EPA Clean Water Act
National Compliance Initiative Series

BMPs for POTW Compliance: Critical Elements of Successful Wastewater Treatment (Part 2 of 2)

Presented Live:
September 15, 2020

DISCLAIMER

The information presented in this webinar is intended as training to help NPDES regulated entities and NPDES regulators understand additional techniques that can help operators refine their operations and, if need, to help bring their facilities back into compliance. Invited speakers are not speaking on behalf of EPA and do not necessarily reflect EPA positions or policy. This webinar is not intended, and cannot be relied upon, to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. EPA reserves the right to act at variance with the information presented in this webinar at any time without public notice.
US EPA Office of Compliance Technical Assistance Webinar Series

Introduction: Seth Heminway, US EPA Office of Compliance (heminway.seth@epa.gov)

- Webinar series supports the national EPA and state initiative to reduce noncompliance among CWA - NPDES permitted facilities. Focus is on helping wastewater system operators return their facilities to compliance, and those interested in fine-tuning their systems.

- The webinar will be recorded and posted.

- Certificates of attendance will be sent to those who have registered.

- You will be in “listen only mode.”

- Use the chat box to ask questions and to suggest other training

- Speakers do not necessarily reflect EPA positions or policy.

- We strive for continuous improvement. Please complete the post webinar survey.
Why do we need SOPs?

SOPs create repeatable protocols for carrying out critical tasks, creating consistency in facility and operator performance.
What will a good SOP help you achieve?

- Proper operation and maintenance
- Manage avoidable failures
- Facility optimization and efficiency
- Meet Permit standards
- Employee health and safety
- Training
What should you consider?

- **Audience is key** – Not all procedures need to be complicated. Think of who will be using them.
- **Operations are constantly evolving and may need modification** – Make sure to have a procedure in place to review your procedures.
- **Make sure SOPs are used** – SOPs should not be designed to sit in a book or on a shelf. Make them known and make sure they are field functional.
- **Link SOPs to documentation** – Ensure mechanisms for data collection and documenting observations is included.
- **TRAINING!**
Mixing System

Resetting the Maintenance Light

1. Open the control cabinet and get the RFID card.
2. Place the card over the RFID logo on the front of the control panel.
3. Press Enter
4. Scroll down to #4 Maintenance.
5. Press Enter.
6. Scroll to the line below the maintenance description.
7. Press the right arrow button ► to highlight the box located on the right side of the screen.
8. Press [Enter]. The box will flash.
9. Press the up arrow ▲ or the down arrow ▼. An X will appear in the box.
10. Press Enter. The timer will reset.
11. Press ESC. to back out to the main screen.
12. Return the RFID card to the inside of the cabinet.

Tips and Tricks

• Engage operators in the development process.
• Keep it simple when appropriate but include key operational values and ranges.
• Use pictures and imagery – before and after, right and wrong.
• Keep SOPs close to the equipment and operations they were developed for.
• Use SOPs as a chance to set expectations – for example, how long a task should take or cost.
• Attach or incorporate SOPs into work orders.
EMERGENCY SPILL RESPONSE PROCEDURE

Date: 8/27/18

Description of Action Taken

9:55 am  Spill/Sheen reported to office. Reported by Michael. From A:6 to A:49
10:15 am  Investigate sheen; if possible, determine where originating from.
10:25 am  Determine Product: Gasoline, Diesel, Engine Oil or other.
10:25 am  Unknown
10:25 am  Action Taken: Deploy sweep, boom, etc. Let it separate
10:30 am  Instruct crew member to take camera and document all actions with pictures

Call National Response Center 1-800-424-8802

Person spoken to: Quinn

Time begin call: 10:35 am  Time End call: 10:40 am

Report Number: 1222862

10:43 am  Call MD Department of Environment (MDE) 1-866-633-6486

Person spoken to: Neil

Time begin call: 10:43 am  Time End call: 10:46 am

Report Number: 1222862

Call vessel owner, if sinking, get permission to pump-out and haul-out and/or ask if Boat/US or Sea Tow Member. Have owner call Boat/US or Sea Tow if needed and have them respond.

0:50 am

11:00 am

Remarks/Comments:

Polymer System Manual Filling

1. Press Rapid Fill ON and fill mix tank half full
2. Press Rapid Fill OFF
3. Press Blower ON
4. Press Wetting Head ON
5. Press Mix Tank Mixer ON
6. Press Screw Feeder ON
7. Go to MAIN screen and watch Polymer Feed Time Remaining (minutes)
8. After 5.55 minutes, go to Manual Screen and press Screw Feeder OFF
9. Press Wetting Head OFF
10. Press Blower OFF
11. Press Rapid Fill ON, and fill mixing tank to full level
12. Press Rapid Fill OFF
13. Mix for 45 minutes then press Mixer OFF
Example: SOP for Post-Aeration Basin Management

