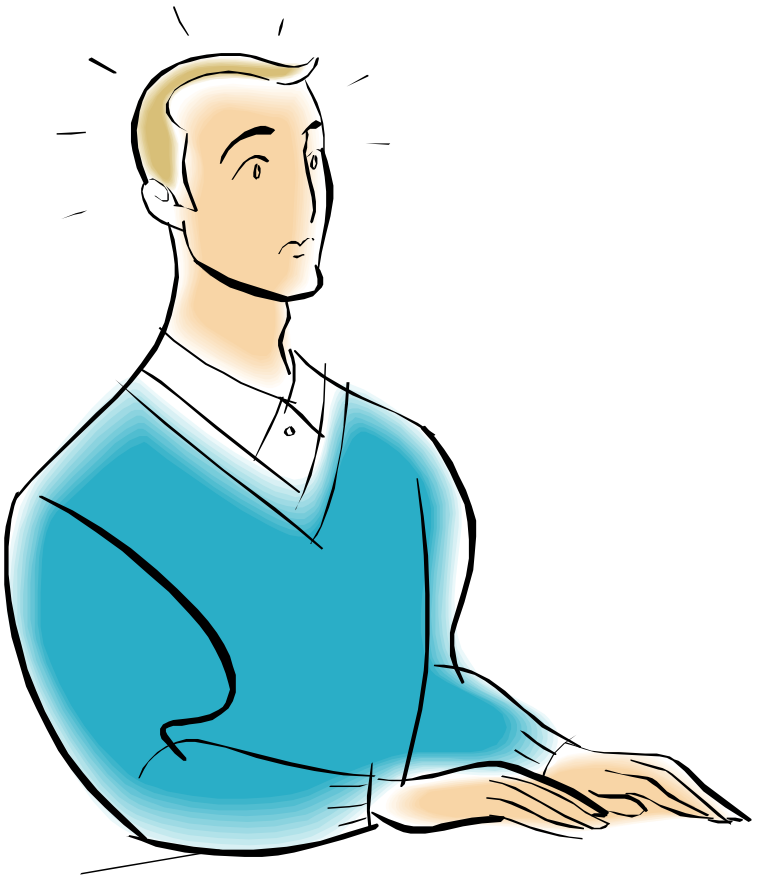
Fundamentals of Asset Management

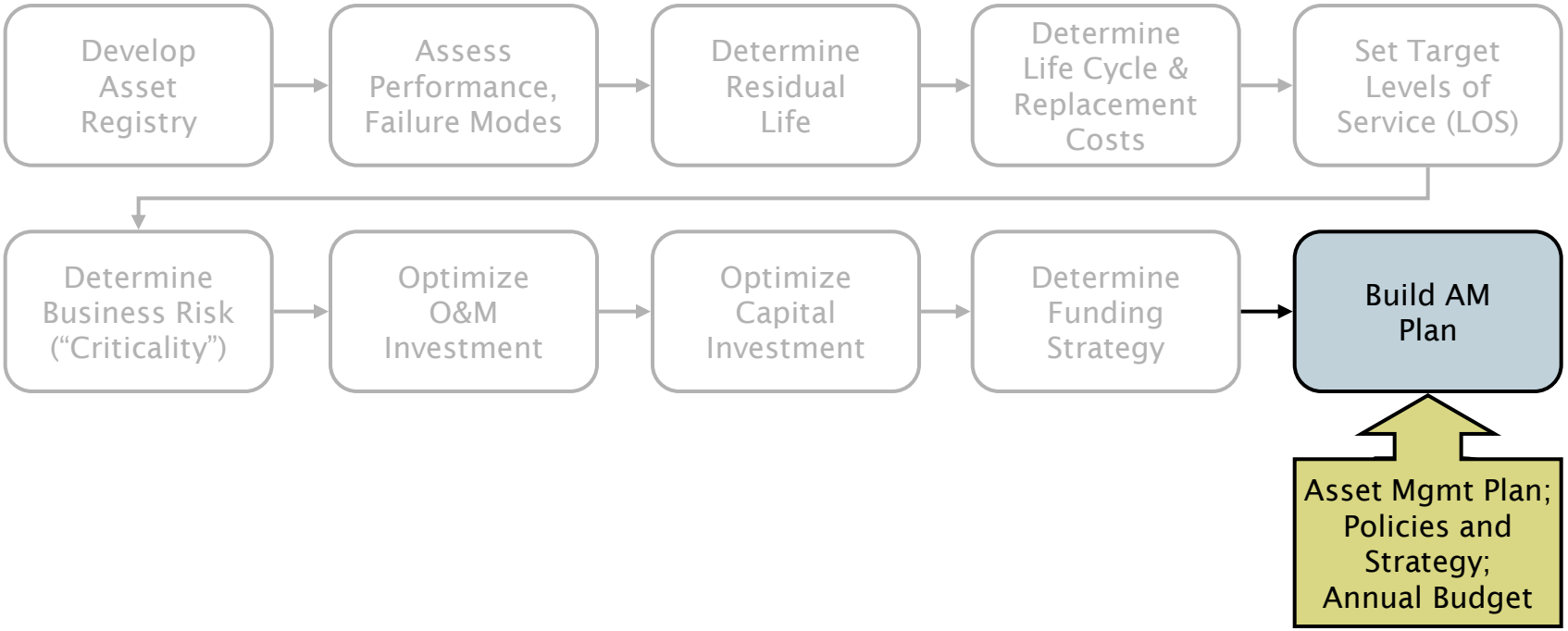
Step 10. Build Asset Management Plan

A Hands-On Approach

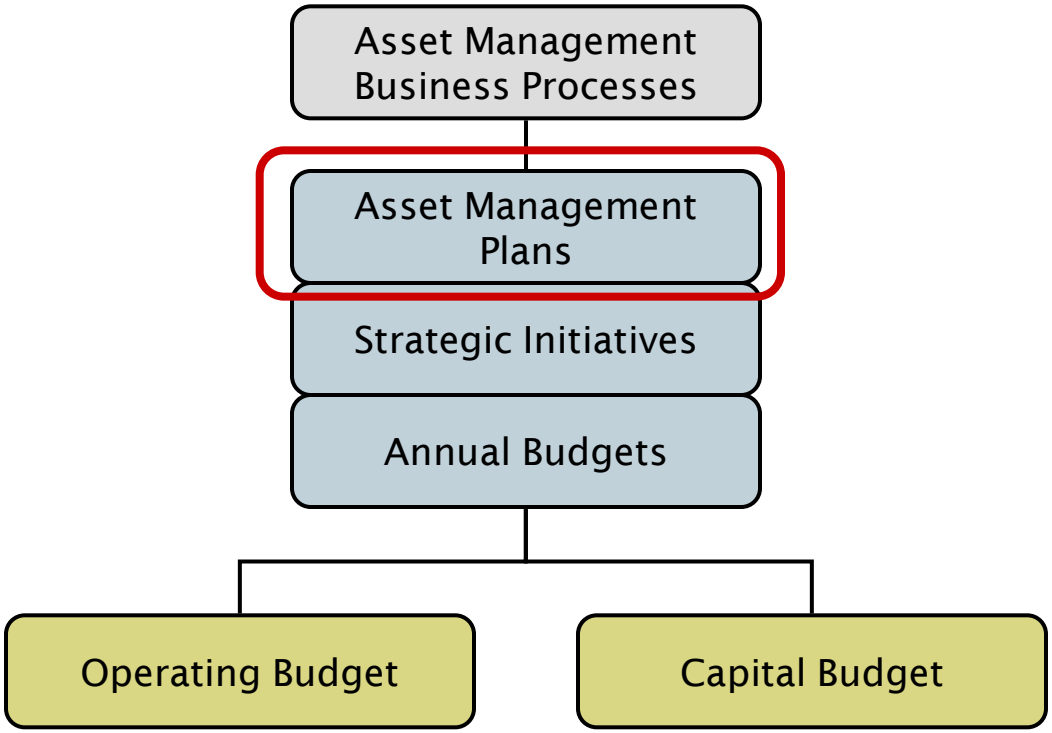
Tom’s bad day…



AM plan 10-step process



Recall View 4: Management framework



Asset decision framework

Big picture

- Whole portfolio perspective
  - Trends
  - Macro forces
- Policy framework
- Budget arena

Micro view

- Event based
- Specific asset focus
- Case-by-case decision points

Maintain? Repair? Refurbish? Replace? Augment?

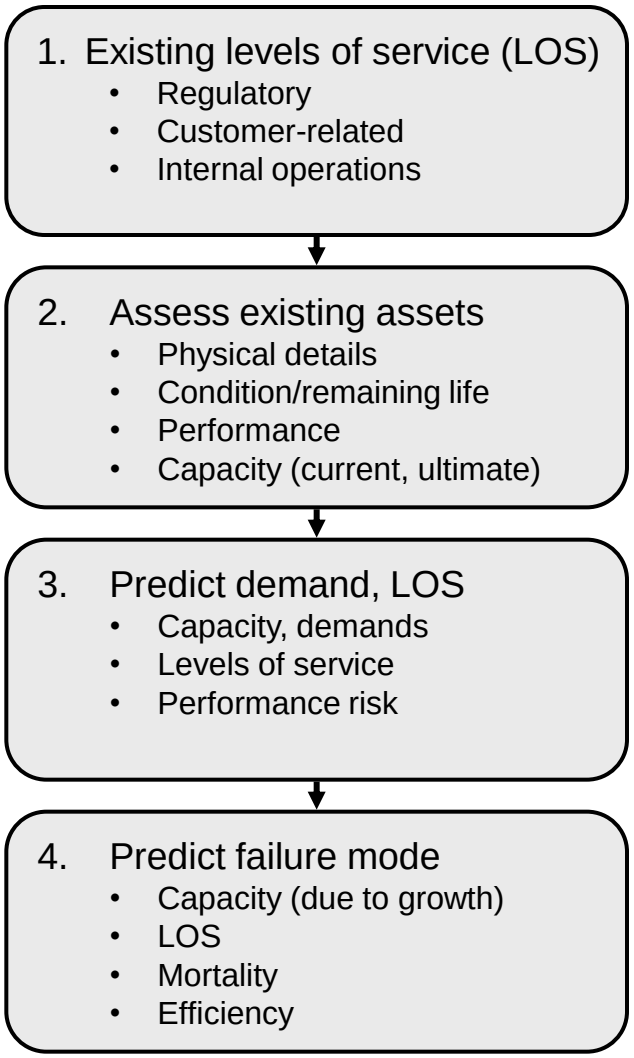
Tom's Jones Street asset management plan: Key points

- *State of the facility*
  - Facility is well into mature stage of life cycle
  - Most imminent major failure mode—capacity
    - Assume two years before peak design flow is exceeded—growth
    - Additional capacity can not be feasibly added
  - Physical state is very poor, especially pumps and motors
  - Asset is largely at 75% to 90% physical life consumed
- *Required LOS*
  - *Stop SSOs*
  - Meet Whispering Oaks flow requirements
- *Critical assets*
  - Roof
  - Power
  - Controls
  - Pump assemblies

