The Fundamentals of Asset Management

Welcome

A Hands-On Approach

AGENDA

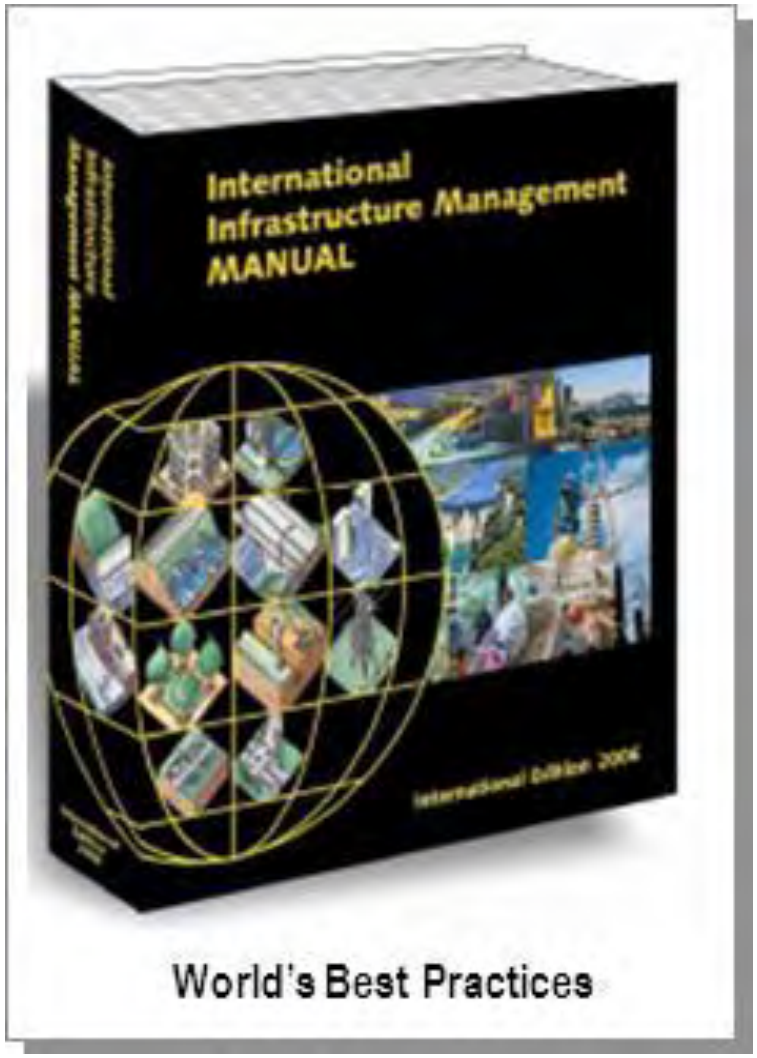
Day 1

- *Welcome, Introductions & Housekeeping Details*
- *"Storyline" Introduction, Background And Context*
- *Overview Of Fundamental Concepts & Core Practices*
- *The Storyline: Tom's Really Bad Day*
- *Core Question 1: What Is The Current State Of My Assets?*
- *Core Question 2: What Is My Required "Sustainable" Level Of Service?*
- *Review of Key Slides; Discussion / Q & A*

Day 2

- *Core Question 3: Which Assets Are Critical To Sustained Performance?*
- *Core Question 4: What Are My Minimum "Life-cycle-cost" CIP and O&M Strategies?*
- *Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?*
- *Focus Topic 1: Deploying An AAM Program*
- *Focus Topic 2: Meeting The IT Challenge – Toward An Enterprise Asset Management System (EAMS)*
- *Summary, Addressing Your Questions, Comments*

Drawing from the AM Knowledge Base



This workshop is produced by GHD Inc.

- *Australian-based international company with over100 offices worldwide*
- *6500+ management consultants, engineers, scientists, planners, architects*
- *Recognized as a world leader in advanced asset management – over 25 years*
- *Literally, "wrote the book" on Best Practices*
- *Hundreds of engagements over two decades*

Our “Faculty”

Mr. Steve Allbee

- *USEPA Project Director, Gap Analysis;*
- *Primary author, USEPA’s The Clean Water and Drinking Water Infrastructure Gap Analysis;*
- *30 years EPA - development of financing programs;*
- *BA, MA, MPA.*

Mr. Duncan Rose

- *Principal Consultant; AM Technical Director – GHD Inc;*
- *Former city/county manager;*
- *Co-author of WEF’s Managing the Water & Wastewater Utility;*
- *30 years state & local management;*
- *Adjunct Faculty, Florida State University, Askew School of Public Policy and Administration;*
- *BA, MSP, MAPA.*

By the end of this workshop you should be able to address these five questions

- What is AM?
- Why do AM?
- What "deliverables" do I get?
- How to do it?
- How do I move forward?

The Fundamentals of Asset Management

Executive Overview

A Hands-On Approach

Emerging utility business conditions

- Increasing demand for utility services
- Diminishing resources
- Leveling of production efficiencies
- Increasing restrictions on output
- Aging infrastructure

Result: *increasingly expensive treatment options*

Emerging utility business conditions

- Aging customer base
- Diminishing technical labor pool
- Larger and more sophisticated facilities
- Loss of knowledge with personnel retirements
- Public resistance to rate increases

Result: *increasingly complex management environment*

Changing utility business environment

- Demand to do more with existing resources
- Need to make every dollar work – to better use capital and operating budgets
- Move from *reactive* to *proactive* work environment

A paradigm shift…

- Transition from *building and operating* to *managing* assets
  - Extending asset life
  - Optimizing maintenance and renewal
  - Developing accurate long-term funding strategies
  - *Sustain long term performance!*

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

- Acquisition
- Operation
- Maintenance
- Renewal

Resulting in *lowest total cost of ownership*

This training describes…

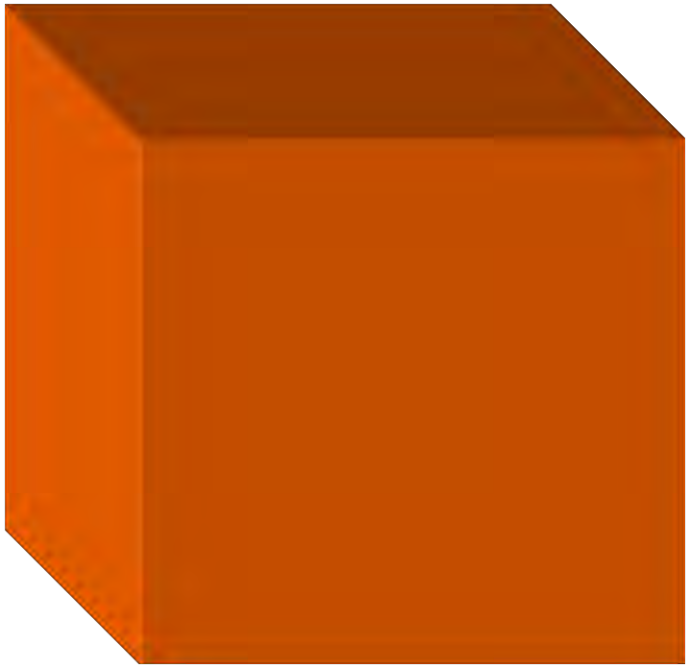
- *What* is asset management?
- *Why* do it?
- What *deliverables* do I get from it?
- What are the *steps*?
- *How* do I move my organization forward?

What, then, is asset management (AM)?

- Systematic integration of advanced and sustainable management techniques into a management paradigm or *way of thinking*, with
- Primary focus on the *long-term life cycle* of the asset and its sustained performance, rather than on short-term, day-to-day aspects of the asset

Views on asset management – a framework

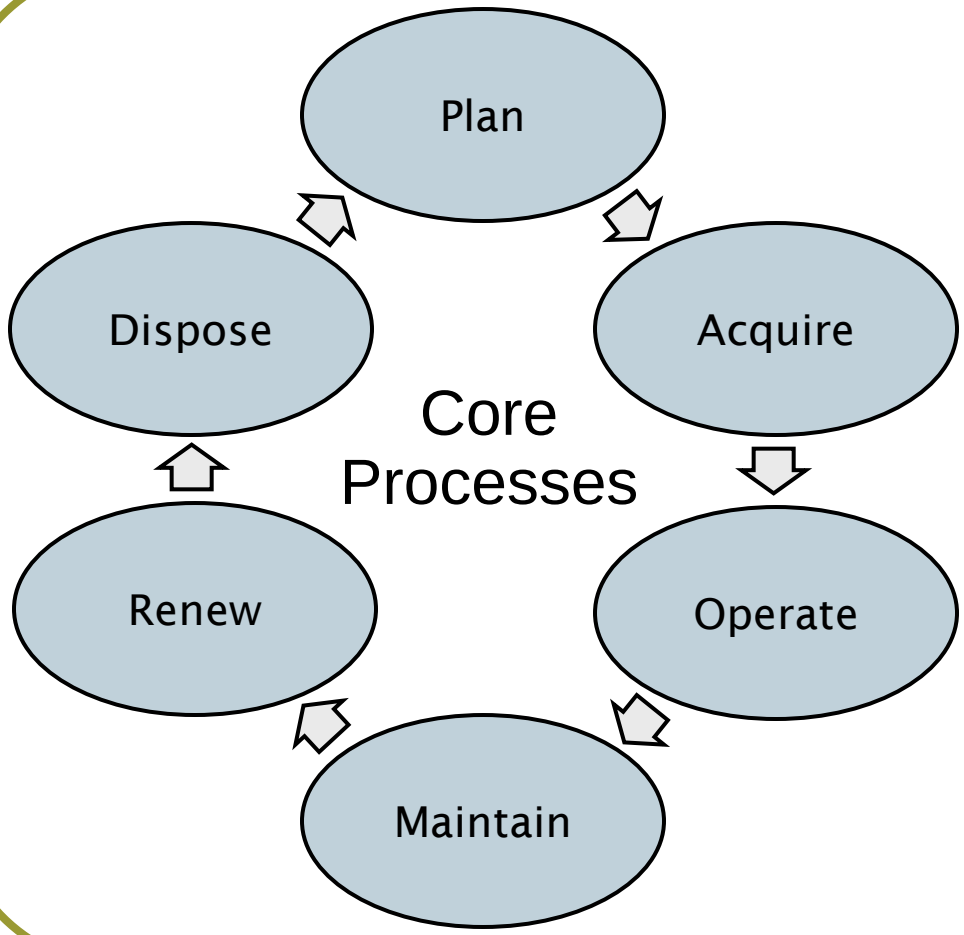
- Asset management can be thought of as an object - a box or framework
- Following is a brief characterization of *8 different views* on asset management
- These views make up the framework



View 1: Definition - asset management

- *Management paradigm* and *body of management practices*
- Applied to the *entire portfolio* of infrastructure assets at all levels of the organization
- Seeking to *minimize total costs* of acquiring, operating, maintaining, and renewing assets…
- Within an environment of *limited resources*
- While *continuously delivering the service levels* customers desire and regulators require
- At an acceptable level of *risk* to the organization

