FINAL

SARASOTA COUNTY

"Dedicated to Quality Service"

Water Supply Master Plan Update

Technical Memorandum 2 - Water System Assets

August 2005

carollo engineers

SARASOTA COUNTY
"Dedicated to Quality Service"

WATER SUPPLY MASTER PLAN UPDATE

TECHNICAL MEMORANDUM 2

WATER SYSTEM ASSETS

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

2.0 INTRODUCTION

Sarasota County (County) completed a Water Supply Master Plan (WSMP) in 2001. The purpose of that document was to address the County's water supply needs through 2030 as part of their comprehensive water supply planning efforts. The report outlined future water demand projections, as well as current water supplies for the County. In addition, it described and evaluated several potential new ground and surface water sources, storage technologies and options, and associated costs.

Carollo Engineers was selected to work with the County to review, update, and expand the 2001 WSMP. The primary goal of the WSMP Update (WSMPU) is to document the County's existing system and its performance to provide a basis for the continuation of sustainable water supply development throughout Sarasota County.

The major objectives of the WSMPU as developed by the County are to:

- Compile future demand projections for Sarasota County and all Alliance members.
- Prepare an inventory of existing County water facilities, including water treatment facilities, tanks, reservoirs, wellfields, and pump stations.
- Identify and document specific problems in the system, water supply weaknesses, and planned future capital improvement projects through interviews with County personnel, including water treatment facility supervisors, maintenance managers, and other pertinent staff.
- Identify evaluation criteria for preliminary assessment of potential water supply projects.
- Screen potential projects according to these criteria and work with County staff to identify the ten most promising water supply projects.
- Investigate and document the feasibility and advantages and disadvantages of the selected projects.
- Develop a 10-year Capital Improvements Program (CIP) to best satisfy the County's future water supply needs.

The WSMPU will be comprised of five technical memoranda and a final, comprehensive graphics-oriented executive summary. Two workshops also will be conducted to review

to review results of selected tasks of the project: *Workshop 1 - Demands, Assets, and Water Supply Projects* and *Workshop 2 - 2050 Water Supply Scenarios*.

This document, Technical Memorandum 2 - Water System Assets (TM2), provides an inventory of major County water system assets. This TM identifies key system components including water treatment facilities, storage tanks, and pump stations. Information regarding each asset was documented and will assist the project team in defining areas in which improvements will be needed to maintain reliable water distribution to the County's customers. Carollo also conducted interviews with key County staff, including water treatment facility supervisors and maintenance managers, to identify and document specific problems in the water system, water supply weaknesses, and planned future capital improvement projects. An analysis of the existing facilities identified current capacities, bottlenecks in the system, and system weaknesses. Information gathered under this task was evaluated to determine the system's abilities and limitations to supply water in the future. The primary objectives of TM2 are to:

- Summarize the existing water infrastructure and operational practices relative to water treatment, production, and distribution.
- Provide a basis for the development of water treatment and supply planning alternatives.

2.1 WATER SYSTEM OVERVIEW

The Sarasota County water system is comprised of three groundwater treatment facilities, surface water from a regional wholesale provider and a neighboring county, 28 wells (13.643 mgd of permitted capacity), 11 concrete ground storage tanks (24 MG capacity), 2 elevated storage tanks (2 MG usable capacity), 6 pumping stations, and several miles of distribution mains. Each of these facilities is discussed in more detail within this report. Due to changes in the water distribution system, several ground storage tanks and pump stations are not utilized under current operating conditions. The current average daily permitted quantities of water from each supply source include: University Wellfield - 2.0 mgd, Jacaranda Wellfield - 4.34 mgd, Carlton Wellfield - 7.303 mgd, Manatee County purchase - 10 mgd, and Peace River/Manasota Regional Water Supply Authority (PR/MRWSA) wholesale purchase - 5.625 mgd. Actual production from each wellfield and actual wholesale purchase quantities vary based on infrastructure constraints, water quality issues, and treatment cost.

2.2 INTERLOCAL AGREEMENTS

Sarasota County participates in interlocal agreements with both Manatee County and the PR/MRWSA. The Manatee County agreement currently allows Sarasota County to purchase up to 10 mgd of their reserve capacity. The contract decreases the maximum reserve quantity of water through 2025, at which time the agreement expires. The available contracted reserve quantity from Manatee County is provided according to the following schedule:

- March 1, 2004 through March 31, 2008 - maximum daily reserve capacity of 10 mgd
- April 1, 2008 through March 31, 2015 - maximum daily reserve capacity of 8 mgd
- April 1, 2015 through March 31, 2020 - maximum daily reserve capacity of 6 mgd
- April 1, 2020 through March 31, 2025 - maximum daily reserve capacity of 5 mgd
- After March 31, 2025 - maximum daily reserve capacity of 0 mgd

Sarasota County also has a contract to purchase 3.625 mgd from the PR/MRWSA and is a governing member of this regional water provider. The County began to purchase water from the PR/MRWSA after the Peace River Option project was completed in 2002. Prior to the Peace River Option, the PR/MRWSA did not sell water to the County. In addition to their contracted 3.625 mgd, the County purchases 2 mgd of capacity from another PR/MRWSA member, Charlotte County, bringing the total water supplied to the County by the PR/MRWSA to 5.625 mgd. Negotiations between Sarasota and Charlotte Counties may result in Sarasota County giving this additional 2 mgd of capacity back to Charlotte County prior to the original contract expiration date of September 30, 2010.

The quantity of water purchased from Manatee County ranged from 7 to 12 mgd prior to the initiation of the PR/MRWSA supply. Since beginning to purchase water from the PR/MRWSA in 2002, the quantity of water purchased from Manatee County has decreased to between 6 and 9 mgd, depending on demands. Figure 2.1 illustrates the monthly average quantities purchased from Manatee County and the PR/MRWSA from 1997 to 2004. Supply from the PR/MRWSA has typically ranged from approximately 4 to 5 mgd, although this flow may decrease during drought conditions.

Monthly Average Quantities from Peace River and Manatee County

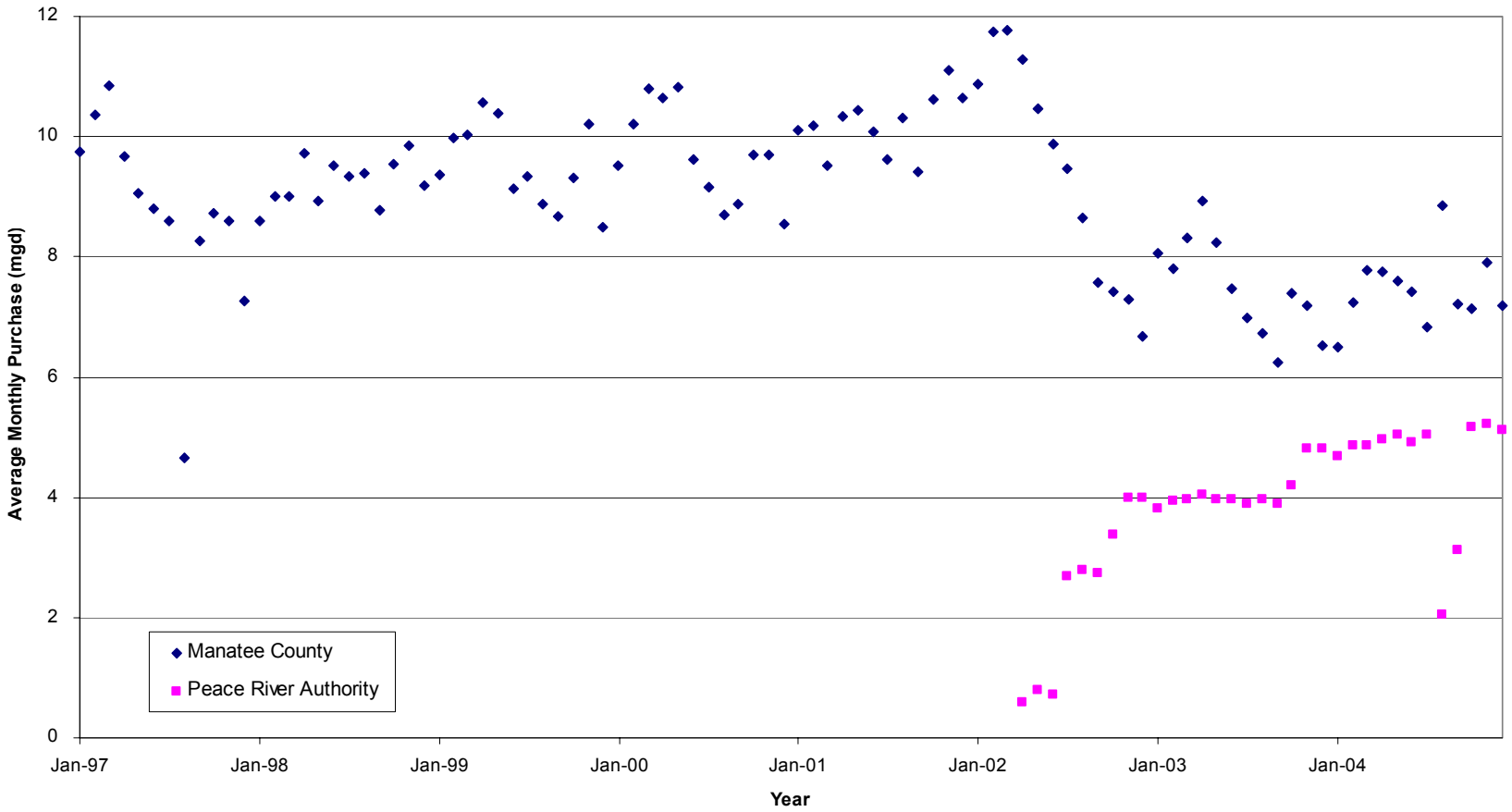

FIGURE 2.1

The PR/MRWSA is currently proposing the Regional Expansion Project, an additional facility expansion that would bring the permitted capacity of their system from 18 to 32.7 mgd. Sarasota County has proposed to purchase 9.725 mgd of the 14.7 mgd of expanded facility capacity. In total, the County has proposed to purchase 13.35 mgd from the PR/MRWSA after completion of the Regional Expansion Project. Final negotiations regarding the Regional Expansion Project will determine the quantity of water supplied by this source.

2.3 WATER TREATMENT FACILITIES

This section summarizes the design and current operation of the County's water treatment facilities and groundwater production sites. These summaries were developed from information collected through site visits, discussions with facility supervisors, operators, and County staff, review of planning and design documents, analysis of operational water quality data, and facility record drawings. The focus is on the current condition and use of the treatment facilities that are significant from a water supply perspective. The intent is to characterize the processes and transmission of water for future development of water supply projects, to identify potential areas for improvement, and to define the starting point from which process improvement alternatives can be developed and evaluated.

2.3.1 Carlton Water Treatment Facility

Sarasota County's largest water producer is the T. Mabry Carlton Water Treatment Facility (WTF). Figure 2.2 illustrates the County's water supply area and indicates the location of the Carlton WTF and Wellfield, as well as the County's other existing WTFs. The Carlton WTF is located in the southeastern portion of the county, just north and east of Interstate-75 in the T. Mabry Carlton, Jr. Memorial Preserve. The facility began production in 1995 to treat groundwater for delivery to the County's potable water system.

The Carlton Wellfield is comprised of 14 active wells with an average daily permitted pumping capacity of 7.303 mgd. The peak month permitted capacity is 9.625 mgd. The existing water use permit (WUP) was renewed in December of 1999 and is scheduled to expire on December 14, 2009. The Carlton wells are located within the Upper Floridan and the Intermediate Aquifer System and range in depth from 400 to 715 feet. Total dissolved solids (TDS) concentration in the wells ranges from approximately 900 - 2500 mg/L, with sulfate being a major constituent.

Sarasota County Water Supply Area and Water Treatment Facilities

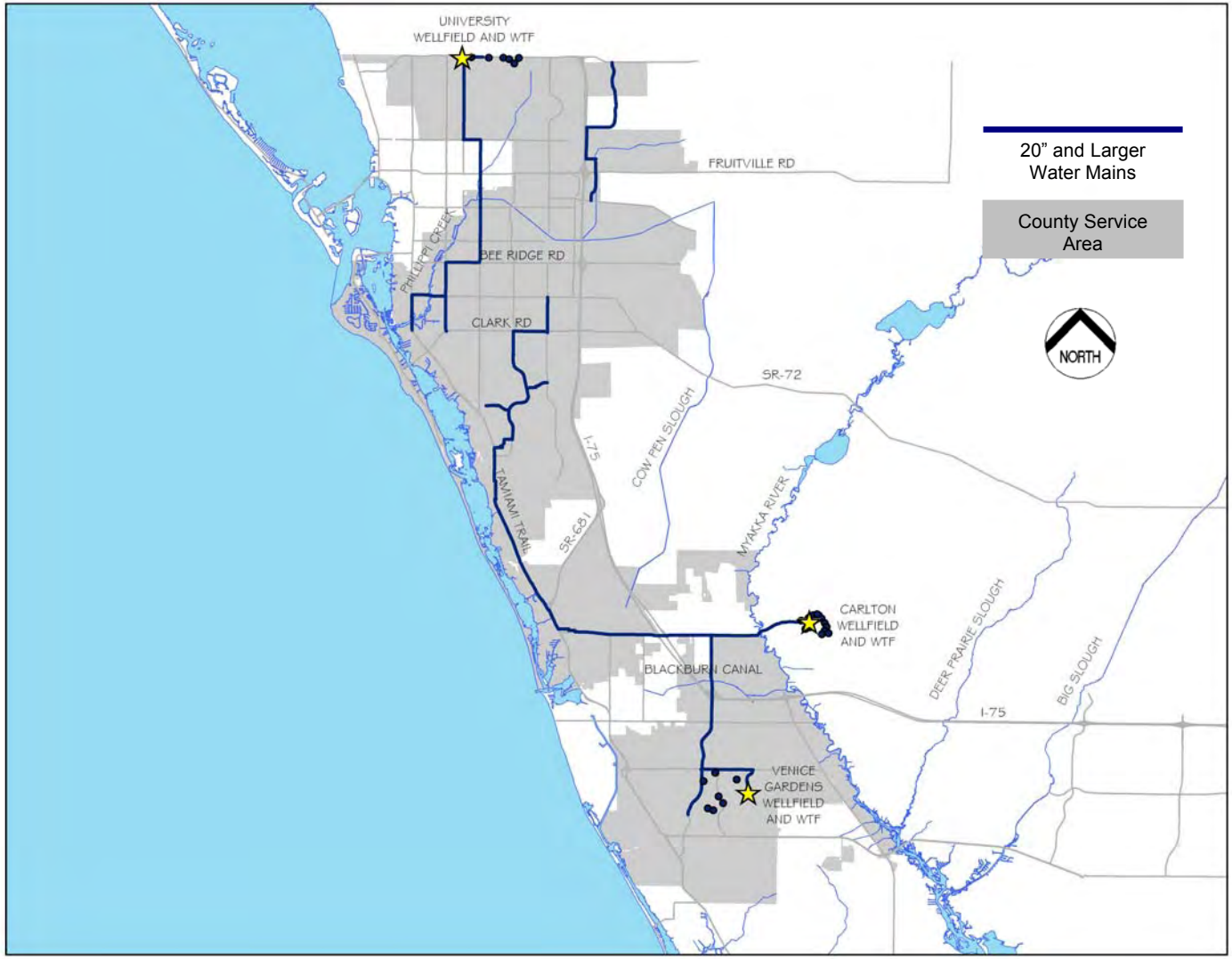

FIGURE 2.2

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Sarasota County Water Supply Master Plan Update
Technical Memorandum 2 – Water System Assets – FINAL

Sarasota County
Environmental Services

According to the Carlton WTP Operation and Maintenance Manual, the average daily design hydraulic capacity is 8 mgd, provided by 10 parallel 1.4 mgd electrodialysis reversal (EDR) treatment trains. The peak day capacity with all EDR units running is 12 mgd. The typical EDR recovery is 80%, providing approximately 5.85 and 7.7 mgd of potable water at average annual day and peak month conditions, respectively, under the current permit. Figure 2.3 indicates that the average monthly production at the Carlton WTF has varied from approximately 3 to 8 mgd over the past 8 years with an average production of 5.6 mgd.

2.3.1.1 Process Description

The Carlton WTF site and wellfield is shown in Figure 2.4. Wells are located in an approximate oval shape on the 24,000-acre site. Figure 2.5 presents a process flow schematic of the Carlton WTF. The facility's treatment elements include groundwater pumping, degasification, pressure filtration, EDR, disinfection, and pH adjustment. Figure 2.5 also shows the locations of chemical feed points. Like all other County facilities, the Carlton utilizes free chlorine (in the form of sodium hypochlorite) for primary disinfection and adds ammonia to form chloramines for residual disinfection. Treated water from the Carlton WTF is stored in an onsite ground storage tank and is pumped to the southern and central portions of the County, boosted by Pump Station No. 6.

Table 2.1 presents a summary of key process design criteria for the Carlton WTF. A description of the process train is described in the following sections.

Carlton WTF Average Monthly Water Production

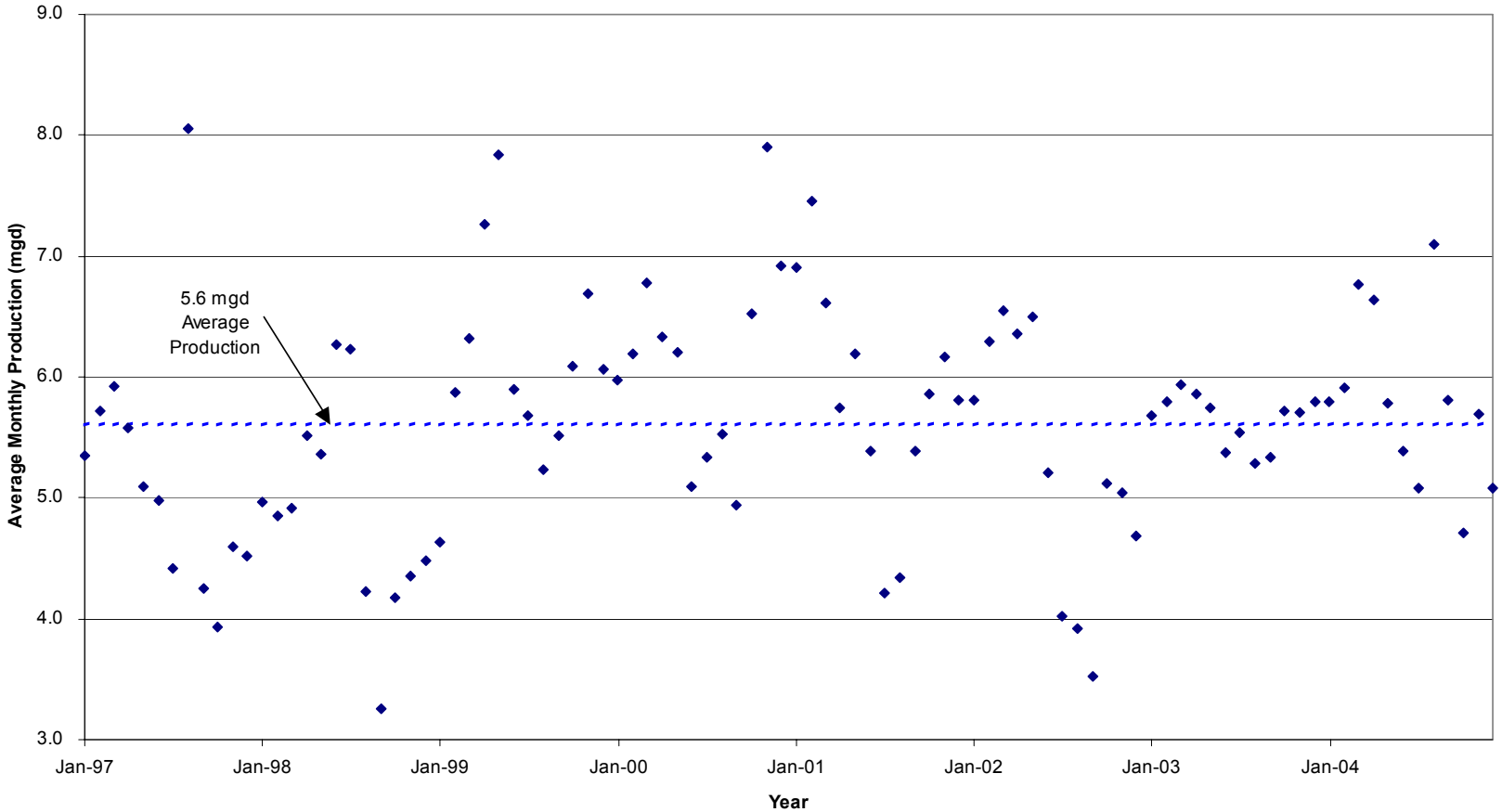
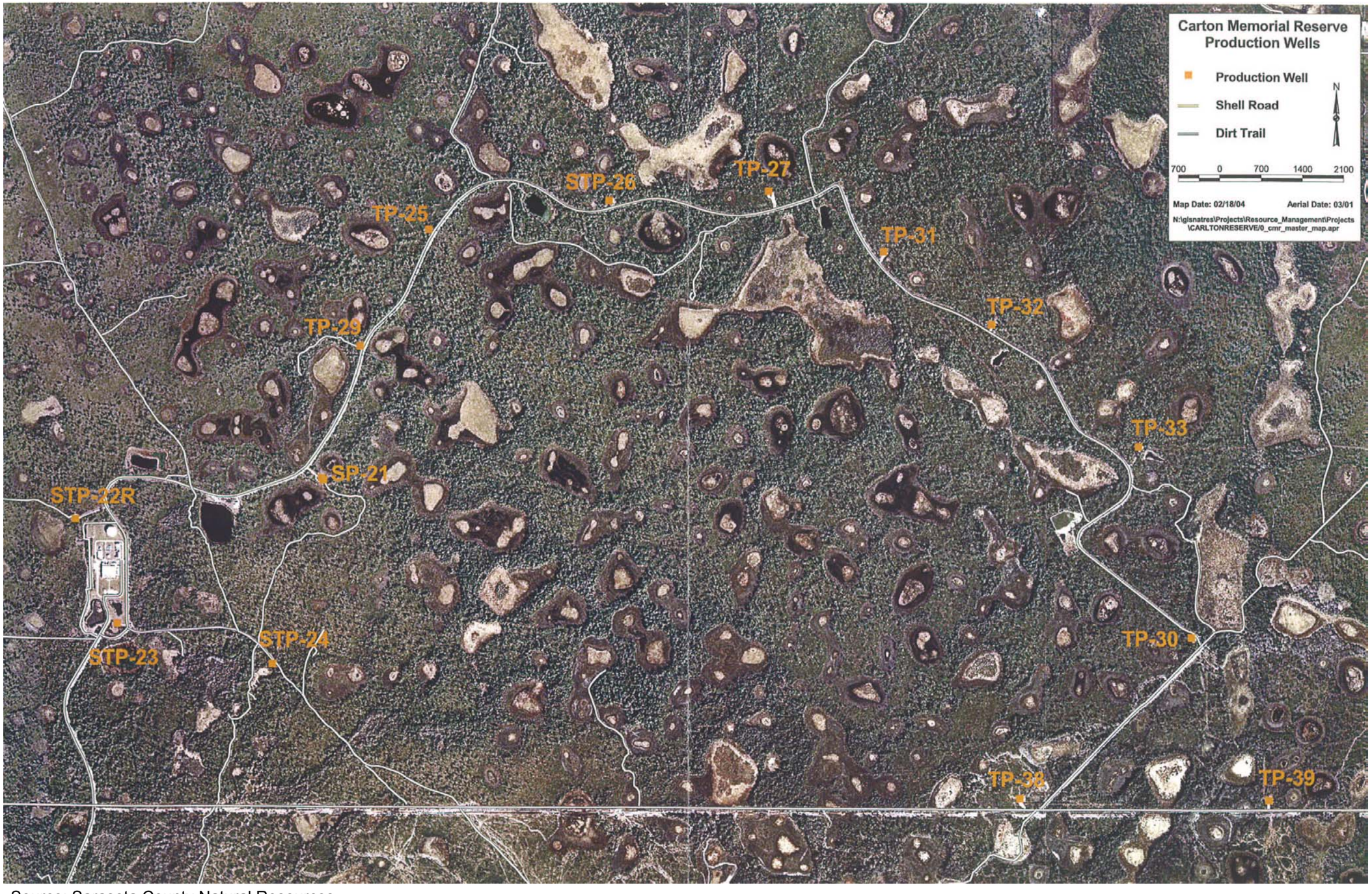


FIGURE 2.3



Source: Sarasota County Natural Resources

Carlton WTF and Wellfield Site

FIGURE 2.4

Sarasota County Water Supply Master Plan Update
Technical Memorandum 2 – Water System Assets - FINAL

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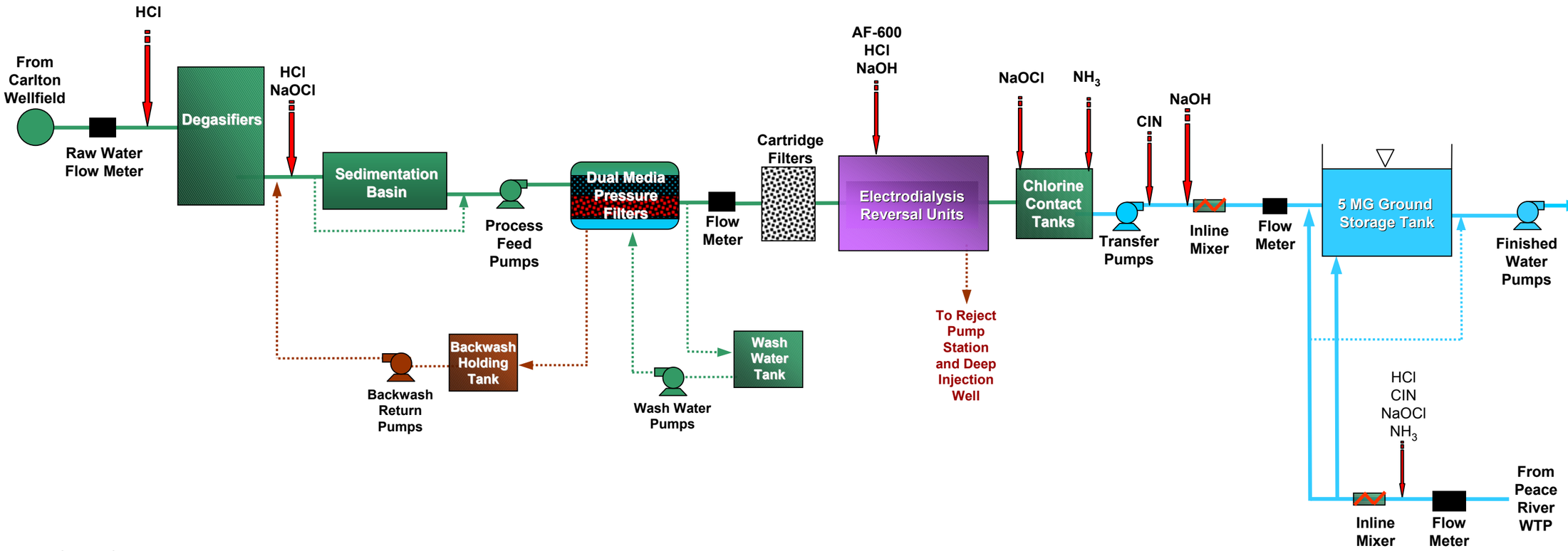

Legend

CIN	Corrosion Inhibitor
HCl	Hydrochloric Acid
NaOCl	Sodium Hypochlorite
NaOH	Sodium Hydroxide
NH_3	Ammonia
AF-600	Anti-scalant

Note: Chemicals shown in **bold** are those used regularly.

Carlton WTF Process Schematic

FIGURE 2.5

Sarasota County Water Supply Master Plan Update
Technical Memorandum 2 – Water System Assets - FINAL

Sarasota County Environmental Services

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Table 2.1 Summary of Carlton WTF Design Parameters	
Parameter	**Value**
Facility Production Capacity[1]	
Annual average day design flow, mgd	8
Maximum day flow, mgd	12
Degasifiers[1]	
No. of units	4
Type	Forced draft
Total surface area, ft^2	576
Maximum liquid loading rate, gpm/ft^2	23
Design airflow rate, cfm/ft^2	70
Sedimentation Basin[1]	
Number of basins	1
Volume, gal	105,000
Average day design flow, mgd	9.4
Overflow rate, gpd/ft^2	2,611
Detention time, min	18.6
Process Feed Pumps[1]	
Number of pumps	6
Type	Vertical turbine
Capacity, gpm	2000
Motor size, hp	200
Pump speed	Variable
Pressure Filtration[1]	
Number of vessels	5
Design hydraulic flow, mgd	15
Surface area per vessel, ft^2	432
Maximum loading rate, gpm/ft^2	6.0
Media depths	
Anthracite, in	24
Sand, in	12
Support gravel, in	15

Table 2.1 Summary of Carlton WTF Design Parameters

Parameter	Value
Cartridge Filters[1]	
Number of filters	4
Type	Vertical
Design flow per unit, gpm	3,330
Particle removal size, micron	>10
Electrodialysis Reversal[2]	
Number of units	10
Number of trains per unit	8
Number of stages (stacks) per train	4
Total number of membrane stacks	320
Number of membrane pairs per stack	300
Design feed water flow per unit, mgd	1.4
Design recovery, %	85
Design product water flow per unit, mgd	1.2
Chlorine Contact Chambers[1]	
Number of units	2
Total available volume, gal	302,000
Contact time at average daily flow, min.	48
Transfer Pumps[1]	
Number of pumps	5
Type	Vertical turbine
Capacity, gpm	2000
Motor size, hp	40
Pump speed	Variable
Finished Water Storage Tank	
Number of tanks	1
Type	Covered ground storage
Total volume, MG	5
High Service Pumps[1]	
Number of pumps	4

Table 2.1 Summary of Carlton WTF Design Parameters

Parameter	Value
Type	Horizontal, split case
Capacity, gpm	4,000
Pump head, ft	182
Motor size, hp	250
Pump speed	Variable

Notes: [1] Information obtained from *Carlton Water Treatment Plant/Wellfield Operation and Maintenance Manual*, Boyle Engineering, 1995.
[2] Information obtained from *Aquamite 120 Operations and Maintenance Manual*, Ionics, 1994.

2.3.1.1.1 Groundwater Pumping

The Carlton Wellfield has 14 active permitted wells. Withdrawals for each well range from 350 gpm to 2,300 gpm, and an operational use matrix has been developed to utilize some wells while others rest. Under current typical facility production, four to six wells are utilized at any given time. The configurations are rotated on a regular basis. Production wells range in their water quality, pump speed and type, withdrawal rate, and aquifer source. A wellfield management plan has been developed to optimize the wellfield operation and to avoid stressing particular areas of the wellfield. Chloride trigger levels were also established to control the effects of withdrawals and to provide proper resting times for each well. Chloride trigger levels are established guidelines to control the effects of wellfield withdrawals. According to the County's WUP, if the 3-month average chloride concentration for a well exceeds its trigger, or if the chloride concentration exhibits a 6-month increasing trend above the trigger level, the well is to be rotated out of service for 30 days. If at this time the chloride concentrations are not below the trigger, the Southwest Florida Water Management District (SWFWMD) is contacted for additional evaluation.

The pumps are rebuilt every five to six years for preventative maintenance or more often if problems develop. All wells were recently upgraded with mechanical seals. Further information regarding the Carlton Wellfield including well capacities and raw water quality is provided in Appendix A.

Raw water is pumped from the wells to the degasification system through a 24-inch pipeline.

2.3.1.1.2 Degasification

Raw water enters one of four degasifiers in which countercurrent forced air and water flow over baffles to strip hydrogen sulfide from the water. The baffles are constructed of horizontally mounted PVC bars, which provide turbulence and surface area to aid in degasification. No significant bio-growth problems have been experienced, and an annual inspection of the interior has been sufficient for maintenance requirements.

The flow from the degasifiers gravity feeds to a sand trap basin located directly below the equipment where sodium hypochlorite is drip injected to obtain a trace chlorine residual throughout the remainder of the facility. Following the sand trap, the flow spills over a weir to the sedimentation basin to further remove fine sands and solids before entering the pressure filtration vessels.

2.3.1.1.3 Sedimentation

Following degasification, water flows over a weir into the sedimentation basin. The basin was designed to remove fine sands and solids prior to entering the pressure filtration vessels. Residuals accumulate very slowly in the basin. When necessary, the solids are pumped to the backwash holding tank. The rectangular basin has grout-filled corners that slope to form a circular bottom. The basin originally contained a residuals removal device; however, the scraper mechanism was not needed so facility staff removed it. A bypass line was constructed around the sedimentation basin; however, it was designed to transfer only half of the facility's design flow.

2.3.1.1.4 Pressure Filtration

The Carlton WTF utilizes five pressure filtration vessels for removal of fine particles not removed by the sedimentation basin. The dual media filters are currently controlled by Allen-Bradley PLCs that are scheduled to be replaced due to their age and condition. Although the PLCs feed information into the facility's SCADA system, facility staff control the filters manually.

The pressure filtration tanks and downstream treatment processes (through the chlorine contact tanks) are fed via 6 high-pressure feed water pumps. The pumps are located at the sedimentation basin effluent and are controlled with variable frequency drives (VFDs) in order to maintain a constant pressure throughout the facility. The feed water pumps are rebuilt on a rotational basis (approximately every 5 to 6 years according to facility staff).

The pressure filters are backwashed primarily based on a filter runtime of 200 hours. If the pressure in the filters exceeds 10 pounds per square inch (psi) prior to the 200-hour point, the filters go into an alarm mode and cannot be reset without performing a backwash cycle. However, facility staff could not recall a time when this occurred. The filters also enter an

advisory alarm mode if they exceed 200 hours of runtime, but they are still operable until they exceed a headloss of 10 psi. The backwash holding tank is cleaned approximately once annually, and the solids collected from the tank are dried onsite and sludge is hauled to a landfill. Facility staff stated that sludge hauled to the landfill amounts to approximately 3 cubic yards per year.

2.3.1.1.5 Electrodialysis Reversal

Ion exchange (IX) membranes are used as a separation process to allow selective passage of ions, or charged species, in the flow stream. Only anions, or negatively charged ions, can pass through an anion exchange membrane, while cation exchange membranes transport positively charged ions or cations. Carlton's EDR system utilizes an electrodialysis (ED) process in which ions are transferred through ion exchange membranes by means of direct current (DC) voltage. During the ED process, ions are removed from the feed water as the current drives the ions through the membranes to desalinate the process stream. It should be noted that prior to entering the ED process, water flows through one of four cartridge filters to remove fine silt and sand before entering the membranes.

Current polarity reversal causes the concentrating and diluting flow streams to switch after every cycle. Any fouling or scaling constituents are removed when the process reverses, sending fresh product water through compartments previously filled with concentrated waste streams. Therefore, EDR systems operate with a high concentration in the brine or concentrate streams with less flow to waste. Typically, the Carlton system operates at 80 to 85 percent recovery rates.

The EDR system consists of 10 individual units each capable of producing 1.2 mgd of product water, creating a peak facility capacity of 12.0 mgd with all units operating. Facility capacity with one unit out of service for maintenance yields a facility capacity of 10.8 mgd. Each EDR unit consists of 8 individual trains, each of which contains 4 stages of membrane stacks. Each stage reduces the TDS by approximately 30%. The facility's 320 stacks are rotated and maintained on a regular basis.

2.3.1.1.6 Chlorine Contact Chambers

Following the EDR treatment process, product water flows into one of two chlorine contact chambers. Liquid chlorine is added to the contact chamber influent via 2 mechanical mixers. Water flows around a series of baffle walls to attain the contact time required for disinfection. Ammonia is added at the end of the chlorine contact chambers to form chloramines for residual disinfection. Contact tank effluent flows over a weir and is then pumped to the ground storage tanks via the transfer pumps.