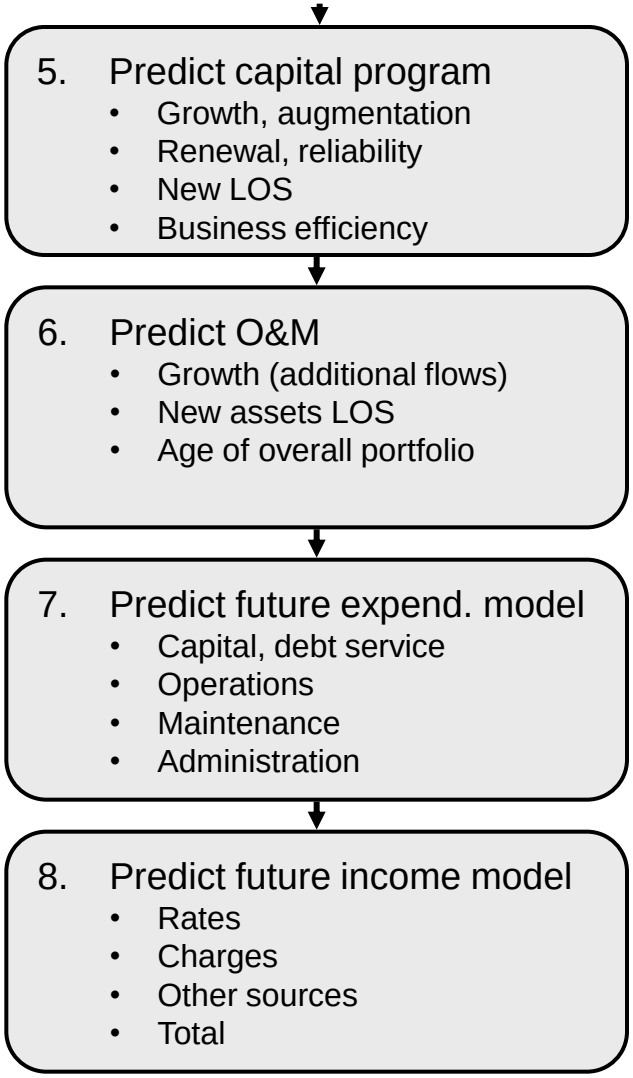
Tom's Jones Street asset management plan: Key points

- *O&M/CIP investment strategies*
  - Keep lift station running for two years, then decommission
  - All replacement equipment sized for reuse in new lift station
  - Move to predictive maintenance (set up monitoring intervals) for dynamic (mechanical/electrical) equipment based on root cause
  - Run to failure with effective reactive response plan for rest
  - Assure that reactive response plan provides for continuous functioning (bypass/supplemental power/supplemental pump)
- *Toward a funding strategy*
  - Identify O&M budget requirements to fund interim O&M strategy
  - Prepare valid capital budget/project to replace lift station
  - Prepare business case and present to Council

