

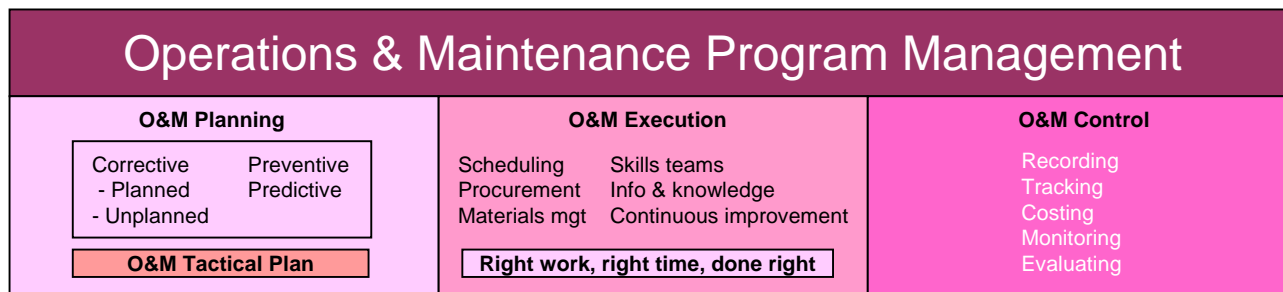
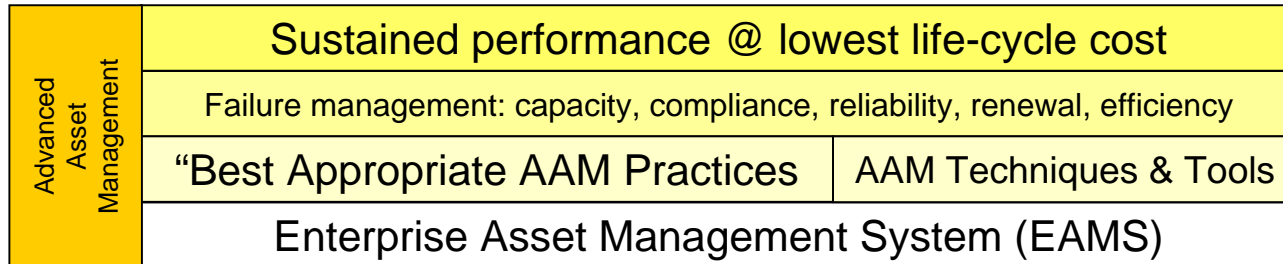
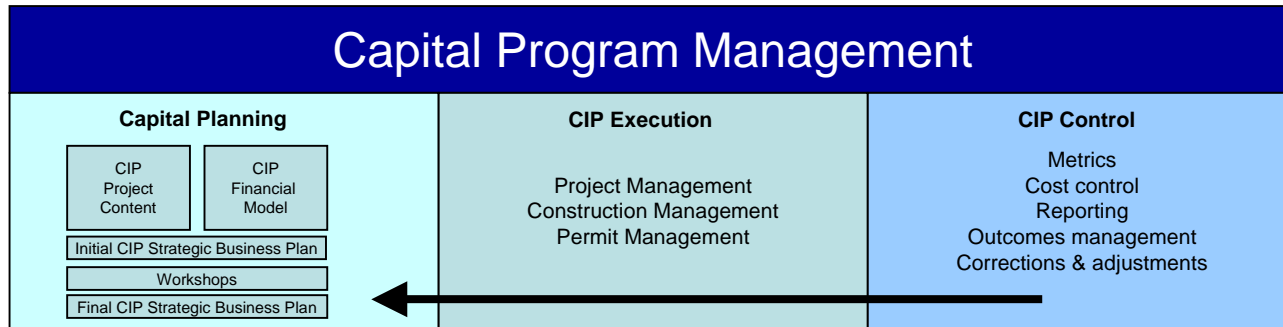


***Q4b. Using AAM To Drive
The CIP***

AMPLE

**Asset Management Program
Learning Environment**

The AAM Model



Continuous Learning/Knowledge Management
“AAM University”



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*

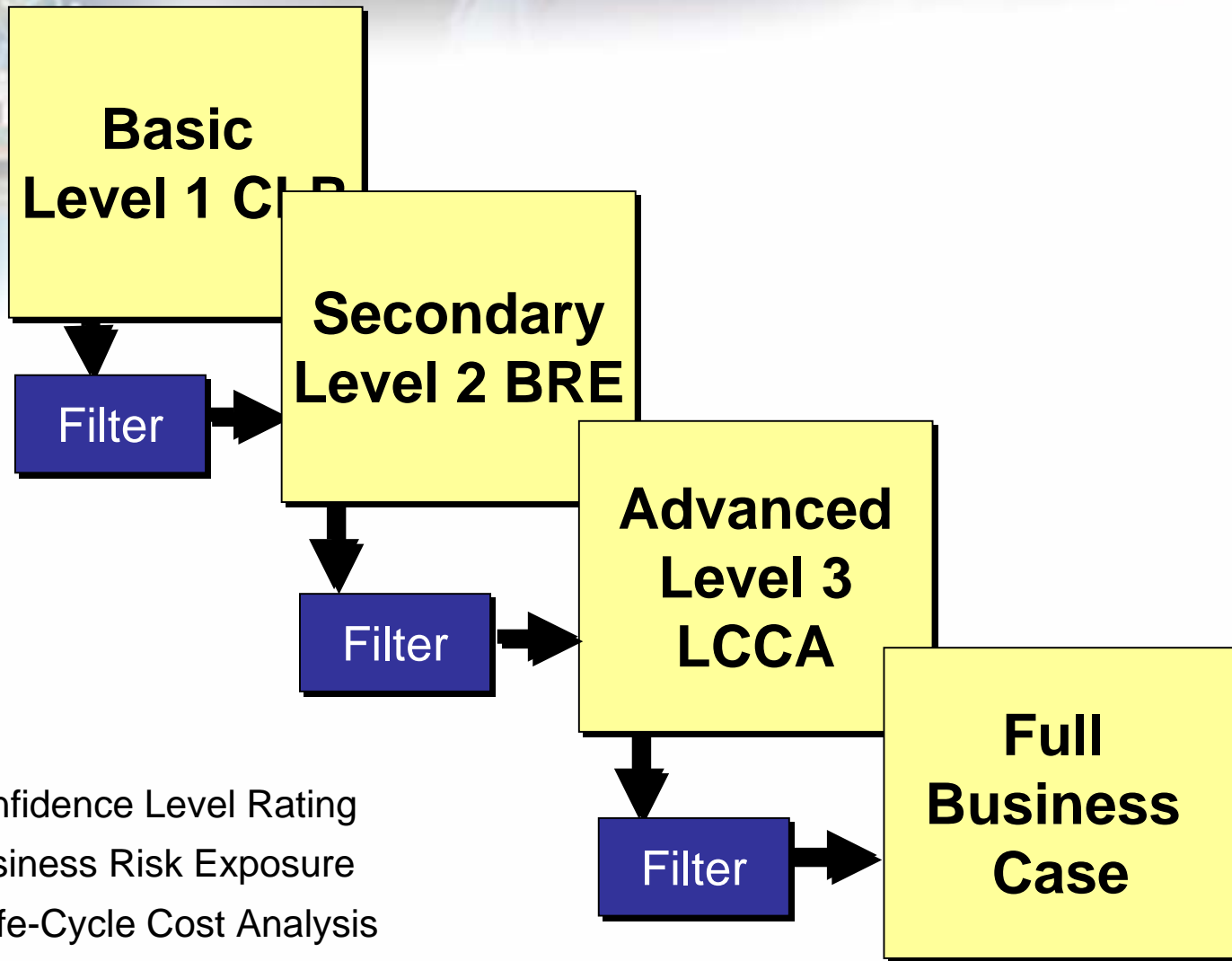
A scenic view of a river with a bridge and a building in the background. The bridge is a suspension bridge with a large tower. The building is a large, classical-style building with a dome. The river is calm and reflects the sky and the bridge. The background shows a city skyline with buildings and trees.

