OLVER ASSOCIATES INC.

ENVIRONMENTAL ENGINEERS

290 MAIN STREET WINTERPORT, MAINE

ASSET MANAGEMENT AND/OR CLIMATE ADAPTATION PLANS: WHO NEEDS THEM & WHY?

PRESENTED TO:

UNITED SOUTH & EASTERN TRIBES (USET) UTILITY SUMMIT
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PRESENTER

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Water/Wastewater System Infrastructure Planning Considerations

- Typical useful life of critical process equipment is about 20 years.
- Processes should be evaluated every two decades or so.
- Recently emerging concern at some wastewater facilities is rising sea levels and flooding from climate change and storm surges. Some facilities have critical wastewater infrastructure components in the 100-year flood plain and in danger of inundation.
- This impacts long term planning decisions for treatment plant system upgrades.

What is the Difference Between the Types of Studies?- CPE-Comprehensive Process Evaluation

- Looks at a treatment facility process including:
  - Design basis and actual flows
  - Planning considerations such as growth or climate issues
  - Condition and capacity and age of pump stations
  - Condition and capacity of process equipment
    - Headworks, clarifiers, aeration, disinfection, sludge management, and general condition of structures and lab facilities.
    - Defines deficiencies, recommended upgrades, and provides preliminary cost estimates.

What is the Difference Between the Types of Studies?- Facilities Plan

- Similar to CPE but format dates back to U. S. Environmental Protection Agency policy:
  - Establishes a planning period, design basis for a treatment system.
  - Planning considerations such as growth or present environmental issues
  - Focusses more on alternatives analysis of technologies and if applicable locations with a set scoring criteria to result in an “unbiased” decision on options.

What is the Difference Between the Types of Studies?- Facilities Plan Style

OVERALL SUMMARY OF PRINCIPAL ALTERNATIVES RANKINGS

DESCRIPTION	ALT. 1 ACT. SLUDGE (Landspread)	ALT. 2 ACT. SLUDGE (Press)	ALT. 3 SBR (Landspread)	ALT. 4 SBR (Press)	ALT. 5 LAGOON	ALT. 6 SPRAY IRRIGATION	ALT. 7 REGIONAL TREATMENT
Capital costs	1	2	5	4	3	7	6
Operating costs	6	5	4	3	2	1	7
Annual equivalent cost	1	2	5	4	3	6	7
Present worth costs	1	2	5	4	3	7	6
Reliability	3	2	6	5	2	1	4
Complexity	4	5	4	5	2	3	1
Energy consumption	6	7	3	5	2	1	4
Implementability	2	1	3	3	5	6	4
Environmental impacts	1	1	2	2	3	2	1
Final Score	25	27	37	35	25	34	40
Comparative Ranking	1	1	2	2	3	2	1

What is the Difference Between the Types of Studies?- Asset Management Plan

- Goal is to prepare a plan which helps the operators manage the components of each wastewater collection and treatment system in a manner that maintains the desired level of service at the lowest possible cost.
- The plan will attempt to outline the useful life of each part of the system, its current age and condition, and set target dates for rehabilitation, repair, or replacement.

What is the Difference Between the Types of Studies?- Climate Adaptation Plan

- Focusses on the short and long term anticipated impacts of climate change

- In coastal areas, this is generally sea level rise and storm surge.

- Extreme storms with increased winds, intense rains can also be climate change related.

Why Consider Asset Management Planning?

- All infrastructure deteriorates due to use and age.
- Lack of maintenance accelerates the deterioration process.
- Lack of resources (time, staff, funds) limits the maintenance that can occur.
- Competing priorities prevent critical needs from being addressed.

Infrastructure Planning Can Be:

Reactive or Proactive

Most Communities Are In Reactive Mode by Necessity

Problem	Solution/Project
Water main breaks	Repair it
Pothole	Fill it
DEP mandates repair	Fix it

Reactive Mode Most Expensive:

- Overtime costs
- Emergency shipping/parts acquisition
- Generates complaints from users/residents
- Can result in fines from regulatory agencies
- Reduces opportunity to request outside grant funding

What is the Goal of Asset Management?

- Slow down deterioration/increase service life.
- Increase cost effectiveness/avoid unnecessary expenditures.
- Minimize unplanned repairs or expenses.

How Do You Break the Cycle?

- Educate decision makers & public as to long term importance of planning.

