

City of Cambridge and IBM Build a Smarter City

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Presented by...

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City of Cambridge

Infrastructure Asset Life Cycle

- Install / Acquire
- Operate
- Maintain / Inspect
- Repair
- Renew

- Replace



Increasing O&M Costs



\$ Funding ?

Role of Asset Management

Ensure that Infrastructure Assets achieve the full serviceable life within the most effective total cost of ownership.

We achieve a state of affordable sustainable public infrastructure practices.

How Cambridge is Implementing Asset Management

- Established Asset Management Principles
 - InfraGuide - *National Guide to Infrastructure Management*
- Three pronged approach
 - Information
 - Technology
 - Business

Asset Management Fundamentals

InfraGuide - *National Guide to Asset Management*

1. What do you have?
2. What is it worth?
3. What condition is it in?
4. What needs to be done?
5. When does it have to be done?
6. How much money will it take?
7. How do we fund it?

Cambridge Implementation

Information

Inventory
Condition Assessment
Remaining Serviceable Life

Technology

Geographic Information Systems (GIS)
Core Database
Work Management System
Expert Analysis Tools / Processes
Mobile Computing

Business

Policy, Practices, Procedures
Current and expected future legislation
Records Management
Level of Service
Planning / Financing
Risk Management

Timeline...

- **2003** – Initial Study to address the aging infrastructure issue
 - recommended that the City establish an Asset Management Division
- **2005** – Asset Management Division Established
 - Started with Inventory & ESRI's GIS Technology
- **2006** – Began condition assessments of roads, sewers, sidewalks, and storm infrastructure
 - Implemented Orion's Onpoint GIS Portal for internal staff
- **2007** – Ongoing pipeline condition assessments
- **2008** – Implemented IBM's Maximo Work/Asset Management Systems
- **2009** – Life-cycle analysis and long-term Financial Sustainability Plan for Capital Renewals (water/sewer).
 - Full integration of Asset Inventory with Financial PSAB Reporting
- **2010** – Refinement of 10 year Capital Forecast based on integrated Needs Assessments and Financial Sustainability Plan.

Infrastructure Summary

Asset Category	Quantity	Replacement Value	Typical Life (yrs)	Avg Age
Parking Lots	25	\$1,522,780	20	12
Storm Ponds	62	\$87,433,507	50	13
Walkways	100	\$4,138,861	40	24
Road & Sidewalk	980 lane*km	\$371,190,374	30	20
Bridges	24	\$8,025,000	50	45
Culverts	61	\$5,977,164	35	28
Dams	2	\$2,000,000	50	102
Sewer System	480 km	\$298,530,301	65	35
Drainage System	320 km	\$185,210,195	65	28
Water System	490 km	\$294,619,300	70	40

\$1,258,647,483

Key Issues

- Accumulated Infrastructure Gap
 - System has aged faster than renewal
 - ‘Echo-effect’ of building booms of the past
 - Estimated \$54M backlog in water system
 - Estimated \$17M backlog in sewer system
- Increased pressure on Operations & Maintenance
 - Higher failure rate on aged infrastructure
 - Re-active repairs on aging infrastructure increasingly consumes more and more resources
- Increased expenses as a result of Infrastructure Gap
 - Examples...
 - Water Loss ~\$2M Annually
 - Inflow / Infiltration to Sewer System ~ \$4M Annually
- Aging experienced workforce
 - Long term dedicated employees...
 - Impending knowledge gap when those individuals retire...

