be to engineer the fire pumps to operate on both the Horseshoe Place pressure zone and the Arbor Hills pressure zone. On-site automatic backup power would be provided for both Phase 2 and Phase 1 during Phase 1.

Additional water mains would be required to be constructed with Horseshoe Station #1. SEH recommends a 12-inch water main to connect the Wedgewood pressure zone to Horseshoe Station #1 from Highway 33. 12-inch main is required provide adequate transmission main abilities to Horseshoe Station #1 apart from the surrounding service mains in the vicinity and water mains previously discussed. The 12-inch main will have a future dual purpose, serving both the Horseshoe Place pressure zone and the Arbor Hills pressure zone.

4.3.2.3 Wedgewood - Willow Way Interzone Transfer Station.

The Wedgewood – Willow Way Interzone Transfer Station (Willow Station #1 in Figure 4-2) would be constructed to connect the Wedgewood and Willow Way pressure zones. Willow Station #1 would provide pressure to the future Willow Way pressure zone.

Willow Station #1 is anticipated to contain two 1,000 gpm fire pumps on variable frequency drives plus two 100 gpm jockey pumps on variable frequency drives with a hydropneumatic tank. The redundant jockey pumps would provide the continuous pressure to the pressure zone, with the fire pumps able to support as required.

12-inch main is required to provide adequate transmission main abilities to Willow Station #1, apart from the surrounding service mains in the vicinity and water mains previously discussed.

4.3.3 Long Term Improvements

The following long term improvements are intended to extend service throughout the service area as expansion occurs. These improvements are meant to follow the expansion schedule in Figure 1-3. Water mains would be constructed as the Town extends service, and water mains are not specifically addressed case by case.

4.3.3.1 Horseshoe Place Interzone Transfer Station Phase 2

The Horseshoe Place Interzone Transfer Station (Horseshoe Station #1 in Figure 4-2) would be expanded to provide supplement supply to the Arbor Hills pressure zone. Horseshoe Station #1 would be constructed in two phases: the first phase to meet the medium term Horseshoe Place pressure zone needs and the second phase to meet the long term future Arbor Hills pressure zone needs.

Horseshoe Station #1 in the long term would have two additional pumps added to the Phase 1 elements. Phase 2 additions to the Horseshoe Station #1 would include two 500 gpm pumps with variable frequency drives to the Arbor Hills pressure zone. Space already provided in Phase 1 would allow the equipment and controls for the Phase 2 pumps to be added without reconstructing the building. Horseshoe Station #1 would have a SCADA controlled flow control valve added to enable flow from the Arbor Hills pressure zone to the Wedgewood pressure zone.

The discharge pressure of Horseshoe Station #1 Phase 2 would be on the order of 150 to 200 psi. Special engineering design would be required for this high pressure transmission main. 12-inch main is required from Horseshoe Station #1 to the future units in the expanded Arbor Hills pressure zone, apart from the surrounding service mains in the vicinity and water mains previously discussed.

4.3.3.2 Arbor Hills Water Tower #2

The Arbor Hills Water Tower #2 (Arbor Hills Tower #2 in Figure 4-2) would provide the expanded Arbor Hills pressure zone pressure stability and easier operation. Arbor Hills Tower #2 would supplement fire protection and equalize demand in the expanded Arbor Hills pressure zone. With the construction of the flow control valve at Arbor Hills Well #2 and at Horseshoe Station #1 Phase 2, Arbor Hills Tower #2 would also support the Wedgewood pressure zone and its dependencies.

The primary purpose Arbor Hills Tower #2 is to stabilize pressure in the remote areas of the system. Pressures have a tendency to surge and oscillate on water mains of long distances.

Arbor Hills Tower #2 would also provide the fire protection in the immediate vicinity of the served units.

Arbor Hills Tower #2 should be a minimum 50,000 gallons based on typical elevate tank sizes, assuming the construction of Horseshoe Station #1 Phase 2 occurs concurrently to help support the tank. Upon moving forward with actual construction and depending on actual expansion, if the Town would like to have more storage for fire protection, Arbor Hills Tower #2 could be constructed larger than 50,000 gallons.

4.4 Future Fire Protection

Similar to Figure 3-2, available flow for fire protection at 20 psi was estimated for the future water system. Figure 4-5 shows the anticipated future available flows at 20 psi throughout the future water system. Future transmission mains are planned to be no smaller than 12-inch diameter and service mains are planned to be no smaller than 8-inch diameter.

A couple points within the existing Wedgewood PRV pressure zone are shown with less than 500 gpm at 20 psi. Over time, as street replacements occur, these water mains should be upsized to 8-inch. In the short term, the Town is advised to open or bypass the pressure reducing valve to increase pressure in the Wedgewood PRV pressure zone if a fire were to occur.

4.5 Capital Improvements Plan

This section summarizes the above recommended improvements and an order of magnitude cost estimate associated with each improvement. Table 4-1 on the next page shows the list of capital improvements with high-level planning budget estimates. The improvements listed in Table 4-1 were displayed in Figure 4-4.

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Legend

- Future Well
- Future Control Valve
- Future Booster Station
- Future Tank
- Existing Well
- Existing PRV
- Existing Tank
- Pressure Zone Boundary
- Water Main
- Parcels
- City of La Crosse
- Township Boundary

Available Flow

- Less than 500 gpm
- 500 to 750 gpm
- 750 to 1,000 gpm
- 1,000 to 1,250 gpm
- 1,250 to 1,500 gpm
- Greater than 1,500 gpm

Assumptions:
1. All wells on.
2. Drought maximum day demand.
3. All tanks 5 feet below overflow.
4. C-factors per Table 3-3.
5. Elevations from La Crosse County LIDAR.
6. One high service pump off at Arbor Hills.

Town of Medary

Town of Barre

Arbor Hills Pressure Zone HGL = 1410 feet

Fire protection in the Willow Way pressure zone will depend on the fire pump.

Willow Way Pressure Zone HGL = 1130 feet

City of La Crosse

Wedgewood Pressure Zone HGL = 963 feet

Over time, as street replacement occurs, replace 4-inch mains with 8-inch mains. In short term, open up the PRV during a fire to increase pressure.

Wedgewood PRV Pressure Zone HGL = 850 feet ±

Wedgewood Pressure Zone HGL = 963 feet

Horseshoe Place Pressure Zone HGL = 1050 feet

Fire protection in the Horseshoe Place pressure zone will depend on the fire pump.

Skyline Pressure Zone HGL = 1074 feet

Arbor Hills Pressure Zone HGL = 1410 feet

Town of Greenfield

Town of Shelby

N

0 1,000 2,000 4,000 Feet

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Path: C:\Projects\PT\SHLBY\145278\planning\GIS\Fig 4-5 Future Flow.mxd

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Map by: jbohnert
Projection: NAD_1983_HARN_WISCRS_LaCrosse_County_Feet
Source: SEH File

Future Available Flow at 20 psi

2018 Water System Evaluation
Town of Shelby, Wisconsin

Figure 4-5

Table 4-1: Capital Improvements Plan

General Items constructed as expansion occurs		
Figure 4-3 shows the following total quantities of water main: 1,160 LF 6"; 51,600 LF 8"; 43,100 LF 12" Subtract water main quanities below as they are accounted for		
Name	**Budget***	**Includes (items listed are for estimate only and require design)**
6-inch water main	$ 140	per LF with hydrants and valves every 500 feet; restoration; engineering; construction; insurance.
8-inch water main	$ 150	per LF with hydrants and valves every 500 feet; restoration; engineering; construction; insurance.
12-inch water main	$ 180	per LF with hydrants and valves every 500 feet; restoration; engineering; construction; insurance.
Each Serivice Connection	$ 2,000	50 LF 1" copper service; corporation stop; curb stop; tap; restoration; engineering; construction; insurance.
Specific Items		
Name	**Budget***	**Includes (items listed are for estimate only and require design)**
Arbor Hills Well #1	$ 1,200,000	New well like Skyline Well #1, except 8" drilling to 835 feet bgs ±; well house; 200 amp / 440 volt electrical service; well pump (250 gpm at 850 feet); 75 HP motor; variable frequency drive, chlorine and fluoride chemical equipment; SCADA; site work; 100 LF 8-inch water main; engineering; construction; insurance.
Arbor Hills Control Valve #1 & Water Main	$ 400,000	350 psi 6-inch full port flow control valve with pressure sustaining override pilot; remote pilot control; 8-foot diameter manhole with flood proof cover; sump pump; 100 amp / 110 volt electrical service; site work; SCADA; 1100 LF 6-inch Pressure Class 350 psi water main; 320 LF 8-inch water main; two gate valves; engineering; construction; insurance.
Arbor Hills Tower #1	$ 1,200,000	One elevated spherical steel tank of 150,000 gallon volume; overflow elevation of 1410 feet with ground elevation of 1270 feet; site work; 100 LF 12-inch water main; painting; logo; restoration; engineering; construction; insurance.
Skyline Station #1	$ 800,000	Two split-case pumps (1,000 gpm at 150 feet); two 50 HP motors; pump house; 200 amp / 220 volt electrical service; two variable frequency drives, SCADA; 8-inch full port flow control valve with pressure sustaining override pilot; site work; 100 LF 12-inch water main; on-site generator; restoration; engineering; construction; insurance.
Service to Skyline Station #1	$ 800,000	4500 LF 12-inch water main; 9 hydrants; 9 gate valves; restoration; engineering; construction; insurance. Service connections not included.
Wedgewood PRV #2 & Highway Crossing	$ 300,000	12-inch full port pressure reducing valve; 8-foot diameter manhole with flood proof cover; sump pump; 100 amp / 110 volt electrical service; site work; SCADA; 100 LF 12-inch water main; engineering; construction; insurance.
Horseshoe Station #1 Phase 1	$ 1,600,000	Two jockey pumps (100 gpm at 100 feet); two split-case pumps (1,000 gpm at 480 feet); two 10 HP motors; two 150 HP motors; pump house; hydropneumatic tank, two air compressors; 800 amp / 440 volt electrical service; two 10 HP variable frequency drives; two 150 HP variable frequency drives; site work; 100 LF 12-inch pressure class 350 psi water main; 8-inch pressure reducing valve; 6-inch pressure relief valve; 8-inch full port flow control valve with pressure sustaining override pilot; on-site generator; engineering; construction; insurance.
Horseshoe Station #1 Phase 2 & Water Main	$ 500,000	1200 LF 12-inch pressure class 350 psi transmission main; three gate valves; 6" pressure relief valve; 8-foot diameter manhole with flood proof cover; sump pump; 100 amp / 110 volt electrical service; site work; engineering; construction; insurance. Assumes the Phase 1 pumps are already set up to deliver the Phase 2 performance requirements.
Service to Horseshoe Place Station #1 & pressure zone	$ 1,500,000	2700 LF 12-inch water main; 6500 LF 8-inch water main; 18 hydrants; 18 gate valves; restoration; engineering; construction; insurance. Service connections not included.
Willow Way Station #1	$ 1,200,000	Two jockey pumps (100 gpm at 100 feet); two split-case pumps (1,000 gpm at 200 feet); two 10 HP motors; two 75 HP motors; pump house; hydropneumatic tank, two air compressors; 400 amp / 220 volt electrical service; two 10 HP variable frequency drives; two 75 HP variable frequency drives; site work; 100 LF 12-inch pressure class 350 psi water main; on-site generator; engineering; construction; insurance.
Service to Willow Way Station #1 & pressure zone	$ 2,000,000	4100 LF 12-inch water main; 8500 LF 8-inch water main; 25 hydrants; 25 gate valves; restoration; engineering; construction; insurance. Service connections not included.
Arbor Hills Tower #2	$ 1,200,000	One elevated spherical steel tank of 150,000 gallon volume; overflow elevation of 1410 feet with ground elevation of 1270 feet; site work; 100 LF 12-inch water main; painting; logo; restoration; engineering; construction; insurance.

* Numbers shows are high-level planning costs. Actual design & bidding will dictate actual costs.

Appendix A

Glossary of Terms

Glossary Terms

Aquifer:	A saturated geological formation capable of transmitting significant quantities of water under normal hydraulic gradients.
Average Day Demand:	The average quantity of daily water usage in a municipal water system.
Drawdown:	The difference between the pumping water level and static water level in a well (usually expressed as feet at a specific flow rate).
Elevated Storage:	A facility for storing water supplies above ground level at a specific elevation
Flow Capacity:	The maximum flow rate that can be supplied by a water distribution system at a specified location and residual pressure (usually expressed as gallons per minute).
Formation:	A geological soil and rock profile.
Future Service Area:	The area which is expected to develop in the future and require municipal utility services.
Groundwater Level (or Water Table):	The highest elevation of fully saturated soil in a geological formation.
Groundwater Depletion:	The removal of water supplies from a groundwater system.
Groundwater Recharge:	The entry of water into the saturated zone of a geological formation, together with the associated flow away from the water table.
Hydraulic Gradient:	The unconfined change in water surface elevation with respect to horizontal distance for a sloping water surface.
Hydrology:	Study of the physical behavior of water from its occurrence as precipitation to its entry into streams, lakes and reservoirs, and its return to the atmosphere.
Maximum Day Demand:	The highest quantity of daily water usage in a municipal water system.
Maximum Day Ratio:	The ratio of maximum day to average pumpage (usually expressed as a percentage).
Peak Hour Demand:	The daily rate of water usage during the hour of greatest water demand on a maximum usage day.
Peak Hour Demand Ratio:	The ratio of peak hour pumpage (expressed as a daily rate) to average day pumpage (usually expressed as a percentage).

Pipe Roughness Coefficient:	A coefficient (generally assumed to be constant) which describes the energy loss due to friction that will occur as water flows through a section of piping.
Pumping Water Level:	The water level in a well while it is being pumped (usually measured from ground surface or top of well casing).
Reliable Supply Capacity:	The pumping capacity of a water supply facility with the largest pumping unit out of service.
Residual Pressure:	Pressure at a specified location in the water distribution system when water is being removed or flowed.
Specific Capacity:	The specific capacity of a well is the yield per unit of drawdown (usually expressed as gallons per minutes per foot of drawdown).
Static Pressure:	Normal pressure at a specified location in the water distribution system when no water is being removed or flowed.
Static Water Level:	The water level in a well when no water is being taken from the aquifer either by pumping or free flow (usually measured from ground surface or top of well casing).
Time-of-day Demand Curve:	A curve which describes changes in the quantities of water used by customers at different times of the day.
Total Dynamic Head:	The total energy that a pump must overcome to deliver a given flow rate including suction lift, discharge, and friction loses (usually expressed in feet of water).
Unaccounted-For Water:	The difference between the total volume of water pumped and the volume of water sold (expressed as gallons or as a percentage of total pumpage).
Water Demand:	The amount of water required by a water user or users at a specific point or area within a water distribution system.
Water Distribution Main:	A water main which primarily extends water services and fire protection to an area.
Water Distribution System:	A facility usually consisting of a network of piping which is designed to distribute water from a given water supply to specific water users.
Water Supply System:	Facilities designed to collect and furnish a controlled supply of water for consumption or other water needs.
Water Transmission Main:	A large water main (generally 10-inch or larger) which is used to convey water between a water system's supply/storage facilities and service area.

