



Asset Management Conveyance System

Presented to MWPAAC Subcommittees
February 4, 2020



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

Today's Presentation

- Conveyance system history
- Recent major asset replacements
- Equipment Service Life Factors
- Upcoming major asset replacements



Conveyance System History – Major Expansions

1900s

- Seattle combined system construction (North Trunk still in use)

1960s

- Metro regional system construction

1980s

- Renton Effluent Transfer pipeline

1990s

- RWSP adopted, CSI program started

2000s

- CSO Facilities



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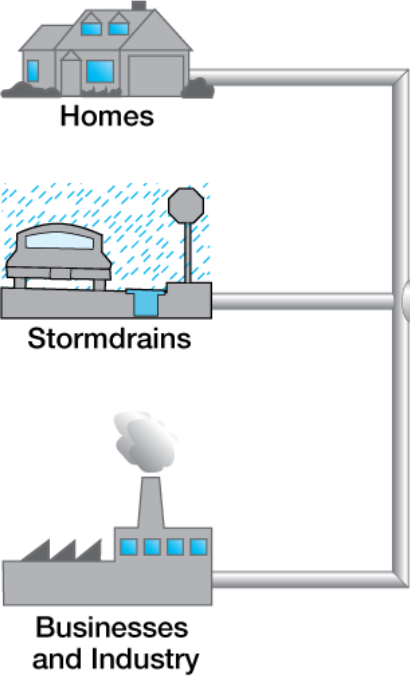
Conveyance System

- Approximately 400 miles of sewer pipelines
- 25 regulator stations
- 48 pump stations