Examples of Infrastructure

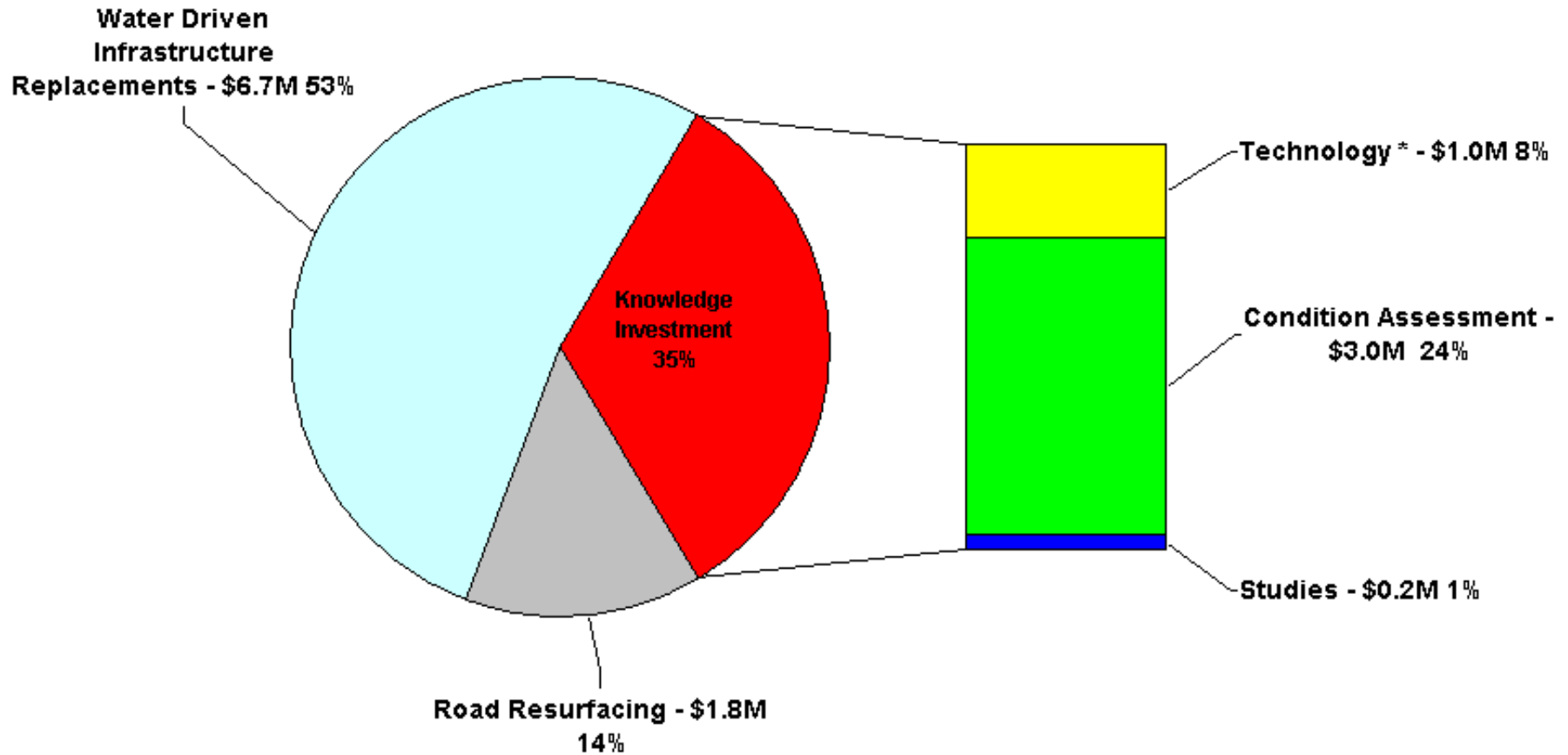


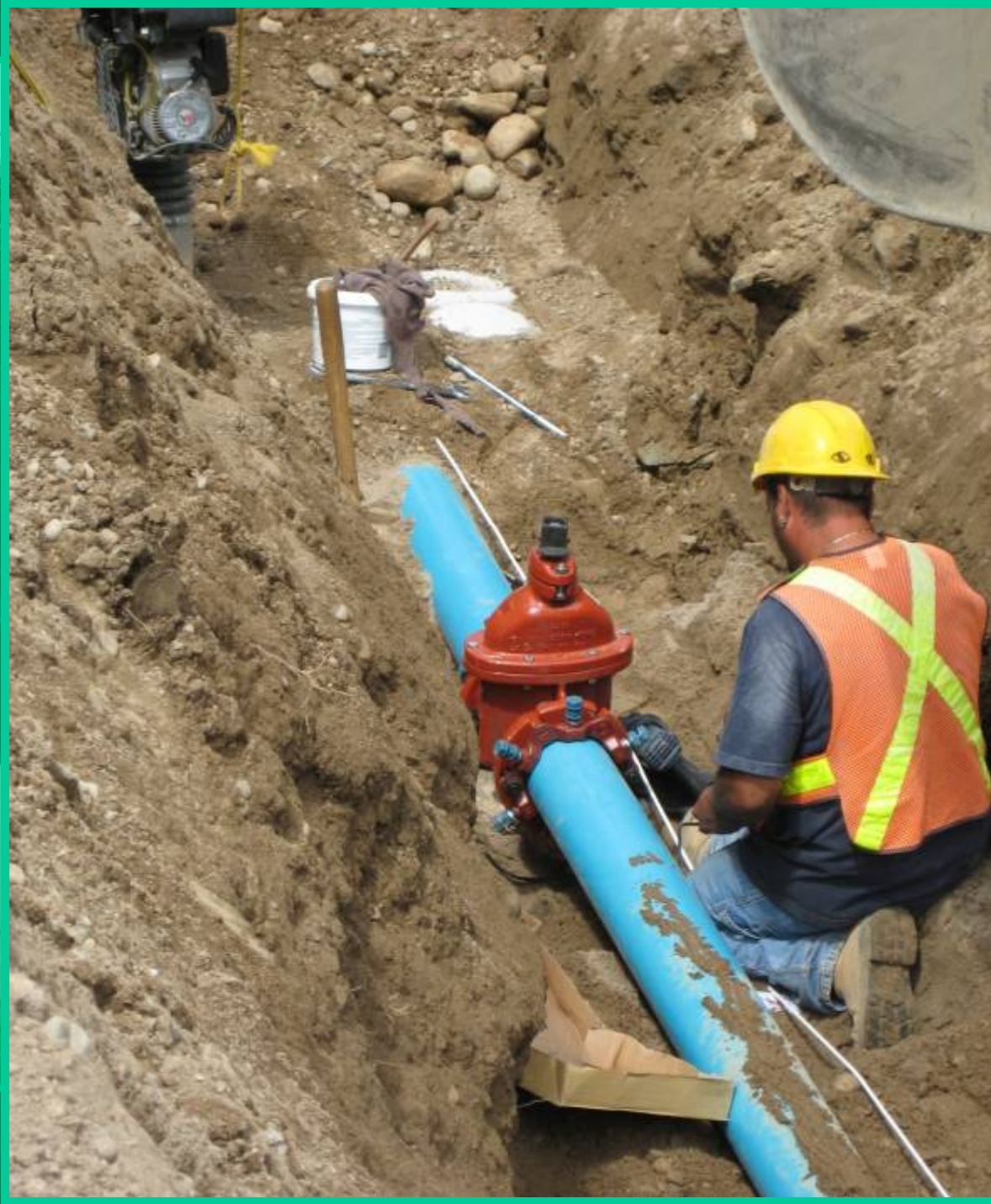
Addressing Infrastructure Funding Gap

Gas Tax Funding

- \$12,670,196 invested in Cambridge 2005-2010
- Federal Commitment of \$3,692,380 per year 2010-2014
- Allocated towards Sustainable Infrastructure Initiatives.
 - Asset Management Knowledge / Technology Foundations
 - Infrastructure Renewals addressing Backlog

Cambridge Gas Tax Funding Allocation Breakdown 2005 - 2010





Other Funding Sources...

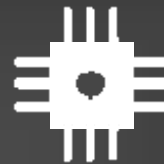
- City Capital Works Reserves
 - \$0.7 M 2004/2005
- Provincial Surpluses
 - \$2.3 M 2006 *Investing in Ontario Act*
 - \$1.7 M 2008 *Municipal Infrastructure Investment Initiative*
- Economic Stimulus Funding Partnerships
 - \$12 M *Federal/Provincial/Municipal 2009/2010*
- Municipal Debentures
 - \$5 M 2010-2012
- Water / Sewer rate increases
 - Estimated average of 8.3% per year over next 10 yrs
- Sustainable Financial Plan
 - Water renewal backlog to be cleared within 15 yrs
 - Sewer renewal backlog to be cleared within 7 yrs

Technology and Business

Industry Relationships

- Industry Collaboration...
 - IBM *Maximo : Work/Asset Management Technology*
 - Createch *IBM Business Partner*
 - ESRI *GIS Technology*
 - Rolta/Orion *Onpoint : GIS Portal Technology*
 - University of Waterloo *Center for Advanced Trenchless Technologies (CATT)*
 - BMA Consulting *Financial Planning*
 - AECOM *National Water and Waste Water Benchmarking Initiative*
 - NASSCO *National Association of Sewer Service Companies*
 - CSA *Canadian Standards Association*

