Capital Investment Project Prioritization: Plan and Acquire Assets (or not)

May 12th 2010,
Pre Conference Workshop:
ASSET MANAGEMENT

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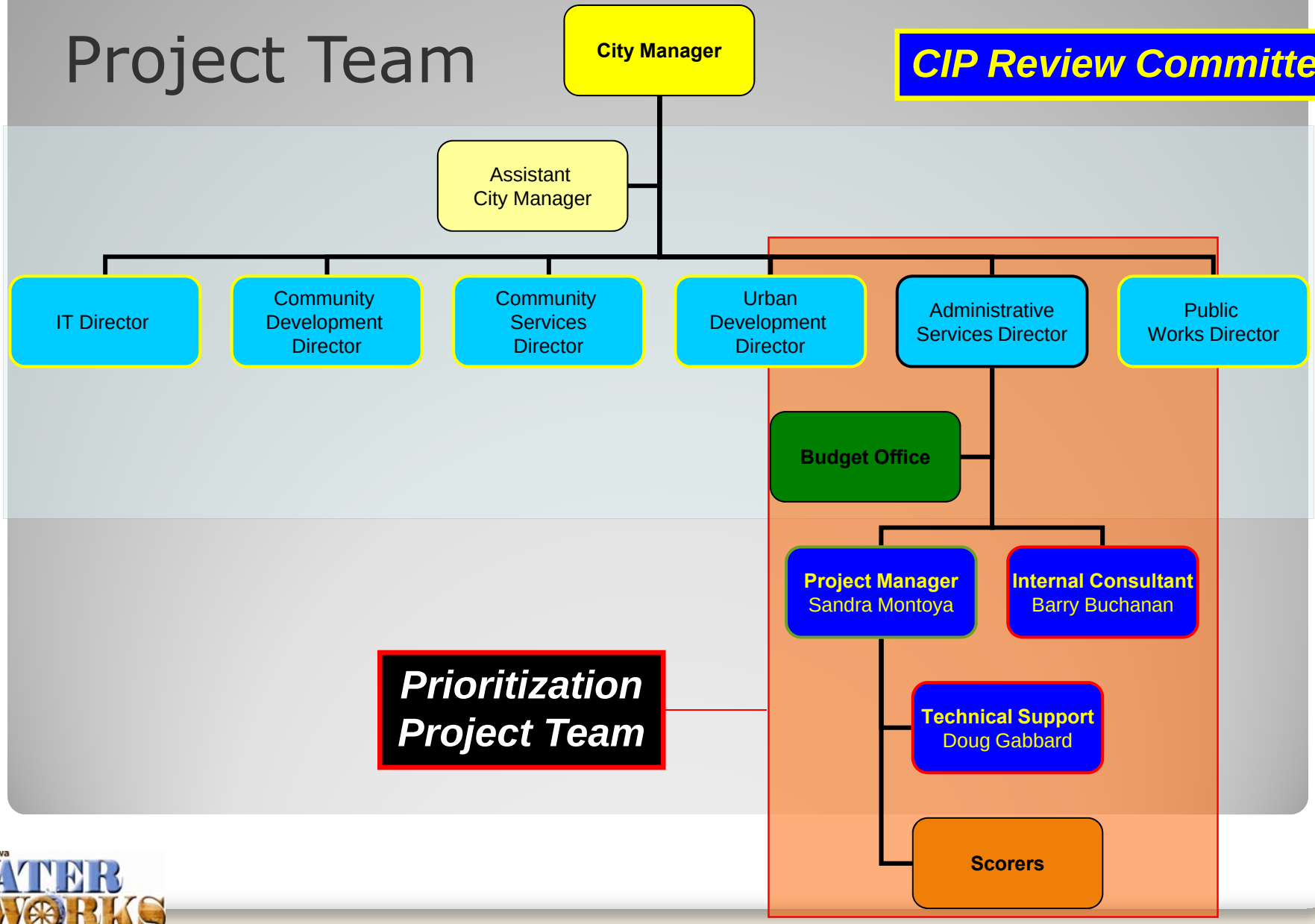
Statement

2008 Council and City Manager's desire to:

- See transparency in the development of the Capital Improvement Plan and Budget processes;
- Have project priority determined on a risk basis; and
- Identify top priority needs and match them to the limited resources in a thoughtful, responsible manner.

The proposed problem solving technique integrates both expert judgment and a risk-based decision **aiding** model to prioritize an assets needs list.

Project Team



Prioritization Process:
- Participant

Assets came from Whole of Governance:

- Facilities – Buildings and amenities
- Utilities – Storm-water, Potable Water, Wastewater
- Services – Libraries, Parks, gardens and recreation
- Transportation – Streets, Bridges & Airports
- Information Technology – Telephones, Computer and Radios

Issue Identification by:

- Public, Council, Management, Staff

Criteria Setting by:

- Council, Boards, & Management

Issue Scoring by:

- Middle management, staff & issue identifiers

The Key Questions

What is the required level of service?

Standards:
Service Levels:
- Demand
- Customer agreements
- Regulations
- Codes
- Directives
- Plans
- Guidelines

What is the current state of the asset?

Asset Register:
- Name/Number
- What
- Where
- Age
- Condition
- Capability
- Remaining Life
- Economic Value

Which assets are critical to sustain performance?

Prioritization:
- Asset Criticality
  - -Redundancy
  - -Failure Affect
- Failure Modes
  - -Condition
- Work Priority
- Risk of failure:
  - -Likelihood
  - -Consequence

