HYDROMAX USA
Advanced Water, Wastewater and Gas Data Collection

Village of Wellington

Water Distribution Valve Maintenance Program 2018-2019

Prepared for Shannon LaRocque / Bradley Wolak

Prepared by Shane Majetich

April 20th, 2018

understand the present | **protect the future**

April 20th, 2018

Shannon LaRocque / Bradley Wolak
Village of Wellington
12300 Forest Hill Blvd
Wellington, FL 33414

RE: Valve Assessment/Repair & Related Asset Management Services

Dear Shannon/Bradley:

Hydromax USA is extremely pleased to provide the enclosed Quote in response to your request.

Established in 2003, Hydromax USA is a professional services firm specializing in data collection in support of locating and assessing the condition of the country's aging water, wastewater and natural gas conveyance systems. HUSA's vast experience with new technologies and techniques empowers contractors, engineers and utility owners to make the best rehabilitation decisions regarding their buried infrastructure.

Based upon a strong record of performance, our customers have recognized that HUSA brings a unique ability to meet their needs for advanced data collection. We work from coast to coast covering the entire United States, without exception. Hydromax USA utilizes the largest array of technologies, within one company, to provide the broadest capability in the country to assess buried infrastructure.

Our in-house crews and project managers have first-hand experience working with buried infrastructure for water, wastewater, and gas systems.

We have 16 full-time GIS professionals in our data center that specialize in client information management, condition assessment program analytics, and customer reporting.

Our proven processes and best practices in the areas of progress reporting, risk management and quality assurance help us to plan for and deliver projects on-time and within budget.

Our team continues to be excited about this opportunity and looks forward to working with you and the other members of the Indian River team in the weeks and months ahead. Should you have any questions regarding the enclosed proposal, please do not hesitate to contact me directly at (813) 305-6610.

Thank you again for your time and consideration.

Sincerely,

Shane Majetich

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INTRODUCTION

WELCOME TO HYDROMAX USA, A UNIQUE ORGANIZATION PROVIDING ESSENTIAL SERVICES FOR UTILITIES ACROSS AMERICA.

Our Solutions are designed to maximize the value of our customer's water products and services by optimizing water distribution system performance and reliability, minimizing delivery costs, controlling water loss, and enhancing water quality.

Our Team has performed infrastructure condition assessment programs that have evaluated *hundreds of thousands* of water distribution system assets, helped clients recover *millions of gallons* in lost water, and provided information management services for improvement of system models and development of GIS integrated solutions for utilities across the United States. Our customers consider us a part of their team and appreciate our genuine sense of accountability in meeting their goals. No matter how large or small your needs are, our professionals are ready to exceed your expectations.

VALVE ASSESSMENT AND MAINTENANCE PROGRAM

Hydromax USA's Water Distribution Services Team has built a reputation for the quality of our valve maintenance programs. Our capabilities have allowed us the opportunity to provide assessments and GIS services to utilities throughout the US ranging from a few thousand assets to tens of thousands of assets. Following is a summary of Hydromax USA's project understanding and approach.

Hydromax USA's valve assessment and maintenance program is designed to comply with AWWA standards (including publication M44 – Distribution Valves: Selection, Installation, Field Testing and Maintenance) and meet the requirements of oversight environmental agencies as well as all OSHA and confined space safety regulations. Hydromax USA works to develop a comprehensive valve assessment and maintenance program that meets the individual needs of each utility.

Planning and Implementation Tasks

1) **Client Gap Analysis and Data Model Alignment:** Prior to the start of the program, HUSA will hold a project meeting at the client offices to better understand the operational characteristics of the distribution system such as problem areas prone to poor fire flow, age of pipe, and pressure problems in the distribution system. This will allow for a greater understanding of how the distribution system is functioning, establish expectations for all parties, and allow priorities to be assigned to particular segments of the work. As a part of this gap analysis, Hydromax will conclude the interview process with a water data model alignment meeting, assimilating information gathered in the process from stakeholders

