6th EWA / JSWA / WEF Joint Conference
„The Resilience of the Water Sector"
15-18 May 2018, Munich, Germany

Wastewater Resilience Planning

Kishen Prathivadi, P.E., PMP
Half Moon Bay, USA
May 17, 2018

Presentation Outline

Wastewater Resilience Planning

1. Introduction
2. Assessment Methodology
3. Assessment Results
4. Conclusion
5. Q&A

Introduction

1

Wastewater Resilience Planning

Introduction

- Kishen Prathivadi, P.E., PMP

  Engineering and Construction Contracts Manager

  Sewer Authority Mid-Coastside, Half Moon Bay, CA

- Timothy Monahan, P.E. (Co-author)

  Project Manager

  SRT Consultants, Inc. San Francisco, CA

EWA EUROPEAN WATER ASSOCIATION | JSWA | Water Environment Federation the water quality people

Introduction

The Sewer Authority Mid-Coastside (SAM) is a coalition of three entities on California's Pacific coast 30 miles (48 km) south of San Francisco:

- City of Half Moon Bay
- Granada Community Services District
- Montara Water and Sanitary District

THE CITY OF HALF MOON BAY CALIFORNIA | Granada Community Services District | Montara Water and Sanitary District

Introduction

SAM provides wastewater treatment services and contract wastewater collection services for approximately 30,000 people in these 6 communities:

- City of Half Moon Bay
- El Granada
- Miramar
- Montara
- Moss Beach
- Princeton by the Sea

Introduction

SAM’s assets:

- 3 regional wastewater pumping stations
- 6.5 miles (10.5 km) of force mains and interceptors
- 1 regional wastewater treatment plant
- 1 ocean outfall

Introduction

- Water agencies in the United States are required to prepare vulnerability assessment per the Environmental Protection Agency
- Although not required, wastewater agencies prepare similar assessments to reduce risk of service failures
- Resilience planning is the product of these assessments

