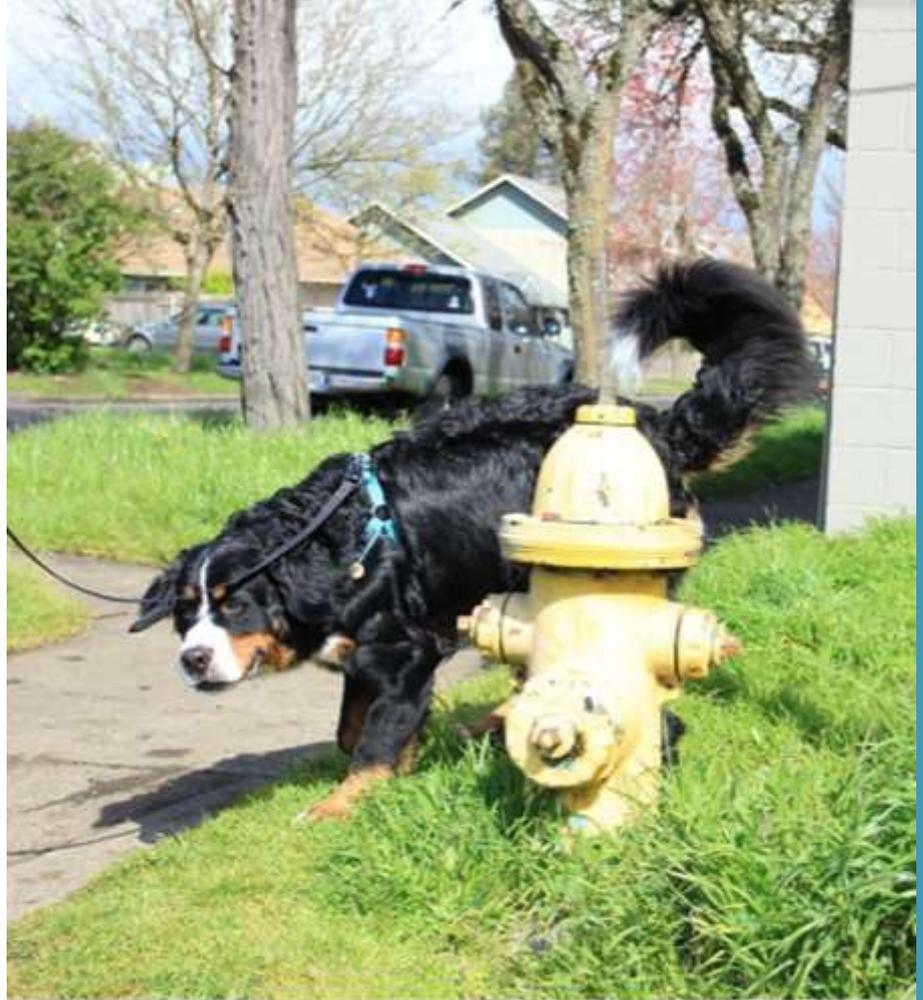


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Not Just for the Dogs: Inspection, Maintenance and Data Management of Hydrant Assets

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Ronan Igloria, P.E.



Background

- The City of Eugene owns the fire hydrants. EWEB owns the water system.
- EWEB and City partnered to assess the value and costs for owning and maintaining public fire hydrants over the long-term.
- EWEB and the City were assessing potential ownership transfer and continued O&M of the City fire hydrants.



Outline

- Assessment and recommendations
 - Current assets and practices
 - Planning for R&R and O&M budget
 - Asset management considerations
- Implementation
 - Inspection standardization
 - Data management (web-based)
 - Status and next steps



Assessment and Recommendations

Project Scope

- Review hydrant data
- Review operation and maintenance costs
- Estimate current and replacement value



Data Sources

- EWEB GIS (“wHydrants” feature class)
- City Fire inspection data in Microsoft Access (ELOG database)
- Hydrants feature class from the City hydrant inventory (not directly used; used for comparison)
- EWEB and City Fire interviews (inspection and replacement processes and costs)
- References (AWWA M17, EPA AM)



