Barton & Loguidice, P.C.

Engineers • Environmental Scientists • Planners • Landscape Architects

Asset Management Concepts and Tools

Smart Management for Small Communities

April 11, 2012

by Timothy Taber, PE, BCEE

What is Asset Management

Answer the 5 Core Questions

- What is the Current State of Your Assets
- What are the Desired Levels of Service
- Which Assets are Critical to Providing Those Services
- What are the Best Operation and Maintenance and Capital Improvement Strategies
- What is the Long-Term Funding Strategy

Why Asset Management

Infrastructure is the foundation to sustained quality of life

Consequences of asset failure can be severe

Asset management improves…

Decision making throughout the life cycle of the asset

- Design
- Planning
- Funding
- Acquisition / Construction
- Operation
- Maintenance
- Renewal
- Replacement

Resulting in *lowest total cost of ownership*

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- Maintenance
- Renewal
- Replacement

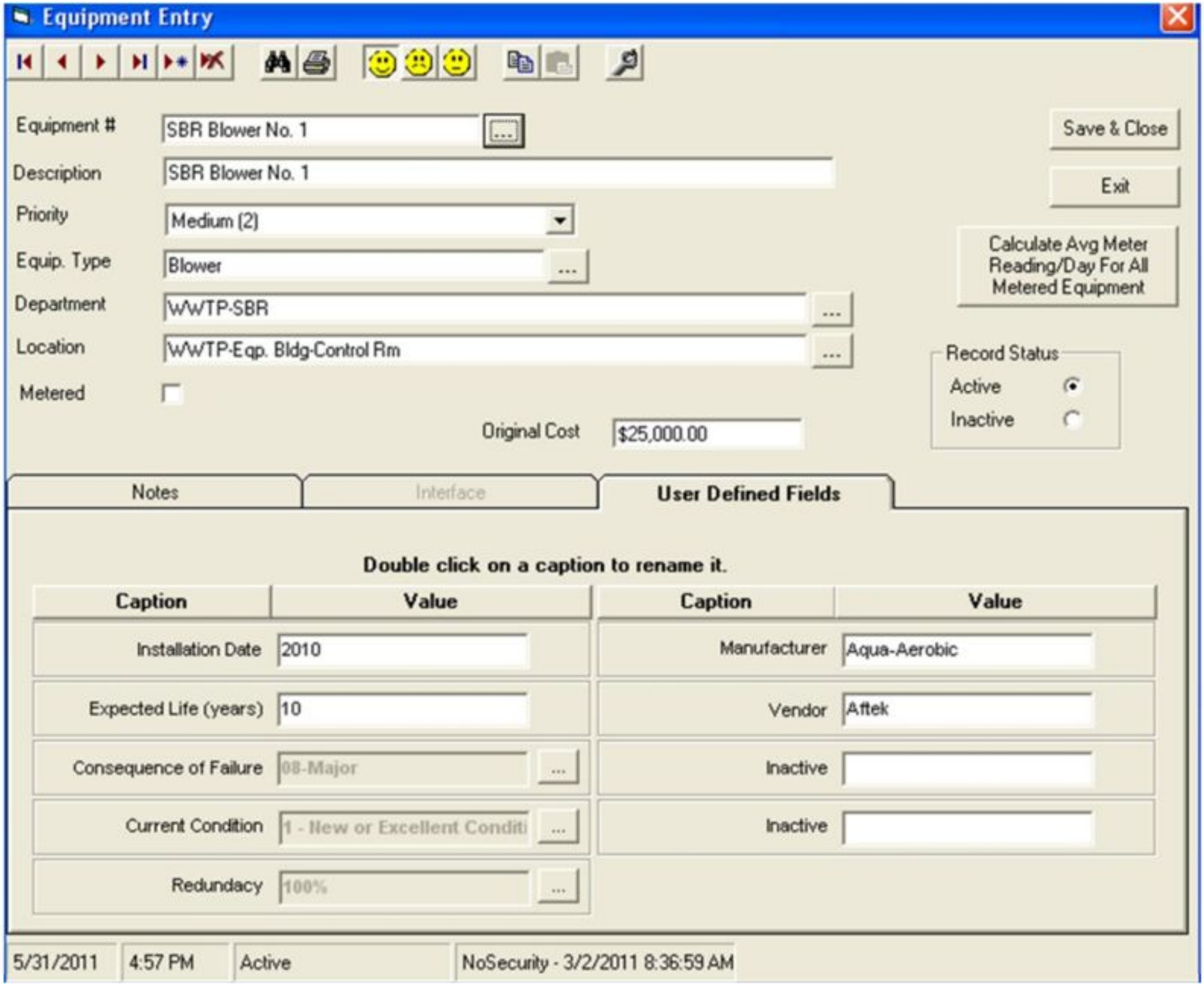
Resulting in *lowest total cost of ownership*

Question 1:
What is the Current State of Your Assets

What do you own?
Where is it located?
What condition is it in?
What is the remaining useful life?
What is the remaining economic value?

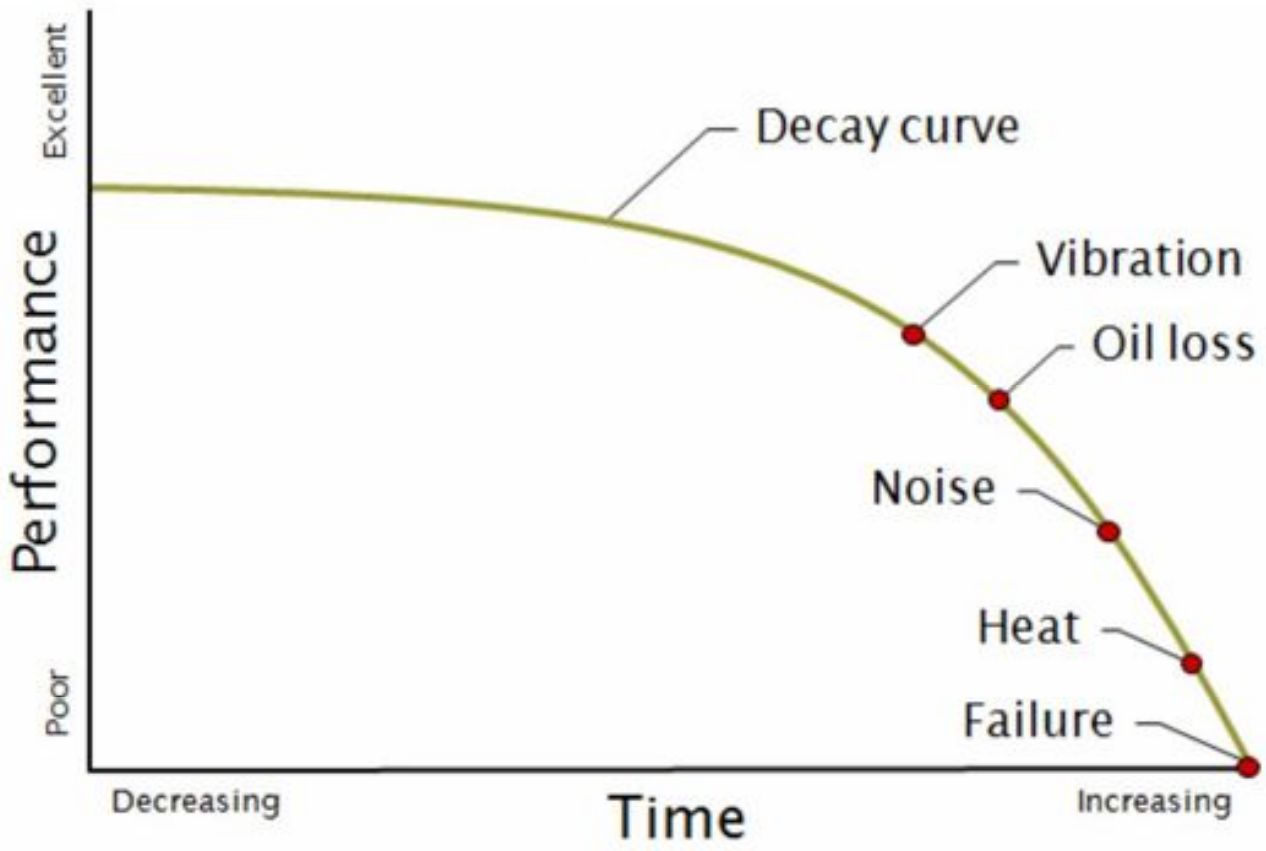
Develop The Asset Inventory


LIFT HERE


Equipment Entry
Equipment #
SBR Blower No. 1
Description
SBR Blower No. 1
Priority
Medium (2)
Equip. Type
Blower
Department
WWTP-SBR
Location
WWTP-Eqp. Bldg-Control Rm
Metered
Original Cost
$25,000.00
Save & Close
Exit
Calculate Avg Meter Reading/Day For All Metered Equipment
Record Status
Active
Inactive
Notes
Interface
User Defined Fields
Double click on a caption to rename it.
Caption
Value
Caption
Value
Installation Date
2010
Manufacturer
Aqua-Aerobic
Expected Life (years)
10
Vendor
Aftek
Consequence of Failure
08-Major
Inactive
Current Condition
1 - New or Excellent Conditi
Inactive
Redundancy
100%
5/31/2011
4:57 PM
Active
NoSecurity - 3/2/2011 8:36:59 AM