Appendix B

Maintenance Record

Sanitary District No. 2

Town of Shelby
2800 Ward Ave.
La Crosse, WI. 54601

Well and Lift Station Pump General Information

Wells

Location	HP	Volts	3 Phase	Year Drilled	Year Pump Installed	Date Last Visually Inspected
Arbor Hills	40	480	Yes	1970	2009	2009
Wedgewood Dr. Valley #1	30	208	Yes	1956	2011	2012
Vista Dr. Valley #2	30	208	Yes	1973	2007	2007
Hagen/Skyline	40	480	Yes	1967	1991	~~2002~~ 2014

Lift Station Pumps

Hillcrest Dr.	7.5	240	No		2010	2014
Floral Ln.	5	230			1991	
Creekside Meadows	1	230	No		1990	2014
Arbor Hills	7.5	230	Yes		2007	

Some Pumps and motors have been rebuilt or replaced since installation dates

Appendix C

Well Data

MUNICIPAL
WELL & PUMP

Shelby Sanitary District #2

Operation & Maintenance Manual

March, 2007 Inspections

Customer:

Town of Shelby
La Crosse, WI

March 2007

Corporate Office
1212 Storbeck Drive
PO Box 311
Waupun, WI 53963
Phone: 920-324-3400
Fax: 920-324-3431
www.municipalwellandpump.com

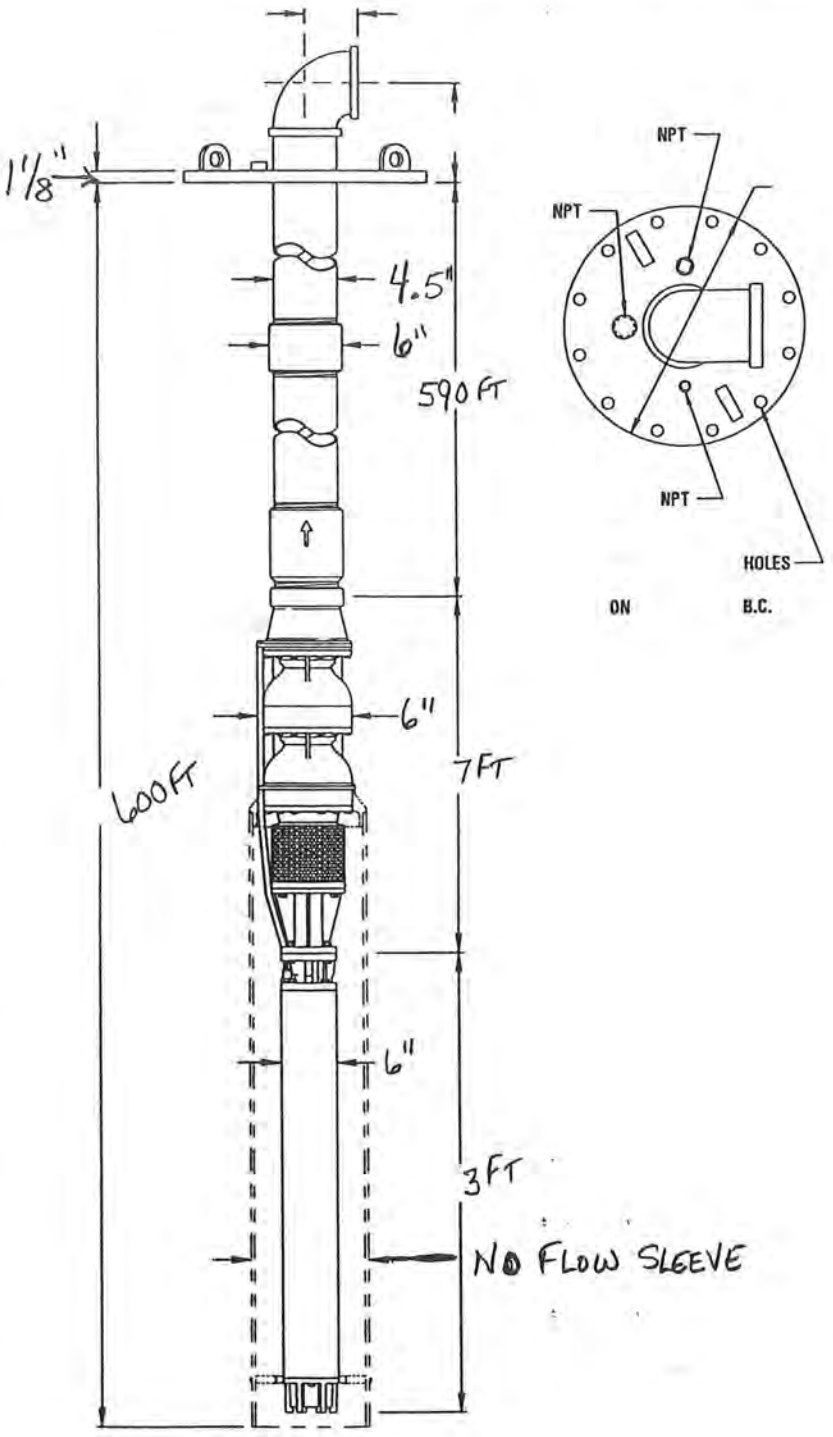
Arbor Hills Well #1

MUNICIPAL WELL & PUMP
1212 STORBECK DRIVE
WAUPUN, WI 53963
(920) 324-3400 • FAX (920) 324-3431

SUBMERSIBLE PUMP WITH THREADED COLUMN PIPE

DATE 10-16-04 DISTRIBUTOR

JOB MV04-272 - TOWN OF SHELBY, ARBOR HTS GPM 210 TDH 530 FT



DISCHARGE HEAD FABRICATED

DISCHARGE FLANGE 4-INCH

FOUNDATION PLATE 10-INCH STANDARD FLG

COLUMN ASSEMBLY 4-INCH
7- PCS GALVANIZED IN WATER
21- PCS BLK -REUSED

CHECK VALVE 1 - 4" SIMMONS
1 - 4" MAAS

CABLE 4/3 TWISTED CABLE WITH GROUND

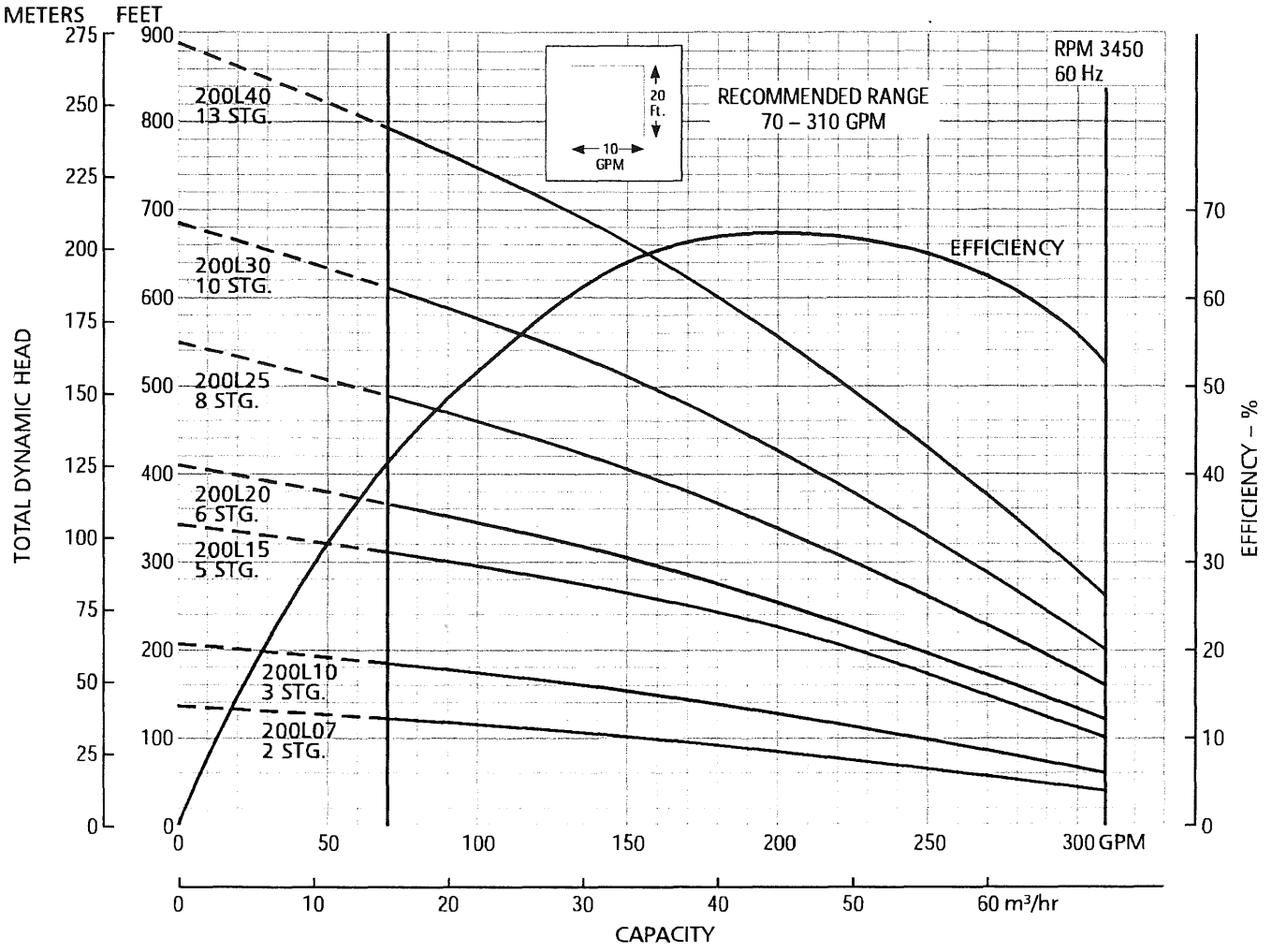
BOWL MODEL # GOULDS # 200L 40R
SERIAL #: K034 8005
IMPELLER DIAMETER
IMPELLER TYPE STAINLESS STEEL
SPECIAL
BUILT-IN CHECK VALVE

MOTOR MAKE FRANKLIN
HP 40 SIZE 6-INCH
R.P.M. 3450
PHASE 3 HERTZ 60
VOLTAGE 480
OTHER MODEL #: 3336334930
SER. #: 04J19-29-0076

OTHER DUAL PLASTIC AIRLINES

Model 200L

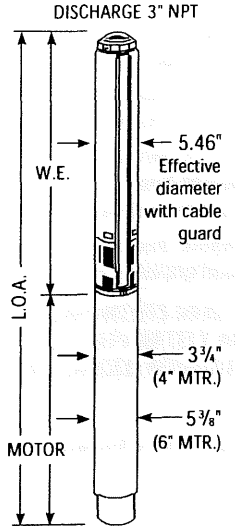
GOULDS PUMPS



Curve Reference SU 0008R00

DIMENSIONS AND WEIGHTS

HP	Stages	W.E. Order No.	Motor Order No.	PH	Motor Volts	Motor Length	W.E. Length	L.O.A.	Wt. (lbs.)
7.5	2	200L07	S11970	1	230	28.0	28.0	56.0	155
			S11978 S11971 S11972 *S11979	3	200 230 460 575	24.2	28.0	52.2	130
10	3	200L10	S12970	1	230	30.6	32.5	63.1	175
			S12978 S12971 S12972 *S12979	3	200 230 460 575	25.4	32.5	57.9	145
15	5	200L15	S13970	1	230	33.1	41.3	74.4	197
			S13978 S13971 S13972 *S13979	3	200 230 460 575	28.0	41.3	69.3	171
20	6	200L20	S14978 S14971 S14972 *S14979	3	200 230 460 575	30.6	45.8	76.4	187
25	8	200L25	S15978 S15971 S15972 *S15979	3	200 230 460 575	33.1	54.5	87.6	237
30	10	200L30	S16978 S16971 S16972 *S16979	3	200 230 460 575	35.7	63.4	99.1	252
40	13	200L40	S17972 *S17979	3	460 575	40.8	76.5	117.3	290



(All dimensions are in inches and weights in lbs. Do not use for construction purposes.)
*Non-stock motors have a six (6) week lead time.

Water end and motor must be ordered separately and are packaged separately.

MUNICIPAL
WELL & PUMP

Well & Pump - Maintenance Report

Owner	Town of Shelby Sanitary District #2		
Well Location	Arbor Hills #1		
City	La Crosse	**State**	WI
Phone #	608-788-1032	**Contact Name**	Harvey Geary

Well Information

Unique Well ID #	BG164	Owner Well #	#1	PWS ID#	6320312390	Date Drilled	Nov. 7, 1969
Casing Diameter	10-inch	Well Depth	802 ft	Casing Depth	611 ft	Type of Well	Open Hole
Well Screen (Y/N)	N	Scr. Length	N/A	Depth to Top	N/A	Type of Screen	N/A
Date of Last Rehab		Notes					

Test Results	Date	G.P.M	Static	Pumping Level	Drawdown	Specific Capacity
Original Well Performance	11/07/69	214	485	537	52	4.1
After Last Rehab						
After Last Maintenance Test	01/06/06	220	484	518	34	6.5
Current Results	03/21/07	225	485	517	32	7.0

Length of Pump Test (hours)	20 minutes	Completed By:	Marty Van Ells		
Water Meter Reading - Current		Meter Last Test		Water Usage since last Test (gal)	-

Pump & Motor Information

Pump Manufacturer	Goulds		Model #	200L40R		Type of Pump	Submersible
Rated Capacity	210	GPM	Serial Number	K0348005		Date of Install	10/16/2004
	530	Ft of TDH	Length of Airline		590 feet	Setting Depth	590 feet

Motor Manufacturer	Franklin		Model #	336334930	Serial #	04J19-29-0076	
Motor HP	40	Volts	480V	Amps	53.5	RPM	3450
Gear Drive (Y/N)	N	HP		Ratio		Phase	3

Date of Last Rehab	10/16/04	Notes	Pump and motor replaced due to failure in transformer.

Preventative Maintenance Test Results

Item Tested	Yes / No	Notes
Change Motor Oil & Grease	N/A	
Repack Stuffing Box	N/A	
Grease Stuffing Box Bearing	N/A	
Check Valves Operational	Yes	Good
Check Wiring Connections	Yes	Good
Piping OK?	Yes	See (1)
Building OK?	Yes	Good
HVAC OK?	Yes	Good
Lighting OK?	Yes	Good

Electrical Data Results							
Voltage	AB	489	AC	491	BC	493	
Amp Draw	L1	61.8	L2	62.2	L3	64.8	
Megohms	A-G	∞	B-G	∞	C-G	∞	
Winding Test	A-B Ohms	0.3	A-C Ohms	0.3	B-C Ohms	0.3	
Vibration Analysis		**Top of Motor**		**Base of Motor**		**Base of Head**	
With Flow (Inch/Sec)							
Cross Flow (In/Sec)							
System Pressure		0		Rated Shutoff Hd			
Shut Off Pressure				Calc Shutoff Hd			

Overall Remarks: (1) Installed bypass in piping to run to waste.

PO Box 311, Waupun, WI 53963 – Office: 920-324-3400 – Toll-Free: 800-383-7412 – Fax: 920-324-3431
IL: 1206 Streamwood Lane, Vernon Hills, IL 60061 - Office: 847-541-8816 - Fax: 847-367-0625
www.municipalwellandpump.com

WISCONSIN UNIQUE WELL NUMBER **BG164**

Source: SWAP PROJECT KEYED

State of Wi-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Depth 802 FT

Property Owner: SHELBY SANITARY DISTRICT #2		Telephone Number: 608-788-1032	
Mailing Address: 2800 WARD AVE			
City: LA CROSSE	State: WI	Zip Code: 54601	
County of Well Location: 32 LA CROSSE	Co Well Permit No W	Well Completion Date: June 18, 1970	
Well Constructor: ACE WELL DRILLING INC	License #: 393	Facility ID (Public): 632032390	
Address: N9899 HWY 23		Public Well Plan Approval#: 690850	
City: WISCONSIN DELLS	State: WI	Zip Code: 53965	Date Of Approval: 11/07/1969
Hrcap Permanent Well #: 80923	Common Well #: 001	Specific Capacity: 40 gpm/ft	

1. Well Location

T=Town C=City V=Village: T of SHELBY

Fire#:

Street Address or Road Name and Number: THISTLEDOWN DR #1 ARBOR HLS

Subdivision Name: ARBOR HLS | Lot#: | Block #:

Gov't Lot or NE 1/4 of NE 1/4 of Section 3 T 15 N;R 7 W

Latitude Deg. 43 Min. 48.5448

Longitude Deg 91 Min. 11.5463

2. Well Type 1 (See item 12 below)

1=New 2=Replacement 3=Reconstruction

of previous unique well # _____ constructed in 0

Reason for replaced or reconstructed Well?

