Wastewater Collection System Management: Defining A Level-of-Service Based Approach

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CLARK REGIONAL WASTEWATER DISTRICT

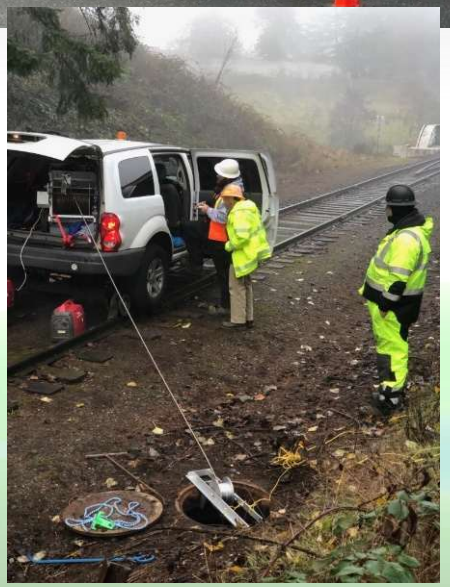
Agenda

- Clark Regional Wastewater District Introduction
- Level of Service – What Is It & Why Is It Important?
- Developing Initial Level of Service
- Review & Update Process
- New Level of Service –Recommendations
- Optimization Opportunities
- Staffing Model Update
- Final Outcomes

CLARK REGIONAL WASTEWATER DISTRICT INTRODUCTION

Clark Regional Wastewater District Introduction

- Title 57 Sewer District
- Established – 1958 (68 Years Ago!!!)
  - Business Community Identified a Need for Sewer Service in Hazel Dell – "Hazel Dell Sewer District"
- Grown & Adapted Our Services to Meet the Needs of Our Community
  - Acquired Services of Other Local Agencies
    - When Requested
  - Formed New Partnership Structures to Deliver Service
    - Discovery Clean Water Alliance
  - Delivered Strategic Capital Projects
    - Discovery Corridor Wastewater Transmission System
    - Salmon Creek Treatment Plant Phase 4/Phase 5 Expansions



Clark Regional Wastewater District Introduction

- 98 Employees
- $67M Annual Budget
- 56,850 ERUs
- Growth Oriented
  - 25% +/- of County Population
  - 50% +/- of County Growth Area
- Regional System
  - Collection System
    - 883 Miles of Pipe
    - 77 Pump Stations
    - 897 STEP Systems
  - Pump Stations & Interceptors
  - Treatment Plants

LEVEL OF SERVICE – WHAT IS IT AND WHY IS IT IMPORTANT?

Level of Service – What Is It & Why Is It Important?

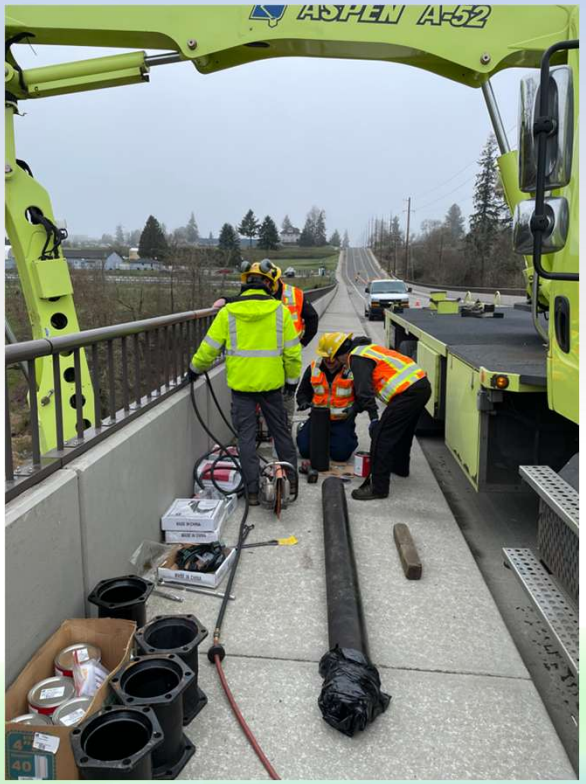
Google AI:

- Level of Service (LOS) is a rating system that measures the quality of a transportation facility from a traveler's perspective, which categorizes traffic flow and assigns quality levels based on performance measures like vehicle speed, density, and congestion
- LOS is typically measured on an A-F scale, with A representing the best operating conditions and F the worst

Level of Service – What Is It & Why Is It Important?

