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Best Practice Asset Management In Canada

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INFRASTRUCTURE ASSET MANAGEMENT ALBERTA

Overview IAMA February 2020

Asset Management Overview
Risk Framework – Lethbridge County
Data Structure
Working groups to discuss Sturcture
Climate Change Data
Working groups to discuss climate change data

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Asset Management Discipline

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It involves:

Processes, procedures and practices to assist and define the management of infrastructure

Achieving total lowest cost of ownership

The Benefits

Benefits of Asset Management	
	Good governance and increased accountability
	Data-driven decision-making
	Enhanced sustainability of infrastructure
	Improved level of service and quality of life
	Accurate forecasting of infrastructure replacement and enhancement needs
	Compliance with federal and provincial regulations

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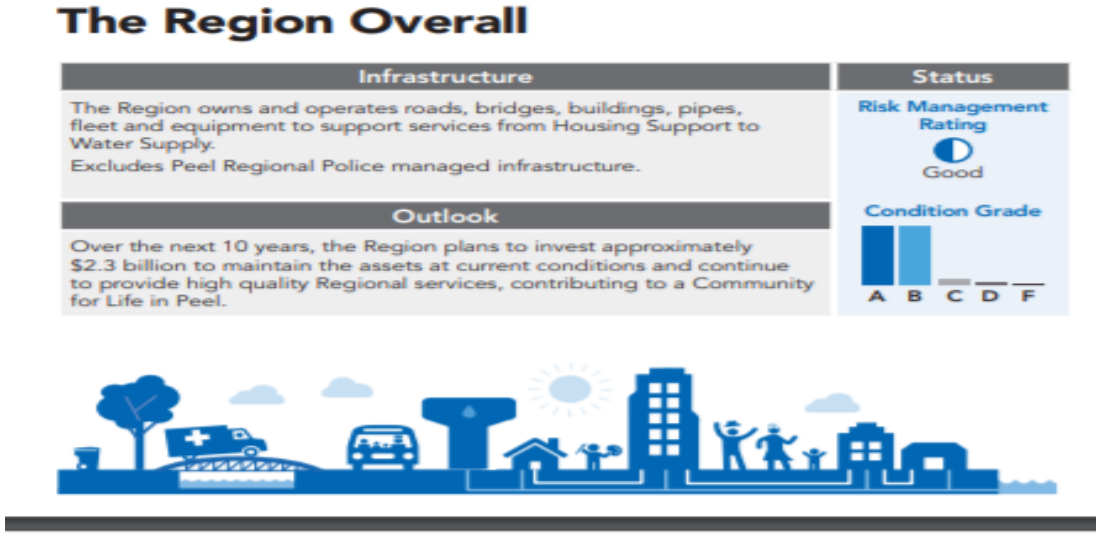
Asset Management Program Development & Asset Management Plan

Where do WE start or should we be considering

Policy
Team
Maturity + Strategy
Data
Life-Cycle Framework
Risk Framework
Financial Strategies
Levels of Service Framework
Communication Tools (AMP)



The Region Overall

Infrastructure	Status
The Region owns and operates roads, bridges, buildings, pipes, fleet and equipment to support services from Housing Support to Water Supply. Excludes Peel Regional Police managed infrastructure.	Risk Management Rating: Good Condition Grade: A B C D F

Outlook

Over the next 10 years, the Region plans to invest approximately $2.3 billion to maintain the assets at current conditions and continue to provide high quality Regional services, contributing to a Community for Life in Peel.

What do the symbols mean?

Risk Management Rating Key		Condition Grade Key	
Very Good	Almost all assets in the portfolio are achieving the desired targets	A	New or like new condition
Good	Most assets in the portfolio are achieving the desired targets	B	In a good state of repair
Fair	Many assets in the portfolio are not achieving the desired targets	C	Some non-critical defects; some critical repairs in the near term
Poor	Most assets in the portfolio are not achieving the desired targets	D	Some critical defects; many critical repairs in the near term
Very Poor	Almost all assets in the portfolio are not achieving the desired targets	F	Many critical defects; immediate repair or replacement required

Infrastructure	Status	Asset Value (M)	Condition Grade
Operations Yards, Fleet and Equipment	●	$91	
Wastewater	○	$11,780	
Water Supply	●	$12,353	
Heritage, Arts & Culture	◐	$29	
Waste	◐	$147	
Roads and Transportation	●	$2,145	
TransHelp	●	$6	
Paramedics	●	$103	
Long Term Care	◐	$218	
Housing Support*	●	$289	

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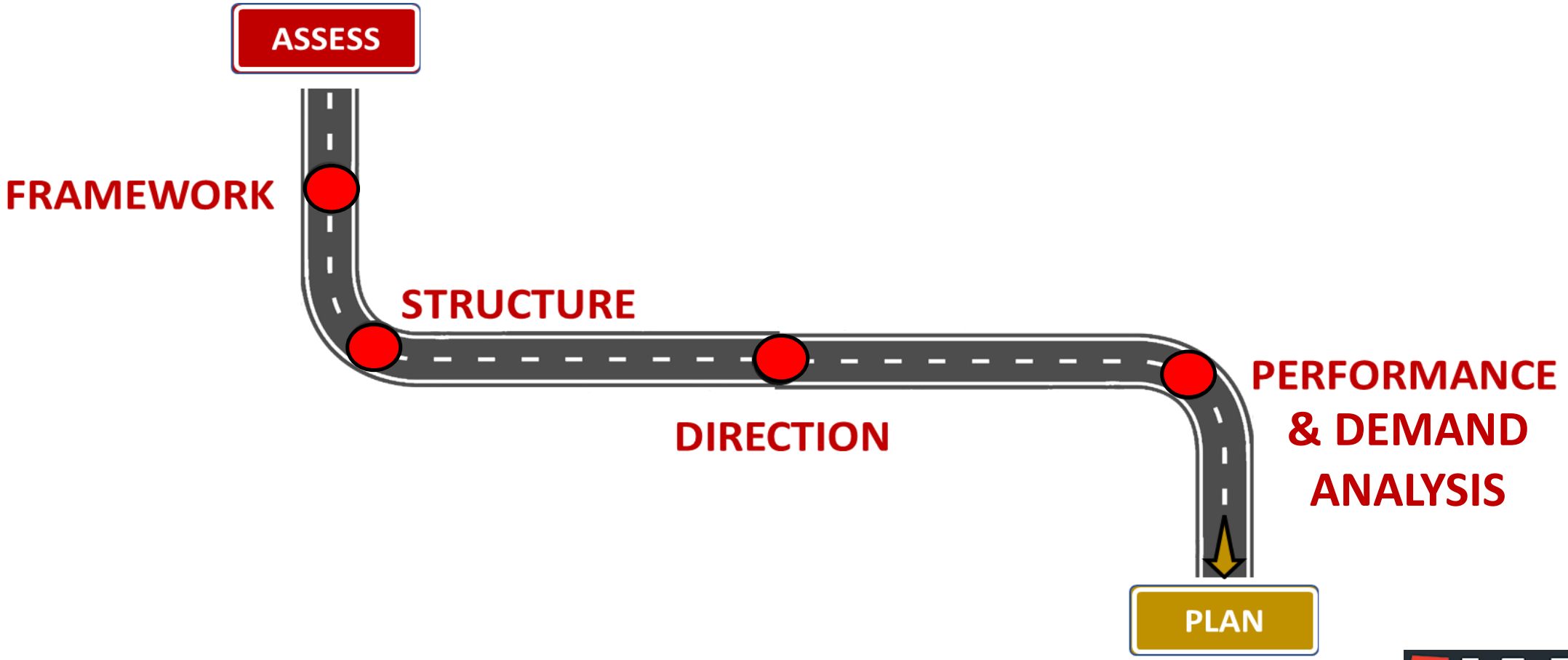
Asset Management Program Development

Assess | Plan | Implement



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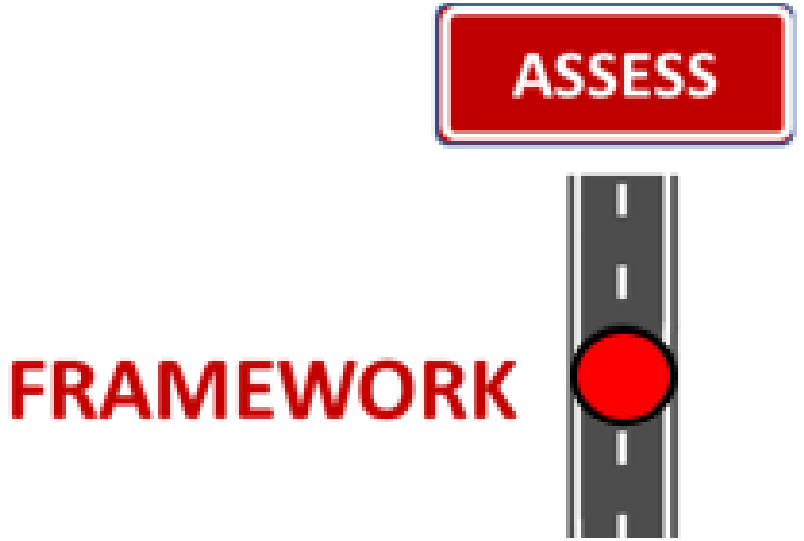
Framework

- Strategic Asset Management Policy
  - Formalizes & institutionalizes AM
  - Ensure continuity across different councils



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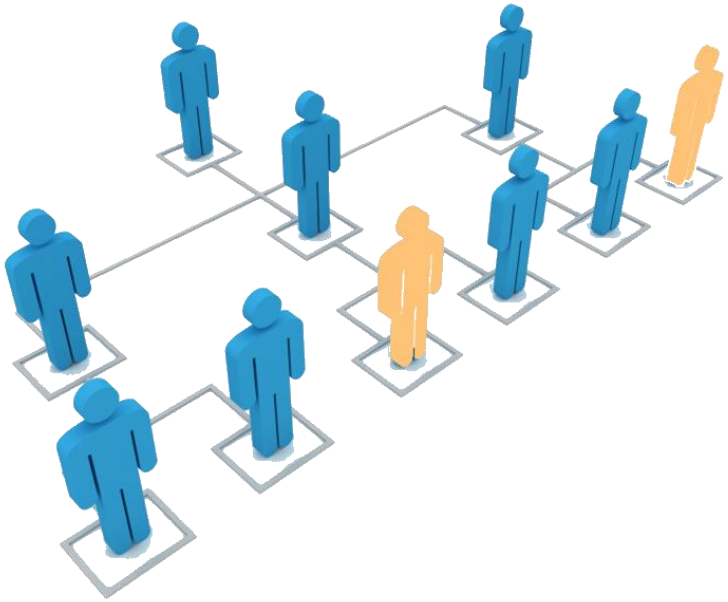
Structure

- AM Champion
  - Influential leader
- AM Steering Committee
  - Decision Makers
    - Finance, Engineering, GIS, Facilities, Public Works, Fleet, Planning, etc.
- AM Coordinator
  - Monitors and governs all aspects of the program
- AM Team
  - Dedicated staff meet and discuss the AM Program regularly

Organizational Overhaul



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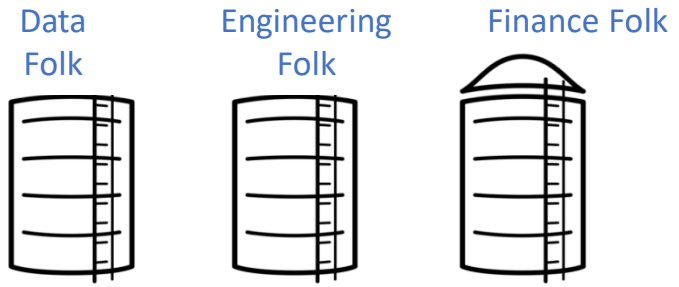
Direction

- Asset Management Maturity Assessment
- Systems Maturity Assessment
- Data Maturity Assessment

Asset Management Data

- Completeness
- Consistency
- Accuracy
- Integrity
- Uniqueness



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Performance & Demand Analysis

Challenges

- Aging Infrastructure
- Future Infrastructure Demand
- Lack of Stable & Predictable Grants
- Extreme Weather & Climatic Changes

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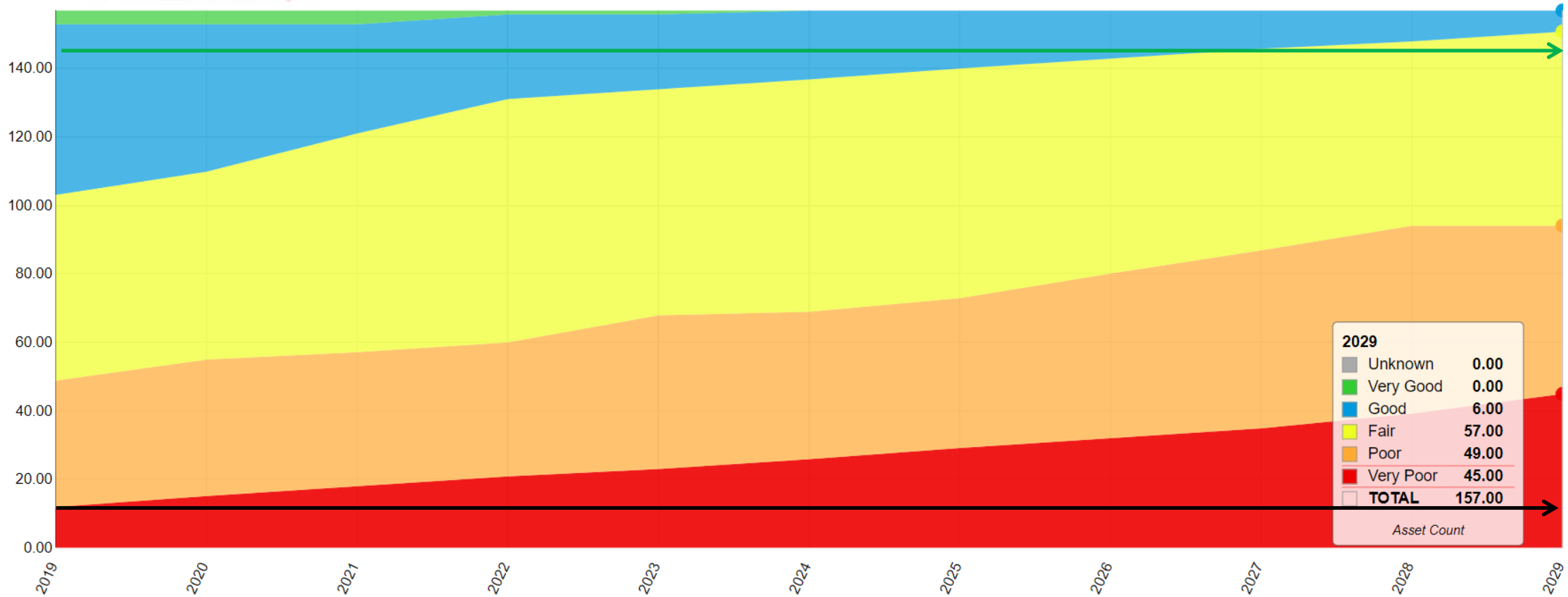
What are your performance projections?

What are your goals?

1 Year.....5 Year.....10 Year



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Asset Performance

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Condition Assessment Program Analysis

Type of capture
Field check or road patrol
Condition assessments
Detailed studies or reports (RNS)

Cycle of Capture

Type of Index or reporting format.

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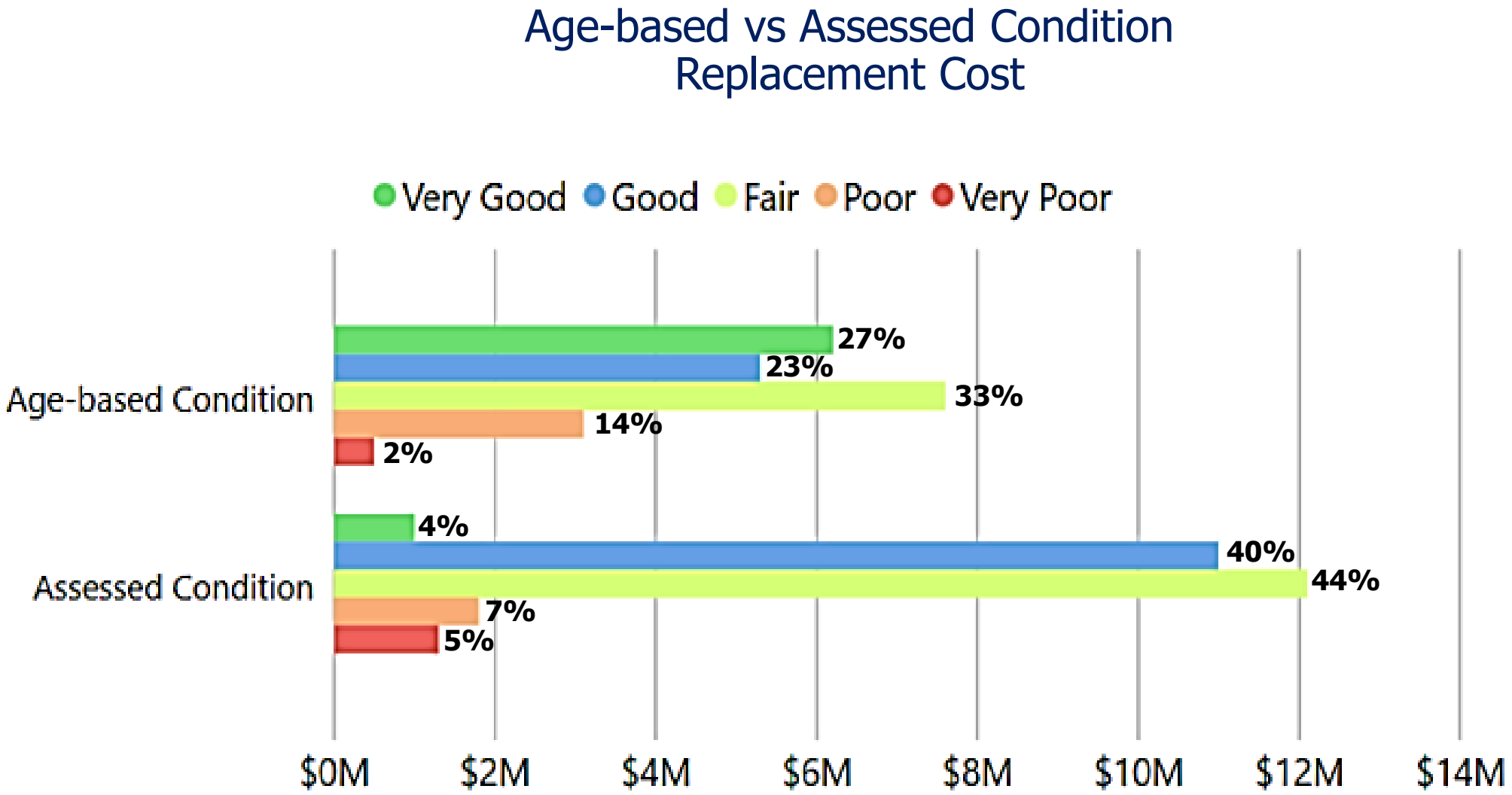
Why not just rely on age-based condition?