Lat/Long Method:

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

3. Well Serves M # of homes and or (eg: barn, restaurant, church, school, industry, etc.)

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

High Capacity: Well?

Property?

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties?

Well located in floodplain?

Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method Lower Open Bedrock

Upper Enlarged Drillhole

Dia.(in.)	From (ft)	To (ft)
17.3	surface	125
12.0	125	600
10.0	600	802

-- 1. Rotary - Mud Circulation
-- 2. Rotary - Air
-- 3. Rotary - Air and Foam
-- 4. Drill-Through Casing Hammer
-- 5. Reverse Rotary
-- 6. Cable-tool Bit _ n. dia
-- 7. Temp. Outer Casing _ Removed ? in. dia. _____ depth ft.

Other

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
18.0	ODPE NEW BLACK STEEL 8# FT 70 59	surface	17
10.0	IDPE NEW BLACK STEEL 40 375# FT	1	611

Dia.(in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material

Method / Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
CEMENT	surface	600.0	

Geology Codes	8. Geology Type, Caving Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
O_G_	GRAVEL	0	10
T_LR	DOLOMITE PDC	10	35
T_N_	SANDSTONE JORDAN	35	140
_HML	SILTSTONE ST LAWR	140	160
__LS	DOLOMITE ST LAWR	160	180
_HML	SILTSTONE ST LAWR	180	190
__L_	DOLOMITE ST LAWR	190	195
E_L_	DOLOMITE TUN CITY	195	210
E_NH	SANDSTONE TUN CITY	210	280
E_H_	SHALE TUN CITY	280	315
__NH	SANDSTONE TUN CITY	315	330
E_LS	DOLOMITE TUN CITY	330	335

9. Static Water Level

485.0 feet B ground surface A=Above B=Below

10. Pump Test

Pumping level 537.0 ft. below surface

Pumping at 214.0 GP M 24.0 Hrs

11. Well Is: 0 in. Grade A=Above B=Below

Developed?

Disinfected?

Capped?

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?

If no, explain

13. Initials of Well Constructor or Supervisory Driller Date Signed

Initials of Drill Rig Operator (Mandatory unless same as above) Date Signed

Additonal Comments?

Owner Sent Label? Y

Variance Issued?

More Geology?

Batch 548

ARBOR HILLS

Well Construction Reports

Help Reports

WI Unique Well No:	BG164	**High Capacity Well No:**	80923
County Well Location:		**DNR Region:**	West Central
County:	La Crosse	**Muni Type:**	T
Municipality:	SHELBY	**Completion Date:**	06/18/1970 **mm/dd/yyyy**
DNR Received Date:		**Constructor:**	ACE WELL DRILLING INC
Constructor Address:	N9899 HWY 23	**Constructor City:**	WISCONSIN DELLS
Constructor State:	WI	**Constructor Zip:**	53965
Status:	New Well	**Original Year:**	
Replacement Reason:		**Previous WI Well No:**	
Replacement WI Well No:		**Construction Type:**	1
Other Const. Type:		**Category:**	Municipal/Community
Well Depth:	802 ft	**# Services:**	
Facility Type:		**Highest Point on Property:**	
In Floodplain:		**Rotary - Mud Circulation:**	
Rotary - Air:		**Rotary - Foam:**	
Reverse Rotary:		**Cable Tool Bit:**	
Cable Bit Diameter:	in	**Temp Outer Casing:**	
Temp Casing Diameter:	in	**Temp Casing Removed:**	
Why not removed?:		**Other Drilling method:**	
Other Drilling Description:		**Screen Diameter:**	**inches**
Screen Description:		**Screen From:**	**feet**
Screen To:	**feet**	**Sealant Method:**	
Static Water level:	485 feet	**Pumping level:**	537 **feet**
Pumping at:	214	**Pumping units:**	Minutes
For:	24 **Hour(s)**	**Well Starting Depth:**	0 inches

Developed:		**Disinfected:**	
Capped:		**Proper Seal:**	
Seal Description:		**Contractor Signed on:**	
Rig Operator Signed on:		**Geologic Log Number:**	LC0107
Common Well Number:	001	**Calculated Specific Capacity:**	40
DNR Facility ID:	632032390	**Well Name:**	ARBOR HILLS #1
Water Quality Comments:		**Water Quantity Comments:**	
Drilling Difficulty:		**Other Driller Comments:**	
Exception Areas:		**Exception Area Comments:**	

Distances in Feet to Nearest Objects

No Records returned

Error!

The following unhandled error has occurred in the routine watr$distances.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Drillhole Dimensions

Diameter (in)	From Depth (ft.)	To Depth (ft.)
17.25	0	125
12	125	600
10	600	802

Error!

The following unhandled error has occurred in the routine watr$drill_dim.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Casing & Liner

Diameter (inches)	Description	From Depth (ft.)	To Depth (ft.)
18	ODPE NEW BLACK STEEL 8# FT 70 59	0	17
10	IDPE NEW BLACK STEEL 40 375# FT	.9	610.6

Error!

The following unhandled error has occurred in the routine watr$casing.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Grout or Other Sealant Materials

Kind of Sealing Material	From Depth (ft.)	To Depth (ft.)	Amount	Units
CEMENT	0	600		

Error!

The following unhandled error has occurred in the routine watr$sealant.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Geology

Geology	Geology Description	Driller's Description	USGS Code	From Depth (feet)	To Depth (feet)
O-G-	Orange; Gravel/Cobbles/Boulders/Stones;	GRAVEL		0	10
T-LR	Tan/Brown; Limestone/Dolomite; w/Chert;	DOLOMITE PDC		10	35
T-N-	Tan/Brown; Sandstone;	SANDSTONE		35	140

		JORDAN			
-HML	Hard/Firm; Silt; Limey or Dolomitic;	SILTSTONE ST LAWR		140	160
--LS	Limestone/Dolomite; Sandy;	DOLOMITE ST LAWR		160	180
-HML	Hard/Firm; Silt; Limey or Dolomitic;	SILTSTONE ST LAWR		180	190
--L-	Limestone/Dolomite;	DOLOMITE ST LAWR		190	195
E-L-	Green; Limestone/Dolomite;	DOLOMITE TUN CITY		195	210
E-NH	Green; Sandstone; Shaley;	SANDSTONE TUN CITY		210	280
E-H-	Green; Shale;	SHALE TUN CITY		280	315
--NH	Sandstone; Shaley;	SANDSTONE TUN CITY		315	330
E-LS	Green; Limestone/Dolomite; Sandy;	DOLOMITE TUN CITY		330	335
E-N-	Green; Sandstone;	SANDSTONE TUN CITY		335	375
--N-	Sandstone;	SANDSTONE WONEWOC		375	575
G-N-	Gray; Sandstone;	SANDSTONE EC		575	615
--N-	Sandstone;	SANDSTONE MT SIMON		615	802

Error!

The following unhandled error has occurred in the routine watr$geology.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Samples

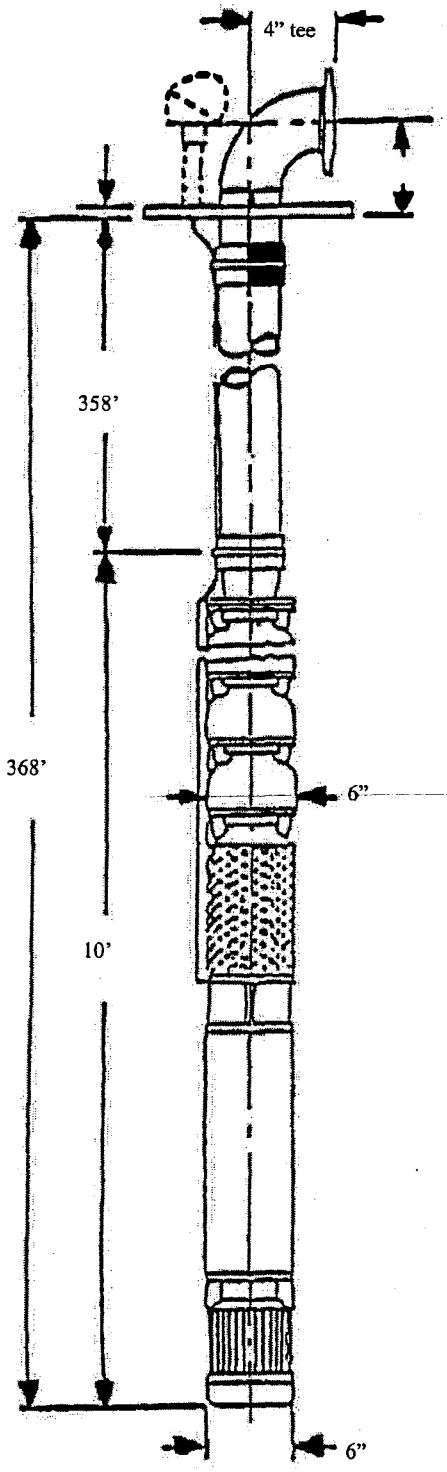
No Records returned

Error!

The following unhandled error has occurred in the routine

Skyline Well #1

Water Well Solutions



SUBMERSIBLE PUMP DATA

Customer	Town of Shelby Sanitary District No.2
Well No.	Skyline
Project No.	21141281
Date	12-11-2014

PITLESS ADAPTER

Make	NA
Size	NA
Depth to Discharge	NA

WELL SEAL

Type	Flanged
Size	8" X 4"

MOTOR

Make	Franklin		
HP	40	RPM	3450
Phase	3	Cycle	60
Voltage	460		
Model #	2366178125		
Serial #	Date Code 14C		

CABLE

Size	#6
Length	358'
Type	Flat 3 wire w/ground

RISER

Size pipe	4 inch
Section lengths	21 foot
Spec coating	Galvanized

Installer Austin B.

SURFACE

Type	8" X 4"
Size	4 inch

PUMP Grundfos

Type	230S	Stage	12
GPM	230	TDH	450
Length	72"		
Bowl Material	SS		
Impeller	SS		
Bowl Bearings	SS		
Wear Rings	SS		
Serial #	2305400/12		
Airline Mat'l	PVC		
Length	358'		

WELL DATA

Inside diameter	>8 inches
Well depth from grade	457'
Pump setting above grade	1'
Diameter of screen	NA
Screen length	NA
Slot	NA
Gravel pack NA	Tubular NA
Size of gravel pack	NAta

PUMP TEST DATA

Pump test data date: 12-11-14

Static level 198 Ft.

Capacity (GPM)	Pumping level	
291	233	Ft.
306	240	Ft.
332	255	Ft.

Comments Well casing heavily encrusted

Water Well Solutions
Toll Free: (888) 769-9009 www.waterwellsolutions.com

PUMPING TEST DATA SHEET

Project Town of Shelby Sanitary District No.2 **Date Tested** 12-11-2014

Location N1468 Hagen Road **Job No.** 21141281

Depth of Well 457 feet **Dia. of Well** Less than 8 inches **Pump Size** 6 inch **Orifice** 6" X 4"

Measuring Point Elevation 24" **Ground Elevation** **Well Type** sandstone

Airline Length 358 feet **Non-Pumping Water Level** 198 feet **Tested By** Austin

Time	Orifice Reading	G.P.M.	Airline Reading	Pumping Level	Drawdown	Discharge Pressure (psi)	Total Dynamic Head	Specific Capacity	Remarks
6:30			160'	198'					Off
6:35	Start								
6:39	20	291	125'	233'	35'	70	263'		
6:55	22	306	118'	240'	42'	50	261'		
7:15	24	319	115'	243'	45'	30	256'		
7:30	26	332	103'	255'	57'	9	259'		Wide open

Note: Discharge to waste 100 feet away at playground.
High tension power lines over head and above pump set to well house.

8/28/2012

COPY

HAGEN - SKYLINE

Well Depth - 457'
Submersible - Static 190' – Pumping 210'
HP 40 3 Phase
GPM – 260
21 years old
Last pulled 2002
Reservoir – 2 37,000 gallon capacity 2000
10,000 gallon capacity 1970

6" – 5738
8" - 2055

Sampling data
See attached sheet

Well Information: Skyline

facility name: **Skyline** facility I.D: **63203107**

well number: **1** unique well number: **BG165** status: **A**

date constructed: **10/4/67** well driller: **Bergson-Caswell Inc.**

well depth: **457 ft** construction report available: **Y**

well location: **SE¼ NE¼**, section **15**, **T15N**, **R7W** address: **Hagan St.**

is well located in a flood plain: **N** if "yes", is well adequately protected: **Y**

aquifer type: **Sandstone** latest reconstruction date:

Geologic Data

formation:	depth (ft) from:	to:
Alluvium	**0**	**50**
Tunnel City	**50**	**80**
Wonowoc	**80**	**200**
EauClaire	**200**	**320**
Mt. Simon	**320**	**456**

Casing Data

diam. (in):	depth (ft) from:	to:
16	**0**	**84**
8	**0**	**322**

Other Data

item:	depth (ft) from:	to:
Screen		
Borehole 8"		**457**
Grout	**0**	**322**

	Original	Current
static water level:	**190 ft**	**190 ft**
pumping water level:	**280 ft @ 270 gpm**	**210 ft @ 225 gpm**
specific capacity:	**3 gpm/ft**	**11 gpm/ft**

means for measuring water levels: **airline** airline length: **310 feet**

airline seal: **S** well seal: **Grout around base plate needed**

well vent: **S** gravel refill pipes: **n/a**

u-bend: **S** capped:

screened: **S** above floor:

above floor: **24"**

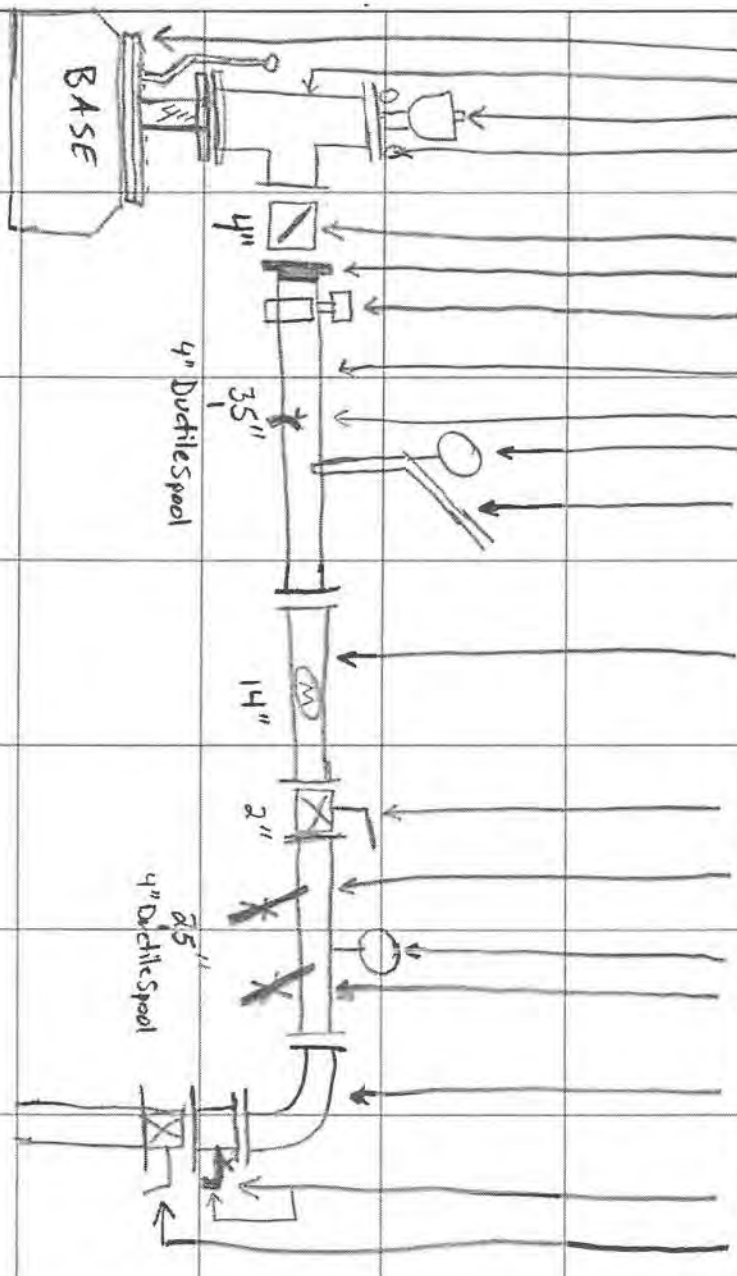
pump base height: **6"**

rehabilitation performed: **televised** date: **10/16/2002**

Water Well Solutions

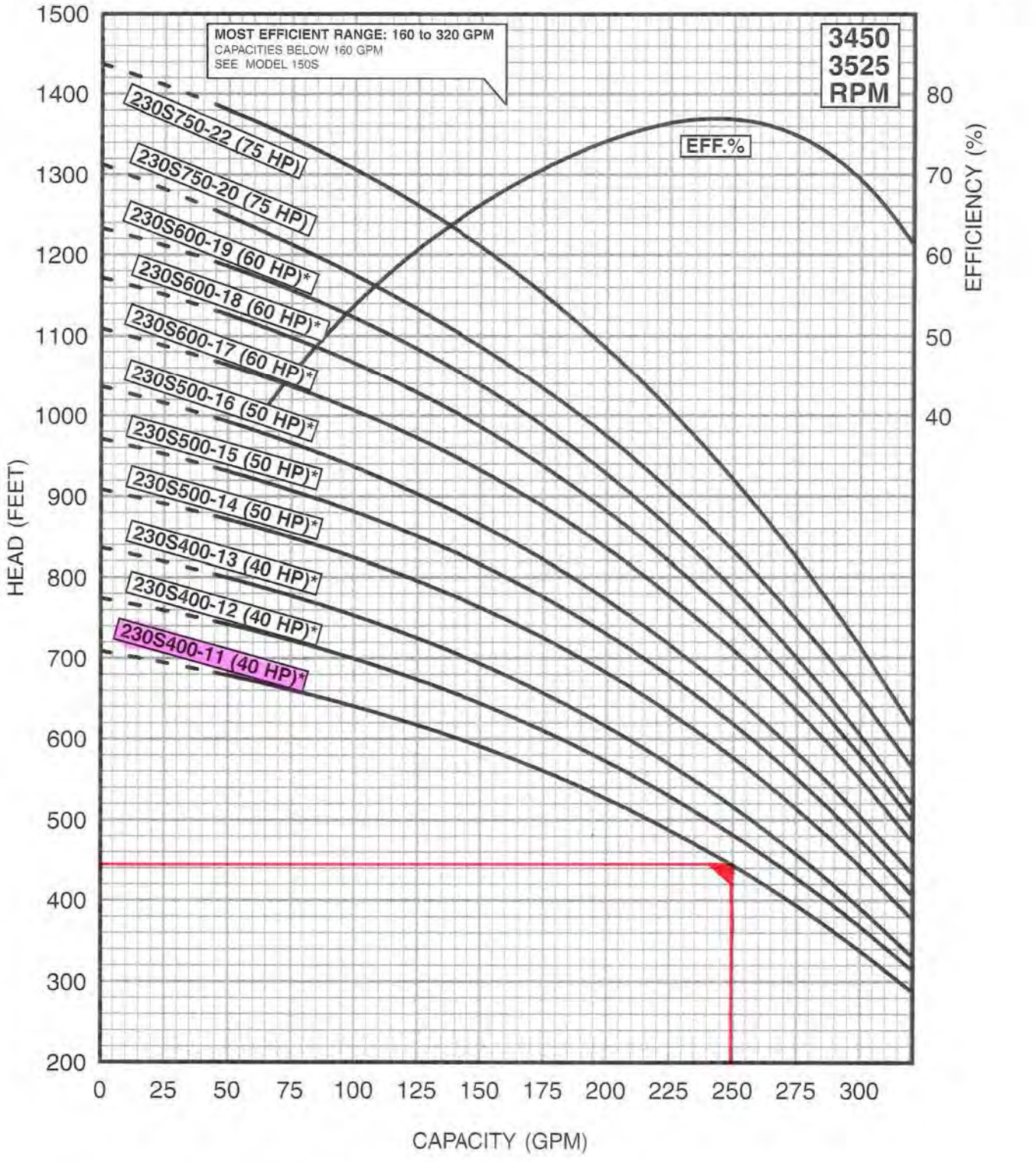
Project: Shelby

Job # 2114 1281 Date: 12-12-14 / Austin



Wisconsin – Illinois
(888) 769-9009 • FAX (920) 474-4771

FLOW RANGE: 160 -320 GPM **OUTLET SIZE: 3" NPT** **NOMINAL DIA. 6"**



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
4" MOTOR STANDARD, 7.5 HP/3450 RPM
6" MOTOR STANDARD, 10-60 HP/3450 RPM.
8" MOTOR STANDARD, 75 HP/3525 RPM.
* Alternate motor sizes available.

Performance conforms to ISO 9906 Annex A
@ 8 ft. min. submergence.

DIMENSIONS AND WEIGHTS

MODEL NO.	FIG.	HP	MOTOR SIZE	DISCH. SIZE	DIMENSIONS IN INCHES					APPROX. SHIP WT.
					A	B	C	D	E	
230S20-1B	A	2	4"	3" NPT	29.7	15.1	14.6	3.8	5.7	44
230S30-1A	A	3	4"	3" NPT	38.2	23.6	14.6	3.8	5.7	55
230S50-1	A	5	4"	3" NPT	44.2	29.6	14.6	3.8	5.7	65
230S50-2AB	A	5	4"	3" NPT	48.5	29.6	18.9	3.8	5.7	71
230S75-2	A	7.5	4"	3" NPT	48.5	29.6	18.9	3.8	5.7	88
230S75-2	A	7.5	6"	3" NPT	43.0	24.2	18.9	5.4	5.7	124
230S75-3BB	A	7.5	4"	3" NPT	53.5	29.6	23.9	3.8	5.7	96
230S75-3BB	A	7.5	6"	3" NPT	48.1	24.2	23.9	5.4	5.7	96
230S100-3	A	10	4"	3" NPT	67.8	43.9	23.9	3.8	5.7	146
230S100-3	A	10	6"	3" NPT	49.3	25.4	23.9	5.4	5.7	140
230S100-4BC	A	10	4"	3" NPT	72.3	43.9	28.4	3.8	5.7	147
230S100-4BC	A	10	6"	3" NPT	53.8	25.4	28.4	5.4	5.7	147
230S150-4	A	15	6"	3" NPT	56.4	28.0	28.4	5.4	5.7	161
230S150-5B	A	15	6"	3" NPT	60.8	28.0	32.8	5.4	5.7	165
230S200-5	A	20	6"	3" NPT	63.4	30.6	32.8	5.4	5.7	167
230S200-6	A	20	6"	3" NPT	67.8	30.6	37.3	5.4	5.7	186
230S200-7C	A	20	6"	3" NPT	67.8	30.6	37.3	5.4	5.7	202
230S250-7	A	25	6"	3" NPT	74.9	33.1	41.7	5.4	5.7	202
230S250-8B	A	25	6"	3" NPT	79.3	33.1	46.2	5.4	5.7	209
230S250-8	A	25	6"	3" NPT	79.3	33.1	46.2	5.4	5.7	209
230S250-9BB	A	25	6"	3" NPT	83.8	33.1	50.6	5.4	5.7	228
230S300-9	A	30	6"	3" NPT	86.3	35.7	50.6	5.4	5.7	228
230S400-10*	A	40	6"	3" NPT	95.9	40.81	55.1	5.4	5.7	234
230S400-11*	A	40	6"	3" NPT	100.3	40.81	59.5	5.4	5.7	273
230S400-12*	A	40	6"	3" NPT	104.8	40.81	64.0	5.4	5.7	279
230S400-13*	A	40	6"	3" NPT	109.2	40.81	68.4	5.4	5.7	284
230S500-14*	A	50	6"	3" NPT	130.7	57.83	72.9	5.4	5.7	388
230S500-15*	A	50	6"	3" NPT	135.2	57.83	77.3	5.4	5.7	393
230S500-16*	A	50	6"	3" NPT	139.6	57.83	81.8	5.4	5.7	399
230S600-17*	A	60	6"	3" NPT	151.2	63.83	87.4	5.4	5.7	438
230S600-18*	A	60	6"	3" NPT	155.6	63.83	91.8	5.4	5.7	445
230S600-19*	A	60	6"	3" NPT	160.1	63.83	96.3	5.4	5.7	449
230S600-17	A	60	8"	3" NPT	129.2	41.79	87.4	7.5	7.6	544
230S600-18	A	60	8"	3" NPT	133.6	41.79	91.8	7.5	7.6	551
230S600-19	A	60	8"	3" NPT	138.0	41.79	96.3	7.5	7.6	555
230S750-20**	B	75	8"	4" M-NPT	154.7	47.41	107.3	7.5	7.6	634
230S750-22**	B	75	8"	4" M-NPT	163.6	47.41	116.2	7.5	7.6	681

NOTES: All models suitable for use in 6" wells, unless equipped with 8" motor.
Weights include pump end with motor in lbs.
* Alternate motor sizes available.
** Built into sleeve, 4" NPT, 8" motor required.

Fig. A

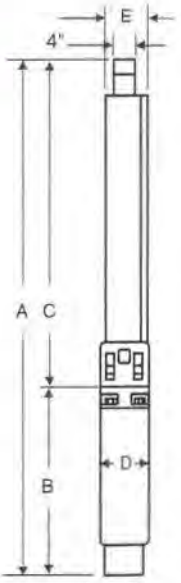


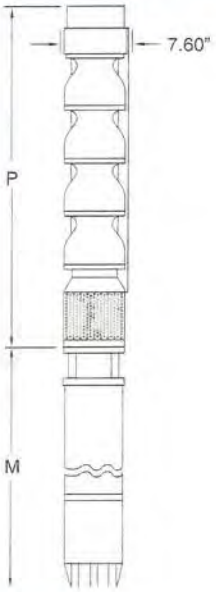
Fig. B

Model 275STS8 Performance

Dimension Information

HP	Stages	Trim	Motor Size	P	M*	MD*	Motor Wt.	Pump Wt.
				inch	inch	inch	lbs.	lbs.
40	4	2A 2B	6"	40.4	40.8	5.44	182	177
40	4	2A 2B	8"	41.8	36.4	7.70	274	200
50	5	5B	6"	45.9	55.3	5.44	263	204
50	5	5B	8"	47.3	39.4	7.70	309	227
60	6	2A 4B	6"	51.4	61.3	5.44	291	232
60	6	2A 4B	8"	52.8	42.1	7.70	344	254
75	7	7A	8"	58.3	47.4	7.70	399	282
100	9	9A	8"	69.3	54.9	7.70	481	336
125	12	10A 2B	8"	85.8	68.8	7.70	644	418

Note: *__MD__ diameter = Franklin Electric Motor, __M__ = Maximum Length of Franklin Electric Motor



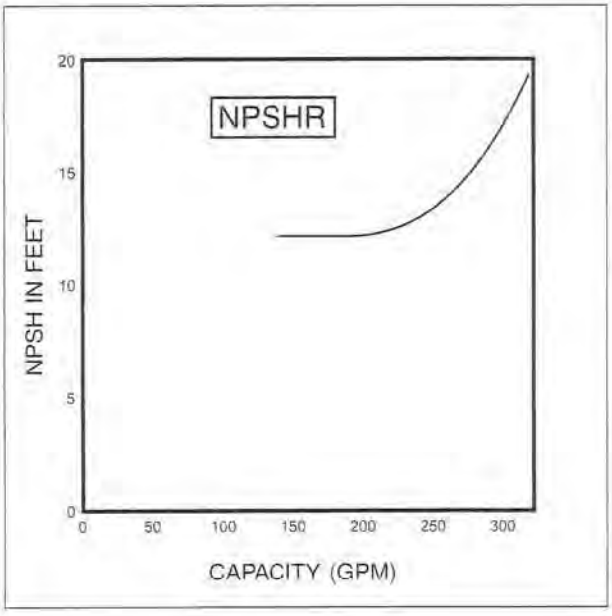
Order Information

8" Submersible Turbine Pump Ends								
GPM	HP	Stages	Trim Size	Motor Bracket Size	Discharge Size	Order No.	Model No.	Shipping Weight (lbs.)
275	40	4	2A 2B	6"	4" NPT	97080275004	275STS40D8X-0464	198
	40	4	2A 2B	6"	6" NPT	97080275104	275STS40D8X-0466	198
	40	4	2A 2B	8"	4" NPT	97080275804	275STS40D8X-0484	221
	40	4	2A 2B	8"	6" NPT	97080275904	275STS40D8X-0486	221
	50	5	5B	6"	4" NPT	97080275005	275STS50D8B-0564	228
	50	5	5B	6"	6" NPT	97080275105	275STS50D8B-0566	228
	50	5	5B	8"	4" NPT	97080275805	275STS50D8B-0584	251
	50	5	5B	8"	6" NPT	97080275905	275STS50D8B-0586	251
	60	6	2A 4B	6"	4" NPT	97080275006	275STS60D8X-0664	260
	60	6	2A 4B	6"	6" NPT	97080275106	275STS60D8X-0666	260
	60	6	2A 4B	8"	4" NPT	97080275806	275STS60D8X-0684	282
	60	6	2A 4B	8"	6" NPT	97080275906	275STS60D8X-0686	282
	75	7	7A	8"	4" NPT	97080275807	275STS75D8A-0784	310
	75	7	7A	8"	6" NPT	97080275907	275STS75D8A-0786	310
	100	9	9A	8"	4" NPT	97080275809	275STS100D8A-0984	401
	100	9	9A	8"	6" NPT	97080275909	275STS100D8A-0986	401
	125	12	10A 2B	8"	4" NPT	97080275812	275STS125D8X-1284	495
	125	12	10A 2B	8"	6" NPT	97080275912	275STS125D8X-1286	495

MATERIALS OF CONSTRUCTION

COMPONENT	CYLINDRICAL SHAFT (2-18 Stgs.)
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Diffuser Chamber	304 Stainless Steel
Split Cone Nut	304 Stainless Steel
Split Cone	304 Stainless Steel
Impeller	304 Stainless Steel
Suction Interconnector	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Straps	304 Stainless Steel
Cable Guard	304 Stainless Steel
Coupling	316/329 Stainless Steel**
Pump Shaft	431 Stainless Steel
Intermediate Bearings	NBR
Impeller Seal Ring	NBR/304 Stainless Steel
Check Valve Seat	NBR/316 Stainless Steel
Top/Lower Bearing	NBR/316 Stainless Steel
8" Motor Adaptor Plate	304 Stainless Steel
Upthrust Washer	Carbon/Graphite HY22
Upthrust stop ring	304 S.S./Tungsten Carbide
Sleeve*	304 Stainless Steel
Sleeve Flange*	304 Stainless Steel

NOTES: Specifications subject to change without notice.
* Required for 20-22 stage only.
** 4" Coupling made of 316 Stainless Steel.



