VALVE EXERCISING PROGRAM

ST. JOHN'S
DEPARTMENT OF PUBLIC WORKS & PARKS
ENVIRONMENTAL SERVICES DIVISION
Overview

• City of St. John's Water Distribution System
• Details of a Valve Exercising Program
• City of St. John's Valve Exercising Program
• City of St. John's Valve Program - Future
CSJ Water Distribution Sys.

Treatment Plants (2)

Bay Bulls Big Pond
- 24 MGD
- St. John's (West)
- Mount Pearl
- Paradise
- CBS

Windsor Lake
- 12 MGD
- St. John's (East)
CSJ Water Distribution Sys.

Water Storage Tanks (10)

- Ruby Line
- Southlands (2)
- Jensen Camp
- Kenmount Hill (2)
- Shea Heights
- Airport Heights
- Bay Bulls Big Pond
- Windsor Lake
CSJ Water Distribution Sys.

Pumping Stations (10)
- Bay Bulls Big Pond
- Ruby Line
- Kenmount
- New Pennywell
- Windsor Lake
- Autumn Drive
- Shea Heights
- Densmore Lane
- Fahey Street
- Valleyview
CSJ Water Distribution Sys.

Pressure Reducing Stations (12)

- Topsail Road
- Waterford Lane
- Waterford Bridge Road
- Kenmount Pump Station
- Kenmount Road - VOCM
- Kenmount Road @ Pippy Place
- Howley Avenue
- Higgins Line
- Portugal Cove Road (2)
- Janeway Place
- Portugal Cove Place
- Major's Path
CSJ Water Distribution Sys.

Pressure Zones (22)

• Service Area from 190m Contour to Sea Level
• Controlled by
  – Reservoirs (2)
  – Tanks (10)
  – Pump Stations (10)
  – PRV Stations (12)
• Total of 22 Zones
• Future – 30 Zones?
CSJ Water Distribution Sys.

CSJ Infrastructure

- Water Mains > 300mm
  - 70 km
- Water Mains ≤ 300mm
  - 480 km
- Fire Hydrants
  - City Owned = 2841
  - Private = 435
- Water Main Valves
  - Valves > 9100
Valve Exercising Program

What is a Valve Exercising Program?

A systematic program to locate and exercise water valves to ensure that they function / operate properly.
Valve Exercising Program

AWWA Definition

"Each valve should be operated through a full cycle and returned to it's normal position on a schedule that is designed to prevent a buildup of tuberculation or other deposits that could render the valve inoperable or prevent a tight shut-off."
Valve Exercising Program

Why should we exercise valves?

Valves are an integral part of the water distribution system and in the event of an emergency:

- Valve locations will be known;
- Valves will operate correctly;
- Valves will be accessible;
- Result - reduced damage to infrastructure.
Valve Exercising Program

Why Not?

Some common reasons:
• Our system is old;
• Our system is new;
• Our system is small;
• We have no history of problems with our valves;
• I'm retiring in a couple of years, let the new guy do it.
Valve Exercising Program

Benefits

• Valve locations will be known;
• Quicker to shut for emergencies;
• Reduce leak run time therefore reduce loss of treated water = $$;
• Reduce leak time therefore reduce damage to municipal infrastructure;
• Reduce area / residents affected by breaks & outages.
• Legal Benefits – less claims & legal defence.
Valve Exercising Program

Problems

- Locating the valves;
- Valves will be broken;
- Wrong valve will be operated;
- Cause dirty water;
- Disruption to residents.
Valve Exercising Program

Program Components

1. Locate Valves;
2. Exercise Valves;
3. Valve Records;
Valve Exercising Program

Step 1: Locate Valves

- Find All Visible Valves;
- Valve Ties;
- As-Built Drawings;
- Water Main Break Reports;
- Use Metal Detector.
Valve Exercising Program

Missing Valves - No Records?