2.3.1.1.7 Chemical Feed Systems

Figure 2.5 illustrated the chemical feed points at the Carlton WTF. Chemicals shown in bold are those used regularly. The following describes the chemical feed strategies currently employed at the Carlton WTF:

- Hydrochloric acid - pH adjustment for degasification.
- Sodium hydroxide - pH adjustment for desired finished water pH.
- AF-600 - EDR membrane anti-scalant.
- Orthophosphate - corrosion inhibition. The County is considering switching the corrosion inhibitor to an orthophosphate/polyphosphate blend in the near future.
- Chlorine - disinfection. The Carlton WTF was converted from gaseous chlorine to liquid sodium hypochlorite in 2003. Liquid chlorine is added to the chlorine contact chambers where contact time to meet primary disinfection requirements occurs.
- Ammonia - Ammonia is added to the end of the chlorine contact chambers for the formation of chloramines for residual disinfection. The typical chlorine to ammonia ratio target is approximately 4.8 to 1. The target finished water chloramine residual concentration is 4 mg/L.

The chemical storage area is located in the center of the WTF site with the bulk storage tanks stored outdoors and the day tanks and chemical feed pumps stored in individual interior rooms. The bulk storage tank containment areas were coated approximately six years ago, and the coating is still in relatively good condition. However, the corrosion inhibitor containment area that was installed approximately 2 years ago was not coated and is now experiencing some corrosion. Facility staff stated that they will coat this containment area soon. Chemical storage tank information is presented in Table 2.2. It should be noted that due to its low use, the AF-600 anti-scalant is bought in 55-gallon drums and is pumped into the day tank.

Chemicals are fed in a manual mode, usually based on the number of EDR units in operation. Although there is the capability to flow pace some of the chemicals, facility staff prefer to operate the chemical feed pumps manually. They stated that the varying flow from the EDR units (due to the flushing cycle after polarity reversal) makes it difficult to use automatic equipment that operates best in constant flow conditions. Facility staff has been unsuccessful in flow pacing chemicals downstream of the EDR units; however, some of the pretreatment chemicals have been flow paced successfully in the past since they are based on relatively constant influent flows.

Table 2.2 Carlton WTF Chemical Storage Facilities				
Chemical	**Number of Bulk Tanks**	**Bulk Tank Volume (gal)**	**Total Volume (gal)**	**Tank Manufacturer**
Hydrochloric acid	2	13,000	26,000	Industrial Plastic Systems
Sodium hypochlorite	4	2,500	10,000	Schneider
Sodium hydroxide	1	16,300	16,300	Industrial Plastic Systems
Ammonia	1	1,000	1,000	Bower Ammonia Co.
Orthophosphate	1	2,500	2,500	Justin Tanks

2.3.1.1.8 Brine Disposal

Residuals handling at the Carlton WTF includes EDR brine and pressure filter backwash disposal. The brine and backwash water are stored onsite in an underground storage tank and are pumped via 5 transfer pumps to deep injection wells (DIWs) that are located offsite. The Carlton WTF can pump reject water to 1 of 3 deep injection wells, the Center Road DIW, the Venice Gardens Water Reclamation Facility (WRF) DIW, and the Venice Gardens Water Treatment Facility DIW. Normal operation disposes of reject to the Center Road DIW. The deep injection wells range from approximately 1500 to 1900 feet deep and discharge high TDS concentration water into a confined layer deep beneath the earth's surface. Flow to the deep injection wells is continuously monitored. The Center Road DIW permit requires a maximum sustained pressure of 72 pounds per square inch at the wellhead and a peak flow of 4 mgd (2776 gpm). The Venice Gardens WRF DIW permit requires a maximum sustained pressure of 107 pounds per square inch at the wellhead and a peak flow of 6 mgd (4167 gpm). The requirements of the Venice Gardens WTF are described in Section 2.3.2.1.

2.3.1.2 Peace River Supply

The County is contracted to receive 3.625 mgd of water from the PR/MRWSA. The County is also currently purchasing a portion, 2 mgd, of Charlotte County's contracted flows; however, this quantity may be given back to Charlotte County within the next year. The flow from the Authority is transported to the Carlton WTF via a 42-inch steel, mortar-lined transmission main. The water is blended with the finished water from the Carlton WTF in the Carlton Ground Storage Tank. There are provisions to re-chlorinate the Authority water before it blends with Carlton water; however, the chlorine residual is typically at adequate levels. If the residual is low, the chlorine level from the Carlton WTF is increased to compensate since both waters are blended in the ground storage tank.

2.3.1.3 Treated Water Storage and Delivery

The Carlton WTF utilizes a 5 MG ground storage tank and a high service pump station to provide supply to portions of southern and central Sarasota County. The high service pump station is comprised of four 250-hp high service pumps. New VFDs for each high service pump were installed in May and June of 2005. Pump Station No. 6 provides further boosting to northern areas of the distribution system.

2.3.1.4 Finished Water Quality

Finished water quality data were tabulated for the Carlton WTF based on reports submitted to the Florida Department of Environmental Protection. Table 2.3 provides a summary of effluent water quality parameters from January through December of 2004.

Table 2.3 Carlton WTF Finished Water Quality[1]

Parameter	Average
Total dissolved solids (mg/L)	407
pH (pH units)	7.7
Residual chlorine (mg/L)	4.1

Notes: [1] Based on data from June 2004 through May 2005.

2.3.1.5 Operations and Maintenance Costs

The primary operations and maintenance (O&M) costs at the Carlton WTF are chemicals, electricity, replacement parts, and labor for facility operation and routine maintenance. The EDR treatment process is power and labor intensive. Carlton WTF staff stated that the average monthly electric power cost to operate the raw water wells and the WTF is approximately $72,000. Based on average daily production of 6 mgd, the power cost can be estimated at approximately $0.40 per 1000 gallons.

Chemical costs vary according to chemical type and dosage. Because treatment operations may be changing in the near future, the historical chemical costs may not be indicative of future chemical costs. Therefore, chemical cost estimates are being developed under a different project being done by Carollo Engineers for the County, which is investigating treatment optimization alternatives using different chemicals and dosing strategies at the County's water treatment facilities.

2.3.1.6 Planned Future Upgrades or Modifications

The Carlton WTF is in various stages of investigating or implementing several projects to improve the facility's efficiency and production. These projects include:

- The original average day design capacity of the Carlton WTF was 8.0 mgd with a peak day capacity of 12.0 mgd. Recently, the County has investigated the use of new membranes and/or the expansion of the existing trains to obtain additional treatment capacity. An increase in the Carlton Wellfield Water Use Permit also would be required. New membrane spacers could increase the capacity of the units while reducing maintenance requirements and producing higher quality water. An evaluation by GE Ionics will determine the efficiency and product water quality of retrofitting the existing EDR units with new spaces, as well as with the new generation of EDR equipment. A summary of the options provided by Ionics will be provided in TM3 - Water Supply Projects, which will discuss the alternatives for additional water supply.

- The facility is in the midst of a VFD upgrade, which will include installing 20 new VFDs throughout the facility. The 4 high service pump VFDs were replaced in June 2005. The 6 high pressure feed water pump VFDs will be replaced in September 2005. These VFDs are located in an enclosed building next to the sedimentation basin and feed pumps. During construction, the VFDs will be placed upon newly constructed concrete pads in order to raise their elevation. The current floor elevation is too low, which allows water to contribute to corrosion. The wiring to the pumps will also be pulled and replaced during this facility upgrade. Ten additional VFDs are scheduled to be replaced throughout the facility in the next few years. The feed water pump VFDs are scheduled to be replaced in October 2005.

- An additional ground storage tank will be constructed in 2007. Plans for a new high service pump station also are being considered, although this project would occur after the completion of the ground storage tank.

- Infrared scans on breakers and electrical equipment have been completed in the past on some facility equipment and have provided an opportunity to identify problems before they become a large maintenance issue. Facility staff are considering implementing a program to conduct regular infrared inspections on all facility equipment.

- A chemical strip was performed on the dual-media pressure filters in 2002. The filters experienced little filter media loss, and it appeared to be a good way to rejuvenate the filters. Facility staff plan to continue this on a regular basis every 2 to 3 years to extend media life.

- A cover for the sedimentation basin will be installed in 2006. The cover likely will be an aluminum roof with screened walls.

- The County may construct up to 5 additional groundwater wells in the future to increase rotational capabilities.

- A project to install new air pipes to transfer compressed air to the facility is currently underway. The project also entails replacing the existing air compressor with a new compressor. The air will provide power for tools and may operate new valves on the EDR units, depending on system upgrades.

2.3.1.7 Summary of Key Operational and Infrastructure Issues

During interviews with facility staff, several operational and infrastructure issues were identified. Notes from visits with Carlton WTF staff are included in Appendix B. The following points summarize the problems that were identified by facility staff:

- The pressure filter PLCs require frequent replacement (approximately every 2 years) due to corrosion of the chassis in the rear of the PLC. Facility staff would like to relocate these PLCs in future facility upgrades.

- A new SCADA system, software, and computer system is needed for the facility, as well as for the entire water system. The system is often overloaded with information, runs slow, and is hard to manipulate. Wonderware is installed at the Venice Gardens WTF and is being tested at the University WTF. Depending on the trial runs at the University WTF, Wonderware may be implemented at the Carlton WTF.

- The facility still has several original PLCs, including PLCs on the individual EDR units, which are outdated and difficult to obtain new parts.

- The motor operated valve (MOV) couplers in the EDR units wear out quickly and are hard to repair. Facility staff must retrofit the couplers themselves because replacement valves are not compatible.

- Chemical feed piping is difficult to access due to its location in tunnels under concrete sidewalks.

- The process feed pump room sits at a low elevation, gathering water that leads to accelerated corrosion of the equipment and wiring.

- As the facility grows, they will need additional staff. Currently, the facility is operated and maintained by 14 persons, including 2 supervisors, 11 operators/maintenance personnel, and 1 pump mechanic. As the production of the facility increases, the

facility will need to increase staffing to respond to facility maintenance issues more quickly.

During the interviews with facility staff, the following recommendations regarding the Carlton WTF were suggested:

- Increase capacity by increasing voltage, thereby obtaining greater TDS removal. This would allow some water to be bypassed and blended. Installation of a bypass pipe would be required to consider this option.
- Current domestic irrigation days (Sunday and Tuesday) create significantly higher demands, especially during dry periods. Facility staff suggested moving towards a Monday through Friday watering program to spread the watering demand over more days and to equalize demand. This could be done based on the last digit of addresses (0 and 1 on Monday, 2 and 3 on Tuesday, etc.).
- A high-pressure blowoff or air release valve would be helpful in the two EDR headers.

2.3.2 Venice Gardens Water Treatment Facility

The Venice Gardens WTF and Jacaranda Wellfield are located in the southwestern portion of the County, just east of Jacaranda Boulevard and north of Indian Hills Boulevard. The WTF and wellfield were bought from Southern States Utilities in December 1994 to increase water supply in the County's southern areas. The facility was operated by the County until 1996, at which time it was taken offline since the Carlton facility had been brought online and was able to provide sufficient supply to the southern areas of the County. The Venice Gardens WTF remained in a standby mode for approximately six years. As the County's demand increased and in order to utilize the County's existing WUP, part of the facility was upgraded and brought back online in July of 2002. The current membrane system operates at approximately 50% recovery and has a capacity of approximately 750,000 gallons per day. Figure 2.6 indicates that the average monthly production at the Venice Gardens WTF has varied from approximately 130,000 to 280,000 gallons per day since the facility was brought back online in 2002 with an average production of 167,000 gallons per day throughout this time.

The Jacaranda Wellfield is comprised of 7 active wells with an average daily permitted pumping capacity of 4.43 mgd. The peak month permitted capacity is 4.47 mgd. Wells #1 through #5 provide water to Building 2, while Wells #6 and #7 provide water to Building 1. Building 1 contains the portion of the facility that was upgraded with new membranes and other equipment to bring the facility back online in 2002.

Venice Gardens WTF Average Monthly Water Production

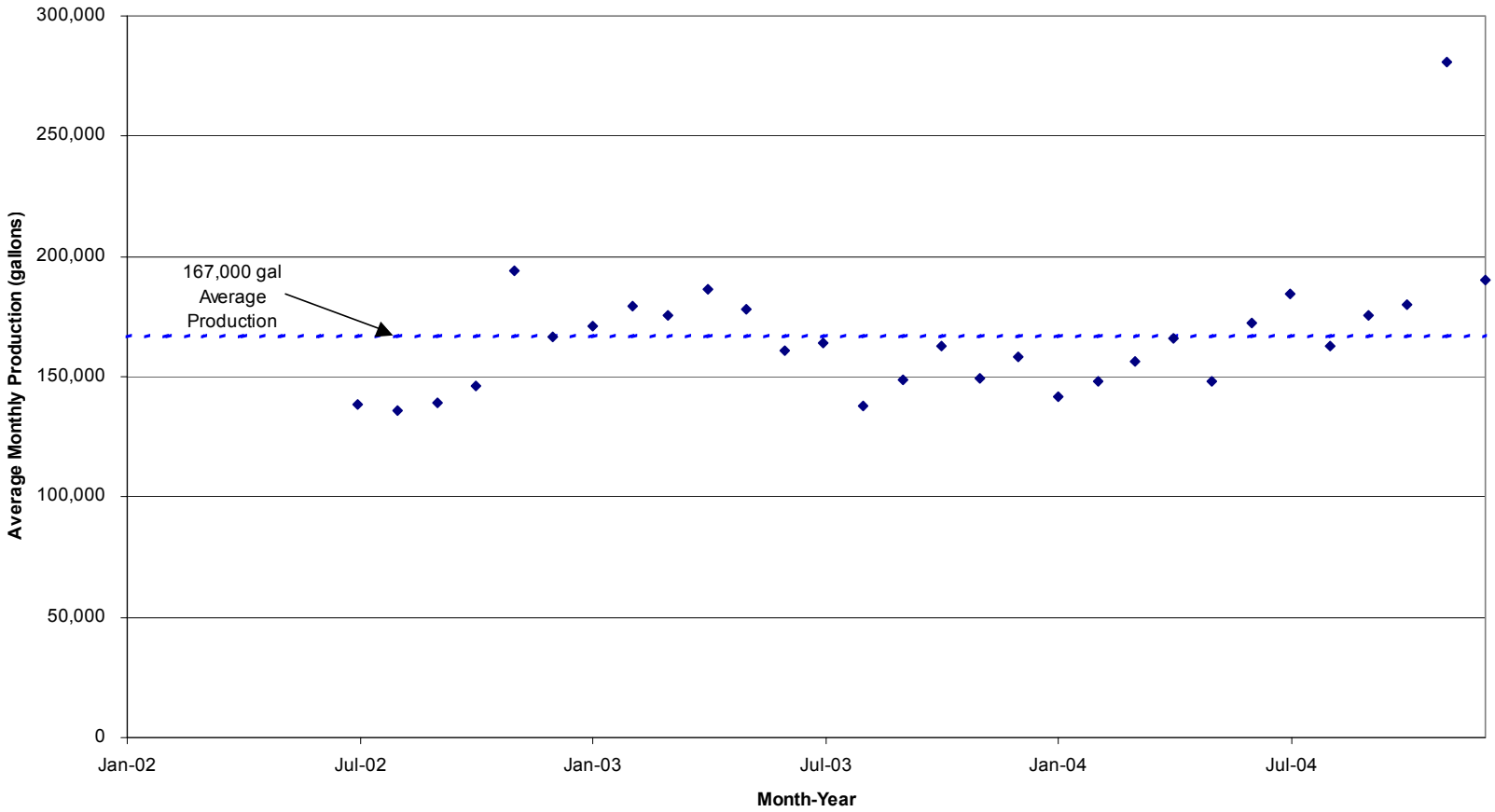


FIGURE 2.6

The existing WUP was issued in September of 1996 and is scheduled for renewal in 2006. The Jacaranda wells are located within the Intermediate/Upper Floridan Aquifer System and range in depth from 520 to 530 feet. Total dissolved solids (TDS) concentration in the wells ranges from approximately 2000 to 3000 mg/L, with sulfate being the major constituent. The existing RO membranes allow some raw water to be blended into the RO product stream while still meeting the secondary water quality standard of 500 mg/L of TDS. Currently, raw water is blended with RO product water at approximately a 1 to 5 ratio. On the day of the facility site visit, the system was blending approximately 500 gpm of RO product water with 100 gpm of raw water to produce the finished water.

The County recently acquired the permitted quantities for two additional wells, RO-9 and RO-10, after acquiring land that had an existing WUP. These two wells are not yet connected to the Venice Gardens WTF, but they could provide additional flow in the future.

2.3.2.1 Process Description

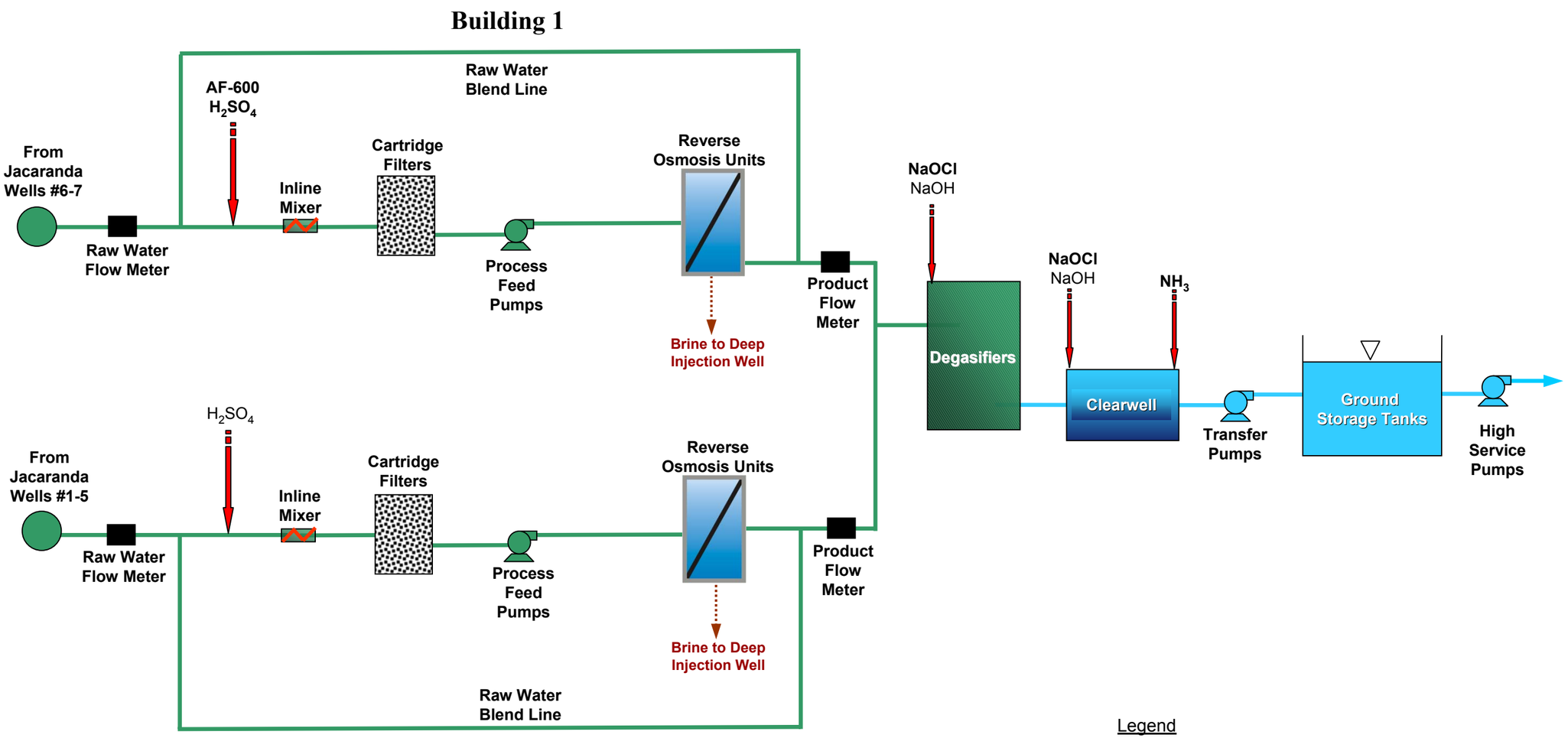
The Venice Gardens WTF and Jacaranda Wellfield site are shown in Figure 2.7. Wells are located on the WTF site and to the south and east of the site. Figure 2.8 presents a process flow schematic of the Venice Gardens WTF. The facility's treatment elements include groundwater pumping, pH adjustment, anti-scalant addition, cartridge filtration, reverse osmosis, degasification, and disinfection. Figure 2.8 also shows the locations of chemical feed points. Like all other County WTFs, the Venice Gardens WTF utilizes free chlorine (in the form of sodium hypochlorite) for primary disinfection and adds ammonia to form chloramines for residual disinfection. Treated water from the Venice Gardens WTF is stored in onsite ground storage tanks and is pumped to the southern and central portions of the County. The Venice Gardens WTF was equipped with a new SCADA system and Wonderware computer software during the 2002 upgrade. Although the facility currently is incompatible with the rest of the water distribution system software, their system will be easily integrated once the remaining WTFs and pumps stations are upgraded with new software and automation and control equipment.

Table 2.4 presents a summary of key process design criteria for the Venice Gardens WTF. A description of the process train is provided in the following sections.

Venice Gardens WTF and Jacaranda Wellfield Site

Source: Sarasota County Natural Resources

FIGURE 2.7



Legend

H_2SO_4	Sulfuric Acid
NaOCl	Sodium Hypochlorite
NaOH	Sodium Hydroxide
NH_3	Ammonia
AF-600	Anti-scalant

Note: Chemicals shown in **bold** are those used regularly.

Venice Gardens WTF Process Schematic

FIGURE 2.8

Sarasota County Water Supply Master Plan Update
Technical Memorandum 2 – Water System Assets - FINAL

Sarasota County Environmental Services

carollo engineers

Table 2.4 Summary of Venice Gardens WTF Design Parameters[1]

Parameter	Value
Facility Production Capacity[1]	
Existing production capacity, gpd	750,000
Future production capacity, mgd	2.2
Process Feed Pumps	
Building 1	
Number of pumps	2
Type	Vertical turbine
Capacity, gpm	420
Pump head, ft	415
Motor size, hp	100
Pump speed	Constant
Building 2	
Number of pumps	5
Type	Vertical turbine
Capacity, gpm	316
Pump head, ft	516
Motor size, hp	75
Pump speed	Constant
Cartridge Filters	
Building 1	
Number of filters	2
Particle removal size, micron	5
Building 2	
Number of filters	3
Particle removal size, micron	5
Reverse Osmosis	
Building 1	
Number of units	2
Production capacity per unit, gal/day	375,000
Number of units at full-expanded capacity	6

Table 2.4 Summary of Venice Gardens WTF Design Parameters[1]

Parameter	Value
Number of vessels per unit	10
Number of stages	1
Design recovery, %	50
Building 2	
Number of units	5
Number of units at full-expanded capacity	5
Number of vessels per unit	9
Number of stages	1
Design recovery, %	50
Chlorine Contact Tank/Clearwell	
Number of units	1
Total volume, gal	42,000
Transfer Pumps	
Number of pumps	2
Type	Vertical turbine
Capacity, gpm	1500
Pump head, ft	38
Motor size, hp	20
Pump speed	Constant
Finished Water Storage Tank	
Number of tanks	3
Type	Covered ground storage
Total volume, MG	5
High Service Pumps	
Number of pumps	3
Capacity, gpm	1620
Pump head, ft	162
Motor size, hp	100
Pump speed	Variable

Notes: [1] Information obtained through interviews with WTF staff and equipment inspection.

2.3.2.1.1 Groundwater Pumping

The Jacaranda Wellfield has 7 constructed, permitted wells and 1 un-drilled, permitted well. Permitted withdrawals for the wells range from 500,000 to 600,000 gallons per day (350 to 415 gpm) per well. Each well is dedicated to one side of the facility, either Building 1 or Building 2. Wells #1 through #5 supply Building 2 and are currently not in service since Building 2 is not being operated. Wells #6 and #7 supply Building 1, as will Well #8 after it is constructed. Production wells range in their water quality, pump speed and type, and withdrawal rate. After the Building 2 rehabilitation is complete, Wells #1 through #5 will be assessed and any repairs or adjustments will be made to allow these wells to provide supply to the new membrane system.

Chloride concentration limits were established to control the effects of withdrawals and to manage potential increases in water quality parameters. According to the County's WUP, if the chloride concentration exceeds 1000 mg/L the County must take action to reduce the concentration to below the permitted limits.

Further information regarding the Jacaranda Wellfield including well capacities and raw water quality is provided in Appendix C.

The County recently acquired the permitted quantities for two additional wells, RO-9 and RO-10, after purchasing land that had an existing WUP. These two wells are not yet connected to the Venice Gardens WTF, but they could provide additional flow in the future. Each well is permitted to supply 440,000 gallons per day on an annual average basis, with a peak month quantity of 576,000 gallons per day.

2.3.2.1.2 Reverse Osmosis

Building 1 - Prior to entering the facility, water flows through a static mixer where sulfuric acid and an anti-scalant are added to lower the pH and to protect the membranes against scaling, respectively. Upon entering the facility, water flows through one of two cartridge filters to remove fine silts and sands. Currently, the facility is utilizing only 1 cartridge filter. The cartridge filters house eighty-five 30-inch extended core 5-micron filters. Provisions for a third cartridge filter were built into Building 1. Water pressure is then boosted by two 100-hp high pressure pumps to provide pressure for treatment through the reverse osmosis (RO) system. The RO system is comprised of 2 single-stage trains, each of which contain ten 8-inch diameter membrane vessels. Facility staff stated that the total production capacity of the RO units in Building 1 is 750,000 gallons per day. Pressure, flow, conductivity, and pH are monitored via automated instrumentation at the entry point to the RO skids. Building 1 is equipped to hold an additional 4 RO skids, for a total of 6 units at build-out conditions.

Building 2 - The RO systems in Building 2 were not retrofitted prior to reopening the facility in 2002, and this treatment train is not used at this time. New membranes and instrumentation are scheduled to be installed in the near future, as well as rebuilding the high pressure pumps and motors. Building 2 currently contains 3 cartridge filters, 5 high pressure pumps, and 5 RO skids comprised of nine 8-inch diameter membrane housings. Building 2 will be equipped with new membranes during the planned upgrade.

2.3.2.1.3 Degasification

Blended water from the RO systems and raw water bypass line enter the degasification system, in which upward forced air combined with hollow spherical media strip hydrogen sulfide from the flow stream. The configuration of the unit is similar to the degasification system at the University WTF; however, the Venice Gardens WTF staff has not found the significant maintenance issues experienced at the University facilities even though similar spherical baffle media is used.

The flow from the degasifiers feeds to an underground clearwell in which disinfection chemicals are added and the contact time required for disinfection occurs.

2.3.2.1.4 Chlorine Contact Chamber/Clearwell

Flow from the degasifier system enters an underground, rectangular clearwell. Chlorine is added at the beginning of the clearwell, and water flows through a series of baffle walls to attain the contact time required for disinfection. Ammonia is added at the end of the clearwell for the formation of chloramines to provide secondary disinfection. Disinfected water is then transferred to the ground storage tanks via 2 transfer pumps.

2.3.2.1.5 Chemical Feed Systems

Figure 2.8 illustrated the chemical feed points at the Venice Gardens WTF. Chemicals shown in bold are those used regularly. The following describes the chemical feed strategies currently employed at the Venice Gardens WTF:

- Sulfuric acid - pH adjustment for RO treatment process.
- AF-600 - reverse osmosis membrane anti-scalant.
- Sodium hydroxide - pH adjustment to attain desired finished water pH (storage tank and feed piping installed, but chemical is not currently utilized or stored onsite). Facility staff stated that stripping and disinfection bring pH up to an adequate level.
- Chlorine - disinfection. The Venice Gardens WTF was upgraded from gaseous chlorine cylinders to liquid sodium hypochlorite during the 2002 retrofit. Liquid

chlorine (10.5%) is added at the beginning of the chlorine contact tank/clearwell and is used to meet primary disinfection requirements. Chlorine can also be added to the chemical scrubbers to help with odor control.

- Ammonia - Liquid ammonia (18%) is added to the end of the clearwell to allow the formation of chloramines for residual disinfection. The typical chlorine to ammonia ratio target is approximately 5 to 1. The target residual concentration is 3.5 to 4.0 mg/L.

The chemical storage areas are located throughout the WTF site with all bulk storage tanks, aside from sodium hypochlorite, stored outdoors and the day tanks and chemical feed pumps stored in individual rooms. Sodium hypochlorite is stored in and fed from two bulk storage tanks located in an enclosed room. Liquid ammonia is stored in and fed from totes that are housed in a covered outdoor area in the location of the original tray aerator system. The bulk sulfuric acid tank is located outside of Building 1, while the acid day tank and antiscalant totes and tank are stored inside of the building. In the upgrade to Building 2, new anti-scalant chemical feed equipment will be installed. A new acid feed system also will be installed, if necessary. Chemical storage tank information is presented in Table 2.5.

Table 2.5 Venice Gardens WTF Chemical Storage Facilities

Chemical	Number of Tanks	Tank Volume (gal)	Total Volume (gal)	Notes
Sulfuric Acid	1	4,500	4,500	Bulk tank. Fed from 250-gal day tank.
Sodium Hypochlorite	2	850	1,700	Fed from bulk tanks.
Ammonia Hydroxide	2	330	660	Stored in totes.
AF-600 (Anti-scalant)	1	100	100	Day tank filled from 55-gallon drums.

Sodium hypochlorite and ammonia are fed in a manual mode, due to the facility's current low flow. The flow meter used to flow pace these chemicals is not accurate at the current flowrates, so these chemicals must be fed manually. However, the capability to flow pace these chemicals will be available when the facility's flow increases. The pretreatment chemicals, sulfuric acid and AF-600 anti-scalant, are fed via flow-pacing.

2.3.2.1.6 Concentrate Disposal

Residuals handling at the Venice Gardens WTF includes the disposal of RO concentrate. The concentrate is pumped into an onsite permitted deep injection well. The deep injection well is approximately 1700 feet deep and discharges high TDS concentration water into a confined layer deep beneath the earth's surface. Flow to the deep injection well is continuously monitored. The Venice Gardens RO WTF DIW permit requires a maximum sustained pressure of 36 pounds per square inch at the wellhead and a peak flow of 1.86 mgd (1292 gpm). The WTF is not equipped with a backup concentrate disposal method.

2.3.2.2 Treated Water Storage and Delivery

The Venice Gardens WTF contains 3 covered ground storage tanks with a total storage capacity of 5 MG. Two of the tanks existed prior to the 2002 upgrade. The third storage tank was constructed from 2004 to 2005 and is in stages of final completion. All tanks are interconnected with valving to provide transfer between and utilization of any combination of tanks.

Recently, a new high service pumping station was installed, which supplies water to southern portions of the County. The new high service pumping station is comprised of three 100-hp high service pumps operated with VFDs.

2.3.2.3 Finished Water Quality

Finished water quality data were tabulated for the Venice Gardens WTF. The facility has a relatively consistent effluent water quality. Table 2.6 provides a summary of effluent water quality parameters from June 2004 through May 2005.

Table 2.6 Venice Gardens WTF Finished Water Quality[1]

Parameter	Average
Total dissolved solids (mg/L)	398
pH (pH units)	8.08
Residual chlorine (mg/L)	3.7

Notes: [1] Based on data from June 2004 through May 2005.

2.3.2.4 Operations and Maintenance Costs

The O&M costs at the Venice Gardens WTF include chemicals, electricity, replacement parts, and labor for facility operation and routine maintenance. Chemical costs vary

according to chemical type and dosage. Because treatment operations will change in the near future with an upgrade to Building 2, the historical O&M costs will not be indicative of future costs. Therefore, chemical cost estimates are being developed under a different project being done by Carollo Engineers for the County, which is investigating treatment optimization alternatives using different chemicals and dosing strategies at the County's water treatment facilities.

2.3.2.5 Planned Future Upgrades or Modifications

The following bullets contain a summary of the major planned future facility upgrades at the Venice Gardens WTF:

- A new high service pump station is in its final stages of completion. The pumps have been brought online to supply water to the southern portions of the County. Final adjustments in pump and system operation will be made within the next few months to obtain optimum operation.

- The membrane system in Building 2 will be upgraded with new membranes, some chemical feed modifications, and new instrumentation for flow, pH, and conductivity. The five high pressure feed pumps and motors will also be rebuilt. Strategies for upgrading this membrane system include new membranes and anti-scalants that provide higher recovery. Any necessary repairs to the production wells that serve Building 2 (RO1 through RO5) will also be completed. The Building 2 retrofit is scheduled to begin in approximately September of 2005, and the expected water recovery of the new RO system is 70 to 75%.

- During the retrofit of Building 2, provisions to feed an anti-scalant will be completed. In addition, the acid feed system will be upgraded, if necessary.

2.3.2.6 Summary of Key Operational and Infrastructure Issues

During interviews with facility staff, several operational and infrastructure issues were identified. Notes from visits with Venice Gardens WTF staff are included in Appendix D. The following points summarize the problems that were identified by facility staff:

- Facility staff stated that the existing generator would not be able to provide power to the entire facility during an electrical power failure. The existing generator would be able to provide power to only a portion of the equipment, including the pump station. Facility staff suggested that this generator be taken to one of the production well sites, neither of which have stand-by power, and that a new generator be installed that could power the entire facility.

- The facility is not equipped with a backup concentrate disposal method, and the deep injection well has experienced some problems in the past. Therefore, a reject transfer station is needed. The facility is already equipped with piping and a hydropneumatic tank to transfer brine to another deep injection well within the County's system. An onsite storage tank and pumping system to transfer the brine could provide a backup disposal option for the facility.

- Facility staff stated that the facility's main wastewater lift station needs to be upgraded.

- An old sulfuric acid tank outside of Building 2 had a chemical leak that corroded some of the containment area. If pH adjustment is needed for the new RO membranes in Building 2, a new acid tank will be needed. However, facility staff are considering alternative anti-scalants that may eliminate the need for pH adjustment.

- As the facility grows, it will need additional staff. Currently, the facility is operated and maintained by 3 persons who staff the facility 5 days per week for 8 hours each day. Although facility staff will be adding 2 new positions in the fall, they stated that as the production of the facility increases, they will need to increase staffing due to permit requirements and increased runtime (16 hours a day, 7 days per week).

2.3.3 University Water Treatment Facility

The University Wellfield and WTF is located in the north-central portion of the county, just south of the County line on University Parkway. This wellfield lies within the Most Impacted Area (MIA) of the Southern Water Use Caution Area (SWUCA). The WTF was constructed at the site of Manatee County Interconnect #1 and Pump Station No. 1. The original interconnect and pump station were constructed in 1973 to deliver water to the County's potable water system.

The University Wellfield is comprised of 7 active wells with an average daily permitted pumping capacity of 2.0 mgd. The peak month permitted capacity is 2.4 mgd. Well #1 was constructed in 1981, Wells #2 through #6 were constructed in 1985, and the Well #7 was constructed in 1989 to increase the supply in the northern portions of the County.

The existing WUP was issued in September of 1996 and is scheduled for renewal in 2006. The University wells are located within the Floridan Aquifer System and range in depth from 580 to 640 feet. Total dissolved solids (TDS) concentration in the wells ranges from approximately 950 - 1450 mg/L, with sulfate being the major constituent.

The University facility is limited in their production due to water quality constraints. Due to the high TDS concentrations, the County blends water produced by the University Wellfield with water purchased from Manatee County. The County limits the University production to

just over 1 mgd in order to meet a blending ratio of approximately 5:1, which will maintain TDS concentrations below 500 mg/L. Figure 2.9 indicates that the historical monthly average production at the University WTF can vary from 0 to 2 mgd depending on system needs. An average daily flow of 1.1 mgd has been produced throughout the past 8 years. Purchased water from Manatee County is scheduled to decline gradually until 2025, at which time the contract will expire. At that time, the County will not be able to utilize this water source unless another treatment method is employed to decrease TDS concentrations.