OUT OF SERVICE

Assess Performance and Failures

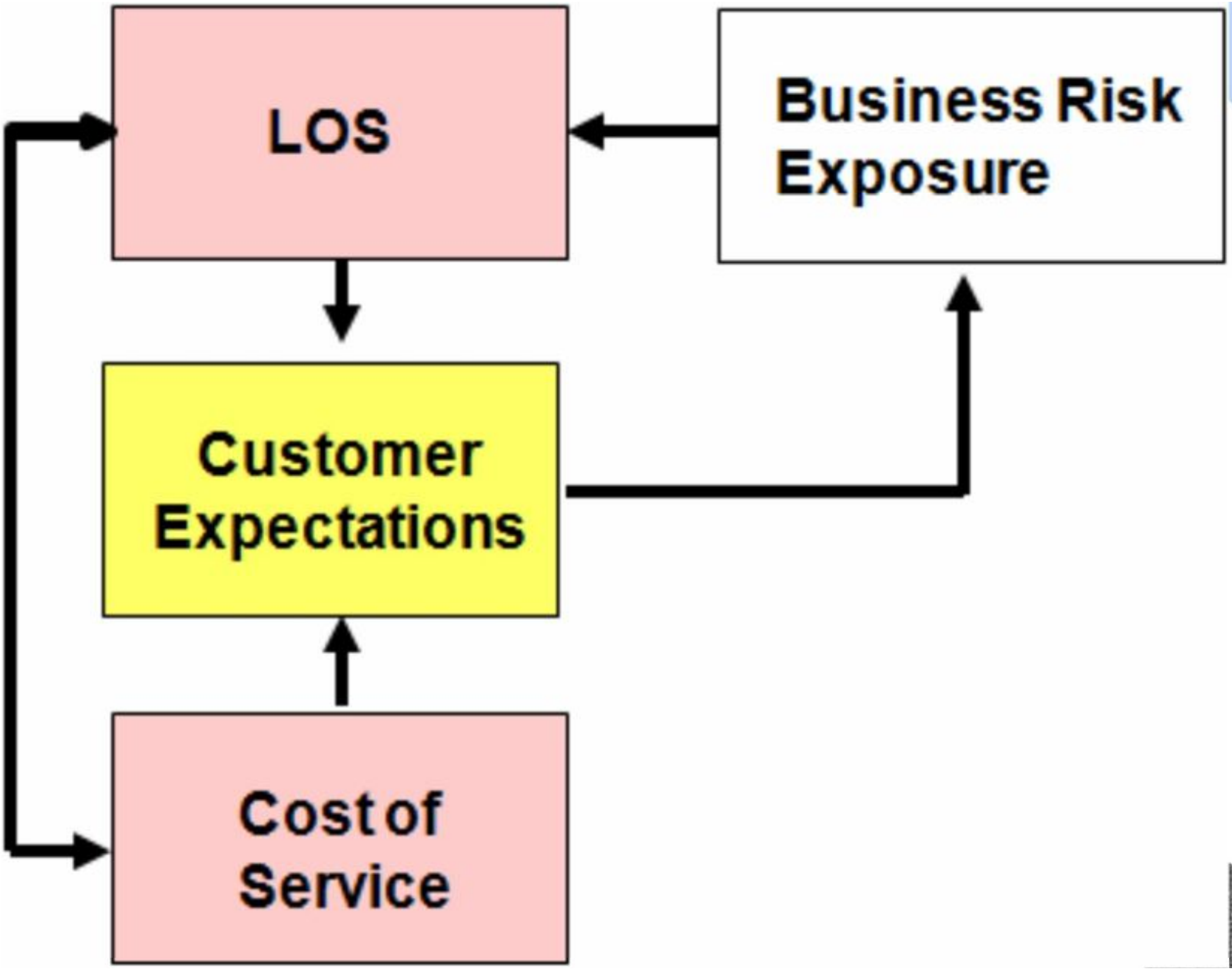


The Four Major Failure Modes

Mode	Definition	Tactical Aspects	Management Strategy
1. Capacity	Volume of demand exceeds design capacity	Growth, system expansion	Redesign
2. LOS	Functional requirements exceed design capability	Codes/permits: NPDES, CSOs, SSOs, OSHA, noise, odor, life safety; service, etc	Redesign
3. Mortality	Consumption of asset reduces performance below an acceptable minimum level	Physical deterioration due to age, usage (including operator error), acts of nature	O&M, Renewal
4. Efficiency	Performs ok, but cost of operation exceeds that of feasible alternatives	"Pay-back" period	Replace

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?*


LOS
Business Risk Exposure
Customer Expectations
Cost of Service

Customer Expectations

Cost of Service

Level of Service

Business Risk

Your Business

efforts & resources

Services Available to Village Residents

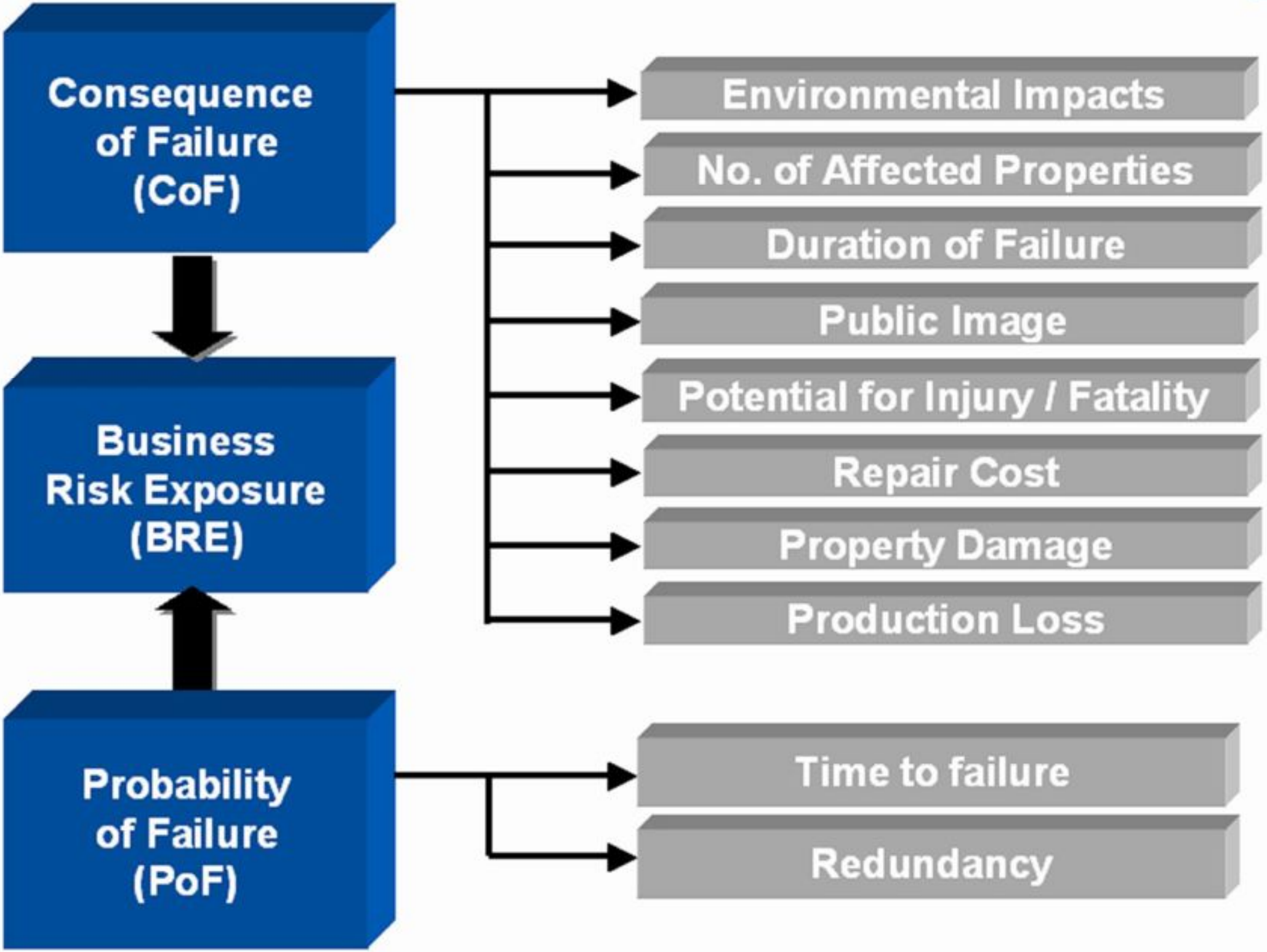
- **Water Supply**
- **Sanitary Waste Disposal**
- **Recycling**
- **On-Site Wastewater Treatment**
- **Solid Waste Disposal**
- **Waste Oil Drop Off Site**
- **Brush / Yard Waste Drop Off Site**
- **Christmas Tree Disposal**
- **Storm Water**
- **Police**
- **Fire Protection**
- **Emergency Medical Service**
- **Library**
- **Senior Services**
- **Youth Services**
- **Utilities - Electric Power, Gas and Telephone, and Cable**
- **Telecommunication Towers**
- **Public Works Facility**
- **Municipal Center**
- **Community Pool**
- **McFarland Community Fitness Center**
- **Post Office**
- **Historical Society**
- **Food Pantry**

