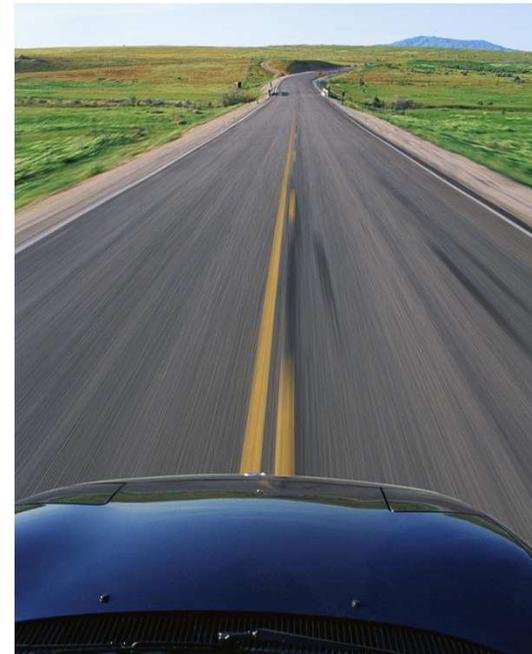


City of Lockport

Pavement Management Optimization



Prepared by



The problem....

Good Roads are NOT Glamorous

...SO

- ▶ Easily deferred
- ▶ Routinely not invested in
- ▶ Simply forgotten until its too late (thus too expensive)



This is a National and State issue!

2010 REPORT CARD for **illinois** INFRASTRUCTURE

Each category was evaluated on the basis of condition vs. need and funding vs. need.

- A = Exceptional**
- B = Good**
- C = Mediocre**
- D = Poor**

AVIATION	C+
BRIDGES	C+
DAMS	C
DRINKING WATER	D+
NAVIGABLE WATERWAYS	D-
RAIL	D
ROADS	D

NORTH AMERICAN BEST PRACTICES

- ▶ US Federal Highway Admin
 - ▶ ...Model to use incremental benefit cost analysis to optimize highway investment.

- ▶ Institute for Research in Construction
 - ▶ ...owners are accumulating an ever increasing maintenance deficit...remedies in the short term may not be the most economical in the long term.

- ▶ “Work Plan for Best Practices: Preventative Maintenance of Municipal Roads”
 - ▶ Slow the rate of deterioration to prolong pavement life
 - ▶ Applying a series of low cost preventative treatments extends the life.
 - ▶ Life cost analysis plays a pivotal role
 - ▶ The success largely depends on the timing of the maintenance.
 - ▶ Asset management tools are essential.
 - ▶ Necessary to apply the right treatment to the right pavement at the right time



Data Collection

Before

- ▶ **PASER**
 - ▶ Visual survey
 - ▶ Seasonal impacts
 - ▶ Weather impacts
 - ▶ Somewhat subjective
 - ▶ People dependent

Now

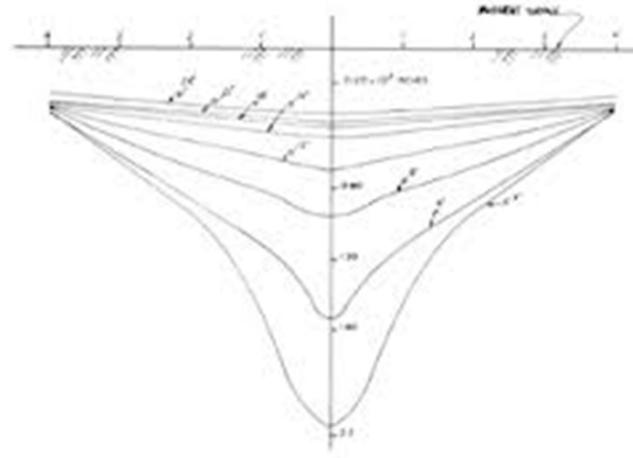
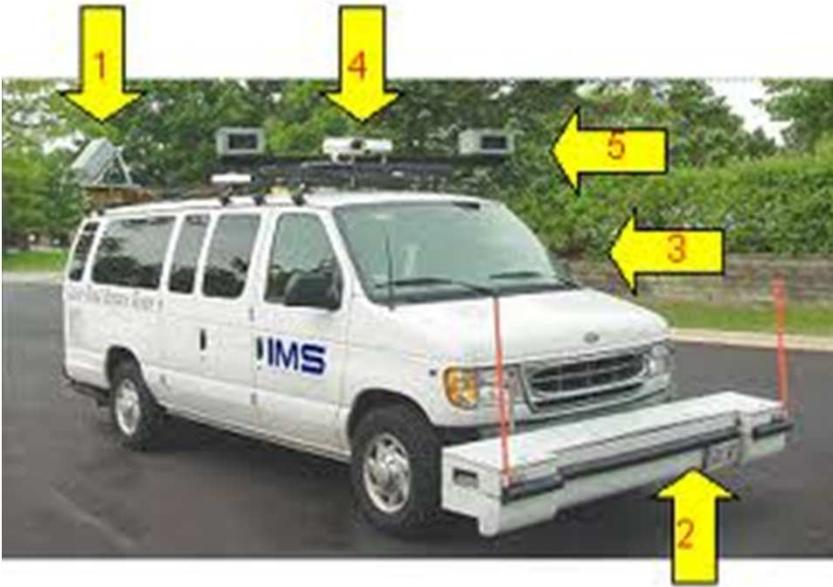
- ▶ **Automated Collection**
 - ▶ Utilizes state of the art technology (lasers, accelerometers and rate gyroscopes)
 - ▶ GPS enabled
 - ▶ Objective pavement surface distress data, roughness and rutting.
 - ▶ Non-destructive deflection testing
 - ▶ Takes out politics



IMS Pavement Analysis Timeline

- ▶ City contracted with IMS to perform pavement analysis (data collection) of roadway network: March 21, 2012
- ▶ Contracted IMS data delivery date: early-mid June 2012
- ▶ Actual IMS delivery date: July 20th
- ▶ Robinson review of data for completeness/errors: week of July 24th
- ▶ Post processing of “raw” data: July 30th – September 7th
- ▶ Met with City staff to review translated OCI mapping from “raw” data and discuss proposed alternative analysis: September 20th
- ▶ Calibration of OCI mapping: September 21st – October 9th
- ▶ Develop baseline maps post 2012 resurfacing program and perform initial alternative analysis: October 9th – October 19th.
- ▶ Met with City staff to review results of alternative analysis: October 24rd.
- ▶ Revise analysis based on feedback from City and review alternate scenarios for optimization: October 24th – November 9th





Pavement Management Optimization



City of Lockport

2012 Pavement Condition

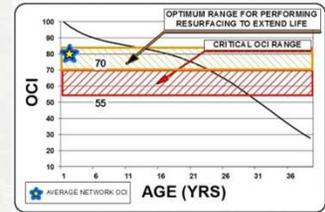
After the 2012 Program



Legend

Overall Condition Index			2012 AVERAGE OCI	
OCI	General Operations	Rating	3% INFLATION ASSUMED	
0 - 54	Reconstruct	Very Poor	1.23 miles	1.22%
55 - 70	Rehabilitate	Poor	19.96 miles	19.67%
71 - 80	Resurface	Fair	28.76 miles	28.49%
81 - 90	Crack Seal/Maintain	Good	29.85 miles	29.57%
91 - 100	Crack Seal	Very Good	21.25 miles	21.05%
			100.95 miles	
Identified Subsurface Issue			24.10 miles	
Dynamic or Deflection Index Values less than 55				
2012 Resurfacing Program			11.86 miles	
2012 Reconstruct Program			0.68 miles	
2013 Spring Reconstruct Program			0.74 miles	

* ROADWAY COSTS ASSUME A DRAINAGE SYSTEM IS IN PLACE



Condition Weighting

Bleeding	4%
Distortion	4%
Distress	35%
Patching	4%
Potholes	4%
Raveling	4%
Ride	10%
Rippling	4%
Rutting	6%
Subsurface	
Deflection	13%
Dynamic	12%