- Demonstrate potential cost savings.

Dedicate time or funding to create the appropriate plan for your infrastructure

Common Reasons Asset Management Planning not Conducted:

- Our community is too small.
- We have no staff to do this and not enough time.
- It’s going to cost too much to hire someone.
- Local government entity will never support this effort.

Reality?

Asset management may be time consuming initially, just like creating a map, but once you have it, it is really helpful tool on which way to go.

Asset Management Basics

- Inventory the Asset Components
- Determine Useful Life
- Estimate Replacement Value
- Determine funding options/available funds
- Set Priorities & Schedules

Asset Management Planning Process Outline

Develop an Inventory of System Assets:

- Treatment Facility Equipment
- Distribution or Collection System-Pipe and Pump Stations
- Buildings-Office, Plant, Storage, Pump Stations, Booster Stations
- Land
- Personnel
- All of these are essential parts of the working treatment system.

Asset Management Planning Process Outline

At the Treatment Facility: Equipment

- Create a list of all of your pieces of equipment, their age, performance and maintenance history.
- Some asset management programs are integrated with, or can be first steps in creation of a more formal maintenance program.

Wastewater Collection System

The assets to inventory:

- Sewer lines
- Manholes
- Pump Stations
- Other items (combined sewer overflow, siphons)

The characteristics:

- Pipe materials
- Age (if known, or estimated)
- Sizes
- Combined, or sanitary only?

Water Distribution System

- Similar to sewer in characteristics but the consequences of aging are sometimes a little more obvious.

Water Distribution System

- Pipe size, materials, installation dates-don’t hesitate to estimate if unknown.
- Estimate remaining useful life
- Estimate replacement costs
- Create priority based on impacts of breaks

Water Treatment Plant

- Inventory all equipment, including lab, office & maintenance items
- Estimate useful life
- Estimate replacement costs
- Create priority list of implications of failure
- Budget maintenance and replacements accordingly

Stormwater Collection – The Forgotten Utility

- Usually the lowest priority, but can create some significant issues.

Why is Stormwater Often Forgotten?

- No specific regulatory agency
- Historically, little or no grant funding options
- Spot repairs addressed on emergency basis
- System tends to evolve as issues occur

But Stormwater Failure Can Rival Watermain Breaks for Drama

Asset Management Planning Process Outline

Create comprehensive inventory of system components including:

- collection/distribution system,
- treatment facility,
- remote facilities such as pumping or booster stations
- support systems such a maintenance shop & administrative.

Asset Management Planning Process Outline

Include considerations such as:

What is the structural condition of the buildings? Are the concrete tanks solid, or is concrete aged, spalling, rebar visible?

Asset Management Planning Process Outline

Include considerations such as:

Is Heating Ventilation Air Condition (HVAC) working and up to Code?

Asset Management Planning Process Outline

A comprehensive approach would also include:

- What is status of lab equipment-age, are they current to standards?
- Computers, data storage, paper file storage.
- Operators-do you have enough operations, management, maintenance and support staff and a transition plan for upcoming transitions such as retirement?
- Do you have enough staff for the size/grade of your plant?

Asset Management Planning Process Outline

A comprehensive approach would also include considerations such as:

- Computers, data storage, paper file storage

Asset Management Planning Process Outline

Set priorities based on the importance of each asset:

- ❖ protects public health
- ❖ protects distribution system or effluent water quality
- ❖ essential to function of the system
- ❖ no redundancy or back up option

Asset Management Planning Process Outline

Set schedule for maintenance, repair, rehab, or replacement of each asset:

- ❖ what is the expected useful life?
- ❖ can the asset be refurbished rather than replaced?
- ❖ what is the estimated cost of the work/item?
- ❖ plan for 5 year short term, while defining longer term needs.

