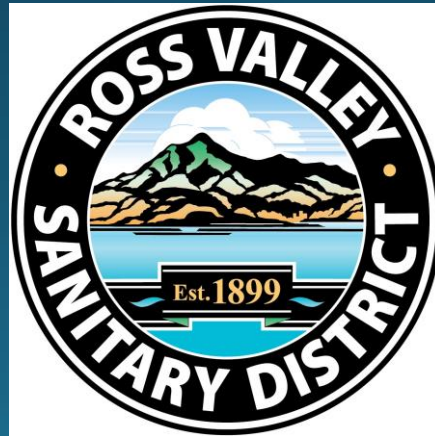


Pipe Clean Risk Model Development Asset Maintenance Scheduling Program



Ross Valley Sanitary District

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What is the Goal?

- Apply an O&M risk score to every pipe in our service area.
- Apply a cleaning frequency to every pipe using Asset Management methodology
- Narrow hundreds of variables into a basic model that District agrees upon and follows.
- Provide the highest level of service using resources effectively and efficiently.
- Continually update the Cleaning Model
- Prevent Overflows!

A 5x5 risk matrix tilted at an angle, showing risk levels from Low to Extreme. The matrix is color-coded: Low (yellow), Medium (orange), High (red), and Extreme (purple).

Medium	High	High	Extreme	Extreme
Medium	Medium	High	High	High
Low	Medium	Medium	High	High
Low	Low	Medium	Medium	Medium
Low	Low	Low	Medium	Medium

Topics for Today

- A Brief History
- What RVSD wants from the Pipe Clean Model
- Inventory at RVSD
- What's Going into the Model
- Lessons Learned
- Present Day Model
- Future Outlook



Past, Present and Future

- Past

- Clean all Pipes in a Circular Fashion in the District.
- No Rhyme nor Reason on what to Clean.
- If it had an Overflow, add to 6 Month Cleaning.
- Zero Asset Management

- Present

- Asset Management in Place with InfoNet
- New Risk Model Software with InfoMaster
- Final Stages of creating a working Risk Model in InfoMaster
- All Pipes have a Cleaning Frequency Based on Agreed Upon Criteria

- Future

- Constantly Update the Model as new Data is Retrieved and Updated.
 - MACP
 - Lateral Information
 - Scenario Creation
- Reduce Cleaning Frequencies for 30% of Pipe