2.3.3.1 Process Description

The University Wellfield and WTF site are shown in Figure 2.10. Wells are located along University Parkway starting at the WTF site and extending to the east. Figure 2.11 presents a process flow schematic of the University WTF. The facility's treatment elements include groundwater pumping, degasification, disinfection, and treated water storage and delivery. Figure 2.10 also shows the locations of chemical feed points. Like all other County WTFs, University utilizes free chlorine (in the form of sodium hypochlorite) for primary disinfection and adds ammonia to produce chloramines for residual disinfection. Treated water from the University WTF is stored in an onsite ground storage tank and is pumped to the northern and central portions of the County, supplemented by water received from Manatee County.

A description of the process train is described in the following sections.

2.3.3.1.1 Groundwater Pumping

The University Wellfield has 7 active permitted wells. Each well is equipped to withdraw 500 gpm, and typically three wells are operated at one time to utilize some wells while others rest and to equalize production from each well. The configurations are rotated on a regular basis (approximately once per month). Production wells range in their water quality pump horsepower. A rotation schedule has been developed to optimize the wellfield operation and to avoid stressing particular areas of the wellfield. A chloride trigger level of 70 mg/L has been established for all University wells to control the effects of withdrawals and to allow for proper resting times for each well. All wells have been regularly maintained, and within the past six years all but one have been upgraded with new pumps and motors and have been pulled for cleaning. Further information regarding the University Wellfield is provided in Appendix E.

Raw water is pumped from the wells directly to the degasification system.

University Wellfield Average Monthly Production

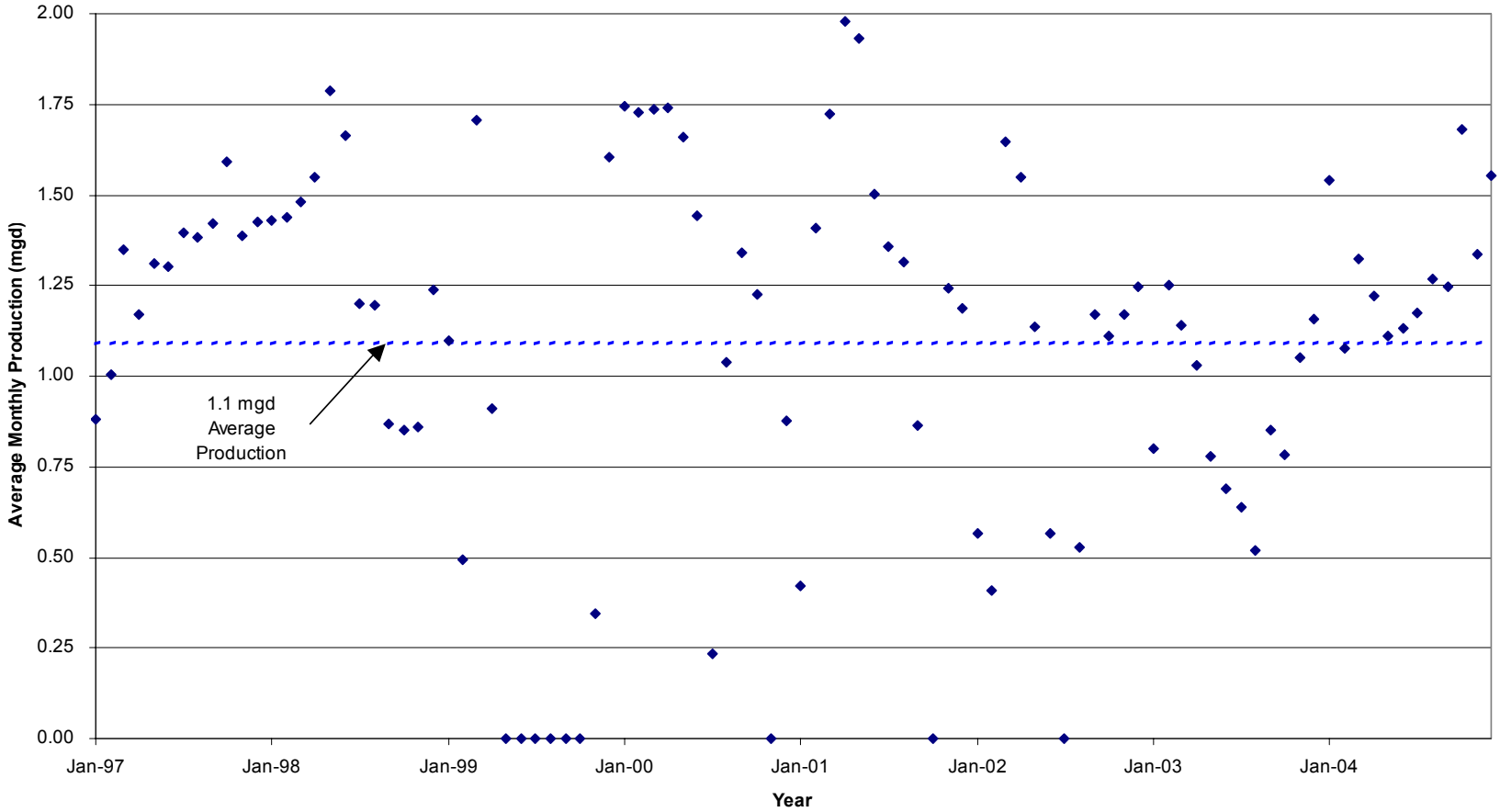


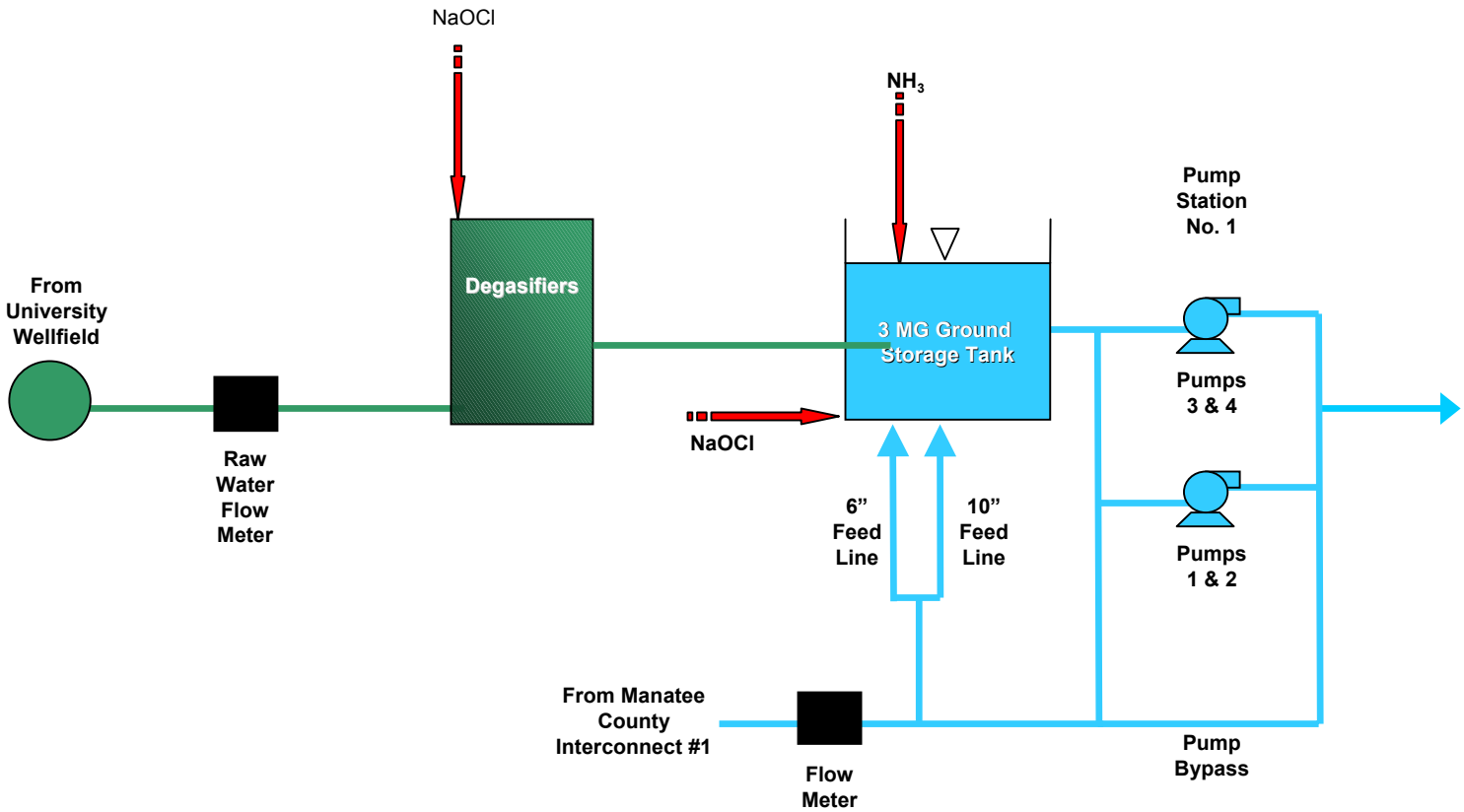
FIGURE 2.9

University Wellfield and WTF Site

Source: Sarasota County Natural Resources

FIGURE 2.10

University WTF Process Schematic



Legend

NaOCl	Sodium Hypochlorite
NH_3	Ammonia

Note: Chemicals shown in **bold** are those used regularly.

FIGURE 2.11

2.3.3.1.2 Degasification

Raw water enters the degasification and stripper system, in which countercurrent forced air combined with hollow plastic media strip hydrogen sulfide from the flow stream. The system was installed in 1998 and consists of a stripper tower, two blowers, and a mulch biofilter to scrub the tower offgas. The stripper tower was retrofitted in 2000 with new media, as the original media clogged shortly after installation. After flowing through the tower media, water enters an underground storage vault. Transfer pumps transport the water from the vault to the ground storage tank. Prior to installing this degasification system, the WTF utilized a tray aeration system that was located over the ground storage tank.

The system is taken offline for cleaning approximately once every three months. The tower must be cleaned manually, which takes approximately 2 days. When cleaning the tower, operators isolate the degasification system from the wells and the ground storage tank. The ground storage tank is emptied and is not used during this time. The degasification tower is isolated from the underground vault by inserting an inflatable plug into the connection between the tower and the vault. A cleaning solution comprised of sodium hypochlorite and sodium hydroxide is added to the tower. The solution is recirculated through the media for approximately 2 days to remove biogrowth from the media. The solution is then disposed of on top of the biofilter. Following the chemical clean, the tower is flushed with water from one of the wells. After flushing, the wellfield and degasification system are brought back online.

Operators also clean the underground vault approximately twice per year by pressure washing the walls of the vault to remove biogrowth. The floor of the vault was not constructed with a slope, sludge removal mechanism, or sump pump, so the waste resulting from the pressure wash is removed with a vacuum truck.

Operators also stated that the degasification fans and motors sit in a low spot on the deck of the vault. During heavy rains or when the tower is drained, the bottom of the motors and fans are immersed in water. This has caused some deterioration of the concrete pads and is hard on the equipment according to operators.

2.3.3.1.3 Chemical Feed Systems

Figure 2.11 illustrated the chemical feed points at the University WTF. Chemicals shown in bold are those used regularly. The following describes the chemical feed strategies currently employed at the University WTF.

- Chlorine - The University WTF was upgraded from gaseous chlorine cylinders to liquid sodium hypochlorite in 2002. Free chlorine and detention time in the ground storage tank are used to meet primary disinfection requirements. Sodium hypochlorite (~12.5% solution) is stored in a 4000-gallon tank and fed to the ground storage tank

via a 0.5-hp chemical metering pump. The chlorine discharge location is at the northern base of the ground storage tank. Chlorine doses vary throughout the year, as higher doses tend to be applied in the low-demand, hotter summer months than during the high-demand, cooler winter months.

- Ammonia - Liquid ammonia is added for the formation of chloramines for residual disinfection. Liquid ammonia (~18% solution) is stored in three 300-gallon tanks and is transferred to a 100-gallon day tank prior to dosing. Ammonia is fed through the top of the west side of the ground storage tank via a 0.5-hp chemical metering pump. The typical chlorine to ammonia ratio target is 5 to1, although facility staff stated that the actual ratio typically produced is 4 to 1. The target residual chlorine concentration is 3.0 mg/L, and facility staff state that actual residuals in the reservoir range from 2.5 to 3.5 mg/L, depending on season. County staff have expressed some concern of short-circuiting and inadequate mixing in the tank due to the chemical feed injection points. Additionally, the tank is not equipped with recirculation piping or a mixing device. Further investigation should be initiated to confirm that primary disinfection requirements are being met and that optimum mixing and chloramine formation is taking place.

It should be noted that the chemical delivery area at the University WTF is difficult for delivery trucks to maneuver. The trucks must enter via a narrow driveway and have no parking lot or other space to turnaround on the property grounds. Therefore, delivery trucks must back into the facility from University Parkway. University Parkway is a major city street, and trucks stopping and backing into the driveway creates dangerous conditions. County staff have stated their concern of the dangerous conditions for chemical delivery, and a larger chemical delivery area is desired. The facility's septic tank drainfield is located next to the existing driveway preventing the construction of a turnaround area. If the facility were connected to the County's sewer system, the septic tank and drainfield could be decommissioned and a turnaround area could be constructed in this area.

2.3.3.2 Treated Water Storage and Delivery

Treated water is stored in the onsite ground storage tank prior to delivery to the distribution system by Pump Station No. 1, which is also located at the University WTF site. Water discharged from the degasification system is blended in the tank with some of the water received from Manatee County prior to being discharged to the tank. The typical blend ratio is 1 to 1, and normal flows are 1.2 mgd of both well water and Manatee County water. The remaining Manatee County water flows through the bypass pipe to obtain the 5 to 1 blend ratio discussed in Section 2.3.3.

County staff stated that the tank is kept at an almost constant, full level in order to minimize short-circuiting and to maximize mixing in the tank. The tank is not equipped with mixers,

and it is used for primary disinfection contact time, as well as a contact chamber for chloramine formation.

2.3.3.3 Finished Water Quality

The University WTF does not report finished water quality parameters; rather, the County monitors for required parameters in the distribution system. However, the facility does monitor several water quality parameters to maintain treatment goals. Finished water quality data from January 2004 through July 2005 for the University Wells and Manatee County blended water is summarized in Table 2.7.

Table 2.7 University Wells and Manatee County Blended Finished Water Quality[1]

Parameter	Average
Conductivity (µs/cm)	548
pH (pH units)	7.76
Total chlorine (mg/L)	4.75
Ammonia	1.04

Notes: [1] Based on data from January 2004 through July 2005.

2.3.3.4 Operations and Maintenance Costs

The O&M costs at the University WTF include chemicals, electricity, replacement parts, and labor for facility operation and routine maintenance. Chemical costs vary according to chemical type and dosage. Because treatment operations may be changing in the near future, the historical chemical costs may not be indicative of future chemical costs. Therefore, chemical cost estimates are being developed under a different project being done by Carollo Engineers for the County, which is investigating treatment optimization alternatives using different chemicals and dosing strategies at the County's water treatment facilities.

2.3.3.5 Planned Future Upgrades or Modifications

The University WTF is currently investigating two facility upgrades:

- The facility is currently experimenting with new SCADA system software. A Wonderware program has been installed at the University WTF and Pump Station No. 1 to determine its benefits to the County.

- The discharge flow meter assembly failed and was removed from Pump Station No. 1 (located at the University WTF site) a few years ago. The pressure transmitter equipment is still installed, and facility staff are investigating a new meter assembly for this location. This meter would provide the total flow discharged from Pump Station No. 1.

- The degasification tower will be replaced soon due to structural failure. This replacement will address the immediate need to allow continued operation of the facility; however, additional upgrades will be made to chemical feed systems and other facility components in the future.

2.3.3.6 Summary of Key Operational and Infrastructure Issues

During interviews with facility staff, several operational and infrastructure issues were identified. Notes from visits with University WTF and water distribution system staff are included in Appendix F. The following points summarize the problems at University WTF that were identified by facility staff:

- The degasification system must be taken offline to be cleaned approximately once every three months. The manual clean takes approximately 2 days and the University Wellfield must be taken offline during cleaning. An upgrade to this treatment process is recommended.

- The disinfection and finished water storage infrastructure cause poor mixing hydraulics in the ground storage tank. Further investigation should be conducted to confirm that primary disinfection requirements are being met and that optimum mixing and chloramine formation is taking place. Facility staff stated that the water distribution system is operated to keep the level in the University Ground Storage Tank (Ground Storage Tank #1) between 25 and 29 feet due to poor mixing conditions and fear of short-circuiting.

- The delivery of water treatment chemicals poses a sizeable challenge at the University WTF. The delivery facilities are difficult to maneuver due to the narrow driveway and lack of turnaround space, and trucks must back into the WTF site from University Parkway. This could be remedied by constructing a turnaround area somewhere on the facility site, potentially in the area of the existing drainfield if the facility can be connected to the County's sanitary sewer system.

2.4 WATER TRANSMISSION SYSTEM

The water distribution system is an important component of the County's water supply. The purpose of this section is the document the information that is available about the system

and how it is operated. This information can then contribute to an understanding of existing or potential infrastructure constraints, water quality concerns, and future projects. This information was derived from a series of interviews with operations personnel, as well as internal knowledge gained during previous projects. Appendix F contains field notes and minutes from interviews with County distribution system staff.

The major goals of water distribution to achieve safe, reliable water include:

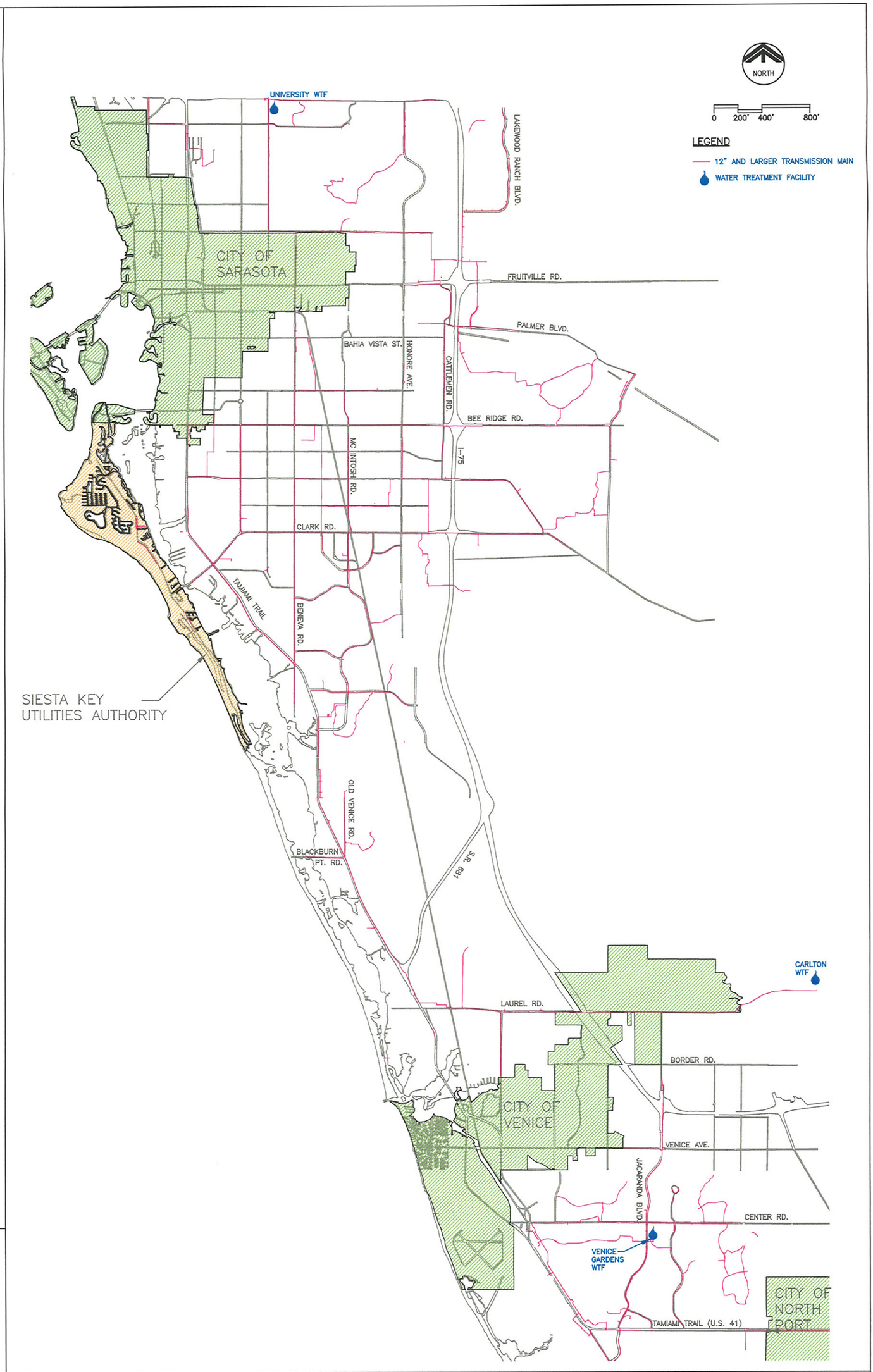
- Minimize the total water purchase, treatment, and delivery cost.
- Provide the best quality, safest water possible that meets or exceeds all regulations.
- Provide customer service by preventing disruption of water delivery, meeting fire flow requirements, and maintaining sufficient pressures within the distribution system.

In general, two major areas supply the County: Manatee County and University Wellfield from the north and Carlton and Peace River from the southeast. The Venice Gardens WTF also supplies a small area of the County. Due to the history of changes in the County and the way it operates its distribution system, several system assets are underutilized. In addition, due to the variety of water sources, water quality issues arise in areas receiving mixed sources. Portions of the central areas of the County receive a “mix” of waters, so ensuring a compatible disinfection and corrosion control program is essential.

Although this WSMPU will document existing water system infrastructure, hydraulic modeling is not part of this project scope. A hydraulic water distribution system model is being developed concurrently with this project under a different County project. Hydraulic modeling will provide specific information on the need, location, and size of new water distribution mains, as well as the need for storage and pumping facilities in specific locations. In order to incorporate the need for additional water system infrastructure, the WSMPU project team will integrate results of the hydraulic modeling when developing the CIP at the end of the project.

2.4.1 Distribution System Transmission Mains

The County has a large water transmission system, consisting of mains from 4 to 42 inches in diameter. Large transmission mains (18-inch and greater) are usually ductile iron pipe, although a few large PVC pipes have been installed. Smaller transmission lines are typically constructed from PVC. Transmission pipes for sizes 12 inches and greater are shown in Figure 2.12. It should be noted that some new areas of the water system might not appear on the map in Figure 2.12.



WATER SYSTEM 12" AND LARGER TRANSMISSION MAINS

FIGURE 2.12

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The County distribution system does not have many dedicated large trunk mains, resulting in the use of several smaller mains. Currently, a small number of transmission mains supply the developing portions of the County east of Interstate-75. A new large transmission main in this area of the County will assist in meeting demands in the future.

Additionally, in newly developing portions of the County that are not yet built to full capacity, the new infrastructure being installed is intended to meet future build-out conditions. In the interim, this infrastructure is over-sized for the small number of residents currently living in these areas. This situation is currently being remediated via regular hydrant flushing in strategic locations, as well as by the installation of automatic flushing systems in the most highly affected locations.

2.4.2 Pump Stations

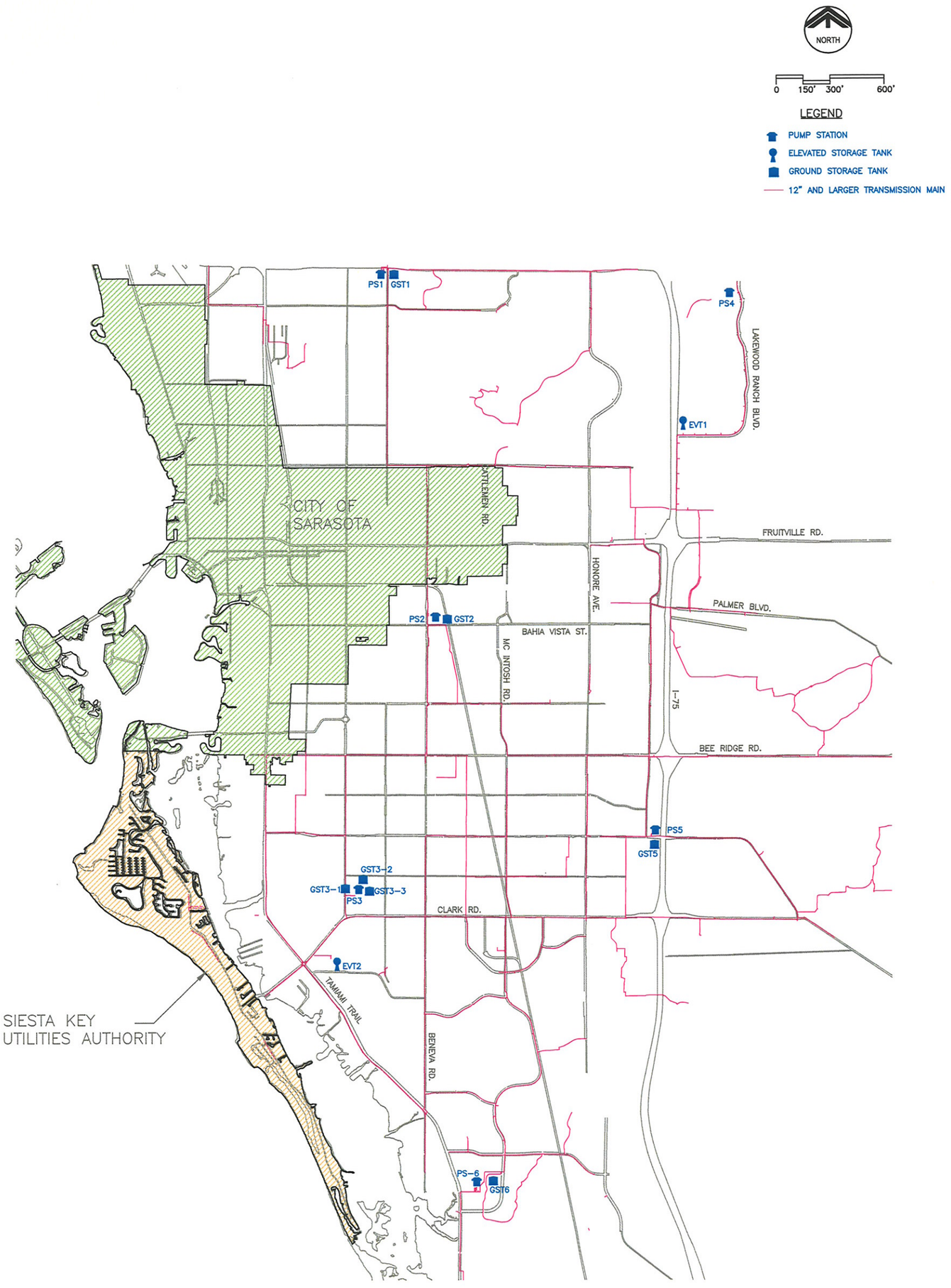
The County water system contains 6 pump stations, 2 of which can operate as either a high service or a booster pumping station. The remaining 4 pumps stations operate as high service pumps stations only. The location of the original pump stations (Numbers 1, 2, and 3) correspond to the needs of the system prior to introducing new water sources such as the Carlton WTF and Peace River supply. As the water area expanded and demands grew, the operational needs of the system changed and some pump stations became obsolete.

2.4.2.1 Pump Station Location and Operation

The locations of the 6 pump stations are shown in Figure 2.13, and their operational strategies are described below. Pump curves and specific information regarding pumps, motors, and flow set points for pump stations can be found in Appendix G.

It should be noted that during initial inquiries to obtain pump curves, County staff stated that pump curves were not available. Subsequent inquiries to the County resulted in pump curves for most individual pump stations. Certified pump curves that were received are included in Appendix G. However, some certified pump curves were not obtained from the County (Pump Station No. 3 and Carlton WTF high service pumps). Therefore, these pump curves were obtained based on collected field data, such as model, horsepower, and impeller size, which was matched with cut-sheets from the associated manufacturer. Consequently, the pump curves included for these pumps are not certified and require verification prior to being used in hydraulic modeling or for other purposes.

WATER SYSTEM PUMP STATIONS AND STORAGE TANKS



NOTE:
GROUND STORAGE TANKS AND HIGH SERVICE PUMP STATIONS AT CARLTON WTF AND VENICE GARDENS WTF NOT SHOWN. SEE FIGURE 2.12 FOR WTF LOCATIONS.

FIGURE 2.13

- Pump Station No. 1 (PS1) - PS1 is located on the University WTF grounds. PS1 is used regularly to introduce Manatee County water (from Manatee County Interconnect #1) and water from the University WTF to the County's distribution system. Pump Station No. 1 can be fed directly from the University Ground Storage Tank and/or from Manatee County Interconnect #1 as shown in Figure 2.11. The high service pumps transporting water from the ground storage tank are not operated on automatic setpoints. Rather, operators adjust the pumping rates manually to maintain the correct blending ratio in the storage tank. On the day of the facility inspection, the Manatee County to University wells blending ratio was approximately 1:1, blending approximately 1.2 mgd of each source to fill the University Ground Storage Tank. The remaining Manatee County water flows directly from Manatee County Interconnect #1 to Pump Station No. 1, where booster pumps are operated if Manatee County pressure drops. A bypass line is available if boosting is not necessary. A check valve prevents boosted water from entering the bypass line when the pumps are operating. Operators stated that typically 4 to 5 mgd flows directly from Manatee County Interconnect #1 to Pump Station No. 1 without entering the ground storage tank.

- Pump Station No. 2 (PS2) - PS2 is located on Beneva Road north of Bahia Vista Street and contains two high service pumps. PS2 is normally not used, although if system pressures drop to less than 48 psi, the pumps start and operate with VFDs to keep system pressures above 48 psi. Water flows from north to south at PS2, and a check valve is installed to prevent water from moving north in the system at this location. PS2 was upgraded in 2000 with new yard piping.

- Pump Station No. 3 (PS3) - PS3 is located just northeast of the intersection of Tuttle Avenue and Clark Road. This pump station contains two high service pumps and one diesel backup pump, and according to facility staff, is never used because it is not needed. However, the pump station has been maintained in case system requirements change and it is needed once again. County staff feels that the station could be utilized if it were retrofitted as a booster station.

- Pump Station No. 4 (PS4) - PS4 is located on Lakewood Ranch Boulevard just south of University Parkway and contains two high service pumps. PS4 was designed as a fire flow pump station. County staff indicated that the pumps at PS4 are seized and inoperable. However, PS4 is not needed due to the high pressures and flow of water entering the system from Manatee County at Manatee County Interconnect #3 (MCI3), as well as the elevated tank located just south of the station. In addition, a pressure reducing valve is in operation at the exit of PS4 in case the valve at MCI3 fails. The valve at PS4 is typically set at 15% open.

- Pump Station No. 5 (PS5) - PS5 is located on Proctor Road just west of Interstate-75. PS5 contains two high service pumps and is currently not in service. County staff stated that when this pump station is brought online, low chlorine residuals are seen within approximately a 1-mile radius of the station. County staff stated that this pump station could be utilized to boost pressures in eastern portions of the service area if it were retrofitted as a booster pump station.

- Pump Station No. 6 (PS6) - PS6 is located on Vamo Road just east of Tamiami Trail south of Central Sarasota Parkway. PS6 contains three pumps and is operable as either a booster or a high service pump station. This pump station is used regularly to pump water from the Carlton WTF to the north; however, it is equipped to pump water to either the north or to the south depending on the needs of the system. The pressure set point for operation of PS6 is 74 psi. Facility staff has stated that the pumps sit slightly higher than the base of GST6. As the tank approaches its minimum level, the pumps begin to cavitate.

The only pump stations that normally are used in the County water distribution system are PS1 and PS6. PS2 is in operational mode in case of a system pressure drop, but it is normally not needed. County staff stated that booster stations would be better utilized in the system in the locations of the remaining high service pump stations. Although several of them are not used, all of the pump stations have been well maintained, and all equipment is in operable condition aside from Pump Station No. 4.

2.4.2.2 Siesta Key Utilities Authority Pump Stations

In July 2006, the County is scheduled to assume responsibility for the Siesta Key Utilities Authority (SKUA) and all of their associated facilities. SKUA has four pump stations that will be conveyed to the County at that time. Therefore, the pump stations are included in the inventory in Appendix G and a brief description of the pump stations is included below.

SKUA operates four pump stations on an as-needed basis to provide water to its distribution system. High service pumping is available for the storage tanks located at the SKUA treatment facility site. High service pumping is also available for the tank located at the SKUA office site; however, since this tank has not been used for many years, these pumps are not in service. Booster pumps are located at both the Stickney Point and Siesta Cove interconnections to the County. The booster pumps are operated based on system pressure set points. SKUA indicated that the County pressure is usually such that the pumps do not run except during peak demand times. The booster pump stations are enclosed in fenced areas and feed both chlorine and ammonia for residual disinfectant boosting, if necessary. County staff stated that the booster stations were recently refurbished. Although the project team was not able to enter the SKUA facilities, they appeared to be in good condition.

2.4.3 Storage Tanks

The County water storage system is comprised of eleven ground storage tanks and two elevated tanks, only one of which is being used. Each pump station, aside from PS4, has at least one ground storage tank. These facilities provide storage to meet daily demand fluctuations, as well as to meet fire flow requirements. The locations of existing storage facilities were shown in Figure 2.13. Due to changes in system operation, some of the storage tanks are currently not utilized. Additionally, the entrance and exit piping of the tank is a joint system, meaning that water enters and leaves the tank through the same pipe. Distribution system operators stated that it is difficult to maintain a chlorine residual in the tanks due to their long detention times. A summary of the storage tanks located in the County system is provided in Table 2.8. None of the tanks contain recirculation piping or booster disinfection facilities, aside from the disinfection facilities located at a WTF. Further information regarding storage tanks is provided in Appendix H.

Table 2.8 Summary of Water System Storage Tanks

Tank ID	Description	Capacity (MG)	Year of Construction	Utilized in System?
GST1	University Ground Storage Tank	3.0	1984	Yes
GST-C	Carlton Ground Storage Tank	5.0	1995	Yes
GST-VG1	Venice Gardens Ground Storage Tank #1	1.0	1974	Yes
GST-VG2	Venice Gardens Ground Storage Tank #2	2.0	1983	Yes
GST-VG3	Venice Gardens Ground Storage Tank #3	2.0	2005	Yes
EVT1	Elevated Storage Tank #1	2.0	1997	Yes
EVT2	Elevated Storage Tank #2	0.25	1969	No
GST2	PS2 Ground Storage Tank	1.0	1975	No
GST3-1	PS3 Ground Storage Tank #1	1.5	1975	Rarely
GST3-2	PS3 Ground Storage Tank #2	1.5	1975	Rarely
GST3-3	PS3 Ground Storage Tank #3	1.5	1983	Rarely
GST5	PS5 Ground Storage Tank	2.5	1984	Occasionally
GST6	PS6 Ground Storage Tank	3.0	1991	Rarely

2.4.3.1 Storage Tank Utilization

Due to changes in the system operation over the past five to ten years, some of the ground storage tanks are not currently utilized. As shown in Table 2.8, the only tanks used regularly are Elevated Storage Tank #1 and the ground storage tanks at the University, Venice Gardens, and Carlton WTFs. This amounts to slightly more than 50 percent of the total system storage capacity. County staff has stated that certain tanks are not utilized on a regular basis for the following reasons:

- GST2 - Does not provide storage due to the location of the storage tank relative to the needs in the system. This tank was taken offline approximately 10 years ago and has not been used since that time.
- GST3-1, 2, & 3 - These three ground storage tanks are not used due to their location in the system. Although they are not used, the tanks are cleaned and maintained regularly, and one of them is equipped to be put into service if needed.
- GST5 - This tank is only used occasionally, usually for watering days during high demand conditions.
- GST6 - This tank is normally not used, but can be put into service if needed.
- EVT2 - The County inherited this tank in 2003 from Florida Cities Utilities. This tank was not well maintained by its previous owner. Although a structural evaluation was complete when the County assumed control of this facility, the piping and other interior appurtenances have not been upgraded. There is rust on some of the piping and valves, and sand blasting and cleaning would be required prior to utilizing this tank. This tank is not expected to be brought online. Although the tank is closed from the water system by 3 valves, there is some leakage into the tank. County staff stated that they empty the tank every few months to dispose of the water that has leaked into the tank.