Why Develop a Collection System Level of Service? (2008-2010)

- District Board Questions About Staff and Equipment Needs Resulted in Challenging Budget Processes
- New General Manager Questions About Business Plan for Operations
- Interagency Cooperation:
  - City of Vancouver – desired a collaborative/common approach for larger Vancouver Urban Growth Area
  - City of Ridgefield – how would their system be managed if a transition to District operations occurred?



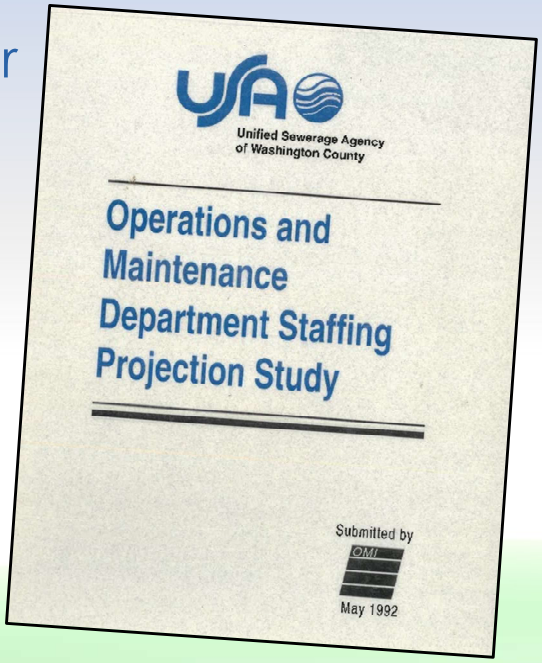
To Answer These Questions – Needed to Define Collection System Business Model, Based on Defined Level of Service

DEVELOPING INITIAL LEVEL OF SERVICE

Developing Initial Level of Service

How Do You Start to Develop a Collection System Level of Service? (2011-2012)

- Similar Work Performed Previously by General Manager Before Coming to District (Consultant)
- Researched Available National/Regional Standards (e.g., EPA Capacity, Management, Operations, and Maintenance (CMOM), etc.) Limited Specific Best Management Practices
- Visited Relevant Regional Example Collection Systems in Urban Areas of OR & WA (Medium to Large)
- Convened Stakeholder Group & Held Workshops with District & City of Vancouver Staff



Process Resulted in Initial Level of Service, Adopted in 2013

- **Initial Staffing Model Developed in 2013 to Support Level of Service**

Developing Initial Level of Service

Initial Levels of Service – Examples

- CCTV Line Cleaning Program
  - All pipes installed after 1975 and in good condition from CCTV records will be cleaned on 8-year cycle
- CCTV Line Inspection Program
  - All gravity lines will be CCTV'd on 8-year cycle
- First Staffing Model Also Developed

Lessons Learned from Initial Development

- Be Careful What You Ask For!
  - 800 miles of pipe with 8-year cleaning cycle
    - Clean every pipe at least once every 8 years
    - Clean 100 miles of pipe per year

