Asset Management Update – The Life of an Asset

MWPAAC Rates & Finance and Engineering & Planning Subcommittees

January 5, 2023

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Overview

- Goal
- Challenge
- Lifecycle Continuum Phases
- Portfolio Management Introduction
- Project Request Process
- Project Evaluation Process
- Portfolio Inventory
- Individual Project Cost Estimating and Forecasting
- Asset Management (AM) Portfolio Category Forecast Development

The Goal

Asset Management

- Manage over 87,000 assets including treatment plants, pumps and motors, pipelines and storage tanks, pump and regulator stations, offices and shop buildings, vehicles and technology, software and databases.
- Address the backlog of work and fund the highest priority items.
- Coordinate maintenance activities with affected groups to promote efficiency (maintenance, operations, etc.).
- Identify opportunities to improve energy efficiency resulting in cost savings (heat and biogas system improvement, etc.).

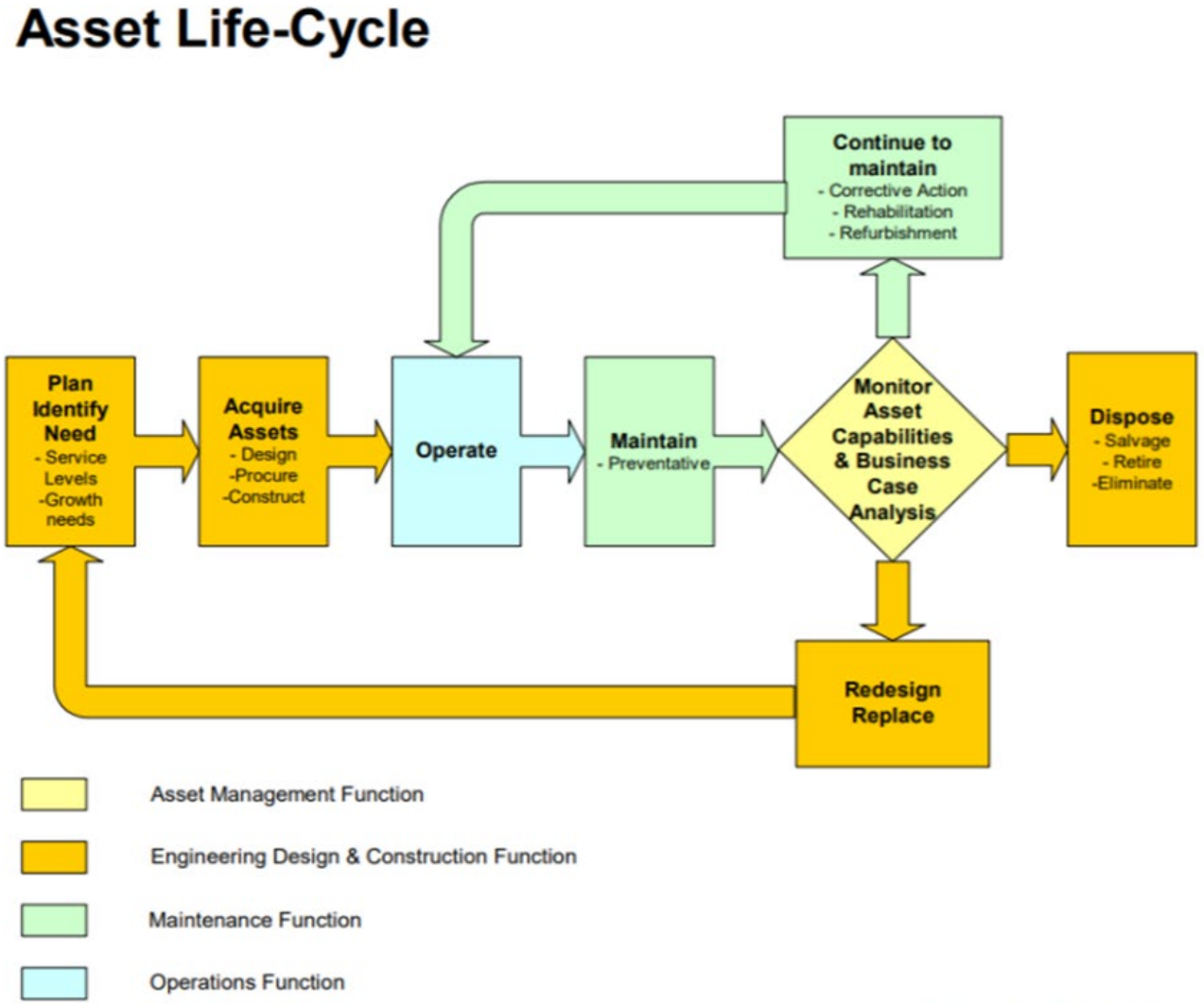
South Plant 1965 West Point 1966

The Challenge

WTD owns and maintains about $5 billion in assets, including:

- ✓ 5 Treatment Plants
- ✓ 4 Combined Sewer Overflow Treatment Plants
- ✓ 400 Miles of Conveyance Pipe
- ✓ 43 Pump Stations
- ✓ 2,398 Pumps
- ✓ 2,413 Motors
- ✓ 863 Variable Frequency Drives
- ✓ 67 Engines
- ✓ 112 Blowers
- ✓ 162 Air handling units
- ✓ 7 Turbines
- ✓ 15 Boilers

Lifecycle Continuum Phases



- Capital Improvement Planning and Finance Phase – Plan, Prioritize and Fund Capital Projects
- Project Delivery Phase – Design, Deliver and Commission Infrastructure, Produce AM Deliverables
- Operate / Maintain Phase – Beneficial Use, Collect Risk Data, Analyze Lifecycle Data, Submit Project Requests

Operate / Maintain Phase

- Operate and maintain assets to meet Level of Service targets
- Source of lifecycle cost data
- Majority of New Project Request Forms (NPRF)
- Source of asset condition information
- Reliability Engineering – Maintenance Best Practice (MBP)
- Work order planning and scheduling
- Key Performance Indicators (KPI)