Historical Maintenance and Replacement Data

- 17 years of ELOG records; ~4,000 hydrants
- Constraints:
 - Inspection activities documented with binary (y/n) fields
 - Maintenance activities/comments in free text fields
 - Inspections and repairs not correlated; work orders not correlated with inspections
 - Repair documentation and condition data very limited

	hydrant_id	insp_date	drain_flag	paint_flag	service_flag	needed_flag	insp_comment	updated_by	updated_date
1	11	1989-08-07 00:00:00.000	Y		Y				2002-06-10 12:49:05.000
2	11	1991-07-05 00:00:00.000	Y		Y				2002-06-10 12:49:05.000
3	11	1991-07-19 00:00:00.000	Y		Y				2002-06-10 12:49:05.000
4	11	1993-06-07 00:00:00.000	Y		Y		NEEDS #		2002-06-10 12:49:05.000
5	11	1996-09-25 00:00:00.000	Y	Y	Y				2002-06-10 12:49:05.000
6	11	1999-10-22 00:00:00.000	Y	Y	Y		NEEDS PAINT		2002-06-10 12:49:05.000
7	11	2001-07-30 00:00:00.000	Y	Y	Y			CEFDARC	2001-07-30 17:19:39.000
8	11	2003-09-08 00:00:00.000	Y					CEFDJLB	2003-09-08 09:27:42.000
9	11	2007-05-22 00:00:00.000						CEFDDCG	2007-05-22 21:11:02.000
10	11	2011-03-25 00:00:00.000						CEFDKEB	2011-03-25 14:40:36.000
11	11	2011-12-05 00:00:00.000						CEFDWSJ	2011-12-05 12:53:09.000
12	11	2013-08-04 00:00:00.000				Y	08/04/13 CEFDSCW: bonnet leaking, needs new number stamp	CEFDSCW	2013-08-04 09:44:35.000

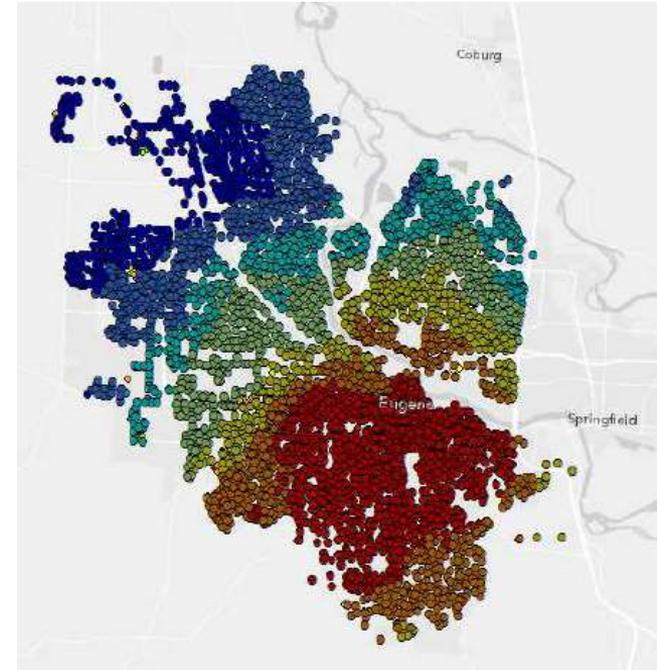
Historical Maintenance and Replacement Costs

- Replacement: \$73,000 total annual; \$4,300 per hydrant
 - City Fire replaced ~17 hydrants per year on average
 - Costs based on labor rates, time and material provided by EWEB
- Maintenance: \$107,000 total annual; \$27 per hydrant
 - Costs based on inspection and maintenance tasks from ELOG



