BUILDING A WORLD OF DIFFERENCE

IMPLEMENTING AN ADAPTIVE CAPITAL IMPROVEMENT PLAN

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ESRI INTERNATIONAL USER CONFERENCE
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Winston-Salem • Forsyth County
City/County Utilities
Water • Sewer • Solid Waste Disposal

BLACK & VEATCH
Building a world of difference.

AGENDA

- Project background
- CIP Prioritization
- iCIP Cost-Estimating tool
- Demo
- Closing

PROJECT BACKGROUND

CITY/COUNTY UTILITIES COMMISSION – COLLECTION SYSTEM OVERVIEW

- Number of Wastewater Customers: 93,684
- Miles of sewer: 1,724
- Pump stations: 49
- Wastewater treated per day: 36 MGD

PROJECT BACKGROUND

- **Engineering agreement with Black & Veatch**
- **Evaluated growth through 2041**
- **Evaluated capacity of three major sewer basins**
- **Master plan**
  - Flow projections
  - Flow monitoring
  - Hydraulic modeling
  - Capacity improvements

PROJECT BACKGROUND

- **Asset Management**
  - PAS55 Assessment
  - GAP Analysis
  - iCIP (interactive Capital Improvement Planning)
    - CIP prioritization
    - CIP cost estimating

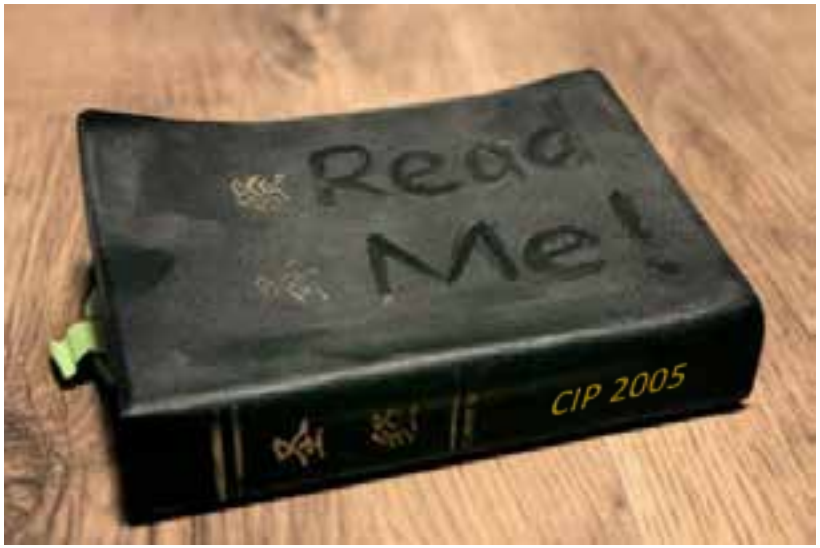
CIP PRIORITIZATION

INDUSTRY FOCUS IS CHANGING: EXPANSION → ASSET MANAGEMENT & OPTIMIZATION

- Need for cost-effective assessments
- Address worst condition pipelines first
- Risk based prioritization