• Valves Paved Over;
• Review construction specifications for guidelines for valve spacing;
• Start at Intersections – 1, 2, 3 or 4;
• Raise Valves to Grade;
• Record Location.
Valve Exercising Program

Step 2: Exercise Valves

• Locate Valve;
• Clean Out Valve Box;
• Exercise the valve through one entire cycle (open & close);
• Record the Information.
Valve Exercising Program

AWWA Recommended Procedure

- Begin with a steady amount of torque in the direction necessary to **close** the valve for 5 - 10 rotations;
- Reverse (open) for 2 - 3 rotations;
- Reverse (close) for 5 - 10 rotations;
- Repeat above until fully closed;
- Once fully closed, open a couple of turns to flush away debris
- Fully open the valve.
Valve Exercising Program

AWWA Recommended Procedure

- The theory for this procedure is that you "scrub" or clean any debris from the gate or slides.
- If the valve gate is forced into the debris at the base of the valve it will be more difficult to open as the debris may become compacted under gate.
- Debris will prevent a tight seal or shut.
Valve Exercising Program

Step 3: Record Information

• Most important step;
• Location - ties
• Obtain information for records, for example size and depth;
• Maintenance History;
• Helpful for future planning.
Valve Exercising Program

Suggested Information to be Recorded

- Location – civic address and ties;
- Valve Size
- Number of Turns
- Depth to Valve Nut
- Valve Head – square vs wheel valve
- Open Direction – left vs right;
- Date Exercised;
- Maintenance Required / Completed.
Valve Exercising Program

Step 4: Valve Maintenance

- Schedule repairs;
- Complete repairs;
- Record any relevant information.
Valve Exercising Program

Starting a Program

• Gather all information on your Water Distribution System;
• Start small - one valve at a time;
• Start with known valves or critical valves;
• Expand to locate all valves;
• Record information;
• Develop a plan to continue program.
Valve Exercising Program

What's Required - Basic

- Employees;
- Training on program;
- Valve Keys;
- Vehicle;
- Method for Record Keeping.
Valve Exercising Program

What's Required - Extra

- Small Vacuum System;
- Mechanical Valve Exerciser;
- Metal Detector;
- Pavement Breaker – Optional.
Valve Exercising Program
CSJ Valve Exercising Program

Summary

- Started in 2001 with 4 employees;
- 2002 – added Portable Vacuums;
- 2003 – started to collect GPS valve locations;
- 2004 – added iPaq data collectors;
- 2005 – concentrated on locating Valves
CSJ Valve Exercising Program

Program Components

1. Locate Valves;
2. Exercise Valves;
3. Valve Records;
CSJ Valve Exercising Program

Step 1 – Locate Valves

• Started in 2003;
• Collected using Handheld GPS unit;
• Currently 9140 valves;
• Still looking for valves using As-Built drawings and Valve Ties.
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Valve Records

• All information stored using GIS system;
• ESRI ARCMAP;
• Each layer is a Feature Class;
• Each Feature Class has its own Attribute Table;
• Data is stored in Attribute Table.
# CSJ Valve Exercising Program

## Attribute Table - Valves

- **GPS Coordinates**
- **No. of Turns**
- **Description**
- **Valve Size**
- **Exercise: Y or N**
- **Node / GIS Number**
- **Label / Type**
- **Open Type**

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<th>NORTHING</th>
<th>EASTING</th>
<th>POINT_ID</th>
<th>ASSUM_NUM</th>
<th>TURNS</th>
<th>DESCRPT</th>
<th>VALVESIZE</th>
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<th>gisnum</th>
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<td>2002</td>
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</table>
CSJ Valve Exercising Program

- Main Line
- Sample Port
- Valve Chamber
- Hydrant Valve
- Division Gate
- EastWest Gates
- Bi-Pass
- Air Release
- Service
- Curb Stop
- Abandoned/FalseValve
- Sewer
CSJ Valve Exercising Program

Step 2 – Exercise Valves

- Valves to be exercised selected from GIS;
- Only Main Line Valves are Exercised;
- Map of valves to be exercised produced;
- Individual record sheets for each valve.