Agenda for data alignment meeting

1. Introduction
    - a. Participants
    - b. Roles
    - c. Communications
2. Determination of Existing Conditions
    - a. GeoDatabase schema
        - i. Assets in existing schema
        - ii. Fields in existing schema
        - iii. Data capture methodology
        - iv. Data QC procedures.
3. Determination of data to be captured under contract
    - a. Data capture workflow.
4. ArcGIS GeoDatabase deliverable.
    - a. HUSA data QA procedures.
    - b. Feature classes.
        - i. Valves
        - ii. Pipes
        - iii. Object classes
        - iv. VALVE_GPS Table
    - c. Geodatabase delivery.
        - i. Tables
        - ii. Attributes
        - iii. Field relationships
        - iv. Primary/foreign keys.
5. Reports
    - a. Production reports
    - b. System status reports.
    - c. Work orders
    - d. System evaluation report.
    - e. Map-based reports.

v. VALVE_INSPECTION Table.
vi. Geometric Network

2) **Program Execution Planning.** Hydromax will determine the Utility's desired geographical or hierarchical approach for initial implementation into areas of the distribution. This would include setting a schedule designed to maintain a level of field staffing that will insure completion of the valve assessments within the schedule and budget allotted.

3) **Field Workflow Pilot Test Cycle.** Hydromax will develop and test pilot program area to validate fully functioning work flows from replicated data distribution through all field activities and test of data delivery to client.

4) **Initiate Full Program Implementation.** Hydromax will perform assessments on the distribution system and document all locations and assessments in a manner that will allow a prioritized list of maintenance items to be provided to the municipality.
    a. Locate all valves with GPS (within an accuracy of less than 1 meter or 3.28 feet maximum form the center of the valve) in a manner that will allow their positions to be known and readily re-creatable by Utility personnel upon demand.
    b. Document each asset maintained and collect individual asset data to such an extent as to provide information characteristic to each specific attribute as defined by the Utility. Village of Wellington will provide the existing utility GIS shapefile containing utility specific valve ID's for current known system valves. Newly discovered valves will be given a unique and distinguishable identifier for update and incorporation into the Village of Wellington utility GIS system. The Village of Wellington will be responsible for final valve ID nomenclature.
    c. Provide constant communication with the Utility staff so that the program is proactively managed and permit issues to be addressed in a timely manner.
    d. Provide in the field training to Utility staff during the course of the assessments so once the program is concluded the Utility staff will have a complete understanding proper operation of valve operating devices.
    e. Provide periodic corroborative field survey to ensure the spatial accuracy of the data submitted

Project Management Support

Hydromax USA employs a critical path project approach utilizing PMI principles and philosophies. This is designed to ensure a continuum of the following:

- Management of key decisions and milestones during this project.
- Preparation of initial project development plan (including the schedule of work tasks and key personnel to perform the work in the field to meet the milestones and objectives)
- Coordination of communications and meetings with the Utility as needed or requested to review technical concepts and alternatives, gathering staff feedback and coordinating activities with the project team.
- Oversight of the execution and development of the project deliverables.

This comprehensive approach is not just employed by the project manager who owns it, but each member of the support team and field crew in order to provide superior valve assessment service.

Project Scheduling / Project Reporting

After completion of Tasks 1 and 2, Hydromax USA will prepare a formal project schedule for review and approval by the Utility. Hydromax USA uses two primary methods to communicate project planning and project management. Project plans are formally prepared using MS Project and distributed to the project team for approval and coordination. If the project includes geographic assignments, the project schedule is updated to include this information for stakeholders inside and outside the municipality. Often this information is communicated to customer service to address customer questions regarding Hydromax staff field personnel performing assigned activities.

Hydromax utilizes our custom HUSA Operations Dashboard to provide client management real time access to field activity and program results. The dashboard will provide a vehicle for Hydromax to provide program metrics to the Utility on a daily basis and will form the foundation for monthly progress reporting. The Utility will be able to see detailed valve physical and operational condition as they are found by our field crews.