CIP Validation

How do I know that I have:

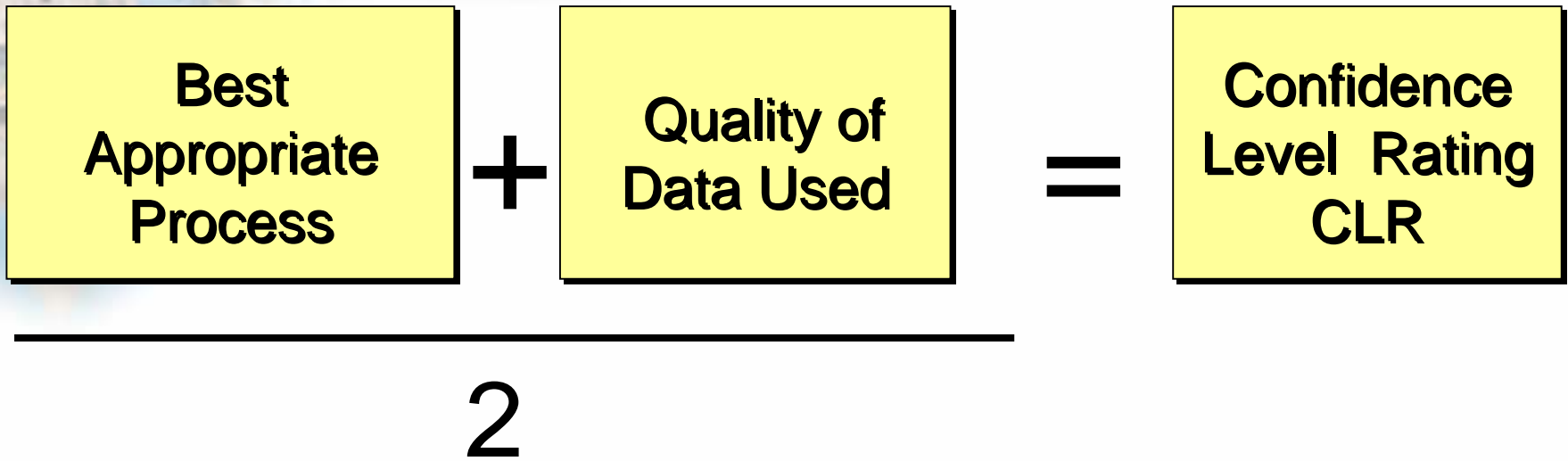
- The right projects,
- At the right time,
- At the right cost,
- For the right reasons?

CIP Validation Process



CLR – Confidence Level Rating
BRE – Business Risk Exposure
LCCA – Life-Cycle Cost Analysis

Confidence Level Rating Metrics



$$\frac{70\% + 40\%}{2} = 55\%$$

OUTLINE OF AAM QUALITY ELEMENTS AND SUB-COMPONENTS
(Tertiary level subcomponents are not shown)

| | | |
|-------------|---|--|
| 1.00 | ASSET MANAGEMENT PROCESS AND PRACTICES | |
| | 1.01 | Demand Analysis |
| | 1.02 | Knowledge of Assets |
| | 1.03 | Accounting and Costing |
| | 1.04 | Strategic Planning Life Cycle |
| | 1.05 | Capital Expenditure Evaluation Process |
| | 1.06 | Business Risk Assessment and Management |
| | 1.07 | Creation and Acquisition |
| | 1.08 | Rationalization and Disposal |
| | 1.09 | Operations |
| | 1.10 | Maintenance |
| | 1.11 | Work / Resources Management |
| | 1.12 | Review Audit (Continuous Quality Improvement) |
| 2.00 | ASSET MANAGEMENT INFORMATION | |
| | 2.01 | Primary Applications |
| | 2.02 | Secondary Applications |
| | 2.03 | Tertiary (Life Cycle) Applications |
| | 2.04 | General Overall Information System Issues |
| 3.00 | DATA RATING | |
| | 3.01 | Primary Data |
| | 3.02 | Secondary Data |
| | 3.03 | Tertiary Data |
| 4.00 | COMMERCIAL TACTICS | |
| | 4.01 | Core/ Non-core Activities Identified |
| | 4.02 | Packaging of Contracts |
| | 4.03 | Specification Quality |
| | 4.04 | Information and Data Availability |
| | 4.05 | Contract Supervision (Contract Performance Monitoring) |
| | 4.06 | Contractor Selection and Assessment |
| 5.00 | ORGANIZATIONAL ISSUES | |
| | 5.01 | Life Cycle Asset Management Roles and Responsibilities |
| | 5.02 | Business Asset Management Teams |
| | 5.03 | Overall Commitment |

