Asset Management
Answering the 5 Core Questions

by Timothy Taber, PE
Barton & Loguidice

Engineers • Environmental Scientists • Planners • Landscape Architects

Agenda

Asset Management Case Study

1. What is the current state of my assets?
2. What is my required “sustainable” level of service?
3. Which assets are critical to sustained performance?
4. What are my minimum life cycle costs?
5. What is my best long-term funding strategy?

Question #1

What is the current state of my assets?

- What do I own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its remaining economic value?

What is the current state of my assets?

What do I own? - Where is it?

Pick Equipment From Active Records.

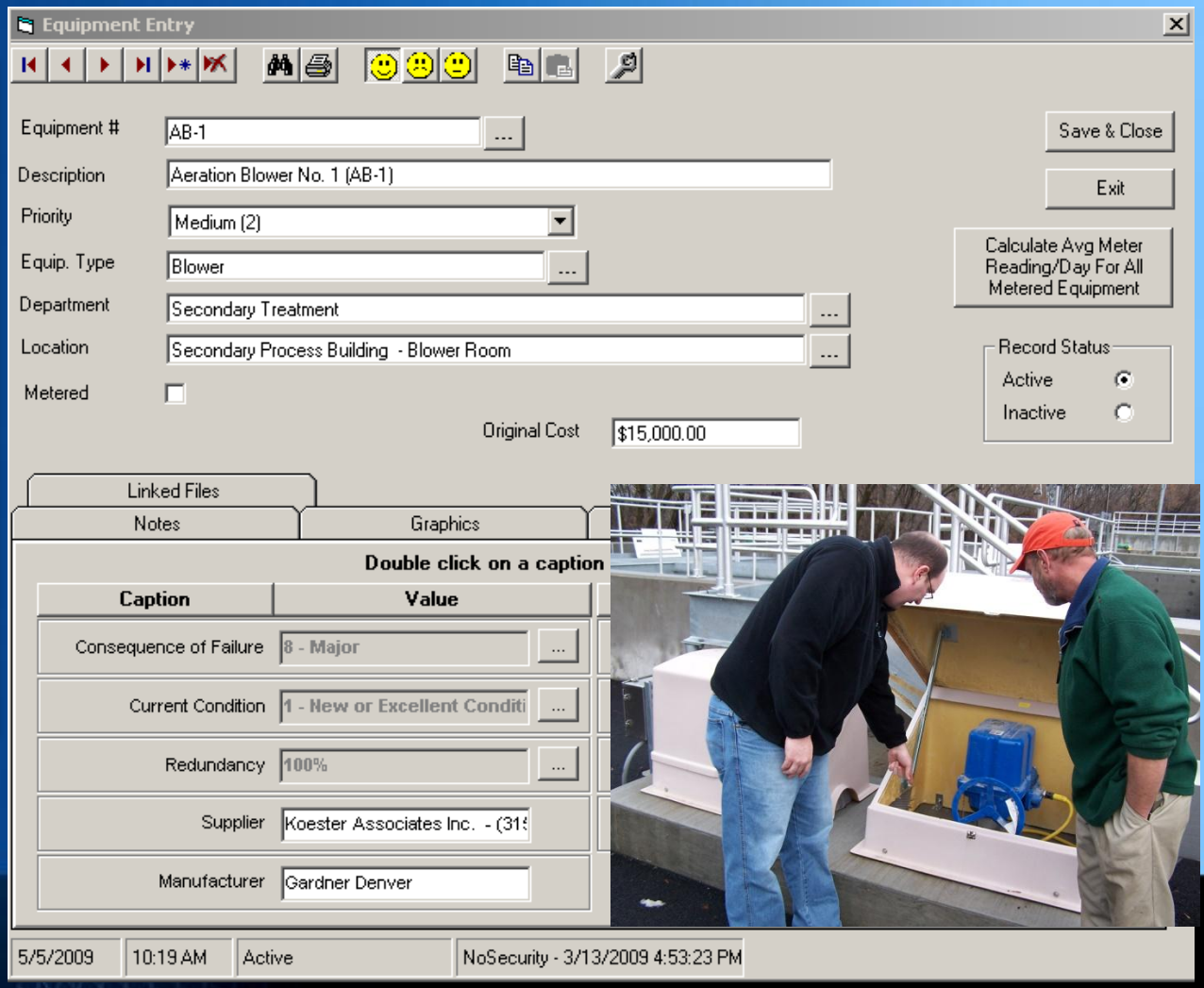
OK | Cancel | Find | Filter | Print | Export

Equipmer	Description	Location	Department	Type
AB-1	Aeration Blower No. 1 (AB-1)	Secondary Process Building - Blower Room	Secondary Treatment	Blower
AB-1 MOT	Aeration Blower No. 1 Motor	Secondary Process Building - Blower Room	Secondary Treatment	Motor
AB-2	Aeration Blower No. 2 (AB-2)	Secondary Process Building - Blower Room	Secondary Treatment	Blower
AB-2 MOT	Aeration Blower No. 2 Motor	Secondary Process Building - Blower Room	Secondary Treatment	Motor
AB-3	Aeration Blower No. 3 (AB-3)	Secondary Process Building - Blower Room	Secondary Treatment	Blower
AB-3 MOT	Aeration Blower No. 3 Motor	Secondary Process Building - Blower Room	Secondary Treatment	Motor
AB-4	Aeration Blower No. 4 (AB-4)	Secondary Process Building - Blower Room	Secondary Treatment	Blower
AB-4 MOT	Aeration Blower No. 4 Motor	Secondary Process Building - Blower Room	Secondary Treatment	Motor
AB-5	Aeration Blower No. 5 (AB-5)	Secondary Process Building - Blower Room	Secondary Treatment	Blower
AB-5 MOT	Aeration Blower No. 5 Motor	Secondary Process Building - Blower Room	Secondary Treatment	Motor
AC-1	Air Conditioner (AC-1)	Administration Building - Bacterial Lab	HVAC	HVAC
AC-2	Air Conditioner (AC-2)	Administration Building - Outdoors	HVAC	HVAC
AC-3	Air Conditioner (AC-3)	Administration Building - Wastewater Lab	HVAC	HVAC
ADM-FAP	Administration Building Fire Alarm Control Panel	Administration Building - Lobby	Safety	Control Panel
ADM-PB	Administration Building - Phone Board	Administration Building - Mechanical Room	Computer	Control Panel
ADP-1	Aeration Tank Dewatering Pump (ADP-1)	Secondary Process Building - Pump Gallery	Secondary Treatment	Pump
AFM-1	Air Flow Meter - 1	Aeration Tanks - Aeration Tank No. 1	Secondary Treatment	Meters
AFM-2	Air Flow Meter - 2	Aeration Tanks - Aeration Tank No. 2	Secondary Treatment	Meters
AFM-3	Air Flow Meter - 3	Aeration Tanks - Aeration Tank No. 3	Secondary Treatment	Meters
AFM-4	Air Flow Meter - 4	Aeration Tanks - Aeration Tank No. 4	Secondary Treatment	Meters
AHU-1	Air Handling Unit No. 3 (AHU-3)	FST Complex (Building) - Electrical Room	HVAC	HVAC

Information needed on my assets?