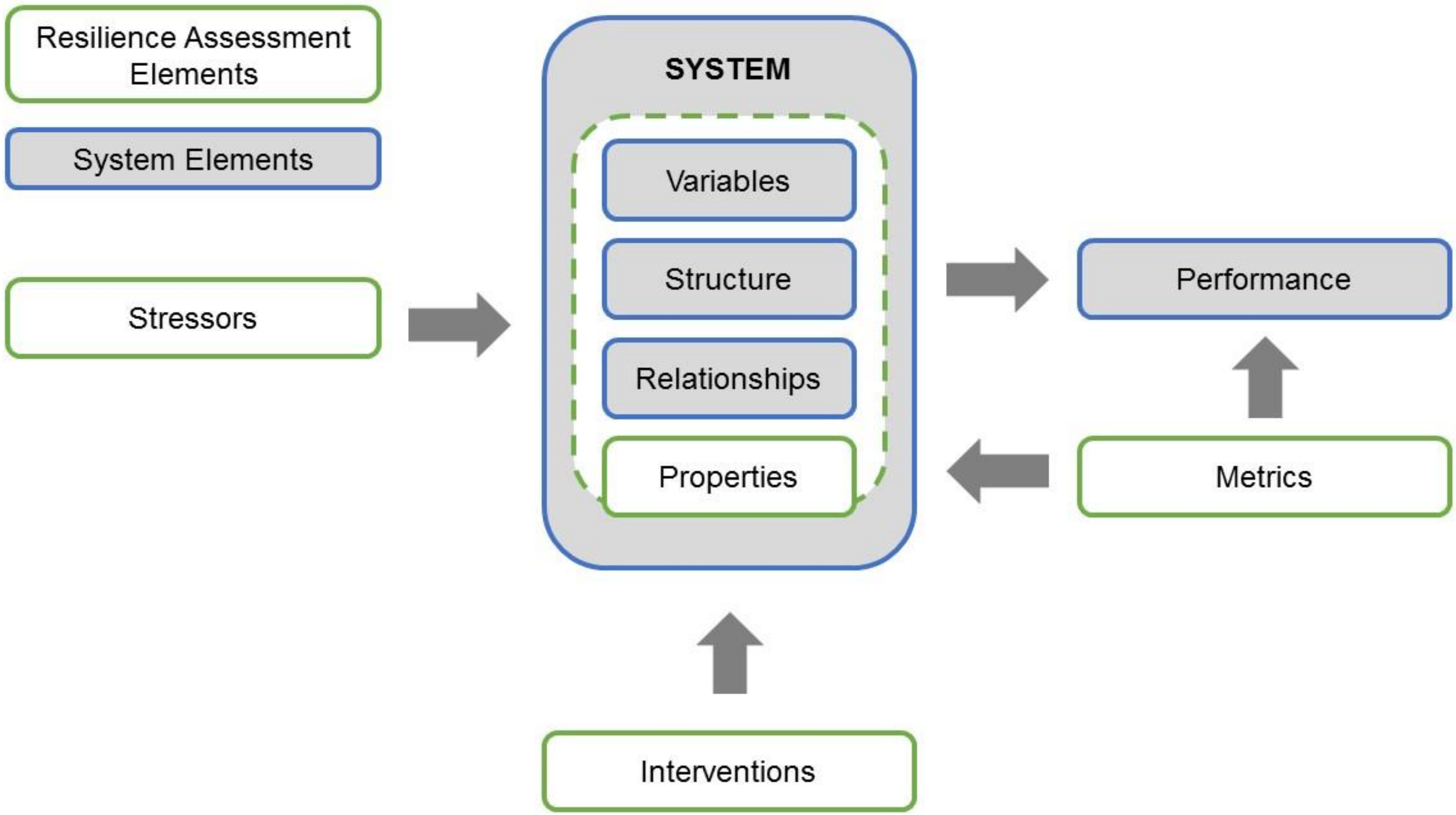
Introduction

- Resilience in ecology:

  Capacity of an ecosystem to survive, adapt, and grow in the face of unforeseen changes

- Resilience in engineered systems:

  Capacity of the system to absorb disturbance while undergoing change so as to retain the same function, structure, identity, and response mechanisms


Resilience Assessment Elements
System Elements
Stressors
SYSTEM
Variables
Structure
Relationships
Properties
Performance
Metrics
Interventions

Stressors to SAM’s WWTP Assets

- Malevolent: sabotage of physical and cyber assets
- Natural: flooding, wild fires, earthquake
- Electro-mechanical failure
  - General failure
  - Lack of spare parts
  - Age

1 Introduction

2 Assessment Methodology

Wastewater Resilience Planning

Assessment Methodology

- Performance Goals of SAM’s WWTP:
  - Average dry weather flow 4 MGD (18,200 m3/day)
  - Peak wet weather capacity – 15 MGD (68,200 m3/day)
- Challenges to Meeting Performance Goals
  - Lack of emergency storage
  - Lack of redundancy
  - Aging infrastructure

Evaluation of SAM's Assets

- Assets were evaluated based on their criticality to the overall performance of the WWTP and pump stations
- Evaluation identified assets that if fail could result in:
  - *Prolonged or widespread interruption of service*
  - *Degradation of other systems*
  - *Injuries / fatalities*
  - *Detrimental economic impact to SAM or the community*
  - *Detrimental environmental impact*

Age of SAM’s Assets

Asset Type	Useful Life (years)	Current Age (years)
Pipelines	50	32
Structures	30 to 50	16 to 32
Process Equipment	15 to 20	30
Auxiliary Equipment	10 to 15	30

Probability of Failure

Rate of occurrence:	Once in 10 years	Once in 5-10 years	Once in 3-5 years	Once in 1-3 years	Less than once/yr.
Probability of failure rating:	0.5	2.5	5.0	7.5	10.0

Consequence of Failure

Three criteria were considered:

1. *Impact on the WWTP effluent quality*
2. *Impact on the WWTP treatment capacity*
3. *Ability to return the equipment to service (including staff)*

Consequence of Failure

Criteria	Relative Weight	Anticipated Consequences		
Effluent quality	33%	none	Mid-term Non-compliance	Immediate Non-compliance
Treatment capacity	33%	none	No more redundancy or peak capacity <15 MGD	Failed process or average capacity <4 MGD
Ability to return to service	34%	Immediate repair replacement possible	Repair possible before treatment is impacted	No contingency plan preparedness uncertain
Criteria rating:		1 = negligible	5 = low	10 = severe
Consequence rating:		Sum of the three weighted criteria ratings		

