"An invasion of armies can be resisted, but not an idea whose time has come."

Victor Hugo
Les Miserables

Advancing Asset Management in Your Utility: A "Hands-on" Approach

Day 2

AGENDA

Day 1

- *Welcome, Introductions & Housekeeping Details*
- *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?*
- *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?*
- *Discussion/Q & A; Review of Self-audit*

Day 2

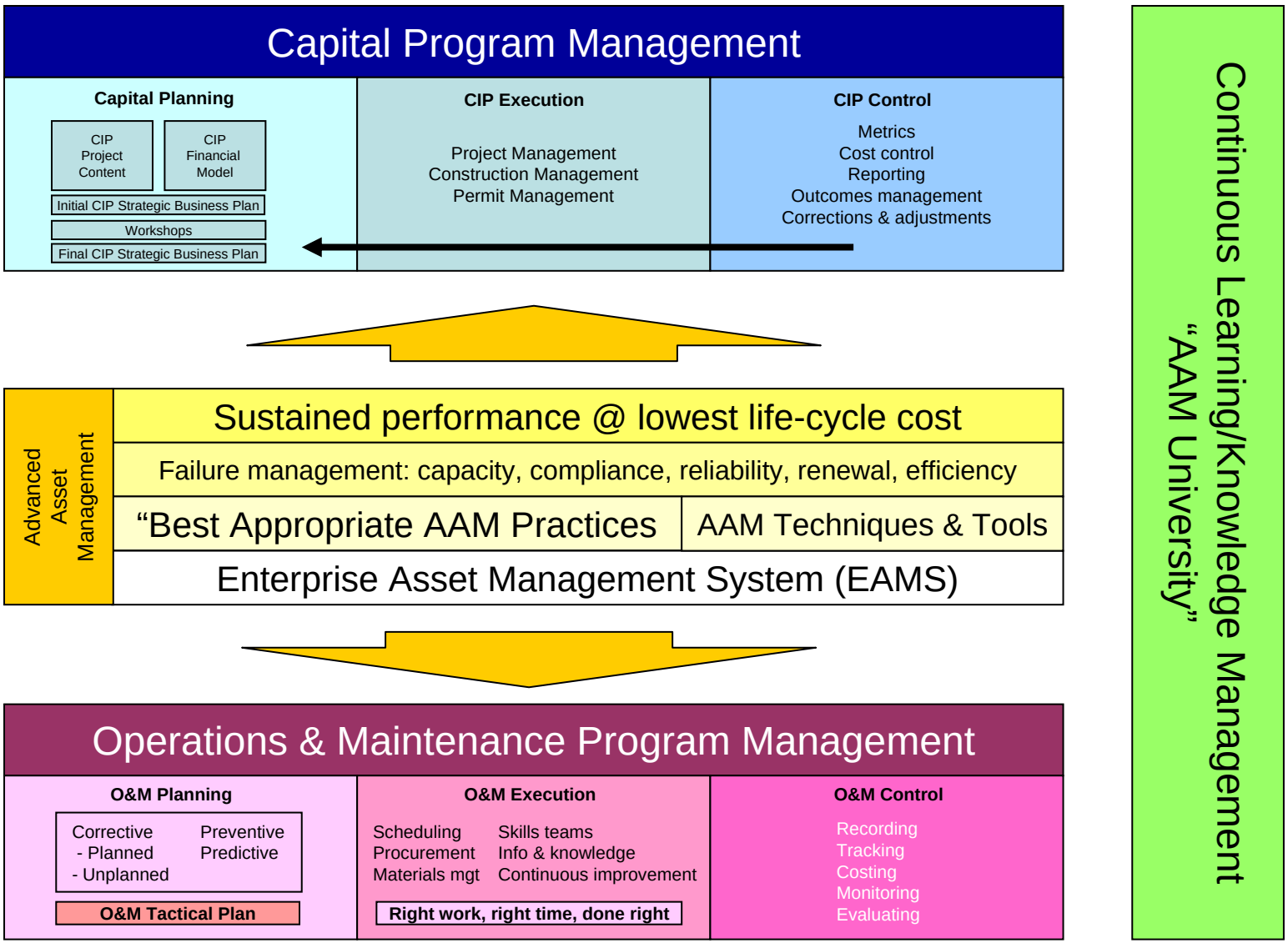
- ***Summary of Day 1; Outline of Day 2***
- ***Core Question 4 (Continued)***
- ***Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?***
- ***Case Study 1: Deploying An AAM Program***
- ***Case Study 2: Meeting The IT Challenge – Toward An Enterprise Asset Management System (EAMS)***
- ***Summary, Addressing Your Questions, Comments, Self-audit***

AGENDA

Day 2

- *Summary of Day 1; Outline of Day 2*
- *Core Question 4: What Are My Minimum "Life-cycle-cost" CIP and O&M Strategies? (Continued from Day 1)*
- *Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?*
- *Lunch*
- *Case Study 1: Deploying An AAM Program*
- *Case Study 2: Meeting The IT Challenge – Toward An Enterprise Asset Management System (EAMS)*
- *Summary, Addressing Your Questions, Comments, Self-audit*

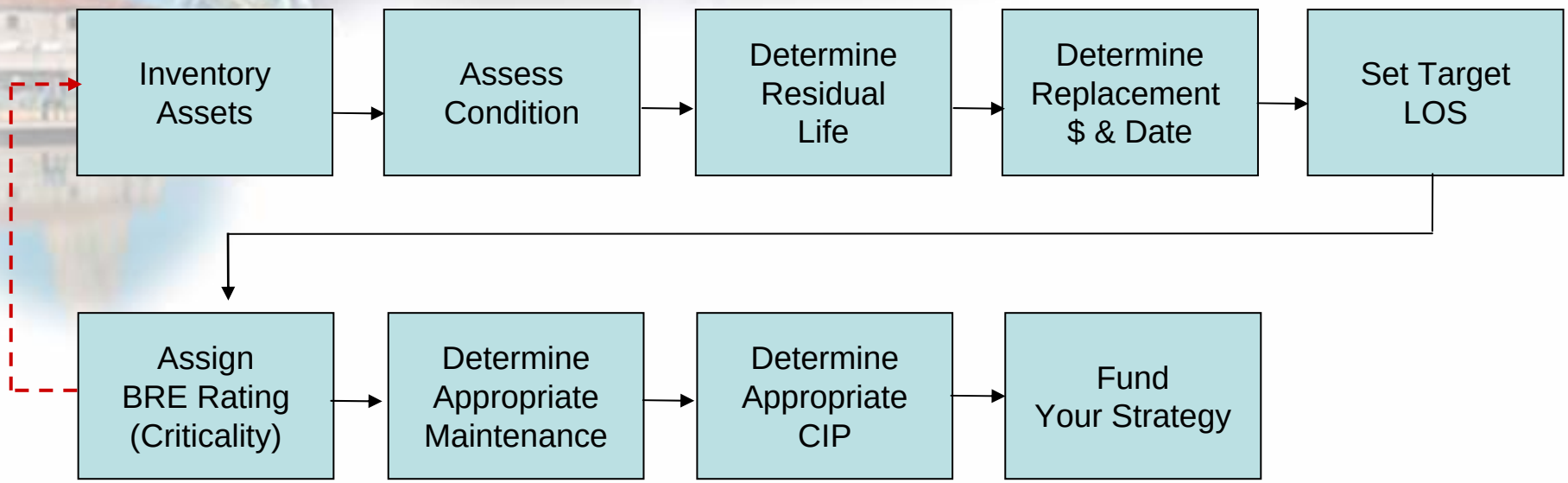
Parsons/GHD AAM Model



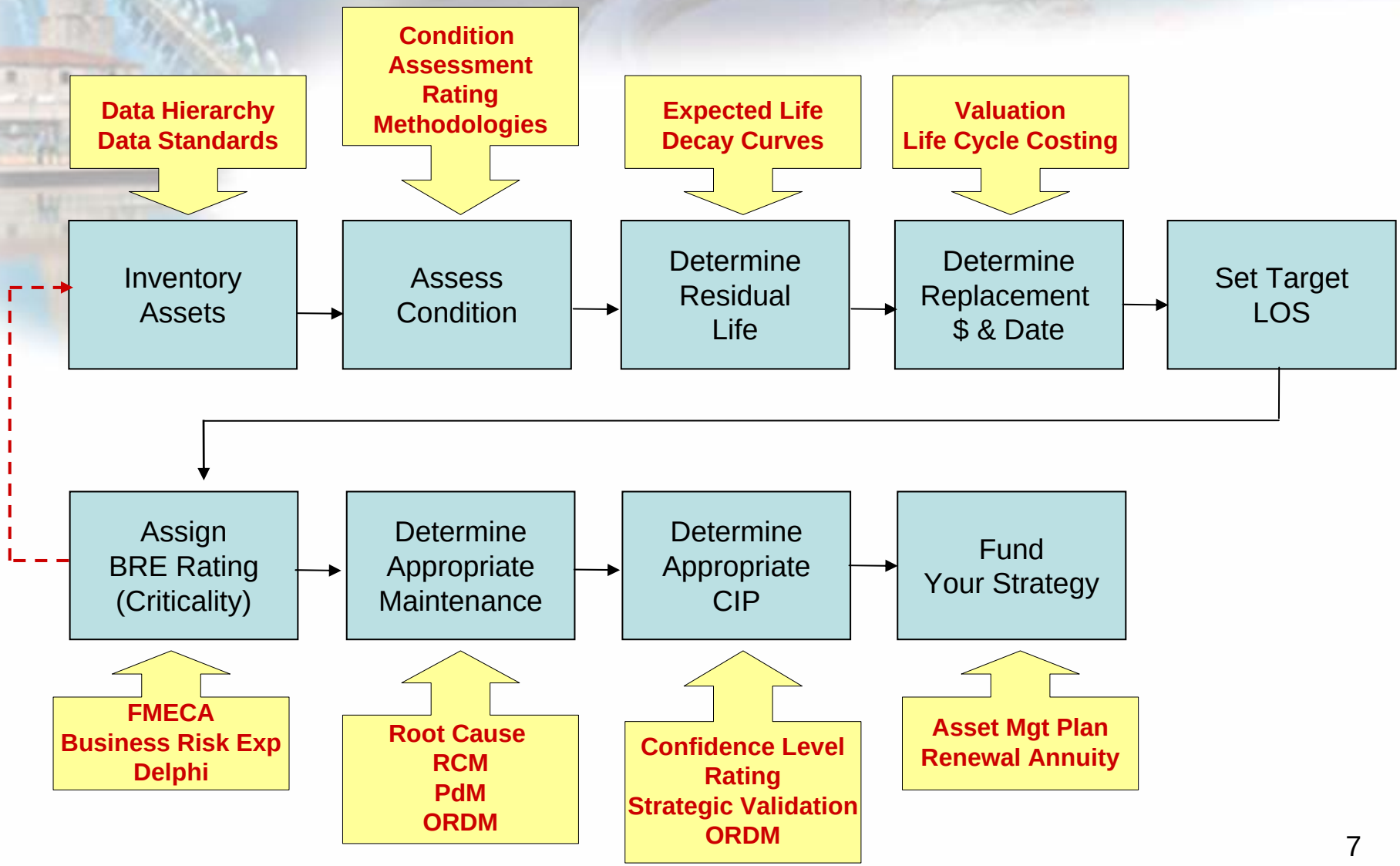
The Five Core AM Questions

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 remaining useful life? • What is its economic value?
2. What is my required sustained Level Of Service?
3. Given my system, 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 "minimum life-cycle-cost CIP and O&M strategies? • What alternative treatment options exist? • Which are most feasible?
5. Given the above, what is my best long-term funding strategy?

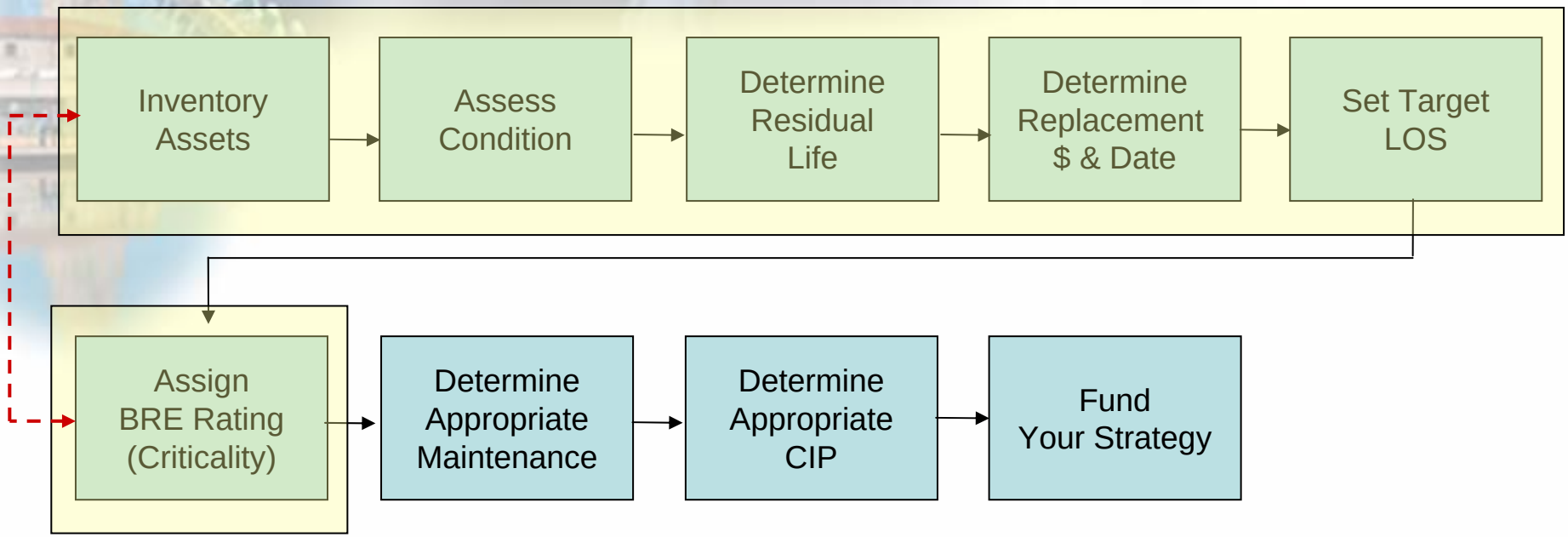
The AAM Program Process



Core AAM Program Process Tools



AAM Program Process



AGENDA

Day 2

- *Summary of Day 1; Outline of Day 2*
- *Core Question 4: What Are My Minimum "Life-cycle-cost" CIP and O&M Strategies? (Continued from Day 1)*
- *Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?*
- *Lunch*
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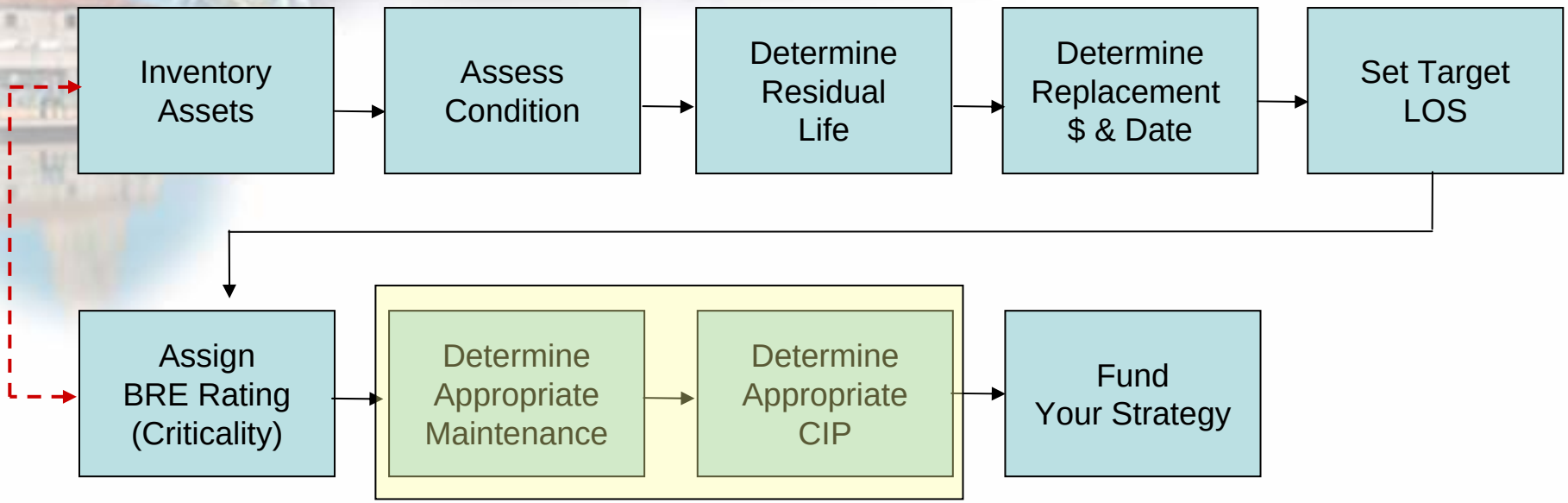
- *Summary, Addressing Your Questions, Comments, Self-audit*

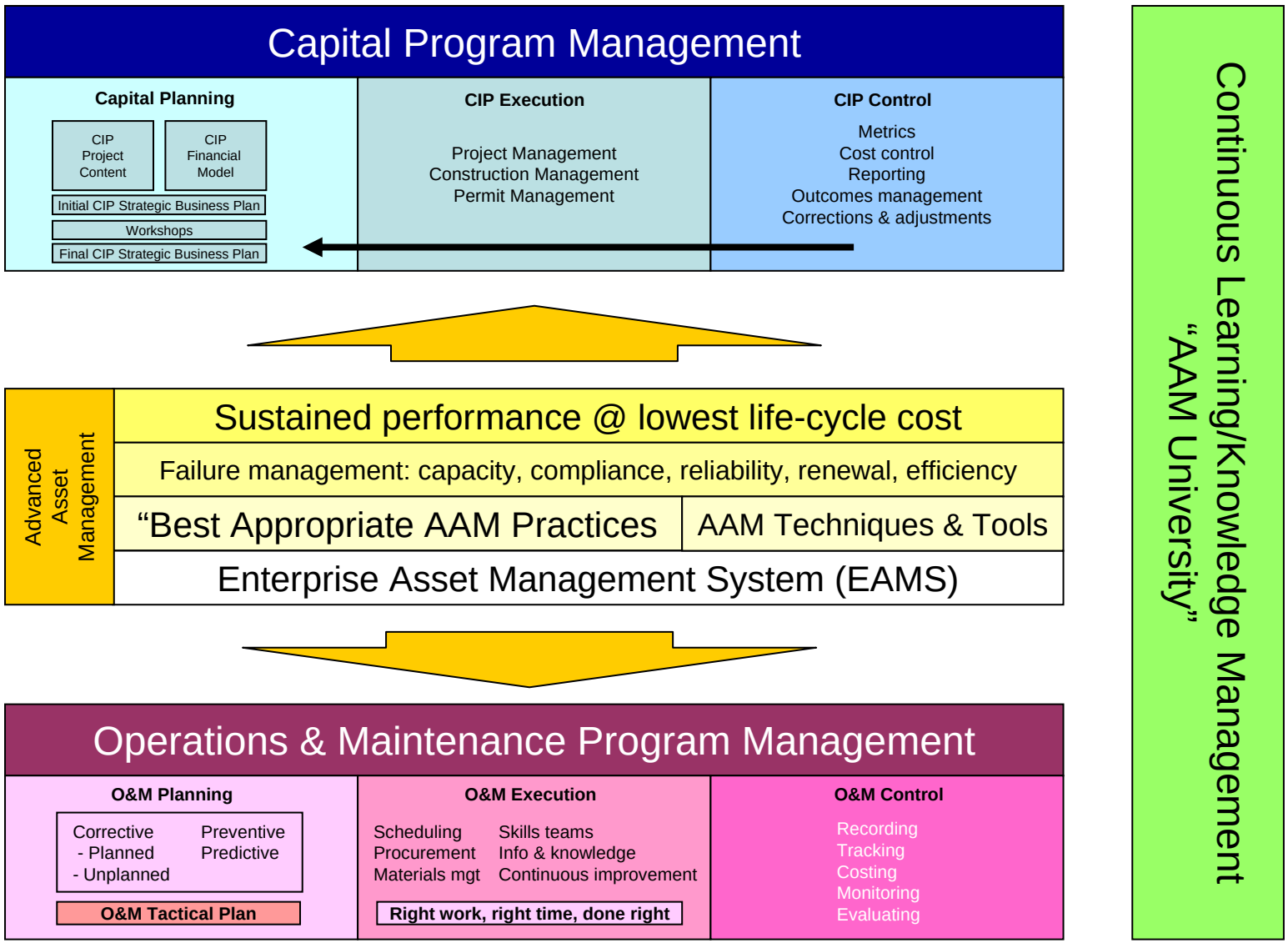
AAM Program Process



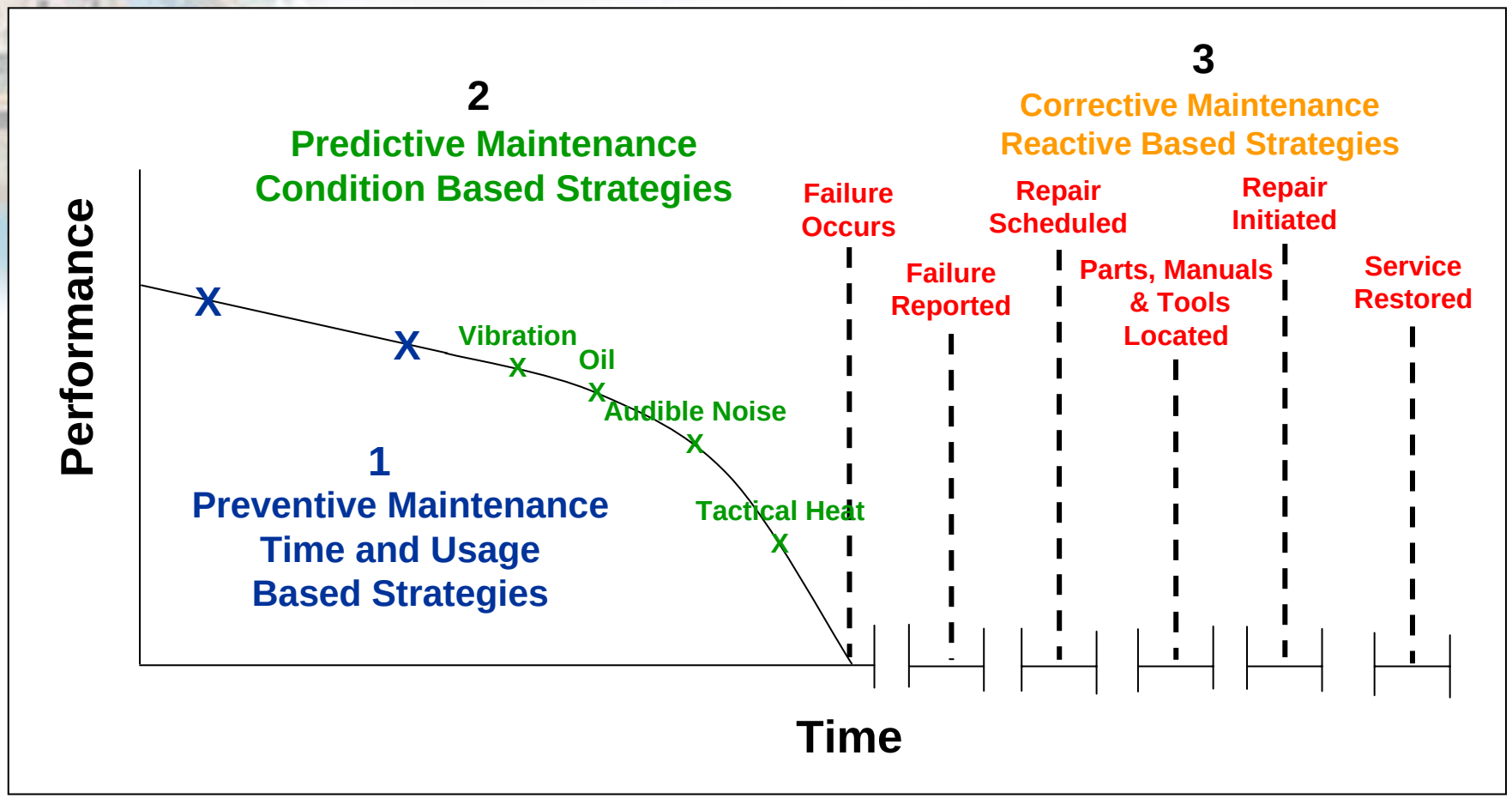
Q4: What Are My Best Minimum Life-Cycle-Cost Strategies?

Q1a: Applied to O&M

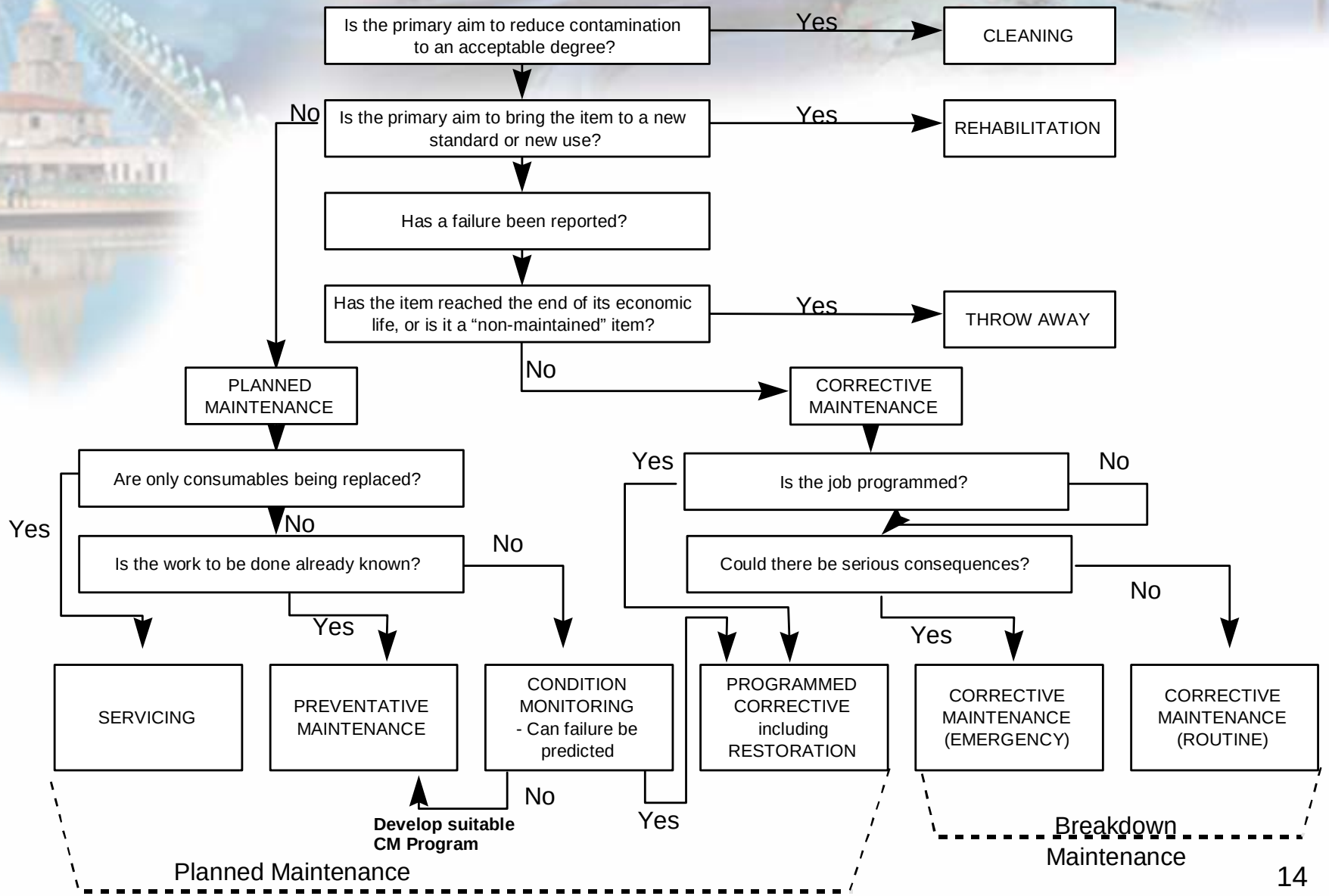
Parsons/GHD AAM Model



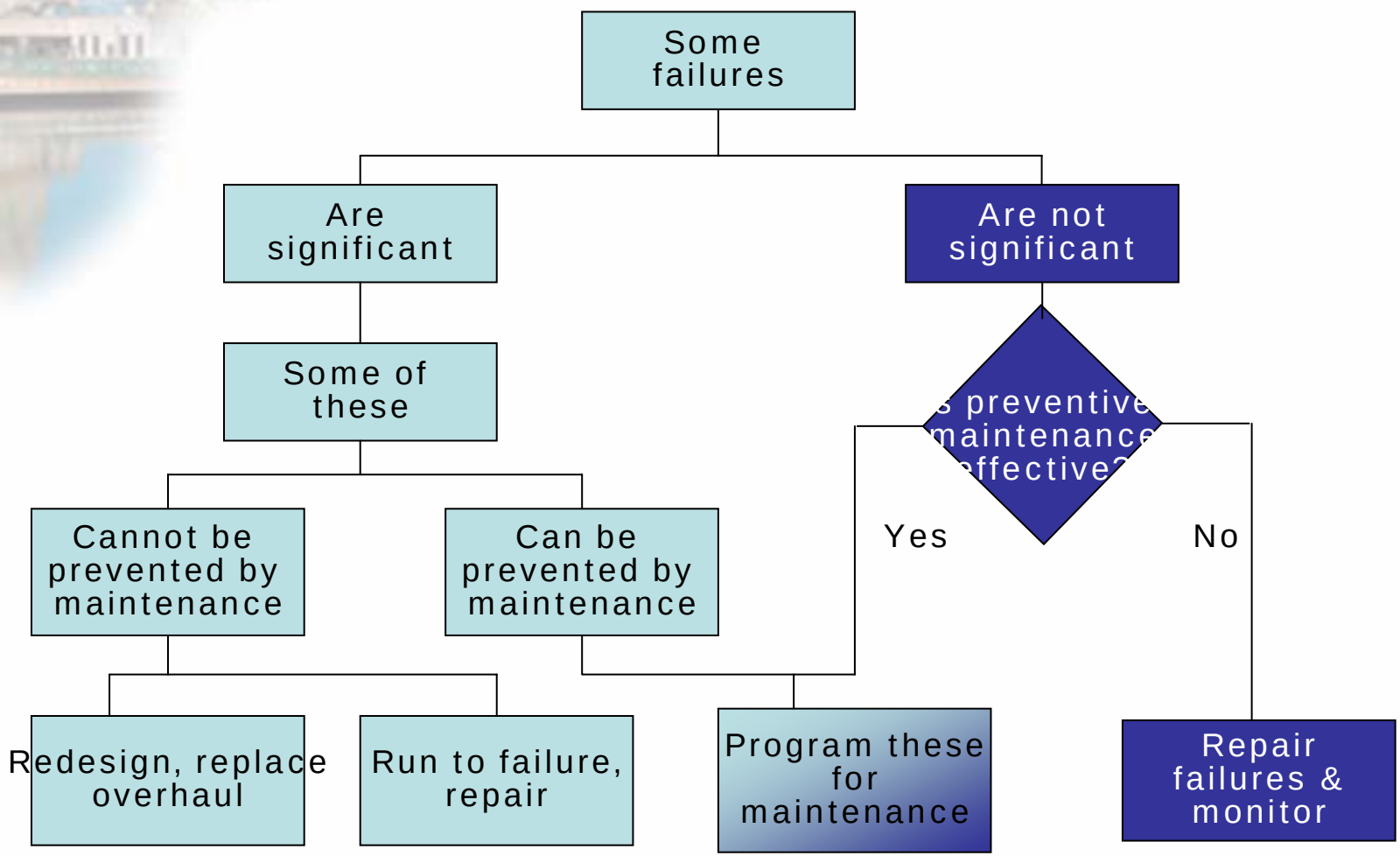
Better Understanding of the Asset Life-Cycle Drives Improved Management Strategies



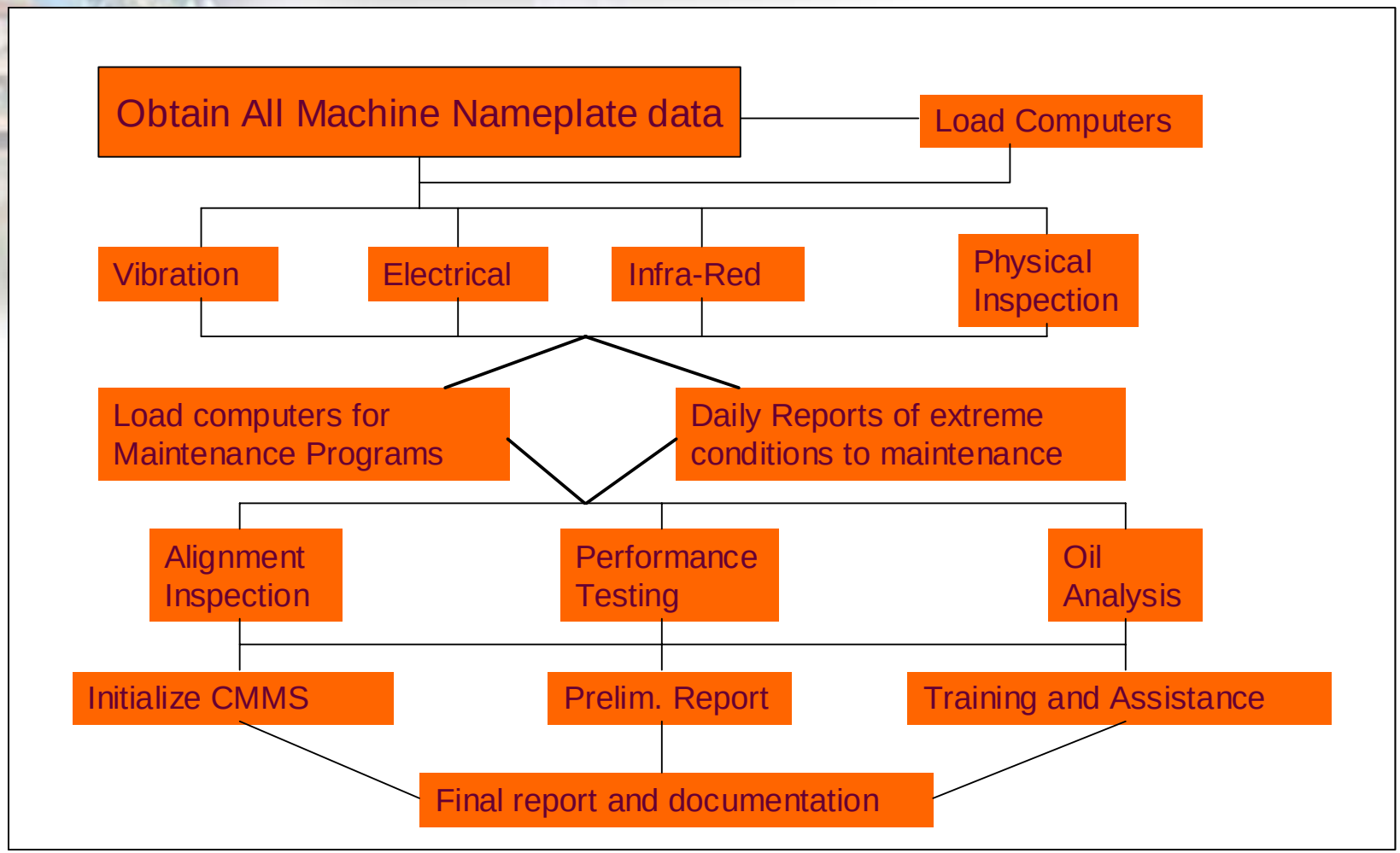
Maintenance Definitions



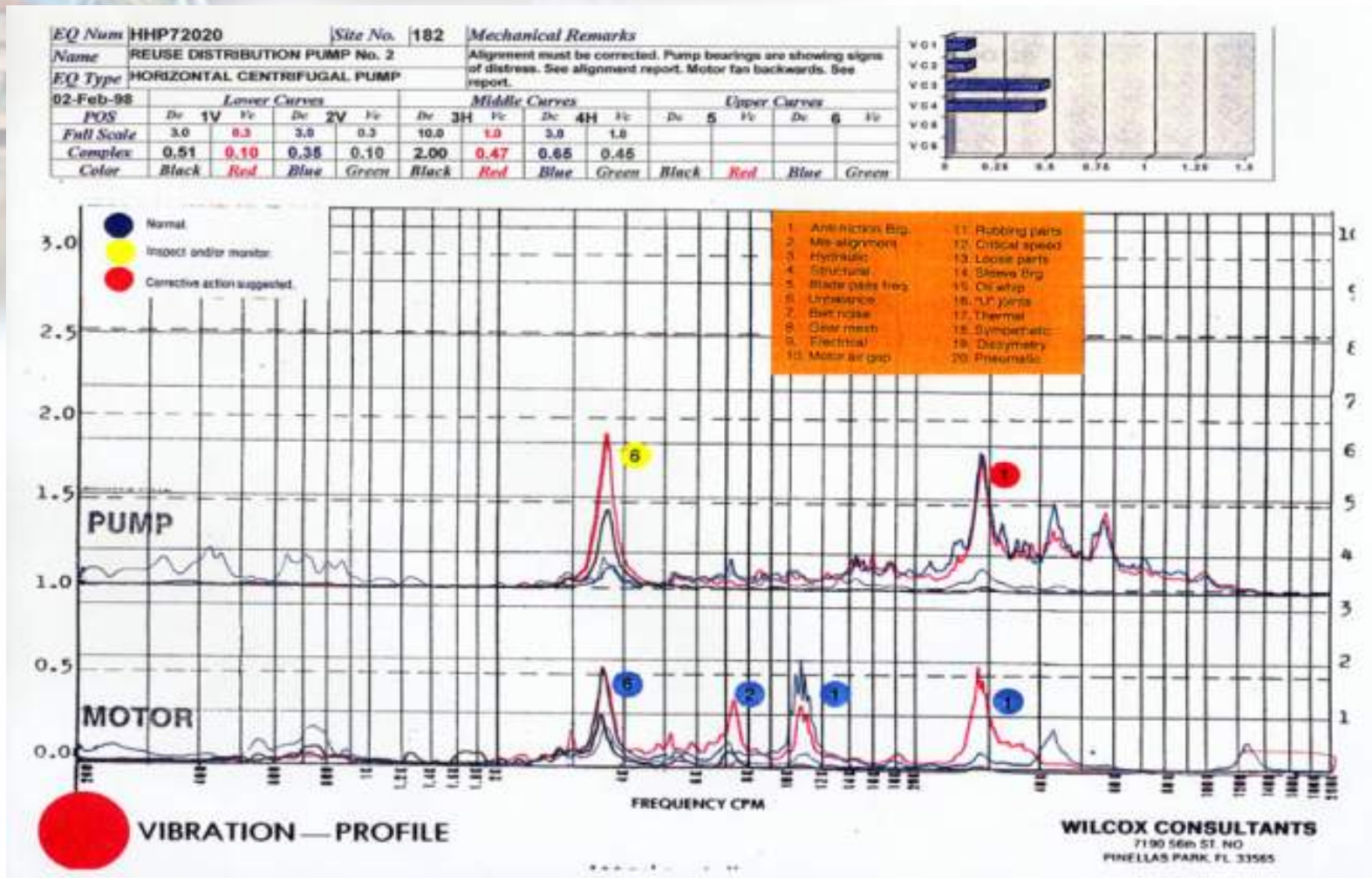
Failure-mode Based Management Logic



Condition-Based Maintenance (CBM)



Vibration Analysis - The Vibration Profile



Power Evaluation

Sample County - Waste Water Utilities Systems

Sewage Lift Stations - Electrical Report - Data as Recorded, June, 1998

	Voltage Line to Line			Amperage			Voltage Drops			Power Data				Horsepower and Load Percent		
Equip. Number	A to B	B to C	C to A	A	B	C	A	B	C	KVA	KVAR	KW	PF	Calc.	Rated	Percent
20LS-RSP-002	244.0	243.0	244.0	24.2	23.7	24.3	0.09	0.08	0.09	9.7	6.9	6.8	90.0	9.1	15.00	60.7
ABLS-RSP-001	474.0	473.0	475.0	24.1	25.1	25.7				17.5	2.8	17.2	98.7	23.1	25.00	92.4
ABLS-RSP-002	474.0	474.0	475.0	27.5	26.7	29.1				18.8	3.2	18.5	98.6	24.8	25.00	99.2
ABLS-RSP-003	474.0	475.0	475.0	25.4	25.8	29.5				17.8	2.9	17.6	98.7	23.6	25.00	94.4
BELS-RSP-001	239.0	240.0	242.0	59.8	52.6	65.7	0.19	0.19	0.18	23.9	12.7	20.3	84.9	27.2	25.00	108.8
BELS-RSP-002	240.0	242.0	240.0	50.5	51.3	55.4	0.16	0.16	0.18	21.5	13.6	16.7	77.6	22.4	25.00	89.6
BGLS-RSP-001	242.0	241.0	242.0	8.5	8.6	8.8	0.30	0.30	0.35	3.6	2.4	2.7	74.5	3.6	3.00	120.0
BGLS-RSP-002	242.0	241.0	242.0	9.4	9.3	9.6	0.24	0.18	0.17	3.9	2.1	3.3	84.2	4.4	3.00	146.7
BLLS-RSP-001	479.0	475.0	468.0	3.9	3.8	3.9	0.08	0.08	0.07	3.0	2.0	2.3	75.3	3.1	2.00	155.0
BLLS-RSP-002	482.0	483.0	485.0	4.0	3.9	4.0	0.08	0.06	0.13	3.1	2.1	2.3	73.9	3.1	2.00	155.0
CMLS-RSP-001	457.0	456.0	456.0	6.6	6.6	7.2	0.40	0.40	0.42	5.1	3.6	3.7	71.3	5.0	7.50	66.7
CMLS-RSP-002	457.0	458.0	458.0	6.0	6.0	6.1	0.27	0.27	0.63	4.7	3.8	2.7	58.0	3.6	7.50	48.0
DWLS-RSP-001	486.0	485.0	486.0	22.1	22.9	24.0	0.14	0.21	0.14	19.0	10.9	15.6	82.0	20.9	20.00	104.5
DWLS-RSP-002	485.0	486.0	485.0	21.3	22.0	22.8	0.16	0.14	0.15	18.3	10.7	14.8	81.1	19.8	20.00	99.0
FDLS-RSP-001	239.0	239.0	239.0	21.1	22.1	22.8	0.21	0.25	0.20	9.0	6.6	6.1	68.2	8.2	10.00	82.0
FDLS-RSP-002	240.0	239.0	240.0	23.9	24.0	25.6	0.26	0.26	0.31	10.0	7.0	7.1	70.9	9.5	10.00	95.0
FRLS-RSP-001	212.0	213.0	215.0	4.9	5.4	5.9	0.23	0.22	0.26	2.0	1.5	1.3	66.5	1.7	2.00	85.0
FRLS-RSP-002	212.0	213.0	215.0	5.2	5.6	6.1	0.25	0.25	0.27	2.1	1.5	1.4	70.0	1.9	2.00	95.0
FSLS-RSP-001	239.0	240.0	240.0	33.7	36.6	42.7	0.14	0.14	0.13	14.8	10.3	10.6	71.7	14.2	15.00	94.7
FSLS-RSP-002	239.0	239.0	240.0	31.4	34.7	39.8	0.17	0.18	0.19	13.9	10.7	8.9	63.9	11.9	15.00	79.3
H5LS-RSP-001	244.0	242.0	242.0	9.2	8.8	9.5	0.62	0.79	0.73	3.8	2.5	2.9	74.7	3.9	3.00	130.0
H5LS-RSP-002	242.0	242.0	241.0	10.2	9.5	10.0	0.49	0.61	0.60	4.1	2.9	2.9	70.6	3.9	3.00	130.0
HCLS-RSP-001	242.0	242.0	243.0	28.4	27.1	26.0	0.12	0.10	0.12	11.2	9.0	6.7	59.3	9.0	15.00	60.0
HCLS-RSP-002	243.0	242.0	243.0	28.3	28.9	25.8	0.12	0.11	0.12	11.2	8.6	7.1	63.6	9.5	15.00	63.3
HKLS-RSP-001	241.0	241.0	242.0	60.3	60.1	38.2	0.45	0.30	0.72	27.1	20.6	17.7	65.1	23.7	40.00	59.3
HKLS-RSP-002	240.0	241.0	241.0	62.4	63.2	65.0	0.23	0.36	0.65	26.6	15.9	21.3	80.2	28.6	40.00	71.5
HSLS-RSP-001	208.0	206.0	208.0	240.3	26.2	28.1	0.19	0.19	0.28	9.0	5.8	6.9	76.5	9.2	10.00	92.0
HSLS-RSP-002	208.0	206.0	208.0	24.1	26.4	27.7	0.17	0.19	0.20	9.0	5.7	6.7	77.4	9.0	10.00	90.0
JHLS-RSP-001	244.0	243.0	243.0	50.9	52.4	51.6	0.21	0.65	0.19	21.4	15.4	14.9	69.6	20.0		
JHLS-RSP-002	245.0	244.0	245.0	44.1	42.9	45.1	0.36	0.54	0.32	18.4	12.7	13.4	72.7	18.0		
MWLS-RSP-001	241.0	240.0	241.0	11.0	11.6	12.4	0.19	0.13	0.14	4.7	2.5	4.0	84.8	5.4	7.50	72.0

Prepared by Wilcox Consulting Inc. - Madeira Beach Office - 11/8/00

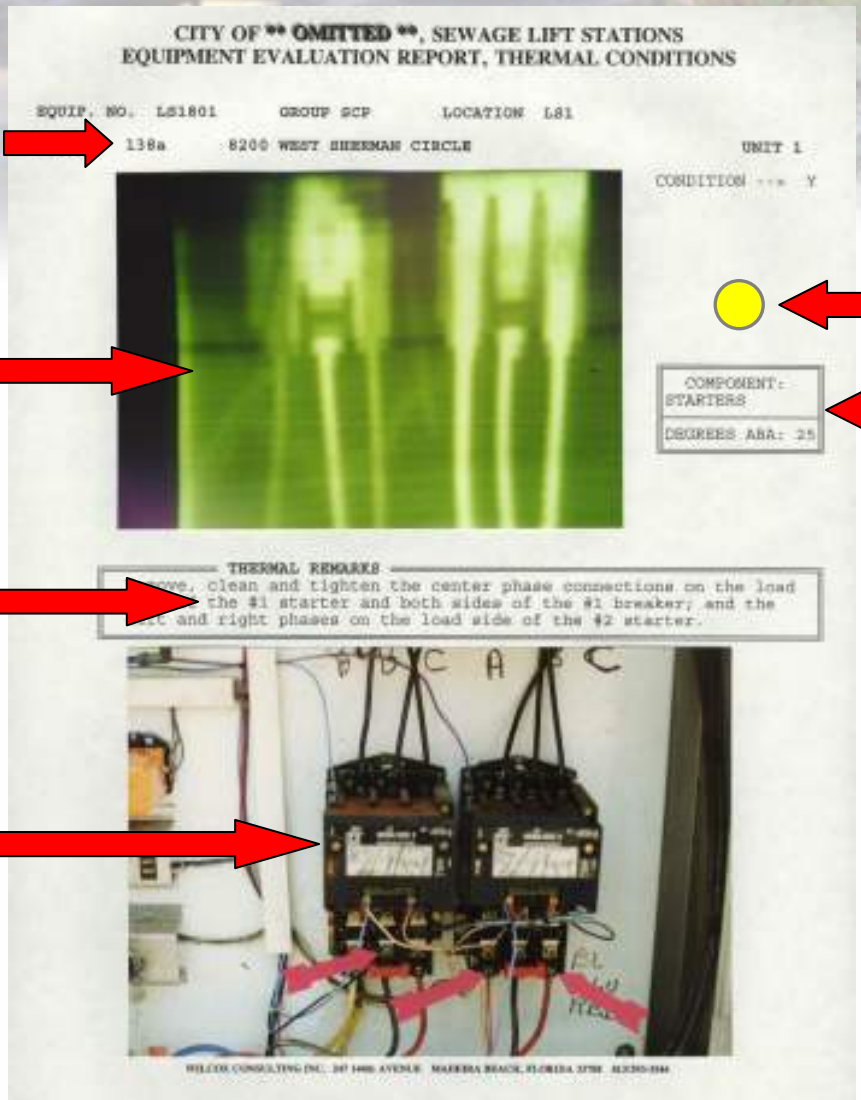
Page 1

Identification

IR View

Remarks

Visual



Severity Code

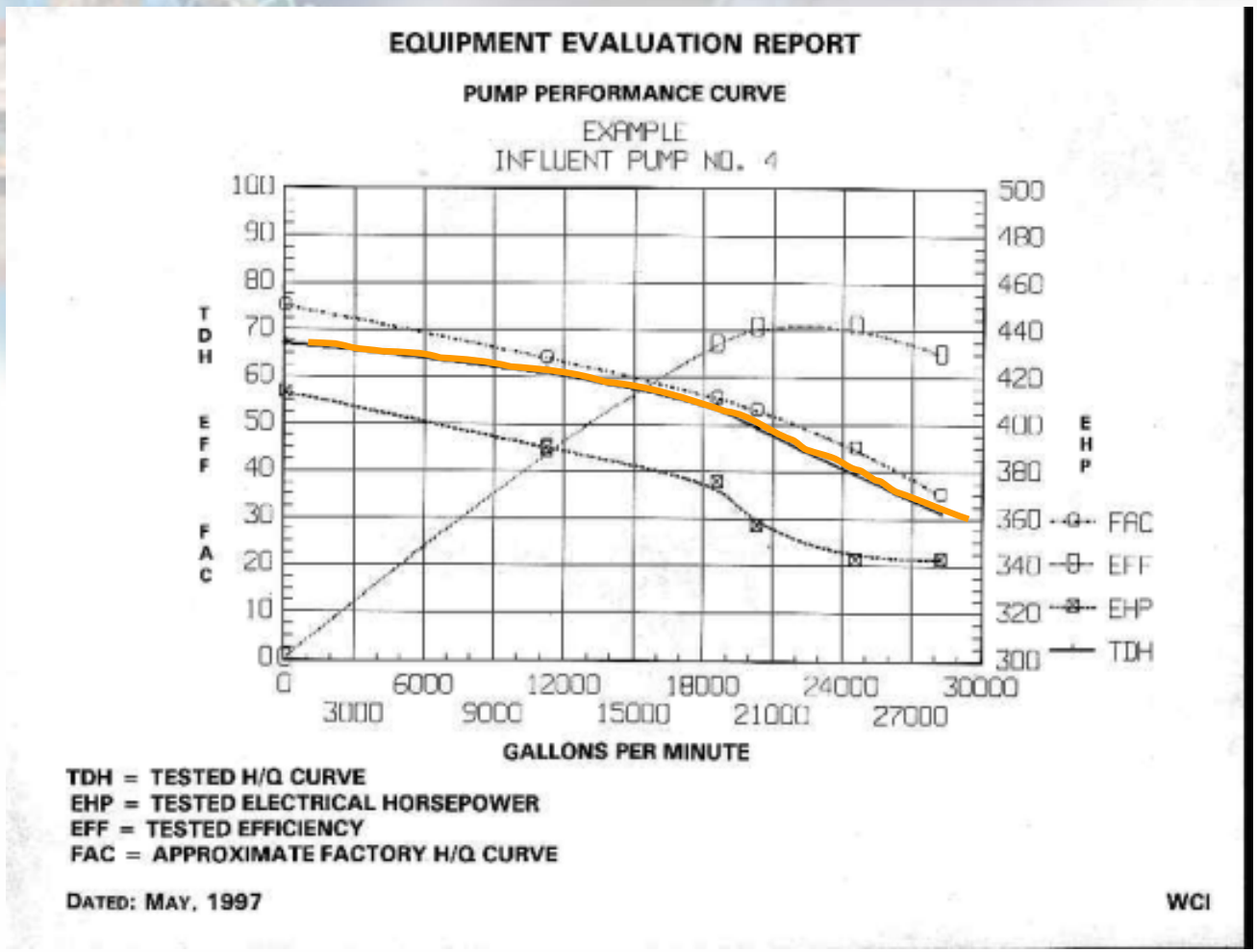
Component Temp

Typical Infrared Report Sheet

Alignment Inspection and Correction Data

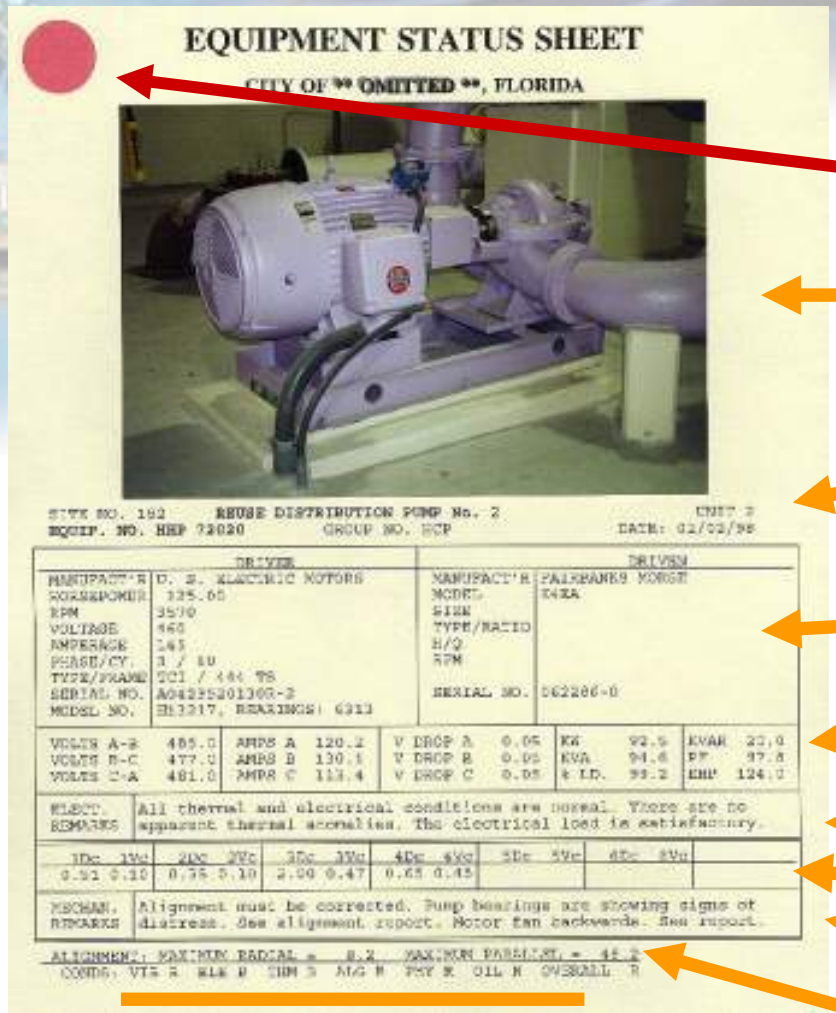
- Coupling Failure
- Bearing Failure

Machine Performance Tests



- Full hydraulic testing of selected machines
- Conforms to factory test curves?

The Status Sheet (Summary)



EQUIPMENT STATUS SHEET

CITY OF ** OMITTED **, FLORIDA

SITE NO. 182 REUSE DISTRIBUTION PUMP No. 2 UNIT 2

EQUIP. NO. HEP 72020 GROUP NO. RCP DATE: 02/02/96

DRIVER		DRIVEN	
MANUFACT'R	U. S. ELECTRIC MOTORS	MANUFACT'R	FAIRBANKS MORSE
HORSEPOWER	125.00	MODEL	6X8A
RPM	3570	SIZE	
VOLTAGE	460	TYPE/RADIO	
AMPERAGE	145	H/Q	
PHASE/CY.	3 / 60	RPM	
TYPE/FRAME	SCI / 444 TS		
SERIAL NO.	A0433520130G-2	SERIAL NO.	062206-0
MODEL NO.	813317, BEARINGS: 6313		

VOLTS A-B	465.0	AMPS A	120.2	V DROP A	0.05	KW	92.5	KVAR	22.0
VOLTS B-C	477.0	AMPS B	130.1	V DROP B	0.05	KVA	94.6	PF	97.8
VOLTS C-A	481.0	AMPS C	113.4	V DROP C	0.05	% LD.	99.2	EMF	124.0

ELECT. REMARKS: All thermal and electrical conditions are normal. There are no apparent thermal anomalies. The electrical load is satisfactory.

1Dc 1Vc	2Dc 2Vc	3Dc 3Vc	4Dc 4Vc	5Dc 5Vc	6Dc 6Vc
0.91 0.10	0.35 0.10	2.00 0.47	0.65 0.45		

MECHAN. REMARKS: Alignment must be corrected. Pump bearings are showing signs of distress. See alignment report. Motor fan backwards. See report.