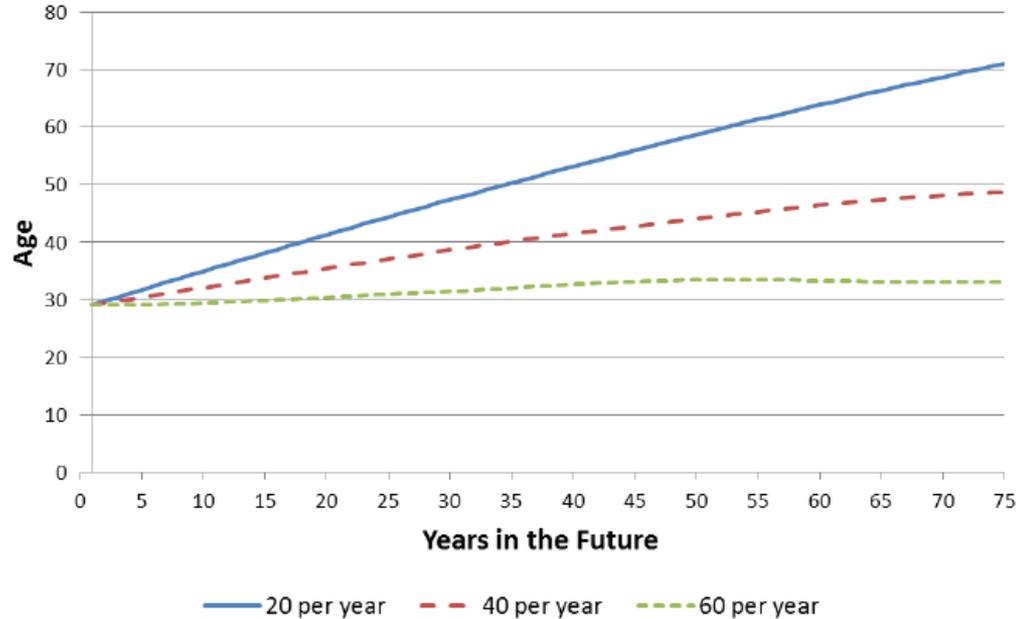
Limitations on Estimating Useful Life

- Time (in years) that hydrant performance meets LOS requirements
 - No formal documentation of hydrant LOS
 - Current LOS will continue unchanged through planning period
- Lack field-verified condition data for predictive modeling
- Actual useful life of individual hydrants may vary significantly from the average
 - Manufacturers: > 100 years
 - EPA: 40 years average
 - PWB: Max 100 years; average 50 years



Hydrant Replacement Rates

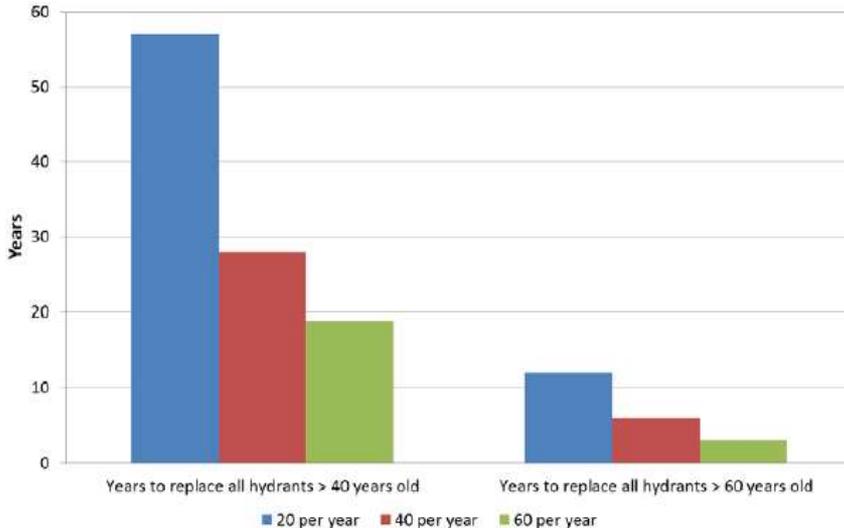
- Age used as proxy for condition
- Current average age ~29 years
- Considered 20-, 40-, and 60-per year
- Replacement rate of at least 40 per year better manages increasing average age of hydrants than current replacement rates



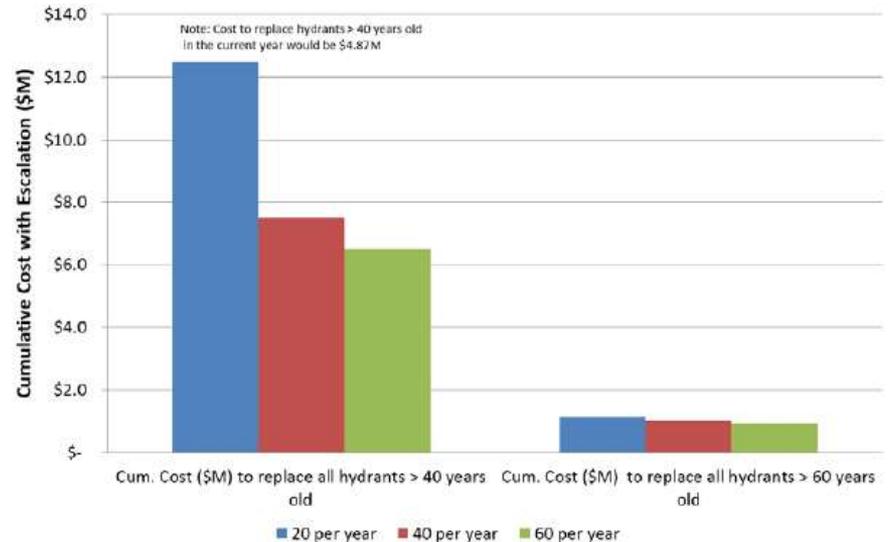
Planning-level Replacement

- More aggressive replacement rate has a lower present value (PV) cost to replace all hydrants of a given age