Determining Risk Score

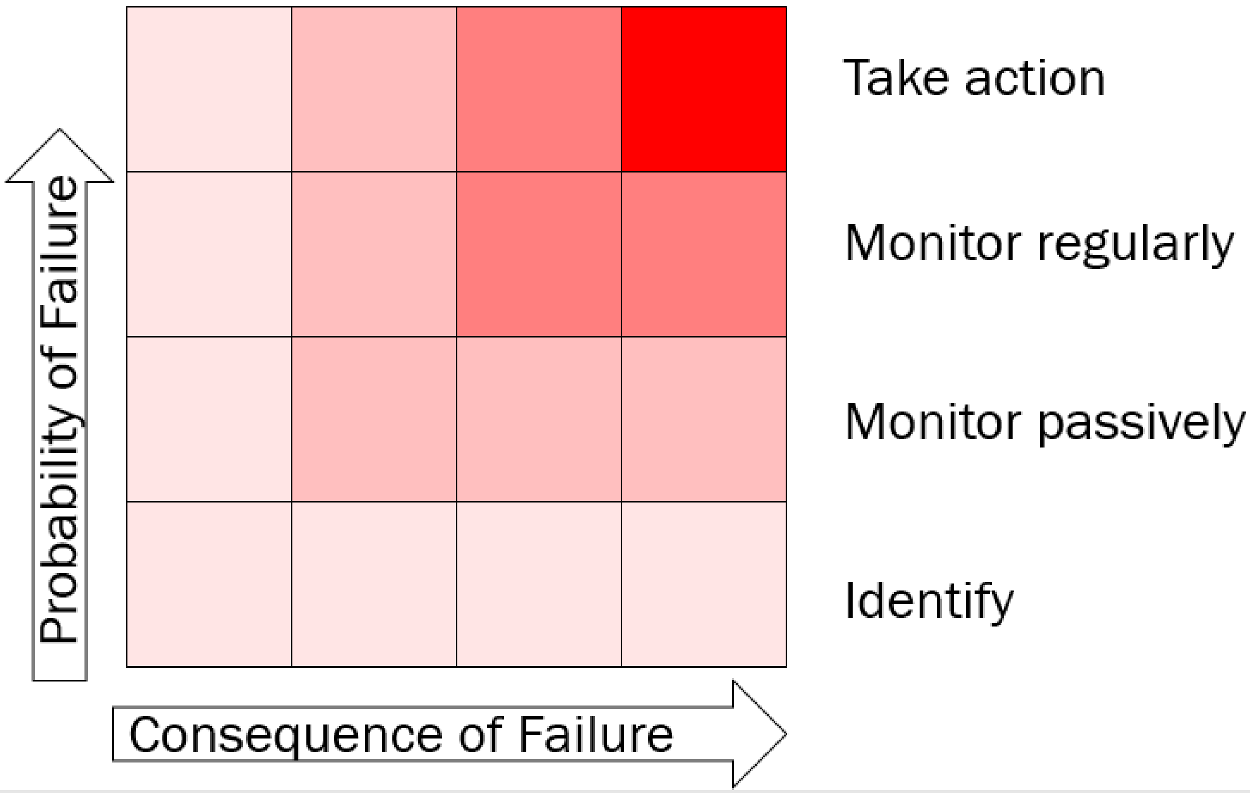
Risk Score = Probability of Failure Rating x Consequence Rating

Example:

Asset	Probability of Failure Rating	Consequence of failure			Consequence of Failure Rating	Risk Score
		Quality	Capacity	Service-ability		
		33%	33%	34%		
Belt filter press	10	5	10	10	8.4	84

Risk Score = 10 x (5 x 0.333 + 10 x 0.333 + 10 x 0.344) = 84

Risk Scores Used to Prioritize Projects



Wastewater Resilience Planning

1 Introduction

2 Assessment Methodology

3 Assessment Results

Assessment Results

- 50 major projects identified
- Projects ranked according to Risk Score from lowest to highest
- Projects further prioritized:

Mandatory – regulatory or safety driven

must do

Replacement and Rehabilitation

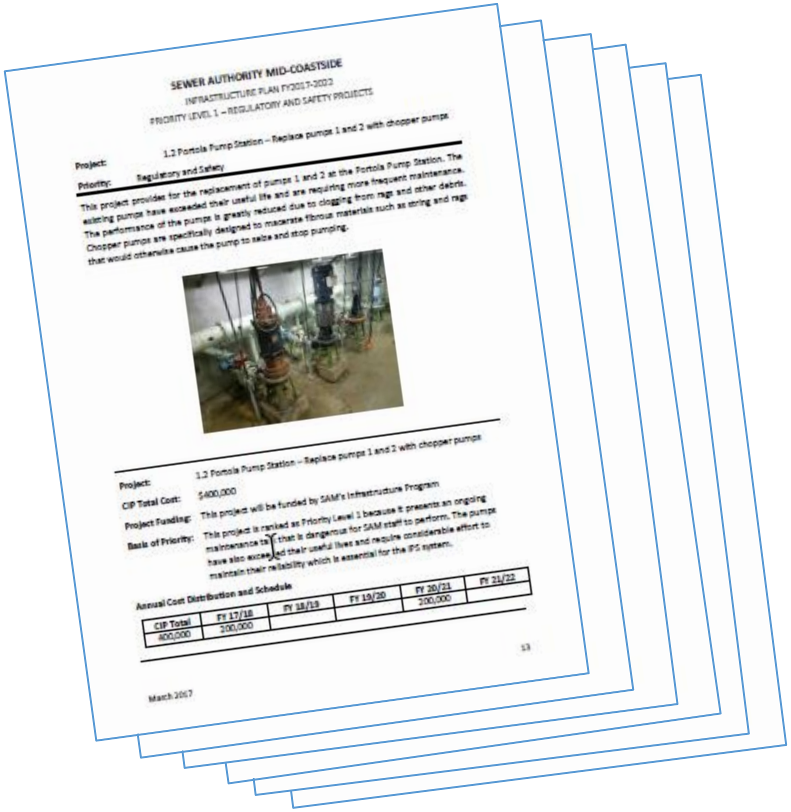
must be done

Sustainability, energy reduction, optimization

should be done

Assessment Results

- 5 year capital improvement plan
- $22.0 million in projects
- Update each year
- Proactive funding
- Risk reduction



SEWER AUTHORITY MID-COASTSIDE
INFRASTRUCTURE PLAN FY2017-2022
PRIORITY LEVEL 1 – REGULATORY AND SAFETY PROJECTS

Project: 1.2 Portola Pump Station – Replace pumps 1 and 2 with chopper pumps
Priority: Regulatory and Safety

This project provides for the replacement of pumps 1 and 2 at the Portola Pump Station. The existing pumps have exceeded their useful life and are requiring more frequent maintenance. The performance of the pumps is greatly reduced due to clogging from rags and other debris. Chopper pumps are specifically designed to macerate fibrous materials such as string and rags that would otherwise cause the pump to seize and stop pumping.

Project: 1.2 Portola Pump Station – Replace pumps 1 and 2 with chopper pumps
CIP Total Cost: $400,000
Project Funding: This project will be funded by SAM's Infrastructure Program
Basis of Priority: This project is ranked as Priority Level 1 because it presents an ongoing maintenance ta[illegible] that is dangerous for SAM staff to perform. The pumps have also exce[illegible]ed their useful lives and require considerable effort to maintain their reliability which is essential for the IPS system.