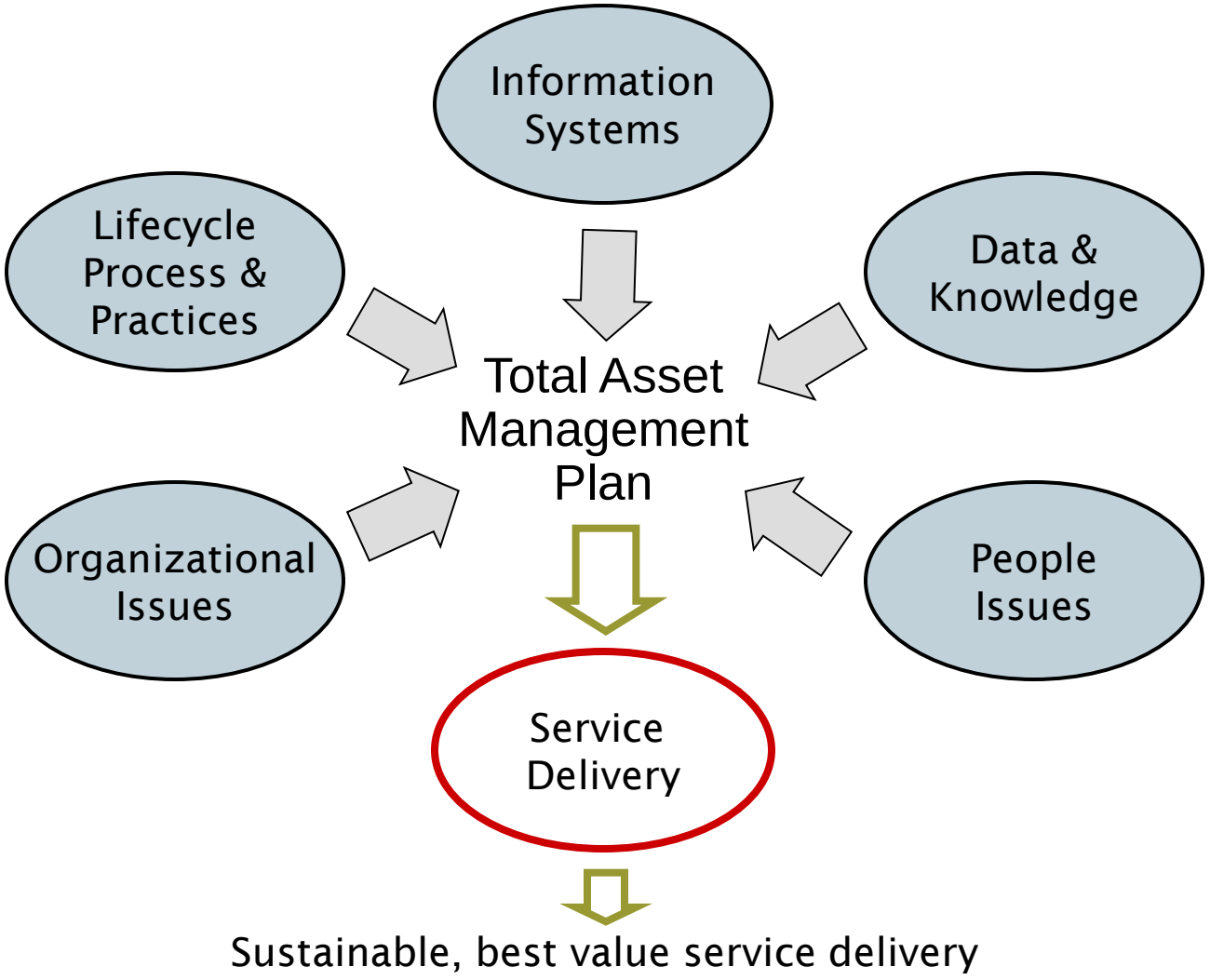
View 2: Life cycle business processes



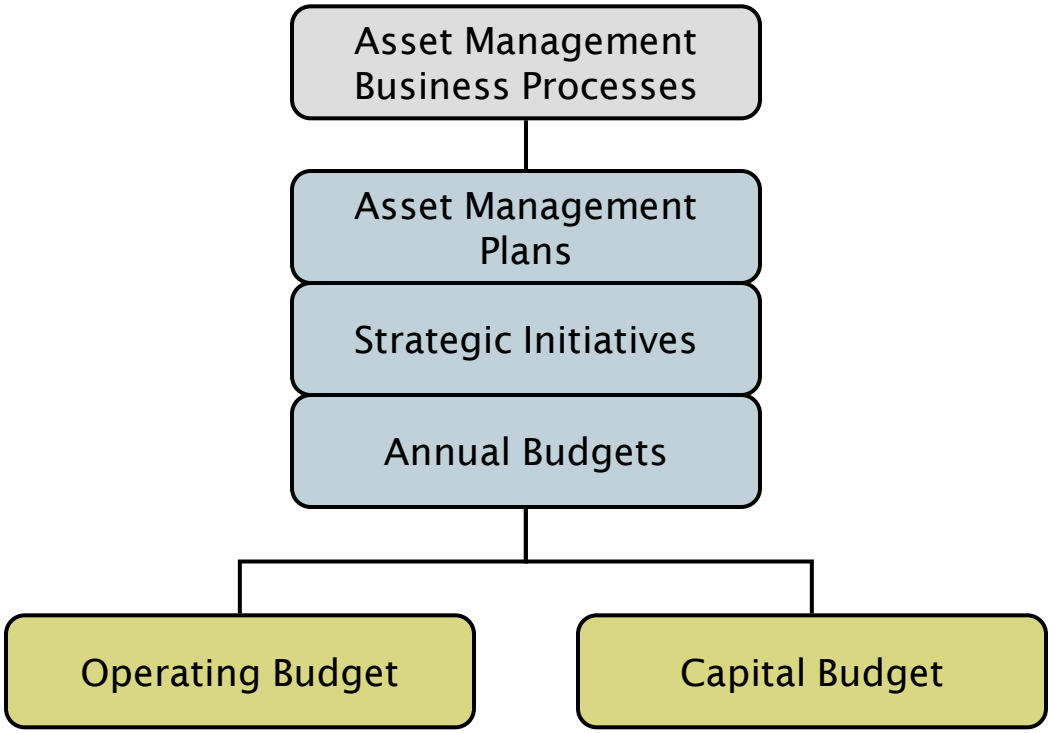
Support processes:

- Demand management
- Knowledge of assets
- CIP validation
- Accounting & economics
- Condition & performance monitoring
- Business risk exposure
- Human resource management
- Review & continuous improvement