Comparison of Number of Years to Replace Hydrants
Currently Older than 40- and 60-years
(@ Replacement Rates of 20-, 40- and 60- per year)

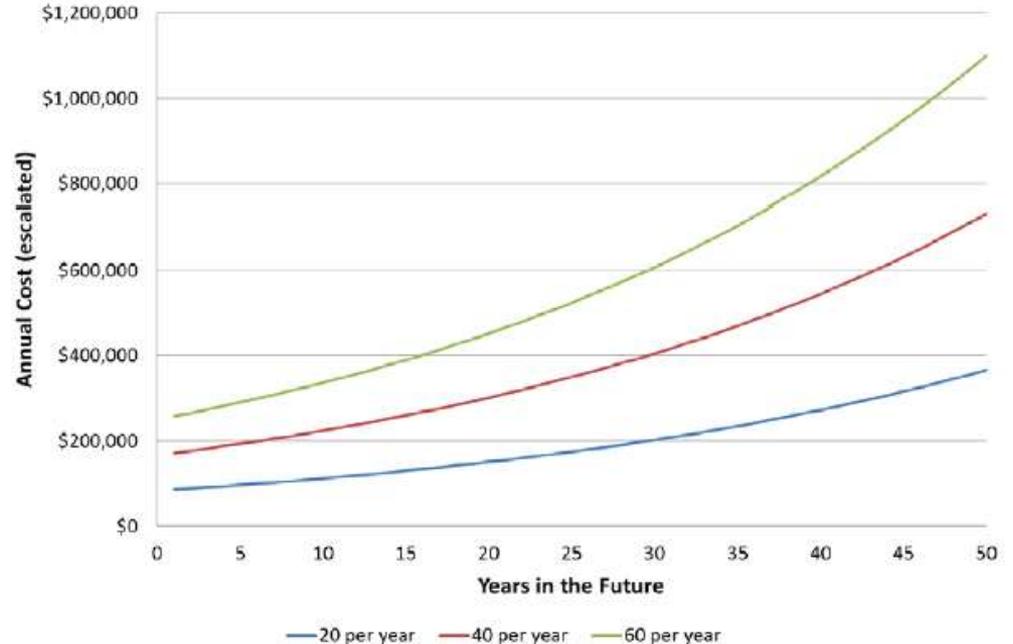


Comparison of Cumulative Cost (PV) to Replace Hydrants
Currently Older than 40- and 60-years
(@ Replacement Rates of 20-, 40- and 60- per year)



Future O&M and Replacement Costs

- Replacement rate considerations:
 - LOS impact on the reliability of the system
 - Financial impact on customers
 - Maintenance and rehabilitation
 - Extraordinary (local) conditions



Asset Management Recommendations

- Risk Management: CoF x LoF
 - Adopt regular inspections and condition assessments
 - Define consequence (proximity; isolation)
 - Track condition by: age, style, make and model, frequency of use and repair, damage (contractors / workers), site development changes, and operations and testing activities
- Prioritize maintenance, repairs, replacements
- Improved planning and budgeting

		Condition Index	Condition Beta												
Condition Values	Poor	0 to 0.9	10	11	12	13	14	15	16	17	18	19	20	Risk Level Results (Map #) High 17 - 20	
		1 to 1.9	9	10	11	12	13	14	15	16	17	18	19		
		2 to 2.9	8	9	10	11	12	13	14	15	16	17	18		
	Fair	3 to 3.9	6	7	8	9	10	11	12	13	14	15	16	Medium-High 13 - 16	
		4 to 4.9	5	6	7	8	9	10	11	12	13	14	15		
		5 to 5.9	4	5	6	7	8	9	10	11	12	13	14		Medium 9 - 12
		6 to 6.9	3	4	5	6	7	8	9	10	11	12	13		
	Good	7 to 7.9	2	3	4	5	6	7	8	9	10	11	12	Medium-Low 5 - 8	
		8 to 8.9	1	2	3	4	5	6	7	8	9	10	11		
		9 to 10	0	1	2	3	4	5	6	7	8	9	10		
Consequence Beta			1	2	3	4	5	6	7	8	9	10			
Risk Level			Low		Medium-Low		Medium		Medium-High		High				
				Consequence											