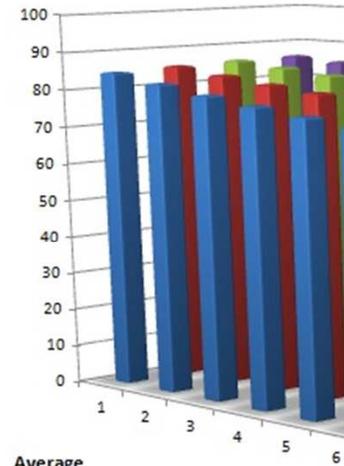


NOVEMBER 8, 2012



Pavement Management Optimization

Road Improvements Budget Forecasting & Long Range



Average Condition Index

	1	2	3
\$100K-\$2M	84.91	82.83	80.87
\$200K-\$4M	85.48	83.93	82.44
\$300K-\$6M	86.01	84.93	83.81
\$350K-\$7M	86.27	85.4	84.46

Segments Detail

Route

Total for Segment Count

Route

Predict Functional Class Pavement Class

Recon

Detailed Insp Inq

Overall Con

Survey Category

Category:

- Bleeding
- Deflection
- Distortion
- Distress
- Dynamic
- Patching
- Potholes
- Raveling
- Ride
- Rippling
- Rutting

Samples Data

Distress Data

- Distress
- AAC Fatigue
- AAC Linear C
- AAC Patching
- AAC Raveling
- AAC Rutting
- AAC Rutting
- AAC Total Cr

Budget Summary

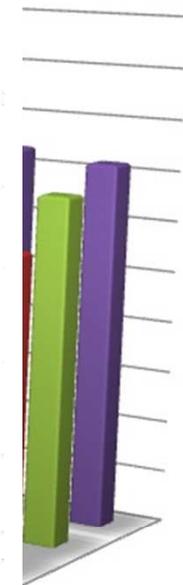
100K Budget Summary

Scenario 100K
Protocol RESURFACE
Is OCI Driven No
Do Best First No
Description

Time Frame 20
Budget 100K
Inflation 3.39
Interest Rate 4.50

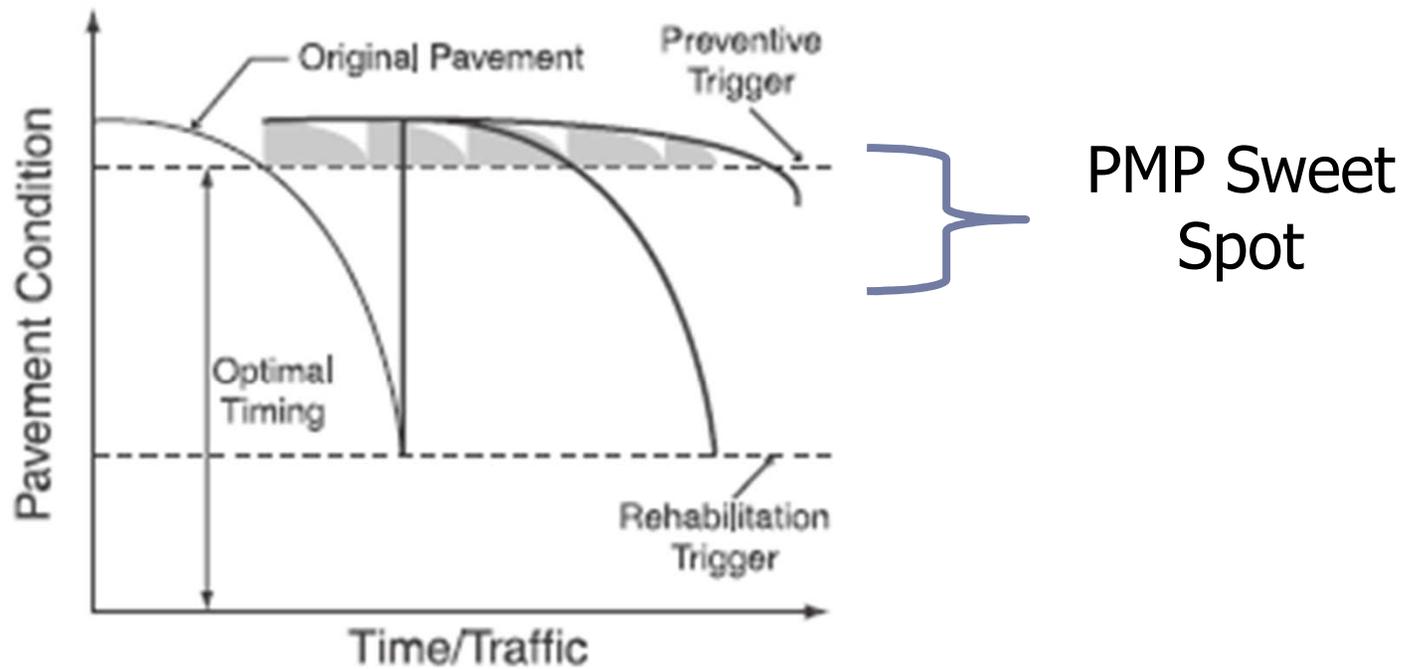
Plan Year	1	2	3	4	5	6	7	8	9
	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00	Target Network OCI 100.00
	Unimproved Network OCI = 84.26	Unimproved Network OCI = 82.21	Unimproved Network OCI = 80.26	Unimproved Network OCI = 78.54	Unimproved Network OCI = 76.90	Unimproved Network OCI = 75.42	Unimproved Network OCI = 74.06	Unimproved Network OCI = 72.72	Unimproved Network OCI = 72.72
	Improved Network OCI = 84.91	Improved Network OCI = 82.83	Improved Network OCI = 80.87	Improved Network OCI = 79.15	Improved Network OCI = 77.52	Improved Network OCI = 76.05	Improved Network OCI = 74.68	Improved Network OCI = 73.35	Improved Network OCI = 73.35
	Cost of Improvement = \$99,726.71	Cost of Improvement = \$100,075.63	Cost of Improvement = \$99,565.35	Cost of Improvement = \$99,288.35	Cost of Improvement = \$99,607.70	Cost of Improvement = \$99,446.59	Cost of Improvement = \$100,669.86	Cost of Improvement = \$100,259.59	Cost of Improvement = \$100,259.59

enarios



	19	20
8	51.26	48.54
17	61.61	59.39
32	69.55	67.77
17	73.63	72.02

Graph of Life

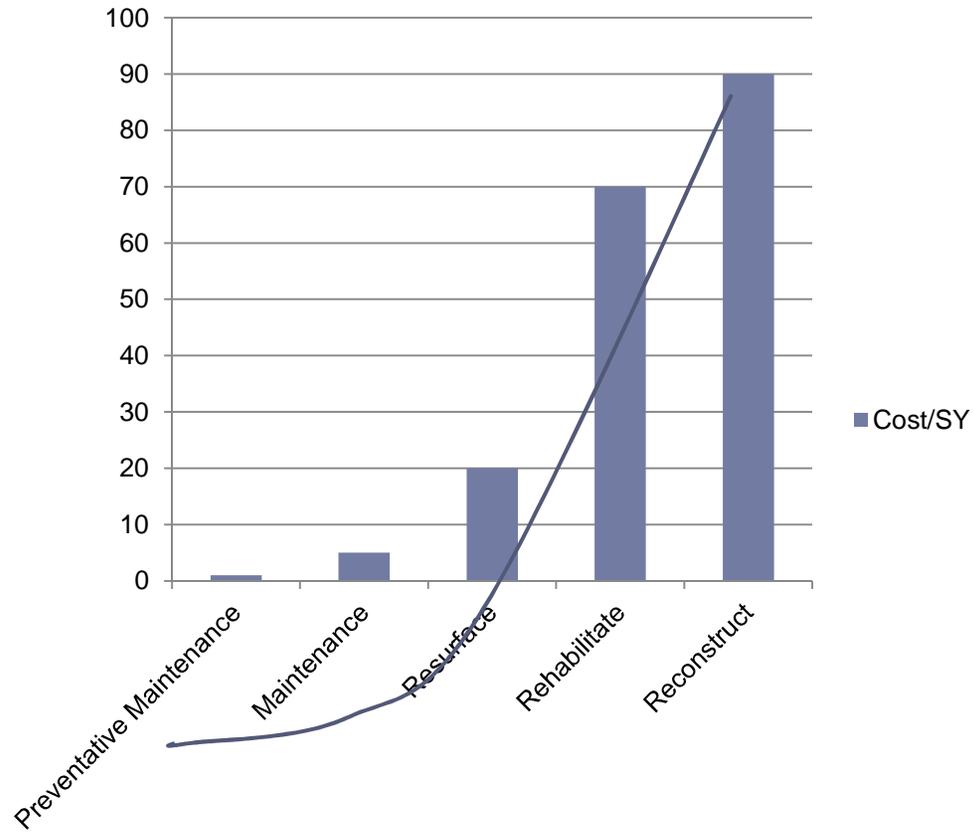


**Extending the useful life
of pavement**

Key principles

- ▶ For every \$1.00 we spend at the right time, we save AT LEAST \$4.00.
- ▶ Better infrastructure = higher property values