“Quality”
 Elements
 to be
 Considered

OUTLINE OF AM QUALITY ELEMENTS AND SUB-COMPONENTS (continued)
(Tertiary level subcomponents are not shown)

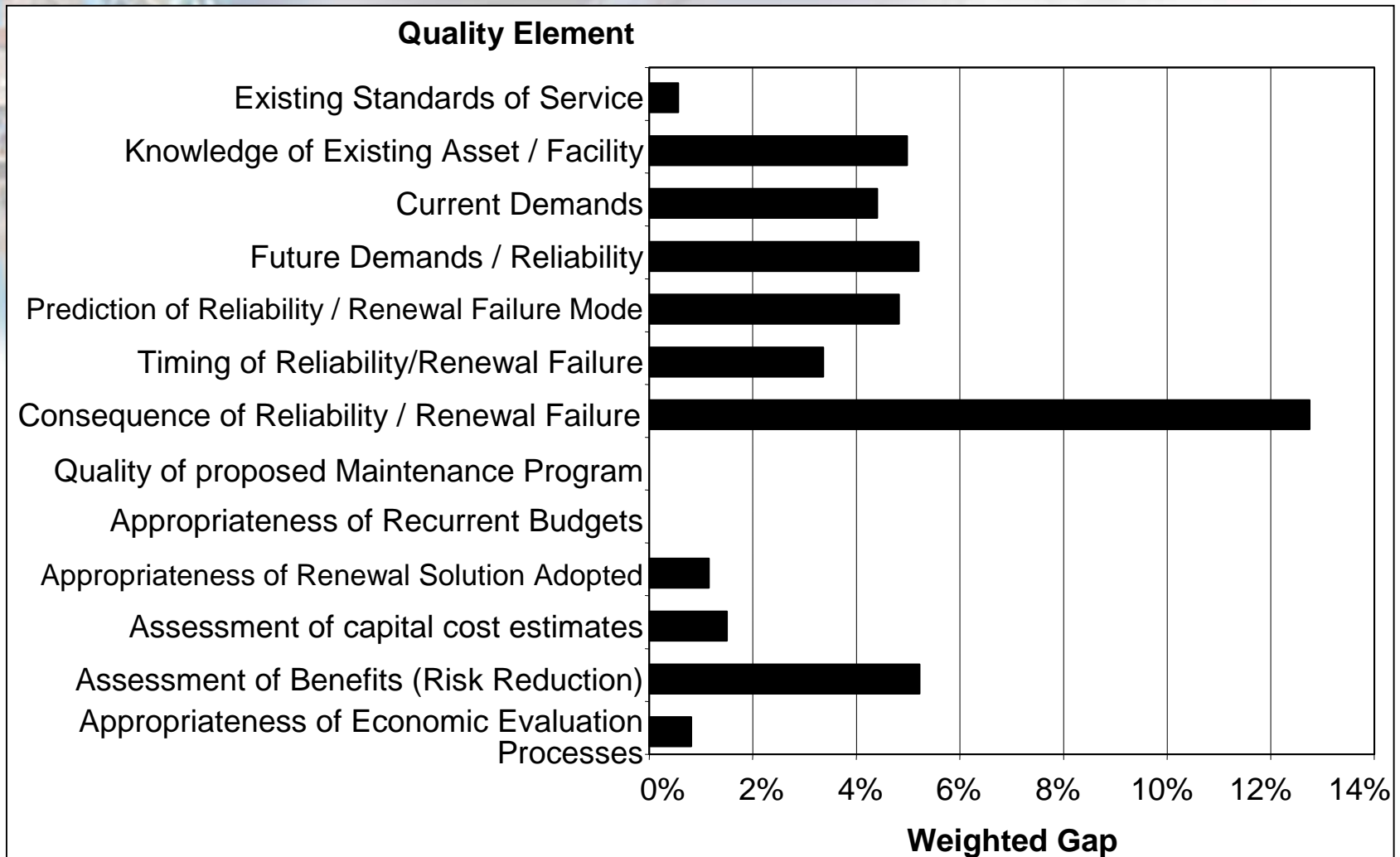
| | | |
|-------------|---|--|
| 6.00 | PEOPLE ISSUES | |
| | 6.01 | Skills and Age Profiles |
| | 6.02 | Attitude and Culture |
| | 6.03 | Change Management Activities |
| | 6.04 | Appropriate Skills |
| | 6.05 | Appropriate Resources |
| | 6.06 | Training Issues |
| | 6.07 | Corporate Knowledge Management |
| 7.00 | TOTAL ASSET MANAGEMENT PLANNING/PLAN | |
| | 7.01 | Current Standards |
| | 7.02 | Knowledge of Assets |
| | 7.03 | Current Demands |
| | 7.04 | Predicted Failure Modes |
| | 7.05 | Consequences of Failure |
| | 7.06 | Quality of Optimized Renewal Decision Making |
| | 7.07 | Quality of New Works Programs |
| | 7.08 | Quality of Operations and Maintenance Programs |
| | 7.09 | Alternative Options Identified |
| | 7.10 | Customer/Stakeholders Acceptance Surveys |
| 7.11 | Business Goals/Linkages to Total Asset Management Plans | |

“Quality”
 Elements
 to be
 Considered

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 O&M Costs | 75% | 75% | 75% | 2% | 1.5 |
| 10 | Appropriateness of Capital Solution Adopted | 79% | 79% | 79% | 15% | 11.8 |
| 11 | Assessment of Capital Cost Estimates | 85% | 85% | 85% | 7% | 6.0 |
| 12 | Assessment of Benefits | 72% | 72% | 72% | 5% | 3.6 |
| 13 | Appropriateness of Economic Eval. Processes | 70% | 70% | 70% | 5% | 3.5 |
| | TOTALS | | | | 100% | 72 |

