American Water Works Association

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WATER RESEARCH FOUNDATION™

ADVANCING THE SCIENCE OF WATER®

Human Resource Challenges

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2016 JWWA General Assembly & Research Conference

November 10, 2016

Order of Presentation

- Introduction
- US Water Challenges
- Aging water workforce
- Why be Concerned?
- Initiatives to Mitigate the Problem
- Knowledge management
- Q&A

US Water Utility Challenges

- Aging infrastructure
- Climate change
- Meeting water demand
- Water quality
- Water affordability
- **Aging workforce**

Average Age of US Water Utility Worker

- Water utility workers → 44.7 years old
- Wastewater workers → 45.4 years old

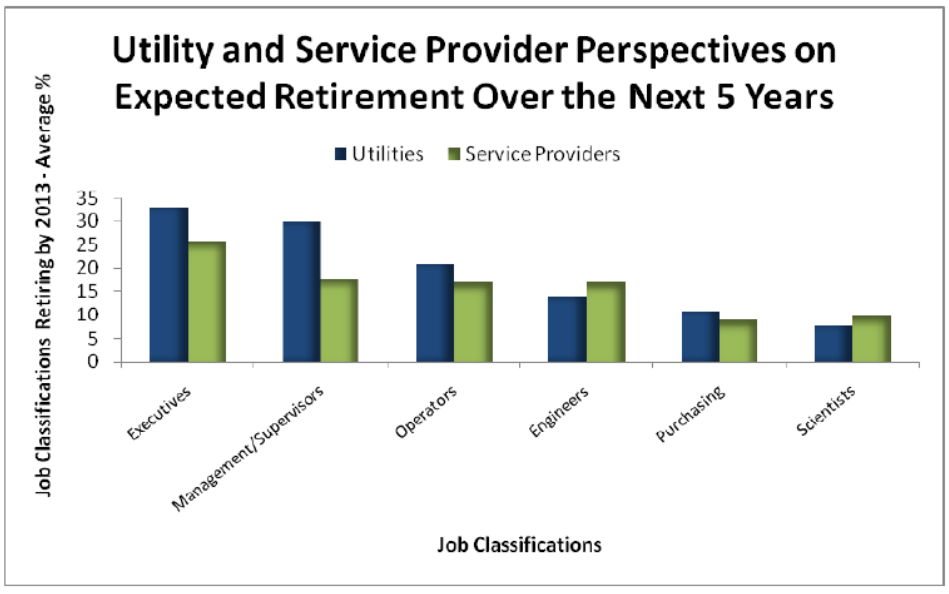
- Average retirement age for utility personnel is 56

Baby Boomers Exodus

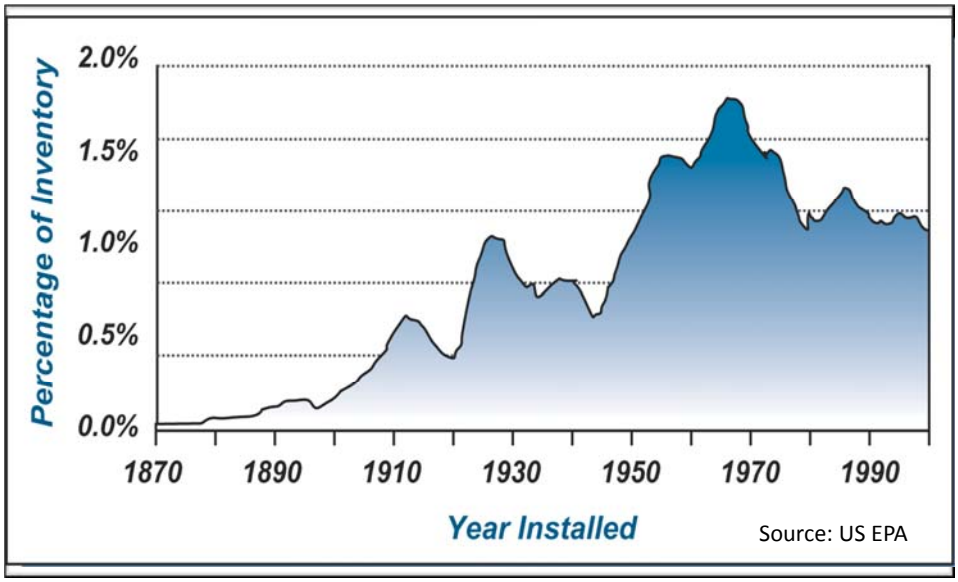
- Baby boomer retirement began about five years ago and is estimated to continue over the next 10 to 15 years
- Anticipated loss of current utility employees at between 30 to 50 percent within the next 10 years

Who is Retiring?