View 3: Core AM program elements



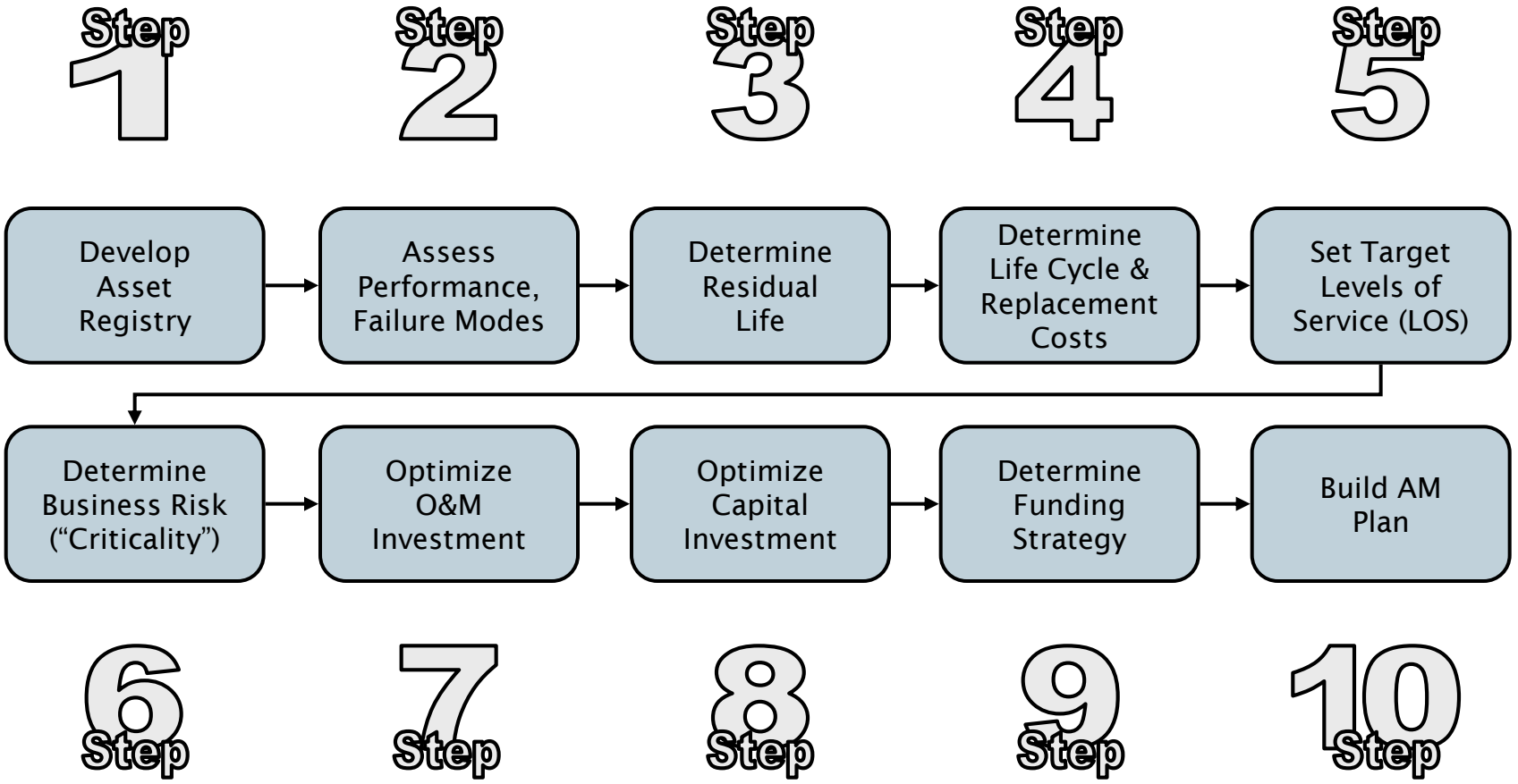
View 4: Management framework



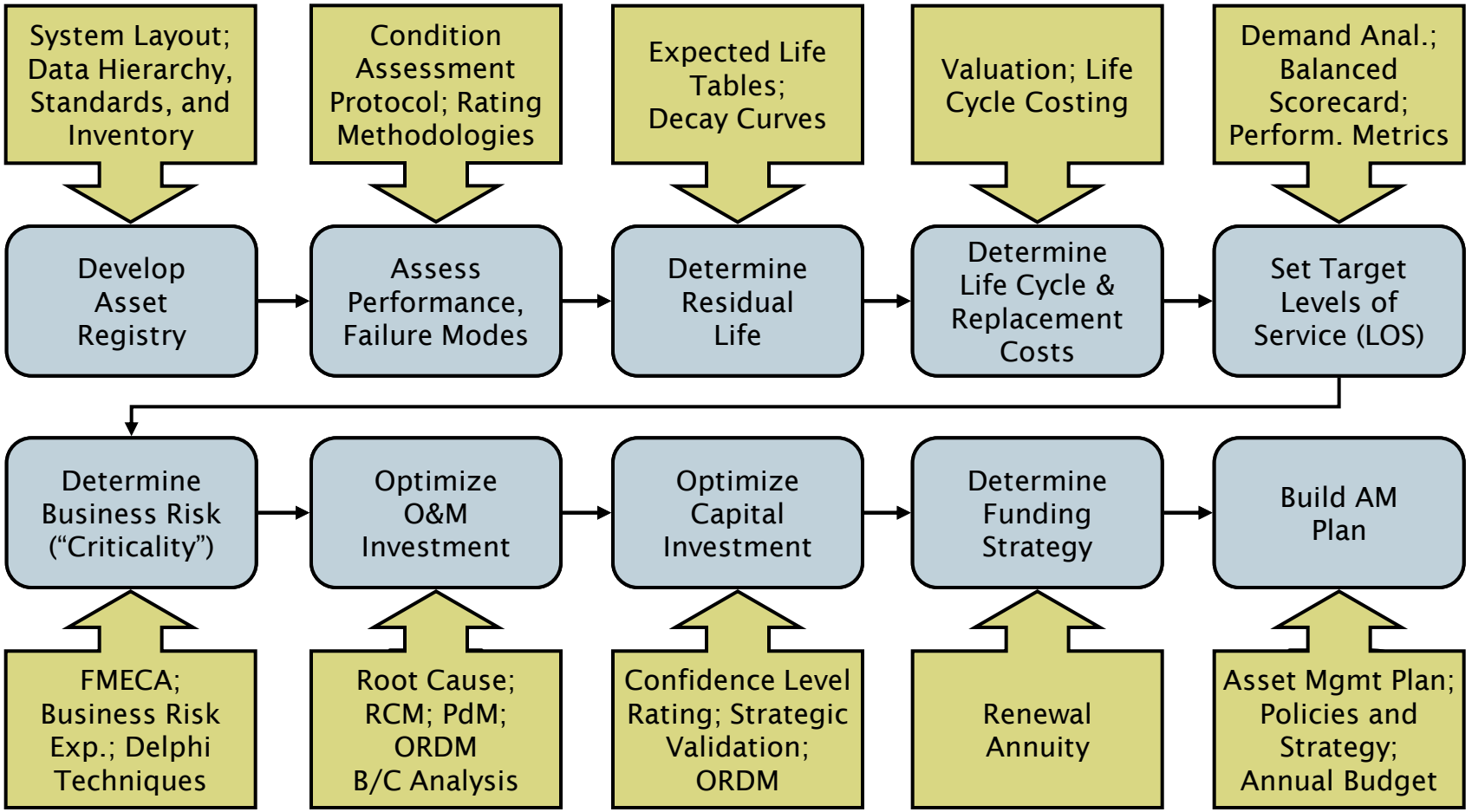
View 5: Five core questions

1. What is the current state of my assets?
   - What do I own?
   - Where is it?
   - What condition is it in? What is its performance?
   - What is its remaining useful life?
   - What is its remaining economic value?
2. What is my required level of service (LOS)?
   - What is the demand for my services by my stakeholders?
   - What do regulators require?
   - What is my actual performance?
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?
4. What are my best O&M and CIP investment strategies?
   - What alternative management options exist?
   - Which are the most feasible for my organization?
5. What is my best long-term funding strategy?

View 6: AM plan 10-step process



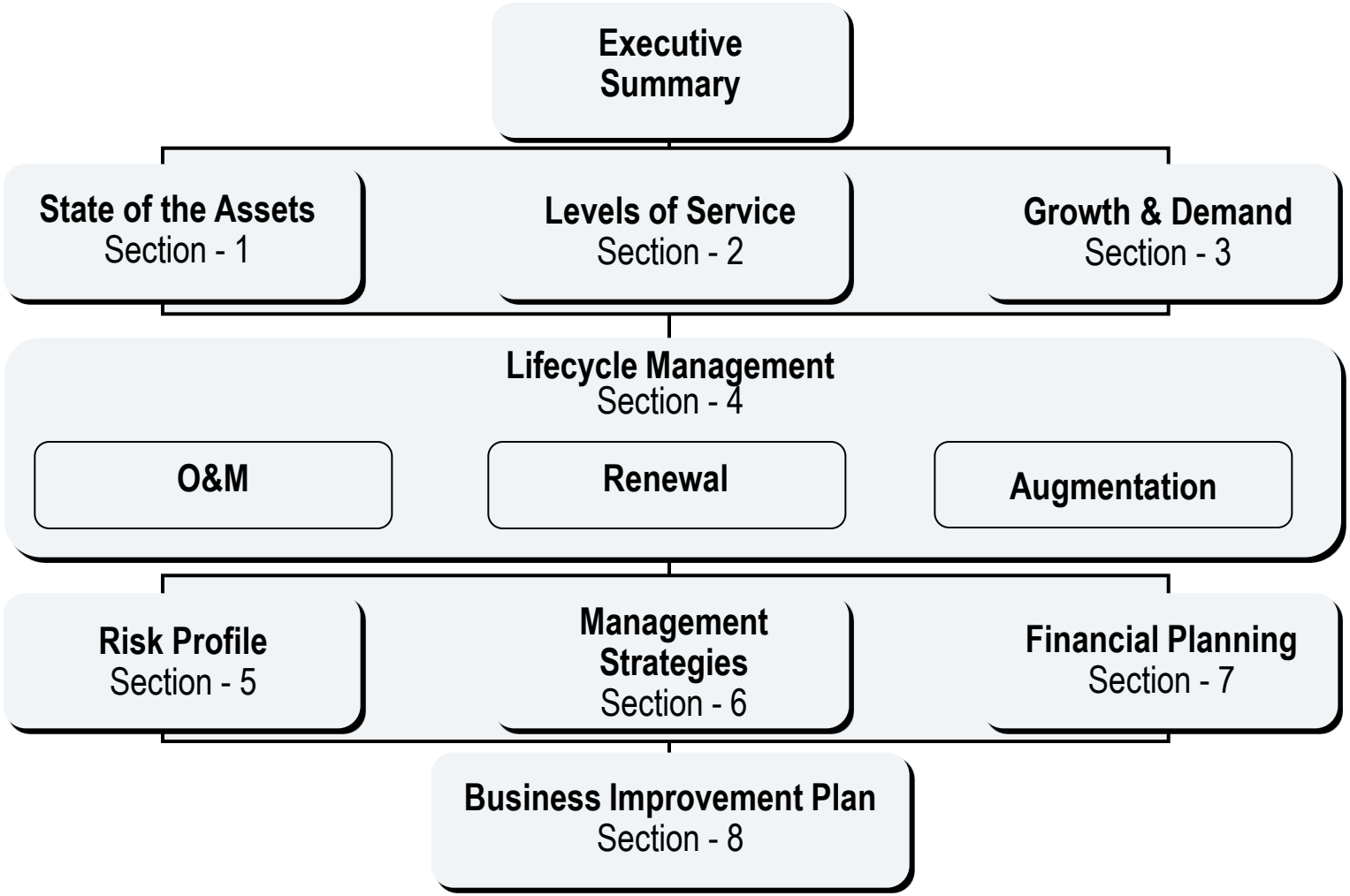
View 6: AM plan 10-step process



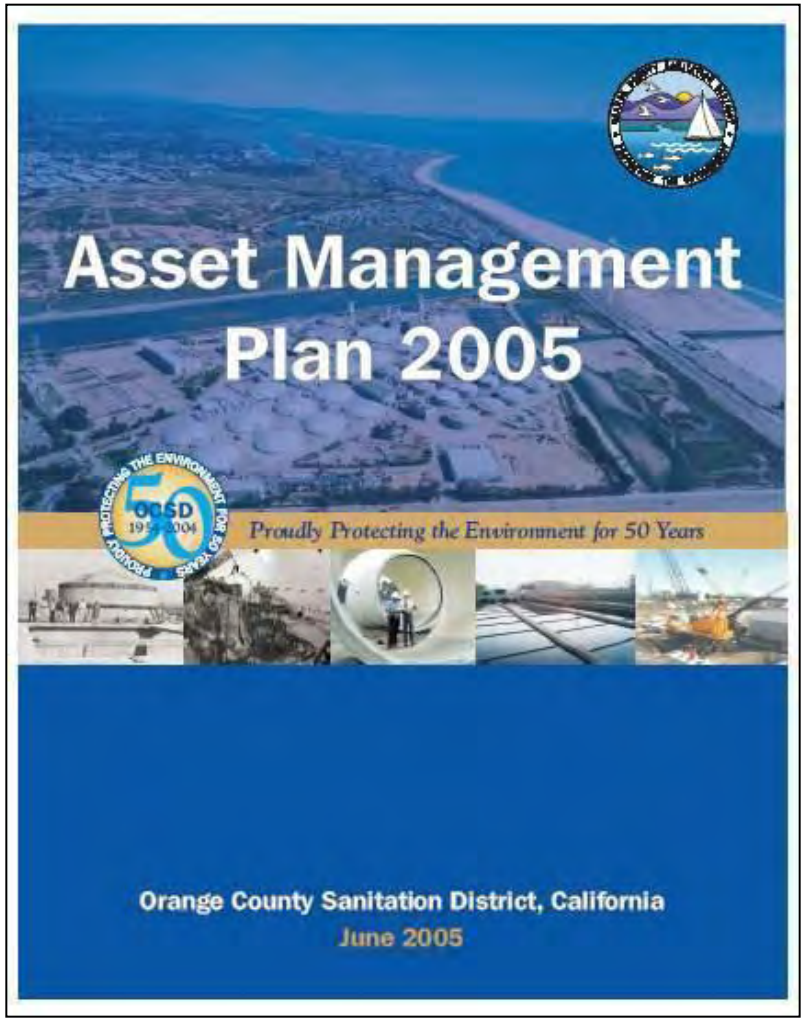
View 7: Seven principles of asset management