The remaining storage tanks, Elevated Tank 1 (EVT1), GST1, and the ground storage tanks at the Carlton and Venice Gardens WTFs, are used on a regular basis to store water and meet daily demand fluctuations. It should be noted that when the University Wellfield and WTF are not in operation (normally due to cleaning the degasification system), GST1 is typically drained down and not used. In this case, Manatee County water alone supplies Pump Station No. 1. GST1 is put back online when operation of the wells and WTF resumes.

2.4.3.2 Analysis of Storage Requirements

The principle function of storage is to provide reserve supply of water for: 1) operational equalization, 2) fire reserve, and 3) emergency needs. Operational storage is directly related to the amount of water necessary to meet peak demands. The intent of operational storage is to provide the difference in quantity between the peak demands and the system's reliable available supply. The volume of water allocated for emergency use is decided based on the historical record of emergencies experienced, and on the amount of time which is expected to occur before a hypothetical emergency can be corrected.

The total capacity of storage tanks in the County water system will be 26 MG after the newest ground storage tank at the Venice Gardens WTF (GST-VG3) is brought online. As discussed in the previous section, only some of the tanks are currently being utilized. Total currently utilized storage capacity is approximately 13 MG under normal operating conditions.

2.4.3.2.1 Operational Storage

The operational storage is the amount of desirable stored water in a system to regulate fluctuations in demand so that extreme variations will not be imposed on the sources of supply. With operational storage, system pressures are improved and stabilized to better serve customers throughout the service area. Operational storage is commonly estimated between 25 and 50 percent of the maximum day demand. According to Florida Administrative Code Rule 62-555.320(19), the total useful finished water storage capacity (excluding any storage capacity for fire protection) must at least equal 25 percent of a system's maximum day water demand, excluding any design fire-flow demand. A volume less than described is acceptable if the County can demonstrate that the total useful finished water storage capacity (excluding any storage capacity for fire protection) is sufficient for 1) operational equalization and 2) meeting the water system's peak hour demand for four consecutive hours.

Projected maximum day demand values were obtained by dividing the current maximum daily demand by the current average demand and multiplying that ratio by the projected average daily demand. From 1997 to 2004, the maximum day peaking factor ranged from 1.24 to 1.49. Therefore, a 1.5 maximum day peaking factor was assumed to obtain a conservative estimate. The projected annual average daily demand in 2025 is 29.3 mgd according to *TM1 - Water Demand Projections*. A peaking factor of 1.5 produces a peak day demand of 44 mgd in 2025.

2.4.3.2.2 Fire Storage

Fire storage is the amount of water required when the capacity of the production facilities is insufficient to meet the necessary maximum day demand plus fire flow demands for a

particular duration of time. The American Insurance Association recommends fire-flow demands and storage volumes according to the following equation:

$$G = 1{,}020\sqrt{P}\left(1 - 0.01\sqrt{P}\right)$$

Where:

G = fire flow demand rate, gpm

P = population served in thousands

The required fire storage capacity is obtained by multiplying the fire flow demand rate by the desired fire duration. Fire flow duration generally ranges from 2 to 10 hours for multiple fire occurrences within a pressure zone. An analysis of the finished water storage tank capacity at Carlton WTF using a 4-hour fire flow duration was completed under another project with the County (Carollo, 2004). The 4-hour fire flow duration was also used to determine the fire flow requirements for the entire water system. The total required storage based on a 4-hour fire duration is approximately 3 MG under current population conditions and will be approximately 3.5 MG in the year 2025.

2.4.3.2.3 Emergency Storage

Emergency storage is the volume recommended to meet demand during emergency situations such as pipeline failures, major trunk main failures, pump failures, electrical power outages, or natural disasters. The amount of emergency storage included within a particular water distribution system is an owner option, based on the assessment of risk, the desired degree of system reliability, economic considerations, and water quality concerns. Emergency storage is also used to provide reliability and redundancy to adjacent utilities. In Florida, hurricanes and major tropical storms pose a potential need for emergency storage. A customary rule of thumb for emergency storage is 10 percent of the maximum day demand.

2.4.3.2.4 Total Storage

The minimum allowable operational storage capacity for Sarasota County is equal to 25 percent of the maximum day water demand. Additionally, the recommended fire storage capacity is 3.5 MG in the year 2025, and the recommended emergency storage is equal to 10 percent of the maximum day demand. Assuming a maximum day water demand of 44 mgd in 2025, the recommended minimum storage is approximately 19 MG. The existing storage capacity in the County water system (26 MG) exceeds the recommended minimum storage; however, not all of the storage tanks are utilized. County staff has stated that some tanks can be brought online when necessary (such as storage tanks at Pump Station Nos.

5 and 6), but some tanks cannot be used under current operating conditions. In the absence of these tanks, the recommended storage is not met in 2025. The County will be able to conduct further storage requirements for fire flow analysis after completion of the hydraulic water model.

It should be noted that the analysis provided in this section is based on system-wide considerations. The system as a whole provides sufficient reserve storage. However, evaluations for individual storage tanks may produce other recommendations for individual storage tanks, such as in the *Carlton WTF Finished Water Storage Capacity Analysis Report* (Carollo, 2004).

2.4.3.3 Siesta Key Utilities Authority Storage Tanks

In July 2006, the County is scheduled to assume responsibility for the SKUA and all of their associated facilities. SKUA has three storage tanks that will be conveyed to the County at that time. Although this storage capacity was not included in the analysis of storage requirements in this WSMPU, the capacity will be available after July 2006. Therefore, the tanks are included in the inventory in Appendix H and a brief description of the SKUA storage facilities is included below.

The SKUA has three storage tanks with a total capacity of 3.75 MG. Two of the storage tanks, capacities of 0.75 MG and 2 MG, are located at the SKUA treatment facilities site. The tanks can store water received by Sarasota County, which is then re-disinfected if necessary and delivered to the distribution system via high service pumps. The third storage tank is located at the SKUA office site and has not been used for many years. SKUA reports that the condition of the inside of this tank is unknown.

2.4.4 Automatic Flushing Units

In areas of new growth, installed infrastructure is often sized for the ultimate build-out capacity of the service area. This can cause problems in the interim period when a relatively small number of customers utilize the transmission mains. These “over-sized” mains cause problems in the distribution system, primarily stagnant water and little or no disinfectant residual. In order to prevent these conditions, flushing of dead-end or over-sized mains is practiced. In cases in which a large volume of water must be flushed in order to maintain a disinfectant residual, an automatic flushing system can be installed.

The County has installed five Hydro-Guard direct discharge automatic flushing units in their distribution system. These units allow the user to connect to a discharge line to dispose of the flushed water. The units also are equipped with backflow prevention devices and water meters.

All automatic flushing units are portable and can be moved as necessary. All units are less than 4 years old and appear to be in good working condition. Units are plumbed above grade to a fire hydrant or blow off valve and discharge to a nearby ditch or pond. Locations of the automatic flushing units in June 2005 are shown in Figure 2.14 and include the following:

- At the new Founders Club subdivision on Fruitville Road. This flusher was installed in May 2005, and the flushed water at this location is discharged to a nearby storm sewer manhole. Prior to this location, the flusher was located at the corner of Iona Road and Palmer Boulevard in the approximate location of what used to be Barton Farms. After that water main was extended, the flusher was moved to its current location at the Founders Club.

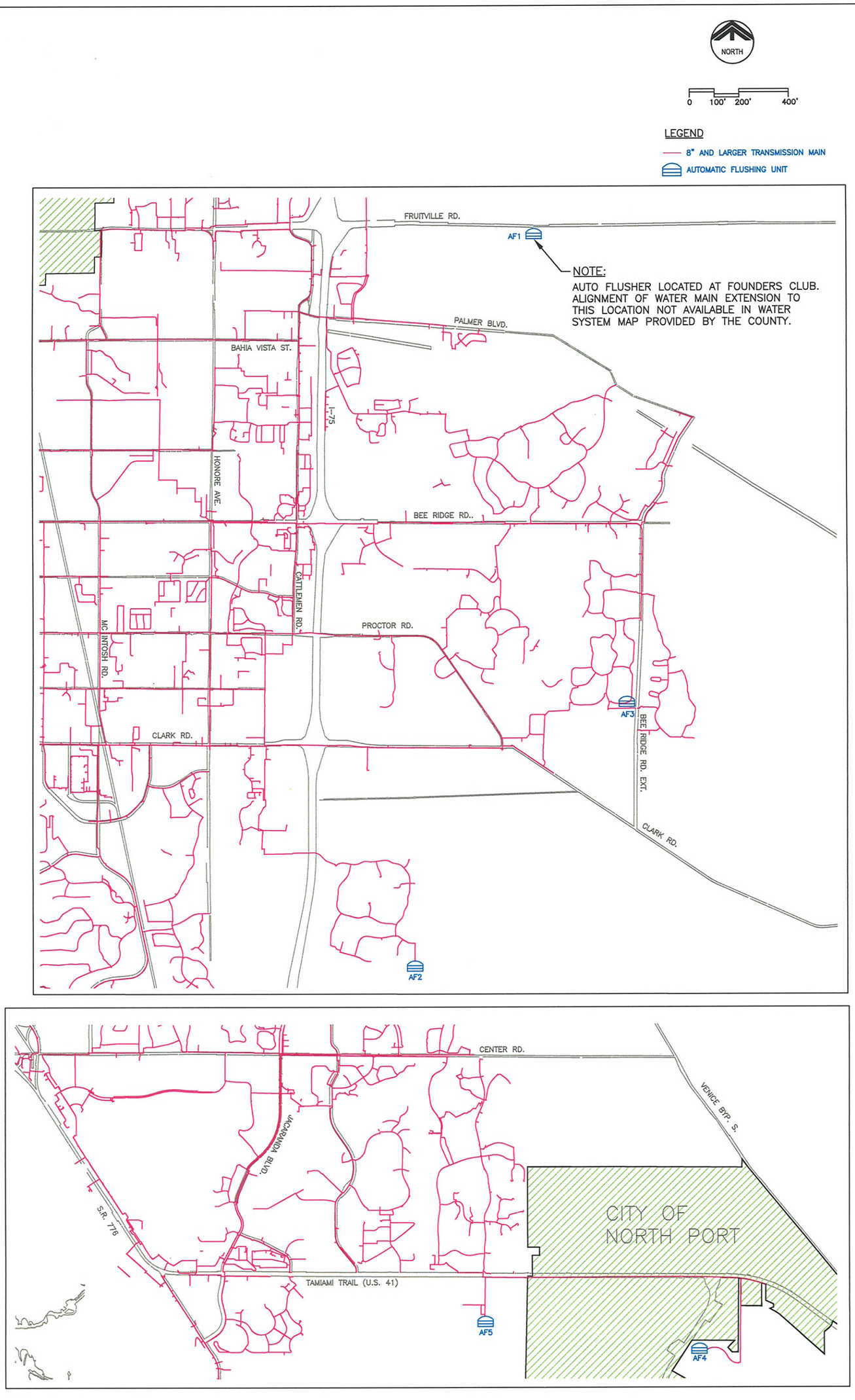
- On the perimeter of Serenoa Lakes Subdivision along Ibis Road. The flushed water at this location is discharged to a nearby retention pond.

- At a point in the approximate center of the Bee Ridge Extension line, a 12-inch main. This main is over-sized and currently has a small amount of connections relative to its ultimate build-out capacity. In addition, the main is located in a “mixing zone” between Carlton and PR/MRWSA water from the south and University and Manatee water from the north; therefore, water does not move consistently in one direction, causing stagnation. The flushed water at this location is discharged to a drainage ditch.

- At the Manatee Community College Resource Center. The flushed water at this location is discharged to a nearby retention pond. The flusher is located at the end of a 12-inch water main that extends past the Manatee Community College and curves to the west, just beyond the Resource Center.

- At the Taylor Ranch Elementary School. The flusher is located at the end of a 12-inch water main that serves the school buildings. This unit was offline due to school construction during the time of the site inspection.

Two of the existing automatic flushing units are equipped with dechlorination systems. Utility staff indicated that a tablet dechlorination system was used in the past, but that it was chemically and maintenance intensive. Although the disinfectant residual is characteristically low in these locations (the primary reason for flushing), some chlorine could be present in the water that is discharged.



WATER SYSTEM AUTOMATIC FLUSHING UNITS

FIGURE 2.14

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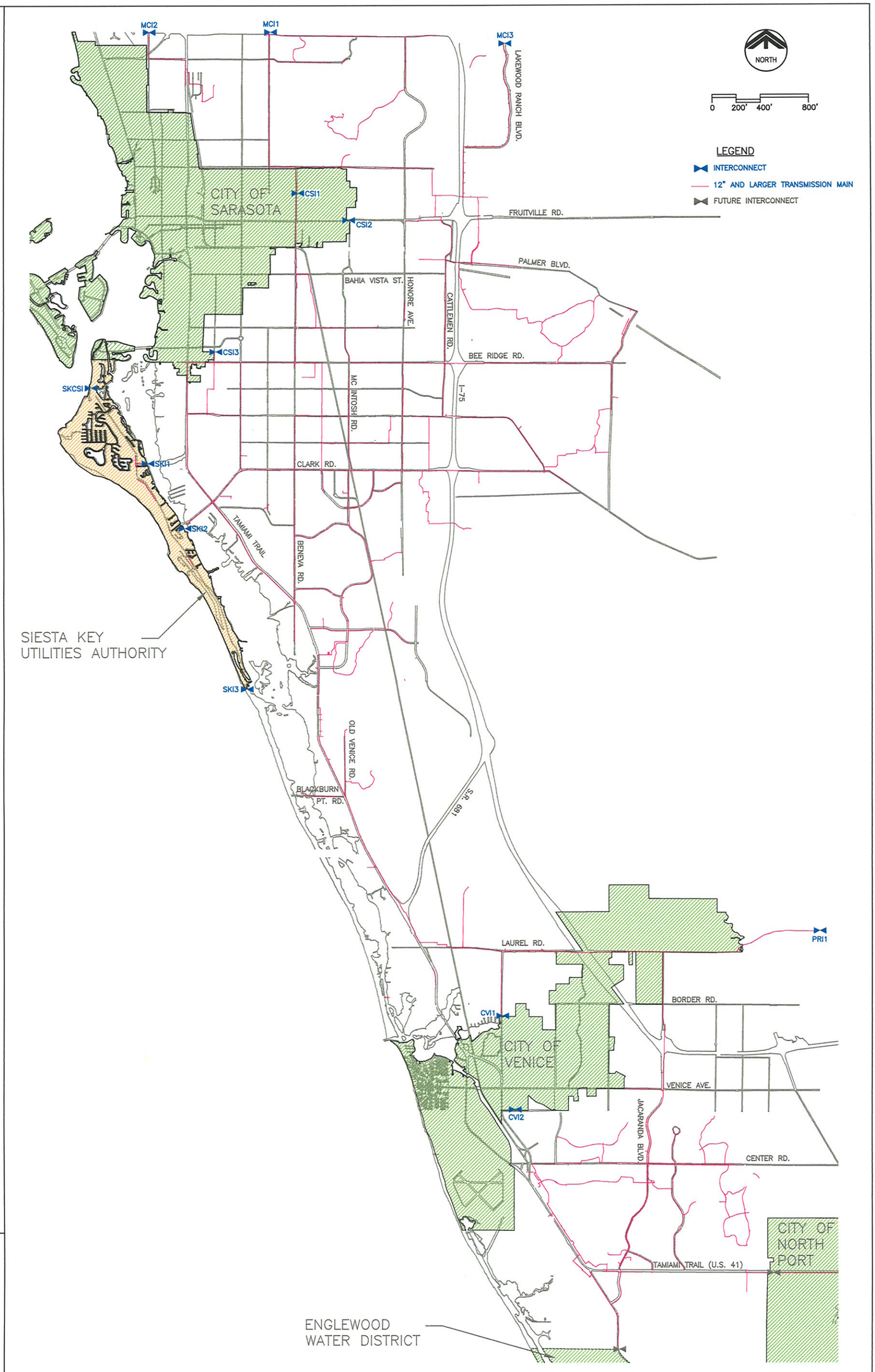
According to County staff, the average flow of the units is 150 gpm, and flushing is carried out for either 6 or 12 hours per day, depending on location. Approximately 302,000 gallons per day are flushed and discharged to various disposal sites. This amounts to approximately 9 million gallons per month, or 108 million gallons per year of water that is not being utilized. In 2004, County records showed a total daily supply average of 19.3 mgd. Assuming a flushed volume of 302,000 gallons per day, approximately 1.6% of the total production was lost via the automatic flushing units in 2004.

Further information regarding each automatic flushing unit can be found in Appendix I.

In addition to the automatic flushing units in the system, utility personnel manually flush hydrants in the system as needed. In some new areas of the County in which build-out residential capacity has not yet been reached, some mains are over-sized for the current customers. In some cases, more than one large diameter main dead-ends in the same vicinity. Some of these mains have been connected to provide a looping system that will help to prevent the occurrence of stagnant water. Other areas have been identified for future looping.

2.5 WATER SYSTEM INTERCONNECTS

The County is connected to several of the surrounding utility service areas via system interconnections. Some connections serve to provide backup water supplies during emergencies, and some serve as connection points for bulk water sales. Existing connections to surrounding utilities include 3 with Manatee County, 3 with the City of Sarasota, 2 with the City of Venice, 3 with SKUA, and 1 with the PR/MRWSA. An emergency connection is also available between SKUA and the City of Sarasota. This interconnect is significant to the County, as they will be assuming control of SKUA in July of 2006. The County is also currently constructing emergency interconnects with the Englewood Water District and the City of North Port. The existing and future system interconnects are shown in Figure 2.15 and are described further in the following sections. Although the pump station utilities staff monitored and maintained the County interconnects in the past, utilities staff stated that the meter maintenance crew assumed responsibility for maintenance of the interconnects in 2000. Additional information regarding the system interconnects can be found in Appendix J.



WATER SYSTEM INTERCONNECTS

FIGURE 2.15

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2.5.1 Manatee County Interconnects

Sarasota County currently holds a contract with Manatee County to purchase up to 10 mgd of water that is delivered via 3 system interconnections. The contractual quantity is scheduled to step down until 2025, at which time the contract expires. The junctions can also serve to provide backup water supply to or from Manatee County in case of an emergency. The County controls 2 of the 3 Manatee County interconnections. The first is Manatee County Interconnect #1 (MCI1), which is located on the northwest corner of Lockwood Ridge Road and University Parkway at the site of the University WTF and Pump Station No. 1. Manatee County water is fed by pressure from the Manatee County system via a 30-inch main that connects to Pump Station No. 1. The majority of the Manatee County water (approximately 75 to 80 percent) flows directly to Pump Station No. 1. There is also a tee off of the 30-inch main that transports water to the University Ground Storage Tank. Prior to entering the tank the line is split and reduced to a 6-inch and a 10-inch feed line. Utility staff has the option of using either the 6-inch or 10-inch line depending on system conditions and the desired flow of blend water. The Manatee County water is blended with water from the University Wellfield to produce a blend of water that is less than 500 mg/L in total dissolved solids (TDS). County staff indicated that they normally use the 6-inch blending line.

The second interconnect controlled by Sarasota County is Manatee County Interconnect #3 (MCI3), which is located in a parking lot at the southwest corner of University Parkway and Lakewood Ranch Boulevard. This connection is made via a 10-inch pipe and is controlled with a pressure-reducing valve. The MCI3 facilities appear to be in good working condition. County staff stated that the pressure coming into the system at this location is typically 70 to 90 psi, but that it has peaked to over 100 psi in the past. This connection also consists of an increaser, which enlarges the pipe size to 24-inch prior to entering the County water system. County staff stated that the pressure reducing valve is normally set at 15-20% open and that approximately 1.2 mgd of water is passed through MCI3.

The third interconnect is located within a Manatee County facility and consists of a 10-inch pipe connection that remains fully open. This connection, identified as Manatee County Interconnect #2 (MCI2), is located just north of University Parkway approximately 450 feet east of Highway 301 just west of the railroad tracks. The flow through this connection is governed based on system pressures and the flow through the other 2 interconnects.

2.5.2 City of Sarasota Interconnects

Sarasota County maintains 3 connections to the City of Sarasota. Although the connections were used frequently in the past, they have not been used for many years. Utilities staff stated that water has not been bought from or sold to the City of Sarasota since

approximately 1993. The interconnects now provide an important backup water supply for both the County and the City of Sarasota that may be needed during emergencies. The interconnect valves should be maintained and exercised regularly in order to provide a reliable connection if it is ever needed.

City of Sarasota Interconnect #1 (CSI1) is located on the southeast corner of Circus Boulevard and Beneva Road. The facility is fenced and is overgrown with foliage. The connection valves are located above grade and have some visible corrosion. Utilities staff did not know if the valves are in working condition. CSI1 is operated manually and is able to convey flow in either direction. Flow from the County to the City of Sarasota flows by gravity. Because County water pressure is maintained at a higher level than the City of Sarasota system, a pump is required to move water from the City to the County. CSI1 was used on a daily basis via an automatic timer in the past.

The second interconnect is City of Sarasota Interconnect #2 (CSI2), which is located on the northwest corner of Fruitville Road and McIntosh Road. The CSI2 valving and meters are located above grade and, aside from some visible corrosion, appear to be in satisfactory condition. This connection is operated via a manually controlled valve and operates in only one direction, from the City of Sarasota to the County. County staff could not recall this interconnect ever being used.

City of Sarasota Interconnect #3 (CSI3), is located on the southeast corner of Shade Avenue and Tulip Street. The CSI3 facilities are co-located with connections to the bulk water meter customer Southgate Utilities. All facilities at this location are located in underground vaults. Although project team members were not able to see the inside of the vaults, the aboveground portion of the facility appeared to be in good condition. The connection between the County and the City of Sarasota is operated with manual valves and free flow is allowed in either direction depending on system pressures.

2.5.3 City of Venice Interconnects

The County has 2 interconnections with the City of Venice. City of Venice Interconnect #1 (CVI1) is located on the northwest corner of the intersection of Albee Farm Road and Colonia Lane. This interconnection is located above grade and appeared to be in satisfactory condition. The connection between the County and the City of Venice is operated with manual valves and free flow is allowed in either direction depending on system pressures. Meters are available to measure flow in either direction.

City of Venice Interconnect #2 (CVI2) is located near the intersection of County Club Way and Gulf Coast Boulevard. All facilities at this location are located in underground vaults. Although project team members were not able to see the inside of the vaults, the aboveground portion of the facility appeared to be in good condition.

2.5.4 Siesta Key Interconnects

The County has 3 interconnections with SKUA. These connections serve as junctions for metered bulk water sales from the County to SKUA. In July 2006, the County is scheduled to assume responsibility for the SKUA and all of their associated facilities.

Siesta Key Interconnect #1 (SKI1) is located at the end of Constitution Boulevard on the mainland side of the connection and along Siesta Cove on Siesta Key. SKI1 provides a 10-inch connection that meters sales to the SKUA. SKI1 was recently raised to above grade, and all valves are operated manually. If system pressure is low, water from SKI1 passes through a booster pump station. Although the project team was not able to enter the SKUA facilities, SKI1 appears to be in good working condition.

Siesta Key Interconnect #2 (SKI2) is located just south of Stickney Point Road on the western end of the Stickney Point Bridge. The interconnect consists of manual valves, a 10-inch meter, and a booster pump station, through which water passes prior to being distributed to SKUA customers if system pressure is low. The booster station is located in a fenced area that is operated by the SKUA. Although the project team was not able to enter the SKUA facilities, SKI2 appears to be in good working condition.

Siesta Key Interconnect #3 (SKI3) is a connection between Siesta Key and Casey Key. Sarasota County Utilities assumed control of the Casey Key water system in 1993. At this time, the County began selling water to the SKUA through SKI3. Although this connection was not operating on the day of the site inspection, County staff indicated that it has been used recently and that it was shut off due to a repairs needed at this facility. SKI3 has valve locations on both the northern tip of Casey Key and on the southern tip of Siesta Key, just south of Turtle Beach. The Casey Key side of the connection is an 8-inch valve located in a fenced area, had visible corrosion, and is operated manually. The valve on the Siesta Key side of the connection is located in a vault below grade and is under SKUA control. County staff stated that at this side of the connection, the main is reduced into two 2-inch meters. Although the project team could not see inside of the SKUA vault, the aboveground facility appeared to be in good condition.

Finally, the SKUA has an interconnection between Siesta Key and the City of Sarasota on Lido Key, the Siesta Key - City of Sarasota Interconnect (SKCSI). Although SKUA currently maintains this connection, it is discussed in this TM since the County will be assuming these facilities in 2006. Utilities staff could not recall a time when this connection has ever been used. The connecting valves are located in vaults along Shell Road on Siesta Key. The connecting water main extends down Shell Road, across Big Pass, and into South Lido Park. The interconnect valves are located in 2 separate vaults, one to operate flow coming into Siesta Key and one to operate flow discharging from Siesta Key. Flow from both directions is via gravity. The valves in both vaults were almost completely submerged in

water and significant corrosion was apparent. Although both vaults were equipped with sump pumps, they were not in working condition. County staff indicated that they did not know who is responsible for maintaining these valves nor if they have been exercised regularly. County staff also stated that this interconnect was relocated in 1999. Aboveground facilities appeared to be in good condition.

2.5.5 Peace River Authority Interconnect

The County has one interconnect with the PR/MRWSA, Peace River Interconnect #1 (PRI1), which is used to transfer bulk water sales to the County. This interconnect is located at the Carlton WTF to the west of the chlorine contact tanks. The PR/MRWSA's water is delivered via a 42-inch pipe and is blended with the Carlton WTF product water in the onsite ground storage tank prior to being pumped to the distribution system. This interconnect also has the ability to transport water from the County to the PR/MRWSA under emergency conditions.

2.5.6 Future Interconnects

The County is currently constructing interconnects with the City of North Port and with the Englewood Water District (EWD). The interconnection with the City of North Port will be located along Highway 41 just to the east of the boundary between the County and the City of North Port's service areas. This interconnect may serve as a vehicle to provide short-term bulk water sales to the City of North Port until the City is able to bring other water sources online. After this interim period, the interconnect likely will only provide an emergency interconnect between the water systems.

The County is also constructing an emergency interconnect with the EWD. This interconnect will be located along State Road 776 just inside the EWD's service area. This interconnect is expected to be utilized under emergency conditions only.

2.6 SUMMARY OF WATER SYSTEM LIMITATIONS

This technical memorandum, TM2 - Water System Assets, summarized the location, size, and condition of the components of Sarasota County's water treatment and distribution system. The scope of this portion of the WSMPU was to document the system's assets and to identify system limitations and weaknesses with respect to water supply in the future. The information presented in this TM will be taken into account in the remaining sections of the WSMPU when considering various future supply projects and when developing the County's 10-year CIP. The following points summarize the major limitations of Sarasota County's water treatment and delivery system:

- The chlorine and ammonia chemical feed at the Carlton WTF is not flow paced. Operators feed the chemicals manually based on residual levels and the number of EDR units in operation. This could cause overfeeding of chemicals and requires additional time from operators. It is recommended that the chemical feed systems be upgraded for flow pacing. Carollo Engineers will complete further evaluation of the Carlton WTF's chemical feed systems under a separate project with the County.

- The finished water alkalinity from the Carlton WTF is relatively low compared to typical values. Low alkalinity levels generally provide less buffering capacity, which can lead to conditions conducive for corrosion. However, evidence of overall system corrosion, such as red water or high lead and copper values, are not present in the County's system. Additionally, water quality compatibility with other waters in the distribution system, such as Peace River and Manatee County, is important in maintaining stable water in the distribution system. Carollo Engineers will complete further evaluation of the Carlton WTF's chemical feed systems and water quality compatibility under a separate project with the County.

- An additional finished water ground storage tank and new high service pump station are recommended at the Carlton WTF. Although the existing storage capacity in the County's distribution system is adequate to meet the FDEP regulations for finished water storage, the additional storage volume would provide for additional ease of operation and would meet diurnal fluctuations while maintaining emergency reserve and fire flow volumes. These upgrades are planned for completion in 2007.

- The Venice Gardens WTF is not equipped with a backup concentrate disposal method, and the deep injection well has experienced some problems in the past. Therefore, a reject transfer station is recommended. The facility is already equipped with piping and a hydropneumatic tank to transfer brine to another deep injection well within the County's system. An onsite storage tank and pumping system to transfer the brine would provide a backup disposal option for the facility.

- The old membrane system in Building 2 at Venice Gardens WTF is not operational; therefore, this asset is being underutilized. County staff stated that this portion of the facility will be upgraded with new membranes, some chemical feed modifications, and new instrumentation for flow, pH, and conductivity in late 2005. The five high pressure feed pumps and motors will also be rebuilt. County staff will also consider strategies for obtaining higher recovery in the upgraded system.

- The degasification system at the University WTF is labor intensive and often out of service due to maintenance requirements. An upgrade to the degasification system is recommended.

- The disinfection chemical feed and finished water storage tank infrastructure at University WTF may provide poor mixing hydraulics in the ground storage tank. Further investigation should be initiated to confirm that primary disinfection requirements are being met and that optimum mixing and chloramine formation is taking place at this facility.

- The delivery of water treatment chemicals poses a challenge at the University WTF. The delivery facilities are difficult to maneuver due to the narrow driveway and lack of turnaround space.

- No major north-south transmission main exists in the eastern portion of the County. A large transmission main in this area of the County will assist in meeting demands in the future. Evaluations with the hydraulic model will aid in determining the best location for a new major transmission main.

- Several pump stations and storage tanks in the distribution system are under utilized (or not utilized at all) due to changes in system operation over the past ten years. For example, County staff stated that Pump Station No. 5 could be used to boost pressures in the eastern portions of the system if it were configured for boosting system pressure. Evaluations with the hydraulic model will aid in determining if there are alternative methods of operating the distribution system that could reestablish the use of some of these assets.

- Water entering the distribution system from opposite directions can create “dead zones” where the two sources are mixed in the distribution system. Further, the flow of water in certain pipes can change directions frequently depending on system pressures. These areas can experience water quality problems such as stagnant water and low disinfection residuals, since water has the ability to “sit” in the pipe for extended periods of time. Evaluations with the hydraulic model will determine if looping or adding check valves to the system could help in decreasing water age in the distribution system at these locations.

- Similar to the mixing zones described in the previous bullet, dead-end mains and “over-sized” mains in new development areas can cause stagnant water and low disinfectant residuals. The mains are currently over-sized because the development has not yet reached its build-out capacity. These low flow areas have necessitated the use of automatic flushing units in the system, which waste (discharge to ditches) approximately 300,000 gallons of water per day. Evaluations with the hydraulic model will determine if looping the system could help to decrease the water age in the distribution system at these locations and the amount of wasting required.

CARLTON WELLFIELD

Water Supply Master Plan Update
Sarasota County

Carlton Wellfield Asset Inventory

Well ID	Description	General Information								Pump Information							
		Well Capacity[1] (gpm)	Well Depth[2] (ft)	Well Head Elev[3] (ft)	Casing Diameter[2] (in)	Casing Depth[2] (ft)	Aquifer[1]	Discharges To	General Facility Condition	Pump Type[2]	Pump Manufacturer[3]	Pump Model[2]	Speed Control[1]	Serial Number[3]	Total Design Head[2] (ft)	Pumping Capacity[2] (gpm)	Pump hp[2]	Pump Speed[3] (rpm)
1	Well #21	520	715	26.93	12	434	Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	10TLC	Constant	116119 (93D3605)	144	757	40	1760
57	Well #22R	1370	See note #4				Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	See note #4		Variable	See note #4				
3	Well #23	1350	601	25.54	16	290	Intermediate / Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12TLC	Constant	116121 (93D3607)	151	1444	100	1760
4	Well #24	1500	621	27.64	16	300	Intermediate / Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12TLC	Constant	116122 (93D3608)	160	1410	100	1760
5	Well #25	1650	See note #4				Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	See note #4		Variable	See note #4				
6	Well #26	770	500	32.68	16	180	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12RKBL	Constant	116123 (93D3609)	131	736	40	1760
7	Well #27	1100	See note #4				Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	See note #4		Variable	See note #4				
8	Well #29	1760	See note #4				Upper Floridan	Degasifier System	Rotational Refurburbishment	Vertical Turbine	See note #4		Variable	See note #4				
9	Well #30	1080	400	34.18	16	320	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12RL	Constant	116124 (93D3610)	152	917	60	1770
10	Well #31	1200	400	34.68	16	320	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12TLC	Constant	116125 (93D3611)	150	1201	100	1760
11	Well #32	1440	400	34.93	16	330	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12KHHH	Constant	116127 (93D3613)	146	1688	100	1770
12	Well #33	1150	400	36.12	16	300	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12RL	Constant	116126 (93D3612)	150	1035	75	1770
13	Well #38	350	400	32.68	16	310	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	12ELH	Constant	116128 (93D3614)	197	563	50	1770
14	Well #39	850	400	33.58	16	285	Intermediate	Degasifier System	Rotational Refurburbishment	Vertical Turbine	Aurora	11BHC	Constant	116129 (93D3615)	176	792	60	1770

Notes: [1] Obtained from the Carlton Wellfield Management Plan, Sarasota County Environmental Services, January 2003.
[2] Obtained from Carlton Water Treatment Plant/Wellfield Operation and Maintenance Manual, Boyle Engineering, April 1995.
[3] Obtained from Carlton Operations and Maintenance Manual - Wellfield, Boyle Engineering, 1991.
[4] These wells were not part of the original plant. Plant staff provided motor hp and capacity, but they could not find any documented information on these wells.

Water Supply Master Plan Update
Sarasota County

Carlton Wellfield Asset Inventory

Well ID	Description	Motor Information						Raw Water Quality (January 1995 - December 2004 data, when available)						Chloride Trigger Level[1] (mg/L)	Remarks[1]
		Motor Manufacturer[3]	Model[3]	Motor hp[3]	Volts[3]	Phase[3]	Motor Speed[3] (rpm)	TDS Average (mg/L)	TDS Range (mg/L)	Chloride Average (mg/L)	Chloride Range (mg/L)	Sulfate Average (mg/L)	Sulfate Range (mg/L)		
1	Well #21	USEM	324TPH	40	460	3	1800	1235	912-1540	30	16-56	731	381-955	45	
57	Well #22R	See note #4		75	See note #4			1943	1872-2028	68	39-100	1079	840	1289	Chloride trigger of 70 mg/L suggested to SWFWMD
3	Well #23	USEM	6347	100	460	3	1800	2147	1258-2684	82	25-152	1323	856-1580	90	
4	Well #24	USEM	6347	100	460	3	1800	1420	1222-1788	33	10-59	847	610-1155	45	
5	Well #25	See note #4		75	See note #4			1427	1316-1536	40	26-97	813	643-1004	TBD	
6	Well #26	USEM	G74322	40	460	3	1800	1178	864-1584	83	9-185	594	450-740	75	
7	Well #27	See note #4		50	See note #4			1172	1032-1296	64	33-93	604	466-705	80	
8	Well #29	See note #4		75	See note #4			2125	1936-2336	139	101-168	1154	938-1353	TBD	
9	Well #30	USEM	6234	60	460	3	1800	1120	858-1488	87	24-296	561	346-662	65	Try to operate 30 & 38 together
10	Well #31	USEM	6347	100	460	3	1800	1078	936-1354	31	10-74	605	439-789	45	
11	Well #32	USEM	6347	100	460	3	1800	1537	1286-1844	129	81-217	833	585-1062	160	
12	Well #33	USEM	6326	75	460	3	1800	1155	844-1660	48	19-89	641	406-1155	60	
13	Well #38	USEM	G74304	50	460	3	1800	1488	1126-1752	65	22-105	865	550-1155	85	Try to operate 30 & 38 together
14	Well #39	USEM	G74318	60	460	3	1800	1327	900-1680	202	60-355	580	363-1050	230	

Notes: [1] Obtained from the Carlton Wellfield Management Plan, Sarasota County Environmental Services, January 2003.
[2] Obtained from Carlton Water Treatment Plant/Wellfield Operation and Maintenance Manual, Boyle Engineering, April 1995.
[3] Obtained from Carlton Operations and Maintenance Manual - Wellfield, Boyle Engineering, 1991.
[4] These wells were not part of the original plant. Plant staff provided motor hp and capacity, but they could not find any documented information on these wells.