Operate / Maintain Phase – Building the Case

Raw Sewage Pump Replacement

2015 Raw Sewage Pump Replacement South Plant

Replacement Case Study: RSP #1, #4, #6

- Age: Installed 1965
- Criticality: High
- Documented Lifecyle Maintenance and Condition Monitoring: End of useful Life
- Parts Availability: Obsolete
- Energy Efficiency: Replacement with new technology and VFD Drives: Savings $150,000/year
- Reliability: Improved
- Performance: Improved / Operability improved with elimination of Eddy Current Clutch
- Opportunity: Puget Sound Energy Grant Funded $894,970

Operate / Maintain Phase – Building the Case

Raw Sewage Pump Replacement

2023-2024 Raw Sewage Pump Replacement South Plant

Replacement Case Study: RSP #3

- Age: Oldest in operation, Manufactured in 1972
- Criticality: High
- Documented Lifecyle Maintenance and Condition Monitoring: End of useful Life
- Parts Availability: Obsolete
- Energy Efficiency: Replacement with new technology and VFD Drives, Savings to be evaluated
- Reliability: Improved
- Performance: Improved / Operability improved with elimination of Eddy Current Clutch
- Opportunity: Grants being sought

Capital Improvement Planning and Finance Phase

- Intake NPRFs
- Prioritize requested projects
- Formulate projects
- Balance portfolio
- Collaborate with Finance on biennial budget requests
- Manage long-term capital forecast

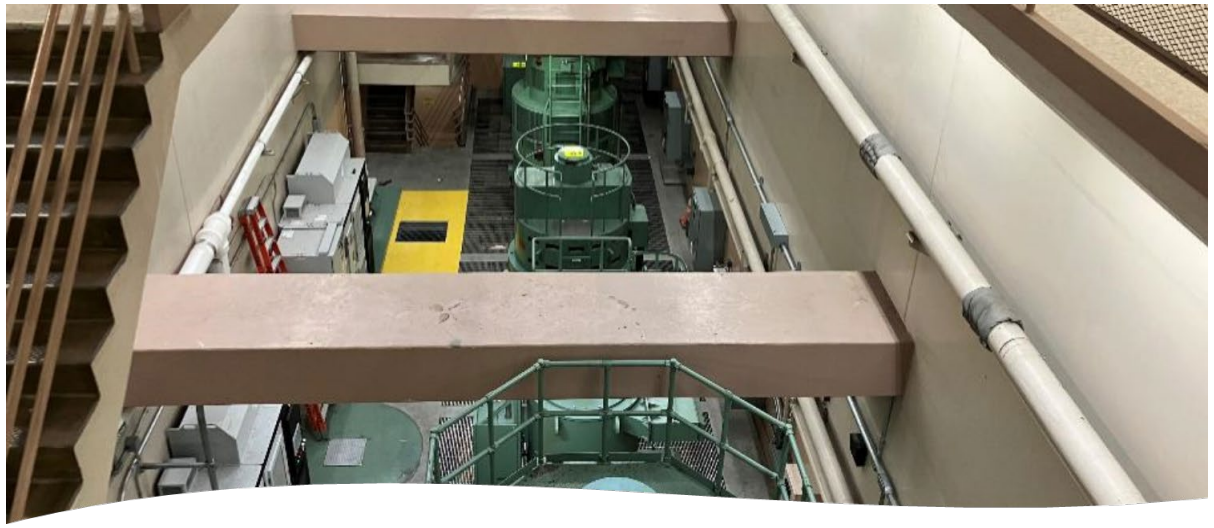
Capital Improvement Planning and Finance Phase

Objective -

- Manage infrastructure risk
- Prioritize, fund and staff the right projects at the right time for the right reasons

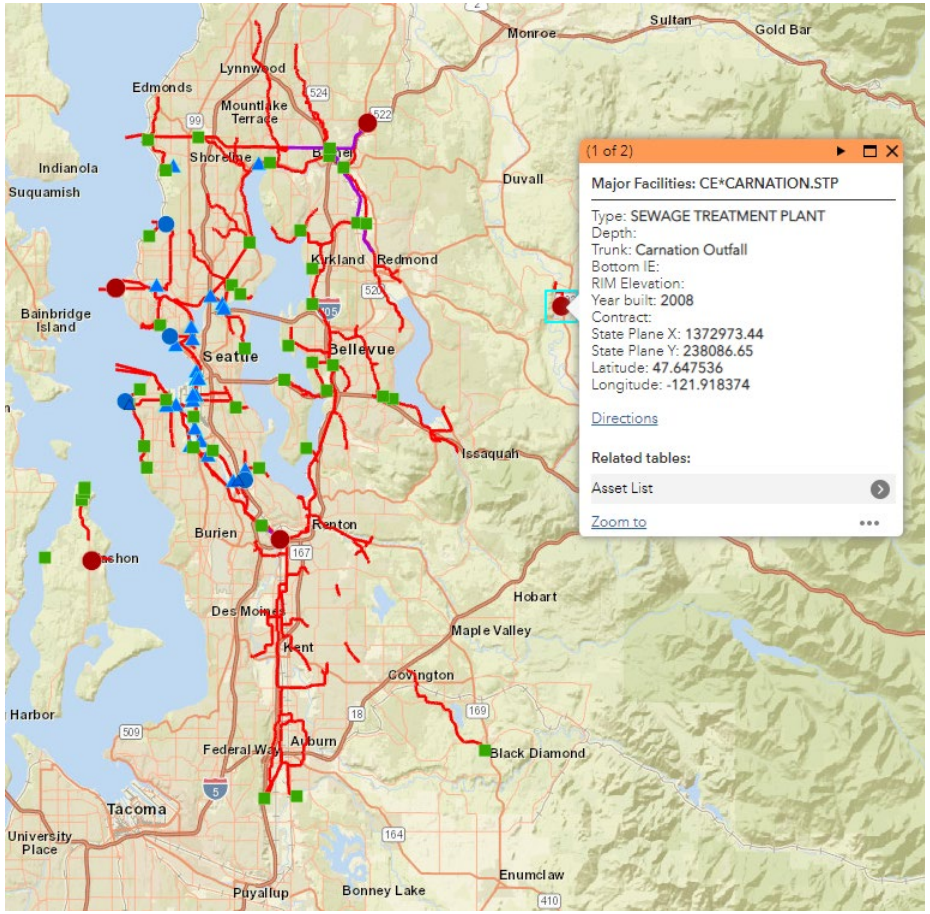
Delivery Opportunities -

- Lifecycle replacement programs
- Performance upgrades
- Energy efficiency program
- Connect to larger projects
- Coordinate with Conveyance System Improvement (CSI) Program