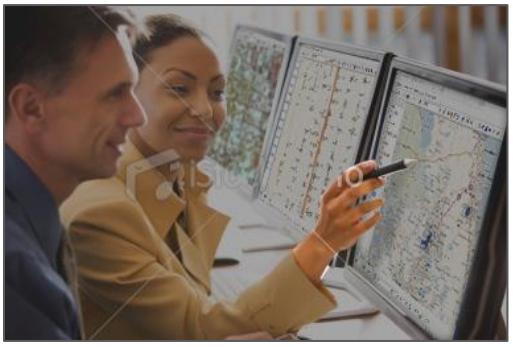
Responsiveness – Routine, Urgent, Emergency

The Hydromax team is fully poised to deliver and mobilize the necessary equipment for this program's operational needs. Most importantly our **Tampa Hydromax facility** holds the ability to quickly mobilize a vast array of equipment to support the needs of the Utility during conditions where the ability to serve the public is in jeopardy or has been compromised. The utility's operations teams will have access to Hydromax teams for unscheduled activities as the contract requires. Phone information will be available for the on-site Project Lead and Operations Manager as well as the Manager of National Water Distribution Services to ensure access to the full complement of resources that Hydromax can bring to bear if needed. Our field technicians will be based out of our Tampa, FL office for the term of the project and will be able to respond appropriately as needed.

GEOSPATIAL DATA MANAGEMENT

Information Management Approaches

The data capture during this program will be one of the factors utilized in risk and CIP prioritization models. The critical aspects to this project are field collection and data management between the field crews and Hydromax and the replication of collected data between Hydromax and the Utility. To assure smooth, low impact, data deliverables Hydromax USA will hold 'GIS data alignment meeting(s)' to obtain and review the current water database structure, also known as 'data-model'. This review will focus on Hydromax's internal data workflow processes and identifying possible data-model revision recommendations for the Utility to consider prior to the beginning of field operations. Hydromax is flexible regarding project data deliverables and will work with the Utility to determine the most efficient delivery format. These proven GIS data deliverables can range from simple Personal Geodatabase, ArcSDE to XML exports, to ArcSDE versioned database replication:



- Personal Geodatabase deliverables provide a simple, single file, format of GIS data that can be reviewed in ArcMap prior to migrating this data into the Utility's enterprise GIS. Manual or Model-builder geoprocessing tools can then be employed to append deliverable data in the Utility's enterprise GIS.
- ArcSDE to XML export creates a small foot-print file that retains SDE (Spatial Database engine) properties. This file would need to be 'Imported' into a staging SDE geodatabase for review in ArcMap prior to migrating this data into the Utility's enterprise GIS. Manual or Model-builder geoprocessing tools can then be employed to append deliverable data in the Utility's enterprise GIS.

ArcSDE Versioned Database Replication provides a more direct connection between the Utility's enterprise GIS and Hydromax's GIS. Two-way replication has been used by Hydromax's programs to ensure that control of information is maintained between the client and Hydromax. Using this process the Utility would provide the initial source data in xml to be imported into an ArcSDE database. This is a replicated database so it can only function in a versioned environment (i.e. an ArcSDE database rather than a gdb or mdb). Field data will be created and deployed. Inspection data is processed daily. Once it has been QCd, the replicated database data is updated with the inspection data. The changes are compiled and then exported to xml in a file called a delta file. The replicated database status is now changed to data receiver and HUSA will await an acknowledgement file in xml from the Utility which will be imported into the database. Once the data is accepted, a delta file is sent back and it is imported with edits in favor of the Utility and the status is changed back to data sender. An acknowledgment file is sent back to the Utility upon successful import. An HUSA formatted data deliverable is additionally sent to the Utility as well with each delta file on an agreed upon basis.

Minimum Data Deliverable Quality Assurance & Quality Control

Hydromax USA's Quality Assurance Program is a formal methodology designed to assess and continually monitor the quality of services provided to ensure the services are within specifications of the contract scope. Our quality assurance includes formal review of processed and data, problem identification, corrective actions to remedy any deficiencies and evaluation of actions taken.

Quality Control involves defining the standard means and methods that data will be captured and then reviewed for accuracy. This includes automated tests for adherence to domain values, maintaining integrity of database schemas, and validating data based on best practices established by Hydromax for field inspections of water features. Hydromax will perform these tests as a combination of programmatic geoprocessing tools and manual review prior to submission to the utility.