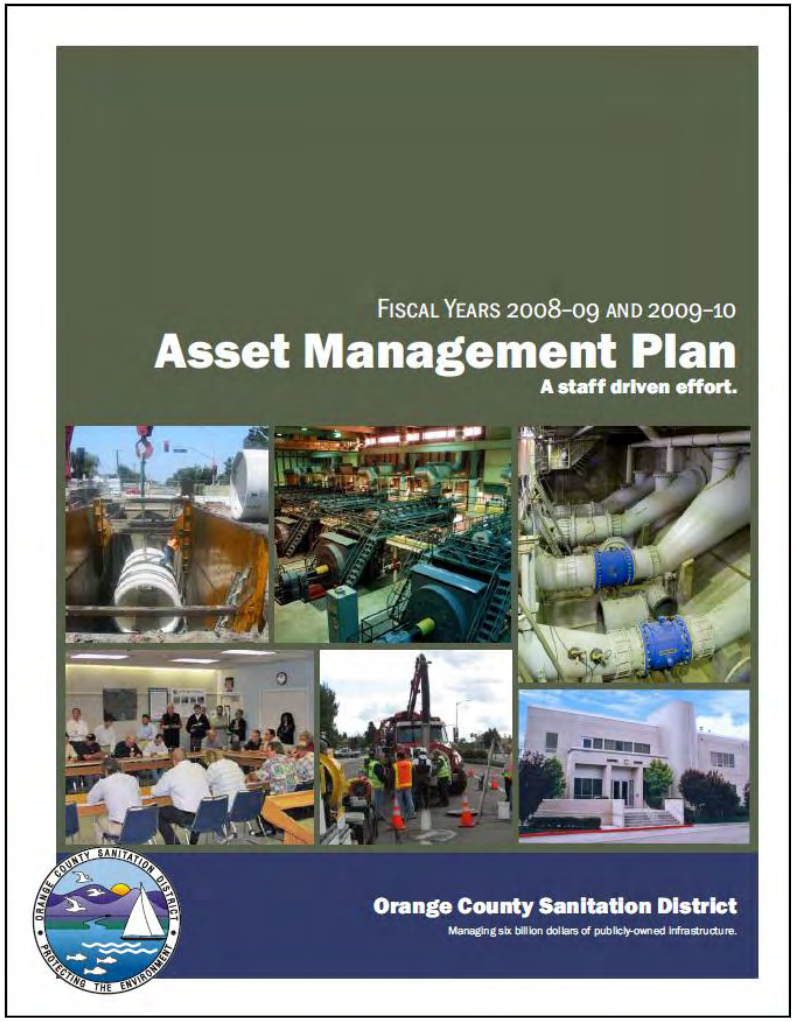
1. The “Value Added/Level of Service” Principle—assets exist to deliver services and goods that are valued by the customer-stakeholder; for each consumer-stakeholder there is a minimum level of service below which a given service is not perceived as adding value.
2. The “Life Cycle” Principle—all assets pass through a discernable life cycle, the understanding of which enhances appropriate management.
3. The “Failure” Principle—usage and the operating environment work to break-down all assets; failure occurs when an asset can not do what is required by the user in its operating environment.
4. The “Failure Modes” Principle—not all assets fail in the same way.
5. The “Probability” Principle—not all assets of the same age fail at the same time.
6. The “Consequence” Principle—not all failures have the same consequences.
7. The “Total Cost of Ownership” Principle—there exists a minimum optimal investment over the life cycle of an asset that best balances performance and cost given a target level of service and a designated level of risk.