NOTES FROM INTERVIEWS WITH CARLTON WTF STAFF

Carlton Site Visit - May 19, 2005

General Notes

- Carlton has 2 backup diesel generators (Caterpillar) that operators run 4 hours/month and 8 hours/quarter under load. They keep generators on during storms as backup.
- T. Mabry Carlton, Jr. Memorial Preserve is 24,000 acres, of which 300 acres are impacted by the WTF and wells.
- The facility is rated to treat 14 mgd (raw) and currently treats 6-7 mgd of raw water.
- There are 14 wells, of which 4-6 are typically used at any one time (4 have VFDs and the rest are constant speed).
- Forced air degasification system has PVC bars with baffles. Facility staff open and inspect the degas units annually. The degasifiers acquire very little bio growth.
- The sedimentation basin is not needed for sedimentation, but it is kept online. NaOCl is added prior to the sedimentation basin (in sand trap under degasifiers) to keep a slight residual through the facility.
- The sedimentation basin will be covered within1 year.
- The bypass around the sedimentation basin can handle only half of the facility flow.
- Facility staff rebuild feed pumps and well pumps as needed and on a rotational basis.
- Facility staff replace the PLCs at the filters often and are considering relocating them.
- The PLCs feed information to the SCADA system, but facility staff manually control the filters.
- Filters are relatively maintenance free. Operators performed a chemical strip in ~2002 and had little resin loss. Facility staff plan to do this every 2-3 years to extend media life.
- The ground storage tank turns over ~2.5 times per day. It has baffles across the bottom and receives relatively good mixing.
- The facility has a backwash holding tank that goes to the brine holding tank and then to deep injection wells. Sludge is cleaned out annually.
- Facility staff stated that there are not major problems with the chemical storage area. The HCl tank was replaced 2 years ago.
- The facility used to have air diaphragm pumps and now has been switched to electric.

- The phosphate tank is too small for delivery (they like to buy in bulk to save money), so they fill up drums with the excess. Phosphate containment area needs to be coated because it is corroding.

- In the past the facility was run at a 8.5-8.7 pH. After phosphate was installed, it was run at 7.2-7.5. Now it has been brought back up to 8.0.

- Phosphate residual target is 1.3-1.5 mg/L.

- Facility staff found a 20% soda ash provider that they are considering instead of caustic soda.

- Replaced gas chlorine with bleach ~2 years ago.

- A new air compressor has been ordered to operate air-powered tools.

- The softened water tank is not used for softened water as originally designed. It is now used for a backup to the caustic tank.

- The facility is equipped with piping and pumps to send chemicals to Peace River water, but normally they are not used.

- Staff plan to replace all the VFDs on the feed water pumps.

- The electro CIP runs automatically once every 8 hours to constantly clean the electrode.

- The CIP is an acid/caustic wash that is done once every 800 hours (~ every 2 months).

- All chemical containment areas were coated approximately 6 years ago and the coating is still in good condition.

- No polymer is used in the facility at this time.

- Hurricane plans and protection have been upgraded to rate for a Category IV hurricane.

- Each EDR unit has 2 rectifiers (convert AC to DC current), and they are run on the lowest setting.

- Facility staff would like regular (semi-annual) infrared scans on all breakers and electrical equipment to identify corrosion and potential problems.

- The high service pumps are in the process of getting new VFDs.

- The 17 motor-operated valves on each unit are troublesome to repair. The coupler wears out and is difficult to rebuild and/or replace.

- Some PLCs have been upgraded to Allen-Bradley PLCs, and others are in need of replacement.

- Cartridge filters require little maintenance and they replace them once every 4 months (all at the same time). They run all 4 at all times.

- Pressure is measured after the cartridge filters and PLC sends info to feed pumps (which are on VFDs) to keep pressure constant.

- The EDR feed header splits into 2 sides.

- There are 320 stacks that process 1.5 mgd (produce 1.2 mgd).

- Each unit has 8 trains, 4 stages per train. Each stage acheives a 30% TDS reduction.

- The first stage is run at higher voltage, all run at 70 psi.

- There are 300 pairs of membranes per stack (anion and cation).

- The facility staffs 14 people: 2 supervisors, 1 pump mechanic, and 11 operators/maintenance. The facility is staffed 24 hours per day with at least 2 people per shift.

- The electrodes in the EDR units are replaced approximately every 5 years (more often for the first stage).

- EDRs run in a high voltage, low amp configuration.

- The ammonia system just received new valves and ammoniators.

- The target chloramine residual is 4.5 mg/L in the product water, 3.5 mg/L from Peace River, for a combined finished water of 4 mg/L.

- CCT tanks have 2 chambers and 2 mixers. After flowing through the baffles, water flows over a weir. Facility staff try to run a 5:1 chlorine to ammonia ratio.

- All chemicals are dosed based on the number of stacks running (average flow). All chemicals are a constant feed, manually set, with no flow pacing.

- Process feed pump room has new VFDs coming soon. They will also pull and replace the wiring, as it is very corroded. The building sits in a low spot on the site and has water problems, which is conducive for corrosion.

- Facility staff plan to put the VFDs on pads and then raise the floor. They also will build a birm with a sump pump.

- Sidewalks cover chemical trenches. The covers are hard to remove because the removal mechanism is rusted. Instead anchor bolts are used, but it is hard to lift the covers.

- Carlton uses the deep well on Center Road for concentrate disposal. There is also the option of going to the DIW at the Venice Gardens Water Reclamation Facility.

- The facility has 5 transfer pumps to take reject to DIWs. It is approximately 5 miles in a 16” line. The facility produces approximately 1 mgd of brine/backwash water.

- The auto flusher at Taylor Ranch runs 5 hours/night every other day.

- The auto flusher at Resource Center runs 6 hours/night.

- Some of the online analyzers do not provide reliable results.

Carlton Site Visit - May 26, 2005

General Comments

Carlton has several planned projects in various stages of completion/planning:

- Replacing all 6 feed water pump VFDs, putting them up on pads.
- Rebuilding feed water pumps and well pumps on a rotational basis (~ every other year).
- Replacing filter PLCs ~ every 2 years due to chassis in back of PLC. Facility staff are also looking into relocating these PLCs.
- Conducting infrared scans on electrical equipment. Facility staff have done this occasionally on some equipment and want to start a program to do it regularly. This would be sub-contracted to a professional electrician.
- New VFDs on high service pumps should be complete w/in 2 weeks.
- New air compressor and new airlines for tools and possibly for new valves on EDR units.
- SCADA system, software, and computer system upgrade for operating the facility. Facility staff are looking into Wonderware at other locations in the water system.
- All wells have been recently upgraded with mechanical seals.
- A cover for the sedimentation basin is planned for next year.
- The County may add up to 5 additional wells at Carlton to increase rotational capabilitites.

Problems mentioned by facility staff include:

- Some PLCs are outdated and it is hard to get parts.
- The MOV couplers wear out quickly and they are looking into upgrading the valves.
- They have to retrofit the MOV couplers themselves because the replacement valves are not compatible. Ionics is preparing a quote to replace these valves.
- The individual EDR unit PLCs need replacement soon.
- Chemical piping is hard to get to under the sidewalk.
- The process feed pump room has significant corrosion, sits at a low elevation, and water drains toward the building. The wiring near the floor is corroding.

- They often have to flush hydrants in southern portions of town to keep chlorine residuals up.

- The pumps at PS6 are at a slightly higher elevation that GST6. As the tank approaches its minimum level, the pumps start cavitating.

- As the facility grows they will need more staff. Currently they have 14 full-time staff including 2 supervisors, 11 operators/maintenance, and 1 pump mechanic. They are going to get 2 new positions in October. They have a lot of redundancy now, so maintaining things can be done as they are able, but with an increase in production they will need to be able to respond more quickly.

Potential changes to be made in facility suggested by facility staff:

- Could increase capacity by increasing voltage, obtaining more removal, and then bypassing water and blending. However, a bypass/blending pipe was not included in the original facility.

- A new storage tank is needed at Carlton. They turn over the existing tank 2.5 times per day.

- A high pressure blowoff or air release would be helpful in the two EDR feed headers.

- Watering days are currently Sunday and Tuesday. This creates very high demands during dry months. It would be better to stagger watering days from Monday-Friday. They have suggested correlating watering day with last digit of address (0&1 on Monday, 2&3 on Tuesday, etc).

<u>Other Notes</u>

- The facility has been run in a manual mode for the past 2 years. They flow pace every chemical manually. Facility staff feel that manual control has some advantages. The constantly varying flow of the EDR units makes it hard to use automatic equipment that operates best with a constant flow. They have tried flow pacing the chemicals on the product side of the flow, but had little success. They are going to start flow pacing the pretreatment chemicals again soon.

- Distribution system staff operate the system to keep the water level in the University tank at 25-29' because they believe it short-circuits. They also get poor mixing in this tank due to the locations of the chemical feed.

Appendix C

JACARANDA WELLFIELD

Water Supply Master Plan Update
Sarasota County

Jacaranda Wellfield Asset Inventory

	General Information[1]								Pump Information[1]					Raw Water Quality (January 2003 - December 2004 data)							
Well ID	Well Name	Location	Well Capacity (gpm)	Well Depth (ft)	Casing Diameter (in)	Casing Depth (ft)	Aquifer	Discharges To	Pump Manufacturer	Pump Model	Total Design Head (ft)	Design Pumping Rate (gpm)	Pump hp	TDS Average (mg/L)	TDS Range (mg/L)	Chloride Average (mg/L)	Chloride Range (mg/L)	Sulfate Average (mg/L)	Sulfate Range (mg/L)	Chloride Concentration Limit	Remarks
53	RO-1	1350 Jacaranda Blvd	350	525	12	240	Intermediate / Upper Floridan	Cartridge filters	Grundfos	385S250-4B	215	350	25	No data.						n/a	Not currently in service.
54	RO-2	1350 Jacaranda Blvd	350	525	12	240	Intermediate / Upper Floridan	Cartridge filters	Grundfos	385S250-4B	215	350	25	No data.						1000	Not currently in service.
55	RO-3	1350 Jacaranda Blvd	350	525	12	240	Intermediate / Upper Floridan	Cartridge filters	Grundfos	385S250-4B	215	350	25	No data.						n/a	Not currently in service.
102	RO-4	1801 Venice East Blvd	600	530	10	240	Intermediate / Upper Floridan	Cartridge filters	Grundfos	SP125-3AN	266	600	n/a	No data.						n/a	Not currently in service.
103	RO-5	1801 Venice East Blvd	600	520	10	240	Intermediate / Upper Floridan	Cartridge filters	Grundfos	SP125-3AN	266	600	n/a	No data.						1000	Not currently in service.
104	RO-6	610 Venice East Blvd	595 [2]	530	12	246	Intermediate / Upper Floridan	Cartridge filters	Grundfos	L625S600-3	n/a	n/a	60	2286	1916-3152	485	382-616	924	789-1031	1000	
143	RO-7	610 Venice East Blvd	367 [2]	530	12	245	Intermediate / Upper Floridan	Cartridge filters	Grundfos	L625S600-3	n/a	n/a	60	2569	2476-2664	617	539-665	996	876-1113	n/a	

Notes: [1] Information obtained from Kevin Brown - Chief WTP Operator at Venice Gardens WTP, Jennifer Steadman Ryan - Sarasota County Environmental Services, and the Jacaranda Wellfield Water Use Permit.

[2] Capacitites attained when RO-6 and RO-7 operated simultaneously.

Appendix D

NOTES FROM INTERVIEW WITH VENICE GARDENS WTF STAFF

Venice Gardens Site Visit - June 1, 2005

General Notes

- Venice Gardens has several planned projects in various stages of completion/planning:
    - New high service pumps station currently in final stages of completion. The pumps are operating and final site restoration and building construction will be complete soon.
    - The old membrane system (in Building 2) will be upgraded with new membranes, some chemical feed improvements, and instrumentation for flow, pH, and conductivity. The 5 high pressure feed pumps and motors will also be rebuilt. When these improvements are made, they will bring Wells #1-5 online to begin producing water through this train.
- Problems mentioned by facility staff include:
    - No backup concentrate disposal.
    - Main onsite wastewater lift station needs to be upgraded.
    - The onsite generator cannot power the entire facility. A generator upgrade will be needed in the future. The existing generator could be used to power offsite wells. None of the offsite wells have backup generators.
    - The old sulfuric acid tank outside of Building 2 had a chemical leak that corroded much of the containment area. If pH adjustment is needed for the new membranes, a new acid tank is needed. However, facility staff are looking at a different antiscalant that may not require pH adjustment.
- Potential changes to be made in plant suggested by facility staff:
    - Reject transfer station is needed as a back up to the deep injection well. The facility has no backup for concentrate disposal in case of deep injection well problems. The piping and hydropnuematic tank is already in place to transfer to another deep injection well.
    - A Venturi meter on the total finished water prior to disinfection would be helpful. Currently they have 2 paddle wheel meters for each of the product waters.
- The wellfield has 2 monitoring wells.
- Roofs on both buildings have been upgraded recently.
- AF-600 needs to be plumbed to Building 2.

- Wells 6 and 7 supply the refurbished side of the facility (Building 1), and Wells 1-5 supply the other side of the facility (Building 2). There is a backup connection valve that allows water to be transferred to either building if necessary. Well 8 (permitted but not constructed) also will supply Building 1.

- Facility staff mentioned the importance of being a good neighbor. The facility is located in a central area and the site maintenance is very important to area homeowners. This can be a challenge during construction projects.

- Disinfection is completed with sodium hypochlorite and liquid ammonia.

- Degasification system has whiffle ball type media and uses upward forced air to strip hydrogen sulfide. The facility does not have problems with biofouling on this media.

- Have separate flow meters for product water for Building 1 and Building 2 (after blend is added).

- Cartridge filters are 5-micron and 30" in length. Facility staff purchase the filters with the extended core, because although they are a bit more expensive they are easier to install.

- Obtain ~50% recovery in the RO process.

- Blend approximately 5:1 of product to raw. On day of site visit, facility was running about 500 gpm of product and about 100 gpm of raw.

- Facility staff rigged a chemical "booster pump" to bring chlorine to the scrubbers. This helps with odors.

- Although the facility is equipped to feed caustic soda to both the scrubbers and the clearwell, it is not needed. The pH is brought up to acceptable levels by stripping and chlorine/ammonia addition.

- The facility runs entirely on Wonderware control softare. It is equipped to be integrated into the new County system when it is installed. The Wonderware works well, but they cannot "see" what the rest of the system is doing due to present incompatibilities in software.

- Building 2 has been equipped with Wonderware and will be operable when the rehabilitation improvements are made.

- Sulfuric acid and AF-600 are fed via flow pacing to the static mixer prior to the RO skids. Chlorine and ammonia can be flow paced to the clearwell; however, presently the flow is so low that facility staff doses the chemicals manually because the flow meter is not accurate at these flows.

- The feed pH is typically about 6.7. The pH is lowered to about 4.7-5.1 for RO process. Product water is about 8.8 (with no pH adjustment chemical added).

- The facility is staffed by 3 people and run 5 days a week, 8 hours per day. In October, the facility will be getting 2 additional staff members. Once they make the planned upgrades they will expand to 7 days a week, 16 hours a day. At that time, additional staff will be needed.

- Membranes in Building 1 were installed in 2002.

- New high service pumps are 100 hp each (3 of them). Model 6LR-13A by Flowserve.

- Building 1 is equipped to measure online pH, pressure, conductivity, and flow.

- Building 1 RO runs at 150-170 psi.

- The 3 storage tanks have a common header and valving to isolate any tank.

- New pump station has Allen Bradley PLCs and VFDs.

- The location of the original tray aerator is now the ammonia room.

Venice Gardens Site Visit - June 2, 2005

General Notes

- Degasification system is an upflow forced air with plastic hollow spherical media.
- Cartridge filters hold 85 5-micron elements.
- Building 1 RO units have ten 8" shells with 60 total elements with a total production capacity of 375,000 gpd each.
- Building 2 contains 5 high pressure pumps, which have 75-hp, 3-phase, 460 V motors by US Electric (3540 rpm). The pumps are 4 stage, 316 gpm, 3600 rpm, at 516' of head.
- Building 2 has 3 cartridge filters with max feed pressure of 150 psi.
- Building 2 has 5 RO units, 3 trains of 9 units (Codeline) and 2 trains of 9 units (Filmtec). All are 8" elements.
- The generator is relatively new, but it can't power the entire facility.
- The staff rebuilt the laboratory area themselves recently.
- Building 1 has 2 cartridge filters (space for 3), and only 1 is in service.
- Building 1 has 2 RO units, each with 10 trains.
- Building 1 has 2 high pressure pumps at 100 hp, 3530 rpm motor, 420 gpm at 415' of head, with a pump speed of 3600 rpm.
- Sulfuric acid is stored in a 4500-gallon bulk tank and then pumped from a 250-gallon day tank.
- NaOCl is 10.5% strength and is stored and fed from two 850-gallon tanks.
- Ammonia hydroxide is stored at 18% in two 330-gallon totes.
- The 2 transfer pumps to the storage tanks are 20-hp each operating at 1770 rpm, 1500 gpm at 38' of TDH.
- The AF-600 is stored in a 100-gallon day tank and is pumped from 55-gallon drums.
- Membranes receive a citric acid and trisodium phosphate clean.
- VGU just acquired 2 wells from the Plantation site. They are piped in a header that comes within approximately 500 feet to the header from Wells #6 and #7. These wells are permitted for 440,000 gpd on an annual average daily basis.

- There are 2 interconnects with the City of Venice - one on Country Club Boulevard and one on Albee Road and Colonia.

- The RO facility was originally opened in 1991. It was closed down in 1995 in order to better utilize the new Carlton WTF. The Venice Gardens WTF was refurbished and reopened in 2002.

Appendix E

UNIVERSITY WELLFIELD

Water Supply Master Plan Update
Sarasota County

University Wellfield Asset Inventory

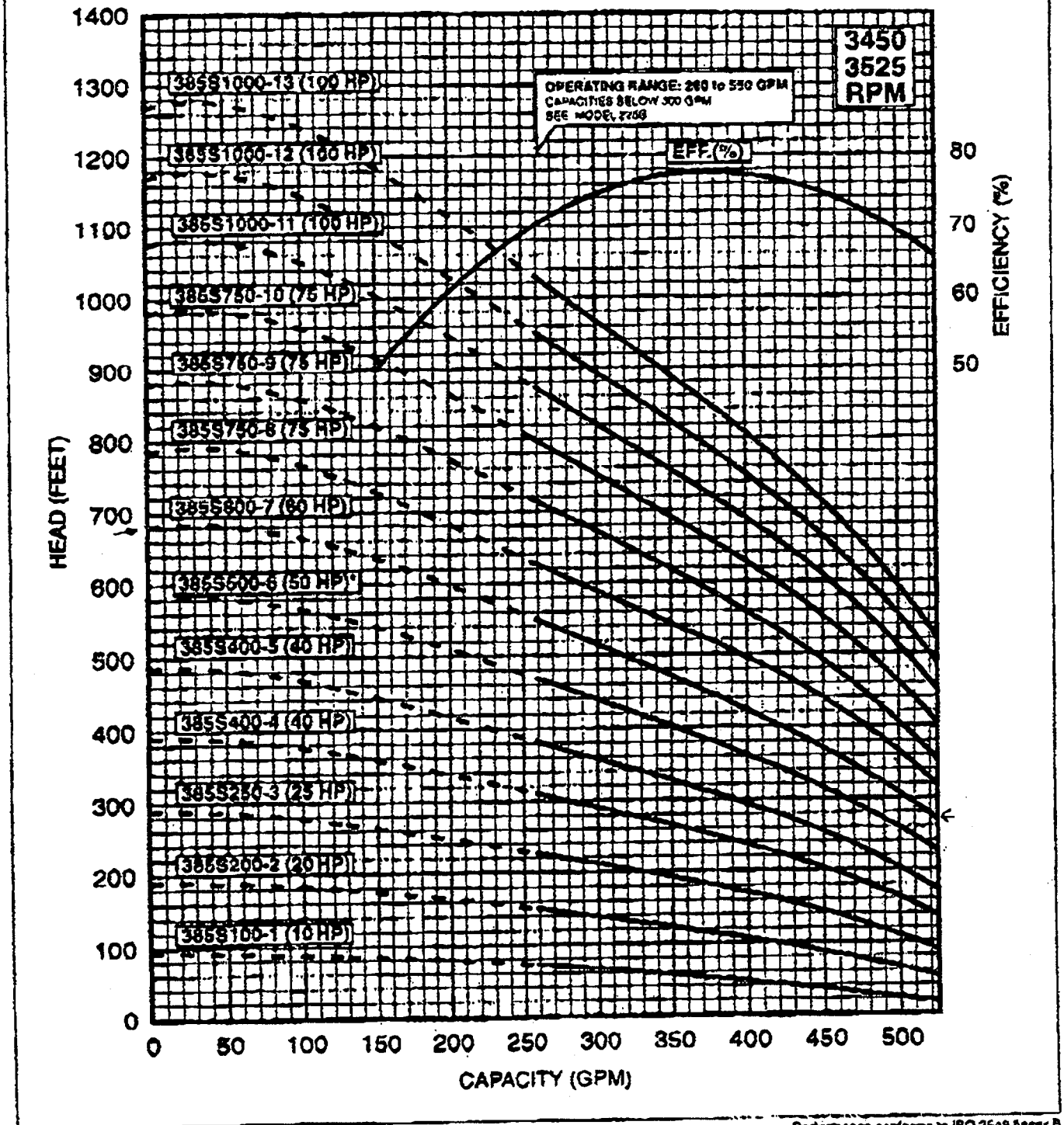
General Information[1]										Pump Information[1]						Raw Water Quality (January 2001 - March 2005 data)						Remarks
Well ID	Description	Location	Well Capacity (gpm)	Well Depth (ft)	Casing Diameter (in)	Casing Depth (ft)	Aquifer	Discharges To	General Facility Condition	Pump Manufacturer	Depth of Pump	Pump Model	Total Design Head (ft)	Design Pumping Rate (gpm)	Pump hp	TDS Average (mg/L)	TDS Range (mg/L)	Chloride Average (mg/L)	Chloride Range (mg/L)	Sulfate Average (mg/L)	Sulfate Range (mg/L)	
UPW1	Production Well #1	3120 University Parkway	500	606	8	350	Floridan	Degasifier	Good	Grundfos	140	No documented information found. Is is either a 20-hp or a 25-hp pump.				1088	988-1316	81	54-154	518	454-611	Of the 7 wells, 3 have 20-hp motors and 4 have 25-hp motors. Operators are not sure which wells have which hp motors. All wells except #1 have been rebuilt in the past 5-6 years. Well #7 has been refurbished most recently due to a pitted pipe.
UPW2	Production Well #2	3350 University Parkway	500	600	10	420	Floridan	Degasifier	Good	Grundfos	140	385S250-3	220	250-550	25	1094	960-1312	75	50-97	531	411-717	
UPW3	Production Well #3	3550 University Parkway	500	580	10	440	Floridan	Degasifier	Good	Grundfos	80	No documented information found. Is is either a 20-hp or a 25-hp pump.				1202	1024-1344	88	68-125	591	455-699	
UPW4	Production Well #4	3650 University Parkway	500	600	10	440	Floridan	Degasifier	Good	Grundfos	100	No documented information found. Is is either a 20-hp or a 25-hp pump.				1069	980-1336	59	45-79	536	454-622	
UPW5	Production Well #5	3800 University Parkway	500	640	10	400	Floridan	Degasifier	Good	Grundfos	80	No documented information found. Is is either a 20-hp or a 25-hp pump.				1258	1080-1428	104	57-158	628	510-771	
UPW6	Production Well #6	3900 University Parkway	500	600	8	350	Floridan	Degasifier	Good	Grundfos	140	No documented information found. Is is either a 20-hp or a 25-hp pump.				1207	1004-1330	66	47-104	642	486-764	
UPW7	Production Well #7	4400 University Parkway	500	640	10	460	Floridan	Degasifier	Good	Grundfos	140	385S250-3	220	250-550	25	1272	998-1432	49	28-73	706	529-855	

Notes: [1] Information obtained from County water distribution system staff and the University Wellfield Water Use Permit.

Model 385S 385 GPM Performance Curves

FLOW RANGE: 260 - 550 GPM **OUTLET SIZE: 4" NPT** **NOMINAL DIA. 8"**

UNIVERSITY WELLFIELD WELL PUMPS 1 → 7



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
6" MOTOR STANDARD, 10-60 HP/3450 RPM.
8" MOTOR STANDARD,60-100 HP/3525 RPM.
* Also available with 6" motor.

Performance conforms to ISO 2548 Annex B @ 8 ft. min. submergence.

GRUNDFOS

Figure E.1 University Well #2

Appendix F

NOTES FROM INTERVIEW WITH WATER DISTRIBUTION SYSTEM STAFF

Distribution System Site Visits - March 24, 2005

General Notes

- Need to consider the Siesta Key Utilities Authority, which the County will acquire in July 2006. This will include tanks, distribution lines, etc. Comprises ~3500 customers.

- The auto flushers at the north sites discharge 4-10 MG per month.

- According to nodes shown by SCADA system at PS2, the pressure in the system at ~8am was 50-65 psi.

- The system has 15 pressure nodes that are monitored. Some are at key intersections or near key intersections. County just added one at Palmer Ranch and would like to add more to Siesta Key when they take over SKUA.

- Current SCADA system at PS2 uses a Dynac software system. County wants to upgrade the whole system to Wonderware eventually.

Distribution System Site Visits - March 31, 2005

General Notes

- Some of the empty tanks were filled last year prior to the hurricanes.

- Currently have the Dynac SCADA system installed at all facilitys except at Venice Gardens WTF, and aside from the WonderWare trial package being installed at PS1. This current software has done well for the County, but it has a few "bugs." The clock is not set to the correct time, and it cannot be adjusted. Often, the operators find that if one parameter is altered or fixed, another parameter stops working. The County would like to eventually install WonderWare at all the pump stations and facilities.

- In the past with the old control system, PS6 could control the Carlton WTF in case of storm or other problem at Carlton. With the new system, they can't do this. It is the opinion of the operators that the County should reinstate the ability to control Carlton from PS6.

- Pump Stations 1, 2, 4, and 6 have the ability to be booster stations. Pump Stations 3 and 5 are high service stations only. It is the opinion of the operators that it would be beneficial to convert PS3 and PS5 to booster stations.

- It is the operator's opinion that the most important project to be done in the system is to upgrade the degasification system at University WTF.

- Chlorine demand increases dramatically in the summer months. Example: at University the chlorine feed has increased from 9 to 13.5 gallons per hour in the past 2 weeks.

- SKUA typically purchases 50-70 MG per month.

- SKUA used to sell to Casey Key. When the County took over the Casey Key system, they turned the meters around and now sell to SKUA.

- As far as operators know, the County has not bought from or sold to the City of Sarasota since 1993.

- A few years ago, the meter crew took over the maintenance of the County's water system interconnects.

- SKUA interconnects with City of Sarasota are in poor condition. The valve pits are completely submerged in water. Pits are equipped with sump pumps that were not operating. Severe corrosion was noted in both pits.

Distribution System Site Visits - April 7, 2005

General Notes

- Distribution system staff's opinion is that highest priorities in system are the degasification system at University, Elevated Tank #2, and changing Pump Stations 3 and 5 into booster stations.

- Elevated Tank #2 was repaired in summer 2004 and is now structurally sound. The County has 3 contracts with companies that have antennae on the tower. A new tower is limited to a height of 80' by a new ordinance, but since this tank is grandfathered in everyone wants to use it.

- Pump Station 6 is used in booster mode. The tank at PS6 is empty. The pumps are getting new drives soon, as the current drives are getting old and spare parts are hard to find. They are also getting new stainless steel valves for the vault at PS6 in order to have better control and less maintenance.

- All pump stations are equipped with alarm systems.

- Have 3 major dead ends in vicinity of Auto Flusher #1. Have 2 dead-end 12" lines very close to one another here. Distribution system staff suggest that they be connected. The County manually flushes hydrants in these areas once per month.

- University has a lot of trouble with the degasification unit.

Appendix G

WATER SYSTEM PUMP STATIONS

Water Supply Master Plan Update
Sarasota County

Pump Station Asset Inventory

Site Information				Pump Information[1]											Pump Start Set Point		Pump Stop Set Point	
Pump Station	Site Address	Pump ID	Pump Description	Pump Manufacturer	Pump Type	Model No.	Serial No.	Total Design Head (ft)	Design Pumping Rate (gpm)	Pump hp	Pump Speed (rpm)	Impeller Diameter (in)	Inlet Pipe Diameter (in)	Outlet Pipe Diameter (in)	Pressure at Set Point (psi)	Head at Set Point (ft)	Pressure at Set Point (psi)	Head at Set Point (ft)
PS1	3120 University Pkwy	PS1-BP1	Booster Pump #1	Gould	Horizontal Split Case	3410	239C435	29	5250	150	1470	15.375	14	12	62	143	65	150
PS1	3120 University Pkwy	PS1-BP2	Booster Pump #2	Gould	Horizontal Split Case	3410	240C737	29	5250	150	1470	15.375	14	12	62	143	65	150
PS1	3120 University Pkwy	PS1-HSP1	High Service Pump #1	Gould	Horizontal Split Case	3410	240C964	155	1500	75	1800	12.25	8	6	n/a	n/a	n/a	n/a
PS1	3120 University Pkwy	PS1-HSP2	High Service Pump #2	Gould	Horizontal Split Case	3410	240C963	160	2000	125	1800	13	8	6	n/a	n/a	n/a	n/a
PS2	1001 South Beneva Road	PS2-P1	Pump #1	Gould	Horizontal Split Case	3410	229C549	180	4200	250	1800	14.375	12	10	48	110	n/a	n/a
PS2	1001 South Beneva Road	PS2-P2	Pump #2	Gould	Horizontal Split Case	3410	229C549	180	4200	250	1800	14.375	12	10	48	110	n/a	n/a
PS3	5508 Ruby Place	PS3-P1	Pump #1	Gould	Horizontal Split Case	3410	227C815	155	5500	300	1800	14.125	12	10	50 (if pump station were operating)	115 (if pump station were operating)	n/a	n/a
PS3	5508 Ruby Place	PS3-P2	Pump #2	Gould	Horizontal Split Case	3410	227C681	155	5500	300	1800	14.125	12	10	50 (if pump station were operating)	115 (if pump station were operating)	n/a	n/a
PS3	5508 Ruby Place	PS3-P3	Pump #3	Gould	Horizontal Split Case	3405	267B405	165	2000	300	1780	13.375	12	10	n/a	n/a	n/a	n/a
PS4	6171 Lakewood Ranch Blvd	PS4-P1	Pump #1	Aurora	Horizontal Split Case	413BF	9613515-1	63	1000	20	1800	9.1875	8	6	n/a	n/a	n/a	n/a
PS4	6171 Lakewood Ranch Blvd	PS4-P2	Pump #2	Aurora	Horizontal Split Case	413BF	9613515-2	63	1000	20	1800	9.1875	8	6	n/a	n/a	n/a	n/a
PS5	5949 Proctor Road	PS5-P1	Pump #1	Gould	Horizontal Split Case	3410	242C250-1	175	2500	150	1800	13.625	10	8	56 (if pump station were operating)	129 (if pump station were operating)	n/a	n/a
PS5	5949 Proctor Road	PS5-P2	Pump #2	Gould	Horizontal Split Case	3410	242C250-2	175	2500	150	1800	13.625	10	8	56 (if pump station were operating)	129 (if pump station were operating)	n/a	n/a
PS6	4201 Vamo Road	PS6-P1	Pump #1	Gould	Horizontal Split Case	3405L	203C930-1	200	4400	300	1800	15.88	12	10	74	171	n/a	n/a
PS6	4201 Vamo Road	PS6-P2	Pump #2	Gould	Horizontal Split Case	3405L	203C930-2	200	4400	300	1800	15.88	12	10	74	171	n/a	n/a
PS6	4201 Vamo Road	PS6-P3	Pump #3	Gould	Horizontal Split Case	3405L	203C930-3	200	4400	300	1800	15.88	12	10	74	171	n/a	n/a

Notes: [1] Information obtained from County water distribution system staff and equipment inspection during site visits.

Water Supply Master Plan Update
Sarasota County

Pump Station Asset Inventory

Site Information			Motor Information[1]						General Facility Condition	Remarks
Pump Station	Pump ID	Pump Description	Motor Manufacturer	Serial Number	Motor hp	Volts	Amps	Motor Speed (rpm)		
PS1	PS1-BP1	Booster Pump #1	US Motors	H020-205Z043R297M	150	460	171.7	1775	Good	The booster pumps usually do not run. The pressure from Manatee County (65-70 psi) is sufficient for the Sarasota County system. If pressure drops to less than 62 psi, the booster pumps start. They operate to keep the pressure between 62 and 65 psi when needed. Operators see little pressure drop through the pump station, so pressures entering Sarasota County are approximately 65 psi.
PS1	PS1-BP2	Booster Pump #2	US Motors	C603601-827	150	460	183	1775	Good	
PS1	PS1-HSP1	High Service Pump #1	US Motors	G61370/V07V1670083R	75	230/460	172/86	1780	Good	Don't have automatic start and stop set points for pumps. They are operated manually at the decision of the operators, usually based on keeping water quality at certain levels (turbidity <1.0) and on blending as much Manatee water as needed to meet desired TDS concentrations. Usually use a 1:5 blend of well water to Manatee County water. The day of inspection operators were blending ~1.2 MG of each source in the tank. Additional Manatee water bypasses the tank and is blended back at the pumps to attain the 1:5 blend.
PS1	PS1-HSP2	High Service Pump #2	US Motors	5K405AL2100	125	460	148	1780	Good	
PS2	PS2-P1	Pump #1	US Motors	C603599-907	250	460	330	1770	Good	Tank at this pump station is not in use. Have a check valve on line outside of this pump that allows the water only to flow south. Water free flows unless pressure in the system drops. The pumps are normally not in use, but are in opeartional mode in case pressure drops to < 48 psi. The pumps then are controlled by VFDs to maintain system pressure above 48 psi.
PS2	PS2-P2	Pump #2	US Motors	C603599-892	250	460	290	1770	Good	
PS3	PS3-P1	Pump #1	US Motors	C603600-867 86-00549	300	460	360	1760	Good	Not in service and is completely obsolete according to pump station staff. Many homes around PS3 are on wells. PS3 could possible be utilized if it were a booster station rather than just a high service station.
PS3	PS3-P2	Pump #2	US Motors	C603600-867 86-00548	300	460	360	1760	Good	
PS3	PS3-P3	Pump #3	Caterpillar	66D38672	250		2200		Good	Back up pump connected to generator with direct drive diesel motor.
PS4	PS4-P1	Pump #1	US Motors	Model H13904	20	460	23.9	1800	Pumps are seized.	Normal operation does not require this pump station, as it was designed soley for fire protection. The pumps are seized and are inoperable. The valve on the water main outside of PS4 is partially closed in case the valve at MCI3 fails. The day of inspection, the valuve was ~15% open.
PS4	PS4-P2	Pump #2	US Motors	Model H13905	20	460	23.9	1800	Pumps are seized.	
PS5	PS5-P1	Pump #1	Reliance Electric	01MLN79071 G001GC	150	460	165	1785	Good	Not in service. Plant staff stated that PS5 would be much more beneficial if it were a booster station rather than just a high service pumping station. It could boost pressure to eastern residences.
PS5	PS5-P2	Pump #2	Reliance Electric	01MLN79071 G001GC	150	460	165	1785	Good	
PS6	PS6-P1	Pump #1	US Motors	651211-U11U1900345R-1	300	460	334	1774	Good	Can serve as a booster or a high service station and can pump to/from north or south. Two pumps normally run in lead/lag operation. Third can be added manually. VFDs and valves are to be replaced at this pump station soon. PS6 pumps Carlton water to the northern areas of the system.
PS6	PS6-P2	Pump #2	US Motors	651211-U11U1900345R-2	300	460	334	1774	Good	
PS6	PS6-P3	Pump #3	US Motors	651211-U11U1900345R-3	300	460	334	1774	Good	

Notes: [1] Information obtained from County water distribution system staff and equipment inspection during site visits.