Annual Cost Distribution and Schedule

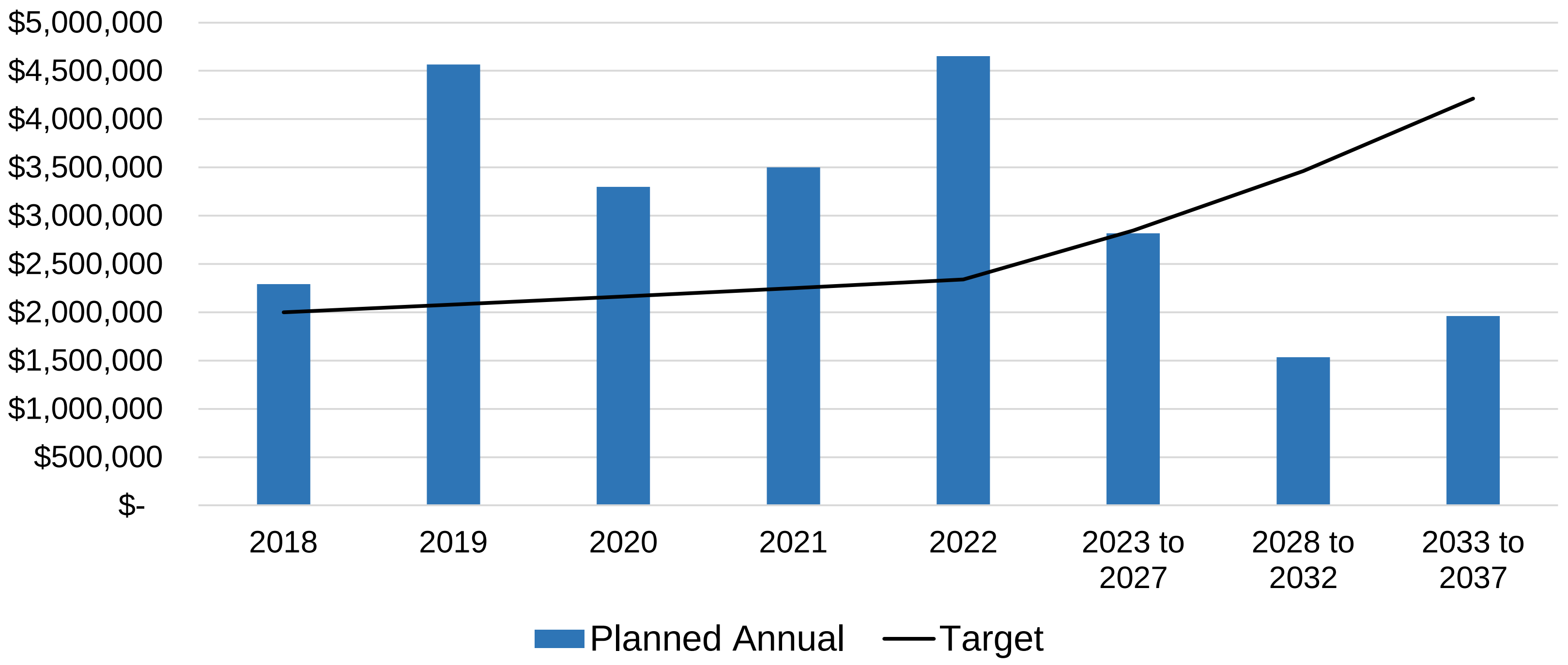
CIP Total	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
400,000	200,000			200,000	