Project Delivery Phase

- Fund Projects
- Staff project teams
- Design and deliver projects
- Collaborate with Operations to commission infrastructure
- Produce asset management deliverables
- Project Oversight Boards



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Portfolio Management

- In 2018, King County WTD implemented the Portfolio Management process to prioritize its capital program
  - Centralized management of multiple portfolio categories to **achieve strategic objectives**
  - AM Category aligned with Sewer Rate goal: *Advance the most critical asset management projects*
- WTD maintains inventories of projects in all categories, forms basis of Capital Improvement Program (CIP) forecasts
- Projects enter inventory through a project request process

Asset Management – Plants and Conveyance

Capacity Improvements

Operational Enhancements

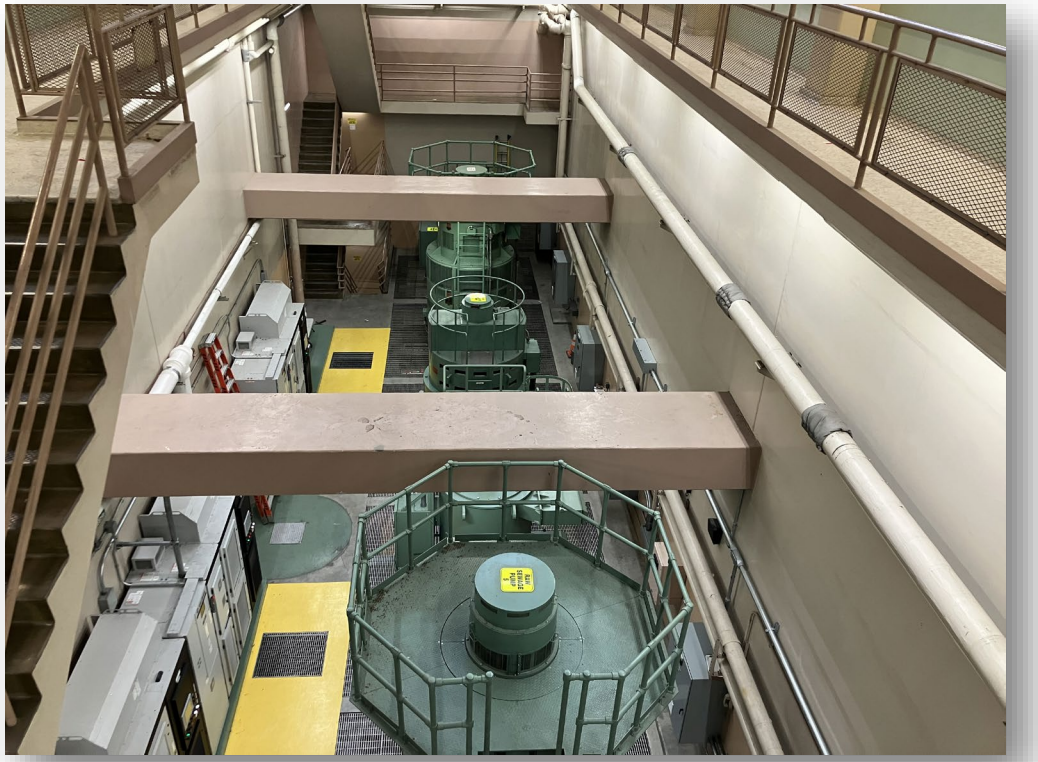
Regulatory

Resiliency

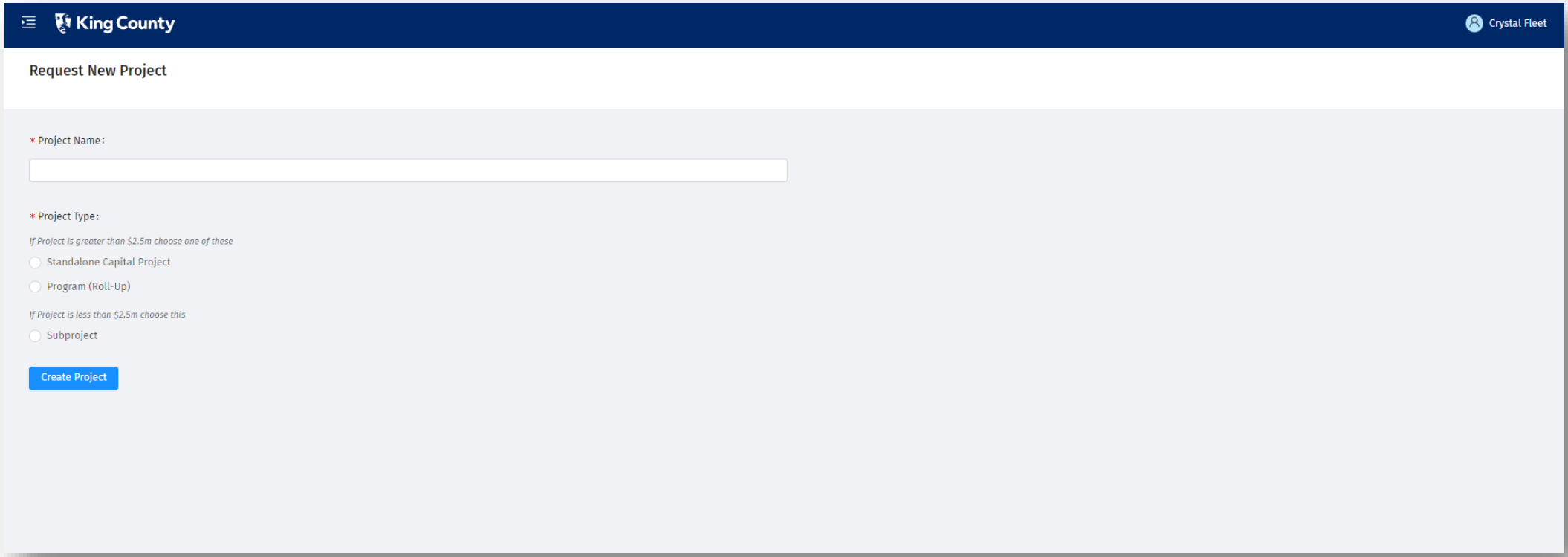
Resource Recovery

Project Request Process

- South Plant Raw Sewage Pump #3 Request Portfolio Management (vms-pro.com)



Project Request Process



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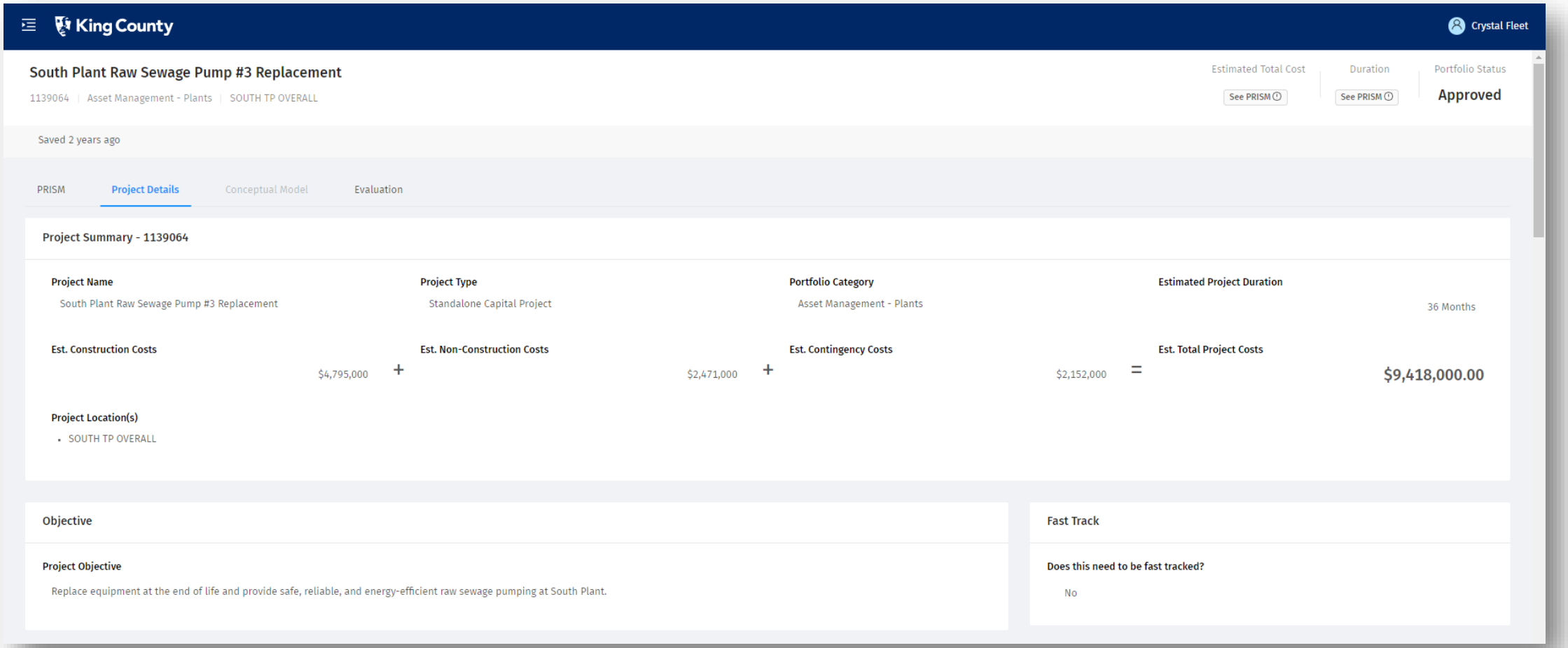