CIP PRIORITIZATION - OLD APPROACH

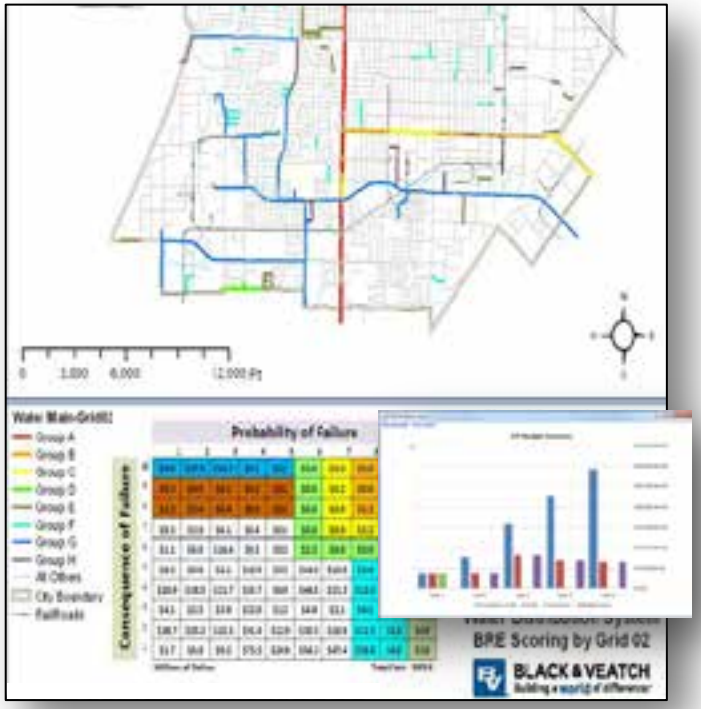
Traditional CIP



- Not risk-based
- Static CIP Report
- Time and situation constrained
- Not adaptable

CIP PRIORITIZATION – ADAPTIVE APPROACH

Adaptive CIP



- Elevate awareness
- Leverage risk-based prioritization
- Interactive and dynamic
- Enhanced scenario management
- Geographic interface
- Graphic displays

PRIORITIZING AGING INFRASTRUCTURE

Risk =

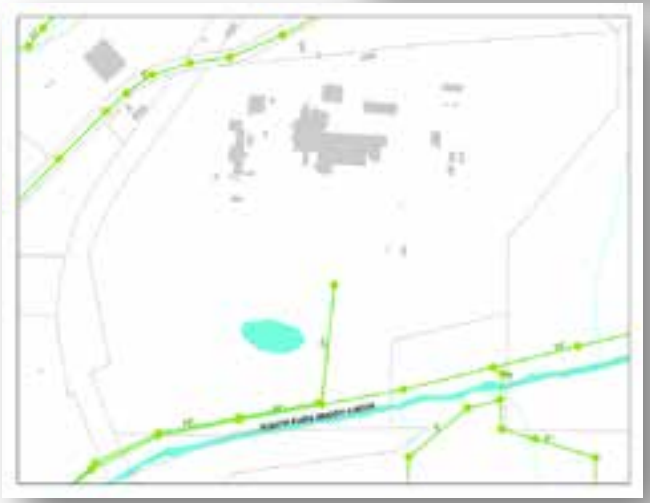
Likelihood of Failure (LoF)
X
Consequence of Failure (CoF)

EXAMPLE LIKELIHOOD OF FAILURE FACTORS

- Age
- Material
- Failure History
- Geotechnical
- Contractor History
- Infiltration
- Condition Inspection
- Available Capacity
- Exposure
- Life Expectancy

EXAMPLE CONSEQUENCE OF FAILURE FACTORS

- Critical Customers
- Proximity to Wetlands
- Proximity to Water Supply
- Number of Impacted Customers
- Critical Area
- Sensitive Locations
- Pipe Size
- Difficulty of Repair



CONSEQUENCE OF FAILURE CRITERIA FOCUS

- Economic
- Environmental
- Social/Political
- Health and Safety

CONSEQUENCE OF FAILURE CRITERIA: ECONOMIC & ENVIRONMENTAL

Economic					15%
Transport		**70%**	**Diameter**		**30%**
Minor thoroughfare	6%	0.13	2-10, 1	6%	0.15
Beltway	11%	0.23	12-16, 2	10%	0.23
Major thoroughfare	11%	0.24	18-24, 3	21%	0.50
Rail	26%	0.57	26-36, 4	22%	0.54
Expressway	46%	1.00	>36, 5	41%	1.00

Environmental								29%
Stream		**26%**	**Diameter**		**34%**	**River**		**40%**
Intersect	69.10%	1.00	2-10, 1	6%	0.15	Very near	75%	1.00
Near	24.00%	0.35	12-16, 2	10%	0.23	Near	25%	0.33
No	6.90%	0.10	18-24, 3	21%	0.50	No	0%	0.00
			26-36, 4	22%	0.54			
			>36, 5	41%	1.00			