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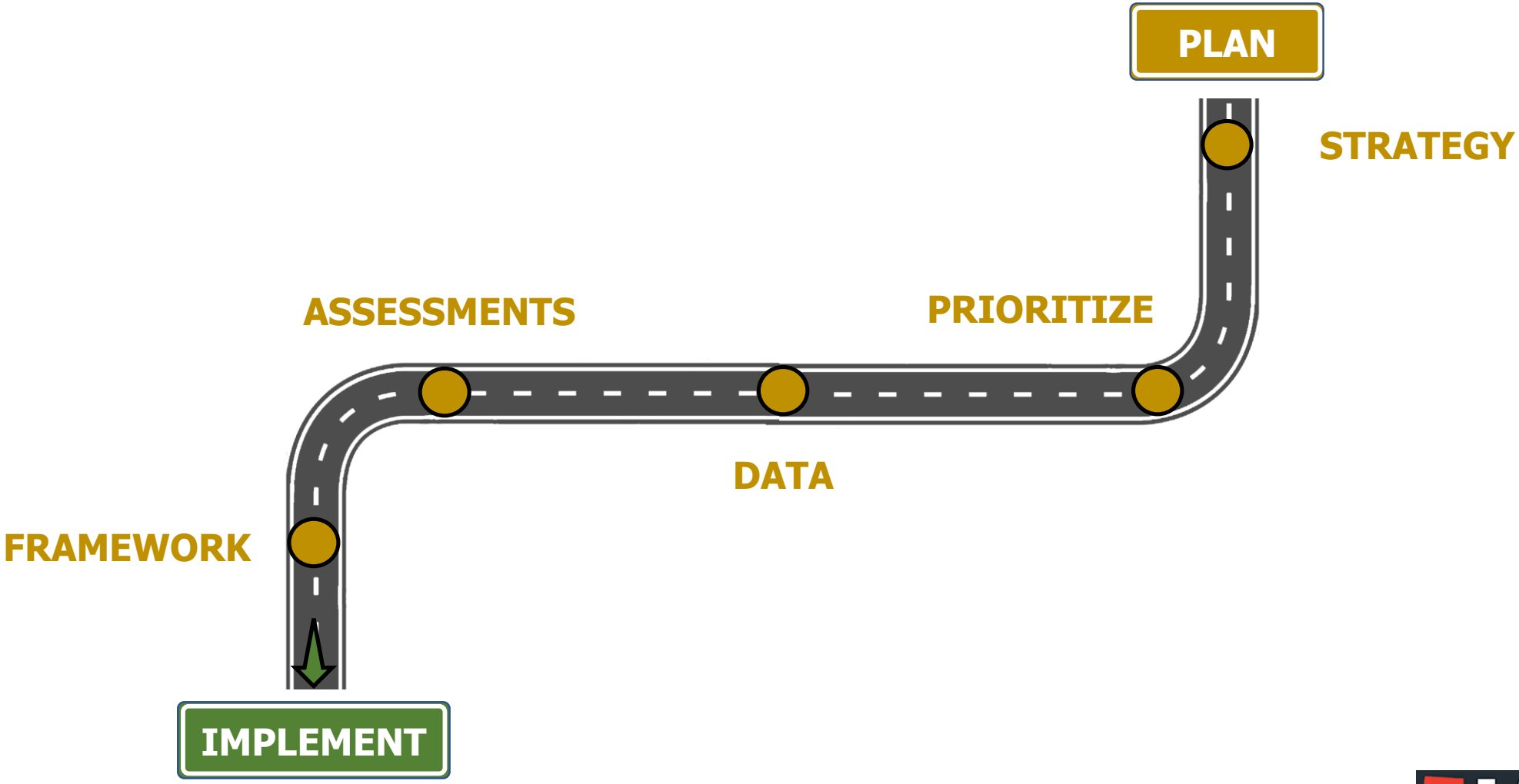
Asset Management Program Development

Assess | Plan | Implement



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Planning for Success!

Asset Management Strategy

- Provides guidance and a foundational framework
  - Outlines key initiatives that must be taken, along with realistic timelines
  - Outlines AM objectives that align with corporate goals and priorities
    - Addresses each element of asset management, including the Organization, People and Financial Management
  - Applies a corporate lens to asset management
  - Promotes transparency
  - Supports capacity building
  - Entrenches continuous improvement in Asset Management

Every successful plan starts with a strategy

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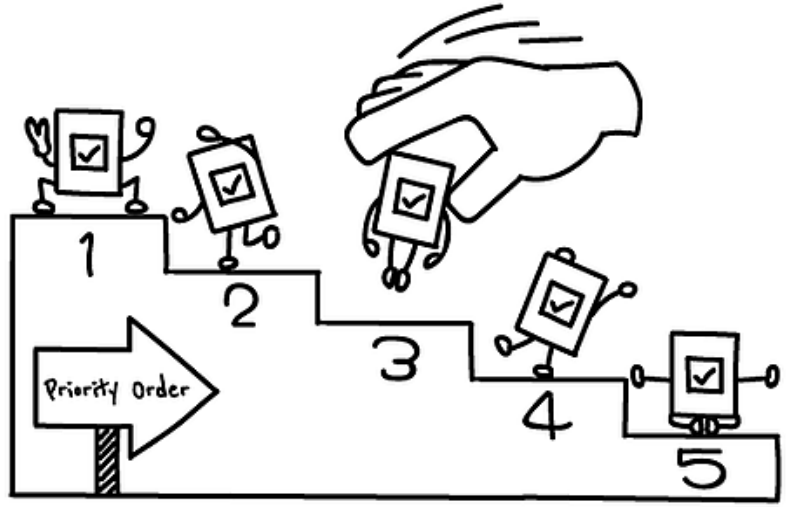
Prioritization Planning

Choosing battles wisely!
Sticking to the plan!

- Data Collection & Enrichment Process
- Condition Assessments
- Asset Management Framework
  - Risk Analysis Framework
  - Lifecycle Management
  - Levels of Service



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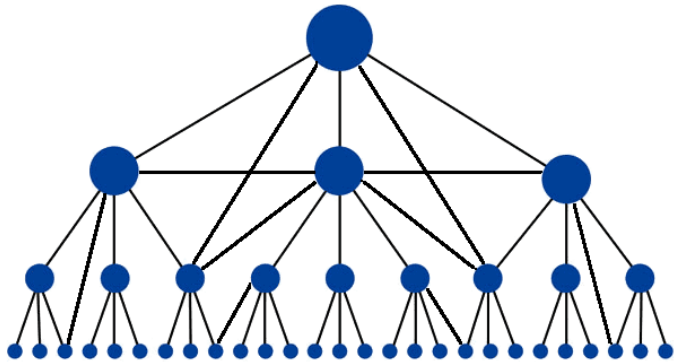
Data Objective

Centralized Municipal Asset Management Data Model

- Connecting silos rather than break them down
  - Discuss
  - Collaborate
  - Translate & Consolidate
  - Build



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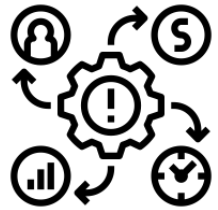
Risk Analysis Framework

What attribute data is available?
Which impact will the attribute data contribute to?

- **Probability of failure**
  - Condition
  - Deterioration Acceleration
    - Climatic Vulnerability
      - Exposure
      - Sensitivity
      - Adaptive Capacity
    - Infrastructure Demands

- **Consequence of failure**
  - Economic
  - Social
  - Environmental
  - Operational
  - Health and Safety
  - Strategic

Triple Bottom Line



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Lethbridge County's Bridge Risk Model Development Process

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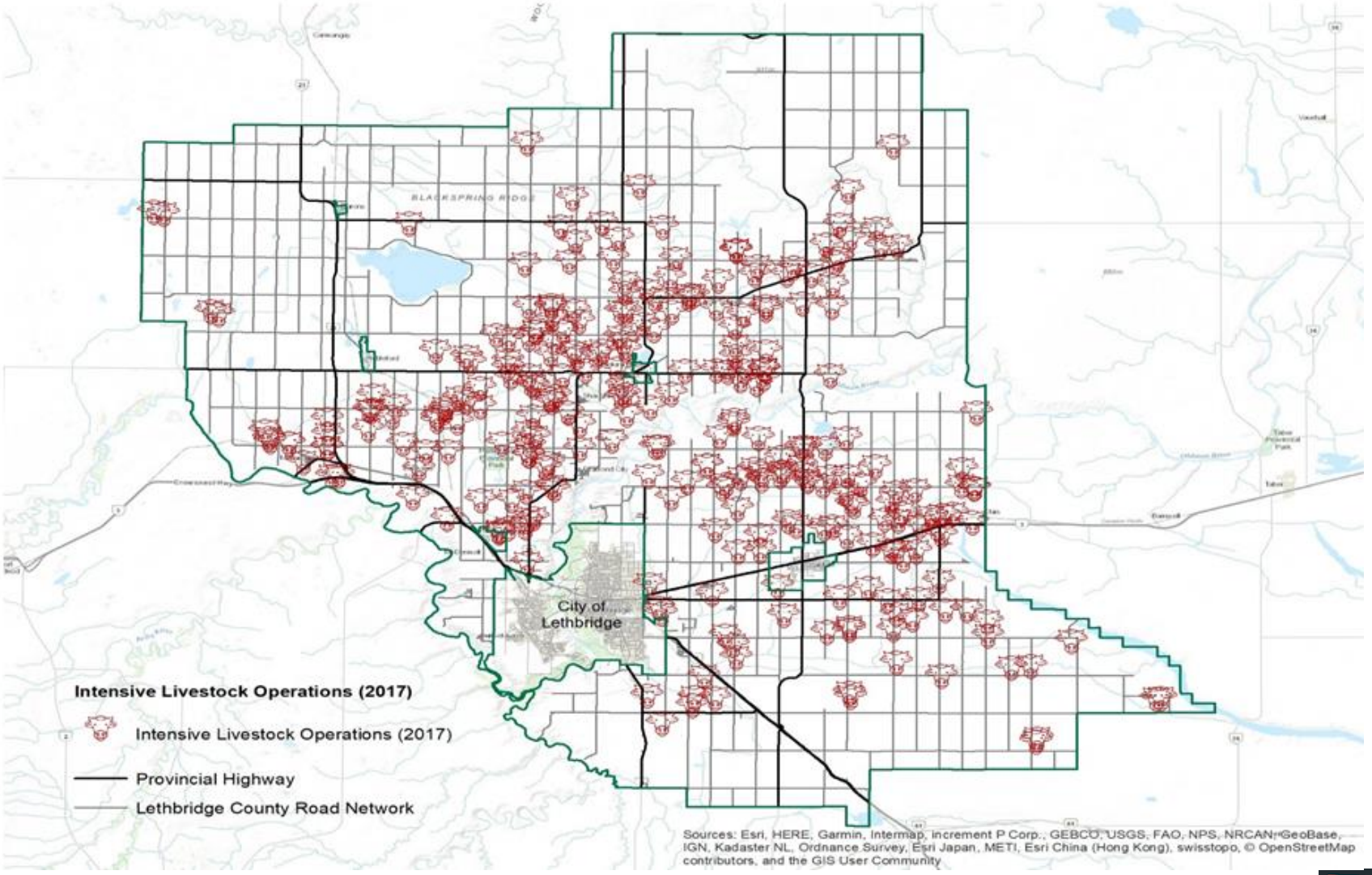
Intensive Livestock Operations



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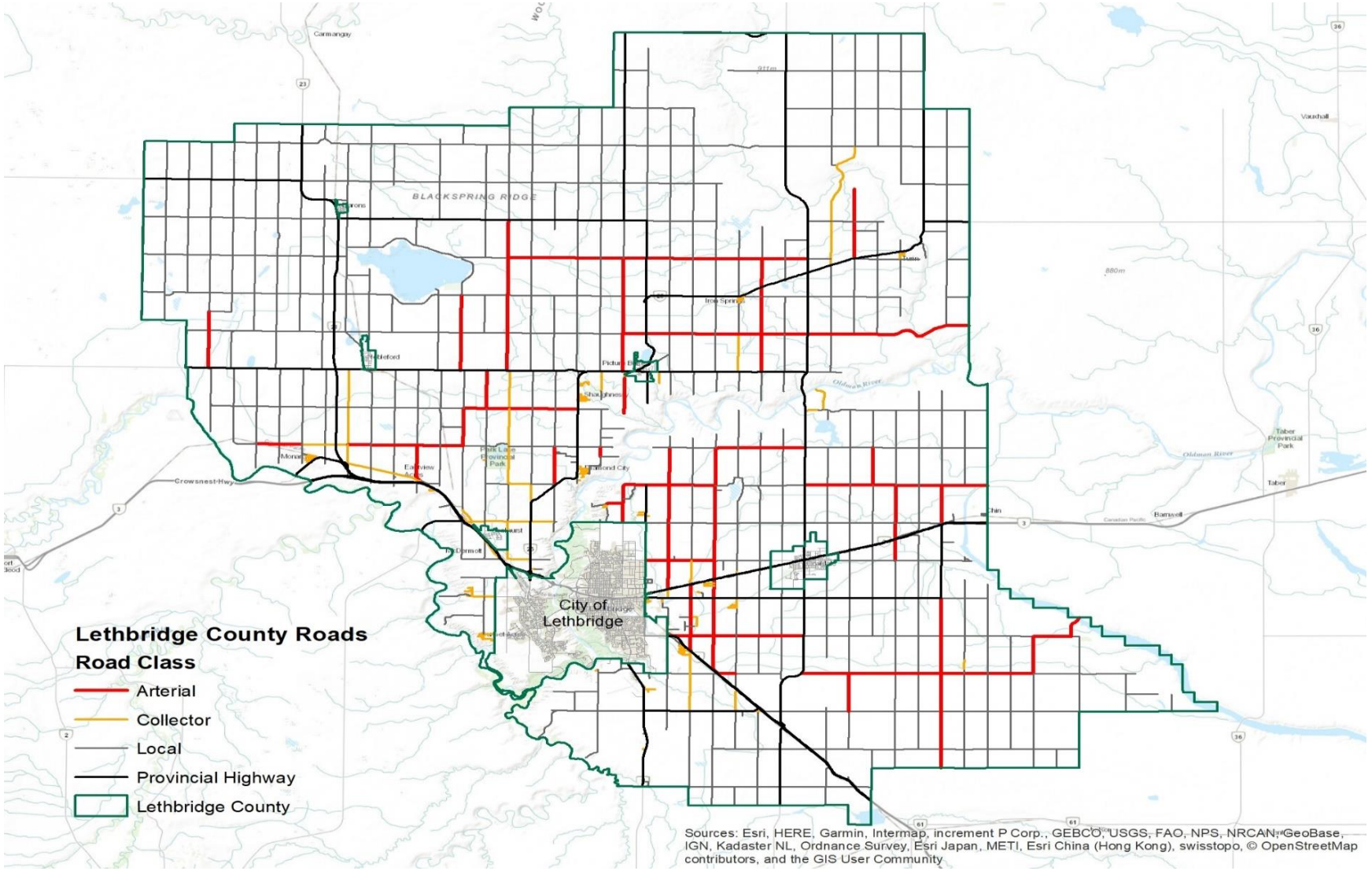
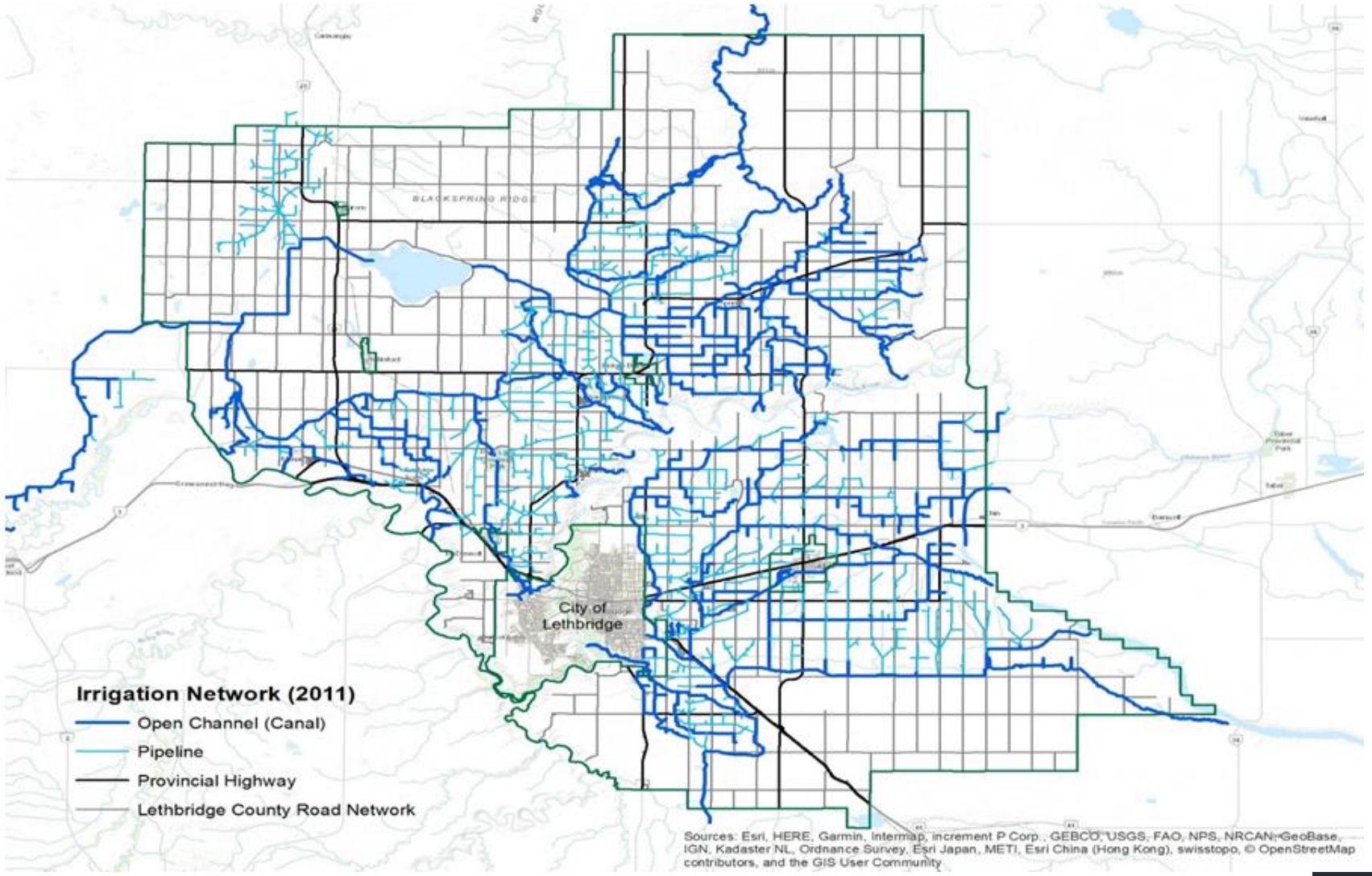
Transportation Network



Irrigation Utility



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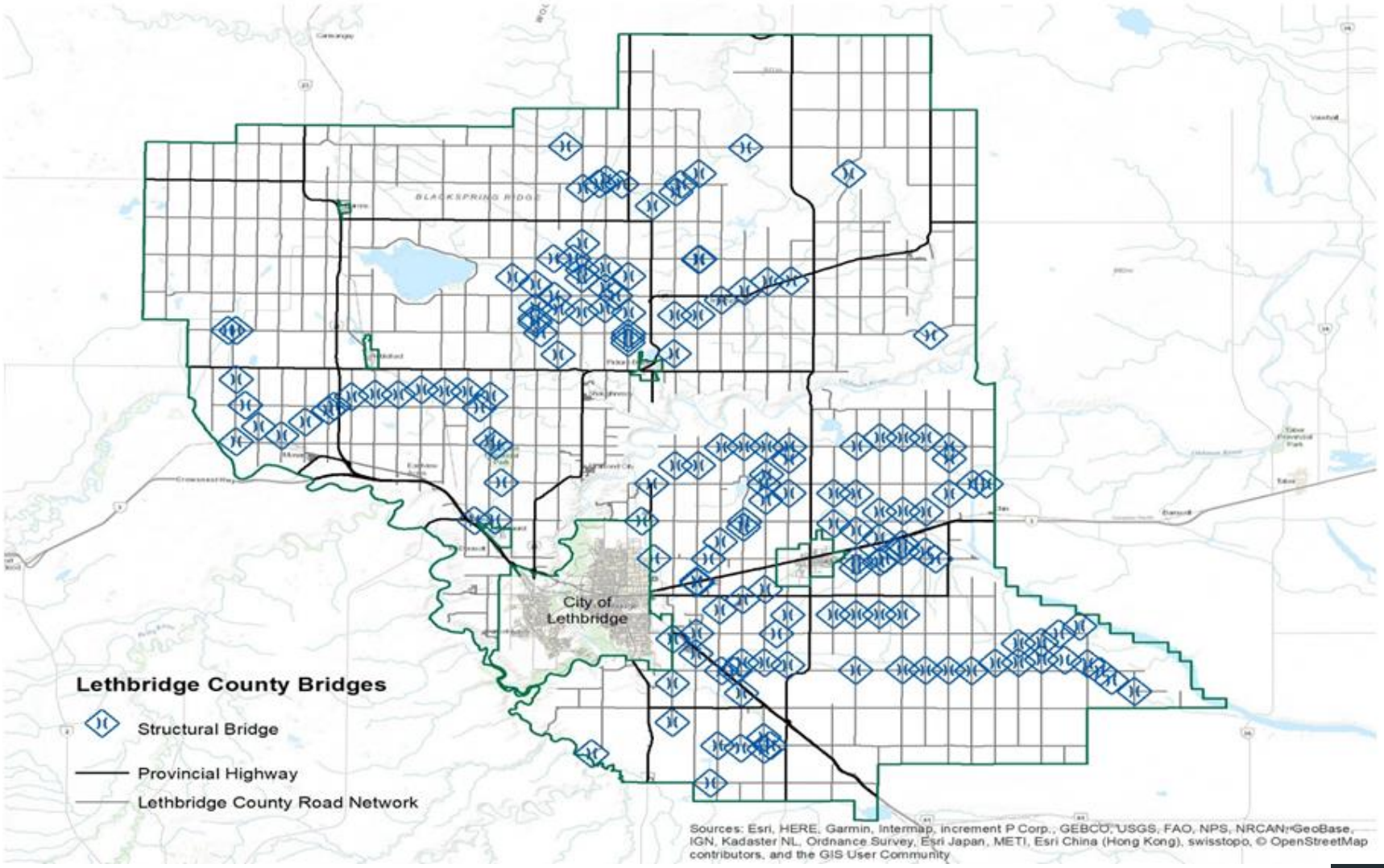
150+ Structural Water Crossings