- Expected retirement over the next 5 years by job classification



Why Should We be Concerned?



Why the Gap?

- Aging baby boomers
- Civil and environmental engineering
  - Not sexy
  - Doesn't pay as much
  - Technology does not advance quickly
  - Need professional license
- Declining government funding

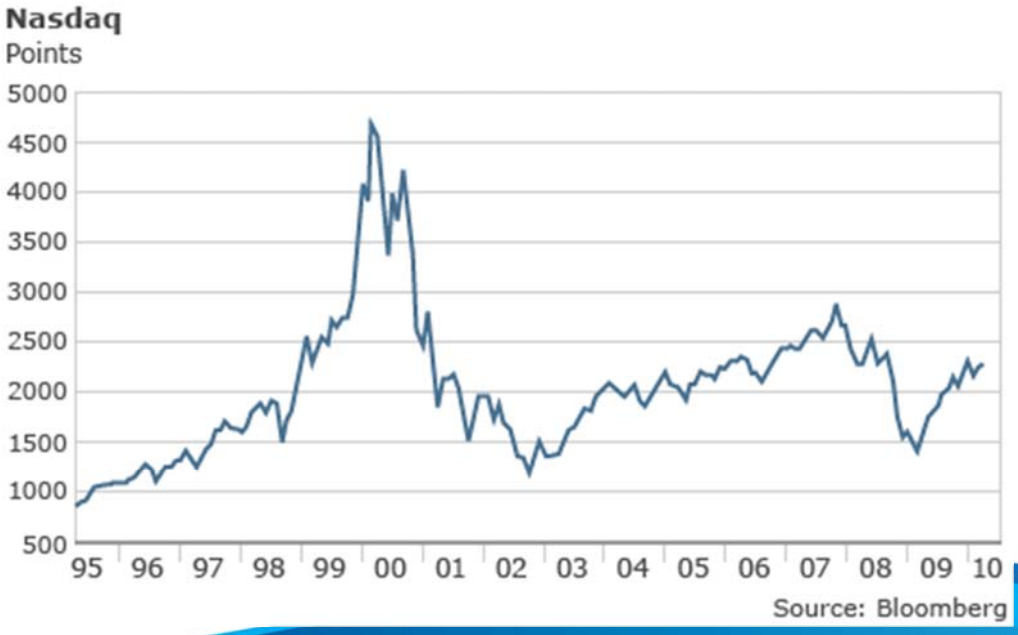
Civil Engineering is Losing Attraction

Sexy

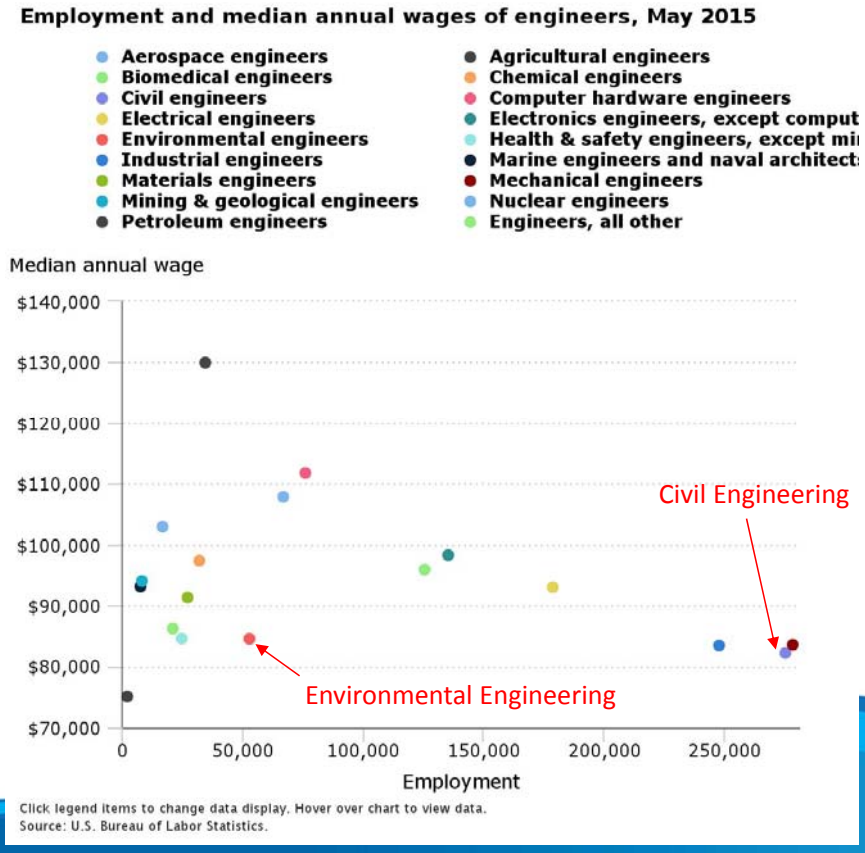
Maybe not so sexy

Lost Engineers to DOTCOM

- Growth trend of DOTCOM



Median Engineering Salary



Declining STEM Education in US

- STEM (Science, Technology, Engineering, & Math)
  - US faces a shortage of engineers and scientists
  - Number of students earning bachelors or masters degrees in STEM declined from 1 in 6 in 1960 to 1 in 10 in 2000
  - US has not effectively promoted and funded advanced education in technical skills and knowledge in STEM
  - US now faces a shortage of new workers with the right mix of technical and interpersonal skills to replace those exiting the workforce

What Needs to be Done

- Increasing STEM funding
- Increase civil engineering pay
- Educate about the importance of infrastructure / sustainability (industry importance and branding)
- Define water sector career pathway
- Use of new tool and technology
- Develop an organizational culture more suited to younger generation
- Communicate
- Training / employee development
- Capture existing knowledge

What Needs to be Done Immediately?

Knowledge Management

- Goal:
  - Right knowledge is systematically collected, stored, organized, and transferred to the appropriate employee in a timely and effective manner
- Objectives:
  - Identify key knowledge holders
  - Assess criticality of knowledge and knowledge holder
  - Provide a simple and convenient way for staff to document asset related knowledge in a structured and readily accessible knowledge database

Core Elements of Knowledge Management

1. **Assets** – what practices, procedures and policies (current and historic) relevant to a specific asset should the organization understand to lead towards achieving/sustaining the business mission?
2. **Business Processes** – what asset life cycle based business process knowledge should be managed that ties to achieving and sustaining the business mission?
3. **Documents** – which documents, formal and informal (notes, working drafts, personal files, worksheet, etc.), are important?
4. **History** – what knowledge of history at the enterprise, plant, system, network or major process level should be captured and managed?