CONSEQUENCE OF FAILURE CRITERIA: SOCIAL/POLITICAL & HEALTH AND SAFETY

Social/Political					21%
Population Density		**33%**	**Transport**		**67%**
<=621, 1	7%	0.17	Minor thoroughfare	6%	0.13
622-1172, 2	10%	0.24	Beltway	11%	0.23
1173-1876, 3	21%	0.50	Major thoroughfare	11%	0.24
1877-3109, 4	22%	0.54	Rail	26%	0.57
>=3110, 5	41%	1.00	Expressway	46%	1

Health and Safety					35%
Population Density		**75%**	**Diameter**		**25%**
<=621, 1	7%	0.17	2-10, 1	6%	0.15
622-1172, 2	10%	0.24	12-16, 2	10%	0.23
1173-1876, 3	21%	0.50	18-24, 3	21%	0.50
1877-3109, 4	22%	0.54	26-36, 4	22%	0.54
>=3110, 5	41%	1.00	>36, 5	41%	1.00

ASSET RISK ASSESSMENT

LoF scoring and weighting

Pipe		Work Order		Age		SSO	
UNITID	UNITID2	Distance to Work Order (ft)	Work Order Score	Installed Date	Age Score	Distance to SSO (ft)	SSO SCORE
SMH28571	SMH2857	172	4	11/10/1925	5		1
SMH51286	SMH5128	362	2	04/01/1927	5		1
SMH15857	SMH1585	490	1	04/01/1927	5		1
SMH50496	SMH5049		2.5	04/01/1947	4	164	2
SMH6422	SMH6421		2.5	08/01/1949	4		1
SMH42947	SMH6422		2.5	08/01/1949	4		1
SMH27201	SMH2720	432	1	01/17/1964	4	79	4
SMH27198	SMH2719		2.5	01/17/1964	4	20	5

Population Impact		Proximity to Water Source		Proximity to Highway		Railroad		Pipe Size	
Population Density	Population Score	Distance to Water Source	Hydrology Score	Distance to Highway (ft)	Highway Score	Distance to Railroad (ft)	Railroad Score	Pipe Diameter	Pipe Size Score
3980	5		3			24	5	8	1
2175	4		3			69	4	8	1
3886	5		3	143	3	28	5	8	1
2173	4	80	4			43	5	18	3
3980	5		3			48	5	6	1
3886	5	37	5				1	6	1
1876	3		3			4	5	8	1
1290	3		3			78	4	8	1