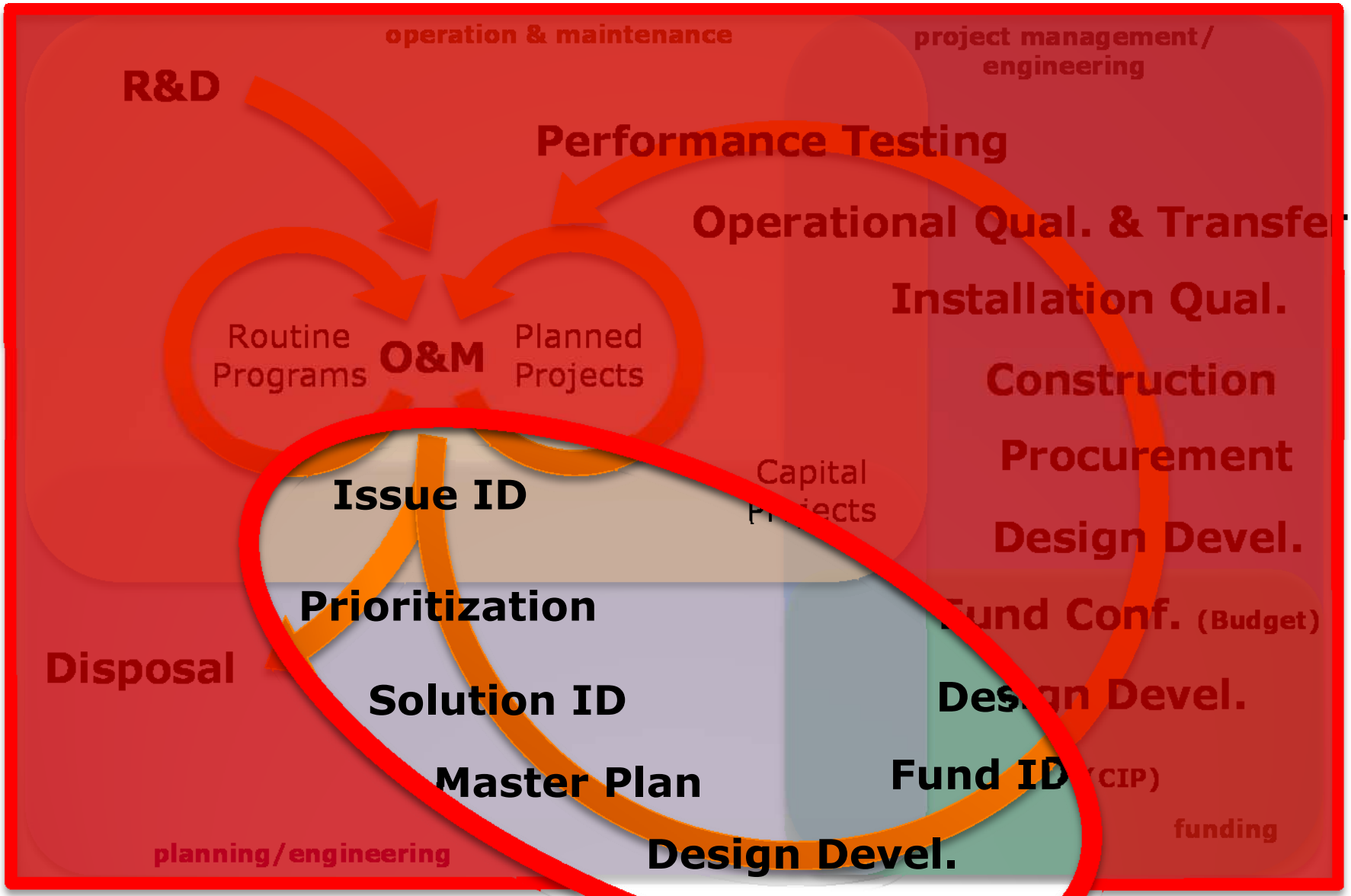
What is the Least Life Cycle Cost?

Business Case Eval.
- Intervention Strategy
- Optimization
- Run to failure
- Repair
- Replenish
- Refurbish
- Replace
- New
- Disposal

What is the best Whole of Life funding strategy?

Funding Sources:
- Loans
- Funds
- Grants
- SDC's
- Rates
- Fees

Allocating Funds:
- CIP
- Budgeting



Asset Life Cycle in Asset Plan

Setting the Stage:

Define Judgment Criteria:
Standard/
Levels of Service

for Criticality, Condition
and Prioritization analysis

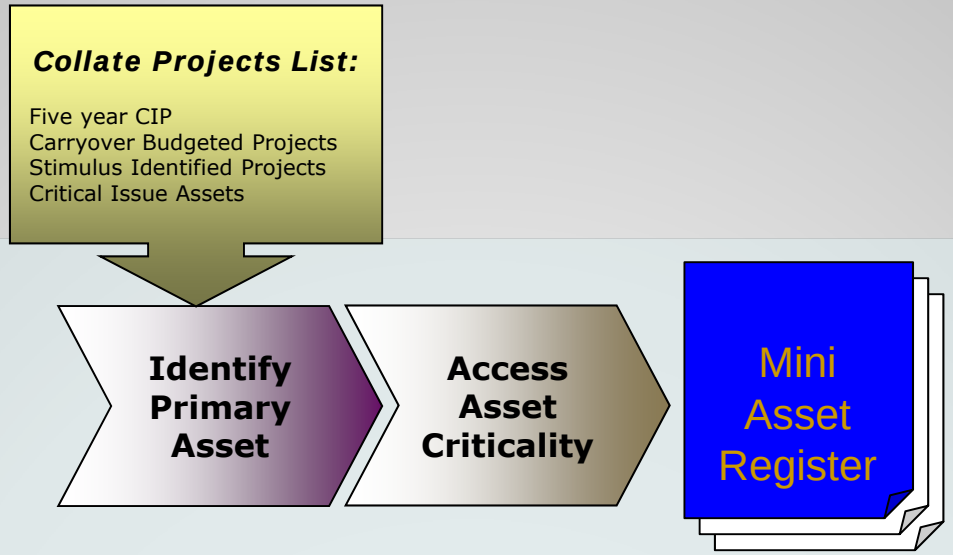
Define Financial Strategy:

for Financing, Accounting
Monitoring and Controlling

Output & Outcomes – step 1

Collate Asset Data	➢ Asset Register
Issue Identification	➢ Issues List
Issue Prioritization	➢ Gaps List
Solution Identification	➢ Needs List/Master Plan
Funds Identification	➢ Capital Improvement Plan

Our First Steps:



Establish Asset Criticality

- Criticality (of an asset failing) =
  - Operational Redundancy x Breath of Affect
- Resultant Scores Range:
  - 1 – 100
  - Low – High

Establish Asset Criticality

= Redundancy x Affect

Define Criteria to Suit Application Number given not to be taken as absolute

Asset CRITICALITY

Higher

OPERATIONAL REDUNDANCY

	Component	Element	Device	Unit Process	Train	Facility	Utility	>0.5% Comm.	>1% Comm.	5%> Comm.
No Operation	10	20	30	40	50	60	70	80	90	100
	9	18	27	36	45	54	63	72	81	90
25% Operation	8	16	24	32	40	48	56	64	72	80
	7	14	21	28	35	42	49	56	63	70
50% Operation	6	12	18	24	30	36	42	48	54	60
	5	10	15	20	25	30	35	40	45	50
75% Operation	4	8	12	16	20	24	28	32	36	40
	3	6	9	12	15	18	21	24	27	30
Full Operation	2	4	6	8	10	12	14	16	18	20
	1	2	3	4	5	6	7	8	9	10

Lower

If Asset FAILS

BREADTH of FAILURE AFFECT

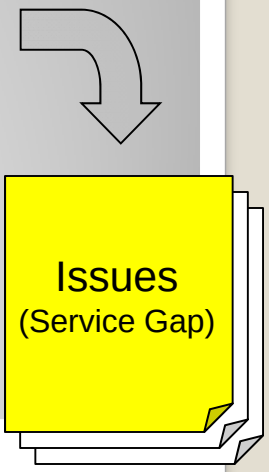
Outputs & Outcomes – step 2

Collate Asset Data	Asset Register
Issue Identification	Issues List
Issue Prioritization	Gaps List
Solution Identification	Needs List/Master Plan
Funds Identification	Capital Improvement Plan

Condition Assessment

- Failure Mode Evaluation
  - Is the **Capacity** adequate?
  - What is the **Physical Condition**?
  - Is the Asset's **O&M efficient**?
  - Are agreed **Levels of Service** being met?