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)
  - Service levels
  - Costs & budgets
  - Rate impacts
  - Reinvestments for Renewal
  - Level of Risk

Question 3:
Which assets are critical to sustained performance?

- *How does it fail? How can it fail?*
- *What is the likelihood of failure?*
- *What does it cost to repair?*
- *What are the consequences of failure?*

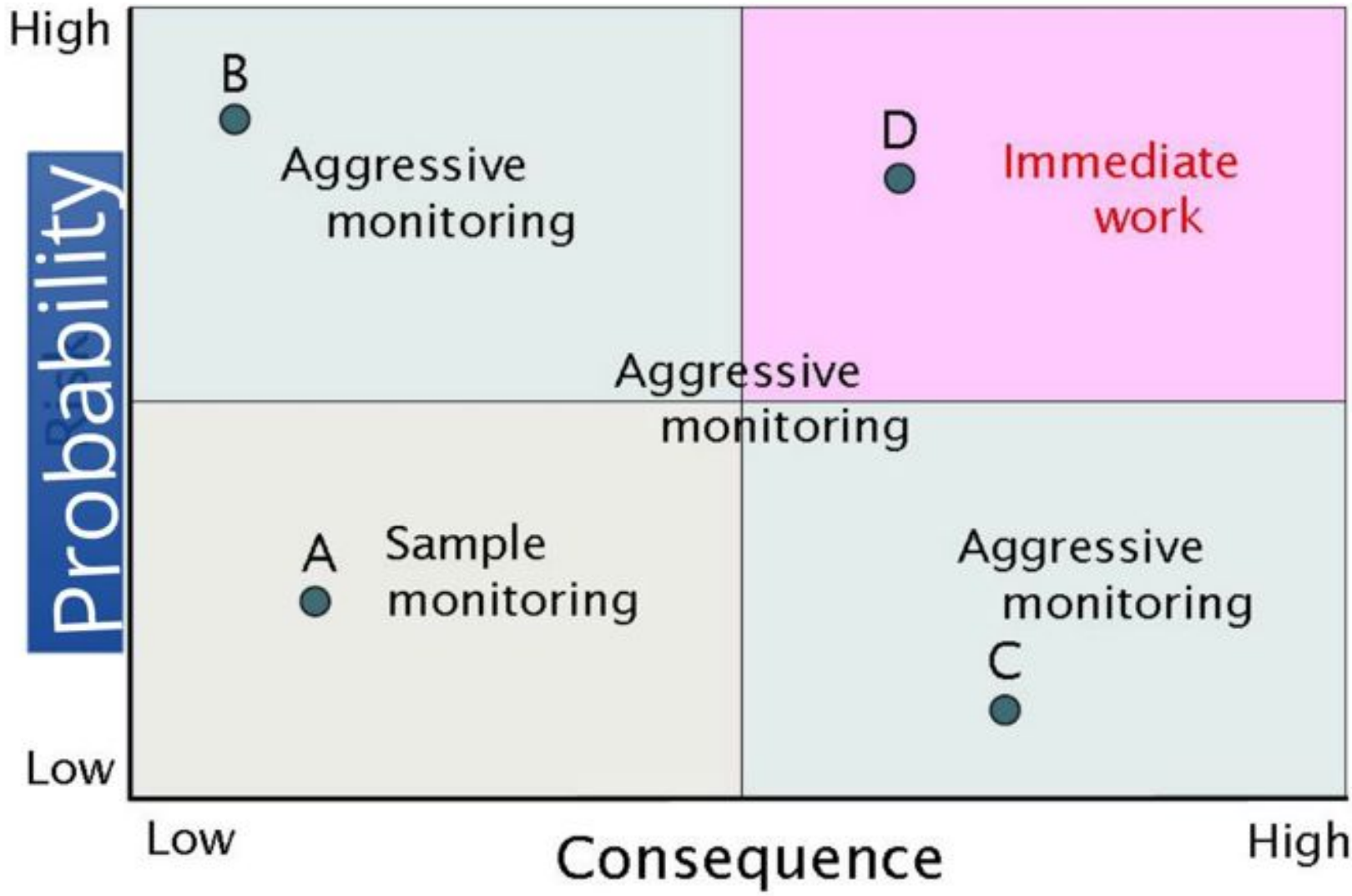

Consequence of Failure (CoF)
Business Risk Exposure (BRE)
Probability of Failure (PoF)
Environmental Impacts
No. of Affected Properties
Duration of Failure
Public Image
Potential for Injury / Fatality
Repair Cost
Property Damage
Production Loss
Time to failure
Redundancy

Which assets are critical to sustained performance?