MUNICIPAL
WELL & PUMP

Well & Pump - Maintenance Report

Owner	Town of Shelby Sanitary District #2				
Well Location	Hagen St. #1 - Skyline				
City	La Crosse			**State**	WI
Phone #	608-788-1032	**Contact Name**	Harvey Geary		

Well Information

Unique Well ID #	BG165	Owner Well #	#1	PWS ID#	632031070	Date Drilled	October 4, 1967
Casing Diameter	8-inch	Well Depth	457 ft	Casing Depth	322 ft	Type of Well	Open Hole
Well Screen (Y/N)	N	Scr. Length	N/A	Depth to Top	N/A	Type of Screen	N/A
Date of Last Rehab		Notes					

Test Results	Date	G.P.M	Static	Pumping Level	Drawdown	Specific Capacity
Original Well Performance	10/04/67	270	190	280	90	3.0
After Last Rehab						
After Last Maintenance Test	01/06/06	250	192	240	48	5.2
Current Results	03/21/07	260	196	236	40	6.5

Length of Pump Test (hours)	20 minutes	Completed By:	Marty Van Ells		
Water Meter Reading - Current		Meter Last Test		Water Usage since last Test (gal)	-

Pump & Motor Information

Pump Manufacturer	Unknown		Model #			Type of Pump	Submersible
Rated Capacity		GPM	Serial Number			Date of Install	
		Ft of TDH	Length of Airline		Estimated 316	Setting Depth	316 feet

Motor Manufacturer	Franklin		Model #	236616	Serial #	Unknown	
Motor HP	40	Volts	480V	Amps	53.5	RPM	3450
Gear Drive (Y/N)	N	HP		Ratio		Phase	3

Date of Last Rehab		Notes	

Preventative Maintenance Test Results

Item Tested	Yes / No	Notes
Change Motor Oil & Grease	N/A	
Repack Stuffing Box	N/A	
Grease Stuffing Box Bearing	N/A	
Check Valves Operational	Yes	Good
Check Wiring Connections	Yes	Good
Piping OK?	Yes	Good
Building OK?	Yes	Good
HVAC OK?	Yes	Good
Lighting OK?	Yes	Good

Electrical Data Results

Voltage	AB	496	AC	498	BC	494	
Amp Draw	L1	58	L2	54.3	L3	60	
Megohms	A-G	∞	B-G	∞	C-G	∞	
Winding Test	A-B Ohms	0.3	A-C Ohms	0.3	B-C Ohms	0.3	

Vibration Analysis	Top of Motor	Base of Motor	Base of Head
With Flow (Inch/Sec)			
Cross Flow (In/Sec)			

System Pressure	79	Rated Shutoff Hd	
Shut Off Pressure		Calc Shutoff Hd	

Overall Remarks:

PO Box 311, Waupun, WI 53963 - Office: 920-324-3400 - Toll-Free: 800-383-7412 - Fax: 920-324-3431
IL: 1206 Streamwood Lane, Vernon Hills, IL 60061 - Office: 847-541-8816 - Fax: 847-367-0625
www.municipalwellandpump.com

WISCONSIN UNIQUE WELL NUMBER **BG165**
Source: SWAP PROJECT KEYED

State of Wi-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Depth 457 FT

Property Owner: SHELBY SANITARY DISTRICT #2 | Telephone Number: 608-788-1032

Mailing Address: 2800 WARD AVE

City: LA CROSSE | State: WI | Zip Code: 54601

County of Well Location: 32 LA CROSSE | Co Well Permit No: W | Well Completion Date: October 4, 1967

Well Constructor: BERGERSON CASWELL INC | License #: 398 | Facility ID (Public): 632031070

Address: 5115 INDUSTRIAL ST | Public Well Plan Approval#: 670591

City: MAPLE PLAIN | State: MN | Zip Code: 55359 | Date Of Approval: 05/11/1967

Hicap Permanent Well #: 80924 | Common Well #: 001 | Specific Capacity: 30 gpm/ft

1. Well Location
T=Town C=City V=Village: T of SHELBY | Fire#:

Street Address or Road Name and Number: HAGAN ST #1 SKYLINE

Subdivision Name: | Lot#: | Block #:

Gov't Lot or SE 1/4 of NE 1/4 of Section 15 T 15 N;R 7 W

Latitude Deg. 43 Min. 46.7691

Longitude Deg 91 Min. 11.6407

2. Well Type 1 (See item 12 below) | Lat/Long Method

1=New 2=Replacement 3=Reconstruction

of previous unique well # _____ constructed in 0

Reason for replaced or reconstructed Well?

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

3. Well Serves M # of homes and or (eg: barn, restaurant, church, school, industry, etc.)

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

High Capacity: Well? Property?

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties?

Well located in floodplain?

Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method Lower Open Bedrock

Dia.(in.)	From (ft)	To (ft)
15.0	surface	84
12.0	84	121
10.0	121	322
8.0	322	457

Upper Enlarged Drillhole
-- 1. Rotary - Mud Circulation
-- 2. Rotary - Air
-- 3. Rotary - Air and Foam
-- 4. Drill-Through Casing Hammer
-- 5. Reverse Rotary
-- 6. Cable-tool Bit _ n. dia
-- 7. Temp. Outer Casing _ in. dia. _____ depth ft. Removed ?
Other

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)		From (ft.)	To (ft.)
16.0		surface	84
8.0		84	322

Dia.(in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material

Method / Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT	surface	322.0	

Geology Codes	8. Geology Type, Caving Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
_C_	CLAY	0	35
_M_	SILT	35	50
_NH	SANDSTONE TUN CITY	50	80
Y_N_	SANDSTONE WONEWOC	80	200
_N_	SANDSTONE EC	200	230
_H_	SHALE EC	230	275
_N_	SANDSTONE EC	275	280
_H_	SHALE EC	280	320
_N_	SANDSTONE MT SIMON	320	452
G_H_	SHALE MT SIMON	452	457

9. Static Water Level
190.0 feet B ground surface
A=Above B=Below

10. Pump Test
Pumping level 280.0 ft. below surface
Pumping at 270.0 GP M 17.5 Hrs

11. Well Is: 0 in. Grade A=Above B=Below
Developed?
Disinfected?
Capped?

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
If no, explain

13. Initials of Well Constructor or Supervisory Driller | Date Signed

Initials of Drill Rig Operator (Mandatory unless same as above) | Date Signed

Additonal Comments?
Owner Sent Label? Y
Variance Issued?
More Geology?

Batch 548

SKYLINE - HAGEN #1

Well Construction Reports

Help Reports

WI Unique Well No:	BG165	**High Capacity Well No:**	80924
County Well Location:		**DNR Region:**	West Central
County:	La Crosse	**Muni Type:**	T
Municipality:	SHELBY	**Completion Date:**	10/04/1967 **mm/dd/yyyy**
DNR Received Date:		**Constructor:**	BERGERSON CASWELL INC
Constructor Address:	5115 INDUSTRIAL ST	**Constructor City:**	MAPLE PLAIN
Constructor State:	MN	**Constructor Zip:**	55359-9545
Status:	New Well	**Original Year:**	
Replacement Reason:		**Previous WI Well No:**	
Replacement WI Well No:		**Construction Type:**	1
Other Const. Type:		**Category:**	Municipal/Community
Well Depth:	457 ft	**# Services:**	
Facility Type:		**Highest Point on Property:**	
In Floodplain:		**Rotary - Mud Circulation:**	
Rotary - Air:		**Rotary - Foam:**	
Reverse Rotary:		**Cable Tool Bit:**	
Cable Bit Diameter:	in	**Temp Outer Casing:**	
Temp Casing Diameter:	in	**Temp Casing Removed:**	
Why not removed?:		**Other Drilling method:**	
Other Drilling Description:		**Screen Diameter:**	**inches**
Screen Description:		**Screen From:**	**feet**
Screen To:	**feet**	**Sealant Method:**	
Static Water level:	190 feet	**Pumping level:**	280 **feet**

Pumping at:	270	**Pumping units:**	Minutes
For:	17.5 **Hour(s)**	**Well Starting Depth:**	0 inches
Developed:		**Disinfected:**	
Capped:		**Proper Seal:**	
Seal Description:		**Contractor Signed on:**	
Rig Operator Signed on:		**Geologic Log Number:**	LC0079
Common Well Number:	001	**Calculated Specific Capacity:**	30
DNR Facility ID:	632031070	**Well Name:**	SKYLINE #1
Water Quality Comments:		**Water Quantity Comments:**	
Drilling Difficulty:		**Other Driller Comments:**	
Exception Areas:		**Exception Area Comments:**	

Distances in Feet to Nearest Objects

No Records returned

Error!

The following unhandled error has occurred in the routine watr$distances.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Drillhole Dimensions

Diameter (in)	From Depth (ft.)	To Depth (ft.)
15	0	84
12	84	121
10	121	322
8	322	457

Error!

The following unhandled error has occurred in the routine watr$drill_dim.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Casing & Liner

Diameter (inches)	Description	From Depth (ft.)	To Depth (ft.)
16		0	84
8		84	322

Error!

The following unhandled error has occurred in the routine watr$casing.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Grout or Other Sealant Materials

Kind of Sealing Material	From Depth (ft.)	To Depth (ft.)	Amount	Units
NEAT CEMENT	0	322		

Error!

The following unhandled error has occurred in the routine watr$sealant.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Geology

Geology	Geology Description	Driller's Description	USGS Code	From Depth (feet)	To Depth (feet)
--C-	Clay;	CLAY		0	35
--M-	Silt;	SILT		35	50
--NH	Sandstone; Shaley;	SANDSTONE TUN CITY		50	80

Y-N-	Yellow; Sandstone;	SANDSTONE WONEWOC		80	200
--N-	Sandstone;	SANDSTONE EC		200	230
--H-	Shale;	SHALE EC		230	275
--N-	Sandstone;	SANDSTONE EC		275	280
--H-	Shale;	SHALE EC		280	320
--N-	Sandstone;	SANDSTONE MT SIMON		320	452
G-H-	Gray; Shale;	SHALE MT SIMON		452	457

Error!

The following unhandled error has occurred in the routine watr$geology.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Samples

No Records returned

Error!

The following unhandled error has occurred in the routine watr$ws_sample_collection.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

- Abandonment (0 Rows)
- Variances (0 Rows)
- Rehabilitation/Redevelopment (0 Rows)
- **Other DNR information on this Well**
  - Public Water Supply System
  - High Capacity Well Data
  - Groundwater Retrieval Network Data

Wedgewood Well #1

MUNICIPAL
WELL & PUMP

Well & Pump - Maintenance Report

Owner	Town of Shelby Sanitary District #2		
Well Location	Wedgewood Drive - Wedgewood Valley #1		
City	La Crosee	**State**	WI
Phone #	608-788-1032	**Contact Name**	Harvey Geary

Well Information

Unique Well ID #	BG166	Owner Well #	#1	PWS ID#	632031180	Date Drilled	January 1, 1956
Casing Diameter	6-inch	Well Depth	375 ft	Casing Depth	130 ft	Type of Well	Open Hole
Well Screen (Y/N)	N	Scr. Length	N/A	Depth to Top	N/A	Type of Screen	N/A
Date of Last Rehab		Notes					

Test Results	Date	G.P.M	Static	Pumping Level	Drawdown	Specific Capacity
Original Well Performance	01/01/56	155	85	125	40	3.9
After Last Rehab						
After Last Maintenance Test	01/06/06	120	86	141	55	2.2
Current Results	03/21/07	125	88	142	54	2.3

Length of Pump Test (hours)	20 minutes	Completed By:	Marty Van Ells		
Water Meter Reading - Current		Meter Last Test		Water Usage since last Test (gal)	-

Pump & Motor Information

Pump Manufacturer	Unknown		Model #			Type of Pump	Submersible
Rated Capacity		GPM	Serial Number			Date of Install	
		Ft of TDH	Length of Airline		Estimated 169	Setting Depth	169 feet

Motor Manufacturer	Franklin		Model #	236606	Serial #	Unknown	
Motor HP	230V	Volts	230V	Amps	79	RPM	3450
Gear Drive (Y/N)	N	HP		Ratio		Phase	

Date of Last Rehab		Notes	

Preventative Maintenance Test Results

Item Tested	Yes / No	Notes
Change Motor Oil & Grease	N/A	
Repack Stuffing Box	N/A	
Grease Stuffing Box Bearing	N/A	
Check Valves Operational	Yes	Good
Check Wiring Connections	Yes	Good
Piping OK?	Yes	See (1)
Building OK?	Yes	Good
HVAC OK?	Yes	Good
Lighting OK?	Yes	Good

Electrical Data Results							
Voltage	AB	243	AC	243	BC	246
Amp Draw	L1	72.6	L2	72.5	L3	70.3
Megohms	A-G	∞	B-G	∞	C-G	∞
Winding Test	A-B Ohms	0.3	A-C Ohms	0.3	B-C Ohms	0.3

Vibration Analysis	Top of Motor	Base of Motor	Base of Head
With Flow (Inch/Sec)			
Cross Flow (In/Sec)			

System Pressure	110	Rated Shutoff Hd	
Shut Off Pressure		Calc Shutoff Hd	

Overall Remarks: (1) Piping modified to install valve for discharging to waste.

PO Box 311, Waupun, WI 53963 - Office: 920-324-3400 - Toll-Free: 800-383-7412 - Fax: 920-324-3431
IL: 1206 Streamwood Lane, Vernon Hills, IL 60061 - Office: 847-541-8816 - Fax: 847-367-0625
www.municipalwellandpump.com

WISCONSIN UNIQUE WELL NUMBER **BG166**
Source: SWAP PROJECT KEYED

State of Wi-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Depth 375 FT

Property Owner: SHELBY SANITARY DISTRICT
Telephone Number: 608-788-1032
Mailing Address: 2800 WARD AVE
City: LA CROSSE
State: WI
Zip Code: 54601
County of Well Location: 32 LA CROSSE
Co Well Permit No: W
Well Completion Date: January 1, 1956

1. Well Location
T=Town C=City V=Village: T of SHELBY
Fire#:
Street Address or Road Name and Number: WEDGEWOOD DR E #1
Subdivision Name:
Lot#:
Block #:
Gov't Lot or SW 1/4 of NE 1/4 of Section 10 T 15 N;R 7 W
Latitude Deg. 43 Min. 47.5777
Longitude Deg 91 Min. 11.9611

Well Constructor: WICK, WILBERT
License #: 39
Facility ID (Public): 632031180
Address:
Public Well Plan Approval#:
City:
State:
Zip Code:
Date Of Approval: 02/24/1955
Hicap Permanent Well #: 80925
Common Well #: 001
Specific Capacity: 39 gpm/ft

2. Well Type 1 (See item 12 below)
1=New 2=Replacement 3=Reconstruction
Lat/Long Method
of previous unique well # _____ constructed in 0
Reason for replaced or reconstructed Well?

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

3. Well Serves M # of homes and or (eg: barn, restaurant, church, school, industry, etc.)
M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole
High Capacity: Well?
Property?