Water Supply Master Plan Update
Sarasota County

SKUA Pump Station Asset Inventory

Site Information[1]			Pump Information[1]			Motor Information[1]		General Facility Condition	Remarks
Pump Station	**Site Address**	**Pump ID**	**Pump Manufacturer**	**Pump Type**	**Design Pumping Rate (gpm)**	**Motor Manufacturer**	**Motor hp**		
SKPS1	5200 Oakmont Place	SKPS1-1	Peerless	Horizontal Split Case	1800	Marathon	100	Unknown, did not have access to plant site.	Pump #2 (75-hp) has a propane motor for emergency backup power.
SKPS1	5200 Oakmont Place	SKPS1-2	Peerless	Horizontal Split Case	1350	Cont.	75		
SKPS1	5200 Oakmont Place	SKPS1-3	Peerless	Horizontal Split Case	1760	GE	50		
SKPS2	Siesta Cove	SKPS2-1	Motortronics	Varispeed	2400	US Motors	40	Good	Pump station and co-located disinfection facilities recently upgraded.
SKPS3	Stickney Point Road	SKPS3-1	Peerless	Varispeed	1500	Baldor	25	Good	Pump station and co-located disinfection facilities recently upgraded.
SKPS3	Stickney Point Road	SKPS3-2	Peerless	Varispeed	1500	Baldor	25	Good	
SKPS4	6647 Midnight Pass	SKPS4-1	Peerless	Varispeed	2800	US Motors	125	Unknown, inside of SKUA building	Pumps not used since tank is out of service. Pump #2 (200-hp) has a diesel motor for emergency backup power.
SKPS4	6647 Midnight Pass	SKPS4-2	Peerless	Varispeed	2800	Cont.	200		

Notes: [1] Information obtained from Siesta Key Utilities Authority.

Figure G.1 Pump Station No. 6

Figure G.2 Pump Station No. 1

1.1 Pump Curves

Pump curves for each pump station are provided in this section. It should be noted that during initial inquiries to obtain pump curves, County staff stated that pump curves were not available. Therefore, the pump curves included in Draft TM2 were obtained based on collected field data, such as model, horsepower, and impeller size, which was matched with cut-sheets from the associated manufacturer.

Subsequent inquiries to the County resulted in pump curves for most individual pump stations. Certified pump curves are included in this section when available, as indicated on the appropriate pages. However, some pump curves were not obtained from the County (Pump Station No. 3 and Carlton WTP high service pumps). Therefore, the pump curves included for these pumps are not certified and require verification prior to being used in hydraulic modeling or for other purposes.

The Siesta Key Utilities Authority provided certified pump curves when available. These pump curves are also included in this section.

Pump Station No. 1

PUMP STATION #1 HIGH SERVICE PUMP # 1

DATE 12-12-86 REV. DATE

GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

CENTRIFUGAL PUMP CHARACTERISTICS

RPM 1780 CDS 3855

MODEL 3410

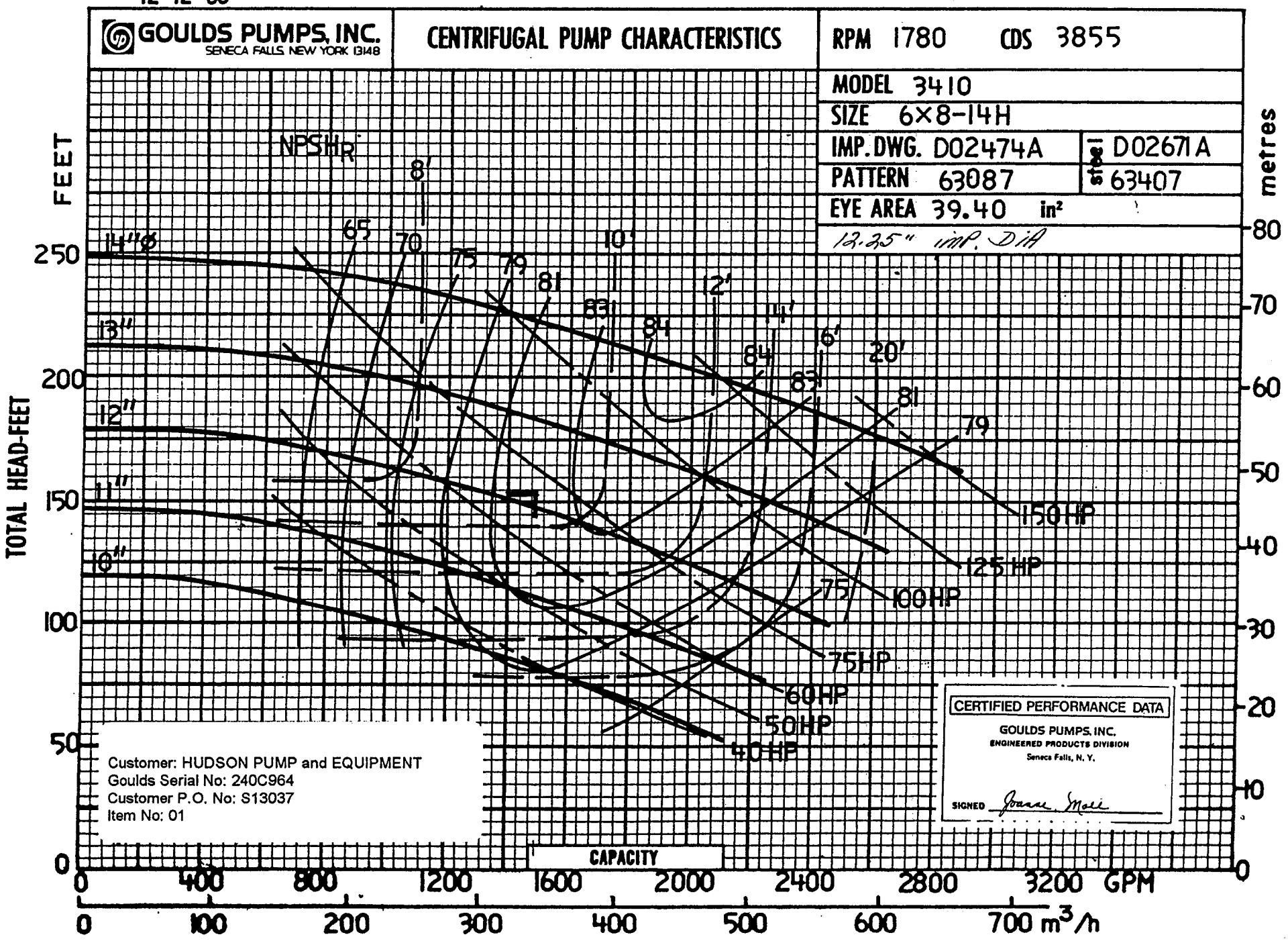
SIZE 6×8-14H

IMP. DWG. D02474A | stage D02671A

PATTERN 63087 | stage 63407

EYE AREA 39.40 in²

13.25" IMP. DIA



Customer: HUDSON PUMP and EQUIPMENT
Goulds Serial No: 240C964
Customer P.O. No: S13037
Item No: 01

CERTIFIED PERFORMANCE DATA
GOULDS PUMPS, INC.
ENGINEERED PRODUCTS DIVISION
Seneca Falls, N. Y.
SIGNED

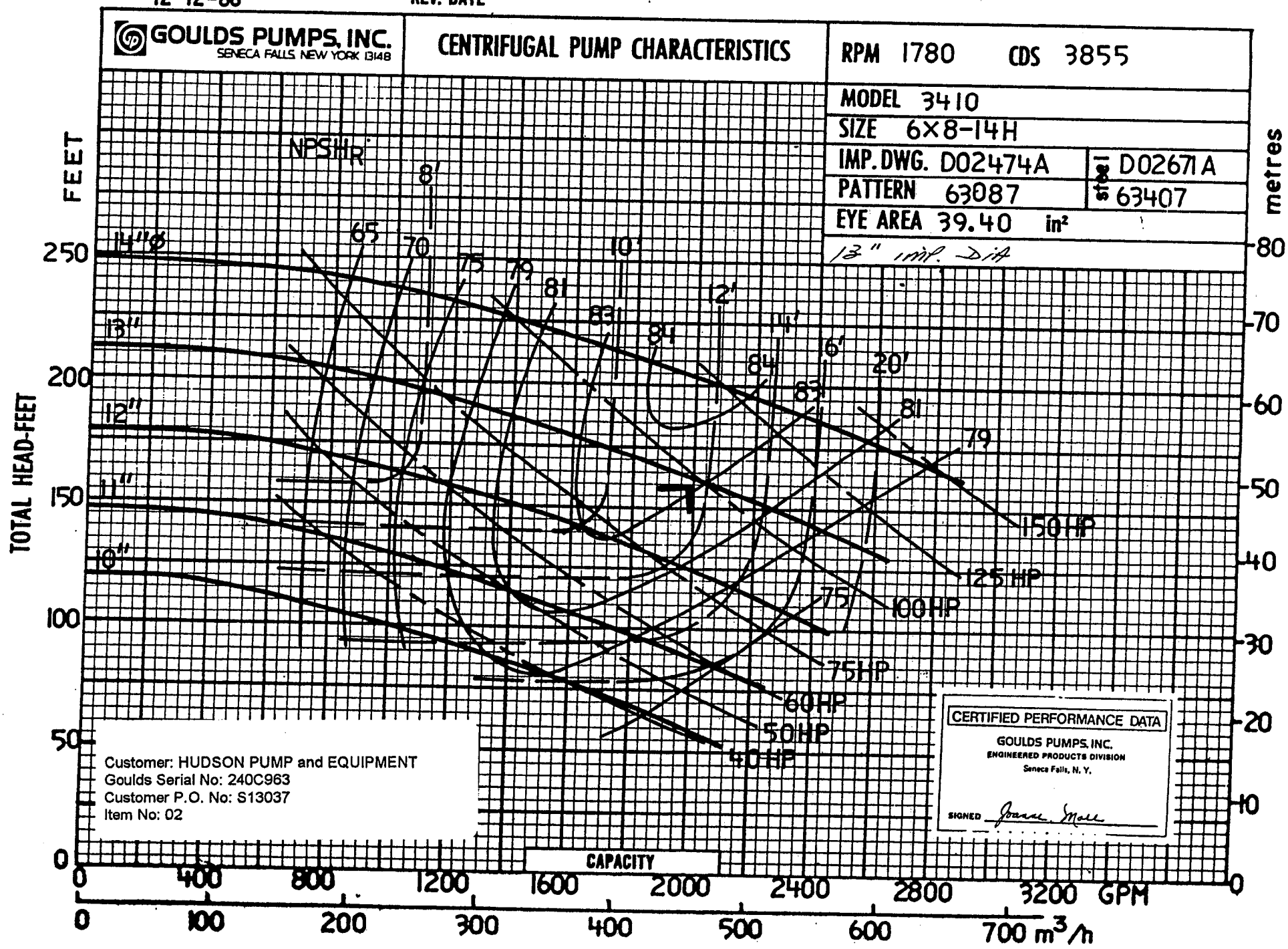
DATE 12-12-86 REV. DATE

PUMP STATION # 1 HIGH SERVICE PUMP # 2

GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

CENTRIFUGAL PUMP CHARACTERISTICS

RPM 1780	CDS 3855
MODEL 3410	
SIZE 6X8-14H	
IMP. DWG. D02474A	Stage I D02671A
PATTERN 63087	63407
EYE AREA 39.40 in²	
13" Impl. Dia	



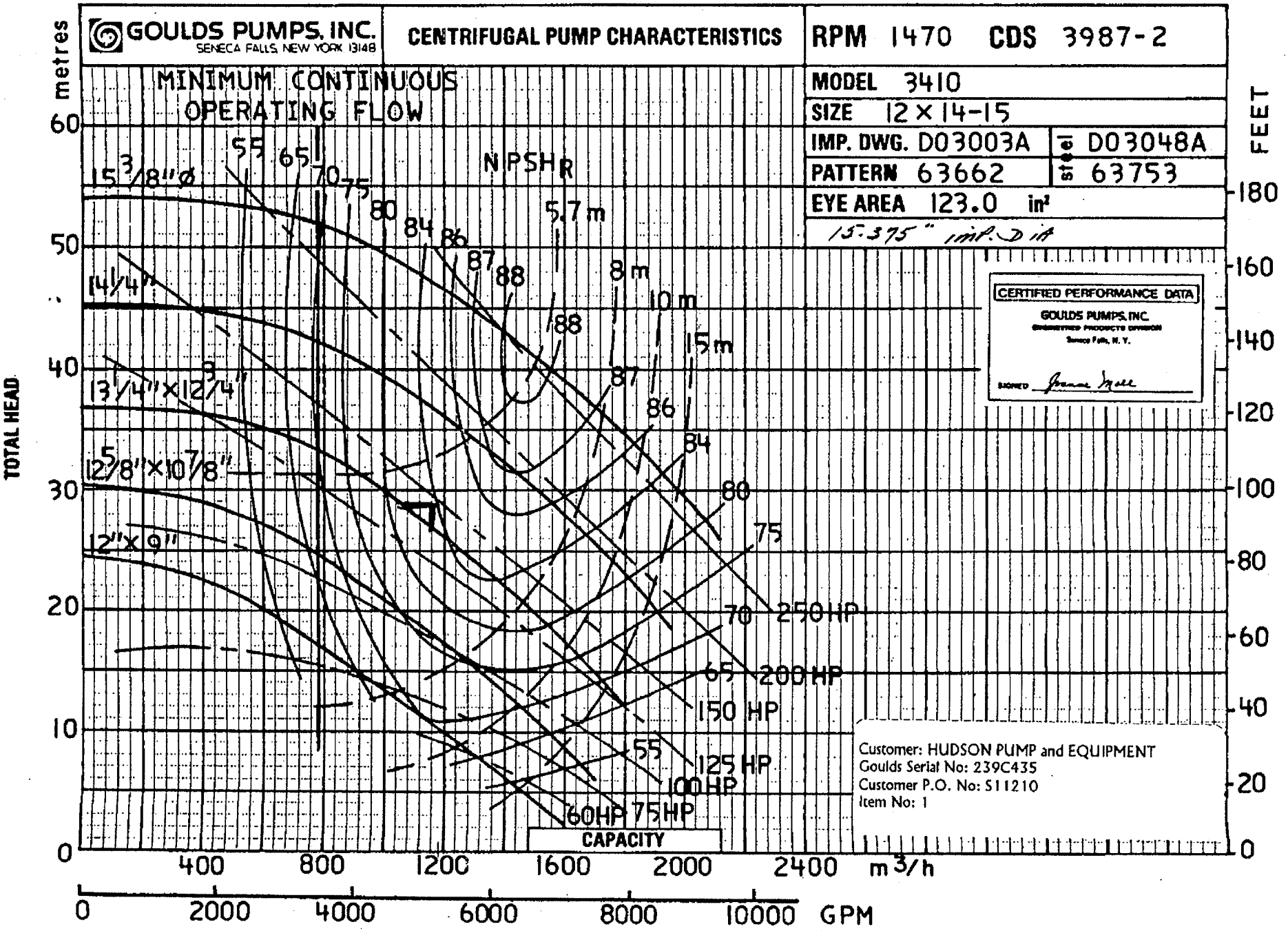
Customer: HUDSON PUMP and EQUIPMENT
Goulds Serial No: 240C963
Customer P.O. No: S13037
Item No: 02

CERTIFIED PERFORMANCE DATA
GOULDS PUMPS, INC.
ENGINEERED PRODUCTS DIVISION
Seneca Falls, N. Y.
SIGNED

PUMP STATION #1 Booster PUMPS

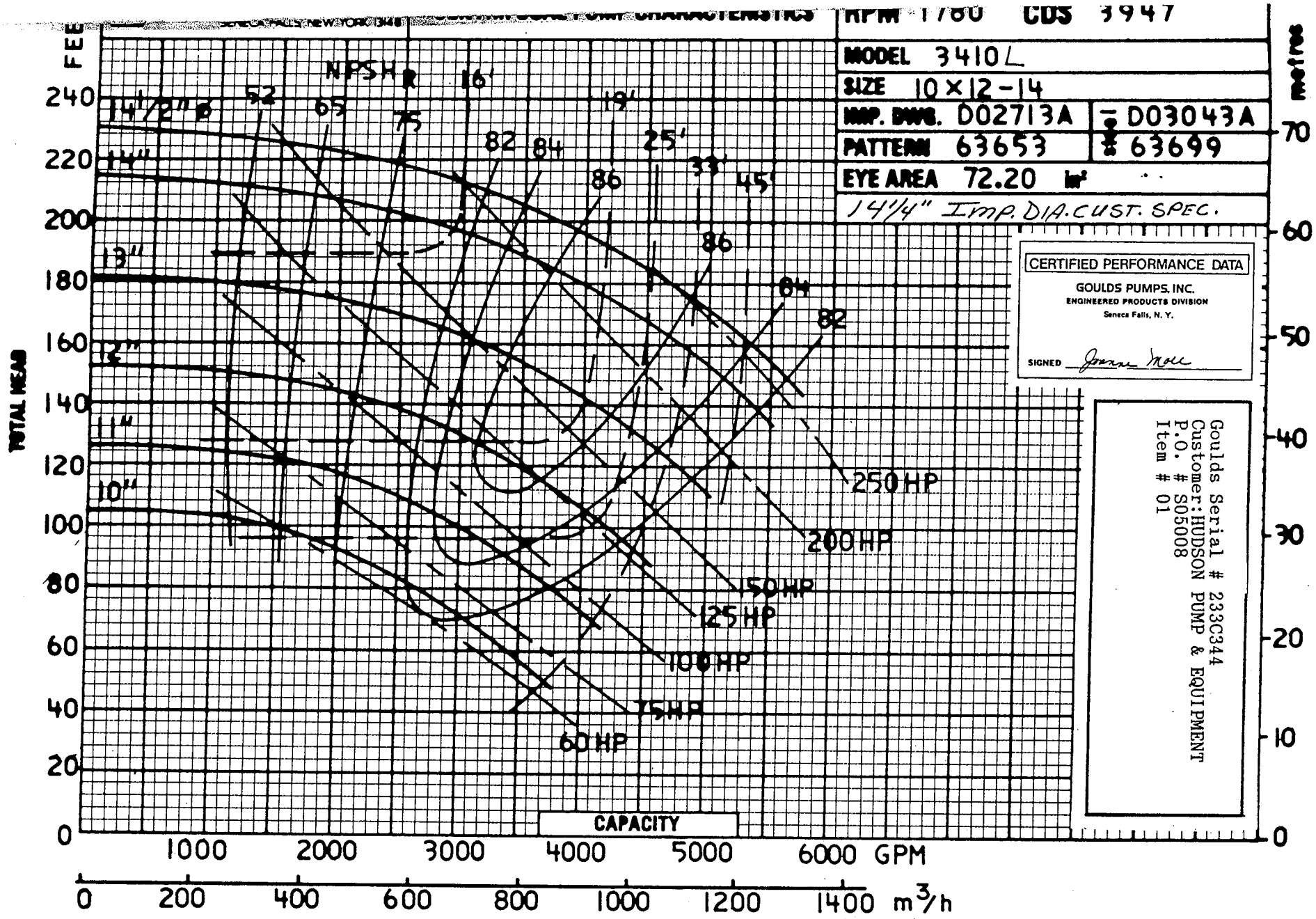
DATE 2-7-87

12-18-91 ISSUE YDA
REV. DATE 10-25-90 ADDED MIN. FLOW



Pump Station No. 2

PUMP STATION # 2 PUMPS #1 & #2



Pump Station No. 3

Model:3410	Size:10X12-15	Group:XL	60Hz	RPM:1785	Stages:1

Job/Inqu. No.
Purchaser:
User:
Item/Equip.No:
Service:

Issued by: fghgfh fghgfh
Quotation No.
Order No.

Date: 5/18/05
Certified By:

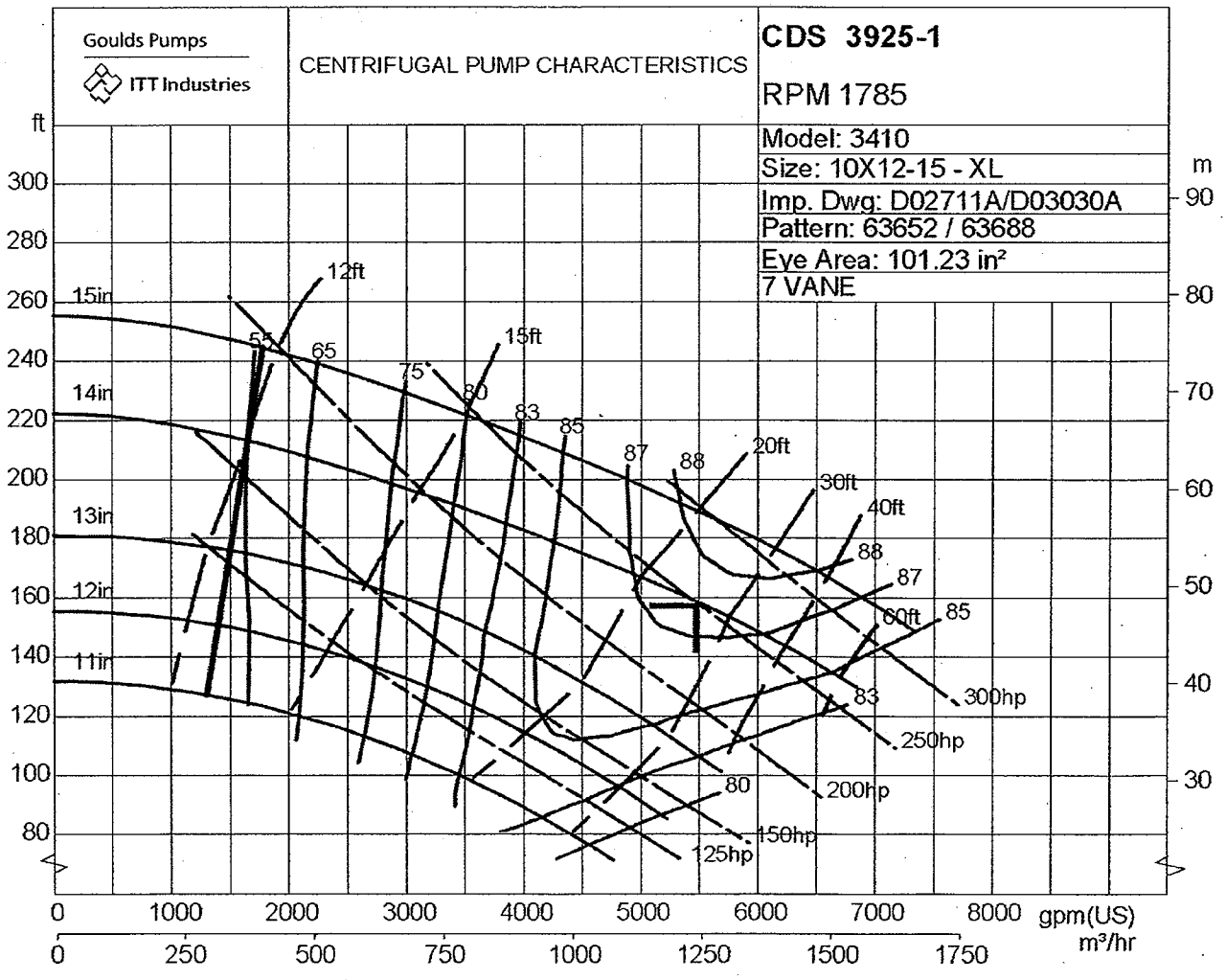
Operating Conditions

Liquid:	Water	Actual Pump Eff.:	87.5 %
		Actual Pump Power:	250.9 hp
Temp.:	70 °F	Mech. Seal Loss:	0 hp
Sp. Heat:		Dyn. Seal Loss:	0 hp
S.G./Visc.:	1/1 cp	Other Power Loss:	0 hp
Flow:	5500 gpm(US)	Rated Total Power:	250.9 hp
TDH:	155 ft	Imp. Dia. First 1 Stg	14 in
NPSHa:		NPSHr:	26.4 ft
Req. solid size:		Shut off Head:	222.4 ft
% Solids:		Max. Solids Size:	1.38 in
Vapor Press:			

Pump Performance

Suction Specific Speed:	8671 (gpm(US) , ft)
Min. Cont. Stable Flow:	1658.5 gpm(US)
Min. Cont. Thermal Flow:	
Non-Overloading Power:	267.2 hp
Imp. Dia. Addt'l Stg	
Mag. Drive Circuit Flow:	
Max Drive Power:	
Max Drive Temp:	
Max Motor Size:	

Notes: 1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above. 2. Magnetic drive eddy current and viscous effect on power and efficiency is not included. 3. Elevated temperature effects on performance are not included.



Pump Station No. 4

PUMP STATION #4 PUMPS # 1 & #2

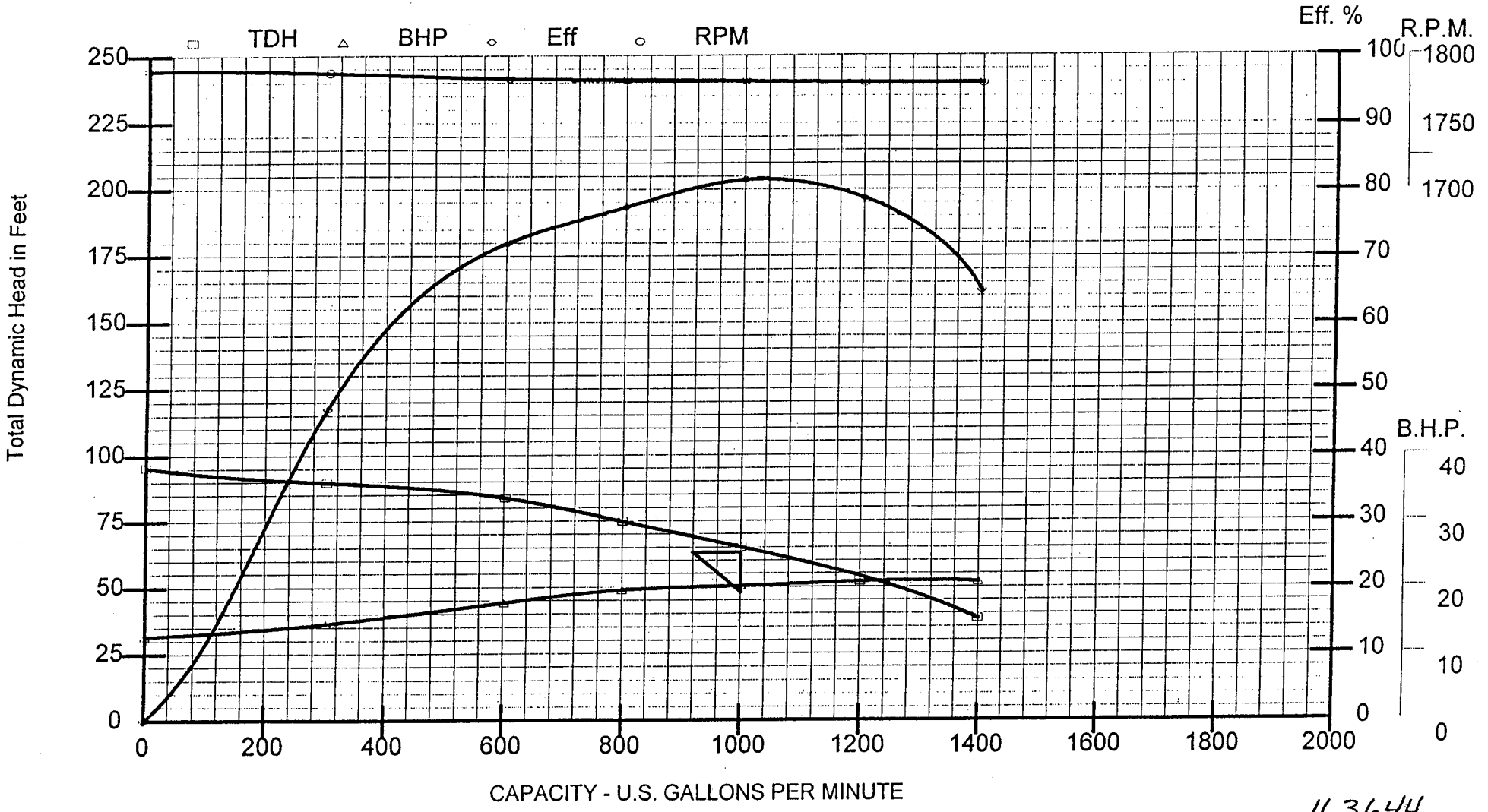
L D Pierce
Certified By

3-10-97
Date

GENERAL SIGNAL PUMP GROUP
A UNIT OF GENERAL SIGNAL

Pump No:	3515-1
Size:	5x6x11A
Type:	413
R.P.M.:	Test
Stage:	1
Spec. Gravity:	1.0
Imp. Dia.:	9.1875
Impeller Patt. No:	
Curve No:	163644
Test No:	0397106
Plotted By:	5700,
Date:	3/10/97

CARTER & VERPLANCK INC
Customer



163644

Pump Station No. 5

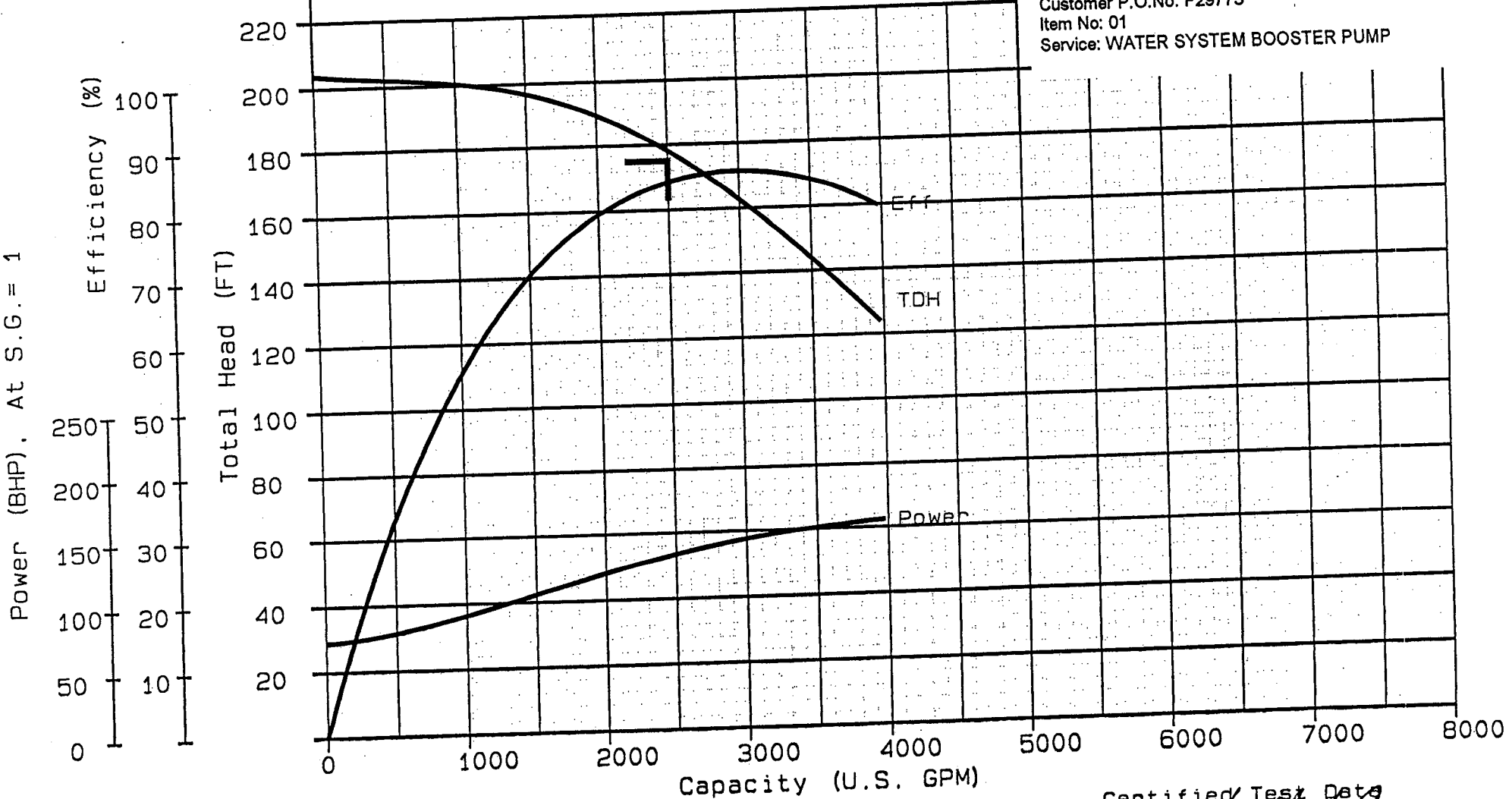
PUMP STATION # 5 PUMPS # 1 & # 2

Model: 3410M
Speed: 1785 RPM
Drawing No: D02621A

Size: 8X10-14
Impeller Dia.: 13.625
Pattern No: 63444

TEST DATE: 8-31-00
AS-BUILT PERFORMANCE CURVE

Customer: HUDSON PUMP & EQUIPMENT
Goulds Serial No: 242C250-1-2
Customer P.O.No: F29773
Item No: 01
Service: WATER SYSTEM BOOSTER PUMP



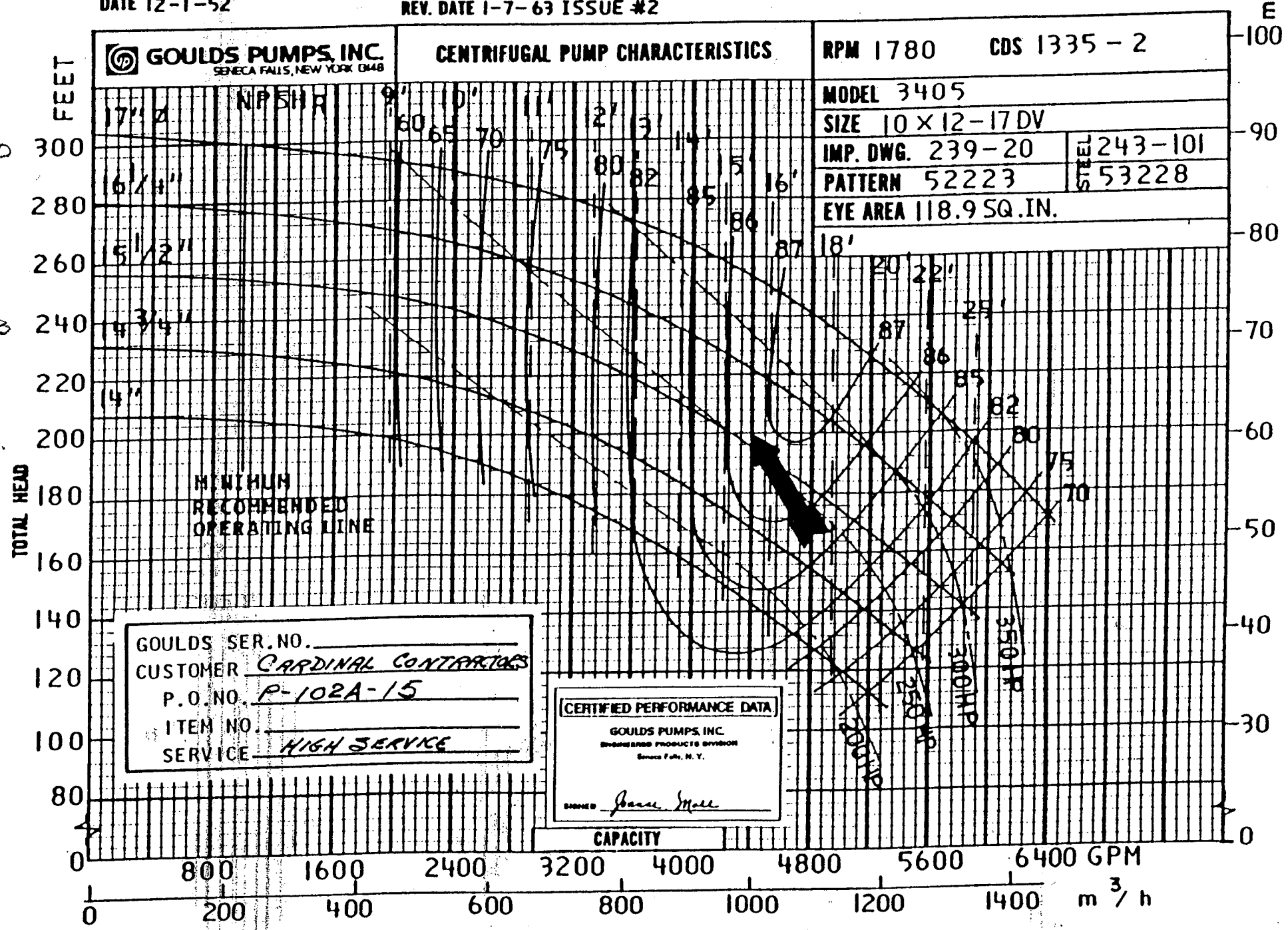
Certified Test Data
By: Heidi A. Rapone
Date: 8-31-00

Pump Station No. 6

PUMP STATION #6 PUMPS #1, #2 & #3

DATE 12-1-52 12-30-77 TRACED, METRIC ADDED P.A.D.