Data delivered from the field is processed through Hydromax' standardized QA/QC ModelBuilder scripts to evaluate data against established HUSA program queries for valve data discrepancies. All data that is identified as exception data is reviewed by the program Operations Manager and reported to the Data Auditor prior to being released to the field for correction.

Reflective of our commitment to data accuracy, Hydromax USA employs a dedicated **Data Auditor** to support our Project Managers and GIS analysts.
Hydromax auditing services include:

- Hydromax USA shall randomly select one day per month, and the work performed during this day shall be reviewed by the Data Auditor.
- If the work is greater than or equal to 95% accurate, no further additional auditing will be required for the month unless requested by the client.
- If the work is less than 95% accurate, Hydromax shall correct any known discrepancies in the work and have the work re-audited by the data auditor once the issues are resolved. Another sample data set from that submittal/ crew shall then be reviewed under this process until satisfactory results are achieved. In addition, the initial audit sample size will be doubled to determine if any systemic issues are present.
- The minimum levels of accuracy to be attained under the program are as follows:
    - Inspection Accuracy 95%
    - GPS Accuracy 98%
- Hydromax will perform this QA/QC analysis on all data recorded before the data is submitted to the client.
- Hydromax will also review, prior to each submission, the accuracy of the billing, contractual compliance (including program M/WDE participation) and internal procedural compliance.
- All non-conforming audit findings will be documented with Corrective Action Requests as appropriate.

ACCEPTED/LATEST PROFESSIONAL ENGINEERING PRACTICES
OPERATION AND REPAIR OF VALVES

Hydromax will bring to the program a vast amount of experience and knowledge within the field of water infrastructure condition assessment. Valve assessment is an essential component of good distribution system management. Malfunctioning, closed, "frozen" and/or "lost" valves make isolating a specific area of the distribution system for emergency and/or routine repairs difficult, time consuming and on occasion, impossible. Such conditions inevitably lead to excessive overtime, excessive water loss and adverse public relations. Initial distribution system valve assessment followed by annual system wide valve maintenance enhances the utility operator's capability to effectively control the flow of water within the distribution system. Valve assessment and maintenance will prolong the life of the valves in the distribution system, insure that the valves can be located, accessed and operated as needed and allows for the utility to better plan for and schedule system repairs/improvements.

The first step in an assessment program is to prioritize the valve locations. Usually those near critical customers such as hospitals are the most important. Other factors could include the size of the water main, proximity to pump stations and treatment plants, the amount of flow through the valve and water main, age of the valve, or proximity to a main intersection on a busy street. The main components to a Valve Exercise Program are:

- Find and document the location. Note the precise location using global positioning system (GPS) equipment and by traditional surveying (within an accuracy of less than 1 meter or 3.28 feet maximum form the center of the valve).
- Take a digital picture showing the valve and surrounding area. The point is: don't lose the valve site location once it has been found. For valves being repaired (raise/realign) both before and after phots will be taken.
- Ensure that the valve operates through the full range of motion *at least* two full cycles until the valve operates freely with little resistance. This may take several full cycles as well as several partial reverse/forward exercises.
- Keep and maintain detailed records for each valve. This includes mapping locations taken from as-built drawings or road maps as well as field verification of locations, and possible interviews with staff regarding unrecorded installations of valves. This data will then be maintained in both electronic and hard copies.
- Data will include, among other things: valve age if verified, valve position (open/closed), and turns direction to close.
- Schedule and perform needed repairs. Often, valve boxes are out of alignment, so a valve key cannot access the valve. Valves are sometimes broken during the exercising program because they have not previously been used or previously incorrectly turned. Fixing the broken valves in a timely manner is very important so the integrity of the distribution system is maintained and safety of the public is insured.
- Repeat these steps on a routine basis. Experts recommend exercising a valves annually if possible. Valves should at least be operated once every two to three years. Some valves will need to have a different schedule than others based on their location or unusual operating conditions such as large valves or those in critical areas. It's usually a good idea to perform the exercising program during moderate weather conditions although valves should be able to be operated in any condition.