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties?
Well located in floodplain?
Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method Lower Open Bedrock

Dia.(in.)	From (ft)	To (ft)
12.0	surface	63
6.0	63	375

Upper Enlarged Drillhole
-1. Rotary - Mud Circulation
-2. Rotary - Air
-3. Rotary - Air and Foam
-4. Drill-Through Casing Hammer
-5. Reverse Rotary
-6. Cable-tool Bit _ n. dia
-7. Temp. Outer Casing _ in. dia. _____ depth ft. Removed ?
Other

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)		From (ft.)	To (ft.)
12.0		surface	56
6.0		56	130

Dia.(in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material

Method / Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
CEMENT	surface	63.0	

Geology Codes	8. Geology Type, Caving Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
_MS	SILT @ SAND	0	45
_X_	CLAY @ SAND	45	110
G_HN	SHALE @ SS EC	110	160
_HM_	SILTSTONE EC	160	165
G_HL	SHALE EC	165	170
_HM_	SILTSTONE EC	170	180
G_HL	SHALE EC	180	220
G_N_	SANDSTONE EC	220	275
_HMS	SILTSTONE EC	275	285
G_N_	SANDSTONE MT SIMON	285	375

9. Static Water Level
85.0 feet B ground surface
A=Above B=Below

10. Pump Test
Pumping level 125.0 ft. below surface
Pumping at 155.0 GP M 8.0 Hrs

11. Well Is:
0 in. Grade
A=Above B=Below
Developed?
Disinfected?
Capped?

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
If no, explain

13. Initials of Well Constructor or Supervisory Driller Date Signed

Initials of Drill Rig Operator (Mandatory unless same as above) Date Signed

Additonal Comments?
Owner Sent Label? Y
Variance Issued?
More Geology?

Batch 548

VALLEY #1

Well Construction Reports

Help Reports

WI Unique Well No:	BG166	**High Capacity Well No:**	80925
County Well Location:		**DNR Region:**	West Central
County:	La Crosse	**Muni Type:**	T
Municipality:	SHELBY	**Completion Date:**	01/01/1956 **mm/dd/yyyy**
DNR Received Date:		**Constructor:**	WICK, WILBERT
Constructor Address:		**Constructor City:**	
Constructor State:		**Constructor Zip:**	
Status:	New Well	**Original Year:**	
Replacement Reason:		**Previous WI Well No:**	
Replacement WI Well No:		**Construction Type:**	1
Other Const. Type:		**Category:**	Municipal/Community
Well Depth:	375 **ft**	**# Services:**	
Facility Type:		**Highest Point on Property:**	
In Floodplain:		**Rotary - Mud Circulation:**	
Rotary - Air:		**Rotary - Foam:**	
Reverse Rotary:		**Cable Tool Bit:**	
Cable Bit Diameter:	**in**	**Temp Outer Casing:**	
Temp Casing Diameter:	**in**	**Temp Casing Removed:**	
Why not removed?:		**Other Drilling method:**	
Other Drilling Description:		**Screen Diameter:**	**inches**
Screen Description:		**Screen From:**	**feet**
Screen To:	**feet**	**Sealant Method:**	
Static Water level:	85 feet	**Pumping level:**	125 **feet**
Pumping at:	155	**Pumping units:**	Minutes
For:	8 **Hour(s)**	**Well Starting Depth:**	0 inches
Developed:		**Disinfected:**	
Capped:		**Proper Seal:**	

Seal Description:		**Contractor Signed on:**	
Rig Operator Signed on:		**Geologic Log Number:**	LG0038
Common Well Number:	001	**Calculated Specific Capacity:**	39
DNR Facility ID:	632031180	**Well Name:**	WEDGEWOOD VALLEY #10
Water Quality Comments:		**Water Quantity Comments:**	
Drilling Difficulty:		**Other Driller Comments:**	
Exception Areas:		**Exception Area Comments:**	

Distances in Feet to Nearest Objects

No Records returned

Error!

The following unhandled error has occurred in the routine watr$distances.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Drillhole Dimensions

Diameter (in)	From Depth (ft.)	To Depth (ft.)
12	0	63
6	63	375

Error!

The following unhandled error has occurred in the routine watr$drill_dim.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Casing & Liner

Diameter (inches)	Description	From Depth (ft.)	To Depth (ft.)
12		0	56
6		56	130

Error!

The following unhandled error has occurred in the routine watr$casing.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Grout or Other Sealant Materials

Kind of Sealing Material	From Depth (ft.)	To Depth (ft.)	Amount	Units
CEMENT	0	63		

Error!

The following unhandled error has occurred in the routine watr$sealant.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Geology

Geology	Geology Description	Driller's Description	USGS Code	From Depth (feet)	To Depth (feet)
--MS	Silt; Sandy;	SILT @ SAND		0	45
--X-	Sand & Clay;	CLAY @ SAND		45	110
G-HN	Gray; Shale; w/Sandstone;	SHALE @ SS EC		110	160
-HM-	Hard/Firm; Silt;	SILTSTONE EC		160	165
G-HL	Gray; Shale; Limey or Dolomitic;	SHALE EC		165	170
-HM-	Hard/Firm; Silt;	SILTSTONE EC		170	180
G-HL	Gray; Shale; Limey or Dolomitic;	SHALE EC		180	220

G-N-	Gray; Sandstone;	SANDSTONE EC		220	275
-HMS	Hard/Firm; Silt; Sandy;	SILTSTONE EC		275	285
G-N-	Gray; Sandstone;	SANDSTONE MT SIMON		285	375

Error!

The following unhandled error has occurred in the routine watr$geology.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Samples

No Records returned

Error!

The following unhandled error has occurred in the routine watr$ws_sample_collection.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

- Abandonment (0 Rows)
- Variances (0 Rows)
- Rehabilitation/Redevelopment (0 Rows)
- **Other DNR information on this Well**
  - Public Water Supply System
  - High Capacity Well Data
  - Groundwater Retrieval Network Data

Last Revised: 03/23/2007

Wedgewood Well #2

MUNICIPAL
WELL & PUMP

Well & Pump - Maintenance Report

Owner	Town of Shelby Sanitary District #2		
Well Location	Vista Drive - Wedgewood Valley #2		
City	La Crosee	**State**	WI
Phone #	608-788-1032	**Contact Name**	Harvey Geary

Well Information

Unique Well ID #	BG167	Owner Well #	#2	PWS ID#	632031180	Date Drilled	January 1, 1981
Casing Diameter	6-inch	Well Depth	~~503~~ ft 440	Casing Depth	~~440~~ ft 218	Type of Well	Open Hole
Well Screen (Y/N)	N	Scr. Length	N/A	Depth to Top	N/A	Type of Screen	N/A
Date of Last Rehab	1981	Notes	Drilled well an additional 63 feet deeper.				

Test Results	Date	G.P.M	Static	Pumping Level	Drawdown	Specific Capacity
Original Well Performance	01/01/81	200	180	252	72	2.8
After Last Rehab (Pump Only)	01/01/03	124	177	295	118	1.1
After Last Maintenance Test	01/06/06	155	177	335	158	1.0
Current Results	03/21/07	155	187	339	152	1.0

Length of Pump Test (hours)	20 minutes	Completed By:	Marty Van Ells		
Water Meter Reading - Current		Meter Last Test		Water Usage since last Test (gal)	-

Pump & Motor Information

Pump Manufacturer	Unknown		Model #			Type of Pump	Submersible
Rated Capacity		GPM	Serial Number			Date of Install	
		Ft of TDH	Length of Airline		Estimated 357	Setting Depth	357 feet

Motor Manufacturer	Franklin		Model #	236606	Serial #	Unknown	
Motor HP	230V	Volts	230V	Amps	79	RPM	3450
Gear Drive (Y/N)	N	HP		Ratio		Phase	

Date of Last Rehab	2003?	Notes	Pump Only & specific capacity had been dropping considerably at that time

Preventative Maintenance Test Results

Item Tested	Yes / No	Notes
Change Motor Oil & Grease	N/A	
Repack Stuffing Box	N/A	
Grease Stuffing Box Bearing	N/A	
Check Valves Operational	Yes	
Check Wiring Connections	Yes	
Piping OK?	Yes	See (1)
Building OK?	Yes	
HVAC OK?	Yes	
Lighting OK?	Yes	

Electrical Data Results						
Voltage	AB	239	AC	240	BC	239.6
Amp Draw	L1	81.4	L2	79.4	L3	78.1
Megohms	A-G	∞	B-G	∞	C-G	∞
Winding Test	A-B Ohms	0.4	A-C Ohms	0.4	A-C Ohms	0.4

Vibration Analysis	Top of Motor	Base of Motor	Base of Head
With Flow (Inch/Sec)			
Cross Flow (In/Sec)			
System Pressure	56	Rated Shutoff Hd	
Shut Off Pressure		Calc Shutoff Hd	

Overall Remarks: (1) Piping modified to install valve for discharging to waste.

The pumping level is getting very close to the pump. With a specific capacity of 1 gallon per foot of drawdown, the well is only capable of another 18 GPM until it draws down to the pump. Damage to the pump and/or motor would result.

PO Box 311, Waupun, WI 53963 - Office: 920-324-3400 - Toll-Free: 800-383-7412 - Fax: 920-324-3431
IL: 1206 Streamwood Lane, Vernon Hills, IL 60061 - Office: 847-541-8816 - Fax: 847-367-0625
www.municipalwellandpump.com

WISCONSIN UNIQUE WELL NUMBER **BG167**
Source: SWAP PROJECT KEYED

State of Wi-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Depth 503 FT

Property Owner: SHELBY SANITARY DISTRICT #2		Telephone Number: 608-788-1032	
Mailing Address: 2800 WARD AVE			
City: LA CROSSE	State: WI	Zip Code: 54601	
County of Well Location: 32 LA CROSSE	Co Well Permit No: W	Well Completion Date: January 1, 1981	

1. Well Location

T=Town C=City V=Village: T of SHELBY

Fire#:

Street Address or Road Name and Number: VISTA DR #2 WEDGEWOOD

Subdivision Name: | Lot#: | Block #:

Gov't Lot: or NW 1/4 of NE 1/4 of Section 10 T 15 N;R 7 W

Latitude Deg. 43 Min. 47.9078

Longitude Deg 91 Min. 11.864

Lat/Long Method:

Well Constructor: WICK, WILBERT	License #: 39	Facility ID (Public): 632031180	
Address:		Public Well Plan Approval#:	
City	State / Zip Code	Date Of Approval: 02/22/1973	
Hrcap Permanent Well #: 80926	Common Well #: 002	Specific Capacity: 2.8 gpm/ft	

2. Well Type 3 (See item 12 below)

1=New 2=Replacement 3=Reconstruction

of previous unique well # _____ constructed in 1973

Reason for replaced or reconstructed Well?: DEEPENED

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

3. Well Serves: M (# of homes and or eg: barn, restaurant, church, school, industry, etc.)

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

High Capacity: Well? Property?

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties?

Well located in floodplain?

Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method Lower Open Bedrock

Dia.(in.)	From (ft)	To (ft)
12.0	surface	122
6.0	122	440

Upper Enlarged Drillhole
-- 1. Rotary - Mud Circulation
-- 2. Rotary - Air
-- 3. Rotary - Air and Foam
-- 4. Drill-Through Casing Hammer
-- 5. Reverse Rotary
-- 6. Cable-tool Bit _ n. dia
-- 7. Temp. Outer Casing _ in. dia. _____ depth ft. Removed ?
Other

8. Geology

Geology Codes	Type, Caving Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
_CH	CLAY @ SHALE	0	35
_H_	SHALE-PRAIRIE DU CHIEN	35	55
_N_	SANDSTONE-CAMBRIAN	55	210
U_H_	SHALE-CAMBRIAN	210	318
_N_	SANDSTONE-CAMBRIAN	318	440
_Z_	UNKNOWN(1983 DEEPEN ING)	440	503

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)		From (ft.)	To (ft.)
12.0		surface	46
6.0		0	218

Dia.(in.)	Screen type, material & slot size	From	To

9. Static Water Level
180.0 feet B ground surface
A=Above B=Below

10. Pump Test
Pumping level 252.0 ft. below surface
Pumping at 200.0 GP M 0.0 Hrs

11. Well Is: 0 in. Grade A=Above B=Below
Developed?
Disinfected?
Capped?

7. Grout or Other Sealing Material

Method / Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT	surface	122.0	

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?
If no, explain

13. Initials of Well Constructor or Supervisory Driller Date Signed

Initials of Drill Rig Operator (Mandatory unless same as above) Date Signed

Additonal Comments?
Owner Sent Label? Y
Variance Issued?
More Geology?

Batch 548

VALLEY #2

Well Construction Reports

Help Reports

WI Unique Well No:	BG167	**High Capacity Well No:**	80926
County Well Location:		**DNR Region:**	West Central
County:	La Crosse	**Muni Type:**	T
Municipality:	SHELBY	**Completion Date:**	01/01/1981 **mm/dd/yyyy**
DNR Received Date:		**Constructor:**	WICK, WILBERT
Constructor Address:		**Constructor City:**	
Constructor State:		**Constructor Zip:**	
Status:	Reconstruction	**Original Year:**	1973
Replacement Reason:	DEEPENED	**Previous WI Well No:**	
Replacement WI Well No:		**Construction Type:**	1
Other Const. Type:		**Category:**	Municipal/Community
Well Depth:	503 ft	**# Services:**	
Facility Type:		**Highest Point on Property:**	
In Floodplain:		**Rotary - Mud Circulation:**	
Rotary - Air:		**Rotary - Foam:**	
Reverse Rotary:		**Cable Tool Bit:**	
Cable Bit Diameter:	in	**Temp Outer Casing:**	
Temp Casing Diameter:	in	**Temp Casing Removed:**	
Why not removed?:		**Other Drilling method:**	
Other Drilling Description:		**Screen Diameter:**	**inches**
Screen Description:		**Screen From:**	**feet**
Screen To:	**feet**	**Sealant Method:**	
Static Water level:	180 feet	**Pumping level:**	252 **feet**
Pumping at:	200	**Pumping units:**	Minutes
For:	0 **Hour(s)**	**Well Starting Depth:**	0 inches

Developed:		**Disinfected:**	
Capped:		**Proper Seal:**	
Seal Description:		**Contractor Signed on:**	
Rig Operator Signed on:		**Geologic Log Number:**	
Common Well Number:	002	**Calculated Specific Capacity:**	2.8
DNR Facility ID:	632031180	**Well Name:**	WEDEWOOD VALLEY #2
Water Quality Comments:		**Water Quantity Comments:**	
Drilling Difficulty:		**Other Driller Comments:**	
Exception Areas:		**Exception Area Comments:**	

Distances in Feet to Nearest Objects

No Records returned

Error!

The following unhandled error has occurred in the routine watr$distances.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Drillhole Dimensions

Diameter (in)	From Depth (ft.)	To Depth (ft.)
12	0	122
6	122	440

Error!

The following unhandled error has occurred in the routine watr$drill_dim.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Casing & Liner

Diameter (inches)	Description	From Depth (ft.)	To Depth (ft.)
12		0	46
6		0	218

Error!

The following unhandled error has occurred in the routine watr$casing.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Grout or Other Sealant Materials

Kind of Sealing Material	From Depth (ft.)	To Depth (ft.)	Amount	Units
NEAT CEMENT	0	122		

Error!

The following unhandled error has occurred in the routine watr$sealant.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Geology

Geology	Geology Description	Driller's Description	USGS Code	From Depth (feet)	To Depth (feet)
--CH	Clay; Shaley;	CLAY @ SHALE		0	35
--H-	Shale;	SHALE-PRAIRIE DU CHIEN		35	55
--N-	Sandstone;	SANDSTONE-CAMBRIAN		55	210
U-H-	Blue; Shale;	SHALE-CAMBRIAN		210	318
--N-	Sandstone;	SANDSTONE-CAMBRIAN		318	440

–Z-	Clay & Gravel;	UNKNOWN(1983 DEEPEN ING)		440	503

Error!

The following unhandled error has occurred in the routine watr$geology.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

Samples

No Records returned

Error!

The following unhandled error has occurred in the routine watr$ws_sample_collection.QueryList:

ORA-16000: database open for read-only access

Please contact your support representative.