13

March 2017

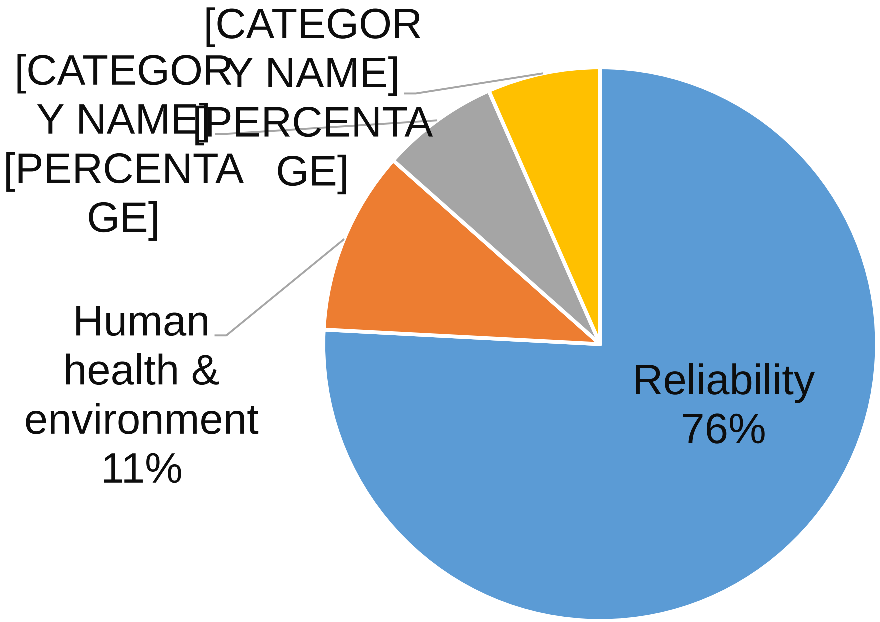
20-year CIP – total annual spending

$35.8 million over 20 years

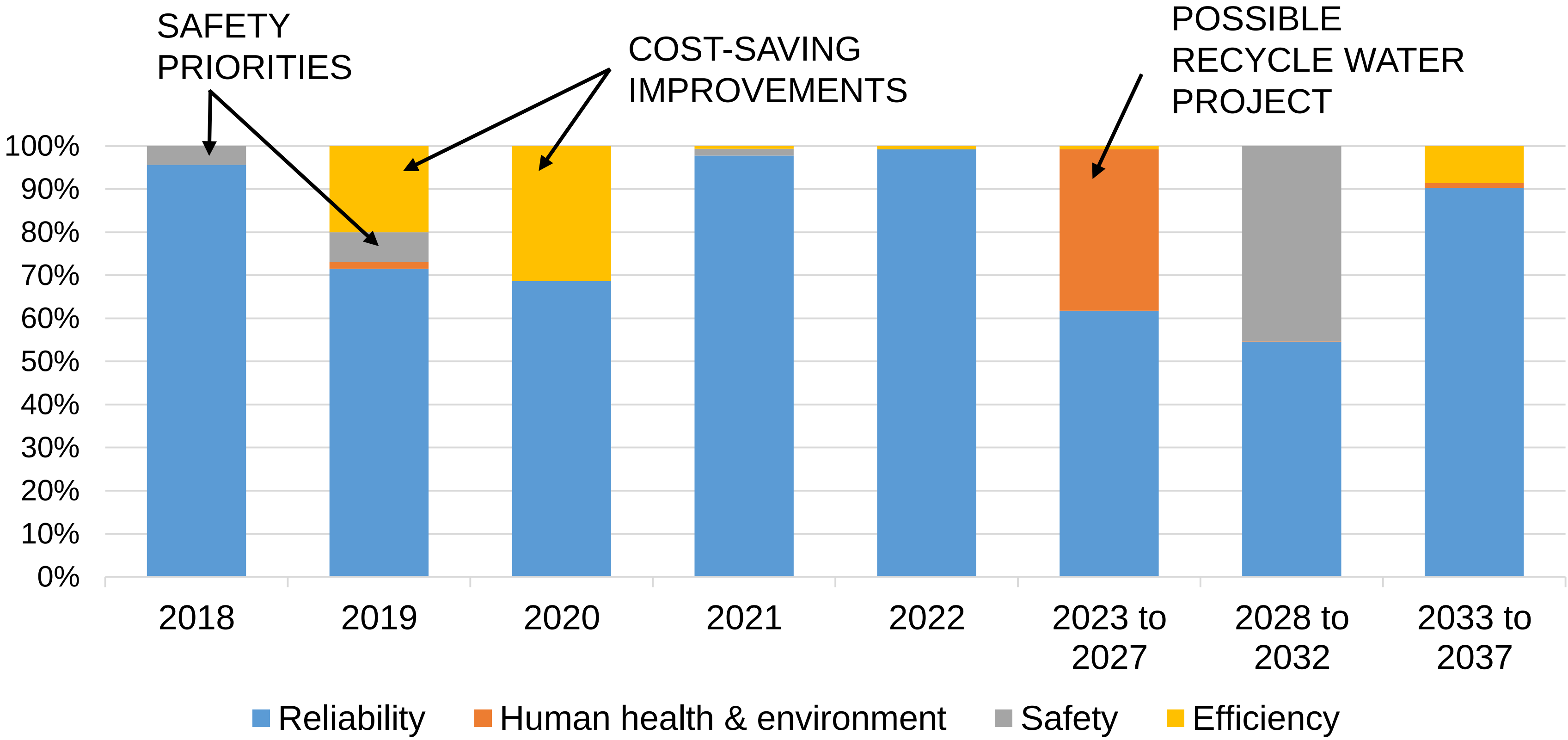


Spending by Objective

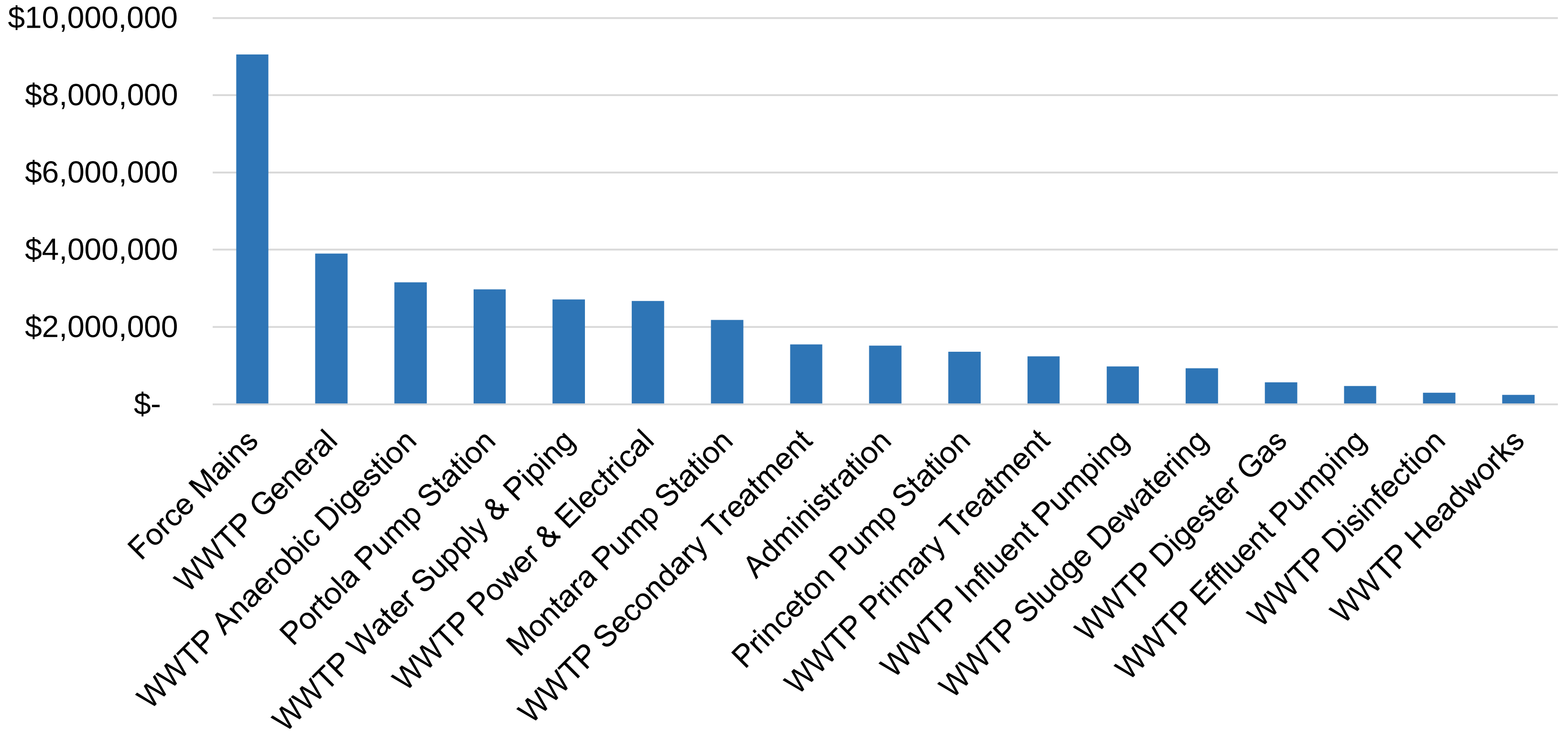
$35.8 million over 20 years



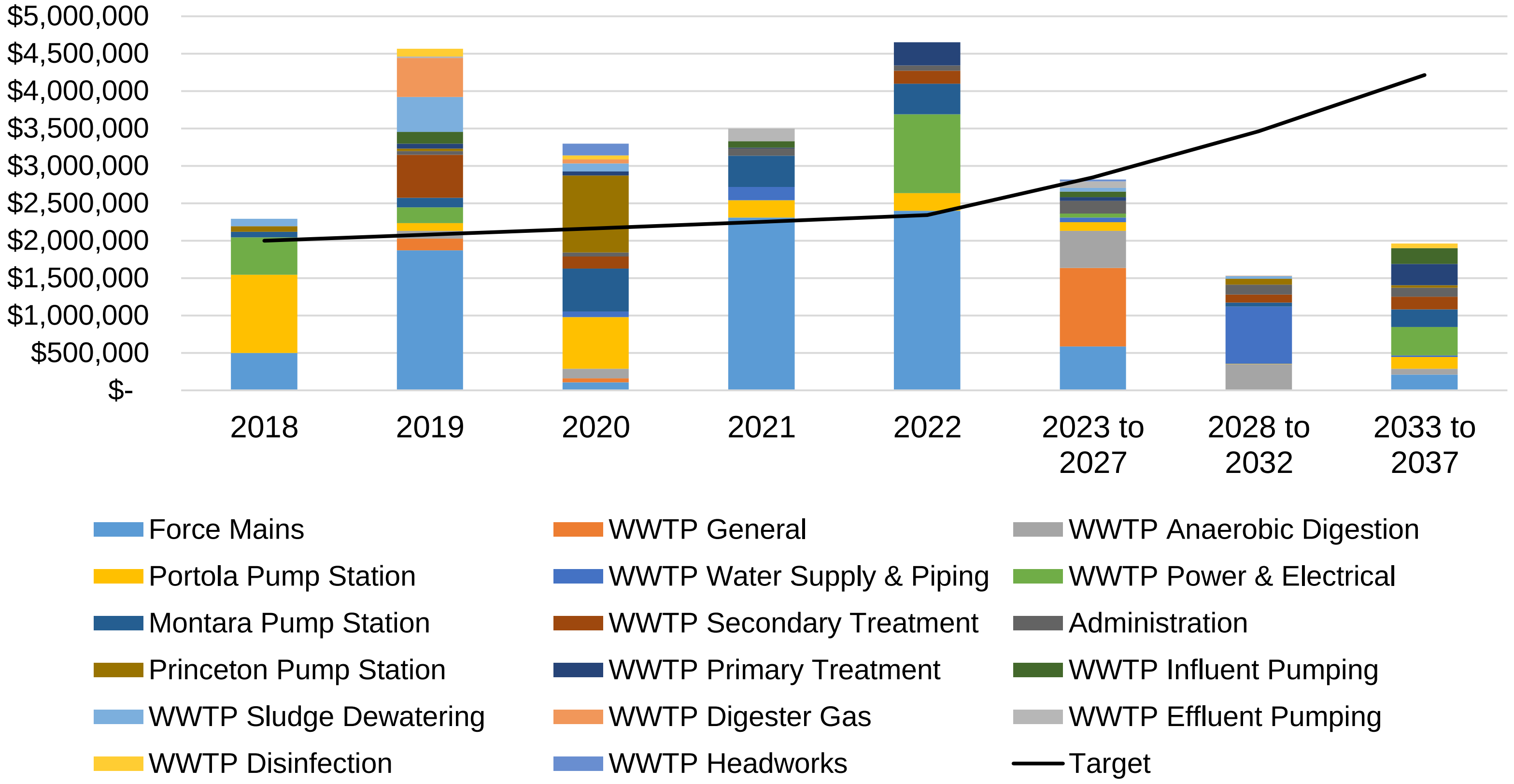
Spending by Objective



Spending by Category



Spending by Category



SAM’s Wastewater Resilience Projects