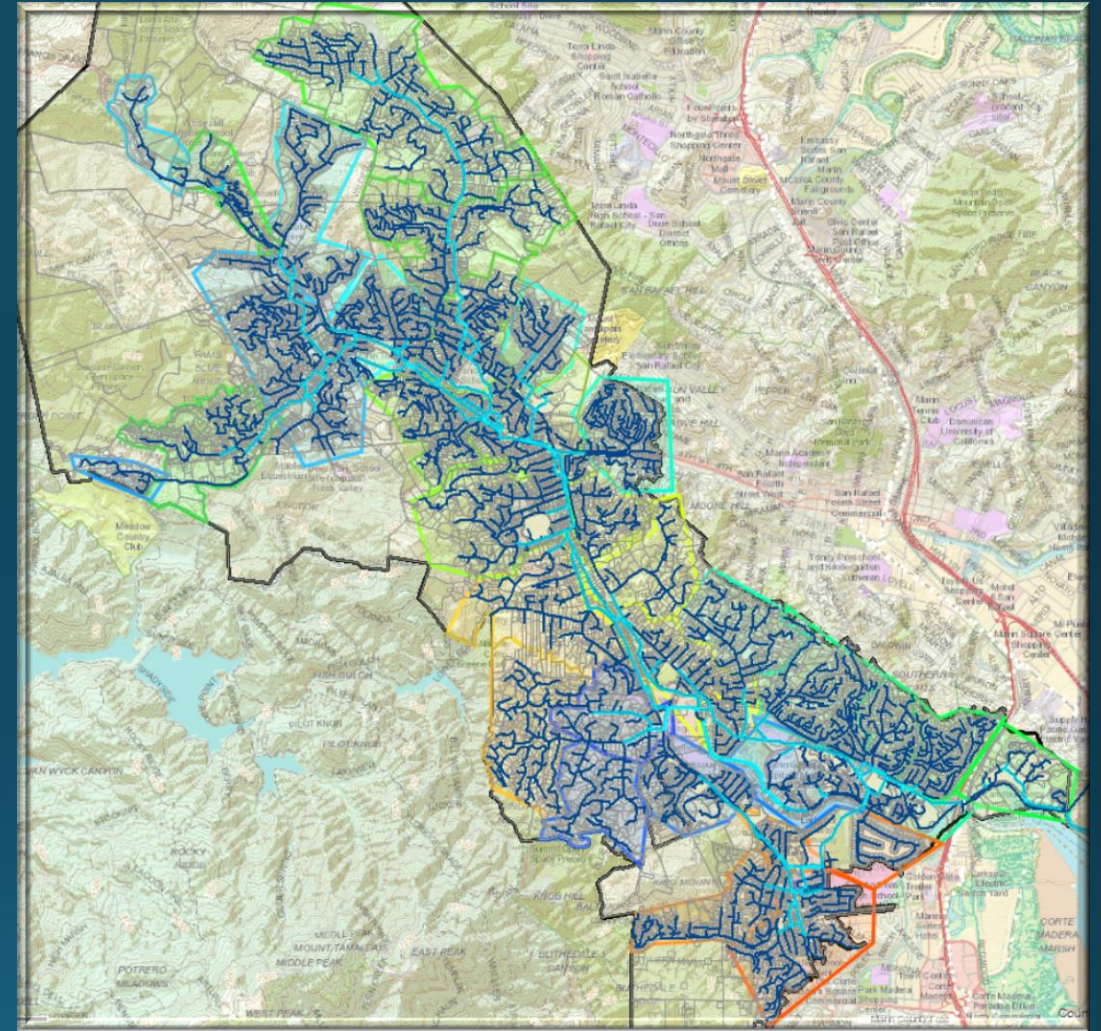
Risk Model History

- 2013: Infrastructure Asset Management Plan
- 2014: The SMARTtool was developed during a series of meetings with VWHA.
- 2015: Pipe Clean Matrix data was used after 2 cleaning cycles to determine frequency.
- 2016: InfoMaster was purchased and implemented to create a Pipe Clean Risk Model (s).
- 2016-2018: QA/QC of both Models



The Drill Down

- 194 mi Gravity Sewer
- Over 20,000 EDU's
- 200 mi Private Laterals
- 73% 6 inch Pipe or smaller
- 40% of Pipe on Easements
- 5,200+ Manholes or Rod Holes
- Thousands of Alignment Changes
- Access is hard for more than 50% of RVSD nodes



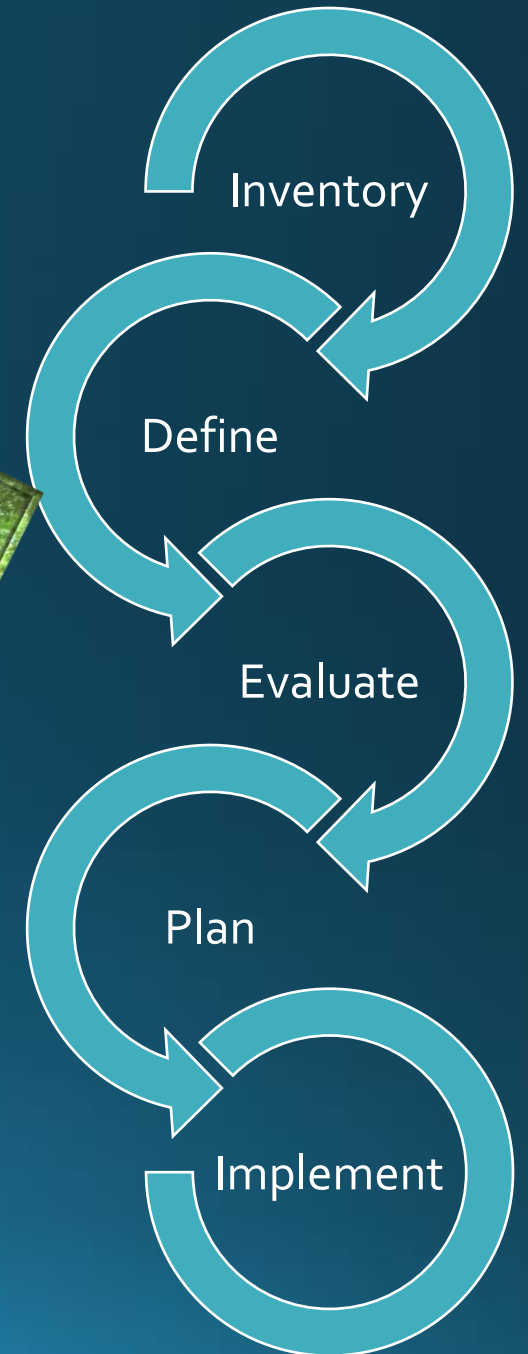
Keep on Drilling!