The world is changing, enabling organizations to make faster, better-informed decisions



Instrumented



Interconnected



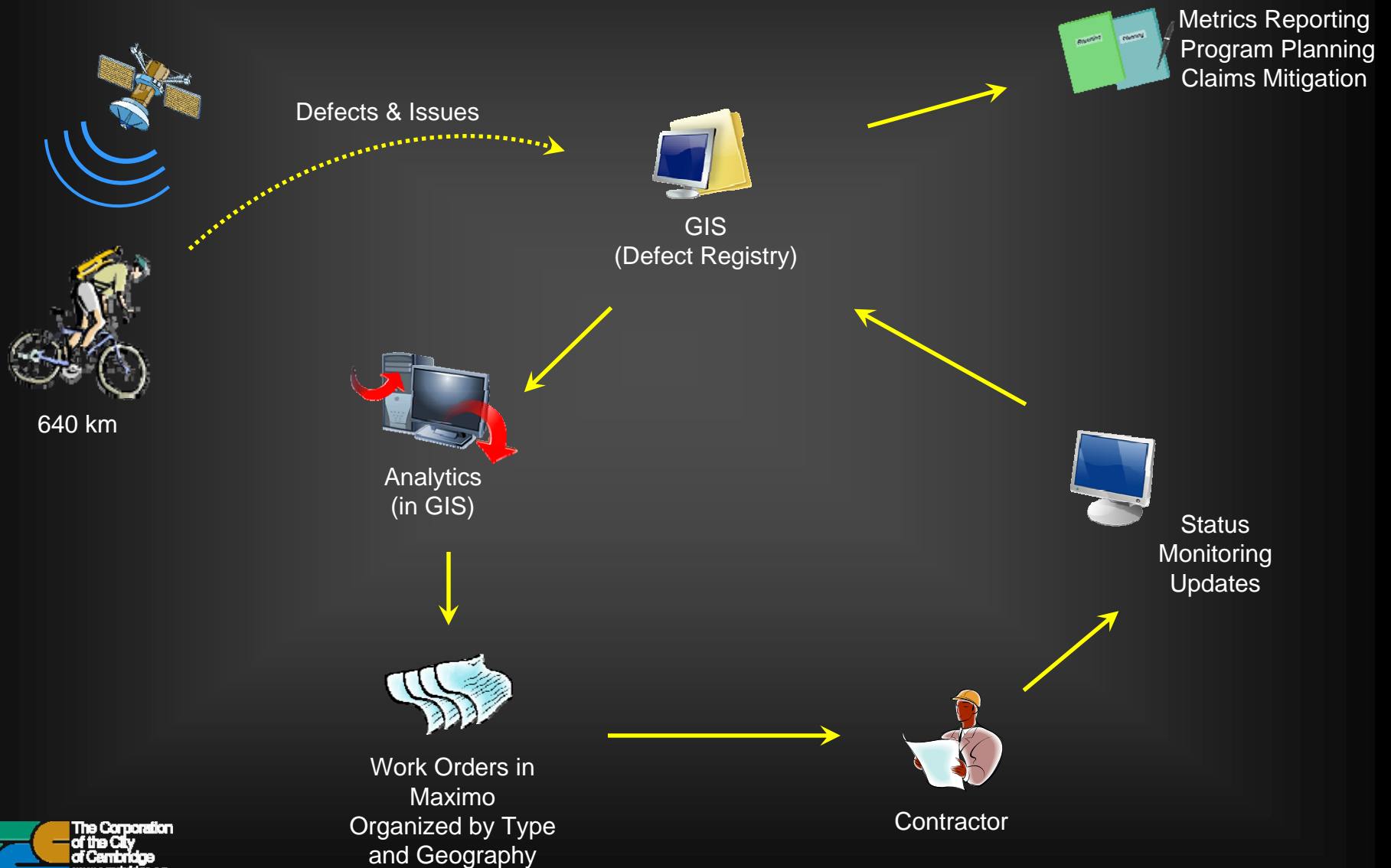
Intelligent

This is an opportunity to develop a new kind of intelligence on a Smarter Planet.