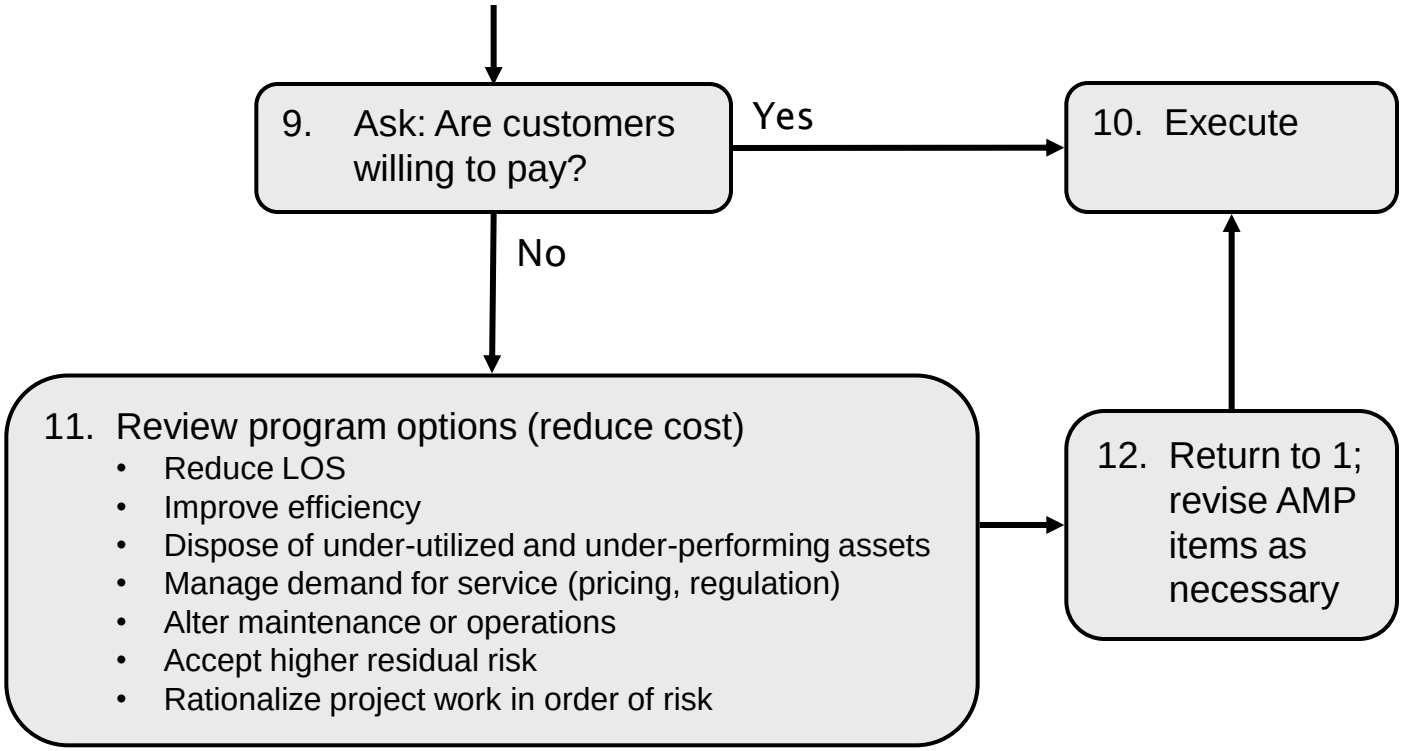
Steps in developing your AMP



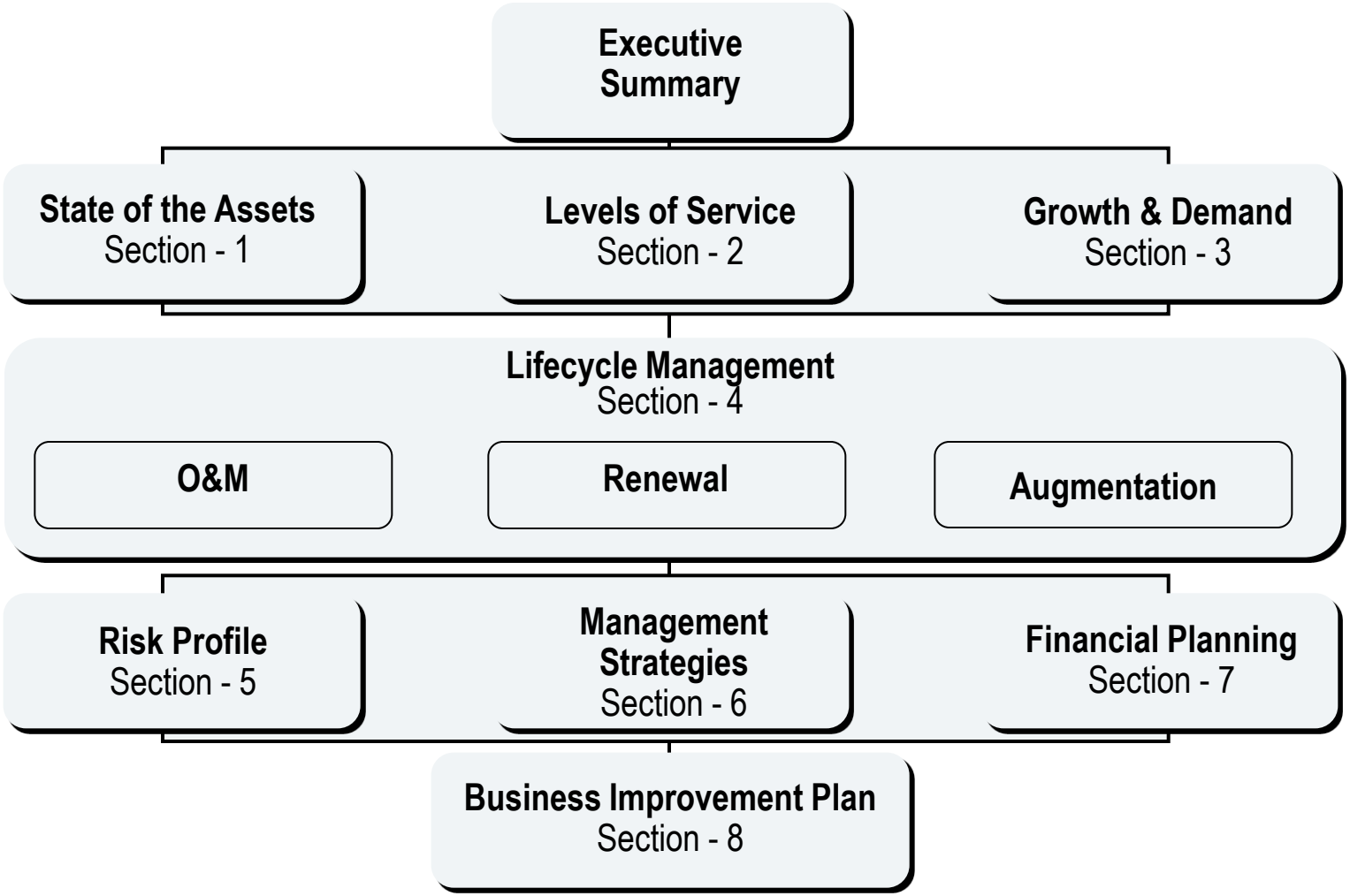
Steps in developing your AMP, cont.



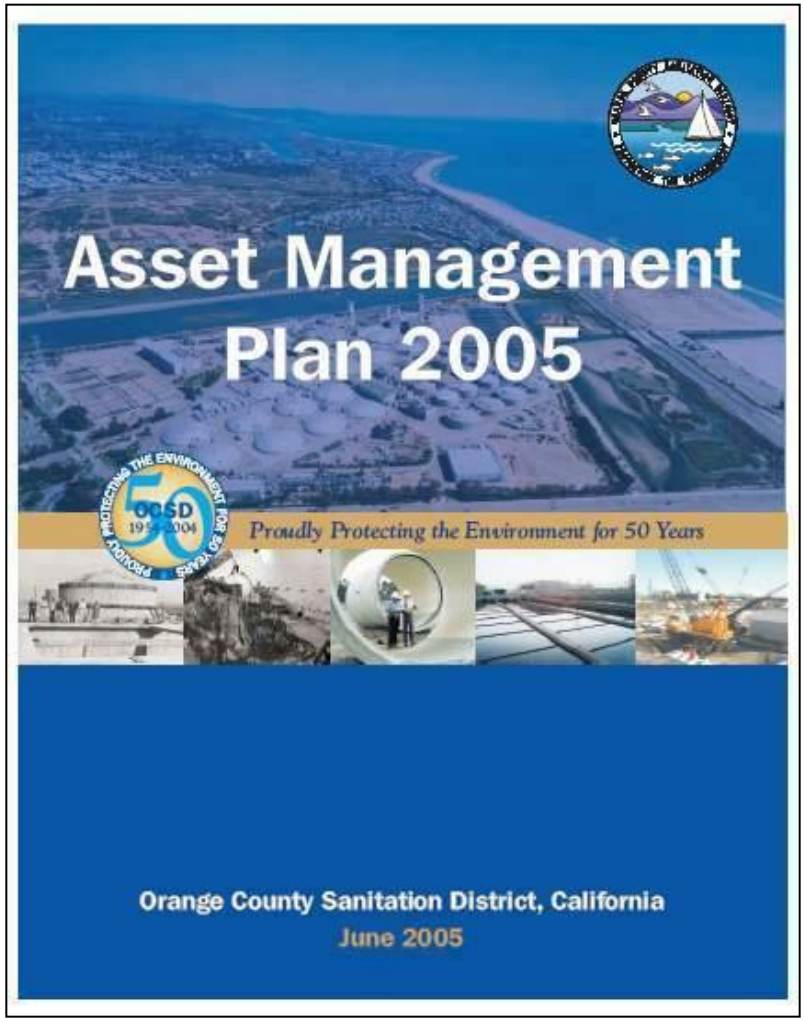
Steps in developing your AMP, cont.