- CCTV Defects
- Grease
- Roots
- Sags in the Line
- No access (Blind Tees)
- Type of Road
- Traffic Control
- Node Location
- The List Goes On and On!



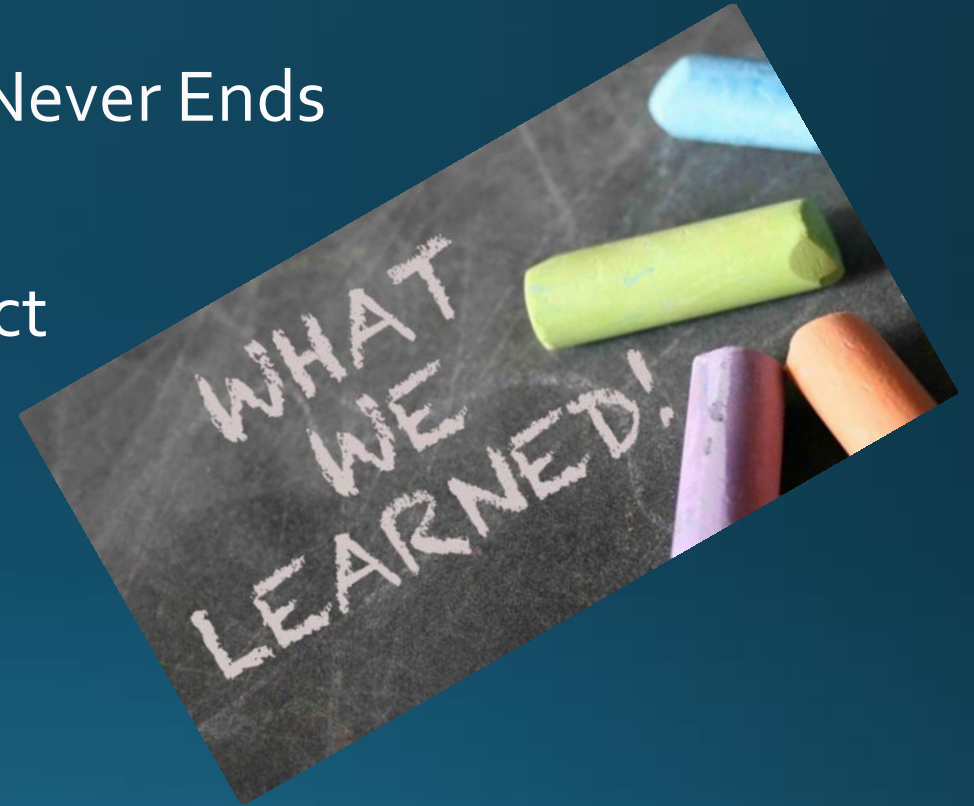
The Key Elements to Create the Pipe Clean Model

- Staff
 - Field Staff
 - Engineering
 - Analysts
 - Consultants
- Equipment
 - Cleaning Trucks
 - Nozzle Selection
- Experience
 - Tacit Knowledge
 - Blockage Incident Cards Pre CMMS



Risk Model Development and Lessons Learned

- Developing a Risk Model is a Journey that Never Ends
- Always have a Plan (IAMP)
- Admit Faults and Continually Course Correct
- Question Everything
- Develop in Stages
- The Learning Curve is High
- Get Help!
- Document Hits and Misses throughout Development