REV. DATE 1-7-63 ISSUE #2



Venice Gardens WTP High Service Pump Station

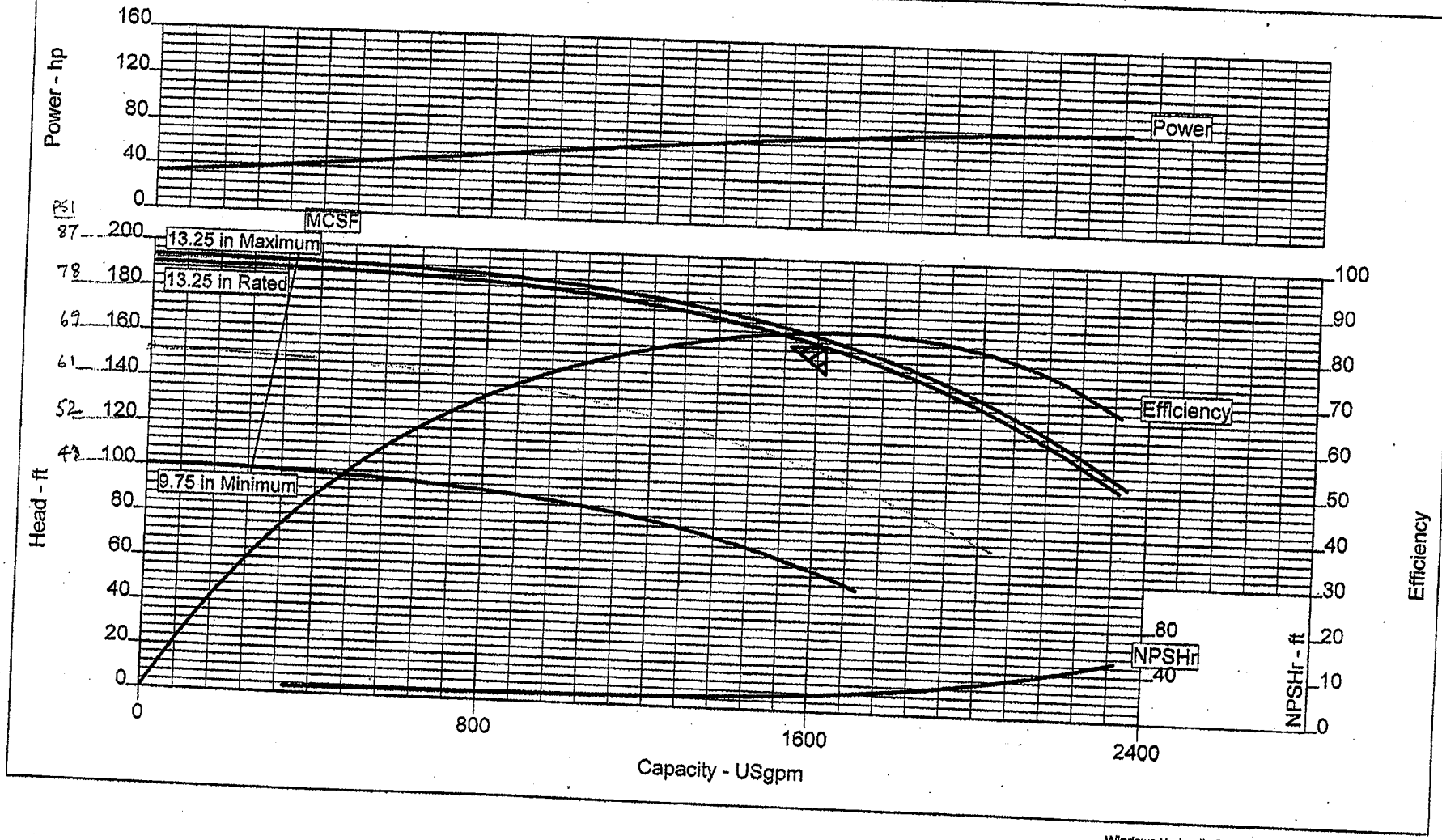
CARDINAL CONTRACTORS, INC.
VENICE GARDENS WWTP PROJECT
CUSTOMER PO: 402-02
EQUIPMENT TAG: 60P-1, 60P-2, 60P-3
PUMP MODEL: 6LR-13A
FLOWSERVE ORDER: 047-82491

FLOWSERVE Pump Division

Capacity	: 1620.0 USgpm	Specific gravity	: 1.000
Head	: 162.00 ft / 70 PSI	Pump speed	: 1775 rpm

Pump size & type	: 6LR-13A
Based on curve no.	: A-19878R1
Number of stages	: 1

CURVES ARE APPROXIMATE. PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS, CAPACITY, HEAD, AND EFFICIENCY.



Windows Hydraulic Selection V3.00, Output Module V3.07

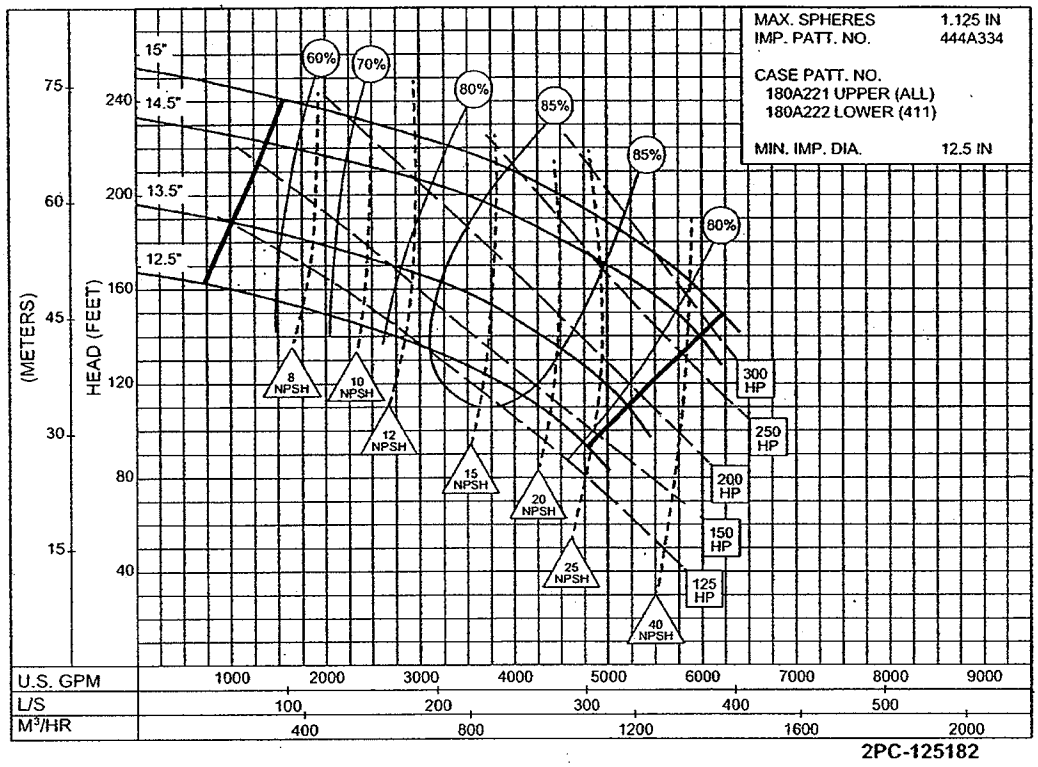
Carlton WTP High Service Pump Station

10 x 12 x 15C
SERIES 410

ENCLOSED IMPELLER

Supersedes Section 410 Page 433
Dated June 1989

SIZE : 10x12x15C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1775**

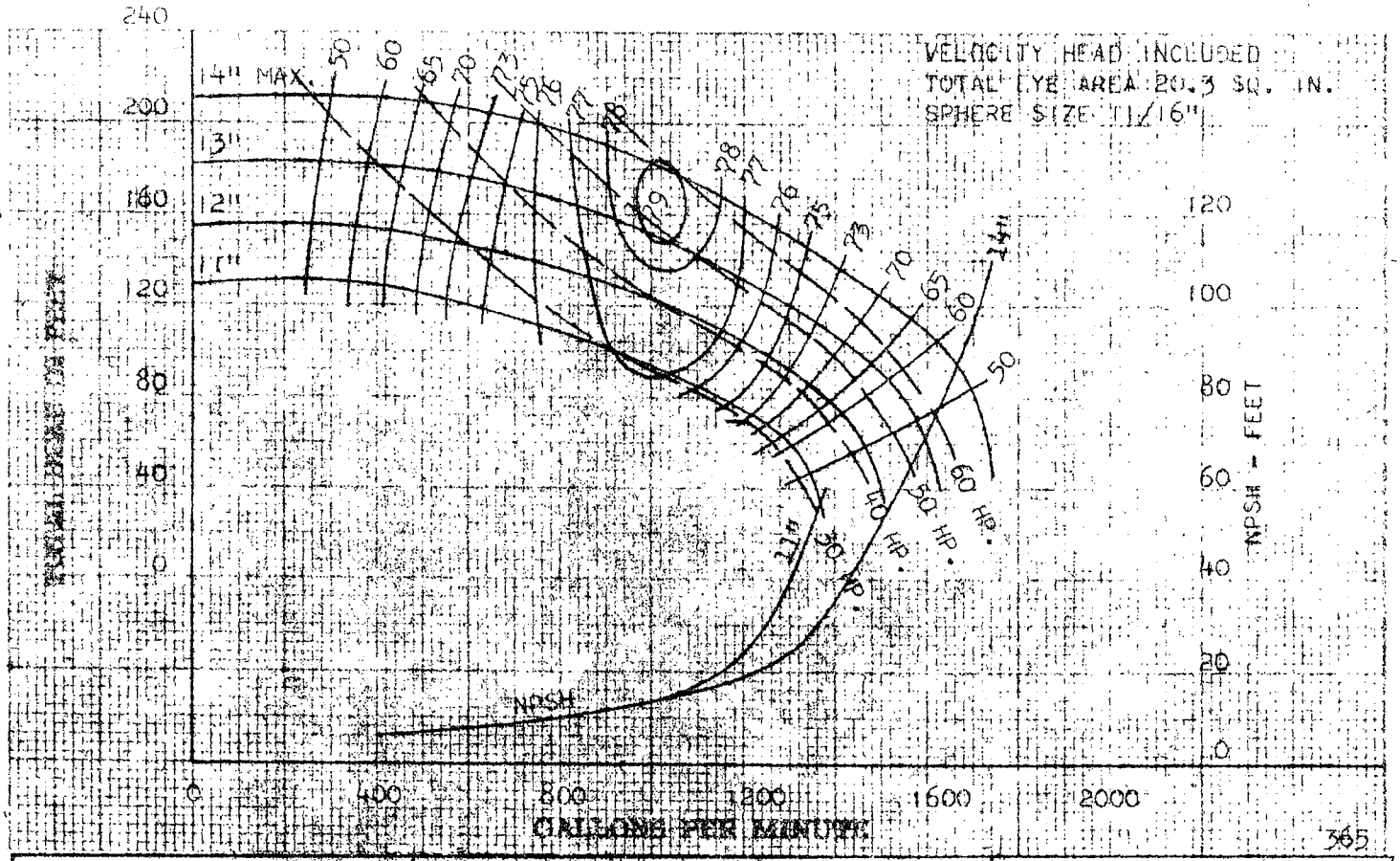


2PC-125182

1775 RPM

SKUA Pump Station No. 1 - Oakmont Place

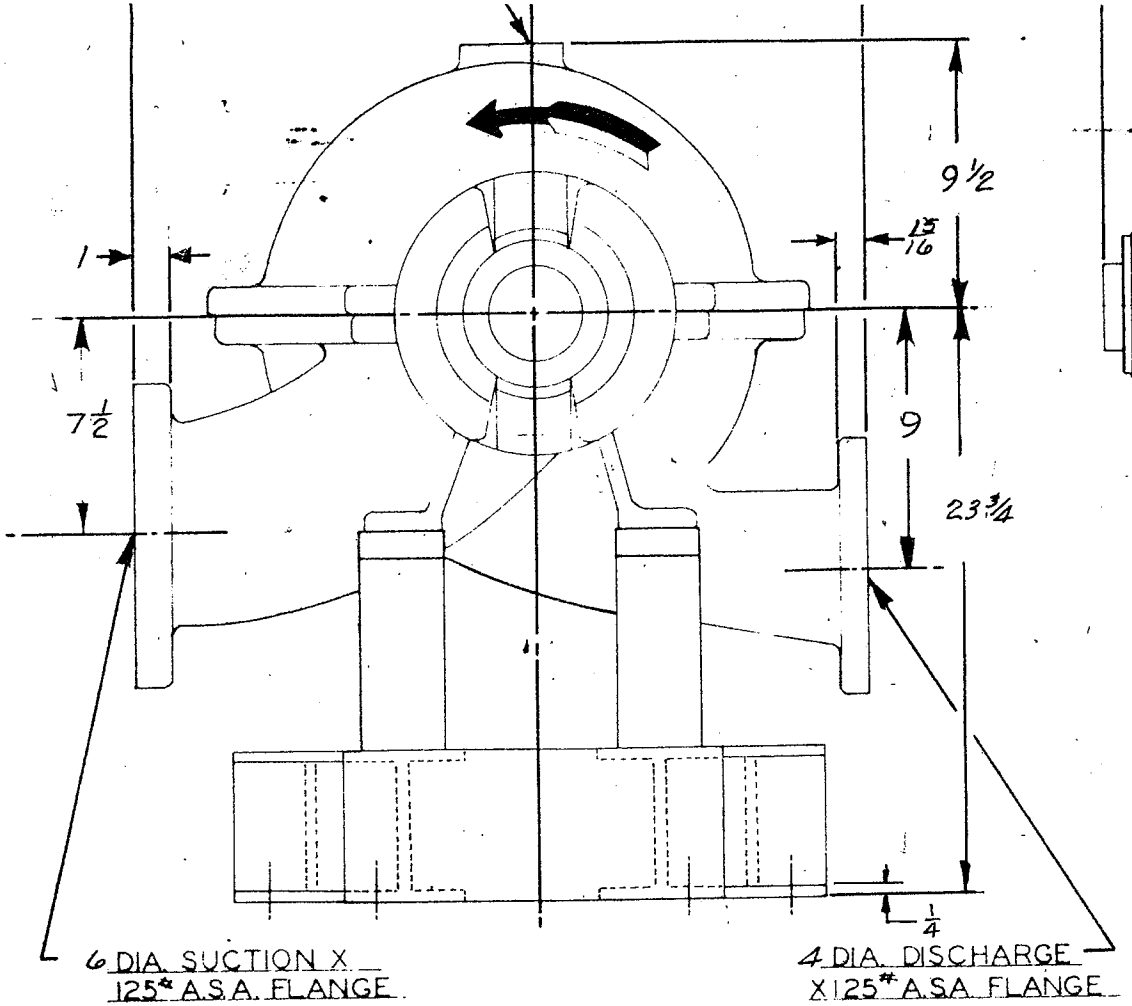
50 HP HS PUMP

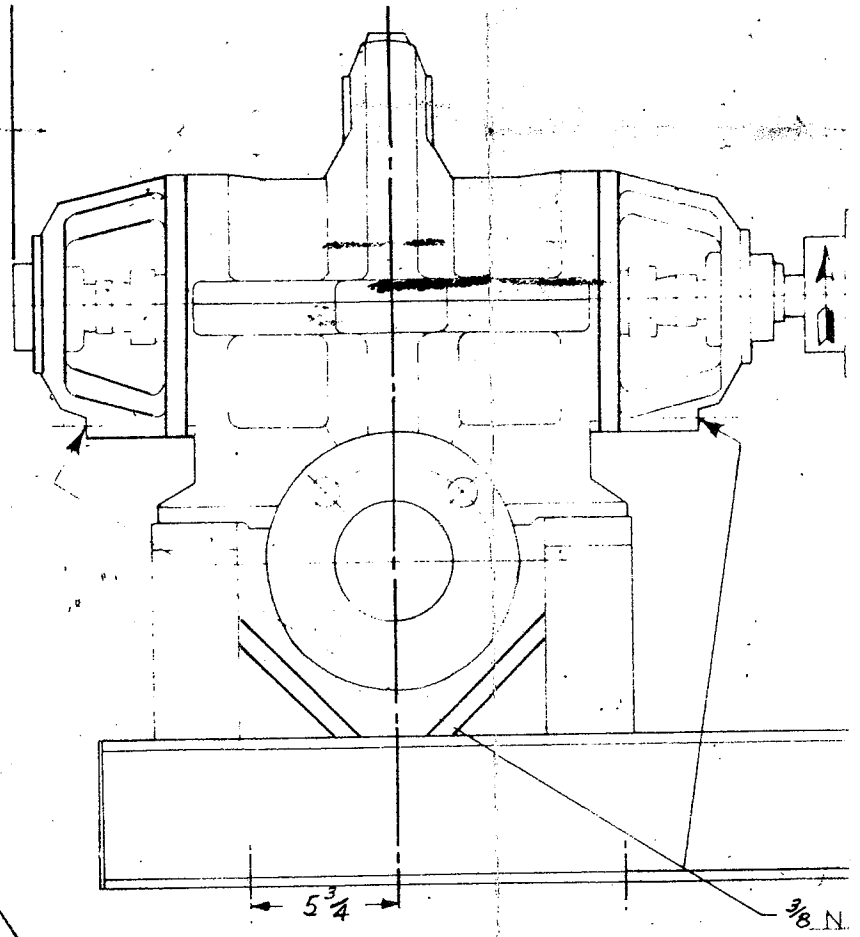


IMPELLER 2668637	HYDRODYNAMICS DIVISION	SIZE 4AD14
CURVE NO. 2887115	**PEERLESS PUMP** Los Angeles 31, Calif. · Indianapolis 8, Ind.	SPEED 1750 R.P.M.

N 1373A

IMP DIA. APPROX. 13"





SOLD TO Wakeman Construction Co.

USER Siesta Key Water Treatment Plant

INVOICE NO.	PUMP NO.	TYPE PUMP	SIZE PUMP	NO. STAGES	CAPACITY G. P. M.	NET HEAD	SPEED R. P. M.	ROTATION	H. P.	FRAME NO.	
80518-HDC	360486 360487	AD-14	4	1	900	150	1680	R.H.	50	326TC M-12	Motor 2 Fluid Drive

SKUA Pump Station No. 2 - Siesta Cove

Peerless Pump
A Sterling Company

Siesta Cove Booster Pump

813-247-4299

PEERLESS PUMP TAMPA FLORIDA P.O DRAWER 22105 PHONE 813-872-8461

~~1-289-4176~~

DATE	20-Jun-84	GPM :	2400	SUCT LIFT	
NO :		FLD hd:	46	SUCT PRESS	0-90
TO :	SIESTA KEY UTILITY	Hfloss:	0.00	DISC PRESS	60
ADD :	P.O. DRAWER 40078	HPloss:	2.50	STATIC WL	
	SARASOTA, FL. 33581	RPM :	1670	DRAW DN	
ATT :	MARTIN MURPHY	EFF :	0.80	PUMP LEV	
PHONE:		IMP NO:	2621973	FIELD HD	46
USER :	SKUA	DIA :		ROTATION	CCW
SERV :	SIESTA COVE BOOSTER	CURVE :	2846905	NPSH REQ	20
TYPE	VERTICAL	LAB hd:	46.0		
MODEL:	14HH-1	FLD hp:	37.3	REF:	TI 32887

DESCRIPTION	QTY	WGT EACH	PRICE EACH	MULT	TOTAL
MODIFICATION OF EXISTING PUMP SER. NO. TI 24569					
FROM CONSTANT SPEED (2750 GPM @ 46')			-		
TO VARIABLE SPEED (2400 GPM @ 46')					
USING EXISTING PUMP AND MOTOR					
VH 111 PEERLESS HYDROCONSTANT	1	641			
DRIVE WITH NEW MOTOR SHAFT					
MOTOR TO DRIVE YOKE					
MOTOR TO DRIVE COUPLING					
DRIVE TO PUMP YOKE					
DRIVE TO PUMP COUPLING					
HIGH OIL TEMP SW					
LOW OIL LEVEL SW					
AIR COOLED OIL COOLER	1	100			
RELAY FOR FAN					
SHIP SCHEDULE 16 WEEKS FREIGHT ALLOWED TO TAMPA					

RECOMMEND EXISTING PUMP BE REMOVED AND SHIPPED TO TAMPA
FOR MINOR MODIFICATIONS TO HEAD SHAFT AND PROPER FIT
OF ALL COMPONENTS. AT SAME TIME INSPECT ALL WEAR PARTS
CLEAN AND PAINT ESTIMATED ADDITIONAL COST
SUGGEST WE WAIT FOR REAL COST

PRICES DO NOT INCLUDE FREIGHT TO AND FROM TAMPA

DRAWINGS OF RETROFIT ITEMS ATTACHED
NEW PERFORMANCE CURVE ATTACHED
INSTRUCTIONS ATTACHED

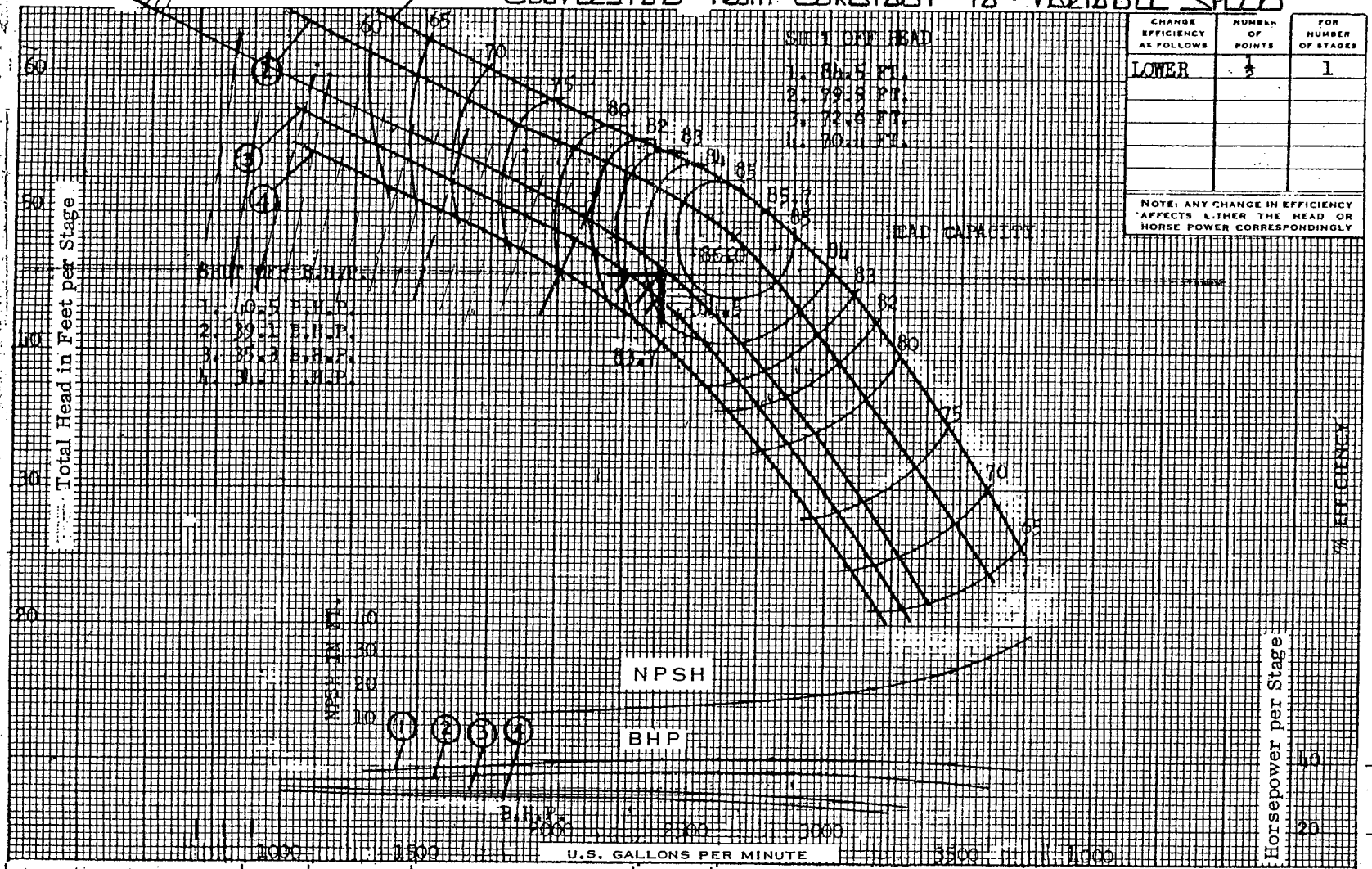
TOTAL WEIGHT 741 LBS

Val Earle

VAL EARLE
CC BENNETT AND BISHOP

JUNE 20, 1984

CONVERSION FROM CONSTANT TO VARIABLE SPEED



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
LOWER	½	1

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Guaranteed at designated point only, and contingent on: Proper flow to pump suction, Proper submergence, Fluid free of gas, air & abrasives, Proper lateral setting of impeller	1	2621973	$7\frac{17}{32}$" x $9\frac{13}{16}$"	39875
	2	2621973	$7\frac{5}{32}$" x $9\frac{21}{32}$"	39993
	3	2621973	$6\frac{11}{16}$" x $9\frac{7}{16}$"	39768
	4	2621973	$6\frac{5}{16}$" x $9\frac{1}{4}$"	39991

Customer SIESTA KEY UTILITIES
SIESTA COVE CROSSING MODIFICATIONS
Item BOOSTER PUMP
Peerless Ref. No: TI 24569

Laboratory Performance BOWL 2623188 CIE

SIZE 14 HH | RPM 1785 | CURVE 2846905

PUMP DESCRIPTION; Driver 40HP VHS ENSTROG ; Head 10X10X11½ ; Column 10" x 1½"

GUARANTEED PERFORMANCE: BOWL ☐ FIELD ☐ Capacity 2400 gpm; Head 46' ft; Eff 80 %; BHP 35

Peerless Pump
An Indian Head Company

VERTICAL TURBINE PUMPS

Stages ___ Horsepower for 1 Stages

Section 140
10-74

SKUA Pump Station No. 3 - Stickney Point Road

STICKNEY POINT

South Crossing Booster Pumps

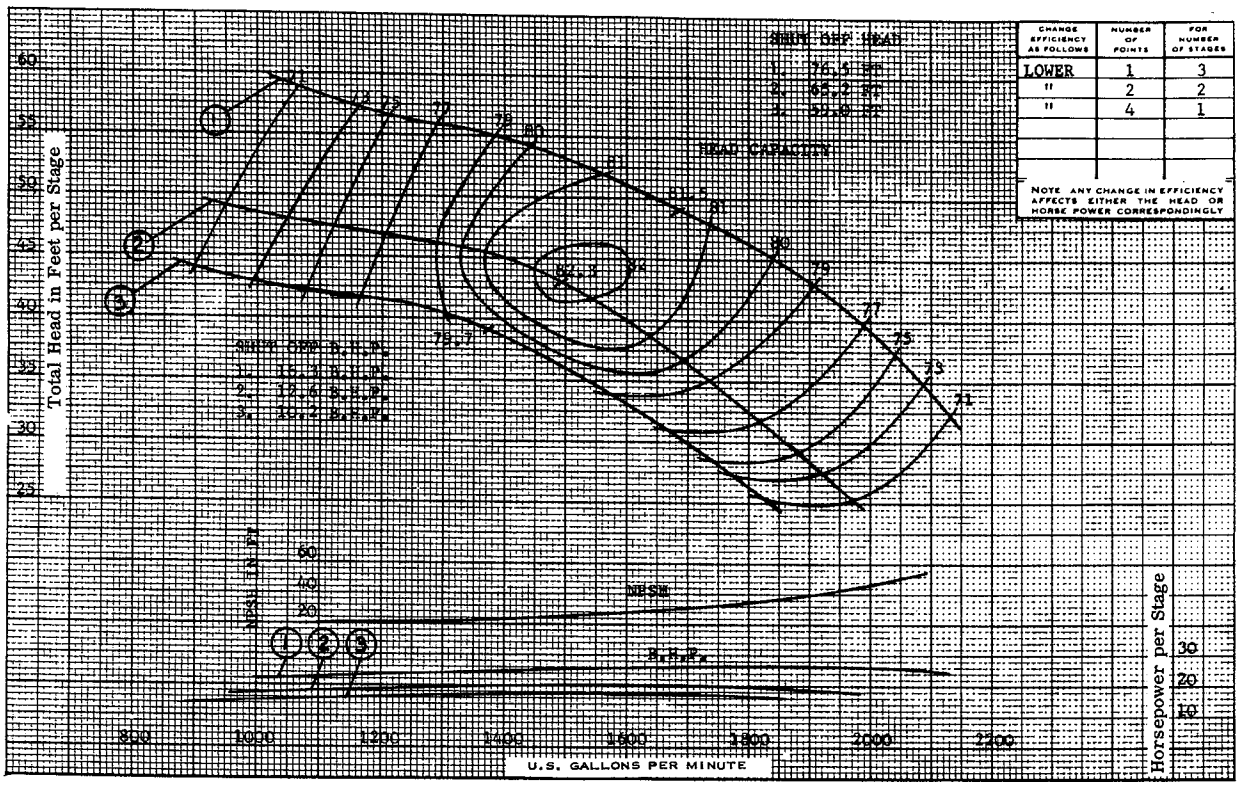
2 EA. - 25 HP Baylor Motors

Pezaless Pumps Model

12 HXB - 1 STE - OLS

Hydeo Constant Model

VS-111-1830-100

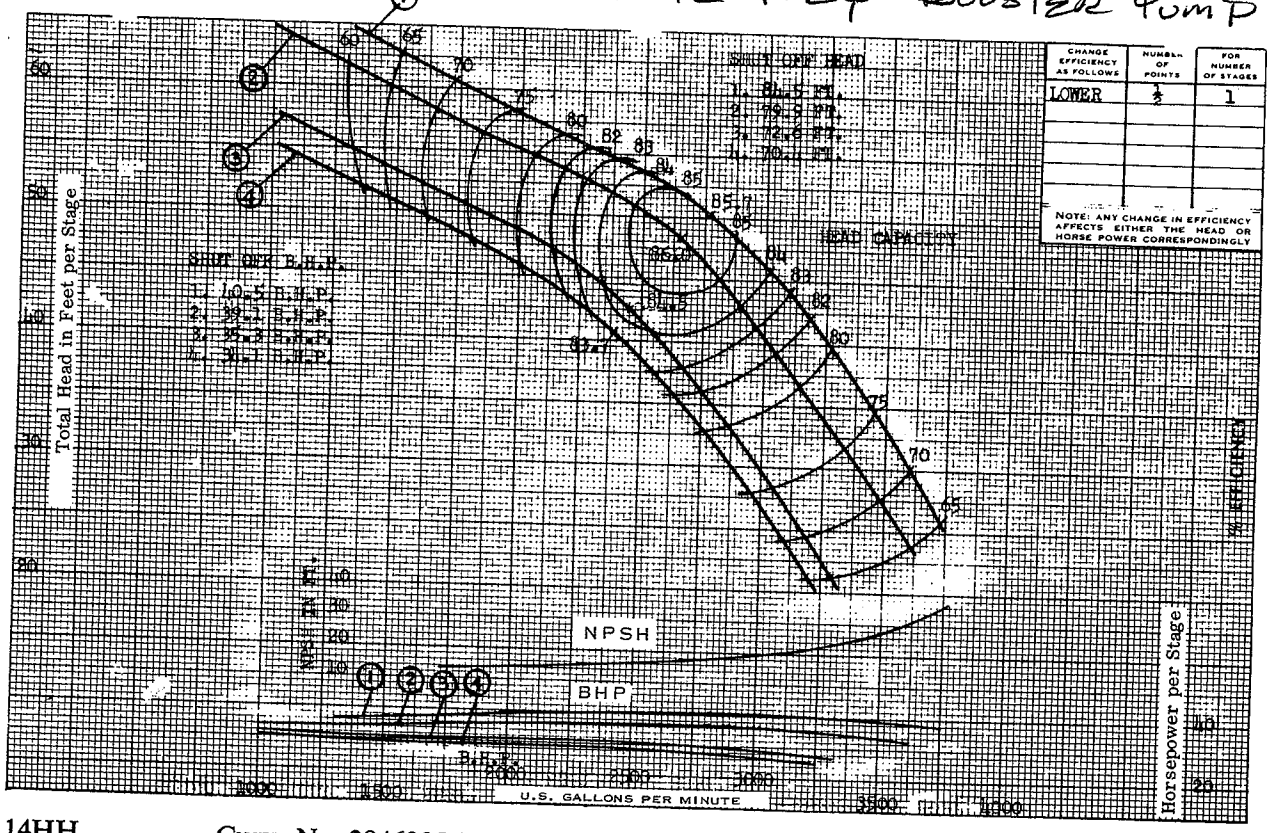


12HXB Curve No. 2844766 (10-74) Impeller No. 2608368 1760 RPM

1760 RPM

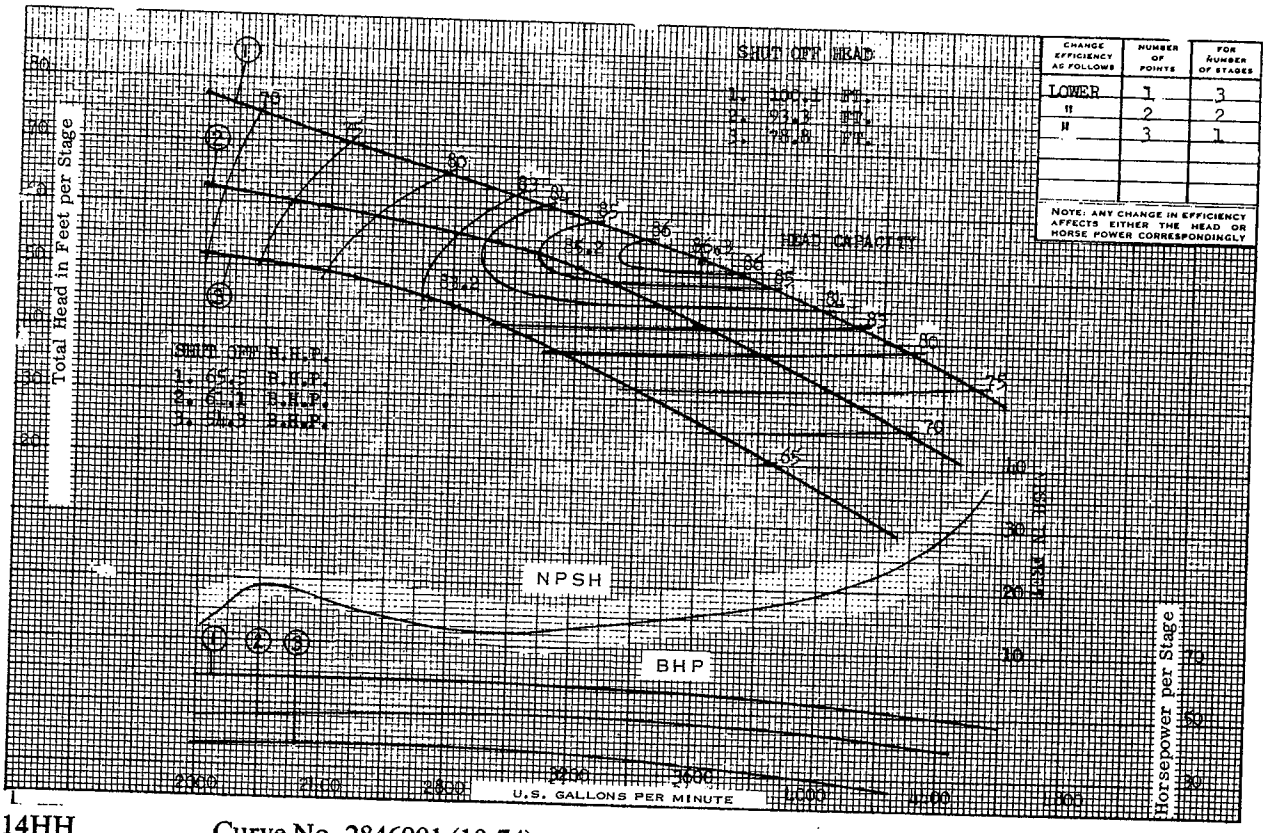
SKUA Pump Station No. 4 - Midnight Pass

MIDNIGHT PASS
Mid Key Booster Pump



14HH Curve No. 2846905 (10-74) Impeller No. 2621973 1785 RPM

1760 RPM



14HH Curve No. 2846901 (10-74) Impeller No. 2621959 1785 RPM

Peerless Pump
An Indian Head Company

P.O. BOX 22105
TAMPA, FLA. 33622

Mid Key Elect.