Collection System Components Inventory Table

LOCATION	SIZE	MATERIAL	YEAR INSTALLED	LENGTH (FT)	LIFE
ADAMS STREET GRAVITY SEWER					
MH258 to MH256	8" Ø	PVC	1991	431	100
MH256 to MH254	8" Ø	Ductile Iron	1991	370	100
MH254 to MH187	8" Ø	AC	1961	488	75
BARRON ROAD GRAVITY SEWER					
MH95 to MH17	8" Ø	PVC	1991	402	100
BATTERY STREET GRAVITY SEWER					
MH43 to MH42	8" Ø	PVC	1991	231	100
MH9 to MH5	8" Ø	PVC	1991	228	100
MH5 to MH2	24" Ø	PVC	1991	305	100
BOYNTON STREET GRAVITY SEWER					
MH148 to MH145	8" Ø	PVC	1991	726	100
MH294 to MH289	8" Ø	PVC	1991	1,052	100
MH289 to MH172	8" Ø	Ductile Iron	1991	209	100

Pumping Station Components Inventory Table

PUMPING STATIONS		INVENTORY						
Est. Purchase Year	Description	Location	#	Life Expectancy (yrs)	Remaining Life (yrs)	Replacement Cost (in 2024 dollars)	Cost Basis	Theoretical Replacement Year
QUODDY VILLAGE COLLECTION SYSTEM PUMP STATIONS								
	Perkins Road Residential Pump Station							
1990	4' Ø Wet Well	Perkins Road	1	50	26	-	Structure	-
1990	1/2 HP Submersible Pump	Perkins Road	2	20	-4	50,000	Equipment	2010
1990	Pump Station Controls	Perkins Road	1	20	-4		Equipment	2010
1990	Level Alarm	Perkins Road	1	10	-14		Equipment	2000
1990	Pump Station Piping	Perkins Road	-	40	16		Equipment	2030
	Snyder Road Central Pump Station							
1990	6' Ø Dry Well	Snyder Road	1	50	26	-	Structure	-
1990	6' Ø Wet Well	Snyder Road	1	50	26	-	Structure	-
2012	4 HP Submersible Pump	Snyder Road	2	20	18	$150,000	Equipment	2032
2012	Pump Station Controls	Snyder Road	1	20	18		Equipment	2032
2012	Level Alarm	Snyder Road	1	10	8		Equipment	2022
2012	Pump Station Piping	Snyder Road	-	40	38		Equipment	2052
	Snyder Road Residential Pump Station							
1990	4' Ø Wet Well	Snyder Road	1	50	26	-	Structure	-
1990	1/2 HP Submersible Pump	Snyder Road	2	20	-4	$50,000	Equipment	2010
1990	Pump Station Controls	Snyder Road	1	20	-4		Equipment	2010
1990	Level Alarm	Snyder Road	1	10	-14		Equipment	2000
1990	Pump Station Piping	Snyder Road	-	40	16		Equipment	2030

Treatment Plant Components Inventory Table

INVENTORY								
Est. Purchase Year	Description	Location	#	Life Expectancy (yrs)	Remaining Life (yrs)	Replacement Cost (in 2024 dollars)	Cost Basis	Planned Replacement Year
QUODDY VILLAGE WASTEWATER TREATMENT PLANT								
	INFLUENT PUMP STATION							
1990	Wet Well	WWTP	1	50	26	-	Structure	-
2014	4 HP Submersible Pump	WWTP	2	20	20	$50,000	Equipment	2034
2014	Pump Station Controls	WWTP	1	20	20	$20,000	Equipment	2034
2014	Level Alarm	WWTP	1	10	10		Equipment	2024
2014	Pump Station Piping	WWTP	-	40	40	$50,000	Equipment	2054
	DISINFECTION							
2014	Sodium Hypochlorite Injection Pump	WWTP	2	10	10	$5,513	Equipment	2024
1990	Valve Pit	WWTP	1	50	26	-	Structure	-
2014	Sodium Bisulfite Injection Pump	WWTP	2	10	10	$5,513	Equipment	2024
2014	16.5' x 30' Chemical Building	WWTP	1	50	50	-	Structure	-
2014	6" Ø Magnetic Flow Meter	WWTP	1	20	20	$5,513	Equipment	2034
2014	4" Ø Magnetic Flow Meter	WWTP	1	20	20	$5,513	Equipment	2034
2014	6" Ø Static Mixer	WWTP	1	25	25	$1,103	Equipment	2039
2014	4" Ø Static Mixer	WWTP	1	25	25	$1,103	Equipment	2039
2014	Chemical Building Process Piping	WWTP	-	40	40	$49,613	Equipment	2054
2014	Effluent Sampler	WWTP	1	15	15	$5,513	Equipment	2029
2014	Chemical Storage Tanks with Containment	WWTP	2	20	20	$22,050	Equipment	2034
2014	Controls	WWTP	1	20	20	$13,781	Equipment	2034
	EFFLUENT PUMP STATION							
1990	38,000 Gallon Wet Well/CT Chamber	WWTP	1	50	26	-	Structure	-
1990	6' Ø Valve Pit	WWTP	1	50	26	-	Structure	2040
2014	5 HP Submersible Pump	WWTP	2	20	20	$50,000	Equipment	2034
2014	Pump Station Controls	WWTP	1	20	20	$15,000	Equipment	2034
2014	Level Alarm	WWTP	1	10	10	-	Equipment	2024
2014	Pump Station Piping/Valves	WWTP	-	40	40	$50,000	Equipment	2054
	GENERATOR BUILDING							
1990	8' x 14' Generator Building	WWTP	1	40	16	-	Structure	2030
1990	30 kW Generator	WWTP	1	30	6	$18,040.00	Equipment	2020
1990	Generator Controls	WWTP	1	30	6	$10,000.00	Equipment	2020