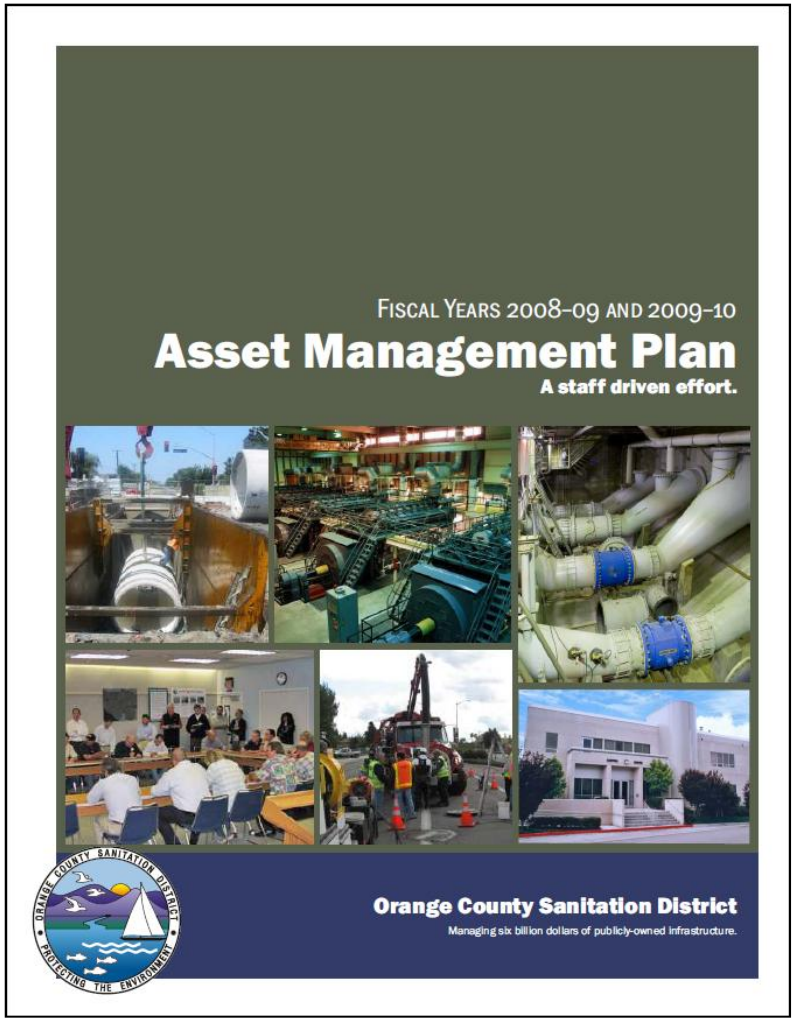


The Enterprise Asset Management Plan



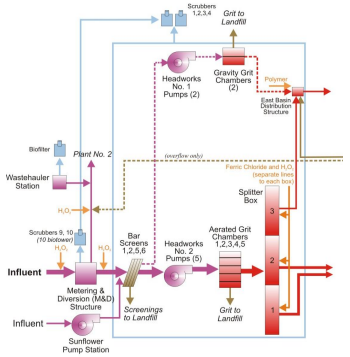
The enterprise asset management plan





The Enterprise Asset Management Plan—asset system summary

1. Asset Profile



Metering & Diversion Structure

A total of six influent trunk lines bring influent into the metering and diversion structure at Plant No. 1. This structure contains magnetic flow meters, pH meters and electro-conductivity meters along with gates that can be raised or lowered to move flows from one trunk-line to another as necessary. A portion of the influent can also be diverted to Plant No. 2 through an interplant pipeline to regulate flow into Plant No. 1.

Headworks #1 & #2

There are two Headworks at Plant 1, which have a total rated pump capacity of 210 mgd with 130 mgd of stand by. Headworks #2 can be increased by another 70 mgd in the future by addition of another pump. It has two support generation units with a power rating of 1000 KW. Headworks #2 is the newest and is the operated system and Headworks #1 is the standby system. Three key processes for Headworks are bar screens, influent pumps, and grit removal.

Screening Station (Bar screens)

Flow from the Metering and Diversion Structure is routed to the influent channel for the mechanically-cleaned bar screens at Headworks #2. There are four individual bar screen channels containing automatically cleaned screens. Two of the screens are operated and the other two are standby. The structure contains space to accommodate two additional screens in the future.

Main Sewage Pumps

After passing through the Headworks #2 bar screens, wastewater flows into the Influent Pump Station wet well. The Influent Pump Station lifts screened wastewater to the influent channel serving the grit removal chambers. There are four 70 mgd variable speed pumps at Headworks #2 and two 30 mgd constant speed pump at Headworks #1, which services as stand by pumps. A sluice gate in this wet well can be opened to allow screened wastewater to flow to the Headworks #1 Influent Pump Station wet well if required allowing the wet wells at Headworks #2 and Headworks #1 to act as one large wet well under extreme wet weather conditions.