DATE: August 5, 1977

BENNETT AND BISHOP
ET 4509 Bee Ridge Road
Sarasota STATE Florida 33580
NTION: ART PHONE

JOB REF. SIESTA KEY WATER TREATMENT PLANT

ITEM VARIABLE SPEED ELECTRIC PUMP

H. PRESS	PSI.	WELL I.D.	IN.	PUMP TYPE	☐ HORIZONTAL		☑ VERTICAL	
PRESS	PSI.	STATIC W.L.	FT.	MODEL 14HH	STAGES			
LIFT	PSI.	DRAW DOWN	FT.	IMP. NO. 2621973	CURVES			
PUMP	PSI.	PUMPING LEVEL	FT.	SUCTION "	FLG. DISCH. 12 "	150#	FLG.	
ID		DISCH. HEAD	FT.	DRIVE 125	HP 1800	RPM 960	VOLT	
		TOTAL FIELD HD.	FT.	GPM.	HEAD	EFF.	BHP	NPSH
R.		PUMP LOSSES	FT.					
OSITY		TOTAL LAB HD. 140	FT.	2800	140'	84	117.8	20'
AVAILABLE	FT.	SUMP DEPTH	FT.					
R PRESS	PSI.	COLUMN SETTING	FT.					
CITY 2800	GPM.	COLUMN SIZE 12" x 1⅛"						

QT.	MATERIAL DESCRIPTION	WGT.	NET COST
1	125 HP Vertical solid shaft, normal thrust 3 phase, 60 cycle, 460 volt, 1800 RPM motor	990	
1	Model MV78 variable speed oil filled fluid drive with automatic speed controls	1700	
1	Falk 80T10 (motor to fluid drive) coupling	75	
1	Vertical solid shaft flanged coupling 2.75 x 1.50	95	
1	12 x 12 x 16½ fabricated steel discharge head w/ circular base for 24" barrel	901	
10'	12" Standard steel column x 1½", 410 S.S. shaft w/ two-piece top shaft	554	
1	14HH, 3-Stage, C.I.E. bowl assembly w/ bronze impellers, 410 S.S. impeller shaft, cast iron, bell suction manifold	870	
1	Combination custom control console, circuit breaker type disconnect switch, magnetic reduced voltage starters, selector switches, relays to operate on pressure demand	1800	

Faxed
Faxed

MARKS:

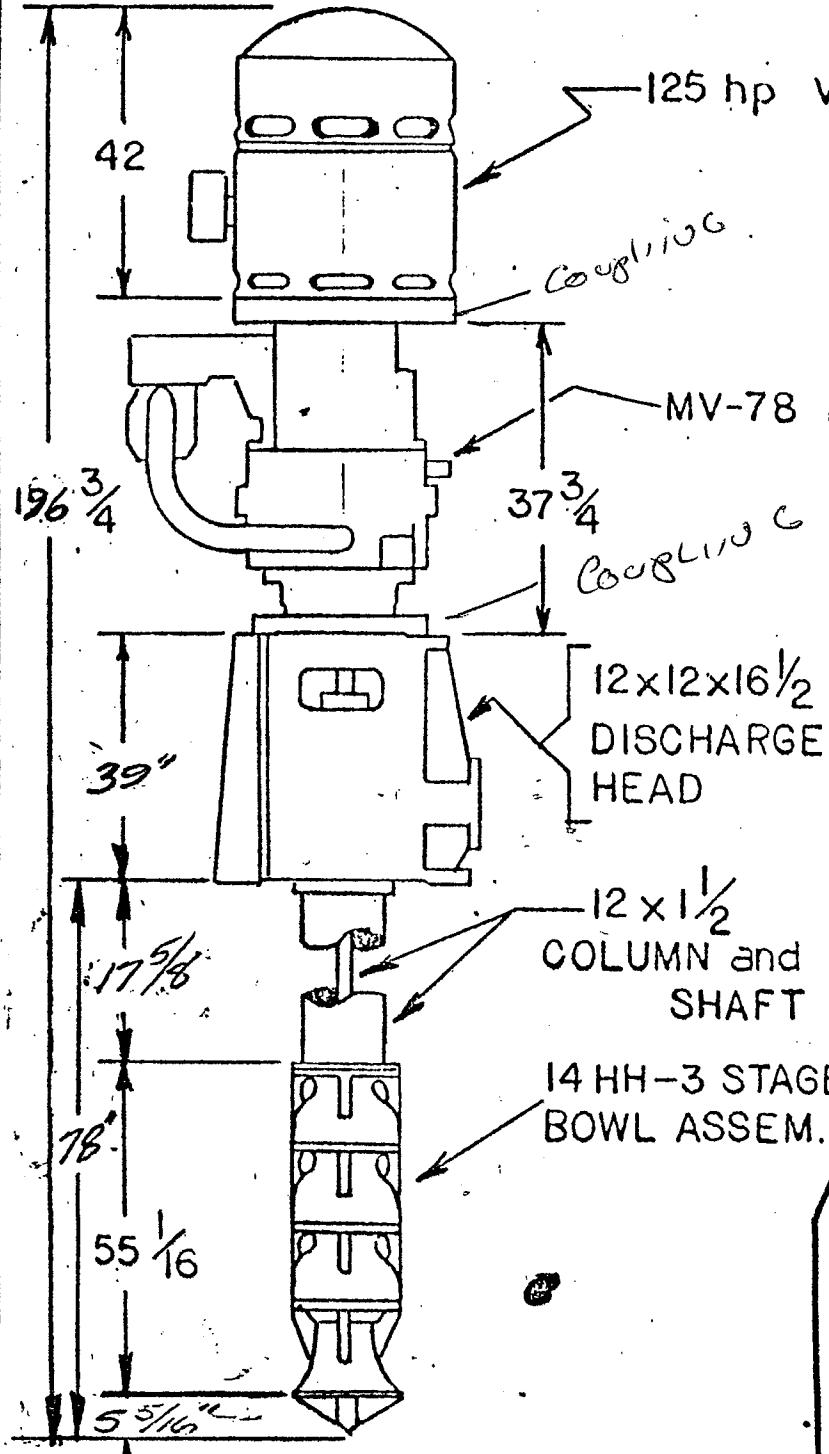
DATA FOR:
☐ ESTIMATE
☐ QUOTATION
☐ APPROVAL

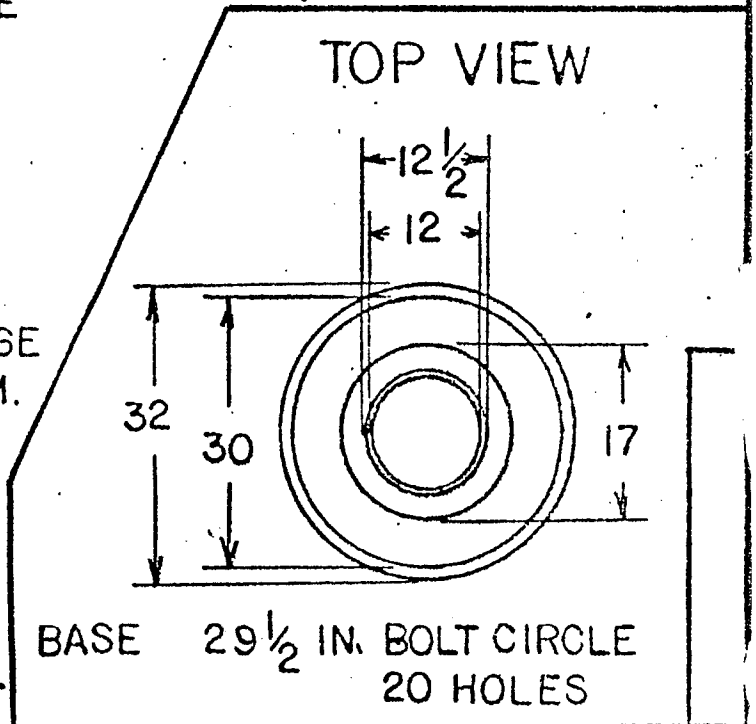
BY: Keith Medcalf

Keith Medcalf, Proposal Engineer

NO	REVISIONS	DATE	BY	APP.

mid key elect.





2800 GPM
140 F.T. TDH

Peerless Pump
An Indian Head Company

SIESTA KEY

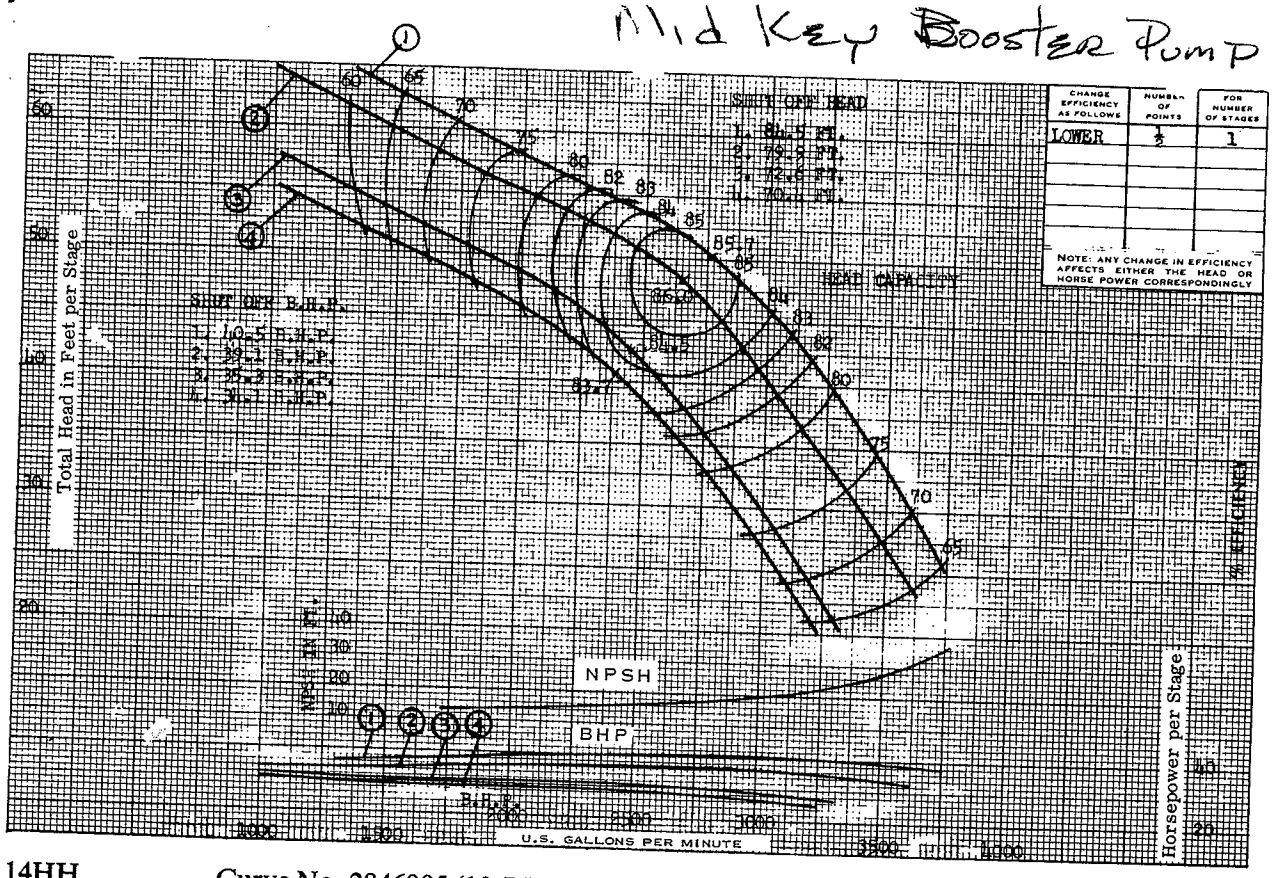
TYPE OF DRAWING

K. Mulcahy

4/21

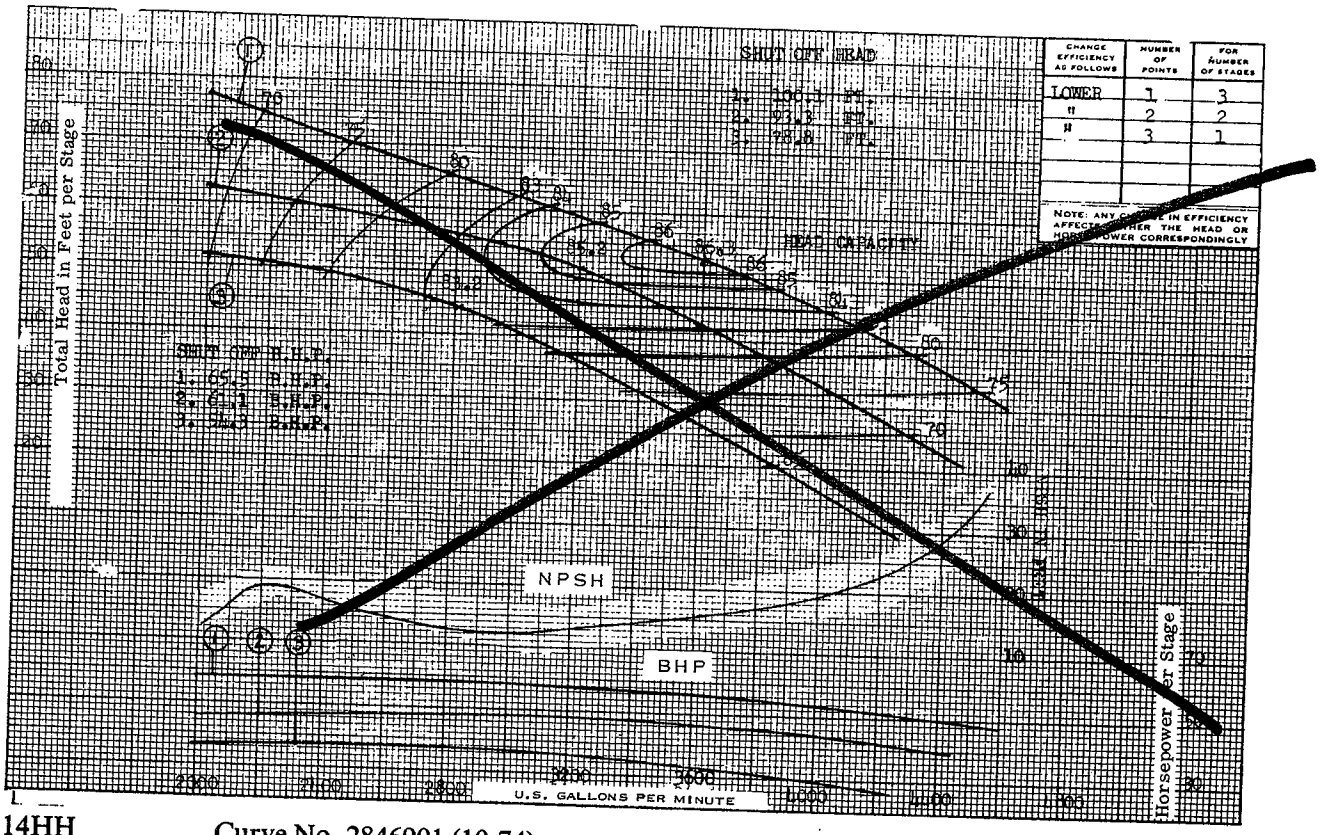
MIDNIGHT PASS

Mid Key Booster Pump Diesel



14HH Curve No. 2846905 (10-74) Impeller No. 2621973 1785 RPM

1760 RPM



14HH Curve No. 2846901 (10-74) Impeller No. 2621959 1785 RPM

Peerless Pump
An Indian Head Company

P.O. BOX 22105
TAMPA, FLA. 33622

DATE: August 5, 1977

TO BENNETT & BISHOP	JOB REF. SIESTA KEY WATER TREATMENT PLANT
STREET 4509 Bee Ridge Road	
CITY Sarasota STATE Florida 33580	
ATTENTION: ART PHONE	ITEM HIGH SERVICE PUMP - DISEL

DISCH. PRESS	PSI.	WELL I.D.	IN.	PUMP TYPE	☐ HORIZONTAL	☒ VERTICAL			
SUCT PRESS	PSI.	STATIC W.L.	FT.	MODEL	14HH	STAGES	3		
SUCT. LIFT	PSI.	DRAW DOWN	FT.	IMP. NO.	2621973	CURVES			
NET PUMP	PSI.	PUMPING LEVEL	FT.	SUCTION	"	FLG. DISCH.	12 "	150#	FLG.
LIQUID		DISCH. HEAD	FT.	DRIVE	Diesel	HP	1760	RPM	24 VOLT
TEMP.		TOTAL FIELD HD.	FT.	GPM.	HEAD	EFF.	BHP	NPSH	
SP GR.		PUMP LOSSES	FT.	2800	140	84	117.8	20'	
VISCOSITY		TOTAL LAB HD. 140	FT.						
NPSH AVAILABLE	FT.	SUMP DEPTH	FT.						
VAPOR PRESS	PSI.	COLUMN SETTING	FT.						
CAPACITY 2800	GPM.	COLUMN SIZE 12" x 1½"		0	246		120		

ITEM	QT.	MATERIAL DESCRIPTION	WGT.	NET COST
1.	1	Cummins Model N855F dual battery, automatic battery automatic diesel engine		
2.	1	Amarillo right angle gear, 1:1 ratio, NRR		
3.	1	Watson WS-55 shaft, 10 1/4" w/ hubs and guard	3992	
4.	1	12 x 12 x 16½ fabricated steel discharge head w/ circular base for 24" barrel	901	
5.	10'	12" standard steel column x 1½", 410 SS shaft w/ two piece top shaft	554	
6.	1	14HH, 3-Stage, C.I.E. bowl assembly w/ bronze impellers, 410 SS impeller shaft, cast iron, bell suction manifold	870	
7.	1	Lexington LX2000 control panel to include: Automatic stop, recording pressure gauge, lockout relay, time delay start	300	
8.	4	Lead acid batteries, racks and cables	540	
9.	1	Maxim residential muffler	185	
10.	1	Flexible exhaust connector	20	
11.	1	Furl system w/ 250 gallon tank and gauge	630	

REMARKS

DATA FOR:

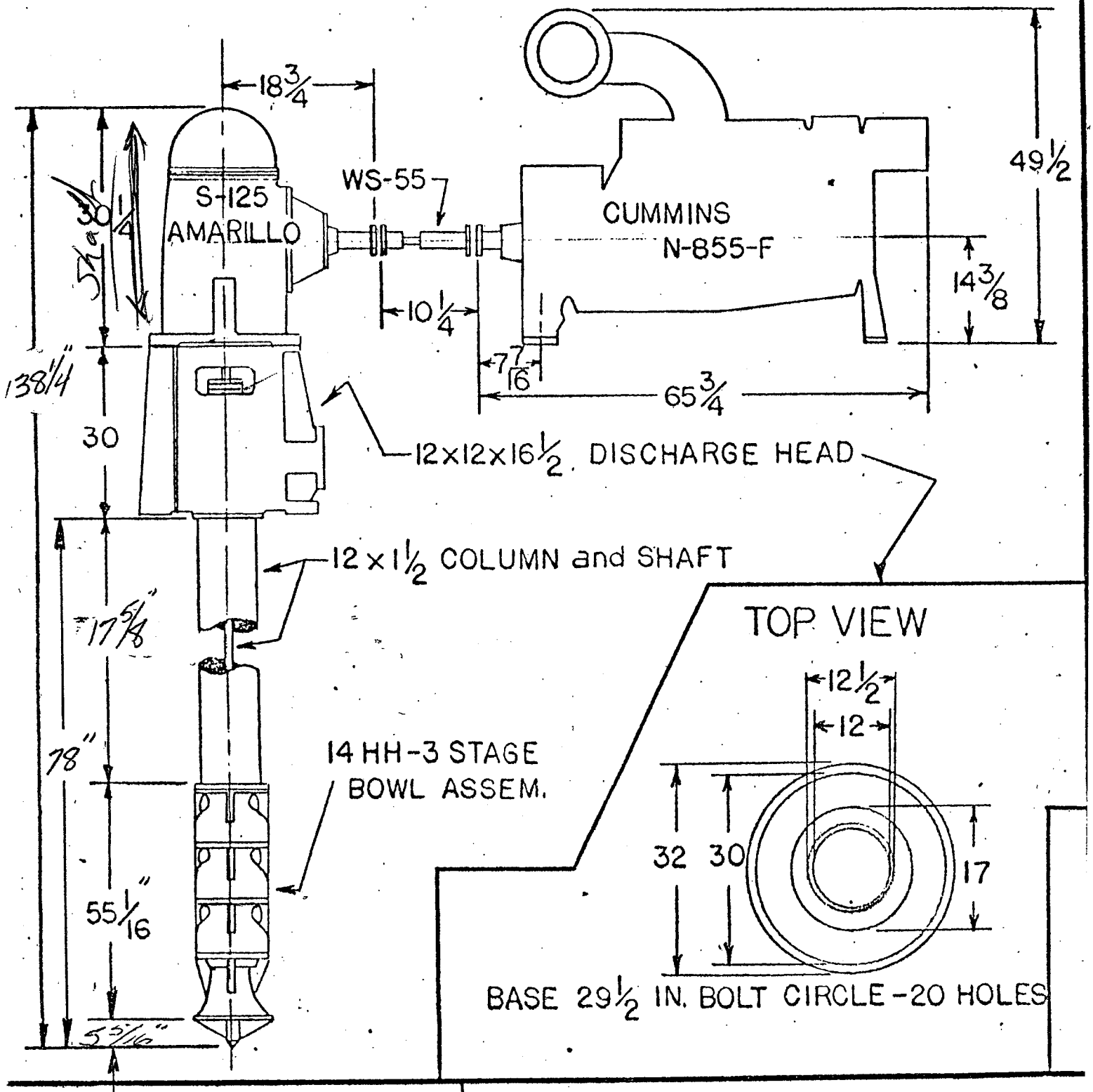
☐ ESTIMATE

☐ QUOTATION

☐ APPROVAL BY: Keith Medcalf

Keith Medcalf, Proposal Engineer

NO.	REVISIONS	DATE	BY	APP.



2800. GPM
140 FT. TDH

Peerless Pump
An Indian Head Company

SIESTA KEY
WATER TREATMENT PLANT

TYPE OF DRAWING		
	K. Mulcahy	4-70

Appendix H

WATER STORAGE TANKS

Water Supply Master Plan Update
Sarasota County

Water Storage Tank Asset Inventory

Tank ID	Description	Site Address	Base Elevation[1] (ft)	Height[1] (ft)	Size[1] (MG)	Diameter[1] (ft)	Water Levels[1] Min (ft)	Water Levels[1] Max (ft)	Tank Construction	Tank Manufacturer	Year of Construction	Year of Last Structural Evaluation	Disinfection System (Yes/No)	Recirculation Piping (Yes/No)	General Facility Condition	Remarks
EVT1	Elevated Tank #1	1850 Wendell Kent Rd	34	155	2.0	100	115	155	A36 Steel	Pitt-Des Moines	1997	Had coating inspection ~3 years ago. Are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good - Will need new coating within 10 years	
EVT2	Elevated Tank #2	2602 Mall Dr	No drawings		0.25	No drawings				Pitt-Des Moines	1969	Was repaired in summer 2004 to secure tower to base.	No	No	Poor. Needs repair - structural evaluation, new coating, etc.	Acquired from Florida Cities Utilities in 2003. The tank is closed from the system by 3 valves. There is some leakage and staff has to empty the tank every few months.
GST1	University Ground Storage Tank	3120 University Pkwy	34.7	32.3	3.0	125	See note #1		Prestressed Composite	Crom	1984	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	Yes	No	Good - Has poor mixing when level drops to < 20'	Location of chemical feed may not be optimum. Chlorine feeds at base, and ammonia feeds at top ~90 degrees from chlorine. Operators keep water level at 25-29' to prevent short-circuiting and time for mixing.
GST-C	Carlton Ground Storage Tank	1255 T. Mabry Carlton Pkwy, Venice	24.5	See note #1	5.0	160	25.5	57.58	Prestressed Composite	Crom	1995	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	Turns over 2.5 times per day.
GST-VG1	Venice Gardens Ground Storage Tank #1	1350 Jacaranda Blvd, Venice	See note #1	See note #1	1.0	85	See note #1	23.42	Prestressed Composite	Crom	1974	Cleaned and inspected by Crom in 2005. Coated the baffle walls inside of tank.	No	No	Good	
GST-VG2	Venice Gardens Ground Storage Tank #2	1350 Jacaranda Blvd, Venice	See note #1	See note #1	2.0	107	See note #1	29.75	Prestressed Composite	Crom	1983	Cleaned and inspected by Tank Engineering in 2005.	No	No	Good	
GST-VG3	Venice Gardens Ground Storage Tank #3	1350 Jacaranda Blvd, Venice	15.91	See note #1	2.0	107	15.91	45.66	Prestressed Composite	Crom	2004	n/a - New tank.	No	No	New	Construction completed recently. Not yet in service.
GST2	PS2 Ground Storage Tank	1001 S. Beneva Road	See note #1	21	1.0	90	See note #1		Prestressed Composite	Crom	1975	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	Not in service. Taken offline approximatley 10 years ago.
GST3-1	PS3 Ground Storage Tank #1	5508 Ruby Place	See note #1	23.5	1.5	105	See note #1		Prestressed Composite	Crom	1975	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	Rarely in service. Distribution system staff have trouble keeping chlorine residuals in the tanks. Tanks are regualarly cleaned and maintained. The tankare set up to be online when/if needed.
GST3-2	PS3 Ground Storage Tank #2	5508 Ruby Place	See note #1	23.5	1.5	105	See note #1		Prestressed Composite	Crom	1975	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	
GST3-3	PS3 Ground Storage Tank #3	5508 Ruby Place	See note #1	23.5	1.5	105	See note #1		Prestressed Composite	Crom	1983	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	
GST5	PS5 Ground Storage Tank	5949 Proctor Road	32.5	29.17	2.5	120	See note #1	62.08	Prestressed Composite	Crom	1984	Cleaned, painted, inspected in Summer 2004	No	No	Good	This tank is only used occasionally for watering days. Operators have problems keeping a chlorine residual in the tank.
GST6	PS6 Ground Storage Tank	4201 Vamo Road	14.75	35	3.0	120	See note #1		Prestressed Composite	Crom	1991	Operators did not know exact date of last inspection. However, staff are developing a program to inspect all tanks every 5 years per new DEP Rules.	No	No	Good	This tank is normally not used, but can be put into service when needed.
SKT1 [2]	Siesta Key Utilities Authority Ground Storage Tank #1	5200 Oakmont Place	5	20	0.75	80	5	25	Concrete	n/a	1967	n/a	Yes	n/a	Unknown, did not have access to plant site.	
SKT2 [2]	Siesta Key Utilities Authority Ground Storage Tank #2	5200 Oakmont Place	5	28	2.0	110	5	33	Concrete	n/a	1972	n/a	Yes	n/a		
SKT3 [2]	Siesta Key Utilities Authority Ground Storage Tank #3	6647 Midnight Pass Road	n/a	n/a	1.0	n/a	n/a	n/a	Concrete	n/a	n/a	n/a	No	n/a	Unknown, did not have access to tank.	Tank has not been used for many years.

Notes: [1] Some record drawings do not indicate elevations or minimum and maximum water levels. Only dimensions shown on drawings are included in this table.

[2] Information provided by Siesta Key Utilities Authority.

Figure H.1 Elevated Tank #1

Figure H.2 Elevated Tank #1 Tap for Future Expansion

Figure H.3 Elevated Storage Tank #2

Figure H.4 Elevated Storage Tank #2 Valving

Figure H.5 Pump Station No. 3 Ground Storage Tanks

Figure H.6 Pump Station No. 5 Ground Storage Tank

Appendix I

AUTOMATIC FLUSHING UNITS

Water Supply Master Plan Update
Sarasota County

Automatic Flushing Unit Asset Inventory

Flusher ID	Description	Location	Manufacturer	Connected To	Timer Schedule	Average Flow (gpm)	General Facility Condition	Remarks	General
AF1	Auto Flusher #1	Founders Club on Fruitville Road	Hydro-Guard	Hydrant	6 hours per day	150	Good	This flusher was located on Palmer Road at the location of old Barton Farms prior to being moved to the Founders Club in May 2005.	Locations listed are the existing locations. Units are portable and can be moved as necessary. All units are less than 4 years old. They are tied in above grade, with holes drilled through side of unit. They are plumbed into a hydrant or blowoff valve and drained to a ditch or retention pond. All flushers are metered except #1, which is getting a meter soon.
AF2	Auto Flusher #2	Ibis & Serenoa Lakes	Hydro-Guard	Hydrant	6 hours per day	150	Good		
AF3	Auto Flusher #3	Bee Ridge Extension	Hydro-Guard	Hydrant	12 hours per day	150	Good	This flusher is not located on a deadend main. It is on an oversized line that does not get enough flow and is in a mixing zone, so water doesn't move.	
AF4	Auto Flusher #4	Manatee Community College Resource Center	Hydro-Guard	Hydrant	5 hours per day, 5 days per week	150	Good - Connected to low hydrant	Located on minimum-maintenance road just past the Resource Center on the path to the old package plant.	
AF5	Auto Flusher #5	Taylor Ranch Elementary School	Hydro-Guard	Hydrant	6 hours per day	150	Good		

Figure I.1 Automatic Flushing Unit Drained to Ditch

Figure I.2 Automatic Flushing Unit Connected to Hydrant

Appendix J

WATER SYSTEM INTERCONNECTS

Water Supply Master Plan Update
Sarasota County

Water System Interconnections Asset Inventory

Interconnect ID	Description	Location	Connect Diameter (in)	Control System	General Facility Condition	Remarks
MCI1	Manatee County Interconnect #1	NW Corner Lockwood Ridge & University	30"	Manual valves	Good	Owned by Manatee County. Connects 30" line from Manatee to PS1. Line also tees off into two blending lines that flow to the University Ground Storage Tank. County staff stated that this interconnect is in poor condition.
MCI2	Manatee County Interconnect #2	NE Corner West Univesity Pkwy & RR Tracks	12" line reduced to 10" meter	No control	n/a	Owned by Manatee County. The flow is determined based on pressures in system and flows the through the other 2 interconnects. County staff stated that this interconnect is in poor condition.
MCI3	Manatee County Interconnect #3	SW Corner University Pkwy & Lakewood Ranch Blvd	12" line reduced to 10" meter	Throttle control valve	Good	Generally sees pressures of 70-90 psi, but have seen as high as 100 psi. Usually set TCV at 15-20% open. Connects to 24" line. Usually pass ~1.2 mgd through MCI3.
CSI1	City of Sarasota Interconnect #1	SE Corner Circus Blvd & Beneva Road	6" on County side, 10" on City side reduced to 6" meter	Manual valves	Fenced, with foilage overgrown. Some corrosion visible was visible on the valves and piping.	Because City pressure runs lower, there is a pump to pump from the City to the County. The connection from the County to the City is gravity flow. This IC used to be in use daily with a timer.
CSI2	City of Sarasota Interconnect #2	NW Corner Fruitville & McIntosh	8" reduced to 6" meter	Manual control valve. Only operates in 1 direction from City to County.	No fence	As far as operators know, this IC has never been used. Valving and meter above ground.
CSI3	City of Sarasota Interconnect #3	SE Corner Shade & Tulip	8"	Manual valves with free flow in either direction depending on system pressure.	Good above ground. Did not see inside of pits.	This location also has a franchise meter to Southgate Utilities. All meters and valves are underground.
CVI1	City of Venice Interconnect #1	NE Corner Albee Farm Road & Colonia Lane	6"	Manual valves with bidirectional flow capability depending on system pressure.	Good. Has meters in both directions.	
CVI2	City of Venice Interconnect #2	NE Corner of Gulf Coast Blvd & Country Club Way	n/a	n/a	In vault. Did not see inside of vault. Above ground facilities appeared in good condition.	Operators did not know if this interconnect has ever been used.
CKI1	Casey Key Interconnect #1	Albee Road	12"	n/a	n/a	Not true interconnects. Since Casey Key system was taken over by Sarasota, there are just a straight pipe connections between the mainland system and the island.
CKI2	Casey Key Interconnect #2	Blackburn Point Road	12"	n/a	n/a	
SKI1	Siesta Key Interconnect #1	End of Siesta Cove Drive	10"	Manual valve. Meters sales to SKUA.	Good. Recently raised to above ground.	This interconnect and the booster station is operated by SKUA. Booster station located ~0.5 miles from the interconnect has chlorine and ammonia boosting. Has been refurbished recently with fencing, chemical feed, etc.
SKI2	Siesta Key Interconnect #2	Just South of Stickney Point Road on west side of bridge	12" line reduced to a 10" meter	Manual valve. Meters sales to SKUA.	Good. Recently refurbished.	This interconnect and the booster station is operated by SKUA. Booster station has chlorine and ammonia boosting. Has been refurbished recently with fencing, chemical feed, etc.
SKI3	Casey Key to Siesta Key Interconnect	Northern tip of Casey Key & at southern tip of Siesta Key near Turtle Beach	Reduced to two 2" meters on Siesta side. 8"on Casey side.	Manual valves.	Good on Siesta side (Did not see inside of vault). Casey Key side has some visible corrosion.	Has been used regularly until recently - operators said the valve was closed recently due to breakage. There are meters and valves on both Siesta and Casey Keys.
SKCSI	Siesta Key to City of Sarasota Interconnect	Shell Road, Siesta Key	n/a	Manual valves in 2 pits, 1 for each direction. Both gravity flow. Maintained by SKUA.	Poor. Both valve pits were completely submerged in water. Severe corrosion visible.	As far as operators know, this IC has never been used. Both vaults had sump pumps that were not operating.
PRI1	Peace River Interconnect #1	At Carlton WTP Site		Manual valves with free flow in either direction depending on system pressure.	Good	Interconnect used daily to receive water from Peace River Authority.

Figure J.1 Manatee County Interconnect #1

Figure J.2 City of Sarasota Interconnect #1

Figure J.3 Siesta Key Interconnect in Siesta Cove

Figure J.4 Casey Key to Siesta Key Interconnect on Casey Key

Figure J.5 Siesta Key to City of Sarasota Interconnect

Figure J.6 Siesta Key to City of Sarasota Interconnect Inside of Vault