ALIGNMENT: MAXIMUM RADIAL = 8.2 MAXIMUM PARALLEL = 44.2

COUPL: VTS R HLS R THM S AXS R PHY R OIL N OVERALL R

Overall condition

Picture of machine

Description

All Nameplate Data

Electrical Data

Elect. And Thermal Remarks

Vibration Data

Mech. and Phys. Remarks

Alignment Data

Conditions

Equipment Status List

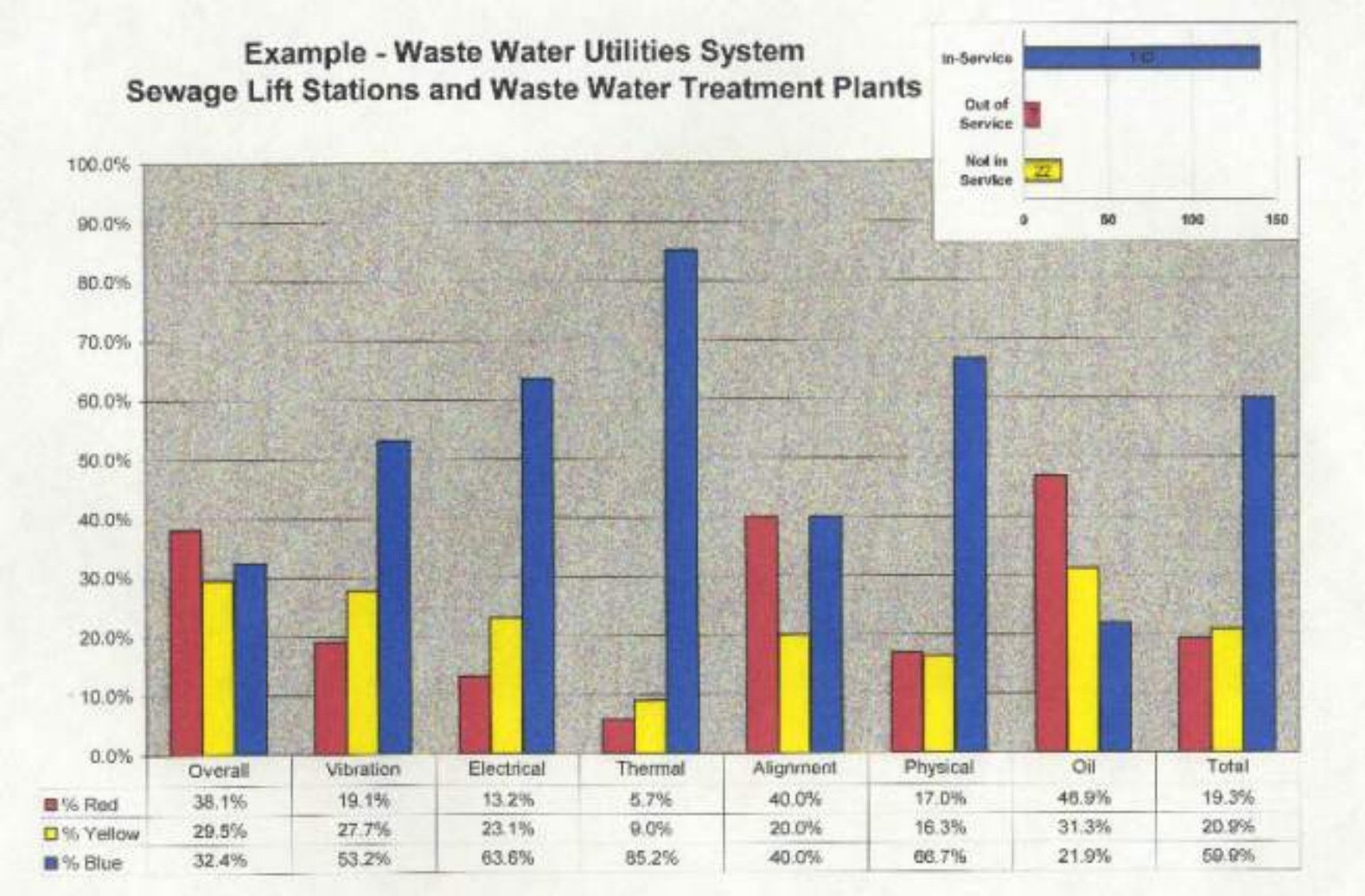
EQUIPMENT SUMMARY REPORT - STATUS LIST

June, 1998

Equipment Number	Site Number	Overall	Vibration	Electrical	Thermo-graphy	Alignment	Physical	Oil
LOCEQ	SITENO	OACC	VIBC	ELEC	THRC	ALGC	PHYC	OILC
20LS-RSP-001	113A	O	N	N	N	N	R	N
20LS-RSP-002	113B	Y	Y	B	B	N	B	N
ABLS-RSP-001	101A	Y	B	B	B	N	B	N
ABLS-RSP-002	101B	Y	Y	B	B	N	B	N
ABLS-RSP-003	101C	Y	B	N	N	N	R	N
ABTP-ADU-001	201	B	B	Y	B	N	B	B
ABTP-ADU-002	202	Y	N	N	N	N	B	B
ABTP-ADU-003	203	B	N	N	N	N	B	B
ABTP-ADU-004	204	R	N	N	N	N	B	B
ABTP-BC1-001	205	R	N	N	N	N	B	R
ABTP-BC1-002	206	R	N	B	B	N	B	R
ABTP-BC1-002	207	R	B	B	B	N	B	R
ABTP-MAC-001	225	N	B	B	B	N	B	N
ABTP-PFP-001	226	N	B	B	B	N	B	N
ABTP-SFP-001	223	N	N	N	N	N	N	N
ABTP-SFP-002	227	N	N	Y	B	N	Y	N
ABTP-SFP-002	224	N	R	R	B	N	R	N
ABTP-TBF-001	211	N	N	B	B	N	B	N
ABTP-TBF-002	212	N	N	B	B	N	B	N
ABTP-TBF-003	213	N	B	B	Y	N	B	N
ABTP-TBF-004	214	N	N	B	B	N	B	N
ABTP-TBF-005	215	N	Y	Y	B	N	Y	N
ABTP-TBF-006	216	N	N	Y	B	N	Y	N
ABTP-THK-001	220	R	N	N	N	N	N	R
ABTP-THK-002	221	B	B	B	B	N	B	N

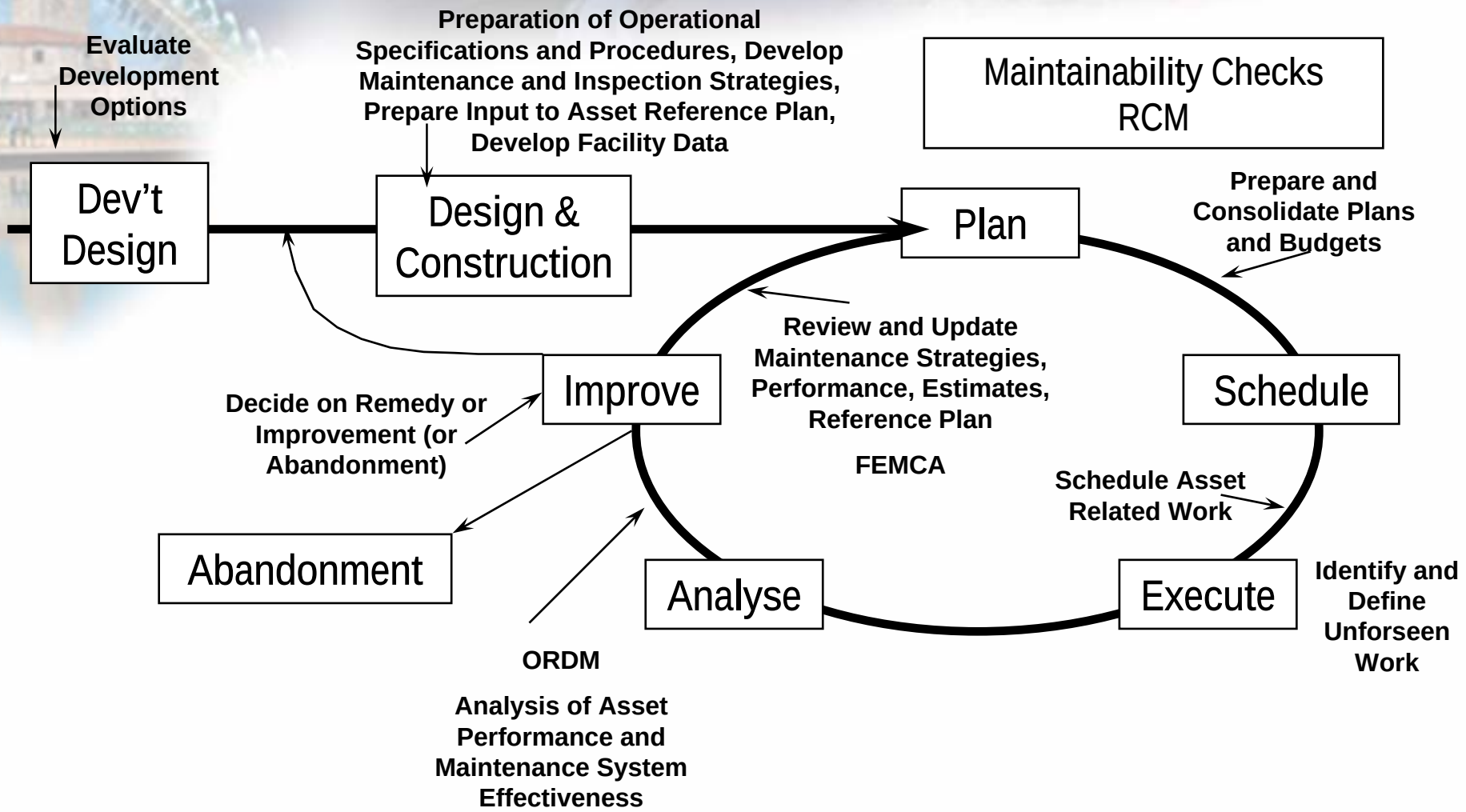
Severity Color Code

Graphic Summary - All Machines



	Overall	Vibration	Electrical	Thermal	Alignment	Physical	Oil	Total
% Red	38.1%	19.1%	13.2%	5.7%	40.0%	17.0%	46.9%	19.3%
% Yellow	29.5%	27.7%	23.1%	9.0%	20.0%	16.3%	31.3%	20.9%
% Blue	32.4%	53.2%	63.6%	85.2%	40.0%	66.7%	21.9%	59.9%

Maintenance - Contribution to LCAM



Example RCM Analysis on Headworks Screen

RCM II INFORMATION WORKSHEET © 1994 Aladon Ltd	SYSTEM	*Bull screens*	No. 0	Compiled by	Date *18-Aug-02*	Sheet *1*
	SUB-SYSTEM		Ref. *Bull screens*	Reviewed by	Date	of *49*

FUNCTION		FUNCTIONAL FAILURE		FAILURE MODE (Cause of failure)		FAILURE EFFECT (What happens when it fails)
1	To remove all sedimentary and floating foreign matter greater than 1 inch from the effluent	A	Cannot remove foreign matter from the effluent	1	Bull screen shovel control cable worn	Over time the control cable wears and thins, strands start to break and eventually the cable looses enough tensile strength that it can no longer support the shovel's weight when open. The cable breaks and the shovel closes and cannot be opened. During its decent the shovel catches on the scraper and beaks it off. The shovel continues its cycle but does not open and cannot gather foreign matter. The excess material in front of the screen accumulates and the water level differential across the screen rises. The shovel tries to clean the screen more often and eventually the water level in front of the screen rises enough that the "high level" alarm sounds in the control room. With time the channel overflows. Repair time: 4 hours, Downtime: 5 hours. Special tools: mobile scaffolding and security bar. Spare parts: Wire rope in stock.
1		A		2	Bull screen shovel control cable extension worn	The control cable extension is positioned at the portion of the cable that flexes the most during normal operation. Over time the control cable extension wears and thins, strands start to break and eventually the cable looses enough tensile strength that it can no longer support the shovel's weight when open. The cable breaks and the shovel closes and cannot be opened. During its decent the shovel catches on the scraper and beaks it off. The shovel continues its cycle but does not open and cannot gather foreign matter. The excess material in front of the screen accumulates and the water level differential across the screen rises. The shovel tries to clean the screen more often and eventually the water level in front of the screen rises enough that the "high level" alarm sounds in the control room. With time the channel overflows. Repair time: 4 hours, Downtime: 5 hours. Special tools: mobile scaffolding and security bar. Spare parts: Wire rope in stock from which to make the extension.

IVARA-EAM
SPEED TO ACHIEVE

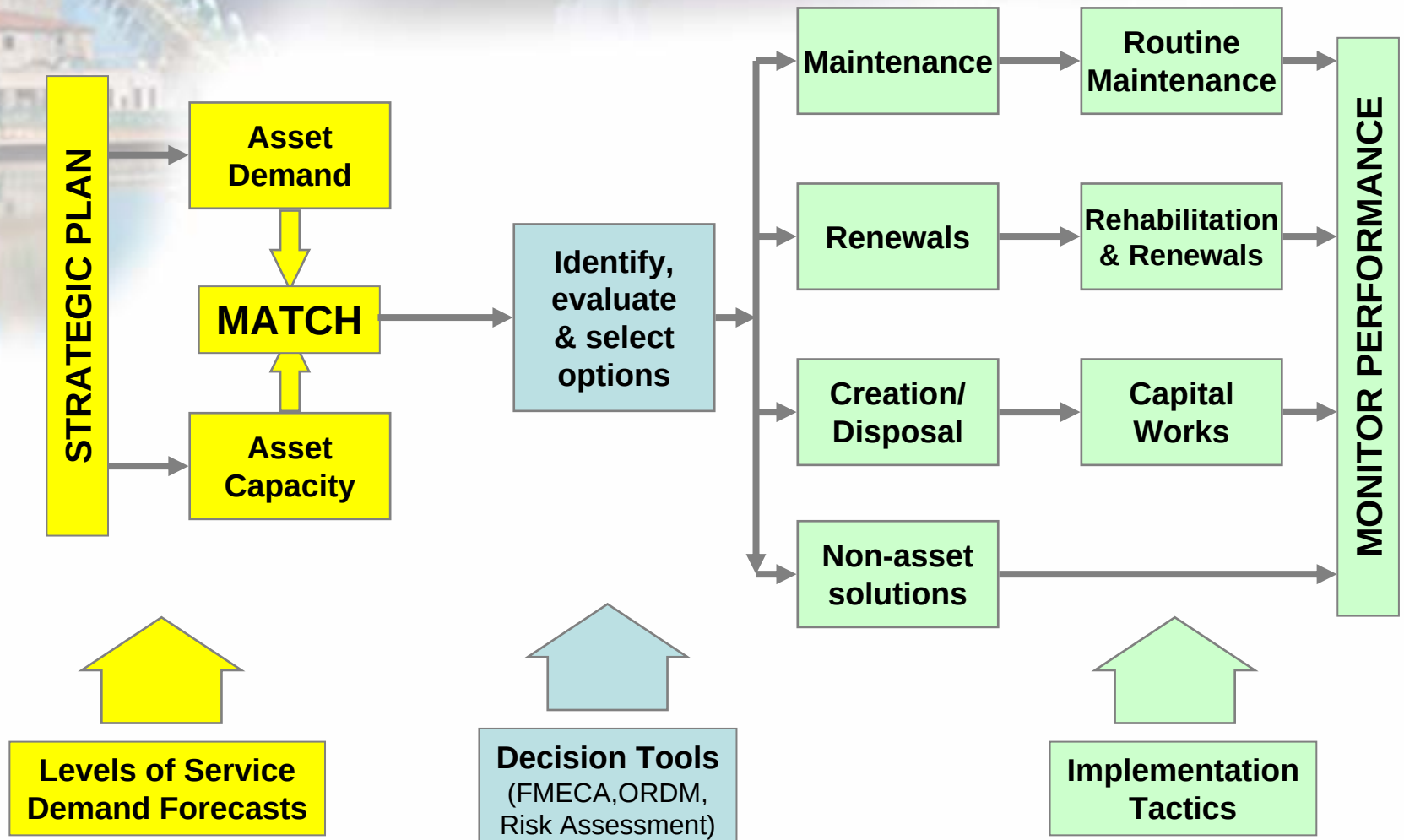
Example RCM Analysis on Headworks Screen

RCM II DECISION WORKSHEET

SYSTEM	*Bull screens*	No. 0	Compiled by	Date *18-Aug-02*	Sheet *1*
SUB-SYSTEM		Ref. *Bull screens*	Reviewed by	Date	of 9

Information reference			Consequence evaluation				H1 S1 O1 N1	H2 S2 O2 N2	H3 S3 O3 N3	Default tasks			Proposed Task	Initial Interval	Can be done by
F	FF	FM	H	S	E	O				H4	H5	S4			
1	A	1	Y	N	N	Y	Y						Visual inspection of the shovel control cable for broken strands and reduced cable diameter. Standards to be established. Replace cable as needed.	5000 cycles	Mechanic
1	A	2	Y	N	N	Y	N	N	Y				Replace the bull screen shovel control cable extension	3500 cycles	Mechanic
1	A	3	Y	N	N	Y	N	Y					Shorten the bull screen shovel lift cable to eliminate the worn section, from the connector to the curvature. Ensure that both lift cables are the same length. The cable can be shortened twice before a new cable must be installed.	3500 cycles	Mechanic
1	A	4	Y	N	N	Y	Y						Visual inspection of the bull screen shovel lift cables for broken strands and reduced cable diameter. Standards to be established. Replace cable as needed. When replacing the cable, ensure that both lift cables are the same length.	5000 cycles	Mechanic
1	A	5	Y	N	N	Y	N	N	N				No scheduled maintenance		
1	A	6	Y	N	N	Y	Y						Visual inspection of the bull screen shovel's lift wench's drums for accumulation of foreign matter. Have the drum's surface cleaned when the accumulation affects cable seating.	Mensuel	Operator
1	A	7	Y	N	N	Y	Y						Visual inspection of the bull screen shovel's control wench's drum for accumulation of foreign matter. Have the drum's surface cleaned when the accumulation affects cable seating.	Mensuel	Operator
1	A	8	Y	N	N	Y	N	Y					Lubricate the bull screen shovel wench's bearings. Norms to be established.	Annuel	Mechanic

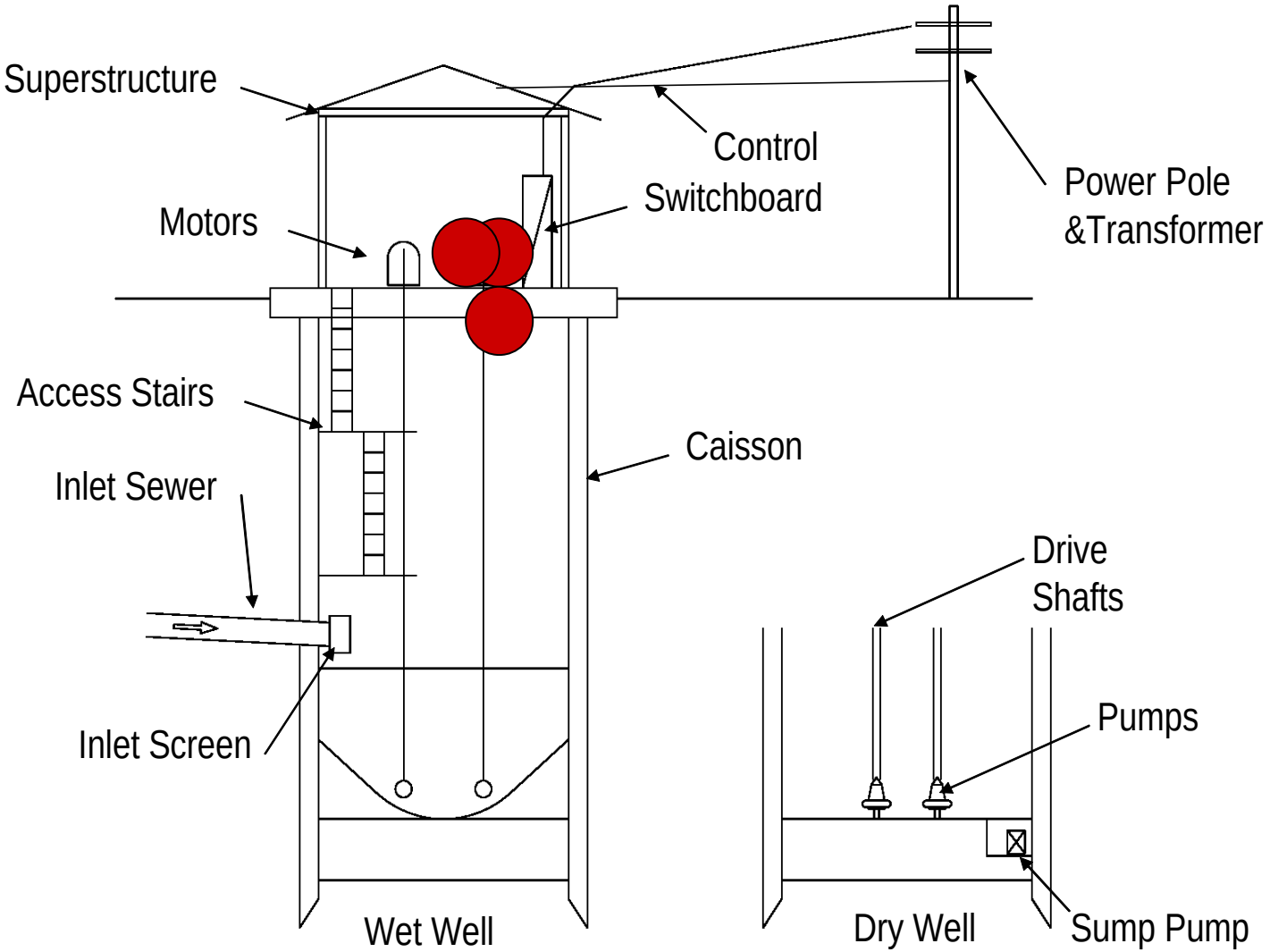
Asset Management Planning Process



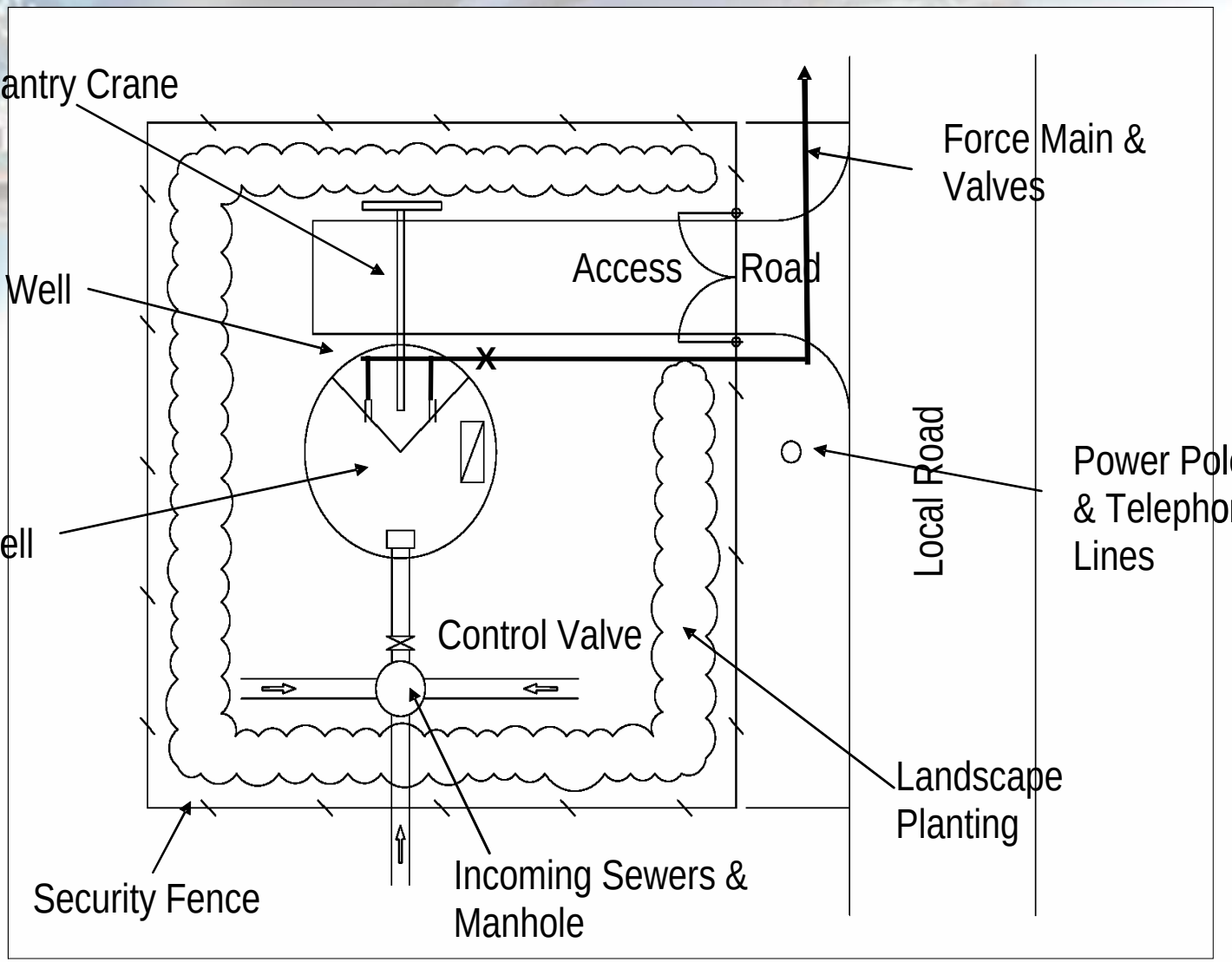
Q4: Given the above, what are the likely changes you would make to your present maintenance program?

Work through spreadsheet …

The Pump Station



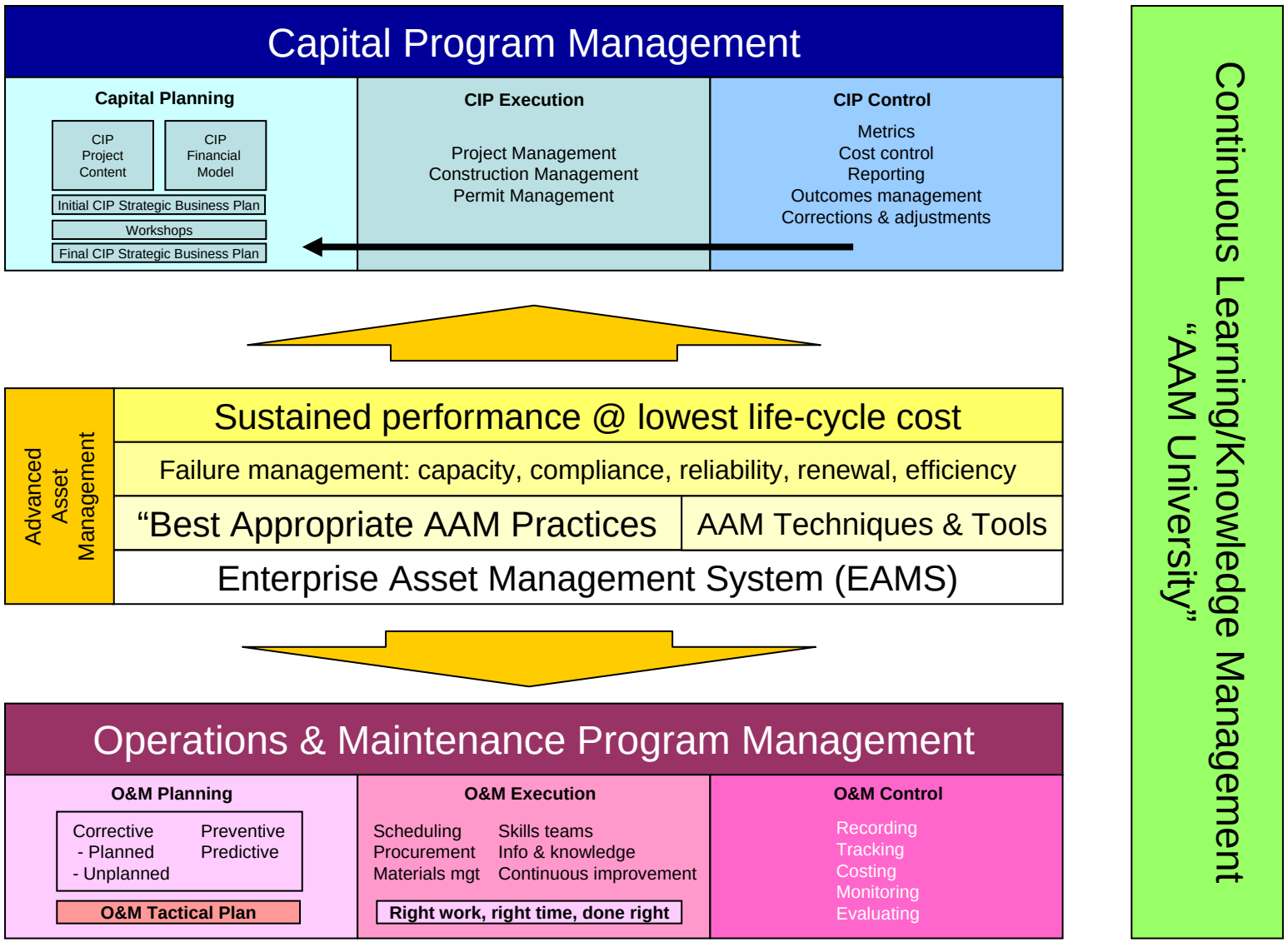
The Layout View



Q4: What Are My Best Minimum Life-Cycle-Cost Strategies? (continued from yesterday)

Q1b: Applied to CIP

Parsons/GHD AAM Model



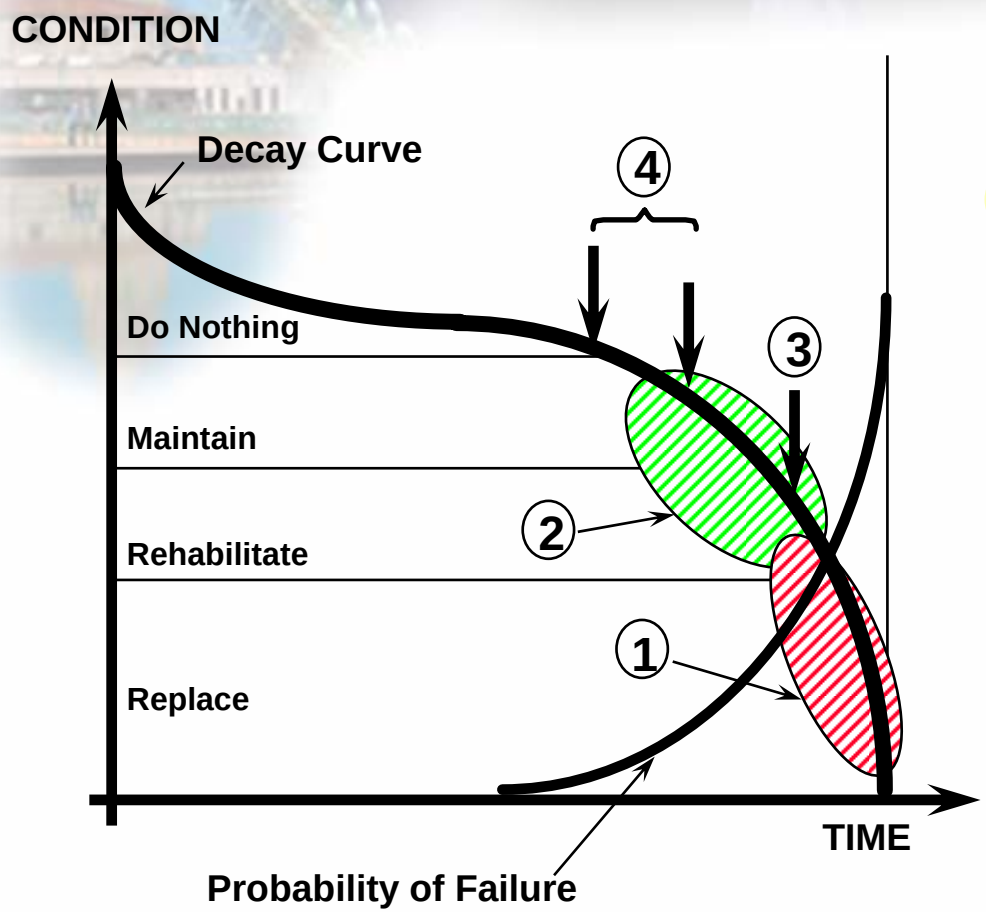
Setting the Scene

- *Now we have the Asset Management Improvement Program running.*
- *But it will still be sometime before we can get good data …*
- *So what can we do now to improve our situation?*
- *We can start to review and optimize our spending and commence to identify the "lowest life cycle cost" CIP ….*

Key Strategies

1. *Start your first Asset Management Plan. Build your first system-wide – a "full portfolio" funding model…*
2. *Then – optimize the investments we are making now – Use advanced AM techniques to validate and approve your CIP projects & programs.*

Implementation Priority

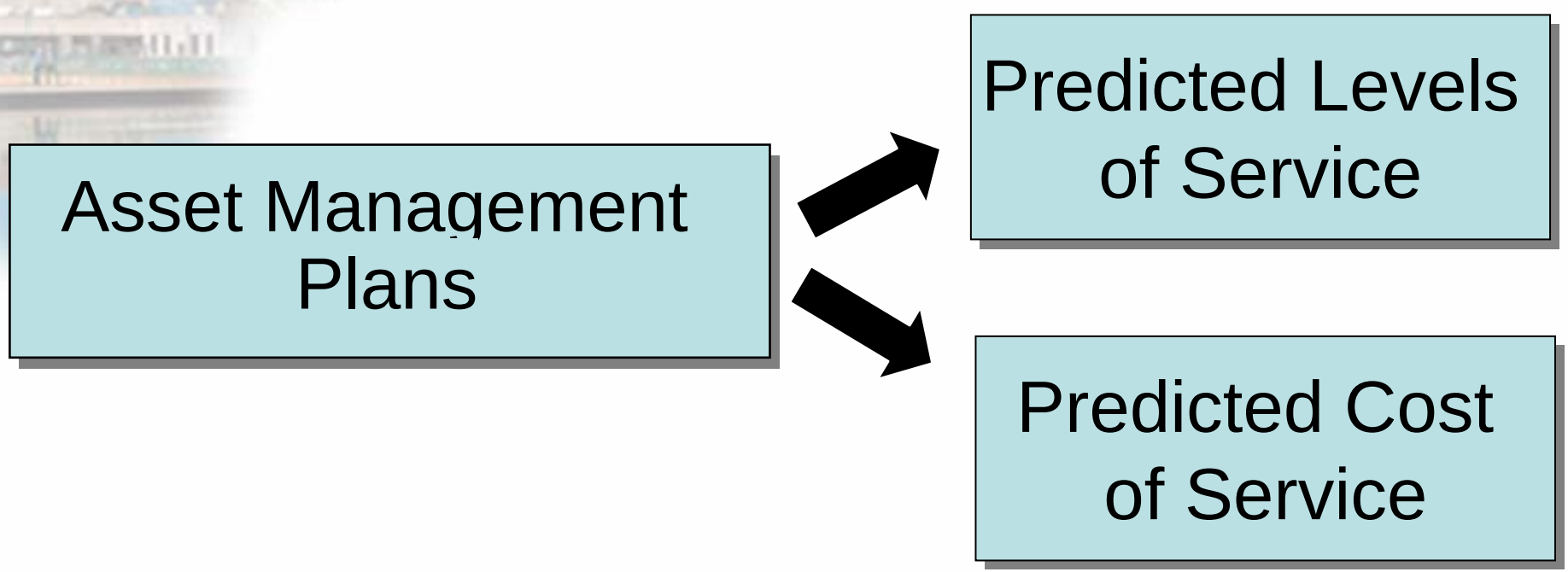


Benefit Based Priorities

Priority order

1. Assets with a high probability or history of failure (reliability).
2. Assets with a high business risk cost (consequence).
3. Assets where rehabilitation intervention is beneficial.
4. Assets where more appropriate maintenance is beneficial (eg. with high unplanned maintenance).

Asset Management Plans



Steps In Developing Your AMP

1

Existing Levels of Service:
- *Regulatory*
- *Customer related*
- *Internal operations*

2

Assess Existing Assets:
- *Physical Details*
- *Condition/Remaining Life*
- *Performance*
- *Capacity (Current / Ultimate)*

3

Predict Demand / Levels of Service:
- *Capacity / Demands*
- *Levels of Service*
- *Performance / Risk*

4

Predict Mode of Failure
- *Capacity (Due to Growth)*
- *Performance / Reliability*
- *Condition (Age) Integrity*
- *Cost of Service*

Steps In Developing Your AMP

5

Predict Capital Program :
- *Growth / augmentation*
- *Renewal / Reliability*
- *New levels of service*
- *Business Efficiency*

6

Predict Operations & Maintenance
- *Growth (additional flows)*
- *New assets Levels of Service*
- *Age of overall portfolio*

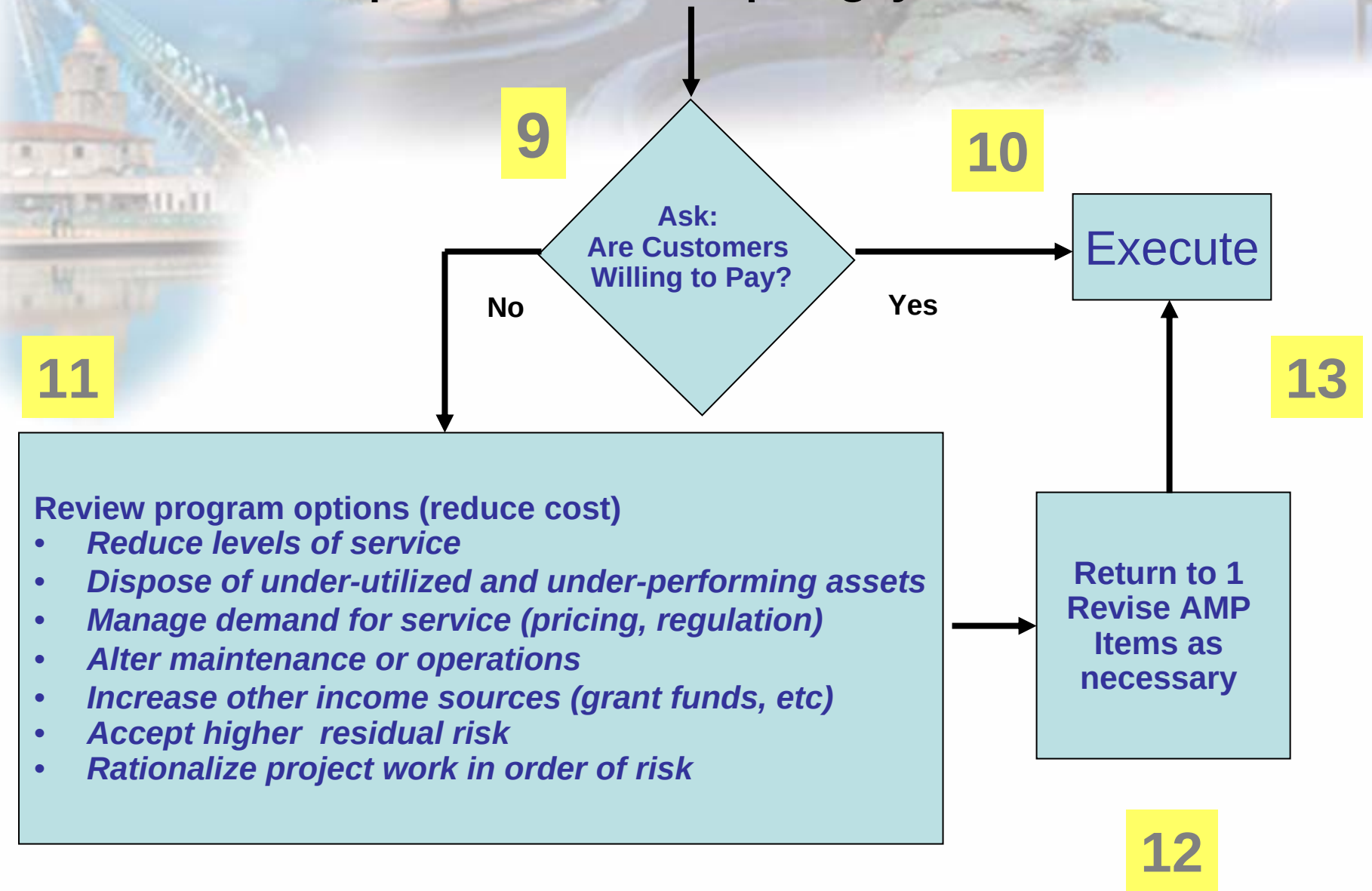
7

Predict Future Expenditure Model
- *Capital*
- *Operations*
- *Maintenance*
- *Administration*

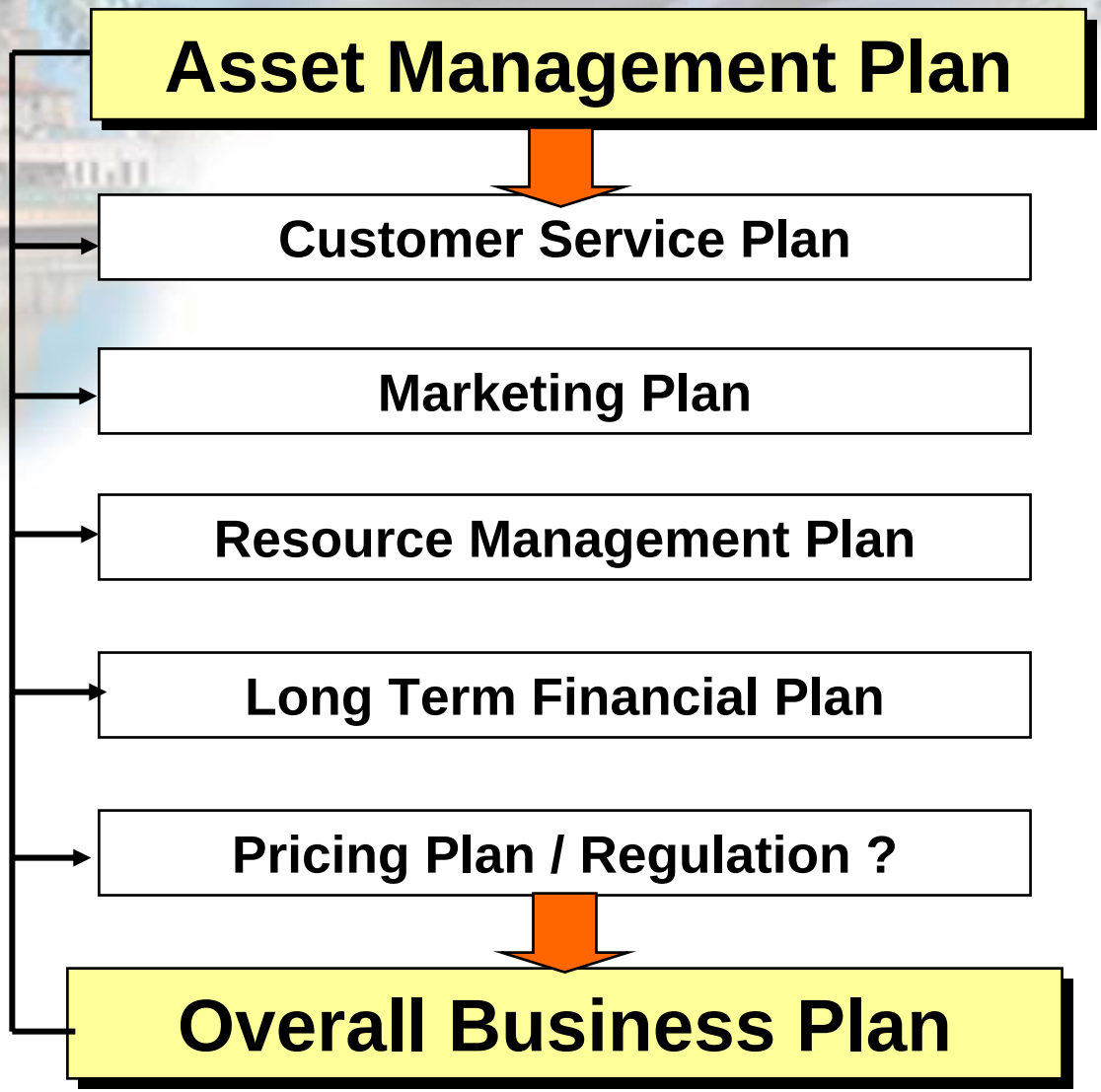
8

Predict Future Income Model
- *Rates*
- *Charges*
- *Other sources*
- *Total*

Steps In Developing your AMP



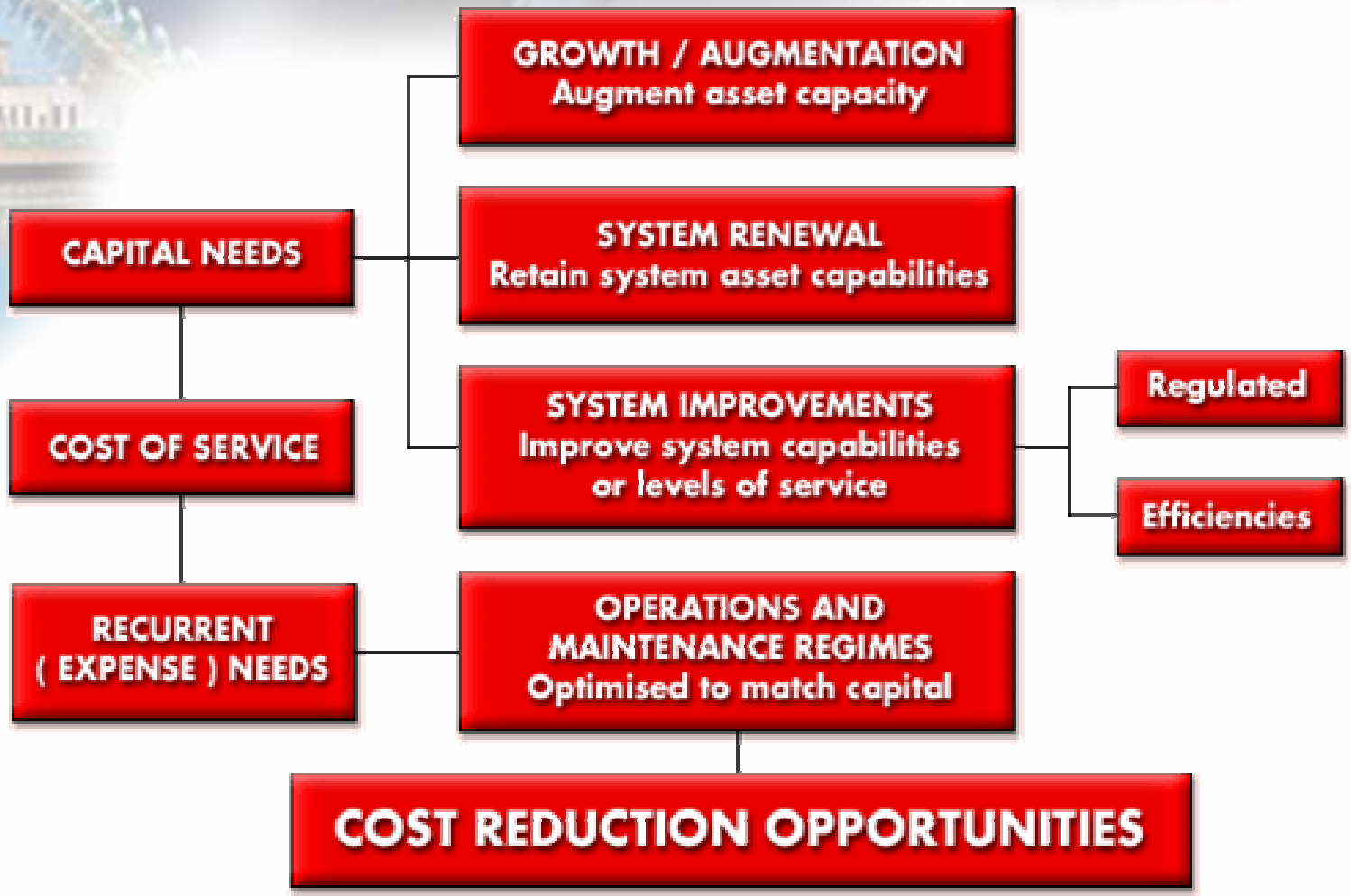
Role of the AM Plan



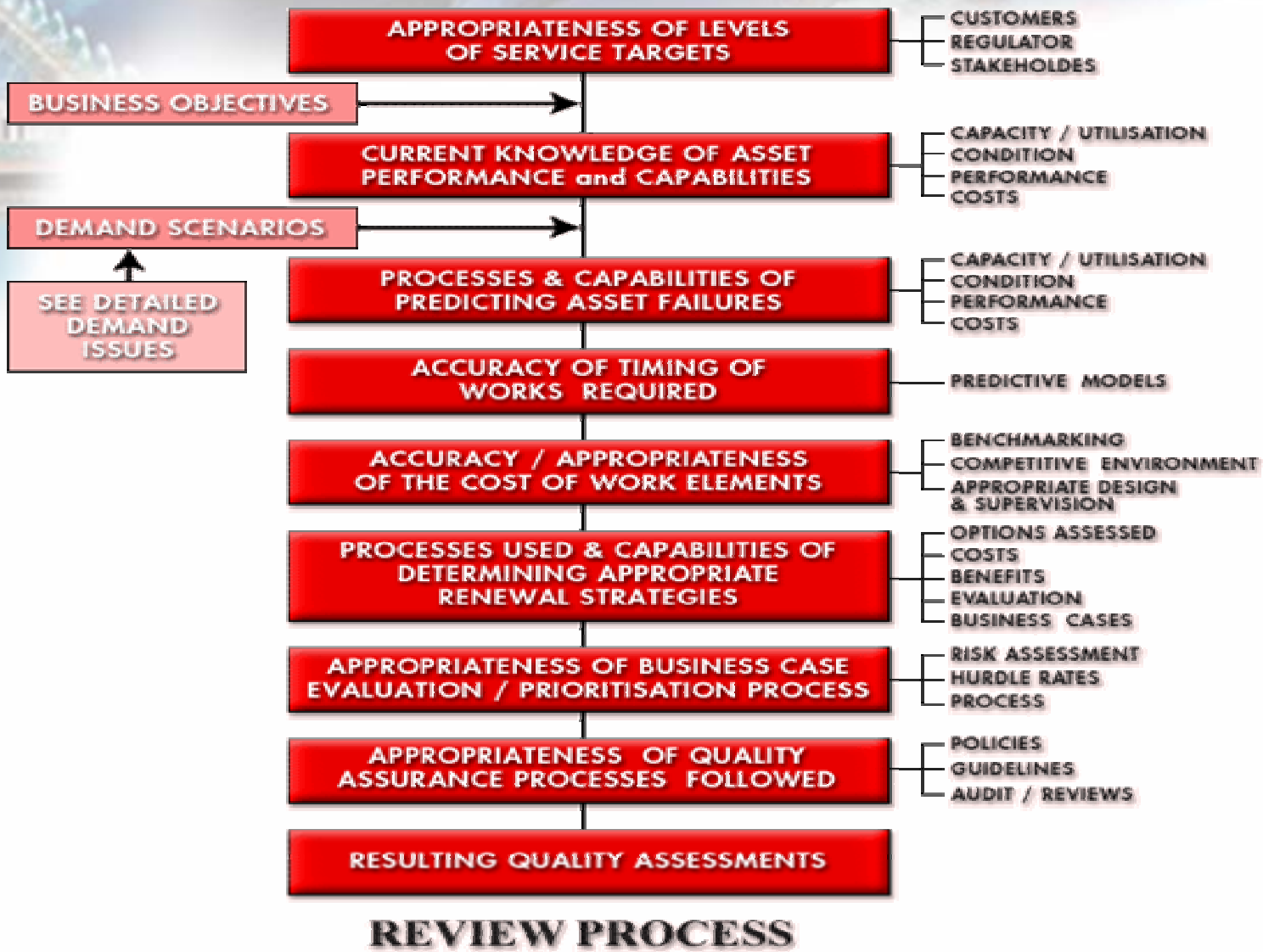
Key Outputs:

- **Costs**
- **Performance**

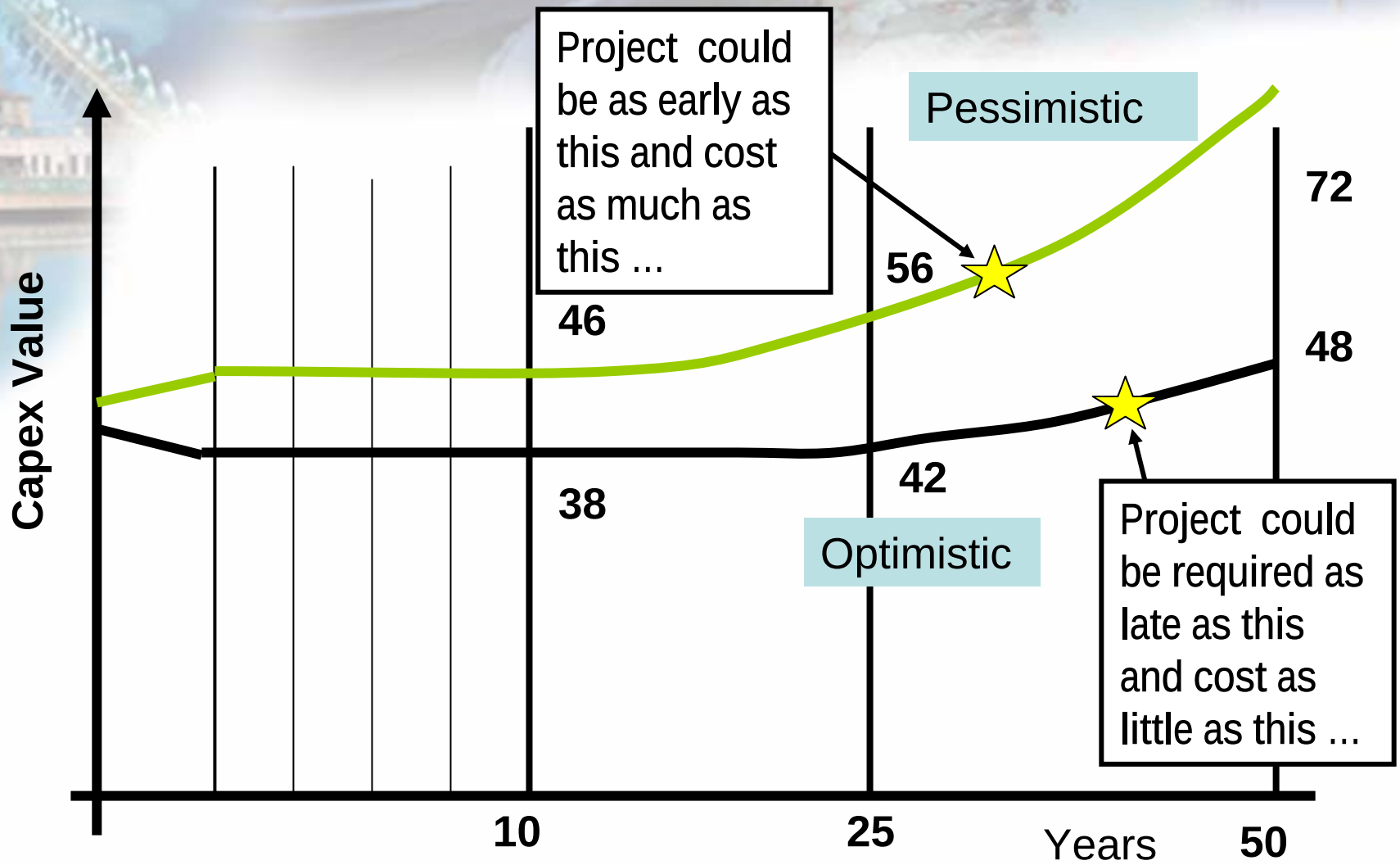
The CIP Decision Framework



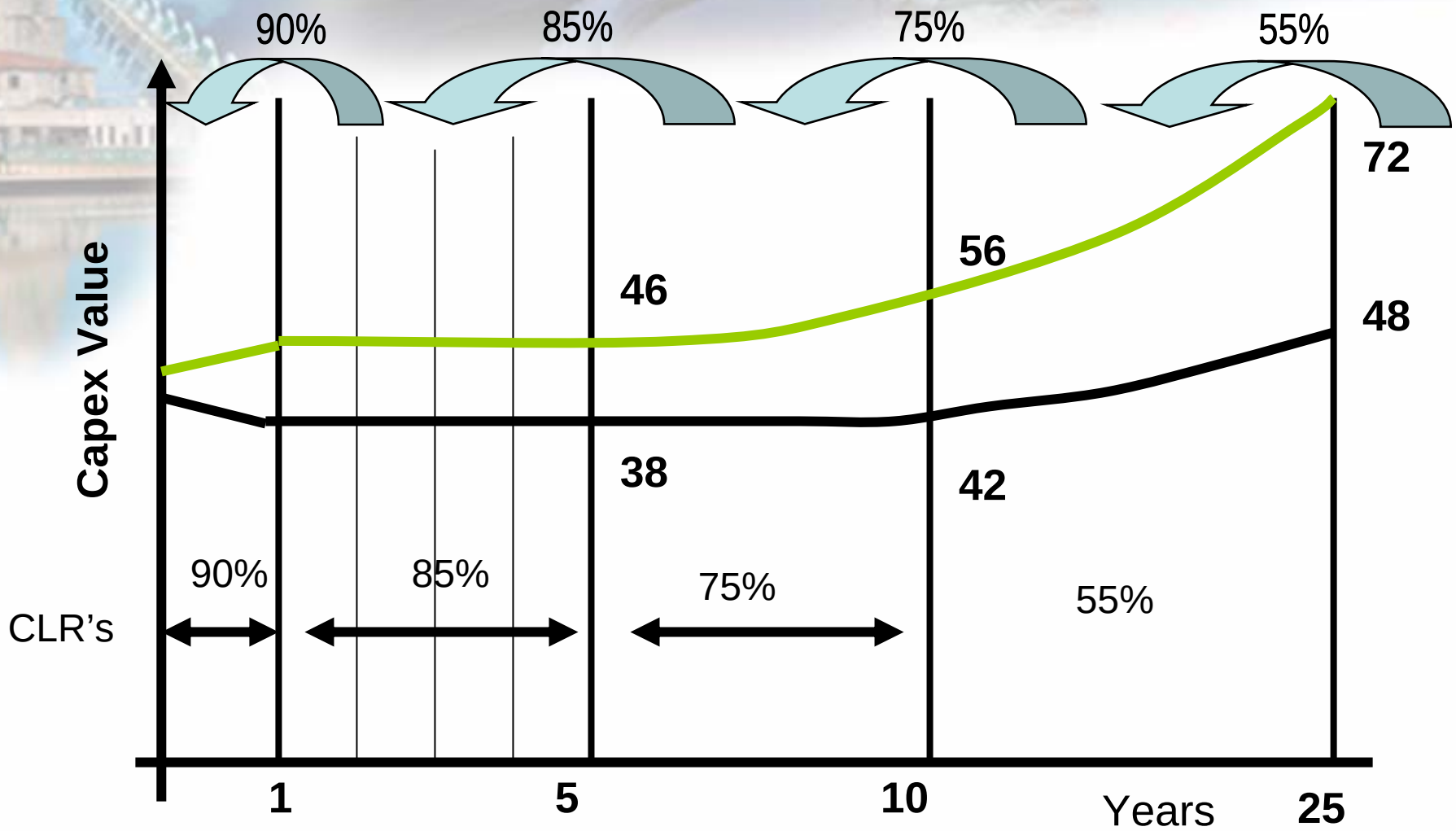
An AAM Based CIP Decision Model



Building the Funding Envelope

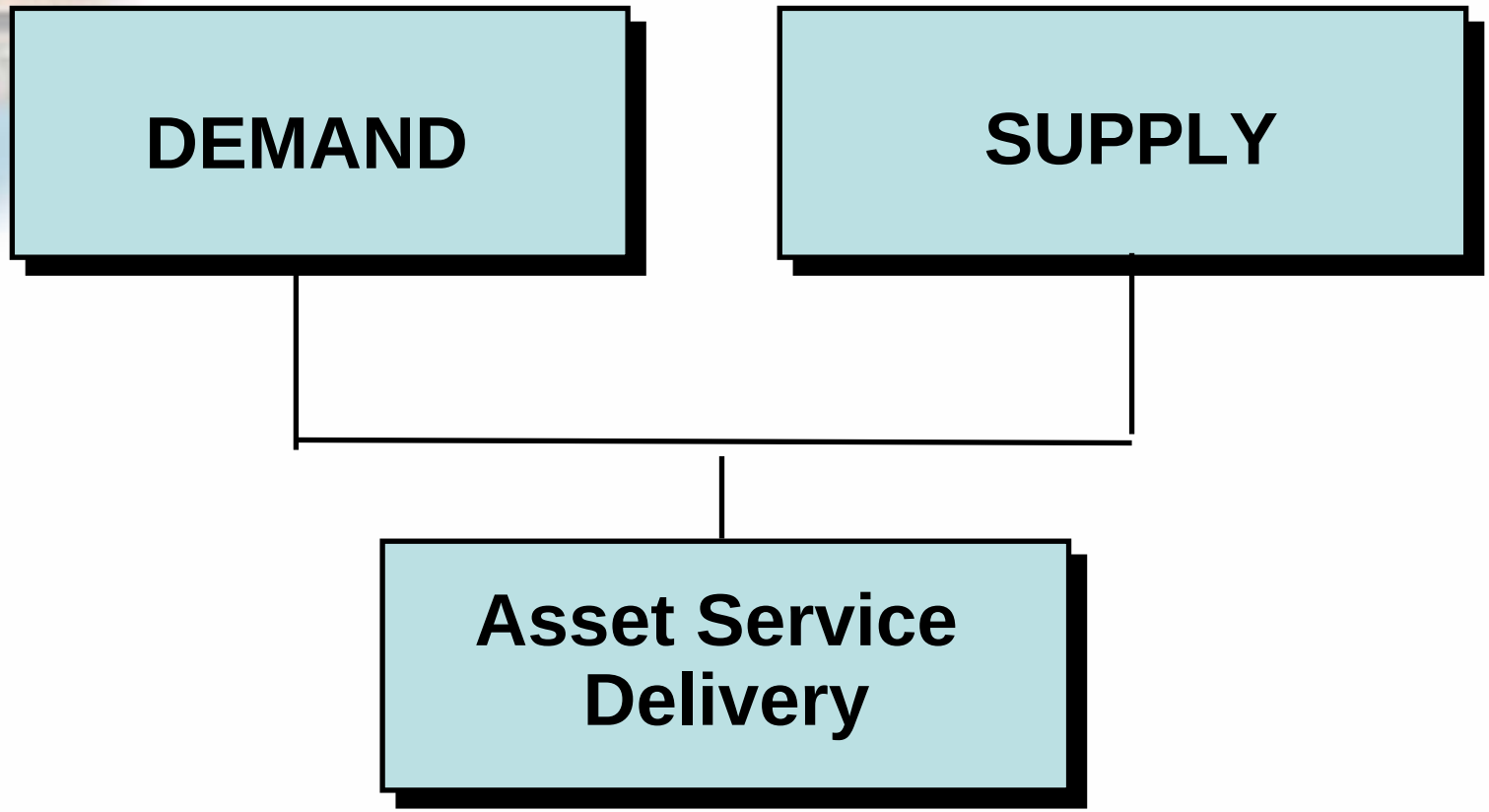


The AMP Process – Phase



Clearing the Hurdles

The Supply and Demand Elements



Supply and Demand Quality Elements

DEMAND
Understand

SUPPLY

- Demand for service and LoS
- Understand system capacity
- Understand rate of decay
- Understand the accurate Probability of failure (the timing)
- Understand the consequence (cost) to the business in TBL terms