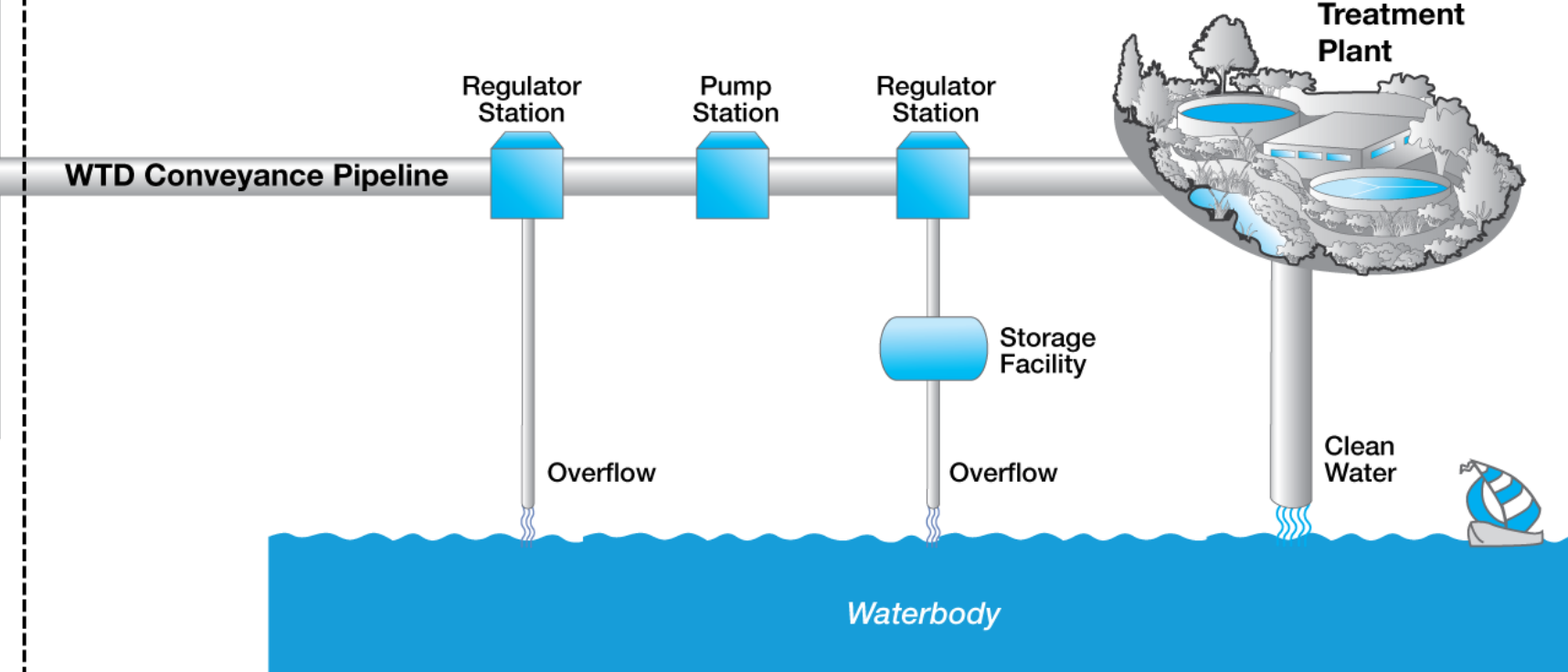


Conveyance System Facilities

Local Sewer System

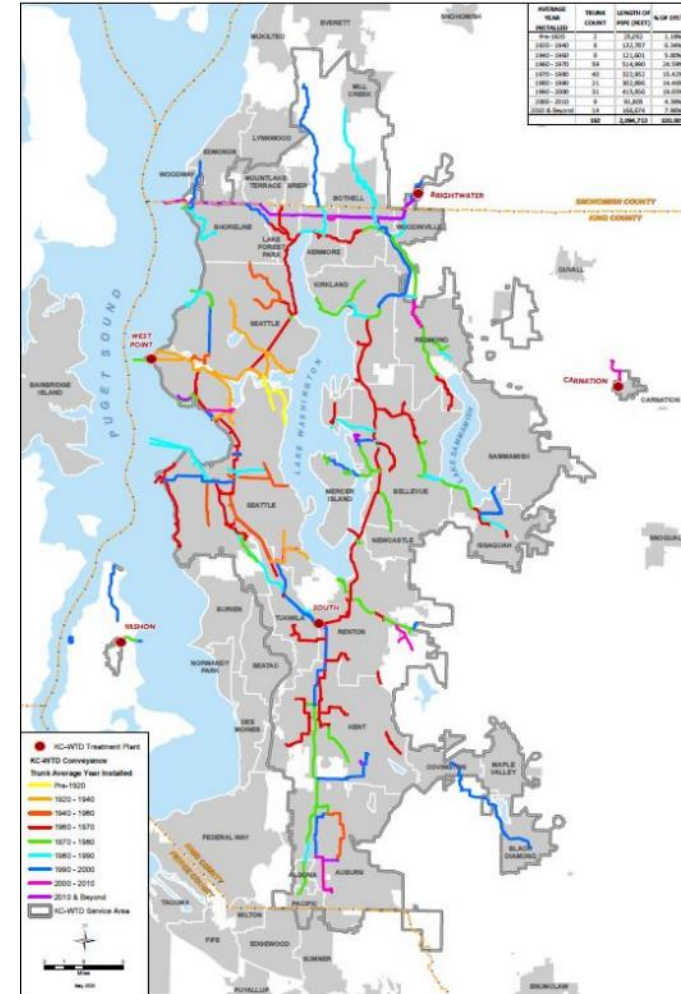


Regional Sewer System



Conveyance System – Piping Age

AVERAGE YEAR INSTALLED	TRUNK COUNT	LENGTH OF PIPE (FEET)	% OF SYSTEM
Pre-1920	2	25,052	1.19%
1920 - 1940	8	132,787	6.34%
1940 - 1960	8	121,601	5.80%
1960 - 1970	59	514,990	24.59%
1970 - 1980	40	322,952	15.42%
1980 - 1990	21	302,896	14.46%
1990 - 2000	31	415,856	19.85%
2000 - 2010	9	91,905	4.39%
2010 & Beyond	14	166,674	7.96%
	192	2,094,713	100.00%



Conveyance System History – Recent Major Asset Replacements/Refurbishments

Pump Station Replacements / Upgrades

- Juanita Bay PS (2009)
- Bellevue PS (2010)
- Sunset and Heathfield PS (Anticipated 2021)

New Pipelines / Replacements

- Fairwood Interceptor (2006)
- Bellevue Influent Trunk (2012)
- Kent Hill East and Stuck River Trunk (2014)
- Fremont Siphon (2017)
- North Creek Interceptor (2018)
- Auburn West Interceptor Parallel (2019)

Pipeline Rehabilitations

- Beach Drive Interceptor (2012)
- Eastgate Interceptor (2013, 2014, 2018)
- Eastside Interceptor Section 13 (2017)
- Eastside Interceptor Section 2 (2020)



Service Life Issues

- Pump Station Equipment Age
 - Robust maintenance program has allowed WTD to significantly extend the life of existing assets.
- Wear on Equipment from Grit and Rags
 - Binding and wear of pumps
 - Increase in use of “Flushables”
- Saltwater Corrosion and Intrusion
 - Corrosion on level control gates, actuators, and sewer structures
 - Intrusion and sea level rise (king tides) affects system capacity



Service Life Issues

- Fats, Oil, and Grease
 - Accumulation affects capacity
- High Process Flows
 - West Section is a Combined Sewer System
 - Rapidly changing conditions and high flows during storms take operating equipment to maximum capacity
- Obsolescence
 - Controls system, Variable Frequency Drives, Motor Control Centers go obsolete quickly
 - Equipment manufacturer stop supporting equipment like pumps
- Hydrogen Sulfide Corrosion



Hydrogen Sulfide Corrosion

- Hydrogen Sulfide corrosion eats away at concrete pipe wall and reinforcing steel
- Occurs at many places in conveyance system
- Areas of high corrosion have Odor Control / Chemical treatment systems
- New piping installations are designed to prevent corrosion
- Rehabilitation of existing sewers is difficult and costly



Upcoming Major Asset Replacements



- North Mercer Island and Enatai Interceptors Upgrade (Mercer Island, Bellevue)
- Pump station and conveyance system capacity upgrade
- New force mains, gravity pipe, and siphons as well as gravity pipe rehabilitation