Weighted Gap Improvements



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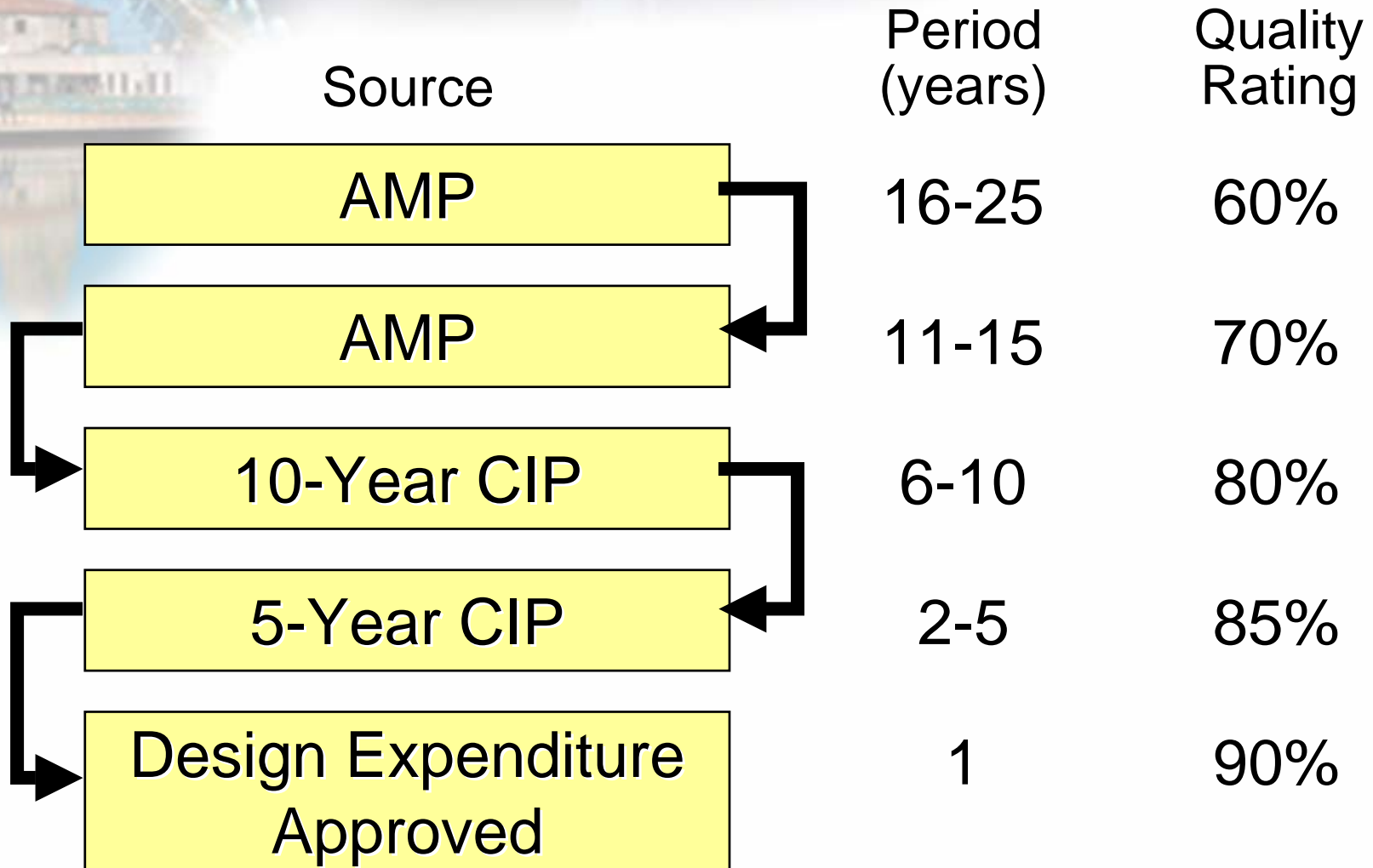
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| | | | | | | | | |
|---|---|--|--|--|--|---------------|----------------|-------------|
| 1 | CLIENT: <i>Orange County Sanitation District</i> | | | | | COMPRESS ROWS | SHOW BEST WINS | Renewal - F |
| 2 | COMMISSION: <i>Initial Capex Evaluation Project</i> | | | | | | | Renewal - S |
| 3 | PROJECT: <i>Magnolia Trunk Sewer Rehabilitation</i> | | | | | EXPAND ROWS | SHOW BEST WINS | Renewal - S |
| 4 | PROJECT NO: <i>03-35-R2</i> | | | | | | | Renewal - S |
| 5 | | | | | | | | |