Consequence of Failure

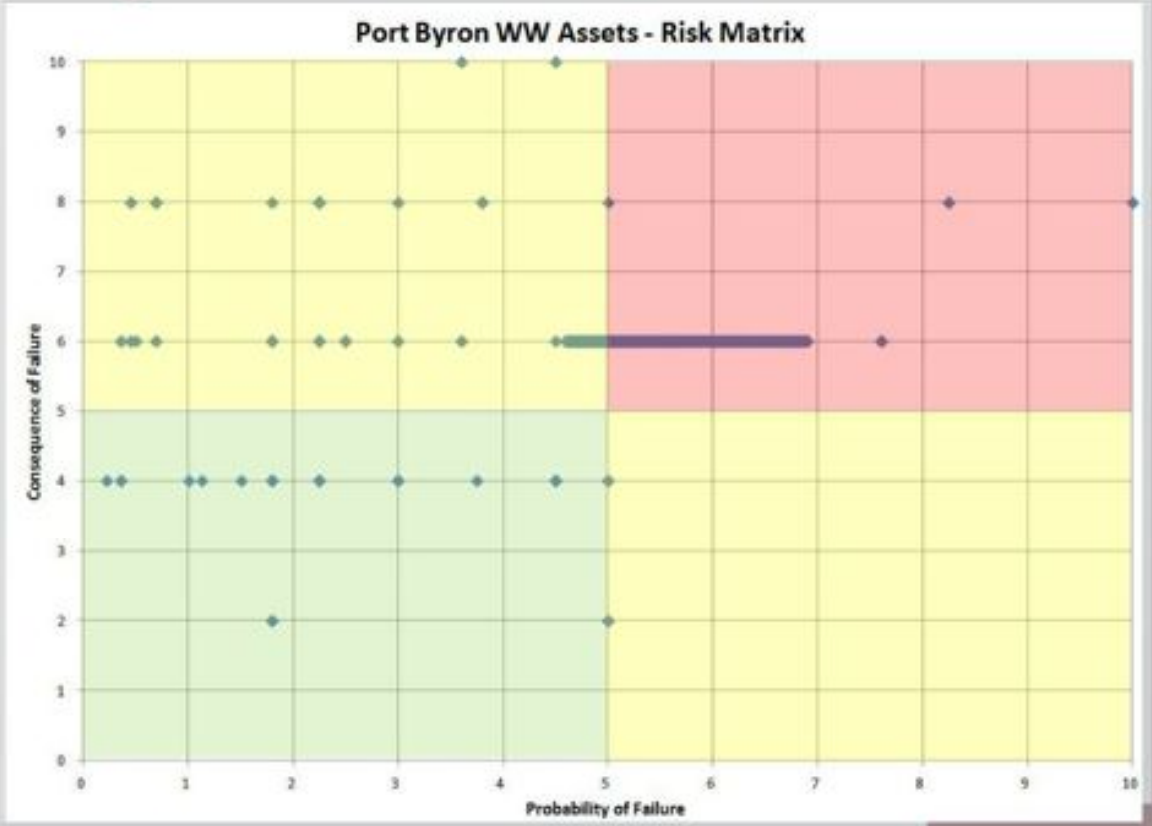
1. Spill, Flood, Odor
2. Water or Effluent Quality
3. Regulatory Compliance
4. Loss of Service to Customers
5. Equipment and Safety
6. Economic Impact

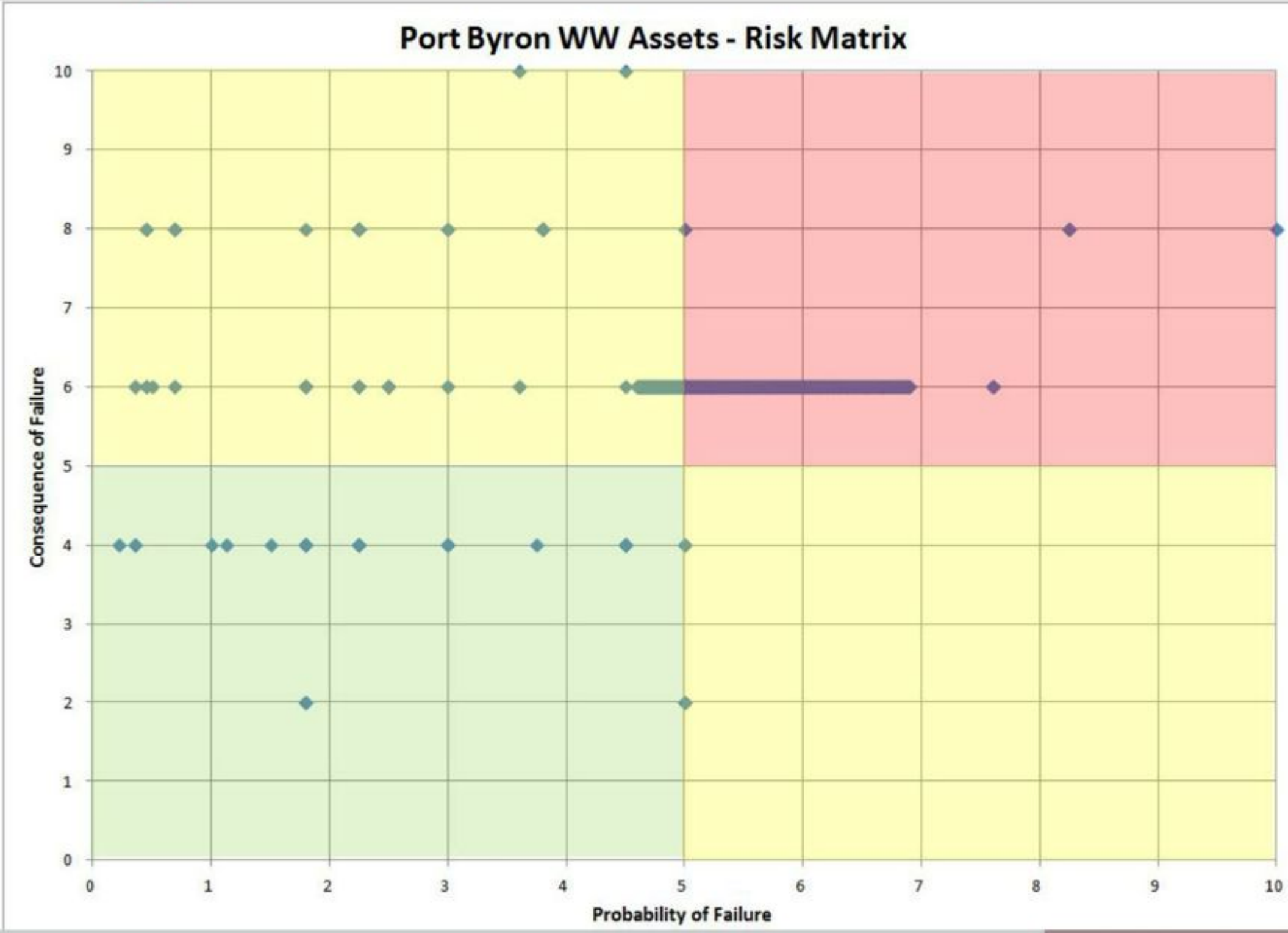
Scoring Criteria
2 - Insignificant
4 - Minor
6 - Moderate
8 - Major
10 - Catastrophic


High
Probability
Low
B
Aggressive monitoring
D
Immediate work
Aggressive monitoring
A
Sample monitoring
Aggressive monitoring
C
Low
Consequence
High

Port Byron Wastewater Asset Inventory							
Description	Estimated Original Cost	Consequence of Failure	Current Condition	Redundacy	Installation Year	Expected Life (Years)	Risk
Wet Well Submersible Pump	$5,000.00	8 - Major	4 - Significant Deterioration	0%	1/1/1965	40	80
Control Building	$25,000.00	8 - Major	4 - Significant Deterioration	0%	1/1/1965	60	65.96491
Pump/Blower Building	$25,000.00	8 - Major	4 - Significant Deterioration	0%	1/1/1965	60	65.96491
Grit Channel	$5,000.00	6 - Moderate	4 - Significant Deterioration	0%	1/1/1965	65	45.66802
Outfall Structure	$1,000.00	6 - Moderate	4 - Significant Deterioration	0%	1/1/1965	65.1	45.59787
MH-2	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.2	41.41104
MH-73	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.3	41.34763
MH-72	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.4	41.2844
MH-3A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.5	41.22137
MH-4A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.6	41.15854
MH-5A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.7	41.09589
MH-6A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.8	41.03343
MH-7A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	65.9	40.97117
MH-8A	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	66	40.90909
125 kW Emergency Generator	$10,000.00	10 - Catastrophic	3 - Moderate Deterioration	0%	1/1/2003	20	45
Influent Pump #2	$5,000.00	8 - Major	4 - Significant Deterioration	50%	1/1/1965	20	40
MH-7	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	66.1	40.8472
MH-8	$360.00	6 - Moderate	3 - Moderate Deterioration	0%	1/1/1967	66.2	40.7855

Port Byron Asset Risk




Port Byron WW Assets - Risk Matrix
Consequence of Failure
Probability of Failure
0
1
2
3
4
5
6
7
8
9
10