Information for Asset Management

- Consequence of Failure
- Current Condition
- % Redundancy
- Installation Date
- Expected Life
- Replacement Cost



Asset Expected Life Guidelines

Asset Type	Estimated Useful Life
Buildings	37.5
Charger	12.5
Computer Equipment / Software	5
Concrete & Metal Storage Tanks	45
Disinfection Equipment	10
Distribution Pipes	37.5
Door	37.5
Galleries and Tunnels	35
Hydrants	45
Hydropneumatic Tanks	10
Intake Structures	40
Lab / Monitoring Equipment	6
Land	300
Meters	12.5

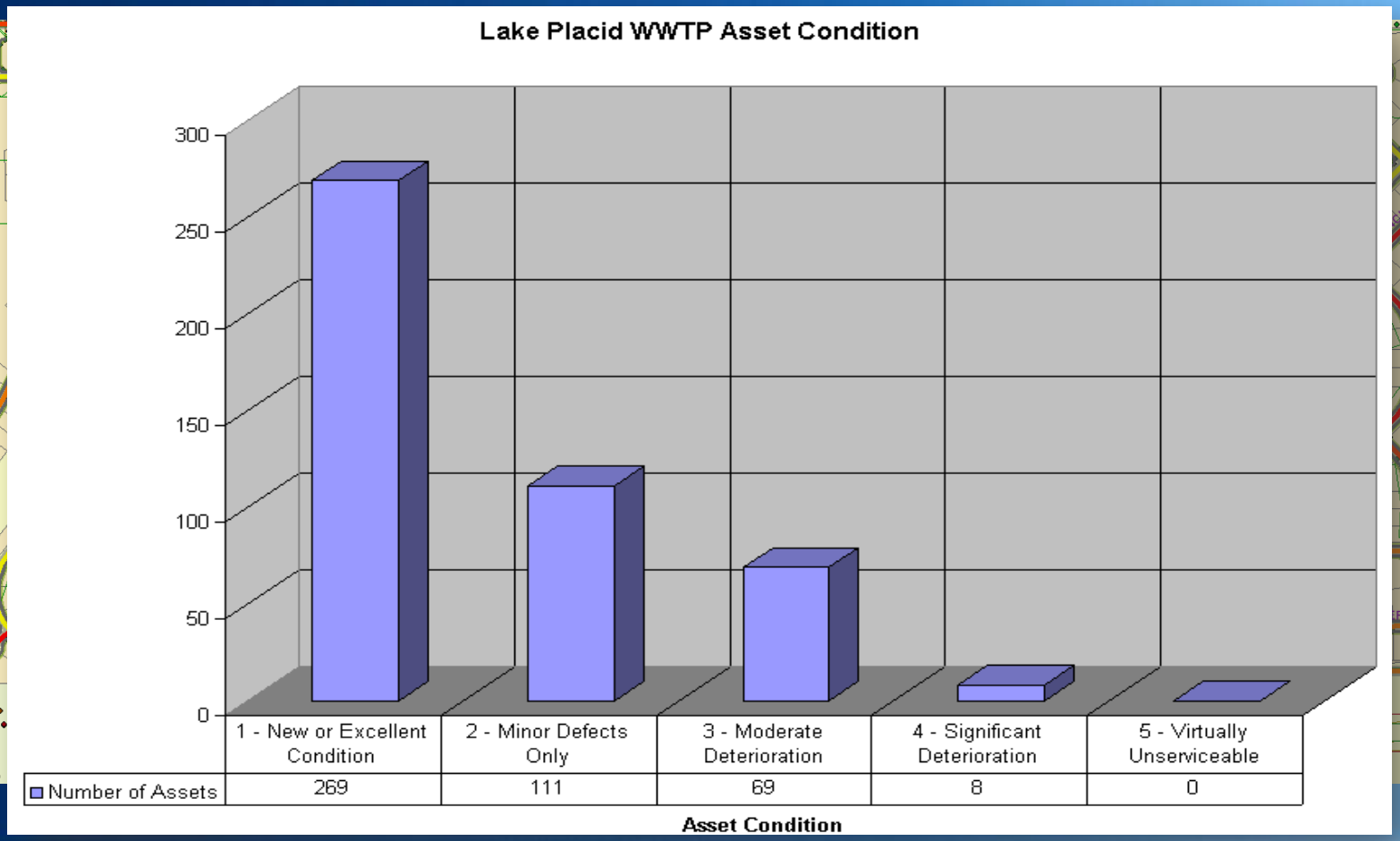
Asset Type	Estimated Useful Life
Motor Controls / Drives	10
Pressure Pipework	60
Pumping Equipment	10
Security Equipment	7
Sensors	8.5
Service Lines	35
Sewers	100
Tools and Shop Equipment	12.5
Transformers / Switchgears / Wiring	20
Transmission Mains	37.5
Transportation Equipment	10
Treatment Equipment	12.5
Valves	30
Wells and Springs	30

What is the current state of my assets?

What do I own? - Where is it?

What is the current state of my assets?

What condition is it in?



Condition Assessment Protocols (CAP's)

Which assets? What information? *How used?*

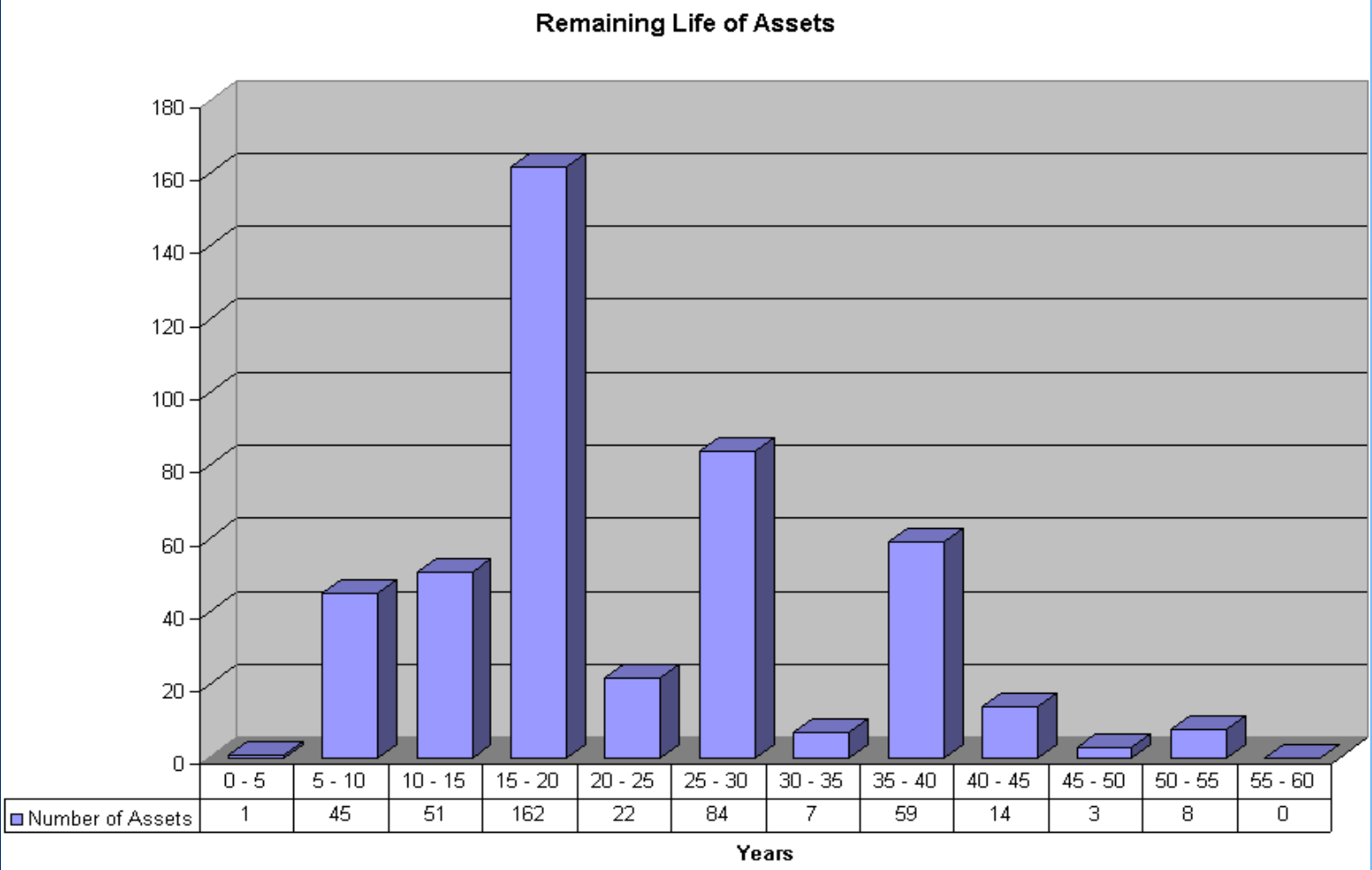
CAP 1 - A simple scoring system: "good, fair, poor" or 1-5 or 1-10

CAP 2 - A matrix scoring system with multiple distress factors and weightings to derive a score

CAP 3 - Use of sophisticated techniques to determine the "residual life to intervention" or end of physical life

What is the current state of my assets?