Ross Valley Sanitary District
Example Cleaning Results Matrix

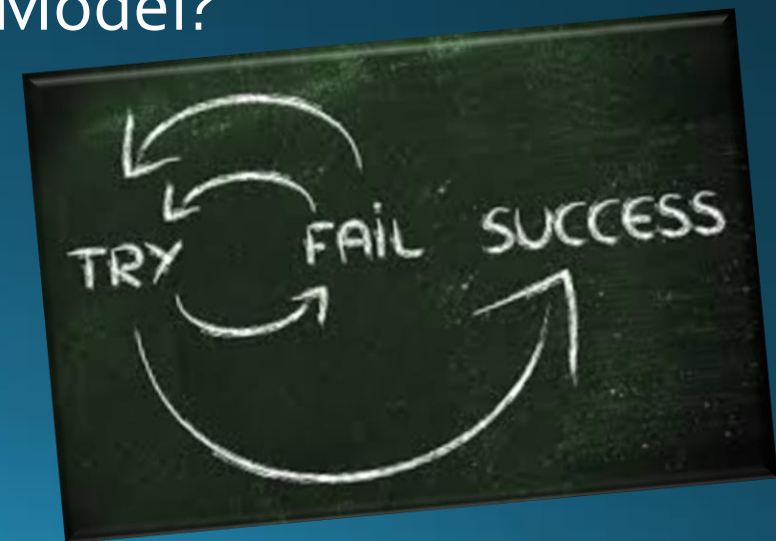
	Clear	Light	Moderate	Heavy
Debris	No observable debris	Minor amount of debris (1 pass)	Moderate debris (2-3 passes)	Significant debris (>4 passes, concern for future blockage)
Grease	No observable grease	Minor amount of grease. 15 minutes or less to clean.	Small "chunks" and no "logs". 15 minutes or less to clean.	Big "chunks" or "logs". More than 4 passes to clean. Operator concern for blockage.
Roots	No observable roots	Minor amounts of roots (1 pass)	Thin, stringy roots. No "clumps". (2-3 passes)	Thick roots. Large "clumps". More than 4 passes. Operator concern for future blockage.
Debris (pipe fragments, soils, rock, etc.)	No observable materials	Minor amounts	Moderate amounts not causing blockage.	Significant amounts. Operator concern for future blockage.
Action	Decrease to next lower frequency after 2 consecutive results (e.g., 6 months to 12 months)		Increase current maintenance frequency to next higher frequency (e.g., 6 months to 3 months)	

FlowChart6 , Page 1

The flowchart, titled 'FlowChart6 , Page 1', outlines the logic for determining inspection frequency. It begins at a 'Start' node and branches into two main paths. The left path starts with a decision on '[GravityMain.p pipe material] IN (PVC, PE)'. If 'Yes', it leads to '[LOF7 - SEW_LOF7 (user_text_8)] = (5)'. If 'No', it leads to '[GravityMain.height] <= (8)'. The right path starts with '[GravityMain.height] >= (10) & [GravityMain.height] <= (16)'. Both paths involve multiple decision points based on user input (LOF, SEW_LOF, SSO_cause, Def_Count, Def_Code, user_text_8) and lead to various schedule outcomes: '2 YEARS SCHEDULE', '1 YEAR SCHEDULE', '5 YEARS SCHEDULE', 'WATCH PIPE NO ACTION', 'INCREASE FREQUENCY BY 1 STEP', and 'REDUCE FREQUENCY BY 1 STEP'. The flowchart also includes several oval-shaped notes providing context or additional conditions, such as 'Pipe in standard/12 months', 'Moderate/Heavy clean result', 'Debris related SSO in past 2yrs', and 'Hole/Void Visible Struc. Defects'.

Take Away from Murgreen Environmental

- Not enough CCTV Data used in Model with Lack of Roots
- Give Better Information to Consultant
- Learned a Great Deal from InfoMaster on Possibilities
- The Lateral Question throws of the Present Flow Chart
- Own your own Model and Software
- At what point is there TOO Much Information in the Model?



What We Want in the Model

- Pipe Size
- Pipe Material
- Pipe Slope
- Maintenance History
- Grease Level
- Root Level
- Debris Level
- CCTV Data
- Lateral Information
- Private SSO's
- Public SSO's
- Slide Prone Area
- Upstream EDU Count
- Proximity to High Priority Sites (Schools, Hospital, etc.)
- Proximity to Creek
- Hydraulic Capacity



The Future Pipe Clean Model Goals

- Reduce Cleaning Frequencies on the 751 Pipes that are HFC's
- Reduce Cleaning Frequencies for the 32 Miles of 8" Pipe in a Justifiable Manner
- Apply a O&M Risk Score to Every Pipe Based on the Future Model
- Use the Data to Schedule Line Maintenance Based Upon the Quarterly Work Plan
- Document the Entire Process in Creating the Risk Model
- Update Model Based on New Information Quarterly
- Answer the Private Lateral Question



How Do We Get There?

- Training Capital Analyst on InfoMaster Should Begin Immediately
- Workshops are Planned so Criteria can be Mapped Out Beginning in June
- Thorough Scenario Testing and Field QA/QC is Complete and Documented.
- Schedule Meetings with Capital Analyst and Operations
- Figure out the Lateral Question
- Update CCTV Pipe Monitoring Plan
- Assess the Program and Modify as Needed.
- Implement the InfoMaster/InfoNet RVSD Asset Management System



Questions?