Knowledge Holder Criticality

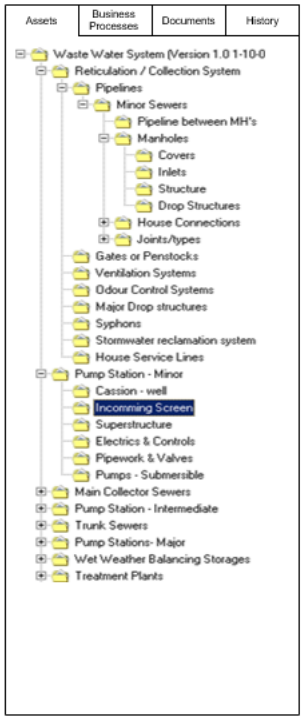
Key Knowledge Roster

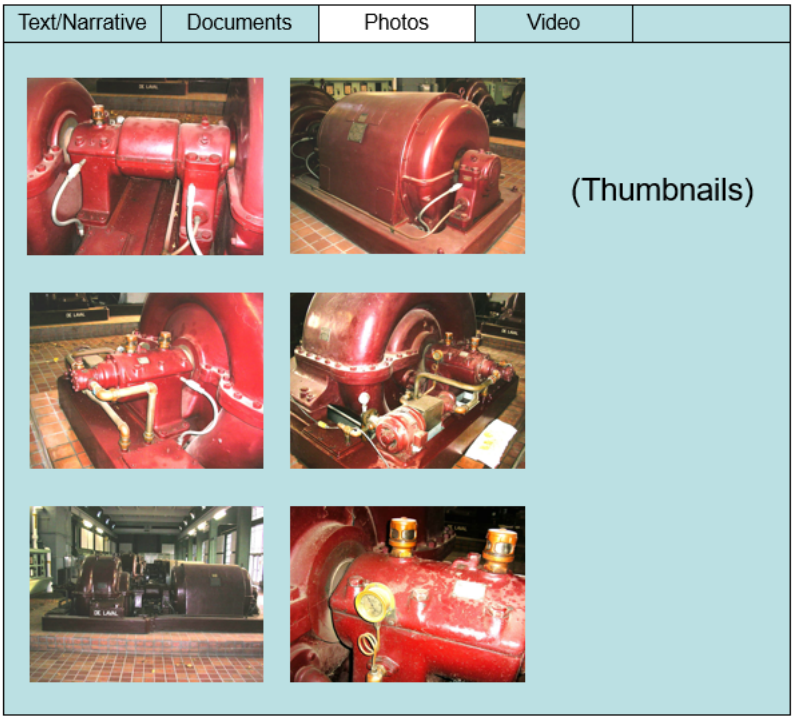
Organization Unit	Name	Position	Hire Date	Eligibility to Retire	Knowledge About				Interview Priority	Interview Time Required	Eligibility Score	Knowledge Score	Total Score
					Critical or at Risk Assets	Key Business Processes	Location of Key Documents	Organizational History					
Mgr/Supervisors	Werner, Randy	Public Works Supervisor - Water/Recycl	10/6/1971	N	H	H	H	H			4	12	48
Administration	Bequette, Kathleen S.	Senior Clerk	9/2/1997	N			H	H			4	6	24
Mgr/Supervisors	Dozier, Michael	Public Works Supervisor - Maint	8/2/1999	2	H	H	H	H			2	12	24
Operations	Truesdell, Jimmie L.	WR Supervising Operator	1/20/1986	2	H	M	H	H			2	10	20
Administration	Cuadra, Carla A.	Division Clerk	8/28/1997	2		H	H	M			2	7	14
Collections	Durflinger, Steven B.	WW Collections Systems Worker II	8/8/1994	2	H	M	M	H			2	8	16
Maintenance	Accornero, Mary	Senior Clerk	9/14/1999	2	M	H	H	M			2	8	16
Maintenance	Hall, Andrew T.	Instrument Tech	7/22/2002		H	H	H	H			1	12	12
Operations	Kepler, Kevin D.	WR Supervising Operator	5/19/1997		H	H	H	H			1	12	12
Maintenance	Kenney, Brian	Mechanic II	1/13/2003	2	H	M	M	M			2	6	12
Maintenance	Kumar, Rajesh	WR Coordinator - Instrumentation	8/14/2000		H	M	H	H			1	10	10