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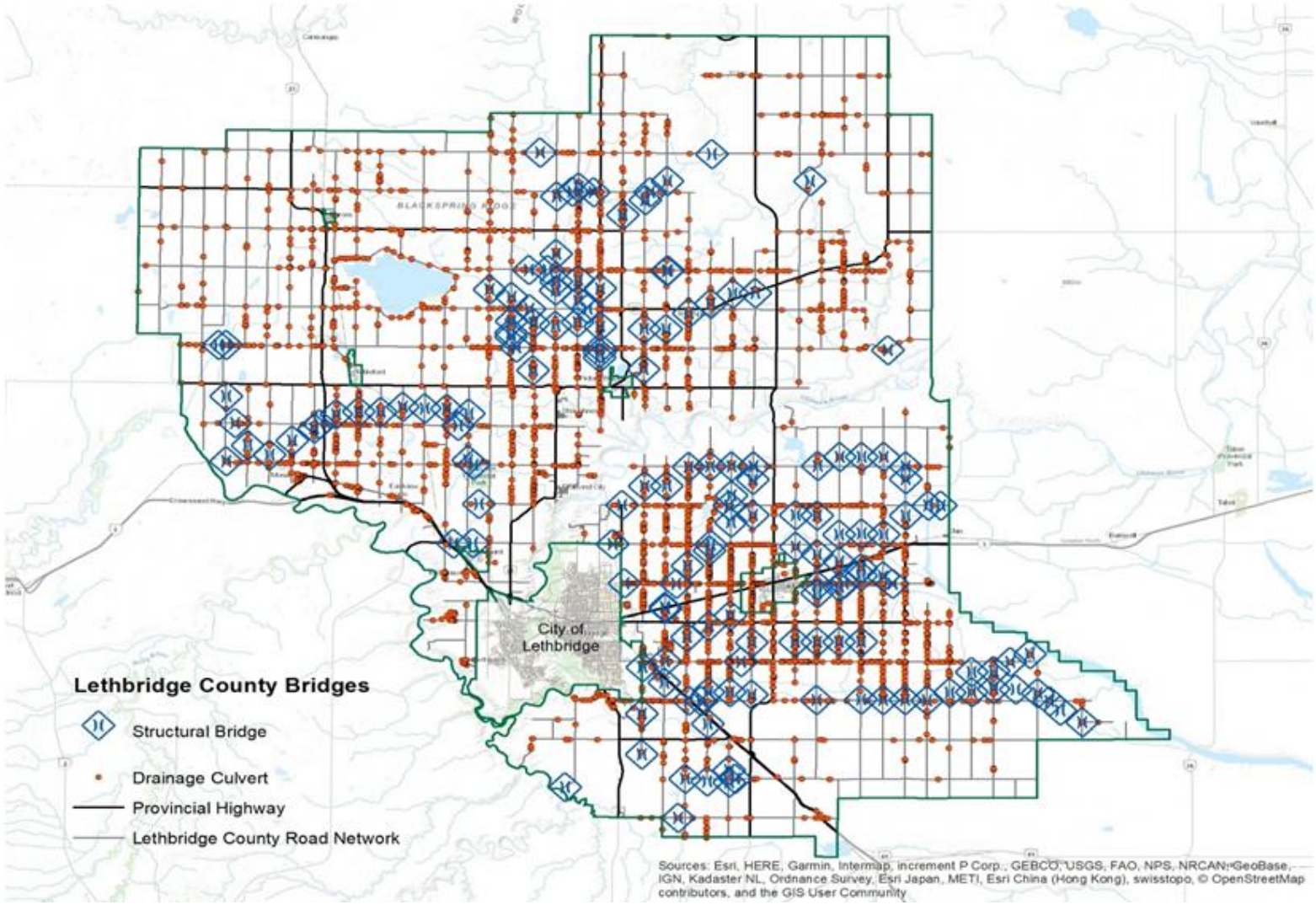
Include Another 3300+ Drainage Culverts



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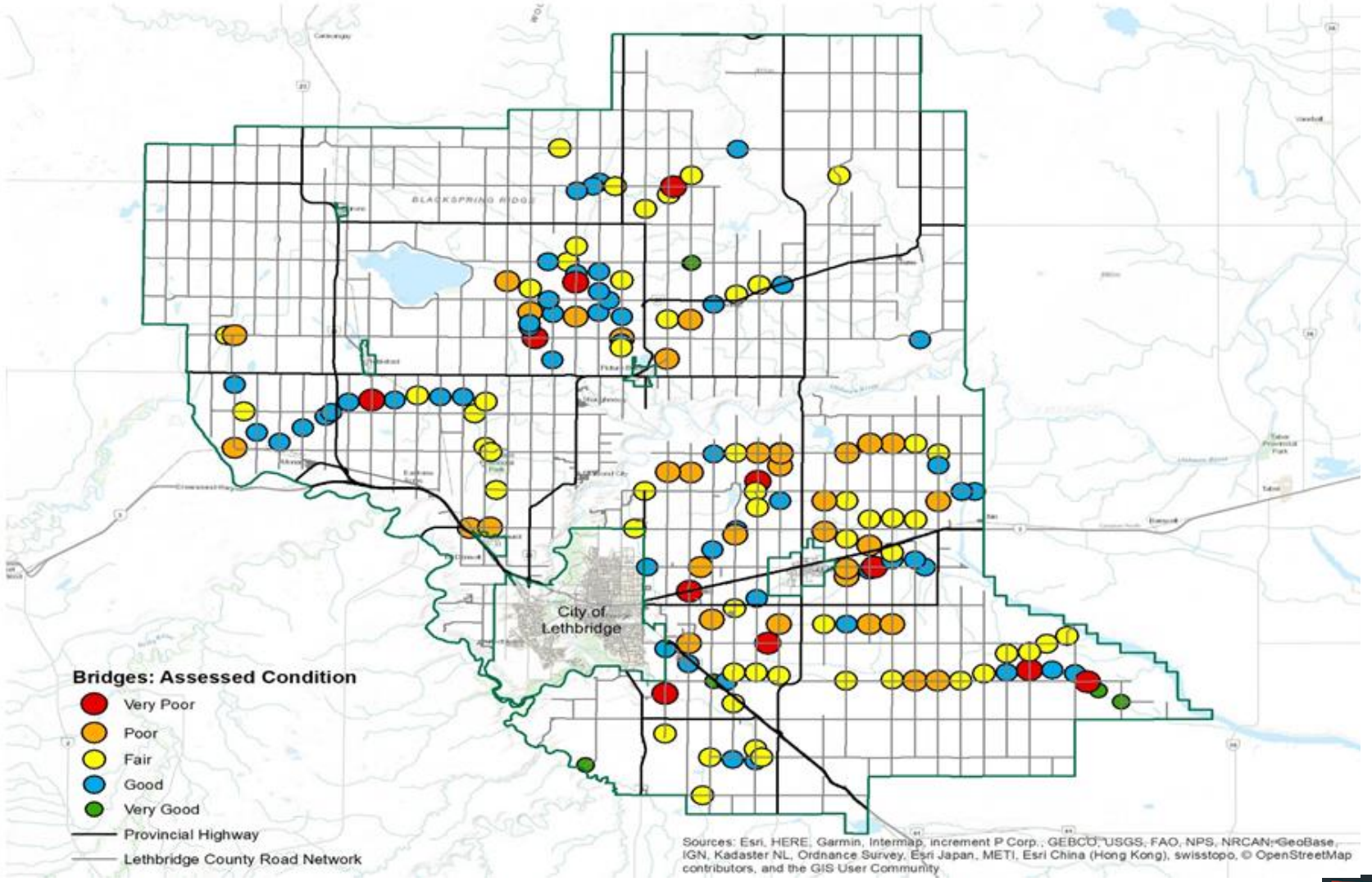
Current Assessed Condition



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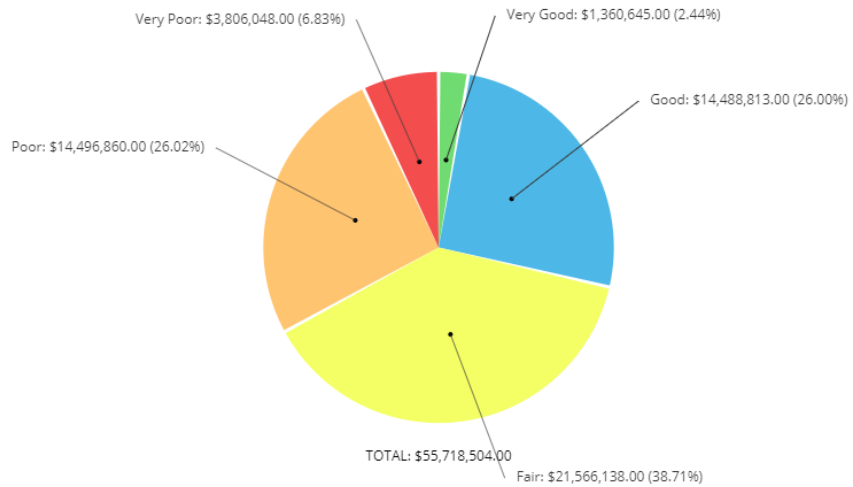
Current Assessed Condition

- Very Good – 2%
  - $1,360,000
- Good – 26%
  - $14,490,000
- Fair – 39%
  - $21,566,000
- Poor – 26%
  - $14,497,000
- Very Poor – 7%
  - $3,800,000



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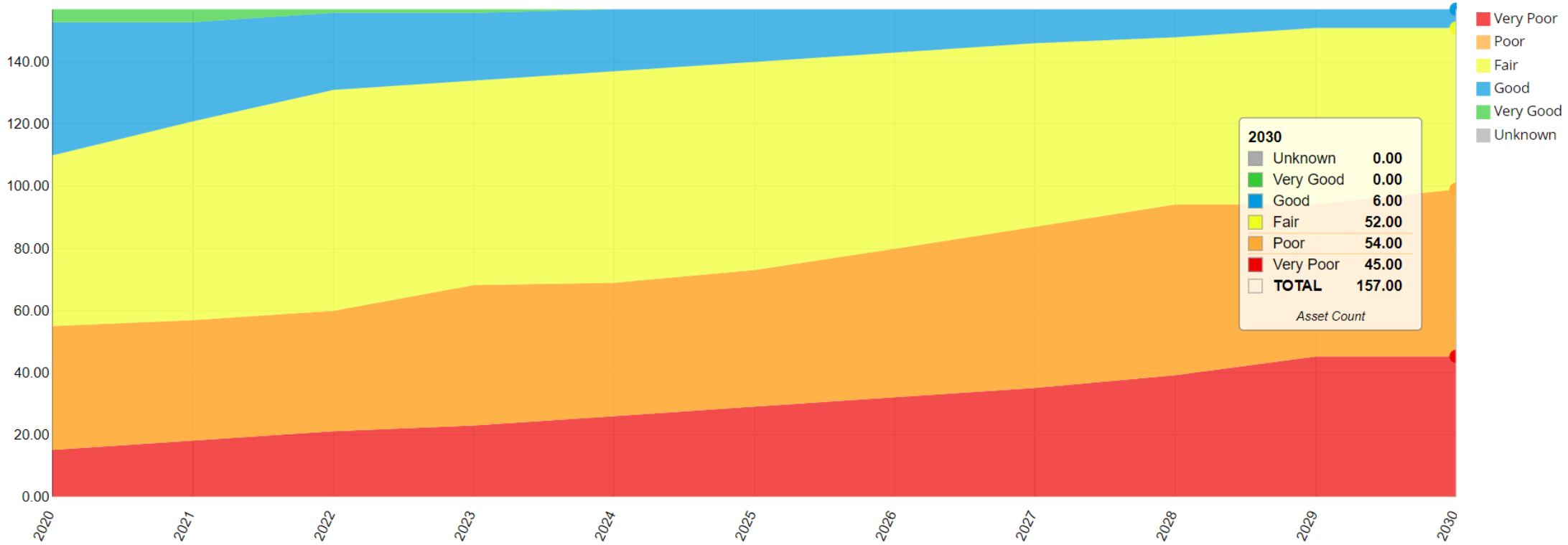
10 Year Projected Condition

- Approximately 7% of all bridges were in very poor condition in comparison to only 2% in very good condition for 2019.

- Over the next 10 years, 29% of bridges are projected to be in very poor condition with no bridges in very good condition.



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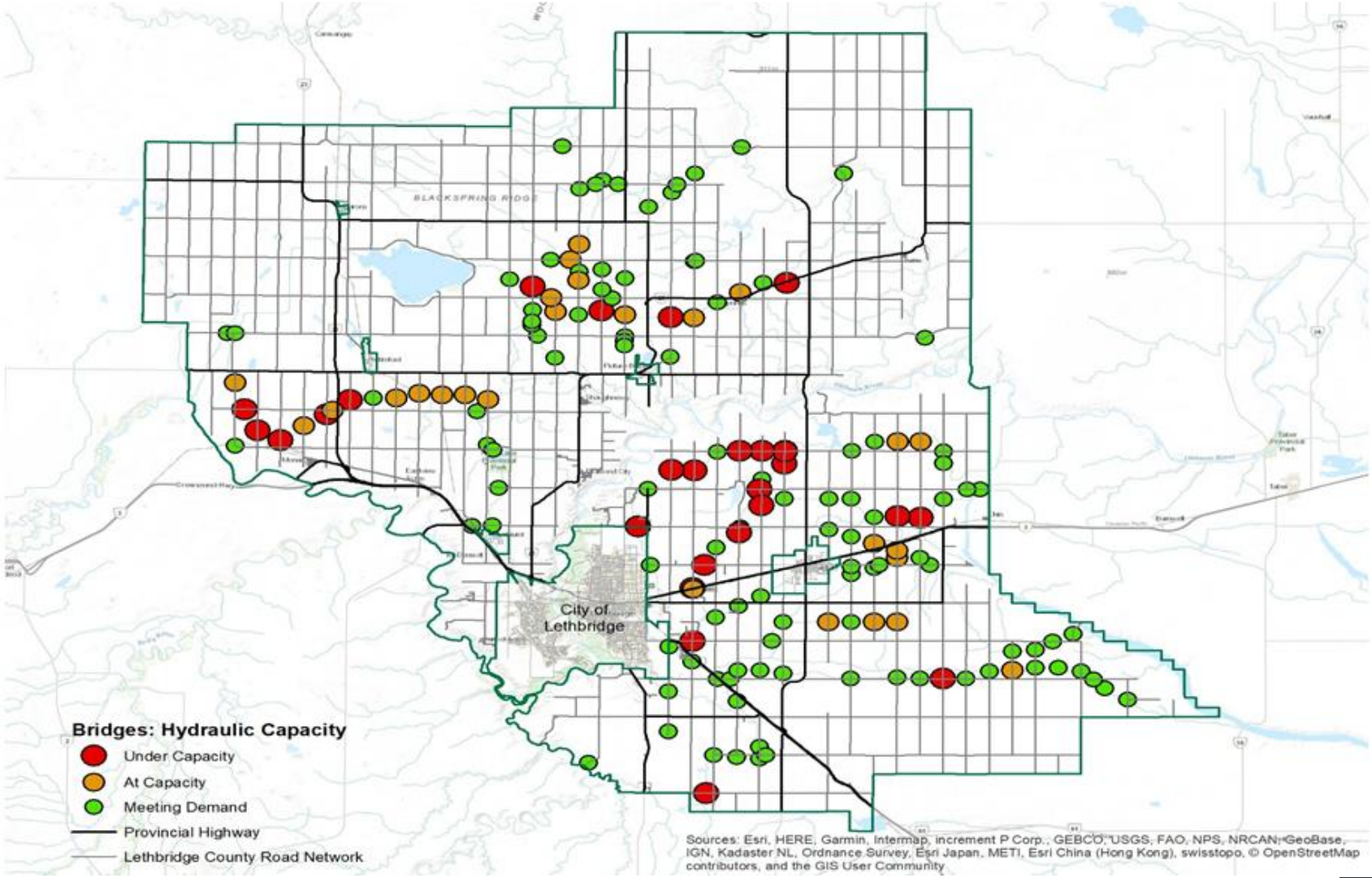
Hydraulic Capacity



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Increasing Canal Capacity

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Resulting Impacts

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Mitigation Strategy

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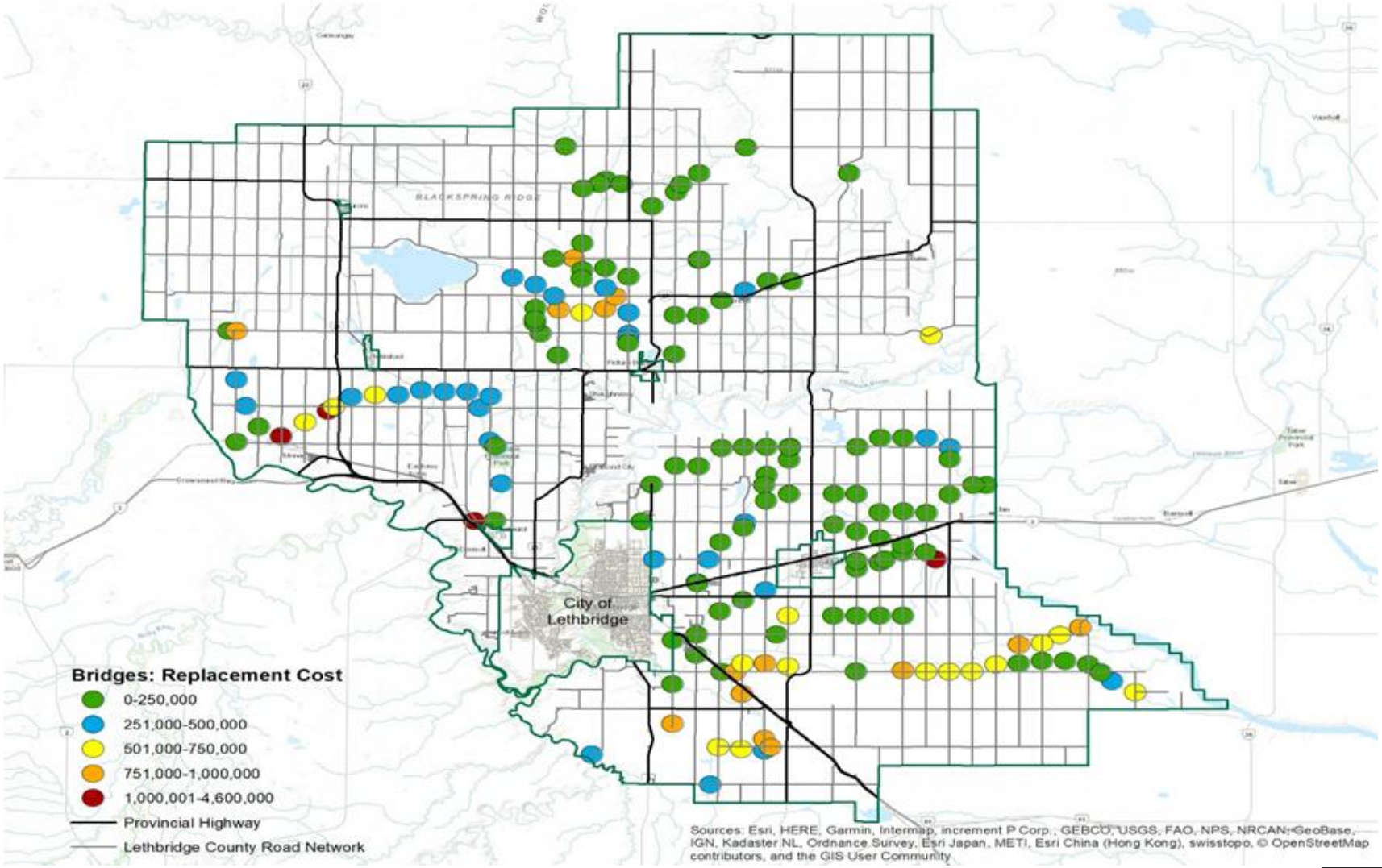
Economic Impacts