Grit System (Grit Removal)

There are five aerated grit removal chambers at Headworks #2 and two at Headworks #1 that are standby. The purpose of these is to remove inorganic solids that are present in the wastewater. The removal of this grit helps prevent clogging in pipes, protects mechanical equipment, and reduces the amount of material that collects in the sludge digesters. Each grit chamber contains four grit collection hoppers. Grit is removed from the chambers using telescoping valves that continuously discharge grit slurry by gravity to classifiers. Grit from the classifiers discharged to the conveyor belt carrying screens normally or to a separate grit bin for off-site disposal. Flow from the Headworks #2 grit removal chambers is collected in an effluent channel that discharges to the Primary Influent Distribution Structure (Splitter Box).

Splitter Box

The splitter structure discharges to the Primary Clarifier Basin # 1 to 5 through a 72 inch-diameter pipeline and/or to the rectangular PCB # 6 to 15 through two 90 inch-diameter pipelines. Splitting is accomplished using the sluice gates.

2. Demand Profile and Performance

Table 1 Peak, Average and Standby Design Capacities

System Sub System(s)	Design Capacity (Min, max, peak and/or average)	Actual Performance
Metering & Diversion Structure	Max. Flowrate 490 MGD	
Hydrogen Peroxide	Max. Pressure 150 psi	
Sunflower Pump Station	30 MGD duty 30 MGD standby?	
Headworks No. 1	30 MGD duty	
Main Sewage Pumps	30 MGD duty 30 MGD standby	
Grit Removal	2 chambers	
Headworks No. 2	210 MGD duty	
Main Sewage Pumps	280 MGD duty 70 MGD standby	
Bar Screens	4 units (+allowance for 2 units to be constructed) 234 MGD max 1 unit standby	
Grit System		
• Grit Chambers	87 MGD duty 25 MGD standby 5 tanks 2 tanks standby	
• Grit Washers	Hydraulic 1800 gpm Overflow Rate 12,000 gpd/ft2 1 duty and 1 standby	
• Grit Storage Capacity	2 days	
Splitter Box	325 MGD	
Odor Control Facilities (Bleach)	3 @ 24000 cfm duty 1 @ 24,000 cfm standby	
• Feed Pumps	3 @ 11.3 gph duty 1 @ 20 gph standby	
• Recirculation Pumps	4 @ 600-700 gpm duty 4 @ 600-700 gpm standby	
• Muriatic Acid Scrubbing Cleaning Pumps	1 @ 30 gpm duty 1 @ 30 gpm standby	
Trunk Line Scrubbers 1 * Caustic 1 * Biotower	24,000 CFM duty 24,000 CFM standby	Insufficient performance
Ferric Chloride • Feed Pump	3 @ 200 gph duty 1 @ 200 gph standby	
Hydrogen Peroxide		
• Headworks	4 duty (See 10H-120, Pump information) 4 standby pumps Flowrate Capacity 85 gpm Pressure 116 psi	
• Splitter Box	Max. Flowrate Capacity 325 gpd Max. Pressure 150 psi	
Support Generators	Power Rating 1000 KW	
Scrubbers Headworks	2 on trunk lines	

3. Failure Mode

Table 2 Failure Summary

Process	Area	Rating				
		Condition	Capacity	Function	Reliability	Efficiency
Metering & Diversion Structure	10A	2				
Headworks #1	10B	5			5	
Headworks #2	10C	3				

4. Key Issues for Further Investigation

General

Project I-10 to increase flow to Plant 1 by 40 MG/D

Metering & Diversion Structure

Concerns about the reliability and accuracy of meters exist due to meter failures. Proper operation of the meters is important because treatment costs are allocated to the various revenue areas based on influent meter readings.

Headworks No. 1

Questions have been raised as to the ability of the headworks to operate properly under emergency conditions.

Headworks No. 2

Grit Chamber No. 2 is out of service.

6. Investment Program

Table 3 5-Year Summary

Investment (thous.)	Total Projected Budget	Cost to date	2005-06	2006-07	2007-08	2008-09
P1-105	4,920	240	393	320	3,430	537
Total	**4,920**	**240**	**393**	**320**	**3,430**	**537**

Table 4 O&M Cost Summary

Cost (thous.)	2002-03	2003-04	2004-05	2005-06	2006-07
Maintenance			208		
Operations			1108		

5. Current Program

Study

TBA

Planning

TBA

Design & Construction

P1-105 - Headworks Rehabilitation and Expansion at Plant No. 1

This project rehabilitates and refurbishes process equipment and infrastructure within the Plant 1 Headworks facility, to ensure that the facility continues to be operational. Several studies have been conducted on the Headworks facility and a number of non-critical items have been identified for repair and upgrade. The bulk of the project includes upgrades to existing bar screens, an additional bar screen, a screenings compressor, improvements to the grit removal facilities, improvements to the power distribution system including three new larger emergency generators, and miscellaneous process, mechanical, structural and I&C upgrades.

This project is in keeping with industry practices as required for reliable and dependable plant operations. The capital budget identified on this sheet is based on the non-critical items necessary to ensure the facility continues to function and conforms to the ultimate layout of the facility. The FY 2004/05 budgets for P1-71 and P1-105 have been reallocated after further evaluation of critical and non-critical work. P1-105 will address increases in the facilities capacity to meet expected increases in wastewater flow projected in the 2001 Interim Strategic Plan Update.