Expense of Operation



Pavement Management Optimization

Two Variables to Consider Managing

1 – Condition Index

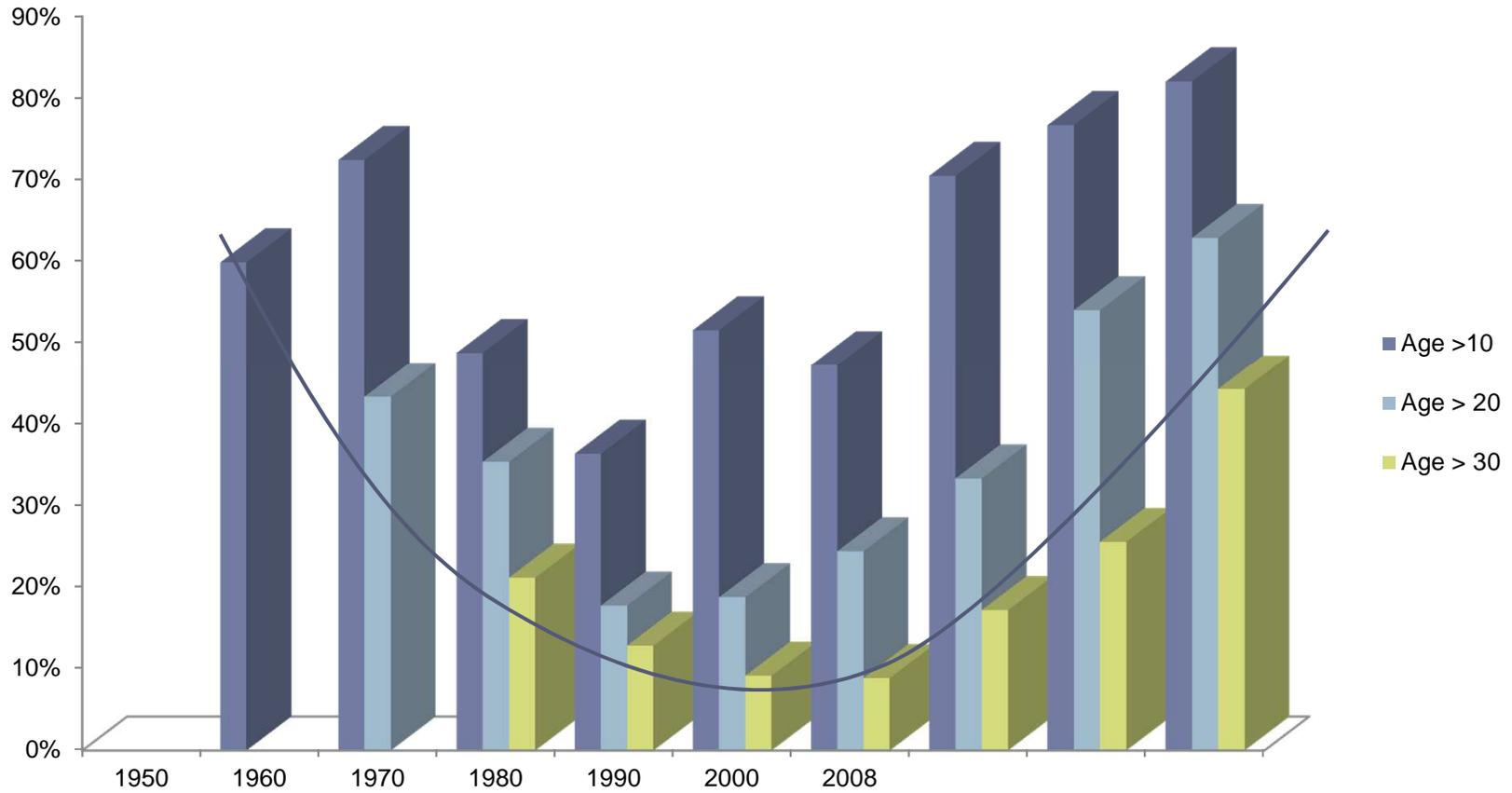
- ▶ Set a targeted average condition index and determine the cost to optimize
 - ▶ Generally requires roadways to be in a mostly serviceable condition.

2 - Dollars

- ▶ Set a budgeted amount and maximize impact
 - ▶ Generally used by most communities because of existing failed roadways.