<table>
<thead>
<tr>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The primary purpose of the Post-Aeration Basin is to ensure that WWTP’s effluent dissolved oxygen level is maintained at a concentration of 6.5 mg/L or greater. The basin also provides an opportunity for the operations team to visually inspect the SBR effluent quality prior to the UV disinfection process.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>This SOP describes the process for determining the performance of the Post Aeration Basin at the current time and since the last sludge judge solids depth measurements. Field data will be collected, documented and maintained in the Basin Sludge Level Form. The raw data and visual observations will be critical in the diagnostic evaluations of the operational variables contributing to the negative impacts on the performance of the Post-Aeration Basin and threats to the Plant’s effluent quality.</td>
</tr>
</tbody>
</table>

The following quantitative information and operations observations will be critical to supporting the diagnostic evaluations of operational variables:

- WWTP current operation mode (normal/dry weather or wet weather mode)
- Visual appearance of SBR’s effluent
- Volume/rate of SBR decant cycle
- Depth of the SBR decant arm with respect to the SBR’s sludge blanket during the complete decant cycle
- Visual appearance of basin without aeration
- Visual appearance of basin during aeration
- Depth of solids in the basin
- Visual appearance of basin’s effluent to UV System

<table>
<thead>
<tr>
<th>RELATED SOPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Weather Operations Mode SOP</td>
</tr>
<tr>
<td>Sequenced Batch Reactor SOP</td>
</tr>
<tr>
<td>Ultraviolet Disinfection Unit SOP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEALTH AND SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to the collection of sludge judge solids depth measurements, the operator shall ensure that they have the proper personal protective equipment (PPE) staged in the collection area and that PPE will be worn during the activity. The collection of sludge judge core samples and any wastewater samples will require the use of eye protection, plastic gloves, disinfectant cleaning solution and paper towels. All other applicable safety procedures and PPE should be employed as needed, including but not limited to vests, cones, lockout/tagout procedures, and other process area control procedures and equipment.</td>
</tr>
<tr>
<td>STEP No. / DESCRIPTION</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>1. Observe the visual water quality of the basin</td>
</tr>
</tbody>
</table>

Observe the basin’s visual quality during morning and afternoon rounds. Note the following:

1. Color and solids concentrations during both aeration and standby modes.
2. If there is any color or solids during an aeration cycle return to the basin 10 minutes after the decant cycle has been completed. Make additional observations and conduct a sludge judge profile of the basin as described on the Basin Sludge Level Form (Appendix 2).
3. Operator will follow the procedures reviewed in Step No. 2 when profiling the basin.

2. Solids profiling of the Post Aeration Basin

1. The basin should be profiled for solids accumulation on a regular basis. The WWTP team will use the Basin Sludge Level Form (Appendix 2).
2. The basin will be profiled at least 3 times a week even if color and/or solids are not observed.

- Basin during an aeration cycle without solids. **Condition:** Good
- Basin during an aeration cycle with approximately 8 inches of settled solids accumulation in basin **Condition:** Poor
<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Criteria</th>
<th>Comments/Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>No sludge judge measurable solids in the basin.</td>
<td>No action required.</td>
</tr>
<tr>
<td></td>
<td>SBR effluent is free of visible and measure solids.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-Aeration Basin effluent is free of visible and measure solids.</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>Measurable amount (up to 1&quot;) of solids found during sludge judge profiling, not impacting effluent quality.</td>
<td>No action required.</td>
</tr>
<tr>
<td></td>
<td>SBR effluent has a faint shade of color.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effluent from basin to UV disinfection clear.</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>Measurable amount (1&quot; to 3&quot;) of solids, starting to impact effluent quality, water quality still in compliance.</td>
<td>Implement additional monitoring.</td>
</tr>
<tr>
<td></td>
<td>Some floating solids observed after aeration cycle has been completed.</td>
<td>Confirm effluent quality with respect to permit limitations.</td>
</tr>
<tr>
<td></td>
<td>SBR effluent has color and is changing the color in the Post-Aeration Basin.</td>
<td>Formally review recent stresses to the SBRs, try to identify peak hourly flow period.</td>
</tr>
<tr>
<td></td>
<td>Effluent from basin to UV disinfection has a light color.</td>
<td>Document length of Wet Weather event operations.</td>
</tr>
<tr>
<td></td>
<td>Solids can be seen in the effluent at times.</td>
<td>Evaluate solids removal scheduling. Ensure that</td>
</tr>
<tr>
<td>Poor</td>
<td>Measurable amount (&gt; 3&quot;) of solids, impacting effluent quality, water quality compliance is threatened.</td>
<td>Have solids removed from basin immediately.</td>
</tr>
<tr>
<td></td>
<td>Floating solids observed after aeration cycle has been completed.</td>
<td>Implement additional monitoring.</td>
</tr>
<tr>
<td></td>
<td>SBR effluent has dark color and is changing the color in the Post-Aeration Basin.</td>
<td>Confirm effluent quality with respect to permit limitations.</td>
</tr>
<tr>
<td></td>
<td>Effluent from basin to UV disinfection has a dark color.</td>
<td>Formally review recent stresses to the SBRs, try to identify peak hourly flow period.</td>
</tr>
<tr>
<td></td>
<td>A large volume of solids can be seen in the effluent. The effluent is not clear.</td>
<td>Document length of Wet Weather or operational event identified as the stress to operations.</td>
</tr>
<tr>
<td></td>
<td>Disinfection process may be threatened.</td>
<td>Modify operating and maintenance schedules so that solids are removed prior to threatening permit compliance.</td>
</tr>
</tbody>
</table>
Example: SOP for Asset Risk Assessment