Supply and Demand Quality Elements

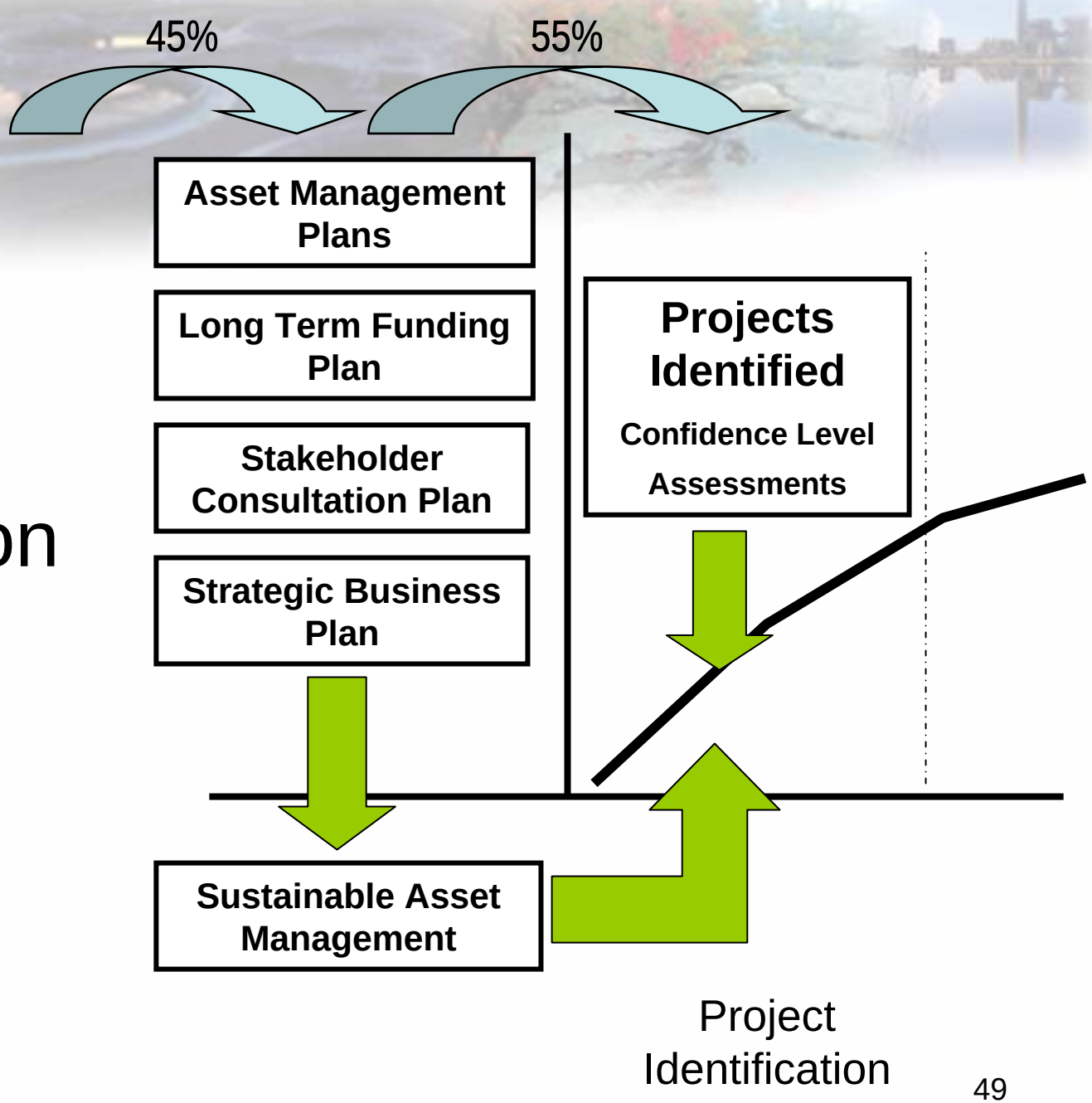
DEMAND

SUPPLY
Analyze Options

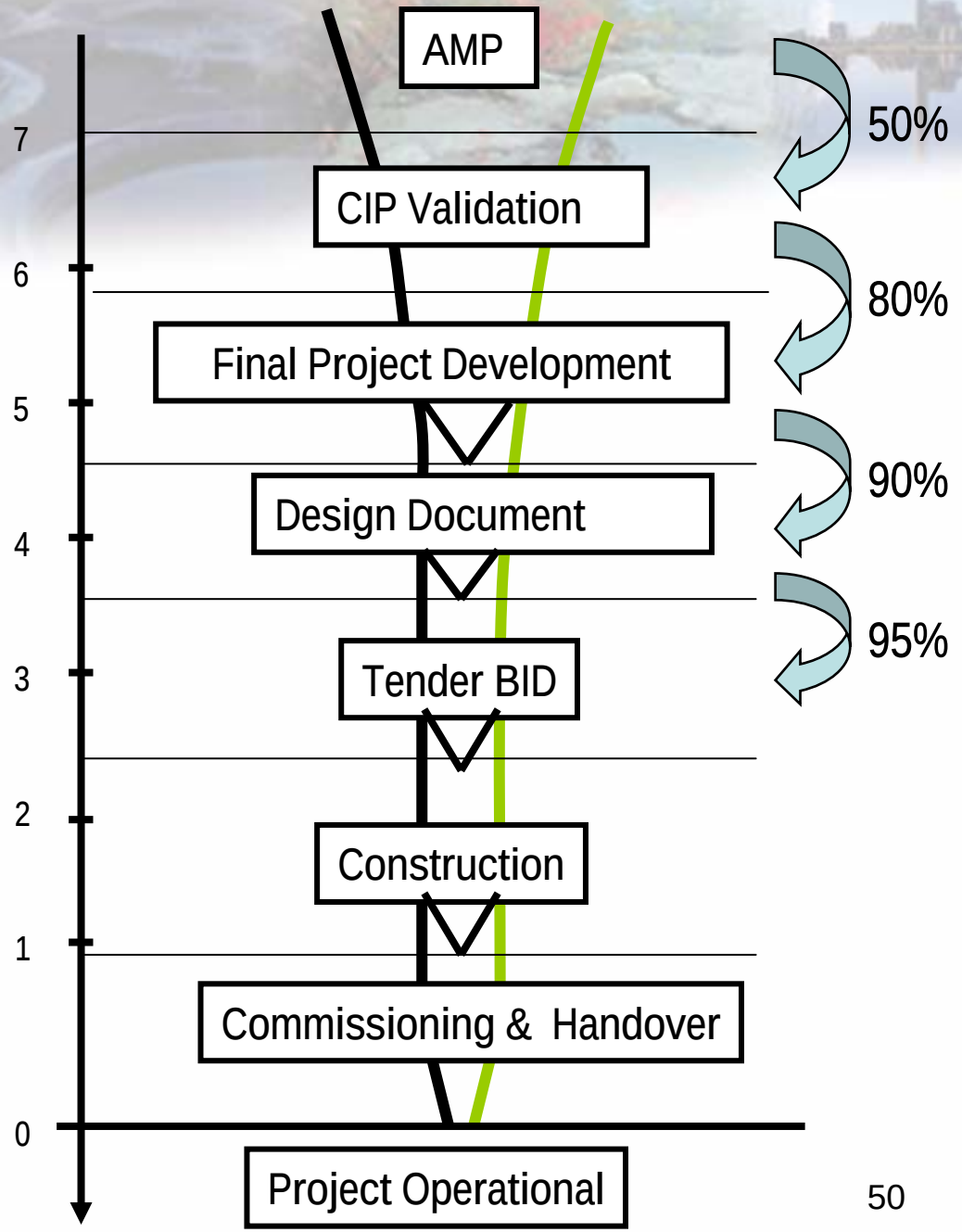
- Construct New Assets
- Refurbish / augment existing assets
- Operate differently
- Maintain differently
- Non asset Options

Lowest Sustainable Life Cycle Cost Option

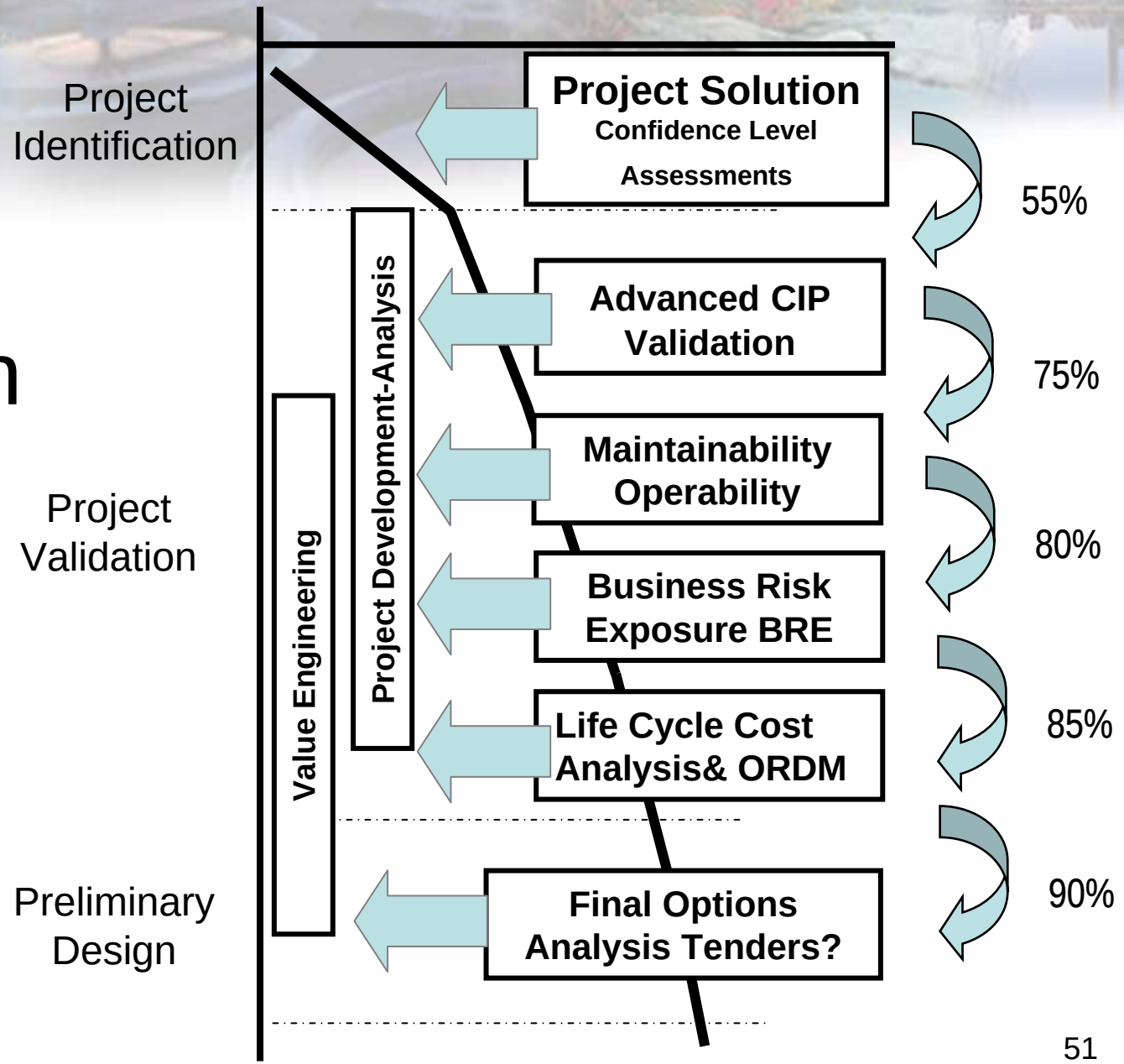
Project Identification Phase



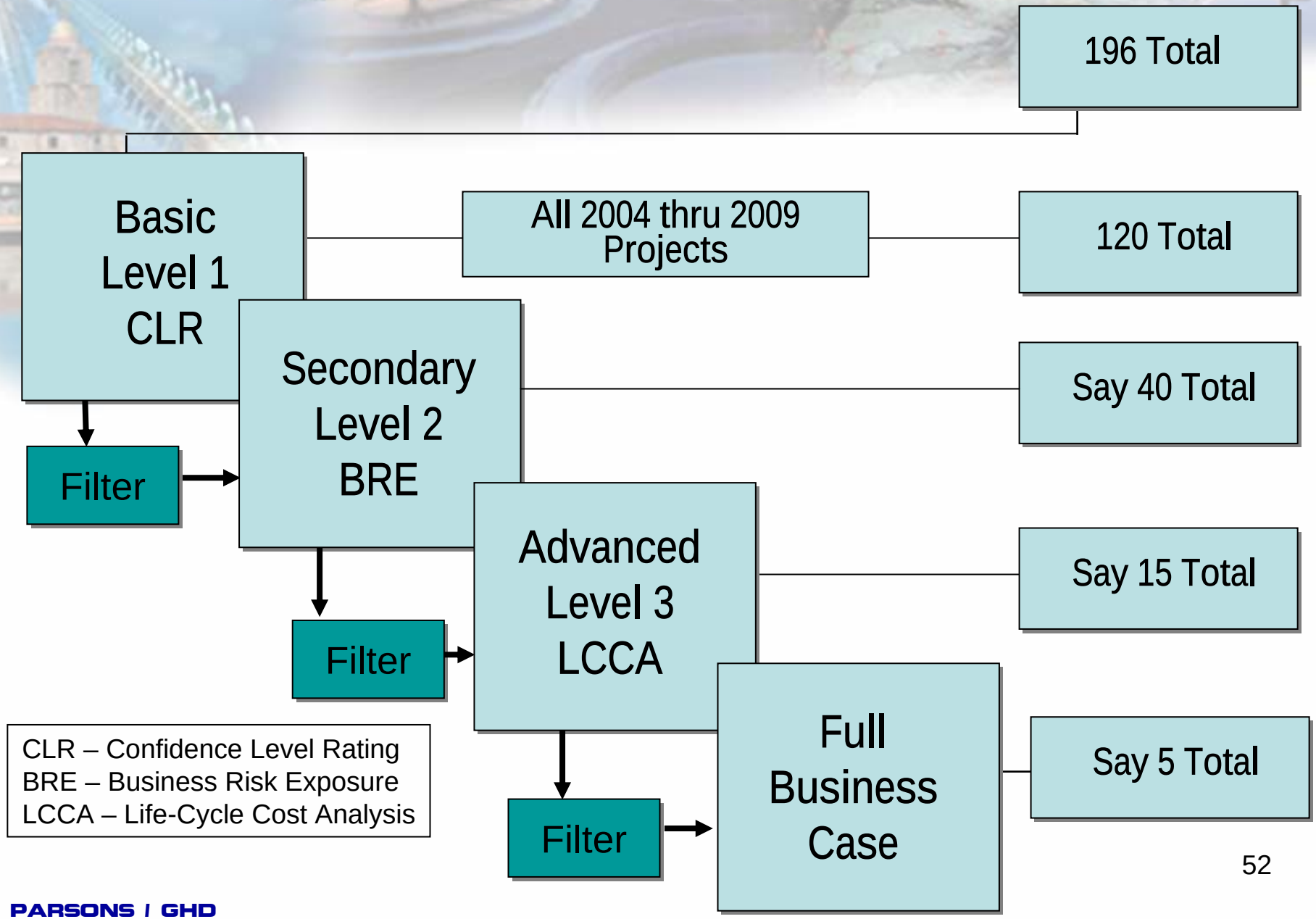
The Critical Timing Issues "Clearing the Hurdles"

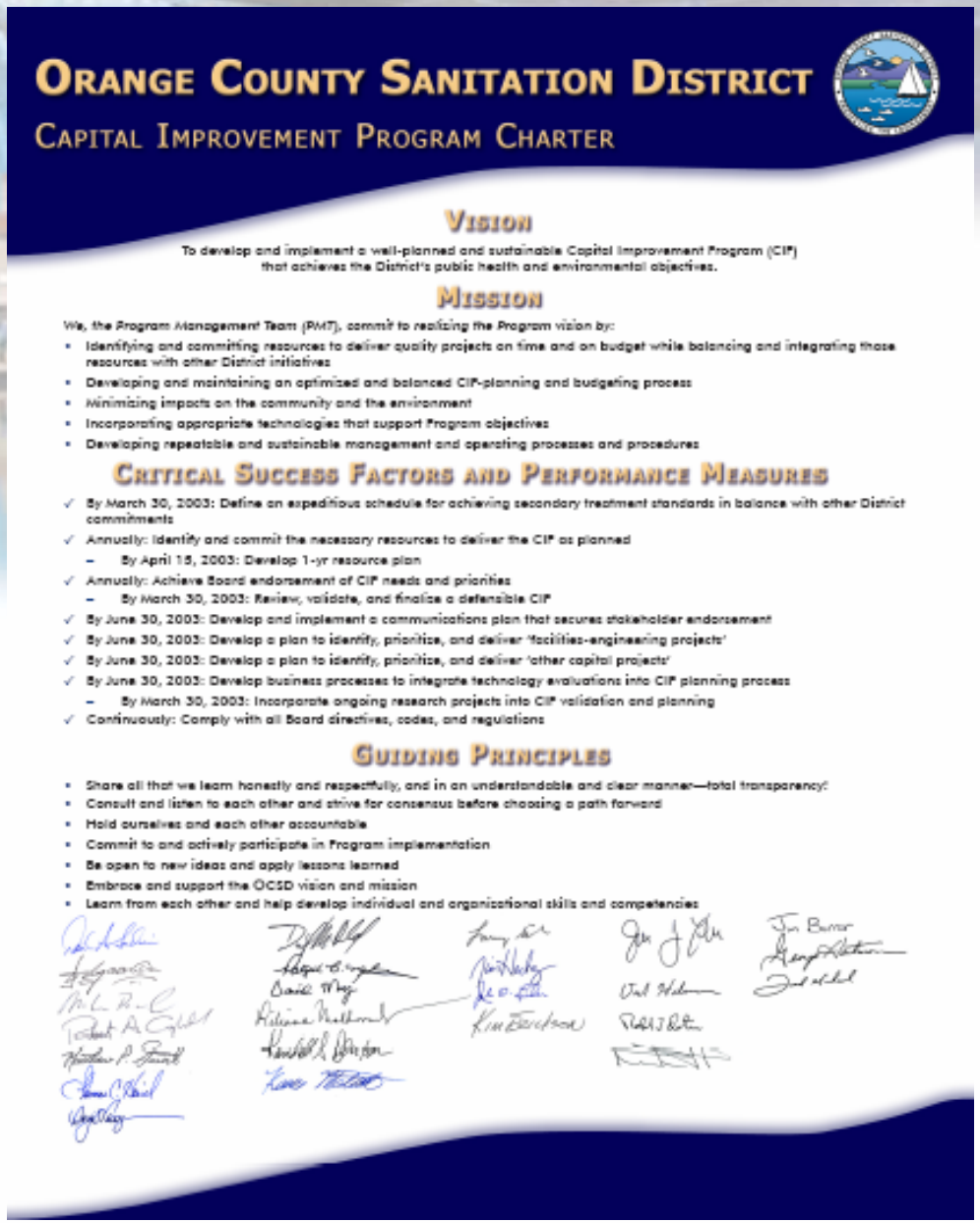


Project Validation Phase



Filtering The Project For Review





ORANGE COUNTY SANITATION DISTRICT

CAPITAL IMPROVEMENT PROGRAM CHARTER

VISION

To develop and implement a well-planned and sustainable Capital Improvement Program (CIP) that achieves the District's public health and environmental objectives.

MISSION

We, the Program Management Team (PMT), commit to realizing the Program vision by:

- Identifying and committing resources to deliver quality projects on time and on budget while balancing and integrating those resources with other District initiatives
- Developing and maintaining an optimized and balanced CIP-planning and budgeting process
- Minimizing impacts on the community and the environment
- Incorporating appropriate technologies that support Program objectives
- Developing repeatable and sustainable management and operating processes and procedures

CRITICAL SUCCESS FACTORS AND PERFORMANCE MEASURES

- ✓ By March 30, 2003: Define an expeditious schedule for achieving secondary treatment standards in balance with other District commitments
- ✓ Annually: Identify and commit the necessary resources to deliver the CIP as planned
  - By April 15, 2003: Develop 1-yr resource plan
- ✓ Annually: Achieve Board endorsement of CIP needs and priorities
  - By March 30, 2003: Review, validate, and finalize a defensible CIP
- ✓ By June 30, 2003: Develop and implement a communications plan that secures stakeholder endorsement
- ✓ By June 30, 2003: Develop a plan to identify, prioritize, and deliver 'facilities-engineering projects'
- ✓ By June 30, 2003: Develop a plan to identify, prioritize, and deliver 'other capital projects'
- ✓ By June 30, 2003: Develop business processes to integrate technology evaluations into CIP planning process
  - By March 30, 2003: Incorporate ongoing research projects into CIP validation and planning
- ✓ Continuously: Comply with all Board directives, codes, and regulations

GUIDING PRINCIPLES

- Share all that we learn honestly and respectfully, and in an understandable and clear manner—total transparency!
- Consult and listen to each other and strive for consensus before choosing a path forward
- Hold ourselves and each other accountable
- Commit to and actively participate in Program implementation
- Be open to new ideas and apply lessons learned
- Embrace and support the OCSD vision and mission
- Learn from each other and help develop individual and organizational skills and competencies

CIP (CAPEX) Validation AM Review

Quality Elements To Be Considered

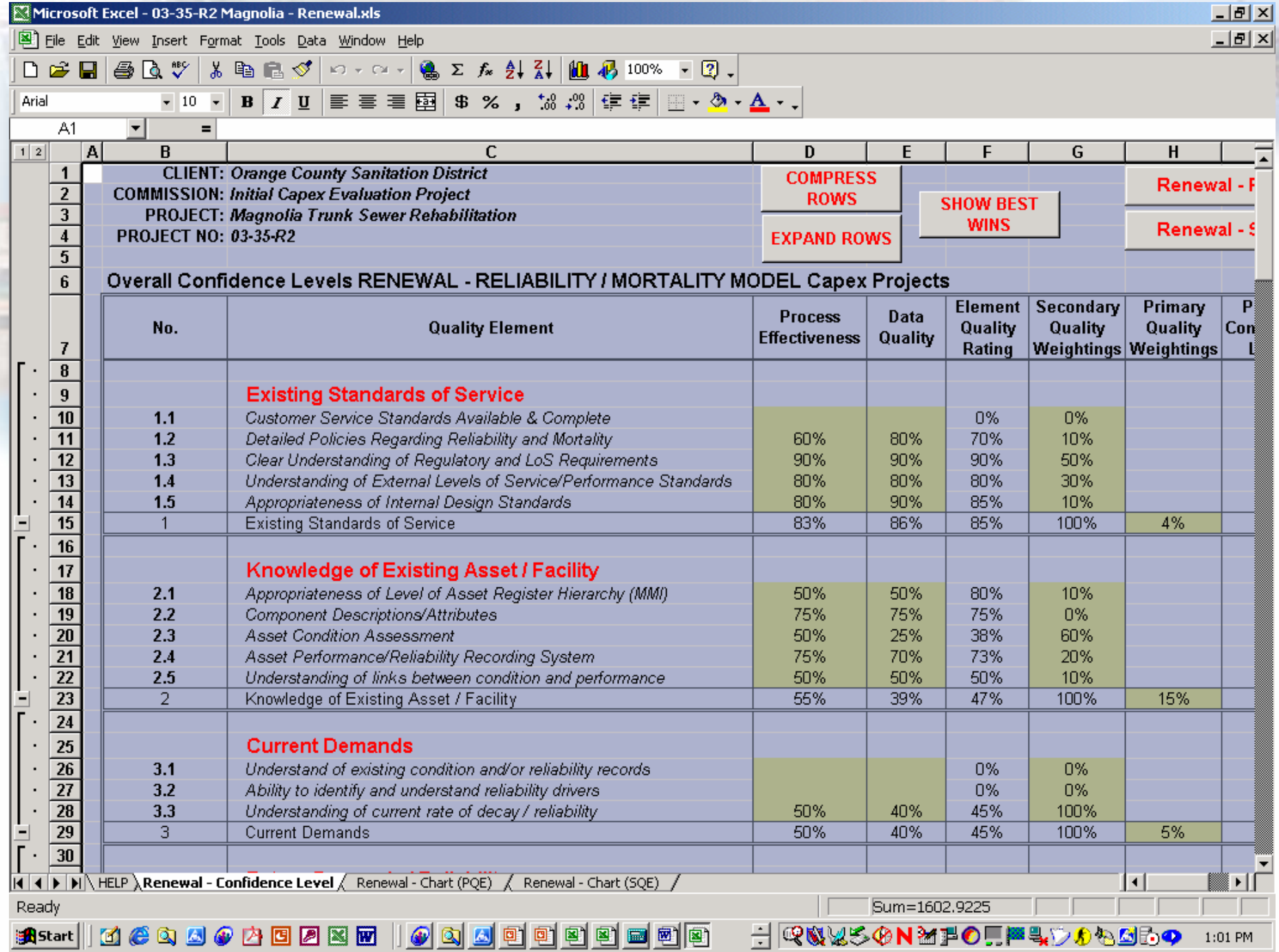
1. Current Standards of Service
2. Knowledge of Existing Assets
3. Current Asset Demand/Utilisation
4. Projected Future Demand/Performance Expectations
5. Predicted Modes of Service Delivery Failure

Quality Elements (Cont)

6. Timing/Probability of Failure
7. Consequence of failure to Business
8. Accuracy of Predicted Operational Costs
9. Accuracy of Predicted Maintenance Costs
10. Appropriateness of Renewal Options

Quality Elements (Cont)

11. Accuracy of Cost Estimates
12. Appropriateness of Renewal Economic Evaluations
13. Relationship Between Plan and Customer Acceptance
14. Ability to Modify Plan to Suit Available Resources
15. Appropriateness of Plan Action Links to Corporate Goals



Microsoft Excel - 03-35-R2 Magnolia - Renewal.xls

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A1 =

CLIENT: *Orange County Sanitation District*
COMMISSION: *Initial Capex Evaluation Project*
PROJECT: *Magnolia Trunk Sewer Rehabilitation*
PROJECT NO: *03-35-R2*

COMPRESS ROWS
EXPAND ROWS
SHOW BEST WINS
Renewal - R
Renewal - S

Overall Confidence Levels RENEWAL - RELIABILITY / MORTALITY MODEL Capex Projects

No.	Quality Element	Process Effectiveness	Data Quality	Element Quality Rating	Secondary Quality Weightings	Primary Quality Weightings	P Con L
	Existing Standards of Service						
1.1	*Customer Service Standards Available & Complete*			0%	0%		
1.2	*Detailed Policies Regarding Reliability and Mortality*	60%	80%	70%	10%		
1.3	*Clear Understanding of Regulatory and LoS Requirements*	90%	90%	90%	50%		
1.4	*Understanding of External Levels of Service/Performance Standards*	80%	80%	80%	30%		
1.5	*Appropriateness of Internal Design Standards*	80%	90%	85%	10%		
1	Existing Standards of Service	83%	86%	85%	100%	4%	
	Knowledge of Existing Asset / Facility						
2.1	*Appropriateness of Level of Asset Register Hierarchy (MMI)*	50%	50%	80%	10%		
2.2	*Component Descriptions/Attributes*	75%	75%	75%	0%		
2.3	*Asset Condition Assessment*	50%	25%	38%	60%		
2.4	*Asset Performance/Reliability Recording System*	75%	70%	73%	20%		
2.5	*Understanding of links between condition and performance*	50%	50%	50%	10%		
2	Knowledge of Existing Asset / Facility	55%	39%	47%	100%	15%	
	Current Demands						
3.1	*Understand of existing condition and/or reliability records*			0%	0%		
3.2	*Ability to identify and understand reliability drivers*			0%	0%		
3.3	*Understanding of current rate of decay / reliability*	50%	40%	45%	100%		
3	Current Demands	50%	40%	45%	100%	5%	

HELP | Renewal - Confidence Level | Renewal - Chart (PQE) | Renewal - Chart (SQE)

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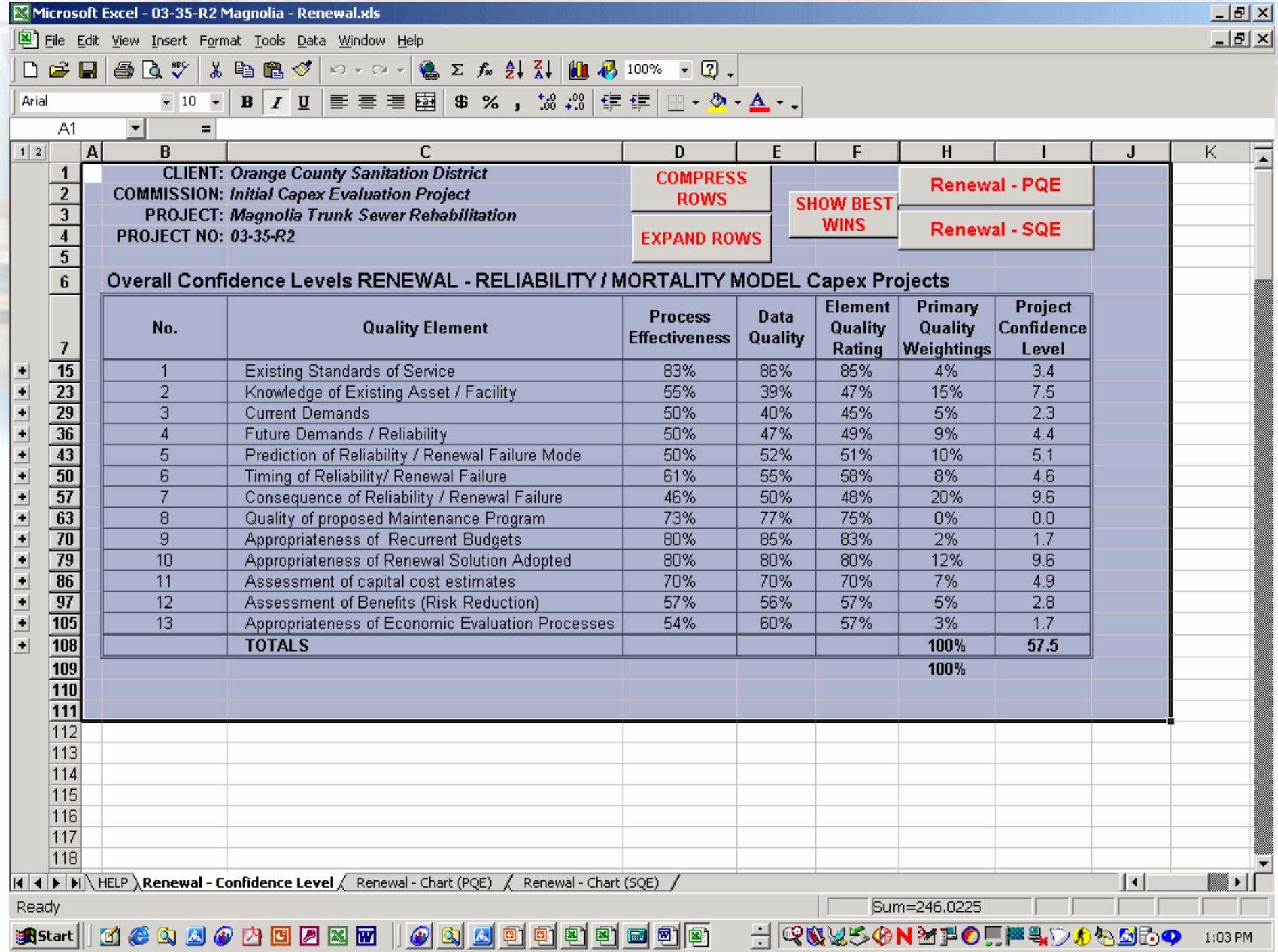
PARSONS / GHD


Microsoft Excel - 03-35-R2 Magnolia - Renewal.xls
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CLIENT: Orange County Sanitation District
COMMISSION: Initial Capex Evaluation Project
PROJECT: Magnolia Trunk Sewer Rehabilitation
PROJECT NO: 03-35-R2
COMPRESS ROWS
EXPAND ROWS
SHOW BEST WINS
Renewal - PQE
Renewal - SQE
Overall Confidence Levels RENEWAL - RELIABILITY / MORTALITY MODEL Capex Projects
No. | Quality Element | Process Effectiveness | Data Quality | Element Quality Rating | Primary Quality Weightings | Project Confidence Level
1 | Existing Standards of Service | 83% | 86% | 85% | 4% | 3.4
2 | Knowledge of Existing Asset / Facility | 55% | 39% | 47% | 15% | 7.5
3 | Current Demands | 50% | 40% | 45% | 5% | 2.3
4 | Future Demands / Reliability | 50% | 47% | 49% | 9% | 4.4
5 | Prediction of Reliability / Renewal Failure Mode | 50% | 52% | 51% | 10% | 5.1
6 | Timing of Reliability/ Renewal Failure | 61% | 55% | 58% | 8% | 4.6
7 | Consequence of Reliability / Renewal Failure | 46% | 50% | 48% | 20% | 9.6
8 | Quality of proposed Maintenance Program | 73% | 77% | 75% | 0% | 0.0
9 | Appropriateness of Recurrent Budgets | 80% | 85% | 83% | 2% | 1.7
10 | Appropriateness of Renewal Solution Adopted | 80% | 80% | 80% | 12% | 9.6
11 | Assessment of capital cost estimates | 70% | 70% | 70% | 7% | 4.9
12 | Assessment of Benefits (Risk Reduction) | 57% | 56% | 57% | 5% | 2.8
13 | Appropriateness of Economic Evaluation Processes | 54% | 60% | 57% | 3% | 1.7
TOTALS | 100% | 57.5
100%
HELP Renewal - Confidence Level Renewal - Chart (PQE) Renewal - Chart (SQE)
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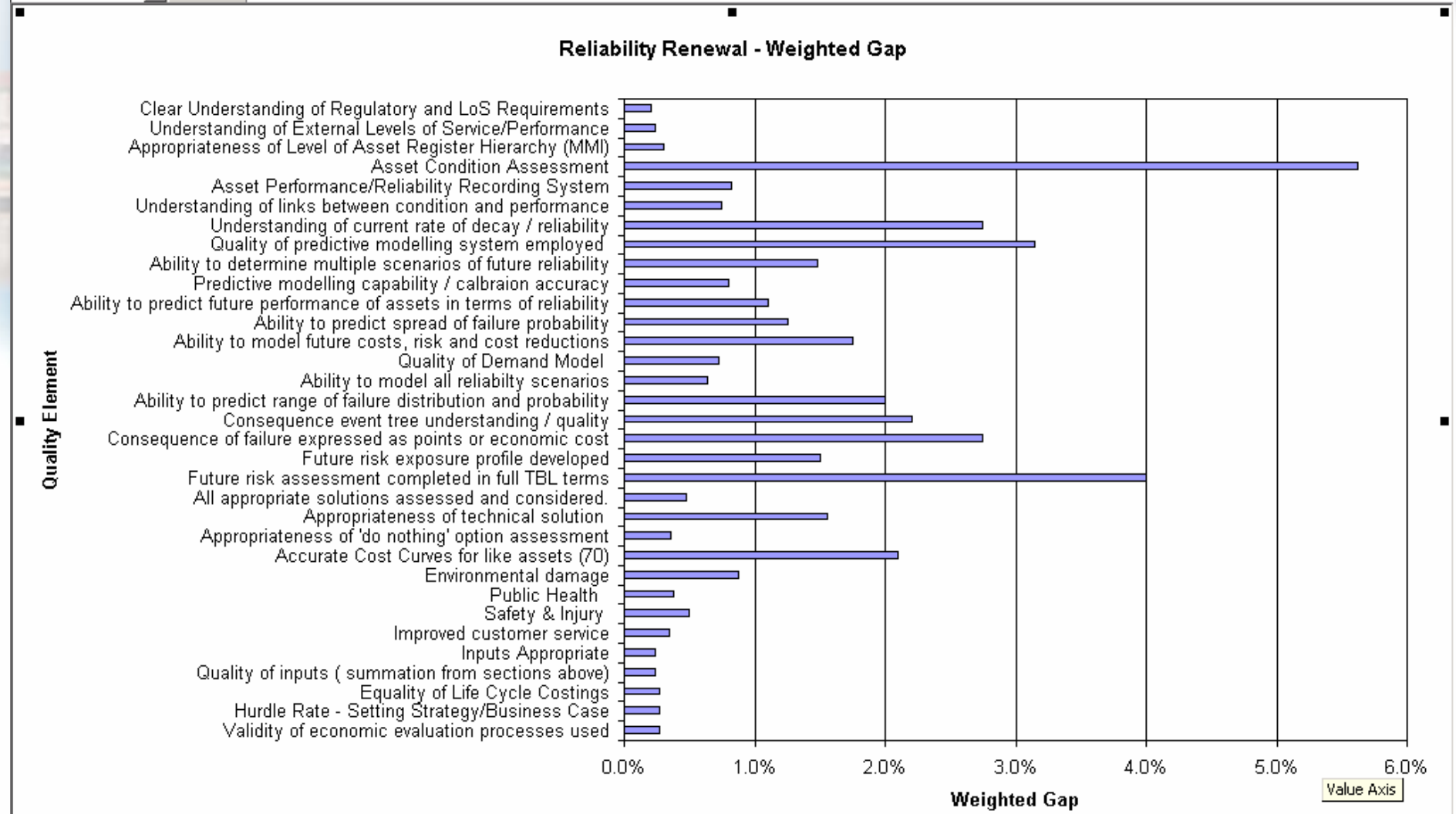

HELP | Renewal - Confidence Level | Renewal - Chart (PQE) | Renewal - Chart (SQE)

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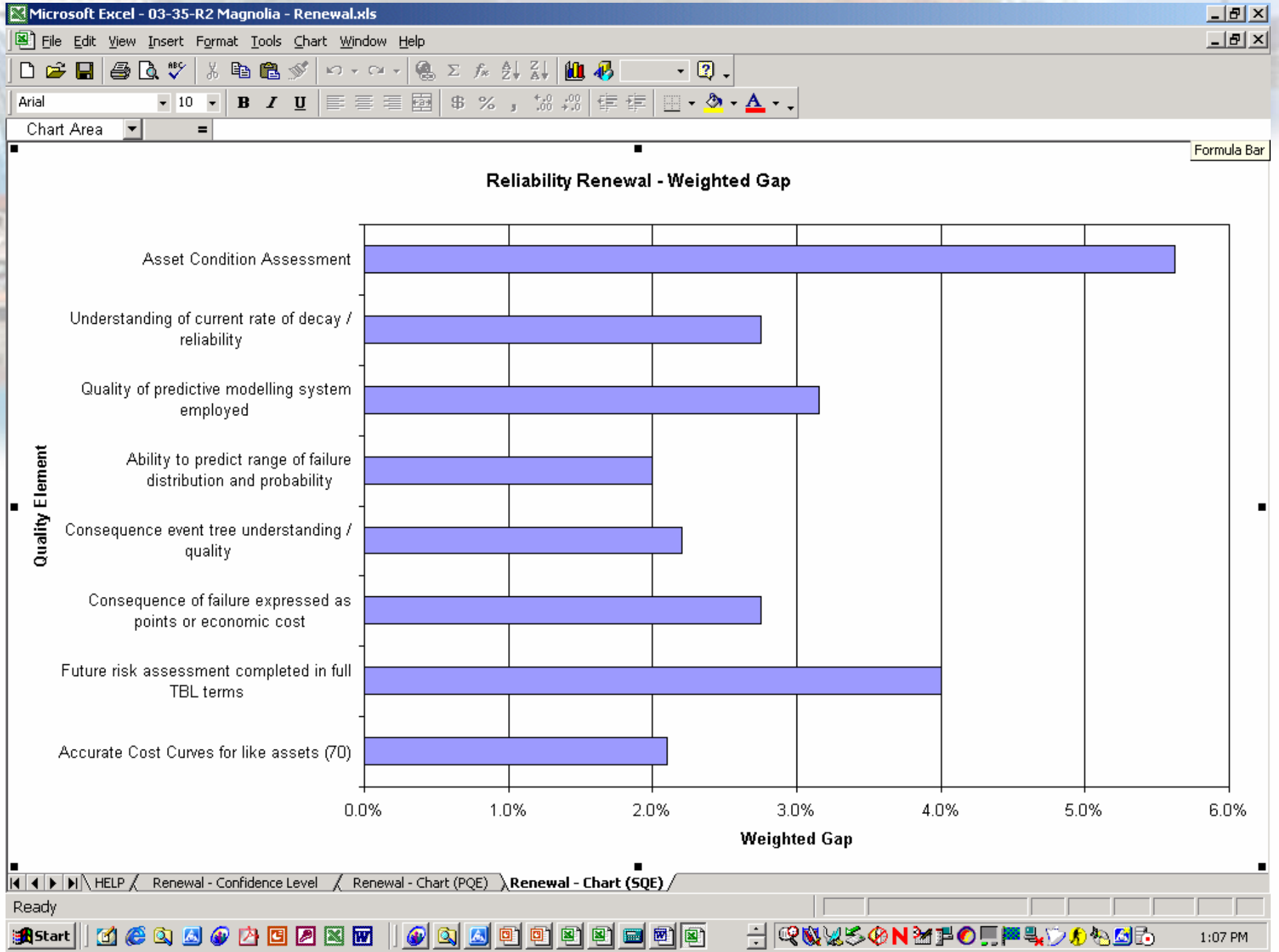
Microsoft Excel - 03-35-R2 Magnolia - Renewal.xls
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Chart Area
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Reliability Renewal - Weighted Gap
Asset Condition Assessment
Understanding of current rate of decay / reliability
Quality of predictive modelling system employed
Ability to predict range of failure distribution and probability
Consequence event tree understanding / quality
Consequence of failure expressed as points or economic cost
Future risk assessment completed in full TBL terms
Accurate Cost Curves for like assets (70)
Quality Element
0.0%
1.0%
2.0%
3.0%
4.0%
5.0%
6.0%
Weighted Gap
HELP
Renewal - Confidence Level
Renewal - Chart (PQE)
Renewal - Chart (SQE)
Ready
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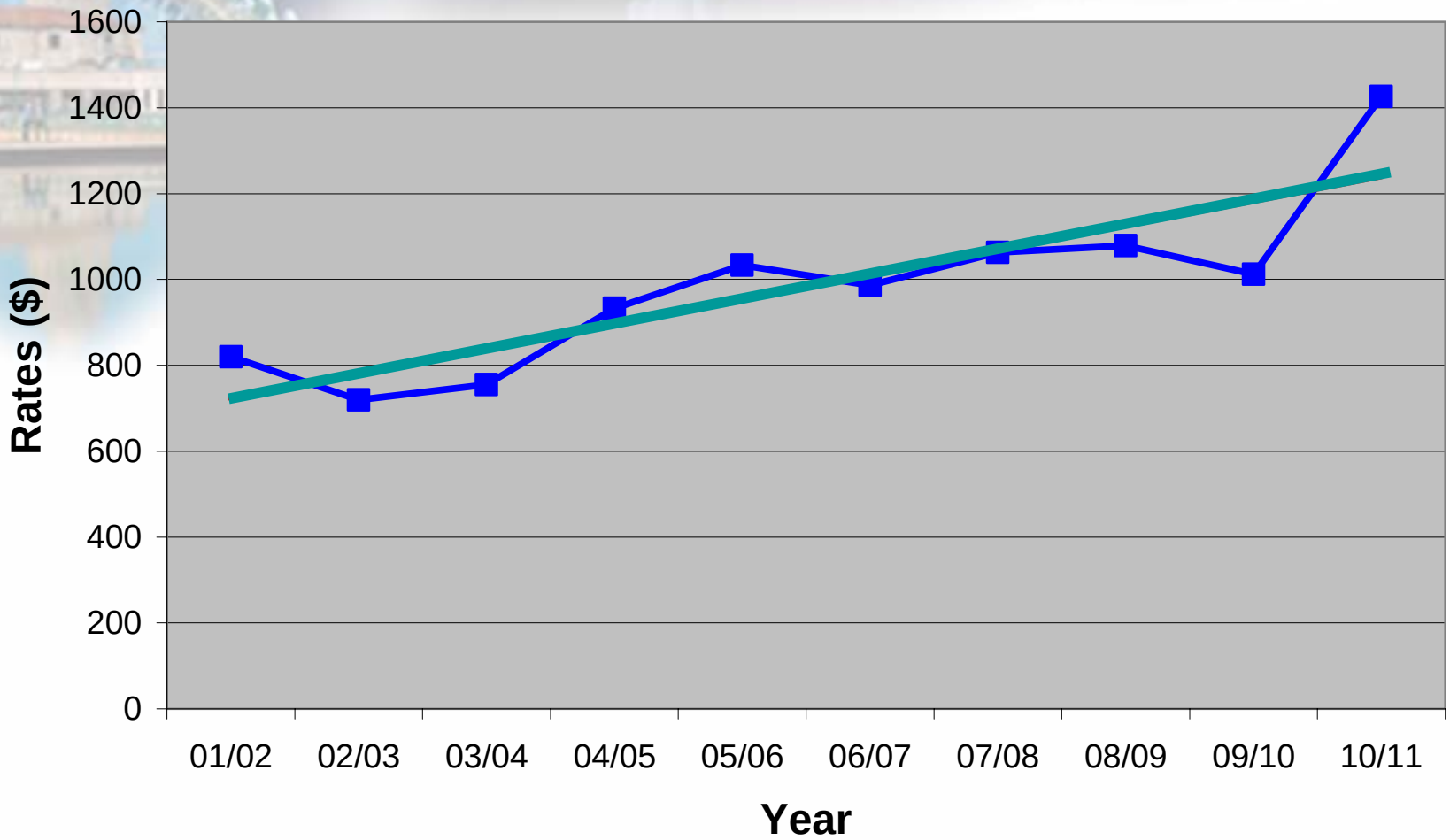
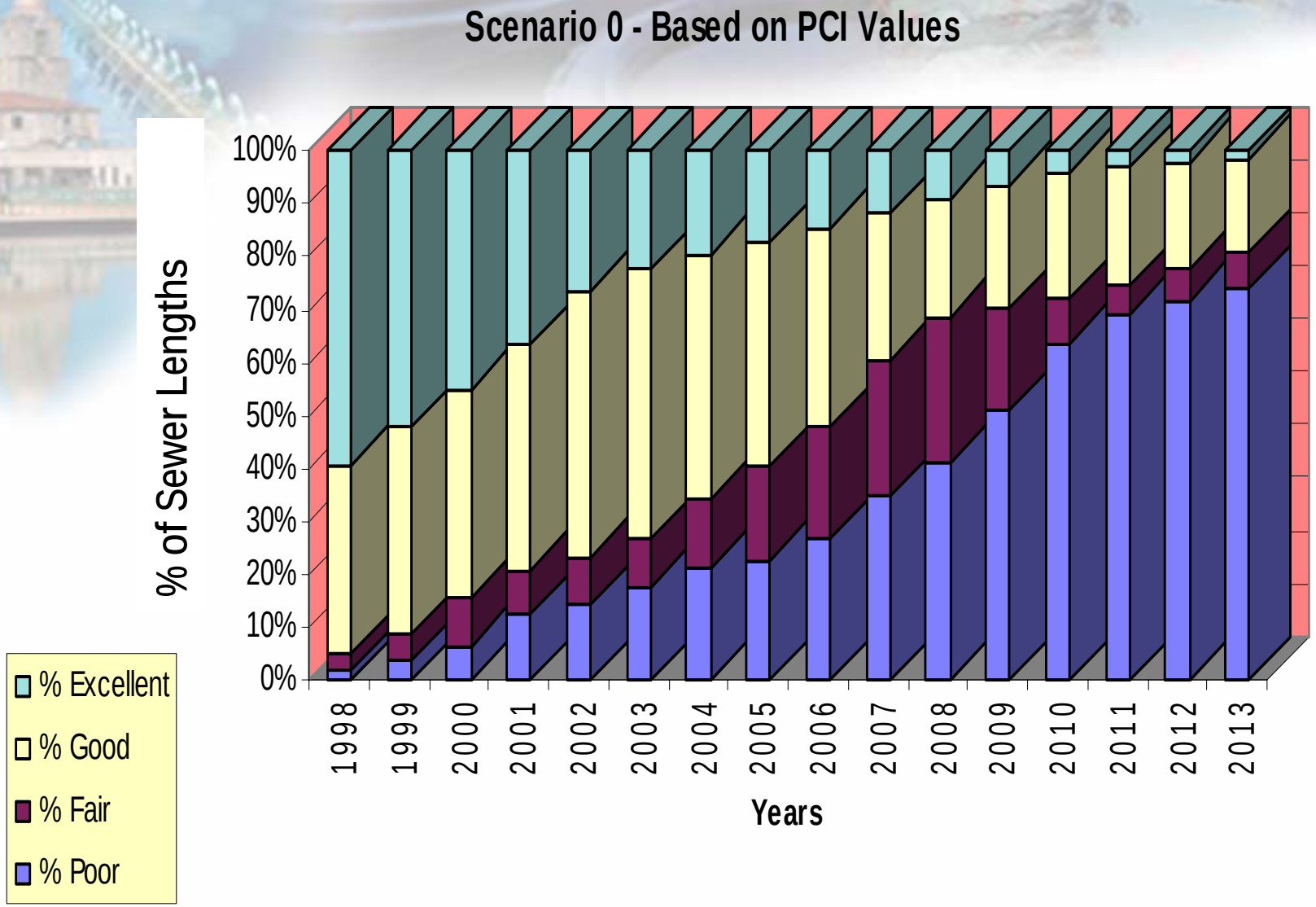
Long Term Impact on Rates

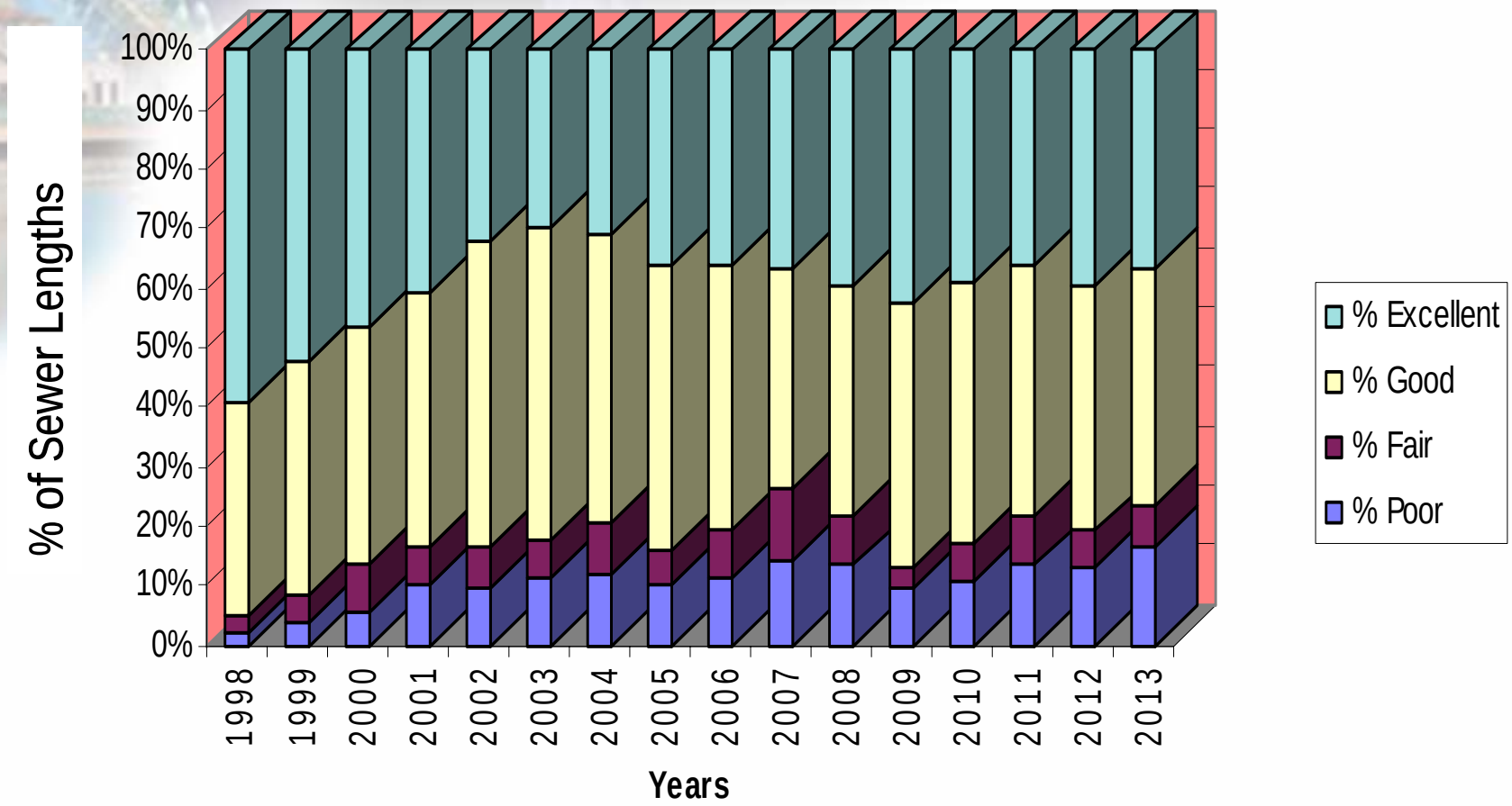
Rates with Time



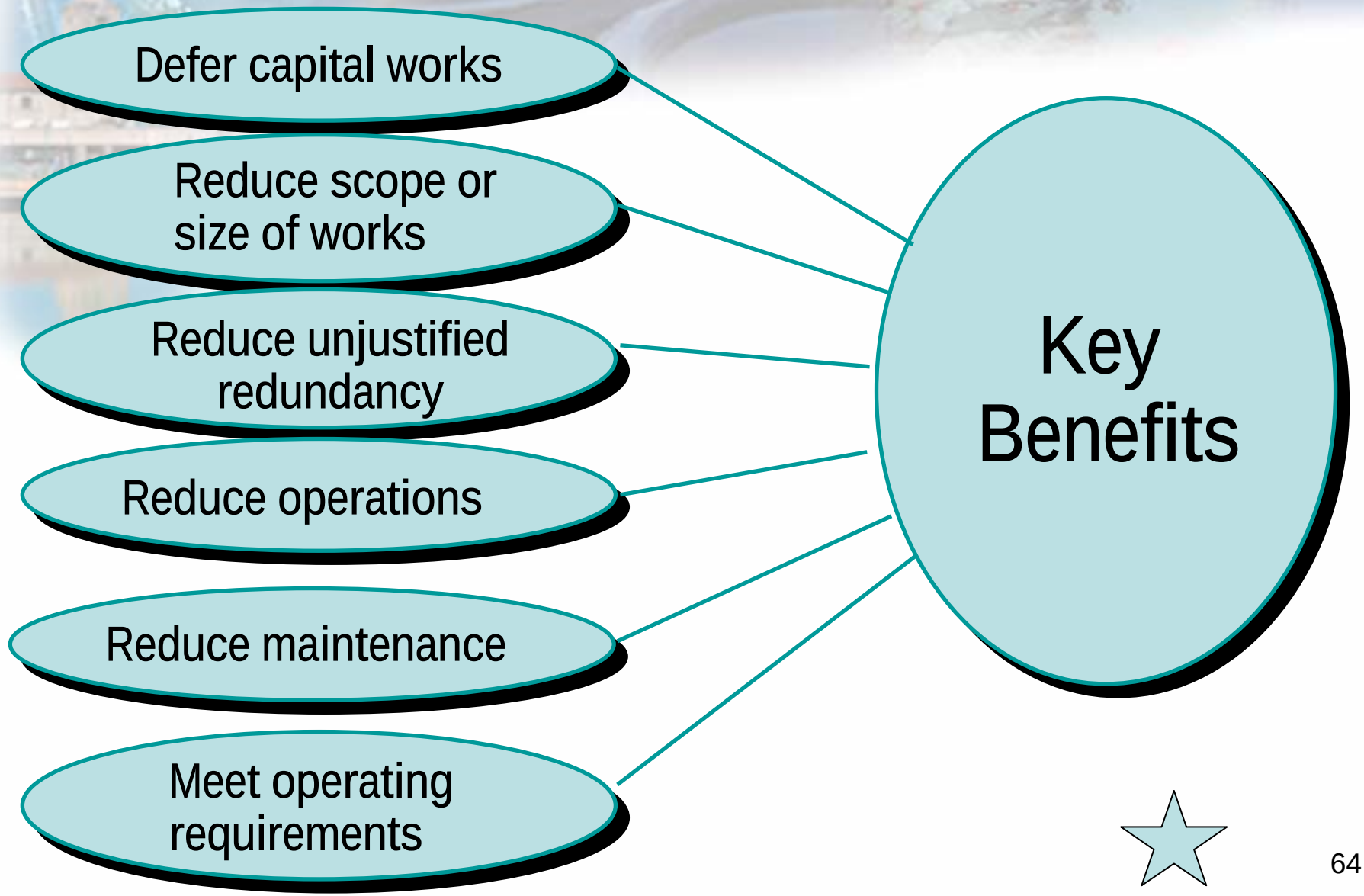
Sewer System – Status Quo



Sewer System – Optimal Strategy



Key Benefits of Advanced CIP Validation



Case Study - OCSD CIP Review

Recall:

60% Capital & 85% of all Life-Cycle Costs are “Locked-In” When Decisions are Made on…

- ✓ Project Identification
- ✓ Strategic CIP Planning

$2.4 Billion in 10 years

Case Study - OCSD CIP Review

- Pilot project – 15 selected from 190 CIP projects
- Collections to treatment plant projects
- Compared current OCSD practices to AM best practices
- Purpose – show insight to better ways to select projects and build CIP

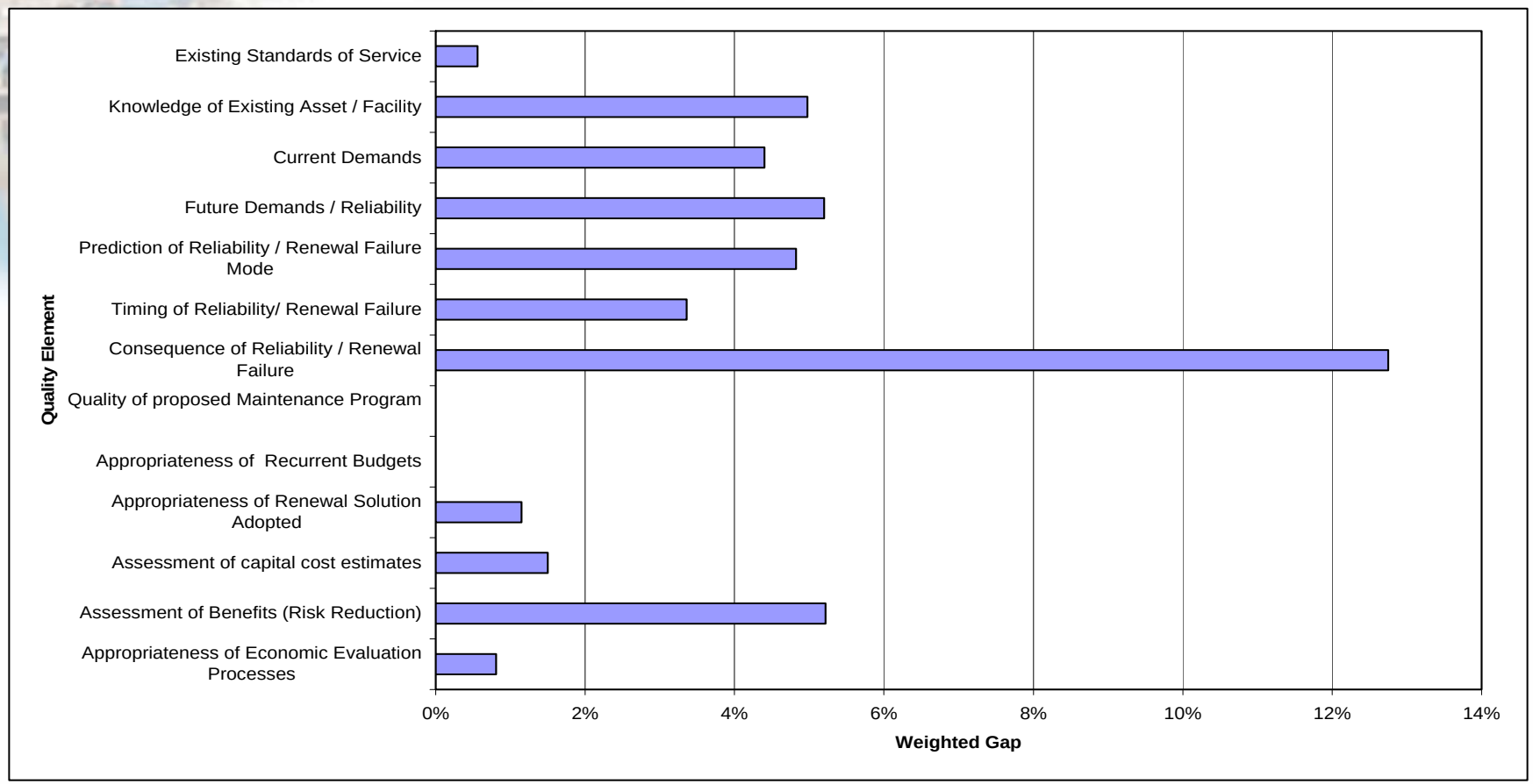
CIP Review (cont)

- Projects audited
  - Quality of processes and practices
  - Quality of data
- Confidence level generated for each project
- Identified weaknesses in projects
- Showed where future improvements could be made

Quality Assessment

No.	Quality Element	Process Effectiveness	Data Quality	Element Quality Rating	Primary Quality Weightings	Project Confidence Level
1	Existing Standards of Service	84%	84%	84%	4%	3.4
2	Knowledge of Existing Assets / Portfolio	63%	56%	59%	12%	7.8
3	Current Demands	78%	78%	78%	8%	6.3
4	Future Demands / Changes in LOS	85%	85%	85%	10%	8.5
5	Prediction of Failure Mode	77%	77%	77%	2%	1.5
6	Timing of Capacity Failure	78%	78%	78%	8%	6.2
7	Consequence of Capacity Failure	58%	53%	55%	20%	11.0
8	Quality of proposed Maintenance Program	58%	53%	56%	2%	1.1
9	Appropriateness of Oper. & Maintce. Costs	75%	75%	75%	2%	1.5
10	Appropriateness of Capital Solution Adopted	79%	79%	79%	15%	11.8
11	Assessment 0f Capital Cost Estimates	85%	85%	85%	7%	6.0
12	Assessment of Benefits	72%	72%	72%	5%	3.6
13	Appropriateness of Economic Evaluation Processes	70%	70%	70%	5%	3.5
	TOTALS				**100%**	**72**

Weighted Gap Improvements



CIP Evaluation Stages

Source	Period (Years)	Quality Rating
AMP	16- 25	60%
AMP	11- 15	70%
10 Yr CIP	6 - 10	80%
5 Yr CIP	2 - 5	85%
Investment Approved	1	90%

OCSD CIP Recommendations

- Better “business case” for projects – “Triple Bottom Line” (financial, social, economic impact)
- Clearer understanding :
  - How project affects business risk
  - FMECA and timing of projects
  - Life cycle costs
- More programmatic view of how projects interact

FMECA – Failure mode, effects and criticality analysis

Orange County Sanitation District Pilot Asset Management Review Results

15 CIP Projects reviewed:

- 2 Met validation criteria & will proceed as is
- 2 Are unlikely to proceed at all
- 3 Will be reduced in scope (redundancy)
- 3 Will be deferred over 10 years
- 5 Likely to result in reduced life cycle cost

(Note: Similar to Australian experience for businesses at same stage as OCSD)

Potential Future Savings 2004 – 2008 Conclusions

Based on the findings from the initial Confidence Level Ratings and these initial project element reviews, it is believed that there is potential to save between :

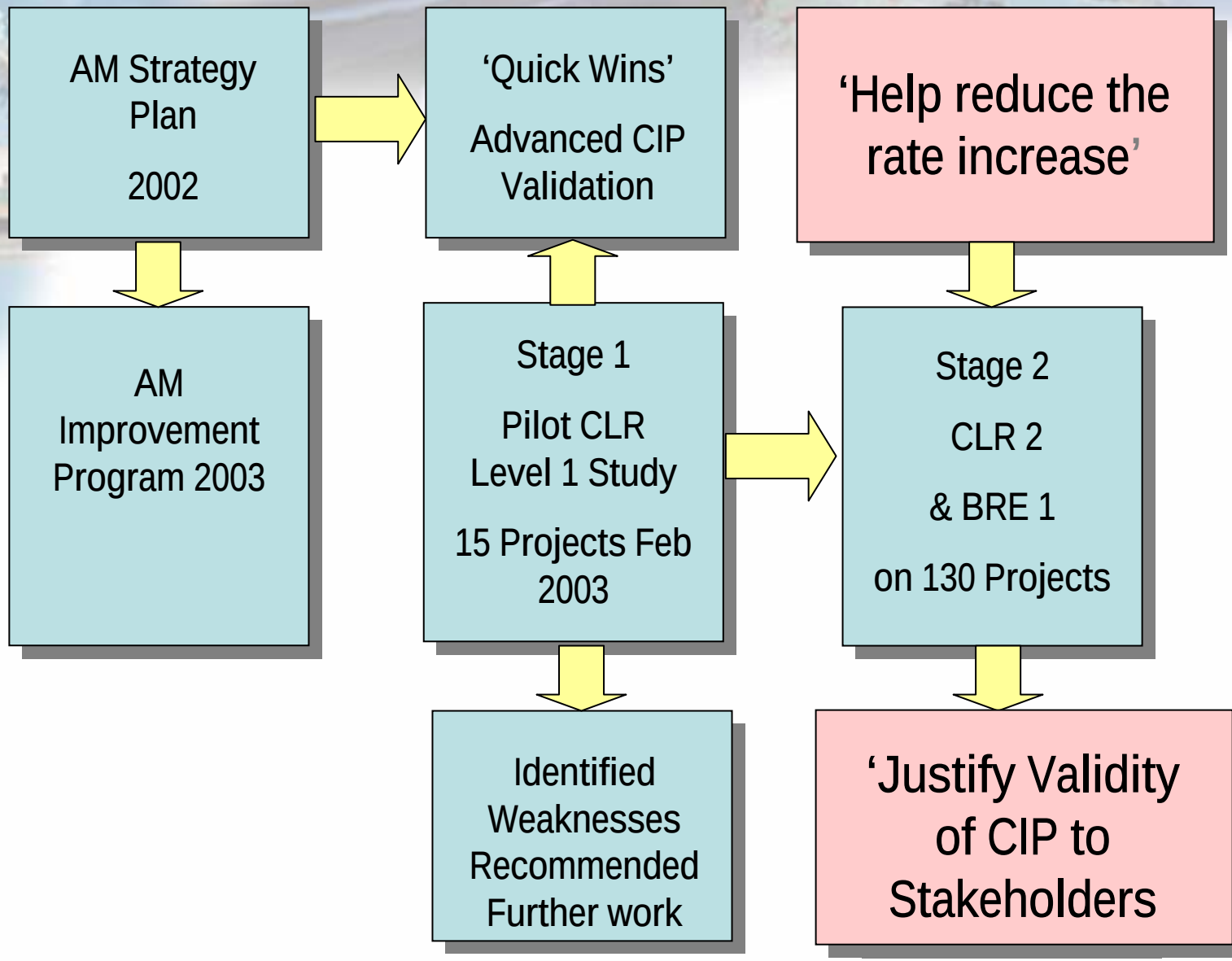
- $130M to $260M in capital deferred or eliminated
- $160M to $320M in “bottom-line” life cycle costs

Savings Identified from Work to Date

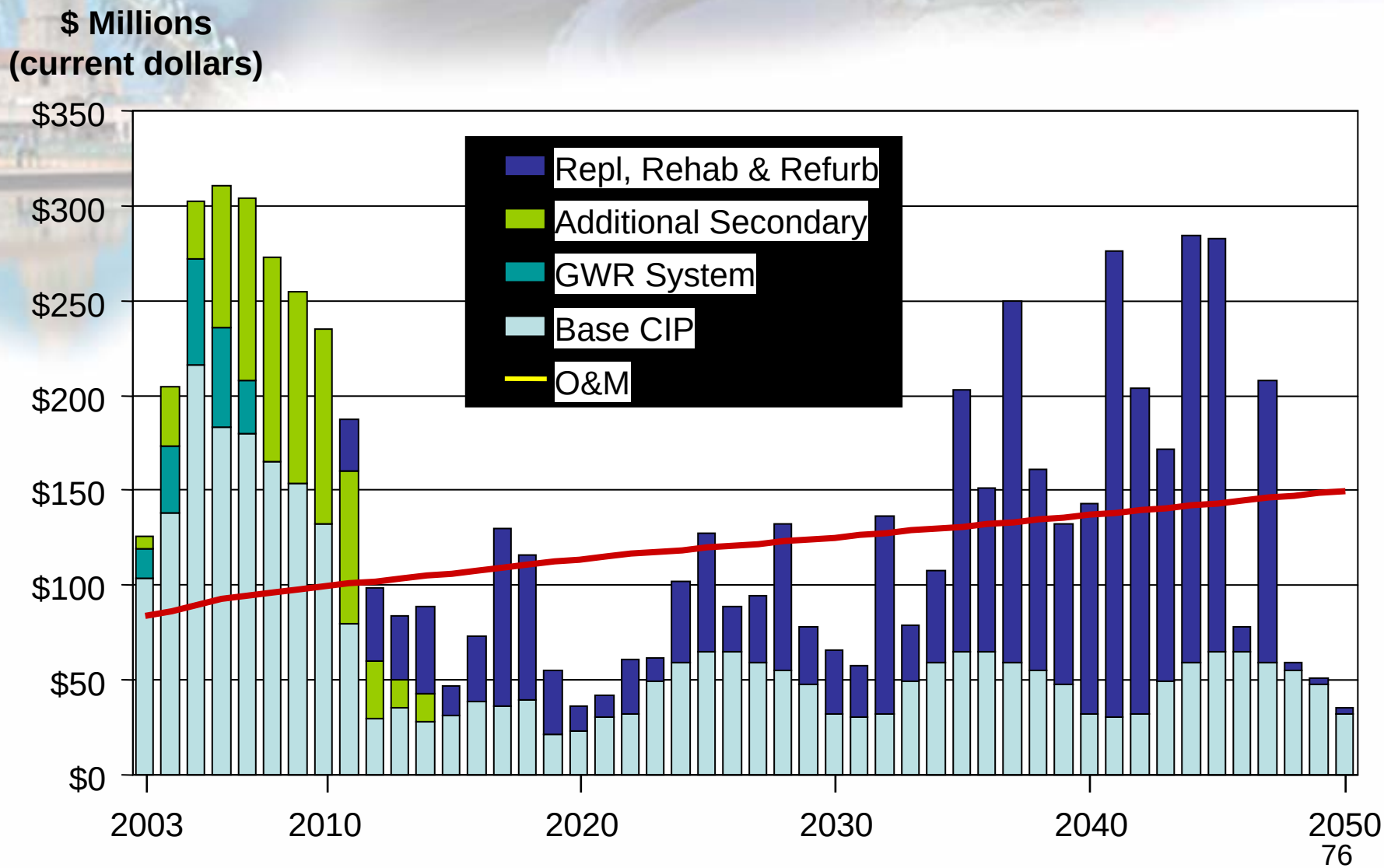
Project Element Name	Project Value $ M	Capital Deferred $ M	Period Deferred Yrs.	LCC Savings NPV $ M
Mixers Complete	3.0	3.0	5 to 10	5.0 – 6.5
Concrete Rehabilitation	4.0	2.4	10 to 30	2.5 – 7.5
Interconnecting Pipe work	0.3	0.3	15 to 30	0.25 to 0.30
RAS Pipe work & PS	0.6	0.3	10 to 20	0.23 to 0.53
Totals (Savings Identified)	(7.9)	6.0	10 to 22.5	7.9 to 14.8

Total Initial Project Budget - $40 million
Total Project Portion Reviewed - $8.0

The work to date – Objectives



Asset Management Affects on Capital Improvement Program



BRE (Business Risk) Evaluation

Australian Case Study

- Major water / wastewater business in Australia
- Adopted whole-business advanced AM approach

What Did They Do?

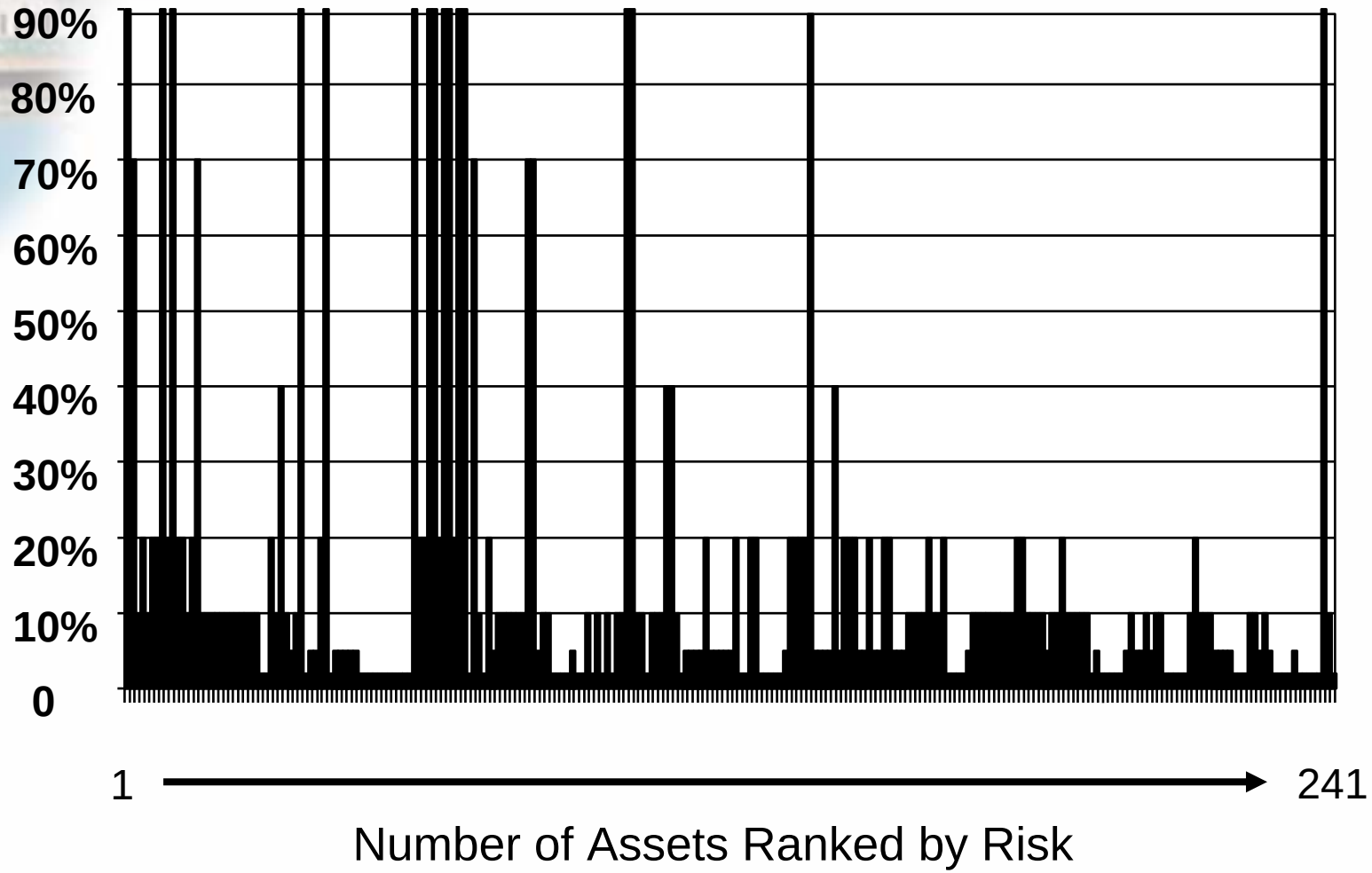
- Failure mode analysis
- Risk evaluation process
- Balancing capital and O&M costs

Business Risk Evaluation

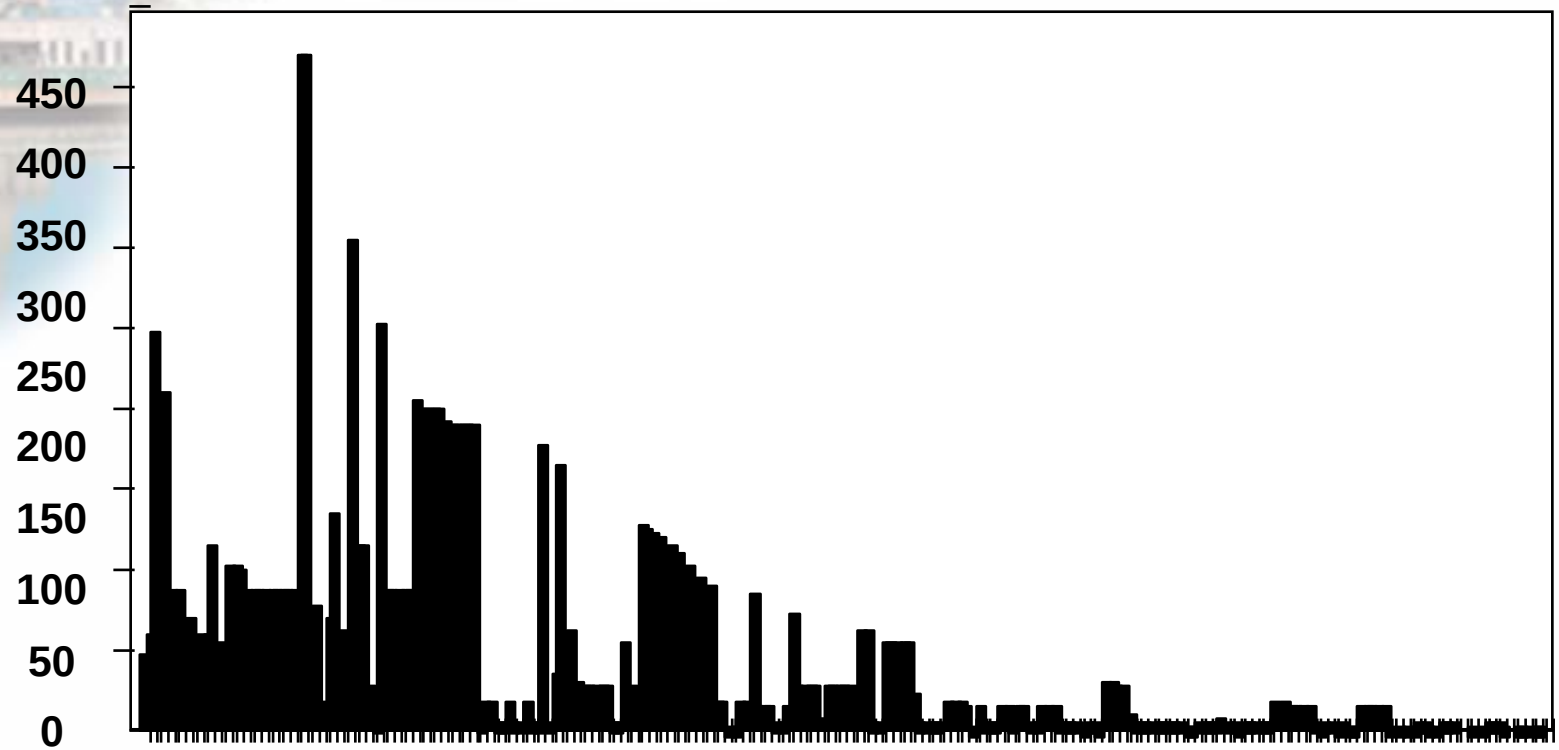
Business Risk =

Probability x Consequence of Failure

Probability Of Failure



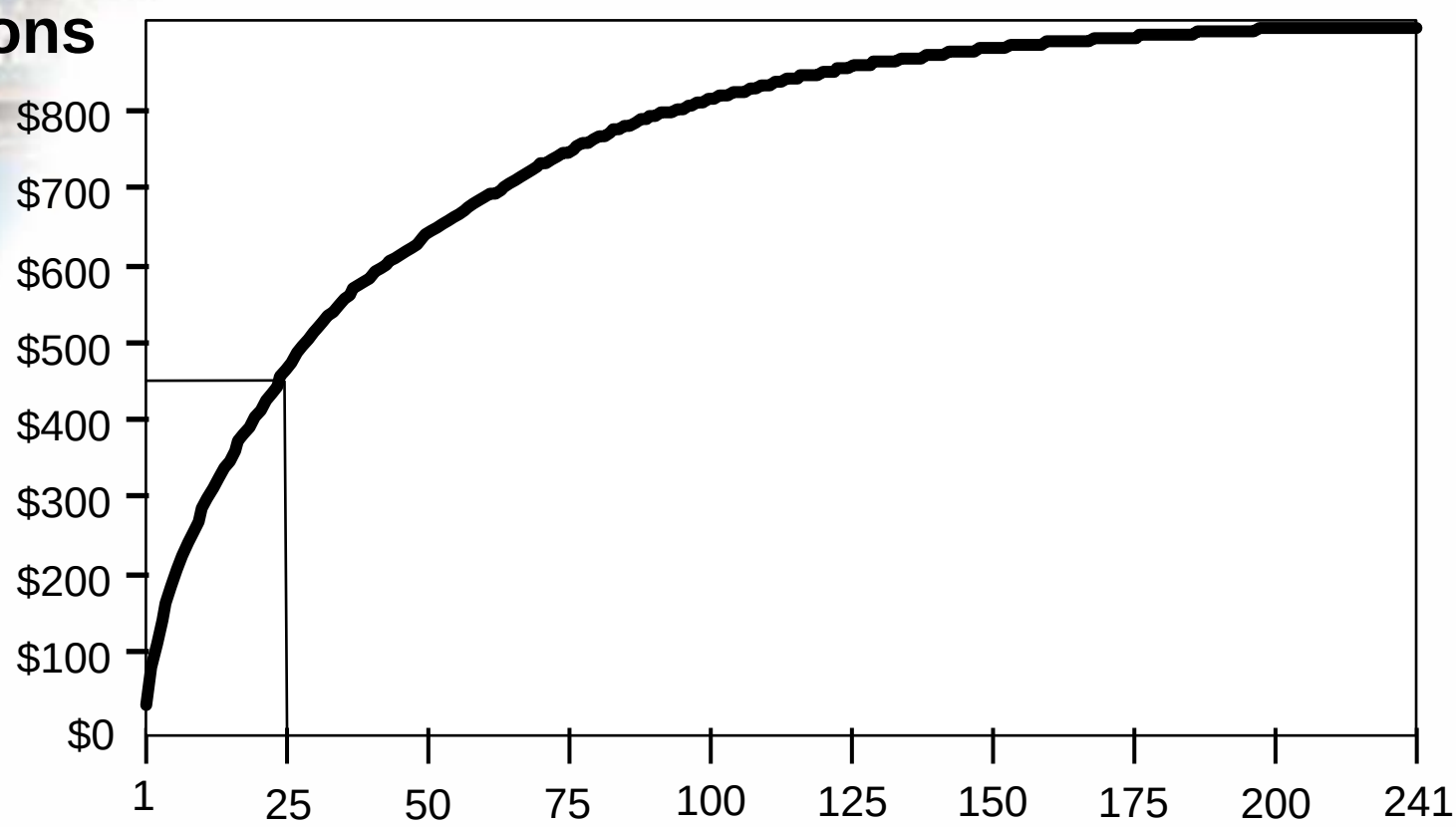
Consequence of Failure



Consequences of Failure Assessed

1. Environmental damage impacts
2. Repair costs (over planned renewal)
3. Loss of service
4. Outage / time off supply
5. Number of customers affected
6. Public image
7. Other property damage
8. Secondary impacts (disturbance)
9. Loss of income / product produced
10. Injury or fatality

Cumulative Risk Cost



Benefits / Savings Realized

- Reduced CIP program by 20%
- Deferred additional 25% of the CIP program by over 10 years
- Reduced future maintenance by approx 30%
- Reduced future operations by approx 10%

Savings Realized

- Capital Savings $ 560 M
- Life Cycle Cost Savings $ 392 M

Savings shown = NPV over 25 years

Key Lessons Learned

- ⇨ Complete a similar process for all your assets.
- ⇨ Do it with the best data you have.
- ⇨ Construct your first AM plan following this process.
- ⇨ Build the Capital Improvement Plan.
- ⇨ Add allowances for O&M.
- ⇨ Build your initial funding plan.
- ⇨ Understand its impact on your rates.
- ⇨ Decide on a strategy to sell / market the needs.

Take Home Messages

- Start your asset management plans as soon as possible…
- Don’t wait .. Get started now ..
- Don’t worry about quality (confidence level) but just keep going
- Understand the biggest weaknesses
- Improve those next year ..
- Follow the continuous improvement proposition..

AGENDA

Day 2

- *Summary of Day 1; Outline of Day 2*
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- *Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?*
- *Lunch*
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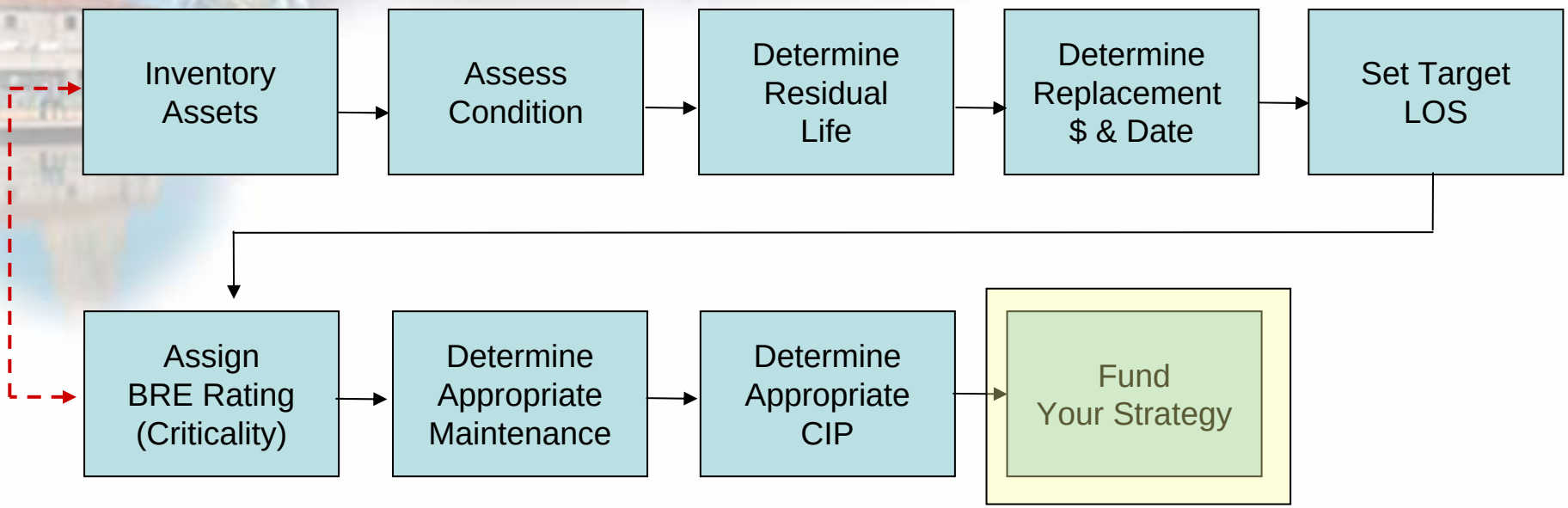
- *Summary, Addressing Your Questions, Comments, Self-audit*

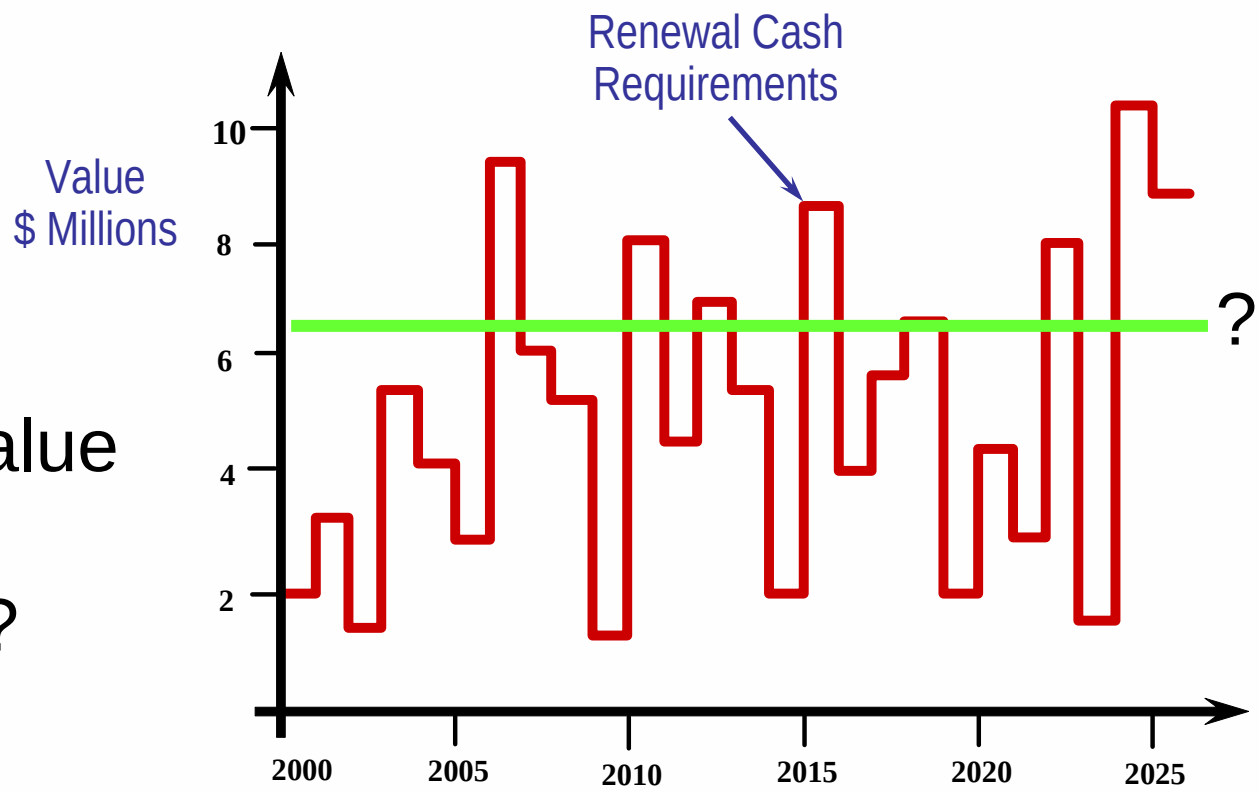
Q5: Given the above, what are my best long-term funding strategies?

AAM Program Process

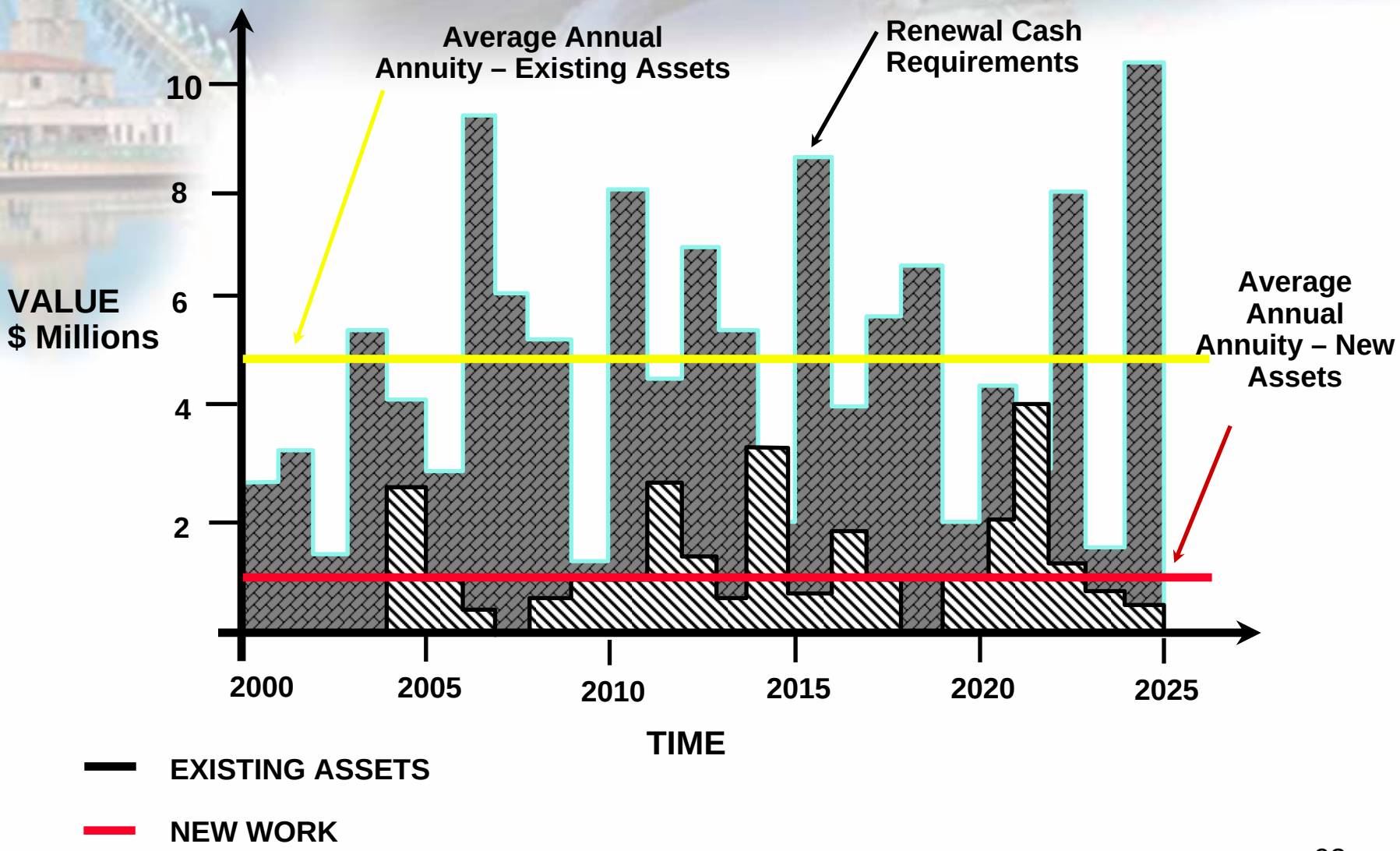


Are We Fully Funding Our Sustainable Future ?

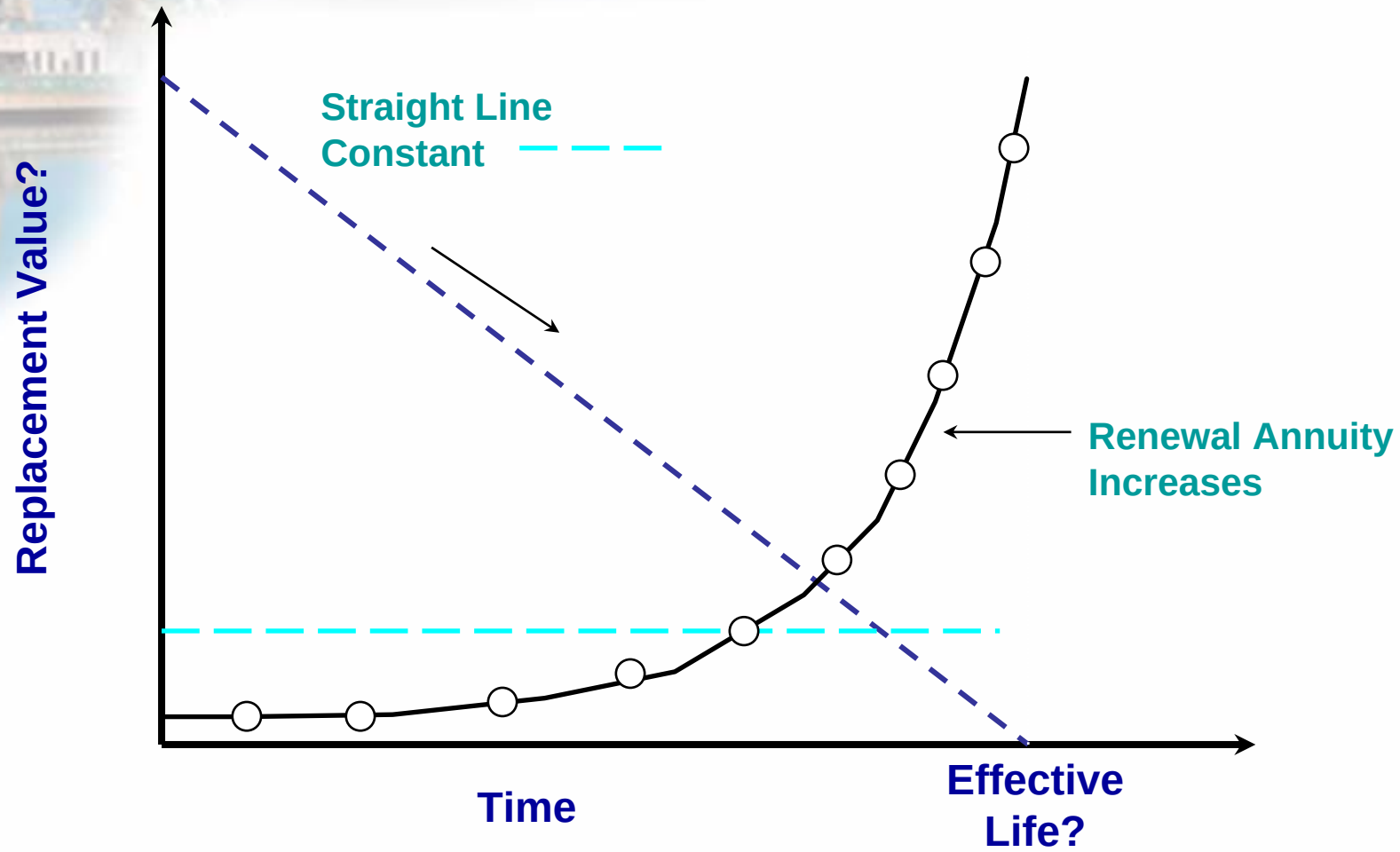
- Have we defined a sustainable future?
- Have we assigned value to the costs associated?
- Have we determined a funding level?



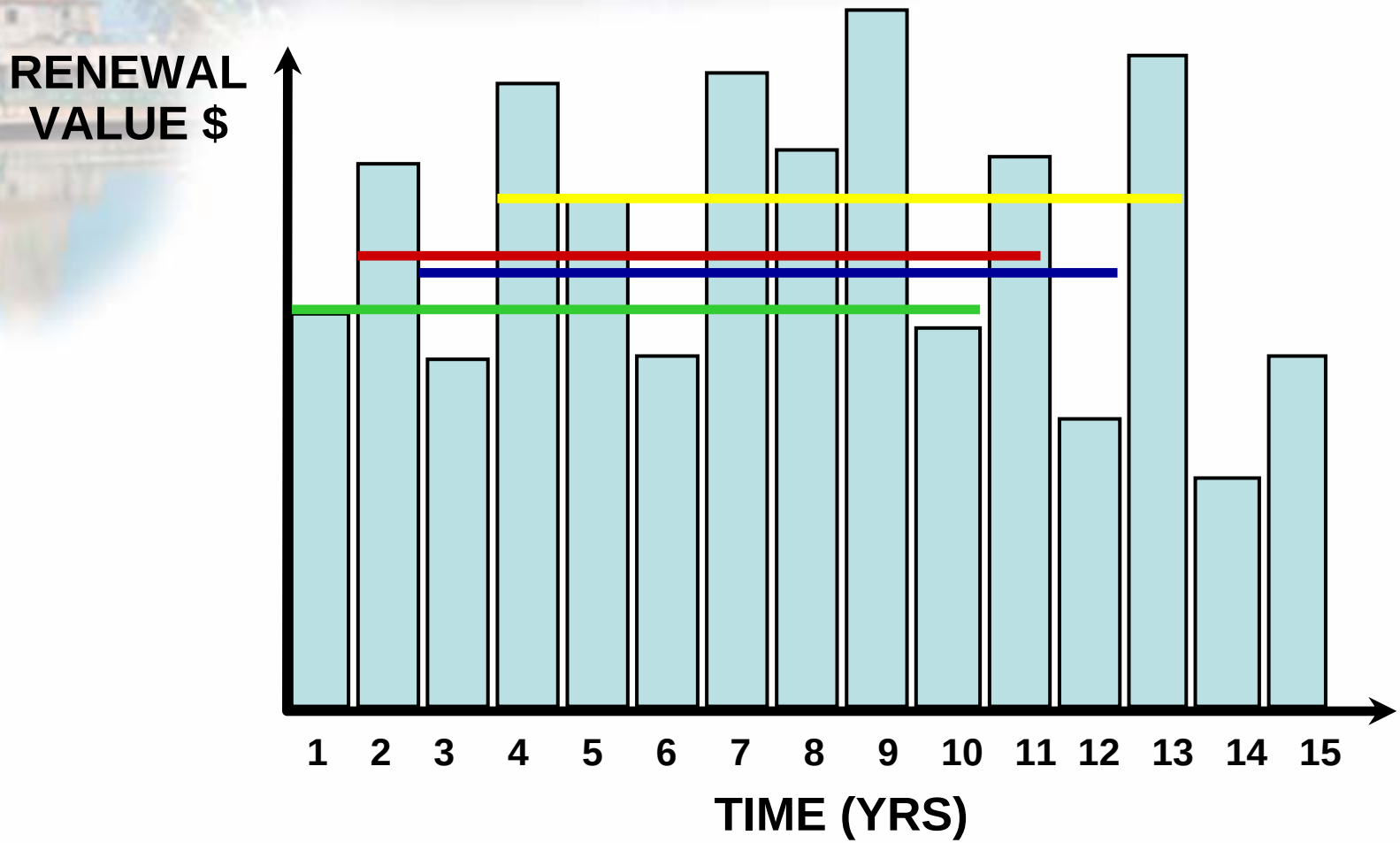
Renewal Programs



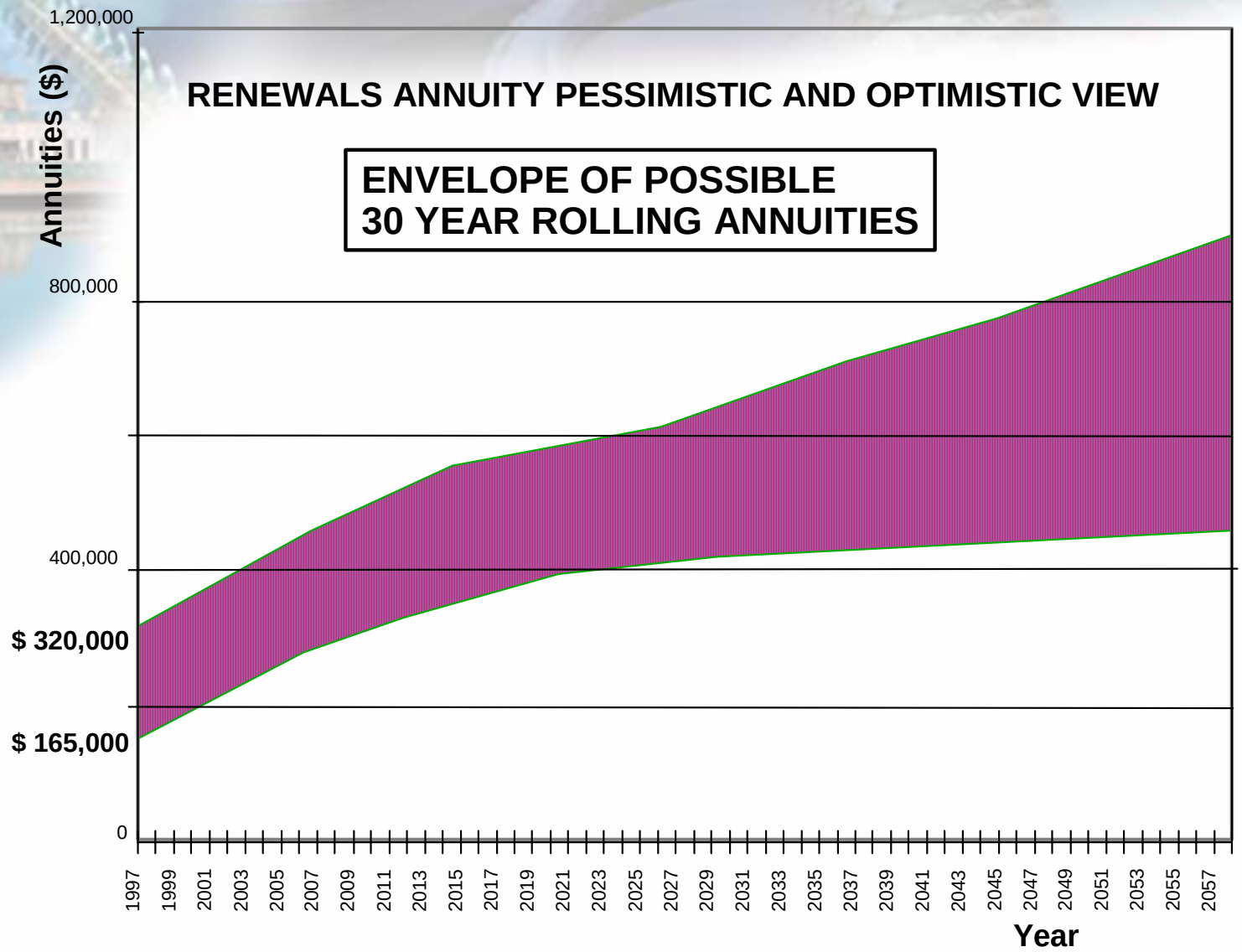
Annuity Requirement Increases as Funding is Deferred



Rolling Annuities



Understanding Asset Renewals



Funding Annuity Exercise

Tom needs to determine a renewal funding level for his "problem" pump station.

The Valuation Results.

Type of Cost	Cost ($K)	Book Value ($K)	Annual Deprec ($ p.yr)	Accumul Deprec. ($K)
Historic	130	31	2,708	99
Replacement	440	104	9,160	NA
Renewal	644	NA	10,000	NA

Valuation Accuracy V. Hierarchical Level.

Level of Valuation	Value ($K)	Effect. Life (yr)	Annual Deprec ($ p.yr)	CLR
Level 1 (3)	130	70	1,860	45%
Level 2 (4)	440	48 (wt)	9,160	55%
Level 3 (5) AARA	644 (198)npv	As Is	10,000	70%

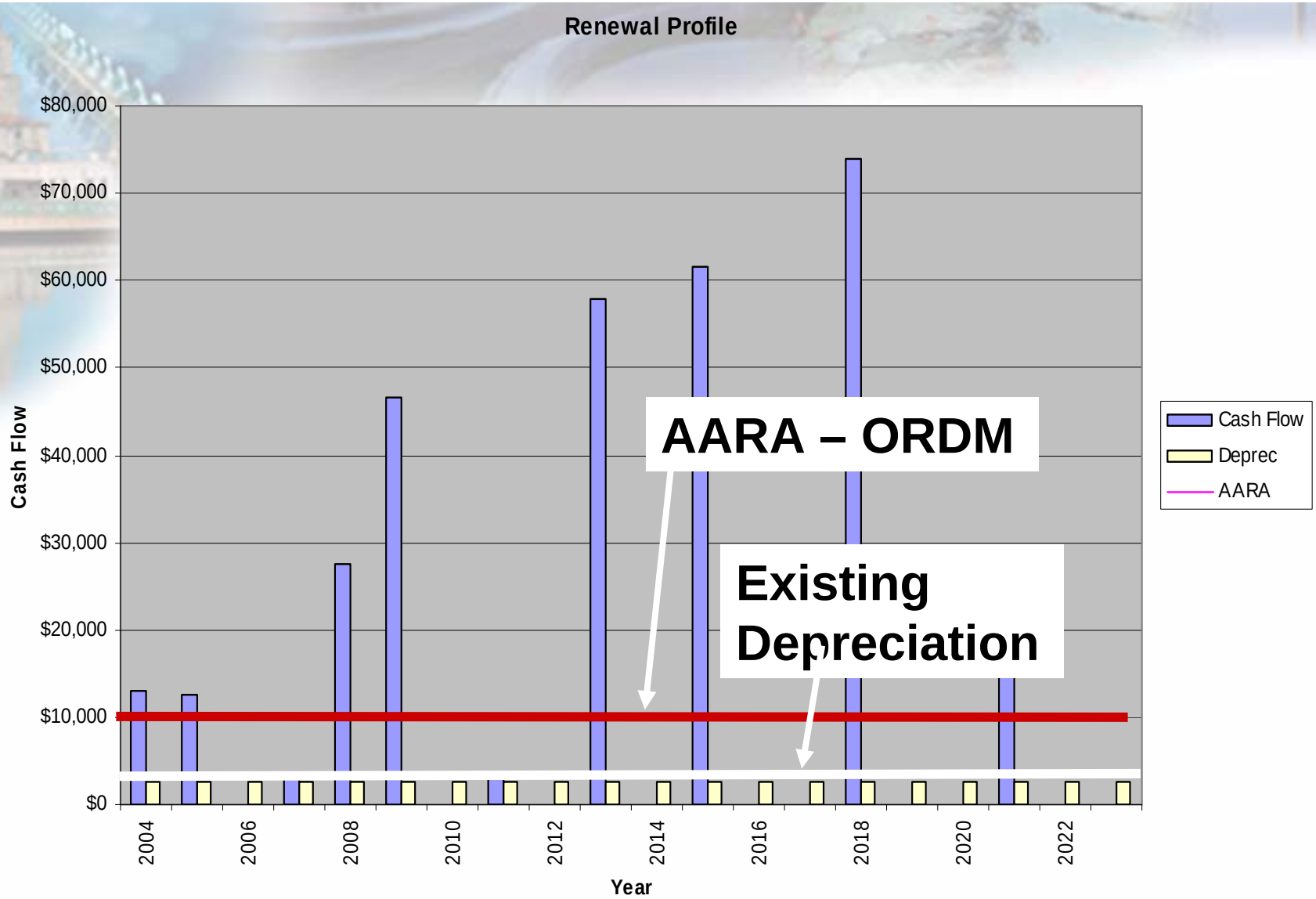
Philosophy of Confidence Levels

Best Appropriate Process *	+	Quality of Data Used	=	Confidence Level Rating CLR
80 %		70 %		75 %

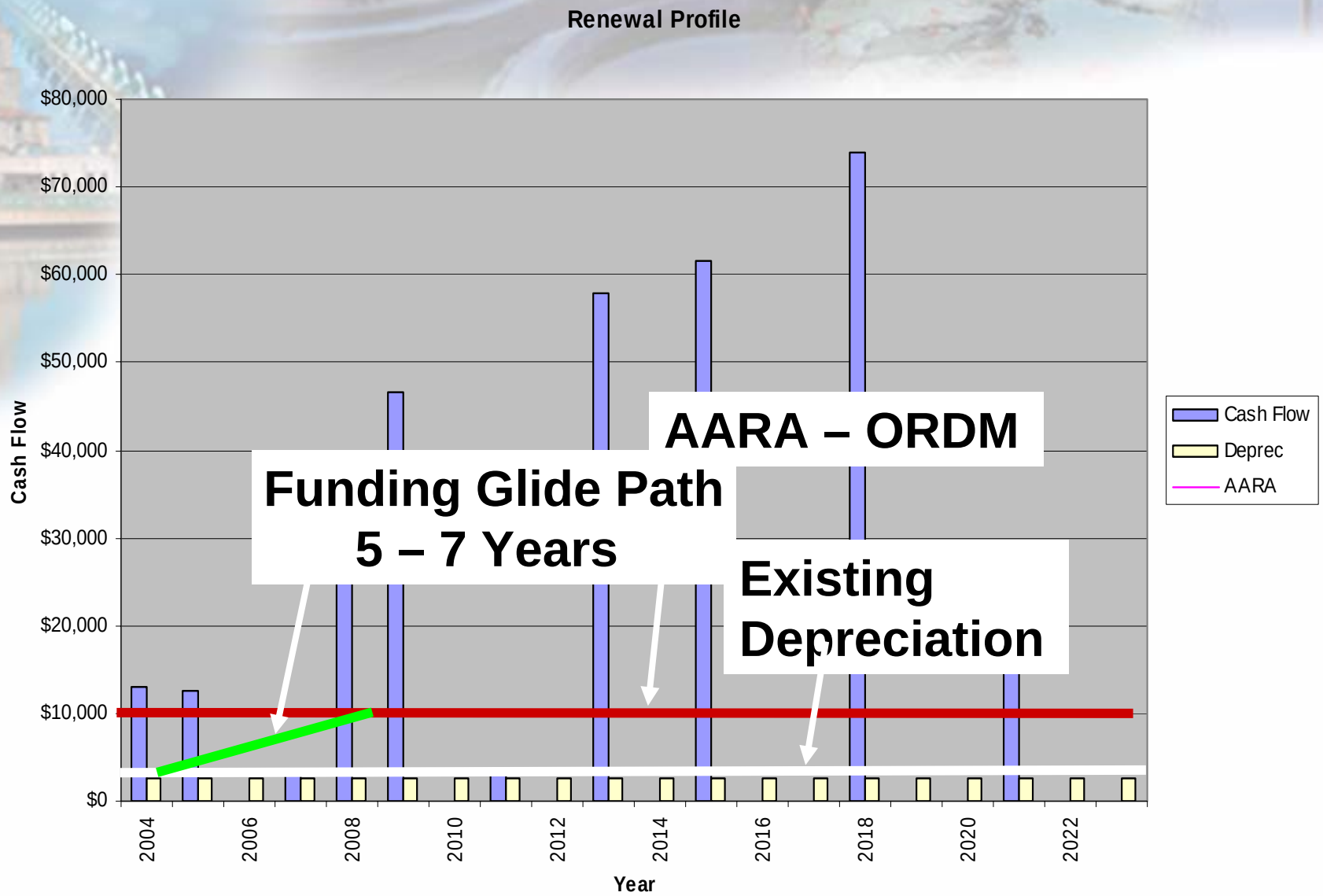
*** Note : 1. Best Appropriate Practice varies from Basic AM to Sophisticated AM**

2. The numbers are averaged

How Much Money Does Tom Need ?