- Each Scored 0-10, highest score prevails



Failure Mode judgment standards established by Cost Benefit analysis

Condition Assessment

- Judgment Criteria

Scoring Scale: 0, …. 2, ……. 8, …. 10

Failure Modes:					
Capacity vs demand	=>115%	113%	……	107%	<=105%
Physical Condition	New	Insignificant Deterioration	……	Significant Deterioration	Failing
O&M efficiency gain	=<5%	7%	……..	13%	=>15%
Level of Service **Regulations, Directives, Procedures, Guidelines, Plans, Agreement, etc,etc**	=105%	=106% or =104%	…….	=109% or =101%	=>110% or =<100%

Outputs & Outcomes – step 3

Collate Asset Data	➢ Asset Register
Issue Identification	➢ Issues List
Issue Prioritization	➢ Gaps List
Solution Identification	➢ Needs List/Master Plan
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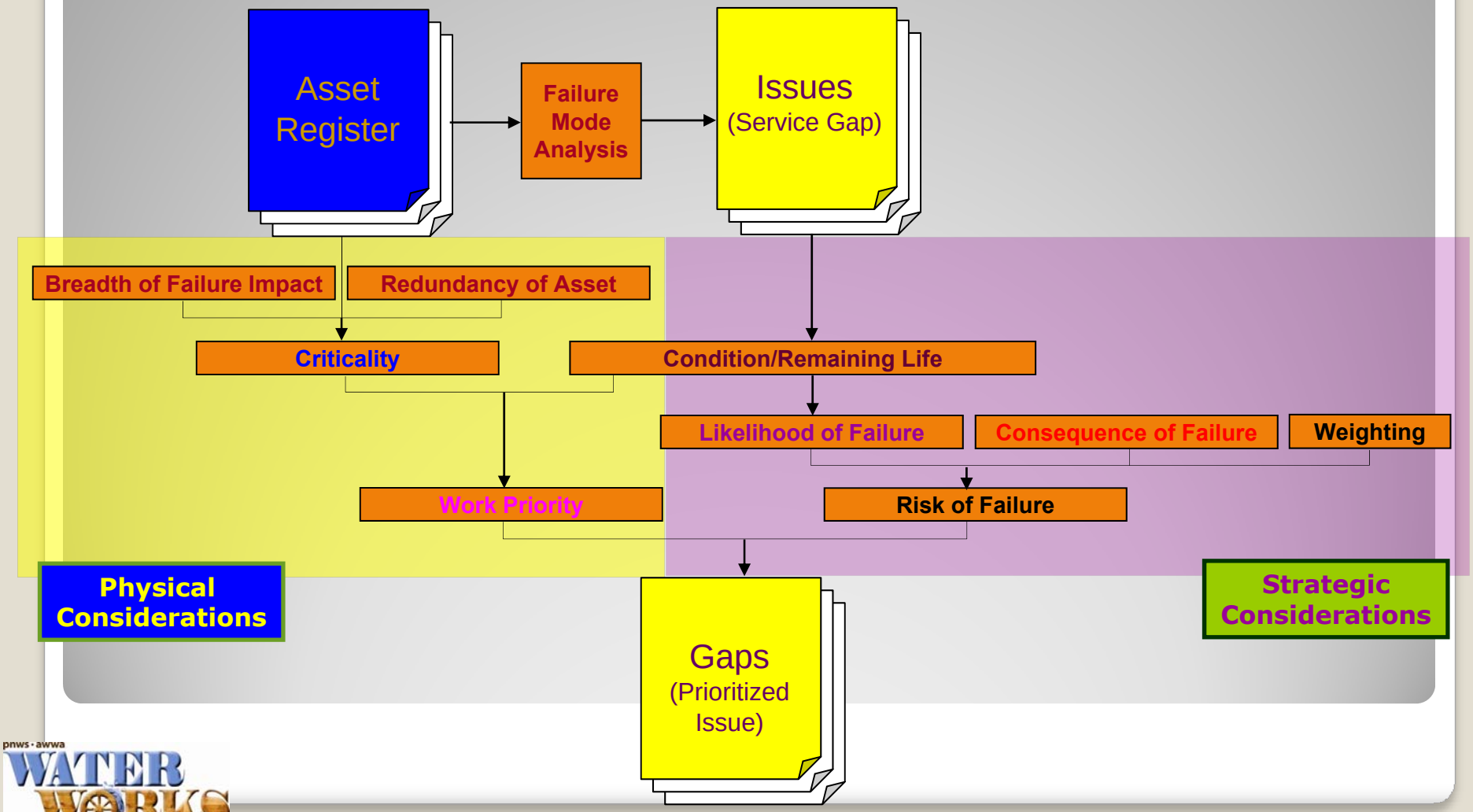
Prioritization