Port Byron Wastewater Asset Inventory

Description	Estimated Original Cost	Consequence of Failure	Current Condition	Redundancy	Installation Year	Expected Life (Years)	Risk
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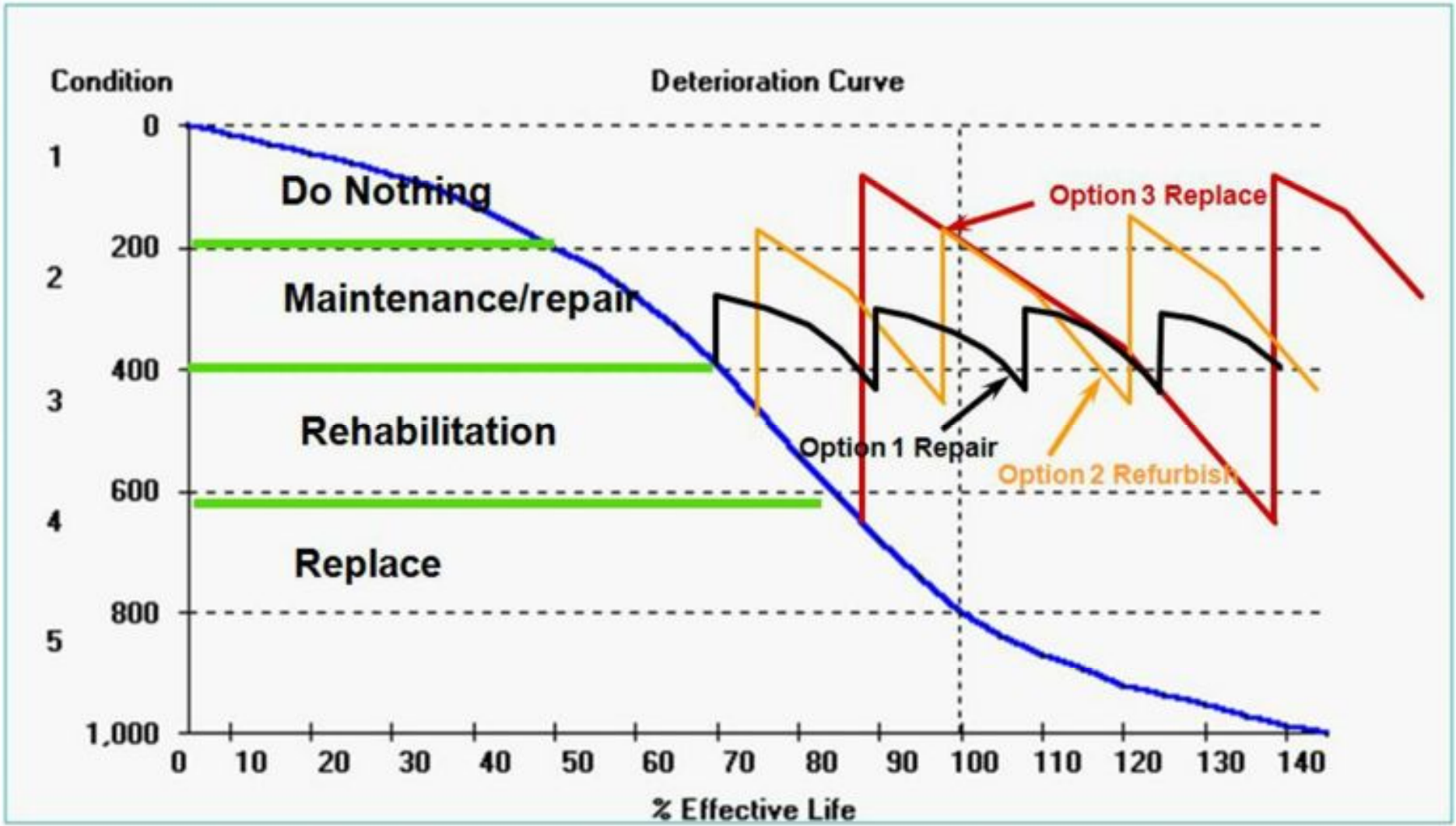
Port Byron Asset

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?*

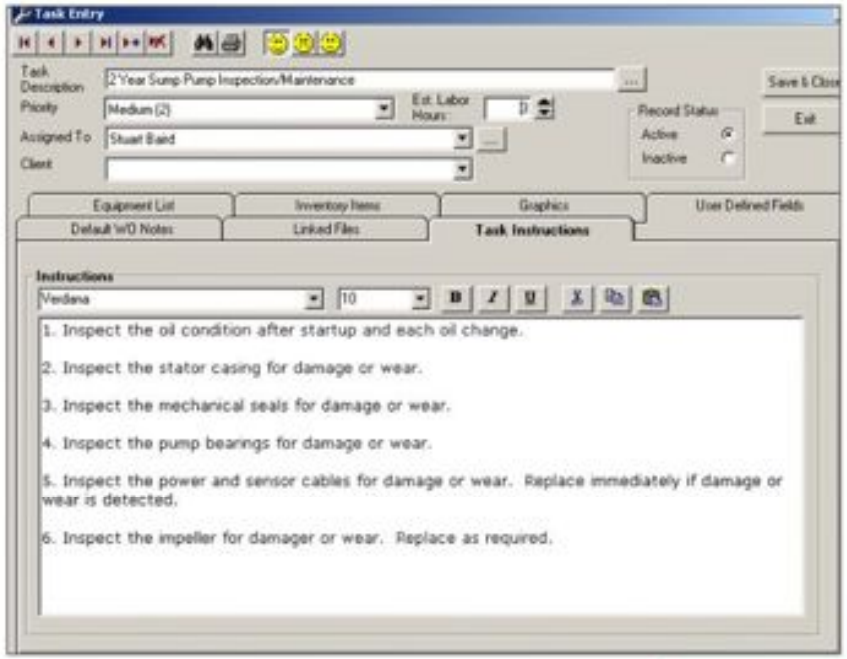
Managing the "Asset Consumption" Process