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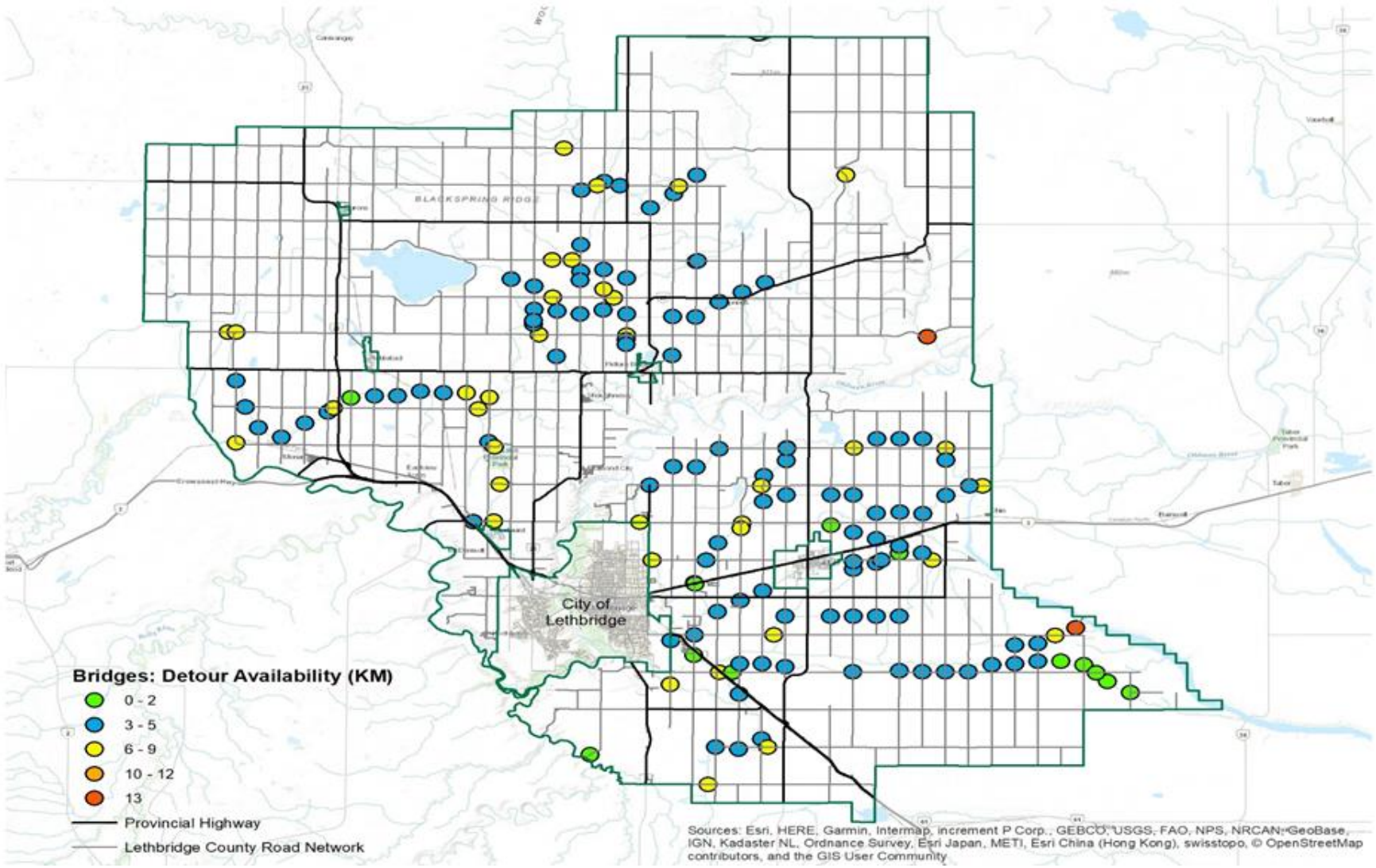
Available Alternative Routes



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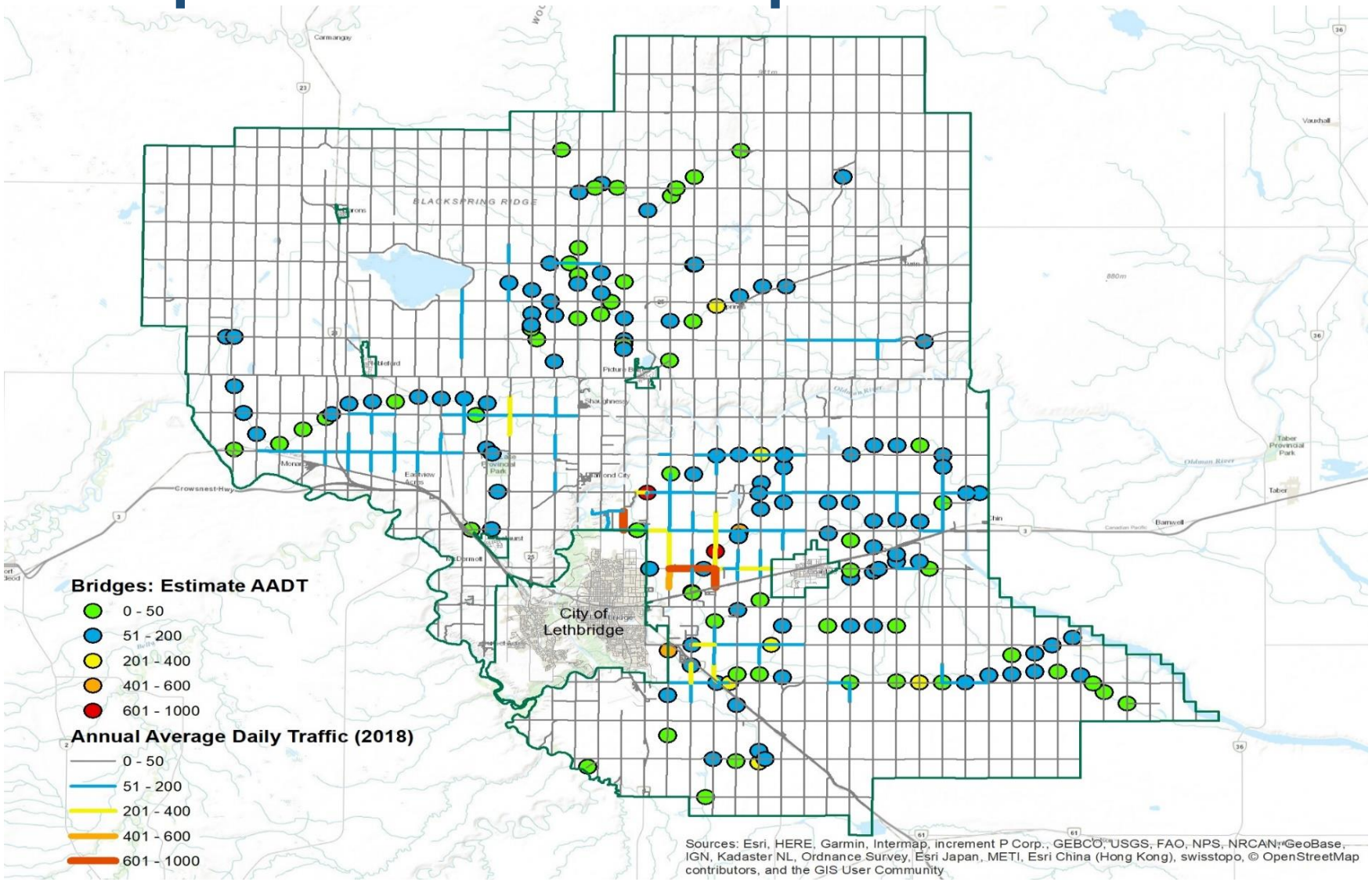
Disruption to Transportation



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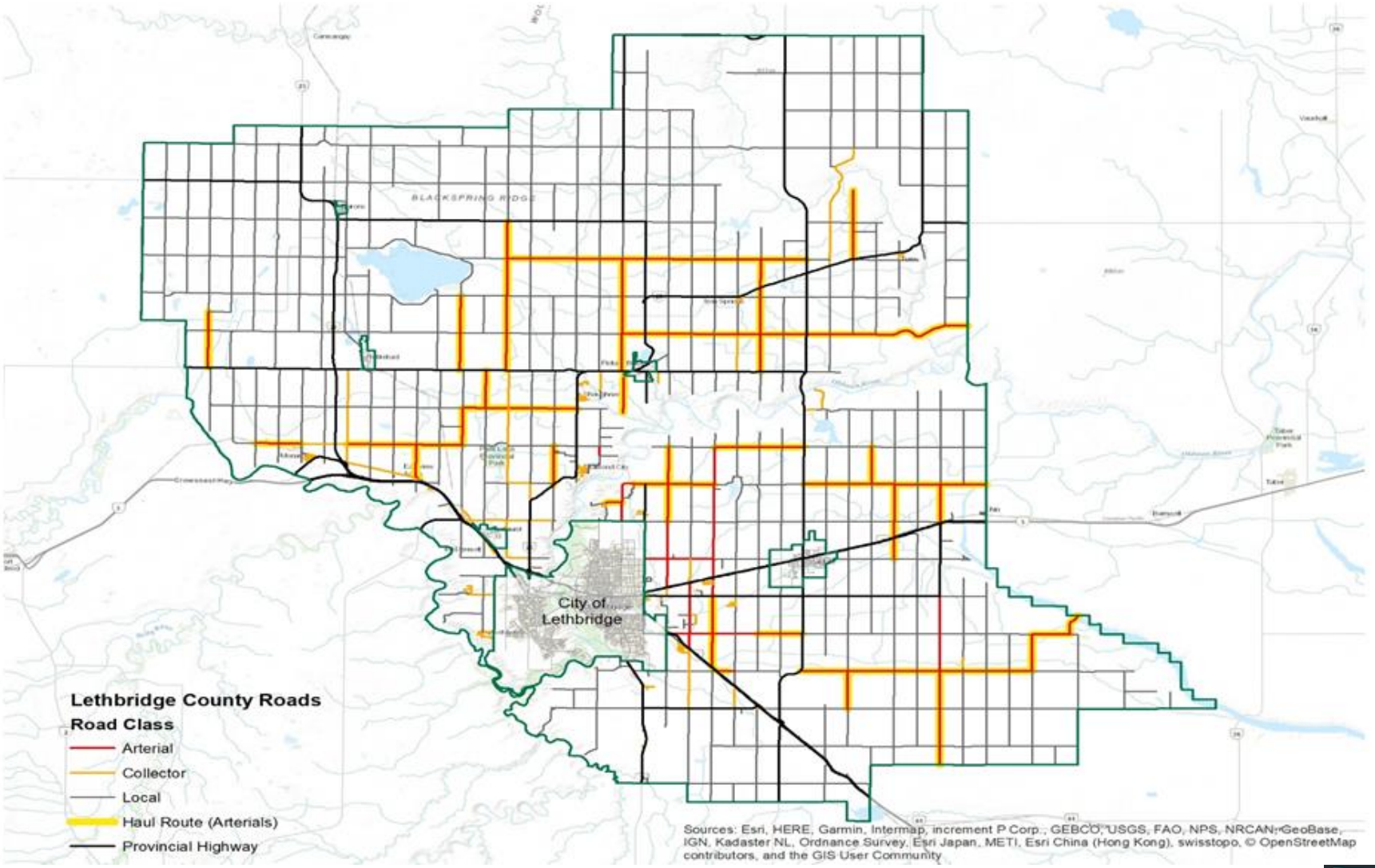
Strategic Considerations



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Current Risk

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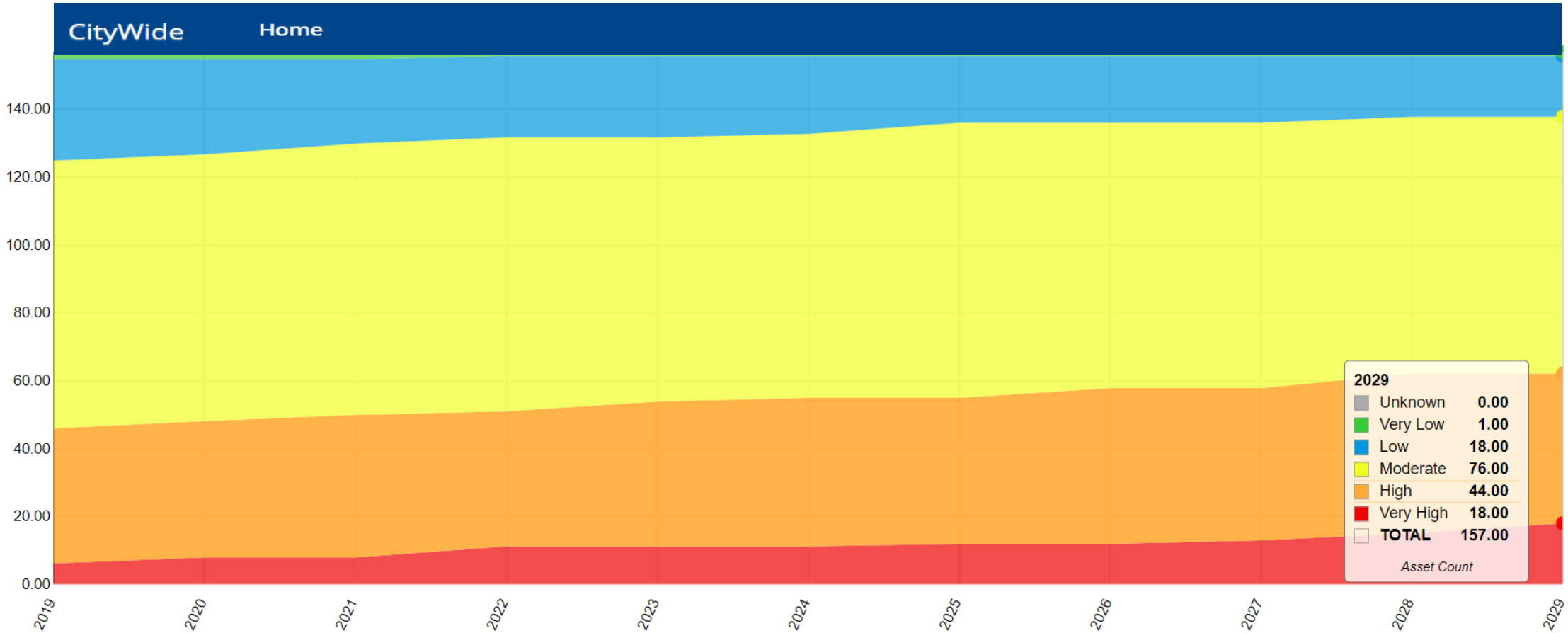
10 Year Projected Risk

- 6 bridges at very high risk in 2019
- 18 bridges projected at very high risk in 2029 with no mitigation strategy applied



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Leads to Informed Decision Making

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CityWide Home > AM > **Inventory (2018)** - Active Inventory and WIP

Asset ID	Name	Import ID	Replacement Cost	Last Condition A...	Probability of Failure	Consequence of Failure	Risk Rating	Design Capacity	Estimated AADTS
2918	PICTURE BUTT	B-70758	$122,647.00	22.2 - Very Poor	4.25 - Likely	1.18 - Insignificant	5 - Low	MEETING CAP	37
2976	LETHBRIDGE	B-79602	$183,600.00	27.8 - Very Poor	5 - Almost Certain	1.18 - Insignificant	5.88 - Low	UNDER CAP	66
2901	LETHBRIDGE	B-815	$131,445.00	33.3 - Poor	5 - Almost Certain	1.26 - Insignificant	6.32 - Low	UNDER CAP	91
2904	MONARCH	B-1692	$238,162.00	33.3 - Poor	4.25 - Likely	1.18 - Insignificant	5 - Low	UNDER CAP	35
2925	PICTURE BUTT	B-71467	$164,340.00	33.3 - Poor	5 - Almost Certain	1.18 - Insignificant	5.88 - Low	UNDER CAP	43
2928	COALDALE	B-72098	$115,162.00	33.3 - Poor	5 - Almost Certain	1.35 - Insignificant	6.76 - Low	UNDER CAP	316
2939	COALDALE	B-76411	$96,075.00	33.3 - Poor	5 - Almost Certain	1.18 - Insignificant	5.88 - Low	UNDER CAP	69
2950	PICTURE BUTT	B-78397	$229,207.00	33.3 - Poor	4.5 - Likely	1.18 - Insignificant	5.29 - Low	AT CAP	81
2995	COALDALE	B-79770	$246,450.00	33.3 - Poor	4.25 - Likely	1.09 - Insignificant	4.63 - Low	UNDER CAP	40
2997	COALDALE	B-79773	$77,062.00	33.3 - Poor	4.25 - Likely	1.18 - Insignificant	5 - Low	MEETING CAP	55
3005	NOBLEFORD	B-79825	$633,675.00	33.3 - Poor	5 - Almost Certain	2.82 - Minor	14.12 - High	UNDER CAP	193
3066	NOBLEFORD	B-81684	$864,000.00	33.3 - Poor	4.25 - Likely	3.74 - Moderate	15.88 - High	UNDER CAP	69
2979	LETHBRIDGE	B-79605	$367,200.00	38.9 - Poor	4.25 - Likely	2 - Minor	8.5 - Moderate	UNDER CAP	128
2907	COALDALE	B-7195	$211,668.00	44.4 - Poor	4.25 - Likely	1.09 - Insignificant	4.63 - Low	UNDER CAP	49
2937	PICTURE BUTT	B-76077	$444,690.00	44.4 - Poor	4.25 - Likely	2 - Minor	8.5 - Moderate	UNDER CAP	101

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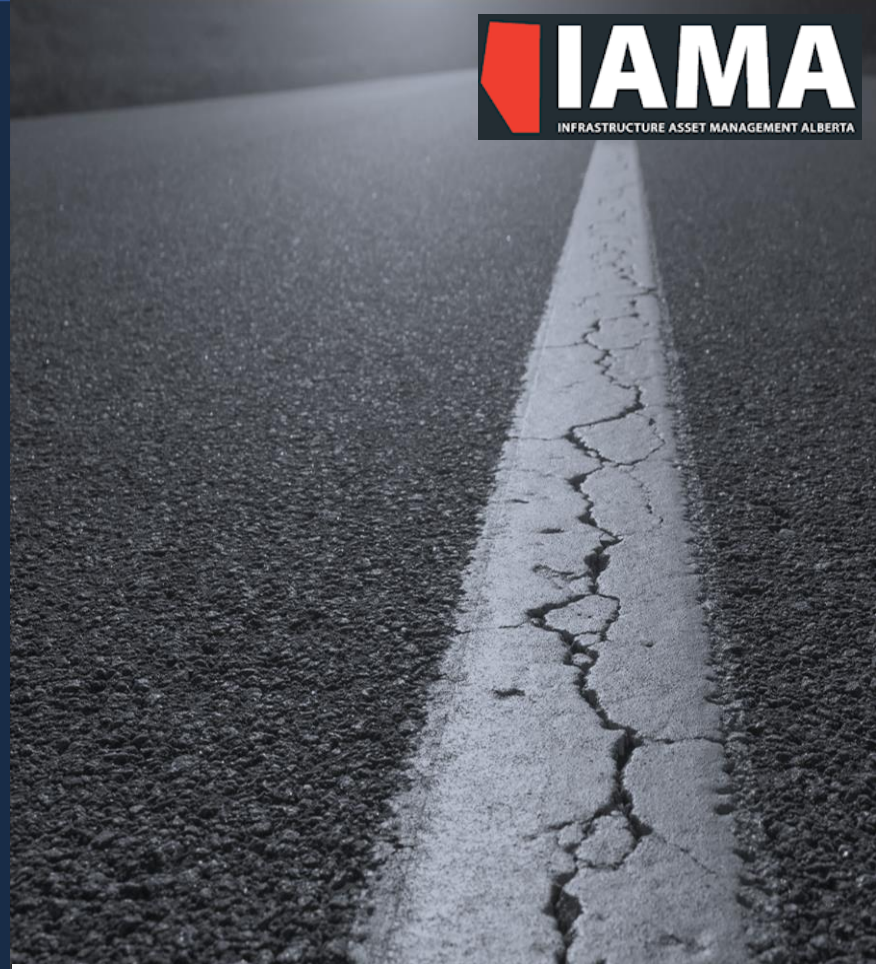
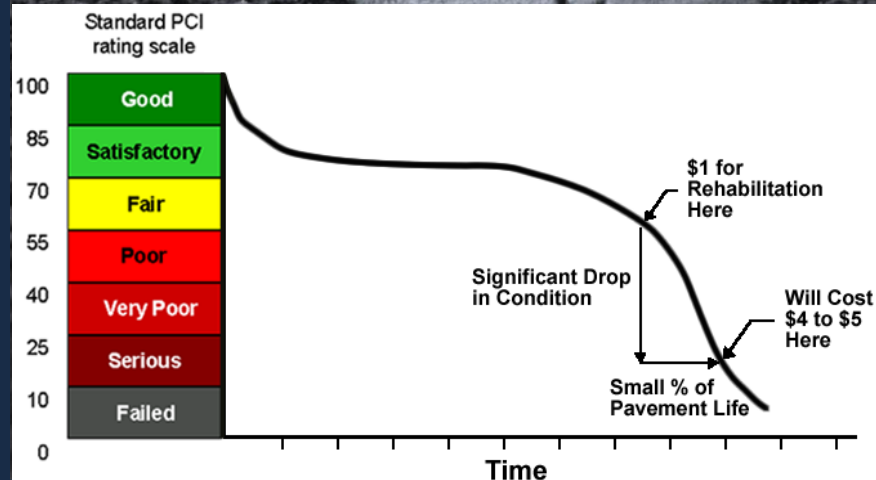
Lifecycle Strategies Framework

- Understand the complexity and diversity of infrastructure and asset portfolios
- Understanding demand & performance needs
  - Paved Road Composition
    - HCB HL4 – 50mm
    - HCB HL8 – 75mm
    - HCB Superpave – 100mm
  - ICB
  - LCB
  - Surface Treated
  - Gravel Roads
    - Typical Design
    - Base Stabilized
  - Candidates for Structural Upgrades
    - E.G. LCB conversion to HCB HL4 – 100mm





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Climatic Adaptation Considerations

Understanding which assets are vulnerable to climatic impacts.