- Evaluation Elements



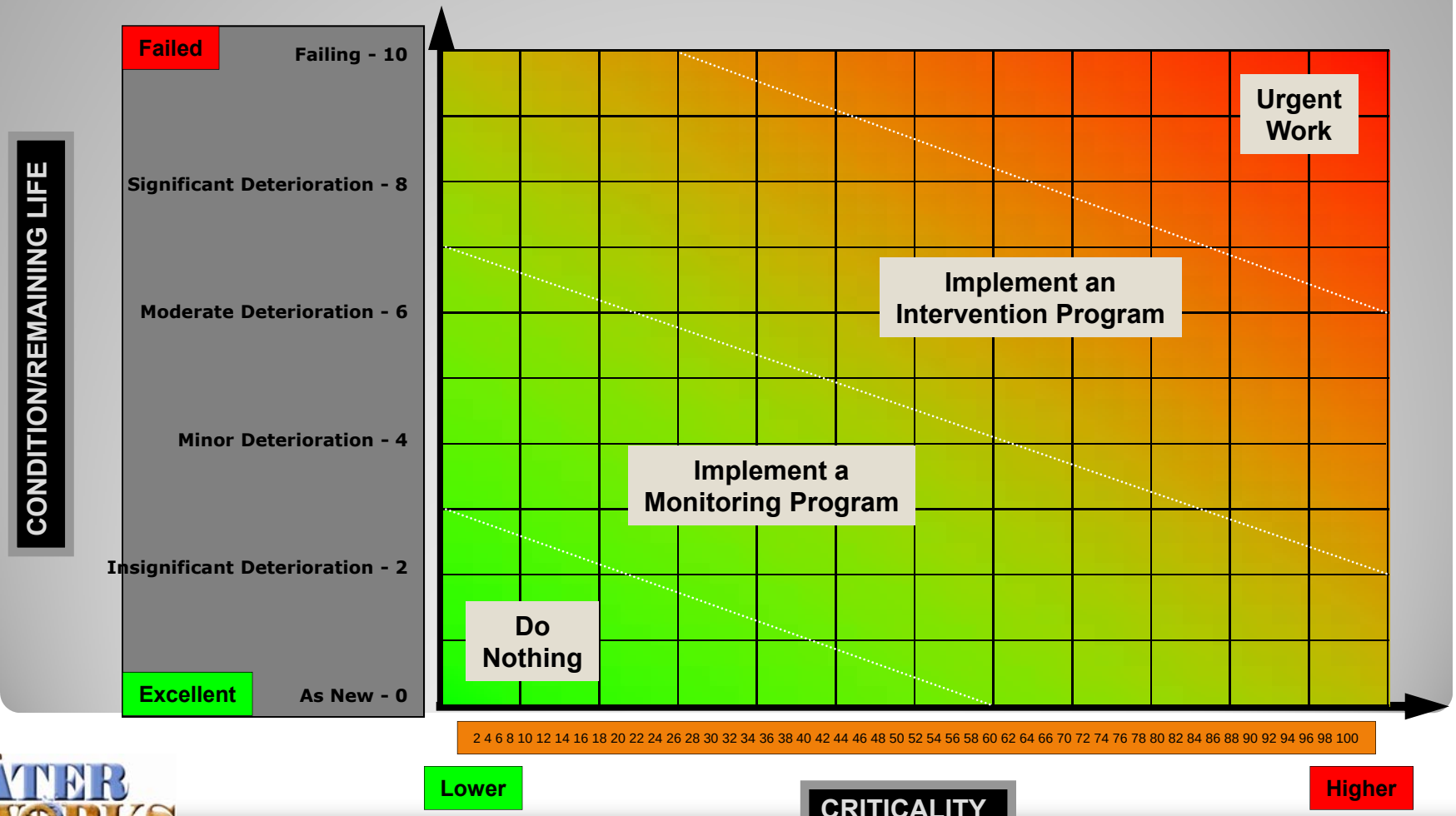
Determining Work Priority

- Work Priority =
  - Criticality x Condition
- Resultant Scores Range:
  - 0 – 1000
  - Do Nothing – Implement Monitoring Program – Implement Intervention Plan – Urgent Work

Work Priority

= Criticality x Condition

Define Criteria to Suit Application



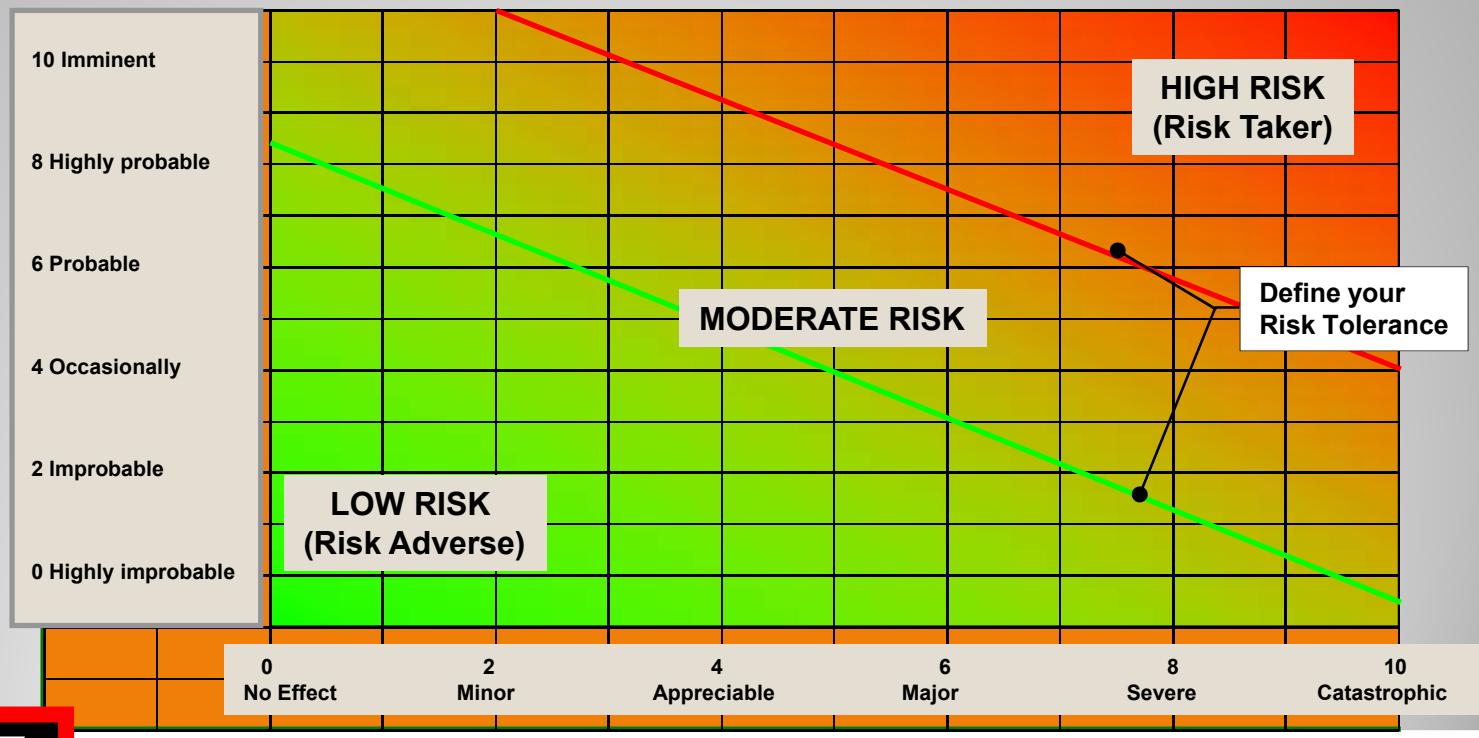
Risk of Failure

- Risk =
  - Likelihood (of failure) x Consequence (of Failure) x Weighting
- Score Range:
  - Likelihood
    - 0 - Highly improbable, 10 - Imminent
  - Consequence
    - 0 - No effect, 10 - Catastrophic
  - Weighting
    - % of 100% for each category, 1-5 for each Council Goal
  - Resultant Score x weighting
    - 0 - Low Risk, Risk Adverse, 100 - High Risk, Risk Taker