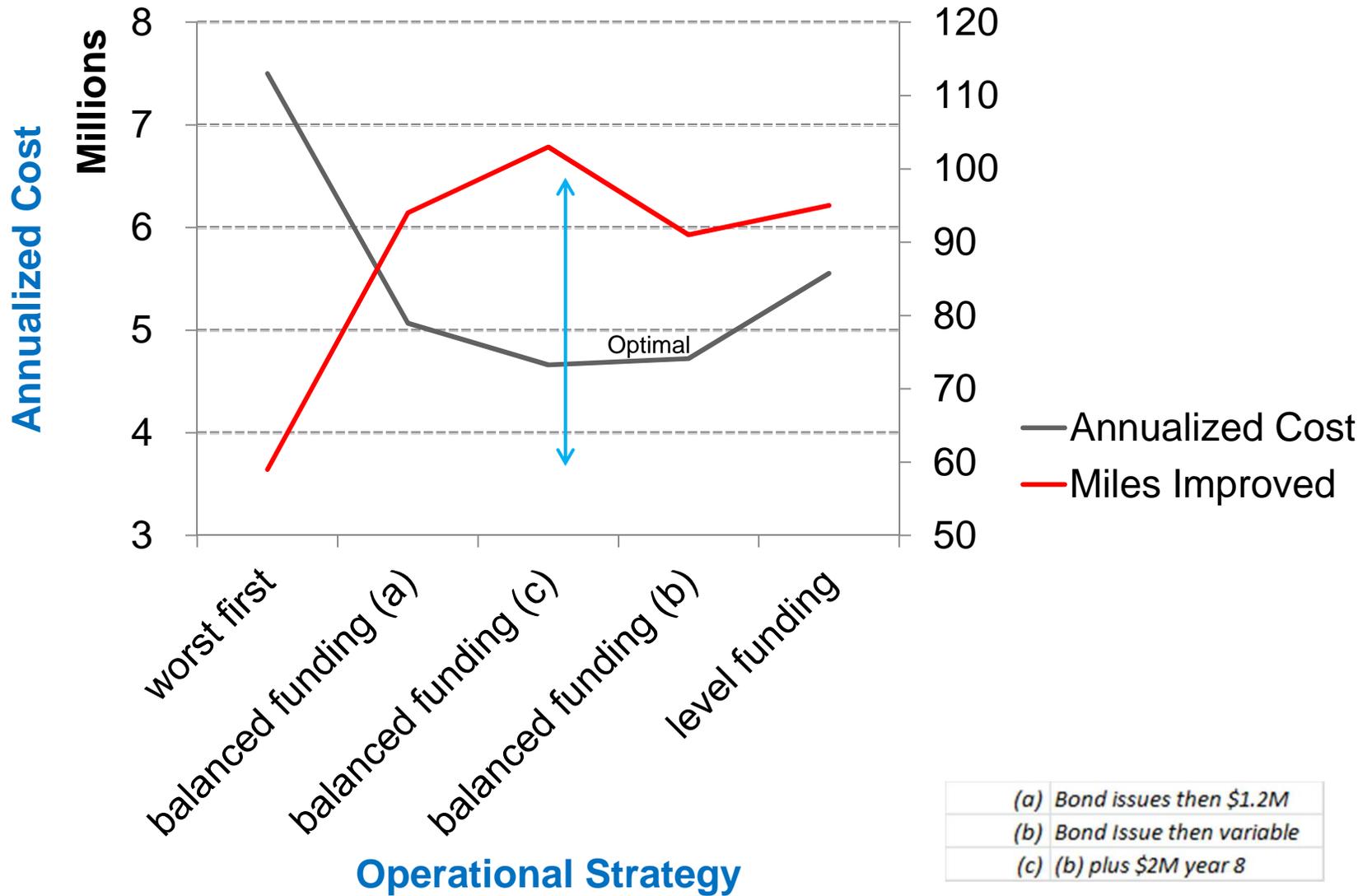


Percentage of 'Aged' Infrastructure

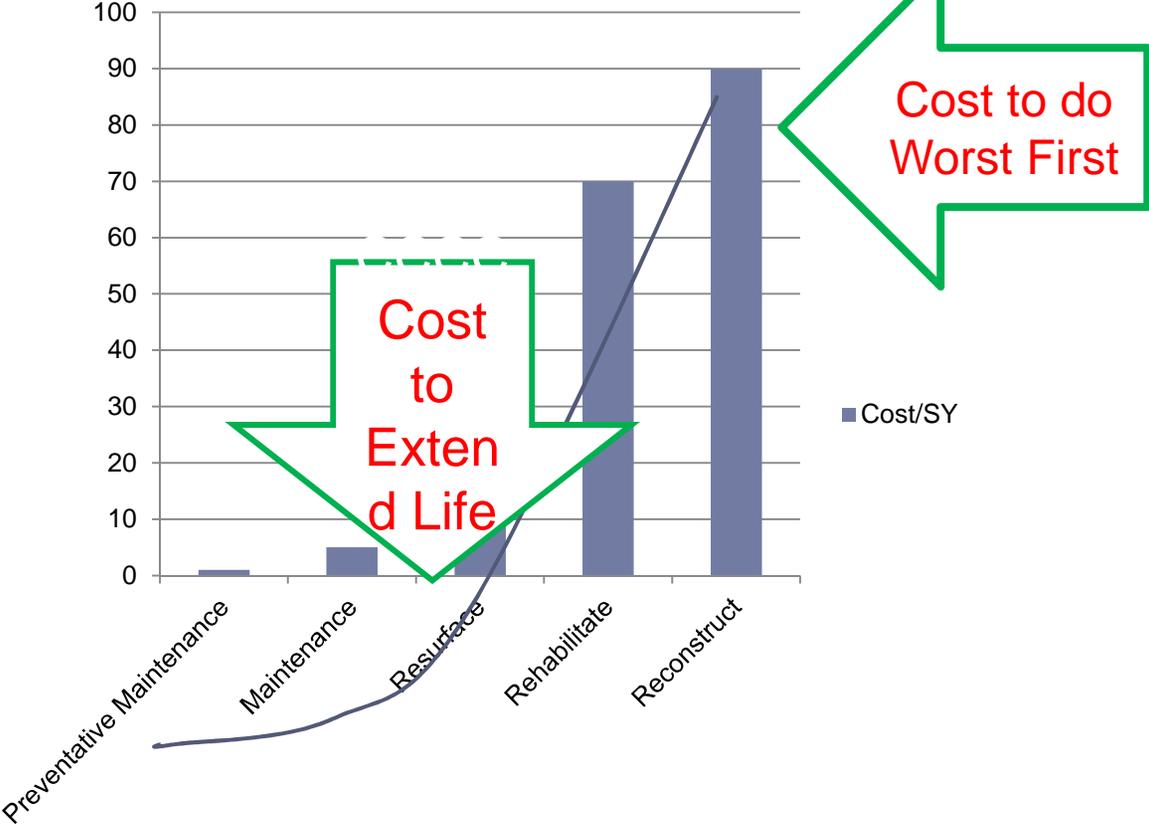


The aging of the infrastructure

Optimization Curve



Expense of Operation



Pavement Management Optimization

Point of Optimal Timing

- ▶ Exponential damage to pavement...
- ▶ ...same time as exponential cost rise.
- ▶ Interesting item:
“ the value of the raw materials on the street today is worth more per ton than the cost to originally place it.”

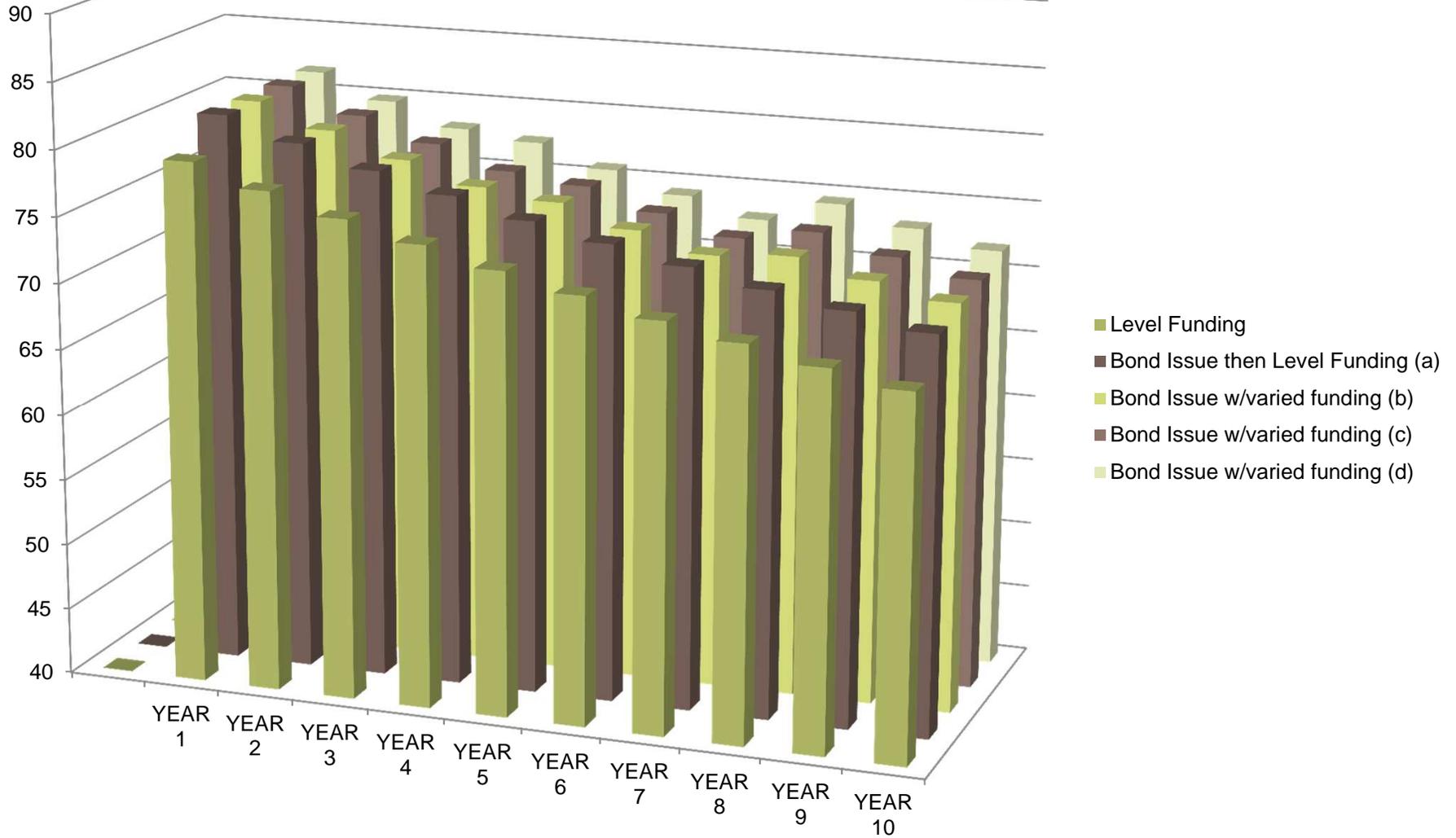
Global Street View		
	% of Network	% of Need (\$)
Poor or Very Poor	29%	78%
Fair	32%	21%
Good	30%	1%
Very Good	9%	0%



PMP Sweet Spot



OCI over time with Varied Scenarios



Pavement Management Optimization

Proposed Program

Funding is based on the City's current projections as provided by the finance department.