- Abandonment (0 Rows)
- Variances (0 Rows)
- Rehabilitation/Redevelopment (0 Rows)
- **Other DNR information on this Well**
  - Public Water Supply System
  - High Capacity Well Data
  - Groundwater Retrieval Network Data

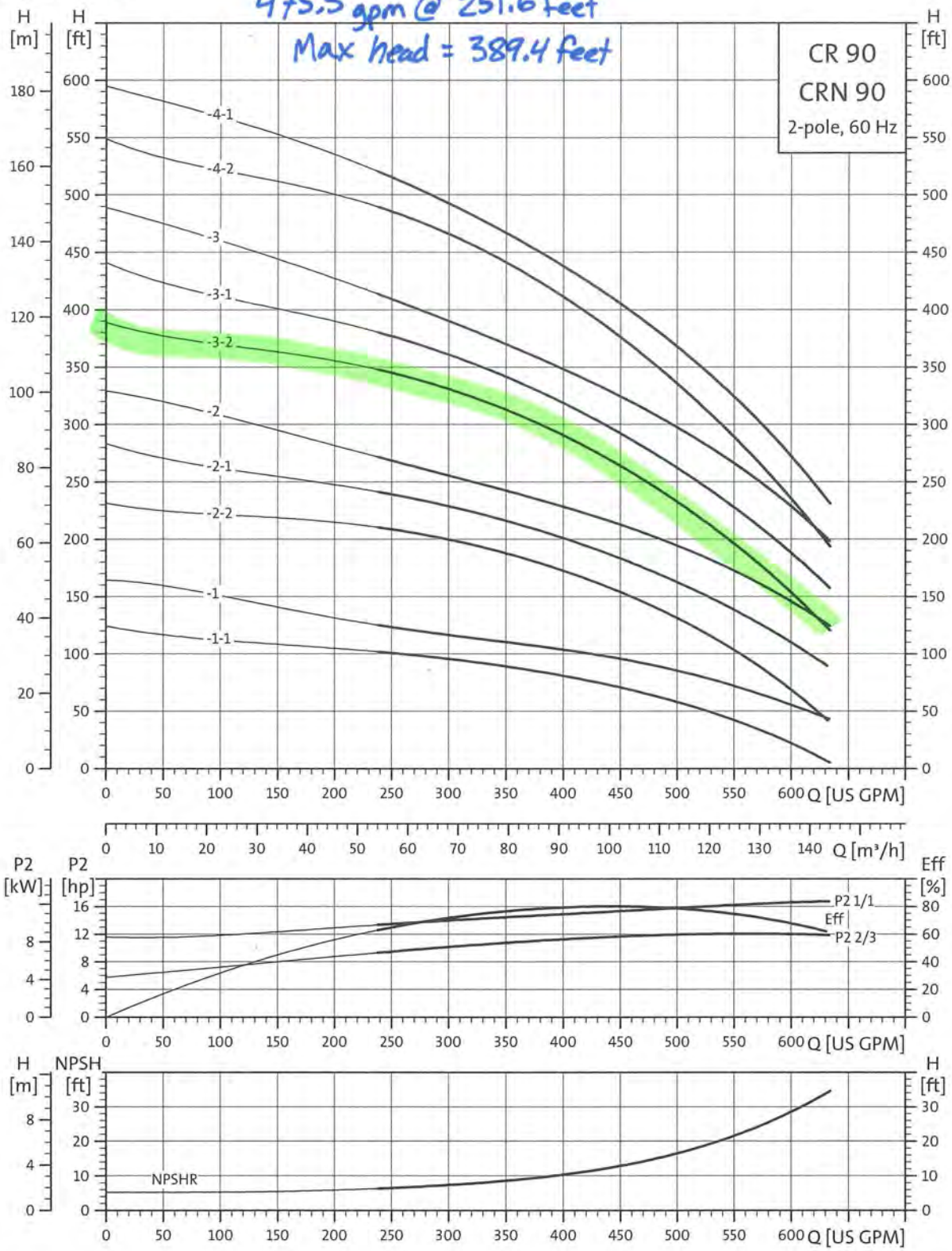
Last Revised: 03/23/2007

Appendix D

Arbor Hills Booster Pumps

Arbor Hills
High Service Pumps
CR90-3-2 A-G-A-E-KUBE
475.5 gpm @ 251.6 feet
Max head = 389.4 feet

CR, CRN 90



TM02 0042 1303

Appendix E

Wedgewood Pressure Reducing Valve

DAVY ENGINEERING CO.

(608)782-3130 FAX (608)784-6611

FACSIMILE TRANSMITTAL SHEET

TO: Jeff Brudos	FROM: Jim Kochie
COMPANY: Shelby San. Dist #2	DATE: 10/17/00
FAX NUMBER: 788-6840	TOTAL NO. OF PAGES INCLUDING COVER: 4
RE: Control Valve Information	PROJECT NUMBER: 1118-065.040

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY

NOTES/COMMENTS:

The control valve is a Watts, Figure 115 for both sizes. Attached is a copy of the catalog information for your use.

The valve supplier should verify that the valves will function correctly under the following conditions:

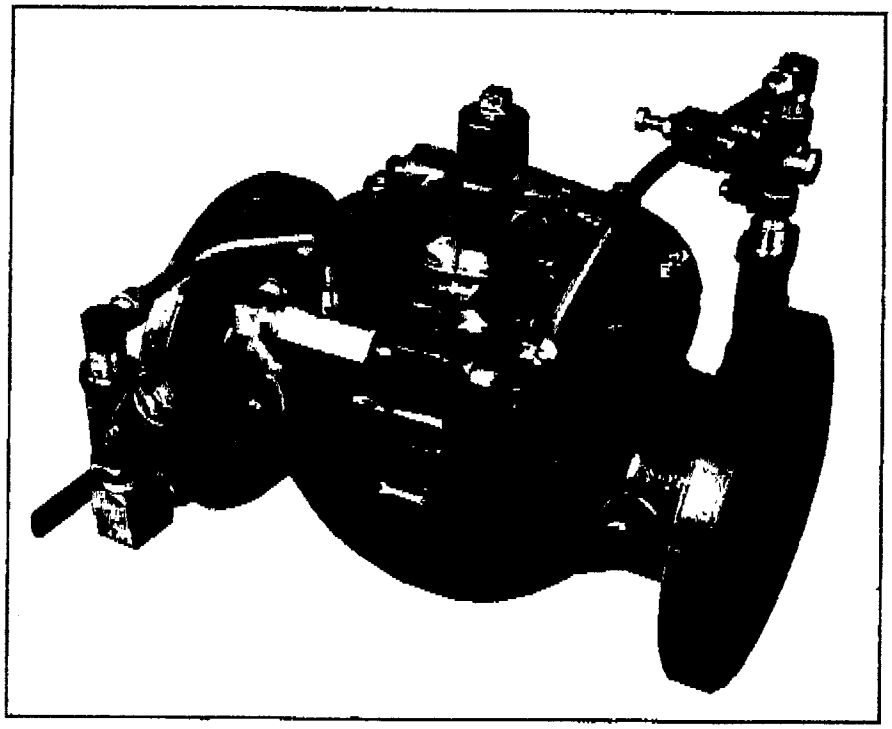
1. Maximum inlet pressure – 107 psi
2. Minimum inlet pressure – 105 psi
3. Normal outlet pressure required – 62 psi
4. Flow required during fire or flushing conditions – $\geq$ 500 gpm
5. Minimum flow – 0 gpm
6. Flow at average usage – 100 gpm

AUTOMATIC CONTROL VALVES
P.O. BOX 752289 - HOUSTON, TX 77275-2289 - PHONE (713) 943-0688 - FAX (713) 944-9445

WATTS REGULATOR MUESCO

PRESSURE REDUCING VALVES

SERIES 115



WATTS/MUESCO pressure reducing control valves reduce a higher inlet pressure to a constant, lower, outlet pressure.

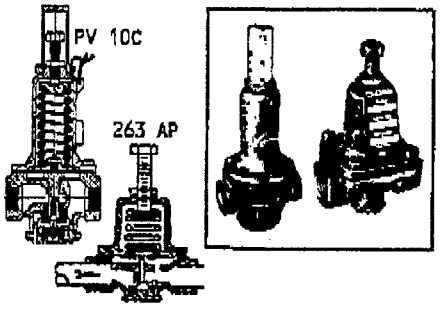
The pressure reducing function is controlled by a normally open control pilot, held open by a spring set to maintain a constant discharge pressure from the valve (adjustable). As downstream pressure increases, the control pilot throttles towards closed, modulating the main valve towards closed. Closing speed is regulated by an adjustable needle valve.

As downstream pressure decreases, the control pilot throttles towards open, modulating the main valve towards open. All Watts/Muesco reducing valves are equipped with opening speed control which regulates main valve response to downstream pressure fluctuations.

Control of the downstream pressure is constant, accurate, and automatic.

CONTROL PILOTS

WATTS/MUESCO pressure reducing control pilots are normally open, diaphragm actuated regulators. The pressure reducing set-point, is adjustable within the spring range. Downstream pressure is sensed under the diaphragm. As downstream pressure increases, the diaphragm pushes against the spring. The pilot stem/seat is pulled towards the closed position, restricting flow through the pilot. As downstream pressure decreases under the diaphragm, the spring pushes the stem/seat towards the open position, increasing flow through the pilot. This sensitive spring/diaphragm interaction closely tracks and responds to changes in downstream pressure.



SPRING RANGE FOR ILLUSTRATED PILOTS
The illustrated pilots are standard on Series 115, cast iron valves. The 263 AP is used on valves 6" and smaller and the PV 10C on valves 8" and larger.

263 AP
20-175 PSIG standard
(0-30 PSIG optional)

PV 10C
20-200 PSIG standard
(0-30 PSIG, 100-300 PSIG optional)

RECOMMENDATIONS/REQUIREMENTS

As with all automatic control valves, isolation valves should be installed in the line before and after the valve so that the valve may be isolated from pressure during start-up and in-line servicing.

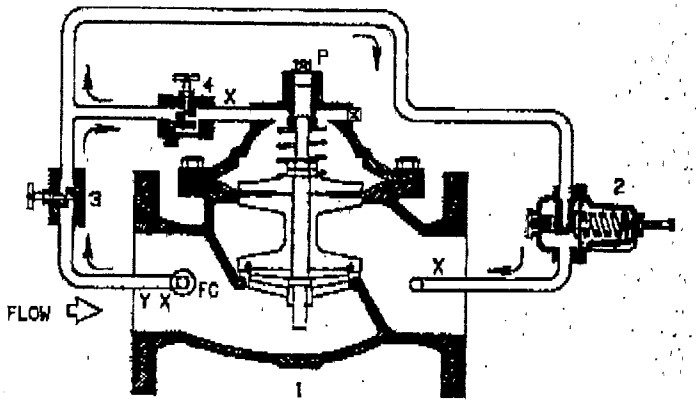
Should installation require the valve stem to be horizontal (cover pointed sideways), factory should be consulted concerning valves of 6" and larger.

WATTS/MUESCO Automatic Control Valves are hydraulically operated, diaphragm actuated, pilot controlled, globe or angle valves of packless design. The stem assembly is the only moving part in the main valve and is guided top and bottom. Positive, drip-tight closure is accomplished by a quad-ring or o-ring seat seal. The basic valve is available in Cast Iron, Steel, and Aluminum in a variety of sizes, end connections, and options. Consult the WATTS/MUESCO factory for further information.

WATTS REGULATOR MUESCO

PRESSURE REDUCING

115



COMPONENTS
1-BASIC VALVE
2-REDUCING CONTROL
3-NEEDLE VALVE- ADJ. RESTRICTION- CLOSING
4-FLOW CONTROL - ADJUSTABLE OPENING SPEED

LOCATION OF ACCESSORIES
P-POSITION INDICATOR
X-ISOLATION COCKS
Y-Y STRAINER
FC-FLO-CLEAN STRAINER

WATTS/MUESCO Figure 115 reduces higher inlet pressure to constant, lower, outlet pressure.

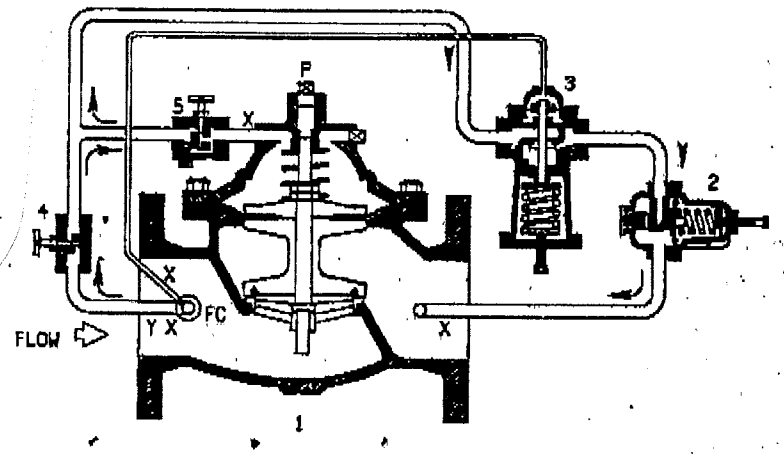
The adjustable, normally open Pressure Reducing Control throttles in response to downstream pressures, modulating the main valve to maintain the desired outlet pressure.

115-1

PRESSURE REDUCING/REMOTE SENSED Figure 115-1 functions the same as Figure 115 except downstream pressure is sensed at a remote location.

PRESSURE REDUCING/SUSTAINING

115-2



COMPONENTS
1-BASIC VALVE
2-REDUCING CONTROL
3-SUSTAINING CONTROL
4-NEEDLE VALVE- ADJ. RESTRICTION- CLOSING
5-FLOW CONTROL- ADJUSTABLE OPENING SPEED

LOCATION OF ACCESSORIES
P-BASIC VALVE
X-ISOLATION COCKS
Y-Y STRAINER
FC-FLO-CLEAN STRAINER

WATTS/MUESCO Figure 115-2 reduces a higher inlet pressure to a constant, lower, outlet pressure.

The adjustable, normally open, Pressure Reducing Control throttles in response to downstream pressures, modulating the main valve to maintain the desired outlet pressure.

If upstream pressure drops to the sustaining set-point, the Sustaining Control assumes control of the main valve.

The adjustable, normally closed, Pressure Sustaining Control remains open when pressure exceeds the set-point and throttles towards closed in response to drops in upstream pressure, modulating the main valve closed to insure a minimum upstream pressure.

WATTS REGULATOR MUESCO

SPECIFICATIONS - CAST IRON VALVE ASSEMBLIES

BASIC VALVE
- Body and Cover
  - Cast Iron - ASTM A48
  - Valve size 1 1/4"-10" are standard with fused epoxy inside and out.
- Seat (trim)
  - Bronze: ASTM B62
  - Stainless Steel (optional): AISI 303
- Internals (seat seal retainer, retainer plate, and diaphragm washer):
  - Fused Epoxy-coated - Ductile Iron ASTM A536
- Stem and Spring
  - Stainless Steel - AISI 303
- Elastomers*
  - Diaphragm: Nylon reinforced BUNA N
  - Seat Seal (quad-ring or o-ring): BUNA N

HYDRAULIC CONTROL PILOTS
- Bodies: Bronze B62
- Internals: Stainless Steel-AISI 303
- Elastomers: BUNA N

MISCELLANEOUS CONTROL ACCESSORIES
- Bodies:Bronze-ASTM B62
  Brass-BQB 626
- Internals: Stainless Steel-AISI 303
- Elastomers (where applicable): BUNA N

ELECTRICAL*
- 110 VAC, 60 Hz.
- General purpose enclosures

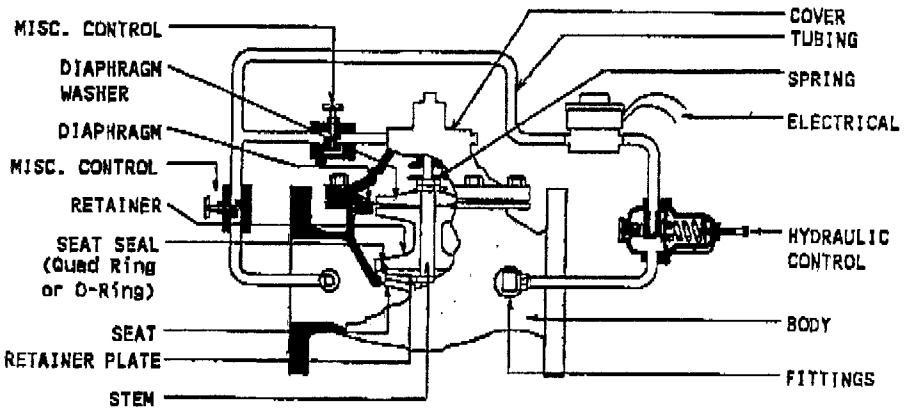
CONTROL TUBING - Copper

FITTINGS - Brass

OPERATING TEMPERATURES
- Water: +32 degrees to 180 degrees F.
- Light Petroleum Products: -40 degrees to 180 degrees F.