Risk (of Failure)
-Likelihood x Consequence

NOTE: Define Criteria

RISK MATRIX



of FAILURE

CONSEQUENCE

Likelihood (of Failure)

- Expressed as:
  - A number 0-n
  - A probability 1/N
- Determined by:
  - Mean time to failure;
  - A function of condition, or
  - Ratio: (Tot. Life – Remaining life)/Total Life as % x 10
  - etc

Consequence (of Failure)

Descriptors	None	Minor	Appreciable	Major	Severe	Weighting	
Customer Impact Social Quality Financial Legal Health & Safety Image Public response Service/reliability Environmental Regulatory Inter-relationship Security O&M	Score Keys **What is the Consequence of FAILURE?**					Council Goal Multiplier	Asset Category Weighting
Rank	0	2	4	6	8	10	

Gap Priority #:

- "The Prioritized Issue Score"

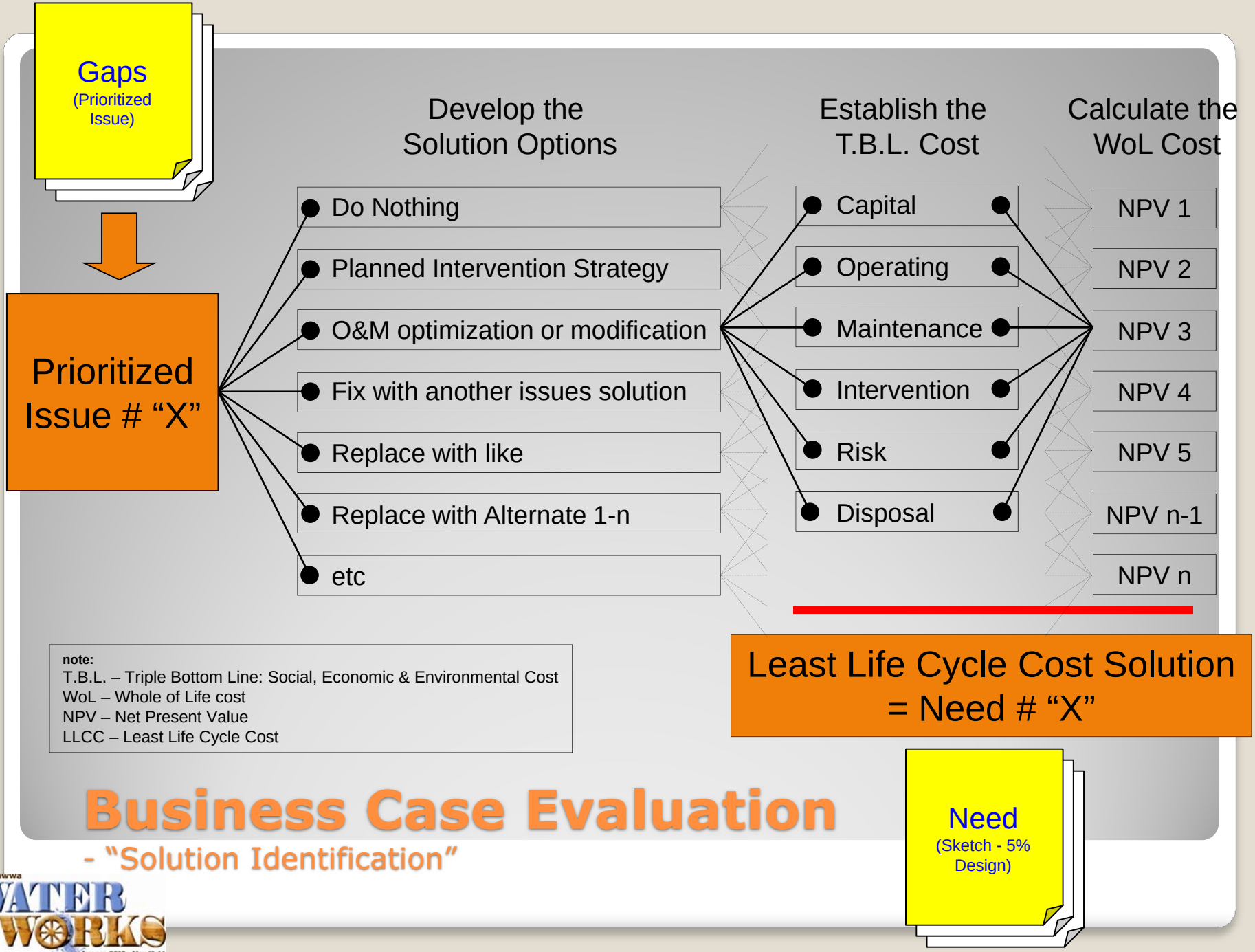
- Priority # =
  - Work Priority x Weighted Risk #
- Resultant Score Range:
  - 0 – 500,000 then normalized ((x-ū)/σ).10+50)

- Ranking

Title	Redundancy	Affect	Criticality	Condition	Work Priority	Likelihood	Consequence	Risk #	Priority #	Normalized #	Rank #
Potential Score	0-10	0-10	0-100	0-10	0-1000	1-10	0-33.3	0-333.3	0-333,333	Ū=50, σ=10	1-n

Outputs & Outcomes – step 4

Collate Asset Data	Asset Register
Issue Identification	Issues List
Issue Prioritization	Gaps List
Solution Identification	Needs List/Master Plan
Funds Identification	Capital Improvement Plan



Business Case Evaluation

- "Solution Identification"