Formalized Guidance and Standard Operating Procedures

• Incorporated separate guidance to educate why the SOPs are needed and how they were developed.
  • How does the utility define an asset?
  • Condition assessment criteria
  • Considerations for determining the potential and consequence of failure (i.e., POF and COF)
  • Estimating useful life
• Photos, images, and examples from the utility
• SOPs were designed to be detached from the guidance and carried in the field
When considering whether to classify an item as an asset, a supply, or something else, one should answer the following questions:

1. Does it have value for the organization?
2. Is it managed (i.e., is routine and/or corrective maintenance performed on it, or would it just be discarded and replaced)?
3. Would it cost more than $1,000 to $2,000 to replace? (Additional consideration can be made for lower cost items that occur in large quantities, such that collectively, the total value is significant.)

If the answer to all three questions is yes, it is an asset.

In many cases, it will be appropriate to break an asset into smaller units, or sub-assets (i.e., a parent–child relationship). A sub-asset, or child asset, is one that fits the following conditions:

1. It is managed separately from the parent asset.
2. It is or can be replaced separately from the rest of the parent asset.
3. The component in question cannot be classified as a supply (something that is discarded when it malfunctions or wears out and replaced without much thought).
4. Appropriate level of detail (enough assets to enable work orders to be written effectively without being too much of a burden to manage the information)
5. In general, costs more than $1,000 to $2,000 to replace. (Additional consideration can be made for lower cost items that occur in large quantities, such that collectively, the total value is significant.)

Example Parent–Child Relationship

Parent Asset:
Headworks Blower

Child Asset 1: Blower Motor

Child Asset 2: Blower Unit with Filter (filter considered a supply not an asset)

Child Asset 3: Blower Controls

3. Assess Asset Condition

For assets that can be seen in the field without risking harm to those making the assessment, assess the condition while looking at the asset. Use the following rating scale:

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Performs like new.</td>
</tr>
<tr>
<td></td>
<td>- No identifiable problems.</td>
</tr>
<tr>
<td></td>
<td>- No visible wear.</td>
</tr>
<tr>
<td>Good</td>
<td>Is an efficient asset.</td>
</tr>
<tr>
<td></td>
<td>- Could have a minor defect, but not one affecting performance.</td>
</tr>
<tr>
<td></td>
<td>- Wear less than 15%.</td>
</tr>
<tr>
<td>Average</td>
<td>Minor defects, some that affect performance.</td>
</tr>
<tr>
<td></td>
<td>- Shows some wear and tear (16% - 25% wear).</td>
</tr>
<tr>
<td>Fair</td>
<td>Major and minor defects, some or most affecting performance.</td>
</tr>
<tr>
<td></td>
<td>- Shows wear and tear (26% - 50%).</td>
</tr>
<tr>
<td>Poor</td>
<td>Getting close to end of useful life.</td>
</tr>
<tr>
<td></td>
<td>Major defects, most or all affecting performance.</td>
</tr>
<tr>
<td></td>
<td>- Shows major wear and tear (greater than 50%).</td>
</tr>
<tr>
<td></td>
<td>- At or near the end of its useful life.</td>
</tr>
<tr>
<td></td>
<td>- Should be replaced.</td>
</tr>
<tr>
<td></td>
<td>- May require constant maintenance or operational interventions.</td>
</tr>
</tbody>
</table>

Condition Ratings

- Pua Pump Station Discharge Valve Condition: Good
- Hilo WWTP Headworks Blower No. 1 Motor Condition: Average
- Hilo WWTP Biotower Pump No. 1 Condition: Fair
- Kealakehe Pump Station Pump No. 2 Check Valve Condition: Poor

Documented data and records, such as work orders and inspection reports, can be used to supplement the field information. For assets that cannot be seen (e.g., collection system pipes), use historical data and personnel experiences to help in rating the condition.
4. Estimate the useful life remaining

To estimate the useful life remaining for an asset or sub-asset, think about what that asset or type of asset is expected to do. Consider all you know about the asset (e.g., how the asset has performed, whether and what type of maintenance has been completed, history of repairs, past experience with assets of this type) and estimate how much longer the asset can continue to do what it is supposed to do. Provide the useful life estimate in terms of years of life remaining.