Maintenance Strategy

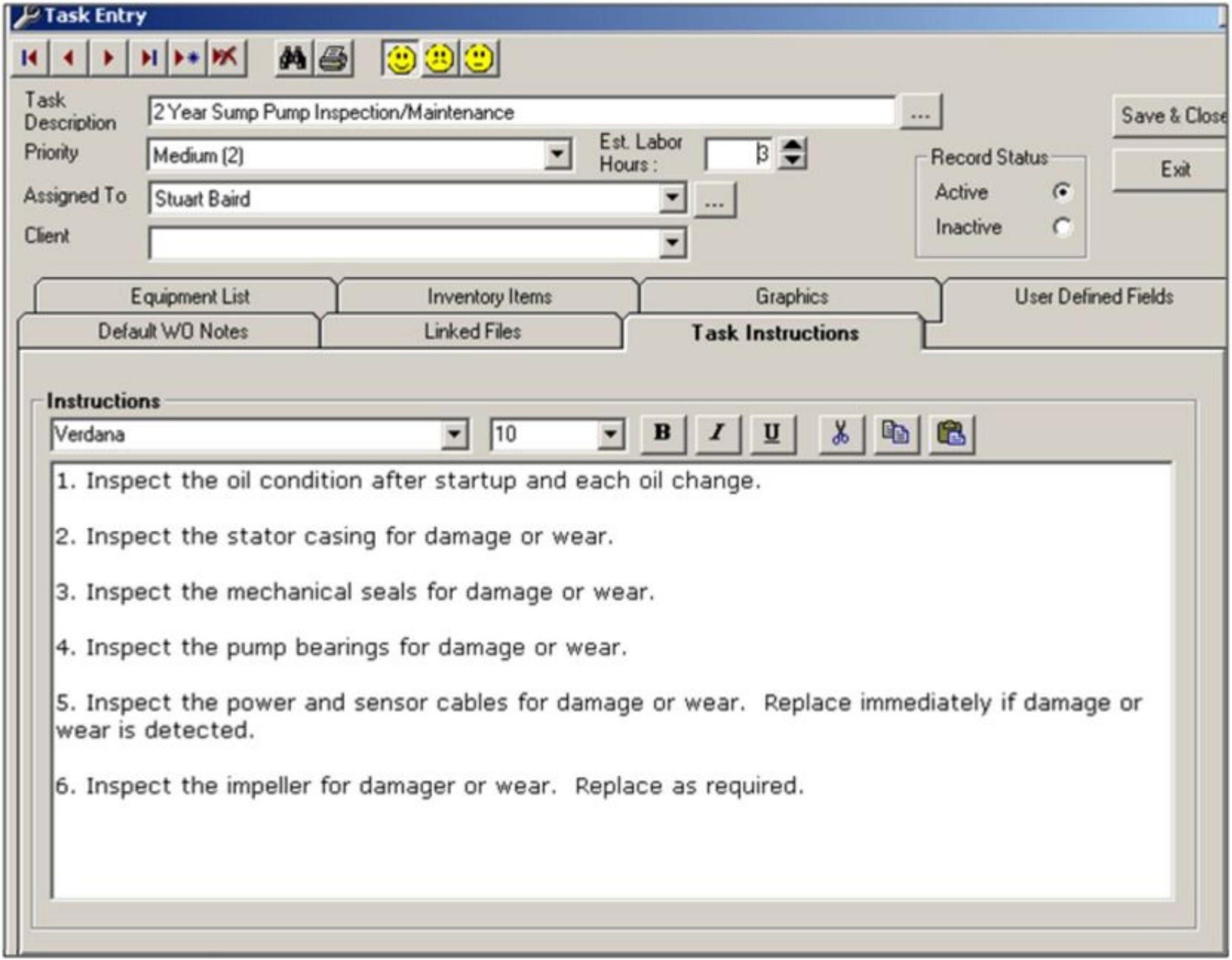
Description

- 2 Year Belt Filter Press Inspection/Maintenance
- 2 Year Chemical Feed System Maintenance
- 2 Year Sump Pump Inspection/Maintenance
- 2 Year UV Disinfection System Maintenance
- 3 Year Aeration Blower Maintenance
- 5 Year Chemical Feed System Maintenance
- 5 Year Maintenance of Grit Classifier
- 5 Year Sump Pump Inspection/Maintenance
- 6 Month Anoxic Zone Mixer Maintenance/Inspection
- 6 Month Belt Filter Press Inspection/Maintenance