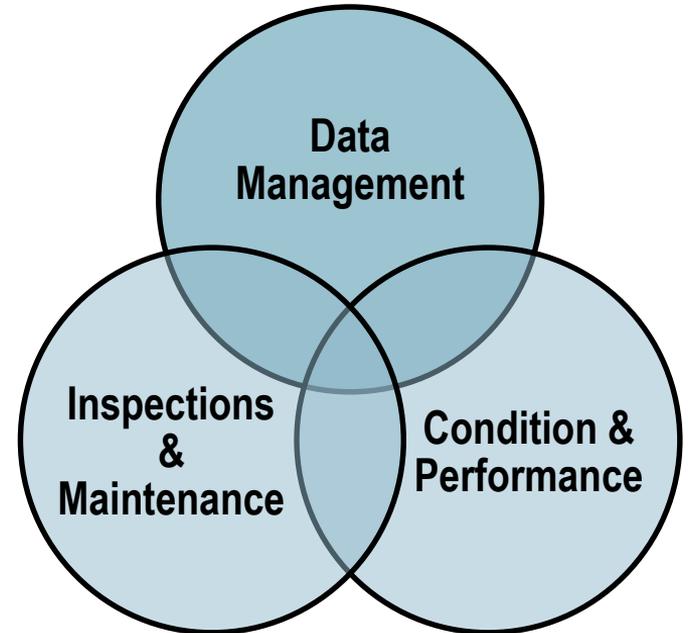
Asset Management Recommendations

- Data Management to allow more robust tracking of O&M:
 - **Define coding standards** across agencies for condition assessments and work performed
 - **Define Facility IDs** as primary keys with no spaces or null records
 - **Assure cross-referencing of GIS data** on repairs/renewals in a one-to-many relationship
 - **Clarify workflow and validation** to assure quality in data entry process



Summary of Recommendations from Assessment

- Changes to data management for more robust tracking of O&M and cost of ownership
- Planned and consistent inspections / maintenance
- Leverage improved inspection and maintenance to understand condition and performance

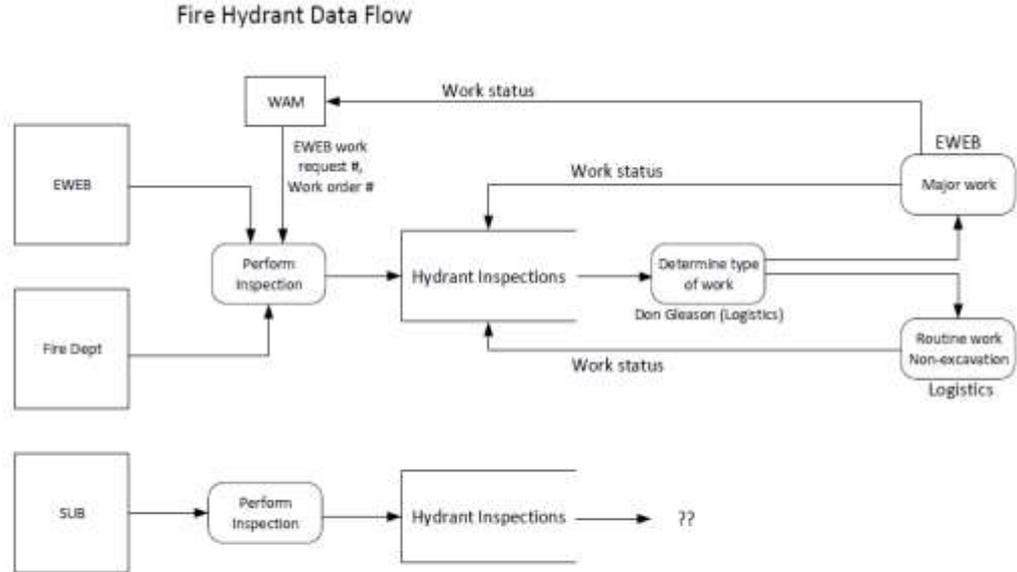


O&M Implementation

Inspections and Data Management

Process Mapping and Data Flow

- Monthly meetings with the Fire Dept. to review hydrant assessment and recommendations
- Identifying the gaps with the existing work flow process
- Goals Developed:
 - Standardize Inspection and maintenance data collection
 - Improve and share data management system
 - Implement and Improve hydrant inspection and maintenance.
 - Update MOU/ IGA.



Hydrant Inspections

- **NO COMMENT FIELD!**
- Inspection Standardization:
 - AWWA inspection report
 - EWEB inspection form
 - Fire department Inspections (ELOG)
 - Springfield's (SUB) inspection checklist
- Single data management system required for EWEB and Fire Dept.