Capture Knowledge

Name	Knowledge Area	Knowledge (Business Processes, Documentation or Organization)	Where Info Held	Other Knowledgeable Colleagues	Recommendations
Werner, Randy					
	Assets	WRD Water Services Timeline			
	System operation	Most economical operation is taking water outside the Clearwell Patterson Treatment Plant and pumping up to tanks. Our tanks will feed water. *(Randy refers to map to discuss turnouts and feeds, CalWater and Zone 7 lines)* Both turnouts feed into airport zone. Doolan Water Tank finished 2008. Airway PS 2006. Numerous connections to Zone 7 lines. WRD has ten turnouts. **Emergency Plan** in binder. Limited access to Helen, Darren, Randy. Helen has hard copy. Health Dept. has copy for security reasons. After vulnerability accessment, did Emergency Action Plan. Used Pleasanton's as template. Unfinished operation plan, so off the radar with health dept. Do not have emergency operations plan. Major telemetry is at Vasco Rd. which goes up to Dalton Tank, then back up to Altamont tank. Telemetry between them. Most efficient is pumping up to those tanks and letting them gravity feed down. If pump station non-operable, Vasco Rd can pump into Zones 2 & 3. Operates on tank levels, not on pressure, so tanks stay full all the time. Break point	Limited system info in Scada (In progress)	Dave Lennier has maps of turnouts.	Configuration management for post earthqu
	Old part of the system	Original tracks in low part of Springtown 1963. *(Refers to map and build-out sequence)* All A/C lines in Springtown. One steel line. Joyce St. Cast Iron pipe cracked after 1995. All cast iron converted to plastic PVC 1987-88. System not that old. No major rehab investments or failures yet. Only Isabel needed to be relocated CalTrans freeway project. Springtown has "hot" alkaline soil that disagrees with copper. WRD replaced old copper service failures with plastic PVC. Greenville/Vasco assesment district backbone pipes			
	Trevarno PS	*First Pump Station. Old, but not unique. Supposed to rehab by 2015. May not make it that long. Security fencing recently installed to deter vandals. Cameras not yet installed. Station turned on for exercise occasionally, but No wear. Back-up station. Only PS with no emergency generator backup. Four Pumps - 600 GPM. Two 1200 pumps.1000 Gallon. Motors - Three 50 Horsepower and one 25. MCC Center for controlling four pumps. Zone 7 has a turnout infront of PS and have access to their electronics there. One or*		Jim, Dean	*Put Power Monitoring in Scada. Eg: Peak h pumping.*
	Key Business Processes				
	Water projections	Have to go out to 2030 - 20 years out. Now based on per capita - 20/20 law recently passed. Trying to find service area population (cumbersome). Can currently only use year 2000 census data and calculate forward (2010 census not completed), or dept. of finance data (must be well documented). Will overlay service area boundary over surface tracks to get service area population. WRD receives a checklist from Dept of Water Resources (DWR) of areas to address in Urban Water Management (UWM) plan report, then sends it to DWR for review. Randy projects consumption for 2030 in UWM based on how much each service connection uses on average multiplied by the number of services = X million gallons. Randy bases the five year water supply demands request for Zone 7 projected connections. Randy has a spreadsheet for this. He takes service connections on July 1st of each year, depending on fiscal or calendar year calculation, and uses 40 years worth of average use per service data, averaged in 10 year increments. Drought brings		Helen top director, and Michelle working with Randy and Jim to gather info and modify old docs for DWR.	