Projected bond issue in year 8

Option 3 (c) - BALANCED		
Bond Issue w/varied funding		
Reinvestment needed after 10th year		
Cost	Miles Done	OCI
4,915,600	15.4	81.75
908,900	5.2	79.87
958,400	5.0	78.13
619,100	2.8	76.45
2,636,000	6.6	75.78
598,500	2.8	74.18
644,600	2.8	72.76
6,003,200	12.7	73.68
936,700	2.8	72.3
945,000	2.6	71.1

Balanced Approach with a 10% 60% and 30% split is the cost effective solution.

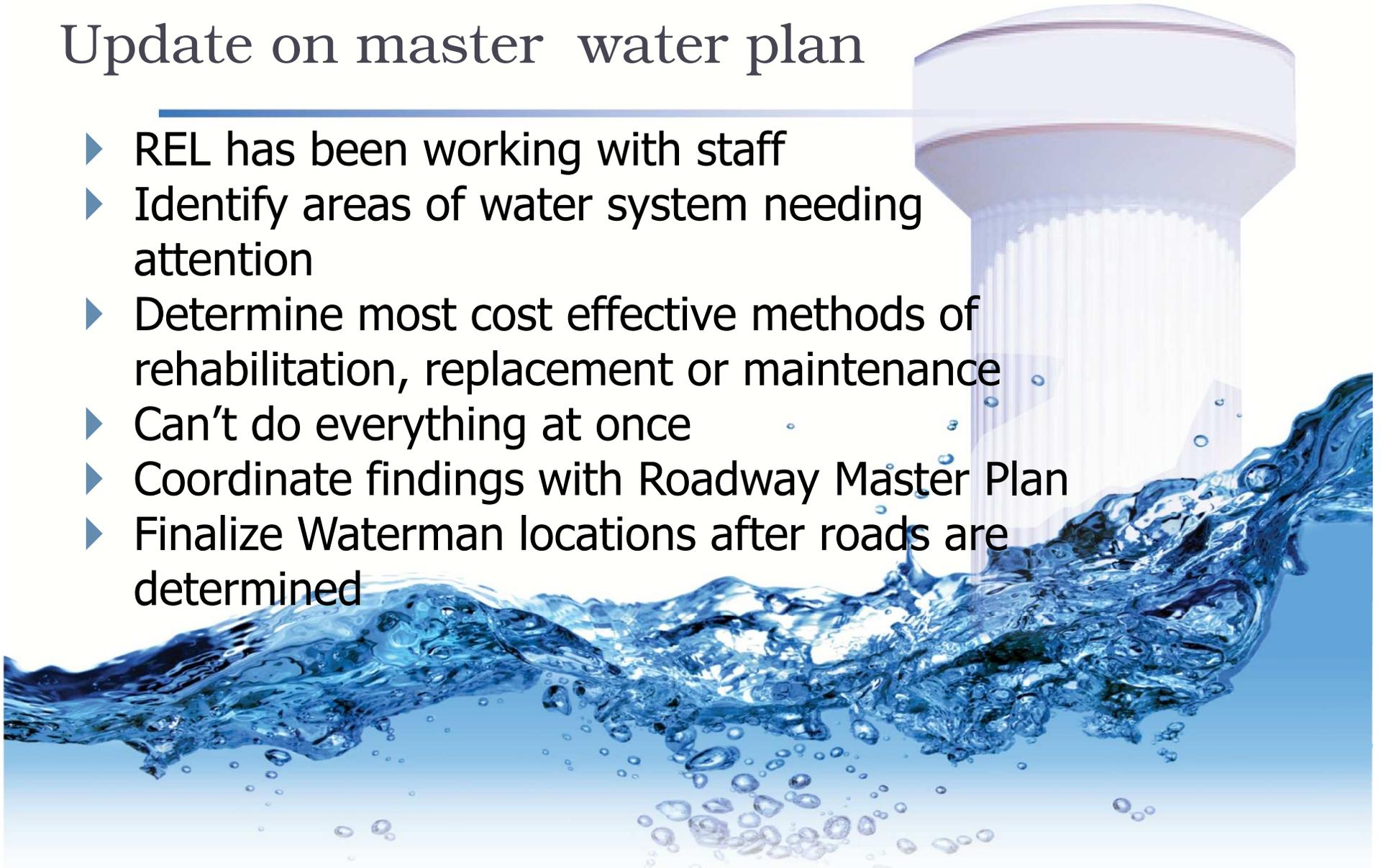
Note: This approach remains consistent regardless of the final funding allocation

FAQ's:

- ▶ What does OCI = 80 mean?
 - ▶ This is the average pavement condition index based on the work completed thru 2012. Some streets are much better and many worse, this is the “system” average.
- ▶ Is there an ‘ideal’ OCI?
 - ▶ From a pure optimization model, maintaining OCI=85 would yield the lowest long term cost. **HOWEVER:** often impractical due to current conditions.
- ▶ How much would it cost to get to OCI=85?
 - ▶ An infusion in excess of \$17M.
- ▶ With a balanced approach, won't we still have roads needing major improvements?
 - ▶ **YES.** The worst first approach is both costly and ineffective. The balanced approach will require patience or a large funding infusion in later years.

Update on master water plan

- ▶ REL has been working with staff
- ▶ Identify areas of water system needing attention
- ▶ Determine most cost effective methods of rehabilitation, replacement or maintenance
- ▶ Can't do everything at once
- ▶ Coordinate findings with Roadway Master Plan
- ▶ Finalize Waterman locations after roads are determined



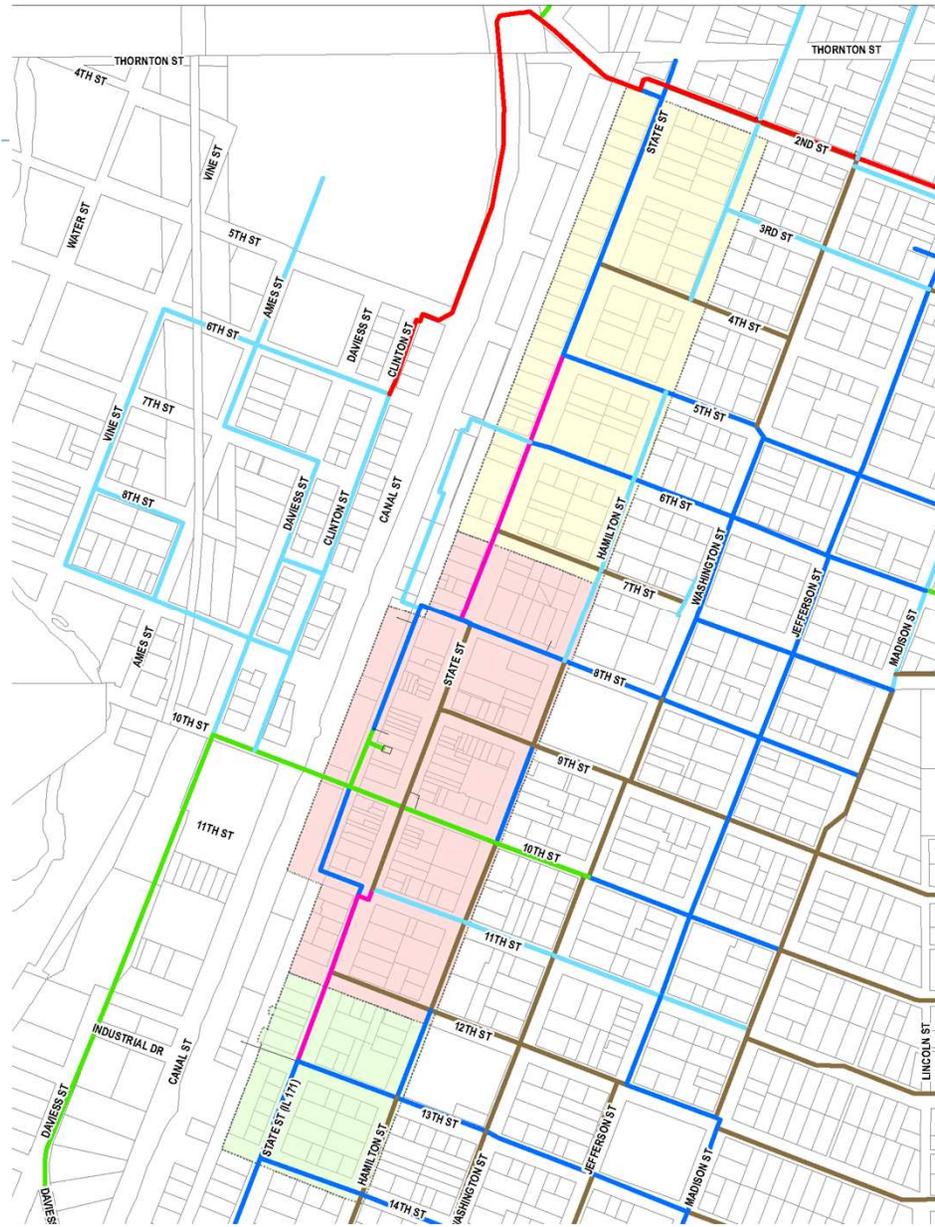
Considerations

- ▶ REL looking at 3 key issues
 - ▶ Fire Flow Improvements
 - ▶ Met with Fire Protection District
 - ▶ Water Main Maintenance (Repair Locations)
 - ▶ Water Quality
 - ▶ Rusty water