Figure 9-3: Hydrant inspection report

Fire Hydrant Inspections

Please use the following Symbols:
 Y = Everything is Good
 B = Inspected / Repaired / Deficient
 M = Maintenance Required

Map Title # Hydrant # Date

Flow Test Results

Flow (gpm)

Time Flushed (min)

Water Used (gal)

Flow

Change

Case

Spins

Packing

Dr Ring

Top Nut

Spoke

Wire Size

Cost of Water

Remarks

Comments

Please note any corrections that need to take place operation, leaking or not draining

SPRINGFIELD UTILITY BOARD WATER DIVISION
 HYDRANT INSPECTION CHECKLIST

Map # _____ Hydrant # _____ Address _____

Date _____ Inspected by _____

- Visually inspect the area
- Visually check for leaks
- Remove caps. Clean and lubricate threads. Replace caps
- Install base or diaphragm if necessary
- Open hydrant SLOWLY to full open position
- Perform Fire Flow Test if required
- Check for leakage:
 - Reduce flow and run for at least 1 minute
 - Check water clarity with initial water cap
 - Reduce flow SLOWLY and shut off hydrant
 - Watch to see hydrant stops dripping. Re-check if necessary
 - Remove base or fittings
- Check to see if water obtains flow based on hydrant
- Replace cap
- Repair any damage to surrounding area
- Report problems to Water Division for Maintenance

NO Problems Found

Problems Identified

Problems Resolved:

Blue Mark Created for Repair

None

© 2009 EWEB Utility Board Water Division. Springfield, Oregon. The Content Owner: IT110240/Hydrant Inspection Checklist 2008-006

Enter Inspection

Hydrant ID: 535

Station Acronym: [dropdown]

Address: 555 E 10th Ave

Location Comment: 0980 Int

Inspection Date: 12/3/2014

Class Not Clean: [checkbox]

Needs Paint: [checkbox]

Needs Rebuild: [checkbox]

Inspection Needed: [checkbox]

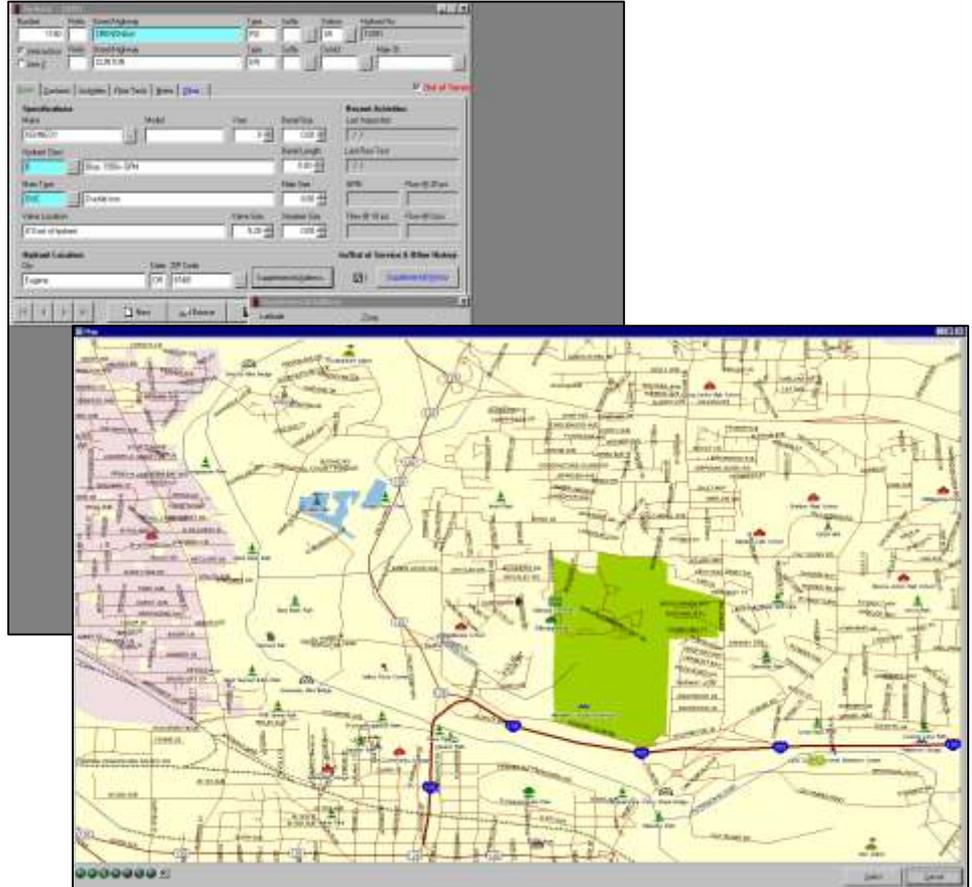
Send to PIA Table: [checkbox]