When operating valves, Hydromax will adhere to a strict methodology involving the following principles

- Work in an orderly and safe manner to insure protection of the local residents, Utility employees, and the Field Staff so that no avoidable accidents occur. Use confined space practices to ensure safe entries when required.
- Employ a combination of recorded information, manual and technical testing techniques as needed to establish the location of valves.
- Operate valves in accordance with the AWWA manual M-44, "Distribution Valves: Selection, Installation, Field Testing and Maintenance"
- Attempt to operate the valve manually.
- Don't force the valve, or be in a hurry.
- During initial valve closure, the valve will be turned no more than five turns before turn direction is reversed to two turns, thus allowing the threads of the stem and gate to free themselves.
- If the valve cannot be operated manually by one person, then employ a hydraulic operator with torque control.
- The valves will then be exercised from full open to full closure until such time as this can be done without further turn range improvement or no further reduction in the required operating torque is noted, through *a minimum* of two consecutive ranges of operations.
- Use the lowest hydraulic torque (turning force or rational force) setting possible to allow valve operation.
- Turn valves slowly to avoid water hammer or potential water main rupture.
- Listen closely as water flow changes can occur when operating a valve. This may help determine if the valve is operating correctly.
- Debris can be stirred up during valve programs so public notification should be performed before starting the process. This will keep the dirty water complaint calls down.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.
- Butterfly valves will need to be operated with great care so they are not over torqued and damaged.
- If there is reasonable evidence that a valve might break during the exercising process, the Utility will be notified immediately and a decision will be made to attempt or not to attempt the process.
- Broken valves will be reported immediately to the Utility so that notations can be made for future potential emergency situations.

Valve Maintenance Activities 4" And Smaller Gate Valves

- Special care will be taken for valves in this size range. Unless directed otherwise, all valves, 6" and smaller will be manually operated to avoid damage.
- Locate valve, properly position valve operator for minimum interference with vehicular and/or pedestrian traffic.
- Establish and set up M.O.T. as appropriate. Remove valve box lid and clean out valve box to access valve.
- Verify location, size and operational direction (left or right) of valve by cross reference of supplied water atlas.
- Valves of this size (especially 2" and 3") may be located at the "dead end" of a water main. If this is the case, follow protocol established as opening may create a washout.
- Attempt to identify the type of valve. Older valves, (especially in the 2" to 3" range) may be bronze disc "plumbing" style valves such as NIBCO or bronze ball valves of the "corporation stop" style. In either case,

neither will have the standard operating nut and a pronged or slotted valve wrench will need to be employed.

- Carefully work the valve from open to closed, to back open position until the appropriate number of turns is achieved.
- Carefully operate the valve through a minimum of (2) full cycles leaving valve in full open position, unless directed otherwise.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.

6" To 12" Gate Valves

- Locate valve then properly position valve operator for minimum interference with vehicular and/or pedestrian traffic.
- Establish and set up M.O.T. as appropriate. Remove valve box lid and/or open valve vault hatch covers. Clean out valve box and/or vault to access valve.
- Verify location, size and operational direction (left or right) of valve by cross reference of supplied water atlas.
- Work the valve from open to closed, to back open position until the minimum torque limit or appropriate number of turns is achieved. If torque limit is reached prior to obtaining the appropriate number of turns, continue to "massage" the valve by repeating the process and slowly increasing the torque limit up to, but not exceeding the maximum torque limit, until the appropriate number of turns are obtained.
- Operate the valve through a minimum of (2) full cycles leaving valve in full open position, unless directed otherwise.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.

Actual experience in operating 16-inch and larger geared valves is far scarcer in the industry than the experience of having operated buried service valves that do not entail complex and extremely old gearing. Hydromax will approach the exercising of large geared valves with an engineered protocol:

16" And Larger Gate Vales That Are Not Geared.