P1-71 - Headworks Rehabilitation/Refurbishment

The scope of work consists of rehabilitating and refurbishing the VFDs for the main sewage pumps and the cable trays and wiring from the VFDs to the pumps. An evaluation of the pumping capacity of Headworks No. 2 at Plant 1 conducted in 2001. Capacity issues will not be addressed through this project as capacity upgrades are being handled through a separate project (Ellis Avenue). There are other potential tasks items for this project which includes: a grit characterization study based on a computer model, gate operators, and installation of ventilation in Headworks 1 to meet NFPA 820. Other tasks that were previously part of this project have been moved to Job No. P1-105.

This project is in keeping with industry practices as required for reliable and dependable plant operations. These reliability of these VFDs must be restored by late 2008 such that Plant 1 may reliably accept diverted flow from Plant 2 during Plant 2 Headworks changeover.

P1-104 – Regional FOG Control Collection at Plant 1

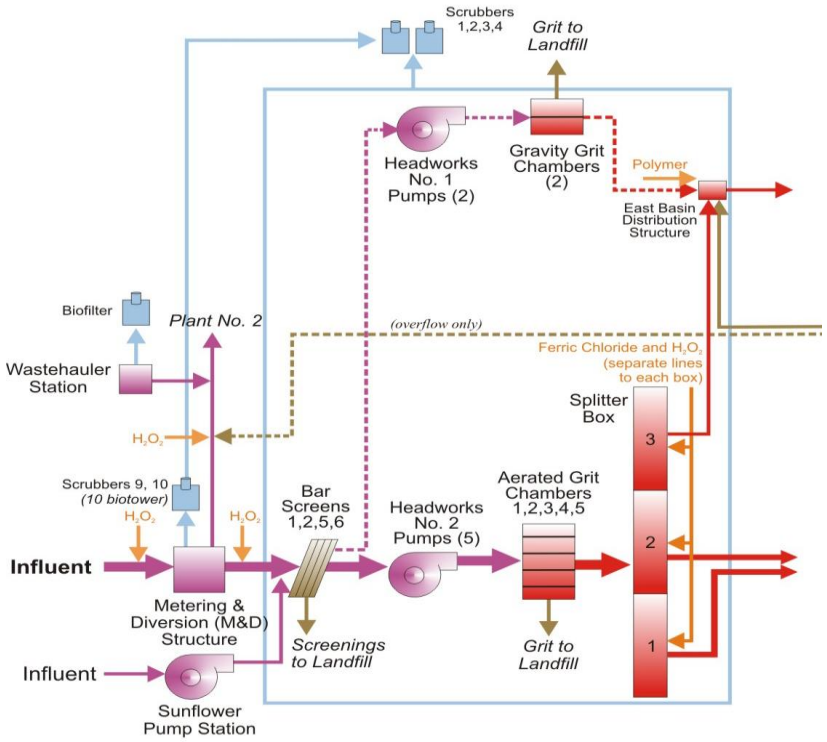
J71-8 – Headwork Scrubbing Replacement

Management Strategies

TBA

Detail, left page

1. Asset Profile



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Detail, right page

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The asset management improvement plan section

OCSD Asset Management Improvement Program
Staff Lead Program 2005/06 Budget - Overall Timeline

Project No.	Project Name	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May
11 & 12	Data Standards Asset Registers				(GHD)		CMMS						
8	AMIS Function Applications and Strategy									(GHD)			
13	Condition Assessment Guidelines						(GHD)						
2	CIP Validation Stage 4					(JB)							
4	BRE Collections			(NA)									
5	BRE Plant						(JB)						
6	LOS Stage 2									(JH)			
7	4 Box Model									(DS)			
1	Asset Management Plan 2									(AMT-DS)			
10	ORDM / LLCCA					(AMT-DS)							
9	Risk Policy							(AMT-DS)					
14	Organizational Alignment										(AMT-DS)		
3	Reliability Centered Management												

Example: Organizational AM strategies

No.	Description	Remarks /Deliverables	Benefits
1	Asset Management Plan 2006	Increase confidence level rating with better accurate data on condition and performance, more defined management strategies, improve future predictions on changed levels of service overall results / outputs etc including rate modeling. Complete updated asset management plan analysis and assess improvements made. Links and inputs from most projects.	◗ Asset Management Plan output improvements. ◗ Improved Confidence Level Rating. ◗ Improved Business Risk Exposure assessments, funding and rate models, operations and maintenance budgets. ◗ Expenditure prediction Tool enhancements and improved Business Risk Exposure modeling.
2/10	Capital Improvement Program Validation Stage 4 (2005/06)	Add life cycle costs, Business case analysis methodology, including improved maintenance budgets /options and improve risk model to full economic cost and Triple Bottom	◗ Significant benefits derived for 2004 program ($25M in capital) and over $50M in life cycle costs.

ASSET MANAGEMENT POLICIES

Washington Suburban Sanitary Commission

Effective planning, design, construction, operation, maintenance and renewal of infrastructure assets are the primary means by which we meet our obligations to stakeholders and rate-payers.

We are committed to an asset management program that ensures our staff and management will:

1. Provide training in all relevant aspects of asset management to enable staff to perform required functions at a high level of competence while pursuing opportunities for continuous improvement. This includes implementing:
   - Asset management systems and resource management tools to ensure that appropriate skills and resources match our anticipated work;
   - An organization-wide knowledge management system incorporating the retention and /transfer of knowledge of individuals, and
   - Regular training programs that address asset management practices, business processes, and skills requirements.
2. Know what assets we own and for which assets we have responsibility or legal liability. We will record these assets in one register down to a maintenance-managed item (MMI level).
3. Apply best appropriate life cycle processes and practices to our assets. We will acquire and maintain the necessary data and knowledge these processes and practices require. We will store our data and knowledge in suitable enterprise-wide information systems that support our asset management responsibilities.
4. Monitor the condition, performance, use and cost of infrastructure assets down to the appropriate level (part, item, asset, etc.) and against prescribed service levels and regulatory requirements.
5. Understand those infrastructure assets that are critical to our service levels and prioritize their management to ensure they don't fail. (This is not to imply that non-critical assets are ignored).
6. Understand and record the current levels of service with which we provide our customers. We will understand the likely future levels of service required in order to continue to serve our customers.
7. Know the future level of service options available and their associated costs. We will publish future level of service options periodically through our asset management plans and associated funding strategies. We will use future level of service options in our public/customer outreach programs.
8. Link our level of service with our stakeholder expectations, through customer outreach, at a cost that our customers are willing to pay.
9. Understand customer expectations including the non-regulatory aspects of our business (e.g., noise, customer service, appearance, cleanliness, customer outreach).