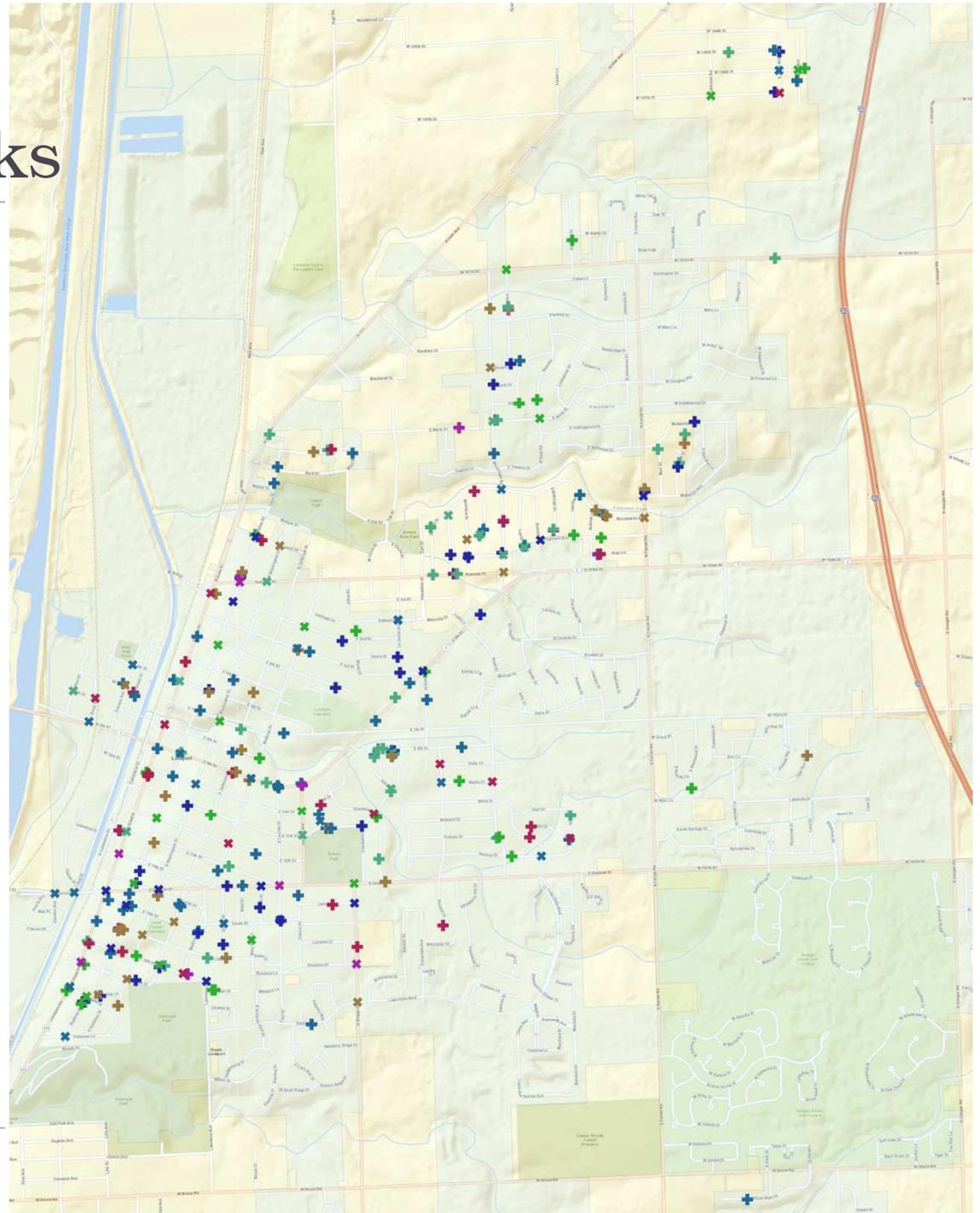
Downtown Fire Flow

- ▶ Fire Protection District
- ▶ Helped categorize areas
 - ▶ **High** Priority
 - ▶ **Medium** Priority
 - ▶ **Low** Priority
- ▶ To target water main replacements
 - ▶ State Street 1st priority



Water Main Breaks

- ▶ Historical Data
- ▶ Last 6 years
 - ▶ Identify mains that are a maintenance concern
 - ▶ Plan for replacement
 - ▶ Coordinate locations with Roadway Program
 - ▶ minimize disruption caused by construction
 - ▶ minimize restoration costs



Water Quality

- ▶ **Historical Data**
 - ▶ Identify mains that may be contributing to water quality complaints (rusty water)
 - ▶ Plan for replacement, rehabilitation or additional maintenance
 - ▶ Goal-Minimize water quality complaints



Funding

- ▶ **Reviewing City Budgets**
 - ▶ Determining methods to finance
 - ▶ IEPA Loan
 - ▶ 1.93% for 20 years
 - ▶ City will ultimately decide how much they can afford



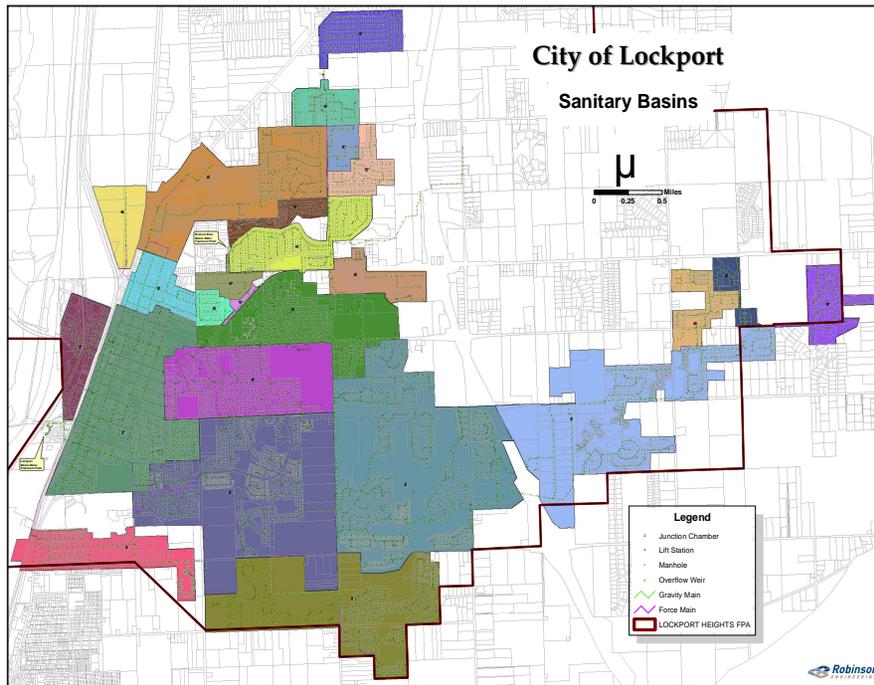
Sewer Master Plan Update--Goals

- ▶ Reduce the amount of rainwater entering the sanitary sewers and WWTP
- ▶ Reduce the operating cost by not conveying or treating rainwater
- ▶ Reduce sanitary over flows
- ▶ *Reduce* the possibility of basement back-ups



INFLOW AND INFILTRATION REDUCTION MASTER PLAN

Sanitary Basin Map & Statistics



3 SANITARY DISTRICTS

(BBFMSD, LHSD and Lockport Township)

129 miles of sewer

Lockport

110 Miles

19 sub-basins

8 lift stations

2 WWTP' s

LHSD

5 miles

2 sub basin

BBFMSD

10 miles

3 Sub basins

Lockport Township

2 miles

1 sub basins

1 lift stations

I/I Reduction Plan

- Address the problem systematically
- Allow the City to spend their limited amount of funds in the most cost effective manner.