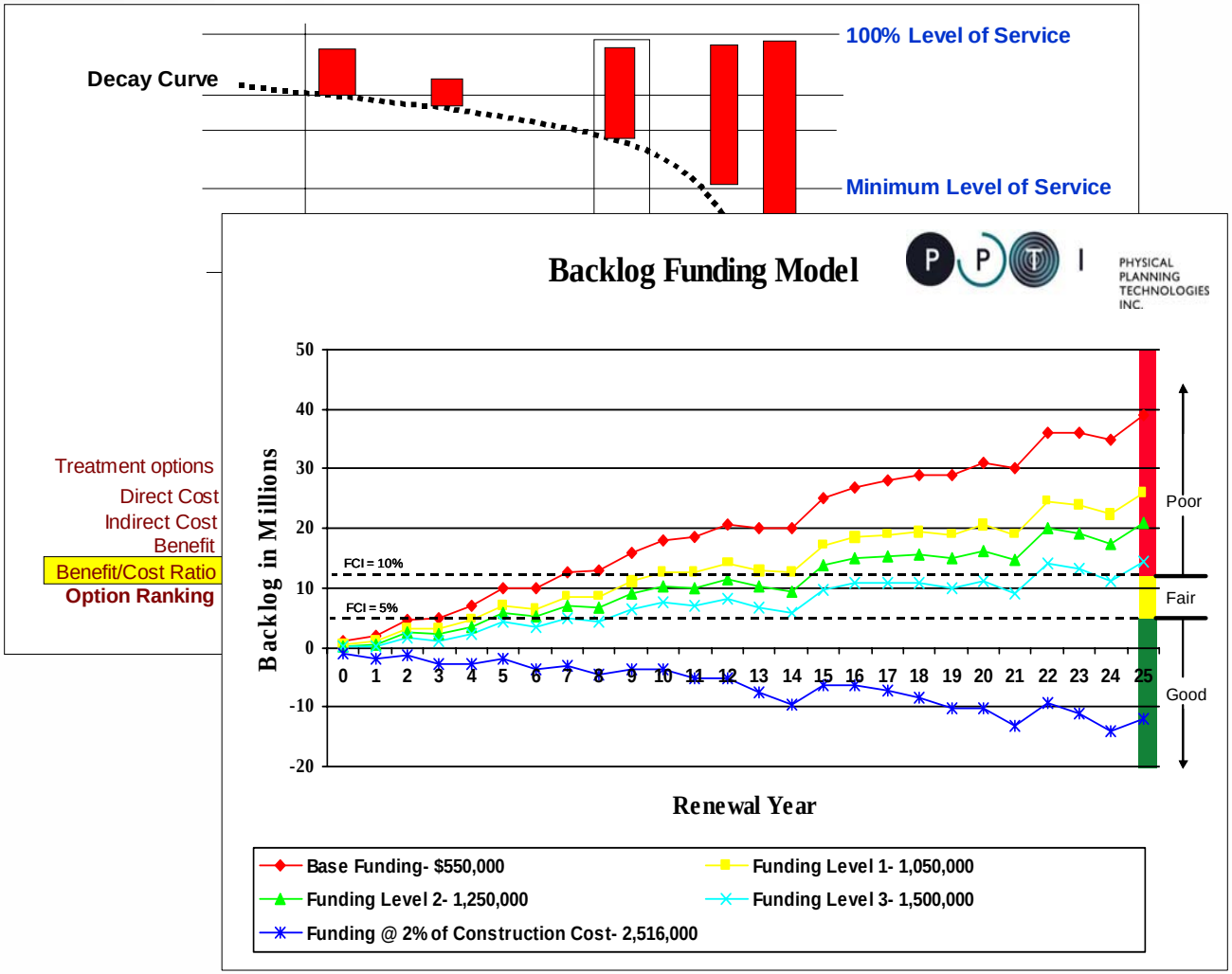
How Much Money Does Tom Need ?



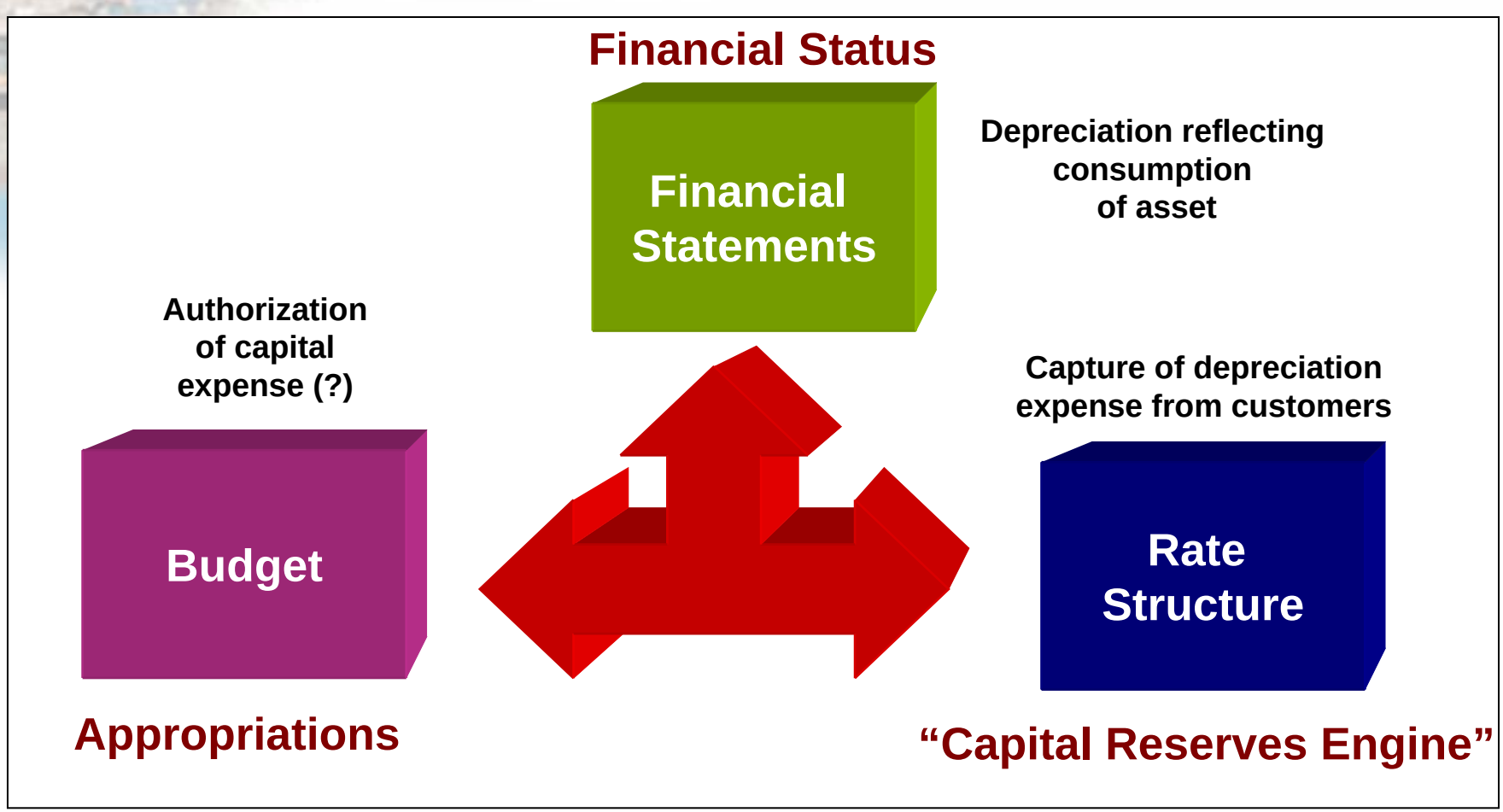
Telling the Renewal Story

Confidence in decision making

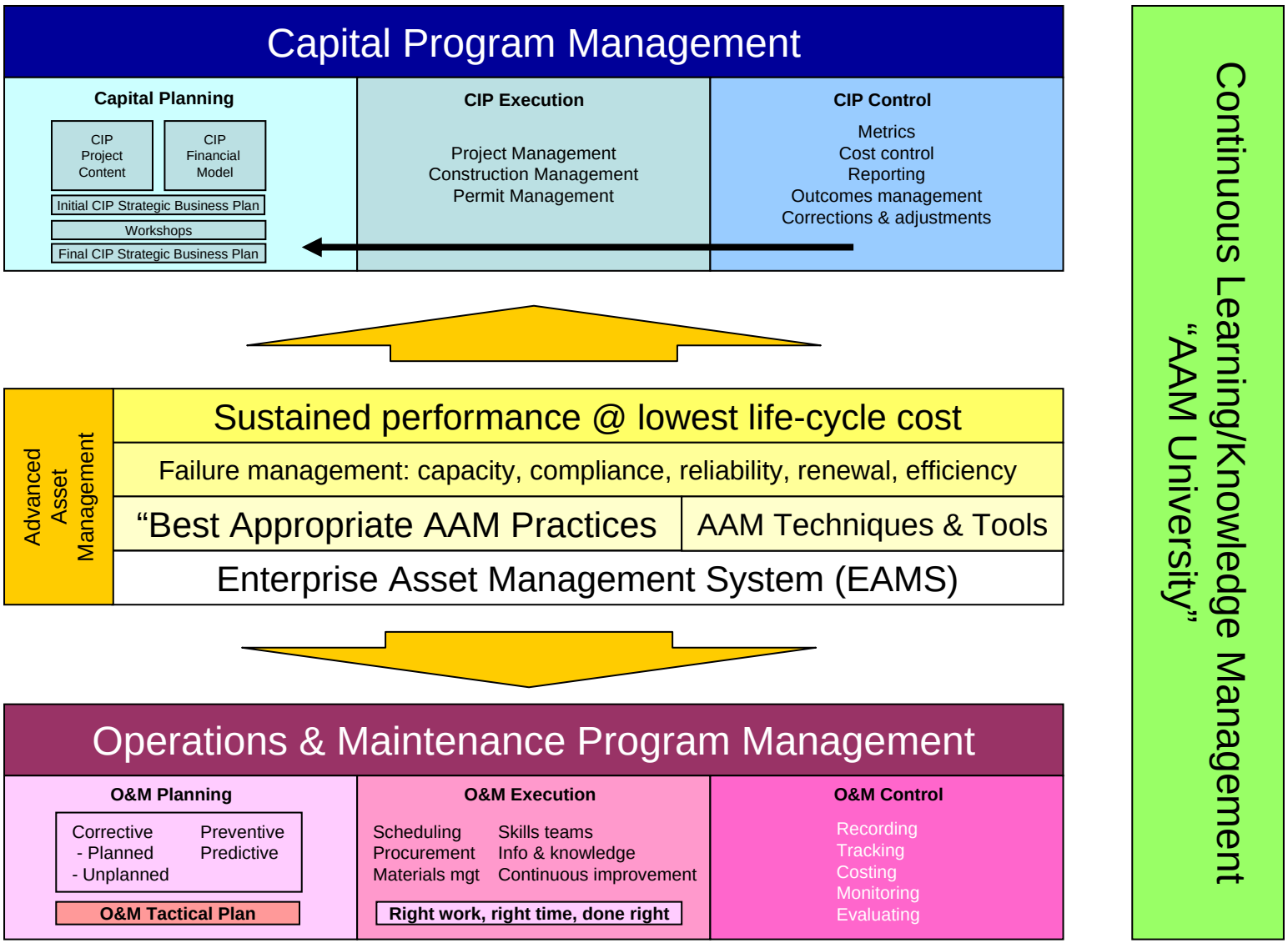
Effective presentation



It Ain't "Renewals Funding" If It Is Appropriated For Something Else



Parsons/GHD AAM Model



The Five Core AM Questions

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 remaining useful life? • What is its economic value?
2. What is my required sustained Level Of Service?
3. Given my system, 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 "minimum life-cycle-cost CIP and O&M strategies? • What alternative treatment options exist? • Which are most feasible?
5. Given the above, what is my best long-term funding strategy?

Steps In Total Asset Management Planning

1 Identify Current Levels of Service

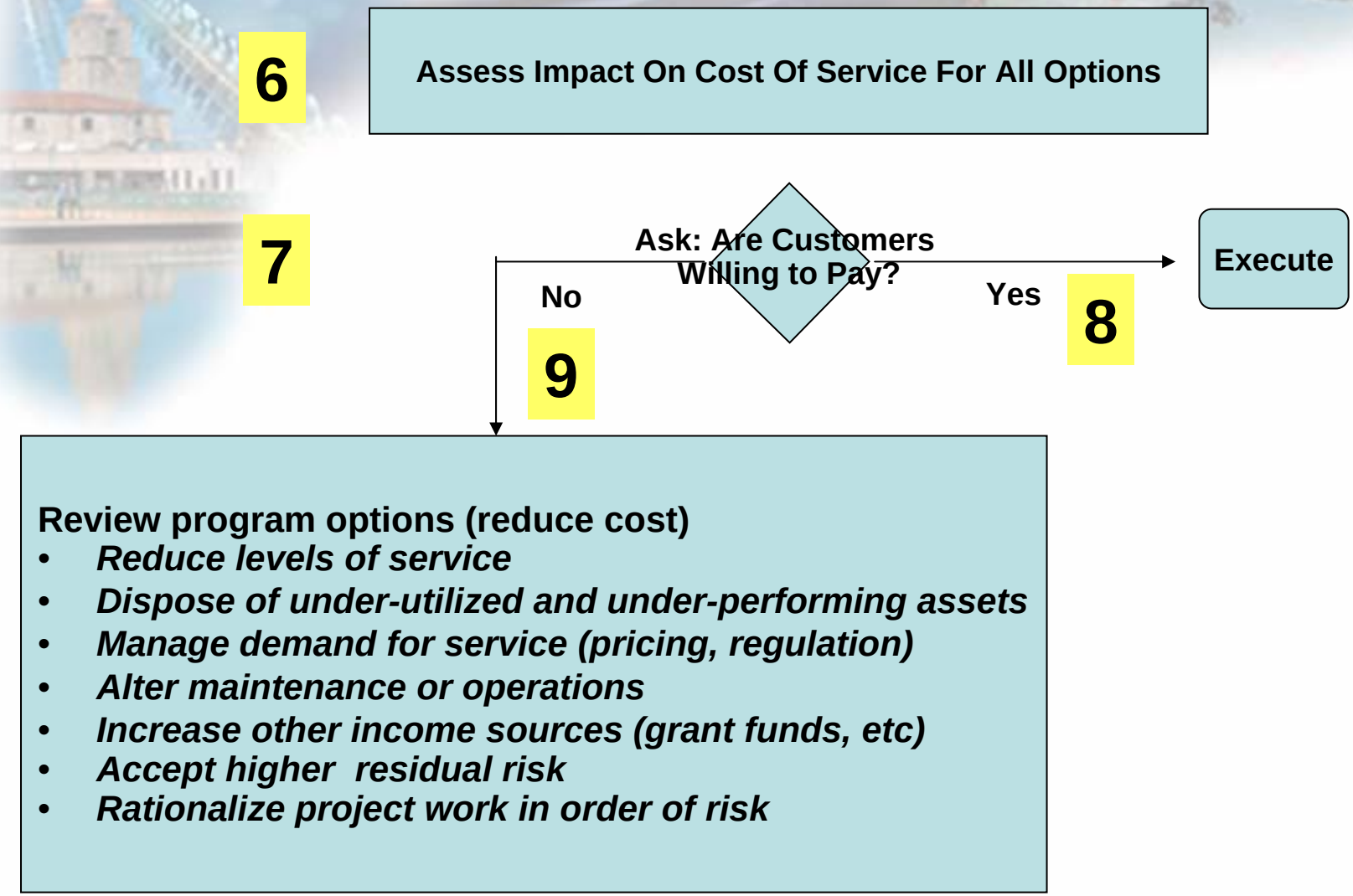
2 Assess Existing Assets:
- *Physical Details*
- *Condition/Remaining Life*
- *Performance*
- *Capacity (Current / Ultimate)*

3 Predict Demand:
- *Capacity / Demands*
- *Levels of Service*
- *Performance / Risk*

4 Predict Mode of Failure
- *Capacity (Due to Growth)*
- *Performance / Reliability*
- *Condition (Age) Integrity*
- *Cost of Service*

5 Examine All Feasible Treatment Alternatives:
New Assets / Renewal / Growth / Efficiency
Improved levels of service
Determine all Technical / Financial Options

Steps In Total Asset Management Planning (Cont'd)



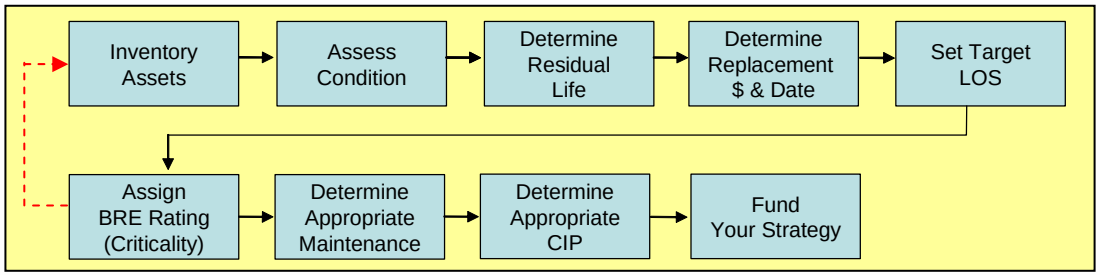
Four Major Stages of AAM Program Deployment

1. Awareness (framework)

Initial Training / Orientation

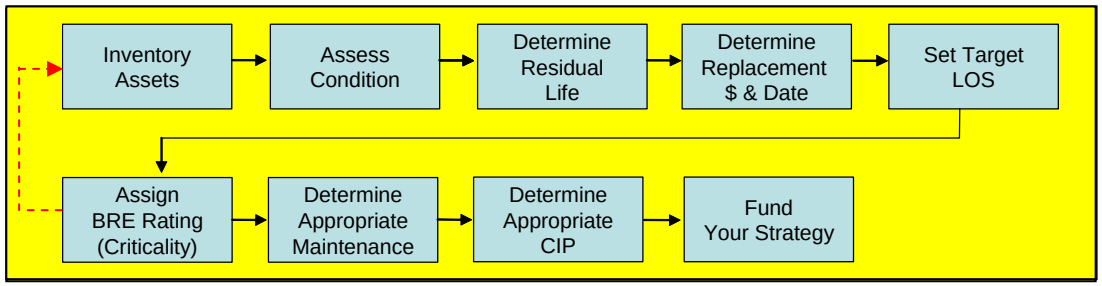
"AM University"

2. Systematic Application (Structure)



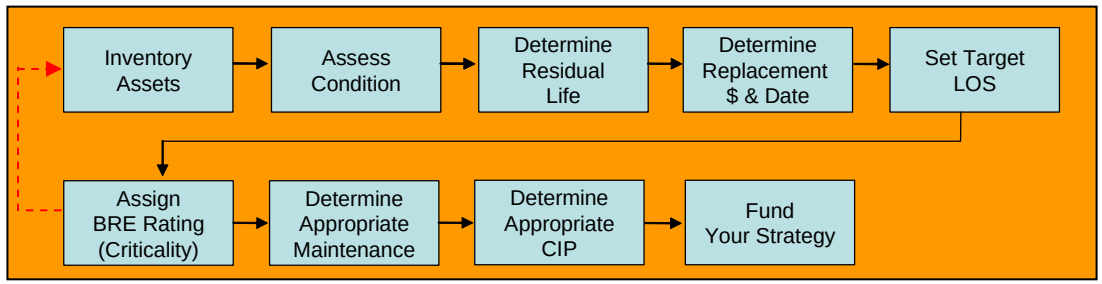
"BOBSRATT" Use what we Have BRE/CLR Level 1

3. Competency (Content & Process)



Gather 7 Load Mentoring BRE/CLR Level 2

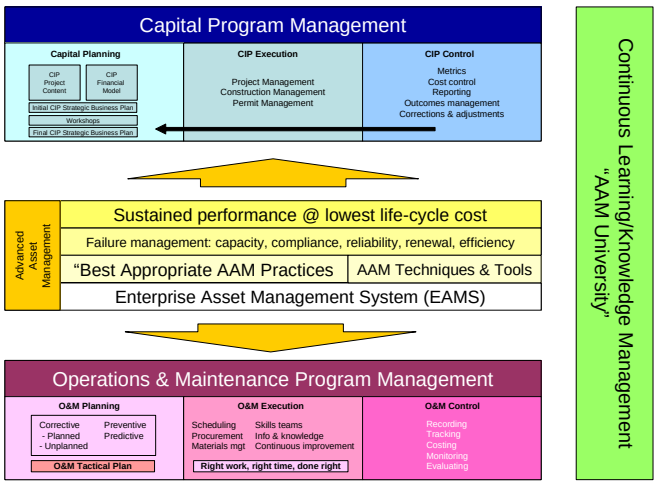
4. Excellence (Sustainability)



Refine, "Culturize" BRE/CLR Level 3

Fitting It All Together

Parsons/GHD AAM Model



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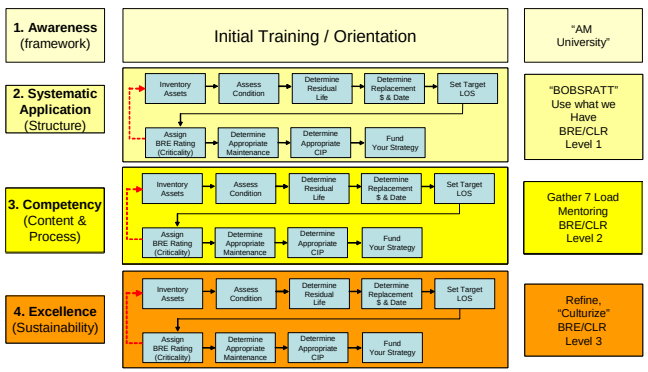
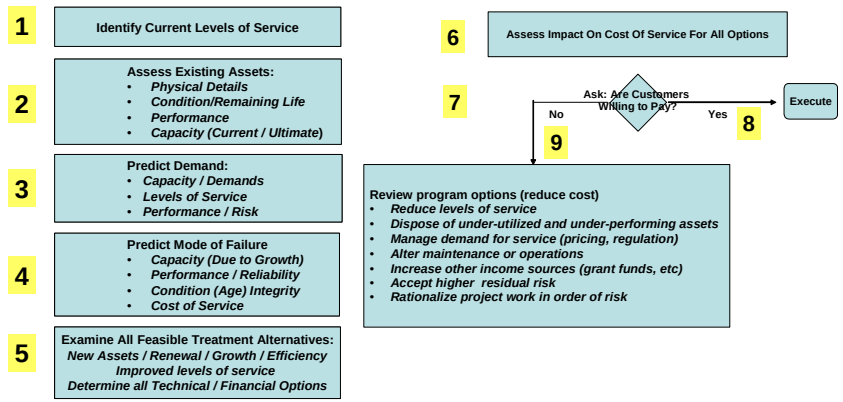


Steps In Total Asset Management Planning



PARSONS / GHD

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Case Study in Developing and Deploying an AAM Program for a Large Utility

Orange County Sanitation District, Orange County, California

Issues in Effective Deployment

- Framework – Creating a common conceptual framework (paradigm)
- Structure – The Asset Management Steering Team
- Workplan – Who does what for whom by when?
- Culture – Transitioning from “short-term operations centric” to “long-term asset centric”
- Politics – Winning commitment from the top shop
- Cost – Funding the first steps; making the business case

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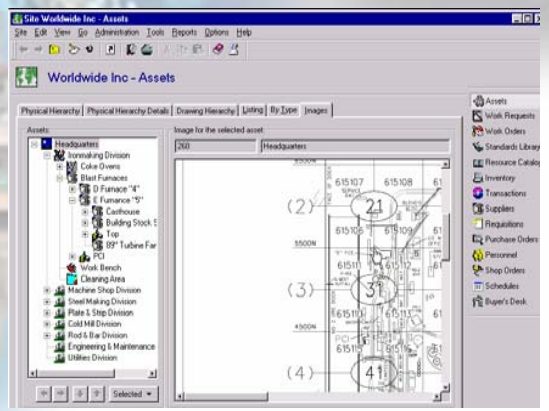
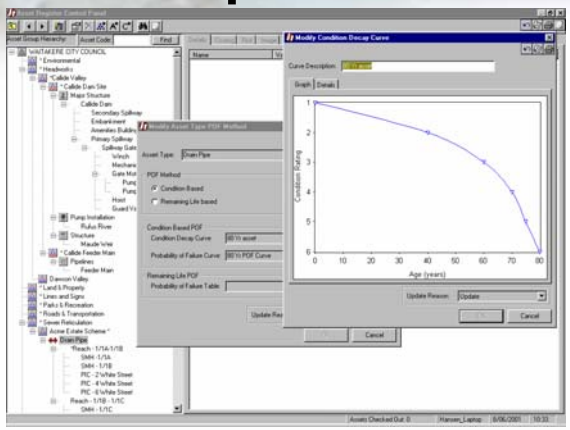
IT Systems – 4 Core EAMS Components

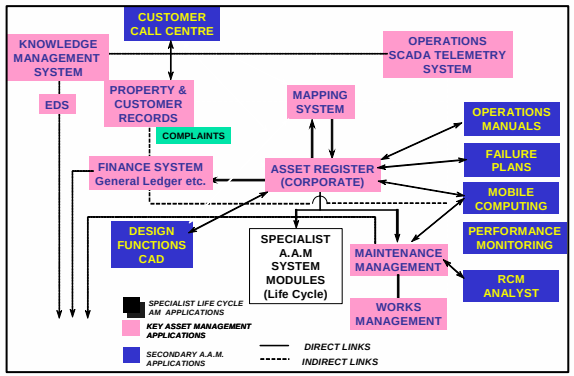


1. Data Standards/Asset Hierarchy



2. Work Processes/"Best Practices"

4. Knowledge Management



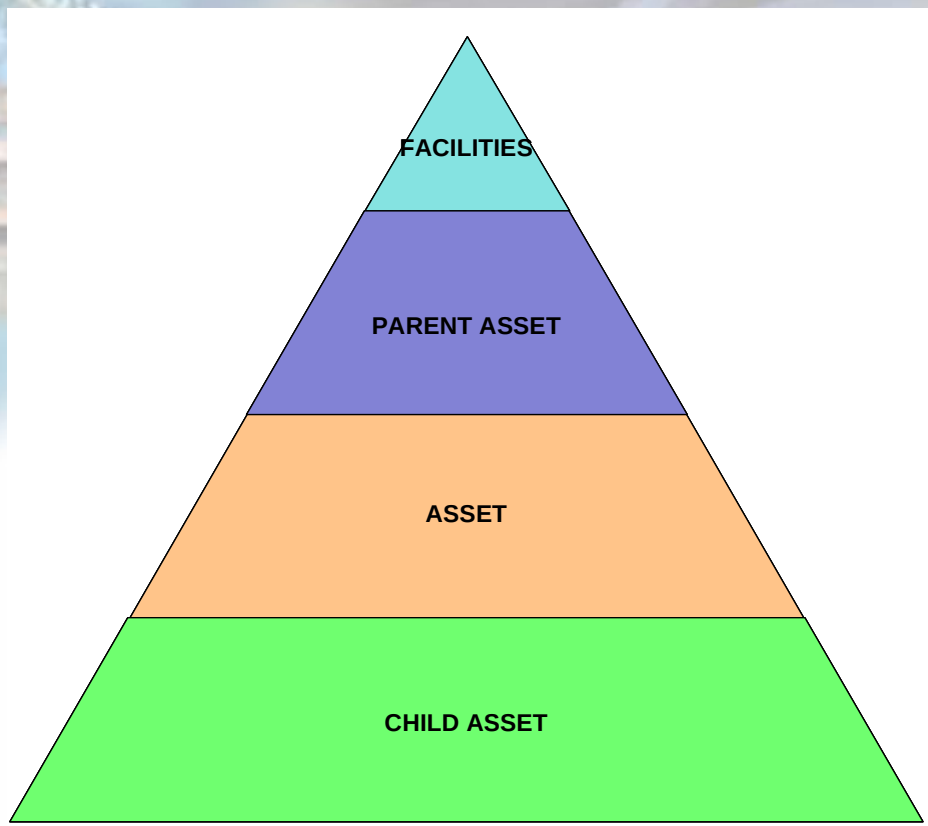
3. Architecture/Integration of Tools

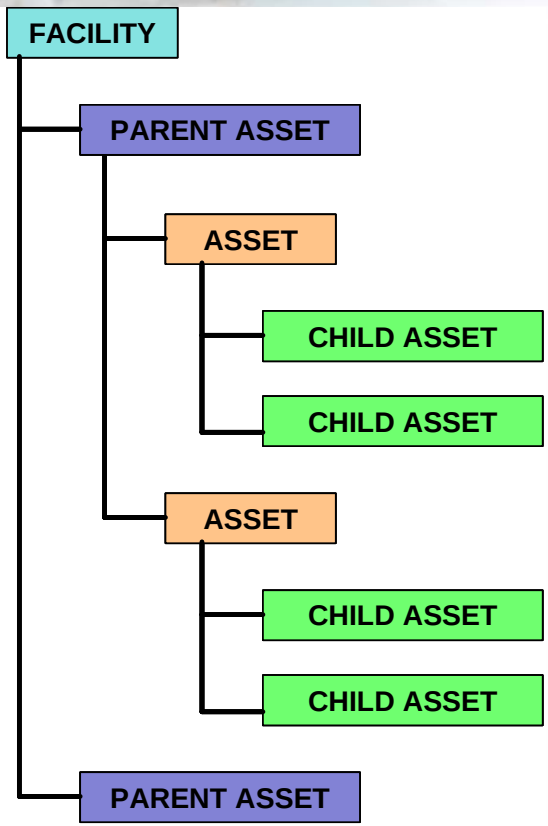
Robust Enterprise Asset Management System
– Enterprise-Wide EAM Functionality

A Vision of IT Best Practice – The Starting Point

- "We monitor the condition, performance, utilization, and costs of assets down to the Managed Maintenance Item component level (as justified) and aggregate this data up to give outputs of cost and performance at:
  - asset
  - facility
  - sub system or
  - full system / program level"

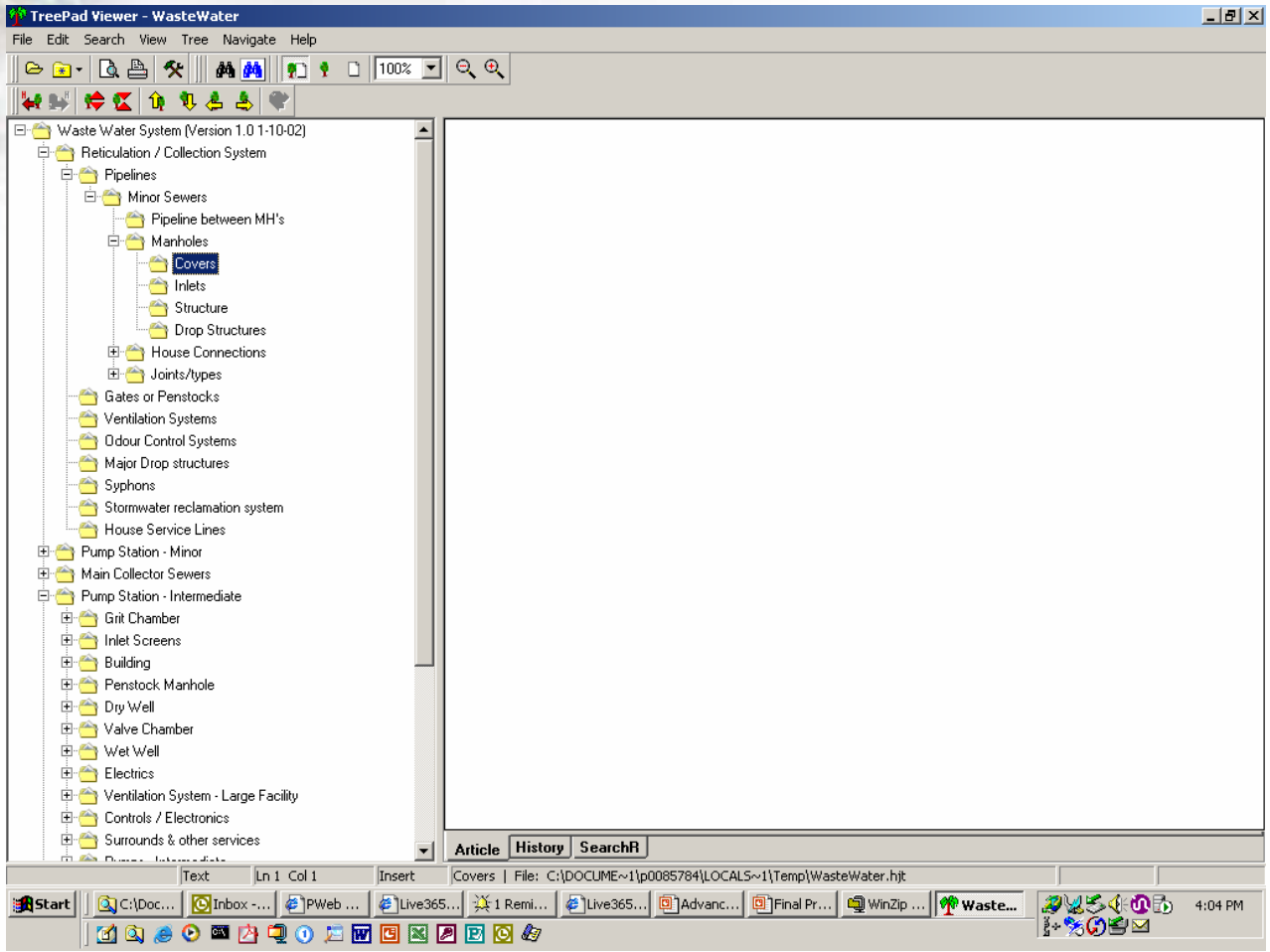
1. Data Standards and Asset Hierarchy





An agency's data standards are the backbone of its management capabilities:
if we don't know what we have, where it is, and what condition it is in, we can't really be managing it.

1. Data Standards and Asset Hierarchy



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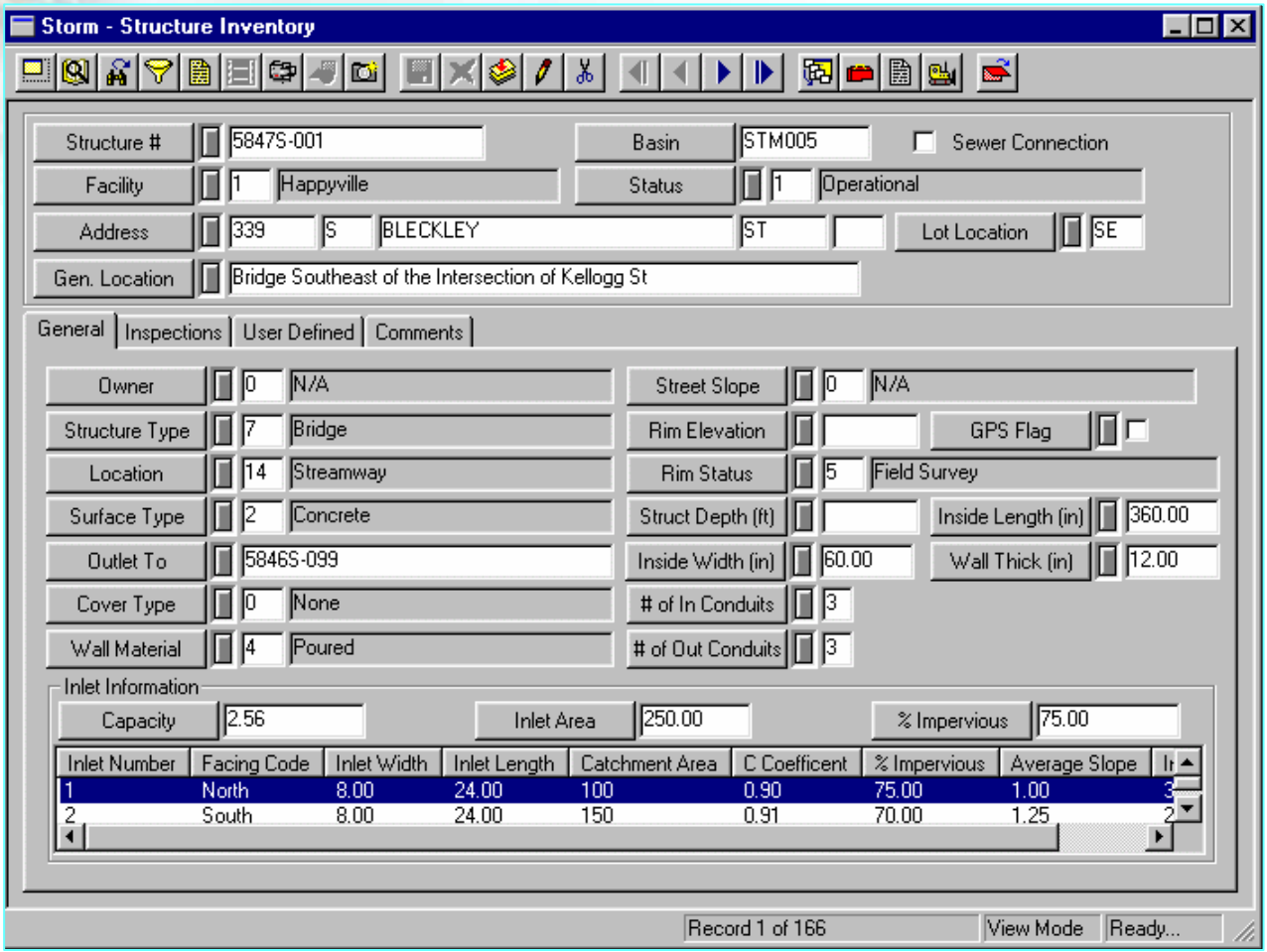
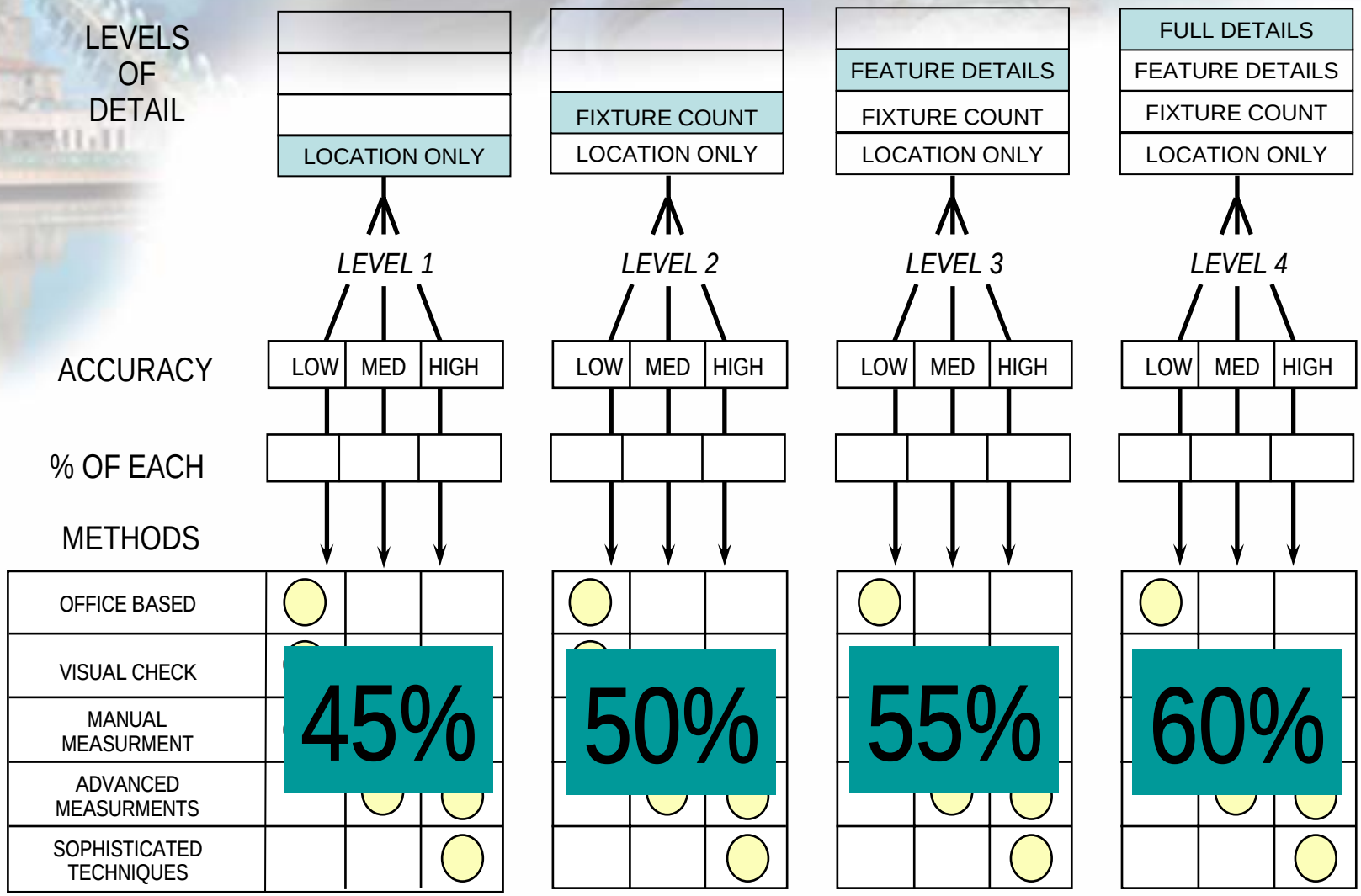
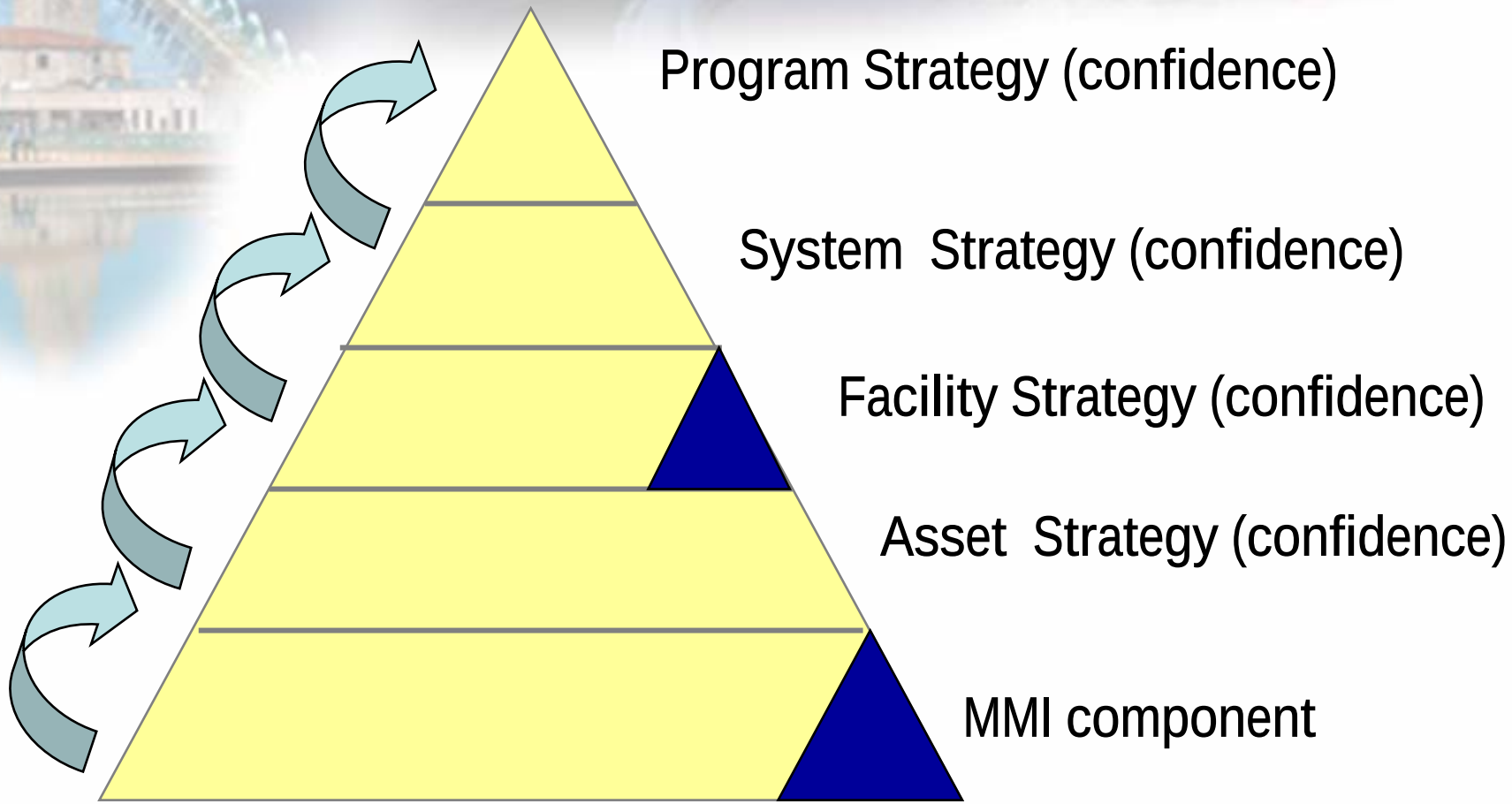


Data Collection – Levels of Detail



Rolling up Confidence

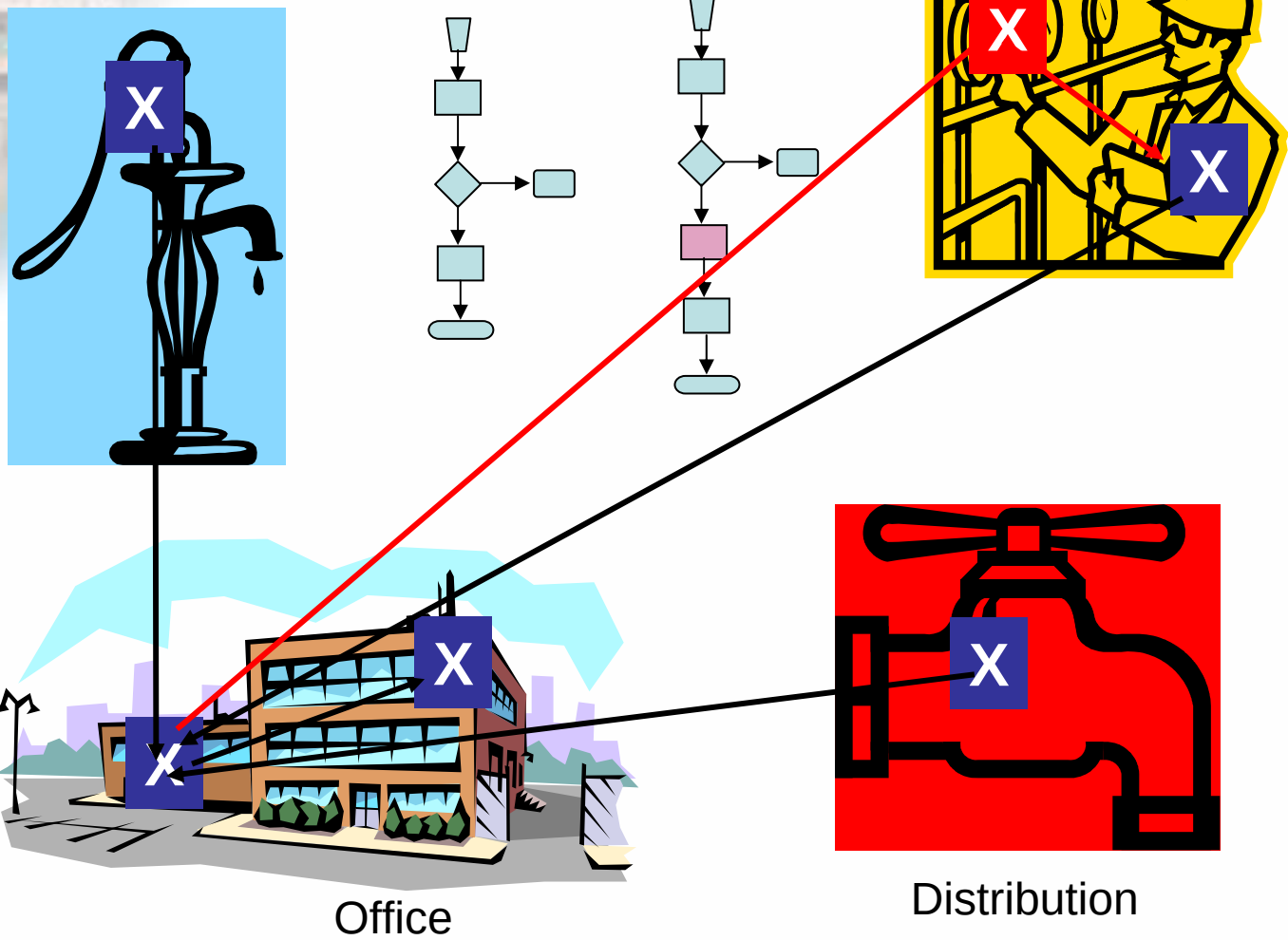


Confidence at higher system levels is determined by MMI component accuracy.

2. Work Processes + “Best Practices”

Collection/Conveyance

Treatment



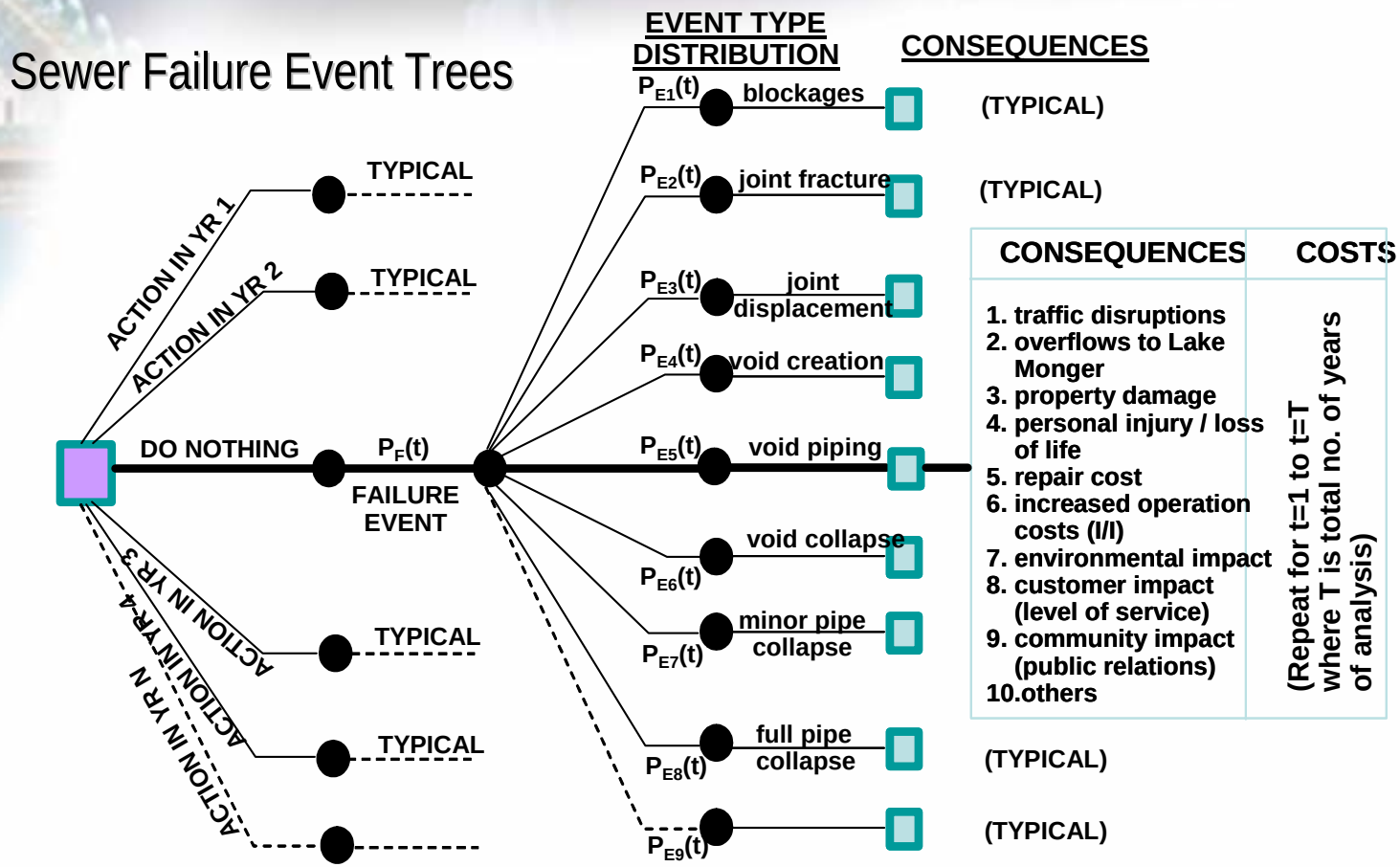
Office

Distribution

Who?
What?
When?
“Best Practice” work processes should drive system functionality

2. Work Processes + "Best Practices"

Sewer Failure Event Trees

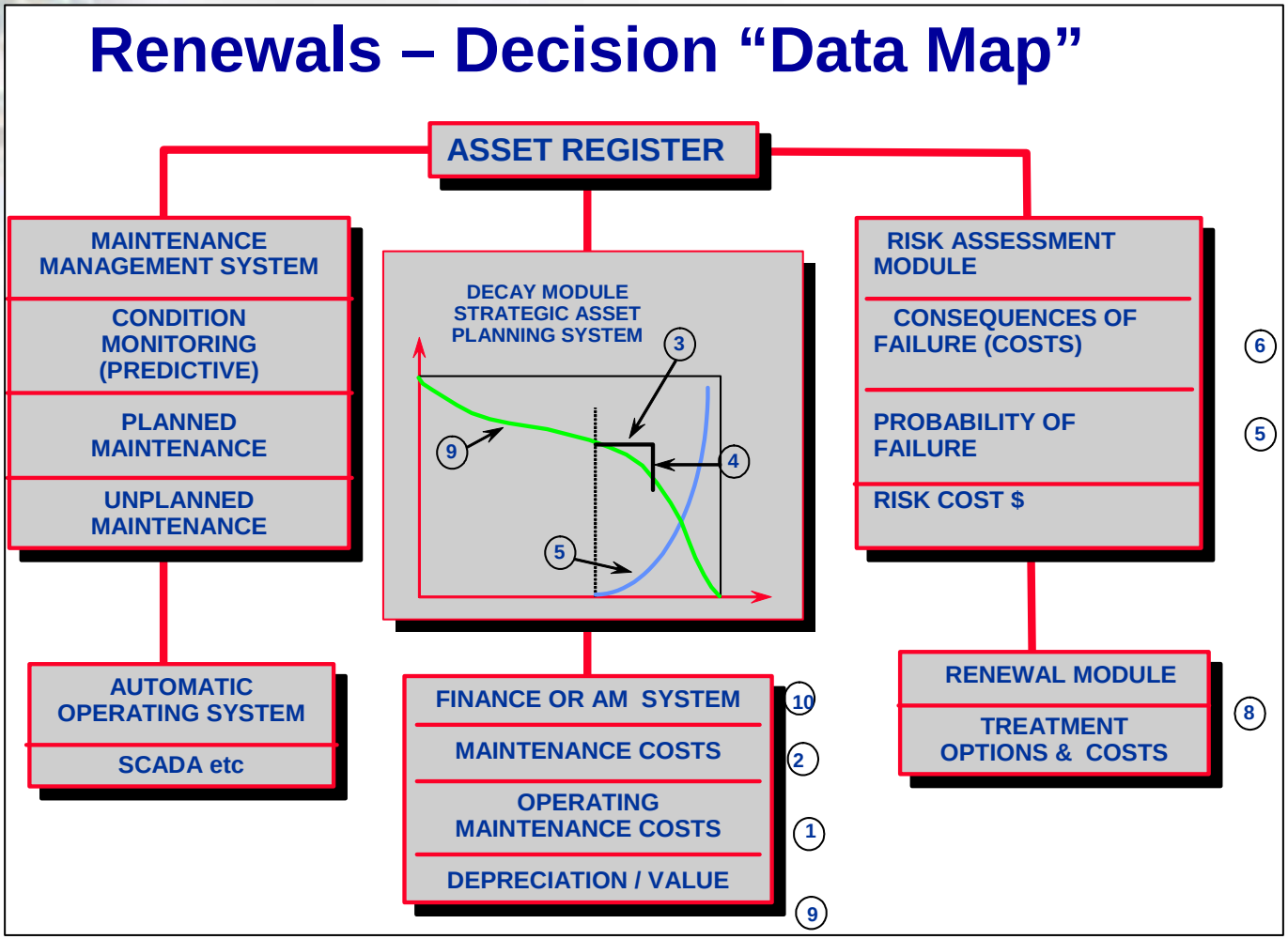


$P_F(t)$: Prob of Failure occurring in year (t)

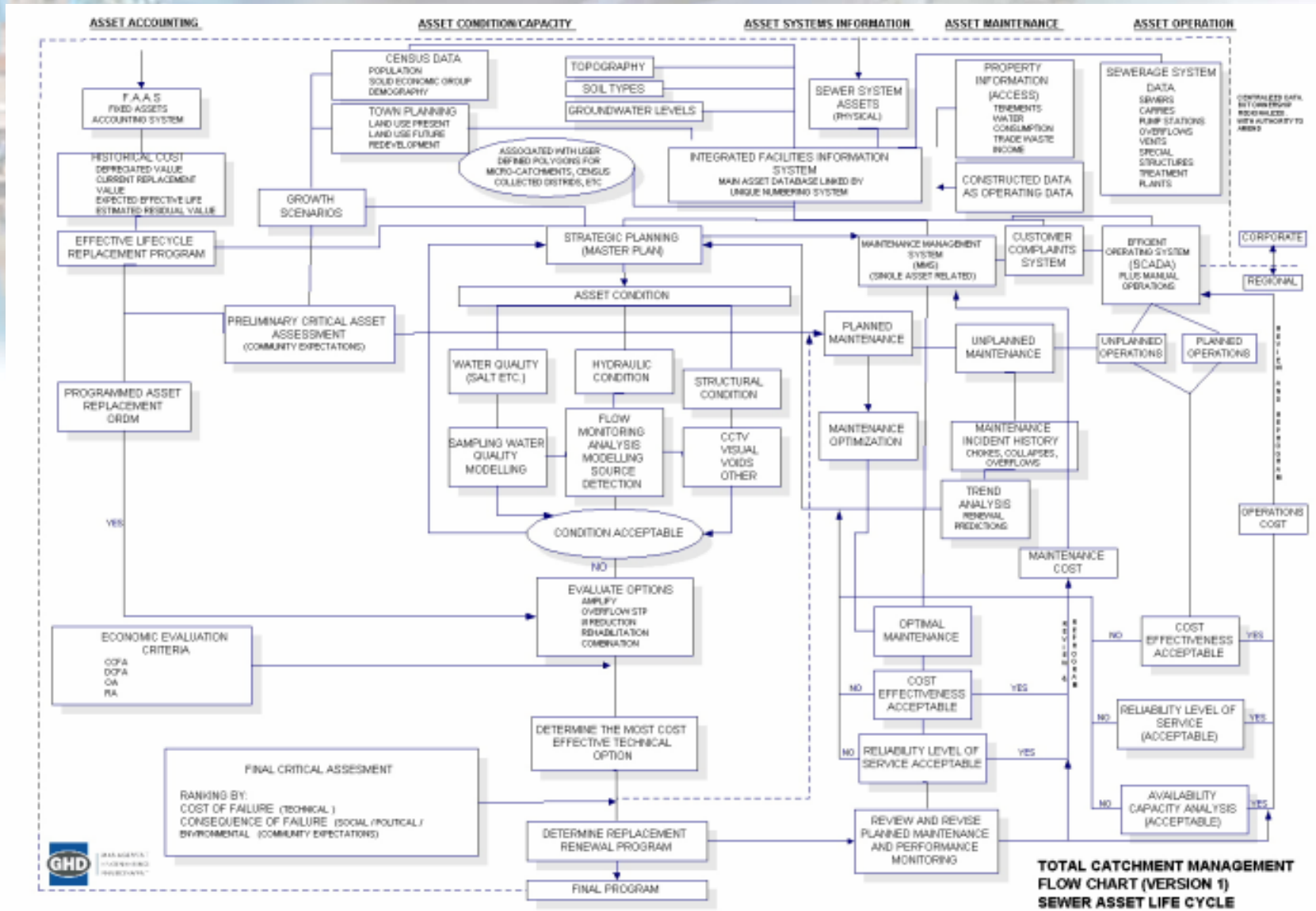
$P_{E1}(t)$: Prob of particular event occurring in year (t)