What is its remaining useful life?



Question #2

What is my required level of service?

- What is the demand for my services by my stakeholders?
- What do regulators require?
- What is my actual performance?

Why LOS?

It helps us…

- **Concentrate (focus) efforts & resources**
  - On agreed on service levels
  - Less “service level defined by notion”
- **Communicate service expectations and choices**
  - Increased service = increased costs
  - Discussion of trade-offs & risks
- **Negotiate (regulators and council/commission/board)**
  - Service levels
  - Costs & budgets
  - Rate impacts
  - Reinvestments for Renewal
  - Level of Risk

The Management Model

Customer Expectations	Cost of Service	Level of Service	Business Risk

What is my required level of service?

Level of Service	Target
Employee health and safety	Zero Injuries
Competitive rates / taxes	Within 5% of New York State average
Public image	No adverse media reports
Compliance with effluent discharge permits	100%

LOS statement

ENVIRONMENTAL

Key Performance Indicators	2005 Target Level of Service
1. OCSD will comply with effluent quality standards.	
a. Compliance with all Ocean Discharge Permit Limits, %	100%
b. Concentration of Emerging Chemical Constituents of Concern, Plant No. 1 Secondary Effluent	NDMA < 150 ppt 1,4 Dioxane <2ppb
c. Effluent total coliform bacteria after initial dilution, mpn	<1,000
a. Odor complaints: Reclamation Plant No. 1	
Treatment Plant No. 2	5
Collection System	4
b. Air emissions health risk to:	
Community, cancer risk per 1 million	<25
Employees	<25
c. Air mass emissions permit compliance, %	100%

SOCIAL

Key Performance Indicators	2005 Target Level of Service
1. OCSD will be a good neighbor and will be responsive to its customers.	
a. Off site Biosolids nuisance complaints	0
b. Odor complaint response	
Treatment Plants within 1 hour	100%
Collection System within 1 working day	100%
2. OCSD will provide public access to OCSD information.	
a. Public Records Act requests within 10 working days	100%
b. Post Board/Committee Agenda Packages 72 hours prior to meeting	100%
c. Post studies and reports on OCSD website within 1 week of receive/file.	100%
3. OCSD will take care of its people.	
a. Training hours per employee	45
b. Employee Injury Incident Rate	<3.75
c. COP service Principal and Interest	< than O&M expenses
d. Annual SFR user fee increase	not more than 15%
e. Annual user fees	Sufficient to cover all O&M requirements
f. Annual increase in collection, treatment, and disposal costs per million gallons	< 10%
g. Annual variance from adopted reserve policy	<5%

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Question #3

Which assets are critical to sustained performance?

- **How doe… fail?**
- **What…**
- **What doe…**
- **What are the consequences of failure?**

Which assets are critical to sustained performance?

Consequence of Failure

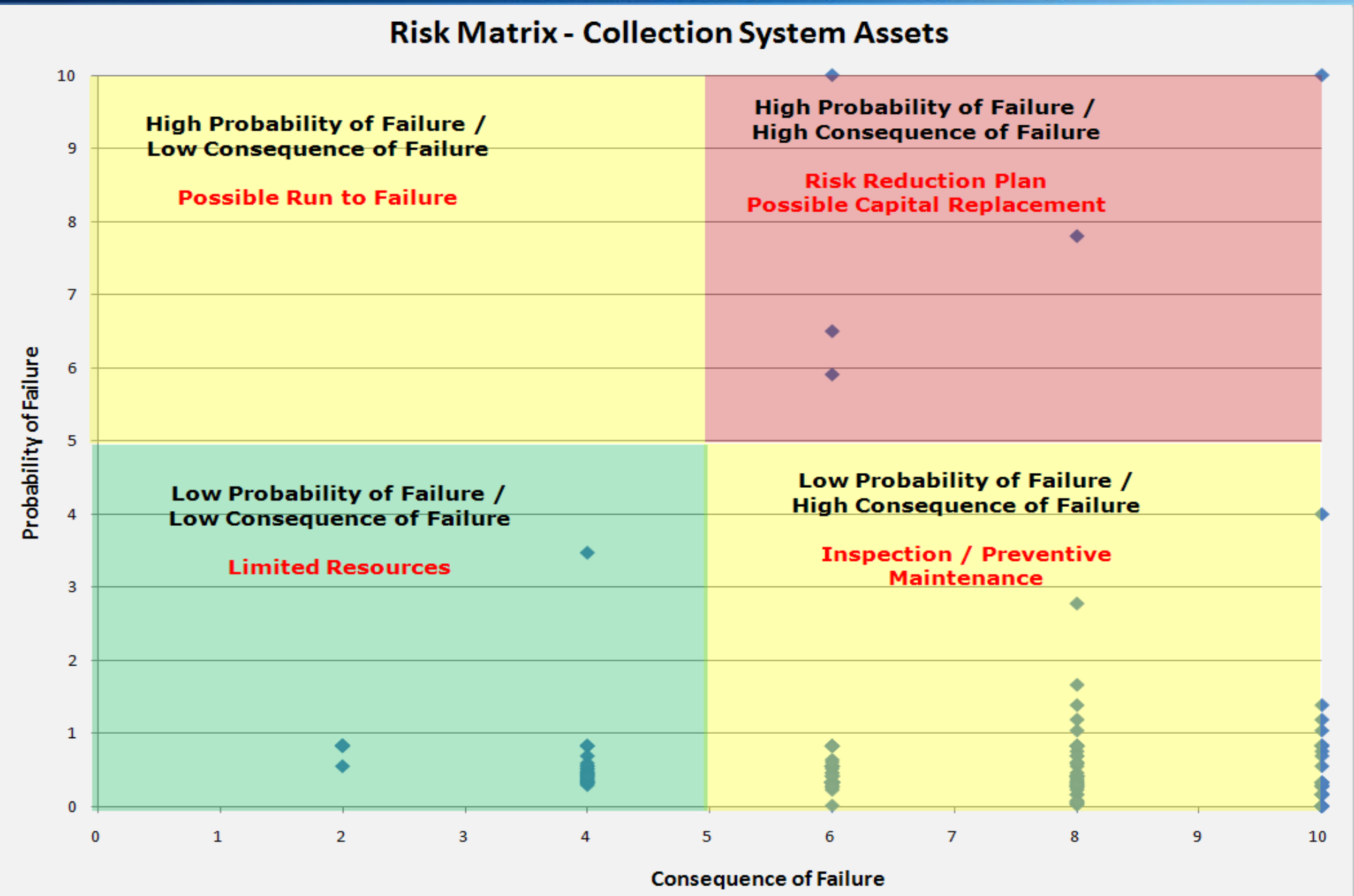
1. Spill, Flood, Odor
2. Water or Effluent Quality
3. Regulatory Compliance
4. Loss of Service to Customers
5. Equipment and Safety
6. Economic Impact

Scoring Criteria
2 - Insignificant
4 - Minor
6 - Moderate
8 - Major
10 - Catastrophic

Which assets are critical to sustained performance?