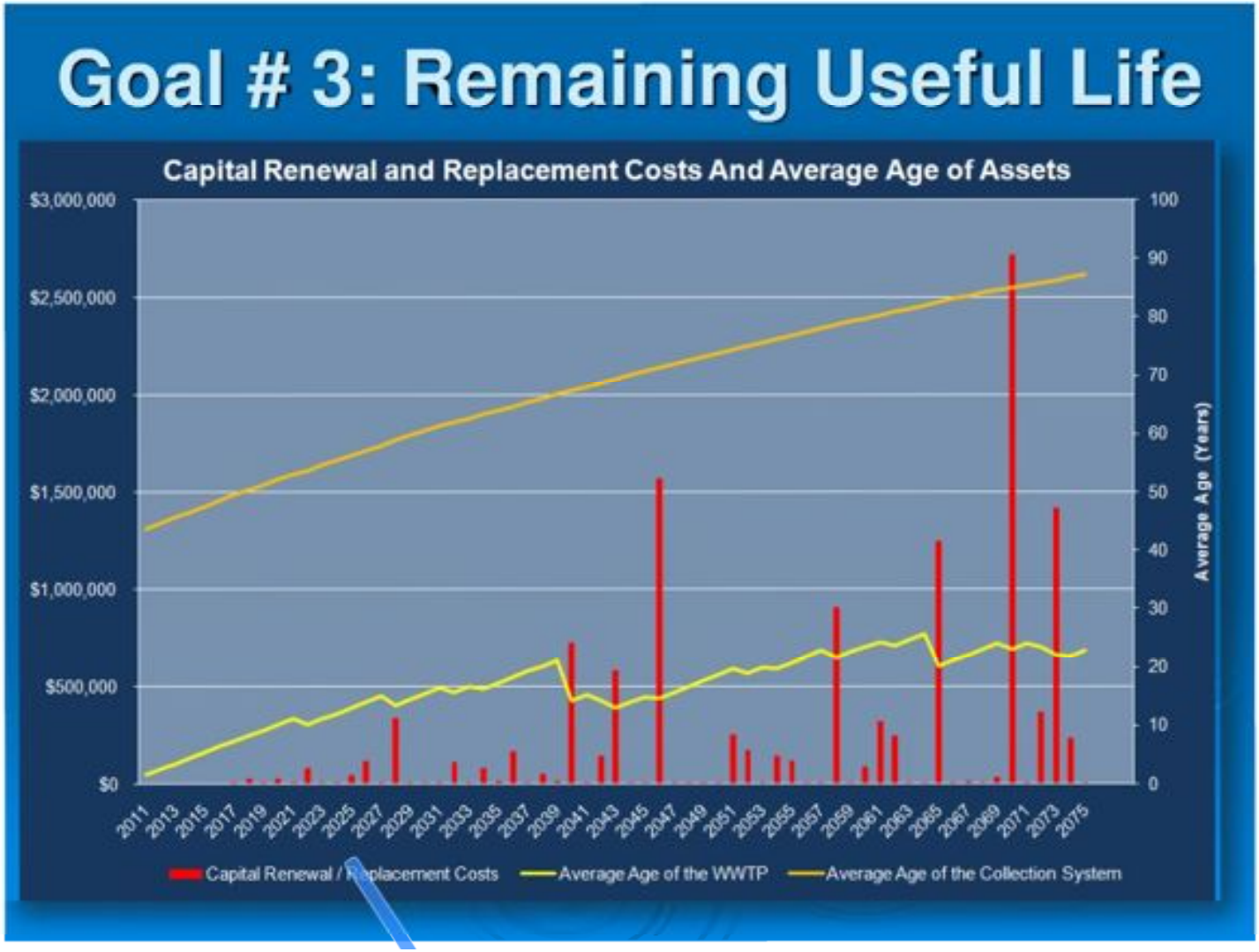


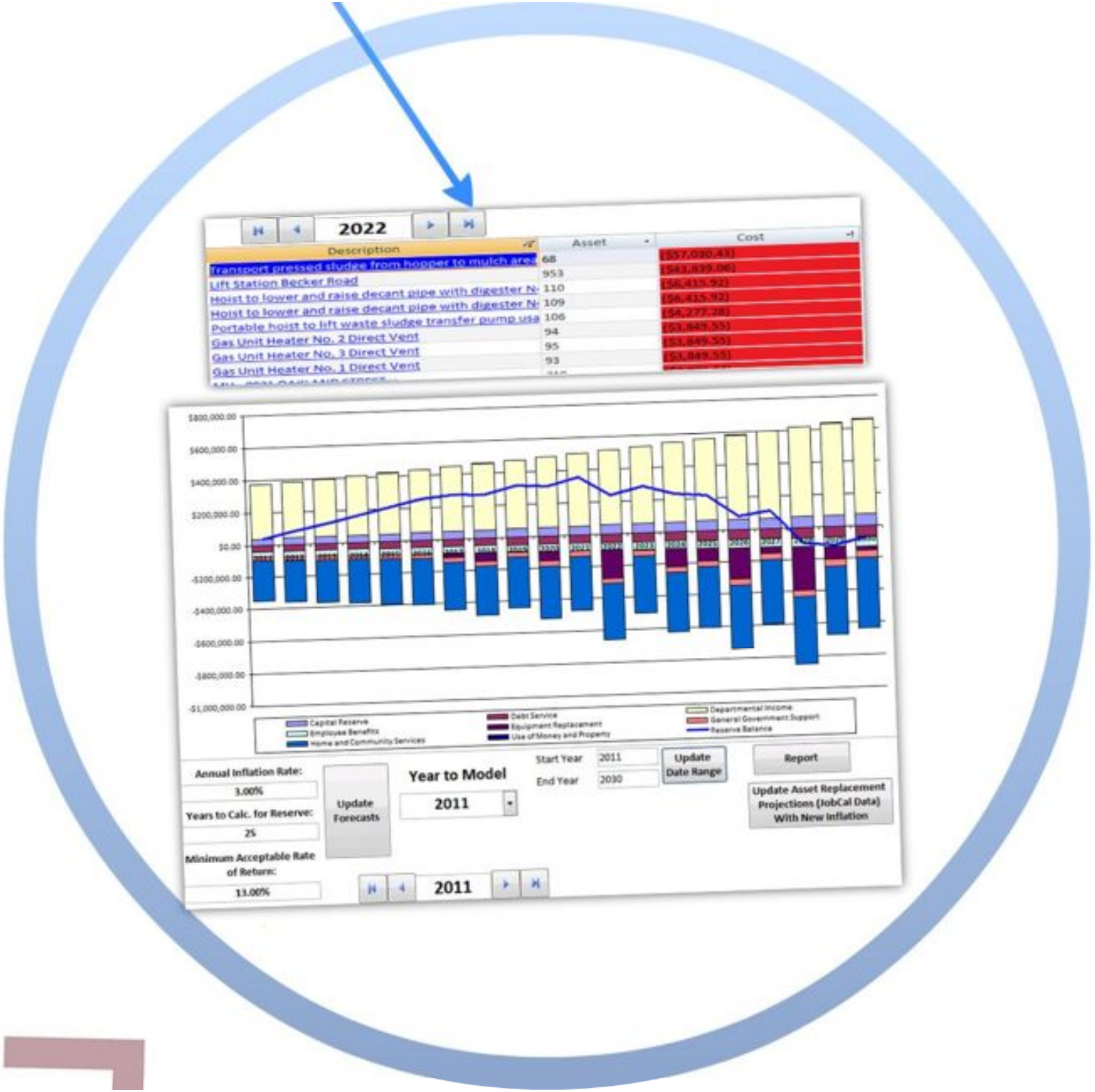
File Find Edit Utilities Help

	Week of 3/5/2012	Week of 3/12/2012	Week of 3/19/2012	Week of 3/26/2012	Week of 4/2/2012	Week of 4/9/2012
1	Pressure Transducer No. 3 // Monthly cleaning of	WWTP // WWTP Daily Maintenance Checklist	WWTP // WWTP Daily Maintenance Checklist	WWTP // WWTP Daily Maintenance Checklist	EUH-4 // Bi-annual HVAC Inspection & Maintenance	WWTP // WWTP Daily Maintenance Checklist
2	Pressure Transducer No. 5 // Monthly cleaning of	Dissolved Oxygen Proble No. 5 // Monthly cleaning	Dissolved Oxygen Proble No. 4 // Monthly cleaning	Mechanical Bar Screen // Annual mechanical bar	Lift Station No. 1 // Weekly Inpsection of Lift	Dissolved Oxygen Proble No. 5 // Monthly cleaning
3	Pressure Transducer No. 4 // Monthly cleaning of	Dissolved Oxygen Proble No. 1 // Monthly cleaning	Fine Bubble Diffuser No. 3-R // Monthly flexing of	Furnace and Cooling Coil // Bi-annual HVAC	Chain Hoist // Quarterly Winch maintenance	Dissolved Oxygen Proble No. 1 // Monthly cleaning
4	Pressure Transducer No. 2 // Monthly cleaning of	Floating Decanter No. 1 // Bi-annual decanter spring	Fine Bubble Diffuser No. 3-L // Monthly flexing of	Valve -SBR-BL 1 DISCH // Annual Valve Maintenance	Hoist Digester No. 1 // Quarterly Winch	Compost Blower // Monthly blower check
5	Pressure Transducer No. 1 // Monthly cleaning of	Floating Decanter No. 3 // Bi-annual decanter spring	Fine Bubble Diffuser No. 2-R // Monthly flexing of	EUH-1 // Bi-annual HVAC Inspection & Maintenance	SBR Diffuser Winch No. 1-R // Quarterly Winch	SBR Blower No. 3 // Monthly blower check
6	Mechanical Bar Screen // Semi-annual mechanical	Floating Decanter No. 2 // Bi-annual decanter spring	Digester Difffuser No. 1 // Monthly flexing of	Valve -SBR-BL 2 DISCH // Annual Valve Maintenance		Dissolved Oxygen Proble No. 3 // Monthly cleaning
7	Portable Hoist Effluent Pump // Quarterly Winch	Chemical Feed Pump No. 2 // Semi-Annual chemical	Digester Difffuser No. 2 // Monthly flexing of	Valve -SBR-BL 3 CHK // Annual Valve Maintenance		Dissolved Oxygen Proble No. 2 // Monthly cleaning
8		Chemical Feed Pump No. 3 // Semi-Annual chemical	Fine Bubble Diffuser No. 2-L // Monthly flexing of	SBR Blower No. 1 // Monthly check of blower		Dissolved Oxygen Proble No. 6 // Monthly cleaning
9		Chemical Feed Pump No. 4 // Semi-Annual chemical	Fine Bubble Diffuser No. 1-R // Monthly flexing of	Oil / Water Seperator // Monthly Water/Oil		Mechanical Bar Screen // Quarterly mechanical bar
10		Compost Blower // Monthly blower check	Fine Bubble Diffuser No. 1-L // Monthly flexing of	EF-2 // Bi-annual HVAC Inspection & Maintenance		
11		SBR Blower No. 3 // Monthly blower check	Mechanical Bar Screen // Monthly Mechanical Bar	EF-5 // Bi-annual HVAC Inspection & Maintenance		
12		Dissolved Oxygen Proble No. 3 // Monthly cleaning		CF-1 // Bi-annual HVAC Inspection & Maintenance		
13		Dissolved Oxygen Proble No. 6 // Monthly cleaning		EF-4 // Bi-annual HVAC Inspection & Maintenance		
14		Dissolved Oxygen Proble No. 2 // Monthly cleaning		EF-3 // Bi-annual HVAC Inspection & Maintenance		
15		WWTP // Sludge De-watering Checklist		CF-2 // Bi-annual HVAC Inspection & Maintenance		
16				EF-6 // Bi-annual HVAC Inspection & Maintenance		
17						
18						


Task Entry
Task Description
2 Year Sump Pump Inspection/Maintenance
Priority
Medium (2)
Est. Labor Hours :
3
Assigned To
Stuart Baird
Client
Record Status
Active
Inactive
Save & Close
Exit
Equipment List
Inventory Items
Graphics
User Defined Fields
Default WO Notes
Linked Files
Task Instructions
Instructions
Verdana
10
B
I
U
1. Inspect the oil condition after startup and each oil change.
2. Inspect the stator casing for damage or wear.
3. Inspect the mechanical seals for damage or wear.
4. Inspect the pump bearings for damage or wear.
5. Inspect the power and sensor cables for damage or wear. Replace immediately if damage or wear is detected.
6. Inspect the impeller for damager or wear. Replace as required.

Question 5:
Long-Term Funding Strategy?




2022
Description
Asset
Cost
Transport pressed sludge from hopper to mulch area
68
Lift Station Becker Road
953
Hoist to lower and raise decant pipe with digester N
110
Hoist to lower and raise decant pipe with digester N
109
Portable hoist to lift waste sludge transfer pump usa
106
Gas Unit Heater No. 2 Direct Vent
94
Gas Unit Heater No. 3 Direct Vent
95
Gas Unit Heater No. 1 Direct Vent
93
$800,000.00
$600,000.00
$400,000.00
$200,000.00
$0.00
-$200,000.00
-$400,000.00
-$600,000.00
-$800,000.00
-$1,000,000.00
Capital Reserve
Employee Benefits
Home and Community Services
Debt Service
Equipment Replacement
Use of Money and Property
Departmental Income
General Government Support
Reserve Balance
Annual Inflation Rate:
3.00%
Years to Calc. for Reserve:
25
Minimum Acceptable Rate of Return:
13.00%
Update Forecasts
Year to Model
2011
Start Year
2011
End Year
2030
Update Date Range
Report
Update Asset Replacement Projections (JobCal Data) With New Inflation
2011