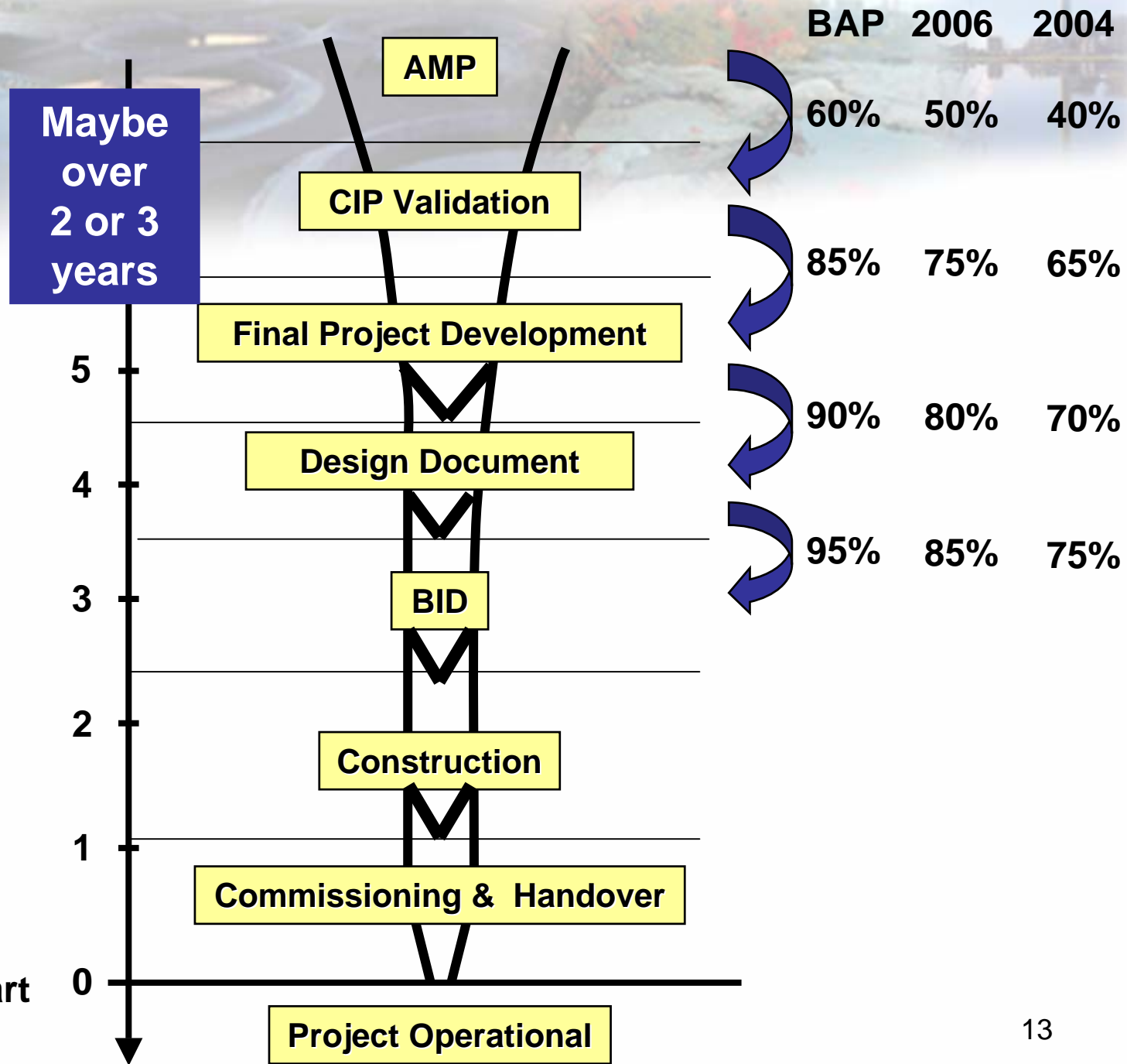
Overall Confidence Levels RENEWAL - RELIABILITY / MORTALITY MODEL Capex Projects