END CONNECTIONS/MAXIMUM WORKING PRESSURE
- 125# Flange: ANSI B16.1/200 PSIG
- 250# Flange: ANSI B16.1/300 PSIG
- Threaded ANSI: B2.1/500 PSIG

*Options available-consult factory



EXAMPLE OF STANDARD FIGURE 115-4

CAST IRON VALVE DIMENSIONS

VALVE SIZE	DIMENSION	GLOBE FLANGED 125 #	GLOBE FLANGED 250 #	ANGLE FLANGED 125 #	ANGLE FLANGED 250 #	GLOBE THREADED	ANGLE THREADED
1 1/4	A					A = 5 3/4	E = 3 1/4, F = 1 7/8
	E						
	F						
1 1/2	A					A = 5 3/4	E = 3 1/4, F = 1 7/8
	E						
	F						
2	A	8 3/8	10			A = 8	E = 4, F = 4
	E			4	4 1/4		
	F			4	4 1/4		
2 1/2	A						
	E			5 1/2	5 13/16		
	F			4	4 9/16		
3	A	12	13 1/4			A = 10 1/2	E = 4 1/8, F = 4 1/8
	E			5 3/4	6 1/8		
	F			5 3/4	6 1/8		
4	A	16	15 3/8				
	E			6 3/4	7 1/8		
	F			6 3/4	7 1/8		
6	A	20	21				
	E			8 1/8	8 7/8		
	F			8 1/2	8 7/8		
8	A	22	23				
	E			11	11 1/8		
	F			11	11 1/8		
10	A	28 3/4	31 1/8				
	E			14 7/8	15 3/8		
	F			14 7/8	15 3/8		
12	A	34	35 1/2	*	*		
14	A	39	40 1/2	*	*		
16	A	41 3/8	43 1/2	*	*		

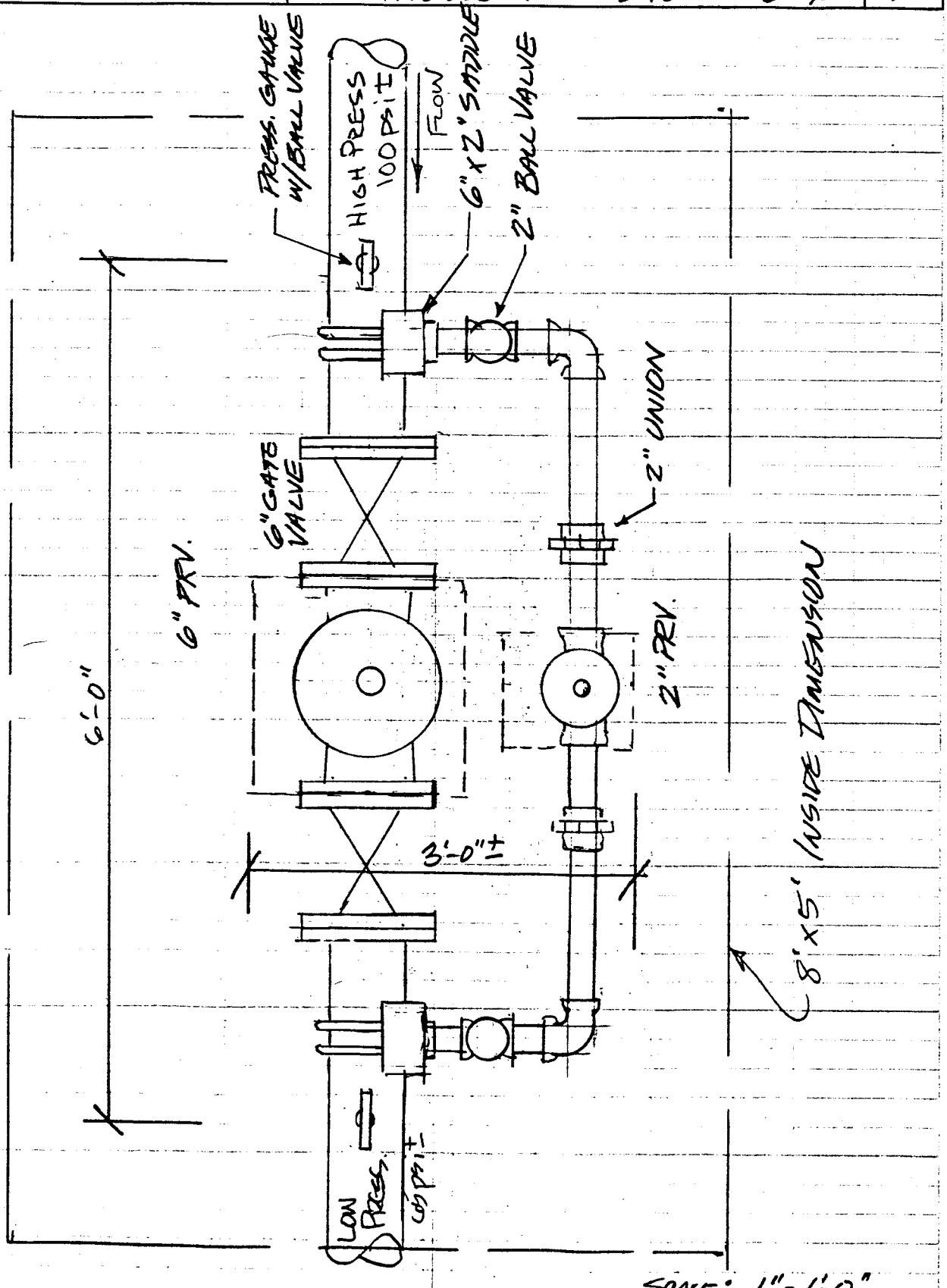
*Consult factory Steel and Aluminum valve dimensions consult factory

DAVY ENGINEERING

Project: WEDGEWOOD VALLEY PRESSURE REDUCING STATION SHELBY SANITARY DIST. #2

Project No.: 1118-065.040 Date: 10-13-00 By: JPL

PAGE 1 of 2



SCALE: 1" = 1'-0"

115 S. 6th St., P.O. Box 2076, La Crosse, WI 54602 (608) 782-3130 FAX (608) 784-6611

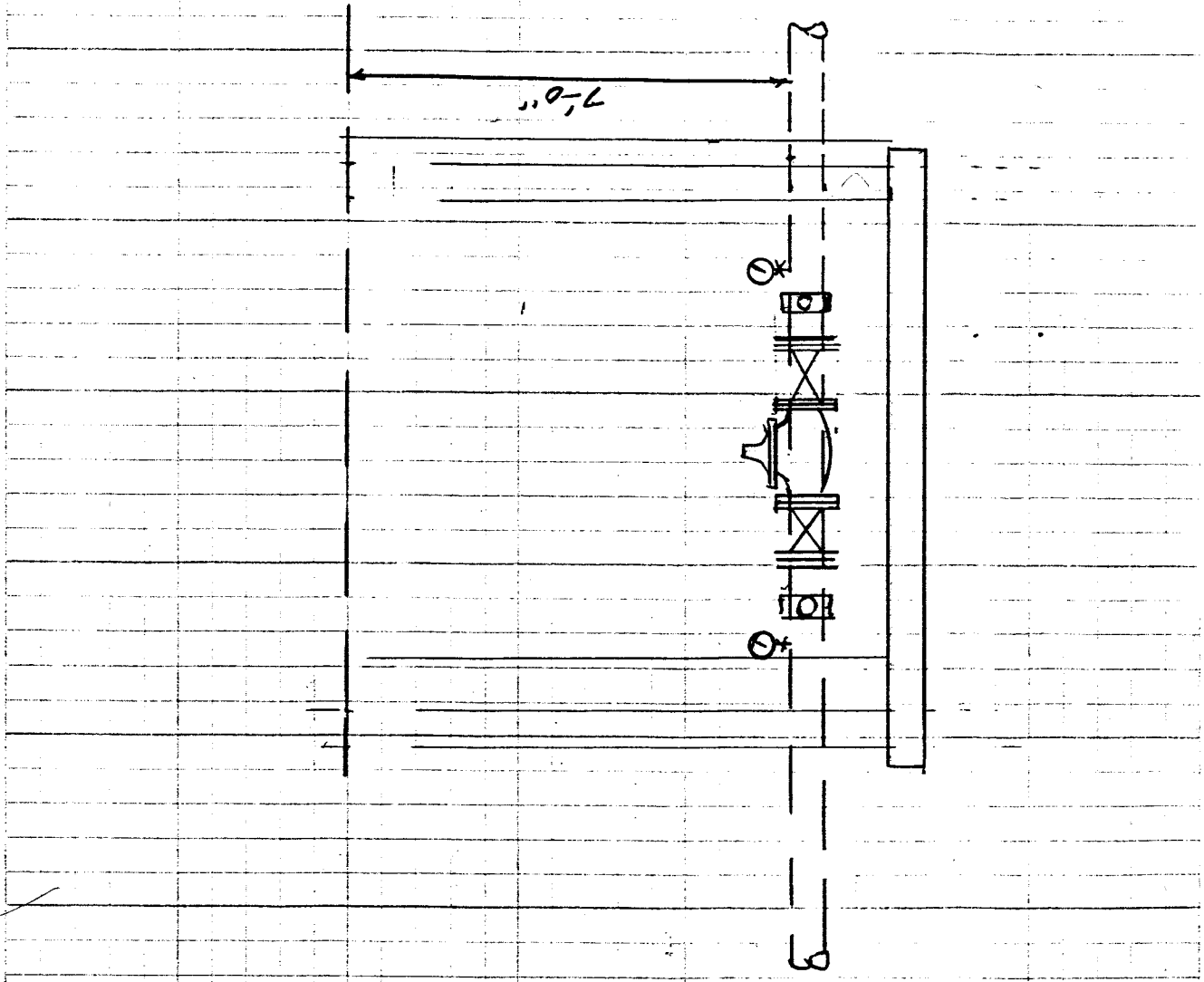
DAVY ENGINEERING

Project: WEDGEWOOD VALLEY
PRESSURE REDUCING STATION
SHELBY SANITARY DIST. #2

Project No.: 1118-065.040 Date: 10-13-00 By: JFK

PAGE 2 of 2

SCALE: 3/8" = 1'-0"



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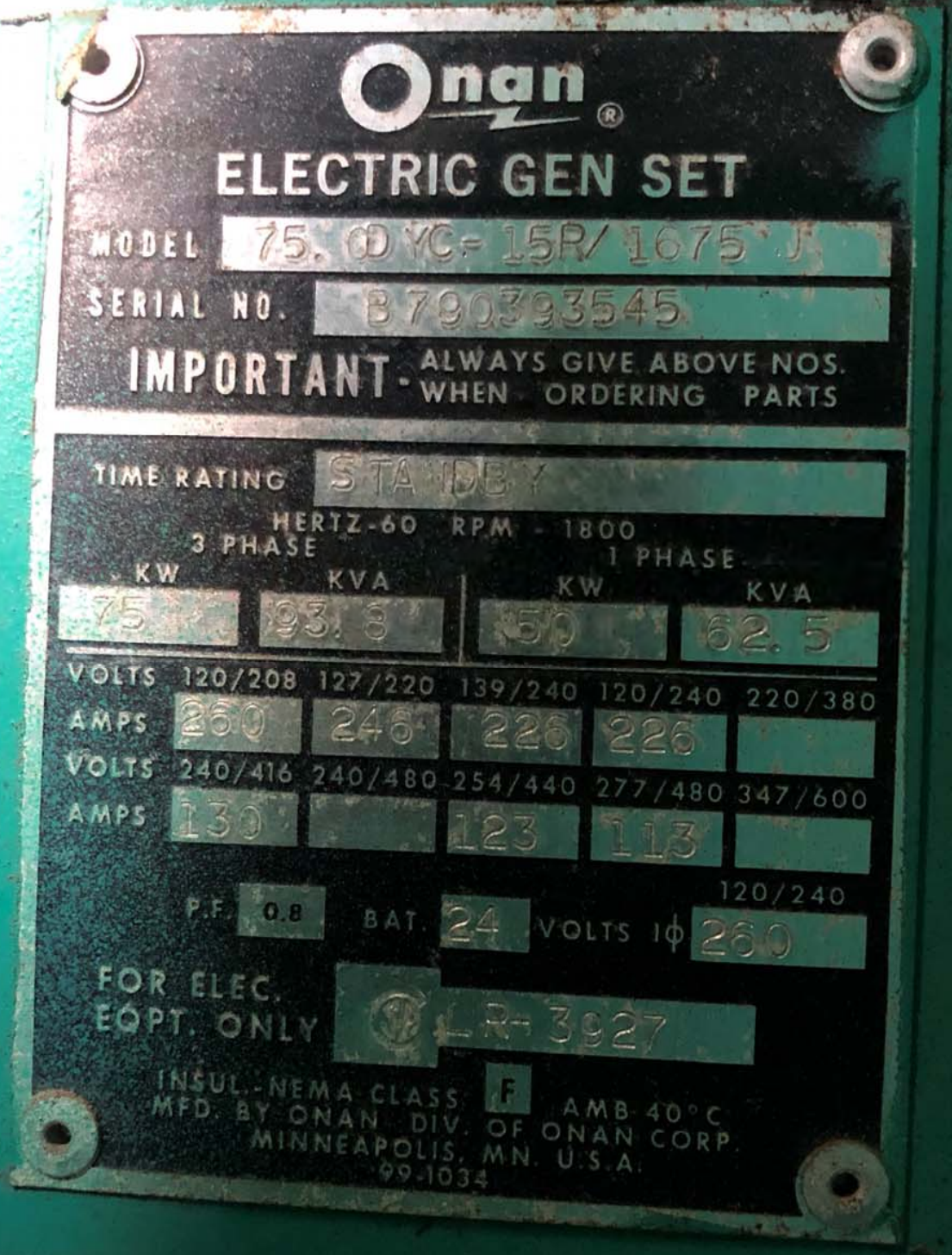
Appendix F

Arbor Hills Portable Generator Data


Onan
ELECTRIC GEN SET
MODEL 75.0DYC-15R/1675J
SERIAL NO. B790393545
IMPORTANT - ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS
TIME RATING STANDBY
HERTZ-60 RPM - 1800
3 PHASE
1 PHASE
KW KVA KW KVA
75 93.8 50 62.5
VOLTS 120/208 127/220 139/240 120/240 220/380
AMPS 260 246 226 226
VOLTS 240/416 240/480 254/440 277/480 347/600
AMPS 130 123 113
P.F. 0.8 BAT. 24 VOLTS 1φ 120/240 260
FOR ELEC. EQPT. ONLY LR-3927
INSUL.-NEMA CLASS F AMB 40°C
MFD. BY ONAN DIV. OF ONAN CORP.
MINNEAPOLIS, MN. U.S.A.
99-1034

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We're confident in our ability to balance these requirements.

SEH