- Heavy rainfall
- Excessive spring runoff
- Extreme heat & drought
- High winds
- Rising sea levels
- Extreme weather events

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Defining Treatment Options

Event Class	Description	Example	Cost
General Maintenance	Any activities that repair current defects or deteriorations	(Roads) Pothole Repairs	**$**
Preventative Maintenance	Any activities that prevent defects or deteriorations from occurring	(Roads) Crack Seal	**$**
Rehabilitation	Any activities that rectify defects or deficiencies that are already present and may be affecting asset performance	(Roads) Mill & Resurface	**$$**
Replacement	Asset end-of-life activities that often involve the complete replacement of assets	(Roads) Full Reconstruction	**$$$**
Replacement Upgrade	Asset end-of-life activities that involve the complete replacement of assets with an upgraded asset	(Roads) Reconstruct from LCB to HCB surface composition	**$$$$**

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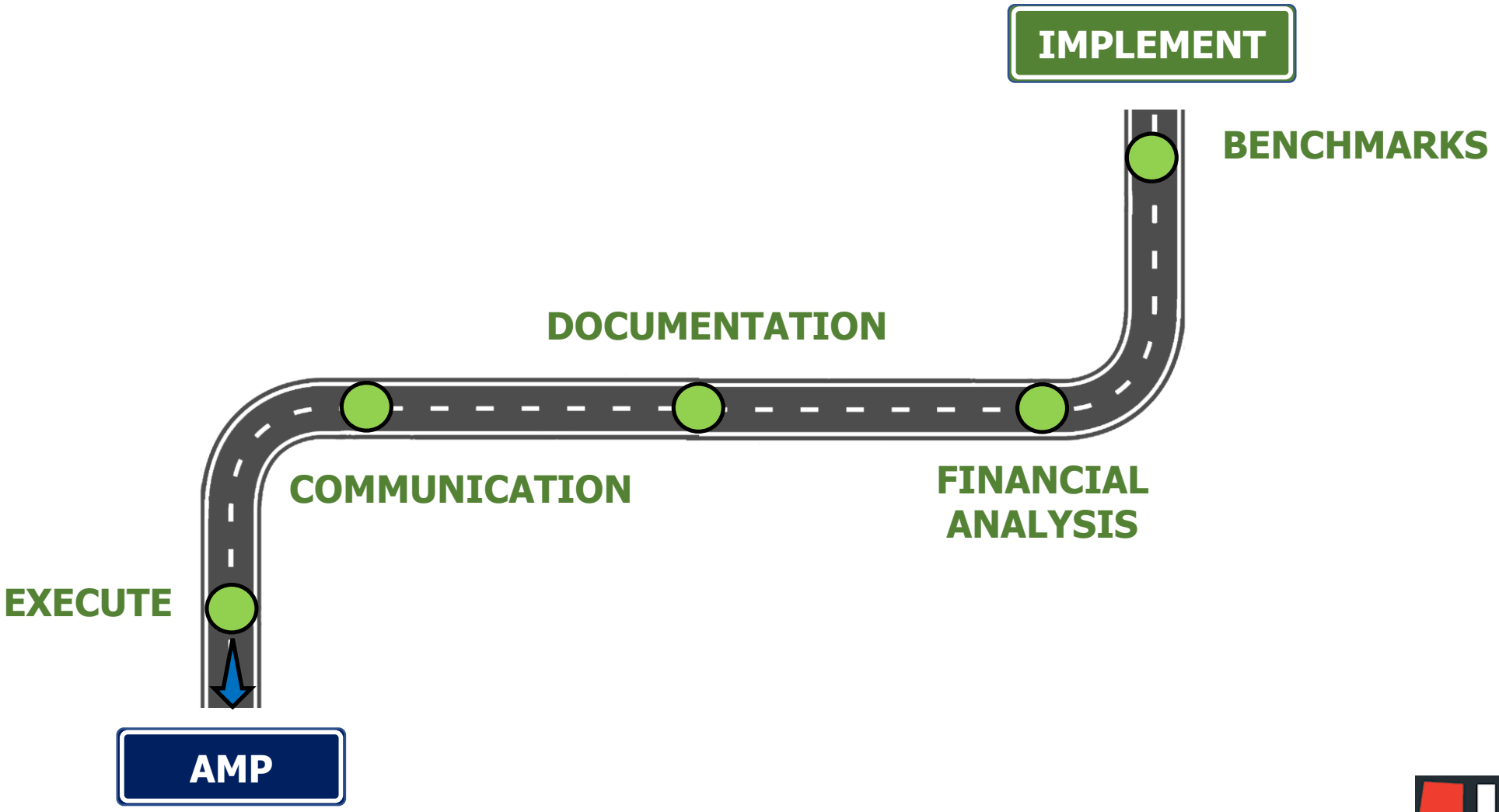
Asset Management Program Development

Assess | Plan | Implement



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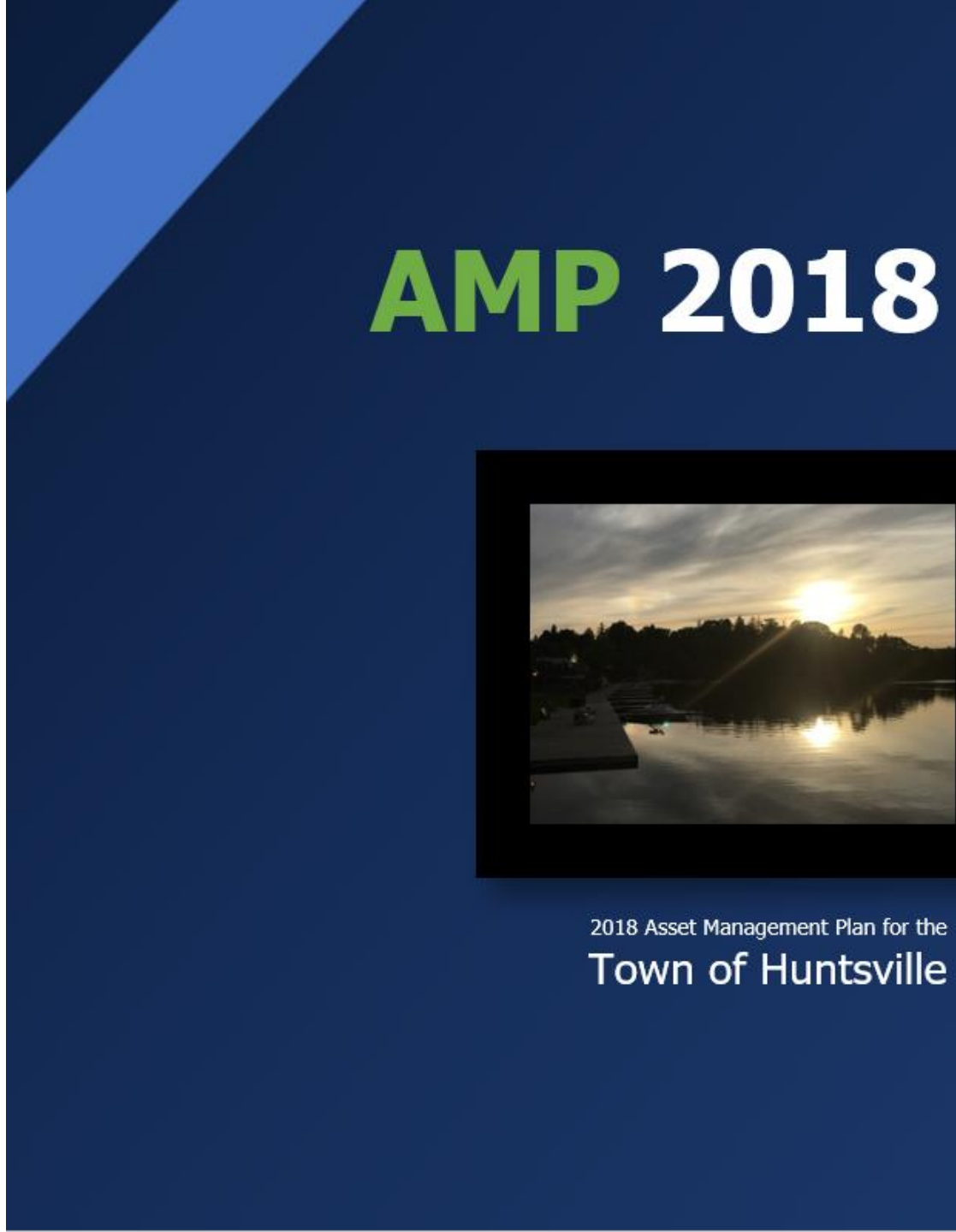
Implementation

Final Steps:

- **Establishing Benchmarks**:
  - Levels of Service
- **Developing Financial Strategy**:
  - Cost Quantification
  - Full Life Cycle cost of Ownership and disposal
  - Multiple Budget Scenarios
- **Formal Documentation**
- **Communication Strategy**
- **Execute**:
  - Asset Management Plan



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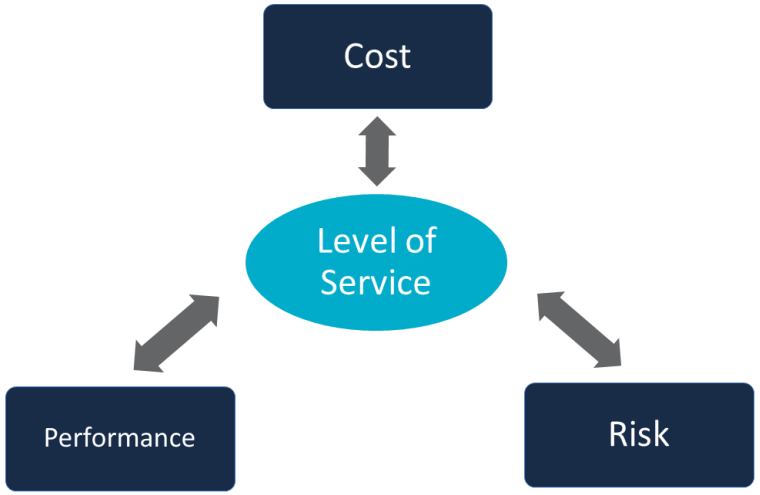
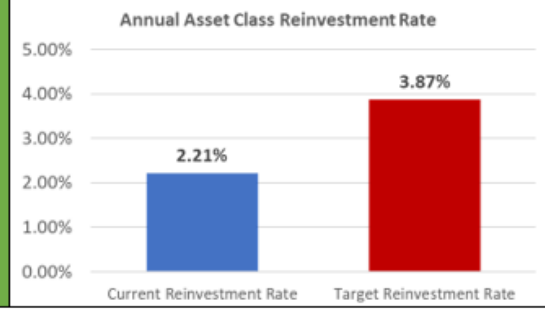
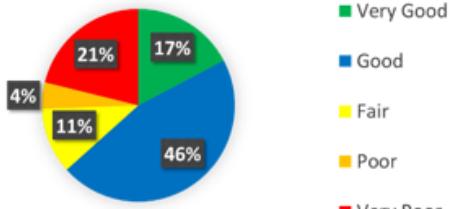
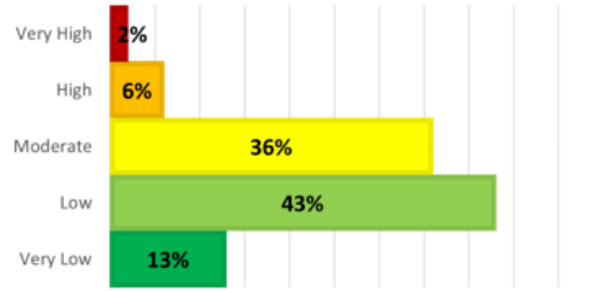
What are Levels of Service?

A measure of the service outcomes that the community receives



Asset Class	Annual Asset Class Reinvestment Rate	Condition	Risk	Level of Service Trend
Road Network				

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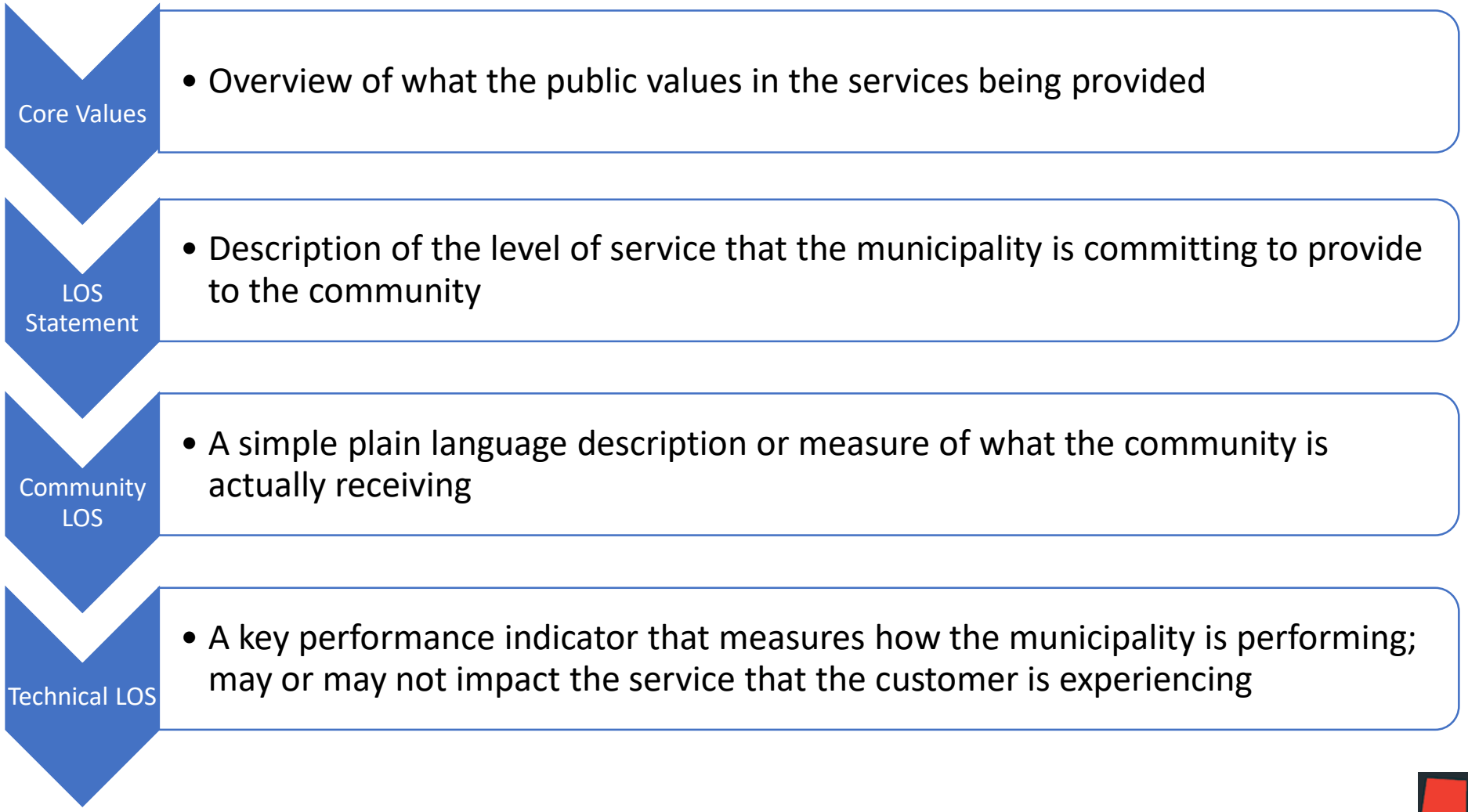
LOS Framework Components



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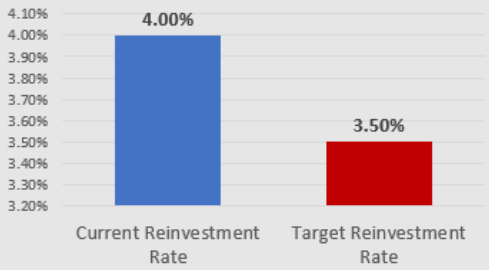
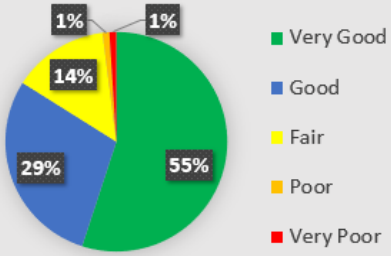
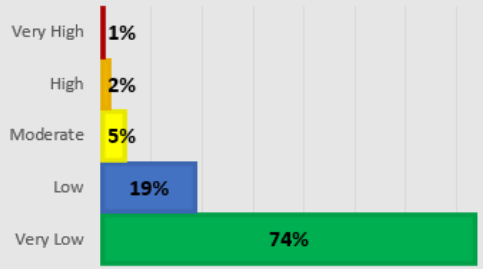
Level of Service Framework

Water Network

	Cost: Annual Reinvestment Rate	**Condition :** % of assets in very good, good, fair, poor, very poor condition	**Risk:** % of assets in very low, low, moderate, high, very high risk profiles	**Levels of Service Trend**
				

Core Value	Level of Service Statement	Community Level of Service	Technical Level of Service	Current and Historical Performance					LOS Target	Performance Evaluation	Suggested Action	Notes
				2018	2019	2020	2021	2022				
Accessible & Reliable	A reliable water supply is provided with minimal service disruptions	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	% of properties connected to the municipal water system									
		Description, which may include maps, of the user groups or areas of the municipality that have fire flow	% of properties where fire flow is available									
			# of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system									
Safe & Regulatory	Water supply is safe to drink and meets all regulatory requirements	Description of boil water advisories and service interruptions	# of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system									
			# of water quality customer complaints									
Affordable	Water services are affordable and household flat-rate charges are fair and reasonable to reflect water conservation initiatives	Description of the lifecycle activities (maintenance, rehabilitation and replacement) performed on the water network	O&M Cost / km of watermains									
			Annual capital reinvestment rate									
Sustainable	Water resources are used efficiently and long-term plans are in place for the sustainability of the water supply and all water infrastructure	Description of the current condition of the water network and the plans that are in place to maintain or improve the provided level of service	% of the water network that is in good or very good condition									
			% of the water network that is in poor or very poor condition									