- Locate main line valve (and by-pass valve, if applicable) then properly position valve operator for minimum interference with vehicular and/or pedestrian traffic.
- Establish and set up M.O.T. as appropriate. Remove valve box lid and/or open valve vault hatch covers. Clean out valve box and/or vault to access valve.
- Verify location, size and operational direction (left or right) of main line valve (and by-pass valve, if applicable) by cross reference of supplied water atlas.
- Identify size and type of main line valve (and by-pass valve, if applicable) and determine if valve is geared or not. If possible, determine manufacturer of valve. Cross reference the manufacturers specifications for minimum and maximum torque and the number of turns from full open to full closed for both the by-pass valve (if applicable) and main valve.
- Set the hydraulic valve operator for desired minimum torque and appropriate number of turns (for by-pass valve first, if applicable).
- Work valve from open to close position until the minimum torque limit or appropriate number of turns is achieved. If torque limit is reached prior to obtaining the appropriate number of turns, continue to

"massage" the valve by repeating the process and slowly increasing the torque limit up to, but not exceeding the maximum torque limit, until the appropriate number of turns are obtained.

- Operate both the main line valve (and by-pass valve, if applicable) through a minimum of (2) full cycles leaving valve in full open position, unless directed otherwise by Water Department.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.

16" And Larger Geared Valves

- Locate main line valve (and by-pass valve, if applicable) then properly position valve operator for minimum interference with vehicular and/or pedestrian traffic.
- Establish and set up M.O.T. as appropriate. Remove valve box lid and/or open valve vault hatch covers. Clean out valve box and/or vault to access valve.
- Verify location, size and operational direction (left or right) of main line valve (and by-pass valve, if applicable) by cross reference of supplied water atlas.
- Identify size and type of main line valve (and by-pass valve, if applicable) and determine if valve is geared or not. If possible, determine manufacturer of valve.
- Cross reference the manufacturers specifications for minimum and maximum torque and the number of turns from full open to full closed for both the by-pass valve (if applicable) and main valve.

- If valve is found to be geared, activate gear reduction mode on hydraulic valve operator and enter desired torque range.
- Set the hydraulic valve operator for desired minimum torque and appropriate number of turns.
- Work valve from open to close position until the minimum torque limit or appropriate number of turns is achieved. If torque limit is reached prior to obtaining the appropriate number of turns, continue to "massage" the valve by repeating the process and slowly increasing the torque limit up to, but not exceeding the maximum torque limit until the appropriate number of turns are obtained.
- Operate valve through a minimum of (2) full cycles leaving valve in full open position, unless directed otherwise by Water Department.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.

Butterfly Valves of Various Sizes

- Locate valve, properly position valve operator for minimum interference with vehicular and/or pedestrian traffic.
- Establish and set up M.O.T. as appropriate. Remove valve box lid and/or open valve vault hatch covers. Clean out valve box and/or vault to access valve.
- Verify location, size and operational direction (left or right) of valve by cross reference of supplied water atlas.
- Attempt to determine manufacturer of valve. Cross reference the manufacturers specifications for torque and actuator requirements and the number of turns from full open to full closed position.

- Keeping in mind that this is a butterfly valve and not a gate valve, set the hydraulic valve operator for desired minimum torque and appropriate number of turns.
- After verifying the operational direction of valve, work valve from open to close position until the minimum torque limit or appropriate number of turns is achieved. If torque limit is reached prior to obtaining the appropriate number of turns, continue to "massage" the valve by repeating the process and slowly increasing the torque limit up to, but not exceeding the maximum torques. If valve is determined to be "stuck" between the open and closed position, notify utility for permission to access actuator. If permission is granted, access the actuator and check for jamming. If nothing is found, the interference is likely in the valve. If this is the case,
- Do not attempt to force the disc open or closed since excessive torque in this situation can severely damage internal valve and/or actuator components.
- Once it is established that butterfly valve is operational, cycle the valve through (2) full cycles leaving valve in full open position, unless directed otherwise.
- Turns will be counted and recorded both down and up to insure they match. Valve sizes should match accepted turn ranges per size of valve. In cases where large valves are gear reduced, gear ratios should be noted if that determination can be made.