REVIEW & UPDATE PROCESS

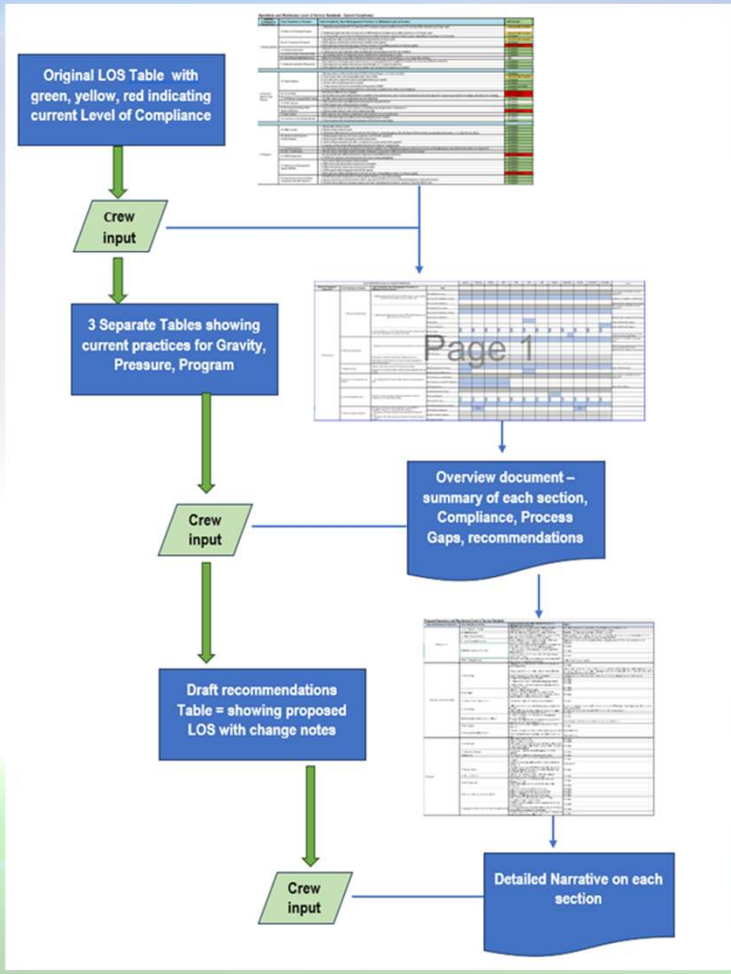
Compliance Review and Update Initiated

What Spurred Review (2021-2024)?

- 8 years Had Passed = Theoretically One Complete Cycle of Gravity Inspections and Cleanings
- Data Gaps Identified
- "Why Am I Cleaning A New Clean Line When I Know That One Over There Needs to be Cleaned?"
- Desire to Check In on Performance and Need for Any Changes

Compliance Review Process

- 2023 Workplan – Schedule of Activities
- Review Existing Level of Service
  - How are we doing?
- Define & Document Actual Work Activities
  - Many meetings, data gathering, and communicating with management
- Recommend New Level of Service Standards
  - Future optimization opportunities
  - Board of Commissioners' endorsement



Compliance Review Summary

Gravity Systems

- Cleaning
  - Approximately 80% of LOS met – data challenges
- Inspections
  - Full inspection completed in December 2023 – 10 years vs. 8 years
- Lateral Ownership
  - Transfer of lateral ownership to property owners prior to assumption
    - *District owns laterals while City of Vancouver does not*

Compliance Review Summary

Pressure Systems

- Not All Pump Stations Have Uninstalled Back-Up Pump Available
- Not All Stations are Set Up for Pigging; All Pump Stations are Visited at Least Once Monthly vs. Twice Weekly
- STEP Systems have been Inspected on a 5-Year Cycle Rather than Annually
- Siphons Under Salmon Creek Not Cleaned Annually

Program (Support Activities)

- Locations of Some Force Mains are Not Fully Known

Compliance Review Process

Overall Level of Service Compliance Summary

Category	Total Elements	Compliant	Partially Compliant	Not Compliant
Gravity Systems	13	7	4	2
		54%	31%	15%
Pressure Systems	16	9	3	4
		56%	19%	25%
Program	19	16	1	2
		84%	5%	11%
Total	**48**	**32**	**8**	**8**
		67%	**17%**	**17%**

New Level of Service – Recommendations

New Level of Service – Recommendations

Gravity Systems

- Shift Primary Focus to CCTV Inspections
  - Pipe condition drives operations/maintenance activities
  - Shift inspections to basin-by-basin approach to increase efficiency
  - Increase inspection cycle to 6 years (from 8 years)
- Cleaning Performed Based on Unsatisfactory Inspection
  - Gravity pipes with an O&M score of 3-5 indicate higher risk and represent approximately 5% of the system
- Known Problem Areas Inspected/Cleaned on More Frequent Basis

Net Result: Incrementally More CCTV Inspections; Cleaning Only Where Needed

New Level of Service – Recommendations

Pressure Systems

- Pump Stations
  - Inspections updated to current practice of virtual via SCADA, rather than "twice weekly" physical visits
  - Visits weekly to high priority stations, others monthly (aka "Pump Run")
- STEP System Inspections to Occur every 3 Years vs. Annually
  - Research indicates a range of inspection cycles by other agencies, with indications that annual inspection may be too frequent
- Reflect current practices.