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BUILDING A STRATEGY FOR BETTER ASSET DATA

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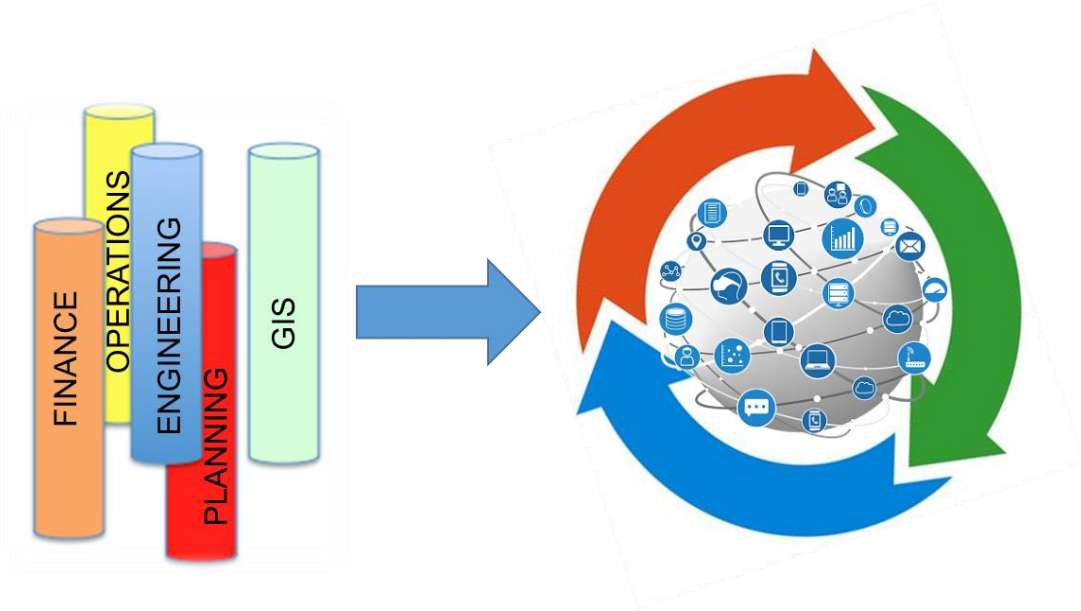
The Challenge

- Data, Data, and More Data
- Multiple datasets owned and maintained by various departments including Finance, Engineering, GIS, spreadsheets
- Legacy Processes
- Bringing Value and Purpose to Data
- Data Confidence – Validating the quality of data
- Managing data and determining what data brings value to your organization



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Additional Considerations

- What data do we have and what are we missing?
- What is the business need? Who uses the data and is there value to creating and maintaining it?
- What is the process for gathering the data?
- Is the process for gathering data aligned with operational workflows?

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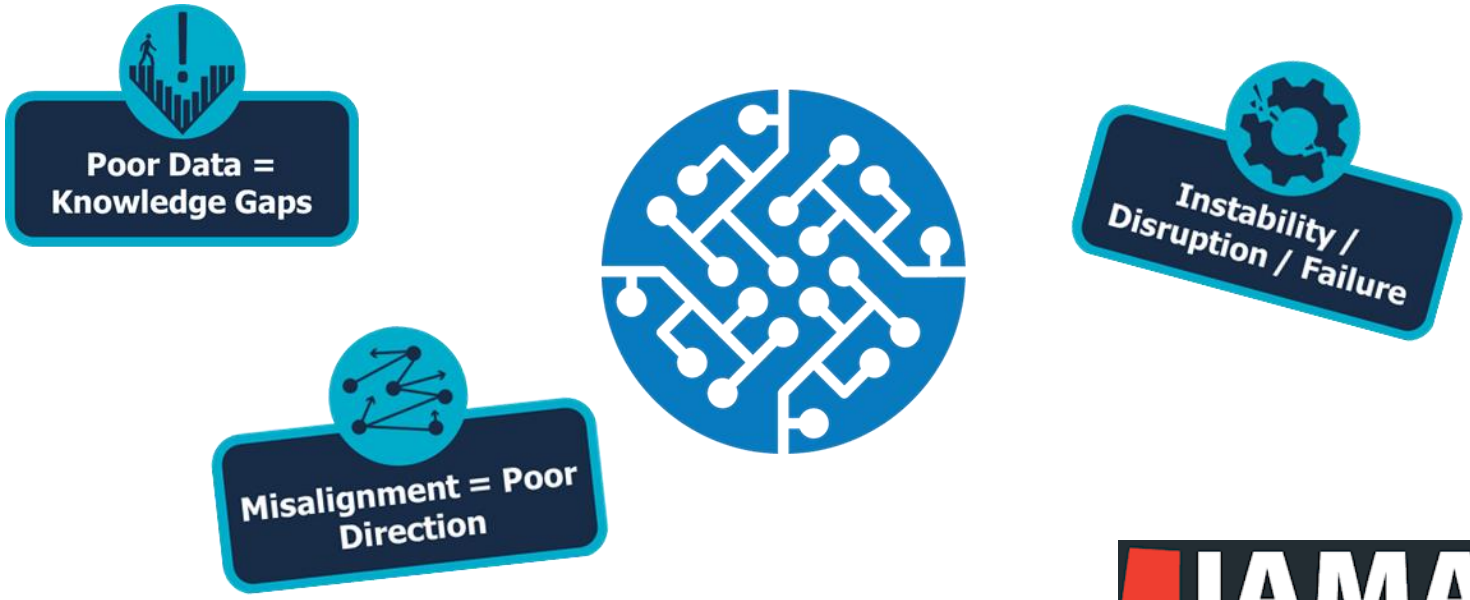
Data Confidence

- Not a quick process…it is dynamic and continuous (AM for your data)
- Objective is to have accurate, reliable, and timely information that supports both operations and strategic initiatives
- Data Completeness
- Data Integrity
- Data Accuracy



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Step 1: Objective

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Data Objective

Centralized Municipal Asset Management Data Model

- Connecting silos rather than break them down
  - Discuss
  - Collaborate
  - Translate & Consolidate
  - Build

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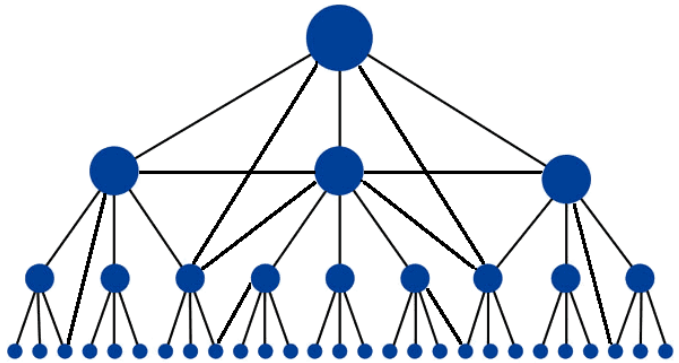

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Step 2: Understanding Organizational Business Needs

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Understanding the Purpose

SUPPORTS THE OBJECTIVE

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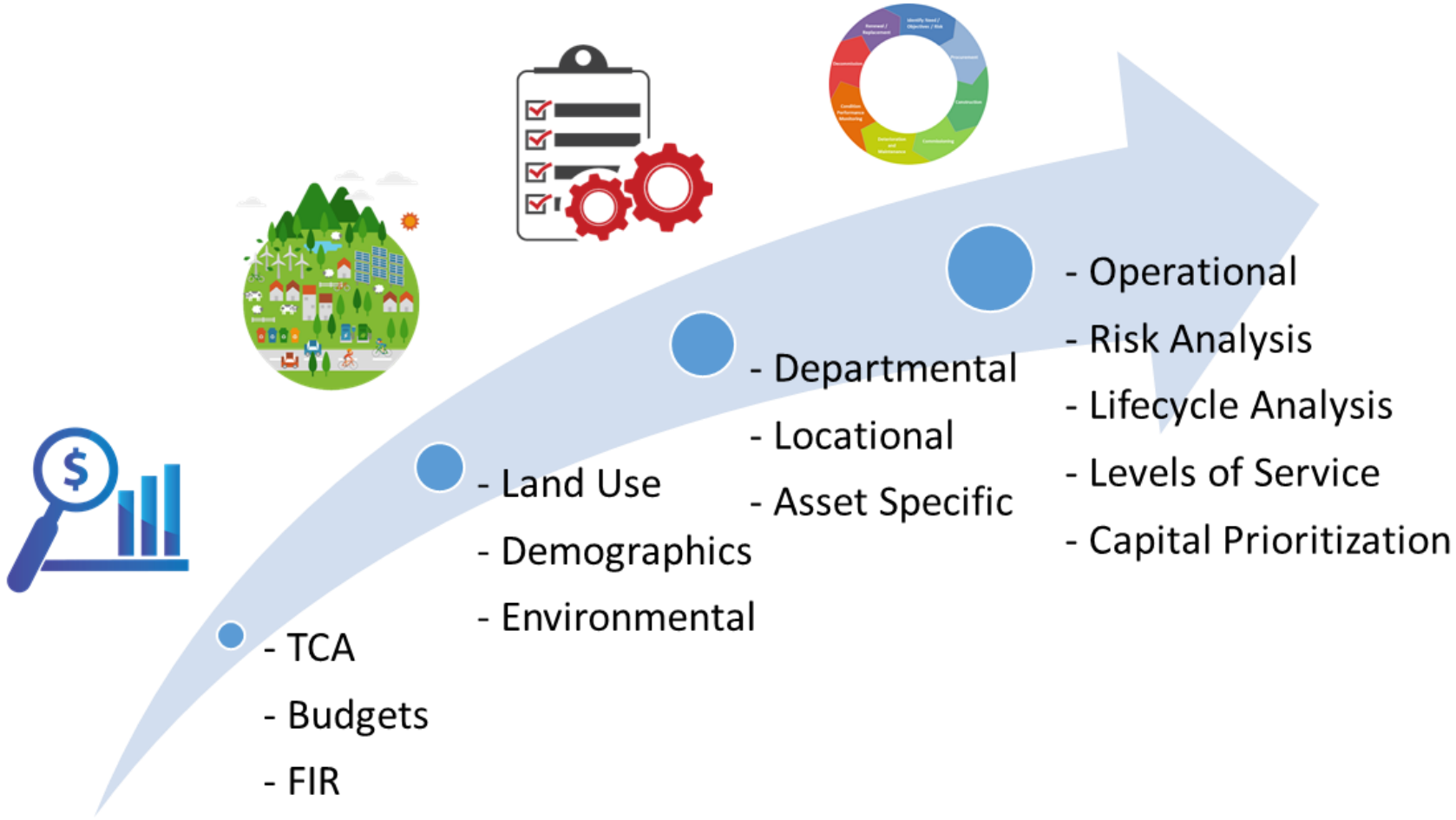
Identifying Functional Needs



SUPPORTS THE PURPOSE

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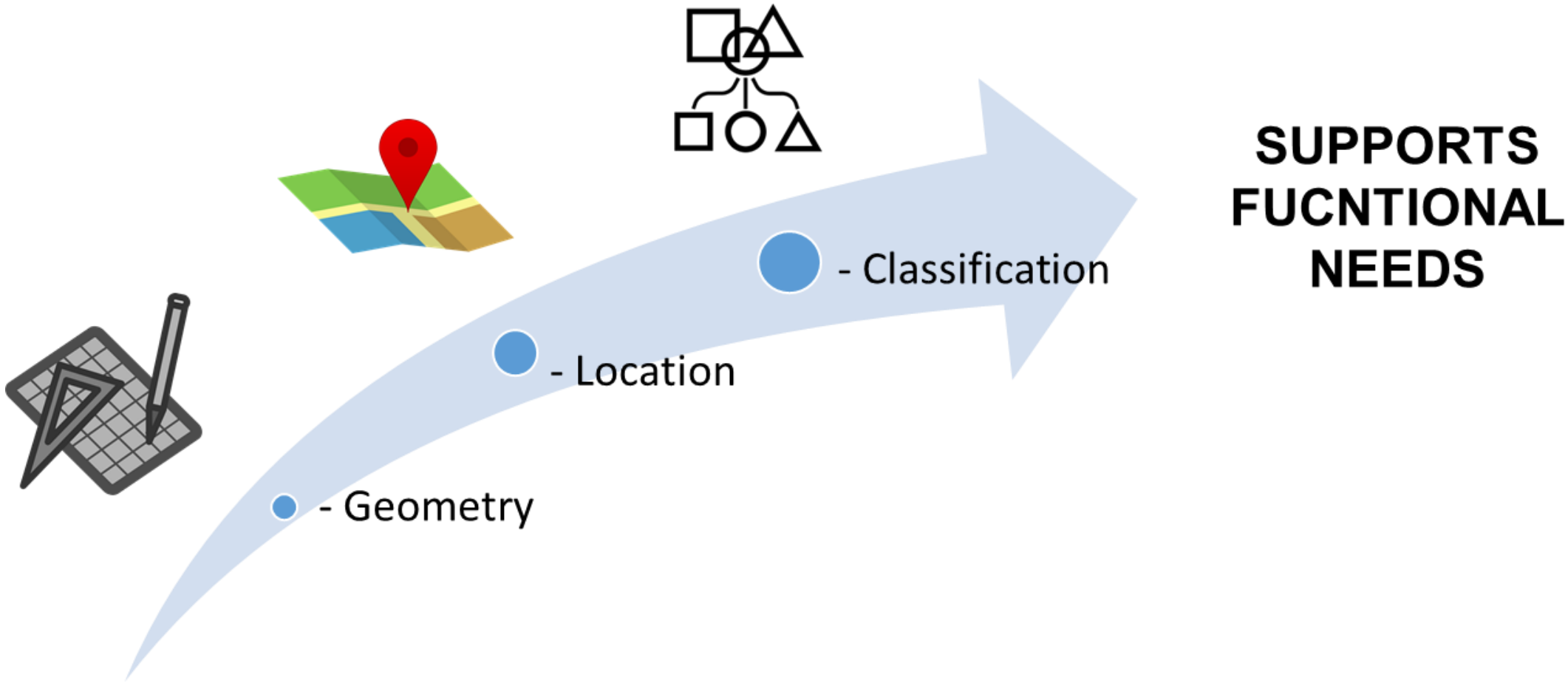
Supporting Static Data



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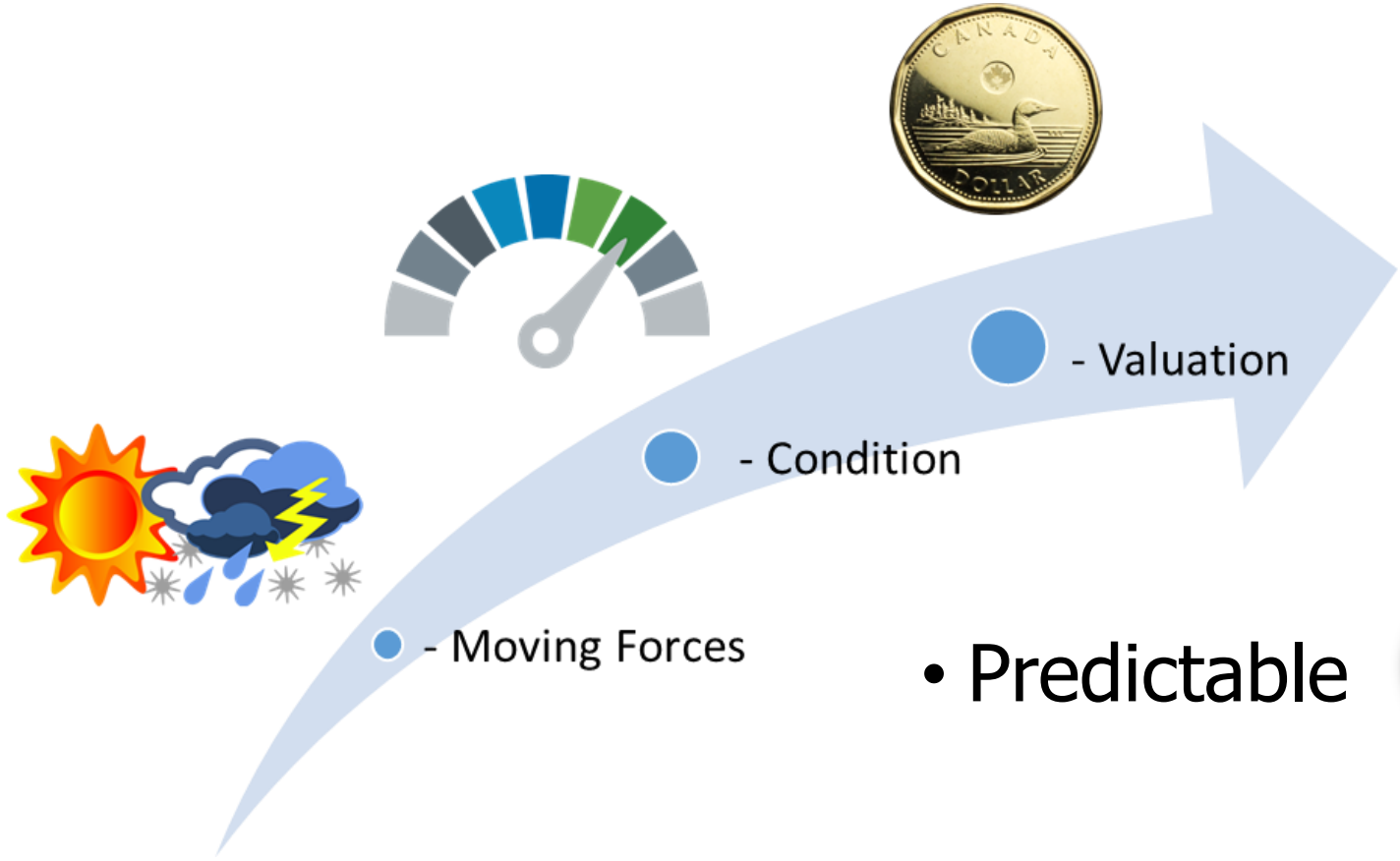
Supporting Dynamic Data



SUPPORTS FUCNTIONAL NEEDS

- Predictable

- Unpredictable

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Step 3: Database Hierarchy

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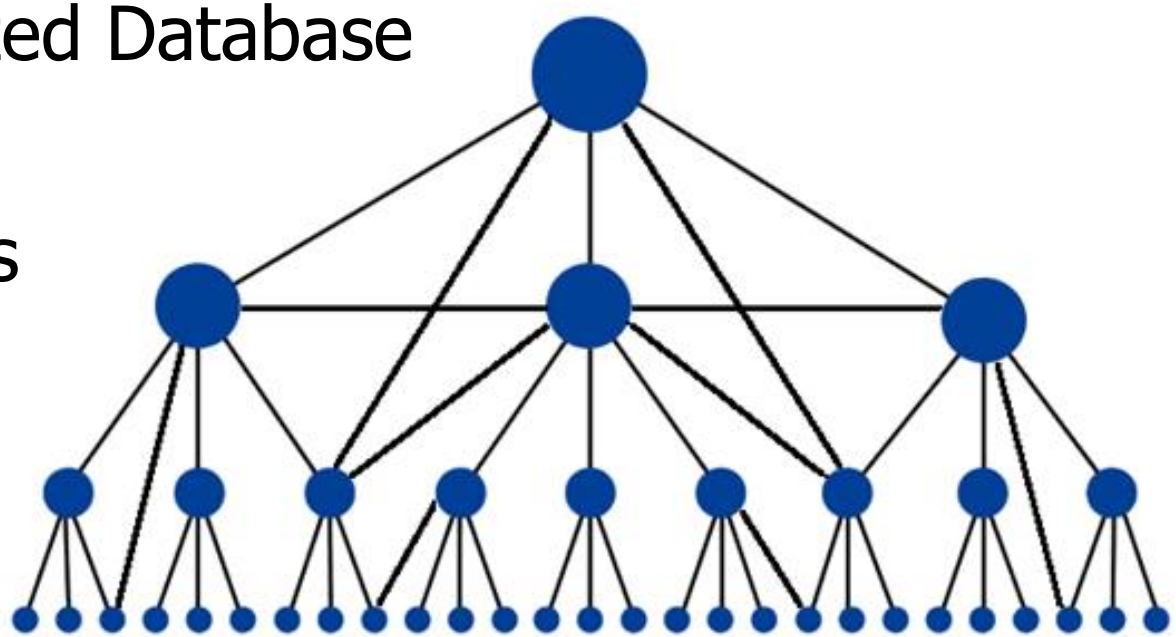
A Top-Down Approach