Upcoming Major Asset Replacements

Variable Frequency Drive Replacement (Systemwide)

- Ongoing program
- Proactively replace variable frequency drives (VFDs) at the end of their life or that become obsolete
- 2021 Planned Replacements:
 - Duwamish PS (Seattle)
 - 63rd Ave PS (Seattle)
 - West Seattle PS (Seattle)
 - Wilburton PS (Bellevue)
 - South Mercer PS (Mercer Island)
 - Kenmore PS (Kenmore)



Upcoming Major Asset Replacements



Richmond Beach PS

- Replace Motor Control Center (MCC) and service switchboard
- Project objective is to improve power system reliability at the station
- Station has experienced overflows resulting from power outages
- Includes installation of a Load Bank Connection to improve testing of the standby generator



Upcoming Major Asset Replacements

Medina PS

- Replace Motor Control Center
- Replace Variable Frequency Drives
- Install a permanent standby generator



Upcoming Major Asset Replacements



Lakeland Hills Generator (Auburn)

- Install a standby generator and fuel tank
- The pump station does not currently have a standby power system
- Currently served by a mobile generator



Upcoming Major Asset Replacements



Small Generators Replacement (Seattle)

- Replacing small standby generators at various regulator stations.
- Standby generators are beyond their service life and are obsolete
- Project will ensure that adequate back-up power is available at these stations



Upcoming Major Asset Replacements

Alki Permanent Standby Generator (Seattle)

- Replace existing generator at Alki Wet Weather Treatment Station (WWTS)
- Backup power to both Alki WWTS and 63rd Avenue PS
- Pump station does not have a standby power system
 - Currently served by a mobile generator



Upcoming Pipeline Replacements

Coal Creek Trunk (Bellevue)

- Capacity expansion
- Realignment out of a creek bed



Upcoming Pipeline Replacements



Lake Hills Trunk and Northwest Lake Sammamish Interceptor Upgrade (Redmond and Unincorporated King County)

- Replace, refurbish, or parallel 4.5 miles of pipeline
- Current pipes are under capacity and in poor condition



Upcoming Pipeline Replacements / Rehabilitation



Figure 32: Ov



Interbay Force Main & Odor Control (Seattle)

- Dual force mains, discharge structure, and gravity pipe are corroded
- Replace the Interbay Pump Station dual force mains
- Rehabilitate the force main discharge structure (FMDS)
- Rehabilitate downstream 96" gravity pipe
- Construct an odor control facility at the FMDS



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Upcoming Pipeline Rehabilitation

Lake Hills Interceptor Rehabilitation Phase II (Bellevue)

- Rehabilitate 7,776 linear feet of reinforced concrete Lake Hills Interceptor pipe
- Pipeline is deteriorating due to hydrogen sulfide exposure



Future Asset Replacement / Refurbishments



Offsite Controls and Communications (Systemwide)

- Wet well level control equipment at offsite facilities are no longer being supported by manufacturer and controls designs are not up to current standards
- Communications equipment from offsite stations to main control need to be updated



Lakeland Hills PS (Auburn)

- Raw sewage pumps are old, making them subject to clogging and dry well flooding



Lake Ballinger PS (Shoreline)

- Pumps are maintenance-intensive



Hidden Lake PS (Shoreline)

- Recent pump inspections revealed a need for replacement rotors



Future Asset Replacement / Refurbishments



Murray PS (Seattle)

- Pumps are at end of life and prone to clogging due to rags and debris



Matthews Park PS Odor Control (Seattle)

- Existing odor control scrubber and odor control piping are showing signs of corrosion and deterioration



North Beach Pump Station (Seattle)

- Force main assessments show corrosion and additional capacity is needed
- Raw sewage pumps need replacing



Future Pipeline Rehabilitation / Replacements

- **Auburn**
 - M Street Trunk
- **Bellevue**
 - Lake Hills Boulevard Siphon
 - Bellevue Interceptor
 - ESI Section 8
 - ESI Section 10
 - ESI Section 13
- **Bothell**
 - East North Creek Force Main
- **Issaquah**
 - Issaquah Interceptor
- **Kenmore**
 - Kenmore Interceptor Landfall Structure
- **Kent**
 - Kent Cross Valley Interceptor
- **Kirkland**
 - Juanita Interceptor
 - ESI Section 14
- **Redmond**
 - Redmond Interceptor
- **Renton**
 - May Creek Interceptor
 - South Interceptor
 - ESI Section 2
- **Sammamish Plateau**
 - Sammamish Plateau Diversion, Phase 1
- **Seattle**
 - North Beach Outfall
 - EBI Section 4



Project Delivery Challenges

- 24/7 operations must be maintained
 - Construction constrained to seasons and times with low flows
- Lack of redundancy
 - Flow cannot be diverted within the system, must rely on above-ground temporary bypass systems
- Coordination between projects
 - Outages and flow control for one project may affect projects in other parts of the system
- Specialized construction
 - Pipeline rehabilitation methods have limited vendors and certified contractors



Next Steps

- Upcoming presentations on:
 - Further information for all plants on condition assessment, analysis, and approach



Questions?

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