Example Useful Life Estimates

- **Pua Pump Station** Discharge Valve No. 1
  - Useful Life Remaining: 8 yrs.

- **Hilo WWTP Headworks Blower No. 1 Motor**
  - Useful Life Remaining: 3 yrs.

- **Hilo WWTP Biotower Pump No. 1**
  - Useful Life Remaining: 1 yr.

- **Kealakehe Pump Station Pump No. 2 Check Valve**
  - Useful Life Remaining: 1 yr.

5. Determine Probability of Failure (POF)

Recall that there are four major failure modes of an asset:
- Mortality
- Level of Service
- Financial Inefficiency
- Capacity

While evaluating each asset, consider all failure modes and which failure mode is likely to dominate. Rank the probability that the asset will fail from 1 to 5, with 1 being least likely, and 5 being most likely. Use the table below for guidance.

<table>
<thead>
<tr>
<th>POF Factor</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asset is brand new or like new.</td>
</tr>
<tr>
<td>2</td>
<td>Asset is not brand new but shows no more than cosmetic signs of wear and tear.</td>
</tr>
<tr>
<td>3</td>
<td>Asset shows signs of operational or physical decline but has not yet entered a potential failure state. Asset may show light to moderate rust, some light to moderate wear and tear, be nearing but not at physical capacity.</td>
</tr>
<tr>
<td>4</td>
<td>Asset is in potential failure—showing signs of failure, such as cracks, root intrusions, vibration, noise, excessive rust—but is still delivering all or most of the required service (i.e., not in functional failure mode). Functional failure not expected within the next year, but within the next few years.</td>
</tr>
<tr>
<td>5</td>
<td>Asset is already in failure mode (Level of Service, Mortality, Financial, Capacity) or expected to fail within 1 year.</td>
</tr>
</tbody>
</table>

Example POF Ratings

- **Pua Pump Station** Discharge Valve No. 1 Motor
  - POF: 1

- **Hilo WWTP Headworks Blower No. 1 Motor**
  - POF: 2

- **Hilo WWTP Headworks Electrical Controls**
  - POF: 3

- **Hilo WWTP Biotower Pump No. 1**
  - POF: 4

- **Kealakehe Sewage Pump Station – Pump No. 2**
  - POF: 5
POLL QUESTION: Your utility currently uses:
A. A comprehensive asset management system (CMMS or similar)
B. A proprietary electronic work order system
C. Paper-based or basic spreadsheet-type documentation
D. None of the above
Best Management Practices for POTW Compliance: Critical Elements of Successful Wastewater Treatment - Part 2

Asset Management for Compliance and Efficiency

Presented by
Heather Himmelberger, P.E.
Director, Southwest Environmental Finance Center
## Resources (money & time) Available

<table>
<thead>
<tr>
<th>Sewer Cleaning</th>
<th>Compliance Sampling</th>
<th>Sewer Inspection</th>
<th>Preventative Maintenance</th>
<th>Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation of Assets</td>
<td>Operations</td>
<td>Capital Improvement Planning</td>
<td>Billing</td>
<td>Customer Relations</td>
</tr>
</tbody>
</table>

### Typical Situation
Resources (money & time) Available

So what happens?
What we really need is a better way to make these hard decisions.
Asset Management provides that better way
Google’s Secret Formula for Management? Doing the Basics Well

“Success at almost anything rests upon this single principle: Do the basics, do them well, and do them every day, even when you don’t feel like doing them.”

-Champions are brilliant at the basics.
- Author: John Wooden

We realized how important it was for us to play well. We got back to basics. When we were struggling, we knew that was a wake-up call for us.

Successful people master the basics. They become phenomenal by consistently doing the little things well.

-Billy Alsbrooks

It helps you do the basic functions well

To improve compliance & efficiency

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It helps you do the basic functions well

To improve compliance & efficiency
What are the most important basics?

- Protect Public Health
- Protect the Environment
- Customer Service
- Maintain Assets in Acceptable Condition
- Manage Risk
Where does compliance fit in?

- Protect Public Health
- Protect the Environment
- Customer Service
- Maintain Assets in Acceptable Condition
- Manage Risk
The purpose of regulations and compliance with regulations is to protect public health and the environment.
Why?

Doing the basics well helps maintain resiliency to all kinds of outside stressors.

CDC Data: Leading Causes of Death 1900 and 1997

[Chart showing bar graphs for Leading Causes of Death in 1900 and 1997]

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm4829a1.htm
If we believe compliance is important, how can **Asset Management** help?
Asset Management is a thought process that guides you through more efficient and effective operation and management.
Asset Management

is designed to help you decide the best way to spend your limited resources (time and money) to have the best outcomes (to do the basics well to meet the needs of customers)
It includes 5 Major Components

What assets do you have?