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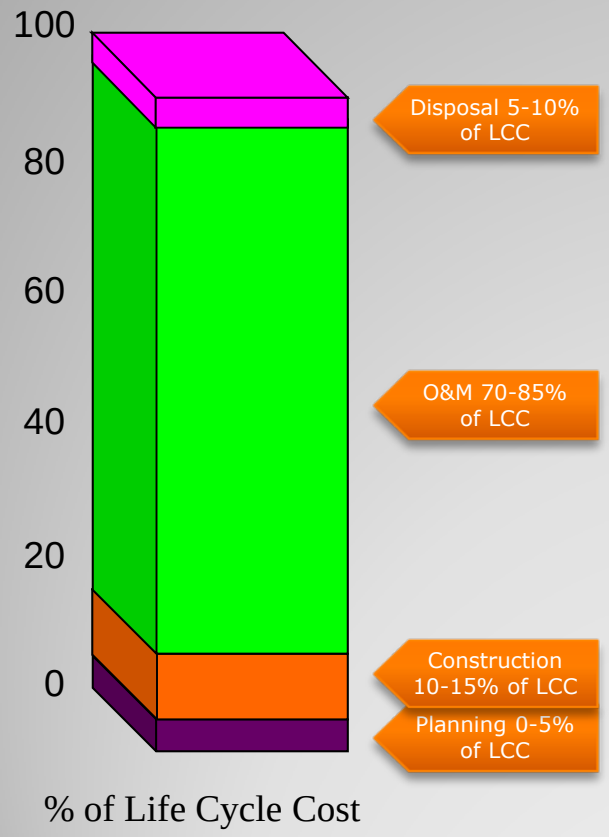
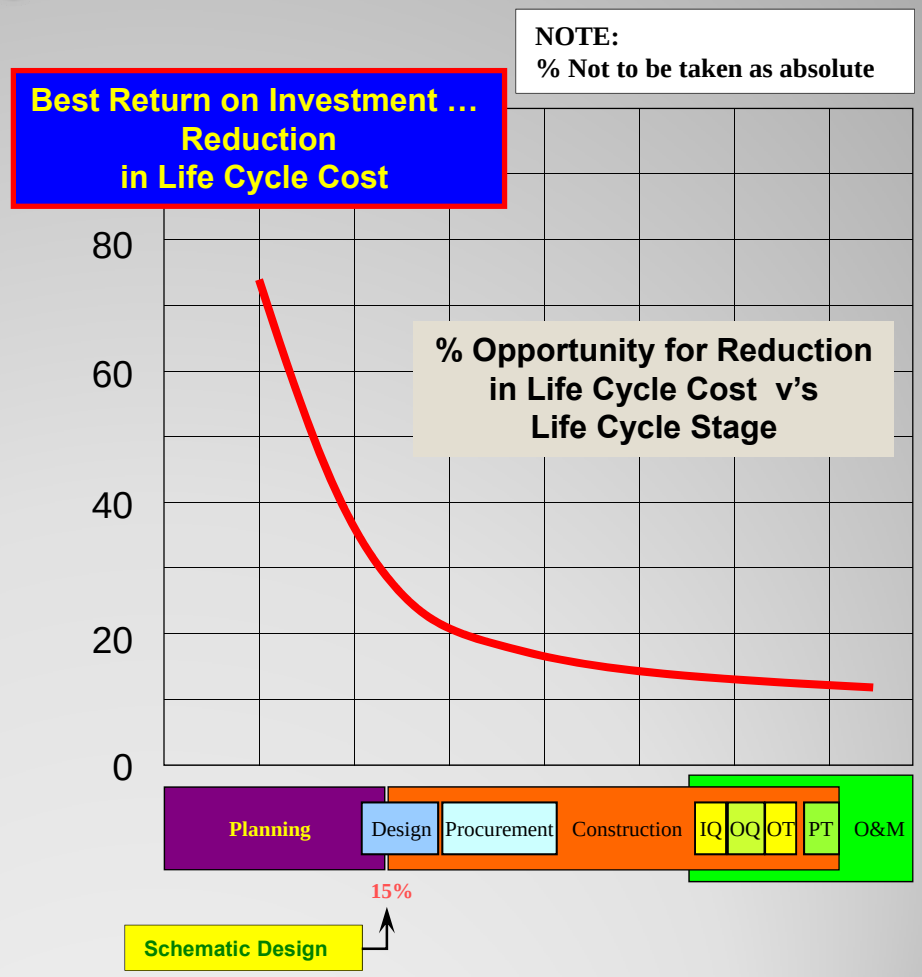
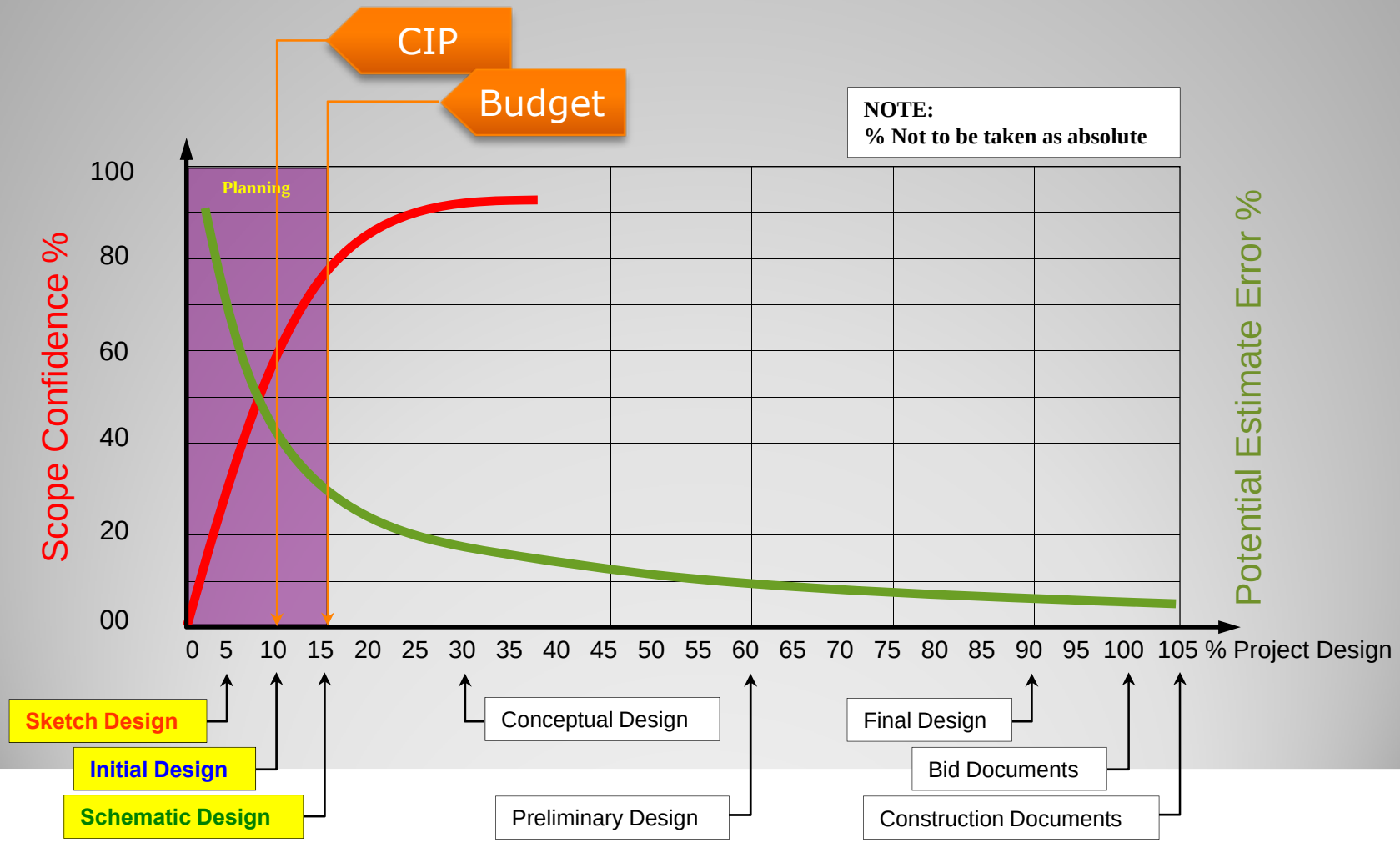
Life Cycle Cost