- Centralized Database
- Categories
- Components
- Supporting Data



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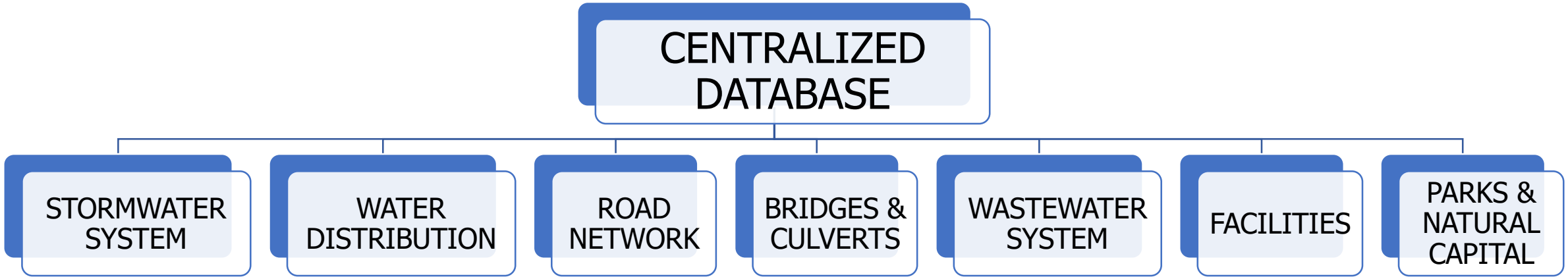
Data Hierarchy – Level 1



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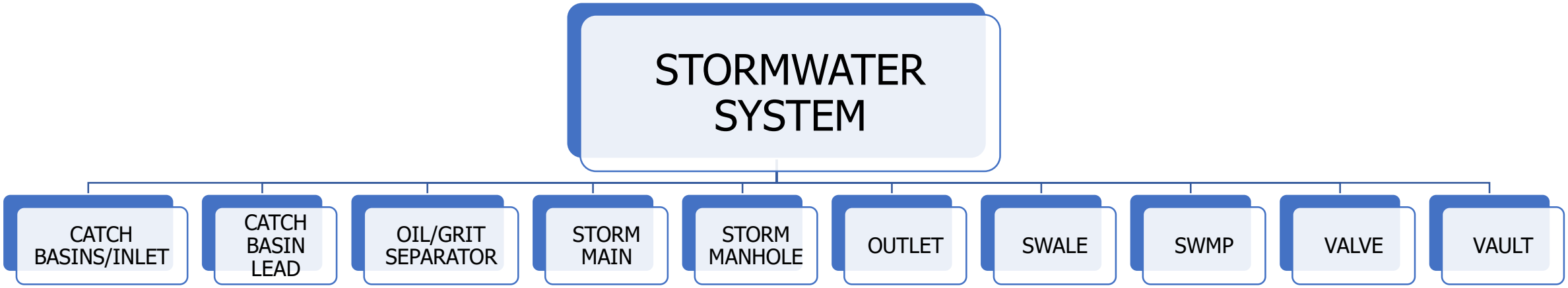
Data Hierarchy – Level 2



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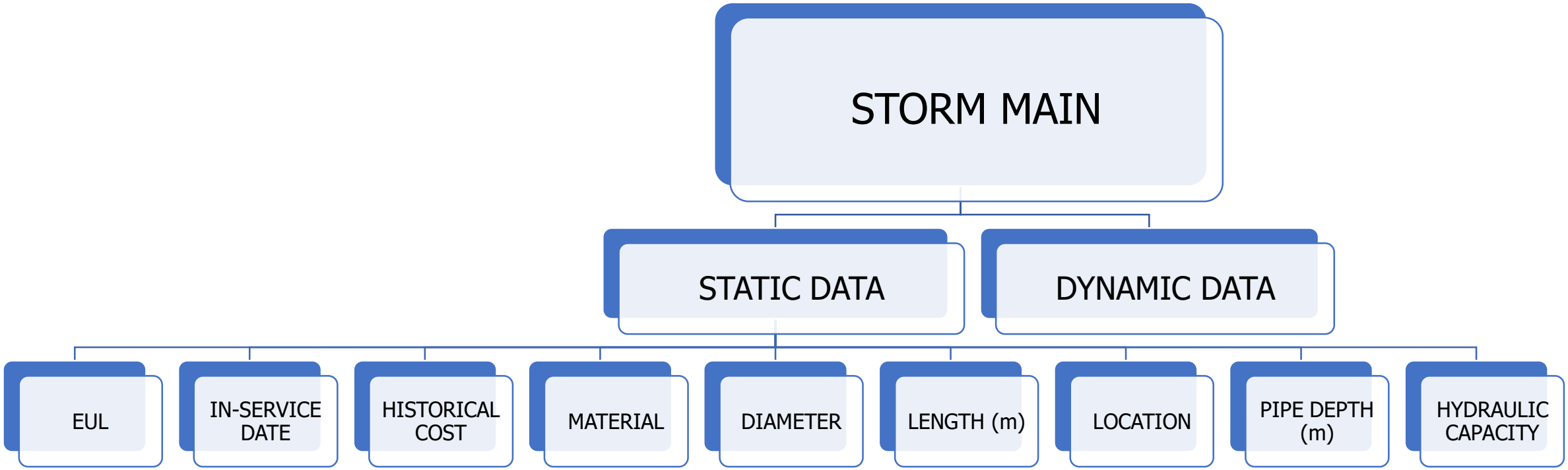
Data Hierarchy – Level 3



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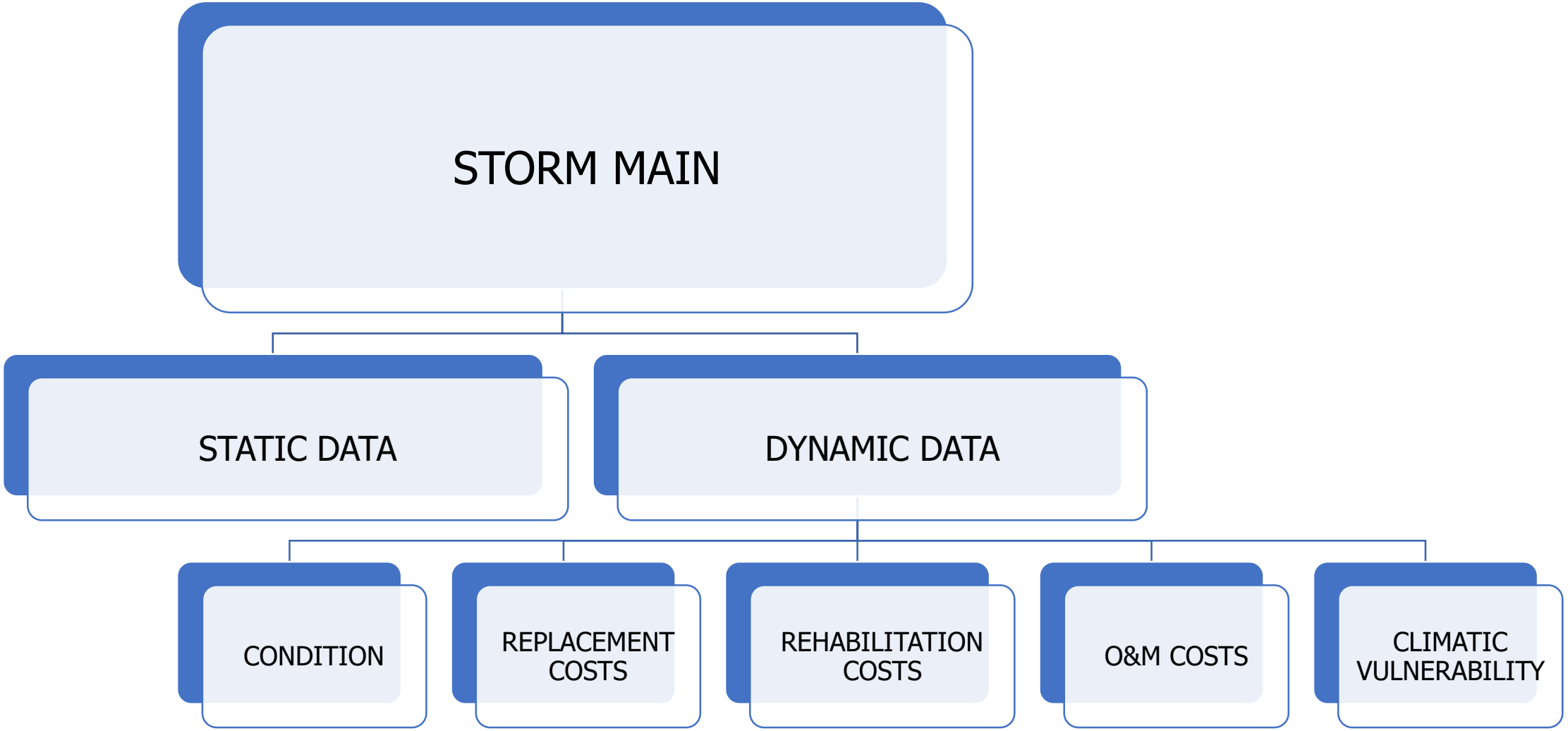
Data Hierarchy – Level 3



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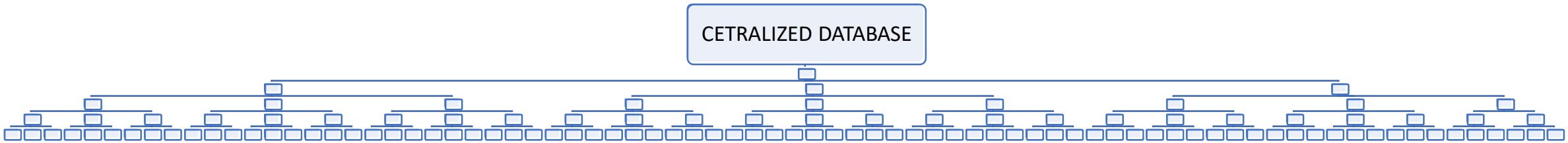
Municipal Asset Management Data Model



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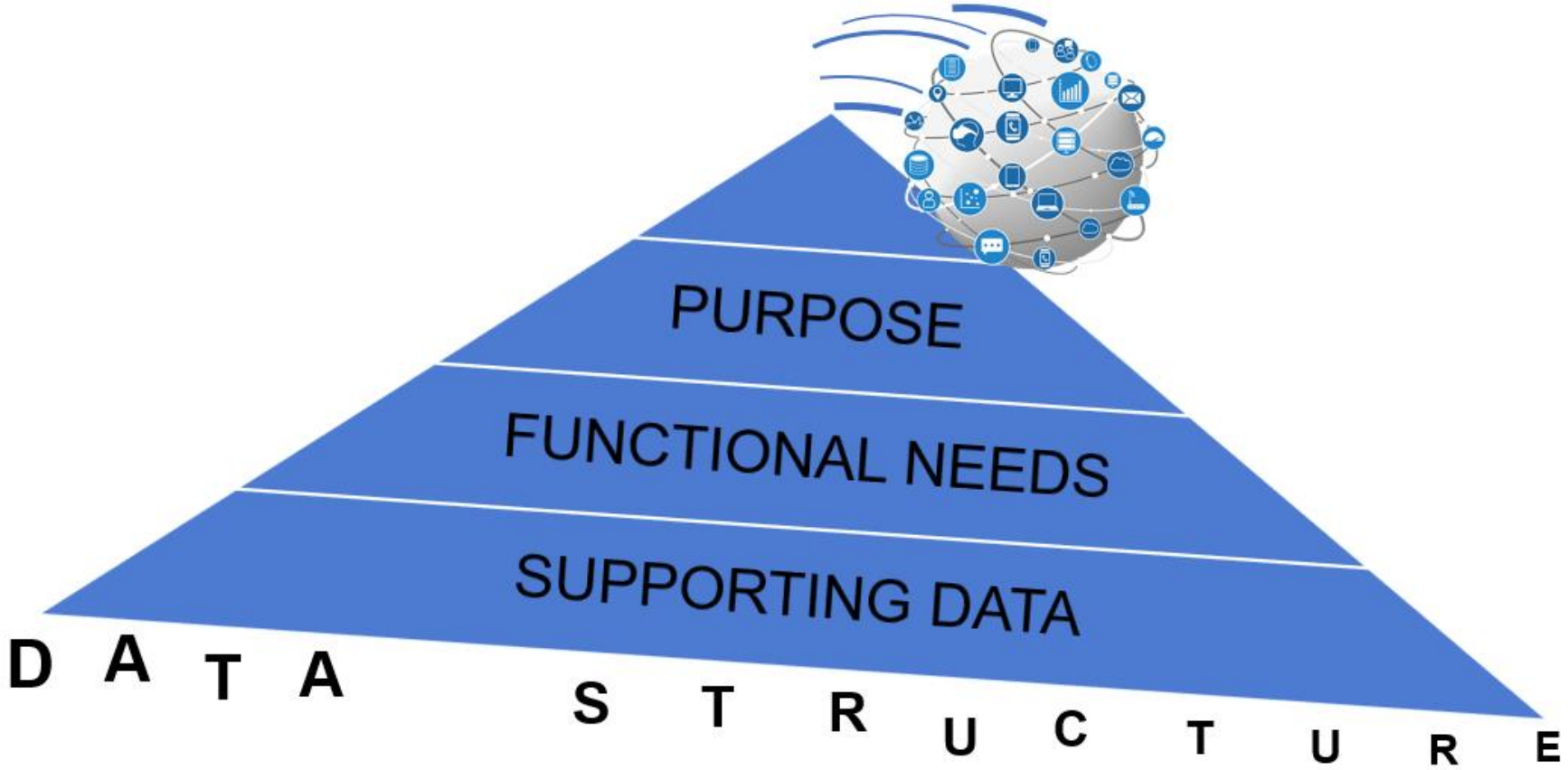
The Backbone to Asset Management!



Without it, you're only 50% complete in everything!

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Step 4: Assess

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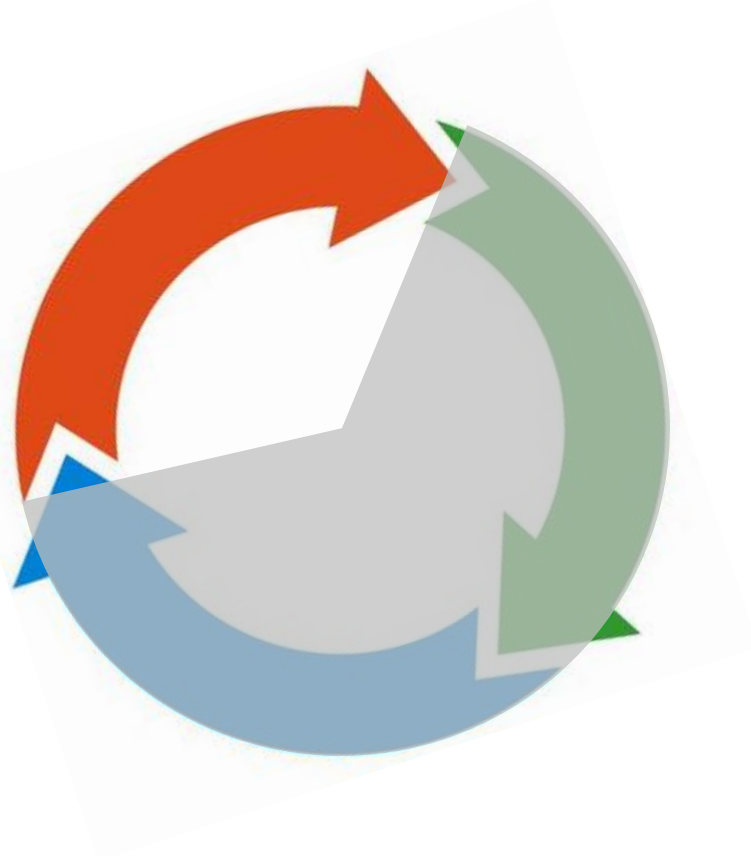
Assess – Gap Analysis

- Gap Analysis (Understand what you have and what you don't)
- What are the Authoritative Data Sources (Systems, Excel, GIS)
- Create a Data Roadmap
  - What to Collect (Critical vs. Nice to Have)
  - How to Structure your Data (Standards – UNIFORMAT II, ISO 55000, IIMM)
  - Create a Data Catalogue for each Asset Type. This will allow you to fill the data gaps
  - Develop a Data Collection Timeline



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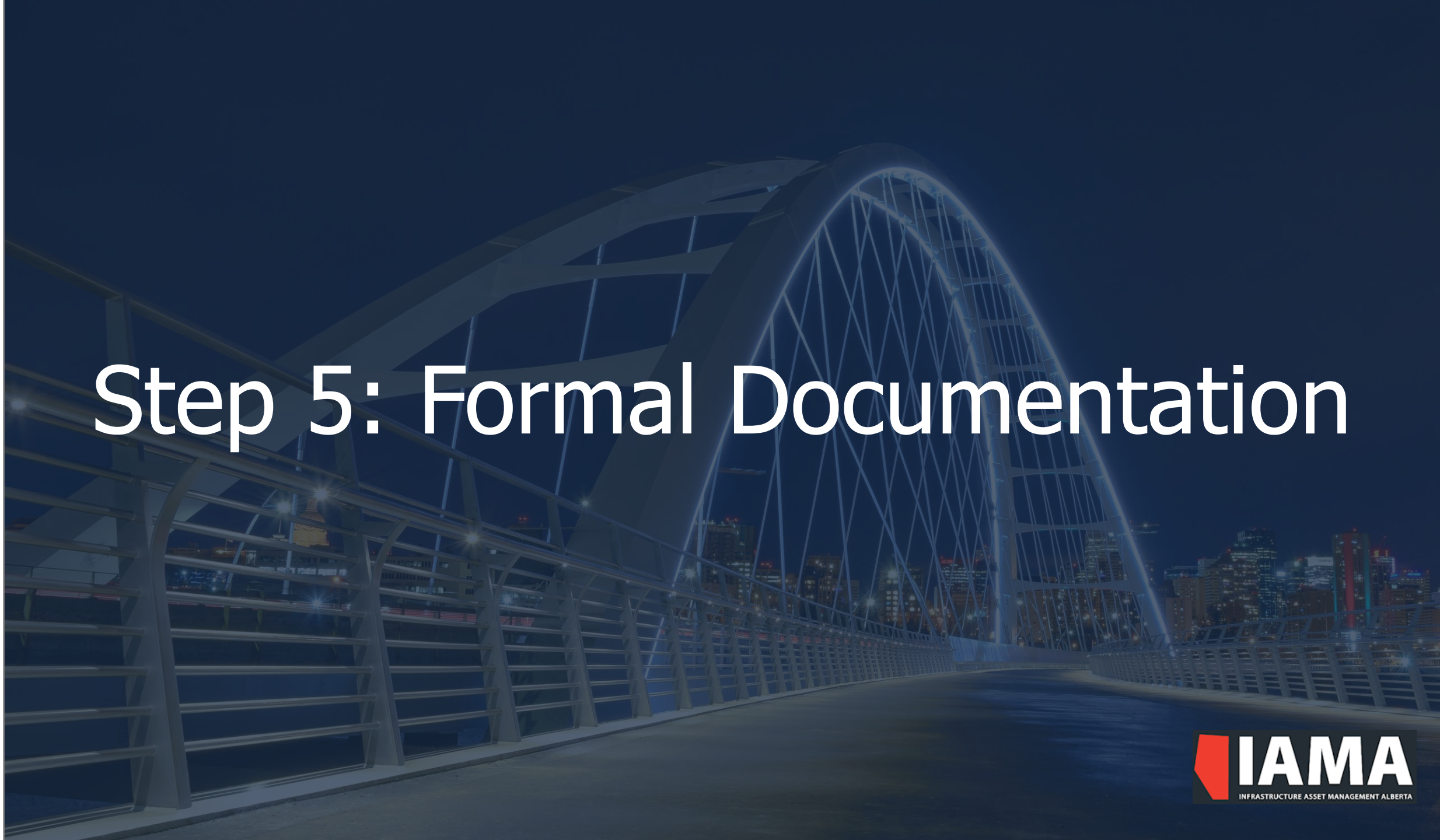
Step 5: Formal Documentation



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Documentation

Storm Sewer System Database Structure

The following is a recommendation of how storm system linear and point feature assets can be defined within CityWide AM inventory.