Net Result: Less Frequent STEP System Inspections per LOS, but More Frequent Than in Practice

New Level of Service – Recommendations

Program

- Simplified Utility Locates to Align with RCW
- Reference New Health & Safety Coordinator
- Add "System Repairs" Category
  - Repair work was not clearly identified in prior LOS for any District assets
  - Category clearly indicates that the District will:
    - Evaluate system deficiencies
    - Determine the appropriate corrective action
    - Self-perform repair work when deemed feasible
- Reflect Current Practices

Net Result: Clarify and Validate Repair Activities

Optimization Opportunities

Optimization Opportunities – Future Efforts

Gravity

- Develop Procedure to Ensure Pipes with Roots, Grease and Debris are Re-Inspected Periodically to Check for Recurring Issues *DONE*
- Finalize Condition Scoring Criteria for Non-Structural Defects *DONE*

Pressure

- Add QA/QC STEP System GIS Features – Clearly Indicate Locations, etc. *IN PROGRESS*
- Schedule STEP Inspections Geographically to Improve Efficiency *DONE*

Program

- Prioritize and Program/Plan System Repairs Annually *DONE*
- Update Maintenance Management System to Align with the LOS *IN PROGRESS*

Staffing Model Update

Staffing Model Update - Process

- Reviewed Prior Model Structure with General Manager
- Realigned Model Activities with New LOS
  - Included workload elements that support the LOS
- Gathered Available Data to Inform Activity Productivity and Workload
- Multiple Meetings with Maintenance Staff to Confirm Activities, Productivity Rates, and Workload
- Met with General Manager for Endorsement of Process and Results
- Presented Results to Board of Commissioners for Final Endorsement

Staffing Model Update – Data & Basis

- Various Sources of Reliable Data were Used to Inform Model Parameters (Workload, Production Rates)
  - CMMS & GIS data
  - Work order history
  - Timesheets
  - Historical production records, where applicable
- Data was Reviewed and Vetted with Staff
  - Use of longer-term average production rates
  - Consideration of anomalies
  - Reasonable assumptions on data that does not currently exist

Staffing Model Update – Doing the Math

Inputs (per LOS activity)

- WHAT: Workload – what are we maintaining?
  - **How many miles of pipe to inspect?**
- WHEN: Level of Service frequency – how often do we do the activity?
  - **How often is the pipe inspected?**
- HOW: Productivity factor – how long does it take?
  - **How many feet/hour can be inspected (on average)?**
- WHO: How many people are needed to complete the activity?
  - **How many people on CCTV truck crew (on average)?**

Considerations

- Staff availability – recognize impact of holidays/time off (time not working)
  - **District estimates staff availability is 77% of 2,080 annual work hours**
- Factors such as productivity rates, crew size, staff availability can impact results significantly

Activities	Crew Size	Level of Service	Core Function Productivity Factor	Workload	Resource Requirement (annual hours)	Resource Requirement (FTEs)	Department Availability Factor	Staff Requirement (FTEs)
Gravity System								
CCTV Inspection Program								
1A(i) Inspection by Basin - 6-year cycle	2	Inspection cycle (years) 6.0	Hourly production (feet) 175	Length of pipe (miles) 445	4,475	2.15	77%	2.79

Staffing Model Results - Snapshot

CCTV Inspection		Shift to 6-yr cycle – CCTV Drives Program
Line Cleaning		Shift to cleaning based on inspection
Pump Stations/ARVs		More time spent on PS maintenance & inventory increase
STEP Systems		Shift to 3-year inspection cycle (from 5-year)*
Utility Locates		Updated data indicates less time spent on locates
Customer Service		MS customer service time not included in 2019 model
System Repairs		No time allocated to system repairs in 2019 model
Support Tasks		Shop Upkeep, Fabrication, Inventory, Engineering Support, and Systems – some elements not in 2019 model

* *Original LOS Indicated Annual STEP Inspections. However, Original Staffing Model Used a 5-Year Cycle, which Resulted in a Reduced Workload*