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CSJ Valve Exercising Program

Valve Sheets - Grid

- Individual Grid Selected
- Overview of entire area for reference
- All Valves to be exercised are highlighted.
CSJ Valve Exercising Program

Valve Sheets - Data

- Operator & Date
- Valve Number
- Location / Description
- Valve Size
- Depth to Operating Nut
- Open Direction
- Number of Turns
- Valve Position
- Valve Deficiencies

<table>
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<tr>
<th>City of St. John’s</th>
<th>Valve Maintenance Checklist Form</th>
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<td>Operator: _________</td>
<td>Date: __________</td>
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<td>Current Location Description: Main Line Valve - Empire Avenue</td>
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<tr>
<td>Proper Location Description: ____________________________</td>
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<tr>
<td>Valve Size: _____</td>
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<tr>
<td>Depth: (To Operating Nut) _________</td>
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<tr>
<td>Open: Clockwise ____  Counter Clockwise ______</td>
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<tr>
<td>Approx # of Turns to Fully Open/Close: ________</td>
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<tr>
<td>Actual # of Turns to Fully Open/Close: ________</td>
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<tr>
<td>Valve Position: <strong>opened</strong> <strong>closed</strong></td>
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<tr>
<td>Installed Temp. Cover &amp; Cold Mix Asphalt (Y/N): __________</td>
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<tr>
<td>Installed New Cover (Y/N): ________</td>
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<tr>
<td>Installed Valve Box Insert: Y/N ______</td>
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<td>Valve/Valvebox Deficiencies: (See List)</td>
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<tr>
<td>1. Temporary Cover 2. Broken Valve Box 3. Valve Box Off Center</td>
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<td>4. Valve Box Broken 5. Valve Box Above Grade 6. Valve Box Extension Needed</td>
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<td>10. Valve Locking Pin Missing</td>
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</table>

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CSJ Valve Exercising Program

• Wachs Industrial Vacuum System; Used to remove water, dirt and debris from valve box.
• Originally Trailer Mounted; Placed in back of Stake Body to Reduce Length.
CSJ Valve Exercising Program

Equipment - Exerciser
• Hurco Spin Doctor;
• Hydraulically Operated;
• Connected to Truck with Trailer Receiver;
• Can Reach up to 13ft.
• Data Collection Unit to Record Information.
CSJ Valve Exercising Program
CSJ Valve Exercising Program

Step 3 – Record Data

• Data recorded on paper sheets and iPaq's;
• Started using data collection unit with exerciser in 2007;
• Data collected and stored in GIS database.
CSJ Valve Exercising Program

• Typical Screen Shots from Valve Exerciser
CSJ Valve Exercising Program

Step 4 – Valve Maintenance

- Immediate Maintenance:
  - Replace Cover
  - Install Valve Insert
  - Repair Asphalt

- Scheduled Maintenance:
  - Replace Valve Nut
  - Replace Valve Packing
  - Repair Valve Box
  - Replace Valve

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CSJ Valve Exercising Program

Typical Valve Insert & Repair
CSJ Valve Program - Future

New Technology / Advancements

• New Valve Boxes
  – Single Piece Lower Section Valve Boxes with ductile iron upper section.

• Pavement Breaker
  – Breaker on each truck powered by same hydraulic unit as valve exerciser.

• Replacement Trucks
CSJ Valve Program - Future

Composite Valve Box

- Lower – Single Piece Plastic Material
- Upper – Ductile Iron
- Slider Type no corrosion between plastic and metal.
- Reduces misalignment between valve box sections
CSJ Valve Program - Future

Composite Valve Box – Upper Section

- Tapered Lip for plows to "ride" up.
- "Floats" with asphalt surface
CSJ Valve Program - Future

Pavement Breaker

- Powered by hydraulic unit for valve exerciser.
- Allows for valve repairs to be made at the same time as the valve is exercised.
CSJ Valve Program - Future

Replacement Trucks
- Multi – Purpose Truck
- Vacuum System
- Valve Exerciser
- Pavement Breaker
- Storage Compartments
City of St. John's Valve Exercising Program

QUESTIONS / COMMENTS

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