Which ones are most critical to doing that?

Do you have the money to get it all done?

What do you want them to do?

How do you ensure the assets do their job over their life spans?
The Category Names

Current State of the Assets

Level of Service

Criticality

Life Cycle Costing

Long-Term Funding
Asset Management Is Not Actually Linear

- CURRENT STATE OF THE ASSETS
- LEVEL OF SERVICE
- LONG-TERM FUNDING
- CRITICALITY
- LIFE CYCLE COSTING
AM doesn’t have a beginning or end

Your utility starts wherever it is. You aren’t responsible for the past and can’t change it.

Use the past as a learning opportunity.
AM is a JOURNEY not a destination

Move forward from wherever you are

Continue the practice on into the future
Let’s dig a little deeper
Current State of the Assets
Current State of the Assets is the **foundation** upon which **everything else** is built.
Answers the Basic Questions…

What assets do I have?

Where are they located?

What do I need to know about them?
Assets: Anything you own or manage that has value
Collect field data
MAKE A MAPS

ALL TYPES OF MAPS CAN BE USEFUL. DOESN‘T HAVE TO BE AN ELECTRONIC MAP.
One use of a map: Creating a Legacy
Asset Name and ID

Condition

Remaining useful life

Replacement Cost

Anything Else You Want to Know
Maintenance Records

Operational status

Size or Volume

Manufacturer

Warranty Status

Supplier Contact Info
<table>
<thead>
<tr>
<th>WA/SE</th>
<th>DATE</th>
<th>TIME</th>
<th>ADDRESS</th>
<th>USER CALLED</th>
<th>NOTES</th>
<th>UPDATES</th>
<th>WORK TICKET #</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2/9/2016</td>
<td>10:39AM</td>
<td>OLD HILLSIDE NURSING HOME</td>
<td>RN RM</td>
<td>FIRE HYDRANT RUNNING</td>
<td>DROP WORKING ON LINE PREPARED</td>
<td>48874</td>
</tr>
<tr>
<td>4</td>
<td>2/9/2016</td>
<td>11:24AM</td>
<td>1008 PLEASANT</td>
<td>RM</td>
<td>LEAK IN THE STREET</td>
<td>FIXED</td>
<td>48862</td>
</tr>
<tr>
<td>5</td>
<td>2/9/2016</td>
<td>11:00AM</td>
<td>400 FINNEMORE</td>
<td>RM</td>
<td>SEWER BACKED UP AT STREET</td>
<td>UNCLODGED</td>
<td>48883</td>
</tr>
<tr>
<td>6</td>
<td>2/9/2016</td>
<td>11:00AM</td>
<td>1550 EUGER ROAD</td>
<td>RM</td>
<td>A CAR HIT THE FIRE HYDRANT</td>
<td>FIXED DA/CON 2-23-16</td>
<td>48861</td>
</tr>
<tr>
<td>7</td>
<td>2/9/2016</td>
<td>12:00AM</td>
<td>CORNER OR 22ND AND WA&amp;CO</td>
<td>RM</td>
<td>LEAK FILLING UP OULVERT</td>
<td>FIXED</td>
<td>48860</td>
</tr>
<tr>
<td>8</td>
<td>2/9/2016</td>
<td>12:00AM</td>
<td>2015 WA&amp;CO</td>
<td>RM</td>
<td>RAW SEWER SHOOTING UP IN A IR FROM CLEAN OUT</td>
<td>UNCLODGED</td>
<td>48884</td>
</tr>
<tr>
<td>9</td>
<td>2/9/2016</td>
<td>1:15PM</td>
<td>2355 S LORD</td>
<td>RM</td>
<td>A PC PIPE BROKELED</td>
<td>FIXED</td>
<td>48844</td>
</tr>
<tr>
<td>10</td>
<td>2/9/2016</td>
<td>1:15PM</td>
<td>206 4TH</td>
<td>RM</td>
<td>LEAK ON 4TH STREET</td>
<td>FIXED</td>
<td>48845</td>
</tr>
<tr>
<td>11</td>
<td>2/9/2016</td>
<td>1:15PM</td>
<td>119 36 ST</td>
<td>RM</td>
<td>CUSTOMER CALLED AGAIN AND SAID METER LEAK WAS BANZER CALLED RODENT TO LET HIM KNOW</td>
<td>FIXED</td>
<td>48649</td>
</tr>
<tr>
<td>12</td>
<td>2/9/2016</td>
<td>1:15PM</td>
<td>123 26 ST</td>
<td>RM</td>
<td>WATER SHOOTING OUT OF MANHOLE</td>
<td>FIXED</td>
<td>48667</td>
</tr>
<tr>
<td>13</td>
<td>2/11/2016</td>
<td>9:45AM</td>
<td>26TH AND MEADS</td>
<td>RM</td>
<td>WATER LEAK BEHIND BUILDING</td>
<td>FIXED</td>
<td>48675</td>
</tr>
<tr>
<td>14</td>
<td>2/11/2016</td>
<td>9:45AM</td>
<td>BLESSINGS BUILDING</td>
<td>RM</td>
<td>CALLED LAST NIGHT AT 8 AND THEY OPENED THE WATE R BUT THEY NEED TO JUMP BOTH HOLES WHEN</td>
<td>FIXED</td>
<td>48655</td>
</tr>
<tr>
<td>15</td>
<td>2/11/2016</td>
<td>11:00AM</td>
<td>321 1/2 SURRY 3904</td>
<td>Dd RM</td>
<td>SEWER STOP UP FIXED</td>
<td>FIXED</td>
<td>48666</td>
</tr>
<tr>
<td>16</td>
<td>2/11/2016</td>
<td>11:00AM</td>
<td>409 PARK</td>
<td>Dd RM</td>
<td>SEWER STOP UP BUT SAID THEY NEED TO JUMP BOTH HOLES WHEN</td>
<td>FIXED</td>
<td>48655</td>
</tr>
<tr>
<td>17</td>
<td>2/16/2016</td>
<td>11:00AM</td>
<td>401 S, 34TH ST.</td>
<td>VS RM</td>
<td>WANTS TO KNOW IF THERE IS A METER IN PLACE OR IF HE NEEDS TO GET ONE INSTALLED</td>
<td>48695/48676</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2/16/2016</td>
<td>11:00PM</td>
<td>9TH STREET</td>
<td>RM</td>
<td>WATER LEAK</td>
<td>IT IS NOT A LEAK 02-17-16</td>
<td>48654</td>
</tr>
</tbody>
</table>