Final Outcomes

Final Outcomes

Collection System Maintenance	Current District Services		Current Staffing Model	
Core Functions	**Staff Current (FTEs)**	**Staff Current (%)**	**Staff Requirement (FTEs)**	**Staff Requirement (percentage)**
1 CCTV Inspection			4.25	17.0%
2 Manhole Inspection			0.44	1.8%
3 Line Cleaning			0.22	0.9%
4 Lateral Maintenance			0.69	2.7%
5 I&I Compliance			0.20	0.8%
6 Pump Stations			5.30	21.2%
7 Force Mains			0.07	0.3%
8 Air Release/Vacuum Relief Valves			0.76	3.0%
9 STEP Systems			1.26	5.0%
10 MOV Systems/Siphons			0.09	0.4%
11 Odor Control			0.34	1.4%
12 Utility Locates			1.46	5.8%
13 Customer Service (MS Only)			0.27	1.1%
14 System Repairs			1.28	5.1%
Subtotal	**15.00**	**65.2%**	**16.64**	**66.5%**
Additional Maintenance Tasks				
15 Fleet/Equipment Maintenance			0.40	1.6%
16 Shop Maintenance/Facilities Support			0.26	1.0%
17 Fabrication			0.13	0.5%
18 Inventory			0.32	1.3%
19 Construction/Engineering Support			0.23	0.9%
20 Public Outreach			0.03	0.1%
Subtotal	**1.00**	**4.3%**	**1.38**	**5.5%**
Systems and Support				
15 GIS		0.0%	1.50	6.0%
16 MMS		0.0%	0.30	1.2%
17 CUES/G-Net		0.0%	0.20	0.8%
18 SCADA/PLC Programming/Hardware		0.0%	1.00	4.0%
19 Admin		0.0%	1.00	4.0%
Total - Systems and Support	**4.00**	**17.4%**	**4.00**	**16.0%**
Management and Supervision				
Manager	1.00	4.0%	1.00	4.0%
Supervisor	2.00	8.0%	2.00	8.0%
Total - Department Management and Supervision	**3.00**	**13.0%**	**3.00**	**12.0%**
Total Staffing Requirements				
Total - Staff Requirements for All Functions	**23.00**	**100.0%**	**25.02**	**100.0%**

Final Outcomes

- Data Management
  - Implementation of asset/data collection and tracking to monitor progress
    - Update previous assumed production rates based on actual data
    - Update staffing model regularly to inform resource needs as system continues to grow
- Tool Development (Via Mobile Devices)
  - Improved work order and inspection forms to gather data
  - Improved access to existing data

Final Outcomes

- Buy-in from District Maintenance and Operations Crews
  - Ownership of implementable Level of Service standard by which the District operates and maintains its collection system
- District Board of Commissioners' Endorsement
  - New Level of Service implemented in 2024
  - Budget approval for 2 new FTE
- Review/Buy-In From Partner Agencies
- Development of 2024 Workplan Outlining Schedule of Activities, Including Expected Production
- Adjusted 2025 Workplan per Lessons Learned in 2024
  - Improved data
  - Timing of work activities based on reality
- Commitment and Flexibility Towards Continuous Improvement
- New Service Plan Adopted September 23, 2025

CLARK REGIONAL WASTEWATER DISTRICT

Final Outcomes – LOS Workplan (2025)