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

CIP Evaluation Stages



Setting the Hurdles for OCSD

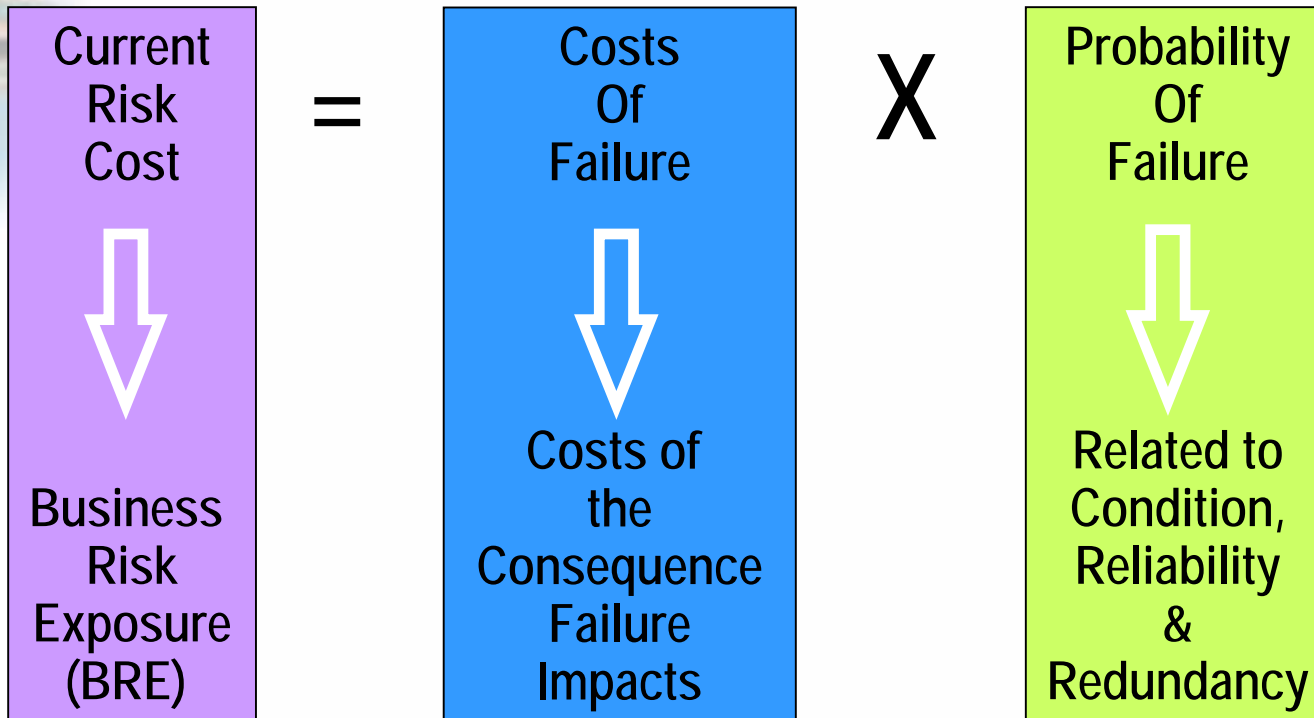




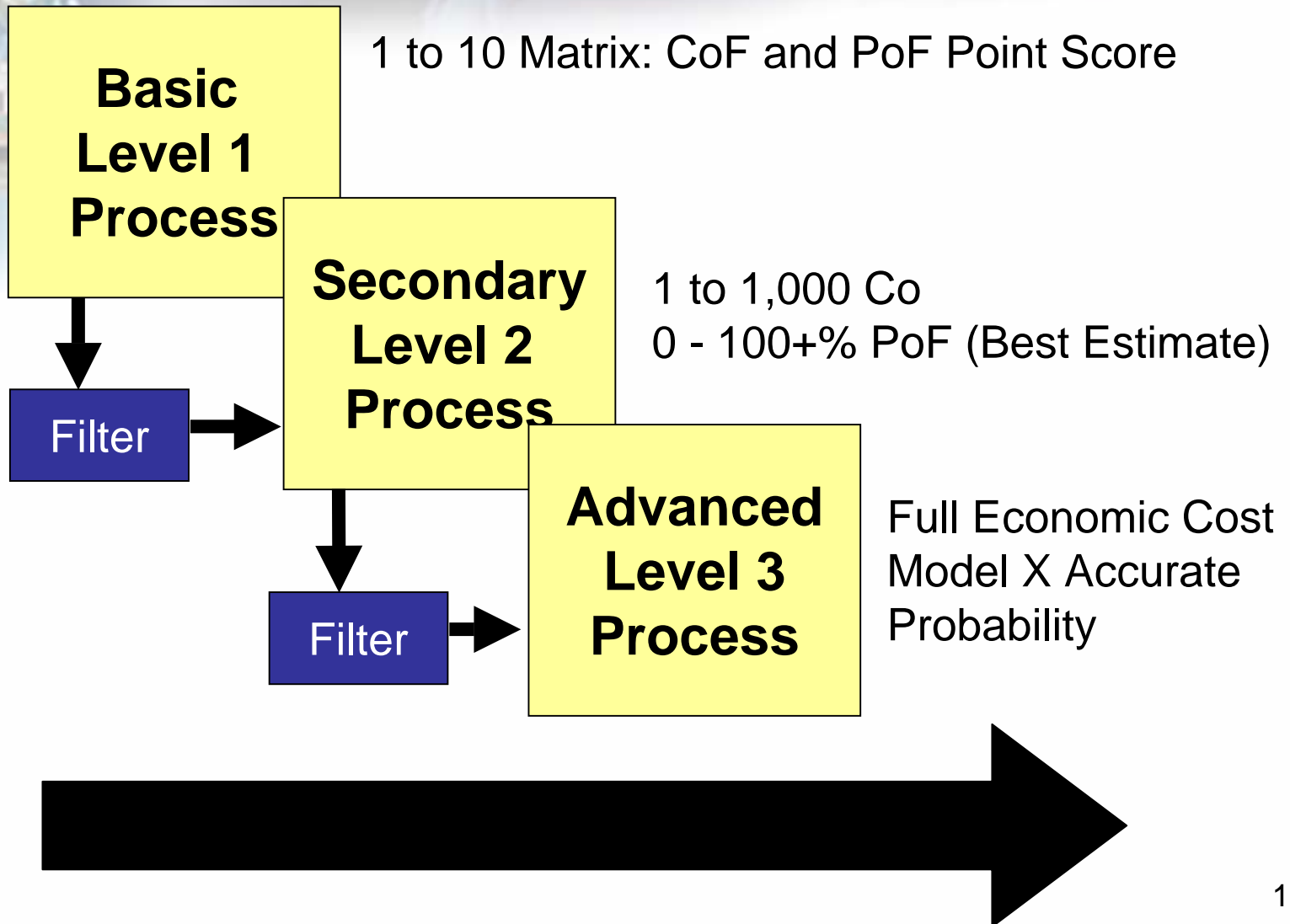
BRE

(Business Risk Exposure)

Recall: The Risk (Criticality) Metric



Evolutionary BRE Methodology



BRE* 1 - Simple Approach

* Business Risk Exposure

High

1

2

3

3

3

6

9

2

2

4

6

1

1

2

3

Low

CoF / Consequence of Failure

High

Business Risk Exposure

Table 1
Consequence of Failure – Capacity Based Rating

| CoF Rating | Description | % Affected | Level |
|------------|-------------------------------|------------|----------------------------------|
| 1 | Minor Component Failure | 0-25% | Asset Component Minor |
| 2 | Major Component Failure | 25-50% | Asset Component or multiple min. |
| 3 | Major Asset | 0-25% | Major Asset or multiple compts |
| 4 | Multiple Asset Failure | 25-50% | Facility or Sub-System |
| 5 | Major Facility Failure | 50-100% | Facility or Sub System |
| 6 | Minor Sanitary System Failure | 20-40% | Total System |
| 7 | Medium | 40-60% | Total System |
| 8 | Intermediate | 60-80% | Total System |
| 9 | Significant | 80-90% | Total System |
| 10 | Total | 90-100% | Total System |

Converting Likelihood to Probability

| Years till 100% Sure | Probability of Failure Rating |
|-------------------------|----------------------------------|
|-------------------------|----------------------------------|

| | |
|---------|-------|
| Over 5 | 1.40 |
| 5 yrs | 1.80 |
| 4 yrs | 2.50 |
| 3 yrs | 3.60 |
| 2 yrs | 5.60 |
| 1 yr | 8.50 |
| 0 (now) | 10.00 |



Don't Forget Redundancy


| Level of Redundancy | Reduce PoF by: |
|-----------------------|----------------|
| 50% Backup | 50% |
| 100% Backup | 90% |
| 200% Secondary Backup | 98% |

Microsoft Excel - BRE 1.0 Model (5x5 Matrix) Ver 4.xls

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Arial 12 B I U

C20 = With Backup

| | | | | |
|----|---|--|--------------|--|
| 1 |  | Business Risk Exposure Tool Calculator BRE 1.0 Model (5 x 5 Matrix) Version 4.0 | | |
| 2 | | Licensed Client ** : Orange County Sanitation District | | |
| 3 | | 2005 CIP Validation Program | | |
| 4 | | | | |
| 5 | Project Description: | | | |
| 6 | Project No: | | | |
| 7 | Name/s of Assesor/s: | | | |
| 8 | Date : | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | Consequence of Failure | | | |
| 12 | | | | |
| 13 | Description | Percentage Affected | Level | |
| 14 | Major Component Failure | 25-50% | Asset | |
| 15 | | | | |
| 16 | | | | |
| 17 | Probability of Failure | | | |
| 18 | | | | |
| 19 | Years to 100% Probability of Failure | > 5 years | | |
| 20 | Redundancy | With Backup | | |
| 21 | Probability | No Backup With Backup | 0.50 | |
| 22 | | | | |
| 23 | | | | |
| 24 | Business Risk Exposure | | | |
| 25 | | | | |
| 26 | Total BRE | 1.00 | | |
| 27 | | | | |
| 28 | | | | |
| 29 | This workbook forms part of GHD's Approach to Advanced Life Cycle Asset Management of Infrastructure & other assets. | | | |
| 30 | It uses our TEAMQF™, Quality Framework and Confidence Level Rating (CLR) & Business Risk Exposure (BRE) Techniques. | | | |
| 31 | This patented process is the Copyright of GHD Pty. Ltd. 10 Bond Street Sydney Australia | | | |