Revision Date: March 3, 2008

The AM "charter"

The AM charter

Asset Inventory We will know the assets that we own, or for which we have legal responsibility, and will maintain an accurate computerized asset register developed around an asset hierarchy that supports advanced asset management functions.

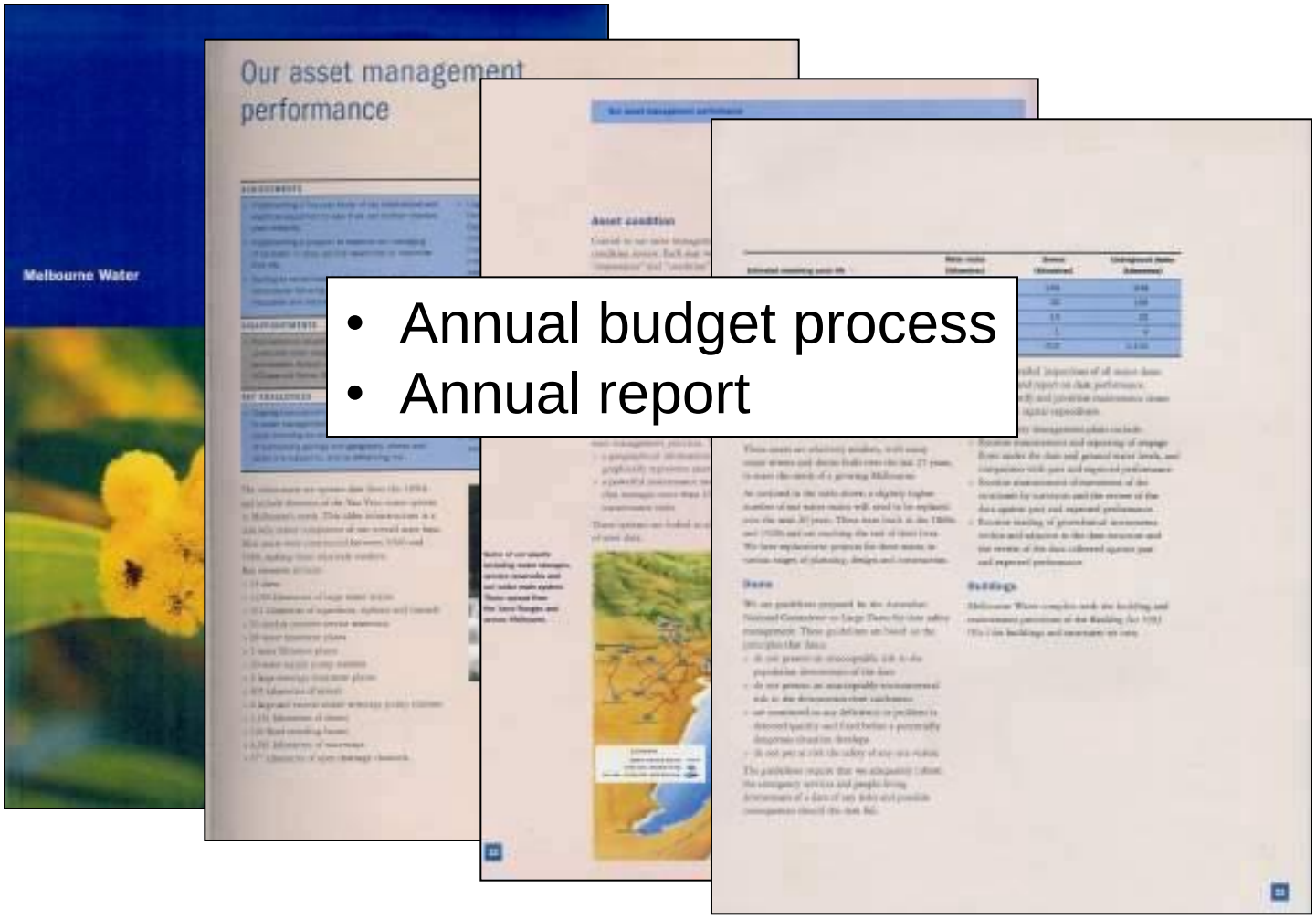
The AM charter

Condition Assessment We will gather, record, and analyze condition assessment data; store and analyze it using user friendly computerized systems; design these systems to support high confidence level asset related decision making; and create a comprehensive and dynamic condition index.

The AM charter

Maintenance We will retain a detailed maintenance policy, and operate a user friendly, accurate, and comprehensive enterprise asset management system (that includes a Computerized Maintenance Management System) to ensure that the assets, facilities, and systems perform to their design criteria and meet their design lives.

Telling the story—institutionalization



- Annual budget process
- Annual report

Key points from this session

What does my asset management plan look like?

Key Points:

- AM focuses relentlessly on providing sustained performance at the lowest life-cycle cost to the organization
- AM is both a way of thinking and a set of specific practices
- The more we understand about our assets, the better we can mange them
- Understanding our assets starts with asking the right questions

Associated Techniques:

- The Enterprise Asset Management Plan
- The Total Enterprise Asset Management Improvement Program
- Best AM Practices; Best Appropriate Practices
- The Five Core AM Questions
- The 10 Step Process to an asset management plan