View 8: Enterprise asset management plan

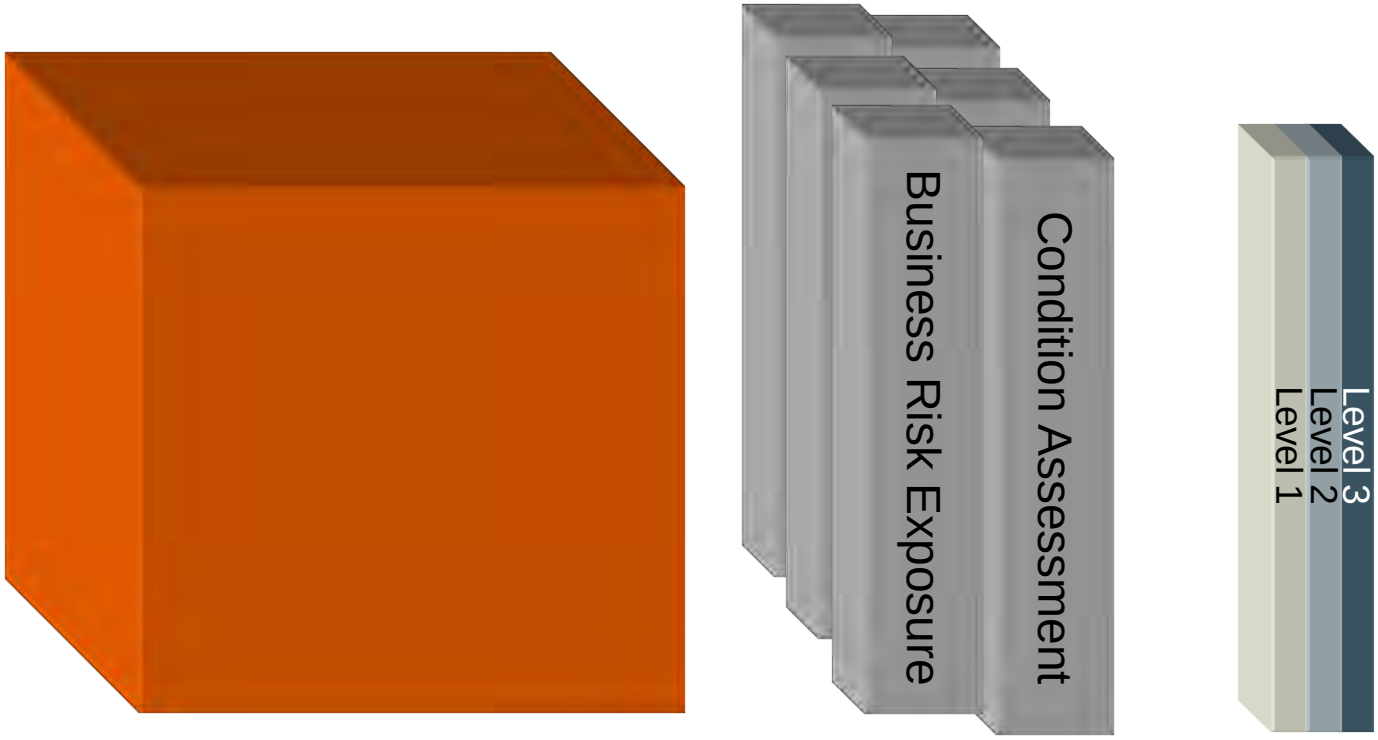


The enterprise asset management plan

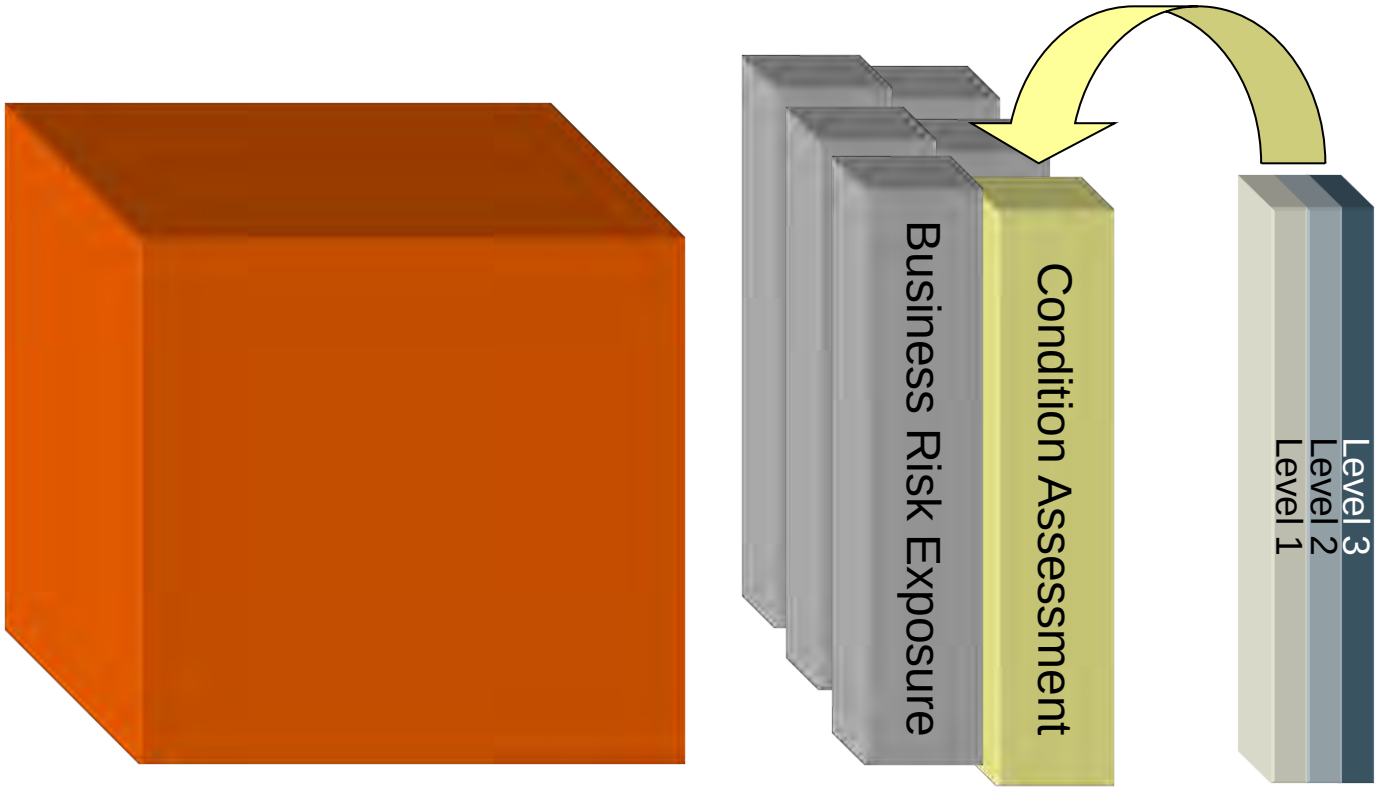




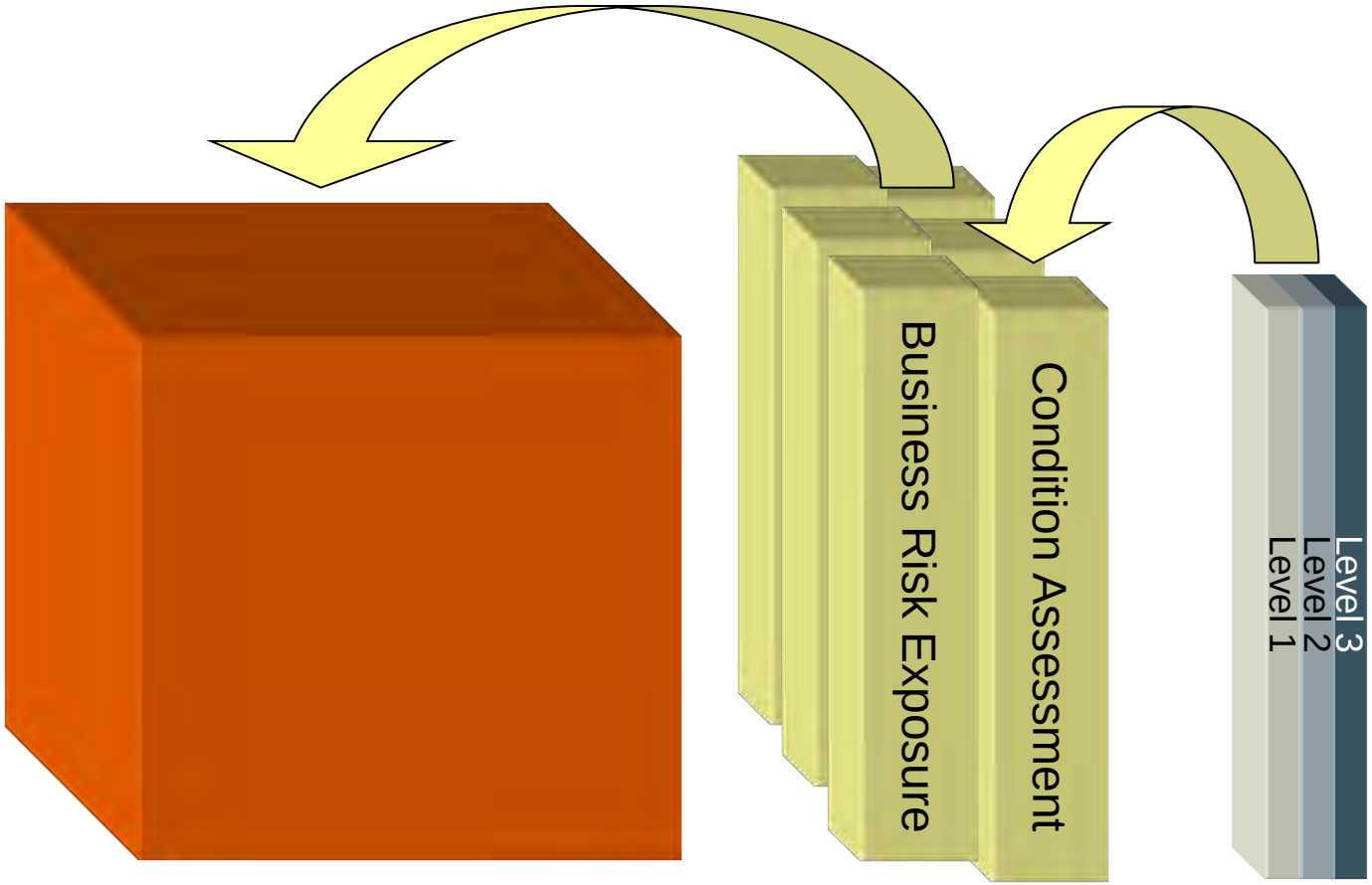
Inside the AM framework



Inside the AM framework



Inside the AM framework



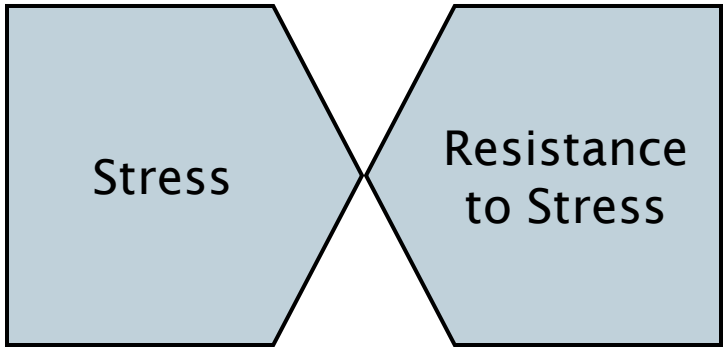
Three fundamental management decisions

1. What are my work crews doing, where are they doing it—*and why*?
2. What CIP projects should be done—*and when*?
3. When should I *repair*, when should I *rehabilitate*, and when should I *replace*?

These decisions typically account for *over 80%* of a utility's annual expenditures

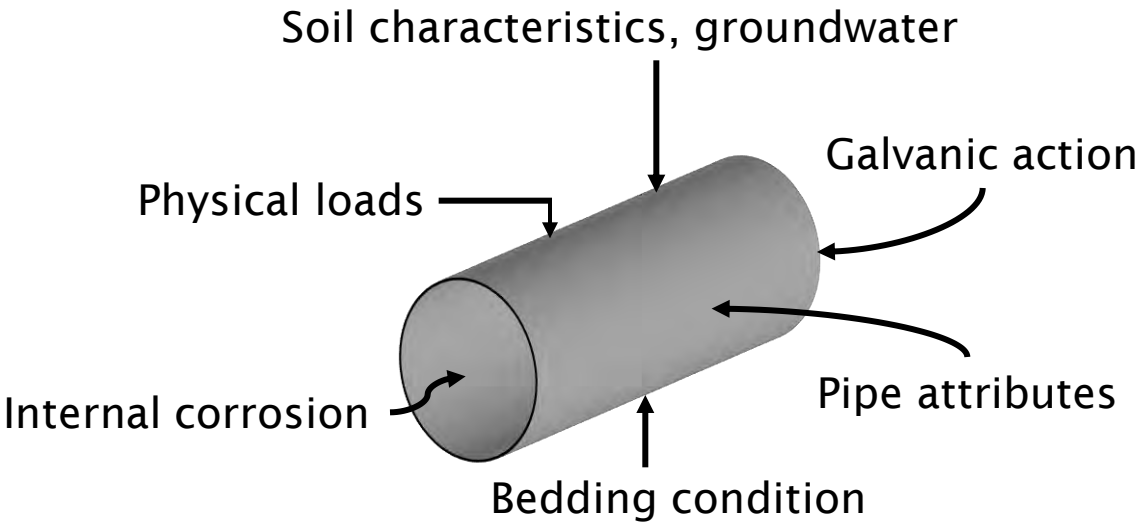
Understanding how our assets fail

Yin-yang of asset failure



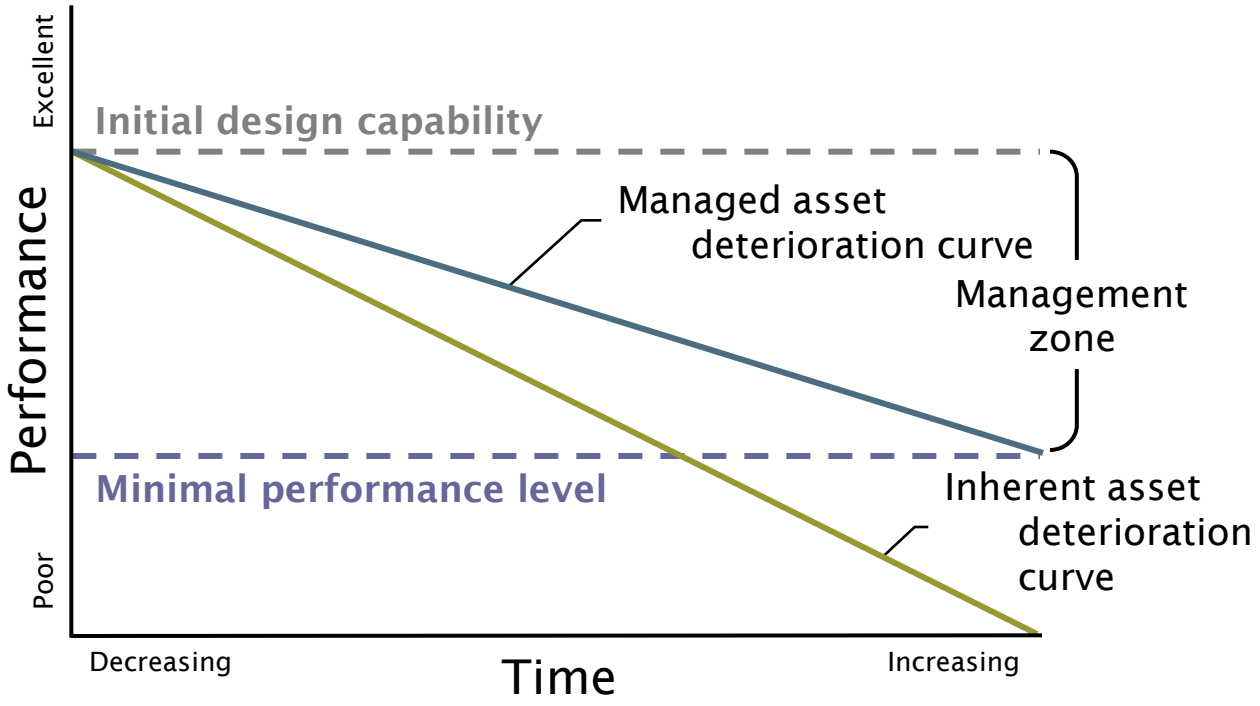
Understanding how our assets fail

Pipe failure



Understanding how our assets fail

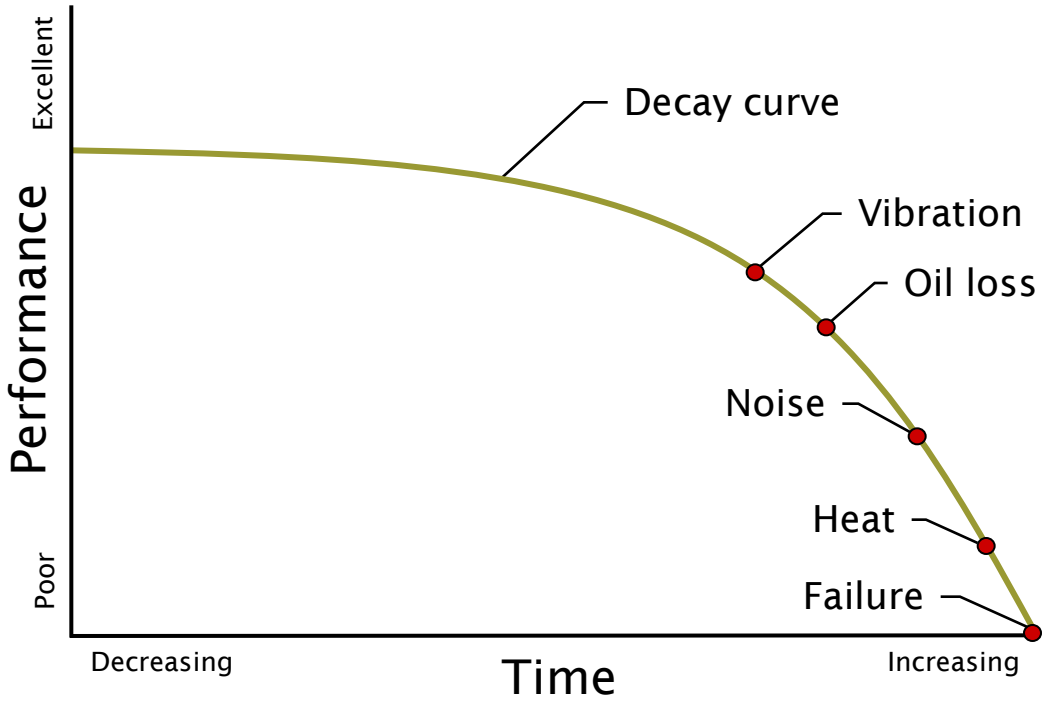
Managing asset deterioration



"Failure is…the inability of any asset to do what users want it do to."
John Moubray

Understanding how our assets fail

Monitoring performance is a key to *reliability*



Understanding how our assets fail

Experience indicates…

- Failure can be subjected to systematic study – a science
- *30-70%* of equipment maintenance activity is typically *misdirected – it is not cost effectively deterring failure*

