### VALVE EXERCISING PROGRAM



### ST. J@HN'S

## 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





#### 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)



#### Water Storage Tanks (10)

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



#### Pumping Stations (10)

- Bay Bulls Big Pond
- Ruby Line
- Kenmount
- New Pennywell
- Windsor Lake
- Autumn Drive
- Shea Heights
- Densmore Lane
- Fahey Street
- Valleyview



#### 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



#### 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 Infrastructure**

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

### What is a Valve Exercising Program?

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



### **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."



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.



### 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.



#### **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.

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### **Problems**

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



### Program Components

- 1. Locate Valves;
- 2. Exercise Valves;
- 3. Valve Records;
- 4. Valve Maintenance.



### Step 1: Locate Valves

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



### 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.



### Step 2: Exercise Valves

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



#### AWWA Recommended Procedure

- Begin with a steady amount of torque in the direction necessary to <u>close</u> 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.



### 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.



### Step 3: Record Information

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



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.



Step 4: Valve Maintenance

- Schedule repairs;
- Complete repairs;
- Record any relevant information.



### 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.



What's Required - Basic

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



### What's Required - Extra

- Small Vacuum System;
- Mechanical Valve Exerciser;
- Metal Detector;
- Pavement Breaker Optional.





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### <u>Summary</u>

- 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
- 2007 added Hydraulic Exercisers.



### Program Components

- 1. Locate Valves;
- 2. Exercise Valves;
- 3. Valve Records;
- 4. Valve Maintenance.





#### <u>Step 1 – Locate Valves</u>

- 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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NORTHING	EASTING	POINT_ID	ASSUM_NUM	TURNS	DESCRIPT	VALVESIZE	exercise	nodenum	gisnumber	labels	type
5273182.168	324480.492	479		36	Main Line Valve - Branscombe Street	300	Y	10887	1110	Main Line	1
5266953.534	324826.141	147		0	Abandoned Hydrant Valve	0	N	0	1241	Abandoned/FalseValve	
5268690.79	326917.431	183		18	Service Valve - 270 Southside Road	150	N	2260	1265	Main Line	Standard
5275532.176	326983.801	217		36	Main Line Valve - Stavanger Drive	300	Y	9539	1289	Main Line	Standard
5275545.11	326980.038	218		36	Main Line Valve - Stavanger Drive	300	Y	9541	1290	Main Line	Standard
5275542.242	326977.363	219		24	Main Line Valve - Trebble Place	200	Y	9540	1291	Main Line	Standard
5275448.399	326862.43	226		24	Main Line Valve - Trebble Place	200	Y	9547	1295	Main Line	Standard
5275393.106	327020.811	227		36	Main Line Valve - Stavanger Drive	300	Y	9534	1296	Main Line	Standard
5275400.746	327013.482	228		24	Main Line Valve - Veitch Crescent	200	Y	9535	1297	Main Line	Standard
5255178.133	321717.226	684		0	Air Release Valve	0	N	0	1583	Air Release	
5267668.346	326663.859	1095		18	Service Valve - 161 Blackhead Road, Senior's Complex	150	N	0	1846	Service	
5275407.41	327016.863	1234		36	Main Line Valve - Stavanger Drive	300	Y	9536	1922	Main Line	Standard
5266656.572	323715.303	1341		36	Division Gate - Eastaff Street	300	N	2729	1978	Main Line	Standard
5268722.957	326463.995	1509		18	Main Line Valve - Springdale Street	150	Y	1919	2078	Main Line	Standard
5265461.918	322877.867	5		24	Main Line Valve - Thomas Street	200	Y	391	2092	Main Line	Standard
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### 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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- Main Line
- Sample Port
- Valve Chamber
- Hydrant Valve
- Division Gate
- EastWest Gates
- Bi-Pass
- Air Release
- Service
- ⊕ Curb Stop
- Abandoned/FalseValve
- Sewer



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#### <u>Step 2 – Exercise Valves</u>

- 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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### Valve Sheets - Grid

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





#### Valve Sheets - Data

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







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#### 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.







Typical Screen Shots from Valve Exerciser







### <u>Step 4 – Valve Maintenance</u>

- Immediate Maintenance:
  - Replace Cover
  - Install Valve Insert
  - Repair Asphalt
- Scheduled Maintenance:
  - Replace Valve Nut
  - Replace Valve Packing
  - Repair Valve Box
  - Replace Valve





#### **Typical Valve Insert & Repair**



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





### 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





#### **Composite Valve Box – Upper Section**

- Tapered Lip for plows to "ride" up.
- "Floats" with asphalt surface



### 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.





### **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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