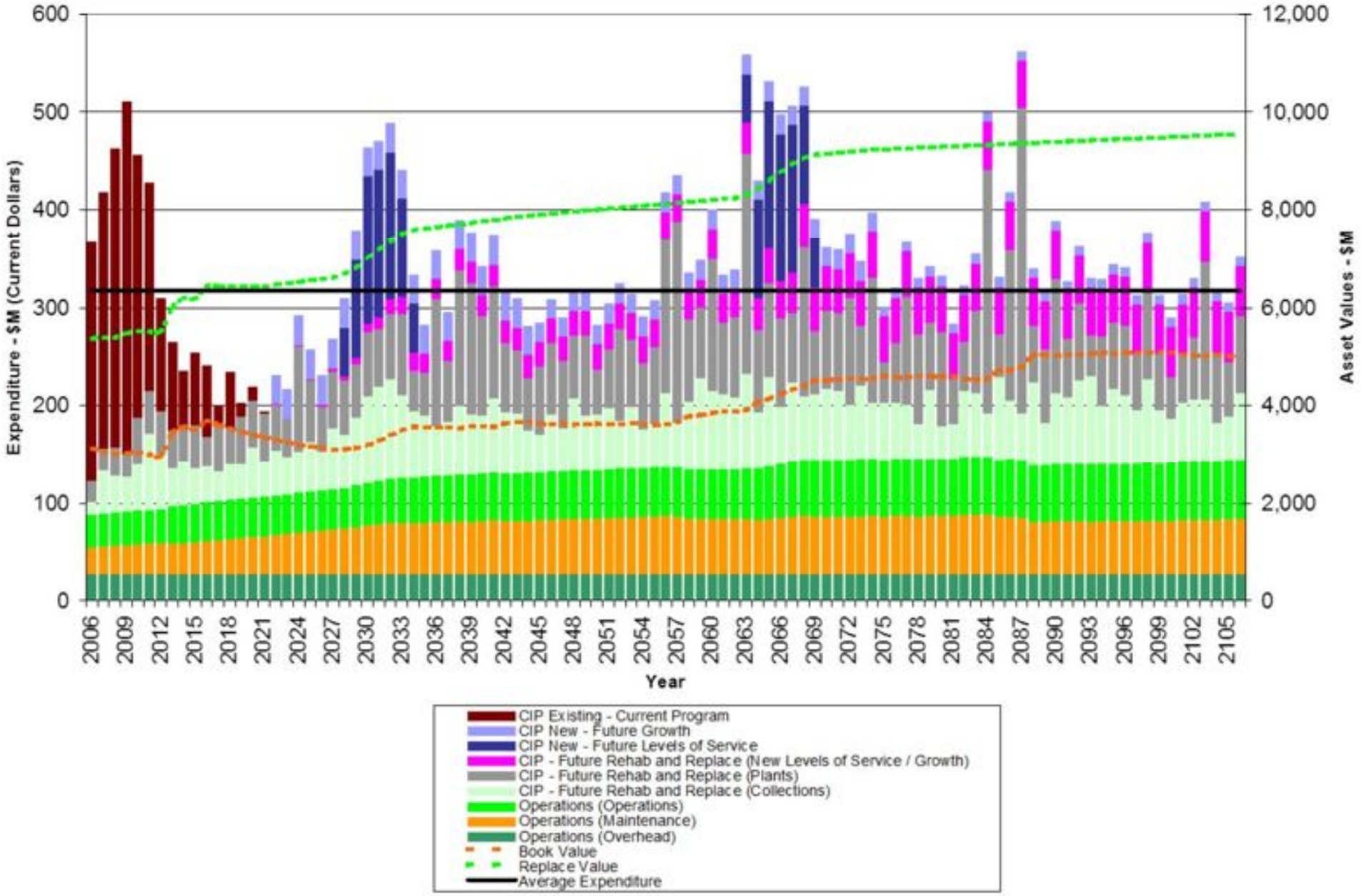
2022

Description	Asset	Cost
Transport pressed sludge from hopper to mulch area	68	($57,030.43)
Lift Station Becker Road	953	($43,839.06)
Hoist to lower and raise decant pipe with digester N	110	($6,415.92)
Hoist to lower and raise decant pipe with digester N	109	($6,415.92)
Portable hoist to lift waste sludge transfer pump usa	106	($4,277.28)
Gas Unit Heater No. 2 Direct Vent	94	($3,849.55)
Gas Unit Heater No. 3 Direct Vent	95	($3,849.55)
Gas Unit Heater No. 1 Direct Vent	93	($3,849.55)

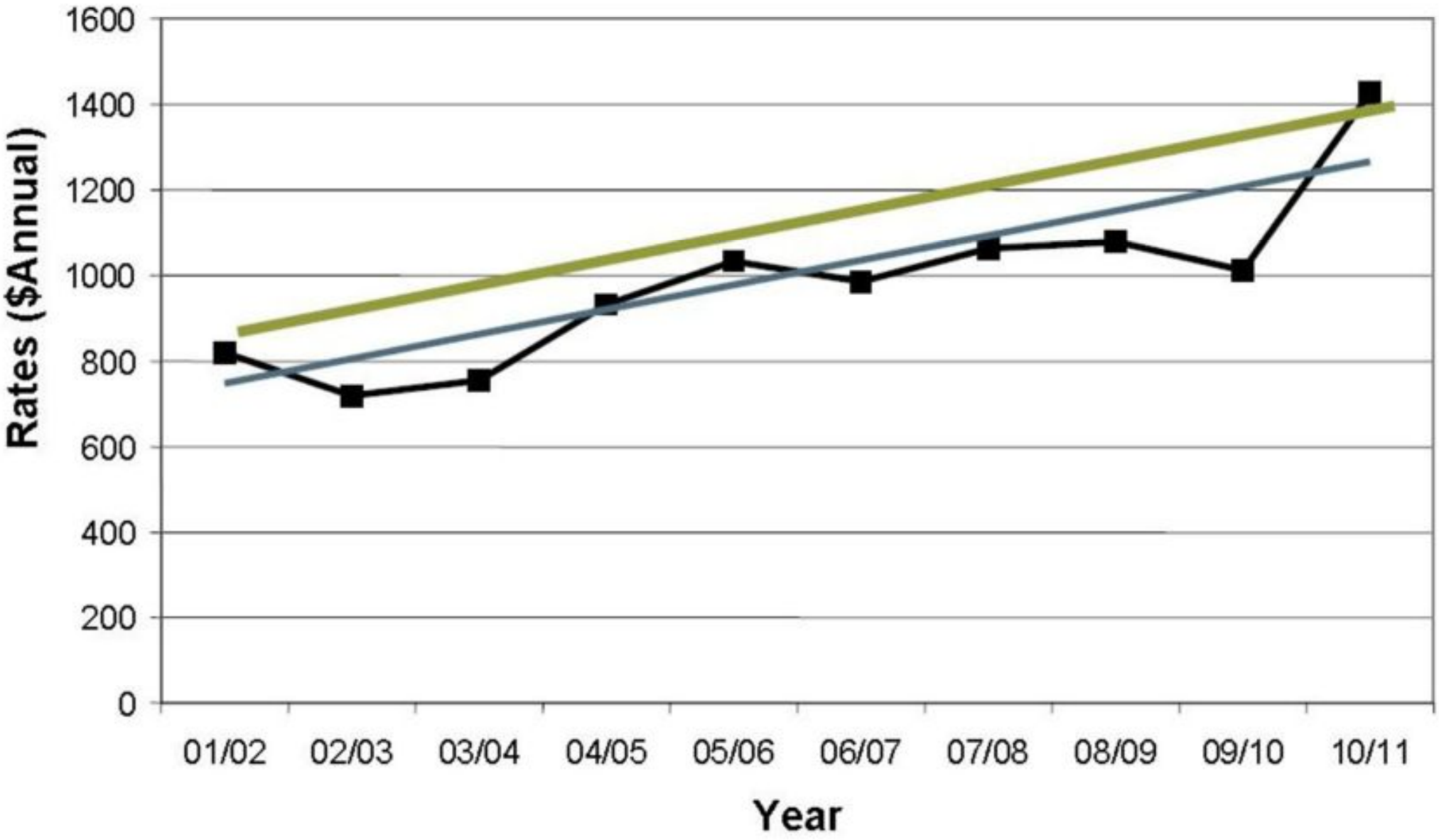
diture

Question 5: What is my best long-term funding strategy?

Overall Projected (Optimized) Expenditures



Projected rates over time by financing scenario




Information Systems
Lifecycle Processes and Practices
Data & Knowledge
Asset Management Plan (Integrated Strategies)
Organizational Issues
People Issues
Sustainable Service Delivery


Develop Asset Registry
Assess Performance, Failure Modes
Determine Residual Life
Determine Life Cycle & Replacement Costs
Set Target Levels of Service (LOS)
Determine Business Risk ("Criticality")
Optimize O&M Investment
Optimize Capital Investment
Determine Funding Strategy
Build AM Plan
What is the Current State of my Assets?
Levels of Service?
Which Assets Are Critical?
What are our best O&M and CIP Strategies?
How are we going to fund this long-term?


Wisdom
Knowledge
Information
Data

Thank You for Your Attention

Any Questions?