Asset Management Planning Process Outline

Once completed, the objective is to use the document to support funding requests and follow the plan to achieve the goal of manage the components of each wastewater collection and treatment system in a manner that maintains the desired level of service at the lowest possible cost.

Asset Management Summary

- Concepts are relatively simple, but implementation can be daunting.
- Don’t be intimidated by the details – use estimates, institutional knowledge, and start somewhere.
- Develop a plan for your system even if it isn’t comprehensive.
- Bring in outside assistance if necessary.

Recent Extreme Storms Have Drawn Public Attention to Climate Related Issues

Climate Adaptation Plan Concepts

- Key wastewater infrastructure components should be located at elevation at least 3 feet higher than 100-year flood elevation.

- Flood elevations have been modeled to increase in height over time.

- Milestones to consider

  - ❖ Present day baseline – 2024 elevations.

  - ❖ Mid-term flooding – 25 years out (2050).

  - ❖ Longer term flooding – 50 years out (2075).

Sea Rise & Storm Surge Can be Controlling Factors in Facility Evaluations

PLANT COMPONENT	ELEVATION (FT)	100-YR FLOOD ELEVATIONS (FT)			STORM SURGE ELEVATIONS (FT)		
		2022	2045	2070	2022	2045	2070
Headworks Floor	9.71	10.17	11.02	12.38	14.15	15.00	16.36
Garage Slab Floor	9.42	10.17	11.02	12.38	14.15	15.00	16.36
Top Aeration Basins	9.31	10.17	11.02	12.38	14.15	15.00	16.36
Blower Building Floor	9.31	10.17	11.02	12.38	14.15	15.00	16.36
Top of Sludge Tank Wall	21.18	10.17	11.02	12.38	14.15	15.00	16.36
Ops Building Floor	13.20	10.17	11.02	12.38	14.15	15.00	16.36
Top of Clarifier Walls	11.19	10.17	11.02	12.38	14.15	15.00	16.36
Top of Chorine Tank	11.05	10.17	11.02	12.38	14.15	15.00	16.36
Storage Shed Floor	9.57	10.17	11.02	12.38	14.15	15.00	16.36
Top of Splitter Box	11.76	10.17	11.02	12.38	14.15	15.00	16.36
Top of Scum Tank	11.44	10.17	11.02	12.38	14.15	15.00	16.36

Planning for Future Sea Rise

- What are present and anticipated conditions?
  - ❖ Present day baseline – 2024 elevations-is there already an issue?
  - ❖ Mid-term flooding – 25 years out are expected to be 1-3 feet higher than present.
  - ❖ Longer term flooding – 50 to 100 years out are modeled to be 3 to 9 feet higher than present.
  - ❖ Since plant evaluations are suggested every 20 years, there will be an opportunity to reevaluate actual in future studies.

Goals of Climate Adaptation Planning

- Identify potential hazards associated with climate change using accepted, repeatable methodology.
- Evaluate the impact of potential hazards on the existing wastewater infrastructure.
- Identify adaptation procedures for the facility to minimize and mitigate the impact of climate change on the utility system and its operation.
- Identify improvements to the utility infrastructure as needed to address the impacts of climate change.
- Develop an implementation plan for the adaptation procedures and mitigation improvements and estimate associated costs.