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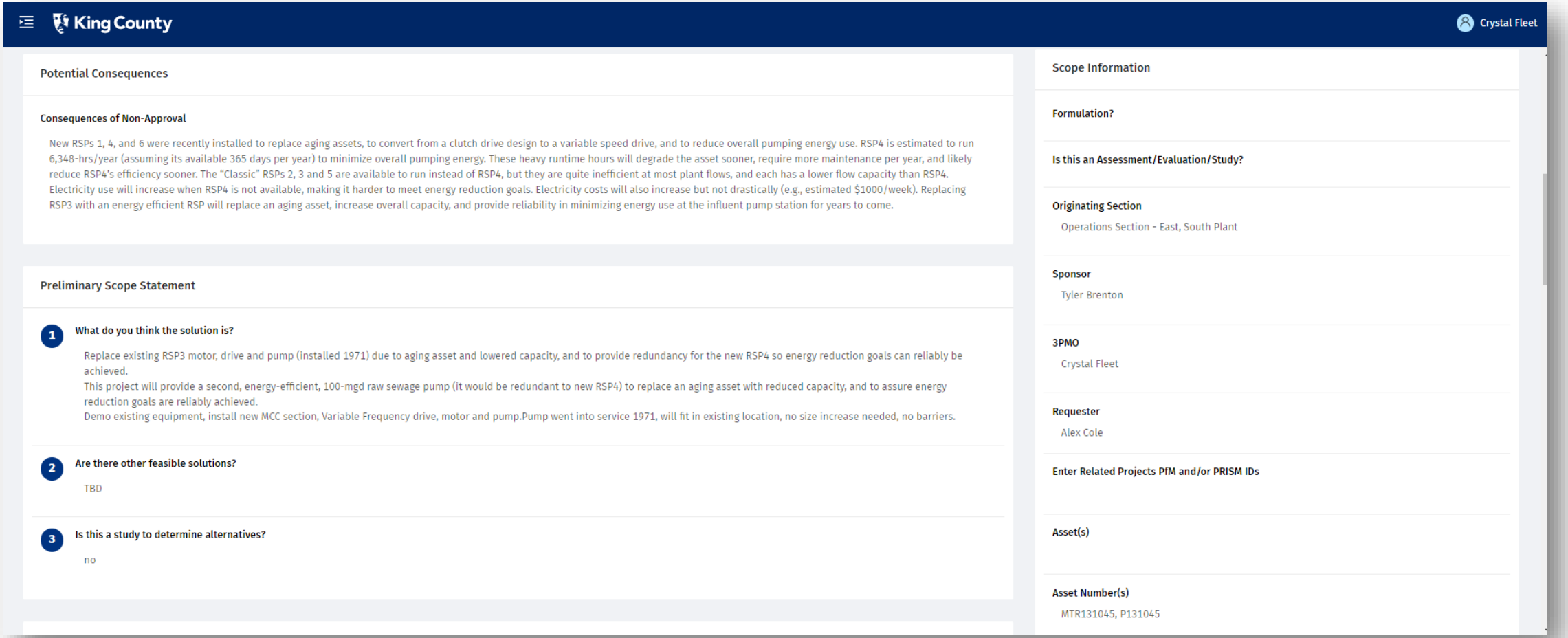

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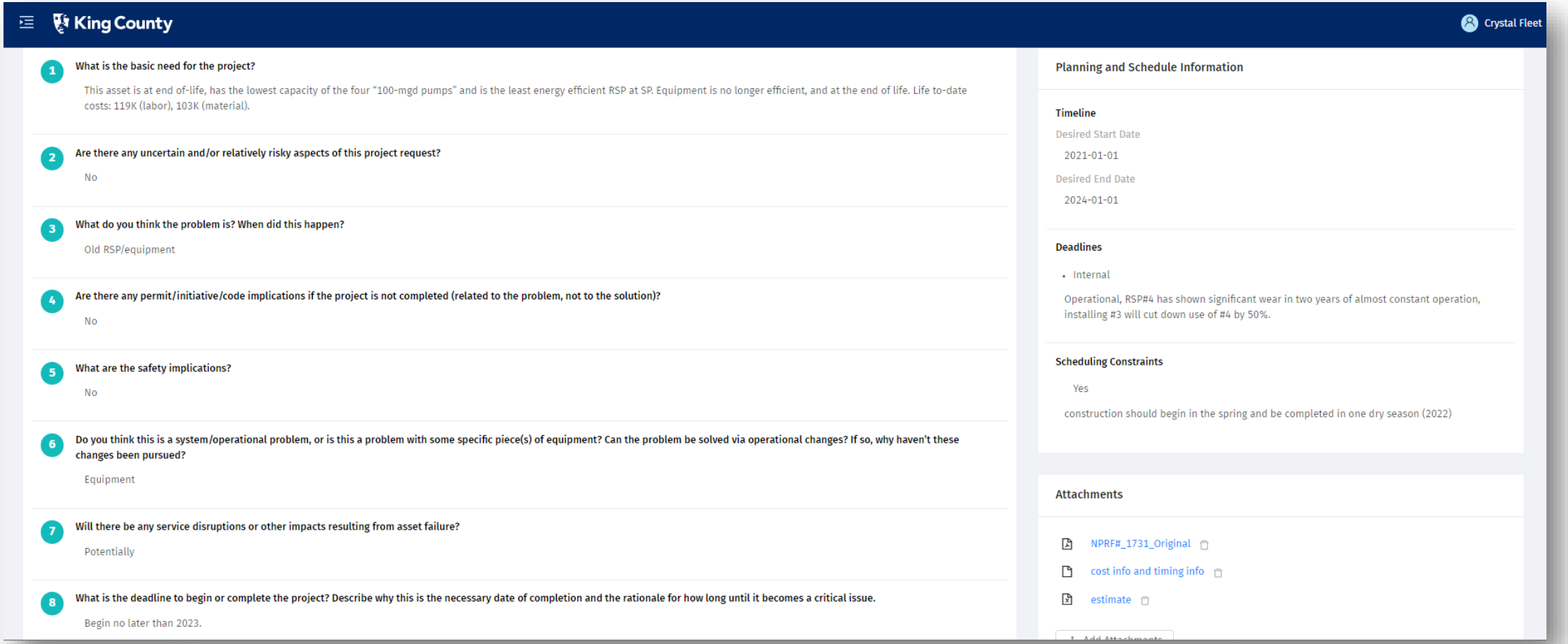