Records

Pictures

Video

Notes
Collect all the data into an Asset Inventory
Where can you store your asset data?
There are many possibilities: CMMS, Database, Spreadsheet, Word, etc.
Level of Service
A wastewater system is first and foremost a customer service business.
Level of Service is a chance to have a conversation with customers.
Level of Service is directly related to cost

higher levels of service = higher costs
lower levels of service = lower costs
Level of Service sets the overall policies, goals and procedures for the organization.

It puts everyone on the same page...
### Desired Characteristics of Levels of Service Goals

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Meaningful** | Relevant to staff and stakeholders  
                  Provides a clear picture of performance |
| **Measurable** | Can be measured in a cost-effective manner  
                  Expressed as a qualitative or quantitative measure |
| **Consistent** | Consistent with industry practice  
                  Measurement is reproducible by others |
| **Useful** | Helps manage the utility  
                 Encourages improvement |
| **Unique** | Describes a specific attribute of utility  
                 services or activities  
                 Independent of other levels of service |
Goals can be internal, meaning they are relevant primarily to internal staff (operators, managers).
Types of goals: System Maintenance, Employee Safety, Energy Management
Goals can be external....

Meaning they are also relevant to elected leaders and customers.
Types of goals: Public Health & Safety, Customer Service, Response Time
Having goals won’t help if we can’t or don’t measure them….
CONSIDER HOW GOALS CHANGE YOUR OPERATION AND MANAGEMENT
Goals are not set in stone...

They can be changed, adjusted over time and added or removed.
Criticality

Risk Analysis
Criticality is the heart and soul of asset management.
Projects and activities should be prioritized based on criticality/risk to ensure limited financial and personnel resources are used efficiently.
Probability of Failure

Consequence of Failure
What is the likelihood a given asset will fail?

No single cause should be the sole predictor...
Most Common Factors to Consider

- Condition of the Assets
- Remaining Useful Life
- Historical Knowledge
- Repair History
- Operation and Maintenance History
<table>
<thead>
<tr>
<th>1</th>
<th>Extremely low probability of failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Low probability of failure</td>
</tr>
<tr>
<td>3</td>
<td>Average probability of failure</td>
</tr>
<tr>
<td>4</td>
<td>High probability of failure</td>
</tr>
<tr>
<td>5</td>
<td>Extremely high probability of failure</td>
</tr>
</tbody>
</table>
Consider the triple bottom line:

1. Financial
2. Environmental
3. Social
## CoF Rankings from 1 to 5

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extremely low consequence of failure</td>
</tr>
<tr>
<td>2</td>
<td>Low consequence of failure</td>
</tr>
<tr>
<td>3</td>
<td>Average consequence of failure</td>
</tr>
<tr>
<td>4</td>
<td>High consequence of failure</td>
</tr>
<tr>
<td>5</td>
<td>Extremely high consequence of failure</td>
</tr>
</tbody>
</table>
More time and effort should be spent on highest risk assets.
Ways to Reduce Risk

- Routine & Preventative maintenance
- Redundancy
- Spare Parts
- Specialized Training
- Replace Assets Early
- Monitoring
Life Cycle Costing

An examination of the entire life of the asset to *optimize* O&M, repair, rehabilitation, and replacement of *system assets*. 
What is an asset's life cycle?
How do planning, design, and construction intersect with operations?
Once you have your assets in place....
It’s time to manage them....
Operation: skydiving

Assets: jump-suit, shoes, parachute
Where should most resources be focused?