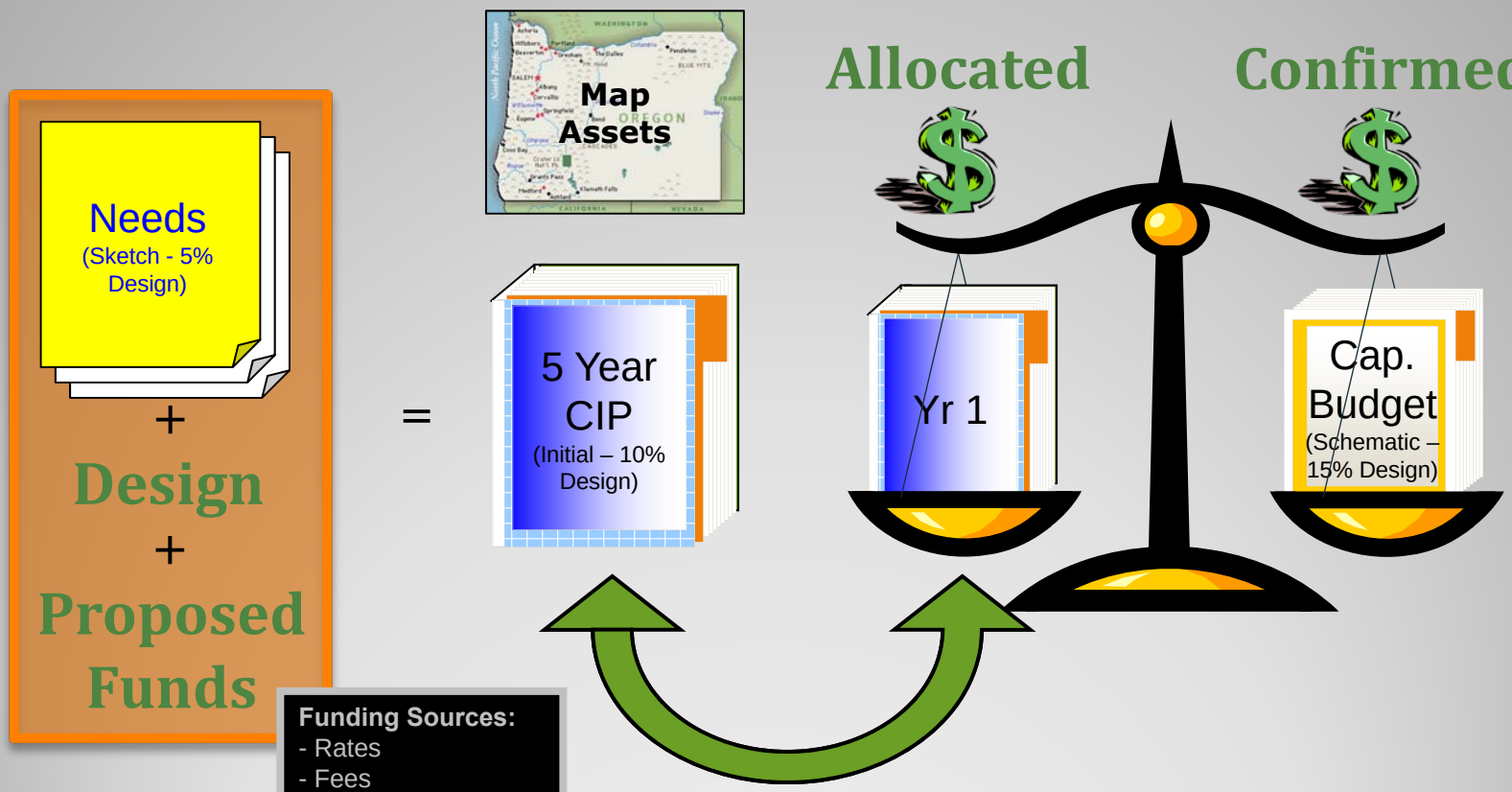
Confidence


CIP
Budget
NOTE:
% Not to be taken as absolute
Planning
Scope Confidence %
100
80
60
40
20
00
Potential Estimate Error %
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 % Project Design
Sketch Design
Initial Design
Schematic Design
Conceptual Design
Preliminary Design
Final Design
Bid Documents
Construction Documents

Output & Outcomes – step 5

Collate Asset Data	Asset Register
Issue Identification	Issues List
Issue Prioritization	Gaps List
Solution Identification	Needs List/Master Plan
Funds Identification	Capital Improvement Plan

Funding Strategy



Funding Sources:
- Rates
- Fees
- Bonds/Loans
- Funds
- SDC's
- Developers
- Grants
- etc, etc

Where, When What & How?

Funding

- Allocating available money

Title	Rank #	Project $0.00	Year P			Fund Source
Project Title	1-n	$ABC.00			Yes/No	Rates, SDC's etc

$:00				ources			Cap. Cost	Balance
				.....	FS# n	Σ		
P 2	.....							
	N#n							
Total								

Easy Right! What a load of BS!

- What is a “Capital” work?
  - Any asset requiring work above a set monetary value;
  - A new asset;
  - An expanding asset; or
  - Some other definition
- Where should the “CIP” data reside?
  - In an enterprise Asset Management System;
  - In a dedicated Data Management System;
  - With Operations, Planning, Engineering, or Finance
- Should Financial Placeholders be part of the CIP or just budget line items?
- If Placeholders are to be within the CIP how are they prioritized?
- What is the real affect of normalized priority scores?
- What are the compounding affects of normalization and dedicated funding sources?
- How should dedicated funding sources and priority be related?