Description	Remaining Life	Life (Range)	Replacement Date	Replacement Costs (Inflated)	Consequence of Failure	Probability of Failure	Risk
MCC-1	-9.84	0 - 5	7/2/99	$ 7,000.00	6	13.36	**80.14**
Golf Course Irrigation Pump	-0.09	0 - 5	4/1/09	$ -	8	9.99	**79.93**
Air Incubator	-1.09	0 - 5	4/1/08	$ 1,000.00	4	12.50	**50.02**
Dissolved Oxygen Meter & Probe	1.99	0 - 5	5/1/11	$ 2,000.00	6	8.27	**49.61**
TSS Analyzer	-0.34	0 - 5	1/1/09	$ 1,000.00	4	11.47	**45.87**
Analytical Balance	-0.34	0 - 5	1/1/09	$ 2,000.00	4	11.47	**45.87**
Floor Mounted Main Aeration Sy	7.66	10 - 15	1/1/17	$ 6,000.00	8	5.73	**45.84**
Secondary Process Building - Fire Alarm Control Panel	6.66	10 - 15	1/1/16	$ 2,000.00	8	5.25	**42.02**
UV Disinfection System	6.66	10 - 15	1/1/16	$ 37,000.00	8	5.25	**42.02**
Gas Monitoring System	6.66	10 - 15	1/1/16	$ 1,000.00	8	5.25	**42.02**
Ethernet Switching	6.66	10 - 15	1/1/16	$ 12,000.00	8	5.25	**42.02**
HP Workstation	1.16	0 - 5	7/2/10	$ 2,000.00	4	10.50	**42.02**
Multiparameter Meter w/Probe	0.32	0 - 5	8/31/09	$ 3,000.00	4	10.41	**41.63**
Conductivity Meter & Probes	0.32	0 - 5	8/31/09	$ 1,000.00	4	10.41	**41.63**
Refrigerator	2.12	0 - 5	6/20/11	$ 1,000.00	4	10.10	**40.39**
SCADA-2	2.36	0 - 5	9/13/11	$ 2,000.00	4	9.24	**36.94**
Lab Computer	2.36	0 - 5	9/13/11	$ 2,000.00	4	9.24	**36.94**
Laser Printer	2.36	0 - 5	9/13/11	$ -	4	9.24	**36.94**
Color Printer	2.36	0 - 5	9/13/11	$ -	4	9.24	**36.94**
Photo Copier	2.36	0 - 5	9/13/11	$ 1,000.00	4	9.24	**36.94**
RAS Flow Meter and Display	10.66	10 - 15	1/1/20	$ 4,000.00	8	4.58	**36.67**
Autoclave	1.57	0 - 5	12/1/10	$ 5,000.00	4	8.84	**35.35**
Water Incubator	1.57	0 - 5	12/1/10	$ 1,000.00	4	8.84	**35.35**
Lab Water System	1.57	0 - 5	12/1/10	$ 5,000.00	4	8.84	**35.35**
Overfill Alarm System	8.86	10 - 15	3/15/18	$ 3,000.00	8	4.38	**35.02**

Which assets are critical to sustained performance?



Four Major *Failure Modes*

Failure Mode	Definition	Tactical Aspects	Management Strategy
Capacity	Volume of demand exceeds design capacity	Growth, system expansion	Redesign
Level of Service	Functional requirements exceed design capacity	Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety; service, etc.	O&M optimization, renewal
Mortality	Consumption of asset reduces performance below acceptable level	Physical deterioration due to age, usage (including operator error), acts of nature	O&M optimization, renewal
Financial Efficiency	Operations costs exceed that of feasible alternatives	Pay-back period	Replace

Which assets are critical to sustained performance?

Consequence by LOS Category

Consequence Category	Weight	Negligible = 1	Low = 4	Moderate = 7	Severe = 10
Health &Safety	0.20	**No injuries or adverse health effects**	**No lost-time injuries or medical attention**	**Lost-time injury or medical attention**	**Loss of life**
Compliance with Regulation	0.20	**100% compliance with permits**	**Technical violation but no enforcement action**	**Violation with minor enforcement action**	**Enforcement action with fines**
Financial Impact	0.10	**Absorbed within budget line item**	**Absorbed within current budget**	**May require transfer from reserves**	**May require new borrowing or im pact rates**
Disruption to the Community	0.15	**No social or economic impact**	**Minor disruption (e.g., traffic, dust, noise)**	**Short-term impact; substantial disruption**	**Long-term impact; area-wide disruption**
Service Delivery	0.20	**No overflows, backups, or odors**	**No dry weather overflows or backups; infrequent odors**	**Short duration dry weather overflows or backups; occasional odor**	**Numerous overflows, backups; widespread or persistent odors**
Ability to Respond and Continue Service	0.15	**< 2 hours**	**2 to < 8 hours**	**8 to < 24 hours**	**> 24 hours**

Sample Likelihood of Failure Matrix and Scoring System

Likelihood of Asset Failure by Category

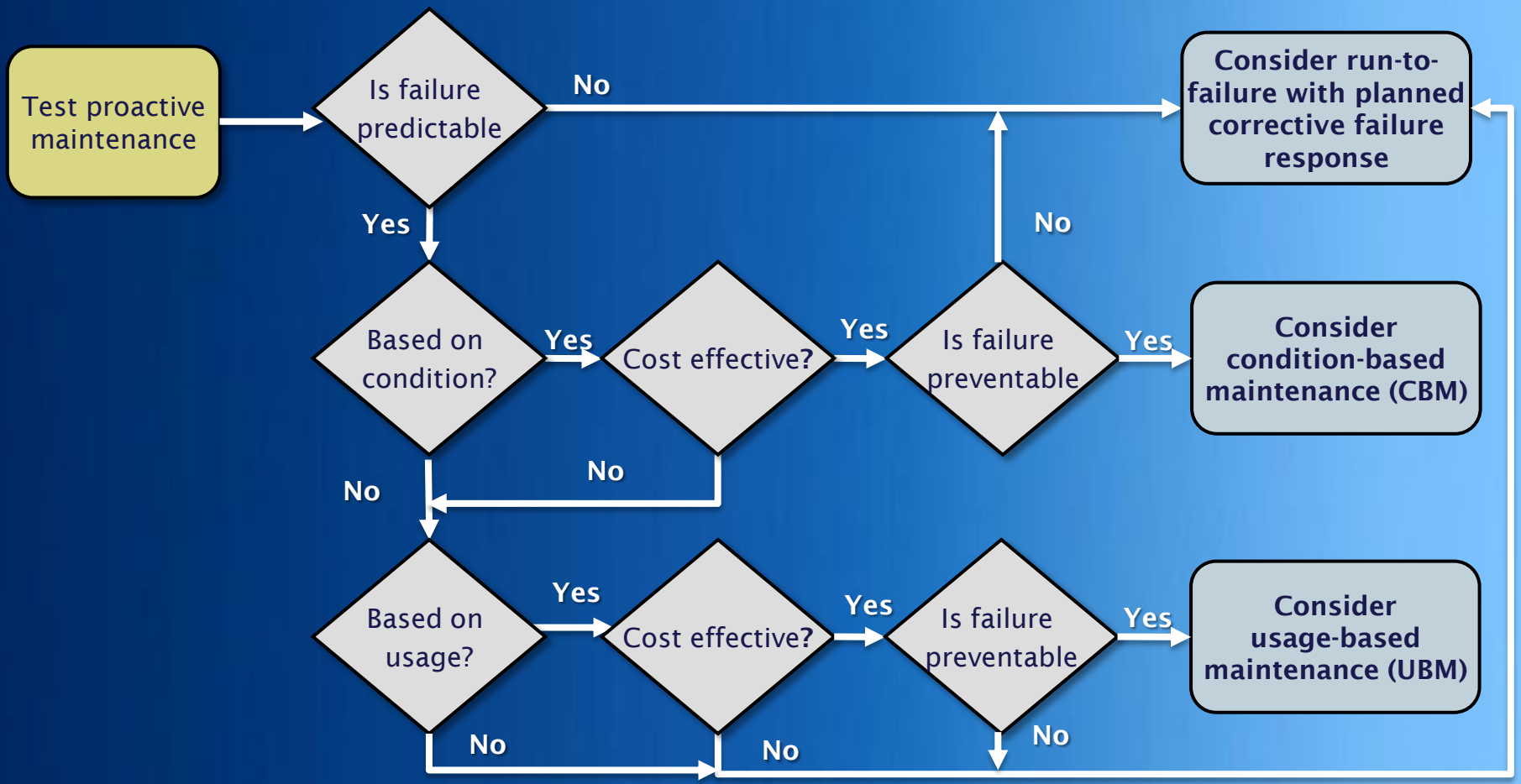
Likelihood Category	Weight	Negligible = 1	Unlikely = 2	Possible = 4	Likely = 7	Very Likely = 10
Physical Condition	0.60	Very good (Condition Grade I)	Good (Condition Grade 2)	Fair (Condition Grade 3)	Poor (Condition Grade 4)	Very poor (Condition Grade 5)
Performance	0.20	Sufficient capacity to meet average and peak flow requirements; appropriate utilization and function	Under-utilized or oversized, causing O&M issues	Sufficient capacity but does not meet functional requirements or over-utilized	Able to meet current average capacity demands but not peak demands	Unable to meet current average capacity needs
O&M Protocols	0.05	Complete,. up-to-date written/ online, easily accessible	Complete, written/online, up-to-date, but not easily accessible	Written/online but not complete, not up-to-date, or not easily accessible	Written/online but not complete, out-of-date, or location is unknown	None
Reliability: Planned maintenance as a % of total maintenance	0.15	> 75%	SO% to 75%	35% to 50%	25% to 35%	< 25%

Question #4

What are my best O&M and CIP investment strategies?