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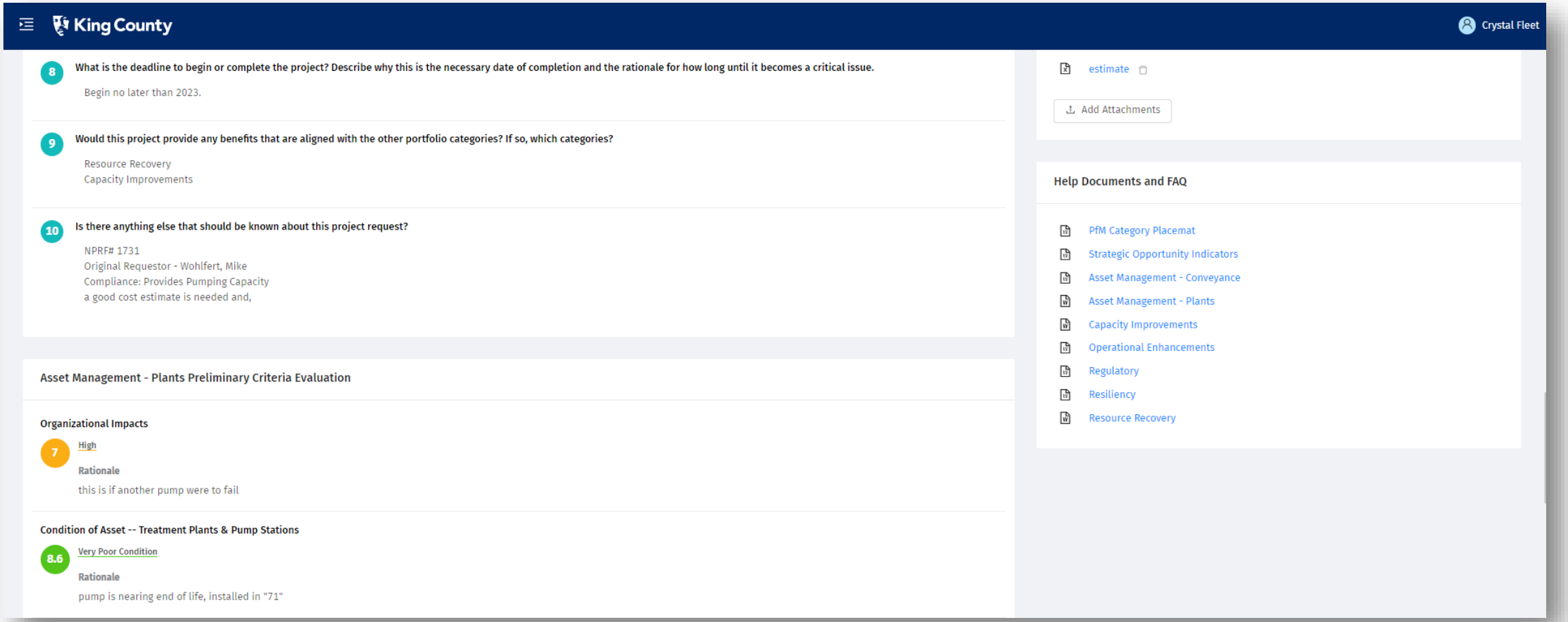
Project Request Process



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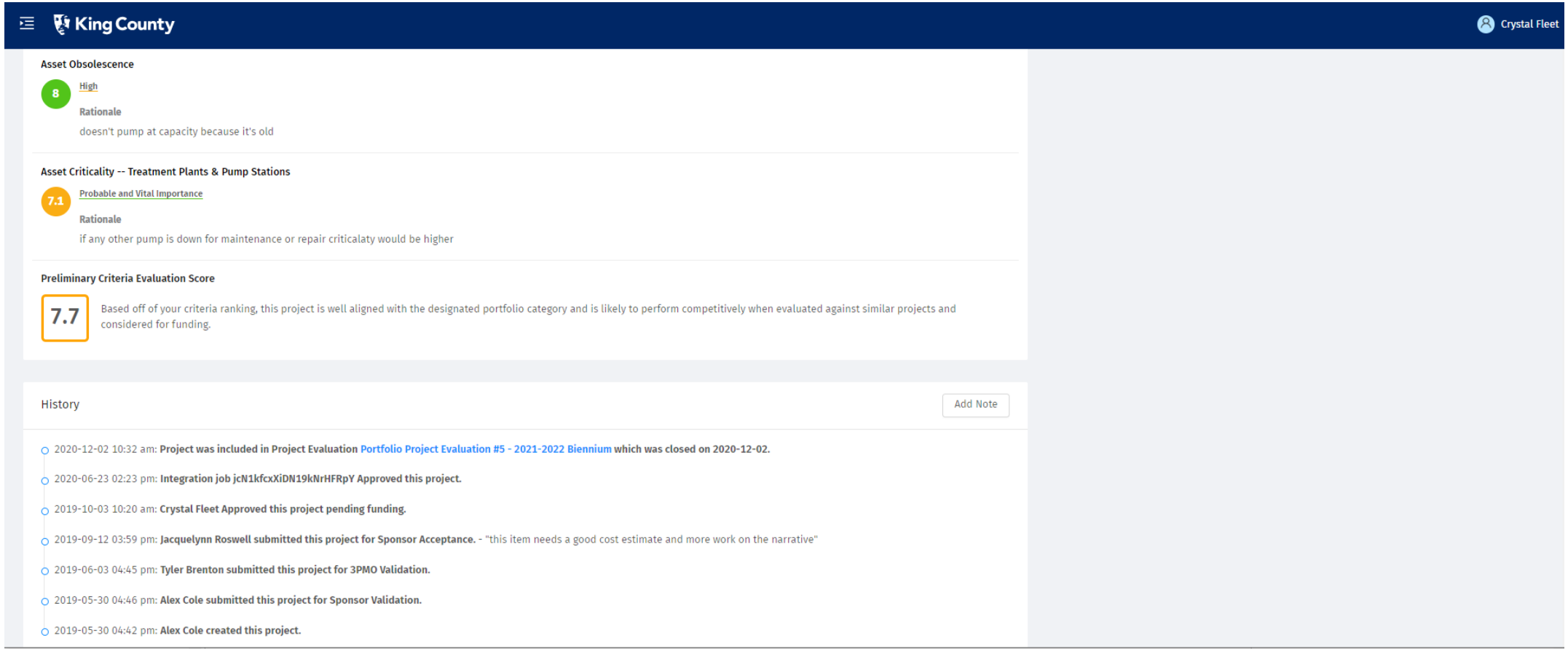
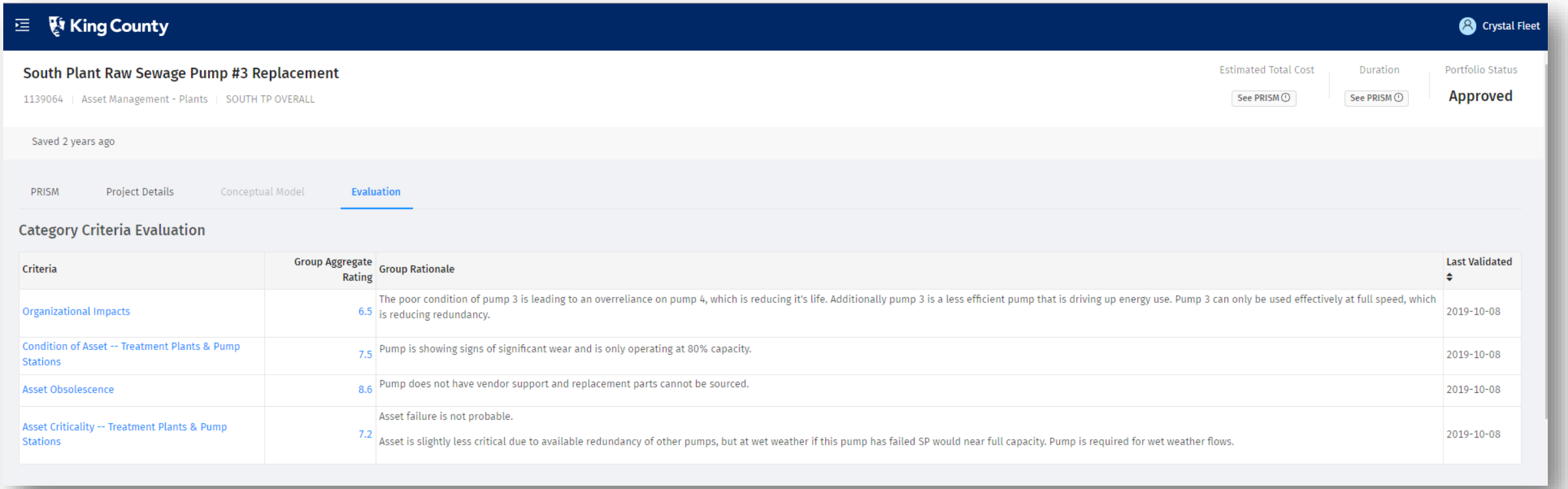
Project Request Process