	REVENUE BUDGET	*Randy uses Lotus spreadsheets w/ customer numbers. He calculates monthly running average of water consumed on 3 tiers, and how much water on each tier sells for. He calculates all months by tier at year end and figures how much will sell in various tiers going forward. Unaccounted water from flushing and leaks (7-8%). Use same percentages for years ahead with tiers and service connections. Fairly accurate (usually within 5%) when level (unchanging) amount of water used. Be more realistic than optimistic. Uses trending data and consumption to get accurate number and ballpark number. Used to do all own rate case studies, now consultant does some updates. Used to be simpler: would calculate what Zone 7 would use, guessed how much to put toward reserves. REVENUE: City Engineering (Joel) now handles CIP's for WRD. CIP's have not yet included line replacement, just new tanks. Funding is based on Craig Lawson's (Utility Consultant) Report from 3 years ago. Randy puts together the budget for O&M. CIP budget is separate from O&M, and should be based on growth. City has policy on operating reserves. Large projects funded by connection fees tracked in Fund 251, then likely transfered to 259. Connection fees for recycled and potatble water have been blended together. Fund 259 is a fairly new Renewal and Replacement fund, but is possibly not being controlled. A replacement reserve used to be in 250, which is now 259. 250 still has an operating reserve. Concern that politicians will see reserve and want to re-allocate funds. Fund 239 is Sewer - w/ different sources, including West Valley. Zone 7 rate increases for the last three years have been 9%, 16.5% & 11% and could not be passed on. The*	*Randy can print out fund activity in Pentamation (Finance Plus). Dan's detailed fund balance policies are on drive and in hard copy.Randy has a budget book.*	*Michelle and Kathi familiar with Funds. Darren decides end of year fund transfers. Dan has fund policies.*	*Michelle using Municast forecasting via det excel spreadsheets. Wants to use historica for future projections. Michelle wants foreca model to plug numbers into for future. Wan projections to go a few years. Randy Weav suggests Probability Failure Projections/Calculations. Tie together rever projections and R&R needs to make case f increases/revenues.*
	Calculating Revenue - (Randy Style)	Two ways: First keep historical records of revenue for many years. Calculate how much water you will buy in a particular year (calculated by filling in blanks on page in Lotus - *Michelle copies this*) Figure how much water you estimate you will sell - easy if level. Bookends are historical amounts - knowing accurate meter count, and fixed charges (12 months of meter charges = $ amount), then put revenue projections to residential and commercial. Other bookend is service charges (usually guessed) b/c either end of December/ first of January gives you a balance on the two 6 month periods. Usually service numbers go up or stay the same, so having a number mid-year indicates what revenue will be for annual service charges. Randy calculates how many gallons of water per service and adjusts per history. Then three tiers. Numbers identical when no rate increases. Figure how much you will sell, split it between tiers for residential and commercial. Figure out split between residential and commercial (residential about 62%, commercial 38%), then figure how much sold on both tiers of commercial. Randy projects consumption by individual years. Can revise and publish mid-year budget. Finance	Historical data in Lotus spreadsheets. Tier consumption and other Reports in Pentamation and Community Plus. Eric in Finance provides service class data and		Electronic Dashboard with straighforward m can input cells or populate data via Commu Plus or Finance Plus (montly usage, conne Plug in variables or eventually have auto po from different sources.