**Max Search Distance 500 ft

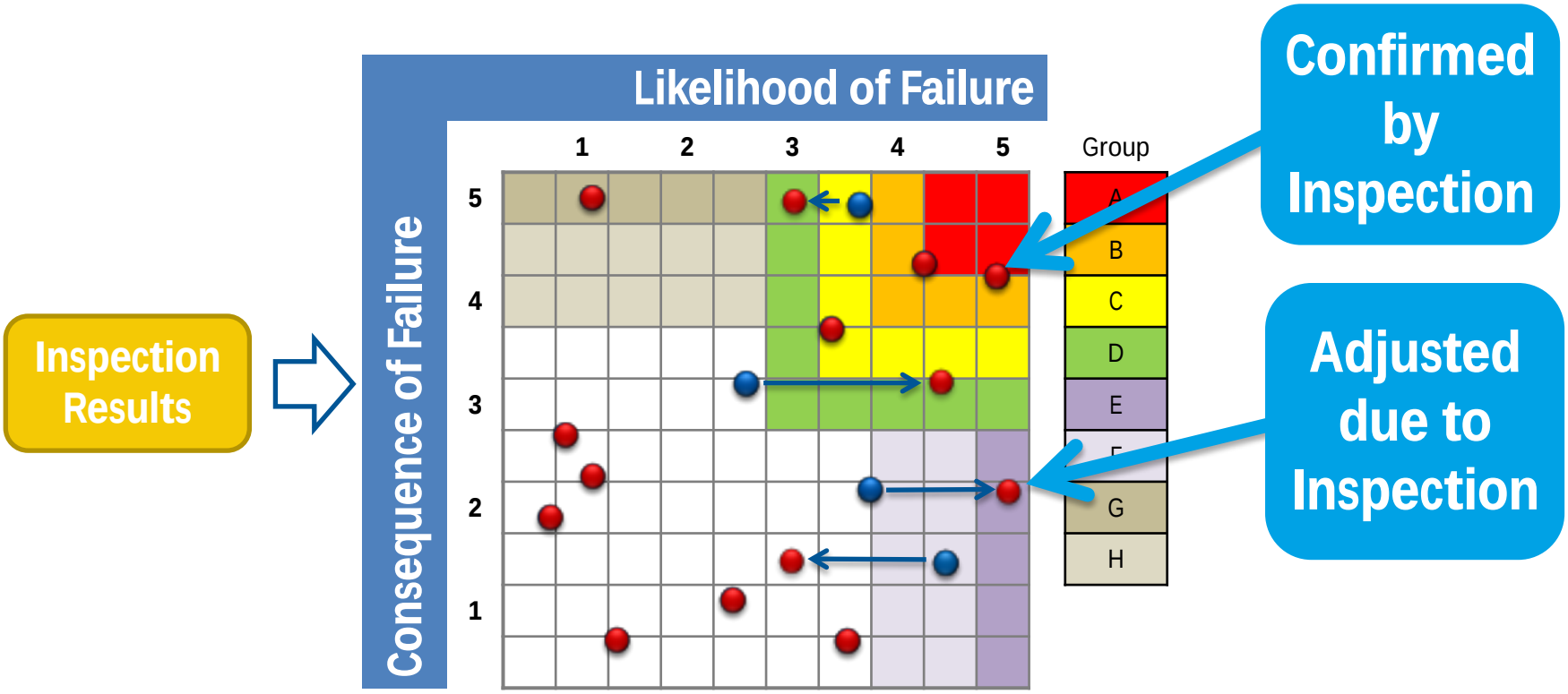
CoF scoring and weighting

RISK RATING & ASSET PRIORITIZATION

RISK-BASED CIP PRIORITIZATION

Consequence of Failure (CoF)	Likelihood of Failure (LoF) 1	2	3	4	5	6	7	8	9	10	Group
10	$95	$14	$0	$0	$0	$15	$0	$1	$20	$5	A
9	$89	$0	$42	$52	$0	$1	$0	$10	$10	$25	B
8	$11	$0	$12	$0	$0	$3	$20	$2	$15	$4	C
7	$12	$52	$45	$0	$0	$25	$0	$22	$35	$8	D
6	$0	$10	$0	$0	$0	$0	$30	$0	$0	$0	E
5	$10	$22	$17	$0	$0	$25	$0	$0	$0	$30	F
4	$62	$6	$56	$0	$0	$0	$0	$0	$0	$0	G
3	$90	$99	$10	$0	$0	$28	$0	$0	$0	$0	H
2	$25	$35	$24	$0	$10	$0	$15	$0	$0	$52	
1	$45	$0	$0	$1	$0	$10	$0	$0	$0	$0	