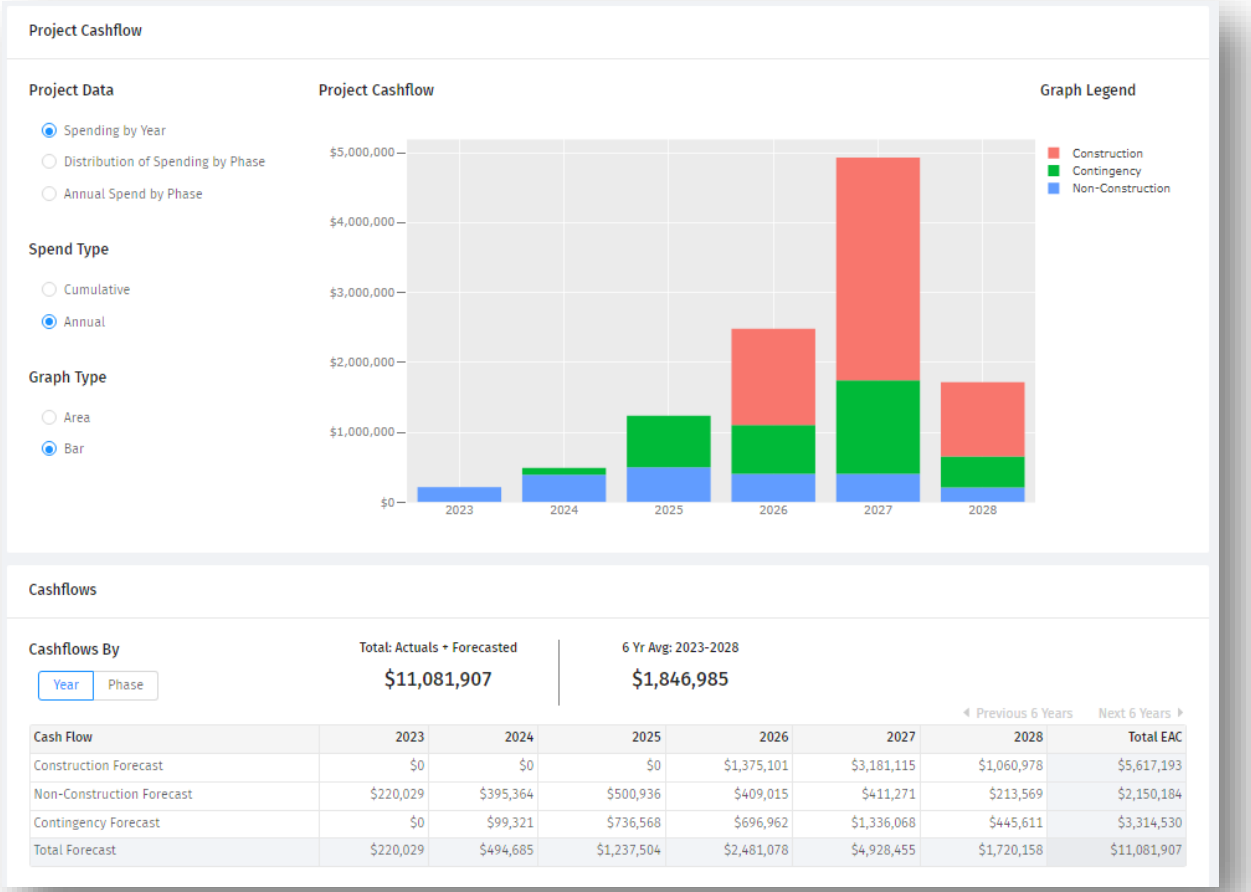


Project Evaluation Process



Project Cost Estimating and Forecasting

A	B	C	D	E	F
Estimate - AACEI Class 5					
Project Nam				Date:	
Location:				Estimator:	
Description				Version:	
DIRECT: SUBTOTAL CONSTRUCTION COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1					$ -
2					$ -
3					$ -
4					$ -
5					$ -
6					$ -
7					$ -
8					$ -
9					$ -
10					$ -
				Subtotal Construction Costs	$ -
				Allowance for Indeterminates (Design Allowance)	$ -
				Street Use Permit	$ -
				ESTIMATED PROBABLE COST OF CONSTRUCTION BID	$ -
DIRECT: SUBTOTAL ADDITIONAL CONSTRUCTION COSTS					
				Mitigation Construction Contracts	$ -
				Construction Change Order Allowance	$ -
				Material Pricing Uncertainty Allowance	$ -
				Subtotal Primary Construction Amount	$ -
				Construction Sales Tax	$ -
				Owner Furnished Equipment	$ -
				Outside Agency Construction	$ -
				Subtotal KC Contribution to Construction	$ -
DIRECT: SUBTOTAL OTHER CAPITAL CHARGES					
				KC/WTD Direct Implementation	$ -
				Misc. Capital Costs	$ -
				TOTAL DIRECT CONSTRUCTION COSTS	$ -
INDIRECT: NON-CONSTRUCTION COSTS					
				Design and Construction Consulting	$ -
				Other Consulting Services	$ -
				Permitting & Other Agency Support	$ -
				Right-of-Way	$ -
				Misc. Service & Materials	$ -
				Non-WTD Support	$ -
				WTD Staff Labor	$ -
				Subtotal Non-Construction Costs	$ -
				Project Contingency	$ -
				Initiatives	$ -
				TOTAL INDIRECT NON-CONSTRUCTION COSTS	$ -
				TOTAL PROJECT COST	$ -



Cash Flow	2023	2024	2025	2026	2027	2028	Total EAC
Construction Forecast	$0	$0	$0	$1,375,101	$3,181,115	$1,060,978	$5,617,193
Non-Construction Forecast	$220,029	$395,364	$500,936	$409,015	$411,271	$213,569	$2,150,184
Contingency Forecast	$0	$99,321	$736,568	$696,962	$1,336,068	$445,611	$3,314,530