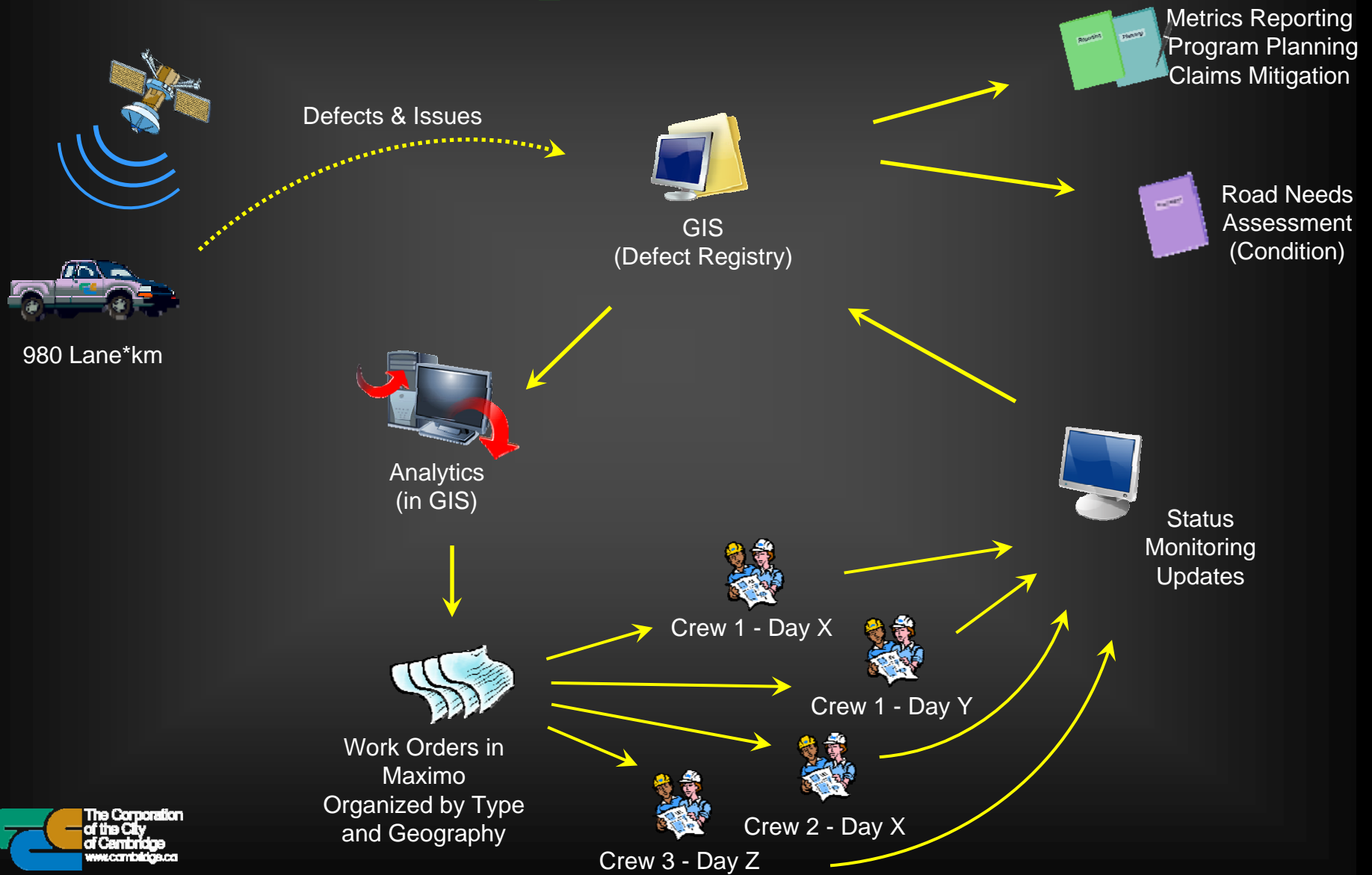
Business Intelligence

- Incorporating Business Logic into the Technology
 - For every issue – there is a ‘Response Plan’
 - Transfer of experience-based knowledge of staff into system
 - Metrics
 - quantities and types of issues
 - Levels of Service being provided vs targets
 - Resources and associated costs
 - Management decisions can take into account a broader perspective using key performance indicators.