Controlling Torque Using Hydraulic Valve Turning Device

The torque is automatically monitored and controlled by the hydraulic valve operator once our technician pre-sets the desired torque limit and activates the automatic mode. The technician will then closely monitor the torque range while the valve operator is turning to insure that mechanical failure does not inadvertently impact the valve being turned.

Valves Found in the Wrong Position

If a valve is found in the wrong (closed) position, our technician will immediately contact the Water Department and inform them of the situation. If instructed to leave closed, our technician will document and record the valve status and all appropriate data in the program data and proceed to the next valve. If instructed to operate valve to full open position, our technician will proceed as appropriate for the type of valve encountered.

VALVE TECHNICAL SPECIFICATIONS

Torque Limits for Each Valve

The following information is compiled from AWWA references and various resilient wedge, double disc and butterfly valve manufacturer specifications. Specific manufacturer requirements will supersede below information if applicable.

- (4" through 12" valves have an opening torque that is approximately 30% of the closing torque)

- (14" through 60" valves have an opening torque that is equal to or less than the closing torque during normal operation)

  - 6" non-geared resilient wedge (RW) or double disc gate valve -50 to 110 ft #
  - 6" bevel geared RW or DD gate valve - 30 to 64.7 ft # (Rotork) or 25 to 56.3 ft # (MasterGear)
  - 6" spur geared RW or DD gate valve- 30 to 60.1 ft # (Rotork)
  - 8" non-geared RW or DD gate valve- 75to 150 ft #
  - 8" bevel geared R W or DD gate valve - 4 5 to 88.2 ft# (Rotork) or 40 to 76.7 ft # (MasterGear)
  - 8" spur geared RW or DD gate valve- 40 to 82 ft #(Rotork)
  - 10" non-geared RW or DD gate valve-90tol85 ft #
  - 10" bevel geared RW or DD gate valve- SO to 108 .8 ft # (Rotork) or 45 to 94.6 ft #(MasterGear)
  - 10" spur geared RW or DD gate valve - SO to lOLl ft # (Rotork)
  - 12" non-geared RW or DD gate valve - 100 to 225 ft #
  - 12" spur geared RW or DD gate valve - 60 to 123 ft # (Rotork)
  - 14" non-geared RW or DD gate valve - 110 to 225 ft #
  - 14" bevel geared RW or DD gate valve - 30 to 75 ft # (Rotork) or 25 to 58.8 ft # (MasterGear)
  - 14" spur geared RW or DD gate valve - 25 to 61ft # (Rotork 4.1:1), or 55 to 117.9 ft # (Rotork 2.12:1)
  - 16" non-geared RW or DD gate valve - 110 to 225 ft #
  - 16" bevel geared R W or DD gate valve - 130 to 161.8 ft # (Rotork 2:1), 45 to 91.7 ft # (Rotork 4:1) or 35 to 71.9 ft # (MasterGear)
  - 16" spur geared RW or DD gate valve - 30 to 61 ft # (Rotork 4.1:1), or 55 to 117.9 ft # (Rotork 2.12:1)
  - 18" non-geared RW or DD gate valve - 110 to 225 ft #
  - 18" bevel geared RW or DD gate valve -80 to 161.8 ft # (Rotork 2:1),90 to 91.7 ft # (Rotork 4:1) or 35 to
  - 71.9 ft # (MasterGear 4.5:1)
  - 18" spur geared RW or DD gate valve- 35 to 74.5 ft # (Rotork 4.1:1), or 70 to 144.1 ft # (Rotork 2.12:1)
  - 20" non-geared RW or DD gate valve- 100 - 300 ft #
  - 20" bevel geared RW or DD gate valve - 65 to 176.5 ft # (Rotork 2:1), 50 to 100 ft # (Rotork 4:1) or 35 to 78.4 ft # (MasterGear 4.5:1)
  - 20" spur geared R W or DD gate valve - 40 to 81.3 ft # (Rotork 4.1:1), or 75 to 157.2 ft # (Rotork 2.12:1)
  - 20" butterfly valve - 100 to 300 ft #
  - 24" non-geared RW or DD gate valve - 160 to 325 ft #
  - 24" bevel geared RW or DD gate valve - 60 to 127.5 ft # (Rotork 3:1)
  - 24" spur geared RW or DD gate valve- 40 to 88.1 ft # (Rotork 4.1:1), or 60 to 120.4 ft # (Rotork 3:1)
  - 24" butterfly valve - 100 to 300 ft #
  - 30" non-geared RW or DD gate valve -150 to 450 ft #
  - 30" bevel geared RW or DD gate valve - 80 to 176.5 ft # (Rotork 3:1), 65 to 132.4 ft # (Rotork 4:1) or 60 to 125 ft # (Limitorque 4:1)