Total Forecast	$220,029	$494,685	$1,237,504	$2,481,078	$4,928,455	$1,720,158	$11,081,907

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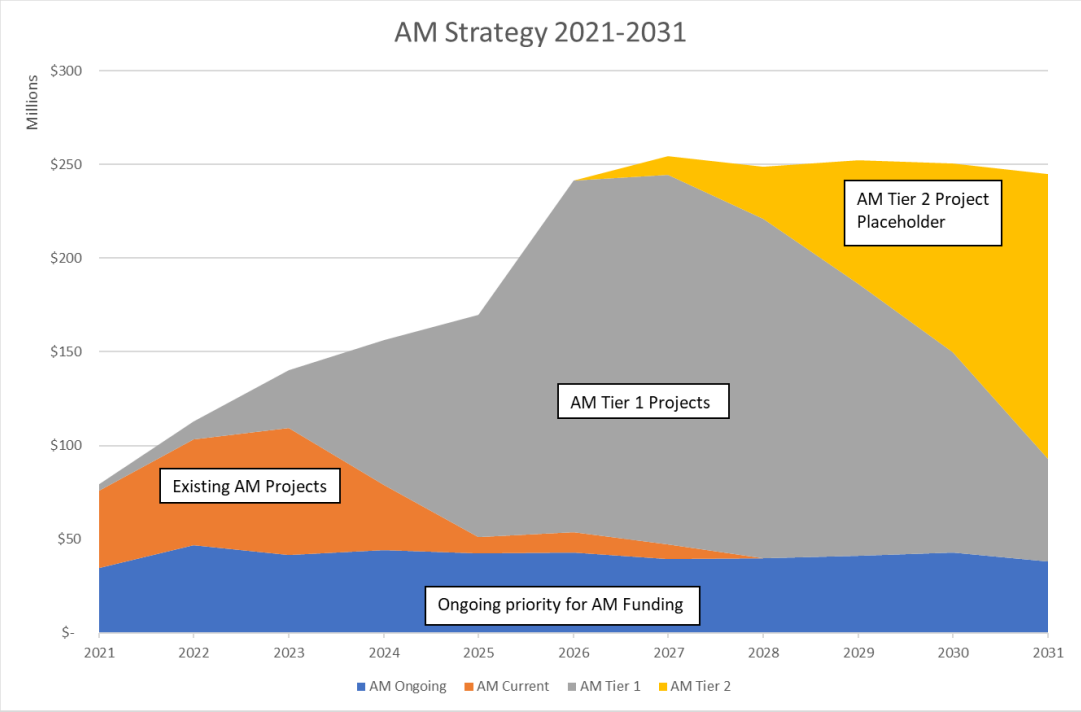
AM Category Forecast Development

2022 Sewer Rate AM Category



How Each Layer is Estimated

Layer	Forecast Type	Potential Variability
Ongoing Priority – low cost, routine	Individual subproject forecasts + historical spending averages	Low
Existing AM Projects – highest priority, currently in delivery	Individual project cost and schedule forecasts	Moderate – cost estimates range from planning level through construction bid, durations subject to individual and global risks
AM Tier 1 Projects – currently poor condition or obsolete; high consequences of failure	Individual project cost estimates and analogous durations, composed of unfunded projects sequenced to meet 2030 priority inventory goal	Significant – cost estimates range from pre-planning through planning level, projects may be added or rescheduled based on emerging conditions, highly dependent on completing existing projects and future resource availability
AM Tier 2 Project Placeholder – assets expected to age into inventory	Extrapolates peak forecast average	Significant – rough order of magnitude

Conclusion

- Assets are managed in a whole life continuum approach
- Projects are inventoried in the capital portfolio through a project request process, which relies on human decision making
- Projects in the inventory are scored by subject matter experts using objective criteria to evaluate information from the project request
- The portfolio forecast relies on aggregation of individual inventoried project forecasts aligned to meet strategic goals
- The further out the forecast, the more uncertainty there is

Questions?

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