New Comment: [text area]

Save Close

Data Management Option 1: Fire House

- A records management system, specifically designed for fire departments.
 - Several linked modules
 - Customizable reports and queries within the user-interface.
 - Interfaces to and from the regional computer aided dispatch system
- City of Eugene owned, cloud-based web version
 - **Limited sharing functionality for EWEB**



Data Management Option 2: ELOG (Improved)



- **DEVELOPED FOR HYDRANT INSPECTION & MAINTENANCE MANAGEMENT**
- City of Eugene owned (ELOG) application housed on a City-owned server.
- Requires modifying the existing system used by Fire Dept. for hydrant inspection.
- Secure database with permissions and access.
- Accessible via internet (or mobile device) allowing Fire Dept. and EWEB users to:
 - Remotely display
 - Update, store, and retrieve fire hydrant inspection and maintenance records
 - Search and display inspection and maintenance records
 - Export search results and records

Data Management: ELOG

- Hydrant inspection and maintenance records:

Enter Inspection

Hydrant ID: **84012** Private Station Assigned: **11** Address: **525 DR**

Inspector Date:

Inspected By: Name and User Id

Location Comment: [Updates master hydrant record]

Hydrant make: [Updates master hydrant record]

Year of manufacture: YYYY [Updates master hydrant record]

Mark as Acceptable

1. Bury elevation: Acceptable Repair needed

2. Orientation: Acceptable Repair needed

3. Clearance: Acceptable Repair needed

4. Blue reflector: Acceptable Repair needed

Water Testing: Water continues to be tested after flowing for 5-7 minutes at 50 gpm. [Sends email to Water Ops Coordinators]

Inspectable: [Updates hydrant record, send to Water Ops Hydrant Notification]

Sent to FM Office: [Email to Engine FPS Communicator with Inspector Comment]

Inspection Comment:

Save Close

Enter Maintenance

Hydrant ID: **91026** Station Assigned: **2** Address: **2701**

Maintenance Date:

Maintained By: Name and User Id

EWB Work Order Number: EWEB only

Location Comment: [Updates master hydrant record]

Hydrant make: [Updates master hydrant record]

Year of manufacture: YYYY [Updates master hydrant record]

1. Bury elevation: Install extension Remove extension
 Replace hydrant with proper bury depth
Other:

2. Orientation: Turn hydrant Acceptable

3. Clearance: Trim brush Refer to Fire Marshal
Comment:

4. Blue reflector: Install reflector

5. Ground valve condition: Replace leaking valve bonnet Replace valve nut
 Replace inoperable valve
 Locate and clean out valve file Replace valve file and box

6. Ease of operation: Lubricate hydrant bonnet parts Replace worn stem parts and/or o-rings
 Fill of reservoir Replace hydrant Acceptable for hydrant make

7. Bonnet leakage: Replace o-rings Replace bonnet gasket
 Replace/adjust stem packing

8. Traffic flange condition: Replace flange o-ring or gasket Replace break away flange
 Replace break away bolts Install new traffic flange kit

9. Valve seat leakage: Replace main valve seat Replace drain valve

10. Cap gaskets: Install or replace cap gaskets

11. Drain: Force pressurized water through weep holes
 Excavate to clear blockage of weep holes

12. Paint: Smooth Sand
Other:

Inspectable: [Updates master hydrant record and sends email to Logistics]

Sent to FM Office: [Sends email to FMO with Maintenance Comment]

Retrospection Needed:

Maintenance Comment:

Implementation Status and Next Steps

- Improved communications between the fire department, City and EWEB
- Hydrant inspections are performed to the same standard
- Inspection data is being collected in one system
- EWEB can search for all hydrant inspections in prior years to avoid duplicating inspections
- EWEB, the City and Fire Dept. are finalizing the MOU

Thank You! Questions?