A - his jumpsuit

B - his shoes

C - his parachute
Answer: 84
In this case, it was pretty obvious what to spend time and money on. Is it always that easy?
We’re making maintenance decisions now, but are they the right ones?
We need more (and accessible) information to make better decisions.
What kind of information would you want?
Asset Information
Condition Information
POLL QUESTION: Asset risk is typically calculated by:
A. Condition x Useful Life
B. Potential of Failure x Consequence of Failure
C. Age x Redundancy
D. Maintenance Frequency X Cost
Risk (PoF X CoF)
Cost Information
<table>
<thead>
<tr>
<th>WA/SE</th>
<th>DATE</th>
<th>TIME</th>
<th>ADDRESS</th>
<th>USER CALLED</th>
<th>NOTES</th>
<th>UPDATES</th>
<th>WORK TICKET #</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2/9/2016</td>
<td>10:38AM</td>
<td>OLD HILLSIDE NURSING HOME</td>
<td>BH</td>
<td>FIRE HYDRANT RUNNING</td>
<td>48674</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2/9/2016</td>
<td>11:24AM</td>
<td>1008 PLEASANT</td>
<td>DD</td>
<td>LEAK IN THE STREET</td>
<td>48642</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2/9/2016</td>
<td>11:24AM</td>
<td>400 PINEMERE</td>
<td>RH</td>
<td>SEWER BACKED UP AT STREET</td>
<td>48683</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2/9/2016</td>
<td>10:00AM</td>
<td>1332 EUGER ROAD</td>
<td>DD</td>
<td>A CAR HIT THE FIRE HYDRANT</td>
<td>48644</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2/9/2016</td>
<td>10:00AM</td>
<td>CORNELL PRYOR</td>
<td>DD</td>
<td>UNCLUGDED</td>
<td>48684</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2/9/2016</td>
<td>10:00AM</td>
<td>255 HELSTONE</td>
<td>DD</td>
<td>FIXED</td>
<td>48645</td>
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<tr>
<td>9</td>
<td>2/9/2016</td>
<td>11:45AM</td>
<td>323 S 25 ST</td>
<td>DD</td>
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<td>48649</td>
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<tr>
<td>10</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>313 N 26 ST</td>
<td>RH</td>
<td>FIXED</td>
<td>48641</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>250 S 16 ST</td>
<td>DD</td>
<td>FIXED</td>
<td>48642</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>276 S 14 ST</td>
<td>RH</td>
<td>WATER SHOOTING OUT OF MANNHOLE</td>
<td>48682</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>BLESSING'S BUILDING</td>
<td>DD</td>
<td>WATER LEAK BEHIND BUILDING</td>
<td>48671</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>312 2/2 SURRY 3004</td>
<td>DD</td>
<td>FIXED</td>
<td>48683</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>415 PARK</td>
<td>DD</td>
<td>FIXED</td>
<td>48643</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>401 S 34TH ST</td>
<td>KS</td>
<td>WATER BACKED UP BUT THEY NEED TO JUMP BOTH HOLES WHEN THERE IS AN EXISTING HOE</td>
<td>48684</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>5TH STREET</td>
<td>BH</td>
<td>WATER LEAK</td>
<td>48674</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2/10/2016</td>
<td>10:00AM</td>
<td>REYNOLDS &amp; RUTHERFORD</td>
<td>RH</td>
<td>WATER LEAK</td>
<td>48684</td>
<td></td>
</tr>
</tbody>
</table>

**Types of Data**
- Electronic Files
- Pictures
- Videos
- Notes
Think about:

What data do you collect? How/Where do you keep it? Is it accessible? Could you use it to make decisions? Could you use it to determine trends?
What are some of the outcomes of implementing the life cycle costing portion of AM?
A strategic plan for operating and maintaining assets
Five questions to help develop an O&M plan…

- What Maintenance Activities Do You Need To Do?
- When Should You Do Them?
- How Do You Do Them?
- What Equipment Do You Need?
- What Do They Cost?
Making the Case for O&M/Repair/Rehab Over Replacement

O&M, Repair, Rehabilitation

Replacement

$ 100
Using risk to drive decisions on O&M, Repair, Rehab, and Replacement

- Lowest level of effort
- Moderate level of effort
- Highest level of effort
Let’s go back to our example