Understanding how our assets fail

From the science of failure - tools for *proactive* management

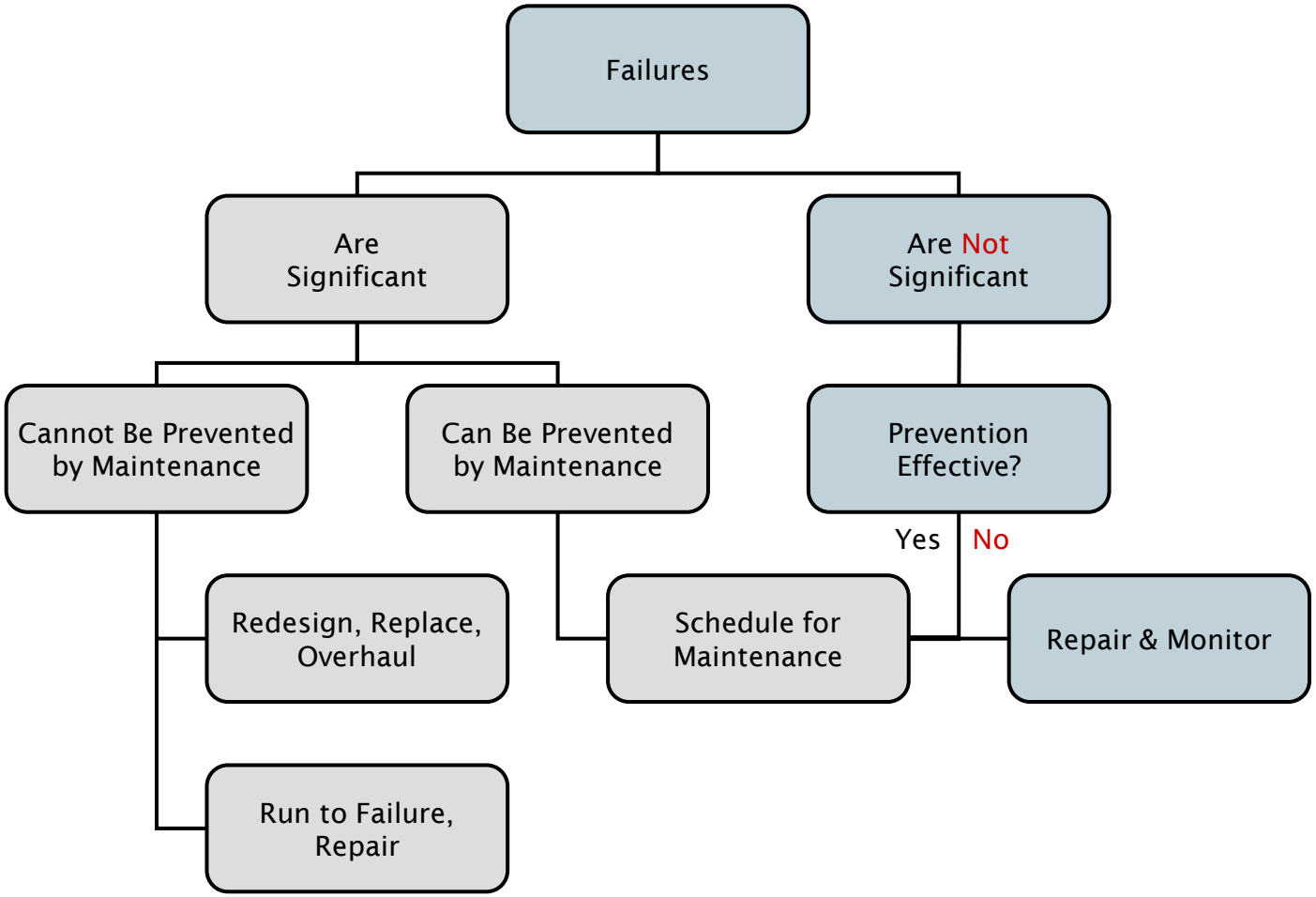
- Root cause analysis
- Failure mode, effects, and criticality analysis (FMECA)
- Condition-based monitoring, failure/survival curves
- Predictive maintenance (PdM)
- Proactive maintenance (zero breakdown, reliability centered maintenance, total productive maintenance)
- Reliability centered management (design, O&M)

AM is all about *managing the potential to fail*

Our investment *toolkit*

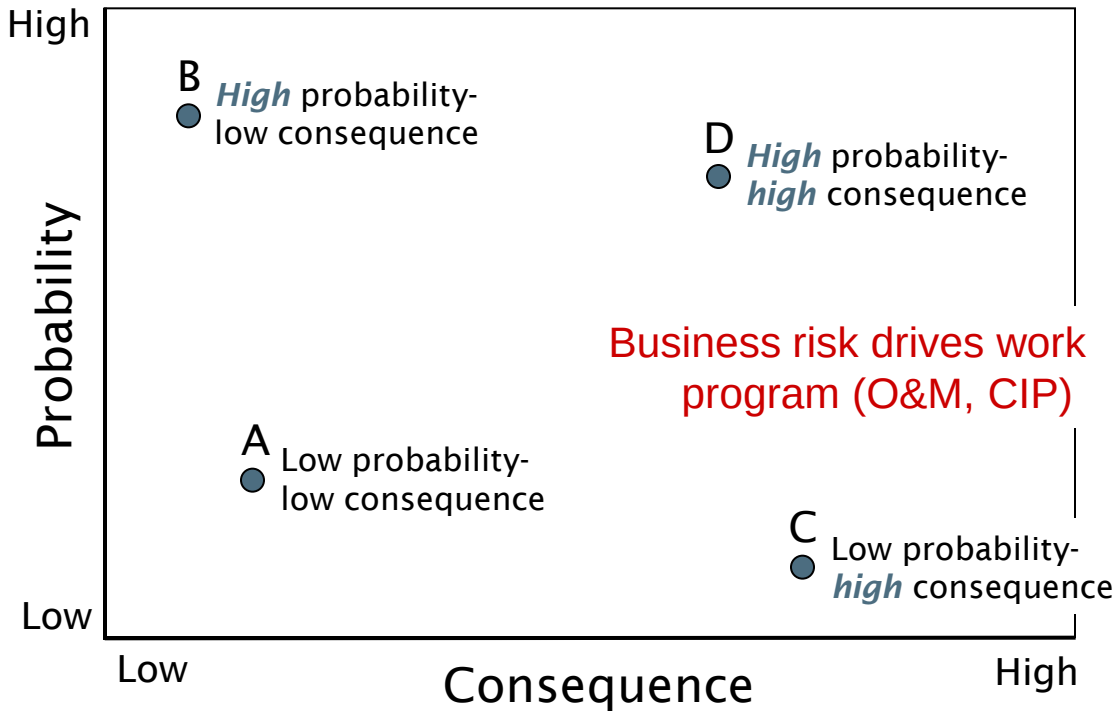
- Maintenance
- Renewal:
  - Major Repair – repair beyond normal periodic maintenance, relatively minor in nature, anticipated in the long-term operation of the asset; no enhancement of capabilities; typically funded by operating budget
  - Refurbish/Rehabilitate– replacement of a component part or parts or equivalent intervention sufficient to return the asset to level of performance above minimum acceptable level; may include minor enhancement of capabilities; typically funded out of capital budgets
  - Replace
    - Without enhancement – substitution of an entire asset with a new or equivalent asset without enhancement of capabilities
    - With enhancement - substitution of an entire asset with a new or equivalent asset with enhanced capabilities
- "Augmentation"