BRE Calculator

Ready

Start

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2:56 PM

Example:
BRE Level 1



Microsoft Excel - BRE 2.5 Model 3.xls

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Arial 10 B I U

C23 = Wastewater

Business Risk Exposure Tool BRE 2.5 Model Version 3.0
 Licensed Client ** : Orange County Sanitation District
 2005 CIP Validation Program

Date :

Renewal / Reliability
 Collection Systems / Pipelines and Structures

Consequence of Failure

| Element | Rating | Score |
|-------------------------------------|--|----------------------|
| Capacity of Asset (\$/Week) | 20 | \$112,000 |
| Period of likely failure (weeks) | 20 | \$2,240,000 |
| Repair difficulty | Under Critical Rail / Freeways | |
| Potential for injury | Possibility of death | |
| Potential for environmental damage | Significant environmental damage | \$342,720,000 |
| Relative Impact Reductions | Wastewater | |
| Total Consequence of Failure | Noise Odor Air Pollution Wastewater | \$342,720,000 |

Probability of Failure

| | |
|--------------------------------------|---------------|
| Years to 100% Probability of Failure | 3 years |
| Redundancy | No Backup |
| Probability | 36.00% |

Total BRE \$123,379,200

Renewal_Collection / Capacity_Plant / Capacity_Collection / Level of Service_Plant / Level of Service_Collection / Factors

Ready

Start C:\Doc... Dunca... AMPL... Americ... Palam... Google... Advan... Advan... Micro...

2:47 PM

Example:
BRE Level "2.5"



Project Decision Matrix

**High BRE
Over 15**

**Medium BRE
5-15**

**Low BRE
Under 5**

**High CLR
Over 75**

Proceed with Project - No Changes

Proceed with Project using Design Consultant increase CLR

Consider Deferral, Delay, Project Break Up and Cancellation

**Medium CLR
60-75**

Consider Proceed with Project using Design Consultant increase CLR, Deferral and Delay

Consider Deferral, Delay, Project Break Up, and Proceed with Project using Design Consultant increase CLR

Consider Deferral, Delay and Project Break Up and Cancellation

**Low CLR
Under 60**

Consider Deferral, Delay, Project Break Up, and Proceed with Project using Design Consultant increase CLR

Consider Deferral, Delay and Project Break Up

Consider Mothball, Delay, and Cancellation



What Better Decisions Can We Make Now?



Work Undertaken in the 2004 CIP Validation Project

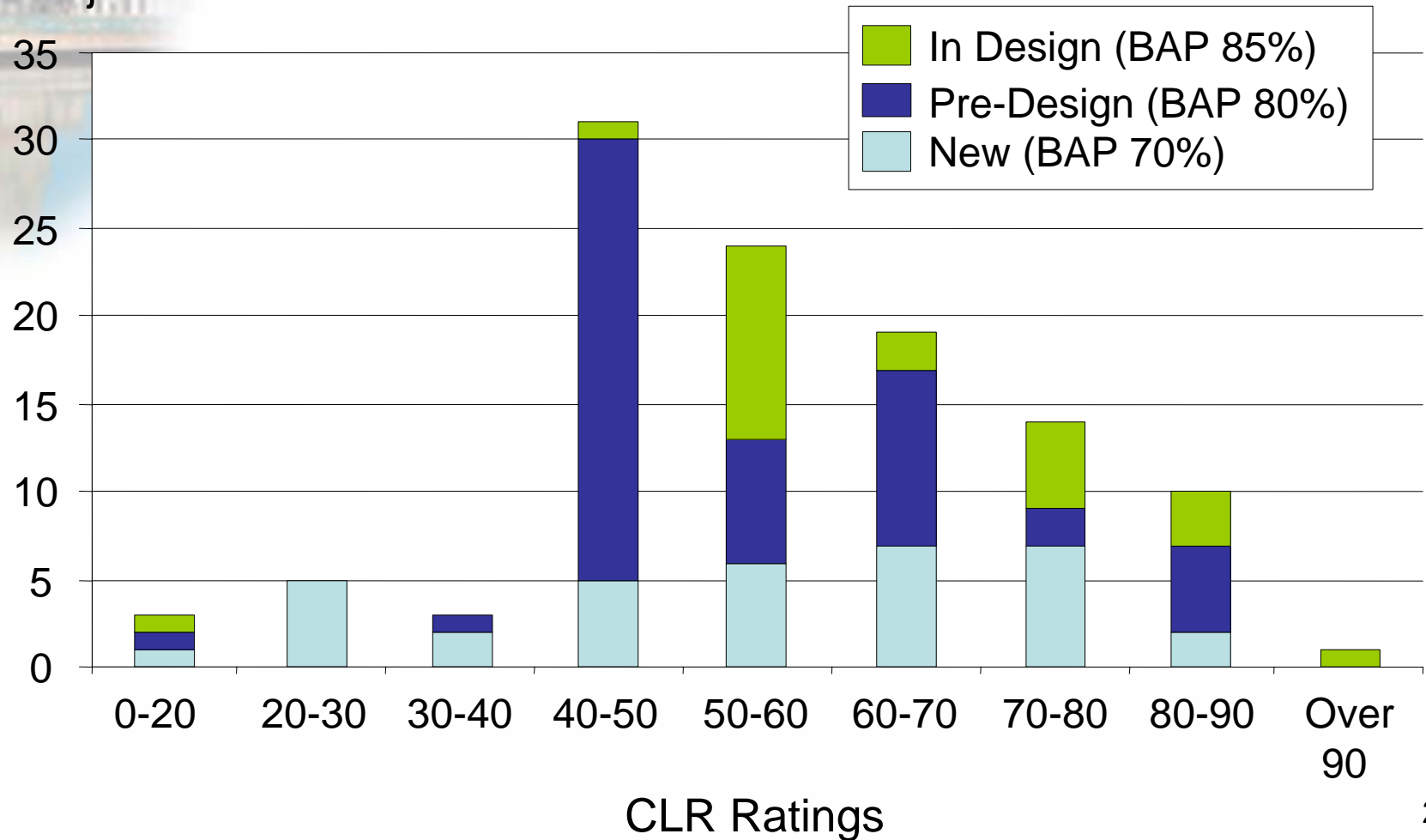
- 111 CIP Projects reviewed to CLR2 Level
- All projects assessed to BRE 1.5 level
- Investment Risk model used to rate top 15
 - Value x BRE x CLR gap
- Top 15 CIP Projects reviewed to CLR3 level