- **What alternative management options exist?**
- **Which are the most feasible for my organization?**

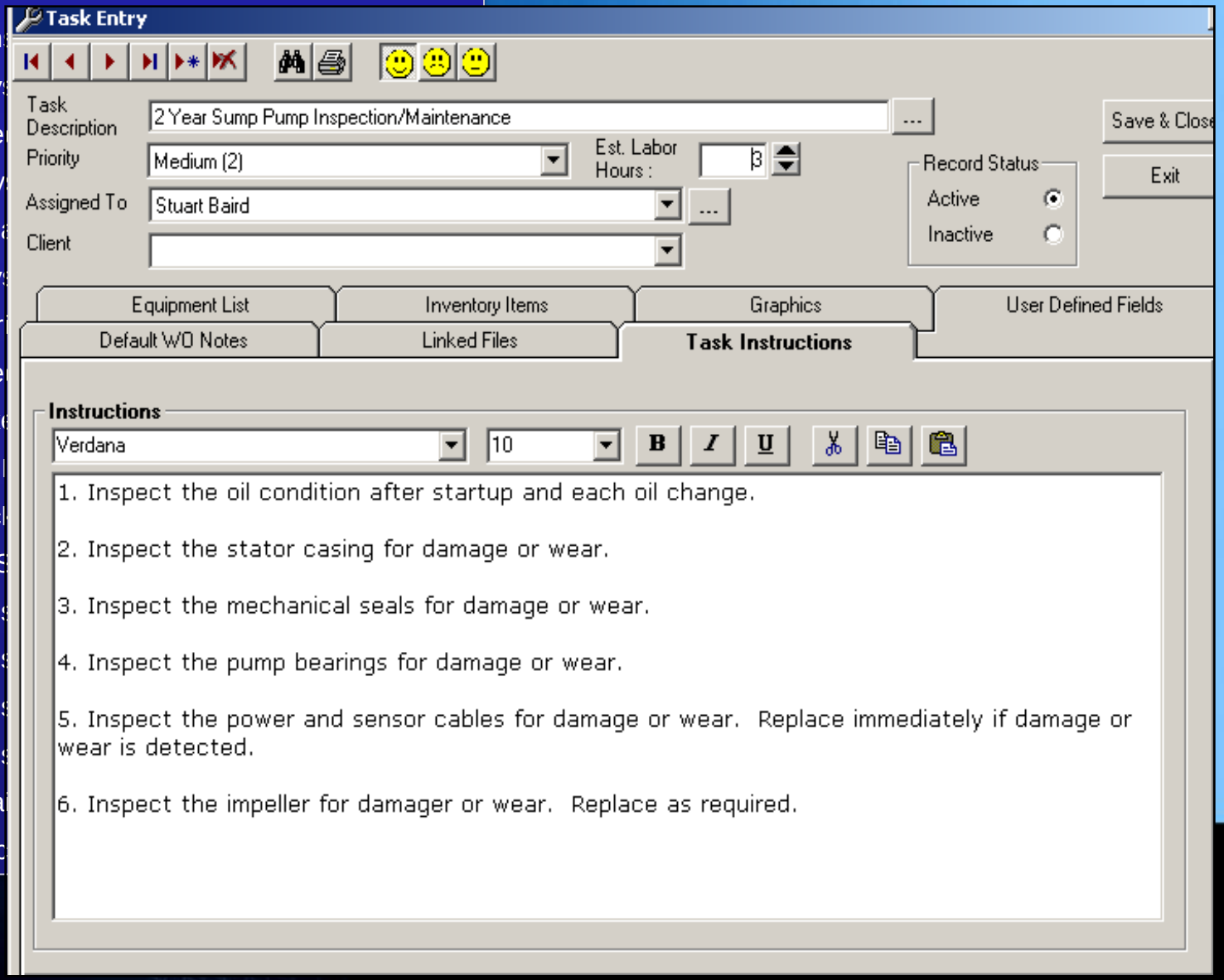
Determine Proactive Maintenance Strategy



What are my best O&M and CIP investment strategies?

Description

2 Year Belt Filter Press In
2 Year Chemical Feed Sy
2 Year Sump Pump Inspe
2 Year UV Disinfection Sy
3 Year Aeration Blower Ma
5 Year Chemical Feed Sy
5 Year Maintenance of Gr
5 Year Sump Pump Inspe
6 Month Anoxic Zone Mix
6 Month Belt Filter Press
6 Month Gravity Belt Thic
6 Month UV Disinfection S
Aeration Tank No. 1 Gate
Aeration Tank No. 2 Gate
Aeration Tank No. 3 Gate
Aeration Tank No. 4 Gate
Annual Clarifier Drive Ma
Annual Air Diffuser Inspec



What are my best O&M and CIP investment strategies?

Edit/Cl

Work Order 533

Facility: Lake Placid **Date Complete:** _____

Work Order History by Equipment with Work Order Notes
04/28/2009 To 05/12/2009

WO#	Date Complete	Task Description	Type*	Assigned to	Hours	Labor Cost	Inventory Cost	Misc. Cost	Total Cost	Lag Time**
Equipment:	**CF-1 - Caustic Feed Pump No. 1 (CF-1)**									
350	5/5/2009	Annual Chemical Feed System Maintenance	P		32.00	$960.00	$9,132.00	$0.00	$10,092.00	1
	Notes:									
Number of WO's	**1**			**Sub Totals:**	**32.00**	**$960.00**	**$9,132.00**	**$0.00**	**$10,092.00**	**1.00**
Equipment:	**EFF-1 - Effluent Sampler EFF - 1**									
443	5/5/2009	Quarterly Wastewater Sampler Maintenance	P		33.00	$990.00	$0.00	$0.00	$990.00	6
	Notes:									
Number of WO's	**1**			**Sub Totals:**	**33.00**	**$990.00**	**$0.00**	**$0.00**	**$990.00**	**6.00**
Equipment:	**FST-2 DRIVE - Final Settling Tank No. 2 Drive**									
477	5/5/2009	Monthly Clarifier Drive Equipment Maintenance	P		111.00	$3,330.00	$0.00	$0.00	$3,330.00	-6
	Notes:									
Number of WO's	**1**			**Sub Totals:**	**111.00**	**$3,330.00**	**$0.00**	**$0.00**	**$3,330.00**	**-6.00**