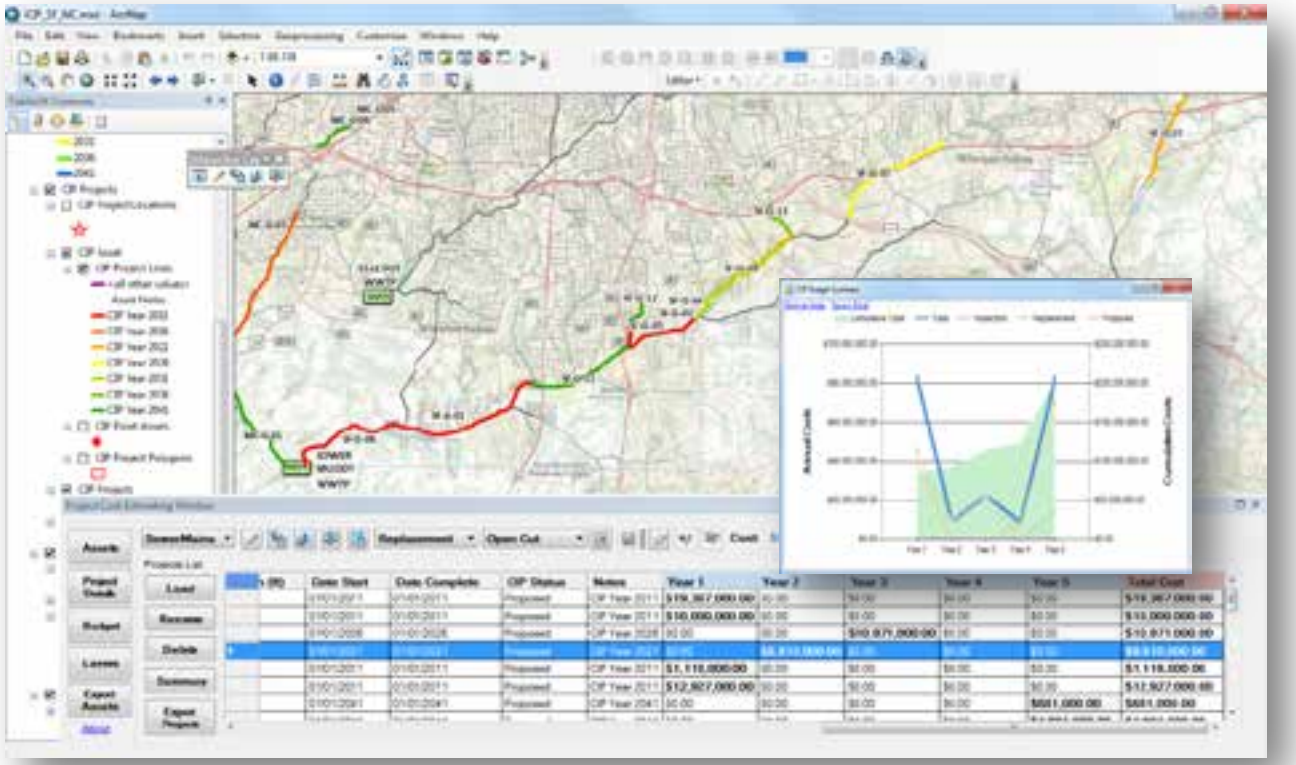
ADAPT TO FUTURE CONDITION ASSESSMENT



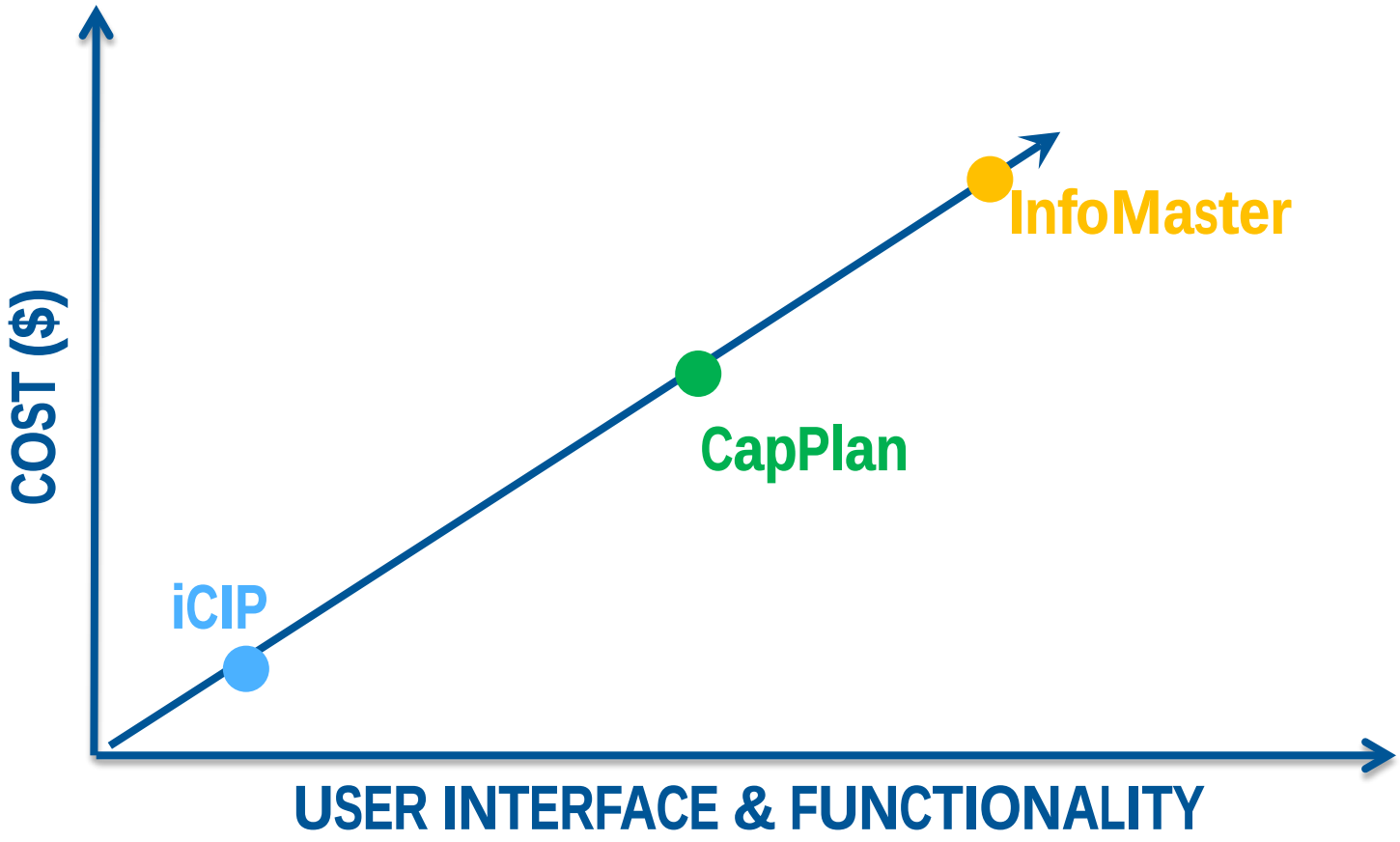
ICIP COST-ESTIMATING TOOL

iCIP

- interactive Capital Improvement Planning
- Built on top of ArcGIS (Esri Add-in)
- Based on Esri CIP template, enhanced by B&V
- Includes suite of tools for interactive CIP planning, budgeting and reporting



DYNAMIC PLANNING TOOLS - COST VS. FUNCTIONALITY



WHAT ARE THE BENEFITS?

- Leverage risk-based prioritization and/or capacity assessments
- Graphically see immediate results of decisions
- Review multiple budget scenarios to refine R & R projects
- CIP projects can be dynamically added, removed or updated to reflect current budgets and needs
- Easy to integrate with existing GIS asset inventory
- Fully customizable and scalable
- Integration with Excel

DEMO

CLOSING

CLOSING

- CCUC currently moving forward with risk-based prioritization
- iCIP will help CCUC to manage capacity and risk-based linear and facility CIP projects
- Sync tools will allow users to work in either GIS or more familiar Excel environments
- Future iCIP enhancements include Web-based / mobile deployment

IT COULD BE WORSE.

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Together

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