Failure mode-based management logic

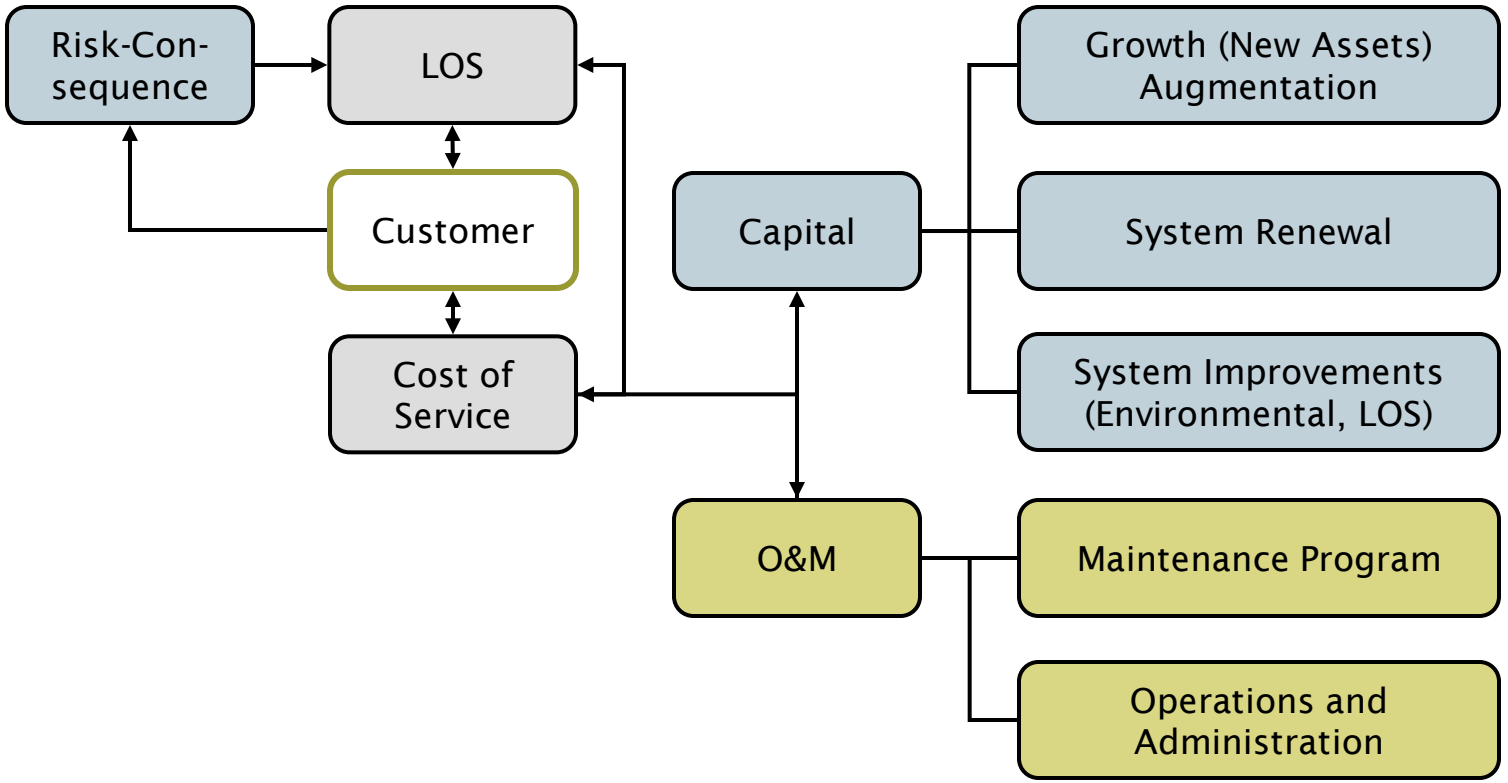


Determining “significant” failures

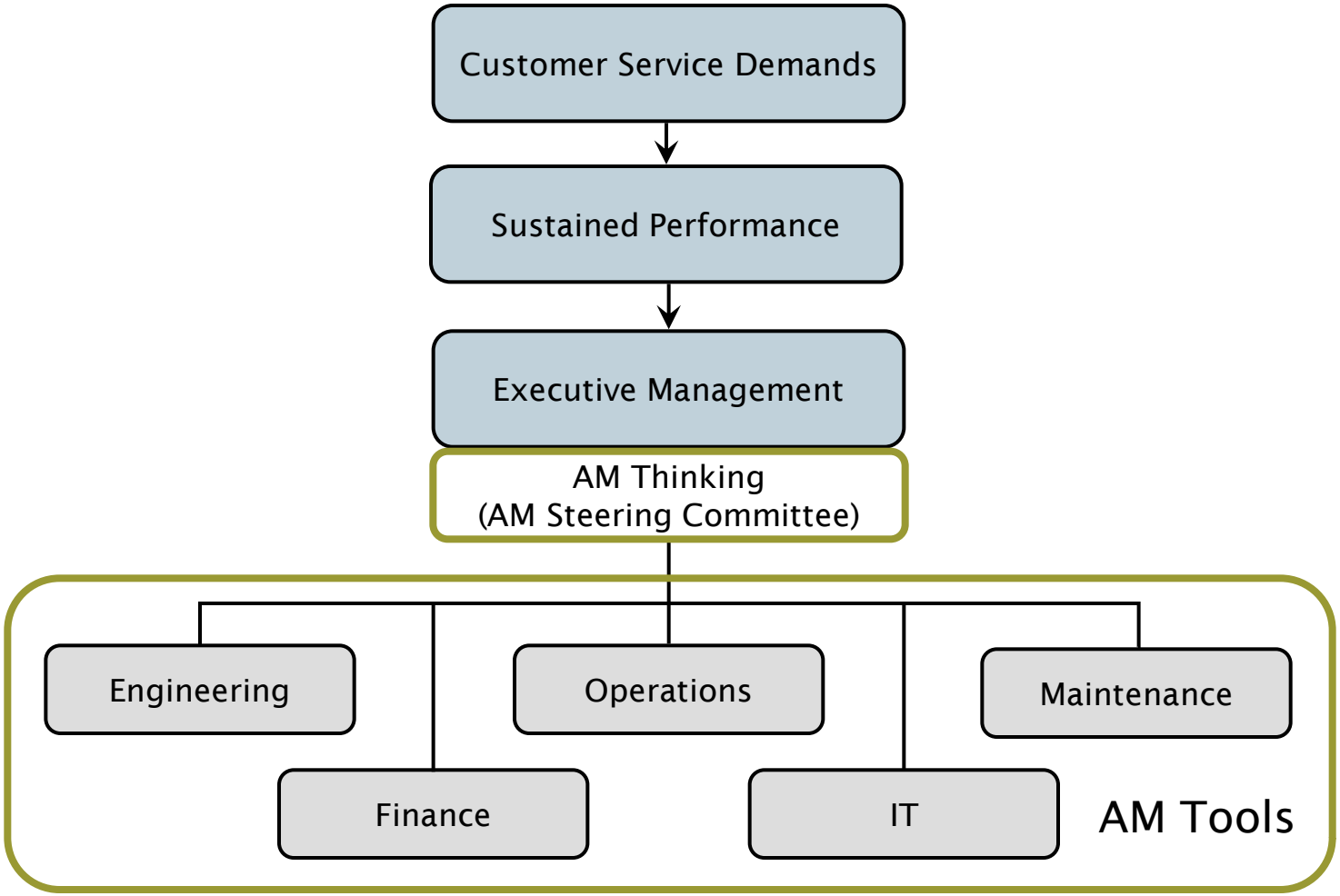
What is probability of failure? What is consequence of failure?



The big picture



AM-oriented structure



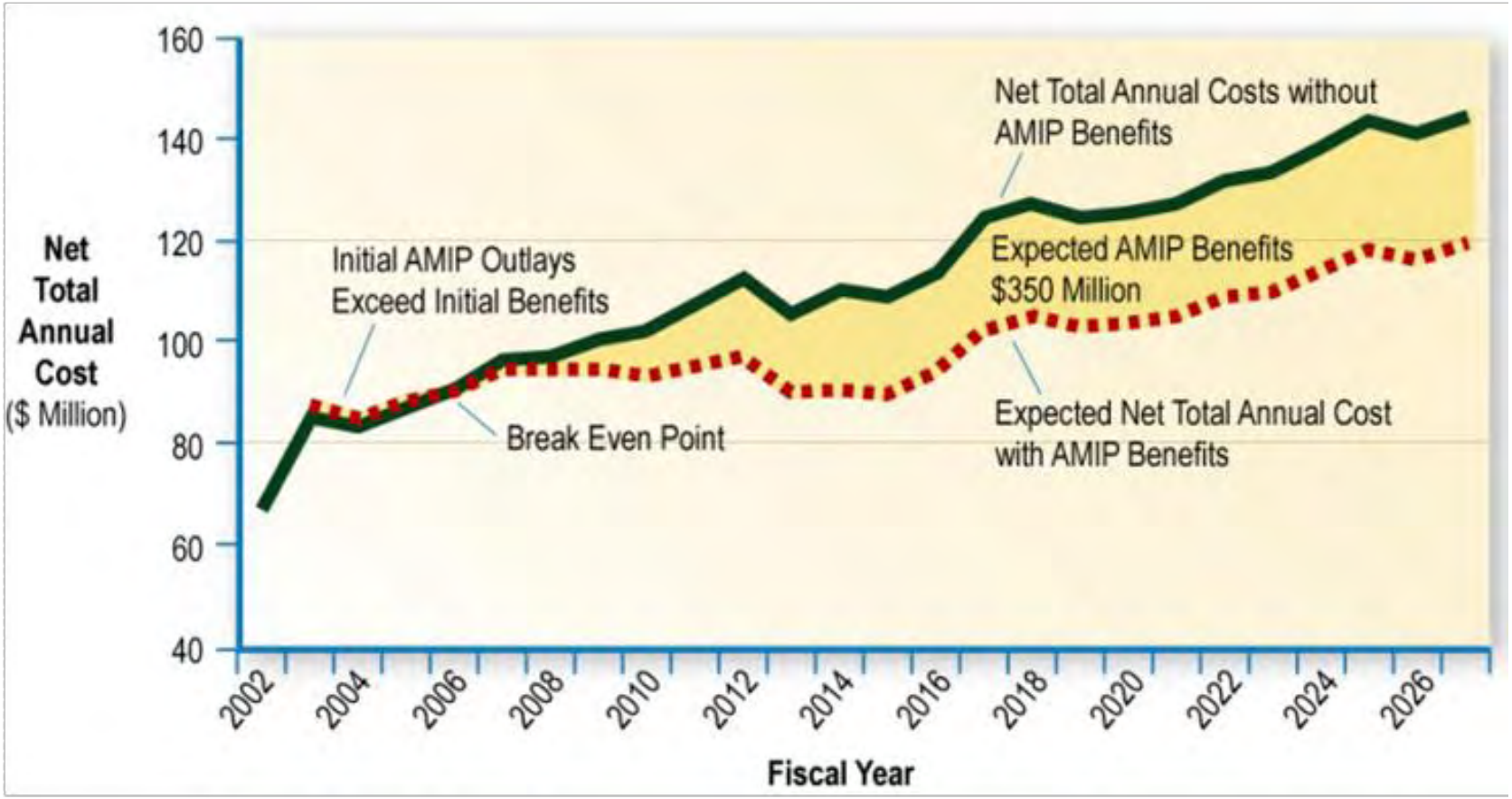
AM-based decisions produce real *savings*

From assessment of Australia's advanced management practices, *20-30%* future life cycle cost *savings* typically is achievable for US water and wastewater utilities

Where savings develop from…

- Efficiency gains
- Cost avoidance (defer, eliminate, reduce)
- Cost effectiveness and redirection

Making business case for AM

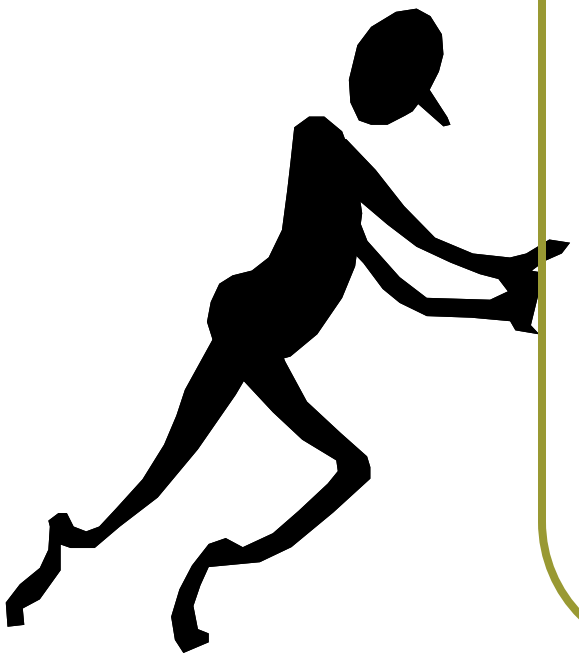


AM payoffs

- Reduced life cycle costs from better-focused (redirected) resource use
- Better value-per-dollar spending
- Confidence in decision-making

The right work,
the right investment,
at the right time,
for the right
reasons.