A - his jumpsuit

B - his shoes

C - his parachute
How Would We Handle These Assets Based on The Risk

PROBABILITY OF FAILURE

CONSEQUENCE OF FAILURE

Shoes

Jump Suit

Parachute
Long Term Funding

In order to maintain the desired level of service for the lowest life cycle cost, a utility must have a sustainable funding strategy.
**Resources**

*(money & time)*

**Available**

<table>
<thead>
<tr>
<th>Sewer Cleaning</th>
<th>Compliance Sampling</th>
<th>Sewer Inspection</th>
<th>Preventative Maintenance</th>
<th>Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation of Assets</td>
<td>Operations</td>
<td>Capital Improvement Planning</td>
<td>Billing</td>
<td>Customer Relations</td>
</tr>
</tbody>
</table>

**Remember this?**
Resources (money & time) Available

The first 4 parts of Asset Management Can Improve Efficiency to help shrink size of boxes...
Resources (money & time) Available

Long-Term funding – 5th part of Asset Management – addresses the size of the green box
What funds are available?
Internal

- Rates
- Taxes
- Fees
- Reserves
External

- Grants
- Loans
- Bonds
Internal funds come primarily from your Rates
Are your rates sufficient? When was the last rate increase? Do increases keep pace with rising costs?
How is your money being spent? Are there changes that could be made?
Do you have long-term plans related to spending funds? (e.g., CIP)
Are you incrementally funding infrastructure replacement?

What is your replacement cycle?
Do you know how to access outside funding sources?
https://efcnetwork.org/funding-sources-by-state/

Funding Sources by State or Territory

Note: Some states or territories may have additional resources listed below the map.

Click on the map below to view funding sources for each state:
Back to the basics:

- Protect Public Health
- Protect the Environment
- Customer Service
- Maintain Assets in Acceptable Condition
- Manage Risk
AM Addresses all of these:

- Protect Public Health
- Protect the Environment
- Customer Service
- Maintain Assets in Acceptable Condition
- Manage Risk
Which helps compliance by:

- Understanding risk and acting on it reduces overall risk
- Doing preventative and routine maintenance to keep assets working
- Understanding what assets you have to do the job at hand
- Recognizing that Customer Service is first and foremost
- Collecting operational data to be able to trend and see when things are going awry
- Having a CIP allows for a good long term plan for what work to do when money is available and what work to put off when it is not available
- Understanding condition and maintaining condition enables them to do the tasks
- Helps develop a plan for and make a case for incremental investment
The Southwest Environmental Finance Center has partnered with EPA to create a repository of documentation and tools related to Asset Management.

Whether you are new to the Asset Management process or just need a refresher on a specific topic, the resource you are looking for is probably here. If you're unable to find what you're looking for, reach out and tell us about it.

If you would like to contribute by having a resource added to the repository, please email the Southwest Environmental Finance Center (by clicking on the link below) and tell us about it. We welcome your feedback and strive to serve your utility and water systems at large.

https://swefcamswitchboard.unm.edu/am/
An Asset Management IQ Test is presented here in order to help you review the concepts of the various core components of Asset Management. Both the test and a scoring table are also available as a printable PDF, which may be copied for use by multiple personnel within your utility.

In the web version of the test, clicking on a choice will automatically enter the number of points for that option and keep track of the score for each section of the Asset Management IQ as well as the total cumulative score. If a new answer is selected, the new choice and the new points will appear and the old points will be removed.

If the user completes the entire Asset Management IQ tool (all 30 questions) before starting Asset Management, it will provide a baseline evaluation at the beginning of Asset Management. Comparing the scores of each of the six sections will show which areas have the biggest gaps in terms of Asset Management activities. Those scores may provide information about where efforts should be focused. You may wish to start with areas that are the weakest, offering a large improvement with a little effort, or with areas that are strong, which would offer a chance to get started in a familiar area.

As the utility progresses, the Asset Management IQ can be repeated and the scores compared to previous scores. At a minimum, you may wish to repeat the Asset Management IQ every year.

It should be noted that a total score of 150 would represent best practice in all areas of Asset Management. Not all utilities will be interested in achieving this goal. The utility should set its own target levels. The tool is meant to help utilities gauge their progress over time.
Additional Resources for Training and Technical Assistance

- EPA’s Water Infrastructure and Resiliency Finance Center
  https://www.epa.gov/waterfinancecenter

- EPA’s Tools, Training, and Technical Assistance for Small and Rural Wastewater Systems

- Clean Water State Revolving Fund
  General Info: https://www.epa.gov/cwsrf
  State contacts: https://www.epa.gov/cwsrf/state-cwsrf-program-contacts

- Environmental Finance Centers
  https://www.epa.gov/waterfinancecenter/efcn

- Rural Community Assistance Corporation (RCAC)
  https://rcac.org/

- National Rural Water Association (NRWA)
  https://nrwa.org/
We strive for continuous improvement.
Please complete the post webinar survey.

Thank You!