I/I Reduction Plan

- How are we going to do it?
 - Measure the problem
 - Identify the defects
 - Prepare cost estimates
 - Estimate the I/I flow per defect
 - Prioritize the defects according to cost effectiveness
 - Seek funding
 - Bid out repair work

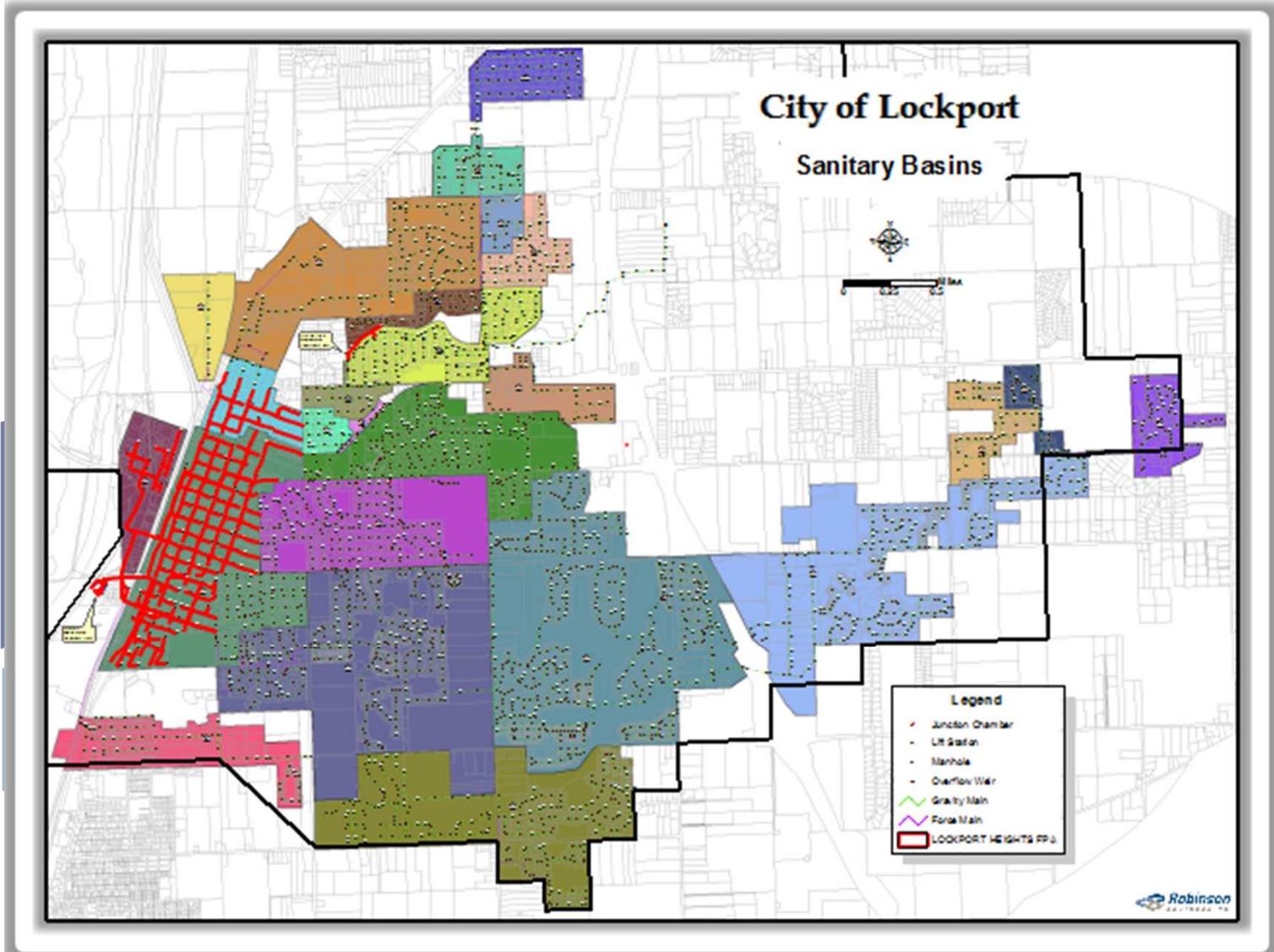


I/I Reduction Targets

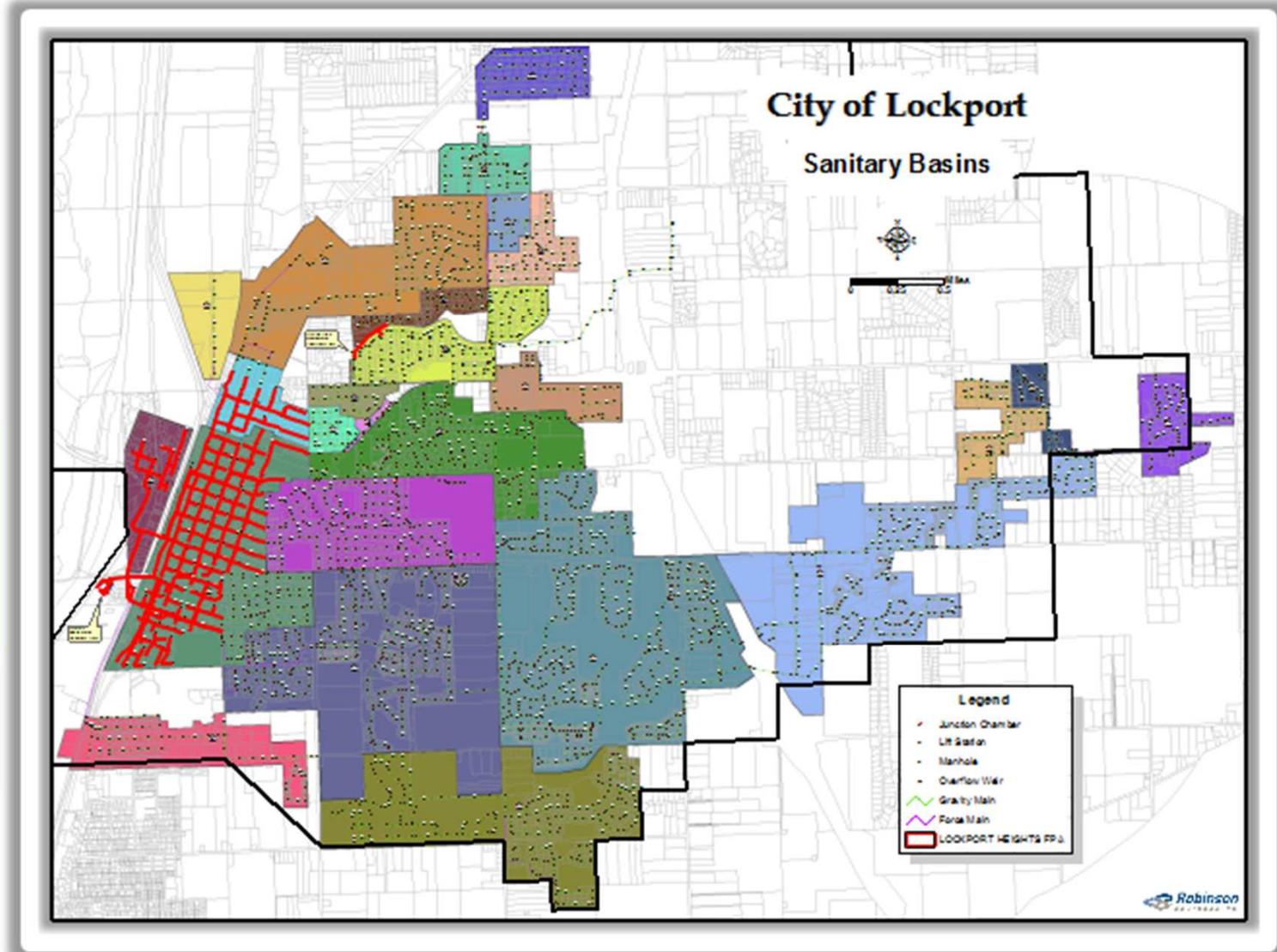
- ✓ **Priority One - Pipes 50 - 75 yrs old & west side**
- ✓ **Priority Two - Pipe 25 - 50 yrs old**
- ✓ **Priority Three - Pipes less than 25 yrs old**