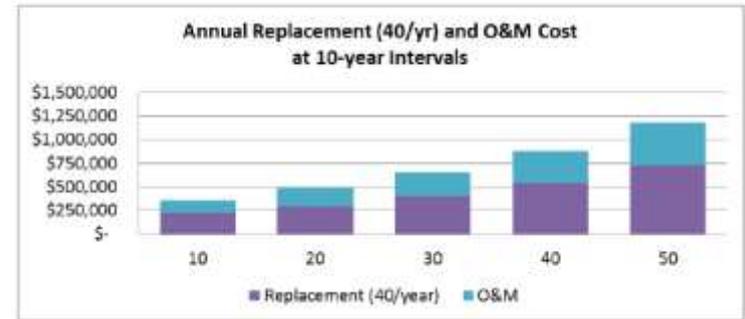
Nathan.Endicott@EWEB.org
Eugene, OR

Ronan.Igloria@hdrinc.com
Portland, OR



Future O&M and Replacement Costs

- Replacement rates of 20-, 40- and 60-hydrants per year
- As the replacement rate is increased the relative proportion of the total cost favors capital over O&M



Data Management: ELOG

Hydrant Detail:



Records Hydrant Maintenance Compare Inspections and Maintenance Maintenance Needed

Hydrant Detail - ID: 84012

General Inspect History Asset History Map Inspections (Reports) Repair Log (Reports) Work Orders (Reports) Compliance Options

General Information

Hydrant ID: 84012	
House Number: <input type="text" value="525"/> <input type="text" value="DK"/> Street: <input type="text"/> Type: <input type="text" value="DR"/>	
Location Comment: <input type="text" value="Starting Cx Int"/>	
Make: <input type="text" value="M & H"/>	
Manufacture Year: <input type="text" value="YYYY"/>	Flow Test Date: <input type="text" value="YYYY MM"/>
Installation Date: <input type="text" value="YYYY MM"/>	Private: <input type="text" value="Yes"/>
Water Main Size: <input type="text" value="36"/>	Material: <input type="text" value="Unrelated"/>
Bury Depth: <input type="text" value="0.0"/>	Station Assigned: <input type="text" value="11 - Santa Clara"/>
Dead End Water Main: <input type="text" value="No"/>	EPD Map Number: <input type="text" value="458"/>
Number of Ports: <input type="text" value="1"/>	EWEB Map Name: <input type="text" value="15W"/>
Main Valve Size: <input type="text" value="4.00"/>	EWEB District: <input type="text" value="SC"/>
Static Pressure: <input type="text"/>	Tap Color: <input type="text"/>
Residual Pressure: <input type="text"/>	Barrel Color: <input type="text" value="Yellow"/>
Actual Flow: <input type="text"/>	
Flow at 20 psi: <input type="text"/>	
Flow 20 explanation: <input type="text"/>	
Ground Valve Location: <input type="text"/>	
File District: <input type="text" value="ESF Eugene Fire & EMS Department"/>	
Replaces per MOU: <input type="text"/>	
Replaces Hydrant ID: <input type="text"/>	
New per MOU: <input type="text"/>	
Responsible: <input type="text"/>	
Updated: CEFDKOS Ewing Steve 3/14/2016 11:57:44	

Classification:

- 1. Class AA - Blue - Rated capacity of 1500 GPM or greater
- 2. Class A - Green - Rated capacity of 1000 - 1499 GPM
- 3. Class B - Orange - Rated capacity of 500 - 999 GPM
- 4. Class C - Red - Rated capacity of less than 500 GPM
- 5. Class D - Black - Hydrants located in pressure zones
- 6. Hydrants sensitive to water hammering - White barrel and appropriate colored cap
- 7. Designated hydrants for Mobile water use - Completely colored hydrant with appropriate color

Data Management: ELOG

- Home Page:



EUGENE
SPRINGFIELD
FIRE

ELOG Home
Hydrant Home
Hydrant List
Hydrant Inspections
Hydrant Maintenance
Compare Inspections and Maintenance
Maintenance Needed

Export to Excel

Hydrant List

Find: Hydrant or Street

Active/Inactive: Public/Private: Assigned Station:

EFD Map: EWEB Map: Fire District:

	Hydrant ID	House No.	DW	Street	Type	Location Comment	Inactive	Station	EFD Map	EWEB Map	Fire District
Details	10	859		CLARK	ST		Y	0	0		EGF
Details	11	1000		CLARK	ST	@Cedar Int		2	310	18P	EGF
Details	14	1199		RAILROAD	BLVD	@Grand Int		2	310	18P	EGF
Details	20	1400	W	1st	AVE	1ST AV W (1400)		2	309	17P	EGF
Details	42	3340		ALDER	ST	@Hilyard Int		13	162	21I	EGF
Details	51	401	W	4th	AVE	@Washington Int		1	310	19P-3	EGF