Resultant Output

$50M — **List 1** — Work In Progress/ Construction → WIP

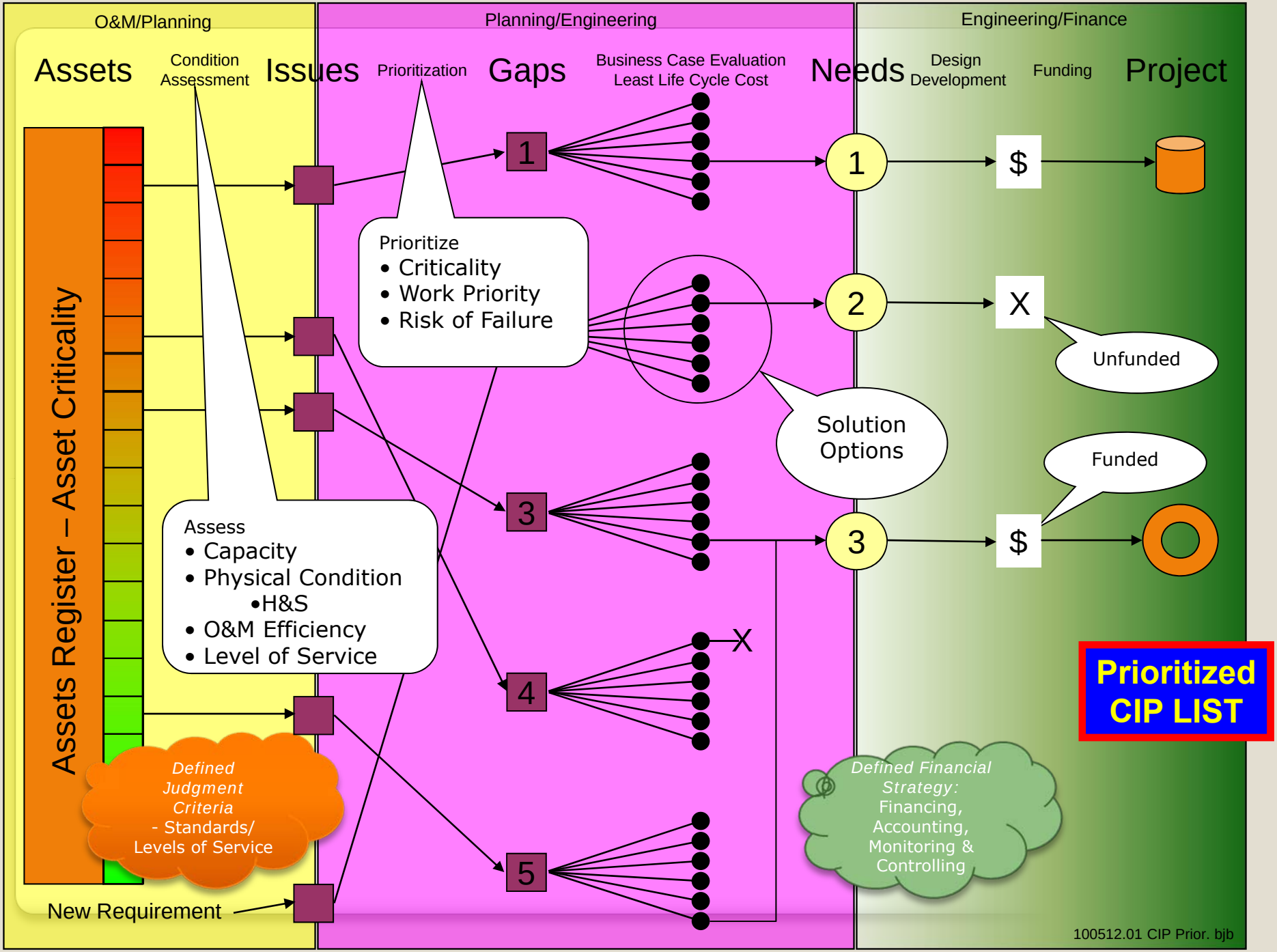
$100M — **List 2** — Financial Place Holder → Expenses, Construction Reserve, Fund Source

$500M (Approx 700 projects) — **List 3** — Ranked Issues → Scored Project

- 5 Year CIP Projects
- 09-10 Budgeted Projects
- Identified Stimulus Projects
- Additional Critical Asset Issues

$350M — **List 4** — Not scored → Identified un-scored

- Items < $50K
- Items outside 5 year
- Completed

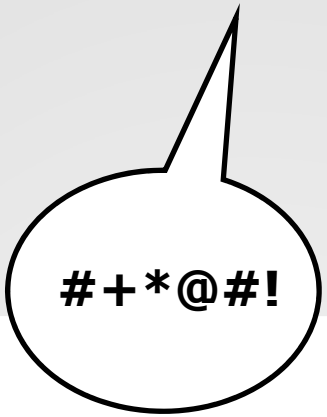

O&M/Planning
Planning/Engineering
Engineering/Finance
Assets
Condition Assessment
Issues
Prioritization
Gaps
Business Case Evaluation Least Life Cycle Cost
Needs
Design Development
Funding
Project
Assets Register – Asset Criticality
Prioritize
• Criticality
• Work Priority
• Risk of Failure
Assess
• Capacity
• Physical Condition
•H&S
• O&M Efficiency
• Level of Service
Solution Options
Unfunded
Funded
Prioritized CIP LIST
Defined Judgment Criteria - Standards/ Levels of Service
Defined Financial Strategy: Financing, Accounting, Monitoring & Controlling
New Requirement
100512.01 CIP Prior. bjb

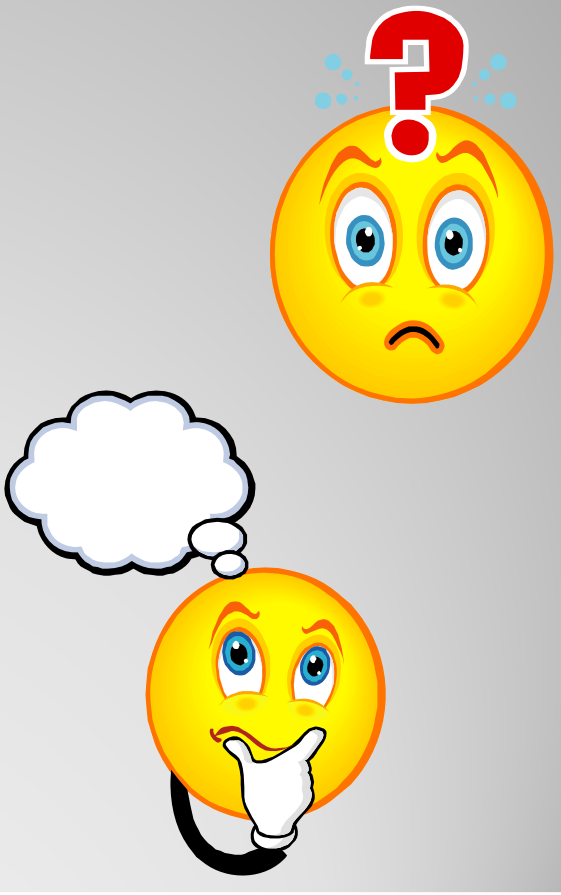
Capital Investment Project Prioritization

– City of Salem, OR

Thank you for listening

- Questions
- Ideas
- Thoughts
- Comments





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