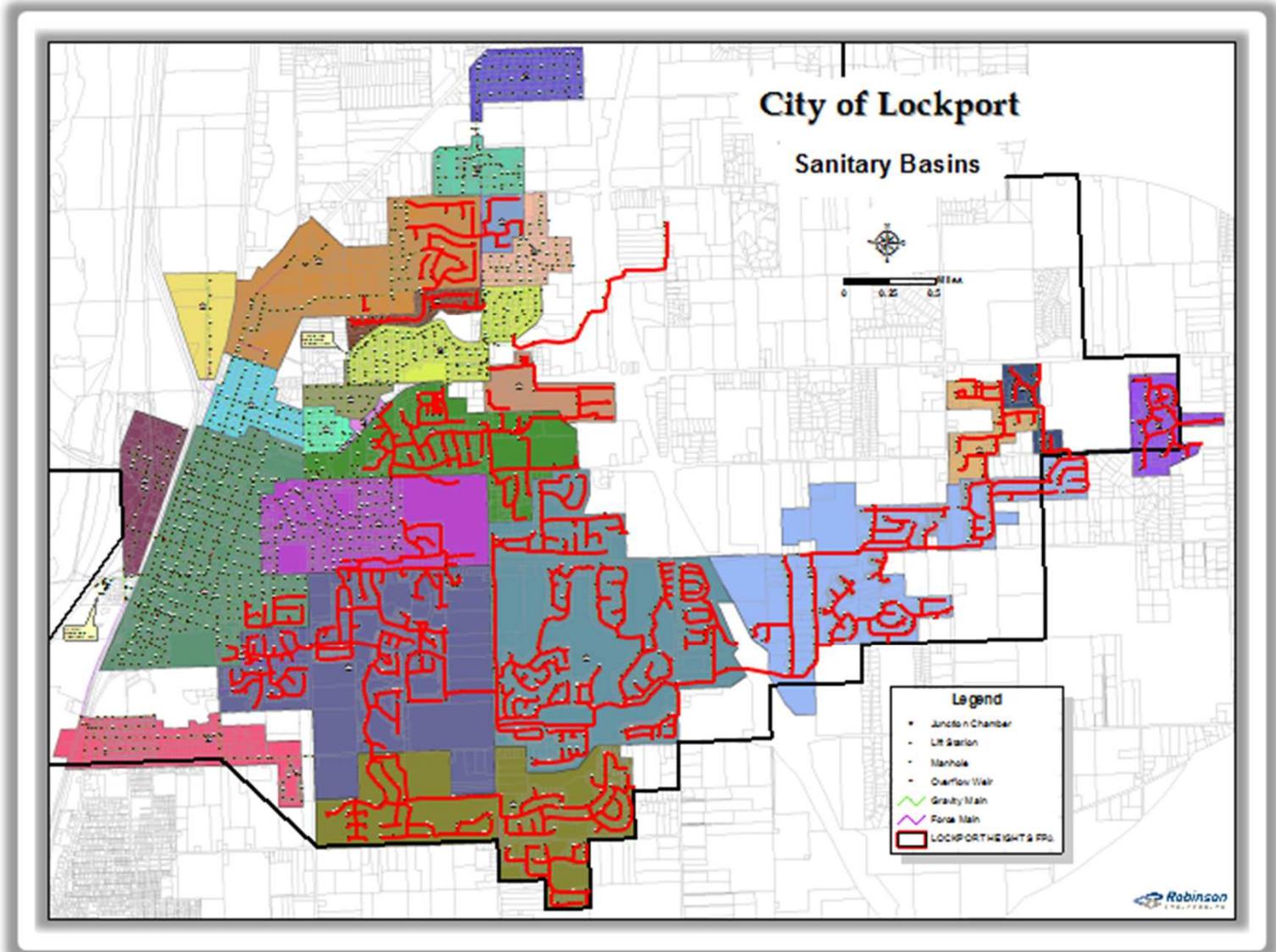
INFLOW AND INFILTRATION REDUCTION MASTER PLAN *50 to 75 yrs old*



INFLOW AND INFILTRATION REDUCTION MASTER PLAN *25 to 50 Years*



INFLOW AND INFILTRATION REDUCTION MASTER PLAN *Less than 25 Years*



Investigation Work needed now

- ▶ Manhole inspections for sewers 50-75 yrs. old
- ▶ Smoke testing for sewers 50-75 yrs. old
- ▶ Plans and specification for clean and TV sewers 50-75 yrs. old
- ▶ City wide flow monitoring +/- 22 basins
- ▶ Clean and TV sewers 50-75 yrs. old (work to be completed by a sewer televising contractor)



Proposed plan

- ▶ City is currently planning on \$300K sewer lining project
- ▶ Need to continue to investigate the sewers to prioritize/justify future repair work
- ▶ The justification will be needed for the use of low interest loan funds by the IEPA
- ▶ City will set total loan amount after investigative work
- ▶ The IEPA will not allow loan funds to be used for investigative work



2012 Clean Water Initiative (CWI)

- ▶ Announced by Governor Quinn
 - ▶ \$1 billion in additional financing will be available through the State Revolving Fund (SRF) Loan Program from the Illinois EPA for drinking water and wastewater infrastructure improvements.

- ▶ Interest Rate of 1.93% for FY 2013



- ▶ These water and sewer projects are eligible for FY 2014 funding (October 1, 2013- September 30, 2014).
- ▶ To be in the best position to receive funding the City should do the following once a potential project is identified:
 - ▶ Submit a pre-application BEFORE March 31, 2013
 - ▶ Submit a Project Plan as soon as possible after submitting the pre-application



2012 Clean Water Initiative (CWI)-Example of savings vs Conventional Loan

► Comparison to Conventional Bond at 4%

Loan Amount	IEPA Low Interest Loan			Conventional Bond			Savings
	20 year term			20 year term			
	Interest	Yearly Payment	Total Payment	Interest	Yearly Payment	Total Payment	
\$ 1,000,000	1.93%	\$60,744	\$ 1,214,887	4.00%	\$73,582	\$ 1,471,635	\$ 256,748
\$ 2,000,000	1.93%	\$121,489	\$ 2,429,775	4.00%	\$147,164	\$ 2,943,270	\$ 513,495
\$ 3,000,000	1.93%	\$182,233	\$ 3,644,662	4.00%	\$220,745	\$ 4,414,905	\$ 770,243
\$ 4,000,000	1.93%	\$242,977	\$ 4,859,550	4.00%	\$294,327	\$ 5,886,540	\$ 1,026,990
\$ 5,000,000	1.93%	\$303,722	\$ 6,074,437	4.00%	\$367,909	\$ 7,358,175	\$ 1,283,738
\$ 6,000,000	1.93%	\$364,466	\$ 7,289,325	4.00%	\$441,491	\$ 8,829,810	\$ 1,540,485
\$ 7,000,000	1.93%	\$425,211	\$ 8,504,212	4.00%	\$515,072	\$ 10,301,445	\$ 1,797,233
\$ 8,000,000	1.93%	\$485,955	\$ 9,719,099	4.00%	\$588,654	\$ 11,773,080	\$ 2,053,981
\$ 9,000,000	1.93%	\$546,699	\$ 10,933,987	4.00%	\$662,236	\$ 13,244,715	\$ 2,310,728
\$ 10,000,000	1.93%	\$607,444	\$ 12,148,874	4.00%	\$735,818	\$ 14,716,350	\$ 2,567,476



Summary

- ▶ City needs to determine funding levels for roads, sewer and water
- ▶ Road locations could then be finalized
- ▶ Water main replacements would be coordinated based on road locations
- ▶ Sewer work would be done before roadway work
 - ▶ Investigative work needs to start immediately
- ▶ City should submit IEPA low interest loan applications



Questions?

“I am a firm believer in the people. If given the truth, they can be depended upon to meet any national crisis. The great point is to bring them the real facts.”

-Abraham Lincoln