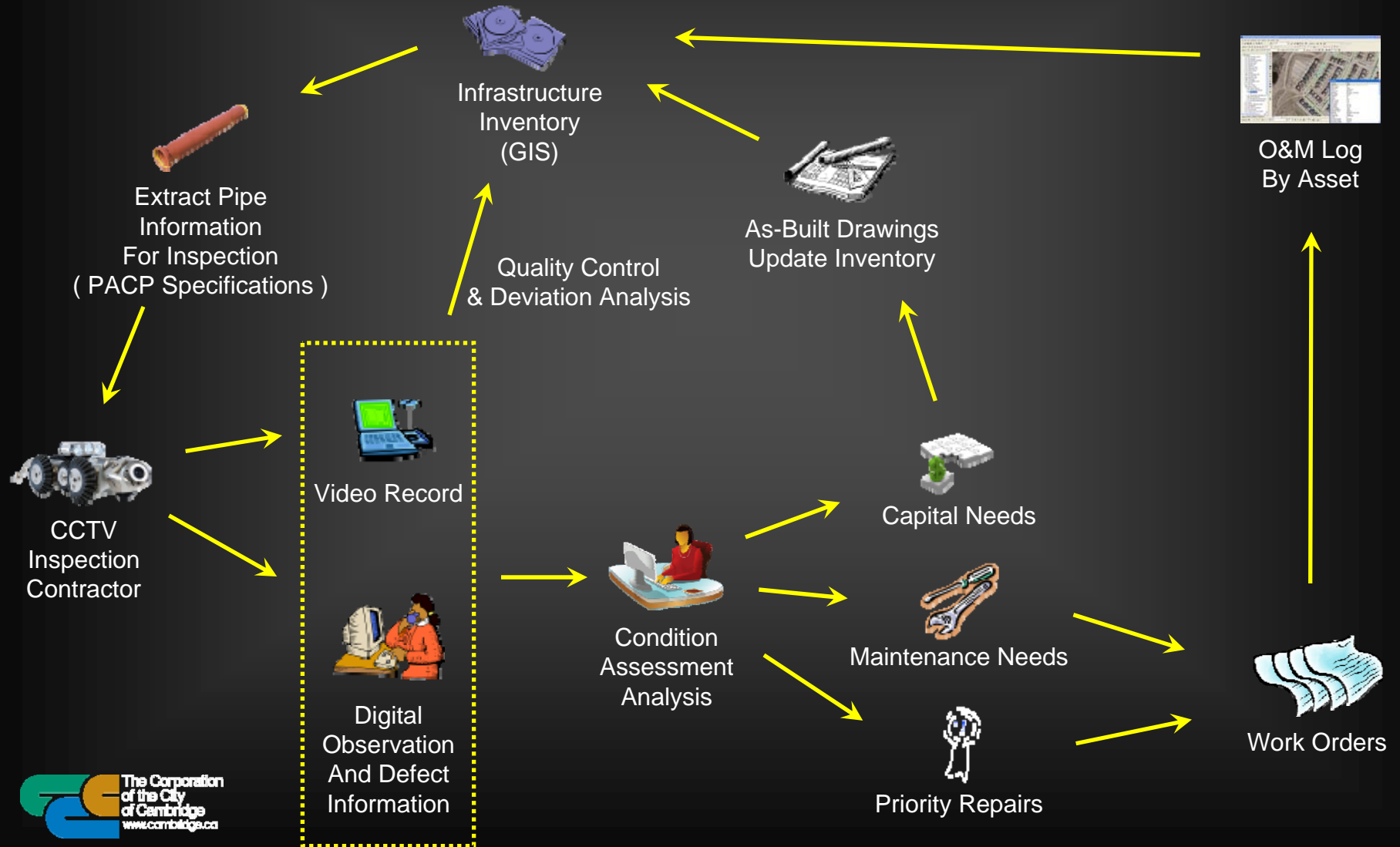
Sidewalk Inspection Process



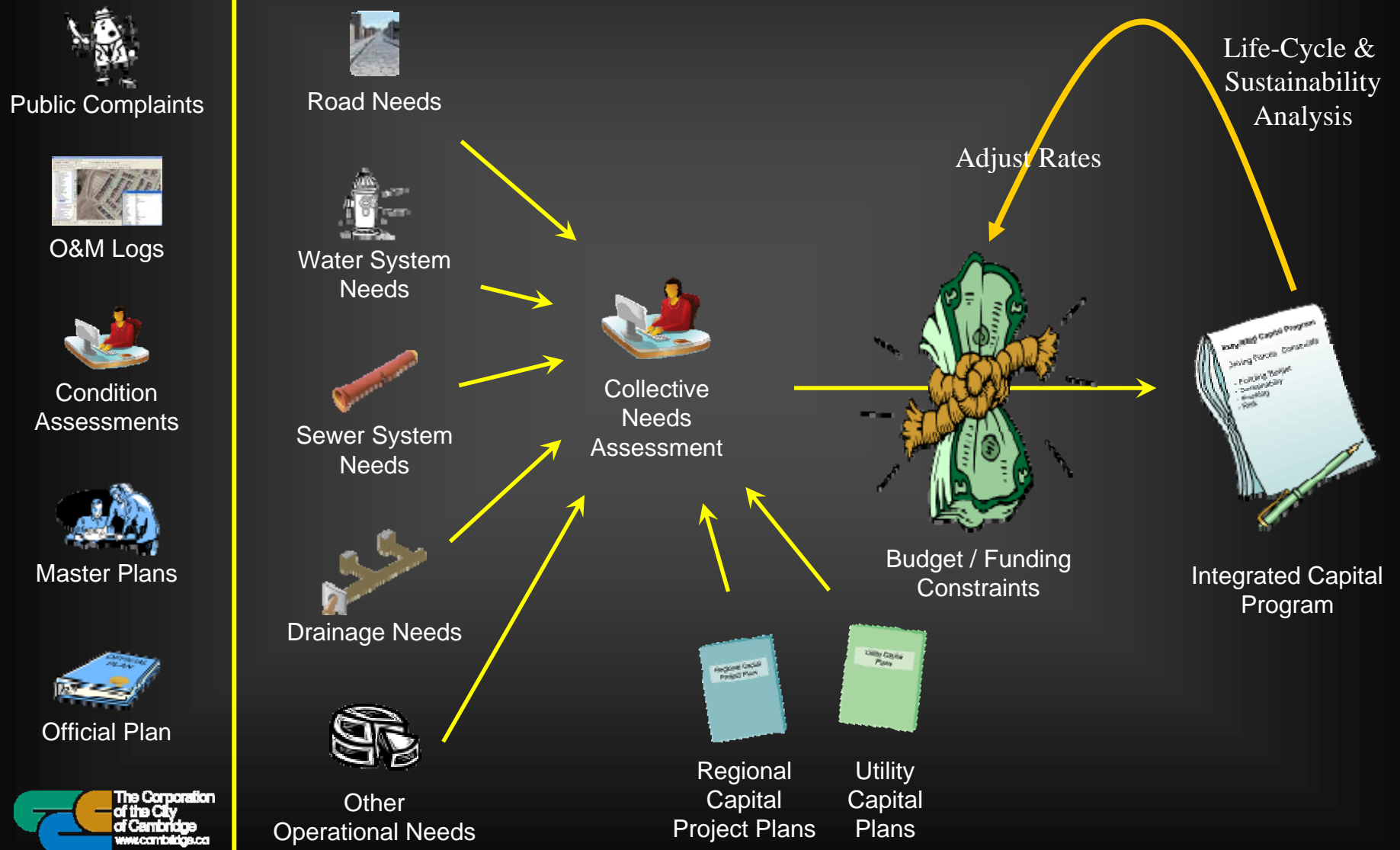
Road Inspection Process

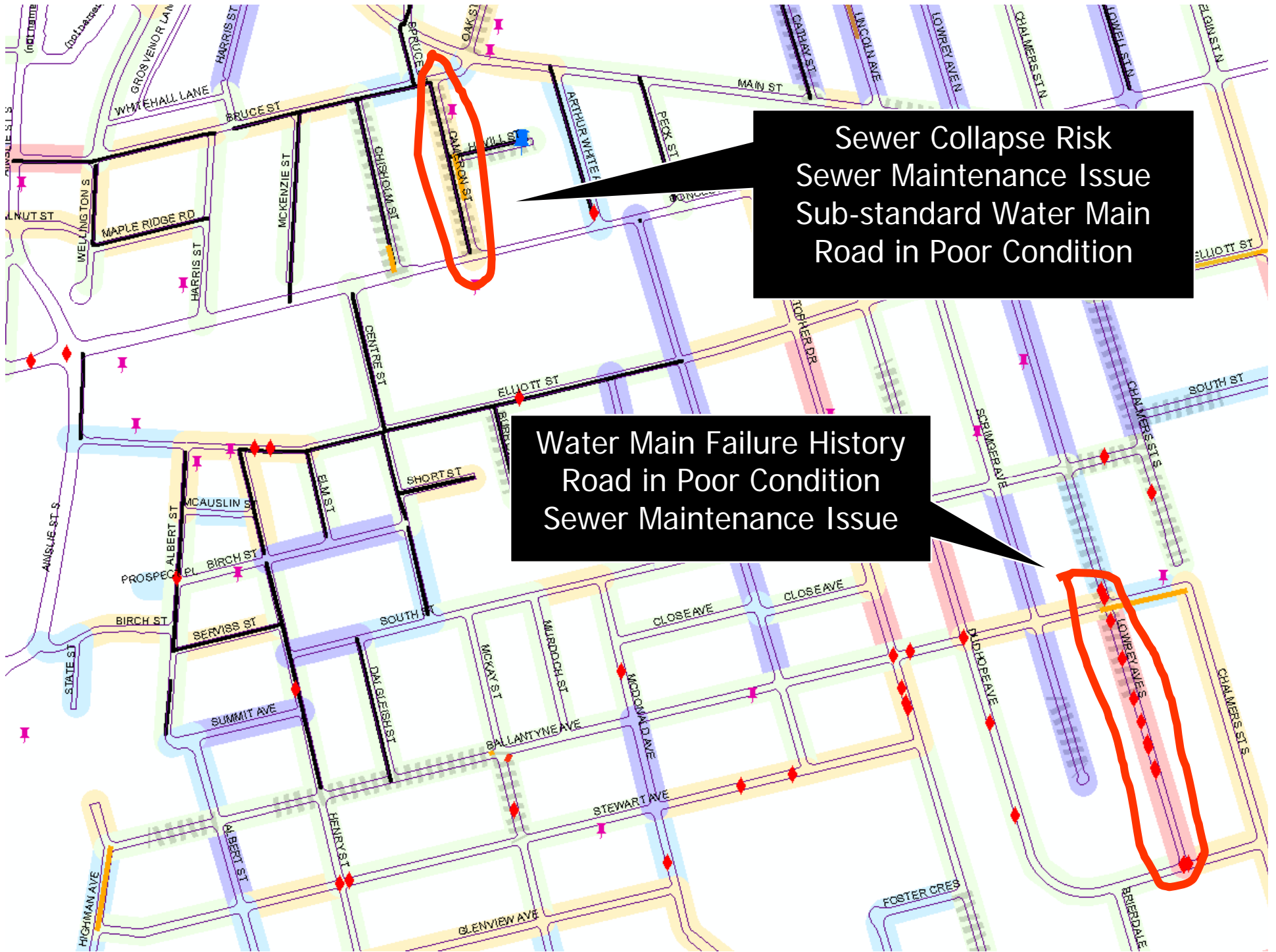


Pipeline Condition Assessment Process



Integrated Capital Planning





Sewer Collapse Risk
Sewer Maintenance Issue
Sub-standard Water Main
Road in Poor Condition

Water Main Failure History
Road in Poor Condition
Sewer Maintenance Issue

Examples of Technology



Questions...

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City of Cambridge
Transportation and Public Works

Infrastructure Renewal Metrics

Capital Renewal - City Owned Assets

	2006	2007	2008	2009	2010*
Storm Pipe (m)	911	805	1392	2448	1212
Sanitary Pipe (m)	887	1128	975	2850	1816
Water Pipe (m)	2411	1591	2315	4419	2128
Road Reconstruction (lane*km)	3	5.4	5.1	8.9	4.6
Road Resurface (lane*km)	3	2	19	73	41

Road Condition

- In 2007 – 44% of roads were ‘good’
- Today – 68% of roads are ‘good’
 - Systematic approach to managing the infrastructure renewals.
 - Several Infusions of \$\$
 - Gas Tax
 - Provincial Grants
 - Economic Stimulus Program