Goals of Climate Adaptation Planning

- Minimize disruptions in utility's service and treatment resulting from climate change.
- Protect the Community's large investment in its sewerage collection/water distribution, conveyance, treatment, and discharge facilities from the impacts of climate change.
- Maintain a low risk for sanitary sewer overflows (SSO) or water system contamination.
- Perform all operations in a safe manner to prevent personal injury.
- Continue to comply with applicable regulations.

Methodology References

Base Flood Levels – the Federal Emergency Management Administration (FEMA) flood insurance maps include the 100 year Base Flood Elevation (BFE). These were used as the high water level baseline to evaluate the potential inundation of existing infrastructure. The BFE includes snowmelt and tides in its determination.

Tidal Influence – the BFE includes tide levels as a component.

Snowmelt – the BFE includes snowmelt as a component.

Sea level rise (SLR) – this was determined using the United States Army Corps of Engineers (USACE) guidance document *Engineering Circular 1165-2-212: Sea-Level Change Consideration for Civil Works Programs* and updated through their Sea Level Analysis Tool.

Wave action – waves were considered using information on the FEMA maps, which is included in BFE data for coastal regions.

Storm surge – storm surge is a component of the BFE data on the FEMA maps. The CAP separately evaluated storm surge using the National Oceanic and Atmospheric Administration (NOAA) Sea Lake and Overland Surges from Hurricanes (SLOSH) model for hurricanes.

Survey – existing facility plans, along with supplemental surveying, would be used for identifying elevations of critical wastewater system infrastructure.

Historical data – the highest water levels recorded at the closest tide gauge in the area of the facility.

-

Peak flows – increases in storm frequency and intensity that could exceed the capacities of the collection, pumping and treatment facilities.

Planning for Future Sea Rise Flooding Remediation

- The immediate goal would be to have all current facilities above or able to withstand flooding at an elevation 3 feet below current FEMA flood elevation at the location under consideration.

- **Action Examples include:**

  - Raise elevation/ add watertight covers to manholes.

  - Modify pump stations.

  - Treatment Plant:

    - ❖ Can we construct flood barrier walls in short term?

    - ❖ Do we need to start planning to relocate plant?

Document Would Typically Include:

- A basic inventory of all facility assets to be evaluated for climate related vulnerability.
- Projection of the impacts on each component of the system in a series of time periods.
- Discussion of options for addressing the vulnerabilities.
- Preliminary Planning level cost estimates and recommended schedule to implement the improvements.

Existing Conditions vs a FEMA Flood Plain Map :

Existing Conditions vs a SLOSH Flood Plain Map :

Data will be Summarized Regarding Current and Projected Conditions:

BUILDINGS				
COMPONENT	ELEVATION (FT)	YEARLY FLOOD ELEVATIONS (FT)		
		2024	2050	2075
Blower Room Floor	26.01	25.23	26.39	27.98
Garage Slab Floor	20.85	25.23	26.39	27.98
Headworks Floor	27.73	25.23	26.39	27.98
Ops Building Floor	23.11	25.23	26.39	27.98
Sludge Thicken Floor	24.28	25.23	26.39	27.98
TREATMENT STRUCTURES				
COMPONENT	ELEVATION (FT)	YEARLY FLOOD ELEVATIONS (FT)		
		2024	2050	2075
Top of Chlorine Tank	22.89	25.23	26.39	27.98
Top of Clarifier Walls	23.39	25.23	26.39	27.98
Top of Decant Tank	22.88	25.23	26.39	27.98
Top of Digester Walls	32.07	25.23	26.39	27.98
Top of Effluent Well	23.39	25.23	26.39	27.98
Top of Headworks	28.05	25.23	26.39	27.98
Top of Influent Well	23.39	25.23	26.39	27.98
Top of Oxidation Ditch	24.51	25.23	26.39	27.98
Top of Selector	25.73	25.23	26.39	27.98

Utilities System Upgrades Implementation

Result of study will be a tool to use to make decisions for future planning:

- Presents potential options and costs to decision makers.
- Gives operators documented information indicating result of lack of action.
- Supports funding applications for recommended action items.

Utilities System Upgrades Implementation

From study phase through decision making process to proceed, establishing funding, environmental review, design, bidding, and construction, most facilities need at least 6 to 8 years from study to completion of construction for a plant upgrade.

- Take the time to plan before there are critical needs and failures.
- Invest in planning documents to support your request for funding and approvals to proceed with upgrades.
- Some basic level of planning is better than none at all.

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QUESTIONS & DISCUSSION

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