2025 OPERATIONS LEVEL OF SERVICE WORKPLAN				January				February				March				April				May				June				July				August				September				October				November				December				Notes
				W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	
General Category or Topic	**Core Function or Service**	**Joint Standards, Best Management Practices or Minimum Level of Service**	**Task**																																															
1. Gravity Systems	A. CCTV Inspection Program	i. All gravity lines will be closed-circuit television inspected on a minimum 6-year cycle following a basin-by-basin approach.	CCTV Inspection by Basin 6-Year Cycle	51,719' 51,719'/33,245'				37,755' 89,474'/66,490'				48,590' 138,064'/99,735'				46,107' 184,171'/132,980'				29,956' 214,127'/166,225'				15,303' 229,430'/199,470'				42,501' 271,931'/232,715'				33,245' '/265,960'				33,245' '/299,205'				33,245' '/332,450'				33,245' '/365,695'				33,245' '/398,940'				2,393,634' / 72 months = 33,245' per month
		ii. Gravity lines cleaned as a result of issues found during CCTV inspection will be re-inspected after cleaning (see 1C(i)).	Follows Cleaning Program (see 1C(i))																																														
		iii. Gravity lines with a history of operational issues (debris or grease buildup, root intrusion) will be re-inspected on a more frequent cycle not to exceed 3 years.	CCTV Inspection - O&M Issues	4				1				2				1				0				0				0				11				1				0				0				1				Hotspots due for re-TV
		iv. Interceptors, trunk lines 24 inches or greater in diameter, and limited-access lines will be inspected on a 3-year cycle.	CCTV Inspection - Interceptors/Limited Access							Tenny						Overlook												Lower SCI								Trunks																Need PMs for 24-in trunks (20th Ave, 99th St and randoms)
		v. District will perform gravity line inspections using the NASSCO PACP standard.																																															
	B. Manhole Inspection	i. Manholes will be inspected with CCTV program cycle.	Manhole Inspections 6-Year Cycle																																														Follows CCTV Inspections
		ii. Limited access area manholes will be visually inspected annually for line flow and condition	Manhole Inspection Limited Access																																													January - visit each manhole but don't pull lids June - manhole inspection
	C. Cleaning Program	i. Gravity lines with a PACP operational score of 3-5 will be maintained using an appropriate method to address issues (high-velocity cleaning, root removal, root treatment).	Known Issues	229				221				209				202				205				213				166				214																		
			Issues Addressed	13				18				35				20				20				53				17																						
			Root Foaming																																															Approx 22,000 feet/74 segments (needs updated w/ 2025 #s inApril)
			HVC Root Foamed Lines																																														Approx 22,000 feet/74 segments (needs updated w/ 2025 #s inApril)
		ii. Known problem areas at risk for failure (hot spots) will be cleaned on separate rotation cycles, depending on severity (3, 6 or 12 month).	HVC Hot Spots	19				31				48				22				0				15				18				41				33				22				14				22				
			HVC Downtown Ridgefield (Trunk on Rail Road)																																														
	D. Lateral Maintenance/Ownership	i. District will inspect laterals as needed from issues identified during mainline inspection or from customer inquiry.	Inspections Needed	17				20				21				11				9				9				8				8																		
			Inspections Completed	6				12				11				15				15				8				17																						
		ii. District will address issues found within the District-owned portion of the lateral posing a risk of service interruption.	Lateral Maintenance (Root Cutting/Foaming, HVC)	3				2				6				6				6				6				4																						
		iii. Laterals at risk for failure (hot spots) will be inspected and cleaned annually.	Re-inspect Laterals with Previous Issues	3				4				2				4				5				7				5				3				6				4				2				2				
			Inspect/HVC Lateral Hotspots																													31																		
		iv. District will work cooperatively with other agencies to transition ownership of laterals to property owners in case of system ownership transfer (see also 3A(iii), 4F(i) and 5H(v)).																																															
	E. Compliance	i. District will manage system performance to exceed published Ecology/EPA standards for excessive infiltration and inflow.	EPA Reporting - Engineering					SCTP																																RTP											
		ii. District will conduct spot checks for excessive infiltration and inflow and/or more involved investigations as needed.	Spot Checks/Investigation as Needed																																														

- Represents $6M Plan for Deployment of Resources
- Empowers Supervisors and Staff to Own Their Programs
- Organized Effort to Monitor Progress and Continuously Refine Processes

Keys to Success

- Listening and utilizing feedback from staff involved in implementing the system was critical – cultivate a culture of active and honest participation:
  - ✓ Reality based information/data
  - ✓ Adjustments that make sense and are implementable
  - ✓ Buy-in on recommendations
- Look at other agencies – what are they doing?
- Data availability, mining of data, and research into industry standards
- Regular check-ins with Management and Approving Authority – build trust, confidence, and support throughout the process
- Keep the end goal in mind

QUESTIONS?

Thank you for your time & attention!

Download copy of the presentation & helpful handouts at
www.crwwd.com/presentations/

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