$\Sigma P_E(t) = 1$ for year t
(Repeat for t=1 to t=T
where T is total no. of years of analysis)

2. Work Processes + “Best Practices”

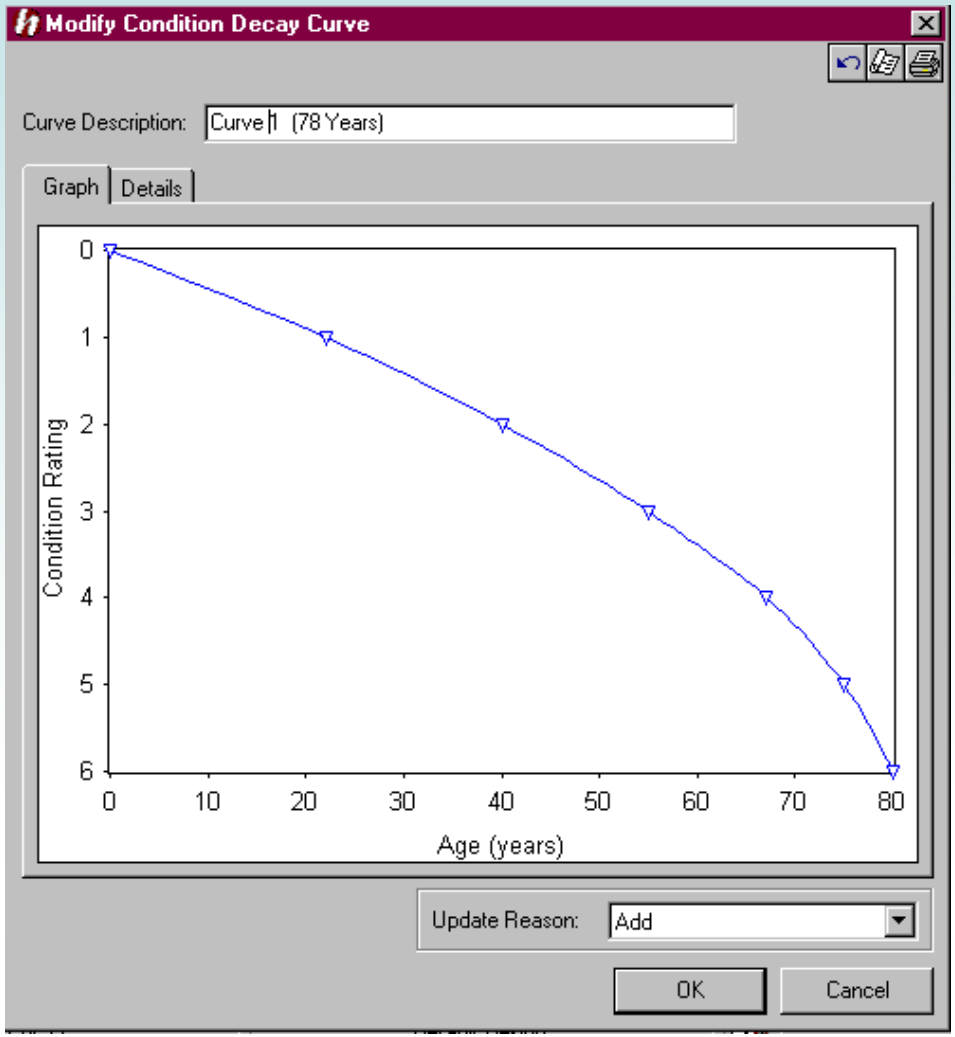


Mapping the Work Process



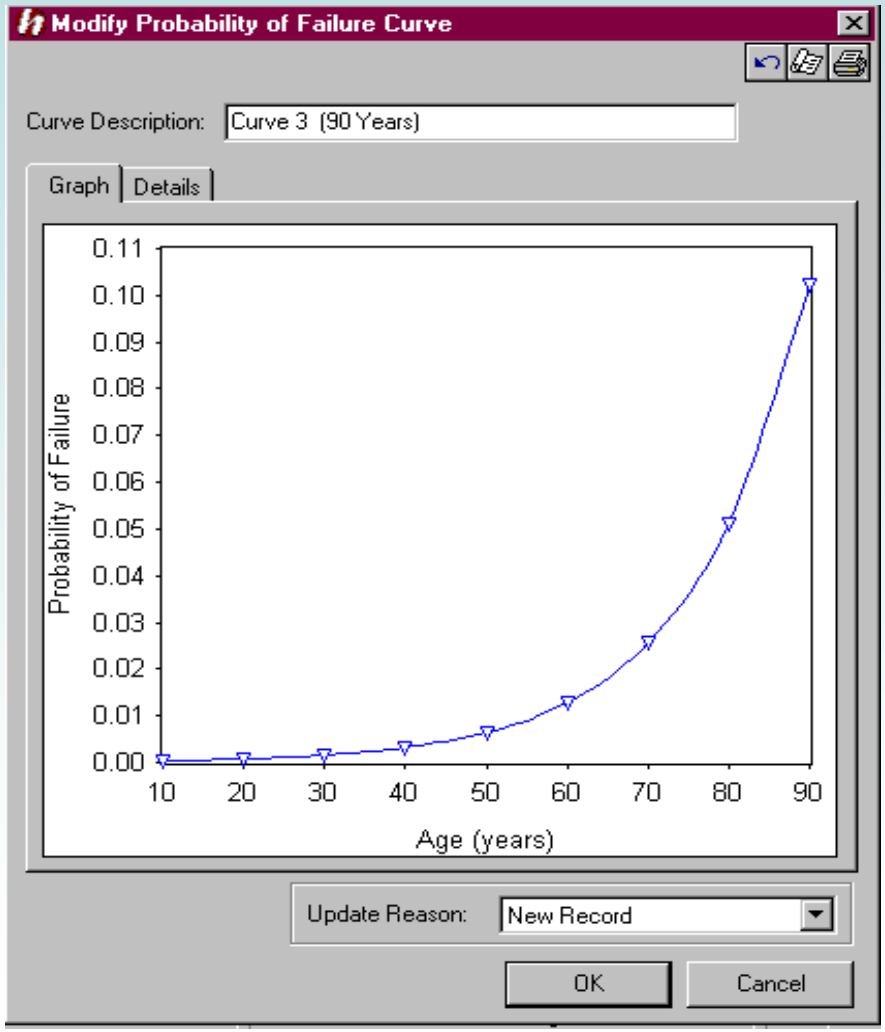
TOTAL CATCHMENT MANAGEMENT FLOW CHART (VERSION 1) SEWER ASSET LIFE CYCLE

AssetLife



Risk Management - Definable Decay Curves

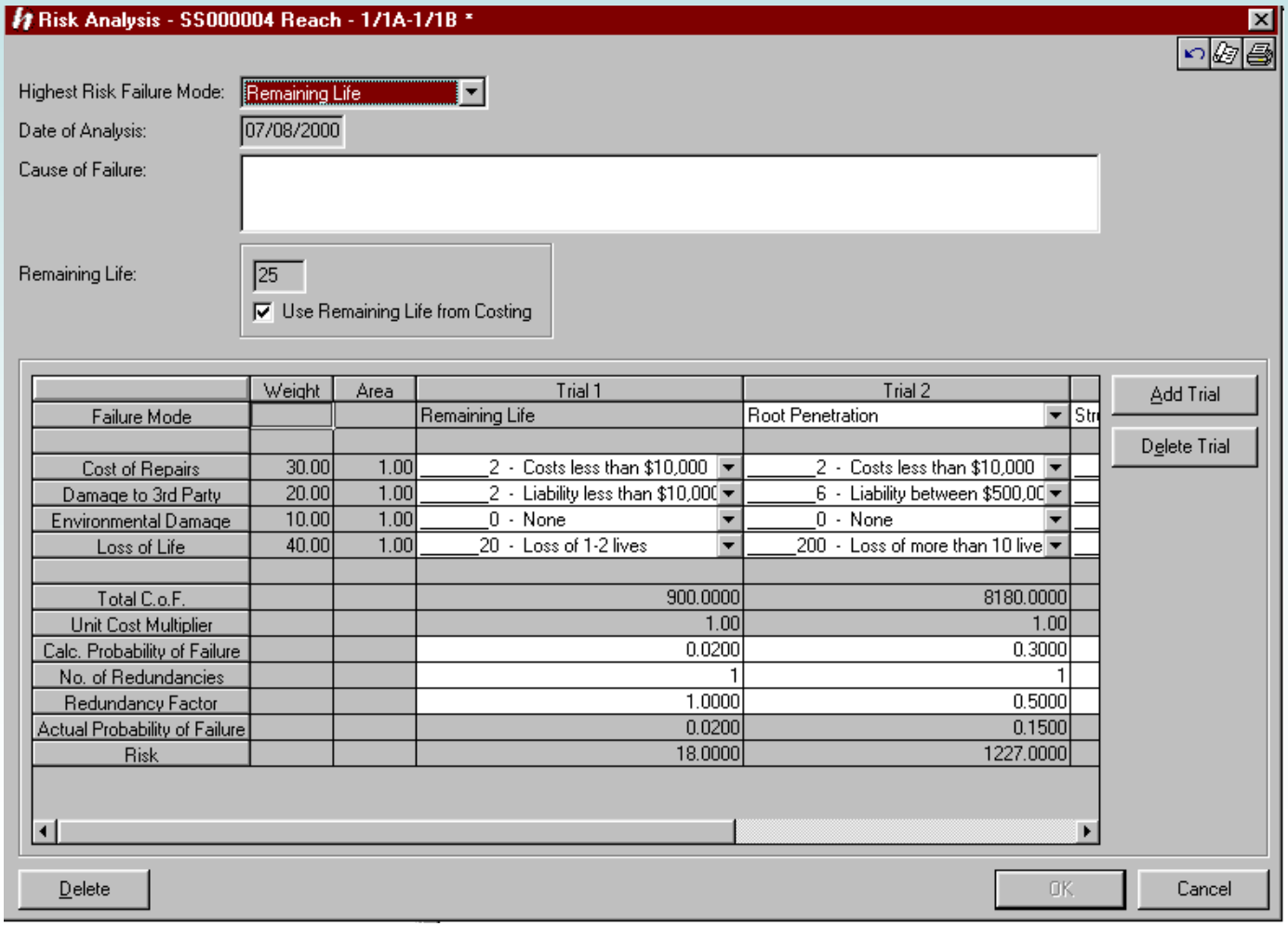
AssetLife



Risk Management - Definable Probability of Failure Curves

AssetLife

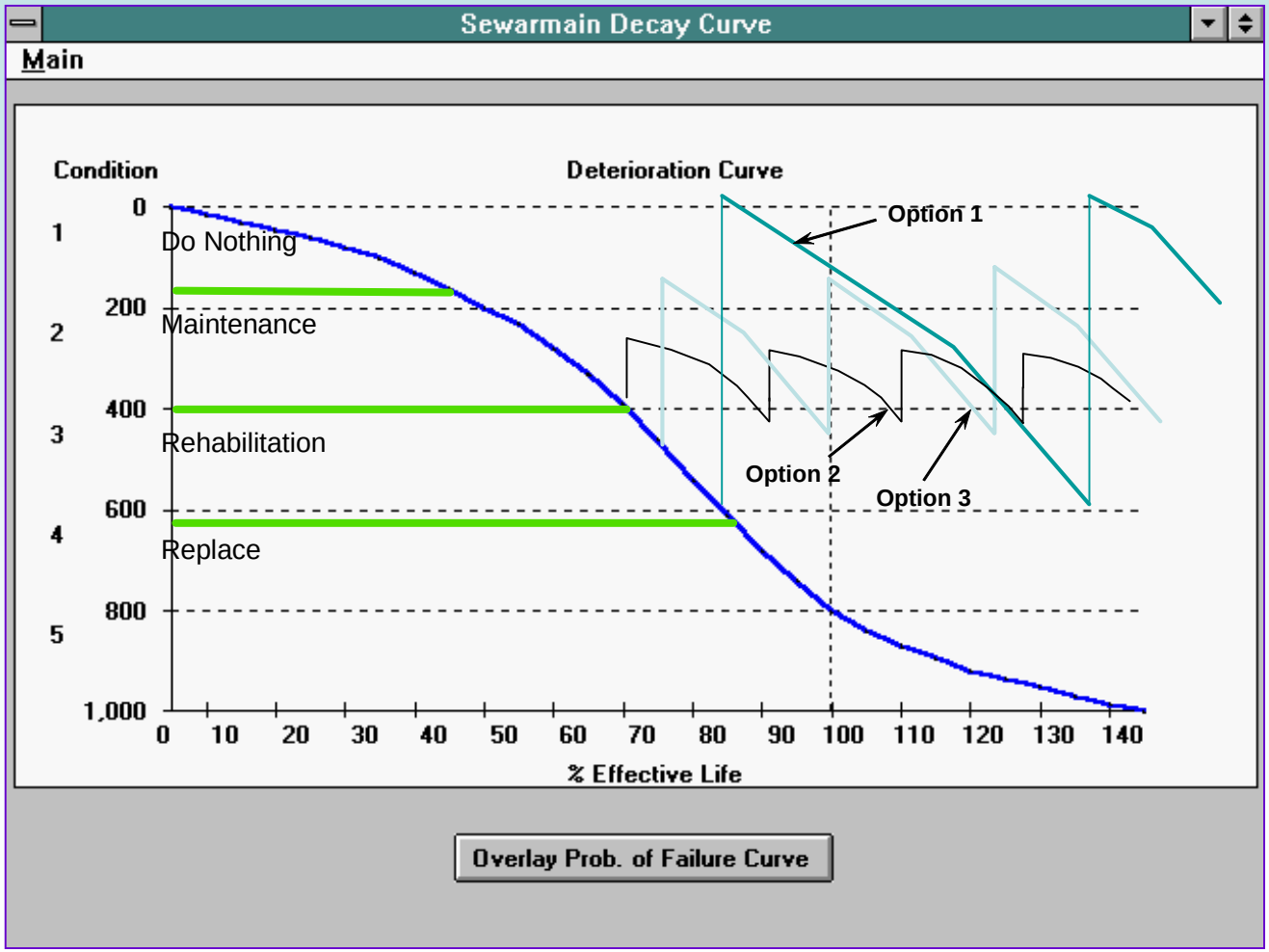
Risk Management - Multi-Trial Risk Analysis



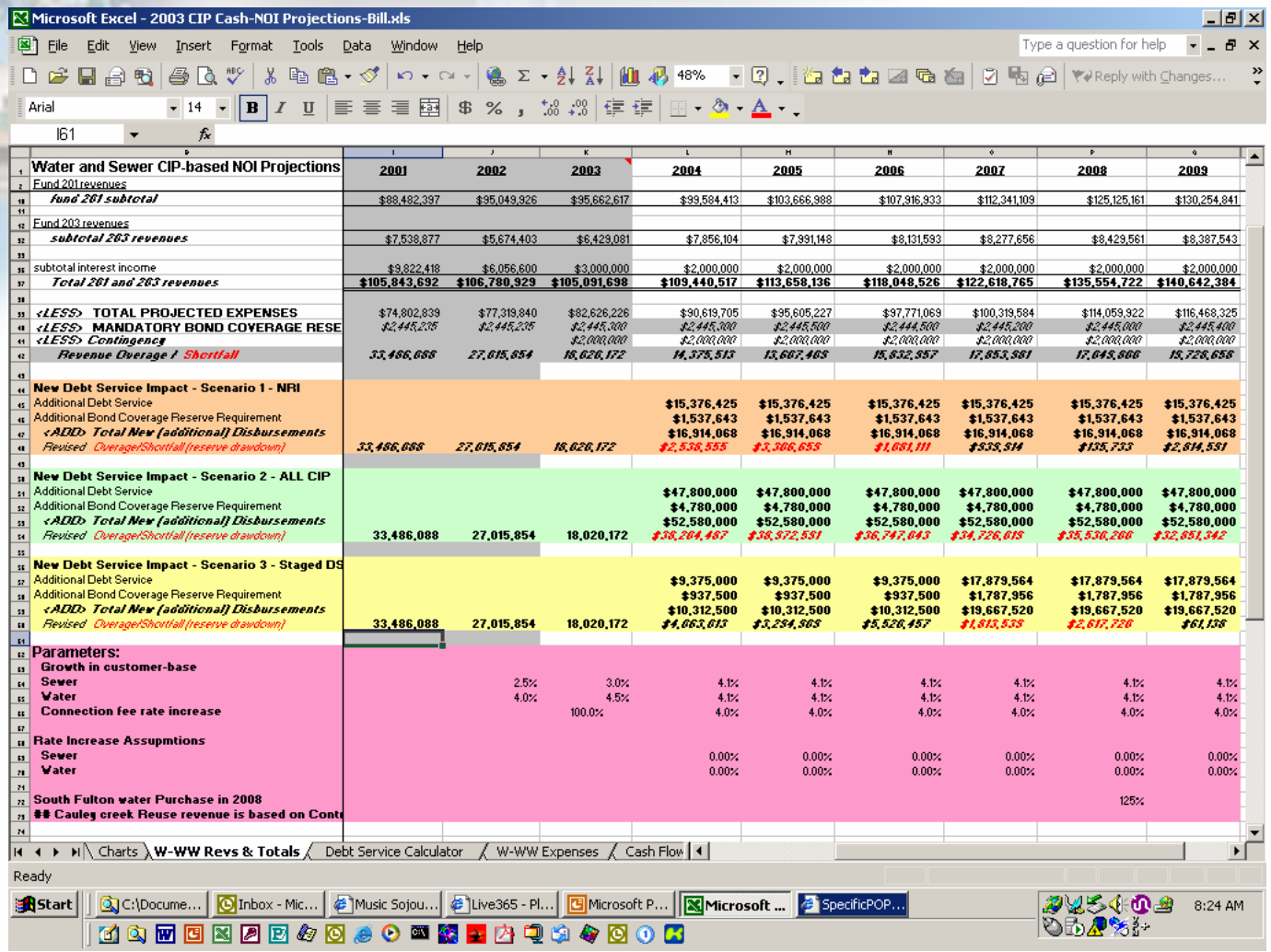
	Weight	Area	Trial 1	Trial 2	
Failure Mode			Remaining Life	Root Penetration	Str
Cost of Repairs	30.00	1.00	2 - Costs less than $10,000	2 - Costs less than $10,000	
Damage to 3rd Party	20.00	1.00	2 - Liability less than $10,000	6 - Liability between $500,00	
Environmental Damage	10.00	1.00	0 - None	0 - None	
Loss of Life	40.00	1.00	20 - Loss of 1-2 lives	200 - Loss of more than 10 live	
Total C.o.F.			900.0000	8180.0000	
Unit Cost Multiplier			1.00	1.00	
Calc. Probability of Failure			0.0200	0.3000	
No. of Redundancies			1	1	
Redundancy Factor			1.0000	0.5000	
Actual Probability of Failure			0.0200	0.1500	
Risk			18.0000	1227.0000	

AssetLife

Risk Management - Multi-Trial Risk Analysis



NOI/Cash Generation Projections

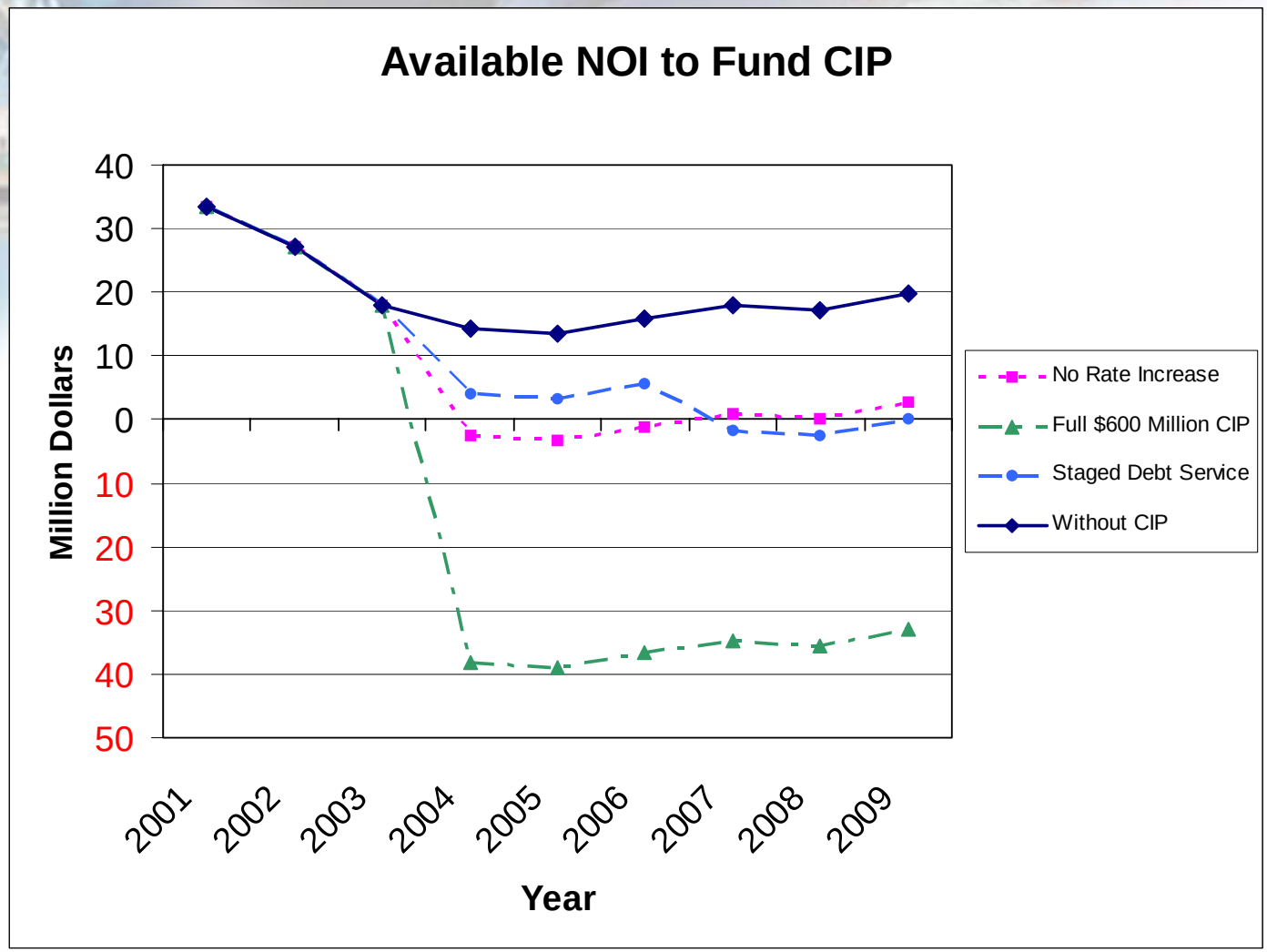


Alternative Funding Scenarios

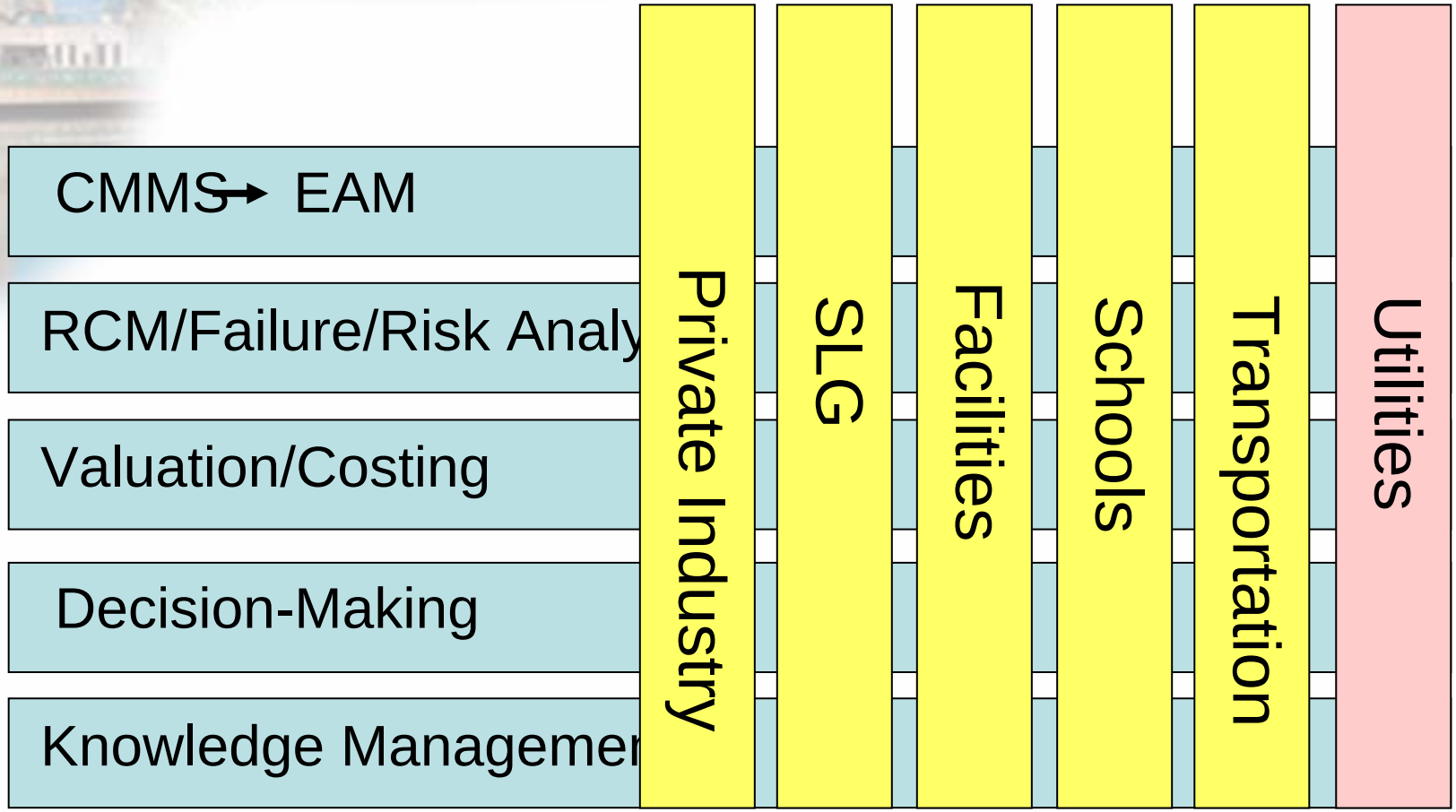
Scenario	Gross Bond Amount (millions)	Net Bond Proceeds (millions)	Annual Debt Service (millions)	Notes
1. No rate increase	$215.0	$193.5	$15.4	Current 201/203 available cash balances pay for current 203 projects for all scenarios
2. Fund all $600 million initially	$668.4	$601.5	$47.8	30 to 35% immediate rate increase
3. Staged Debt Service	$250.0	$225.0	$9.4 $17.9	3 years of interest only
4. “Just in time” capacity, obligations	$230.0	$207.0	$8.6 $16.5	3 years of interest only; meets “bottom line” capacity requirements and commitments

Bond assumptions: 20 year term, semi-annual payments, 3.75% rate, 10% cost-to-issue, initial payment in June 2004

Cash Impact By Scenario



3. Architecture/Integration of Tools



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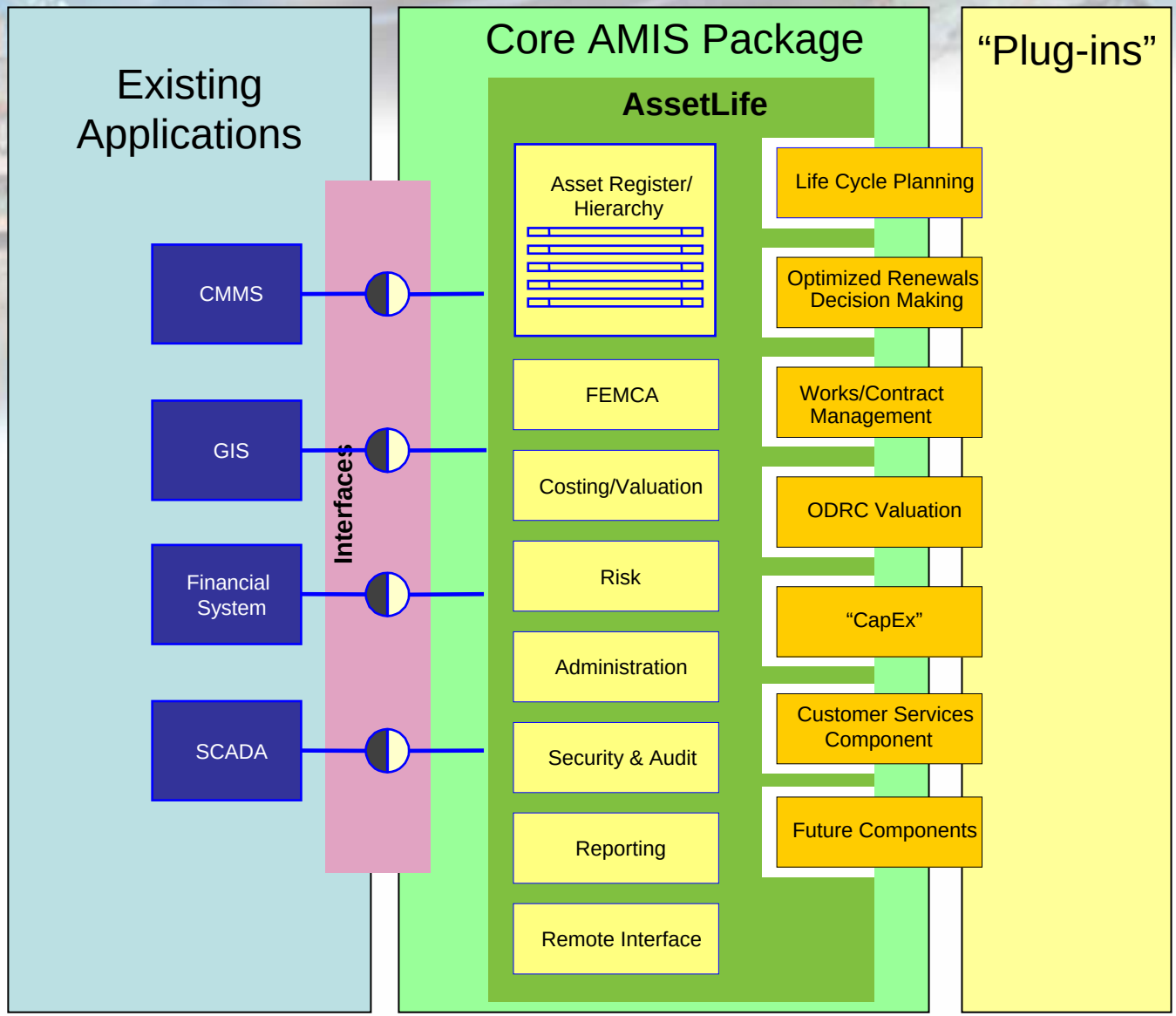
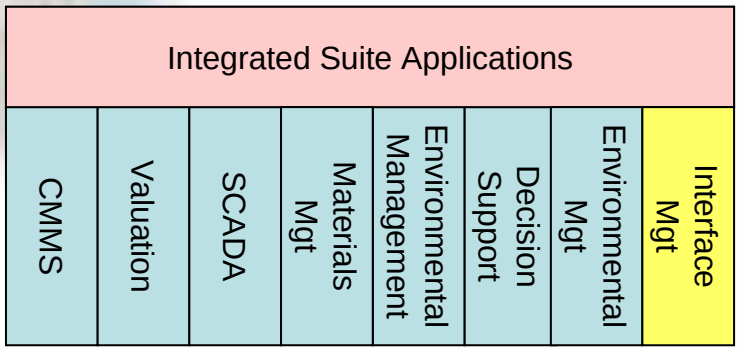


Most agencies find it much more cost-effective to build on existing platforms, step-by-step.

“ERP” Versus “Integrated Suite”

Integrated Suite

1. Deploy



2. Modify Work Processes to fit those embedded in Suite

- Hansen USA
- DataStream
- MRO Maximo
- Synergen
- GBA Master Series

“ERP”

1. Refine work processes
   - Determine “As Is”
   - Identify “To be”

2. Program “business logic” using programming tools built into the ERP package

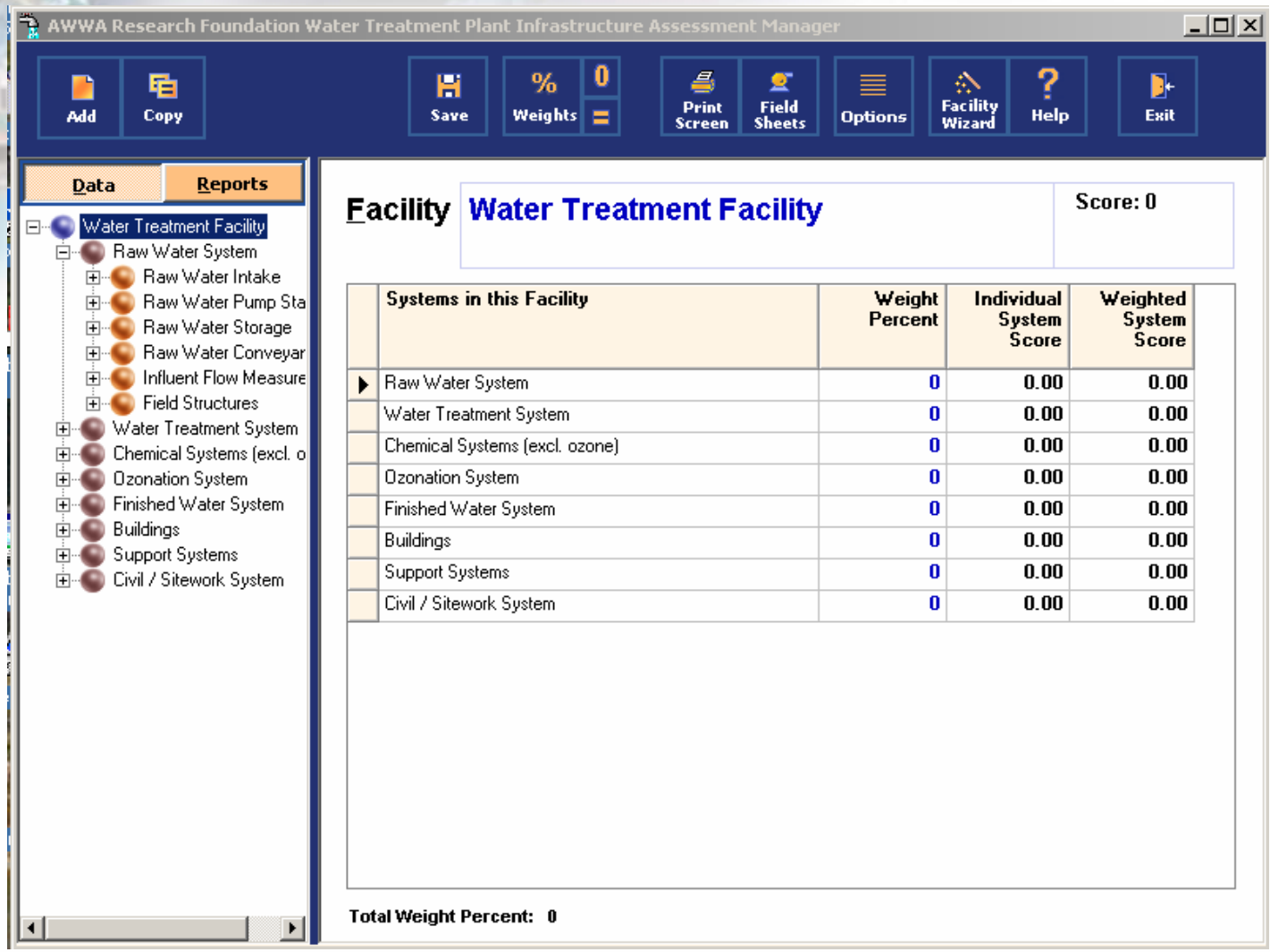
3. Deploy

- SAP
- Oracle
- PeopleSoft
- JD Edwards

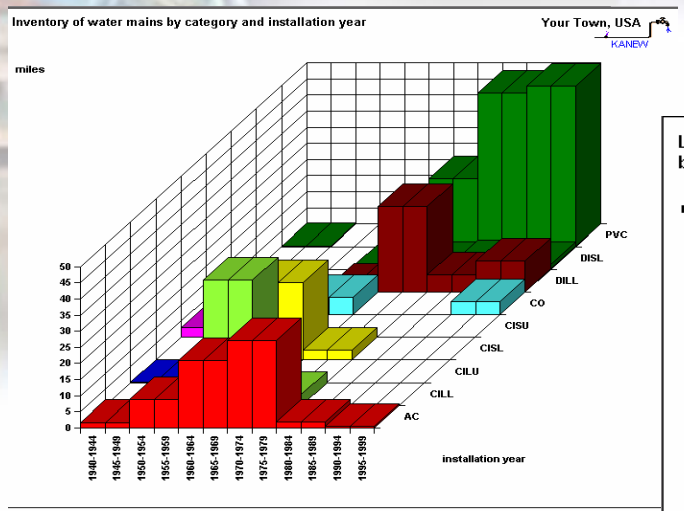
“Best of Breed”

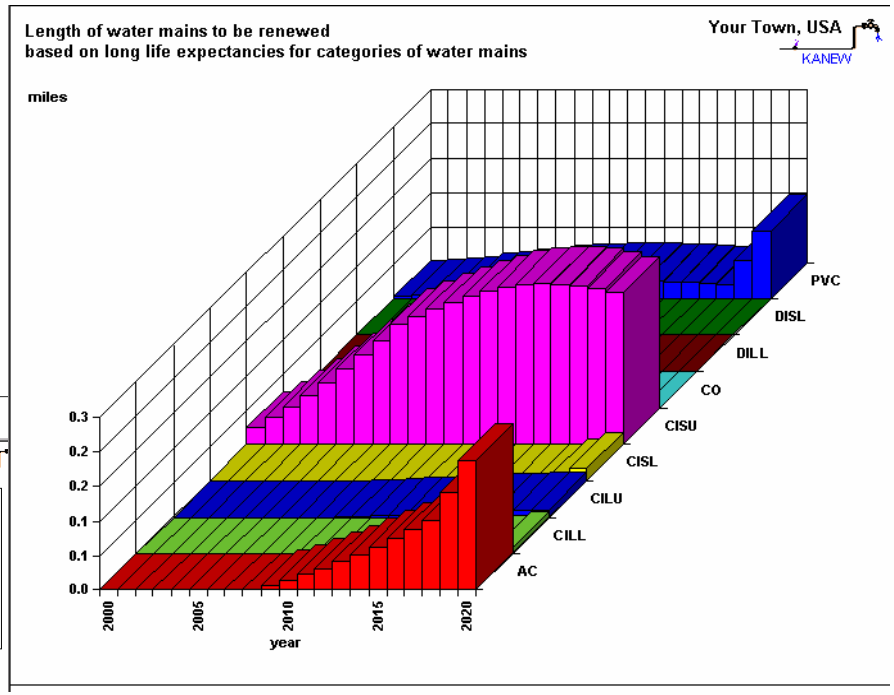
CMMS/ EAMS	CMMS – Driven: DataStream MRO Maximo Synergen Hansen GBA MasterSeries IVARA	GIS – Driven: City Works ESRI ARCFM
AAM	AssetLife HRA Nessie Model CAPFinance KANEW AWWA Infrastructure Manager	

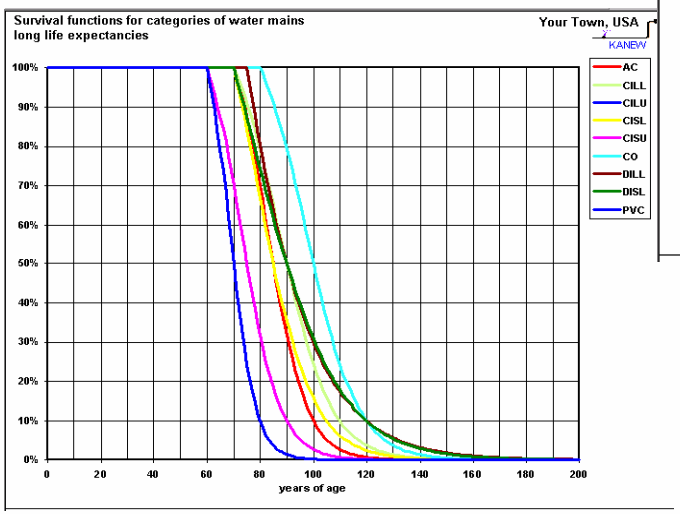
Plug-In Applications May Be Relatively Inexpensive – AWWA's "Plant Manager"



Plug-In Applications May Be Relatively Inexpensive – AWWA's "Kanew"

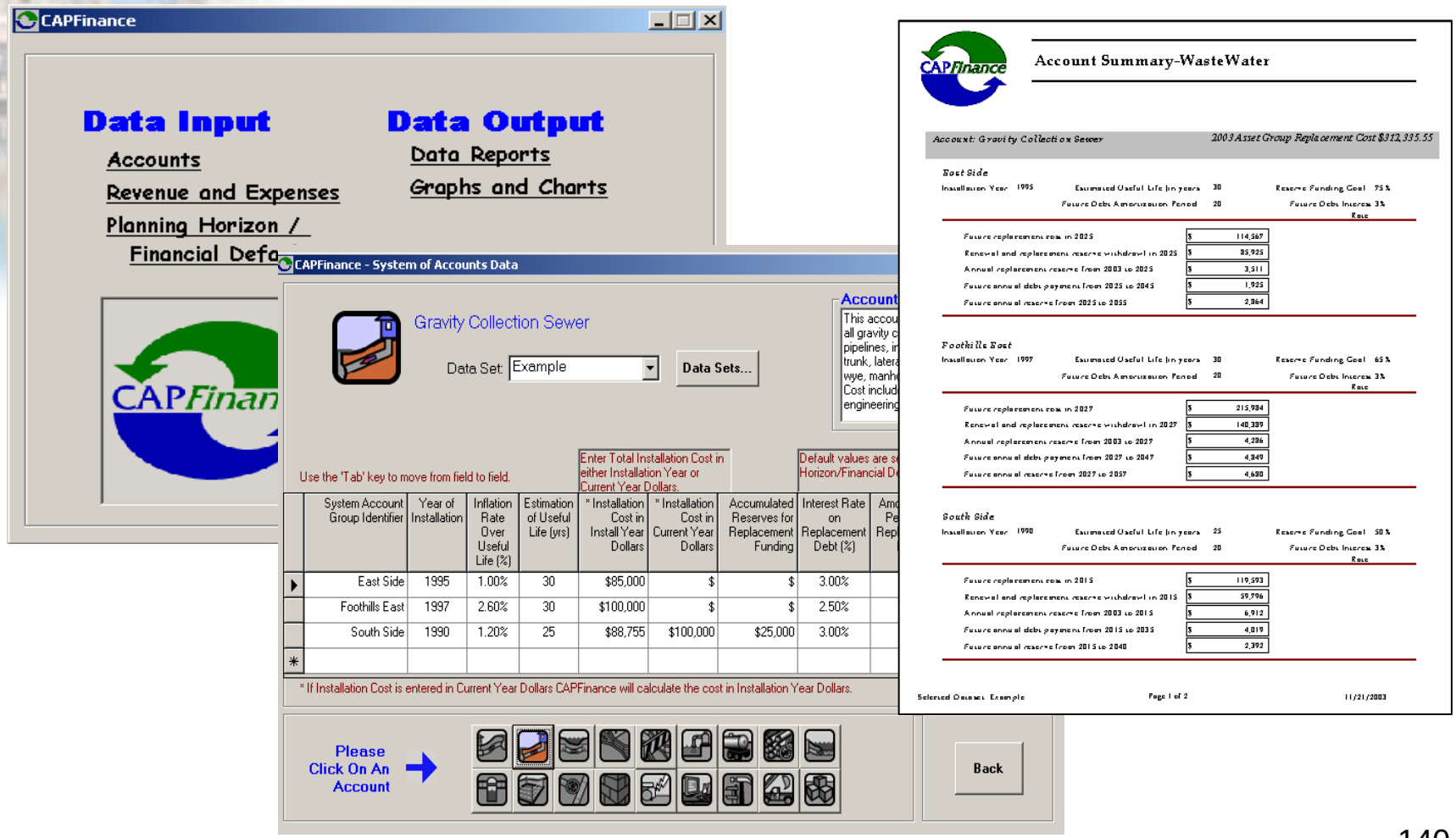




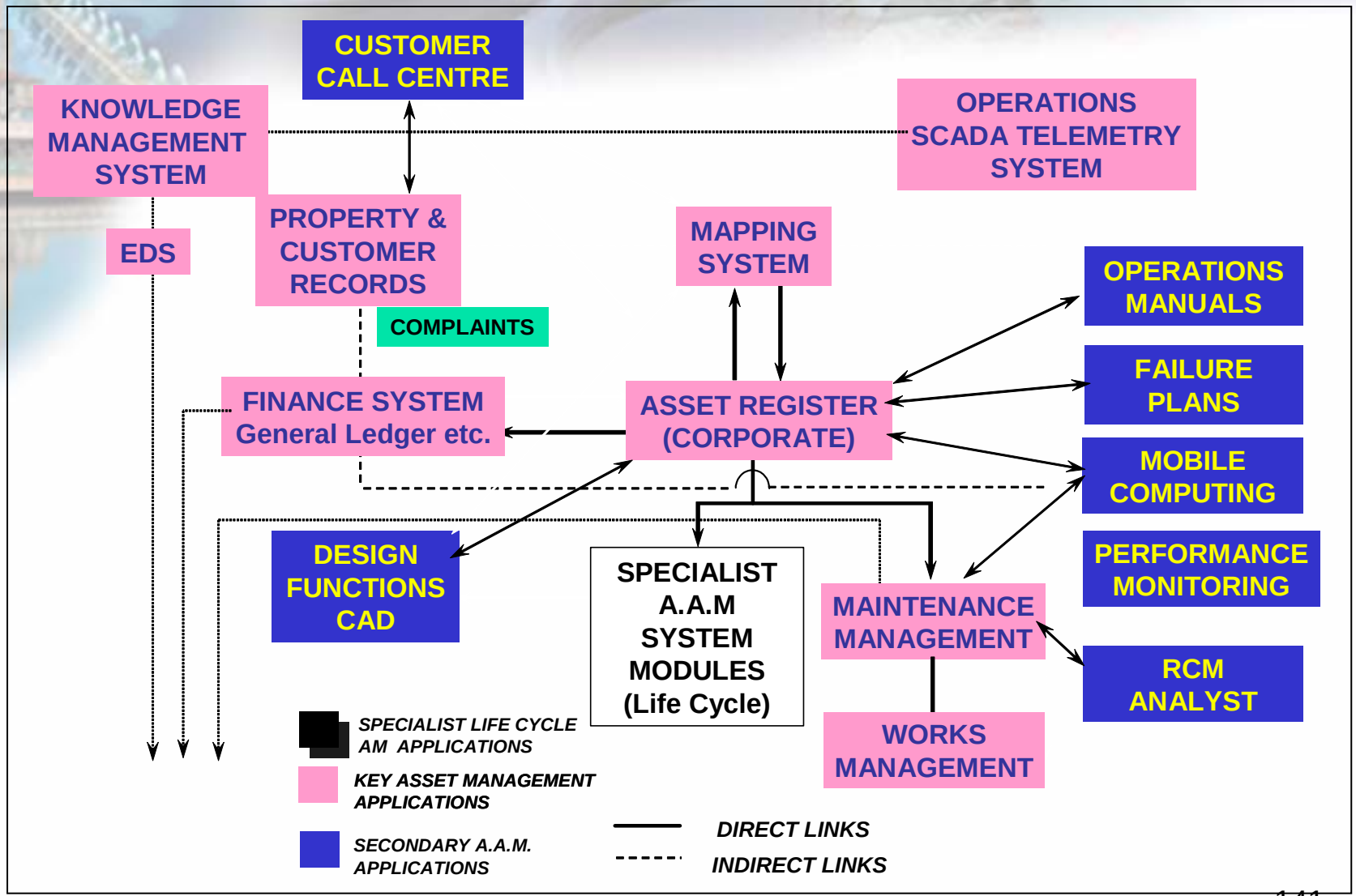


Plug-In Applications May Be Relatively Inexpensive:

USEPA's Environmental Finance Center (Boise State) "CAP*Finance*"



Idealized Model of Integrated Functionality



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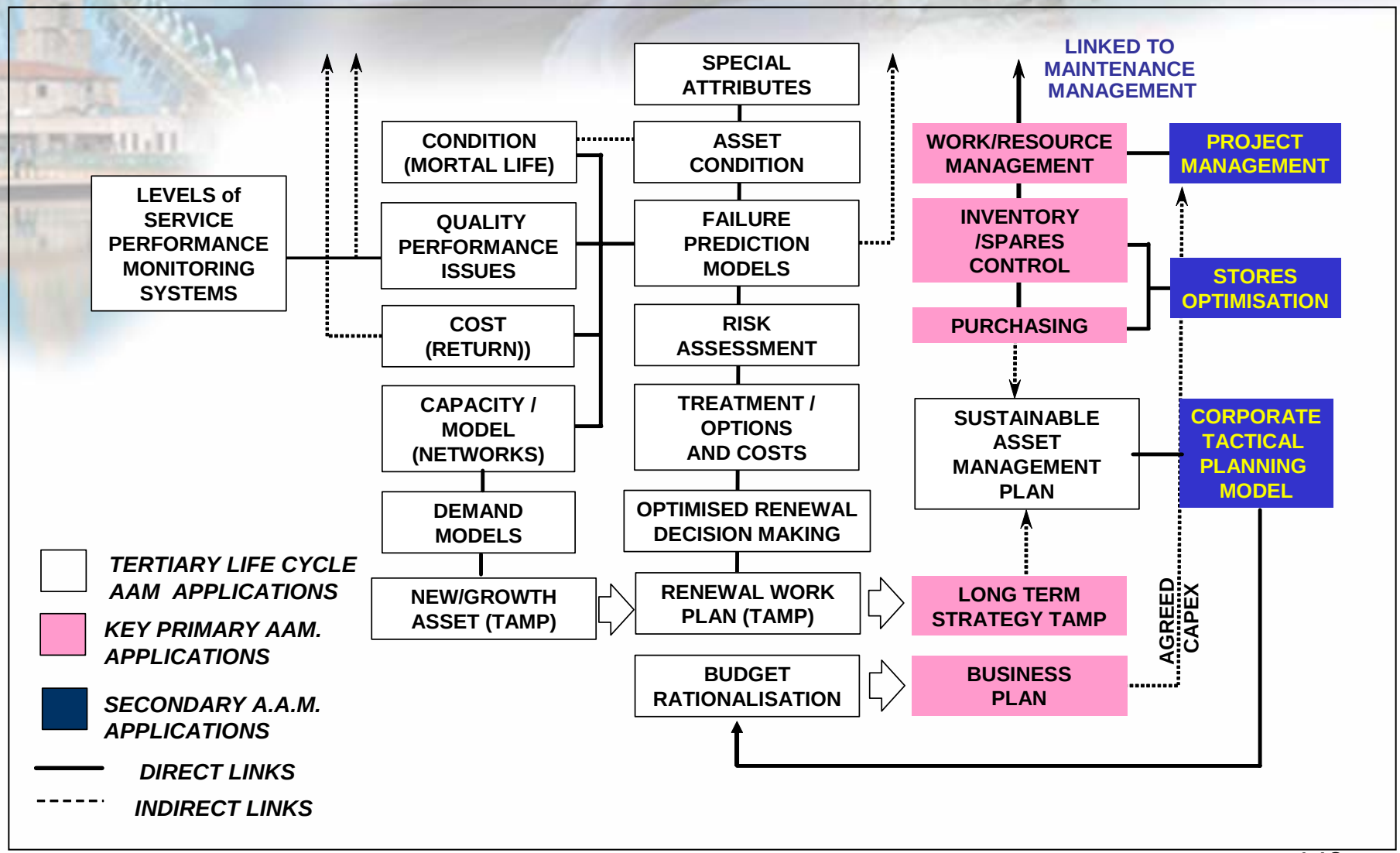
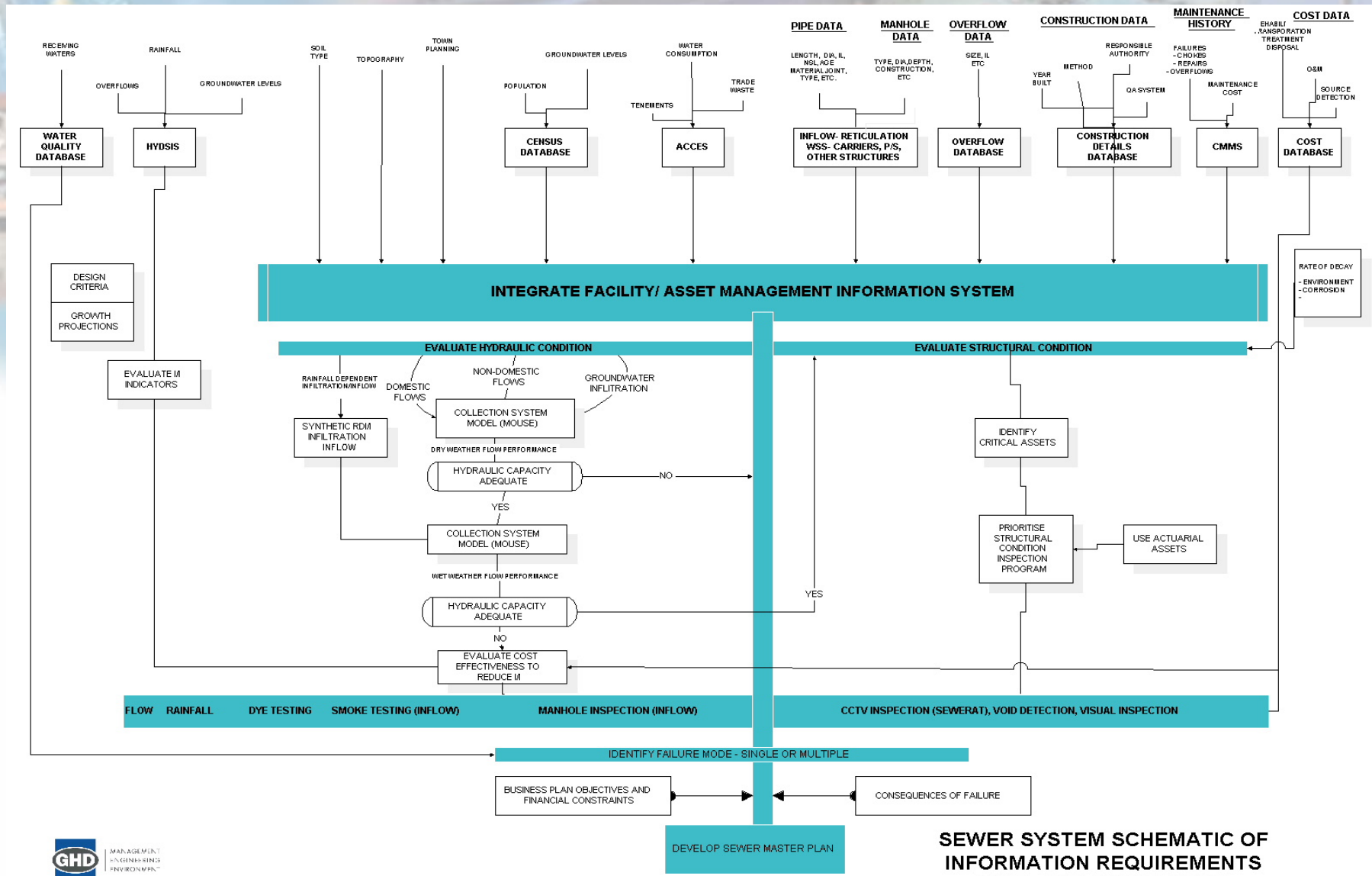