CIP 2004 – Results of CLR 2s

| CLR Ratings | New Projects | Existing Projects Pre-Design | Existing Projects in Design |
|--------------------|---------------------|-------------------------------------|------------------------------------|
| 0-20 | 1 | 1 | 1 |
| 20-30 | 5 | – | – |
| 30-40 | 2 | 1 | – |
| 40-50 | 5 | 25 | 1 |
| 50-60 | 6 | 7 | 11 |
| 60-70 | 7 | 10 | 2 |
| 70-80 | 7 | 2 | 5 |
| 80-90 | 2 | 5 | 3 |
| Over 90 | – | – | 1 |
| Average | 53% | 56% | 66% |
| BAP Target | 70% | 80% | 85% |

CIP 2004 – Results of CLR 2s

Number
of Projects



The background of the slide features a blurred image of a suspension bridge with a large, domed building in the distance, likely a government or institutional structure. The text is overlaid on this background.

Results Achieved through the 2004 CIP Validation Project

All projects assessed & recommendations made for:

- Potential to defer
- Break up project
- Need for Future analysis

Results:

- \$153 million in project deferrals or deletions has been identified in next year's CIP budget

The background of the slide features a blurred image of a suspension bridge with a large, domed building in the distance, likely a government or institutional structure. The text is overlaid on this background.

Savings Achieved through the 2004 CIP Validation Project

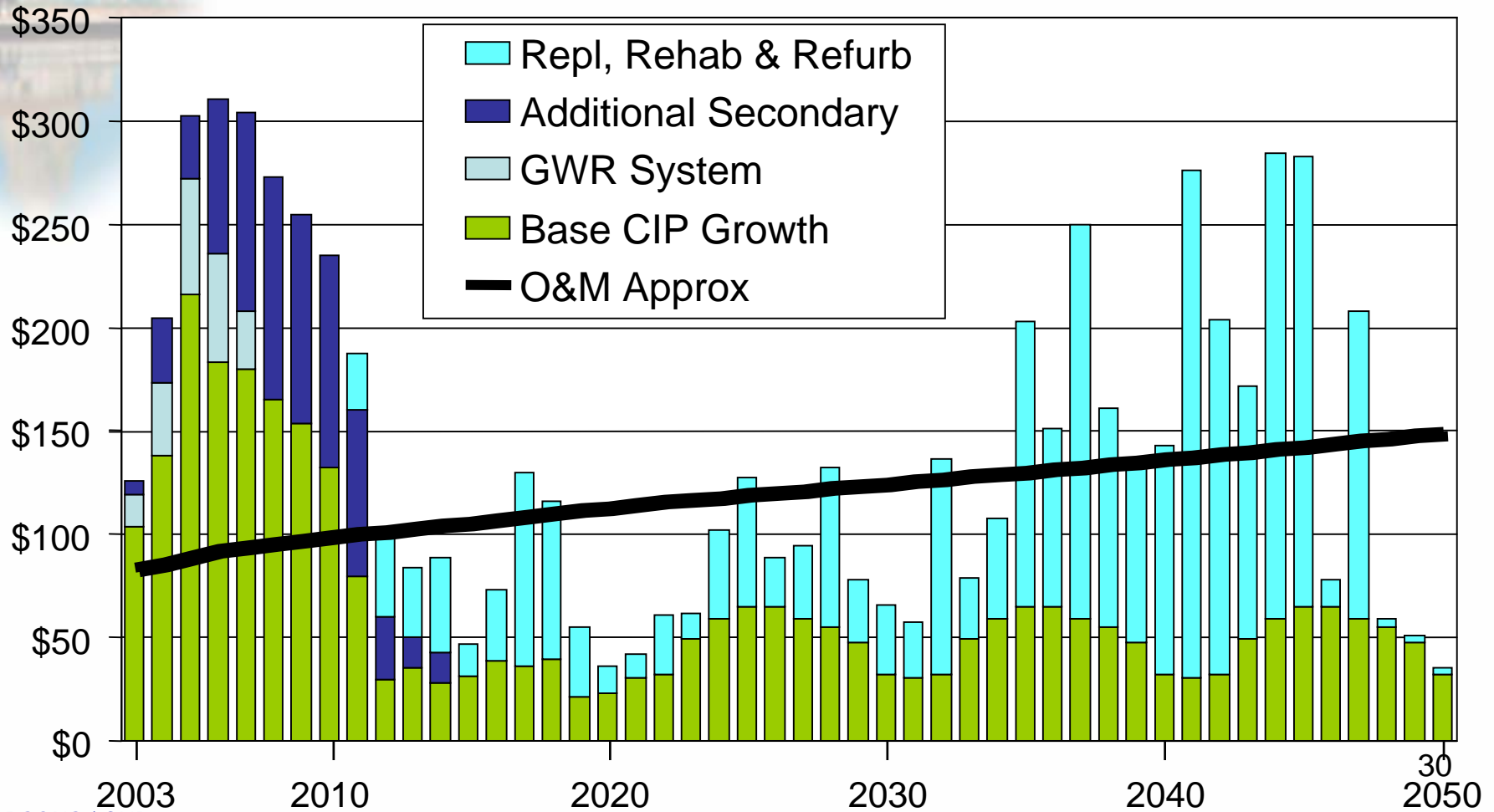
Savings of \$25 million:

- \$ 23.5 million project costs eliminated and \$ 1.9 million interest charges, also
- \$ 6.8 million interest charges were saved by deferring additional low risk projects

Note: savings apply only to the 10 of 111 CIP projects reviewed

Asset Management Effects on Capital Improvement Program

\$ Millions
(current dollars)



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..