Category

- Storm Sewer System

Segments

- Main
- Catch Basin/Inlet
- Culvert
- Manhole
- Oil Grit Separator
- Outfall
- Water Lift Station
- Storm Water Management Pond
- Swale
- Valve
- Vault

Segment Details

Main (STMN)

- **Name** = Main Type
  - Trunk
  - Lateral or Lead
- **Location** = Street Name
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STMN123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = Additional attributes (E.g. Supplier, Material, Diameter, Length, Manhole To, Manhole From, Rd Seg ID, etc.)

Catch Basin/Inlet (CB)

- **Name** = Inlet Type
  - Apron
  - Curb
  - Ditch
  - Drop
  - Flanking
  - Slotted
- **Location** = Street Name
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. CB123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. Supplier, Material, Dimensions, Rd Seg ID, etc.)

Culvert (CLV)

- **Name** = Culvert Type
  - Arch
  - Box
  - Bridge
  - Circular
  - Elliptical
- **Location** = GPS Coordinates, street name, civic address, water feature name, etc.
- **Import ID** = Unique GIS ID (Alphanumeric preferred. E.g. CLV123)
- **Description** = Material
  - Concrete (CON)
  - Corrugated Metal Pipe (CMP)
  - DuroMaxx (DM)
  - High Density Polyethylene (HDPE)
  - Smooth Steel (STL)

User defined attributes = additional attributes (E.g. Supplier, Diameter, Length (m), Manufacturer, Rd Seg ID, etc.)

Manhole (STMH)

- **Name** = Manhole Type
  - Shallow
  - Normal
  - Deep
- **Location** = Street Name
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STMH123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = Additional attributes (E.g. Supplier, Material, Diameter, Invert Depth, Line in, Line out, Rd Seg ID, etc.)

Outfall (STO)

- **Name** = Outfall type
  - Ditch
  - Pipe
- **Location** = GPS Coordinates, street name, civic address, water feature name, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STO123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. Supplier, Material, Shape, Dimensions, Line in, Rd Seg ID, etc.)

Oil Grit Separator (OGS)

- **Name** = Separator name or type
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. OGS123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. Supplier, Material, dimensions, Rd Seg ID, etc.)

Lift Station (STLS)

- **Name** = Lift Station Name
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STLS123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. dimensions, particulars, etc.)

Storm Water Management Pond (SWMP)

- **Name** = SWMP Type
  - Dry Pond (Detention Basin)
  - Wet Pond (Retention Basin)
  - Natural (Marsh or Fen)
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. SWMP123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. Volume, dimensions, particulars, etc.)

Swale (STSW)

- **Name** = Swale Type
  - Dry
  - Wet
  - Vegetation
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STSW123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = additional attributes (E.g. Material, length, width, etc.)

Valve (STV)

- **Name** = Valve Name or Type
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique or GIS ID (Alphanumeric preferred. E.g. STV123)
- **Description** = Town, Hamlet, Subdivision, System, etc.
- **User defined attributes** = Additional attributes (E.g. Supplier, Material, Diameter, Rd Seg ID, etc.)

Vault (STVLT)

- **Name** = Vault Name or Type
- **Location** = GPS Coordinates, street name, civic address, etc.
- **Import ID** = Unique GIS ID (Alphanumeric preferred. E.g. WVLT123)
- **Description** = Vault Description
- **User defined attributes** = additional attributes (E.g. Type, Purpose, etc.)

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Step 6: Implement

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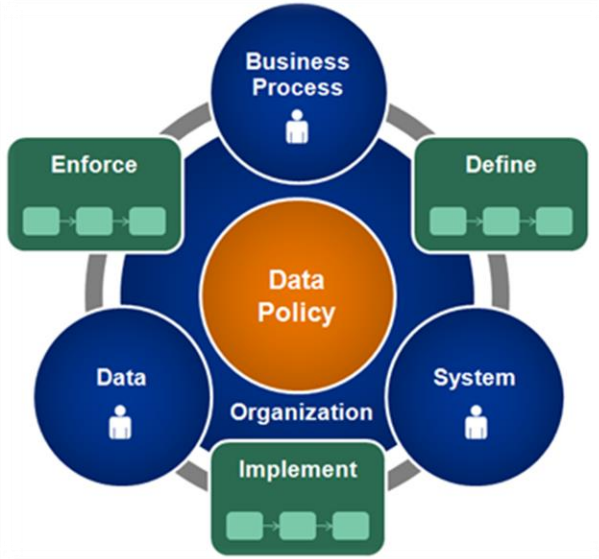
Data Governance

- DATA POLICY
  - The purpose of this policy is to ensure the consistency, integrity and continuity of the municipality's asset database inventory. It should also include defined roles and responsibilities to facilitate a standardized, structured approach to database management.
  - Individuals of groups involved
  - Principles
  - Alignment to the organizational objectives



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Climate Change and Asset Management

Integrating Climate Change Adaptation and Asset Management Practices

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Climate Change Adaptation and Asset Management

- Canada's temperature increase is double the global average
- Canadian infrastructure is in poor health
- Shared goal of sustainable service delivery
- Holistic approach to risk management

NWWC 2019

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Infrastructure & Assets Affected By Climate Change

- Roads
- Bridges
- Water
- Wastewater
- Stormwater
- Water
- Parks and Natural Capital
- Buildings

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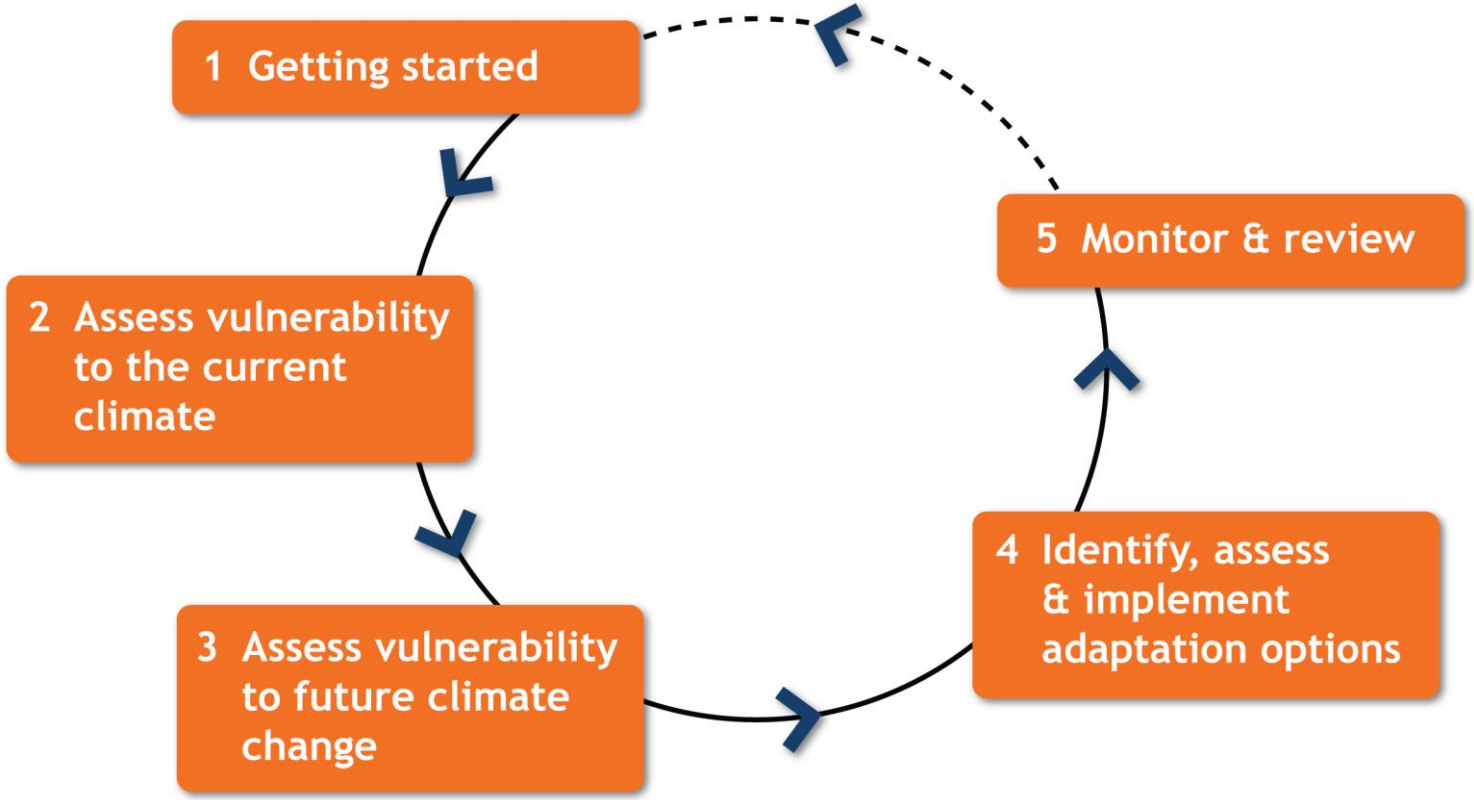
Climate Adaptation



UKCIP Adaptation Wizard – Oxford University

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Step 1 – Getting Started

The AM Policy

- The Problem / issue that needs to be addressed
  - Include the organization's commitment to integrating climate change
- The Players - the individuals and/or groups involved
  - Council, Finance, Public Works (include Sustainability / Environmental staff)
- A course of action and/or principles
  - Include the Integration of climate change adaptation
- Alignment to organizational objectives and goals
  - Include reference to other plans / policies / council directives with climate change considerations (Strat Plan, Official Plan, etc)

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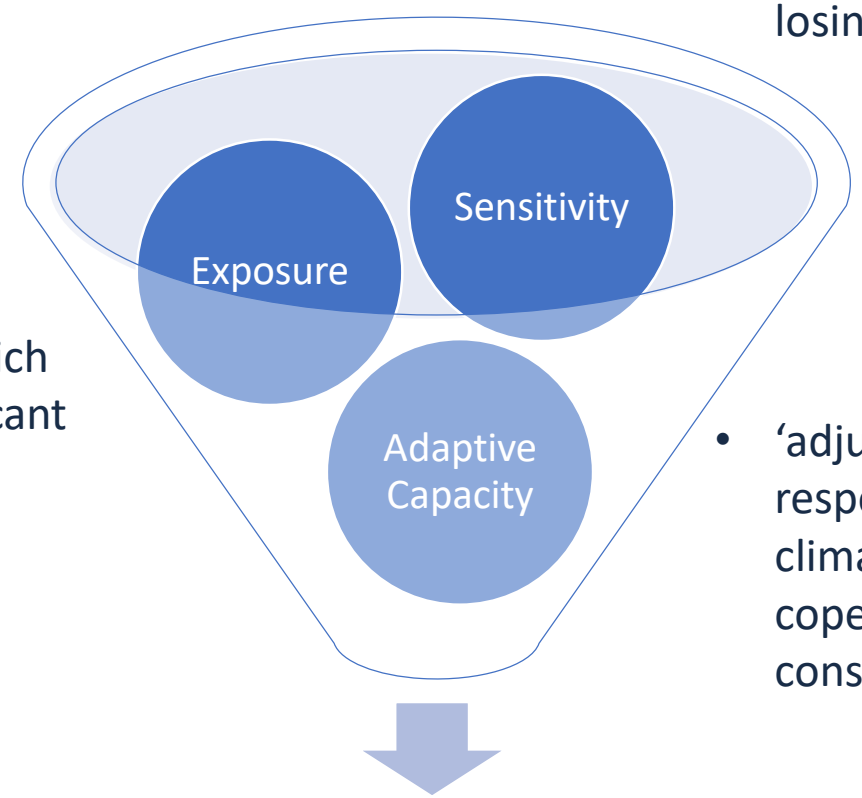
Step 2 – Assess Vulnerability to Current Climate Change

- ‘the capacity of a **system** to absorb disturbance without losing essential function.’



- ‘the nature and degree to which a **system** is exposed to significant climate variations.’

- ‘adjustments in a **system**, in response to actual or expected climatic variations, to better cope with adverse consequences.’

Vulnerability

- ‘the degree to which a **system** is susceptible, and unable to cope with, adverse effects of climate change, including climate variability and extremes.’

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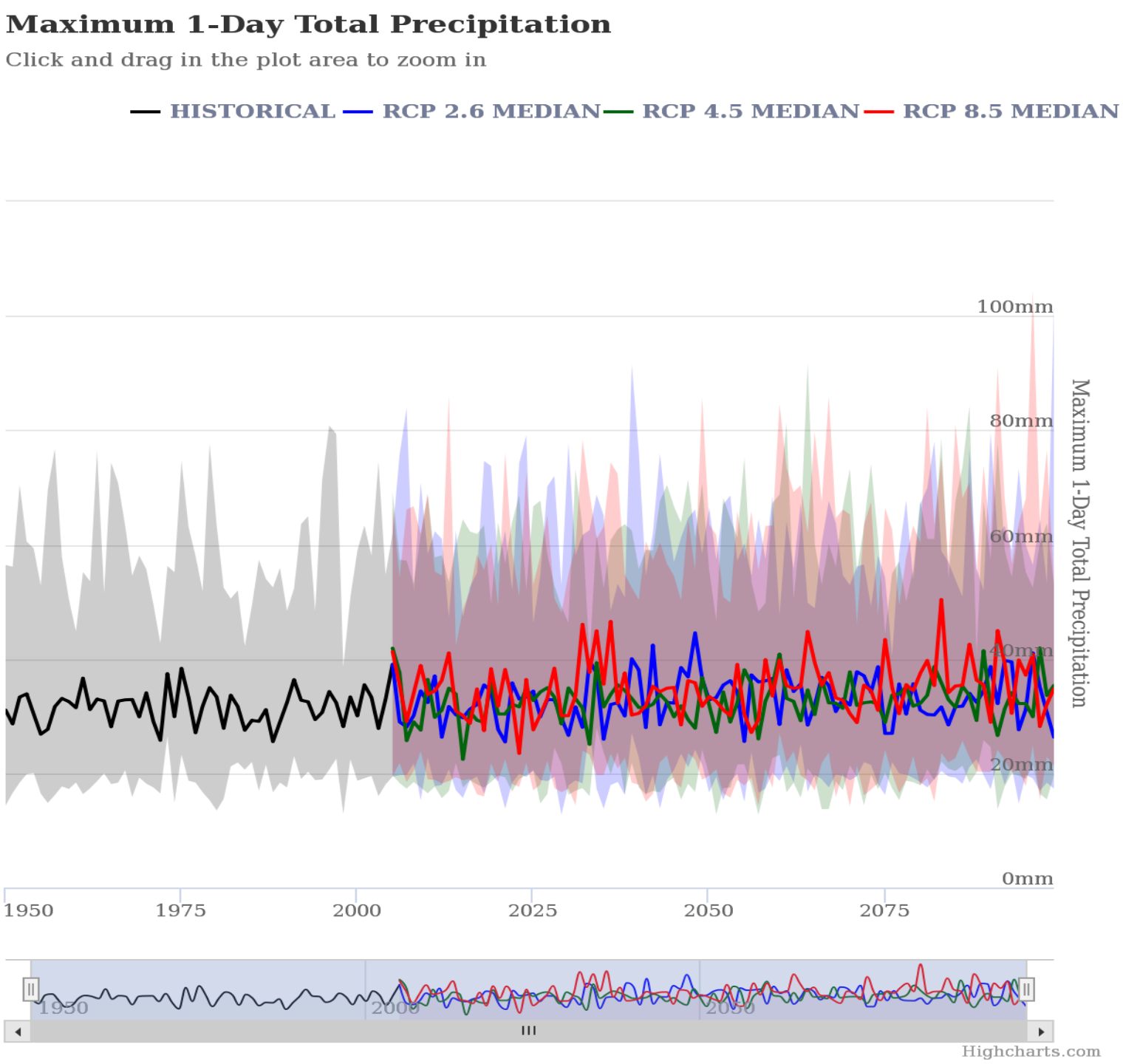
Step 3 – Assess Vulnerability to Future Climate Change

NWWC 2019

Lethbridge Precipitation Data

climatechangedata.ca



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Step 4 – Identify, Assess, & Implement Adaptation Options

AM – Life Cycle Activity Models - (Total Cost of Ownership)

Due to Climate Variability and Extreme Events:

- The estimated useful life span of assets may need to be reduced
- The interval between treatments may have to change
- The types of materials used in treatments may change
- New technologies may need to be introduced
- Some assets will need premature replacement and upgrading

- **All of the above will effect the Life Cycle Model & Total Cost of Ownership**

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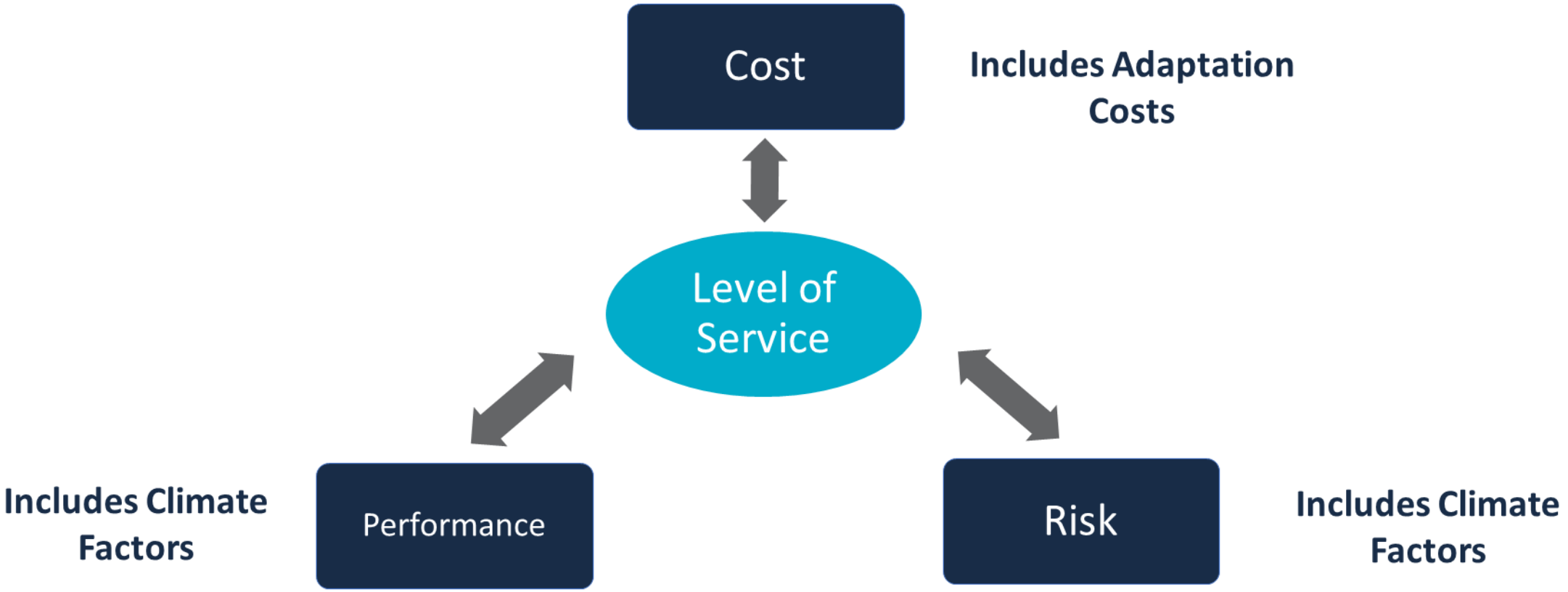
Step 5 – Monitor & Review

Levels of Service Frameworks



Local Network

A Roundtable for Local Leaders on Climate Change Adaptation

"Sometimes you don't have the money and the resources to develop a solution, so the best option is to build an informal network, just as we have created here today."

– Dr. Peter Walton, Knowledge Exchange Research Fellow, University of Oxford

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