Wastewater Pumping Station Rehabilitation

SAM’s Wastewater Resilience Projects

Force Main Replacement

SAM’s Wastewater Resilience Projects

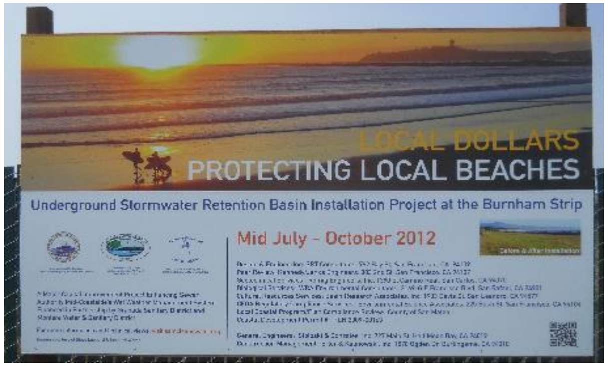
Force Main By-Pass Improvements

SAM’s Wastewater Resilience Projects

Interceptor Repairs and CIPP Lining

SAM’s Wastewater Resilience Projects

Wet Weather Storage Facility



EUROPEAN WATER ASSOCIATION

JSWA

Water Environment Federation
the water quality people

Wastewater Resilience Planning

1 Introduction

2 Assessment Methodology

3 Assessment Results

4 Conclusion

5 Q&A

Conclusion

Wastewater resilience planning:

- *Improves safety*
- *Improves reliability*
- *Reduces risk of failure*
- *Allows systematic modernization of facilities*
- *Prioritizes competing projects*
- *Allows more predictable funding vs reactionary spending*

Q&A