5/5/2009

3. Slowly pour hydraulic fluid into funnel and continue filling reservoir until full.

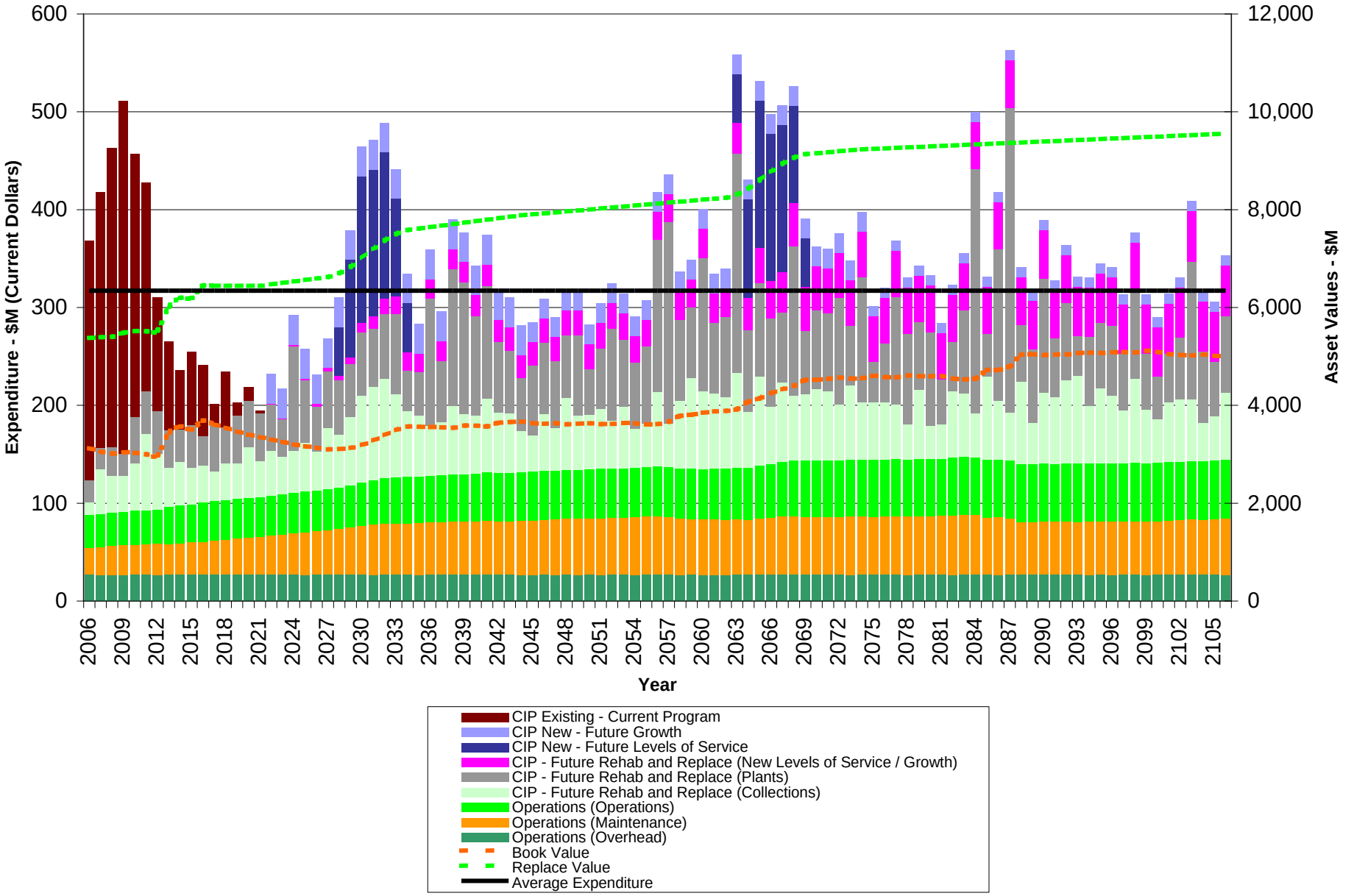
CAUTION: Use a Trojan approved hydraulic fluid. Please refer to Material Safety Data Sheets in

What are my best O&M and CIP investment strategies?

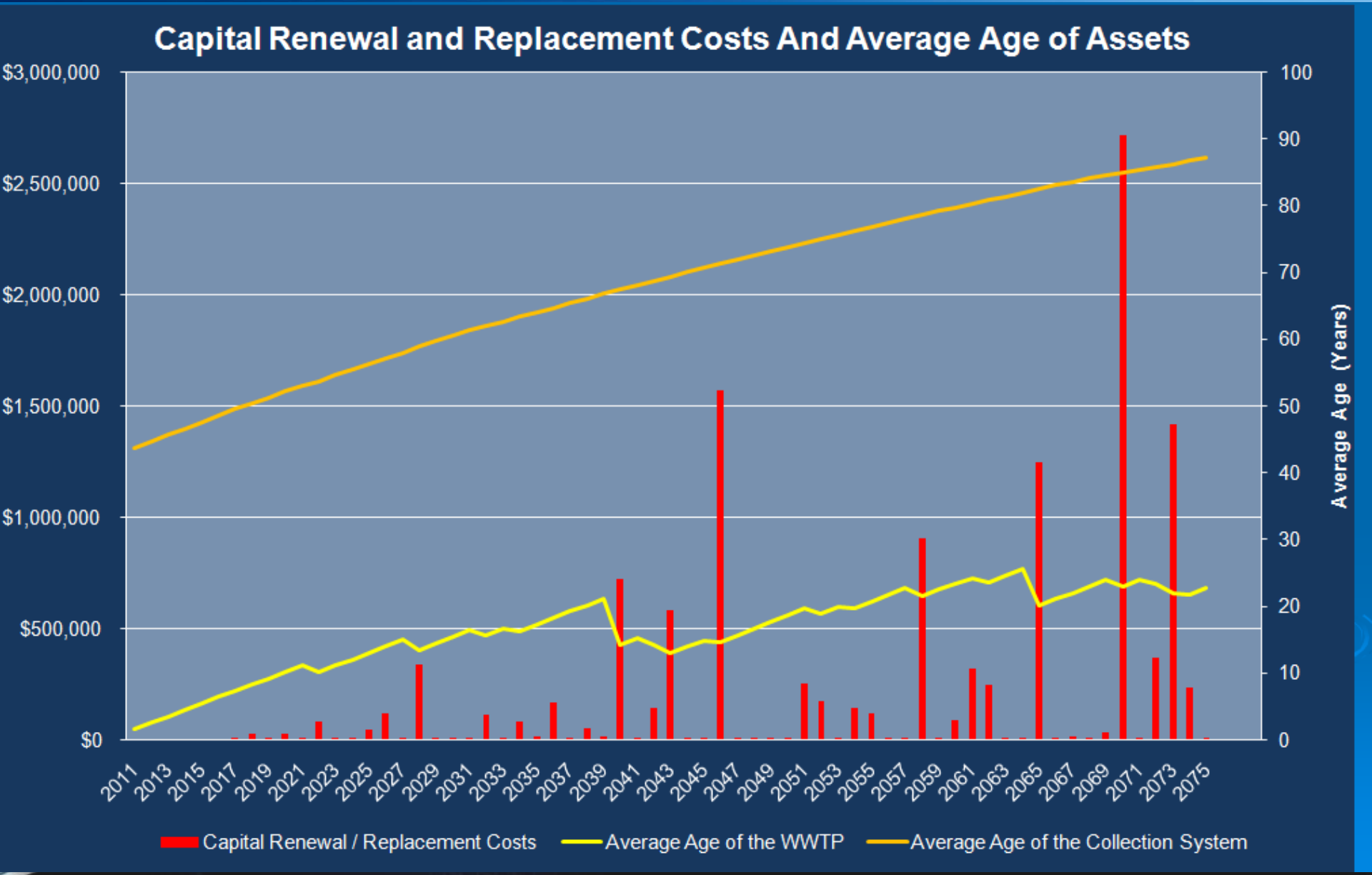
Risk Reduction Opportunities

1. **Capital rehabilitation**
2. **Capital replacement**
3. **Changes to operating procedures**
4. **Changes to maintenance procedures**
5. **Demand management**
6. **Reduction of level(s) of service**
7. **Improvement in response or recovery**