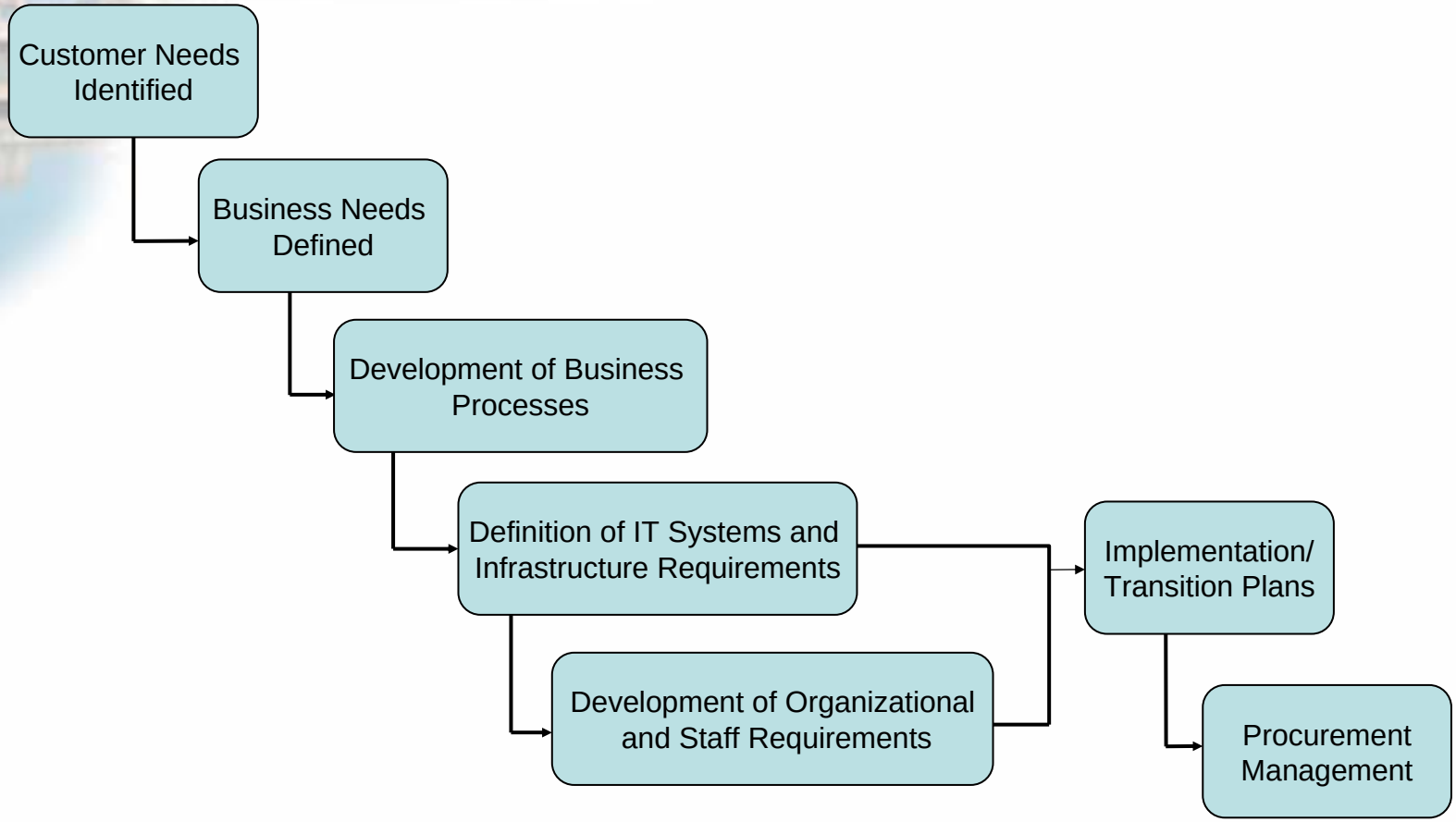
Dataflow Diagrams – Work Process + Data



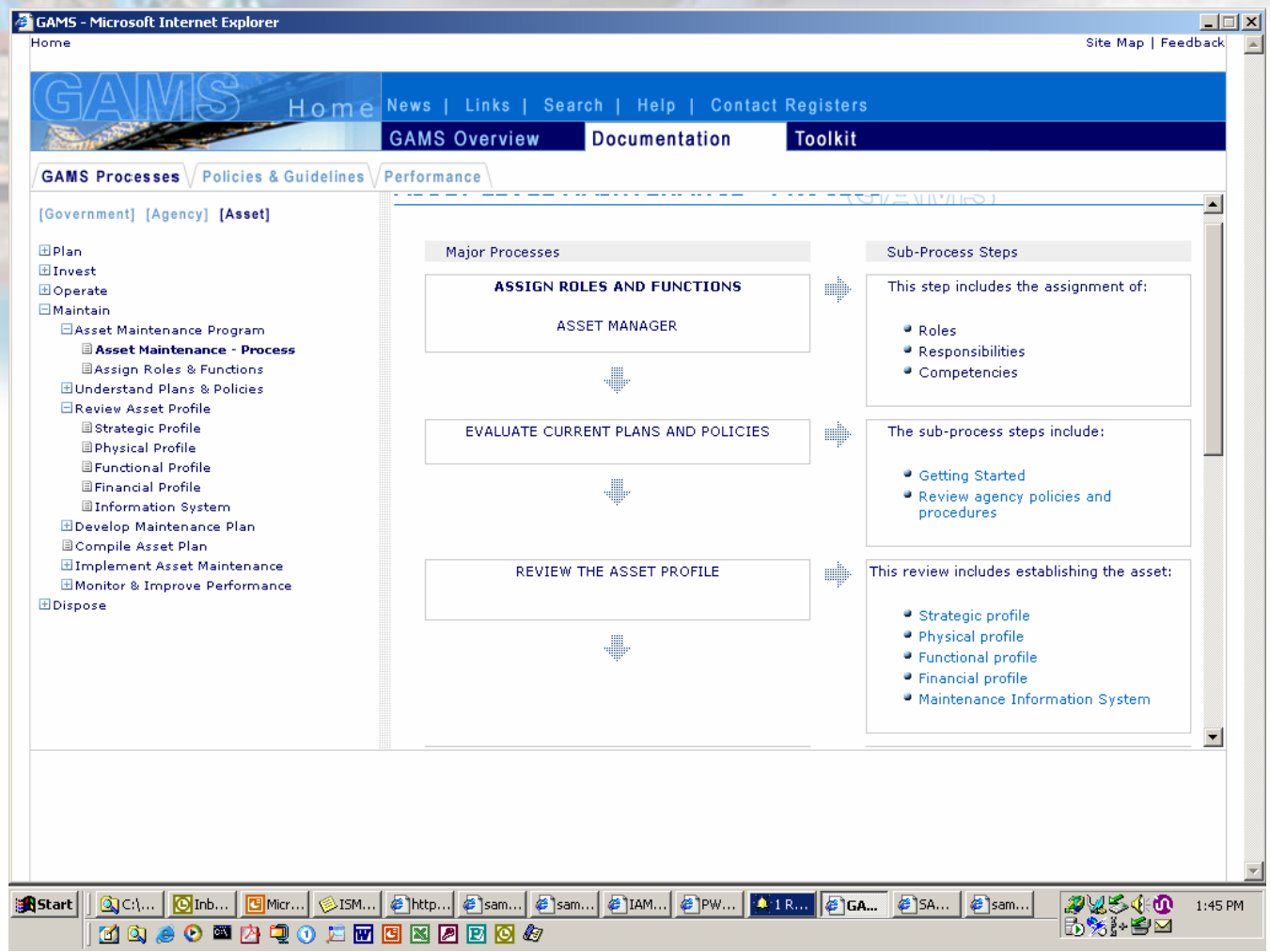
SEWER SYSTEM SCHEMATIC OF INFORMATION REQUIREMENTS DATA AND KNOWLEDGE

GHD MANAGEMENT ENGINEERING ENVIRONMENT

The System Design/Integration Process

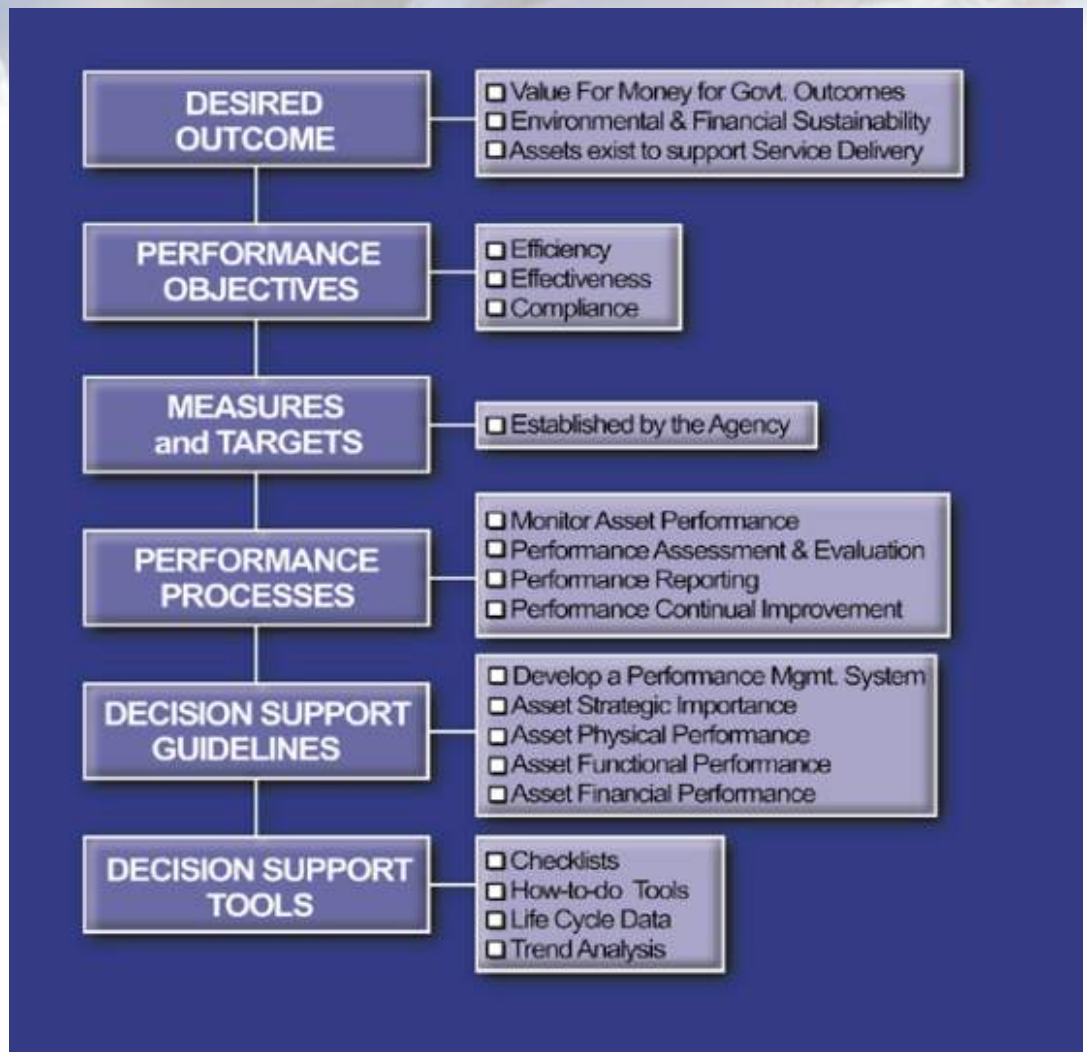


4. Knowledge Management



Bedding down EAM work processes in the organization is critical to sustaining long term improvements

4. Knowledge Management



GAMS IN A "MANAGING FOR OUTCOMES" ENVIRONMENT

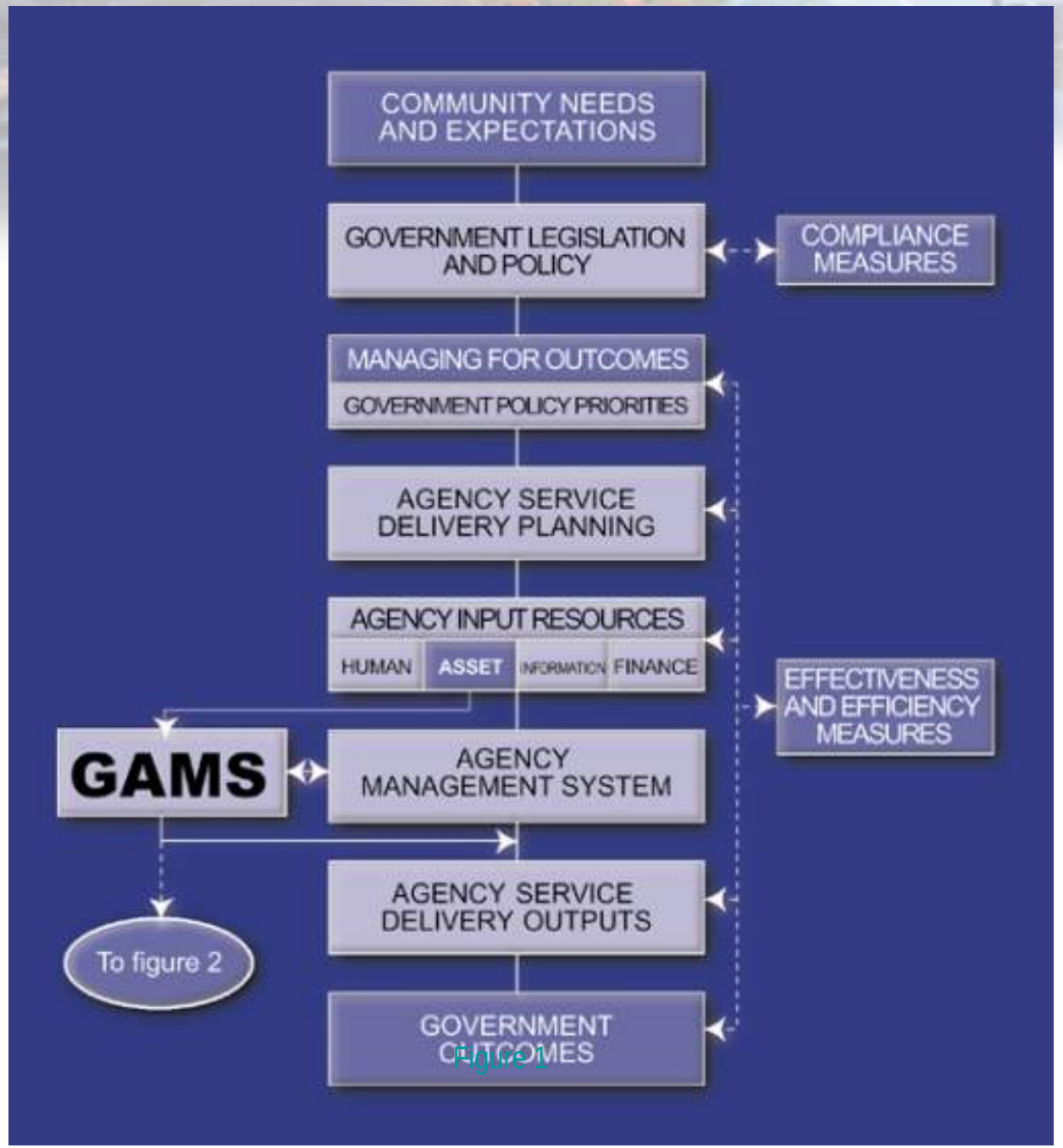


Figure 1

THE GAMS ASSET MANAGEMENT FRAMEWORK

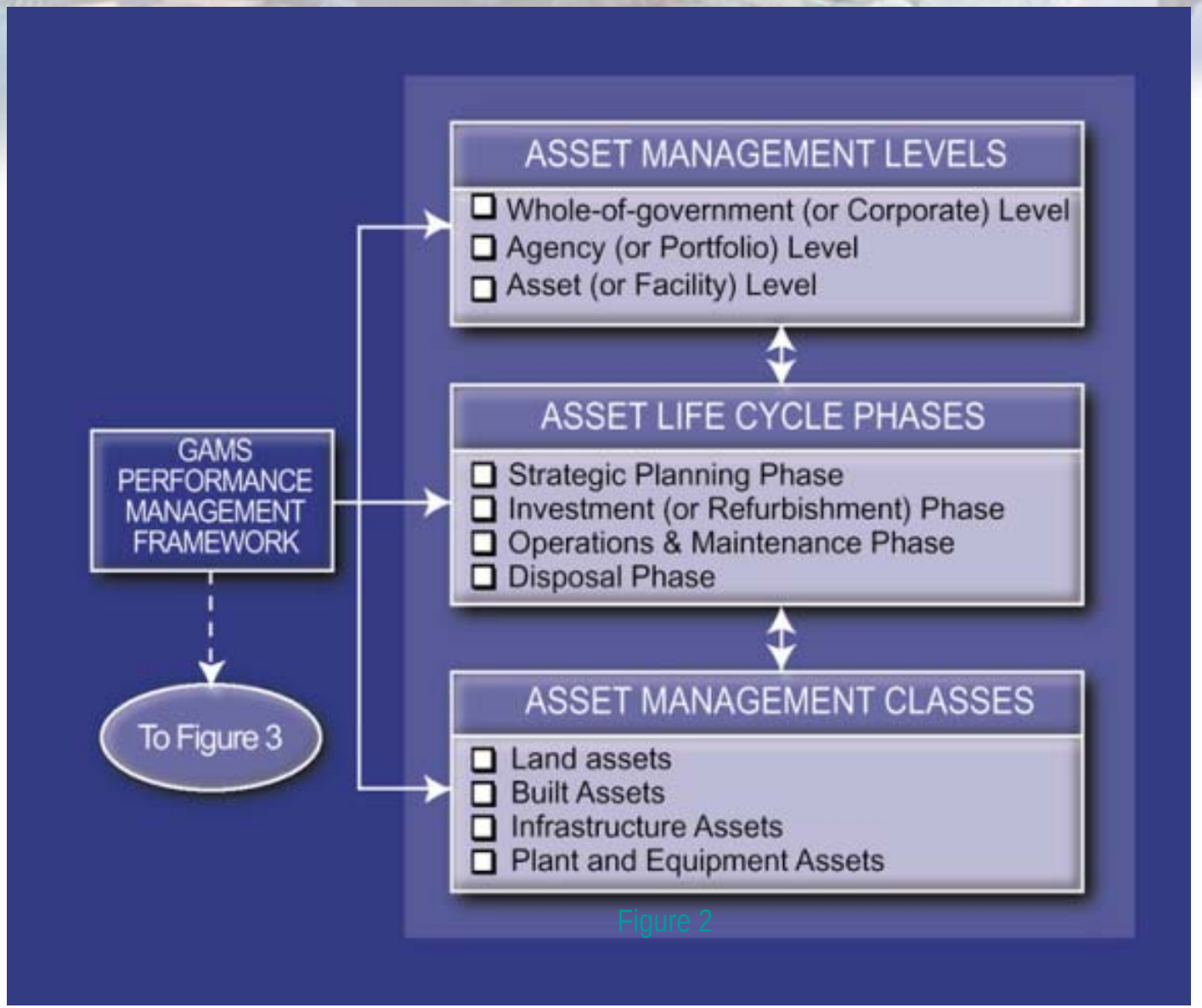


Figure 2

GAMS PERFORMANCE MANAGEMENT FRAMEWORK

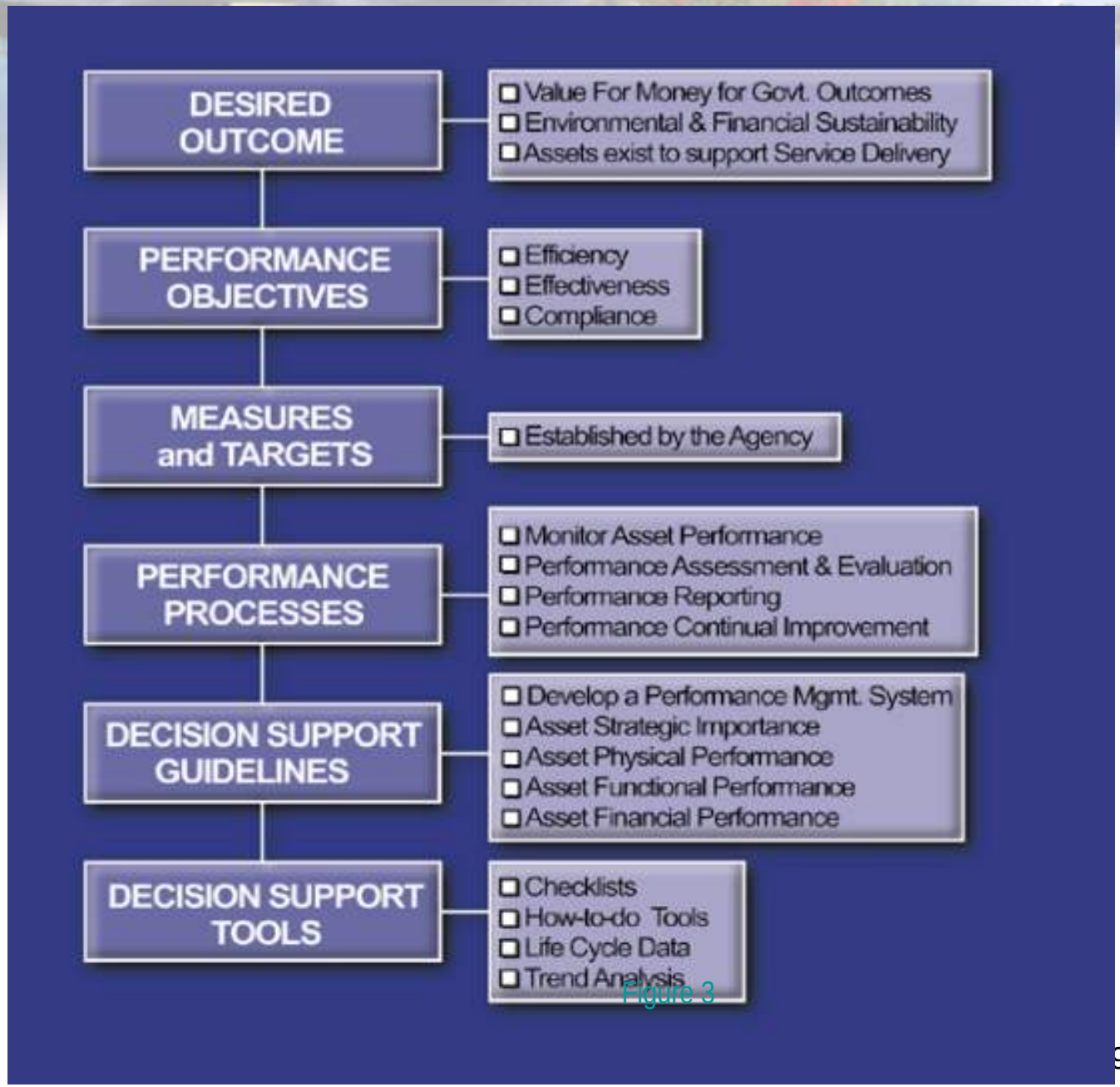
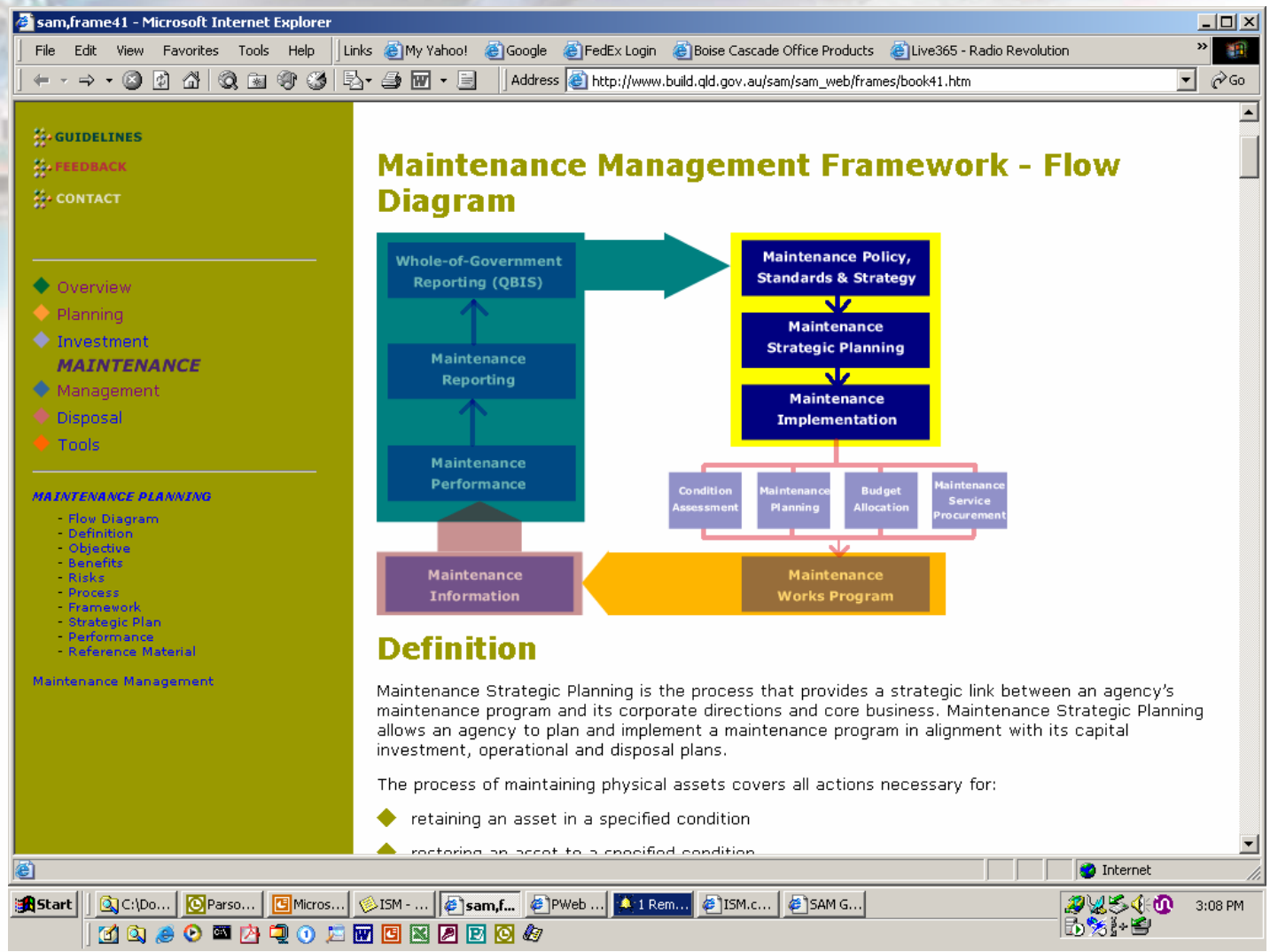
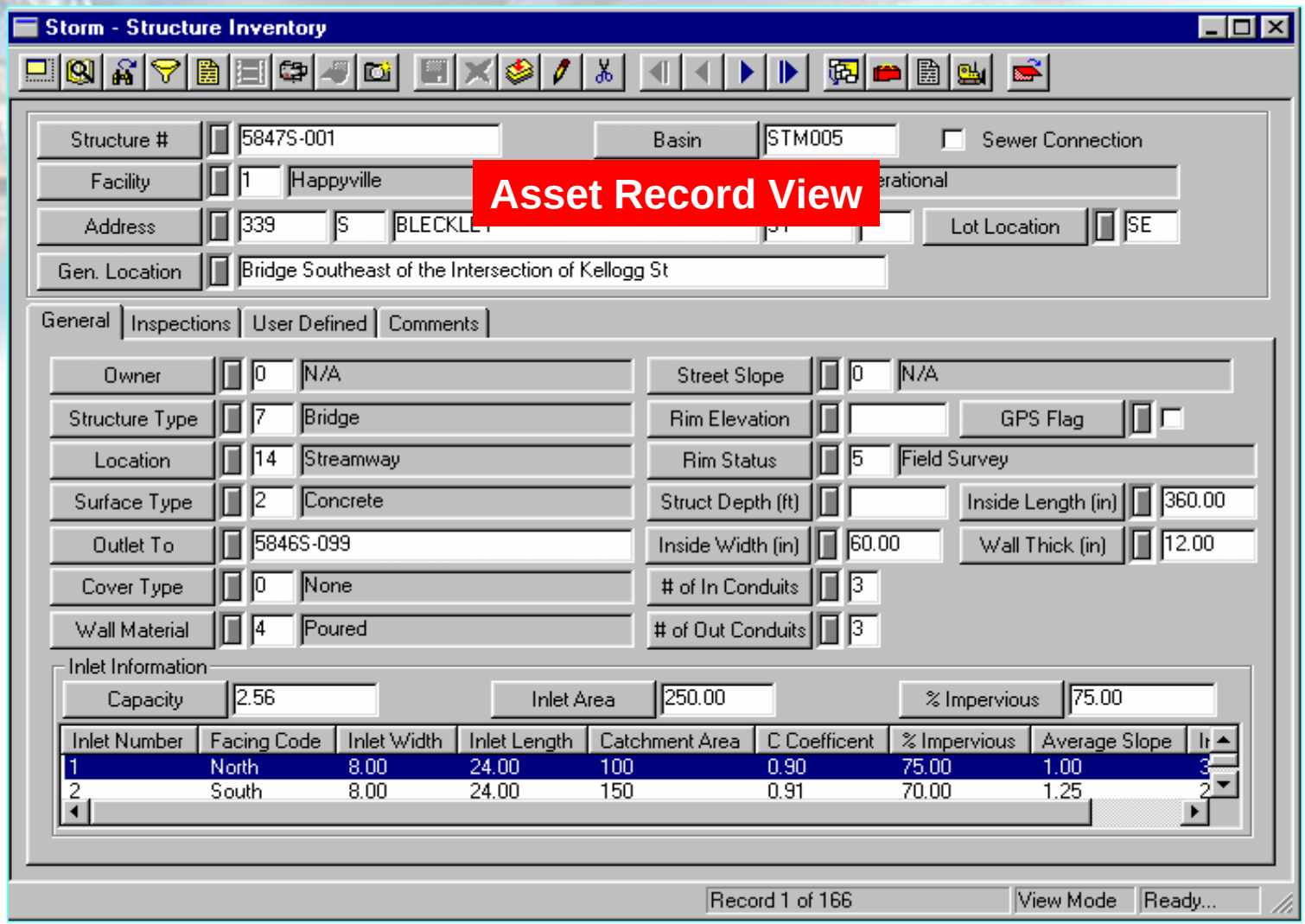


Figure 3

4. Knowledge Management



The Role of the “Data View”



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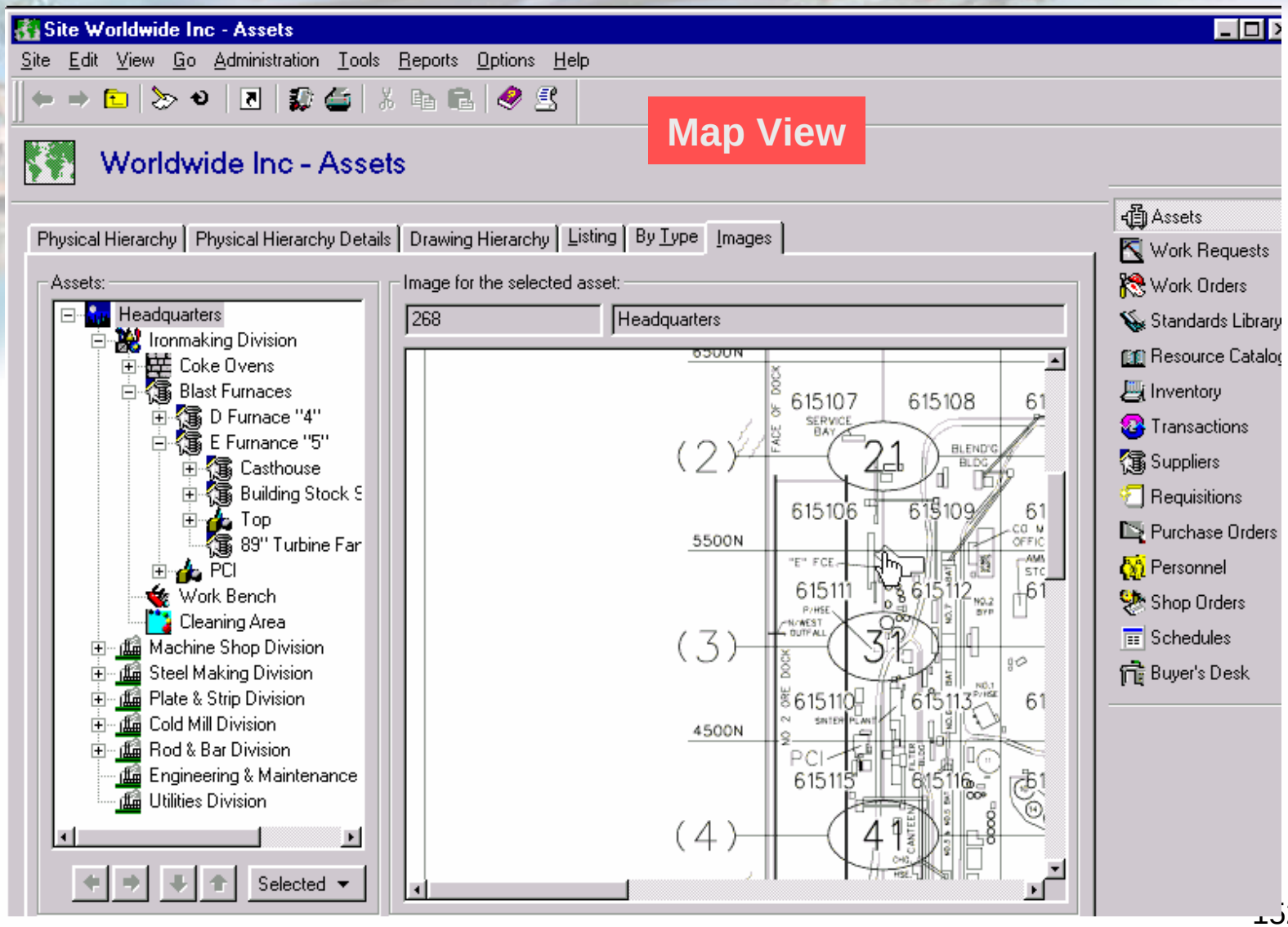
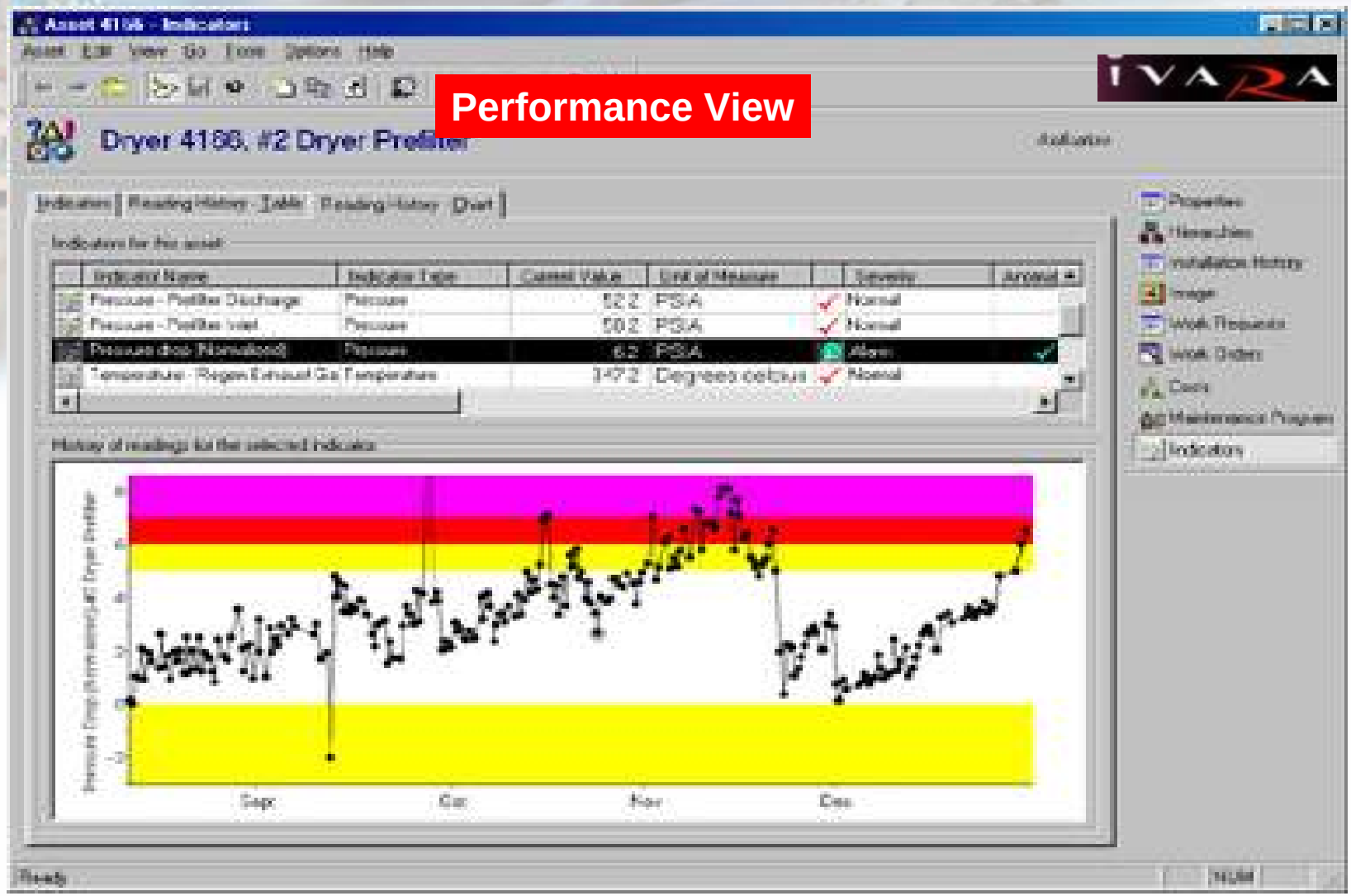
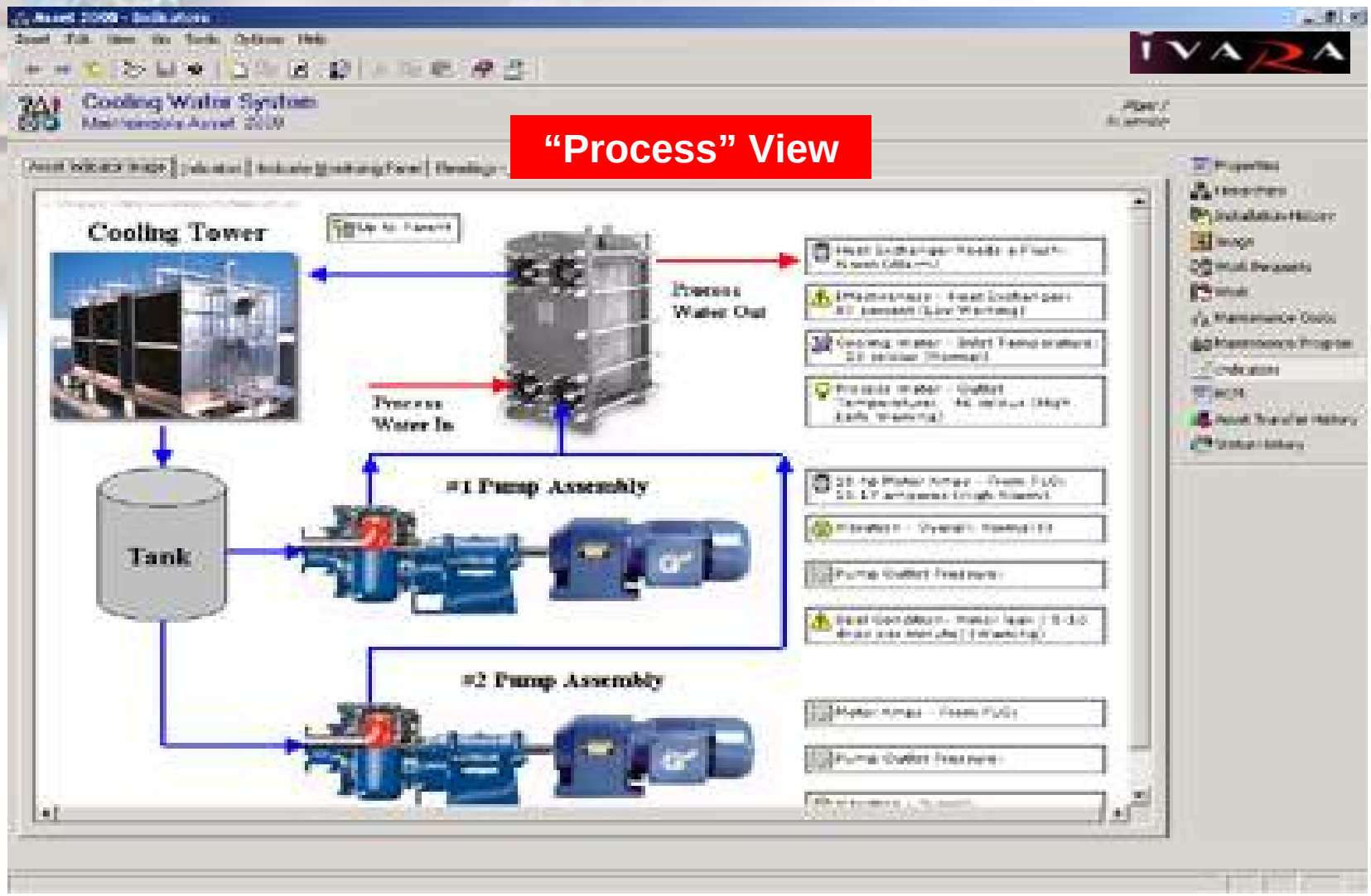


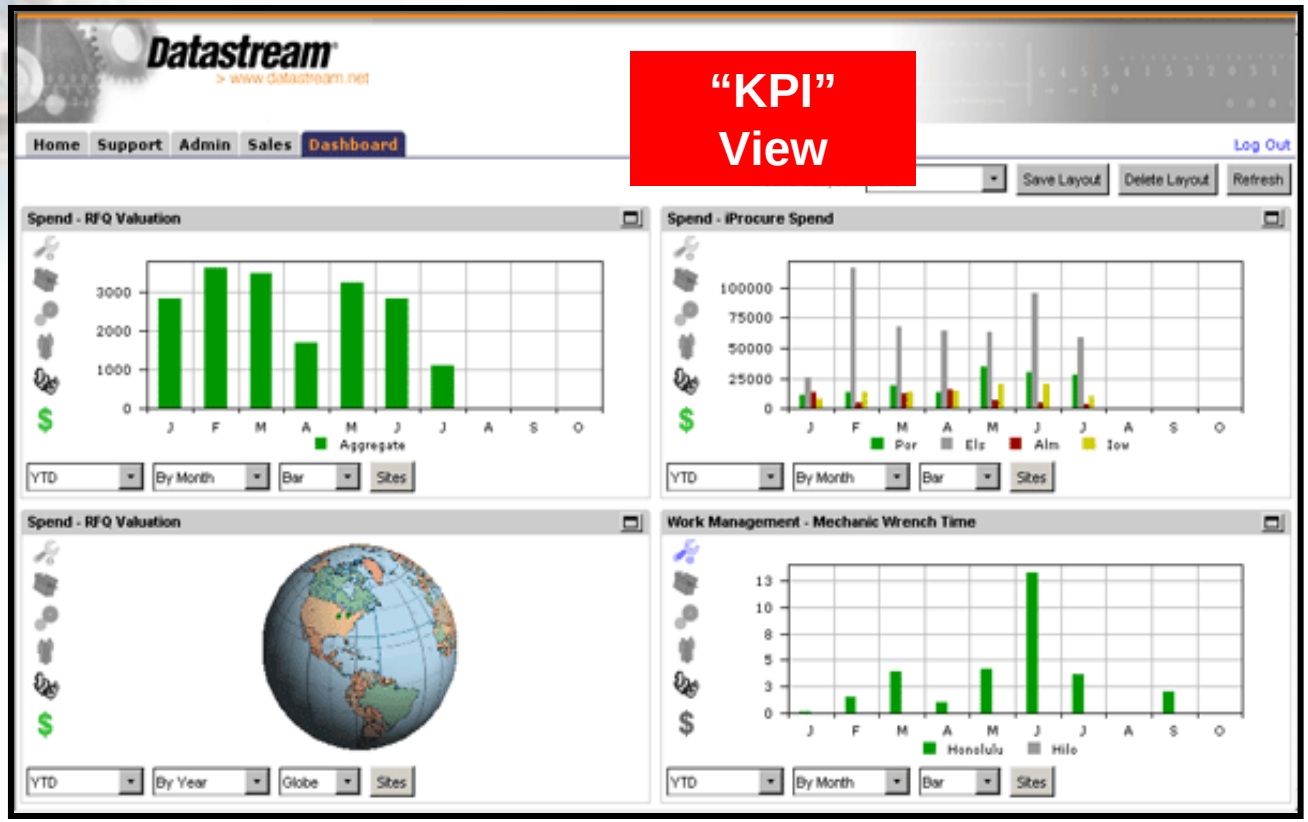
The Role of the “Data View”



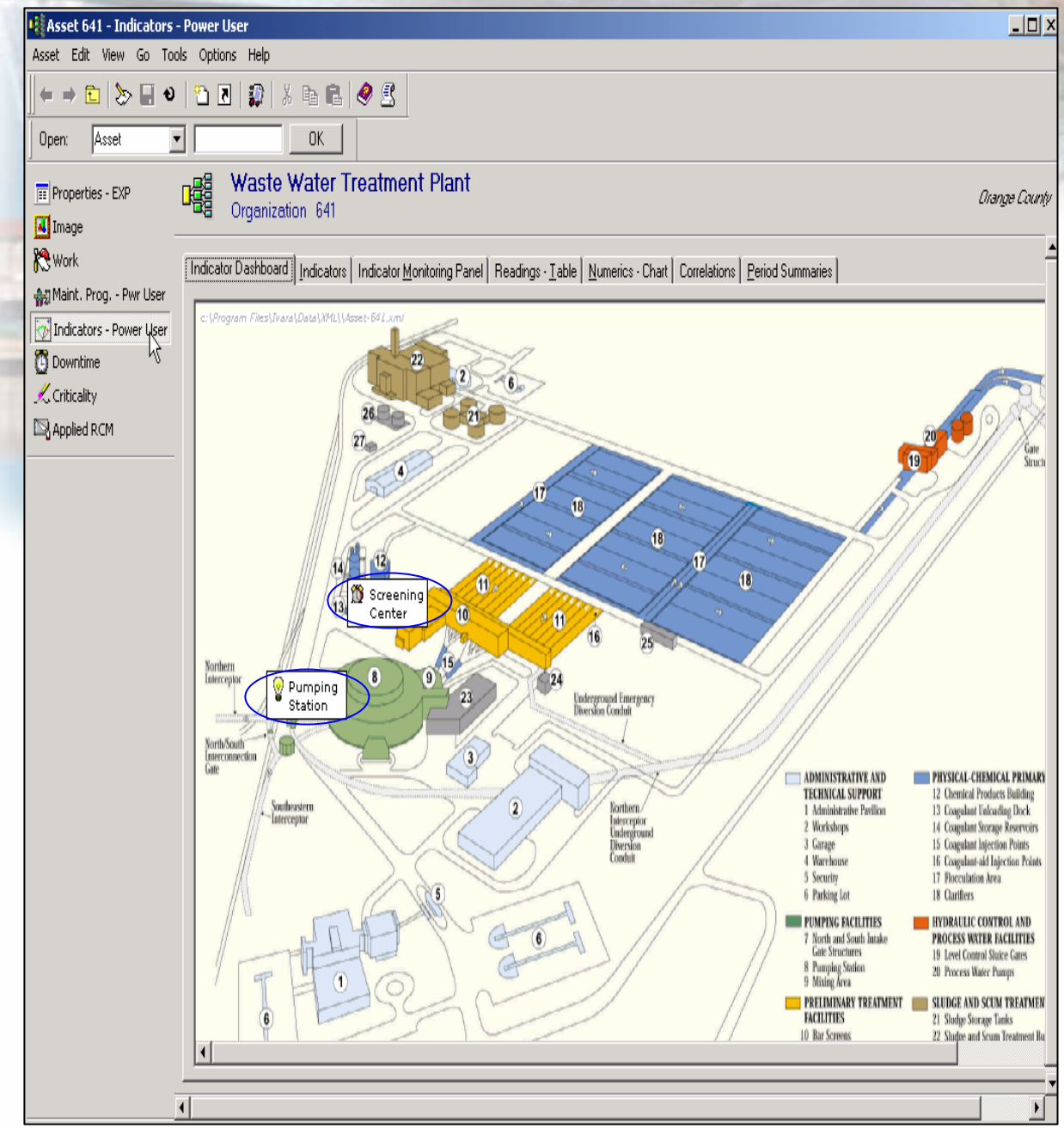
The Role of the “Data View”



The Role of the “Data View”

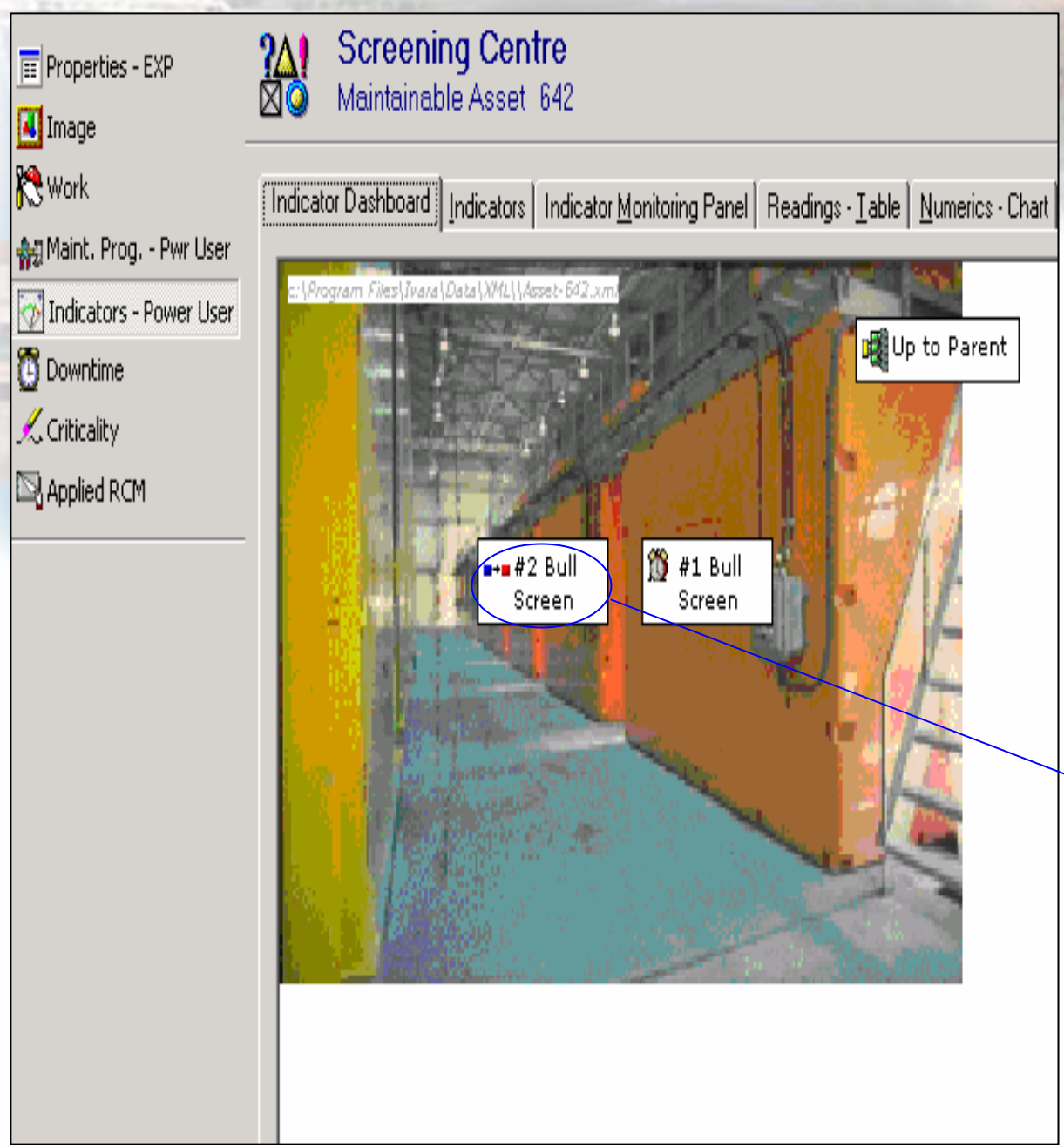


Navigation by Images

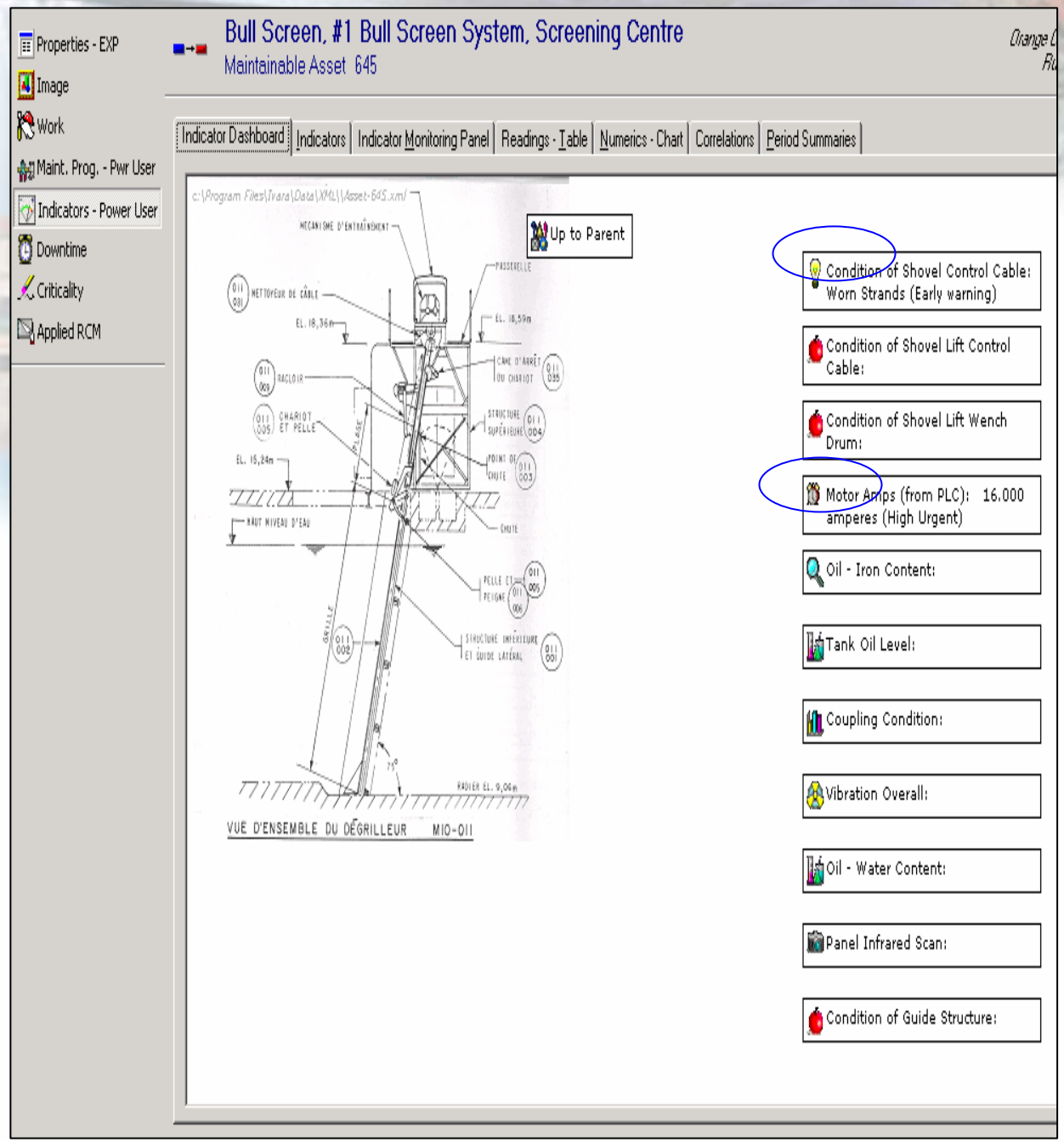


- Click on the hotlinks to drill in.
- Icons (blinking) show highest alarm on each hotlinked asset
- Easy to use/understand

Navigation by Images



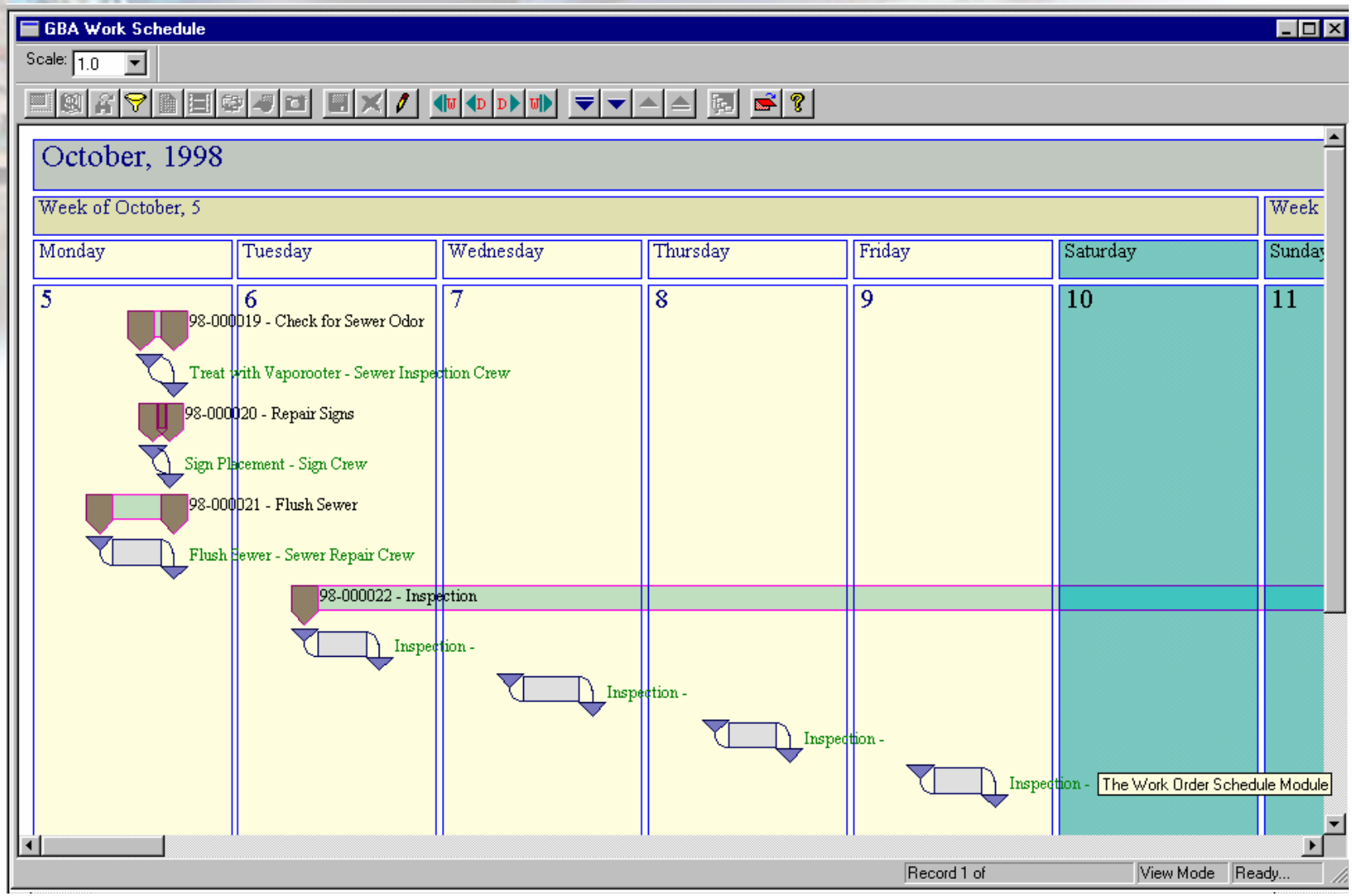
- Down one level at the Screening Center
- More hotlinks to child assets
- Blinking icons for assets in alarm condition