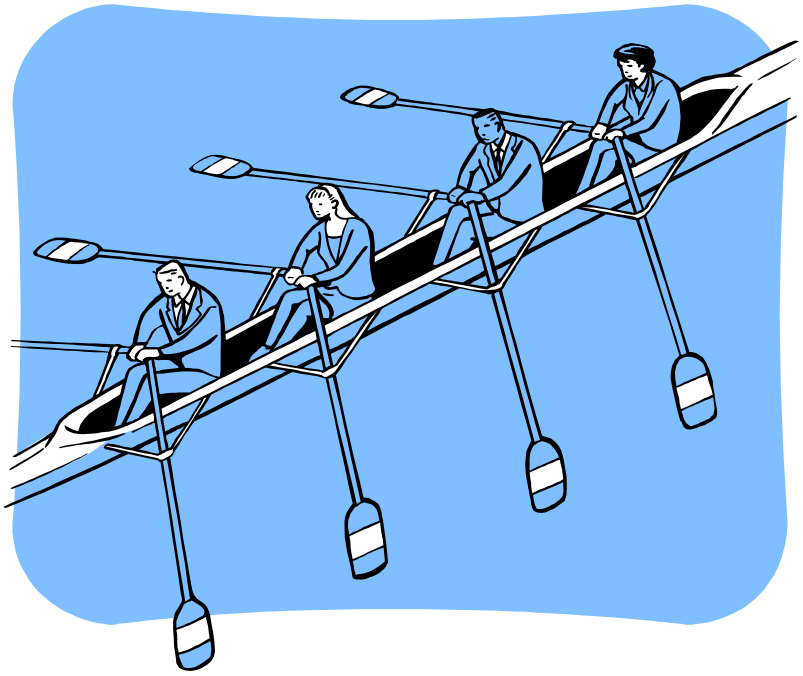
Realistic expectations for AM



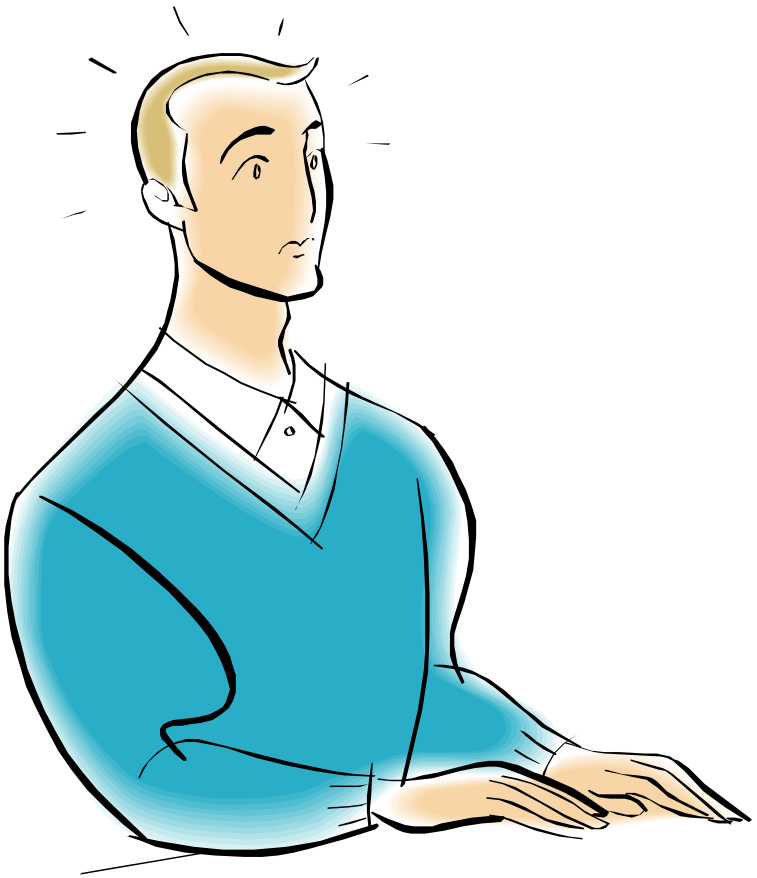
- Takes several years of detailed, *nitty-gritty work* to fully deploy
- Requires eventual *buy-in* commitment of the whole organization
- Needs *upfront* investment to get started, with *hidden* returns for initial years

AM is a business model…

- *What* we do
- *Why* we do it
- *How* we do it
- *Where* we invest
- What our *costs* are
- What our *return* is



Tom’s bad day…



Tom's spreadsheet

Storyline:

A Step-By-St
Asset Man

Prologue

It's twilight. Night is co
the 40's. Tom is standi
Street lift station. Raw
street. An old pick-up t
and has hit the power
been called and are sta
up at any moment wit
their whine to the din a

His emergency respon
waiting for an electricia
pump station's motor
they wait, they would
force main to divert the
can not be found an
warehouse. June, the
owner, and asks the ow

Meanwhile the size of
drain and from there in
river is the sole water
make matters worse,
up-stream local industi
wastewater backups.

This, unfortunately, is
Each of the other three
problem in a control p
another. The third fa
main from a 50 year
significant wastewater
also caused wastewat
made the six o'clock ne

Tom has been a Cit
Supervisor, was prom

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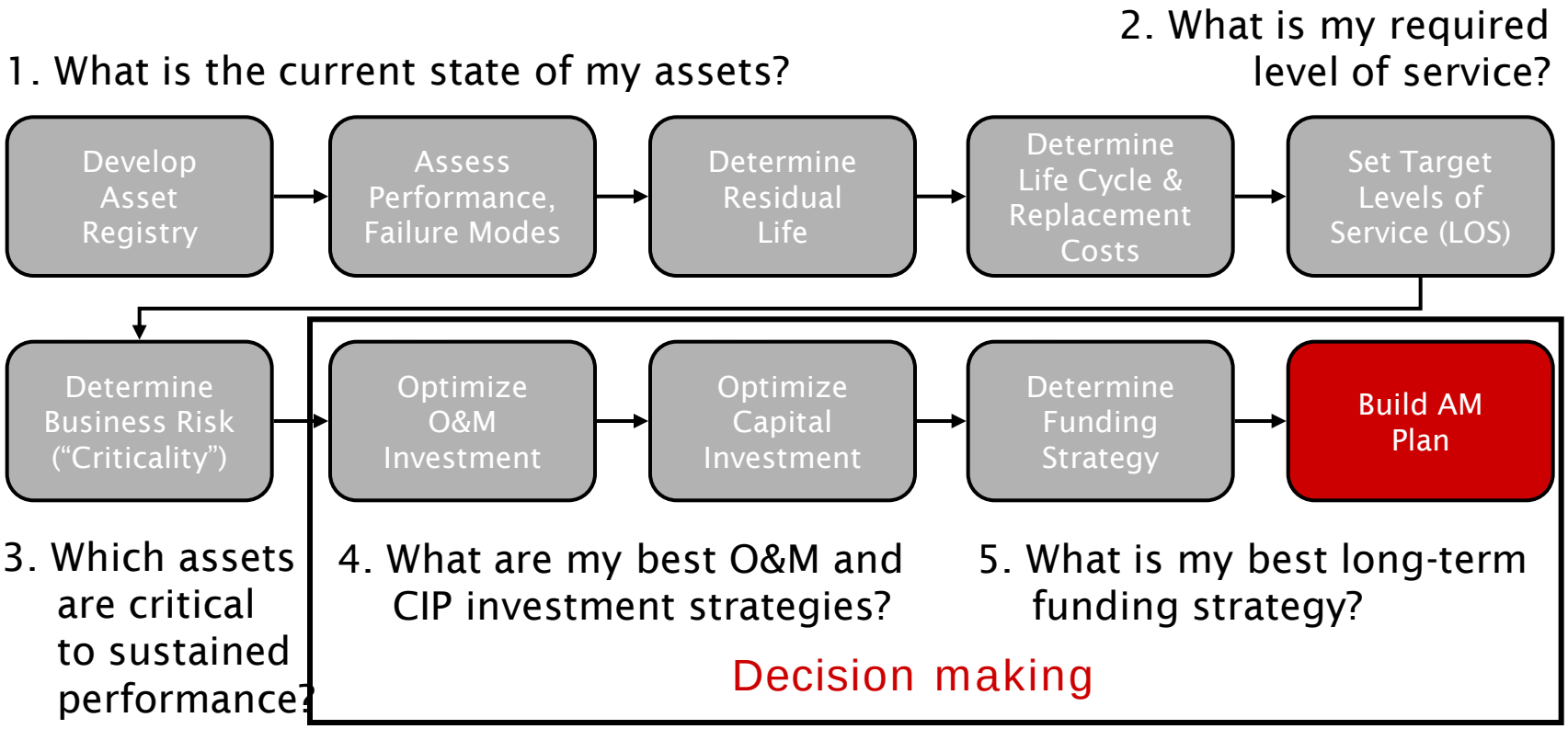
	A	B	C	D	E	F	G	H	I	J	S	T	U	V	W	X	Y
6						What is the State of My Assets?							Required LOS?		Which Are Most "Critical"?		
7	Asset Register and Hierarchy					Installed Date	Asset Class	Original Cost	Estimated Effective Life	Condition Rating	Annual Dep	Accum Dep	Current LOS?	Minimum Condition	Backup Reduction (Redundancy)	Probability of Failure	Consequence of Failure
8	Curre	2006				Year		$	Years	1 to 10	$	$			%	Rating	1 to 10
9	Level 1	Level 2	Level 3	Level 4	Level 5	Act or Est	Tab A	Act or Est	Calculated	Tab A	Calculated	Calculated		Tab A	Tab D	Calculated	Tab C
10	Sanitation System																
11		Disposal System															
12		Treatment Plants															
13		Collection Systems															
14			Sewer Mains														
15			Pump Station														
16				Incoming Sewer									Avg 1500 cfm; peak 2100cfm				
17					Pipes	1963	3	$ 1,725	100	6	$ 17	$ 742		2	0%	4	5
18					Manhole	1963	3	$ 340	100	5	$ 3	$ 146		2	0%	4	5
19					Influent Gate Valve	1986	5	$ 442	30	8	$ 15	$ 295		2	0%	7	5
20				Incoming Power									20 kw peak				
21					Pole & Transformer	2006	4	$ -	40	1	$ -	$ -		2	0%	0	5
22					Connection	2006	7	$ -	35	1	$ -	$ -		2	0%	0	5
23				Control system													
24					Incoming Telephone	1985	8	$ 85	25	7	$ 3	$ 71		2	0%	8	2
25					PLC	1983	8	$ 8,600	25	8	$ 344	$ 7,912		2	0%	9	2
26					Manual controls	1978	8	$ 425	25	7	$ 17	$ 476		2	50%	5	2
27				Land & Improvemnts.													
28					Land	1950	10	$ 630	300	1	$ 2	$ 118		4	0%	2	1
29					Access Road	1963	1	$ 12,500	75	5	$ 167	$ 7,167		4	0%	6	1
30					Landscaping	2000	1	$ 595	75	6	$ 8	$ 48		3	0%	1	1
31					Security fence	1963	1	$ 1,360	75	7	$ 18	$ 780		2	0%	6	3
32				Sub Structure													
33					Cassion Outer	1963	1	$ 30,600	75	6	$ 408	$ 17,544		3	0%	6	4
34					Upper Floor	1963	1	$ 4,250	75	6	$ 57	$ 2,437		3	0%	6	4
35					Dry well	1963	1	$ 6,800	75	6	$ 91	$ 3,899		3	0%	6	4
36					Landings and Stairs	1963	9	$ 4,250	60	7	$ 71	$ 3,046		2	0%	7	4
37					Wet Well	1963	1	$ 5,100	75	6	$ 68	$ 2,924		3	0%	6	4
38					Shaped floor	1963	1	$ 850	75	6	$ 11	$ 487		3	0%	6	3
39					Sump pump	1963	4	$ 595	40	6	$ 15	$ 640		2	0%	10	4
40				Pumps									peak 2100cfm				
41					Drive shafts	2006	6	$ 12,560	35	1	$ 359	$ -		2	TBD	10	TBD
42					Pumps	2006	4	$ 29,750	40	1	$ 744	$ -		2	TBD	10	TBD

E - Renewal S

Ready

start | Modules 2 | Duncan Rose - Inbox ... | Webpage has expire... | EPA 0 Overview.ppt | Day 1.EPA.Revised.ppt | Microsoft Excel - EPA ... | 10:43 AM Tuesday 4/10/2007

Integration of 5 core questions with 10-step process



The Bear and the Butterfly