Knowledge Management System





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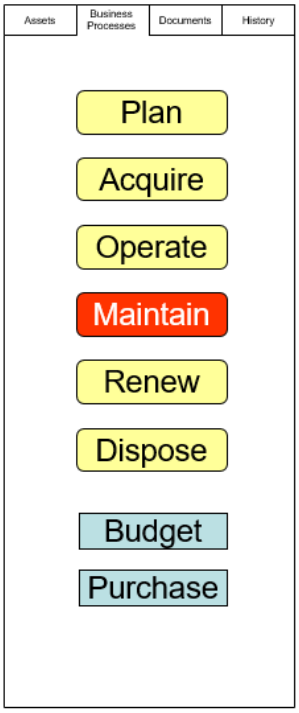

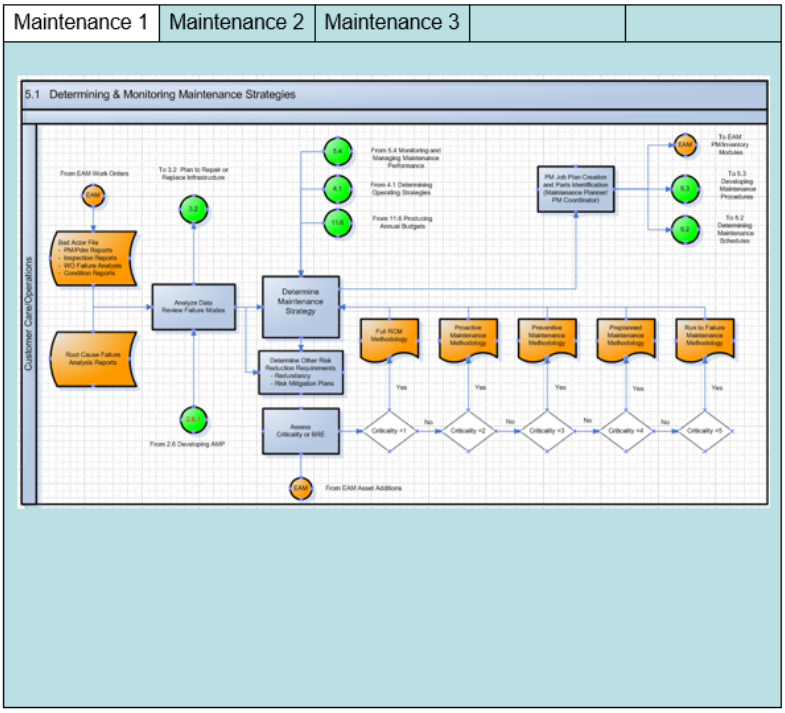

Questions?