- 30” spur geared R W or DD gate valve - 60 to 127.8 ft # (Rotork 4:1), or 80 to 166.7 ft # (Rotork 3:1)
- 30” butterfly valve -100 to 300 ft #
- 36” non-geared RW or DD gate valve-200 to 550 ft #
- 36” bevel geared RW or DD gate valve - 80 to 161.8 ft # (Rotork 4:1) or 75 to 152.8 ft # (Limitorque 4:1)
- 36” spur geared R W or DD gate valve - 75 to 156.3 ft # (Rotork 4:1) +
- 36” butterfly valve - 100 to 300 ft #
- 42” non-geared RW or DD gate valve-200to700 ft #
- 42” bevel geared RW or DD gate valve - 100 to 205.9 ft # (Rotork 4:1) or 90 to 194.4 ft # (Limitorque 4:1)
- 42” spur geared RW or DD gate valve - 90 to 198.9 ft #(Rotork 4:1) +
- 42” butterfly valve - 100 to 300 ft #
- 48” non-geared RW or DD gate valve - 300 to 800 ft #
- 48” bevel geared RW or DD gate valve - 115 to 235.3 ft #. (Rotork 4:1) or 110 to 222.2 ft # (Limitorque 4:1)
- 48” spur geared RW or DD gate valve - 110 to 227.3 ft # (Rotork 4:1)
- 48” butterfly valve - 100 to 300 ft #
- 54” non-geared RW or DD gate valve - 300 to 850ft ft #
- 54” bevel geared R W or DD gate valve - 120 to 240ft ft #
- 54” spur geared RW or DD gate valve- ll0to227 ft #
- 54” butterfly valve - 100 to 300 ft #
- 60” non-geared RW or DD gate valve- 350to900 ft #
- 60” bevel geared double disc valve - 125to 250 ft #
- 60” butterfly valve - 100 - 300 ft #

Hydromax adheres to strict guidelines for the operation and exercising of valves as indicated in the torque limit chart provided within these technical specifications. At no time will HUSA exceed the suggested maximum torque limits without authorization from the utility thereby releasing Hydromax USA from obligations that exceed the published torque specifications. HUSA is aware that exceeding the maximum torque may release pressure and increase operability but will not proceed beyond the recommended torque specification without authorization and witnesses form the utility to verify the operational ability and possibility of operation beyond the specified limits.

VALVE ASSESSMENT AND REMEDIATION QUOTATION

ITEM NUMBER	UNIT OF MEASURE	ITEM DESCRIPTION	QTY	UNIT PRICE	EXTENSION
B2	Each	Valve Maintenance (Includes sub-foot GPS)	4000	$42.00	$168,000.00
B4	Each	Raise Valve Box to Grade <12" depth (excluding concrete areas and vehicular arteries)	0	$31.13	$0.00
B5	Each	Raise Valve Box to Grade <12" depth in concrete areas and vehicular arteries	0	$155.00	$0.00
B23	Each	Realign Valve box to grade in dirt, grass, sand or Gravel (0-4')	0	$55.00	$0.00
A5	Each	Install Reflective Road Marker, DOT Standard Blue	0	$10.00	$0.00
				Total	$168,000.00

Per Pricing Terms and Condition of Seminole County specification IFB-602347-15/GCM

**** When raising valves under line item B4, B5, and B23 Hydromax will install a 2x2x4 prefabricated valve pad, if provided by the city.**