Total Projected Costs

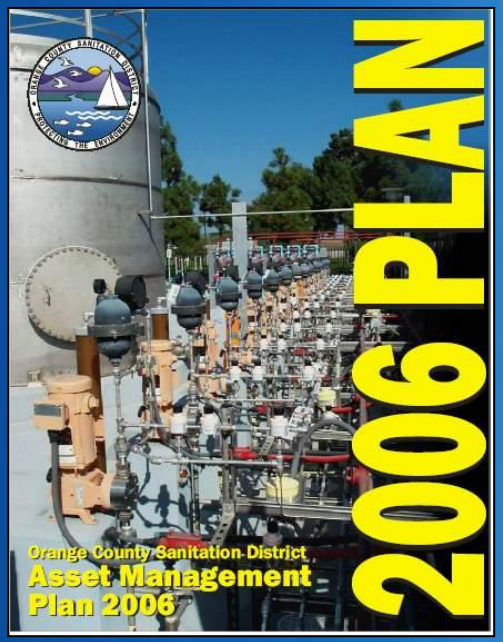


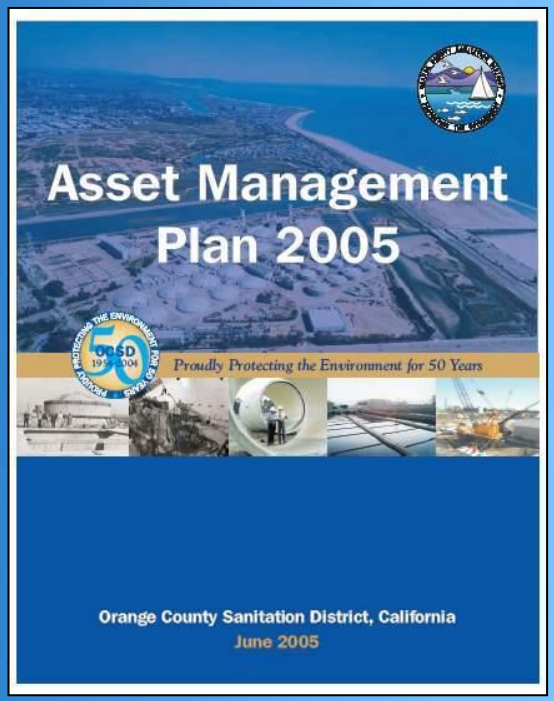
What are my best O&M and CIP investment strategies?



Question #5

What is my best long-term funding strategy?





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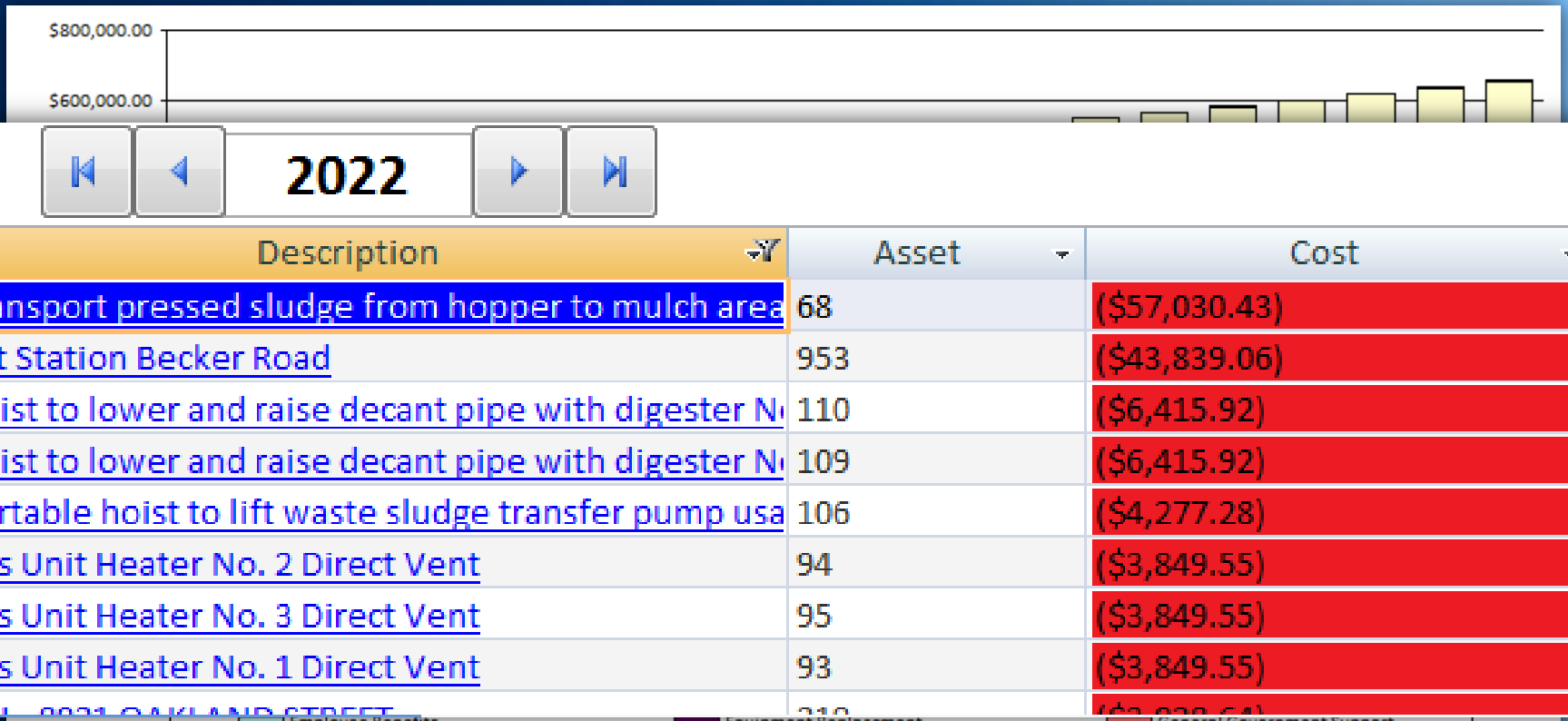
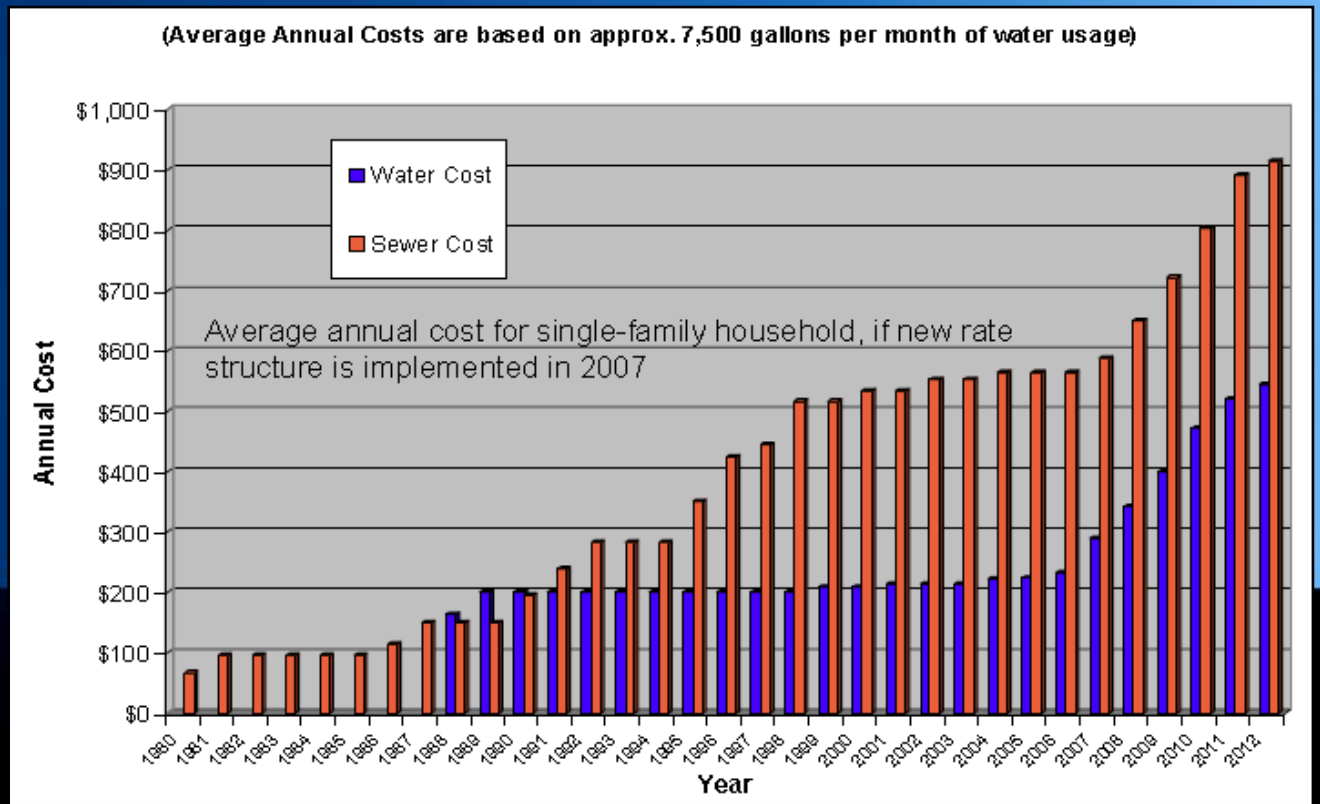
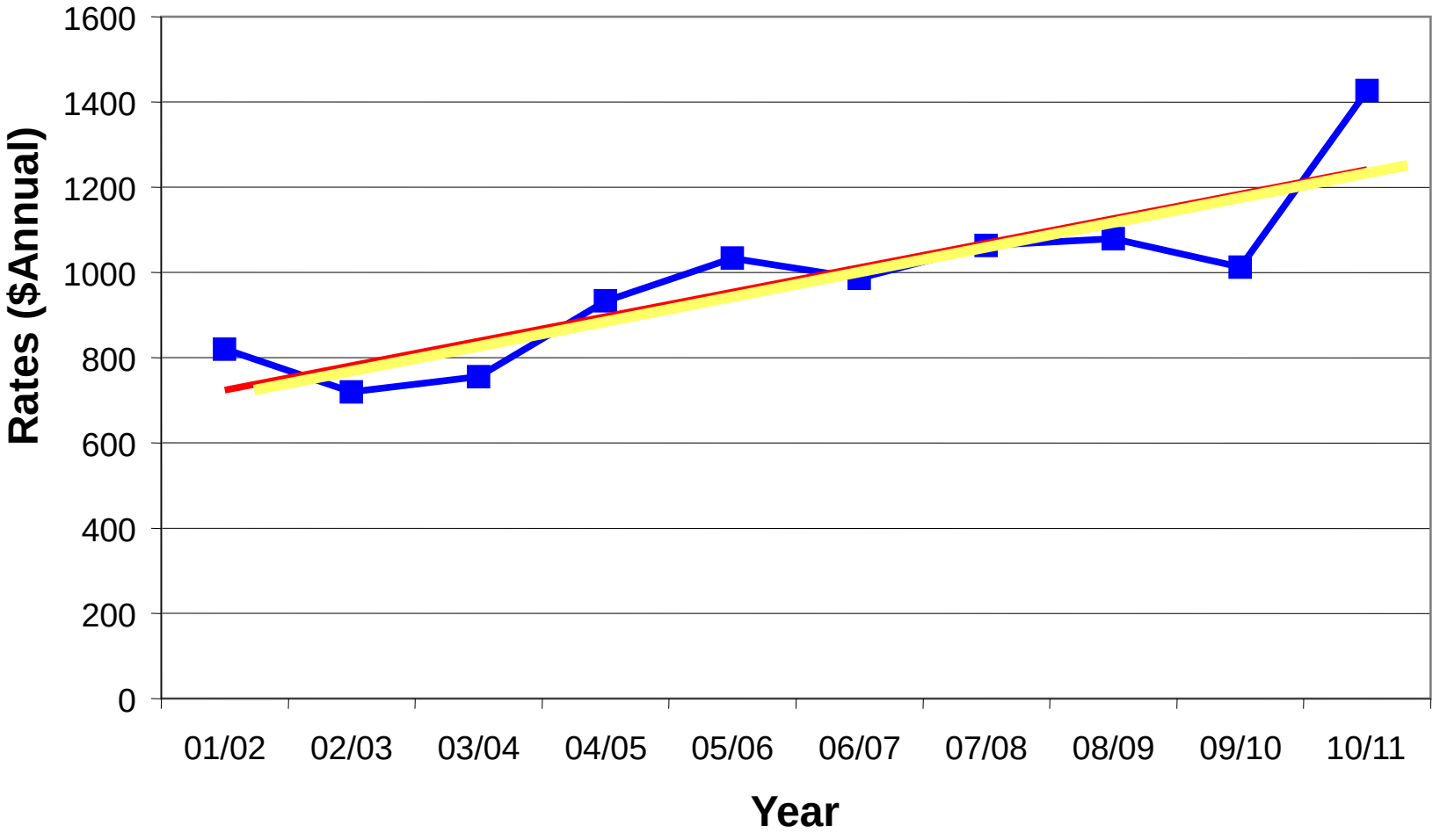