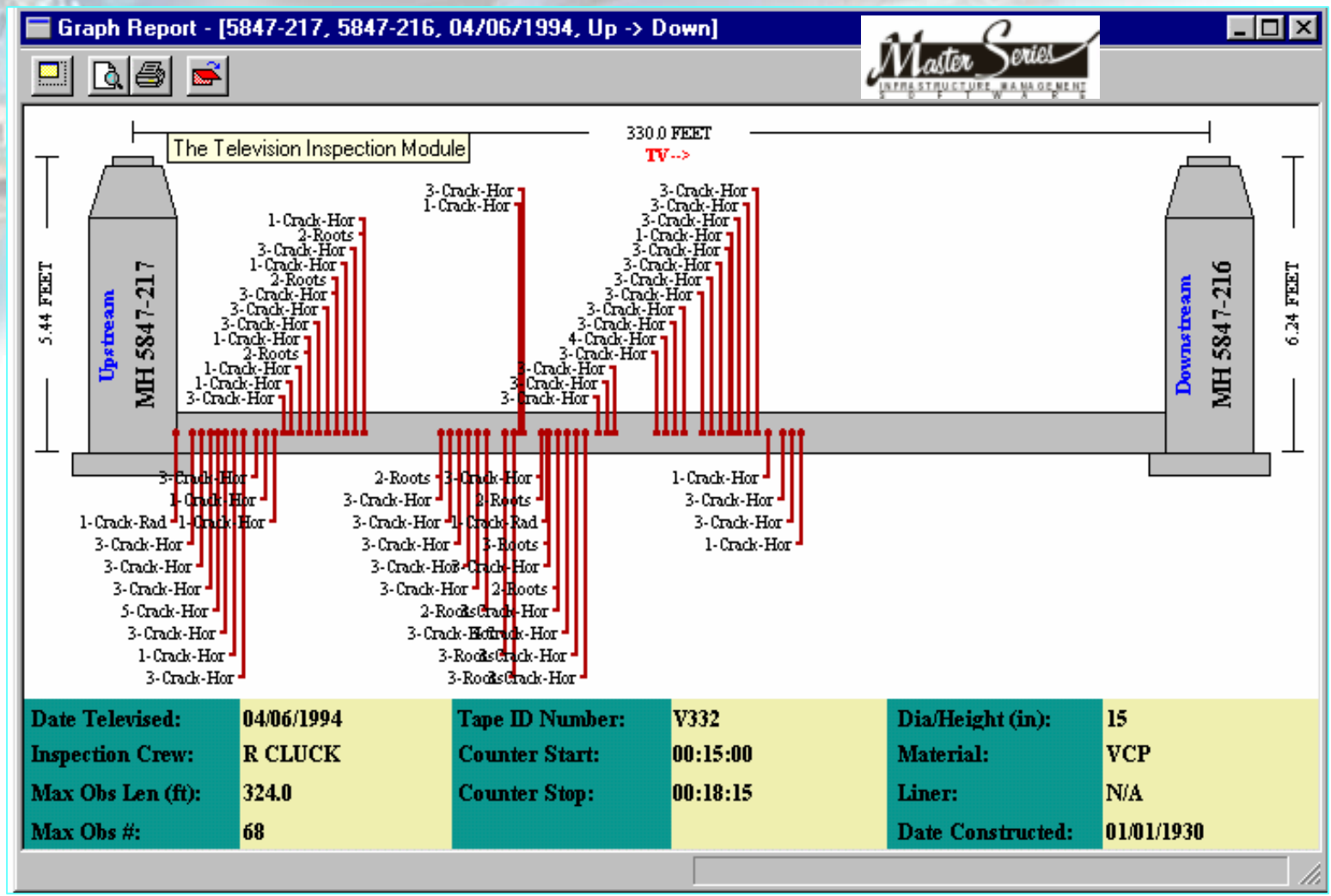
Navigation by Images

- One more level down
- Number of levels not restricted
- Key indicator dashboard on critical assets
- Blinking icons show severity, words show condition
- Interactive links (right mouse click)

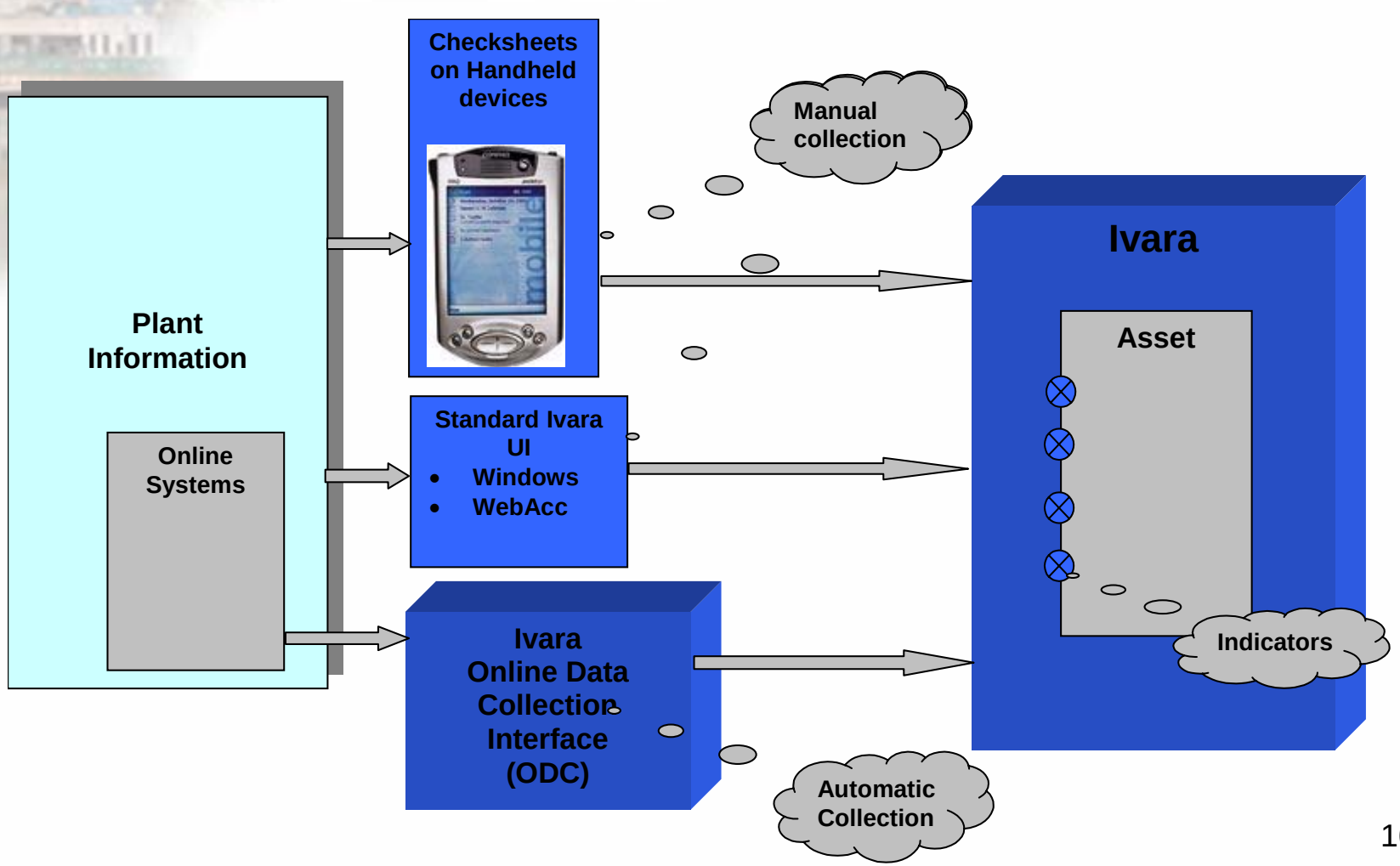
Friendly Work Process Interface



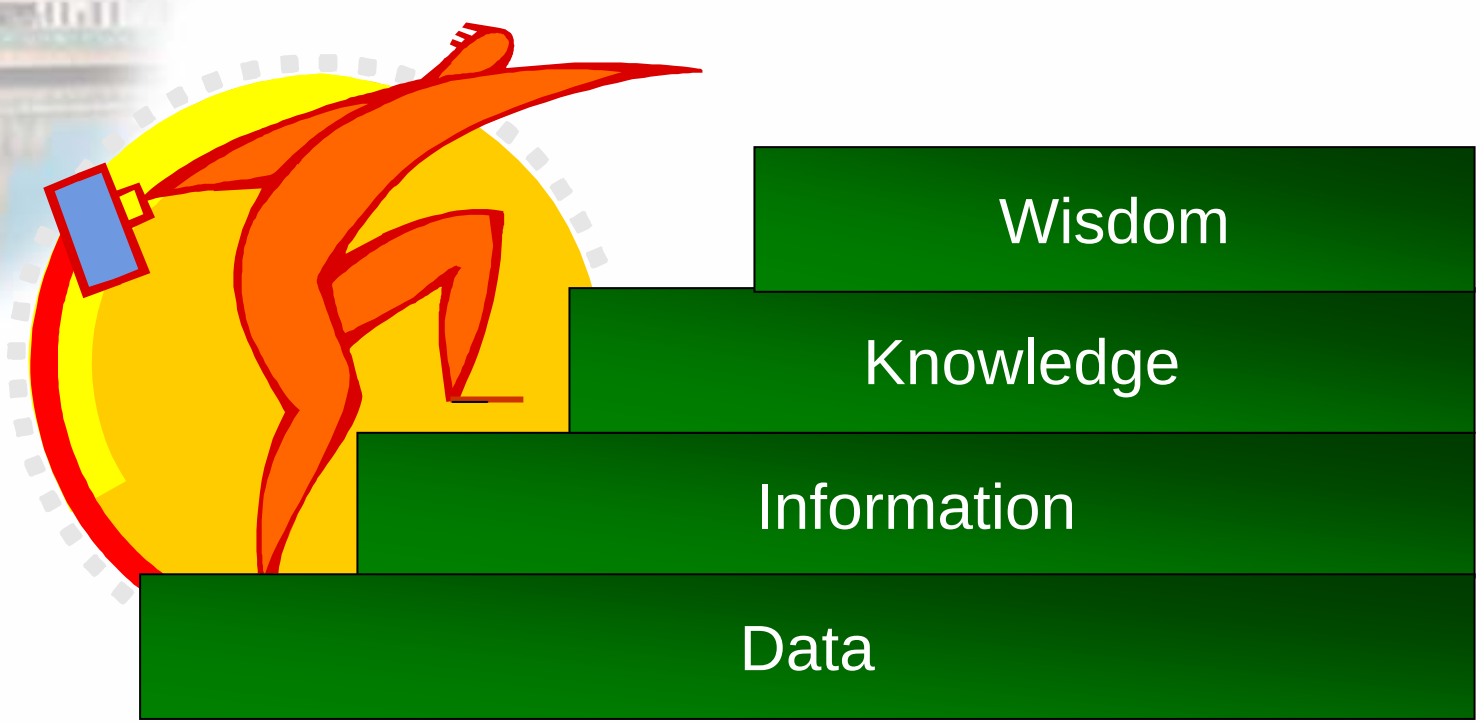
Friendly Work Process Interface



Asset Data Collection Interfaces

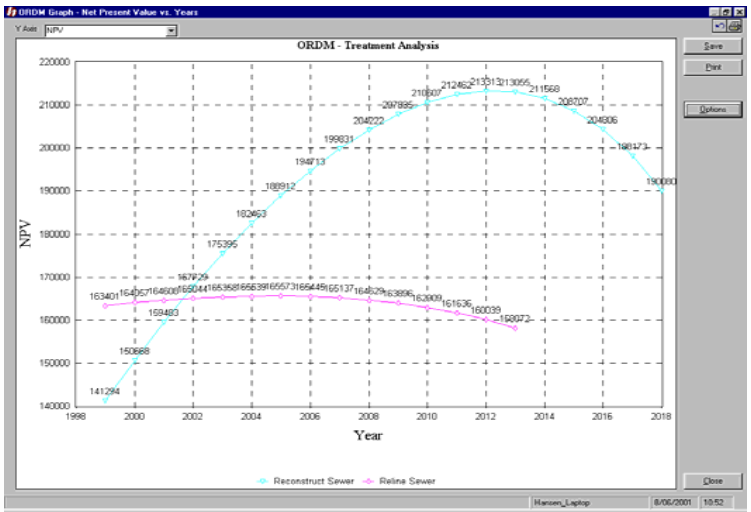


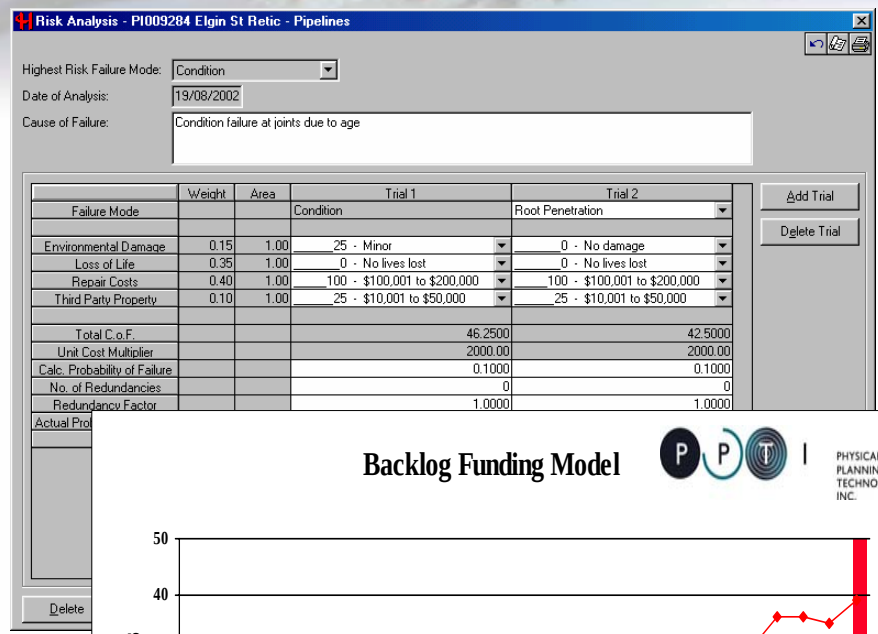
An AAM Program Is All About Knowledge Management

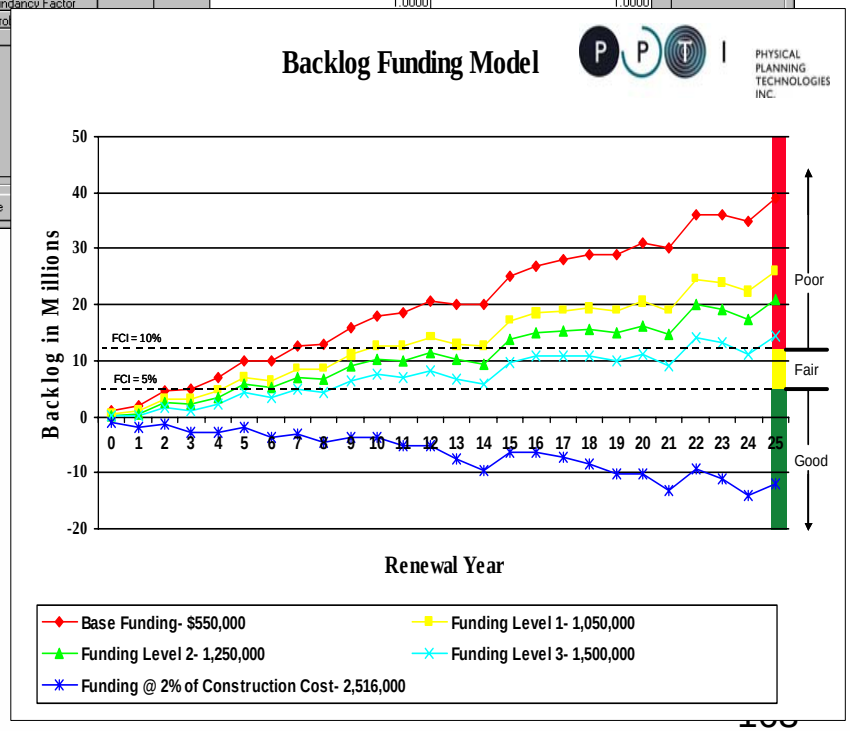


It's All About Better Decision Making

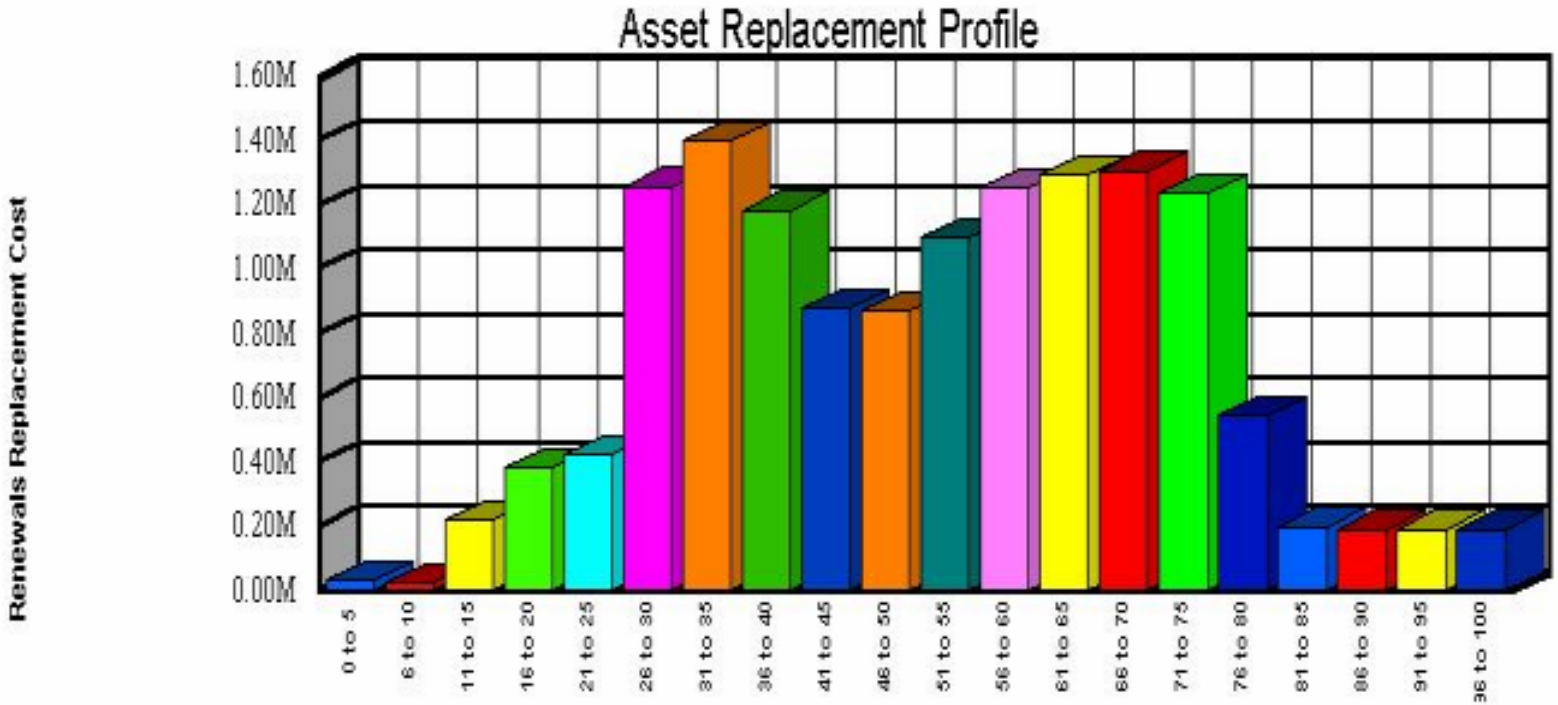
- Decision points
  - "Opex" & "Capex"
  - Optimal Renewal
  - Annuity renewal funding







Effective Presentation is Key to Good Decision Making



Displays asset replacement profile and related annuity (reserve) values for selected asset groups

5 Phases of AM IT Improvement

PHASES	DELIVERABLES
PHASE 1: Describe Current System Architecture and Structural Limits	Ø Description
PHASE 2: Determine Functionality "Gaps"	Ø "Model" AMIS structure Ø System functionality assessment Ø Functionality gaps identified Ø Functionality specifications
PHASE 3: Identify "Gap Elimination Strategies"	ø Development/deployment strategies
PHASE 4: Execute the Identified "Gap Elimination Strategies"	Ø Selection process Ø Systems development work plan Ø Systems integration work plan
PHASE 5: Train Personnel/Teams and Institutionalize	Ø Training program structure Ø Training program content Ø Training oversight

Skills Transfer Techniques

- "AM University"
  - Collaborative workshops
  - Classroom training
  - Side-by-side mentoring / "skills impact teams"
  - Brown bag training
- Peer-to-peer interviews
- Knowledge Management System

Lessons Learned…

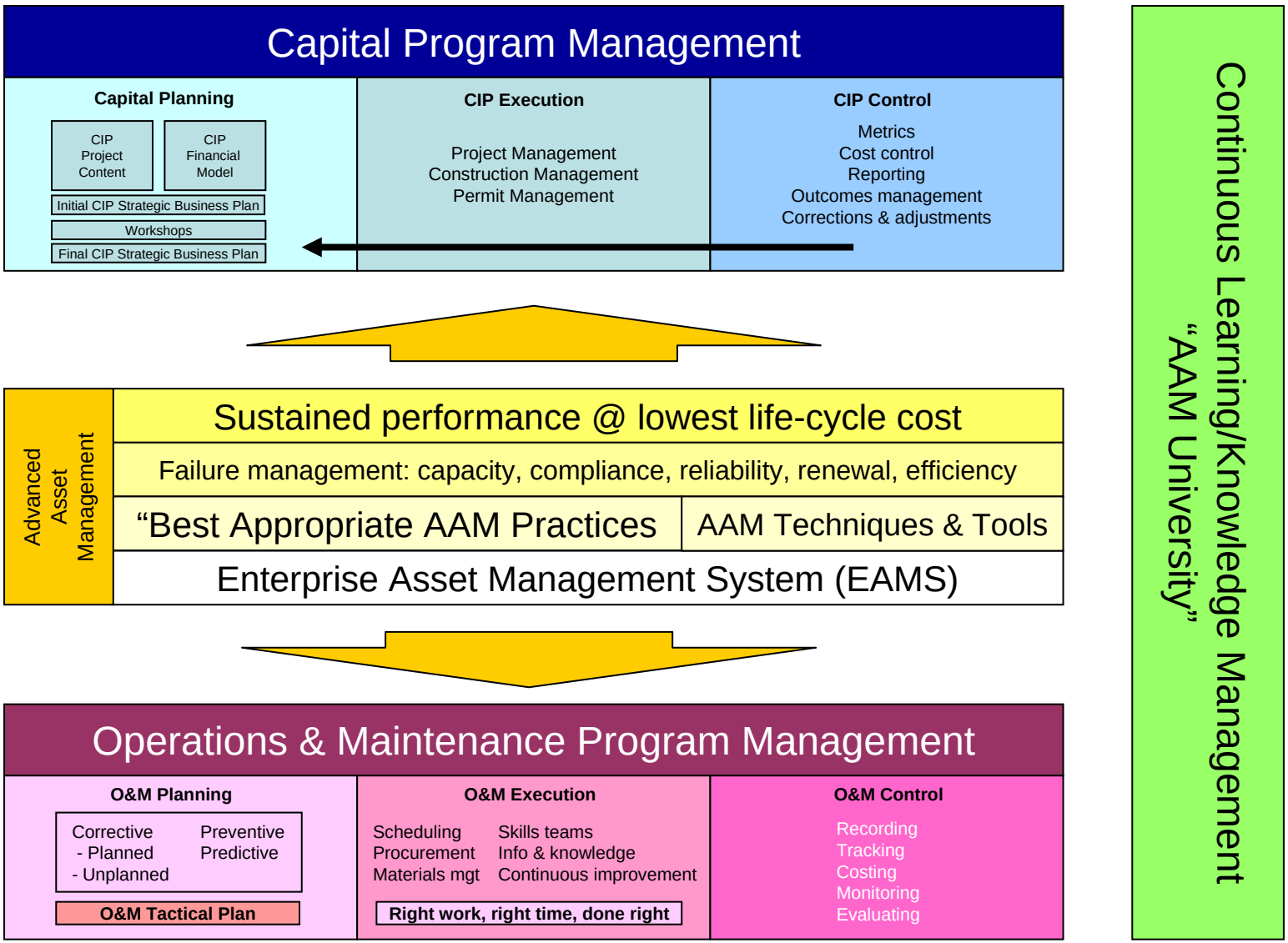
- Keep it simple – it's more common sense than rocket science
- Keep it organized and focused
  - Core questions/"storyline"
  - Gap Analysis and Quarterly Work Plans
  - AAM Charter
- Focus on the relevant decision process – who should be asking what questions and what is needed to give credible answers
- Implement in this order:
  1. Concepts and framework
  2. Work processes
  3. Data acquisition and IT development/integration
- Use prototype projects, Skills Teams
- Focus where best gains can be made first
- It's ultimately all about knowledge management

AGENDA

Day 2

- *Summary of Day 1; Outline of Day 2*
- *Core Question 4: What Are My Minimum "Life-cycle-cost" CIP and O&M Strategies? (Continued from Day 1)*
- *Core Question 5: Given The Above, What Is My Best Long-term Funding Strategy?*
- *Lunch*
- *Case Study 1: Deploying An AAM Program*
- *Case Study 2: Meeting The IT Challenge – Toward An Enterprise Asset Management System (EAMS)*
- *Summary, Addressing Your Questions, Comments, Self-audit*

Parsons/GHD AAM Model



The Five Core AM Questions

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 remaining useful life? • What is its economic value?
2. What is my required sustained Level Of Service?
3. Given my system, 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 "minimum life-cycle-cost CIP and O&M strategies? • What alternative treatment options exist? • Which are most feasible?
5. Given the above, what is my best long-term funding strategy?

Steps In Total Asset Management Planning

1 Identify Current Levels of Service

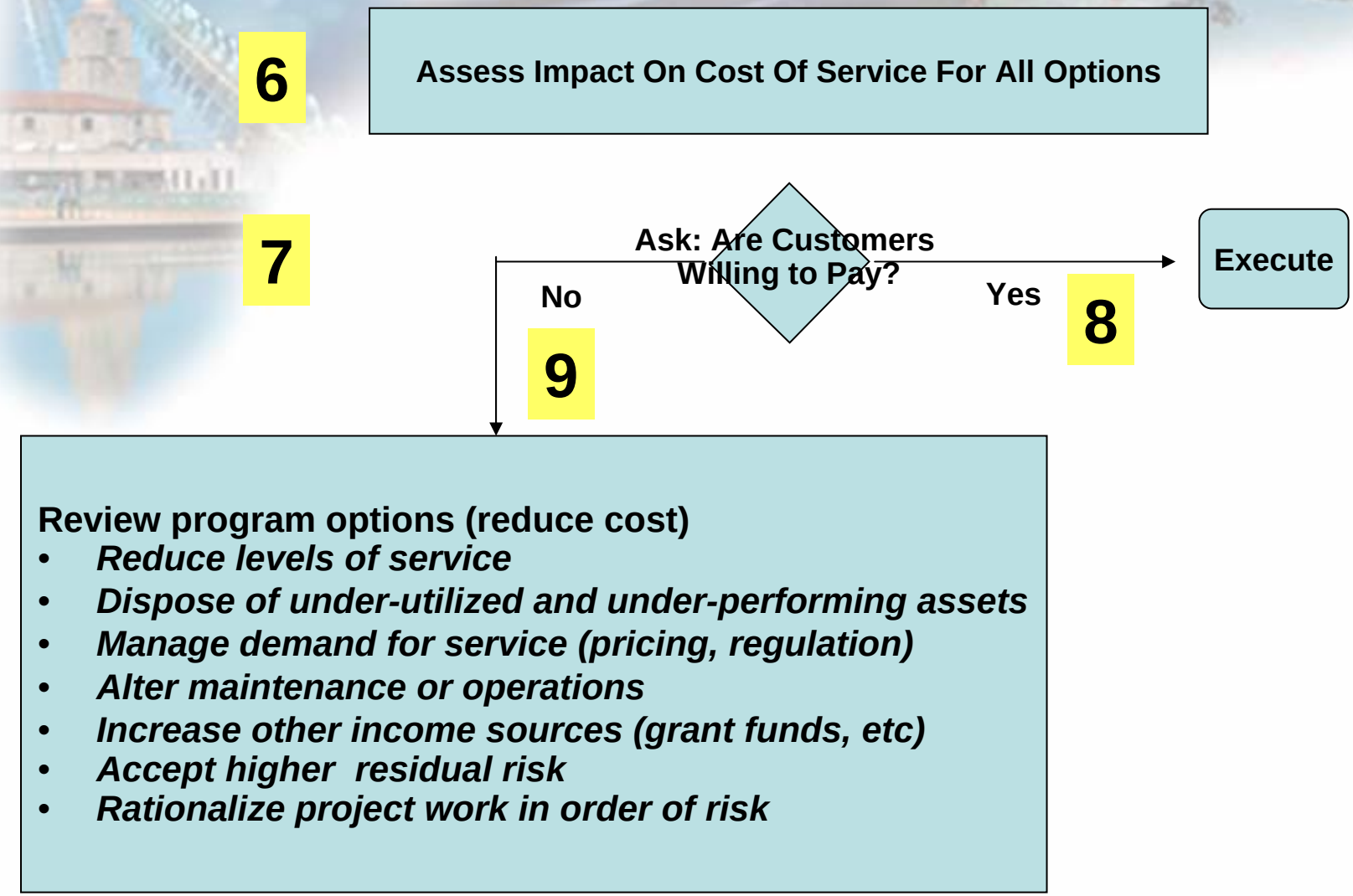
2 Assess Existing Assets:
- *Physical Details*
- *Condition/Remaining Life*
- *Performance*
- *Capacity (Current / Ultimate)*

3 Predict Demand:
- *Capacity / Demands*
- *Levels of Service*
- *Performance / Risk*

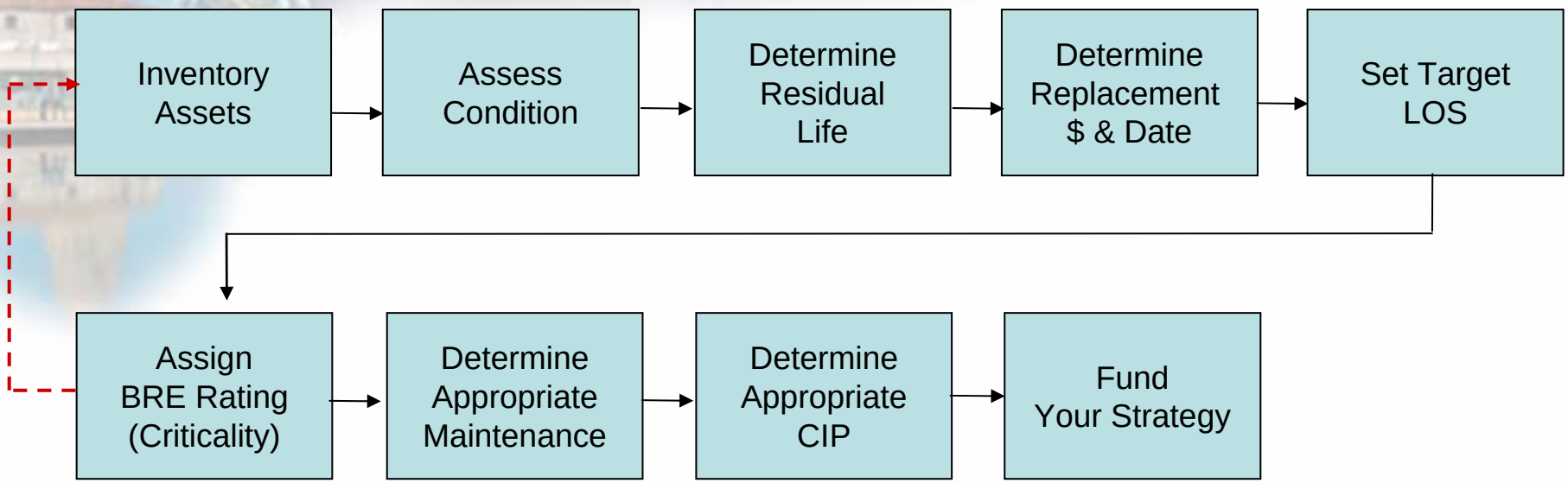
4 Predict Mode of Failure
- *Capacity (Due to Growth)*
- *Performance / Reliability*
- *Condition (Age) Integrity*
- *Cost of Service*

5 Examine All Feasible Treatment Alternatives:
New Assets / Renewal / Growth / Efficiency
Improved levels of service
Determine all Technical / Financial Options

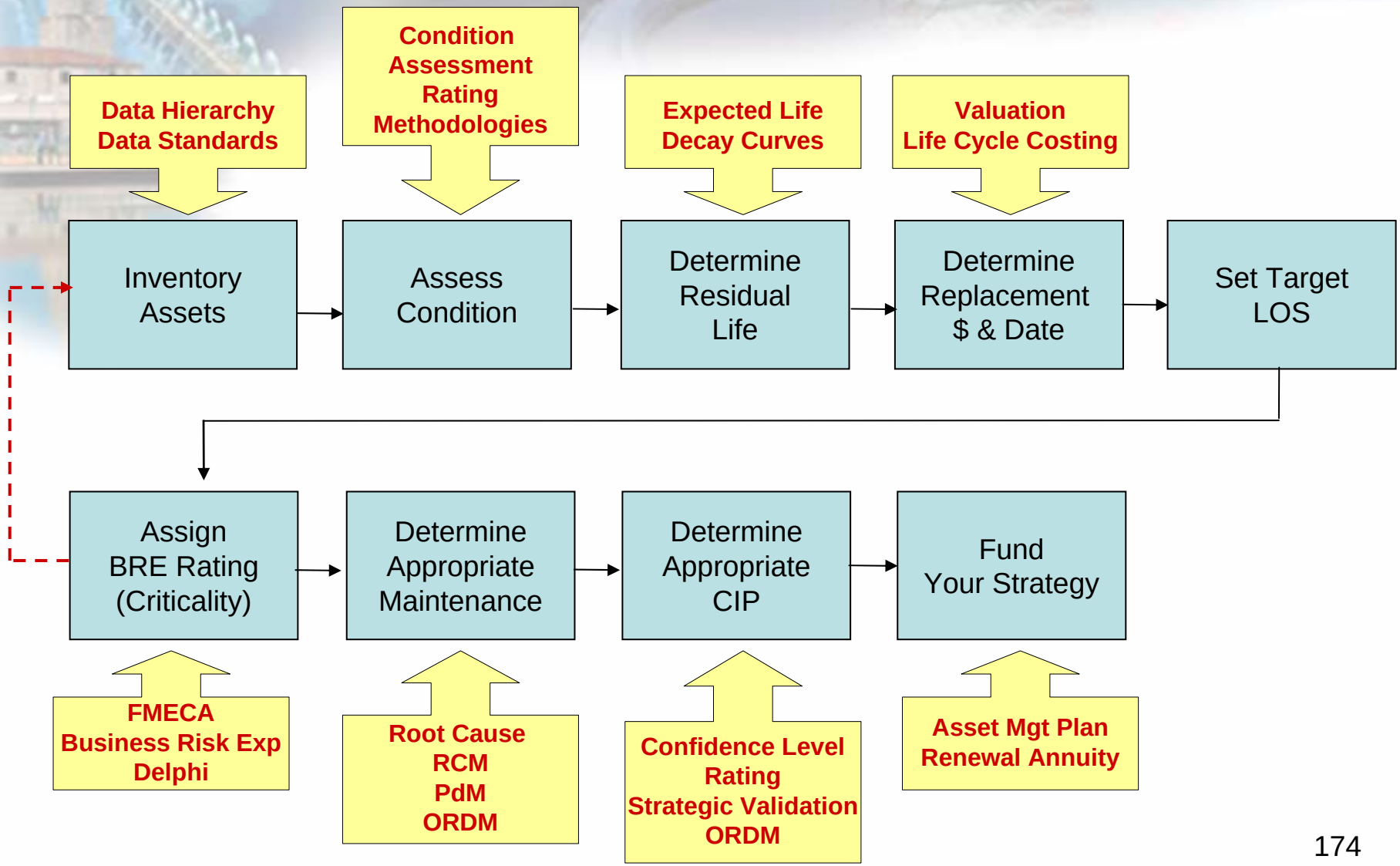
Steps In Total Asset Management Planning (Cont'd)



The AAM Program Process



Core AAM Program Process Tools



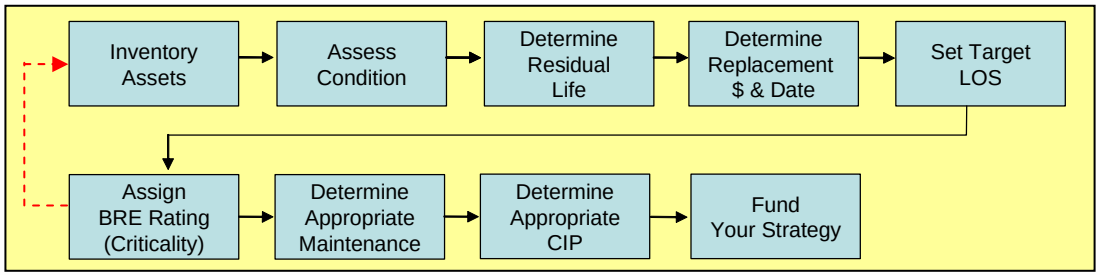
Four Major Stages of AAM Program Deployment

1. Awareness (framework)

Initial Training / Orientation

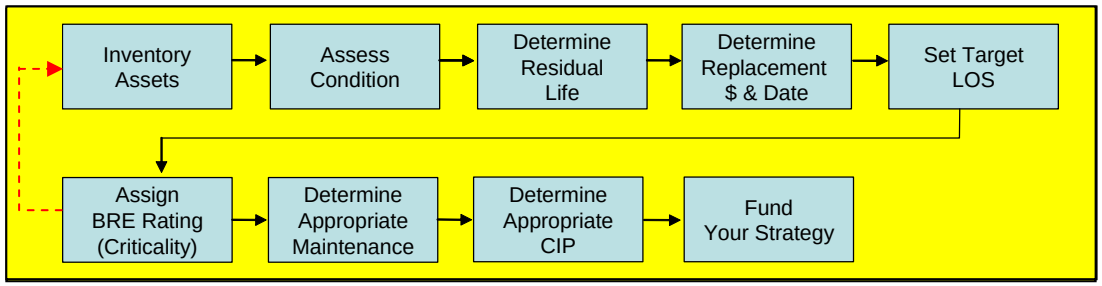
"AM University"

2. Systematic Application (Structure)



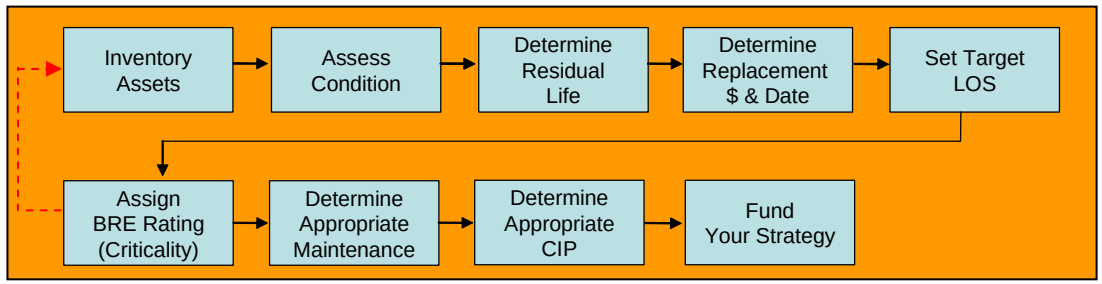
"BOBSRATT" Use what we Have BRE/CLR Level 1

3. Competency (Content & Process)



Gather 7 Load Mentoring BRE/CLR Level 2

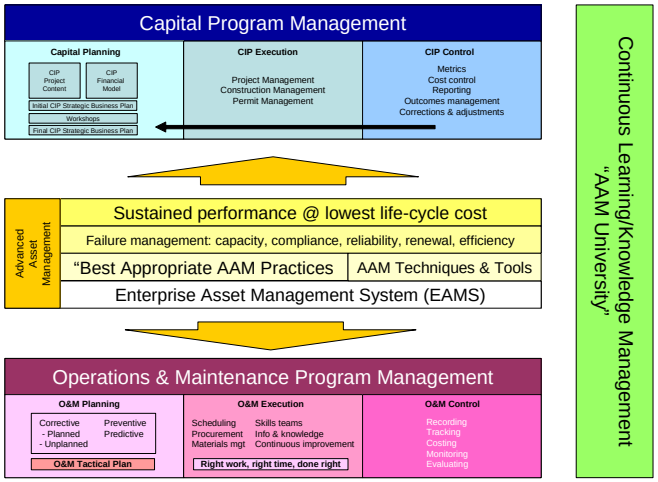
4. Excellence (Sustainability)



Refine, "Culturize" BRE/CLR Level 3

Fitting It All Together

Parsons/GHD AAM Model



Core Questions

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

2. What is my required sustained Level Of Service?

3. Given my system, which assets are critical to sustained performance?

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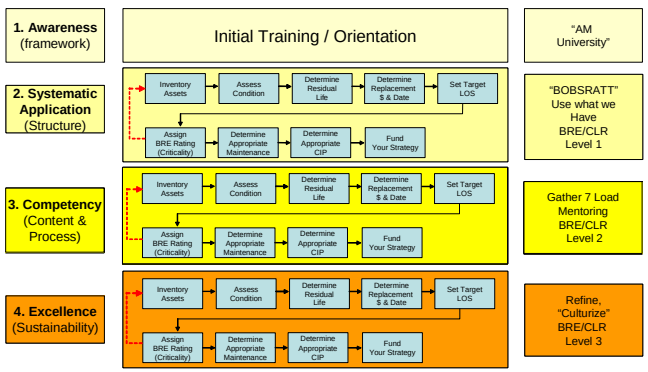
4. What are my best "minimum life-cycle-cost CIP and O&M strategies?

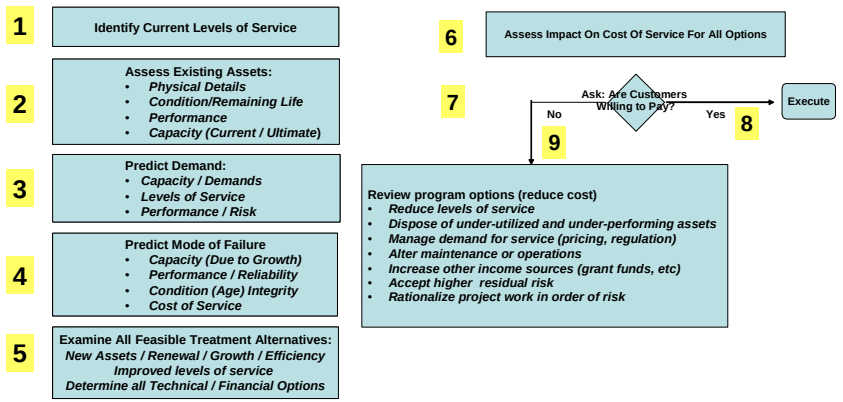
- What alternative treatment options exist?
- Which are most feasible?

5. Given the above, what is my best long-term funding strategy?

Four Major Stages of AAM Program Deployment



Steps In Total Asset Management Planning



PARSONS / GHD

US EPA 2004 – Basic Audit Self Assessment Tool ..

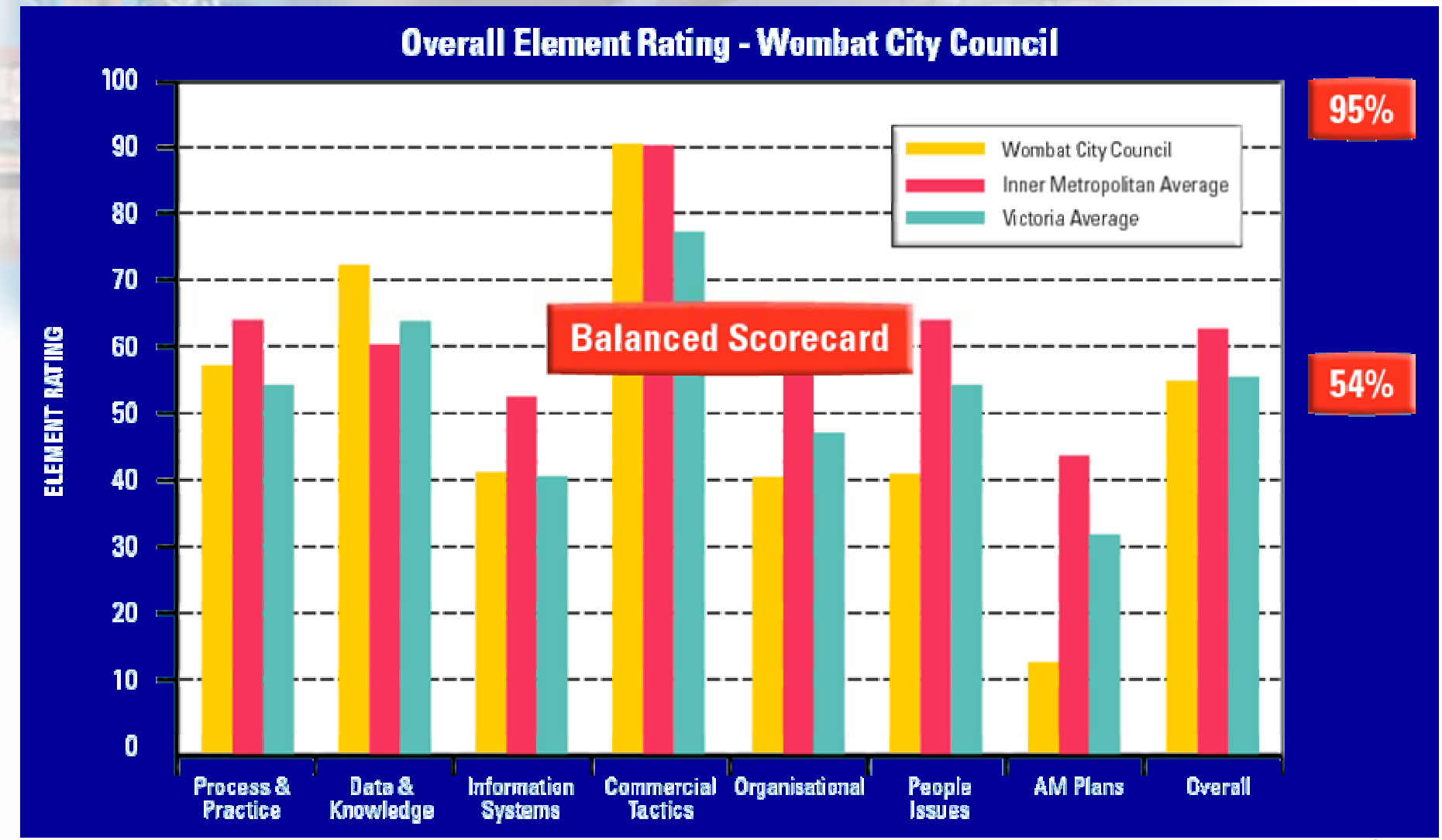
Helping you & your Agency to better understand the strengths and weaknesses of your current asset management activities…

- *You will be e-mailed a self-assessment file ..*
- *You need to complete the survey ..*
- *We will then aggregate the data and provide you with feedback…*
- *It will show you …*

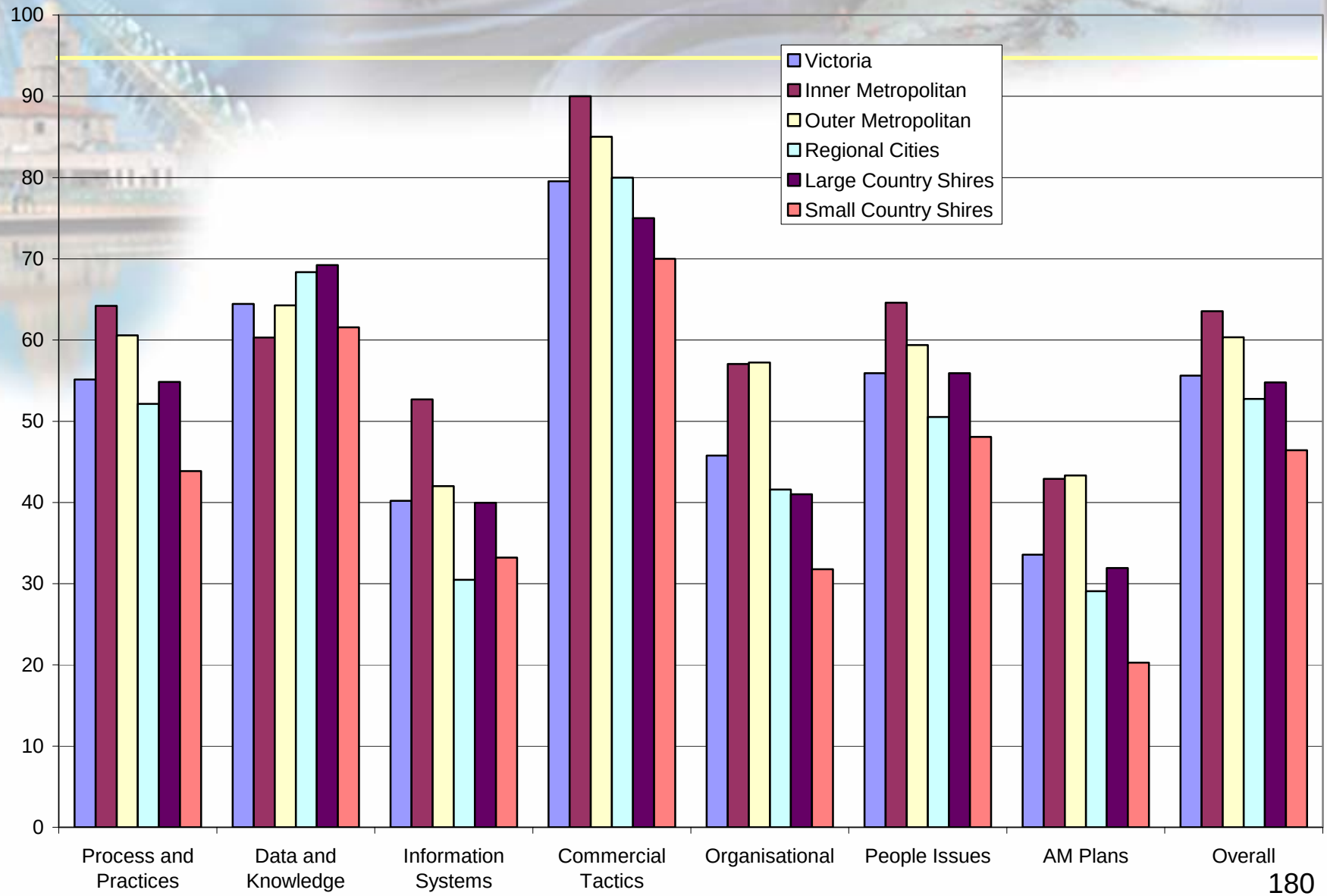
US EPA 2003 – Basic Self -Audit
What Will You Get For This Effort ?

- *You will get a short 3 page report..*
- *You will be able to see how you rate against:*
  - *Your USA Sanitation Agency peers*
  - *Australian & New Zealand Agencies (over 50% are using this tool)*
- *By early 2004 we hope to have enough US data to enable you to be compared with like sized businesses*

Typical Business Unit TEAMQF Report



Example AM Benchmarking Study



Typical Individual Agency Report ..

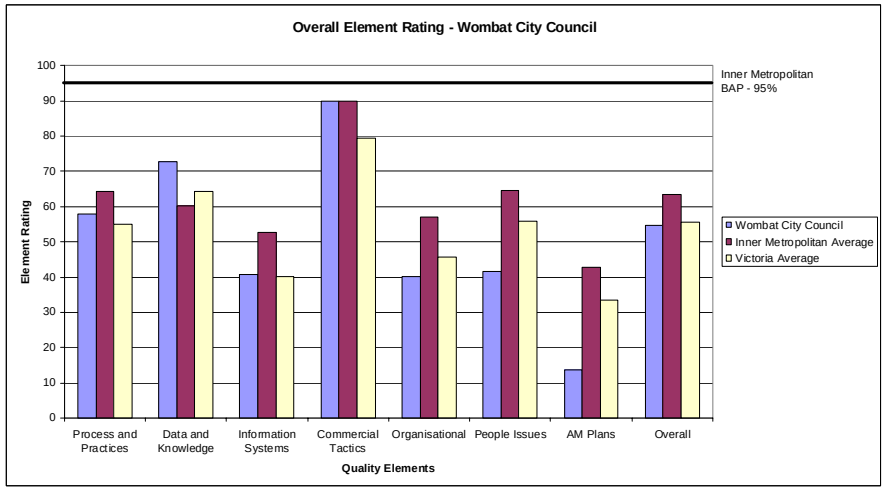
Quality Elements	Weighted Gap	Rank
Process & Practices	741	3
Data & Knowledge	334	5
Information Systems	814	2
Commercial Tactics	100	7
Organisational	274	6
People Issues	533	4
AM Plans	1219	1

MAV ASSET MANAGEMENT BENCHMARKING STUDY

WOMBAT CITY COUNCIL

Confidential Results for Wombat City Council only

OVERALL BENCHMARK



GAP ANALYSIS

Quality Elements	Weighted Gap	Rank
Process and Practices	741	3
Data and Knowledge	334	5
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Organisational	274	6
People Issues	533	4
AM Plans	1219	1

IMPROVEMENT PRIORITIES

Based on this gap analysis, Wombat City Council is 19.6% behind the top ten percentile of the Council's in the Inner Metropolitan category and 40.2% behind the best appropriate practice target level as deemed appropriate for a Council of this size and nature. Wombat City Council has over $605M worth of infrastructure assets, the management of which is crucial to Council's performance in terms of both cost and levels of service.

This form of the benchmarking does not allow a detailed analysis, however, based on GHD's weighted gap shown above, the following items are likely areas where improvement should be considered in more detail.

For the purposes of this study we have restricted this to the top 4 quality elements in order of importance.

You Will Get A Brief Report

Asset Management Plans

The organisation should develop asset management plans for all infrastructure and physical assets involved in service programs. These plans should follow the format outlined in the International Infrastructure Management Manual (IIMM).

The organisation has significant amounts of data, however, more use could be made of this data in terms of analysis in production of asset management plans. It is vital that the organisation considers these aspects.

Information Systems

Information systems become a critical element of sound asset management by replicating the best appropriate processes and providing a location to store the relevant data and knowledge.

The organisation should undertake and validate the information systems and develop appropriate improvement strategies in issues such as:

- Implementing a maintenance management system
- Implementing a works management system
- Implementing life cycle asset management systems for the following asset groups:
  - Parks and gardens assets
  - Solid waste assets
  - Fleet assets
  - Recreational assets
- These systems need to be interfaced to the corporate asset register

Processes and Practices

The key improvements in this area include:

- The development of specific asset management policies covering issues such as:
  - Only improving new capital works on a life cycle cost basis, including full recurrent expenditures.
  - That asset renewal expenditures will be approved before new services or improved levels of service are considered.
- Asset handover procedures need to be developed to ensure that new and rehabilitated assets are included onto the asset register immediately in the most cost effective manner.
- Processes that outline the way in which the organisation will produce asset management plans on a regular basis including the clearly defined outputs such as:
  - Capital works in the following categories:
    - Sustaining existing service levels
    - Improving service levels
    - New assets or services
    - New works related to growth
    - Works related to new regulations
    - Asset sales
  - Operations
  - Maintenance
  - Depreciation
  - Administration
- Develop process to assist staff to complete better life extension or renewal decision making.

People Issues

Showing Your Key Areas For Improvement

Testimonial…

"The basic audit results proved extremely useful to me and my City.

By understanding how we rated against our peers I was able to win our management's attention to the situation and it allowed us to commence AM improvement in earnest…"

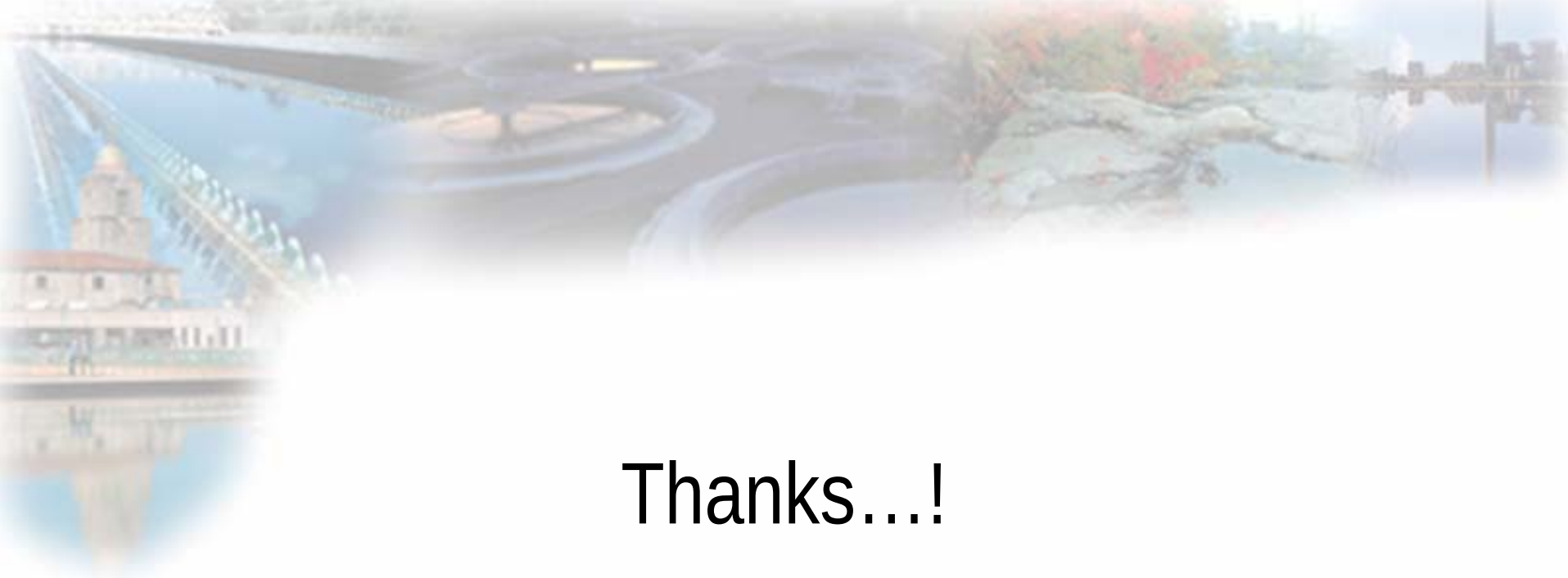
Cheryl Kidston *Strategic Planner City Services – City of Melbourne.*

The International Infrastructure Management Manual

can be purchased online from:

www.ipwea.org.au

for approximately $220 US



Thanks…!