Is the rate structure sustainable?

- Rates finance essential water and sewer services and ensure clean, safe drinking water.
- Assess the costs of providing water and sewage services, and to recover the amount of money needed to operate and maintain them.

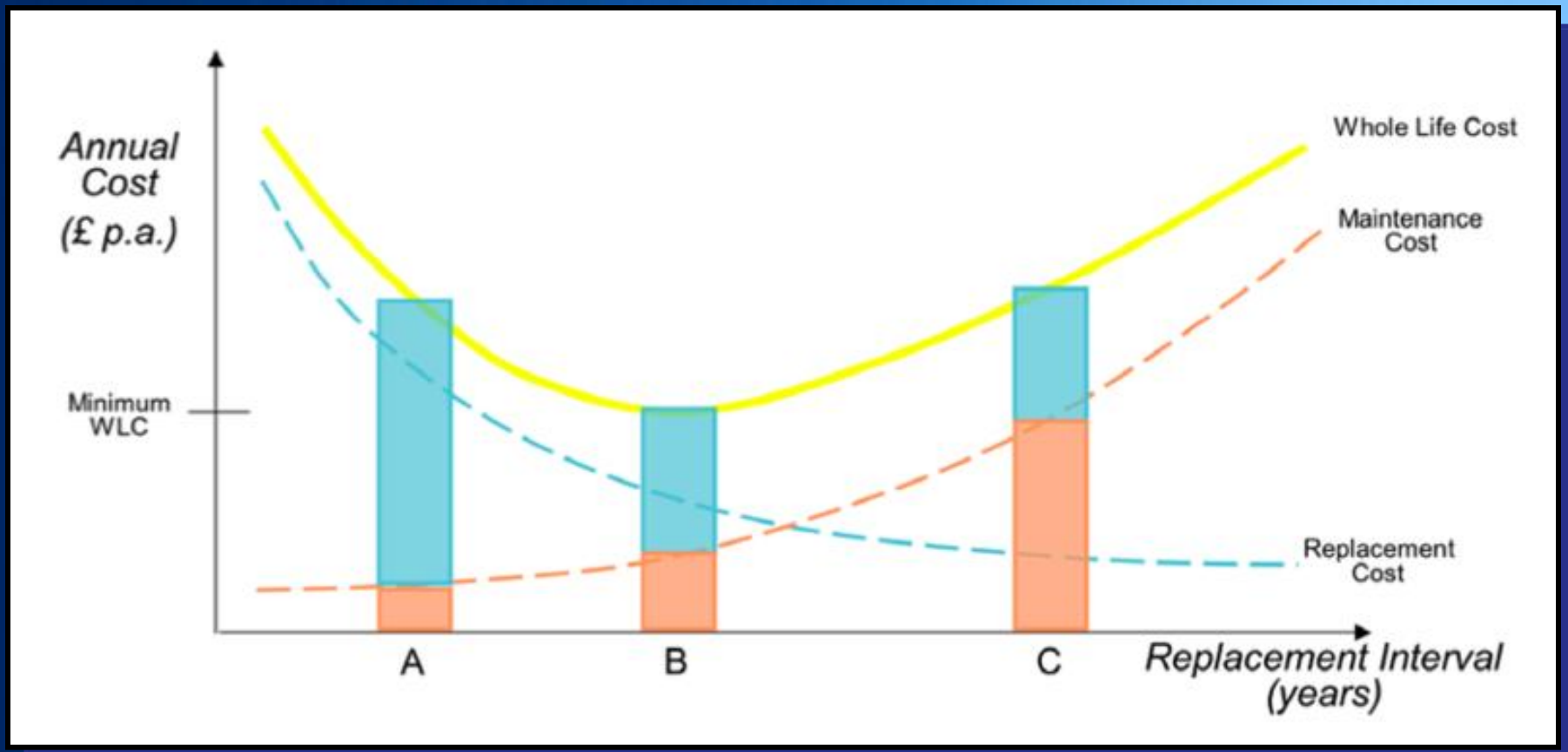


Projected Rates Over Time by Scenario



An Asset Management Program Is All About Knowledge Management

Questions?



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